Honeywell

LCZ Series

Hall-effect Zero Speed Sensors

DESCRIPTION

The LCZ Series Hall-effect Zero Speed Sensors provide a durable, cost-effective solution in most harsh environments.

The sensor is available in 9,5 mm [3/8 in/0.375 in] and 15,9 mm [5/8 in/0.625 in] diameters, in both 50,8 mm [2.00 in] and 76,2 mm [3.00 in] lengths.

The stainless steel package is simple to install and adjust. It does not require rotational orientation.

FEATURES

- Low cost
- Omni-directional sensor to target orientation
- Digital output
- Small size
- Low power consumption

POTENTIAL APPLICATIONS

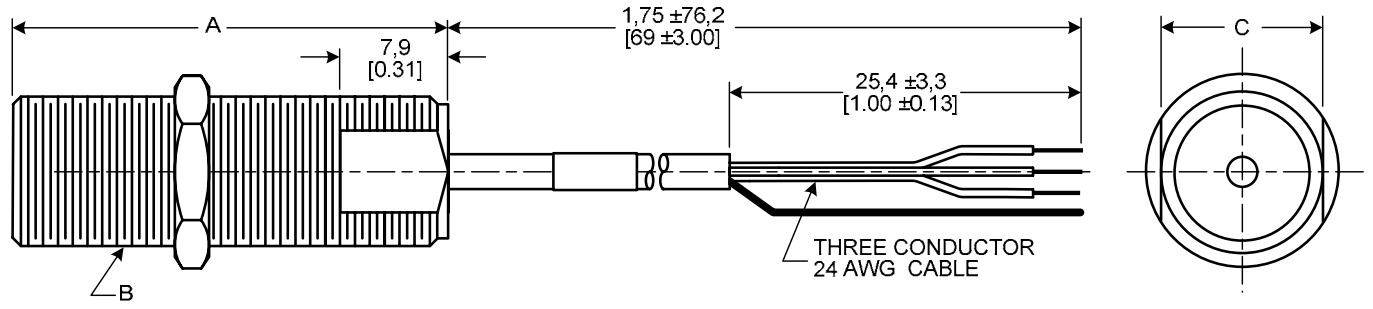
- Industrial process control
- Factory automation
- Rotary applications, such as:
  - Pumps
  - Rollers
  - Mixers
  - Fan speed measurement
  - Transmission
  - Spindles
  - Gear reducer RPM
  - Process speed
  - Synchronization
  - Generator set
  - Compressor speed
  - Dyno testing

LCZ Series

SENSOR SPECIFICATIONS

Characteristic	Minimum	Maximum	Unit	Condition
Supply voltage	4.5	26	Vdc	–
Supply current	–	20	mA	load = infinity, Vcc = 26
Reverse polarity	30	–	Vdc	–
Output sinking	–	20	mA	0.4 V max. short circuit protected
Voltage low	–	0.4	V	at 30 mA max. sink
Voltage high	–	30	Vdc	–
Duty cycle	20	80	%	within operating gap
Operating frequency	0	15 k	Hz	no orientation required
Output signal rise/fall time	–	4.0	µs	880 Ohm, 20 pF
Dielectric strength	200	–	Vac	<2 mA leakage
Operation gap	–	–	–	at gaps below curve (see Air Gap Performance Curve)
Output impedance	4.7	5.3	kOhm	–
Operating temperature range	-40 [-40]	125 [257]	°C [°F]	–
Storage temperature	–	125 [257]	°C [°F]	–
Sealing	IP68			
Shock	50 Gs, 11 ms			–
Vibration	15 Gs, 10 Hz to 2000 Hz			–
Housing material	stainless steel			–
Weight	see Mounting Dimensions			–

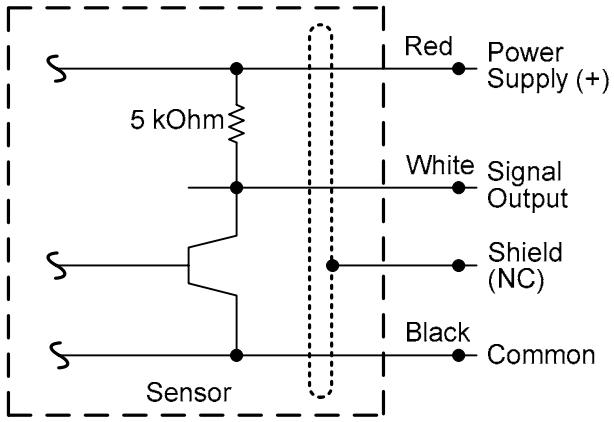
MOUNTING DIMENSIONS (For reference only: mm/[in])



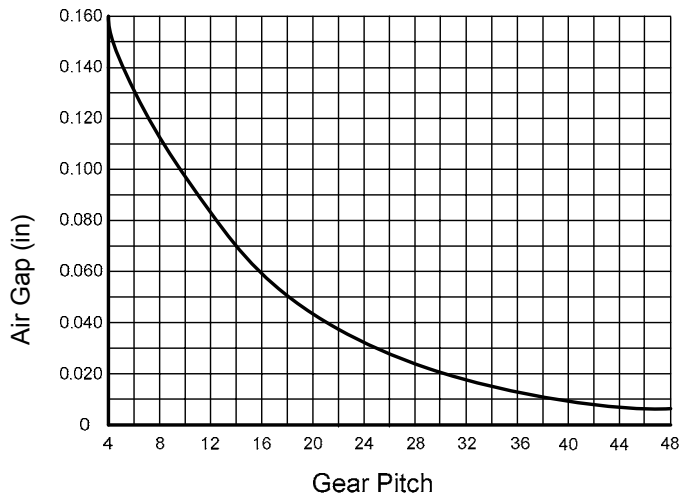
Catalog Listing	Thread Length (A)	Thread Type (B)	Flats (C)	Max. Mounting Torque	Weight
LCZ260	50,8 mm [2.00 in]	3/8-24UNF-2A	7,9 mm [0.312 in]	4,1 [36 in lb]	59,5 g [2.1 oz]
LCZ260-30	76,2 mm [3.00 in]	3/8-24UNF-2A	7,9 mm [0.312 in]	4,1 [36 in lb]	68,0 g [2.4 oz]
LCZ460	50,8 mm [2.00 in]	5/8-24UNF-2A	14,3 mm [0.562 in]	27,1 N m [240 in lb]	104,9 [3.7 oz]
LCZ460-30	76,2 mm [3.00 in]	5/8-24UNF-2A	14,3 mm [0.562 in]	27,1 N m [240 in lb]	136,1 g [4.8 oz]

Hall Effect Zero Speed Sensor

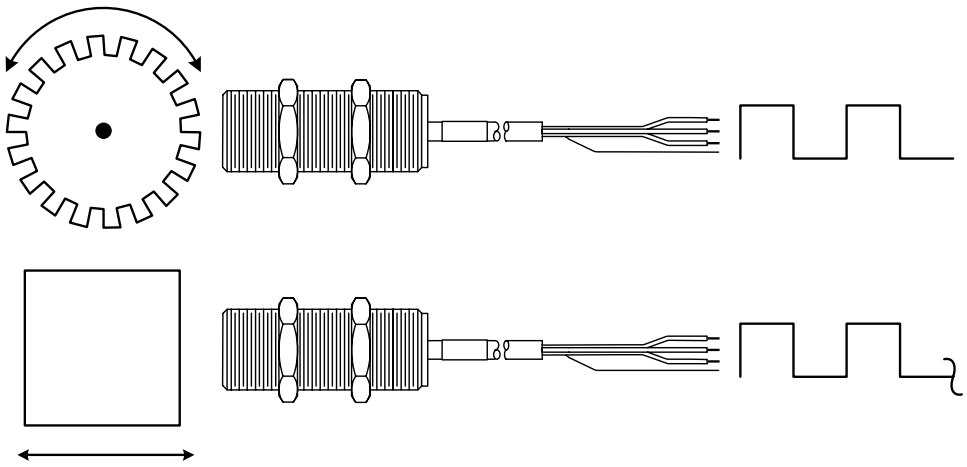
EQUIVALENT ELECTRICAL SCHEMATIC



AIR GAP PERFORMANCE CURVE



TARGET MOTION



ORDER GUIDE

Catalog Listing	Description
LCZ260	Hall-effect speed sensor, 3/8-24UNF-2A thread, 50,8 mm [2.00 in] length
LCZ260-30	Hall-effect speed sensor, 3/8-24UNF-2A thread, 76,2 mm [3.00 in] length
LCZ460	Hall-effect speed sensor, 5/8-24UNF-2A thread, 50,8 mm [2.00 in] length
LCZ460-30	Hall-effect speed sensor, 5/8-24UNF-2A thread, 76,2 mm [3.00 in] length

⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

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SALES AND SERVICE

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	+1-305-883-8257 Fax
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Honeywell

SNDJ-T4C-G01 Series

Double Hall-Effect Speed Sensor

DESCRIPTION

The T4C Hall-effect sensor generates square wave signals proportional to rotary speeds and also provides directional indication.

The T4C consists of two back-biased Hall-effect ICs that are zero-speed capable. The sensor must be oriented to the target using a special orientation sleeve. Zero-speed capabilities allow the T4C to also be used as a proximity switch.

FEATURES

- Back biased differential hall sensor
- Direct sensing of ferrous metal target
- Speed and direction output signals
- Zero speed sensing capability
- Rugged 12 mm [0.47 in] stainless steel housing
- IP68 sealing
- 1,5 mm [0.06 in] sensing range
- Quick connect termination

POTENTIAL APPLICATIONS

- Speed and direction monitoring of rotating target
- Over-speed detection
- Monitor shaft rotation
- Detect rotary position of gear or shaft

T4C Series

SENSOR SPECIFICATIONS

Characteristic	Parameter
Supply voltage	11 Vdc to 32 Vdc
Current consumption	20 mA max. (without load)
Signal outputs	1 square wave and 1 direction signal Open collector outputs with 10 kOhm pull-up; Imax = -20 mA The sensor is able to drive the coil of a relay by using a simple current limiting resistor. No additional protection against voltage peaks is needed. Limit values: Isink <70 mA, L <800 mH
Frequency range	0 Hz to 15 kHz
Insulation	Housing, cable shield, and electronic galvanically isolated (500 V/50 Hz/1 min.)
Operating temperature	-20 °C to 100 °C [-4 °F to 212 °F]
Housing	Stainless steel 1.4305. Max. allowable pressure applied to the front face: 100 bar
Cable/connector	S variant: with cable PUR, four wires 0.34 mm^2, AWG 22 C variant: with connector 4 pins/M12 standard
Protection class	Sensor head IP68, cable/entrance IP67, connector IP68 (mated)
Vibration immunity	30 g in the range of 5 Hz to 2000 Hz
Shock immunity	50 g during 20 ms, half-sine wave
Weight	~120 g, including 1 m cable
Air gap	For pole wheel M1 (DP 25,4): 0,1 mm to 0,5 mm [0.004 in to 0.02 in] For pole wheel M2 (DP 12,7): 0,1 mm to 1,5 mm [0.004 in to 0.06 in]
Pole wheel	Ferromagnetic toothed wheel, i.e. B. Ust37-2, type 1018 CRS, preferred involute gear form Module ≥(DP 25,4 [1.0 in]), min. tooth width 10 mm [0.4 in], side offset with min. tooth width: <0,2 mm [0.008 in], eccentricity <0,2 mm [0.008 in].

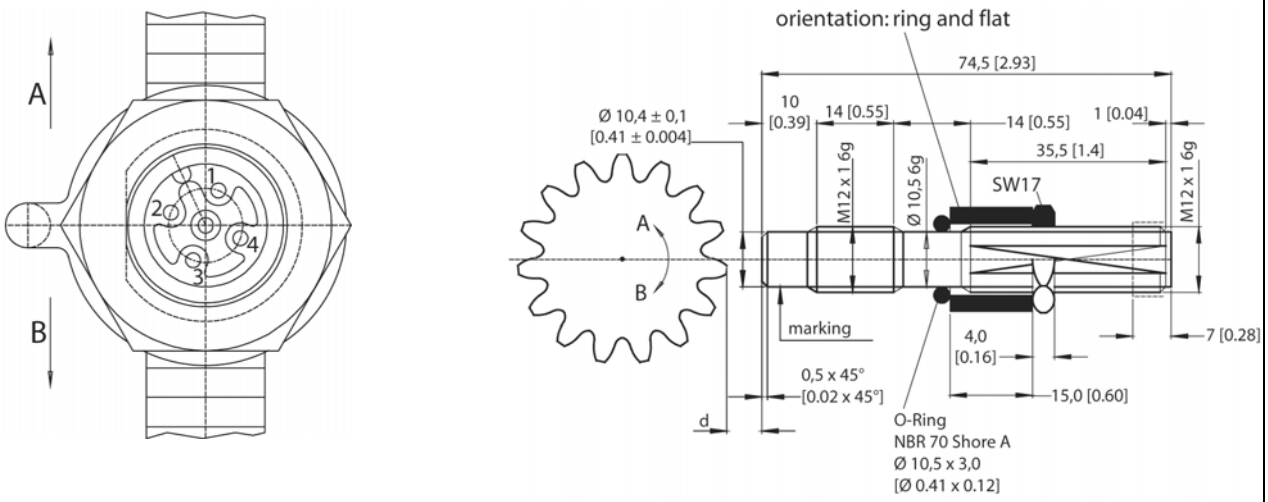
NOTICE

INSTALLATION INFORMATION

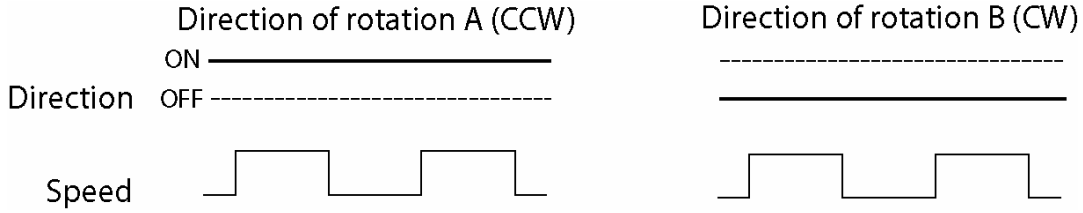
- The sensor wires must be laid as far as possible from large electrical machines. They must not run parallel with power cables. The maximum permissible cable length is 20 m [65 ft].
- The sensor should be mounted with the middle of the face side over the middle of the pole wheel. Where the pole wheel has teeth or slots and with radial sensor location, the sensor would normally be mounted over the center. Dependent upon the wheel width, a degree of axial movement is permissible.
- A solid and vibration-free mounting of the sensor is important.

Double Hall-Effect Speed Sensor

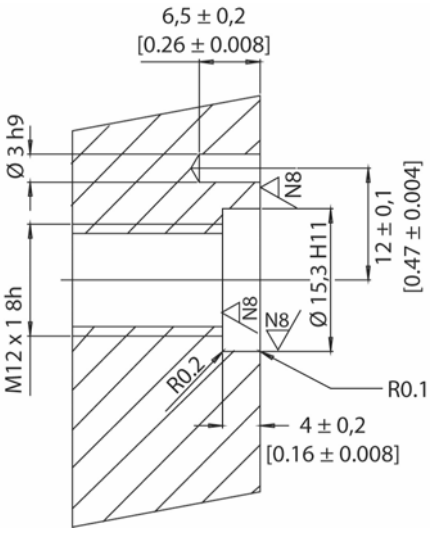
MOUNTING DIMESIONS (For reference only) mm [in]



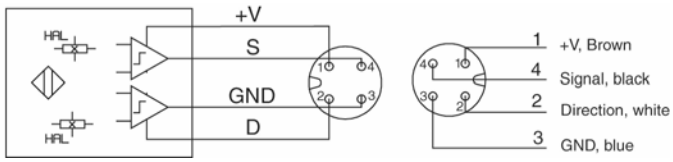
PULSE DIAGRAM



MOUNTING HOLES



WIRING DIAGRAM



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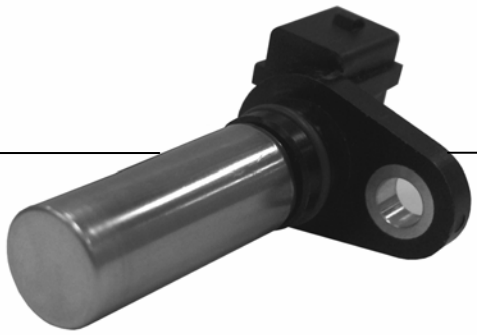
September 2006

Honeywell

SNDH Series

Quadrature General Industrial Speed and Direction Sensors



DESCRIPTION

The SNDH Series is a dual differential hall sensor that provides speed and direction information using a quadrature output with signals 90° phase shifted from each other. Target direction is determined by output lead/lag phase shifting.

This product is designed for applications where extremely high resolution is required at wide frequency ranges, 0 kHz to 15 kHz, and large air gaps. BiCMOS (bipolar complementary metal-oxide-semiconductor) Hall-effect technology, using advanced digital signal processing for dynamic off-set cancellation, provides enhanced air gap performance and phase shift accuracy over most conditions.

Unique patented (pending) IC (integrated circuit) packaging provides output phase shift tolerancing with enhanced accuracy.

The robust package is automotive under-the-hood grade for most environmental conditions as well as EMI (electromagentic interference) hardened. Multiple connection options, including wire harness and integral connector versions using AMP super seal or AMP Jr. Timer connectors, are available. Package design includes an o-ring seal for pressure applications and a fixed mounting flange.

FEATURES

- Hall-effect magnetic sensing technology
- Dual differential Hall provides enhanced target resolution
- Advanced performance dynamic offset self calibration
- Air gap up to 2 mm [0.08 in]
- Near zero speed
- Automotive under-the-hood packaging integrity
- EMI hardened
- High frequency switching capability (up to 15 kHz)
- -40 ºC to 150 ºC [-40 °F to 302 °F] continuous operating temperature
- Multiple connector options
- Short circuit protection
- Reverse voltage protection
- Open collector output
- Low jitter output
- O-ring seal

POTENTIAL APPLICATIONS

- Steering position
- Tachometers/counters
- Encoders
- Speed and direction of gears and shafts in transmissions, hydraulic motors, pumps, and gear boxes

SNDH Series

TABLE 1. SPECIFICATIONS

Characteristic	Parameter	Note
Sensing air gap	0 mm to 2,0 mm [0 in to 0.08 in]	may achieve larger gaps with testing of actual target
Target tooth width	2,0 mm [0.08 in] (recommended)	other geometry may be suitable
Target slot width	2,0 mm [0.08 in] (recommended)	other geometry may be suitable
Tooth height	>3,0 mm [0.12] (recommended)	shorter tooth heights may limit max. air gap performance
Target width	>5,0 mm [0.20] (recommended)	narrow targets may limit axial offsets
Sensor misposition to target	±1,5 mm [0.06]	dependent on target geometry
EMI radiated immunity	100 V/m peak	400 Hz to 2 GHz
EMI bulk current injection	60 mA	20 MHZ to 400 MHz
EMI ESD	16/8 KV air/contact	against the connector (150 pF, 330 Ohm)
EMI fast transient burst	EN61000-4-4 Level 4	–
Operating temperature	-40 °C to 150 °C [-40 °F to 302 °F]	continuous
Thermoshock	-40 °C to 150 °C [-40 °F to 302 °F]	–
Humidity	168 hr	95% humidity at 90 °C [194 °F]
Salt fog	96 hr	DIN IEC 6872-11
Thermosaline dunk	5 dunks	105 °C to 0 °C [221 °F to 32 °F] air to liquid, 5% saline
High temp exposure with power	1000 hs at 150 °C [302 °F]	–
Mechanical shock	50 g	–
Vibration	30 g, 10 Hz to 2 kHz	–
Resistance to fluids	general automotive under the hood fluids	–
Supply voltage	4.5 V to 18 V	–
Max. continuous supply voltage	18 V	–
Reverse voltage	-18 V max.	continuous
Current (normal)	13.6 mA	all conditions
Current (max.)	18 mA	all conditions
Short circuit protection	80 mA	–
Output signal type	square wave	two channel, phase shifted by 90°, either channel can lead or lag, push/pull
Duty cycle	50% ±10%	–
Phase shift	90% ±20%	using recommended target tooth/slot
Output high	≥Vs - 0.5 V	–
Output low	≤0.5 V	–
Load current	20 mA max.	each output at all conditions
Output low	≤0.5 V	–
Rise time	10 µs typ.	dependent on load resistor
Fall time	1 µs typ.	–
Frequency	0 Hz to 15 kHz	higher frequencies about 10 kHz may be dependent on target geometry and air gap

FIGURE 1. WIRING DIAGRAM

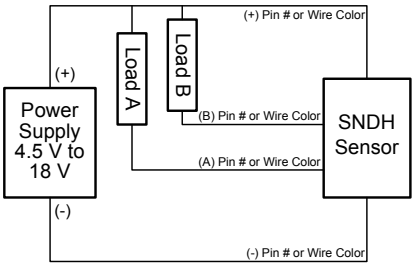


FIGURE 2. SENSOR OUTPUT

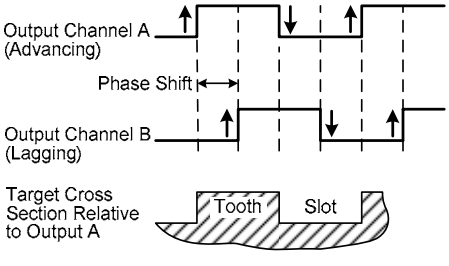
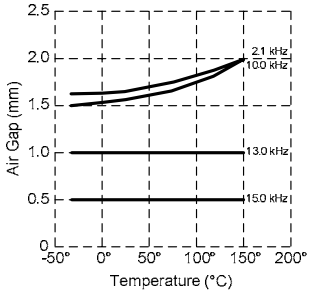


FIG. 3. TEMPERATURE/AIR GAP/ FREQUENCY DERATING CURVE



MOUNTING DIMENSIONS (For reference only: mm [in])

FIGURE 4. SNDH-T4C-G01

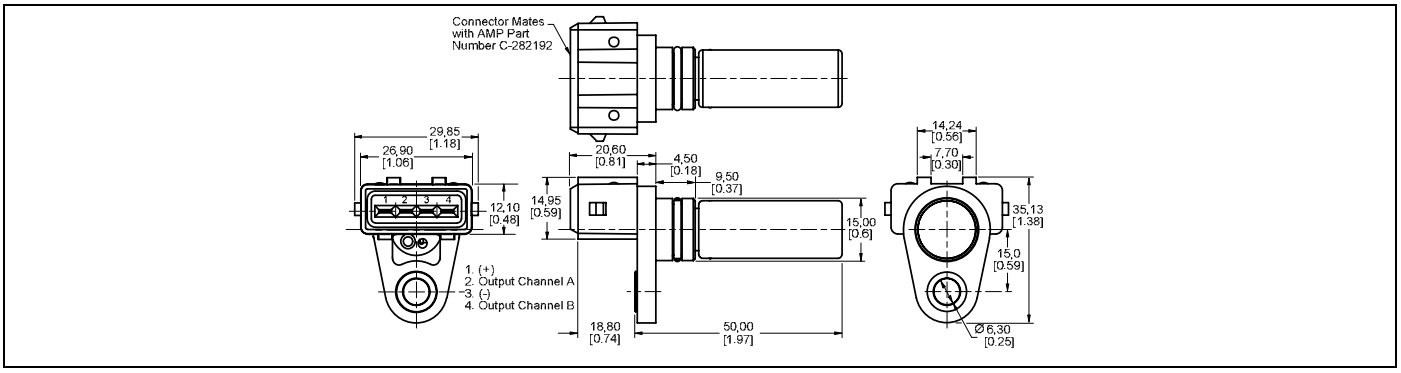


FIGURE 5. SNDH-T4L-G01

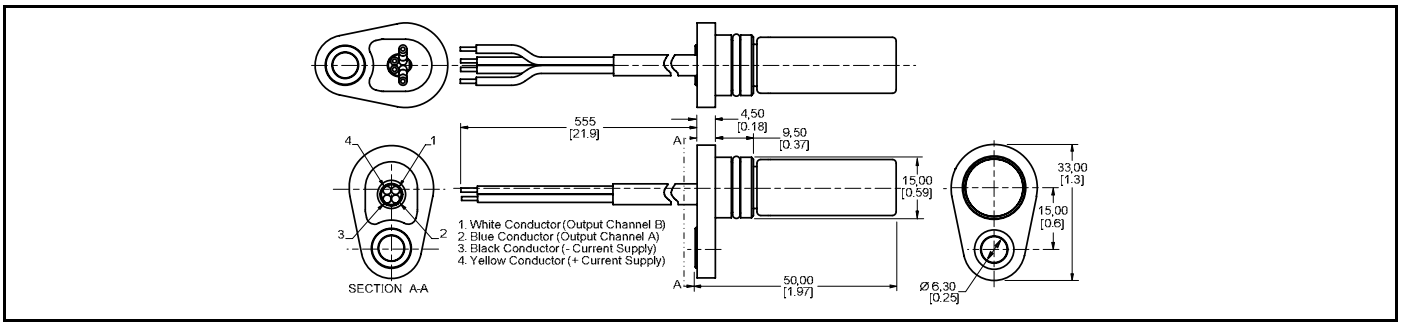


FIGURE 6. SNDH-T4P-G01

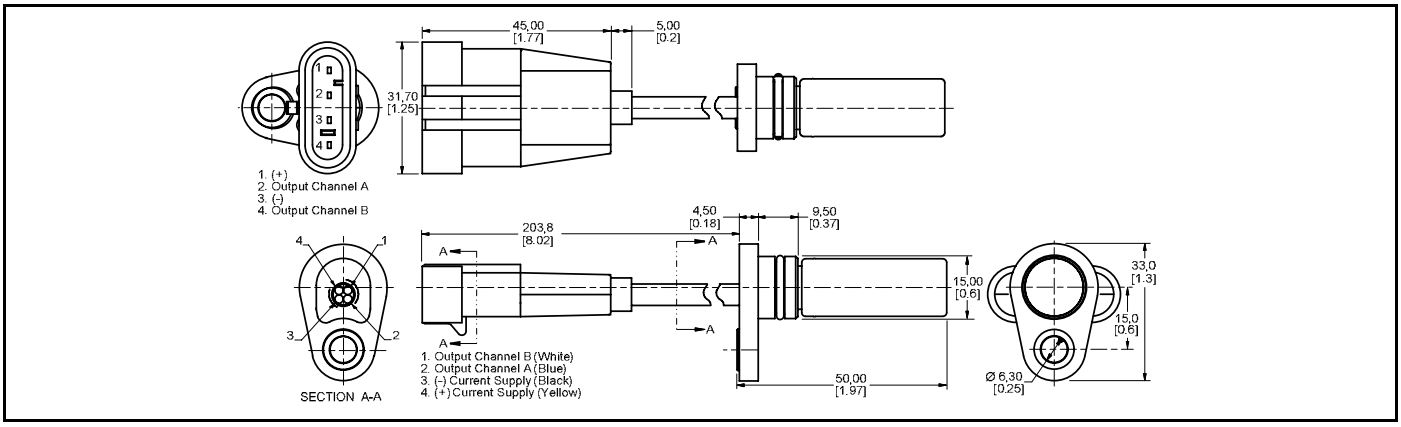


FIGURE 7. SNDH-T4P-G02

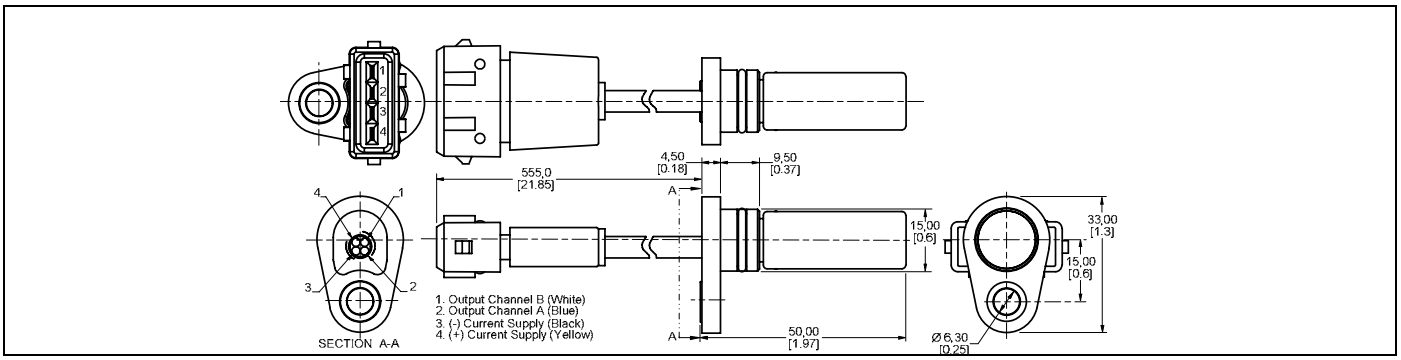
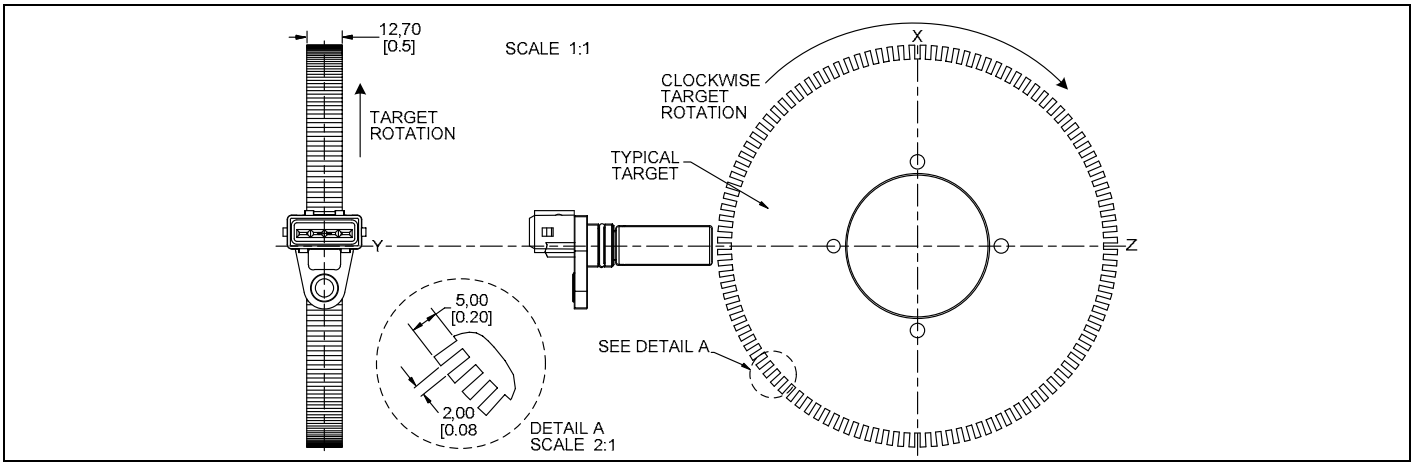


FIGURE 8. GENERAL MOUNTING GEOMETRY



ORDER GUIDE

Catalog Listing	Description
SNDH-T4C-G01	SNDH Series, dual hall speed and position sensor, 4 wire output, connector
SNDH-T4L-G01	SNDH Series, dual hall speed and position sensor, 4 wire output, leadwire
SNDH-T4P-G01	SNDH Series, dual hall speed and position sensor, 4 wire output, pigtail with rectangular connector
SNDH-T4P-G02	SNDH Series, dual hall speed and position sensor, 4 wire output, pigtail with oval connector

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USA/Canada	+1-800-537-6945
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	+1-815-235-6545 Fax

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Honeywell

000641-2-EN IL50 GLO Printed in USA
October 2007

Honeywell

SNDJ-CNT Series

Tachometers

DESCRIPTION

Honeywell's CNT Series is the next generation of flexible and powerful tachometer products. Configured as either DIN rain or panel-mounted units, CNT Series products are suitable for the measurement, display, and control of speed in various applications – from diesel engines to windmills and escalators. They sense, monitor, discriminate, protect, diagnose, and boost.

The G01/G02 and G03/G04 are supplied with full documentation and the CNT Windows software. This allows quick and easy configuration of all operating parameters, unit interrogation of identity and parameters, PC display of current measurement and relay status, and archiving and printing of the configuration.

FEATURES

- Converts absolute speed into an analog signal
- Including 2 limits (A/B) with programmable hysteresis
- One changeover relay assigned via binary input to limit (A or B)
- G03 and G04 models with digital display
- Isolated signal input with automatic trigger level adjustment
- Built in isolated sensor supply with sensor monitoring
- Open collector output of sensor frequency
- Accuracy class 0.05 % for limits and 0.5 % for analog signals
- Configuration and status via Windows software
- Wide tolerance 10 Vdc to 36 Vdc power supply

POTENTIAL APPLICATIONS

- Diesel engine start control and overspeed protection
- Micro turbine measurement and protection
- Turbocharger speed measurement
- Machine protection in safety critical applications
- Universal speed measurement and indication

SNDJ-CNT Series

SPECIFICATIONS

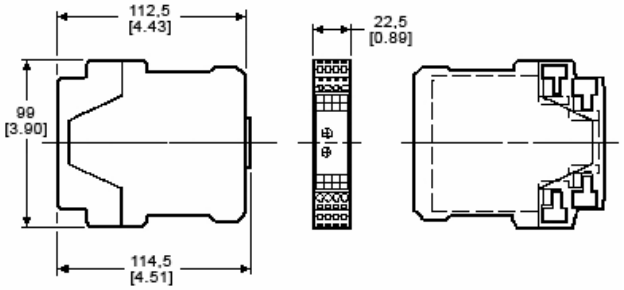
Parameter	Characteristic
Measuring range	Lowest: 0 Hz to 1,000 Hz Highest: 0 Hz to 35 kHz
Accuracy	0.5% referred to the analog output end of range value.
Analog output	G01/G03: current output 0 mA to 20 mA, resp. 4 mA to 20 mA G02/G04: voltage output 0 V to 10 resp. 2 V to 10 V Load G01: max 500 Ohm corresponding to a max. of 10 V Load G02: min. load 7 kOhm corresponding to a max. of 1.4 mA
Maximum open circuit voltage	12 V
Resolution	12 bit corresponding to 1:4096.
Maximum linearity error	0.1 %
Temperature drift	±100 ppm/degree K typ., ±300 ppm/degree K max.
Set points/relay range	See measuring range above
Hysteresis	for each limit an upper and a lower set point may be set independently
Change over contact	max. 250 Vac, 1250 VA (dc: see operating instructions)
Data I/O	Serial EIA RS 232 interface with +5V-CMOS level 3-pole. 3,5 mm stereo headphone connector on the front side, common reference potential with negative pole of sensor supply
Measuring/response time	The min. measuring time (fix time) is programmable: 2/5/10/20/50/100/200/500 ms, 1/2/5 s **For input frequencies with a period SHORTER than the fix time:** *Analog output* • Max.: 2 tix time + max. period of the input frequency + 7.5 ms • Typ.: fix time + 1 period of the input frequency + 7.5 ms *Relay* • Max.: 2 fix time + max. period of the input frequency + 10.5 ms • Typ.: fix time + 1 period of the input frequency + 10.5 ms **For input frequencies with a period LONGER than the fix time**: *Analog output* • Max.: period of the input frequency + 7.5 ms *Relay* • Max.: period of the input frequency + 10.5 ms
Sensor input	• Input resistance: 30 kOhm • Frequency range: (-3 dB): 0.01 Hz/35 kHz • Trigger level: adaptive trigger level from 20 mV to 5 V or 500 mV to 5 V (factory configuration) peak depending on the amplitude of the input signal
Sensor supply	Built-in sensor power supply: +14 V, max 35 mA, short-circuit proof built-in pull up (+14 V) and pull-down (0 V) resistor 820 Ohm for connection of two-wire transmitters or daisy chaining of CNTs
Sensor monitoring	• Powered 2 and 3 wire sensors: min. and max. current consumption values are selectable in the range • 0.5 mA to 25 mA. Sensors with consumption below Imin. or above Imax. will be signaled as defective • Electromagnetic/VR sensors: Open circuit state of sensors. This supervision runs permanently • Both monitoring functions can be switched off via the configuration software
Open collector output	Galvanically separated output of sensor frequency.
Binary inputs	For external selection between two sets (A/B) of programmable relay control and acknowledge functions: (No external pull up needed) low active :U < +1.5 V high (open) :U > +3.5 V

SPECIFICATIONS (continued)

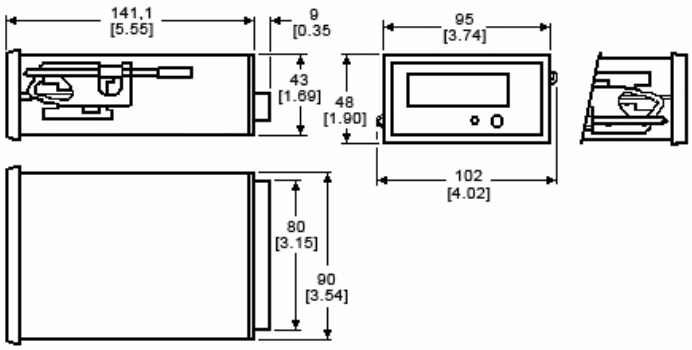
Parameter	Characteristic
Environmental	KUE according to DIN 40 040 • Operating temperature: -40 °C to 85 °C [-40 °F to 185 °F] • Storage temperature: -40 °C to 90 °C [-40 °F to 194 °F] • Relative humidity up to 75% average over one year period, up to 90% max. for 30 days
Power supply	10 Vdc to 36 Vdc, power consumption max. 3 W
Insulation	Galvanic separation between power supply, current output and the sensor power supply. Isolation 700 Vdc/500 Vac. Relay contact isolation: 1500 AC
Electromagnetic compatibility (EMC)	• Radiation in accordance with international standards and EN 50081-2 • Immunity in accordance with international standards and EN 50082-2 • Conducted emissions: CISPR 16-1, 16-2 Radiated emissions: EN 55011 • Electrostatic discharge: IEC 61000-4-2 Electromagnetic fields: IEC 61000-4-3 • Conducted fast transients: IEC 61000-4-4 Conducted slow transients: IEC 61000-4-5 • Conducted high frequency: IEC 61000-4-6 • Pulse modul. elec. field: ENV 50140 • Power frequency magnetic field: IEC 1000-4-8
Standards	• EN 50155 • GL/Germanischer Lloyd • Meets UL requirements - certification available upon request
Rail	Rail DIN 4622713 (EN 50022) or mounting plate to DIN 43660 (46121)
Housing	Protection class IP40, Terminal IP20
Terminals	See operating instructions
Weight	G01/G02: 150 g [5.29 oz] G03/G04: 210 g [7.41 oz]

DIMENSIONS (For reference only. mm/[in])

G01/G02



G03/G04



ORDER GUIDE

Catalog listing	Description
G01	One channel tachometer with relay and 0 mA/4 mA to 20 mA output
G02	One channel tachometer with relay and 0 V/2 V to 10 V output
G03	One channel tachometer with relay and 0 mA/4 mA to 20 mA output, with display
G04	One channel tachometer with relay and 0 V/2 V to 10 V output, with display

⚠ WARNING

PERSONAL INJURY

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December 2006

Honeywell

SNDJ-H3*-G0* Series

Hall-Effect Zero-Speed Sensors

DESCRIPTION

The H3C and H3L series Hall-effect speed sensors are designed for use with a ferromagnetic gear or pole wheel to generate impulse frequencies proportional to the speed of the target.

The sensors are capable of zero speed and rotational orientation is independent of sensor function.

FEATURES

- Back biased hall sensor
- Direct sensing of ferrous metal target
- Zero speed capability
- Rugged 12 mm [0.47 in] and 5/8 in [15,88 mm] stainless steel housing
- IP68 sealing
- 1,5 mm [0.06 in] sensing range
- Preleaded cable of connector versions available

POTENTIAL APPLICATIONS

- High speed gear tooth sensing
- Over-speed detection
- Monitor shaft rotation
- Detect rotary position of gear or shaft
- Position sensing of any ferrous target

SNDJ-H3*-G0*Series

SENSOR SPECIFICATIONS

Characteristic	Parameter
Supply voltage	8 Vdc to 25 Vdc
Current consumption	10 mA max. (without load)
Signal outputs	Square wave signal from NPN output transistor with 2.7 kOhm pull-up, dc-coupled to the supply (negative pole = reference voltage) 25 mA max. load Output voltage HI: power supply voltage Output voltage LO: <0.5 Volt @ I = 25 mA
Frequency range	0 Hz to 15 kHz
Insulation	Housing and electronics are galvanically isolated (500 V/50 Hz/1 min.)
Operating temperature	-20 °C to 100 °C [-4 °F to 212 °F]
Housing	Stainless steel 1.4305. Dimensions per drawings.
Cable/connector	L version: PUR cable, three conductor 0.34 mm^2 [0.013 in^2](AWG 22) C version: Euro M12 thread 4-pin connector
Protection class	Sensor head IP68, cable/entrance IP67, connector IP68 (mated)
Vibration immunity	30 g in the range 5 Hz to 2000 Hz
Shock immunity	50 g during 20 ms, half-sine wave
Weight	L version: ~120 g, including 1 m [39.37 in] cable C version: ~80 g
Air gap	For pole wheel M1 (DP 25,4): 0,3 mm to 0,5 mm [0.012 in to 0.02 in] For pole wheel M2 (DP 12,7): 0,3 mm to 1,5 mm [0.012 in to 0.06 in]
Pole wheel	Ferromagnetic toothed wheel, i.e. B. USt37-2, type 1018 CRS, preferred involute gear form Module ≥(DP 25.4 [1.0 in]), min. tooth width 6 mm [0.24 in], side offset with min. tooth width: <0,2 mm [0.008 in]

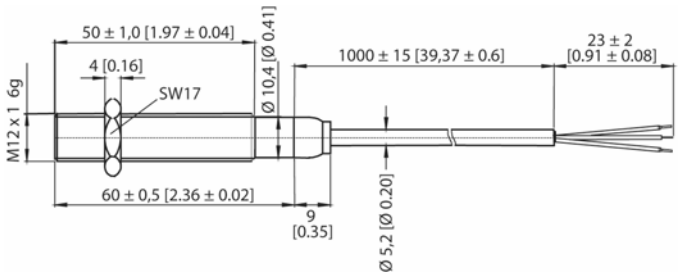
NOTICE

INSTALLATION INFORMATION

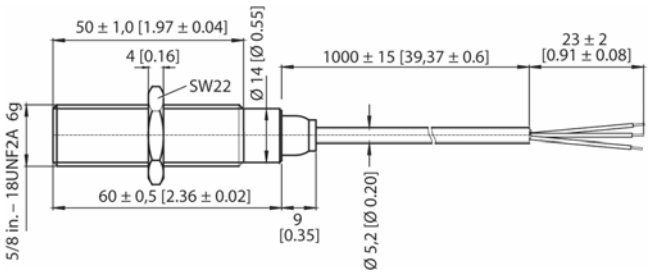
- The sensor wires must be laid as far as possible from large electrical machines. They must not run parallel with power cables. The maximum permissible cable length is 20 m [65 ft].
- Using radial or axial mounting, the sensor should be mounted with the center of the sensor face over the center of the gear teeth or targets. Using radial sensor mounting, some axial movement is permissible.
- A solid and vibration-free mounting of the sensor is important.

MOUNTING DIMESIONS (For reference only) mm [in]

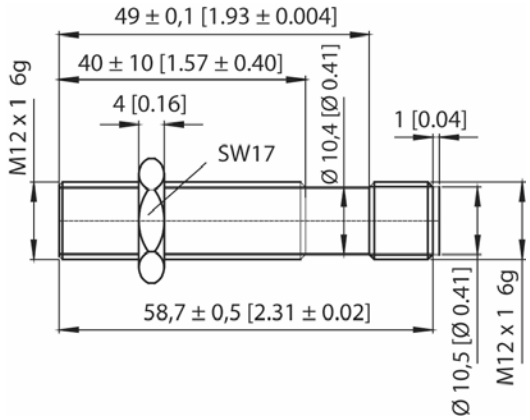
H3L-G01



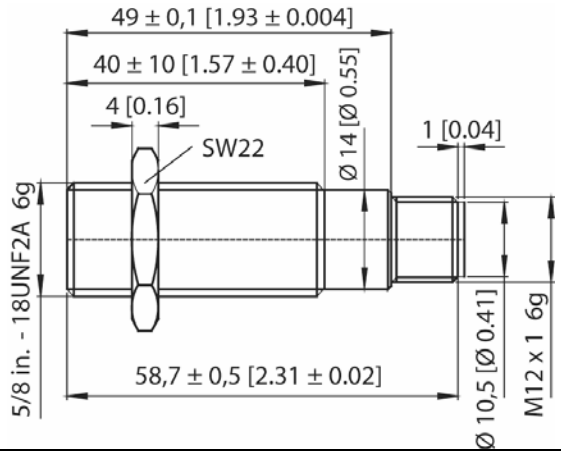
H3L-G02



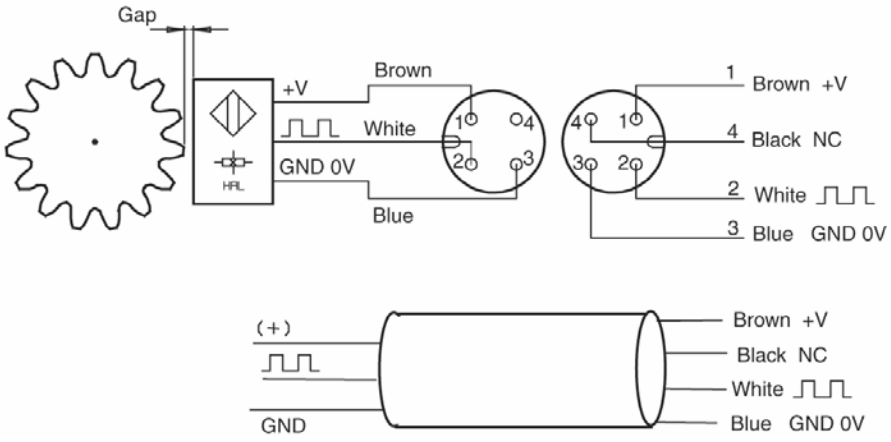
H3C-G01



H3C-G02



WIRING DIAGRAM



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September 2006

Honeywell

SNDJ-T4C-G01 Series

Double Hall-Effect Speed Sensor

DESCRIPTION

The T4C Hall-effect sensor generates square wave signals proportional to rotary speeds and also provides directional indication.

The T4C consists of two back-biased Hall-effect ICs that are zero-speed capable. The sensor must be oriented to the target using a special orientation sleeve. Zero-speed capabilities allow the T4C to also be used as a proximity switch.

FEATURES

- Back biased differential hall sensor
- Direct sensing of ferrous metal target
- Speed and direction output signals
- Zero speed sensing capability
- Rugged 12 mm [0.47 in] stainless steel housing
- IP68 sealing
- 1,5 mm [0.06 in] sensing range
- Quick connect termination

POTENTIAL APPLICATIONS

- Speed and direction monitoring of rotating target
- Over-speed detection
- Monitor shaft rotation
- Detect rotary position of gear or shaft

T4C Series

SENSOR SPECIFICATIONS

Characteristic	Parameter
Supply voltage	11 Vdc to 32 Vdc
Current consumption	20 mA max. (without load)
Signal outputs	1 square wave and 1 direction signal Open collector outputs with 10 kOhm pull-up; Imax = -20 mA The sensor is able to drive the coil of a relay by using a simple current limiting resistor. No additional protection against voltage peaks is needed. Limit values: Isink <70 mA, L <800 mH
Frequency range	0 Hz to 15 kHz
Insulation	Housing, cable shield, and electronic galvanically isolated (500 V/50 Hz/1 min.)
Operating temperature	-20 °C to 100 °C [-4 °F to 212 °F]
Housing	Stainless steel 1.4305. Max. allowable pressure applied to the front face: 100 bar
Cable/connector	S variant: with cable PUR, four wires 0.34 mm^2, AWG 22 C variant: with connector 4 pins/M12 standard
Protection class	Sensor head IP68, cable/entrance IP67, connector IP68 (mated)
Vibration immunity	30 g in the range of 5 Hz to 2000 Hz
Shock immunity	50 g during 20 ms, half-sine wave
Weight	~120 g, including 1 m cable
Air gap	For pole wheel M1 (DP 25,4): 0,1 mm to 0,5 mm [0.004 in to 0.02 in] For pole wheel M2 (DP 12,7): 0,1 mm to 1,5 mm [0.004 in to 0.06 in]
Pole wheel	Ferromagnetic toothed wheel, i.e. B. Ust37-2, type 1018 CRS, preferred involute gear form Module ≥(DP 25,4 [1.0 in]), min. tooth width 10 mm [0.4 in], side offset with min. tooth width: <0,2 mm [0.008 in], eccentricity <0,2 mm [0.008 in].

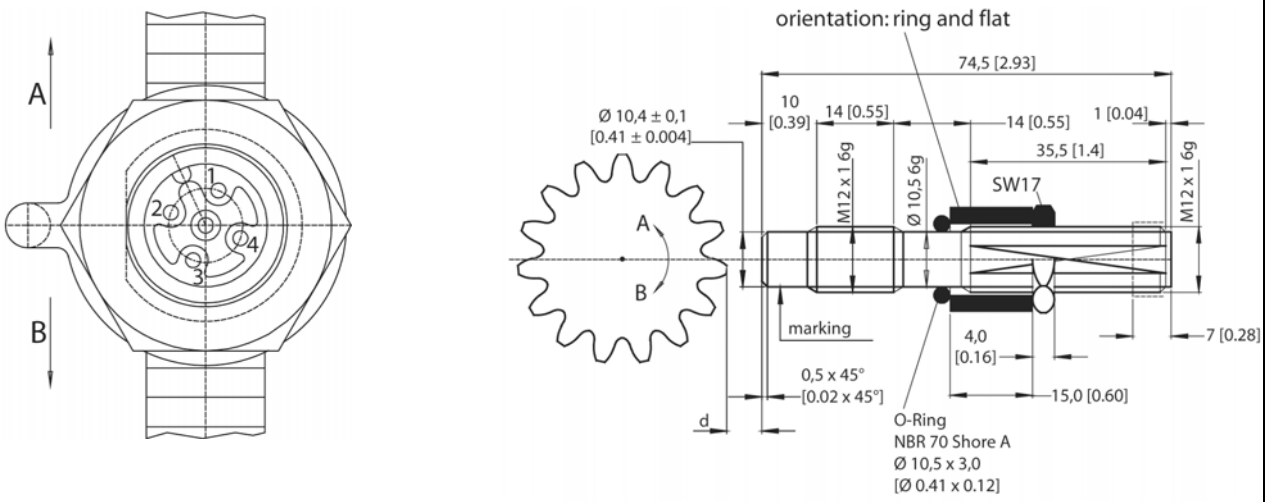
NOTICE

INSTALLATION INFORMATION

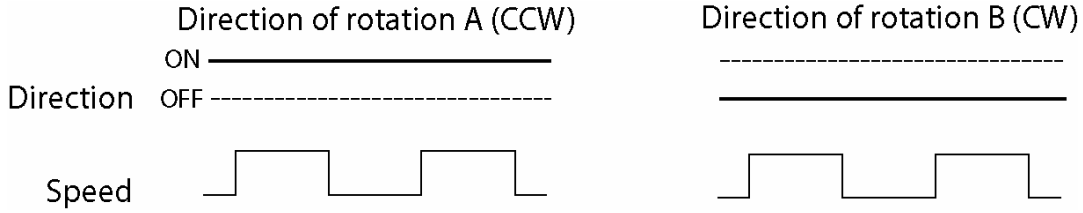
- The sensor wires must be laid as far as possible from large electrical machines. They must not run parallel with power cables. The maximum permissible cable length is 20 m [65 ft].
- The sensor should be mounted with the middle of the face side over the middle of the pole wheel. Where the pole wheel has teeth or slots and with radial sensor location, the sensor would normally be mounted over the center. Dependent upon the wheel width, a degree of axial movement is permissible.
- A solid and vibration-free mounting of the sensor is important.

Double Hall-Effect Speed Sensor

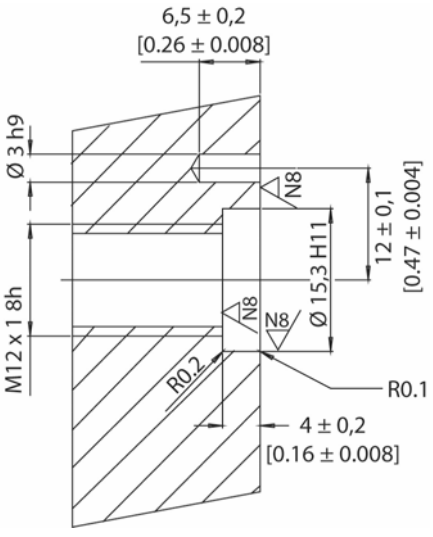
MOUNTING DIMESIONS (For reference only) mm [in]



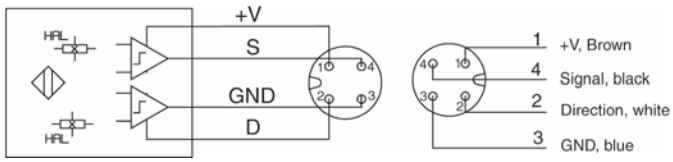
PULSE DIAGRAM



MOUNTING HOLES



WIRING DIAGRAM



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Honeywell

ZH10 Series

Hall-effect Zero Speed Sensors

DESCRIPTION

The ZH10 Hall-effect Speed Sensor Sensors provide a durable, cost-effective solution in most harsh environments.

The sensor is available in a 11,9 mm [15/32 in/0.46875 in] diameter, in a 25,4 mm [1.00 in] length.

The aluminum package is simple to install and adjust. It does not require rotational orientation.

FEATURES

- Low cost
- Omni-directional sensor to target orientation
- Digital output
- Small size
- Low power consumption

POTENTIAL APPLICATIONS

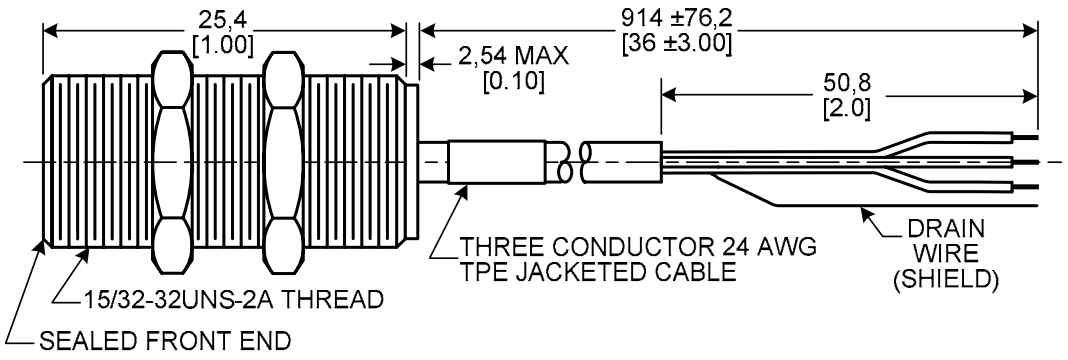
- Industrial process control
- Factory automation
- Rotary applications, such as:
  - Pumps
  - Rollers
  - Mixers
  - Fan speed measurement
  - Transmission
  - Spindles
  - Gear reducer RPM
  - Process speed
  - Synchronization
  - Generator set
  - Compressor speed
  - Dyno testing

ZH10 Series

SENSOR SPECIFICATIONS

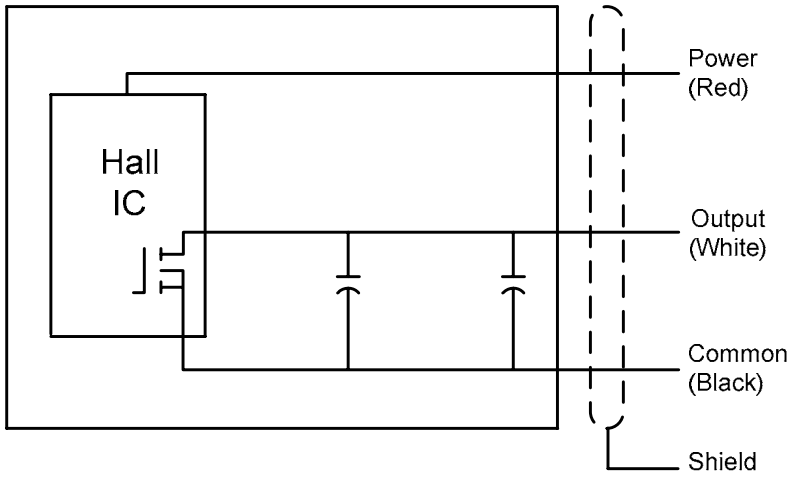
Characteristic	Minimum	Maximum	Unit	Condition
Supply voltage	4	24	Vdc	–
Supply current	–	6	mA	–
Output current	–	30	mA	short circuit protected
Output on voltage	–	0.6	Vdc	at 25 mA load
Output configuration	–	–	–	open drain MOFSET
Voltage low	–	0.4	V	at 30 mA max. sink
Voltage high	–	30	Vdc	–
Target orientation	–	–	–	omnidirectional
Duty cycle	35	65	%	within operating gap
Operating frequency	0	15 k	Hz	no orientation required
Output signal rise/fall time	–	4.0	µs	880 Ohm, 20 pF
Dielectric strength	200	–	Vac	<2 mA leakage
Operation gap	–	–	–	at gaps below curve (see Air Gap Performance Curve)
Output impedance	4.7	5.3	kOhm	–
Operating temperature range	-40 [-40]	100 [212]	°C [°F]	–
Storage temperature	–	125 [257]	°C [°F]	–
Sealing	IP67			–
Shock	50 Gs, 11 ms			–
Vibration	15 Gs, 10 Hz to 2000 Hz			–
Housing material	aluminum			–

MOUNTING DIMENSIONS (For reference only: mm/[in])

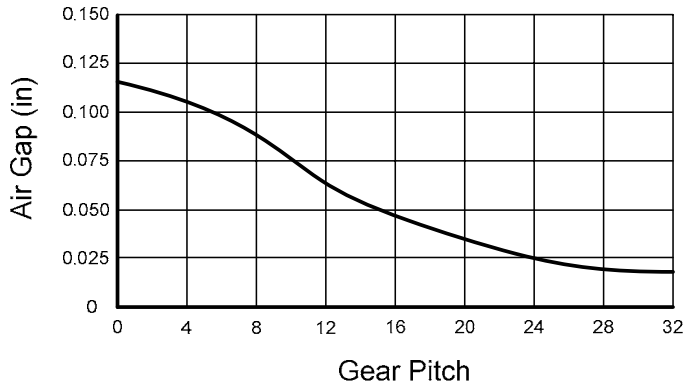


Hall Effect Zero Speed Sensor

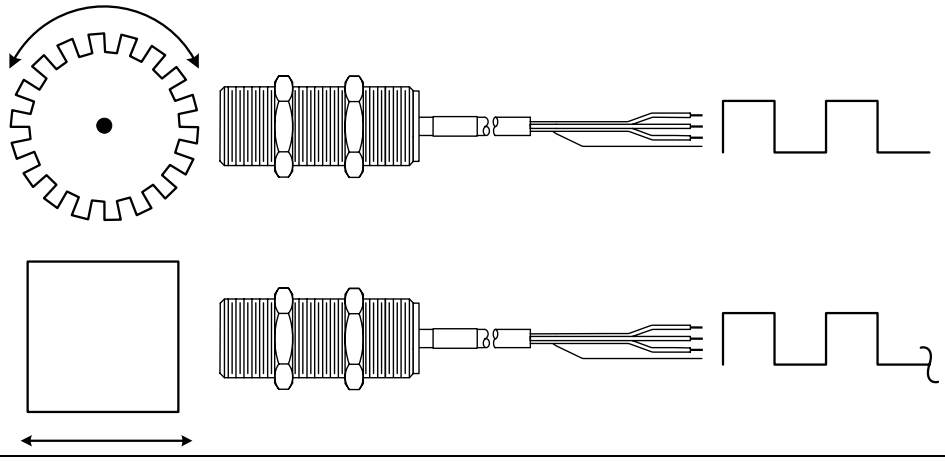
EQUIVALENT ELECTRICAL SCHEMATIC



AIR GAP PERFORMANCE CURVE



TARGET MOTION



ORDER GUIDE

Catalog Listing	Description
ZH10	Hall-effect zero speed sensor

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005885-1-EN IL50 GLO Printed in USA
June 2007

Honeywell

RPN Series

Hall-Effect Rotary Position Sensors

DESCRIPTION

RPN Series Rotary Position Sensors use a magnetically biased, Hall-effect integrated circuit (IC) to sense rotary movement of the actuator shaft over a set operating range. Rotation of the actuator shaft changes the IC's position relative to the magnets. The resulting flux density change is converted to a linear output.

The IC, together with conditioning and protection circuitry, and two permanent magnets, is sealed in a rugged package of IP67 or greater for durability in most harsh environments.

Solid-state Hall-effect technology provides non-contact operation, long service life, low torque actuation and reduced wear-out mechanisms.

Eight operating ranges (50°, 60°, 70°, 90°, 120°, 180°, 270° and 360°) are tolerant to over travel and allow use in most common applications.

Five different supply voltages and eight different output configurations, in either mA or Vdc, improve compatibility with a variety of control systems.

Two versions provide dual outputs for use where an additional output may be desired where redundancy and backup is needed. Another potential application includes using one output for an indicator and the second for the control system.

Lever versions are available. The easy-to-mount sensor has a mounting flange with two round or oval mounting holes. All products have AMP or Deutsch receptacles.

FEATURES

- Solid-state Hall-effect technology
- Eight operating ranges, up to 360°
- Variety of supply voltages and output configurations
- Rugged sealed package with integral connector
- IP67 or greater
- Integrated reverse polarity, short circuit and EMC protection
- Single or dual output versions available
- Industry-standard termination

POTENTIAL APPLICATIONS

Position and movement detection of pedals, throttle, gear shift, levers, linkages, suspension and hitches in:

- Trucks
- Off road vehicles
- Industrial vehicles and equipment
- Construction vehicles and equipment
- Agricultural vehicles and equipment
- Cranes

RPN Series

Table 1. RPNR Redundant (Dual) Output Specifications

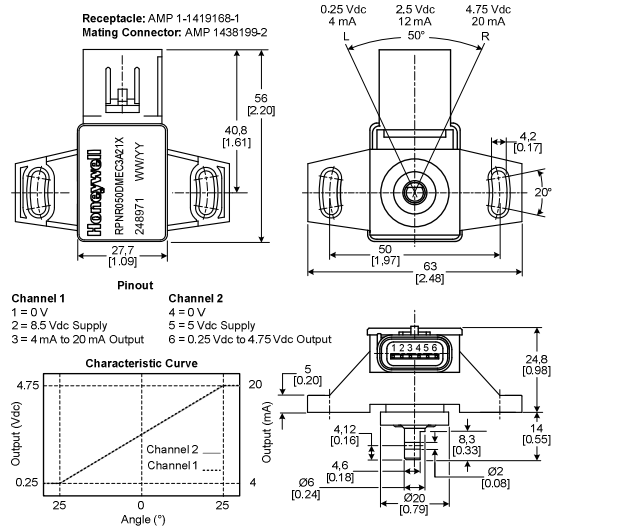
Characteristic	Parameter
Operating ranges available	50° (±25°), 90° (±45°)
Output available	50° (±25°): Channel 1: 4 mA (left), 20 mA (right); Channel 2: 0.25 Vdc (left), 4.75 Vdc (right) 90° (±45°): Channel 1: 0.25 Vdc (left), 4.75 Vdc (right); Channel 2: 4.75 Vdc (left), 0.25 Vdc (right)
Supply voltage range(s) available	50° (±25°): Channel 1: 8.5 Vdc; Channel 2: 5 Vdc 90° (±45°): Channel 1: 10 Vdc to 30 Vdc; Channel 2: 10 Vdc to 30 Vdc
Current consumption	20 mA max.
Output signal delay	3 ms approx.
Accuracy	±1.6%
Hysteresis	none
Linearity RPNR050SDMEC3A21X RPNR090KAAA3A11X	 ±0.35° ±0.6°
Reverse polarity protection	yes
Operating and storage temperature range	-40 °C to 125 °C [-40 °F to 257 °F]
EMC	200 V/m ISO 11452-3
Expected life	$30x10^6$ cycles
Protection class	IP69K DIN 40050
Housing material	PA66 plastic
Shaft material	stainless steel
Termination	AMP 1-1419168-1
Mechanical end stop	no

Table 2. RPNS Single Output Specifications

Characteristic	Parameter
Operating ranges available	50° (±25°), 60° (±30°), 70° (±35°), 90° (±45°), 120° (±60°), 180° (±90°), 270° (±135°), 360° (±180°)
Outputs available	0.25 Vdc (left), 4.75 Vdc (right) 4 mA (left), 20 mA (right) 0.5 Vdc (left), 4.5 Vdc (right) 20 mA (left), 4 mA (right) 1 Vdc (left), 9 Vdc (right) 3 Vdc (left), 5 Vdc (right) 4.5 Vdc (left), 0.5 Vdc (right) 4.75 Vdc (left), 0.25 Vdc (right)
Supply voltage range(s) available	5 Vdc, 8 Vdc to 30 Vdc, 10 Vdc to 30 Vdc
Current consumption (maximum)	20 mA
Output signal delay (approx)	3 ms
Reverse polarity protection	yes
EMC	200 V/m ISO 11452-3
Operating and storage temperature range	-40 °C to 125 °C [-40 °F to 257 °F]
Protection class	IP67 DIN 40050
Accuracy	±1.6%
Hysteresis	none
Linearity RPNS050BB1A21X, RPNS050FA1A21X RPNS060AC1A21X RPNS070DD1A21X All other listings RPNS120AA1A21X	 ±0.35° ±0.6 ±1° ±2° ±5°
Housing material	PA66 plastic
Shaft material	stainless steel
Expected life	$30x10^6$ cycles
Termination	AMP Superseal 282087-1, Deutsch DT04-3P
Mechanical end stop	no

Figure 1. RPNR Redundant (Dual) Output Versions (For Reference Only: mm/[in].)

RPNR050DMEC3A21X



RPNR090KAAA3A11X

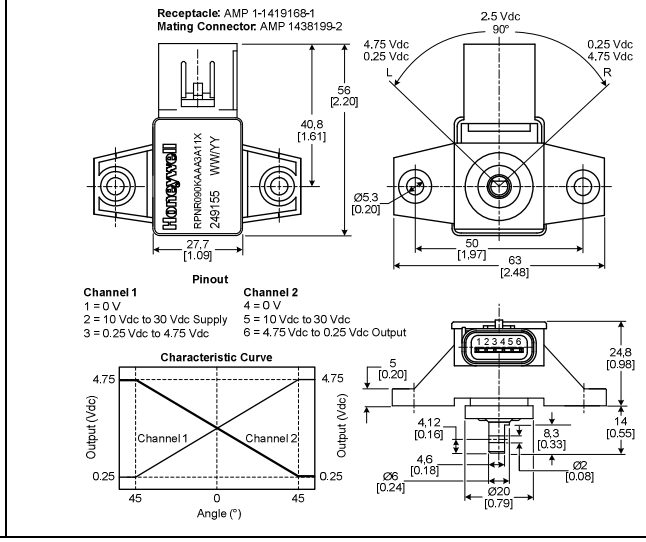
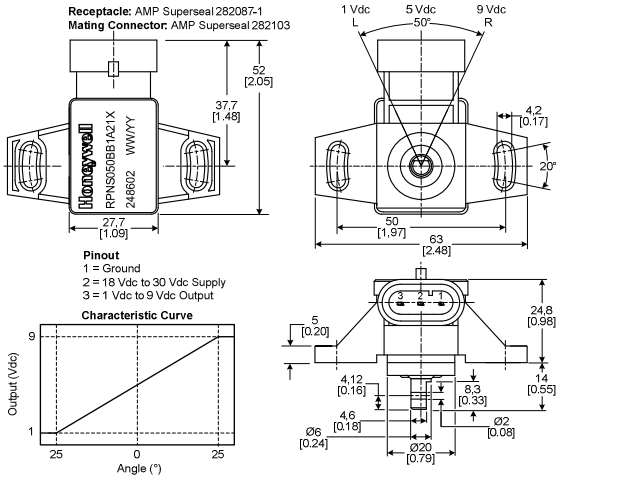
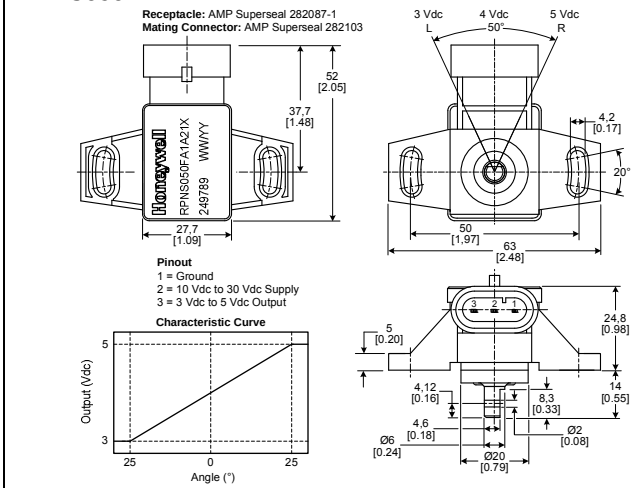


Figure 2. RPNS Single Output Versions (For Reference Only: mm/[in].)

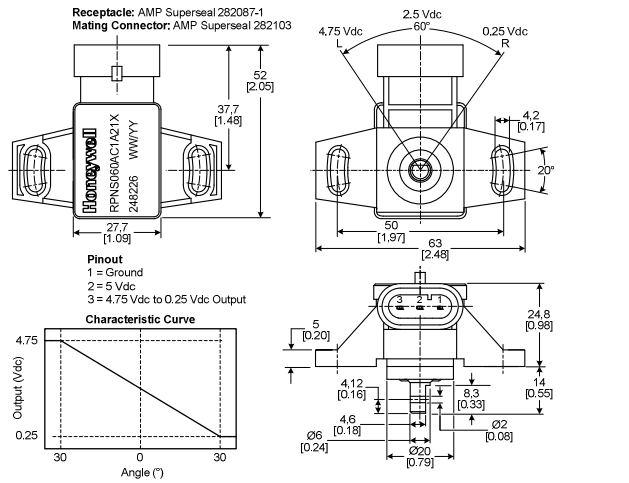
RPNS050BB1A21X



RPNS050FA1A21X



RPNS060AC1A21X



RPNS070DD1A21X

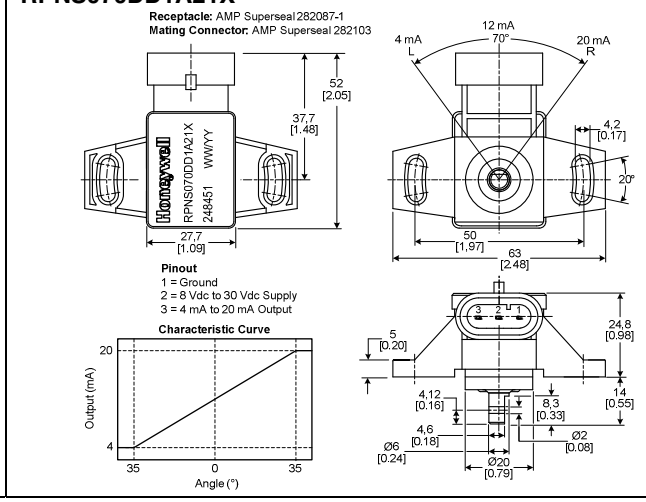
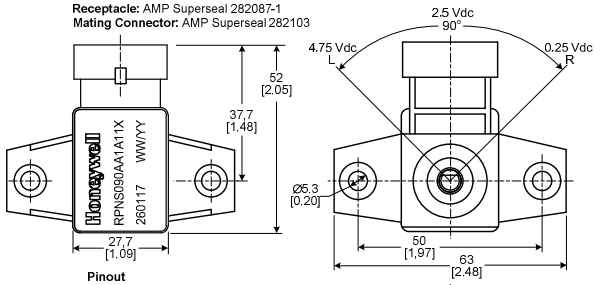


Figure 2. RPNS Single Output Versions (Continued)

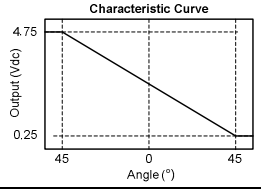
RPNS090AA1A11X

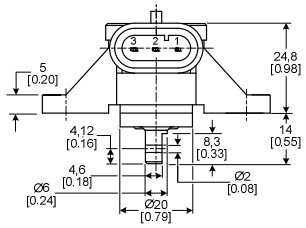
Receptacle: AMP Superseal 282087-1
Mating Connector: AMP Superseal 282103



Pinout
1 = Ground
2 = 10 Vdc to 30 Vdc Supply
3 = 4.75 Vdc to 0.25 Vdc Output

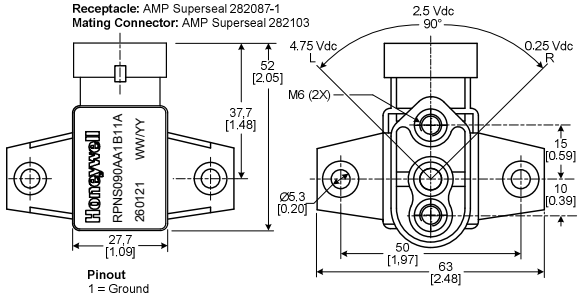
Characteristic Curve





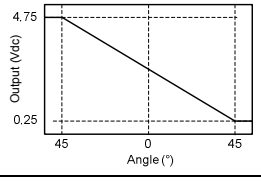
RPNS090AA1B11A

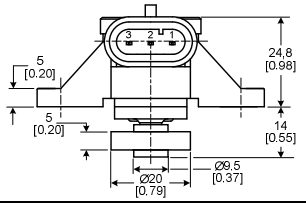
Receptacle: AMP Superseal 282087-1
Mating Connector: AMP Superseal 282103



Pinout
1 = Ground
2 = 10 Vdc to 30 Vdc Supply
3 = 4.75 Vdc to 0.25 Vdc Output

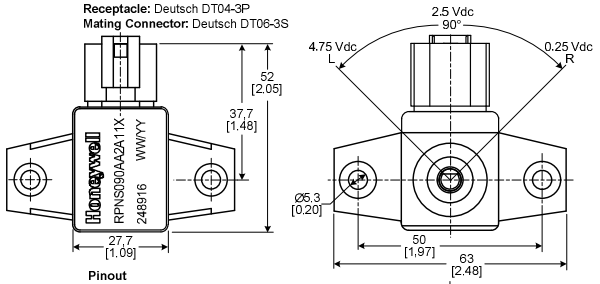
Characteristic Curve





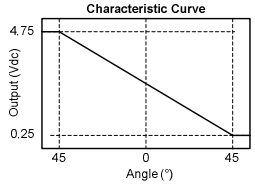
RPNS090AA2A11X

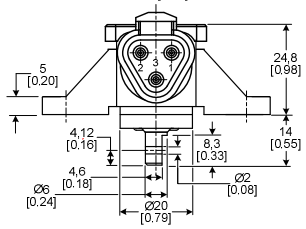
Receptacle: Deutsch DT04-3P
Mating Connector: Deutsch DT06-3S



Pinout
1 = Ground
2 = 10 Vdc to 30 Vdc Supply
3 = 4.75 Vdc to 0.25 Vdc Output

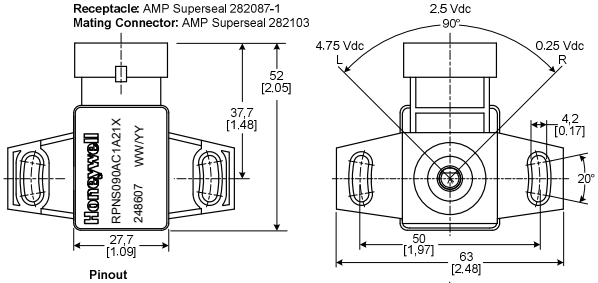
Characteristic Curve





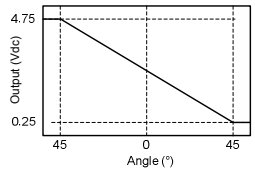
RPNS090AC1A21X

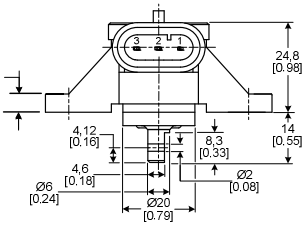
Receptacle: AMP Superseal 282087-1
Mating Connector: AMP Superseal 282103



Pinout
1 = Ground
2 = 5 Vdc Supply
3 = 4.75 Vdc to 0.25 Vdc Output

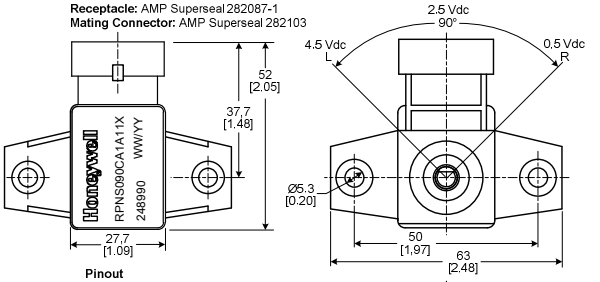
Characteristic Curve





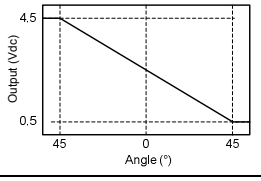
RPNS090CA1A11X

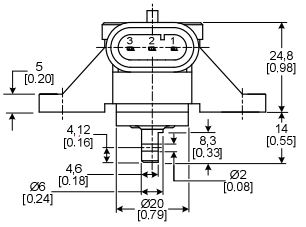
Receptacle: AMP Superseal 282087-1
Mating Connector: AMP Superseal 282103



Pinout
1 = Ground
2 = 10 Vdc to 30 Vdc Supply
3 = 4.5 Vdc to 0.5 Vdc Output

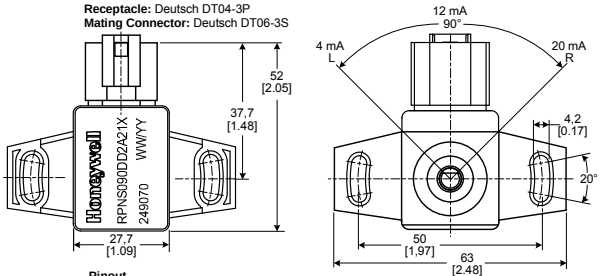
Characteristic Curve





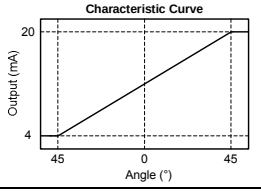
RPNS090DD2A21X

Receptacle: Deutsch DT04-3P
Mating Connector: Deutsch DT06-3S



Pinout
1 = Ground
2 = 8 Vdc to 30 Vdc Supply
3 = 4 mA to 20 mA Output

Characteristic Curve



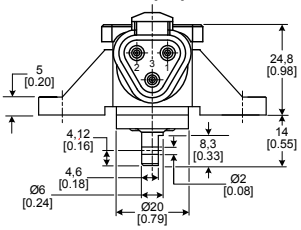


Figure 2. RPNS Single Output Versions (Continued)

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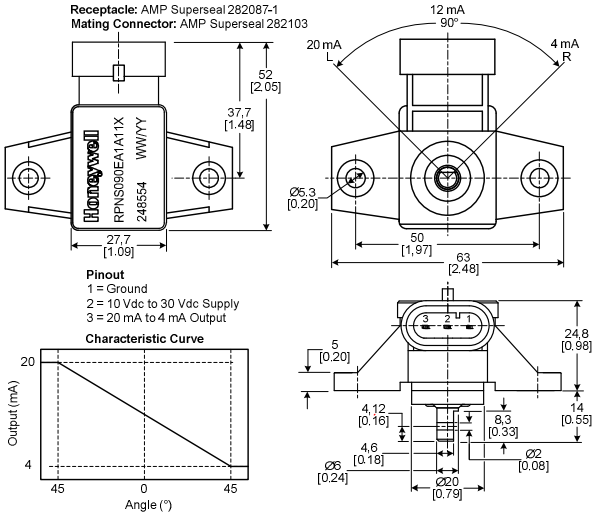
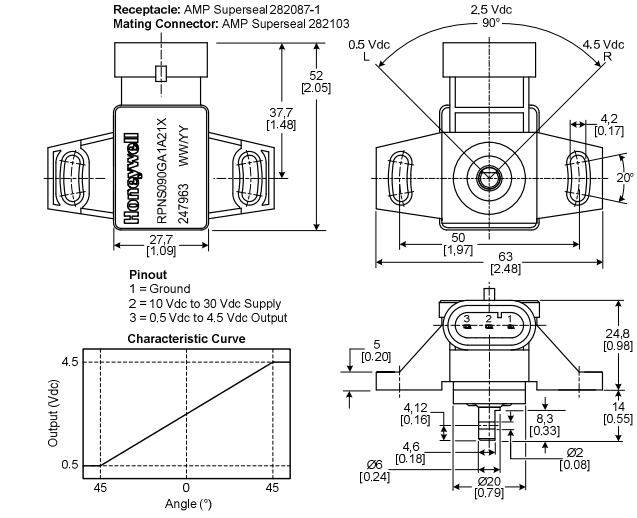


RPNS090GA1A21X



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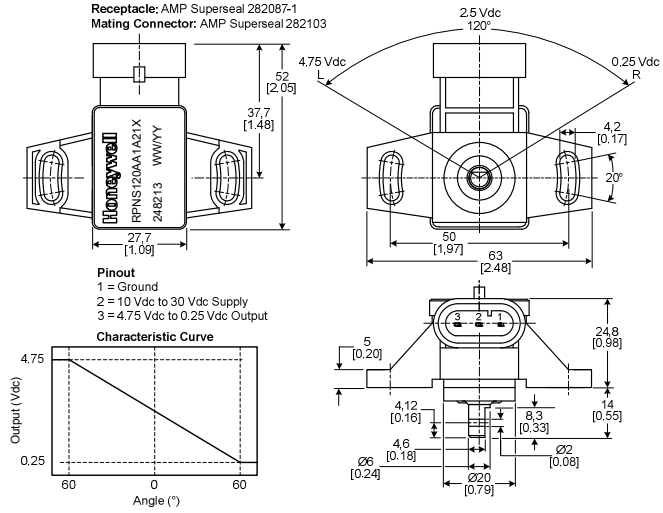
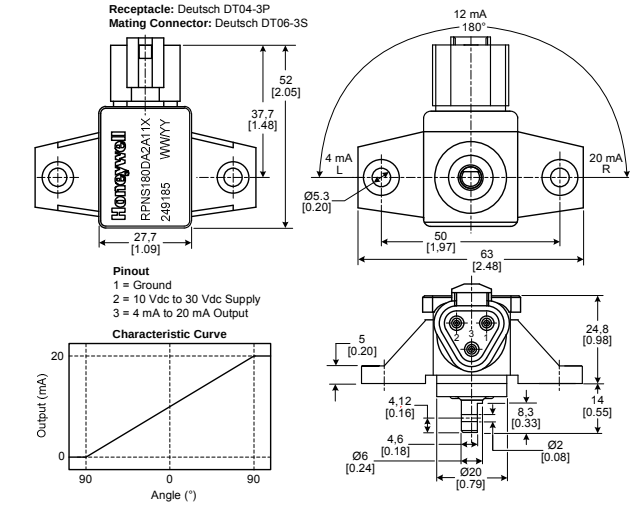
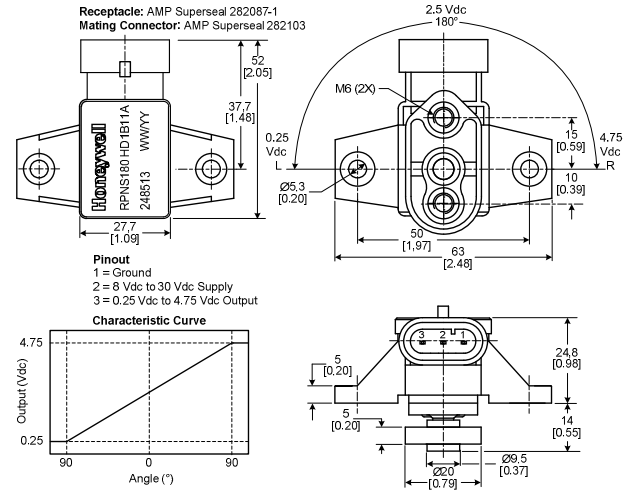


RPNS180DA2A11X



RPNS180HD1B11A



RPNS270DA1A21X

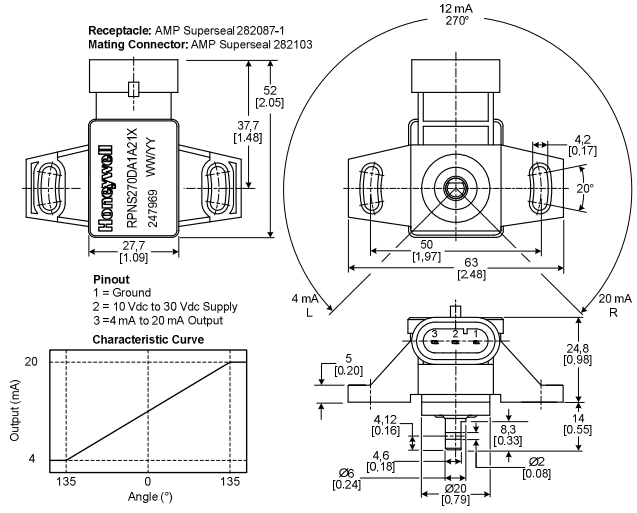
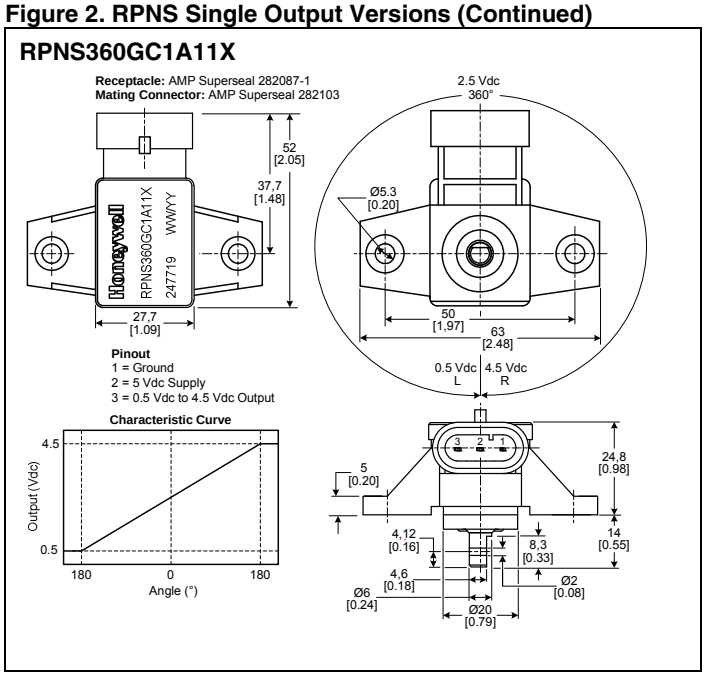


Figure 2. RPNS Single Output Versions (Continued)



Order Guide

Catalog Listing	Output Style	Operating Range	Supply Voltage	Output Type	Termination	Shaft Shape	Mounting Hole	Lever
RPNR050DMEC3A21X	redundant (dual)	50° (±25°)	Channel 1: 8.5 Vdc Channel 2: 5 Vdc	Channel 1: 4 mA (left), 20 mA (right) Channel 2: 0.25 Vdc (left), 4.75 Vdc (right)	AMP 1-1419168-1	flat	oval	none
RPNR090KAAA3A11X	redundant (dual)	90° (±45°)	10 Vdc to 30 Vdc	Channel 1: 0.25 Vdc (left), 4.75 Vdc (right) Channel 2: 4.75 Vdc (left), 0.25 Vdc (right)	AMP 1-1419168-1	flat	round	none
RPNS050BB1A21X	single	50° (±25°)	18 Vdc to 30 Vdc	1 Vdc (left), 9 Vdc (right)	AMP Superseal 282087-1	flat	oval	none
RPNS050FA1A21X	single	50° (±25°)	10 Vdc to 30 Vdc	3 Vdc (left), 5 Vdc (right)	AMP Superseal 282087-1	flat	oval	none
RPNS060AC1A21X	single	60° (±30°)	5 Vdc	4.75 Vdc (left), 0.25 Vdc (right)	AMP Superseal 282087-1	flat	oval	none
RPNS070DD1A21X	single	70° (±35°)	8 Vdc to 30 Vdc	4 mA (left), 20 mA (right)	AMP Superseal 282087-1	flat	oval	none
RPNS090AA1A11X	single	90° (±45°)	10 Vdc to 30 Vdc	4.75 Vdc (left), 0.25 Vdc (right)	AMP Superseal 282087-1	flat	round	none
RPNS090AA1B11A	single	90° (±45°)	10 Vdc to 30 Vdc	4.75 Vdc (left), 0.25 Vdc (right)	AMP Superseal 282087-1	round	round	43 mm [1.69 in]
RPNS090AA2A11X	single	90° (±45°)	10 Vdc to 30 Vdc	4.75 Vdc (left), 0.25 Vdc (right)	Deutsch DT04-3P	flat	round	none
RPNS090AC1A21X	single	90° (±45°)	5 Vdc	4.75 Vdc (left), 0.25 Vdc (right)	AMP Superseal 282087-1	flat	oval	none
RPNS090 CA1A11X	single	90° (±45°)	10 Vdc to 30 Vdc	4.5 Vdc (left), 0.5 Vdc (right)	AMP Superseal 282087-1	flat	round	none
RPNS090DD2A21X	single	90° (±45°)	8 Vdc to 30 Vdc	4 mA (left), 20 mA (right)	Deutsch DT04-3P	flat	oval	none
RPNS090EA1A11X	single	90° (±45°)	10 Vdc to 30 Vdc	20 mA (left), 4 mA (right)	AMP Superseal 282087-1	flat	round	none
RPNS090GA1A21X	single	90° (±45°)	10 Vdc to 30 Vdc	0.5 Vdc (left), 4.5 Vdc (right)	AMP Superseal 282087-1	flat	oval	none
RPNS120AA1A21X	single	120° (±60°)	10 Vdc to 30 Vdc	4.75 Vdc (left), 0.25 Vdc (right)	AMP Superseal 282087-1	flat	oval	none
RPNS180DA2A11X	single	180° (±90°)	10 Vdc to 30 Vdc	4 mA (left), 20 mA (right)	Deutsch DT04-3P	flat	round	none
RPNS180HD1B11A	single	180° (±90°)	8 Vdc to 30 Vdc	0.25 Vdc (left), 4.75 Vdc (right)	AMP Superseal 282087-1	round	round)	43 mm [1.69 in]
RPNS270DA1A21X	single	270° (±135°)	10 Vdc to 30 Vdc	4 mA (left), 20 mA (right)	AMP Superseal 282087-1	flat	oval	none
RPNS360GC1A11X	single	360° (±180°)	5 Vdc	0.5 Vdc (left), 4.5 Vdc (right)	AMP Superseal 282087-1	flat	round	none

⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

⚠ WARNING

MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

E-mail: info.sc@honeywell.com

Internet: www.honeywell.com/sensing

Phone and Fax:

Asia Pacific	+65 6355-2828
	+65 6445-3033 Fax
Europe	+44 (0) 1698 481481
	+44 (0) 1698 481676 Fax
Latin America	+1-305-805-8188
	+1-305-883-8257 Fax
USA/Canada	+1-800-537-6945
	+1-815-235-6847
	+1-815-235-6545 Fax

Sensing and Control
Honeywell
1985 Douglas Drive North
Minneapolis, MN 55422
www.honeywell.com/sensing

Honeywell

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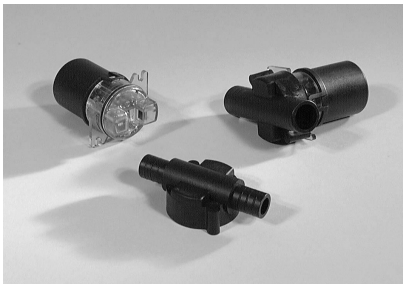
July 2009

Turbidity Sensors
Wash Process Sensors



FEATURES
- Low-cost infrared turbidity sensing
- Multiple sensors in a single package for simple integration
- Ratio turbidity output to minimize common-mode effects
- Flow-through covers available for hose applications and simple retrofit
- On-board microprocessor for signal conditioning and communications

TYPICAL APPLICATIONS
- Parts washers
- Printed circuit board washers
- Plating rinse baths
- Industrial and coin-operated laundry machines
- Commercial dishwashers
- Mixing tanks
- Water treatment equipment

OPERATION
The APMS-10G Wash Process Sensor provides an integrated package consisting of a microprocessor and three sensing functions:
- Turbidity
- Conductivity
- Temperature

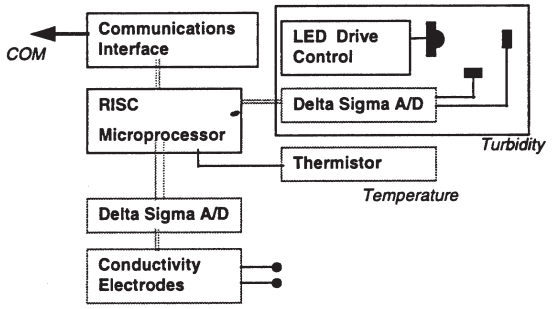
The sensor can monitor and control an application process to improve the quality of the process, minimizing the consumption of energy, water, materials and time.

Each sensor output is conditioned by the internal microprocessor. All data transmitted to the host system is supplied by the microprocessor via a 5 VDC serial communications link. The sensor operates in slave mode, waiting for the host system to request sensor information.

ORDER GUIDE

Catalog Listings*	Sensor Included	Flow-through Cap Installed
APMS-10GRCF	Yes	No
APMS-10GRCF-50	Yes	.5 inch OD
APMS-10GRCF-18	Yes	18 mm OD
APMS-10GRCF-KIT	Yes	Both, not installed Kit includes sensor, flow-through caps, PC interface, and software

WASH PROCESS SENSOR FUNCTIONAL DIAGRAM



GENERAL SPECIFICATIONS

Parameter	Min.	Typ.	Max.	Units
Supply Voltage	8	24	30	Volts DC
Supply Current		16	40	mA
Output Voltage				
Sensor Transmit Low	0		1.1	volts*
Sensor Transmit High	4	5	5.25	volts*
Sensor Receive Low	0		1.7	volts*
Sensor Receive High	3.3		5.25	volts*

* Assumes a sinking output current of 3 mA maximum.

TURBIDITY SPECIFICATIONS

Characteristic	Min.	Typ.	Max.	Units
Ratio Range	0		4000	NTU
	.03		10	units
Response Time			1.3	seconds

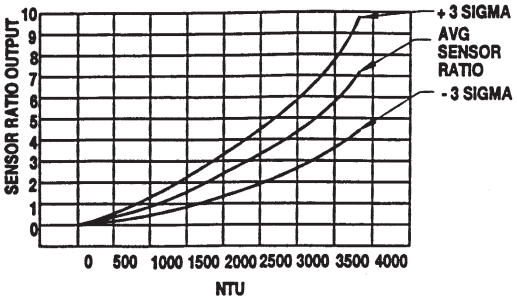
CONDUCTIVITY SPECIFICATIONS

Characteristic	Min.	Typ.	Max.	Units
Range	.0001		15	mSiemens
Range	4		255	units
Response Time			0.85	second

TEMPERATURE SPECIFICATIONS

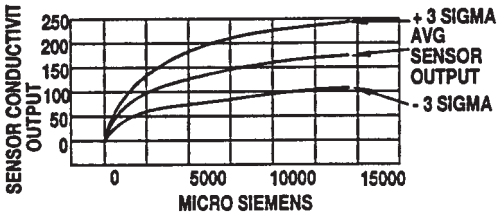
Characteristic	Min.	Typ.	Max.	Units
Range	68		140	°F
Accuracy	-4		+4	°F
Response Time			0.03	second
Stabilization Time	3		5	minutes

TURBIDITY CHARACTERISTICS

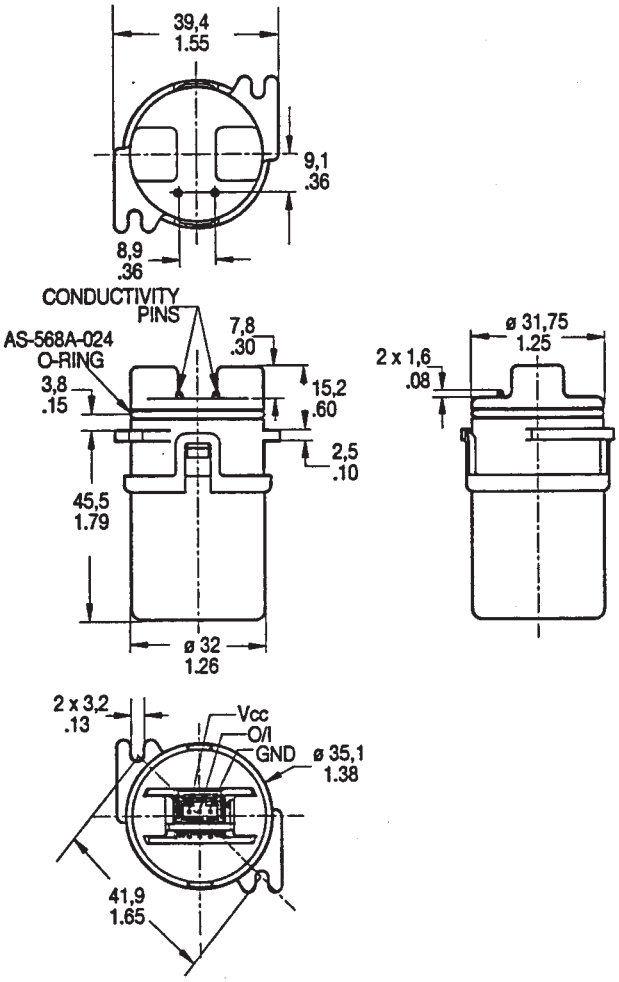


This graph is based on testing using formazin as the medium at room temperature. Characteristics may change when sensor is subjected to media other than formazin.

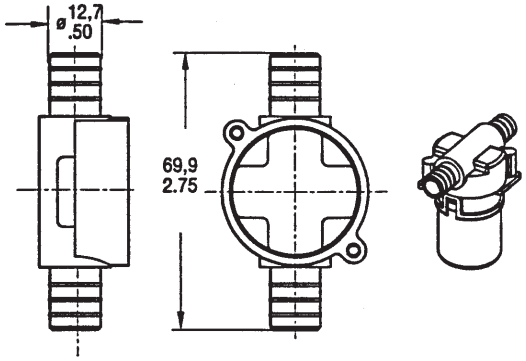
CONDUCTIVITY ACCURACY



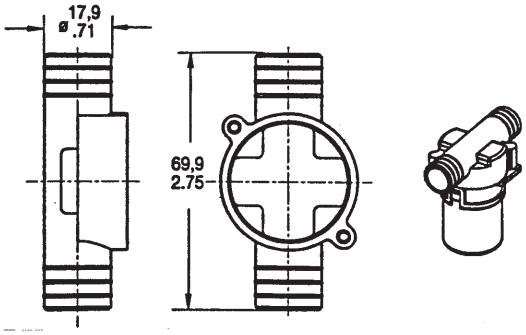
MOUNTING DIMENSIONS (for reference only)



CAP FOR APMS-10GRCF-50



CAP FOR APMS-10GRCF-18



Honeywell

Installation Instructions for the MICRO SWITCH APMS-10G Series Wash Process Sensor

ISSUE 1

PK 80023

GENERAL SPECIFICATIONS

Parameter	Min.	Typ.	Max.	Units
Supply Voltage	8	24	30	volts
Supply Current		16	40	mA
Output Voltage				
Sensor Transmit Low	0		1.1	volts*
Sensor Transmit High	4	5	5.25	volts*
Sensor Receive Low	0		1.7	volts*
Sensor Receive High	3.3		5.25	volts*
Storage Temperature	-20		+70	°C

* Assumes a sinking output current of 3 mA maximum.

TURBIDITY SPECIFICATIONS

Characteristic	Min.	Typ.	Max.	Units
Range	0		4000	NTU
Ratio Range	0.03		10	units
Response Time			1.3	seconds

CONDUCTIVITY SPECIFICATIONS

Characteristic	Min.	Typ.	Max.	Units
Range	.00010		15	mSiemen
Range	4		255	units
Response Time			0.85	seconds

TEMPERATURE SPECIFICATIONS

Characteristic	Min.	Typ.	Max.	Units
Range	68		140	°F
Accuracy	-4		+4	°F
Response Time			.03	second
Stabilization Time	3		5	minutes

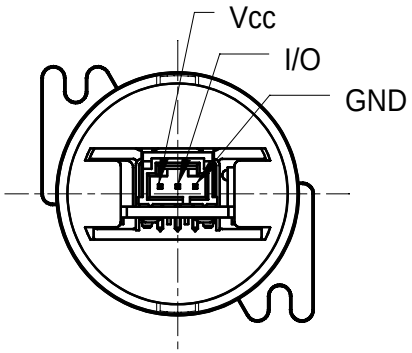
MATING CONNECTOR

Molex 70400, 70430, or 70066 (G Version) type or equivalent (2.54/.100 pitch, 3-pin).

MOUNTING

Mounting holes accept #4 self-tapping screws, 6.4 mm/.250 inch minimum length. Surface finish on mating sealing surface is not to exceed 32 microinches. The AS-568A-02A O-ring seal is provided assembled to the sensor.

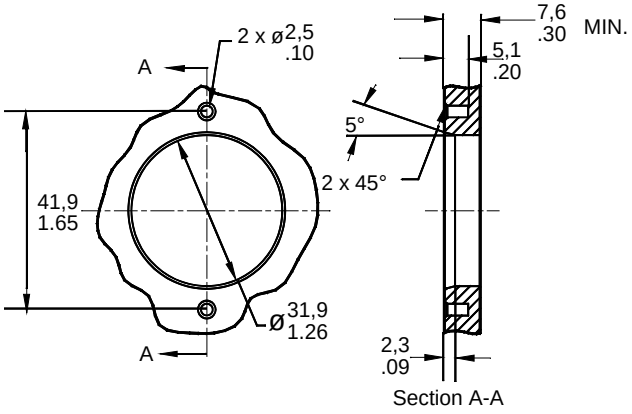
CONNECTION DIAGRAM



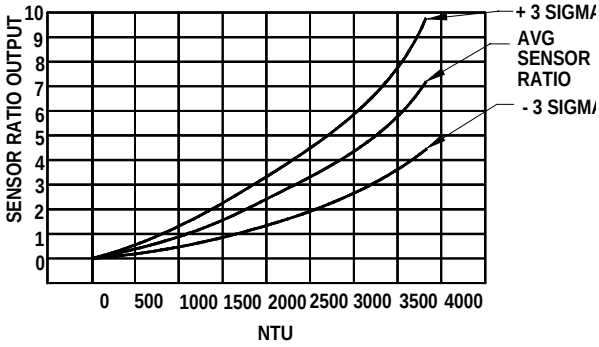
NOTICE

- APMS-10G Series sensors do not have reverse voltage protection. Permanent damage may occur if the sensors are powered with reverse polarity.
- The back of the sensor is not environmentally sealed. Permanent damage may occur if fluids enter through the connector area. Do not submerge or wash down the connector area of the sensor.
- The sensor's optical face should be kept wet at all times in the application. Repeated wet/dry cycles may cause filming from detergents and mineral deposits.
- The sensor contains Class 1 static-sensitive components. Avoide making contact with the connector terminals without static protection.

MOUNTING DETAIL



TURBIDITY CHARACTERISTICS

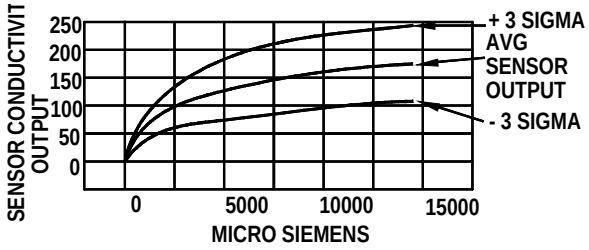


This graph is based on testing using formazin as the medium at room temperature. Characteristics may change when sensor is subjected to media other than formazin.

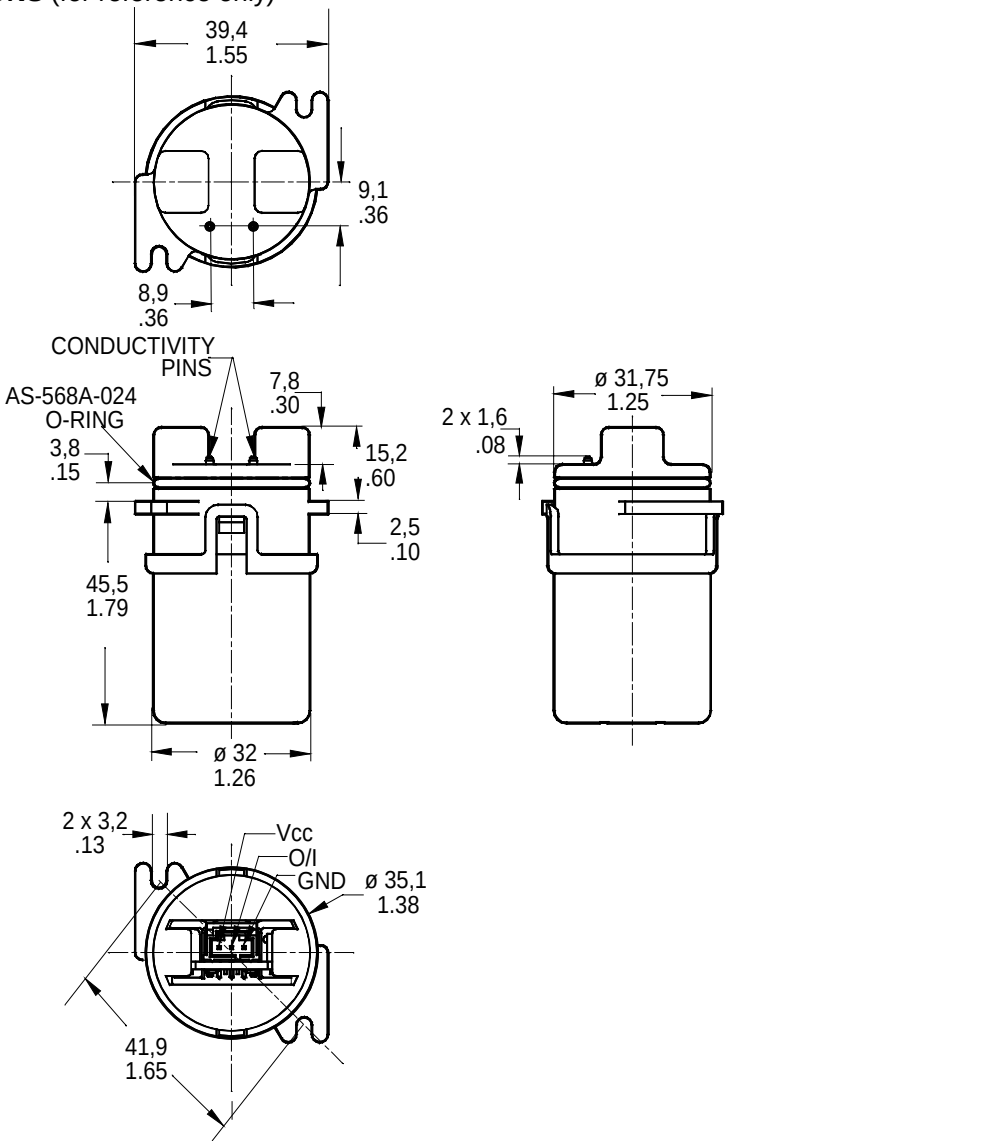
APMS-10G SERIES DESCRIPTION

Catalog Listing	Sensor Included	Flow-through Cap Installed
APMS-10GRCF	Yes	No
APMS-10GRCF-50	Yes	.50 in. OD
APMS-10GRCF-18	Yes	18 mm OD
APMS-10GRCF-KIT	Yes	Both, not installed

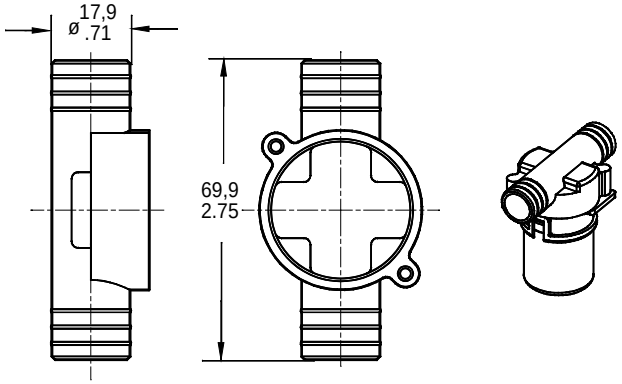
CONDUCTIVITY ACCURACY



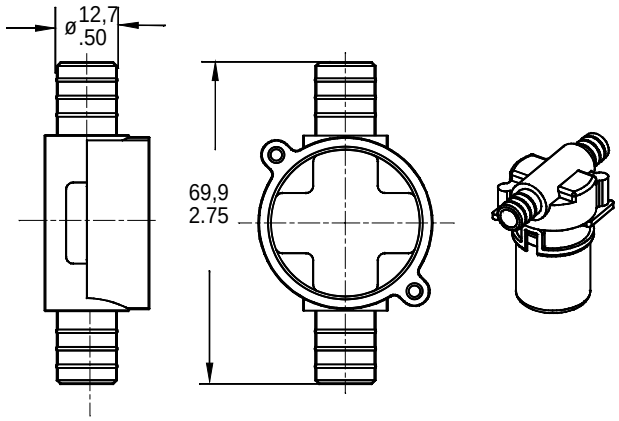
MOUNTING DIMENSIONS (for reference only)



CAP FOR APMS-10GRCF-18



CAP FOR APMS-10GRCF-50



WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose**.

For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact a nearby sales office. Or call:

1-800-537-6945 USA
1-800-737-3360 Canada
1-815-235-6847 International

FAX

1-815-235-6545 USA

INTERNET

http://www.sensing.honeywell.com
info@micro.honeywell.com

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While we provide application assistance, personally and through our literature, it is up to the customer to determine the suitability of the product in the application.

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Ultrasonic Sensors

940 Series

Compact 18 mm Diameter Digital

FEATURES

- Sensing distance up to 1,5 meters
- 18 mm diameter housing
- IP 67 sealing
- High output current
- High power transducer
- Microprocessor controlled

ORDER GUIDE

Sensor Package Style	Sensing Range* mm (in.)	Digital Output	Termination	Catalog Listing
18 mm dia. PBTB Plastic 	200 - 1500 (7.87 - 59.05)	PNP, N.O.	Cable	940-F4Y-2D-001-180E
		NPN, N.O.	Cable	940-F4Y-2D-002-180E
		PNP, N.O.	Connector cable	940-F4X-2D-001-180E
		NPN, N.O.	Connector cable	940-F4X-2D-002-180E
	150 - 700 (5.9 - 27.5)	PNP, N.O.	Cable	940-F4Y-2D-001-300E
		NPN, N.O.	Cable	940-F4Y-2D-002-300E
		PNP, N.O.	Connector cable	940-F4X-2D-001-300E
		NPN, N.O.	Connector cable	940-F4X-2D-002-300E

* Standard target is 120 mm square of mild steel perpendicular to ultrasonic beam.

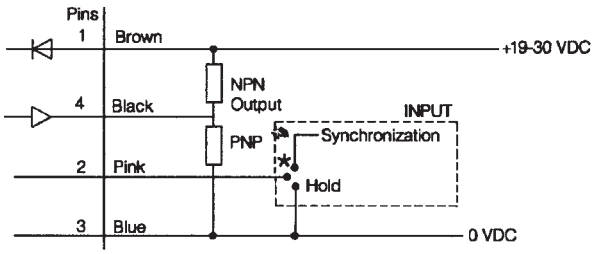
SPECIFICATIONS

Catalog Listings	940-F4Y-2D-001-180E 940-F4Y-2D-002-180E 940-F4X-2D-001-180E 940-F4X-2D-002-180E	940-F4Y-2D-001-300E 940-F4Y-2D-002-300E 940-F4X-2D-001-300E 940-F4X-2D-002-300E
Max. Sensing Distance	1500 mm (59.05 in.)	700 mm (27.5 in.)
Min. Sensing Distance	200 mm (7.87 in.)	150 mm (5.91 in.)
Beam Angle	8°	8°
POWER SUPPLY		
Supply Voltage	19 - 30 VDC	
Supply Current	<25 mA without load	<35 mA without load
Circuit Protection	Reverse polarity	
OUTPUT CHARACTERISTICS		
Load Current	0 - 500 mA	
Switching Frequency	8 Hz	25 Hz
Hysteresis	~ 2% of setpoint	~ 2.5% of setpoint
Repeatability	± 1 mm	
Setpoint Adjustment	4-turn potentiometer	
Circuit Protection	Short circuit	
ENVIRONMENTAL		
Operating Temperature	−15 to 70°C (5 to 158°F)	
Storage Temperature	−25 to 85°C (−13 to 185°F)	
Sealing	IP 67	
SPECIAL FEATURES		
Hold Input	Stops transmission and reception when input is connected to 0 VDC. Last output will be stored until input is disconnected	
Synchronization Input	Avoids mutual interference from several sensors by interconnecting the hold input from each sensor.	
LED Indicator	Illuminates when sensor detects target	

Ultrasonic Sensors

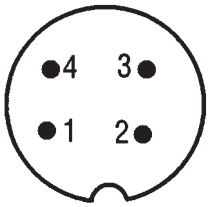
Compact 18 mm Diameter Digital

WIRING DIAGRAM



*Normal operation with no connection

940-F4X/Y-20-001/2-300E Versions only

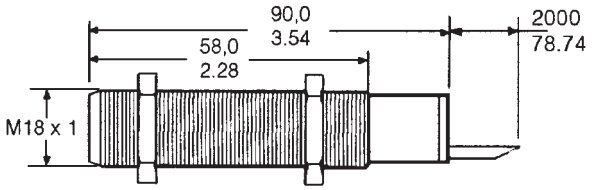


4-pin DC Micro (M12 x 1)

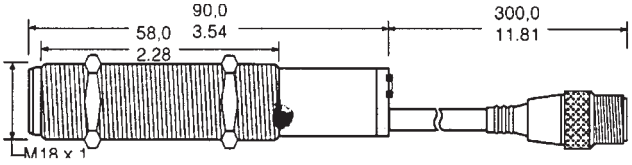
Pin	Color
1	BRN
2	PINK
3	BLU
4	BLK

MOUNTING DIMENSIONS (For reference only)

940-F4X/Y-20-001/2-180E



940-F4X/Y-2D-001/2-300E



ACCESSORIES

	Catalog Listing	Feature
Mounting clamp	43178389-018	Allows mounting to a flat surface
Beam deflector	43192871-003	Allows right angle mounting (Approx. dim. 50 x 170 mm)
Focusing beam deflector	43192871-004	Reduces beam angle by approximately 1/2 (Approx. dim. 35 x 52 mm)
Straight connector w/o cable	66195044-001	Connector has screw terminals for wiring connection
Right angle connector w/o cable	66195045-001	Connector has screw terminals for wiring connection
24 VDC Power supply, Relay output, 110 VAC input	FF-MADB24RB	See page B102 for more information
24 VDC POwer supply, On/Off delay, 110 VAC input	FF-MADC24RB	See page B102 for more information

Ultrasonic Sensors
30 mm Diameter Analog

FEATURES
- Measuring range up to 2000 mm (78.74 in.)
- High repeatability

ORDER GUIDE

Sensor Package Style	Sensing Range* mm (in.)	Analog Output	Termination	Catalog Listing
30 mm dia. Stainless Steel 	300 - 2000 (11.81 - 78.74)	1.5 - 10 V	Cable	940-A4Y-AD-1C0-130E
	150 - 1200 (5.90 - 47.24)	1.25 - 10 V	Cable	940-A4Y-AD-1C0
			Connector	940-A4V-AD-1C0

* Standard target is 120 mm square of mild steel perpendicular to ultrasonic beam.

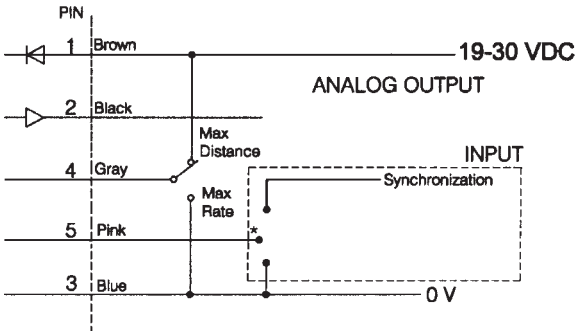
SPECIFICATIONS

Catalog Listings	940-A4Y-AD-1C0-130E		940-A4Y-AD-1C0 940-A4V-AD-1C0	
	Max. Range	Max. Rate	Max. Range	Max. Rate
Max. Sensing Distance	2000 mm (78.74 in.)	1000 mm (39.37 in.)	1200 mm (47.2 in.)	600 mm (23.6 in.)
Min. Sensing Distance	300 mm (11.8 in.)		150 mm (5.91 in.)	
Beam Angle	8°		10°	
POWER SUPPLY				
Supply Voltage	19 - 30 VDC			
Supply Current	<20 mA without load			
Circuit Protection	Reverse polarity			
OUTPUT CHARACTERISTICS				
Load Current	10 mA max.			
Switching Frequency	6 Hz		11 Hz	
Repeatability	±2 mm		±1 mm	
Linearity	<0.2%			
Output Adjustment	4 Turn Potentiometer			
Output Mode	Max. Range or Max. Rate selected by wiring terminal connection			
Circuit Protection	Short Circuit			
ENVIRONMENTAL				
Operating Temperature	0 to 50°C (32 to 122°F)			
Storage Temperature	0 to 70°C (32 to 158°F)			
Sealing	IP 65			
SPECIAL FEATURES				
Hold Input	Stops transmission and reception of sensor when input is connected to 0 VDC. Analog output would be zero.			
Synchronization Input	Avoids mutual interference from several ultrasonic sensors (external synchronization unit required; see Accessories)			
LED Indicator	Illuminates when sensor detects a target			

Ultrasonic Sensors

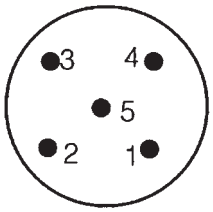
30 mm Diameter Analog

WIRING DIAGRAM



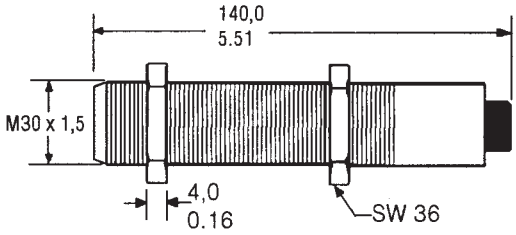
*Normal operation with connection +19-30 VDC

CONNECTOR VERSION ONLY

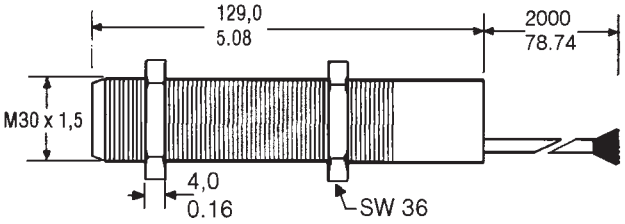


Pin	Color
1	BRN
2	WHT
3	BLU
4	BLK
5	GRAY

MOUNTING DIMENSIONS (For reference only)
940-A4V-AD-1C0



940-A4Y-AD-1C0-130E
940-A4Y-AD-1C0



ACCESSORIES

	Catalog Listing	Feature
Mounting clamp, 30 mm sensor	43178389-030	Allows mounting to a flat surface
Beam deflector	43192871-001	Allows right angle mounting (Approx. dim. 50 x 170 mm)
Focusing beam deflector	43192871-002	Reduces beam angle by approximately 1/2
Compact deflector	66195116-001	Allows right angle mounting (Approx. dim. 35 x 52 mm)
2 meter cable, Straight connector	RKT5-612/2M	Used for wiring to connector version
5 meter cable, Straight connector	RKT5-612/5M	Used for wiring to connector version
2 meter cable, Right angle connector	RKWT5-612/2M	Used for wiring to connector version
5 meter cable, Right angle connector	RKWT5-612/5M	Used for wiring to connector version
Synchronization unit	55000001	Controls up to 100 sensors

Ultrasonic Sensors

942 Series

Compact 30 mm Diameter Analog and Digital, RS232/RS485 Interface

FEATURES

- Programmable
- RS232 or RS485 interface
- 0 - 10 VDC/4 - 20 mA output
- Two N.O. PNP outputs or one N.O. PNP/one N.C. PNP output

ORDER GUIDE

Sensor Package Style	Sensing Range* mm (in.)	Analog Output	Digital Output	Interface	Catalog Listing
30 mm dia. Stainless Steel  272,1g (9.6 oz)	300 - 3000 (11.8 - 118)	0 - 10 V	PNP, N.O./N.C.	RS232	942-A4N-2D-1C1-130E
		4 - 20 mA	PNP, N.O./N.C.	RS232	942-A4N-2D-1D1-130E
		0 - 10 V	PNP, N.O./N.C.	RS485	942-A4N-2D-1E1-130E
		4 - 20 mA	PNP, N.O./N.C.	RS485	942-A4N-2D-1F1-130E
	150 - 1500 (5.9 - 59.1)	0 - 10 V	PNP, N.O./N.C.	RS232	942-A4N-2D-1C1-220S
		4 - 20 mA	PNP, N.O./N.C.	RS232	942-A4N-2D-1D1-220S
		0 - 10 V	PNP, N.O./N.C.	RS485	942-A4N-2D-1E1-220S
		4 - 20 mA	PNP, N.O./N.C.	RS485	942-A4N-2D-1F1-220S
	100 - 600 (3.94 - 23.6)	0 - 10 V	PNP, N.O./N.C.	RS232	942-A4N-2D-1C1-300E

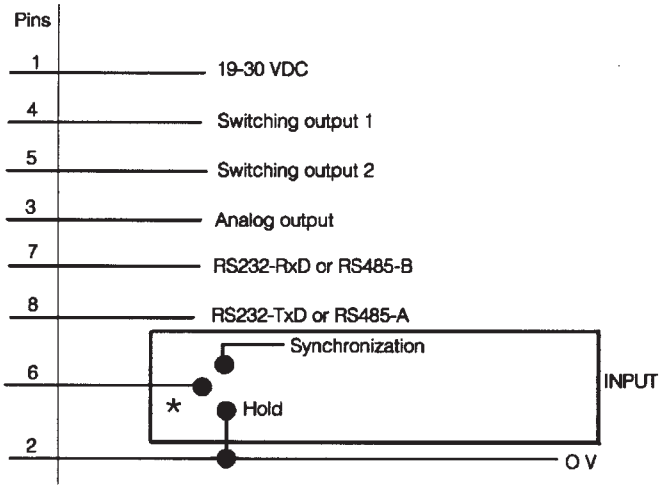
* Standard target is 120 mm square of mild steel perpendicular to ultrasonic beam.

SPECIFICATIONS

Catalog Listings	942-A4N-2D-1C1-130E 942-A4N-2D-1D1-130E 942-A4N-2D-1E1-130E 942-A4N-2D-1F1-130E	942-A4N-2D-1C1-220S 942-A4N-2D-1D1-220S 942-A4N-2D-1E1-220S 942-A4N-2D-1F1-220S	942-A4N-2D-1C1-300E
Max. Sensing Distance	3000 mm (118 in.)	1500 mm (59.1 in.)	600 mm (23.6 in.)
Min. Sensing Distance	300 mm (11.8 in.)	150 mm (5.91 in.)	100 mm (3.94 in.)
Beam Angle	8°	10°	8°
POWER SUPPLY			
Supply Voltage	19 - 30 VDC		
Supply Current	< 30 mA without load		
Circuit Protection	Reverse Polarity		
OUTPUT CHARACTERISTICS (DIGITAL)			
Load Current	0 - 100 mA		
Hysteresis	Programmable (0 - 255 mm)		
Switching Frequency	Programmable 5-30 Hz	Programmable 5-30 Hz	Programmable 5-50 Hz
Repeatability	±2 mm or ±0.4% of reading		
Setpoint Adjust	Programmable within sensing range		
Circuit Protection	Short circuit		
OUTPUT CHARACTERISTICS (ANALOG)			
Switching Frequency	Programmable 5-30 Hz	Programmable 5-30 Hz	Programmable 5-50 Hz
Repeatability	±2 mm or ±0.4% of reading		
Linearity	3 mm or ±0.5%		
Output Adjust	Programmable		
Circuit Protection	Short circuit		
ENVIRONMENTAL			
Operating Temperature	−15 to 70°C (5 to 150°F		
Storage Temperature	−25 to 85°C (−13 to 185°F)		
Sealing	IP 65		
SPECIAL FEATURES			
Hold Input	Stops transmission and reception when input is connected to 0 VDC. Analog output would be zero.		
Synchronization input	Avoids mutual interference from several sensors by interconnecting the Hold input from each sensor.		
LED Indicator	Illuminates when sensor detects target		
Programmable Parameters	Analog Output: Span, Offset, Positive or Negative slope Digital Output: Hysteresis, N.O./N.C.		

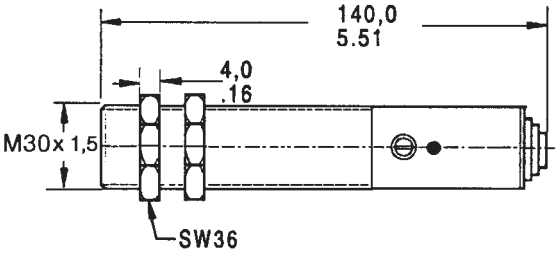
Compact 30 mm Diameter Analog and Digital, RS232/RS485 Interface

WIRING DIAGRAM



*Normal operation with no connection

MOUNTING DIMENSIONS (For reference only)



ACCESSORIES

	Catalog Listing	Features
Mounting clamp	43178389-030	Allows mounting to flat surface
Beam deflector	43192871-001	Allows right angle mounting (approx. dim. 50 x 170 mm)
Focusing beam deflector	43192871-002	Reduces beam angle by approximately 50%
Compact deflector	66195116-001	Allows right angle mounting (approx. dim. 35 x 52 mm)
Programming adapter	55000005-002	Allows sensor programming via RS232 interface
RS232/RS485 converter	55000003-001	Converts RS232 interface to RS485 interface
24 VDC Power supply, relay output, 110 VAC input	FF-MADB24RB	See page B102 more information
24 VDC Power supply, On/Off delay, 110 VAC input	FF-MADC24RB	See page B102 more information
Software package (disk, manual, cable + 1 sub min D9 connector)	55195101-101	Allows programming of sensor
Software package (disk, manual, cable + 2 sub min D9 connectors)	55195101-102	Allows programming of sensor
Straight connector	66195126-001	Used for wiring to connector
2 meter cable with straight connector	55195126-001	Used for wiring to connector

Ultrasonic Sensors

942 Series

2-Piece 30 mm Diameter
Precision Switching, Analog, Digital BCD, Hexadecimal Outputs

FEATURES

- **Background suppression**
- Sensor sealed to IP 65
- Amplifier sealed to IP 54
- DIN rail mounting
- Compensated over 0 to 50°C (32 to 120°F)
- Amplifier provides analog, digital switching, BCD or hexadecimal outputs

ORDER GUIDE

Sensor Package Style	Sensing Range* mm (in.)	Digital Output**	Multiplex Digital Output	Analog Output	Catalog Listing***
30 mm (1.18 in.) Stainless steel sensor head  272g (9.6 oz)	150 - 1500 (5.9 - 59.0)	Two PNP N.O. or N.C.	BCD/HEX	0 - 10 VDC 4 - 4 20 mA	942-M3A-2D-1G1-220S *Standard target: 120 mm thick square of mild steel perpendicular to ultrasonic beam. **N.O./N.C. output selectable ***Includes stainless steel sensor head, cable, straight connector and amplifier.

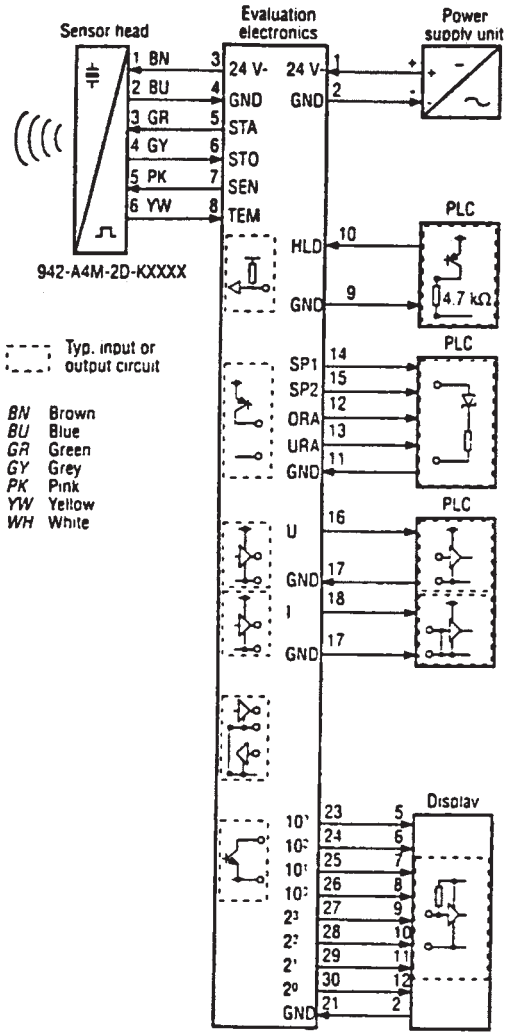
SPECIFICATIONS

Max. Sensing Distance	1500 mm (59.1 in.)
Min. Sensing Distance	150 mm (5.91 in.)
Beam Angle	10°/5°
POWER SUPPLY	
Supply Voltage	19-30 VDC
Supply Current	<130 mA without load
Circuit Protection	Reverse polarity
OUTPUT CHARACTERISTICS (DIGITAL)	
Load Current	0-100 mA
Hysteresis	±1% of setpoint
Switching Frequency	8 Hz
Repeatability	±1 mm or 0.2% of reading
Setpoint Adjustment	Digital switches
Output Adjustment	Beam angle 10° w/max. sensitivity or beam angle 5° w/min. sensitivity
Circuit Protection	Short circuit
OUTPUT CHRACTERISTICS (MULTIPLEX DIGITAL)	
Resolution	1 mm
Information Output	Bit Parallel/Word Serial
Setpoint Adjustment	Beam angle 10° w/max. sensitivity or beam angle 5° w/min. sensitivity
OUTPUT CHARACTERISTICS (ANALOG)	
Switching Frequency	8 Hz
Repeatability	±1 mm or 0.2% of reading
Linearity	±2 mm or 0.3%
Output Range Adjustment	Digital switches
Output Adjustment	Beam angle 10° w/max. sensitivity or beam angle 5° w/min. sensitivity
Min. Load Resistance (VDC)	1000 Ohms (0-10 VDC output)
Max. Load Resistance (mA)	250 Ohms (4-20 mA output)
Slope of Output	Positive or Negative via switch
ENVIRONMENTAL	
Operating Temperature	Sensor head: 0 to 70°C (32 to 158°F)/Amplifier: 0 to 50°C (32 to 122°F)
Storage Temperature	Sensor head/Amplifier: −25 to 85°C (−13 to 185°F)
Sealing	Sensor Head: IP 65/Amplifier: IP 54
SPECIAL FEATURES	
LED Indicators	RED - Under Range/ RED - Over Range: illumination dependent on analog range chosen and target position with respect to sensor YELLOW - Setpoint: illuminates when target reaches setpoint 1 or setpoint 2
Hold Input	Stops transmission and reception when input is connected to 0 VDC. Last output stored until input is disconnected
Synchronization Input	Avoids mutual interference from several sensors by interconnecting the hold input from each sensor

Ultrasonic Sensors

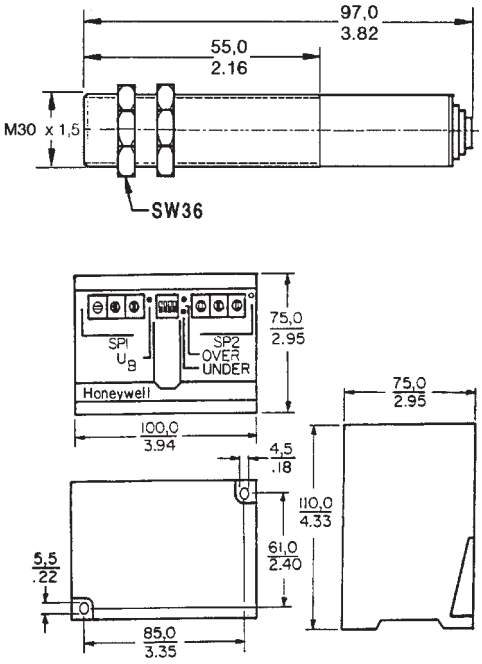
2-Piece 30 mm Diameter
Precision Switching, Analog, Digital BCD, Hexadecimal Outputs

WIRING DIAGRAM



	PWS	External supply terminals
1	19-30 V	19-30 V supply
2	GND	0 V line
Sensor head		Sensor head terminals
3	19-30 V	+Vs supply voltage
4	GND	0 V line
5	STA	Signal transmit command
6	STO	Stop signal, echo received
7	SEN	Receive sensitivity
8	TEM	Temperature sensor
RM	CO	Transmit control
9	GND	0 V line
10	HLD	Transmit inhibit, synchronize
Outputs		Switching outputs
11	GND	0 V line
12	ORA	No echo, out of range
13	URA	Under range, target too close
14	SP1	Switching output 1
15	SP2	Switching output 2
Analog out		Analog outputs
16	V	V out, 0-10 V
17	GND	0 V line
18	I	Current out, 4-20 mA
Digital out		Multiplexed digital outputs
23	10^3	1000 decade strobe
24	10^2	100 decade strobe
25	10^1	10 decade strobe
26	10^0	1 decade strobe
27	2^3	8 BCD/HEX
28	2^2	4 BCD/HEX
29	2^1	2 BCD/HEX
30	2^0	1 BCD/HEX

MOUNTING DIMENSIONS (For reference only)



Proximity

ACCESSORIES

	Catalog Listing	Features
Mounting clamp	43178389-030	Allows mounting to flat surface
Beam deflector	43192871-001	Allows right angle mounting (approx. dim. 50 x 170 mm)
Focusing beam deflector	43192871-002	Reduces beam angle by approximately 50%
Compact deflector	66195116-001	Allows right angle mounting (approx. dim. 35 x 52 mm)

REPLACEMENT LISTINGS

Sensor Head	942A4M-2D-K220S
Amplifier	942-M0A-2D-1G1-220S
Straight Connector (cable not included)	66195074-001

942 SERIES ULTRASONIC CROSS REFERENCE

Obsolete Listing	Replacement Listing	Comments
942-M88 942-M88-LF	942-M96	Sensor head, includes connector
942-M3A-2D-1G1	942-M0A-2D-1G1-220S	Amplifier

FEATURES
- Resistance interchangeable
- Accurate
- Linear
- Fast
- Laser trimmed
- Bolt, cement-on or strap-on models

TYPICAL APPLICATIONS
- HVAC – room, duct and refrigerant equipment
- OEM assemblies
- Electronic assemblies – semiconductor protection, temperature compensation
- Process control – temperature regulation

The HRTS is designed to measure surface temperatures from −200° to +480°C (−320° to +900°F) in printed circuit, temperature probe, or other applications.

HRTS surface temperature sensors are fully assembled elements, ready to use, without the need for fragile splices to extension leads.

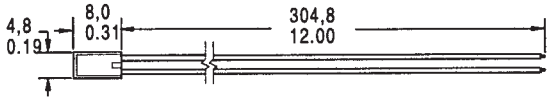
A thin layer of platinum is deposited on an alumina substrate and laser trimmed to a resistance interchangeability of ±0.2% with ±0.5°C accuracy or ±0.1% with ±0.3°C accuracy. The sensor chip is then glassed, wired and potted or ceramic fired to result in a cylindrical alumina package with either Teflon or fiber glass insulated lead wires.

ORDER GUIDE

HRTS-5760-B	Miniature, ceramic body, 28 ga TFE Teflon insulated leads (2-wire only)			
HRTS-61	Bolt-on, nickel plated copper alloy body, 24 ga fiberglass insulated leads, SST braid, TFE overwrap, spiral armor			
	-T	100Ω, 0.00385 Ω/Ω/°C, 3-wire leads, DIN specification		
	-U	1000Ω, 0.00375 Ω/Ω/°C, 2-wire leads		
		-0	±0.2% Resistance Trim (Standard)	
		-1	±0.1% Resistance Trim (Optional)	
			-12	Standard length, HRTS-5760-B
			-24	Standard length, HRTS-61

MOUNTING DIMENSIONS (for reference only)

HRTS-5760-B



HRTS-61

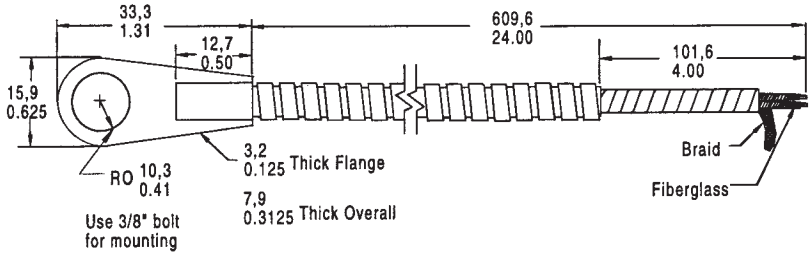


Fig. 1: Wheatstone Bridge 2-Wire Interface

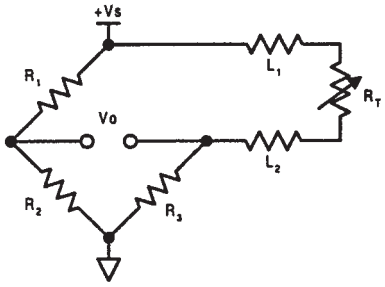


Fig. 2: Linear Output Voltage

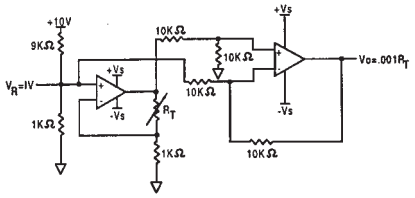
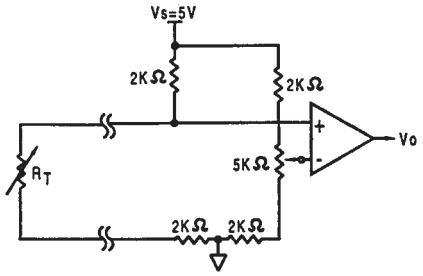


Fig. 3: Adjustable Point (Comparator) Interface



Temperature

FUNCTIONAL BEHAVIOR

$R_T = R_0(1+AT+BT^2-100CT^3+CT^4)$
RT = Resistance (Ω) at temperature T (°C)
R_0 = Resistance (Ω) at 0°C
T = Temperature in °C

$$A = \alpha + \frac{\alpha\,\delta}{100} \qquad B = \frac{-\alpha\,\delta}{100^2} \qquad C_{T<0} = \frac{-\alpha\,\beta}{100^4}$$

CONSTANTS

Alpha, α (°C^{-1})	0.00375 ±0.000029	0.003850 ±0.000010
Delta, δ (°C)	1.605 ± 0.009	1.4999 ± 0.007
Beta, β (°C)	0.16	0.10863
A (°C^{-1})	3.81×10^{-3}	3.908×10^{-3}
B (°C^{-2})	-6.02×10^{-7}	-5.775×10^{-7}
C (°C^{-4})	-6.0×10^{-12}	-4.183×10^{-12}

Both β = 0 and C = 0 for T>0°C

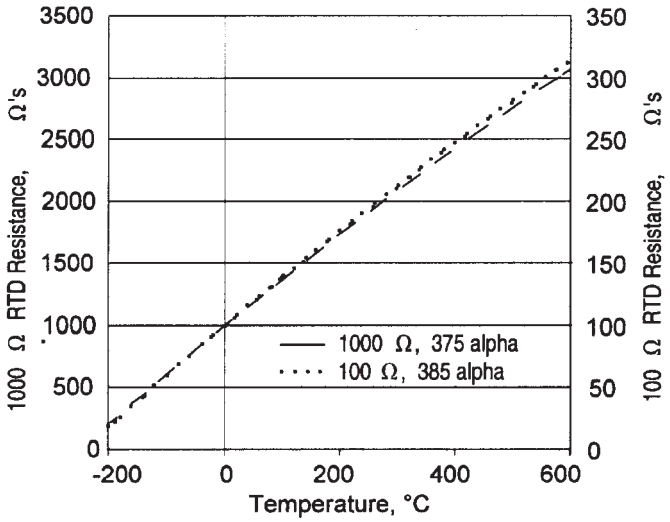
ACCURACY VS TEMPERATURE

HRTS platinum RTDs are available in two base resistance trim tolerances: ±0.2% or ±0.1%. The corresponding resistance interchangeability and temperature accuracy for these tolerances are:

Tolerance	**Standard ±0.2%**		**Optional ±0.1%**	
Temperature (°C)	±ΔR* (Ω)	±ΔT (°C)	±ΔR* (Ω)	±ΔT (°C)
−200	6.8	1.6	5.1	1.2
−100	2.9	0.8	2.4	0.6
0	2.0	0.5	1.0	0.3
100	2.9	0.8	2.2	0.6
200	5.6	1.6	4.3	1.2
300	8.2	2.4	6.2	1.8
400	11.0	3.2	8.3	2.5
500	12.5	4.0	9.6	3.0
600	15.1	4.8	10.4	3.3

*1000Ω RTD. Divide ΔR by 10 for 100Ω RTD.

RESISTANCE VS TEMPERATURE CURVE



CAUTION
PRODUCT DAMAGE
The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation, take normal ESD precautions when handling this product.

SPECIFICATIONS

Sensor Type	Thin film platinum RTD: R_o = 1000 Ω @ 0°C; alpha = 0.00375 Ω/Ω/°C R_o = 100 Ω @ 0°C; alpha = 0.00385 Ω/Ω/°C
Temperature Range	HRTS-5760-B: −200° to +260°C (−320° to +500°F) HRTS-61: −75° to +425°C (−100° to +800°F)
Temperature Accuracy	±0.5°C or 0.8% of temperature @ 0.2% R_o Trim ±0.3°C or 0.6% of temperature @ 0.1% R_o Trim Optional
Time Constant, 1/e	HRTS-5760-B: Typically 0.6 sec. on metal surfaces HRTS-61: Typically 20 sec. On metal surfaces
Operating Current	2 mA max. for self-heating errors of 1°C 1 mA recommended
Self-Heating	0.3 mW/°C
Lead Material	Nickel coated stranded copper, Teflon or Fiberglass insulated

Ultrasonic Sensors

945 Series

Precision Digital 18 mm Diameter

FEATURES

- **Background suppression**
- Sealed to IP 65
- Fixed or adjustable setpoint control
- Temperature compensation over 0 to 50°C (32 to 122°F)
- Inhibit/synchronization input
- Stainless steel or plastic housings

ORDER GUIDE

Sensor Package Style	Sensing Range* mm (in.)	Setpoint	Output Type	Catalog Listing
18 mm dia. Plastic  90,7 g (3.2 oz.)	100 - 500 (3.9 - 19.68)	Fixed @ 400 mm (15.75 in.) ± 20 mm**	PNP, N.O.	945-F4Y-AD-001
			NPN, N.O.	945-F4Y-AD-002
	100 - 200 (3.9 - 7.87)	Fixed @ 200 mm (7.87 in.) ± 20 mm**	PNP, N.O.	945-N4Y-AD-001
			NPN, N.O.	945-N4Y-AD-002
	200 - 500 (7.87 - 19.68)	Setpoint adjustment within sensing range	PNP, N.O.	945-F4Y-AD-001-180E
	70 - 180 (2.76 - 7.09)	Setpoint adjustment within sensing range	PNP, N.O.	945-F4Y-AD-001-300E
18 mm dia. Stainless Steel  136 g (4.8 oz.)	100 - 500 (3.9 - 19.68)	Setpoint adjustment within sensing range	PNP, N.O.	945-L4Y-AD-001
			NPN, N.O.	945-L4Y-AD-002
	100 - 200 (3.9 - 7.87)	Setpoint adjustment within sensing range	PNP, N.O.	945-S4Y-AD-001
			NPN, N.O.	945-S4Y-AD-002

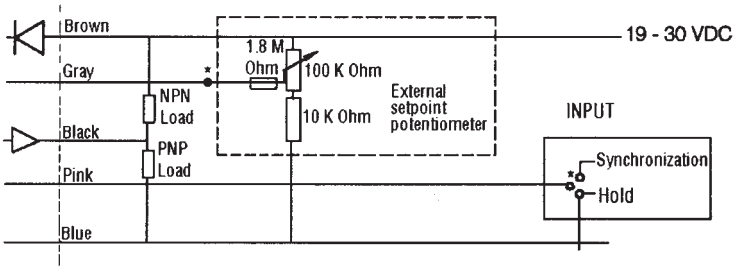
* Standard target is 120 mm square of mild steel perpendicular to ultrasonic beam.
**External setpoint adjustment wiring possible.

SPECIFICATIONS
SENSING CHARACTERISTICS

Catalog Listings	945-F4Y-AD-001 945-F4Y-AD-002 945-L4Y-AD-001 945-L4Y-AD-002	945-N4Y-AD-001 945-N4Y-AD-002 945-S4Y-AD-001 945-S4Y-AD-002	945-F4Y-AD-001-180E	945-F4Y-AD-001-300E
Max. Sensing Distance	500 mm (19.66 in.)	200 mm (7.87 in.)	500 mm (19.66 in.)	180 mm (7.09 in.)
Min. Sensing Distance	100 mm (3.9 in.)	100 mm (3.9 in.)	200 mm (7.87 in.)	70 mm (2.76 in.)
Beam Angle	10°	10°	8°	8°
POWER SUPPLY				
Supply Voltage	19 - 30 VDC			
Supply Current	<30 mA without load		<25 mA without load	
Circuit Protection	Reverse polarity			
OUTPUT CHARACTERISTICS				
Load Current	0 - 100 mA			
Hysteresis	~ 10 mm			
Switching Frequency	30 Hz	60 Hz	25 Hz	60 Hz
Repeatability	± 0.5 mm or 0.3% or reading			±0.2 mm or 0.2% or reading
Setpoint Adjustment	(Fixed or External Circuit) or 4 Turn Potentiometer			
Circuit Protection	Short Circuit			
ENVIRONMENTAL				
Operating Temperature	0 to 50°C (32 to 122°F)			
Storage Temperature	0 to 70°C (32 to 150°F)			
Sealing	IP 65			
SPECIAL FEATURES				
Hold Input	Stops transmission and reception when input is connected to 0 VDC. Last output will be stored until input is disconnected			
Synchronization Input	Avoids mutual interference from several sensors. (External synchronization unit is required. See Accessories)			
LED Indicator	Illuminates when sensor detects target			

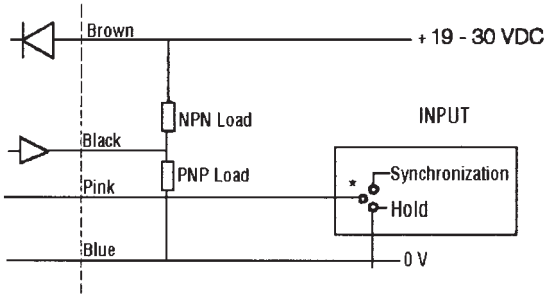
WIRING DIAGRAMS

945-F/N Series



*Normal operation with no connection

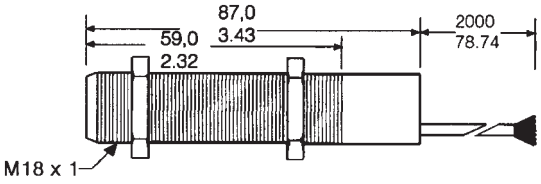
945-L/S Series



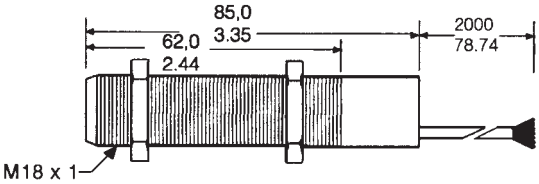
*Normal operation with no connection

MOUNTING DIMENSIONS (For reference only)

945-F/N Series plastic Housing



945-L/S Series Stainless Steel Housing



ACCESSORIES

	Catalog Listing	Features
24 VDC Power supply, relay output, 110 VAC input	FF-MADB24RB	See page B102 for more information
24 VDC Power supply, ON/OFF delay, 110 VAC input	FF-MADC24RB	See page B102 for more information
Synchronization unit	55000001	Controls up to 100 sensors
Mounting clamp, 18 mm housing	43178389-018	Allows mounting to a flat surface
Beam deflector	43192871-003	Allows right angle mounting (approx. dim. 50 x 170 mm)
Focusing beam deflector	43192871-004	Reduces beam angle by approximately 50%

Ultrasonic Sensors

945 Series

Precision Analog 18 mm Diameter

FEATURES

- **Background suppression**
- Sealed to IP 65
- Adjustable sensitivity
- Temperature compensation over 0 to 50°C (32 to 122°F)
- Inhibit/synchronization input
- Stainless steel or plastic housings

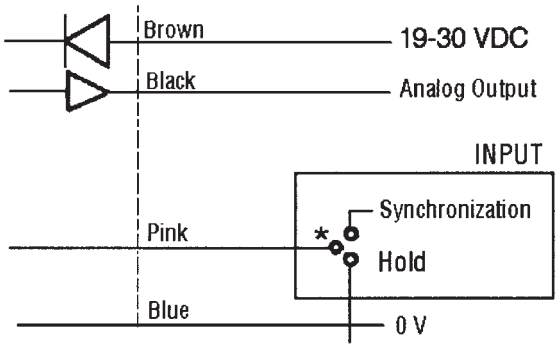
ORDER GUIDE

Sensor Package Style	Sensing Range* mm (in.)	Analog Output	Catalog Listing
18 mm dia. Plastic  90,7 g (3.2 oz.)	150 - 600 (5.9 - 23.6)	1.5 - 6 V	945-F4Y-AD-1C0-180E
	60 - 200 (2.36 - 7.87)	1.8 - 6 V	945-F4Y-AD-1C0-300E
18 mm dia. Stainless Steel  136 g (4.8 oz.)	100 - 600 (3.9 - 23.6)	1 - 6 V	945-L4Y-AD-1C0
18 mm dia. Plastic with Stainless Steel or Plastic External Head 	150 - 600 (5.9 - 23.6)	1.5 - 6 V	945-E3Y-AD-1C0-180E (M18 x 1 stainless steel sensor head)
	30 - 150 (1.18 - 5.9)	0.9 - 4.5 V	945-G3Y-AD-1C0-300E (M12 x 1 plastic sensor head)

SPECIFICATIONS

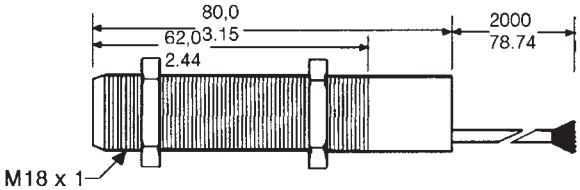
Catalog Listings	945-F4Y-AD-1C0-180E	945-F4Y-AD-1C0-300E	945-L4Y-AD-1C0	945-E3Y-AD-1C0-180E	945-G3Y-AD-1C0-300E
Max. Sensing Distance	600 mm (23.6 in.)	200 mm (7.87 in.)	600 mm (23.6 in.)	600 mm (23.6 in.)	150 mm (5.9 in.)
Min. Sensing Distance	150 mm (5.9 in.)	60 mm (2.36 in.)	100 mm (3.9 in.)	150 mm (5.9 in.)	30 mm (1.18 in.)
Beam Angle	8°	8°	10°	8°	8°
POWER SUPPLY					
Supply Voltage	19 - 30 VDC				
Supply Current	<20 mA without load				
Circuit Protection	Reverse polarity				
OUTPUT CHARACTERISTICS					
Load Current	10 mA max.				
Switching Frequency	10 Hz	20 Hz	10 Hz	10 Hz	20Hz
Repeatability	< ± 0.3% of reading				
Linearity	<0.2%				
Output Adjustment	4 turn potentiometer				
Circuit Protection	Short Circuit				
ENVIRONMENTAL					
Operating Temperature	0 to 50°C (32 to 122°F)				
Storage Temperature	0 to 70°C (32 to 158°F)				
Sealing	IP 65				
SPECIAL FEATURES					
Hold Input	Stops transmission and reception of sensor when input is connected to 0 VDC. Analog output would be zero VDC				
Synchronous Input	Avoids mutual interference from several ultrasonic sensors (external synchronization unit is required; see accessories)				
LED Indicator	Illuminates when sensor detects a target				

WIRING DIAGRAMS
945-F/L, 945-E/G Series

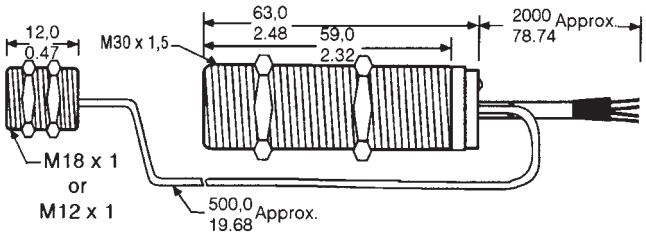


*Normal operation with connection to 19-30 VDC

MOUNTING DIMENSIONS (For reference only)
945-F/L Series Housing



945-E/G Series with External Head



Proximity

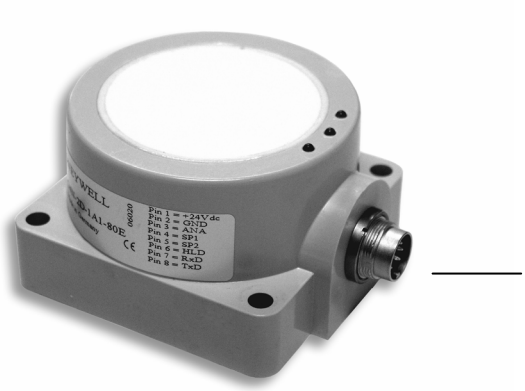
ACCESSORIES

	Catalog Listing	Features
Synchronization unit	55000001	Controls up to 100 sensors
Mounting clamp, 18 mm housing	43178389-018	Allows mounting to flat surface
Beam deflector	43192871-003	Allows right angle mounting (approx. dim. 50 x 170 mm)
Focusing beam deflector	43192871-004	Reduces beam angle by approximately 50%

Honeywell

94X Series (942-04N-2D-1A1/1A2-80E, 943-04V-2D-001/002/1C0/1D0-80E, 947-04V-2D-1C0/1D0-80E)

Ultrasonic Distance Sensors



DESCRIPTION

This collection of ultrasonic devices offers enhanced sensing range capability in a square plastic housing. Available sensor types include programmable, Teach-In, and analogue and fixed output versions.

FEATURES

- Non contact distance sensing for use in non invasive measurement
- Reduced sensitivity to light intensity/reflectivity/opacity of target for enhanced flexibility and certainty of measurement
- Detects over much longer distance than other detection methods reducing the need for close proximity to the target
- Extremely long sensing distance (up to 6 m [19.65 ft]) reducing the need for close proximity measurement which can be critical for some applications

POTENTIAL APPLICATIONS

- Level measurement
- Presence/absence detection
- Distance measurement

943 Series (942-O4N-2D-1A1/1A2-80E, 943-O4V-2D-001/002/1C0/1D0-80E, 947-O4V-2D-1C0/1D0-80E)

Specifications

Parameter	942-O4N-2D-1A1-80E	942-O4N-2D-1A2-80E	943-O4V-2D-001-80E	943-O4V-2D-002-80E	943-O4V-2D-1C0-80E	943-O4V-2D-1D0-80E	947-O4V-2D-1C0-80E	947-O4V-2D-1D0-80E
Max. sensing distance	6000 mm [236.22 in]						5000 mm [196.85 in]	
Min. sensing distance	600 mm [23.62 in]						500 mm [19.69 in]	
Expected response time 90% of final value	250 ms/prog		–		700 ms		400 ms	
Beam angle	8º						10º	
Switching frequency	7 Hz/prog		0.5 Hz		7 Hz/prog			
Linearity error	<0.3%		–		<0.5 %			
Hysteresis	prog		~1%		–			
Repeatability of measured distance	0.2%		–		0.2% ±2 mm [0.08 in]		0.2%	
Temperature range	-15 °C to 70 °C [-5 °F to 158 °F]							
Temperature compensation	yes						–	
Operating voltage	15 Vdc to 30 Vdc		12 Vdc to 30 Vdc		15 Vdc to 30 Vdc		24 Vdc ±20%	
Expected current consumption	100 mA		<80 mA		<35 mA		<40 mA	
Analogue output	0 V to 10 V/4 mA to 20 mA		–		0 V to 10 V	4 mA to 20 mA	0 V to 10 V	4 mA to 20 mA
Analogue output selection by load	load >2 kOhm Uout load <500 Ohm Iout		–					
Switching outputs	2 PNP NO/NC	2 NPN NO/NC	2 PNP NO/NC	2 NPN NO/NC	–			
Expected output current	100 mA max.		500 mA max.		–			
Adjustment	programming		Teach-In				–	
Alignment LED Status switching output 1 Status switching output 2	green (1) yellow (2) yellow (3)				–			
Control input Inhibit connect to: Synchronisation connect to: Enable connect to:	Pin 6→ 0 V Pin 6 ↔ Pin 6 Pin 6 → NC		–				Pin 2→ 0 V Pin 2 ↔ Pin 2 Pin 2 → NC	
Interface	RS232		–					
Plastic housing	PBPT							
Sealing*	IP65							
Connector	8 pin M16x0.75		5 pin M12x1					

*Attention! Do not expose sensor head to hot water >50 °C or steam vapour.

Accessories: 942-O4N-2D-1A1/1A2-80E

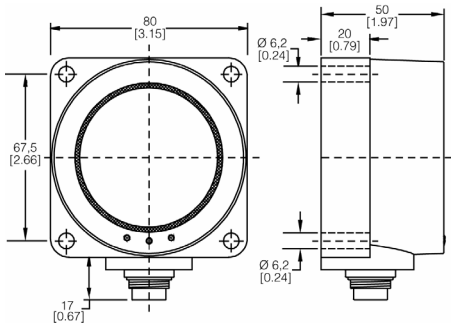
Catalog Listing	Description
66195126-001	Mating connector straight
55000005-002	Programming adaptor
55000010-001	Software programming adaptor and PC connection cable
55000018-001	Programming cable

Accessories: 943-O4V-2D-001/002-80E, 943-O4V-2D-1C0/1D0-80E, 947-O4V-2D-1C0/1D0-80E

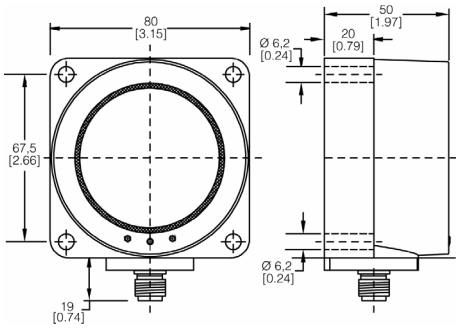
Catalog Listing	Description
66195044-001	Mating connector straight
66195045-001	Mating connector angled
66195214-001	Straight cable/connector 2 m
66195216-001	Right-angle cable/connector 2 m

Mounting Dimensions (For reference only. mm/[in])

942-O4N-2D-1A1/1A2-80E

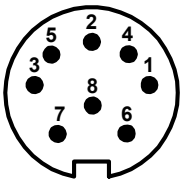


943-O4V-2D-001/002/1C0/1D0-80E,
947-O4V-2D-1C0/1D0-80E



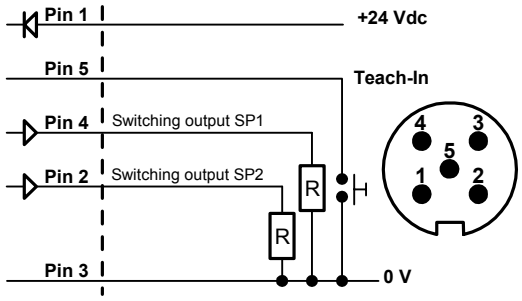
Wiring

P42-O4N-2D-1A1/1A2-80E
View to solder pins of connector

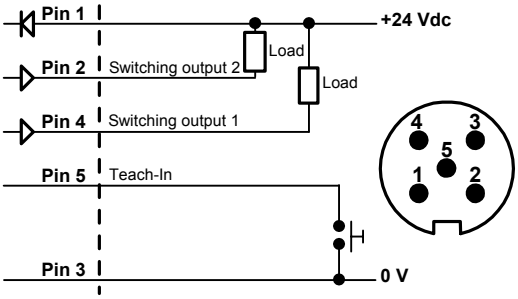


Pin 1: + 24 Vdc
Pin 2: GND
Pin 3: U/I
Pin 4: SP1
Pin 5: SP2
Pin 6: Hld/Sync
Pin 7: RxD
Pin 8: TxD

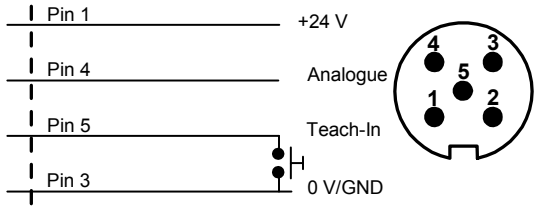
943-O4V-2D-001-80E



943-O4V-2D-002-80E



943-O4V-2D-1C0/1D0-80E



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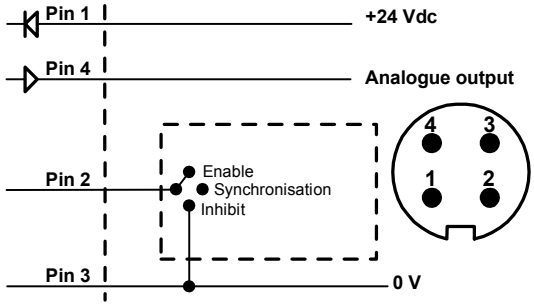

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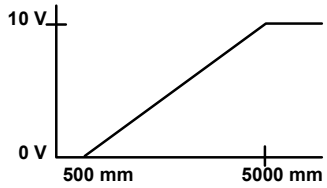

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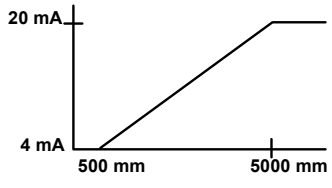
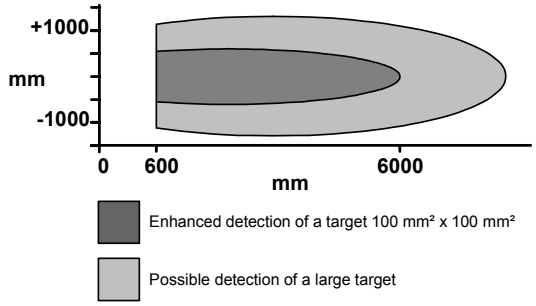
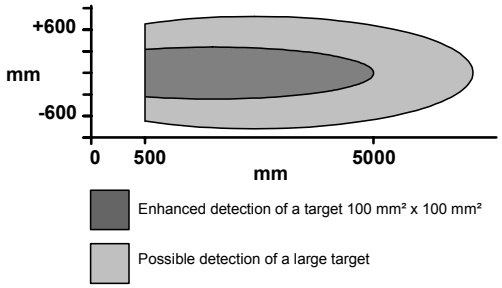


Detection Range

942-O4N-2D-1A1/1A2-80E,
943-04V-2D-001/002/1C0/1D0-80E



947-04V-2D-1C0/1D0-80E



⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

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While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

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Honeywell

004451-1-EN IL50 GLO Printed in USA
February 2006

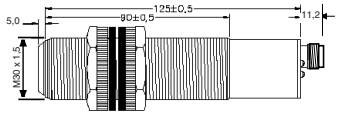
943 Series
Ultrasonic Distance Sensors

CE

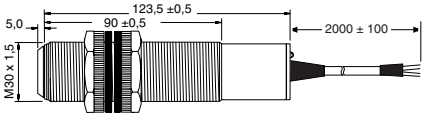
The new 943 series industrial sensors are the latest addition to our product range. They have improved scanning ranges, remote teach in of the switching or analog outputs, as well as new advanced features, such as window and hysteresis modes.

M30

CONNECTOR

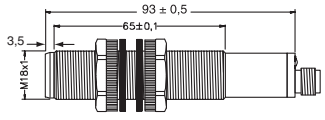


CABLE

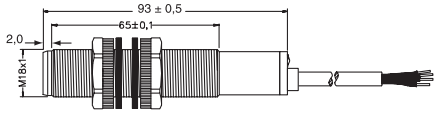


M18

CONNECTOR



CABLE



M18/M30

Termination: Connector M12 x 1
Cable Preleaded 2 m

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OPTIONS AND ORDER GUIDE

2 switching outputs PNP NO and NPN NO

Beam angle: 8°
Supply voltage: 12 to 30 V
Sealing: IP67

M30

Housing: M30 x 1,5 mm plastic (PBTB)
Max. sensing distance: 3500 mm
Min. sensing distance: 300 mm
Switching frequency: 1.0 Hz
Repeatability: 0,2 % or 2 mm

OUTPUT	TERMINATION	REFERENCE
PNP, 2 NO/NC	Connector	943-T4V-2D-001-130E
PNP, 2 NO/NC	Cable	943-T4Y-2D-001-130E
NPN, 2 NO/NC	Connector	943-T4V-2D-002-130E
NPN, 2 NO/NC	Cable	943-T4Y-2D-002-130E

M18

Housing: M18 x 1,0 mm plastic (PBTB)
Max. sensing distance: 2000 mm
Min. sensing distance: 200 mm
Switching frequency: 1.2 Hz
Repeatability: 0,2 % or 2 mm

OUTPUT	TERMINATION	REFERENCE
PNP, 2 NO/NC	Connector	943-F4V-2D-001-180E
PNP, 2 NO/NC	Cable	943-F4Y-2D-001-180E
NPN, 2 NO/NC	Connector	943-F4V-2D-002-180E
NPN, 2 NO/NC	Cable	943-F4Y-2D-002-180E

Max. sensing distance: 800 mm
Min. sensing distance: 100 mm
Switching frequency: 4.7 Hz
Repeatability: 0,2 % or 1 mm

OUTPUT	TERMINATION	REFERENCE
PNP, 2 NO/NC	Connector	943-F4V-2D-001-300E
PNP, 2 NO/NC	Cable	943-F4Y-2D-001-300E
NPN, 2 NO/NC	Connector	943-F4V-2D-002-300E
NPN, 2 NO/NC	Cable	943-F4Y-2D-002-300E

Max. sensing distance: 500 mm
Min. sensing distance: 60 mm
Switching frequency: 4.7 Hz
Repeatability: 0,2 % or 1 mm

OUTPUT	TERMINATION	REFERENCE
PNP, 2 NO/NC	Connector	943-F4V-2D-001-330E
PNP, 2 NO/NC	Cable	943-F4Y-2D-001-330E
NPN, 2 NO/NC	Connector	943-F4V-2D-002-330E
NPN, 2 NO/NC	Cable	943-F4Y-2D-002-330E

Analogue voltage output 0-10 V and 4-20 mA

Beam angle: 8°
Supply voltage: 15 to 30 V
Sealing: IP67

M30

Housing: M30 x 1,5 mm plastic (PBTB)
Max. sensing distance: 3500 mm
Min. sensing distance: 300 mm
Response time: 400 ms
Repeatability: 0,2 % or ±2 mm

OUTPUT	TERMINATION	REFERENCE
0-10 V	Connector	943-T4V-2D-1C0-130E
0-10 V	Cable	943-T4Y-2D-1C0-130E
4-10 mA	Connector	943-T4V-2D-1D0-130E
4-20 mA	Cable	943-T4Y-2D-1D0-130E

M18

Housing: M18 x 1,0 mm plastic (PBTB)
Max. sensing distance: 2000 mm
Min. sensing distance: 200 mm
Switching frequency: 250 ms
Repeatability: 0,2 % or ±2 mm

OUTPUT	TERMINATION	REFERENCE
0-10 V	Connector	943-F4V-2D-1C0-180E
0-10 V	Cable	943-F4Y-2D-1C0-180E
4-10 mA	Connector	943-F4V-2D-1D0-180E
4-20 mA	Cable	943-F4Y-2D-1D0-180E

Max. sensing distance: 800 mm
Min. sensing distance: 100 mm
Switching frequency: 100 ms
Repeatability: 0,2 % or ±1 mm

OUTPUT	TERMINATION	REFERENCE
0-10 V	Connector	943-F4V-2D-1C0-300E
0-10 V	Cable	943-F4Y-2D-1C0-300E
4-10 mA	Connector	943-F4V-2D-1D0-300E
4-20 mA	Cable	943-F4Y-2D-1D0-300E

Max. sensing distance: 500 mm
Min. sensing distance: 60 mm
Switching frequency: 100 ms
Repeatability: 0,2 % or ±1 mm

OUTPUT	TERMINATION	REFERENCE
0-10 V	Connector	943-F4V-2D-1C0-330E
0-10 V	Cable	943-F4Y-2D-1C0-330E
4-10 mA	Connector	943-F4V-2D-1D0-330E
4-20 mA	Cable	943-F4Y-2D-1D0-330E

WARNING

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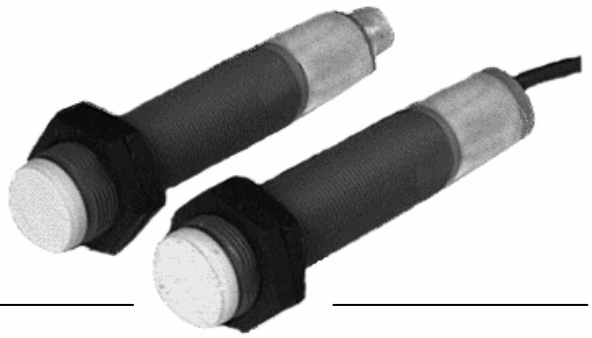
100464-EN Issue 1 02/04 UK07 GLO

Honeywell

943 Series (943-F4V/F4Y-2D-001/002/1C0/1D0-360E)



Ultrasonic Distance Sensors

DESCRIPTION

The new 943-F4V (connector) and 943-F4Y (cable) Series industrial sensors are the latest additions to our range of ultrasonic distance sensors. They offer improved scanning ranges and remote Teach-In of the switching or analog outputs, in addition to new, advanced features, such as Window and Hysteresis modes. The devices are Teach-In compatible and have an M18 plastic housing.

FEATURES

- Non contact distance sensing for use in non invasive measurement
- Reduced sensitivity to light intensity/reflectivity/opacity of target for enhanced flexibility and certainty of measurement
- Detects over much longer distance than other detection methods reducing the need for close proximity to the target
- Presence absence, tank fill level and diameter measurement provides an extremely robust and flexible measurement method
- Short distance (in ultrasonic terms) for enhanced accuracy, repeatability (material independent) measurement to 30 mm [1.18 in].
-

POTENTIAL APPLICATIONS

- Reel diameter measurement
- Tank level measurement
- Presence/absence of an object
- Loop control
- Product height measurement
- Tire manufacturing

943 Series (943-F4V/F4Y-2D-001/002/1C0/1D0-360E)

Specifications

Parameter	943-F4V-2D-001-360E	943-F4V-2D-002-360E	943-F4V-2D-1C0-360E	943-F4V-2D-1D0-360E	943-F4Y-2D-001-360E	943-F4Y-2D-002-360E	943-F4Y-2D-1C0-360E	943-F4Y-2D-1D0-360E
Max. sensing distance	400 mm [15.75 in]							
Min. sensing distance	30 mm [1.18 in]							
Expected response time 90% of final value	–		60 ms		–		60 ms	
Beam angle	8º							
Switching frequency	15 Hz		–		15 Hz		–	
Linearity error	–		<0.5%		–		<0.5%	
Hysteresis	1%		–		1%		–	
Repeatability of measured distance	±1 mm [0.039 in] ±0.2%							
Temperature range	-15 °C to 70 °C [-5 °F to 158 °F]							
Temperature compensation	yes							
Operating voltage	12 Vdc to 30 Vdc		15 Vdc to 30 Vdc		12 Vdc to 30 Vdc		15 Vdc to 30 Vdc	
Possible min. supply	–		12 Vdc		–		12 Vdc	
Expected current consumption	<80 mA		<40 mA		<80 mA		<40 mA	
Output	2X PNP NO/NC	2X NPN NO/NC	0 V to 10 V	4 mA to 20 mA	2X PNP NO/NC	2X NPN NO/NC	0 V to 10 V	4 mA to 20 mA
Expected output current	500 mA max.		–		500 mA max.		–	
Adjustment set point	Teach-In		–		Teach-In		–	
Teach-In input	pin 5				pink wire			
Sensitivity Teach-In: P1/P2 determines output position	–		Teach-In		–		Teach-In	
Plastic housing	PBPT M18x1							
Sealing*	IP65							
Connector	M12x1				–			
Cable connection	–				2 m [6.56 ft]			

*Attention! Do not expose sensor head to hot water >50 °C or steam vapour.

Accessories: 943-F4V-2D-001/002/1CO/1DO-360E

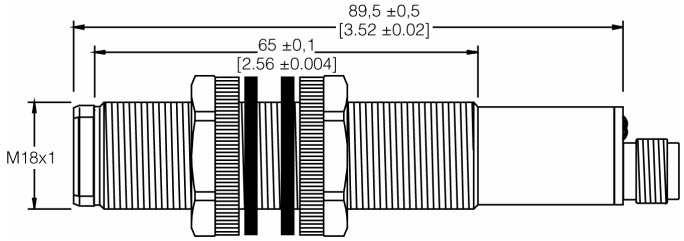
Catalog Listing	Description
66195044-001	Mating connector straight
66195045-001	Mating connector angled
66195214-001	Straight cable/connector 2 m
66195216-001	Right-angle cable/connector 2 m
43178389-018	Mounting clamp
43192871-003	Beam deflector
43192871-004	Focusing beam deflector

Accessories: 943-F4Y-2D-001/002/1CO/1DO-360E

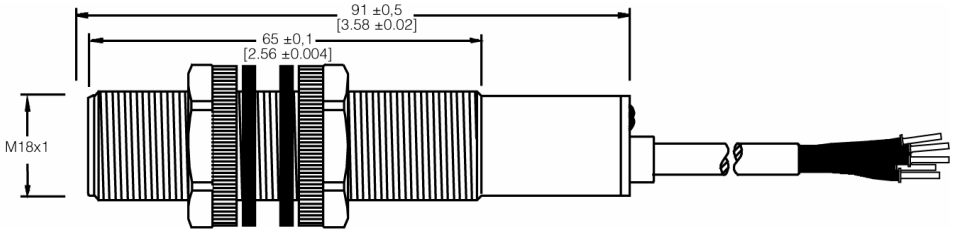
Catalog Listing	Description
43178389-018	Mounting clamp
43192871-003	Beam deflector
43192871-004	Focusing beam deflector

Mounting Dimensions Continued (For reference only. mm/[in])

943-F4V-2D-001/002/1C0/1D0-360E

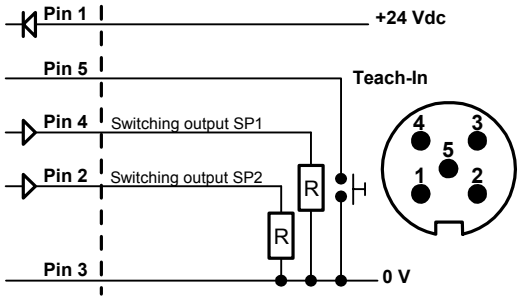


943-F4Y-2D-001/002/1C0/1D0-360E

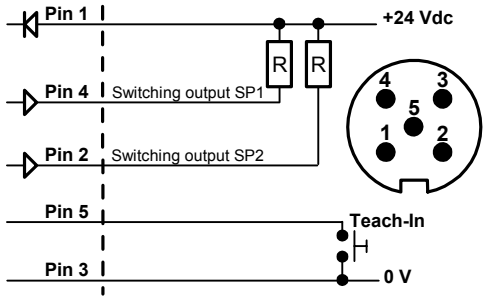


Wiring

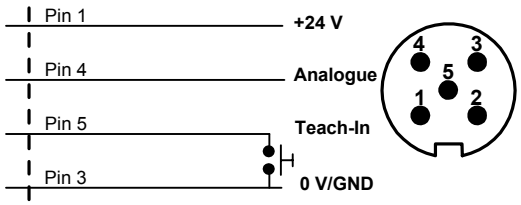
943-F4V-2D-001-360E



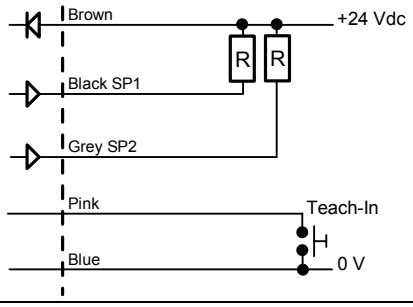
943-F4V-2D-002-360E



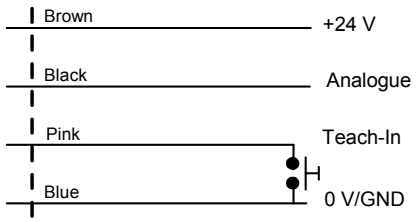
943-F4V-2D-1C0/1D0-360E



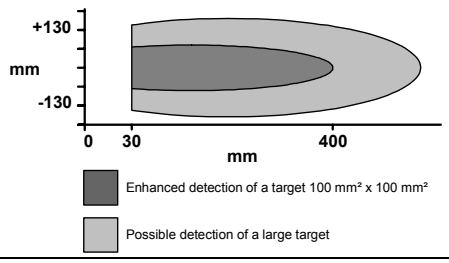
943-F4Y-2D-001/002-360E



943-F4Y-2D-1C0/1D0-360E



Detection Range



⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

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SALES AND SERVICE

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Honeywell

943 Series (943-G4V-2G-001/002-400E)

Ultrasonic Distance Sensors

DESCRIPTION

The new 943-G4V series industrial sensors are the latest addition to our range of ultrasonic distance sensors. They offer improved scanning ranges and remote Teach-In of the switching or analogue outputs, in addition to new, advanced features, such as Window and Hysteresis modes. The devices are Teach-In compatible and have an M12 stainless steel housing for the 943 G4V.

FEATURES

- Non contact distance sensing for use in non invasive measurement
- Reduced sensitivity to light intensity/reflectivity/opacity of target for enhanced flexibility and certainty of measurement
- Detects over much longer distance than other detection methods reducing the need for close proximity to the target
- Short distance (in ultrasonic terms) for accuracy, repeatability (material independent) measurement to 25 mm [0.98 in].

POTENTIAL APPLICATIONS

- Reel diameter measurement
- Tank level measurement
- Presence/absence of an object
- Loop control
- Product height measurement
- Tire manufacturing

943 Series (943-G4V-2G-001/002-400E)

Specifications

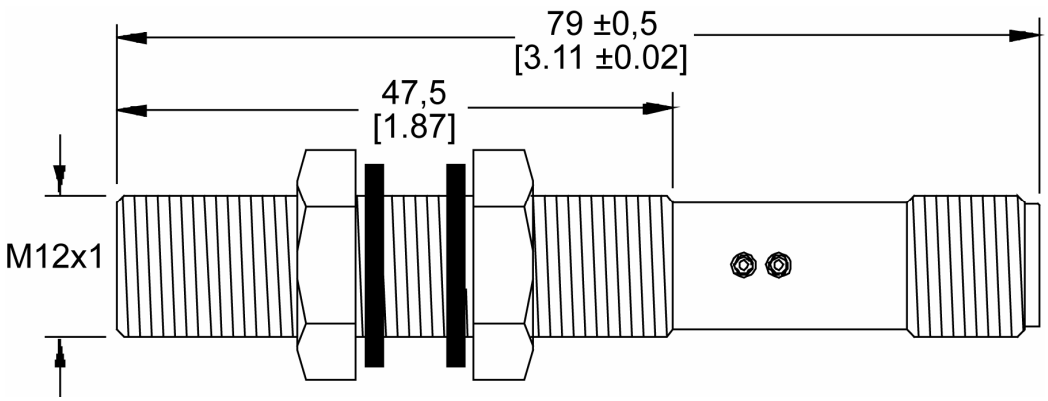
Parameter	943-G4V-2G-001-400E	943-G4V-2G-002-400E
Max. sensing distance	250 mm [9.84 in]	
Min. sensing distance	25 mm [0.98 in]	
Switching frequency	30 Hz	
Hysteresis	1%	
Beam angle	8°	
Repeatability	0,3 mm [0.012 in]	
Temperature range	-20 °C to 70 °C [-4 °F to 158 °F]	
Operating voltage	10 Vdc to 30 Vdc	
Expected current consumption	<100 mA	
Output	PNP NO/NC	NPN NO/NC
Expected output current	100 mA max.	
Adjustment set point	Teach-In	
Stainless steel housing	M12x1	
Sealing*	IP65	
Connector	M12x1	

*Attention! Do not expose sensor head to hot water >50 °C or water vapour.

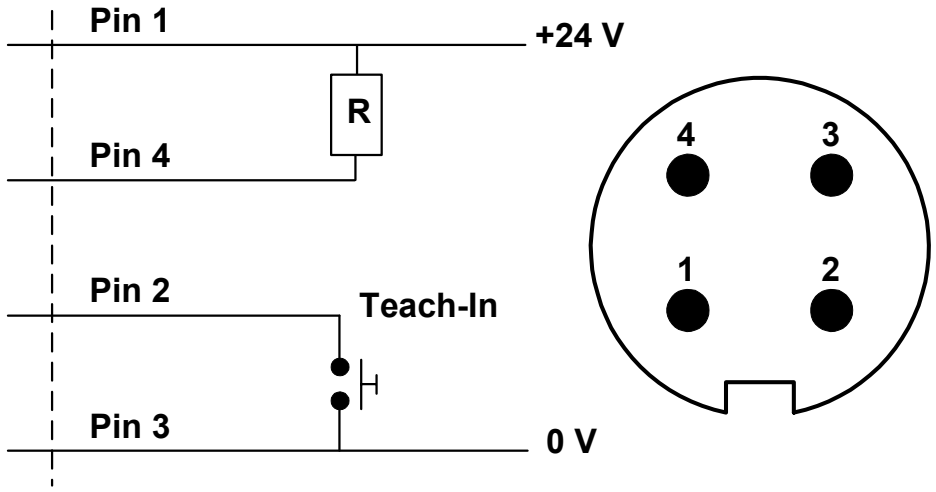
Accessories

Catalog Listing	Description
66195044-001	Mating connector straight
66195045-001	Mating connector angled

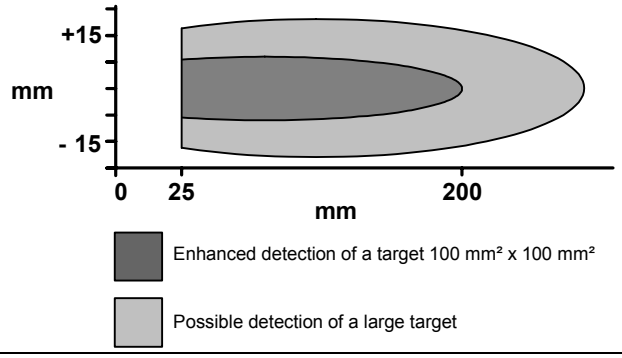
Mounting Dimensions (For reference only. mm/[in])



Wiring



Detection Range



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Honeywell

943 Series (943-K4U-2G-001/002/1C0-400E)

Ultrasonic Distance Sensors

DESCRIPTION

The new 943-K4U series industrial sensors are the latest addition to our range of ultrasonic distance sensors. They offer improved scanning ranges and remote Teach-In of the switching or analogue outputs, in addition to new, advanced features, such as Window and Hysteresis modes. The devices are Teach-In compatible and have a plastic housing.

FEATURES

- Non contact distance sensing for use in non invasive measurement
- Reduced sensitivity to light intensity/reflectivity/opacity of target for enhanced flexibility and certainty of measurement
- Detects over much longer distance than other detection methods reducing the need for close proximity to the target
- Presence absence, tank fill level and diameter measurement provide an extremely robust and flexible measurement method
- Miniature form factor device fits into the smallest mounting positions
- Two mounting methods provide flexibility of mounting options to suit the application

POTENTIAL APPLICATIONS

- Level measurement in small containers/test tubes
- Small object detection in narrow environments
- Presence detection
- Winding/unwinding control
- Height/thickness measurement
- Parts counting

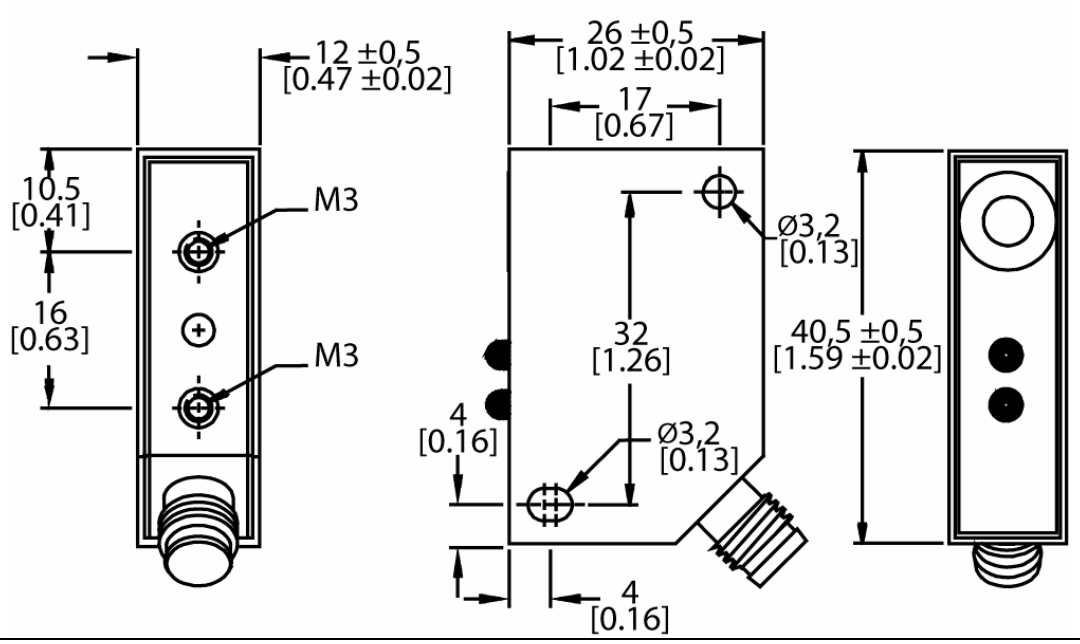
943 Series (943-K4U-2G-001/002/1C0-400E)

Specifications

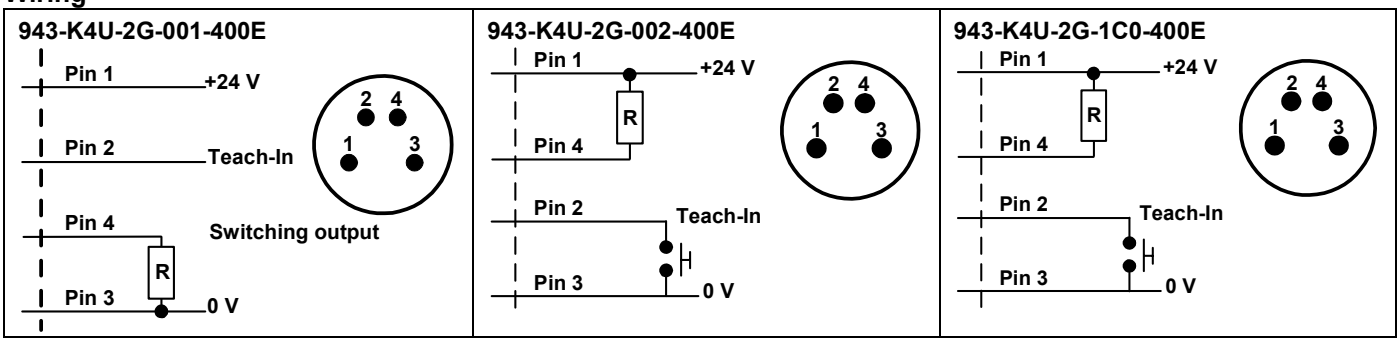
Parameter	943-K4U-2G-001-400E	943-K4U-2G-002-400E	943-K4U-2G-1C0-400E
Max. sensing distance	250 mm [9.84 in]		
Min. sensing distance	25 mm [0.98 in]		
Switching frequency	25 Hz		–
Linearity error	–		<0.3%
Hysteresis	2%		–
Repeatability of measured distance	-		±0.2 mm [0.008 in] ±0.2%
Beam angle	8°		
Temperature range	-25 °C to 70 °C [-13 °F to 158 °F]		
Temperature compensation	yes		
Operating voltage	10 Vdc to 30 Vdc		12 Vdc to 30 Vdc
Expected current consumption	<100 mA		
Output	PNP NO/NC	NPN NO/NC	0 V to 10 V
Expected output current	100 mA max.		–
Adjustment set point	Teach-In		–
Adjustment	–		Teach-In
Housing material	plastic		
Sealing*	IP67		
Connector	M8		

*Attention! Do not expose sensor head to hot water >50 °C or steam vapour.

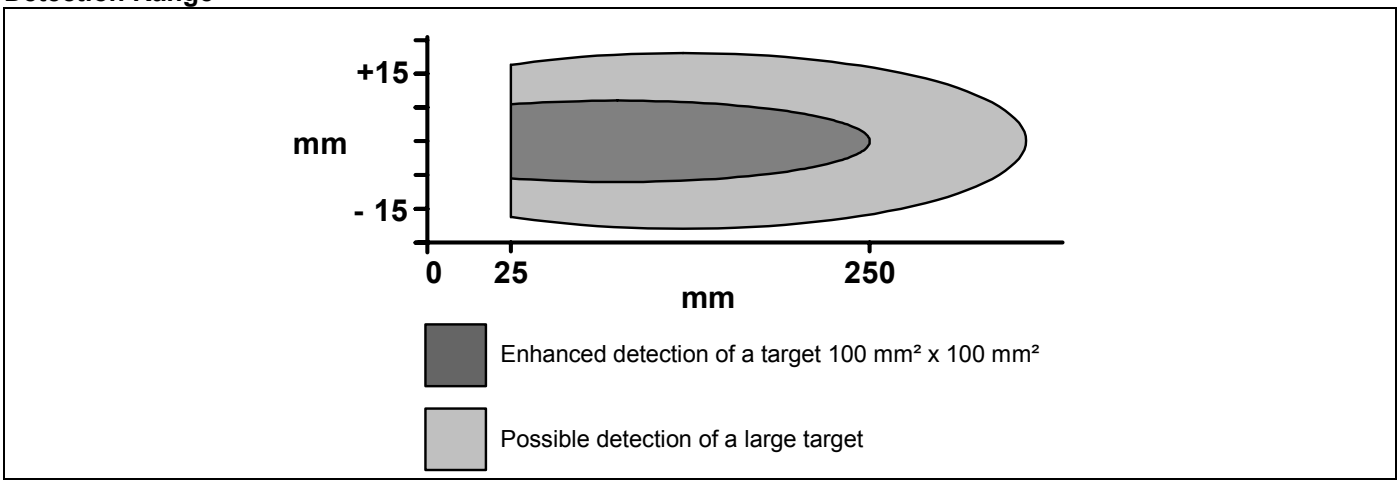
Mounting Dimensions (For reference only. mm/[in])



Wiring



Detection Range



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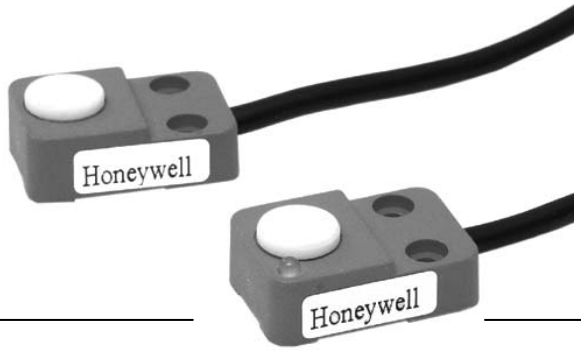
Honeywell

948 Series (948-ISY-2D-001/002/003/004-180E)

Ultrasonic Distance Sensors



DESCRIPTION

The 948 Series is one of the smallest ultrasonic scan through devices in the world. Its small, rectangular, IP67-rated plastic housing makes it easy to install in limited space applications. The sensor consists of two parts, a transmitter and a receiver. It is especially suited for food and beverage applications, in particular bottle counting.

FEATURES

- Thru-scan detection regardless of the object material for enhanced detection
- Non contact distance sensing for use in non invasive measurement
- Reduced sensitivity to light intensity/reflectivity/opacity of target for enhanced flexibility and certainty of measurement
- Detects over much longer distance than other detection methods reducing the need for close proximity to the target
- Presence absence, tank fill level and diameter measurement provides an extremely robust and flexible measurement method

POTENTIAL APPLICATIONS

- Food and beverage machinery and equipment
- Rapid presence/absence detection: bottle counting
- Loop control

948 Series (948-ISY-2D-001/002/003/004-180E)

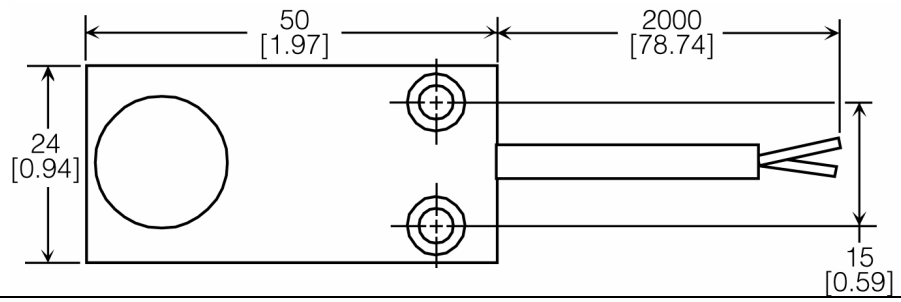
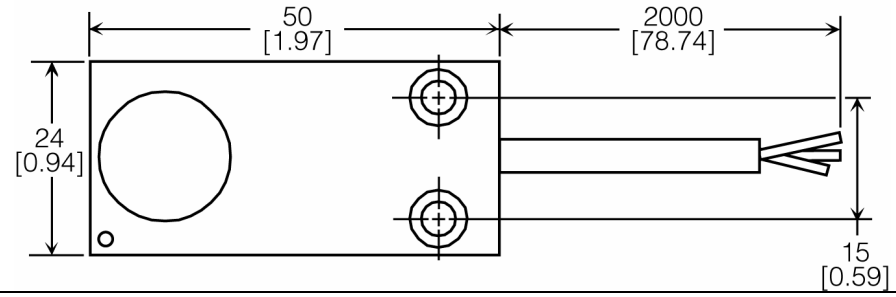
Specifications

Parameter	948-ISY-2D-001-180E	948-ISY-2D-002-180E	948-ISY-2D-003-180E	948-ISY-2D-004-180E
Sensing distance	1100 mm [3.61 ft]			
Response time on/off	3 ms			
Beam angle	15º			
Output	NO PNP	NO NPN	NC PNP	NC NPN
Expected output current	500 mA			
Switching frequency	150 Hz			
Temperature range	-15 °C to 60 °C [-5 °F to140 °F]			
Operating voltage	18 Vdc to 30 Vdc			
Expected current consumption	<40 mA			
Housing	plastic			
Sealing	IP67			
Cable connection	2 m [6.56 ft]			

Sensor consists of 2 parts: 1 transmitter and 1 receiver.

With flat targets best results may be achieved with an angle 30° object-ultrasonic beam.

Mounting Dimensions (For reference only. mm/[in])

Transmitter 	Brown: Vdc Blue: 0 V
Receiver 	Brown: Vdc Blue: 0 V Black: O/P

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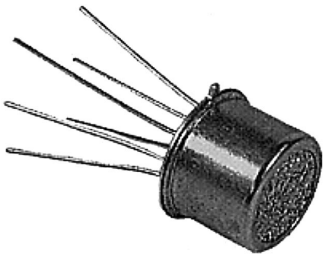
February 2006



FEATURES
- Linear voltage output vs %RH
- Laser trimmed interchangeability
- High accuracy, fast response
- Chemically resistant
- Stable, low drift performance
- Built-in static protection
- Ideal for dew point and absolute moisture measurements
- TO-39 housing

TYPICAL APPLICATIONS
- Refrigeration
- Drying
- Meteorology
- Battery-powered systems
- OEM assemblies

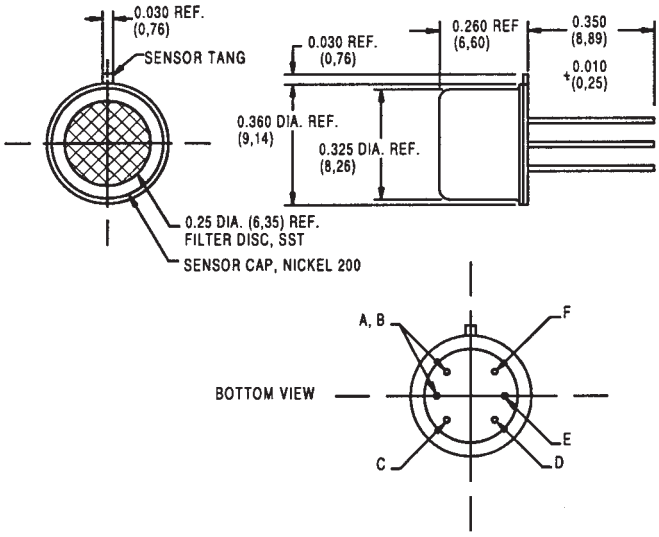
GENERAL INFORMATION
HIH-3602-A and HIH-3602-C Relative Humidity (RH) sensors combine both relative humidity and temperature sensing in a TO-5 housing with a hydrophobic sintered stainless steel filter

The laser trimmed thermoset polymer capacitive sensing elements have on-chip integrated signal conditioning. The temperature sensor is thermally connected with the RH sensor making the HIH-3602-A/C ideal for measuring dew point and other absolute moisture terms. Factory calibration data supplied with each sensor allows individually matched downstream electronics and ±2% RH total accuracy.

ORDER GUIDE

Catalog Listing	Description
HIH-3602-A	Monolithic IC humidity sensor with integral thermistor in TO-5 can
HIH-3602-C	Monolithic IC humidity sensor with integral precision RTD in TO-5 can

MOUNTING DIMENSIONS (for reference only)
HIH-3602-A and HIH-3602-C

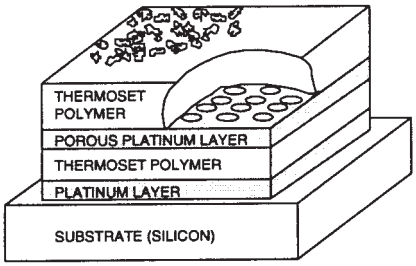


INTERNAL PIN CONNECTIONS

0.018 (0,46) dia. lead gold plated (6 places)	
A, B	(HIH-3602-A) Thermistor for temperature compensation
A, B	(HIH-3602-C) RTD for temperature compensation
C	+VDC supply
D	(−) Power or ground
E	VDC out
F	Case ground

NIST CALIBRATION
Each HIH-3602-A or HIH-3602-C sensor includes a sensor specific NIST calibration and data printout. Sensors are not individually serialized.

RH SENSOR CONSTRUCTION
Sensor construction consists of a planar capacitor with a second polymer layer to protect against dirt, dust, oils and other hazards.



CAUTION
PRODUCT DAMAGE
The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation, take normal ESD precautions when handling this product.

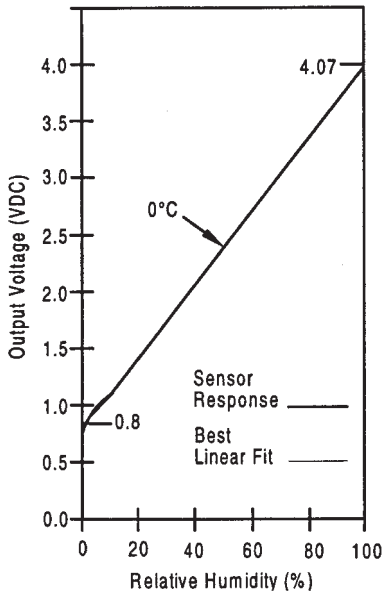
Humidity

PERFORMANCE SPECIFICATIONS

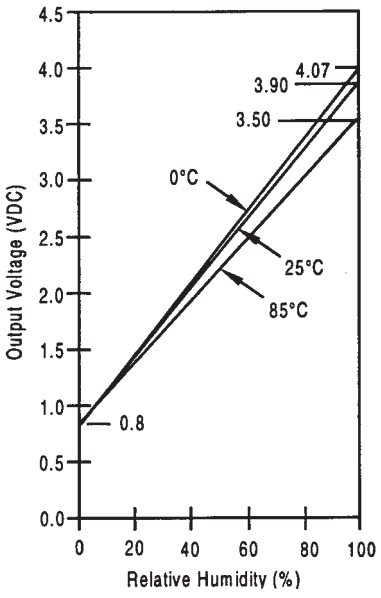
Catalog Listing	HIH-3602-A	HIH-3602-C
Temperature Sensor	Rb = 100 kΩ ±5% @ 25°C, NTC 0-50°C, β = 4143K, T = °K R(T) = Rb exp (β/T-β/298.15)	1000Ω ±0.2% @ 0°C Thin Film Platinum RTD alpha = 0.00375 Ω/Ω/°C
Temperature Accuracy	±3.0°C @ 25°C	±0.5°C @ 25°C
RH Accuracy[1]	±2% RH, 0-100% RH non-condensing, 25°C, V_{supply} = 5 VDC	
RH Interchangeability	±5% RH, 0-60% RH; ±8% @ 90% RH	
RH Linearity	±0.5% RH typical	
RH Hysteresis	±1.2% of RH span maximum	
RH Repeatability	±0.5% RH	
RH Response Time, 1/e	50 sec in slowly moving air at 25°C	
RH Stability	±1% RH typical at 50% RH in 5 years	
Power Requirements Voltage Supply Current Supply	 4 to 5.8 VDC, sensor calibrated at 5 VDC 200 μA at 5 VDC, 2 mA typical at 9 VDC	
Voltage Output V_{supply} = 5 VDC Drive Limits	V_{out} = V_{supply} (0.0062 (Sensor RH) +0.16), typical @ 25°C (Data printout provides a similar, but sensor specific, equation at 25°C.) 0.8 to 3.9 VDC output @ 25°C typical Push/pull symmetric; 50 μA typical, 20 μA minimum, 100 μA maximum Turn-on ≤0.1 second	
Temp. Compensation Effect @ 0% RH Effect @ 100% RH	True RH = (Sensor RH)/(1.093-.0012T), T in °F True RH = (Sensor RH)/(1.0546-0.00216T), T in °C ±0.007% RH/°C (negligible) −0.22% RH/°C (<1% RH effect typical in occupied space systems above 15°C (59°F))	
Humidity Range Operating Storage	 0 to 100% RH, non-condensing[1] 0 to 90% RH, non-condensing	
Temperature Range Operating Storage	 −40° to 85°C (−40° to 185°F) −40° to 125°C (−40° to 275°F)	
Package	TO-5 with 60μ hydrophobic sintered stainless steel filter, resists condensation	
Handling	Static sensitive diode protected to 15 kV maximum	

1. Extended exposure to ≥90% RH causes a reversible shift of 3% RH.

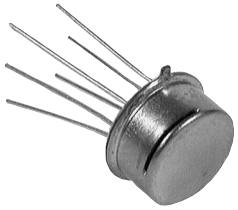
OUTPUT VOLTAGE VS RELATIVE HUMIDITY (at 0°C)



OUTPUT VOLTAGE VS RELATIVE HUMIDITY (at 0°C, 25°C, and 85°C)



Humidity Sensors
Relative Humidity



FEATURES
- Linear voltage output vs %RH
- Laser trimmed interchangeability
- High accuracy
- Fast response
- Stable, low drift performance
- Chemically resistant
- Built-in static protection

TYPICAL APPLICATIONS
- Refrigeration
- Drying
- Meteorology
- Battery-powered systems
- OEM assemblies

GENERAL INFORMATION
The HIH-3602-L IC (Integrated Circuit) Relative Humidity (RH) sensor delivers instrumentation quality RH sensing performance in a rugged, low cost, slotted TO-39 housing.

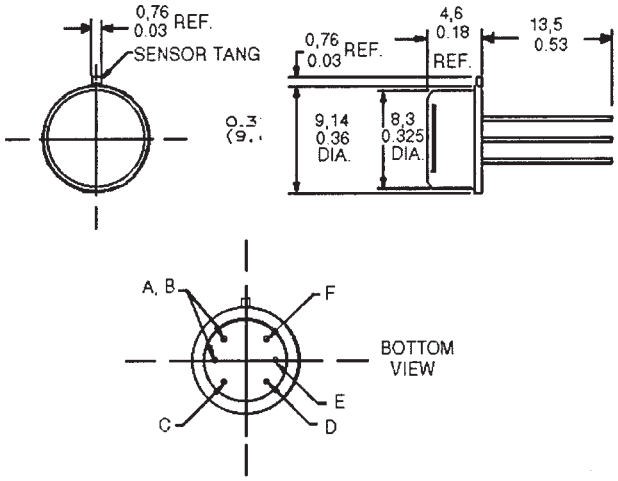
The RH sensor is a thermoset polymer capacitive sensing element with on-chip integrated signal conditioning. On-board signal conditioning reduces product development times while a typical current draw of only 200 μA makes the HIH-3602-L perfect for battery powered systems.

ORDER GUIDE

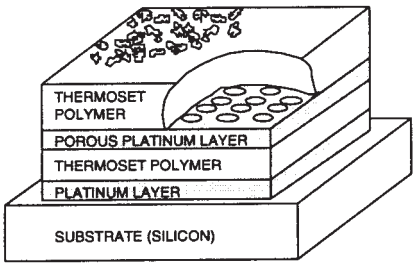
Catalog Listing	Description
HIH-3602-L	Integrated circuit humidity sensor in TO-39 can
HIH-3602-L-CP	Integrated circuit humidity sensor in TO-39 can with calibration and data printout

NIST CALIBRATION
HIH-3602-L may be ordered with a NIST calibration and sensor specific data printout. Append ''−CP'' to the model number to order.

MOUNTING DIMENSIONS (for reference only)



RH SENSOR CONSTRUCTION
Sensor construction consists of a planar capacitor with a second polymer layer to protect against dirt, dust, oils and other hazards.



CAUTION
PRODUCT DAMAGE
The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation, take normal ESD precautions when handling this product.

INTERNAL PIN CONNECTIONS

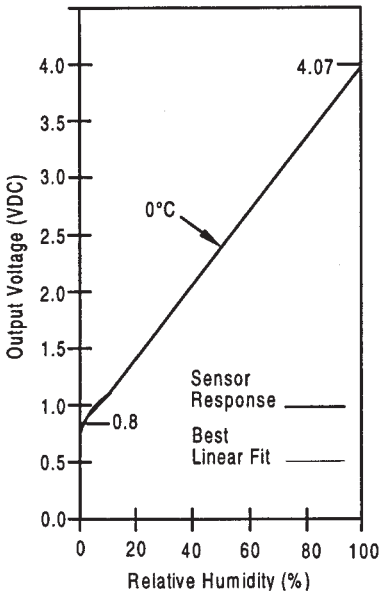
0.018 (0,46) dia. lead gold plated (6 places)	
A, B	No connection
C	+VDC supply
D	(−) Power or ground
E	VDC out
F	Case ground

PERFORMANCE SPECIFICATIONS

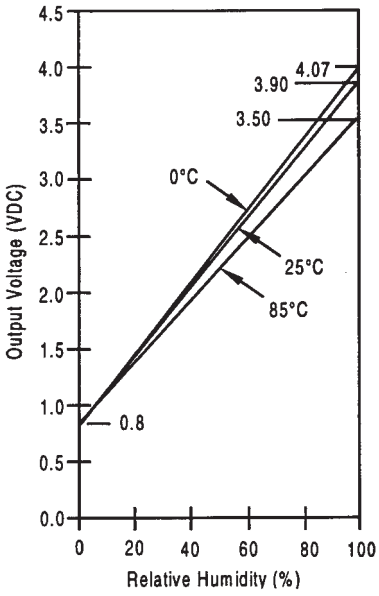
Parameter	Conditions
RH Accuracy[1]	±2% RH, 0-100% RH non-condensing, 25°C, V_{supply} = 5 VDC
RH Interchangeability	±5% RH, 0-60% RH; ±8% @ 90% RH typical
RH Linearity	±0.5% RH typical
RH Hysteresis	±1.2% of RH span maximum
RH Repeatability	±0.5% RH
RH Response Time, 1/e	30 seconds in slowly moving air at 25°C
RH Stability	±1% RH typical at 50% RH in 5 years
Power Requirements	
Voltage Supply	4 to 5.8 VDC, sensor calibrated at 5 VDC
Current Supply	200 μA at 5 VDC, 2 mA typical at 9 VDC
Voltage Output	$V_{out} = V_{supply}$ (0.0062 (Sensor RH) +0.16), typical @ 25°C (Data printout provides a similar, but sensor specific, equation at 25°C.)
V_{supply} = 5 VDC	0.8 to 3.9 VDC output @ 25°C typical
Drive Limits	Push/pull symmetric; 50 μA typical, 20 μA minimum, 100 μA maximum Turn-on ≤0.1 second
Temp. Compensation	True RH = (Sensor RH)/(1.093-.0012T), T in °F True RH = (Sensor RH)/(1.0546-0.00216T), T in °C
Effect @ 0% RH	±0.007% RH/°C (negligible)
Effect @ 100% RH	−0.22% RH/°C (<1% RH effect typical in occupied space systems above 15°C (59°F))
Humidity Range	
Operating	0 to 100% RH, non-condensing
Storage	0 to 90% RH, non-condensing[1]
Temperature Range	
Operating	−40°C to 85°C (−40°F to 185°F)
Storage	−40°C to 125°C (−40°F to 257°F)
Package	Six pin TO-39 with slotted nickel cap[2]
Handling	Static sensitive, diode protected to 15 kV maximum

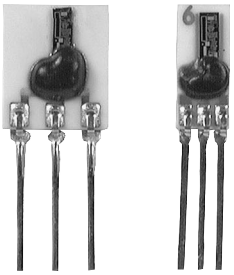
Notes:
1. Extended exposure to ≥90% RH causes a reversible shift of 3% RH.
2. This sensor is light sensitive. For best results, shield the sensor from bright light.

OUTPUT VOLTAGE VS RELATIVE HUMIDITY (at 0°C)



OUTPUT VOLTAGE VS RELATIVE HUMIDITY (at 0°C, 25°C, and 85°C)





FEATURES
- Linear voltage output vs %RH
- Laser trimmed interchangeability
- Low power design
- High accuracy
- Fast response time
- Stable, low drift performance
- Chemically resistant

TYPICAL APPLICATIONS
- Refrigeration
- Drying
- Meteorology
- Battery-powered systems
- OEM assemblies

GENERAL INFORMATION
The HIH-3605 monolithic IC (Integrated Circuit) humidity sensor is designed specifically for high volume OEM (Original Equipment Manufacturer) users. Direct input to a controller or other device is made possible by this sensor's linear voltage output. With a typical current draw of only 200 μA, the HIH-3605 is ideally suited for low drain, battery powered systems.

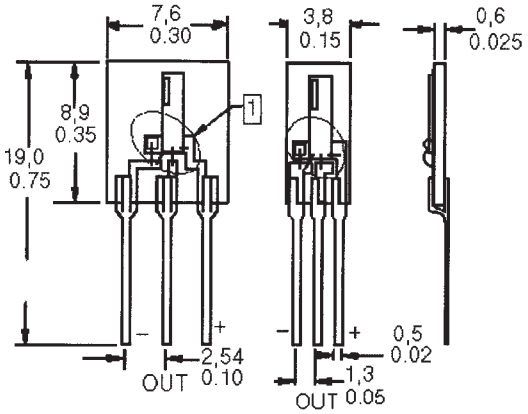
The HIH-3605 delivers instrumentation quality RH sensing performance in a low cost, solderable SIP (Single In-line Package). Available in two lead spacing configurations, the RH sensor is a laser trimmed thermoset polymer capacitive sensing element with on-chip integrated signal conditioning.

ORDER GUIDE

Catalog Listing	Description
HIH-3605-A	Integrated circuit humidity sensor, 0.100 in. lead pitch SIP
HIH-3605-A-CP	Integrated circuit humidity sensor, 0.100 in. lead pitch SIP with calibration and data printout
HIH-3605-B	Integrated circuit humidity sensor, 0.050 in. lead pitch SIP
HIH-3605-B-CP	Integrated circuit humidity sensor, 0.050 in. lead pitch SIP with calibration and data printout.

MOUNTING DIMENSIONS (for reference only)

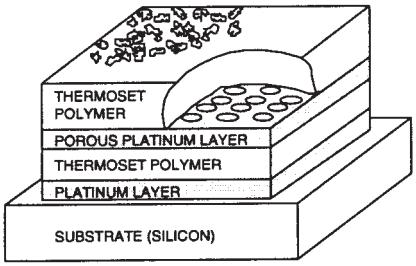
HIH-3605-A **HIH-3605-B**



1 Protective Sealant

NIST CALIBRATION
HIH-3605 sensors may be ordered with a NIST calibration and sensor specific data printout. Append ''–CP'' to the model number to order.

RH SENSOR CONSTRUCTION
Sensor construction consists of a planar capacitor with a second polymer layer to protect against dirt, dust, oils and other hazards.



CAUTION
PRODUCT DAMAGE
The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation, take normal ESD precautions when handling this product.

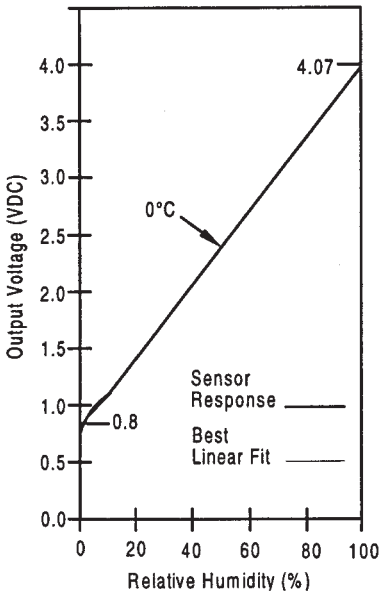
Humidity

PERFORMANCE SPECIFICATIONS

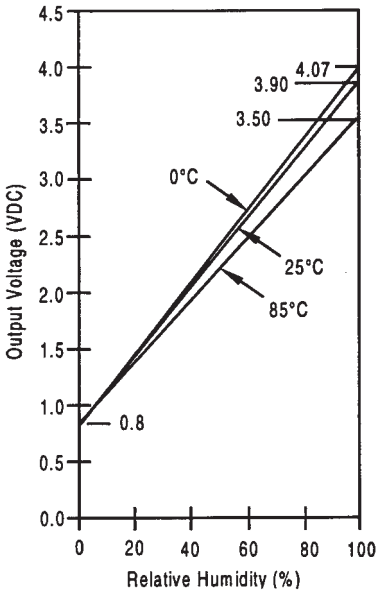
Parameter	Conditions
RH Accuracy[1]	±2% RH, 0-100% RH non-condensing, 25°C, V_{supply} = 5 VDC
RH Interchangeability	±5% RH, 0-60% RH; ±8% @ 90% RH typical
RH Linearity	±0.5% RH typical
RH Hysteresis	±1.2% of RH span maximum
RH Repeatability	±0.5% RH
RH Response Time, 1/e	15 sec in slowly moving air at 25°C
RH Stability	±1% RH typical at 50% RH in 5 years
Power Requirements	
Voltage Supply	4 to 5.8 VDC, sensor calibrated at 5 VDC
Current Supply	200 μA at 5 VDC, 2 mA typical at 9 VDC
Voltage Output	$V_{out} = V_{supply}$ (0.0062 (Sensor RH) +0.16), typical @ 25°C (Data printout provides a similar, but sensor specific, equation at 25°C.)
V_{supply} = 5 VDC	0.8 to 3.9 VDC output @ 25°C typical
Drive Limits	Push/pull symmetric; 50 μA typical, 20 μA minimum, 100 μA maximum Turn-on ≤0.1 second
Temp. Compensation	True RH = (Sensor RH)/(1.093-.0012T), T in °F True RH = (Sensor RH)/(1.0546-0.00216T), T in °C
Effect @ 0% RH	±0.007% RH/°C (negligible)
Effect @ 100% RH	−0.22% RH/°C (<1% RH effect typical in occupied space systems above 15°C (59°F))
Humidity Range	
Operating	0 to 100% RH, non-condensing[1]
Storage	0 to 90% RH, non-condensing
Temperature Range	
Operating	−40° to 85°C (−40° to 185°F)
Storage	−51° to 125°C (−60° to 257°F)
Package[2]	Three pin solderable ceramic SIP
Handling	Static sensitive diode protected to 15 kV maximum

Notes:
1. Extended exposure to ≥90% RH causes a reversible shift of 3% RH.
2. This sensor is light sensitive. For best results, shield the sensor from bright light.

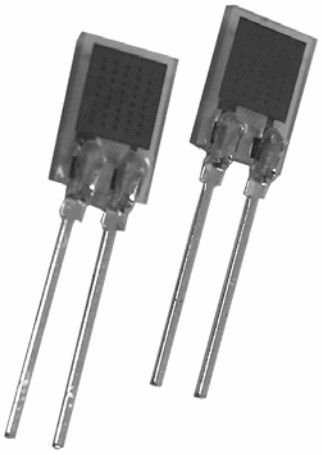
OUTPUT VOLTAGE VS RELATIVE HUMIDITY (at 0°C)



OUTPUT VOLTAGE VS RELATIVE HUMIDITY (at 0°C, 25°C, and 85°C)



Honeywell



HCH-1000 Series

Capacitive Humidity Sensor

DESCRIPTION

The HCH-1000 series humidity sensor is a capacitive polymer sensor designed for relative humidity measurement. The sensor converts humidity value into capacitance, which can be measured electronically.

Polyimide is used as a humidity sensing material because of its inherent IC (Integrated Circuit) processing compatibility, reduced temperature dependence and enhanced resistance against contamination. The HCH-1000-Series is manufactured using semiconductor technology.

The sensor consists of a grid top electrode, a polyimide layer, and a bottom electrode. The grid top electrode on the bottom electrode provides enhanced sensitivity when compared to that of a standard structure.

A cased version, for dust protection, and an uncased version are available.

FEATURES

- Polymer sensing offers enhanced resistance against contamination
- Reduced temperature dependence
- Semiconductor fabrication technology
- Uses glass wafer as substrate
- Enhanced sensitivity and accuracy, fast response
- Low hysteresis and long-term stability

POTENTIAL APPLICATIONS

- Hygrometers, consumer goods
- Humidifiers and dehumidifiers
- Medical
- Automotive
- HVAC systems
- Weather stations

HCH-1000 Series

SPECIFICATIONS (T_A= 25 ºC [77 ºF], Input Voltage = 1 V_{RMS}, Frequency = 20 kHz)

Characteristic	Min.	Typ.	Max.	Unit	Note
Normal capacitance	310	330	350	pF	at 55% RH
Sensitivity	0.55	0.60	0.65	pF/%RH	10% RH to 95% RH
Humidity hysteresis	–	±2	–	%RH	–
Linearity	–	±2	–	%RH	–
Response time	–	15	–	sec	30% RH to 90% RH
Temperature coefficient	0.15	0.16	0.17	pF/°C	5 °C to 70 °C [41 °F to 158 °F]
Long-term stability (drift)	–	0.2	–	%RH/year	–
Operating temperature range	-40 [-40]	–	120 [248]	°C [°F]	–
Operating humidity range	0%	–	100%	RH	–
Operating frequency range	1	–	100	kHz	–

FIGURE 1: FREQUENCY CHARACTERISTICS

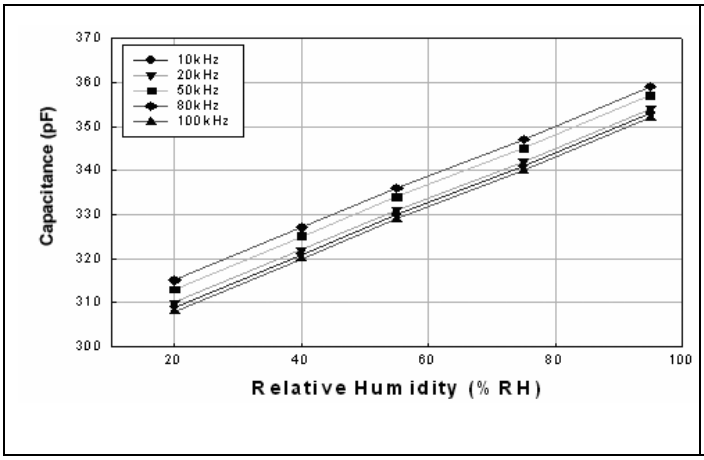


FIGURE 2: TYPICAL HUMIDITY RESPONSE (Sensitivity = 0.6 pF/%RH)

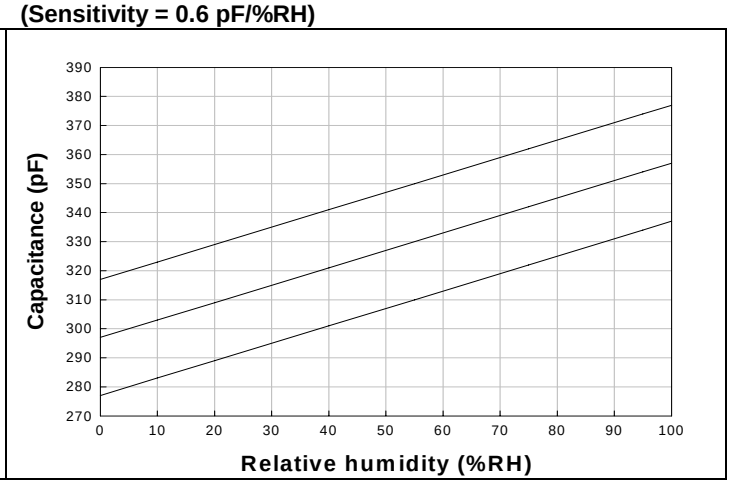


FIGURE 3: TEMPERATURE CHARACTERISTICS (At 1 V_{RMS} and 20 kHz)

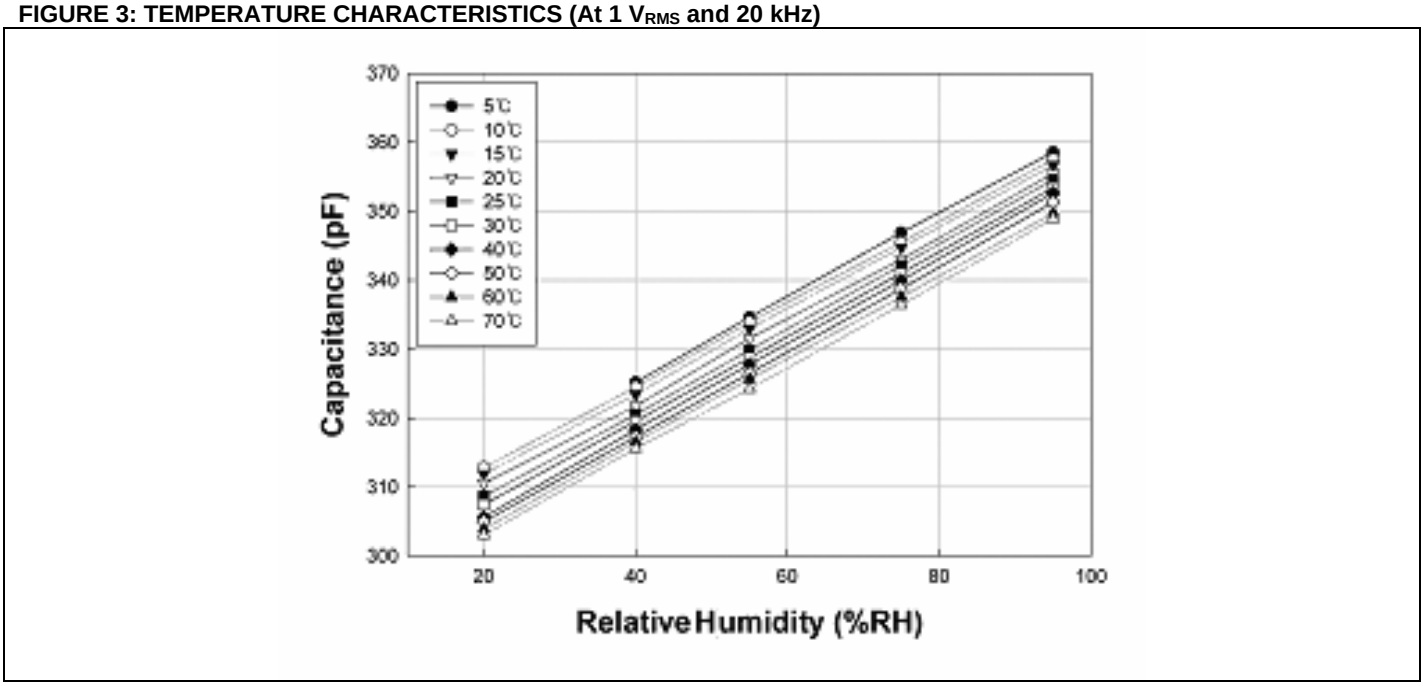
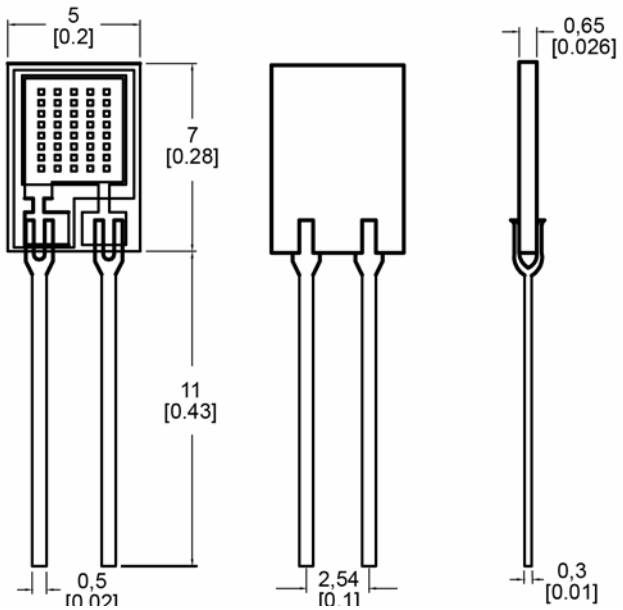
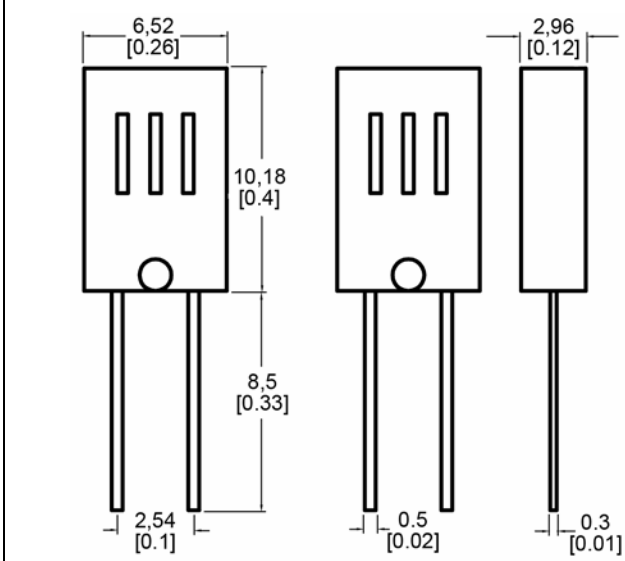


FIGURE 4: MOUNTING DIMENSIONS (For reference only: mm [in])

HCH-1000-001



HCH-1000-002



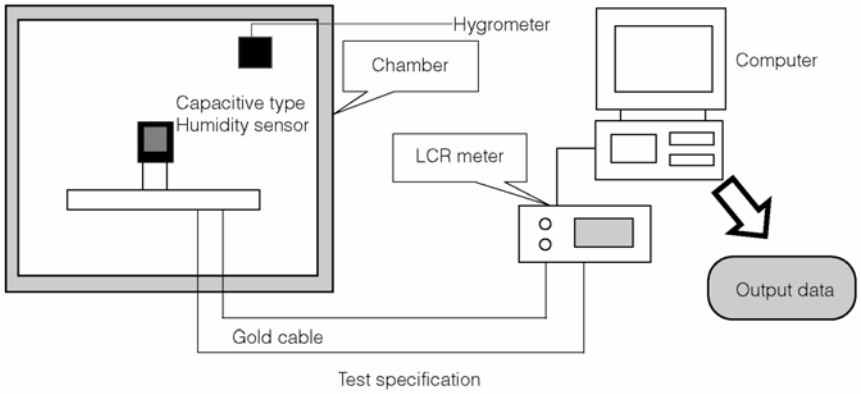
ENVIRONMENTAL TEST SYSTEM

Figure 5 depicts environmental testing. The devices are characterized at 25 °C [77 °F] between 20% RH and 95% RH. The meter is set to measure capacitance at 1 V and 20 kHz.

For a precise measurement, a hygrometer is compared with the humidity of the temperature-humidity chamber.

The data output indicates the effect of sensor characterization before/after environmental tests.

FIGURE 5: ENVIRONMENTAL TEST SYSTEM DIAGRAM



Test specification

Temperature	25 °C [77 °F]
Voltage	1 V
Frequency	20 kHz
Test humidity range	10% RH to 98% RH

Software program: hitester
Chamber temperature compensation range: 25 °C ±0.5 °C [77 °F ±0.5 °F]
Chamber humidity compensation range: ±3% RH

ORDER GUIDE

Catalog Listing	Description
HCH-1000-001	HCH Series capacitive polymer humidity sensor, 2,54 mm [0.100 in] lead pitch SIP
HCH-1000-002	HCH Series capacitive polymer humidity sensor, 2,54 mm [0.100 in] lead pitch SIP, cased version

⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

⚠ WARNING

MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

E-mail: info.sc@honeywell.com

Internet: www.honeywell.com/sensing

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	+65 6445-3033 Fax
Europe	+44 (0) 1698 481481
	+44 (0) 1698 481676 Fax
Latin America	+1-305-805-8188
	+1-305-883-8257 Fax
USA/Canada	+1-800-537-6945
	+1-815-235-6847
	+1-815-235-6545 Fax

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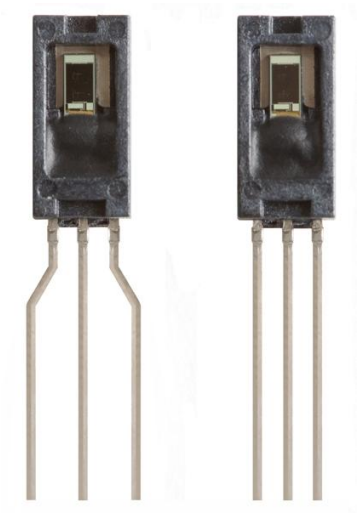
HIH-4000 Series

Humidity Sensors



DESCRIPTION

The HIH-4000 Series Humidity Sensors are designed specifically for high volume OEM (Original Equipment Manufacturer) users.

Direct input to a controller or other device is made possible by this sensor's near linear voltage output. With a typical current draw of only 200 µA, the HIH-4000 Series is often ideally suited for low drain, battery operated systems.

Tight sensor interchangeability reduces or eliminates OEM production calibration costs. Individual sensor calibration data is available.

The HIH-4000 Series delivers instrumentation-quality RH (Relative Humidity) sensing performance in a competitively priced, solderable SIP (Single In-line Package).

Available in two lead spacing configurations, the RH sensor is a laser trimmed, thermoset polymer capacitive sensing element with on-chip integrated signal conditioning.

The sensing element's multilayer construction provides excellent resistance to most application hazards such as wetting, dust, dirt, oils and common environmental chemicals.

FEATURES

- Molded thermoset plastic housing
- Near linear voltage output vs % RH
- Laser trimmed interchangeability
- Low power design
- Enhanced accuracy
- Fast response time
- Stable, low drift performance
- Chemically resistant

POTENTIAL APPLICATIONS

- Refrigeration equipment
- HVAC (Heating, Ventilation and Air Conditioning) equipment
- Medical equipment
- Drying
- Metrology
- Battery-powered systems
- OEM assemblies

HIH-4000 Series

Table 1. Performance Specifications (At 5 Vdc supply and 25 ºC [77 ºF] unless otherwise noted.)

Parameter	Minimum	Typical	Maximum	Unit	Specific Note
Interchangeability (first order curve)	–	–	–	–	–
0% RH to 59% RH	-5	–	5	% RH	–
60% RH to 100% RH	-8	–	8	% RH	–
Accuracy (best fit straight line)	-3.5	–	+3.5	% RH	1
Hysterisis	–	3	–	% RH	–
Repeatability	–	±0.5	–	% RH	–
Settling time	–	–	70	ms	–
Response time (1/e in slow moving air)	–	5	–	s	–
Stability (at 50% RH)	–	1.2	–	% RH	–
Voltage supply	4	–	5.8	Vdc	2
Current supply	–	200	500	µA	–
Voltage output (1st order curve fit)	$V_{OUT}=(V_{SUPPLY})(0.0062(\text{sensor RH}) + 0.16)$, typical at 25 ºC				
Temperature compensation	True RH = (Sensor RH)/(1.0546 – 0.00216T), T in ºC				
Output voltage temperature, coefficient at 50% RH, 5 V	–	-4	–	mV/ºC	
Operating temperature	-40[-40]	See Figure 1.	85[185]	ºC[ºF]	–
Operating humidity	0	See Figure 1.	100	% RH	3
Storage temperature	-50[-58]	–	125[257]	ºC[ºF]	–
Storage humidity	See Figure 2.			% RH	3

Specific Notes:

1. Can only be achieved with the supplied slope and offset. For HIH-4000-003 and HIH-4000-004 catalog listings only.
2. Device is calibrated at 5 Vdc and 25 ºC.
3. Non-condensing environment.

General Notes:

- Sensor is ratiometric to supply voltage.
- Extended exposure to ≥90% RH causes a reversible shift of 3% RH.
- Sensor is light sensitive. For best performance, shield sensor from bright light.

FACTORY CALIBRATION DATA

HIH-4000 Sensors may be ordered with a calibration and data printout. See Table 2 and the order guide on the back page.

Table 2. Example Data Printout

Model	HIH-4000-003
Channel	92
Wafer	030996M
MRP	337313
Calculated values at 5 V V_{OUT} at 0% RH V_{OUT} at 75.3% RH	 0.826 V 3.198 V
Linear output for 3.5% RH accuracy at 25 °C Zero offset Slope RH	 0.826 V 31.483 mV/%RH (V_{OUT} - zero offset)/slope (V_{OUT} - 0.826)/0.0315
Ratiometric response for 0% RH to 100% RH V_{OUT}	 V_{SUPPLY} (0.1652 to 0.7952)

Figure 1. Operating Environment (Non-condensing environment.)

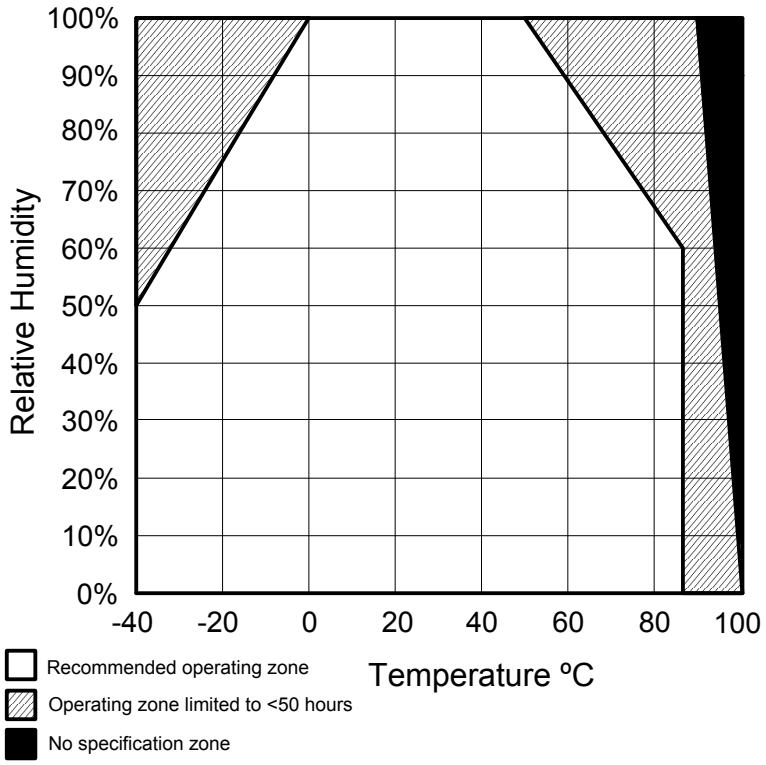


Figure 2. Storage Environment (Non-condensing environment.)

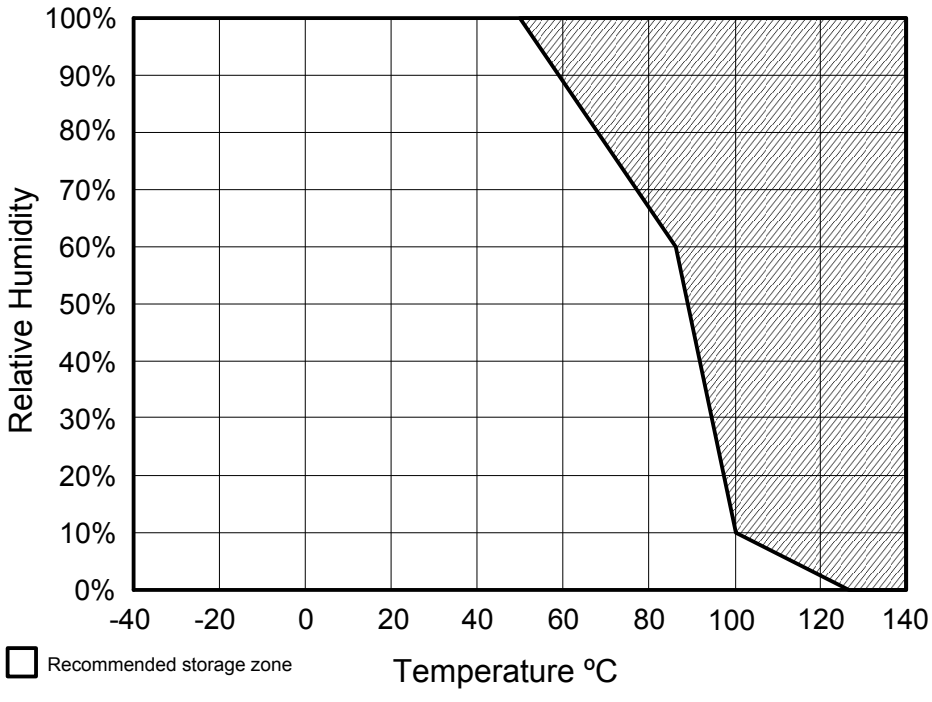


Figure 3. Typical Output Voltage vs Relative Humidity (At 25 ºC and 5 V.)

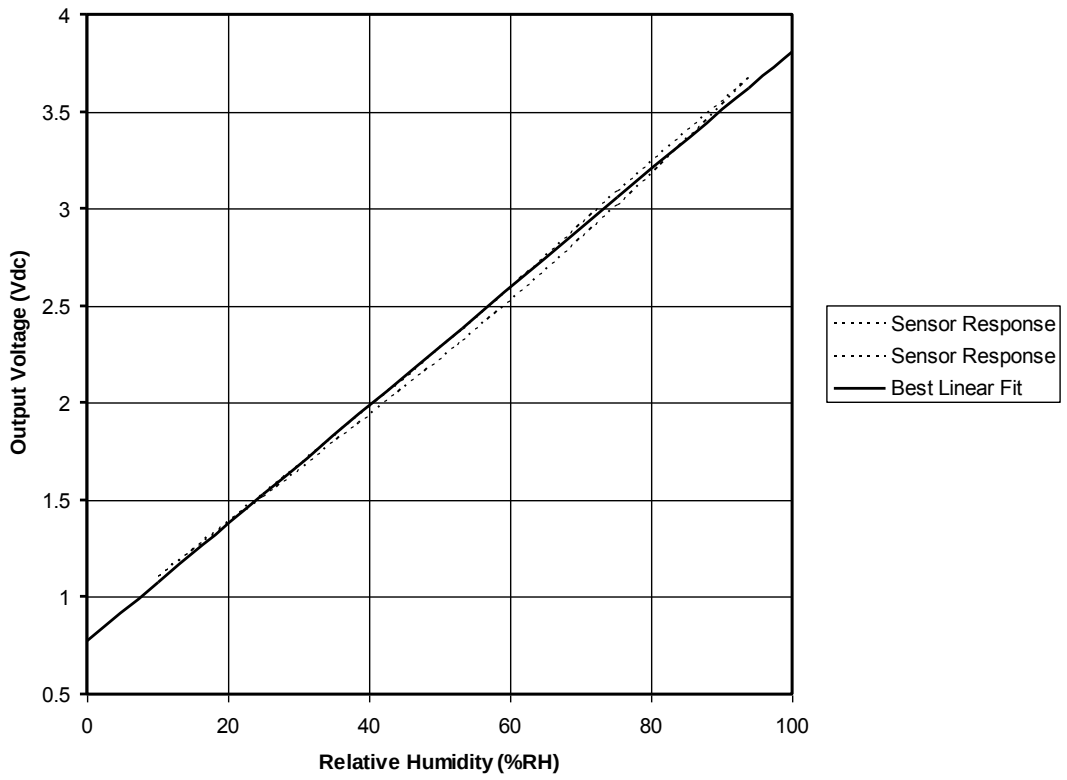


Figure 4. Typical Output Voltage (BFSL) vs Relative Humidity (At 0 ºC, 70 ºC and 5 V.)

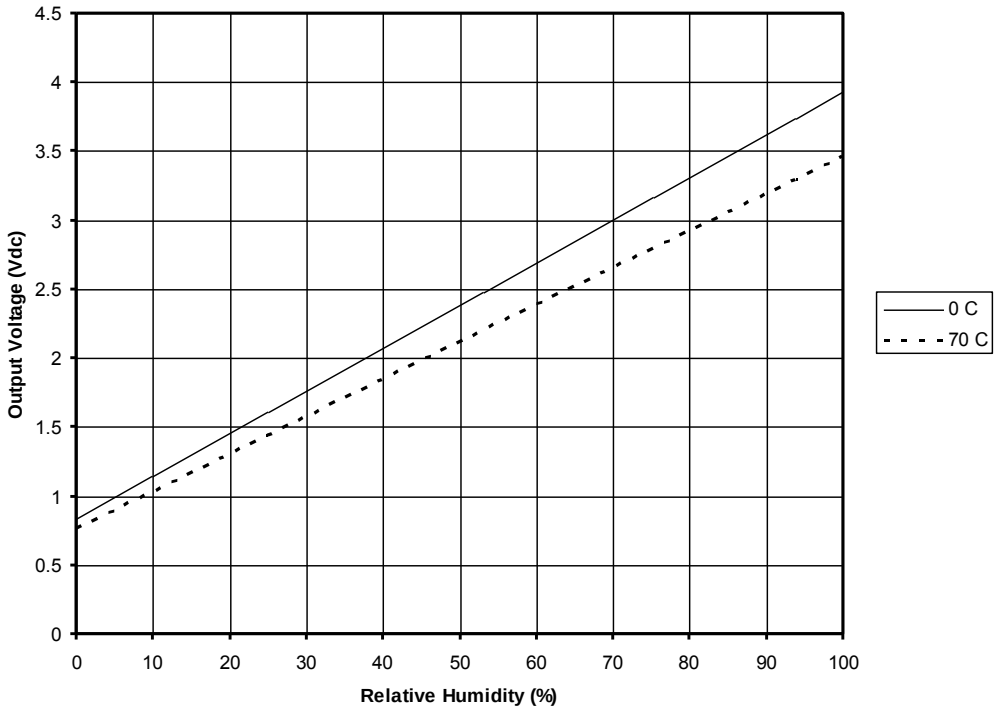


Figure 5. Mounting Dimensions (For reference only. mm/[in])

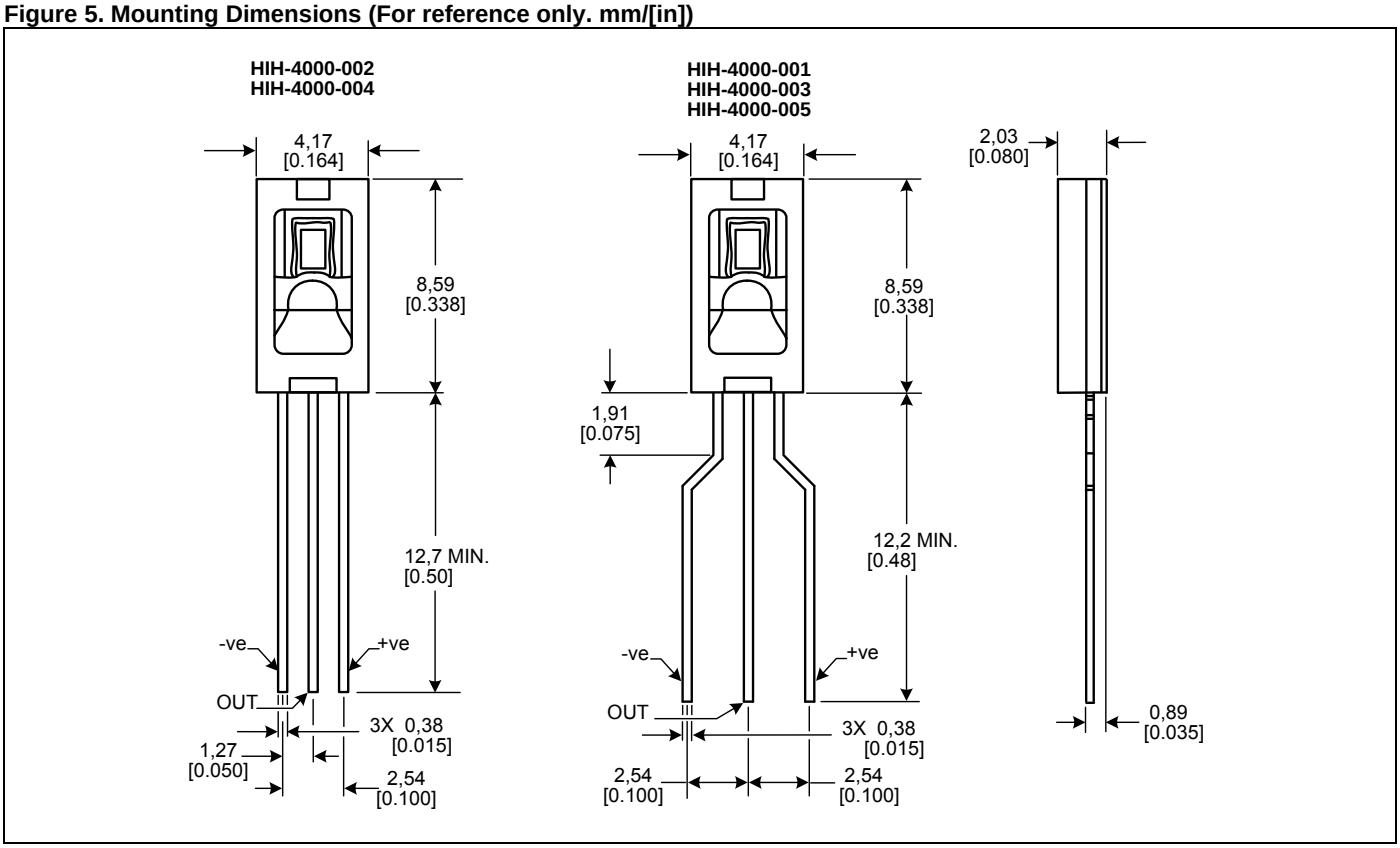
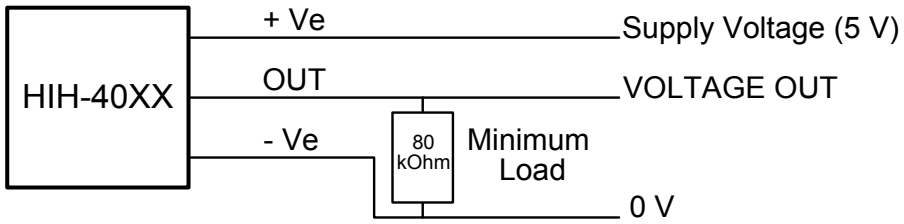


Figure 6. Typical Application Circuit



ORDER GUIDE

Catalog Listing	Description
HIH-4000-001	Integrated circuit humidity sensor, 2,54 mm [0.100 in] lead pitch SIP
HIH-4000-002	Integrated circuit humidity sensor, 1,27 mm [0.050 in] lead pitch SIP
HIH-4000-003	Integrated circuit humidity sensor, 2,54 mm [0.100 in] lead pitch SIP, calibration and data printout
HIH-4000-004	Integrated circuit humidity sensor, 1,27 mm [0.050 in] lead pitch SIP, calibration and data printout
HIH-4000-005	Equivalent to HIH-4000-001

ADDITIONAL HUMIDITY SENSOR INFORMATION

See the following associated literature at **www.honeywell.com/sensing**:

- Product installation instructions
- Application sheets:
  - Humidity Sensor Performance Characteristics
  - Humidity Sensor Theory and Behavior
  - Humidity Sensor Moisture and Psychrometrics
  - Thermoset Polymer-based Capacitive Sensors

⚠ WARNING

MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

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Asia Pacific	+65 6355-2828
	+65 6445-3033 Fax
Europe	+44 (0) 1698 481481
	+44 (0) 1698 481676 Fax
Latin America	+1-305-805-8188
	+1-305-883-8257 Fax
USA/Canada	+1-800-537-6945
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	+1-815-235-6545 Fax

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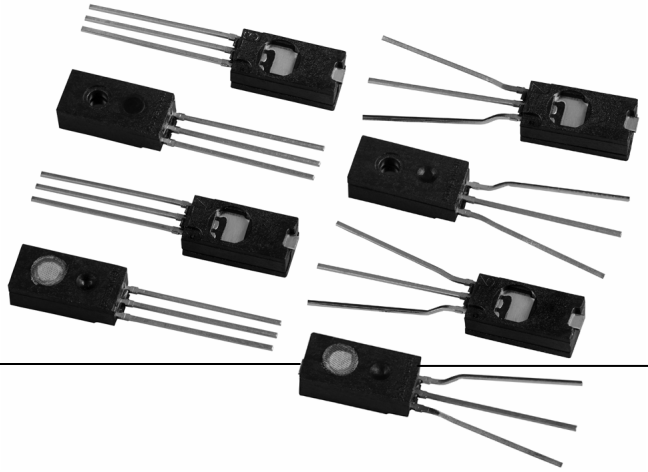
Honeywell

HIH-4010/4020/4021 Series

Humidity Sensors



DESCRIPTION

The HIH-40104020/4021 Series Humidity Sensors are designed specifically for high volume OEM (Original Equipment Manufacturer) users.

Direct input to a controller or other device is made possible by this sensor's near linear voltage output. With a typical current draw of only 200 µA, the HIH-4010/4020/4021 Series is often ideally suited for low drain, battery operated systems.

Tight sensor interchangeability reduces or eliminates OEM production calibration costs. Individual sensor calibration data is available.

The HIH-4010/4020/4021 Series delivers instrumentation-quality RH (Relative Humidity) sensing performance in a competitively priced, solderable SIP (Single In-line Package).

The HIH-4010 is an uncovered integrated humidity sensor, the HIH-4020 is a covered integrated circuit humidity sensor, and the HIH-4021 is a covered, condensation-resistant, integrated circuit humidity sensor. All three products are available in two lead space configurations.

The RH sensor is a laser trimmed, thermoset polymer capacitive sensing element with on-chip integrated signal conditioning.

The sensing element's multilayer construction provides excellent resistance to most application hazards such as wetting, dust, dirt, oils and common environmental chemicals. Both products are available in two lead spacing configurations, as well as with or without calibration and data printouts.

FEATURES

- Molded thermoset plastic housing
- Near linear voltage output vs %RH
- Laser trimmed interchangeability
- Low power design
- Enhanced accuracy
- Fast response time
- Stable, low drift performance
- Chemically resistant

POTENTIAL APPLICATIONS

- Refrigeration equipment
- HVAC (Heating, Ventilation and Air Conditioning) equipment
- Medical equipment
- Drying
- Metrology
- Battery-powered systems
- OEM assemblies

TABLE 1. PERFORMANCE SPECIFICATIONS (At 5 Vdc supply and 25 ºC [77 ºF] unless otherwise noted.)

Parameter	Minimum	Typical	Maximum	Unit	Specific Note
Interchangeability (first order curve)	–	–	–	–	–
0% RH to 59% RH	-5	–	5	% RH	–
60% RH to 100% RH	-8	–	8	% RH	–
Accuracy (best fit straight line)	-3.5	–	+3.5	% RH	1
Hysterisis	–	3	–	% RH	–
Repeatability	–	±0.5	–	% RH	–
Settling time	–	–	70	ms	–
Response time (1/e in slow moving air)	–	5	–	s	–
Stability (at 50 %RH in 1 year)	–	±1.2	–	% RH	2
Stability (at 50 %RH in 1 year)	–	±0.5	–	% RH	3
Voltage supply	4	–	5.8	Vdc	4
Current supply	–	200	500	µA	–
Voltage output (1st order curve fit)	$V_{OUT}=(V_{SUPPLY})(0.0062(\text{sensor RH}) + 0.16)$, typical at 25 ºC				
Temperature compensation	True RH = (Sensor RH)/(1.0546 – 0.00216T), T in ºC				
Output voltage temp. coefficient at 50% RH, 5 V	–	-4	–	mV/ºC	–
Operating temperature	-40[-40]	See Figure 1.	85[185]	ºC[ºF]	–
Operating humidity (HIH-4010)	0	See Figure 1.	100	% RH	5
Operating humidity (HIH-4020)	0	See Figure 1.	100	% RH	5
Operating humidity (HIH-4021)	0	See Figure 1.	100	% RH	–
Storage temperature	-50[-58]	–	125[257]	ºC[ºF]	–
Storage humidity	See Figure 2.			% RH	5

Specific Notes:

1. For HIH-4010/20/21-003/004 catalog listings only.
2. Includes testing outside of recommended operating zone.
3. Includes testing for recommended operating zone only.
4. Device is calibrated at 5 Vdc and 25 ºC.
5. Non-condensing environment. When liquid water falls on the humidity sensor die, output goes to a low rail condition indicating no humidity.

General Notes:

- Sensor is ratiometric to supply voltage.
- Extended exposure to >90% RH causes a reversible shift of 3% RH.
- Sensor is light sensitive. For best performance, shield sensor from bright light.

FACTORY CALIBRATION DATA

HIH-4010/4020/4021 Sensors may be ordered with a calibration and data printout. See Table 2 and the order guide on the back page.

TABLE 2. EXAMPLE DATA PRINTOUT

Model	HIH-4010-003
Channel	92
Wafer	030996M
MRP	337313
Calculated values at 5 V V_{OUT} at 0% RH V_{OUT} at 75.3% RH	 0.958 V 3.268 V
Linear output for 3.5% RH accuracy at 25 °C Zero offset Slope Sensor RH	 0.958 V 30.680 mV/%RH (V_{OUT} - zero offset)/slope (V_{OUT} - 0.958)/0.0307
Ratiometric response for 0% RH to 100% RH V_{OUT}	 V_{SUPPLY} (0.1915 to 0.8130)

For HIH-4010-001/002/003/004 catalog listings only.

For HIH-4020-001/002/003/004 and HIH-4021-001/002/003/004 catalog listings only.

FIGURE 1. OPERATING ENVIRONMENT (Non-condensing environment for HIH-4010 and HIH-4020 catalog listings only.)

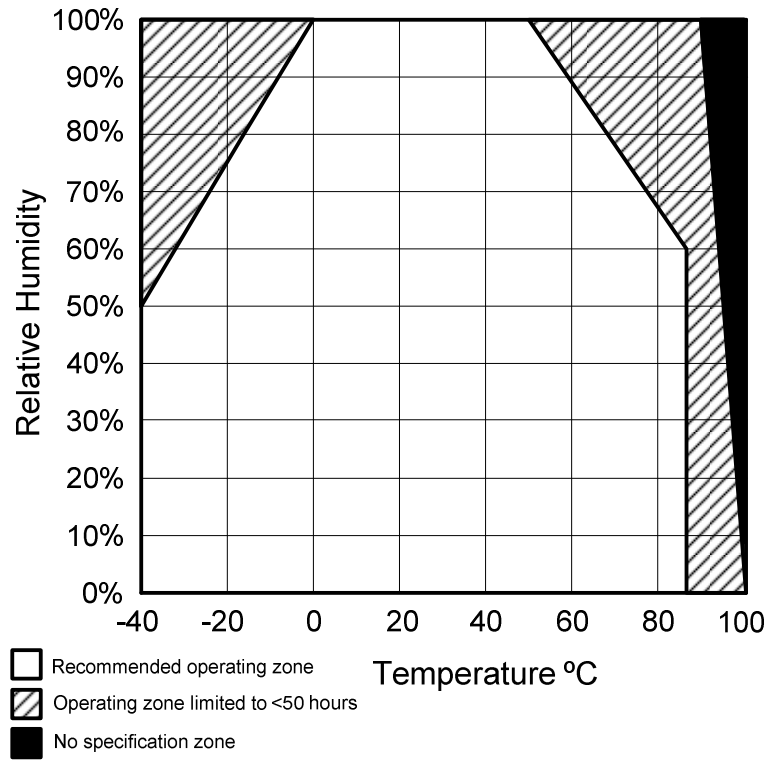


FIGURE 2. STORAGE ENVIRONMENT (Non-condensing environment for HIH-4010 and HIH-4020 catalog listings only.)

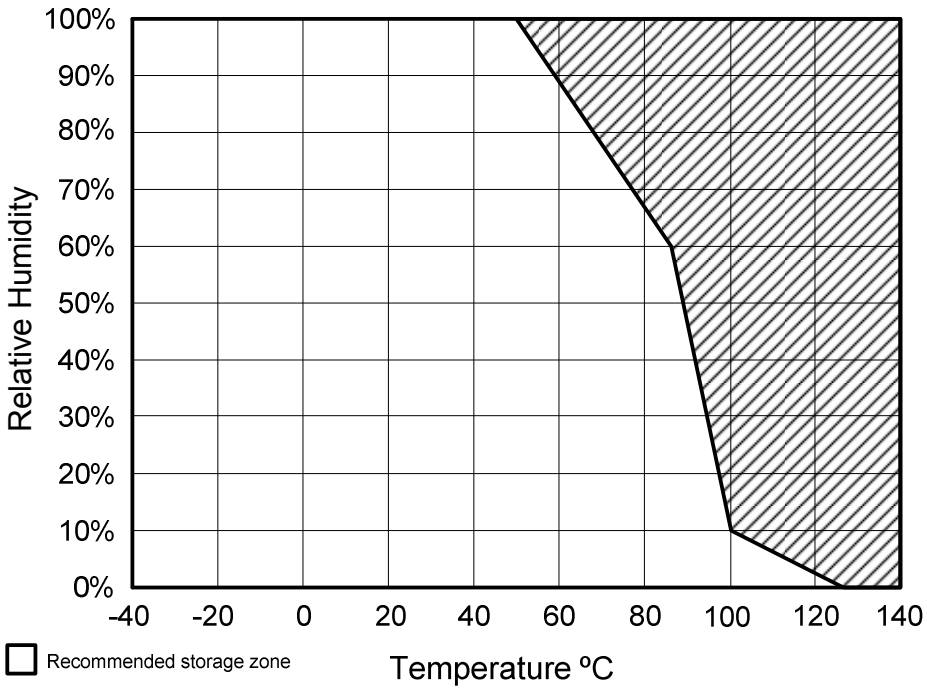


FIGURE 3. TYPICAL OUTPUT VOLTAGE VS RELATIVE HUMIDITY (At 25 ºC and 5 V.)

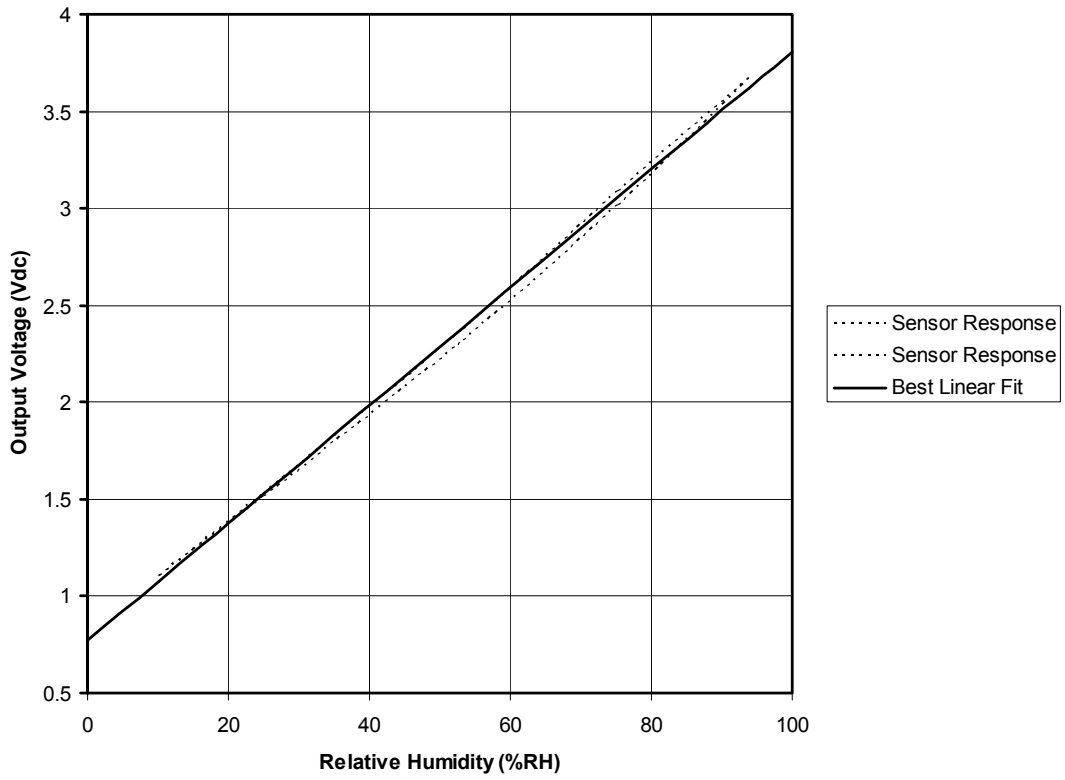


FIGURE 4. TYPICAL OUTPUT VOLTAGE (BFSL) VS RELATIVE HUMIDITY (At 0 ºC, 70 ºC and 5 V.)

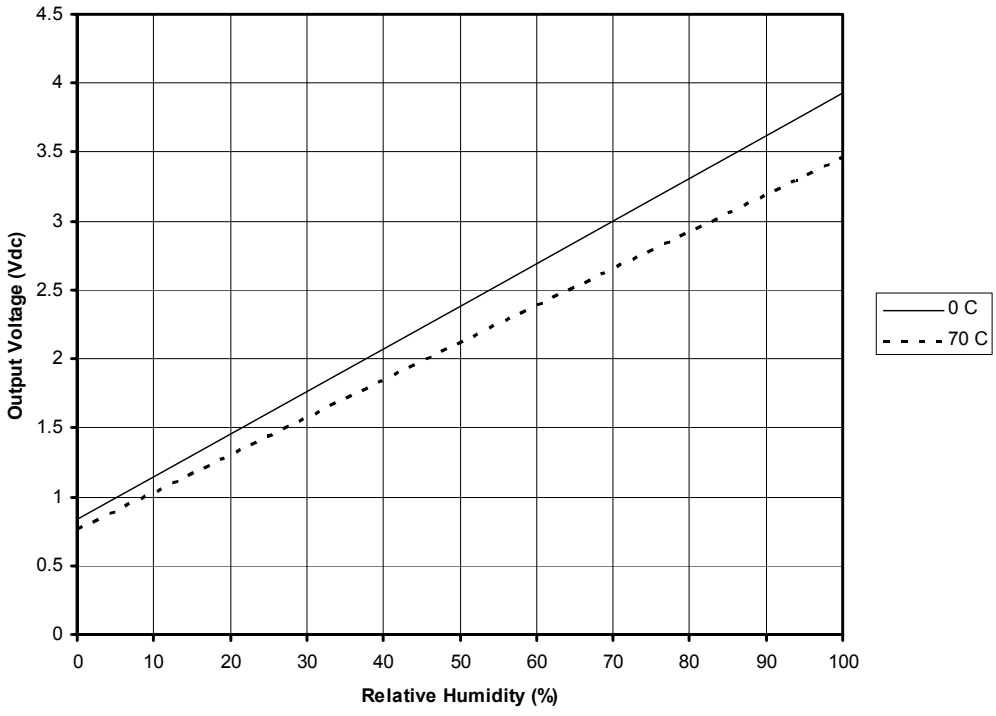


FIGURE 5. HIH-4010 MOUNTING DIMENSIONS (For reference only. mm/[in])

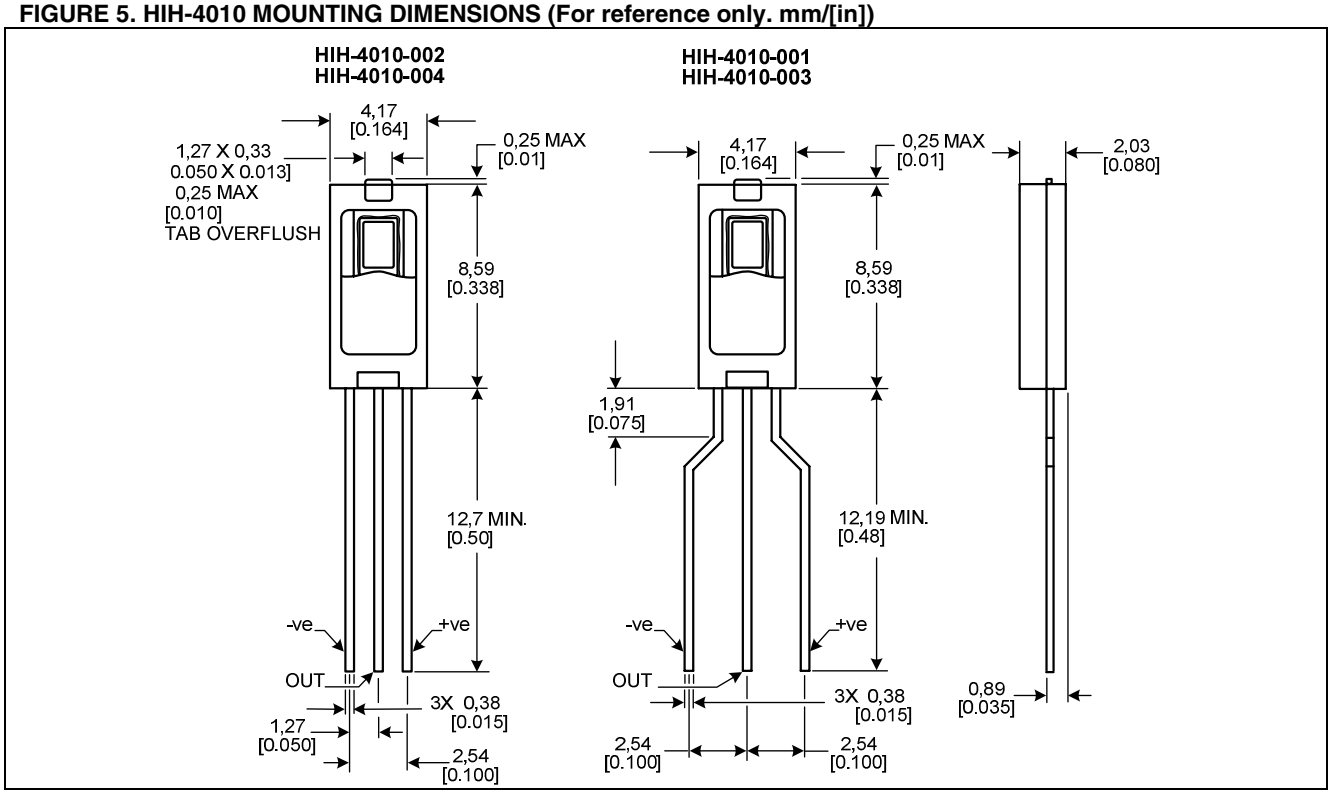


FIGURE 6. HIH-4020 MOUNTING DIMENSIONS (For reference only. mm/[in])

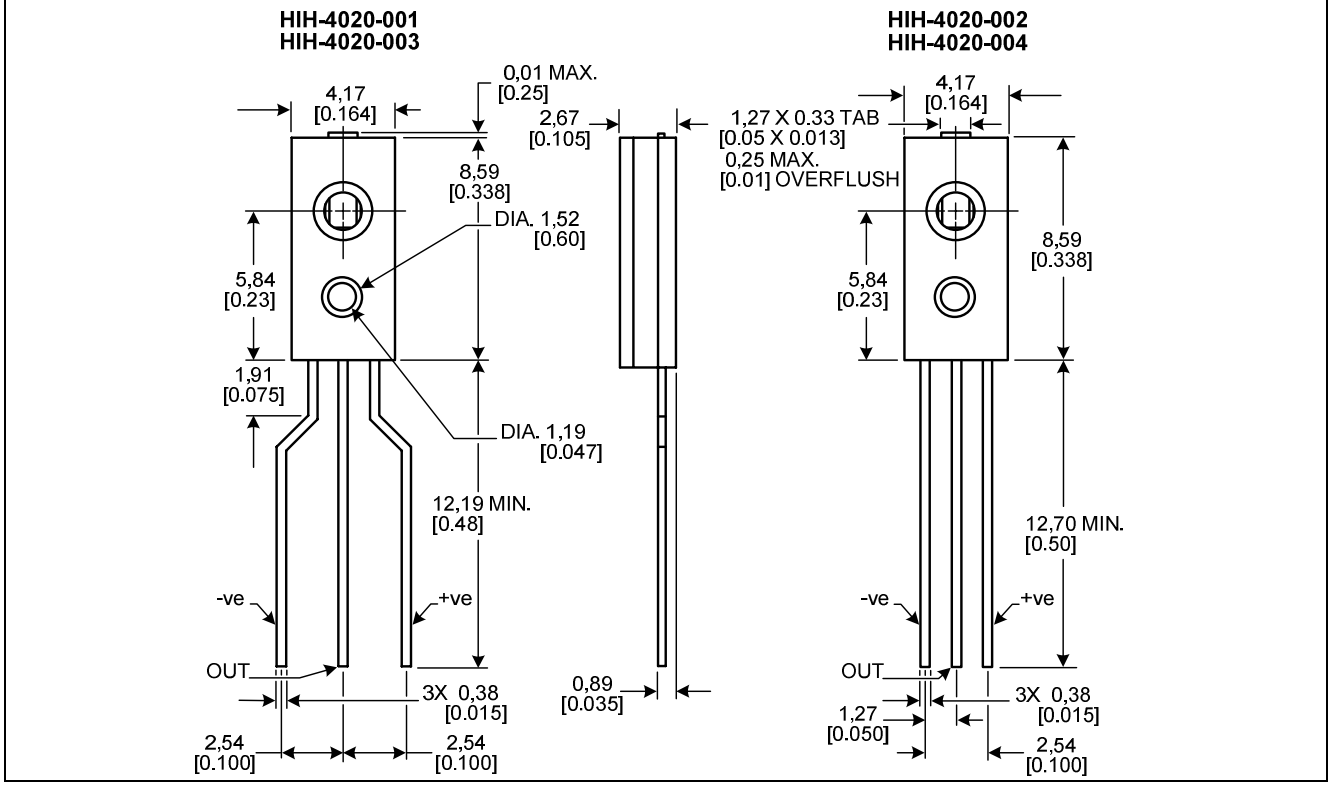


FIGURE 7. HIH-4021 MOUNTING DIMENSIONS (For reference only. mm/[in])

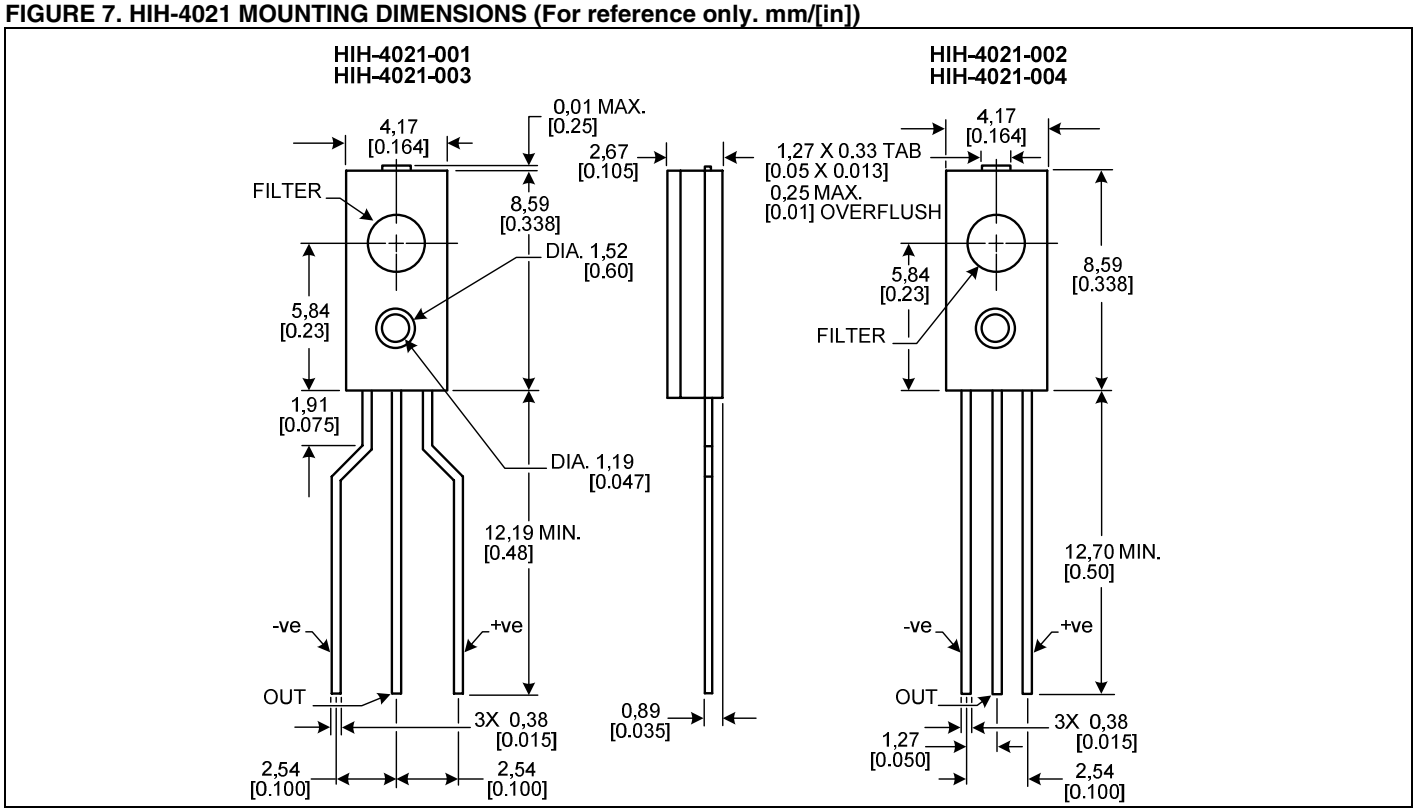
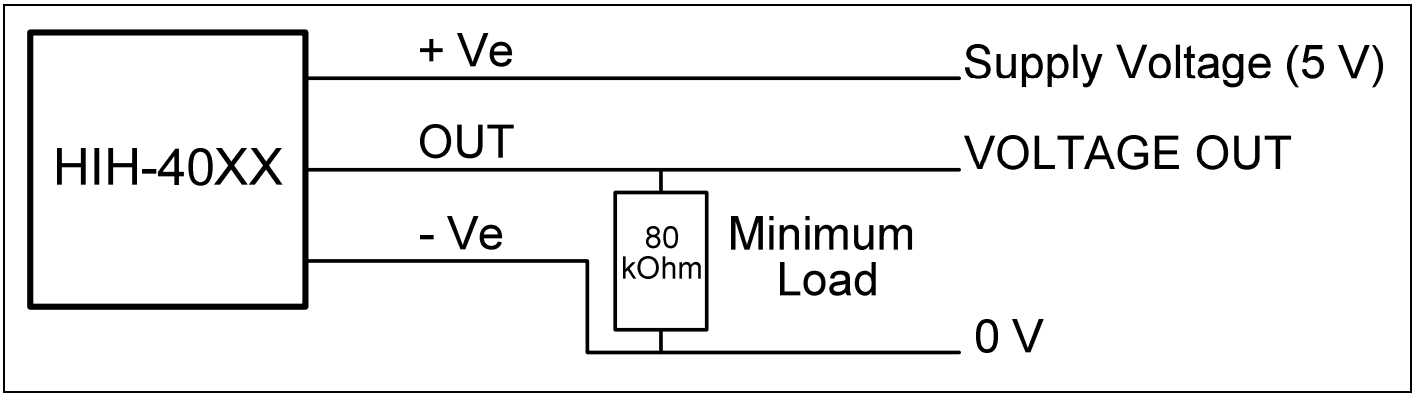


FIGURE 8. TYPICAL APPLICATION CIRCUIT



ORDER GUIDE

Catalog Listing	Description
HIH-4010-001	Integrated circuit humidity sensor, 2,45 mm [0.100 in] lead pitch SIP
HIH-4010-002	Integrated circuit humidity sensor, 1.27 mm [0.050 in] lead pitch SIP
HIH-4010-003	Integrated circuit humidity sensor, 2,45 mm [0.100 in] lead pitch SIP, calibration and data printout
HIH-4010-004	Integrated circuit humidity sensor, 1.27 mm [0.050 in] lead pitch SIP, calibration and data printout
HIH-4020-001	Covered integrated circuit humidity sensor, 2,45 mm [0.100 in] lead pitch SIP
HIH-4020-002	Covered integrated circuit humidity sensor, 1.27 mm [0.050 in] lead pitch SIP
HIH-4020-003	Covered integrated circuit humidity sensor, 2,45 mm [0.100 in] lead pitch SIP, calibration and data printout
HIH-4020-004	Covered integrated circuit humidity sensor, 1.27 mm [0.050 in] lead pitch SIP, calibration and data printout
HIH-4021-001	Covered, filtered integrated circuit humidity sensor, 2,45 mm [0.100 in]lead pitch SIP
HIH-4021-002	Covered, filtered integrated circuit humidity sensor, 1.27 mm [0.050 in] lead pitch SIP
HIH-4021-003	Covered, filtered integrated circuit humidity sensor, 2,45 mm [0.100 in] lead pitch SIP, calibration and data printout
HIH-4021-004	Covered, filtered integrated circuit humidity sensor, 1.27 mm [0.050 in] lead pitch SIP, calibration and data printout

FURTHER HUMIDITY SENSOR INFORMATION

See the following associated literature at **www.honeywell.com/sensing**:

- Product installation instructions
- Application sheets:
  - Humidity Sensor Performance Characteristics
  - Humidity Sensor Theory and Behavior
  - Humidity Sensor Moisture and Psychrometrics
  - Thermoset Polymer-based Capacitive Sensors

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While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

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SALES AND SERVICE

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Internet: www.honeywell.com/sensing

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	+65 6445-3033 Fax
Europe	+44 (0) 1698 481481
	+44 (0) 1698 481676 Fax
Latin America	+1-305-805-8188
	+1-305-883-8257 Fax
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	+1-815-235-6545 Fax

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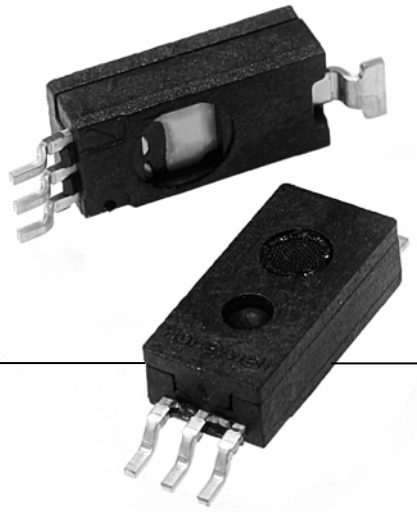


HIH-4030/31 Series

Humidity Sensors

DESCRIPTION

Honeywell has expanded our HIH Series to include an SMD (Surface Mount Device) product line: the new HIH 4030/4031. The HIH 4030/4031 complements our existing line of non-SMD humidity sensors. SMD packaging on tape and reel allows for use in high volume, automated pick and place manufacturing, eliminating lead misalignment to printed circuit board through-hole.

The HIH-4030/4031 Series Humidity Sensors are designed specifically for high volume OEM (Original Equipment Manufacturer) users.

Direct input to a controller or other device is made possible by this sensor's near linear voltage output. With a typical current draw of only 200 µA, the HIH-4030/4031 Series is often ideally suited for low drain, battery operated systems.

Tight sensor interchangeability reduces or eliminates OEM production calibration costs. Individual sensor calibration data is available.

The HIH-4030/4031 Series delivers instrumentation-quality RH (Relative Humidity) sensing performance in a competitively priced, solderable SMD.

The HIH-4030 is a covered integrated circuit humidity sensor. The HIH-4031 is a covered, condensation-resistant, integrated circuit humidity sensor that is factory-fitted with a hydrophobic filter allowing it to be used in condensing environments including industrial, medical and commercial applications.

The RH sensor uses a laser trimmed, thermoset polymer capacitive sensing element with on-chip integrated signal conditioning.

The sensing element's multilayer construction provides excellent resistance to most application hazards such as condensation, dust, dirt, oils and common environmental chemicals.

Sample packs are available. See order guide.

FEATURES

- Tape and reel packaging allows for use in high volume pick and place manufacturing (1,000 units per tape and reel)
- Molded thermoset plastic housing
- Near linear voltage output vs %RH
- Laser trimmed interchangeability
- Low power design
- Enhanced accuracy
- Fast response time
- Stable, low drift performance
- Chemically resistant

POTENTIAL APPLICATIONS

- Refrigeration equipment
- HVAC (Heating, Ventilation and Air Conditioning) equipment
- Medical equipment
- Drying
- Metrology
- Battery-powered systems
- OEM assemblies

HIH-4030/31 Series

TABLE 1. PERFORMANCE SPECIFICATIONS (At 5 Vdc supply and 25 ºC [77 ºF] unless otherwise noted.)

Parameter	Minimum	Typical	Maximum	Unit	Specific Note
Interchangeability (first order curve)	–	–	–	–	–
0% RH to 59% RH	-5	–	5	% RH	–
60% RH to 100% RH	-8	–	8	% RH	–
Accuracy (best fit straight line)	-3.5	–	+3.5	% RH	1
Hysterisis	–	3	–	% RH	–
Repeatability	–	±0.5	–	% RH	–
Settling time	–	–	70	ms	–
Response time (1/e in slow moving air)	–	5	–	s	–
Stability (at 50% RH in a year)	–	±1.2	–	% RH	2
Stability (at 50% RH in a year)	–	±0.5	–	% RH	3
Voltage supply	4	–	5.8	Vdc	4
Current supply	–	200	500	µA	–
Voltage output (1st order curve fit)	$V_{OUT}=(V_{SUPPLY})(0.0062(\text{sensor RH}) + 0.16)$, typical at 25 ºC				
Temperature compensation	True RH = (Sensor RH)/(1.0546 – 0.00216T), T in ºC				
Output voltage temp. coefficient at 50% RH, 5 V	–	-4	–	mV/ºC	–
Operating temperature	-40[-40]	See Figure 1.	85[185]	ºC[ºF]	–
Operating humidity (HIH-4030)	0	See Figure 1.	100	% RH	5
Operating humidity (HIH-4031)	0	See Figure 1.	100	% RH	–
Storage temperature	-50[-58]	–	125[257]	ºC[ºF]	–
Storage humidity	See Figure 2.			% RH	5

Specific Notes:

1. Can only be achieved with the supplied slope and offset. For HIH-4030/31-003 catalog listings only.
2. Includes testing outside of recommended operating zone.
3. Includes testing for recommended operating zone only.
4. Device is calibrated at 5 Vdc and 25 ºC.
5. Non-condensing environment. When liquid water falls on the humidity sensor die, output goes to a low rail condition indicating no humidity.

General Notes:

- Sensor is ratiometric to supply voltage.
- Extended exposure to ≥90% RH causes a reversible shift of 3% RH.
- Sensor is light sensitive. For best performance, shield sensor from bright light.

FACTORY CALIBRATION DATA

HIH-4030/31 Sensors may be ordered with a calibration and data printout. See Table 2 and the order guide on the back page.

TABLE 2. EXAMPLE DATA PRINTOUT

Model	HIH-4030-003
Channel	92
Wafer	030996M
MRP	337313
Calculated values at 5 V V_{OUT} at 0% RH V_{OUT} at 75.3% RH	 0.958 V 3.268 V
Linear output for 3.5% RH accuracy at 25 °C Zero offset Slope Sensor RH	 0.958 V 30.680 mV/%RH (V_{OUT} - zero offset)/slope (V_{OUT} - 0.958)/0.0307
Ratiometric response for 0% RH to 100% RH V_{OUT}	 V_{SUPPLY} (0.1915 to 0.8130)

FIGURE 1. OPERATING ENVIRONMENT (Non-condensing environment for HIH-4030 catalog listings only.)

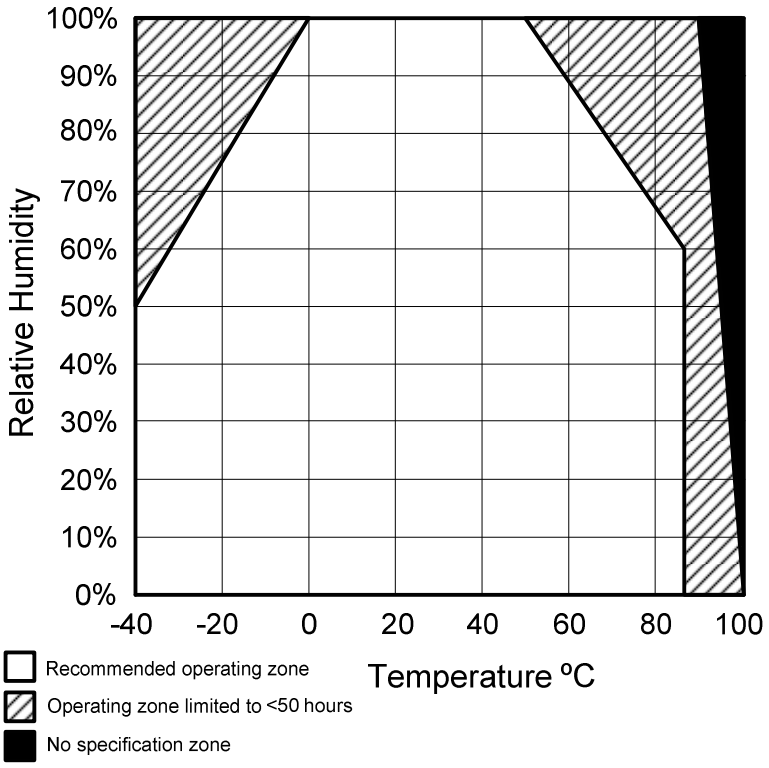


FIGURE 2. STORAGE ENVIRONMENT (Non-condensing environment for HIH-4030 catalog listings only.)

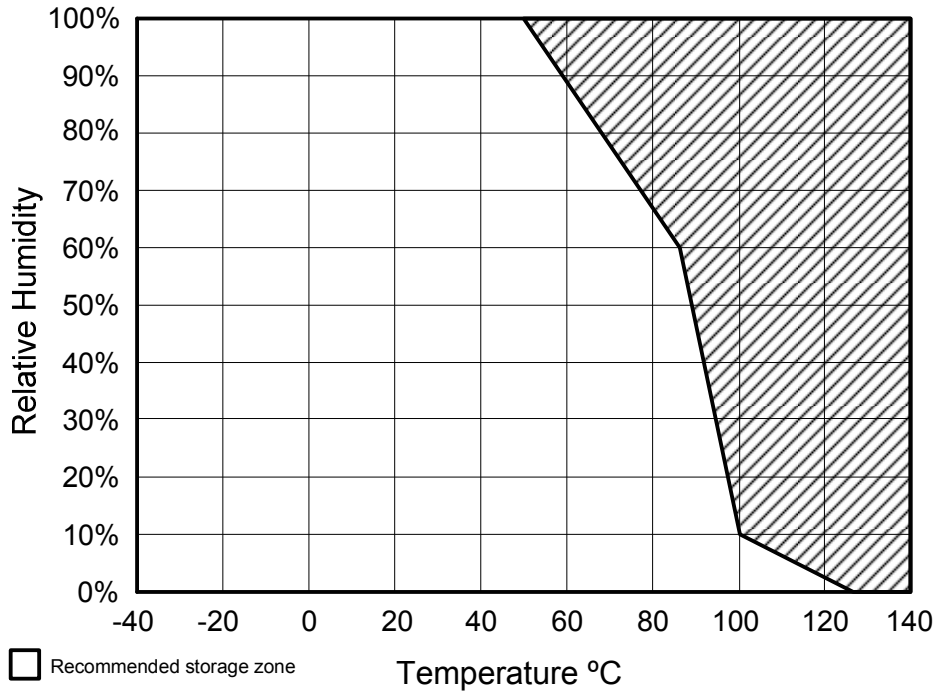


FIGURE 3. TYPICAL OUTPUT VOLTAGE VS RELATIVE HUMIDITY (At 25 ºC and 5 V.)

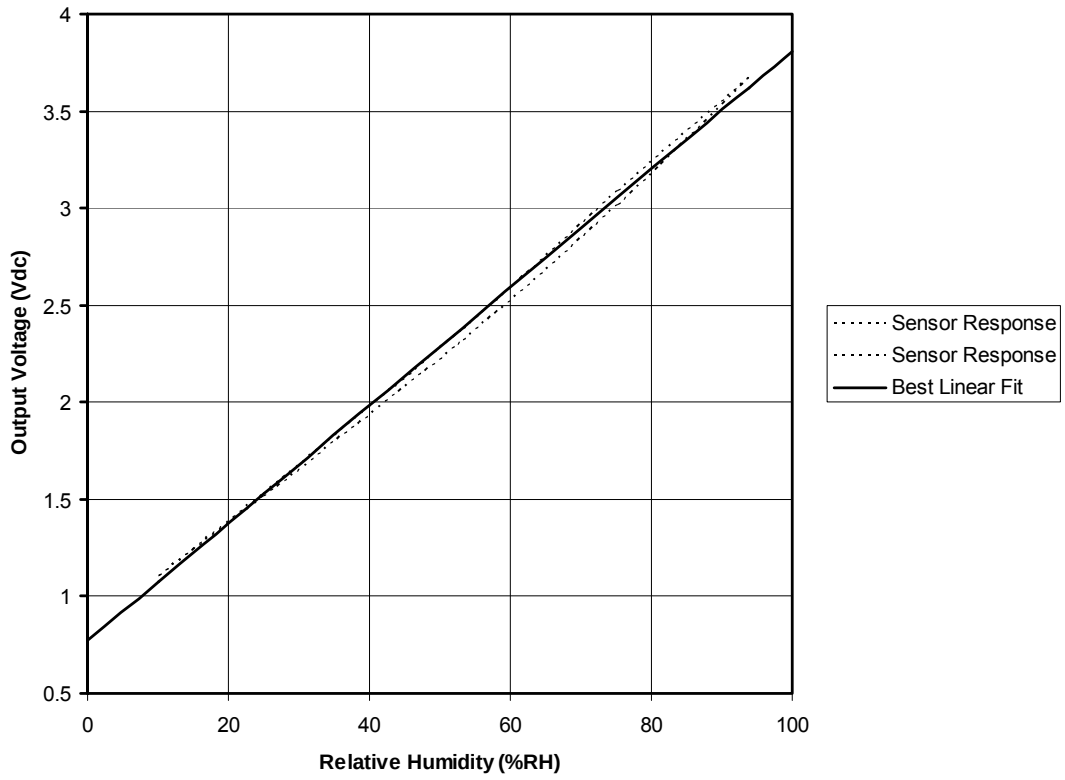


FIGURE 4. TYPICAL OUTPUT VOLTAGE (BFSL) VS RELATIVE HUMIDITY (At 0 ºC, 70 ºC and 5 V.)

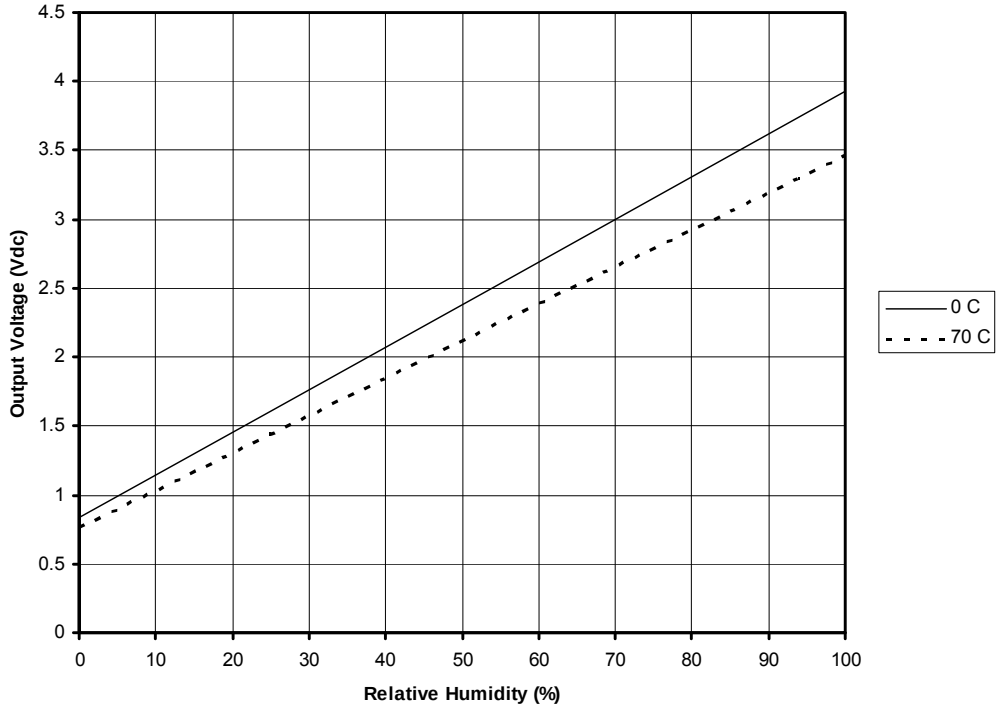


FIGURE 5. HIH-4030 MOUNTING DIMENSIONS (For reference only. mm/[in])

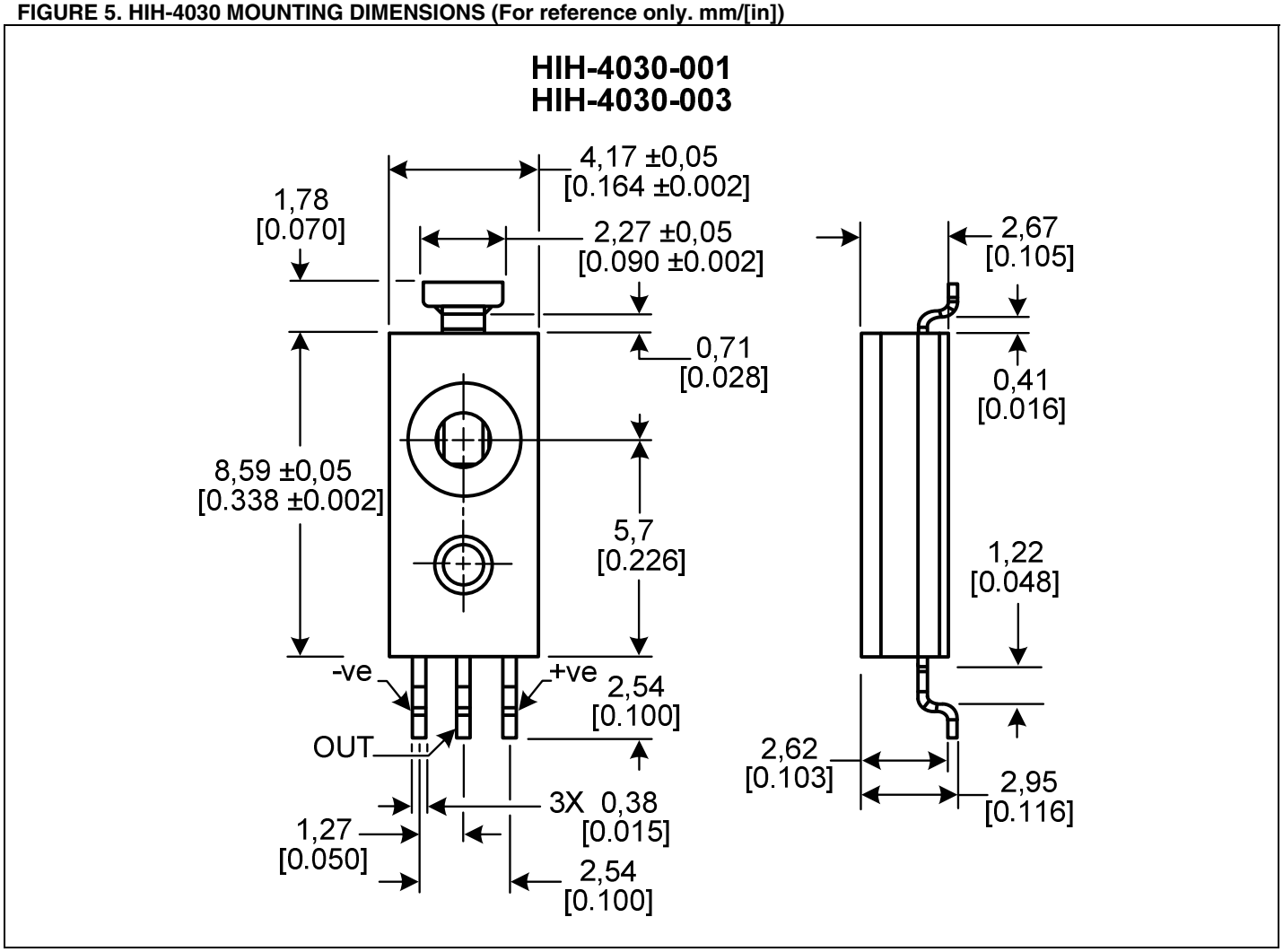


FIGURE 6. HIH-4031 MOUNTING DIMENSIONS (For reference only. mm/[in])

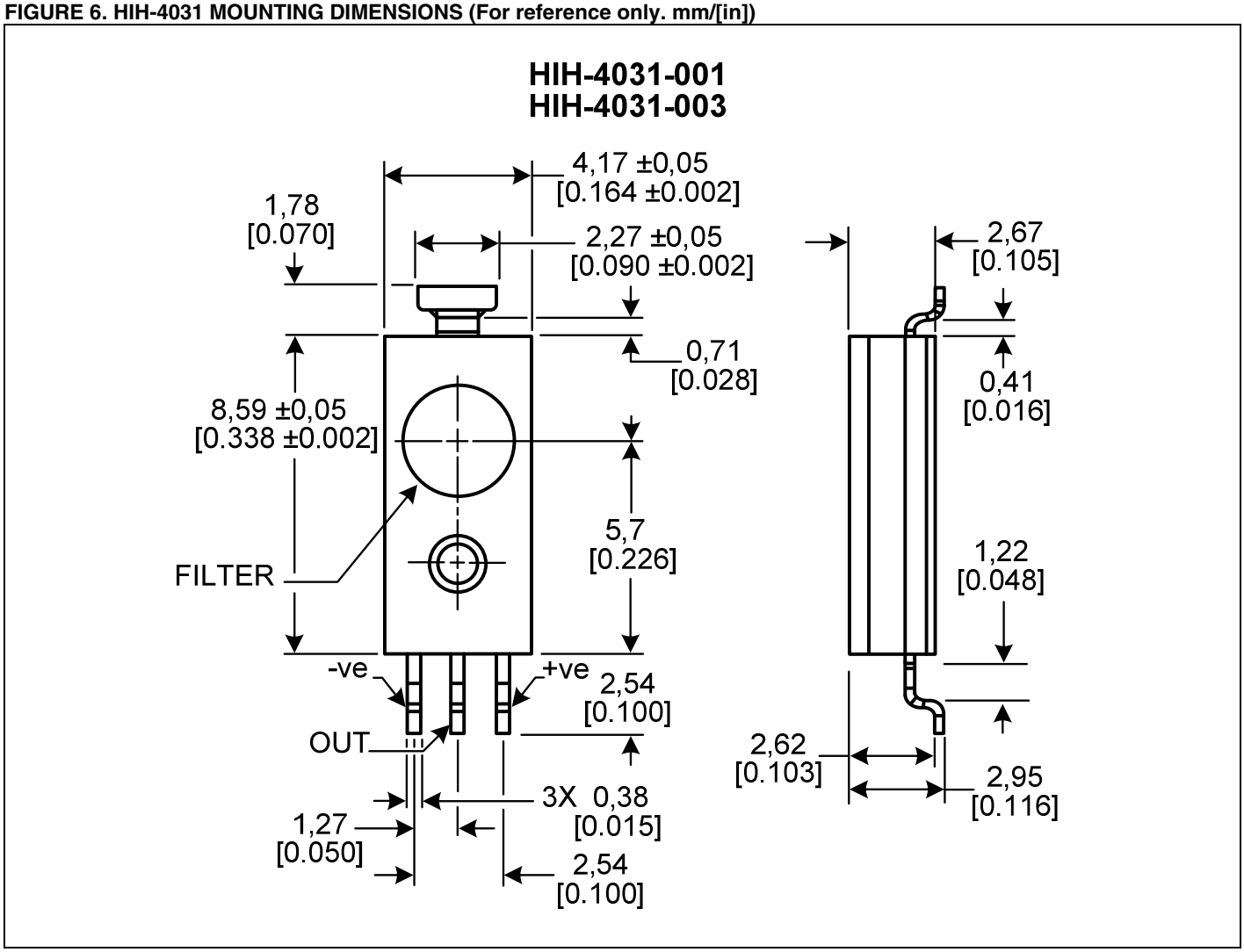


FIGURE 7. HIH-4031 PCB LANDING PATTERN (For reference only. mm/[in])

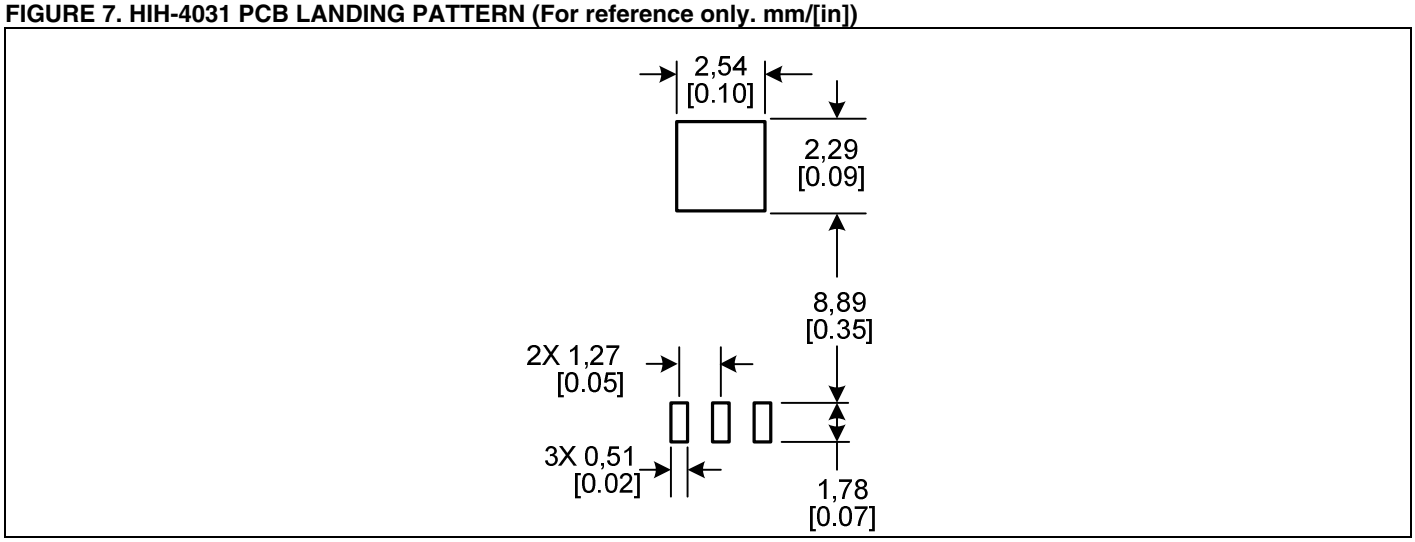


FIGURE 8. TAPE AND REEL DIMENSIONS (For reference only. mm/[in])

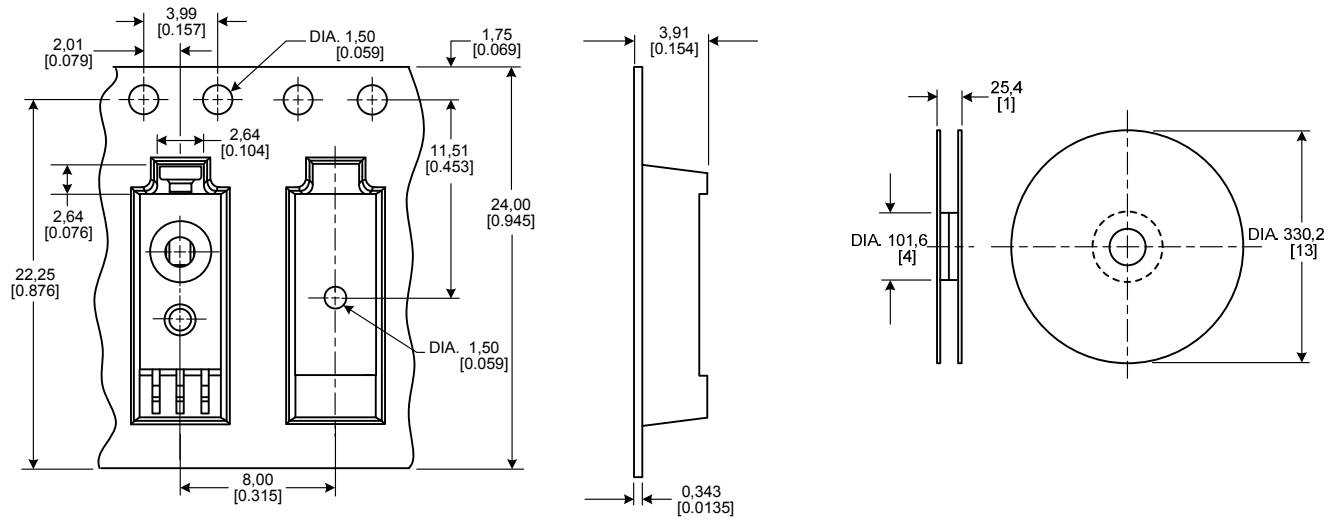
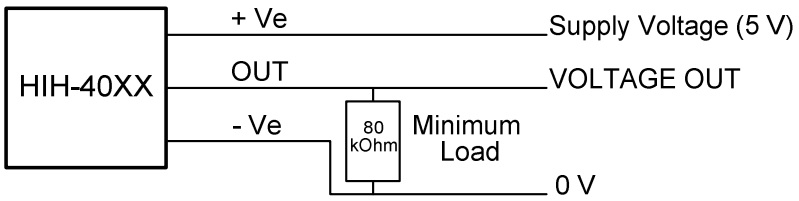


FIGURE 9. TYPICAL APPLICATION CIRCUIT



ORDER GUIDE

Catalog Listing	Description
HIH-4030-001	Covered integrated circuit humidity sensor, SMD, 1000 units on tape and reel
HIH-4030-003	Covered integrated circuit humidity sensor, SMD, calibration and data printout, 1000 units on tape and reel
HIH-4031-001	Covered, filtered integrated circuit humidity sensor, SMD, 1000 units on tape and reel
HIH-4031-003	Covered, filtered integrated circuit humidity sensor, SMD, calibration and data printout, 1000 units on tape and reel
HIH-4030-001S	Sample pack: covered integrated circuit humidity sensor, SMD, five units on tape
HIH-4030-003S	Sample pack: covered integrated circuit humidity sensor, SMD, calibration and data printout, five units on tape
HIH-4031-001S	Sample pack: covered, filtered integrated circuit humidity sensor, SMD, sample pack, five units on tape
HIH-4031-003S	Sample pack: covered, filtered integrated circuit humidity sensor, SMD, calibration and data printout, five units on tape

FURTHER HUMIDITY SENSOR INFORMATION

See the following associated literature is available on the Web:

- Product installation instructions
- Application sheets:
  - Humidity Sensor Performance Characteristics
  - Humidity Sensor Theory and Behavior
  - Humidity Sensor Moisture and Psychrometrics
  - Thermoset Polymer-based Capacitive Sensors

⚠ WARNING

MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

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	+44 (0) 1698 481676 Fax
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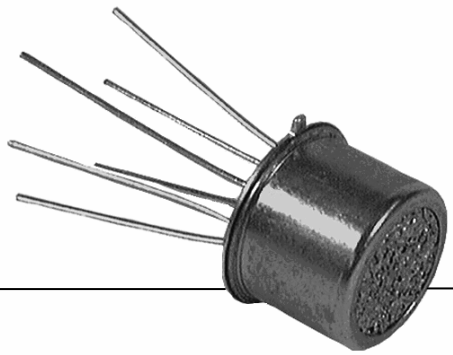
HIH-4602-A/C Series

Humidity Sensors



DESCRIPTION

HIH-4602-A/C Series Relative Humidity (RH) sensors combine both relative humidity and temperature sensing in a TO-5 housing with a hydrophobic sintered stainless steel filter.

The laser-trimmed, thermoset polymer capacitive sensing elements have on-chip integrated signal conditioning.

The temperature sensor is thermally connected with the RH sensor making the HIH-4602-A/C often ideal for measuring dew point and other absolute moisture terms.

The HIH-4602-A contains an integral thermistor, while the HIH-4602-C contains an integral precision RTD.

Factory calibration data supplied with each sensor allows individually matched downstream electronics and ±3.5 %RH total accuracy.

FEATURES

- Near linear voltage output vs %RH
- Laser-trimmed interchangeability
- Enhanced accuracy, fast response
- Chemically resistant
- Stable, low drift performance
- Built-in static protection
- Often ideal for dew point and absolute moisture measurements
- TO-5 housing

POTENTIAL APPLICATIONS

- Refrigeration
- Drying
- Meteorology
- Battery-powered systems
- OEM (Original Equipment Manufacturer) assemblies

HIH-4602-A/C Series

TABLE 1. PERFORMANCE SPECIFICATIONS (At 5 Vdc supply and 25 ºC [77 ºF] unless otherwise noted.)

Parameter	Minimum	Typical	Maximum	Unit	Specific Note
Interchangeability (first order curve)	–	–	–	–	–
0% RH to 59% RH	-5	–	5	% RH	–
60% RH to 100% RH	-8	–	8	% RH	–
Accuracy (best fit straight line)	-3.5	–	+3.5	% RH	1
Hysterisis	–	3	–	% RH	–
Repeatability	–	±0.5	–	% RH	–
Settling time	–	–	70	ms	–
Response time (1/e in slow moving air)	–	50	–	s	–
Stability (at 50% RH in one year)	–	±1.2	–	% RH	–
Voltage supply	4	–	5.8	Vdc	–
Current supply	–	200	500	µA	–
Output voltage temp. coefficient at 50% RH, 5 V	–	-4	–	mV/ºC	–
Voltage output (1st order curve fit)	$V_{OUT}=(V_{SUPPLY})(0.0062(\text{sensor RH}) + 0.16)$, typical at 25 ºC				
Temperature compensation	True RH = (sensor RH)/(1.0546-0.00216T), T in ºC				
Operating temperature	-40[-40]	See Figure 1.	85[185]	ºC[ºF]	–
Operating humidity	0	See Figure 1.	100	% RH	2
Storage temperature	-50[-58]	–	125[257]	ºC[ºF]	–
Storage humidity	See Figure 2.			% RH	2

Specific Notes:
1. Device is calibrated at 5 Vdc and 25 ºC.
2. Non-condensing environment.

General Notes:
- Sensor is ratiometric to supply voltage.
- Extended exposure to ≥90% RH causes a reversible shift of 3% RH.
- Sensor is light sensitive. For best performance, shield sensor from bright light.

FACTORY CALIBRATION DATA
HIH-4602 Sensors are supplied with a calibration and data printout. See Table 2.

TABLE 2. EXAMPLE DATA PRINTOUT

Model	HIH-4602-C
Channel	92
Wafer	030996M
MRP	337313
Calculated values at 5 V V_{OUT} at 0% RH V_{OUT} at 75.3% RH	 0.826 V 3.198 V
Linear output for 3.5% RH accuracy at 25 °C Zero offset Slope RH	 0.826 V 31.483 mV/%RH (V_{OUT} - zero offset)/slope (V_{OUT} - 0.826)/0.0315
Ratiometric response for 0% RH to 100% RH V_{OUT}	 V_{SUPPLY} (0.1652 to 0.7952)

TABLE 3. HIH-4602-A NTC THERMISTOR TEMPERATURE SPECIFICTIONS

Rb = 100 kOhm ±5% at 25 ºC		
Beta = 4250, 25 ºC to 85 ºC		
1/T = a + b(Ln R) + c(Ln R) ^ 3, T in degrees K		
	Temp. ºC	**Resistance**
Low	0	351000
Mid	50	33590
High	100	5569
a = 0.000828083		
b = 0.000208691		
c = 8.0812E-08		

TABLE 4. HIH-4602-C RTD TEMPERATURE SENSOR SPECIFICATIONS

Thin film platinum RTD – Class 2B (Ro: ±0.25%)
DIN EN 60571 (PER IEC 751)
TCR = 3750 ppm/ºC
1000 Ohm at 0 ºC [32 ºF]

FIGURE 1. OPERATING ENVIRONMENT (Non-condensing environment.)

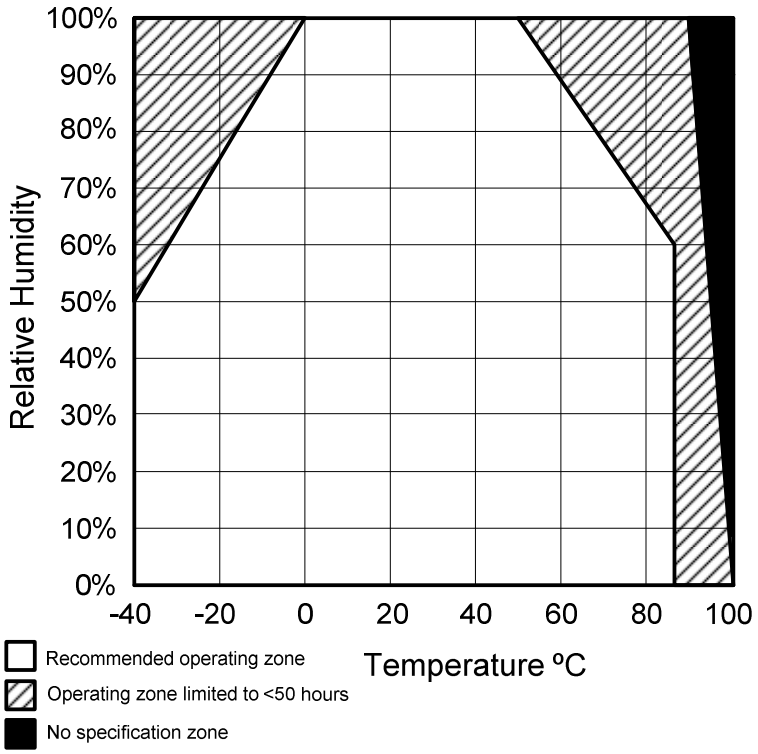


FIGURE 2. STORAGE ENVIRONMENT (Non-condensing environment.)

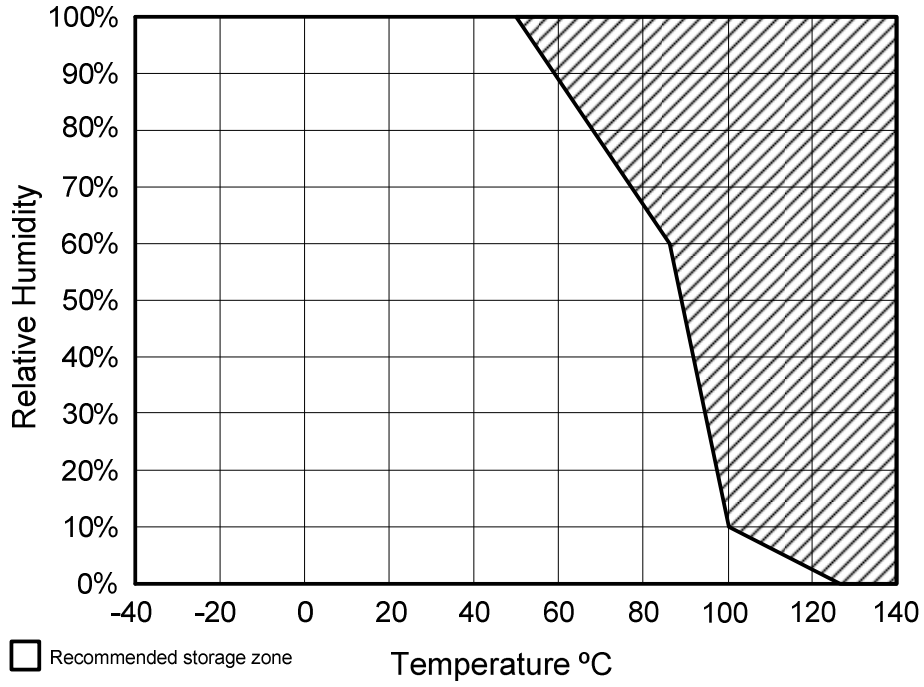


FIGURE 3. TYPICAL OUTPUT VOLTAGE VS RELATIVE HUMIDITY (At 25 ºC and 5 V.)

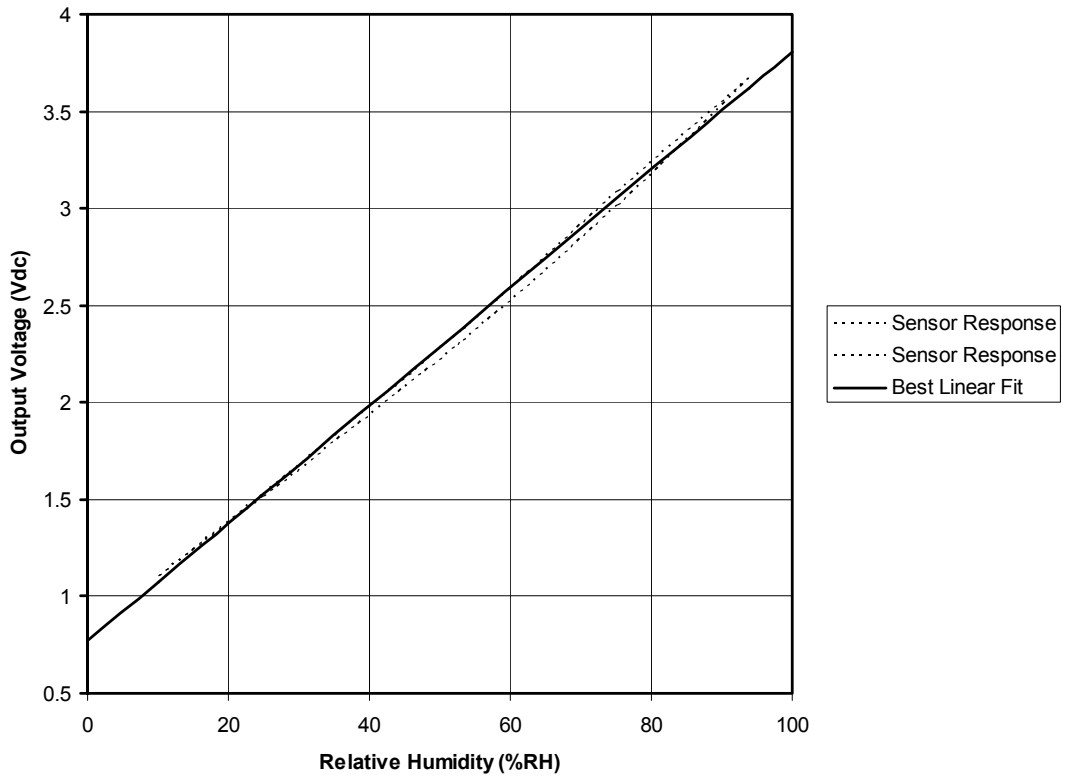


FIGURE 4. TYPICAL OUTPUT VOLTAGE (BFSL) VS RELATIVE HUMIDITY (At 0 ºC, 70 ºC and 5 V.)

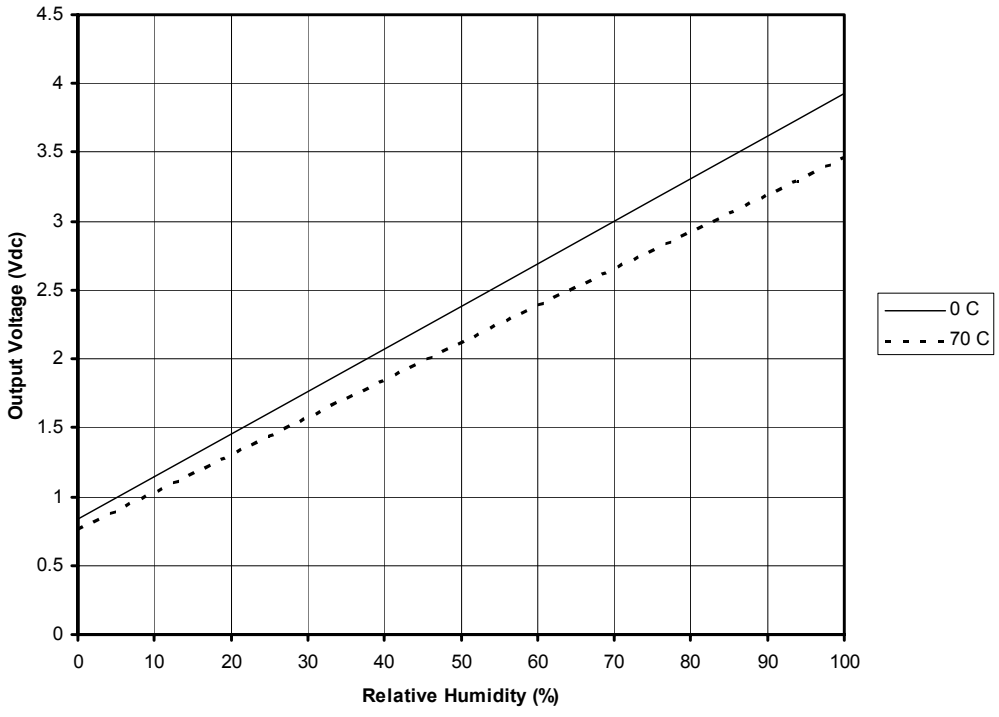
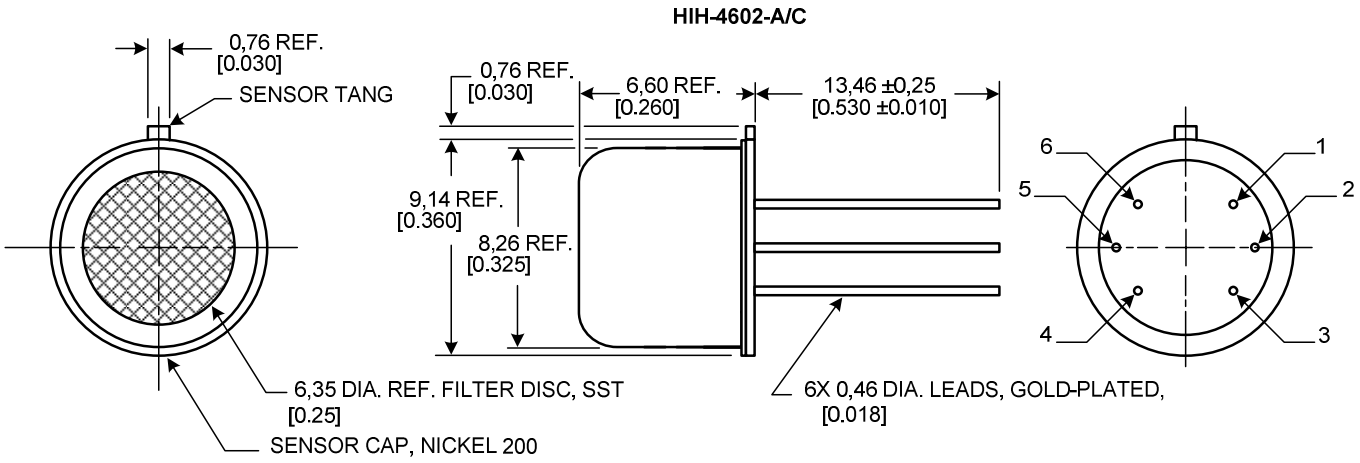


FIGURE 5. HIH-4602-A/C 1MOUNTING DIMENSIONS (For reference only. mm/[in])



1. Case ground	4. (+) Vdc supply
2. Vdc out	5., 6. HIH-4602-A thermistor for temperature compensation
3. (-) Power or ground	5., 6. HIH-4602-C RTD for temperature compensation

FIGURE 6. RH SENSOR CONSTRUCTION

Sensor construction consists of a planar capacitor with a second polymer layer to protect against dirt, dust, oils and other hazards.

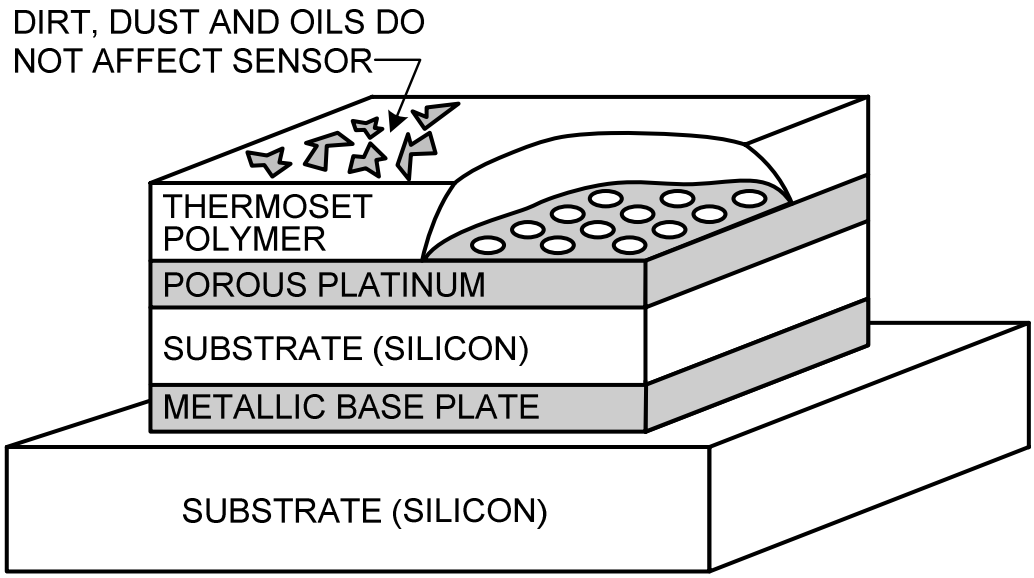
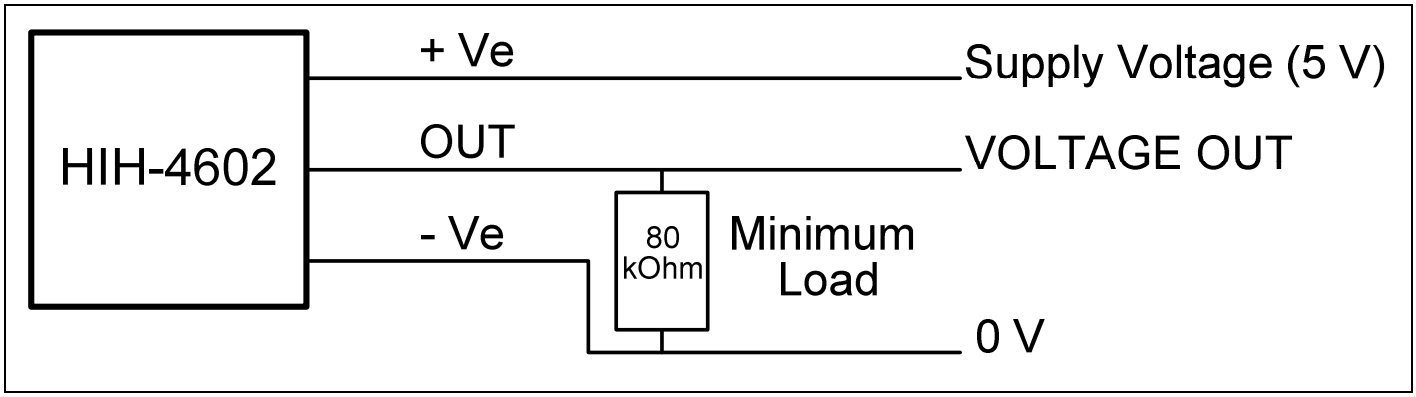


FIGURE 7. TYPICAL APPLICATION CIRCUIT



ORDER GUIDE

Catalog Listing	Description
HIH-4602-A	Monolithic IC humidity sensor with integral thermistor in TO-5 can
HIH-4602-C	Monolithic IC humidity sensor with integral precision RTD in TO-5 can

FURTHER HUMIDITY SENSOR INFORMATION

See the following associated literature at **www.honeywell.com/sensing**:

- Product installation instructions
- Application sheets:
  - Humidity Sensor Performance Characteristics
  - Humidity Sensor Theory and Behavior
  - Humidity Sensor Moisture and Psychrometrics
  - Thermoset Polymer-based Capacitive Sensors

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WARRANTY/REMEDY

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While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

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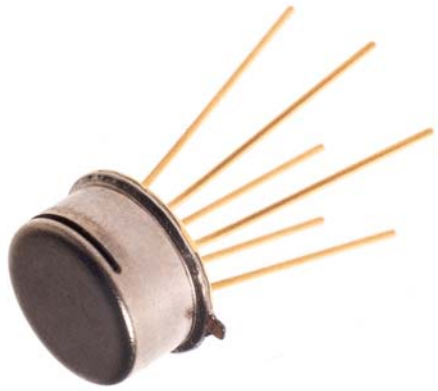
HIH-4602-L Series

Humidity Sensors



DESCRIPTION

HIH-4602-L Series Relative Humidity (RH) sensors are designed to deliver RH sensing in a rugged, low-cost slotted TO-5 can.

The laser-trimmed, thermoset polymer capacitive sensing elements have on-chip integrated signal conditioning, helping to reduce product development times.

A typical current draw of only 200 µA allows use in battery-powered systems.

HIH-4602-L-CP sensors include a calibration and data printout to allow individually matched downstream electronics and ±3.5 %RH total accuracy.

FEATURES

- Near linear voltage output vs %RH
- Laser-trimmed interchangeability
- Enhanced accuracy, fast response
- Chemically resistant
- Stable, low drift performance
- Built-in static protection
- TO-5 can

POTENTIAL APPLICATIONS

- Refrigeration
- Drying
- Meteorology
- Battery-powered systems
- OEM (Original Equipment Manufacturer) assemblies

HIH-4602-L Series

Table 1. Performance Specifications (At 5 Vdc supply and 25 ºC [77 ºF] unless otherwise noted.)

Parameter	Minimum	Typical	Maximum	Unit	Specific Note
Interchangeability (first order curve)	–	–	–	–	–
0% RH to 59% RH	-5	–	5	% RH	–
60% RH to 100% RH	-8	–	8	% RH	–
Accuracy (best fit straight line)	-3.5	–	+3.5	% RH	1
Hysterisis	–	3	–	% RH	–
Repeatability	–	±0.5	–	% RH	–
Settling time	–	–	70	ms	–
Response time (1/e in slow moving air)	–	30	–	s	–
Stability (at 50% RH in one year)	–	1.2	–	% RH	–
Voltage supply	4	–	5.8	Vdc	–
Current supply	–	200	500	µA	–
Output voltage temp. coefficient at 50% RH, 5 V	–	-4	–	mV/°C	–
Voltage output (1st order curve fit)	$V_{OUT} = (V_{SUPPLY})(0.0062(\text{sensor RH}) + 0.16)$, typical at 25 °C				2
Temperature compensation	True RH = (sensor RH)/(1.0546-0.00216T), T in °C				
Operating temperature	-40[-40]	See Figure 1.	85[185]	°C[°F]	–
Operating humidity	0	See Figure 1.	100	% RH	3
Storage temperature	-40[-40]	See Figure 2.	125[257]	°C[°F]	–
Storage humidity	See Figure 2.			% RH	3

Specific Notes:
1. Applies to HIH-4602-L-CP only.
2. Device is calibrated at 5 Vdc and 25 ºC.
3. Non-condensing environment.

General Notes:
- Sensor is ratiometric to supply voltage.
- Extended exposure to ≥90% RH causes a reversible shift of 3% RH.
- Sensor is light sensitive. For best performance, shield sensor from bright light.

Factory Calibration Data
HIH-4602-L-CP Sensors include a calibration and data printout. See Table 2.

Table 2. Example Data Printout

Model	HIH-4602-L-CP
Channel	92
Wafer	030996M
MRP	337313
Calculated values at 5 V V_{OUT} at 0% RH V_{OUT} at 75.3% RH	 0.958 V 3.268 V
Linear output for 3.5% RH accuracy at 25 °C Zero offset Slope RH	 0.958 V 30.680 mV/%RH (V_{OUT} - zero offset)/slope (V_{OUT} - 0.958)/0.0307
Ratiometric response for 0% RH to 100% RH V_{OUT}	 V_{SUPPLY} (0.1915 to 0.8130)

Figure 1. Operating Environment (Non-condensing environment.)

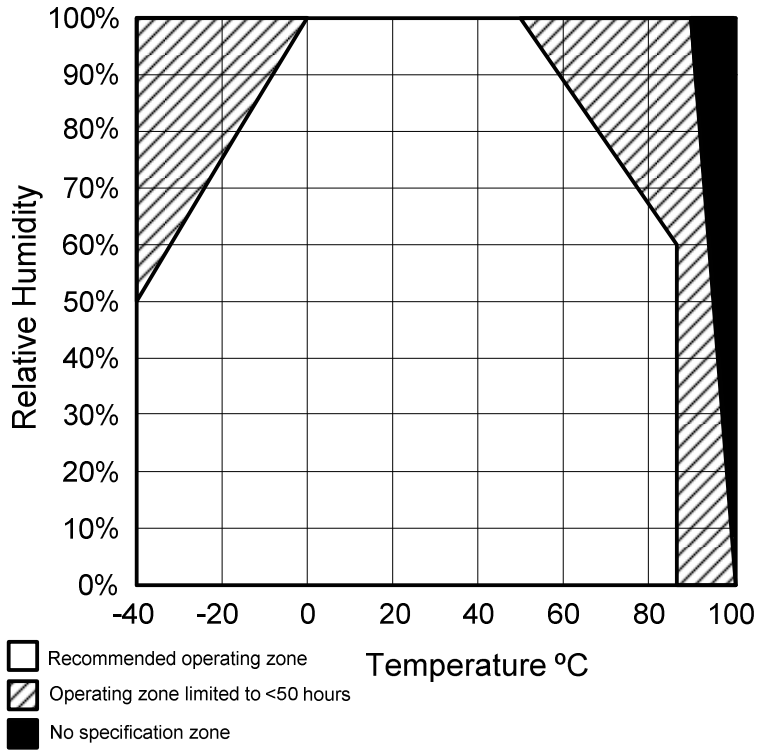


Figure 2. Storage Environment (Non-condensing environment.)

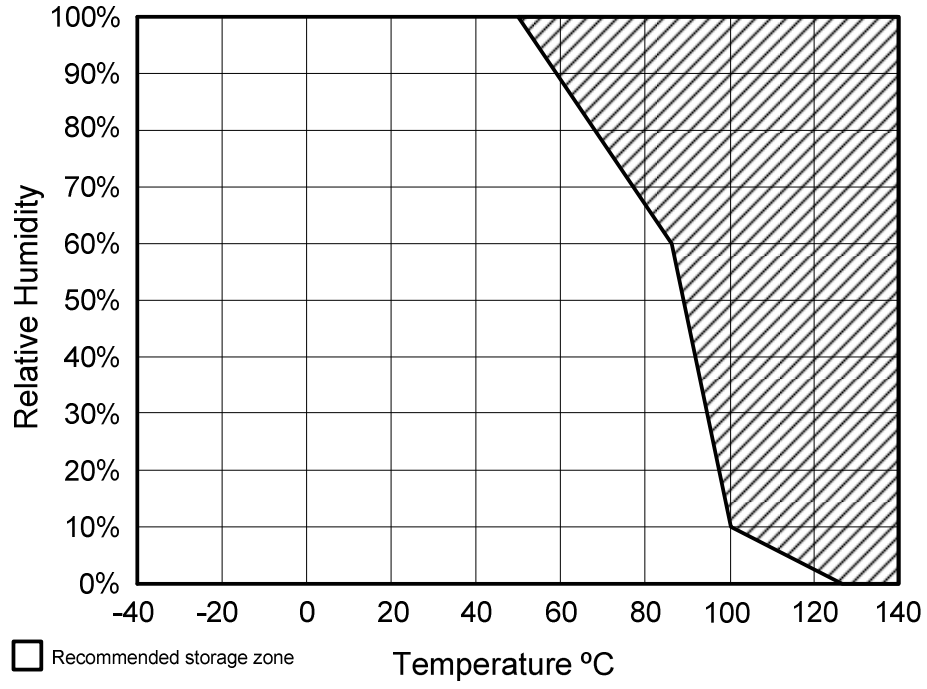


Figure 3. Typical Output Voltage vs Relative Humidity (At 5 V and 25 °C.)

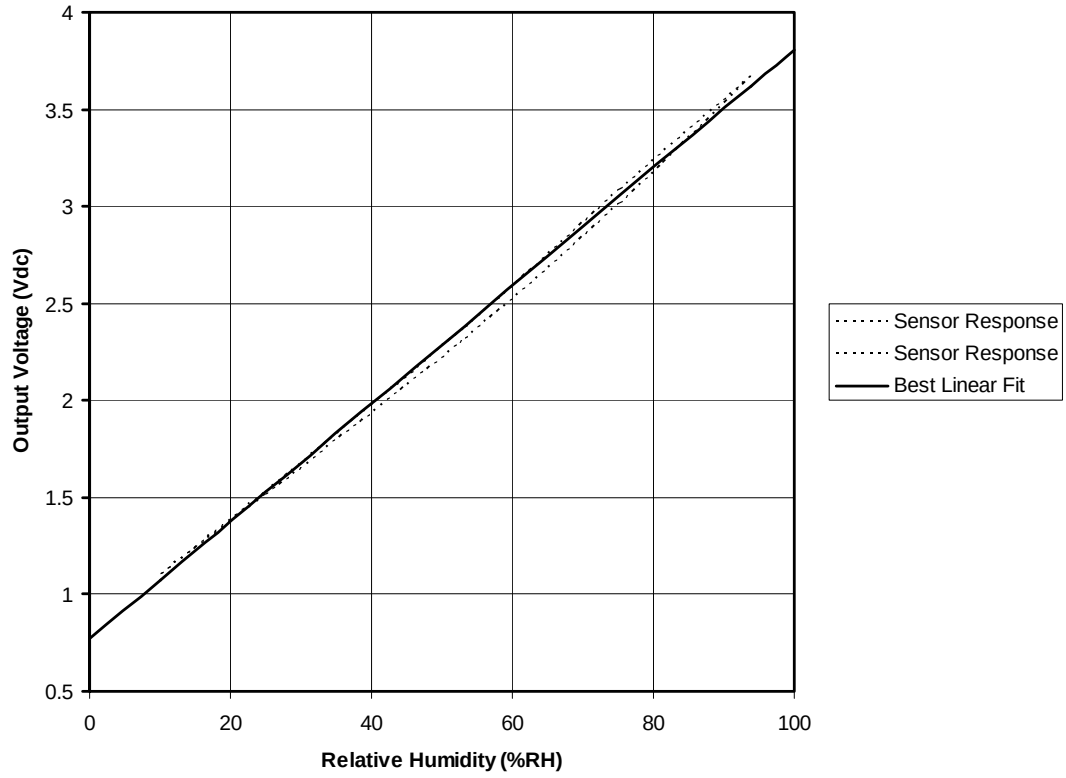


Figure 4. Typical Output Voltage (BFSL) vs Relative Humidity (At 0 ºC, 70 ºC and 5 V.)

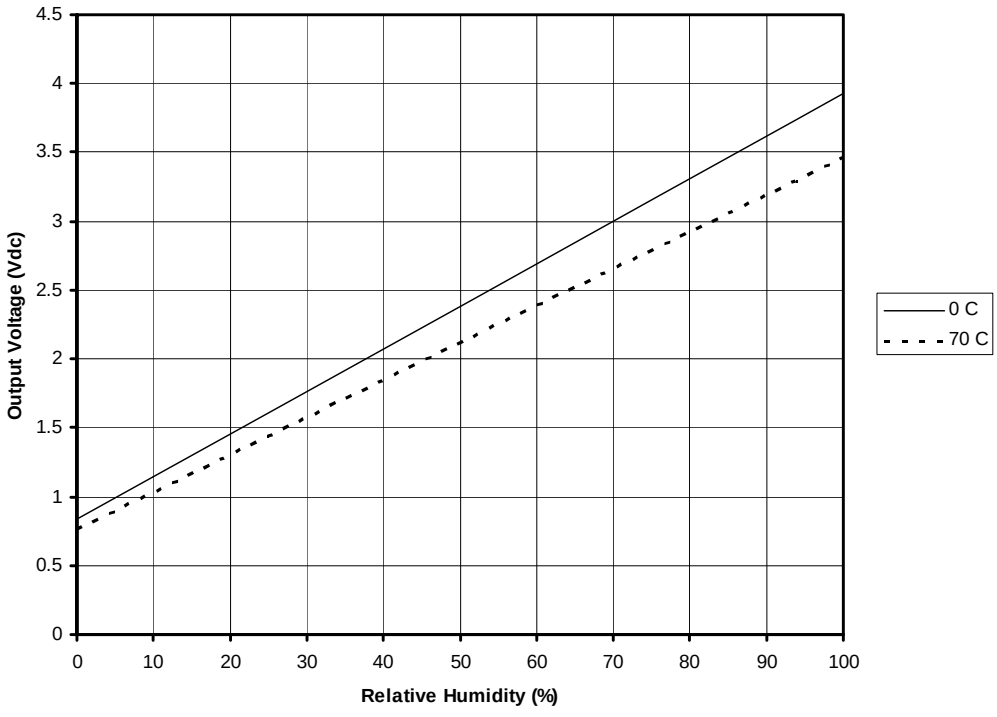
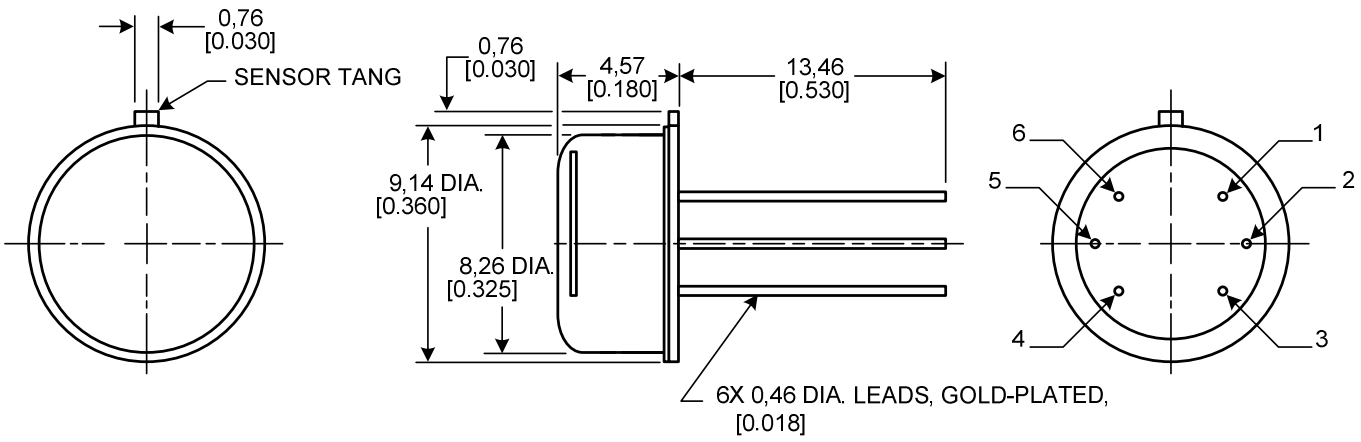


Figure 5. Mounting Dimensions (For reference only. mm/[in])



1. Case ground	4. (+) Vdc supply
2. Vdc out	5. No connection
3. (-) Power or ground	6. No connection

Figure 6. RH Sensor Construction

Sensor construction consists of a planar capacitor with a second polymer layer to protect against most dirt/dust particles, oils and other hazards.

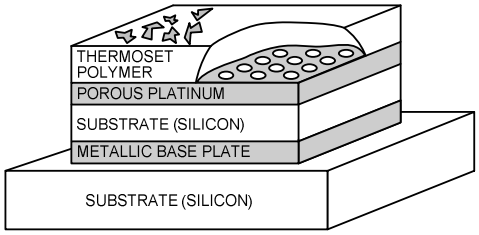
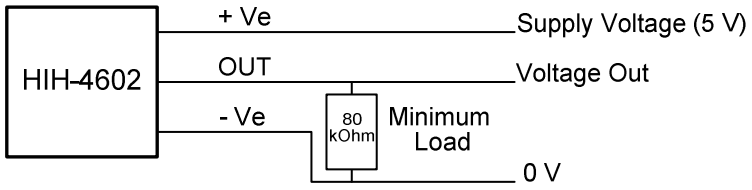


Figure 7. Typical Application Circuit



Order Guide

Catalog Listing	Description
HIH-4602-L	Relative humidity sensor in TO-5 can
HIH-4602-LP	Relative humidity sensor in TO-5 can with calibration and data printout

ADDITIONAL HUMIDITY SENSOR INFORMATION

See the following associated literature at **www.honeywell.com/sensing**:

- Product installation instructions
- Application sheets:
  - Humidity Sensor Performance Characteristics
  - Humidity Sensor Theory and Behavior
  - Humidity Sensor Moisture and Psychrometrics
  - Thermoset Polymer-based Capacitive Sensors

⚠ WARNING

MISUSE OF DOCUMENTATION

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- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

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SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

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Internet: www.honeywell.com/sensing

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	+65 6445-3033 Fax
Europe	+44 (0) 1698 481481
	+44 (0) 1698 481676 Fax
Latin America	+1-305-805-8188
	+1-305-883-8257 Fax
USA/Canada	+1-800-537-6945
	+1-815-235-6847
	+1-815-235-6545 Fax

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December 2008

Honeywell

HIH-5030/5031 Series

Low Voltage Humidity Sensors

DESCRIPTION

The HIH-5030/5031 Series Low Voltage Humidity Sensors operate down to 2.7 Vdc, often ideal in battery-powered systems where the supply is a nominal 3 Vdc.

The HIH 5030/5031 complements our existing line of 5 Vdc SMD (Surface Mount Device) humidity sensors. SMD packaging on tape and reel allows for use in high volume, automated pick and place manufacturing, eliminating lead misalignment to printed circuit board through-holes.

The HIH-5030/5031 Series Humidity Sensors are designed specifically for high volume OEM (Original Equipment Manufacturer) users.

Direct input to a controller or other device is made possible by this sensor's near linear voltage output. With a typical current draw of only 200 µA, the HIH-5030/5031 Series is ideally suited for many low drain, battery operated systems.

Tight sensor interchangeability reduces or eliminates OEM production calibration costs.

The HIH-5030/5031 Series delivers instrumentation-quality RH (Relative Humidity) sensing performance in a competitively priced, solderable SMD.

The HIH-5030 is a covered integrated circuit humidity sensor. The HIH-5031 is a covered, condensation-resistant, integrated circuit humidity sensor that is factory-fitted with a hydrophobic filter allowing it to be used in many condensing environments including industrial, medical and commercial applications.

The RH sensor uses a laser trimmed, thermoset polymer capacitive sensing element with on-chip integrated signal conditioning.

The sensing element's multilayer construction provides excellent resistance to most application hazards such as condensation, dust, dirt, oils and common environmental chemicals.

Sample packs are available. See order guide.

FEATURES

- Operates down to 2.7 Vdc, often ideal in battery-powered systems where the supply is a nominal 3 Vdc.
- Tape and reel packaging allows for use in high volume pick and place manufacturing (1,000 units per tape and reel)
- Molded thermoset plastic housing
- Near linear voltage output vs %RH
- Laser trimmed interchangeability
- Low power design
- Enhanced accuracy
- Fast response time
- Stable, low drift performance
- Chemically resistant

POTENTIAL APPLICATIONS

Industrial

- Air compressors
- Battery-powered systems
- Drying equipment
- HVAC (includes air conditioning, air movement, thermostats, humidifiers, de-humidifiers, humidistats, enthalpy sensing)
- OEM assemblies
- Office automation equipment
- Process equipment
- Refrigeration (includes bulk and transport systems)
- Telecommunications cabinets
- Weather stations and meteorology equipment

Medical

- Hospital air compressors
- Infant incubators
- Microenvironments
- Sleep apnea equipment
- Treadmill stress monitoring equipment

Table 1. Performance Specifications (At 3.3 Vdc supply and 25 °C [77 °F] unless otherwise noted.)

Parameter	Minimum	Typical	Maximum	Unit	Specific Note
Interchangeability (first order curve) 0% RH to 10% RH, 90% RH to 100% RH 11% RH to 89% RH	 -7 -3	 – –	 7 3	 % RH % RH	 –
Accuracy (best fit straight line) 11% RH to 89% RH	-3	–	+3	% RH	4
Hysteresis	–	2	–	% RH	–
Repeatability	–	±0.5	–	% RH	–
Settling time	–	–	70	ms	–
Response time (1/e in slow moving air)	–	5	–	s	–
Stability (at 50% RH in 5 years)	–	±1.2	–	% RH	1
Voltage supply	2.7	–	5.5	Vdc	2
Current supply	–	200	500	µA	–
Voltage output (1st order curve fit)	$V_{OUT}=(V_{SUPPLY})(0.00636(\text{sensor RH}) + 0.1515)$, typical at 25 °C				
Temperature compensation	True RH = (Sensor RH)/(1.0546 – 0.00216T), T in °C				
Output voltage temp. coefficient at 50% RH, 3.3 V	–	-2	–	mV/°C	–
Operating temperature	-40[-40]	See Figure 2.	85[185]	°C[°F]	–
Operating humidity (HIH-5030)	0	See Figure 2.	100	% RH	3
Operating humidity (HIH-5031)	0	See Figure 2.	100	% RH	–
Storage temperature	-50[-58]	–	125[257]	°C [°F]	–
Storage humidity	See Figure 3.			% RH	3

Specific Notes:

1. Includes stress outside of recommended operating zone.
2. Device is tested at 3.3 Vdc and 25 °C.
3. Non-condensing environment. When liquid water falls on the humidity sensor die, output goes to a low rail condition indicating no humidity.
4. Total accuracy including interchangeability is ±3 %RH.

General Notes:

- Sensor is ratiometric to supply voltage.
- Extended exposure to ≥90 % RH causes a reversible shift of 3 % RH.
- Sensor is light sensitive. For best performance, shield sensor from bright light.

Figure 1. Operating Environment (Non-condensing environment for HIH-5030 catalog listings only.)

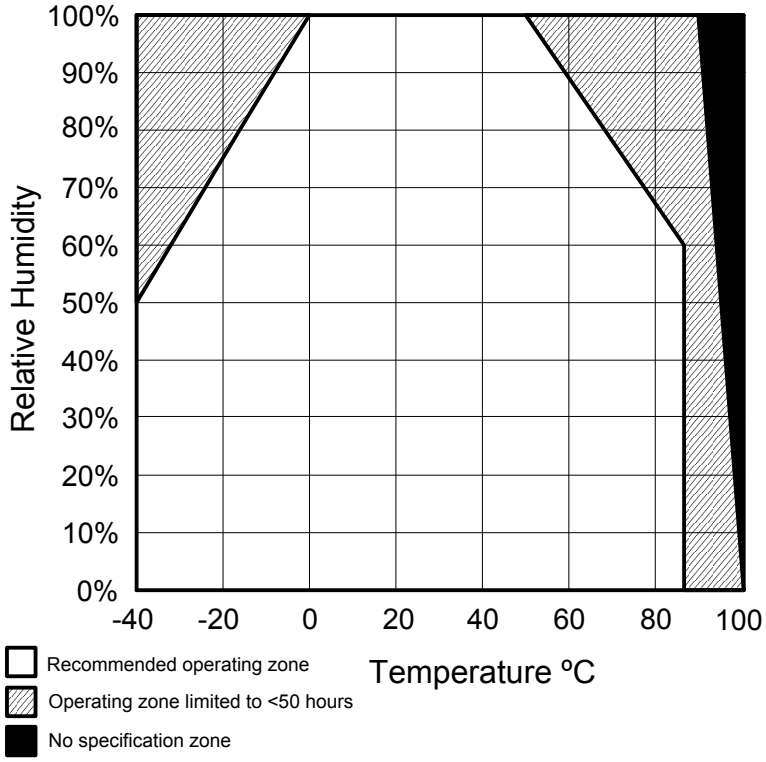


Figure 2. Storage Environment (Non-condensing environment for HIH-5030 catalog listings only.)

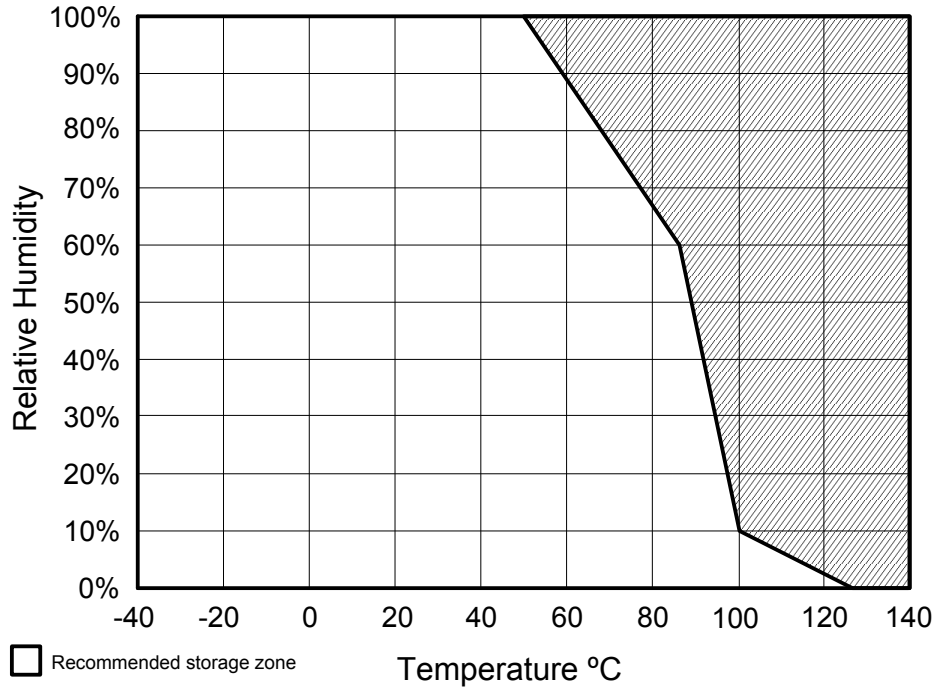


Figure 3. Typical Output Voltage vs Relative Humidity (At 25 °C and 3.3 Vdc.)

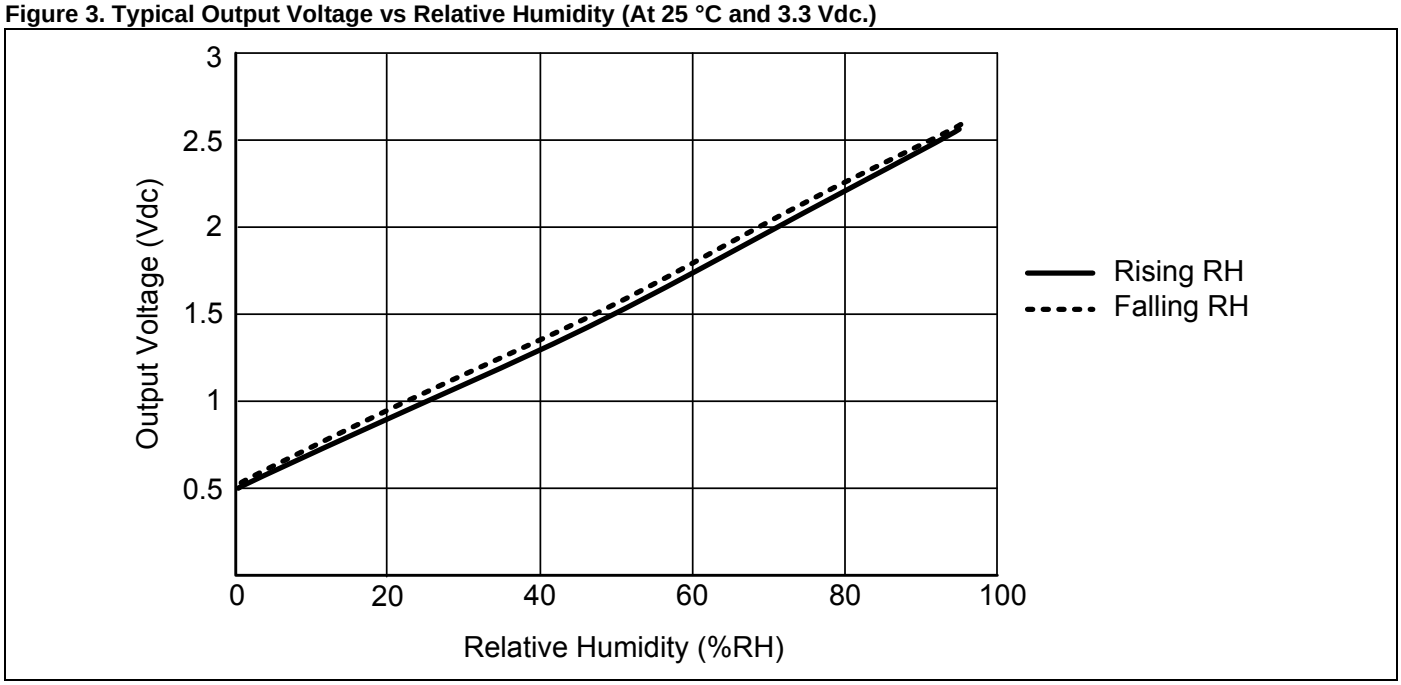


Figure 4. Typical Output Voltage (BFSL) vs Relative Humidity (At 0 °C, 70 °C and 3.3 Vdc.)

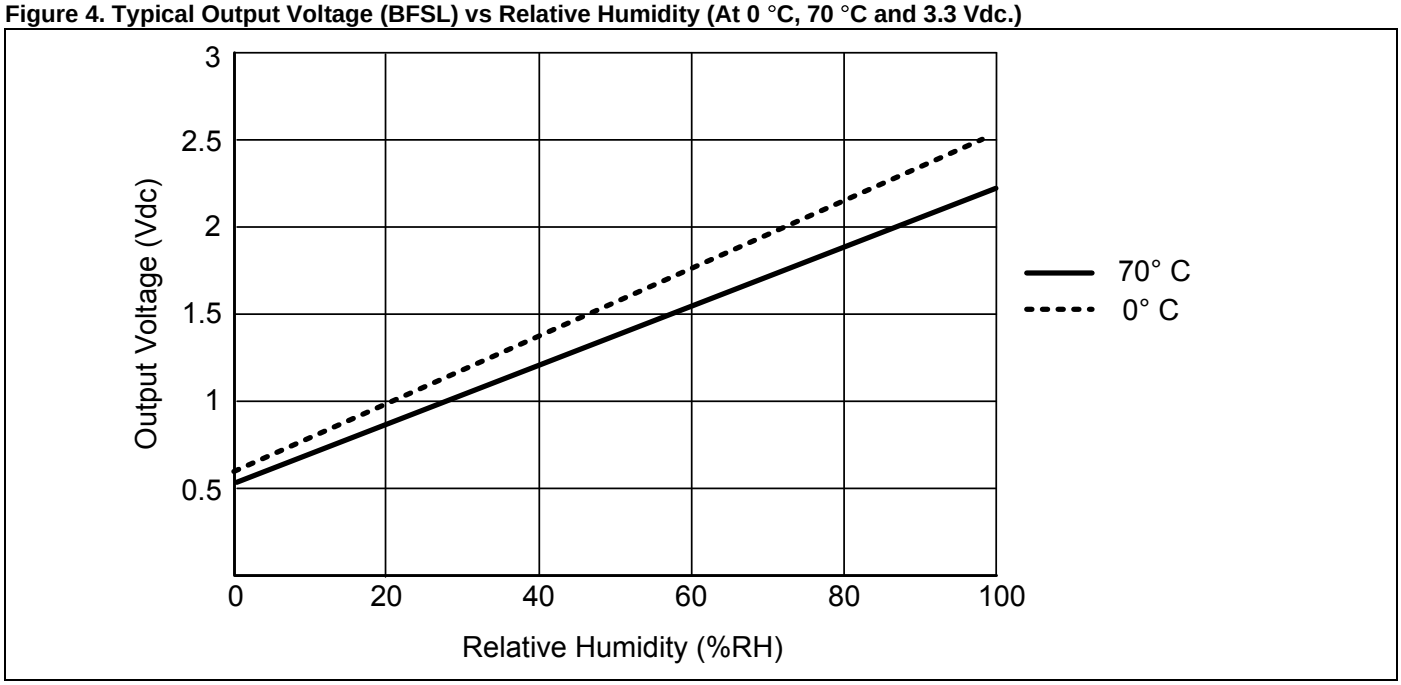


Figure 5. HIH-5030 Mounting Dimensions (For reference only. mm/[in])

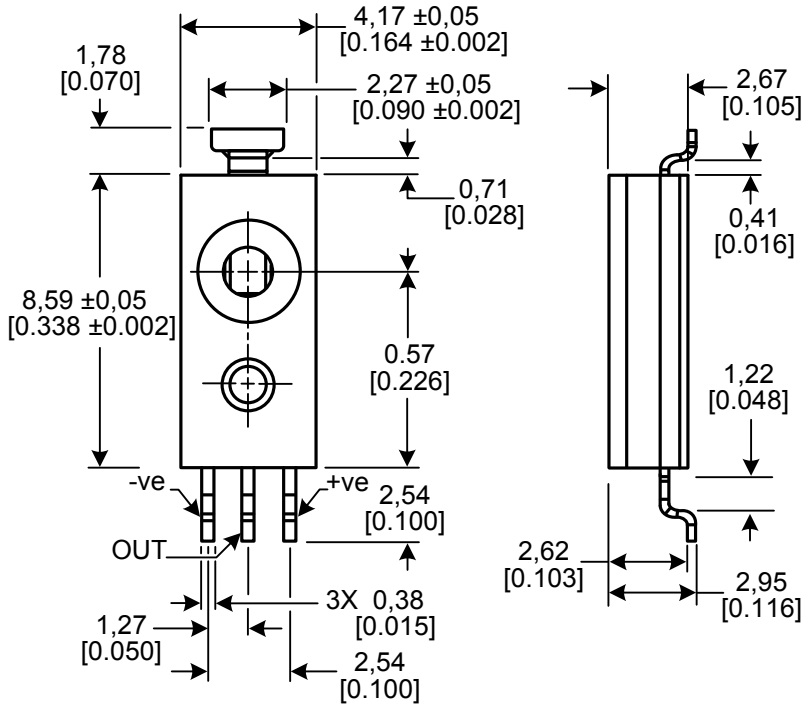


Figure 6. HIH-5030 PCB Landing Pattern (For reference only. mm/[in])

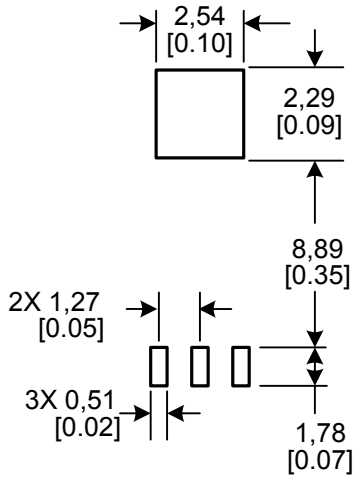


Figure 7. HIH-5031 Mounting Dimensions (For reference only. mm/[in])

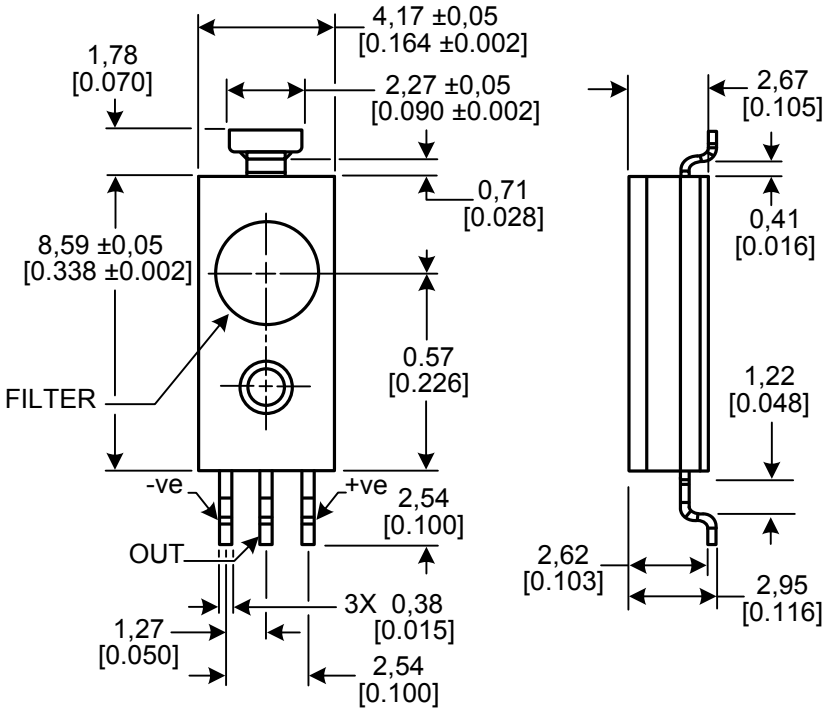


Figure 8. HIH-5031 PCB Landing Pattern (For reference only. mm/[in])

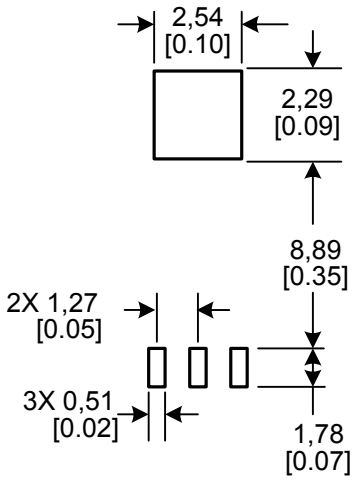


Figure 9. Tape and Reel Dimensions (For reference only. mm/[in])

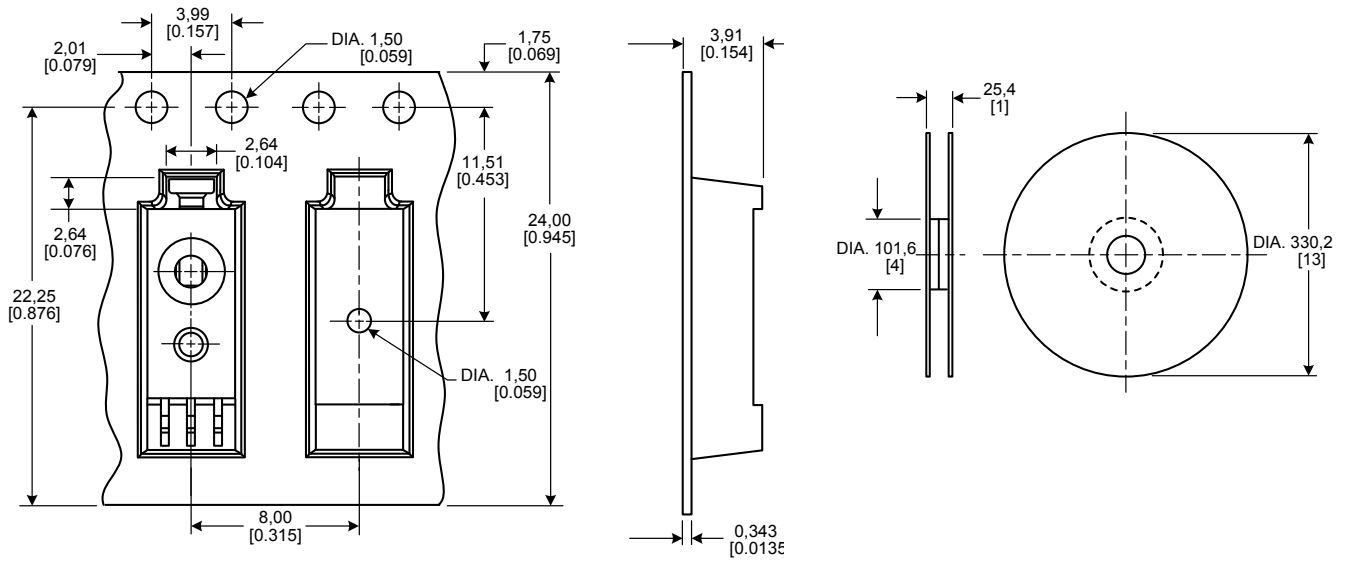
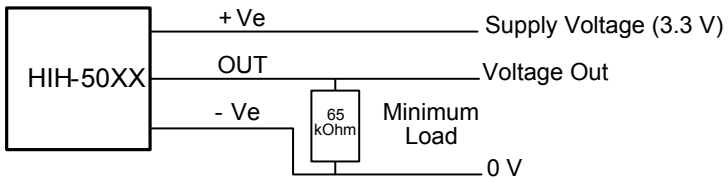


Figure 10. Typical Application Circuit



ORDER GUIDE

Catalog Listing	Description
HIH-5030-001	Covered integrated circuit humidity sensor, SMD, 1000 units on tape and reel
HIH-5031-001	Covered, filtered integrated circuit humidity sensor, SMD, 1000 units on tape and reel
HIH-5030-001S	Sample pack: covered integrated circuit humidity sensor, SMD, five units on tape
HIH-5031-001S	Sample pack: covered, filtered integrated circuit humidity sensor, SMD, sample pack, five units on tape

ADDITIONAL HUMIDITY SENSOR INFORMATION

See the following associated literature is available on the Web:

- Product installation instructions
- Application sheets:
  - Humidity Sensor Performance Characteristics
  - Humidity Sensor Theory and Behavior
  - Humidity Sensor Moisture and Psychrometrics
  - Thermoset Polymer-based Capacitive Sensors

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SALES AND SERVICE

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Internet: www.honeywell.com/sensing

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Europe	+44 (0) 1698 481481
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Latin America	+1-305-805-8188
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Mar 2010

Honeywell

MICRO SWITCH Force Sensors

Force Sensor

FS Series

FEATURES

- Robust performance characteristics
- Precision force sensing
- Adaptable product design
- Highly reliable
- Signal conditioning available
- Electrically ratiometric output
- Extremely low deflection (30 microns typical @ Full Scale)
- Low repeatability errors (± 0.2% Span)
- Low linearity errors (± 0.5% Span)
- Low off-center loading errors
- Resolution to 1.0 gram force
- Fast response time
- Low power consumption
- High ESD resistance - 10 KV

TYPICAL APPLICATIONS

- Medical infusion pumps
- Kidney dialysis machines
- Robotic end-effectors
- Variable tension control
- Load and compression sensing
- Contact sensing

The FS Series Force Sensor provides precise, reliable force sensing performance in a compact commercial grade package. The sensor features a proven sensing technology that utilizes a specialized piezoresistive micro-machined silicon sensing element. The low power, unamplified, non-compensated Wheatstone bridge circuit design provides inherently stable mV outputs over the 1,500 gram force range.

The force sensor operates on the principle that the resistance of silicon implanted piezoresistors will increase when the resistors flex under an applied force The sensor concentrates force from the application through the stainless steel plunger directly to the silicon sensing element. The amount of resistance changes in proportion to the amount of force being applied. This change in circuit resistance results in a corresponding mV output level.

The sensor package design incorporates a patented modular construction. The use of innovative elastomeric technology and engineered molded plastics results in load capacities of 5.5 Kg over-force. The stainless steel plunger provides excellent mechanical stability and is adaptable to a variety of applications. Various electrical interconnects can accept pre-wired connectors, printed circuit board mounting, and surface mounting. The unique sensor design also provides a variety of mounting options including mounting brackets, as well as application-specific mounting requirements.

MICRO SWITCH Force Sensors

Force Sensor

FS Series

PERFORMANCE CHARACTERISTICS @ 10 ± 0.01 VDC, 25°C

Preliminary, based on limited test data

Parameter	Min.	Typ.	Max.	Units
Excitation*	—	10	12	VDC
Null shift, 25 to 0°, 25 to 50°C	—	± 0.5	—	mV
Null offset	-30	0	+30	mV
Linearity (BFSL)	—	± 0.5	—	% Span
Sensitivity	—	0.24	—	mV/grf
Sensitivity shift 25 to 0°, 25 to 50°C	—	± 5.0	—	% Span
Repeatability	—	± 0.2	—	% Span
Response time	—	—	1.0	msec
Input resistance	—	5.0 K	—	ohms
Output resistance	—	5.0 K	—	ohms
Plunger deflection	—	30	—	microns
Weight	—	2.0	—	grams
ESD (direct contact - terminals and plunger)	10	—	—	kVolts

* Non-compensated force sensors, excited by constant current (1.5 mA) instead of voltage, exhibit partial temperature compensation of Span.

ENVIRONMENTAL SPECIFICATIONS

Operating temperature	-40 to +85°C (-40 to +185°F)
Storage temperature	-55 to +105°C (-67 to +221°F)
Shock	Qualification tested to 150 g
Vibration	Qualification tested to 0 to 2 kHz, 20 g sine

Note: All force related specifications are established using dead weight or compliant force.

ORDER GUIDE

Catalog Listing	Force Range (grams)	Span, mV			Overforce grams
		Min.	Typ.	Max.	Max.
FSG-15N1A	1,500	290	360	430	5,500

MOUNTING

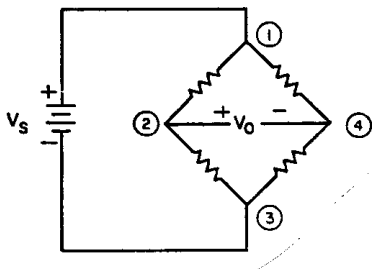
The sensor output characteristics do not change with respect to mounting orientation. Care should be taken not to obstruct the vent hole in the bottom of the sensor housing. Improper venting may result in unstable output.

Mounting bracket mounting torque: 2-5 in. lb. (,21-,56 Nm).

APPLYING FORCE

Evaluation of the sensor is to be performed using dead-weight or compliant force. Application of a rigid, immobile force will result in output drift (decrease) as elastomeric seals relax. Off-center plunger loading has minimal effect on sensor performance and maintains operation within design specifications.

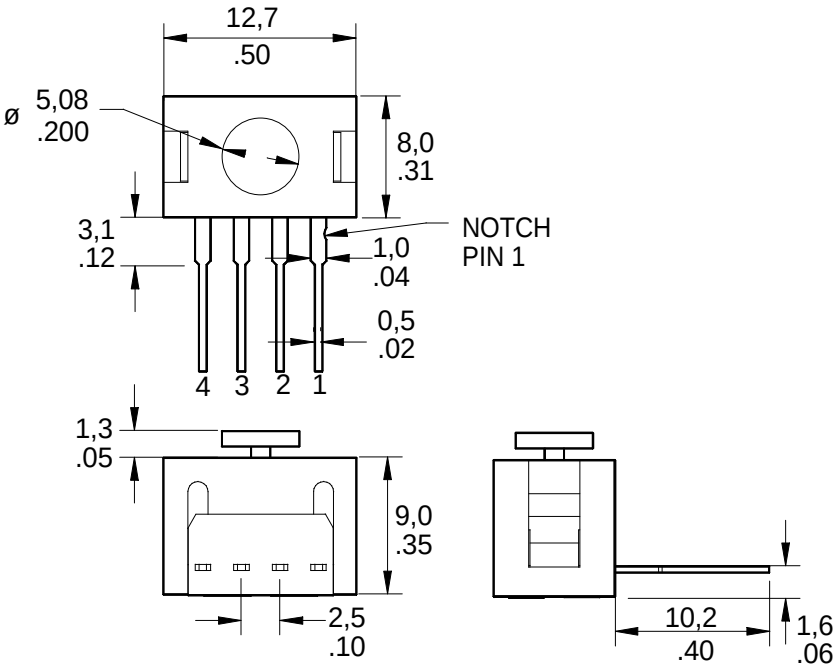
EXCITATION SCHEMATIC



FS SERIES CIRCUIT

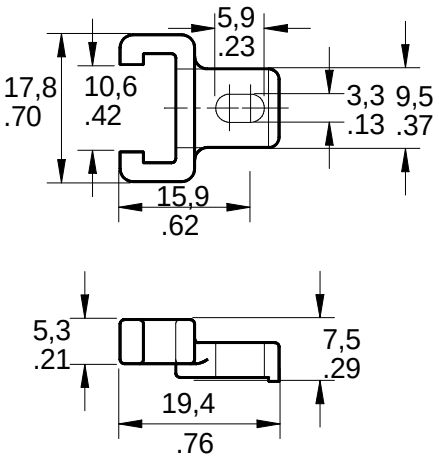
1. Circled numbers refer to sensor terminals (pins). Pin 1 is designated with a notch.
   Pin 1 = Supply V_S (+)
   Pin 2 = Output, (+)
   Pin 3 = Ground, (-)
   Pin 4 = Output, (-)
2. The force sensor may be powered by voltage or current. Maximum supply voltage is not to exceed 12 volts. Maximum supply current is not to exceed 1.6 mA. Power is applied across Pin 1 and Pin 3.
3. The sensor output should be measured as a differential voltage across Pin 2 and Pin 4 ($V_O = V_2 - V_4$). The output is ratiometric to the supply voltage. Shifts in supply voltage will cause shifts in output. Neither Pin 2 nor Pin 4 should be tied to ground or voltage supply.

MOUNTING DIMENSIONS (for reference only)



ACCESSORY

Catalog Listing	Description
PC15132	Plastic mounting bracket



MICRO SWITCH Force Sensors

Force Sensor

FS Series

SALES AND SERVICE

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1-416-293-8111 Canada
1-815-235-6847 International

INTERNET

http://www.sensing.honeywell.com
info@micro.honeywell.com

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While we provide application assistance, personally and through our literature, it is up to the customer to determine the suitability of the product in the application.

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Freeport, Illinois 61032

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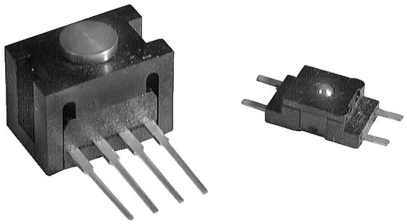
Helping You Control Your World

Force Sensors
FSG and FSL Series

NEW



FEATURES
- Compact commercial grade package
- Robust performance characteristics
- Adaptable product design
- Precision force sensing
- Electrically ratiometric output
- Extremely low deflection (30 microns typ. @ Full Scale)
- High ESD resistance 10 KV
- Available signal conditioning
- Optional terminal configurations

The FS Series Force Sensors provide precise, reliable force sensing performance in a compact commercial grade package. The sensor features a proven sensing technology that utilizes a specialized piezoresistive micro-machined silicon sensing element. The low power, unamplified, noncompensated Wheatstone bridge circuit design provides inherently stable mV outputs over the force range.

Force sensors operate on the principle that the resistance of silicon implanted piezoresistors will increase when the resistors flex under any applied force. The sensor concentrates force from the application, through the stainless steel plunger, directly to the silicon sensing element. The amount of resistance changes in proportion to the amount of force being applied. This change in circuit resistance results in a corresponding mV output level.

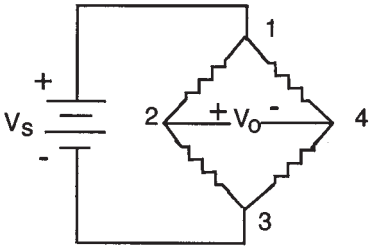
The sensor package design incorporates a patented modular construction. The use of innovative elastomeric technology and engineered molded plastics results in load capacities of 4.5 Kg over-force. The stainless steel plunger provides excellent mechanical stability and is adaptable to a variety of applications. Various electrical interconnects can accept prewired connectors, printed circuit board mounting, and surface mounting. The unique sensor design also provides a variety of mounting options including mounting brackets, as well as application specific mounting requirements.

MOUNTING
Sensor output characteristics do not change with respect to mounting orientation. Care should be taken not to obstruct the vent hole in the bottom of the housing. Improper venting may result in unstable output.

APPLYING FORCE
Evaluation of the sensor is to be performed using deadweight or compliant force. Application of a rigid, immobile force will result in output drift (decrease) as elastomeric seals relax. Off-center plunger loading has minimal effect on sensor performance and maintains operation within design specifications.

TYPICAL APPLICATIONS
1. Medical infusion pumps
2. Kidney dialysis machines
3. Load and compression sensing
4. Variable tension control
5. Robotic end-effectors
6. Wire bonder equipment

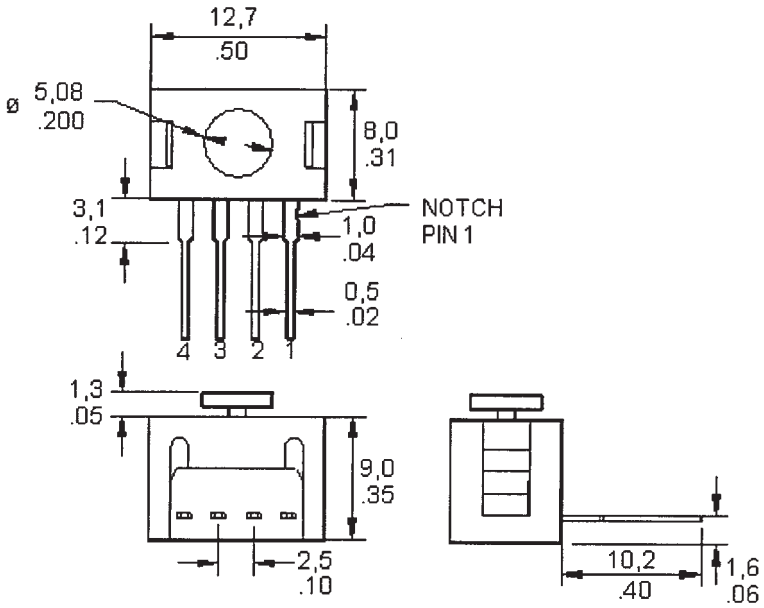
ELECTRICAL CONNECTIONS



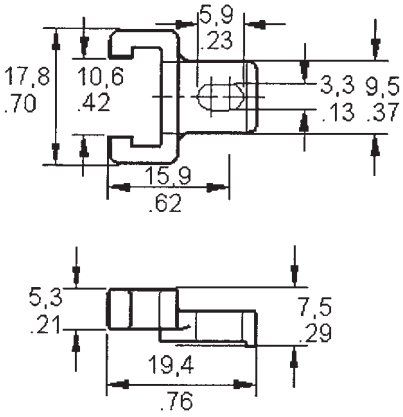
FS SERIES CIRCUIT NOTES
1. Circled numbers refer to Sensor Terminals (interface pins).
   Pin 1 = V_s (+)
   Pin 2 = Output, (+)
   Pin 3 = Ground, (−)
   Pin 4 = Output, (−)
2. The force sensor may be powered by voltage or current.
   Maximum supply voltage is not to exceed 12 volts.
   Maximum supply current is not to exceed 1.6 mA. Power is applied across Pin 1 and Pin 3.
3. The sensor output should be measured as a differential voltage across Pin 2 and Pin 4 ($V_o = V_2 - V_4$). The output is ratiometric to the supply voltage. Shifts in supply voltage will cause shifts in output. Neither Pin 2 nor Pin 4 should be tied to ground or voltage supply.

Force

MOUNTING DIMENSIONS (for reference only)
FSG15N1A



ACCESSORY (FSG Sensor only)
PC-15132 Plastic Mounting Bracket



PERFORMANCE CHARACTERISTICS @ 10.0 ±0.01 VDC, 25°C

Parameter	Min.	Typ.	Max.	Units
Excitation*	—	10.0	12.0	VDC
Null offset	−30	0	30	mV
Operating Force	0	—	1500	grams
Sensitivity	0.20	0.24	0.28	mV/gram
Linearity (B.F.S.L.)**	—	±22.5	45	grams
Null Shift				
+25°C to 0°C, +25°C to +50°C	—	±1.0	—	mV
Sensitivity Shift				
+25°C to 0°C	—	0.012	—	mV/gram
+25°C to +50°C	—	−0.012	—	mV/gram
Hysteresis	—	45	180	grams
Repeatability (@ 1500 grams)	—	30	120	grams
Input Resistance	4.0 K	5.0 K	6.0 K	Ohms
Output Resistance	4.0 K	5.0 K	6.0 K	Ohms
Overforce	—	—	4,500	grams

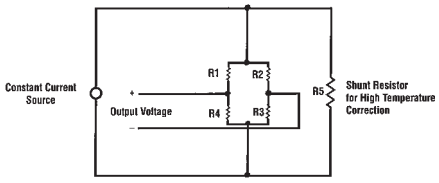
ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	−40° to 85°C (−40° to +185°F)
Storage Temperature	−55° to +105°C (−131° to +221°F)
Vibration	Qualification tested to 10 Hz to 2 kHz, 20 g sine
Shock	Qualification tested to 150 g, 6 ms, half-sine
Solderability	5 sec at 315°C per lead
Output ratiometric	Within Supply Range

**B.F.S.L.—Best Fit Straight Line
Note: All force related specifications established using dead weight or compliant force.

Constant Current Excitation Schematic
* Non-compensated force sensors, excited by constant current instead of voltage, exhibit temperature compensation of Span. Application Note #1 briefly discusses current excitation.

Constant current excitation has an additional benefit of temperature measurement. When driven by a constant current source, a silicon pressure sensor's terminal voltage will rise with increased temperature. The rise in voltage not only compensates the Span, but is also an indication of die temperature.



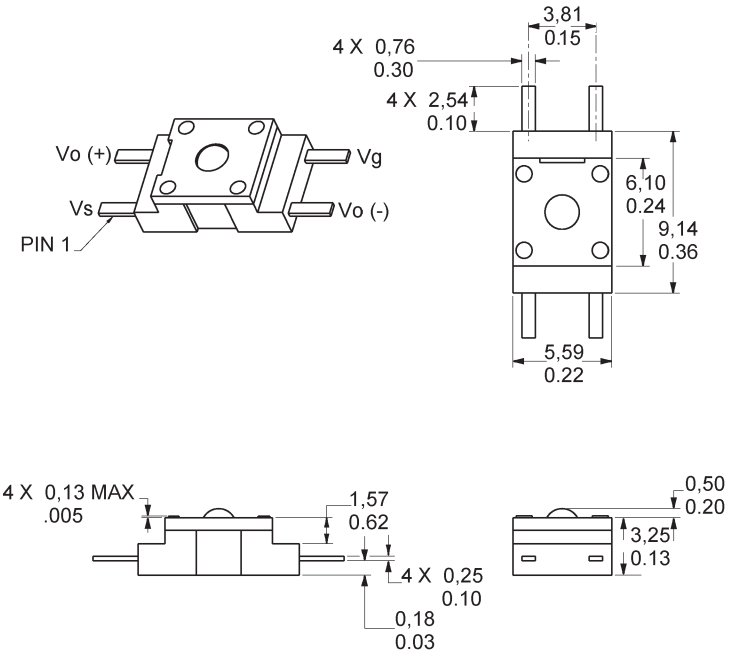
FS SERIES ORDER GUIDE

Catalog Listing	Force Range (grams)	Sensitivity mV/V/gram			Span mV	Over Force grams
		Min.	Typ.	Max.	Typ.	Max.
FSG15N1A	1,500	.02	.024	.028	360 (at 10 VDC)	4,500

Force Sensors
FSG and FSL Series

NEW

MOUNTING DIMENSIONS (for reference only)
FSL05N2C



PERFORMANCE CHARACTERISTICS @ 5.0 ±0.01 Excitation, 25°C

Parameter	Min.	Typ.	Max.	Units
Excitation*	—	5.0	12	VDC
Null offset	−15	0	15	mV
Operating Force	0	—	500	grams
Sensitivity	0.1	0.12	0.14	mV/gram
Linearity (B.F.S.L.)**	—	±10	—	grams
Repeatability @ 300 g	—	±10	—	grams
Null Shift				
+25°C to 2°C, +25°C to +40°C	—	±0.5	—	mV
Sensitivity Shift				
+25°C to 2°C	—	0.012	—	mV/gram
+25°C to +40°C	—	−0.012	—	mV/gram
Input Resistance	4.0 K	5.0 K	6.0 K	Ohms
Output Resistance	4.0 K	5.0 K	6.0 K	Ohms
Overforce	—	—	4,500	grams
ESD (Direct contact, terminals and plunger)	10	—	—	kVolts

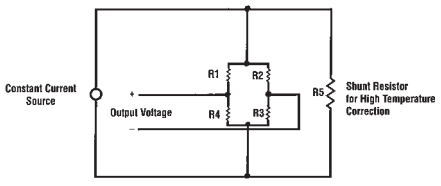
ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	+2°C to +40°C (+36°F to +104°F)
Storage Temperature	−40° to +70°C (−40° to +158°F)
Vibration	Qualification tested to 10 Hz to 2 kHz, 20 g sine
Shock	Qualification tested to 150 g, 6 ms, half-sine
MCTF	7 million
Solderability	5 sec at 315°C per lead
Output ratiometric	Within Supply Range

**B.F.S.L.—Best Fit Straight Line
Note: All force related specifications established using dead weight or compliant force.

Constant Current Excitation Schematic
*Non-compensated force sensors, excited by constant current instead of voltage, exhibit temperature compensation of Span. Application Note #1 briefly discusses current excitation.

Constant current excitation has an additional benefit of temperature measurement. When driven by a constant current source, a silicon pressure sensor's terminal voltage will rise with increased temperature. The rise in voltage not only compensates the Span, but is also an indication of die temperature.



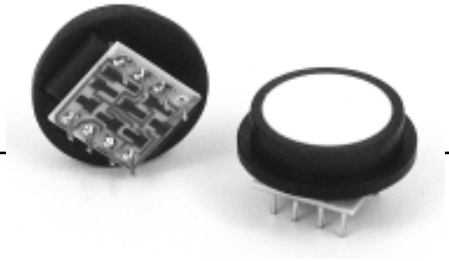
FS SERIES ORDER GUIDE

Catalog Listing	Force Range (grams)	Sensitivity mV/V/gram			Span mV	Over Force grams
		Min.	Typ.	Max.	Typ.	Max.
FSL05N2C	500	.02	.024	.028	60 (at 5 VDC)	4,500

Honeywell

Model 1865 Series

Force/Pressure transducer



DESCRIPTION

The Model 1865 is a high-performance transducer specifically designed to address the needs of medical and specialized OEM applications. Offering laser-trimmed compensation, the Model 1865 may be specified to operate with either a constant current or voltage supply.

The Model 1865 employs a solid state piezoresistive pressure transducer mounted in a plastic package. For applications where force is applied by a flexible membrane to the sensor, such as found in infusion pumps, the Model 1865's precision height silicone diaphragm provides long life and is a reliable replacement for older force or load cell transducers. Utilizing a silicon rubber diaphragm, the 1865 is compatible with some liquid media applications.

The Model 1865 provides access to important safety features in critical care medical instrumentation, such as occlusion pressure or infiltration detection. The pressure data can provide medical personnel with useful diagnostic information regarding the condition of the patient's circulatory system. These force/pressure transducers can also be used with other medical dispensing devices, such as syringe pumps, to improve safety and accuracy.

May be operated in either current or voltage excitation, the Model 1865's output can be amplified or signal conditioned, as required. The semiconductor-based sensor offers high resolution using its Wheatstone Bridge strain gauge design. The height of the unit's patented, poured-in-place silicon rubber diaphragm is controlled to ensure sensitivity to low pressure. This diaphragm is bonded to a plastic header and transmits force applied through a special silicone gel to the diaphragm of a silicon peizoresistive die. The back of the die is exposed to atmospheric pressure, which results in a gauge pressure output.

FEATURES

- Silicon pressure/force interface diaphragm
- Force measurement for infusion pump applications
- Pressure measurement for liquid media
- Medical-grade materials
- 8-pin DIP electrical connection
- Laser trimmed
- Choice of voltage or constant current excitation

TYPICAL APPLICATIONS

- Infusion pumps
- Anesthesia monitors
- Non-corrosive, nonpressurized media-level sensors
- Ventilation systems
- Blood pressure equipment
- Syringe pumps
- Drug delivery systems

Model 1865 Series

ELECTRICAL SPECIFICATIONS

	Ratings
Input impedance	
Current excitation	2.0 kOhm min. to 8.0 kOhm max.
Voltage excitation	8.0 kOhm min. to 40 kOhm max.
Output impedance	
Current excitation	3.5 kOhm min. to 6.0 kOhm max.
Voltage excitation	3.5 kOhm min. to 6.0 kOhm max.
Input excitation	
Current	< 2.0 mA
Voltage	< 15.0 Vdc
Effect of excitation change	Ratiometric
Response time (10% to 90%)	≤ 5 milliseconds
Insulation resistance	≥ 100 MOhm at 50 Vdc
Output common mode voltage	50 % of input typical

PHYSICAL SPECIFICATIONS

	Specification
Pressure over-range protection	3X span or 60 psi, whichever is least
Media/materials compatibility	
Top side	Room atmosphere, directly applied force, and liquids compatible with dimethyl silicon, polyetherimide (Ultem)
Bottom side	Non-corrosive dry gasses and fluids compatible with silicon, Pyrex, RTV silicone, and ceramic
Mass	3.0 g with laser-trim board

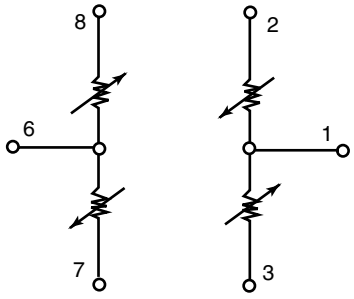
ENVIRONMENTAL CONDITIONS

	Specification
Position effect	≤ 0.05 % of zero or span shift for 90° tilt in any direction
Vibration effect	No change in performance at 10 Gs RMS, 20 Hz to 2,000 Hz
Shock	100 Gs for 11 milliseconds
Life	1 million cycles

PERFORMANCE SPECIFICATIONS

	Min.	Typ.	Max.	Unit
Temperature Compensated Performance				
Nonlinearity	-	0.10	0.25	% of Span, BFSL
Hysteresis	-	0.0125	0.015	% of Span, BFSL
Repeatability	-	0.0125	0.015	% of Span, BFSL
Output (laser trimmed normalized)				
Current excitation	98	100	102	mVdc
Voltage Excitation	38	40	42	mVdc
Zero pressure	-2	0	2	mVdc
Temperature Performance				
Compensated temperature range	-1 °C to 54 °C [30 °F to 129 °F]			
Operating temperature range	-28 °C to 54 °C [-19 °F to 129 °F]			
Maximum zero error			0.5	% of Span in reference to 27 °C [80.6 °F]
Maximum span error			0.5	% of Span in reference to 27 °C [80.6 °F]
Thermal hysteresis			0.2	% of Span, compensated temperature range
Long-term stability			± 0.3	% of Span per six months

FIGURE 1. SENSING ELEMENTS



Pin	Connection	Pin	Connection
1	+ Output	5	+ Input
2	NC	6	- Output
3	- Input	7	NC
4	NC	8	NC

REFERENCE CONDITIONS

	Specification
Media temperature	27 °C ± 1 °C [80 °F ± 2 °F]
Ambient temperature	27 °C ± 1 °C [80 °F ± 2 °F]
Vibration	0.1 G (1 m/s/s) max.
Humidity	50 % ± 10 %
Ambient pressure	12.8 psi to 16.5 psi [860 mBar to 1060 mBar]
Excitation source	1.5 mAdc ± 0.0015 mAdc or 10.0 Vdc ± 0.01 Vdc

FIGURE 2. MOUNTING DIMENSIONS IN MM (INCHES), FOR REFERENCE ONLY

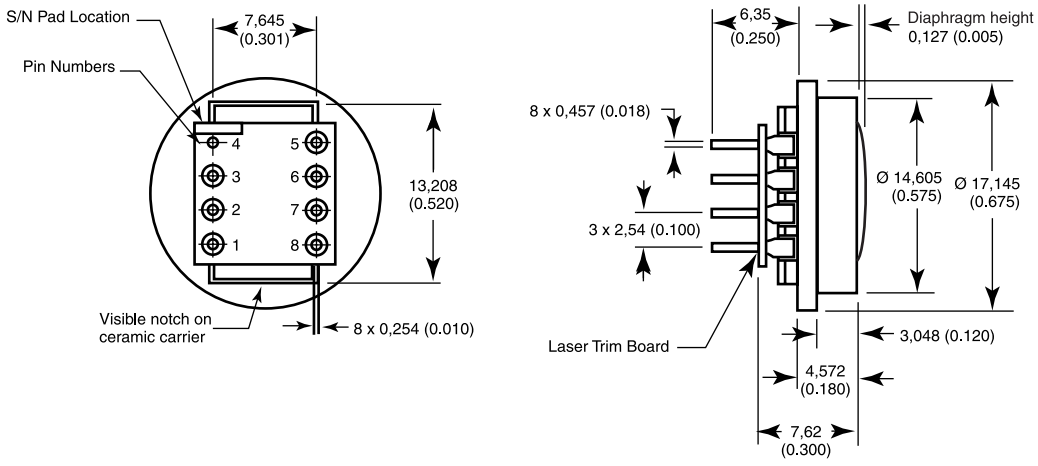


FIGURE 3. LASER TRIM BOARD

Current Excitation, Normalized Output

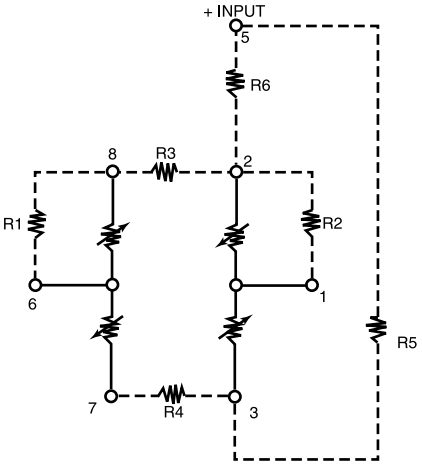
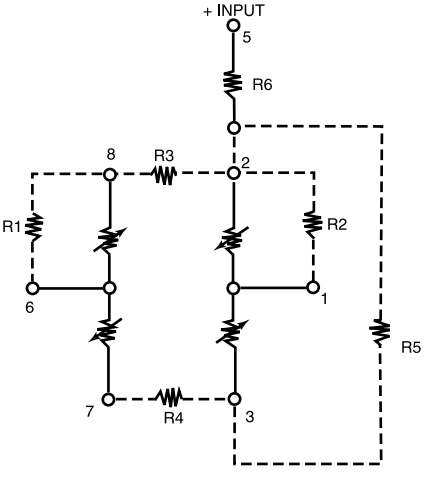
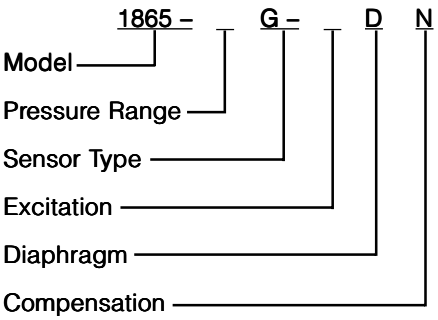


FIGURE 4. LASER TRIM BOARD

Voltage, Normalized Output



ORDER GUIDE



PRESSURE RANGE

01 = 0 psi to 5 psi
02 = 0 psi to 10 psi
03 = 0 psi to 15 psi
05 = 0 psi to 25 psi
07 = 0 psi to 30 psi

SENSOR TYPE

G = Gauge Pressure

EXCITATION

L = 1.5 mA
K = 10 Vdc

DIAPHRAGM TYPE

D = Dimethyl Silicone

COMPENSATION

N = Laser trimmed, normalized output

ACCURACY GRADE

Higher accuracy grades are available as specials.
Custom configurations are available on request.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

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Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury. **Failure to comply with these instructions could result in death or serious injury.**

SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

E-mail: info.sc@honeywell.com

Internet: www.honeywell.com/sensing

Phone and Fax:

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	+65 6445-3033 Fax
Europe	+44 (0) 1698 481481
	+44 (0) 1698 481676 Fax
Latin America	+1-305-805-8188
	+1-305-883-8257 Fax
USA/Canada	+1-800-537-6945
	+1-815-235-6847
	+1-815-235-6545 Fax

⚠ WARNING

MISUSE OF DOCUMENTATION

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Automation and Control Solutions
Sensing and Control
Honeywell
11 West Spring Street
Freeport, Illinois 61032, USA
www.honeywell.com

Honeywell

008094-2-EN IL50 GLO
April 2005

Honeywell

Pressure Sensors

FS01/FS03 Force Sensors

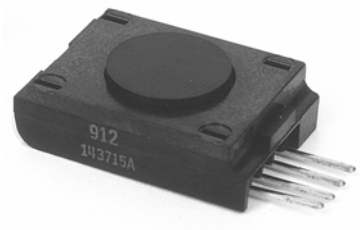
FS Series

FEATURES

- 0 to 1.5 pounds and 0 to 3.0 pound ranges
- High-level output range
- Temperature compensated
- Calibrated zero and span
- Small size
- Low noise

TYPICAL APPLICATIONS

- Medical infusion pumps
- Ambulatory noninvasive pump pressure
- Occulsion detection
- Kidney dialysis machines
- Load and compression sensing
- Variable tensions control



The FS01/FS03 sensors are special low cost, peizoresistive-based force sensors. These high-level voltage output, calibrated, and temperature compensated sensors give an accurate and stable output over a 5 °C to 50 °C [41 °F to 122 °F] temperature range. They offer simple operation from a single 5.0 Vdc supply. Operation from any DC supply voltage, up to 12.0 Vdc, is acceptable.

The FS01/FS03 sensors feature an integrated circuit sensor element and laser trimmed think film ceramic in a small plastic housing. Their extremely small size enables the use of multiple sensors in limited available space. This package also provides excellent corrosion resistance and isolation to external package stress.

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PRESSURE SENSOR SPECIFICATIONS

	Max. Ratings
Supply voltage, Vs	12.0 Vdc
Maximum over load	3.18 kg [7 lbs]
Lead temperature (soldering 2-4 seconds)	220 °C [428 °F]

ENVIRONMENTAL SPECIFICATIONS

Compensated temperature	5 °C to 50 °C [41 °F to 122 °F]
Operating temperature	0 °C to 70 °C [0 °F to 158 °F]
Storage temperature	-20 °C to 85 °C [13 °F to 185 °F]
Humidity limits	0% RH to 95% RH

STANDARD FORCE RANGES

			Full-Scale Span		
Part Number	Operating Force	Maximum Force	Min.	Typ.	Max.
FS01	0 lbs to 1.5 lbs [0 kg to 0.68 kg]	7 lbs	2.85 Vdc	3.0 Vdc	3.15 Vdc
FS03	0 lbs to 3.0 lbs [0 kg to 1.36 kg]	7 lbs	2.85 Vdc	3.0 Vdc	3.15 Vdc

PERFORMANCE SPECIFICATIONS

	Min.	Typ.	Max.	Unit
Zero force offset	0.95	1.0	1.05	Vdc
Full scale span [(2)]	2.85	3.0	3.15	Vdc
Linearity	–	± 1.0	± 3.0	%FSS
Hysteresis [(3)]	–	± 0.5	–	%FSS
Temp effect on Span (0 °C to 50 °C [0 °F to 122 °F]) [(4)]	–	± 1.0	± 2.5	%FSS
Temp. effect on Offset (0 °C to 50 °C [0 °F to 122 °F]) [(4)]	–	± 1.0	± 2.5	%FSS
Creep [(5)]	–	0.5	–	%FSS
Long-term stability of Offset and Span [(6)]	–	± 1.0	–	%FSS

Specification Notes:

Note 1: Reference conditions (unless otherwise noted): Supply voltage, Vs = 5 Vdc; T_A = 25 °C [77 °F]

Note 2: Full-scale Span is the algebraic difference between the output voltage at full-scale load and the output at zero load. Span is ratiometric to the supply voltage.

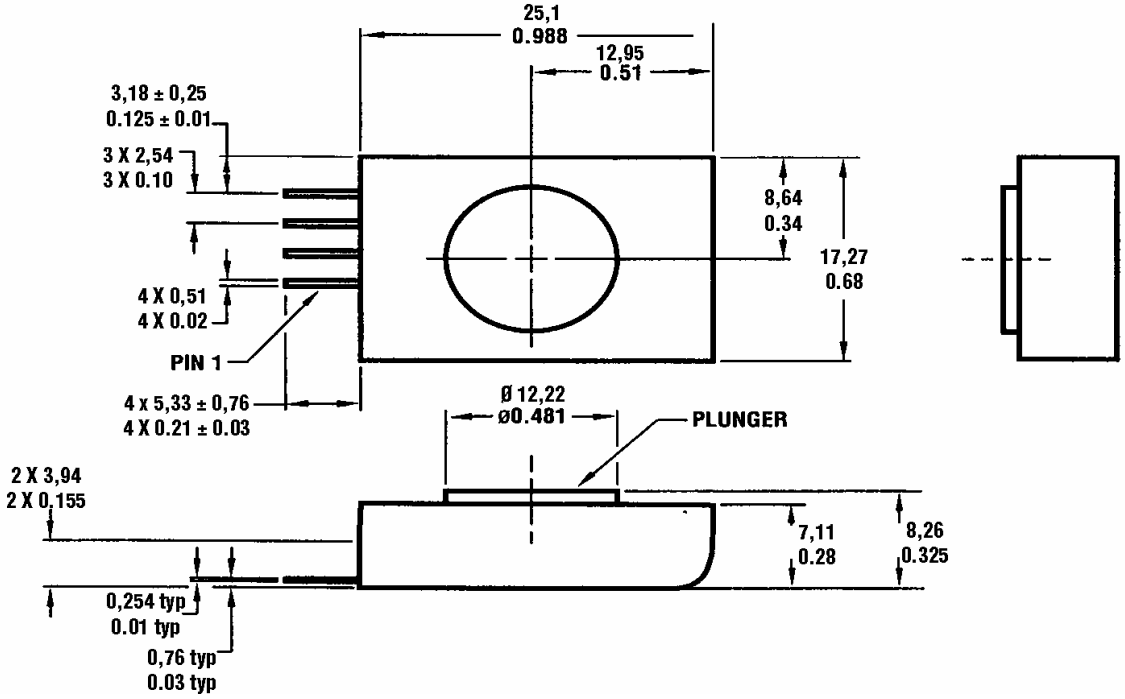
Note 3: Hysteresis is the maximum output difference at any point within the operating pressure range for increasing and decreasing load.

Note 4: Maximum error band of the offset voltage and the effort band of span, relative to the 25 °C [77 °F] reading.

Note 5: Maximum difference in output at full-scale load in a 20 minute period.

Note 6: Maximum difference in output within any operating force after 1 million force cycles

DIMENSIONAL DRAWING
(FOR REFERENCE ONLY)

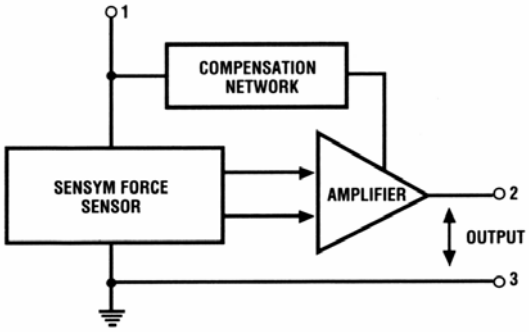


Tolerances, unless otherwise noted

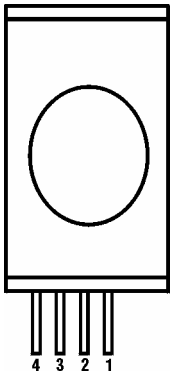
± 0.01 for two decimal places

± 0.005 for three decimal places

EQUIVALENT CIRCUIT



ELECTRICAL CONNECTION PINOUT



Pin 1 = + Supply
Pin 2 = + Output
Pin 3 = - Output/Ground
Pin 4 = N/C

Pressure Sensors

FS01/FS03 Force Sensors

FS Series

ORDER GUIDE

Part Number	Force Range
FS01	0 lbs to 1.5 lbs [0 kg to 0.68 kg]
FS03	0 lbs to 3.0 lbs [0 kg to 1.36 kg]

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. **The foregoing is Buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

For application assistance, current specifications, or name of the nearest Authorized Distributor, contact a nearby sales office. Or call:

1-800-537-6945 USA/Canada

1-815-235-6847 International

FAX

1-815-235-6545 USA

INTERNET

www.honeywell.com/sensing

info.sc@honeywell.com

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Freeport, Illinois 61032

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Honeywell

Force Sensors

FSS Low Profile Force Sensors

FS Series

FEATURES

- True Surface Mount Technology
- Maximum peak reflow temperature of 260 °C [500 °F]
- Compact, commercial grade package
- Robust performance characteristics
- Adaptable package design
- Precision force sensing
- Reliability rated at 20 million MCTF at 25 °C [77 °F]
- Electrically ratiometric output
- Extremely low deflection (30 microns typ. @ Full Scale)
- High ESD resistance 8 kV
- Available signal conditioning
- Optional terminal configurations

TYPICAL APPLICATIONS

- Medical infusion pumps
- Ambulatory noninvasive pump pressure
- Occlusion detection
- Kidney dialysis machines
- Load and compression sensing
- Variable tensions control
- Robotic end-effectors
- Wire bonding equipment

⚠ WARNING

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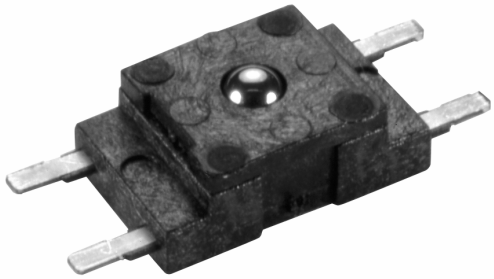

The FS Series sensors provide precise reliable force sensing performance in a compact commercial grade package at a cost effective price. The sensor features a proven sensing technology that uses a specialized piezoresistive micromachined silicon sensing element. The low power, unamplified, uncompensated Wheatstone bridge circuit design provides inherently stable mV outputs over the force range.

Force sensors operate on the principle that the resistance of silicon-implanted piezoresistors will increase when the resistors flex under any applied force. The sensor concentrates force from the applications, through the stainless steel ball, directly to the silicon-sensing element. The amount of resistance changes in proportion to the amount of force being applied. This change in circuit resistance results in a corresponding mV output level change.

The sensor package design incorporates patented modular construction. The use of innovative elastomeric technology and engineered molded plastics result in load excitation capacities of 4.5/5.5 kg over-force. The stainless steel ball provides excellent mechanical stability and is adaptable to a variety of applications. The FSS sensor delivered 20 million operations in Mean Cycles to Failure (MCTF) reliability testing at 50 °C [122 °F]. This test determines the number of possible sensor operations at full scale until failure. Various electric interconnects can accept prewired connectors, printed circuit board mounting, and surface mountings. The unique sensor design also provides a variety of mounting options that include mounting brackets, as well as application specific mounting requirements.

⚠ WARNING

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PERFORMANCE CHARACTERISTICS @ 5.0 ± 0.01 Vdc Excitation*, 25 °C [77 °F]

Parameter	Min.	Typical	Max.	Units
Null Offset	-15	0	+15	mV
Operating Force	0	–	1500	grams
Sensitivity.	0.1	0.12	14	mV/gram
Linearity (B.FS.L.)**	–	± 1.5	–	% span
Repeatability @ 300 g	–	± 10	–	grams
Null Shift				
25 °C to 2 °C [77 °F to 35.6 °F]	–	± 0.5	–	mV
25 °C to 40 °C [77 °F to 104 °F]	–	± 0.5	–	mV
Sensitivity Shift				
25 °C to 50 °C [77 °F to 122 °F]	–	5.5	–	% span
25 °C to 0 °C [77 °F to 32 °F]	–	5.5	–	% span
Input Resistance	4.0 K	5.0 K	6.0 K	Ohms
Output Resistance	4.0 K	5.0 K	6.0 K	Ohms
Overforce	–	–	4,500	grams
ESD (direct contact, terminals and plunger)	8	–	–	kV

* Non-compensated force sensors, excited by constant current (1.5 mA) instead of voltage, exhibit partial temperature compensation of Span.

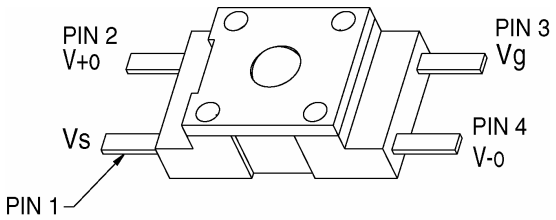
** BFSL: Best Fit Straight Line

ENVIRONMENTAL SPECIFICATIONS

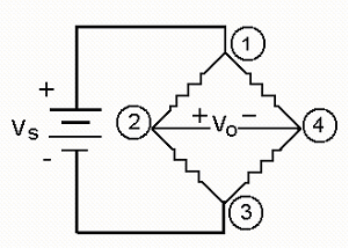
Operating temperature	-40 °C to 85 °C [-40 °F to 185 °F]
Storage temperature	-40 °C to 100 °C [-40°F to 212 °F]
Shock	Qualification tested to 150 g
Vibration	Qualification tested to 0 to 2 kHz, 20 g sine
MCTF	20 million at 25 °C [77 °F]
Solderability	5 sec at 315 °C [599 °F] per lead
Output ratiometric	Within supply range

Note: All force related specifications are established using dead weight or compliant force.

SENSOR PINOUT



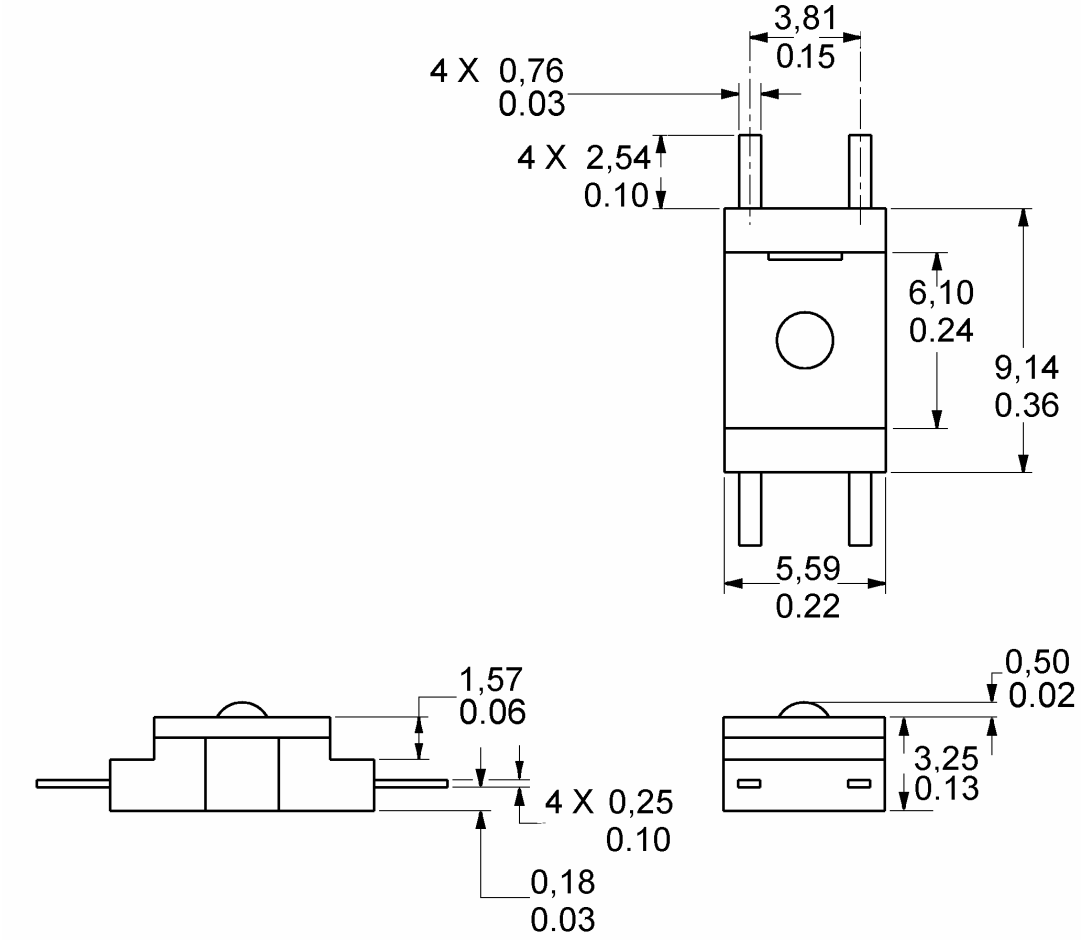
EXCITATION SCHEMATIC
Excitation 5 Vdc Typ., 12 Vdc Max.



FS SERIES CIRCUIT

1. Circled numbers refer to sensor terminals (pins).
   Pin 1 = Supply V_S (+)
   Pin 2 = Output Vo (+)
   Pin 3 = Ground V_g (-)
   Pin 4 = Output V_O (-)
2. The force sensor may be powered by voltage or current. Maximum supply voltage is not to exceed 12 volts. Maximum supply current is not to exceed 1.6 mA. Power is applied across Pin 1 and Pin 3.
3. The sensor output should be measured as a differential voltage across Pin 2 and Pin 4 ($V_O = V_2 - V_4$). The output is ratiometric to the supply voltage. Shifts in supply voltage will cause shifts in output. Neither Pin 2 nor Pin 4 should be tied to ground or voltage supply.

MOUNTING DIMENSIONS (for reference only) mm/in



DESCRIPTION

Catalog Listing	Packing Style
FSS1500NST	Tube
FSS1500NSB	Bubble Pack
FSS1500NSR	Tape and Reel

WARRANTY/REMEDY
Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. **The foregoing is Buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**
Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.
For application assistance, current specifications, or name of the nearest Authorized Distributor, contact a nearby sales office. Or call:
1-800-537-6945 USA
1-800-737-3360 Canada
1-815-235-6847 International
FAX
1-815-235-6545 USA
INTERNET
www.honeywell.com/sensing
info.sc@honeywell.com

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Sensing and Control
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11 West Spring Street
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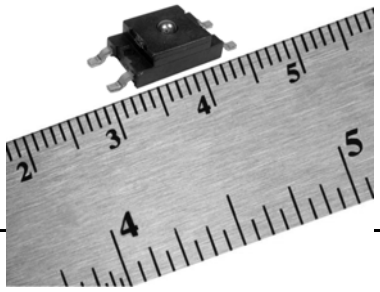
Honeywell

FSS-SMT Series

Low Profile Force Sensor



DESCRIPTION

Honeywell's FSS-SMT Series force sensors are designed to be one of the most reliable force sensors available as illustrated by 20 million Mean Cycles To Failure (MCTF) at 25 °C [77 °F] rating. This low profile Surface Mount Technology (SMT) sensor allows for automated assembly on a printed circuit board, often helping the customer to reduce assembly costs.

The FSS-SMT Series force sensor is designed to provide precise and reliable force sensing performance in a compact commercial-grade package. The sensor incorporates Honeywell sensing technology that uses a specialized piezoresistive micromachined silicon sensing element. The low power, unamplified, uncompensated Wheatstone bridge circuit design provides inherently stable millivolt output over the force range.

Force sensors operate on the principle that the resistance of silicon-implanted piezoresistors will change when the resistors flex under applied force. The sensor concentrates force from the applications, through the stainless steel ball, directly to the silicon-sensing element. The amount of resistance changes in proportion to the amount of force being applied. This change in circuit resistance results in a corresponding mV output level change.

The sensor package design incorporates patented modular construction. The use of innovative elastomeric technology and engineered molded plastics results in load excitation capacities of 44 N over-force. The stainless steel ball provides excellent mechanical stability, and is suitable for a variety of potential medical and commercial applications.

FEATURES/BENEFITS

- Surface Mount Technology allows for automated assembly and may eliminate hand soldering
- RoHS-compliant materials meet Directive 2002/95/EC
- Low deflection (30 microns typical at full scale) help reduce measurement error
- Direct mechanical coupling of the actuation ball to the sense element reduces coupling errors and keeps mechanical hysteresis to a minimum
- Product rating of 20 million MCTF at 25 °C [77 °F], subject to application variation, provides for consistent output over time and reduces repairs or replacements
- Small size minimizes space on the printed circuit board (PCB)
- Provides enhanced sensitivity without compromising signal integrity, resulting in low system noise and reducing measurement errors
- Electrically ratiometric output accommodates supply voltage variations, leading to low ratiometricity error
- Low voltage supply allows for use in many battery powered applications
- High resistance to electrostatic discharge (ESD) (8 KV) meets ESD Sensitivity Classification Level 3, reducing special handling during assembly
- Sensor output has low sensitivity to many mounting stresses

FSS-SMT Series

POTENTIAL APPLICATIONS

Medical

- Infusion pumps
- Ambulatory non-invasive pumps
- Occlusion detection
- Kidney dialysis machines
- Enteral pumps

Commercial

- Load and compression sensing
- Variable tension control
- Wire bonding equipment

Table 1. Absolute Maximum Ratings[1]

Parameter	Min.	Max.	Unit
Electro-Static Discharge (ESD)	-	8	kV
Storage temperature[2]	-40 [-40]	100 [212]	°C [°F]
Solderability[3]	-	260 [500] for 10 s	°C [°F]

Table 2. Operating Specifications (Performance characteristics at 5.0 ± 0.01 Vdc excitation, 25 °C [77 °F])

Parameter	Min.	Typical	Max.	Unit
Supply voltage[4]	3.0	5.0	6.0	V
Operating force	0	-	14.7	N
Operating temperature[5]	-40 [-40]	-	85 [185]	°C [°F]
Offset[6]	-15	0	15	mV
Span[7]	150	180	210	mV
Sensitivity[8]	10.2	12.2	14.3	mV/N
Force non-linearity (BFSL)[9]	-	±0.7	±1.5	%FSS
Repeatability at 2.9 N[10]	-	±1.5	-	mV
Mechanical hysteresis[11]		±0.5		%FSS
Thermal effect on offset[12] 25 °C to 0 °C [77 °F to 32 °F], 25 °C to 50 °C [77 °F to 122 °F]	-	±0.5	-	mV
Thermal effect on span[13] 25 °C to 0 °C [77 °F to 32 °F], 25 °C to 50 °C [77 °F to 122 °F]	-	±5.5	-	%FSS
Input resistance	4.0	5.0	6.0	kOhm
Output resistance	4.0	5.0	6.0	kOhm
Over force[14]	44	-	-	N

Table 3. Environmental Specifications

Parameter	Characteristics
Shock	Qualification tested to 150 G
Vibration	Qualification tested to 0 to 2 kHz, 20 G sine
Mean Cycles To Failure (MCTF)[15]	20 million at 25 ° C [77 ° F]

Notes:

1. Absolute maximum ratings are the extreme limits that the device can withstand without damage to the device.
2. The temperature range over which the product may safely be exposed without excitation or force applied. Under these conditions the product will remain in specification after excursion to any temperatures in this range. Exposure to temperatures beyond this range may cause permanent damage to the product.
3. The maximum temperature and time for which the product can be exposed to for processing of solder electrical connections.
4. The range of voltage excitation which can be supplied to the product to produce an output which is proportional to Force but due to Ratiometricity errors may not remain within the specified performance limits.
5. The temperature range over which the product will produce an output proportional to force but may not remain within the specified performance limits.
6. The output signal obtained when the zero force is applied to the sensor. Also known as "null" or "zero".
7. The algebraic difference between output signal measured at the upper and lower limits of the Operating Force Range. Also known as "full scale output" or simply "span".
8. The ratio of output signal change to the corresponding input force change. Sensitivity is determined by computing the ratio of Span to the specified Operating Force Range.
9. Force Non-Linearity (Best Fit Straight Line): The maximum deviation of product output from a straight line fitted to output measured over the operating force range. The straight line through a set of points which minimizes the sum of the square of the deviations of each of the points from the straight line.
10. The maximum difference between output readings when the same force is applied consecutively, under the same operating conditions, with force approaching from the same direction within the operating force range.
11. The maximum difference between output readings when the same force is applied consecutively, under the same operating conditions, with force approaching from opposite directions within the operating force range.
12. The maximum deviation in Offset due to changes in temperature over the Operating Temperature Range, relative to Offset measured at 25 °C.
13. The maximum deviation in Full Scale Span due to changes in temperature over the Operating Temperature Range, relative to Full Scale Span measured at 25 °C.
14. The maximum force which may safely be applied to the product for it to remain in specification once force is returned to the Operating Force Range. Exposure to higher forces may cause permanent damage to the product. Unless otherwise specified this applies to all temperature within the Operating Temperature Range.
15. MCTF is a basic measure of reliability for a non-repairable device. It is the mean number of cycles to maximum operating force over which a sensor can be expected to operate until failure. The mean value is determined statistically from a probability distribution for failures based upon test data. MCTF may vary depending on the specific application in which a sensor is utilized.

Figure 1. Sensor Pinout

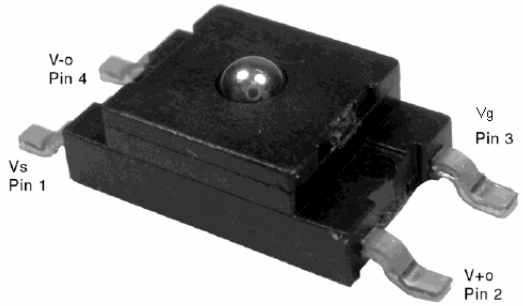
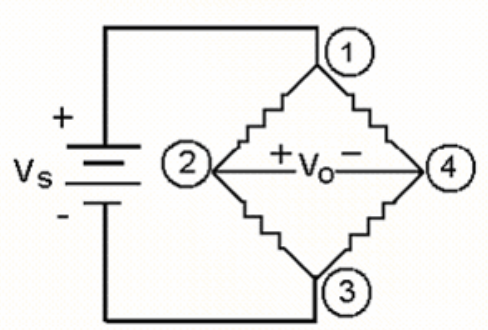


Figure 2. Excitation Schematics – Excitation 5 Vdc Typ., 6 Vdc max.



FS Series Circuit

1. Circled numbers refer to sensor terminals (pins).
   Pin 1 = Supply Vs (+)
   Pin 2 = Output Vo (+)
   Pin 3 = Ground Vg (-)
   Pin 4 = Output Vo (-)
2. The force sensor may be powered by voltage or current. Maximum supply voltage is not to exceed 6 V. Maximum supply current is not to exceed 1.2 mA. Power is applied across Pin 1 and Pin 3.
3. The sensor output should be measured as a differential voltage across Pin 2 and Pin 4 (Vo=Vo(+)-Vo(-)). The output is ratiometric to the supply voltage. Shifts in supply voltage will cause shifts in output. Neither Pin 2 nor Pin 4 should be tied to ground or voltage supply.

Figure 3. Mounting Dimensions (for reference only) in mm

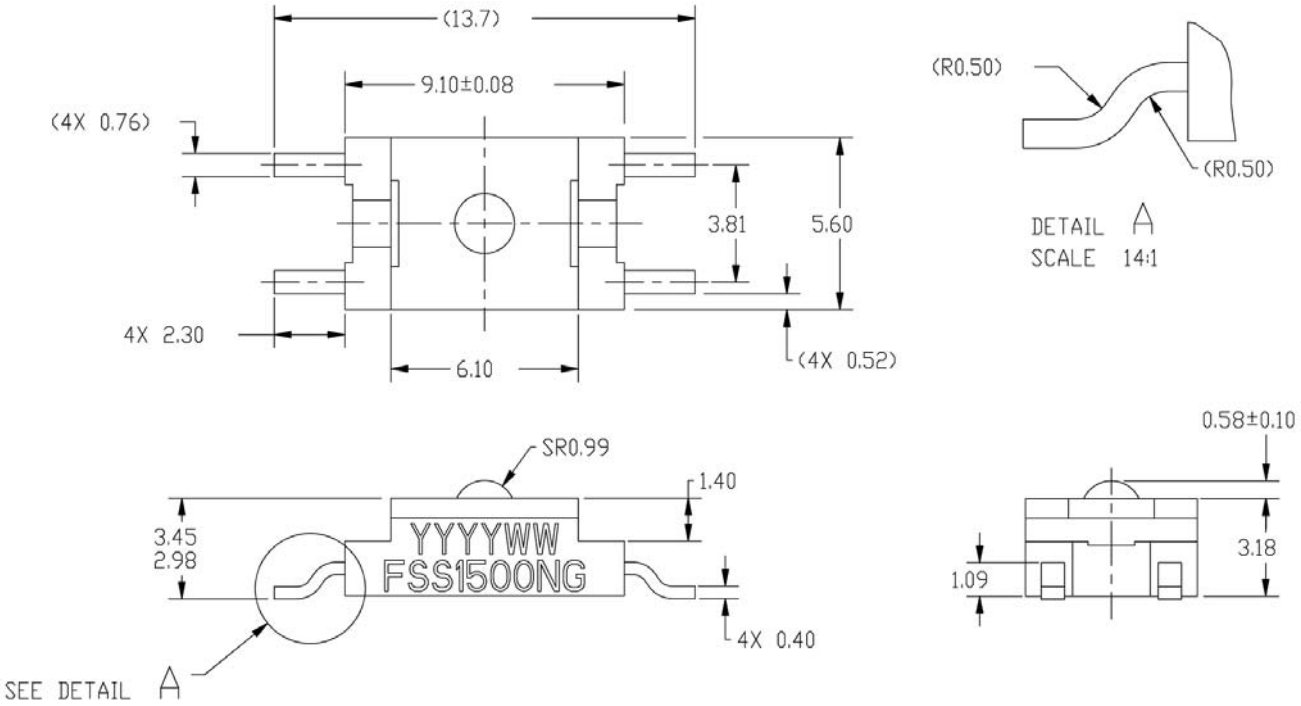


Figure 4. Suggested Land Pattern in mm

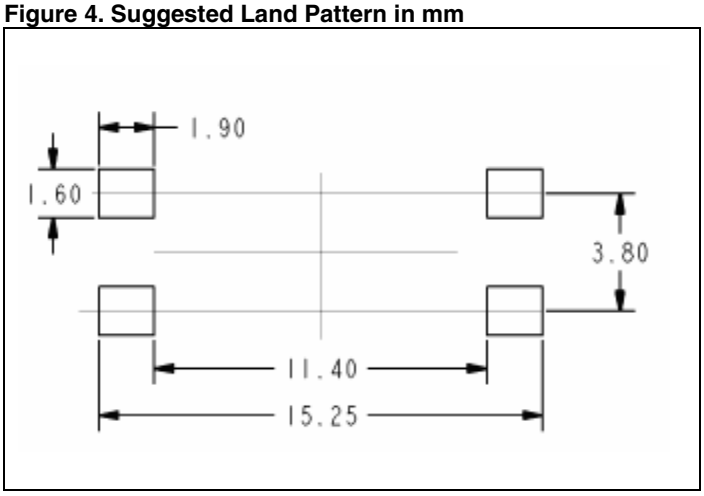


Table 4. Order Guide

Catalog Listing	Packaging*
FSS1500NGT	Tube
FSS1500NGR	Tape and reel (1,000 units)

* Tape and reel packaging in development

⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

⚠ WARNING

MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

E-mail: info.sc@honeywell.com

Internet: www.honeywell.com/sensing

Phone and Fax:

Asia Pacific	+65 6355-2828
	+65 6445-3033 Fax
Europe	+44 (0) 1698 481481
	+44 (0) 1698 481676 Fax
Latin America	+1-305-805-8188
	+1-305-883-8257 Fax
USA/Canada	+1-800-537-6945
	+1-815-235-6847
	+1-815-235-6545 Fax

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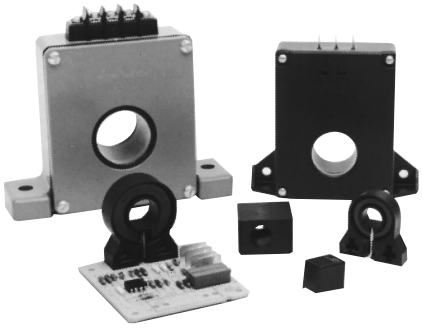
July 2009

Solid State Sensors
Current Sensors



FEATURES
- Digital or linear output
- AC or DC current sensing
- Through-hole design
- Fast response time
- Output voltage isolation from input
- Minimum energy dissipation
- Maximum current limited only by conductor size
- Adjustable performance and built-in temperature compensation assures reliable operation
- Accurate, low cost sensing
- Operating temperature range –25 to 85°C

APPLICATION
- Variable speed motor controls
- Automotive diagnostics (battery drain detector)
- Ground fault detectors
- Motor overload protection
- Current monitoring of electric welders
- Energy management systems
- Protection of power semiconductors
- Control system diagnostics
- Burnt-out light bulb detection

OPERATION
MICRO SWITCH CS series solid state current sensors monitor either alternating (AC) or direct (DC) current. This series includes a wide assortment of devices ranging from digital output current detectors capable of sensing a few hundred milliamps to linear sensors capable of monitoring over one thousand amps. The entire family of CS current sensors provides a means of accurate low-cost current sensing.

Current sensors monitor current flow. Digital sensors produce a digital output signal. Linear sensors produce an analog output signal. When these signals have reached a predetermined level, the control system logic is instructed to perform a function. The digital signal with its logic level output may sound an alarm, start a motor, open a valve, or shut down a pump. The linear signal duplicates the waveform of the current being sensed and is ideal for use as a feedback element to control a motor or regulate the amount of work being done by a machine.

Some CS current sensors utilize a through-hole design. This feature insures that there will not be any DC insertion loss in the conductor. In addition, the through-hole design simplifies installation by eliminating the need for direct connection, which minimizes energy dissipation, and provides output isolation at no extra cost. MICRO SWITCH CS through-hole current sensors cannot be damaged by overcurrent.

Current sensing is accomplished by measuring the magnetic field surrounding a current-carrying conductor. The conductor is passed through the flux collector which concentrates the magnetic field at the sensing element. The magnetic field is directly proportional to the current passing through the conductor. Thus, there is a direct relationship between the output voltage of the current sensor and the level of input current. The waveform of this output voltage will track the waveform of the measured current. The through-hole design electrically isolates the sensor and insures that it will not be damaged by overcurrent or high voltage transients.

LINEAR CURRENT SENSORS
MICRO SWITCH CSL series linear current sensors incorporate our 91SS12-2 and SS94A1 linear output Hall effect transducer (LOHET™). The sensing element is assembled in a printed circuit board mountable housing. This housing is available in four configurations (as shown in mounting dimension Figures 1, 1a, 2, and 2a on page 59). Normal mounting is with 0.375 inch long 4-40 screw and square nut (not provided) inserted in the housing. The combination of the sensor, flux collector, and housing comprises the holder assembly.

When sensing zero current the output voltage of the current sensor is approximately equal to one half of the supply voltage (Voffset – 0.5 Vcc). CS series linear current sensors will sense current in both directions. Current flow in one direction will cause the output voltage to increase from its offset value. Current flow in the opposite direction will cause the output voltage to decrease from its offset value. The output voltage range is from 25% of the supply voltage to 75% of the supply voltage ($0.25\ Vcc < Vo < 0.75\ Vcc$).

While sensing either AC or DC current, the linear output voltage will track the waveform of the sensed current.

The output of these devices can be adjusted by varying the supply voltage, varying the gap cut in the flux collector, or increasing the number of turns of the conductor passing through the center of the flux collector. Devices on page 56 are ratiometric.

ADJUSTABLE LINEAR CURRENT SENSORS
MICRO SWITCH offers two families of linear current sensors with adjustable offset voltage and sensitivity. Both families utilize the previously described linear current sensors mounted to a small printed circuit board containing additional circuitry. The adjustable feature enables the user to define the exact range of operation. The offset voltage and sensitivity are controlled by two trimpots soldered to the printed circuit board. These sensors are ratiometric.

DIGITAL CURRENT SENSORS
Each MICRO SWITCH CSD series digital current sensor provides a logic level output that changes from approximately Vcc to 0.4 volts when the sensed current exceeds the operate point. Each digital sensor will operate on AC or DC current, but the output will turn off at every zero crossing when sensing AC current.

Note: Operate and release currents are specified in Amps-Peak. When monitoring AC current using a digital sensor, peak values should be used. Multiply the RMS values by 1.414 to obtain the peak value.

INDUSTRIAL OUTPUT CURRENT SENSORS
Current sensors with industrial outputs easily interface with programmable controllers and other industrial control and monitoring devices. They have 4 to 20 mA or 1 to 5 VDC outputs and are packaged in a low-cost open PC board configuration or enclosed housings. These devices include a regulator. Therefore, they are not ratiometric.

CATALOG NUMBER SYSTEM

PLEASE NOTE: This matrix is intended **only** to aid you in identifying sensor catalog listings. It is not all-inclusive, and **must not be used** to form new listings.

Example: CSLA1CD

CS Current Sensors
Linear L
Digital D

A1 Holder – 9SS
A2 Holder – SS9
B1 9SS DC-DC Ratiometric Unregulated
B2 9SS AC-DC Ratiometric Unregulated
B3 9SS AC-AC Ratiometric Unregulated
B4 ALC DC-DC Ratiometric Unregulated
B5 ALC AC-DC Ratiometric Unregulated
B6 ALC AC-AC Ratiometric Unregulated
C2 9SS AC-DC 1-5 Unregulated
E1 9SS DC-DC 1-5 V Regulated
E2 9SS AC-DC 1-5 V Regulated
E3 9SS AC-AC 1-5 V Regulated
E4 ALC DC-DC 1-5 V Regulated
E5 ALC AC-DC 1-5 V Regulated
E6 ALC AC-AC 1-5 V Regulated
F1 9SS DC-DC 4-20 mA Regulated
F2 9SS AC-DC 4-20 mA Regulated
F3 9SS AC-AC 4-20 mA Regulated
F4 ALC DC-DC 4-20 mA Regulated
F5 ALC AC-DC 4-20 mA Regulated
F6 ALC AC-AC 4-20 mA Regulated

A PCB Small Holder
B PCB Medium Holder
C Small Holder
D Medium Holder
E Large Holder
F PCB Large Holder
G Small Sidemount
H Plastic Housing Small Opening
J Plastic Housing Large Opening
K Metal Housing
L PCB Small Sidemount

If 9SS	
A	14 Amps
B	16
C	33
D	57
E	75
F	100
G	120
H	150
J	225
K	325
L	625

If SS9ALC		
	DC-DC	Other
C		24
D	57	72
E		92
F	114	125
G	148	150
H	245	235
J	250	310
K		400
L	490	550
M	604	765
N		950
P	1208	
Q		1500

HOW TO INTERPRET CURRENT SENSOR SPECIFICATIONS

The following definitions will help the user understand the characteristics of the MICRO SWITCH current sensor line.

Adjustable Operating Range — The adjustable linear current sensors give the user the option of changing the sensitivity according to the maximum sensed current of the application. The on-board sensitivity adjustment allows the user to alter the amplification of the Hall effect sensor, thereby adjusting the amount of sensed current needed to achieve maximum output voltage.

Example	Vcc – 12V
Voffset	–Vcc/2 – 6V
Vo maximum	–(75%)Vcc – 9V
Vspan available	–3V

Assume a current maximum of 45 amps is determined. The user would then apply 45 amps through the toroid and adjust the sensitivity where indicated until a 9 volt output is achieved. The sensitivity is then determined as (3V)/(45A) – 67mV/A. This design allows for maximum sensor flexibility.

For best results, choose a sensor to operate toward its maximum operate range. Increased amplification occurs when the sensor is adjusted toward its minimum operate range. Any circuit noise is also amplified.

Offset Shift — The offset shift refers to the effect of temperature on the offset voltage. It is defined as a percentage of reading per degree Celsius. Example: Offset voltage is 6.0V at 25°C. The offset shift is ±0.05%/°C. Therefore, the offset voltage at 35°C is 6.0V ± (0.05%/°C) (6.0V) (10°C) – 6.0V ± 0.03V. The offset shift due to temperature increases as the device is operated toward the temperature extremes.

Offset Voltage — The offset voltage is the voltage output when no current is flowing through the current carrying conductor. This is also known as the null voltage.

Operate Current — The operate current is the level of current required to cause a change in logic state from the state at no current flow. For example, the logic output is high at no current flow. When the current level is increased to the operate point, the logic output goes low.

Ratiometric — Characteristics vary in proportion to supply voltage.

Release Current — The release current is the level of current required to cause a change in logic state as the current flow decreases from the operate point.

Response Time (linear) — Measured from the time the input current reaches 90% of its full scale value to the time when the sensor output reaches 90% of final value. This assumes rise time of 1 microsecond or less on input.

Response Time (digital) — The length of time it takes the output to switch to within ten percent of the supply voltage from the negative supply after the rated operate point is reached on the input. Measured time will vary proportionally with the overdrive current.

Sensed Current (Amps Peak) — The SS94A1 and 91SS12-2 linear output Hall effect sensors have a maximum sensed range. The toroid (flux collector) in each holder assembly has a gap in which the sensor is placed. By varying the width of the gap (lg), the level of current that produces the amount of gauss necessary to saturate the sensor is varied. In other words, the maximum/minimum output of the Hall element will always be obtained at rated gauss excitation. The current level needed to achieve that maximum/minimum output depends on the width of the gap in the flux collector. Max sensed current is also affected by number of times sensed current wire is looped thru sensor hole. If max sensed current is 100 amps and current wire is looped thru hole twice, max sensed current drops to 50 amps. Looped 4 times it drops to 25 amps, 5 times to 20 amps.

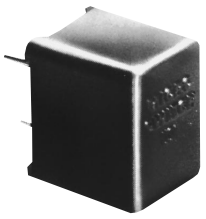
Sensitivity – The change in sensor output to 1 amp change in input. Units are in units/NI where N is number of times sensed current wire is looped thru sensor hole. For example, if sensed current wire is looped thru hole twice then sensitivity doubles; looped thru 3 times, sensitivity triples, etc.

Temperature Range — The –25° to +85°C specified is the operating temperature range that the current sensor has been rated. The performance specifications are not considered to be valid outside the specified temperature range.

Solid State Sensors

CS Series

Series-Connect Digital Current Sensors



FEATURES

- Digital logic level output
- Miniature size
- Encapsulated for physical protection
- Interchangeability
- Printed circuit board mountable
- Transient protection provided on I.C.
- Output voltage isolation from input
- 40 mA current sinking output

TYPICAL APPLICATIONS

- Motor overload protection
- Operations verification
- Power loss detection
- Monitoring
- Burned-out light bulb detection

CS DIGITAL SENSORS

Series-connect current sensors produce a digital logic level output. When the current being sensed reaches a predetermined level, the output changes state.

Operating Principle: The sensor, wired in series with the current being sensed, detects the magnetic field surrounding a current-carrying conductor. This current path is passed through a flux collector inside the package, and the magnetic field is concentrated at the internal digital Hall effect sensing element. The magnetic field is proportional to the current passing through the conductor. Thus, there is a relationship between the output state of the current sensor and the level of current. Housing material: PET polyester.

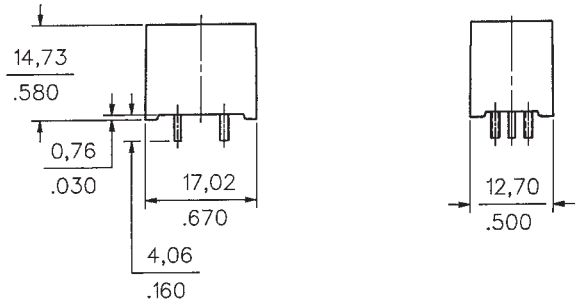
SERIES-CONNECT DIGITAL CURRENT SENSORS ORDER GUIDE, SINKING OUTPUT

Catalog Listing	Operate Current @ 25°C (Amps)	Release Current @ 25°C (Amps)	Max. Continuous Current (Amps)	Resistance (m Ohm)	Inductance (μH)	Supply Volt. (Volts DC)	Output Volt. (Volts)	Output Current (mA) Sinking	Response Time (μ Sec.)
CSDD1ED	3.5	2.6	10	8	7	4.5 to 24	0.4	40 mA	60
CSDD1EC	5.0	3.8	20	5	4	4.5 to 24	0.4	40 mA	60
CSDD1EE	6.5	4.9	20	4	4	4.5 to 24	0.4	40 mA	60
CSDD1EF	9.0	6.8	20	3	3	4.5 to 24	0.4	40 mA	60
CSDD1EG	10.0	7.6	20	3	3	4.5 to 24	0.4	40 mA	60
CSDD1EH	15.0	11.4	20	2	3	4.5 to 24	0.4	40 mA	60

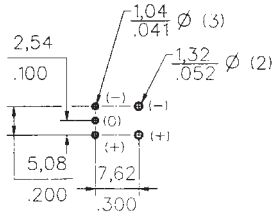
MOUNTING DIMENSIONS

(For reference only)

Key:
0,00=mm
0.00=in.



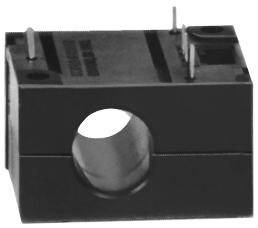
SUGGESTED HOLE CENTERS



View from component side of printed circuit board.

Solid State Sensors
Digital Current Sensors

CS Series



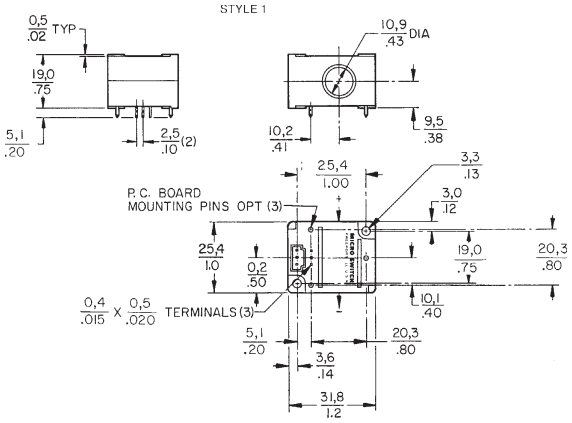
FEATURES
- Digital output
- AC or DC current sensing
- Through-hole design
- Output voltage isolation from input
- Minimum energy dissipation
- Maximum current limited only by conductor size
- Accurate, low cost sensing
- Operating temperature range –25 to 85°C

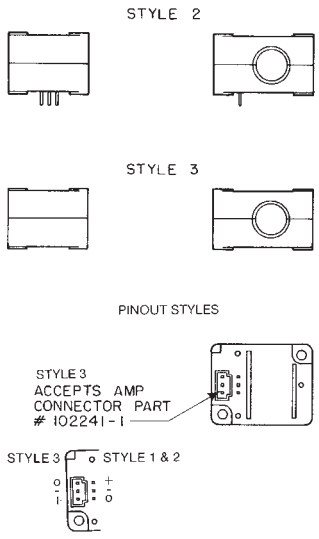
Digital Current Sensors
Each MICRO SWITCH CS series digital current sensor provides a logic level output that changes from approximately Vcc to 0.4 volts when the sensed current exceeds the operate point. Each digital sensor will operate on AC or DC current, but the output will turn off at every zero crossing when sensing AC current. Housing material: PET polyester.

DIGITAL CURRENT DETECTORS ORDER GUIDE, SINKING OUTPUT

Catalog Listings	Pinout Style	Operate Current @ 25°C (Amp-Turns)			Operate Current –25°C to +85°C (Amp-Turns)	Release Current –25°C to +85°C (Amp-Turns Min.)	Supply Volt. (Volts DC)	Output Volt. (Volts)	Output Current (mA) Sinking	Response Time (μ Sec.)
		Min.	Nom.	Max.						
CSDA1BA	2	0.32	0.50	0.88	.25 to 1.0	0.08	6 to 16	0.4	20mA	100
CSDA1BC	2	2.2	3.5	6.5	1.7 to 7.5	0.60	6 to 16	0.4	20mA	100
CSDC1BA	2	0.32	0.50	0.88	.25 to 1.0	0.08	5 ± 0.2	0.4	20mA	100
CSDC1BC	2	2.2	3.5	6.5	1.7 to 7.5	0.60	5 ± 0.2	0.4	20mA	100
CSDA1AA	1	0.32	0.50	0.88	.25 to 1.0	0.08	6 to 16	0.4	20mA	100
CSDA1AC	1	2.2	3.5	6.5	1.7 to 7.5	0.60	6 to 16	0.4	20mA	100
CSDC1AA	1	0.32	0.50	0.88	.25 to 1.0	0.08	5 ± 0.2	0.4	20mA	100
CSDC1AC	1	2.2	3.5	6.5	1.7 to 7.5	0.60	5 ± 0.2	0.4	20mA	100
CSDC1DA	3	0.32	0.50	0.88	.25 to 1.0	0.08	5 ± 0.2	0.4	20mA	100
CSDA1DA	3	0.32	0.50	0.88	.25 to 1.0	0.08	6 to 16	0.4	20mA	100
CSDC1DC	3	2.2	3.5	6.5	1.7 to 7.5	0.60	5 ± 0.2	0.4	20mA	100
CSDA1DC	3	2.2	3.5	6.5	1.7 to 7.5	0.60	6 to 16	0.4	20mA	100

MOUNTING DIMENSIONS (for reference only)





Current

Solid State Sensors
Linear Current Sensors

CS Series

FEATURES
- Linear output
- AC or DC current sensing
- Through-hole design
- Fast response time
- Output voltage isolation from input
- Minimum energy dissipation
- Maximum current limited only by conductor size
- Adjustable performance and built-in temperature compensation assures reliable operation
- Accurate, low cost sensing
- Operating temperature range –25 to 85°C
- Housing: PET polyester

LINEAR CURRENT SENSORS
MICRO SWITCH CS series linear current sensors incorporate our 91SS12-2 and SS94A1 linear output Hall effect transducer (LOHET™). The sensing element is assembled in a printed circuit board mountable housing. This housing is available in four configuration as shown in mounting dimension figures 1, 1a, 2 and 2a. Normal mounting is with 0.375 inch long 4-40 screw and square nut (not provided) inserted in the housing or a 6-20 self-tapping screw. The combination of the sensor, flux collector, and housing comprises the holder assembly. These sensors are ratiometric.

ORDER GUIDE — BOTTOM MOUNT WITH 9SS SENSOR, SOURCE OUTPUT

Catalog Listing	Mtg. Dim. Fig.	Supply Volt. (Volts DC)	Supply Current (mA Max.)	Sensed Current (Amps Peak)	Offset Volt. (Volts±10%)	Sensitivity mV•N* At 12 VDC		Offset Shift (%/°C)	Response Time (μ Sec.)
						Nominal	± TOL		
CSLA1CD	1	8 to 16	19	57	Vcc/2	49.6	5.8	±.05	3
CSLA1CE	1	8 to 16	19	75	Vcc/2	39.4	4.4	±.05	3
CSLA1DE	2	8 to 16	19	75	Vcc/2	39.1	4.8	±.05	3
CSLA1CF	1	8 to 16	19	100	Vcc/2	29.7	2.7	±.05	3
CSLA1DG	2	8 to 16	19	120	Vcc/2	24.6	2.1	±.05	3
CSLA1CH	1	8 to 16	19	150	Vcc/2	19.6	1.8	±.05	3
CSLA1DJ	2	8 to 16	19	225	Vcc/2	13.2	1.2	±.05	3
CSLA1EJ	1a	8 to 16	19	225	Vcc/2	13.2	1.5	±.05	3
CSLA1DK	2	8 to 16	19	325	Vcc/2	9.1	1.7	±.05	3
CSLA1EK	1a	8 to 16	19	325	Vcc/2	9.4	1.3	±.05	3
CSLA1EL	1a	8 to 16	19	625	Vcc/2	5.6	1.3	±.05	3

BOTTOM MOUNT WITH SS9 SENSOR, SINK/SOURCE OUTPUT

Catalog Listing	Mtg. Dim. Fig.	Supply Volt. (Volts DC)	Supply Current (mA Max.)	Sensed Current (Amps Peak)	Offset Volt. (Volts±2%)	Sensitivity mV•N* At 8 VDC		Offset Shift (%/°C)	Response Time (μ Sec.)
						Nominal	± TOL		
CSLA2CD	1	6 to 12	20	72	Vcc/2	32.7	3.0	±.02	3
CSLA2CE	1	6 to 12	20	92	Vcc/2	26.1	2.1	±.02	3
CSLA2DE	2	6 to 12	20	92	Vcc/2	25.6	2.2	±.02	3
CSLA2CF	1	6 to 12	20	125	Vcc/2	19.6	1.3	±.02	3
CSLA2DG	2	6 to 12	20	150	Vcc/2	16.2	1.1	±.02	3
CSLA2DJ	2	6 to 12	20	225	Vcc/2	8.7	0.6	±.020	3
CSLA2DH	2	6 to 12	20	235	Vcc/2	9.8	1.1	±.0125	3
CSLA2EJ	1a	6 to 12	20	310	Vcc/2	7.6	0.7	±.0125	3
CSLA2DK	2	6 to 12	20	400	Vcc/2	5.8	0.5	±.0125	3
CSLA2EL	1a	6 to 12	20	550	Vcc/2	4.3	0.4	±.0125	3
CSLA2EM	1a	6 to 12	20	765	Vcc/2	3.1	0.3	±.007	3
CSLA2EN	1a	6 to 12	20	950	Vcc/2	2.3	0.2	±.007	3

NOTE: When monitoring purely AC current with zero DC component, a capacitor can be inserted in series with the output of the current sensor. The capacitor will block out the effect of the temperature variation of the offset voltage which increases the accuracy of the device.

* N = number of turns

Solid State Sensors
Linear Current Sensors

SIDE MOUNT WITH 9SS SENSOR, SOURCE OUTPUT

Catalog Listing	Mtg. Dim. Fig.	Supply Volt. (Volts DC)	Supply Current (mA Max.)	Current (Amps Peak)	Sensed Offset Volt. (Volts±10%)	Sensitivity mV•N* At 12 VDC Nominal	Sensitivity mV•N* At 12 VDC ± TOL	Offset Shift (%/°C)	Response Time (µ Sec.)
CSLA1GD	2a	8 to 16	19	57	Vcc/2	49.6	5.8	±.05	3
CSLA1GE	2a	8 to 16	19	75	Vcc/2	39.4	4.4	±.05	3
CSLA1GF	2a	8 to 16	19	100	Vcc/2	29.7	2.7	±.05	3

SIDE MOUNT WITH SS9 SENSOR, SINK/SOURCE OUTPUT

Catalog Listing	Mtg. Dim. Fig.	Supply Volt. (Volts DC)	Supply Current (mA Max.)	Sensed Current (Amps Peak)	Offset Volt. (Volts±2%)	Sensitivity mV•N* At 8 VDC Nominal	Sensitivity mV•N* At 8 VDC ± TOL	Offset Shift (%/°C)	Response Time (µ Sec.)
CSLA2GD	2a	6 to 12	20	72	Vcc/2	32.7	3.0	±.02	8
CSLA2GE	2a	6 to 12	20	92	Vcc/2	26.1	2.1	±.02	8
CSLA2GF	2a	6 to 12	20	125	Vcc/2	19.6	1.3	±.02	8
CSLA2GG	2a	6 to 12	20	150	Vcc/2	12.7	0.6	±.02	8

NOTE: When monitoring purely AC current with zero DC component, a capacitor can be inserted in series with the output of the current sensor. The capacitor will block out the effect of the temperature variation of the offset voltage which increases the accuracy of the device.

*N = number of turns.

MOUNTING DIMENSIONS (for reference only)

Figure 1

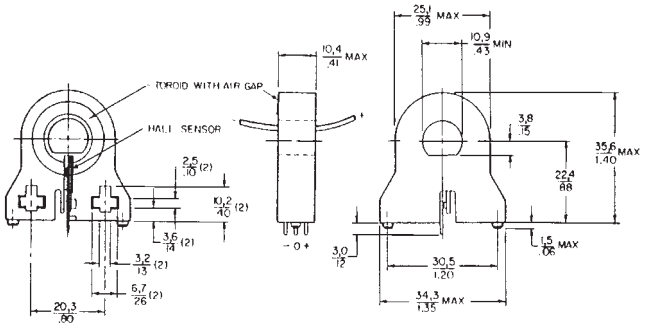


Figure 2

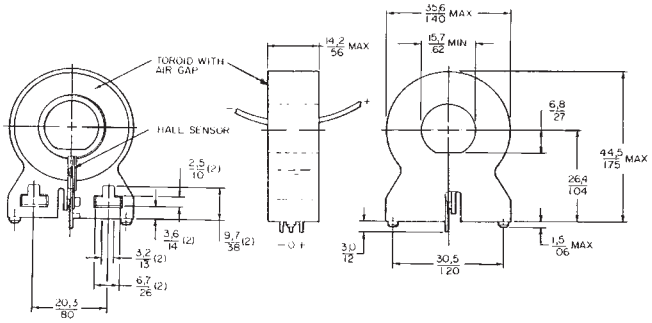


Figure 1a

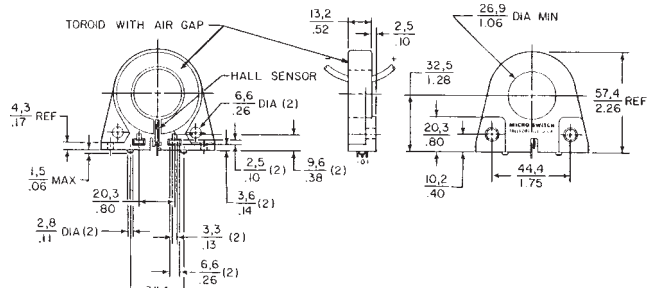
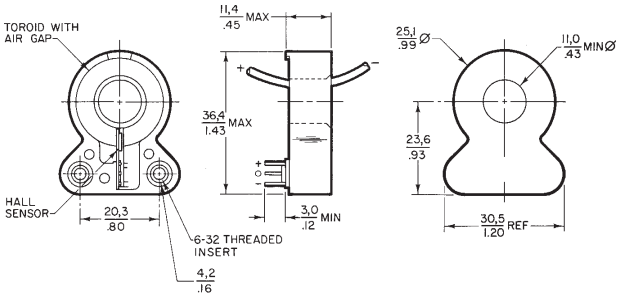


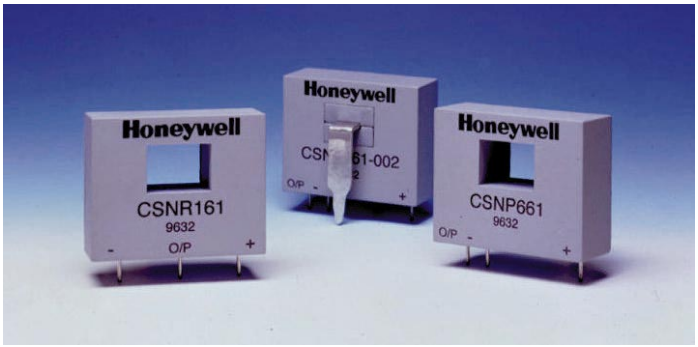
Figure 2a



* Application consideration: The output is clamped at the high end. Clamping voltage may be as low as 9VDC. The output will not exceed the clamping voltage regardless of field strength or supply voltage.

Current

Solid State Sensors
Closed Loop Current Sensors



FEATURES
- Current sensing up to 1200 amps
- Measures AC, DC and impulse currents
- Lowest cost/performance ratio
- Rapid response, no overshoot
- High overload capacity
- High level of electrical isolation between primary and secondary circuits
- Small size and weight

CLOSED LOOP SENSORS
Closed loop current sensors measure AC, DC and impulse currents over 0-25, 0-50, 0-100, 0-600 and 0-1200 Amp ranges. The CSN Series is based on the principles of the Hall effect and the null balance or zero magnetic flux method (feedback system). The magnetic flux in the sensor core is constantly controlled at zero. The amount of current required to balance zero flux is the measure of the primary current flowing through the conductor, multiplied by the ratio of the primary to secondary windings. This closed loop current is the output from the device and presents an image of the primary current reduced by the number of secondary turns at any time. This current can be expressed as a voltage by passing it through a resistor.

CATALOG NUMBER SYSTEM
PLEASE NOTE: This matrix is intended **only** to aid you in identifying sensor catalog listings. It is not all-inclusive, and **must not be used** to form new listings.

Example: CSNA111

CSN Closed Loop Current Sensor

Current Range (Peak/RMS nom.)
A ±70 A/50 A rms nom.
B ±100 A/50 A rms nom.
C ±90 A/50 A rms nom.
D ±22 A/15 A rms nom.
E ±36 A/25 A rms nom.
F ±150 A/100 A rms nom.
J ±600 A/300 A rms nom.
K ±1200 A/500 A rms nom.
L ±600 A/300 A rms nom.
M ±1200 A/500 A rms nom.
P ±90 A/50 A rms nom.
R ±200 A/125 A rms nom.
T ±150 A/50 A rms nom.

Supply Voltage
1 ±15 V
2 ±13 V
3 ±5 V
4 ±12 V to 18 V
5 ±15 V to 24 V
6 ±12 V to 15 V

Coil Characteristics
1 1:1000 turns/90 Ω @ 70°C
2 1:2000 turns/160 Ω @ 70°C
3 1:2000 turns/130 Ω @ 70°C
4 1:1000 turns/50 Ω @ 70°C
5 1:1000 turns/110 Ω @ 70°C
6 1:1000 turns/30 Ω @ 70°C
7 1:2000 turns/80 Ω @ 70°C
8 1:2000 turns/25 Ω @ 70°C
9 1:5000 turns/50 Ω @ 85°C

Housing Material
1 Polycarbonate/ABS blend

Solid State Sensors
Closed Loop Current Sensors

CSNA, CSNB, CSNE SERIES ORDER GUIDE

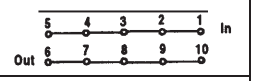
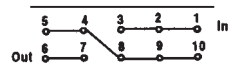
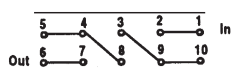
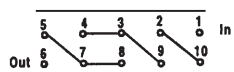
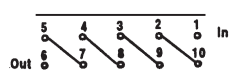
Catalog Listing	Current Range Amps	Supply Voltage VDC ±5%	Coil Characteristics		Meas. Currents Nom.	Meas. Resist (@ I_{nom})
			Turns	Resistance		
CSNA111	±70	±15	1000	90Ω @ 70°C	50 mA for 50 A	40 to 130Ω
CSNB121	±100	±15	2000	160Ω @ 70°C	25 mA for 50 A	40 to 270Ω
CSNB131	±100	±15	2000	130Ω @ 70°C	25 mA for 50 A	40 to 300Ω
CSNE151	±5-36	±15	1000	110Ω @ 70°C	25 mA for 25 A	100 to 320Ω
CSNE381*	±5-36	±5V	1000	66Ω @ 70°C	25 mA for 25 A	0 to 84Ω
CSNH151*	±4-43	±15V	1000	110Ω @ 70°C	25 mA for 25 A	100 to 320Ω

NOTE: Extended temperature range and potting also available.
* Contact the 800 number for more information.

SPECIFICATIONS

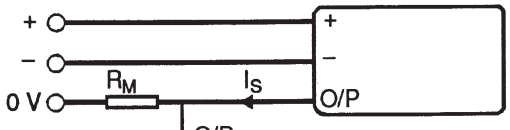
Catalog Listing	CSNA111	CSNB121	CSNB131	CSNE151
Offset Current @ 25°C, mA max.	±0.20	±0.10	±0.10	±0.10
Temperature Drift, 0 to 70°C, mA	±0.35 typ. ±0.60 max.	±0.20 typ. ±0.30 max.	±0.20 typ. ±0.30 max.	±0.17 typ. ±0.60 max.
Linearity	0.1%	0.1%	0.1%	0.2%
Supply Voltage	±15V	±15V	±15V	±15V
Galvanic Isolation @ 50 Hz/1 min.	2.5 kV rms			5 kV rms
Accuracy	±0.5% of I_N (nominal Current) at 25°C			
Response Time	<1 μs			
Bandwidth	DC to 150 kHz			
Temperature	Operating: 0 to 70°C (32 to 150°F)		Storage: −25 to 85°C (−13 to 185°F)	
Primary Circuit Connection	Thru-hole	Thru-hole	Thru-hole	Invasive on 10 pins
Secondary Circuit Connection	3 Pins	3 Pins	3 Pins	3 Pins
Current Drain	10 mA (no load current) + output current (secondary current)			
''In-Out'' Sense Signal	To obtain positive measuring current on O/P terminal, current must flow in direction of arrow			
Mounting	PCB, 3 pins, hole size 0.95 mm			PCB, 13 pins

PRIMARY PIN CONNECTIONS FOR CSNE151

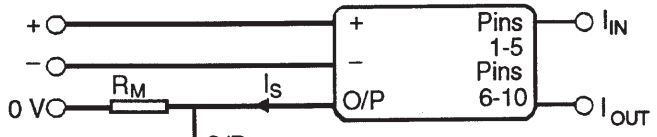
Primary Turns	Primary Current		Output Current (mA)	Primary Resistance (mΩ)	Primary Pin Connections
	Nom. I_{DN} (A)	Max. I_D (A)			
1	24	36	25	0.3	
2	12	18	24	1.1	
3	8	12	24	2.5	
4	6	9	24	4.4	
5	5	7	25	6.3	

WIRING DIAGRAMS

CSNA111/CSNB121/CSNB131



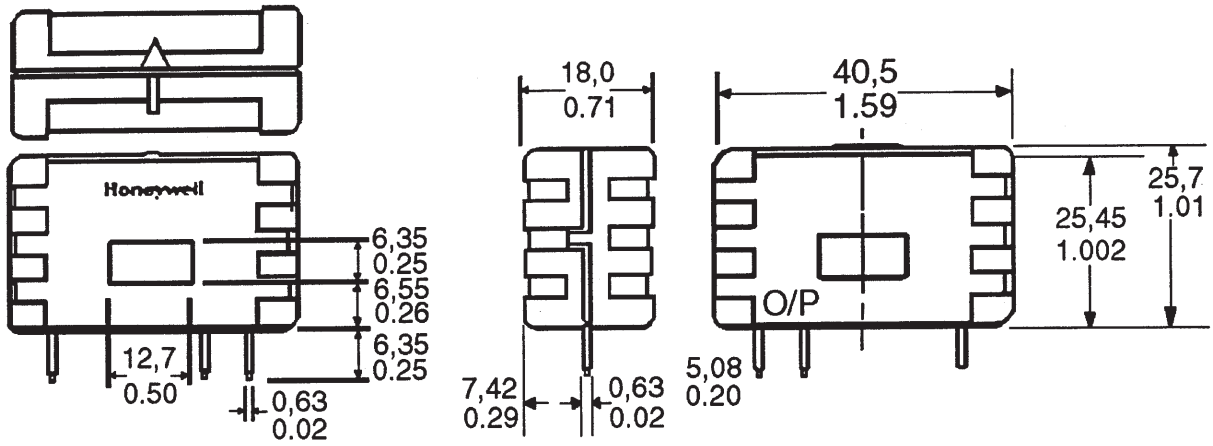
CSNE151



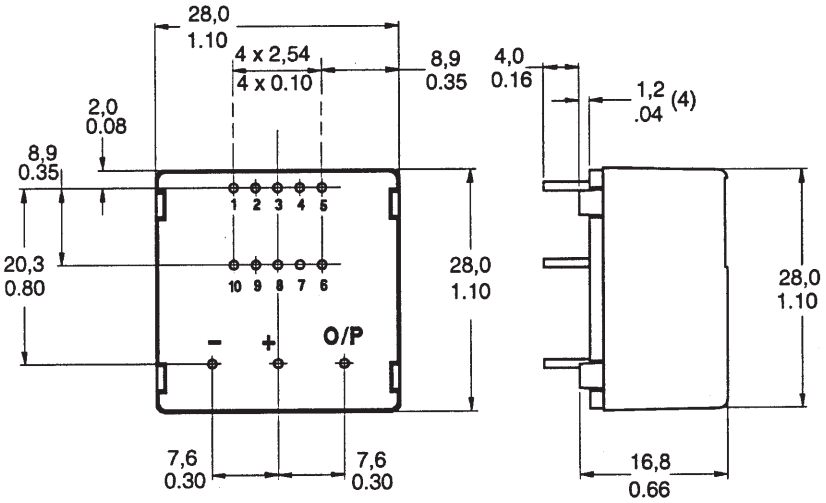
Current

MOUNTING DIMENSIONS (for reference only)

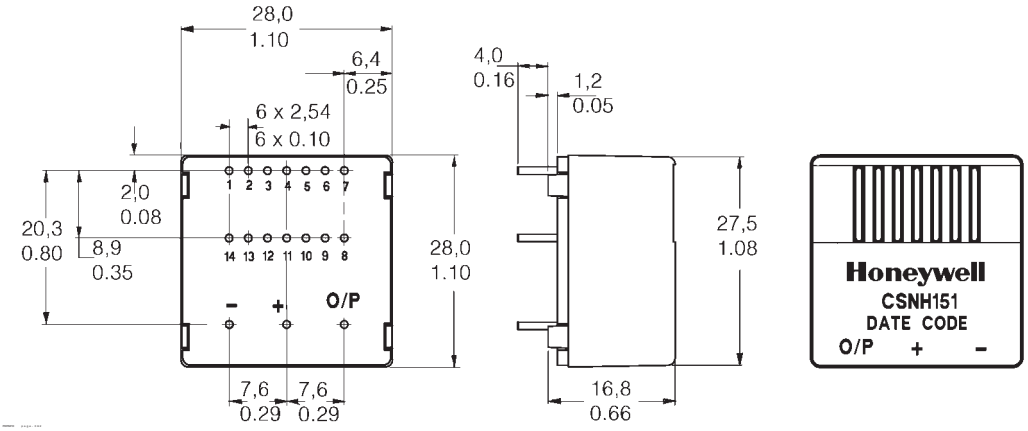
CSNA111, CSNB121, CSNB131



CSNE151/CSNE381



CSNH151



Closed Loop Current Sensors

CSNJ, CSNK SERIES ORDER GUIDE

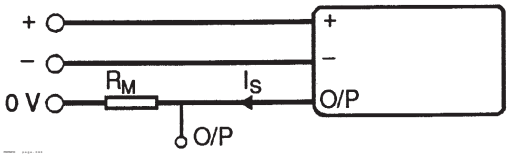
Catalog Listings	Current Range Amps	Supply Voltage VDC ± 5%	Coil Characteristics		Meas. Currents Nom.	Meas. Resist (@ I_{nom})
			Turns	Resistance		
CSNJ481	±600	±12 to 18	2000	25Ω @ 70°C	150 mA for 300 A	0 to 70Ω
CSNJ481-001*	±600	±12 to 18	2000	25Ω @ 70°C	150 mA for 300 A	0 to 70Ω
CSNJ481-002	±600	±12 to 18	2000	25Ω @ 70°C	150 mA for 300 A	0 to 70Ω
CSNJ481-003*	±600	±12 to 18	2000	25Ω @ 70°C	150 mA for 300 A	0 to 70Ω
CSNK591	±1200	±15 to 24	5000	50Ω @ 70°C	100 mA for 500 A	0 to 130Ω
CSNK591-001*	±1200	±15 to 24	5000	50Ω @ 70°C	100 mA for 500 A	0 to 130Ω
CSNK591-002	±1200	±15 to 24	5000	50Ω @ 70°C	100 mA for 500 A	0 to 130Ω
CSNK591-003*	±1200	±15 to 24	5000	50Ω @ 70°C	100 mA for 500 A	0 to 130Ω

*Fitted with busbar

SPECIFICATIONS

Catalog Listings	CSNJ481 CSNJ481-001	CSNJ481-002 CSNJ481-003	CSNK591 CSNK591-001	CSNK591-002 CSNK591-003
Offset Current @ 25°C, mA max.	±0.30	±0.30	±0.20	±0.20
Temperature Drift, 0 to 70°C, mA	±0.30 typ. ±0.50 max.	±0.30 typ. ±0.50 max.	±0.20 typ. ±0.30 max.	±0.20 typ. ±0.30 max.
Linearity	±0.1%	±0.1%	±0.1%	±0.1%
Supply Voltage	±12 to ±18V	±12 to ±18V	±15 to ±24V	±15 to ±24V
Galvanic Isolation @ 50 Hz/1 min.	7.5 kV rms	7.5 kV rms	6 kV rms	6 kV rms
Accuracy	±0.5% of I_N (nominal Current) at 25°C			
Response Time	<1 μs			
Bandwidth	DC to 150 kHz			
Operating Temperature	−40 to 85°C (−40 to 185°F)	0 to 70°C (32 to 158°F	−40 to 85°C (−40 to 185°F)	0 to 70°C (32 to 158°F)
Storage Temperature	−40 to 90°C (−40 to 194°F)	−25 to 85°C (−13 to 85°F	−40 to 90°C (−40 to 194°F)	−25 to 85°C (−13 to 85°F)
Primary Circuit Connection	Thru-hole or busbar	Thru-hole or busbar	Thru-hole or busbar	Thru-hole or busbar
Secondary Circuit Connection	3 pins	3 pins	3 pins	3 pins
Current Drain	14 mA (no load current) + output current		22 mA (24 V) + output current	
''In-Out'' Sense Signal	To obtain positive measuring current on O/P terminal, current must flow in direction of arrow			
Mounting	Faston, 3 pins		Push-on (spade), 3 terminals	

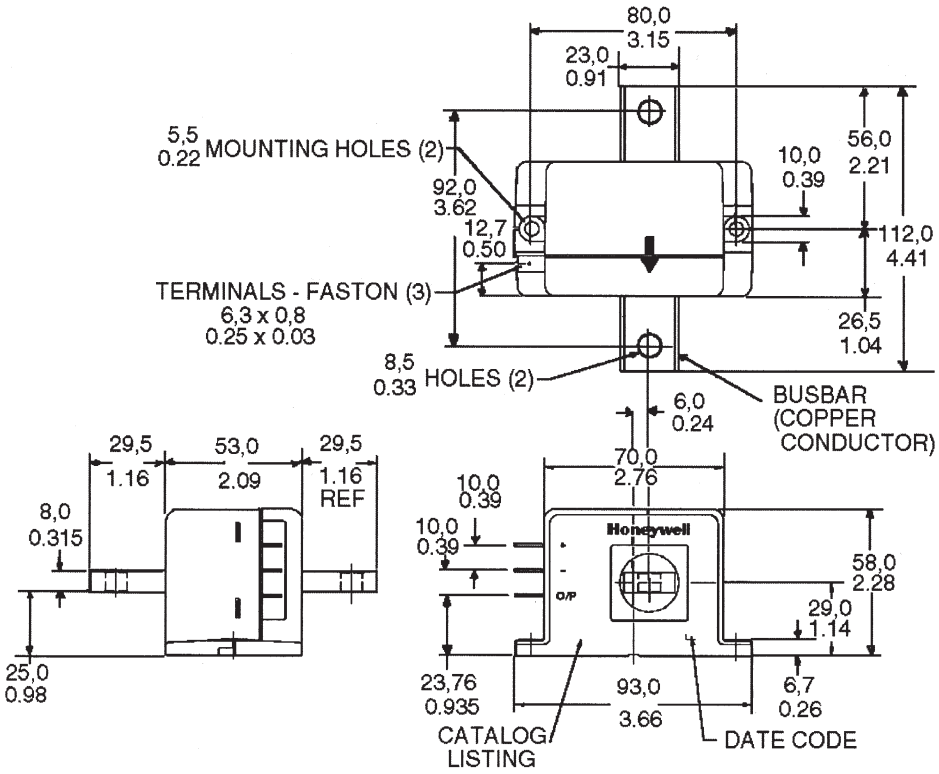
WIRING DIAGRAM



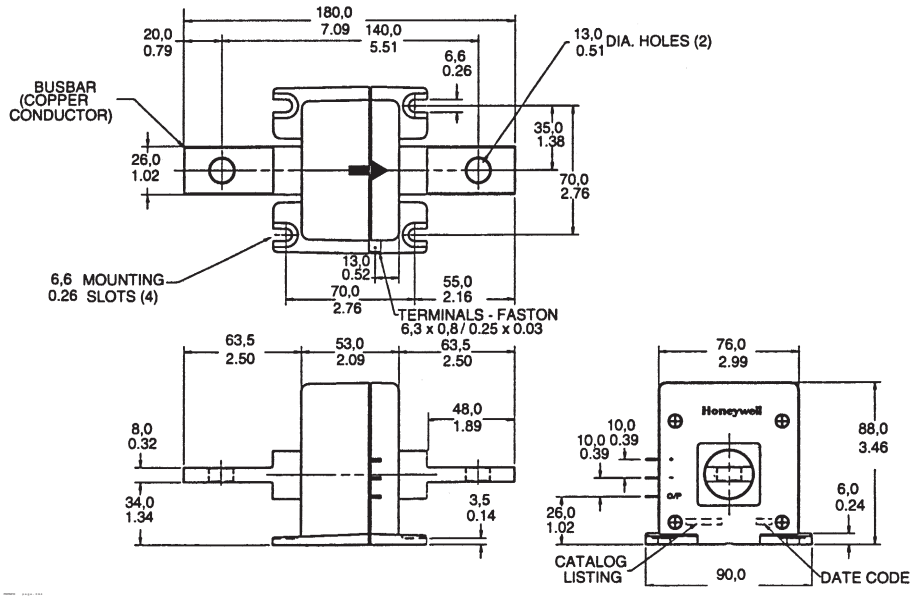
Current

MOUNTING DIMENSIONS (for reference only)

CSNJ481



CSNK591



Closed Loop Current Sensors

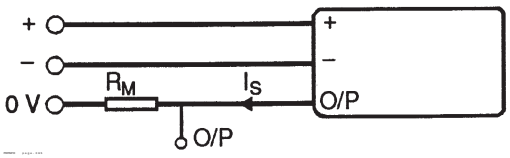
CSNL, CSNM SERIES ORDER GUIDE

Catalog Listings	Peak Current Range Amps	Supply Voltage VDC ± 5%	Coil Characteristics		Meas. Currents Nom.	Meas. Resist (@ I_{nom})
			Turns	Resistance		
CSNL181	±600	±12 to 18	2000	25Ω @ 70°C	150 mA for 300 A	0 to 70Ω
CSNM191	±1000	±12 to 18	5000	50Ω @ 70°C	100 mA for 500 A	0 to 120Ω

SPECIFICATIONS

Catalog Listings	CSNL181	CSNM191
Offset Current @ 25°C, mA max.	±0.30	±0.20
Temperature Drift, 0 to 70°C, mA	±0.30 typ. ±0.50 max.	±0.20 typ. ±0.30 max.
Linearity	±0.1%	±0.1%
Supply Voltage	±12 to ±18V	±12 to ±18V
Galvanic Isolation @ 50 Hz/1 min.	7.5 kV rms	7.5 kV rms
Accuracy	±0.5% of I_N (nominal Current) at 25°C	
Response Time	500 ns	<1 μs
Bandwidth	DC to 150 kHz	
Operating Temperature	−40 to 85°C (−40 to 185°F)	
Storage Temperature	−40 to 90°C (−40 to 194°F)	
Primary Circuit Connection	Thru-hole	Thru-hole
Secondary Circuit Connection	3 pins	3 pins
Current Drain	14 mA (no load current) + output current	
''In-Out'' Sense Signal	To obtain positive measuring current on O/P terminal, current must flow in direction of arrow	
Mounting	Faston, 3 pins	

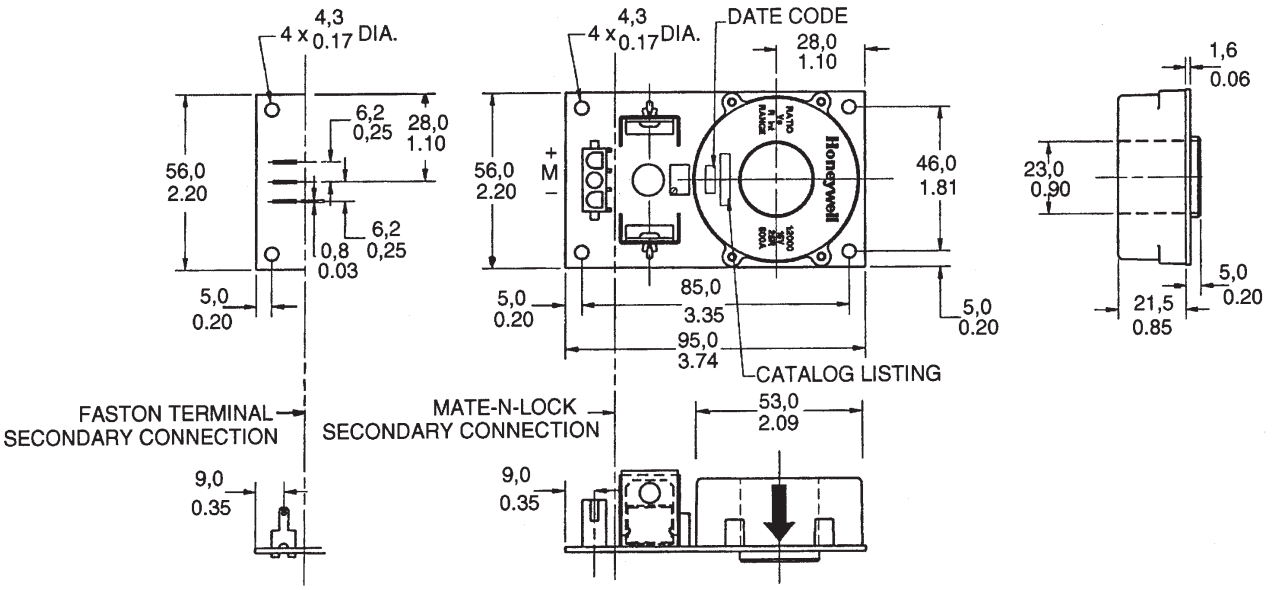
WIRING DIAGRAM



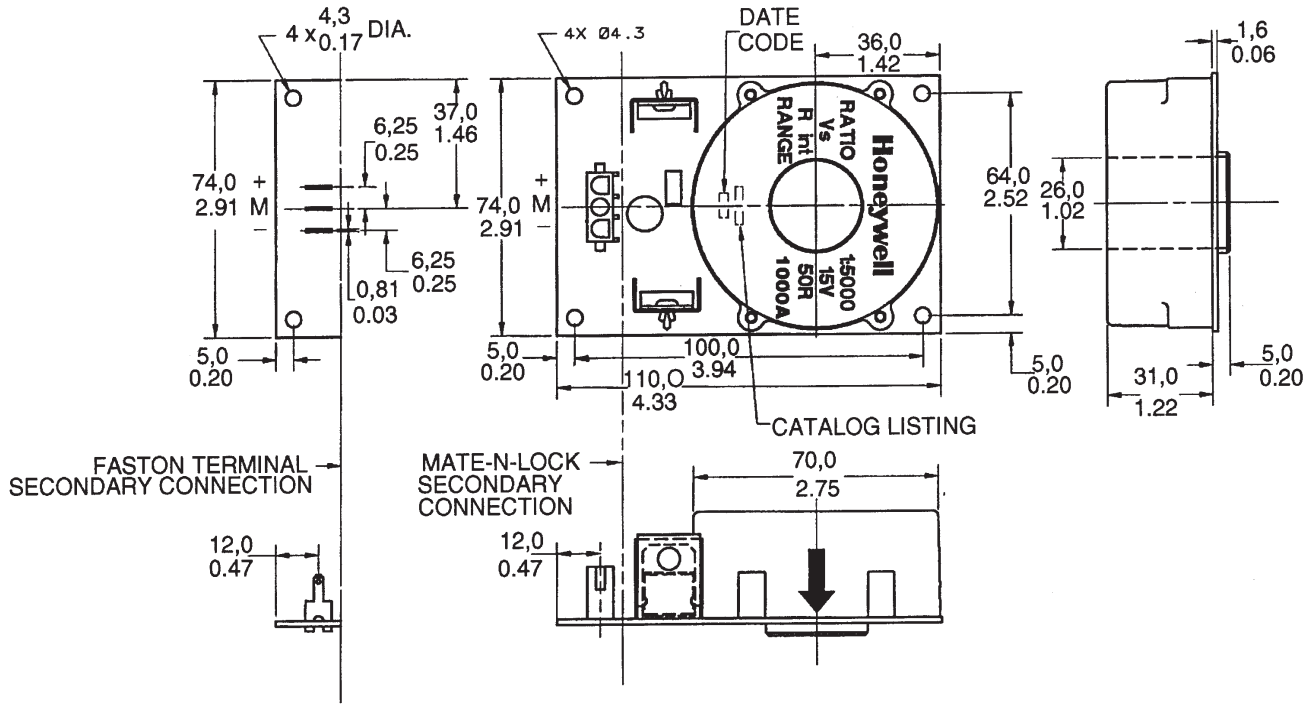
Current

MOUNTING DIMENSIONS (for reference only)

CSNL181



CSNM191



Closed Loop Current Sensors

CSNF, CSNR, CSNP, CSNT SERIES ORDER GUIDE

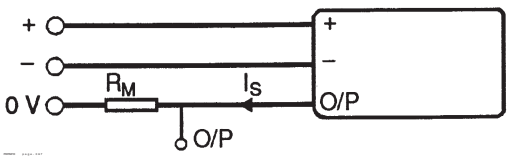
Catalog Listings	Peak Current Range Amps	Supply Voltage VDC ± 5%	Coil Characteristics		Meas. Currents Nom.	Meas. Resist (@ I_{nom})
			Turns	Resistance		
CSNP661	±90	±12 to 15	1000	30Ω @ 70°C	50 mA for 50 A	50 to 100Ω
CSNT651	±150	±12 to 15	2000	100Ω @ 70°C	25 mA for 50 A	40 to 75Ω
CSNF161	±150	±12 to 15	1000	30Ω @ 70°C	100 mA for 100 A	10 to 40Ω
CSNF151	±180	±12 to 15	2000	100Ω @ 70°C	50 mA for 100 A	10 to 75Ω
CSNR161	±200	±12 to 15	1000	30Ω @ 70°C	125 mA for 125 A	30 to 40Ω
CSNR151	±200	±12 to 15	2000	100Ω @ 70°C	62.5 mA for 125 A	10 to 40Ω

NOTE: Busbar options available.

SPECIFICATIONS

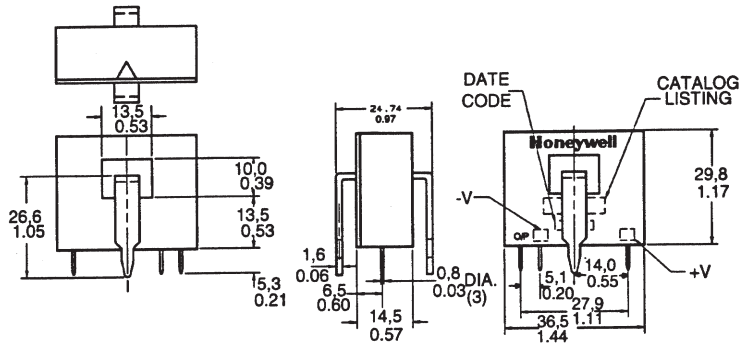
Catalog Listings	CSNP661	CSNT651	CSNF161	CSNF151	CSNR161	CSNR151
Offset Current @ 25°C, mA max.	±0.20	±0.10	±0.20	±0.10	±0.20	±0.10
Temperature Drift, 0 to 70°C, mA	±0.30 typ. ±0.50 max.	±0.15 typ. ±0.25 max.	±0.30 typ. ±0.50 max.	±0.15 typ. ±0.25 max.	±0.30 typ. ±0.60 max.	±0.15 typ. ±0.30 max.
Linearity	±0.1%	±0.1%	±0.1%	±0.1%	±0.1%	±0.1%
Supply Voltage	±12 to 15V	±12 to 15V	±12 to 15V	±12 to 15V	±12 to 15V	±12 to 15V
Galvanic Isolation @ 50 Hz/1 min.	3 kV rms	3 kV rms	3 kV rms	3 kV rms	3 kV rms	3 kV rms
Accuracy	±0.5% of I_N (nominal Current) at 25°C					
Response Time	<500 ns					
Bandwidth	DC to 150 kHz					
Operating Temperature	−40 to 85°C (−40 to 185°F)		−40 to 85°C (−40 to 185°F)			
Storage Temperature	−40 to 90°C (−40 to 194°F)		−40 to 90°C (−40 to 194°F)			
Primary Circuit Connection	Thru-hole					
Secondary Circuit Connection	3 pins					
Current Drain	10 mA (no load current) + output current		14 mA (no load current) + output current			
''In-Out'' Sense Signal	To obtain positive measuring current on O/P terminal, current must flow in direction of arrow					
Mounting	3 pins					
Pin Style	A	A	B	B	B	B

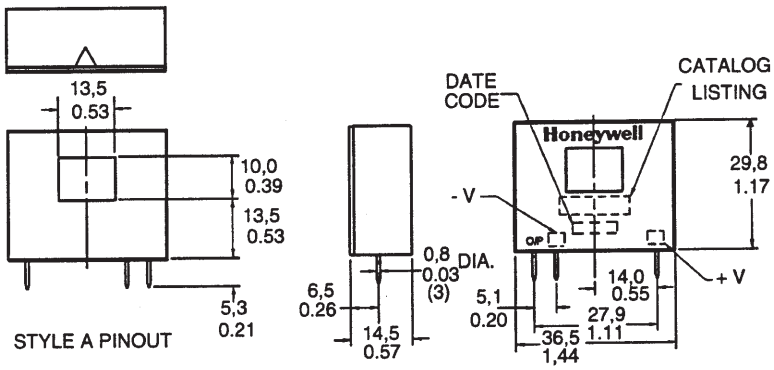
WIRING DIAGRAM

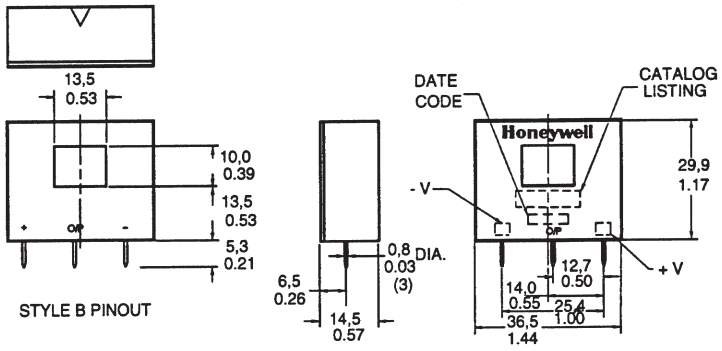


Current

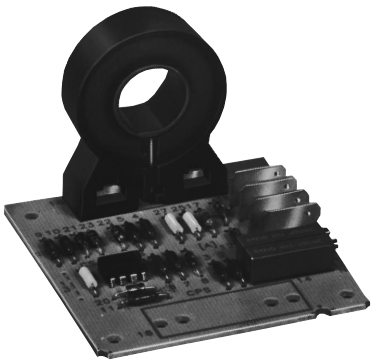
MOUNTING DIMENSIONS (for reference only)







Adjustable Linear Current Sensors



ADJUSTABLE LINEAR SENSORS DC/DC
This family is designed to provide a DC output voltage while sensing DC current. By adjusting the offset voltage trimpot the user can adjust the offset to one half of the supply voltage. The full scale current output voltage can be adjusted by the use of the sensitivity trimpot. Depending on the direction of current flow, the output voltage wil either increase or decrease from the offset value. These sensors can sense current from 0 to 50 kHz. Ratio metric sink/source output.

NOTE: DC/DC sensors should be used to sense AC current when a DC bias is present.

Due to magnetic properties a residual magnetic field can remain present in the flux collector at zero current. To facilitate resolution of DC current in the lower 1% of the dynamic range, adjust the null offset after a nominal level of current has passed thru the sensor.

DC/DC ORDER GUIDE RATIOMETRIC SINK/SOURCE OUTPUT

Catalog Listings	Mtg. Dim. Fig.	Supply Volt. (Volts DC)	Supply Current (mA Max.)	Max. Sensed Current (Amps-Peak)	Adjustable Operating Range @ Vcc – 12VDC*				Offset Volt. (Volts)	Offset Shift (%/°C)	Response Time (μ Sec.)
					Min. Sens. (mV/NI)	Oper. Range (Amps)	Max. Sens. (mV/NI)	Oper. Range (Amps)			
CSLB1AD	3	10 to 15	30	57	53	0-57	90	0-33	Vcc/2	±.03	8
CSLB1BE	4	10 to 15	30	75	40	0-75	75	0-40	Vcc/2	±.03	8
CSLB1AF	3	10 to 15	30	100	30	0-100	55	0-55	Vcc/2	±.03	8
CSLB1BG	4	10 to 15	30	120	25	0-120	46	0-65	Vcc/2	±.03	8
CSLB1AH	3	10 to 15	30	150	20	0-150	38	0-80	Vcc/2	±.03	8
CSLB1BJ	4	10 to 15	30	225	13	0-225	26	0-115	Vcc/2	±.03	8
CSLB1BK	4	10 to 15	30	325	9	0-325	16	0-185	Vcc/2	±.03	8

* For best results, choose a sensor to operate toward its maximum operate range. Increased amplification occurs when adjusting toward a minimum operate range; noise is also amplified.
Operating temperature range: –25 to +85°C

MOUNTING DIMENSIONS (for reference only)

Figure 3

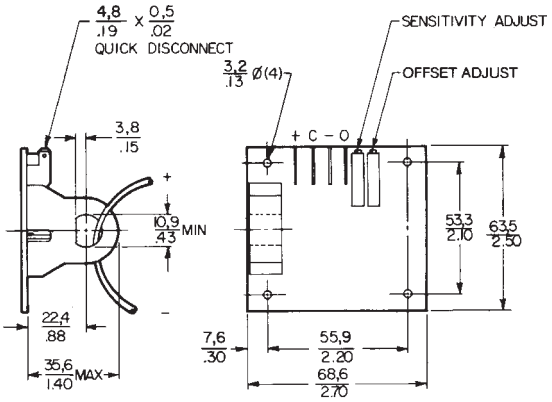
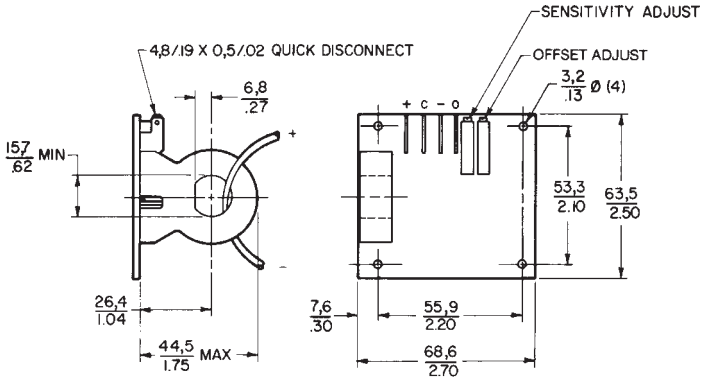


Figure 4



Current

Adjustable Linear Current Sensors

AC/DC

This family is designed to provide a DC output voltage while sensing AC current. The signal conditioning circuitry rectifies and filters the AC waveform into a 1.0 to 5.0 volt DC output signal. The offset voltage trimpot is used to adjust the offset at 1.0 volts. The sensitivity trimpot is used to adjust the maximum output voltage. AC/DC sensors are optimized to sense AC current from 50 Hz to 70 Hz, however, they can sense current from 10 Hz to 15 kHz. Ratiometric sink/source output.

NOTE: The input of the AC/DC sensors is capacitive coupled and should not be used to sense DC current.

AC/DC ORDER GUIDE RATIOMETRIC SINK/SOURCE OUTPUT

Catalog Listings	Mtg. Dim. Fig.	Supply Volt. (Volts DC)	Supply Current (mA Max.)	Max. Sensed Current (Amps-Peak)	Adjustable Operating Range @ Vcc – 12VDC*				Offset Volt. (Volts)	Offset Shift (%/°C)	Response Time (mSec.)
					Min. Sens. (mV/NI)	Oper. Range (Amps)	Max. Sens. (mV/NI)	Oper. Range (Amps)			
CSLB2AB	5	10 to 15	30	16	188	0-16	428	0-7	Vcc/2	±.063	700
CSLB2AC	5	10 to 15	30	33	90	0-33	214	0-14	Vcc/2	±.031	700
CSLB2AD	5	10 to 15	30	57	53	0-57	107	0-28	Vcc/2	±.018	700
CSLC2AD	5	12	30	57	70	0-57	190	0-21	1.0	±.083	700
CSLC2BE	6	12	30	75	53	0-75	154	0-26	1.0	±.083	700
CSLC2AF	5	12	30	100	40	0-100	114	0-35	1.0	±.083	700
CSLC2BG	6	12	30	120	33	0-120	98	0-41	1.0	±.083	700
CSLC2AH	5	12	30	150	27	0-150	80	0-50	1.0	±.083	700
CSLC2BJ	6	12	30	225	18	0-225	53	0-75	1.0	±.083	700
CSLC2BK	6	12	30	325	12	0-325	34	0-118	1.0	±.083	700

* For best results, choose a sensor to operate toward its maximum operate range. Increased amplification occurs when adjusting toward a minimum operate range; noise is also amplified.

The common terminal ''C'' is used when the sensor is excited by dual supplies. With dual excitation, the offset voltage is 0 volts for the first three AC/DC listings shown above. For the remaining AC/DC sensors, the offset voltage is adjusted to −5.0 volts when using +6 volt supplies.

MOUNTING DIMENSIONS (for reference only)

Figure 5

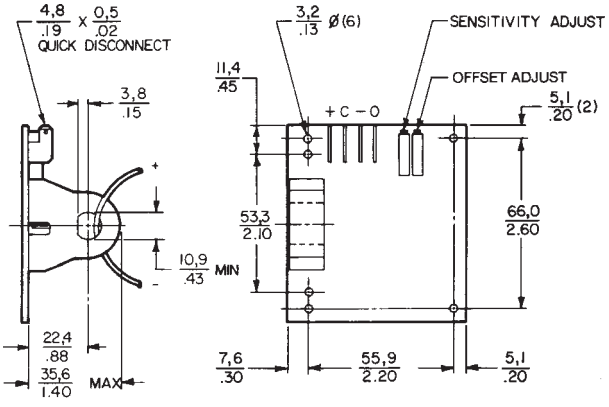
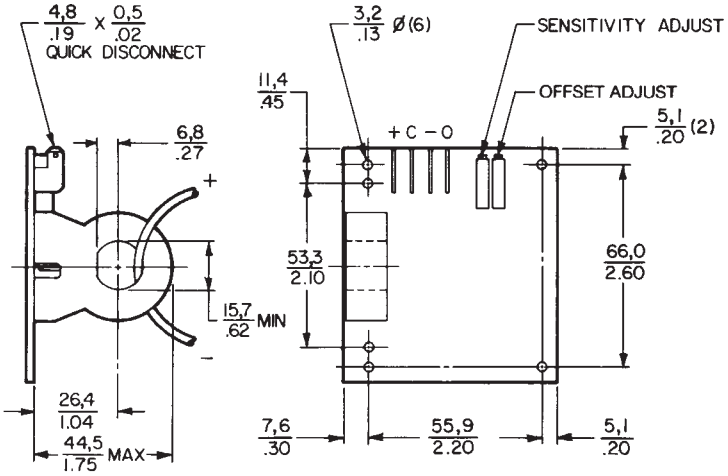


Figure 6



Adjustable Linear Current Sensors

ADJUSTABLE LINEAR SENSORS WITH STANDARD INDUSTRIAL OUTPUTS

The through-hole sensor housing is mounted on a small printed circuit board containing additional circuitry and two trimpots. Offset voltage is controlled by one trimpot, while the other controls sensitivity. By adjusting the trimpots, the user defines the exact range of operation. A regulator is used on each circuit. Output is ratiometric. Terminate 1 to 5 volt outputs with ≥500 ohms. Terminate 4 to 20 mA with ≤250 ohms.

DC/DC sensors provide a DC output voltage/current while sensing DC current. The offset voltage trimpot enables the offset to be either 1 volt or 4 milliamps. The full scale output voltage/current can be adjusted by using the sensitivity trimpot.

AC/DC sensors provide a DC output voltage while sensing AC current. The signal conditioning circuitry rectifies and filters the AC waveform into a 1.0 to 5.0 volt DC or a 4 to 20 mA output signal. The offset trimpot adjusts the offset at a 1.0 volt or 4 mA. The sensitivity trimpot adjusts the maximum output voltage/current. AC/DC sensors can sense AC current from 50 to 400 Hz.

NOTE: The input of AC/DC sensors is capacitive coupled. They should not be used to sense DC current.

NOTE: DC/DC sensors should be used to sense AC current when a DC bias is present.

DC/DC SENSORS WITH 1.0 to 5.0 VOLTS SINK/SOURCE OUTPUT ORDER GUIDE/OPERATING CHARACTERISTICS

Catalog Listing	Mtg. Dim. Fig.	Supply Voltage (DC)	Supply Current (mA max.)	Max. Sensed Current* (Amps-Peak)	Adjustable Operating Range				Offset Voltage (Volts)	Offset Shift (%/°C)	Response Time (μ Sec. typ.)
					Min. Sens. (mV/NI)	Oper. Range (Amps)	Max. Sens. (mV/NI)	Oper. Range (Amps)			
CSLE4AD	1	10.5 to 24	30	57	70	57	138	29	1.0	±0.092	8
CSLE4AF	1	10.5 to 24	30	114	35	114	70	57	1.0	±0.092	8
CSLE4BG	2	10.5 to 24	30	148	27	148	54	74	1.0	±0.092	8
CSLE4FH	3	10.5 to 24	30	245	16	245	33	123	1.0	±0.092	8
CSLE4FL	3	10.5 to 24	30	490	8	490	16	245	1.0	±0.063	8

Note: Output current 10mA max. source, 1mA max. sink.

AC/DC SENSORS WITH 1.0 to 5.0 VOLTS SINK/SOURCE OUTPUT ORDER GUIDE

Catalog Listing	Mtg. Dim. Fig.	Supply Voltage (DC)	Supply Current (mA max.)	Max. Sensed Current* (Amps-Peak)	Adjustable Operating Range				Offset Voltage (Volts)	Offset Shift (%/°C)	Response Time (mSec. typ.)
					Min. Sens. (mV/NI)	Oper. Range (Amps)	Max. Sens. (mV/NI)	Oper. Range (Amps)			
CSLE5AC	1	10.5 to 24	30	24	167	24	500	8	1.0	±0.04	150
CSLE5AD	1	10.5 to 24	30	72	56	72	167	24	1.0	±0.04	150
CSLE5BE	2	10.5 to 24	30	92	43	92	129	31	1.0	±0.04	150
CSLE5FG	3	10.5 to 24	30	153	26	153	78	51	1.0	±0.04	150
CSLE5FK	3	10.5 to 24	30	408	10	408	29	136	1.0	±0.04	150
CSLE5FN	3	10.5 to 24	30	950	4	950	12	340	1.0	±0.04	150

Note: Output current 10mA max. source, 1mA max. sink.

DC/DC SENSORS WITH 4.0 to 20.0 MILLIAMPS SOURCE OUTPUT ORDER GUIDE

Catalog Listing	Mtg. Dim. Fig.	Supply Voltage (DC)	Supply Current (mA max.)	Max. Sensed Current* (Amps-Peak)	Adjustable Operating Range				Offset Current (mA)	Offset Shift (%/°C)	Response Time (mSec. typ.)
					Min. Sens. (μA/NI)	Oper. Range (Amps)	Max. Sens. (μA/NI)	Oper. Range (Amps)			
CSLF4AD	1	10.5 to 24	30	57	280	57	552	29	4.0	±0.125	8
CSLF4AF	1	10.5 to 24	30	114	140	114	281	57	4.0	±0.125	8
CSLF4BG	2	10.5 to 24	30	148	108	148	216	74	4.0	±0.125	8
CSLF4FH	3	10.5 to 24	30	245	65	245	130	123	4.0	±0.125	8
CSLF4FL	3	10.5 to 24	30	490	32	490	65	245	4.0	±0.125	8

* Optimum accuracy is obtained when operating the sensor at maximum sensed current.

Adjustable Linear Current Sensors

AC/DC SENSORS WITH 4.0 TO 20.0 MILLIAMPS SOURCE OUTPUT ORDER GUIDE

Catalog Listing	Mtg. Dim. Fig.	Supply Voltage (DC)	Supply Current (mA max.)	Max. Sensed Current* (Amps-Peak)	Adjustable Operating Range				Offset Voltage (Volts)	Offset Shift (%/°C)	Response Time (mSec. typ.)
					Min. Sens. (μA/NI)	Oper. Range (Amps)	Max. Sens. (μA/NI)	Oper. Range (Amps)			
CSLF5AC	1	10.5 to 24	30	24	667	24	2000	8	4.0	±0.043	150
CSLF5AD	1	10.5 to 24	30	72	222	72	667	24	4.0	±0.043	150
CSLF5BE	2	10.5 to 24	30	92	174	92	516	31	4.0	±0.043	150
CSLF5FG	3	10.5 to 24	30	153	105	153	314	51	4.0	±0.043	150
CSLF5FK	3	10.5 to 24	30	408	39	408	118	136	4.0	±0.043	150
CSLF5FN	3	10.5 to 24	30	950	17	950	47	340	4.0	±0.043	150

* Optimum accuracy is obtained when operating the sensor at maximum sensed current.

MOUNTING DIMENSIONS

Dimensions shown are for reference only. Key: 0,0–mm / 0.00–in.

Fig. 1

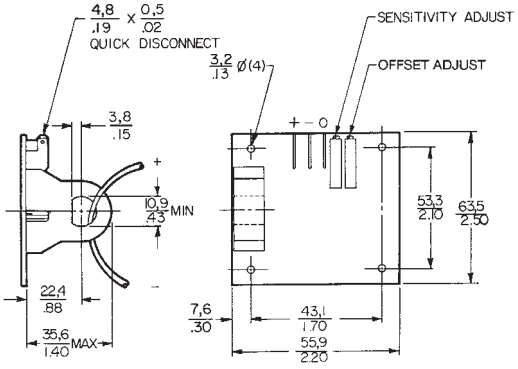


Fig. 2

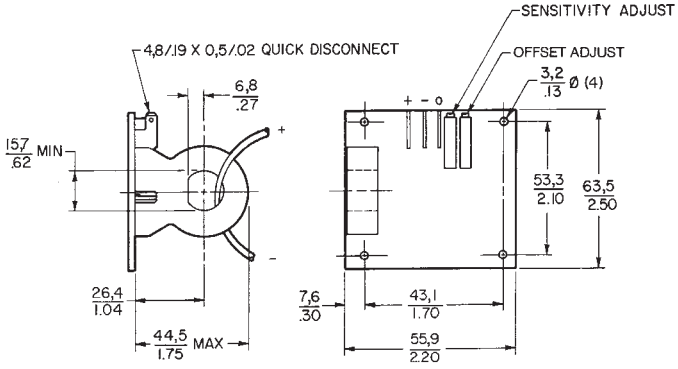
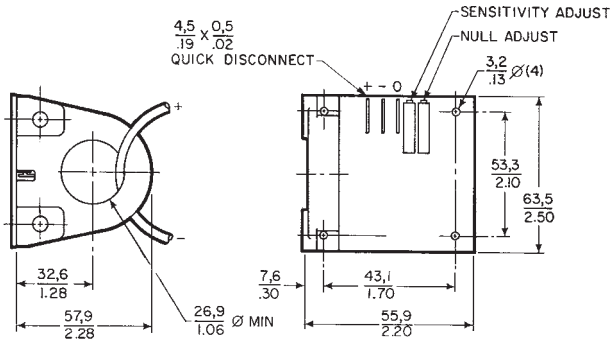
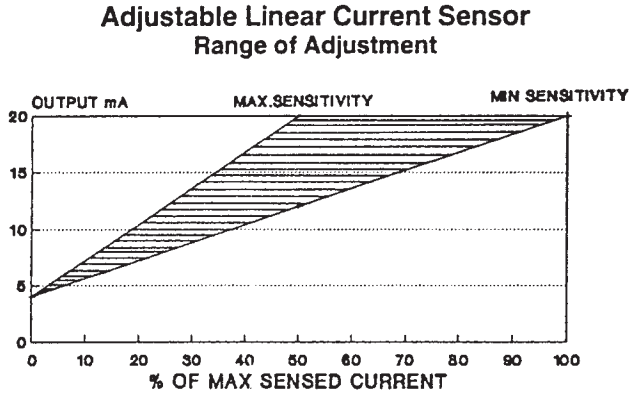


Fig. 3

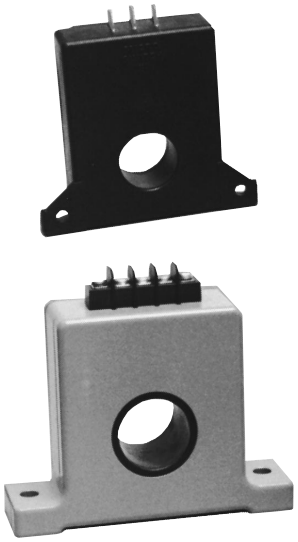




Solid State Sensors

CS Series

Industrial Enclosed Linear Current Sensors



TYPICAL APPLICATIONS

- In-line test equipment
- Automotive diagnostics (battery drain detector, alternator monitor)
- Ground fault detectors
- Motor overload protection
- Current monitoring of electric welders
- Energy management systems
- Protection of power semiconductors

FEATURES

- Adjustable operating range
- Industrial standard 1 to 5 VDC or 4 to 20 mA output
- Regulated power supply accepts 0.5 to 24 VDC input
- AC or DC current sensing
- Through-hole design
- Fast response time
- Output voltage isolation from input
- Minimum energy dissipation
- Sensors available with adjustable performance feature
- Built-in temperature compensation promotes reliable operation
- Operating temperature range: –25° to 85°C (–13° to 185°F)
- Accurate, low-cost sensing

DC/DC sensors provide a DC output voltage/current while sensing DC current. The offset voltage trimpot enables the offset to be either 1 volt or 4 milliamps. The full scale output voltage/current can be adjusted by using the sensitivity trimpot.

AC/DC sensors provide a DC output voltage while sensing AC current. The signal conditioning circuitry rectifies and filters the AC waveform into a 1.0 to 5.0 volt DC or a 4 to 20 mA output signal. The offset trimpot adjusts the offset at 1.0 volt or 4 mA. The sensitivity trimpot adjusts the maximum output voltage/current. These sensors can sense AC current from 50 to 1000 Hz. (AC/DC sensors without the adjustable performance feature are factory adjusted @ 60 Hz.)

GENERAL INFORMATION

CS Series solid-state industrial linear current sensors are completely enclosed to provide the circuitry and sensing elements a degree of protection from contaminants and physical damage. They detect variations iin the flow of either alternating (AC) or direct (DC) current. The sensor output easily interfaces with programmable controllers and other industrial control and monitoring devices.

While monitoring current flow up to 1,000 amperes, these sensors produce a linear output signal (1 to 5 volts DC or 4 to 20 milliamps). This signal duplicates the waveform of the DC current being sensed and responds to peak AC current levels. It is ideal for use as a feedback element to control a motor or regulate the amount of work being done by a machine.

NOTE: DC/DC sensors should be used to sense AC current when a DC bias is present.

NOTE: The input of AC/DC sensors is capacitive coupled. They **cannot** be used to sense DC current.

DC/DC SENSORS WITH 1.0 TO 5.0 VOLTS SINK/SOURCE OUTPUT ORDER GUIDE/OPERATING CHARACTERISTICS

Catalog Listing	Mtg. Dim. Fig.	Supply Voltage (DC)	Supply Current (mA max.)	Max. Sensed Current* (Amps-Peak)	Adjustable Operating Range				Offset Voltage (Volts)	Offset Shift (%/°C)	Response Time (mSec. typ.)
					Min. Sens. (mV/NI)	Oper. Range (Amps)	Max. Sens. (mV/NI)	Oper. Range (Amps)			
CSLE4HG	4	10.5 to 24	30	147	28	147	54	73	1.0	±0.092	0.008
CSLE4JH	5	10.5 to 24	30	245	17	245	32	122	1.0	±0.092	0.008
CSLE4JM	5	10.5 to 24	30	600	7	600	13	300	1.0	±0.092	0.008
CSLE4KM	6	10.5 to 24	30	600	7	600	—	—	1.0	±0.092	1.000
CSLE4KP	6	10.5 to 24	30	1200	4	1200	—	—	1.0	±0.063	1.000

Note: Output current 10mA max. source, 1mA max. sink.

AC/DC SENSORS WITH 1.0 TO 5.0 VOLTS SINK/SOURCE OUTPUT ORDER GUIDE

Catalog Listing	Mtg. Dim. Fig.	Supply Voltage (DC)	Supply Current (mA max.)	Max. Sensed Current* (Amps-Peak)	Adjustable Operating Range				Offset Voltage (Volts)	Offset Shift (%/°C)	Response Time (mSec. typ.)
					Min. Sens. (mV/NI)	Oper. Range (Amps)	Max. Sens. (mV/NI)	Oper. Range (Amps)			
CSLE5HE	4	10.5 to 24	30	92	44	92	1333	30	1.0	±0.04	150
CSLE5JG	5	10.5 to 24	30	153	27	153	78	51	1.0	±0.04	150
CSLE5JK	5	10.5 to 24	30	408	10	408	294	136	1.0	±0.04	150
CSLE5KQ	6	10.5 to 24	30	1500	3	1500	—	—	1.0	±0.04	150

Note: Output current 10mA max. source, 1mA max. sink.

Industrial Enclosed Linear Current Sensors

DC/DC SENSORS WITH 4.0 TO 20.0 MILLIAMPS SOURCE OUTPUT ORDER GUIDE

Catalog Listing	Mtg. Dim. Fig.	Supply Voltage (DC)	Supply Current (mA max.)	Max. Sensed Current* (Amps-Peak)	Adjustable Operating Range				Offset Amps (mA)	Offset Shift (%/°C)	Response Time (mSec. typ.)
					Min. Sens. (μA/NI)	Oper. Range (Amps)	Max. Sens. (μA/NI)	Oper. Range (Amps)			
CSLF4HG	4	10.5 to 24	30	147	109	147	219	73	4.0	±0.125	0.008
CSLF4JH	5	10.5 to 24	30	245	66	245	131	122	4.0	±0.125	0.008
CSLF4KM	6	10.5 to 24	30	600	27	600	—	—	4.0	±0.125	1.000
CSLF4KP	6	10.5 to 24	30	1200	14	1200	—	—	4.0	±0.085	1.000

*Optimum accuracy is obtained when operating the sensor at maximum sensed current.

AC/DC SENSORS WITH 4.0 TO 20.0 MILLIAMPS SOURCE OUTPUT ORDER GUIDE

Catalog Listing	Mtg. Dim. Fig.	Supply Voltage (DC)	Supply Current (mA max.)	Max. Sensed Current* (Amps-Peak)	Adjustable Operating Range				Offset Amps (mA)	Offset Shift (%/°C)	Response Time (mSec. typ.)
					Min. Sens. (μA/NI)	Oper. Range (Amps)	Max. Sens. (μA/NI)	Oper. Range (Amps)			
CSLF5HD	4	10.5 to 24	30	18	889	18	2666	6	4.0	±0.043	150
CSLF5HE	4	10.5 to 24	30	92	174	92	533	30	4.0	±0.043	150
CSLF5JG	5	10.5 to 24	30	153	105	153	313	51	4.0	±0.043	150
CSLF5JK	5	10.5 to 24	30	408	40	408	117	136	4.0	±0.043	150
CSLF5KQ	6	10.5 to 24	30	1500	11	1500	–	–	4.0	±0.043	150

*Optimum accuracy is obtained when operating the sensor at maximum sensed current.

MOUNTING DIMENSIONS

Dimensions shown are for reference only.

Key: 0,0 = mm / 0.00 = inches

Fig. 4 Plastic Housed

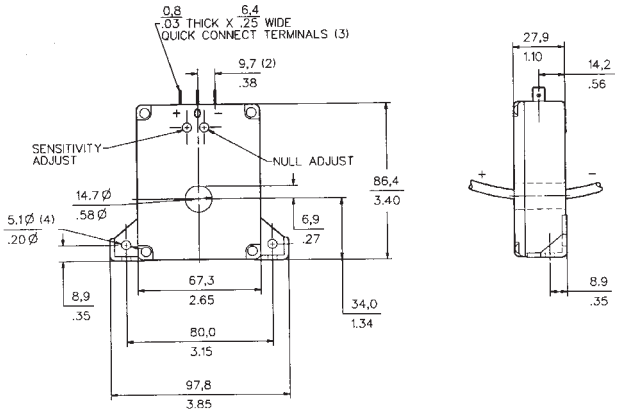


Fig. 5 Plastic Housed

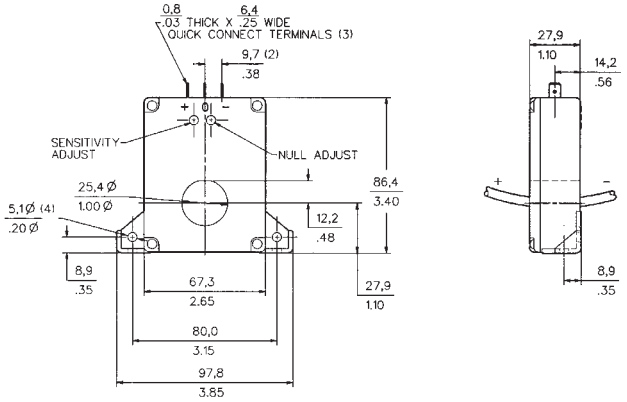
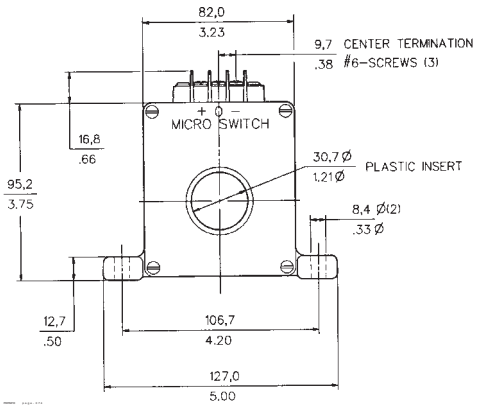
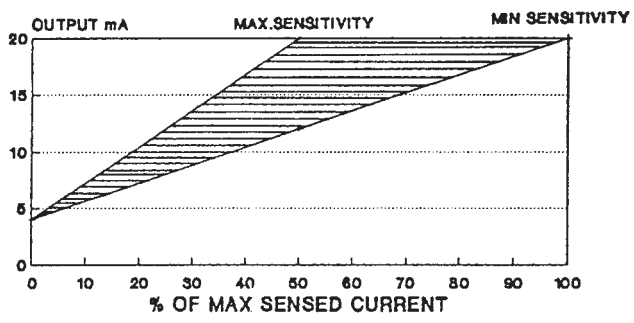


Fig. 6 Metal Housed



Adjustable Linear Current Sensor
Range of Adjustment



Honeywell

CSCA-A Series

Hall-Effect Based Open-Loop Current Sensors

DESCRIPTION

The CSCA-A Series of open-loop current sensors are based on the principles of the Hall-effect wherein a Hall-effect device (HED) produces an output voltage linearly related to the amplitude and phase of a magnetic field applied to it.

Current flowing through a primary conductor generates a rotating magnetic field around the conductor. This field is collector by a core of magnetically sensitive material and concentrated in the gap in this core. The HED is located in this core gap. Therefore, the HED output is directly proportional to the amplitude and phase of the primary current.

The HED output is trimmed for gain and offset calibration such that the CSCA-A Series sensor provides a predefined output sensitivity versus primary current.

FEATURES

- Measures ac, dc and impulse currents
- Competitive cost/performance ratio
- Low power consumption
- Compact size
- High level of electrical isolation between primary and secondary circuits
- Large primary aperture
- RoHs compliant
- CE, UL approvals (pending)

POTENTIAL APPLICATIONS

- Variable speed drives
- Ground fault detectors
- Current feedback control systems
- Robotics
- UPS and telecommunication power supplies
- Welding power supplies
- Automotive - Battery management systems
- Watt meters

CSCA-A Series

SPECIFICATIONS (all specifications are at ±15 Vdc supply and 25 °C [77 °F] ambient temperature unless otherwise specificed)

Characteristic	Symbol	Parameter
Nominal current	I_{PN}	See product selection guide
Peak measuring range (ac peak)	I_{PK}	See product selection guide
Nominal output voltage at I_{PN}	V_{SN}	4 V ± 1 %
Supply voltage	V_{cc}	±15 Vdc ± 5 %
Supply current	I_{cc}	17 mA typ.
Accuracy at I_{PN} [1]	X	≤ ±2 % of I_{PN}
Linearity [2]	E_I	< ±1 %
Zero current offset	V_O	≤ ±20 mV
Residual offset after I_{PN}	V_{OR}	≤ ±20 mV
Thermal drift of offset	V_{OT}	≤ ±3 mV/°C @ I_{PN} = 50 A ≤ ±1.5 mV/°C @ I_{PN} = 100 A to 600 A
Thermal drift of gain	V_{ST}	≤ ±4 mV/°C
Response time [3]	t_R	3 μs to 7 μs
di/dt accuracy followed	di/dt	≥ 50A/μs
Bandwidth	f	dc to 50 kHz
Isolation voltage	V_D	3 kV, 50 Hz, 60 sec
Rated insulation voltage	V_I	849 V reinforced
Output resistance	R_S	≥ 10 kOhm
Ambient operating temperature	T_A	-10 °C to 80 °C [14 °F to 176 °F]
Ambient storage temperature	T_S	-25 °C to 85 °C [-13 °F to 185 °F]

NOTES:

[1] For $I_P > I_{PN}$ then X is the same percentage value but of I_P

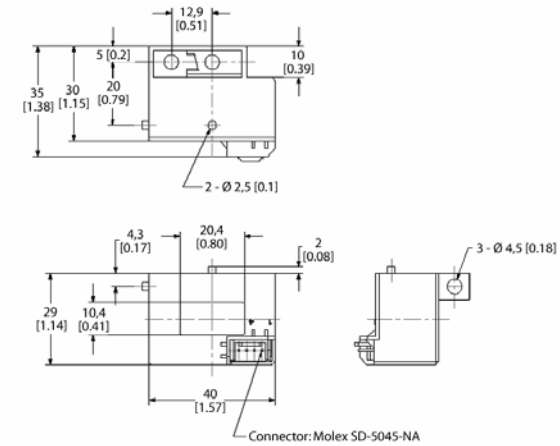
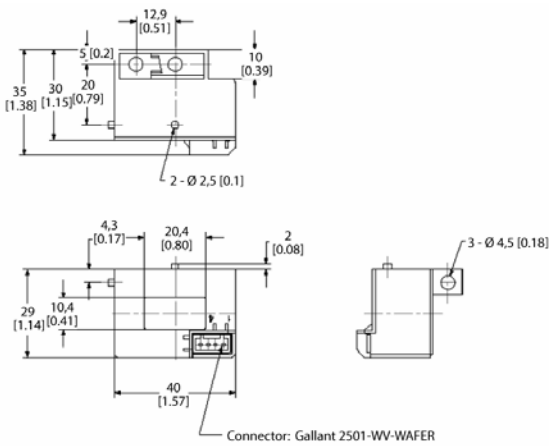
[2] Independent linearity per the Instrument Society of America

[3] At 90% of I_P

[4] Appropriate specification items defined using the guidance of EN50178

Hall-Effect Based Open Loop Current Sensors

MOUNTING DIMENSIONS (For reference only. mm)

CSCA-A-001	**CSCA-A-002**
	
Pins arrangement	**Pins arrangement**
1. + 15 V	1. + 15 V
2. - 15 V	2. - 15 V
3. Output	3. Output
4. Ground	4. Ground

ORDER GUIDE

Catalog listing	Description
CSCA0050A000B15B01	Hall-effect based, open-loop current sensor, Molex-type connector, 50 A rms nominal, ±150 A range
CSCA0100A000B15B01	Hall-effect based, open-loop current sensor, Molex-type connector, 100 A rms nominal, ±300 A range
CSCA0200A000B15B01	Hall-effect based, open-loop current sensor, Molex-type connector, 200 A rms nominal, ±600 A range
CSCA0300A000B15B01	Hall-effect based, open-loop current sensor, Molex-type connector, 300 A rms nominal, ±900 A range
CSCA0400A000B15B01	Hall-effect based, open-loop current sensor, Molex-type connector, 400 A rms nominal, ±900 A range
CSCA0500A000B15B01	Hall-effect based, open-loop current sensor, Molex-type connector, 500 A rms nominal, ±900 A range
CSCA0600A000B15B01	Hall-effect based, open-loop current sensor, Molex-type connector, 600 A rms nominal, ±900 A range
CSCA0050A000B15B02	Hall-effect based, open-loop current sensor, Gallant connector, 50 A rms nominal, ±150 A range
CSCA0100A000B15B02	Hall-effect based, open-loop current sensor, Gallant connector, 100 A rms nominal, ±300 A range
CSCA0200A000B15B02	Hall-effect based, open-loop current sensor, Gallant connector, 200 A rms nominal, ±600 A range
CSCA0300A000B15B02	Hall-effect based, open-loop current sensor, Gallant connector, 300 A rms nominal, ±900 A range
CSCA0400A000B15B02	Hall-effect based, open-loop current sensor, Gallant connector, 400 A rms nominal, ±900 A range
CSCA0500A000B15B02	Hall-effect based, open-loop current sensor, Gallant connector, 500 A rms nominal, ±900 A range
CSCA0600A000B15B02	Hall-effect based, open-loop current sensor, Gallant connector, 600 A rms nominal, ±900 A range

⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

MISUSE OF DOCUMENTATION

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WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

E-mail: info.sc@honeywell.com

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	+44 (0) 1698 481676 Fax
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	+1-815-235-6847
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February 2007

Honeywell

CSLS Series

Miniature Open-Loop Current Sensors

DESCRIPTION

Honeywell's CSLS Series miniature, open-loop current sensors incorporate our SS490 Series miniature ratiometric linear Hall-effect sensor (MRL™). The sensing element is encapsulated in a printed circuit board-mountable plastic package.

The combination of sensor, flux collector and housing comprises the current sensor assembly. These sensors are ratiometric.

FEATURES

- Open-loop, through-hole design
- Output voltage isolation from input
- ac or dc current sensing
- Linear ratiometric output
- Current sinking or sourcing output for interfacing flexibility
- Fast response time
- Compact size
- Accurate, low-cost sensing
- Minimum energy dissipation
- Maximum current limited only by conductor size
- Built-in temperature compensation promotes reliable operation
- Operating temperature range -25 °C to 100 °C [-13 °F to 212 °F]
- RoHs compliant (lead-free)

POTENTIAL APPLICATIONS

- Motor control in appliances, HVAC and consumer tools
- Current monitoring of electronic circuits
- Overcurrent protection
- Ground fault detectors
- Robotics
- Industrial process control
- UPS and telecommunication power supplies
- Welding current monitoring
- Battery management systems in mobile equipment
- Watt meters
- Variable speed drives

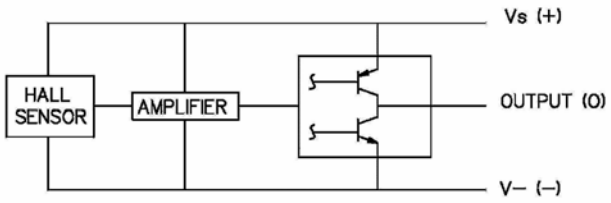
CSLS Series

PRODUCT SPECIFICATIONS

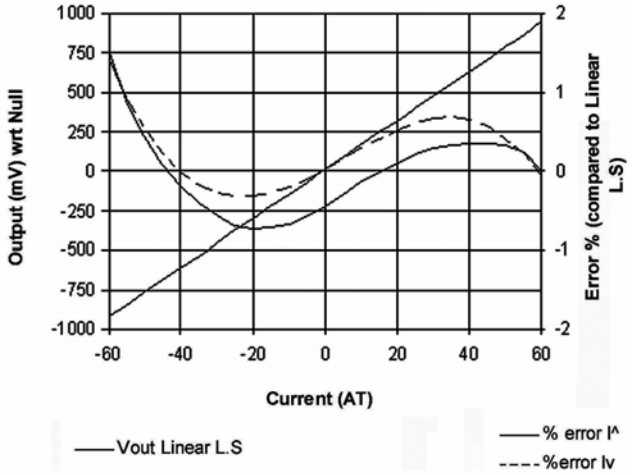
Product type	miniature hall-effect linear open-loop current sensor
Package quantity/type	25 per box
Package style	PC board mount – radial lead IC
Supply voltage	4.5 Vdc to 10.5 Vdc
Output type	sink/source
Magnetic actuation type	analog ratiometric

Parameter	Symbol	Min.	Typ.	Max.	Units	Condition
Current range	Ip	±60	—	—	AT	<±1.5 % error (-25 °C to 100 °C [-13 °F to 212 °F])
Supply voltage	V_s	4.5	5	10.5	V	—
V_{out} @ 0 NI	V_o	2.35	2.5	2.65	V	—
Supply current	I_s		7	9	mA	no load
Sensitivity	ΔV/I	15	17	19	mV/AT	-25 °C to 100 °C [-13 °F to 212 °F]
Hysteresis	—	—	—	0.5	%	±60 A
Temp error - null	$TC_{\Delta Vo/Vo}$	-0.064	—	0.064	%/°C	—
Temp error - gain	TC_G	-0.03	—	0.12	%/ °C	-25 °C to 100 °C [-13 °F to 212 °F]
Rise time	t_r	—	3	—	µs	0 A to 2.0 A

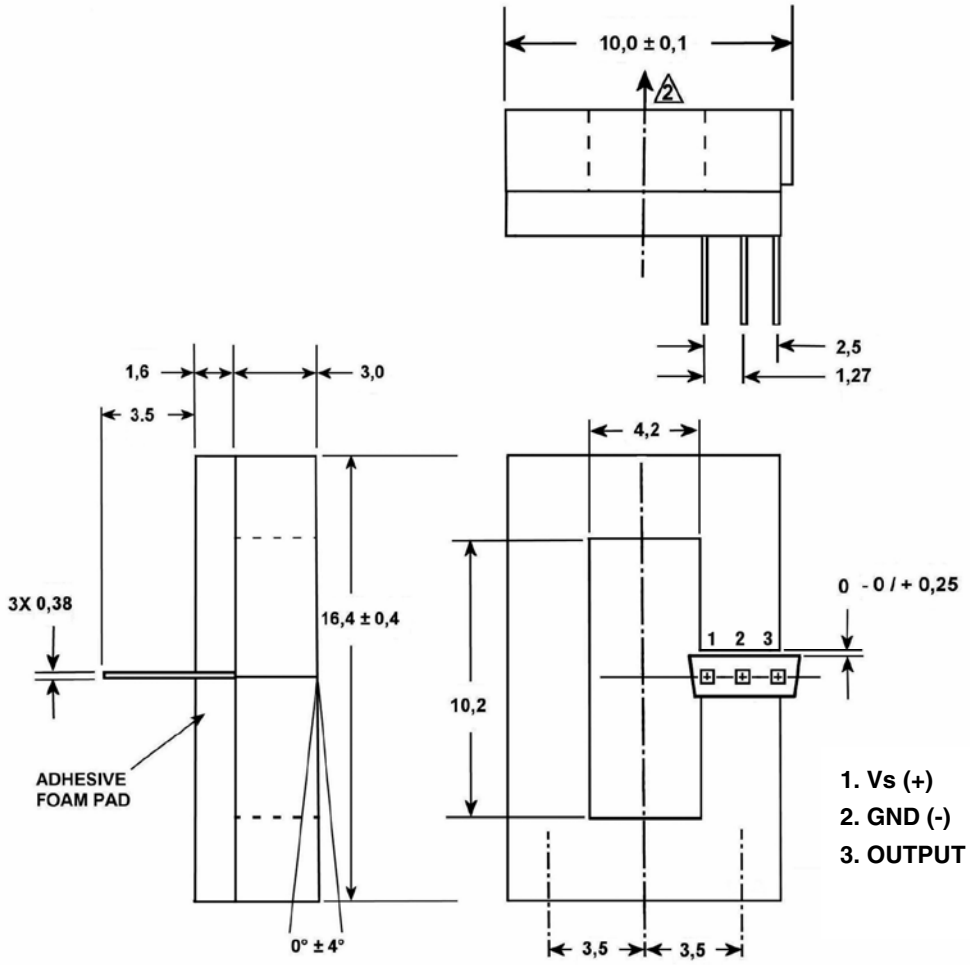
BLOCK DIAGRAM



CSLS6B60 TYPICAL TRANSFER FUNCTION [25 °C]



DIMENSIONAL DRAWING (For reference only [mm])



ORDER GUIDE

Catalog Listing	Description
CSLS6B60	CSLS Series, Miniature, Open-Loop Current Sensor, 60 A

⚠ WARNING

PERSONAL INJURY

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Failure to comply with these instructions could result in death or serious injury.

WARRANTY/REMEDY

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SALES AND SERVICE

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	+44 (0) 1698 481676 Fax
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	+1-305-883-8257 Fax
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	+1-815-235-6847
	+1-815-235-6545 Fax

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www.honeywell.com/sensing

Honeywell

005863-1-EN IL50 GLO Printed in USA
November 2005

Honeywell

CSLT Series

Miniature, Open-Loop Current Sensors

DESCRIPTION

Honeywell's CSLT Series miniature, open-loop current sensors incorporate our SS490 Series miniature ratiometric linear Hall-effect sensor (MRL™). The sensing element is encapsulated in a printed circuit board-mountable plastic package.

The combination of sensor, flux collector and housing comprises the current sensor assembly. These sensors are ratiometric.

FEATURES

- Open-loop, through-hole design
- Output voltage isolation from input
- ac or dc current sensing
- Linear ratiometric output
- Current sinking or sourcing output for interfacing flexibility
- Fast response time
- Compact size
- Accurate, low-cost sensing
- Minimum energy dissipation
- Maximum current limited only by conductor size
- Built-in temperature compensation promotes reliable operation
- Operating temperature range -25 °C to 100 °C [-13 °F to 212 °F]
- RoHs compliant (lead-free)

POTENTIAL APPLICATIONS

- Motor control in appliances, HVAC and consumer tools
- Current monitoring of electronic circuits
- Overcurrent protection
- Ground fault detectors
- Robotics
- Industrial process control
- UPS and telecommunication power supplies
- Welding current monitoring
- Battery management systems in mobile equipment
- Watt meters
- Variable speed drives

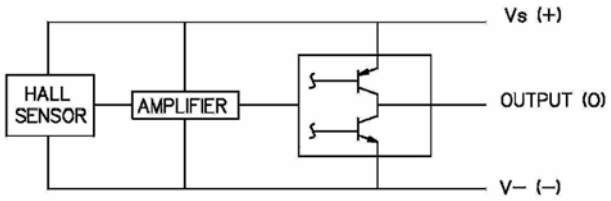
CSLT Series

PRODUCT SPECIFICATIONS

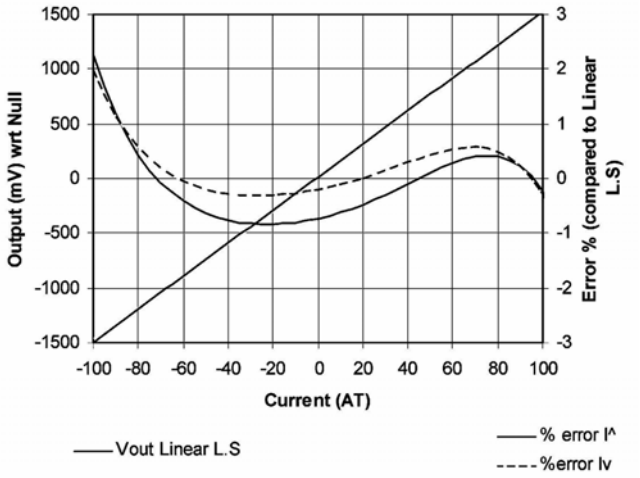
Product type	miniature hall-effect linear open-loop current sensor
Package quantity/type	25 per box
Package style	PC board mount – radial lead IC
Supply voltage	4.5 Vdc to 10.5 Vdc
Output type	sink/source
Magnetic actuation type	analog ratiometric

Parameter	Symbol	Min.	Typ.	Max.	Units	Condition
Current range	Ip	±100	—	—	AT	<±1.5 % error (-25 °C to 100 °C [-13 °F to 212 °F])
Supply voltage	V_s	4.5	5	10.5	V	—
V_{out} @ 0 NI	V_o	2.35	2.5	2.65	V	—
Supply current	I_s	—	7	9	mA	no load
Sensitivity	ΔV/I	13.5	16	18.5	mV/AT	-25 °C to 100 °C [-13 °F to 212 °F]
Hysteresis	—	—	—	0.5	%	±100 A
Temp error - null	$TC_{\Delta Vo/Vo}$	-0.064	—	0.064	%/°C	—
Temp error - gain	TC_G	-0.03	—	0.12	%/ °C	-25 °C to 100 °C [-13 °F to 212 °F]
Rise time	t_r	—	3		µs	0 A to 2.0 A

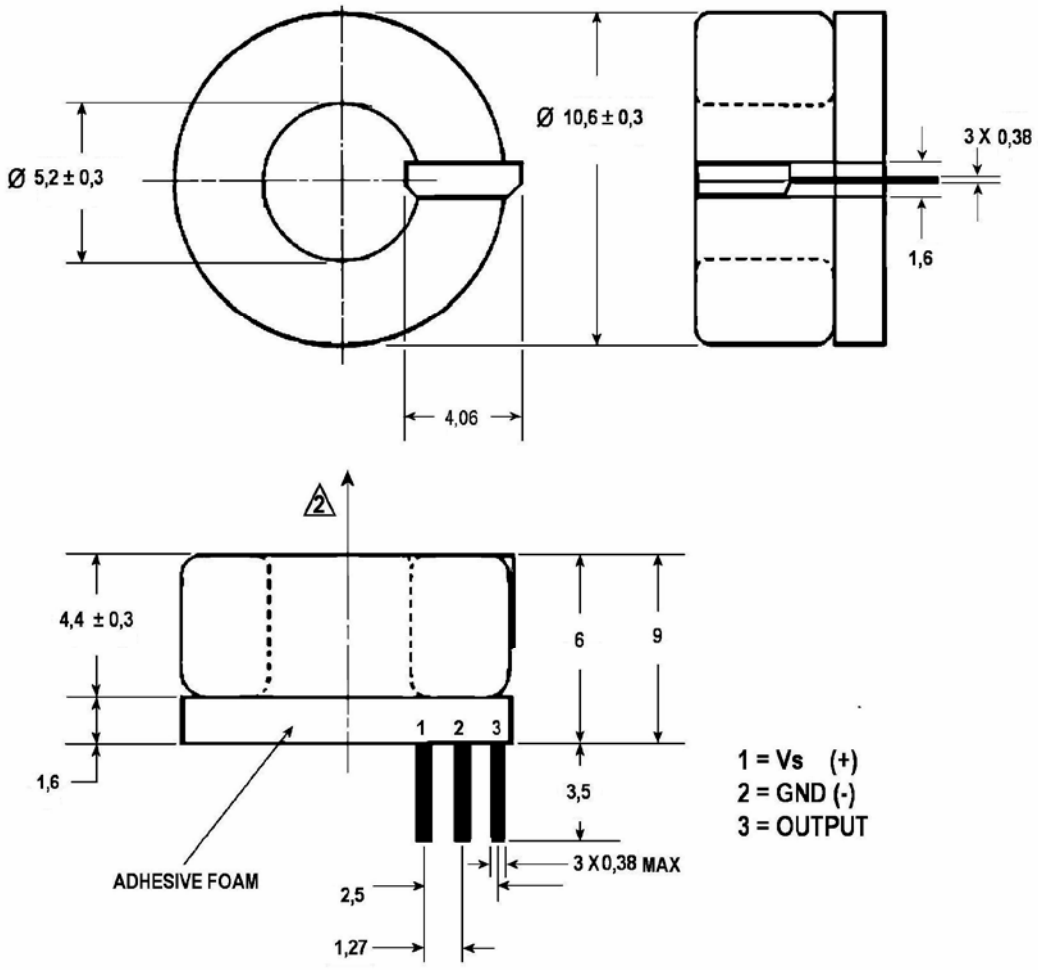
BLOCK DIAGRAM



CSLT6B100 TYPICAL TRANSFER FUNCTION [25 °C]



DIMENSIONAL DRAWING (For reference only [mm])



ORDER GUIDE

Catalog Listing	Description
CSLTB100	CSLT Series, Miniature, Open-Loop Current Sensor, 100 A

⚠ WARNING

PERSONAL INJURY

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WARRANTY/REMEDY

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Internet: www.honeywell.com/sensing

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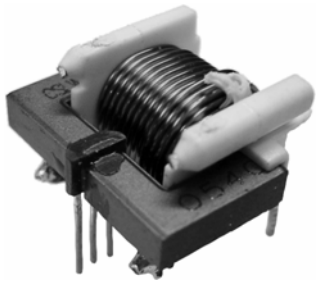
November 2005

Honeywell

CSLW Series

Miniature Wired Open-Loop Current Sensors



DESCRIPTION

Honeywell's CSLW Series miniature, open-loop current sensors incorporate our SS490 Series miniature ratiometric linear Hall-effect sensor (MRL™). The sensing element is encapsulated in a printed circuit board-mountable plastic package.

The combination of sensor, flux collector, housing, and wire coil comprises the current sensor assembly. These sensors are ratiometric.

FEATURES

- Wired open-loop design with multiple turns for increased sensitivity
- ac or dc current sensing
- Linear ratiometric output
- Current sinking or sourcing output for interfacing flexibility
- Low insertion loss
- Fast response time
- Compact size for applications with limited space
- Accurate, low-cost sensing
- Minimum energy dissipation
- Maximum current limited only by conductor size
- Built-in temperature compensation promotes reliable operation
- Operating temperature range -25 °C to 100 °C [-13 °F to 212 °F]
- RoHs compliant (lead-free)

POTENTIAL APPLICATIONS

- Motor control in appliances, HVAC and consumer tools
- Current monitoring of electronic circuits
- Overcurrent protection
- Ground fault detectors
- Robotics
- Industrial process control
- UPS and telecommunication power supplies
- Welding current monitoring
- Battery management systems in mobile equipment
- Watt meters
- Variable speed drives

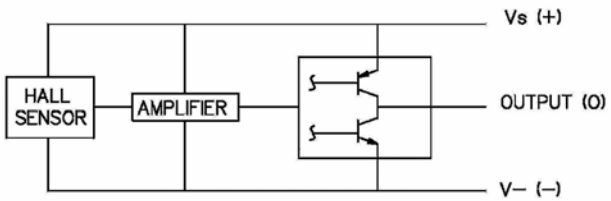
CSLW Series

PRODUCT SPECIFICATIONS

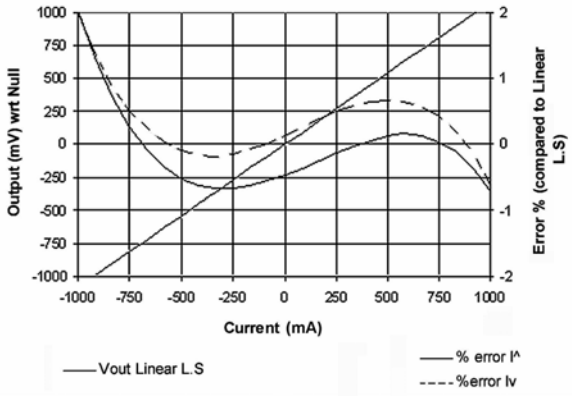
Product type	miniature hall-effect linear open-loop current sensor
Package quantity/type	25 per box
Package style	PC board mount – radial lead IC
Supply voltage	4.5 Vdc to 10.5 Vdc
Output type	sink/source
Magnetic actuation type	analog ratiometric

Parameter		CSLW6B1	CSLW6B5	CSLW6B40M	CSLW6B200M	Units	Symbol	Conditions
Current range (min.)		±1 A	±5 A	±40 mA	±200 mA	—	Ip	<±1.5 % error (-25 °C to 100 °C [-13 °F to 212 °F])
Supply voltage		4.5 to 10.5	4.5 to 10.5	4.5 to 10.5	4.5 to 10.5	V	V_s	—
V_{out} @ 0 AT		2.50 ±0.15	2.50 ±0.15	2.50 ±0.15	2.50 ±0.15	V	V_o	—
Supply current	**typ.**	7	7	7	7	mA	I_s	No Load
	max.	9	9	9	9			
Turns		60 ±1	12	1500 ±20	300 ±5	—	N	—
Coil resistance	**typ.**	0.16	0.01	120	4	Ω	—	—
Sensitivity	**min.**	898	179	22400	4500	mV/A	Δ V/ I	-25 °C to 100 °C [-13 °F to 212 °F]
	typ.	1020	204	25500	5100			
	max.	1142	229	30000	5700			
Hysteresis	**max.**	0.5	0.5	0.5	0.5	%	—	@ min current range
Temp error – null	**max.**	±0.064	±0.064	±0.064	±0.064	%/°C	$TC_{\Delta Vo/Vo}$	—
Temp error - gain	**max.**	-0.03 +0.12	-0.03 +0.12	-0.03 +0.12	-0.03 +0.12	%/°C	TC_G	-25 °C to 100 °C [-13 °F to 212 °F]
Rise time	**typ.**	3	3	3	3	µs	t_r	0 to 40% of min current range

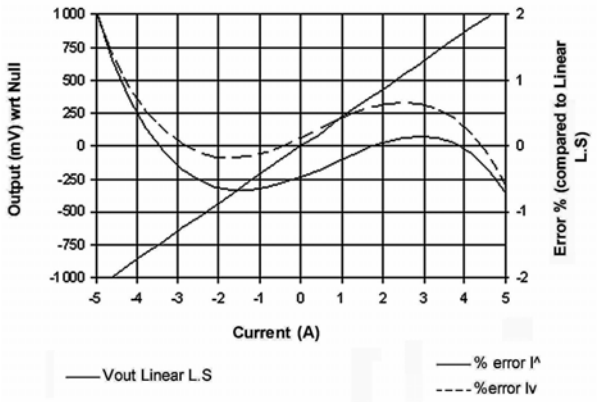
BLOCK DIAGRAM



CSLW6B1 TYPICAL TRANSFER FUNCTION [25 °C]

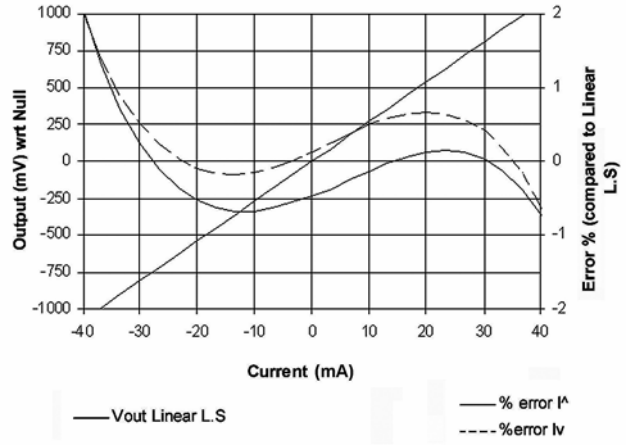


CSLW6B5 TYPICAL TRANSFER FUNCTION [25 °C]

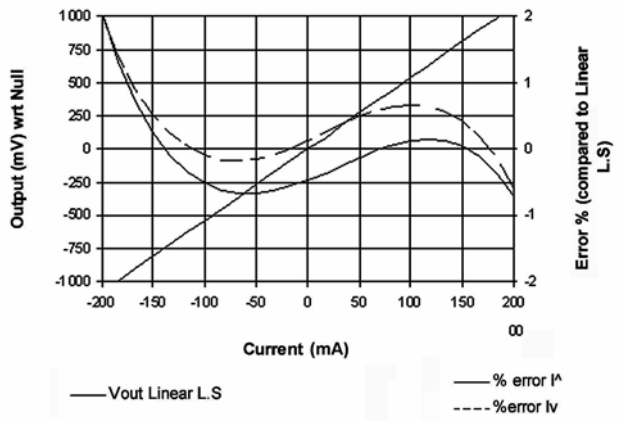


Miniature Wired Open-Loop Current Sensors

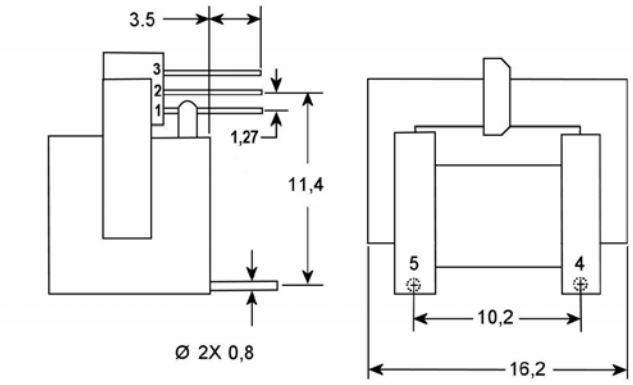
CSLW6B40M TYPICAL TRANSFER FUNCTION [25 °C]



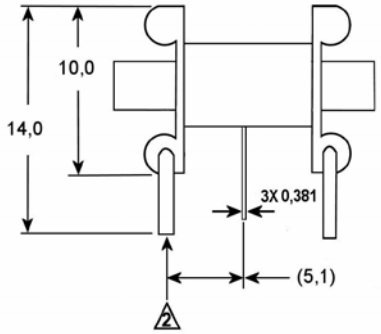
CSLW6B200M TYPICAL TRANSFER FUNCTION [25 °C]



DIMENSIONAL DRAWING (For reference only [mm])



PIN OUT
1 Vs (+)
2 GND (-)
3 OUT (O)
4 PRIMARY Iout
5 PRIMARY Iin



ORDER GUIDE

Catalog Listing	Description
CSLW6B1	CSLW Series, Miniature, Open-Loop Current Sensor, 1 A
CSLW6B5	CSLW Series, Miniature, Open-Loop Current Sensor, 5 A
CSLW6B40M	CSLW Series, Miniature, Open-Loop Current Sensor, 40 mA
CSLWB200M	CSLW Series, Miniature, Open-Loop Current Sensor, 200 mA

⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

⚠ WARNING

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SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

E-mail: info.sc@honeywell.com

Internet: www.honeywell.com/sensing

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005861-1-EN IL50 GLO Printed in USA
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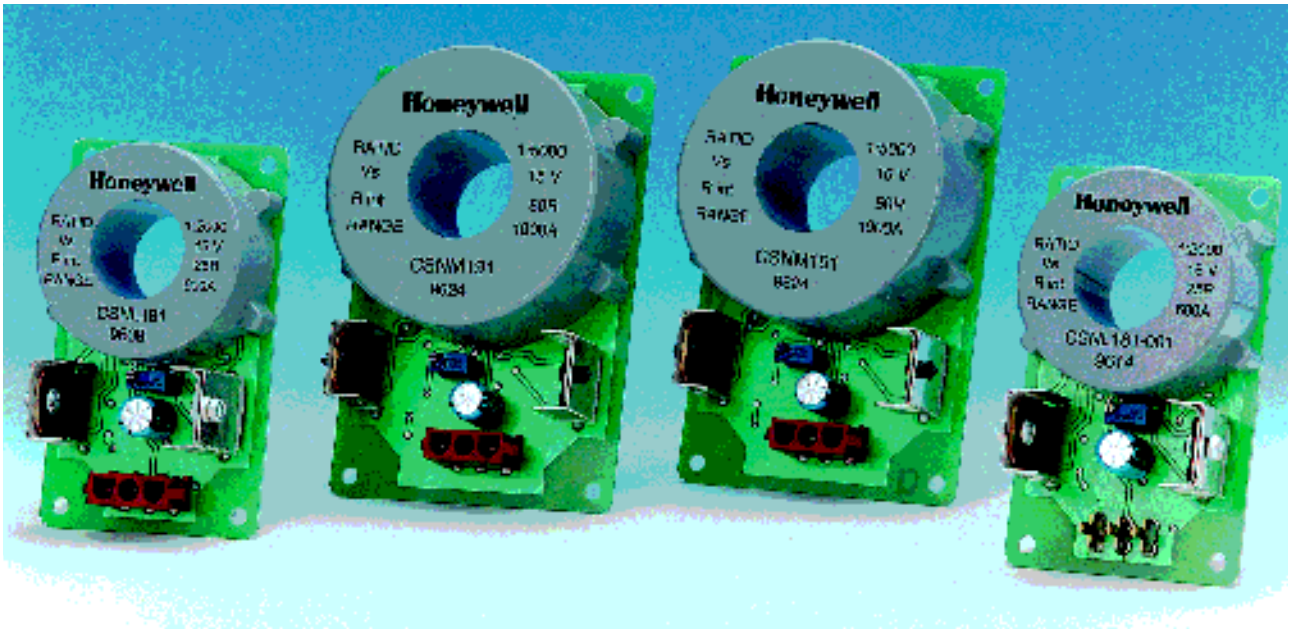
Honeywell

CSN Series
Hall Effect Current Sensors



FEATURES

- Current sensing up to 1000A
- Measures DC, AC and impulse currents
- Very fast response
- High overload capability
- Extended temperature range -40°C to +85°C
- Different termination styles
- Optional conformal coating

BENEFITS

- Increased measuring range in compact package
- No restriction on input current waveform
- Output signal accurately tracks changes in input signal
- Sensor integrity unaffected
- Improved reliability
- Flexibility of connection style
- Provides additional protection to the sensors

DESCRIPTION

These new industrial current sensors extend Honeywell's closed loop current sensing capability. They offer increased current measuring capability up to 1000Aover an extended temperature range of -40°C to +85°C and are available with different terminal options.

The sensors are closed loop devices based on the principle of the hall effect and null balance method. The output from the current sensor is the balancing current which is a perfect image of the primary current reduced by the number of secondary turns at any time. This current can be expressed as a voltage by passing it through a resistor.

TYPICAL APPLICATIONS

- Variable speed drives
- Overcurrent protection
- Power supplies
- Feedback control systems
- Robotics
- Welding equipment

PERFORMANCE DATA

Definition

Acurrent transducer based on the principle of magnetic compensation. It provides electronic measurement of DC, AC, pulsed currents and their combinations with galvanic isolation between the primary (high current) and secondary circuits.

Electrical Data

		CSNL181 - XXX			CSNM191 - XXX	
Nominal current (In)		: 300 Arms			: 500 Arms	
Measuring range		: 0 to ±600 A			: 0 to ±1000 A	
Measuring Resistance (Rm)		: Rm min	Rm max		: Rm min	Rm max
with ±15V	at ±300 A.t max	: 0 ohm	50 ohm	at ±500 A.t max	: 0 ohm	50 ohm
	at ±600 A.t max	: 0 ohm	10 ohm	at ±1000 A.t max	: 0 ohm	5 ohm
Nominal analogue output current		: 150 mA			: 100 mA	
Turns Ratio		: 1/2000			: 1/5000	
Overall accuracy at +25°C		: ±0.5% on In			: ±0.5% of In	
Supply Voltage		: ±12V to 18V (±5%)			: ±12V to ±18V (±5%)	
Isolation between primary and secondary		: 7.5 kV rms/50 Hz/1 min			: 6.0 kV rms/50 Hz/1 min	
Accuracy - Dynamic Performance						
Zero offset current at +25°C		: Max ±0.3 mA			: Max ±0.2 mA	
Thermal drift of offset current, between 0°C to +70°C		: Typ ±0.3 mA; Max ±0.5 mA			: Typ ±0.2 mA; Max ±0.3 mA	
Linearity		: better than ±0.1%			: better than ±0.1%	
Response time		: better than 500nS			: better than 1µs	
di/dt accurately followed		: better than 50 A/µs			: better than 50 A/µs	
Bandwidth		: DC to 150 KHz			: DC to 100 KHz	
General data						
Operating temperature		: -40°C to +85°C (-40°F to +185°F)			: -40°C to +85°C (-40°F to +185°F)	
Storage temperature		: -40°C to +90°C (-40°F to +194°F)			: -40°C to +90°C (-40°F to +194°F)	
Current consumption		: Typ 14mA(±18V) + output current			: Typ 14mA(±18V) + output current	
Secondary internal resistance		: 25 ohm (at 70°C)			: 50 ohm (at 70°C)	
Sensor Housing		: Insulated plastic case (Bayblend FR1468)			: Insulated plastic case (Bayblend FR1468)	
Signal sense		: a positive output current is obtained on terminal O/Pwhen the primary current flows in the direction of the arrow			: a positive output current is obtained on terminal O/Pwhen the primary current flows in the direction of the arrow	
EMC		: EN50081-2, EN 50082-2			: EN50081-2, EN 50082-2	

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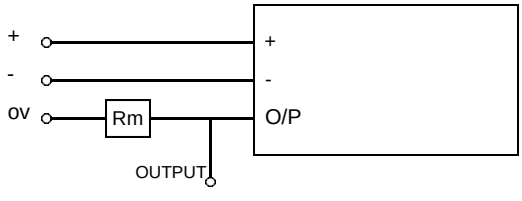
Electrical Connection



Termination

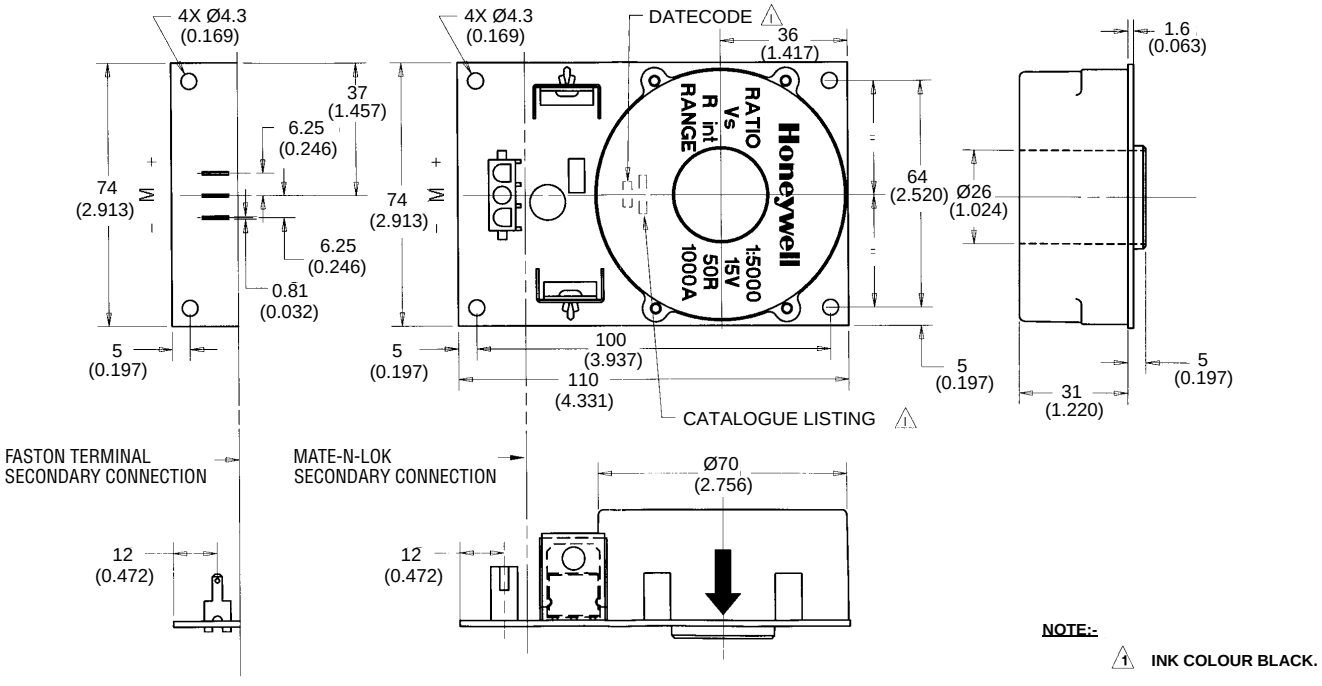
300A: Supply Voltage ±12V to ±18V

500A: Supply Voltage ±12V to ±18V

O/PMeasured output signal

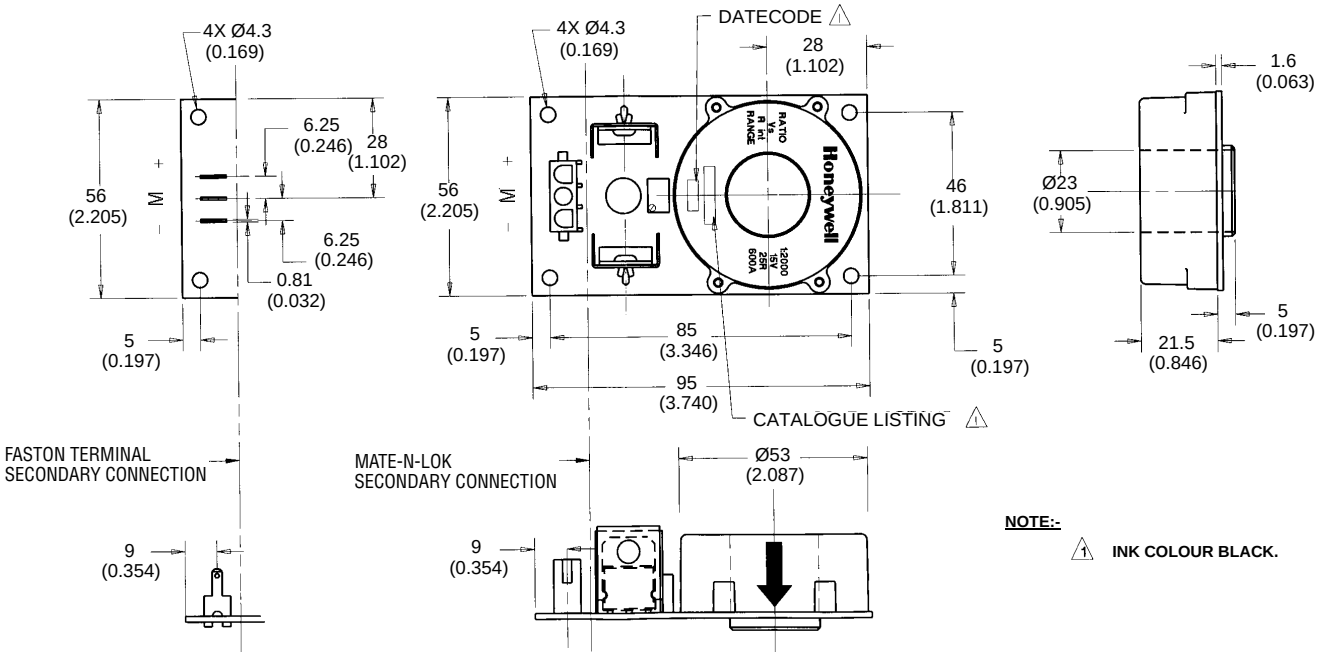
CHARACTERISTICS		
Catalogue Listing	**Secondary Connection**	**Conformal Coating**
CSNL181	**Amp 3-Way Pin Mate-N-Lok Connector**	**No**
CSNL181-001	**Amp Tab, 2.79(.110) Series Faston Terminal**	**No**
CSNL181-002	**Amp 3-Way Pin Mate-N-Lok Connector**	**Humiseal 1R32**
CSNL181-003	**Amp Tab, 2.79(.110) Series Faston Terminal**	**Humiseal 1R32**
CSNM191	**Amp 3-Way Pin Mate-N-Lok Connector**	**No**
CSNM191-001	**Amp Tab, 2.79(.110) Series Faston Terminal**	**No**
CSNM191-002	**Amp 3-Way Pin Mate-N-Lok Connector**	**Humiseal 1R32**
CSNM191-003	**Amp Tab, 2.79(.110) Series Faston Terminal**	**Humiseal 1R32**

MOUNTING DIMENSIONS IN MM AND (INCHES)



NOTE:-

1 **INK COLOUR BLACK.**



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Honeywell

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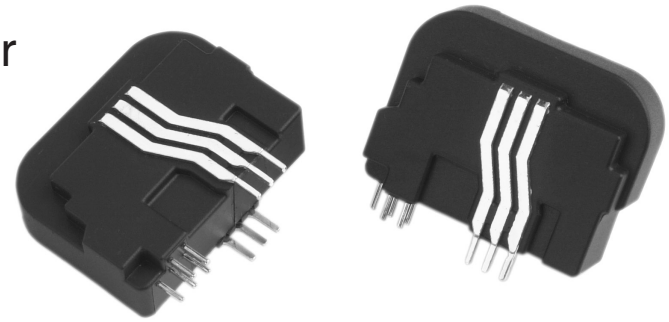
100418-1-EN GLO 12/97

Printed in the United Kingdom

CSN Series Magnetoresistive (MR) Closed Loop Current Sensor



Features

- Ultra low offset drift with temperature
- Unipolar voltage supply
- Superior global accuracy over temperature range -40 °C to 85 °C
- Customer adjustable gain
- Customer accessible voltage reference
- Self calibrating
- Designed for auto assembly
- Current output

Typical applications

- Servo drives
- Variable speed drives
- Frequency converters
- Power supply systems
- Over current protection
- Uninterruptible power supplies UPS
- Power metering

The CSN Series MR current sensor builds on patented Honeywell technology to offer superior sensor performance and accuracy in current measuring applications.

The current sensor utilises an ASIC (Application Specific Integrated Circuit) and a magnetoresistive (MR) Honeywell magnetic sensor to provide extremely low offset drift with temperature resulting in stable, repeatable, accurate measurements. This is achieved by using an ASIC to exploit the unique features of the MR sensor. There is virtually no offset drift over the entire operating temperature range.

The sensor operates from a +5 V unipolar supply and has an accessible, internal 2.5 V voltage reference. The sensor can operate from either the internal voltage reference or an external voltage reference, thus enabling several sensors to be used without offset imbalance. Three primary pins enable the sensor to be configured for different measuring ranges and the current output signal enables different load resistors to be used depending on the application.

The sensor offers flexibility and performance to meet many applications.

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CSN Series MR Current Sensor

Technical information

Supply voltage is +5 V and temperature is 25 °C unless otherwise stated

Electrical

Nominal current (In)		25 A.t rms	
Measuring range		0 to ± 56 A.t [1]	
Measuring resistance [2]		Rm min.	Rm max.
with +5 V	@ ± 25 A.t rms	0 Ohm	80 Ohm
	@ ± 40 A.t rms	0 Ohm	31 Ohm
Nominal analogue output current		12.5 mA rms	
Turns ratio		1-2-3/2000	
Accuracy [3] @ 25 °C		max. ± 0.24 % @ In	
@ -40 °C to 85 °C		max. ± 0.32 % @ In	
Supply voltage		+5 Vdc (± 5 %)	
Internal reference voltage		+2.5 Vdc (± 10 mV)	
Galvanic isolation		5.0 kV rms/50 Hz/1 minute	

Accuracy - dynamic performance

Zero offset current at 25 °C	< ± 30 uA *(= 0.24 % of 25 A)*
Thermal drift of offset current 10 °C to 50 °C	< ± 5 uA *(= 0.04 % of 25 A)*
Thermal drift of offset current -40 °C to 85 °C	< ± 10 uA *(= 0.08 % of 25 A)*
Linearity	< ± 0.1 %
Response time @ 90 % of pulse amplitude	< 200 ns
di/dt accurately followed	> 100 A/us
Bandwidth (-1 dB)	dc to 200 kHz

General data

Operating temperature	-40 °C to 85 °C
Storage temperature	-40 °C to 90 °C
Current consumption	12 mA (+5 V) plus output current
Secondary internal resistance (@ 70 °C)	50 Ohm
Positive primary current	In direction of arrow
Sensor housing	Glass-filled Polyamide (UL94-V0)
Approvals	EN 50082-2, EN 50081-2, UL, CE
Rated insulation voltage (RIV)/Insulation classification	400 V reinforced
Dimensions [L x W x H] (mm)	34 x 12,6 x 25,5
Construction	Fully encapsulated
Environment	Pollution degree 2, Category III
Fastening	PCB mounted sensor
Weight	20 g
Connection to primary	Via 6 x 0,8 mm square pins
Connection to secondary	Via 5 x 0,64 mm square pins

Notes

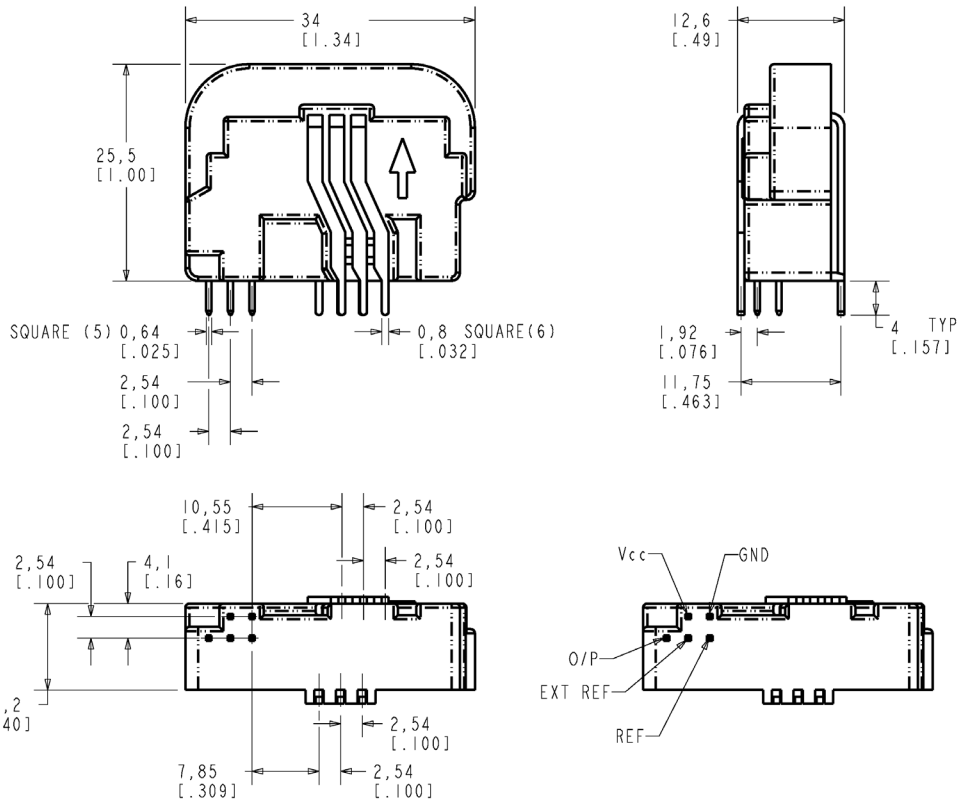
[1] ac peak. Maximum dc or ac rms range is 40 A.t.

[2] Higher resistance (Rm) values can be used with reduced measuring range. Specified values conditional on 70 °C ambient and no power supply tolerance.

[3] Excludes the effects of tolerances of reference voltage and external load resistance.

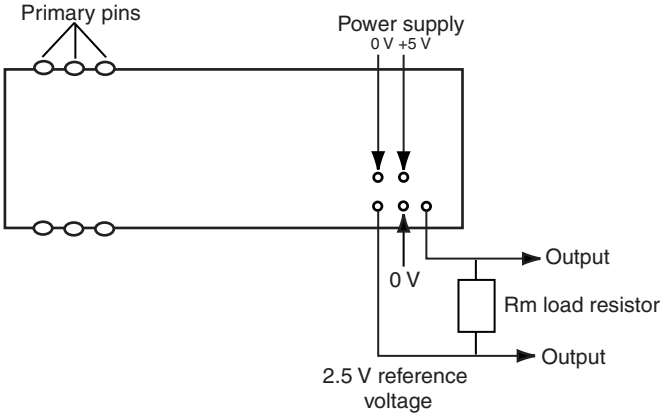
CSN Series MR Current Sensor

Mounting drawing in mm and [inches]

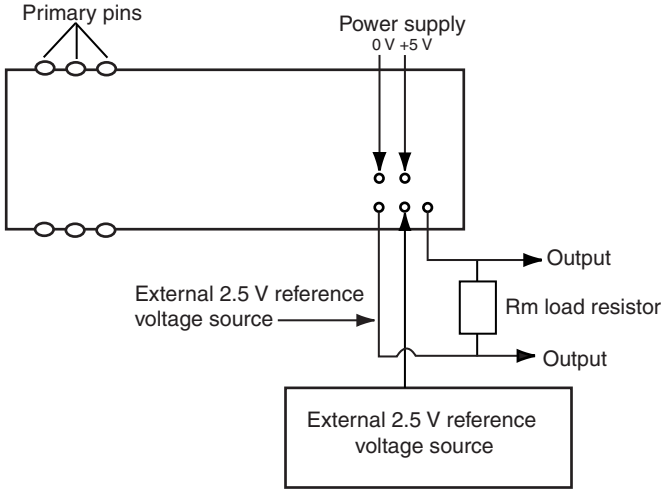


Electrical wiring diagram

Internal voltage reference mode



External voltage reference mode



Order guide

Description	Listing
25 A MR current sensor	CSNX25

Performance Parameter Definition

Nominal Current

The maximum virtual value current can be measured in full temperature range. It was defined as A*Ts (ampere*turns) due to primary ampere effective was multiplied by primary turns and output current is proportional to ampere*turns measured.

The current sensor is sensitive to the primary current linkage With Np: the number of primary turns (1 to 3 depending upon the connection of the primary jumpers).

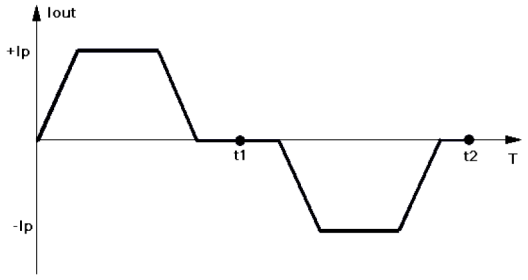
Measuring Range

The maximum peak current can be measured in full temperature range, but not continually.

Offset Current

The offset current can either be measured when the magnetic core of the transducer are:

- Completely demagnetized, and measure offset directly
- In known Magnetization state caused by a cycle current as below:



Using the current cycle as shown above, the offset was calculated as:

$I_{offset} = (I_1 + I_2) / 2$
I_1 = Output current at t1
I_2 = Output current at t2

Residual current

Due to hysteresis of magnetic material used, the residual current I_M is the consequence of a current on the primary side and appears as an additional error of offset current. Using the current cycle same as above offset definition, the residual current can be calculated as:

$I_{OM} = (I_1 - I_2) / 2$
I_1 = Output current at t1
I_2 = Output current at t2

NOTE: I_{OM} depends on the current value I_P.

Thermal Drift

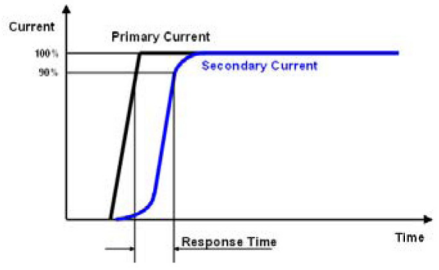
The thermal drift of the offset current is the variation of the offset from 25 °C to the considered temperature:

$I_{OT} = I_T - I_0$
I_T = Output current at temperature T without primary current
I_0 = Output current at temperature 25 °C without primary current

NOTE: all data are exclude residual current, the current sensor has to be demagnetized prior to the application of the current cycle (for example with a demagnetization tunnel).

Response Time

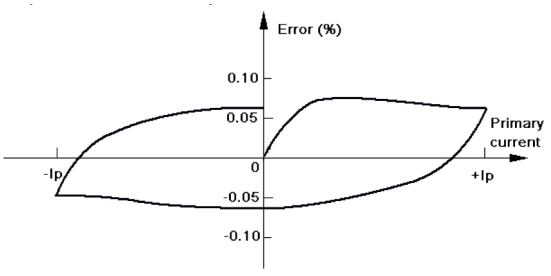
The response time t_r is shown in the figure below. Response time is related with both product performance and primary current di/dt. So, they are measured at nominal ampere-turns and maximum di/dt.



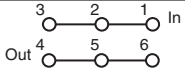
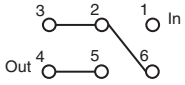
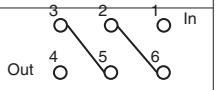
Linearity

Increasing the primary current (DC) from 0 to Ip, then decreasing to 0; and then increasing to -Ip and back to 0, the step of increasing/decreasing is 10 % of Ip.

The linerity error ε_L was defined as the maximum difference between whether positive or negative measured points and the linear regression line, and expressed in % of Ip.



Primary pin connections (3 turns)

Primary turns	Primary Current		Nominal output (mA)	Primary pin connection
	Nom Ipn (A)	Max Ip (A)		
1	25	56	12.5	
2	12	27	12	
3	8	18	12	

Warranty/Remedy

Honeywell warrants goods of its manufacture as being free of defective material and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during that period of coverage, Honeywell will repair or replace without charge those items it finds defective. **The foregoing is Buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

While we provide application assistance, personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change at any time without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

Sales and Service

Honeywell serves its customers through a worldwide network of sales offices and distributors. For application assistance, current specifications, pricing or name of the nearest Authorised Distributor, contact your local sales office or:

TELEPHONE:

International:	1-815-235-6847
USA:	1-815-537-6945
Europe:	+44 (0)1698 481 481
Asia Pacific:	+65 6355-2828
Latin America:	1-305-805-8188

INTERNET:
www.honeywell.com/sensing

Sensing and Control
Honeywell
1985 Douglas Drive North
Golden Valley, MN 55422 USA
www.honeywell.com

100452-4-EN IL50 GLO
June 2010

FEATURES
- Interchangeable without sensor-to-sensor recalibration
- Very small thermal mass for fast response
- Air or liquid temperature sensing
- Linear temperature sensitivity
- Proven thin film processing reliability
- Low cost
- Long term stability
- 2000 ohms nominal resistance at 20°C

TYPICAL APPLICATIONS
- HVAC – room, duct and refrigerant temperature
- Motors – overload protection
- Electronic circuits – semiconductor protection
- Process control – temperature regulation
- Automotive – air or oil temperature
- Appliances – cooking temperature

GENERAL INFORMATION
TD Series temperature sensors from MICRO SWITCH respond rapidly to temperature changes, and are accurate to ±0.7°C at 20°C—completely interchangeable without recalibration. They are RTD (resistance temperature detector) sensors, and provide 8 Ω/°C sensitivity, with inherently near linear outputs.

The sensing element is a silicon chip, 0.040 × 0.050″ with a thin film resistive network pattern. The chips are individually laser trimmed to provide 2000 ohms nominal resistance at room temperature (20°C), accurate to ±0.7°C. Maximum error over the entire operating range of −40 to +150°C (−40 to +302°F) is ±2.5°C. This extremely accurate trimming provides true sensor-to-sensor interchangeability without recalibration of the user circuit.

TD4A Liquid temperature sensor
TD4A liquid temperature sensor is a two-terminal threaded anodized aluminum housing. The environmentally sealed liquid temperature sensors are designed for simplicity of installation, such as in the side of a truck. TD4A sensors are not designed for total immersion. Typical response time (for one time constant) is 4 minutes in still air and 15 seconds in still water (unmounted position). The temperature rise is 0.12° C/milliwatt suspended by leads in still air, and 0.08° C/milliwatt when mounted on 1 square foot 0.25″ thick aluminum foil.

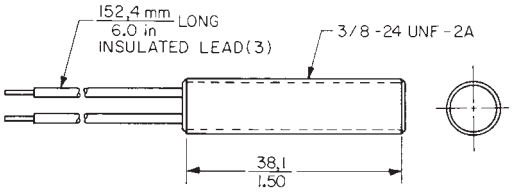
TD5A Miniature temperature sensor
The TD5A is a subminiature temperature sensor with three leads (center not connected). It has response times of 11.0 seconds and a temperature rise of .23°C per milliwatt in still air.

TD ORDER GUIDE

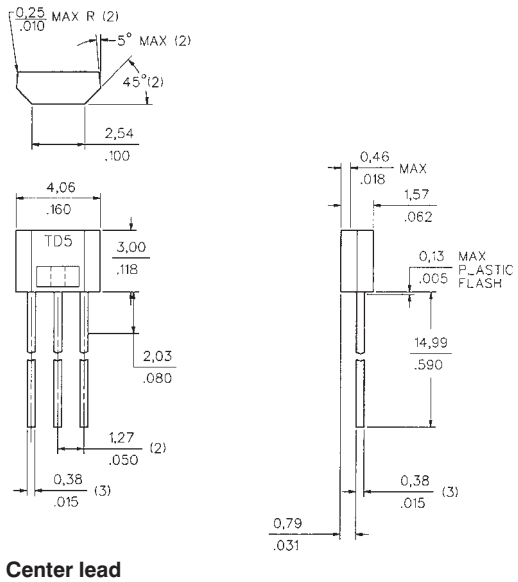
Catalog Listing	Description
TD4A	Liquid temperature sensor, 1.5° threaded (3/8-24 UNF-2A) anodized aluminum housing, two six inch black insulated leads
TD5A	Subminiature package, low cost, fast response time (TO-92)

MOUNTING DIMENSIONS (for reference only)

TD4A



TD5A



Center lead not connected

Temperature

ABSOLUTE MAXIMUM RATINGS

Operating temperature range	−40 to +150°C (−40 to +302°F)
Storage temperature range	−55 to 165°C (−67 to +338°F)
Voltage	10 VDC Continuous (24 hours)

INTERCHANGEABILITY (with 100 μA maximum current)

Temperature	Resistance (Ohms)	Temperature	Resistance (Ohms)
−40°C (−40°F)	1584 ± 12 (1.9°C)	+60°C (140°F)	2314 ± 9 (1.1°C)
−30°C (−22°F)	1649 ± 11 (1.7°C)	+70°C (158°F)	2397 ± 10 (1.2°C)
−20°C (−4°F)	1715 ± 10 (1.5°C)	+80°C (176°F)	2482 ± 12 (1.4°C)
−10°C (14°F)	1784 ± 9 (1.3°C)	+90°C (194°F)	2569 ± 14 (1.6°C)
0°C (32°F)	1854 ± 8 (1.1°C)	+100°C (212°F)	2658 ± 16 (1.8°C)
+10°C (50°F)	1926 ± 6 (0.8°C)	+110°C (230°F)	2748 ± 18 (2.0°C)
+20°C (68°F)	2000 ± 5 (0.7°C)	+120°C (248°F)	2840 ± 19 (2.0°C)
+30°C (86°F)	2076 ± 5 (0.7°C)	+130°C (266°F)	2934 ± 21 (2.2°C)
+40°C (104°F)	2153 ± 6 (0.8°C)	+140°C (284°F)	3030 ± 23 (2.4°C)
+50°C (122°F)	2233 ± 7 (0.9°C)	+150°C (302°F)	3128 ± 25 (2.5°C)

It is recommended that resistance measurements be made at 100 μA or less to minimize internal heating of the sensor. Measurements at currents up to 1mA will not damage the sensor, but the resistance characteristics should be adjusted for internal heating.

Equation for computing resistance:

$R_T = R_O + (3.84 \times 10^{-3} \times R_O \times T) + (4.94 \times 10^{-6} \times R_O \times T^2)$

R_T = Resistance at temperature T

R_O = Resistance at 0°C

T = Temperature in °C

Figure 2
Linear Output Voltage Circuit

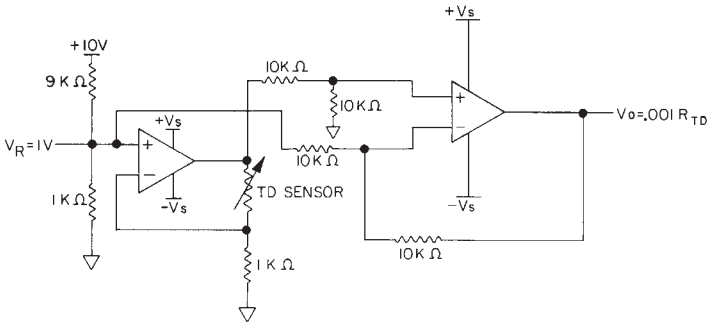
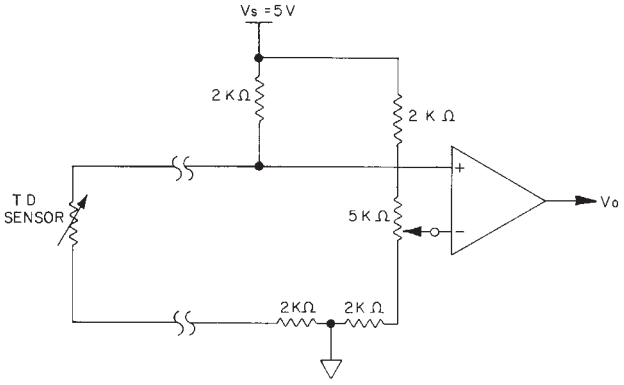


Figure 3
Adjustable Point (Comparator) Interface



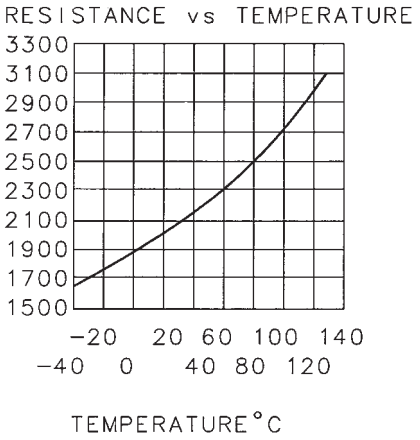
Linearity

±2% (−25 to 85°C)
±3% (−40 to 150°C)
TD sensors can be linearized to within ±0.2%.

Repeatability

±1 Ω

Figure 1
TD Series Resistance vs Temperature



ELECTRICAL INTERFACING

The high nominal resistance, positive temperature coefficient and linear sensitivity characteristics of the TD Series temperature sensors simplifies the task of designing the electrical interface. Figure 2 is a simple circuit that can be used to linearize the voltage output to within 0.2% or a ±0.4°C error over a range of −40° to +150°C (−40° to +302°F).

In some applications, it may be desirable to detect one particular temperature. Figure 3 illustrates one way this can be accomplished. In the comparator circuit shown, the potentiometer can be adjusted to correspond to the desired temperature.

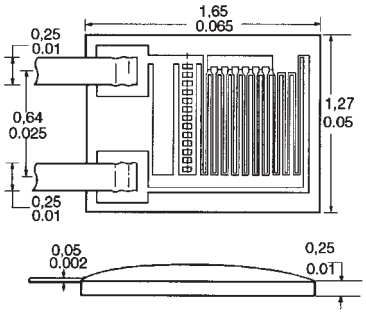
FEATURES
- Linear resistance vs temperature
- Accurate and Interchangeable
- Excellent stability
- Small for fast response
- Wide temperature range
- 3-packaging options

TYPICAL APPLICATIONS
- HVAC - room, duct and refrigerant equipment
- Electronic assemblies - thermal management, temperature compensation
- Process control - temperature regulation

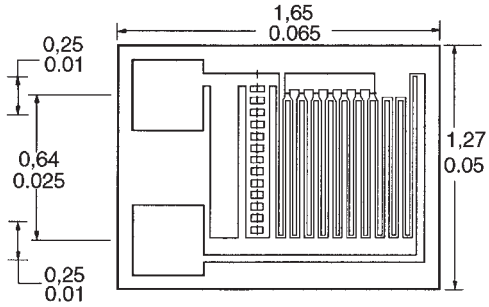
HEL-700 Thin Film Platinum RTDs (Resistance Temperature Detectors) provide excellent linearity, accuracy, stability and interchangeability. Resistance changes linearly with temperature. Laser trimming provides ±0.3°C interchangeability at 25°C.

1000Ω, 375 alpha provides 10X greater sensitivity and signal-to-noise. Both 1000Ω and 100Ω provide interchangeabilities of ±0.6°C or better from -100°C to 100C, and ±3.0°C at 500°C.

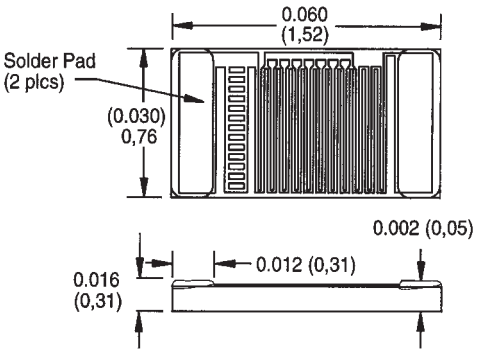
MOUNTING DIMENSIONS (for reference only)
HEL-700 Ribbon Lead



HEL-700 Radial Chip



HEL-700 SMT (Axial) Flip Chip



ORDER GUIDE

HEL-700	Thin Film Platinum RTD		
	-U	1000Ω, 0.00375 Ω/Ω/°C	
	-T	100Ω, 0.00385 Ω/Ω/°C DIN Standard	
		-0	±0.2% Resistance Trim (Standard)
		-1	±0.1% Resistance Trim (Optional)
			-A Radial Ribbon Lead
			-B Radial Chip
			-C SMT Axial Flip Chip (1000Ω **ONLY)**

Fig. 1: Linear Output Voltage

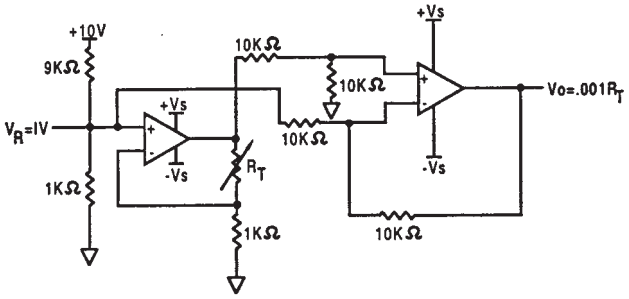
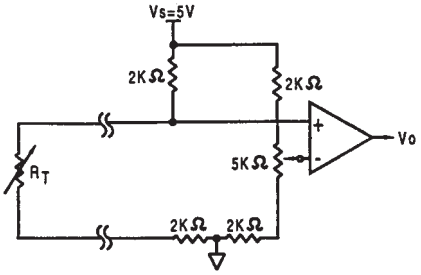


Fig. 2: Adjustable Point (Comparator) Interface



Temperature

Temperature Sensors
Platinum RTDs

FUNCTIONAL BEHAVIOR

$R_T = R_0(1+AT+BT^2-100CT^3+CT^4)$
RT = Resistance (Ω) at temperature T (°C)
R_0 = Resistance (Ω) at 0°C
T = Temperature in °C

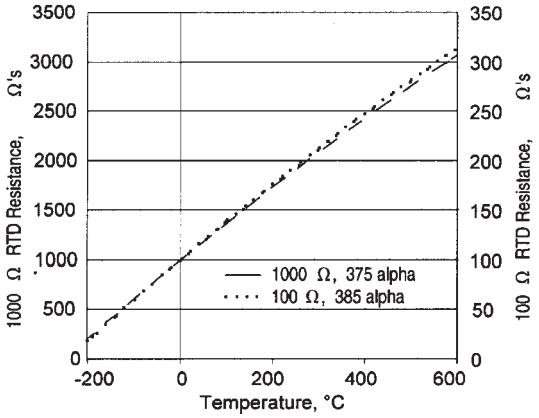
$A = \alpha + \frac{\alpha\,\delta}{100}$ $B = \frac{-\alpha\,\delta}{100^2}$ $C_{T<0} = \frac{-\alpha\,\beta}{100^4}$

CONSTANTS

Alpha, α (°C^{-1})	0.00375 ±0.000029	0.003850 ±0.000010
Delta, δ (°C)	1.605 ± 0.009	1.4999 ± 0.007
Beta, β (°C)	0.16	0.10863
A (°C^{-1})	3.81×10^{-3}	3.908×10^{-3}
B (°C^{-2})	-6.02×10^{-7}	-5.775×10^{-7}
C (°C^{-4})	-6.0×10^{-12}	-4.183×10^{-12}

Both β = 0 and C = 0 for T>0°C

RESISTANCE VS TEMPERATURE CURVE



ACCURACY VS TEMPERATURE

HEL-700 platinum RTDs are available in two base resistance trim tolerances: ±0.2% or ±0.1%. The corresponding resistance interchangeability and temperature accuracy for these tolerances are:

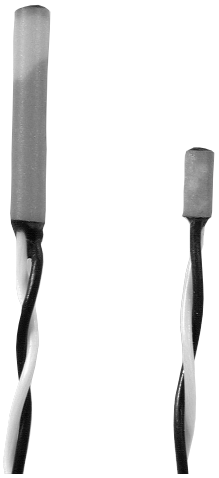
Tolerance	Standard ±0.2%		Optional ±0.1%	
Temperature (°C)	±ΔR* (Ω)	±ΔT (°C)	±ΔR* (Ω)	±ΔT (°C)
−200	6.8	1.6	5.1	1.2
−100	2.9	0.8	2.4	0.6
0	2.0	0.5	1.0	0.3
100	2.9	0.8	2.2	0.6
200	5.6	1.6	4.3	1.2
300	8.2	2.4	6.2	1.8
400	11.0	3.2	8.3	2.5
500	12.5	4.0	9.6	3.0
600	15.1	4.8	10.4	3.3

*1000Ω RTD. Divide ΔR by 10 for 100Ω RTD.

CAUTION
PRODUCT DAMAGE
The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation, take normal ESD precautions when handling this product.

SPECIFICATIONS

Sensor Type	Thin film platinum RTD; R_0 = 1000 Ω @ 0°C; alpha = 0.00375 Ω/Ω/°C R_0 = 100 Ω @ 0°C; alpha = 0.00385 Ω/Ω/°C
Temperature Range	−200 to +540°C (−300 to +1000°F)
Temperature Accuracy	±0.5°C or 0.8% of temperature, °C (R_0 ±0.2% trim), whichever is greater ±0.3°C or 0.6% of temperature, °C (R_0 ±0.1% trim), whichever is greater (optional)
Base Resistance and Interchangeability, $R_0 \pm \Delta R_0$	1000 ± 2 Ω (±0.2%) @ 0°C 1000 ± 1 Ω (±0.1%) @ 0°C (optional)
Linearity	±0.1% of full scale for temperatures spanning −40° to +125°C ±2.0% of full scale for temperatures spanning −200° to +540°C
Time Constant	<0.15 seconds in water @ 3 ft./sec. <1 second on metal surfaces: <4 seconds in air @ 10 ft./sec.
Operating Current	2 mA max. For self-heating errors of 1°C 1 mA recommended
Stability	Better than 0.25°C/year: 0.05°C/5 years for occupied environments
Self-Heating	0.3 mW/°C
Insulation Resistance	>50 MΩ @ 50 VDC @ 25°C
Case Material	99% alumina support, vapor deposited alumina passified resistance portion, refractory glass passified overall
Lead Material – Ribbon	Platinum ribbon, 0.002 × 0.010 × 0.16 in. long nominal
Lead Pull Strength – Ribbon	200 grams nominal pulling up from surface



FEATURES
- Linear resistance vs temperature
- Accurate and Interchangeable
- Excellent stability
- Teflon or fiberglass lead wires
- Wide temperature range
- Ceramic case material

TYPICAL APPLICATIONS
- HVAC – room, duct and refrigerant equipment
- Instrument and probe assemblies – temperature compensation
- Process control – temperature regulation

HEL-700 Series elements are fully assembled, ready to use directly or in probe assemblies without the need for fragile splices to extension leads.

The 1000Ω, 375 alpha version, provides 10X greater sensitivity and signal-to-noise. Optional NIST calibrations improve accuracy to ±0.03°C at 0°C.

ORDER GUIDE

HEL-705	28 ga. TFE Teflon, 2-wire only				
HEL-707	28 ga. Fiberglass, 2-wire only				
HEL-711	28 ga. TFE Teflon (2-wire 1000Ω, 3-wire 100Ω)				
HEL-712	28 ga. Fiberglass (2-wire 1000Ω, 3-wire 100Ω)				
HEL-716	24 ga. TFE Teflon (2-wire 1000Ω, 3-wire 100Ω)				
HEL-717	24 ga. Fiberglass (2-wire 1000Ω, 3-wire 100Ω)				
	-U	1000Ω, 0.00375 Ω/Ω/°C			
	-T	100Ω, 0.00385 Ω/Ω/°C DIN Standard			
		-0	±0.2% Resistance Trim (Standard)		
		-1	±0.1% Resistance Trim (Optional)		
			-12	Lead wire length, 12 inches	
				-00	No NIST calibration
				-C1	NIST @ 0°C
				-C2	NIST @ 0 & 100°C
				-C3	NIST @ 0, 100 & 260°C

MOUNTING DIMENSIONS (for reference only)

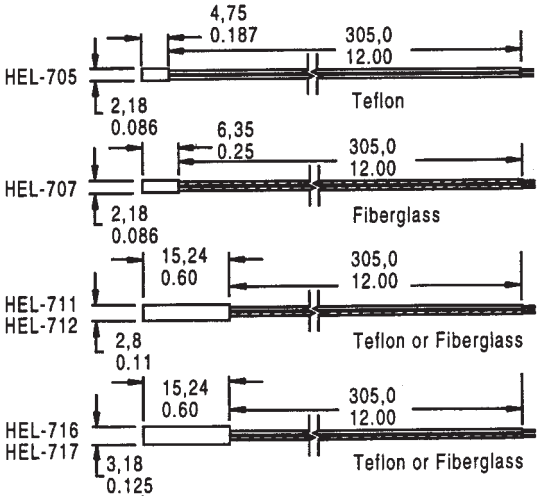


Fig. 1: Wheatstone Bridge 2-Wire Interface

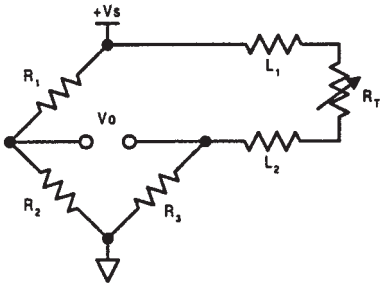


Fig. 2: Linear Output Voltage

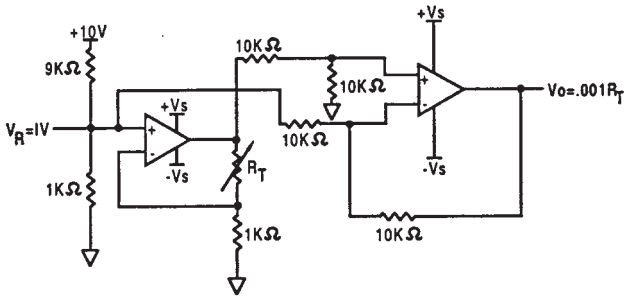
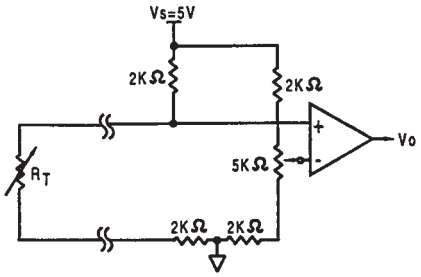


Fig. 3: Adjustable Point (Comparator) Interface



CAUTION
PRODUCT DAMAGE
The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation, take normal ESD precautions when handling this product.

Temperature

Temperature Sensors
Platinum RTDs

FUNCTIONAL BEHAVIOR

$R_T = R_0(1+AT+BT^2-100CT^3+CT^4)$
RT = Resistance (Ω) at temperature T (°C)
R_0 = Resistance (Ω) at 0°C
T = Temperature in °C

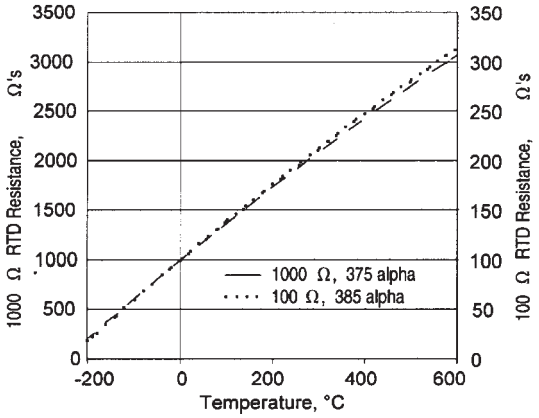
$A = \alpha + \frac{\alpha\,\delta}{100}$ $\quad B = \frac{-\alpha\,\delta}{100^2}$ $\quad C_{T<0} = \frac{-\alpha\,\beta}{100^4}$

CONSTANTS

Alpha, α (°C^{-1})	0.00375 ±0.000029	0.003850 ±0.000010
Delta, δ (°C)	1.605 ± 0.009	1.4999 ± 0.007
Beta, β (°C)	0.16	0.10863
A (°C^{-1})	3.81×10^{-3}	3.908×10^{-3}
B (°C^{-2})	-6.02×10^{-7}	-5.775×10^{-7}
C (°C^{-4})	-6.0×10^{-12}	-4.183×10^{-12}

Both β = 0 and C = 0 for T>0°C

RESISTANCE VS TEMPERATURE CURVE



ACCURACY VS TEMPERATURE

Tolerance	Standard ±0.2%		Optional ±0.1%	
Temperature (°C)	±ΔR* (Ω)	±ΔT (°C)	±ΔR* (Ω)	±ΔT (°C)
−200	6.8	1.6	5.1	1.2
−100	2.9	0.8	2.4	0.6
0	2.0	0.5	1.0	0.3
100	2.9	0.8	2.2	0.6
200	5.6	1.6	4.3	1.2
300	8.2	2.4	6.2	1.8
400	11.0	3.2	8.3	2.5
500	12.5	4.0	9.6	3.0
600	15.1	4.8	10.4	3.3

*1000Ω RTD. Divide Δ by 10 for 100Ω RTD.

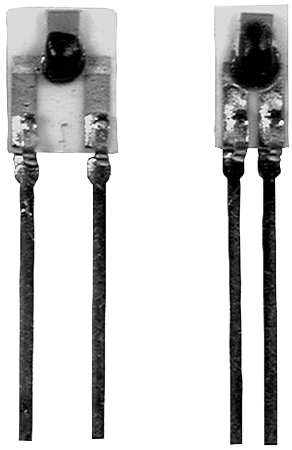
NIST CALIBRATION

NIST traceable calibration provides resistance readings at 1, 2 or 3 standard temperature points to yield a resistance versus temperature curve with 10x better accuracy.

Calibration	1 Point	2 Point	3 Point
T (°C)	±ΔT (°C)	±ΔT (°C)	±ΔT (°C)
-200	0.9	—	—
-100	0.5	0.27	0.15
0	0.03	0.03	0.03
100	0.4	0.11	0.07
200	0.8	0.2	0.08
300	1.2	0.33	6.2
400	1.6	0.5	8.3
500	2.0	0.8	9.6
600	2.6	1.2	10.4

SPECIFICATIONS

Sensor Type	Thin film platinum RTD; R_0 = 1000 Ω @ 0°C; alpha = 0.00375 Ω/Ω/°C R_0 = 100 Ω @ 0°C; alpha = 0.00385 Ω/Ω/°C
Temperature Range	TFE Teflon: −200° to +260°C (−320° to +500°F) Fiberglass: −75° to +540°C (−100° to +1000°F)
Temperature Accuracy	±0.5°C or 0.8% of temperature, °C (R_0 ±0.2% trim), whichever is greater ±0.3°C or 0.6% of temperature, °C (R_0 ±0.1% trim), whichever is greater (optional)
Base Resistance and Interchangeability, $R_0 \pm \Delta R_0$	1000 ± 2 Ω (±0.2%) @ 0°C 1000 ± 1 Ω (±0.1%) @ 0°C (optional)
Linearity	±0.1% of full scale for temperatures spanning −40° to +125°C ±2.0% of full scale for temperatures spanning −75° to +540°C
Time Constant	<0.5 sec. 0.85 inch O.D. in water at 3 ft/sec; <1.0 sec, 0.85 inch O.D. in still water
Operating Current	2 mA maximum for self heating errors of <1°C; 1 mA recommended
Stability	<0.25°C/year; 0.05°C per 5 years in occupied environments
Self Heating	<15 mW/°C for 0.85 O.D. typical
Insulation Resistance	>50 MΩ at 50 VDC at 25°C
Construction	Alumina case; Epoxy potting (Teflon leads); Ceramic potting (fiberglass leads)
Lead Material	Nickel coated stranded copper, Teflon or Fiberglass insulated



FEATURES
- Linear resistance vs temperature
- Accurate and Interchangeable
- Excellent stability
- Small size
- Printed circuit mountable
- Ceramic SIP package

TYPICAL APPLICATIONS
- HVAC – room, duct and refrigerant equipment
- Instrument and probe assemblies
- Electronic assemblies – temperature compensation
- Process control – temperature regulation

HEL-775 platinum RTDs are designed to measure temperatures from −55° to +150°C (−67° to 302°F) in printed circuit boards, temperature probes, or other lower temperature applications. Solderable leads in 0.050″ or 0.100″ spacing provide strong connections for wires or printed circuits.

The 1000Ω, 375 alpha version, provides 10x greater sensitivity and signal-to-noise. The 0.050″ lead space models are ideal for probes.

ORDER GUIDE

HEL-775-A	Ceramic SIP pkg. 0.100″ lead spacing		
HEL-775-B	Ceramic SIP pkg. 0.050″ lead spacing		
	-U	1000Ω, 0.00375 Ω/Ω/°C	
	-T	100Ω, 0.00385 Ω/Ω/°C, DIN specification	
		-0	±0.2% Resistance Trim (Standard)
		-1	±0.1% Resistance Trim (Optional)

MOUNTING DIMENSIONS (for reference only) mm/in.

HEL-775-A **HEL-775-B**

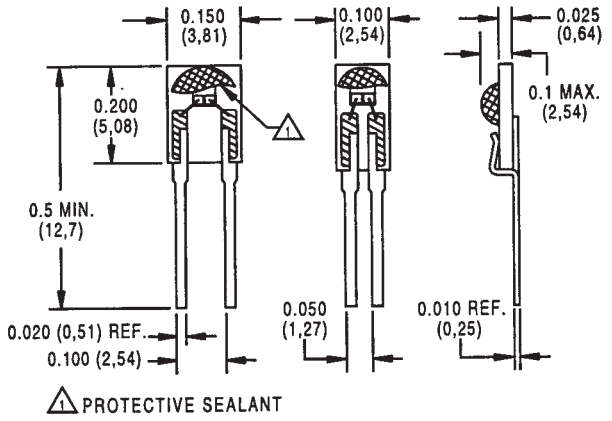


Fig. 1: Wheatstone Bridge 2-Wire Interface

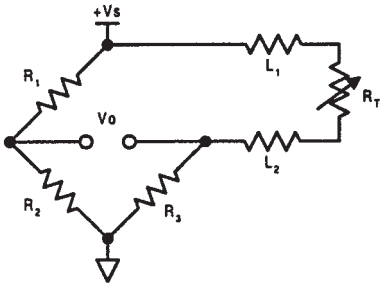


Fig. 2: Linear Output Voltage

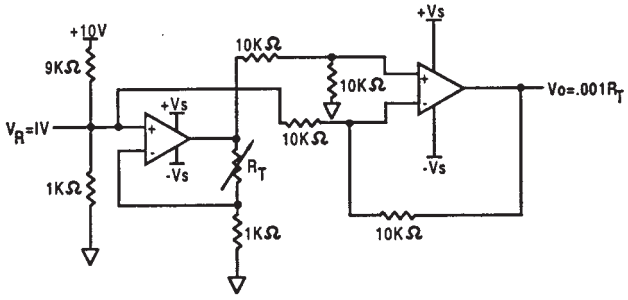
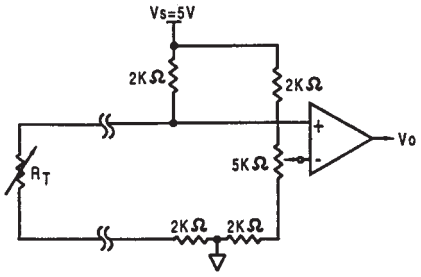


Fig. 3: Adjustable Point (Comparator) Interface



CAUTION
PRODUCT DAMAGE
The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation, take normal ESD precautions when handling this product.

Temperature

Platinum RTDs

FUNCTIONAL BEHAVIOR

$R_T = R_0(1+AT+BT^2-100CT^3+CT^4)$
RT = Resistance (Ω) at temperature T (°C)
R_0 = Resistance (Ω) at 0°C
T = Temperature in °C

$A = \alpha + \frac{\alpha\,\delta}{100}$ $B = \frac{-\alpha\,\delta}{100^2}$ $C_{T<0} = \frac{-\alpha\,\beta}{100^4}$

Alpha, α (°C^{-1})	0.00375 ±0.000029	0.003850 ±0.000010
Delta, δ (°C)	1.605 ± 0.009	1.4999 ± 0.007
Beta, β (°C)	0.16	0.10863
A (°C^{-1})	3.81×10^{-3}	3.908×10^{-3}
B (°C^{-2})	-6.02×10^{-7}	-5.775×10^{-7}
C (°C^{-4})	-6.0×10^{-12}	-4.183×10^{-12}

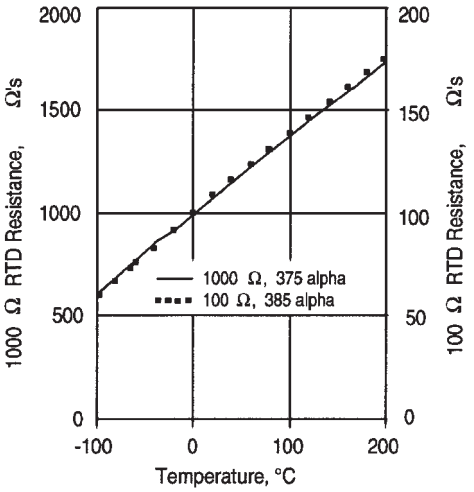
Both β = 0 and C = 0 for T>0°C

ACCURACY VS TEMPERATURE

Tolerance	Standard ±0.2%		Optional ±0.1%	
Temperature (°C)	±ΔR* (Ω)	±ΔT (°C)	±ΔR* (Ω)	±ΔT (°C)
−200	6.8	1.6	5.1	1.2
−100	2.9	0.8	2.4	0.6
0	2.0	0.5	1.0	0.3
100	2.9	0.8	2.2	0.6
200	5.6	1.6	4.3	1.2
300	8.2	2.4	6.2	1.8
400	11.0	3.2	8.3	2.5
500	12.5	4.0	9.6	3.0
600	15.1	4.8	10.4	3.3

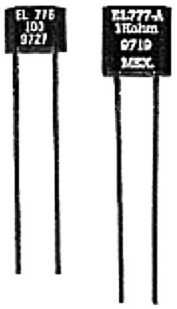
* 1000Ω RTD. Divide ΔR by 10 for 100Ω RTD.

RESISTANCE VS TEMPERATURE CURVE



SPECIFICATIONS

Sensor Type	Thin film platinum RTD: R_0 = 1000 Ω @ 0°C; alpha = 0.00375 Ω/Ω/°C R_0 = 100 Ω @ 0°C; alpha = 0.00385 Ω/Ω/°C
Temperature Range	−55° to +150°C (−67° to +302°F)
Temperature Accuracy	±0.5°C or 0.8% of temperature, °C (R_0 ±0.2% trim), whichever is greater ±0.3°C or 0.6% of temperature, °C (R_0 ±0.1% trim), whichever is greater (optional)
Base Resistance and Interchangeability, $R_0 \pm \Delta R_0$	1000 ± 2 Ω (±0.2%) @ 0°C or 100 ± 0.2 Ω (±0.2%) @ 0°C 1000 ± 1 Ω (±0.1%) @ 0°C or 100 + 0.2 Ω (+0.2%) @ 0°C (optional)
Linearity	±0.15% of full scale for temperatures spanning −55° to 150°C
Time Constant	<10 sec. in air at 10 ft./sec.
Operating Current	1 mA maximum in still air for <0.3°C (0.5°F) self heating
Stability	<0.05°C per 5 years in occupied environments
Self Heating HEL-775-A HEL-775-B	 9.7mW/°C nominal in air at 10ft/sec, 4.3mW/°C nominal in enclosed still air 6.8mW/°C nominal in air at 10ft/sec, 3.0mW/°C nominal in enclosed still air
Insulation Resistance	>50 MΩ @ 50 VDC @ 25°C
Construction	Alumina substrate with epoxy protection
Lead Material	Phosphor bronze with bright tin lead 60/40 plating
Lead Configuration	2-wire



FEATURES
- Linear resistance vs temperature
- Accurate and Interchangeable
- Excellent stability
- Small size
- Printed circuit mountable
- Ceramic SIP package

TYPICAL APPLICATIONS
- HVAC – room, duct and refrigerant equipment
- Instrument and probe assemblies
- Electronic assemblies – temperature compensation
- Process control – temperature regulation

HEL-776 and HEL-777 platinum RTDs are designed to measure temperatures from −55° to +150°C (−67° to 302°F) in printed circuit boards, temperature probes, or other lower temperature applications. Solderable leads in 0.050″ or 0.100″ spacing provide strong connections for wires or printed circuits.

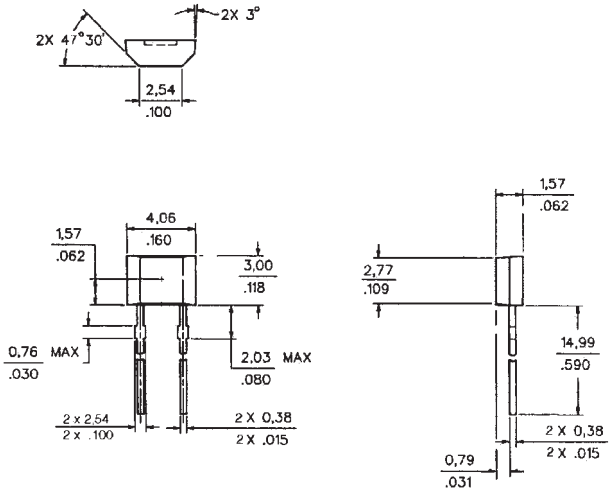
The 1000Ω, 375 alpha version, provides 10x greater sensitivity and signal-to-noise. Both are ideal for air temperature sensing.

ORDER GUIDE

HEL-776-A	Molded SIP pkg. 0.100″ lead spacing		
HEL-777-A	Molded SIP pkg. 0.100″ lead spacing		
	-U	1000Ω, 0.00375 Ω/Ω/°C	
	-T	100Ω, 0.00385 Ω/Ω/°C	
		-0	±0.2% Resistance Trim (Standard)
		-1	±0.1% Resistance Trim (Optional)

MOUNTING DIMENSIONS (for reference only) mm/in.

HEL-776-A



HEL-777-A

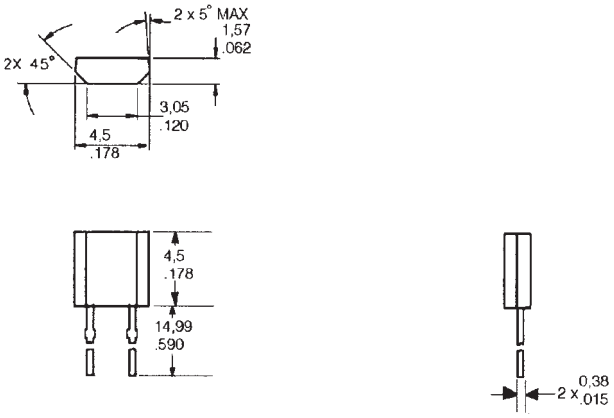


Fig. 1: Wheatstone Bridge 2-Wire Interface

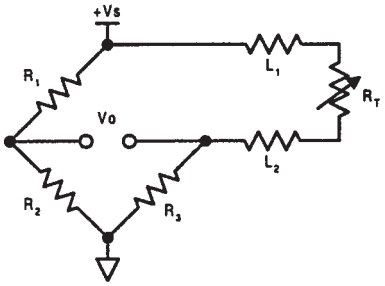


Fig. 2: Linear Output Voltage

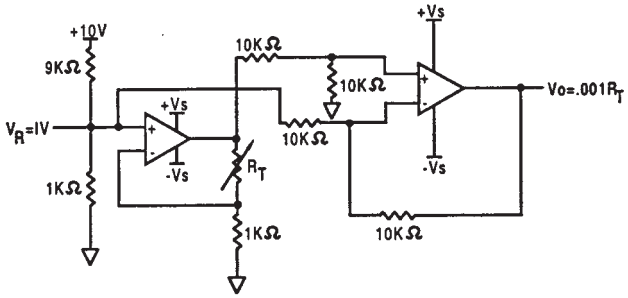
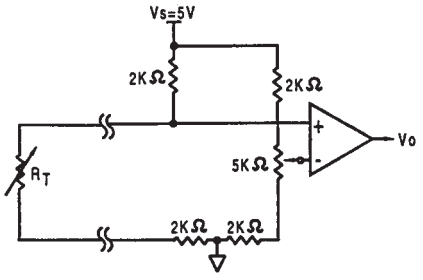


Fig. 3: Adjustable Point (Comparator) Interface



CAUTION
PRODUCT DAMAGE
The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation, take normal ESD precautions when handling this product.

Temperature

Platinum RTDs

FUNCTIONAL BEHAVIOR

$R_T = R_0(1+AT+BT^2-100CT^3+CT^4)$
RT = Resistance (Ω) at temperature T (°C)
R_0 = Resistance (Ω) at 0°C
T = Temperature in °C

$A = \alpha + \frac{\alpha\,\delta}{100}$ $B = \frac{-\alpha\,\delta}{100^2}$ $C_{T<0} = \frac{-\alpha\,\beta}{100^4}$

CONSTANTS

Alpha, α (°C^{-1})	0.00375 ±0.000029	0.003850 ±0.000010
Delta, δ (°C)	1.605 ± 0.009	1.4999 ± 0.007
Beta, β (°C)	0.16	0.10863
A (°C^{-1})	3.81×10^{-3}	3.908×10^{-3}
B (°C^{-2})	-6.02×10^{-7}	-5.775×10^{-7}
C (°C^{-4})	-6.0×10^{-12}	-4.183×10^{-12}

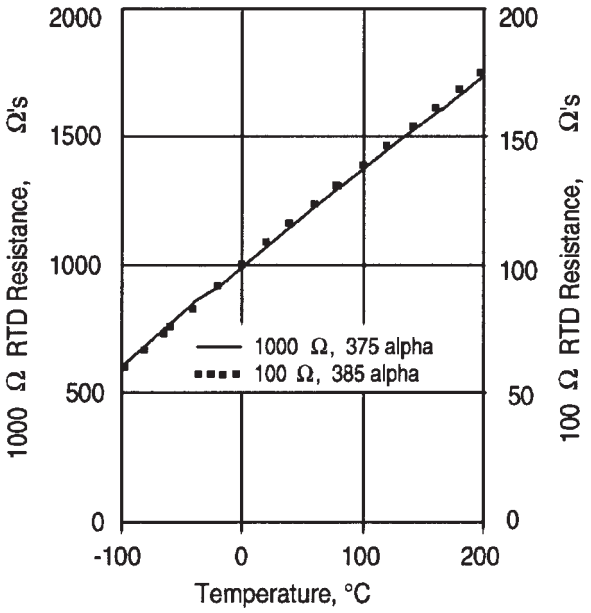
Both β = 0 and C = 0 for T>0°C

ACCURACY VS TEMPERATURE

Tolerance	Standard ±0.2%		Optional ±0.1%	
Temperature (°C)	±ΔR* (Ω)	±ΔT (°C)	±ΔR* (Ω)	±ΔT (°C)
−200	6.8	1.6	5.1	1.2
−100	2.9	0.8	2.4	0.6
0	2.0	0.5	1.0	0.3
100	2.9	0.8	2.2	0.6
200	5.6	1.6	4.3	1.2
300	8.2	2.4	6.2	1.8
400	11.0	3.2	8.3	2.5
500	12.5	4.0	9.6	3.0
600	15.1	4.8	10.4	3.3

* 1000Ω RTD. Divide ΔR by 10 for 100Ω RTD.

RESISTANCE VS TEMPERATURE CURVE



SPECIFICATIONS

Sensor Type	Thin film platinum RTD: R_0 = 1000 Ω @ 0°C; alpha = 0.00375 Ω/Ω/°C R_0 = 100 Ω @ 0°C; alpha = 0.00385 Ω/Ω/°C
Temperature Range	TFE Teflon: −200° to +260°C (−320° to +500°F) Fiberglass: −75° to +540°C (−100° to +1000°F)
Temperature Accuracy	±0.5°C or 0.8% of temperature °C (R_0 ±0.2% trim), whichever is greater ±0.3°C or 0.6% of temperature °C (R_0 ±0.1% trim), whichever is greater (optional)
Base Resistance and Interchangeability, $R_0 \pm \Delta R_0$	1000 ± 2 Ω (±0.2%) @ 0°C or 100 ± 0.2 Ω (±0.2%) @ 0°C 1000 ± 1 Ω (±0.1%) @ 0°C or 100 ± 0.2 Ω (±0.2%) @ 0°C (optional)
Linearity	±0.1% of full scale for temperatures spanning −40° to 125°C ±2.0% of full scale for temperatures spanning −75° to 540°C
Time Constant	<0.5 sec, 0.85 inch O.D. in water at 3 ft/sec; <1.0 sec, 0.85 inch O.D. in still water
Operating Current	2 mA maximum for self heating errors of <1°C; 1 mA recommended
Stability	<0.25°C/year; 0.05°C per 5 years in occupied environments
Self Heating	<15mW/°C for 0.85 O.D. typical
Insulation Resistance	>50 MΩ @ 50 VDC @ 25°C
Construction	Alumina case; Epoxy potting (Teflon leads); Ceramic potting (fiberglass leads)
Lead Material	Nickel coated stranded copper, Teflon or Fiberglass insulated

FEATURES
- Resistance interchangeable
- Accurate
- Linear
- Fast
- Laser trimmed
- Bolt, cement-on or strap-on models

TYPICAL APPLICATIONS
- HVAC – room, duct and refrigerant equipment
- OEM assemblies
- Electronic assemblies – semiconductor protection, temperature compensation
- Process control – temperature regulation

The HRTS is designed to measure surface temperatures from −200° to +480°C (−320° to +900°F) in printed circuit, temperature probe, or other applications.

HRTS surface temperature sensors are fully assembled elements, ready to use, without the need for fragile splices to extension leads.

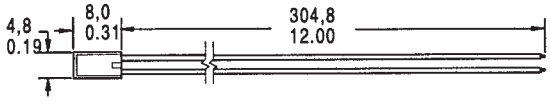
A thin layer of platinum is deposited on an alumina substrate and laser trimmed to a resistance interchangeability of ±0.2% with ±0.5°C accuracy or ±0.1% with ±0.3°C accuracy. The sensor chip is then glassed, wired and potted or ceramic fired to result in a cylindrical alumina package with either Teflon or fiber glass insulated lead wires.

ORDER GUIDE

HRTS-5760-B	Miniature, ceramic body, 28 ga TFE Teflon insulated leads (2-wire only)			
HRTS-61	Bolt-on, nickel plated copper alloy body, 24 ga fiberglass insulated leads, SST braid, TFE overwrap, spiral armor			
	-T	100Ω, 0.00385 Ω/Ω/°C, 3-wire leads, DIN specification		
	-U	1000Ω, 0.00375 Ω/Ω/°C, 2-wire leads		
		-0	±0.2% Resistance Trim (Standard)	
		-1	±0.1% Resistance Trim (Optional)	
			-12	Standard length, HRTS-5760-B
			-24	Standard length, HRTS-61

MOUNTING DIMENSIONS (for reference only)

HRTS-5760-B



HRTS-61

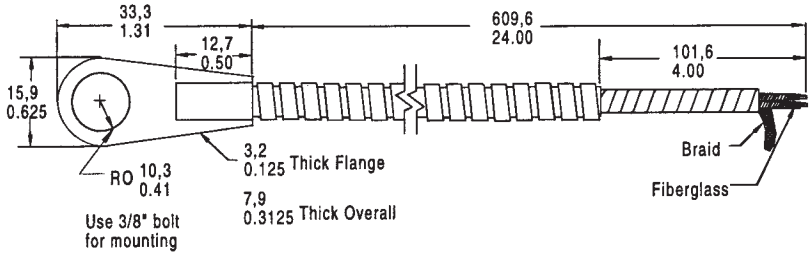


Fig. 1: Wheatstone Bridge 2-Wire Interface

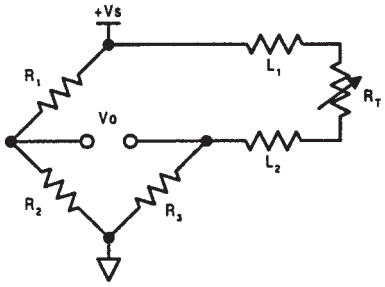


Fig. 2: Linear Output Voltage

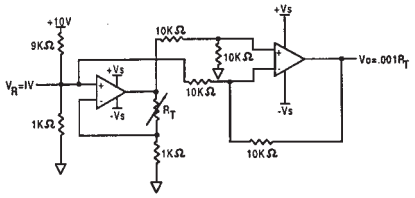
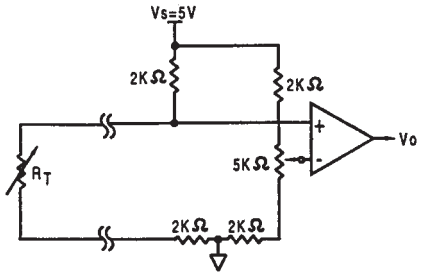


Fig. 3: Adjustable Point (Comparator) Interface



Temperature

FUNCTIONAL BEHAVIOR

$R_T = R_0(1+AT+BT^2-100CT^3+CT^4)$
RT = Resistance (Ω) at temperature T (°C)
R_0 = Resistance (Ω) at 0°C
T = Temperature in °C

$$A = \alpha + \frac{\alpha\,\delta}{100} \qquad B = \frac{-\alpha\,\delta}{100^2} \qquad C_{T<0} = \frac{-\alpha\,\beta}{100^4}$$

CONSTANTS

Alpha, α (°C^{-1})	0.00375 ±0.000029	0.003850 ±0.000010
Delta, δ (°C)	1.605 ± 0.009	1.4999 ± 0.007
Beta, β (°C)	0.16	0.10863
A (°C^{-1})	3.81×10^{-3}	3.908×10^{-3}
B (°C^{-2})	-6.02×10^{-7}	-5.775×10^{-7}
C (°C^{-4})	-6.0×10^{-12}	-4.183×10^{-12}

Both β = 0 and C = 0 for T>0°C

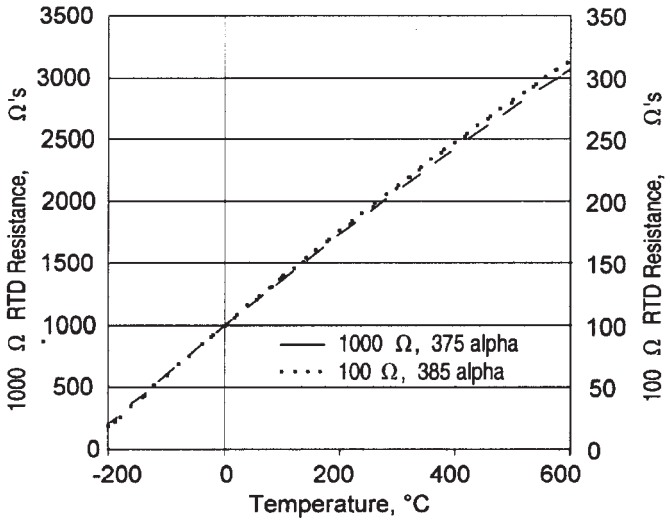
ACCURACY VS TEMPERATURE

HRTS platinum RTDs are available in two base resistance trim tolerances: ±0.2% or ±0.1%. The corresponding resistance interchangeability and temperature accuracy for these tolerances are:

Tolerance	**Standard ±0.2%**		**Optional ±0.1%**	
Temperature (°C)	±ΔR* (Ω)	±ΔT (°C)	±ΔR* (Ω)	±ΔT (°C)
−200	6.8	1.6	5.1	1.2
−100	2.9	0.8	2.4	0.6
0	2.0	0.5	1.0	0.3
100	2.9	0.8	2.2	0.6
200	5.6	1.6	4.3	1.2
300	8.2	2.4	6.2	1.8
400	11.0	3.2	8.3	2.5
500	12.5	4.0	9.6	3.0
600	15.1	4.8	10.4	3.3

*1000Ω RTD. Divide ΔR by 10 for 100Ω RTD.

RESISTANCE VS TEMPERATURE CURVE



CAUTION
PRODUCT DAMAGE
The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation, take normal ESD precautions when handling this product.

SPECIFICATIONS

Sensor Type	Thin film platinum RTD: R_o = 1000 Ω @ 0°C; alpha = 0.00375 Ω/Ω/°C R_o = 100 Ω @ 0°C; alpha = 0.00385 Ω/Ω/°C
Temperature Range	HRTS-5760-B: −200° to +260°C (−320° to +500°F) HRTS-61: −75° to +425°C (−100° to +800°F)
Temperature Accuracy	±0.5°C or 0.8% of temperature @ 0.2% R_o Trim ±0.3°C or 0.6% of temperature @ 0.1% R_o Trim Optional
Time Constant, 1/e	HRTS-5760-B: Typically 0.6 sec. on metal surfaces HRTS-61: Typically 20 sec. On metal surfaces
Operating Current	2 mA max. for self-heating errors of 1°C 1 mA recommended
Self-Heating	0.3 mW/°C
Lead Material	Nickel coated stranded copper, Teflon or Fiberglass insulated

Honeywell

R300 Series

Temperature Sensor

DESCRIPTION

The R300 Series is a passive, resistive temperature device (RTD), high temperature probe. This product features a robust, stainless steel closed-tip design that enhances reliability in aggressive environments, while still providing excellent response time.

This one-piece sensor with integral connector was designed for use in heavy duty vehicle engine exhaust gas recirculation (EGR) systems where temperature excursions to 300 °C [572 °F] can occur.

Other potential applications for this harsh duty sensor may include fluid or air temperature sensing within the engine environment or in industrial applications such HVAC or refrigeration compressor equipment where this type of sensor packaging and temperature range is often ideal.

FEATURES

- Working temperature range: -40 °C to 275 °C [-40 °F to 527 °F], continuous, excursion to 300 °C [572 °F] for 10 min. max.
- Response time: T63; at 10 m/s gas flow rate at 150 °C [302 °F] ~15 s
- Accuracy: better than ±3 °C, -40 °C to 300 °C [-40 °F to 572 °F] typical
- M14 x 1.5 mounting thread
- Enhanced reliability
- Linear output
- Long life

POTENTIAL APPLICATIONS

- Exhaust gas temperature sensing systems on heavy duty, truck, agriculture and construction vehicle engines including:
  - In-line fluid temperature sensing
  - Cylinder head temperature sensing
- High temperature industrial or commercial applications including:
  - Bulk refrigeration
  - Domestic heating and controls
  - Hot tub and pool temperature controls
  - Industrial ovens up to 300°C [572 °F]

R300 Series

FIGURE 1. MOUNTING DIMENSIONS (For reference only: mm/[in])

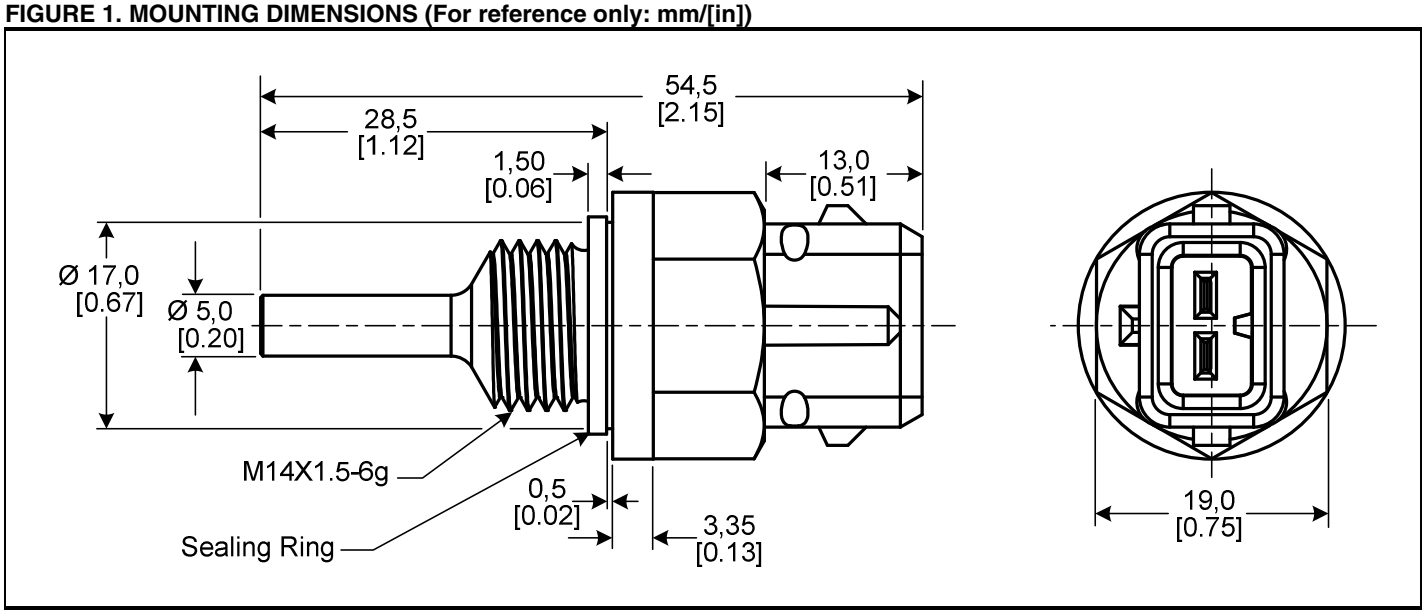
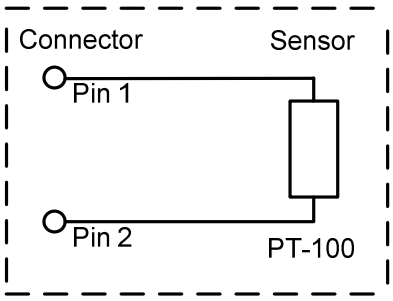


TABLE 1. GENERAL SPECIFICATIONS

Characteristic	Parameter	Note
Insertion depth	28,5 mm [1.12 in]	custom devices available upon request
Sealing surface dimensions	7.0 mm [0.28 in] dia.; 0,5 mm [0.02 in] thickness	—
Mating cable harness connector	AMP JPT/Bosch Jetronics	custom connectors available upon request
Mounting	M14x1.5 male thread, fixing nuts integrated with sensor body	—
Nominal resistance	100 Ohm/0 °C [32 °F]	—
Operating temperature range	-40 °C to 275 °C [-40 °F to 527 °F]	continuous, excursion to 300 °C [572 °F] for 10 min. max.
Accuracy	better than ±3.0 °C	—
Response time	T63; at 10 m/s gas flow rate at 150 °C [302 °F] ~15 s	—
Reliability	Less than or equal to 1.5% failures per one million miles	—
Measurement range continuous probe tip	-40 °C to 275 °C [-40 °F to 527 °F]	—
Measurement range continuous probe body	-40 °C to 250 °C [-40 °F to 482 °F]	—
Storage temperature range	-40 °C to 150 °C [-40 °F to 302 °F]	—
Insulation breakdown	>10 MOhm	100 Vdc for 3 s at room temperature
Torque limits	16 N m [11.8 ft lb] +20%	at room temperature
Housing material	stainless steel	—
Sealing	IP59K	—
Approvals	EN 6071:1996, IEC 751:1983	—

FIGURE 2. ELECTRICAL PERFORMANCE



Characteristic Equation:

$R_T = R_{ZERO}*(1 + \alpha T + \beta T^2)$ for T > 0 ºC

$R_T = R_{ZERO}*(1 + \alpha T + \beta T^2 + v(T-100)T^3)$ for T < ºC

R_T = sensor output resistance

R_{ZERO} = PT100 resistance at 0 ºC [32 ºC]

T = temperature in ºC

$\alpha = 3.9083 \times 10^{-3}$ ºC^{-1} = characteristic curve parameter

$\beta = -5.7750 \times 10^{-7}$ ºC^{-2} = characteristic curve parameter

$v = -4.183 \times 10^{-12}$ ºC^{-4}

TABLE 2. RESISTANCE/TEMPERATURE DATA

T (Temperature) °C [°F]	Ro (PT100 Resistance) Ohm	T (Temperature) °C [°F]	Ro (PT100 Resistance) Ohm	T (Temperature) °C [°F]	Ro (PT100 Resistance) Ohm
-40 [-40]	84.72	80 [176]	130.90	200 [392]	175.86
-20 [-4]	92.16	100 [212]	138.51	220 [428]	183.19
0 [32]	100	120 [248]	146.07	240 [464]	190.47
20 [68]	107.79	140 [284]	153.58	260 [500]	197.71
40 [104]	115.54	160 [320]	161.05	280 [536]	204.9
60 [140]	123.24	180 [356]	168.48	300 [572]	212.05

FIGURE 3. CIRCUIT EXAMPLE

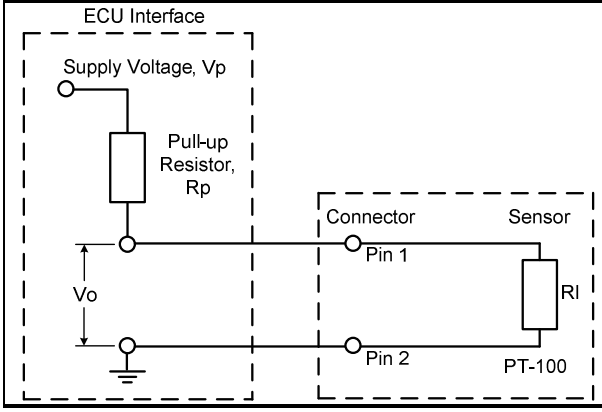
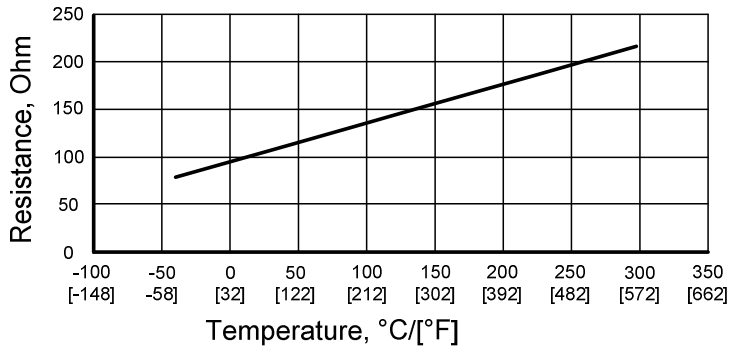


FIGURE 4. PT100 CLASS B RTD – R/T CURVE



ORDER GUIDE

Catalog Listing	Description
R300-F35-M14-C	R300 Series exhaust gas recirculation RTD sensor with stainless steel probe tip, M14 mechanical interface thread and integral connector

⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

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SALES AND SERVICE

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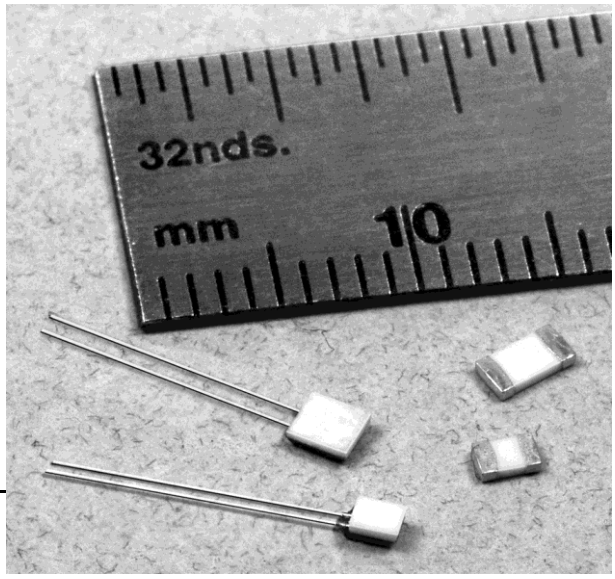


700 Series Platinum RTDs

Temperature Sensors

DESCRIPTION

The 700 Series Platinum RTD (Resistance Temperature Detector) is an economical, miniature temperature sensor. The series is available in two different package configurations, leaded and SMT (Surface Mount Technology). Two sizes are available for each configuration, with the SMT available in industry standard 0805 and 1206 packages.

The 700 Series has 100 Ω and 1000 Ω base resistances and is available in both the 3750 ppm/K and 3850 ppm/K temperature coefficients (375 and 385 alphas). The tolerances of the 700 Series meet DIN class A, DIN class B and DIN class 2B industry-standards.

The 700 Series is RoHS (Restriction of Hazardous Substances) compliant (EU Directive 2002/95/EC).

FEATURES

- Linear resistance vs temperature
- High accuracy
- Interchangeable
- Excellent stability
- Fast time response
- Wide temperature range
- RoHS compliant

POTENTIAL APPLICATIONS

- HVAC (Heating Ventilation and Air Conditioning)
- Electronic assemblies
- Process control
- Appliances
- Automotive
- Instrumentation

700 Series Platinum RTDs

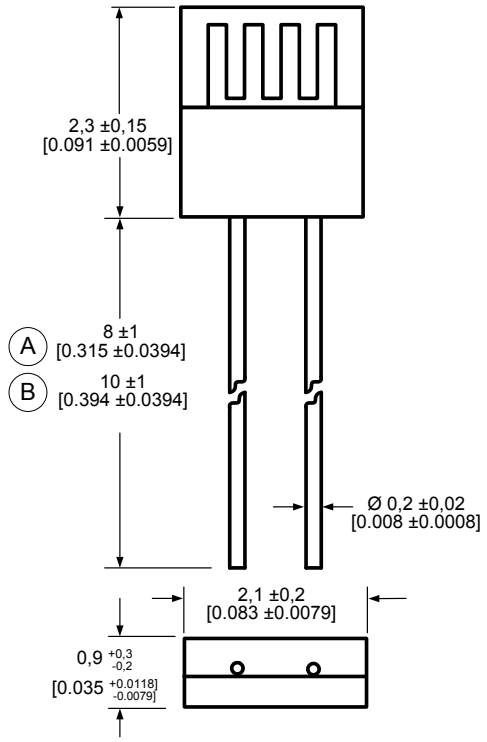
Table 1. Specifications

	700-*	701-*
Temperature range	Class B and 2B: -70 °C to 500 °C (continuous operation) Class A: -30 °C to 300 °C	Class B and 2B: -70 °C to 500 °C (continuous operation) Class A: -30 °C to 300 °C
Leads	Pt-clad Ni wire	Pt-clad Ni wire
Long-term stability	max. R_0 drift 0.04% after 1000 h at 500 °C	max. R_0 drift 0.04% after 1000 h at 500 °C
Vibration resistance	at least 40 g acceleration at 10 Hz to 2000 Hz, depends on installation	at least 40 g acceleration at 10 Hz to 2000 Hz, depends on installation
Shock resistance	at least 100 g acceleration with 8 ms half sine wave, depends on installation	at least 100 g acceleration with 8 ms half sine wave, depends on installation
Environmental conditions	unhoused for dry environments only	unhoused for dry environments only
Insulation resistance	>100 MΩ at 20 °C; >2 MΩ at 500 °C	>100 MΩ at 20 °C; >2 MΩ at 500 °C
Self heating	0.4 K/mW at 0 °C	0.6 K/mW at 0 °C
Response time	water current (v=0.4 m/s): $t_{0.5}$=0.05 s; $t_{0.9}$=0.15 s air stream (V=2 m/s): $t_{0.5}$=3.0 s; $t_{0.9}$=10.0 s	water current (v=0.4 m/s): $t_{0.5}$=0.04 s; $t_{0.9}$=0.12 s air stream (V=2 m/s): $t_{0.5}$=2.2 s; $t_{0.9}$=7.0 s
Measuring current	100 Ω: 0.3 mA to 1.0 mA 1000 Ω: 0.1 mA to 0.3 mA	100 Ω: 0.3 mA to 1.0 mA 1000 Ω: 0.1 mA to 0.3 mA
Packaging	anti-static plastic bag	anti-static plastic bag

	702-*	703-*
Temperature range	Class B: -50 °C to 130 °C (continuous operation)	Class B: -50 °C to 130 °C (continuous operation)
Soldering connection	end-termination galvanic tin-plated with Ni barrier layer	end-termination galvanic tin-plated with Ni barrier layer
Long-term stability	max. R_0 drift 0.06 % after 1000 h at 130 °C	max. R_0 drift 0.06 % after 1000 h at 130 °C
Environmental conditions	unhoused for dry environments only	unhoused for dry environments only
Insulation resistance	>100 MΩ at 20 °C; >2 MΩ at 130 °C (glass covering)	>100 MΩ at 20 °C; >2 MΩ at 130 °C (glass covering)
Self heating	0.8 K/mW at 0 °C	0.4 K/mW at 0 °C
Response time	water current (v=0.4 m/s): $t_{0.5}$=0.10 s; $t_{0.9}$=0.25 s air stream (V = 2 m/s): $t_{0.5}$=2.5 s; $t_{0.9}$=8.0 s	water current (v=0.4 m/s): $t_{0.5}$=0.15 s; $t_{0.9}$=0.30 s air stream (V = 2 m/s): $t_{0.5}$=3.5 s; $t_{0.9}$=10.0 s
Measuring current	100 Ω: 0.3 mA to 1.0 mA 1000 Ω: 0.1 mA to 0.3 mA	100 Ω: 0.3 mA to 1.0 mA 1000 Ω: 0.1 mA to 0.3 mA
Processing instructions	face up mounting: reflow soldering or wave soldering, e.g. double wave ≤8 s/235 °C	face up mounting: reflow soldering or wave soldering, e.g. double wave ≤8 s/235 °C
Packaging	face-up in blister reel	face-up in blister reel

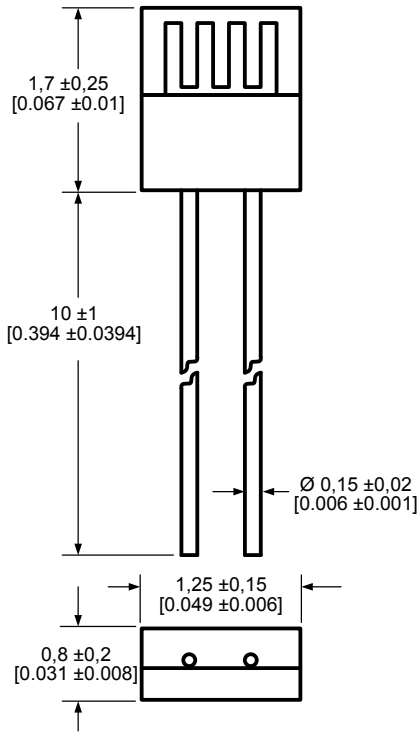
Figure 1. Mounting Dimensions (For reference only mm/[in].)

700-*

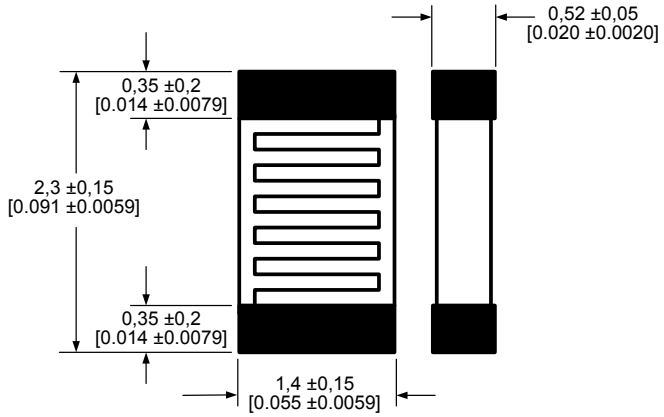


A	Applies to the following 700-* listings only: 700-102AAB-B00 700-102AAC-B00
B	Applies to all other 700-* listings.

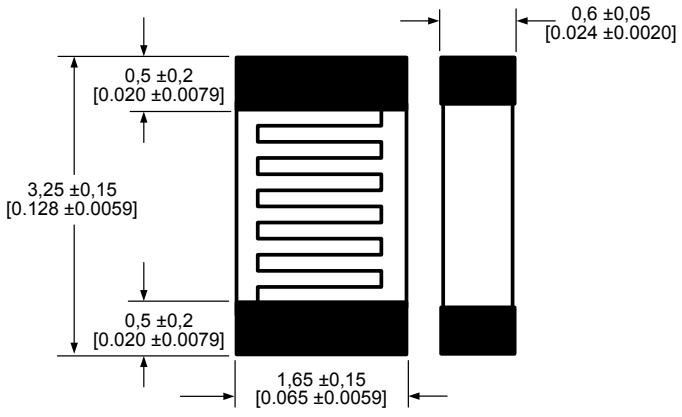
701-*



702-*



703-*



Order Guide

Catalog Listing	Package Style and Size mm [in]	Nominal Resistance at 0 °C	Temp. Coefficient	Temp. Range (°C)	Tolerance	Termination
700-101BAA-B00	chip, 2,1 w x 2,3 l x 0,9 thk [0.083 w x 0.091 l x 0.035 thk]	100 Ω	3850 ppm/K	-70 to 500	DIN EN 60751, class A (R_0: ±0.06 %)	bare Pt-clad Ni wire, adjacent leads
700-101BAB-B00	chip, 2,1 w x 2,3 l x 0,9 thk [0.083 w x 0.091 l x 0.035 thk]	100 Ω	3850 ppm/K	-70 to 500	DIN EN 60751, class B (R_0: ±0.12 %)	bare Pt-clad Ni wire, adjacent leads
700-102AAB-B00	chip, 2,1 w x 2,3 l x 0,9 thk [0.083 w x 0.091 l x 0.035 thk]	1000 Ω	3750 ppm/K	-70 to 500	DIN EN 60751, class B (R_0: ±0.12 %)	bare Pt-clad Ni wire, adjacent leads
700-102AAC-B00	chip, 2,1 w x 2,3 l x 0,9 thk [0.083 w x 0.091 l x 0.035 thk]	1000 Ω	3750 ppm/K	-70 to 500	DIN EN 60751, class 2B (R_0: ±0.24 %)	bare Pt-clad Ni wire, adjacent leads
700-102BAA-B00	chip, 2,1 w x 2,3 l x 0,9 thk [0.083 w x 0.091 l x 0.035 thk]	1000 Ω	3850 ppm/K	-70 to 500	DIN EN 60751, class A (R_0: ±0.06 %)	bare Pt-clad Ni wire, adjacent leads
700-102BAB-B00	chip, 2,1 w x 2,3 l x 0,9 thk [0.083 w x 0.091 l x 0.035 thk]	1000 Ω	3850 ppm/K	-70 to 500	DIN EN 60751, class B (R_0: ±0.12 %)	bare Pt-clad Ni wire, adjacent leads
701-101BAA-B00	chip, 1,25 w x 1,7 l x 0,8 thk [0.049 w x 0.067 l x 0.031 thk]	100 Ω	3850 ppm/K	-70 to 500	DIN EN 60751, class A (R_0: ±0.06 %)	bare Pt-clad Ni wire, adjacent leads
701-101BAB-B00	chip, 1,25 w x 1,7 l x 0,8 thk [0.049 w x 0.067 l x 0.031 thk]	100 Ω	3850 ppm/K	-70 to 500	DIN EN 60751, class B (R_0: ±0.12 %)	bare Pt-clad Ni wire, adjacent leads
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701-102BAB-B00	chip, 1,25 w x 1,7 l x 0,8 thk [0.049 w x 0.067 l x 0.031 thk]	1000 Ω	3850 ppm/K	-70 to 500	DIN EN 60751, class B (R_0: ±0.12 %)	bare Pt-clad Ni wire, adjacent leads
702-101BBB-A00	SMD 0805, 1,4 w x 2,3 l x 0,52 thk [0.055 w x 0.091 l x 0.020]	100 Ω	3850 ppm/K	-50 to 130	DIN EN 60751, class B (R_0: ±0.12 %)	end termination, galvanic Sn-plated with Ni barrier layer
702-102BBB-A00	SMD 0805, 1,4 w x 2,3 l x 0,52 thk [0.055 w x 0.091 l x 0.020]	1000 Ω	3850 ppm/K	-50 to 130	DIN EN 60751, class B (R_0: ±0.12 %)	end termination, galvanic Sn-plated with Ni barrier layer
703-101BBB-A00	SMD 1206, 1,65 w x 3,25 l x 0,6 thk [0.065 w x 0.128 l x 0.024]	100 Ω	3850 ppm/K	-50 to 130	DIN EN 60751, class B (R_0: ±0.12 %)	end termination, galvanic Sn-plated with Ni barrier layer
703-102BBB-A00	SMD 1206, 1,65 w x 3,25 l x 0,6 thk [0.065 w x 0.128 l x 0.024]	1000 Ω	3850 ppm/K	-50 to 130	DIN EN 60751, class B (R_0: ±0.12 %)	end termination, galvanic Sn-plated with Ni barrier layer

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Latin America	+1-305-805-8188
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Minneapolis, MN 55422
www.honeywell.com/sensing

Honeywell

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April 2010

FEATURES

- Rugged, sealed threaded aluminum housing NEMA 3, 3R, 3S, 4, 12 and 13 requirements
- 22 gauge, 6 inch stranded leadwires, color coded and teflon insulated
- Adjustable mounting

NOTE: For digital sensors, see page 14.

103SR ORDER GUIDE

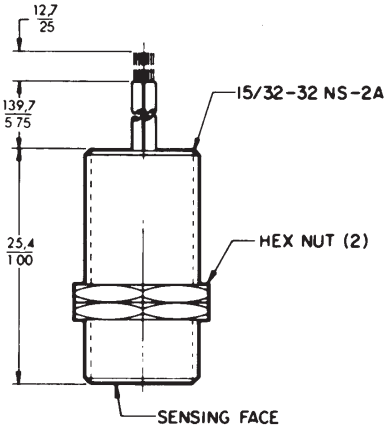
Catalog Listing	103SR3F-5
Supply Voltage (VDC)	4 to 10
Supply Current (mA max.)	3.5
Output Voltage (V)	1.75 to 2.25V at 5V, 0 gauss
Sensitivity	(–400 to +400 gauss) 0.75 to 1.06mV/gauss

mT = Gauss × 10^{-1}

LEADWIRE TYPE

Type 1	22 gage stranded, teflon insulated
Type 2	22 gage PVC insulated conductor with black molded PVC jacket
Type 3	22 gage insulated conductors with yellow thermoplastic polyurethane jacket
Type 4	24 gage irradiated polyethylene

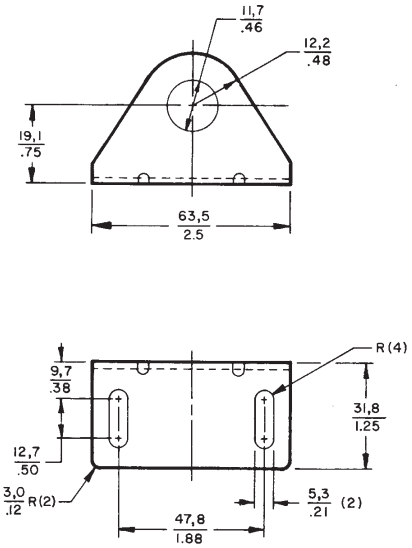
MOUNTING DIMENSIONS (For reference only)



Leadwire color code:

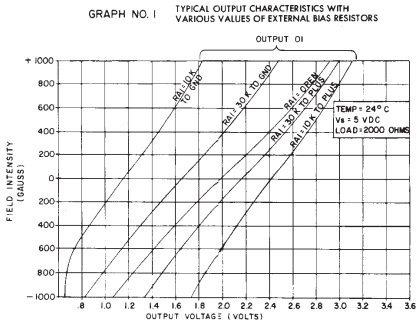
Red	Vs (+)
Black	Ground (–)
Gray	Linear Output
White	R Adjust

1SR15 Mounting Bracket

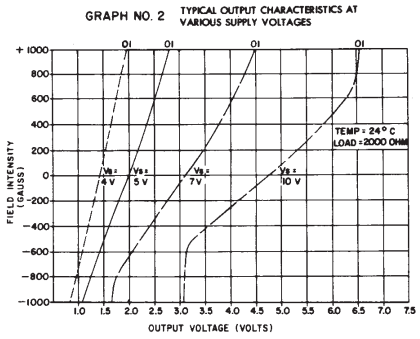


TYPICAL LINEAR OUTPUT CHARACTERISTICS*

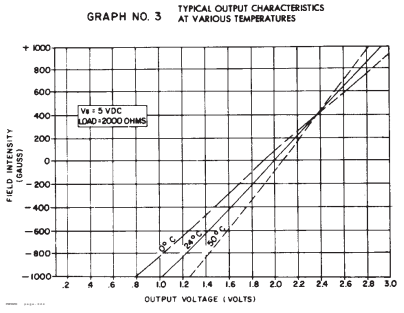
Graph #1
The 103SR3F-5 features a single adjustable linear output. An external bias resistor can be used to vary the zero gauss offset (null) and consequently, the output voltage.



Graph #2
These curves represent the typical output characteristics at various supply voltages.



Graph #3
At 5 VDC supply voltage, these curves represent the typical performance of the 103SR3F-5 over temperature.



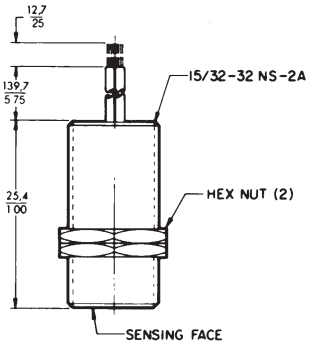
* Illustrated characteristics are typical. Production lot sensor characteristics will be in the general range of those shown.

FEATURES

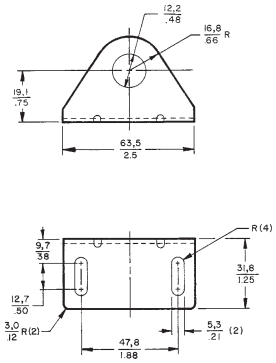
- Current sinking or current sourcing ouput
- Rugged, sealed threaded aluminum housing NEMA 3, 3R, 3S, 4, 12 and 13 requirements**
- 20 gauge, 6 inch stranded leadwires, color coded, or 1 meter jacketed cable
- Adjustable mounting

NOTE: For analog sensors, see page 24.

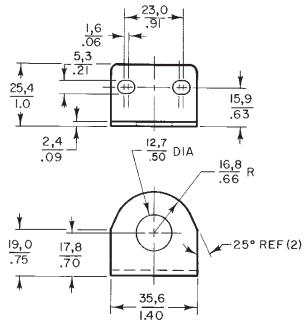
MOUNTING DIMENSIONS (For reference only)



1SR15 Mounting Bracket



1SR15HD Mounting Bracket



Leadwire color code:

Red	Vs (+)
Black	Ground (–)
Blue, Green, or White	Output

103SR ORDER GUIDE

Catalog Listings*		103SR11A-1		103SR12A-1		103SR13A-1		103SR14A-1		103SR17A-1		103SR18-1	
Supply Voltage (VDC)		4.5 to 5.5		6 to 24		4.5 to 24		4.5 to 24		4.5 to 24		4.5 to 24	
Supply Current (mA max.)		4		10		10		10		10		10	
Output Type		Source		Source		Sink		Sink		Sink		Sink	
Output Voltage (V max.)		(Vs-1.5)		(Vs-1.5)		0.4		0.4		0.4		0.4	
Output Current (mA max.)		20		20		20		20		20		20	
Magnetics Type		Unipolar		Unipolar		Unipolar		Unipolar		Bipolar		Latching	
Magnetic Char. & Temp.		G	mT	G	mT	G	mT	G	mT	G	mT	G	mT
0 to 70°C	Max. Op.	735	73.5	495	49.5	475	47.5	—	—	180	18.0	90	9.0
	Min. Rel.	25	2.5	120	12.0	135	13.5	—	—	–180	–18.0	– 90	– 9.0
	Min. Dif.	50	5.0	40	4.0	40	4.0	—	—	40	4.0	40	4.0
–40 to 100°C	Max. Op.	—	—	—	—	495	49.5	160	16.0	205	20.5	120	12.0
	Min. Rel.	—	—	—	—	200	20.0	5	0.5	–205	–20.5	–120	–12.0
	Min. Dif.	—	—	—	—	35	3.5	8	0.8	35	3.5	40	4.0
25°C Typ.	Typ. Op.	350	35.0	350	35.0	400	40.0	90	9.0	50	5.0	50	5.0
	Typ. Rel.	215	21.5	245	24.5	250	25.0	45	4.5	– 50	– 5.0	– 50	– 5.0
	Typ. Dif.	135	13.5	85	8.5	85	8.5	45	4.5	100	10.0	80	8.0

* To order 1 meter jacketed leads, replace the 1 at the end of the catalog listing with a 2. Example 103SR13A-2.
** Stainless steel housing available for applications requiring compliance to NEMA 4X. Contact the 800 number.
G = Gauss
mT = milliTesla

Magnets page 25.

Unipolar: sensor has plus maximum operate point, plus minimum release point. One magnetic pole (South) is required to operate and release a unipolar sensor.

Bipolar sensor has plus (south pole) operate point and minus (north pole) minimum release point. Operate and release points can be both positive or both negative. **Latching cannot be guaranteed.** Ring magnets are usually used with bipolar sensors.

LEADWIRE TYPE

Type 1	22 gage stranded, teflon insulated
Type 2	22 gage PVC insulated conductor with black molded PVC jacket
Type 3	22 gage insulated conductors with yellow thermoplastic polyurethane jacket
Type 4	24 gage irradiated polyethylene

Solid State Sensors

2AV Series

Hall Effect Vane Position Sensor

FEATURES

- Protection against random voltage spikes
  - electrical transients up to +80 volts
  - reverse power supply to −80 volts
- Stainless steel mounting studs lock sensor in place
- Vane depth of 17,2 mm (.68 in.) allows flexibility in actuator placement
- Operating temperature range of −40 to +150°C
- 22 mA current consumption
- 4.5 to 24 VDC supply voltage range
- Current sinking output
- High output current capability up to 40 mA absolute maximum

GENERAL INFORMATION

2AV Series Hall effect vane position sensors are specifically designed to translate the relative position of a ferrous metal actuator into a digital electronic signal. The Hall effect integrated circuit and the magnet are in a rugged plastic housing. When a ferrous metal actuator passes between them, the magnetic flux is shunted away from the sensor. This causes the output signal to change state.

ORDER GUIDE

Catalog Listing	Description
2AV54	Current sinking Hall effect vane sensor

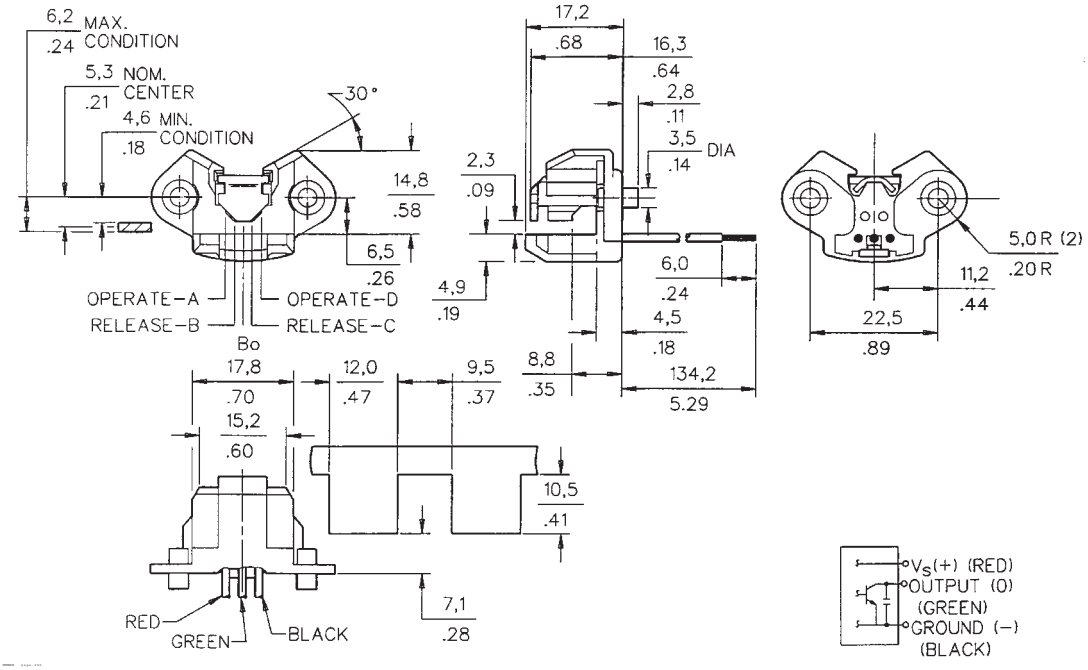
MECHANICAL CHARACTERISTICS

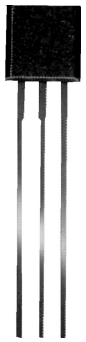
Operating Range	Left or Right Operate	Release	Diff.	Differential L to R, R to L
12 VDC, 25°C	1,19±,30 .047±.012	−1,04±,33 −.041±.013	0,38±,33 .015±.013	2,21±,64 mm .087±.025 in.

ENVIRONMENTAL CHARACTERISTICS

Vibration	45 G per MIL-STD-202, Method 204, condition E
Humidity	Up to 500 hours @ 85°C, 80% RH
Salt spray	48 hours per IEC-68-2-11
Temperature shock	250 air-to-air shocks @ −40° to +130°C

MOUNTING DIMENSIONS (for reference only)





FEATURES

- Low gauss operation can extend sensing distance to one inch or more, depending on magnet size
- Digital current sinking output
- Omnipolar – can be operated with either North or South magnetic pole
- Operating speed: 0 to over 100 kHz
- Small size: .18 x .18 inch
- 3-pin, in-line PC board terminals on .100-inch mounting centers
- Operating temperature range: –20° to 85°C (–4° to 185°F)
- Surface mount style available – 2SSP-S

OPERATION

2SSP Series position sensors have magnetoresistive material integrated on silicon and encapsulated in a plastic package. The integrated circuit provides a digital output in response to very low magnetic fields. Though this signal is identical to our digital Hall effect sensors, it can be achieved by magnetoresistive sensors at much greater sensor-to-magnet distances. For example, the 2SSP sensing distance is approximately one inch, when operated by a MICRO SWITCH 101MG3 magnet.

OPERATING MODE

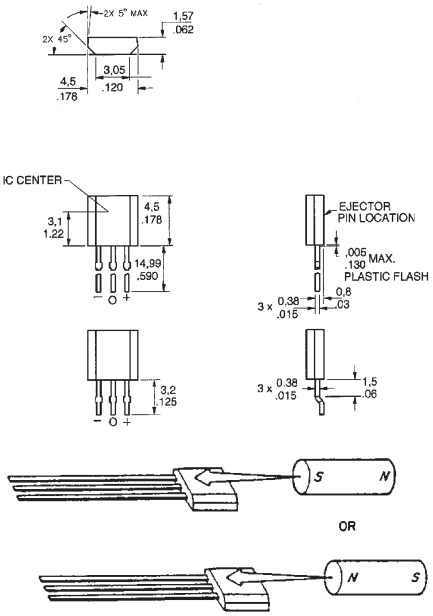
(Arrows indicate direction of magnetic flux.)

2SSP sensors are operated by magnetic fields (North **or** South pole) **parallel** to the magnetoresistive element.

NOTE: Due to the inherent high sensitivity of 2SSP sensors, stray magnetic fields which are parallel to the IC may affect operation.

MOUNTING DIMENSIONS

(For reference only)



2SSP ORDER GUIDE

Catalog Listing			2SSP/2SSP-S	
Supply Voltage (VDC)			6 to 24	
Supply Current (mA max.)			13.5	
Output Type			Sink	
Output Voltage (V) @ 20mA			.40 max.	
Output Current (mA max.)			20	
Leakage Current (μA max.)			10	
Magnetics Type			Omnipolar	
Magnetic Char. & Temp.			Gauss	mT
	–20 to 85°C	Max. Op.	25	2.5
		Min. Rel.	5	0.5
		Max. Dif.	7	0.7
	25°C Typ.	Typ. Op.	15	1.5
		Typ. Rel.	11	1.1
		Typ. Dif.	4	0.4

Magnets page 25.
mT = milliTesla

Solid State Sensors

Hall Effect Vane Position Sensors

4AV Series

FEATURES

- Operated by vane interrupter
- −40 to +125°C temperature range
- Current sinking output
- Smaller size than 2AV
- Four pin in-line printed circuit board terminals or leadwires
- Closely controlled differential to predict pulse width
- 4.5 to 5.5 or 6 to 16 VDC power supply

4AV ORDER GUIDE

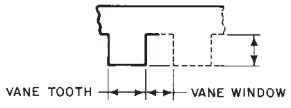
Catalog Listings	4AV11C	4AV12C	4AV11A	4AV12A
Supply Voltage (VDC)	4.5 to 5.5	4.5 to 5.5	6 to 16	6 to 16
Supply Current (mA max.)	7.0	7.0	13.0	13.0
Output Type	Sink	Sink	Sink	Sink
Output Voltage (V)	0.4	0.4	0.4	0.4
Current per Output (mA)	4	8	10	20
Termination	PC Board	Leadwire	PC Board	Leadwire

AV MECHANICAL CHARACTERISTICS

Series	Left Operate a	Mag. Release b	Slope Diff.	Right Operate d	Release c	Diff.	L-R Diff.
4AV*	5,4/.213	6,0/.237	0,6/.024	8,6/.337	7,9/.313	0,6/.024	2,5/.100

* Operating characteristics of the 4AV are adjusted to produce a .100±.010 dimension between the operate point on one side of the switch, to the release point on the other side. The actuator can be designed to produce a specific pulse width for timing or sequencing operations.

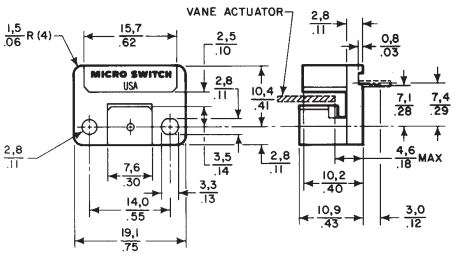
VANE DIMENSIONS (mm/in.)

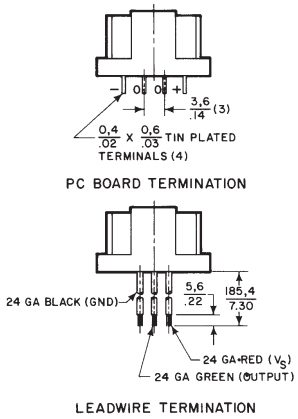


Thickness	Min. Window	Min. Tooth	Min. Tooth Depth
1,0/.04	10,2/.40	10,2/.40	9,3/.37
1,6/.06	10,2/.40	6,3/.25	

Vane material:
Cold rolled steel, 1018 or low in carbon (annealed).

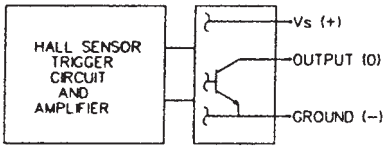
MOUNTING DIMENSIONS (For reference only)



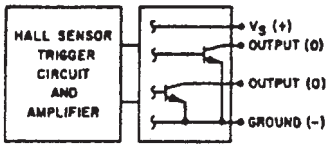


BLOCK DIAGRAM

Leadwire



PC Board

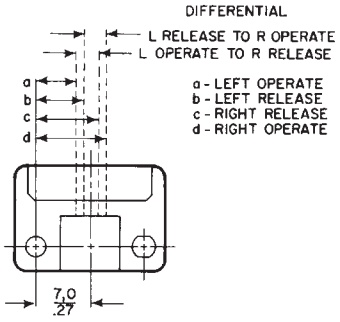


GENERAL INFORMATION

AV vane operated integral magnet position sensors are operated by passing a ferrous vane through the gap between the Hall sensor and the magnet, shunting the magnetic flux away from the sensor. AVs can be used as limit switches by operating with a single large vane; as tachometer sensors by using toothed wheels; or as synchronizing elements by using cams or sectors. AV Series have many features in common such as:

- Operation by a low cost, easy to fabricate ferrous vane
- Magnet and sensor incorporated in same rugged package
- Sealed construction . . . unaffected by dust or dirt
- 0 to 100 kHz operating speed . . . no minimum speed of operation
- On and Off times programmable by vane dimensioning
- Precision mechanical operating characteristics

VANE OPERATION



1. With no vane in the gap the output is conducting (Sinking is Low, Sourcing is High).
2. Vane movement from left to right. When leading edge reaches ''b'', the output stops conducting (Sinking goes High, Sourcing goes Low).
3. **After leading edge reaches ''b'':**
   A. If the vane moves on through the gap; when the trailing edge reaches ''d'', the output will be conducting.
   B. If direction of vane travel **reverses;** ''a'', output will be conducting.
4. For vane movement from right to left, output is non-conducting when the leading edge reaches ''c'', and is conducting when the trailing edge reaches ''a''.

Integral Magnet

Solid State Sensors
Analog Position Sensors

GENERAL INFORMATION

Analog devices are designed to produce an output voltage proportional to the intensity of the magnetic field to which it is exposed.

- Hall effect integrated circuit is mounted on a ceramic substrate. Laser trimmed thick film resistors on the ceramic substrate result in consistent sensitivity from one device to the next, and provide compensation for temperature variations. These analog position sensors feature three pin in-line terminals on .100 inch mounting centers.
- Small, cost-effective plastic packages. They are available on tape-and-reel for automated assembly.
- Rugged aluminum housing has color coded leadwires.

For absolute maximum ratings, see pages 75 and 76.

Solid State Sensors
Position Sensors

FEATURES
- Magnetic sensing using Hall effect technology
- 3.8 to 30 volt supply voltages (SS400/SS100)
- Wide variety of package sizes
- Sensor only and combination magnet/sensor units
- Digital and analog outputs
- Solid state reliability

OPERATION
MICRO SWITCH solid state Hall effect position sensors produce either a digital or analog output. Digital output sensors are in one of two states — on or off. Analog sensors provide a continuous voltage output which increases with a strong magnetic field and decreases with a weak magnetic field.

There are three types of digital sensors, bipolar, omnipolar and unipolar. Bipolar sensors require positive gauss (south pole) to operate and negative gauss (north pole) to release. Omnipolar sensors operate with either the north or the south pole. Unipolar sensors require a single magnetic pole (south) to operate. Release is obtained by moving the south pole away from the sensor. Analog sensors operate by proximity to either magnetic pole. Digital and analog sensor only devices are operated by the magnetic field from a permanent magnet or an electromagnet. Actuation mode depends on the type of magnets used. Integral magnet supplied position sensors are mechanically operated by a magnet mounted on a plastic plunger.

DIGITAL POSITION SENSORS, GENERAL INFORMATION
Digital position sensors are available in a variety of packages: molded plastic, ceramic substrate and threaded cylindrical housings.

- 3 pin in-line plastic packages for printed circuit board mounting with a single output.
- 3 pin plastic packages for surface-mount assembly, identical to industry standard SOT-89 packages.
- Environmentally protected aluminum or plastic housings with color coded leadwires.

APPLICATION
Typical sensor applications include:
- Ignition timing
- Power sensing
- Valve position
- Robotics control
- Current sensing
- Linear or rotary motion detection
- Length measurement
- Flow sensing
- RPM sensing
- Security systems

Sensors are used in:
- Brushless DC motors
- Utility meters
- Water softeners
- Gasoline pumps
- Welding equipment
- Balance scales
- Interlocks
- Flowmeters
- Magnetic card readers
- Vending machines
- Home appliances
- Computer equipment
- Medical instruments
- Copy machines
- Laboratory equipment

DEFINITIONS
Current Sinking (NPN) — A transistor configuration where loads are normally connected between the output and a supply voltage. When the transistor is ON current flow is from the load into the transistor.

Current Sourcing (PNP) — A transistor configuration where loads are normally connected between the output and ground. When the transistor is ON current flow is from the transistor into the load.

Differential (Hall effect transducer) — The difference between the operate and release values of a Hall effect transducer.

Maximum Operate Point refers to the level of magnetic field which will insure the digital output transducer turns ON under any rated condition.

Minimum Release Point refers to the level of magnetic field that insures the transducer is turned OFF.

Magnetic gauss values are found in each order guide.

For magnet ordering information see page 25.

For absolute maximum ratings, see pages 75 and 76.

Hall Effect Gear Tooth Sensors

TYPICAL APPLICATIONS

Automotive and Heavy Duty Vehicles:
- Camshaft and crankshaft speed/ position
- Transmission speed
- Tachometers
- Anti-skid/traction control

Industrial:
- Sprocket speed
- Chain link conveyor speed and distance
- Stop motion detector
- High speed low cost proximity
- Tachometers, Counters

FEATURES

- Senses ferrous metal targets
- Digital current sinking output (open collector)
- Better signal-to-noise ratio than variable reluctance sensors, excellent low speed performance, output amplitude not dependent on RPM
- Sensor electronically *self-adjusts* to slight variations in runout and variations in temperature, simplifying installation and maintenance
- Fast operating speed – over 100 kHz
- EMI resistant
- Reverse polarity protection and transient protection (integrated into Hall I.C.)
- Wide continuous operating temperature range (–40° to 150°C), short term to 160°C

GENERAL INFORMATION

1GT1 Series Gear Tooth Sensors use a magnetically biased Hall effect integrated circuit to accurately sense movement of ferrous metal targets. This specially designed I.C., with discrete capacitor and bias magnet, is sealed in a probe type package for physical protection and cost effective installation.

Units will function from a 4.5 to 24 VDC power supply. Output is digital, current sinking (open collector). Reverse polarity protection is standard. If power is inadvertently wired backwards, the sensor will not be damaged. Built-in protection against pulsed transients to +60V, –40V is also included.

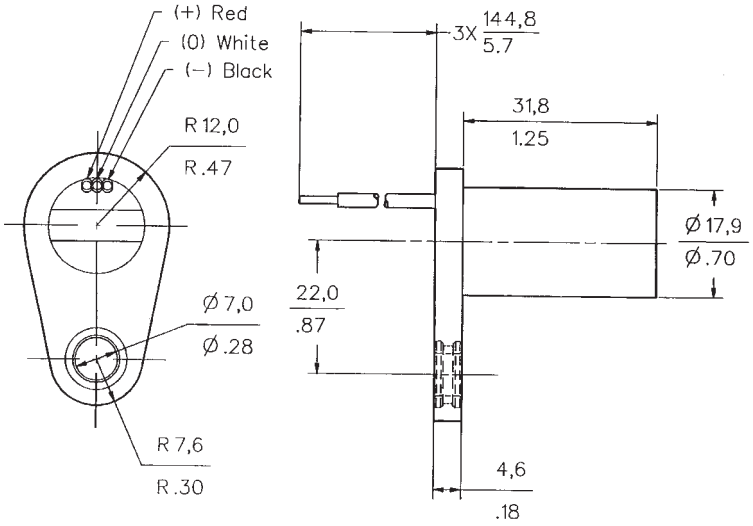
Optimum sensor performance is dependent on the following variables which must be considered in combination:

- Target material, geometry, and speed
- Sensor/target gap
- Ambient temperature
- Magnetic material in close proximity

GT1 ORDER GUIDE

Catalog Listing	Description
1GT101DC	Gear Tooth Sensor

MOUNTING DIMENSIONS (For reference only)



Solid State Sensors
Hall Effect Gear Tooth Sensors

SENSOR SPECIFICATIONS

All values were measured using 1 K pull-up resistor.

Electrical Characteristics	Supply Voltage	4.5 to 24 VDC
	Supply Current	10 mA typ., 20 mA max.
	Output Voltage (output low)	0.4 V max.
	Output Current (output high)	10 µA max. leakage into sensor
	Switching Time	
	Rise (10 to 90%)	15 µsec. max.
	Fall (90 to 10%)	1.0 µsec. max.
Absolute Maximum Ratings*	Supply Voltage (Vs)	±30 VDC continuous
	Voltage Externally Applied To Output (output high)	−0.5 to +30 V
	Output Current	40 mA sinking
	Temperature Range	
	Storage	−40 to 150° (−40 to 302°F)
	Operating	−40 to 150° C (−40 to 302°F)
Switching Characteristics**	Operate Point	3.7±1.25° (3,28±1,13 mm)
	Release Point	4.7±2.50° (4,16±2,21 mm)
	Differential Travel	8.4±3.70° (7,45±3,34 mm)

* As with all solid state components, sensor performance can be expected to deteriorate as rating limits are approached; however, sensors will not be damaged unless the limits are exceeded.
** See Reference Target table.

TARGET GUIDELINES

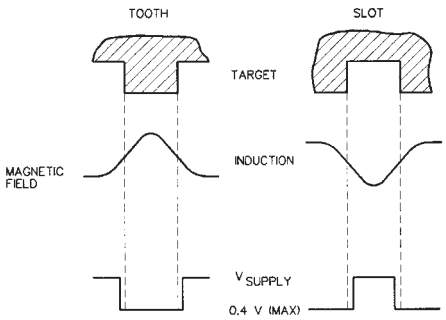
The Target Guidelines table provides basic parameters when an application is not restricted to a specific target.

Any target wheel that exceeds the following minimum specifications can be sensed over the entire temperature range of −40° to 150°C with any sensing gap up to .080 in. (2,0 mm). This data is based on a 4 in. (102 mm) diameter wheel, **rotating 10 to 3600 RPM.**

Reference Target Dimensions

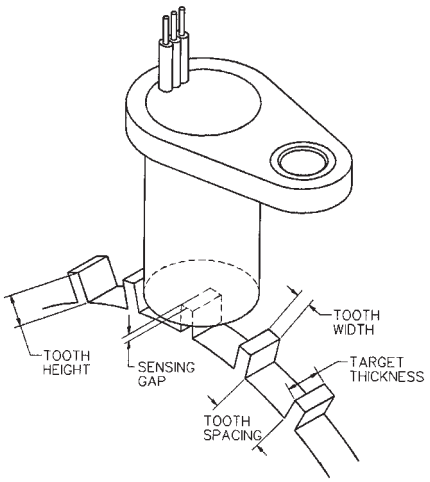
Tooth Height:	.200 in. (5,06 mm) min.
Tooth Width:	.100 in. (2,54 mm) min.
Tooth Spacing:	.400 in. (10,16 mm) min.
Target Thickness:	.250 in. (6,35 mm)

Sensor Output (with pull-up resistor added to output circuit)



REFERENCE TARGET/CONDITIONS

Characteristics will vary due to target size, geometry, location, and material. Sensor specifications were derived using a cold-rolled steel reference target. See table, right, for reference target configuration and evaluation conditions.



Target	
Diameter:	4 in. (101,6 mm)
Tooth Width:	.350 in. (8,89 mm)
Thickness:	.250 in. (6,35 mm)

Test Conditions	
Air Gap:	.040 to .080 in. (1,02 to 2,03 mm)
V Supply:	4.5 to 24 V
RPM:	10 min., 3600 max.

Solid State Sensors
Integral Magnet Position Sensors

GENERAL INFORMATION

MICRO SWITCH combines digital Hall effect sensors with integral magnets to produce the VX series mechanically operated solid state sensors.

- The VX series features a permanent magnet mounted on the plastic plunger which operates a digital Hall effect sensor. When actuated, the sensor produces a sinking output. Mounting dimensions and mechanical characteristics are similar to MICRO SWITCH's popular V3 and V7 electromechanical snap-action switch series. The VX series features AMP plug-in connectors.

- The AV vane sensors consist of a magnet and a Hall effect sensor in a rugged plastic housing. When a ferrous vane is passed through the gap between the Hall sensor and the magnet, the magnetic flux is shunted away from the sensor causing the output to change state. (For more information on vane sensors including actuation and mechanical characteristics, see page 50.)

- GT1 sense small ferrous metal targets and are popular as geartooth sensors. Page 52.

For absolute maximum ratings, see pages 75 and 76.

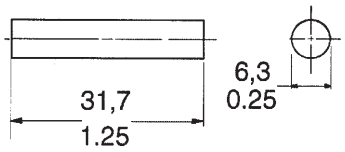
Solid State Sensors
Magnets

GENERAL INFORMATION
Several bar and ring magnets for actuating Hall effect sensors are available from MICRO SWITCH. Bar magnets, in various sizes and strengths, are ideal for sensors with unipolar magnetic characteristics. The ring magnets, with alternate South and North poles on the outside diameter, are especially useful for sensors with bipolar magnetic characteristics. (For more information on magnets and methods of magnet actuation, see Application Data.)

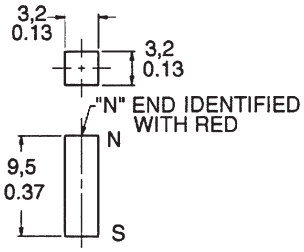
FEATURES
- Wide variety of sizes and shapes
- Wide variety of magnetic materials
- Threaded bushings available on some listings for easy installation

MOUNTING DIMENSIONS (for reference only)

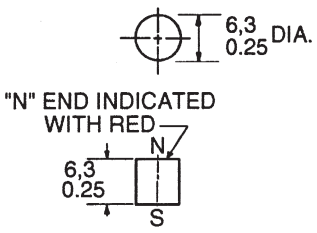
101MG3



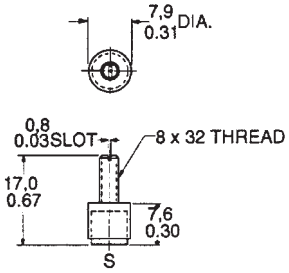
101MG2L1



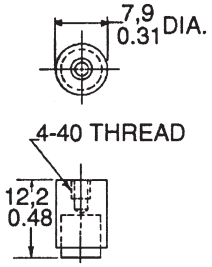
101MG7



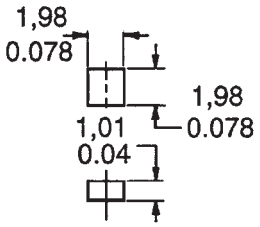
102MG11



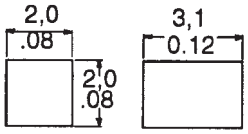
102MG15



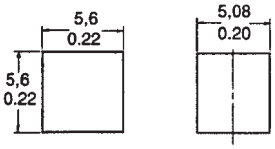
103MG5



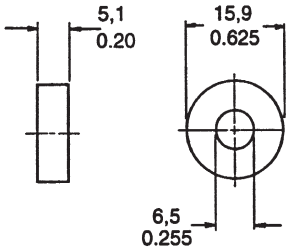
103MG6



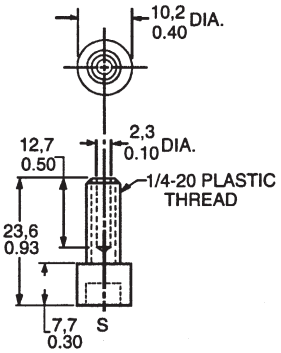
103MG8



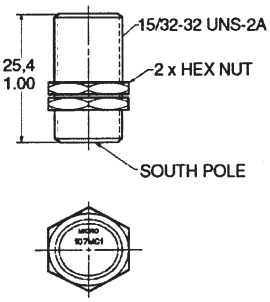
105MG5R2



106MG10



107MG1



Analog

Magnets

MG ORDER GUIDE — BAR MAGNETS

Catalog Listings	101MG3	101MG7*	101MG2L1*	102MG11*	102MG15*	103MG5**	103MG6***	103MG8	106MG10*	107MG1
Outside Diameter	6,3 0.25	6,3 0.25	3,2 0.125	7,9 0.31	7,9 0.31	2,0 .078	2,0 .080	5,6 .220	10,2 0.40	15/32-32 UNS21
Length	31,7 1.25	6,3 0.25	9,5 0.375	17,0 0.67	12,2 .48	2,0 .078	3,1 .120	5,6 .220	23,6 0.93	25,4 1.00

* Bulk packaging in 100 unit lots. Add -**BP** to catalog listing.
** 125 pieces per tube. Poles not marked.
*** 75 pieces per tube. Poles not marked.

MG ORDER GUIDE — RING MAGNETS

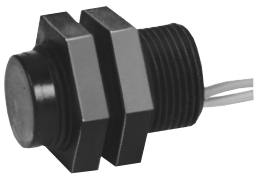
Catalog Listings	105MG5R2	105MG5R4
Outside Diameter	15,9 0.625	15,9 0.625
# Pole Pairs	2	4

MAGNET SELECTION GUIDE

This guide is designed to aid in determining the best magnet for use with a Hall effect sensor. There are several factors to consider when choosing a magnet. The most important is gap distances. There must be adequate magnetic gauss to operate the sensor at the correct distance. By using the maximum operate magnetic gauss characteristics (see sensor order guides), you can determine which magnet(s) will operate the sensor. Other important factors include temperature range and the physical environment of the application.

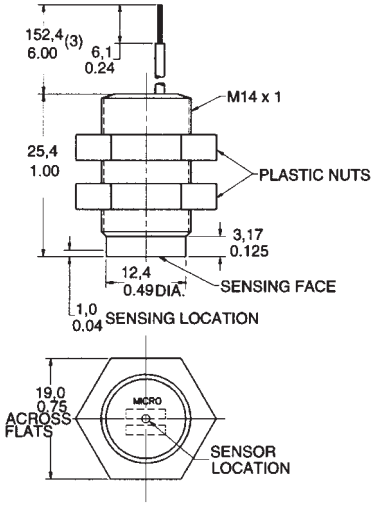
Material and Process	Physical Strength	Temperature Range*	Magnetic Shock Resistance	Resistance To Demagnetization	Gap Distance** & Gauss Level @ 25°C† 0,25 .010	0,76 .030	1,27 .050	2,54 .100	3,81 .150	5,08 .200	Catalog Listing
Alnico V Cast	Good	−40 to 300°C	Poor	Fair	1460	1320	1170	810	575	420	**101MG3**
Alnico VIII Sintered	Good	−40 to 250°C −40 to 140°C −40 to 140°C	Good	Excellent	1050 7800	900 7800	755 7800	470 750	295 550	195 375	**101MG7** **102MG11** **102MG15** **107MG1*** **
Alnico VI Sintered	Good	−40 to 250° C	Good	Good	730	550	410	205	115	75	**101MG2L1**
Indox 1 Pressed	Good	0 to 100°C	Good	Excellent	700	520	375	175	85	45	**105MG5R2** **105MG5R4**
Rare Earth Pressed	Poor	−40 to 250°C	Good	Excellent	1110 2900 2620 2620	630 1400 2100 2100	365 850 1600 1600	120 260 940 940	55 130 550 550	25 70 350 350	**103MG5** **103MG6** **103MG8** **106MG10**

* Magnet will not be damaged over temperature range.
** Gap distance from sensing surface.
*** Measurement device saturated @ 800 gauss.
†milliTesla = Gauss × 10^{-1}



FEATURES
- Completely enclosed housing
- Color coded leadwires
- High speed, no-touch operation over 100 kHz possible
- Adjustable mounting
- Reverse polarity protection (bipolar listing)
- Meets NEMA 3, 3R, 3S, 4, 4X, 12 and 13 requirements
- Bushing is PBT (Valox 420 SEO) 30% glass filled

MOUNTING DIMENSIONS (For reference only)

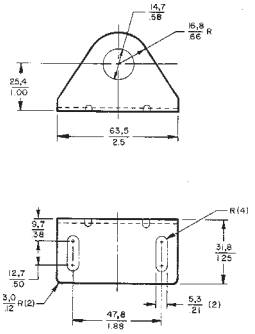


24AWG Leadwire color code:

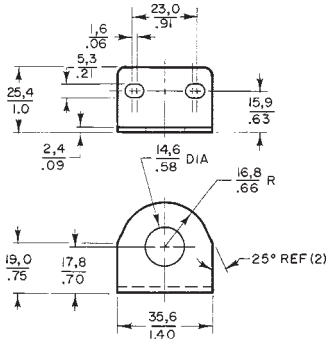
Red	Vs (+)
Green	Output
Black	Ground (–)

MOUNTING BRACKETS

1SR14M



1SR14MHD



SR3 ORDER GUIDE

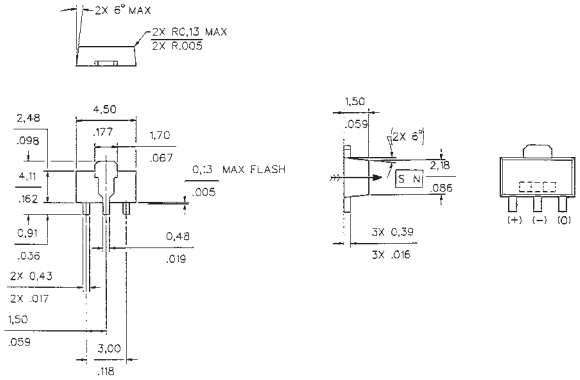
Catalog Listings		SR3F-A1	SR3B-A1	SR3G-A1	SR3C-A1	SR4P2-A1
Supply Voltage (VDC)		4.5 to 24	4.5 to 24	4.5 to 24	4.5 to 24	6 to 24
Supply Current (mA max.)		18.0	15.0	22.0	19.0	13.5
Output Type		Sink	Sink	Sink	Sink	Sink
Output Voltage (V max.)		0.40	0.40	0.40	0.40	0.40
Current per Output (mA max.)		10	10	10	10	20
Magnetics Type		Unipolar (1)	Bipolar (2)	Unipolar (1)	Unipolar (1)	Omnipolar (3)
Magnetic Char. & Temp.		G mT	G mT	G mT	G mT	G mT
–40 to 85°C	Max. Op.	450 45.0	150 15.0	430 43.0	190 19.0	25 2.5
(–40 to +185°F)	Min. Rel.	170 17.0	–150 –15.0	160 16.0	60 6.0	5 0.5
	Min. Dif.	20 2.0	40 4.0	50 5.0	10 1.0	7 0.7
25°C (+77°F)	Typ. Op.	400 40.0	90 9.0	350 35.0	150 15.0	15 1.5
Typical	Typ. Rel.	185 18.5	– 90 – 9.0	280 28.0	100 10.0	11 1.1
	Typ. Dif.	20 2.0	80 8.0	70 7.0	30 3.0	4 0.4

(1) A unipolar sensor has a plus maximum operate point and a plus minimum release point. One magnetic pole (south) is required to operate and release a unipolar sensor.
(2) A bipolar sensor has a plus (south pole) maximum operate point and a minus (north pole) minimum release point. Operate and release points can be both positive, or both negative. **Latching cannot be guaranteed.** Ring magnets are usually used with bipolar sensors.
(3) An omnipolar sensor operates with any magnetic field (north or south pole).
(4) Operating characteristics are from –20°C to +85°C for SR4P2-A1.
(5) To order 1 meter jacketed leads, replace the 1 at end of listing with a 2.
Example: SR3B-A2.
G = Gauss
mT = milliTesla

FEATURES

- Small-size SOT89 style package (.177×.136×.059 in.) surface mounts on PC boards and flexible circuits
- Available in bulk or on tape and reel
- Reverse polarity protection
- Current sinking output
- Sensitive magnetic characteristics
- Compatible with pick-and-place equipment for automated assembly operations
- Operating speed: 0 to over 100 kHz

MOUNTING DIMENSIONS (For reference only)



SS11 sensors are available on tape and reel for high volume, automated pick and place equipment. Each reel contains 1,000 sensors.

NOTE: DO NOT wave solder this product. This process may negatively affect sensor performance and reliability, and will void MICRO SWITCH's warranty.

MICRO SWITCH recommends an infrared reflow process with peak temperatures not to exceed 200°C (392°F) for 10 seconds maximum.

SS1 ORDER GUIDE (Add "T" suffix to catalog listing for tape and reel as shown below.)

Catalog Listings	SS11 (SS11T)	
Magnetic Type	Bipolar	
Supply Voltage (VDC)	4.5 to 24	
Supply Current (mA)	4 typ. 8.7 max.	
Sinking Output (mA)	20 max.	
Output Voltage (V)	0.15 typ. 0.40 max.	
Output Leakage Current, Released (μA) (Leakage into sensor)	10	
Output Switching Time (μs) Rise (10% to 90%)	0.2 typ. 1.5 max.	
Fall (90% to 10%)	0.5 typ. 1.0 max.	
Magnetic Characteristics* @ 0 to 85°C, 32 to 185°F	G	mT
Max. Operate	150	15.0
Min. Release	–150	–15.0
Min. Differential	50	5.0
@ –40 to 125°C, –40 to 257°F		
Max. Operate	200	20.0
Min. Release	–200	–20.0
Min. Differential	40	4.0
@ 25°C, 77°F typ.		
Typ. Operate	40	4.0
Typ. Release	– 40	– 4.0
Typ. Differential	80	8.0

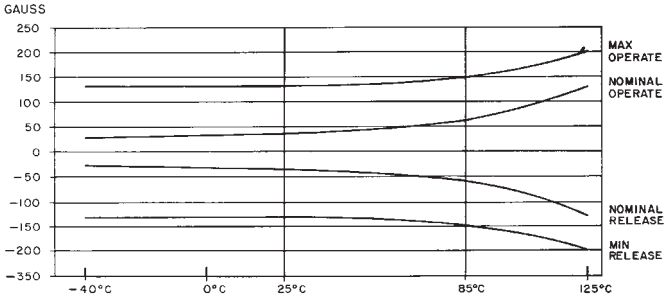
Magnets page 25.

*G = Gauss
mT = milliTesla.

APPLICATION INFORMATION

Operate/Release Characteristics Shift Over Temperature

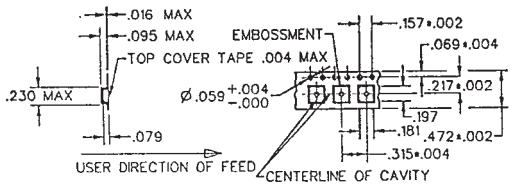
SS11 Operate and Release vs. Temperature



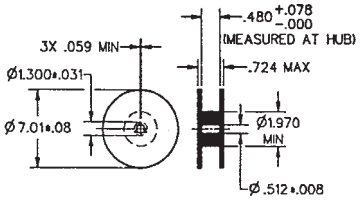
Wave soldering may negatively affect sensor performance.

TAPE AND REEL DIMENSIONS

Tape



Reel



NOTE: One reel contains 1,000 sensors.

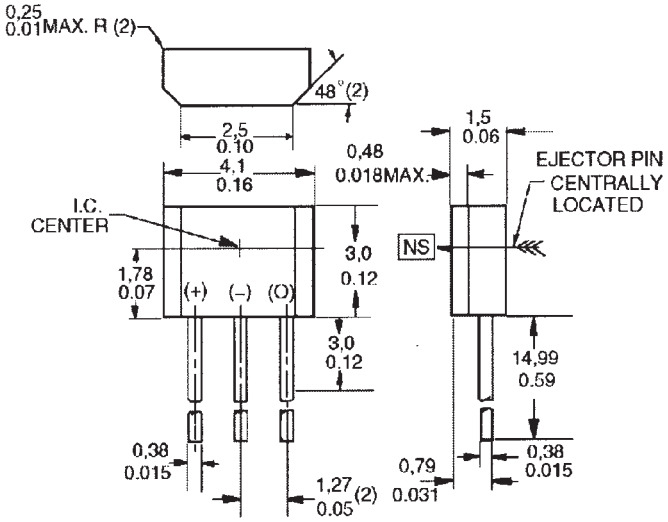
Solid State Sensors

Digital Bipolar Position Sensors

FEATURES

- Small size (.16″ x .12″)
- Reverse power polarity protection
- Current sinking output
- Sensitive magnetic characteristics
- Operating speed from 0 to over 100 kHz
- Operating temperature range: –55° to 150°C

MOUNTING DIMENSIONS (For reference only)



SS40 ORDER GUIDE

Catalog Listings			SS41	
Supply Voltage (VDC)			4.5 to 24	
Supply Current (mA)			4 typ., 8.7 max. @ Vs = 4.5V 6 typ., 15 max. @ Vs = 6 to 24V	
Output Type			Sink (20 mA max.)	
Output Voltage (V)			0.15 typ., 0.40 max. @ –40 to +125°C 0.15 typ., 0.45 max. @ 125 to 150°C	
Output Leakage Current (Released)			10 μA Leakage into sensor	
Output Switching Time	Rise (10% to 90%)		0.2 μs typ. 1.5 μs max.	
	Fall (90% to 10%)		0.5 μs typ. 1.0 μs max.	
Magnetic Type			Bipolar	
Magnetic Char. & Temp.*			G	mT
	0 to 85°C	Max. Op.	150	15.0
		Min. Rel.	–150	–15.0
		Min. Dif.	50	5.0
	–40 to 125°C	Max. Op.	200	20.0
		Min. Rel.	–200	–20.0
		Min. Dif.	40	4.0
	25°C Typ.	Typ. Op.	40	4.0
		Typ. Rel.	– 40	– 4.0
		Typ. Dif.	80	8.0
	–55 to 150°C	Max. Op.	250	25.0
		Min. Rel.	–250	–25.0
		Min. Dif.	30	3.0

*G = Gauss
mT = milliTesla.

Solid State Sensors

Surface Mount Digital Position Sensors

FEATURES

- Quad Hall design virtually eliminates mechanical stress effects
- Temperature compensated magnetics
- Bipolar, unipolar, latching magnetics
- Super high sensitivity available
- Symmetry of operate/release points about zero gauss (bipolar/latching)
- Operating temperature range of –40 to +125°C
- Low current consumption (7 mA typical @ 5 V, 25°C)
- 3.8 to 30 VDC supply voltage range
- High output current capability of 50 mA absolute maximum

The temperature compensated Hall effect sensor consists of a quad Hall sensing element in a square integrated circuit chip, which is then encapsulated in a glass-filled thermoset molding material. The small SOT89 style package surface mounts on PC boards and flexible circuits.

The integrated circuit is thermally balanced for predictable performance over the full temperature range of –40 to +125°C. Built-in temperature compensation has a negative slope (operate and release points decrease as temperature increases). This slope is optimized to match the negative temperature coefficient of low cost magnets, to track their performance over temperature. Bipolar, unipolar and latching magnetics are available.

Band gap regulation provides extremely stable operation over the full supply voltage range of 3.8 to 30 VDC. Current consumption is a low 10 mA maximum. SS100 sensors are capable of continuous 20 mA sinking output, and can withstand temporary current as high as 50 mA absolute maximum. They can use existing power supply sources in most applications, and can be directly interfaced with many electronic components without buffering or compensation circuitry. SS100 Series sensors are available on tape and reel for high-volume, automated pick and place equipment. Each reel contains 1,000 sensors.

NOTE: DO NOT wave solder this product. This process may negatively affect sensor performance and reliability, and will void MICRO SWITCH's warranty. MICRO SWITCH recommends a convection infrared reflow process with peak temperatures not to exceed 220°C (428°F) for 10 seconds maximum.

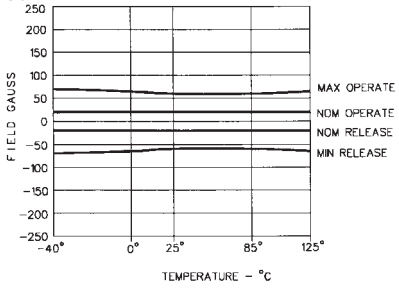
ORDER GUIDE

Catalog Listing		SS111A		SS113A		SS141A		SS143A		SS149A		SS161A		SS166A	
Magnetic Type		Bipolar		Bipolar		Unipolar		Unipolar		Unipolar		Latching		Latching	
Supply Voltage (VDC)		3.8 to 30		3.8 to 30		3.8 to 30		3.8 to 30		3.8 to 30		3.8 to 30		3.8 to 30	
Supply Current (max.)		10 mA		10 mA		10 mA		10 mA		10 mA		10 mA		10 mA	
Output Type		Sink		Sink		Sink		Sink		Sink		Sink		Sink	
Output Voltage (max.)		.40 V		.40 V		.40 V		.40 V		.40 V		.40 V		.40 V	
Output Current (max.)		20 mA		20 mA		20 mA		20 mA		20 mA		20 mA		20 mA	
Leakage Current (max.)		10 µA		10 µA		10 µA		10 µA		10 µA		10 µA		10 µA	
Output Switching Time Rise (10-90%) (max.) Fall (90-10%) (max.)		 1.5 µs 1.5 µs		 1.5 µs 1.5 µs		 1.5 µs 1.5 µs		 1.5 µs 1.5 µs		 1.5 µs 1.5 µs		 1.5 µs 1.5 µs		 1.5 µs 1.5 µs	
Magnetic Characteristics*		G	mT	G	mT	G	mT	G	mT	G	mT	G	mT	G	mT
–40°C	Max. Op.	70	7.0	140	14.0	135	13.5	215	21.5	440	44.0	110	11.0	200	20.0
	Min. Rel.	–70	–7.0	–140	–14.0	20	2.0	80	8.0	210	21.0	–110	–11.0	–200	–20.0
	Min. Dif.	15	1.5	20	2.0	15	1.5	25	2.5	30	3.0	50	5.0	200	20.0
0°C	Max. Op.	65	6.5	140	14.0	117	11.7	190	19.0	400	40.0	90	9.0	185	18.5
	Min. Rel.	–65	–6.5	–140	–14.0	20	2.0	80	8.0	230	23.0	– 90	– 9.0	–185	–18.5
	Min. Dif.	15	1.5	20	2.0	18	1.8	25	2.5	30	3.0	50	5.0	200	20.0
25°C	Max. Op.	60	6.0	140	14.0	115	11.5	180	18.0	390	39.0	85	8.5	180	18.0
	Min. Rel.	–60	–6.0	–140	–14.0	20	2.0	75	7.5	235	23.5	– 85	– 8.5	–180	–18.0
	Min. Dif.	15	1.5	20	2.0	20	2.0	25	2.5	30	3.0	50	5.0	200	20.0
85°C	Max. Op.	60	6.0	140	14.0	120	12.0	180	18.0	400	40.0	85	8.5	180	18.0
	Min. Rel.	–60	–6.0	–140	–14.0	15	1.5	70	7.0	215	21.5	– 85	– 8.5	–180	–18.0
	Min. Dif.	12	1.2	20	2.0	15	1.5	15	1.5	30	3.0	50	5.0	190	19.0
125°C	Max. Op.	65	6.5	140	14.0	123	12.3	190	19.0	410	41.0	100	10.0	180	18.0
	Min. Rel.	–65	–6.5	–140	–14.0	15	1.5	60	6.0	200	20.0	–100	–10.0	–180	–18.0
	Min. Dif.	12	1.2	20	2.0	8	0.8	10	1.0	30	3.0	50	5.0	160	16.0

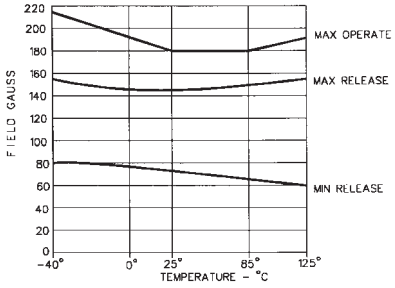
*G = Gauss
mT = milliTesla.

OPERATE AND RELEASE POINTS

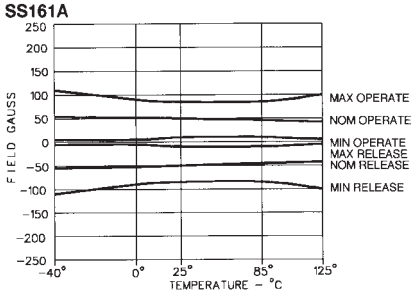
SS111A



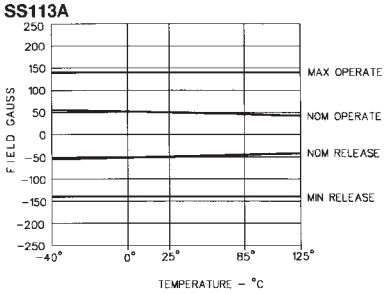
SS143A



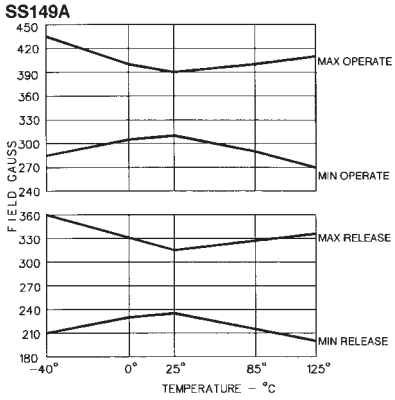
SS161A



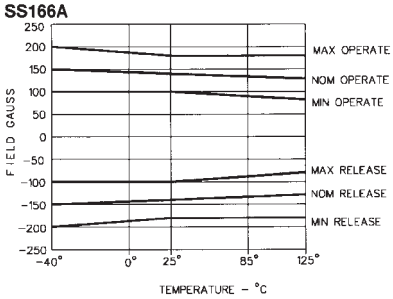
SS113A



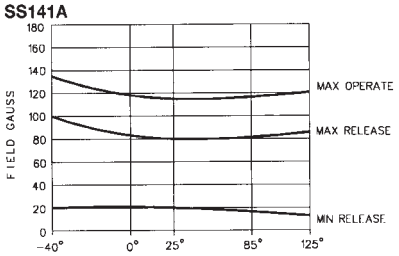
SS149A



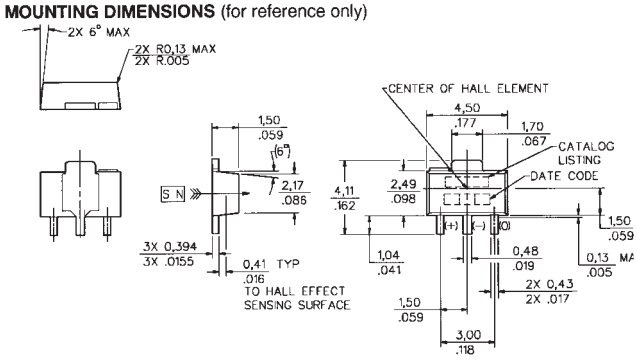
SS166A



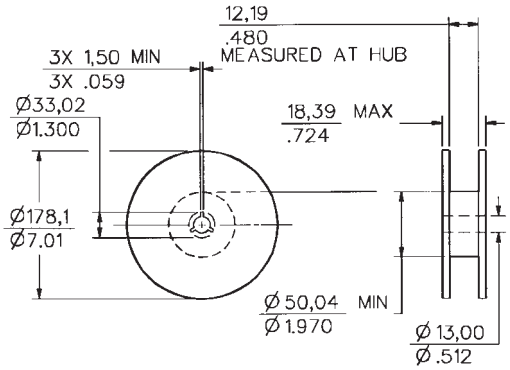
SS141A



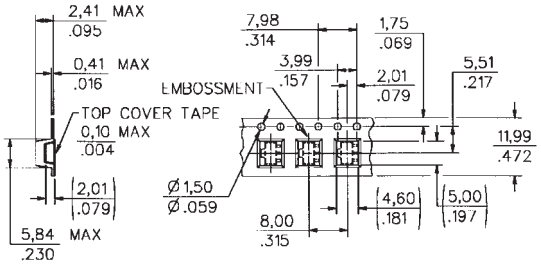
MOUNTING DIMENSIONS (for reference only)



REEL DIMENSIONS



TAPE DIMENSIONS



NOTICE

Interruption of power to a latching device may cause the output to change state when power is restored. If a magnetic field of sufficient strength is present, the sensor output will be in the condition dictated by the magnetic field.

Solid State Sensors
Digital Position Sensors

SS400 Series

FEATURES
- 3.8-30 VDC supply voltage
- Digital current sinking output
- 3 pin in-line PCB terminals
- Quad-Hall design virtually eliminates mechanical stress effects
- Temperature compensated magnetics
- Operate/release points can be customized
- Bipolar, unipolar, latching magnetics
- High output current capability –50 mA absolute maximum
- Operate/release points symmetrical around zero gauss (bipolar/latch)
- Operating temperature range of –40 to +150°C (–40 to +302°F)
- Package material: Plaskon 3300H
- Surface mount version available: SS400-S (with cut and formed leads)

SS400 Series position sensors have a thermally balanced integrated circuit over full temperature range. The negative compensation slope is optimized to match the negative temperature coefficient of lower cost magnets. Bipolar, latching and unipolar magnetics are available.

Band gap regulation provides extremely stable operation over 3.8 to 30 VDC supply voltage range. SS400 sensors are capable of continuous 20 mA sinking output, and may be cycled as high as 50 mA maximum.

NOTICE
Interruption of power to a latching device may cause the output to change state when power is restored. If a magnetic field of sufficient strength is present, the sensor output will be in the condition dictated by the magnetic field.

ORDER GUIDE

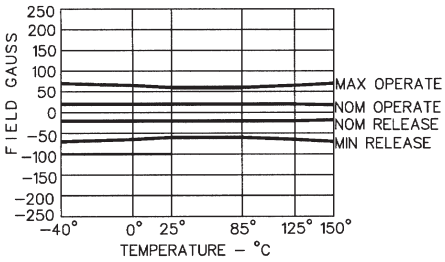
Catalog Listing		SS411A	SS413A	SS441A	SS443A	SS449A	SS461A	SS466A
Magnetic Type		Bipolar	Bipolar	Unipolar	Unipolar	Unipolar	Latching	Latching
Supply Voltage (VDC)		3.8 to 30	3.8 to 30	3.8 to 30	3.8 to 30	3.8 to 30	3.8 to 30	3.8 to 30
Supply Current (max.)		10 mA	10 mA	10 mA	10 mA	10 mA	10 mA	10 mA
Output Type		Sink	Sink	Sink	Sink	Sink	Sink	Sink
Output Voltage (max.)		.40 V	.40 V	.40 V	.40 V	.40 V	.40 V	.40 V
Output Current, max.*		20 mA	20 mA	20 mA	20 mA	20 mA	20 mA	20 mA
Output Leakage Current, max.		10 µA	10 µA	10 µA	10 µA	10 µA	10 µA	10 µA
Output Switching Time V_{CC}=12 V, R_L=1.6 K, C=20 pF	Rise (10-90%)	.05 µs typ. 1.5 µs max.	.05 µs typ. 1.5 µs max.	.05 µs typ. 1.5 µs max.	.05 µs typ. 1.5 µs max.	.05 µs typ. 1.5 µs max.	.05 µs typ. 1.5 µs max.	.05 µs typ. 1.5 µs max.
	Fall (90-10%)	.15 µs typ. 1.5 µs max.	.15 µs typ. 1.5 µs max.	.15 µs typ. 1.5 µs max.	.15 µs typ. 1.5 µs max.	.15 µs typ. 1.5 µs max.	.15 µs typ. 1.5 µs max.	.15 µs typ. 1.5 µs max.
Magnetic Characteristics		G mT	G mT	G mT	G mT	G mT	G mT	G mT
–40°C	Max. Op.	70 7.0	140 14.0	135 13.5	215 21.5	435 43.5	110 11.0	200 20.0
	Min. Rel.	–70 –7.0	–140 –14.0	20 2.0	80 8.0	210 21.0	–110 –11.0	–200 –20.0
	Min. Dif.	15 1.5	20 2.0	15 1.5	25 2.5	30 3.0	50 5.0	200 20.0
0°C	Max. Op.	65 6.5	140 14.0	117 11.7	190 19.0	400 40.0	90 9.0	185 18.5
	Min. Rel.	–65 –6.5	–140 –14.0	20 2.0	80 8.0	230 23.0	– 90 – 9.0	–185 –18.5
	Min. Dif.	15 1.5	20 2.0	18 1.8	25 2.5	30 3.0	50 5.0	200 20.0
25°C	Max. Op.	60 6.0	140 14.0	115 11.5	180 18.0	390 39.0	85 8.5	180 18.0
	Min. Rel.	–60 –6.0	–140 –14.0	20 2.0	75 7.5	235 23.5	– 85 – 8.5	–180 –18.0
	Min. Dif.	15 1.5	20 2.0	20 2.0	25 2.5	30 3.0	50 5.0	200 20.0
85°C	Max. Op.	60 6.0	140 14.0	120 12.0	180 18.0	400 40.0	85 8.5	180 18.0
	Min. Rel.	–60 –6.0	–140 –14.0	15 1.5	70 7.0	215 21.5	– 85 – 8.5	–180 –18.0
	Min. Dif.	12 1.2	20 2.0	15 1.5	15 1.5	30 3.0	50 5.0	190 19.0
125°C	Max. Op.	65 6.5	140 14.0	123 12.3	190 19.0	410 41.0	100 10.0	180 18.0
	Min. Rel.	–65 –6.5	–140 –14.0	15 1.5	60 6.0	200 20.0	–100 –10.0	–180 –18.0
	Min. Dif.	12 1.2	20 2.0	8 0.8	10 1.0	30 3.0	50 5.0	160 16.0
150°C	Max. Op.	70 7.0	140 14.0	125 12.5	200 20.0	420 42.0	110 11.0	185 18.5
	Min. Rel.	–70 –7.0	–140 –14.0	10 1.0	55 5.5	185 18.5	–110 –11.0	–185 –18.5
	Min. Dif.	10 1.0	20 2.0	5 0.5	5 0.5	30 3.0	50 5.0	140 14.0

* Absolute maximum output current is 50 mA for all SS400 listings. G = Gauss. mT = milliTesla.

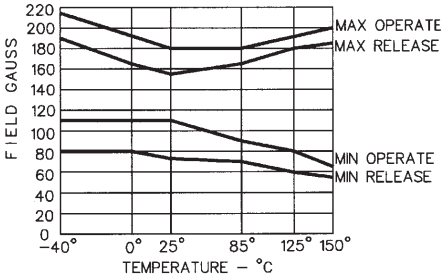
Note: For SS400 on tape with straight or formed leads on 0.100″ centers, contact the 800 number. One box contains 5,000 sensors.

OPERATE AND RELEASE POINTS

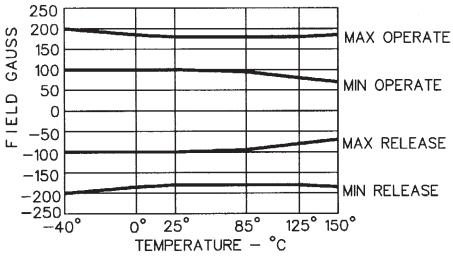
SS411A



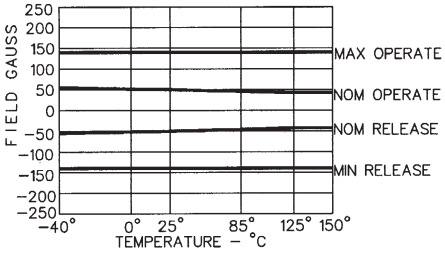
SS443A



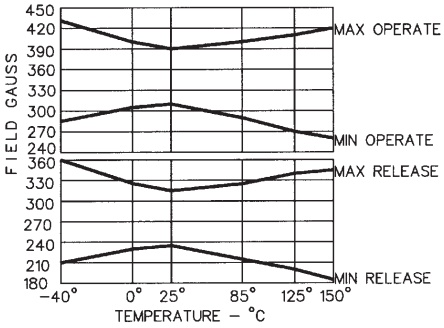
SS466A



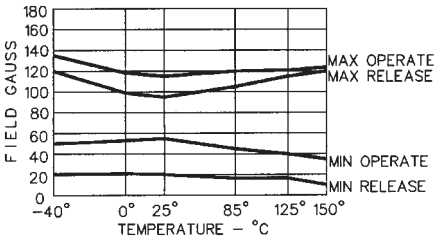
SS413A



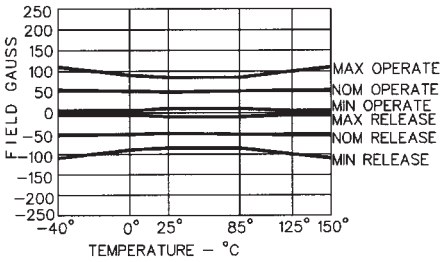
SS449A



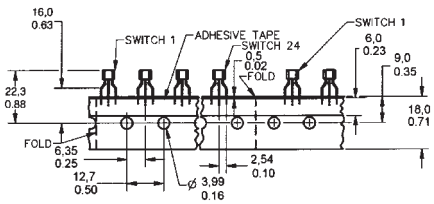
SS441A



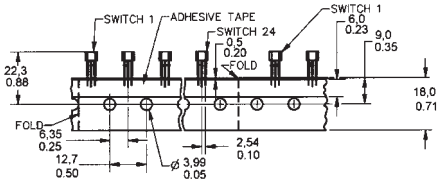
SS461A



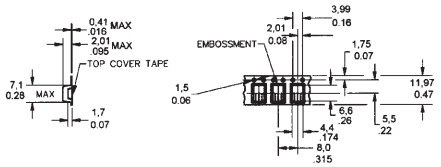
MOUNTING DIMENSIONS (For reference only)



TAPE STYLE T2

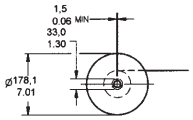


TAPE STYLE T3

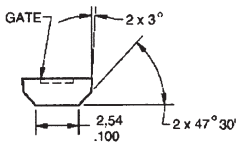


TAPE STYLE SP & RP

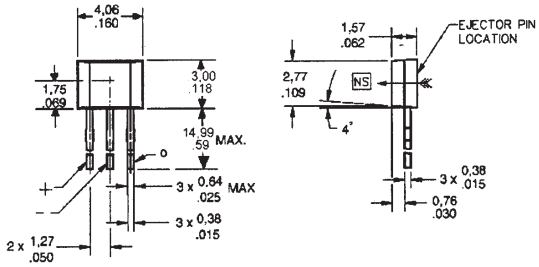
Tape styles T2 and T3 are supplied in Ammopack (Fanfold) format, in cardboard boxes. Each box contains 5000 sensors.



DIRECTION OF FEED FROM REEL

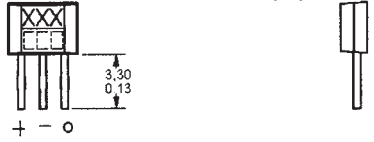


STANDARD LEAD VERSION

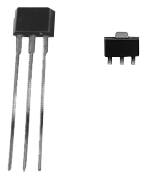


SURFACE MOUNT (-S) VERSION

REDUCED LEAD LENGTH (-R) VERSION



Digital



FEATURES

- 4 to 10 VDC supply voltage
- High output current capability – 10 mA continuous, 20 mA max.
- Ratiometric output
- Low supply current – 4 mA typ., for battery operation (@ 5V)
- Very small, industry accepted packages
- Available on tape and reel for automated assembly
- Responds to North or South pole
- Linear output voltage over wide magnetic flux range
- Best for applications with narrow temperature fluctuation

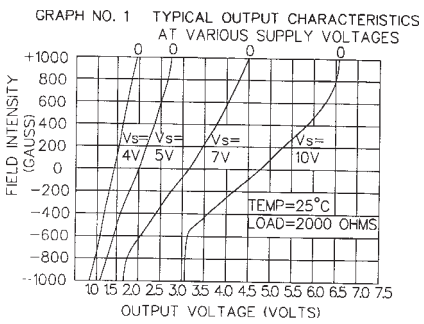
ORDER GUIDE

Catalog Listing	SS49/SS19/SS19T
Supply Voltage	4 to 10 VDC
Supply Current	4 mA typ.
Output Type	Sourcing
Output Voltage @ 0 Gauss	1.75 to 2.25 V @ 5 V, 25°C
Sensitivity (measured between –400 and +400 gauss)	0.60 to 1.25 mV/ gauss

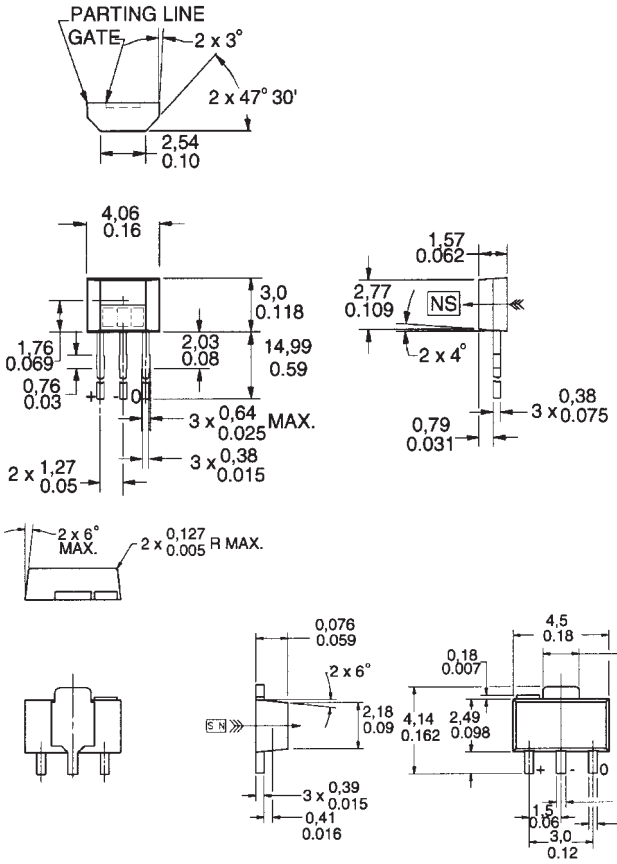
TYPICAL LINEAR OUTPUT CHARACTERISTICS*

Graph #1

This graph displays the relationship between supply voltage and the combined effects of a change in sensitivity (gain) and null voltage output at room temperature. The sensitivity variation is represented by a change in the slope of the curve. The null voltage shifts the entire curve.



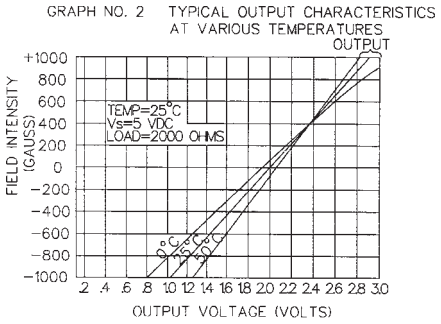
MOUNTING DIMENSIONS (For reference only)



Note: The SS19 is also available on tape and reel. Dimensions page 13.

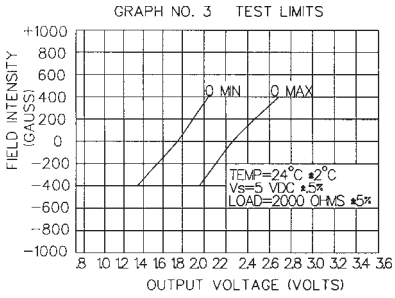
Graph #2

At 5 VDC supply voltage, these curves represent the typical performance of the SS49/SS19 over temperature.



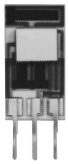
Graph #3

This graph indicates the conditions under which we test the SS49/SS19, and defines the limits of the product. These limits do not take temperature or supply voltage variations into account.



* Illustrated characteristics are typical. Production lot sensor characteristics will be in the general range of those shown.

Analog



FEATURES

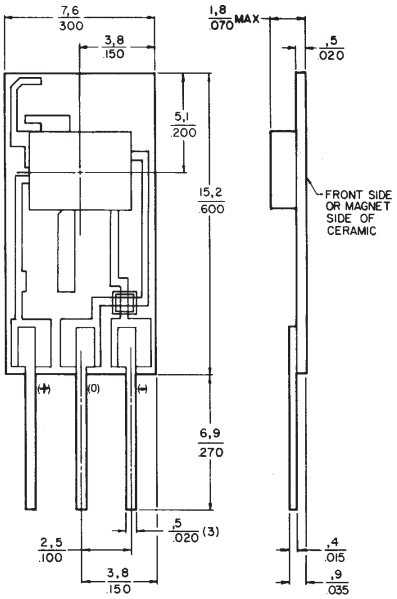
- Single current sinking or current sourcing linear output
- Improved temperature stability
- Three pin in-line printed circuit board terminals
- Standard .100″ mounting centers
- Laser trimmed thin film and thick film resistors minimize sensitivity variations and compensate for temperature variations
- Flux range of ±100 to ±2500 gauss

OPERATION

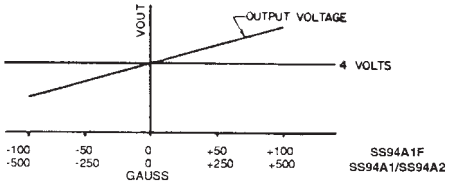
The SS9 utilizes a Hall effect integrated circuit chip which provides increased temperature stability and performance. Laser trimmed thick film resistors on the ceramic substrate and thin film resistors on the integrated circuit reduce null and gain shifts over temperature which results in consistent sensitivity from one device to the next.

MOUNTING DIMENSIONS (For reference only)

SS9



TYPICAL TRANSFER CHARACTERISTICS



Analog

SS9 ORDER GUIDE

Catalog Listing	SS94A1	SS94A1B	SS94A1E	SS94A1F	SS94A2	SS94A2C	SS94A2D
Main Feature	Gen. purpose	5 VDC operation	Low drift	High sensitivity	Noise shielded††	Noise shielded††	Noise shielded††
Supply Voltage (VDC)*	6.6 to 12.6	4.5 to 8.0	6.6 to 12.6	6.6 to 12.6	6.6 to 12.6	6.6 to 12.6	6.6 to 12.6
Supply Current (mA)**	13 typ. 30 max.	8 typ. 17.5 max.	13 typ. 30 max.	13 typ. 30 max.	13 typ. 30 max.	13 typ. 30 max.	13 typ. 30 max.
Output Current (mA) Sinking or Sourcing	1 max.	1 max.	1 max.	1 max.	1 max.	1 max.	1 max.
Response Time (μ sec.)	3 typ.	3 typ.	3 typ.	3 typ.	3 typ.	3 typ.	3 typ.
Magnetic Characteristics*** Span*	.625 V_S	.375 V_S	.625 V_S	.625 V_S	.625 V_S	.625 V_S	.625 V_S
Range (gauss)*	−500 to +500	−500 to +500	−500 to +500	−100 to +100	−500 to +500	−1000 to +1000	−2500 to +2500
Sensitivity (mV/gauss @ 25°C)	5.0±.1	1.875±.100	5.0±.1	25.0±.5	5.0±.1	2.50±.05	1.00±.02
Linearity† (% span)	−0.8 typ. −1.5 max.	−0.8 typ. −1.5 max.	−0.8 typ. −1.5 max.	−0.8 typ. −1.5 max.	−0.8 typ. −1.5 max.	−0.8 typ. −1.5 max.	−0.8 typ. −1.5 max.
Vout (0 gauss @ 25°C)***	4.00±.04V	2.50±.05V	4.00±.04V	4.00±.08V	4.00±.04V	4.00±.04V	4.00±.04V
Temperature Error (all %s reference 25°C value)* Null (%/°C)	±.02	±.025	±.01	±.10	±.02	±.0125	±.007
Gain (%/°C)	±.02	±.025	±.02	+.02 −.055	±.02	±.02	±.02

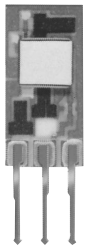
* −40° to 125°C.
** Excludes load. Typical at 25°C/Maximum at −40°C.
*** @ V_s = 5 VDC for SS94A1B only/@ V_s = 8 VDC for all others.
† Derived from straight line between end points.
†† Silver coating on back of ceramic is electrically connected to − terminal.
Specified using a 2.2KΩ resistor unless otherwise noted.

MilliTesla = Gauss 10^{-1}

Null voltage (Vout at 0 gauss) and sensitivity are ratiometric to supply voltage.

Magnets page 25.

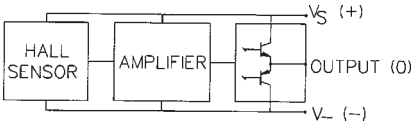
Application consideration: The output is clamped at the high end. Clamping voltage may be as low as 9VDC. The output will not exceed the clamping voltage regardless of field strength or supply voltage.



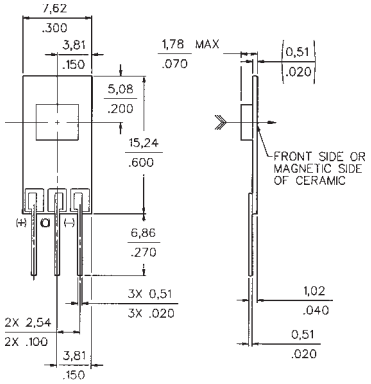
FEATURES

- Single current sinking or current sourcing output
- Three-pin in-line printed circuit board terminals
- Standard .100″ mounting centers
- Laser trimmed thin film and thick film resistors minimize sensitivity variations and compensate for temperature variations

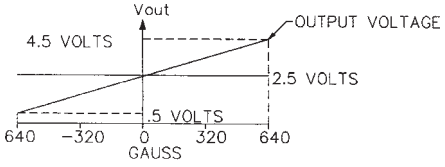
BLOCK DIAGRAM



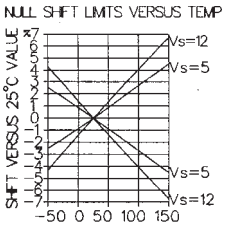
MOUNTING DIMENSIONS
(for reference only)

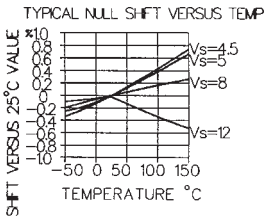


TRANSFER CHARACTERISTICS



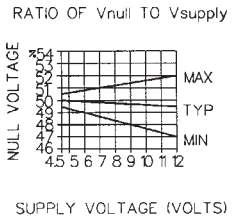
OUTPUT CHARACTERISTICS
(for reference only)

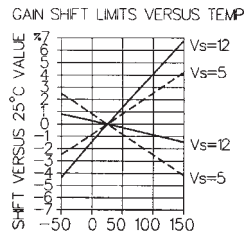


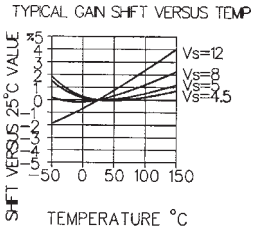


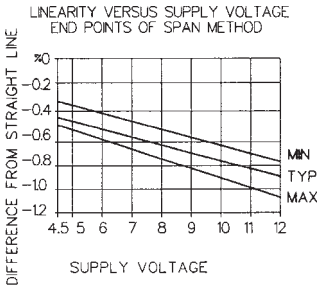
SS94 ORDER GUIDE

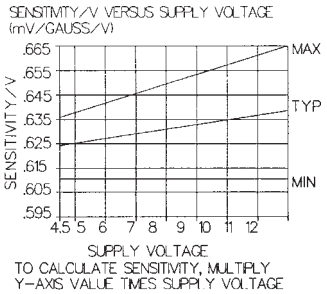
Catalog Listing	SS94B1
Supply Voltage (VDC)	4.5 to 12 Performance @ 5 VDC
Supply Current (mA)	8 typ., 11 max.
Output Current/Type	Ratiometric/Sinking or Sourcing 1 mA typ., 2 mA max.
Output Voltage Swing Negative gauss Positive gauss	 0.4 V typ. V_S - 0.4 V typ.
Magnetic Characteristics @ 25°C, 5 VDC (–67.0 to +67.0 mT,typ.) Span Null (Offset @ 0 gauss) Sensitivity (mV per gauss) Linearity (% span)	 4.0 V (–670 to +670 gauss, typ.), 2.5 ± 0.03 V 3.125 ± 0.063 –0.5 ± 0.5
Temperature Error (@ 25°C) Null Shift (%/°C) Sensitivity (%/°C)	 ± 0.03 ± 0.03

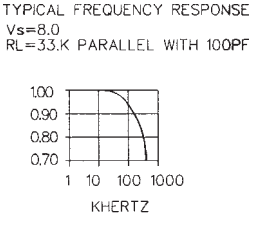


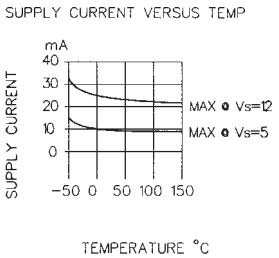




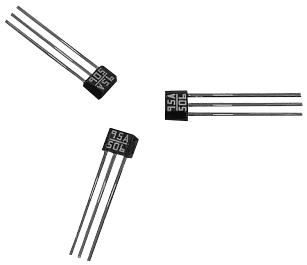








Solid State Sensors
Miniature Ratiometric Linear



FEATURES
- Small size (.160 × .118″)
- Low power consumption - typically 7 mA at 5 VDC
- Single current sinking or current sourcing linear output
- Built-in thin-film resistors - laser trimmed for precise sensitivity and temperature compensation
- Rail-to-rail operation provides more useable signal for higher accuracy
- Operating temperature range of –40 to +150°C
- Responds to either positive or negative gauss
- Quad Hall sensing element for stable output

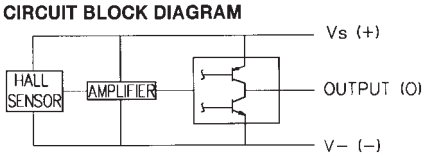
SS490 Series MRL (Miniature Ratiometric Linear) sensors have a ratiometric output voltage, set by the supply voltage. It varies in proportion to the strength of the magnetic field.

A new Hall effect integrated circuit chip provides increased temperature stability and sensitivity. Laser trimmed thin film resistors on the chip provide high accuracy (null to ±3%, sensitivity up to ±3%) and temperature compensation to reduce null and gain shift over temperature. The quad Hall sensing element minimizes the effects of mechanical or thermal stress on the output. The positive temperature coefficient of the sensitivity (+0.02%/°C typical) helps compensate for the negative temperature coefficients of low cost magnets, providing a robust design over a wide temperature range.

NOTICE

Products ordered in bulk packaging (plastic bags) may not have perfectly straight leads as a result of normal handling and shipping operations. Please order tape packaging option for applications with critical lead straightness requirements.

CIRCUIT BLOCK DIAGRAM

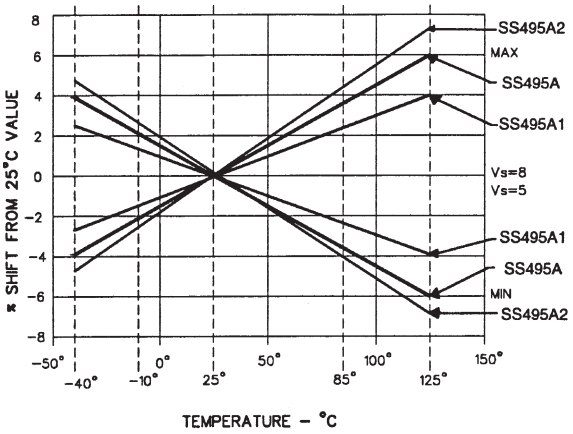


SS495 SPECIFICATIONS, V_S = 5.0 V, T_A = –40 to +125°C (unless otherwise noted)

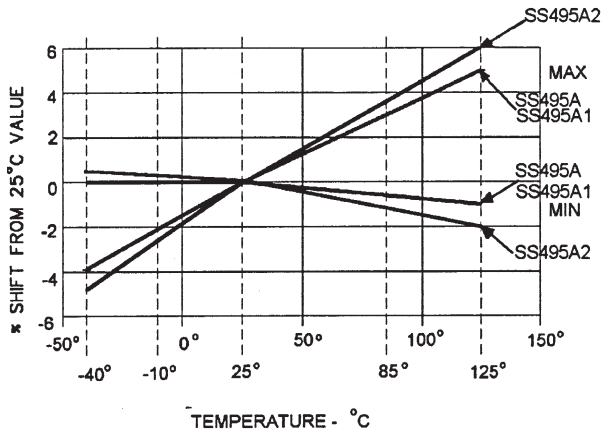
Catalog Listings		SS495A* Standard	SS495A1* High Accuracy	SS495A2* Basic
Supply Voltage (VDC)		4.5 to 10.5	4.5 to 10.5	4.5 to 10.5
Supply Current @ 25°C (mA)	Typ.	7.0	7.0	7.0
	Max.	8.7	8.7	8.7
Output Type (Sink or Source)		Ratiometric	Ratiometric	Ratiometric
Output Current (mA)				
Typ. Source	Vs>4.5V	1.5	1.5	1.5
Min. Source	Vs>4.5V	1.0	1.0	1.0
Min. Sink	Vs>4.5V	0.6	0.6	0.6
Min. Sink	Vs>5.0V	1.0	1.0	1.0
Magnetic Range	Typ.	–670 to +670 Gauss (–67 to +67 mT)		
	Min.	–600 to +600 Gauss (–60 to +60 mT)		
Output Voltage Span	Typ.	0.2 to (Vs - 0.2)	0.2 to (Vs - 0.2)	0.2 to (Vs - 0.2)
	Min.	0.4 to (Vs - 0.4)	0.4 to (Vs - 0.4)	0.4 to (Vs - 0.4)
Null (Output @ 0 Gauss, V)		2.50 ± 0.075	2.50 ± 0.075	2.50 ± 0.100
Sensitivity (mV/G)		3.125 ± 0.125	3.125 ± 0.094	3.125 ± 0.156
Linearity, % of Span	Typ.	–1.0%	–1.0%	–1.0%
	Max.	–1.5%	–1.5%	–1.5%
Temperature Error				
Null Drift (%/°C)		±0.06%	±0.04%	±0.07%
Sensitivity Drift (%/°C)	≥25°C Max.	–0.01%+0.05%	–0.01%+0.05%	–0.02%+0.06%
	<25°C Max.	–0.00%+0.06%	–0.00%+0.06%	–0.01%+0.07%

*Bulk, 1,000 per bag
To order Surface Mount: add -S suffix to listing. Example: SS495A-S.
To order tape in Ammopack style T2: add -T2 suffix to listing.
To order tape in Ammopack style T3: add -T3 suffix to listing.
To order tape in reel style P (surface mount): add -SP suffix to listing.

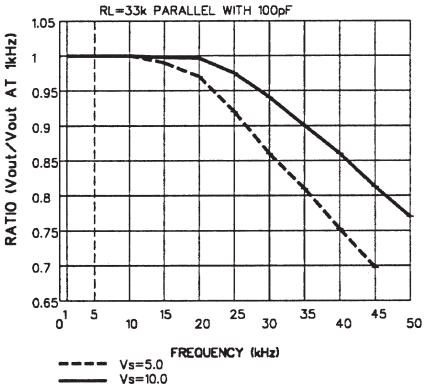
NULL SHIFT VS TEMPERATURE



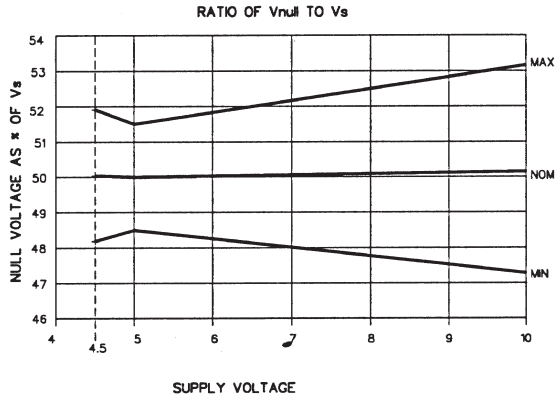
SENSITIVITY SHIFT VS TEMPERATURE



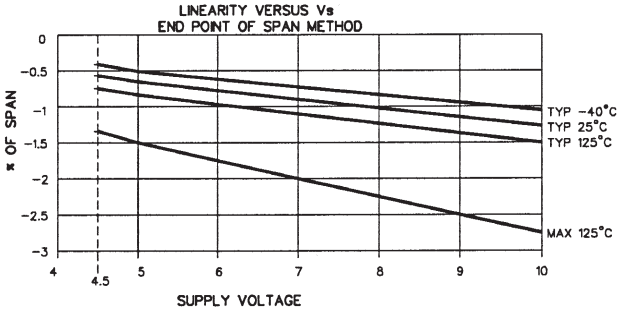
TYP. FREQUENCY RESPONSE



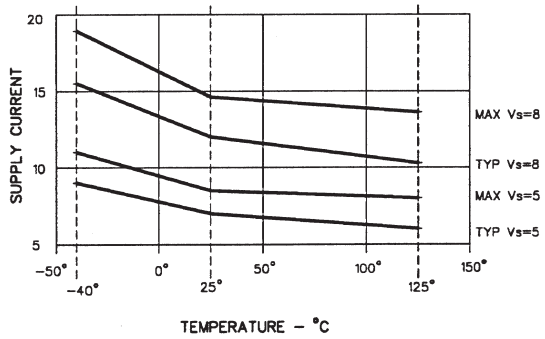
RATIO OF V_{NULL} TO V_S



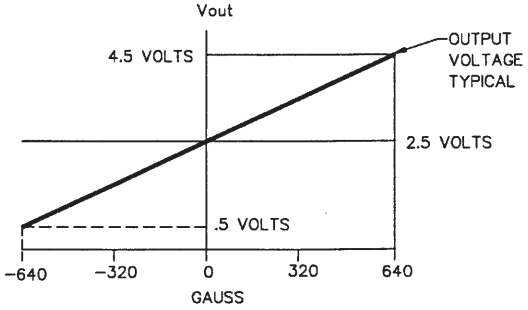
LINEARITY VS V_S



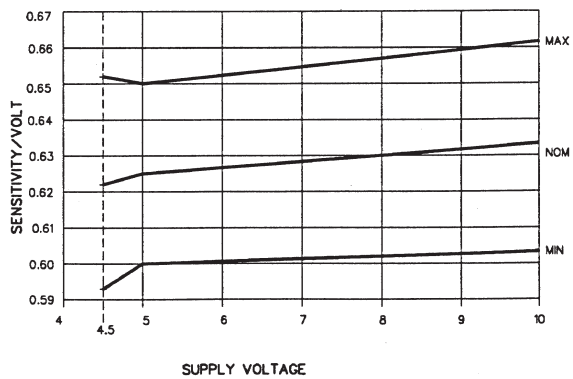
SUPPLY CURRENT VS TEMPERATURE



TRANSFER CHARACTERISTICS V_S 5.0 VDC



SENSITIVITY/V VS V_S

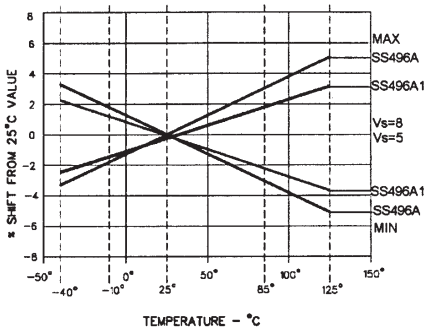


Analog

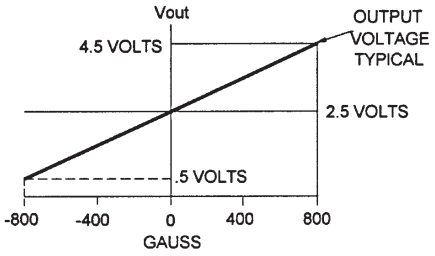
SS496 SPECIFICATIONS, V_S = 5.0 V, T_A = –40 to +125°C (unless otherwise noted)

Catalog Listings		SS496A Standard	SS496A1 High Accuracy
Supply Voltage, DC		4.5 to 10.5	4.5 to 10.5
Supply Current @ 25°C (mA)	Typ.	7.0	7.0
	Max.	8.7	8.7
Output Type (Sink or Source)		Ratiometric	Ratiometric
Output Current, mA			
Typ. Source	Vs>4.5V	1.5	1.5
Min. Source	Vs>4.5V	1.0	1.0
Min. Sink	Vs>4.5V	0.6	0.6
Min. Sink	Vs>5.0V	1.0	1.0
Magnetic Range	Typ.	–840 to +840 Gauss (–84 to +84 mT)	
	Min.	–750 to +750 Gauss (–75 to +75 mT)	
Output Voltage Span	Typ.	0.2 to (Vs - 0.2)	0.2 to (Vs - 0.2)
	Min.	0.4 to (Vs - 0.4)	0.4 to (Vs - 0.4)
Null (Output @ 0 Gauss, V)		2.500 ± 0.175	2.500 ± 0.075
Sensitivity (mV/G)		2.500 ± 0.100	2.50 ± 0.075
Linearity, % of Span	Typ.	–1.0%	–1.0%
	Max.	–1.5%	–1.5%
Temperature Error			
Null Drift (%/°C)		±0.048%	±0.032%
Sensitivity Drift (%/°C)	≥25°C Max.	–0.01, +0.05	–0.01, +0.06
	<25°C Max.	–0.00, +0.06	–0.00, +0.06

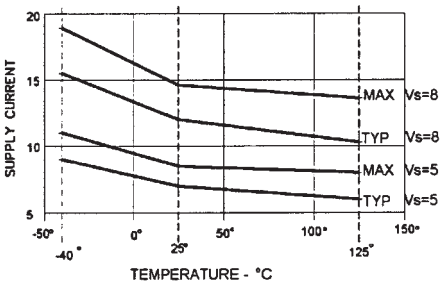
NULL SHIFT VS TEMPERATURE



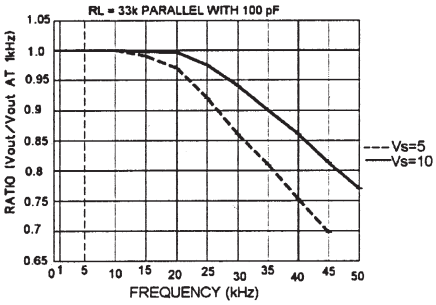
TRANSFER CHARACTERISTICS @ VS = 5 VDC



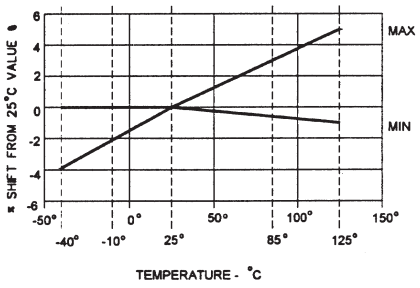
SUPPLY CURRENT VS TEMP.



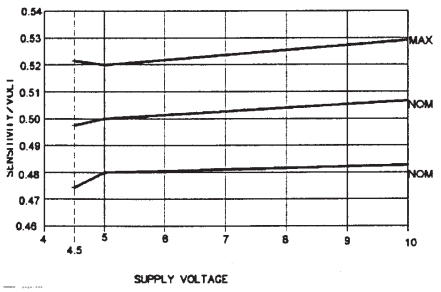
TYP. FREQUENCY RESPONSE



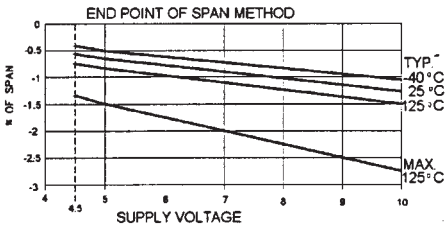
SENSITIVITY SHIFT VS TEMP



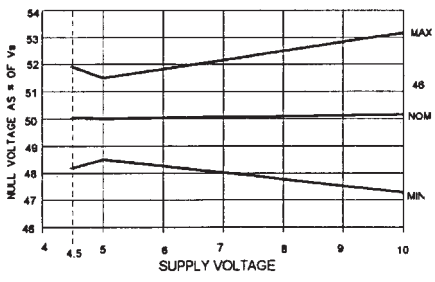
SENSITIVITY/V VS V_S



LINEARITY VS V_S

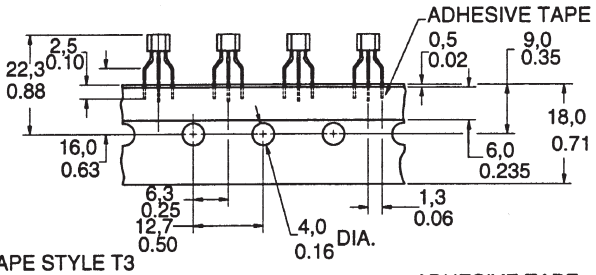


RATIO OF V_{NULL} TO V_S

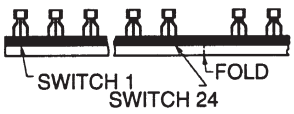


MOUNTING DIMENSIONS (for reference only)

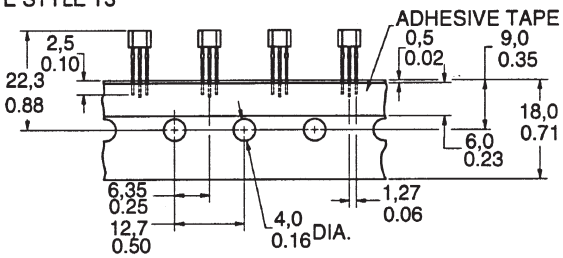
TAPE STYLE T2



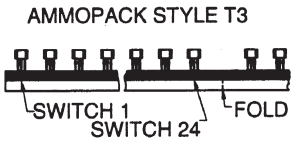
AMMOPACK STYLE T2



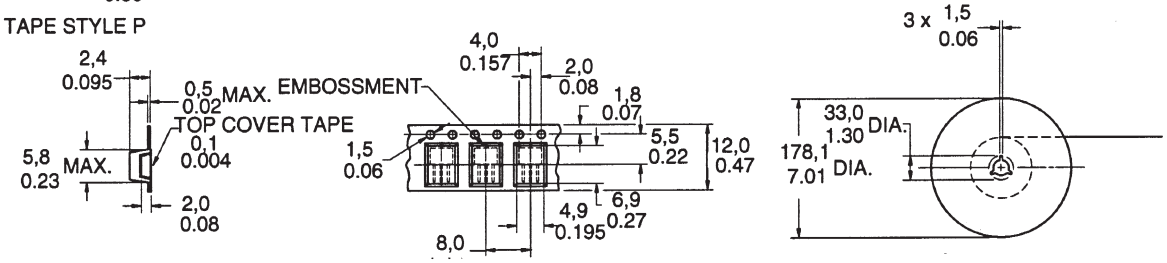
TAPE STYLE T3



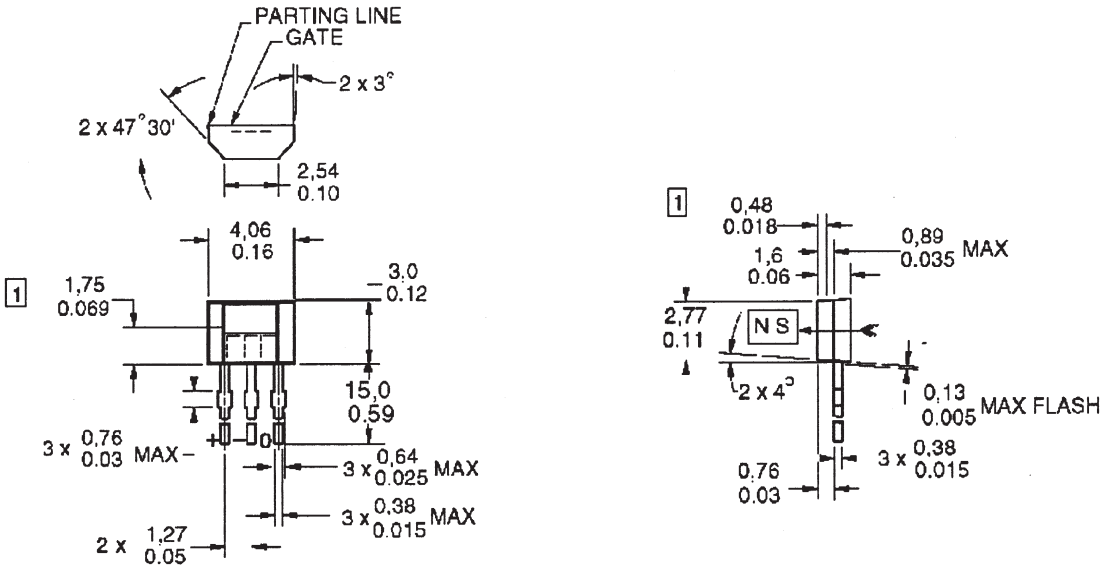
AMMOPACK STYLE T3



TAPE STYLE P



SENSOR PACKAGE



OPTIONAL SURFACE MOUNT STYLE

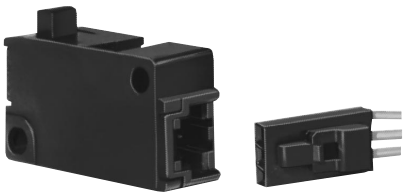
1 Centerline of Hall cell

Analog

Solid State Sensors

VX Series

Solid State Basic Switch



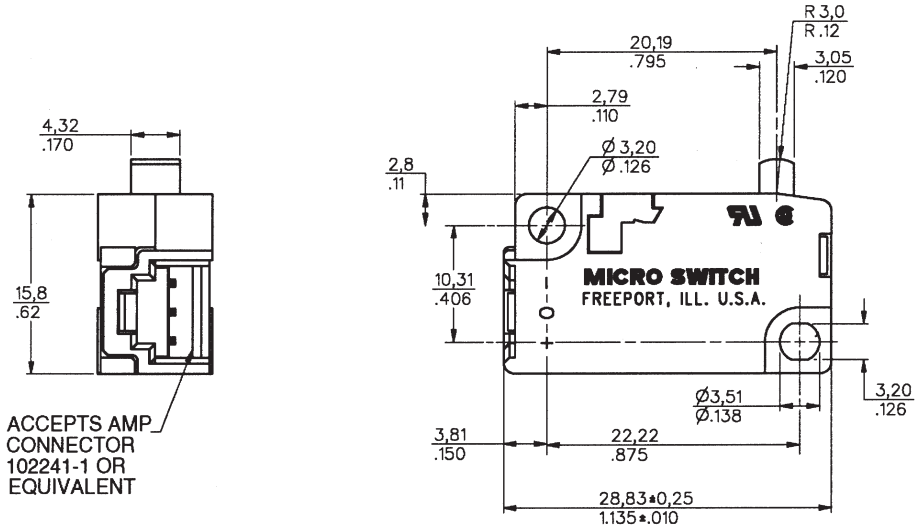
FEATURES

- Plunger operated non-contact digital output
- Low force operation
- −40° to +70°C operating temperature
- Direct interface to solid state circuits
- Reverse voltage protection
- Rugged construction
- Tested to over 100 million operations
- Wide variety of standard levers and actuators available
- Lever external to switch body
- Industry standard mounting holes
- No external terminals — uses standard keyed and locking plug-in connectors
- UL recognized, CSA certified
- Plunger is acetal copolymer. Housing is PBT polyester.

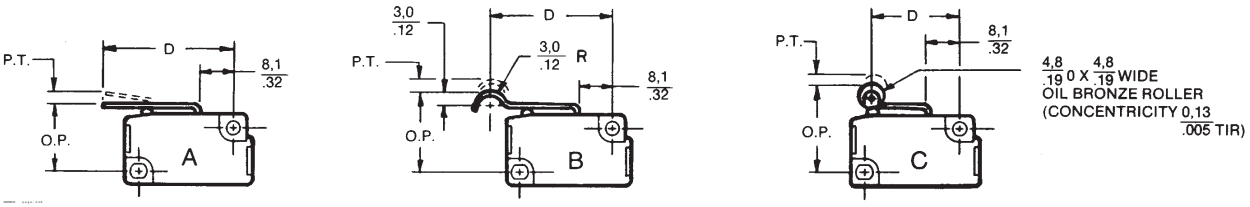
ELECTRICAL SPECIFICATIONS

Supply Voltage (VDC)	4.5 to 24
Supply Current (mA max.)	15
Output Type	Sink
Current per Output (mA)	10

MOUNTING DIMENSIONS (For reference only)



OPERATING CHARACTERISTICS DIMENSIONS



Solid State Basic Switch

Characteristics: P.T. — Pretravel; O.T. — Overtravel; D.T. — Differential Travel; O.P. — Operating Position

VX ORDER GUIDE

Catalog Listings	Operating Force	Lever Actuation Point (D)	Lever Style*	P.T. max	O.T. min.	D.T. max.	O.P.
Accepts AMP Conn.	Ounces Newtons			mm inches	mm inches	mm inches	mm inches
VX10	.35 + .18 (–.14) 0,1 (+,05,–,04)	—	—	2,16 .085	1,02 .040	0,30 .012	14,73 ± 0,51 .580 ± .020
VX80	3.0 ± .88 0,83 ± ,24	—	(Pin Plunger)				
VX10-A1	.35 ± .2 0,1 ± ,06	21,8 .860	A (Short)	2,59 .102	1,02 .040	0,36 .014	15,37 ± 0,69 .605 ± .027
VX80-A1	2.8± 1.1 ,78 ± ,31						
VX10-A2	0.2 ± .1 ,06 ± ,03	35,6 1.400	A (Medium)	5,33 .210	2,16 .085	0,71 .028	15,34 ± 1,40 .604 ± .055
VX80-A2	1.41 ± .50 ,39 ± ,14						
VX10-A3	.10 ± .07 ,03 ± ,02	59,4 2.340	A (Long)	9,96 .392	4,06 .160	1,32 .052	15,24 ± 2,64 .600 ± .104
VX80-A3	.75 + .35 (–.25) ,21 (+0,1–,07)						
VX10-B1	0.20 + .15 (–.10) ,06 (+,04–,03)	32,6 1.285	B (Simulated Roller)	5,21 .205	1,91 .075	0,64 .025	18,52 ± 1,47 .729 ± .058
VX80-B1	1.55 ± .53 ,43 ± ,15						
VX10-C1	.40 ± .20 ,11 ± ,06	20,6 .810	C (Short Roller)	2,49 .098	1,02 .040	0,33 .013	20,68 ± 0,69 .814 ± .027
VX80-C1	3.0 ± 1.06 ,83 ± ,29						

* Other lever styles are available. Contact MICRO SWITCH sales office.

Termination

Terminal pins accept AMP connectors (not furnished):

AMP 102241-1
MICRO SWITCH part number:
VX1A — connector & receptacle unassembled.
VX1A-01 — connector & receptacle pre-assembled with 5.4″, 24 gauge lead wires.

NOTE: The output transistors of the listings shown are ''normally off.'' They are not conducting and the output voltage is High with plunger in free position. To order devices which are ''normally on'' and the output voltage is Low (conducting with plunger in free position), change the second digit from 0 to a 1, or a 2 to a 3 in the catalog listing.

Example: VX1**0**-A1 — VX1**1**-A1

Honeywell

Solid State Sensors

Digital Magnetoresistive Sensor

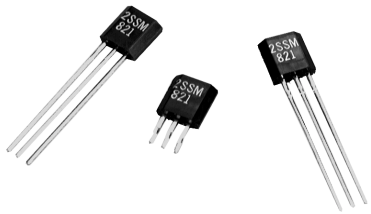
2SS52M Series

FEATURES/BENEFITS

- Advanced electronic circuitry including a band-gap regulator. Can be used with a wide range of supply voltages.
- Low gauss operation can extend sensing distance to one inch or more, depending on magnet size.
- Digital current sinking output
- Omnipolar - can be operated with either North or South magnetic pole. Will simplify installation in single pole applications and double the resolution in rotating magnet applications.
- Operating speed: 0 to over 100kHz; will keep up with fast moving targets.
- 3-pin, in-line PC board terminals on 0.050-inch mounting centers (0.100 centers available on tape for automated assembly).
- Operating temperature range: -40° to +150°C (-40° to 302°F) allows use in extreme temperature conditions.
- Surface mount style available 2SS52M-S for mounting flexibility.

TYPICAL APPLICATIONS

- Cylinder position sensing
- Elevator sensor
- Laptop lid sensor
- Geartooth sensor
- Blood analyzer
- Industrial proximity sensor
- High-resolution magnetic encoder



2SS52M Series position sensors have a built-in magnetoresistive bridge integrated on silicon and encapsulated in a plastic package. The integrated circuit also includes a band-gap regulator and a digital output that will respond to very low magnetic fields. Though the signal is identical to our digital Hall effect sensors, it can be achieved by magnetoresistive sensors at much greater sensor-to-magnet distances.

CATALOG LISTINGS

2SS52M, 2SS52M-S, 2SS52M-T2, 2SS52M-T3

(See reverse side for mounting dimensions)

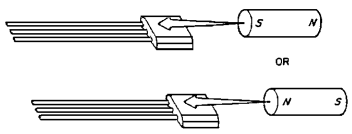
OPERATING CHARACTERISTICS

		2SS52M/2SS52M-S	
Supply voltage (VDC)		3.8 to 30	
Supply Current (mA max.)			
	Operate	11	
	Release	10	
Output Type		Sink	
Output Voltage (V) @ 20mA		.40 max.	
Output Current (mA max.)		20	
Leakage Current (µA, max.)		10	
Operating Temperature		-40 to +150°C	
Magnetics Type		Omnipolar	
Magnetic Char. & Temp.		Gauss	mT
-40 to +150°C	Max. Op.	25	2.5
	Min. Rel.	4	0.4
	Max. Dif.	8	0.8

mT = milliTesla

OPERATING MODE (Arrows indicate direction of magnetic flux.)

2SS52M sensors are operated by magnetic fields (North **or** South pole) **parallel** to the magnetoresistive element.



Note: Due to the inherent high sensitivity of 2SS52M sensors, stray magnetic fields that are parallel to the IC may effect operation.

Solid State Sensors

Digital Magnetoresistive Sensor

2SS52M Series

WARRANTY/REMEDY

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For application assistance, current specifications or name of the nearest Authorized Distributor, contact a nearby sales office. Or call:

1-800-537-6945 USA
1-800-737-3360 Canada
1-815-235-6847 International

FAX

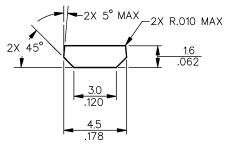
1-815-235-6545 USA

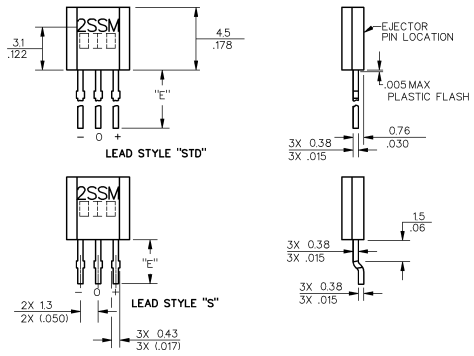
INTERNET

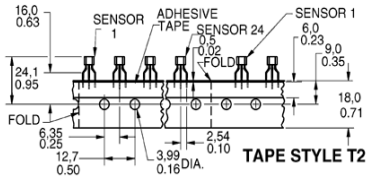
www.honeywell.com/sensing
info@micro.honeywell.com

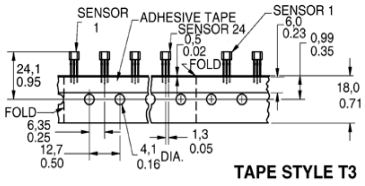
MOUNTING DIMENSIONS

Suffix	Description	Nominal Lead Spacing	Nominal "E" Dim Length	Parts Per Container
(none)	Standard, Bulk Pack	.050	.590	1000/Bag
S	Surface Mount, Bulk Pack	.050	.125	1000/Bag
T2	Tape, Ammopack	.100	.590	5000/Box
T3	Tape, Ammopack	.050	.590	5000/Box









Honeywell

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Honeywell

GTN Series
Hall Effect Gear Tooth Sensors

Features

- Digital current sinking output (open collector)
- Integrated reverse polarity protection
- Measuring range 2 Hz to 9 KHz (depending on target)
- Rugged package with connectorized output
- Diagnostic detection of sensor power supply

Benefits

- Better signal to noise ratio than variable reluctance sensors, output amplitude not dependent on speed
- Resistant to damage from incorrect wiring
- Suitable for most vehicle applications
- Physical protection and cost effective installation.
- Allows breakages or short circuits in sensor power supply to be detected.

Description

GTN Series Gear Tooth Sensors use a magnetically biased Hall effect integrated circuit (IC) to accurately sense movement of ferrous metal targets. This specially designed IC, together with protection and diagnostic circuitry and a permanent magnet, is sealed in a rugged probe type package.

Operation

The flux density of the permanent magnet alters when approached by ferrous metal. This is detected by the Hall IC. If the sensor is positioned at the circumference of a revolving gear wheel, for example, it detects teeth and tooth spaces, supplying a digital pulse output with frequency proportional to gear wheel speed. Optimum performance is dependent on the following variables which must be considered in combination : target material, geometry and speed, sensor/ target gap, ambient temperature and stray fields.

An integrated electronic diagnostics feature enables detection of open or short circuits in the power supply line by monitoring levels in the sensor output.

Installation

The sensor is flange mounted with a range of possible lengths, eliminating adjustment and positioning. Connection is by AMP Superseal 1.5 Series.

Typical Applications

The compact design and rugged construction make this sensor the preferred solution for applications such as :

- Measuring rpm in gearboxes
- Monitoring rpm and position of crankshafts and camshafts
- Pulse counters
- Tachometers

WARNING

MISUSE OF DOCUMENTATION

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Technical Data

Supply voltage		4.5 V to 32 V absolute maximum
		8 V to 16 V nominal (12 V version)
		21 V to 32 V nominal (24 V version)
Current input		20 mA nominal (max 40 mA)
Output data (open collector)		high 18 kOhm
		low 1 kOhm (12 V version)
		1.5 kOhm (24 V version)
Pull-up voltage		4.5 V to 15 V (12 V version)
		4.5 V to 32 V (24 V version)
Switching performance:	rise time	10% to 90% 15 us (according to external
	fall time	90% to 10% 1 us wiring, $R_{pull-up}$ and $U_{pull-up}$)
Measuring range		2 Hz to 9 kHz (depends on target)
Degree of protection		IP 67, IP 68, IP 69K
Ambient temperature		-40 °C to +125 °C
		Up to +150 °C briefly, max 12 h
Vibration		Vibration test in accordance with
		DIN IEC 68 T2-6
Shock		Shock in accordance with
		DIN ICE 68 T2-27
		Repetitive shock in accordance with
		DIN ICE 68 T2-29
EMC protection		Included, details available on request

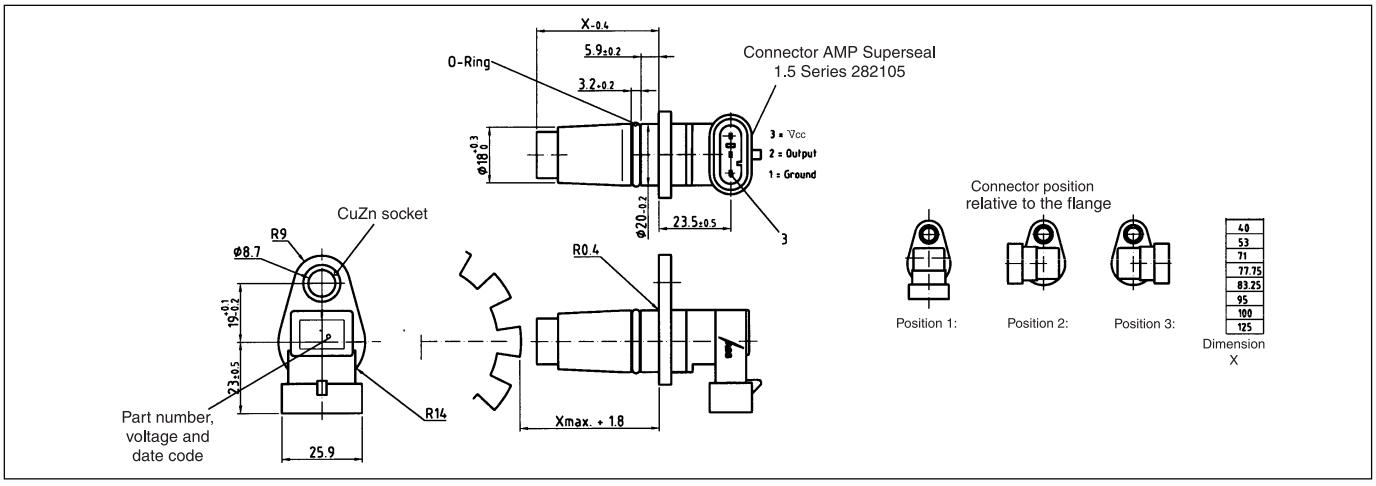
Order Guide

GTN Geartooth Sensors

GTN1A111	12 V, connector position 1, 40 mm probe length
GTN1A112	12 V, connector position 1, 53 mm proble length
GTN1A113	12 V, connector position 1, 77.75 mm proble length
GTN1A114	12 V, connector position 1, 83.25 mm probe length
GTN1A115	12 V, connector position 1, 95 mm probe length
GTN1A116	12 V, connector position 1, 100 mm probe length
GTN1A117	12 V, connector position 1, 125 mm probe length
GTN1A211	24 V, connector position 1, 40 mm probe length
GTN1A131	12 V, connector position 3, 40 mm probe length

Other permutations are possible, contact Honeywell for details

Mounting Dimensions in mm



Warranty/Remedy

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Sales and Service

Honeywell serves its customers through a worldwide network of sales offices and distributors. For application assistance, current specifications, pricing or name of the nearest Authorised Distributor, contact your local sales office or:
INTERNET: www.honeywell.com/sensing
E-mail: info.sc@honeywell.com

Honeywell

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Scotland, UK

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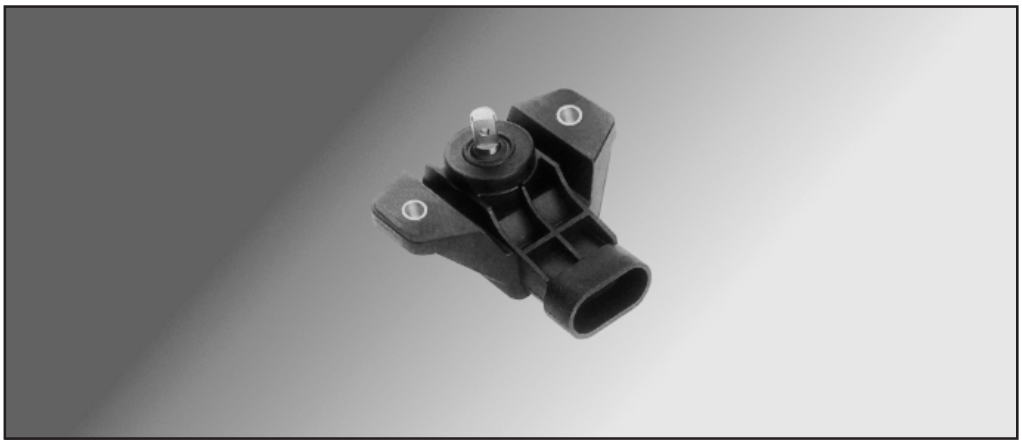
Honeywell

RPN Series
Hall Effect Rotary Position Sensor



Features

- Solid-state Hall effect technology
- Integrated reverse polarity, short circuit and EMC protection
- 90° measuring range with 360° allowable rotation
- Rugged sealed package with integral connector

Benefits

- Long service life, low torque actuation and greatly reduced wear-out mechanisms
- Resistant to damage from incorrect wiring and electrical noise
- Wide operating angle tolerant to overtravel
- Durable in harsh environments

Description

RPN Series Rotary Position Sensors use a magnetically biased Hall effect integrated circuit (IC) to accurately sense rotary movement of the actuator shaft. This IC, together with conditioning and protection circuitry and two permanent magnets, is sealed in a rugged package.

Operation

Rotation of the actuator shaft changes the Hall effect IC's position relative to the magnets. This results in a change in the flux density detected by the Hall effect IC as the shaft is rotated. The output of the IC is converted to a linear output over 90° of travel.

Installation

The sensor is flange mounted with two easily accessible mounting holes. Connection is by AMP Superseal 1.5 Series.

Typical Applications

The compact design and rugged construction make this sensor the ideal solution for detecting position and movement of features such as pedals, throttle, gear shift, levers, linkages, suspension and hitches in:

- Trucks
- Off road vehicles
- Industrial vehicles and equipment
- Construction vehicles and equipment
- Agricultural vehicles and equipment
- Cranes

WARNING

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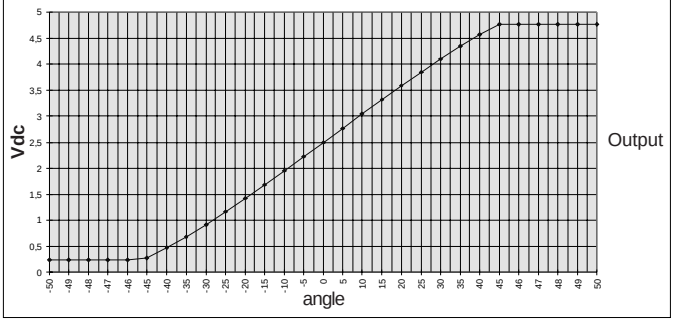
Technical Data

Supply voltage	10 to 30 Vdc
Current input	15 mA max
Output signal	0.25 to 4.75 V
Accuracy	± 0.5°
Linearity	± 2.5°
Load resistance	≥ 5 kOhm
Output	Resistant to continued short circuits
Measuring range	± 45°
Reverse polarity protection	Yes
Mechanical angle of rotation	360°
Measuring principle	Solid state Hall effect
PIN assignments	Pin 1 = GND Pin 2 = Vcc Pin 3 = Output
Temperature range	-25 °C to +85 °C (-40 °C to +125 °C as an option)
Output temperature drift	≤ 1 mV/°C
Degree of protection	IP 67
EMC protection	In accordance with DIN 40 839

Output Characteristics



Order Guide

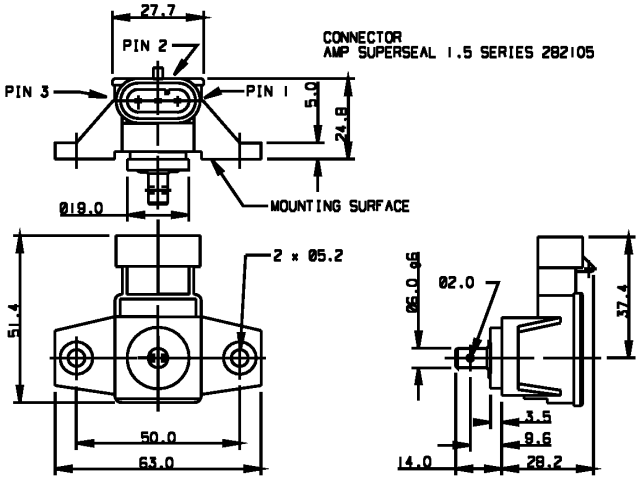
RPN Rotary position sensors

RPN1A112	90° measuring range, standard temperature range, 6 mm plain drive shaft

A ±90° (180° total) measuring range version is in development, contact Honeywell for details

Other permutations are possible, contact Honeywell for details

Mounting Dimensions in mm



Material

Housing:	Nylon 6.6 25% glass filled
Shaft:	Stainless steel
Mounting inserts:	CuZn

Warranty/Remedy

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Honeywell

Solid State Hall Effect
Position Sensors

SR13/15 Series

FEATURES

- 3.8 to 30 VDC supply voltage
- Digital current sinking output
- Snap-in or flat mount packages
- Quad-Hall design eliminates stress effects
- Temperature compensated magnetics
- Bipolar, unipolar and latching magnetics
- High output capability, 50mA absolute maximum
- Operating temperature range -40°C to +150°C
- Varying leadwire lengths of 24 AWG Radox wire

⚠WARNING

PERSONAL INJURY

- DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

The newly introduced SR13/15 Series package enhancements permit quick and easy sensor installation, increasing the usability of the SS400 Series. These devices can be installed without additional mounting hardware. The snap-in and flat mount sensor packages can house any of the present SS400 Series sensors or any similarly sized sensing elements. The packages also provide varying 24AWG Radox leadwire lengths or connector capabilities.

The SS400 Series position sensors have a thermally balanced integrated circuit that provides predictable performance for the -40°C to +150°C operating temperature range. The SS400 Series band gap regulation provides stable operation over 3.8 to 30 VDC. Current consumption is 10 mA at +40°C ambient temperature. SS400 Series sensors are capable of continuous 20 mA sinking output. The sensors may be cycled as high as 50 mA maximum. Bipolar, unipolar and latching magnetics are available.

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OPERATING CHARACTERISTICS –40°C TO 125°C, 3.8 TO 30 VDC

	Min.	Typ.	Max.	Remarks
Supply voltage	3.8	—	30	VDC
Current consumption	—	—	13	mA
Output voltage (operated)	—	—	0.40	Sinking 10 mA max.
Sink current (operated)	—	—	20	mA
Output leakage current (released)	—	—	5 µA	V_{OUT} = 30 VDC, V_{CC} = 30 VDC
Output switching time				
Rise, 10 to 90%	—	1.5 µs.	1.5 µs	V_{CC} = 12 V, R_L = 1.6 KΩ, C_L = 20 pF
Fall, 90 to 10%	—	15 µs	1.5 µs	
Operating Temperature	-40°C to +150°C (-40°F to +302°F)			

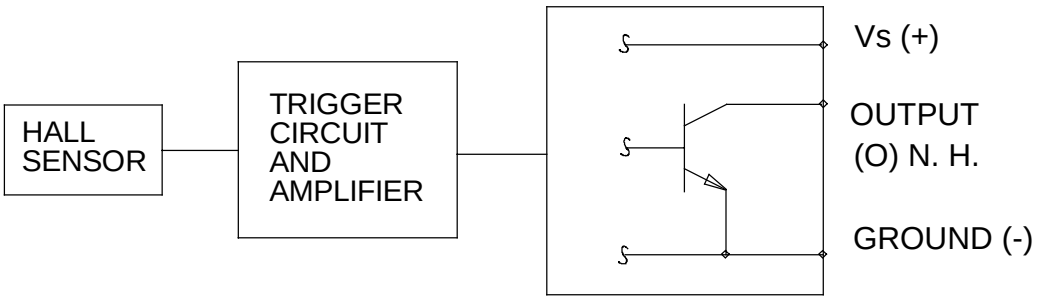
MAGNETIC CHARACTERISTICS

	SR13C-A1	SR13D-A1	SR13F-A1	SR13R-A1	SR15C-A3
Magnetic Type	Unipolar	Unipolar	Unipolar	Latching	Unipolar
25°C					
Max. Op.	180	115	390	85	180
Min. Rel.	75	20	235	-85	75
Min. Dif.	25	20	30	50	25
-20°C to 85°C					
Max. Op.	215	135	435	110	215
Min. Rel.	60	15	200	-110	60
Min. Dif.	10	8	30	50	10

NOTICE

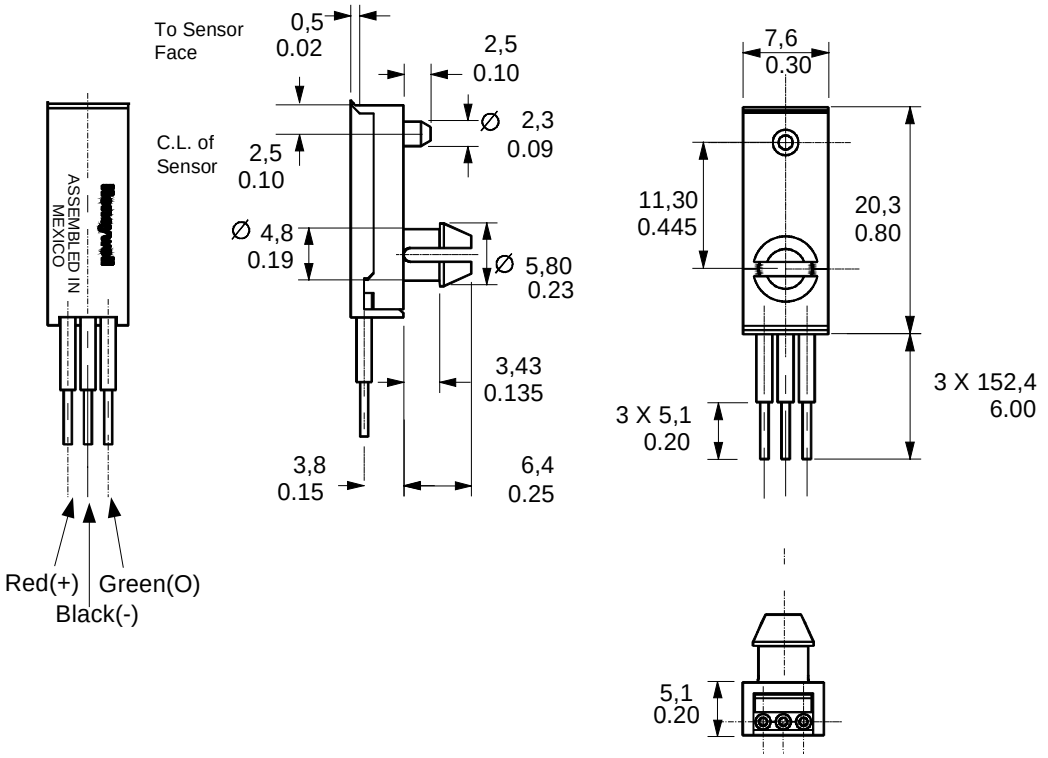
Bipolar Hall effect sensors may have an initial output in either the On or Off state if powered up with an applied magnetic field in the differential zone (applied magnetic field > Brp and < Bop). Honeywell recommends allowing 10 µs for output voltage to stabilize after supply voltage has reached 5 volts.

BLOCK CIRCUIT WIRING DIAGRAM

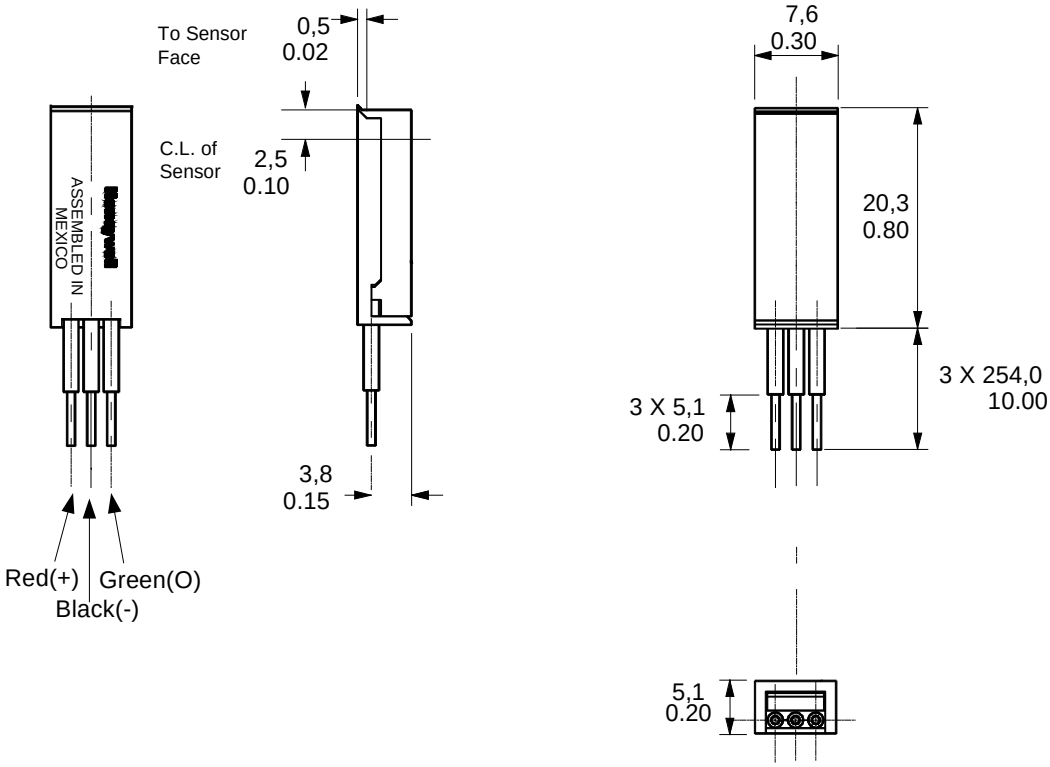


MOUNTING DIMENSIONS (for reference only) mm/in

SNAP-IN DIGITAL POSITION SENSOR (SR13C-A1, SR13D-A21, SR13F-A1, SR13R-A1)



FLAT MOUNT DIGITAL POSITION SENSOR (SR15C-A3)

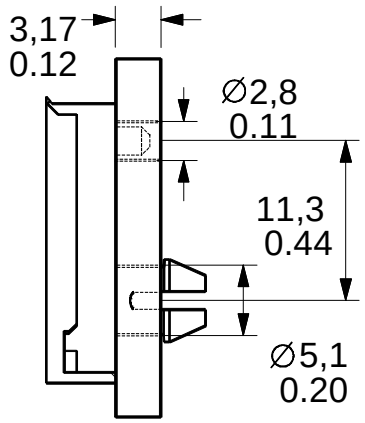


Solid State Hall Effect

Position Sensors

SR13/15 Series

SUGGESTED MOUNTING DETAIL



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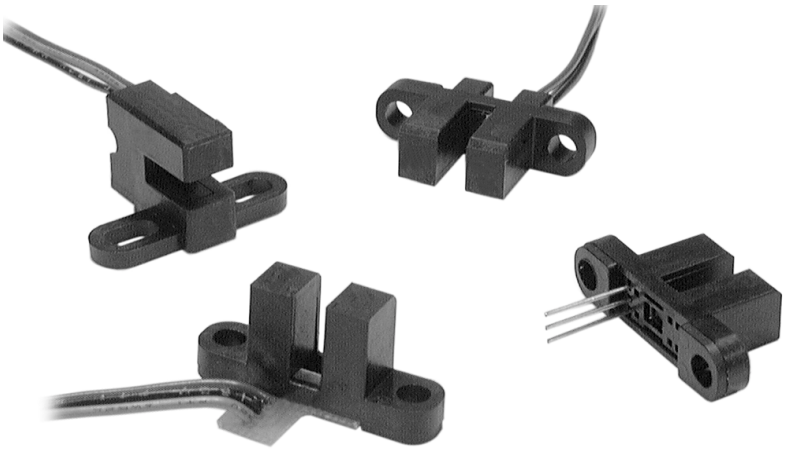
Solid State Sensors

SR16/17 Hall Effect Vane Sensors

SR 16/17 Series

FEATURES

- Compact, robust packages
- Mechanically interchangeable with our standard optical style sensors
- Operated by a “Ferrous Vane” interrupter for pulse counting or position sensing
- Current sinking (Open Collector) output
- 3.8 to 30 VDC power supply
- Medium level magnetic switching to reduce stray field interference
- Internally sealed packages for moderate environment applications
- No mechanical contacts; eliminates product wear
- Noncontact position sensing



The SR16/17 Series Hall effect vane sensors, designed for position and speed sensing, offer side mount packages and three termination variations. The cost effective SR16/17 Series sensors are tailored for fitness and information technology applications. They are well suited for use in moderate electrical, chemical, and mechanical environments.

The SR16/17 Series sensors contain an internal magnet and Hall effect sensor mounted in a twin tower configuration. In application, a customer supplied ferrous target passes between the tower gap, interrupts the magnetic field, and switches the digital state of the sensor.

These robust solid state Hall effect sensors are housed in an environmentally sealed plastic package. The Hall effect sensors provide highly accurate and repeatable performance in environments in which dirt, dust, or stray IR light might affect the performance of optical solutions. The sensor package is constructed of rugged polyphthalamide and polycarbonate material and is mechanically interchangeable with our standard optical sensors.

⚠WARNING

PERSONAL INJURY

- DO NOT USE these products as safety or emergency stop devices, or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

⚠WARNING

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ELECTRICAL CHARACTERISTICS –20°C TO 85 °C, 3.8 TO 30 VDC

	Min.	Max.	Remarks
Supply voltage		3.8 to 30	VDC
Current consumption	—	9	mA (off) 10 mA (on)
Output voltage (operated)	—	0.40 V	Sinking 20 mA max.
Sink current (operated)	—	20	mA
Output leakage current (released)	—	10 μA	V_{OUT} = 30 VDC, V_{CC} = 24 VDC
Output switching time			
Rise, 10 to 90%	—	1.5 μs	V_{CC} = 12 V, R_L = 1.6 KΩ, C_L = 20 pF
Fall, 90 to 10%	—	1.5 μs	V_{CC} = 12 V, R_L = 1.6 KΩ, C_L = 20 pF
Operating Temperature	-20°C to +85°C (-4°F to +185°F)		

MECHANICAL CHARACTERISTICS

Operating Range 12 VDC @ 25°C	
Operate	Release
1.5° ± 2.0°	3.0° ± 2.5°

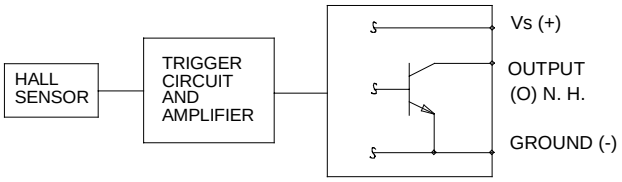
CONDITIONS

Target engagement distance 0.150 in to 0.300 in

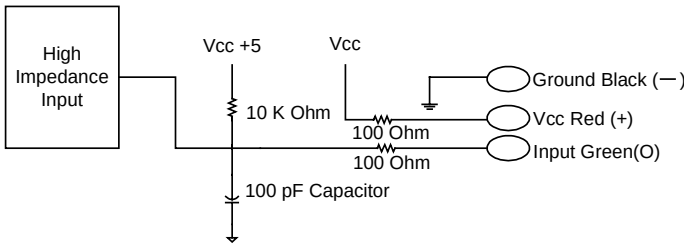
RPMs 0 to 5000

Slot depth 0.250 in min.

BLOCK CIRCUIT WIRING DIAGRAM

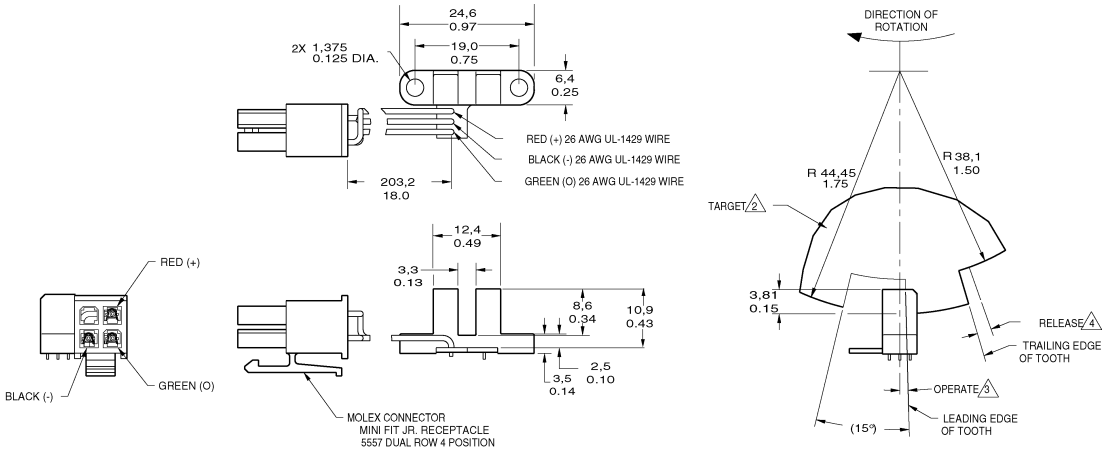


SPEED SENSING INTERFACE



MOUNTING DIMENSIONS (for reference only) mm/in

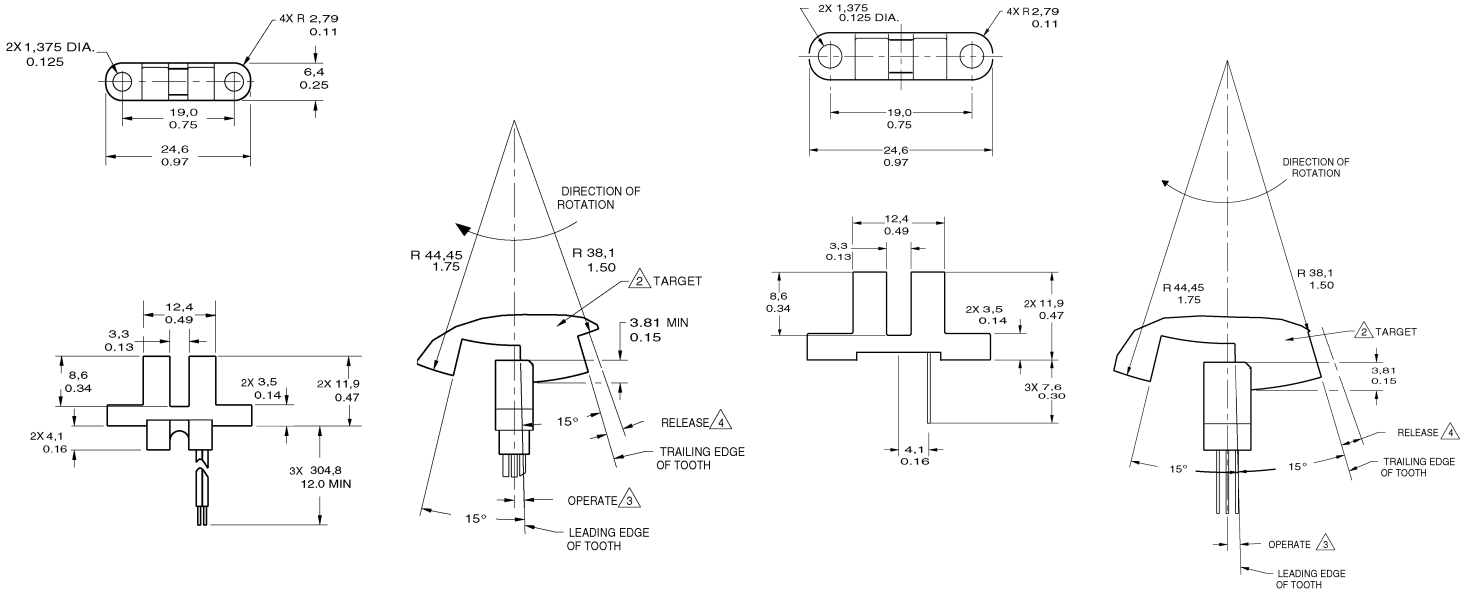
SR16/17 Series Vane Sensors



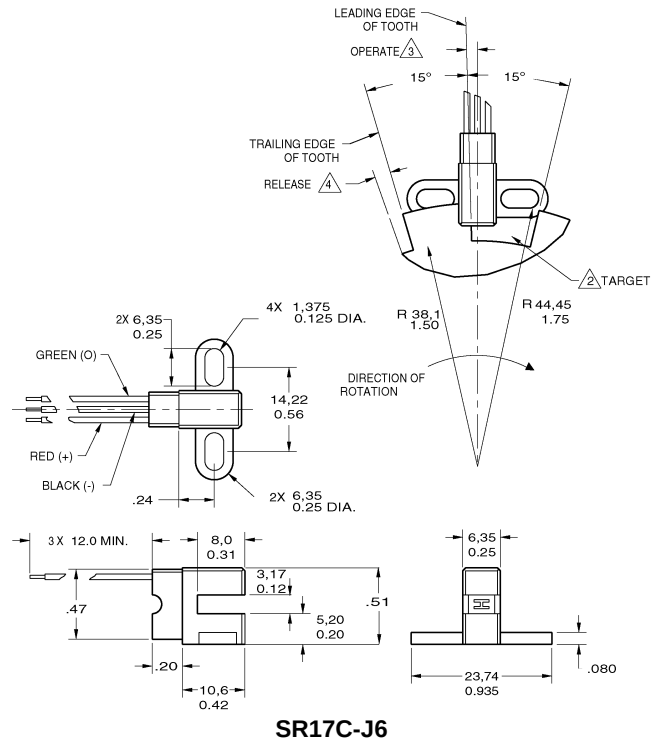
SR16C-J4

MOUNTING DIMENSIONS (for reference only) mm/in

SR16/17 Series Vane Sensors



SR16C-J6 **SR16C-N**



SR17C-J6

Notes:

1. Mounting specification: non-ferrous #4 machine head screws with .25 OD washers torqued to 3-5 in-lbs.
2. Suggested target configuration, material: .045 low carbon steel, high permeability, low residual induction.
3. Operate (degrees) is the angular distance from the leading edge of the tooth to the centerline of the sensor.
4. Release (degrees) is the angular distance from the trailing edge of the tooth to the centerline of the sensor.
5. Operating specification is based on target shown.

Solid State Sensors

SR16/17 Hall Effect Vane Sensors

SR16/17 Series

WARRANTY/REMEDY

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Hall Effect Products

Surface Mount Sensors

SS5 Series

FEATURES/BENEFITS

- Wide temperature and voltage ranges for design flexibility and harsh (automotive)environments.
- Temperature compensated for consistent operation with low-cost magnets (SS500).
- SS5 Package is resistant to thermal and mechanical stress.
- SS5 profile is lower than other SOT-89 packages. This allows the customer to reduce the total gap.
- Industry standard "gull-wing" design. Less susceptibility to "solder bridging". Allows increased circuit board density.
- Bipolar, unipolar and latching magnetics.
- Low Gauss versions available for high accuracy or wide gap applications.
- SS5 package allows 4-pin package designs

TYPICAL APPLICATIONS

- Brushless DC motors
- Digital current sensor
- Anti-skid braking sensor
- Piston detection in hydraulic cylinder
- Valve position sensing
- Cam, lever, shaft position sensing
- Tachometer, counter pickup
- Push-button sensor
- Disk speed, tape rotation, flow rate sensing
- Speed sensing - rate, under, over speed
- Remote reading sensor
- Magnetic card reader

SS5 Series Hall effect position sensors are operated by the magnetic field from a permanent magnet or electromagnet. The small SOT89 style package surface mounts on PC boards and flexible circuits. The SS5 uses a industry standard "gull-wing" design which makes it less susceptible to "solder bridging" and allows increased circuit board density. The SS5 series package can accommodate larger IC's than SS1 and allows for four-pin designs

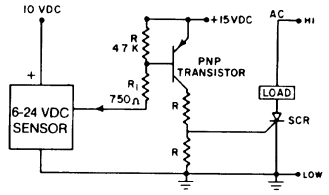
The integrated circuits are designed to provide predictable performance over the full temperature range of -40 to +150°C. Bipolar, unipolar and latching magnetics are available. The SS5 has the same footprint and pin-out as the industry standard SOT-89. It will replace Honeywell SS1 Series and any equivalent SOT-89 sensors from other suppliers with minimum or no design changes.

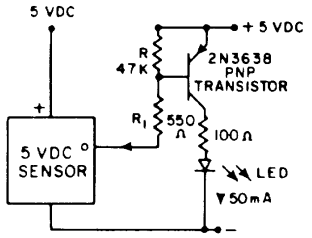
On-board regulation provides extremely stable operation over the full supply voltage range of 4.5 to 24 VDC(SS51T) or 3.8 to 30 VDC(SS500). Current consumption is a low 10 mA maximum at 40°C and is typically 7mA or less at room temperature and above. SS5 sensors are capable of continuous 20 mA sinking output, and can withstand temporary current as high as 20 mA maximum (SS51T) or 50 mA maximum (SS500). They can use existing power supply sources in most applications, and can be directly interfaced with many electronic components without buffering or compensation circuitry.

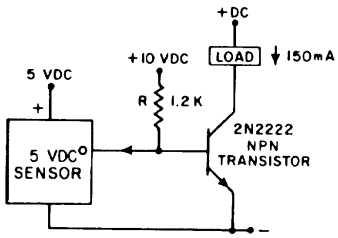
SS5 Series sensors are supplied on tape and reel for high-volume, automated pick and place equipment. Each reel contains 1,000 sensors.

MICRO SWITCH supplies bar and ring magnets for operating Hall effect sensors. Bar magnets can operate any Hall effect sensor. Ring magnets are magnetized on the outside diameter with alternating North and South poles. They are particularly useful with bipolar sensors and rpm measurement.

WIRING DIAGRAMS







ABSOLUTE MAXIMUM RATINGS

Catalog Listing	SS51T	SS500
Supply Voltage	-28 to +28 VDC	-1 to +30 VDC
Voltage externally applied to output	+28 VDC max. (OFF condition only) -0.5 VDC min. (OFF or ON condition)	+30 VDC max. (OFF condition only)
Output ON Current	20 mA max.	50 mA max.
Temperature Limits		
Operating	-40 to +150°C (-40 to +302°F)	-50 to +160°C (-46 to +320°F)
Storage	-40 to +150°C (-40 to +302°F)	-65 to +160°C (-54 to +320°F
Magnetic Flux	No limit. Circuit cannot be damaged by magnetic overdrive.	No limit. Circuit cannot be damaged by magnetic overdrive.

Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operations section for extended periods of time may affect reliability.

OPERATING CHARACTERISTICS

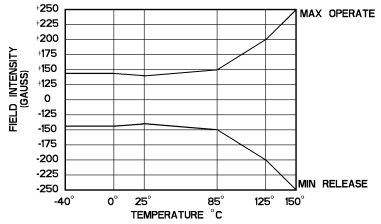
	SS51T	SS500	Remarks
Supply Voltage	4.5 to 24 VDC	3.8 to 30 VDC	
Current Consumption (Ioff)	10 mA	10 mA	Max over temp
Output Voltage (operated)	0.4 V	0.4 V	Sinking 20 mA max.
Output Current (operated)	20 mA	20mA	
Output Leakage Current	10 µA	10µA	
Output Switching Time			V_{CC} = 12 V,
Rise, 10 to 90%	1.5 µs	1.5 µs	R_L = 1.6 K Ohm,
Fall, 90 to 10%	1.5 µs	1.5 µs	C_L = 20 pF
Operating Temperature; °C	-40 to +150°C	-40 to +150°C	

MAGNETIC CHARACTERISTICS

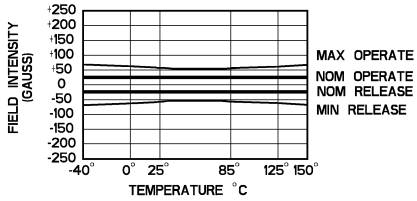
Catalog Listing		SS51T	SS511AT	SS513AT	SS541AT	SS543AT	SS549AT	SS561AT	SS566AT
Magnetic Type		**Bipolar**	**Bipolar**	**Bipolar**	**Unipolar**	**Unipolar**	**Unipolar**	**Latching**	**Latching**
Magnetic Characteristics (Gauss)									
-40°C	Max. Op.	145	70	140	135	215	440	110	200
	Min. Rel.	-145	-70	-140	20	80	210	-110	-200
	Min. Dif.	40	15	20	15	25	30	50	200
0°C	Max. Op.	145	65	140	117	190	400	90	185
	Min. Rel.	-145	-65	-140	20	80	230	-90	-185
	Min. Dif.	50	15	20	18	25	30	50	200
25°C	Max. Op.	140	60	140	115	180	390	85	180
	Min. Rel.	-140	-60	-140	20	75	235	-85	-180
	Min. Dif.	50	15	20	20	25	30	50	200
85°C	Max. Op.	150	60	140	120	180	400	85	180
	Min. Rel.	-150	-60	-140	15	70	215	-85	-180
	Min. Dif.	50	12	20	15	15	30	50	190
125°C	Max. Op.	200	65	140	123	190	410	100	180
	Min. Rel.	-200	-65	-140	15	60	200	-100	-180
	Min. Dif.	60	12	20	8	10	30	50	160
150°C	Max. Op.	250	70	140	125	200	420	110	185
	Min. Rel.	-250	-70	-140	10	55	185	-110	-185
	Min. Dif.	NS	10	20	5	5	30	50	140

OPERATE AND RELEASE POINTS

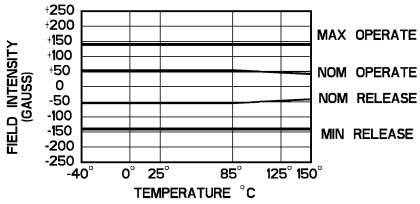
SS51T



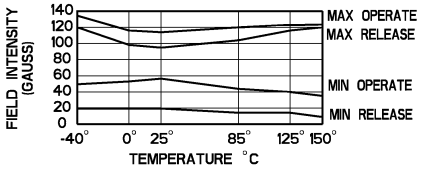
SS511AT



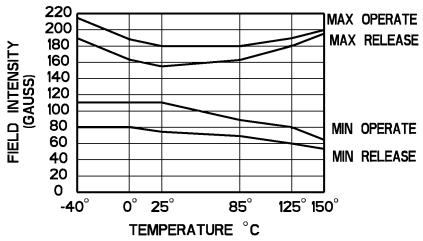
SS513AT



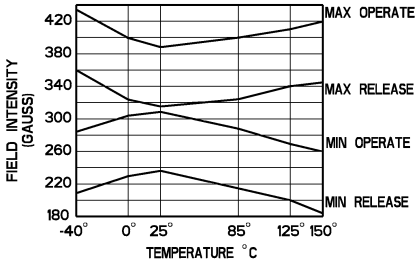
SS541AT



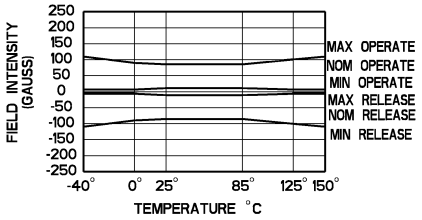
SS543AT



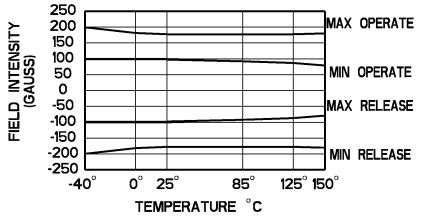
SS549AT



SS561AT



SS566AT



Hall Effect Products

Surface Mount Sensors

SS5 Series

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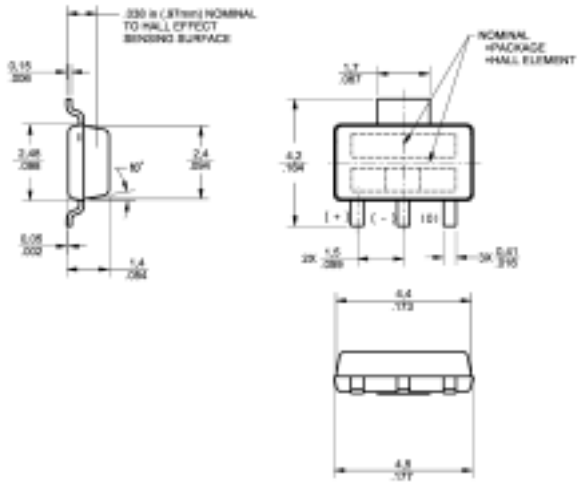
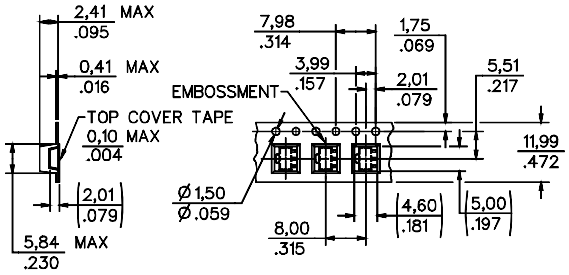
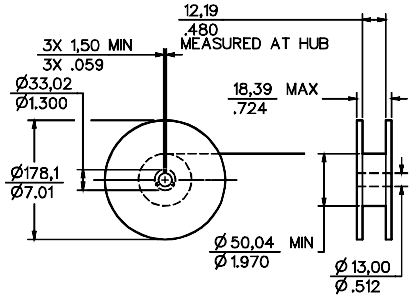
MOUNTING DIMENSIONS



TAPE DIMENSIONS



REEL DIMENSIONS



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Magnetic Position Sensors

Low-Cost, Bipolar, Hall-effect Sensors

SS40A/SS50AT Series

FEATURES

- Small size
- Low cost
- Reverse polarity protection
- Sensitive - bipolar magnetics respond to alternating north and south poles
- Thermally balanced, integrated circuit over a full temperature range
- Stable operation

TYPICAL APPLICATIONS

- Cooling fan control in computers and appliances
- RPM (revolutions per minute) sensing, speed control
- Brushless dc motor commutation
- Position sensing and motor control
- Simple magnetic encoder
- Flow-rate sensor

The SS40A/SS50AT Series sensors are low-cost, bipolar, Hall-effect sensors. These sensitive magnetic sensors offer reverse polarity protection and deliver stable output over a -40 °C to 125 °C [-40 °F to 257 °F] temperature range. Operation from any dc supply voltage from 4.5 Vdc to 24.0 Vdc is acceptable.

The SS40A/SS50AT Series sensors build upon Honeywell's popular magnetic position sensors and offer several competitive advantages. These sensors have been designed with the latest technologies to provide reliable, cost-effective solutions to commercial, computer, medical, and/or consumer applications requiring motor control and RPM sensing.

These products are available in a variety of package styles to suit a number of applications. Ammopack versions, along with tape-and-reel, are standard. The surface mount version is mounted directly on the electrical traces on a PC (printed circuit) board. It is attached by an automatic solder reflow operation which requires no hole, so it reduces the cost of the PC board.

⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

Magnetic Position Sensors

Low-Cost, Bipolar, Hall-effect Sensors

SS40A/SS50AT Series

ABSOLUTE MAXIMUM RATINGS*

Parameter	Min.	Typ.	Max.	Unit
Supply voltage	-28	–	28	V
Applied output voltage	-0.5	–	28	V
Output current	–	–	20	mA
Magnetic flux	–	–	No limit	Gauss

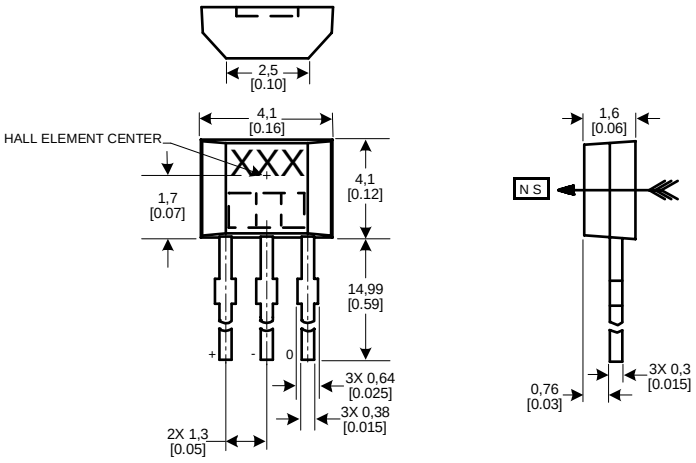
*Absolute maximum ratings are the extreme limits the device will withstand without damage to the device. However, the electrical and mechanical characteristics are not guaranteed as the maximum limits (above recommended operating conditions) are approached, nor will the device necessarily operate at absolute maximum ratings.

ELECTRICAL CHARACTERISTICS

At V_S = 4.5 V to 24 V with 20 mA load with Ta = -40 °C to 125 °C [-40 °F to 257 °F] unless otherwise noted.

Parameter	Cond.	Min.	Typ.	Max.	Unit
Supply voltage	–	4.5	–	24.0	V
Supply current	25 °C [77 °F]	–	6.8	10.0	mA
Supply current	–	–	–	11.3	mA
Output current	–	–	–	20.0	mA
Vsat @ 15 mA	Gauss >170	–	–	0.4	V
Output leakage	Gauss <-170	–	–	10.0	µA
Rise time	25 °C [77 °F]	–	0.5	1.5	µs
Fall time	25 °C [77 °F]	–	0.2	1.5	µs
Response time	25 °C [77 °F]	–	4.0	5.0	µs
Operate	25 °C [77 °F]	–	45	110	Gauss
Operate	0 °C to 85 °C [32 °F to 185 °F]	–	50	130	Gauss
Operate	–	–	55	170	Gauss
Release	25 °C [77 °F]	-110	-45	–	Gauss
Release	-40 °C to 85 °C [-40 °F to 185 °F]	-130	-50	–	Gauss
Release	–	-170	-55	–	Gauss
Differential	–	50	–	–	Gauss
Operating temperature	-40 °C to 125 °C [-40 °F to 257 °F]				
Storage temperature	-55 °C to 165 °C [-67 °F to 329 °F]				

SS40A SERIES MOUNTING DIMENSIONS (for reference only) mm/[in]

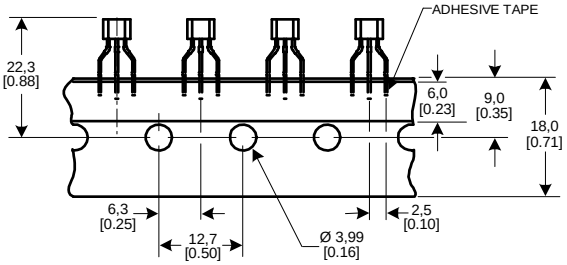


Magnetic Position Sensors

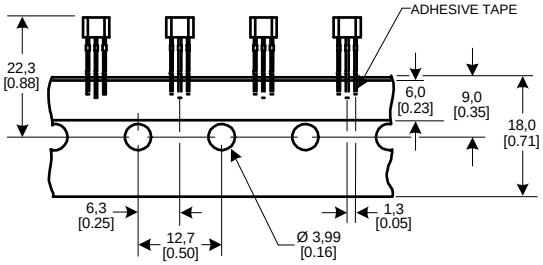
Low-Cost, Bipolar, Hall-effect Sensors

SS40A/SS50AT Series

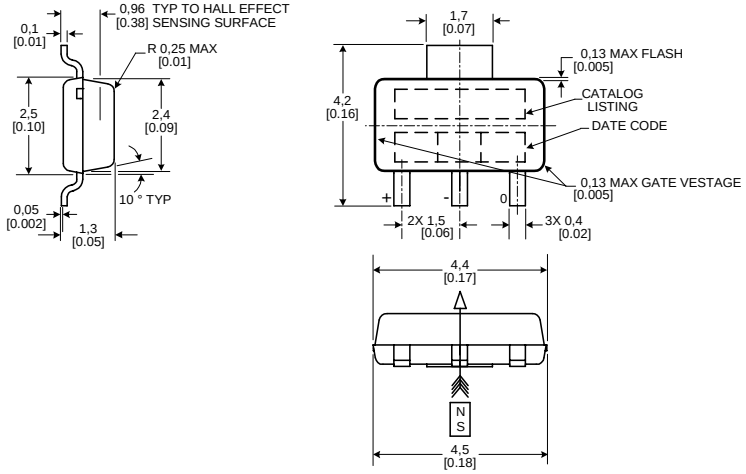
TAPE DIMENSIONS FOR STYLE T2 (for reference only) mm/[in]



TAPE DIMENSIONS FOR STYLE T3 (for reference only) mm/[in]

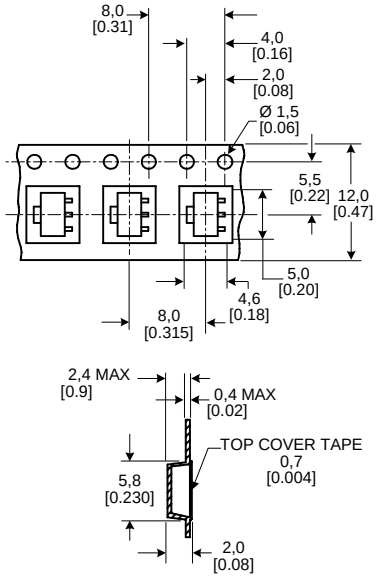


SS50AT SERIES MOUNTING DIMENSIONS (for reference only) mm/[in]

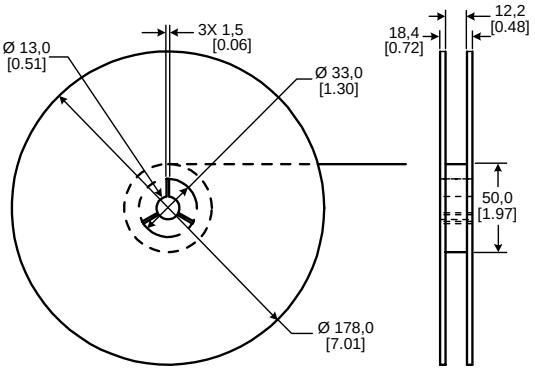


TAPE DIMENSIONS (for reference only) mm/[in]

This product is sold in tape and reel form only, per EIA STD 481. There are 1,000 parts per reel.



REEL DIMENSIONS (for reference only) mm/[in]



Magnetic Position Sensors

Low-Cost, Bipolar, Hall-effect Sensors

SS40A/SS50AT Series

ORDER GUIDE

Part Number	Description
SS40A	Bipolar, Hall-effect sensor, radial lead IC package
SS40A-F	Bipolar, Hall-effect sensor, radial lead IC package with formed leads on 2,54 mm [0.100 in] centers
SS40A-T2	Bipolar, Hall-effect sensor, radial lead IC package tape-in-box (ammopack) version with formed leads
SS40A-T3	Bipolar, Hall-effect sensor, radial lead IC package tape-in-box (ammopack) version with straight leads
SS50AT	Bipolar, Hall-effect sensor, surface-mount package, on tape and reel

WARRANTY/REMEDY

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SS40F/SS40G

Enhanced Low-Cost Bipolar Hall-effect Sensors

DESCRIPTION

The SS40F/SS40G Enhanced Low-Cost Bipolar Hall Effect Sensors are small, versatile digital Hall-effect devices that are operated by the magnetic field from a permanent magnet or an electromagnet. These products are designed to provide a level of compensation for magnetic changes over a range of temperatures. The bipolar magnetics respond to alternating North and South poles.

A built-in regulator is designed to provide very stable operation over 4.5 Vdc to 24 Vdc supply voltage range, and internal circuitry is designed to prevent sensor damage in case the supply voltage polarity is accidentally reversed.

The open-collector sinking output voltage is easily interfaced with a wide variety of electronic circuits.

The SS40F is factory tested at 25 °C [77 °F] and the SS40G is factory tested at both 25 °C [77 °F] and 125°C [257 °F].

Both products are designed for high volume, low-cost applications.

FEATURES

- Miniature construction: 3.0 mm x 4.0 mm [0.12 in x 0.16 in] plastic package
- Power consumption of only 5 mA max at 4.5 Vdc for energy efficiency
- Bipolar magnetics for ring magnet applications
- High speed: operates from 0 kHz to over 100 kHz
- Broad temperature range of -40 °C to 125 °C [-40 °F to 257 °F]
- Built-in reverse polarity protection

POTENTIAL APPLICATIONS

- Speed and RPM (revolutions per minute) sensing
- Brushless dc (direct current) motor commutation
- Motor and fan control
- Tachometer, counter pickup
- Flow rate sensing

TABLE 1. SS40F/SS40G ABSOLUTE MAXIMUM RATINGS*

Characteristic	Minimum	Typical	Maximum	Unit
Supply voltage	-28	–	28	V
Applied output voltage	-0.5	–	28	V
Output current	–	–	20	mA
Magnetic flux	–	–	no limit	gauss

***Note:**
Absolute maximum ratings are the extreme limits the device is designed to withstand without damage to the device. However, the electrical and mechanical characteristics are not guaranteed as the maximum limits (above recommended operating conditions) are approached, nor will the device necessarily operate at absolute maximum ratings.

TABLE 2. SS40F SPECIFICATIONS (At Vs = 4.5 V to 24 V with 20 mA load with Ta = 25 °C [77 °F] unless otherwise noted.

Characteristic	Condition	Minimum	Typical	Maximum	Unit
Supply voltage	–	4.5	–	24.0	V
Supply current	–	–	6.8	10.0	mA
Output current	–	–	–	20.0	mA
Vsat at 15 mA	gauss >170	–	–	0.4	V
Output leakage	gauss <-170	–	–	1.0	µA
Rise time	Vs = 4.5 V	–	0.5	1.5	µs
Fall time	Vs = 4.5 V	–	0.2	1.5	µs
Operate (Bop)	–	–	4.5 (45)	11 (110)	mT (gauss)
Release (Brp)	–	-11 (-110)	-4.5 (-45)	–	mT (gauss)
Differential	–	5.0 (50)	–	–	mT (gauss)
Operating temperature	-40 °C to 125 °C [-40 °F to 257 °F]				
Storage temperature	-65 °C to 160 °C [-85 °F to 329 °F]				

TABLE 3. SS40G SPECIFICATIONS (At Vs = 4.5 V to 24 V with 20 mA load with Ta = -40 °C to 150 °C [-40 °F to 302 °F] unless otherwise noted.

Characteristic	Condition	Minimum	Typical	Maximum	Unit
Supply voltage	–	4.5	–	24.0	V
Supply current	output OFF	–	6.8	10.0	mA
Supply current	output ON	–	–	11.3	mA
Output current	–	–	–	20.0	mA
Vsat at 20 mA	25 °C [77 °F], gauss >170	–	–	0.4	V
Output leakage	Vs = 24 V, gauss <-170	–	–	10.0	µA
Rise time	25 °C [77 °F]	–	0.5	1.5	µs
Fall time	25 °C [77 °F]	–	0.2	1.5	µs
Response time	25 °C [77 °F]	–	4.0	5.0	µs
Operate (Bop)	25 °C [77 °F]	–	4.5 (45)	11 (110)	mT (gauss)
Operate (Bop)	-40 °C to 85 °C [-40 °F to 185 °F]	–	5.0 (50)	13 (130)	mT (gauss)
Operate (Bop)	–	–	5.5 (55)	17 (170)	mT (gauss)
Release (Brp)	25 °C [77 °F]	-11 (-110)	-4.5 (-45)	–	mT (gauss)
Release (Brp)	-40 °C to 85 °C [-40 °F to 185 °F]	-13 (-130)	-5.0 (-50)	–	mT (gauss)
Release (Brp)	–	-17 (-170)	-5.5 (-55)	–	mT (gauss)
Differential	–	5.0 (50)	–	–	mT (gauss)
Operating temperature	-40 °C to 125 °C [-40 °F to 257 °F]				
Storage temperature	-40 °C to 165 °C [-40 °F to 329 °F]				

FIGURE 1. SS40F/SS40G CURRENT SINKING OUTPUT DIAGRAM

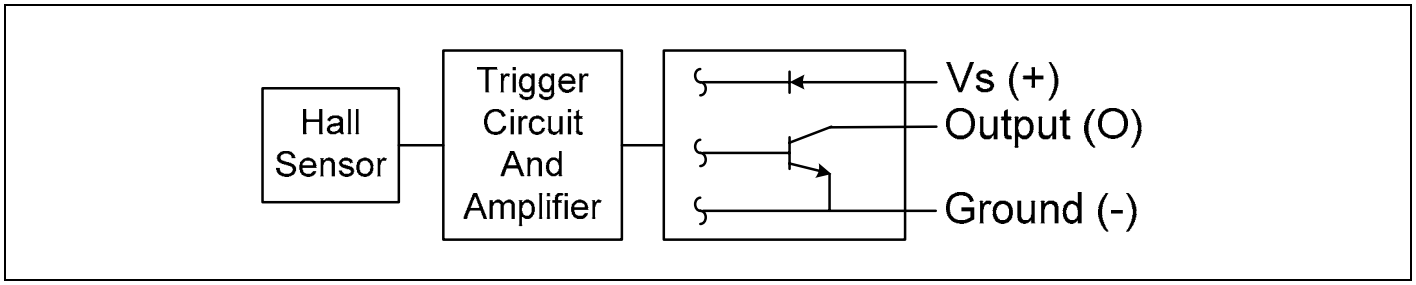
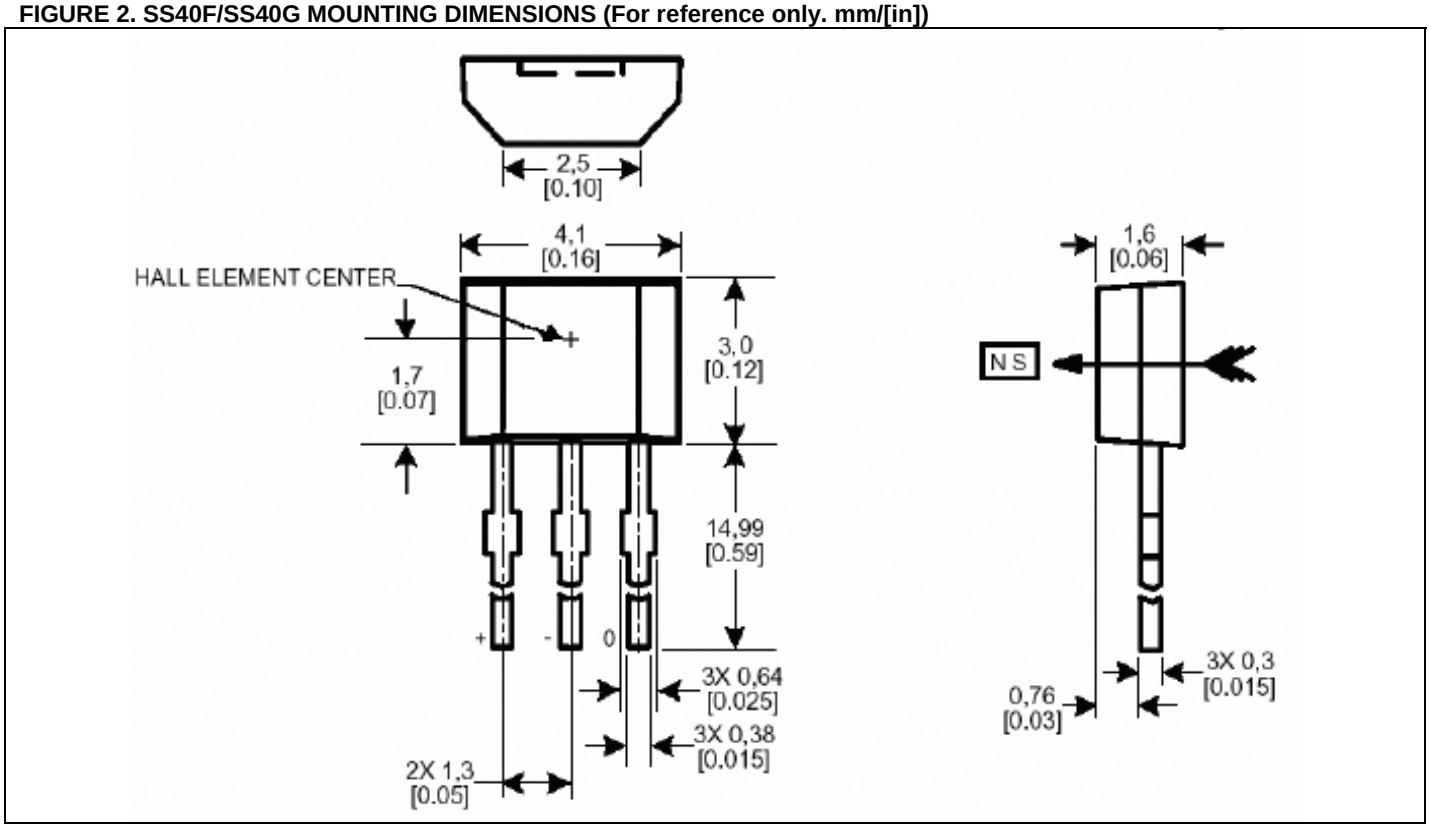


FIGURE 2. SS40F/SS40G MOUNTING DIMENSIONS (For reference only. mm/[in])



ORDER GUIDE

Catalog Listing	Description
SS40F	Enhanced low-cost bipolar hall-effect sensor, tested at 25 °C [77 °F], standard bulk pack with 1000 units per bag
SS40G	Enhanced low-cost bipolar hall-effect sensor, tested at 25 °C [77 °F] and 125°C [257 °F], standard bulk pack with 1000 units per bag

⚠ WARNING

MISUSE OF DOCUMENTATION

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WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

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SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

E-mail: info.sc@honeywell.com

Internet: www.honeywell.com/sensing

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	+65 6445-3033 Fax
Europe	+44 (0) 1698 481481
	+44 (0) 1698 481676 Fax
Latin America	+1-305-805-8188
	+1-305-883-8257 Fax
USA/Canada	+1-800-537-6945
	+1-815-235-6847
	+1-815-235-6545 Fax

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October 2007

Honeywell

SS41F/SS41G

Low-Cost Bipolar Hall-Effect Sensors

DESCRIPTION

The SS41F/SS41G Low-Cost Bipolar Hall-Effect sensors are small, versatile digital Hall-effect devices that are operated by the magnetic field from a permanent magnet or an electromagnet, and are designed to respond to alternating North and South poles.

A built-in regulator provides enhanced stability of operation over 4.5 Vdc to 24 Vdc supply voltage range, and internal circuitry is designed to prevent sensor damage in case the supply voltage polarity is accidentally reversed.

The open-collector sinking output voltage is easily interfaced with a wide variety of electronic circuits.

The SS41F is factory tested at 25 °C [77 °F] and the SS41G is factory tested at both 25 °C [77 °F] and 125 °C [257 °F].

Both products are designed for high volume applications.

FEATURES

- Miniature construction: 3.0 mm x 4.0 mm [0.12 in x 0.16 in] plastic package
- Power consumption of only 5 mA max at 4.5 Vdc for energy efficiency
- Bipolar magnetics for ring magnet applications
- High speed: operates from 0 kHz to over 100 kHz
- Broad temperature range of -40 °C to 125 °C [-40 °F to 257 °F]
- Built-in reverse polarity protection

POTENTIAL APPLICATIONS

- Speed and RPM (revolutions per minute) sensing
- Brushless dc (direct current) motor commutation
- Motor and fan control
- Tachometer, counter pickup
- Flow-rate sensing

TABLE 1. SS41F/SS41G ABSOLUTE MAXIMUM RATINGS*

Characteristic	Minimum	Typical	Maximum	Unit
Supply voltage	-28	–	28	V
Applied output voltage	-0.5	–	28	V
Output current	–	–	20	mA
Magnetic flux	–	–	no limit	gauss

Note:
*Absolute maximum ratings are the extreme limits the device is designed to withstand without damage to the device. However, the electrical and mechanical characteristics are not guaranteed as the maximum limits (above recommended operating conditions) are approached, nor will the device necessarily operate at absolute maximum ratings.

TABLE 2. SS41F SPECIFICATIONS (At Vs = 4.5 V to 24 V with 20 mA load with Ta = 25 °C [77 °F] unless otherwise noted.

Characteristic	Condition	Minimum	Typical	Maximum	Unit
Supply voltage	–	4.5	–	24.0	V
Supply current	–	–	6.8	10.0	mA
Output current	–	–	–	20.0	mA
Vsat at 15 mA	gauss >170	–	–	0.4	V
Output leakage	gauss <-170	–	–	1.0	µA
Rise time	Vs = 4.5 V	–	0.5	1.5	µs
Fall time	Vs = 4.5 V	–	0.2	1.5	µs
Operate (Bop)	–	–	4.0 (40)	15 (150)	mT (gauss)
Release (Brp)	–	-15 (-150)	-4.0 (-40)	–	mT (gauss)
Differential	–	4.0 (40)	–	–	mT (gauss)
Operating temperature	-40 °C to 150 °C [-40 °F to 302 °F]				
Storage temperature	-40 °C to 150 °C [-40 °F to 302 °F]				

TABLE 3. SS41G SPECIFICATIONS (At Vs = 4.5 V to 24 V with 20 mA load with Ta = -40 °C to 150 °C [-40 °F to 302 °F] unless otherwise noted.

Characteristic	Condition	Minimum	Typical	Maximum	Unit
Supply voltage	–	4.5	–	24.0	V
Supply current	output OFF	–	6.8	10.0	mA
Supply current	output ON	–	–	11.3	mA
Output current	–	–	–	20.0	mA
Vsat at 20 mA	25 °C [77 °F], gauss >170	–	–	0.4	V
Output leakage	Vs = 24 V, gauss <-170	–	–	10.0	µA
Rise time	25 °C [77 °F]	–	0.5	1.5	µs
Fall time	25 °C [77 °F]	–	0.2	1.5	µs
Operate (Bop)	25 °C [77 °F]	–	4.0 (40)	15 (150)	mT (gauss)
Operate (Bop)	–	–	–	25 (250)	mT (gauss)
Release (Brp)	25 °C [77 °F]	-14 (-140)	-4.0 (-40)	–	mT (gauss)
Release (Brp)	–	-25 (-250)	–	–	mT (gauss)
Differential	–	4.0 (40)	–	–	mT (gauss)
Operating temperature	-40 °C to 150 °C [-40 °F to 302 °F]				
Storage temperature	-40 °C to 150 °C [-40 °F to 302 °F]				

FIGURE 1. SS41F/SS41G CURRENT SINKING OUTPUT DIAGRAM

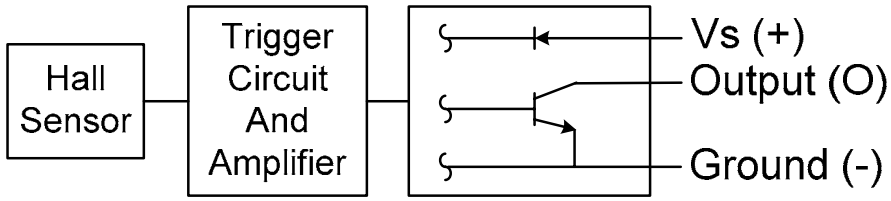
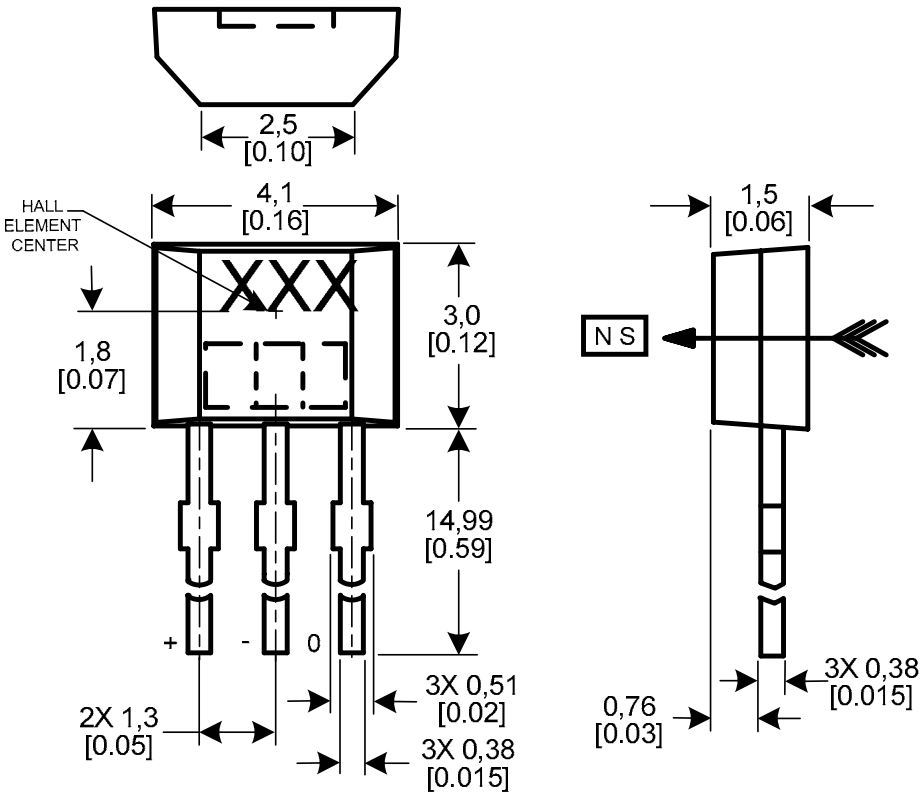


FIGURE 2. SS41F/SS41G MOUNTING DIMENSIONS (For reference only. mm/[in])



ORDER GUIDE

Catalog Listing	Description
SS41F	Low-cost bipolar hall-effect sensor, tested at 25 °C [77 °F], standard bulk pack with 1000 units per bag
SS41G	Low-cost bipolar hall-effect sensor, tested at 25 °C [77 °F] and 125 °C [257 °F], standard bulk pack with 1000 units per bag

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SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

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Honeywell

Solid State Hall-effect Sensors

Active High/Active Low Complementary Output Hall-effect Latch

SS42R Series

FEATURES

- Digital dual complementary sink/source outputs
- Reverse Voltage Polarity protection for full supply range.
- Operate/release points are trimmed for zero symmetry
- High output current capability
- Small 4-pin SIP package

TYPICAL APPLICATIONS

- Conveyors
- Motor control
- Ignition timing
- Power sensing
- Linear or rotary motion detection
- RPM sensing

The SS42R Series is a Bipolar Latching Hall IC with a pair of complementary push/pull outputs. A dual Hall element is used to offset stress induced noise and drift. The operate and release points are laser trimmed to insure near-zero symmetry. The robust outputs are capable of sourcing up to 6.4 mA and sinking up to 4.4 mA. The device contains inherent reverse polarity protection up to the full power supply rating.

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Solid State Hall-effect Sensors

Active High/Active Low Complementary Output Hall-effect Latch

SS42R Series

ABSOLUTE MAXIMUM RATINGS (Note 1)

Parameter	Min	Max	Unit	Conditions
Temperature	-40	125	°C	Storage, no power applied
Supply Voltage (Vs)	-28	28	V	0 °C to 100 °C [32 °F to 212 °F]
Voltage Externally Applied to Output	-1.2	5	V	0 °C to 100 °C [32 °F to 212 °F]
Output Current	-10	10	mA	
Magnetic Flux	–	–	–	No limit; the circuit cannot be damaged by magnetic overdrive

Note:
1. Absolute maximum ratings are the extreme limits that the device will withstand without damage to the device. However, the electrical and magnetic characteristics are not guaranteed as the maximum limits (above recommended operating conditions) are approached nor will the device necessarily operate at absolute maximum rating.

ELECTRICAL CHARACTERISTICS

Parameter	24 °C ± 2 °C [75.2 °F ± 2 °F]		0 °C to 75 °C [32 °F to 167 °F]		Unit	Conditions
	Min	Max	Min	Max		
Supply Current	11.0		12.0		mA	28 V ± 0.5% supply
Output Voltage						
#1 Sourcing	5.0	6.0	–	–	mA	Switch magnetically operated:
#2 Sinking	0	0.2	–	–		No load 28 V ± 0.5% supply.
#1 Sinking	0	0.2	–	–		Switch magnetically released:
#2 Sourcing	5.0	6.0	–	–		No load 28 V ± 0.5% supply.
Leakage (sink)	1.0		1.0		µA	Apply voltage 0.2 V greater than measured output source voltage measure current, no load 28 V ± 0.5% supply.
Output Current						
#1 Sourcing	4.0	6.5	3.75	6.4	mA	Apply 2 V to output and measure current. Switch magnetically operated, no load 28 V ±0.5%.
#2 Sinking	2.8	4.7	2.4	4.4		
#1 Sinking	2.8	4.7	2.2	4.4		Apply 2 V to output and measure current. Switch magnetically released, no load 28 V ±0.5%
#2 Sourcing	4.0	6.5	3.75	6.4		
Output Switching Time						
Fall Time	–	–	1.0		µs	90 % to 10 %; no load 28 V ± 0.5% supply
Rise Time	–	–	1.0			10 % to 90 %; no load 28 V ± 0.5% supply

MAGNETIC CHARACTERISTICS (Note 1)

Parameter	24 °C ± 2 °C [75.2 °F ± 2 °F] Vs=12 Vdc ± 0.5% Vdc		0 °C to 75 °C [32 °F to 167 °F] Vs=4.5 Vdc to 28 Vdc		0 °C to 100 °C [32 °F to 212 °F] Vs=4.5 Vdc to 16 Vdc	
	Min	Max	Min	Max	Min	Max
Operate Point	55	185	40	250	40	350
Release Point	-185	-55	-250	-40	-350	-40
Differential	200	300	150	420	150	600

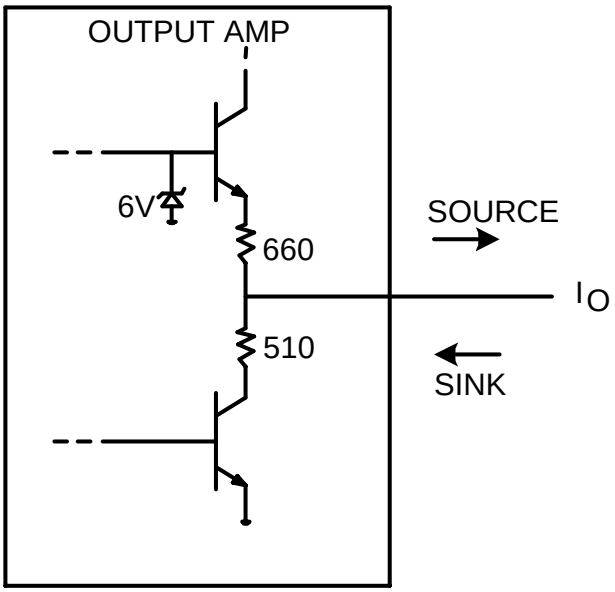
Note:
1. The magnetic field strength (gauss) required to cause the switch to change state (operate and release) will be as specified in the magnetic characteristics. To test the switch against the specified magnetic characteristics the switch must be placed in a uniform magnetic field.

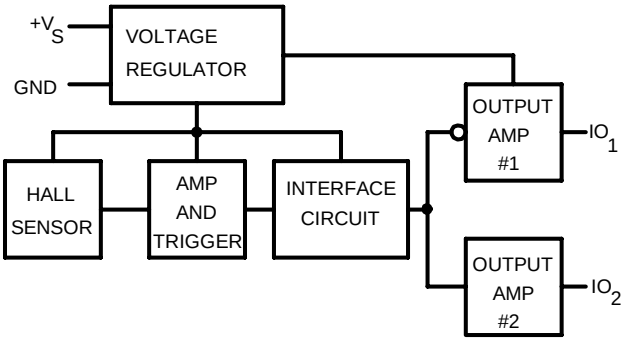
Solid State Hall-effect Sensors

Active High/Active Low Complementary Output Hall-effect Latch

SS42R Series

BLOCK DIAGRAM



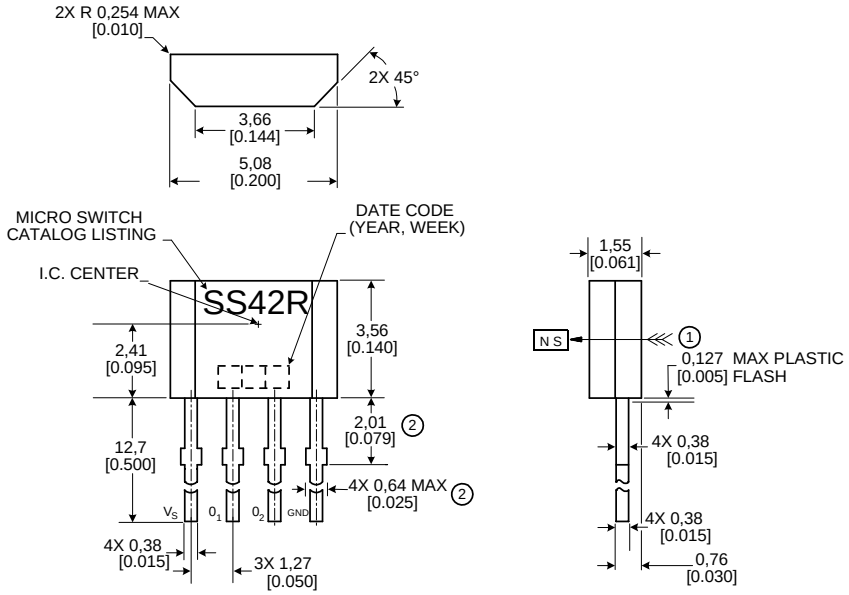


Solid State Hall-effect Sensors

Active High/Active Low Complementary Output Hall-effect Latch

SS42R Series

SS42 SERIES MOUNTING DIMENSIONS mm/[in] (for reference only)



ORDER GUIDE

Catalog Listing	Description
SS42R	Active High/Active Low Complementary Output Hall-effect Latch

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. **The foregoing is Buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

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Honeywell

Sensing and Control

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Honeywell

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Freeport, Illinois 61032

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Honeywell

Solid State Hall-effect Sensors

Economical Linear Position Sensor

SS49E/SS59ET Series

FEATURES

- Miniature construction
- Power consumption of 6 mA at 5 Vdc for energy efficiency
- Single current sourcing output
- Linear output for circuit design flexibility
- Low noise output virtually eliminates the need for filtering
- Thin film resistors for a stable and accurate output
- Temperature range of -40 °C to 100 °C [-40 °F to 212 °F]
- Responds to either positive or negative gauss

TYPICAL APPLICATIONS

- Current sensing
- Motor control
- Position sensing
- Magnetic code reading
- Rotary encoder
- Ferrous metal detector
- Vibration sensing
- Liquid level sensing
- Weight sensing

The SS49E and SS59ET Series Economical Linear Hall-effect sensors are small, versatile linear Hall-effect devices that are operated by the magnetic field from a permanent magnet or an electromagnet. The linear sourcing output voltage is set by the supply voltage and varies in proportion to the strength of the magnetic field.

The integrated circuitry features low noise output, which makes it unnecessary to use external filtering. It also includes thin film resistors to provide increased temperature stability and accuracy. These linear Hall sensors have an operating temperature range of -40 °C to 100 °C [-40 °F to 212 °F], appropriate for commercial, consumer, and industrial environments.

⚠ WARNING

PERSONAL INJURY

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OPERATING CHARACTERISTICS (V_S = 5.0 V, T_A = -40 °C TO 85 °C, EXCEPT WHERE NOTED)

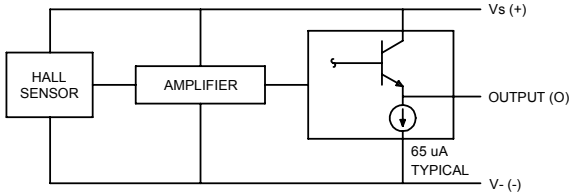
Supply Voltage (Vdc)		3.0 to 6.5
Supply Current (mA)	Typ.	6
@ 25 °C	Max.	10
Output Current (mA)	Min. (V_s > 3.0 V)	1.0
	Typ. (V_s > 3.0 V)	1.5
Output Voltage (mV/G)	Min.	1.0
	Typ.	1.4
	Max.	1.75
Null @ 0 gauss, 25 °C (Vdc)	Min.	2.25
	Typ.	2.50
	Max.	2.75
Output Voltage Span (Vdc)	Min.	1.05 to (V_s – 1.05)
	Typ.	0.95 to (V_s – 0.95)
Magnetic Range (Gauss)	Min.	±650
	Typ.	±1000
Linearity (% of Span)		-0.7
Output Type		Linear, Sourcing
Magnetics Type		Analog
Response Time (µs)		3
Sensitivity (mV/Gauss)	Min.	1.0
@ 25 °C	Typ.	1.4
	Max.	1.75
Operating Temperature		-40 °C to 100 °C [-40 °F to 212 °F]
Temperature Error (%/°C)		
Null Drift	Min.	-0.10
	Max.	0.10
Sensitivy Drift	≥ 25 °C Min.	-0.15
	≥ 25 °C Max.	0.05
	< 25 °C Min.	-0.04
	< 25 °C Max.	0.185

ABSOLUTE MAXIMUM RATINGS*

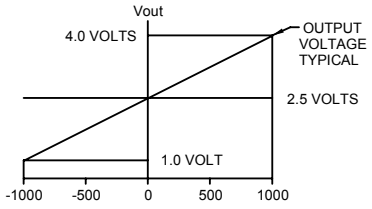
Supply Voltage (Vs)	-0.5 Vdc to 8.0 Vcd
Output Current	10 mA
Storage Temperature	-55 °C to 165 °C [-67 °F to 329 °F]

*Absolute maximum ratings are the extreme limits the device will withstand without damage to the device. However, the electrical and mechanical characteristics are not guaranteed as the maximum limits (above recommended operating conditions) are approached, nor will the device necessarily operate at absolute maximum ratings.

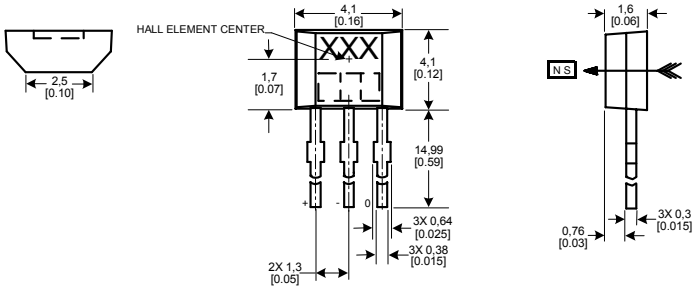
BLOCK DIAGRAM CURRENT SOURCING OUTPUT



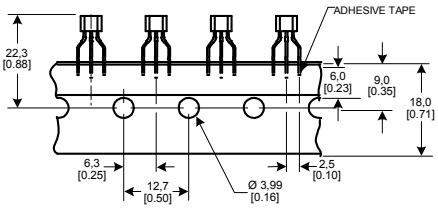
TRANSFER CHARACTERISTICS (VS = 5.0 VDC)



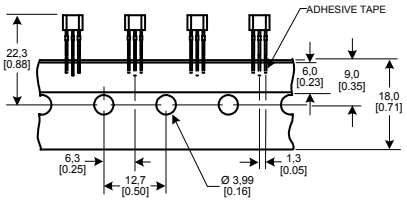
SS49E SERIES MOUNTING DIMENSIONS mm/[in] (for reference only)



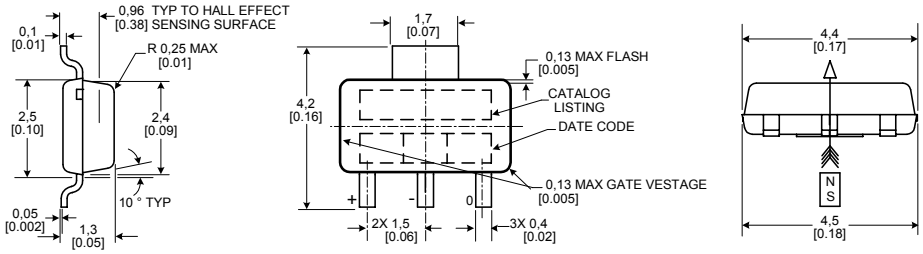
TAPE STYLE T2



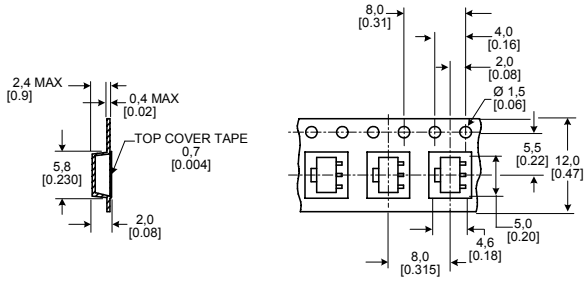
TAPE STYLE T3



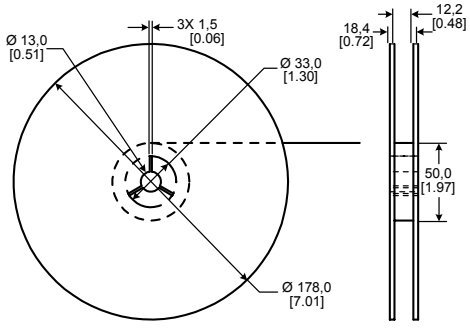
SS59ET SERIES MOUNTING DIMENSIONS mm/[in] (for reference only)



TAPE DIMENSIONS (sold in tape and reel form only, per EIA STD 481; 1,000 parts per reel)



REEL DIMENSIONS



Solid State Hall-effect Sensors

Economical Linear Position Sensor

SS49E/SS59ET Series

ORDER GUIDE

Catalog Listing	Description
SS49E	Standard leaded version
SS49E-L	Long-leaded version
SS49E-T2	Tape-and-reel version with formed leads
SS49E-T3	Tape-and-reel version with straight leads
SS59ET	Standard surface-mount version

NOTICE

Products ordered in bulk packaging (plastic bags) may not have perfectly straight leads as a result of normal handling and shipping operations. Please order a tape packaging option for applications with critical requirements for straight leads.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. **The foregoing is Buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use. While we provide application assistance personally, through our literature and the Honeywell Web site, it is up to the customer to determine the suitability of the product in the application.

For application assistance, current specifications, or name of the nearest Authorized Distributor, contact a nearby sales office. Or call:
1-800-537-6945 USA
1-800-737-3360 Canada
1-815-235-6847 International
FAX
1-815-235-6545 USA
INTERNET
www.honeywell.com/sensing
info.sc@honeywell.com

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Sensing and Control
Honeywell
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Freeport, Illinois 61032
005850-1-EN IL50 GLO 0803 Printed in USA

www.honeywell.com/sensing

Honeywell

Solid State Hall-effect Sensors

Adjustable Hall-Effect Under-speed Detectors

SS421 Series

FEATURES

- Wide temperature ranges for design flexibility
- Temperature compensated for consistent operation with low-cost magnets
- Bipolar operation for easy RPM counting using ring magnets
- Built-in timing circuit greatly simplifies and reduces the cost of PC board design
- Speed trip point adjustable with external resistor and capacitor

TYPICAL APPLICATIONS

- Under-speed detection for fans
- Conveyors
- Motor control
- Power-up fault failure filter in motor start-up

The SS421 Series Adjustable Hall-effect Under-speed Detectors are designed to monitor fan or motor performance. This temperature-compensated, Hall-effect IC contains a timing circuit and logic, that senses magnetic input frequency. The internal circuitry contains a timer so that one or two pulses at a slower repetition rate than the set point do not produce an unwanted output.

A small amount of hysteresis has been built into the output so that operation right at the set point does not result in a chattering output. The user simply provides an external resistor and capacitor combination to select the RPM trip point that will fit the particular application.

External components are used to set the frequency trip point and inertial delay time for output switching. The SS421L has an inverting output; the SS421H has a non-inverting output.

The small 4-pin package easily mounts on PC boards and flexible circuits. Built-in temperature compensation is optimized to match the temperature coefficient of low-cost magnets and track their performance over temperature.

The device will operate with supply voltages as low as 4.5 Vdc and as high as 16.0 Vdc. The output is an open-collector NPN capable of sinking 20 mA.

⚠WARNING

PERSONAL INJURY

- DO NOT USE these products as safety or emergency stop devices, or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

⚠WARNING

MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as product installation information.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

Figure 1. SS421H Timing Diagram
Td is the time delay after the pulses/min go below the trip point. Td is set by the external RC.
Tp is the time delay after the pulses/min go above the trip point. Tp is less than 20% of Td.

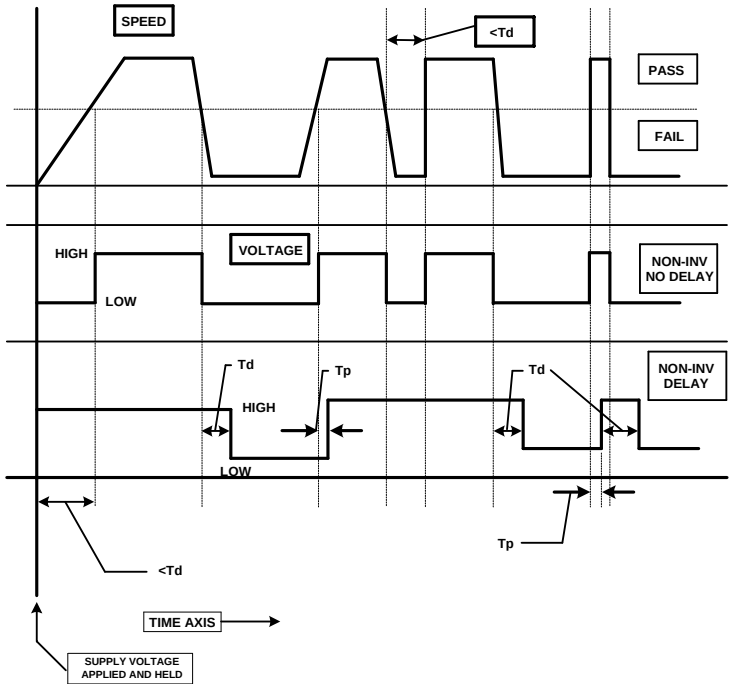


Figure 2. SS421L Timing Diagram
Td is the time delay after the pulses/min go below the trip point. Td is set by the external RC.
Tp is the time delay after the pulses/min go above the trip point. Tp is less than 20% of Td.

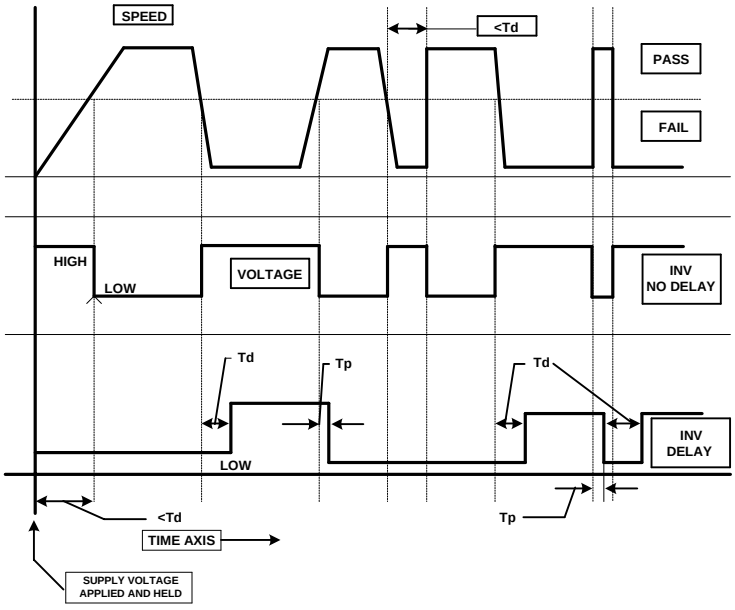


Table 1. Timing Table

Frequency trip point: FTP = 60/**RC** ln[(Vr1-Ic**R**)/(Vr2-Ic**R**)

Inertial delay set time: DST = 7**RC** ln(Vr2/Vr1) + N * 60/FTP

[In is the natural log]

Where nominal value of:

Vr1 = 2

Vr2 = 2Vr1 = 4 V

Ic – 196 µA

N = 12

R, **C** = external components

External components: **R** (Kohm) and **C** (µF)

Target Timings: Frequency trip point (RPM)/Inertial delay set time(s)#

R / C	1	1.2	1.5	1.8	2.2	2.7	3.3
39	3516 / 0.39	2930 / 0.47	2344 / 0.59	1954 / 0.71	1598 / 0.87		
43	3744 / 0.40	3120 / 0.48	2496 / 0.60	2080 / 0.72	1702 / 0.88		
47	3931 / 0.41	3276 / 0.49	2620 / 0.62	2184 / 0.74	1787 / 0.90		
51	4087 / 0.42	3406 / 0.51	2725 / 0.64	2271 / 0.76	1858 / 0.93		
56	4250 / 0.44	3542 / 0.53	2834 / 0.66	2361 / 0.79	1932 / 0.97		
62	4411 / 0.46	3676 / 0.56	2940 / 0.70	2450 / 0.84			
68	4542 / 0.49	3785 / 0.59	3028 / 0.73	2523 / 0.88			
75	4669 / 0.52	3890 / 0.62	3112 / 0.78	2594 / 0.93			
82	4773 / 0.55	3978 / 0.66	3182 / 0.82	2652 / 0.99			
91	4884 / 0.59	4070 / 0.71	3256 / 0.88				
100	4974 / 0.63	4145 / 0.76	3316 / 0.94				
110	5057 / 0.68	4214 / 0.81					
120	5126 / 0.72	4272 / 0.87					
130	5184 / 0.77	4320 / 0.92					
150	5277 / 0.86						1599 / 2.85
300	5579 / 1.58						1691 / 5.23
330						2077 / 4.67	1699 / 5.71
360						2085 / 5.06	1706 / 6.19
390						2092 / 5.45	1712 / 6.67
430					2577 / 4.87	2100 / 5.98	1718 / 7.30
470					2586 / 5.30	2107 / 6.50	1724 / 7.94
510				3169 / 4.68	2592 / 5.72	2112 / 7.02	1728 / 8.58
560				3177 / 5.12	2600 / 6.25	2118 / 7.68	1733 / 9.38
620			3823 / 4.70	3186 / 5.64	2607 / 6.89	2124 / 8.46	1738 / 10.34
680			3832 / 5.14	3193 / 6.16	2613 / 7.53	2129 / 9.25	1742 / 11.30
750			3840 / 5.65	3200 / 6.78	2618 / 8.28	2133 / 10.16	1745 / 12.42
820		4808 / 4.92	3847 / 6.16	3206 / 7.39	2623 / 9.03	2137 / 11.08	1749 / 13.54
910		4818 / 5.45	3854 / 6.81	3212 / 8.17	2628 / 9.99	2141 / 12.26	1752 / 14.98
1000	5790 / 4.98	4825 / 5.97	3860 / 7.46	3217 / 8.96	2632 / 10.95	2144 / 13.44	1755 / 16.42
1100	5798 / 5.46	4832 / 6.55	3865 / 8.19	3221 / 9.83	2636 / 12.02	2147 / 14.75	
1200	5805 / 5.95	4837 / 7.14	3870 / 8.92	3225 / 10.70	2639 / 13.08	2150 / 16.06	
1300	5811 / 6.43	4842 / 7.72	3874 / 9.65	3228 / 11.58	2641 / 14.15	2152 / 17.37	
1500	5820 / 7.40	4850 / 8.88	3880 / 11.10	3233 / 13.32	2645 / 16.28		
1600	5824 / 7.89	4853 / 9.46	3882 / 11.83	3235 / 14.20			
1800	5830 / 8.86	4858 / 10.63	3887 / 13.29	3239 / 15.94			
2000	5835 / 9.83	4862 / 11.79	3890 / 14.74	3242 / 17.69			
2200	5839 / 10.80	4866 / 12.96	3893 / 16.20				
2400	5842 / 11.77	4869 / 14.12					

Table 2. Absolute Maximum Ratings[Note 1)]

Parameter	Min	Max	Unit	Conditions
Ambient temperature	-40 [-40]	125 [257]	°C [°F]	Storage, no power applied
Ambient temperature	-40 [-40]	105 [221]	°C [°F]	Operating, power applied
Supply voltage	-25	25	Vdc	-40 °C to 105 °C [-40 °F to 302 °F] ambient temperature
Voltage at output	-0.5	25	Vdc	Off condition of output over temperature
Open collector NPN	–	20	mA	Operated over temperature, current sinking output inverted or non-inverted

Notes:
1. Absolute maximum ratings are the extreme limits the device will withstand without damage to the device. However, the electrical and mechanical characteristics are not guaranteed as the maximum limits (above recommended operating conditions) are approached, nor will the device necessarily operate at absolute maximum ratings.

Table 3. Electrical Characteristics[Note 1)] (Required -25 °C to 105 °C [-13 °F to 221 °F] ambient)

Parameter	Min	Max	Unit	Conditions
Supply voltage (Vs)	4.5	16.0	Vdc	–
Supply current (Is)	–	15.0 15.0	mA mA	Output released, Vs = 16 V, T_J = 25 °C [77 °F]
Supply current (Is)	–	15.0 15.0	mA mA	Output operated, Vs = 16 V, T_J = 25 °C [77 °F]
Output voltage	–	0.4	Vdc	Sinking 15 mA, Vsat
Output leakage current	–	10.0	µA	Output at 25 V
Rise time (10% to 90%)	–	1.5	µs	Vs = 12 V, R = 800 ohms, C = 50 pf
Fall time (90% to 10%)	–	1.5	µs	Vs = 12 V, R = 800 ohms, C = 50 pf

Notes:
1. Over operating temperature and voltage range unless otherwise noted.

Table 4. Magnetic Characteristics[Note 1)] (Required -25 °C to 105 °C [-13 °F to 221 °F] ambient)

Parameter	Min	Max	Unit	Conditions
Operate point	–	250	G	Ta = 25 °C [77 °F], Note 2
Operate point	–	250	G	25 °C to 105 °CV [77 °F to 221 °FV]
Release point	-250	–	G	Ta = 25 °C [77 °F]
Release point	-250			-25 °C to 105 °C [-13 °F to 221 °F], Note 3
Differential	50	–	G	Operate minus release

Notes:
1. Over operating temperature and voltage range unless otherwise noted.
2. Operate point is defined as the gauss level above which the internal circuitry will always be indicating the presence of a south pole at the IC surface.
3. Release point is defined as the gauss level below which the internal circuitry will always be indication the presence of a north pole at the IC surface.

Table 5. Timing Characteristics[Note 1] (Required -25 °C to 105 °C [-13 °F to 221 °F] ambient)

Parameter	Min	Max	Unit	Conditions
Trip point range	1800	5200	PPM	Ta = 25 °C [77 °F], Note 2
Trip point tolerance	-16.0	16.0	%	Variation from calculated value, Note 3
Trip point delay and power up delay				
Delayed version	5.0	16.0	sec	Ta = 25 °C [77 °F], 1800 to 5200 PPM
Non-delayed version		1.2	sec	Ta = +25 °C [77 °F], 1800 to 5200 PPM, Note 4
Delay set time tolerance				% of delay set time (whichever is smaller of the two sets)
	-40	40	%	
	-4.0	4.0	sec	
Passing delay fail to pass condition	–	20	%	% of delay set time, Note 5
External capacitor leakage coefficient	–	0.05	–	Note 6

Notes:
1. Over operating temperature and voltage range unless otherwise noted. Does not include R and C shifts over temperature.
2. Trip point is the frequency in PPM (pulses per minute) that causes the output to change state. An inverted output is low when the speed is greater than the trip point.
3. This is the accuracy required from unit to unit and includes R and C each varying ± 5% over speed, supply voltage, and temperature.
4. Trip point delay is the delay in output response to an input frequency below the trip point. The time delay is determined by the value of the external resistor and capacitor. Delayed version powers up in the passing condition.
5. Passing delay tolerance is based on delay set time. Its tolerance is proportional to delay set time tolerance.
6. Capacitor leakage coefficient is used to calculate leakage current in the following formula: leakage current = leakage coefficient x capacitance x capacitor voltage.

Table 6. Latch Characteristics[Note 1] (Required -25 °C to 105 °C [-13 °F to 221 °F] ambient)

Parameter	Min	Max	Unit	Conditions
Latch voltage	3.5	4.5	V	At VS = 5.0, Note 2
	2.0	4.5	V	
Latch current	–	1.0	mA	Note 3 (SS421L only)

Notes:
1. Over operating temperature and voltage range unless otherwise noted. External components must be connected between the output and the program/oscillator pin.
2. The open collector output can be used to drive external circuitry that applies a latching voltage to the program/oscillator pin to latch the IC output in the fail state. This latch mode is to be used only on products with delay set times greater than five seconds and with inverted output version of the SS421L.
3. Latching current is the sourcing current required of the applied external voltage to maintain the latch.

Table 7. External R and C Characteristics[Note 1] (Required -25 °C to 105 °C [-13 °F to 221 °F] ambient)

Parameter	Min	Max	Unit	Conditions
External resistor	–	±5	%	Directly related to trip accuracy
External capacitor	–	±5	%	Directly related to trip accuracy
External capacitor leakage coefficient	–	0.05	–	Note 2

Notes:
1. Over operating temperature and voltage range unless otherwise noted.
2. Leakage coefficient is the external capacitor leakage current coefficient such that leakage current = leakage coefficient x capacitance x capacitor voltage.

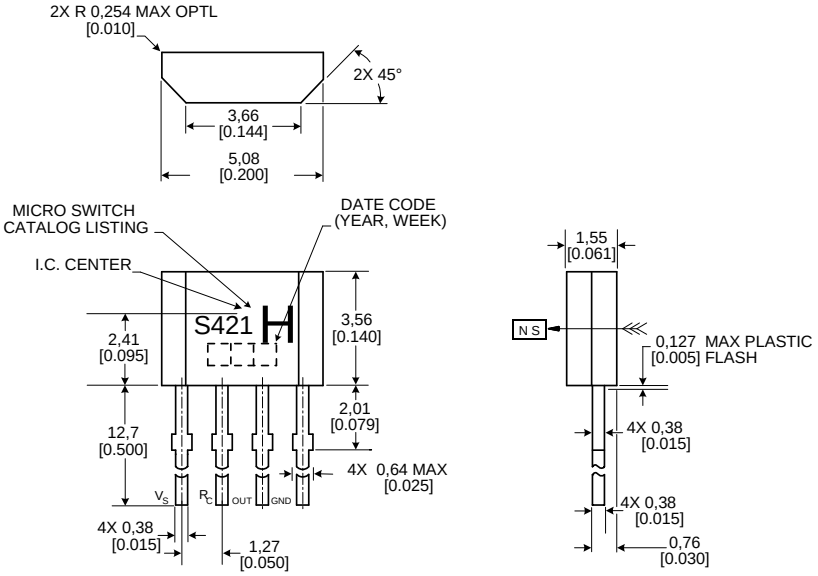
Solid State Hall-effect Sensors

Adjustable Hall-Effect Under-speed Detectors *SS421 Series*

ORDER GUIDE

Catalog Listing	Description
SS421L	Adjustable Hall-effect Under-speed Detector, Low (Speed > set point)
SS421H	Adjustable Hall-effect Under-speed Detector, High (Speed > set point)

Figure 3. SS421L/SS421H Series Mounting Dimensions mm/in
(for reference only)



WARRANTY/REMEDY

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Freeport, Illinois 61032

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Honeywell

Solid State Hall Effect Sensors

High Performance Miniature Ratiometric Linear

SS490 Series

FEATURES

- Small size (.160 x .118 in)
- Power consumption of 7 mA at 5 VDC for energy efficiency
- Single current sinking or current sourcing output
- Linear output for circuit design flexibility
- Built-in thin film resistors are laser trimmed for precise sensitivity and temperature compensation
- Rail-to-rail operation provides more useable signal for higher accuracy
- Temperature range of -40°C to +150°C
- Responds to either positive or negative gauss
- Quad Hall sensing element for stable output

TYPICAL APPLICATIONS

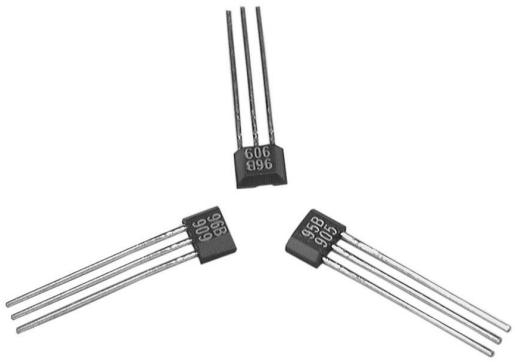
- Current sensing
- Motor control
- Position sensing
- Magnetic code reading
- Rotary encoder
- Ferrous metal detector
- Vibration sensing
- Liquid level sensing
- Weight sensing

⚠WARNING

PERSONAL INJURY

- DO NOT USE these products as safety or emergency stop devices, or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.



The SS490 Series MRL (Miniature Ratiometric Linear) sensors are small, versatile linear Hall effect devices which are operated by the magnetic field from a permanent magnet or an electromagnet. The ratiometric output voltage is set by the supply voltage and varies in proportion to the strength of the magnetic field.

The integrated circuitry provides increased temperature stability and sensitivity. Laser trimmed thin film resistors provide high accuracy (null to ± 3%, sensitivity up to ±3%) and temperature compensation. These linear position sensors have an operating temperature range of -40°C to +150°C, appropriate for industrial and automotive environments. They respond to either positive or negative gauss, monitoring either or both magnetic poles. The quad Hall sensing element minimizes the effects of mechanical or thermal stress on the output. The positive temperature coefficient of the sensitivity (+0.02%/°C typical) helps compensate for the negative temperature coefficients of low cost magnets, providing a robust design over a wide temperature range. Rail-to-rail operation (over full voltage range) provides a more usable signal for higher accuracy.

The recent extension to the product line, the SS490B Series, offers cost-effective MRL sensing solutions with slightly wider specifications than the SS490 high-performance products. Like the SS490 Series, the SS490B has a typical sinking or sourcing output of 1.5 mA continuous, uses 7 mA of supply current at 5.0 volts and 25°C, and provides predictable performance over the full temperature range. The SS490B Series sensors have wider null and sensitivity tolerances and a wider drift over temperature.

The SS490B Series sensors are a new lower cost product line extension. They complement the SS490 Series of small size, high accuracy and high performance miniature linear products.

⚠WARNING

MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as product installation information.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

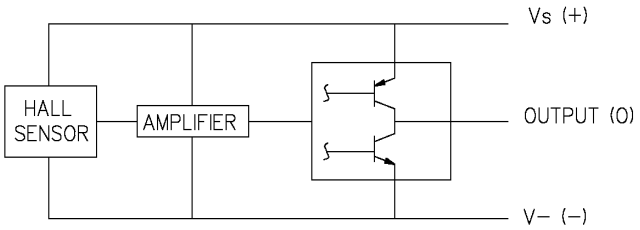
Solid State Hall Effect Sensors

High Performance Miniature Ratiometric Linear *SS490 Series*

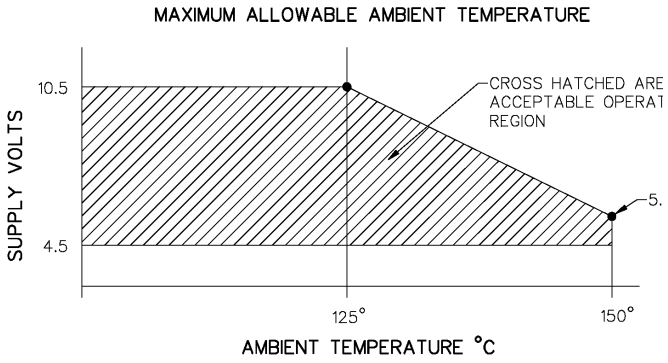
SPECIFICATIONS (V_s = 5.0 v, t_a = -40 to +125°C, unless otherwise noted)

Catalog Listing Type		SS495A	SS495A1	SS495A2	SS495B	SS496A	SS496A1	SS496B
Supply Voltage (VDC)		4.5 to 10.5						
Supply Current @ 25°C (mA)	Typ.	7.0						
	Max.	8.7						
Output Type (Sink or Source)		Ratiometric						
Output Current (mA)								
Typ. Sink or Source	Vs > 4.5 V	1.5						
Min. Source	Vs > 4.5 V	1.0						
Min. Sink	Vs > 4.5 V	0.6						
Min. Sink	Vs > 5.0 V	1.0						
Operating Temperature		-40 to +150°C (-40 to +302°F)						
Magnetic Range, Gauss	Typ.	± 670	± 670	± 670	± 670	± 840	± 840	± 840
	Min.	± 600	± 600	± 600	± 600	± 750	± 750	± 750
Output Voltage Span	Typ.	0.2 to (Vs-0.2)						
	Min.	0.4 to (Vs-0.4)						
Null (Output @ 0 Gauss, V)		2.50 ±0.075	2.50 ±0.075	2.50 ±0.100	2.50 ±0.150	2.50 ±0.075	2.50 ±0.075	2.50 ±0.150
Sensitivity (mV/G)		3.125 ±0.125	3.125 ±0.094	3.125 ±0.156	3.125 ±0.250	2.50 ±0.100	2.50 ±0.075	2.50 ±0.200
Linearity,	Typ.	-1.0						
% of Span)	Max.	-1.5						
Temperature Error								
Null Drift	(%/°C)	± 0.06	± 0.04	± 0.07	± 0.08	± 0.048	± 0.03	± 0.06
Sensitivity Drift	(%/°C)							
≥ 25°C Max.		-0.01, +0.05	-0.02, +0.06	-0.02, +0.06	-0.01, +0.05	- 0.01, +0.05	-0.01, +0.05	- 0.02, +0.06
< 25°C Max.		0.0, +0.06	0.0, +0.06	- 0.01, +0.07	- 0.02, +0.06	0.0, +0.06	0.0, +0.06	- 0.02, +0.06

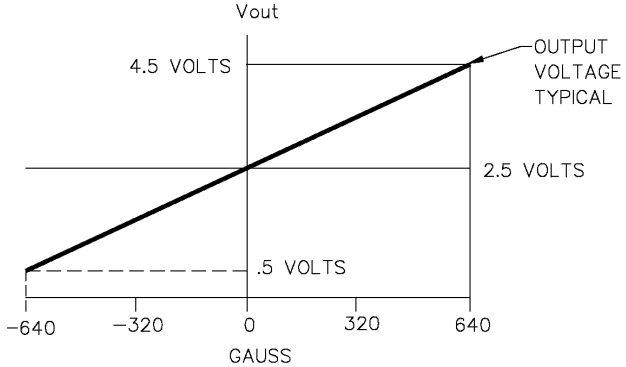
BLOCK DIAGRAM



MAXIMUM SUPLY VOLTAGE vs. TEMPERATURE

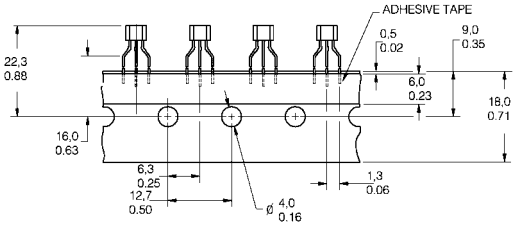


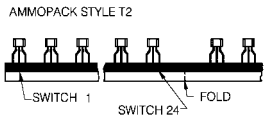
TRANSFER CHARACTERISTICS at Vs = 5.0 VDC



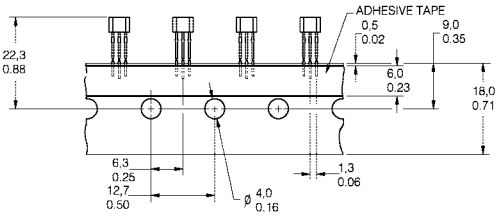
MOUNTING DIMENSIONS (for reference only) mm/in

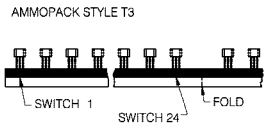
TAPE STYLE T2



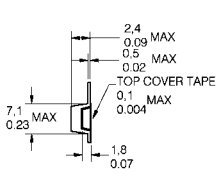


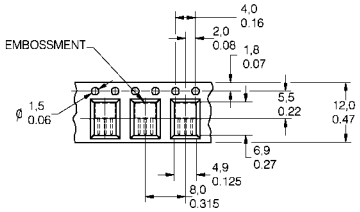
TAPE STYLE T3

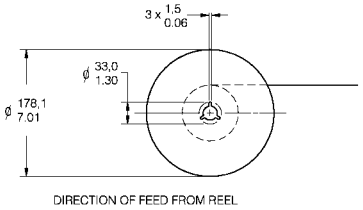




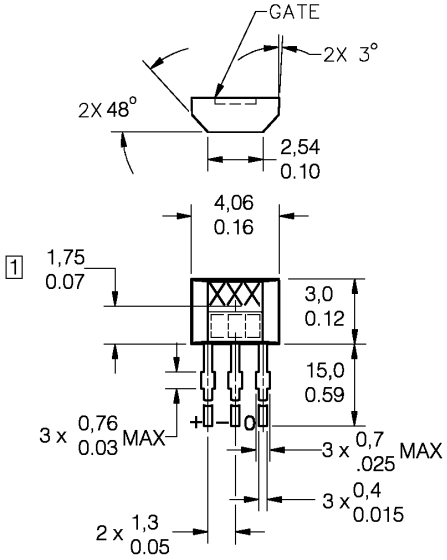
TAPE STYLE P

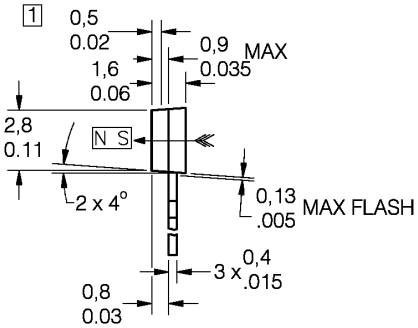




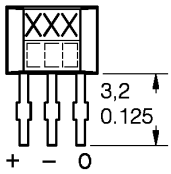


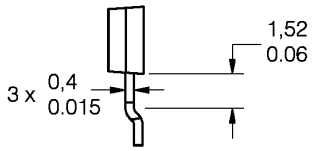
SENSOR PACKAGE (**1** Centerline of Hall cell)





OPTIONAL SURFACE MOUNT





Solid State Hall Effect Sensors

High Performance Miniature Ratiometric Linear *SS490 Series*

ABSOLUTE MAXIMUM RATINGS*

Supply voltage (V_S)	-0.5 to +11 VDC
Output current (mA)	10 mA
Operating temperature	-40°C to +150°C (-40°F to +302°F)
Storage temperature	-55°C to +165°C (-67°F to +329°F)
Magnetic flux	No limit. Circuit cannot be damaged by magnetic over-drive

* Absolute maximum ratings are the extreme limits that the device will withstand without damage to the device. However, the electrical and mechanical characteristics are not guaranteed as the maximum limits (above recommended operating conditions) are approached, nor will the device necessarily operate at absolute maximum ratings.

NOTICE

Products ordered in bulk packaging (plastic bags) may not have perfectly straight leads as a result of normal handling and shipping operations. Please order a tape packaging option for applications with critical requirements for straight leads.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

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1-815-235-6847 International

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INTERNET

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Honeywell Inc.
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Freeport, Illinois 61032

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SS520 Series Dual Hall-effect Digital Position Sensors with speed & direction outputs

Series SS520

FEATURES

- Single miniature plastic package includes two separate Hall sensors
- Frequency signal for speed output
- Logic level (High or Low) signal for direction output
- Temperature compensated magnetics
- Functionality of two discrete Hall sensors and logic circuitry outputs
- Symmetry of operate/release points about zero gauss (bipolar/latching)
- Low current consumption
- Wide operating voltage range

TYPICAL APPLICATIONS

- Anti-pinch electric motor control systems for power windows, power seats (headrest), power sliding doors, sunroofs, garage door openers.
- Magnetic encoding for electronic steering systems
- Motion control sytems for pulleys and belts
- Position and velocity detection
- Fan control
- Rotating shaft monitoring
- Linear displacement sensing (using a magnetic strip of alternating poles)

GENERAL DESCRIPTION

The Speed & Direction Hall-effect sensor has two distinct Hall sensing elements precisely located 1.4 mm apart on a single integrated circuit chip, which is then encapsulated in a thermoset molding material. Two active Hall latches provide indication of the speed and direction of a magnetic gradient across the face of the package, such as the gradient from a rotating ring magnet. The small, 4-pin SOT89 style package surface mounts on PC boards and flexible circuits.
Built-in temperature compensation is optimized to match the temperature coefficient of low cost magnets and track their performance over temperature. Latching magnetics are standard for reliable operation.
A novel regulator circuit provides extremely stable operation with supply voltages as low as 3.4 Vdc and as high as 24 Vdc. A typical room temperature current consumption of 7.5 mA helps conserve power in battery operation. SS520 series sensors can use existing power supply sources in most applications, and can be directly interfaced with many electronic components without buffering or compensation circuitry.

CAUTION
WAVE SOLDER DAMAGE
DO NOT wave solder this product.
Wave soldering may negatively affect the sensor performance and reliability.
Subjecting the sensor to wave soldering will void Honeywell's warranty.
Failure to comply with these instructions may result in product damage.

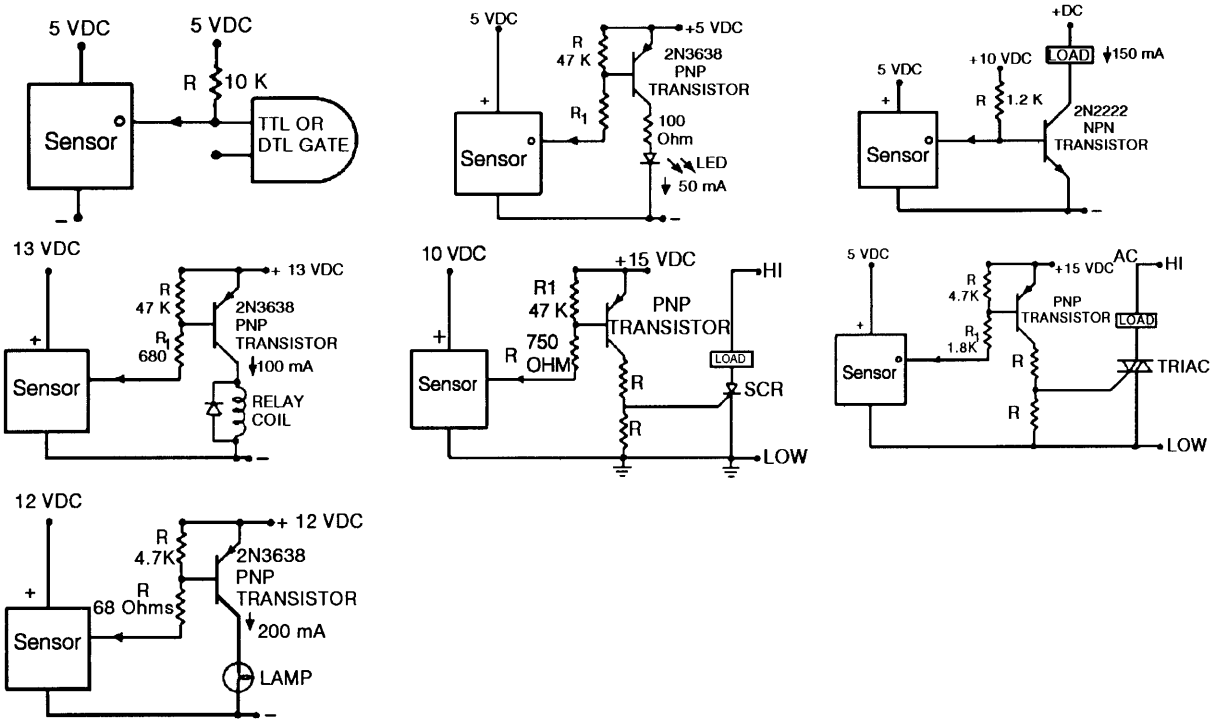
NOTICE
Interruption of power to a latching device may cause the output to change state when power is restored. If a magnetic field of sufficient strength is present, the sensor output will be in the condition dictated by the magnetic field.

Hall-effect Digital Speed & Direction Sensor

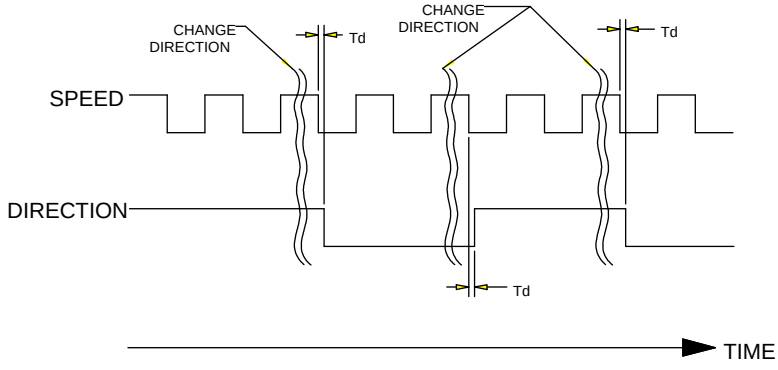
Series SS520

Product Listing	SS526DT
Package Quantity/Type	Available in 1,000/Tape and Reel
Package Style	SS5 Surface Mount
Supply Voltage	-0.5 Vdc to 30 Vdc
Supply Current at 25 °C	7.5 mA typ.
Output Type	Dual Sink (speed & direction)
Output Current	5 mA max. each output
Magnetic Actuation Type	Bipolar Latch
Operate Point at 25 °C	130 Gauss [13.0 mT] typ.
Release Point at 25 °C	-130 Gauss [-13.0 mT] typ.
Operating Temperature Range	-40 °C to 125 °C [-40 °F to 257 °F]
Differential min.	260 Gauss [26.0 mT] typ.
Output Voltage	0.4(V) max.
Switching Time Rise (10 % to 90 %)	1.5 µs max.
Switching Time Fall (90 % to 10 %)	1.5 µs max.
Leakage Current	10 µA max.
Operating Frequency (f)	> 1000 Hz min.
Availability	Global

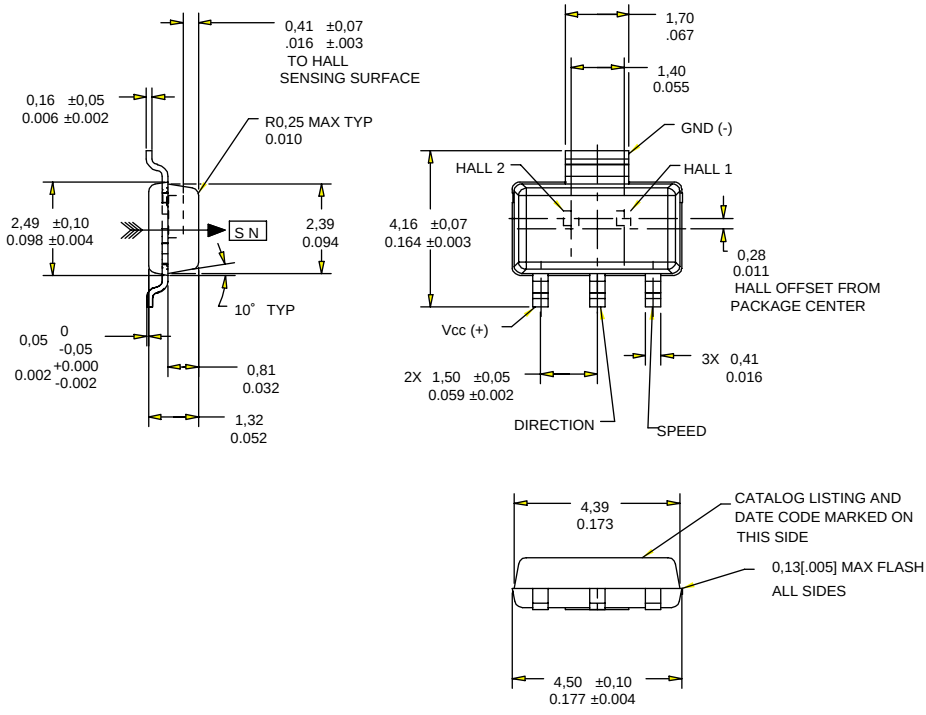
INTERFACING DIAGRAMS



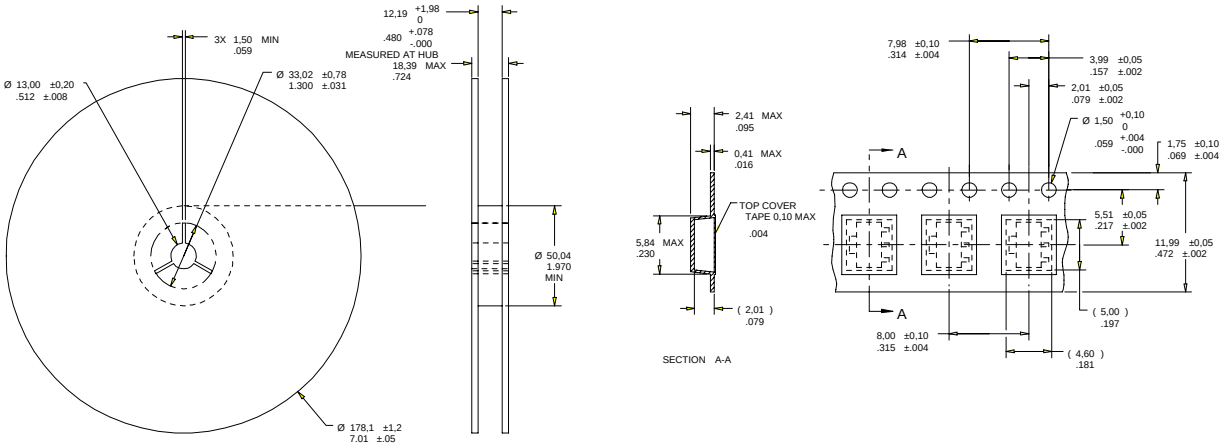
OUTPUT TIMING DIAGRAM



DIMENSIONS mm [in] (For reference only)



TAPE AND REEL DIMENSIONS mm [in] (For reference only)



DIRECTION OF FEED FROM REEL

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FAX
1-815-235-6545 USA
INTERNET
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info.sc@honeywell.com

⚠ WARNING

PERSONAL INJURY
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Failure to comply with these instructions could result in death or serious injury.

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Honeywell

Magnetoresistive Position Sensors

SS552MT Surface Mount Sensor

SS552MT Series

FEATURES

- Low gauss operation can extend sensing distance to one inch or more, depending upon size
- Digital current sinking output
- Omnipolar – can be operated with either north or south magnetic pole
- 0 kHz to over 100 kHz operating speed
- Surface-mount package allows automated, lower cost assembly
- Small size

TYPICAL APPLICATIONS

- Cylinder position sensing in pneumatic cylinders
- Elevator sensor
- Lid sensor for laptop computers
- Position sensor for material handling equipment
- Geartooth sensor for industrial or automotive applications

SS552MT is a digital position sensor in an SOT-89 style surface-mount package with omnipolar magnetic action. The sensor has magnetoresistive material integrated on silicon and encapsulated in a plastic package. The integrated circuit provides a digital output in response to very low magnetic fields. Though this signal is identical to our digital Hall effect sensors, it can be achieved by magneto-resistive sensors at much greater sensor-to-magnet distances.

Surface-mount packages are mounted directly on the electrical traces on the PC board and attached by an automatic solder reflow operation which requires no holes, so it reduces the cost of the PC board. These packages are supplied on tape and reel and can be automatically placed on PC boards by use of pick-and-place equipment.

SS552MT Series is operated by magnetic fields (North **or** South) **parallel** to the sensor package.

NOTE: Due to the inherent high sensitivity of these sensors, stray magnetic fields which are parallel to the IC may affect operation.

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ELECTRICAL SPECIFICATIONS over 3.8 Vdc to 30 Vdc and -40 °C to 150 °C [-40 °F to 302 °F] unless otherwise noted

		Min.	Typ.	Max.	Remarks
Supply Current (without load)		–	6 mA	11 mA	Max. operated
at 25°C, with 16 V supply				10 mA	Max. released
Supply Voltage		3.8 Vdc		30 Vdc	
Output Voltage (operated)		–	0.25 V	0.40 V	Sinking 20 mA max.
Output Leakage Current (released)		–		10 μA	Leakage into sensor output
Output Switching Time	Rise	–	0.2 μs	1.5 μs	10% to 90%, 1600 Ω, 20 pF load
	Fall		0.1 μs	1.5 μs	90% to 10%, 1600 Ω, 20 pF load

MAGNETIC CHARACTERISTICS OVER 3.8 TO 30 VDC SUPPLY VOLTAGE

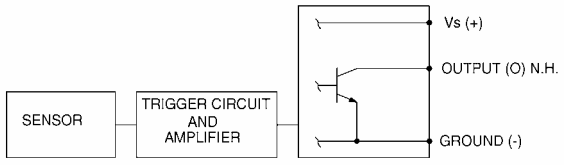
Temperature Range	Max. Operate	Min. Release	Max. Differential
-25 to 85°C [-13 to 185°F]	25 gauss	5 gauss	7 gauss
-40 to 150°C [-40 to 302°F]	25 gauss	4 gauss	8 gauss

ABSOLUTE MAXIMUM RATINGS*

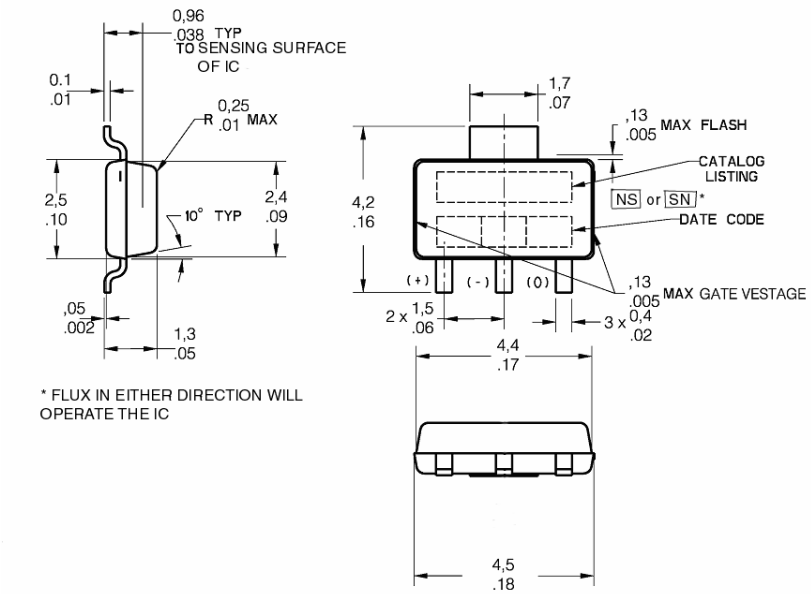
Supply Voltage (V_S)	-0.5 Vdc to 30 Vdc
Voltage Externally Applied to Output	30 Vdc max. (OFF cond. only) -0.5 Vdc min. (OFF or ON cond.)
Output ON Current	20 mA max.
Temperature	-40 °C to 150 °C [-40 °F to 302 °F]
Magnetic Flux	No limit—circuit cannot be damaged by magnetic overdrive

*Absolute maximum ratings are the extreme limits the device will withstand without damage to the device. However, the electrical and mechanical characteristics are not guaranteed as the maximum limits (above recommended operating conditions) are approached, nor will the device necessarily operate at absolute maximum ratings.

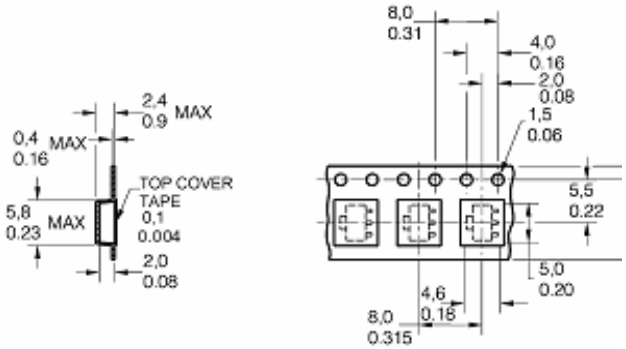
BLOCK DIAGRAM
CURRENT SINKING OUTPUT (NPN)



MOUNTING DIMENSIONS

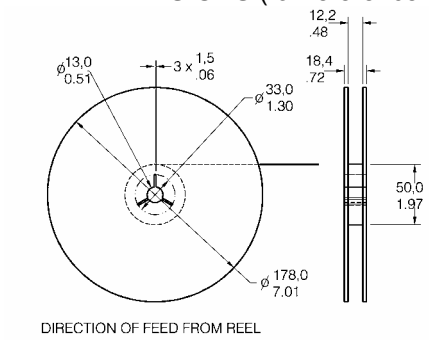


TAPE DIMENSIONS (for reference only) mm/in



NOTE: This product is sold in tape and reel form **only**, per EIA STD 481. There are 1,000 parts per reel.

REEL DIMENSIONS (for reference only) mm/in



Magnetoresistive Position Sensors

SS552MT Surface Mount Sensor

SS552MT Series

ORDER GUIDE

Part number	Description
SS552MT	Magnetoresistive surface mount sensor

WARRANTY/REMEDY

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1-800-737-3360 Canada
1-815-235-6847 International

FAX

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INTERNET

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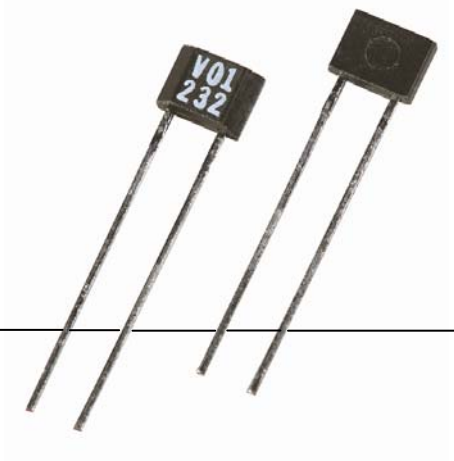
Honeywell

VF401

2-Wire Solid State Switch



DESCRIPTION

The VF401 is a 2-wire MR (magnetoresistive) bridge array in a miniature plastic package, designed for sensing fine pitch ring magnets.

The VF401 allows a greater air gap between the target and the sensor with reduced loss in sensor signal or accuracy.

Patent number 6,297,628.

FEATURES

- Wide operating temperature range
- 2-wire operation means less wiring
- Enhanced sensitivity, ±7 gauss typical
- Output pattern independent of gap between target and sensor

POTENTIAL APPLICATIONS

- Speed encoding using a multipole ring magnet
- Enhanced accuracy cam and crank position sensing
- Wheel speed sensing
- Window lift applications

VF401

ABSOLUTE MAXIMUM RATINGS[1]

Parameter	Minimum	Typical	Maximum	Unit
Supply voltage[2]	-18	–	+18	V
Magnetic flux gauss	no limit			
Temperature	–	–	175 [347] for 10 min. at 10 cycles	°C [°F]
Frequency	–	–	3000	Hz

Notes:

1. Absolute maximum ratings are the extreme limits the device will momentarily withstand without damage to the device. Electrical and magnetic characteristics are not guaranteed if the rated voltage and/or currents are exceeded nor will the device necessarily operate at absolute maximum ratings.
2. Customer supplied sense resistor required for negative reverse voltage.

PERFORMANCE SPECIFICATIONS (Established using a 65,00 mm [2.559 in] diameter, 48 pole pair ring magnet.)

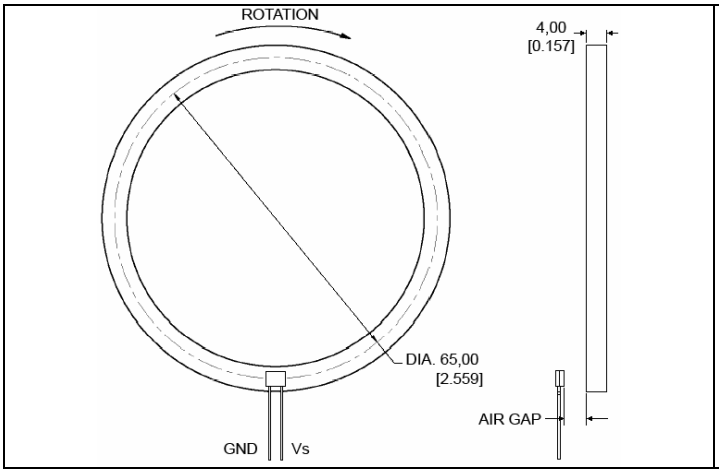
Parameter	Condition	Minimum	Typical	Maximum	Unit
Vcc[1]	–	–	–	–	V
Vh (V+ to V-)	–	4.5	–	16	V
Icc operate	–	11.8	14	16.80	mA
Icc released	–	5.9	7	8.40	mA
Icc ratio (op/rel)	–	1.9	2.0	2.3	–
Rise time at 25 °C [77 °F] 10% to 90%	Vcc = 12 V, R_L: = 150 Ohm, C_L = 1000 pf	–	1.5	–	µs
Fall time at 25 °C [77 °F] 10% to 90%	Vcc = 12 V, R_L: = 150 Ohm, C_L = 1000 pf	–	1.5	–	µs
Operating temperature	–	-40 [-40]	–	150 [302]	°C [°F]
Differential magnetic field over entire MR bridge area operate release	–	–	 +7 -7	–	gauss
Air gap[2]	–	0.75	–	2.5	mm
Duty cycle	–	30	50	70	%

Notes:

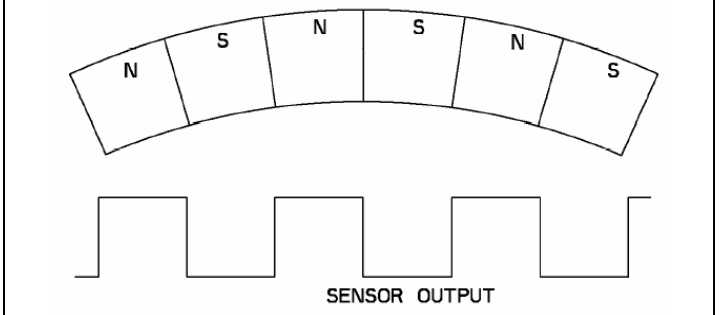
1. Vcc is limited by Vh and the value chosen for the sense resistor.
2. Sensor operation at limits for air gap is dependent on ring magnet.

2-Wire Solid State Switch

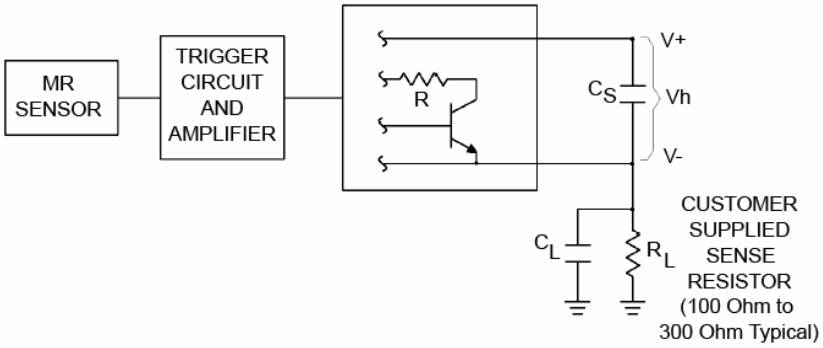
ELECTRICAL SPECIFICATION TEST CONDITION



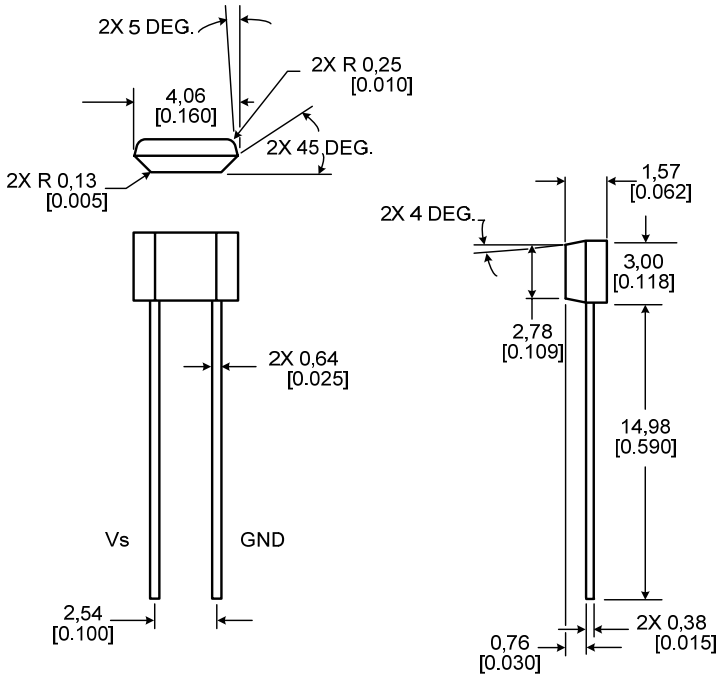
SENSOR OUTPUT



BLOCK DIAGRAM



MOUNTING DIMENSIONS (For reference only. mm/[in])



ORDER GUIDE

Catalog Listing	Description
VF401	2-wire solid state switch, standard bulk pack, 500 units per bag

Note:
Bulk packaging process may affect lead straightness on some units.

⚠ WARNING

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SALES AND SERVICE

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April 2007

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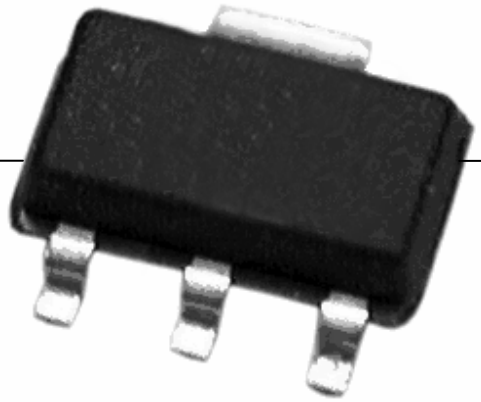
VF526DT

Dual Hall-effect Digital Position Sensor with Speed and Direction Outputs



DESCRIPTION

The VF526DT Series Dual Hall-effect Digital Position Sensor has two distinct Hall sensing elements precisely located 1,4 mm [0.055 in] apart on a single integrated circuit chip. The elements are encapsulated in a thermoset molding material.

The two active Hall latches provide indication of the speed and direction of a magnetic gradient (such as a rotating ring magnet) across the face of the package.

The small, 4-pin SOT89B style package surface mounts on PC (printed circuit) boards and flexible circuits.

The VF526DT's built-in temperature compensation is designed to match the temperature coefficient of low cost magnets.

A unique regulator circuit is designed to provide extremely stable operation with supply voltages from 3.4 Vdc to 24 Vdc. It can be directly interfaced with many electronic components without buffering or compensation circuitry.

FEATURES

- Ultra low offset drift with temperature
- Single miniature plastic package includes two separate Hall sensors
- Frequency signal for speed output
- Temperature-compensated magnetics
- Wide operating voltage range
- Logic level (high or low) signal for direction output

POTENTIAL APPLICATIONS

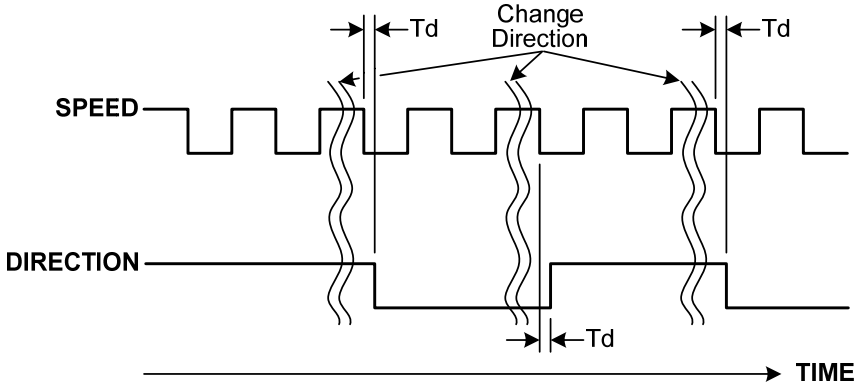
- Anti-pinch electric motor control systems for:
  - power windows
  - power seats (headrest)
  - power sliding doors,
  - sunroofs
  - garage door openers
- Position and velocity detection
- Linear displacement sensing (using a magnetic strip of alternating poles)
- Magnetic encoding for electronic steering systems
- Motion control systems for pulleys and belts

VF5226DT

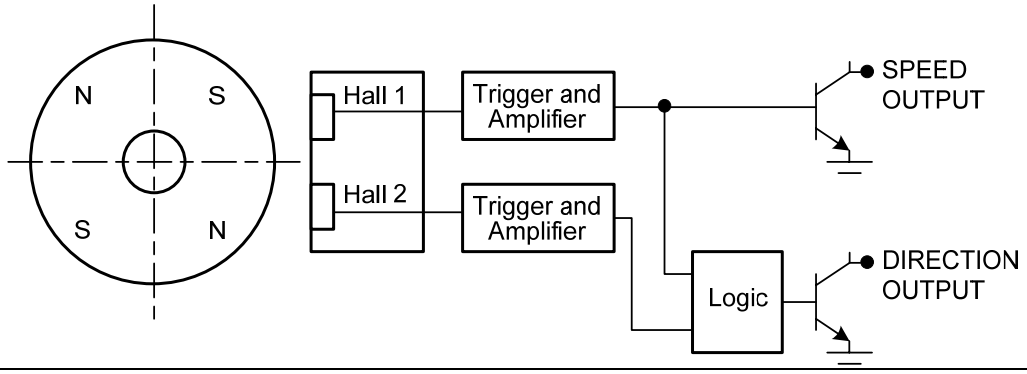
PERFORMANCE SPECIFICATIONS (At 5 Vdc supply and 25 °C [77 °F] unless otherwise noted.)

Parameter	Specification
Supply voltage	3.4 Vdc to 24 Vdc; absolute max.: -0.5 Vdc to 30 Vdc
Output type	Dual Sink (speed & direction)
Magnetic actuation type	Bipolar Latch
Operating temperature range	-40 °C to 125 °C [-40 °F to 257 °F]
Output voltage	0.4 Vdc max. (output on)
Switching time rise (10% to 90%)	1.5 µs max.
Switching time fall (90% to 10%)	1.5 µs max.
Operating frequency (f)	>1000 Hz max.
Supply current (max. at 25 °C)	7.5 mA typ.
Output current (max.)	5 mA max. each output
Operate point at 25 °C	13.0 mT [130 G] typ.
Release point at 25 °C	-13.0 mT [-130 G] typ.
Leakage current max.	10 µA
Differential	26.0 mT [260 G] typ.
Package quantity/type	available in 1,000/tape and reel
Package style	SS5 surface mount (SOT-89B)
Availability	global

OUTPUT TIMIMG DIAGRAM

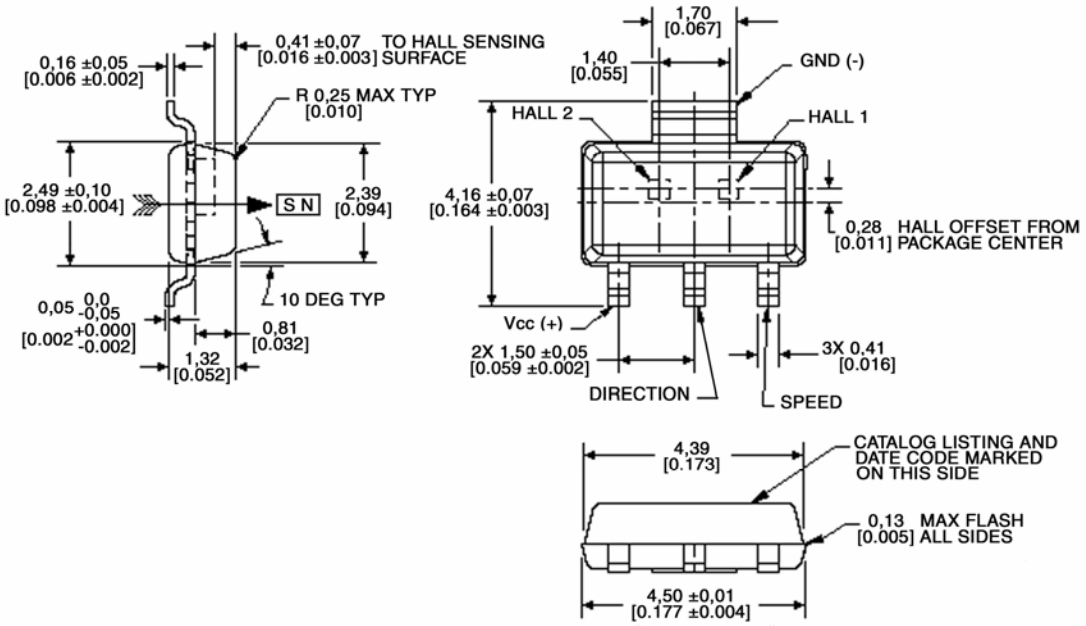


SENSOR FUNCTION DIAGRAM WITH CUSTOMER-SUPPLIED RING MAGNET

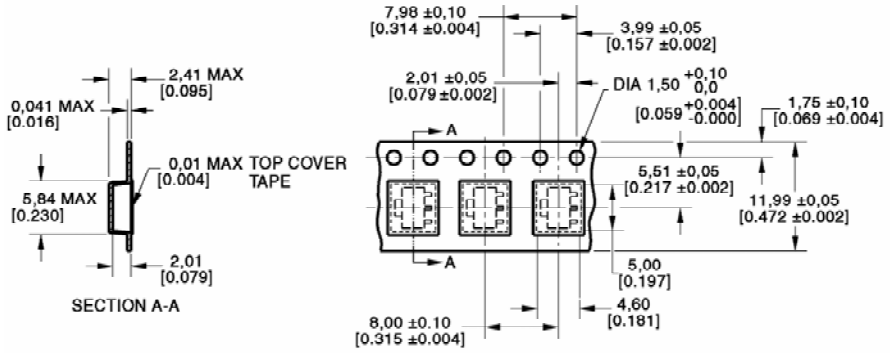


Dual Hall-effect Digital Position Sensor with Speed and Direction Outputs

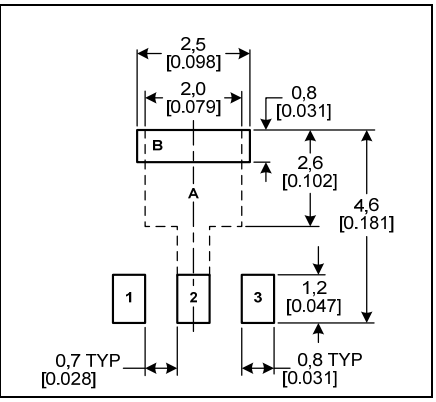
MOUNTING DIMENSIONS (For reference only. mm/[in])



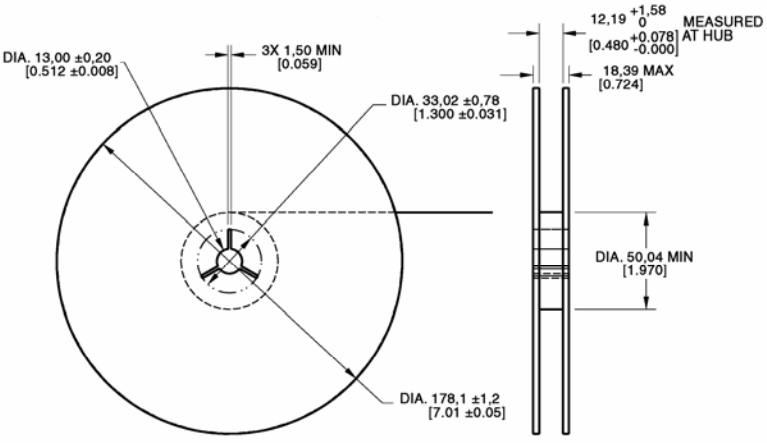
TAPE DIMENSIONS



SOLDER PAD DIMENSIONS



REEL DIMENSIONS



ORDER GUIDE

Catalog Listing	Description
VF526DT	Dual hall-effect digital position sensor with speed and direction outputs

⚠ WARNING

MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

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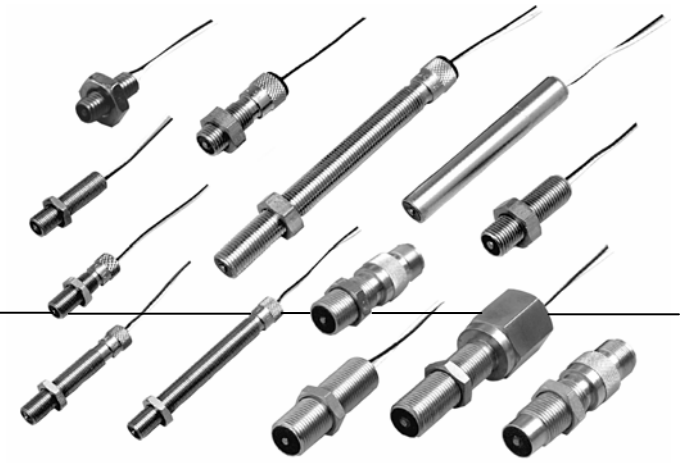
April 2007

Honeywell

General Purpose

Industrial VRS Magnetic Speed Sensors



DESCRIPTION

General Purpose VRS sensors are designed for use in applications with medium to high speeds or in electrically noisy environments with relatively small air gaps.

Passive VRS (Variable Reluctance Speed) Magnetic Speed sensors are simple, rugged devices that do not require an external voltage source for operation.

A permanent magnet in the sensor establishes a fixed magnetic field. The approach and passing of a ferrous metal target near the sensor's pole piece (sensing area) changes the flux of the magnetic field, dynamically changing its strength. This change in magnetic field strength induces a current into a coil winding which is attached to the output terminals.

The output signal of a VRS sensor is an ac voltage that varies in amplitude and wave frequency as the speed of the monitored device changes, and is usually expressed in peak to peak voltage (Vp-p).

One complete waveform (cycle) occurs as each target passes the sensor's pole piece. If a standard gear were used as a target, this output signal would resemble a sine wave if viewed on an oscilloscope.

Honeywell also offers VRS sensors for high output, power output, high resolution, high temperature and hazardous location applications, as well as low-cost molded versions.

FEATURES

- Self-powered operation
- Direct conversion of actuator speed to output frequency
- Simple installation
- No moving parts
- Designed for use over a wide range of speeds
- Adaptable to a wide variety of configurations
- Customized VRS products for unique speed sensing applications
- Housing diameters: 5/8 in (M16), 3/8 in (M12) mm, 1/4 in (M8), 10/32 in
- Housing materials/styles: stainless steel threaded or smooth
- Terminations: MS3106 connector, preleaded
- Output voltages: 8 Vp-p to 40 Vp-p

POTENTIAL APPLICATIONS

- Engine RPM (revolutions per minute) measurement on aircraft, automobiles, boats, buses, trucks and rail vehicles
- Motor RPM measurement on drills, grinders, lathes and automatic screw machines
- Motor RPM measurement on precision camera, tape recording and motion picture equipment
- Process speed measurement on food, textile, paper, woodworking, printing, tobacco and pharmaceutical industry machinery
- Motor speed measurement of electrical generating equipment
- Speed measurement of pumps, blowers, mixers, exhaust and ventilating fans
- Flow measurement on turbine meters
- Wheel-slip measurement on autos and locomotives
- Gear speed measurement

General Purpose

5/8 INCH (M16*) SENSORS (All dimensions for reference only. mm/[in])
*Contact Honeywell for availability of metric mounting thread versions.

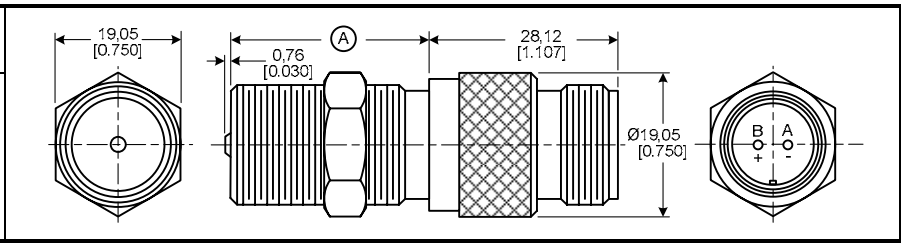
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	40 Vp-p	Inductance	25 mH max.
Coil resistance	45 Ohm to 85 Ohm	Gear pitch range	24 DP (module 1.06) or coarser
Pole piece diameter	2,69 mm [0.106 in]	Optimum actuator	20 DP (module 1.27) ferrous metal gear
Min. surface speed	0,50 m/s [20 in/s] typ.	Max. operating frequency	50 kHz typ.
Operating temp. range	-55 ºC to 120 ºC [-67 ºF to 250 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	5/8-18 UNF-2A	Termination	MS3106 connector

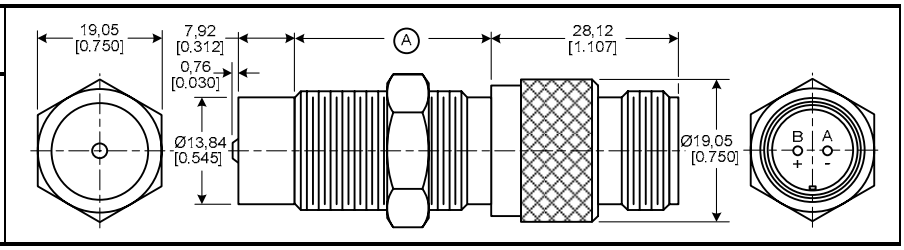
Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm

Catalog Listing	Thread Length (A)	Weight
3010AN	28 mm [1.1 in]	70 g [2.5 oz]
3010AN25	63 mm [2.5 in]	84 g [3.0 oz]
3010AN30	76 mm [3.0 in]	84 g [3.0 oz]
3010AN40	101 mm [4.0 in]	98 g [3.5 oz]
3010AN50	127 mm [5.0 in]	128 g [4.5 oz]



Catalog Listing	Thread Length (A)	Weight
3010A	35 mm [1.4 in]	70 g [2.5 oz]
3010A25	63 mm [2.5 in]	84 g [3.0 oz]



Industrial VRS Magnetic Speed Sensors

5/8 INCH (M16*) SENSORS CONTINUED (All dimensions for reference only. mm/[in])

*Contact Honeywell for availability of metric mounting thread versions.

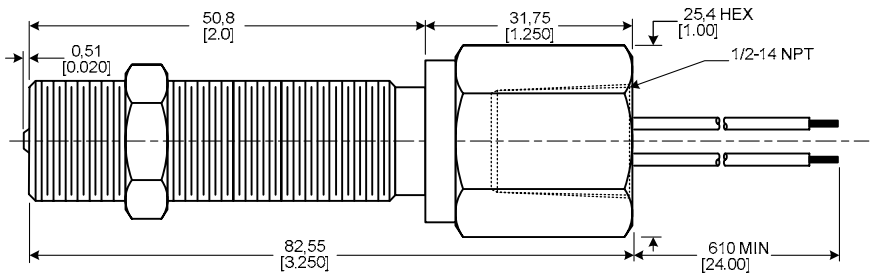
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	40 Vp-p	Inductance	25 mH max.
Coil resistance	45 Ohm to 85 Ohm	Gear pitch range	24 DP (module 1.06) or coarser
Pole piece diameter	2,69 mm [0.106 in]	Optimum actuator	20 DP (module 1.27) ferrous metal gear
Min. surface speed	0,50 m/s [20 in/s] typ.	Max. operating frequency	50 kHz typ.
Operating temp. range	-55 ºC to 120 ºC [-67 ºF to 250 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	5/8-18 UNF-2A	Termination	20 AWG Teflon-insulated leads

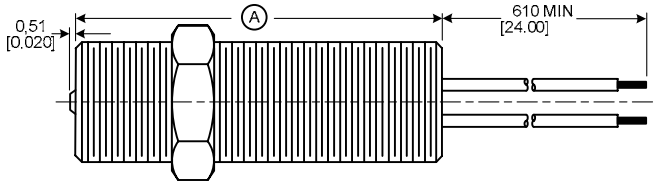
Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm

Catalog Listing	Weight
3010H20	140 g [5.0 oz]



Catalog Listing	Thread Length (A)	Weight
3010S20	50 mm [2.0 in]	70 g [2.5 oz]
3010S30	76 mm [3.0 in]	84 g [3.0 oz]



General Purpose

3/8 INCH (M12*) SENSORS

*Contact Honeywell for availability of metric mounting thread versions.

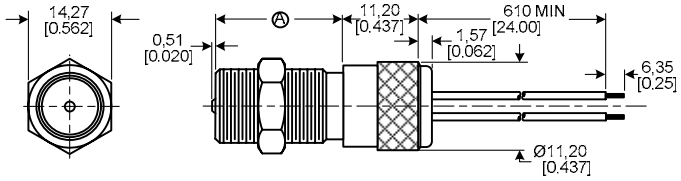
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	20 Vp-p	Inductance	15 mH max.
Coil resistance	45 Ohm to 65 Ohm	Gear pitch range	26 DP (module 0.98) or coarser
Pole piece diameter	2,36 mm [0.093 in]	Optimum actuator	24 DP (module 1.06) ferrous metal gear
Min. surface speed	0,50 m/s [20 in/s] typ.	Max. operating frequency	50 kHz typ.
Operating temp. range	-40 ºC to 107 ºC [-40 ºF to 225 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	3/8-24 UNF-2A	Termination	24 AWG vinyl-insulated leads

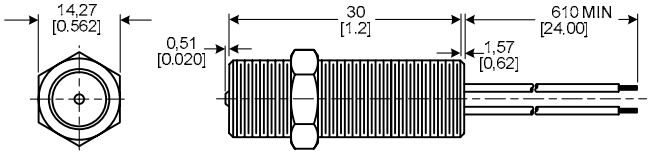
Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm

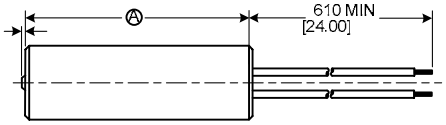
Catalog Listing	Thread Length (A)	Weight
3015A	20 mm [0.8 in]	28 g [1.0 oz]
3015A17	44 mm [1.7 in]	35 g [1.2 oz]
3015A35	88 mm [3.5 in]	42 g [1.5 oz]



Catalog Listing	Weight
3015S13	28 g [1.0 oz]



Catalog Listing	Thread Length (A)	Weight
3015SS13	30 mm [1.2 in]	28 g [1.0 oz]
3015SS25	63 mm [2.5 in]	42 g [152 oz]



Industrial VRS Magnetic Speed Sensors

1/4 INCH (M8*) SENSORS (All dimensions for reference only. mm/[in])

*Contact Honeywell for availability of metric mounting thread versions.

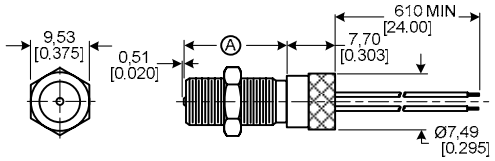
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	12 Vp-p	Inductance	16 mH max.
Coil resistance	190 Ohm max.	Gear pitch range	36 DP (module 0.70) or coarser
Pole piece diameter	1,00 mm [0.040 in]	Optimum actuator	28 DP (module 0.90) ferrous metal gear
Min. surface speed	0,75 m/s [30 in/s] typ.	Max. operating frequency	60 kHz typ.
Operating temp. range	-40 ºC to 107 ºC [-40 ºF to 225 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	1/4-40 UNS-2A	Termination	30 AWG vinyl-insulated leads

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm

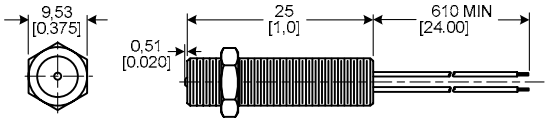
Catalog Listing	Thread Length (A)	Weight
3050	15 mm [0.6 in]	14 g [0.5 oz]
3050A13	30 mm [1.2 in]	14 g [0.5 oz]
3050A20	50 mm [2.0 in]	14 g [0.5 oz]



Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	12 Vp-p	Inductance	16 mH max.
Coil resistance	190 Ohm max.	Gear pitch range	36 DP (module 0.70) or coarser
Pole piece diameter	1,00 mm [0.040 in]	Optimum actuator	28 DP (module 0.90) ferrous metal gear
Min. surface speed	0,75 m/s [30 in/s] typ.	Max. operating frequency	60 kHz typ.
Operating temp. range	-40 ºC to 107 ºC [-40 ºF to 225 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	1/4-40 UNS-2A	Termination	30 AWG PVC-insulated leads

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm

Catalog Listing	Thread Length	Weight
3050S10	25 mm [1.0 in]	14 g [0.5 oz]



General Purpose

10/32 INCH SENSORS (All dimensions for reference only. mm/[in])
(No metric available.)

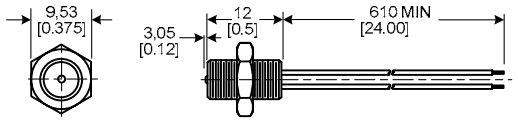
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	8 Vp-p	Inductance	14 mH max.
Coil resistance	155 Ohm	Gear pitch range	32 DP (module 0.80) or coarser
Pole piece diameter	1,5 mm [0.062 in]	Optimum actuator	26 DP (module 0.98) ferrous metal gear
Min. surface speed	0,75 m/s [30 in/s] typ.	Max. operating frequency	60 kHz (typ.)
Operating temp. range	-40 ºC to 107 ºC [-40 ºF to 225 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	10-32 UNF-2A	Termination	32 AWG Teflon-insulated leads

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm

Catalog Listing	Thread Length	Weight
3080	12 mm [0.5 in]	8,5 g [0.3 oz]



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⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

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WARRANTY/REMEDY

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SALES AND SERVICE

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November 2007

Honeywell

Hazardous Location

Industrial VRS Magnetic Speed Sensors

DESCRIPTION

Hazardous Location VRS sensors are designed for use in locations where explosion-proof or intrinsically safe sensors are required.

Passive VRS (Variable Reluctance Speed) Magnetic Speed sensors are simple, rugged devices that do not require an external voltage source for operation.

A permanent magnet in the sensor establishes a fixed magnetic field. The approach and passing of a ferrous metal target near the sensor's pole piece (sensing area) changes the flux of the magnetic field, dynamically changing its strength. This change in magnetic field strength induces a current into a coil winding which is attached to the output terminals.

The output signal of a VRS sensor is an ac voltage that varies in amplitude and wave frequency as the speed of the monitored device changes, and is usually expressed in peak to peak voltage (Vp-p).

One complete waveform (cycle) occurs as each target passes the sensor's pole piece. If a standard gear were used as a target, this output signal would resemble a sine wave if viewed on an oscilloscope.

Honeywell also offers VRS sensors for general purpose, high output, power output, high resolution and high temperature, as well as low-cost molded versions.

FEATURES

- Self-powered operation
- Direct conversion of actuator speed to output frequency
- Simple installation
- No moving parts
- Designed for use over a wide range of speeds
- Adaptable to a wide variety of configurations
- Customized VRS products for unique speed sensing applications
- Housing diameters: 3/4 in, 5/8 in
- Housing material/style: stainless steel threaded
- Terminations: MS3106 connector, preleaded
- Output voltages: 30 Vp-p to 60 Vp-p

POTENTIAL APPLICATIONS

- Engine RPM (revolutions per minute) measurement on aircraft, automobiles, boats, buses, trucks and rail vehicles
- Motor RPM on oil and gas drilling equipment and machinery
- Motor RPM measurement on drills, grinders, lathes and automatic screw machines
- Process speed measurement on food, textile, paper, woodworking, printing, tobacco and pharmaceutical industry machinery
- Motor speed measurement of electrical generating equipment in grain elevators, sawmills and other potentially explosive environments
- Speed measurement of pumps, blowers, mixers, exhaust
- Gear speed measurement

Hazardous Location

3/4 INCH EXPLOSION-PROOF SENSORS (All dimensions for reference only. mm/[in])
When properly installed using the explosion containment method, all 3070X and catalog listings on this page are certified for use in hazardous locations as follows: Class I, Groups A, B, C, D; Class II Groups E, F, G; Class III.

These catalog listings have been tested to and meet the requirements of applicable U.S. and Canadian specifications for the locations described above.

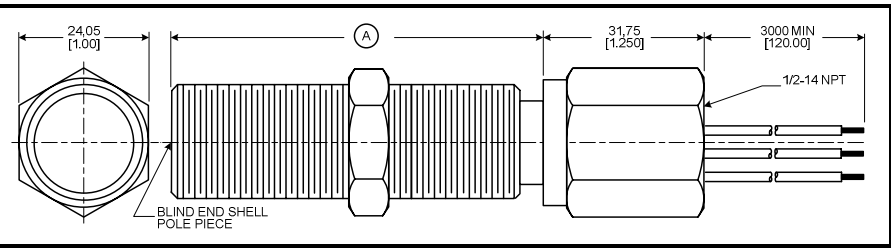
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	60 Vp-p	Inductance	115 mH max.
Coil resistance	191 Ohm to 280 Ohm	Gear pitch range	12 DP (module 2.11) or coarser
Pole piece diameter	4,75 mm [0.187 in]	Optimum actuator	8 DP (module 3.17) ferrous metal gear
Min. surface speed	0,38 m/s [15 in/s] typ.	Max. operating frequency	40 kHz typ.
Operating temp. range	-73 ºC to 93 ºC [-100 ºF to 200 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	3/4-20 UNEF-2A	Termination	18 AWG PVC-Insulated Leads

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	8 DP (module 3.17)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm

Catalog Listing	Thread Length (A)	Weight
3070A	45 mm [1.8 in]	294 g [10.5 oz]
3070A35	88 mm [3.5 in]	322 g [11.5 oz]



5/8 INCH EXPLOSION-PROOF SENSORS (All dimensions for reference only. mm/[in])

When properly installed using the explosion containment method, the 3090X catalog listings on this page are certified for use in hazardous locations as follows: Class I, Groups A, B, C, D; Class II Groups E, F, G; Class III.

These catalog listings have been tested to and meet the requirements of applicable U.S. and Canadian specifications for the locations described above.

The catalog listings on this page conform to standards: Ex II 3 G EEx nA II T6.

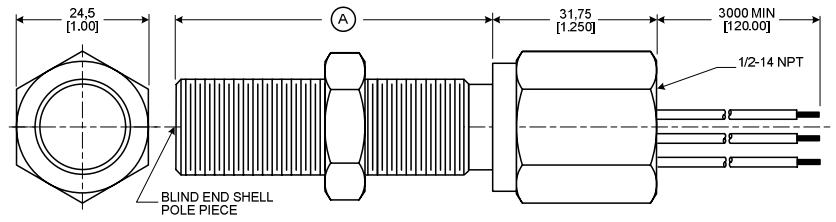
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	60 Vp-p	Inductance	115 mH max.
Coil resistance	191 Ohm to 280 Ohm	Gear pitch range	12 DP (module 2.11) or coarser
Pole piece diameter	4,75 mm [0.187 in]	Optimum actuator	8 DP (module 3.17) ferrous metal gear
Minimum surface speed	0,38 m/s [15 in/s] typ.	Maximum operating frequency	40 kHz typ.
Operating temp. range	-73 ºC to 93 ºC [-100 ºF to 200 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	5/8-20 UNF-2A	Termination	18 AWG PVC-insulated leads

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	8 DP (module 3.17)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm

Catalog Listing	Thread Length (A)	Weight
3090A	45 mm [1.8 in]	280 g [9.0 oz]
3090A35	88 mm [3.5 in]	366 g [10.0 oz]



Hazardous Location

5/8 INCH (M16*) INTRINSICALLY SAFE VRS SENSORS (All dimensions for reference only. mm/[in])

*Contact Honeywell for availability of metric mounting thread versions.

When properly installed using the intrinsic safety protection method connected per the control drawings on pages 6 and 7, catalog listings 3042A is intrinsically safe for hazardous locations as follows:

Class I, Groups A, B, C, D.

This product has been tested to and meets the requirements of applicable U.S. and Canadian specifications for the locations described above.

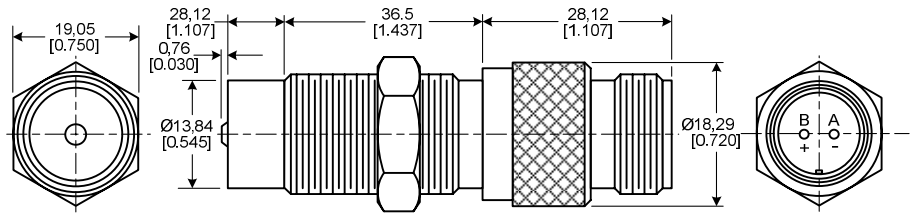
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	30 Vp-p	Inductance	26 mH max.
Coil resistance	150 Ohm	Gear pitch range	16 DP (module 1.58) or coarser
Pole piece diameter	3,9 mm [0.156 in]	Optimum actuator	12 DP (module 3.17) ferrous metal gear
Min. surface speed	0,38 m/s [15 in/s] typ.	Max. operating frequency	40 kHz typ.
Operating temp. range	-55 ºC to 120 ºC [-67 ºF to 250 ºF]	Vibration	N/A
Mounting thread	5/8-18 UNF-2A	Termination	MS3106 connector

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	8 DP (module 3.17)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm

Catalog Listing	Weight
3042A	70 g [2.5 oz]



5/8 INCH (M16*) INTRINSICALLY SAFE VRS SENSORS (All dimensions for reference only. mm/[in])

*Contact Honeywell for availability of metric mounting thread versions.

When properly installed using the intrinsic safety protection method connected per the control drawings on pages 6 and 7, catalog listing 3042H20 is intrinsically safe for hazardous locations as follows:

Class I, Groups A, B, C, D; Class II Groups E, F, G; Class III.

This product has been tested to and meets the requirements of applicable U.S. and Canadian specifications for the locations described above.

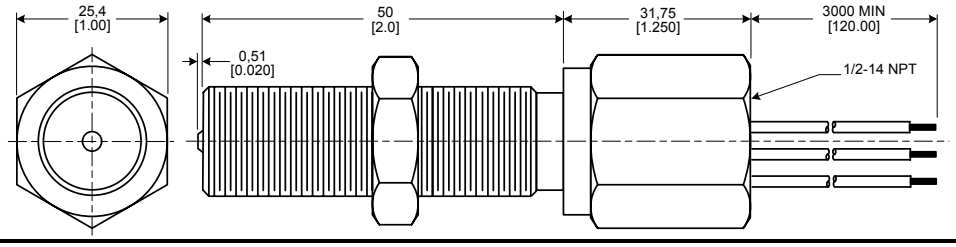
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	30 Vp-p	Inductance	26 mH max.
Coil resistance	150 Ohm	Gear pitch range	16 DP (module 1.58) or coarser
Pole piece diameter	3,9 mm [0.156 in]	Optimum actuator	12 DP (module 3.17) ferrous metal gear
Min. surface speed	0,38 m/s [15 in/s] typ.	Max. operating frequency	40 kHz typ.
Operating temp. range	-55 ºC to 120 ºC [-67 ºF to 250 ºF]	Vibration	N/A
Mounting thread	5/8-18 UNF-2A	Termination	18 AWG PVC-insulated leads

Test Condition Specifications

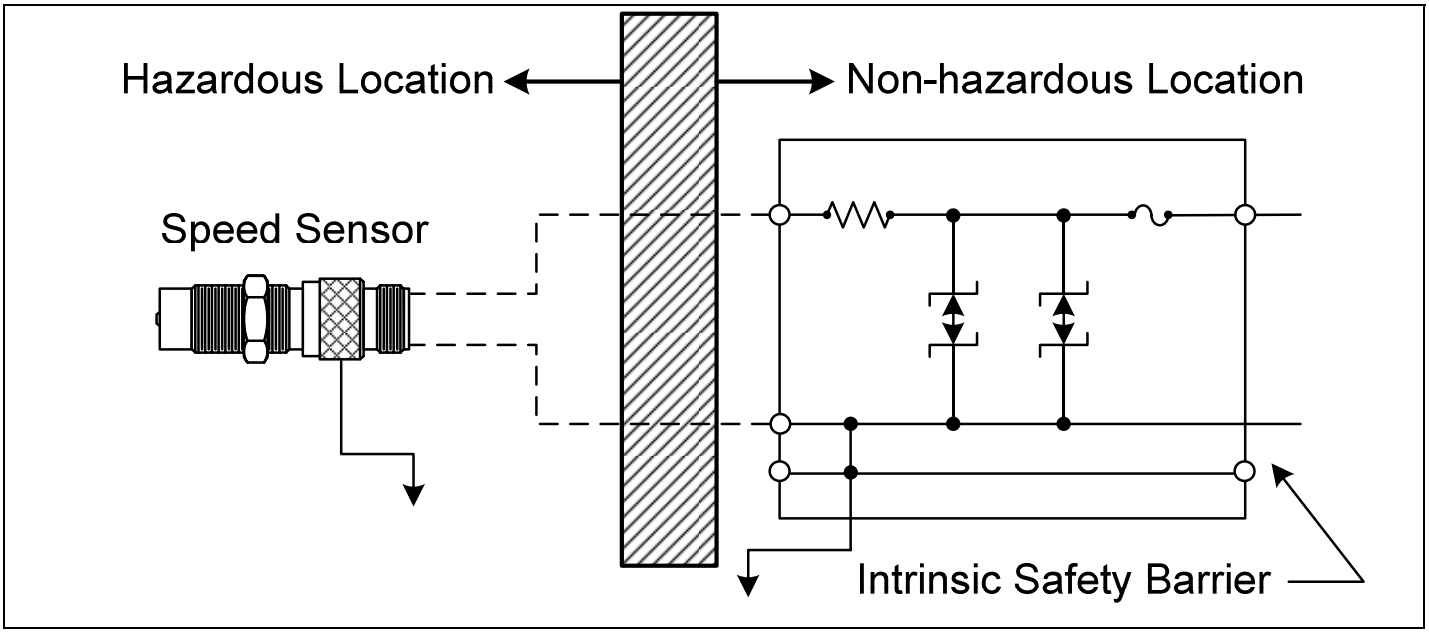
Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	8 DP (module 3.17)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm

Catalog Listing	Weight
3042AH20	140 g [5.0 oz]



Hazardous Location

CONTROL DRAWING FOR SINGLE CHANNEL BARRIERS



HAZARDOUS LOCATIONS

Catalog listing 3042H20:

- Class I, Groups A, B, C, D
- Class II, Groups E, F, G
- Class III

Catalog listing 3042A:

- Class I, Groups A, B, C, D

ENTITY PARAMETERS

Vmax = 24 V, Imax = 35 mA, Li = 26 mH, Ci = 0 μF
Any barrier (see General Notes) with entity parameters connected in accordance with barrier manufacturers instructions of:

Vmax ≥ Voc Ca ≥ Ci + cable capacitance
Imax ≥ Isc La ≥ Li + cable inductance

SYSTEM PARAMETERS

Any barrier (see General Notes) having one of the following specified parameters:

Vmax	Rmin	Vmax	Rmin	Vmax	Rmin
30	707	20	421	10	136
25	580	15	278	5	1

GENERAL NOTES

1. For jurisdictions requiring certification to the applicable Canadian standards, the barrier must be CSA Certified and the system must be installed in accordance with the Canadian Electrical Code Part 1.
2. For jurisdictions requiring certification to the applicable Occupational Safety and Health Administration (OSHA) standards, the barrier must be CSA NRTL or equivalent and the system must be installed in accordance with the National Electrical Code (NEC), article 504 or ANSI/NFPA 70.

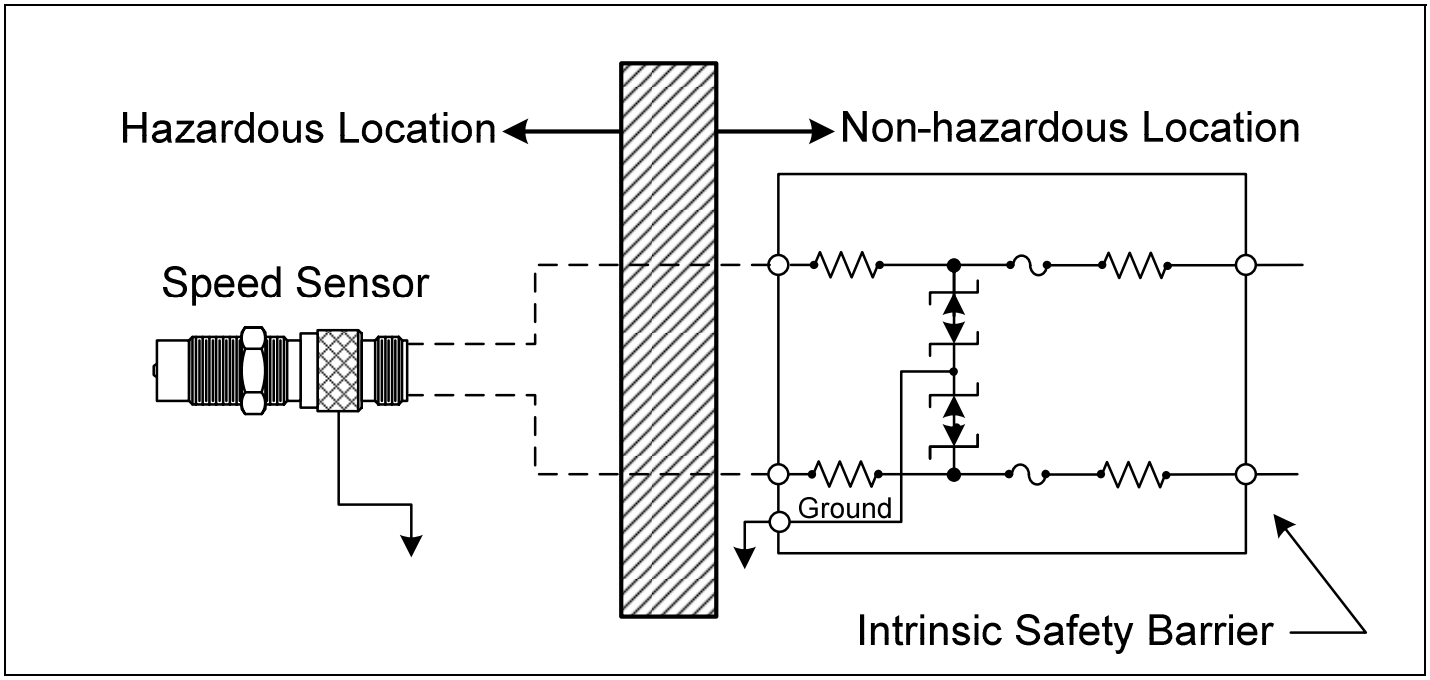
SENSOR GROUNDING

Catalog listing 3042A: Sensor housing must be connected to intrinsically safe system ground during installation.

Catalog listing 3042H20: Green wire must be connected to intrinsically safe system ground.

Exia = Intrinsically Safe, Sécurité Intrinsèque

CONTROL DRAWING FOR DUAL CHANNEL BARRIERS



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HAZARDOUS LOCATIONS

Catalog listing 3042H20:

- Class I, Groups A, B, C, D
- Class II, Groups E, F, G
- Class III

Catalog listing 3042A:
Class I, Groups A, B, C, D

ENTITY PARAMETERS

Vmax = 24 V, Imax = 35 mA, Li = 26 mH, Ci = 0 μF
Any barrier (see General Notes) with entity parameters connected in accordance with barrier manufacturers instructions of:

Vmax ≥ Voc Ca ≥ Ci + cable capacitance
Imax ≥ Isc La ≥ Li + cable inductance

SYSTEM PARAMETERS

Any barrier (see General Notes) having one of the following specified parameters:

Vmax	Rmin	Vmax	Rmin	Vmax	Rmin
30	1414	20	842	10	272
25	1160	15	556	5	2

GENERAL NOTES

1. For jurisdictions requiring certification to the applicable Canadian standards, the barrier must be CSA Certified and the system must be installed in accordance with the Canadian Electrical Code Part 1.
2. For jurisdictions requiring Certification to the applicable Occupational Safety and Health Administration (OSHA) standards, the barrier must be CSA NRTL or equivalent and the system must be installed in accordance with the National Electrical Code (NEC), article 504 or ANSI/NFPA 70.

SENSOR GROUNDING

Catalog listing 3042A: Sensor housing must be connected to intrinsically safe system ground during installation.

Catalog listing 3042H20: Green wire must be connected to intrinsically safe system ground.

Exia = Intrinsically Safe, Sécurité Intrinsèque

⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

⚠ WARNING

MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

E-mail: info.sc@honeywell.com

Internet: www.honeywell.com/sensing

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March 2007

Honeywell

High Output

Industrial VRS Magnetic Speed Sensors

DESCRIPTION

High Output VRS sensors are designed for use in applications where higher output voltages are needed. They perform best at low to medium speeds with medium to high impedance loads. Front-End Sealed versions are available for use where the sensor is exposed to fluids, lubricants or adverse environmental conditions.

Passive VRS (Variable Reluctance Speed) Magnetic Speed sensors are simple, rugged devices that do not require an external voltage source for operation.

A permanent magnet in the sensor establishes a fixed magnetic field. The approach and passing of a ferrous metal target near the sensor's pole piece (sensing area) changes the flux lines of the magnetic field, dynamically changing its strength. This change in magnetic field strength induces a current into a coil winding which is attached to the output terminals.

The output signal of a VRS sensor is an ac voltage that varies in amplitude and wave frequency as the speed of the monitored device changes, and is usually expressed in peak to peak voltage (Vp-p).

One complete waveform (cycle) occurs as each target passes the sensor's pole piece. If a standard gear were used as a target, this output signal would resemble a sine wave if viewed on an oscilloscope.

Honeywell also offers VRS sensors for general purpose, power output, high resolution, high temperature, and hazardous location applications, as well as low-cost molded versions.

FEATURES

- Self-powered operation
- Direct conversion of actuator speed to output frequency
- Simple installation
- No moving parts
- Designed for use over a wide range of speeds
- Adaptable to a wide variety of configurations
- Customized VRS products for unique speed sensing applications
- Housing diameters: 5/8 in (M16), 3/8 in (M12)
- Housing materials/styles: stainless steel threaded or smooth
- Terminations: MS3106 connector, preleaded
- Output voltages: 8 Vp-p to 190 Vp-p

POTENTIAL APPLICATIONS

- Engine RPM (revolutions per minute) measurement on aircraft, automobiles, boats, buses, trucks and rail vehicles
- Motor RPM measurement on drills, grinders, lathes and automatic screw machines
- Motor RPM measurement on precision camera, tape recording and motion picture equipment
- Process speed measurement on food, textile, paper, woodworking, printing, tobacco and pharmaceutical industry machinery
- Motor speed measurement of electrical generating equipment
- Speed measurement of pumps, blowers, mixers, exhaust and ventilating fans
- Flow measurement on turbine meters
- Wheel-slip measurement on autos and locomotives
- Gear speed measurement

High Output

5/8 INCH (M16*) SENSORS (All dimensions for reference only. mm/[in])
*Contact Honeywell for availability of metric mounting thread versions.

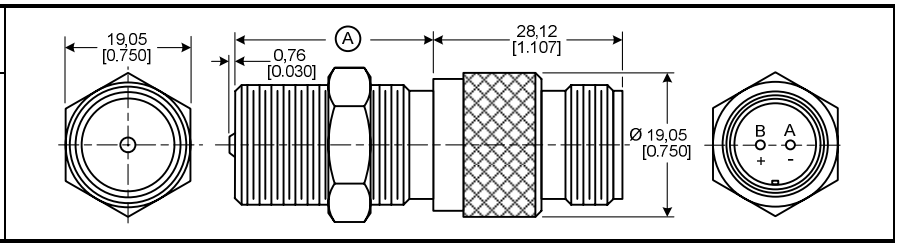
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	190 Vp-p	Inductance	450 mH max.
Coil resistance	910 Ohm to 1200 Ohm	Gear pitch range	24 DP (module 1.06) or coarser
Pole piece diameter	2,69 mm [0.106 in]	Optimum actuator	20 DP (module 1.27) ferrous metal gear
Min. surface speed	0,25 m/s [10 in/s] typ.	Max. operating frequency	15 kHz typ.
Operating temp. range	-55 ºC to 120 ºC [-67 ºF to 250 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	5/8-18 UNF-2A	Termination	MS3106 connector

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm

Catalog Listing	Thread Length (A)	Weight
3030AN	28 mm [1.1 in]	70 g [2.5 oz]
3030AN25	63 mm [2.5 in]	84 g [3.0 oz]
3030AN30	76 mm [3.0 in]	84 g [3.0 oz]
3030AN40	101 mm [4.0 in]	98 g [3.5 oz]
3030AN50	127 mm [5.0 in]	128 g [4.5 oz]



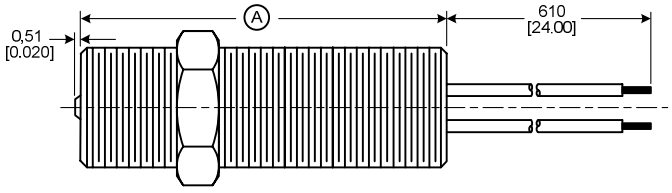
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	190 Vp-p	Inductance	450 mH max.
Coil resistance	910 Ohm to 1200 Ohm	Gear pitch range	24 DP (module 1.06) or coarser
Pole piece diameter	2,69 mm [0.106 in]	Optimum actuator	20 DP (module 1.27) ferrous metal gear
Min. surface speed	0,25 m/s [10 in/s] typ.	Max. operating frequency	15 kHz typ.
Operating temp. range	-55 ºC to 120 ºC [-67 ºF to 250 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	5/8-18 UNF-2A	Termination	20 AWG Teflon-insulated Leads

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm

Catalog Listing	Thread Length (A)	Weight
3030S20	50 mm [2.0 in]	70 g [2.5 oz]
3030S30	76 mm [3.0 in]	84 g [3.0 oz]



Industrial VRS Magnetic Speed Sensors

5/8 INCH (M16*) SENSORS CONTINUED (All dimensions for reference only. mm/[in])

*Contact Honeywell for availability of metric mounting thread versions.

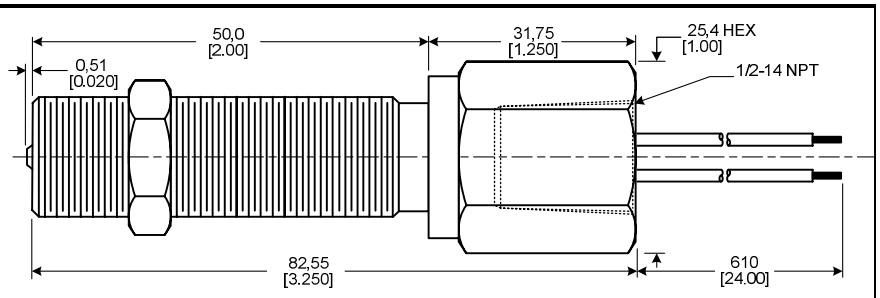
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	190 Vp-p	Inductance	450 mH max.
Coil resistance	910 Ohm to 1200 Ohm	Gear pitch range	24 DP (module 1.06) or coarser
Pole piece diameter	2,69 mm [0.106 in]	Optimum actuator	20 DP (module 1.27) ferrous metal gear
Min. surface speed	0,25 m/s [10 in/s] typ.	Max. operating frequency	15 kHz typ.
Operating temp. range	-55 ºC to 120 ºC [-67 ºF to 250 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	5/8-18 UNF-2A	Termination	20 AWG Teflon-insulated leads

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm

Catalog Listing	Weight
3030H20	140 g [5.0 oz]



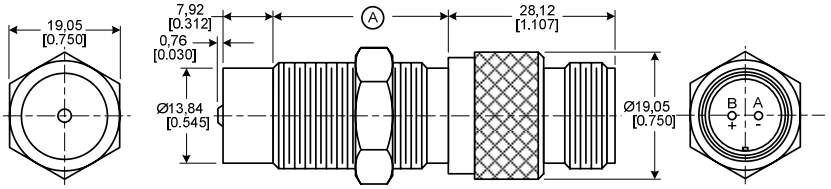
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	190 Vp-p	Inductance	450 mH max.
Coil resistance	910 Ohm to 1200 Ohm	Gear pitch range	24 DP (module 1.06) or coarser
Pole piece diameter	2,69 mm [0.106 in]	Optimum actuator	20 DP (module 1.27) ferrous metal gear
Min. surface speed	0,25 m/s [10 in/s] typ.	Max. operating frequency	15 kHz typ.
Operating temp. range	-55 ºC to 120 ºC [-67 ºF to 250 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	5/8-18 UNF-2A	Termination	MS3106 connector

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm

Catalog Listing	Thread Length (A)	Weight
3030A	35 mm 1.4 in]	70 g [2.5 oz]
3030A25	63 mm [2.5 in]	84 g [3.5 oz]



High Output

5/8 INCH (M16*) SEALED FRONT-END SENSORS (All dimensions for reference only. mm/[in])
*Contact Honeywell for availability of metric mounting thread versions.

HIGH RESISTANCE COILS FOR MAXIMUM OUTPUT VOLTAGE APPLICATIONS

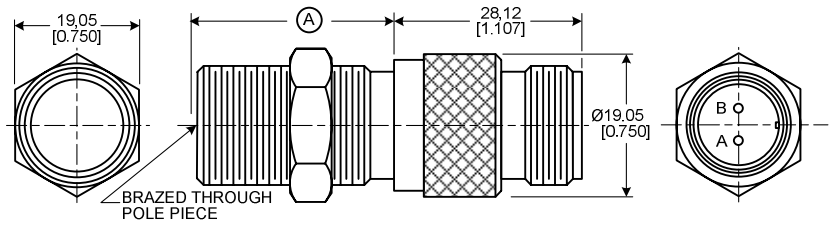
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	175 Vp-p	Inductance	450 mH max.
Coil resistance	910 to 1200 Ohm	Gear pitch range	24 DP (module 1.06) ferrous metal gear
Pole piece diameter	2,69 mm [0.106 in]	Optimum actuator	--
Minimum surface speed	0,25 m/s [10 in/s] typ.	Maximum operating frequency	15 kHz typ.
Operating temp. range	-55 ºC to 150 ºC [-67 ºF to 300 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	5/8-18 UNF-2A	Termination	MS3106 connector

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm

Catalog Listing	Thread Length (A)	Weight
MA230SAN	28 mm [1.1 in]	70 g [2.0 oz]
MA233SAN	76 mm [3.0 in]	98 g [3.5 oz



5/8 INCH (M16*) SEALED FRONT-END SENSORS (All dimensions for reference only. mm/[in])

*Contact Honeywell for availability of metric mounting thread versions.

NOMINAL RESISTANCE COILS FOR LOW IMPEDANCE LOAD APPLICATIONS

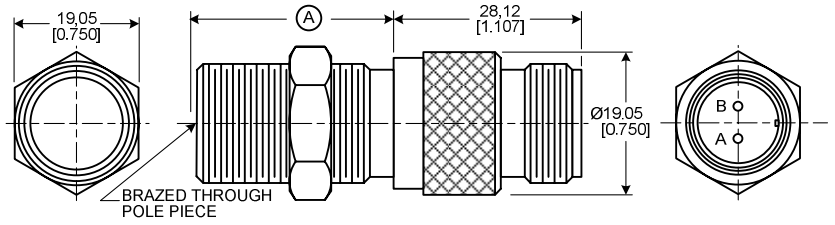
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	60 Vp-p	Inductance	85 mH max.
Coil resistance	120 to 162 Ohm	Gear pitch range	12 DP (module 2.11) ferrous metal gear
Pole piece diameter	4,39 mm [0.173 in]	Optimum actuator	N/A
Minimum surface speed	0,38 m/s [15 in/s] typ.	Maximum operating frequency	40 kHz typ.
Operating temp. range	-55 ºC to 150 ºC [-67 ºF to 300 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	5/8-18 UNF-2A	Termination	MS3106 connector

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	8 DP (module 3.17)
Air gap	0,127 mm [0.005 in]
Load resistance	1.25 kOhm

Catalog Listing	Thread Length (A)	Weight
MA240SAN	28 mm [1.1 in]	70 g [2.0 oz]
MA243SAN	76 mm [3.0 in]	98 g [3.5 oz



High Output

3/8 INCH (M12*) SENSORS (All dimensions for reference only. mm/[in])
*Contact Honeywell for availability of metric mounting thread versions.

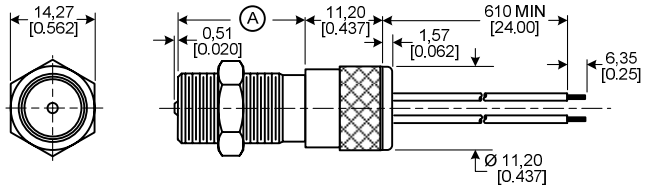
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	55 Vp-p	Inductance	75 mH max.
Coil resistance	275 Ohm to 330 Ohm	Gear pitch range	26 DP (module 0.98) or coarser
Pole piece diameter	2,36 mm [0.093 in]	Optimum actuator	24 DP (module 1.06) ferrous metal gear
Minimum surface speed	0,38 m/s [15 in/s] typ.	Maximum operating frequency	40 kHz typ.
Operating temp. range	-40 ºC to 107 ºC [-40 ºF to 225 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	3/8-24 UNF-2A	Termination	24 AWG, vinyl-insulated leads

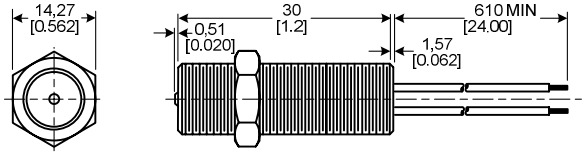
Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm

Catalog Listing	Thread Length (A)	Weight
3025A	20 mm [0.8 in]	28 g [1.0 oz]
3020A17	44 mm [1.7 in]	35 g [1.2 oz]
3020A35	88 mm [3.5 in]	42 g [1.5 oz]



Catalog Listing	Thread Length (A)	Weight
3025S13	30 mm [1.2 in]	28 g [1.0 oz]



3/8 (M12*) SENSORS CONTINUED (All dimensions for reference only. mm/[in])

*Contact Honeywell for availability of metric mounting thread versions.

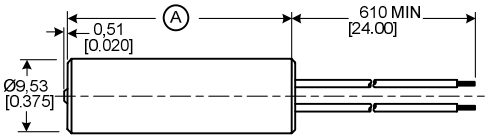
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	55 Vp-p	Inductance	75 mH max.
Coil resistance	275 Ohm to 330 Ohm	Gear pitch range	26 DP (module 0.98) or coarser
Pole piece diameter	2,36 mm [0.093 in]	Optimum actuator	24 DP (module 1.06) ferrous metal gear
Minimum surface speed	0,38 m/s [15 in/s] typ.	Maximum operating frequency	40 kHz typ.
Operating temp. range	-40 ºC to 107 ºC [-40 ºF to 225 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	3/8-24 UNF-2A	Termination	24 AWG, PVC-insulated leads

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm

Catalog Listing	Barrel Length (A)	Weight
3025SS13	30 mm [1.2 in]	28 g [1.0 oz]
3025SS23	63 mm [2.5 in]	42 g [1.5 oz



⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

⚠ WARNING

MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

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Honeywell

High Resolution

Industrial VRS Magnetic Speed Sensors

DESCRIPTION

High Resolution VRS sensors are designed for use in applications where precise timing pulse is required, and/or fine pitch gears are used. Proper alignment of the sensor is required.

Passive VRS (Variable Reluctance Speed) Magnetic Speed sensors are simple, rugged devices that do not require an external voltage source for operation.

A permanent magnet in the sensor establishes a fixed magnetic field. The approach and passing of a ferrous metal target near the sensor's pole piece (sensing area) changes the flux of the magnetic field, dynamically changing its strength. This change in magnetic field strength induces a current into a coil winding which is attached to the output terminals.

The output signal of a VRS sensor is an ac voltage that varies in amplitude and wave frequency as the speed of the monitored device changes, and is usually expressed in peak to peak voltage (Vp-p).

One complete waveform (cycle) occurs as each target passes the sensor's pole piece. If a standard gear were used as a target, this output signal would resemble a sine wave if viewed on an oscilloscope.

Honeywell also offers VRS sensors for general purpose, high output, power output, high temperature and hazardous location applications, as well as low-cost molded versions.

FEATURES

- Self-powered operation
- Direct conversion of actuator speed to output frequency
- Simple installation
- No moving parts
- Designed for use over a wide range of speeds
- Adaptable to a wide variety of configurations
- Customized VRS products for unique speed sensing applications
- Housing diameters:, 5/8 in (M16) 3/8 in (M12)
- Housing material/style: stainless steel threaded
- Terminations: MS3106 connector, preleaded
- Output voltages: 17 Vp-p to 170 Vp-p

POTENTIAL APPLICATIONS

- Engine RPM (revolutions per minute) measurement on aircraft, automobiles, boats, buses, trucks and rail vehicles
- Motor RPM measurement on drills, grinders, lathes and automatic screw machines
- Motor RPM measurement on precision camera, tape recording and motion picture equipment
- Process speed measurement on food, textile, paper, woodworking, printing, tobacco and pharmaceutical industry machinery
- Motor speed measurement of electrical generating equipment
- Speed measurement of pumps, blowers, mixers, exhaust and ventilating fans
- Flow measurement on turbine meters
- Wheel-slip measurement on autos and locomotives
- Gear speed measurement

High Resolution

5/8 INCH (M16*) SENSORS (All dimensions for reference only. mm/[in])
*Contact Honeywell for availability of metric mounting thread versions.

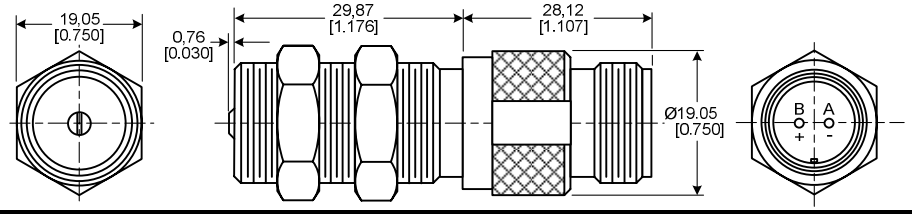
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	34 Vp-p	Inductance	25 mH max.
Coil resistance	45 Ohm to 85 Ohm	Gear pitch range	36 DP (module 0.07) or coarser
Chisel pole piece width	2,54 mm [0.010 in]	Optimum actuator	N/A
Min. surface speed	0,50 m/s [20 in/s] typ.	Max. operating frequency	50 kHz typ.
Operating temp. range	-55 ºC to 120 ºC [-67 ºF to 250 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	5/8-18 UNF-2A	Termination	MS3106 connector

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	8 DP (module 3.17)
Air gap	0,127 mm [0.005 in]
Load resistance	1.25 kOhm

Catalog Listing	Weight
3009AN	70 g [2.5 oz]



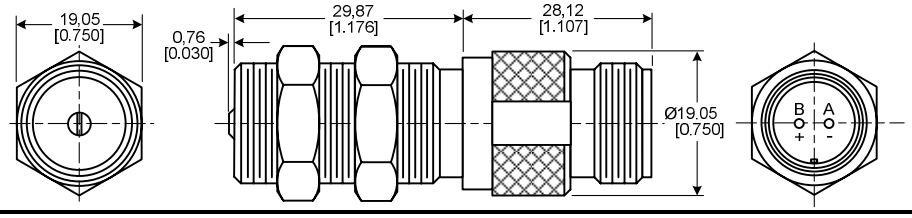
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	170 Vp-p	Inductance	450 mH max.
Coil resistance	910 Ohm to 1200 Ohm	Gear pitch range	36 DP (module 0.07) or coarser
Chisel pole piece width	2,54 mm [0.010 in]	Optimum actuator	N/A
Min. surface speed	0,25 m/s [10 in/s] typ.	Max. operating frequency	15 kHz typ.
Operating temp. range	-55 ºC to 120 ºC [-67 ºF to 250 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	5/8-18 UNF-2A	Termination	MS3106 connector

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	8 DP (module 3.17)
Air gap	0,127 mm [0.005 in]
Load resistance	1.25 kOhm

Catalog Listing	Weight
3029AN	70 g [2.5 oz]



Industrial VRS Magnetic Speed Sensors

5/8 INCH (M16*) SENSORS CONTINUED (All dimensions for reference only. mm/[in])

*Contact Honeywell for availability of metric mounting thread versions.

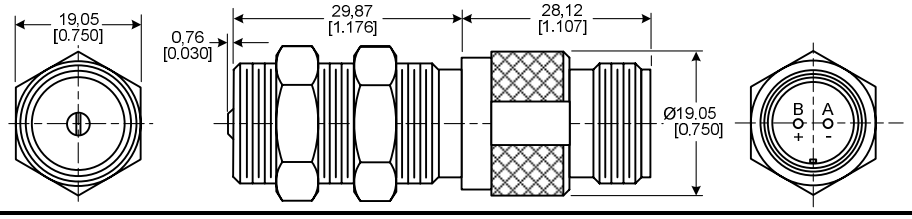
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	40 Vp-p	Inductance	85 mH max.
Coil resistance	120 Ohm to 162 Ohm	Gear pitch range	36 DP (module 0.07) or coarser
Chisel pole piece width	2,54 mm [0.010 in]	Optimum actuator	N/A
Min. surface speed	0,38 m/s [15 in/s] typ.	Max. operating frequency	40 kHz typ.
Operating temp. range	-55 ºC to 120 ºC [-67 ºF to 250 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	5/8-18 UNF-2A	Termination	MS3106 connector

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	8 DP (module 3.17)
Air gap	0,127 mm [0.005 in]
Load resistance	1.25 kOhm

Catalog Listing	Weight
3039AN	70 g [2.5 oz]



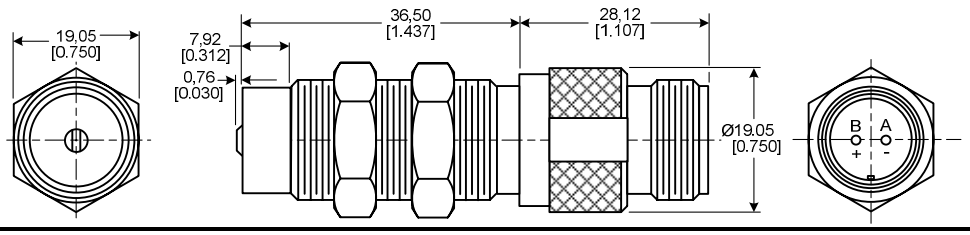
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	80 Vp-p	Inductance	25 mH max.
Coil resistance	45 Ohm to 85 Ohm	Gear pitch range	24 DP (module 1.06) ferrous metal gear
Chisel pole piece width	1,14 mm [0.045 in]	Optimum actuator	N/A
Min. surface speed	0,50 m/s [20 in/s] typ.	Max. operating frequency	50 kHz typ.
Operating temp. range	-55 ºC to 120 ºC [-67 ºF to 250 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	5/8-18 UNF-2A	Termination	MS3106 connector

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	8 DP (module 3.17)
Air gap	0,127 mm [0.005 in]
Load resistance	1.25 kOhm

Catalog Listing	Weight
3044A	70 g [2.5 oz]



High Resolution

5/8 INCH (M16*) SENSORS CONTINUED (All dimensions for reference only. mm/[in])
*Contact Honeywell for availability of metric mounting thread versions.

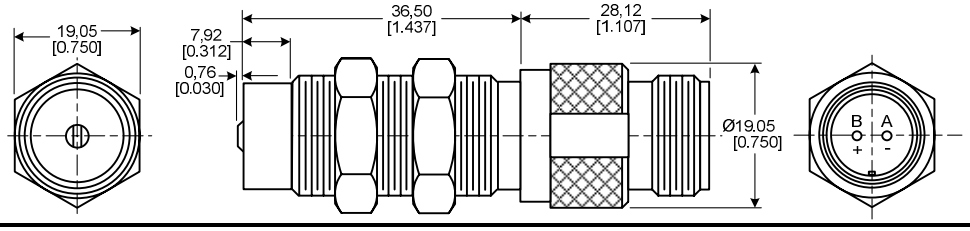
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	300 Vp-p	Inductance	450 mH max.
Coil resistance	910 Ohm to 1200 Ohm	Gear pitch range	24 DP (module 1.06) ferrous metal gear
Chisel pole piece width	1,14 mm [0.045 in]	Optimum actuator	N/A
Min. surface speed	0,38 m/s [15 in/s] typ.	Max. operating frequency	15 kHz typ.
Operating temp. range	-55 ºC to 120 ºC [-67 ºF to 250 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	5/8-18 UNF-2A	Termination	MS3106 connector

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	8 DP (module 3.17)
Air gap	0,127 mm [0.005 in]
Load resistance	1.25 kOhm

Catalog Listing	Weight
3045A	70 g [2.5 oz]



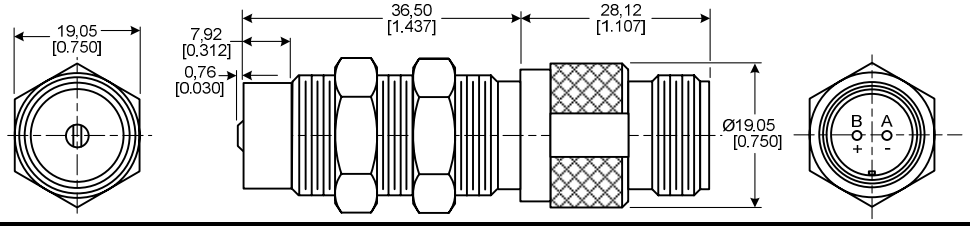
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	65 Vp-p	Inductance	85 mH max.
Coil resistance	120 Ohm to 162 Ohm	Gear pitch range	24 DP (module 1.06) ferrous metal gear
Chisel pole piece width	1,14 mm [0.045 in]	Optimum actuator	N/A
Min. surface speed	0,38 m/s [15 in/s] typ.	Max. operating frequency	40 kHz typ.
Operating temp. range	-55 ºC to 120 ºC [-67 ºF to 250 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	5/8-18UNF-2A	Termination	MS3106 connector

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	8 DP (module 3.17)
Air gap	0,127 mm [0.005 in]
Load resistance	1.25 kOhm

Catalog Listing	Weight
3046A	70 g [2.5 oz]



Industrial VRS Magnetic Speed Sensors

3/8 INCH (M12*) SENSORS (All dimensions for reference only. mm/[in])

*Contact Honeywell for availability of metric mounting thread versions.

LOW RESISTIANCE COILS FOR HIGH FREQUENCY APPLICATIONS

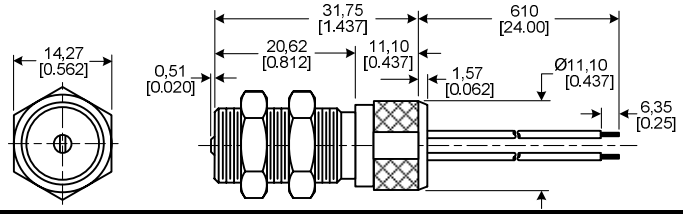
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	17 Vp-p	Inductance	15 mH max.
Coil resistance	45 Ohm to 65 Ohm	Gear pitch range	36 DP (module 0.70) or coarser
Chisel pole piece width	0,25 mm [0.010 in]	Optimum actuator	32 DP (module 0.80)
Min. surface speed	0,75 m/s [30 in/s] typ.	Max. operating frequency	60 kHz typ.
Operating temp. range	-40 ºC to 107 ºC [-40 ºF to 225 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	3/8-24 UNF-2A	Termination	24 AWG PVC-insulated leads

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm

Catalog Listing	Weight
3014A	28 g [1.0 oz]



HIGH RESISTIANCE COILS FOR HIGH FREQUENCY APPLICATIONS

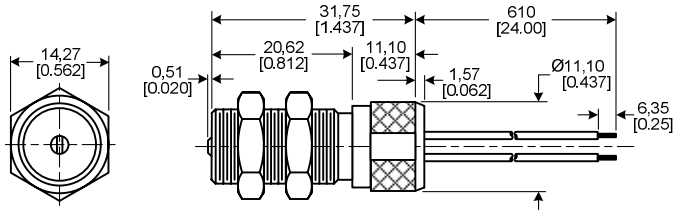
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	55 Vp-p	Inductance	75 mH max.
Coil resistance	275 Ohm to 330 Ohm	Gear pitch range	32 DP (module 0.80) or coarser
Chisel pole piece width	0,25 mm [0.010 in]	Optimum actuator	N/A
Min. surface speed	0,38 m/s [15 in/s] typ.	Max. operating frequency	40 kHz typ.
Operating temp. range	-40 ºC to 107 ºC [-40 ºF to 225 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	3/8-24 UNF-2A	Termination	24 AWG PVC-insulated Leads

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm

Catalog Listing	Weight
3024A	28 g [1.0 oz]



High Resolution

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⚠ WARNING

PERSONAL INJURY

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WARRANTY/REMEDY

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While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

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SALES AND SERVICE

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March 2007

Honeywell

High Temperature

Industrial VRS Magnetic Speed Sensors

DESCRIPTION

High Temperature VRS sensors are designed for use in applications where the sensor is exposed to temperatures up to 260 ºC [450 ºF]. Sealed Front-End versions are available for applications where the sensor is exposed to fluids, lubricants or adverse environmental conditions.

Passive VRS (Variable Reluctance Speed) Magnetic Speed sensors are simple, rugged devices that do not require an external voltage source for operation.

A permanent magnet in the sensor establishes a fixed magnetic field. The approach and passing of a ferrous metal target near the sensor's pole piece (sensing area) changes the flux of the magnetic field, dynamically changing its strength. This change in magnetic field strength induces a current into a coil winding which is attached to the output terminals.

The output signal of a VRS sensor is an ac voltage that varies in amplitude and wave frequency as the speed of the monitored device changes, and is usually expressed in peak to peak voltage (Vp-p).

One complete waveform (cycle) occurs as each target passes the sensor's pole piece. If a standard gear were used as a target, this output signal would resemble a sine wave if viewed on an oscilloscope.

Honeywell also offers VRS sensors for general purpose, high output, power output, high resolution and hazardous location applications, as well as low-cost molded OEM versions.

FEATURES

- Self-powered operation
- Direct conversion of actuator speed to output frequency
- Simple installation
- No moving parts
- Designed for use over a wide range of speeds
- Adaptable to a wide variety of configurations
- Customized VRS products for unique speed sensing applications
- Housing diameters: 5/8 in (M16), 3/8 in (M12), 1/4 in (8M)
- Housing material/style: stainless steel threaded
- Terminations: MS3106 connector, preleaded
- Output voltages: 4.7 Vp-p to 125 Vp-p

POTENTIAL APPLICATIONS

- Engine RPM (revolutions per minute) measurement on aircraft, automobiles, boats, buses, trucks and rail vehicles
- Motor RPM measurement on drills, grinders, lathes and automatic screw machines
- Motor RPM measurement on precision camera, tape recording and motion picture equipment
- Process speed measurement on food, textile, paper, woodworking, printing, tobacco and pharmaceutical industry machinery
- Motor speed measurement of electrical generating equipment
- Speed measurement of pumps, blowers, mixers, exhaust and ventilating fans
- Flow measurement on turbine meters
- Wheel-slip measurement on autos and locomotives
- Gear speed measurement

High Temperature

5/8 INCH (M16*) SENSORS (All dimensions for reference only. mm/[in])
*Contact Honeywell for availability of metric mounting thread versions.

LOW RESISTANCE COILS FOR HIGH FREQUENCY APPLICATIONS

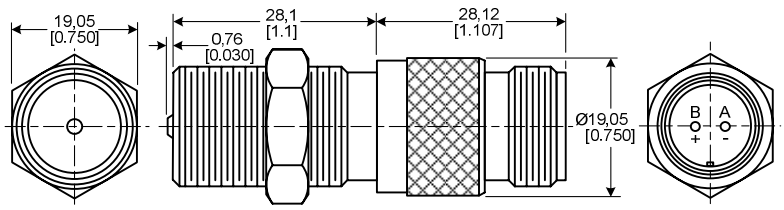
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	25 Vp-p	Inductance	30 mH max.
Coil resistance	65 Ohm typ.	Gear pitch range	24 DP (module 1.06) or coarser
Pole piece diameter	2,69 mm [0.106 in]	Optimum actuator	20 DP (module 1.27)
Min. surface speed	0,50 m/s [20 in/s] typ.	Max. operating frequency	50 kHz typ.
Operating temp. range	-55 ºC to 230 ºC [-67 ºF to 450 ºF]	Vibration	N/A
Mounting thread	5/8-18 UNF-2A	Termination	MS3106 connector

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm

Catalog Listing	Weight
3010HTB	70 g [2.5 oz]



HIGH RESISTANCE COILS FOR MAXIMUM OUTPUT VOLTAGE APPLICATIONS

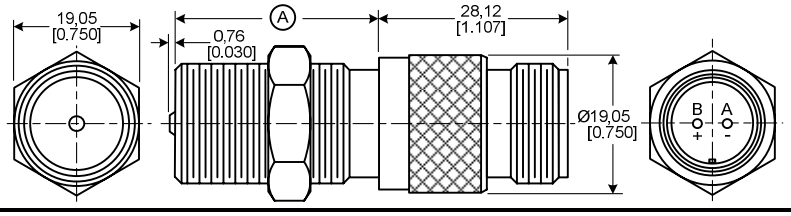
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	125 Vp-p	Inductance	450 mH max.
Coil resistance	1055 Ohm typ.	Gear pitch range	24 DP (module 1.06) or coarser
Pole piece diameter	2,69 mm [0.106 in]	Optimum actuator	20 DP (module 1.27)
Min. surface speed	0,25 m/s [10 in/s] typ.	Max. operating frequency	15 kHz typ.
Operating temp. range	-55 ºC to 230 ºC [-67 ºF to 450 ºF]	Vibration	N/A
Mounting thread	5/8-18 UNF-2A	Termination	MS3106 connector

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm

Catalog Listing	Thread Length (A)	Weight
3030HTB	28 mm [1.1 in]	70 g [2.5 oz]
3030HTB25	63 mm [2.5 in]	84 g [3.0 oz]



5/8 INCH (M16*) SENSORS CONTINUED (All dimensions for reference only. mm/[in])

*Contact Honeywell for availability of metric mounting thread versions.

NOMINAL RESISTANCE COILS FOR LOW IMPEDANCE LOAD APPLICATIONS

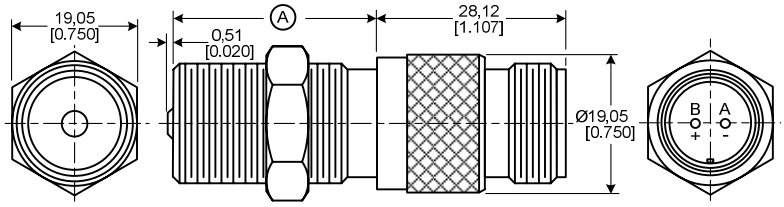
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	45 Vp-p	Inductance	85 mH max.
Coil resistance	141 Ohm typ.	Gear pitch range	12 DP (module 2.11) or coarser
Pole piece diameter	4,75 mm [0.187 in]	Optimum actuator	8 DP (module 3.17)
Min. surface speed	0,38 m/s [15 in/s] typ.	Max. operating frequency	40 kHz typ.
Operating temp. range	-55 ºC to 230 ºC [-67 ºF to 450 ºF]	Vibration	N/A
Mounting Thread	5/8-18 UNF-2A	Termination	MS3106 Connector

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	8 DP (module 3.17)
Air gap	0,127 mm [0.005 in]
Load resistance	1.25 kOhm

Catalog Listing	Thread Length (A)	Weight
3040HTB	28 mm [1.1 in]	70 g [2.5 oz]
3040HTB25	63 mm [2.5 in]	84 g [3.0 oz]



High Temperature

5/8 INCH SEALED FRONT-END SENSORS (All dimensions for reference only. mm/[in])
(No metric available.)

NOMINAL RESISTANCE COILS FOR LOW IMPEDANCE LOADS APPLICATIONS

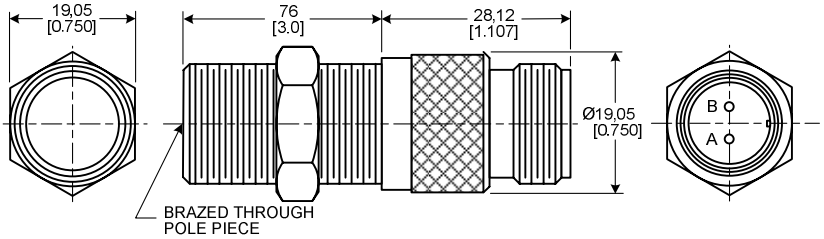
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	60 Vp-p	Inductance	85 mH max.
Coil resistance	120 Ohm to 162 Ohm	Gear pitch range	12 DP (module 2.11) or coarser
Pole piece diameter	4,39 mm [0.173 in]	Optimum actuator	8 DP (module 3.17)
Min. surface speed	0,38 m/s [15 in/s] typ.	Max. operating frequency	40 kHz typ.
Operating temp. range	-54 ºC to 220 ºC [-65 ºF to 428 ºF]	Vibration	N/A
Mounting Thread	5/8-18 UNF-2A	Termination	MS3106 connector

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	8 DP (module 3.17)
Air gap	0,127 mm [0.005 in]
Load resistance	1.25 kOhm

Catalog Listing	Weight
MA243HT	98 g [3.5 oz]



Industrial VRS Magnetic Speed Sensors

3/8 INCH (M12*) SENSORS (All dimensions for reference only. mm/[in])

*Contact Honeywell for availability of metric mounting thread versions.

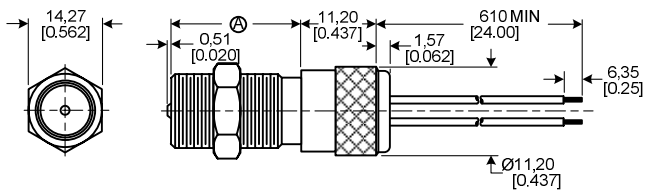
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	15 Vp-p	Inductance	31 mH max.
Coil resistance	110 Ohm max.	Gear pitch range	26 DP (module 0.98) or coarser
Pole piece diameter	2,36 mm [0.093 in]	Optimum actuator	24 DP (module 1.06) ferrous metal gear
Min. surface speed	0,75 m/s [20 in/s] typ.	Max. operating frequency	50 kHz typ.
Operating temp. range	-40 ºC to 205 ºC [-40 ºF to 400 ºF]	Vibration	N/A
Mounting thread	3/8-24 UNF-2A	Termination	24 AWG Teflon-insulated leads

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm

Catalog Listing	Thread Length (A)	Weight
3015HTB	20 mm [0.8 in]	28 g [1.0 oz]
3015HTB15	38 mm [1.5 in]	42 g [1.5 oz]



High Temperature

1/4 INCH (M8*) MINIATURE SENSORS (All dimensions for reference only. mm/[in])
*Contact Honeywell for availability of metric mounting thread versions.

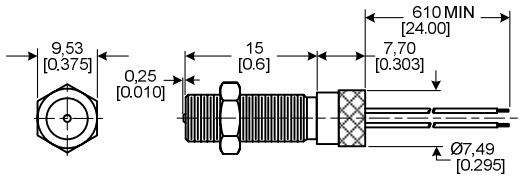
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	4.7 Vp-p	Inductance	13 mH max.
Coil resistance	137 Ohm max.	Gear pitch range	36 DP (module 0.70) or coarser
Pole piece diameter	1 mm [0.040 in]	Optimum actuator	28 DP (Module 0.90) ferrous metal gear
Min. surface speed	0,89 m/s [35 in/s] typ.	Max. operating frequency	70 kHz typ.
Operating temp. range	-40 ºC to 230 ºC [-40 ºF to 450 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	1/4-40 UNS-2A	Termination	30 AWG Teflon-Insulated Leads

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm

Catalog Listing	Weight
3055A	14 g [0.5 oz]



Industrial VRS Magnetic Speed Sensors

1/4 INCH SEALED FRONT-END SENSORS (All dimensions for reference only. mm/[in])
(No metric available.)

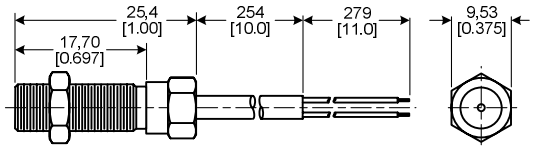
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	5.2 Vp-p	Inductance	85 mH max.
Coil resistance	20 Ohm to 45 Ohm	Gear pitch range	36 DP (module 0.70) or coarser
Pole piece diameter	1 mm [0.040 in]	Optimum actuator	28 DP (module 0.90) ferrous metal gear
Min. surface speed	0,89 m/s [35 in/s] typ.	Max. operating frequency	70 kHz typ.
Operating temp. range	-73 ºC to 230 ºC [-100 ºF to 450 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting Thread	1/4-40 UNS-2A	Termination	28 AWG Teflon-insulated leads

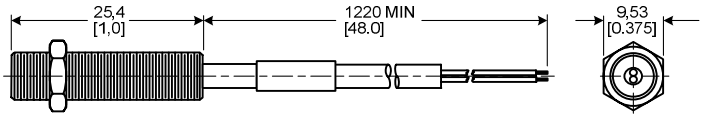
Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm

Catalog Listing	Weight
MA3055	28 g [1 oz]



Catalog Listing	Weight
MA3055S10	28 g [1 oz]



⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

⚠ WARNING

MISUSE OF DOCUMENTATION

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SALES AND SERVICE

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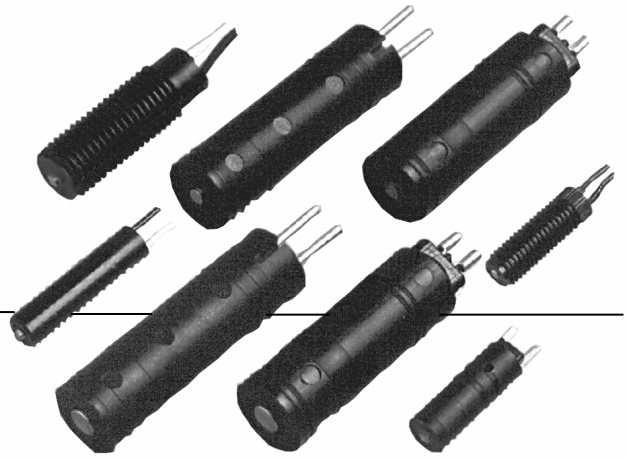


Low-Cost Molded

Industrial VRS Magnetic Speed Sensors

DESCRIPTION

Low-Cost Molded VRS Sensors are designed for use in OEM (Original Equipment Manufacturer) applications.

Passive VRS (Variable Reluctance Speed) Magnetic Speed sensors are simple, rugged devices that do not require an external voltage source for operation.

A permanent magnet in the sensor establishes a fixed magnetic field. The approach and passing of a ferrous metal target near the sensor's pole piece (sensing area) changes the flux lines of the magnetic field, dynamically changing its strength. This change in magnetic field strength induces a current into a coil winding which is attached to the output terminals.

The output signal of a VRS sensor is an ac voltage that varies in amplitude and wave frequency as the speed of the monitored device changes, and is usually expressed in peak to peak voltage (Vp-p).

One complete waveform (cycle) occurs as each target passes the sensor's pole piece. If a standard gear were used as a target, this output signal would resemble a sine wave if viewed on an oscilloscope.

Honeywell also offers VRS sensors for general purpose, high output, power output, high resolution and high temperature, as well as hazardous location applications.

FEATURES

- Self-powered operation
- Direct conversion of actuator speed to output frequency
- Simple installation
- No moving parts
- Designed for use over a wide range of speeds
- Adaptable to a wide variety of configurations
- Customized VRS products for unique speed sensing applications
- Housing diameters: 0.505 in, 7/16 in, 0.292 in, 1/4 in
- Housing materials/styles: plastic smooth or threaded
- Terminations: Crimp, pin, preleaded
- Output voltages: 10 Vp-p to 190 Vp-p

POTENTIAL APPLICATIONS

- Engine RPM (revolutions per minute) measurement on aircraft, automobiles, boats, buses, trucks and rail vehicles
- Motor RPM measurement on drills, grinders, lathes and automatic screw machines
- Motor RPM measurement on precision camera, tape recording and motion picture equipment
- Process speed measurement on food, textile, paper, woodworking, printing, tobacco and pharmaceutical industry machinery
- Motor speed measurement of electrical generating equipment
- Speed measurement of pumps, blowers, mixers, exhaust and ventilating fans
- Flow measurement on turbine meters
- Wheel-slip measurement on autos and locomotives
- Gear speed measurement

Low-Cost Molded

0.505 INCH SENSORS (All dimensions for reference only. mm/[in])

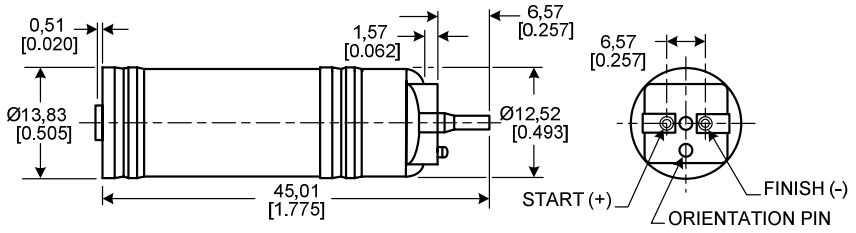
Catalog Listing: 2040C (For 230 ºC [450 ºF] capability, order 2040CHT.)

General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	115 Vp-p	Inductance	85 mH max.
Max. coil resistance	120 Ohm to 162 Ohm	Gear pitch range	12 DP (module 2.11) or coarser
Pole piece diameter	4,75 mm [0.187 in]	Operating temp. range	-55 ºC to 120 ºC [-67 ºF to 250 ºF]
Weight	28 g [1.0 oz]	Termination	Crimp terminals

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	8 DP (module 3.17)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm



NOTES:

1. Left terminal in this orientation represents positive (+) polarity upon approach of ferrous material.

2. Provided with terminals that allow AWG 20 wire to be soldered or crimped to the sensor. Crimp terminals that allow use of AWG 18 wire are available upon special request.

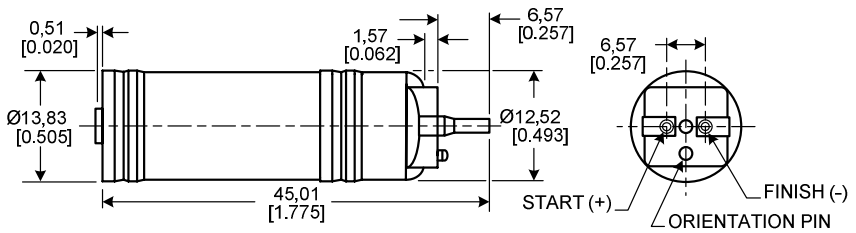
Catalog Listing: 2030C

General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	190 Vp-p	Inductance	400 mH max.
Max. coil resistance	910 Ohm to 1200 Ohm	Gear pitch range	24 DP (module 1.06) or coarser
Pole piece diameter	2.69 mm [0.106 in]	Operating temp. range	-55 ºC to 120 ºC [-67 ºF to 250 ºF]
Weight	28 g [1.0 oz]	Termination	Crimp terminals

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm



NOTES:

1. Left terminal in this orientation represents positive (+) polarity upon approach of ferrous material.

2. Provided with terminals that allow AWG 20 wire to be soldered or crimped to the sensor. Crimp terminals that allow use of AWG 18 wire are available upon special request.

0.505 INCH SENSORS CONTINUED (All dimensions for reference only. mm/[in])

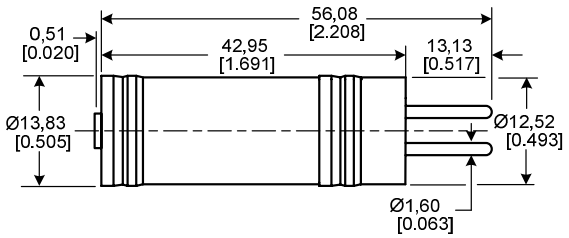
Catalog Listing: 2030P (For 230 ºC [450 ºF] capability, order 2030PHT.)

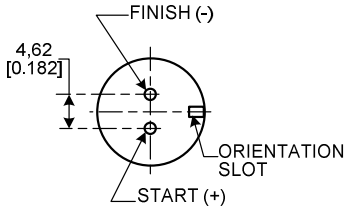
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	190 Vp-p	Inductance	400 mH max.
Max. coil resistance	910 Ohm to 1200 Ohm	Gear pitch range	24 DP (module 1.06) or coarser
Pole piece diameter	2.69 mm [0.106 in]	Operating temp. range	-55 ºC to 120 ºC [-67 ºF to 250 ºF]
Weight	28 g [1.0 oz]	Termination	Pin terminals

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm





NOTES:

1. Bottom terminal in this orientation represents positive (+) polarity upon approach of ferrous material.

2. Provided with No. 20 terminal pins (male) suitable for crimping or soldering to female contacts.

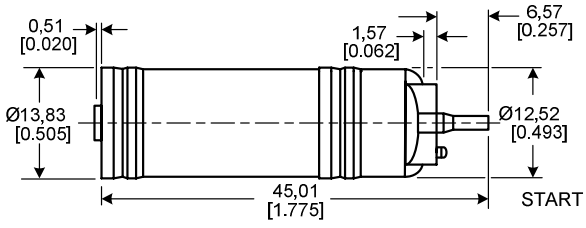
Catalog Listing: 2010C (For 230 ºC [450 ºF] capability, order 2010CHT.)

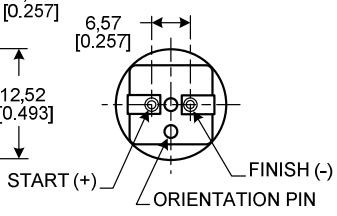
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	40 Vp-p	Inductance	25 mH max.
Max. coil resistance	45 Ohm to 85 Ohm	Gear pitch range	24 DP (module 1.06) or coarser
Pole piece diameter	2.69 mm [0.106 in]	Operating temp. range	-55 ºC to 120 ºC [-67 ºF to 250 ºF]
Weight	28 g [1.0 oz]	Termination	Crimp terminals

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm





NOTES:

1. Left terminal in this orientation represents positive (+) polarity upon approach of ferrous material.

2. Provided with terminals that allow AWG 20 wire to be soldered or crimped to the sensor. Crimp terminals that allow use of AWG 18 wire are available upon special request.

Low-Cost Molded

0.292 INCH SENSORS (All dimensions for reference only. mm/[in])

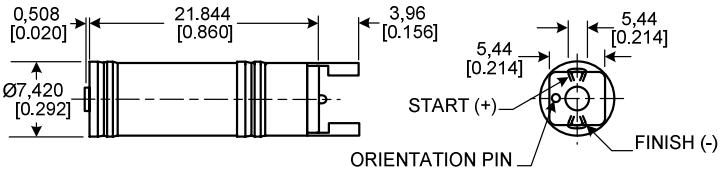
Catalog Listing: 2025C

General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	55 Vp-p	Inductance	75 mH max.
Max. coil resistance	390 Ohm	Gear pitch range	26 DP (module 0.98) or coarser
Pole piece diameter	2.36 mm [0.093] in	Operating temp. range	-40 ºC to 225 ºC [-40 ºF to 107 ºF]
Weight	28 g [1.0 oz]	Termination	Crimp terminals

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm



NOTES:

1. Top terminal pin in this orientation represents positive (+) polarity upon approach of ferrous material.

2. Provided with crimp terminals that allow AWG 24 wire to be soldered or crimped to the sensor..

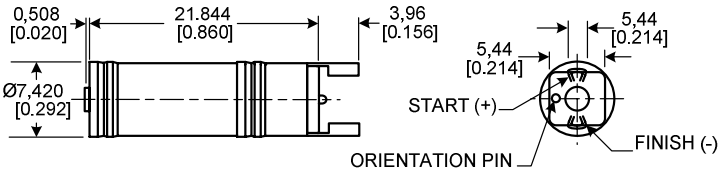
Catalog Listing: 2015C

General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	20 Vp-p	Inductance	15 mH max.
Max. coil resistance	80 Ohm	Gear pitch range	26 DP (module 0.98) or coarser
Pole piece diameter	2.36 mm [0.093] in	Operating temp. range	-40 ºC to 225 ºC [-40 ºF to 107 ºF]
Weight	28 g [1.0 oz]	Termination	Crimp terminals

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm



NOTES:

1. Top terminal pin in this orientation represents positive (+) polarity upon approach of ferrous material.

2. Provided with crimp terminals that allow AWG 24 wire to be soldered or crimped to the sensor..

Industrial VRS Magnetic Speed Sensors

7/16 INCH SENSORS

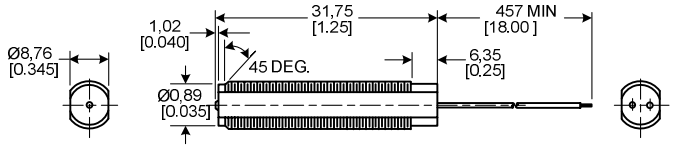
Catalog Listing: 3022

General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	17.5 Vp-p	Inductance	9 mH max.
Max. coil resistance	54 Ohm	Gear pitch range	26 DP (module 0.98) or coarser
Pole piece diameter	2.36 mm [0.093] in	Operating temp. range	-18 ºC to 93 ºC [0 ºF to 200 ºF]
Weight	11 g [0.4 oz]	Termination	22 AWG PVC-insulated leads
Mounting thread	7/16-20 UNF-2A		

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm



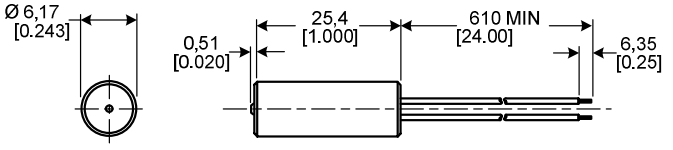
Catalog Listing: 302662

General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	10 Vp-p	Inductance	11 mH max.
Max. coil resistance	130 Ohm	Gear pitch range	32 DP (module 0.80) or coarser
Pole piece diameter	1,83 mm [0.072 in]	Operating temp. range	-40 ºC to 107 ºC [-40 ºF to 225 ºF]
Weight	4.2 g [15 oz]	Termination	26 AWG PVC-insulated leads

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm



Low-Cost Molded

1/4 INCH SENSOR

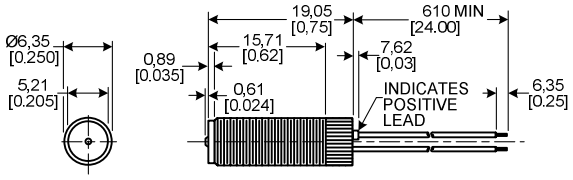
Catalog Listing: 302362

General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	10 Vp-p	Inductance	11 mH max.
Max. coil resistance	130 Ohm	Gear pitch range	32 DP (module 0.80) or coarser
Pole piece diameter	1,83 mm [0.072 in]	Operating temp. range	-18 ºC to 60 ºC [0 ºF to 140 ºF]
Weight	4.2 g [15 oz]	Termination	26 AWG PVC-insulated leads
Mounting thread	1/4 -28 UNF-1A		

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	20 DP (module 1.27)
Air gap	0,127 mm [0.005 in]
Load resistance	100 kOhm



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⚠ WARNING

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SALES AND SERVICE

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March 2007

Honeywell

Power Output

Industrial VRS Magnetic Speed Sensors

DESCRIPTION

Power Output VRS sensors are designed for driving low resistance loads at large air gaps in applications where larger actuators may be used.

Passive VRS (Variable Reluctance Speed) Magnetic Speed sensors are simple, rugged devices that do not require an external voltage source for operation.

A permanent magnet in the sensor establishes a fixed magnetic field. The approach and passing of a ferrous metal target near the sensor's pole piece (sensing area) changes the flux lines of the magnetic field, dynamically changing its strength. This change in magnetic field strength induces a current into a coil winding which is attached to the output terminals.

The output signal of a VRS sensor is an ac voltage that varies in amplitude and wave frequency as the speed of the monitored device changes, and is usually expressed in peak to peak voltage (Vp-p).

One complete waveform (cycle) occurs as each target passes the sensor's pole piece. If a standard gear were used as a target, this output signal would resemble a sine wave if viewed on an oscilloscope.

Honeywell also offers VRS sensors for general purpose, high output, high resolution, high temperature and hazardous location applications, as well as low-cost molded versions.

FEATURES

- Self-powered operation
- Direct conversion of actuator speed to output frequency
- Simple installation
- No moving parts
- Designed for use over a wide range of speeds
- Adaptable to a wide variety of configurations
- Customized VRS products for unique speed sensing applications
- Housing diameter: 5/8 in (M16)
- Housing material/style: stainless steel threaded
- Terminations: MS3106 connector, preleaded
- Output voltage: 70 Vp-p

POTENTIAL APPLICATIONS

- Engine RPM (revolutions per minute) measurement on aircraft, automobiles, boats, buses, trucks and rail vehicles
- Motor RPM measurement on drills, grinders, lathes and automatic screw machines
- Motor RPM measurement on precision camera, tape recording and motion picture equipment
- Process speed measurement on food, textile, paper, woodworking, printing, tobacco and pharmaceutical industry machinery
- Motor speed measurement of electrical generating equipment
- Speed measurement of pumps, blowers, mixers, exhaust and ventilating fans
- Flow measurement on turbine meters
- Wheel-slip measurement on autos and locomotives
- Gear speed measurement

Power Output

5/8 INCH (M16*) SENSORS (All dimensions for reference only. mm/[in])
*Contact Honeywell for availability of metric mounting thread versions.

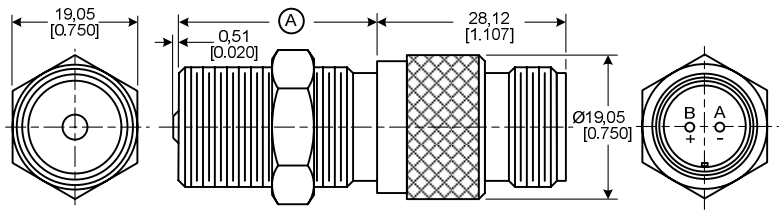
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	70 Vp-p	Inductance	85 mH max.
Coil resistance	120 Ohm to 162 Ohm	Gear pitch range	12 DP (module 2.11) or coarser
Pole piece diameter	4,75 mm [0.187 in]	Optimum actuator	8 DP (module 3.17) ferrous metal gear
Min. surface speed	0,38 m/s [15 in/s] typ.	Max. operating frequency	40 kHz typ.
Operating temp. range	-55 ºC to 120 ºC [-67 ºF to 250 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	5/8-18 UNF-2A	Termination	MS3106 connector

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	8 DP (module 3.17)
Air gap	0,127 mm [0.005 in]
Load resistance	1.25 kOhm

Catalog Listing	Thread Length (A)	Weight
3040AN	28 mm [1.1 in]	70 g [2.5 oz]
3040AN25	63 mm [2.5 in]	84 g [3.0 oz]
3040AN30	76 mm [3.0 in]	84 g [3.0 oz]
3040AN40	101 mm [4.0 in]	98 g [3.5 oz]
3040AN50	127 mm [5.0 in]	128 g [4.5 oz]



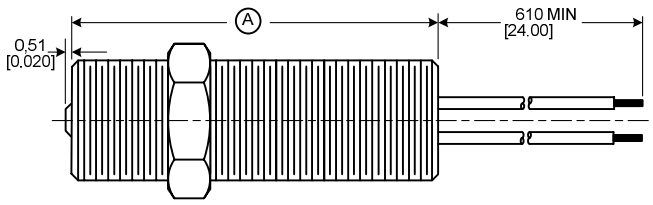
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	70 Vp-p	Inductance	85 mH max.
Coil resistance	120 Ohm to 162 Ohm	Gear pitch range	12 DP (module 2.11) or coarser
Pole piece diameter	4,75 mm [0.187 in]	Optimum actuator	8 DP (module 3.17) ferrous metal gear
Min. surface speed	0,38 m/s [15 in/s] typ.	Max. operating frequency	40 kHz typ.
Operating temp. range	-55 ºC to 120 ºC [-67 ºF to 250 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting Thread	5/8-18 UNF-2A	Termination	20 AWG Teflon-insulated leads

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	8 DP (module 3.17)
Air gap	0,127 mm [0.005 in]
Load resistance	1.25 kOhm

Catalog Listing	Thread Length (A)	Weight
3040S20	50 mm [2.0 in]	70 g [2.5 oz]
3040S30	76 mm [3.0 in]	84 g [3.0 oz]



5/8 INCH (M16*) SENSORS CONTINUED (All dimensions for reference only. mm/[in])

*Contact Honeywell for availability of metric mounting thread versions.

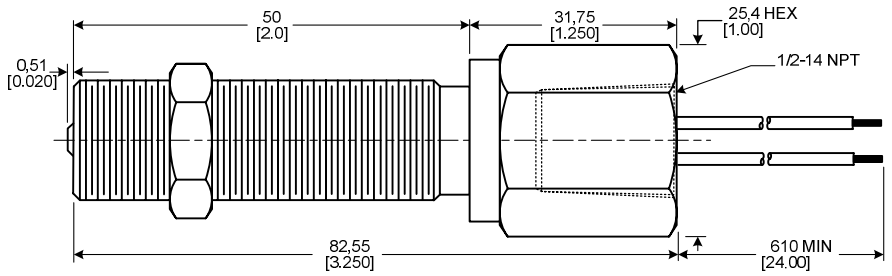
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	70 Vp-p	Inductance	85 mH max.
Coil resistance	120 Ohm to 162 Ohm	Gear pitch range	12 DP (module 2.11) or coarser
Pole piece diameter	4,75 mm [0.187 in]	Optimum actuator	8 DP (module 3.17) ferrous metal gear
Min. surface speed	0,38 m/s [15 in/s] typ.	Max. operating frequency	40 kHz typ.
Operating temp. range	-55 ºC to 120 ºC [-67 ºF to 250 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	5/8-18UNF-2A	Termination	20 AWG Teflon-insulated leads, conduit mount

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	8 DP (module 3.17)
Air gap	0,127 mm [0.005 in]
Load resistance	1.25 kOhm

Catalog Listing	Weight
3040H20	140 g [5.0 oz]



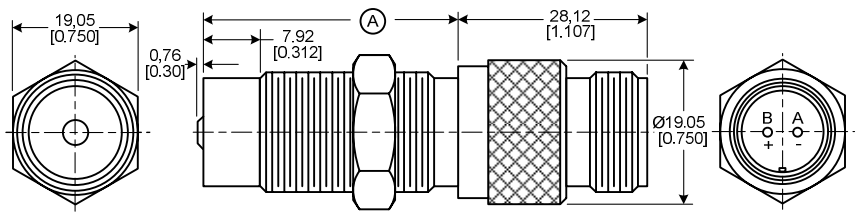
General Specifications

Parameter	Characteristic	Parameter	Characteristic
Min. output voltage	70 Vp-p	Inductance	85 mH max.
Coil resistance	120 Ohm to 162 Ohm	Gear pitch range	12 DP (module 2.11) or coarser
Pole piece diameter	4,75 mm [0.187 in]	Optimum actuator	8 DP (module 3.17) ferrous metal gear
Min. surface speed	0,38 m/s [15 in/s] typ.	Max. operating frequency	40 kHz typ.
Operating temp. range	-55 ºC to 120 ºC [-67 ºF to 250 ºF]	Vibration	Mil-Std 202F Method 204D
Mounting thread	5/8-18 UNF-2A	Termination	MS3106 connector

Test Condition Specifications

Parameter	Characteristic
Surface speed	25 m/s [1000 in/s]
Gear	8 DP (module 3.17)
Air gap	0,127 mm [0.005 in]
Load resistance	1.25 kOhm

Catalog Listing	Thread Length (A)	Weight
3040A	35 mm [1.4 in]	70 g [2.5 oz]
3040A25	63 mm [2.5 in]	84 g [3.0 oz]



⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

⚠ WARNING

MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

E-mail: info.sc@honeywell.com

Internet: www.honeywell.com/sensing

Phone and Fax:

Asia Pacific	+65 6355-2828
	+65 6445-3033 Fax
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	+44 (0) 1698 481676 Fax
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	+1-305-883-8257 Fax
USA/Canada	+1-800-537-6945
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March 2007

Pressure Sensors

22PC Series

Gage/Unamplified-Noncompensated

Basic Sensors

FEATURES

- Lowest priced pressure sensor
- Miniature package
- Can be used to measure with vacuum or positive pressure
- Operable after exposure to frozen conditions
- 2 mA constant current excitation significantly reduces sensitivity shift over temperature*

22PC SERIES PERFORMANCE CHARACTERISTICS at 10.0 ±0.01 VDC Excitation, 25°C

	Min.	Typ.	Max.	Units
Excitation	---	10	12	VDC
Null Shift, 25° to 0°, 25° to 50°C	---	±2.0	---	mV
Null Offset	−30	0	+30	mV
Linearity, P2 > P1, BFSL	---	±0.25	±1.0	%Span
Span Shift, 25° to 0°, 25° to 50°C	---	±6.0	---	%Span
Repeatability & Hysteresis	---	±0.15	---	%Span
Response Time	---	---	1.0	msec
Input Resistance	4.0 K	5.0 K	6.0 K	ohms
Output Resistance	4.0 K	5.0 K	6.0 K	ohms
Weight	---	2	---	grams

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	−40° to +85°C (−40° to +185°F)
Storage Temperature	−55° to +100°C (−67° to +212°F)
Shock	Qualification tested to 150 g
Vibration	Qualification tested to 0 to 2 kHz, 20 g sine
Media (P1 & P2)	Limited only to those media which will not attack polyetherimide, silicon, fluorosilicone, silicone, EPDM, and neoprene seals

22PC SERIES ORDER GUIDE

Catalog Listing	Pressure Range psi	Span, mV			Sensitivity mV/psi Typ.	Overpressure psi, Max.
		Min.	Typ.	Max.		
22PCA Type	1.0	25	42	59	42	20
22PCC Type	15	156	225	294	15	45
22PCF Type	100	147	225	303	2.3	200

SENSOR SELECTION GUIDE

2 Product Family	2 Circuit Type	PC Pressure Transducer	A Pressure Range	F Type of Seal	A Type of Port	6 Termination Style	G Pressure Measurement
2 20PC Family	**2** Noncompensated low cost		**A** 1 psi **C** 15 psi **F** 100 psi	**E** EPDM **F** Fluorosilicone **N** Neoprene **S** Silicone	**A** Straight **B** Barbed **D** Modular **J** Needle	**2** 2 x 2 **6** 1 x 4 (.600″)	**G** Gage

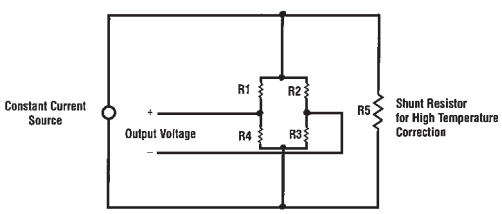
Example: 22PCAFA6G
Non-compensated low cost 1 psi sensor with fluorosilicone seal, straight port, 1 x 4 termination and gage pressure measurement.
See Accessory Guide, page 27.

Note: Not all catalog listings are established. Please refer to the Order Guides, or contact the MICRO SWITCH Application Center at the 800 number.

*Non-compensated pressure sensors, excited by constant current instead of voltage, exhibit temperature compensation of Span. Application Note #1 briefly discusses current excitation.

Constant current excitation has an additional benefit of temperature measurement. When driven by a constant current source, a silicon pressure sensor's terminal voltage will rise with increased temperature. The rise in voltage not only compensates the Span, but is also an indication of die temperature.

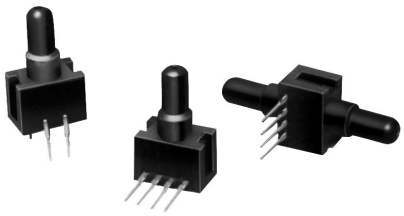
Constant Current Excitation Schematic



Pressure Sensors

Gage and Differential/Unamplified-Noncompensated

Basic Sensors



FEATURES

- Miniature package
- Variety of gage pressure port configurations - easily and quickly modified for your special needs
- Operable after exposure to frozen conditions
- Ideal for wet/wet differential applications
- Choice of termination for gage sensors
- 2 mA constant current excitation significantly reduces sensitivity shift over temperature*
- Can be used to measure vacuum or positive pressure

24PC SERIES PERFORMANCE CHARACTERISTICS at 10.0 ±0.01 VDC Excitation, 25°C

	Min.	Typ.	Max.	Units
Excitation	---	10	12	VDC
Null Offset	−30	0	+30	mV
Null Shift, 25° to 0°, 25° to 50°C	---	±2.0	---	mV
Linearity, P2 > P1, BFSL	---	±0.25	±1.0	%Span
Span Shift, 25° to 0°, 25° to 50°C	---	±5.0*	---	%Span
Repeatability & Hysteresis	---	±0.15	---	%Span
Response Time	---	---	1.0	msec
Input Resistance	4.0 K	5.0 K	6.0 K	ohms
Output Resistance	4.0 K	5.0 K	6.0 K	ohms
Stability over One Year	---	±0.5	---	%Span
Weight	---	2	---	grams

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	−40° to +85°C (−40° to +185°F)
Storage Temperature	−55° to +100°C (−67° to +212°F)
Shock	Qualification tested to 150 g
Vibration	Qualification tested to 0 to 2 kHz, 20 g sine
Media (P1 & P2)	Limited only to those media which will not attack polyetherimide, silicon, fluorosilicone, silicone, EPDM and neoprene seals.

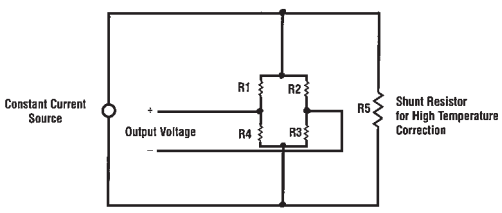
24PC SERIES ORDER GUIDE

Catalog Listing	Pressure Range psi	Span, mV			Sensitivity mV/psi Typ.	Overpressure psi Max.
		Min.	Typ.	Max.		
24PCE Type	0.5	24	35	46	70	20
24PCA Type	1.0	30	45	60	45	20
24PCB Type	5.0	85	115	145	23	20
24PCC Type	15	165	225	285	15	45
24PCD Type	30	240	330	420	11	60
24PCF Type	100	156	225	294	2.25	200
24PCG Type	250	145	212	280	0.85	500

*Non-compensated pressure sensors, excited by constant current instead of voltage, exhibit temperature compensation of Span. Application Note #1 briefly discusses current excitation.

Constant current excitation has an additional benefit of temperature measurement. When driven by a constant current source, a silicon pressure sensor's terminal voltage will rise with increased temperature. The rise in voltage not only compensates the Span, but is also an indication of die temperature.

Constant Current Excitation Schematic



Pressure Sensors

24PC Series

Gage and Differential/Unamplified-Noncompensated

SENSOR SELECTION GUIDE

2 Product Family	4 Circuit Type	PC Pressure Transducer	A Pressure Range	F* Type of Seal	A Type of Port	2 Termination Style	G Pressure Measurement
2 20PC family	**4** Noncompensated		**A** 1 psi **B** 5 psi **C** 15 psi **D** 30 psi **E** 0.5 psi **F** 100 psi **G** 250 psi	**E** EPDM **F** Fluorosilicone **N** Neoprene **S** Silicone	**A** Straight **B** Barbed **C** Luer **D** Modular **H** M5 Thread **I** 90° Port **J** Needle **K** Reverse 98 Port **L** 1/4 - 28 UNF w/Cable Lock **M** 1/4 - 28 UNF w/o Cable Lock **S** Manifold	**1** 1 x 4 (.400″) **2** 2 x 2 **6** 1 x 4 (.600″)	**G** Gage **D** Differential

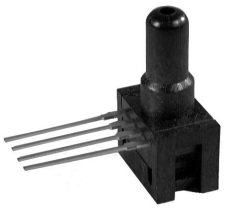
Example: 24PCAFA2G
Standard, non-compensated 1 psi sensor with fluorosilicone seal, straight port, 2 x 2 terminals, and Gage pressure measurement.
*Other media seal materials may be available.

See Accessory Guide, page 27.

Not all combinations are established. Contact 800 number before final design.

Pressure Sensors

Absolute Unamplified Noncompensated



NEW

FEATURES
- Absolute pressure measurement
- Miniature package
- 2-15 and 2-30 psi pressure ranges
- 2 mA constant current excitation significantly reduces sensitivity shift over temperature*

24PC PERFORMANCE SPECIFICATIONS

Accuracy Specifications @ 10.0 ± .01 VDC Excitation, 25°C

Parameter	Range psia	bar	Min.	Typ.	Max.	Units
Excitation			—	10	12	VDC
Null Shift	2-15	1		±2.0	±4.0	mV
0 to 25°C, 25 to 50°C	2-30	2		±2.0	±5.5	
Linearity	2-15	1		.10	.20	% Span
B.F.S.L. P2 < P1**	2-30	2		.15	.30	
Sensitivity Shift 0 to 25°C, 25 to 50°C	All			±5.0	±6.5	% Span
Repeatability & Hysteresis	All			±0.5		% Span
Input Resistance			4.0 K	5.0 K	6.0 K	Ohms
Output Resistance			4.0 K	5.0 K	6.0 K	Ohms
Weight			—	2.0	—	grams

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	−40 to +85°C (−40 to +185°F)
Storage Temperature	−55 to +100°C (−67 to +212°F)
Shock	Qualification tested to 150 G
Vibration	Qualification tested to 0 to 2 kHz, 20 G sine
Media Compatibility	Limited only to those media which will not attack polyetherimide, silicon, fluorosilicone and silicone seals.

*Span: the algebraic difference between output end points
**B.F.S.L.: Best Fit Straight Line

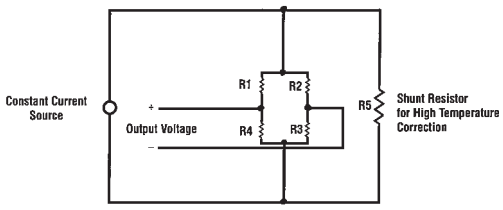
24PC ABSOLUTE ORDER GUIDE

Catalog Listing Type	Pressure Range psia	Span, mV			Null Offset mV			Sensitivity mV/psi Typ.	Over-pressure psia Typ.
		Min.	Typ.	Max.	Min.	Typ.	Max.		
24PCC	2-15	−140	−200	−260	−46	−16	+14	15	45
24PCD	2-30	−160	−300	−440	−61	−16	+29	11	60

* Non-compensated pressure sensors, excited by constant current instead of voltage, exhibit temperature compensation of Span. Application Note #1 briefly discusses current excitation.

Constant current excitation has an additional benefit of temperature measurement. When driven by a constant current source, a silicon pressure sensor's terminal voltage will rise with increased temperature. The rise in voltage not only compensates the Span, but is also an indication of die temperature.

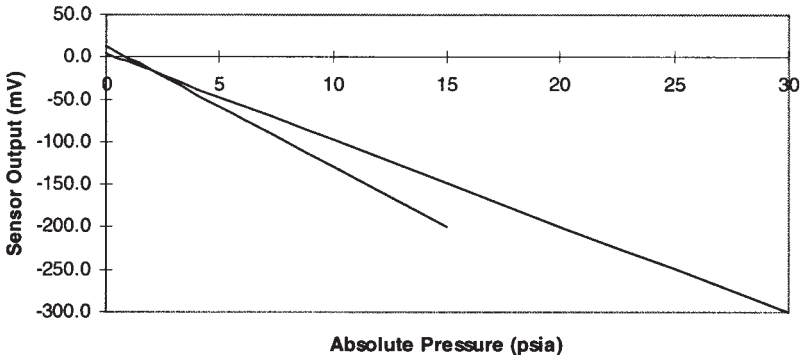
Constant Current Excitation Schematic



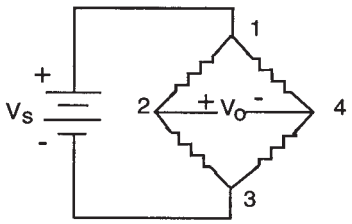
Pressure Sensors

Absolute Unamplified Noncompensated

24PC SERIES ABSOLUTE PRESSURE SENSOR OUTPUT CURVE



EXCITATION SCHEMATIC



TERMINATION STYLE
Style 6 - 1 x 4
Pin 1 = Vs (+)
Pin 2 = Output (+)
Pin 3 = Ground (–)
Pin 4 = Output (–)

Pin 1 is notched
Pin 2 is next to
Pin 1, etc.

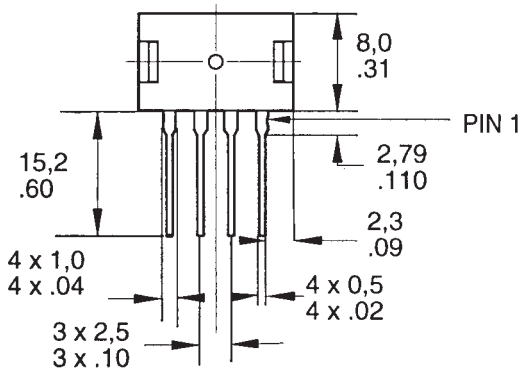
SENSOR SELECTION GUIDE

2 Product Family	4 Circuit Type	PC Pressure Transducer	C Pressure Range	F** Type of Seal	D* Type of Port (P1)	6 Termination Style	A Pressure Measurement
2 20PC Family	**4** Standard noncompensated		**C** 2-15 psia 1 bar **D** 2-30 psia 2 bar	**F** Fluoro-silicone	**A** Straight **D** Modular	**6** 1 x 4 (.600″ long)	**A** Absolute

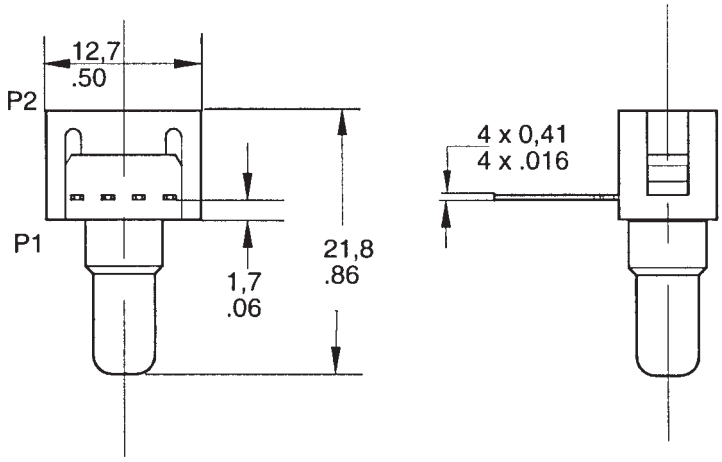
*Port type refers to P1
**Media seal is on P1 side and will not be in contact with media

Example: 24PCCFD6A
Non-compensated 15 psi Absolute sensor with fluorosilicone seal, modular port, 1 x 4 terminals, .600″ long.
See Accessory Guide, page 27.

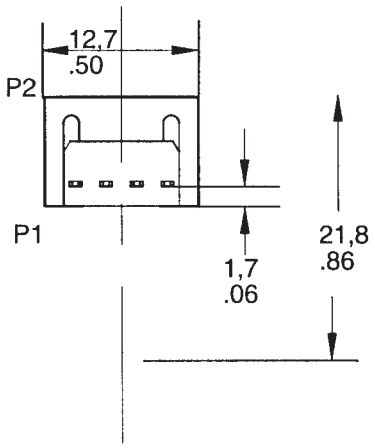
MOUNTING DIMENSIONS (for reference only)



A Straight Port



D Modular Port

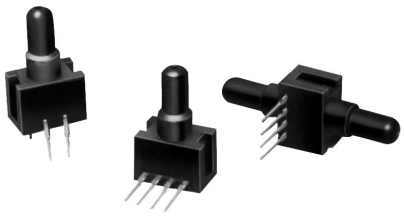


Pressure Sensors

26PC Series

Gage and Differential/Unamplified-Compensated

Temperature Compensated Sensors



FEATURES

- Lowest priced sensor with temperature compensation and calibration
- Variety of gage pressure port configurations - easily and quickly modified for your special needs
- Operable after exposure to frozen conditions
- Choice of termination for gage sensors
- Calibrated Null and Span
- Temperature compensated for Span over 0 to 50°C
- Provides interchangeability
- Can be used to measure vacuum or positive pressure
- Ideal for wet/wet differential applications

Unamplified

26PC SERIES PERFORMANCE CHARACTERISTICS at 10.0 ±0.01 VDC Excitation, 25°C

	Min.	Typ.	Max.	Units
Excitation	---	10	16	VDC
Repeatability & Hysteresis	---	±0.20	---	%Span
Response Time	---	---	1.0	msec
Input Resistance	5.5 K	7.5 K	11.5 K	ohms
Output Resistance	1.5 K	2.5 K	3.0 K	ohms
Stability over One Year	---	±0.5	---	%Span
Weight	---	2	---	grams

Total error calculation, see page 105.

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	−40° to 85°C (−40° to +185°F)
Storage Temperature	−55° to +100°C (−67° to +212°F)
Compensated Temperature	0° to +50°C (32° to +122°F)
Shock	Qualification tested to 150 g
Vibration	MIL-STD-202. Method 213 (150g halfsine, 11 msec)
Media (P1 & P2)	Limited only to those media which will not attack polyetherimide, silicon, fluorosilicone, silicone, EPDM, and neoprene seals.

26PC SERIES ORDER GUIDE

Catalog Listing	Pressure Range (psi)	Linearity (% span)		Null Shift (mV)		Null Offset (mV)			Span Shift (% span)		Span (mV)			Sensitivity mV/psi	Over-pressure psi
		Typ.	Max	Typ.	Max	Min.	Typ.	Max.	Typ.	Max.	Min.	Typ.	Max.	Typ.	Max.
26PCA TYPE	1	0.25	0.5	±0.5	±1.0	−1.5	0	+1.5	±1.0	±2.0	14.7	16.7	18.7	16.7	20
26PCB TYPE	5	0.4	0.5	±0.5	±1.0	−1.5	0	+1.5	±1.0	±1.5	47	50	53	10.0	20
26PCC TYPE	15	0.25	0.5	±0.5	±1.0	−1.5	0	+1.5	±0.75	±1.5	97	100	103	6.67	45
26PCD TYPE	30	0.1	0.2	±0.75	±1.5	−1.5	0	+1.5	±0.75	±1.5	97	100	103	3.33	60
26PCF TYPE	100	0.1	0.2	±1.0	±2.0	−2.0	0	+2.0	±0.5	±1.5	95	100	105	1.0	200
26PCJ TYPE	38*	0.1	0.5	±0.7	±1.5	−1.5	0	+1.5	±1.0	±1.5	37.5	39.5	41.5	2.63	60
26PCK TYPE	38*	0.1	0.5	±0.7	±1.5	−1.5	0	+1.5	±1.0	±1.5	37.5	39.5	41.5	2.63	60

*Accuracy specifications calculated at 15 psi.

Pressure Sensors

26PC Series

Gage and Differential/Unamplified-Compensated

SENSOR SELECTION GUIDE

2 Product Family	6 Circuit Type	PC Pressure Transducer	B Pressure Range	F* Type of Seal	A Type of Port	2 Termination Style	G Pressure Measurement
2 20PC family	**6** Compensated Calibrated		**A** 1 psi **B** 5 psi **C** 15 psi **D** 30 psi **F** 100 psi **J** 38 psi **K** 38 psi (passivated**)	**E** EPDM **F** Fluorosilicone **N** Neoprene **S** Silicone	**A** Straight **B** Barbed **C** Luer **D** Modular **H** M5 Thread **I** 90° Port **J** Needle **K** Reverse 90° Port **L** 1/4-28 UNF w/Cable Lock **M** 1/4 - 28 UNF w/o Cable Lock **S** Manifold	**1** 1 x 4 (.400″) **2** 2 x 2 **6** 1 x 4 (.600″)	**G** Gage **D** Differential

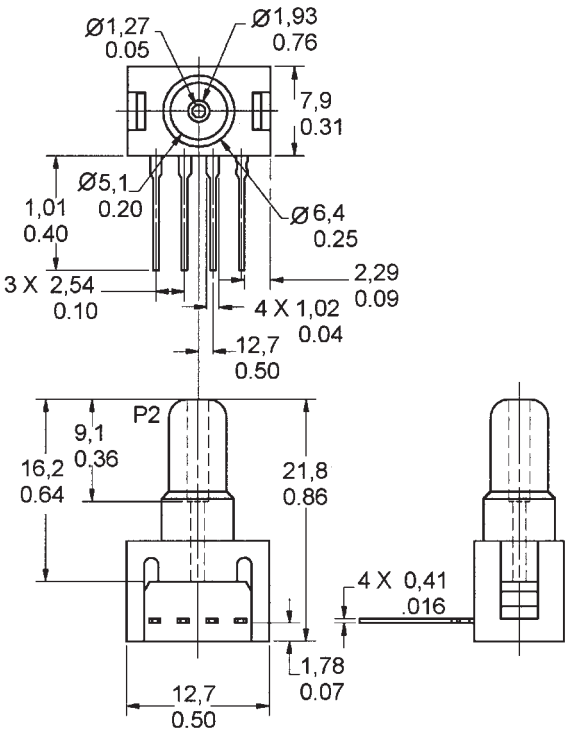
Example: 26PCBFA2G
Compensated and calibrated 5 psi sensor with fluorosilicone seal, straight port, 2 x 2 terminals, and Gage pressure measurement.
*Other media seal materials may be available.
**P2 side of die coated for environmental and dielectric protection.

See Accessories Guide, page 27.

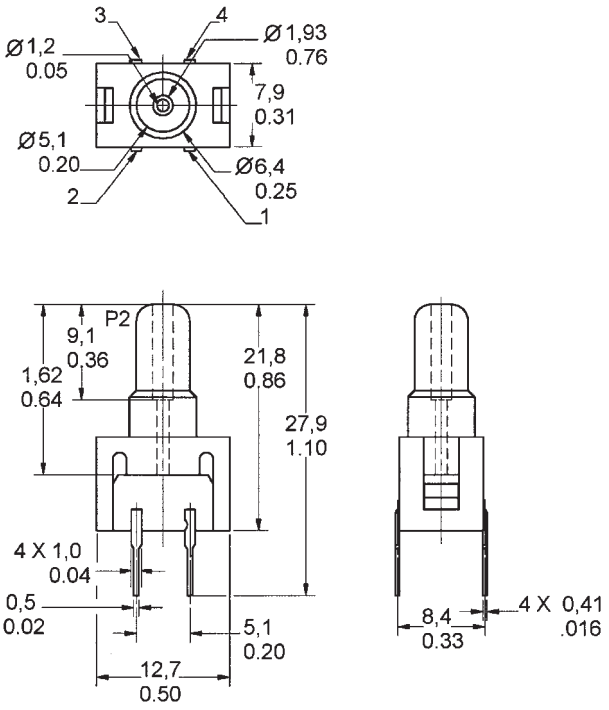
Not all combinations are established. Contact 800 number before final design.

GAGE SENSOR
Pressure is applied to port P2. Port P1 vents to ambient pressure

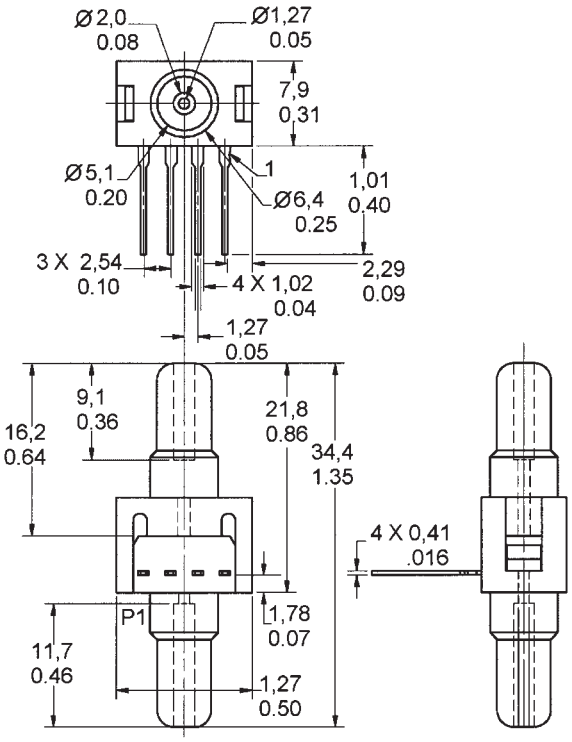
Mounting Dimensions (for reference only)
1 x 4 Termination (Style 1), Straight Port (Style A)
Pin 1 is notched, and is shown at the right of the package. Pin 2 is next to Pin 1, etc.



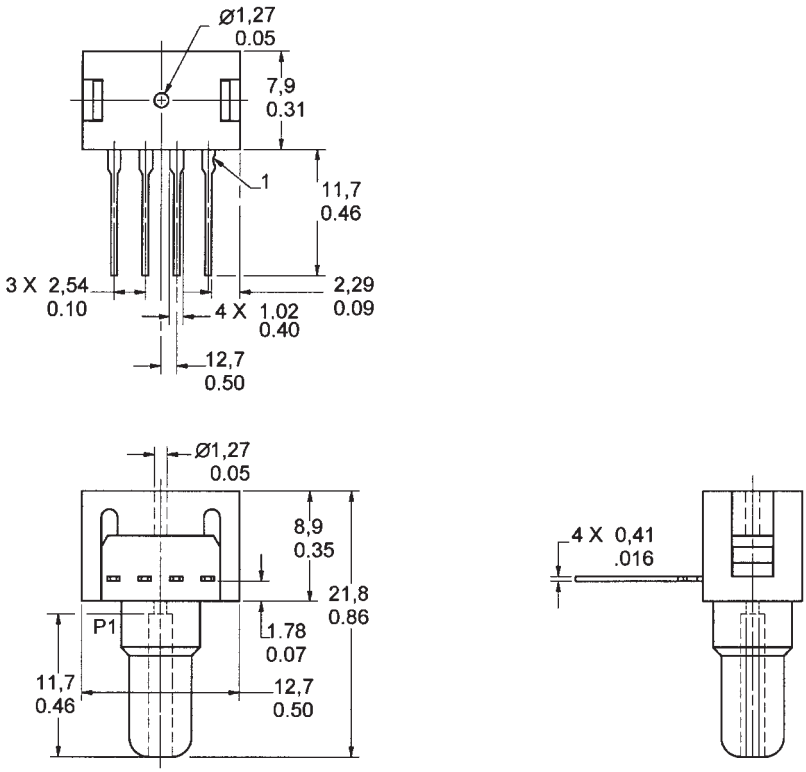
2 x 2 Termination (Style 2), Straight Port (Style A)
Pin 1 is notched and is shown at lower right corner. Pins 2, 3, and 4 are clockwise.



Straight Port, 1 x 4 Termination (Style 1) ONLY
Port 1 is near terminals

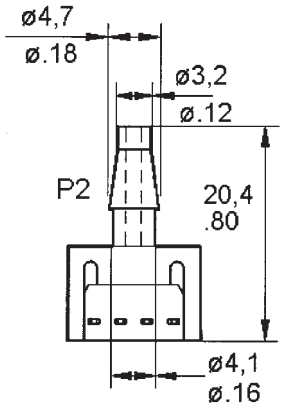


Absolute Sensor
1 x 4 Termination (Style 1), Port 1 is near terminals

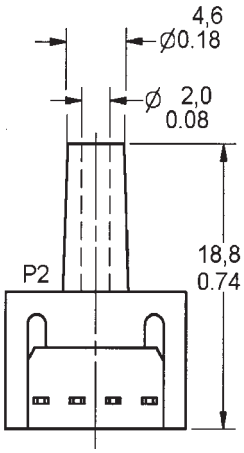


OTHER GAGE SENSOR PORT STYLES
(2 x 2 or 1 x 4 Termination)

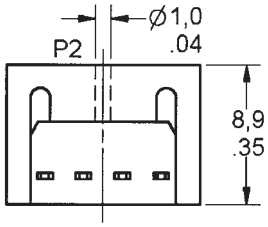
B Barbed



C Luer



D Modular



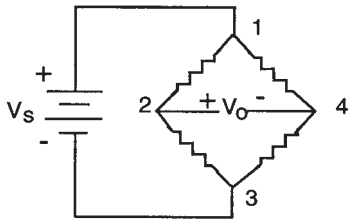
20PC SERIES CIRCUIT - NOTES

1. Circled numbers refer to Sensor Terminals (interface pins).
2. V_O increases with pressure change.
3. $V_O = V_2 - V_4$
4. Pin 1 designated with a notch.

Pin Designation

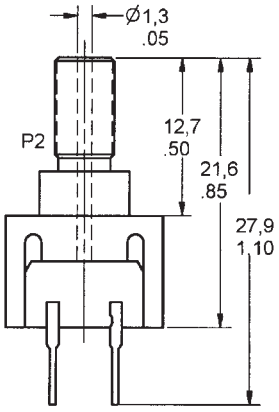
Pin 1 = V_S (+)
Pin 2 = Output (+)
Pin 3 = Ground (−)
Pin 4 = Output (−)

EXCITATION

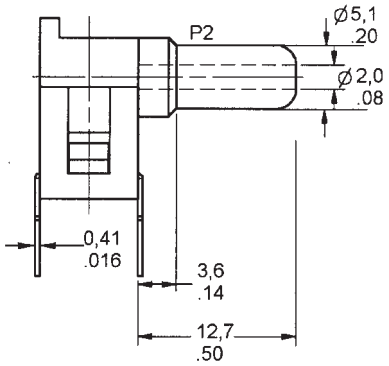


H M5 Thread

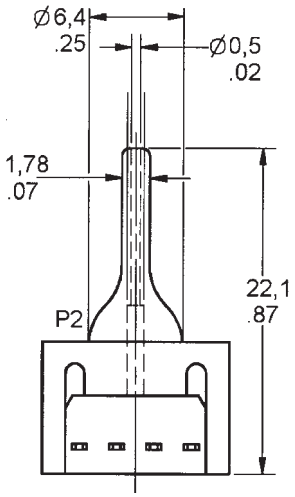
O-Ring Size 007 O-Ring Counterbore
1,02 mm (.040) deep ±0,13 (.005) x 7,6 mm (.30) ±0,8 (.003)



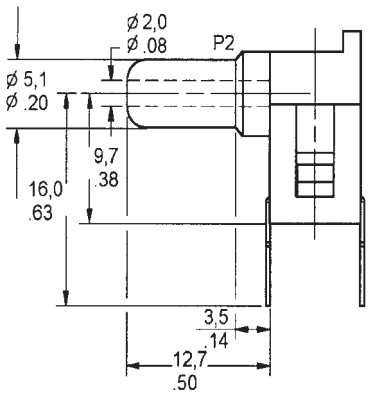
I 90°



J Needle



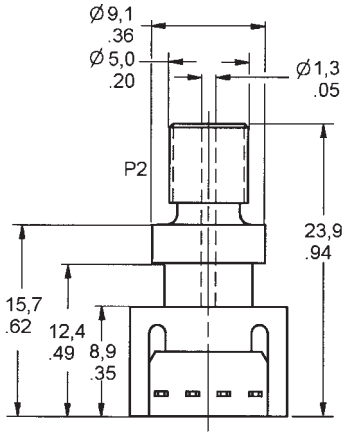
K Reverse 90°



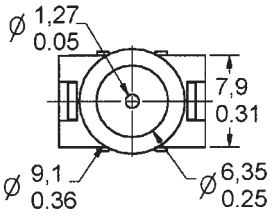
Unamplified

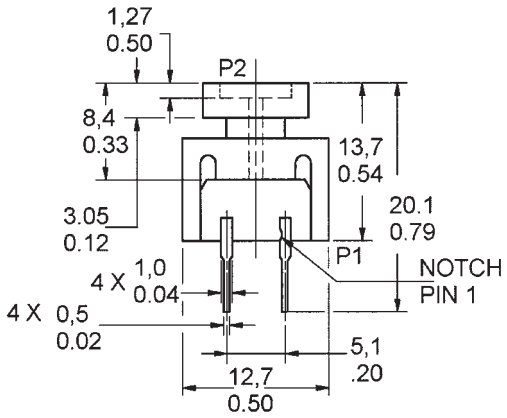
OTHER GAGE SENSOR PORT STYLES
(2 x 2 or 1 x 4 Termination)

M 1/4-28 UNF Thread
O-Ring Size 009 O-Ring Counterbore
1,02 mm (.040) deep ±0,05 (.002) x 9,1 mm (.360) ±0,8 (.003)

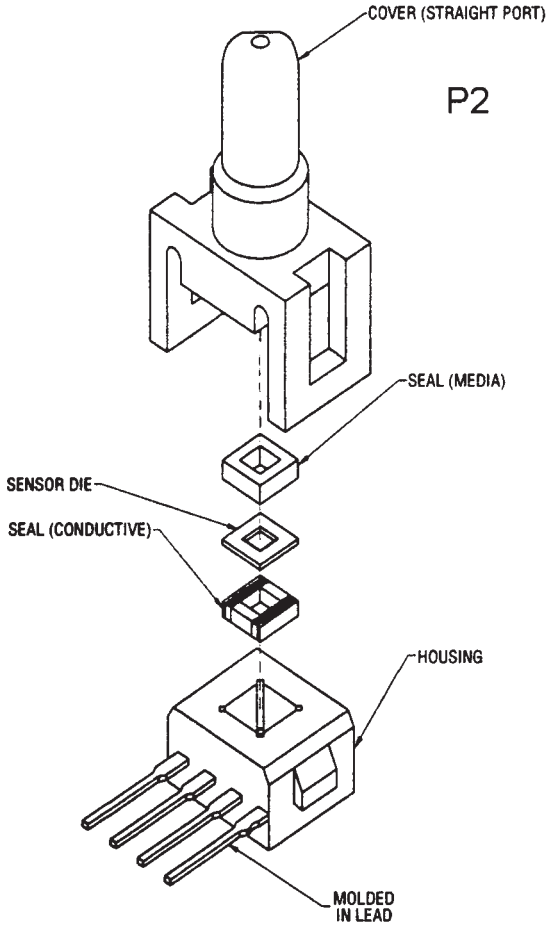


S Manifold





20PC Construction



Pressure Sensors

24PC Series

Gage Unamplified Noncompensated Flow-Through

FEATURES

- Measures positive and negative gage pressures
- Flow-through port design fits in-line with application
- Popular port sizes:
  - 8 mm (.315 in.) OD (1/4 in. ID tubing or standard connectors)
  - 0.144 in. OD (1/8 in. ID tubing)
- Medical grade ISO 10993-1 (USP Class 6) port material
- Silicon sensor chip
- 24 inch wire harness with splash proof connector
- Minimal deadspace — efficient cleansing and disinfecting

Unamplified

24PC SERIES PERFORMANCE CHARACTERISTICS at 10.0 ±0.01 VDC EXCITATION, 25°C

	Min.	Typ.	Max.	Units
Excitation	---	10	12	VDC
Null Shift, 25° to 0°, 25° to 50°C	---	±2.0	---	mV
Null Offset	−30	0	+30	mV
Linearity, P2 > P1, BFSL	---	±0.5	---	%Span
Span Shift, 25° to 0°, 25° to 50°C	---	±5.0	---	%Span
Repeatability & Hysteresis	---	±0.2	---	%Span
Response Time	---	---	1.0	msec
Input Resistance	4.0 K	5.0 K	6.0 K	ohms
Output Resistance	4.0 K	5.0 K	6.0 K	ohms
Stability over One Year	---	±0.5	---	%Span

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	−40° to +85°C (−40° to +185°F)
Storage Temperature	−55° to +100°C (−67° to +212°F)
Shock	Qualification tested to 150 g
Vibration	Qualification tested to 0 to 2 kHz, 20 g sine
Media Compatibility	Limited only to those media which will not attack polysulfone, silicon, fluorosilicone, silicone, EPDM, and neoprene seals

24PC SERIES FLOW THROUGH ORDER GUIDE

Catalog Listing	Pressure Range psi	Span, mV			Sensitivity mV/psi Typ.	Overpressure psi Max.
		Min.	Typ.	Max.		
24PCE Type	0.5	25	35	45	70	20
24PCA Type	1.0	30	45	60	45	20
24PCB Type	5.0	85	115	145	23	20
24PCC Type	15	165	225	285	15	45
24PCD Type	30	240	330	420	11	60
24PCF Type	100	156	225	294	2.25	200
24PCG Type	250	145	212	280	0.85	500

Pressure Sensors

24PC Series

Gage Unamplified Noncompensated Flow-Through

SENSOR SELECTION GUIDE

2 Product Family	4 Circuit Type	PC Pressure Transducer	A Pressure Range	F* Type of Seal	N Port Type	5 Termination Style	G Pressure Measurement
2 20PC Family	**4** Noncompensated		**A** 1 psi **B** 5 psi **C** 15 psi **D** 30 psi **E** 0.5 psi **F** 100 psi **G** 250 psi	**E** EPDM **F** Fluorosilicone **N** Neoprene **S** Silicone	**G** Small **N** Large (.350 dia.) **P** Large (.315 dia.)	**2** 4-pin DIP **5** Wire harness **6** 4-pin SIP	**G** Gage

Example: 24PCBFG5G
Non-compensated 5 psi sensor, fluorosilicone seal, small flow-through ports, wire harness, and gage pressure measurement.
*Other media seal materials may be available.

Note: Not all combinations are established. Contact 800 number before final design.

See Accessory Guide, page 27.

Pressure Sensors

26PC Series

Gage Unamplified Compensated Flow-Through

FEATURES

- Measure positive and negative gage pressures
- Flow-through port design fits in-line with application
- Popular port sizes:
  - 8 mm (.315 in.) OD (1/4 in. ID tubing or standard connectors)
  - 0.144 in. OD (1/8 in. ID tubing)
- Medical grade ISO 10993-1 (USP Class 6) port material
- Silicon sensor chip
- 24 inch wire harness with splash proof connector
- Minimal deadspace — efficient cleansing and disinfecting

Unamplified

26PC SERIES PERFORMANCE CHARACTERISTICS at 10.0 ±0.01 VDC Excitation, 25°C

	Min.	Typ.	Max.	Units
Excitation	---	10	16	VDC
Repeatability & Hysteresis	---	±0.20	---	%Span
Response Time	---	---	1.0	msec
Input Resistance	5.5 K	7.5 K	11.5 K	ohms
Output Resistance	1.5 K	2.5 K	3.0 K	ohms
Stability over One Year	---	±0.5	---	%Span
Weight	---	2	---	grams

Total error calculation, see page 105.

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	−40° to 85°C (−40° to +185°F)
Storage Temperature	−55° to +100°C (−67° to +212°F)
Compensated Temperature	0° to +50°C (32° to +122°F)
Shock	Qualification tested to 150 g
Vibration	MIL-STD-202. Method 213 (150g halfsine, 11 msec)
Media (P1 & P2)	Limited only to those media which will not attack polyetherimide, silicon, fluorosilicone, silicone, EPDM, and neoprene seals.

26PC SERIES ORDER GUIDE

Catalog Listing	Pressure Range (psi)	Linearity (% span)		Null Shift (mV)		Null Offset (mV)			Span Shift (% span)		Span (mV)			Sensitivity mV/psi	Over-pressure psi
		Typ.	Max	Typ.	Max	Min.	Typ.	Max.	Typ.	Max.	Min.	Typ.	Max.	Typ.	Max.
26PCA TYPE	1	0.25	0.5	±0.5	±1.0	−1.5	0	+1.5	±1.0	±2.0	14.7	16.7	18.7	16.7	20
26PCB TYPE	5	0.4	0.5	±0.5	±1.0	−1.5	0	+1.5	±1.0	±1.5	47	50	53	10.0	20
26PCC TYPE	15	0.25	0.5	±0.5	±1.0	−1.5	0	+1.5	±0.75	±1.5	97	100	103	6.67	45
26PCD TYPE	30	0.1	0.2	±0.75	±1.5	−1.5	0	+1.5	±0.75	±1.5	97	100	103	3.33	60
26PCF TYPE	100	0.1	0.2	±1.0	±2.0	−2.0	0	+2.0	±0.5	±1.5	95	100	105	1.0	200
26PCJ TYPE	38*	0.1	0.5	±0.7	±1.5	−1.5	0	+1.5	±1.0	±1.5	37.5	39.5	41.5	2.63	60
26PCK TYPE	38*	0.1	0.5	±0.7	±1.5	−1.5	0	+1.5	±1.0	±1.5	37.5	39.5	41.5	2.63	60

*Accuracy specifications calculated at 15 psi.

Pressure Sensors

26PC Series

Gage Unamplified Compensated Flow-Through

SENSOR SELECTION GUIDE

2 Product Family	6 Circuit Type	PC Pressure Transducer	A Pressure Range	F* Type of Seal	N Port Type	5 Termination Style	G Pressure Measurement
2 20PC Family	**6** Compensated, Calibrated		**A** 1 psi **B** 5 psi **C** 15 psi **D** 30 psi **F** 100 psi **J** 38 psi **K** 38 psi (passivated)	**E** EPDM **F** Fluorosilicone **N** Neoprene **S** Silicone	**G** Small **N** Large (.350 dia.) **P** Large (.315 dia.)	**2** 4-pin DIP **5** Wire harness **6** 4-pin SIP	**G** Gage

Example: 26PCBFG5G
Compensated, calibrated 5 psi sensor, fluorosilicone seal, small flow-through ports, wire harness, and gage pressure measurements.
*Other media seal materials may be available.

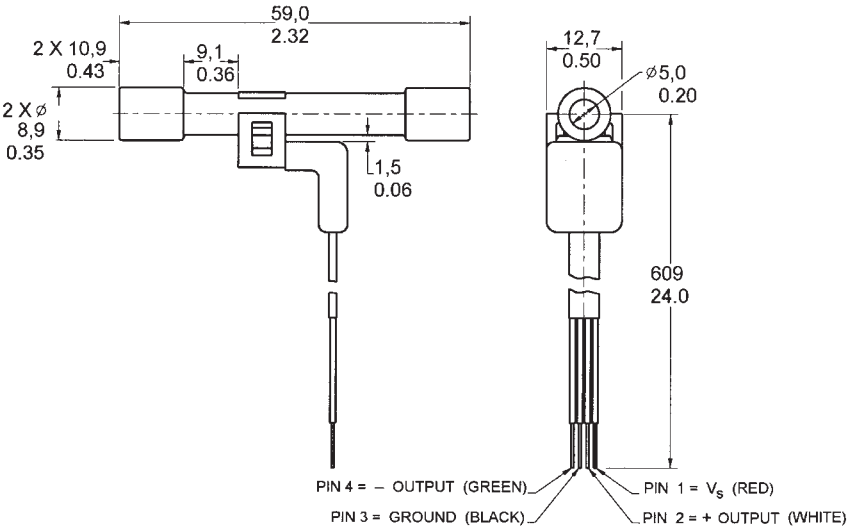
Note: Not all combinations are established. Contact 800 number before final design.

See Accessory Guide, page 27.

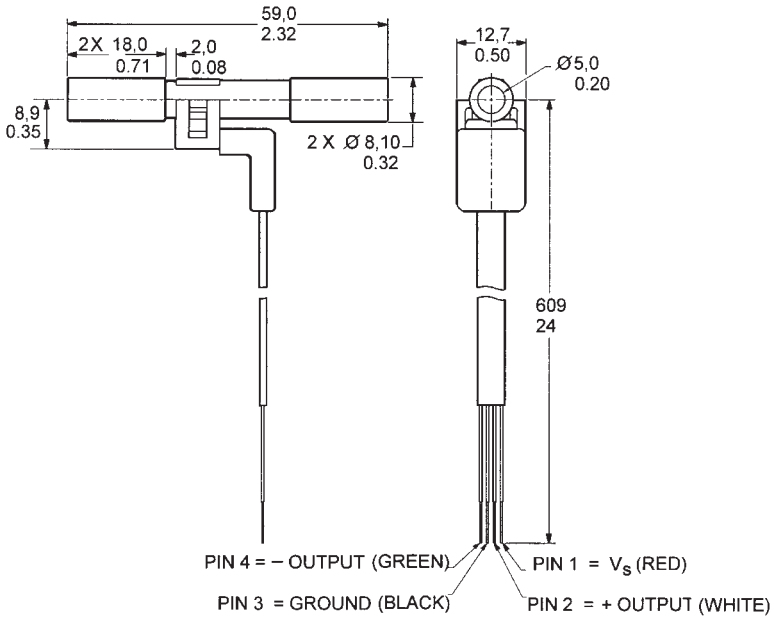
Gage Unamplified Flow-Through

MOUNTING DIMENSIONS (for reference only)

Large Port Sensor N



Large Port Sensor P



NOTE: Wire harness (PC-15175) may be purchased separately.

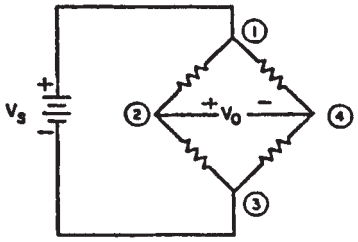
20PC CIRCUIT NOTES

1. Circled numbers refer to Sensor Terminals (interface pins).
2. V_0 increases with pressure change.
3. $V_0 = V_2 - V_4$

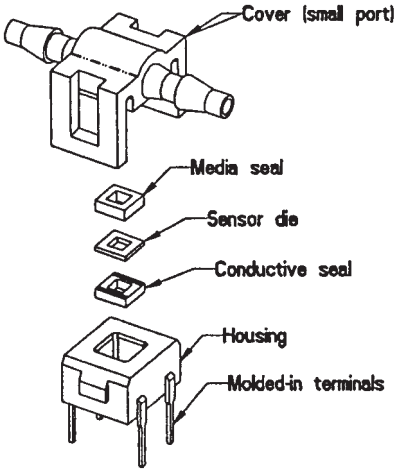
PIN DESIGNATION

Pin 1 = V_s (Red)
Pin 2 = Output, + (White)
Pin 3 = Ground, – (Black)
Pin 4 = Output, – (Green)

EXCITATION



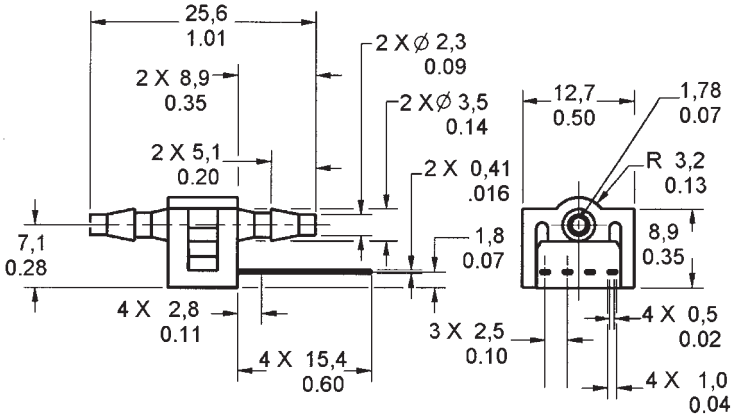
Flow-Through Construction



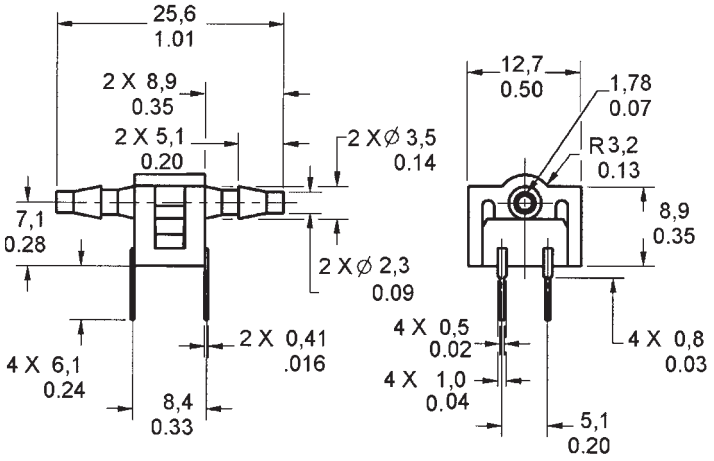
Unamplified

MOUNTING DIMENSIONS (for reference only)

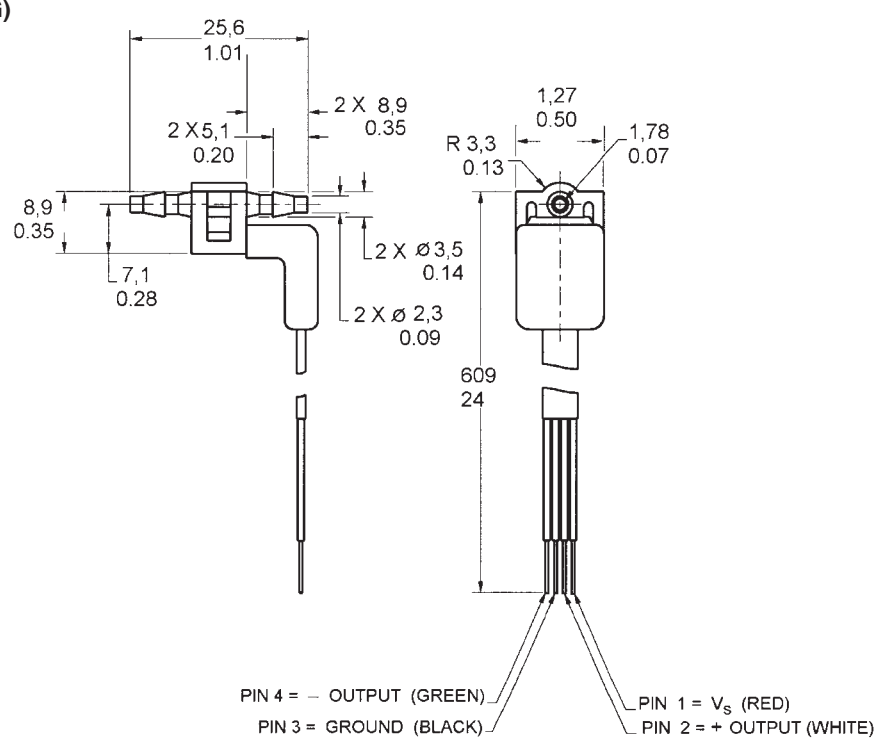
Small Port Sensor (1 x 4)



Small Port Sensor (2 x 2)



Small Port Sensor (G)



ACCESSORIES SELECTION GUIDE

Catalog Listing	Description	Drawing
PC-10182	Steel lockring (included with Port Style A, 1 x 4 terminals only) 22, 24, 26PC only	Figure 1
PC-15111	Cable retaining clip for large port Flow-Through sensor only	Figure 4
PC-15110	Single hole plastic bracket	Figure 3
PC-15015	Mounting bracket	Figure 6
PC-15132	Plastic Mounting bracket	Figure 5
20PCWHRC	Flow-Through wire harness and retaining clip	Figure 2
26PCBKT	Mounting bracket for large port Flow-Through sensor only	Figure 7
PC-15202	Mounting bracket for Luer Port	Figure 8
PC-15204	Mounting bracket for Straight Port	Figure 9

Figure 1 PC-10182
Steel Lockring

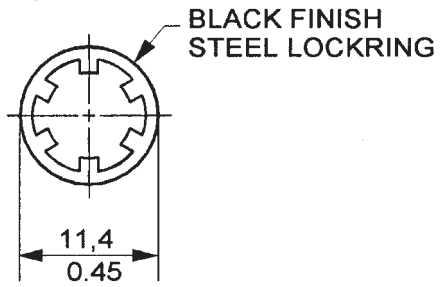


Figure 2 20PCWHRC
Wire Harness and Retaining Clip

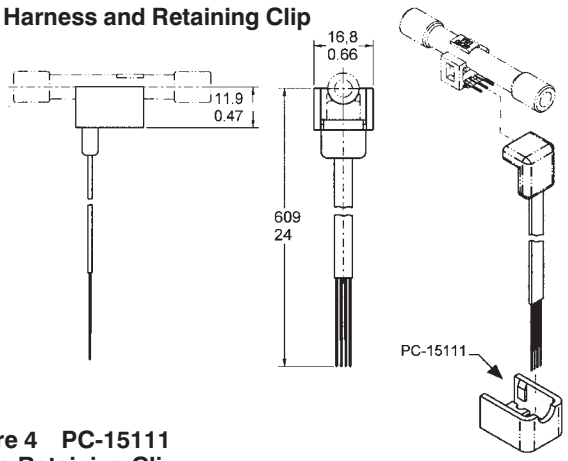


Figure 3 PC-15110
Single Hole Plastic Bracket

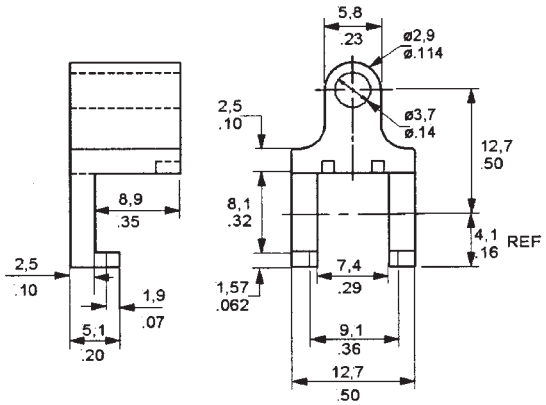


Figure 4 PC-15111
Cable Retaining Clip

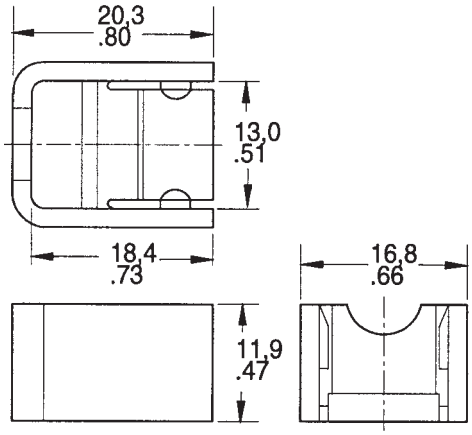


Figure 5 PC-15132
Plastic Mounting Bracket

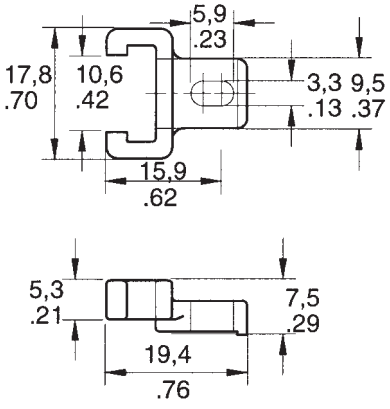
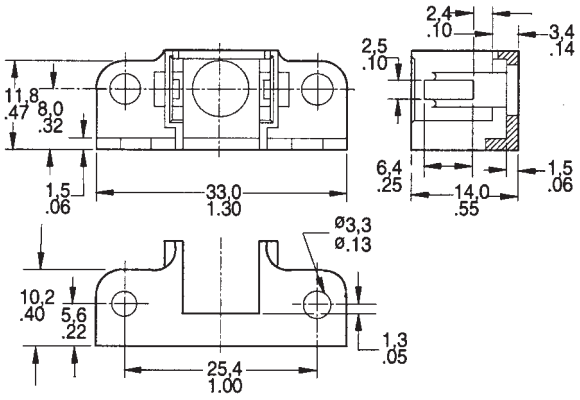


Figure 6 PC-15015
Mounting Bracket



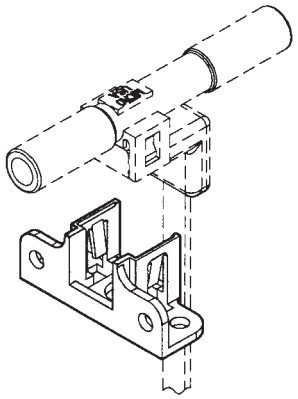
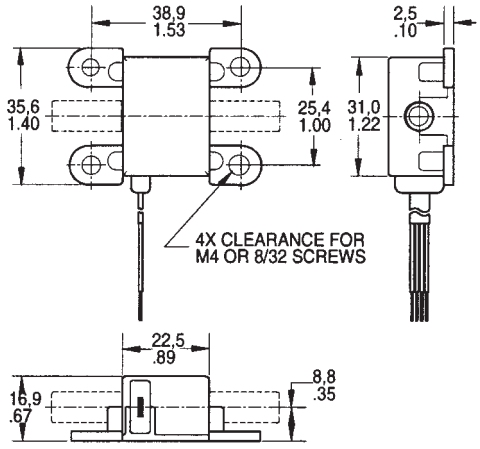


Figure 7 26PCBKT
For use with N, P Large Ports



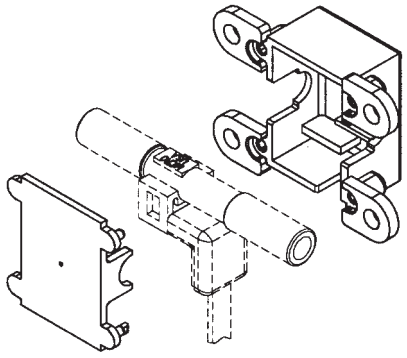


Figure 8 PC-15202
For use with C Luer Port

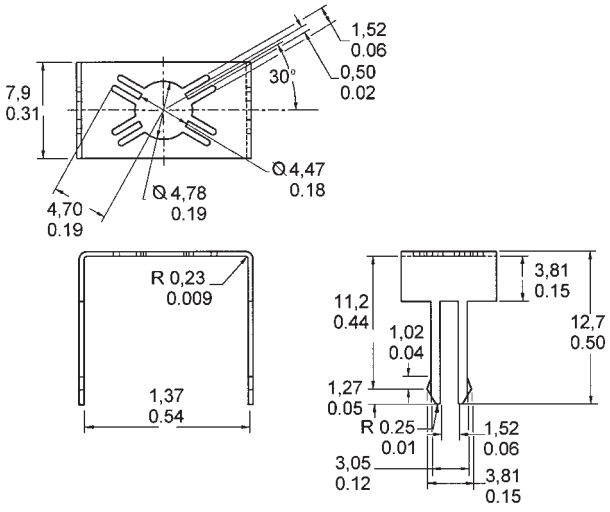
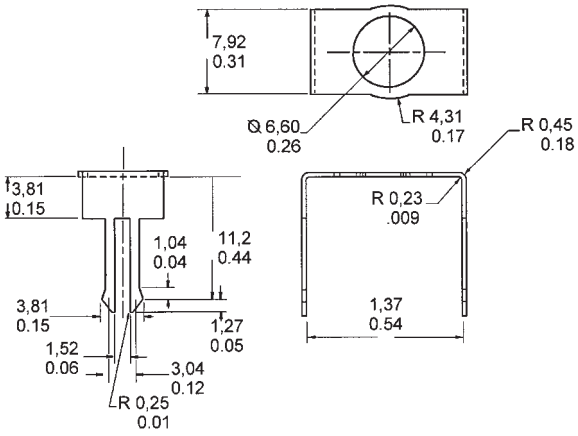


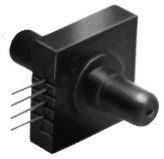
Figure 9 PC-15204
For use with A Straight Port



Note: PC-15202 and PC-15204 are Printed Circuit Board mountable and solderable; designed to be used in a .063 thick PC Board with a recommended mounting hole size of .125 ±.005 in.

Low Pressure Gage & Differential/Unamplified

Temperature Compensated Sensors



FEATURES

- Miniature package
- Low pressure measurement
- Calibrated Null and Span
- Temperature compensated for Span over 0 to 50°C
- Provides interchangeability

176PC SERIES PERFORMANCE CHARACTERISTICS at 10.0 ±0.01 VDC Excitation, 25°C

	Min.	Typ.	Max.	Units
Excitation	---	10	16	VDC
Null Offset	–2	0	+2	mV
Null Shift, 25° to 0°, 25° to 50°C	---	±3.0	---	mV
Sensitivity Shift, 25° to 0°, 25° to 50°C	--- ---	--- ---	±4.0[1] ±3.5[2]	%Span %Span
Repeatability & Hysteresis	---	±0.25	---	%Span
Response Time	---	---	1.0	msec
Input Resistance	---	6.3 K	---	ohms
Output Resistance	---	4.0 K	---	ohms
Stability over One Year	---	±0.5	---	%Span
Weight	---	7	---	grams

Key: 1 = 0-7″, 0-14″ H_2O only
2 = 0-28″ H_2O only

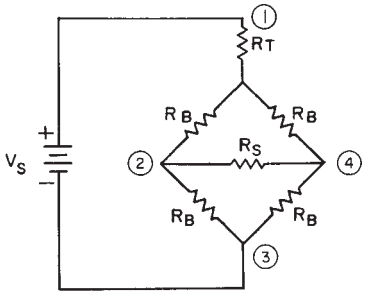
ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	–40° to +85°C (–40° to +185°F)
Storage Temperature	–55° to +125°C (–67° to +257°F)
Compensated Temperature	0° to +50°C (32° to +122°F)
Shock	MIL-STD-202, Method 213 (150 g, half sine, 11 msec)
Vibration	MIL-STD-202, Method 204 (10 to 2000 Hz at 20 g)
Media	P2 port Wetted materials; polyester housing, epoxy adhesive, silicon, borosilicate glass, and silicon-to-glass bond*
	P1 port Dry gases only

* Liquid media containing some highly ionic solutions could potentially neutralize the chip-to-glass tube bond.

ELECTRICAL CONNECTIONS

(Internal Circuitry Shown)



NOTES

1. Circled numbers refer to sensor termination.
2. $V_0 = V_2 - V_4$ (referenced to pin 3).
3. R_B = Strain gage resistors (~4.8 kΩ).
4. R_T = Sensitivity temperature compensation resistor.
5. R_S = Sensitivity calibration resistor.

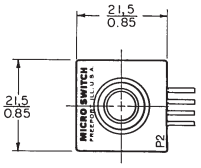
When a positive pressure is applied to port P2, the differential voltage $V_2 - V_4$ (voltage at pin 2, with respect to ground, increases and voltage at pin 4 decreases) increases linearly with respect to the input pressure. When a vacuum pressure is pulled at port P2 (or positive pressure applied to port P1) the voltage $V_2 - V_4$ decreases linearly with respect to the input pressure.

176PC SERIES ORDER GUIDE

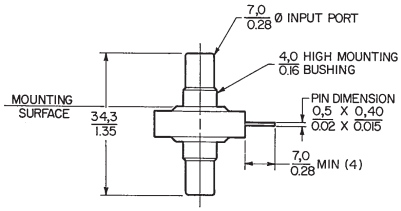
Catalog Listing	Pressure Range H_2O	Span, mV			Sensitivity mV/″H_2O	Overpressure ″H_2O	Linearity, %Span	
		Min.	Typ.	Max.	Typ.	Max.	P2 > P1 Max.	P2 < P1 Max.
176PC07HG2	0-7	26	28	30	4.00	140	±3.00	±1.50
176PC07HD2	0-7	26	28	30	4.00	140	±3.00	±1.50
176PC14HG2	0-14	33	35	37	2.50	140	±3.00	±1.50
176PC14HD2	0-14	33	35	37	2.50	140	±3.00	±1.50

MOUNTING DIMENSIONS (For reference only)

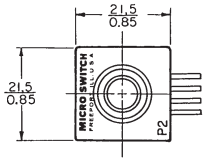
Differential Types

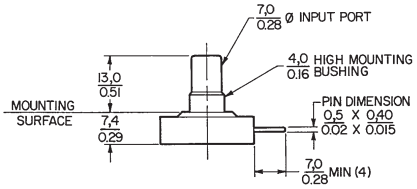


Terminals
1 – Vs (+)
2 – Output A
3 – Ground (–)
4 – Output B

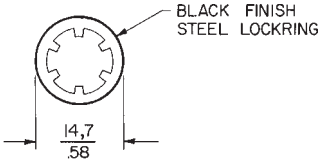


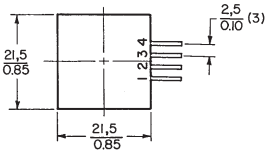
Gage Types



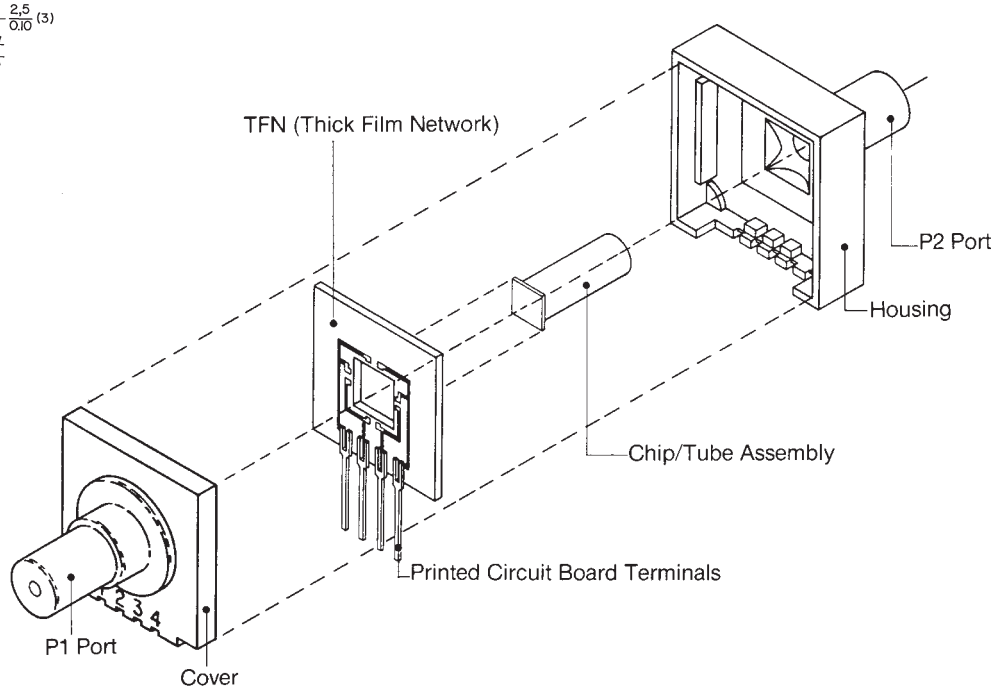


Mounting Hardware - PC10198

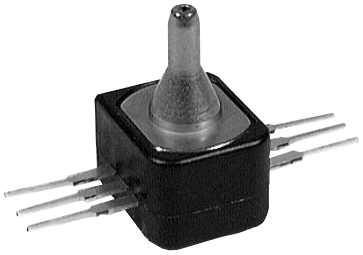




170PC CONSTRUCTION



Pressure Sensors
Miniature Signal Conditioned



NEW

FEATURES
- Smallest amplified sensor package
- Minimal PCB space
- Fully signal conditioned
- Operating temperature range from −45° to +125°C
- Silicon piezoresistive technology
- Monolithic design
- 6 Pin DIP package
- Port designed for O-ring interface
- Excellent media compatibility
- Accuracy of 0.2%

PERFORMANCE CHARACTERISTICS

Pressure Range	±50 mm Hg	0-15 psi	0-100 psi	0-150 psi	0-250 psi
Overpressure, max.	±170 mm Hg	45 psi	200 psi	300 psi	500 psi
Supply Voltage	5 VDC ±0.25				
Supply Current	10 mA max.				
Output Source Current	0.5 mA max.				
Output Sink Current	1.0 mA max.				
Operating Temperature	−45° to +125°C (−49° to +257°F)				
Storage Temperature	−55° to +125°C (−67° to +257°F)				
Hysteresis & Repeatability	0.15% Span, Typ.				
Ratiometricity (at 4.75 to 5.25 Supply Voltage)	±0.25% Span, Typ.				
Output Load Capacitance	0.05 microtarads, max.				
Full Scale					
−50 mm Hg	0.50 VDC Typ.				
+50 mm Hg	4.50 VDC Typ.				
All other pressure ranges	4.50 VDC Typ.				
Media Compatibility P1 port	DRY GASES ONLY: Media must be compatible with epoxy based adhesive				
P2 port	Media must be compatible with glass, silicon, stainless steel, invar, Sn/Ni plating or Sn/Ag solder				

Amplified

40PC SERIES ORDER GUIDE

Catalog Listing	Pressure Range psi	Pressure Type	Lead Style
40PC001B1A	±50 mm Hg	Bi-directional	1-unformed
40PC001B2A	±50 mm Hg	Bi-directional	2-formed away from port
40PC001B3A	±50 mm Hg	Bi-directional	3-formed towards port
40PC015G1A	0-15	Gage	1-unformed
40PC015G2A	0-15	Gage	2-formed away from port
40PC015G3A	0-15	Gage	3-formed towards port
40PC100G1A	0-100	Gage	1-unformed
40PC100G2A	0-100	Gage	2-formed away from port
40PC100G3A	0-100	Gage	3-formed towards port
40PC150G1A	0-150	Gage	1-unformed
40PC150G2A	0-150	Gage	2-formed away from port
40PC150G3A	0-150	Gage	3-formed towards port
40PC250G1A	0-250	Gage	1-unformed
40PC250G2A	0-250	Gage	2-formed away from port
40PC250G3A	0-250	Gage	3-formed towards port

Note: For tubing and O-Ring interface recommendations, see the 40PC Application Note in the Reference Section.

OUTPUT PERFORMANCE CHARACTERISTICS @ 25°C, 5VDC (unless otherwise noted)

Pressure Range	Null (VDC)	Span (VDC)	Sensitivity, Typ.	Linearity, B.F.S.L. (% Span) Max.		Null Shift (% Span) Max.	Span Shift (% Span) Max.	Combined Null and Span Shift (% Span) Max.
±50 mm Hg	2.50 ± 0.050	4.00 Typ.	40.0 mV/mm Hg	0.80	+25° to +50°C	±1.50	±1.50	—
					+25° to 0°C	±1.50	±1.50	—
0 to 15 psi	0.50 ± 0.11	4.00 ± 0.11	266.6 mV/psi	0.20	+25° to −18°C	±2.00	±0.75	±2.00
					+25° to +63°C	±2.00	±0.75	±2.00
					+25° to −45°C	±2.75	±1.00	±3.00
					+25° to +85°C	±2.75	±1.00	±3.00
					+25° to +125°C	—	—	—
0 to 100 psi	0.50 ± 0.04	4.00 ± 0.09	40.0 mV/psi	0.10	+25° to −18°C	±1.25	±0.75	±1.50
					+25° to +63°C	±1.25	±0.75	±1.50
					+25° to −45°C	±2.00	±1.00	±2.50
					+25° to +85°C	±2.00	±1.00	±2.50
					+25° to +125°C	±3.00	±2.00	±3.00
0 to 150 psi	0.50 ± 0.04	4.00 ± 0.07	26.6 mV/psi	0.10	+25° to −18°C	±0.75	±0.75	±0.75
					+25° to +63°C	±0.75	±0.75	±0.75
					+25° to −45°C	±1.00	±1.00	±1.00
					+25° to +85°C	±1.00	±1.00	±1.00
					+25° to +125°C	±1.50	±1.50	±1.50
0 to 250 psi	0.50 ± 0.04	4.00 ± 0.07	16.0 mV/psi	0.10	+25° to −18°C	±0.75	±0.75	±0.75
					+25° to +63°C	±0.75	±0.75	±0.75
					+25° to −45°C	±1.00	±1.00	±1.00
					+25° to +85°C	±1.00	±1.00	±1.00
					+25° to +125°C	±2.00	±2.00	±3.00

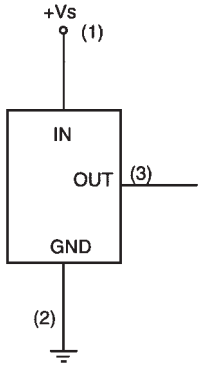
PERFORMANCE SPECIFICATIONS, TEMPERATURE/ACCURACY

Temperature Range	Total Accuracy (% Span) Max.			
	0 to 15 psi	**0 to 100 psi**	**0 to 150 psi**	**0 to 250 psi**
25°C	±0.4 (RSS)	±0.2 (RSS)	±0.2 (RSS)	±0.2 (RSS)
−18° to +63°C	±4.0	±2.5	±2.0	±2.0
−45° to +85°C	±4.0	±2.5	±2.0	±2.0
−45° to +125°C		±3.0	±2.5	±3.0

Note 1: Accuracy at 25°C is defined as RSS error for linearity, hysteresis, and repeatability.

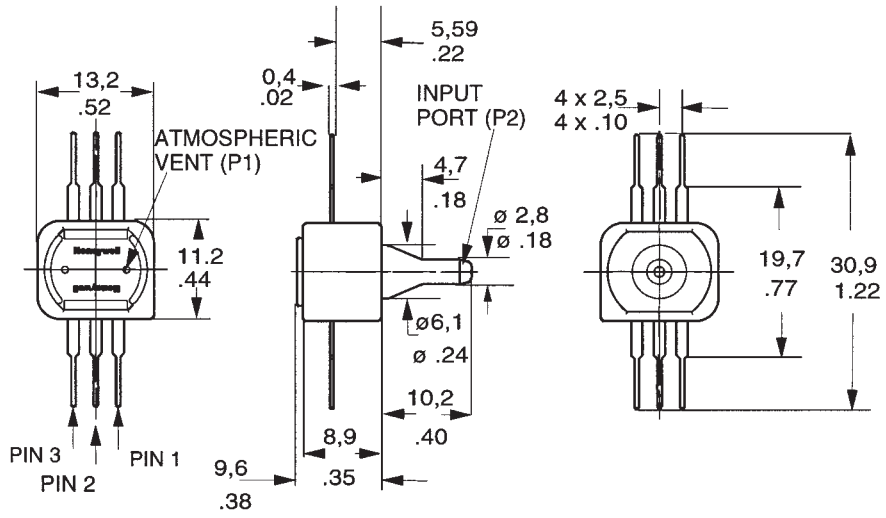
Note 2: Total accuracy is the maximum deviation from the 25°C reference transfer function at any pressure or temperature over the specified ranges. This calculation includes null, span, linearity, hysteresis, repeatability, null shift, and span shift.

ELECTRICAL CONNECTION



NOTES:
1. Square corner marks pin 1 (Vs).
2. Output is short circuit protected.

MOUNTING DIMENSIONS (for reference only) mm/In.

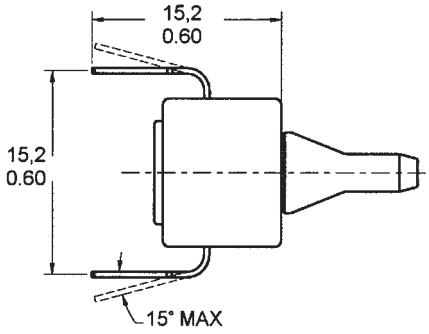


Lead Style 1

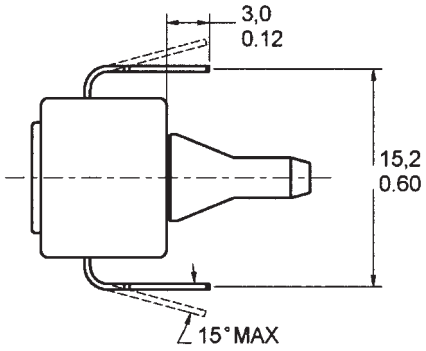
NOTE:
P1 - DRY GASES ONLY: Media must be compatible with epoxy based adhesive.
P2 - Media must be compatible with glass, silicon, stainless steel, invar, Sn/Ni plating or Sn/Ag solder.

Amplified

Lead Style 2



Lead Style 3



Pressure Sensors
Monolithic Signal Conditioned

NEW

FEATURES
- Operating temperature range – −45° to +125°C (−49° to +257°F)
- Monolithic design
- Compatible with media from dry air and water to refrigerant coolants and engine fuels
- 0.2% accuracy
- Rugged stainless steel and brass construction

The 4000 PC Series Package allows use in harsh environmental conditions, such as industrial and off-road applications. The sensor is available with a Packard Connector 12078090 or a connector harness with leadwires.

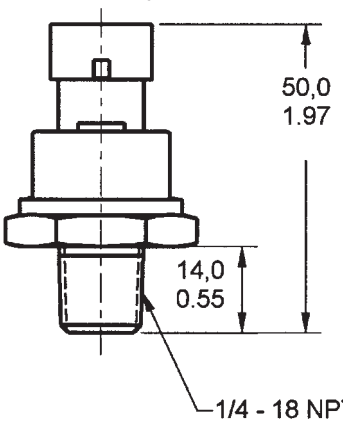
PERFORMANCE CHARACTERISTICS

Pressure Range	±50 mm Hg	0-15 psi	0-100 psi	0-150 psi	0-250 psi
Overpressure, max.	±170 mm Hg	45 psi	200 psi	300 psi	500 psi
Supply Voltage	5 VDC ±0.25				
Supply Current	10 mA max.				
Output Source Current	0.5 mA max.				
Output Sink Current	1.0 mA max.				
Operating Temperature	−45° to +125°C (−49° to +257°F)				
Storage Temperature	−55° to +125°C (−67° to +257°F)				
Hysteresis & Repeatability	0.15% Span, Typ.				
Ratiometricity (at 4.75 to 5.25 Supply Voltage)	±0.25% Span, Typ.				
Output Load Capacitance	0.05 microfarads, max.				
Full Scale					
	−50 mm Hg	0.50 VDC Typ.			
	+50 mm Hg	4.50 ± 0.12 VDC Typ.			
	All other pressure ranges	4.50 VDC Typ.			
Media Compatibility	Media must be compatible with fluorosilicone, fluorocarbon, glass, silicon, stainless steel, invar, Sn/Ni plating or Sn/Ag solder				

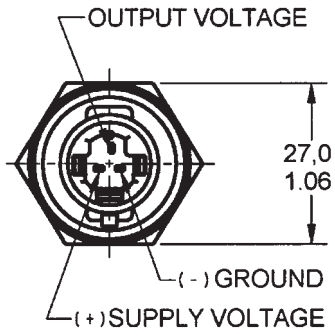
4000PC SERIES ORDER GUIDE

Catalog Listing	Gage Pressure Range	Termination
4040PC001B4D	±50 mm Hg	Packard Connector
4040PC001B5D	±50 mm Hg	Connector with Leadwires
4040PC015G4D	0 to 15 psi	Packard Connector
4040PC015G5D	0 to 15 psi	Connector with Leadwires
4040PC100G4D	0 to 100 psi	Packard Connector
4040PC100G5D	0 to 100 psi	Connector with Leadwires
4040PC150G4D	0 to 150 psi	Packard Connector
4040PC150G5D	0 to 150 psi	Connector with Leadwires
4040PC250G4D	0 to 250 psi	Packard Connector
4040PC250G5D	0 to 250 psi	Connector with Leadwires

MOUNTING DIMENSIONS
(for reference only)



ELECTRICAL CONNECTIONS



Leadwire Color Code
RED – Supply Voltage (+)
BLACK – Ground (−)
GREEN – Output

NOTE:
Output is short circuit protected.

OUTPUT PERFORMANCE CHARACTERISTICS @ 25°C, 5VDC (unless otherwise noted)

Pressure Range	Null (VDC)	Span (VDC)	Sensitivity, Typ.	Linearity, B.F.S.L. (% Span) Max.		Null Shift (% Span) Max.	Span Shift (% Span) Max.	Combined Null and Span Shift (% Span) Max.
±50 mm Hg	2.50 ± 0.050	4.00 Typ.	40.0 mV/mm Hg	0.80	+25° to +50°C	±1.50	±1.50	—
					+25° to 0°C	±1.50	±1.50	—
0 to 15 psi	0.50 ± 0.11	4.00 ± 0.11	266.6 mV/psi	0.20	+25° to −18°C	±2.00	±0.75	±2.00
					+25° to +63°C	±2.00	±0.75	±2.00
					+25° to −45°C	±2.75	±1.00	±3.00
					+25° to +85°C	±2.75	±1.00	±3.00
					+25° to +125°C	—	—	—
0 to 100 psi	0.50 ± 0.04	4.00 ± 0.09	40.0 mV/psi	0.10	+25° to −18°C	±1.25	±0.75	±1.50
					+25° to +63°C	±1.25	±0.75	±1.50
					+25° to −45°C	±2.00	±1.00	±2.50
					+25° to +85°C	±2.00	±1.00	±2.50
					+25° to +125°C	±3.00	±2.00	±3.00
0 to 150 psi	0.50 ± 0.04	4.00 ± 0.07	26.6 mV/psi	0.10	+25° to −18°C	±0.75	±0.75	±0.75
					+25° to +63°C	±0.75	±0.75	±0.75
					+25° to −45°C	±1.00	±1.00	±1.00
					+25° to +85°C	±1.00	±1.00	±1.00
					+25° to +125°C	±1.50	±1.50	±1.50
0 to 250 psi	0.50 ± 0.04	4.00 ± 0.07	16.0 mV/psi	0.10	+25° to −18°C	±0.75	±0.75	±0.75
					+25° to +63°C	±0.75	±0.75	±0.75
					+25° to −45°C	±1.00	±1.00	±1.00
					+25° to +85°C	±1.00	±1.00	±1.00
					+25° to +125°C	±2.00	±2.00	±3.00

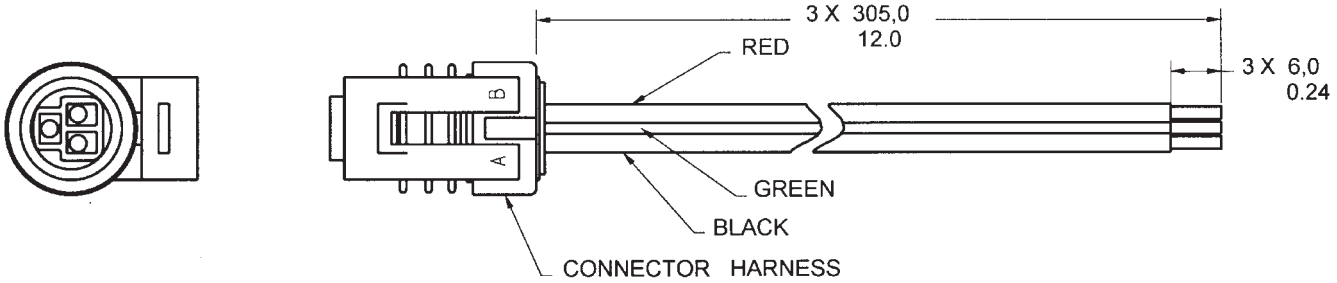
PERFORMANCE SPECIFICATIONS, TEMPERATURE/ACCURACY

Temperature Range	Total Accuracy (% Span) Max.			
	0 to 15 psi	**0 to 100 psi**	**0 to 150 psi**	**0 to 250 psi**
25°C	±0.4 (RSS)	±0.2 (RSS)	±0.2 (RSS)	±0.2 (RSS)
−18° to +63°C	±4.0	±2.5	±2.0	±2.0
−45° to +85°C	±4.0	±2.5	±2.0	±2.0
−45° to +125°C		±3.0	±2.5	±3.0

Note 1: Accuracy at 25°C is defined as RSS error for linearity, hysteresis, and repeatability.

Note 2: Total accuracy is the maximum deviation from the 25°C reference transfer function at any pressure or temperature over the specified ranges. This calculation includes null, span, linearity, hysteresis, repeatability, null shift, and span shift.

PC-15191 4000PC CONNECTOR HARNESS (for reference only)



Amplified

Monolithic Signal Conditioned

SOON TO BE INTRODUCED!

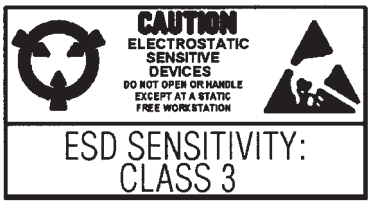
The 5000PC Series package allows use in harsh environmental conditions, such as industrial and off-road applications. The sensor is available with a Packard connector 12078090 or an integral connector with leadwires.

FEATURES

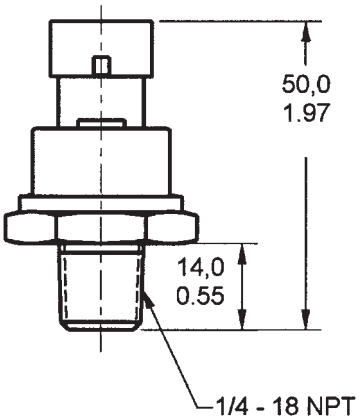
- Operating temperature range – −45° to +125°C (−49° to +257°F)
- Monolithic design
- Compatible with media from dry air and water to refrigerant coolants and engine fuels
- 0.2% accuracy
- Rugged stainless steel and brass construction
- Enhanced EMI performance
- Enhanced sealing for splash protection

PRELIMINARY PERFORMANCE CHARACTERISTICS

Pressure Range	0-15 psi	0-100 psi	0-150 psi	0-250 psi
Overpressure, max.	45 psi	200 psi	300 psi	500 psi
Supply Voltage	5 VDC ±0.25			
Supply Current	10 mA max.			
Output Source Current	0.5 mA max.			
Output Sink Current	1.0 mA max.			
Operating Temperature	−45° to +125°C (−49° to +257°F)			
Storage Temperature	−55° to +125°C (−67° to +257°F)			
Hysteresis & Repeatability	0.15% Span, Typ.			
Ratiometricity (at 4.75 to 5.25 Supply Voltage)	±0.25% Span, Typ.			
Full Scale				
	−50 mm Hg	0.50 VDC Typ.		
	+50 mm Hg	4.50 ± 0.12 VDC Typ.		
	All other pressure ranges	4.50 VDC Typ.		
Media Compatibility	Media must be compatible with fluorosilicone, fluorocarbon, glass, silicon, stainless steel, invar, Sn/Ni plating or Sn/Ag solder			



MOUNTING DIMENSIONS
(for reference only)



Pressure Sensors

Absolute, Differential, Gage, Vacuum Gage/Amplified

FEATURES

- PCB terminals on opposite side from the ports
- Fully signal conditioned

140PC SERIES PERFORMANCE CHARACTERISTICS at 8.0 ±0.01 VDC Excitation, 25°C

	Min.	Typ.	Max.	Units
Excitation	7.00	8.00	16.0	VDC
Supply Current	---	8.00	20.0	mA
Current Sourcing Output	---	---	10	mA
Null Offset (141/142PC)	0.95	1.00	1.05	V
Null Offset (143PC)*	3.45	3.50	3.55	V
Null Offset				
142PC15A @ 2 psia	1.62	1.67	1.72	V
142PC30A @ 2 psia	1.28	1.33	1.38	V
Output at Full Pressure	5.90	6.00	6.10	V
Span† (141/142PC)	4.95	5.00	5.05	V
Span† (143PC)*	---	5.00	---	V
Span				
142PC15A (2 to 15 psia)	4.28	4.33	4.48	V
142PC30A (2 to 30 psia)	4.62	4.67	4.72	V
Ratiometricity Error				
7 to 8 V or 8 to 9 V	---	±0.50	---	%Span
9 to 12 V	---	±2.00	---	
Stability over One Year	---	±0.50	---	%Span
Response Time	---	---	1.00	msec
Common Mode Pressure**	---	---	40	psi
Weight	---	28	---	grams
Short Circuit Protection	Output may be shorted indefinitely to ground			
Output Ripple	None, DC device			
Ground Reference	Supply and output are common			

*Positive and negative pressure measurement.
**Higher common mode pressures possible if sensor is not used over entire operating temperature range.
†Span is defined as the algebraic difference between end points. Please note: actual output is 1 V to 6 V (at 8.00 ±0.01 VDC). Span is then 5V.

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	−40° to +85°C (−40° to +185°F)	
Storage Temperature	−55° to +125°C (−67° to +257°F)	
Compensated Temperature	−18° to +63°C (0° to +145°F)	
Shock	MIL-STD-202, Method 213 (50 g, half sine, 6 msec)	
Vibration	MIL-STD-202, Method 204 (10 to 2000 Hz at 10 g)	
Media	P2 port	Wetted materials; polyester housing, epoxy adhesive, silicon, borosilicate glass, and silicon-to-glass bond*
	P1 port	Dry gases only

*Liquid media containing some highly ionic solutions could potentially neutralize the chip-to-glass tube bond.

140PC SERIES ORDER GUIDE, VACUUM GAGE TYPE

Catalog Listing	Pressure Range psi	Shift Null, Sensitivity, Combined**				Sensitivity V/psi	Overpressure psi Max.	Linearity, B.F.S.L.		Repeatability & Hysteresis %Span Typ.
		25 to 5° 25 to 45°C		25 to −18° 25 to +63°C	25 to −40° 25 to 85°C			P2 > P1	P2 < P1	
								%Span		
		Typ.	Max.	Max.	Max.			Max.	Max.	
141PC01G	0-−1	---	±1.50	---	---	5.000	20	---	±0.75	±0.30
141PC05G	0-−5	±0.50	---	±1.00	±2.00	1.000	20	---	±0.75	±0.25
141PC15G	0-−15	±0.50	---	±1.00	±2.00	0.333	45	---	±0.40	±0.15

140PC SERIES ORDER GUIDE, GAGE TYPE

Catalog Listing	Pressure Range psi	Shift Null, Sensitivity, Combined**				Sensitivity V/psi	Overpressure psi Max.	Linearity, B.S.F.L.		Repeatability & Hysteresis %Span Typ.
		25 to 5° 25 to 45°C		25 to −18° 25 to +63°C	25 to −40° 25 to 85°C			P2 > P1	P2 < P1	
								%Span		
		Typ.	Max.	Max.	Max.			Max.	Max.	
142PC01G	0-1	---	±1.50	---	---	5.000	20	±0.75	---	±0.30
142PC02G	0-2	---	±1.50	---	---	2.500	20	±0.75	---	±0.30
142PC05G	0-5	±0.50	---	±1.00	±2.00	1.000	20	±1.50	---	±0.25
142PC15G	0-15	±0.50	---	±1.00	±2.00	0.333	45	±0.75	---	±0.15
142PC30G	0-30	±0.50	---	±1.00	±2.00	0.167	60	±0.75	---	±0.15
143PC03G	±2.5	---	---	±1.00	±1.50	1.000	20	±0.75	---	±0.25
143PC05G	±5	---	---	±1.00	±1.50	0.500	30	±0.75	---	±0.15
143PC15G	±15	---	---	±1.00	±1.50	0.177	50	±0.75	---	±0.15

140PC SERIES ORDER GUIDE, DIFFERENTIAL TYPE

Catalog Listing	Pressure Range psi	Shift Null, Sensitivity, Combined**				Sensitivity V/psi	Overpressure psi Max.	Linearity, B.F.S.L.		Repeatability & Hysteresis %Span Typ.
		25 to 5° 25 to 45°C		25 to −18° 25 to +63°C	25 to −40° 25 to 85°C			P2 > P1	P2 < P1	
								%Span		
		Typ.	Max.	Max.	Max.			Max.	Max.	
142PC01D	0-1	---	±1.50	---	---	5.000	20	±0.75	±0.40	±0.30
142PC02D	0-2	---	±1.50	---	---	2.500	20	±0.75	±0.40	±0.30
142PC05D	0-5	±0.50	---	±1.00	±2.00	1.000	20	±1.50	±0.75	±0.25
142PC15D	0-15	±0.50	---	±1.00	±2.00	0.333	45	±0.75	±0.40	±0.15
142PC30D	0-30	±0.50	---	±1.00	±2.00	0.167	60	±0.75	±0.40	±0.15
143PC03D	±2.5	---	---	±1.00	±1.50	1.000	20	±0.75	±0.40	±0.25
143PC05D	±5	---	---	±1.00	±1.50	0.500	30	±0.75	±0.40	±0.15
143PC15D	±15	---	---	±1.00	±1.50	0.177	50	±0.75	±0.40	±0.15

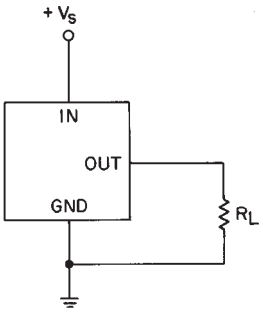
140PC SERIES ORDER GUIDE, ABSOLUTE TYPE*

Catalog Listing	Pressure Range psia	Shift Null, Sensitivity, Combined**				Sensitivity V/psi	Overpressure psi Max.	Linearity, B.F.S.L.		Repeatability & Hysteresis %Span Typ.
		25 to 5° 25 to 45°C		25 to −18° 25 to +63°C	25 to −40° 25 to 85°C			P2 > P1	P2 < P1	
								%Span		
		Typ.	Max.	Max.	Max.			Max.	Max.	
142PC15A	0-15	±0.50	---	±1.00	±2.00	0.333	45	---	±0.40	±0.15
142PC30A	0-30	±0.50	---	±1.00	±2.00	0.167	60	---	±0.40	±0.15

*Tested at 2 psia reference

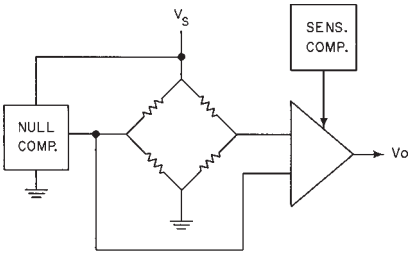
**% Span specification applies to each shift independently. (Null, sensitivity, or combined).

ELECTRICAL CONNECTION
Voltage Excitation

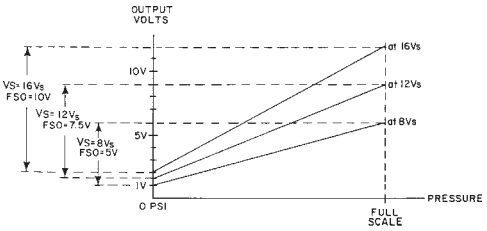


NOTES
1. Terminals are labeled on the sensor.
2. Input and output share a common ground.
3. R_L must be greater than or equal to 3000 ohms.

INTERNAL CIRCUITRY



RATIOMETRICITY

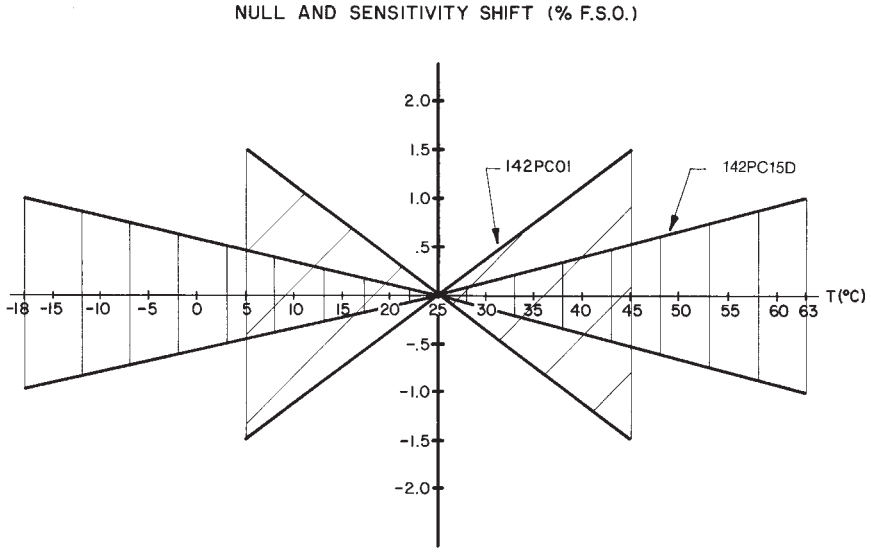


Ratiometricity refers to the output voltage being directly proportional to the supply voltage. 140PC sensors in this catalog are calibrated at 8 VDC supply voltage to provide a 1-6 volt (5V Span) output swing. For example, if supply increases by 50% to 12 VDC, the output voltage increases by 50% to 1.5-9 volts (7.5 V Span).

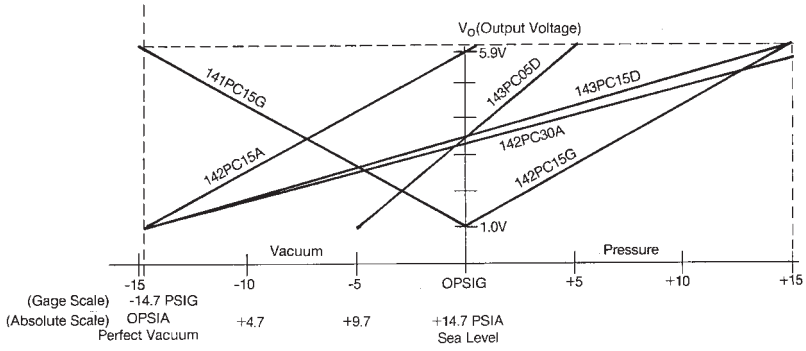
NOTE
The output is not perfectly ratiometric. See specifications for the degree of error.

NULL AND SENSITIVITY TEMPERATURE SHIFT
Amplified pressure sensors are 100% tested to insure that the maximum null and sensitivity temperature shift does not exceed the specification. The diagram below illustrates how null and sensitivity shift relates to temperature. Note that the maximum shift occurs at temperature extremes. Therefore, if a sensor is not exposed to the entire temperature range, the maximum null and sensitivity shift will actually be less than the value specified.

This diagram indicates the temperature shift pertaining to a few listings. Maximum null and sensitivity shift varies from listing to listing.



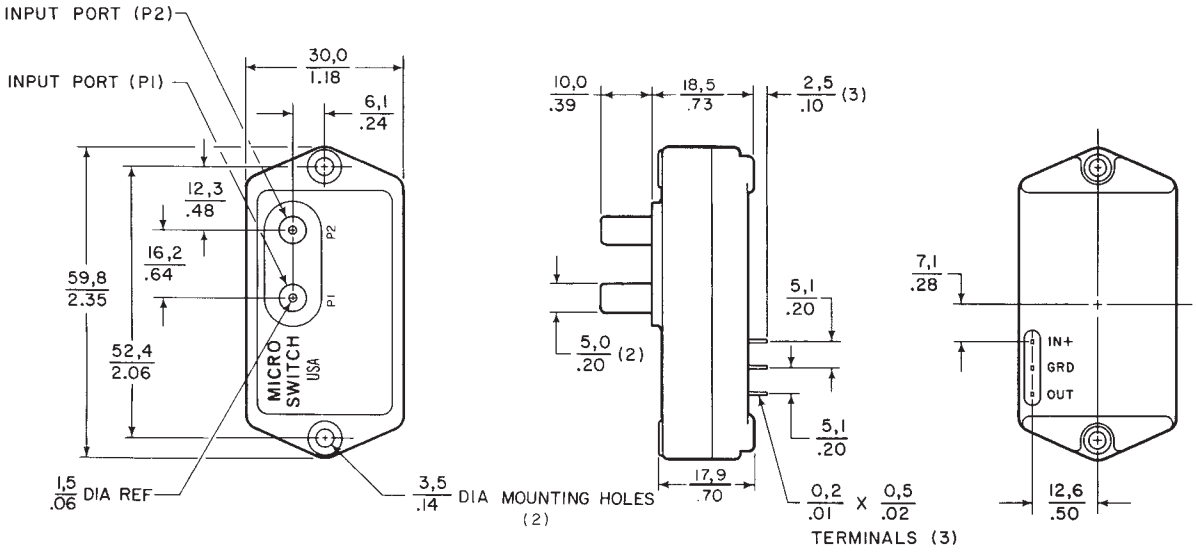
SCALING OF 140PC SERIES SENSORS WITH 8V EXCITATION



142PC15A	Absolute	V_o = 1 V at 0 psia & 6 V at 15 psia
142PC30A	Absolute	V_o = 1 V at 0 psia & 6 V at 30 psia
142PC15G	Gage	V_o = 1 V at 0 psig & 6 V at 15 psig
141PC15G	Vacuum Gage	V_o = 1 V at 0 psig & 6 V at −15 psig
143PC05D	Differential	V_o = 1 V at −5 psig & 6 V at 5 psig
143PC15D	Differential	V_o = 1 V at −15 psig & 6 V at 15 psig

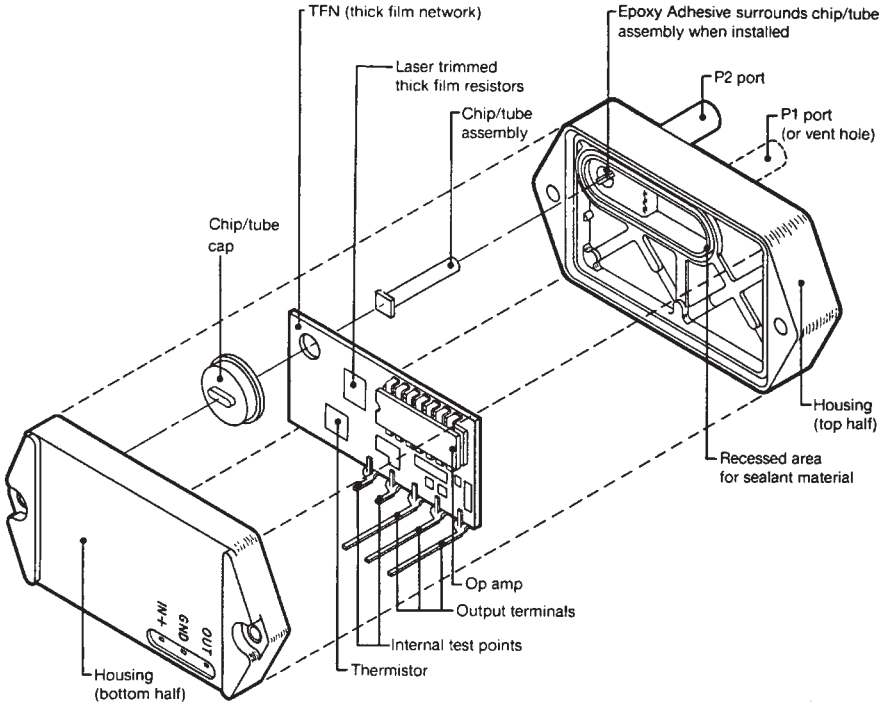
NOTE: 141PC sensors are scaled for vacuum pressure on P2.
142PC sensors are scaled for greater pressure on the P2 side of the chip. Input pressures on absolute units are applied to the P1 port.
Other scalings available upon request.

MOUNTING DIMENSIONS (For reference only)



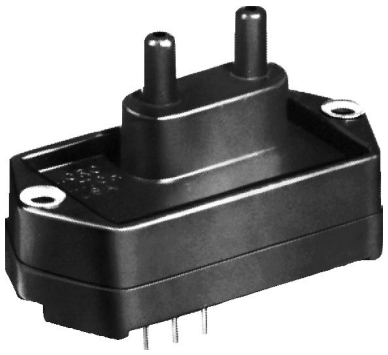
Dimensions shown apply to Differential and Absolute versions. Gage units are identical, except the P1 port is absent.

140PC CONSTRUCTION



Pressure Sensors

Low Pressure Differential, Gage, Vacuum Gage/Amplified



FEATURES
- Low pressure measurement
- PCB terminals on opposite side from the ports
- Fully signal conditioned

160PC SERIES PERFORMANCE CHARACTERISTICS at 8.0 ±0.01 VDC Excitation, 25°C (Exception 163PC at 10 ±0.01 VDC Excitation, 25°C)

	Min.	Typ.	Max.	Units
Excitation	6.00	8.00	16	VDC
Supply Current	---	8.00	20	mA
Current Sourcing Output	---	---	10	mA
Null Offset (161/162/164PC)*	0.95	1.00	1.05	V
Null Offset (163PC)**	3.45	3.50	3.55	V
Output at Full Pressure (161/162/164PC)	5.90	6.00	6.10	V
Output at Full Vacuum (163PC)	0.80	1.00	1.20	V
Span (161/162/164PC)	4.85	5.00	5.15	V
Span (163PC)**	---	5.00	---	V
Ratiometricity Error 7 to 8 V or 8 to 9 V 9 to 12 V	 --- ---	 ±0.50 ±2.00	 --- ---	 %Span
Stability over One Year	---	±0.50	---	%Span
Response Time	---	---	1.00	msec
Weight	---	28	---	grams
Short Circuit Protection	Output may be shorted indefinitely to ground			
Output Ripple	None, DC device			
Ground Reference	Supply and output are common			

*Positive (or negative) pressure measurement.
**Positive AND negative pressure measurement.

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	−40° to +85°C (−40° to +185°F)	
Storage Temperature	−55° to +125°C (−67° to +257°F)	
Compensated Temperature	−18° to +63°C (0° to +145°F)	
Shock	MIL-STD-202, Method 213 (50 g, half sine, 6 msec)	
Vibration	MIL-STD-202, Method 204 (10 to 2000 Hz at 10 g)	
Media	P2 port	Wetted materials; polyester housing, epoxy adhesive, silicon, borosilicate glass,and silicon-to-glass bond*
	P1 port	Dry gases only

*Liquid media containing some highly ionic solutions could potentially neutralize the chip-to-glass tube bond.

Low Pressure Differential, Gage, Vacuum Gage/Amplified

160PC SERIES ORDER GUIDE, VACUUM GAGE AND GAGE TYPE

Catalog Listing	Pressure Range ″H_2O	Shift Null, Sensitivity, Combined** 25 to 5° 25 to 45°C Max.	Shift Null, Sensitivity, Combined** 25 to −18° 25 to +63°C Max.	Shift Null, Sensitivity, Combined** 25 to −40° 25 to 85°C Max.	Sensitivity V/″H_2O	Overpressure psi Max.	Linearity, B.F.S.L. P2 > P1 %Span Max.	Linearity, B.F.S.L. P2 < P1 %Span Max.	Repeatability & Hysteresis %Span Typ.
161PC01D	0-27.68	---	±1.00	±2.00	0.18	5	---	±1.00	±0.15 Vacuum Gage
162PC01G	0-27.68	---	±1.00	±2.00	0.18	5	---	±1.00	±0.15 Gage

160PC SERIES ORDER GUIDE, DIFFERENTIAL TYPE

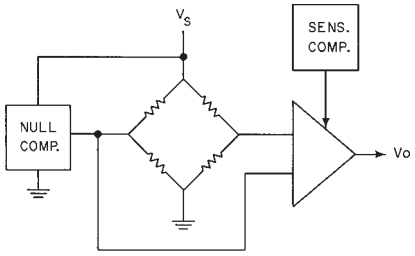
Catalog Listing	Pressure Range ″H_2O	Shift Null, Sensitivity, Combined** 25 to 5° 25 to 45°C Max.	Shift Null, Sensitivity, Combined** 25 to −18° 25 to +63°C Max.	Shift Null, Sensitivity, Combined** 25 to −40° 25 to 85°C Max.	Sensitivity V/″H_2O	Overpressure psi Max.	Linearity, B.F.S.L. P2 > P1 %Span Max.	Linearity, B.F.S.L. P2 < P1 %Span Max.	Repeatability & Hysteresis %Span Typ.
162PC01D	0-27.68	---	±1.00	±2.00	0.18	5	±2.00	---	±0.15
163PC01D36	±5	±1.00	---	---	0.50	5	±2.00	±1.00	±0.25
164PC01D37	0-10	±1.00	---	---	0.50	5	±2.00	---	±0.25
163PC01D75	±2.5	±1.25	---	---	1.00	5	±2.00	±1.00	±0.25
164PC01D76	0-5	±1.25	---	---	1.00	5	±2.00	---	±0.25

160PC SERIES ORDER GUIDE, DIFFERENTIAL TYPE @ 10 VDC ±0.01 EXCITATION, 25°C

Catalog Listing	Pressure Range cmH_2O	Shift Null, Sensitivity, Combined** 25 to 5° 25 to 45°C Max.	Shift Null, Sensitivity, Combined** 25 to −18° 25 to +63°C Max.	Shift Null, Sensitivity, Combined** 25 to −40° 25 to 85°C Max.	Sensitivity V/cmH_2O	Overpressure cmH_2O Max.	Linearity, B.F.S.L. P2 > P1 %Span Max.	Linearity, B.F.S.L. P2 < P1 %Span Max.	Repeatability & Hysteresis %Span Typ.
163PC01D48	−20 to +120	±0.75*	---	---	0.36	350	±1.5	---	±0.15

*Null shift. Span shift is ±1.00/Span
**% Span specification applies to each shift independently (Null, Sensitivity, or Combined)

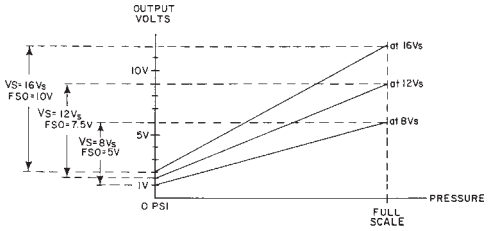
INTERNAL CIRCUITRY



NOTES

1. Terminals are labeled on the sensor.
2. Input and output share a common ground.
3. R_L must be greater than or equal to 3000 ohms.

RATIOMETRICITY



Ratiometricity refers to the output voltage being directly proportional to supply voltage. 160PC sensors in this catalog are calibrated at 8 VDC supply voltage (except 163PC) to provide a 1-6 volt (5 V Span) output swing. For example, if supply increases by 50% to 12 VDC, the output voltage increased by 50% to 1.5-9 volts (7.5 V Span).

NOTE

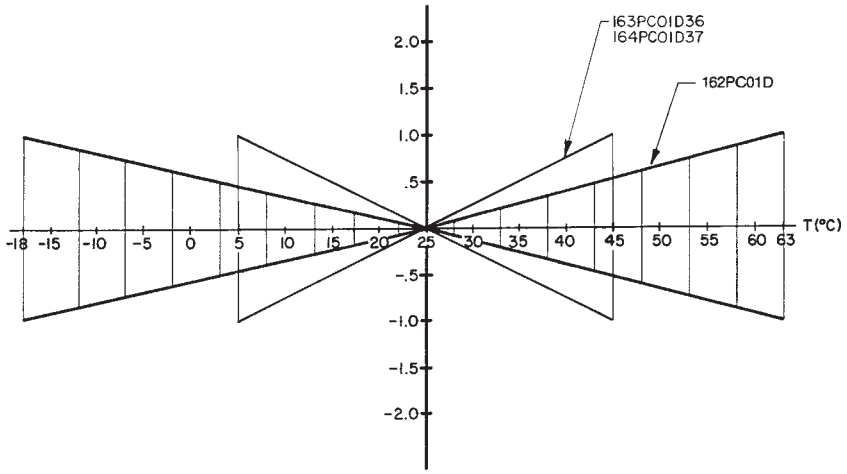
The output is not perfectly ratiometric. See Accuracy specifications for the degree of error.

NULL AND SENSITIVITY TEMPERATURE SHIFT

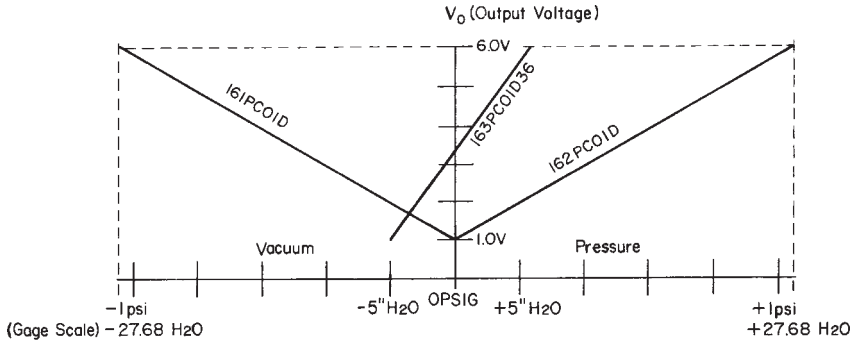
Amplified pressure sensor are 100% tested to insure that the maximum null and sensitivity temperature shift does not exceed the specification. The diagram below illustrates how null and sensitivity shift relates to temperature. Note that the maximum shift occurs at temperature extremes. Therefore, if a sensor is not exposed to the entire temperature range, the maximum null and sensitivity shift will actually be less than the value specified.

This diagram indicates the temperature shift pertaining to a few listings. Maximum null and sensitivity shift varies from listing to listing.

NULL AND SENSITIVITY SHIFT (% F.S.O.)



SCALING OF 160PC SERIES SENSORS WITH 8V EXCITATIONS



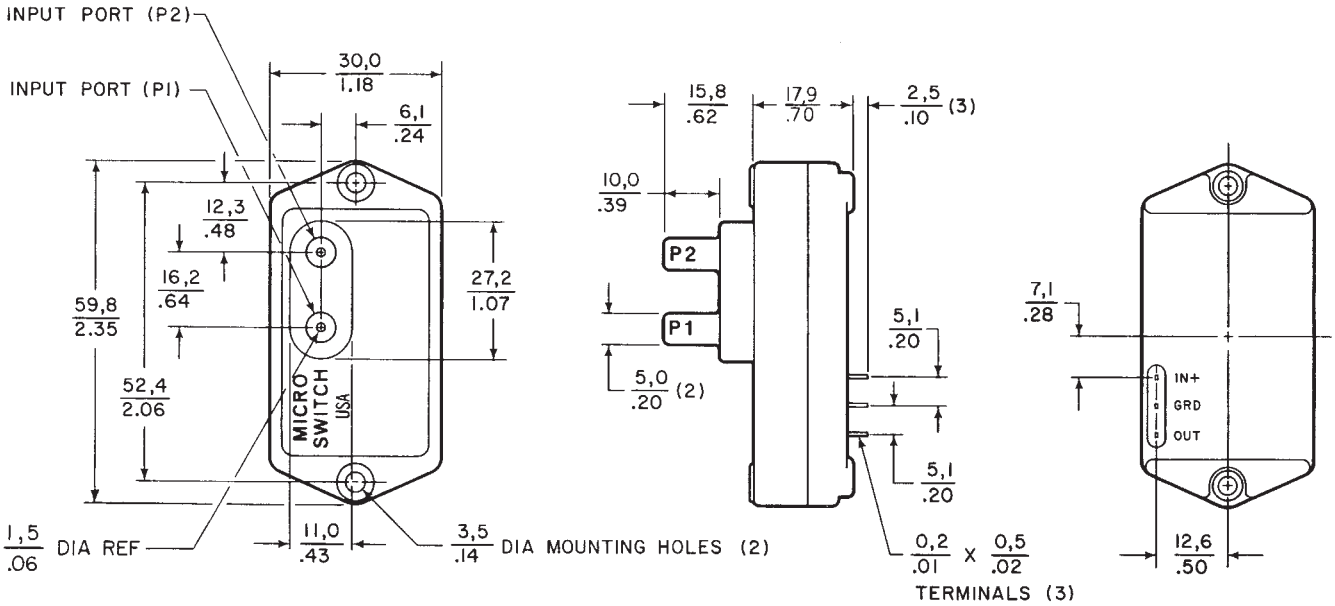
161PC01D	Vacuum Gage	V_o = 1 V at 0 psig & 6 V at −1 psig
162PC01D	Differential	V_o = 1 V at 0 psig & 6 V at 1 psig
163PC01D36	Differential	V_o = 1 V at −5″ H_2O & 6 V at −5″ H_2O

NOTE: 161PC sensors are scaled for greater pressure on the P1 side of the chip. 162PC sensors are scaled for greater pressure on the P2 side of the chip. Other scalings available upon request.

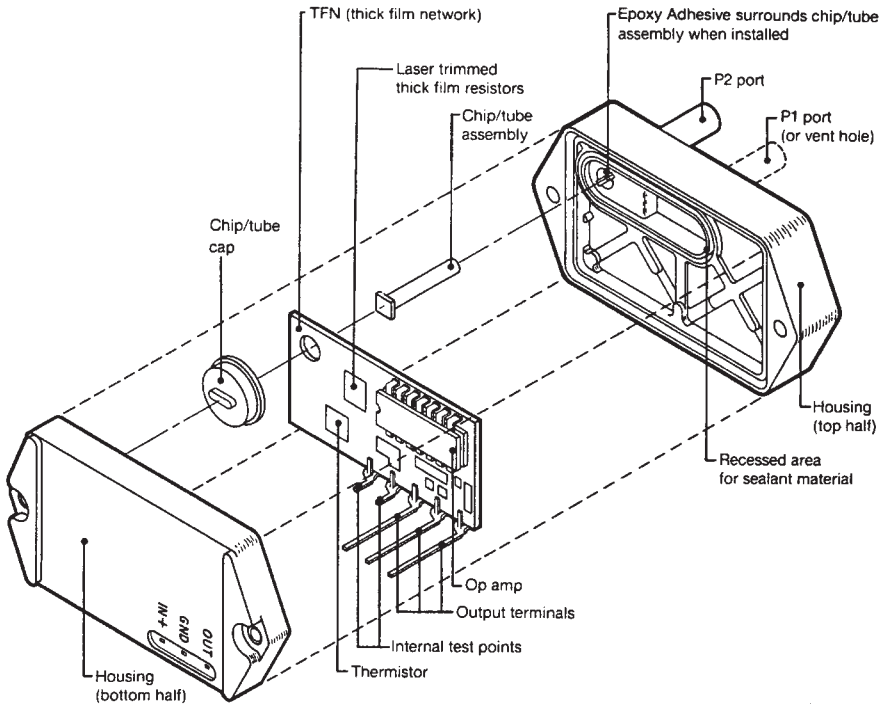
Amplified

Low Pressure Differential, Gage, Vacuum Gage/Amplified

MOUNTING DIMENSIONS (For reference only)

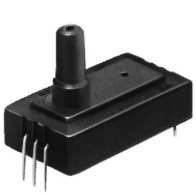


160PC CONSTRUCTION

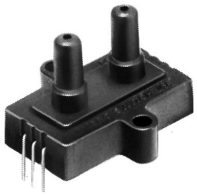


Pressure Sensors

Miniature Absolute, Differential, Gage/Amplified



Terminal Mount



Housing Mount

FEATURES

- Miniature plastic package
- Terminal and housing mount styles
- PCB termination
- Fully signal conditioned

180PC SERIES PERFORMANCE CHARACTERISTICS at 8.0 ±0.01 VDC Excitation, 25°C

	Min.	Typ.	Max.	Units
Excitation	7.00	8.00	16	VDC
Supply Current	---	---	6	mA
Current Sourcing Output	---	---	10	mA
Null Offset (184/185PC)	0.95	1.00	1.05	V
Null Offset (186PC)	3.45	3.50	3.55	V
Null Offset				
185PC15AT @ 2 psia	1.62	1.67	1.72	V
185PC30AT @ 2 psia	1.28	1.33	1.38	V
Output at Full Pressure (184/185PC, G,D)	5.90	6.00	6.15	V
Output at Full Pressure (185PC, A only)	5.85	6.00	6.15	V
Output at Full Pressure (186PC)	5.90	6.00	6.10	V
Span (184/185PC, G,D)	4.95	5.00	5.05	V
Span (185PC, A only)	4.90	5.00	5.10	V
Span (186PC)	---	5.00	---	V
Span (185PC15AT)	4.28	4.33	4.38	V
Span (185PC30AT)	4.62	4.67	4.72	V
Ratiometricity Error				
7 to 8V or 8 to 9V	---	±0.50	---	% Span
9 to 12V	---	±2.00	---	% Span
Temperature Error (Combined null and span)	−2%	0	+2%	% Span
Stability over One Year	---	±0.50	---	% Span
Response Time	---	---	1.00	msec
Weight	---	12	---	grams
Short Circuit Protection	Output may be shorted indefinately to ground			
Output Ripple	None, DC device			
Ground Reference	Supply and output are common			

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	−40° to +85°C (−40° to +185°F)	
Storage Temperature	−55° to +125°C (−67° to +257°F)	
Compensated Temperature	0° to +50°C (32° to +122°F)	
Shock	MIL-STD-202, Method 213 (50 g, half sine, 6 msec)	
Vibration	MIL-STD-202, Method 204 (10 to 2000 Hz at 10 g)	
Media	P2 port	Wetted materials; polyester housing, epoxy adhesive, silicon, borosilicate glass, and silicon-to-glass bond*
	P2 port	Absolute only: Factory sealed vacuum reference, no connection
	P1 port	Dry gases only

*Liquid media containing some highly ionic solutions could potentially neutralize the chip-to-glass tube bond.

Pressure Sensors

Miniature Absolute, Differential, Gage/Amplified

184PC SERIES ORDER GUIDE, VACUUM GAGE TYPE

Catalog Listing	Pressure Range psi	Overpressure psi Max.	Linearity, %Span	
			P2 > P1 Max.	P2 < P1 Max.
184PC05GT	0-−5	20	---	±1.00
184PC15GT	0-−15	45	---	±1.00

185PC SERIES ORDER GUIDE, DIFFERENTIAL TYPE, P2 > P1

Catalog Listing	Pressure Range psi	Overpressure psi Max.	Linearity, %Span	
			P2 > P1 Max.	P2 < P1 Max.
185PC05DT	0-5	20	±2.00	±1.00
185PC15DT	0-15	45	±2.00	±1.00
185PC30DT	0-30	60	±1.50	±0.75

186PC SERIES ORDER GUIDE, BI-DIRECTIONAL TYPE, P2-P1

Catalog Listing	Pressure Range psi	Overpressure psi Max.	Linearity, %Span	
			P2 > P1 Max.	P2 < P1 Max.
186PC03DT	±2.5	20	±2.00	±1.00
186PC05DT	±5.0	20	±2.00	±1.00
186PC15DT	±15	45	±2.00	±1.00

185PC SERIES ORDER GUIDE, ABSOLUTE TYPE

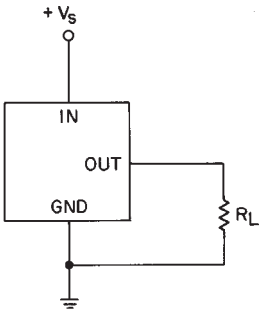
Catalog Listing	Pressure Range psi	Overpressure psi Max.	Linearity, %Span	
			P2 > P1 Max.	P2 < P1 Max.
185PC15AT	0-15	45	---	±1.00
185PC30AT	0-30	60	---	±0.75

HOW TO ORDER

Catalog listings in the order guide are shown with mounting version **T** (terminal mount). **H** (housing mount) also available. Contact 800 number.

ELECTRICAL CONNECTIONS

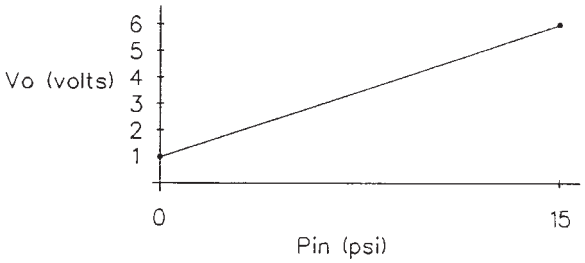
Voltage Excitation



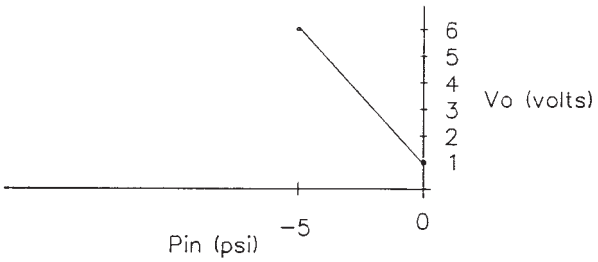
NOTES
1. Terminals are labeled on the sensor.
2. Input and output share a common ground.
3. R_L must be greater than or equal to 3000 ohms.

IDEAL OUTPUT AT Vs = 8.00 ± 0.01 VDC

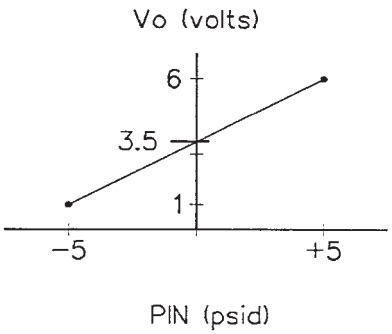
Differential
Example: 185PC15DT when P_{IN} = P2-P1



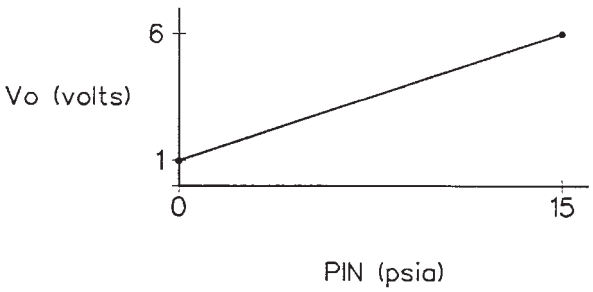
Vacuum Gage
Example: 184PC05GT where P2 = P_{IN} P1 = Ambient



Bi-directional
Example: 186PC05DH where P_{IN} = P2-P1



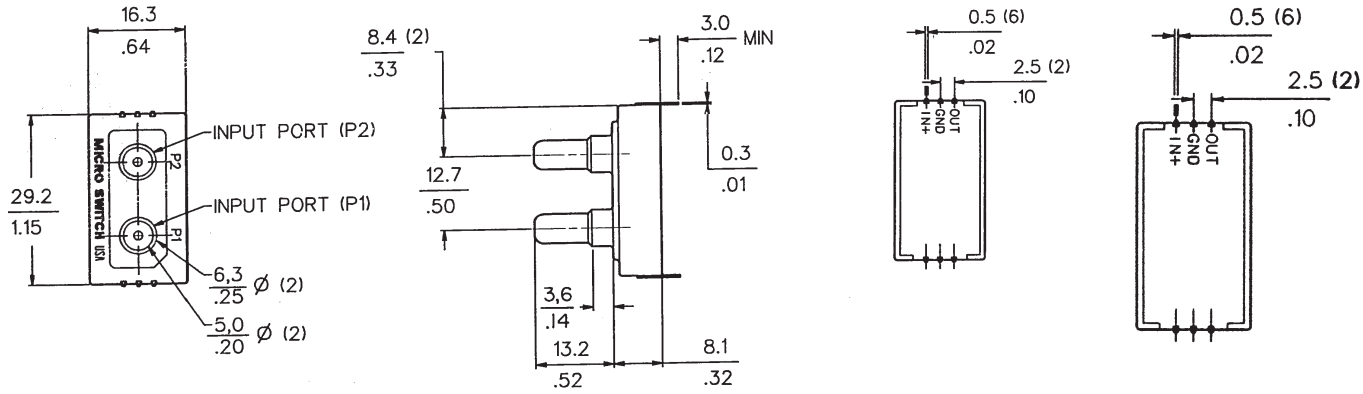
Absolute
Example: 185PC15AP where P1 = P_{IN} P2 = Factory sealed vacuum



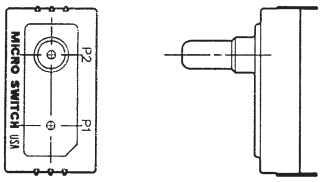
Amplified

MOUNTING DIMENSIONS 0.0 = mm
0.00 = in.

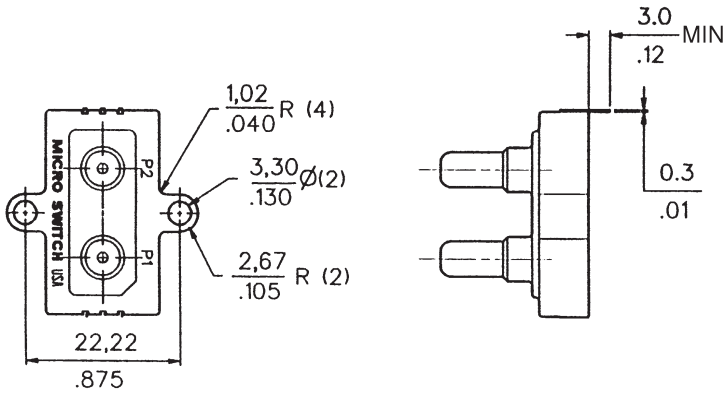
Terminal Mount (Differential "D" or Absolute "A" Housing)

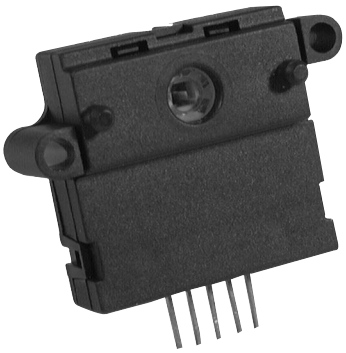


(Gage "G" Housing)



Housing Mount





NEW

FEATURES
- Manifold mount/O-ring sealed
- Fully signal conditioned
- PCB termination
- Operating temperature up to 125°C
- Glass chip tube (non-outgassing)

189PC PERFORMANCE CHARACTERISTICS @ 8.0 ±0.01 VDC Excitation, 25°C

	Min	Typ	Max	Units
Excitation	7.00	8.00	16.0	VDC
Supply Current	—	—	6	mA
Current Sourcing Output	—	—	10	mA
Null Offset	0.95	1.00	1.05	V
Output at Full Pressure	5.80	6.00	6.15	V
Ratiometricity Error				
7 to 8V or 8 to 9V	—	±0.50	—	% Span
9 to 12 V	—	±2.00	—	% Span
Temperature Error (Combined null and span)	−2	0	+2	% Span
Stability over One Year	—	±0.50	—	%Span
Response Time	—	—	1.00	mS
Weight	—	12	—	grams
Short Circuit Protection	Output may be shorted indefinitely to ground			
Output Ripple	None, DC Device			
Ground Reference	Supply and output are common			

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature		−40°C to +85°C (−40° to +185°F)
Storage Temperature		−55° to +125°C (−67° to +257°F)
Compensated Temperature		0° to +50°C (32° to +122°F)
Shock		MIL-STD-202, Method 213 (50g, half sine, 6 msec)
Vibration		MIL-STD-202, Method 204 (10 to 2000 Hz at 10 g)
Media	P2 port	Wetted materials; polyester housing, epoxy adhesive, silicon, borosilicate glass, and silicon-to-glass bond*

*Liquid media containing some highly ionic solutions could potentially neutralize the chip-to-glass tube bond.

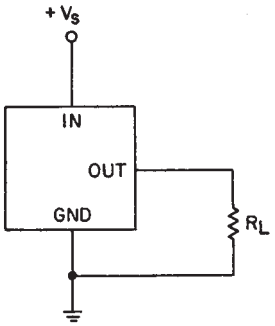
Pressure Sensors
Gage Amplified

189PC SERIES ORDER GUIDE GAGE TYPE

Catalog Listing	Pressure Range psi	Overpressure psi Max.	Linearity, %Span P2 > P1 Max.
189PC15GM	0-15	45	±2.00
189PC100GM	0-100	250	±1.50
189PC150GM	0-150	250	±1.50

Electrical Connections

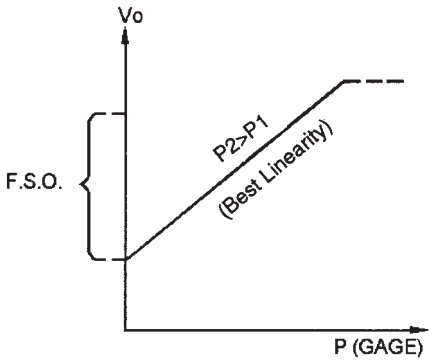
Voltage Excitation



Pin Designation

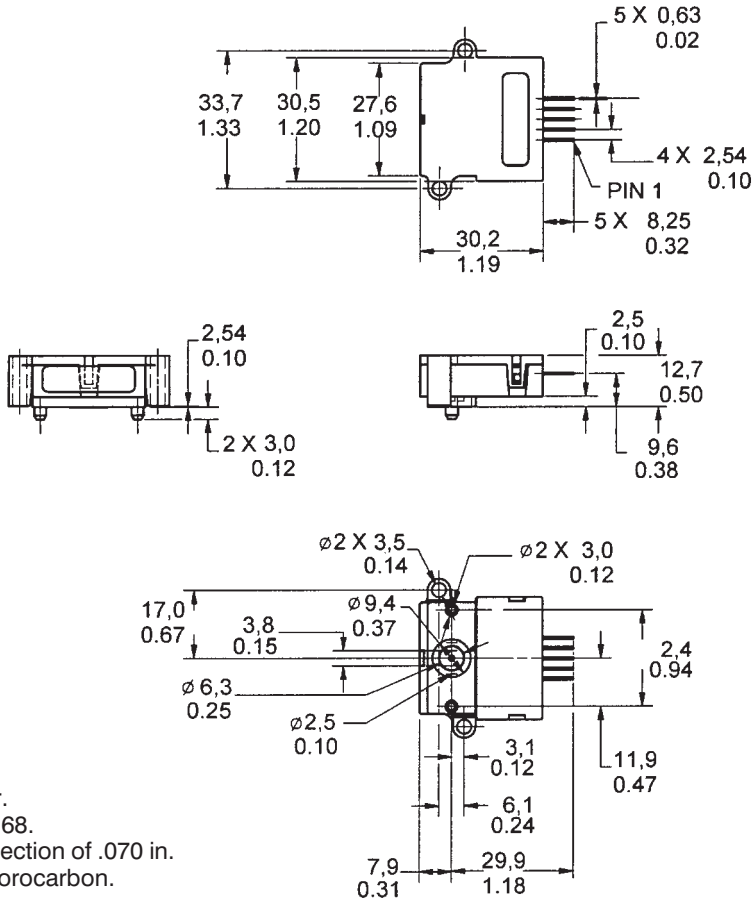
Pin 1 = V_{SS}
Pin 2 = V_{out}
Pin 3 = GND
Pin 4 = No Connect
Pin 5 = V_{CC}

Pressure Reference Gage



NOTES
1. Input and output share a common ground.
2. R_L must be greater than or equal to 3000 ohms.

MOUNTING DIMENSIONS (for reference only)



O-Ring provided with sensor.
O-Ring Part Number: SS-12168.
O.D. of .114 in. and a cross section of .070 in.
Material is 70 Durometer Fluorocarbon.

Pressure Sensors

240PC Series

High Pressure Gage, Vacuum Gage/Amplified

FEATURES

- Internal O-Ring seals for contamination resistance
- Screw-in or flat-pack mounting
- Rugged aluminum housing

240PC SERIES PERFORMANCE CHARACTERISTICS at 8.0 ±0.01 VDC Excitation, 25°C

	Min.	Typ.	Max.	Units
Excitation	7.00	8.00	16.0	VDC
Supply Current	---	8.00	20.0	mA
Current Sourcing Output	---	---	10	mA
Null Offset (241/242PC)*	0.95	1.00	1.05	V
Null Offset (243PC)**	3.45	3.50	3.55	V
Output at Full Pressure**	5.80	6.00	6.20	V
Span (241/242PC)	4.80	5.00	5.20	V
Span (243PC)	---	±2.5	---	V
Ratiometricity Error 7 to 8 V or 8 to 9 V 9 to 12 V	 --- ---	 ±0.50 ±2.00	 --- ---	 %Span
Stability over One Year	---	±0.50	---	%Span
Response Time	---	---	1.00	msec
Weight	---	85	---	grams
Short Circuit Protection	Output may be shorted indefinitely to ground			
Output Ripple	None, DC device			
Ground Reference	Supply and output are common			

*Positive (or negative) pressure measurement
**Positive and negative pressure measurement

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	−40° to +85°C (−40° to +185°F)	
Storage Temperature	−40° to +85°C (−40° to +185°F)	
Compensated Temperature	−18° to +63°C (0° to +145°F)	
Shock	MIL-STD-202, Method 213 (50 g, half sine, 6 msec)	
Vibration	MIL-STD-202, Method 204 (10 to 2000 Hz at 10 g)	
Media	P2 port	Wetted materials; die-cast aluminum housing, O-ring seal, silicon, borosilicate glass, and silicon-to-glass bond*

*Liquid media containing some highly ionic solutions could potentially neutralize the chip-to-glass tube bond.

High Pressure Gage, Vacuum Gage/Amplified

241/242PC SERIES ORDER GUIDE, GAGE AND VACUUM GAGE, Buna-N O-Ring Port Seal

Catalog Listing	Pressure Range psi	Null & Sensitivity Shift (%Span)		Sensitivity V/psi	Overpressure psi Max.	Linearity, %Span B.F.S.L., Max.	Repeatability & Hysteresis %Span Typ.
		25 to −18° 25 to +63°C Max.	25 to −40° 25 to 85°C Typ.				
241PC15M*	0-−15	±1.0	±2.0	0.330	45	±1.50	±0.25
242PC15M*	0-15	±1.0	±2.0	0.330	45	±1.50	±0.25
242PC30M*	0-30	±1.0	±2.0	0.167	60	±1.50	±0.25
242PC60G	0-60	±1.5	±2.0	0.083	120	±0.50	±0.25
242PC100G	0-100	±1.0	±2.0	0.050	200	±0.50	±0.25
242PC150G	0-150	±1.5	±3.0	0.033	300	±0.50	±0.25
242PC250G	0-250	±1.0	±2.0	0.020	500	±0.50	±0.25

242PC SERIES ORDER GUIDE, GAGE, Ethylene propylene O-Ring Seal

Catalog Listing	Pressure Range psi	Null & Sensitivity Shift (%Span)		Sensitivity V/psi	Overpressure psi Max.	Linearity, %Span B.F.S.L., Max.	Repeatability & Hysteresis %Span Typ.
		25 to −18° 25 to +63°C Max.	25 to −40° 25 to 85°C Typ.				
242PC60GS	0-60	±1.5	±2.0	0.083	120	±0.50	±0.25
242PC100GS	0-100	±1.0	±2.0	0.050	200	±0.50	±0.25
242PC150GS	0-150	±1.5	±3.0	0.033	300	±0.50	±0.25
242PC250GS	0-250	±1.0	±2.0	0.020	500	±0.50	±0.25

243PC SERIES ORDER GUIDE, VACUUM GAGE, Buna-N Port Seal

Catalog Listing	Pressure Range psi	Null & Sensitivity Shift (%Span)		Sensitivity V/psi	Overpressure psi Max.	Linearity, BFSL		Repeatability & Hysteresis %Span Typ.
		25 to −18° 25 to +63°C Max.	25 to −40° 25 to 85°C Typ.			P2 > P1 Max.	P2 < P1 Max.	
243PC15M*	±15	±1	±2.0	0.167	50	±1.50	±0.75	±0.25

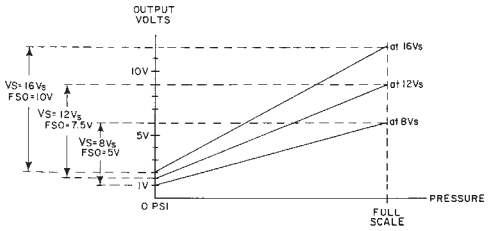
*Adhesive between thermoplastic and aluminum instead of O-ring seal.

PORT SEAL O-RING

Material	Resistant To:
Buna-N (general use)	Petroleum products, freon 12 and others
Ethylene propylene	Phosphate esters and others

High Pressure Gage, Vacuum Gage/Amplified

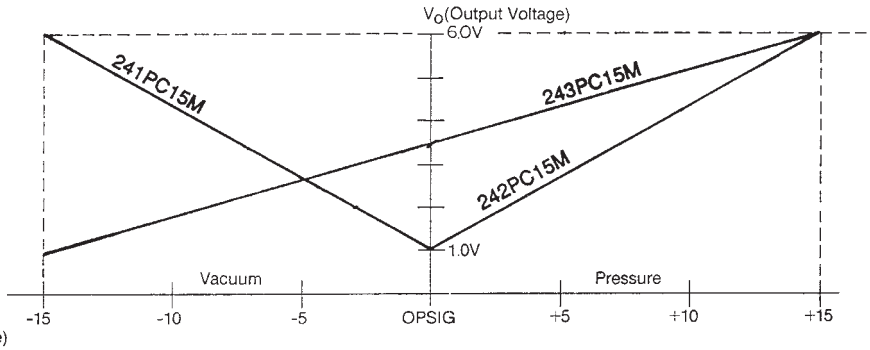
RATIOMETRICITY



Ratiometricity refers to the output voltage being directly proportional to supply voltage. 240PC sensors in this catalog are calibrated at 8 VDC supply voltage to provide a 1-6 volt (5 V Span) output swing. For example, if supply increases by 50% to 12 VDC, the output voltage increased by 50% to 1.5-9 volts (7.5 V Span).

NOTE
The output is not perfectly ratiometric. See Accuracy specifications for the degree of error.

SCALING OF 240PC SERIES WITH 8V EXCITATION



242PC15M	Gage	V_o = 1 V at 0 psig & 6 V at 15 psig
241PC15M	Vacuum Gage	V_o = 1 V at 0 psig & 6 V at −15 psig
243PC15M	Gage	V_o = 1 V at −15 psig & 6 V at 15 psig

NOTE: 241PC sensors are scaled for greater pressure on the P1 side of the chip. 242PC sensors are scaled for greater pressure on the P2 side of the chip.
Other scalings available upon request.

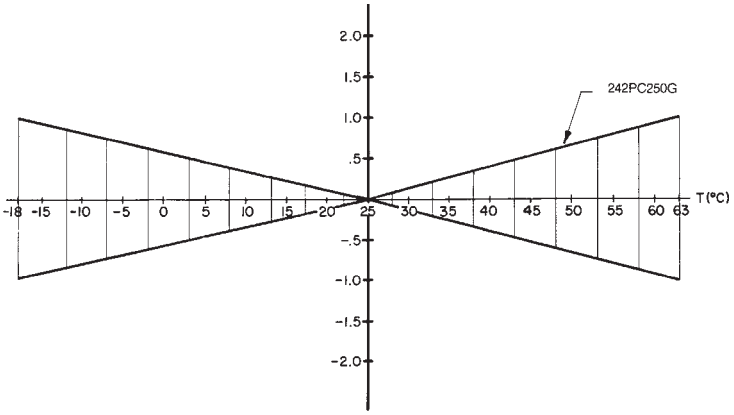
High Pressure Gage, Vacuum Gage/Amplified

NULL AND SENSITIVITY TEMPERATURE SHIFT

Amplified pressure sensors are 100% tested to ensure that the maximum null and sensitivity temperature shift does not exceed the specification. The diagram illustrates how null and sensitivity shift relates to temperature. Note that the maximum shift occurs at temperature extremes. Therefore, if a sensor is not exposed to the entire temperature range, the maximum null and sensitivity shift will actually be less than the value specified.

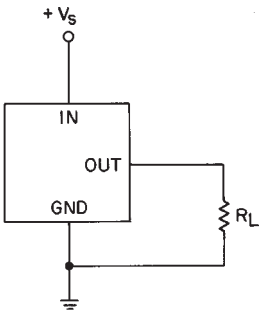
This diagram indicates the temperature shift pertaining to a few listings. Maximum null and sensitivity shift varies from listing to listing.

Null and Sensitivity Shift (% Span)



ELECTRICAL CONNECTIONS

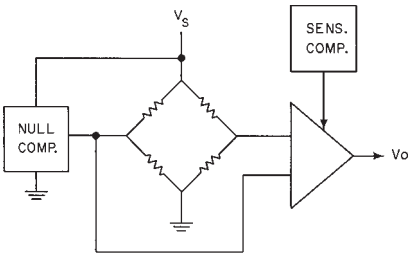
Voltage Excitation



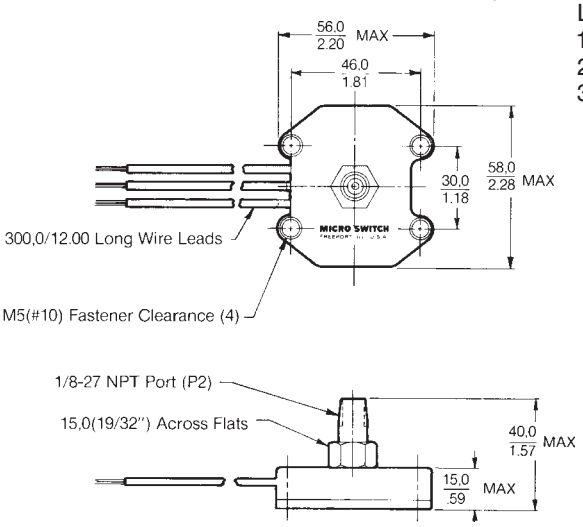
NOTES

1. Terminals are labeled on the sensor.
2. Input and output share a common ground.
3. R_L must be greater than or equal to 3000 ohms.

INTERNAL CIRCUITRY



MOUNTING DIMENSIONS (For reference only)



Leadwires
1 - Red, Vs
2 - Black, Ground (–)
3 - Green, Output

Pressure Sensors
Pressure-to-Current/Amplified

FEATURES
- Unidirectional gage pressure measurement
- 2-wire, causes a 4-20 mA change in current, linearly proportional to pressure input
- Screw-in or flat-pack mounting
- Rugged die-cast aluminum housing

249PC SERIES PERFORMANCE CHARACTERISTICS at 24.0 ±0.01 VDC Excitation, 25 Ohm Load, 25°C

	Min.	Typ.	Max.	Units
Excitation	10.0	24.0	32.0	VDC
Response Time	---	---	1.00	msec
Supply Voltage Sensitivity 20-24 VDC and 24-28 VDC	---	±0.15	---	%Span
Stability over One Year	---	±1.0	---	%Span
Current Output				
249PC15G at 3 psig	3.7	4.0	4.3	mA
249PC15G at 15 psig	19.7	20.0	20.3	
Null (0-100 & 0-250 psig)	3.7	4.0	4.3	
Full pressure (0-100 & 0-250 psig)	19.5	20.0	20.5	
Weight	---	85	---	grams
Output Ripple	None, DC device			

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	−40° to +85°C (−40° to +185°F)
Storage Temperature	−40° to +85°C (−40° to +185°F)
Compensated Temperature	−18° to +63°C (0° to +145°F)
Shock	MIL-STD-202, Method 213 (50 g, half sine, 6 msec)
Vibration	MIL-STD-202, Method 204 (10 to 2000 Hz at 10 g)
Media	P2 port Wetted materials; die-cast aluminum housing, O-ring seal, silicon, borosilicate glass, and silicon-to-glass bond*

*Liquid media containing some highly ionic solutions could potentially neutralize the chip-to-glass tube bond.

249PC SERIES ORDER GUIDE, GAGE, Buna-N O-Ring Port Seal

Catalog Listing	Pressure Range psi	Null & Sensitivity Shift 25 to 0°C, 25 to 50°C Max.	Sensitivity mA/psi	Overpressure psi %Span Max.	Linearity & Hysteresis %Span Max.	Repeatability B.F.S.L. Typ.
249PC15M*	3-15	±1.0	1.330	45	±0.75	±0.25
249PC100G	0-100	±1.0	0.160	200	±0.75	±0.25
249PC250G	0-250	±1.0	0.064	500	±1.00	±0.25

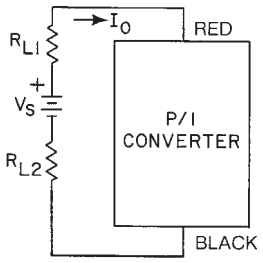
*Adhesive between thermoplastic and aluminum instead of O-ring seal.

249PC SERIES ORDER GUIDE, GAGE, Ethylene Propylene O-Ring Port Seal

Catalog Listing	Pressure Range psi	Null & Sensitivity Shift 25 to 0°C, 25 to 50°C Max.	Sensitivity mA/psi	Overpressure psi %Span Max.	Linearity & Hysteresis %Span Max.	Repeatability B.F.S.L. Typ.
249PC100GS	0-100	±1.0	0.160	200	±0.75	±0.25
249PC250GS	0-250	±1.0	0.064	500	±1.00	±0.25

Pressure-to-Current/Amplified

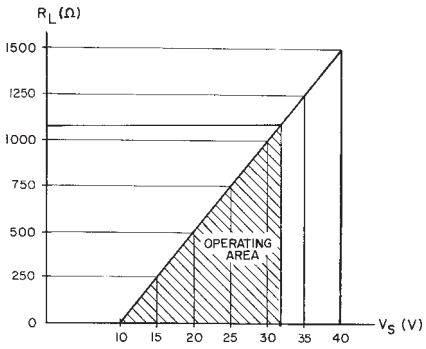
ELECTRICAL CONNECTION



NULL AND SENSITIVITY SHIFT

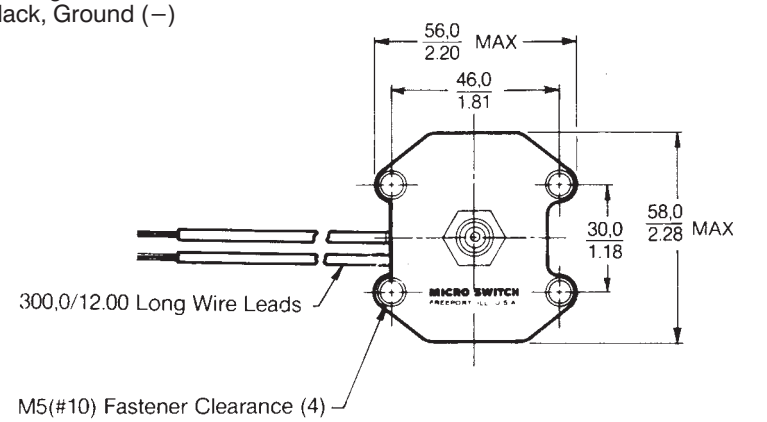
Current output pressure sensors are 100% tested to insure that the maximum null and sensivity temperature shift does not exceed the specification. The maximum shift occurs at temperature extremes. Therefore, if a sensor is not exposed to the entire temperature range, the maximum null and sensitivity shift will actually be less than the value specified.

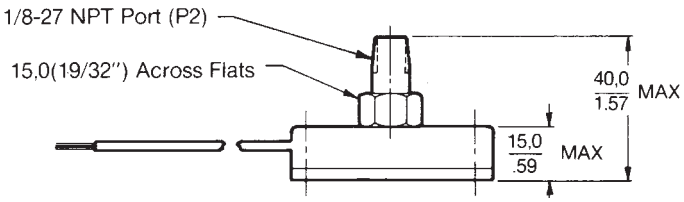
EXTERNAL LOAD RESISTANCE VS SUPPLY VOLTAGE



MOUNTING DIMENSIONS (For reference only)

Leadwires
1 – Red, V_S
2 – Black, Ground (–)

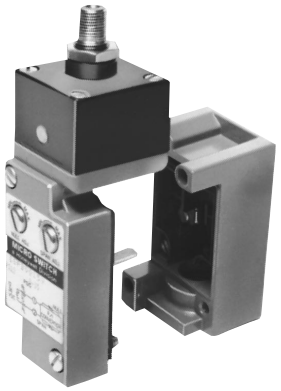




Pressure Sensors

SSPB Series

Heavy Duty DC Adjustable, 2-Wire Analog



FEATURES

- Silicon sensor chip is enclosed in stainless steel welded diaphragm
- Rugged diecast zinc plug-in limit switch style housing
- 2-wire, 4-20 mA output current linearly proportional to pressure
- Sealed to meet NEMA 1, 3, 3R, 4, 6, 6P, 12, 13
- Field adjustable null and span
- Protected against false pulse, transients and industrial noise
- 0 to +50°C operating and compensated temperature
- UL Listed.

SSPB SERIES PERFORMANCE CHARACTERISTICS, 25°C

	Min.	Typ.	Max.	Units
Supply Voltage	12.0	---	36.0	VDC
Hysteresis & Repeatability				
@ nominal span	---	---	±0.5	%Span
@ max. span comp.	---	---	±1.5	
Temperature Error @ nom. span & max. comp.	---	±6.0	±10.0	%Span
Response Time	---	---	2.0	msec
Weight	414 grams (.91 lb.) Note: w/o receptacle			
Change in Current	4 to 20 mA proportional to pressure			
Null Pressure Setting (4 mA output)	Can be adjusted from 0 to 25% of full pressure range			
Full Pressure Setting (20 mA output)	Can be adjusted from 75 to 100% of full pressure range			

ENVIRONMENTAL SPECIFICATIONS

Storage Temperature	−25° to +85°C (−13° to +185°F)
Operating and Compensated Temperature	0° to 50°C (32° to 122°F)
Sealing	NEMA 1, 3, 3R, 4, 6, 6P, 12, 13*
Media	Limited only to those media which will not attack 316 stainless steel

***Application Note:** Enclosures are based, in general, on the broad definitions outlined in NEMA standards. Therefore, it will be necessary for the user to determine that a particular enclosure is adequate when exposed to the specific conditions that might exist in intended applications. Except as might otherwise be noted, all references to products relative to NEMA enclosure types are based on MICRO SWITCH evaluation only.

SSPB SERIES ORDER GUIDE, GAGE PRESSURE

Catalog Listing	Nominal Pressure Range psig	Over Pressure Max. psi	Sensitivity (1) Range mA/psi
SSPB0015V	0-15	30	1.07 to 4.27
SSPB0100V	0-100	200	0.16 to 0.64
SSPB0250V	0-250	500	0.064 to 0.256

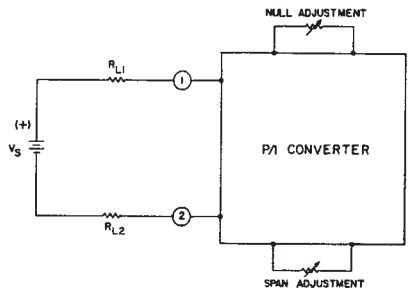
Mating Receptacle LSZ 4001

(1) NOTE: Sensitivity = $\frac{16\text{ mA}}{\text{Upper Pressure Setting - Lower Pressure Setting}}$

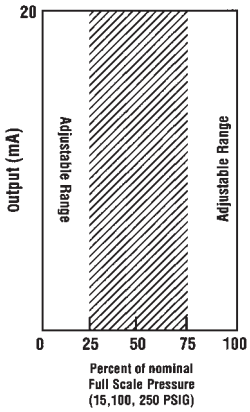
ELECTRICAL CONNECTIONS

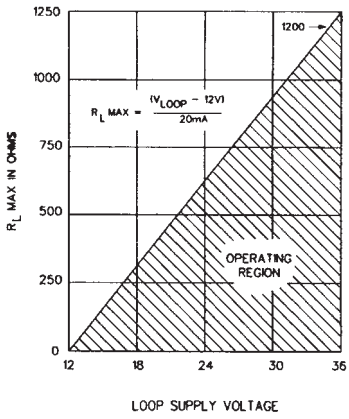
An ammeter, resistor (current output generates a voltage drop across the resistor) or any current sensing device is placed in series with a DC voltage source and the pressure sensor for proper operation. The load, represented by R_L, can be placed on either or both sides of the voltage source. Total load resistance must be within operating area. Output and Power LEDs do not require separate wiring.

$$R_{L(max.)} = \frac{V_S - 12\text{ volts}}{0.020\text{ Amps}}$$



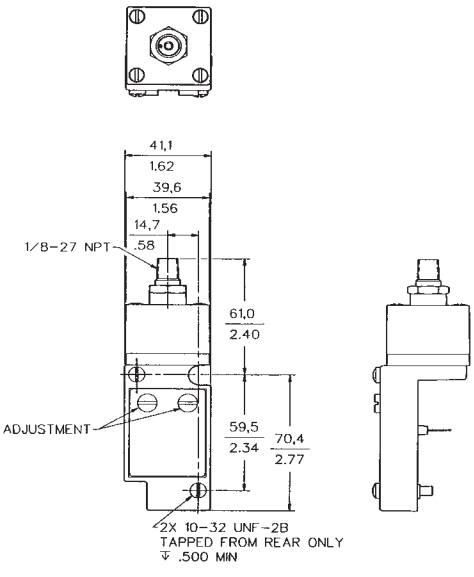
MAXIMUM EXTERNAL LOAD RESISTANCE VERSUS SUPPLY VOLTAGE





MOUNTING DIMENSIONS

(for reference only)

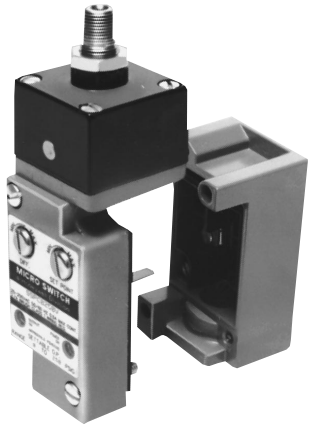


Amplified

Pressure Sensors

SSPC Series

Heavy Duty AC Adjustable Setpoint/2-Wire Digital

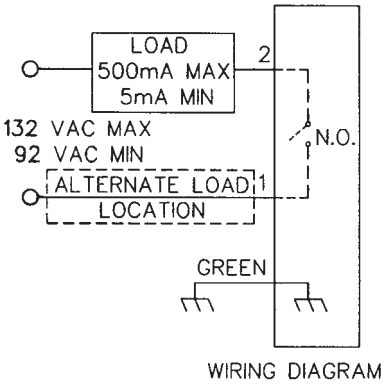


FEATURES

- Silicon sensor chip is enclosed in stainless steel welded diaphragm
- Rugged diecast zinc plug-in limit switch style housing
- Field adjustable setpoint and differential
- Sealed to meet NEMA 1, 3, 3R, 4, 6, 6P, 12, 13
- Protected against false pulse, transients, industrial noise and NEMA noise
- −25 to +85°C storage temperature
- 0 to +50°C operating and compensated temperature
- UL Listed

WIRING DIAGRAM

Output and Power LEDs do not require separate wiring.



WIRING DIAGRAM

SSPC SERIES PERFORMANCE CHARACTERISTICS, 25°C

	Min.	Typ.	Max.	Units
Supply Voltage	92.0	115	132	VAC
Repeatability				
@ 25°C	---	---	±0.5	% of Adjustable range
Comp. temp. range	---	---	±3.0	
Response Time Max (no time delay)	On - 20 msec		Off - 10 msec	
Rate of Operation	---	---	900	per minute
Power Dissipation	0.35 VA excluding load			
Saturation Voltage	9V max with 0.5 Amp load			
Load Current (N.O.)	0.5 Amp max. continuous over full temperature range 2.7 Amp. max. inrush			
Leakage Current (Off state)	2.0 mA RMS, max.			
Protection	False pulse, transients, Industrial noise, NEMA noise			
Weight	414 grams (.91 lb.) Note: w/o receptacle			

ENVIRONMENTAL SPECIFICATIONS

Storage Temperature	−25° to +85°C (−13° to 185°F)
Operating and Compensated Temperature	0° to 50°C (32° to 122°F)
Sealing	NEMA 1, 3, 3R, 4, 6, 6P, 12, 13*
Media	Limited only to those media which will not attack 316 stainless steel

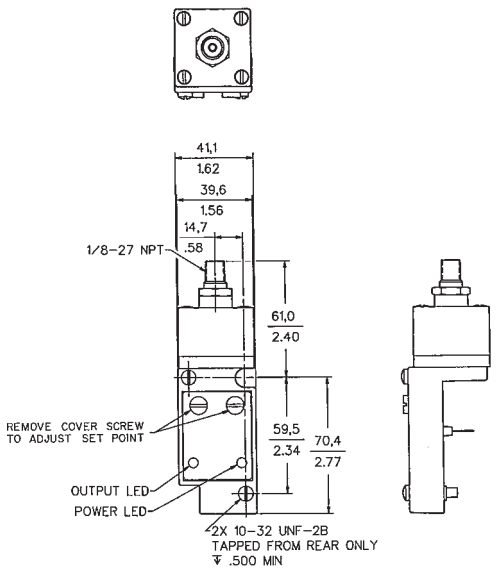
***Application Note:** Enclosures are based, in general, on the broad definitions outlined in NEMA standards. Therefore, it will be necessary for the user to determine that a particular enclosure is adequate when exposed to the specific conditions that might exist in intended applications. Except as might otherwise be noted, all references to products relative to NEMA enclosure types are based on MICRO SWITCH evaluation only.

SSPC SERIES ORDER GUIDE, GAGE PRESSURE

Catalog Listing	Nominal Pressure Range psig	Over-Pressure Max. psi	Adjustable Setpoint Range	Differential Min.
SSPC0015V	0-15	30	1.5-15	30% @ 1.5 psi, 10% @ F.S.
SSPC0100V	0-100	200	10-100	10%
SSPC0250V	0-250	500	25-250	10%

Mating Receptacle LSZ 4001

MOUNTING DIMENSIONS (for reference only)



Pressure Sensors

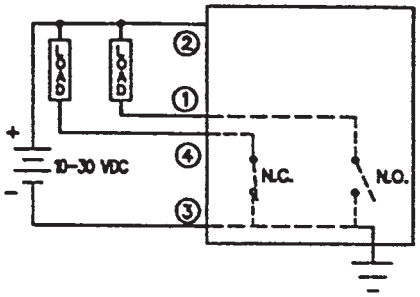
SSPD Series

Heavy Duty DC Adjustable Setpoint, 4-Wire Current Sinking

FEATURES

- Silicon sensor chip is enclosed in stainless steel welded diaphragm
- Rugged diecast zinc plug-in limit switch style housing
- Field Adjustable setpoint and differential
- Sealed to meet NEMA 1, 3, 3R, 4, 6, 6P, 12, 13
- Protected against false pulse, transients and industrial noise
- −25 to +85°C storage temperature
- 0 to +50° operating and compensated temperature
- UL Listed

WIRING DIAGRAM



Amplified

SSPD SERIES PERFORMANCE CHARACTERISTICS, 25°C

Supply Voltage	10 to 30 VDC
Load Current (N.O. & N.C.)	200 mA Max (NPN)
Leakage current, N.C. state	10 μA Max
Voltage Drop, Max	1.25V with 200 mA load
Response Time, Max	15 Milliseconds
Protection	Power up protection, transients, industrial noise
Repeatability (Stability)	±0.5% of Set Points (@25°C) ±3.0% of Set Points (0°C to +50°C)

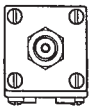
ENVIRONMENTAL SPECIFICATIONS

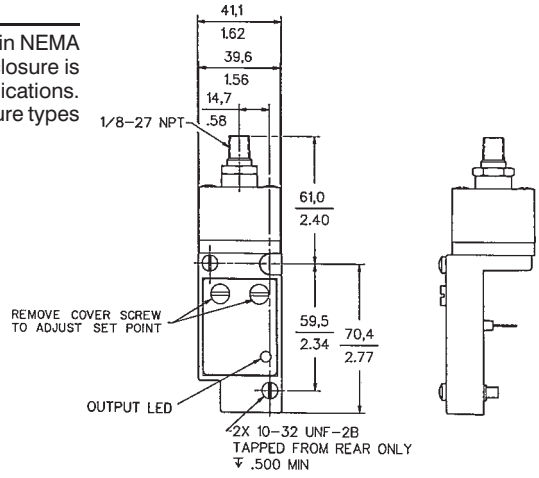
Storage Temperature	−25° to +85°C (−13° to 185°F)
Operating and Compensated Temperature	0° to 50°C (32° to 122°F)
Sealing	NEMA 1, 3, 3R, 4, 6, 6P, 12, 13*
Media	Limited only to those media which will not attack 316 stainless steel

***Application Note:** Enclosures are based, in general, on the broad definitions outlined in NEMA standards. Therefore, it will be necessary for the user to determine that a particular enclosure is adequate when exposed to the specific conditions that might exist in intended applications. Except as might otherwise be noted, all references to products relative to NEMA enclosure types are based on MICRO SWITCH evaluation only.

MOUNTING DIMENSIONS

(for reference only)





SSPD SERIES ORDER GUIDE, GAGE PRESSURE

Catalog Listing	Input Pressure Max. psig	Over-Pressure Max. psi	Adjustable Setpoint Range	Differential Min.
SSPD0015V	1.5-15	30	15	30% @ 1.5 psi, 10% @ F.S.
SSPD0100V	100	200	10-100	10%
SSPD0250V	250	500	25-250	10%

Mating Receptacle LSZ 4001

SSPD Series has one bicolor Output LED.

Pressure Sensors

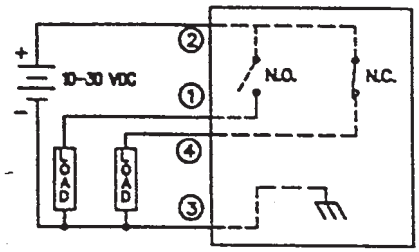
SSPE Series

Heavy Duty DC Adjustable Setpoint, 4-Wire Current Sourcing

FEATURES

- Silicon sensor chip is enclosed in stainless steel welded diaphragm
- Rugged diecast zinc plug-in limit switch style housing
- Field Adjustable setpoint and differential
- Sealed to meet NEMA 1, 3, 3R, 4, 6, 6P, 12, 13
- Protected against false pulse, transients and industrial noise
- −25 to +85°C storage temperature
- 0 to +50° operating and compensated temperature
- UL Listed

WIRING DIAGRAM



SSPE SERIES PERFORMANCE CHARACTERISTICS, 25°C

Supply Voltage	10 to 30 VDC
Load Current (N.O. & N.C.)	200 mA Max (sourcing)
Leakage current, N.C. state	10 μA Max
Voltage Drop, Max	1.25V with 200 mA load
Response Time, Max	15 Milliseconds
Protection	Power up protection, transients, industrial noise
Repeatability (Stability)	±0.5% of Set Points (@25°C) ±3.0% of Set Points (0°C to +50°C)

ENVIRONMENTAL SPECIFICATIONS

Storage Temperature	−25° to +85°C (−13° to 185°F)
Operating and Compensated Temperature	0° to 50°C (32° to 122°F)
Sealing	NEMA 1, 3, 3R, 4, 6, 6P, 12, 13*
Media	Limited only to those media which will not attack 316 stainless steel

***Application Note:** Enclosures are based, in general, on the broad definitions outlined in NEMA standards. Therefore, it will be necessary for the user to determine that a particular enclosure is adequate when exposed to the specific conditions that might exist in intended applications. Except as might otherwise be noted, all references to products relative to NEMA enclosure types are based on MICRO SWITCH evaluation only.

SSPE SERIES ORDER GUIDE, GAGE PRESSURE

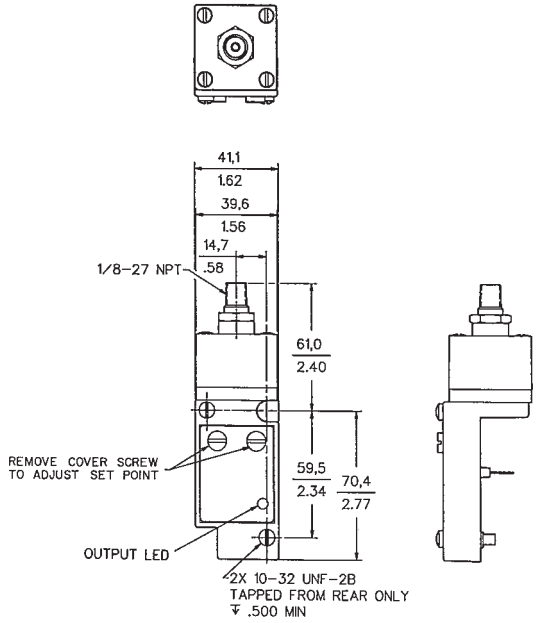
Catalog Listing	Input Pressure Max. psig	Over-Pressure Max. psi	Adjustable Setpoint Range	Differential Min.
SSPE0015V	15	30	1.5-15	30% @ 1.5 psi, 10% @ F.S.
SSPE0100V	100	200	10-100	10%
SSPE0250V	250	500	25-250	10%

Mating Receptacle LSZ 4001

SSPE Series has one bicolor Output LED

MOUNTING DIMENSIONS

(for reference only)



Commercial Grade High Pressure Sensors

20PC Family

20PC Series

FEATURES

- Lowest priced sensor with temperature compensation and calibration
- Variety of gage pressure port configurations; easily modified for special needs
- Operable after exposure to frozen conditions
- Choice of terminations for gage sensors
- Calibrated Null and Span
- Temperature compensated for Span over 0ºC to 50ºC provides interchangeability
- Measures vacuum or positive pressure
- Ideal for wet/wet applications

TYPICAL APPLICATIONS

Medical

- Oxygen and nitrogen gas distribution in hospitals
- Dental chairs
- Water flow measurement

Environmental

- Water control valves
- Instrumentation
- Irrigation equipment
- Filter monitoring equipment

Industrial Instrumentation

- Robotics
- Pressure valves
- Leak detection
- Air compressors

Analytical Instrumentation

- Gas chromatography

The 20PC family has added a new range to its already high pressure sensor family. The 250 psi range is now being offered in our 26PC family. This pressure range completes a full complement of pressure ranges that are compensated over temperature and calibrated at zero and full scale. The addition of the 250 psi pressure range permits greater flexibility in the design of this product family.

The factory calibrated 26PC Series sensors are temperature compensated (0 to 50°C), allowing part interchangeability, high performance, reliability, and accuracy. The lower cost noncompensated 24PC Series sensors are ideal for on-system calibration applications. These versatile 20PC Series products can meet many pressure sensing requirements in the commercial/consumer marketplace. Pressure ranges are from 0.5 psi to 250 psi in the 20PC family.

The extensive port options available for the 20PC Series sensors promote the application flexibility of Honeywell's commercial grade high pressure sensing options.

⚠WARNING

MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as product installation information.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

⚠WARNING

PERSONAL INJURY

- DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

Commercial Grade High Pressure Sensors

20PC Family

20PC Series

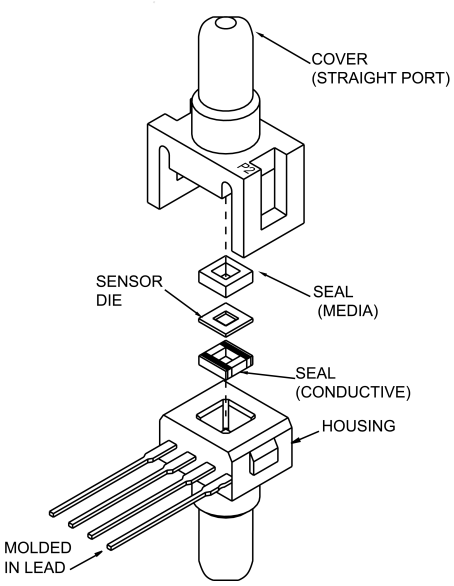
26PC Series Performance Characteristics at 10.0 ± 0.01 Vdc Excitation, 25°C

	Min.	Typ.	Max.	Units
Excitation	—	10	16	Vdc
Response Time	—	—	1.0	ms
Input Resistance	5.5 k	7.5 k	11.5 k	Ohm
Output Resistance	1.5 k	2.5 k	3.0 k	Ohm
Weight		2		gram

Environmental Specifications

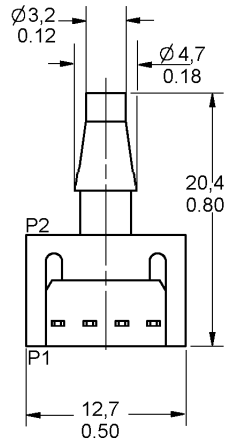
Operating Temperature	-40°C to +85°C (-40°F to +185°F)
Storage Temperature	-55°C to +100°C (-67°F to +212°F)
Compensated Temperature	0°C to +50°C (32°F to +122°F)
Shock	Qualification tested to 150 g
Vibration	MIL-STD-202, Method 213 (0 to 2 kHz, 20 G sine)

NOTE: For media compatibility specifications, refer to Catalog 15, 007908-11, or web site: www.honeywell.com/sensing

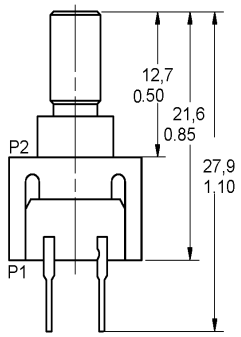


26PC PORT VARIATIONS (dimensions for reference only) mm/in

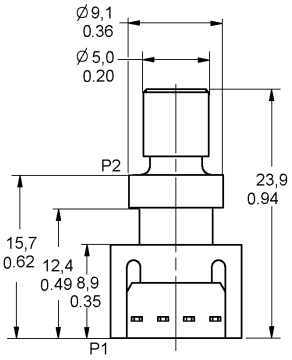
B Barbed



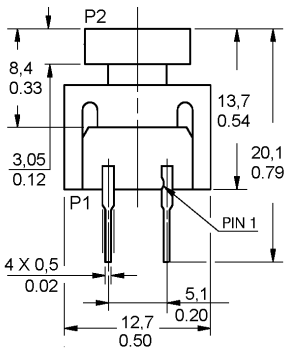
H M5 Thread*



M ¼-28 Thread**



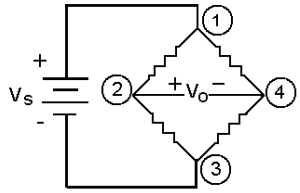
S Manifold



*Recommended torque for sealing is 4 in-lb. Do not exceed 6 in-lb of torque. Use size 007 O-Ring. O-Ring counterbore dimensions are 0.04 ± .005 in D x 0.300 ± .003 in Dia.

**Recommended torque for sealing is 8 in-lb. Do not exceed 12 in-lb. Use size 009 O-Ring. O-Ring counterbore dimensions are .040 ± .002 in D x 0.360 ± .003 in Dia.

26PC CIRCUIT TERMINATION



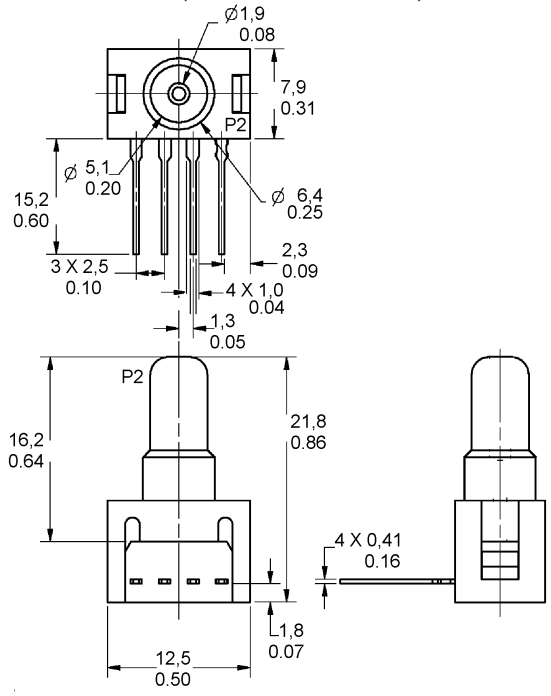
Pin 1 = Vs (+)
Pin 2 = Output (+)
Pin 3 = Ground (-)
Pin 4 = Output (-)
Pin 1 is notched, Pin 2 is next to Pin 1, etc.

MOUNTING DIMENSIONS (for reference only) mm/in

GAGE SENSOR

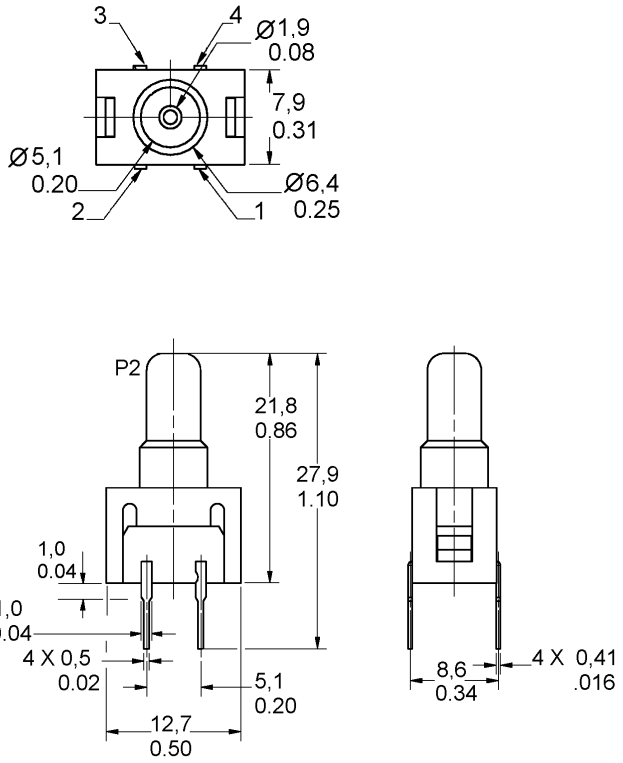
1 x 4 Termination (Style 6) Port Style A, Straight

Pin 1 is notched, Pin 2 is next to Pin 1, etc.



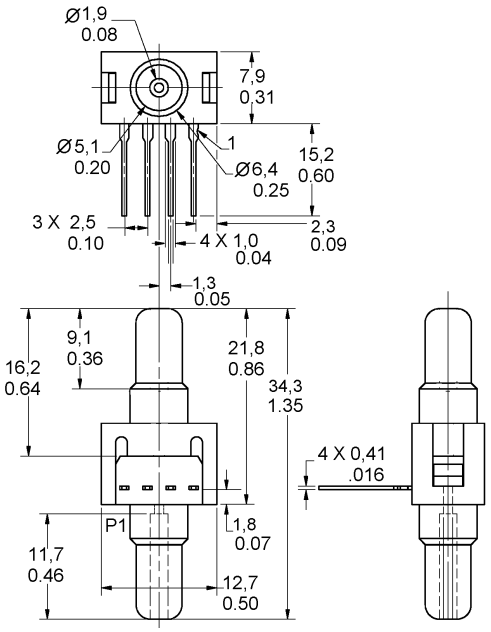
2 x 2 Termination (Style 2) Port Style A, Straight

Pin 1 is notched, Pin 1 is shown at lower right corner. Pins 2, 3, 4 are clockwise.



DIFFERENTIAL SENSOR

1 X 4 Termination (Style 6) Port Style A, Straight (Only)



Commercial Grade High Pressure Sensors

20PC Pressure Sensors

20PC Series

26PC FAMILY SENSOR SELECTION GUIDE

2	6	PC	G	F	A	2	G
Product Family	**Circuit Type**	**Pressure Sensor**	**Pressure Range**	**Seal Type**	**Port Type**	**Termination Style**	**Pressure Measurement**
2 20PC Family	**6** Compensated Calibrated		**A** 1 psi **B** 5 psi **C** 15 psi **D** 30 psi **F** 100 psi **G** 250 psi **J** 38 psi **K** 38 psi*	**E** EPDM **F** Fluorosilicone **N** Neoprene **S** Silicone	**A** Straight **B** Barbed **H** **M5** Thread **M** **1/4-28** Thread **S** Manifold	**2** 4-pin DIP **6** 4-pin SIP	**G** Gage **D** Differential

Example: 26PCGFA2G
Compensated, calibrated 250 psi sensor with fluorosilicone seal, straight port, 2 X 2 termination and gage pressure measurement.
* Passivated (P2 side of die is coated for environmental and dielectric protection)

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

For application assistance, current specifications, or name of the nearest Authorized Distributor, check the Honeywell web site or call:
1-800-537-6945 USA
1-800-737-3360 Canada
1-815-235-6847 International
FAX
1-815-235-6545 USA
INTERNET
www.honeywell.com/sensing
info.sc@honeywell.com

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Freeport, Illinois 61032

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Honeywell

Microstructure Pressure Sensors

24PC SMT (1 psi, 5 psi, 15 psi)

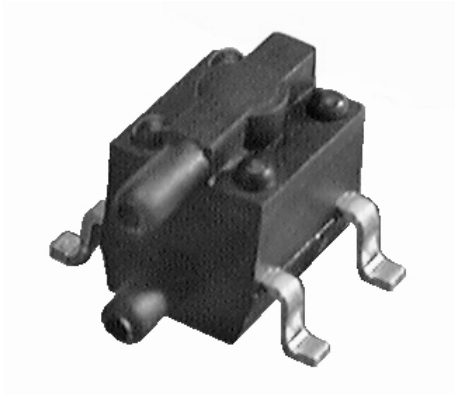
24PC SMT Series

FEATURES

- Alignment pins for position accuracy
- Small package size (less than one half the size of the 24PC) and compact surface mount profile
- 3,18 mm [0.125 in] diameter pick-up feature for use in pick and place machines
- Max peak reflow temperature of 260 °C [500 °F]
- Gage, vacuum gage, differential, wet/wet differential sensing available in one package
- True wet/wet differential sensing
- Proven elastomeric interconnections of the 20PC family
- Sensor consists of only five components
- Elastomeric construction
- Wide operating temperature range of -40 °C to 85 °C [-40 °F to 185 °F]

TYPICAL APPLICATIONS

- Blood glucose monitors
- Oxygen conservers
- Infusion pumps
- Ventilators
- CPAP (Continuous Positive Airway Pressure) equipment
- Residential fuel cells



The 24PC SMT (Surface Mount Technology) Series provides a small, low cost, high value, pressure sensing solution for use with printed circuit boards (PCBs). Based on the long established reliability and accuracy of the 24PC pressure sensor, the 24PC SMT offers reduced size with true surface mount capability. The smaller size reduces the sensor's footprint on the PCB, thereby reducing the size of the PCB. The 24PC SMT been designed to be used with other PCB SMT components, helping to lower installation costs and eliminate secondary operations.

The sensor features Wheatstone bridge construction, silicon piezoresistive technology, and ratiometric output for proven application flexibility, design simplicity and ease of manufacture.

Although primarily designed for the medical industry, the SMT Series of pressure sensors may be applied in almost any industry that requires a surface mount pressure sensor.

⚠WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices, or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

⚠WARNING

MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as system installation information.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

24PC SMT PERFORMANCE CHARACTERISTICS (AT 10 VDC ±0.01 VDC EXCITATION, 25 °C [77 °F])

	Min.	Typ.	Max.	Units
Excitation Voltage	—	10.0	12.0	Vdc
Response Time	—	—	1.0	ms
Input Resistance	4.5 k	5.0 k	5.5 k	Ohm
Output Resistance	4.5 k	5.0 k	5.5 k	Ohm
Span P2>P1[1]	**Min.**	**Typ.**	**Max.**	
0 to 1	25.0	45.0	65.0	mV
0 to 5	60.0	115.0	150.0	mV
0 to 15	160.0	225.0	290.0	mV
Null Offset	**Min.**	**Typ.**	**Max.**	
0 to 1	-30.0	0	+30.0	mV
0 to 5	-30.0	0	+30.0	mV
0 to 15	-30.0	0	+30.0	mV
Linearity (BFSL P2>P1)		**Typ.**	**Max.**	
0 to 1	—	±0.15	±0.4	% span
0 to 5	—	±0.10	±0.2	% span
0 to 15	—	±0.10	±0.3	% span
Null Shift 25 °C to 0 °C, 25 °C to 50 °C[2]		**Typ.**	**Max.**	
0 to 1	—	±1.0	---	mV
0 to 5	—	±1.0	---	mV
0 to 15	—	±1.0	---	mV
Span Shift 25 °C to 0 °C, 25 °C to 50 °C[2]		**Typ.**	**Max.**	
0 to 1	—	±5.0	---	% span
0 to 5	—	±5.0	---	% span
0 to 15	—	±5.0	---	% span
Repeatability and Hysteresis		**Typ.**	**Max.**	
0 to 1	—	±0.15	—	% span
0 to 5	—	±0.15	—	% span
0 to 15	—	±0.15	—	% span
Overpressure P2>P1; P1>P2		**Typ.**	**Max.**	
0 to 1	—	—	20	psi
0 to 5	—	—	20	psi
0 to 15	—	—	45	psi

Notes:

1. Span is the algebraic difference between output at maximum rated operating pressures and output at 0 psi.
2. Temperature error is calculated with respect to 25 °C [77 °F].

SPECIFICATIONS

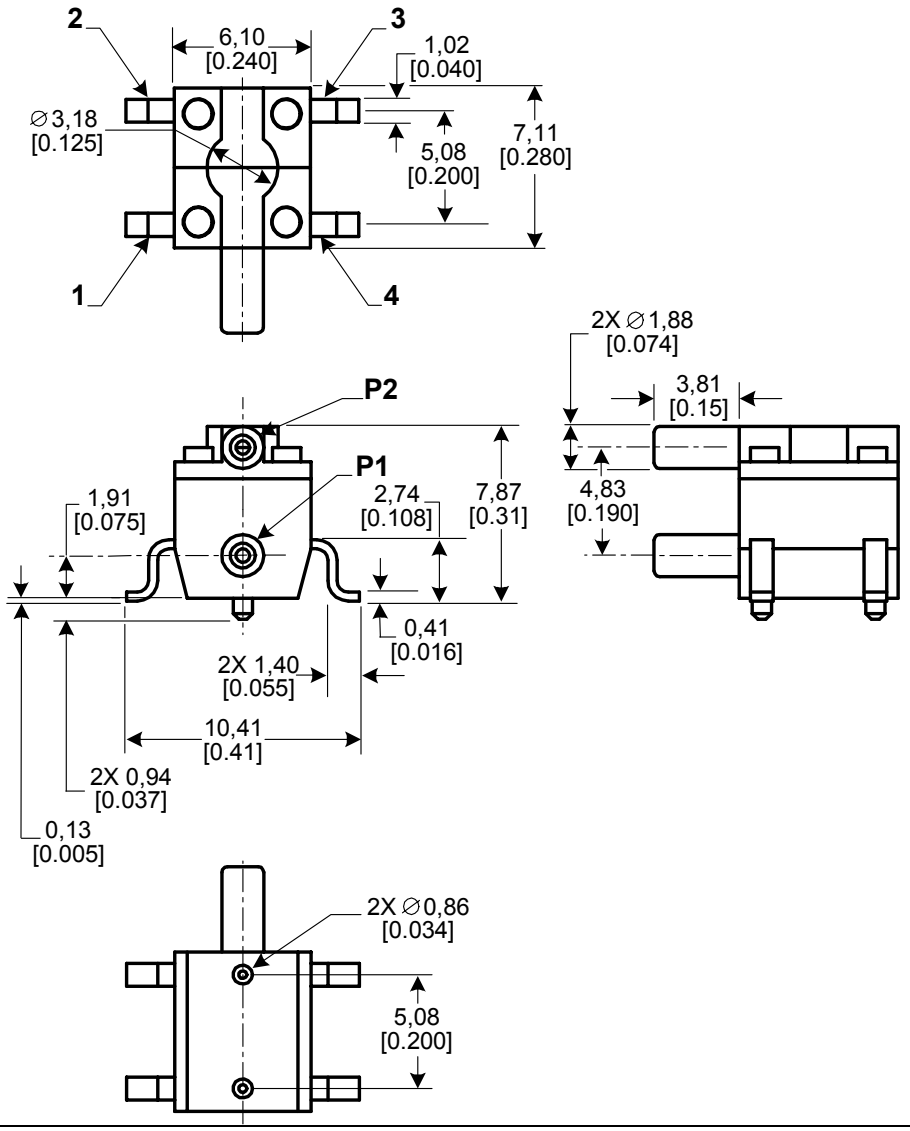
Characteristic	Description
Storage Temperature	-55 °C to 100 °C [-67 °F to 212 °F]
Operating Temperature	-40 °C to 85 °C [-40 °F to 185 °F]
Compensated Temperature	None
Alignment Pins	0,86 mm [0.034 in] diameter pins extend through PCB
Port Diameter	1,88 mm [0.074 in] diameter uses standard 0,59 mm [0.0625 in] ID tubing
Port Orientation	Parallel to PCB (low profile on board)
Pick Up Feature	3,18 mm [0.125 in] feature on port cover
SMT Solder	• Sn 96.5 Ag 3.5 No Clean Flux • Sn 63 Pb 37 No Clean Flux
SMT Reflow Profile	Max peak temperature of 260 °C [500 °F] for 10 seconds
Media Compatibility	Both ports are limited to media that are compatible with polyphthalamide, fluorosilicone and silicon.
Shock	Qualification tested to 150 g
Vibration	MIL-STD-202. Method 213 (150 g half sine 11 ms)
Weight	0.5 grams [0.0176 oz]

Microstructure Pressure Sensors

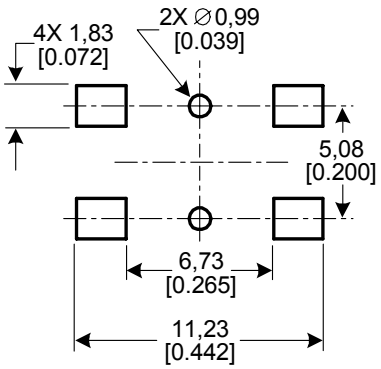
24PC SMT (1 psi, 5 psi, 15 psi)

24PC SMT Series

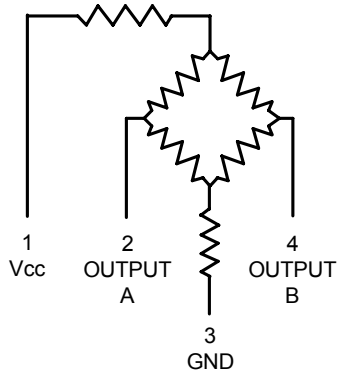
MOUNTING DIMENSIONS mm[in] (for reference only)



SUGGESTED LAND PATTERN



CIRCUIT DIAGRAM



OUTPUT VOLTAGE

Output A increases as P2 pressure increases.

Output B decreases as P2 pressure increases.

Microstructure Pressure Sensors

24PC SMT (1 psi, 5 psi,15 psi)

24PC SMT Series

DATE CODE

_ _ _ _ _ _

Week: Two Digits

Year: Four Digits

CATALOG LISTING NOMENCLATURE

24 PC __ SMT

Package Style: SMT (Surface Mount Technology)

Pressure Range:
01 = 1.0 psi
05 = 5.0 psi
15 = 15.0 psi

Family: PC

Type: Uncompensated

BRANDING SCHEME

4 __ F

Seal: Fluorosilicone

Pressure Range:
01 = 1.0 psi
05 = 5.0 psi
15 = 15.0 psi

Type: Uncompensated

TECHNICAL NOTES

Technical Notes that provide further application information on the 24PC SMT are available on the Honeywell web site at: ***http://www.honeywell.com/sensing/prodinfo/pressure/20pc***

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. **The foregoing is Buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

For application assistance, current specifications, or name of the nearest Authorized Distributor, check the Honeywell web site or call:
1-800-537-6945 USA
1-800-737-3360 Canada
1-815-235-6847 International
FAX
1-815-235-6545 USA
INTERNET
www.honeywell.com/sensing
info.sc@honeywell.com

Honeywell

Sensing and Control
Honeywell
11 West Spring Street
Freeport, Illinois 61032
008082-2-EN IL50 GLO 0803 Printed in USA

Microstructure Pressure Sensors

26PC SMT (1 psi, 5 psi, 15 psi)

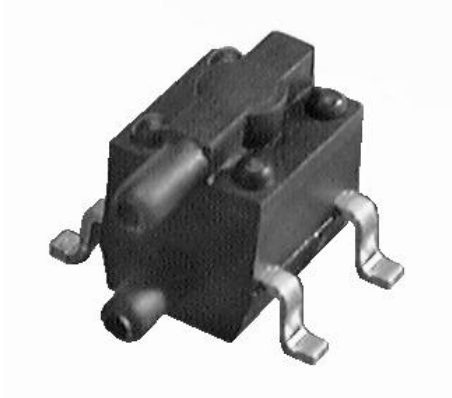
26PC SMT Series

FEATURES

- Alignment pins for position accuracy
- Small package size (less than one half the size of the 26PC) and compact surface mount profile
- 3,18 mm [0.125 in] diameter pick-up feature for use in pick and place machines
- Max peak reflow temperature of 260 °C [500 °F]
- Gage, vacuum gage, differential, wet/wet differential sensing available in one package
- True wet/wet differential sensing
- Proven elastomeric interconnections of the 20PC family
- Temperature compensation
- End point calibration
- Sensor consists of only five components
- Elastomeric construction
- Wide operating temperature range of -40 °C to 85 °C [-40 °F to 185 °F]

TYPICAL APPLICATIONS

- Blood glucose monitors
- Oxygen conservers
- Infusion pumps
- Ventilators
- CPAP (Continuous Positive Airway Pressure) equipment
- Residential fuel cells



The 26PC SMT (Surface Mount Technology) Series pressure sensor, the first offering in the 20PC SMT family of pressure sensors, is a small, low cost, high value, pressure sensing solution for use with printed circuit boards (PCBs). Based on the long established reliability and accuracy of the 26PC pressure sensor, the 26PC SMT offers reduced size with true SMT capability. The smaller size reduces the sensor's footprint on the PCB, thereby reducing the size of the PCB. The 26PC SMT is the first pressure sensor capable of being used with other SMT components on the PCB, helping to lower installation costs and eliminate secondary operations.

The sensor features Wheatstone bridge construction, silicon piezoresistive technology, and ratiometric output for proven application flexibility, design simplicity and ease of manufacture.

Although primarily designed for the medical industry, the 20PC SMT pressure sensor may be applied in any industry that requires a surface mount pressure sensor.

⚠WARNING
PERSONAL INJURY

- DO NOT USE these products as safety or emergency stop devices, or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

⚠WARNING
MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as system installation information.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

26PC SMT PERFORMANCE CHARACTERISTICS (AT 10 VDC ±0.01 VDC EXCITATION, 25 °C)

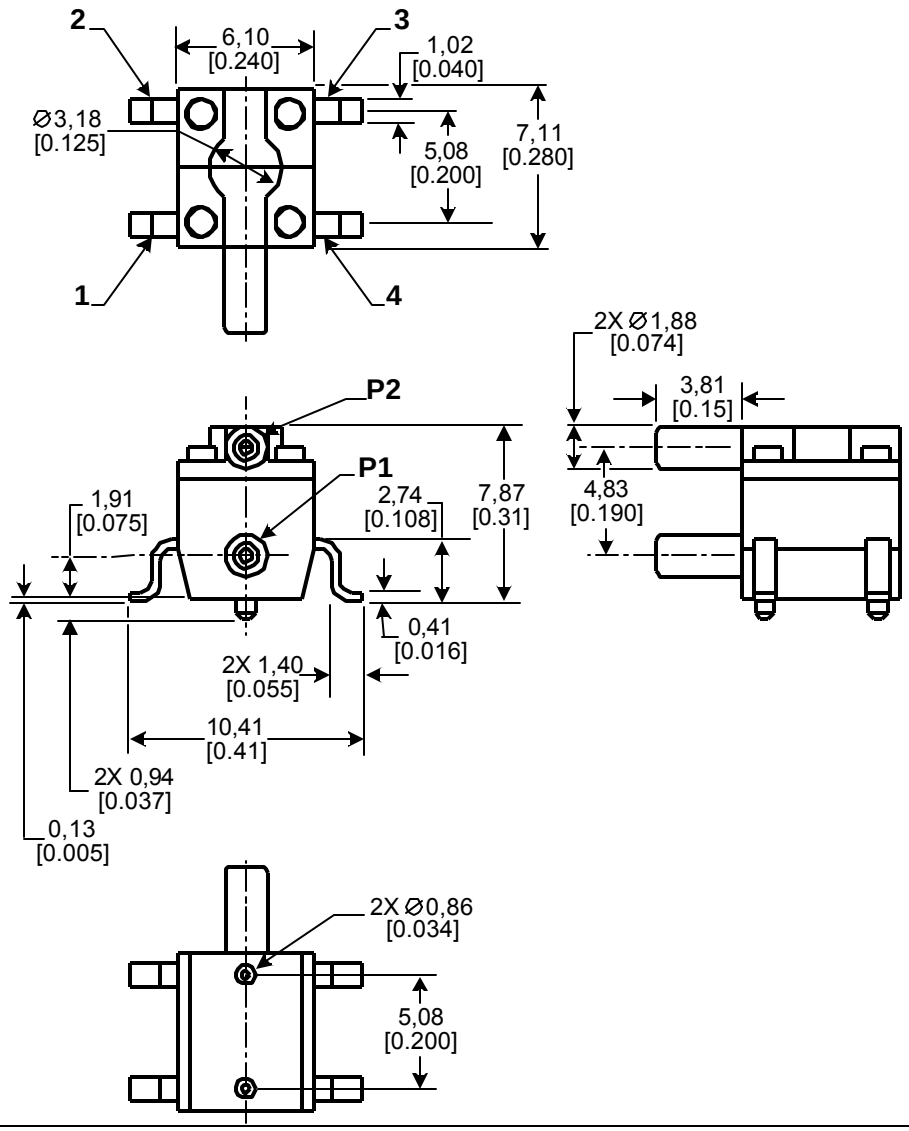
	Min.	Typ.	Max.	Units
Excitation Voltage	—	10.0	16.0	Vdc
Response Time	—	—	1.0	ms
Input Resistance	5.5 k	7.5 k	11.5 k	Ohm
Output Resistance	1.5 k	2.5 k	3.0 k	Ohm
Span P2>P1[1]	**Min.**	**Typ.**	**Max.**	
0 to 1	14.7	16.7	18.7	mV
0 to 5	47	50	53	mV
0 to 15	96	100	104	mV
Null Offset	**Min.**	**Typ.**	**Max.**	
0 to 1	-2.0	0	+2.0	mV
0 to 5	-2.0	0	+2.0	mV
0 to 15	-2.0	0	+2.0	mV
Linearity (BFSL P2>P1)		**Typ.**	**Max.**	
0 to 1	—	±0.50	±1.75	% span
0 to 5	—	±0.50	±1.5	% span
0 to 15	—	±0.50	±1.0	% span
Null Shift 25 °C to 0 °C, 25 °C to 50° C[2]		**Typ.**	**Max.**	
0 to 1	—	—	±1.0	mV
0 to 5	—	—	±1.0	mV
0 to 15	—	—	±1.0	mV
Span Shift 25 °C to 0 °C, 25 °C to 50° C[2]		**Typ.**	**Max.**	
0 to 1	—	±1.5	±4.5	% span
0 to 5	—	±1.0	±1.7	% span
0 to 15	—	±0.75	±1.5	% span
Repeatability and Hysteresis		**Typ.**	**Max.**	
0 to 1	—	±0.2	—	% span
0 to 5	—	±0.2	—	% span
0 to 15	—	±0.2	—	% span
Overpressure P2>P1; P1>P2		**Typ.**	**Max.**	
0 to 1	—	—	20	psi
0 to 5	—	—	20	psi
0 to 15	—	—	45	psi

Notes:
1. Span is the algebraic difference between output at maximum rated operating pressures and output at 0 psi.
2. Temperature error is calculated with respect to 25 °C.

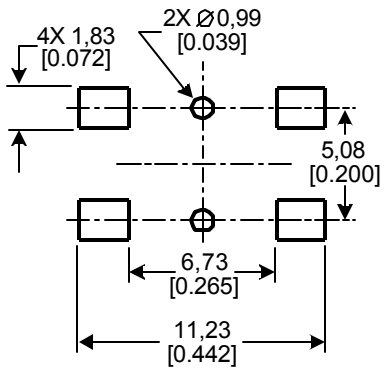
SPECIFICATIONS

Characteristic	Description
Storage Temperature	-55 °C to 100 °C [-67 °F to 212 °F]
Operating Temperature	-40 °C to 85 °C [-40 °F to 185 °F]
Compensated Temperature	0 °C to 50 °C [32 °F to 122 °F]
Alignment Pins	0,86 mm [0.034 in] diameter pins extend through PCB
Port Diameter	1,88 mm [0.074 in] diameter uses standard 0,59 mm [0.0625 in] ID tubing
Port Orientation	Parallel to PCB (low profile on board)
Pick Up Feature	3,18 mm [0.125 in] feature on port cover
SMT Solder	• Sn 96.5 Ag 3.5 No Clean Flux • Sn 63 Pb 37 No Clean Flux
SMT Reflow Profile	Max peak temperature of 260 °C [500 °F] for 10 seconds
Media Compatibility	Both ports are limited to media that are compatible with polyphthalamide, fluorosilicone and silicon.
Shock	Qualification tested to 150 g
Vibration	MIL-STD-202. Method 213 (150 g half sine 11 ms)
Weight	0.5 grams [0.0176 oz]

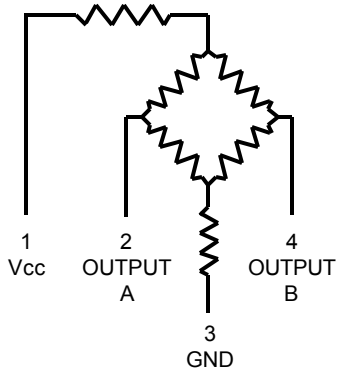
MOUNTING DIMENSIONS mm[in] (for reference only)



SUGGESTED LAND PATTERN



CIRCUIT DIAGRAM



OUTPUT VOLTAGE

Output A increases as P2 pressure increases.

Output B decreases as P2 pressure increases.

Microstructure Pressure Sensors
26PC SMT (1 psi, 5 psi,15 psi)

26PC SMT Series

DATE CODE

_ _ _ _ _ _

Week: Two Digits
Year: Four Digits

CATALOG LISTING NOMENCLATURE

26 PC __ SMT

Package Style: SMT (Surface Mount Technology)
Pressure Range:
01 = 1 psi
05 = 5 psi
15 = 15 psi
Family: PC
Type: Compensated

BRANDING SCHEME

6 __ F

Seal: Fluorosilicone
Pressure Range:
01 = 1 psi
05 = 5 psi
15 = 15 psi
Type: Compensated

TECHNICAL NOTES

Technical Notes that provide further application information on the 26PC SMT are available on the Honeywell web site at: ***http://www.honeywell.com/sensing/prodinfo/pressure/20pc***

WARRANTY/REMEDY

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Honeywell

1800/1805 Series

TO-8, 0 psi to 3 psi, 0 psi to 150 psi Silicon Pressure Sensors

DESCRIPTION

The 1800/1805 Series sensors are high performance TO-8 pressure transducers specifically designed to address a variety of both low and medium pressure original equipment manufacture applications.

The transducers offer two performance grades and a variety of compensation options, including span and calibration to within ±2 mV (normalized output). The 1800/1805 Series can operate with either constant current or voltage excitation.

The 1800/1805 Series contains a solid state piezoresistive pressure sensor mounted in a standard TO-8 package. They are printed circuit board and pin-for-pin compatible with other TO-8 pressure sensors.

FEATURES

- Standard pressure ranges from 0 psi to 3 psi, 0 psi to 150 psi
- Gauge, absolute or differential models
- Voltage or constant current excitation
- Choice of temperature compensation options
  - Laser trim, normalized output
  - Laser trim, standard output
  - Resistor compensation
- Uncompensated version available for microprocessor-based designs

POTENTIAL APPLICATIONS

- Instrumentation calibration
- Avionics/aerospace
- Medical equipment
- HVAC
- Pneumatic controls

1800/1805 Series
TO-8, 0 psi to 3 psi, 0 psi to 150 psi

ENVIRONMENTAL SPECIFICATIONS (All devices)

Characteristic	Parameter	Characteristic	Parameter
Supply voltage, V_S	10 Vdc	Insulation resistance	100 MOhm at 50 Vdc
Compensated temperature range	-1 °C to 54 °C [34 °F to 129 °F]	Humidity	50 % ± 10 %
Operating temperature tange	-40 °C to 121 °C [-40 °F to 257 °F]	Common-mode pressure	150 psig
Vibration	10 g rms at 20 Hz to 200 Hz	Max. soldering temperature	260 °C [500 °F] 10 s max.
Shock	100 g for 11 ms	Excitation voltage V_S	Supply voltage V_s =15 Vdc max.
Life	100 million cycles	Excitation current	Supply current I_s = 2 mA max.

PERFORMANCE CHARACTERISTICS(1)

Characteristic	Min.	Typ.	Max.	Unit
Zero pressure offset(1)	–	–	±0.5	mV
Zero pressure offset (3 psi to 5 only) (1)	–	–	±1	mV
Full-scale span(2)				
Standard output–current excitation	75	–	150	mV
Standard output–voltage excitation	40	–	120	mV
Normalized output–current excitation	98	–	102	mV
Normalized output–current excitation (3 psi only)	73	–	77	mV
Normalized output–voltage excitation	38	–	42	mV
Pressure non-linearity(3)	–	±0.15	±0.20	%FSS
Pressure hysteresis(3)	–	–	±0.0125	%FSS
Repeatability	–	–	±0.0125	%FSS
Temperature effect on offset(4)	–	–	±0.5	mV
Temperature effect on offset (3 psi and 5 psi only) (4)	–	–	±1	mV
Temperature effect on span	–	–	±0.5	mV
Temperature effect on span (3 psi and 5 psi only) (4)		–	±1	mV
Thermal hysteresis	–	±0.1	–	%FSS
Response time(5)	–	–	1	ms
Long term stability of offset and span(6)	–	–	±0.2	%FSS
Common mode voltage(7)				
Standard output–current excitation	–	50 %	–	input
Standard output–voltage excitation	–	50 %	–	input
Normalized output–current excitation	–	35 %	–	input
Normalized output–voltage excitation	–	25 %	–	input
Input resistance	–	–	–	–
Current excitation	2.0	–	8.0	kΩ
Voltage excitation	8.0	–	40	kΩ
Output resistance	3.5	–	6.0	kΩ

PRESSURE RANGE SPECIFICATIONS

Catalog Listing	Pressure Range	Top Side Overpressure(8)	Bottom Side Overpressure(9)
1805-00 (G,D) - (K,L) (0..4) (M,L,N)	0 psi to 3 psi	15 psi	9 psi
1805-01 (G,D) - (K,L) (0..4) (M,L,N)	0 psi to 5 psi	25 psi	15 psi
1800-02 (G,D) - (K,L) (0..4) (M,L,N)	0 psi to 10 psi	50 psi	30 psi
1800-03 (G,D) - (K,L) (0..4) (M,L,N)	0 psi to 15 psi	65 psi	45 psi
1800-07 (G,D) - (K,L) (0..4) (M,L,N)	0 psi to 30 psi	250 psi	50 psi
1800-08 (G,D) - (K,L) (0..4) (M,L,N)	0 psi to 50 psi	350 psi	50 psi
1800-09 (G,D) - (K,L) (0..4) (M,L,N)	0 psi to 100 psi	350 psi	50 psi
1800-10 (G,D) - (K,L) (0..4) (M,L,N)	0 psi to 150 psi	350 psi	50 psi

Notes:

1. Reference conditions (unless otherwise noted); T_A = 25 °C [77 °F], Supply V_S = 10 Vdc ±0.01 Vdc or I_S = 1.5 mA ±0.0015 mA.
2. Full-scale span (FSS) is the algebraic difference between the output voltage at full-scale pressure and the output at zero pressure. FFS is ratiometric to the supply voltage.
3. Pressure non-linearity is based on best-fit straight line from the zero to the full-scale pressure. Pressure hysteresis is the maximum output difference at any point within the operating pressure range for increasing and decreasing pressure.
4. Maximum error band of the offset voltage or span over the compensated temperature range, relative to the 25 °C [77 °F] reading.
5. Response time for a 0 psi to full-scale span pressure step change, 10 % to 90 % rise time.
6. Long term stability over a six month period.
7. Common mode voltage as measured from output to ground. For higher levels of common mode voltage, contact the factory.
8. Pressure overrange: Top: 5 x full-scale pressure or ≤350 psi, whichever is less.
9. Pressure overrange: Bottom: 3 x full-scale or ≤50 psi, whichever is less.

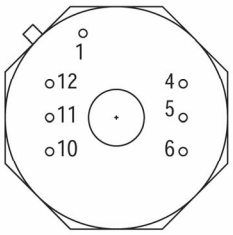
STANDARD COMPENSATION AND TRIM CHOICES
For maximum convenience, the 1800/1805 Series is temperature compensated from -1 °C to 54 °C [34 °F to 129 °F]. Other temperature ranges are available upon request.

Normalized Output Option: For design convenience and sensor interchangeability, the 1800/1805 Series is available with normalized output (100 ±2 mV dc in current excited versions with pressure range >3 psi). Normalized output for current excited 3 psi devices is 75 ±2 mV dc.

Laser Trim: Compensation is accomplished by using an in-house laser trim facility that allows for tighter product performance control and improved flexibility in response to special customer performance requirements.

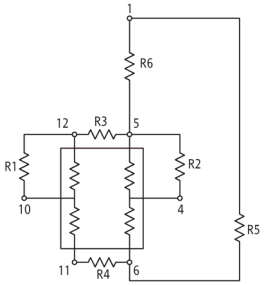
Resistors: This option includes a printout of suggested temperature compensation and zero offset resistor values for each individual sensor.

ELECTRICAL CONNECTIONS



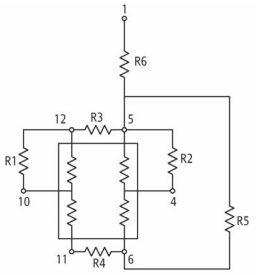
Pin 1 on normalized and voltage excited standard output.

CURRENT EXCITATION



Normalized output shown.
Standard output on pin 5 R6 shorted.

VOLTAGE EXCITATION



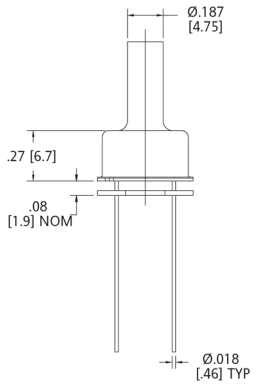
R5 open for standard output.

EXTERNAL CONNECTIONS

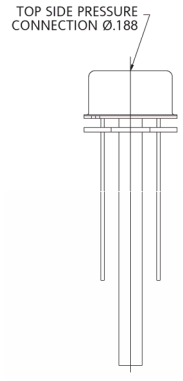
POSITIVE PRESSURE ON TOP AND BOTTOM SIDES								Current or Voltage Excitation – Normalized Output	
Current Excitation – Standard Output				Voltage Excitation – Standard Output					
Discrete Resistor		Laser Trim Board		Discrete Resistor		Laser Trim Board		Laser Trim Board	
Pin	**Connection**	**Pin**	**Connection**	**Pin**	**Connection**	**Pin**	**Connection**	**Pin**	**Connection**
4	+ Output	4	+ Output	4	+ Output	4	+ Output	4	+ Output
5	+ Input	5	+ Input	5	+ Input	5	NC	5	NC
6	- Input	6	- Input	6	- Input	6	- Input	6	- Input
10	- Output	10	- Output	10	- Output	10	- Output	10	+ Output
11	NC	11	NC	11	NC	11	NC	11	NC
12	NC	12	NC	12	NC	12	NC	12	NC
						1	+ Input	1	+ Input

PRESSURE CONNECTION OPTIONS

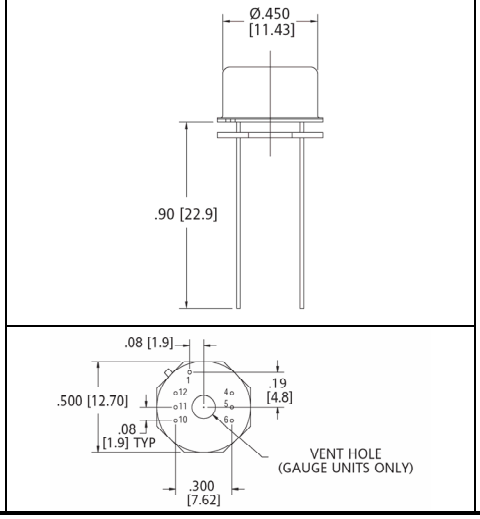
OPTION 0



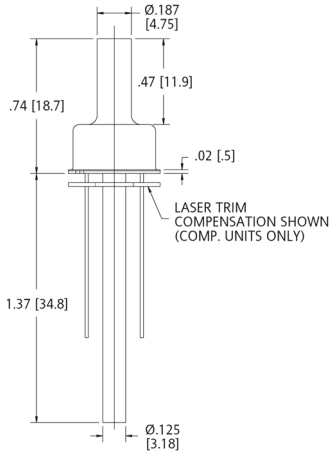
OPTION 1



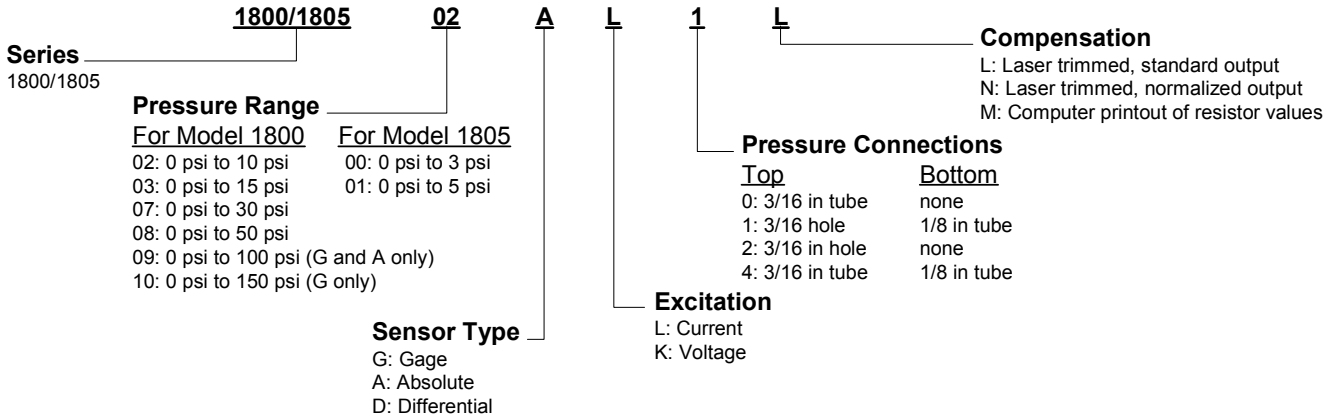
OPTION 2



OPTION 4



ORDER GUIDE



Note:

Transducer recommended for use with non-corrosive, non-condensing gases.

⚠ WARNING

PERSONAL INJURY

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SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

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008137-2-EN IL50 GLO Printed in USA
October 2005

Honeywell

Microstructure Pressure Sensors

Signal Conditioned

0 psi to 1 psi up to 0 psi to 150 psi

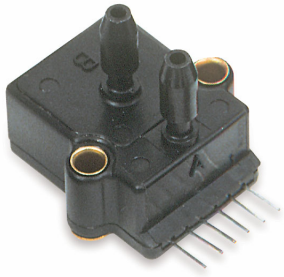
ASCX Series

FEATURES

- 5 Vdc Supply
- High Level Voltage Output
- Field Interchangeable
- Calibrated and Temperature Compensated
- Small Form Factor
- Low Power
- Offset Adjust

TYPICAL APPLICATIONS

- Medical Equipment
- Industrial Controls
- Pneumatic Controls



This series is a signal-conditioned version of Honeywell's proven performer and industry leading SCX series sensor.

This amplified ASCX device is in a package the same as the SCX but it offers a high level (4.5 V span) output on a very cost-effective basis. This family is fully calibrated and temperature compensated over a range of 0 °C to 70 °C [32 °F to 158 °F] but can be operated from -25 °C to 105 °C [-13 °F to 221 °F]. These sensors are intended for use with non-corrosive, non-ionic working fluids such as air and dry gases.

Devices are available to measure absolute, differential and gage pressures from 1 psi (ASCX01) up to 150 psi (ASCX150). The absolute devices (A) have an internal vacuum reference and an output voltage proportional to absolute pressure. Differential devices (D) allow application of pressure to either side of the sensing diaphragm and can be used for gage or differential pressure measurements.

The ASCX series devices feature an integrated circuit (IC) sensor element and laser trimmed thick film ceramic housed in a compact solvent resistant case. It provides excellent corrosion resistance and isolation to external packaging stresses. The package has convenient mounting holes and pressure ports for ease of use with standard plastic tubing for pressure connection.

All ASCX devices are calibrated for span to within ± 1 % (typically ± 0.2 %) of FSO. The devices are characterized for operation from a single 5 volt supply although sensitivity is ratiometric to the supply voltage and any dc supply from 5 Vdc to 16 Vdc is acceptable.

The ACSX series requires very low quiescent current compared to other signal conditioned pressure sensors, thus, this series is ideal for battery-powered applications.

The 100 microseconds response time makes this series an excellent choice for computer peripherals and pneumatic control applications.

Contact your local honeywell representative, or go to Honeywell's website at www.honeywell.com/sensing for additional details.

⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

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Microstructure Pressure Sensors

Signal Conditioned
0 psi to 1 psi up to 0 psi to 150 psi

ASCX Series

PRESSURE RANGE SPECIFICATIONS

				Full-Scale Span [1]		
Model *	**Operating Pressure**	**Proof Pressure [2]**	**Sensitivity [3]**	**Min.**	**Typ.**	**Max.**
ASCX01DN	0 psid to 1 psid	20 psid	4.5V/psi	4.43 V	4.50 V	4.57 V
ASCX05DN	0 psid to 5 psid	20 psid	0.9V/psi			
ASCX15AN	0 psia to 15 psia	30 psia	0.3V/psi	4.455 V	4.50 V	4.545 V
ASCX15DN	0 psid to 15 psid	30 psid	0.3V/psi			
ASCX30AN	0 psia to 30 psia	60 psia	0.15V/psi			
ASCX30DN	0 psid to 30 psid	60 psid	0.15V/psi			
ASCX100AN	0 psia to 100 psia	150 psia	45mV/psi			
ASCX100DN	0 psid to 100 psid	150 psid	45mV/psi			
ASCX150AN	0 psia to 150 psia	150 psia	30mV/psi			
ASCX150DN	0 psid to 150 psid	150 psid	30mV/psi			

*** Ordering information:** Order model number.

MAXIMUM RATINGS

Characteristic	**Description**
Supply Voltage (V_S)	4.5 Vdc to 16 Vdc
Output Current	
Source	5 mA
Sink	3 mA
Lead Soldering Temperature (2 seconds to 4 seconds)	250 °C [482 °F]
Maximum Pressure On Any Port	150 psi
Quiescent Current	4 mA

PARAMETER REFERENCE CONDITIONS

Model	**Reference Conditions**
Supply Voltage	5.01 ± 0.01 Vdc
Reference Temperature	25 °C [77 °F]
Load Condition	200 kOhm
Common Mode Pressure	0 psig

ENVIRONMENTAL SPECIFICATIONS

Characteristic	**Description (Maximum Ratings) All Devices**
Compensated Operating Temperature	0 °C to 70 °C [32 °F to 158 °F]
Operating Temperature	-25 °C to 105 °C [-13 °F to 221 °F]
Storage Temperature	-55 °C to 125 °C [-67 °F to 257 °F]

Microstructure Pressure Sensors

Signal Conditioned
0 psi to 1 psi up to 0 psi to 150 psi

ASCX Series

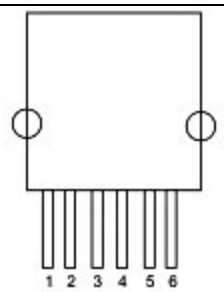
ASCX PERFORMANCE CHARACTERISTICS [4]

Characteristic	Min.	Typ.	Max.	Unit
Offset [5]				
Models ASCX15/30/100/150xN	0.205	0.250	0.295	Volts
Models ASCX01/05DN	0.180	0.250	0.320	Volts
Output @ FS Pressure		4.750		Volts
Combined Pressure Linearity and Hysteresis [6]	–	±0.1	±0.5	% FSO
Temperature Effect on Span 0 °C to 70 °C [32 °F to 158 °F] [7]				
Models ASCX15/30/100/150xN	–	±0.2	±1.0	% FSO
Models ASCX01/05DN	–	±0.2	±1.5	% FSO
Temperature Effect on Offset 0 °C to 70 °C [32 °F to 158 °F] [7]				
Models ASCX15/30/100/150xN	–	±0.5	±1.0	% FSO
Models ASCX01/05DN		±0.5	±1.5	% FSO
Repeatability [8]	–	±0.2	±0.5	% FSO
Response Time [9]	–	100	–	Microsec.

SPECIFICATION NOTES

Note 1: Full-Scale Span is the algebraic difference between the output voltage at full-scale pressure and the output at zero pressure.
Note 2: Maximum pressure above which causes permanent sensor failure.
Note 3: Sensitivity is ratiometric to supply voltage.
Note 4: Performance specs are shown at reference conditions. Specifications apply for absolute pressure devices with pressure applied to Port A. For gage devices, pressure is applied to Port B and Port A is left open for ambient. For differential pressures, Port B is the high-pressure port. All differential devices feature dual pressure ports and can be used as gage or differential sensors. For absolute devices, Port B is inactive.
Note 5: Offset calibration is at the lowest pressure for each given device.
Note 6: Linearity refers to the best straight line fit as measured for offset, full scale and ½ full-scale pressure.
Note 7: Temperature errors are the maximum shift over 0 °C to 70 °C [32 °F to 158 °F], relative to the 25 °C [77 °F] reading.
Note 8: Maximum difference in output at any pressure within the operating pressure range and the temperature within 0 °C to 70 °C [32 °F to 158 °F] after:
a) 100 temperature cycles, 0 °C to 70 °C [32 °F to 158 °F]
b) 1.0 million pressure cycles, 0 psi to Full-Scale Span.
Note 9: Response time for a 0 psi to Full-Scale Span pressure step change, 10 % to 90 % rise time.

ELECTRICAL CONNECTION

Pinout	ASCX Series
	PIN 1) External Offset Adjustment PIN 2) V_s PIN 3) + Output PIN 4) Ground PIN 5) N/C PIN 6) Do Not Use

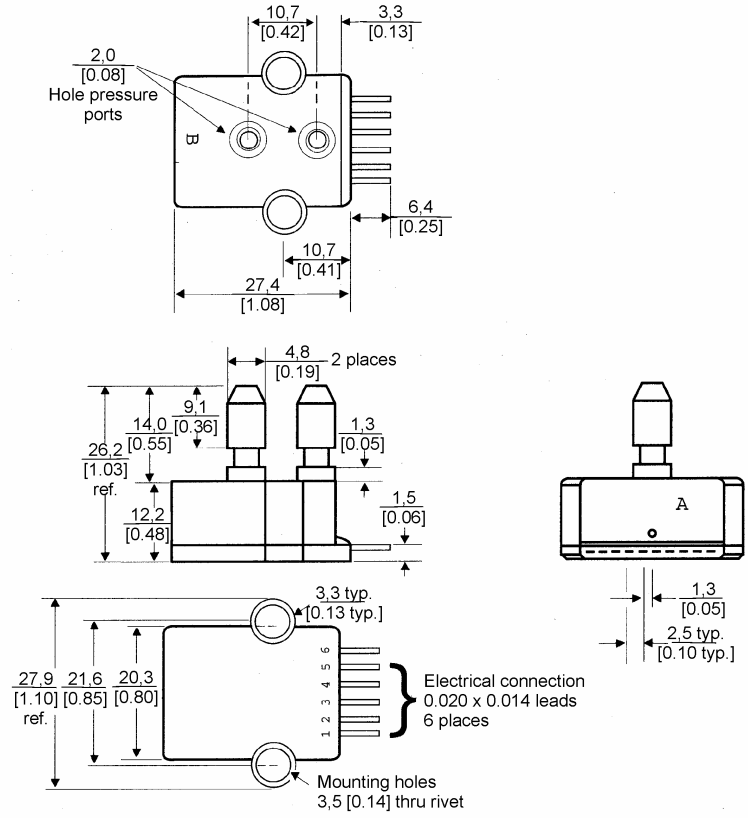
Microstructure Pressure Sensors

Signal Conditioned

0 psi to 1 psi up to 0 psi to 150 psi

ASCX Series

PHYSICAL DIMENSIONS for Reference Only (mm/in)



Dimensions: mm [in]
Weight: 5 grams
Case material: Glass-filled nylon

Wetted material
Port A: Glass-filled nylon, RTV, Silgel
Port B: Glass-filled nylon, Silicon, RTV
See physical construction drawing

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. **The foregoing is Buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

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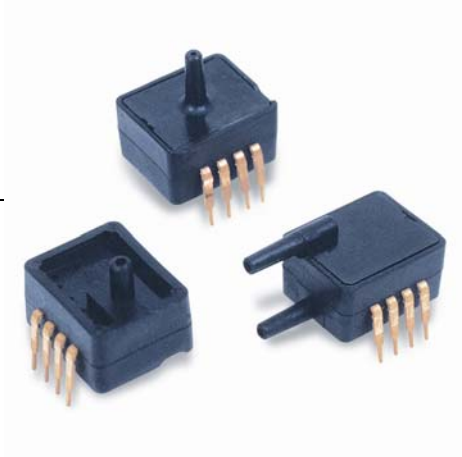
Honeywell

ASDX Series

Pressure Sensors
0 psi to 1 psi through
0 psi to 30 psi



DESCRIPTION

The ASDX Series is an amplified version of Honeywell's proven performer and industry leading SDX Series sensor. The ASDX sensor's footprint is slightly larger than the SDX; however, it offers a high level output (4.0 Vdc span) on a very cost-effective basis. This series is fully calibrated and temperature compensated with on-board Application Specific Integrated Circuitry (ASIC).

These DIP (Dual In-line Package) sensors are designed for use with non-corrosive, non-ionic working fluids; such as air and dry gases.

Sensors are available to measure absolute, differential and gage pressures. The absolute sensors have an internal vacuum reference and an output voltage proportional to absolute pressure. The differential sensors allow application of pressure to either side of the sensing diaphragm and may used for differential or gage measurements. Bidirectional versions are also available.

All ASDX Series sensors are accurate to within ±2.0% full scale and are designed for operation from a single 5.0 Vdc supply.

FEATURES

- ASIC-enhanced output
- Wide compensated temperature range 0 °C to 85 °C [32 °F to 185 °F]
- Available in absolute, differential and gage types
- Pressure ranges from 0 psi to 1 psi through 0 psi to 30 psi
- Accuracy ±2.0% max. V full scale
- Quantization step of 3 mV
- Response time of 8 ms

POTENTIAL APPLICATIONS

- Flow calibrators
- Ventilation and air flow monitors
- Gas flow instrumentation
- Dialysis equipment
- Sleep apnea monitoring and therapy equipment
- Barometry
- HVAC controls
- Pneumatic controls

TABLE 1. GENERAL SPECIFICATIONS

Supply voltage (Vs)[1]	4.75 Vdc to 5.25 Vdc
Maximum supply voltage[1]	6.50 Vdc (max.)
Consumption current	6 mA (typ.)
Output current (sink)	2 mA (max.)
Output current (source)	2 mA (max.)
Lead temperature	2 s to 4 s at 250 °C [482 °F]
Compensated temp. range	0 °C to 85 °C [32 °F to 185 °F]
Operating temp. range	-20 °C to 105 °C [-4 °F to 221 °F]
Storage temp. range	-40 °C to 125 °C [-40 °F to 257 °F]
Vibration	10 g at 20 Hz to 2000 Hz
Shock	100 g for 11 ms
Life	1 million cycles minimum

Note:

1. The sensor is not reverse polarity protected. Incorrect application of excitation voltage or ground to the wrong pin can cause electrical failure. Application of supply voltage above the maximum can cause electrical failure.

TABLE 2. PRESSURE RANGE SPECIFICATIONS

Catalog Listing	Pressure Range	Burst Pressure[1]	Sensitivity
ASDX001	0 psi to 1 psi	5 psi	4.00 V/psi
ASDX005	0 psi to 5 psi	20 psi	0.80 V/psi
ASDX015	0 psi to 15 psi	30 psi	0.267 V/psi
ASDX030	0 psi to 30 psi	60 psi	0.133 V/psi

Note:

1. If the maximum burst pressure is exceeded, even momentarily, the package may leak or burst, or the pressure sensing die may fracture.

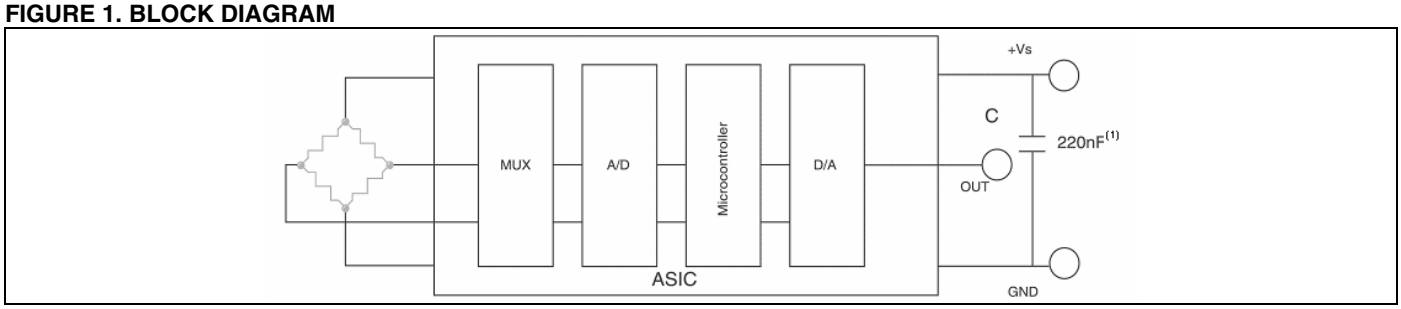
TABLE 3. PERFORMANCE SPECIFICATIONS[1]

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Note
Zero pressure offset	Voff	0.420	0.500	0.580	Vdc	–
Full scale span	Vfss		4.00	–	Vdc	2
Output at FS pressure	Vfso	4.420	4.500	4.580	Vdc	–
Accuracy	–	–	–	±2.0	%V	3
Response time	–	–	8	–	ms	4
Quantization step	–	–	3	–	mV	5

Notes:

1. Reference conditions (unless otherwise noted): Supply voltage, V_S=5.0 ±0.01 Vdc; T_A=25 °C [77 °F]. Output is ratiometric within the supply voltage range (Vs).
2. Span is the algebraic difference between the output voltage at the specified pressure and the output at zero pressure. Span is ratiometric to the supply voltage.
3. Accuracy is the combined errors from offset and span calibration, linearity, pressure hysteresis, and temperature effects. Linearity is the measured deviation based on a straight line. Hysteresis is the maximum output difference at any point within the operating pressure range for increasing and decreasing pressure. Calibration errors include the deviation of offset and full scale from nominal values.
4. Response time for a 0 psi to full-scale pressure step change, 10% to 90% rise time.
5. The smallest change in the output voltage, given any change in pressure.

FIGURE 1. BLOCK DIAGRAM

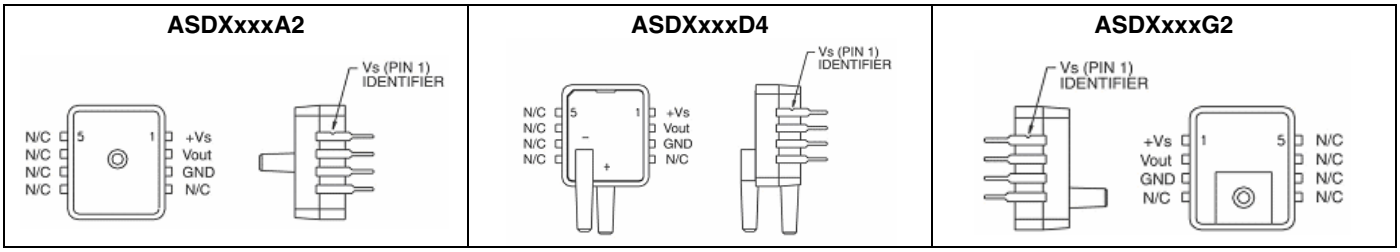


Note:

1. 220 nF capacitor is required between +Vs and GND. 15 nF capacitor between Vout and ground is optional.

Pressure Sensors, 0 psi to 1 psi through 1 psi to 30 psi

FIGURE 2. PIN OUT[1, 2]



Notes:

1. N/C means no connection. Connecting to ground will damage the sensor.
2. Pins 4, 5, 6, 7 and 8 are internal connections and should not be connected to external circuitry or ground.

FIGURE 3. PERFORMANCE CHARACTERISTICS (Error Band Multiplier Over -20 °C to 105 °C [-4 °F to 221 °F])

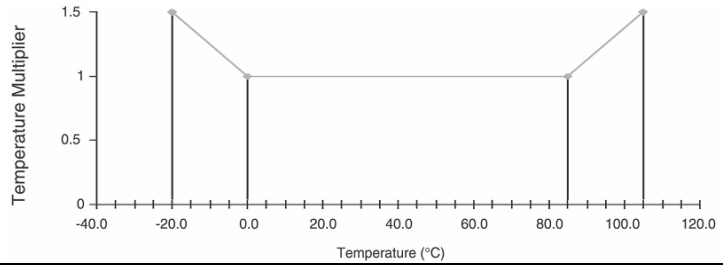
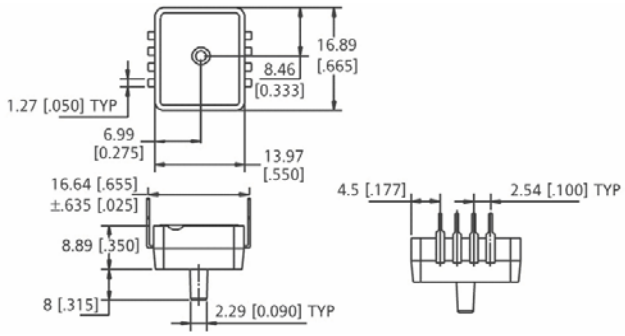
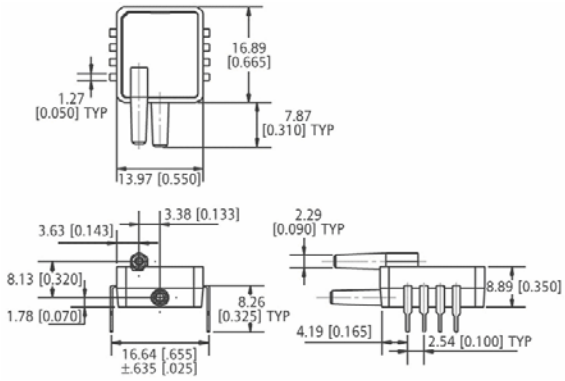


FIGURE 4. DIMENSIONAL DRAWINGS (For reference only: mm [in].)

A2 Package



D4 Package



G2 Package

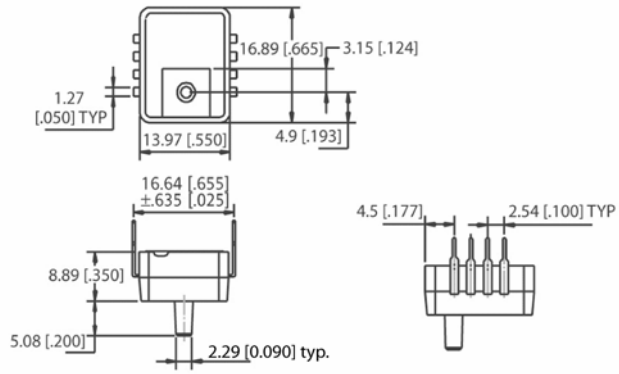
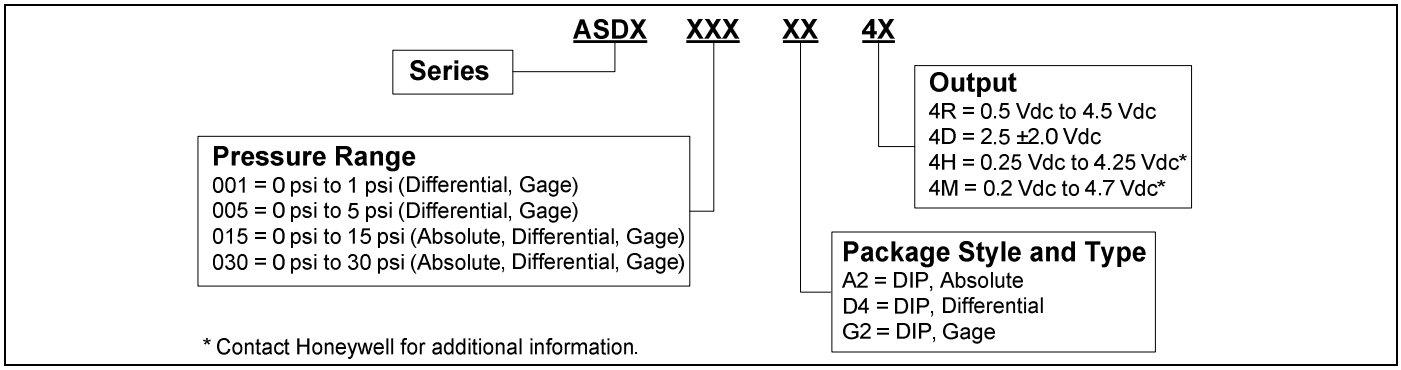


FIGURE 5. NOMENCLATURE TREE



ORDER GUIDE

Absolute Catalog LIsting	Differential[1] Catalog LIsting	Gage Catalog Listing	Bidirectional Catalog Listing	Pressure Range
–	ASDX001D44R	ASDX001G24R	ASDX001D44D	0 psi to 1 psi
–	ASDX005D44R	ASDX005G24R	ASDX005D44D	0 psi to 5 psi
ASDX015A24R	ASDX015D44R	ASDX015G24R	ASDX015D44D	0 psi to 15 psi
ASDX030A24R	ASDX030D44R	ASDX030G24R	ASDX030D44D	0 psi to 30 psi

Note:
1. May also be used in gage applications.

⚠ WARNING

PERSONAL INJURY

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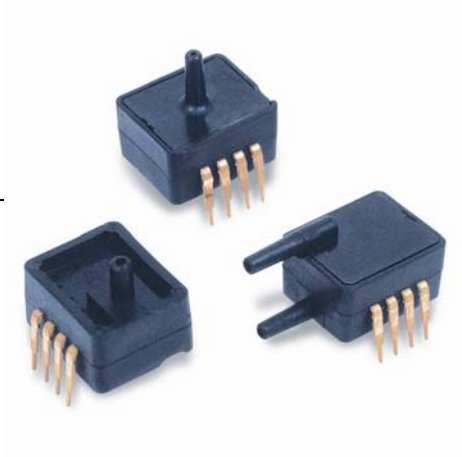
ASDX DO Series

Digital Output Pressure Sensors 0 psi to 1 psi through 0 psi to 30 psi



DESCRIPTION

The ASDX DO Series pressure sensors are fully calibrated and temperature compensated with on-board Application Specific Integrated Circuitry (ASIC). These DIP (Dual In-line Package) sensors provide digital correction of sensor offset, sensitivity, temperature coefficients and non-linearity and are designed for use with non-corrosive, non-ionic working fluids such as air and dry gases.

The ASDX DO Series uses I^2C-compatible protocol, which allows easy interfacing to most commonly used microcontrollers and microprocessors, without additional components and electronic circuitry.

The 2-wire I^2C interface has a Serial Clock Line (SCL) input and serial digital output data line. Sensor output is a corrected pressure value in hexadecimal format with 12-bit resolution.

Sensors are available to measure absolute, differential and gage pressures. The absolute versions have an internal vacuum reference and an output voltage proportional to absolute pressure. Differential versions allow application of pressure to either side of the sensing diaphragm and may be used for differential or gage measurements.

All ASDX DO Sensors are accurate to within ±2.0% full scale and are designed for operation from a single 5 Vdc supply.

FEATURES

- I^2C-compatible protocol
- ASIC-enhanced output
- Calibrated and temperature-compensated output
- Wide compensated temperature range 0 °C to 85 °C [32 °F to 185 °F]
- Available in absolute, differential and gage types
- Pressure ranges from 0 psi to 1 psi through 0 psi to 30 psi
- Response time of 8 ms

POTENTIAL APPLICATIONS

- Flow calibrators
- Ventilation and air flow monitors
- Gas flow instrumentation
- Dialysis equipment
- Sleep apnea monitoring and therapy equipment
- Barometry
- HVAC controls
- Pneumatic controls

TABLE 1. GENERAL SPECIFICATIONS

Characteristic	Parameter	Characteristic	Parameter
Supply voltage (Vs)[1]	4.75 Vdc to 5.25 Vdc	Compensated temp. range	0 °C to 85 °C [32 °F to 185 °F]
Maximum supply voltage[1]	6.50 Vdc (max.)	Operating temp. range	-20 °C to 105 °C [-4 °F to 221 °F]
Consumption current	6 mA (typ.)	Storage temp. range	-40 °C to 125 °C [-40 °F to 257 °F]
Output current (sink)	2 mA (max.)	Vibration	10 g at 20 Hz to 2000 Hz
Output current (source)	2 mA (max.)	Shock	100 g for 11 ms
Lead soldering temperature	2 s to 4 s at 250 °C [482 °F]	Life	1 million cycles minimum

Note:

1. The sensor is not reverse polarity protected. Incorrect application of excitation voltage or ground to the wrong pin can cause electrical failure. Application of supply voltage above the maximum can cause electrical failure.

TABLE 2. PERFORMANCE CHARACTERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Note
4R DO						1, 2
Zero pressure offset	Hoff	158	19A	1DB	counts hex	–
Full scale span (FSS)	Hfss	–	CCC	–	counts hex	3
Output at full scale pressure	Hfso	E25	E66	EA8	counts hex	–
Accuracy	–	–	–	±2.0	%H full scale	4
Response time	–	–	8	11	ms	5
4R DO						1, 2
Zero pressure offset	Hoff	7BE	800	841	counts hex	–
Full scale span (FSS)	Hfss	–	CCC	–	counts hex	3
Output at full scale pressure (P2)	Hfso	E25	E66	EB8	counts hex	6
Output at full scale pressure (P1)	Hfso	158	19A	1DB	counts hex	6
Accuracy	–	–	–	±2.0	% FSS	4
Output resolution	–	–	12	–	bit	–
Response time	–	–	8	11	ms	5

Notes:

1. Reference conditions (unless otherwise noted): supply voltage, V_S=5.0 ±0.01 Vdc, Ta=25 °C [77 °F].
2. Read operation: *Start, Slave Address, R/W =1, Data Byte 1 (MSB), Ackn Bit, Data Byte 2 (LSB).* The output is corrected pressure as unsigned 12 bits. Slave Address is F0h. Acknowledge Bit - pull data line LOW, master generates an extra clock pulse for this purpose.
3. Span is the algebraic difference between the output voltage at the specified high pressure and the output at lowest pressure. Span is ratiometric to the supply voltage.
4. Accuracy is the combined errors from offset and span calibration, linearity, pressure hysteresis, and temperature effects. Calibration errors include the deviation of offset and full scale from nominal values Linearity is the measured deviation based on a straight line. Hysteresis is the maximum output difference at any point within the operating pressure range for increasing and decreasing pressure and temperature.
5. Response time for 0 PSI to full scale pressure step change, 10% to 90% rise time.
6. Sensor output when maximum positive pressure is applied on the back side (P2) or the front side (P1) of the sensing element.

TABLE 3. PRESSURE RANGE SPECIFICATIONS

Catalog Listing	Pressure Range	Burst Pressure[1]
ASDX001xxxx-DO	0 psi to 1 psi	5 psi
ASDX005xxxx-DO	0 psi to 5 psi	20 psi
ASDX015xxxx-DO	0 psi to 15 psi	30 psi
ASDX030xxxx-DO	0 psi to 30 psi	60 psi

Note:

1. If maximum burst pressure is exceeded, even momentarily, the package may leak or burst, or the pressure sensing die may fracture.

FIGURE 1. PERFORMANCE CHARACTERISTICS (Error Band Multiplier Over -20 °C to 105 °C [-4 °F to 221 °F])

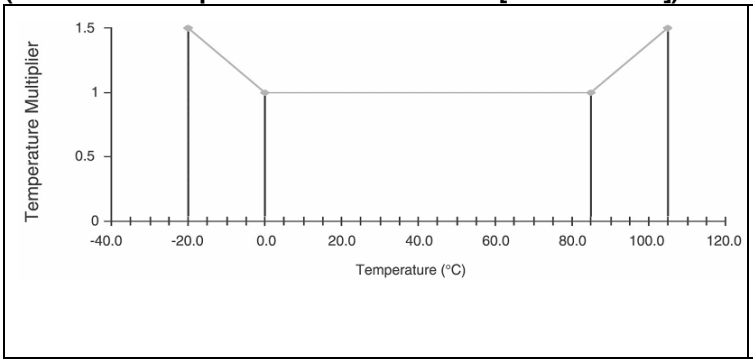
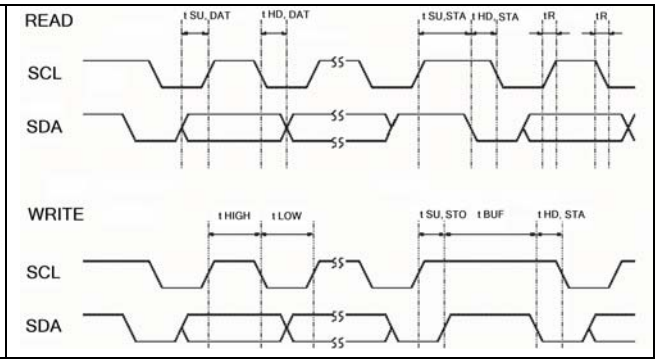


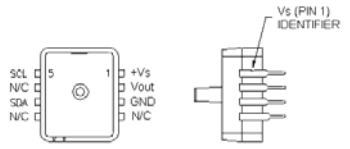
FIGURE 2. SERIAL INTERFACE TIMING CHARACTERISTICS



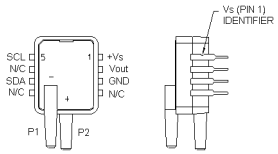
Digital Output Pressure Sensors, 0 psi to 1 psi thru 0 psi to 30 psi

FIGURE 3. PINOUT[1, 2]

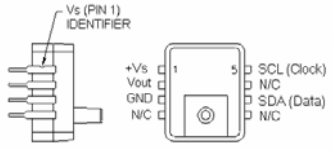
ASDXxxxA2DO



ASDXxxxD4DO



ASDXxxxG2DO



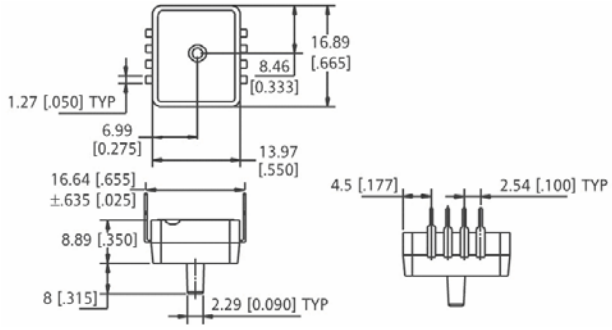
Notes:
1. N/C means no connection. Connecting to ground will damage the sensor.
2. Pin 6 must be left open.

TABLE 4. SERIAL INTERFACE PARAMETERS

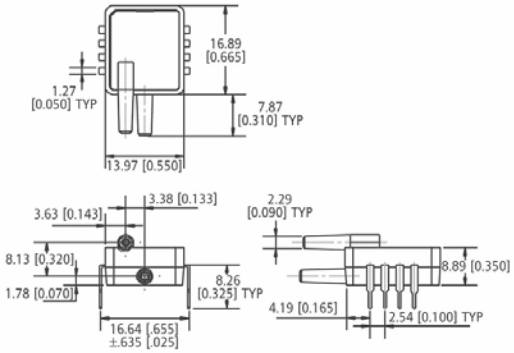
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input high level	V_{IH}	–	4.5	–	1	Vs
Input low level	V_{IL}	–	0	–	0.5	Vs
Output low level	V_{OL}	open drain I_{OL} = -4 mA	–	–	0.1	Vs
Pull up current	V_{OH}	pin SCL and SDA	5	–	20	µA
Load capacitance SDA	CL_{SDA}	–	–	–	400	pF
SCL clock frequency	f_{SCL}	–	–	–	100	kHz
Bus free time between STOP and START condition	t_{BUF}	–	4.7	–	–	µs
Hold time (repeated) START condition	$t_{HD, STA}$	to first clock pulse	4.0	–	–	µs
LOW period of SCL	t_{LOW}	–	4.7	–	–	µs
High period of SCL	t_{HIGH}	–	4.0	–	–	µs
Setup time repeated START condition	$t_{SU, STA}$	–	4.7	–	–	µs
Data hold time	$t_{HD, DAT}$	–	0	–	–	ns
Data setup time	$t_{SU, DAT}$	–	250	–	–	ns
Rise time of both SDA and SCL	t_R	–	–	–	300	ns
Fall time of both SDA and SCL	t_F	–	–	–	300	ns
Setup time for STOP condition	$t_{SU, STO}$	–	4	–	–	µs
Input filter spike suppression	t_{sp}	spikes on SDA or SCL of that length are suppressed	–	–	50	µs

FIGURE 4. DIMESIONAL DRAWING (For reference only: mm [in].)

A2 Package



D4 Package



G2 Package

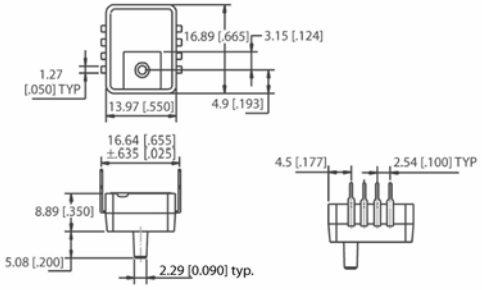
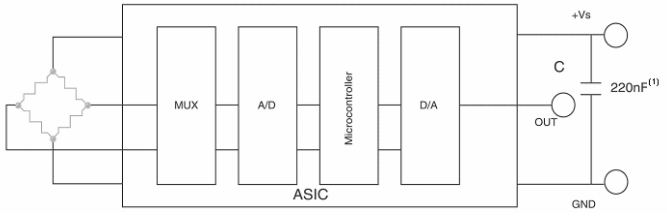
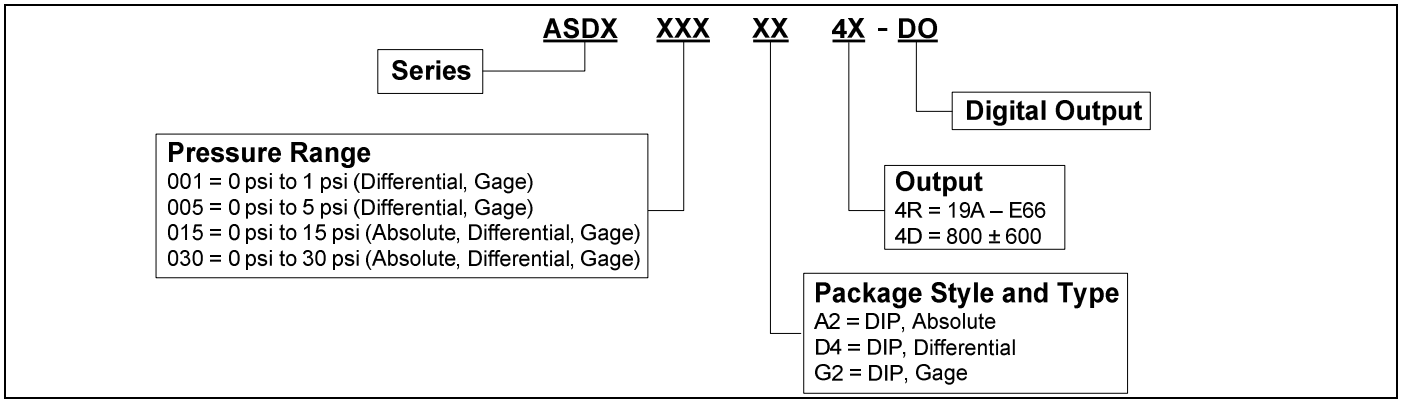


FIGURE 5. BLOCK DIAGRAM



Note:
1. 220 nF capacitor is required between +Vs and GND.

FIGURE 6. NOMENCLATURE TREE



ORDER GUIDE

Differential Catalog Listing[1]	Gage Catalog Listing	Absolute Catalog Listing	Pressure Range	Output
ASDX001D44R-DO	ASDX001G24R-DO	–	0 psi to 1.0 psi	19A – E66
ASDX001D44D-DO	–	–	–	800 ± 600
ASDX005D44R-DO	ASDX005G24R-DO	–	0 psi to 5.0 psi	19A – E66
ASDX005D44D-DO	–	–	–	800 ± 600
ASDX015D44R-DO	ASDX015G24R-DO	ASDX015A24R-DO	0 psi to 15 psi	19A – E66
ASDX015D44D-DO	–	–	–	800 ± 600
ASDX030D44R-DO	ASDX030G24R-DO	ASDX030A24R-DO	0 psi to 30 psi	19A – E66
ASDX030D44D-DO	–	–	–	800 ± 600

Note:
1. May also be used in gage applications.

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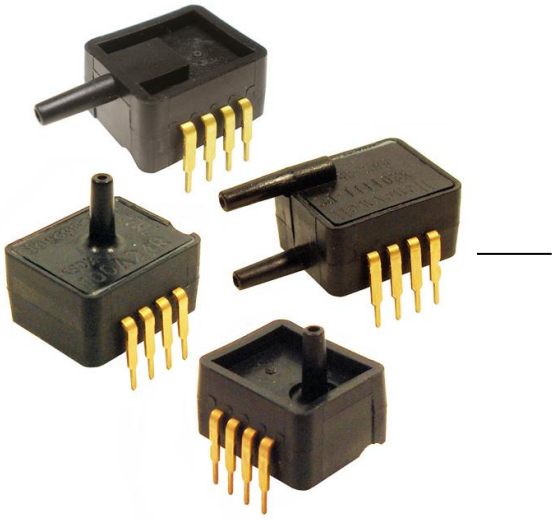
December 2007

Honeywell

ASDX Series Silicon Pressure Sensors

Low Pressure and Ultra-Low Pressure Analog Output, ±2% Total Error Band, 10 Inches H_2O to 100 psi



DESCRIPTION

The ASDX Series is a Silicon Pressure Sensor offering a ratiometric analog interface for reading pressure over the specified full scale pressure span and temperature range.

The ASDX is fully calibrated and temperature compensated for sensor offset, sensitivity, temperature effects and non-linearity using an on-board Application Specific Integrated Circuit (ASIC). Calibrated output values for pressure are updated at approximately 1 kHz.

The standard ASDX is calibrated over the temperature range of 0 °C to 85 °C [32 °F to 185 °F]. The sensor is characterized for operation from a single power supply of either 3.3 Vdc or 5.0 Vdc.

These sensors are available to measure absolute, differential and gage pressures. The absolute versions have an internal vacuum reference and an output value proportional to absolute pressure. Differential versions allow application of pressure to either side of the sensing diaphragm. Gage versions are referenced to atmospheric pressure and provide an output proportional to pressure variations from atmosphere.

The ASDX Series sensors are intended for use with non-corrosive, non-ionic working fluids such as air and dry gases. They are designed and manufactured according to standards in ISO 9001.

FEATURES

- Ratiometric 12-bit analog output
- Precision ASIC conditioning and temperature compensated over 0 °C to 85 °C [32 °F to 185 °F] temperature range
- Low operating voltage
- Absolute, differential and gage types
- Pressure ranges from 10 inches H_2O to 100 psi
- Standard calibrations in inches H_2O, cm H_2O, psi, mbar, bar, kPa
- Total error band of ±2.0% of full scale span maximum
- RoHS compliant

POTENTIAL APPLICATIONS

- Flow calibrators
- Ventilation and air flow monitors
- Gas flow instrumentation
- Sleep apnea monitoring and therapy equipment
- Barometry
- Pneumatic controls
- HVAC

ASDX Series Silicon Pressure Sensors

Table 1. Absolute Maximum Ratings[1]

Parameter	Min	Max	Unit
Supply voltage (V_{supply})	-0.3	6.0	Vdc
Voltage to any pin	-0.3	V_{supply} + 0.3	Vdc
ESD susceptibility (human body model)	3	-	kV
Storage temperature	-50 [-58]	125 [257]	°C [°F]
Lead temperature (2 s to 4 s)	-	250 [482]	°C [°F]
External capacitance between V_{supply} and ground[2]	100	470	nF

Table 2. Operating Specifications

Parameter	Min.	Typ.	Max.	Unit
Supply voltage: (V_{supply})[3] 3.3 Vdc 5.0 Vdc *Sensors are either 3.3 Vdc or 5.0 Vdc per the order guide (see Figure 1).*	 3.0 4.75	 3.3[4] 5.0[4]	 3.6 5.25	Vdc
Supply current	1.5	2.5	3.5	mA
Compensated temperature range[5]	0 [32]	-	85 [185]	°C [°F]
Operating temperature range[6]	-20 [-4]	-	105 [221]	°C [°F]
Overpressure[7]	2X operating pressure range minimum			
Burst pressure[8]	3X operating pressure range minimum			
Startup time (power up to data ready)	-	-	5	ms
Response time	-	1.0	-	ms
Upper output clipping limit	97.5	-	-	V_{supply}
Lower output clipping limit	-	-	2.5	V_{supply}
Minimum load resistance	5.0	-	-	kOhm
Total error band[9]	-	-	2.0	%FSS[10]
Output resolution	12	-	-	bits

Table 3. Environmental Specifications

Parameter	Characteristic
Humidity	0% to 95% RH non-condensing
Vibration	10 G at 20 Hz to 2000 Hz
Shock	100 G for 11 ms
Life	1 million cycles minimum

Table 4. Wetted Materials[11]

Parameter	Port 1 (Pressure Port)[12]	Port 2 (Reference Port)[12]
Covers	glass-filled PBT	glass-filled PBT
Adhesives	silicone	silicone and epoxy
Electronic components	silicon and glass	silicon, glass, and gold

Notes:

1. Absolute maximum ratings are the extreme limits that the device will withstand without damage to the device.
2. An external bypass capacitor is **required** across the supply voltage (Pins 1 and 3 – see Figure 4) as close to the sensor supply pin as possible for correct sensor operation.
3. Ratiometricity of the sensor (the ability of the output to scale to the input voltage) is achieved within the specified operating voltage for each option. Other custom supply voltages are available, please contact Honeywell Customer Service.
4. The sensor is not reverse polarity protected. Incorrect application of excitation voltage or ground to the wrong pin may cause electrical failure.
5. The compensated temperature range is the temperature range (or ranges) over which the sensor will produce an output proportional to pressure within the specified performance limits.
6. The operating temperature range is the temperature range over which the sensor will produce an output proportional to pressure but may not remain within the specified performance limits.
7. Overpressure is the maximum pressure which may safely be applied to the product for it to remain in specification once pressure is returned to the operating pressure range. Exposure to higher pressures may cause permanent damage to the product.
8. Burst pressure is the maximum pressure that may be applied to any port of the product without causing escape of pressure media. Product should not be expected to function after exposure to any pressure beyond the burst pressure.
9. Total error band is the maximum deviation in output from ideal transfer function over the entire compensated temperature and pressure range. Includes all errors due to offset, full scale span, pressure non-linearity, pressure hysteresis, repeatability, thermal effect on offset, thermal effect on span and thermal hysteresis. Specification units are in percent of full scale span (%FSS).
10. Full scale span (FSS) is the algebraic difference between the output signal measured at the maximum (Pmax.) and minimum (Pmin.) limits of the pressure range.
11. Consult Honeywell Customer Service for detailed material information.
12. For AC pressure port configuration, the “pressure” and “reference” ports are reversed.

Figure 1. Nomenclature and Order Guide

Package Selection[13] *Calibration Selection*

ASDX **X** **A**

Series

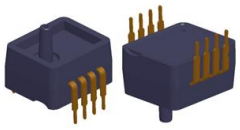
Power Supply Voltage
3 = 3.3 Vdc
5 = 5.0 Vdc

Transfer Function Limits[14]
A = 10% to 90% calibration
B = 5% to 95% calibration

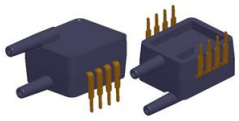
Output Type[15]
A = Analog voltage

Pressure Port

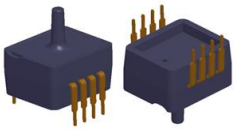
AV = Axial port on top, vented cover on bottom



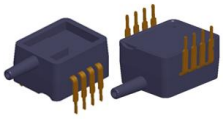
RR = Radial port on top, radial port on bottom



AC = Axial port, sealed cover (commonly used for absolute)



RV = Radial port, single



Future Option

Pressure Range[16, 17, 18]

Gage	Differential	Absolute
-	**005ND** = ±5 in H_2O	-
010NG = 10 in H_2O	**010ND** = ±10 in H_2O	-
-	**015CD** = ±15 cm H_2O	-
025CG = 25 cm H_2O	**025CD** = ±25 cm H_2O	-
001PG = 1 psi	**001PD** = ±1 psi	-
005PG = 5 psi	**005PD** = ±5 psi	-
015PG = 15 psi	**015PD** = ±15 psi	**015PA** = 15 psi
030PG = 30 psi	**030PD** = ±30 psi	**030PA** = 30 psi
100PG = 100 psi	-	**100PA** = 100 psi
-	**015MD** = ±15 mbar	-
025MG = 25 mbar	**025MD** = ±25 mbar	-
050MG = 50 mbar	**050MD** = ±50 mbar	-
100MG = 100 mbar	**100MD** = ±100 mbar	-
200MG = 200 mbar	**200MD** = ±200 mbar	-
500MG = 500 mbar	**500MD** = ±500 mbar	-
001BG = 1 bar	**001BD** = ±1 bar	**001BA** = 1 bar
002BG = 2 bar	**002BD** = ±2 bar	**002BA** = 2 bar
007BG = 7 bar	-	**007BA** = 7 bar
003KG = 3 kPa	**003KD** = ±3 kPa	-
004KG = 4 kPa	**004KD** = ±4 kPa	-
005KG = 5 kPa	**005KD** = ±5 kPa	-
010KG = 10 kPa	**010KD** = ±10 kPa	-
020KG = 20 kPa	**020KD** = ±20 kPa	-
050KG = 50 kPa	**050KD** = ±50 kPa	-
100KG = 100 kPa	**100KD** = ±100 kPa	**100KA** = 100 kPa
200KG = 200 kPa	**200KD** = ±200 kPa	**200KA** = 200 kPa
700KG = 700 kPa	-	**700KA** = 700 kPa

Notes:

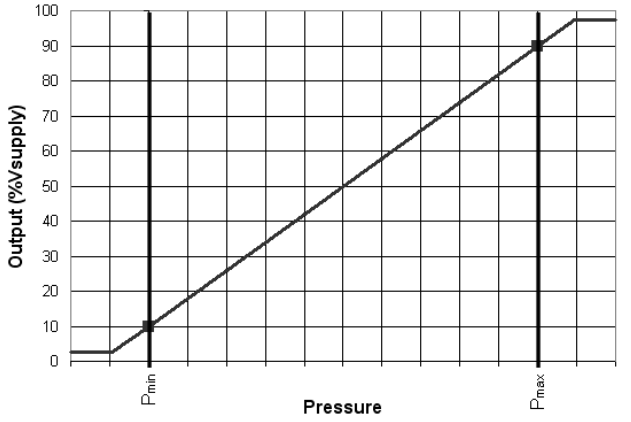
13. Other package combinations are possible, please contact Honeywell Customer Service.
14. The transfer function limits define the output of the sensor at a given pressure input. By specifying the output signal at the maximum (Pmax.) and minimum (Pmin.) limits of the pressure range, the complete transfer curve for the sensor is defined. See Figure 2 for a graphical representation of each calibration.
15. For a digital output, please refer to the ASDX Digital Series.
16. Custom pressure ranges are available, please contact Honeywell Customer Service.
17. The pressure units (inches H_20, cm H_20, psi, mbar, bar, kPa) define the units used during calibration and in the application.
18. See Table 5 for an explanation of sensor types.

Table 5. Sensor Types

Type	Description
Absolute	Output is proportional to difference between applied pressure and built-in reference to vacuum (zero pressure).
Gage	Output is proportional to difference between applied pressure and atmospheric (ambient) pressure.
Differential	Output is proportional to difference between pressure applied to each of the pressure ports (Port 1 – Port 2).

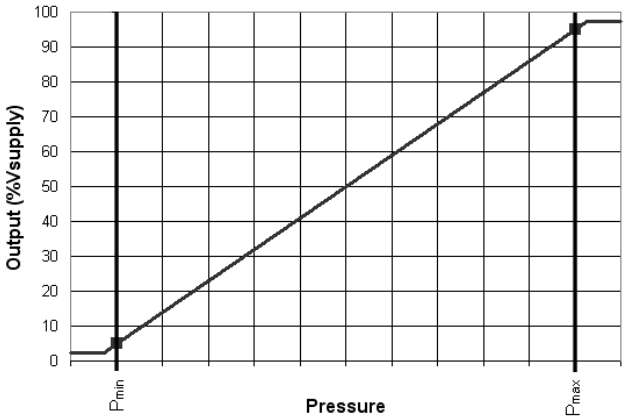
Figure 2. Transfer Functions and Limits

A Calibration, 10% to 90%



$$\text{Output (volts)} = \frac{0.8 \cdot V_{supply}}{P_{max} - P_{min}} \cdot (\text{Pressure}_{applied} - P_{min}) + 0.10 \cdot V_{supply}$$

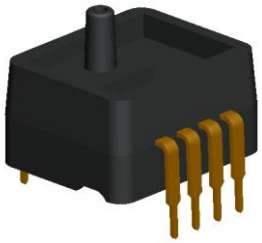
B Calibration, 5% to 95%



$$\text{Output (volts)} = \frac{0.9 \cdot V_{supply}}{P_{max} - P_{min}} \cdot (\text{Pressure}_{applied} - P_{min}) + 0.05 \cdot V_{supply}$$

Figure 3. Completed Catalog Listing Example

ASDXAVX001PGAA3:
AV pressure port, 1 psi gage, analog output, 10% to 90% calibration at 3.3 Vdc operation.



ASDXAV001PGAA3 Output vs. Pressure

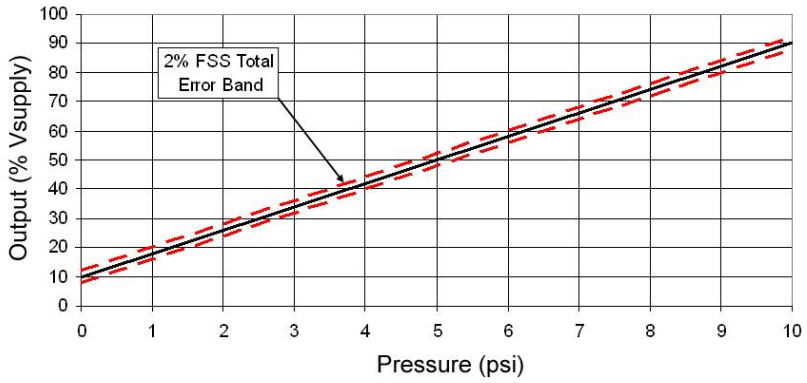
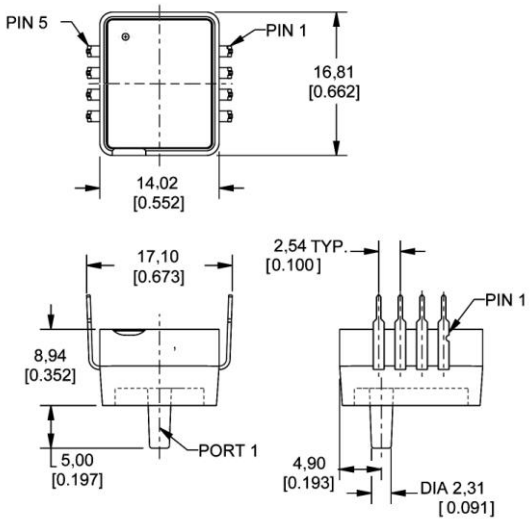
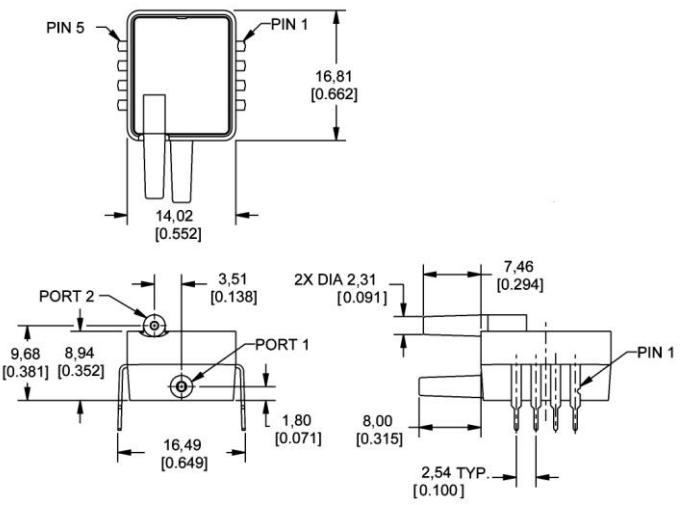


Figure 4. Dimensional Drawings (For reference only: mm [in].)

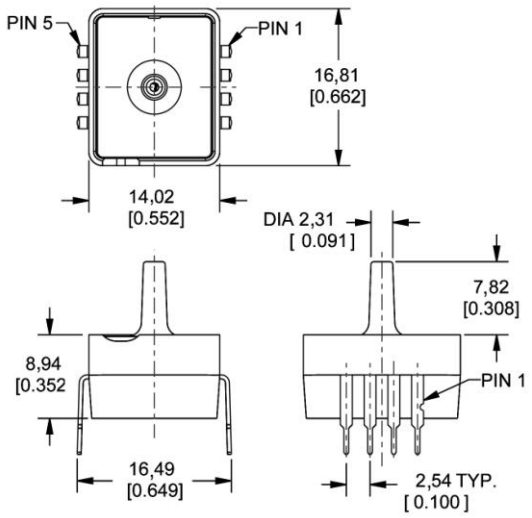
AV Package (Legacy G2)



RR Package (Legacy D4)



AC Package (Legacy A2)



RV Package

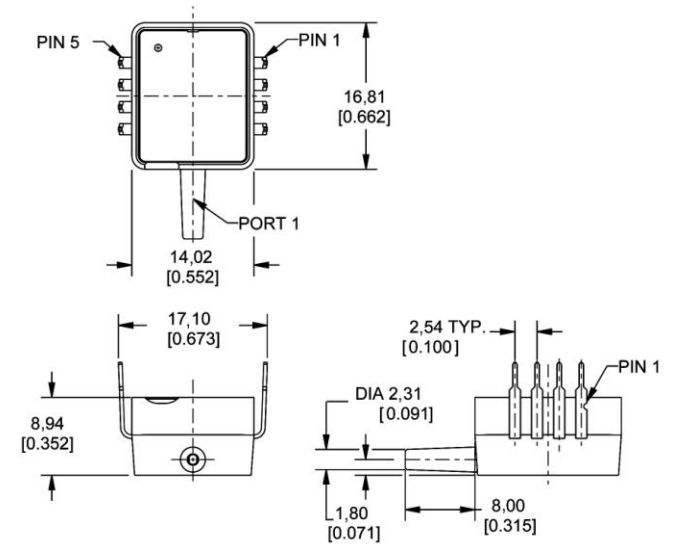


Table 7. Pinout

Pin	Definition	Type	Description
1	Vsupply	supply	power supply source
2	Vout	analog output	provides the analog output
3	GND	supply	power supply ground
4	N/C	not used	do not connect in the application
5	N/C	not used	do not connect in the application
6	N/C	not used	do not connect in the application
7	N/C	not used	do not connect in the application
8	N/C	not used	do not connect in the application

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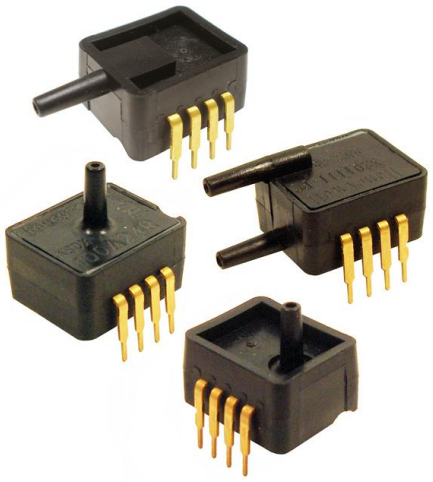
Honeywell

ASDX Series Silicon Pressure Sensors

Low Pressure and Ultra-Low Pressure Digital Output, ±2% Total Error Band, 10 Inches H_2O to 100 psi



DESCRIPTION

The ASDX Series is a Silicon Pressure Sensor offering either an I^2C or SPI digital interface for reading pressure over the specified full scale pressure span and temperature range.

The ASDX is fully calibrated and temperature compensated for sensor offset, sensitivity, temperature effects and non-linearity using an on-board Application Specific Integrated Circuit (ASIC). Calibrated output values for pressure are updated at approximately 1 kHz.

The standard ASDX is calibrated over the temperature range of 0 °C to 85 °C [32 °F to 185 °F]. The sensor is characterized for operation from a single power supply of either 3.3 Vdc or 5.0 Vdc.

These sensors are available to measure absolute, differential and gage pressures. The absolute versions have an internal vacuum reference and an output value proportional to absolute pressure. Differential versions allow application of pressure to either side of the sensing diaphragm. Gage versions are referenced to atmospheric pressure and provide an output proportional to pressure variations from atmosphere.

The ASDX Series sensors are intended for use with non-corrosive, non-ionic working fluids such as air and dry gases. They are designed and manufactured according to standards in ISO 9001.

FEATURES

- Output options: I^2C- or SPI-compatible 12-bit digital
- Precision ASIC conditioning and temperature compensated over 0 °C to 85 °C [32 °F to 185 °F] temperature range
- Low operating voltage
- Absolute, differential and gage types
- Pressure ranges from 10 inches H_20 to 100 psi
- Standard calibrations in inches H_20, cm H_20, psi, mbar, bar, kPa
- Total error band of ±2.0% of full scale span maximum
- RoHS compliant

POTENTIAL APPLICATIONS

- Flow calibrators
- Ventilation and air flow monitors
- Gas flow instrumentation
- Sleep apnea monitoring and therapy equipment
- Barometry
- Pneumatic controls
- HVAC

Table 1. Absolute Maximum Ratings[1]

Parameter	Min	Max	Unit
Supply voltage (V_{supply})	-0.3	6.0	Vdc
Voltage to any pin	-0.3	V_{supply} + 0.3	Vdc
Digital clock frequency: I^2C SPI	 100 50	 400 800	kHz
ESD susceptibility (human body model)	3	-	kV
Storage temperature	-50 [-58]	125 [257]	°C [°F]
Lead temperature (2 s to 4 s)	-	250 [482]	°C [°F]
External capacitance between V_{supply} and ground[2]	100	470	nF

Table 2. Operating Specifications

Parameter	Min.	Typ.	Max.	Unit
Supply voltage: (V_{supply})[3] 3.3 Vdc 5.0 Vdc *Sensors are either 3.3 Vdc or 5.0 Vdc per the Order Guide (see Figure 1).*	 3.0 4.75	 3.3[4] 5.0[4]	 3.6 5.25	Vdc
Supply current	2.0	3.5	5.0	mA
Compensated temperature range[5]	0 [32]	-	85 [185]	°C [°F]
Operating temperature range[6]	-20 [-4]	-	105 [221]	°C [°F]
Overpressure[7]	2X operating pressure range minimum			
Burst pressure[8]	3X operating pressure range minimum			
Startup time (power up to data ready)	-	2.8	7.3	ms
Response time	-	0.46	-	ms
I^2C or SPI voltage level low	-	-	0.2	V_{supply}
I^2C or SPI voltage level high	0.8	-	-	V_{supply}
Pull-up on SDA and SCL (I^2C output only)	1	-	-	kOhm
Total error band[9]	-	-	2.0	%FSS[10]
Output resolution	12	-	-	bits

Table 3. Environmental Specifications

Parameter	Characteristic
Humidity	0% to 95% RH non-condensing
Vibration	10 G at 20 Hz to 2000 Hz
Shock	100 G for 11 ms
Life	1 million cycles minimum

Table 4. Wetted Materials[11]

Parameter	Port 1 (Pressure Port)[12]	Port 2 (Reference Port)[12]
Covers	glass-filled PBT	glass-filled PBT
Adhesives	silicone	silicone and epoxy
Electronic components	silicon and glass	silicon, glass, and gold

Notes:
1. Absolute maximum ratings are the extreme limits that the device will withstand without damage to the device.
2. An external bypass capacitor is **required** across the supply voltage (Pins 6 and 3 – see Figure 4) as close to the sensor supply pin as possible for correct sensor operation.
3. Ratiometricity of the sensor (the ability of the output to scale to the input voltage) is achieved within the specified operating voltage for each option. Other custom supply voltages are available, please contact Honeywell Customer Service.
4. The sensor is not reverse polarity protected. Incorrect application of excitation voltage or ground to the wrong pin may cause electrical failure.
5. The compensated temperature range is the temperature range (or ranges) over which the sensor will produce an output proportional to pressure within the specified performance limits.
6. The operating temperature range is the temperature range over which the sensor will produce an output proportional to pressure but may not remain within the specified performance limits.
7. Overpressure is the maximum pressure which may safely be applied to the product for it to remain in specification once pressure is returned to the operating pressure range. Exposure to higher pressures may cause permanent damage to the product.
8. Burst pressure is the maximum pressure that may be applied to any port of the product without causing escape of pressure media. Product should not be expected to function after exposure to any pressure beyond the burst pressure.
9. Total error band is the maximum deviation in output from ideal transfer function over the entire compensated temperature and pressure range. Includes all errors due to offset, full scale span, pressure non-linearity, pressure hysteresis, repeatability, thermal effect on offset, thermal effect on span and thermal hysteresis. Specification units are in percent of full scale span (%FSS).
10. Full scale span (FSS) is the algebraic difference between the output signal measured at the maximum (Pmax.) and minimum (Pmin.) limits of the pressure range.
11. Consult Honeywell Customer Service for detailed material information.
12. For AC pressure port configuration, the “pressure” and “reference” ports are reversed.

Figure 1. Nomenclature and Order Guide

Package Selection[13] *Calibration Selection*

ASDX **X** _ _ _ _ _ _ _ _ _

Series

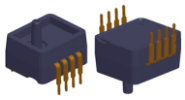
Power Supply Voltage
3 = 3.3 Vdc
5 = 5.0 Vdc

Transfer Function Limits[14]
A = 10% to 90% calibration
B = 5% to 95% calibration

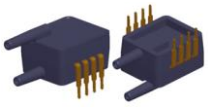
Output Type[15]
S = SPI
2 = I^2C, Address 0x28
3 = I^2C, Address 0x38
4 = I^2C, Address 0x48
5 = I^2C, Address 0x58
6 = I^2C, Address 0x68
7 = I^2C, Address 0x78

Pressure Port

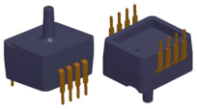
AV = Axial port on top, vented cover on bottom



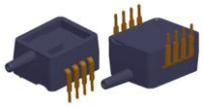
RR = Radial port on top, radial port on bottom



AC = Axial port, sealed cover (commonly used for absolute)



RV = Radial port, single



Future Option

Pressure Range[16, 17, 18]

Gage	Differential	Absolute
-	**005ND** = ±5 in H_2O	-
010NG = 10 in H_2O	**010ND** = ±10 in H_2O	-
-	**015CD** = ±15 cm H_2O	-
025CG = 25 cm H_2O	**025CD** = ±25 cm H_2O	-
001PG = 1 psi	**001PD** = ±1 psi	-
005PG = 5 psi	**005PD** = ±5 psi	-
015PG = 15 psi	**015PD** = ±15 psi	**015PA** = 15 psi
030PG = 30 psi	**030PD** = ±30 psi	**030PA** = 30 psi
100PG = 100 psi	-	**100PA** = 100 psi
-	**015MD** = ±15 mbar	-
025MG = 25 mbar	**025MD** = ±25 mbar	-
050MG = 50 mbar	**050MD** = ±50 mbar	-
100MG = 100 mbar	**100MD** = ±100 mbar	-
200MG = 200 mbar	**200MD** = ±200 mbar	-
500MG = 500 mbar	**500MD** = ±500 mbar	-
001BG = 1 bar	**001BD** = ±1 bar	**001BA** = 1 bar
002BG = 2 bar	**002BD** = ±2 bar	**002BA** = 2 bar
007BG = 7 bar	-	**007BA** = 7 bar
003KG = 3 kPa	**003KD** = ±3 kPa	-
004KG = 4 kPa	**004KD** = ±4 kPa	-
005KG = 5 kPa	**005KD** = ±5 kPa	-
010KG = 10 kPa	**010KD** = ±10 kPa	-
020KG = 20 kPa	**020KD** = ±20 kPa	-
050KG = 50 kPa	**050KD** = ±50 kPa	-
100KG = 100 kPa	**100KD** = ±100 kPa	**100KA** = 100 kPa
200KG = 200 kPa	**200KD** = ±200 kPa	**200KA** = 200 kPa
700KG = 700 kPa	-	**700KA** = 700 kPa

Notes:

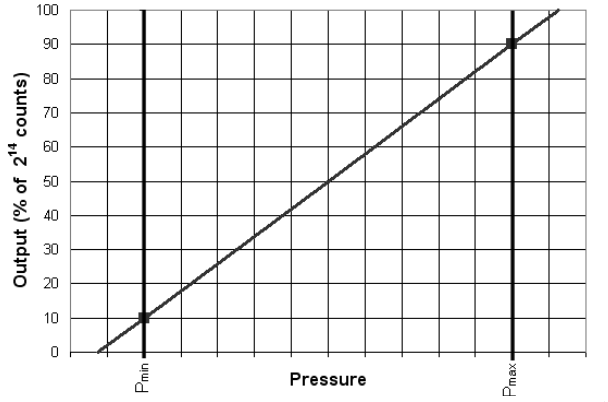
13. Other package combinations are possible, please contact Honeywell Customer Service.
14. The transfer function limits define the output of the sensor at a given pressure input. By specifying the output signal at the maximum (Pmax.) and minimum (Pmin.) limits of the pressure range, the complete transfer curve for the sensor is defined. See Figure 2 for a graphical representation of each calibration. For the 12-bit digital output, Table 6 provides the output of the sensor at significant percentages. These outputs are valid at the rated input voltage of the sensor.
15. The output type defines which communication protocol the sensor uses to communicate. Available protocols are I^2C or half duplex SPI (sensor acts only as a slave). This communication protocol is not field selectable, and must be defined when ordering the sensor.
16. Custom pressure ranges are available, please contact Honeywell Customer Service.
17. The pressure units (inches H_20, cm H_20, psi, mbar, bar, kPa) define the units used during calibration and in the application.
18. See Table 5 for an explanation of sensor types.

Table 5. Sensor Types

Type	Description
Absolute	Output is proportional to difference between applied pressure and built-in reference to vacuum (zero pressure).
Gage	Output is proportional to difference between applied pressure and atmospheric (ambient) pressure.
Differential	Output is proportional to difference between pressure applied to each of the pressure ports (Port 1 – Port 2).

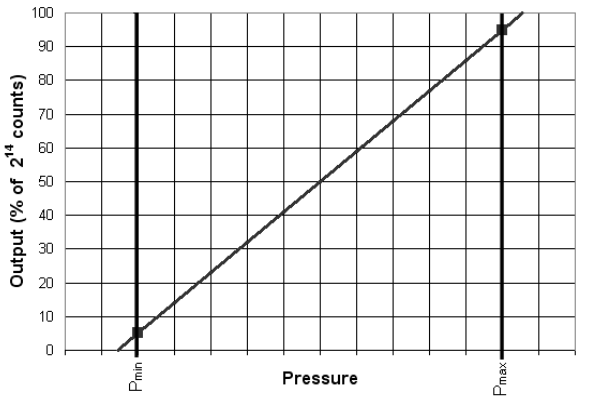
Figure 2. Transfer Functions and Limits

A Calibration, 10% to 90%



$$\text{Output (\% of } 2^{14} \text{ counts)} = \frac{80\%}{P_{max} - P_{min}} \cdot (\text{Pressure}_{applied} - P_{min}) + 10\%$$

B Calibration, 5% to 95%



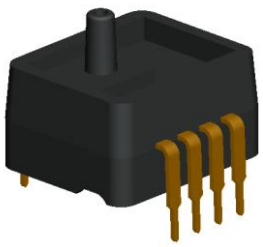
$$\text{Output (\% of } 2^{14} \text{ counts)} = \frac{90\%}{P_{max} - P_{min}} \cdot (\text{Pressure}_{applied} - P_{min}) + 5\%$$

Table 6. Sensor Output at Significant Percentages

% Output	Digital Counts (dec)	Digital Counts (hex)
0%	0	0x0000
5%	819	0x0333
10%	1638	0x0666
50%	8192	0x2000
90%	14746	0x399A
95%	15565	0x3CCD
100%	16383	0x3FFF

Figure 3. Completed Catalog Listing Example

ASDXAVX001PG2A3:
AV pressure port, 1 psi gage, I^2C output (Address 0x28), 10% to 90% calibration at 3.3 Vdc operation.



ASDXAVX001PG2A3 Output vs Pressure

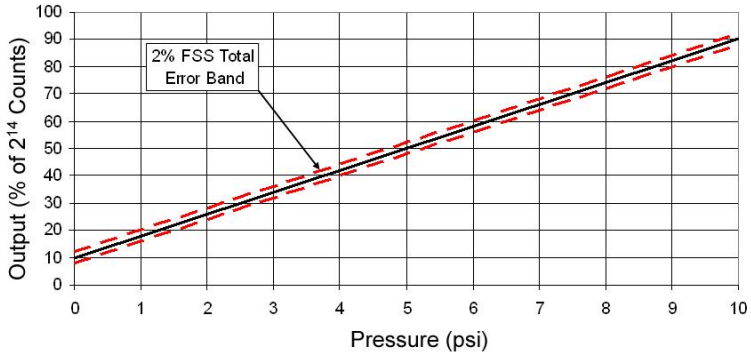
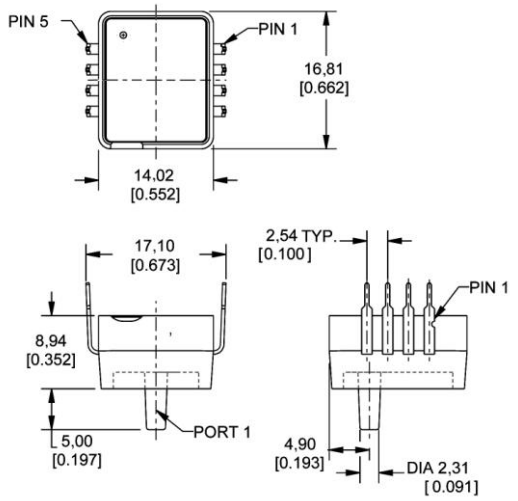
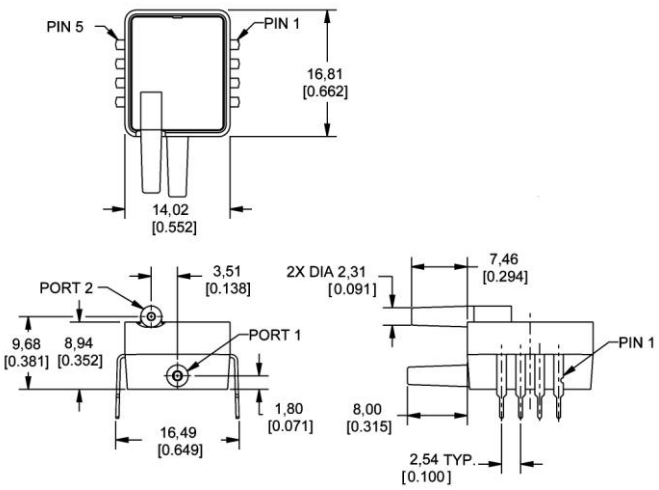


Figure 4. Dimensional Drawings (For reference only: mm [in].)

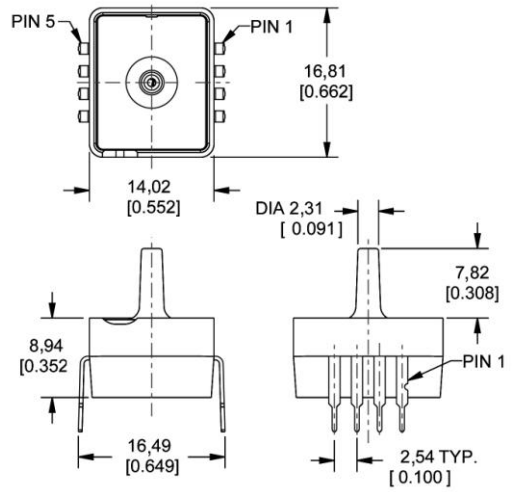
AV Package (Legacy G2)



RR Package (Legacy D4)



AC Package (Legacy A2)



RV Package

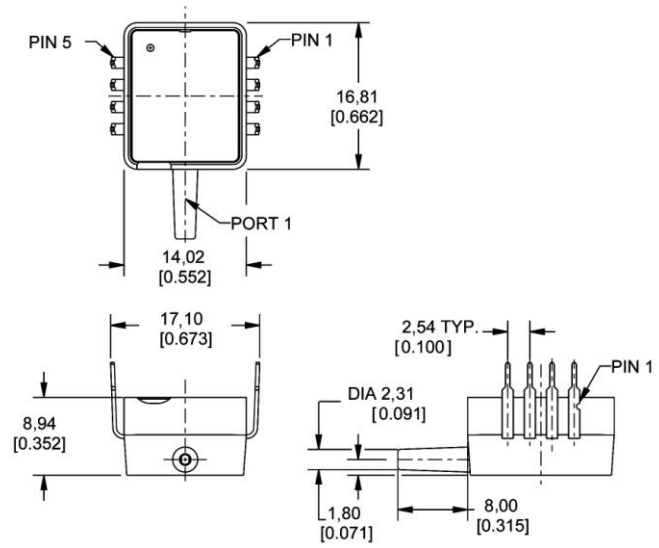


Table 7. Pinout

I²C				SPI			
Pin	**Definition**	**Type**	**Description**	**Pin**	**Definition**	**Type**	**Description**
1	SDA	digital I/O	serial bidirectional data; data is clocked in or out on clock edge of SCL	1	MISO	digital output	"Master In Slave Out" - serial output data; data is clocked out on clock edge of SCK
2	SCL	digital input	serial clock input; used to clock data on SDA	2	SCK	digital input	serial clock input; used to clock data on MISO
3	GND	supply	power supply ground	3	GND	supply	power supply ground
4	N/C	not used	do not connect in the application	4	N/C	not used	do not connect in the application
5	SS	digital output	interrupt signal (conversion complete output)	5	SS	digital input	slave select
6	Vsupply	supply	power supply source	6	Vsupply	supply	power supply source
7	N/C	not used	do not connect in the application	7	N/C	not used	do not connect in the application
8	N/C	not used	do not connect in the application	8	N/C	not used	do not connect in the application

⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

⚠ WARNING

MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

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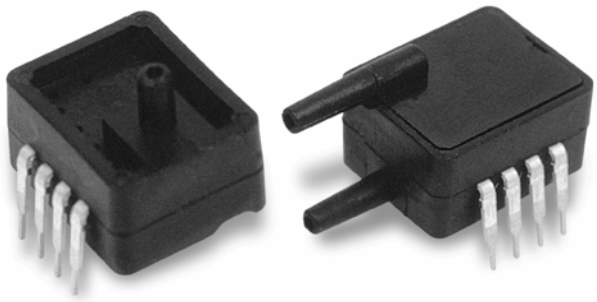
ASDXL Series

Microstructure Pressure Sensors
0 in to ±5 in H_2O, 0 in to 10 in H_2O, 0 in to ±10 in H_2O



DESCRIPTION

The ASDXL Series pressure sensors are fully calibrated and temperature compensated with on-board Application Specific Integrated Circuitry (ASIC). This ASDXL sensor is in a DIP format (Dual In-line Package) and provides digital correction of sensor offset, sensitivity, temperature coefficients and non-linearity. The ASDXL Series has an analog output that is ratiometric with supply voltage over the compensated supply range with 11-bit resolution.

All ASDXL sensors are accurate to within ±2.5 % Full Scale Span (FSS) and are intended for use with non-corrosive, non-ionic working fluids such as air and dry gases. (Contact factory for media compatibility on G2/D4 packages).

This series is designed and manufactured in accordance with ISO 9001 standards and is compliant with the WEEE and RoHS directives.

FEATURES

- Available in differential and gage packages
- Calibrated and temperature compensated output
- Analog output with 11-bit resolution
- Pressure ranges from 0 in to ±5 in H_2O, 10 in H_2O, ±10 in H_2O
- Response time of 8 ms
- DIP package
- ASIC-enhanced output

POTENTIAL APPLICATIONS

- Medical equipment
- HVAC controls
- Pneumatic controls

ASDXL Series
0 in to ±5 in H_2O, 0 in to 10 in H_2O, 0 in to ±10 in H_2O

GENERAL SPECIFICATIONS

Characteristic	Parameter	Characteristic	Parameter
Supply voltage (Vs)	4.75 Vdc to 5.25 Vdc	Lead soldering temperature	4 s at 250 °C [482 °F]
Maximum supply voltage	6.50 Vdc max.	Vibration	10 g at 20 Hz to 2000 Hz
Current consumption	6 mA typ.	Shock	100 g for 11 ms
Output current - sink	2 mA max.	Life	1 million cycles min.
Output current - source	2 mA max.	Position sensitivity	50 μV/V/g typical

ENVIRONMENTAL SPECIFICATIONS

Characteristic	Range
Compensated	0 °C to 85 °C [32 °F to 185 °F]
Operating	-20 °C to 105 °C [-4 °F to 221 °F]
Storage	-40 °C to 125 °C [-40 °F to 257 °F]

PRESSURE RANGE SPECIFICATIONS

Listing	Pressure Range	Burst Pressure [1]
ASDXL05	0 in to ±5 in H_20	3 PSI
ASDXL10	0 in to 10 in H_20 0 in to ±10 H_20	3 PSI

PERFORMANCE CHARACTERISTICS 4D [2]

Characteristic	Min.	Typ.(5)	Max.	Unit
Full scale span (FSS) [3,4]	–	4.000	–	V
Zero pressure offset [4]	2.400	2.500	2.600	V
Output at full scale pressure (P2) [4,5]	4.400	4.500	4.600	V
Output at full scale pressure (P1) [4,5]	0.400	0.500	0.600	V
Accuracy [6]	–	–	±2.5	% FSS
Quantization error [7]	2.44	–	–	mV
Response time [8]	–	8	11	ms

PERFORMANCE CHARACTERISTICS 4R [2]

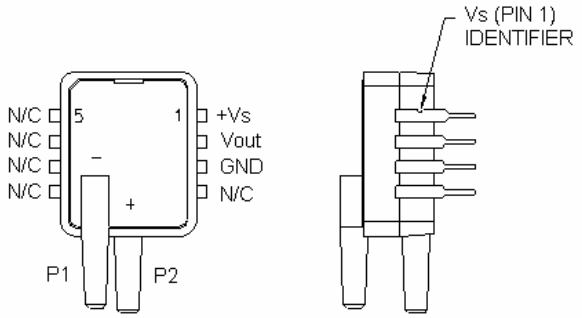
Characteristic	Min.	Typ.	Max.	Unit
Full scale span (FSS) [3,4]	–	4.000	–	V
Zero pressure offset [4]	0.400	0.500	0.600	V
Output at full scale pressure [4]	4.400	4.500	4.600	V
Accuracy [6,7]	–	–	±2.5	% FSS
Quantization error [7]	2.44	–	–	mV
Response time [8]	–	8	11	ms

Notes:

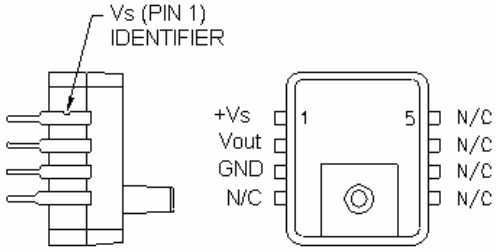
1. If burst pressure is exceeded, even momentarily, the package may leak or the pressure sensing die may fracture.
2. Reference conditions (unless otherwise noted): supply voltage, V_S=5.0 ±0.01 Vdc, Ta=25 °C [77 °F].
3. Span is the algebraic difference between the output voltage at the specified pressure and the output at zero pressure.
4. Output is ratiometric within the supply voltage range (Vs).
5. Output of the device when maximum positive pressure is applied on the backside (P2) or the front side (P1) of the sensing element.
6. Accuracy is the combined errors from offset and span calibration, linearity, pressure hysteresis, and temperature effects. Calibration errors include the deviation of offset and full scale from nominal values Linearity is the measured deviation based on a straight line. Hysteresis is the maximum output difference at any point within the operating pressure range for increasing and decreasing pressure and temperature.
7. Minimum step size in the output due to a change in the input pressure.
8. Response time for 0 PSI to full scale pressure step change, 10% to 90% rise time.
9. 220 nF capacitor required between +Vs and GND.

ELECTRICAL CONNECTIONS [1,2,3]

ASDXLYYD4ZZ



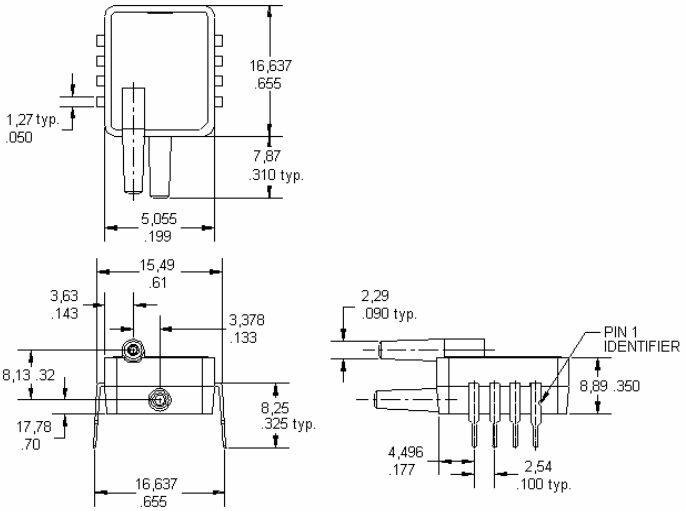
ASDXLYYG2ZZ



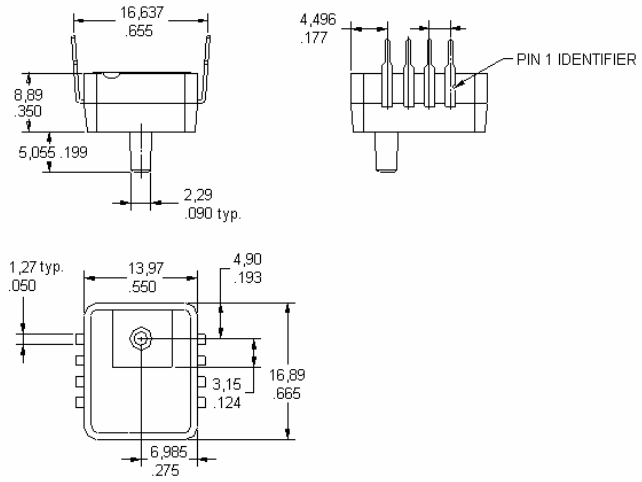
Notes:
1. N/C means no connection. Connecting to ground or other potential may damage sensor
2. Capacitor 220 nF required between +Vs and GND.
3. The sensor is not reverse polarity protected. Incorrect application of excitation voltage or ground to the wrong pin can cause electrical failure. Application of supply voltage above the maximum can cause electrical failure.

DIMENSIONS (For reference only, mm/in.)

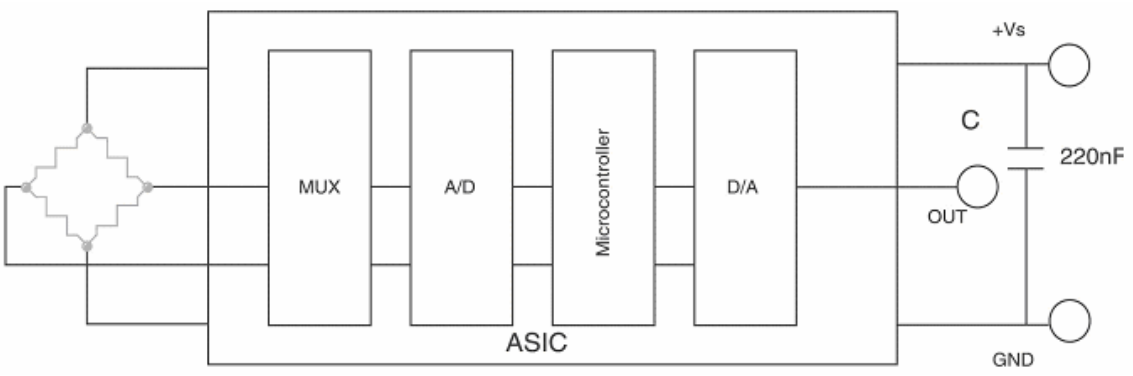
D4 Package



G2 Package



BLOCK DIAGRAM



ORDERING INFORMATION

Pressure Range	Gage	Differential	Bidirectional
0 in to ±5 in H_2O	–	–	ASDXL05D44D
0 in to 10 in H_2O	ASDXL10G24R	ASDXL10D44R	–
0 in to ±10 in H_2O	–	–	ASDXL10D44D

⚠ WARNING

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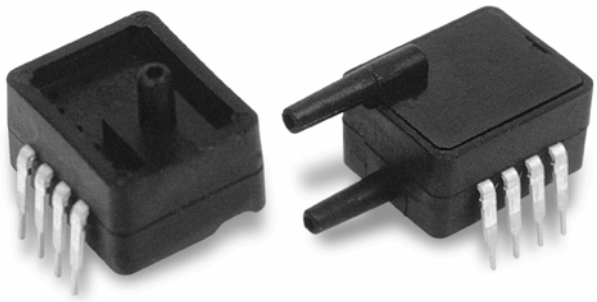
Honeywell

ASDXL DO Series

Microstructure Pressure Sensors
0 in to ±5 in H_2O, 0 in to 10 in H_2O, 0 in to ±10 in H_2O



DESCRIPTION

The ASDXL DO Series pressure sensors are fully calibrated and temperature compensated with on-board Application Specific Integrated Circuitry (ASIC). This ASDXL DO sensor is in a DIP format (Dual In-line Package) and provides digital correction of sensor offset, sensitivity, temperature coefficients and non-linearity. The ASDXL DO Series has 12-bit I^2C compatible protocol interface which allows easy interfacing to most commonly used microcontrollers and microprocessors.

The 2-wire I^2C interface has a Serial Clock Line input (SCL) and serial digital output data line. The output of the device is a corrected pressure value in hexadecimal format with 12-bit accuracy (unsigned) and not ratiometric to the supply voltage.

All ASDXL DO sensors are accurate to within ±2.5 % Full Scale Span (FSS) and are intended for use with non-corrosive, non-ionic working fluids such as air and dry gases. (Contact factory for media compatibility on G2/D4 packages.)

This series is designed and manufactured in accordance with ISO 9001 standards and is compliant with the WEEE and RoHS directives.

FEATURES

- Available in differential and gage packages
- Calibrated and temperature compensated output
- 12-bit digital output (I^2C compatible protocol)
- Pressure ranges from 0 in to ±5 in H_2O, 10 in H_2O, ±10 in H_2O
- Response time of 8 ms
- DIP package
- ASIC-enhanced output

POTENTIAL APPLICATIONS

- Medical equipment
- HVAC controls
- Pneumatic controls

ASDXL DO Series
0 in to ±5 in H_2O, 0 in to 10 in H_2O, 0 in to ±10 in H_2O

GENERAL SPECIFICATIONS

Characteristic	Parameter	Characteristic	Parameter
Supply voltage (Vs)	4.75 Vdc to 5.25 Vdc	Lead soldering temperature	4 s at 250 °C [482 °F]
Maximum supply voltage	6.50 Vdc max.	Vibration	10 g at 20 Hz to 2000 Hz
Current consumption	6 mA typ.	Shock	100 g for 11 ms
Output current - sink	2 mA max.	Life	1 million cycles min.
Output current - source	2 mA max.	Position sensitivity	50 µV/V/g typical

ENVIRONMENTAL SPECIFICATIONS

Characteristic	Range
Compensated	0 °C to 85 °C [32 °F to 185 °F]
Operating	-20 °C to 105 °C [-4 °F to 221 °F]
Storage	-40 °C to 125 °C [-40 °F to 257 °F]

PRESSURE RANGE SPECIFICATIONS

Listing	Pressure Range	Burst Pressure [1]
ASDXL05	0 in to ±5 in H_2O	3 PSI
ASDXL10	0 in to 10 in H_2O 0 in to ±10 H_2O	3 PSI

PERFORMANCE CHARACTERISTICS 4D DO [2,3]

Characteristic	Min.	Typ.(5)	Max.	Unit
Full scale span (FSS) [4,5]	–	CCC	–	counts hex
Zero pressure offset [5]	07AE	0800	0851	counts hex
Output at full scale pressure (P2) [5,6]	0E14	0E66	0EB8	counts hex
Output at full scale pressure (P1) [5,6]	0147	019A	01EB	counts hex
Accuracy [7]	–	–	±2.5	% FSS
Output resolution	–	12	–	bit
Response time [8]	–	8	11	ms

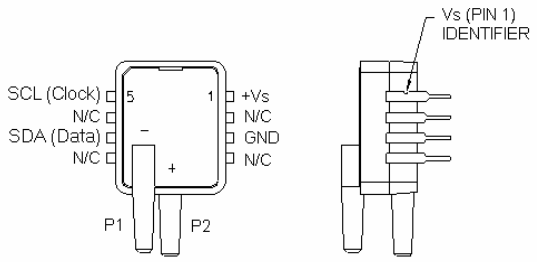
PERFORMANCE CHARACTERISTICS 4R DO [2,3]

Characteristic	Min.	Typ.	Max.	Unit
Full scale span (FSS) [4,5]	–	CCC	–	counts hex
Zero pressure offset [5]	0147	019A	01EB	counts hex
Output at full scale pressure [5]	0E14	0E66	0EB8	counts hex
Accuracy [7]	–	–	±2.5	% FSS
Output resolution	–	12	–	bit
Response time [8]	–	8	11	ms

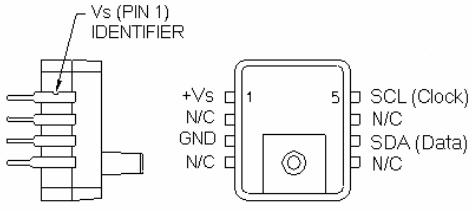
Notes:
1. If burst pressure is exceeded, even momentarily, the package may leak or the pressure sensing die may fracture.
2. Reference conditions (unless otherwise noted): supply voltage, V_S=5.0 ±0.01 Vdc, Ta=25 °C [77 °F].
3. Read operation: *Start, Slave Address, R/W =1, Data Byte 1 (MSB), Ackn Bit, Data Byte 2 (LSB).* The output is corrected pressure as unsigned 12 bits. Slave Address is F0h. Acknowledge Bit - pull data line LOW, master generates an extra clock pulse for this purpose.
4. Span is the algebraic difference between the output voltage at the specified pressure and the output at zero pressure.
5. Output is non-ratiometric within the supply voltage range (Vs).
6. Output of the device when maximum positive pressure is applied on the backside (P2) or the front side (P1) of the sensing element.
7. Accuracy is the combined errors from offset and span calibration, linearity, pressure hysteresis, and temperature effects. Calibration errors include the deviation of offset and full scale from nominal values Linearity is the measured deviation based on a straight line. Hysteresis is the maximum output difference at any point within the operating pressure range for increasing and decreasing pressure and temperature.
8. Response time for 0 PSI to full scale pressure step change, 10% to 90% rise time.
9. 220 nF capacitor required between +Vs and GND.

ELECTRICAL CONNECTIONS [1,2,3]

ASDXLYYD4ZZ-DO



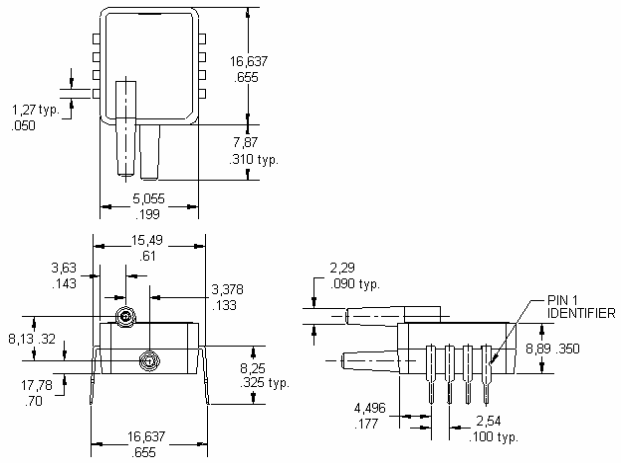
ASDXLYYG2ZZ-DO



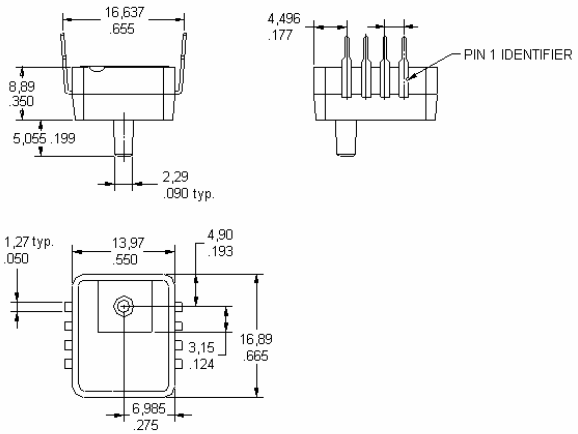
Notes:
1. N/C means no connection. Connecting to ground or other potential may damage sensors.
2. Capacitor 220 nF required between +Vs and GND.
3. The sensor is not reverse polarity protected. Incorrect application of excitation voltage or ground to the wrong pin can cause electrical failure. Application of supply voltage above the maximum can cause electrical failure.

DIMENSIONS (For reference only, mm/in.)

D4 Package



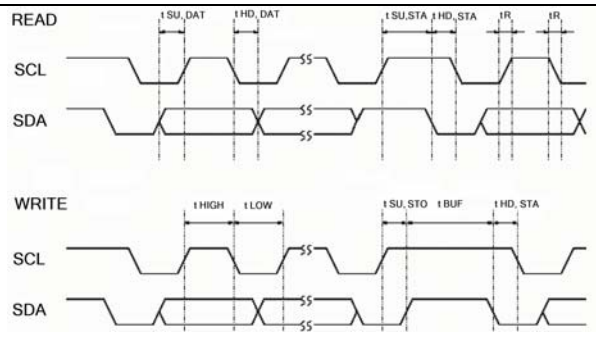
G2 Package



SERIAL INTERFACE PARAMETERS

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input high level	VIH	–	4.5	–	1	Vs
Input low level	VIL	–	0	–	0.5	Vs
Output low level	VOL	open drain IOL = -4 mA	–	–	0.1	Vs
Pull up current	VOH	pin SCL and SDA	5	–	20	µA
Load capacitance SDA	CLSDA	–	–	–	400	pF
SCL clock frequency	fSCL	–	–	–	100	kHz
Bus free time between STOP and START condition	tBUF	–	4.7	–	–	µs
Hold time (repeated) START condition	tHD,STA	to first clock pulse	4.0	–	–	µs
LOW period of SCL	tLOW	–	4.7	–	–	µs
High period of SCL	tHIGH	–	4.0	–	–	µs
Setup time repeated START condition	tSU, STA	–	4.7	–	–	µs
Data hold time	tHD, DAT	–	0	–	–	ns
Data setup time	tSU, DAT	–	250	–	–	ns
Rise time of both SDA and SCL	tR	–	–	–	300	ns
Fall time of both SDA and SCL		–	–	–	300	ns
Setup time for STOP condition	tSU, STO	–	4	–	–	µs
Input filter spike suppression	tsp	spikes on SDA or SCL of that length are suppressed	–	–	50	µs

SERIAL INTERFACE TIMING CHARACTERISTICS



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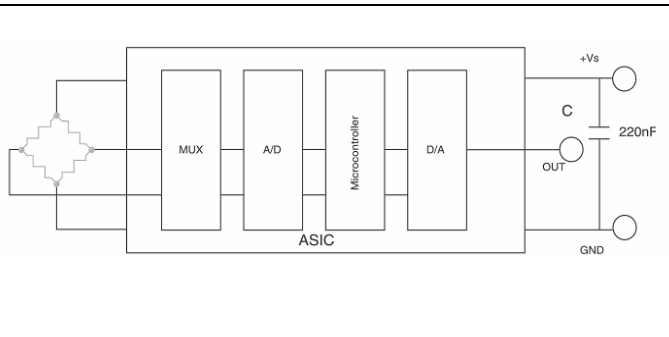

ORDERING INFORMATION

Pressure Range	Gage	Differential	Bidirectional
0 in to ±5 in H_2O	–	–	ASDXL05D44D-DO
0 in to 10 in H_2O	ASDXL10G24R-DO	ASDXL10D44R-DO	–
0 in to ±10 in H_2O	–	–	ASDXL10D44D-DO

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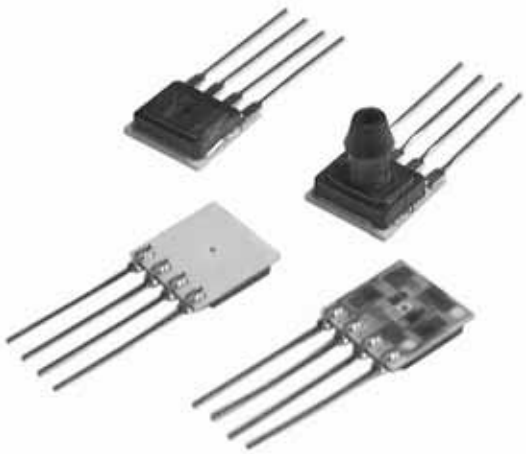
June 2006

Honeywell

CPC/CPCL and CPX/CPXL Series

Uncompensated/Compensated and Compensated Calibrated Silicon Pressure Sensors



DESCRIPTION

The CPX/CPXL and the CPC/CPCL Series sensors integrate silicon micromachined sensing technology, temperature compensation, and calibration in a complete family of low cost packages. This series offers the most cost-effective solution for design requirements.

These piezoresistive pressure sensors use micromachined silicon chips mounted on a ceramic and protected with a plastic cap. Several tube arrangements with nylon housings are available for various pressure applications.

On devices of 5 psi and above, the top side of the chip is protected against humidity by a Silgel coating. While the sensors are designed for use with non-corrosive, nonionic pressure media, they accommodate many gases that are used in medical applications.

The CPC Series is designed for the lowest cost and smallest profile. The standard packages have only a plastic cap for OEM applications. The CPC axial port option accommodates pressure measurements in tube applications.

FEATURES

- Low cost, small size
- Temperature compensated
- Zero and span calibrated
- Millivolt output
- Differential, gage and absolute pressure
- Constant voltage excitation
- High impedance - low current

POTENTIAL APPLICATIONS

- Medical applications
- Applications requiring small size
- Applications requiring vacuum and positive
- Pressure reference, or both

CPC/CPCL and CPX/CPXL Series

ELECTRICAL SPECIFICATIONS

Characteristic	CPC/CPCL at 12 Vdc, 25 °C [77 °F]				CPX/CPXL at 5 Vdc, 25 °C [77 °F]			
	Min.	Typ.	Max.	Unit	Min.	Typ.	Max.	Unit
Excitation voltage	3.0	12.0	16.0	Vdc	3.0	5.0	12.0	Vdc
Null	-1.0	0	1.0	mV	-50	0	50	mV
Offset temperature shift[1] 0 °C to 25 °C [32 °F to 77°F] 25 °C to 70 °C [77 °F to 158 °F][2]	–	–	±1.0	mV	–	±0.5		mV
Full scale temperature shift[2] 0 °C to 25 °C [32 °F to 158 °F] 25 °C to 70 °C [77 °F to 158 °F][2]	–	–	±2	PPM/°C	–	-2200	–	PPM/°C
Linearity, hysteresis error[3]	–	0.25	1.0	% span		0.25	1.0	% span
Input resistance	5.0	–	–	kOhm	5.0	–	–	kOhm
Output resistance	–	3.0	–	kOhm	–	3.0	–	kOhm
Operating temperature	-25 [-13]	–	85 [185]	°C [°F]	-25 [-13]	–	85 [185]	°C [°F]
Storage temperature	-40 [-40]	–	125 [257]	°C [°F]	-40 [-40]	–	125 [257]	°C [°F]
Common mode pressure	–	–	50	psi	–	–	50	psi
Weight	–	2	–	g	–	2	–	g

Notes:

1. Pressure specs obtained with pressure applied to the front of the sensor.
2. Shift is relative to 25 °C [77 °F].
3. Measured at ½ full scale rated pressure using BFSL.

ABSOLUTE OUTPUT

FS Pressure	CPC at 12 Vdc, 25 °C [77 °F] Output Full Scale Span (mV)			CPX at 5 Vdc, 25 °C [77 °F] Output Full Scale Span (mV)			Overpressure (psi)
	Min.	Typ.	Max.	Min.	Typ.	Max.	Max.
5 psi	57	60	63	112	168.5	225	15
15 psi	85	90	95	168	253	338	45
30 psi	85	90	95	168	253	338	90
60 psi	85	90	95	189	263.5	338	180
100 psi	95	100	105	210	295	380	250

GAGE/DIFFERENTIAL[1] OUTPUT

FS Pressure	CPC/CPCL at 12 Vdc, 25 °C [77 °F] Output Full Scale Span (mV)			CPX/CPXL at 5 Vdc, 25 °C [77 °F] Output Full Scale Span (mV)			Overpressure (psi)
	Min.	Typ.	Max.	Min.	Typ.	Max.	Max.
4 in H_2O	23	25	27	50	68	86	3
10 in H_2O	19	20	21	40	78.5	112	3
1 psi	17	18	19	40	75	110	3
5 psi	57	60	63	112	168.5	225	15
15 psi	85	90	95	168	253	338	45
30 psi	85	90	95	168	253	338	90
60 psi	85	90	95	189	263.5	338	180
100 psi	95	100	105	210	295	380	250
150 psi	85	90	95	187	262.5	338	250

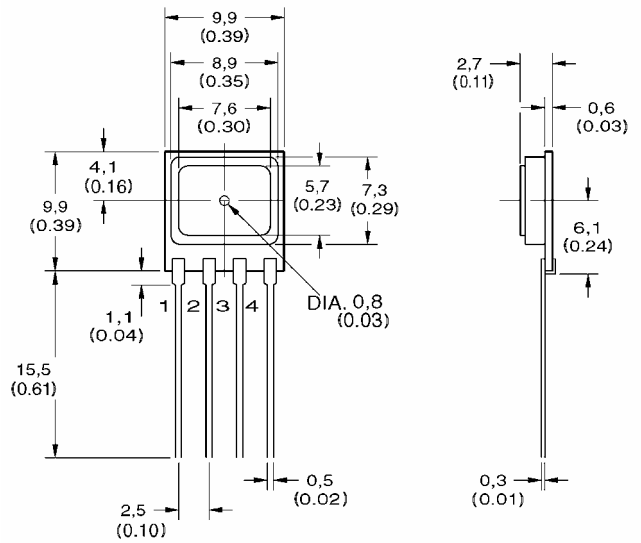
Note:

1. Differential common mode pressure should not exceed 50 psi.

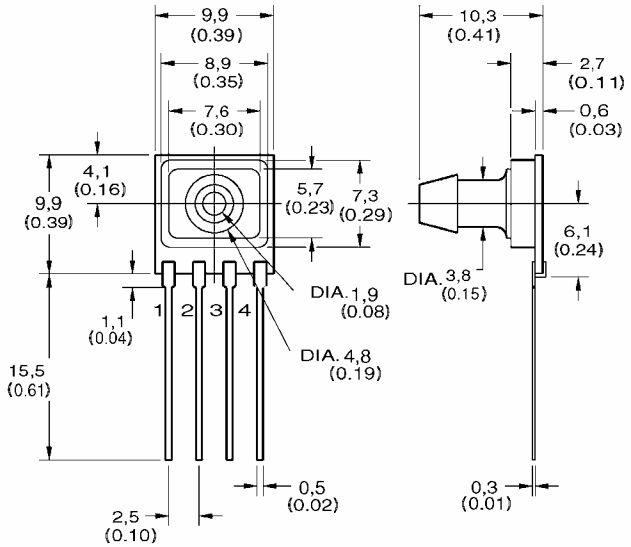
Uncompensated/Compensated and Compensated Calibrated Silicon Pressure Sensors

MOUNTING DIMENSIONS (For reference only: mm [in].)

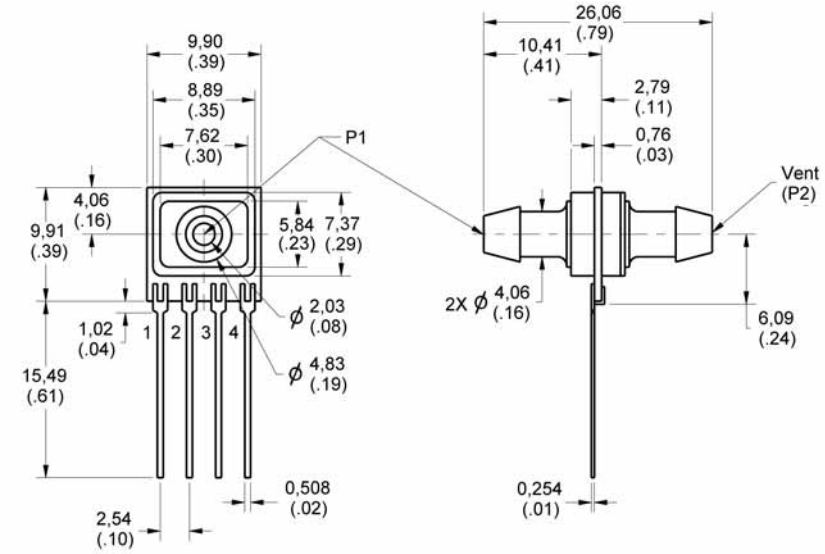
Non-ported Package



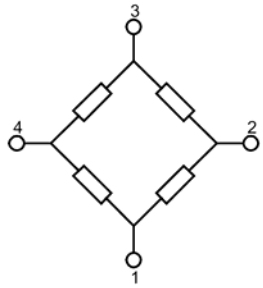
AF and GF Package



DF Package



EQUIVALENT CIRCUIT



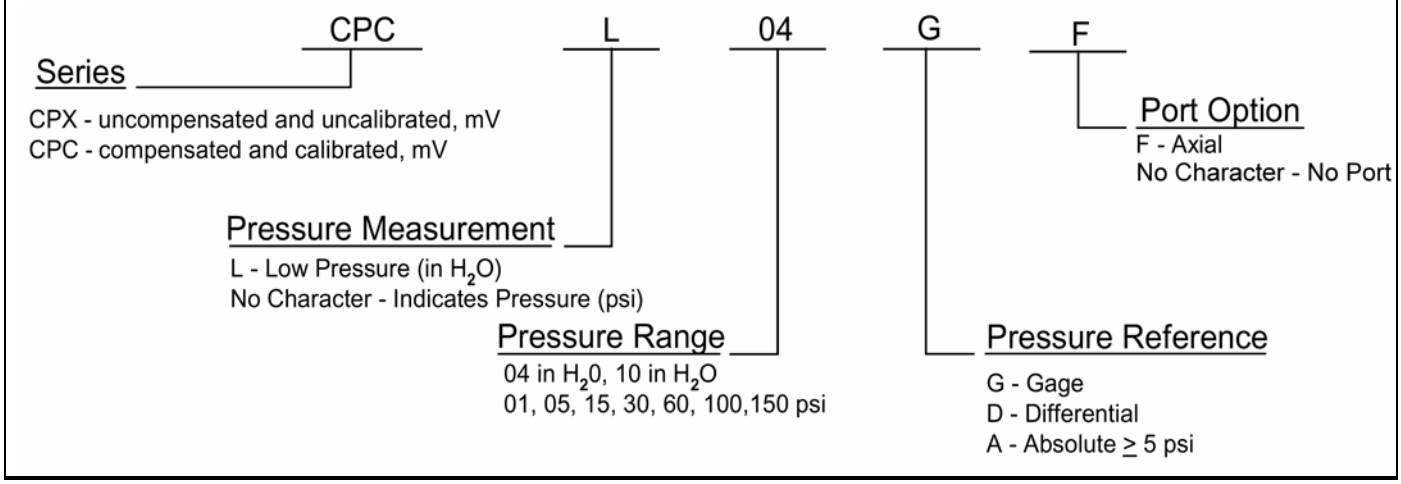
Pinout

1. - V Excitation
2. + Output Signal
3. +V Excitation
4. - Output Signal

MEDIA COMPATIBILITY: Clean, dry gases only

Port 1: Media must be compatible with epoxy-based adhesive.
Port 2: Media must be compatible with nylon housing, epoxy adhesive and silicon.

ORDER GUIDE



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July 2007

Honeywell

Silicon Pressure Sensors

Ultra Low Pressure Sensing

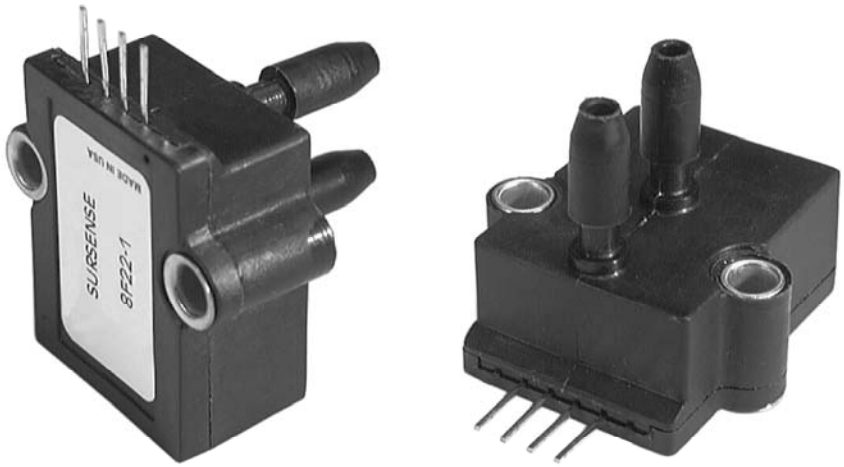
DC Series

FEATURES

- Ultra Low Pressure Sensing, down to 2.5 mBar
- ASIC Technology
- Available in Gage and Differential Pressure Ranges
- Available in Ratiometric and Regulated
- Temperature Compensated over 0 °C to 50°C [32 °F to 122 °F]
- Combined Linearity and Hysteresis error < ±0.25 % Span

TYPICAL APPLICATIONS

- Medical Instrumentation
- HVAC
- Environmental Controls
- Portable Monitors



GENERAL DESCRIPTION

The DC Series pressure sensors combine SURSENSE™ precision high sensitivity silicon sensing capabilities with the latest in Application Specific Integrated Circuitry ASIC technology to produce one of the most precise, reliable pressure sensors in the market. The SURSENSE technology provides Dynamic Self Compensation which substantially reduces offset errors due to changes in temperature, stability to warm up, long term instability and position sensitivity.

When operated with an unregulated 7.0 Vdc to 16.0 Vdc supply the DC sensors provides a ratiometric 0.50 to 4.50 Vdc output (4.0 Vdc span).

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ELECTRICAL SPECIFICATIONS

Ouput	Pressure Reference	Excitation (Vdc)	Offset[1] Voltage (Vdc)	Output Span (Vdc)	Supply Current (max.)	Output Source Current (max.)	Output Sink Current @ null (max.)
C4 Ratiometric	Gage	5 ±0.1	0.25	4	4 mA	2.0 mA	20 µA
	Differential	5 ±0.1	2.25	±2	4 mA	2.0 mA	20 µA
R4 Regulated	Gage	7 to 16	0.25	4	8 mA	2.0 mA	20 µA
	Differential	7 to 16	2.25	±2	8 mA	2.0 mA	20 µA
R5 Regulated	Gage	7 to 16	0.25	5	8 mA	2.0 mA	20 µA
	Differential	7 to 16	3.5	±2.5	8 mA	2.0 mA	20 µA

PERFORMANCE SPECIFICATIONS[2]

Pressure Ranges	Overpressure	Offset Position Sensitivity	Total Error (Typical)	Total Error[3] (Max.)	Accuracy[4]
±0.5 in H_2O	100 in H_2O	±10 mV	±2.0 %	±3.0 %	±0.25 %
1 in H_2O	100 in H_2O	±10 mV	±2.0 %	±3.0 %	±0.25 %
2.5 mBar	250 mBar	±10 mV	±2.0 %	±3.0 %	±0.25 %
2 in H_2O	100 in H_2O	±10 mV	±1.5 %	±2.5 %	±0.25 %
5 mBar	250 mBar	±10 mV	±1.5 %	±2.5 %	±0.25 %
2.5 in H_2O	100 in H_2O	±10 mV	±1.5 %	±2.5 %	±0.25 %
5 in H_2O	150 in H_2O	±5 mV	±1.0 %	±2.0 %	±0.25 %
10 mBar	375 mBar	±5 mV	±1.0 %	±2.0 %	±0.25 %
10 in H_2O	150 in H_2O	±1 mV	±1.0 %	±2.0 %	±0.25 %
25 mBar	375 mBar	±1 mV	±1.0 %	±2.0 %	±0.25 %
20 in H_2O	300 in H_2O	±1 mV	±1.0 %	±2.0 %	±0.25 %
50 mBar	750 mBar	±1 mV	±1.0 %	±2.0 %	±0.25 %
30 in H_2O	450 in H_2O	±1 mV	±1.0 %	±2.0 %	±0.25 %
75 mBar	1125 mBar	±1 mV	±1.0 %	±2.0 %	±0.25 %
140 cm H_2O	1125 cm H_2O	±1 mV	±1.0 %	±2.0 %	±0.25 %

Note 1: Offset voltage and output span are nominal

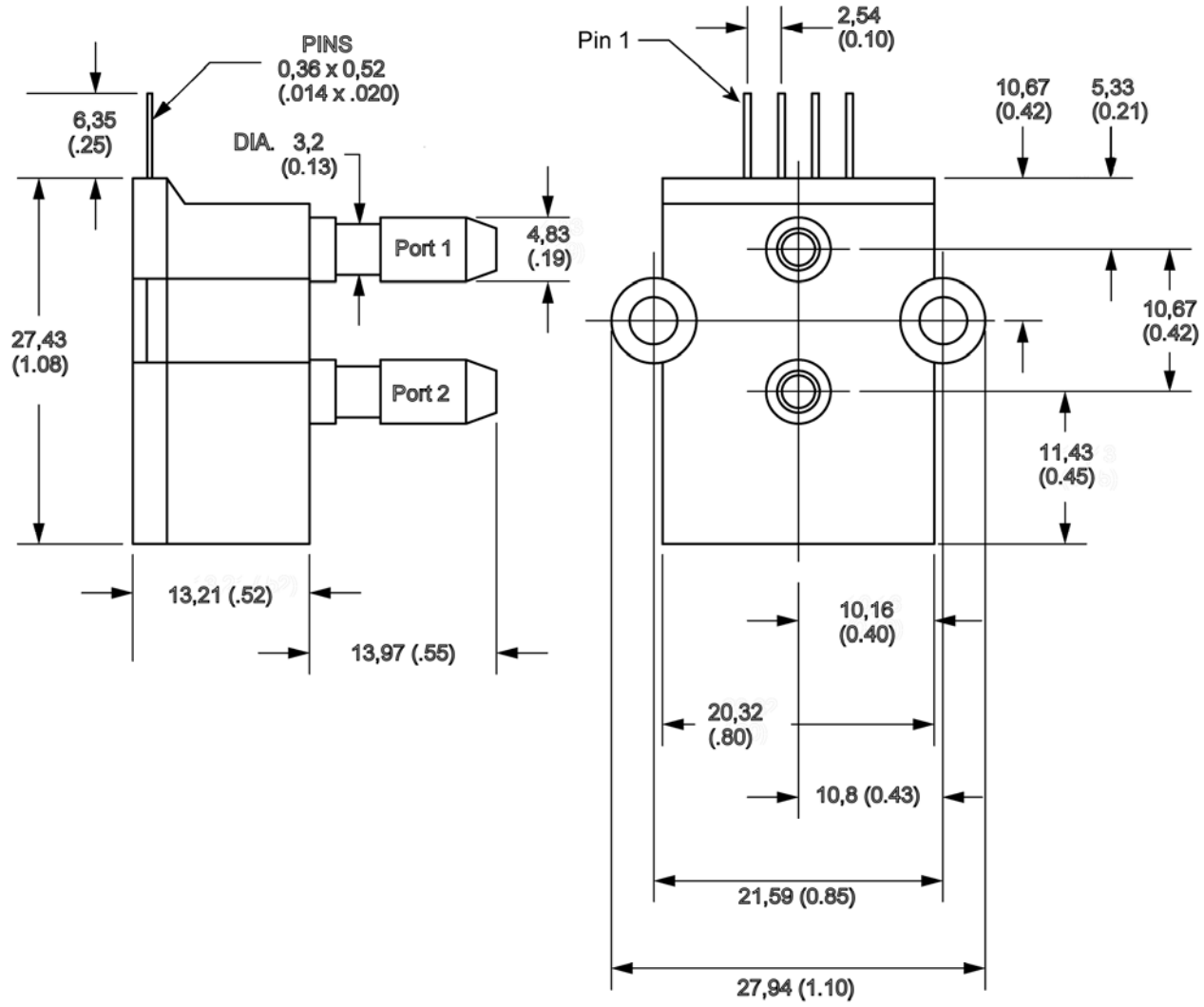
Note 2: All specifications are relative to readings taken at 25 °C [77 °F] and at rated excitation unless otherwise specified.

Note 3: Percentage of Full Scale Includes: zero calibration, span calibration, temperature effect on zero and span, non-linearity, hysteresis, repeatability and stability over the compensated temperature range.

Note 4: Percentage of Best Fit Straight Line Includes: non-linearity, hysteresis, and repeatability.

Material in Contact with Media	Silicon diaphragm, glass filled nylon, silicone, and alumina ceramic.
Compensated Temperature Range	0 °C to 50 °C [32 °F to 170 °F]
Operating Temperature Range	-25 °C to 85 °C [-13 °F to 185 °F]
Storage Temperature	-40 °C to 125 °C [-40 °F to 257 °F]

PHYSICAL DIMENSIONS for reference only mm [In]



Note: For gage sensor apply pressure to port 2.

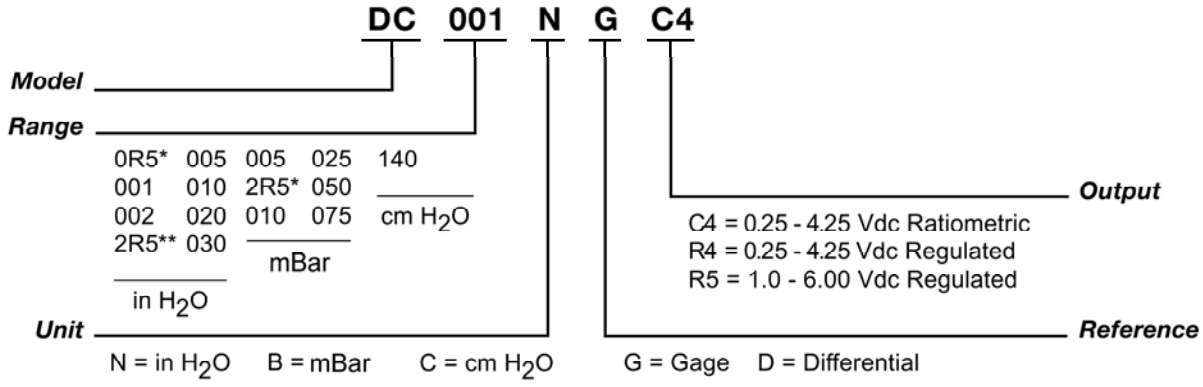
	DC Electrical Output Version		
Pin Number	C4 0.25 Vdc to 4.25 Vdc Ratiometric	R4 0.25 Vdc to 4.25 Vdc Regulated	R5 1.0 Vdc to 6.0 Vdc Regulated
1	V Excitation	V Excitation	V Excitation
2	Common	Common	Common
3	V out	V out	V out
4	Not for Customer Use	Not for Customer Use	Not for Customer Use

Silicon Pressure Sensors

Ultra Low Pressure Sensing

DC Series

DC SERIES ORDER GUIDE



** Note: Differential Only*

*** Note: The character R replaces the decimal points in fractional pressure ranges. Minimum order quantities apply. Contact the factory for more details.*

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. **The foregoing is Buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

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For application assistance, current specifications, or name of the nearest Authorized Distributor, contact a nearby sales office. Or call:

1-800-537-6945 USA/Canada

1-815-235-6847 International

FAX

1-815-235-6545 USA

INTERNET

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Sensing and Control

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008134-2-EN IL50 GLO Printed in USA

April 2009

Honeywell

DCXL-DS Series

SURSENSE™ Ultra Low Silicon Pressure Sensors

DESCRIPTION

The SURSENSE line of ultra low pressure sensors is based upon a proprietary technology designed to reduce output offset or common mode errors.

These sensors use a silicon micromachined sensing element which features a unique stress concentration-enhanced structure to provide a highly stable linear output that is proportional to applied pressure. Output offset errors due to changes in temperature, warm-up, long-term stability and position sensitivity have all been significantly reduced when compared to conventional sensors.

The DCXL-DS Series provides a precision calibrated, ratiometric mV output with SURSENSE-enhanced stability. Each sensor features calibrated offset, full scale span and thermal error calibration to promote accuracy for flow pressure measurement. These highly stable sensors feature an industry-standard, ported package with improved stress isolation for printed circuit board mount applications. The housing design incorporates a snap together cover and housing leading to improved quality and performance.

Product is patented by US patent 6023978.

FEATURES

- Temperature compensated 0 °C to 50 °C [32 °F to 122 °F]
- Available in gage and differential pressure ranges
- Combined linearity and hysteresis error <±0.25% span

POTENTIAL APPLICATIONS

- Medical
- HVAC
- Industrial instrumentation
- Environmental controls

DCXL-DS Series

ELECTRICAL SPECIFICATIONS (12 Vdc excitation at 25 °C [77 °F].)

Characteristic	Min.	Typ.	Max.	Unit
Excitation voltage	3.0	12.0	16.0	Vdc
Null offset	-500	0	500	µV
Span except DCXL01DS	19.0	20.0	21.0	mV
Span DCXL01DS	9.0	10.0	11.0	mV
Offset temperature shift 0 ºC to 50 ºC [32 ºF to 122 ºF][1] except DCXL01DS	-150	–	150	µV
Offset temperature shift 0 ºC to 50 ºC [32 ºF to 122 ºF][1] DCXL01DS	-250	0	250	µV
Span temperature shift 0 ºC to 50 ºC [32 ºF to 122 ºF][1]	-200	0	200	µV
Linearity, hysteresis error[2]	–	0.05	0.25	% span
Compensated temperature	0 [32]	–	50 [122]	°C [°F]
Operating temperature	-25 [-13]	–	85 [185]	°C [°F]
Storage temperature	-40 [-40]	–	125 [257]	°C [°F]
Offset warm-up shift[3] except DCXL01DS	–	±50	–	µV
Offset warm-up shift[3] DCXL01DS	–	±100	–	µV
Offset position sensitivity (±1 g) DCXL01DS	–	±50	–	µV
Offset position sensitivity (±1 g) DCXL05DS, DCXL10DS	–	±10	–	µV
Offset position sensitivity (±1 g) DCXL20DS, DCXL30DS	–	±5	–	µV

Notes:
1. Shift is relative to 25 °C [77 °F].
2. Measured at ½ full scale rated pressure using BFSL.
3. Shift is within the first hour of excitation applied to the device.

PRESSURE RATINGS IN H_2O (By Catalog Listing)

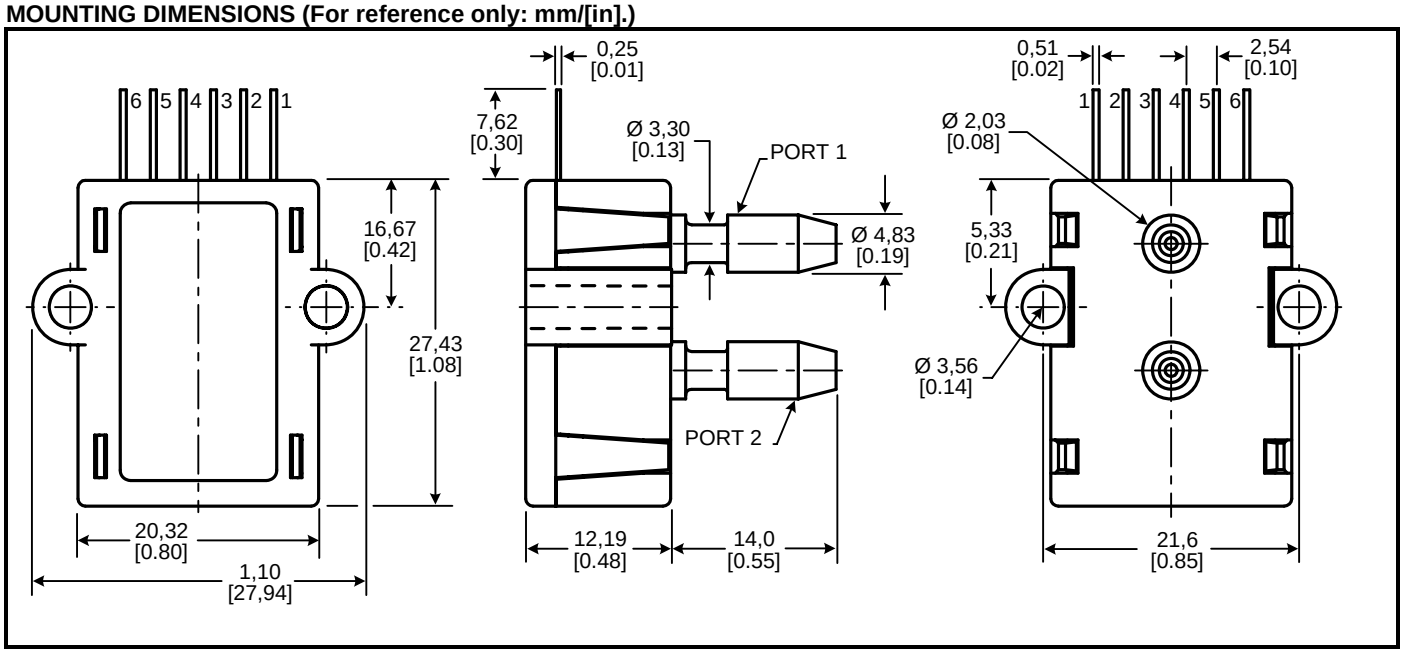
Parameter	01D	05D	10D	20D	30D	Unit
Operating pressure	1	5	10	20	30	in H_2O
Maximum overpressure	5	5	5	5	5	PSI
Common mode	50	50	50	50	50	PSI

TYPICAL RESISTANCE VALUES (By Catalog Listing)

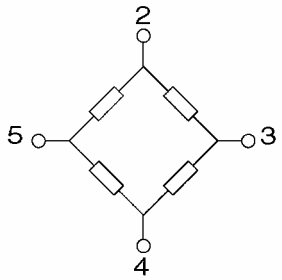
Parameter	01D	05D	10D	20D	30D	Unit
Input resistance	4.5	10	13	10	12	kΩ
Output resistance	1.5	1.5	1.5	2	1.5	kΩ

SURSENSE™ Ultra Low Pressure Sensor Pressure Sensors

MOUNTING DIMENSIONS (For reference only: mm/[in].)



EQUIVALENT CIRCUIT



Pinout

1. V Excitation
2. V Output
3. V Offset (Not to be used unless adjusting null offset.
4. Common

MEDIA COMPATIBILITY: Clean, dry gases only

Port 1: Media must be compatible with epoxy-based adhesive, silicon, silicone, gold, nylon and alumina.
Port 2: Media must be compatible with epoxy-based adhesive, silicon, silicone, gold, nylon and alumina.

PRESSURE COMPATIBILITY

Measures differential or gage pressure and vacuum. Pressure may be applied to either port. For pressure to the low pressure port, the output polarity is reversed.

RATIOMETRIC OUTPUT

The output voltage of the sensor is ratiometric (proportional) to the excitation voltage. All specifications will change proportionally to any changes in the excitation voltage, which may vary between 3 Vdc to 16 Vdc. All specifications will nominally be changed by a ratio of V Excitation/12.0 Vdc. For example: if the excitation voltage is 5.0 Vdc, then both the full scale output voltage and the offset voltage nominal would be 5/12th the specified value.

ORDER GUIDE

DCXL	05	D	S
Series DCLX Compensated and calibrated, mV	Pressure Range 01, 05, 10, 20, 30 in H_20	Pressure Reference D - Differential	Package Type S - Snap cover

⚠ WARNING

PERSONAL INJURY

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WARRANTY/REMEDY

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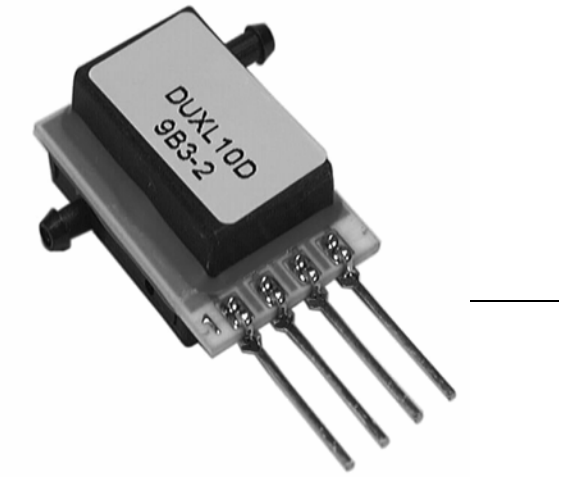
July 2007

Honeywell

DUXL Series

Sursense™ Ultra Low Silicon Pressure Sensors



DESCRIPTION

The SURSENSE™ line of ultra low pressure sensors is based upon a proprietary technology designed to reduce all output offset or common mode errors.

These sensors use a silicon micromachined sensing element which features a unique stress concentration enhanced structure to provide a highly stable linear output that is proportional to applied pressure. Output offset errors due to changes in temperature, warm-up, long term stability and position sensitivity have all been significantly reduced when compared to conventional sensors.

The DUXL Series sensors provide a ratiometric millivolt output and are housed in a low profile miniature ported package. These sensors are intended for those applications where customized external signal conditioning is required or available from other sources. The low profile outline is ideal for portable applications where small size is critical.

Product is patented by US patent 6023978

FEATURES

- Position sensitivity to ±5 mV/g, typical
- Operating temperature range -25 °C to 85 °C [-13 °F to 185 °F]
- Available in gage and differential pressure ranges

POTENTIAL APPLICATIONS

- Hand held instrumentation
- Airflow controllers
- Medical monitors
- Smart microvalves and switches
- Level indicators

DUXL Series

ELECTRICAL SPECIFICATIONS (At 4.5 Vdc Excitation 25 °C [77 °F].)

Characteristic	Min.	Typ.	Max.	Unit
Excitation voltage	3.0	4.5	8.0	Vdc
Span[1] except DUXL01D, DUXL05D	15	30	45	mV
Span[1] DUXL01D	4.0	6.0	8.0	mV
Span[1] DUXL05D	15	22.5	30	mV
Null	-10	0	10	mV
Offset temperature shift 0 °C to 50 °C [32 °F to 122 °F][2]	–	100	–	µV
Span temperature shift 0 °C to 50 °C [32 °F to 122 °F][2]	–	100	–	µV
Linearity, hysteresis error[3]	-0.5	0.1	0.5	% span
Temperature coefficient of resistance	–	2600	–	ppm/°C
Temperature cCoefficient of sensitivity	–	-2200	–	ppm/°C
Operating temperature	-25 [-13]	–	85 [185]	°C [°F]
Storage temperature	-40 [-40]	–	125 [257]	°C [°F]
Offset warm-up shift[4]	–	10	–	µV
Offset position sensitivity (±1 g) DUXL01D, DUXL05D	–	15	–	µV
Offset position sensitivity (±1 g) DUXL10D	–	10	–	µV
Offset position sensitivity (±1 g) DUXL20D, DUXL30D	–	5	–	µV
Offset long term stability (1 year)	–	±100	–	µV
Input resistance	–	2.0	–	kΩ

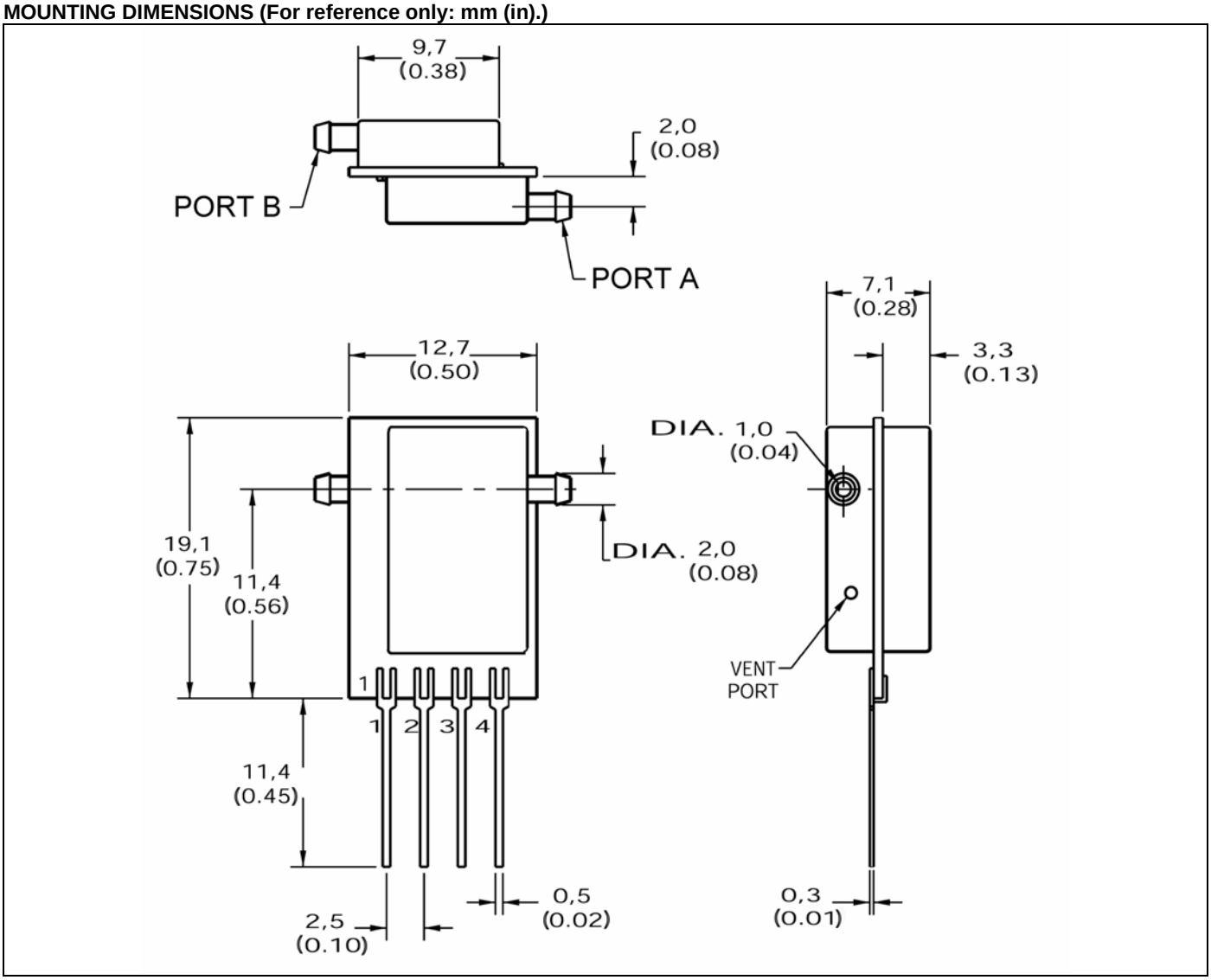
Notes:
1. The voltage added to the offset voltage at full scale pressure. Nominally the output voltage range is 1.0 Vdc to 6.0 Vdc.
2. Shift is relative to 25 °C [77 °F]
3. Measured at ½ full scale operating pressure using BFSL
4. Shift is within the first hour of excitation applied to the device.

PRESSURE RATINGS (In H_2O by Catalog Listing)

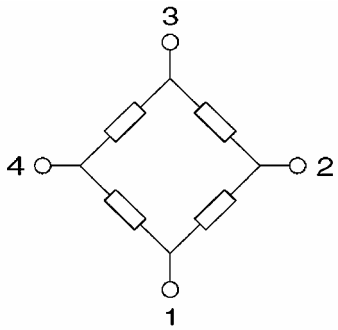
Characteristic	01D	05D	10D	20D	30D
Operating pressure range	1.0	5.0	10.0	20.0	30.0
Maximum overpressure	100	100	150	200	300
Common mode	50	50	50	50	50

Sursense™ Ultra Low Silicon Pressure Sensors

MOUNTING DIMENSIONS (For reference only: mm (in).)



EQUIVALENT CIRCUIT



Pinout
1. –Vdc supply
2. +Vdc output
3. +Vdc supply
4. –Vdc output

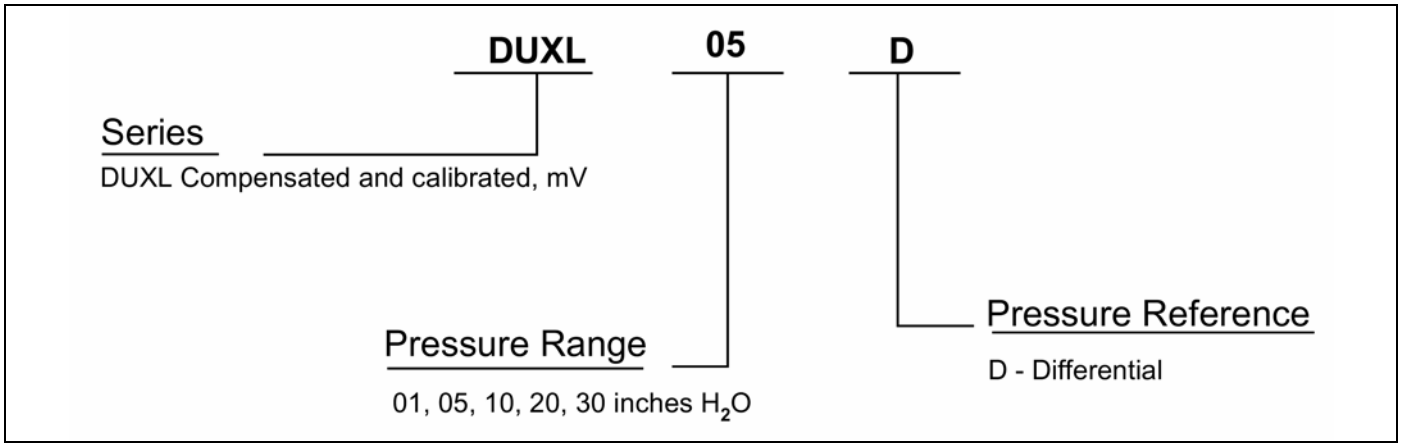
MEDIA COMPATIBILITY: Clean, dry gases only

Port A: Media must be compatible with nylon housing, epoxy adhesive and silicon.
Port B: Media must be compatible with nylon housing, epoxy adhesive and silicon

PRESSURE COMPATIBILITY

Measures differential or gage pressure and vacuum. Pressure may be applied to either port. For pressure to the low pressure port, the output polarity is reversed.

ORDER GUIDE



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Honeywell

008052-3-EN IL50 GLO Printed in USA
July 2007

Honeywell

Microstructure Pressure Sensors

0 mm Hg to 300 mm Hg through 0 psi to 100 psi

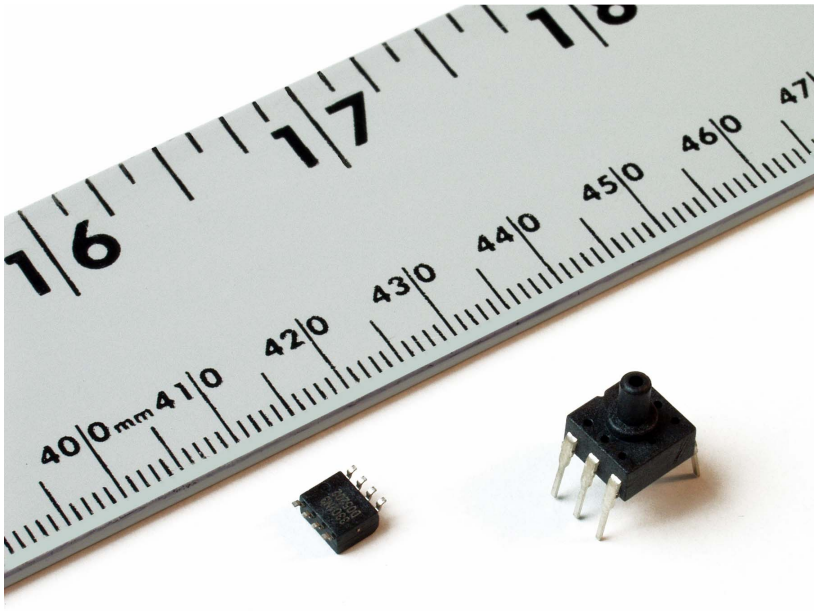
HPX Series

FEATURES

- Miniature package size
- Available in gage and absolute sensing types
- Non-compensated and non-calibrated
- Pressure ranges from 0 psi to 100 psi
- Response time is 1 ms typical
- Two package styles, DIP and SOIC
- Wide operating temperature range
- Surface mount and through hole mounting

TYPICAL APPLICATIONS

- Medical equipment
- Altimeters and barometers
- Pneumatic controls
- Leak detection
- Consumer goods



The HPX Series Pressure Sensors provide accurate, low cost sensing in two different package configurations, DIP (Dual In-line Package) and SOIC (Small Outline Integrated Circuit).

The gage devices come in a 6-pin DIP and the absolute devices come in an 8 pin surface mount SOIC package. Both sensor styles are non-amplified and non-calibrated. The user may provide the HPX Series sensors with amplification and signal conditioning circuitry to meet specific application requirements.

These easy-to-use sensors feature Wheatstone bridge construction, silicon piezoresistive technology and ratiometric output for proven application flexibility, design simplicity and ease of end product manufacturing.

These devices are intended for use with non-corrosive, non-ionic working fluids such as air and dry gases.

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Microstructure Pressure Sensors

0 mm Hg to 300 mm Hg through 0 psi to 100 psi

HPX Series

GENERAL SPECIFICATIONS – GAGE (DIP)

Parameter	Min.	Typ.	Max.	Unit
Excitation	–	3.0	10.0	Vdc
Input impedance	4 k	5 k	6 k	Ohm
Output impedance	4 k	5 k	6 k	Ohm

ENVIRONMENTAL SPECIFICATIONS – GAGE (DIP)

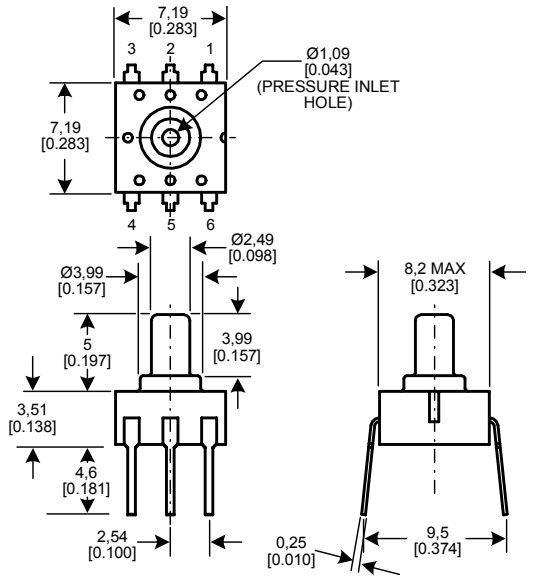
Parameter	Characteristic
Operating temperature range	-20 °C to 100 °C [-4 °F to 212 °F]
Storage	-40 °C to 125 °C [-40 °F to 257 °F]
Vibration	1.5 mm at 10 Hz to 50 Hz
Weight	<1 g [<0.035 oz]
Life	1 million cycles min. (5.8 psi is 100,000 cycles)
Lead solder temperature	DIP solder bath: max. 250 °C [482 °F] for 5 s

PERFORMANCE CHARACTERISTICS – GAGE (DIP)

Pressure Range	Linearity % Span	Hysteresis % Span	Null Offset (mV)	Span (mV)	Overpressure (psi) Max.	Response Time (ms) Typ.	Temperature Coefficient of Null Offset (% Span/ºC) Typ.	Temperature Coefficient of Span (% Span/ºC) Typ.
5.8 psi (300 mm Hg)	±0.5	±0.5	±20	40 ±12	15	1.0	±0.08	-0.1 to -0.3
15 psi	±0.3	±0.3	±30	42 ±12	45	1.0	±0.08	-0.1 to -0.3
30 psi	±0.3	±0.3	±30	60 ±20	90	1.0	±0.08	-0.1 to -0.3
50 psi	±0.3	±0.3	±30	60 ±20	150	1.0	±0.08	-0.1 to -0.3
100 psi	±0.3	±0.3	±30	60 ±20	300	1.0	±0.08	-0.1 to -0.3

Notes:
1. Reference conditions (unless otherwise noted): Supply voltage, V_S=3.0 ± 0.01 Vdc; Ta=25 °C [77 °F]. Output is ratiometric within the supply voltage range (Vs).
2. Temperature coefficients are typical values between -20 °C and 100 °C [-4 °F and 212 °F].
3. Span is the algebraic difference between the output voltage at the specified pressure and the output at zero pressure. Span is ratiometric to the supply voltage.
4. Response time for 0 psi to full-scale pressure step change, 10 % to 90 % rise time.

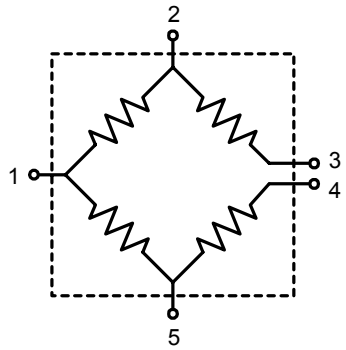
GAGE (DIP) MOUNTING DIMENSIONS (for reference only mm[in])



Absolute Sensor Terminal Connection Table

Terminal Number	Name
1	Power Supply (+)
2	Output (+)
3	Power Supply (-)
4	Power Supply (-)
5	Output (-)
6	No Connection

Wheatstone Bridge



Microstructure Pressure Sensors

0 mm Hg to 300 mm Hg through 0 psi to 100 psi

HPX Series

GENERAL SPECIFICATIONS – ABSOLUTE (SOIC)

Parameter	Min.	Typ.	Max.	Unit
Excitation	–	3.0	10.0	Vdc
Input impedance	4 k	5 k	6 k	Ohm
Output impedance	4 k	5 k	6 k	Ohm

ENVIRONMENTAL SPECIFICATIONS – ABSOLUTE (SOIC)

Parameter	Characteristic
Operating temperature range	-40 °C to 125 °C [-40 °F to 257 °F]
Storage temperature range	-40 °C to 125 °C [-40 °F to 257 °F]
Vibration	1.5 mm at 10 Hz to 50 Hz
Weight	<1 g [<0.035 oz]
Life	1 million cycles min.
SMT solder	Sn 96.5 Ag 3.5 No Clean Flux Sn 63 Pb 37 No Clean Flux
SMT reflow profile	Max peak temperature of 250 °C [482 °F] for 10 s

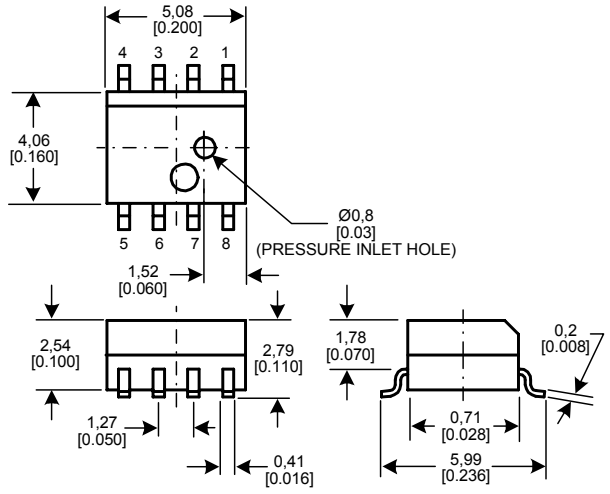
PERFORMANCE CHARACTERISTICS – ABSOLUTE (SOIC)

Pressure Range	Linearity % Span	Hysteresis % Span	Null Offset (mV)	Span (mV)	Overpressure (psi) Max.	Response Time (ms) Typ.	Temperature Coefficient of Null Offset (% Span/ºC) Typ.	Temperature Coefficient of Span (% Span/ºC) Typ.
15 psi	±0.3	±0.3	±30	87 ±18	45	1.0	±0.08	-0.1 to -0.3
30 psi	±0.3	±0.3	±30	60 ±20	90	1.0	±0.08	-0.1 to -0.3
50 psi	±0.3	±0.3	±30	60 ±20	150	1.0	±0.08	-0.1 to -0.3
100 psi	±0.3	±0.3	±30	60 ±20	300	1.0	±0.08	-0.1 to -0.3

Notes:

1. Reference conditions (unless otherwise noted): Supply voltage, V_S=3.0 ± 0.01 Vdc; Ta=25 °C [77 °F]. Output is ratiometric within the supply voltage range (Vs).
2. Temperature coefficients are typical values between -20 °C and 100 °C [-4 °F and 212 °F].
3. Span is the algebraic difference between the output voltage at the specified pressure and the output at zero pressure. Span is ratiometric to the supply voltage.
4. Response time for 0 psi to full-scale pressure step change, 10 % to 90 % rise time.

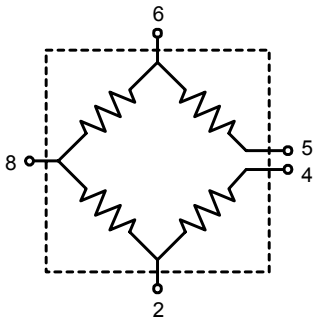
ABSOLUTE (SOIC) MOUNTING DIMENSIONS (for reference only mm[in])



Absolute Sensor Terminal Connection Table

Terminal Number	Name
1	No Connection
2	Output (+)
3	No Connection
4	Power Supply (-)
5	Power Supply (-)
6	Output (-)
7	No Connection
8	Power Supply (+)

Wheatstone Bridge



Microstructure Pressure Sensors

0 mm Hg to 300 mm Hg through 0 psi to 100 psi

HPX Series

ORDER GUIDE

Pressure Range	Absolute (SOIC)	Gage (DIP)
0 psi to 5.8 psi (0 to 300 mm Hg)	–	HPX005GD
0 psi to 15 psi	HPX015AS	HPX015GD
0 psi to 30 psi	HPX030AS	HPX030GD
0 psi to 50 psi	HPX050AS	HPX050GD
0 psi to 100 psi	HPX100AS	HPX100GD

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. **The foregoing is Buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

For application assistance, current specifications, or name of the nearest Authorized Distributor, contact a nearby sales office. Or call:

1-800-537-6945 USA/Canada

1-815-235-6847 International

FAX

1-815-235-6545 USA

INTERNET

www.honeywell.com/sensing

info.sc@honeywell

Honeywell

Sensing and Control

www.honeywell.com/sensing

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008138-1-EN IL50 GLO 1004 Printed in USA

Honeywell

TruStability™ Silicon Pressure Sensors: SSC Series–Standard Accuracy

±2% Total Error Band, Amplified Compensated Analog Output, 1 psi to 150 psi (60 mbar to 10 bar)

DESCRIPTION

The TruStability™ Standard Accuracy Silicon Ceramic (SSC) Series is a piezoresistive silicon pressure sensor offering a ratiometric analog output for reading pressure over the specified full scale pressure span and temperature range.

The SSC Series is fully calibrated and temperature compensated for sensor offset, sensitivity, temperature effects, and non-linearity using an on-board Application Specific Integrated Circuit (ASIC). Calibrated output values for pressure are updated at approximately 1 kHz.

The SSC Series is calibrated over the temperature range of -20 °C to 85 °C [-4 °F to 185 °F]. The sensor is characterized for operation from a single power supply of either 3.3 Vdc or 5.0 Vdc.

These sensors measure absolute, differential, and gage pressures. The absolute versions have an internal vacuum reference and an output value proportional to absolute pressure. Differential versions allow application of pressure to either side of the sensing diaphragm. Gage versions are referenced to atmospheric pressure and provide an output proportional to pressure variations from atmosphere.

The SSC Series sensors are intended for use with non-corrosive, non-ionic working fluids such as air and dry gases. They are designed and manufactured according to standards in ISO 9001.

FEATURES

- Industry-leading long-term stability
- Extremely tight accuracy of ±0.25% FSS BFSL (Full Scale Span Best Fit Straight Line)
- Total error band of ±2% full scale span maximum
- Modular and flexible design offers customers a variety of package styles and options, all with the same industry-leading performance specifications
- Miniature 10 mm x 10 mm [0.39 in x 0.39 in] package
- Low operating voltage
- Extremely low power consumption
- Ratiometric analog output
- High resolution (min. 0.03 %FSS)
- Precision ASIC conditioning and temperature compensated over -20 °C to 85 °C [-4 °F to 185 °F] temperature range
- RoHS compliant
- Virtually insensitive to mounting orientation
- Internal diagnostic functions increase system reliability
- Also available with I^2C or SPI digital output
- Absolute, differential and gage types
- Pressure ranges from 1 psi to 150 psi (60 mbar to 10 bar)
- Custom calibration available
- Various pressure port options

POTENTIAL APPLICATIONS

- **Medical:**
  - Airflow monitors
  - Anesthesia machines
  - Blood analysis machines
  - Gas chromatography
  - Gas flow instrumentation
  - Kidney dialysis machines
  - Oxygen concentrators
  - Pneumatic controls
  - Respiratory machines
  - Sleep apnea equipment
  - Ventilators
- **Industrial:**
  - Barometry
  - Flow calibrators
  - Gas chromatography
  - Gas flow instrumentation
  - HVAC
  - Life sciences
  - Pneumatic controls

Table 1. Absolute Maximum Ratings[1]

Parameter	Min.	Max.	Unit
Supply voltage (V_{supply})	-0.3	6.0	Vdc
Voltage on any pin	-0.3	V_{supply} + 0.3	V
ESD susceptibility (human body model)	3	-	kV
Storage temperature	-40 [-40]	85 [185]	°C [°F]
Soldering time and temperature: Lead solder (SIP, DIP) Peak reflow (SMT)	4 s max. at 250 °C [482 °F] 15 s max. at 250 °C [482 °F]		

Table 2. Operating Specifications

Parameter	Min.	Typ.	Max.	Unit
Supply voltage (V_{supply})[2]: 3.3 Vdc 5.0 Vdc *Sensors are either 3.3 Vdc or 5.0 Vdc based on listing selected.*	 3.0 4.75	 3.3[3] 5.0[3]	 3.6 5.25	Vdc
Supply current: 3.3 Vdc supply 5.0 Vdc supply	 - -	 1.6 2	 2.1 3	mA
Compensated temperature range[4]	-20 [-4]	-	85 [185]	°C [°F]
Operating temperature range[5]	-40 [-40]	-	85 [185]	°C [°F]
Startup time (power up to data ready)	-	-	5	ms
Response time	-	1	-	ms
Upper output clipping limit	-	-	97.5	%V_{supply}
Lower output clipping limit	2.5	-	-	%V_{supply}
Accuracy[6]	-	-	±0.25	%FSS BFSL
Total error band[7]	-	-	±2	%FSS[8]
Output resolution	0.03	-	-	%FSS[8]

Table 3. Environmental Specifications

Parameter	Characteristic
Humidity	0% to 95% RH, non-condensing
Vibration	MIL-STD-202F, Curve AK (20.7 g random)
Shock	MIL-STD-202F, Method 213B, Condition F
Life[9]	1 million cycles minimum
Solder reflow	J-STD-020-C

±2% Total Error Band, Analog Output, 1 psi to 150 psi (60 mbar to 10 bar)

Table 4. Wetted Materials[10]

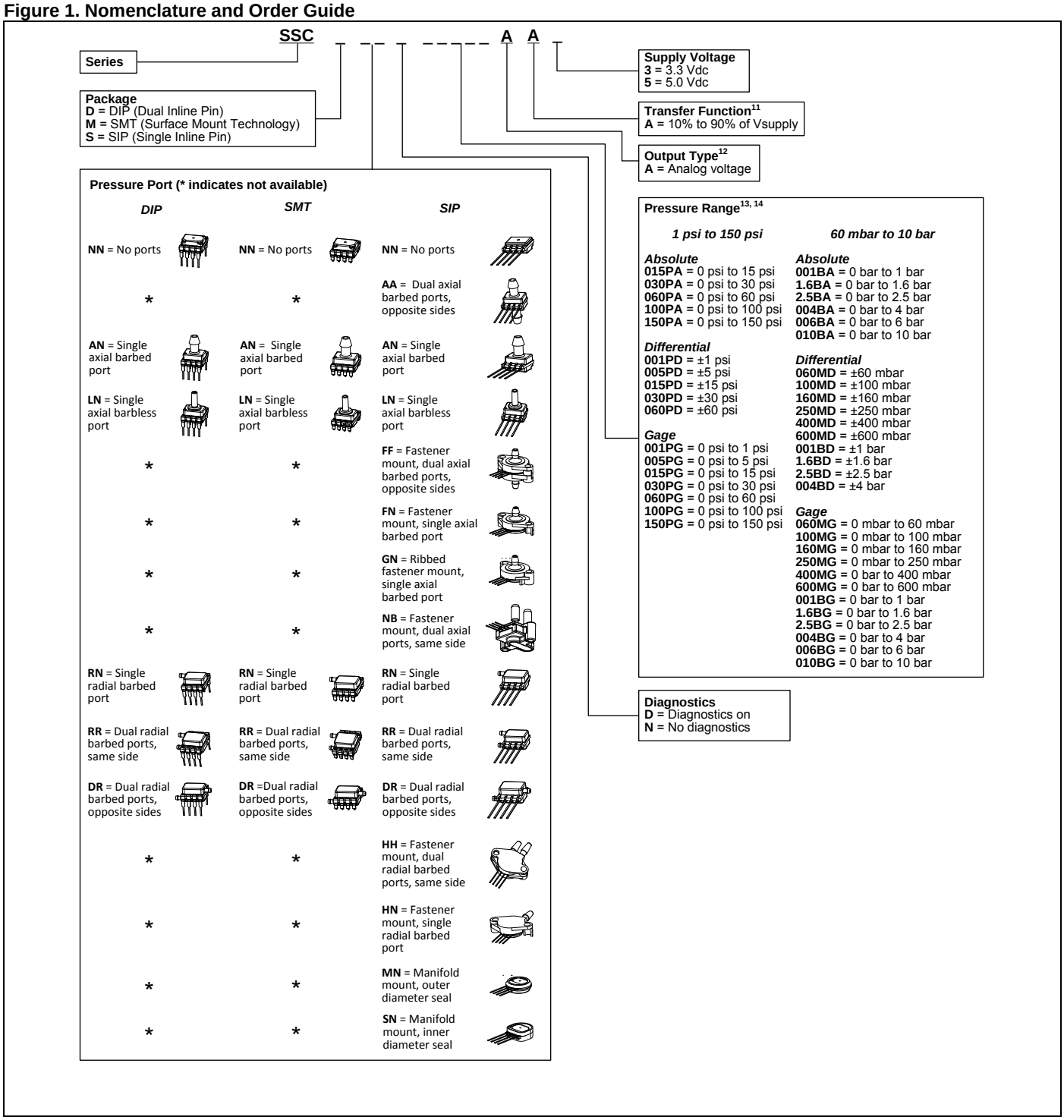
Parameter	Port 1 (Pressure Port)	Port 2 (Reference Port)
Covers	high temperature polyamide	high temperature polyamide
Substrate	alumina ceramic	alumina ceramic
Adhesives	epoxy, RTV	epoxy, RTV
Electronic components	ceramic, glass, solder, silicon	silicon, glass, gold, solder

Notes:

1. Absolute maximum ratings are the extreme limits the device will withstand without damage.
2. Ratiometricity of the sensor (the ability of the device to scale to the supply voltage) is achieved within the specified operating voltage for each option.
3. The sensor is not reverse polarity protected. Incorrect application of supply voltage or ground to the wrong pin may cause electrical failure.
4. The compensated temperature range is the temperature range over which the sensor will produce an output proportional to pressure within the specified performance limits.
5. The operating temperature range is the temperature range over which the sensor will produce an output proportional to pressure but may not remain within the specified performance limits.
6. Accuracy: The maximum deviation in output from a Best Fit Straight Line (BFSL) fitted to the output measured over the pressure range at 25 °C [77 °F]. Includes all errors due to pressure non-linearity, pressure hysteresis, and non-repeatability.
7. Total Error Band: The maximum deviation from the ideal transfer function over the entire compensated temperature and pressure range. Includes all errors due to offset, full scale span, pressure non-linearity, pressure hysteresis, repeatability, thermal effect on offset, thermal effect on span, and thermal hysteresis.
8. Full Scale Span (FSS) is the algebraic difference between the output signal measured at the maximum ($P_{max.}$) and minimum ($P_{min.}$) limits of the pressure range. (See Figure 1 for ranges.)
9. Life may vary depending on specific application in which sensor is utilized.
10. Contact Honeywell Customer Service for detailed material information.

TruStability™ Silicon Pressure Sensors: SSC Series–Standard Accuracy

Figure 1. Nomenclature and Order Guide

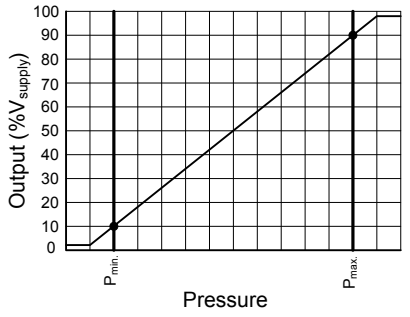


Notes:

11. The transfer function limits define the output of the sensor at a given pressure input. By specifying $P_{min.}$ and $P_{max.}$, the output at $P_{min.}$ and $P_{max.}$, the complete transfer function of the sensor is defined. See Figure 2 for a graphical representation of the transfer function. Other transfer functions are available. Contact Honeywell Customer Service for more information.
12. Digital outputs (SPI or I^2C) are also available. Contact Honeywell Customer Service for more information.
13. Custom pressure ranges are available. Contact Honeywell Customer Service for more information.
14. See Table 5 for an explanation of sensor pressure types.

±2% Total Error Band, Analog Output, 1 psi to 150 psi (60 mbar to 10 bar)

Figure 2. Transfer Function Limits



$$\text{Output (V)} = \frac{0.8 \times V_{supply}}{P_{max.} - P_{min.}} \times (\text{Pressure}_{applied} - P_{min.}) + 0.10 \times V_{supply}$$

Figure 3. Completed Catalog Listing Example

SSCSANN100PGAA3
SIP package, AN pressure port, no diagnostics, 100 psi gage, analog output, 10% to 90% calibration at 3.3 Vdc.

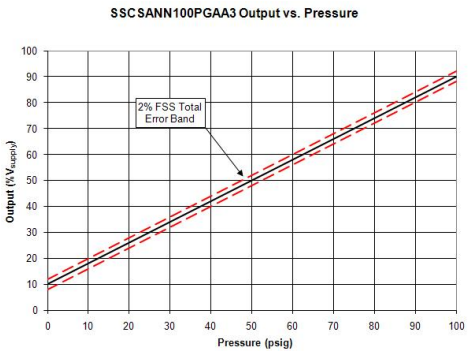


Table 5. Pressure Types

Pressure Type	Description
Absolute	Output is proportional to the difference between applied pressure and a built-in reference to vacuum. $P_{min.}$ is set at absolute zero pressure (full vacuum).
Differential	Output is proportional to the difference between the pressures applied to each port. (Port 1 – Port 2) 50% point of transfer function set at Port 1 = Port 2.
Gage	Output is proportional to the difference between applied pressure and atmospheric (ambient) pressure. $P_{min.}$ is set at atmospheric pressure.

Table 6. Pressure Range Specifications for 1 psi to 150 psi

Order Code	Pressure Range		Over-pressure[15]	Burst Pressure[16]	Common Mode Pressure[17]	Long-term Stability (1000 hr, 25 °C [77 °F])
	$P_{min.}$	$P_{max.}$				
Absolute						
015PA	0 psi	15 psi	30 psi	60 psi	NA	±0.25% FSS
030PA	0 psi	30 psi	60 psi	120 psi	NA	±0.25% FSS
060PA	0 psi	60 psi	120 psi	240 psi	NA	±0.25% FSS
100PA	0 psi	100 psi	250 psi	250 psi	NA	±0.25% FSS
150PA	0 psi	150 psi	250 psi	250 psi	NA	±0.25% FSS
Differential						
001PD	-1 psi	1 psi	10 psi	10 psi	150 psi	±0.35% FSS
005PD	-5 psi	5 psi	30 psi	40 psi	150 psi	±0.35% FSS
015PD	-15 psi	15 psi	30 psi	60 psi	150 psi	±0.25% FSS
030PD	-30 psi	30 psi	60 psi	120 psi	150 psi	±0.25% FSS
060PD	-60 psi	60 psi	120 psi	240 psi	250 psi	±0.25% FSS
Gage						
001PG	0 psi	1 psi	10 psi	10 psi	150 psi	±0.35% FSS
005PG	0 psi	5 psi	30 psi	40 psi	150 psi	±0.35% FSS
015PG	0 psi	15 psi	30 psi	60 psi	150 psi	±0.25% FSS
030PG	0 psi	30 psi	60 psi	120 psi	150 psi	±0.25% FSS
060PG	0 psi	60 psi	120 psi	240 psi	250 psi	±0.25% FSS
100PG	0 psi	100 psi	250 psi	250 psi	250 psi	±0.25% FSS
150PG	0 psi	150 psi	250 psi	250 psi	250 psi	±0.25% FSS

Table 7. Pressure Range Specifications for 60 mbar to 10 bar

Order Code	Pressure Range		Over-pressure[15]	Burst Pressure[16]	Common Mode Pressure[17]	Long-term Stability (1000 hr, 25 °C [77 °F])
	$P_{min.}$	$P_{max.}$				
Absolute						
001BA	0 bar	1 bar	2 bar	4 bar	NA	±0.25% FSS
1.6BA	0 bar	1.6 bar	4 bar	8 bar	NA	±0.25% FSS
2.5BA	0 bar	2.5 bar	6 bar	8 bar	NA	±0.25% FSS
004BA	0 bar	4 bar	8 bar	16 bar	NA	±0.25% FSS
006BA	0 bar	6 bar	17 bar	17 bar	NA	±0.25% FSS
010BA	0 bar	10 bar	17 bar	17 bar	NA	±0.25% FSS
Differential						
060MD	-60 mbar	60 mbar	500 mbar	700 mbar	10 bar	±0.35% FSS
100MD	-100 mbar	100 mbar	500 mbar	700 mbar	10 bar	±0.35% FSS
160MD	-160 mbar	160 mbar	500 mbar	700 mbar	10 bar	±0.35% FSS
250MD	-250 mbar	250 mbar	1.4 bar	2.5 bar	10 bar	±0.35% FSS
400MD	-400 mbar	400 mbar	1.4 bar	2.5 bar	10 bar	±0.35% FSS
600MD	-600 mbar	600 mbar	2 bar	4 bar	10 bar	±0.25% FSS
001BD	-1 bar	1 bar	2 bar	4 bar	10 bar	±0.25% FSS
1.6BD	-1.6 bar	1.6 bar	4 bar	8 bar	10 bar	±0.25% FSS
2.5BD	-2.5 bar	2.5 bar	6 bar	8 bar	10 bar	±0.25% FSS
004BD	-4 bar	4 bar	8 bar	16 bar	10 bar	±0.25% FSS
Gage						
060MG	0 mbar	60 mbar	500 mbar	700 mbar	3.5 bar	±0.35% FSS
100MG	0 mbar	100 mbar	500 mbar	700 mbar	10 bar	±0.35% FSS
160MG	0 mbar	160 mbar	500 mbar	700 mbar	10 bar	±0.35% FSS
250MG	0 mbar	250 mbar	1.4 bar	2.5 bar	10 bar	±0.35% FSS
400MG	0 mbar	400 mbar	1.4 bar	2.5 bar	10 bar	±0.35% FSS
600MG	0 mbar	600 mbar	2 bar	4 bar	10 bar	±0.35% FSS
001BG	0 bar	1 bar	2 bar	4 bar	10 bar	±0.25% FSS
1.6BG	0 bar	1.6 bar	4 bar	8 bar	10 bar	±0.25% FSS
2.5BG	0 bar	2.5 bar	6 bar	8 bar	10 bar	±0.25% FSS
004BG	0 bar	4 bar	8 bar	16 bar	16 bar	±0.25% FSS
006BG	0 bar	6 bar	17 bar	17 bar	17 bar	±0.25% FSS
010BG	0 bar	10 bar	17 bar	17 bar	17 bar	±0.25% FSS

Notes:

15. Overpressure: The maximum pressure which may safely be applied to the product for it to remain in specification once pressure is returned to the operating pressure range. Exposure to higher pressures may cause permanent damage to the product. Unless otherwise specified this applies to all available pressure ports at any temperature with the operating temperature range.
16. Burst pressure: The maximum pressure that may be applied to any port of the product without causing escape of pressure media. Product should not be expected to function after exposure to any pressure beyond the burst pressure.
17. Common mode pressure: The maximum pressure that can be applied simultaneously to both ports of a differential pressure sensor without causing changes in specified performance.

Table 8. Pinout for DIP and SMT Packages

Output Type	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
analog	NC	V_{supply}	OUTPUT+	GND	NC	NC	NC	NC

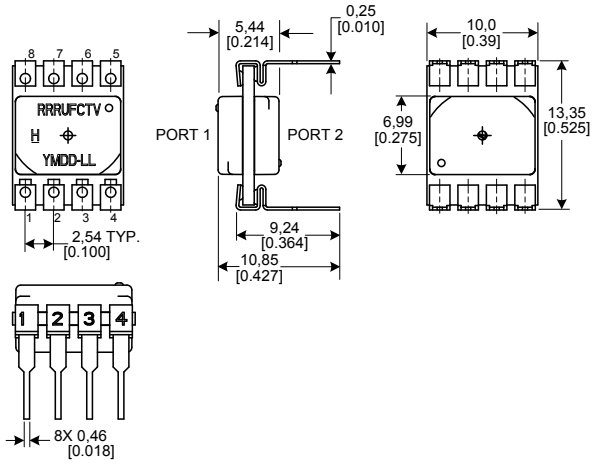
Table 9. Pinout for SIP Package

Output Type	Pin 1	Pin 2	Pin 3	Pin 4
analog	NC	V_{supply}	OUTPUT+	GND

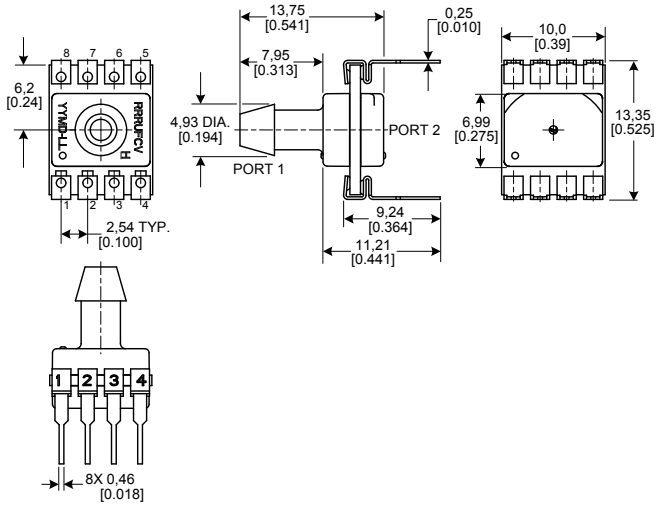
±2% Total Error Band, Analog Output, 1 psi to 150 psi (60 mbar to 10 bar)

Figure 4. DIP Pressure Port Dimensional Drawings (For reference only: mm [in])

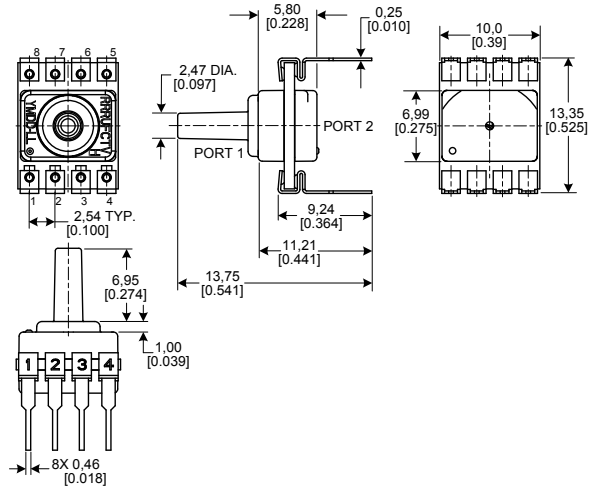
DIP NN: No ports



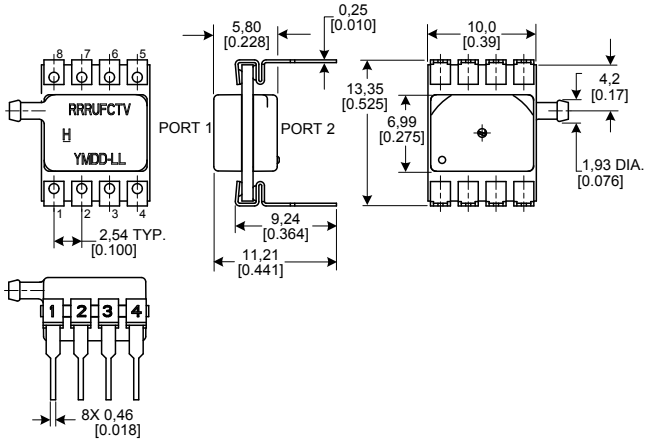
DIP AN: Single axial barbed port



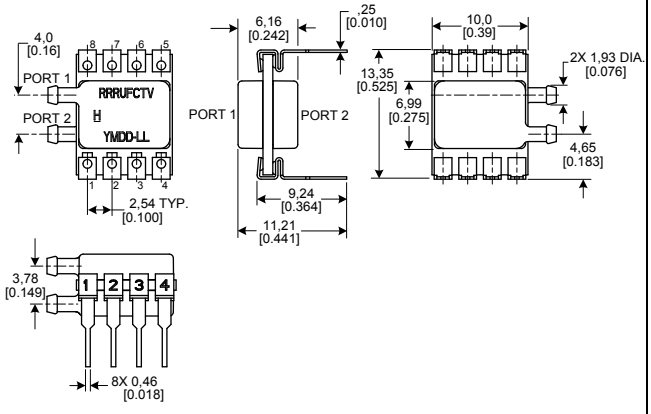
DIP LN: Single axial barbless port



DIP RN: Single radial barbed port



DIP RR: Dual radial barbed ports, same side



DIP DR: Dual radial barbed ports, opposite sides

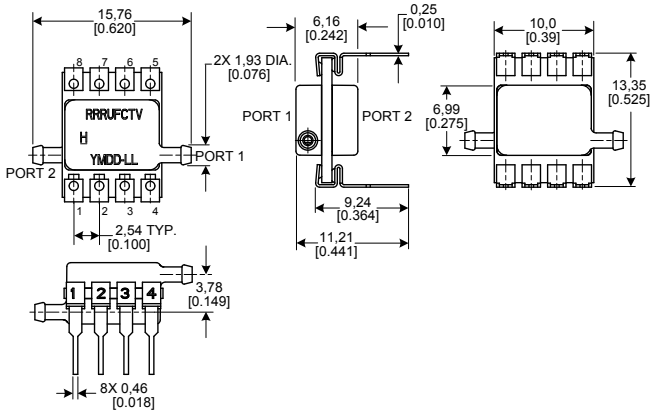
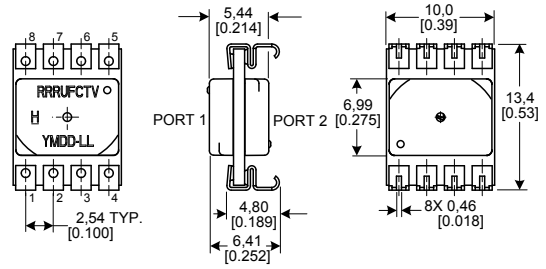
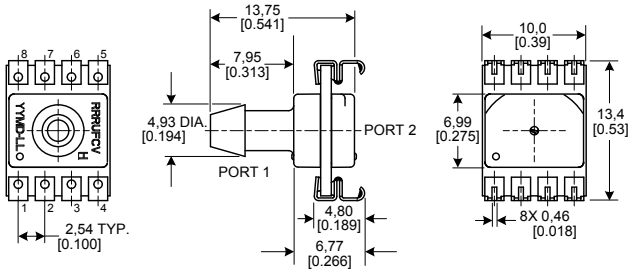


Figure 5. SMT Pressure Port Dimensional Drawings (For reference only: mm [in])

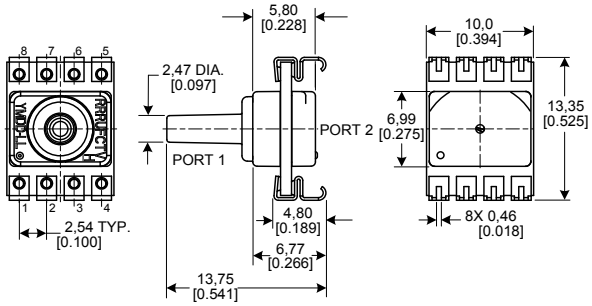
SMT NN: No ports



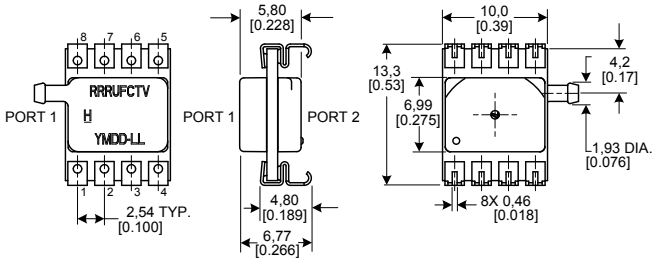
SMT AN: Single axial barbed port



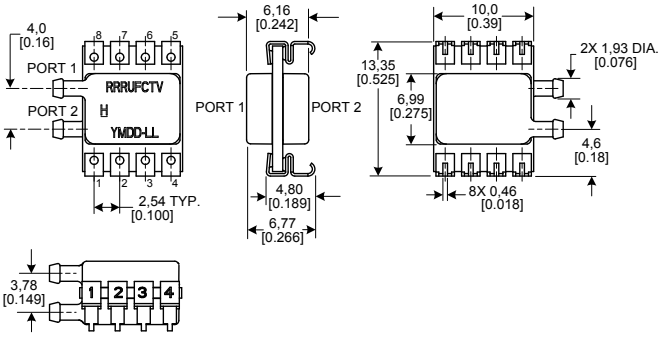
SMT LN: Single axial barbless port



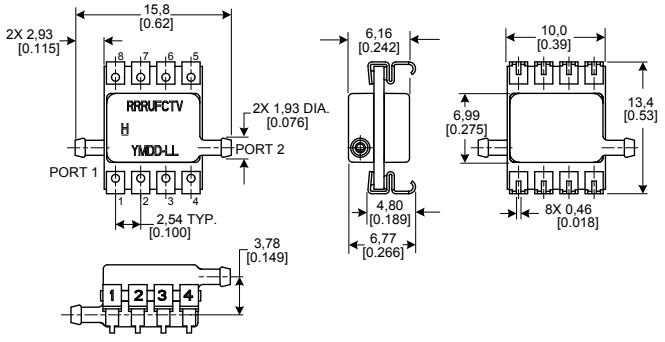
SMT RN: Single radial barbed port



SMT RR: Dual radial barbed ports, same side



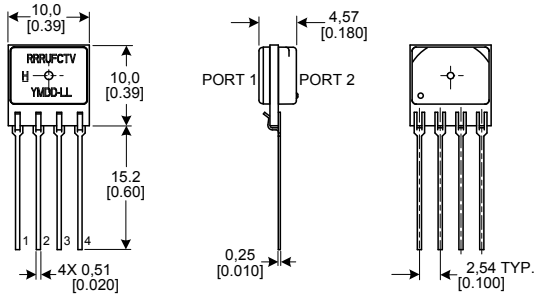
SMT DR: Dual radial barbed ports, opposite sides



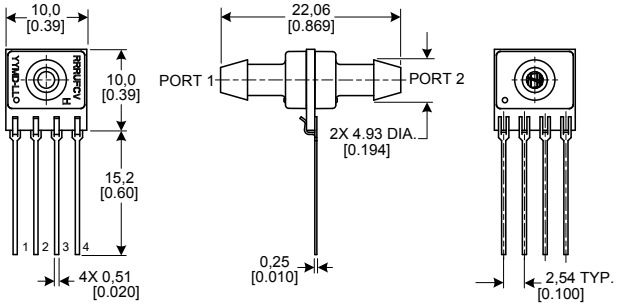
±2% Total Error Band, Analog Output, 1 psi to 150 psi (60 mbar to 10 bar)

Figure 6. SIP Package Dimensional Drawings (For reference only: mm [in])

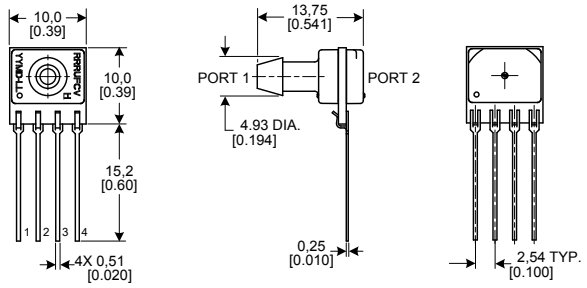
SIP NN: No ports



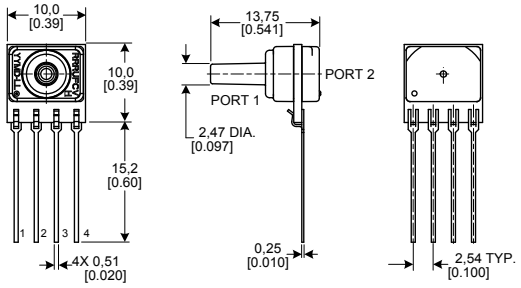
SIP AA: Dual axial barbed ports, opposite sides



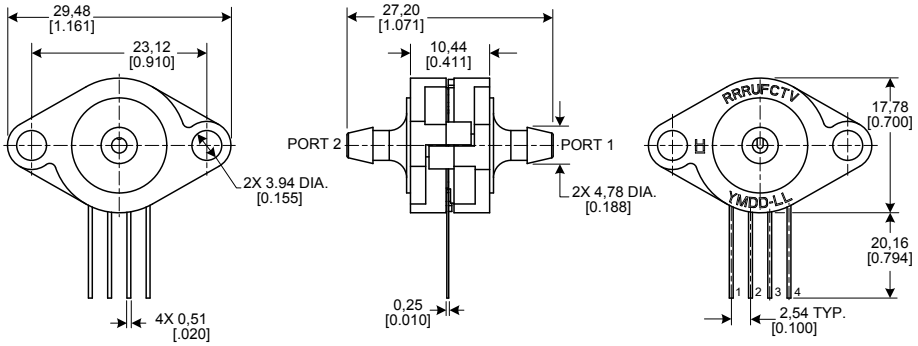
SIP AN: Single axial barbed port



SIP LN: Single barbless port



SIP FF: Fastener mount, dual axial barbed ports, opposite sides



SIP FN: Fastener mount, single axial barbed port

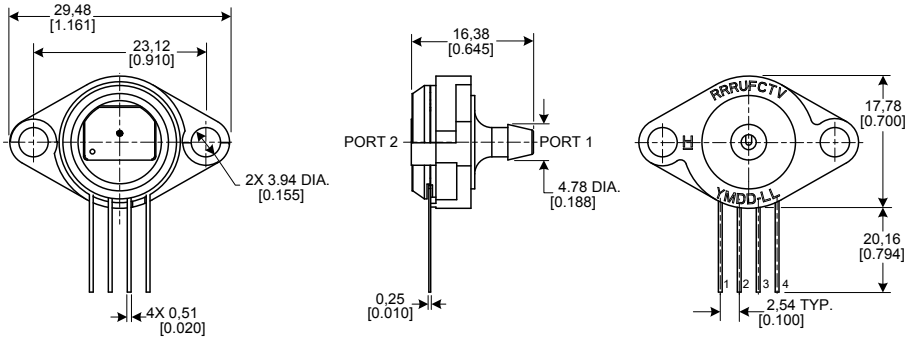
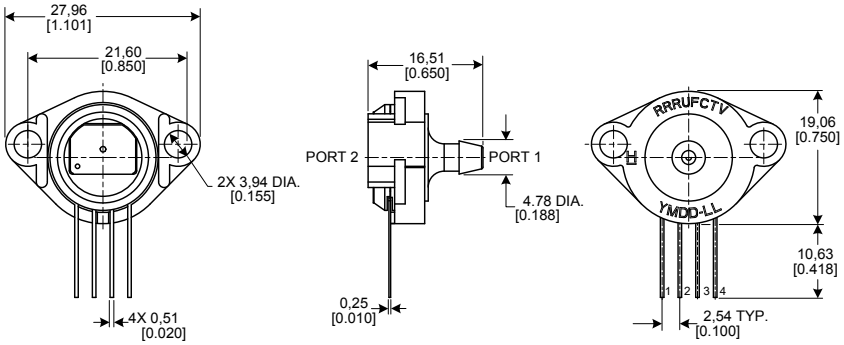
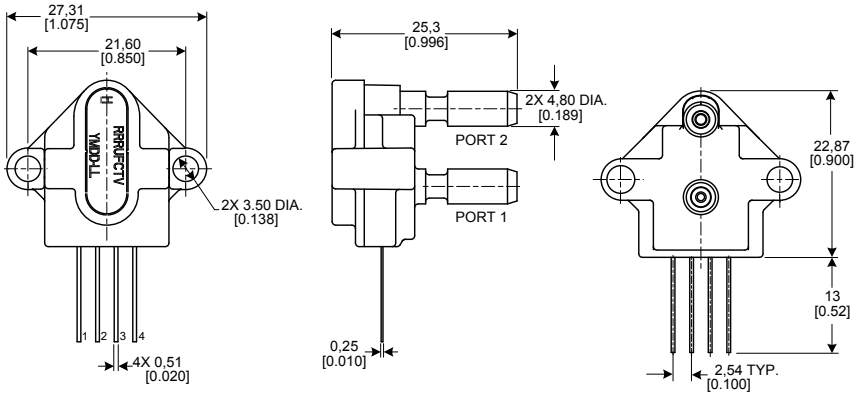


Figure 6. SIP Package Dimensional Drawings (continued)

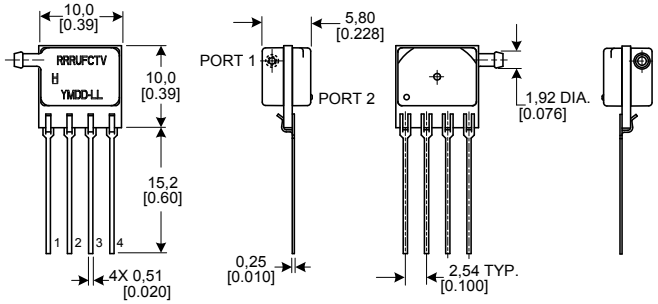
SIP GN: Ribbed fastener mount, single axial barbed port



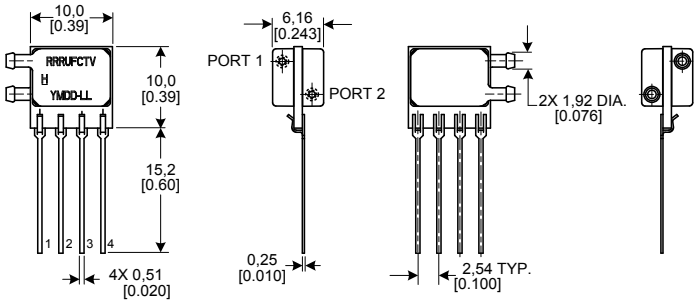
SIP NB: Fastener mount, dual axial ports, same side



SIP RN: Single radial barbed port



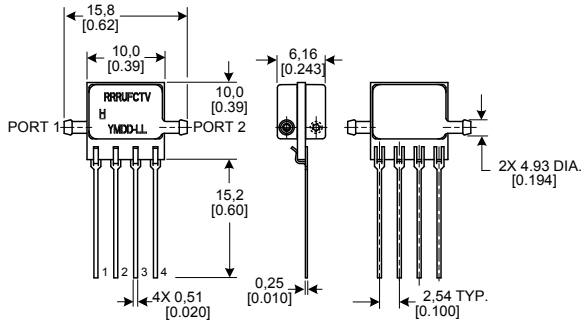
SIP RR: Dual radial barbed ports, same side



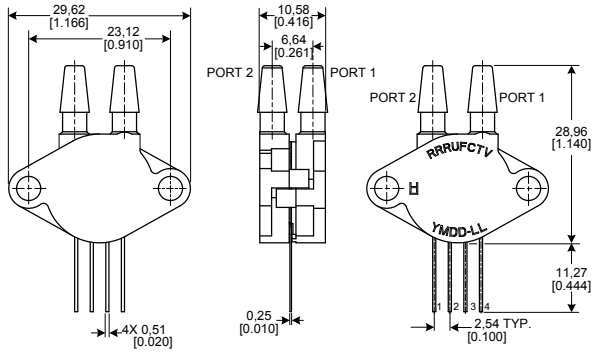
±2% Total Error Band, Analog Output, 1 psi to 150 psi (60 mbar to 10 bar)

Figure 6. SIP Package Dimensional Drawings (continued)

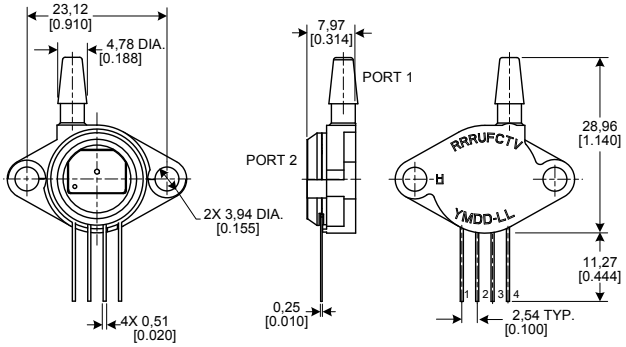
SIP DR: Dual radial barbed ports, opposite side



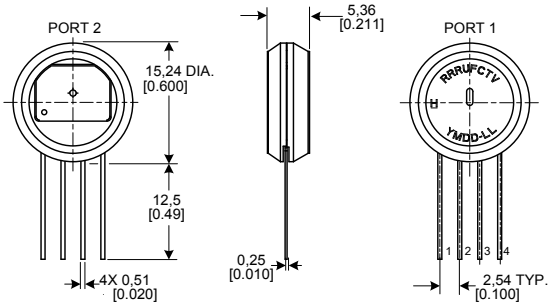
SIP HH: Fastener mount, dual radial barbed ports, same side



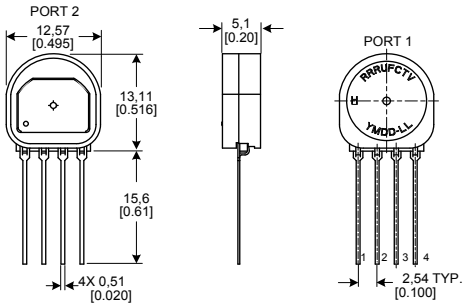
SIP HN: Fastener mount, single radial barbed port



SIP MN: Manifold mount, outer diameter seal



SIP SN: Manifold mount, inner diameter seal



⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

⚠ WARNING

MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. DO NOT USE this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

E-mail: info.sc@honeywell.com

Internet: www.honeywell.com/sensing

Phone and Fax:

Asia Pacific	+65 6355-2828; +65 6445-3033 Fax
Europe	+44 (0) 1698 481481; +44 (0) 1698 481676 Fax
Latin America	+1-305-805-8188; +1-305-883-8257 Fax
USA/Canada	+1-800-537-6945; +1-815-235-6847 +1-815-235-6545 Fax

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Honeywell

TruStability™ Silicon Pressure Sensors: SSC Series–Standard Accuracy

±2% Total Error Band, Amplified Compensated Digital Output, 1 psi to 150 psi (60 mbar to 10 bar)

DESCRIPTION

The TruStability™ Standard Accuracy Silicon Ceramic (SSC) Series is a piezoresistive silicon pressure sensor offering a digital output for reading pressure over the specified full scale pressure span and temperature range.

The SSC Series is fully calibrated and temperature compensated for sensor offset, sensitivity, temperature effects, and non-linearity using an on-board Application Specific Integrated Circuit (ASIC). Calibrated output values for pressure are updated at approximately 2 kHz.

The SSC Series is calibrated over the temperature range of -20 °C to 85 °C [-4 °F to 185 °F]. The sensor is characterized for operation from a single power supply of either 3.3 Vdc or 5.0 Vdc.

These sensors measure absolute, differential, and gage pressures. The absolute versions have an internal vacuum reference and an output value proportional to absolute pressure. Differential versions allow application of pressure to either side of the sensing diaphragm. Gage versions are referenced to atmospheric pressure and provide an output proportional to pressure variations from atmosphere.

The SSC Series sensors are intended for use with non-corrosive, non-ionic working fluids such as air and dry gases. They are designed and manufactured according to standards in ISO 9001.

FEATURES

- Industry-leading long-term stability
- Extremely tight accuracy of ±0.25% FSS BFSL (Full Scale Span Best Fit Straight Line)
- Total error band of ±2% full scale span maximum
- Modular and flexible design offers customers a variety of package styles and options, all with the same industry-leading performance specifications
- Miniature 10 mm x 10 mm [0.39 in x 0.39 in] package
- Low operating voltage
- Extremely low power consumption
- I^2C- or SPI- compatible 14-bit digital output (min. 12-bit sensor resolution)
- Precision ASIC conditioning and temperature compensated over -20 °C to 85 °C [-4 °F to 185 °F] temperature range
- RoHS compliant
- Virtually insensitive to mounting orientation
- Internal diagnostic functions increase system reliability
- Also available with analog output
- Absolute, differential, and gage types
- Pressure ranges from 1 psi to 150 psi (60 mbar to 10 bar)
- Custom calibration available
- Various pressure port options

POTENTIAL APPLICATIONS

- **Medical:**
  - Airflow monitors
  - Anesthesia machines
  - Blood analysis machines
  - Gas chromatography
  - Gas flow instrumentation
  - Kidney dialysis machines
  - Oxygen concentrators
  - Pneumatic controls
  - Respiratory machines
  - Sleep apnea equipment
  - Ventilators
- **Industrial:**
  - Barometry
  - Flow calibrators
  - Gas chromatography
  - Gas flow instrumentation
  - HVAC
  - Life sciences
  - Pneumatic controls

Table 1. Absolute Maximum Ratings[1]

Parameter	Min.	Max.	Unit
Supply voltage (V_{supply})	-0.3	6.0	Vdc
Voltage on any pin	-0.3	V_{supply} + 0.3	V
Digital interface clock frequency: I^2C SPI	 100 50	 400 800	kHz
ESD susceptibility (human body model)	3	-	kV
Storage temperature	-40 [-40]	85 [185]	°C [°F]
Soldering time and temperature: Lead solder (SIP, DIP) Peak reflow (SMT)	4 s max. at 250 °C [482 °F] 15 s max. at 250 °C [482 °F]		

Table 2. Operating Specifications

Parameter	Min.	Typ.	Max.	Unit
Supply voltage (V_{supply})[2]: 3.3 Vdc 5.0 Vdc *Sensors are either 3.3 Vdc or 5.0 Vdc based on listing selected.*	 3.0 4.75	 3.3[3] 5.0[3]	 3.6 5.25	Vdc
Supply current: 3.3 Vdc supply 5.0 Vdc supply	 - -	 1.6 2	 2.1 3	mA
Compensated temperature range[4]	-20 [-4]	-	85 [185]	°C [°F]
Operating temperature range[5]	-40 [-40]	-	85 [185]	°C [°F]
Startup time (power up to data ready)	-	2.8	7.3	ms
Response time	-	0.46	-	ms
I^2C voltage level low	-	-	0.2	V_{supply}
I^2C voltage level high	0.8	-	-	V_{supply}
Pull up on SDA and SCL	1	-	-	kOhm
Accuracy[6]	-	-	±0.25	%FSS BFSL
Total error band[7]	-	-	±2	%FSS[8]
Output resolution	12	-	-	bits

Table 3. Environmental Specifications

Parameter	Characteristic
Humidity	0% to 95% RH, non-condensing
Vibration	MIL-STD-202F, Curve AK (20.7 g random)
Shock	MIL-STD-202F, Method 213B, Condition F
Life[9]	1 million cycles minimum
Solder reflow	J-STD-020-C

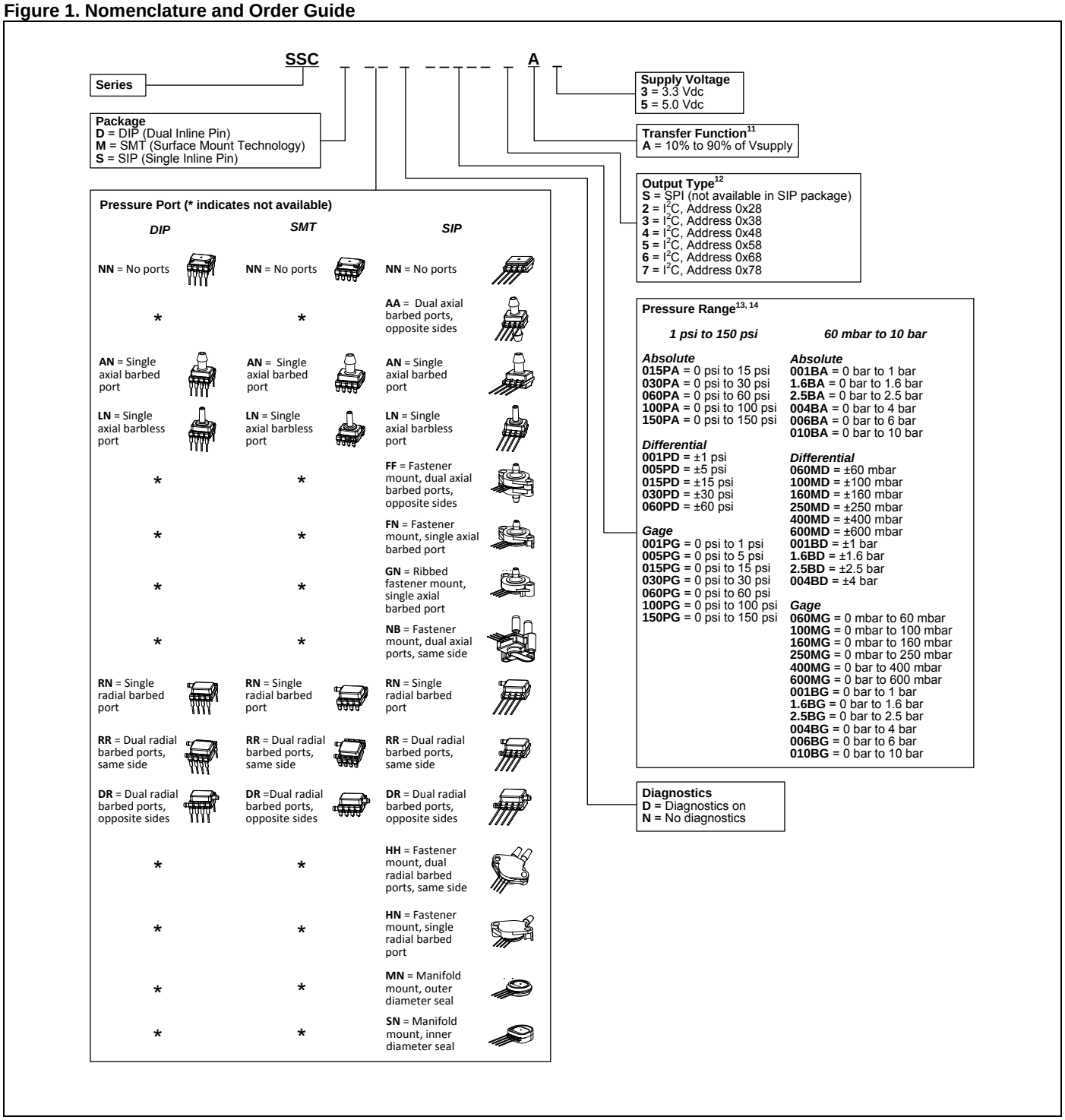
Table 4. Wetted Materials[10]

Parameter	Port 1 (Pressure Port)	Port 2 (Reference Port)
Covers	high temperature polyamide	high temperature polyamide
Substrate	alumina ceramic	alumina ceramic
Adhesives	epoxy, RTV	epoxy, RTV
Electronic components	ceramic, glass, solder, silicon	silicon, glass, gold, solder

Notes:

1. Absolute maximum ratings are the extreme limits the device will withstand without damage.
2. Ratiometricity of the sensor (the ability of the digital device to maintain performance parameters independent of supply voltage) is achieved within the specified operating voltage for each option.
3. The sensor is not reverse polarity protected. Incorrect application of supply voltage or ground to the wrong pin may cause electrical failure.
4. The compensated temperature range is the temperature range over which the sensor will produce an output proportional to pressure within the specified performance limits.
5. The operating temperature range is the temperature range over which the sensor will produce an output proportional to pressure but may not remain within the specified performance limits.
6. Accuracy: The maximum deviation in output from a Best Fit Straight Line (BFSL) fitted to the output measured over the pressure range at 25 °C [77 °F]. Includes all errors due to pressure non-linearity, pressure hysteresis, and non-repeatability.
7. Total Error Band: The maximum deviation from the ideal transfer function over the entire compensated temperature and pressure range. Includes all errors due to offset, full scale span, pressure non-linearity, pressure hysteresis, repeatability, thermal effect on offset, thermal effect on span, and thermal hysteresis.
8. Full Scale Span (FSS) is the algebraic difference between the output signal measured at the maximum ($P_{max.}$) and minimum ($P_{min.}$) limits of the pressure range. (See Figure 1 for ranges.)
9. Life may vary depending on specific application in which sensor is utilized.
10. Contact Honeywell Customer Service for detailed material information.

Figure 1. Nomenclature and Order Guide

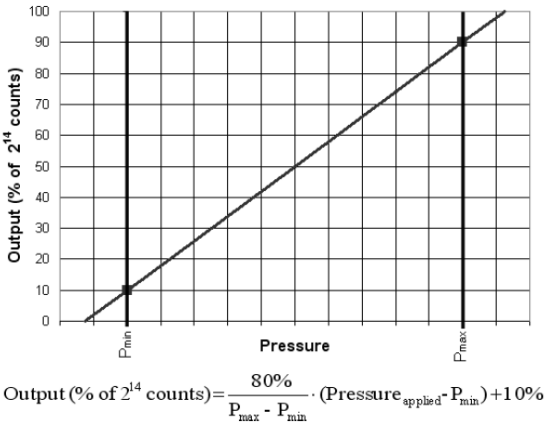


Notes:

11. The transfer function limits define the output of the sensor at a given pressure input. By specifying $P_{min.}$ and $P_{max.}$, the output at $P_{min.}$ and $P_{max.}$ the complete transfer function of the sensor is defined. See Figure 2 for a graphical representation of the transfer function. Other transfer functions are available. Contact Honeywell Customer Service for more information.
12. Analog output is also available. Contact Honeywell Customer Service for more information.
13. Custom pressure ranges are available. Contact Honeywell Customer Service for more information.
14. See Table 5 for an explanation of sensor pressure types.

±2% Total Error Band, Digital Output, 1 psi to 150 psi (60 mbar to 10 bar)

Figure 2. Transfer Function Limits



$$\text{Output (\% of } 2^{14} \text{ counts)} = \frac{80\%}{P_{max} - P_{min}} \cdot (\text{Pressure}_{applied} - P_{min}) + 10\%$$

Figure 3. Completed Catalog Listing Example

SSCSANN100PGSA3
SIP package, AN pressure port, no diagnostics, 100 psi gage, SPI output, 10% to 90% calibration at 3.3 Vdc.

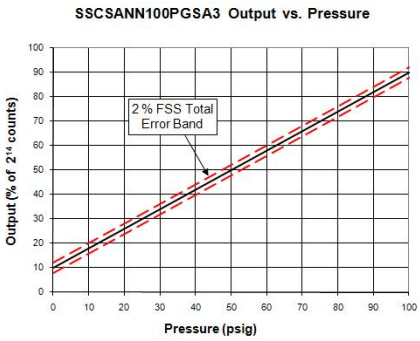


Table 5. Pressure Types

Pressure Type	Description
Absolute	Output is proportional to the difference between applied pressure and a built-in reference to vacuum. $P_{min.}$ is set at absolute zero pressure (full vacuum).
Differential	Output is proportional to the difference between the pressures applied to each port. (Port 1 – Port 2) 50% point of transfer function set at Port 1 = Port 2.
Gage	Output is proportional to the difference between applied pressure and atmospheric (ambient) pressure. $P_{min.}$ is set at atmospheric pressure.

Table 6. Sensor Output at Significant Percentages

% Output	Digital Counts (decimal)	Digital Counts (hex)
0	0	0x0000
10	1638	0x0666
50	8192	0x2000
90	14746	0x399A
100	16383	0x3FFF

Table 7. Pressure Range Specifications for 1 psi to 150 psi

Order Code	Pressure Range		Over-pressure[15]	Burst Pressure[16]	Common Mode Pressure[17]	Long-term Stability (1000 hr, 25 °C [77 °F])
	$P_{min.}$	$P_{max.}$				
Absolute						
015PA	0 psi	15 psi	30 psi	60 psi	NA	±0.25% FSS
030PA	0 psi	30 psi	60 psi	120 psi	NA	±0.25% FSS
060PA	0 psi	60 psi	120 psi	240 psi	NA	±0.25% FSS
100PA	0 psi	100 psi	250 psi	250 psi	NA	±0.25% FSS
150PA	0 psi	150 psi	250 psi	250 psi	NA	±0.25% FSS
Differential						
001PD	-1 psi	1 psi	10 psi	10 psi	150 psi	±0.35% FSS
005PD	-5 psi	5 psi	30 psi	40 psi	150 psi	±0.35% FSS
015PD	-15 psi	15 psi	30 psi	60 psi	150 psi	±0.25% FSS
030PD	-30 psi	30 psi	60 psi	120 psi	150 psi	±0.25% FSS
060PD	-60 psi	60 psi	120 psi	240 psi	250 psi	±0.25% FSS
Gage						
001PG	0 psi	1 psi	10 psi	10 psi	150 psi	±0.35% FSS
005PG	0 psi	5 psi	30 psi	40 psi	150 psi	±0.35% FSS
015PG	0 psi	15 psi	30 psi	60 psi	150 psi	±0.25% FSS
030PG	0 psi	30 psi	60 psi	120 psi	150 psi	±0.25% FSS
060PG	0 psi	60 psi	120 psi	240 psi	250 psi	±0.25% FSS
100PG	0 psi	100 psi	250 psi	250 psi	250 psi	±0.25% FSS
150PG	0 psi	150 psi	250 psi	250 psi	250 psi	±0.25% FSS

Table 8. Pressure Range Specifications for 60 mbar to 10 bar

Order Code	Pressure Range		Over-pressure[15]	Burst Pressure[16]	Common Mode Pressure[17]	Long-term Stability (1000 hr, 25 °C [77 °F])
	$P_{min.}$	$P_{max.}$				
Absolute						
001BA	0 bar	1 bar	2 bar	4 bar	NA	±0.25% FSS
1.6BA	0 bar	1.6 bar	4 bar	8 bar	NA	±0.25% FSS
2.5BA	0 bar	2.5 bar	6 bar	8 bar	NA	±0.25% FSS
004BA	0 bar	4 bar	8 bar	16 bar	NA	±0.25% FSS
006BA	0 bar	6 bar	17 bar	17 bar	NA	±0.25% FSS
010BA	0 bar	10 bar	17 bar	17 bar	NA	±0.25% FSS
Differential						
060MD	-60 mbar	60 mbar	500 mbar	700 mbar	10 bar	±0.35% FSS
100MD	-100 mbar	100 mbar	500 mbar	700 mbar	10 bar	±0.35% FSS
160MD	-160 mbar	160 mbar	500 mbar	700 mbar	10 bar	±0.35% FSS
250MD	-250 mbar	250 mbar	1.4 bar	2.5 bar	10 bar	±0.35% FSS
400MD	-400 mbar	400 mbar	1.4 bar	2.5 bar	10 bar	±0.35% FSS
600MD	-600 mbar	600 mbar	2 bar	4 bar	10 bar	±0.25% FSS
001BD	-1 bar	1 bar	2 bar	4 bar	10 bar	±0.25% FSS
1.6BD	-1.6 bar	1.6 bar	4 bar	8 bar	10 bar	±0.25% FSS
2.5BD	-2.5 bar	2.5 bar	6 bar	8 bar	10 bar	±0.25% FSS
004BD	-4 bar	4 bar	8 bar	16 bar	10 bar	±0.25% FSS
Gage						
060MG	0 mbar	60 mbar	500 mbar	700 mbar	3.5 bar	±0.35% FSS
100MG	0 mbar	100 mbar	500 mbar	700 mbar	10 bar	±0.35% FSS
160MG	0 mbar	160 mbar	500 mbar	700 mbar	10 bar	±0.35% FSS
250MG	0 mbar	250 mbar	1.4 bar	2.5 bar	10 bar	±0.35% FSS
400MG	0 mbar	400 mbar	1.4 bar	2.5 bar	10 bar	±0.35% FSS
600MG	0 mbar	600 mbar	2 bar	4 bar	10 bar	±0.35% FSS
001BG	0 bar	1 bar	2 bar	4 bar	10 bar	±0.25% FSS
1.6BG	0 bar	1.6 bar	4 bar	8 bar	10 bar	±0.25% FSS
2.5BG	0 bar	2.5 bar	6 bar	8 bar	10 bar	±0.25% FSS
004BG	0 bar	4 bar	8 bar	16 bar	16 bar	±0.25% FSS
006BG	0 bar	6 bar	17 bar	17 bar	17 bar	±0.25% FSS
010BG	0 bar	10 bar	17 bar	17 bar	17 bar	±0.25% FSS

Notes:

15. Overpressure: The maximum pressure which may safely be applied to the product for it to remain in specification once pressure is returned to the operating pressure range. Exposure to higher pressures may cause permanent damage to the product. Unless otherwise specified this applies to all available pressure ports at any temperature with the operating temperature range.
16. Burst pressure: The maximum pressure that may be applied to any port of the product without causing escape of pressure media. Product should not be expected to function after exposure to any pressure beyond the burst pressure.
17. Common mode pressure: The maximum pressure that can be applied simultaneously to both ports of a differential pressure sensor without causing changes in specified performance.

Table 9. Pinout for SMT and DIP Packages

Output Type	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
I^2C	GND	V_{supply}	SDA	SCL	NC	NC	NC	NC
SPI	GND	V_{supply}	MISO	SCLK	SS	NC	NC	NC

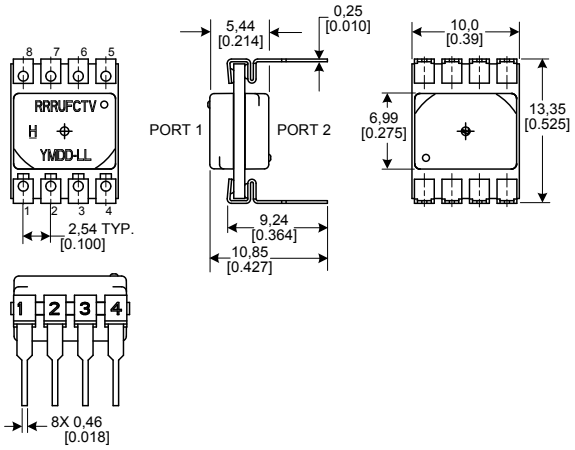
Table 10. Pinout for SIP Package

Output Type	Pin 1	Pin 2	Pin 3	Pin 4
I^2C	GND	V_{supply}	SDA	SCL

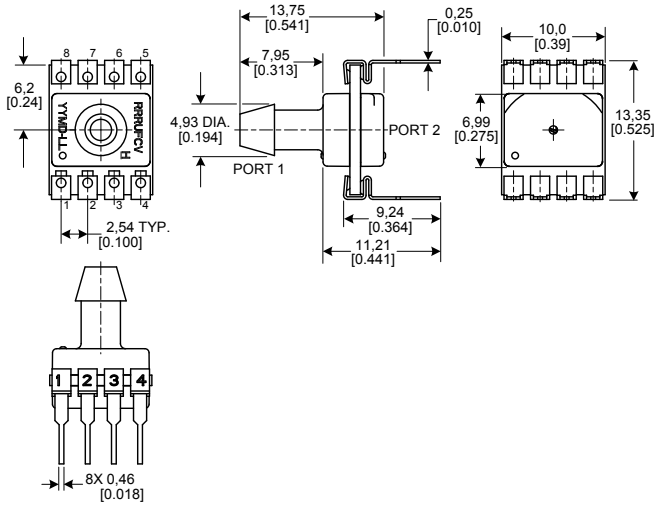
±2% Total Error Band, Digital Output, 1 psi to 150 psi (60 mbar to 10 bar)

Figure 4. DIP Pressure Port Dimensional Drawings (For reference only: mm [in])

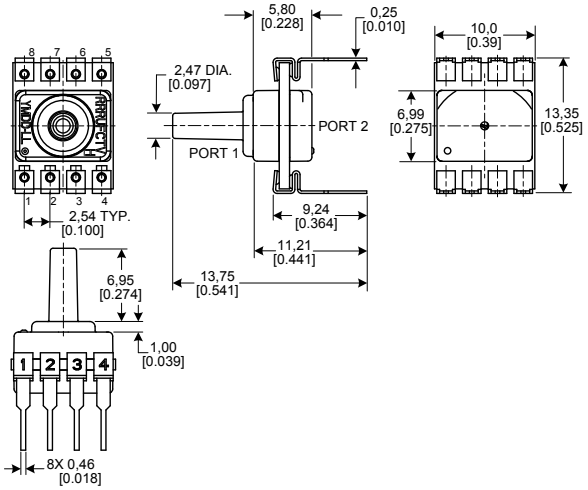
DIP NN: No ports



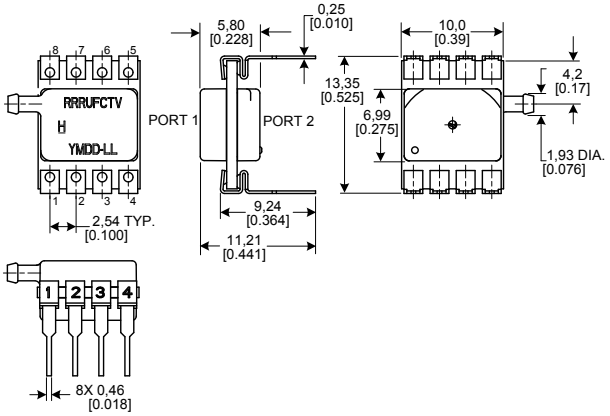
DIP AN: Single axial barbed port



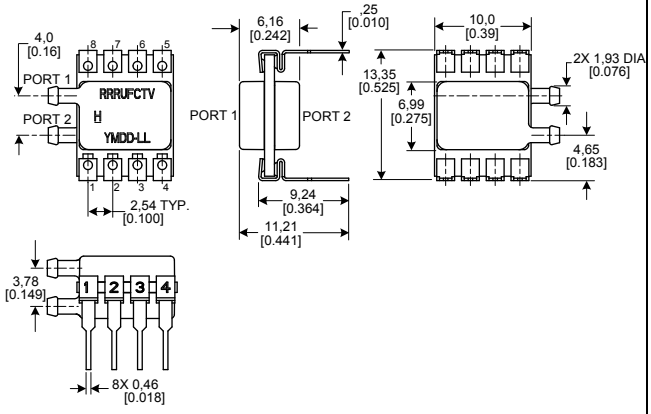
DIP LN: Single axial barbless port



DIP RN: Single radial barbed port



DIP RR: Dual radial barbed ports, same side



DIP DR: Dual radial barbed ports, opposite sides

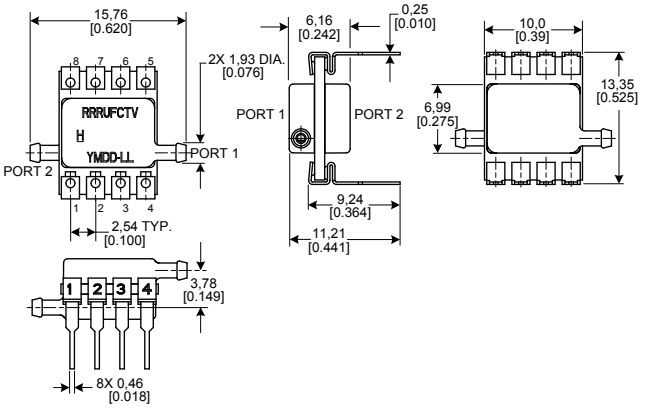
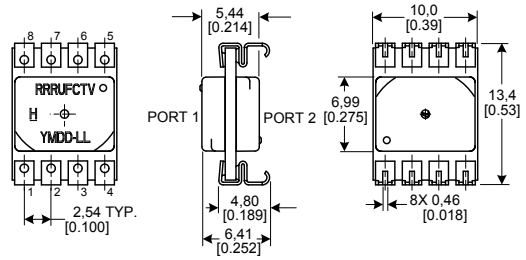
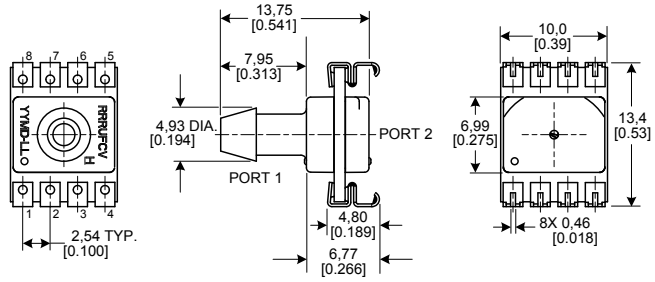


Figure 5. SMT Pressure Port Dimensional Drawings (For reference only: mm [in])

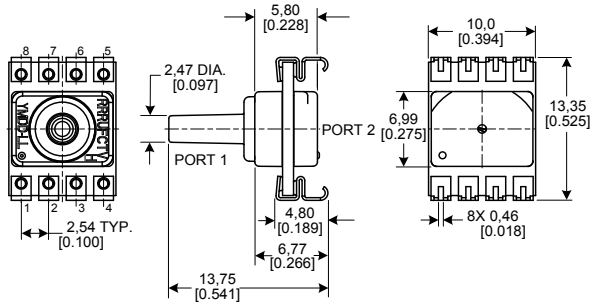
SMT NN: No ports



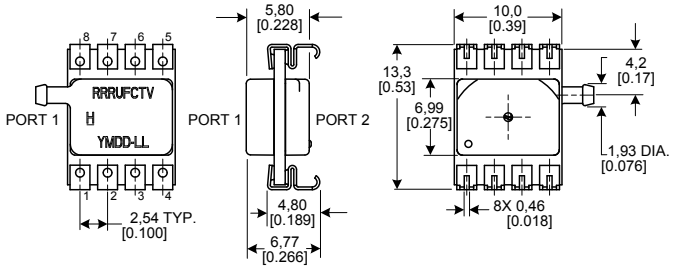
SMT AN: Single axial barbed port



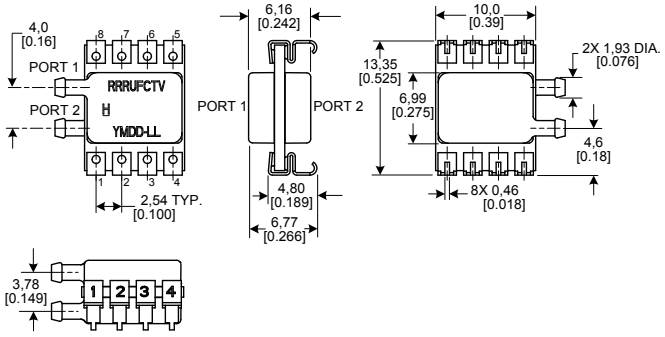
SMT LN: Single axial barbless port



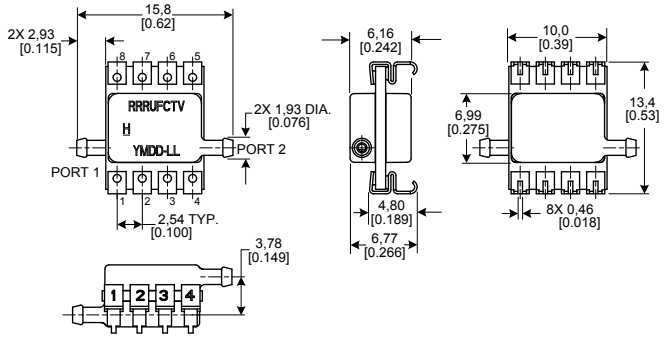
SMT RN: Single radial barbed port



SMT RR: Dual radial barbed ports, same side



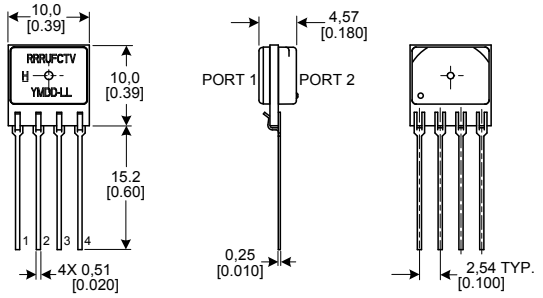
SMT DR: Dual radial barbed ports, opposite sides



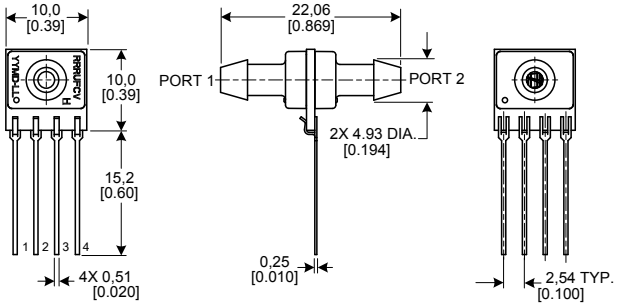
±2% Total Error Band, Digital Output, 1 psi to 150 psi (60 mbar to 10 bar)

Figure 6. SIP Package Dimensional Drawings (For reference only: mm [in])

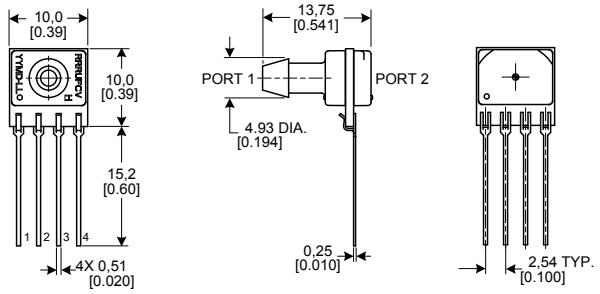
SIP NN: No ports



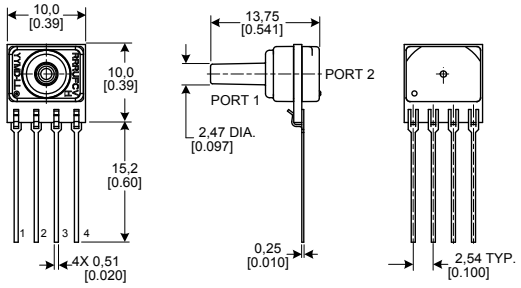
SIP AA: Dual axial barbed ports, opposite sides



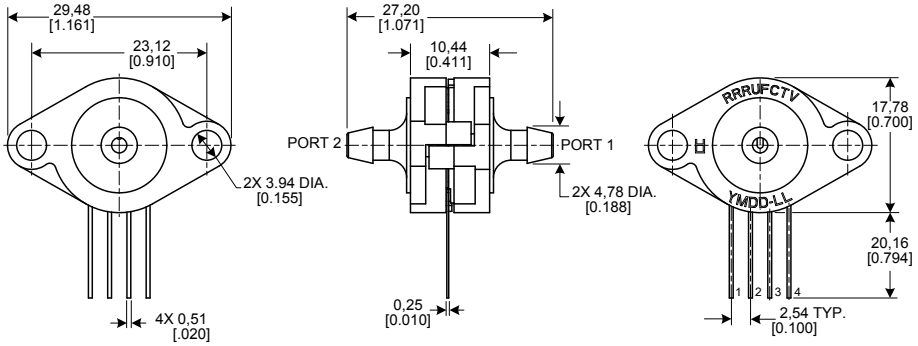
SIP AN: Single axial barbed port



SIP LN: Single barbless port



SIP FF: Fastener mount, dual axial barbed ports, opposite sides



SIP FN: Fastener mount, single axial barbed port

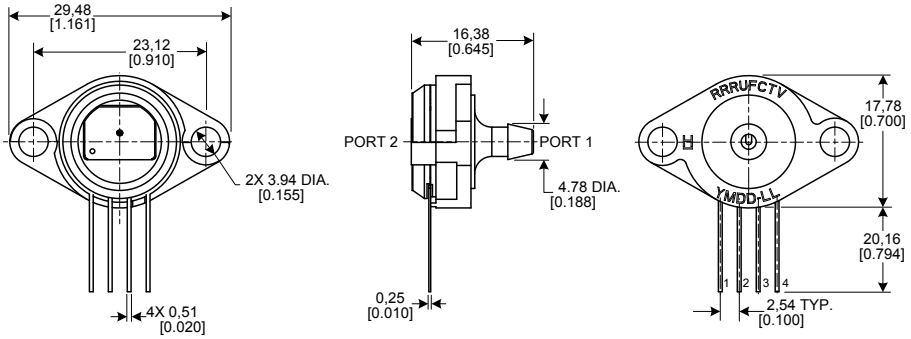
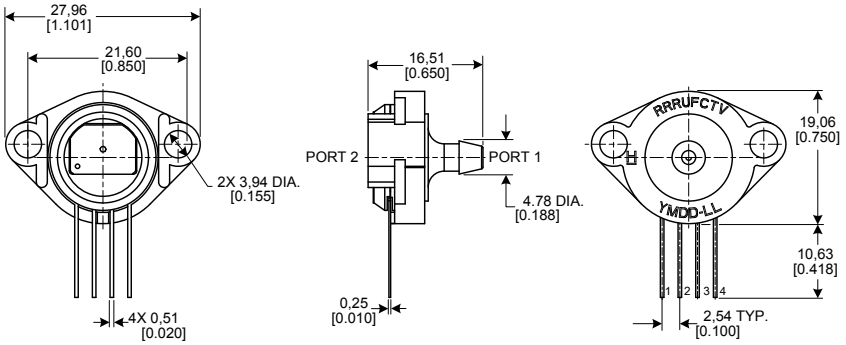
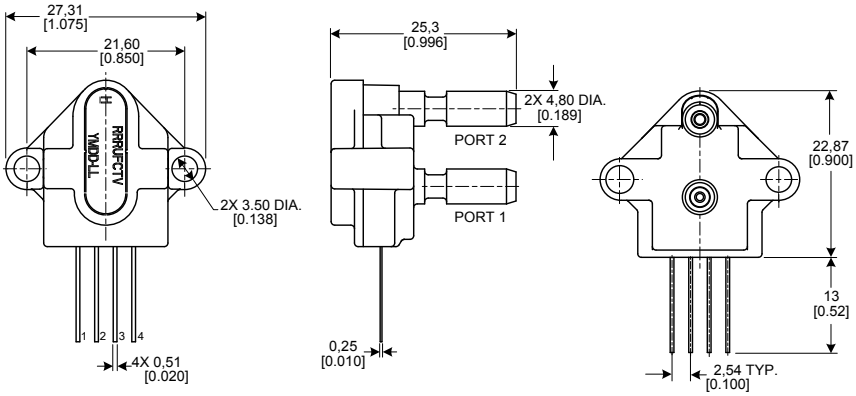


Figure 6. SIP Package Dimensional Drawings (continued)

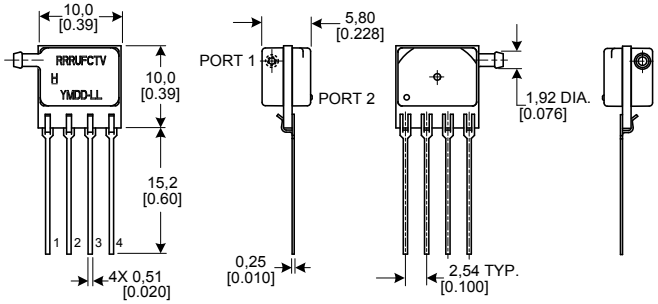
SIP GN: Ribbed fastener mount, single axial barbed port



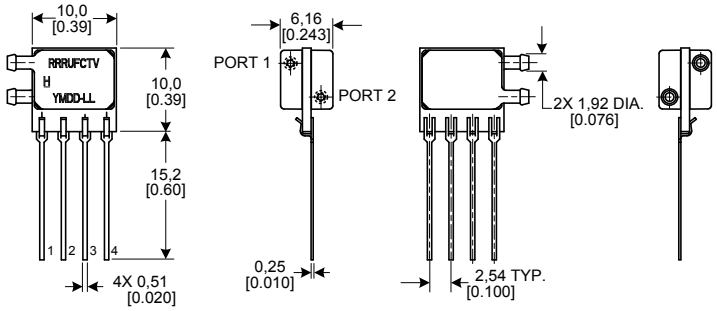
SIP NB: Fastener mount, dual axial ports, same side



SIP RN: Single radial barbed port



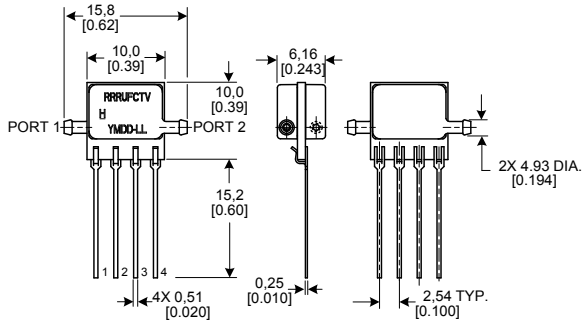
SIP RR: Dual radial barbed ports, same side



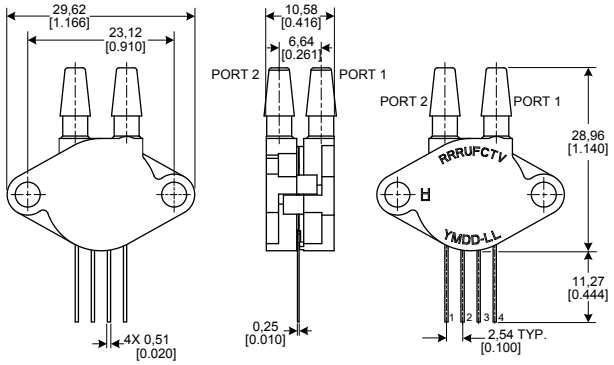
±2% Total Error Band, Digital Output, 1 psi to 150 psi (60 mbar to 10 bar)

Figure 6. SIP Package Dimensional Drawings (continued)

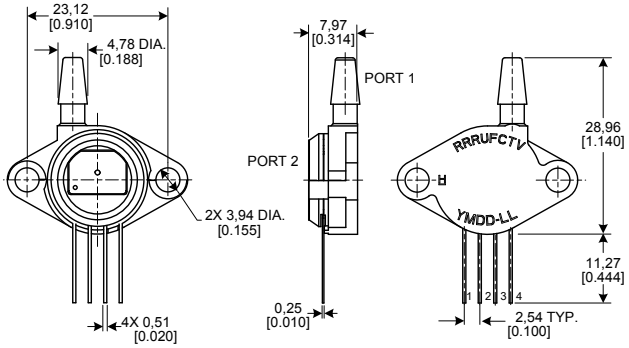
SIP DR: Dual radial barbed ports, opposite side



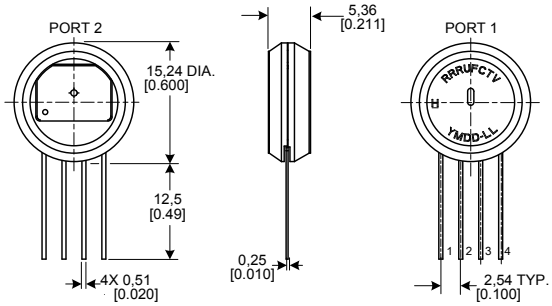
SIP HH: Fastener mount, dual radial barbed ports, same side



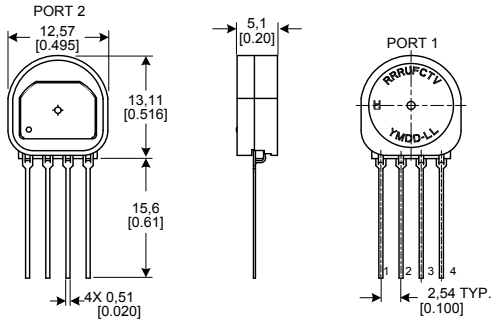
SIP HN: Fastener mount, single radial barbed port



SIP MN: Manifold mount, outer diameter seal



SIP SN: Manifold mount, inner diameter seal



⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

⚠ WARNING

MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. DO NOT USE this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

E-mail: info.sc@honeywell.com

Internet: www.honeywell.com/sensing

Phone and Fax:

Asia Pacific	+65 6355-2828; +65 6445-3033 Fax
Europe	+44 (0) 1698 481481; +44 (0) 1698 481676 Fax
Latin America	+1-305-805-8188; +1-305-883-8257 Fax
USA/Canada	+1-800-537-6945; +1-815-235-6847 +1-815-235-6545 Fax

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Honeywell

TruStability™ Silicon Pressure Sensors: HSC Series–High Accuracy

±1% Total Error Band, Amplified Compensated Analog Output, 1 psi to 150 psi (60 mbar to 10 bar)

DESCRIPTION

The TruStability™ High Accuracy Silicon Ceramic (HSC) Series is a piezoresistive silicon pressure sensor offering a ratiometric analog output for reading pressure over the specified full scale pressure span and temperature range.

The HSC Series is fully calibrated and temperature compensated for sensor offset, sensitivity, temperature effects, and non-linearity using an on-board Application Specific Integrated Circuit (ASIC). Calibrated output values for pressure are updated at approximately 1 kHz.

The HSC Series is calibrated over the temperature range of 0 °C to 50 °C [32 °F to 122 °F]. The sensor is characterized for operation from a single power supply of either 3.3 Vdc or 5.0 Vdc.

These sensors measure absolute, differential, and gage pressures. The absolute versions have an internal vacuum reference and an output value proportional to absolute pressure. Differential versions allow application of pressure to either side of the sensing diaphragm. Gage versions are referenced to atmospheric pressure and provide an output proportional to pressure variations from atmosphere.

The HSC Series sensors are intended for use with non-corrosive, non-ionic working fluids such as air and dry gases. They are designed and manufactured according to standards in ISO 9001.

FEATURES

- Industry-leading long-term stability
- Extremely tight accuracy of ±0.25% FSS BFSL (Full Scale Span Best Fit Straight Line)
- Total error band of ±1% full scale span maximum
- Modular and flexible design offers customers a variety of package styles and options, all with the same industry-leading performance specifications
- Miniature 10 mm x 10 mm [0.39 in x 0.39 in] package
- Low operating voltage
- Extremely low power consumption
- Ratiometric analog output
- High resolution (min 0.03 %FSS)
- Precision ASIC conditioning and temperature compensated over 0 °C to 50 °C [32 °F to 122 °F] temperature range
- RoHS compliant
- Virtually insensitive to mounting orientation
- Internal diagnostic functions increase system reliability
- Also available with I^2C or SPI digital output
- Absolute, differential and gage types
- Pressure ranges from 1 psi to 150 psi (60 mbar to 10 bar)
- Custom calibration available
- Various pressure port options

POTENTIAL APPLICATIONS

- **Medical:**
  - Airflow monitors
  - Anesthesia machines
  - Blood analysis machines
  - Gas chromatography
  - Gas flow instrumentation
  - Kidney dialysis machines
  - Oxygen concentrators
  - Pneumatic controls
  - Respiratory machines
  - Sleep apnea equipment
  - Ventilators
- **Industrial:**
  - Barometry
  - Flow calibrators
  - Gas chromatography
  - Gas flow instrumentation
  - HVAC
  - Life sciences
  - Pneumatic controls

Table 1. Absolute Maximum Ratings[1]

Parameter	Min.	Max.	Unit
Supply voltage (V_{supply})	-0.3	6.0	Vdc
Voltage on any pin	-0.3	V_{supply} + 0.3	V
ESD susceptibility (human body model)	3	-	kV
Storage temperature	-40 [-40]	85 [185]	°C [°F]
Soldering time and temperature: Lead solder temperature (SIP, DIP) Peak reflow temperature (SMT)	4 s max. at 250 °C [482 °F] 15 s max. at 250 °C [482 °F]		

Table 2. Operating Specifications

Parameter	Min.	Typ.	Max.	Unit
Supply voltage (V_{supply})[2]: 3.3 Vdc 5.0 Vdc *Sensors are either 3.3 Vdc or 5.0 Vdc based on listing selected.*	 3.0 4.75	 3.3[3] 5.0[3]	 3.6 5.25	Vdc
Supply current: 3.3 Vdc supply 5.0 Vdc supply	 - -	 1.6 2	 2.1 3	mA
Compensated temperature range[4]	0 [32]	-	50 [122]	°C [°F]
Operating temperature range[5]	-20 [-4]	-	85 [185]	°C [°F]
Startup time (power up to data ready)	-	-	5	ms
Response time	-	1	-	ms
Upper output clipping limit	-	-	97.5	%V_{supply}
Lower output clipping limit	2.5	-	-	%V_{supply}
Accuracy[6]	-	-	±0.25	%FSS BFSL
Total error band[7]	-	-	±1	%FSS[8]
Output resolution	0.03	-	-	%FSS[8]

Table 3. Environmental Specifications

Parameter	Characteristic
Humidity	0% to 95% RH, non-condensing
Vibration	MIL-STD-202F, Curve AK (20.7 g random)
Shock	MIL-STD-202F, Method 213B, Condition F
Life[9]	1 million cycles minimum
Solder reflow	J-STD-020-C

±1% Total Error Band, Analog Output, 1 psi to 150 psi (60 mbar to 10 bar)

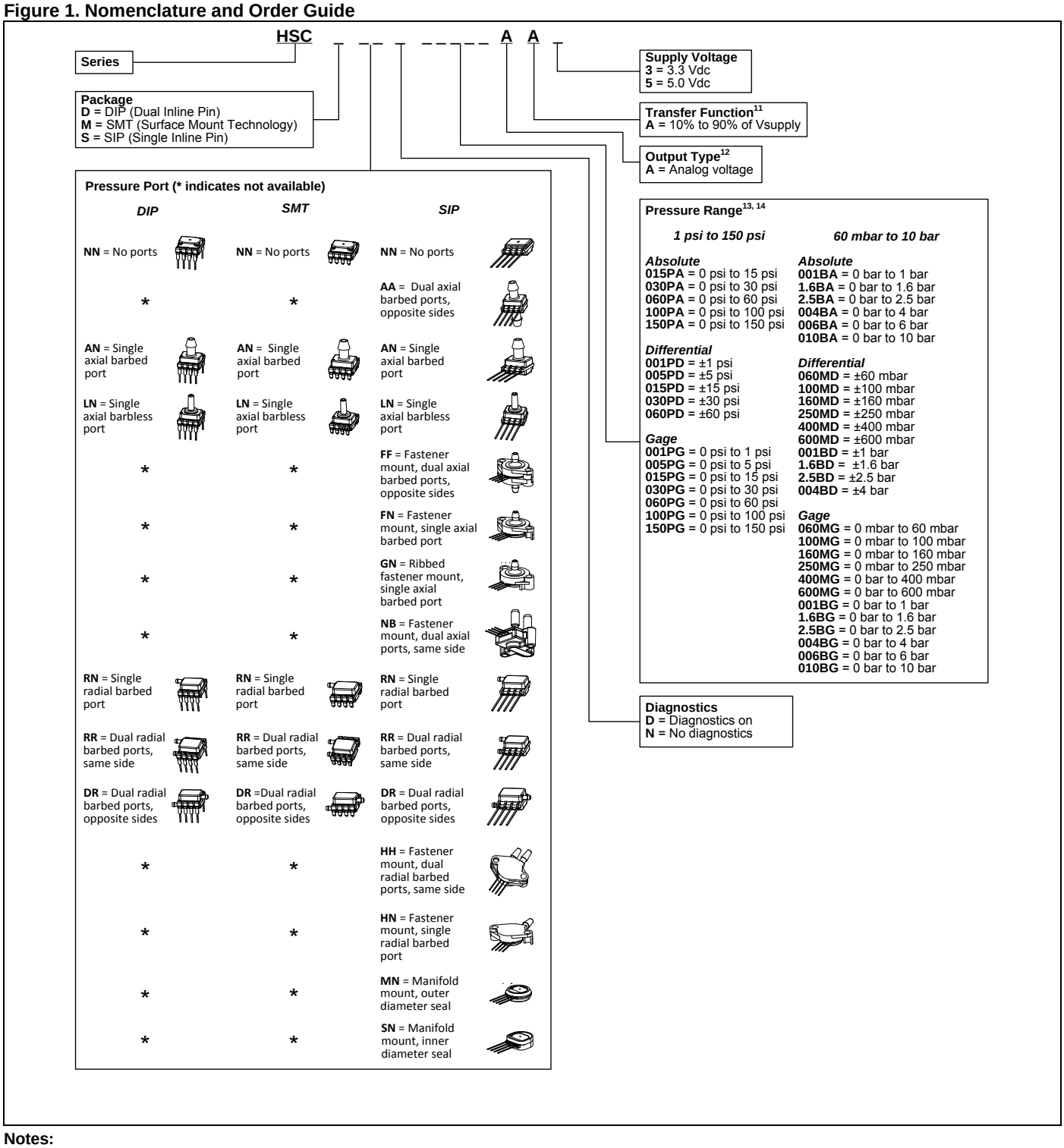
Table 4. Wetted Materials[10]

Parameter	Port 1 (Pressure Port)	Port 2 (Reference Port)
Covers	high temperature polyamide	high temperature polyamide
Substrate	alumina ceramic	alumina ceramic
Adhesives	epoxy, RTV	epoxy, RTV
Electronic components	ceramic, glass, solder, silicon	silicon, glass, gold, solder

Notes:

1. Absolute maximum ratings are the extreme limits the device will withstand without damage.
2. Ratiometricity of the sensor (the ability of the device to scale to the supply voltage) is achieved within the specified operating voltage for each option.
3. The sensor is not reverse polarity protected. Incorrect application of supply voltage or ground to the wrong pin may cause electrical failure.
4. The compensated temperature range is the temperature range over which the sensor will produce an output proportional to pressure within the specified performance limits.
5. The operating temperature range is the temperature range over which the sensor will produce an output proportional to pressure but may not remain within the specified performance limits.
6. Accuracy: The maximum deviation in output from a Best Fit Straight Line (BFSL) fitted to the output measured over the pressure range at 25 °C [77 °F]. Includes all errors due to pressure non-linearity, pressure hysteresis, and non-repeatability.
7. Total Error Band: The maximum deviation from the ideal transfer function over the entire compensated temperature and pressure range. Includes all errors due to offset, full scale span, pressure non-linearity, pressure hysteresis, repeatability, thermal effect on offset, thermal effect on span, and thermal hysteresis.
8. Full Scale Span (FSS) is the algebraic difference between the output signal measured at the maximum ($P_{max.}$) and minimum ($P_{min.}$) limits of the pressure range. (See Figure 1 for ranges.)
9. Life may vary depending on specific application in which sensor is utilized.
10. Contact Honeywell Customer Service for detailed material information.

Figure 1. Nomenclature and Order Guide

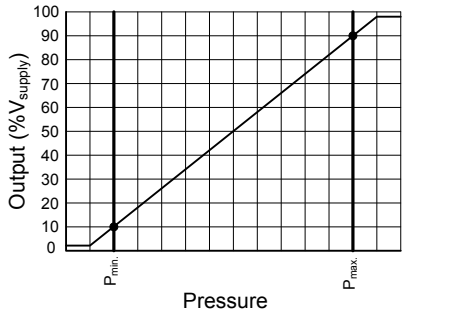


Notes:

11. The transfer function limits define the output of the sensor at a given pressure input. By specifying $P_{min.}$ and $P_{max.}$, the output at $P_{min.}$ and $P_{max.}$, the complete transfer function of the sensor is defined. See Figure 2 for a graphical representation of the transfer function. Other transfer functions are available. Contact Honeywell Customer Service for more information.
12. Digital outputs (SPI or I^2C) are also available. Contact Honeywell Customer Service for more information.
13. Custom pressure ranges are available. Contact Honeywell Customer Service for more information.
14. See Table 5 for an explanation of sensor pressure types.

±1% Total Error Band, Analog Output, 1 psi to 150 psi (60 mbar to 10 bar)

Figure 2. Transfer Function Limits



$$\text{Output (V)} = \frac{0.8 \times V_{supply}}{P_{max.} - P_{min.}} \times (\text{Pressure}_{applied} - P_{min.}) + 0.10 \times V_{supply}$$

Figure 3. Completed Catalog Listing Example

HSCSANN100PGAA3
SIP package, AN pressure port, no diagnostics, 100 psi gage, analog output, 10% to 90% calibration at 3.3 Vdc.

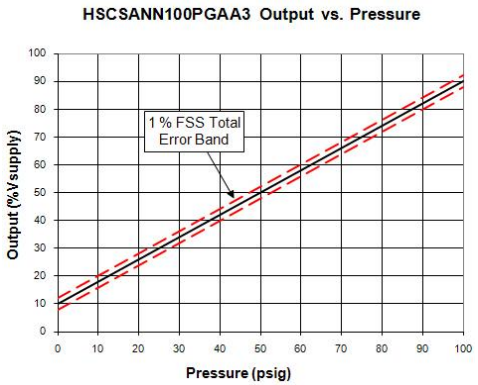


Table 5. Pressure Types

Pressure Type	Description
Absolute	Output is proportional to the difference between applied pressure and a built-in reference to vacuum. $P_{min.}$ is set at absolute zero pressure (full vacuum).
Differential	Output is proportional to the difference between the pressures applied to each port. (Port 1 – Port 2) 50% point of transfer function set at Port 1 = Port 2.
Gage	Output is proportional to the difference between applied pressure and atmospheric (ambient) pressure. $P_{min.}$. is set at atmospheric pressure.

Table 6. Pressure Range Specifications for 1 psi to 150 psi

Order Code	Pressure Range		Over-pressure[15]	Burst Pressure[16]	Common Mode Pressure[17]	Long-term Stability (1000 hr, 25 °C [77 °F])
	$P_{min.}$	$P_{max.}$				
Absolute						
015PA	0 psi	15 psi	30 psi	60 psi	NA	±0.25% FSS
030PA	0 psi	30 psi	60 psi	120 psi	NA	±0.25% FSS
060PA	0 psi	60 psi	120 psi	240 psi	NA	±0.25% FSS
100PA	0 psi	100 psi	250 psi	250 psi	NA	±0.25% FSS
150PA	0 psi	150 psi	250 psi	250 psi	NA	±0.25% FSS
Differential						
001PD	-1 psi	1 psi	10 psi	10 psi	150 psi	±0.35% FSS
005PD	-5 psi	5 psi	30 psi	40 psi	150 psi	±0.35% FSS
015PD	-15 psi	15 psi	30 psi	60 psi	150 psi	±0.25% FSS
030PD	-30 psi	30 psi	60 psi	120 psi	150 psi	±0.25% FSS
060PD	-60 psi	60 psi	120 psi	240 psi	250 psi	±0.25% FSS
Gage						
001PG	0 psi	1 psi	10 psi	10 psi	150 psi	±0.35% FSS
005PG	0 psi	5 psi	30 psi	40 psi	150 psi	±0.35% FSS
015PG	0 psi	15 psi	30 psi	60 psi	150 psi	±0.25% FSS
030PG	0 psi	30 psi	60 psi	120 psi	150 psi	±0.25% FSS
060PG	0 psi	60 psi	120 psi	240 psi	250 psi	±0.25% FSS
100PG	0 psi	100 psi	250 psi	250 psi	250 psi	±0.25% FSS
150PG	0 psi	150 psi	250 psi	250 psi	250 psi	±0.25% FSS

Table 7. Pressure Range Specifications for 60 mbar to 10 bar

Order Code	Pressure Range		Over-pressure[15]	Burst Pressure[16]	Common Mode Pressure[17]	Long-term Stability (1000 hr, 25 °C [77 °F])
	$P_{min.}$	$P_{max.}$				
Absolute						
001BA	0 bar	1 bar	2 bar	4 bar	NA	±0.25% FSS
1.6BA	0 bar	1.6 bar	4 bar	8 bar	NA	±0.25% FSS
2.5BA	0 bar	2.5 bar	6 bar	8 bar	NA	±0.25% FSS
004BA	0 bar	4 bar	8 bar	16 bar	NA	±0.25% FSS
006BA	0 bar	6 bar	17 bar	17 bar	NA	±0.25% FSS
010BA	0 bar	10 bar	17 bar	17 bar	NA	±0.25% FSS
Differential						
060MD	-60 mbar	60 mbar	500 mbar	700 mbar	10 bar	±0.35% FSS
100MD	-100 mbar	100 mbar	500 mbar	700 mbar	10 bar	±0.35% FSS
160MD	-160 mbar	160 mbar	500 mbar	700 mbar	10 bar	±0.35% FSS
250MD	-250 mbar	250 mbar	1.4 bar	2.5 bar	10 bar	±0.35% FSS
400MD	-400 mbar	400 mbar	1.4 bar	2.5 bar	10 bar	±0.35% FSS
600MD	-600 mbar	600 mbar	2 bar	4 bar	10 bar	±0.25% FSS
001BD	-1 bar	1 bar	2 bar	4 bar	10 bar	±0.25% FSS
1.6BD	-1.6 bar	1.6 bar	4 bar	8 bar	10 bar	±0.25% FSS
2.5BD	-2.5 bar	2.5 bar	6 bar	8 bar	10 bar	±0.25% FSS
004BD	-4 bar	4 bar	8 bar	16 bar	10 bar	±0.25% FSS
Gage						
060MG	0 mbar	60 mbar	500 mbar	700 mbar	3.5 bar	±0.35% FSS
100MG	0 mbar	100 mbar	500 mbar	700 mbar	10 bar	±0.35% FSS
160MG	0 mbar	160 mbar	500 mbar	700 mbar	10 bar	±0.35% FSS
250MG	0 mbar	250 mbar	1.4 bar	2.5 bar	10 bar	±0.35% FSS
400MG	0 mbar	400 mbar	1.4 bar	2.5 bar	10 bar	±0.35% FSS
600MG	0 mbar	600 mbar	2 bar	4 bar	10 bar	±0.35% FSS
001BG	0 bar	1 bar	2 bar	4 bar	10 bar	±0.25% FSS
1.6BG	0 bar	1.6 bar	4 bar	8 bar	10 bar	±0.25% FSS
2.5BG	0 bar	2.5 bar	6 bar	8 bar	10 bar	±0.25% FSS
004BG	0 bar	4 bar	8 bar	16 bar	16 bar	±0.25% FSS
006BG	0 bar	6 bar	17 bar	17 bar	17 bar	±0.25% FSS
010BG	0 bar	10 bar	17 bar	17 bar	17 bar	±0.25% FSS

Notes:

15. Overpressure: The maximum pressure which may safely be applied to the product for it to remain in specification once pressure is returned to the operating pressure range. Exposure to higher pressures may cause permanent damage to the product. Unless otherwise specified this applies to all available pressure ports at any temperature with the operating temperature range.
16. Burst pressure: The maximum pressure that may be applied to any port of the product without causing escape of pressure media. Product should not be expected to function after exposure to any pressure beyond the burst pressure.
17. Common mode pressure: The maximum pressure that can be applied simultaneously to both ports of a differential pressure sensor without causing changes in specified performance.

Table 8. Pinout for DIP and SMT Packages

Output Type	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
analog	NC	V_{supply}	OUTPUT+	GND	NC	NC	NC	NC

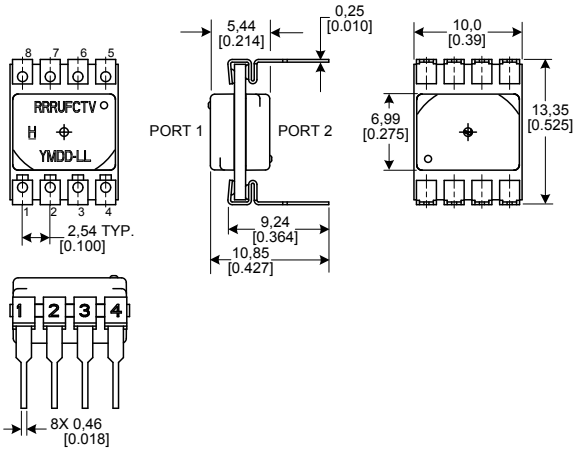
Table 9. Pinout for SIP Packages

Output Type	Pin 1	Pin 2	Pin 3	Pin 4
analog	NC	V_{supply}	OUTPUT+	GND

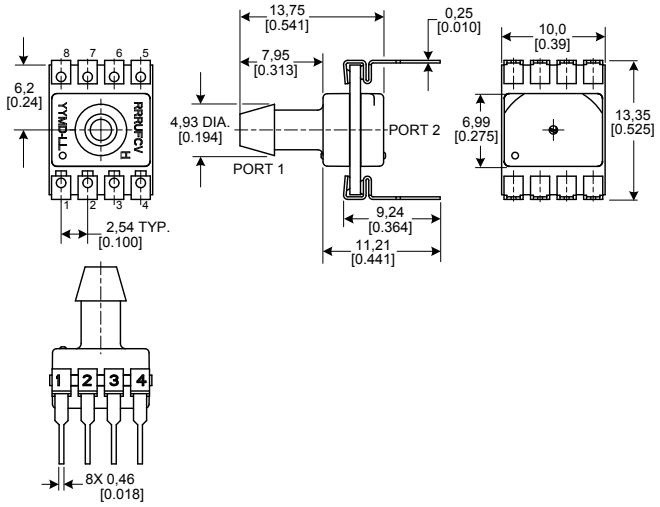
±1% Total Error Band, Analog Output, 1 psi to 150 psi (60 mbar to 10 bar)

Figure 4. DIP Pressure Port Dimensional Drawings (For reference only: mm [in])

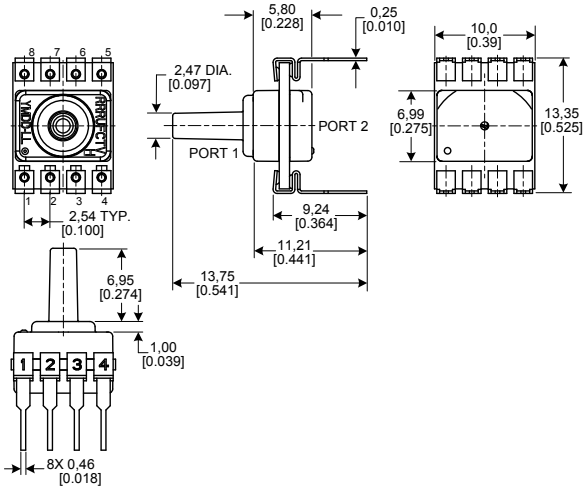
DIP NN: No ports



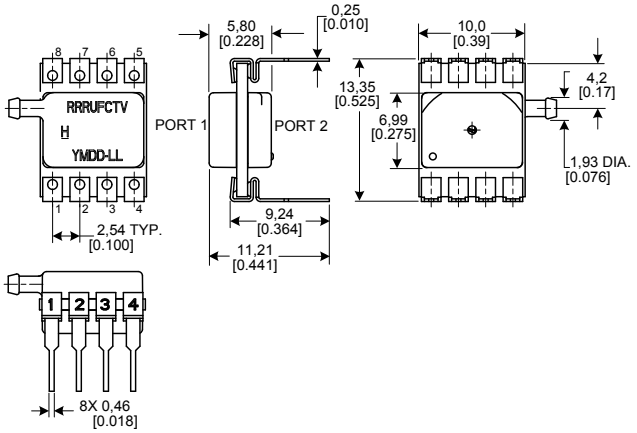
DIP AN: Single axial barbed port



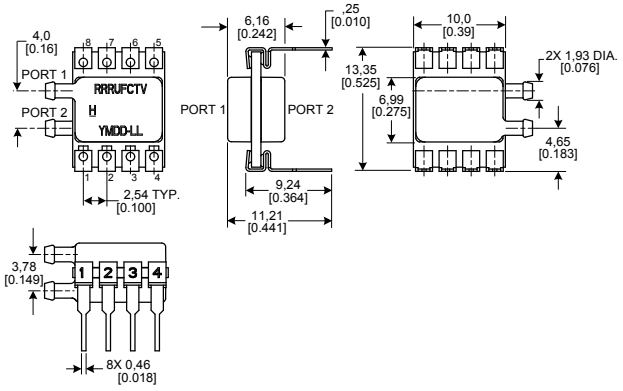
DIP LN: Single axial barbless port



DIP RN: Single radial barbed port



DIP RR: Dual radial barbed ports, same side



DIP DR: Dual radial barbed ports, opposite sides

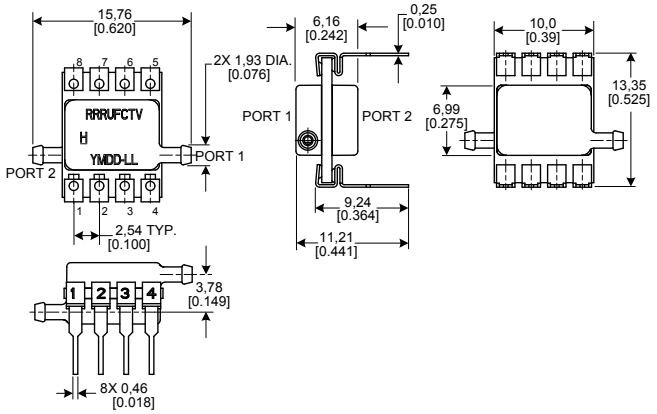
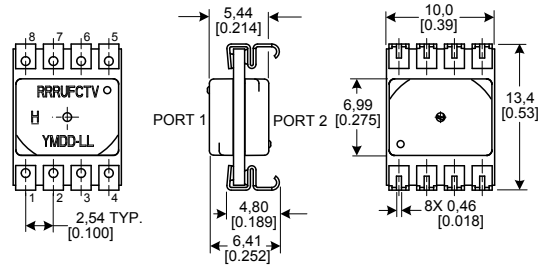
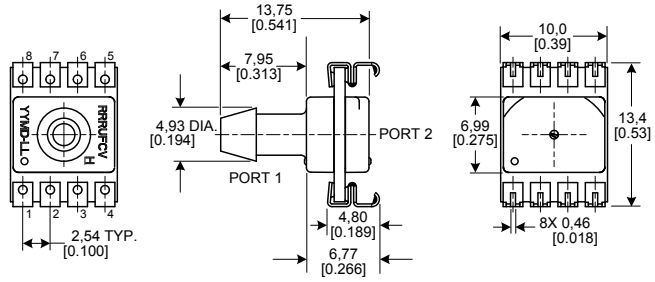


Figure 5. SMT Pressure Port Dimensional Drawings (For reference only: mm [in])

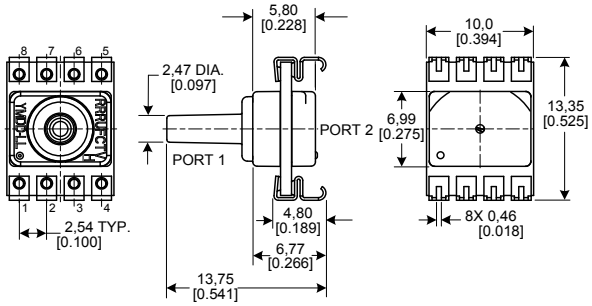
SMT NN: No ports



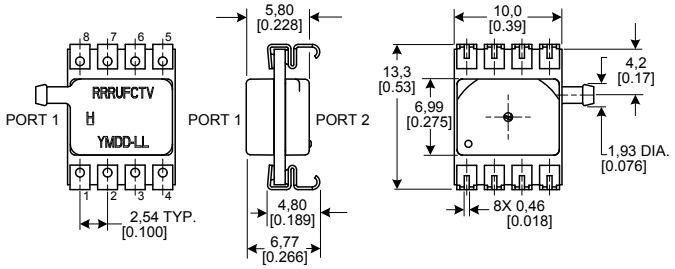
SMT AN: Single axial barbed port



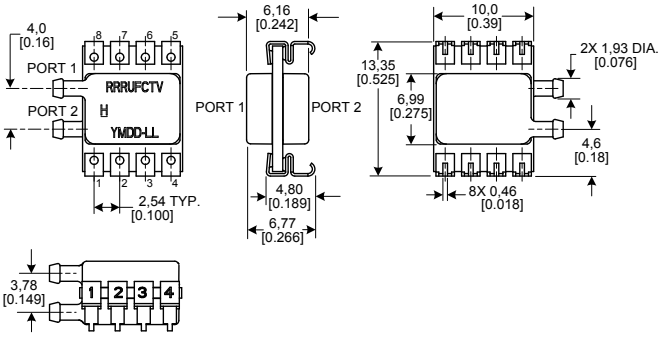
SMT LN: Single axial barbless port



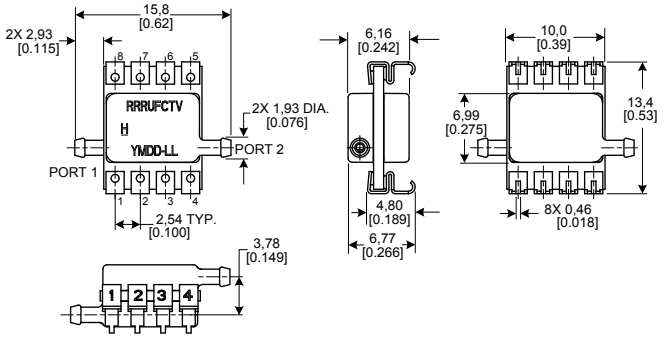
SMT RN: Single radial barbed port



SMT RR: Dual radial barbed ports, same side



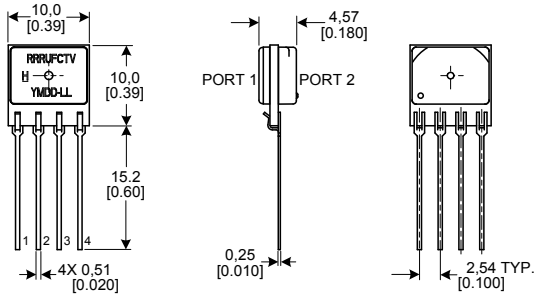
SMT DR: Dual radial barbed ports, opposite sides



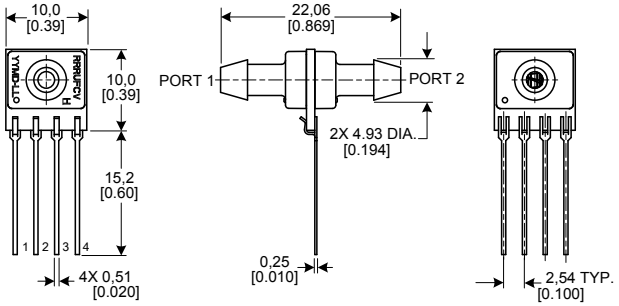
±1% Total Error Band, Analog Output, 1 psi to 150 psi (60 mbar to 10 bar)

Figure 6. SIP Package Dimensional Drawings (For reference only: mm [in])

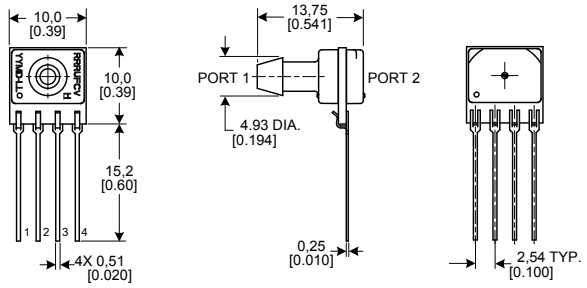
SIP NN: No ports



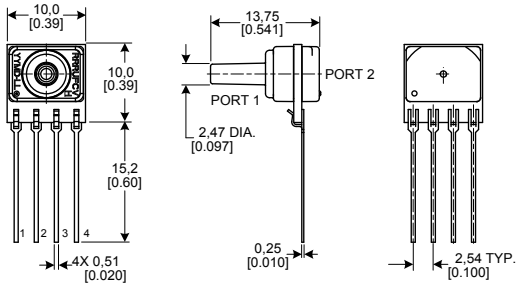
SIP AA: Dual axial barbed ports, opposite sides



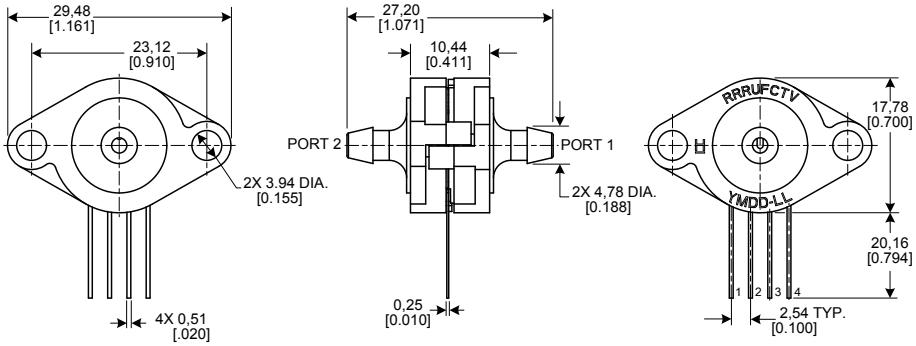
SIP AN: Single axial barbed port



SIP LN: Single barbless port



SIP FF: Fastener mount, dual axial barbed ports, opposite sides



SIP FN: Fastener mount, single axial barbed port

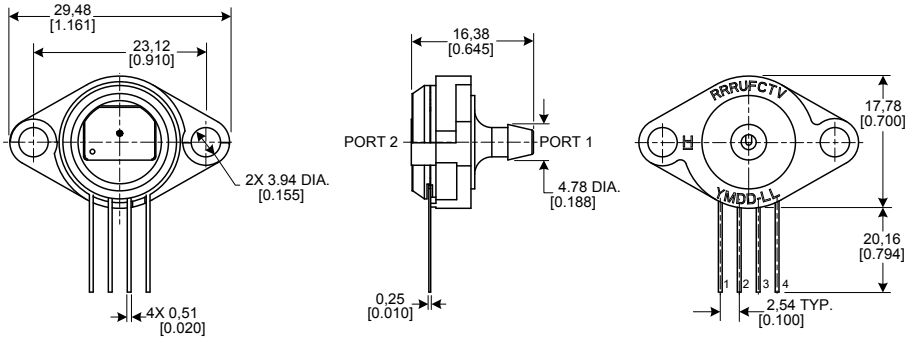
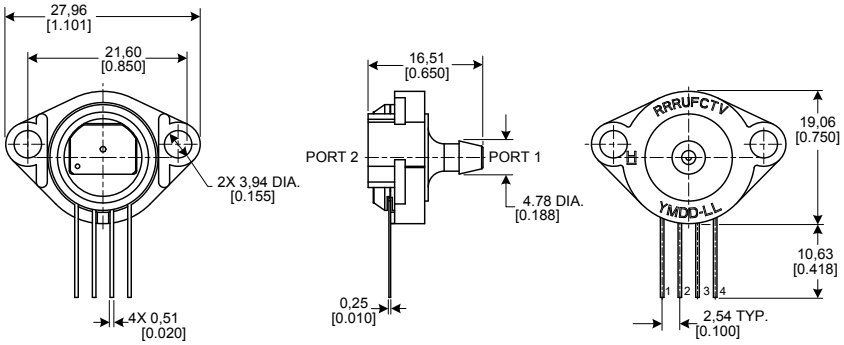
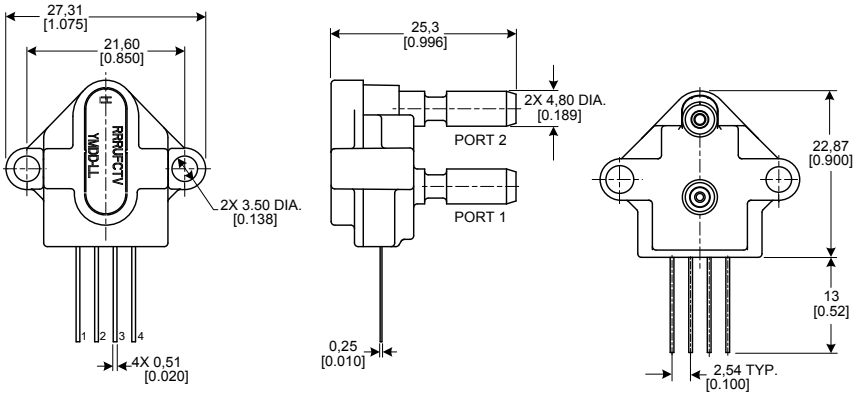


Figure 6. SIP Package Dimensional Drawings (continued)

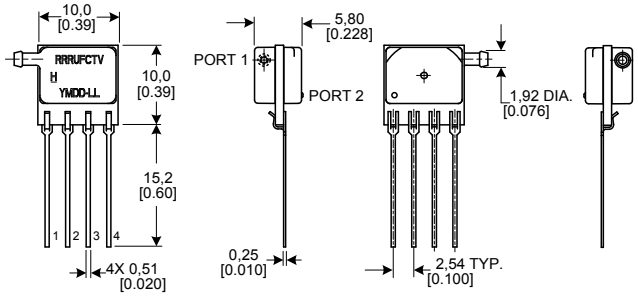
SIP GN: Ribbed fastener mount, single axial barbed port



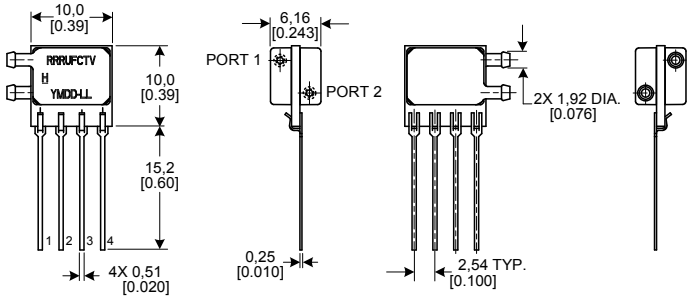
SIP NB: Fastener mount, dual axial ports, same side



SIP RN: Single radial barbed port



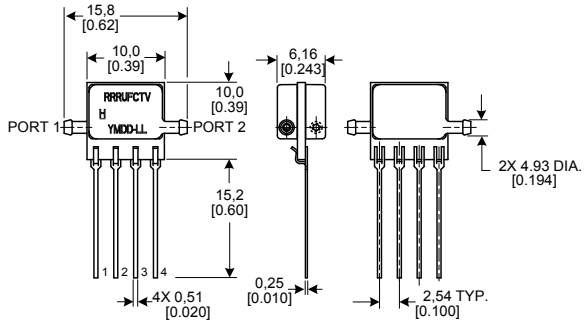
SIP RR: Dual radial barbed ports, same side



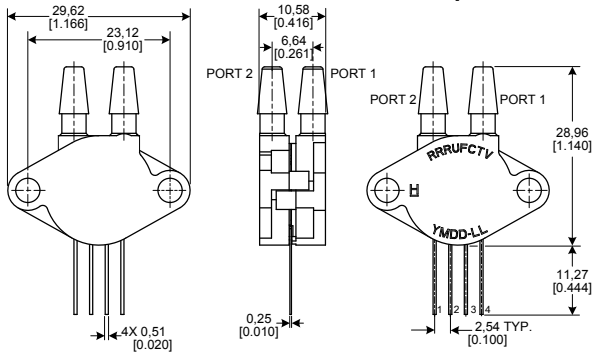
±1% Total Error Band, Analog Output, 1 psi to 150 psi (60 mbar to 10 bar)

Figure 6. SIP Package Dimensional Drawings (continued)

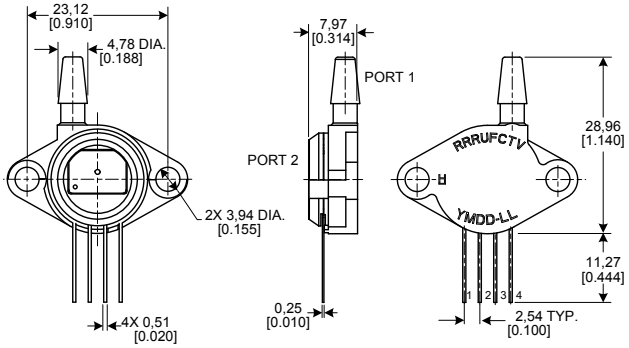
SIP DR: Dual radial barbed ports, opposite side



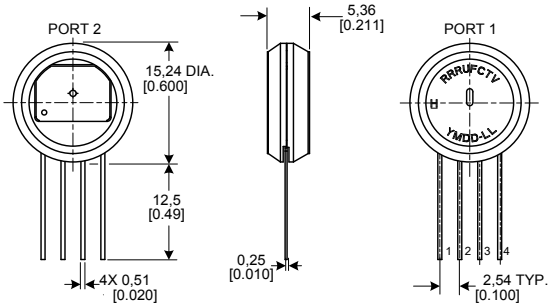
SIP HH: Fastener mount, dual radial barbed ports, same side



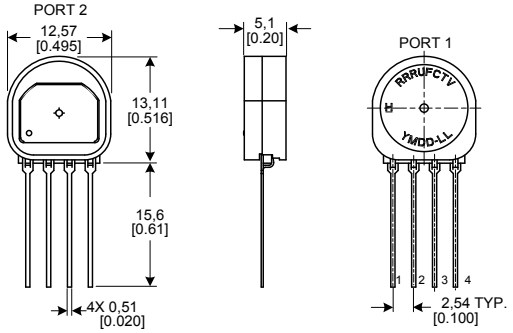
SIP HN: Fastener mount, single radial barbed port



SIP MN: Manifold mount, outer diameter seal



SIP SN: Manifold mount, inner diameter seal



⚠ WARNING

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DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

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Honeywell

TruStability™ Silicon Pressure Sensors: HSC Series–High Accuracy

±1% Total Error Band, Amplified Compensated Digital Output, 1 psi to 150 psi (60 mbar to 10 bar)

DESCRIPTION

The TruStability™ High Accuracy Silicon Ceramic (HSC) Series is a piezoresistive silicon pressure sensor offering a digital output for reading pressure over the specified full scale pressure span and temperature range.

The HSC Series is fully calibrated and temperature compensated for sensor offset, sensitivity, temperature effects, and non-linearity using an on-board Application Specific Integrated Circuit (ASIC). Calibrated output values for pressure are updated at approximately 2 kHz.

The HSC Series is calibrated over the temperature range of 0 °C to 50 °C [32 °F to 122 °F]. The sensor is characterized for operation from a single power supply of either 3.3 Vdc or 5.0 Vdc.

These sensors measure absolute, differential, and gage pressures. The absolute versions have an internal vacuum reference and an output value proportional to absolute pressure. Differential versions allow application of pressure to either side of the sensing diaphragm. Gage versions are referenced to atmospheric pressure and provide an output proportional to pressure variations from atmosphere.

The HSC Series sensors are intended for use with non-corrosive, non-ionic working fluids such as air and dry gases. They are designed and manufactured according to standards in ISO 9001.

FEATURES

- Industry-leading long-term stability
- Extremely tight accuracy of ±0.25% FSS BFSL (Full Scale Span Best Fit Straight Line)
- Total error band of ±1% full scale span maximum
- Modular and flexible design offers customers a variety of package styles and options, all with the same industry-leading performance specifications
- Miniature 10 mm x 10 mm [0.39 in x 0.39 in] package
- Low operating voltage
- Extremely low power consumption
- I^2C- or SPI- compatible 14-bit digital output (min. 12-bit sensor resolution)
- Precision ASIC conditioning and temperature compensated over 0 °C to 50 °C [32 °F to 122 °F] temperature range
- RoHS compliant
- Virtually insensitive to mounting orientation
- Internal diagnostic functions increase system reliability
- Also available with analog output
- Absolute, differential and gage types
- Pressure ranges from 1 psi to 150 psi (60 mbar to 10 bar)
- Custom calibration available
- Various pressure port options

POTENTIAL APPLICATIONS

- **Medical:**
  - Airflow monitors
  - Anesthesia machines
  - Blood analysis machines
  - Gas chromatography
  - Gas flow instrumentation
  - Kidney dialysis machines
  - Oxygen concentrators
  - Pneumatic controls
  - Respiratory machines
  - Sleep apnea equipment
  - Ventilators
- **Industrial:**
  - Barometry
  - Flow calibrators
  - Gas chromatography
  - Gas flow instrumentation
  - HVAC
  - Life sciences
  - Pneumatic controls

Table 1. Absolute Maximum Ratings[1]

Parameter	Min.	Max.	Unit
Supply voltage (V_{supply})	-0.3	6.0	Vdc
Voltage on any pin	-0.3	V_{supply} + 0.3	V
Digital interface clock frequency: I^2C SPI	 100 50	 400 800	kHz
ESD susceptibility (human body model)	3	-	kV
Storage temperature	-40 [-40]	85 [185]	°C [°F]
Soldering time and temperature: Lead solder temperature (SIP, DIP) Peak reflow temperature (SMT)	4 s max. at 250 °C [482 °F] 15 s max. at 250 °C [482 °F]		

Table 2. Operating Specifications

Parameter	Min.	Typ.	Max.	Unit
Supply voltage (V_{supply})[2]: 3.3 Vdc 5.0 Vdc *Sensors are either 3.3 Vdc or 5.0 Vdc based on listing selected.*	 3.0 4.75	 3.3[3] 5.0[3]	 3.6 5.25	Vdc
Supply current: 3.3 Vdc supply 5.0 Vdc supply	 - -	 1.6 2	 2.1 3	mA
Compensated temperature range[4]	0 [32]	-	50 [122]	°C [°F]
Operating temperature range[5]	-20 [-4]	-	85 [185]	°C [°F]
Startup time (power up to data ready)	-	2.8	7.3	ms
Response time	-	0.46	-	ms
I^2C voltage level low	-	-	0.2	V_{supply}
I^2C voltage level high	0.8	-	-	V_{supply}
Pull up on SDA and SCL	1	-	-	kOhm
Accuracy[6]	-	-	±0.25	%FSS BFSL
Total error band[7]	-	-	±1	%FSS[8]
Output resolution	12	-	-	bits

Table 3. Environmental Specifications

Parameter	Characteristic
Humidity	0 % to 95 % RH, non-condensing
Vibration	MIL-STD-202F, Curve AK (20.7 g random)
Shock	MIL-STD-202F, Method 213B, Condition F
Life[9]	1 million cycles minimum
Solder reflow	J-STD-020-C

Table 4. Wetted Materials[10]

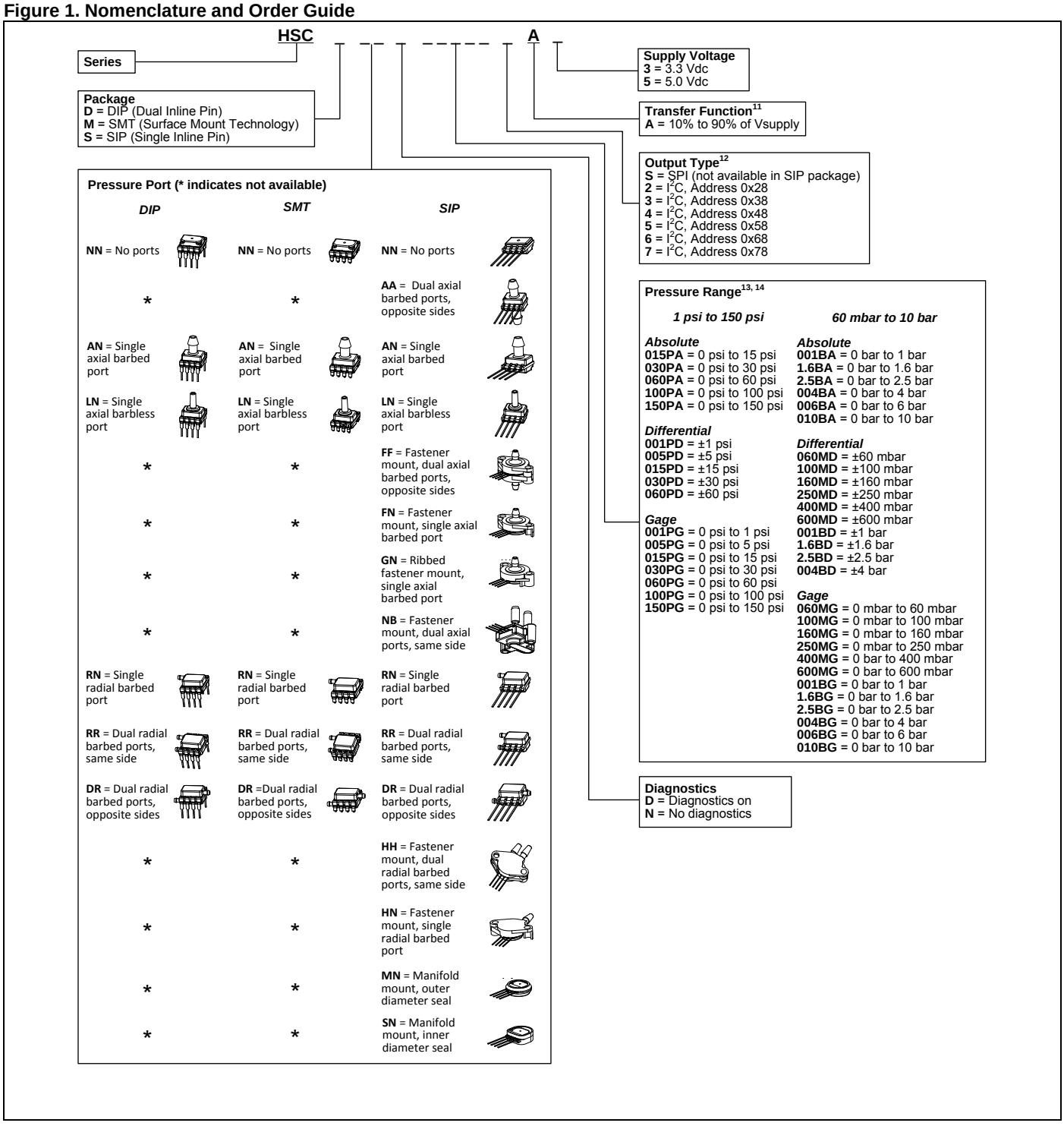
Parameter	Port 1 (Pressure Port)	Port 2 (Reference Port)
Covers	high temperature polyamide	high temperature polyamide
Substrate	alumina ceramic	alumina ceramic
Adhesives	epoxy, RTV	epoxy, RTV
Electronic components	ceramic, glass, solder, silicon	silicon, glass, gold, solder

Notes:

1. Absolute maximum ratings are the extreme limits the device will withstand without damage.
2. Ratiometricity of the sensor (the ability of the digital device to maintain performance parameters independent of supply voltage) is achieved within the specified operating voltage for each option.
3. The sensor is not reverse polarity protected. Incorrect application of supply voltage or ground to the wrong pin may cause electrical failure.
4. The compensated temperature range is the temperature range over which the sensor will produce an output proportional to pressure within the specified performance limits.
5. The operating temperature range is the temperature range over which the sensor will produce an output proportional to pressure but may not remain within the specified performance limits.
6. Accuracy: The maximum deviation in output from a Best Fit Straight Line (BFSL) fitted to the output measured over the pressure range at 25 °C [77 °F]. Includes all errors due to pressure non-linearity, pressure hysteresis, and non-repeatability.
7. Total Error Band: The maximum deviation from the ideal transfer function over the entire compensated temperature and pressure range. Includes all errors due to offset, full scale span, pressure non-linearity, pressure hysteresis, repeatability, thermal effect on offset, thermal effect on span, and thermal hysteresis.
8. Full Scale Span (FSS) is the algebraic difference between the output signal measured at the maximum ($P_{max.}$) and minimum ($P_{min.}$) limits of the pressure range. (See Figure 1 for ranges.)
9. Life may vary depending on specific application in which sensor is utilized.
10. Contact Honeywell Customer Service for detailed material information.

TruStability™ Silicon Pressure Sensors: HSC Series–High Accuracy

Figure 1. Nomenclature and Order Guide

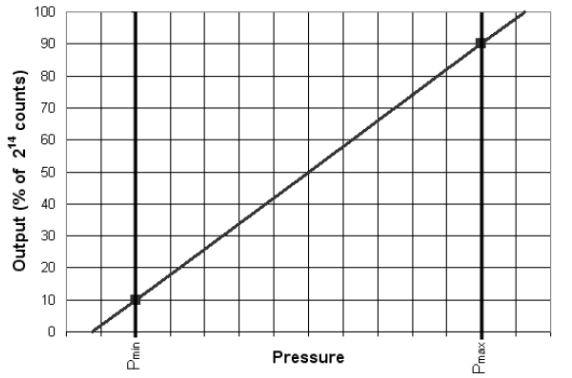


Notes:

11. The transfer function limits define the output of the sensor at a given pressure input. By specifying $P_{min.}$ and $P_{max.}$, the output at $P_{min.}$ and $P_{max.}$, the complete transfer function of the sensor is defined. See Figure 2 for a graphical representation of the transfer function. Other transfer functions are available. Contact Honeywell Customer Service for more information.
12. Analog output is also available. Contact Honeywell Customer Service for more information.
13. Custom pressure ranges are available. Contact Honeywell Customer Service for more information.
14. See Table 5 for an explanation of sensor pressure types.

±1% Total Error Band, Digital Output, 1 psi to 150 psi (60 mbar to 10 bar)

Figure 2. Transfer Function Limits



$$\text{Output (\% of } 2^{14} \text{ counts)} = \frac{80\%}{P_{max} - P_{min}} \cdot (\text{Pressure}_{applied} - P_{min}) + 10\%$$

Figure 3. Completed Catalog Listing Example

HSCSANN100PGSA3
SIP package, AN pressure port, no diagnostics, 100 psi gage, SPI output, 10% to 90% calibration at 3.3 Vdc.

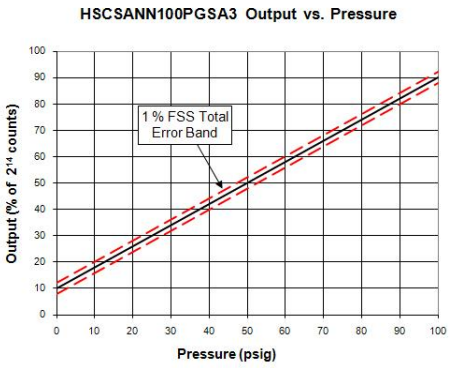


Table 5. Pressure Types

Pressure Type	Description
Absolute	Output is proportional to the difference between applied pressure and a built-in reference to vacuum. $P_{min.}$ is set at absolute zero pressure (full vacuum).
Differential	Output is proportional to the difference between the pressures applied to each port. (Port 1 – Port 2) 50% point of transfer function set at Port 1 = Port 2.
Gage	Output is proportional to the difference between applied pressure and atmospheric (ambient) pressure. $P_{min.}$ is set at atmospheric pressure.

Table 6. Sensor Output at Significant Percentages

% Output	Digital Counts (decimal)	Digital Counts (hex)
0	0	0x0000
10	1638	0x0666
50	8192	0x2000
90	14746	0x399A
100	16383	0x3FFF

Table 7. Pressure Range Specifications for 1 psi to 150 psi

Order Code	Pressure Range		Over-pressure[15]	Burst Pressure[16]	Common Mode Pressure[17]	Long-term Stability (1000 hr, 25 °C [77 °F])
	$P_{min.}$	$P_{max.}$				
Absolute						
015PA	0 psi	15 psi	30 psi	60 psi	NA	±0.25% FSS
030PA	0 psi	30 psi	60 psi	120 psi	NA	±0.25% FSS
060PA	0 psi	60 psi	120 psi	240 psi	NA	±0.25% FSS
100PA	0 psi	100 psi	250 psi	250 psi	NA	±0.25% FSS
150PA	0 psi	150 psi	250 psi	250 psi	NA	±0.25% FSS
Differential						
001PD	-1 psi	1 psi	10 psi	10 psi	150 psi	±0.35% FSS
005PD	-5 psi	5 psi	30 psi	40 psi	150 psi	±0.35% FSS
015PD	-15 psi	15 psi	30 psi	60 psi	150 psi	±0.25% FSS
030PD	-30 psi	30 psi	60 psi	120 psi	150 psi	±0.25% FSS
060PD	-60 psi	60 psi	120 psi	240 psi	250 psi	±0.25% FSS
Gage						
001PG	0 psi	1 psi	10 psi	10 psi	150 psi	±0.35% FSS
005PG	0 psi	5 psi	30 psi	40 psi	150 psi	±0.35% FSS
015PG	0 psi	15 psi	30 psi	60 psi	150 psi	±0.25% FSS
030PG	0 psi	30 psi	60 psi	120 psi	150 psi	±0.25% FSS
060PG	0 psi	60 psi	120 psi	240 psi	250 psi	±0.25% FSS
100PG	0 psi	100 psi	250 psi	250 psi	250 psi	±0.25% FSS
150PG	0 psi	150 psi	250 psi	250 psi	250 psi	±0.25% FSS

Table 8. Pressure Range Specifications for 60 mbar to 10 bar

Order Code	Pressure Range		Over-pressure[15]	Burst Pressure[16]	Common Mode Pressure[17]	Long-term Stability (1000 hr, 25 °C [77 °F])
	P_{min}	P_{max}				
Absolute						
001BA	0 bar	1 bar	2 bar	4 bar	NA	±0.25% FSS
1.6BA	0 bar	1.6 bar	4 bar	8 bar	NA	±0.25% FSS
2.5BA	0 bar	2.5 bar	6 bar	8 bar	NA	±0.25% FSS
004BA	0 bar	4 bar	8 bar	16 bar	NA	±0.25% FSS
006BA	0 bar	6 bar	17 bar	17 bar	NA	±0.25% FSS
010BA	0 bar	10 bar	17 bar	17 bar	NA	±0.25% FSS
Differential						
060MD	-60 mbar	60 mbar	500 mbar	700 mbar	10 bar	±0.35% FSS
100MD	-100 mbar	100 mbar	500 mbar	700 mbar	10 bar	±0.35% FSS
160MD	-160 mbar	160 mbar	500 mbar	700 mbar	10 bar	±0.35% FSS
250MD	-250 mbar	250 mbar	1.4 bar	2.5 bar	10 bar	±0.35% FSS
400MD	-400 mbar	400 mbar	1.4 bar	2.5 bar	10 bar	±0.35% FSS
600MD	-600 mbar	600 mbar	2 bar	4 bar	10 bar	±0.25% FSS
001BD	-1 bar	1 bar	2 bar	4 bar	10 bar	±0.25% FSS
1.6BD	-1.6 bar	1.6 bar	4 bar	8 bar	10 bar	±0.25% FSS
2.5BD	-2.5 bar	2.5 bar	6 bar	8 bar	10 bar	±0.25% FSS
004BD	-4 bar	4 bar	8 bar	16 bar	10 bar	±0.25% FSS
Gage						
060MG	0 mbar	60 mbar	500 mbar	700 mbar	3.5 bar	±0.35% FSS
100MG	0 mbar	100 mbar	500 mbar	700 mbar	10 bar	±0.35% FSS
160MG	0 mbar	160 mbar	500 mbar	700 mbar	10 bar	±0.35% FSS
250MG	0 mbar	250 mbar	1.4 bar	2.5 bar	10 bar	±0.35% FSS
400MG	0 mbar	400 mbar	1.4 bar	2.5 bar	10 bar	±0.35% FSS
600MG	0 mbar	600 mbar	2 bar	4 bar	10 bar	±0.35% FSS
001BG	0 bar	1 bar	2 bar	4 bar	10 bar	±0.25% FSS
1.6BG	0 bar	1.6 bar	4 bar	8 bar	10 bar	±0.25% FSS
2.5BG	0 bar	2.5 bar	6 bar	8 bar	10 bar	±0.25% FSS
004BG	0 bar	4 bar	8 bar	16 bar	16 bar	±0.25% FSS
006BG	0 bar	6 bar	17 bar	17 bar	17 bar	±0.25% FSS
010BG	0 bar	10 bar	17 bar	17 bar	17 bar	±0.25% FSS

Notes:

15. Overpressure: The maximum pressure which may safely be applied to the product for it to remain in specification once pressure is returned to the operating pressure range. Exposure to higher pressures may cause permanent damage to the product. Unless otherwise specified this applies to all available pressure ports at any temperature with the operating temperature range.
16. Burst pressure: The maximum pressure that may be applied to any port of the product without causing escape of pressure media. Product should not be expected to function after exposure to any pressure beyond the burst pressure.
17. Common mode pressure: The maximum pressure that can be applied simultaneously to both ports of a differential pressure sensor without causing changes in specified performance.

Table 9. Pinout for SMT and DIP Packages

Output Type	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
I^2C	GND	V_{supply}	SDA	SCL	NC	NC	NC	NC
SPI	GND	V_{supply}	MISO	SCLK	SS	NC	NC	NC

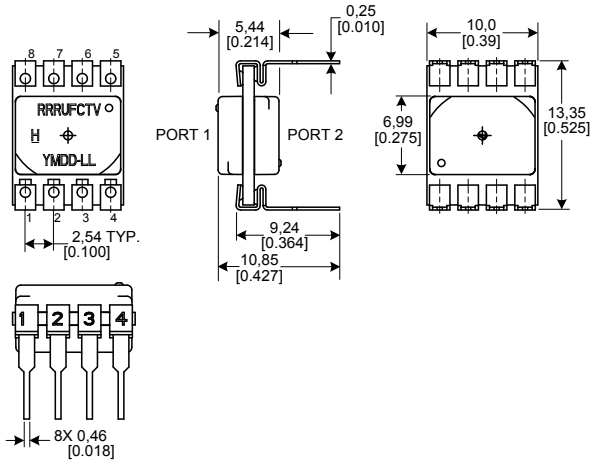
Table 10. Pinout for SIP Package

Output Type	Pin 1	Pin 2	Pin 3	Pin 4
I^2C	GND	V_{supply}	SDA	SCL

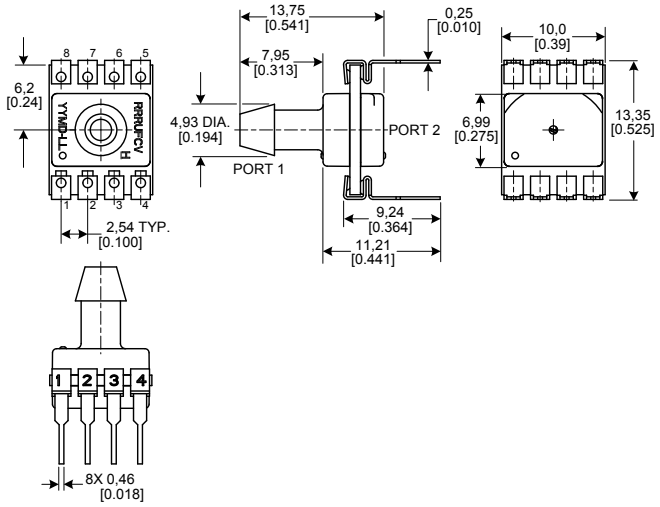
±1% Total Error Band, Digital Output, 1 psi to 150 psi (60 mbar to 10 bar)

Figure 4. DIP Pressure Port Dimensional Drawings (For reference only: mm [in])

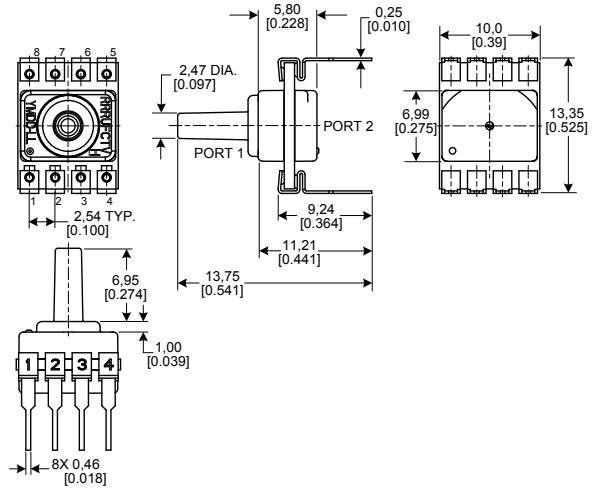
DIP NN: No ports



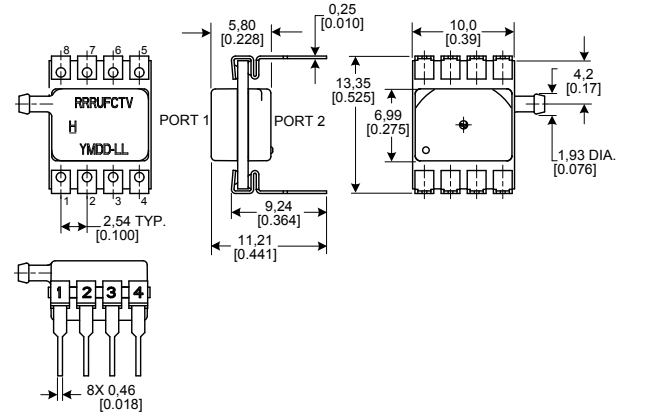
DIP AN: Single axial barbed port



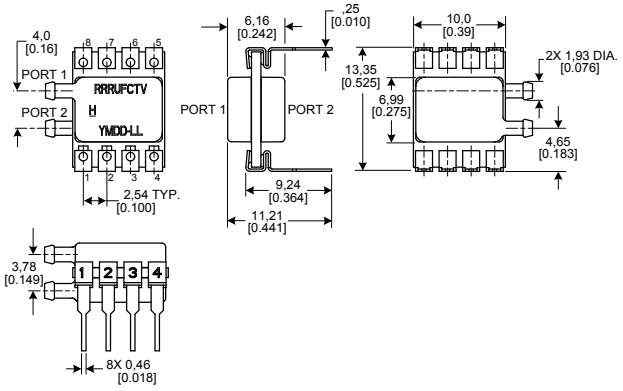
DIP LN: Single axial barbless port



DIP RN: Single radial barbed port



DIP RR: Dual radial barbed ports, same side



DIP DR: Dual radial barbed ports, opposite sides

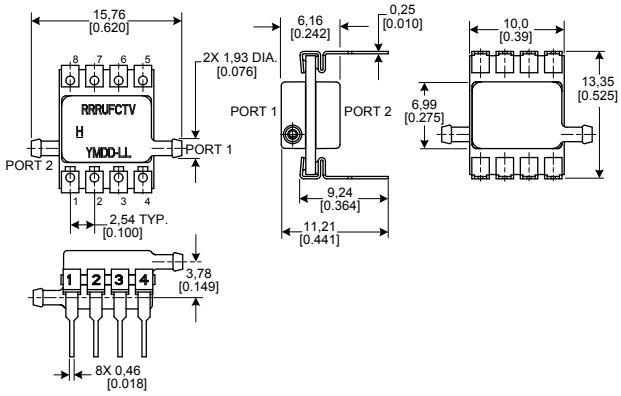
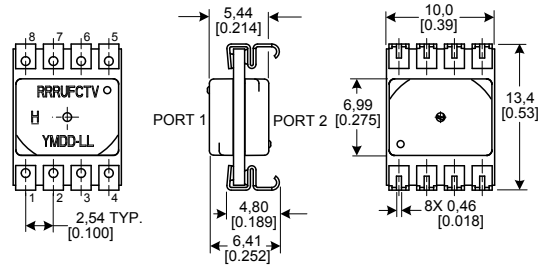
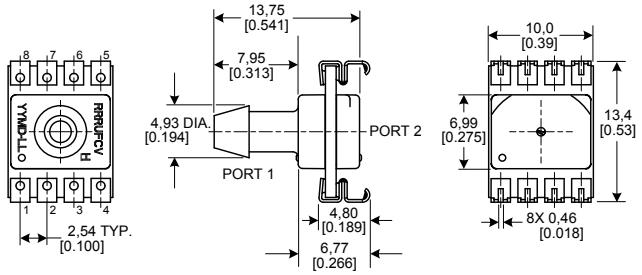


Figure 5. SMT Pressure Port Dimensional Drawings (For reference only: mm [in])

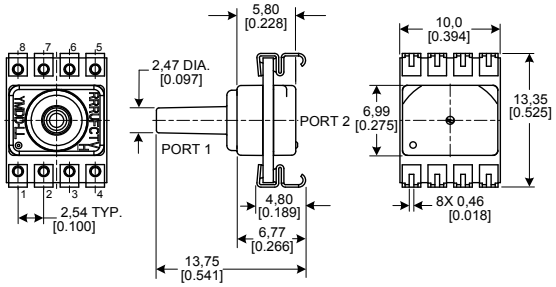
SMT NN: No ports



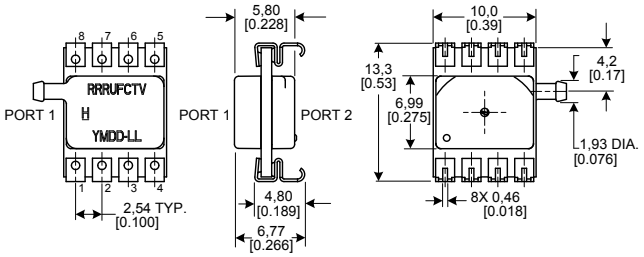
SMT AN: Single axial barbed port



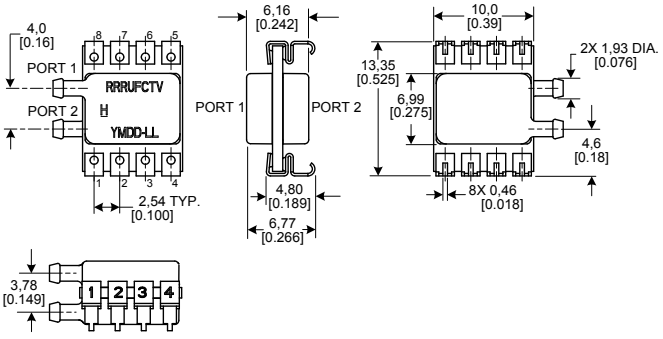
SMT LN: Single axial barbless port



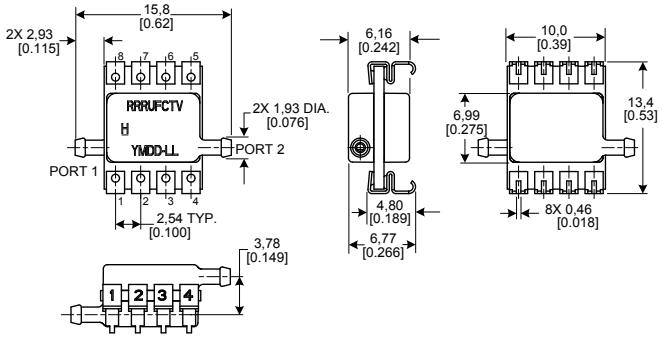
SMT RN: Single radial barbed port



SMT RR: Dual radial barbed ports, same side



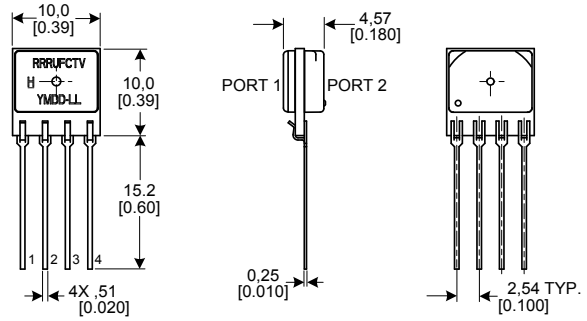
SMT DR: Dual radial barbed ports, opposite sides



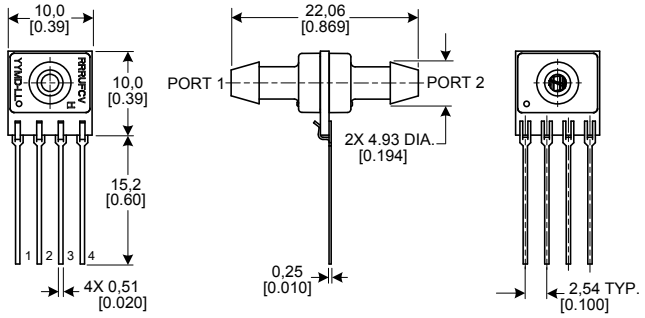
±1% Total Error Band, Digital Output, 1 psi to 150 psi (60 mbar to 10 bar)

Figure 6. SIP Package Dimensional Drawings (For reference only: mm [in])

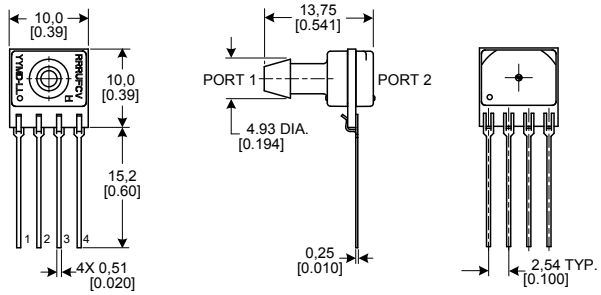
SIP NN: No ports



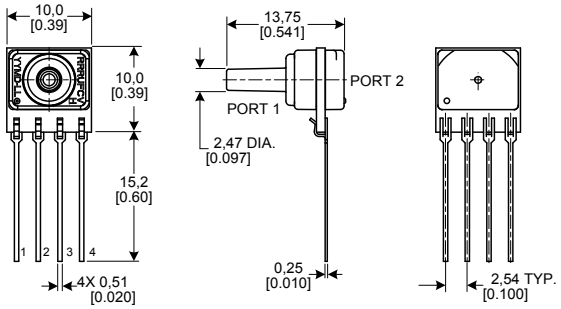
SIP AA: Dual axial barbed ports, opposite sides



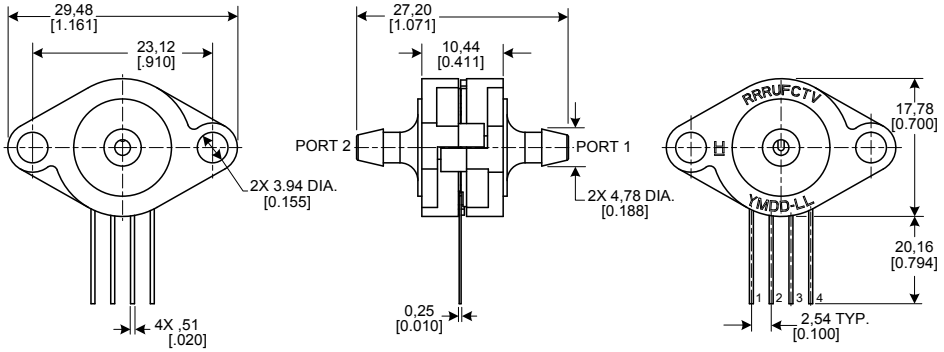
SIP AN: Single axial barbed port



SIP LN: Single barbless port



SIP FF: Fastener mount, dual axial barbed ports, opposite sides



SIP FN: Fastener mount, single axial barbed port

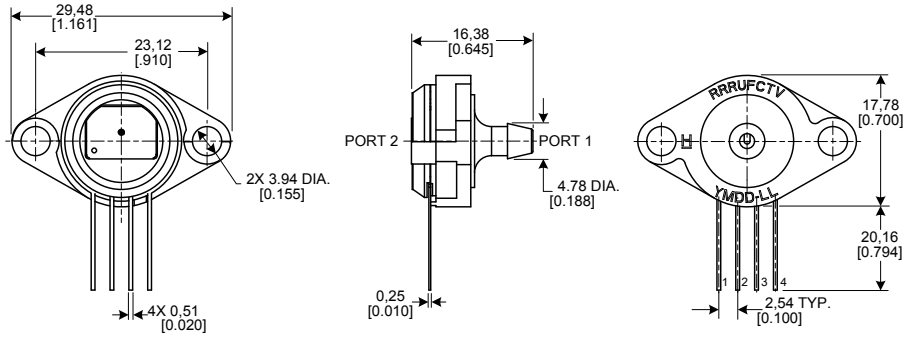
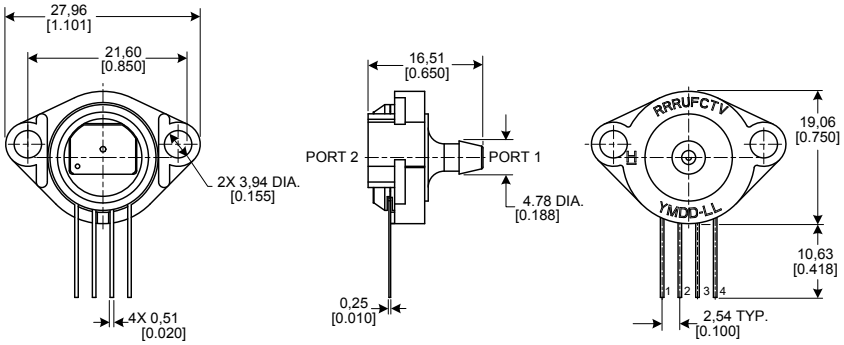
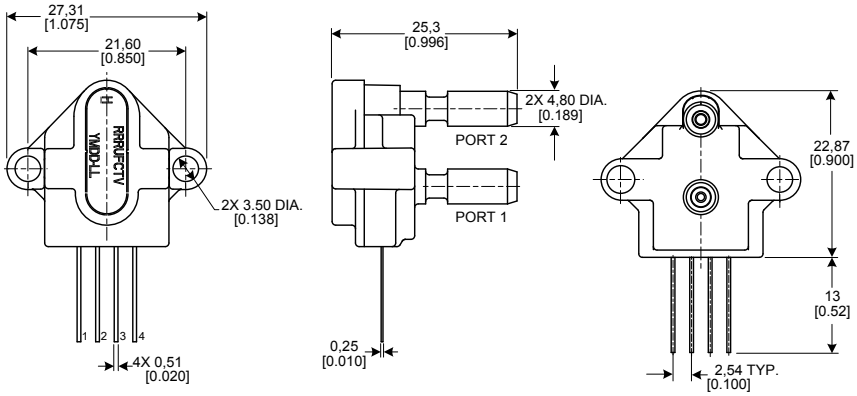


Figure 6. SIP Package Dimensional Drawings (continued)

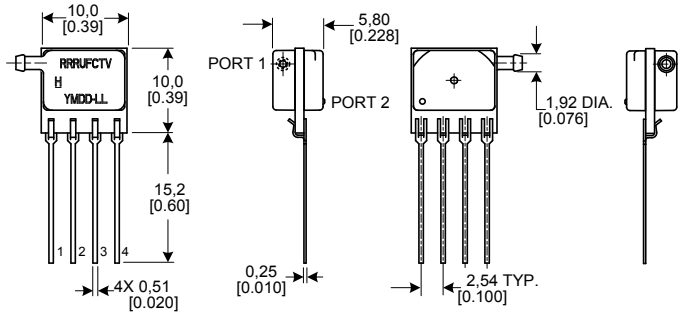
SIP GN: Ribbed fastener mount, single axial barbed port



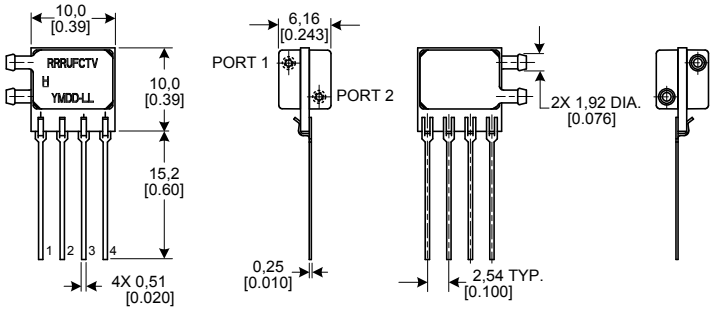
SIP NB: Fastener mount, dual axial ports, same side



SIP RN: Single radial barbed port



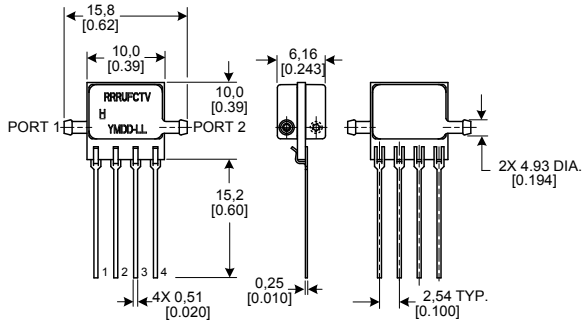
SIP RR: Dual radial barbed ports, same side



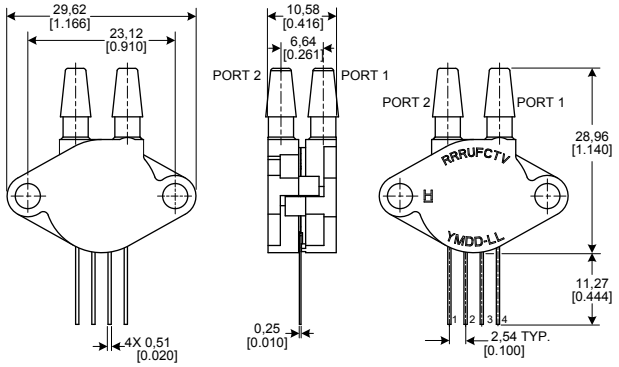
±1% Total Error Band, Digital Output, 1 psi to 150 psi (60 mbar to 10 bar)

Figure 6. SIP Package Dimensional Drawings (continued)

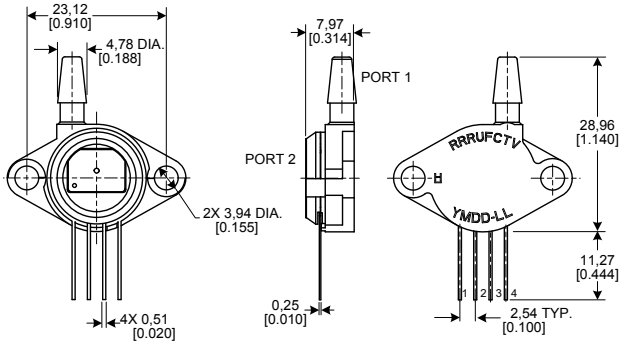
SIP DR: Dual radial barbed ports, opposite side



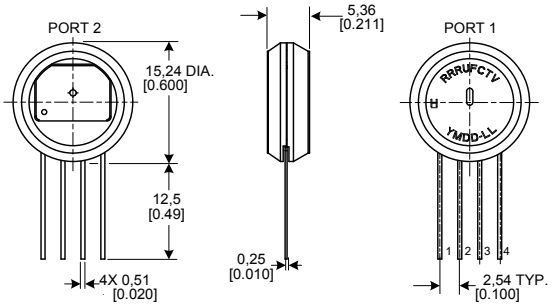
SIP HH: Fastener mount, dual radial barbed ports, same side



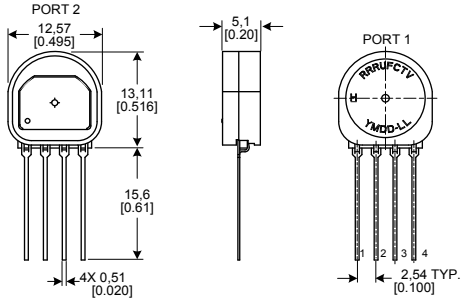
SIP HN: Fastener mount, single radial barbed port



SIP MN: Manifold mount, outer diameter seal



SIP SN: Manifold mount, inner diameter seal



⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

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Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

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- The information presented in this product sheet is for reference only. DO NOT USE this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

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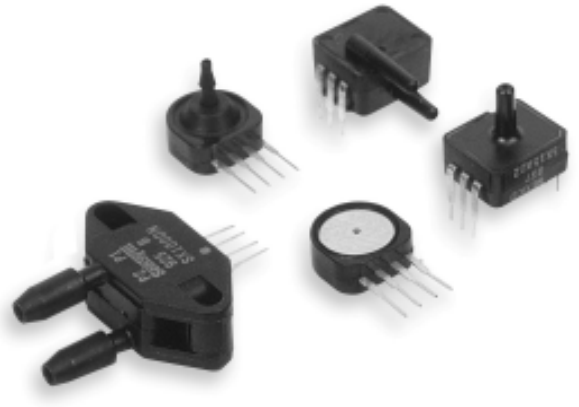
SCC Series

Silicon pressure sensors
0 psi to 5 psi and 0 psi to 300 psi



DESCRIPTION

The SCC Series sensors offer an extremely low cost sensor element with a temperature stable output when driven with a constant current source. These integrated circuit sensors were designed for extremely cost sensitive applications where precise accuracy over a wide temperature range is not required. This series is intended for use with non-corrosive, non-ionic working fluids such as air, and dry gases.

Absolute devices have an internal vacuum reference and an output voltage proportional to applied pressure. The differential devices allow application of pressure to either side of the diaphragm and devices are thereby available to measure both differential and gage pressures.

This product is packaged either in standard low cost chip carrier "button" package or a DIP package. Both packages are designed for applications where the sensing element is to be integral to the OEM equipment. These packages can be o-ring sealed, epoxied, and/or clamped onto a pressure fitting. A closed bridge four pin SIP configuration is provided for electrical connection to the button package. The DIP package offers a 5-pin open bridge configuration.

FEATURES

- Low cost sensor element
- Internal temperature compensation
- Differential or gage pressures

TYPICAL APPLICATIONS

- Pneumatic controls
- Automotive diagnostics
- Medical equipment
- Dental equipment
- Environmental controls

ORDERING INFORMATION

Pressure Range	Part Number for Ordering			
	Sensor in Button Package	Sensor in "N" Package	Sensor in Nipple Package	Sensor in DIP Package
0 psid to 5 psid or psig	SCC05D	SCC05DN	SCC05DP1	SCC05GD2, SCC05DD4
0 psid to 15 psid or psig	SCC015D	SCC015DN	SCC015DP1	SCC15GD2, SCC15DD4
0 psid to 30 psid or psig	SCC30D	SCC30DN	SCC30DP1	SCC30GD2, SCC30DD4
0 psig to 100 psig	SCC100D	SCC100DN	–	SCC100GD2, SCC100DD4
0 psia to 15 psia	SCC15A	SCC15AN	SCC15AP1	SCC15AD2
0 psia to 30 psia	SCC30A	SCC30AN	SCC30AP1	SCC30AD2
0 psia to 100 psia	SCC100A	SCC100AN	–	SCC100AD2
0 psia to 300 psi	–	–	–	–

⚠ WARNING

MISUSE OF DOCUMENTATION

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- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

SPECIFICATION CHARACTERISTICS (Maximum Ratings for All Devices)

Supply current, I_S	1.5 mA
Compensated temperature range	0 °C to 50 °C [32 °F to 122 °F]
Operating temperature range	-40 °C to 85 °C [-40 °F to 185 °F]
Storage temperature range	-55 °C to 125 °C [-67 °F to 257 °F]
Humidity	0 % to 100 % RH
Lead temperature	250 °C [482 °F] Soldering 2 sec to 4 sec
Common-mode pressure	150 psi

PERFORMANCE CHARACTERISTICS (Individual Models) I_s=1.0 mA, T_A=25 °C [77 °F][1]

Part Number	Operating Pressure Range	Maximum Over Pressure	Accuracy[2]	Effect[3, 4] on Span 0 °C to 50 °C	Effect[5, 4] on Offset 0 °C to 50 °C	Full-Scale Span[6] mV
SCC05(D,G)	0 psid to 5 psid (g)	20 psi	0.50 %	1.50 %	30 µV/°C	25-65
SCC15A	0 psia to 15 psia	30 psia	0.50 %	1.50 %	40 µV/°C	40-95
SCC15(D,G)	0 psid to 15 psid (g)	30 psi	0.50 %	1.50 %	40 µV/°C	40-95
SCC30(D,G)	0 psid to 30 psid (g)	60 psi	0.50 %	1.50 %	60 µV/°C	60-150
SCC100A	0 psia to 100 psia	150 psia	0.50 %	1.50 %	30 µV/°C	85-225
SCC100(D,G)[7]	0 psig to 100 psig	150 psig	0.50 %	1.50 %	90 µV/°C	85-225
SCC300A	0 psia to 300 psia	450 psia	0.50 %	1.50 %	50 µV/°C	50-120

PERFORMANCE SPECIFICATIONS (All Models) I_s=10.0 Ma, T_a=25 °C [77 °F]

	Min.	Typ.	Max.	Unit
Zero Pressure Offset[8]	-30.0	-10.0	20.0	mV
Combined Linearity, Hysteresis and Repeatability[2]	–	0.25	0.50	% FSO
Long Term Stability of Offset and Span[9]	–	0.10	–	mV
Response Time (10 % to 90 %)[10]	–	0.10	–	ms
Input Impedance	4.00	5.00	6.50	kOhm
Output Impedance	4.00	5.00	6.50	kOhm

Specification Notes:

Note 1: Reference Conditions; Supply Current = 1.0 mA; TA = 25 °C [77 °F], Common-mode Line Pressure = 0 psig, Pressure Applied to P1, unless otherwise noted.

Note 2: Accuracy is the sum of Hysteresis and Linearity. Hysteresis is the maximum output difference at any point within the operating pressure range for increasing and decreasing pressure. Linearity refers to the best straight line fit as measured for the offset, full-scale and ½ full-scale pressure at 25 °C [77 °F].

Note 3: This is the maximum temperature shift for span when measured between 0 °C and 50 °C [32 °F to 122 °F] relative to the 25 °C [77 °F] reading. Typical temperature coefficients for span and resistance are -2200 ppm/°C and 2200 ppm/°C respectively.

Note 4: Temperature effect on span and offset are guaranteed by design. Therefore these parameters are not 100 % tested.

Note 5: This is the maximum temperature shift for offset when measured at 0 °C and 50 °C [32 °F to 122 °F] divided by the temperature difference.

Note 6: Span is the algebraic difference between the output voltage at full-scale pressure and the ouput at zero pressure.

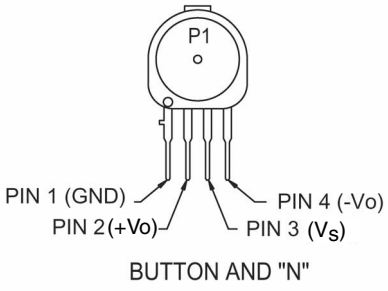
Note 7: The SCC100D devices can only be used in a forward gauge mode. Application of more than 30 psig to the back side of any of the SCC Series devices can result in device failure. On the SCC100GD2 pressure can only be applied to the back side of the die. No pressure I accessible from the front/top side of die.

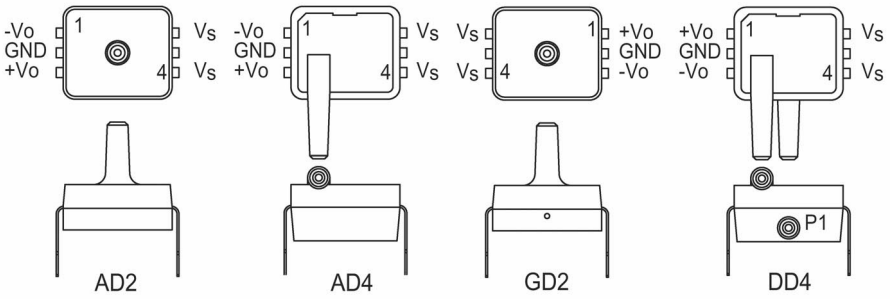
Note 8: The zero pressure offset is 30 to -20 mV max. form parts SCCxxxGD2 and SCCxxDD4 devices.

Note 9: Maximum difference in output at any pressure with the operating pressure range and temperature within 0 °C and 50 °C [32 °F to 122 °F].
a) 100 temperature cycles, 0 °C and 50 °C [32 °F to 122 °F]
b) 1.0 million pressure cycles, 0 psi to full-scale span.

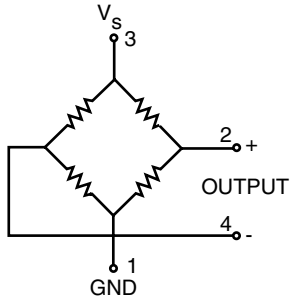
Note 10: Response time for a 0 psi to full-scale span pressure step change. 10 % to 90 % rise time.

ELECTRICAL CONNECTIONS

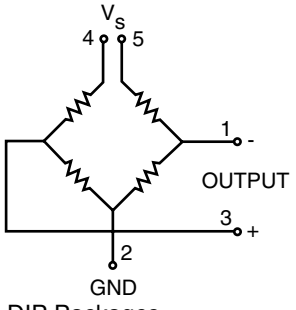




EQUIVALENT CIRCUITS



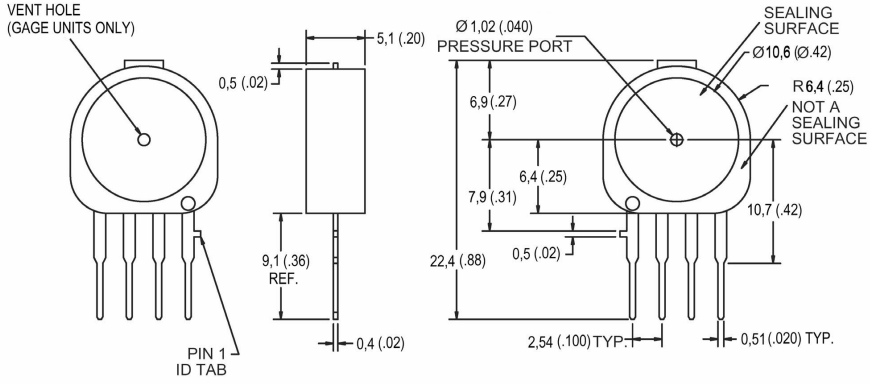
Button, Nipple and "N" Packages



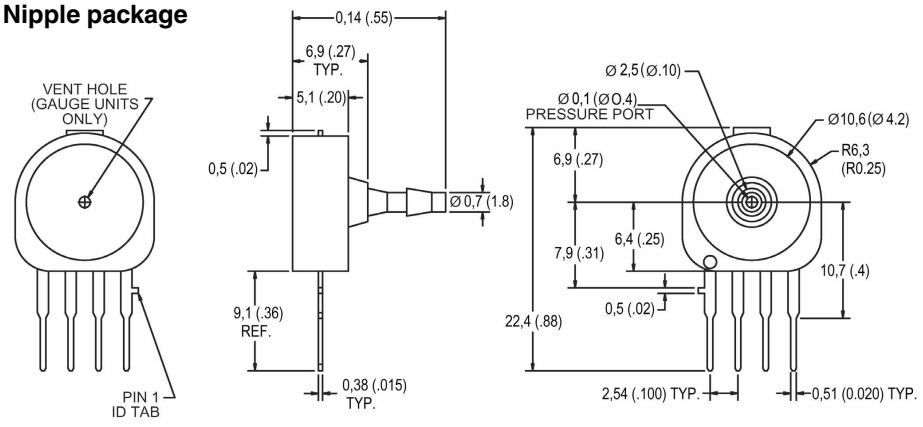
DIP Packages

MOUNTING DIMENSIONS IN MM (INCHES), FOR REFERENCE ONLY

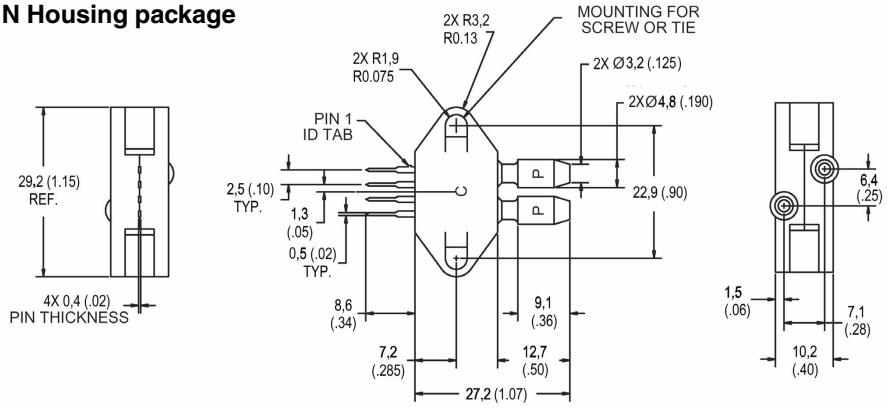
Button package



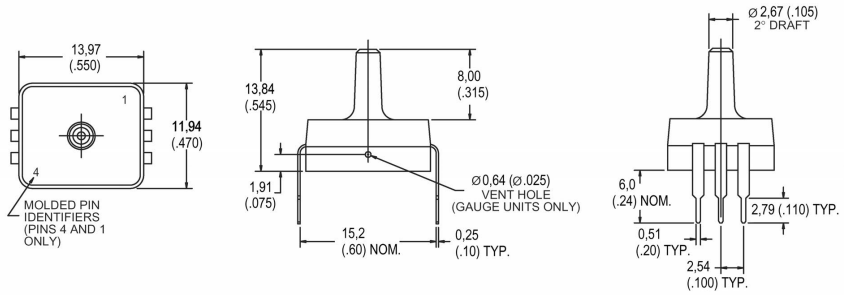
Nipple package



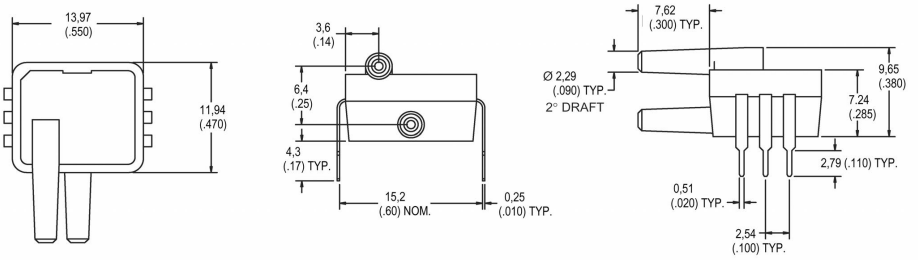
N Housing package



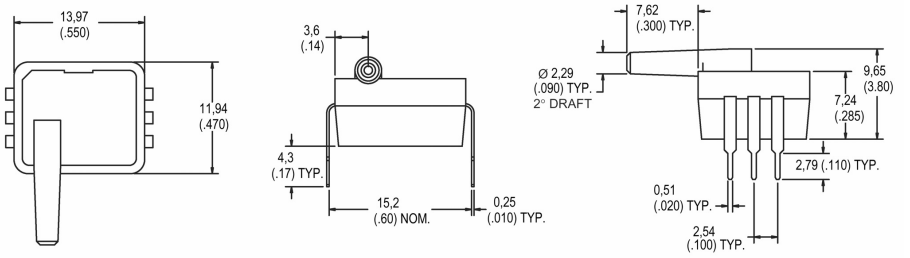
D2 DIP package



DD4 DIP package



AD4 DIP package



WARRANTY/REMEDY

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	+44 (0) 1698 481676 Fax
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	+1-305-883-8257 Fax
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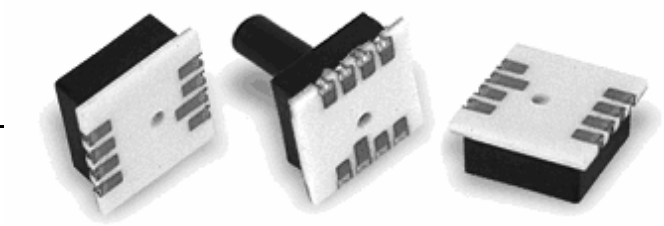
008135-2-EN IL50 GLO
May 2005

Honeywell

SCC SMT Series

Microstructure Pressure Sensors 0 psi to 5 psi through 0 psi to 100 psi



The SCC SMT Series offers an extremely low-cost sensor element with a temperature-stable output when driven with a constant current source. These integrated circuit sensors were designed for extremely cost-sensitive applications where precise accuracy over a wide temperature range is not required.

The standard surface mount package includes an optional ported lid to fit in a variety of applications.

The absolute devices have an internal vacuum reference and an output voltage proportional to absolute pressure. The differential devices allow application of pressure to either side of the sensing diaphragm and can be used for gage or differential measurements.

The 4-pin closed bridge configuration allows electrical connection with additional pads provided for mechanical support. Pulsed power is recommended to achieve maximum accuracy and conserve battery power in portable applications.

FEATURES

- Low cost
- Small size
- Internal temperature compensation
- Absolute or gage pressures
- High-impedance bridge
- Low power consumption

POTENTIAL APPLICATIONS

- Pneumatic controls
- Automotive diagnostics
- Medical equipment/instrumentation
- Dental equipment
- Environmental controls
- Barometric pressure measurement
- Altimeters
- Pneumatic controls
- Battery powered equipment

SCC SMT Series

PRESSURE SENSOR SPECIFICATIONS[1]

Characteristic	Parameter
Supply current, I_S	1.5 mA
Compensated temperature	0 °C to 50 °C [32 °F to 122 °F]
Operating temperature	-40 °C to 125 °C [-40 °F to 257 °F]
Storage temperature	-55 °C to 125 °C [-67 °F to 257 °F]
Humidity	0% to 100% RH
Lead temperature (soldering 2 s to 4 s)	250 °C [482 °F]

STANDARD PRESSURE RANGES[1]

Operating Pressure	Maximum[2] Pressure	Sensitivity[3]		Unit
		Nominal	Std. Dev.	
0 psi to 5 psi	20 psi	7.50	±0.68	mV/mA/psi
0 psi to 15 psi	30 psi	4.30	±0.37	mV/mA/psi
0 psi to 30 psi	60 psi	2.90	±0.57	mV/mA/psi
0 psi to 100 psi	150 psi	1.30	±0.20	mV/mA/psi

PERFORMANCE SPECIFICATIONS[1]

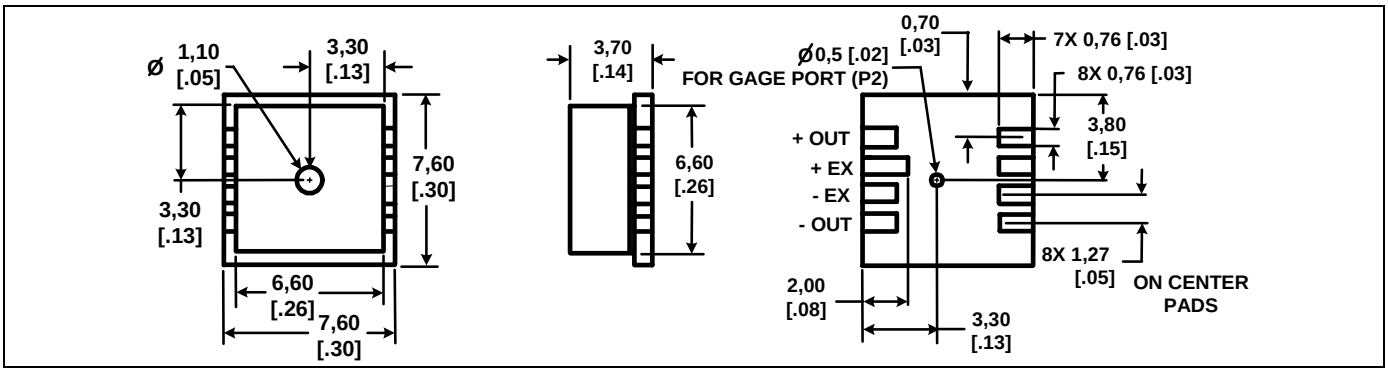
Characteristic	Min.	Typ.	Max.	Unit
Zero pressure offset (T_A = 25 °C)	-30.0	-10.0	20.0	mV
Linearity, hysteresis, repeatability [4]	-1.0	0.2	1.0	% FSS
Temperature effect on span [5]	-1.5	0.25	1.5	% FSS
Temperature effect on offset [5]	-2.0	.5	2.0	% FSS
Long-term stability of offset and span [6]	–	0.1	–	% FSS
Response time (10% to 90%) [7]	–	0.1	–	ms
Input resistance (T_A = 25 °C)	4.00	5.00	6.50	kΩ
Output impedance	4.00	5.00	6.50	kΩ

Notes:

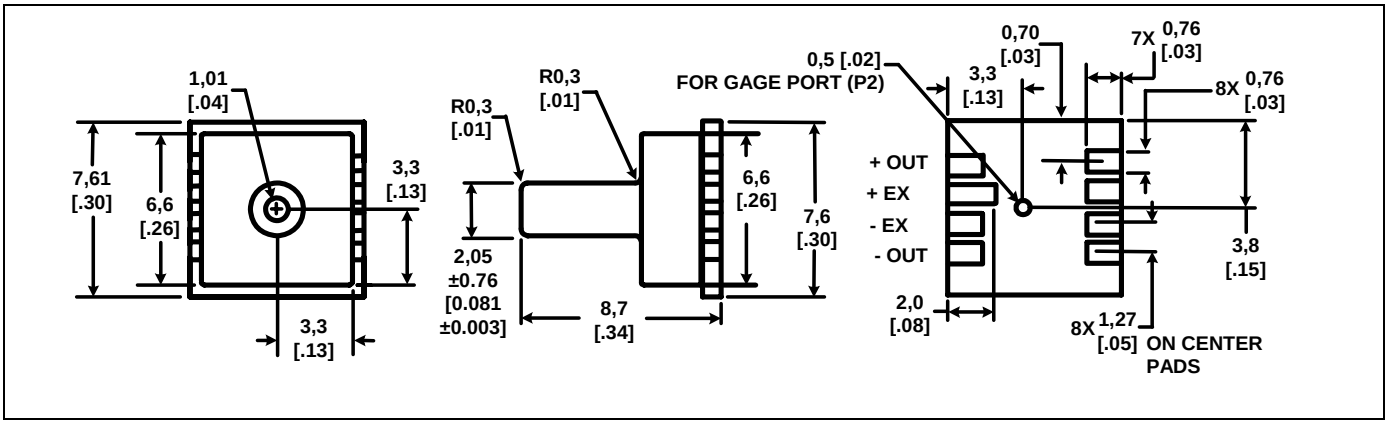
1. Reference conditions: Supply current, I_S = 1.0 mA, T_A = 25 °C to 70 °C [32 °F to 158 °F], common-mode Line pressure = 0 psig, pressure applied to P1 unless otherwise noted.
2. If the maximum pressure is exceeded, even momentarily, the package may leak or burst, or the pressure sensing die may fracture.
3. Sensitivity is the ratio of the output signal voltage change to the corresponding input pressure change. The sensitivity is characterized by design and periodic production testing. This parameter in not 100% tested in production.
4. Linearity is based on best straight line fit. Hysteresis is the maximum output difference at any point within the operating pressure range for increasing and decreasing pressure.
5. Maximum error band of the offset voltage and the error of the band of the span over the compensated temperature range, relative to the 25 °C reading. Typical temperature coefficients for span and resistance are –2200 ppm/°C and 2200 ppm/°C, respectively. Temperature effects on offset and span are guaranteed by design. These parameters are not 100% tested in production.
6. Long term stability over a one year period.
7. Response time for 0 psi to full scale span pressure step change.

MOUNTING DIMENSIONS (For reference only: mm [in].)

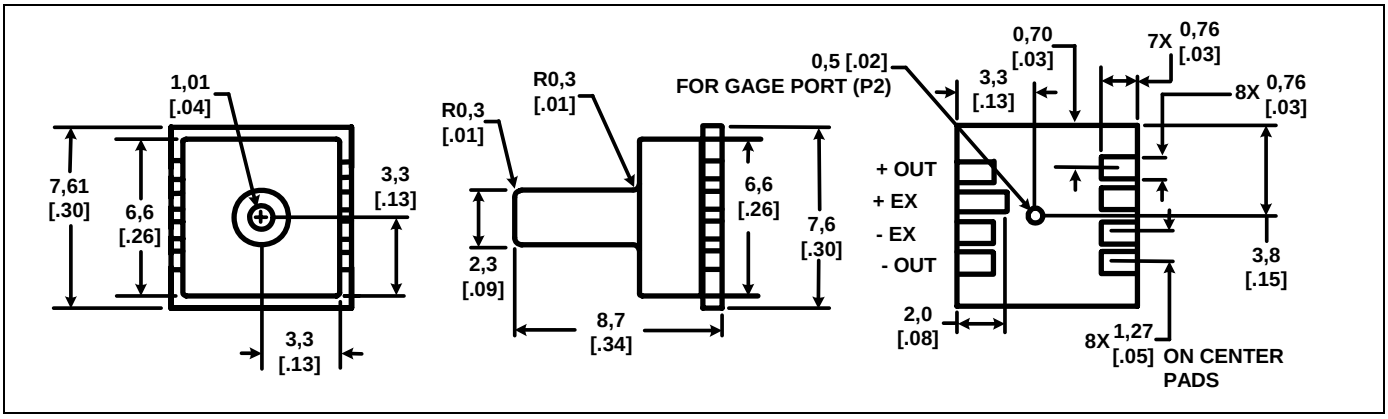
LOW PROFILE SMT



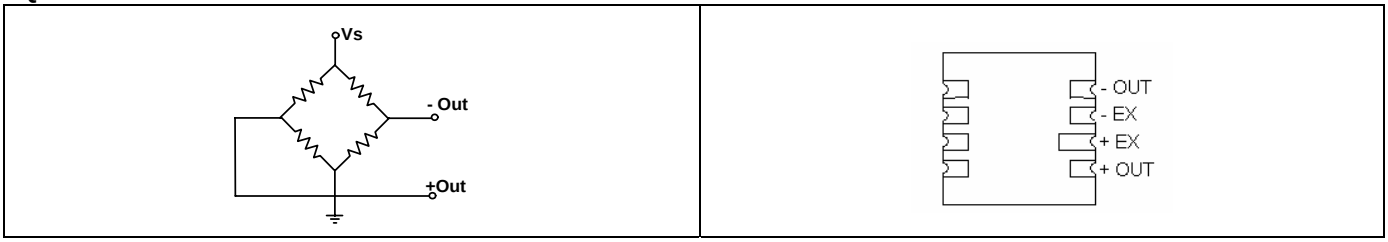
PORTED "P" SMT



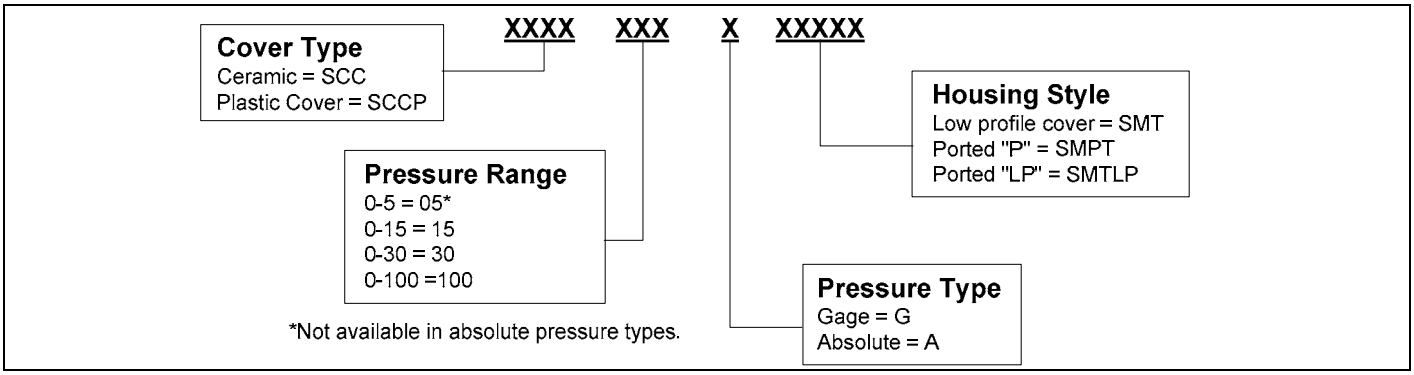
PORTED "LP" SMT



EQUIVALENT CIRCUITS



ORDER GUIDE



⚠ WARNING

MISUSE OF DOCUMENTATION

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- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

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PERSONAL INJURY

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	+44 (0) 1698 481676 Fax
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	+1-305-883-8257 Fax
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Honeywell

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July 2007

Honeywell

Microstructure Pressure Sensors

Compensated 0 psi to 1psi up to 0 psi to 150 psi

SCX Series

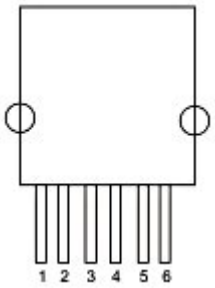
FEATURES

- Precision Temperature Compensation
- Calibrated Zero & Span
- Small Size
- Low Noise
- Low Cost (SCX_NC)
- High Accuracy (SCX_N)
- High Impedance for Low Power Applications

TYPICAL APPLICATIONS

- Medical Equipment
- Barometry
- Computer Peripherals
- Pneumatic Controls
- HVAC

ELECTRICAL CONNECTION



PIN 1) TEMPERATURE OUTPUT (+)
PIN 2) Vs
PIN 3) + OUTPUT
PIN 4) GROUND
PIN 5) - OUTPUT
PIN 6) TEMPERATURE OUTPUT (-)

Note: The polarity indicated is for pressure applied to port B. (For absolute devices pressure is applied to port A and the output polarity is reversed)

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The SCX series sensors provide a very cost-effective solution for pressure applications that require operation over wide temperature range. These internally calibrated and temperature compensated sensors were specifically designed to provide an accurate and stable output over a 0 °C to 70 °C [32 °F to 158 °F] temperature range. This series is intended for use with non-corrosive, non-ionic working fluids such as air, dry gases and the like.

Devices are available to measure absolute, differential and gage pressures from 1 psi (SCX01) up to 150 psi (SCX150). The Absolute (A in model number) devices have an internal vacuum reference and an output voltage proportional to absolute pressure. The Differential (D in model number) devices allow application of pressure to either side of the pressure-sensing diaphragm and can be used for gage or differential measurements.

The SCX series devices feature an integrated circuit (IC) sensor element and laser trimmed thick film ceramic housed in a compact solvent resistant case. This package provides excellent corrosion resistance and provides isolation to external packaging stresses. The package has convenient mounting holes and pressure ports for ease of use with standard plastic tubing for pressure connection.

If the application requires extended temperature range operation, beyond 0 °C to 70 °C [32 °F to 158 °F], two pins which provide an output voltage proportional to temperature are available for use with external circuitry. The 100 microsecond response time makes this series an excellent choice for computer peripherals and pneumatic control applications.

The output of the bridge is ratio metric to the supply voltage. Operation from any dc supply voltage up to 20 Vdc is acceptable.

Contact your local honeywell representative, or go to Honeywell's website at www.honeywell.com/sensing for additional details.

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Microstructure Pressure Sensors

Compensated 0 psi to 1psi up to 0 psi to 150 psi

SCX Series

PRESSURE RANGE SPECIFICATIONS

				Full-Scale Span (1)		
Model *	**Operating Pressure**	**Proof Pressure (2)**	**Sensitivity**	**Min.**	**Typ.**	**Max.**
SCX01DN	0 psid to 1 psid	20 psid	18 mV/psi	17.82 mV	18.00 mV	18.18 mV
SCX01DNC				17.00 mV	18.00 mV	19.00 mV
SCX05DN	0 psid to 5 psid	20 psid	12 mV/psi	59.40 mV	60.00 mV	60.60 mV
SCX05DNC				57.50 mV	60.00 mV	62.50 mV
SCX15AN	0 psid to 15 psia	30 psia	6.0 mV/psi	89.10 mV	90.00 mV	90.90 mV
SCX15ANC				85.00 mV	90.00 mV	95.00 mV
SCX15DN	0 psid to 15 psid	30 psid	6.0 mV/psi	89.10 mV	90.00 mV	90.90 mV
SCX15DNC				85.00 mV	90.00 mV	95.00 mV
SCX30AN	0 psid to 30 psia	60 psia	3.0 mV/psi	89.10 mV	90.00 mV	90.90 mV
SCX30ANC				85.00 mV	90.00 mV	95.00 mV
SCX30DN	0 psid to 30 psid	60 psid	3.0 mV/psi	89.10 mV	90.00 mV	90.90 mV
SCX30DNC				85.00 mV	90.00 mV	95.00 mV
SCX100AN	0 psid to 100 psia	150 psia	1.0 mV/psi	99.00 mV	100.0 mV	101.0 mV
SCX100ANC				95.00 mV	100.0 mV	105.0 mV
SCX100DN	0 psid to 100 psid	150 psid	1.0 mV/psi	99.00 mV	100.0 mV	101.0 mV
SCX100DNC				95.00 mV	100.0 mV	105.0 mV
SCX150AN	0 psid to 150 psia	150 psia	0.6 mV/psi	89.00 mV	90.00 mV	91.00 mV
SCX150ANC				85.00 mV	90.00 mV	95.00 mV
SCX150DN	0 psid to 150 psid	150 psid	0.6 mV/psi	89.00 mV	90.00 mV	91.00 mV
SCX150DNC				85.00 mV	90.00 mV	95.00 mV

*** Ordering information:** Order model number.

GENERAL SPECIFICATIONS

Characteristic	**Description (Maximum Ratings) All Devices**
Supply Voltage (V_S)	20 Vdc
Common Mode Pressure	50 psig
Lead Soldering Temperature (2 seconds to 4 seconds)	250 °C [482 °F]

ENVIRONMENTAL SPECIFICATIONS

Characteristic	**Description (Maximum Ratings) All Devices**
Compensated Operating Temperature	0 °C to 70 °C [32 °F to 158 °F]
Operating Temperature	-40 °C to 85 °C [-40 °F to 185 °F]
Storage Temperature	-55 °C to 125 °C [-67 °F to 257 °F]
Humidity Limits	0 % RH to 100 % RH

ACCURACY

Model	**Accuracy**
SCX01 through SCX150	Calibrated for span to within ±1 % (Highest accuracy)
SCX01_C through SCX150_C	Calibrated for span to within ±5 % (Fine adjustments of zero and span can be provided in external circuitry)

SCX PERFORMANCE CHARACTERISTICS [3]

Characteristic	Min.	Typ.	Max.	Unit
Zero Pressure Offset [4]	-300	0.0	300	Microvolt
Combined Pressure Non-Linearity and Pressure Hysteresis [5]	–	±0.1	±0.5	% FSO
Temperature Effect on Span 0 °C to 70 °C [32 °F to 158 °F] [6]	–	±0.2	±0.1	% FSO
Temperature Effect on Offset 0 °C to 70 °C [32 °F to 158 °F] [6]	–	±100	±500	Microvolt
Repeatability [7]	–	±0.2	±0.5	% FSO
Input Resistance [8]	–	4.0	–	kOhm
Output Resistance [9]	–	4.0	–	kOhm
Common Mode Voltage [10]	5.8	6.0	6.2	Vdc
Response Time [11]	–	100	–	Microsec.
Long Term Stability of Offset and Span [12]	–	±0.1	–	mV

SCX_C SERIES PERFORMANCE CHARACTERISTICS [3]

Characteristic	Min.	Typ.	Max	Unit
Zero Pressure Offset	-1.0	0.0	±1.0	mV
Combined Pressure Non-Linearity and Pressure Hysteresis [5]	–			
Models: SCX05DNC, SCX15ANC, and SCX15DNC,	–	±0.1	±1.0	% FSO
Models: SCX01DNC, SCX30ANC, SCX30DNC, SCX100ANC, SCX100DNC, SCX150ANC, and SCX150DNC		±0.2	±1.0	% FSO
Temperature Effect on Span 0 °C to 70 °C [32 °F to 158 °F] [6]	–	±0.4	±2.0	% FSO
Temperature Effect on Offset 0 °C to 70 °C [32 °F to 158 °F] [6]	–	±0.2	±1.0	mV
Repeatability [7]	–	±0.2	±0.5	% FSO
Input Resistance [8]	–	4.0	–	kOhm
Output Resistance [9]	–	4.0	–	kOhm
Common Mode Voltage [10]	5.7	6.0	6.3	Vdc
Response Time [11]	–	100	–	Microsec.
Long Term Stability of Offset and Span [12]	–	±0.1	–	mV

SPECIFICATION NOTES

Note 1: Full-Scale Span is the algebraic difference between the output voltage at full-scale pressure and the output at zero pressure. Full-Scale Span is ratiometric to the supply voltage.

Note 2: Maximum pressure above which causes permanent sensor failure.

Note 3: Reference Conditions: (Unless otherwise noted)
T_A = 25°C, Supply V_S = 12 Vdc, Common Mode Line pressure = 0 psig, Pressure applied to Port B. For absolute devices only, pressure is applied to Port A, and the output polarity is reversed.

Note 4: For models SCX15AN, SCX30AN, SCX100AN, and SCX150AN, the Maximum zero pressure offset for absolute devices is 0 to ±500 Microvolt.

Note 5: Pressure Hysteresis – the maximum output difference at any point within the operating pressure range for increasing and decreasing pressure.

Note 6: Maximum error band of the offset voltage and the error band of the span, relative to the 25 °C [77 °F] reading.

Note 7: Maximum difference in output at any pressure within the operating pressure range and the temperature within 0 °C to 70 °C [32 °F to 158 °F] after:
a) 1,000 temperature cycles, 0 °C to 70 °C [32 °F to 158 °F]
b) 1.5 million pressure cycles, 0 psi to Full-Scale Span.

Note 8: Input resistance is the resistance between pins 2 and 4.

Note 9: Output resistance is the resistance between pins 3 and 5.

Note 10: Common Mode voltage of the output arms (Pins 3 and 5) for V_S=12 Vdc.

Note 11: Response time for a 0 psi to Full-Scale Span pressure step change, 10 % to 90 % rise time.

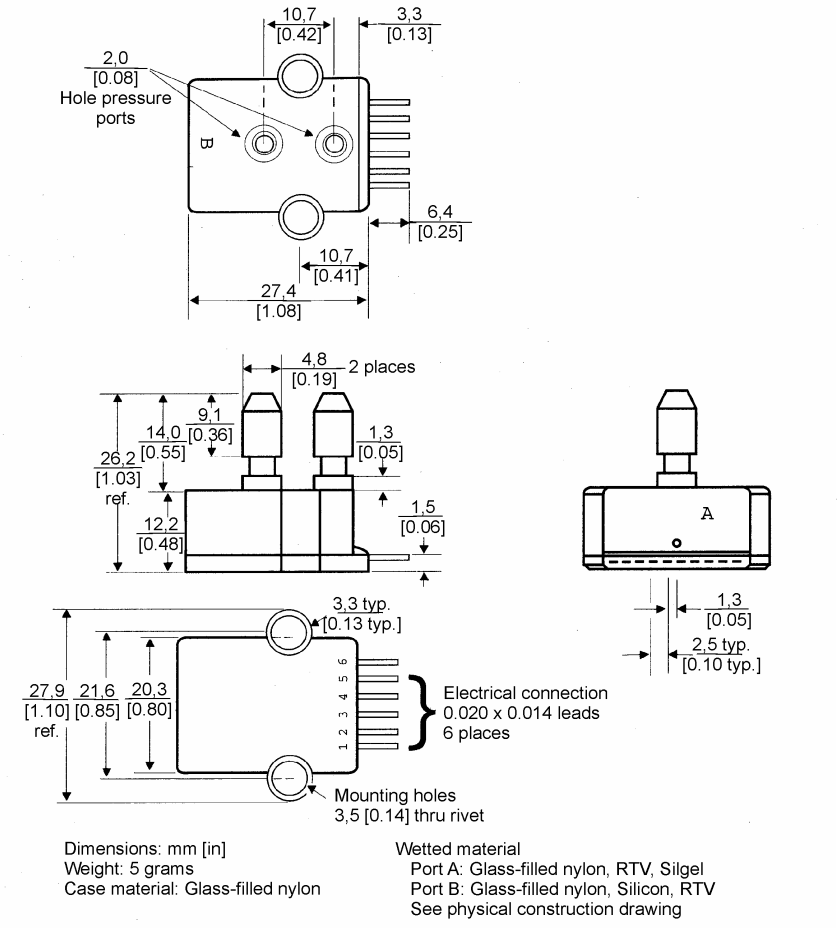
Note 12: Long term stability over a one-year period.

Microstructure Pressure Sensors

Compensated 0 psi to 1psi up to 0 psi to 150 psi

SCX Series

PHYSICAL DIMENSIONS for Reference Only (mm/in)



Dimensions: mm [in]
Weight: 5 grams
Case material: Glass-filled nylon

Wetted material
Port A: Glass-filled nylon, RTV, Silgel
Port B: Glass-filled nylon, Silicon, RTV
See physical construction drawing

WARRANTY/REMEDY

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1-815-235-6847 International

FAX

1-815-235-6545 USA

INTERNET

www.honeywell.com/sensing
info.sc@honeywell.com

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www.honeywell.com/sensing
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11 West Spring Street
Freeport, Illinois 61032

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Honeywell

Microstructure Pressure Sensors

Precision Compensated

0 in H_2O to 4 in H_2O and 0 in H_2O to 10 in H_2O

SCXL Series

FEATURES

- Very Low Pressure Resolution
- Precision Temperature Compensation
- Small Size
- Low Noise
- Calibrated Zero & Span
- High Impedance for Low Power Applications

TYPICAL APPLICATIONS

- Air Flow
- Respirators
- HVAC
- Medical Equipment
- Computer Peripherals
- Pneumatic Controls

The SCXL series sensors provide a very cost-effective solution for pressure applications that require high accuracy over very low operating pressure ranges. These internally calibrated and temperature compensated sensors were specifically designed to provide an accurate and stable output over a 0 °C to 50 °C [32 °F to 122 °F] temperature range. This series is intended for use with non-corrosive, non-ionic working fluids such as air, dry gases and the like.

The output of the bridge is ratiometric to the supply voltage. Operation from any dc supply voltage up to 18 Vdc [Model SCXL004DN] or 20 Vdc [SCXL010DN] is acceptable.

Contact your local honeywell representative or go to Honeywell's website at www.honeywell.com/sensing for additional details.

⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

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Microstructure Pressure Sensors

Precision Compensated

0 in H_2O to 4 in H_2O and 0 in H_2O to 10 in H_2O

SCXL Series

GENERAL SPECIFICATIONS

Characteristic	Description (Maximum Ratings) SCXL004DN	Description (Maximum Ratings) SCXL010DN
Supply Voltage (V_S)	18 Vdc	20 Vdc
Common Mode Pressure	150 in H_2O	50 psig
Lead Soldering Temperature (2 seconds to 4 seconds)	250 °C [482 °F]	250 °C [482 °F]
Proof Pressure [12]	10 in H_2O	10 psi
Burst Pressure	5 psi	200 in H_2O

ENVIRONMENTAL SPECIFICATIONS

Characteristic	Description (Maximum Ratings) SCXL004DN	Description (Maximum Ratings) SCXL010DN
Compensated Operating Temperature	0 °C to 50 °C [32 °F to 122 °F]	0 °C to 50 °C [32 °F to 122 °F]
Operating Temperature	0 °C to 70 °C [32 °F to 158 °F]	-40 °C to 85 °C [-40 °F to 185 °F]
Storage Temperature	0 °C to 70 °C [32 °F to 158 °F]	-40 °C to 125 °C [-40 °F to 257 °F]
Humidity Limits	0 % to 100 % RH	0 % to 100 % RH

PRESSURE RANGE SPECIFICATIONS

			Full-Scale Span [1]		
Listing	Operating Pressure	Proof Pressure [2]	Min.	Typ.	Max.
SCXL004DN	0 in H_2O to 4 in H_2O	10 in H_2O	38.0 mV	40.0 mV	42.0 mV
SCXL010DN	0 in H_2O to10 in H_2O	10 psi	19.5 mV	20.0 mV	20.5 mV

SCXL004DN PERFORMANCE CHARACTERISTICS [3]

Characteristic	Min.	Typ.	Max.	Unit
Zero Pressure Offset [4]	-1.5	0	1.5	mV
Sensitivity	–	10	–	mV/in H_2O
Combined Pressure Non-Linearity and Pressure Hysteresis [5]	–	±0.5	±1.0	% FSS
Temperature Effect on Span 0 °C to 50 °C [32 °F to 122 °F] [6]	–	±0.2	±1.0	% FSS
Temperature Effect on Offset 0 °C to 50 °C [32 °F to 122 °F] [6]	–	±0.5	±2.0	mV
Repeatability [7]	–	±0.2	–	% FSS
Input Resistance [8]	–	4.0	–	kOhm
Output Resistance [9]	–	4.0	–	kOhm
Common Mode Voltage [10]	5.7	6.0	6.3	Vdc
Response Time [11]	–	500	–	Microsec.
Long Term Stability of Offset and Span [12]	–	±0.5	–	% FSS
Position Sensitivity	–	0.25	–	mV/g

SCXL010DN PERFORMANCE CHARACTERISTICS (3)

Characteristic	Min.	Typ.	Max.	Unit
Zero Pressure Offset (4)	-0.3	0.0	0.3	mV
Sensitivity	–	2	–	mV/in H_2O
Combined Pressure Non-Linearity and Pressure Hysteresis (5)	–	±0.2	±0.5	% FSS
Temperature Effect on Span 0 °C to 50 °C [32 °F to 122 °F] (6)	–	±0.2	±1.0	% FSS
Temperature Effect on Offset 0 °C to 50 °C [32 °F to 122 °F] (6)	–	±300	±500	Microvolts
Repeatability (7)	–	±0.2	±0.5	% FSS
Input Resistance (8)	–	4.0	–	kOhm
Output Resistance (9)	–	4.0	–	kOhm
Common Mode Voltage (10)	5.8	6.0	6.2	Vdc
Response Time (11)	–	100	–	Microsec.
Long Term Stability of Offset and Span (12)	–	100	–	Microvolts

SPECIFICATION NOTES

Note 1: Full-Scale Span is the algebraic difference between the output voltage at full-scale pressure and the output at zero pressure. Full-Scale Span is ratiometric to the supply voltage.

Note 2: Proof pressure is the pressure above which devices will not return to guaranteed specifications.

Note 3: Reference Conditions: (Unless otherwise noted)
T_A = 25 °C, Supply V_S = 12 Vdc, Common Mode Line pressure = 0 psig, Pressure applied to Port B. For absolute devices only, pressure is applied to Port A, and the output polarity is reversed.

Note 4: Zero pressure effect is measured with pins pointed towards the ground. Offset can be position sensitive.

Note 5: Pressure Hysteresis – the maximum output difference at any point within the operating pressure range for increasing and decreasing pressure.

Note 6: Maximum error band of the offset voltage and the error band of the span, relative to the 25 °C [77 °F] reading.

Note 7: Maximum difference in output at any pressure within the operating pressure range and the temperature within 0 °C to 50 °C [32 °F to 122 °F] after:
004DN: a) 100 temperature cycles, 0 °C to 50 °C [32 °F to 122 °F]
b) 1 million pressure cycles, 0 psi to Full-Scale Span.
010DN: a) 1,000 temperature cycles, 0 °C to 50 °C [32 °F to 122 °F]
b) 1.5 million pressure cycles, 0 psi to Full-Scale Span.

Note 8: Input resistance is the resistance between pins 2 and 4.

Note 9: Output resistance is the resistance between pins 3 and 5.

Note 10: Common Mode voltage of the output arms (Pins 3 and 5) for V_S=12 Vdc.

Note 11: Response time for a 0 psi to Full-Scale Span pressure step change, 10 % to 90 % rise time.

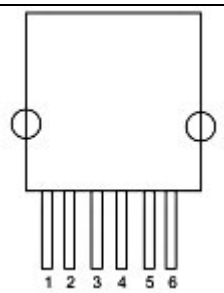
Note 12: Long term stability over a one-year period.

ORDERING INFORMATION

Description	Part Number
0 in H_2O to 4 in H_2O	SCXL 004DN
0 in H_2O to 10 in H_2O	SCXL 010DN

Special Options: Pins with N-90 = 90° Lead Bend

ELECTRICAL CONNECTION

Pinout	SCXL004DN [0 in H_2O to 4 in H_2O]	SCXL004DN [0 in H_2O to 10 in H_2O]
	PIN 1) Temperature output (+) PIN 2) V_S PIN 3) + Output PIN 4) Ground PIN 5) - Output PIN 6) Temperature output (-)	PIN 1) No Connection PIN 2) V_S PIN 3) + Output PIN 4) Ground PIN 5) - Output PIN 6) No Connection

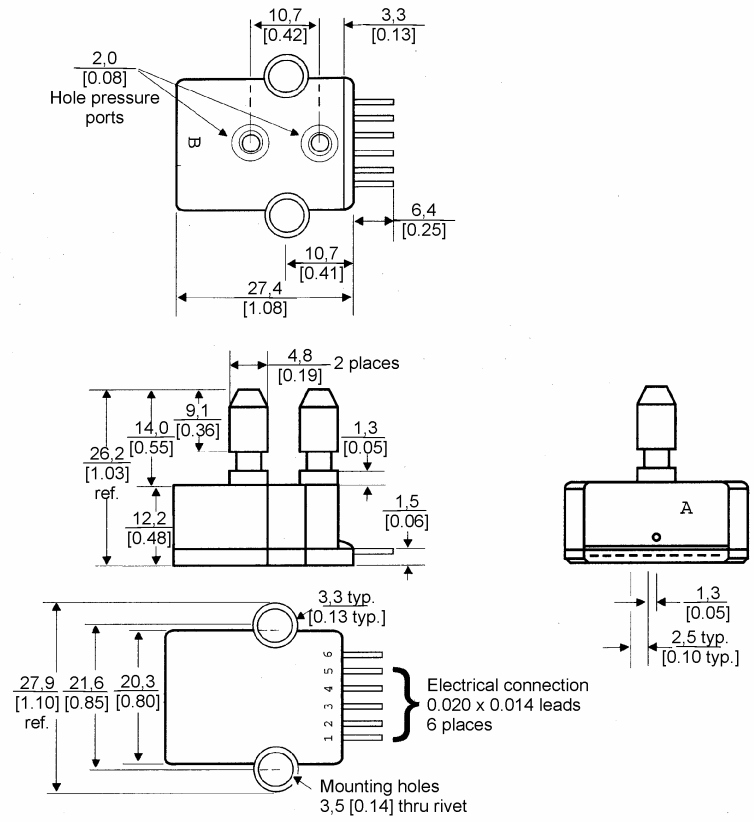
Microstructure Pressure Sensors

Precision Compensated

0 in H_2O to 4 in H_2O and 0 in H_2O to 10 in H_2O

SCXL Series

PHYSICAL DIMENSIONS for Reference Only-(mm/in)



Dimensions: mm [in]
Weight: 5 grams
Case material: Glass-filled nylon

Wetted material
Port A: Glass-filled nylon, RTV, Silgel
Port B: Glass-filled nylon, Silicon, RTV
See physical construction drawing

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. **The foregoing is Buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

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While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

For application assistance, current specifications, or name of the nearest Authorized Distributor, contact a nearby sales office. Or call:

1-800-537-6945 USA/Canada
1-815-235-6847 International

FAX

1-815-235-6545 USA

INTERNET

www.honeywell.com/sensing
info.sc@honeywell.com

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Freeport, Illinois 61032

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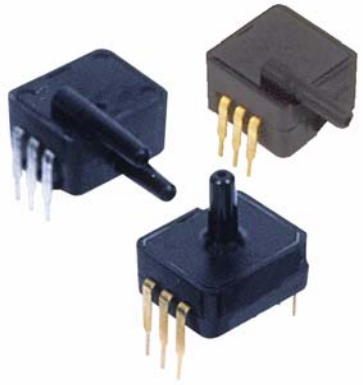
Honeywell

SDX Series

Plastic Silicon Pressure Sensors Low Cost, Temperature Compensated, DIP, 0 psi to 1 psi, 0 psi to 100 psi



DESCRIPTION

The SDX Series sensors provide a very cost-effective solution for pressure applications that require small size plus performance. These calibrated and temperature-compensated sensors give an accurate and stable output over a 0 °C to 50 °C [32 °F to 122 °F] temperature range. This series is intended for use with non-corrosive, non-ionic working fluids such as air and dry gases.

Devices are available to measure absolute and gage pressures from 1 psi (SDX01) up to 100 psi (SDX100). The absolute devices have an internal vacuum reference and an output voltage proportional to absolute pressure. The SDX devices are available in standard commercial and prime grades (SDCXXXXX**-A**) to allow optimization of accuracy and cost in any given application.

The SDX devices feature an integrated circuit (IC) sensor element and laser trimmed thick film ceramic housed in a compact solvent resistant case. The package is a double-wide, dual-inline package (DIP). This is the same familiar package used by IC manufacturers except it is only 11,94 mm [0.470 in] long and has a pressure port(s). The PC board area used by each DIP is approximately 0.26 in^2. This extremely small size enables the use of multiple sensors in limited available space. The DIP provides excellent corrosion resistance and isolation to external package stress.

The DIP mounts on a PC board like a standard IC with through-hole pins. The pins anchor the pressure sensor to the PC board and provide a more secure and stable unit than other types of packages.

The output of the bridge is ratiometric to the supply voltage and operation from any dc supply voltage up to 20 Vdc is acceptable.

FEATURES

- Low cost DIP
- Precision temperature compensation
- Calibrated zero and span
- Small size
- Low noise
- High impedance for low power applications
- Prime grade available (SDXxxxyy-A)

POTENTIAL APPLICATIONS

- Medical equipment
- Computer peripherals
- Pneumatic controls
- HVAC

SDX Series

Table 1. Pressure Range Specifications and Ordering Information

Catalog Listing, Pressure Connection, Pressure Type			Operating Pressure	Proof Pressure [2]	Full-Scale Span [1]		
Gage	Differential/Gage	Absolute			Min.	Typ.	Max.
SDX01G2	SDX01D4	-	0 psid to 1 psid	20 psid	17.37 mV	18.00 mV	18.18 mV
SDX01G2-A	SDX01D4-A	-			17.82 mV	18.00 mV	18.80 mV
SDX05G2	SDX05D4	-	0 psid to 5 psid	20 psid	57.90 mV	60.00 mV	62.10 mV
SDX05G2-A	SDX05D4-A	-			59.40 mV	60.00 mV	60.60 mV
SDX15G2	SDX15D4	-	0 psid to 15 psid	30 psid	86.85 mV	90.00 mV	93.15 mV
SDX15G2-A	SDX15D4-A	-			89.10 mV	90.00 mV	90.90 mV
-	-	SDX15A2	0 psia to 15 psia	30 psia	86.85 mV	90.00 mV	93.15 mV
-	-	SDX15A4			86.85 mV	90.00 mV	93.15 mV
-	-	SDX15A2-A			89.10 mV	90.00 mV	90.90 mV
-	-	SDX15A4-A			89.10 mV	90.00 mV	90.90 mV
SDX30G2	SDX30D4	-	0 psid to 30 psid	60 psid	86.85 mV	90.00 mV	93.15 mV
SDX30G2-A	SDX30D4-A	-			89.10 mV	90.00 mV	90.90 mV
-	-	SDX30A2	0 psia to 30 psia	60 psia	86.85 mV	90.00 mV	93.15 mV
-	-	SDX30A4			86.85 mV	90.00 mV	93.15 mV
-	-	SDX30A2-A			89.10 mV	90.00 mV	90.90 mV
-	-	SDX30A4-A			89.10 mV	90.00 mV	90.90 mV
SDX100G2	SDX100D4	-	0 psid to 100 psid	150 psid	96.50 mV	100.00 mV	103.5 mV
SDX100G2-A	SDX100D4-A	-			99.00 mV	100.00 mV	101.0 mV
-	-	SDX100A2	0 psia to 100 psia	150 psia	96.50 mV	100.00 mV	103.5 mV
-	-	SDX100A4			96.50 mV	100.00 mV	103.5 mV
-	-	SDX100A2-A			99.00 mV	100.00 mV	101.0 mV
-	-	SDX100A4-A			99.00 mV	100.00 mV	101.0 mV

Nomenclature	Pressure Connection (See Fig. 2)	Pressure Type	Grade
G2	A2/G2	gage	standard commercial
G2-A	A2/G2	gage	prime
D4	OK	differential	standard commercial
D4-A	OK	differential	prime
A2	A2/G2	absolute	standard commercial
A2-A	A2/G2	absolute	prime
A4	A4	absolute	standard commercial
A4-A	A4	absolute	prime

Table 2. General Specifications (Maximum)

Characteristic	Parameter
Supply voltage (Vs)	20 Vdc
Common mode pressure	150 psig
Lead soldering temperature (2 s to 4 s)	250 °C [482 °F]

Table 3. Environmental Specifications (Maximum)

Characteristic	Parameter
Compensated operating temperature	0 °C to 50 °C [32 °F to 122 °F]
Operating temperature	-40 °C to 85 °C [-40 °F to 185 °F]
Storage temperature	-55 °C to 125 °C [-67 °F to 257 °F]
Humidity limits	0% RH to 100% RH

Plastic Silicon Pressure Sensors, Low Cost, Temperature Compensated, DIP, 0 psi to 1 psi, 0 psi to 100 psi

Table 4. Performance Characteristics[3]

Characteristic	Min.	Typ.	Max.	Unit
Zero pressure offset	-1.0	0.0	+1.0	mV
Zero pressure offset (prime grade) [4]	-0.3	0.0	0.3	mV
Combined linearity and hysteresis [5]	–	±0.2	±1.0	% FSO
Combined linearity and hysteresis (prime grade) [5] [13]	–	±0.1	±0.25	% FSO
Temperature effect on span, 0 °C to 50 °C [32 °F to 122 °F] [6]	–	±0.4	±2.0	% FSO
Temperature effect on span, 0 °C to 50 °C [32 °F to 122 °F] [6] (prime grade)	–	±0.4	±1.0	% FSO
Temperature effect on offset 0, °C to 50 °C [32 °F to 122 °F] [6]	–	±0.2	±1.0	mV
Temperature effect on offset 0, °C to 50 °C [32 °F to 122 °F] [6] (prime grade)	–	±0.2	±0.5	mV
Repeatability [7]	–	±0.2	±0.5	% FSO
Input resistance [8]	–	4.0	–	kOhm
Output resistance [9]	–	4.0	–	kOhm
Common mode voltage [10]	1.5	3.0	5.0	Vdc
Response time [11]	–	100	–	µs
Long term stability of offset and span [12]	–	±0.1	–	mV

Notes:

1. Full-Scale Span is the algebraic difference between the output voltage at full-scale pressure and the output at zero pressure. Full-Scale Span is ratiometric to the supply voltage.
2. Maximum pressure above which causes permanent sensor failure.
3. Reference conditions:
   - $^{T}_{A}$ = 25 °C (unless otherwise noted).
   - Supply V_S = 12 Vdc, Common Mode Line pressure = 0 psig.
   - Pressure applied to Port B. For absolute devices only, pressure is applied to Port A and the output polarity is reversed.
4. Maximum zero pressure offset for absolute devices is ±500 mV.
5. Hysteresis is the maximum output difference at any point within the operating pressure range for increasing and decreasing pressure.
6. Maximum error band of the offset voltage and the error band of the span, relative to the 25 °C [77 °F] reading.
7. Maximum difference in output at any pressure within the operating pressure range and the temperature within 0 °C to 50 °C [32 °F to 122 °F] after:
   - 100 temperature cycles, 0 °C to 50 °C [32 °F to 122 °F].
   - 1.0 million pressure cycles, 0 psi to full-scale span.
8. Input resistance is the resistance between V_s and ground.
9. Output resistance is the resistance between the + and - outputs.
10. Common Mode voltage of the output arms for V_s=12 Vdc.
11. Response time for a 0 psi to Full-Scale Span pressure step change, 10% to 90% rise time.
12. Long term stability over a one-year period.
13. Maximum combined linearity and hysteresis for the SDX05 prime grade is ±0.5%.

Figure 1. Electrical Connections

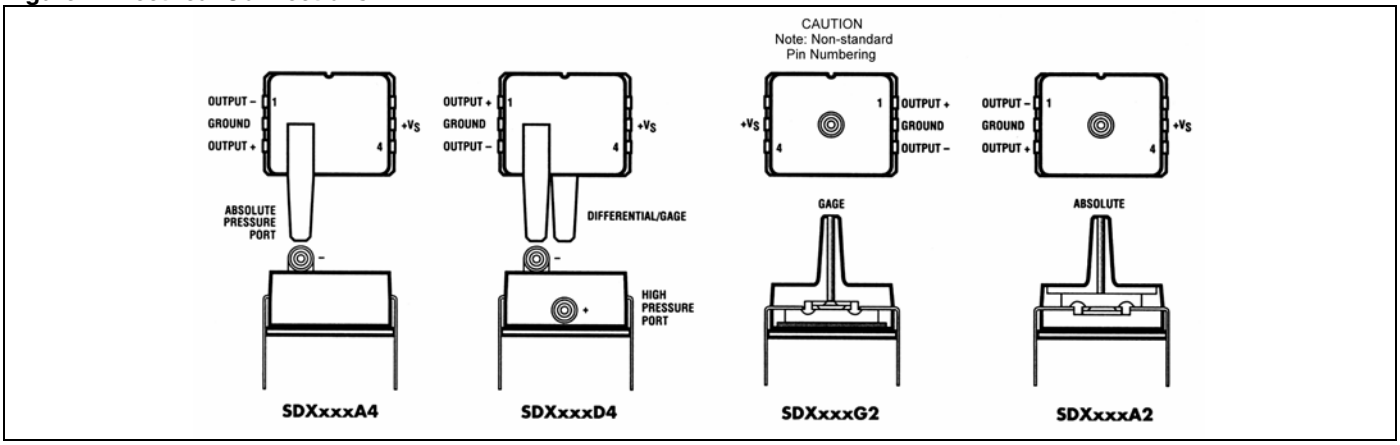
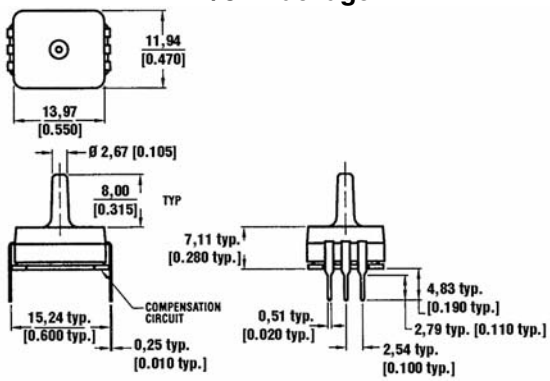
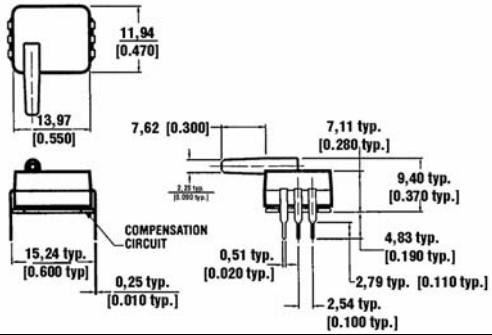


Figure 2. Mounting Dimensions (For Reference Only. mm/[in])

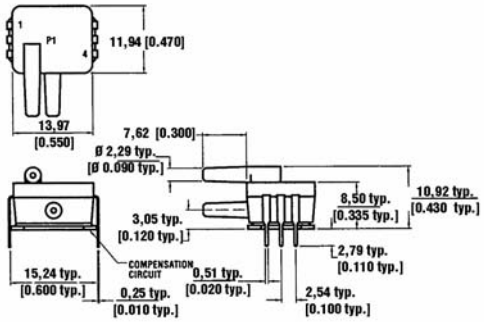
A2/G2 Package



A4 Package



D4 Package



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WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

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SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

E-mail: info.sc@honeywell.com

Internet: www.honeywell.com/sensing

Phone and Fax:

Asia Pacific	+65 6355-2828; +65 6445-3033 Fax
Europe	+44 (0) 1698 481481; +44 (0) 1698 481676 Fax
Latin America	+1-305-805-8188; +1-305-883-8257 Fax
USA/Canada	+1-800-537-6945; +1-815-235-6847 +1-815-235-6545 Fax

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Golden Valley, Minnesota 55422
www.honeywell.com/sensing

008103-3-EN IL50 GLO Printed in USA
November 2008

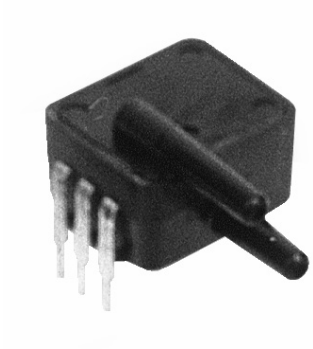
Microstructure Pressure Sensors

Compensated 0 in H_2O to 5 H_2O in H_2O and 0 in H_2O to 10 in H_2O

SDX IND Series

FEATURES
- Low Cost Dual Inline Package
- Temperature Compensated
- Calibrated Zero and Span
- Small Size
- Low Noise
- High Impendance for Low Power Applications

TYPICAL APPLICATIONS
- Medical Equipment
- Computer Peripherals
- Pneumatic Controls
- HVAC



The SDX series sensors provide a very cost effective solution for pressure applications that require small size plus performance. These calibrated and temperature compensated sensors give an accurate and stable output over a 0 °C to 50 °C [32 °F to 122 °F] range. This series is intended for use with non-corrosive, non-ionic working fluids, such as, air and other dry gases.

The SDX series devices are specifically designed to measure low pressures with a 0 in H_2O to 10.0 in H_2O full scale range. The output of the bridge is ratiometric to the supply voltage up to 20.0 Vdc is acceptable.

The SDX series devices feature an integrated circuit sensor element and laser trimmed thick film ceramic housed in a compact solvent resistant case. The package is a double wide (i.e. 15,24 mm [0.600 in] lead spacing) dual inline package. This is the same familiar package used by IC manufactures except it has integral pressure port(s). The PC board area used by each DIP is approximately 6,60 mm² [0.26 in²]. This extremely small size enables the use of multiple sensors in limited available space. The DIP provides excellent isolation to external package stress.

The DIP mounts on a PC board like a standard IC with through-hole pins. The pins anchor the pressure sensor to the PC board which provides a more secure and stable unit than other types of packages.

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Microstructure Pressure Sensors

Compensated 0 in H_2O to 5 in H_2O
and 0 in H_2O to 10 in H_2O

SDX IND Series

PRESSURE RANGE SPECIFICATIONS

			Full-Scale Span [1]		
Listing	**Operating Pressure**	**Proof Pressure**	**Min.**	**Typ.**	**Max.**
SDX005IND4	0 in H_2O to 5 in H_2O	193 in H_2O	19.5 mV	20.0 mV	20.5 mV
SDX010IND4	0 in H_2O to 10 in H_2O	193 in H_2O	24.5 mV	25.0 mV	25.5 mV

GENERAL SPECIFICATIONS (all devices)

Characteristic	**Description (Maximum Ratings)**
Supply Voltage (V_S)	20.0 Vdc
Maximum Pressure on any Port	50 psig
Lead Temperature (Soldering 10 Sec.)	250 °C [482 °F]
Burst Pressure	193 H_2O [7 psi]

ENVIRONMENTAL SPECIFICATIONS (all devices)

Compensated Operating Temperature	0 °C to 50 °C [32 °F to 122 °F]
Operating Temperature	-40 °C to 85 °C [-40 °F to 185 °F]
Storage Temperature	-55 °C to 125 °C [-67°F to 257 °F]
Humidity Limits	0 % RH to 100 % RH

PERFORMANCE SPECIFICATIONS (all devices) [2]

Characteristic	**Min.**	**Typ.**	**Max.**	**Unit**
Zero Pressure Offset	-1.0	0	+ 1.0	mV
Combined Linearity and Hysteresis [3]	–	± 0.2	± 1.0	% FSS
Temperature Effect on Span 0 °C to 50 °C [32 °F to 122 °F] [4]	–	± 0.4	± 2.0	% FSS
Temperature Effect on Offset 0 °C to 50 °C [32 °F to 122 °F] [4]	–	± 0.2	± 0.6	mV
Repeatability [5]	–	± 0.5	–	% FSS
Input Resistance [6]	–	4.0	–	KΩ
Output Resistance [7]	–	4.0	–	KΩ
Common-Mode Voltage [8]	1.5	3.0	5.0	Vdc
Response Time [9]	–	100	–	µsec
Long Term Stability of Offset and Span [10]	–	± 0.1	–	% FSS

SPECIFICATION NOTES

Note 1: Span is the algebraic difference between the output voltage at full-scale pressure and the output at zero pressure. Span is ratiometric to the supply voltage.

Note 2: Reference conditions (unless otherwise noted): Supply voltage, V_s = 12 Vdc, TA = 25 °C [77 °F], Common Mode Line Pressure = 0 psig, pressure applied to port 2

Note 3: Hysteresis is the maximum output difference at any point within the operating pressure range fro increasing and decreasing pressure.

Note 4: Maximum error band of the offset voltage and the error band of the span, relative to the 25 °C [77 °F] reading.

Note 5: Maximum difference in output at any pressure with the operating pressure range and temperature within 0 °C to 50 °C [32 °F to 122 °F] after:
- a) 100 temperature cycles, °C to 50 °C [32 °F to 122 °F]
- b) 1.0 million pressure cycles, 0 in H_2O to full-scale span

Note 6: Input impedance is the impedance between V_s and ground

Note 7: Output impedance is the impedance between the + and – outputs.

Note 8: This is the common-mode voltage of the output arms for VS = 12 Vdc

Note 9: Response time for a 0 psi to full-scale span pressure step change, 10 % to 90 % rise time.

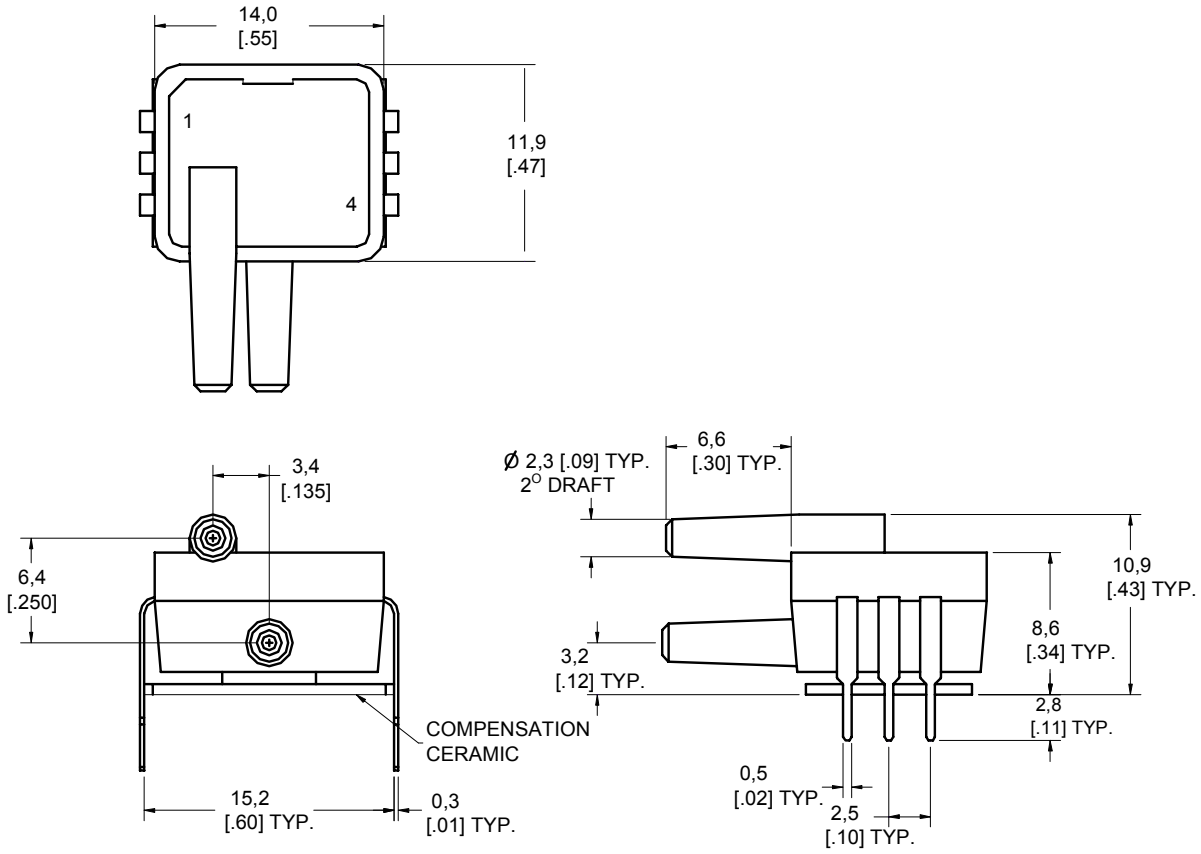
Note 10: Long term stability over a one year period.

Microstructure Pressure Sensors

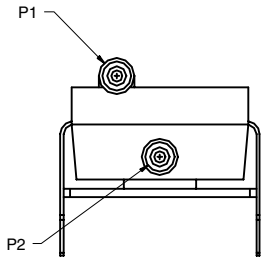
Compensated 0 in H_2O to 5 in H_2O
and 0 in H_2O to 10 inH_2O

SDX IND Series

PHYSICAL DIMENSIONS for reference only mm [in]



PORT CONFIGURATION

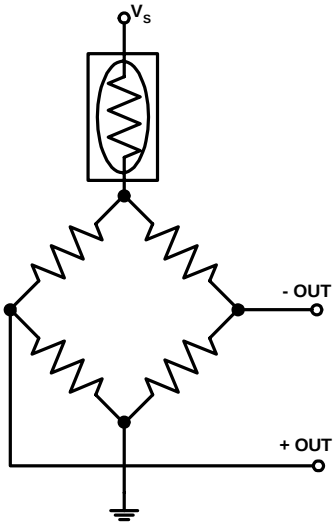


Microstructure Pressure Sensors

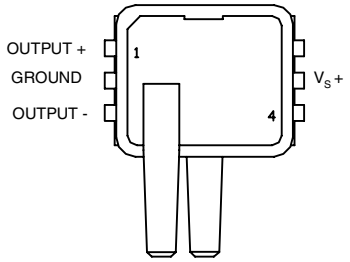
Compensated 0 in H_2O to 5 in H_2O
and 0 in H_2O to 10 in H_2O

SDX IND Series

EQUIVALENT CIRCUIT



ELECTRICAL CONNECTIONS



ORDER INFORMATION

Listings	Operating Pressure Range
SDX005IND4	0 in H_2O to 5 in H_2O
SDX010IND4	0 in H_2O to 10 in H_2O

WARRANTY/REMEDY

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1-800-537-6945 USA/Canada
1-815-235-6847 International

FAX

1-815-235-6545 USA

INTERNET

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Sensing and Control
www.honeywell.com/sensing
Honeywell
11 West Spring Street
Freeport, Illinois 61032

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Honeywell

Pressure Sensor

Low Pressure Sensor

SLP Series

FEATURES

- Accurate low pressure readings
- Low cost
- High impedance bridge
- Low noise
- Low power consumption for battery operation

TYPICAL APPLICATIONS

- Medical instrumentation
- Portable and battery-operated equipment
- Air-flow monitoring
- HVAC
- Industrial controls

The SLP series of pressure sensors provides the lowest cost components for measuring very low pressures. These low pressure range devices were specifically designed to accurately measure differential and gage pressures of 0 inches to four inches of H_2O.

They are meant for use with non-corrosive and non-ionic media, such as air, dry gases, and the like.

These differential devices allow application of pressure to either side of the diaphragm and can be used for gage or differential pressure measurements.

⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

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ABSOLUTE MAXIMUM RATINGS

	Ratings
Supply voltage	7.5 Vdc
Temperature ranges	
Operating	0 °C to 50 °C [32 °F to 122 °F]
Storage	0 °C to 70 °C [32 °F to 158 °F]
Common mode pressure	150 in. H_2O
Lead temperature (soldering 2 to 4 seconds)	250 °C [482 °F]
Proof pressure	10 in H_2O
Burst pressure [9]	5 psi

PERFORMANCE SPECIFICATIONS [1]

	Min.	Typ.	Max.	Unit
Operating pressure	-	-	4.0	In. H_2O
Sensitivity Ta = 25 °C [77 °F]	1700	2500	5500	µV/V/ In. H_2O
Full-scale span 4 In. H_2O [2]	34	50	110	mV
Temperature coefficient of span [3, 4]	-2850	-2400	-1950	ppm/°C
Zero pressure offset Ta = 25 °C [77 °F]	-40	0	40	mV
Temperature coefficient of offset [3]	-	±4	-	µV/V/°C
Combined linearity and hysteresis [5]	-	0.5	1.0	% FS
Long-term stability of offset and sensitivity [6]	-	0.5	-	% FS
Response time (10 % to 90 %) [7]	-	100	-	µS
Input resistance Ta = 25 °C [77 °F]	-	4.7	-	kOhm
Temperature coefficient of resistance [3, 4]	2100	2300	2500	ppm/°C
Output impedance	-	4.7	-	kOhm
Repeatability [8]	-	0.5	-	% FS
Position sensitivity	-	50	-	µV/V/g

SPECIFICATION NOTES

1. Reference conditions: supply voltage Vs = 5 Vdc, Ta = 25 °C [77 °F]. Common-mode line pressure = 0 psig. Pressure applied to P2.
2. Span is the algebraic difference between the output voltage at full-scale pressure and the output at zero pressure.
3. Slope of the best straight line from 0 °C to 50 ° C [32 °F to 122 °F]. For operation outside this temperature, contact factory for more specific application information.
4. This parameter is not 100 % tested. It is guaranteed by process design and tested on a sample basis only.
5. See definition of terms. Hysteresis is the maximum output difference at any point within the operating pressure range for increasing and decreasing pressure
6. Long-term stability over a one year period.
7. Response time for a 0 PSI to full-scan span pressure step change. 10 % to 90 % rise time.
8. Maximum difference in output at any pressure with the operating pressure range and temperature within 0 °C to 50 °C [32 °F to 122 °F] after
   a. 100 temperature cycles, 0 °C to 50 ° C [32 °F to 122 °F]
   b. 1.5 million pressure cycles, 0 psi to full-scale span.
9. If the maximum burst pressure is exceeded, even momentarily, the package may leak or burst, or the pressure sensing die may fracture.

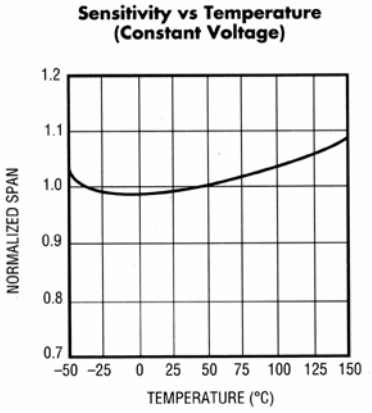
NOTE: Due to the delicate nature of these very sensitive devices, some special handling is required. Parts are sensitive to shock and vibration and must be handled with care. Dropping on any hard surface (bench top, etc.) can destroy the device. Note 10 in H_2O overpressure.

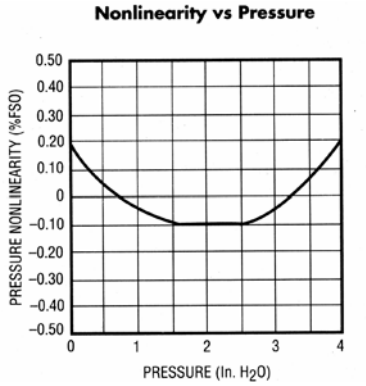
Pressure Sensors

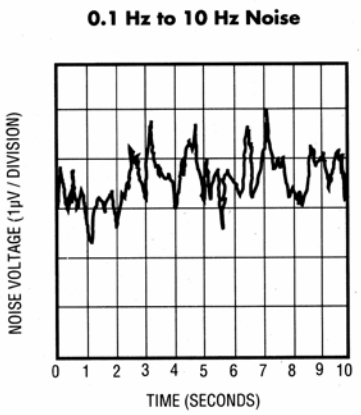
Low Pressure Sensor

SLP Series

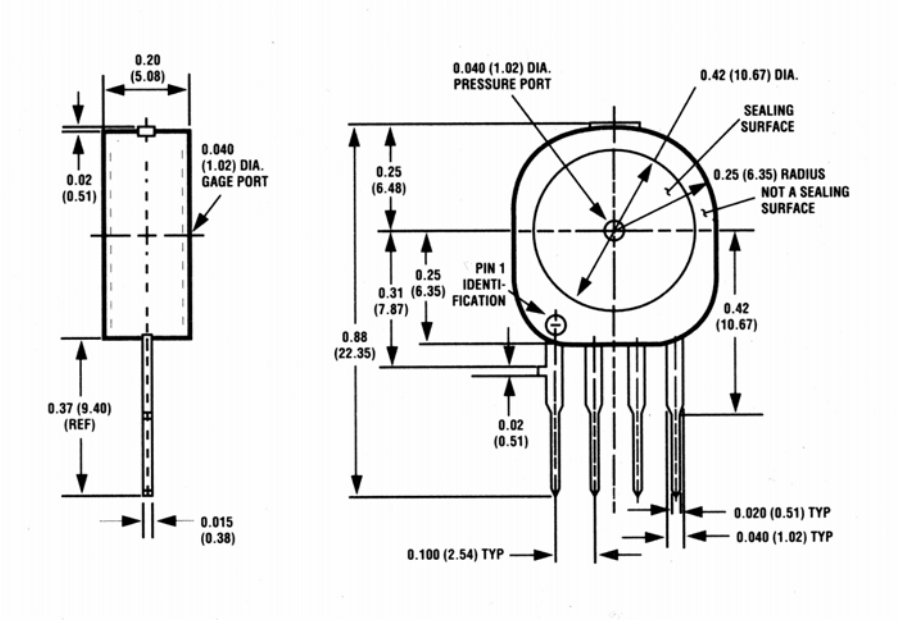
TYPICAL PERFORMANCE CHARACTERISTICS



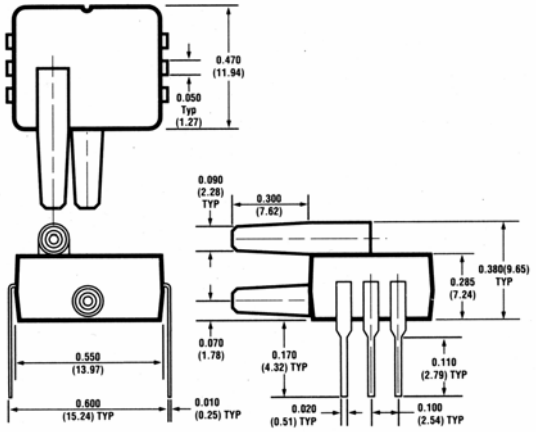




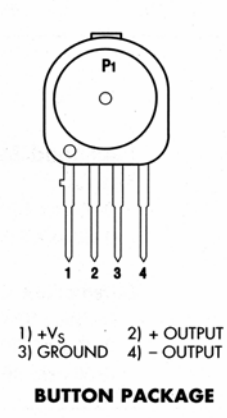
DIMENSIONAL DRAWING – BUTTON SENSOR (for reference only mm/in)

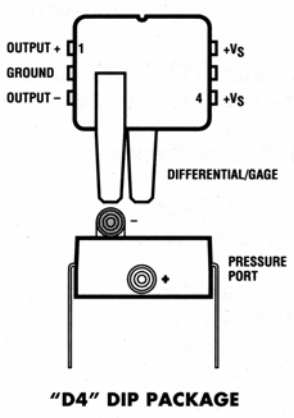


DIMENSIONAL DRAWING –D4 SENSOR (for reference only mm/in)



ELECTRICAL CONNECTIONS





Pressure Sensors

Low Pressure Sensor

SLP Series

APPLICATION INFORMATION

The SLP family of pressure sensors function as a wheatstone bridge. When pressure is applied to the device, the resistors in the arms of the bridge change as shown in Figure 1. The resulting differential output voltage, V_O, is easily shown to be $V_O = V_B \times \Delta R/R$. Since the change in resistance is directly proportional to pressure, Vo can be written as $V_O = S \times P \times V_B + V_{OS}$ Where,

V_O is the output voltage in mV

S is the sensitivity in mV/V psi

P is the pressure in psi

V_B is the bridge voltage in volts

V_{OS} is the offset error, (the differential output voltage when the applied pressure is zero)

FIGURE 1

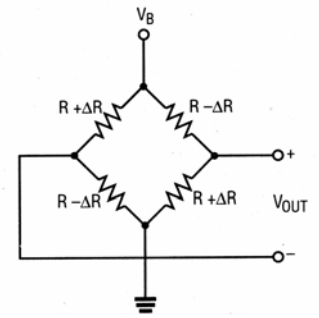
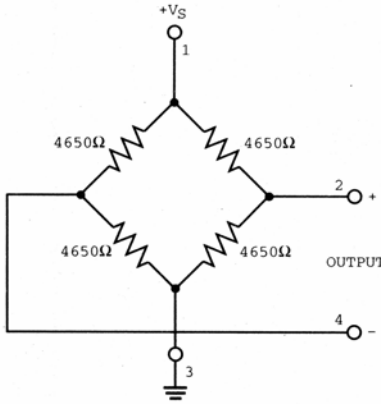


Figure 1.

EQUIVALENT CIRCUIT



ORDER GUIDE

Pressure Range	Sensor in Button Package	Sensor in DIP Package
0 in to 4 in H_2O	SLP004D	SLP004DD4

WARRANTY/REMEDY

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Freeport, Illinois 61032

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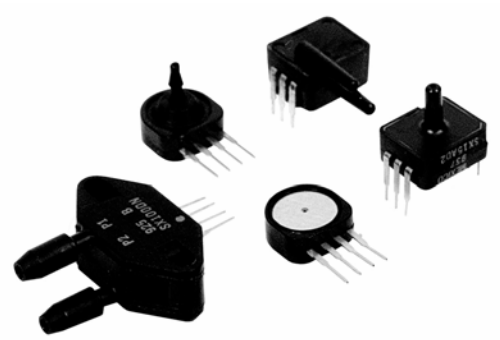


SX Series

Silicon Pressure Sensors
0 psi to 1 psi to 0 psi to 150 psi

DESCRIPTION

The SX Series pressure sensors provide the lowest cost components for measuring pressures up to 150 psi. These sensors are designed for use with non-corrosive, non-ionic media, such as air and dry gases. Convenient pressure ranges are available to measure differential, gauge, and absolute pressures from 0 psi to 1 psi (SX01) up to 0 psi to 150 psi (SX150).

The Absolute (A) devices have an internal vacuum reference and an output voltage proportional to absolute pressure. The differential (D) devices allow application of pressure to either side of the diaphragm and can be used for gauge or differential pressure measurements.

This product is packaged in either the standard low cost chip carrier “button” package, a plastic ported “N” package, or a DIP package. All packages are designed for applications where the sensing element is integral to the OEM equipment. These packages can be o-ring sealed, epoxied, and/or clamped onto a pressure fitting. A closed-bridge four pin SIP configuration is provided for electrical connection to the “Button” or “N” Package. The DIP Package mounts on a PC board like a standard IC with through-hole pins. This extremely small size package enables the use of multiple sensors in applications with limited space.

FEATURES

- Low cost
- High-impedance bridge
- Absolute
- Differential (gage)
- Low noise
- Low power consumption for battery power

POTENTIAL APPLICATIONS

- Medical
- Instrumentation
- Barometric
- Measurement
- Pneumatic controls
- Battery powered equipment

CHARACTERISTICS (Maximum ratings for all devices)

Supply voltage, V_S	12 Vdc
Operating temperature range	-40 °C to 85 °C [-40 °F to 185 °F]
Storage temperature range	-55 °C to 125 °C [-67 °F to 257 °F]
Humidity	0 % to 100 % RH
Common-mode pressure	150 psig
Lead soldering temperature	250 °C [482 °F] 2 sec to 4 sec

PERFORMANCE CHARACTERISTICS(1)

Characteristic description	Min.	Typ.	Max.	Unit
Zero pressure offset(2)	-35.0	-20.0	0.0	mV
Temperature coefficient of offset(3,4)	–	4	–	µV/V/°C
Combined pressure non-linearity, and hysteresis(5)	–	0.2	±0.5	%FSS
Long term stability of offset and span(6)	–	0.1	–	%FSS
Response time(7)	–	100	–	µs
Input resistance	–	4.1	–	kΩ
Temperature coefficient of resistance(3,4)	690	750	810	ppm/°C
Temperature coefficient of span(3,4)	-2550	-2150	-1900	ppm/°C
Output resistance	–	4.1	–	kΩ
Repeatability(8)	–	0.5	–	%FSS

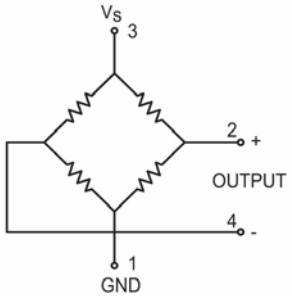
SX PERFORMANCE CHARACTERISTICS(1)

Part number	Operating pressure range	Sensitivity (mV/V/psi)	Full-scale span(9) (mV)			Burst pressure
		Typ	Min.	Typ.	Max.(10)	
SX01	0 psi to 1 psi	4.0	15	20	25	20 psi
SX05	0 psi to 5 psi	3.0	50	75	100	20 psi
SX15	0 psi to 15 psi	1.5	75	110	150	45 psi
SX30	0 psi to 30 psi	0.75	75	110	150	90 psi
SX100	0 psi to 100 psi	0.3	100	150	200	150 psi
SX150	0 psi to 150 psi	0.15	75	110	150	200 psi

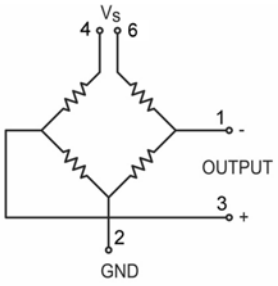
Specification Notes:
Note 1: Reference Conditions; TA = 25 °C [77 °F], Supply VS = 5 Vdc; Common Line Pressure = 0 psig, Pressure Applied to P1
Note 2: The zero pressure offset is 0 mV minimum to -20 mV typical and 35 mV maximum for part numbers SXxxxGD2 and SXxxxDD4.
Note 3: Slope of best straight line fit from 0°C to 70°C. For operation outside this temperature range, contact factory for more information.
Note 4: This parameter is not 100% tested. It is guaranteed by process design.
Note 5: Pressure Hysteresis - the maximum output difference at any point within the operating pressure range for increasing and decreasing pressure. Pressure Non-linearity the maximum deviation of measure output, at constant temperature (25 °C [77 °F]), from “best straight line” through three points (offset pressure, full-scale pressure, one-half full scale pressure).
Note 6: Long term stability over a one year period.
Note 7: Response time for a 0 psi to Full-Scale Span pressure step change, 10% to 90% rise time.
Note 8: Maximum difference in output at any pressure within the operating pressure range and the temperature range within 0 °C to 70 °C [32 °F to 158 °F] after:
a) 100 temperature cycles, 0 °C and 70 °C [32 °F to 158 °F]
b) 1 million pressure cycles, 0 psi to full-scale span.
Note 9: Full-scale span is the algebraic difference between the output voltage at full-scale pressure and the output at zero pressure. Full-scale span is ratiometric to the supply voltage.
Note 10: Exceeding maximum pressure can cause permanent sensor failure

Silicon Pressure Sensors, 0 psi to 1 psi to 0 psi to 150 psi

EQUIVALENT CIRCUITS

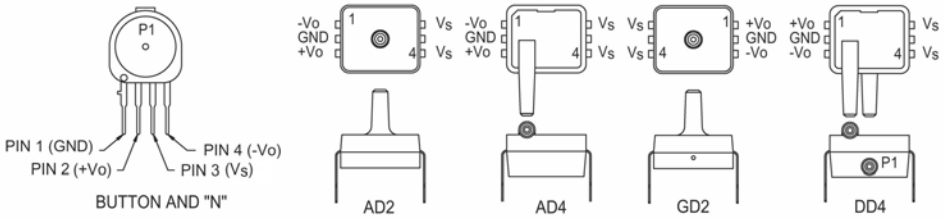


Button, Nipple and N Packages



DIP Packages
(Absolute Version Only)

ELECTRICAL CONNECTIONS



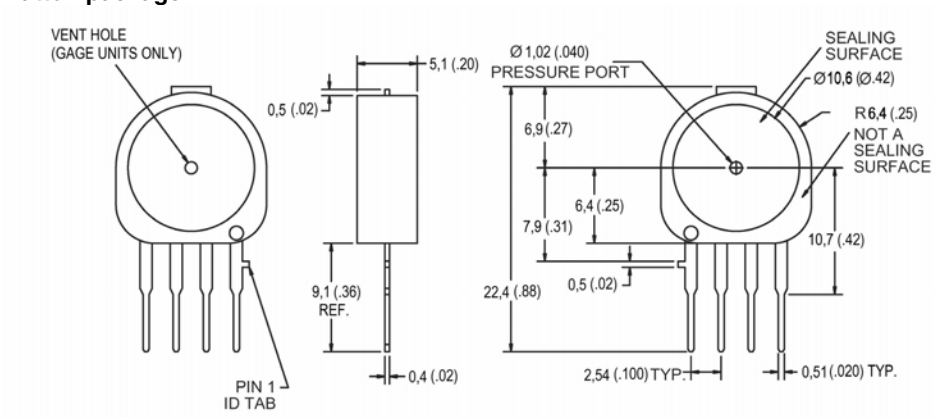
ORDERING INFORMATION

Pressure Range	Order Part Number			
	Button Package	Nipple Package	"N" Package	DIP Package
0 to 1 psid or psig	SX01D	SX01DP1	SX01DN	SX01GD2, SX01DD4
0 to 5 psid or psig	SX05D	SX05DP1	SX05DN	SX05GD2, SX05DD4
0 psia to 15 psia	SX15A	SX15AP1	SX15AN	SX15AD2, SX15AD4
0 psia to 30 psia	SX30A	SX30AP1	SX30AN	SX30AD2, SX30AD4
0 psia to 100 psia	SX100A	–	SX100AN	SX100AD2, SX100AD4
0 psia to 150 psia	SX150A	–	SX150AN	–
0 to 15 psid or psig	SX15D	SX25DP1	SX15DN	SX15GD2, SX15DD4
0 to 30 psid or psig	SX30D	SX30DP1	SX30DN	SX30GD2, SX30DD4
0 to 100 psid or psig	SX100D	–	SX100DN	SX100GD2, SX100DD4
0 to 150 psid or psig	SX150D	–	–	–

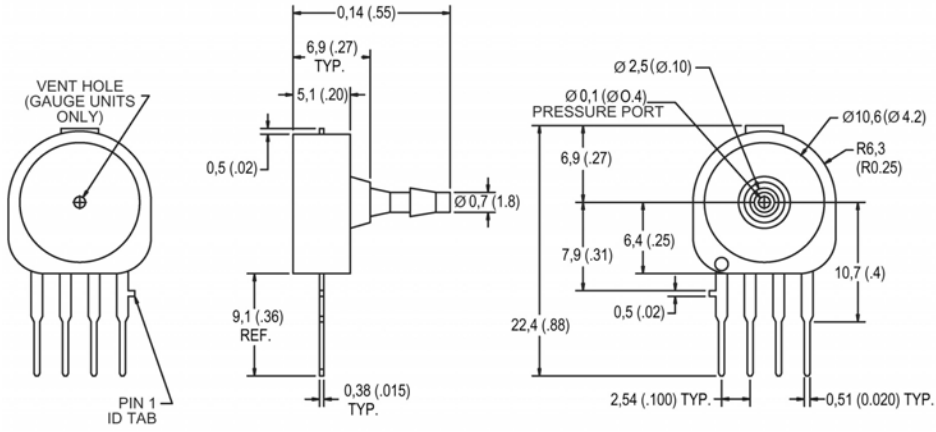
SX Series

PHYSICAL DIMENSIONS for reference only mm [in]

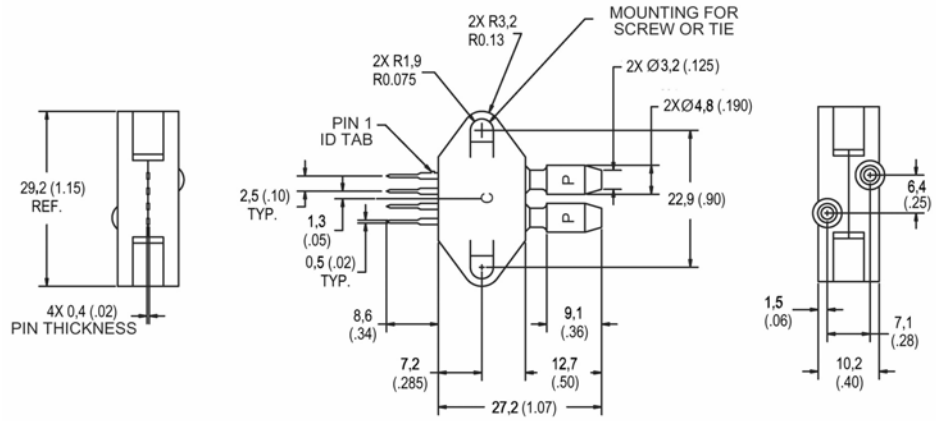
Button package



Nipple package

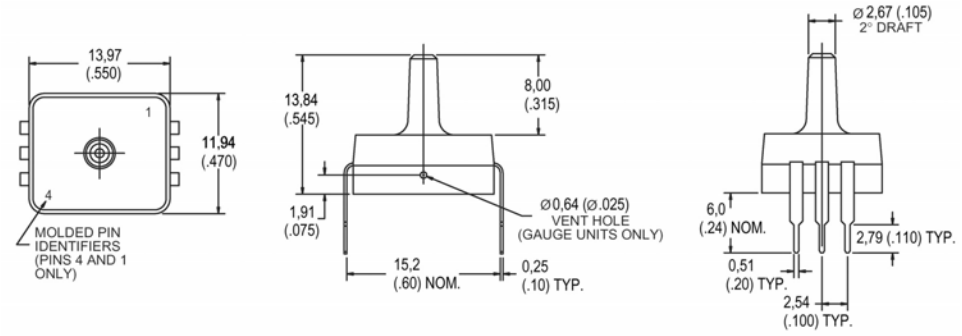


N Housing package

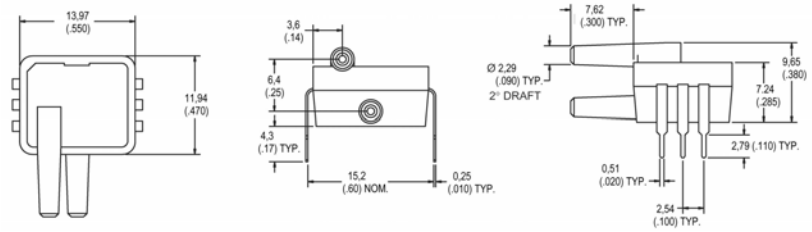


Silicon Pressure Sensors, 0 psi to 1 psi to 0 psi to 150 psi

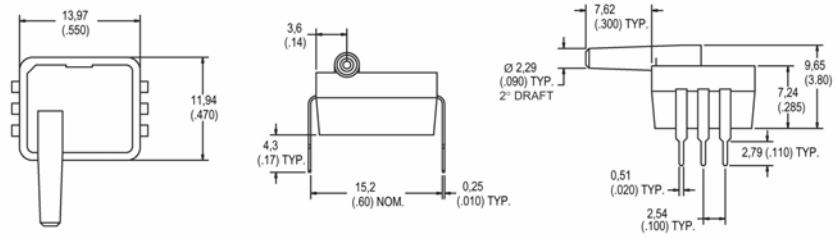
D2 DIP package



DD4 DIP package



AD4 DIP package



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SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

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Internet: www.honeywell.com/sensing

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	+65 6445-3033 Fax
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April 2009

Honeywell

SX7 Series

1 psig to 300 psig Button Package
Plastic Silicon Pressure Sensors

DESCRIPTION

The SX7 Series sensors offer a high pressure sensor in a very small “button” style package.

These special devices use an RTV 730 for die attach to allow measurement of gauge pressures of 1 psi (SX7001D) to 300 psi (SX7300D) with pressure applied to the backside of the sensor chip (Port P2) only. The output voltage is proportional to pressure.

The output of the bridge is ratiometric to the supply voltage and operation from any dc supply voltage up to +12V is acceptable.

This series is intended for use with non-corrosive, non-ionic working fluids such as air, dry gases, and the like.

FEATURES

- Button package
- High pressure
- Small size
- Low noise
- RTV 730 Die Attach

POTENTIAL APPLICATIONS

- Medical equipment
- Computer peripherals
- Pneumatic controls
- HVAC

SX7 Series Plastic Silicon Pressure Sensors

Table 1. Maximum Ratings for All Devices

Characteristic	Parameter	Unit
Supply voltage, VS	+12	Vdc
Maximum pressure on any port	200	psig
Temperature ranges: Operating Storage	 -40 to 85 -55 to 125	°C [°F]
Humidity limits	0% to 100%	RH
Lead temperature	250	°C [°F]
Soldering duration	3	s

Table 2. Standard Pressure Ranges

Catalog Listing	Operating Pressure	Proof Pressure	Maximum Pressure	Full Scale Span*		
				Min.	Typ.	Max.
SX7001D	1 psi	–	20 psid	15 mV	20 mV	25 mV
SX7005D	5 psi	–	20 psid	50 mV	75 mV	100 mV
SX7015D	15 psi	–	30 psid	75 mV	110 mV	150 mV
SX7030D	30 psi	–	60 psid	75 mV	110 mV	150 mV
SX7100D	100 psi	–	150 psid	100 mV	150 mV	200 mV
SX7150D	150 psi	–	200 psid	75 mV	110 mV	150 mV
SX7300D	0 psi to 300 psi	350 psi	300 psid	100 mV	150 mV	200 mV

*Full-Scale Span is the algebraic difference between the output voltage at full-scale pressure and the output at zero pressure. Full-Scale Span is ratiometric to the supply voltage.

Table 3. Performance Characteristics

SX7001D					
Characteristic	**Min.**	**Typ.**	**Max.**	**Unit**	**Note**
Sensitivity	3.0	4.0	5.0	mV/V/psi	–
Temperature coefficient of span	-2550	-2300	-2050	ppm/°C	4
Zero pressure offset	-35	-20	0	mV	–
Temperature coefficient of offset	–	+4	–	µV/V/°C	4
Combined pressure non-linearity and pressure hysteresis	–	0.2	±0.5	%FS	3
Long-term stability of offset and sensitivity	–	0.1	–	%FS	9
Response time (10% to 90%)	–	100	–	µs	8
Input resistance	–	4.1	–	kOhm	6
Temperature coefficient of resistance	+690	+750	+810	ppm/°C	–
Output resistance	–	4.1	–	kOhm	7
Repeatability	–	0.5	–	%FS	5
SX7005D					
Characteristic	**Min.**	**Typ.**	**Max.**	**Unit**	**Note**
Sensitivity	2.0	3.0	4.0	mV/V/psi	–
Temperature coefficient of span	-2550	-2300	-2050	ppm/°C	4
Zero pressure offset	-35	-20	0	mV	–
Temperature coefficient of offset	–	+4	–	µV/V/°C	4
Combined pressure Non-linearity and pressure hysteresis	–	0.2	±0.5	%FS	3
Long-term stability of offset and sensitivity	–	0.1	–	%FS	9
Response time (10% to 90%)	–	100	–	µs	8
Input resistance	–	4.1	–	kOhm	6
Temperature coefficient of resistance	+690	+750	+810	ppm/°C	–
Output resistance	–	4.1	–	kOhm	7
Repeatability	–	0.5	–	%FS	5
SX7015D					
Characteristic	**Min.**	**Typ.**	**Max.**	**Unit**	**Note**
Sensitivity	1.0	1.5	2.0	mV/V/psi	–
Temperature coefficient of span	-2400	-2150	-1900	ppm/°C	4
Zero pressure offset	-35	-20	0	mV	–
Temperature coefficient of offset	–	+4	–	µV/V/°C	4
Combined pressure Non-linearity and pressure hysteresis	–	0.2	±0.5	%FS	3
Long-term stability of offset and sensitivity	–	0.1	–	%FS	9
Response time (10% to 90%)	–	100	–	µs	8
Input resistance	–	4.1	–	kOhm	6
Temperature coefficient of resistance	+690	+750	+810	ppm/°C	–
Output resistance	–	4.1	–	kOhm	7
Repeatability	–	0.5	–	%FS	5

Table 3. Performance Characteristics (continued)

SX7030D					
Characteristic	**Min.**	**Typ.**	**Max.**	**Unit**	**Note**
Sensitivity	0.5	0.75	1.0	mV/V/psi	–
Temperature coefficient of span	-2400	-2150	-1900	ppm/°C	4
Zero pressure offset	-35	-20	0	mV	–
Temperature coefficient of offset	–	+4	–	µV/V/°C	4
Combined pressure Non-linearity and pressure hysteresis	–	0.2	±0.5	%FS	3
Long-term stability of offset and sensitivity	–	0.1	–	%FS	9
Response time (10% to 90%)	–	100	–	µs	8
Input resistance	–	4.1	–	kOhm	6
Temperature coefficient of resistance	+690	+750	+810	ppm/°C	–
Output resistance	–	4.1	–	kOhm	7
Repeatability	–	0.5	–	%FS	5
SX7100D					
Characteristic	**Min.**	**Typ.**	**Max.**	**Unit**	**Note**
Sensitivity	0.2	0.3	0.4	mV/V/psi	–
Temperature coefficient of span	-2400	-2150	-1900	ppm/°C	4
Zero pressure offset	-35	-20	0	mV	–
Temperature coefficient of offset	–	+4	–	µV/V/°C	4
Combined pressure Non-linearity and pressure hysteresis	–	0.2	±0.5	%FS	3
Long-term stability of offset and sensitivity	–	0.1	–	%FS	9
Response time (10% to 90%)	–	100	–	µs	8
Input resistance	–	4.1	–	kOhm	6
Temperature coefficient of resistance	+690	+750	+810	ppm/°C	–
Output resistance	–	4.1	–	kOhm	7
Repeatability	–	0.5	–	%FS	5
SX7150D					
Characteristic	**Min.**	**Typ.**	**Max.**	**Unit**	**Note**
Sensitivity	0.1	0.15	0.2	mV/V/psi	–
Temperature coefficient of span	-2400	-2150	-1900	ppm/°C	4
Zero pressure offset	-35	-20	0	mV	–
Temperature coefficient of offset	–	+4	–	µV/V/°C	4
Combined pressure Non-linearity and pressure hysteresis	–	0.2	±0.5	%FS	3
Long-term stability of offset and sensitivity	–	0.1	–	%FS	9
Response time (10% to 90%)	–	100	–	µs	8
Input resistance	–	4.1	–	kOhm	6
Temperature coefficient of resistance	+690	+750	+810	ppm/°C	–
Output resistance	–	4.1	–	kOhm	7
Repeatability	–	0.5	–	%FS	5
SX7300D					
Characteristic	**Min.**	**Typ.**	**Max.**	**Unit**	**Note**
Sensitivity	0.033	0.04	0.06	mV/V/psi	–
Temperature coefficient of span	-2400	-2150	-1900	ppm/°C	4
Zero pressure offset	-16	0	16	mV	–
Temperature coefficient of offset	–	+4	–	µV/V/°C	4
Combined pressure Non-linearity and pressure hysteresis	–	0.2	±0.5	%FS	3
Long-term stability of offset and sensitivity	–	0.1	–	%FS	9
Response time (10% to 90%)	–	100	–	µs	8
Input resistance	–	4.1	–	kOhm	6
Temperature coefficient of resistance	+690	+750	+810	ppm/°C	–
Output resistance	–	4.1	–	kOhm	7
Repeatability	–	0.5	–	%FS	5

Notes:

1. Reference Conditions: TA = 25°C Supply VS = 5 Vdc Common Mode Line Pressure = 0 psig Pressure applied to Port 2 only.
3: Pressure Hysteresis is the maximum output difference at any point within the operating pressure range for increasing and decreasing pressure.
4: Slope of the best straight line from 0 °C to 70 °C.
5: Maximum difference in output at any pressure with the operating pressure range and the temperature range within 0 °C to 70 °C after:
   a) 100 temperature cycles, 0 °C to 70 °C
   b) 1.0 million pressure cycles, 0 psi to Full-Scale Span
6: Input resistance is the impedance between Vs and ground.
7: Output resistance is the impedance between + and - outputs.
8: Response time for a 0 psi to Full-Scale Span pressure step change, 10% to 90% rise time.
9: Long-term stability over a one year period.

Figure 1. Equivalent circuit

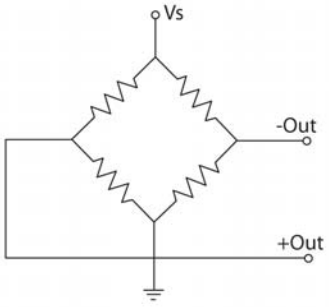


Figure 2. Pinout

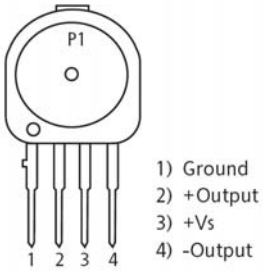
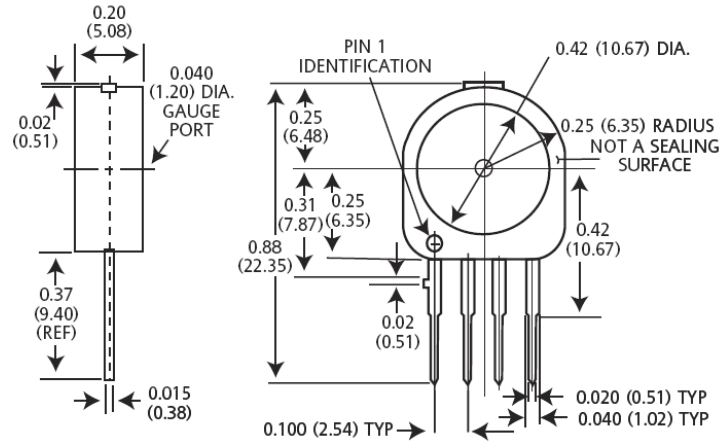


Figure 3. Drawing



⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

⚠ WARNING

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- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

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Honeywell

Pressure Sensor

Low Pressure Sensor

SXL Series

FEATURES

- Accurate low pressure readings
- Low cost
- High impedance bridge
- Low noise
- Low power consumption for battery operation

TYPICAL APPLICATIONS

- Medical instrumentation
- Portable and battery-operated equipment
- Air-flow monitoring
- HVAC
- Industrial controls

The SXL series of pressure sensors provides the lowest cost components for measuring very low pressures. These low pressure range devices were specifically designed to accurately measure differential and gage pressures of 1 inch to ten inches of H_2O.

They are meant for use with non-corrosive and non-ionic media, such as air, dry gases, and the like.

These differential devices allow application of pressure to either side of the diaphragm and can be used for gage or differential pressure measurements.

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ABSOLUTE MAXIMUM RATINGS

	Ratings
Supply voltage	5 Vdc
Temperature ranges	
Operating	0 °C to 50 °C [32 °F to 122 °F]
Storage	0 °C to 70 °C [32 °F to 158 °F]
Common mode pressure	150 in. H_2O
Lead temperature (soldering 2 to 4 seconds)	250 °C [482 °F]
Burst pressure	7 psi = 194 in H_2O

PERFORMANCE SPECIFICATIONS (1)

	Min.	Typ.	Max.	Unit
Operating pressure	-	10.0	-	In. H_2O
Sensitivity Ta = 25 °C [77 °F]	0.4	0.9	1.6	mV/V/ In. H_2O
Full-scale span 10 In. H_2O (2)	20	45	80	mV
Temperature coefficient of span (3, 4)	-	-2300	-	ppm/°C
Zero pressure offset Ta = 25 °C [77 °F]	-35	-20	0	mV/V
Temperature coefficient of offset (3)	-	± 4	-	µV/V/°C
Combined linearity and hysteresis (5)		± 0.2	± 1.0	% FS
Long-term stability of offset and sensitivity (6)	-	± 0.1	-	mV
Response time (10% to 90%) (7)	-	100	-	µS
Input resistance Ta = 25 °C [77 °F]	-	4	-	kOhm
Temperature coefficient of resistance (3, 4)	-	750	-	ppm/°C
Output impedance	-	4	-	kOhm
Repeatability (8)	-	0.5	-	% FSS

SPECIFICATION NOTES

1. Reference conditions: supply voltage Vs = 5 Vdc, Ta = 25 °C [77 °F]. Common-mode line pressure = 0 psig. Pressure applied to P2.
2. Span is the algebraic difference between the output voltage at full-scale pressure and the output at zero pressure.
3. Slope of the best straight line from 0 °C to 50 ° C [32 °F to 122 °F]. For operation outside this temperature, contact factory for more specific application information.
4. This parameter is not 100% tested. It is guaranteed by process design and tested on a sample basis only.
5. See definition of terms. Hysteresis is the maximum output difference at any point within the operating pressure range for increasing and decreasing pressure
6. Long-term stability over a one year period.
7. Response time for a 0 PSI to full-scan span pressure step change. 10 % to 90 % rise time.
8. Maximum difference in output at any pressure with the operating pressure range and temperature within 0 °C to 50 °C [32 °F to 122 °F] after
    a. 100 temperature cycles, 0 °C to 50 ° C [32 °F to 122 °F]
    b. 1.5 million pressure cycles, 0 PSI to full-scale span.
9. If the maximum burst pressure is exceeded, even momentarily, the package may leak or burst, or the pressure sensing die may fracture.

FIGURE 1. EQUIVALENT CIRCUIT

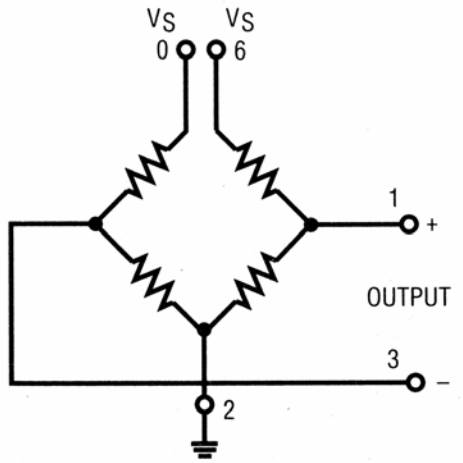
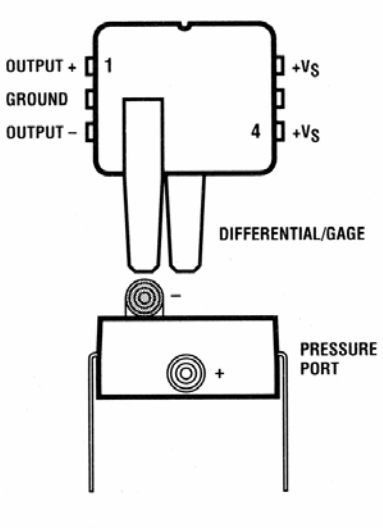
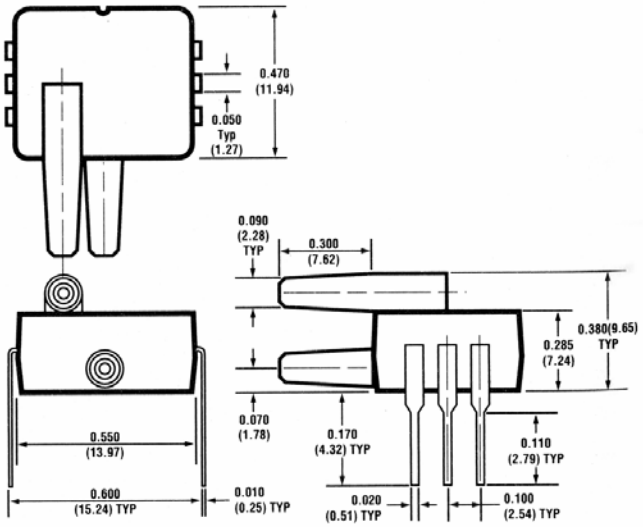


FIGURE 2. DIMENSIONAL DRAWING (FOR REFERENCE ONLY)

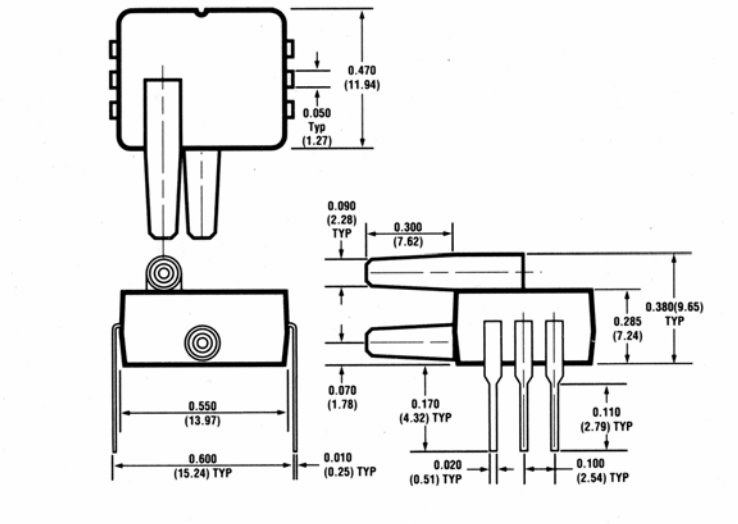


SLPxxxD4



Basic Sensor Sideport 'D4' DIP Package

FIGURE 3. DIMENSIONAL DRAWING – D4 SENSOR - (FOR REFERENCE ONLY)



ORDER GUIDE

	Pressure Range
SXL010D	0 to 10 in H_2O/Standard Package
SXL010DD4	0 to 10 in H_2O/Sideport D4 DIP Package

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. **The foregoing is Buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

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While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

For application assistance, current specifications, or name of the nearest Authorized Distributor, contact a nearby sales office. Or call:

1-800-537-6945 USA/Canada
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FAX

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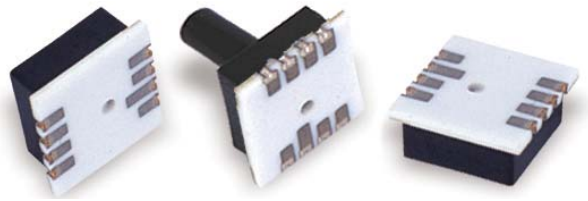


SX SMT Series

Microstructure Pressure Sensors
0 psi to 1 psi through
0 psi to 150 psi

The SX SMT Series provides a most cost-effective method of measuring absolute and gage pressures in a fully packaged sensor. These sensors are designed primarily for use with clean, dry gases such as air and nitrogen.

This series features the standard SX chip in a ceramic, surface mount package. The standard version features a low profile plastic lid to better withstand high temperatures. The optional ported device offers a tube attachment port that is particularly useful in gage applications.

The 4-pin closed bridge configuration allows electrical connection with additional pads provided for mechanical support. Pulsed power is recommended to achieve maximum accuracy and conserve battery power in portable applications.

FEATURES

- Low cost
- Small size
- Absolute or gage pressures
- High-impedance bridge
- Low power consumption

POTENTIAL APPLICATIONS

- Pneumatic controls
- Automotive diagnostics
- Medical equipment/ instrumentation
- Dental equipment
- Environmental controls
- Barometric pressure measurement
- Altimeters
- Pneumatic controls
- Battery powered equipment

SX SMT Series

SPECIFICATIONS[1]

Characteristic	Maximum Rating
Supply voltage	12 Vdc
Operating temperature	-40 °C to 125 °C [-40 °F to 257 °F]
Storage temperature	-55 °C to 125 °C [-67 °F to 257 °F]
Lead temperature (soldering 2 s to 4 s)	250 °C [482 °F]

STANDARD PRESSURE RANGES FOR SX SERIES[1]

Operating Pressure	Maximum Pressure [2]	Sensitivity [3]		Unit
		Nominal	Std. Dev.	
0 psi to 1 psi	20 psi	3.90	±0.40	mV/V/psi
0 psi to 5 psi	20 psi	2.70	±0.38	mV/V/psi
0 psi to 15 psi	30 psi	1.50	±0.25	mV/V/psi
0 psi to 30 psi	60 psi	0.66	±0.06	mV/V/psi
0 psi to 100 psi	150 psi	0.30	±0.05	mV/V/psi
0 psi to 150 psi	200 psi	0.14	±0.02	mV/V/psi

PERFORMANCE SPECIFICATIONS[1]

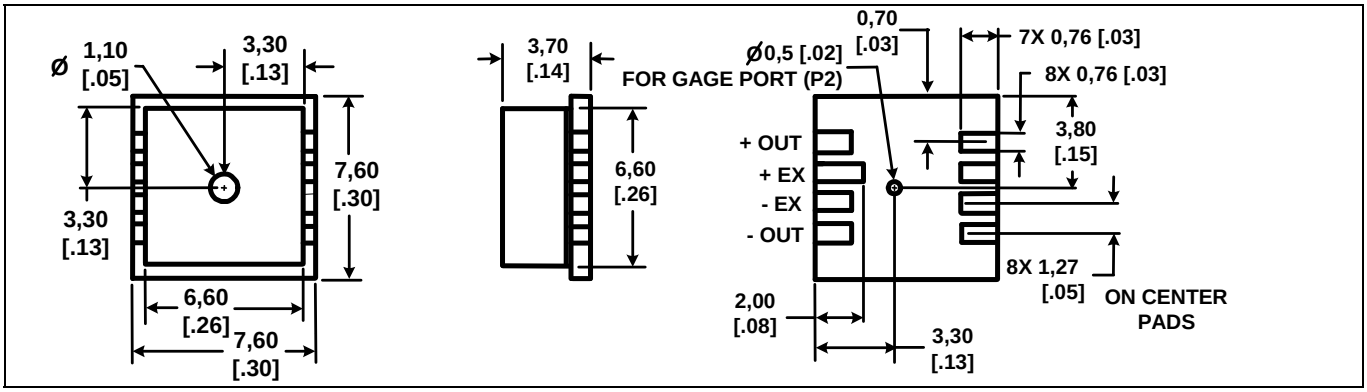
Characteristic	Min.	Typ.	Max.	Unit
Temperature coefficient of span[4,5]	-2400	-2150	-1900	ppm/°C
Zero pressure offset T_A	-35.0	-20.0	0	mV
Temperature coefficient of offset[6,5]	–	4	–	µV/V/°C
Combined, linearity and hysteresis[7]	–	0.2	0.5	% FS
Long term stability of offset and sensitivity[8]	–	0.1	–	mV
Response time (10% to 90%)[9]	–	100	–	µs
Input resistance T_A = 25 °C [77 °F]	–	4.1	–	kΩ
Temperature coefficient of resistance[4,5]	–	750	810	ppm/°C
Output impedance	–	4.1	–	kΩ
Repeatability [10]	–	0.5	–	% FSS

Notes:

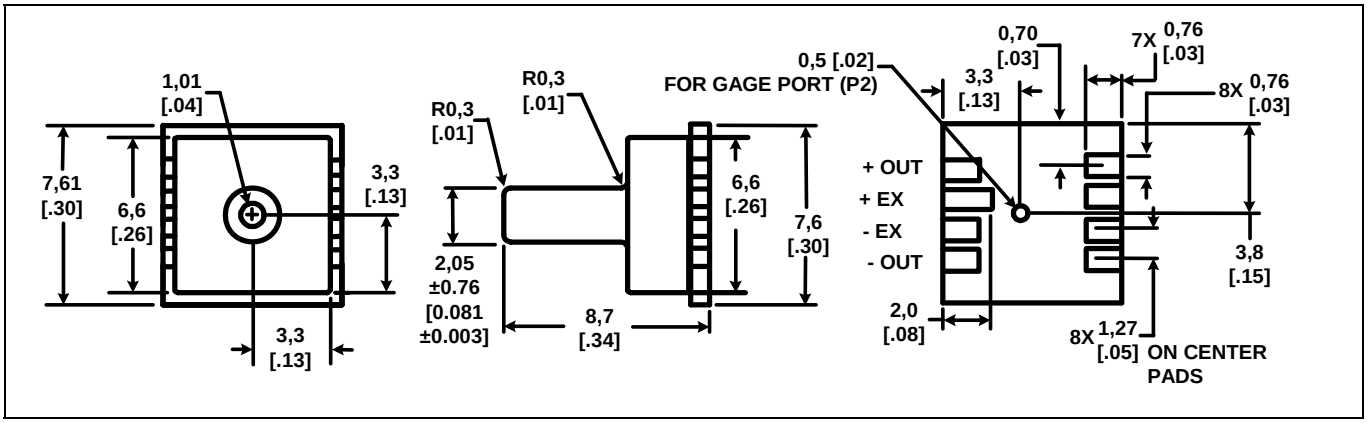
1. Reference Conditions: Supply voltage, Vs = 5.0 Vdc, T_A = 0 °C to 70 °C [32 °F to 158 °F], common-mode line pressure = 0 psig, pressure applied to P1 unless otherwise noted.
2. If maximum pressure is exceeded, even momentarily, the package may leak or burst, or the pressure sensing die may fracture.
3. Sensitivity is the ratio of the output signal voltage change to the corresponding input pressure change. The sensitivity is characterized by design and periodic production testing. This parameter in not 100 % tested in production.
4. This is the best straight line fit for operation between 0 °C to 70 °C [32 °F to 158 °F]. For operation outside this temperature, contact Honeywell representative for more specific application information.
5. This parameter is not 100 % tested. It is guaranteed by process design and tested on a sample basis only. Temperature coefficient of span for the 1.0 psi and 5.0 psi devices is -2550 ppm/°C to -2050 ppm/°C.
6. Slope of the best straight line fit for operation between 0 °C to 70 °C [32 °F to 158 °F]. For operation outside this temperature, contact factory for more specific application information.
7. Hysteresis is the maximum output difference at any point within the operating pressure range for increasing and decreasing pressure.
8. Long-term stability over a one year period.
9. Response time for 0 psi to full scale span pressure step change.
10. Difference in output at any pressure with the operating pressure range and temperature within 0 °C to 70 °C [32 °F to 158 °F] after 100 temperature cycles 0 °C to 70 °C [32 °F to 158 °F], 1.0 million pressure cycles 0 psi to full-scale span.

DIMENSIONAL DRAWINGS (For reference only. mm [in])

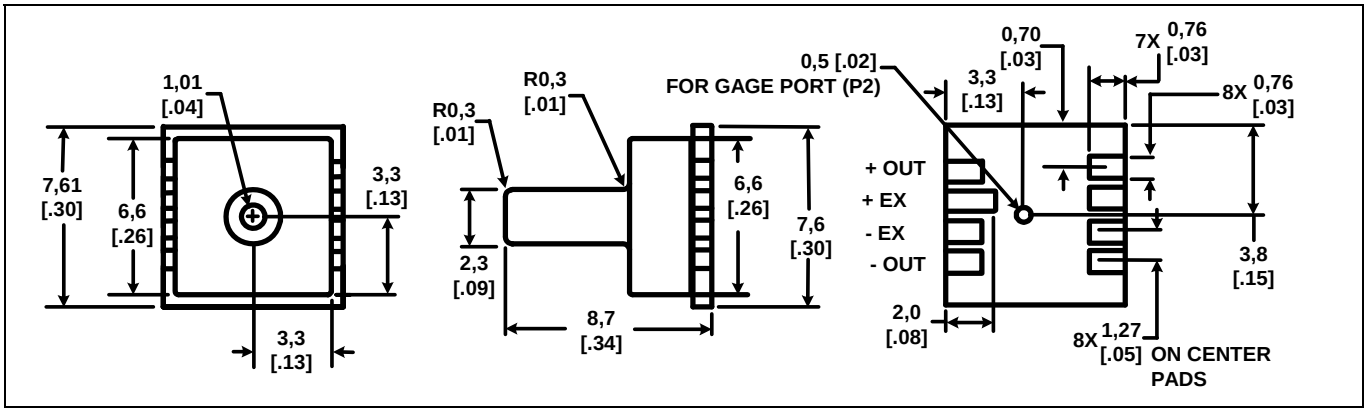
LOW PROFILE SMT



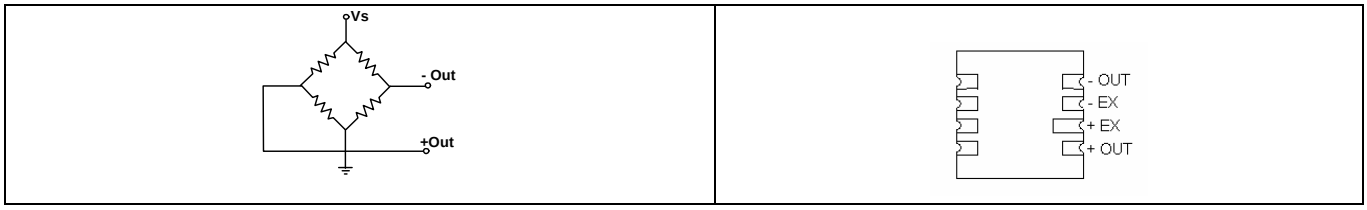
PORTED "P" SMT



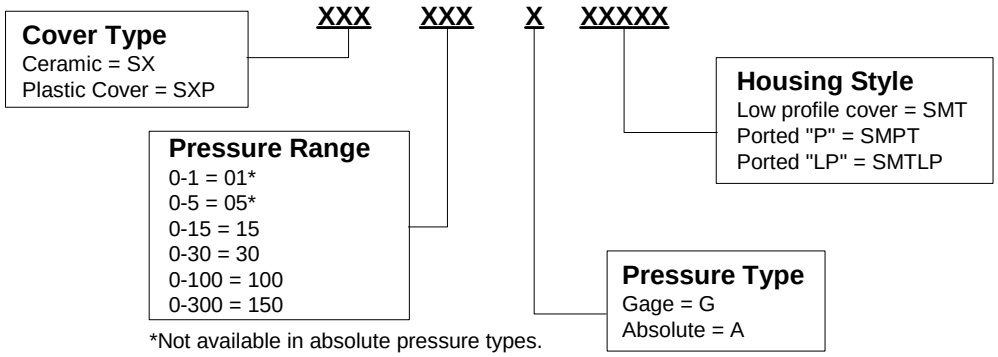
PORTED "LP" SMT



EQUIVALENT CIRCUITS



SX SMT ORDER GUIDE



*Not available in absolute pressure types.

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PERSONAL INJURY

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	+1-815-235-6847
	+1-815-235-6545 Fax

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Honeywell

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XCA Series

Fixed Output, Amplified Calibrated with Ratiometric Output Voltage Pressure Sensors

DESCRIPTION

The XCA Series of pressure sensors use state-of-the-art silicon micromachined pressure sensors in conjunction with stress free packaging techniques to provide highly accurate, amplified, calibrated and temperature compensated pressure sensors for the most demanding applications.

When operated from a fixed 5.0 Vdc supply, the XCA4 gage and absolute sensors provide a 0.25 Vdc to 4.25 Vdc output (4.0 Vdc span).

The XCA5 Series offers an industry standard 1 Vdc to 6 Vdc output (5 Vdc span) when operated from a fixed 8.0 Vdc supply.

All other features are the same for both the XCA4 and the XCA5, incorporating stress isolation and factory calibration to achieve optimum accuracy in this industry standard package.

FEATURES

- Precise temperature compensation
- Low cost
- High performance
- Gage, absolute and differential versions
- Constant voltage excitation
- Calibrated output
- Ratiometric output voltage

POTENTIAL APPLICATIONS

- Ventilators
- Continuous positive airway pressure (CPAP) systems
- Audiometers
- Air compressors
- Chemical analyzers
- Variable air volume (VAV) controllers
- Airflow

XCA Series

XCA4 ELECTRICAL SPECIFICATIONS (At 5 Vdc Excitation, 25 °C [77 °F].)

Characteristic	Min.	Typ.	Max.	Unit
Excitation voltage	3.0	5.0	16.0	Vdc
Null XCA4 (except differential)	0.15	0.25	0.35	Vdc
Null XCA4 (differential)	2.20	2.25	2.30	Vdc
Span XCA4 (except differential)	3.90	4.00	4.10	Vdc
Span XCA4 (differential, changes with ± pressure applied	±1.95	±2.00	±2.05	Vdc
Temperature change span 0 °C to 50 °C [32 °F to 122 °F][1]	–	±0.6	±1.0	% span
Temperature change offset 0 °C to 50 °C [32 °F to 122 °F][1]	–	±0.6	±1.0	% span
Linearity, hysteresis error[3]	–	±0.30	±0.50	% span
Repeatability	–	±0.1	–	% span
Input resistance	–	15.0	–	kΩ
Output resistance	–	3.0	–	kΩ
Operating temperature	-25 [-13]	–	85 [185]	°C [°F]
Storage temperature	-40 [-40]	–	125 [257]	°C [°F]
Common mode pressure	–	–	50	psi

Notes:
1. Shift is relative to 25 °C [77 °F].
2. Measured at ½ full scale rated pressure using BFSL.

XCA5 ELECTRICAL SPECIFICATIONS (At 8 Vdc Excitation, 25 °C [77 °F].)

Characteristic	Min.	Typ.	Max.	Unit
Excitation voltage	3.0	8.0	16.0	Vdc
Null XCA5 (except differential)	0.95	1.00	1.05	Vdc
Null XCA5 (differential)	2.45	3.50	3.55	Vdc
Span XCA5 (except differential)	4.90	5.00	5.10	Vdc
Span XCA5 (differential, changes with ± pressure applied	±2.45	±2.50	±2.55	Vdc
Temperature change span 0 °C to 50 °C [32 °F to 122 °F][1]	–	±0.6	±1.0	% span
Temperature change offset 0 °C to 50 °C [32 °F to 122 °F][1]	–	±0.6	±1.0	% span
Linearity, hysteresis error[2]	–	±0.30	±0.50	% span
Repeatability	–	±0.1	–	% span
Input resistance	–	15.0	–	kΩ
Output resistance	–	3.0	–	kΩ
Operating temperature	-25 [-13]	–	85 [185]	°C [°F]
Storage temperature	-40 [-40]	–	125 [257]	°C [°F]
Common mode pressure	–	–	50	psi

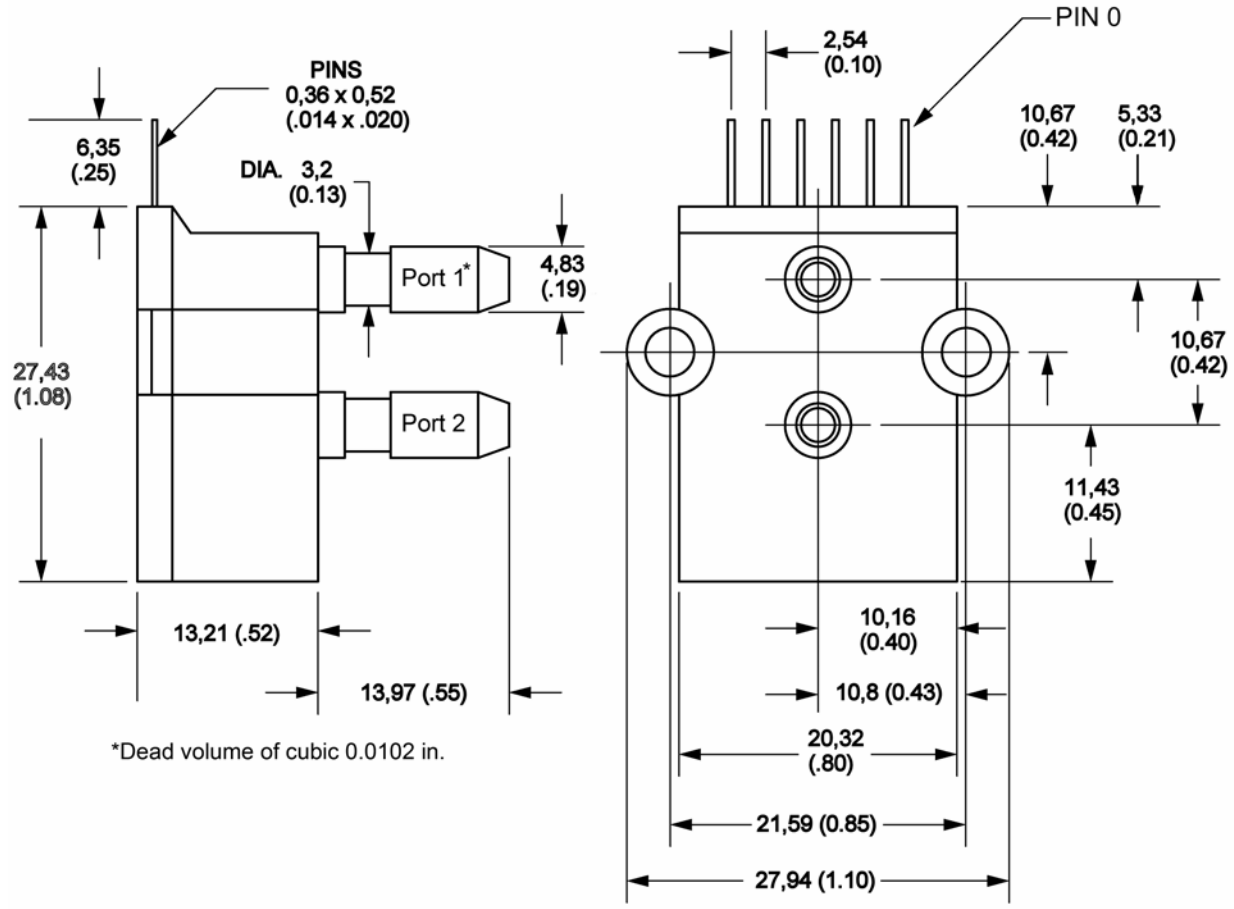
Notes:
1. Shift is relative to 25 °C [77 °F].
2. Measured at ½ full scale rated pressure using BFSL.

OVERPRESSURE RATING

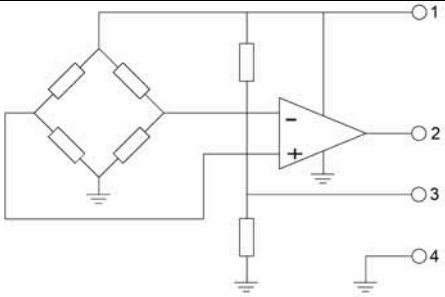
Full Scale Pressure	Overpressure (max.)
4 in H_2O	3 psi
10 in H_2O	3 psi
1 psi	3 psi
5 psi	15 psi
15 psi	45 psi
30 psi	90 psi
60 psi	180 psi
100 psi	250 psi
150 psi	250 psi

Calibrated with Ratiometric Output

MOUNTING DIMENSIONS (For reference only: mm/[in].)



EQUIVALENT CIRCUIT



Pinout

1. V Excitation
2. V Output
3. V Offset (Not to be used unless adjusting null offset.
4. Common

MEDIA COMPATIBILITY: Clean, dry gases only

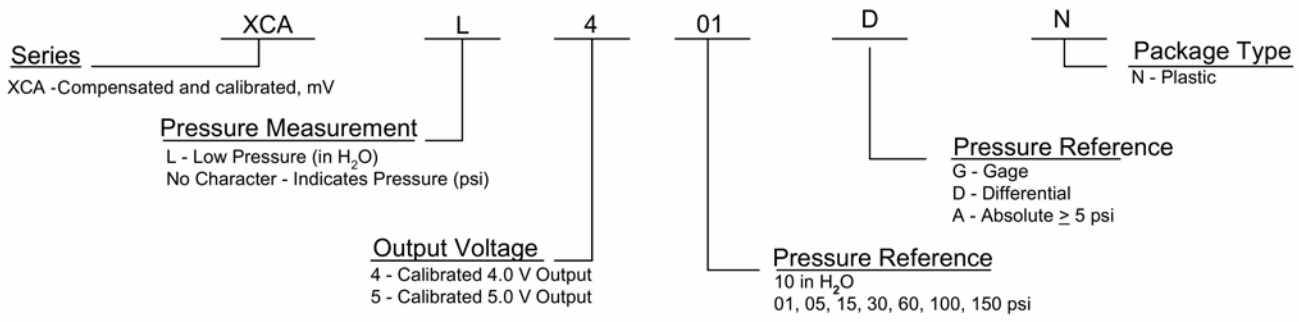
Port 1: Media must be compatible with epoxy-based adhesive.

Port 2: Media must be compatible with nylon housing, epoxy adhesive and silicon. (Port not used for absolute devices.)

PRESSURE COMPATIBILITY

- **XCA4 Gage and Absolute:** Measures gage pressure only with positive pressure to Port 2. There will be a small output voltage between the actual offset voltage and ground proportional to vacuum if applied to Port 2.
- **XCA4 Differential:** Measures differential pressure with positive pressure to Port 2 and negative pressure (vacuum) to Port 1. The offset is set to 2.25 Vdc at 0 psid. It will change slightly with changes in common mode (line) pressure.
- **XCA5 Gage and Absolute:** Measures gage pressure only with positive pressure to Port 2. There will be a small output voltage between the actual offset voltage and ground proportional to vacuum if applied to Port 2.

ORDER GUIDE



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July 2007

Honeywell

XCX/XCXL Series

Compensated Silicon Pressure Sensors

DESCRIPTION

The XCX/XCXL Series integrates silicon micromachined sensing technology, temperature compensation, and calibration in an improved performance industry standard package.

A unique stress isolating design protects against torque induced.

Additional stability and long term accuracy improvements are gained through simplified compensation techniques, which eliminate temperature dependent thermal compensation

These products are available in High Grade (H) which are calibrated for full scale span to ±1.0% over compensated temperature range or in Commercial Grade (C) which are calibrated for full scale span to ±2% over compensated temperature range.

FEATURES

- Pressure ranges from 4 in H_2O, 10 in H_2O and 1 psi through 240 psi
- Calibrated offset
- High Grade (H) listings for high performance sensing solutions or Commercial Grade (C) listings for lower performance sensing solutions
- Temperature Compensated over 0 °C to 70 °C [32 °F to 158 °F]
- Gage, differential, and absolute pressure
- Ratiometric mV output

POTENTIAL APPLICATIONS

- Medical
- Applications requiring small size
- Applications requiring vacuum, positive pressure or both

XCX/XCXL Series

ELECTRICAL SPECIFICATIONS (At 12 Vdc Excitation at 25 °C[1] [77 °F].)

Characteristic	XCX/XCXL C Grade			XCX/XCXL H Grade			Unit
	Min.	Typ.	Max.	Min.	Typ.	Max.	
Excitation voltage	3.0	12.0	16.0	3.0	12.0	16.0	Vdc
Null	–	–	1.0	–	±0.5	±1.0	mV
Temperature error on offset 0 °C to 50 °C [32 °F to 122 °F][2] (4 in H_2O)	–	–	1.0	–	–	0.5	mV
Temperature error on offset 0 °C to 70 °C [32 °F to 158 °F][2] (all except 4 in H_2O)	–	–	1.0	–	–	0.5	mV
Temperature error on span 0 °C to 50 °C [32 °F to 122 °F][2] (4 in H_2O)	–	–	2.0	–	–	1.0	% span
Temperature error on span 0 °C to 70 °C [32 °F to 158 °F][2] (all except 4 in H_2O)	–	–	2.0	–	–	1.0	% span
Linearity, hysteresis error[3]	–	0.5	1.0	–	0.3	0.5	% span
Repeatability	–	0.1	–	–	0.1	–	% span
Input resistance	–	15	–	–	15	–	kΩ
Output resistance	–	3.0	–	–	3.0	–	kΩ
Compensated temperature range	0 [32]	25 [77]	70 [158]	0 [32]	25 [77]	70 [158]	°C [°F]
Storage temperature range	-40 [-40]	–	125 [257]	-40 [-40]	–	125 [257]	°C [°F]
Relative humidity (non-condensing)	0		95	0	–	95	% RH
Common mode pressure	–	–	50	–	–	50	psig
Shock (duration 11 ms any axis)	–	–	10	–	–	10	g
Weight	–	2	–	–	2	–	g

Notes:
1. All parameters are measured at 12 Vdc excitation, pressure specs obtained with pressure applied to the front of the sensor.
2. Shift is relative to 25 °C [77 °F].
3. Measured at ½ full scale rated pressure using BFSL.

DIFFERENTIAL AND GAGE OUTPUT (At 12 Vdc Excitation at 25 °C [77 °F].)

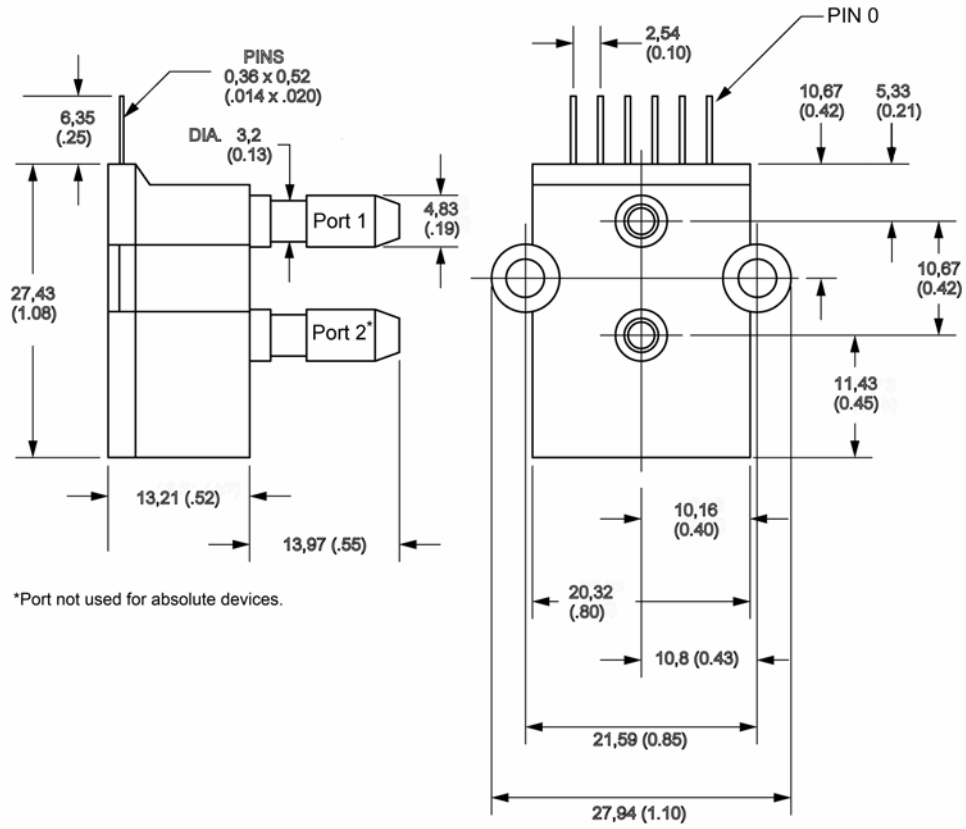
Full Scale Pressure	XCX C Grade Output Full Scale Span (mV)			XCX H Grade Output Full Scale Span (mV)			Max. Overpressure (psi)
	Min.	Typ.	Max.	Min.	Typ.	Max.	
4 in H_2O	38	40	42	–	–	–	5
10 in H_2O	19	20	21	19.8	20.0	20.2	5
0.3 psi	19	20	21	19.8	20.0	20.2	5
1 psi	17	18	19	17.8	18.0	18.2	5
5 psi	57	60	63	59	60	61	15
15 psi	85	90	95	89	90	91	45
30 psi	85	90	95	89	90	91	90
60 psi	85	90	95	89	90	91	180
100 psi	95	100	105	99	100	101	200
150 psi	85	90	95	89	90	91	300
240 psi	95	100	105	99	100	101	300

Compensated Silicon Pressure Sensors

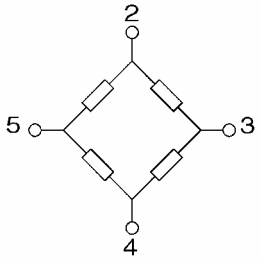
ABSOLUTE OUTPUT (At 12 Vdc Excitation at 25 °C [77 °F].)

FS Pressure	XCX Output, Full Scale Span (mV)			Max. Overpressure (psi)
	Min.	Typ.	Max.	
5 psi	57	60	63	15
15 psi	85	90	95	45
30 psi	85	90	95	90
60 psi	85	90	95	180
100 psi	95	100	105	200

MOUNTING DIMENSIONS (For reference only: mm (in).)



EQUIVALENT CIRCUIT

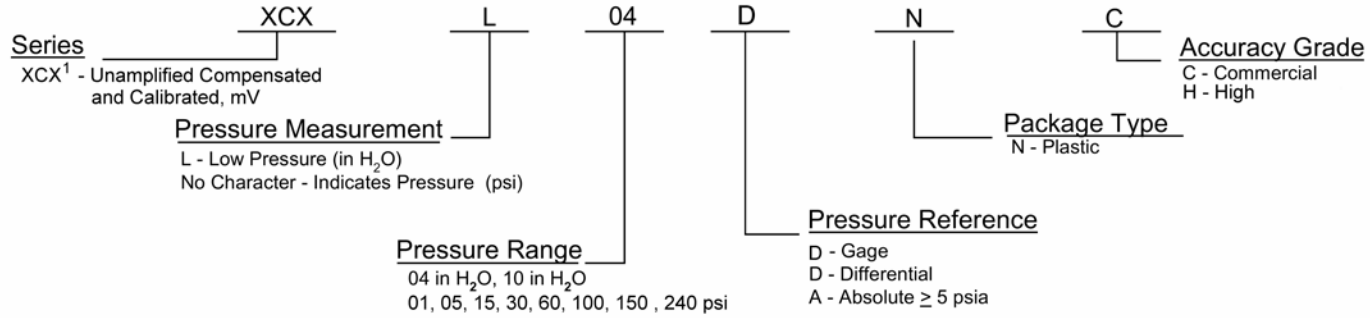


Pinout
1. N/C
2. +V Excitation
3. - Output signal
4. _V Excitation
5. - Output signal
6. N/C

MEDIA COMPATIBILITY: Clean, dry gases only.

P1 Port: Front side of silicon diaphragm, silicone gel passivation, glass-filled nylon alumina.
P2 Port: Silicon diaphragm, glass-filled nylon and alumina ceramic.

ORDER GUIDE



Note 1. Gage and Differential use "D" suffix. Product is the same. Not all combinations are available.

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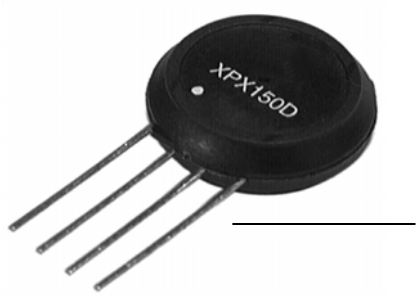
Honeywell

XPC/XPCL and XPX/XPXL Series

Uncompensated/Compensated and Compensated Calibrated Silicon Pressure Sensors



DESCRIPTION

The XPC/XPCL and XPX/XPXL Series sensors integrate silicon micromachined sensing technology, temperature compensation, and calibration in a complete family of low-cost packages. This series offers a cost-effective solution for design requirements.

These piezoresistive pressure sensors use micromachined silicon chips mounted on ceramic and protected with a plastic cap. Several tube arrangements with nylon housings are available for various pressure applications.

On devices of 5 psi and above, the top side of the chip is protected against humidity by a Silgel® coating.

Although the sensors are designed for use with noncorrosive, nonionic pressure media, they accommodate many gases that are used in medical applications.

FEATURES

- Low cost, small size
- Temperature compensated
- Zero and span calibrated
- Millivolt output
- Differential, gage and absolute pressure
- Constant voltage excitation
- High impedance - low current

POTENTIAL APPLICATIONS

- Medical applications
- Applications requiring small size
- Applications requiring vacuum and positive pressure reference or both

XPC/XPCL and XPX/XPXL Series

ELECTRICAL SPECIFICATIONS

Characteristic	XPC/XPCL at 12 Vdc, 25 °C [77 °F]				XPX/XPXL at 5 Vdc, 25 °C [77 °F]			
	Min.	Typ.	Max.	Unit	Min.	Typ.	Max.	Unit
Excitation voltage	3.0	12.0	16.0	Vdc	3.0	5.0	12.0	Vdc
Null	-1.0	0	1.0	mV	-50	0	50	mV
Offset temperature shift[1] 0 °C to 25 °C [32 °F to 77°F] 25 °C to 70 °C [77 °F to 158 °F]	–	–	±1.0	mV	–	±0.5		mV
Full scale temperature shift[1] 0 °C to 25 °C [32 °F to 158 °F] 25 °C to 70 °C [77 °F to 158 °F]	–	–	±2	PPM/°C	–	-2200	–	PPM/°C
Linearity, hysteresis error[2]	–	0.25	1.0	% span		0.25	1.0	% span
Input resistance	5.0	–	–	kOhm	5.0	–	–	kOhm
Output resistance	–	3.0	–	kOhm	–	3.0	–	kOhm
Operating temperature	-25 [-13]	–	85 [185]	°C [°F]	-25 [-13]	–	85 [185]	°C [°F]
Storage temperature	-40 [-40]	–	125 [257]	°C [°F]	-40 [-40]	–	125 [257]	°C [°F]
Common mode pressure	–	–	50	psi	–	–	50	psi
Weight	–	2	–	g	–	2	–	g

Notes:
1. Shift is relative to 25 °C [77 °F].
2. Measured at 1/2 full scale rated pressure using BFSL.

ABSOLUTE OUTPUT

FS Pressure	XPC at 12 Vdc, 25 °C [77 °F] Output Full Scale Span (mV)			XPX at 5 Vdc, 25 °C [77 °F] Output Full Scale Span (mV)			Overpressure (psi)
	Min.	Typ.	Max.	Min.	Typ.	Max.	Max.
5 psi	57	60	63	112	168.5	225	15
15 psi	85	90	95	168	253	338	45
30 psi	85	90	95	168	253	338	90
60 psi	85	90	95	189	263.5	338	180
100 psi	95	100	105	210	295	380	250

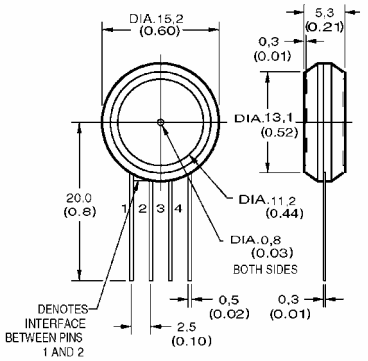
GAGE/DIFFERENTIAL[1] OUTPUT

FS Pressure	XPC/XPCL at 12 Vdc, 25 °C [77 °F] Output Full Scale Span (mV)			XPX/XPXL at 5 Vdc, 25 °C [77 °F] Output Full Scale Span (mV)			Overpressure (psi)
	Min.	Typ.	Max.	Min.	Typ.	Max.	Max.
4 in H_2O	23	25	27	50	68	86	3
10 in H_2O	19	20	21	40	78.5	112	3
1 psi	17	18	19	40	75	110	3
5 psi	57	60	63	112	168.5	225	15
15 psi	85	90	95	168	253	338	45
30 psi	85	90	95	168	253	338	90
60 psi	85	90	95	189	263.5	338	180
100 psi	95	100	105	210	295	380	250
150 psi	85	90	95	187	262.5	338	250

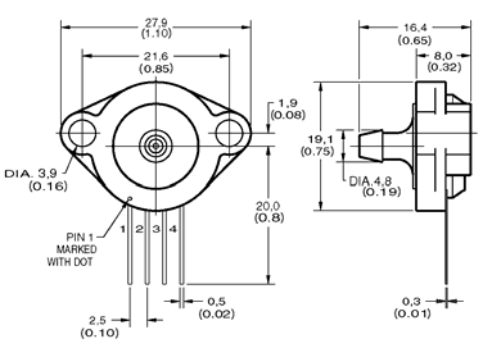
Note:
1. Differential common mode pressure should not exceed 50 psi.

MOUNTING DIMENSIONS (For reference only: mm (in).)

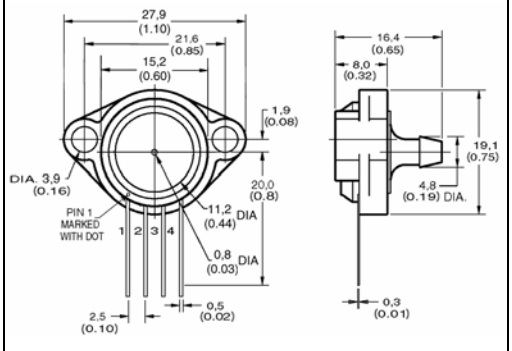
D/A Housing (Differential/Absolute)



GFS/AFS Housing (Gage/Absolute Offset Axial)



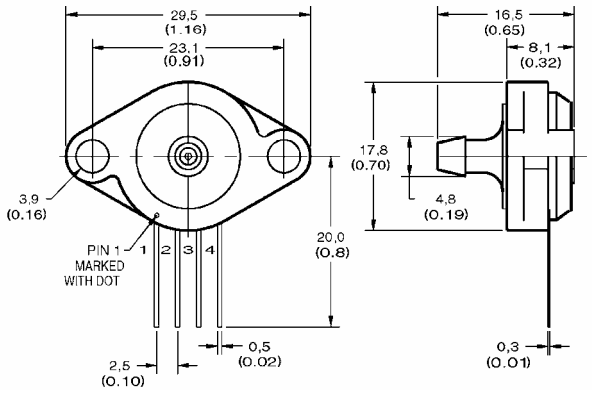
GBFS Housing (Gage Backside Offset Axial)



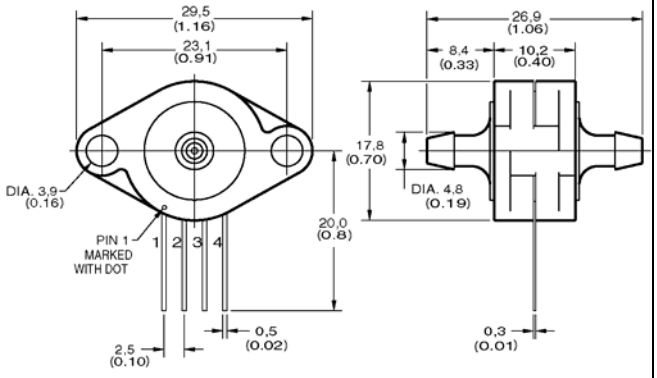
Uncompensated/Compensated and Compensated Calibrated Silicon Pressure Sensors

MOUNTING DIMENSIONS (For reference only: mm (in).)

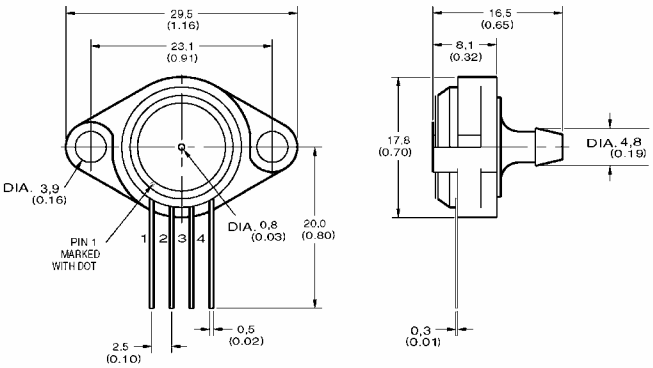
GF/AF Housing
(Gage/Absolute Axial)



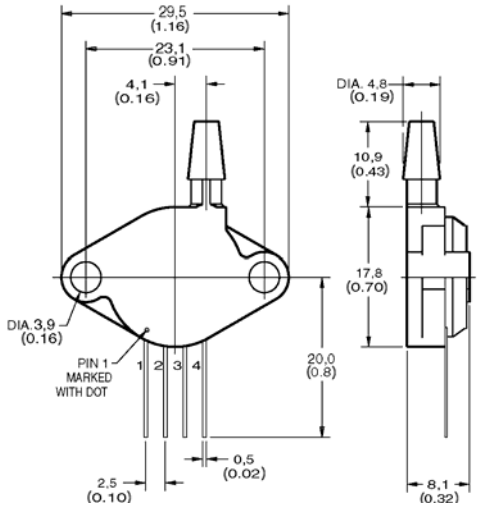
DF Housing
(Differential Axial)



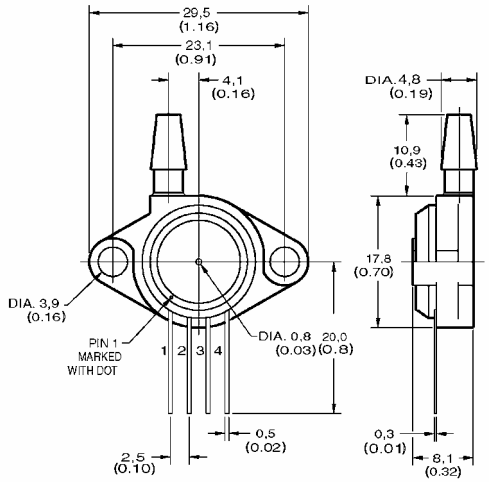
GBF Housing
(Gage Backside Axial)



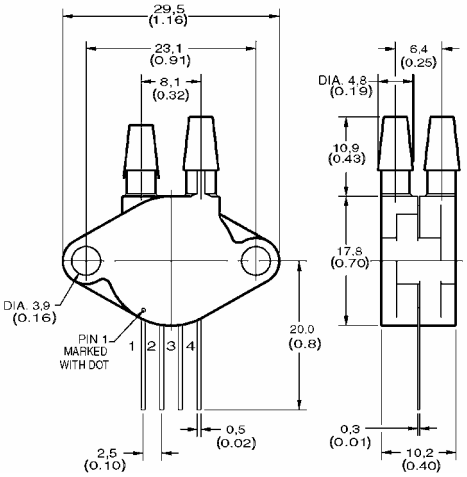
GT/AT Housing
(Gage/Absolute Radial)



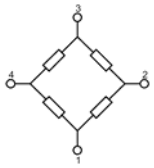
GBT Housing
(Gage Backside Radial)



DT Housing
(Differential Radial)



EQUIVALENT CIRCUIT

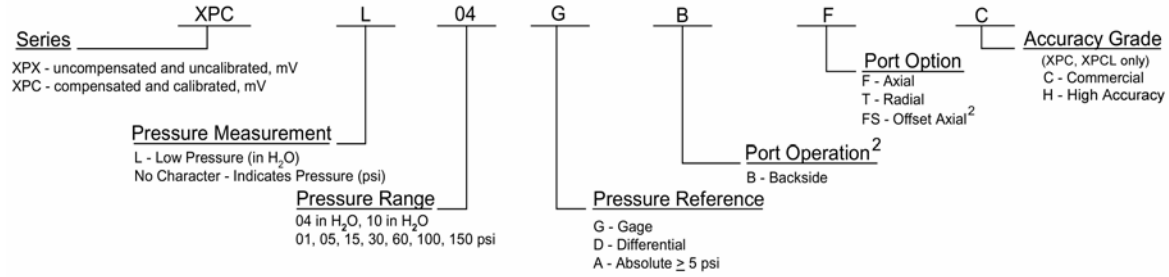


Pinout
1. -V Excitation
2. + Output Signal
3. +V Excitation
4. - Output Signal

Media compatibility: Clean, dry gases only.

P1 Port: Media must be compatible with epoxy-based adhesive and silicon gel.
P2 Port: Media must be compatible with nylon housing, epoxy-based adhesive and silicon.

ORDER GUIDE[1]



Notes:
1. Not all combinations may be available. Contact Honeywell representative for details.
2. Option available in ported gage version only.

⚠ WARNING

PERSONAL INJURY
DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.
Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

MISUSE OF DOCUMENTATION
- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

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WARRANTY/REMEDY
Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

SALES AND SERVICE
Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

E-mail: info.sc@honeywell.com

Internet: www.honeywell.com/sensing

Phone and Fax:

Asia Pacific	+65 6355-2828
	+65 6445-3033 Fax
Europe	+44 (0) 1698 481481
	+44 (0) 1698 481676 Fax
Latin America	+1-305-805-8188
	+1-305-883-8257 Fax
USA/Canada	+1-800-537-6945
	+1-815-235-6847
	+1-815-235-6545 Fax

Sensing and Control
Honeywell
1985 Douglas Drive North
Minneapolis, MN 55422
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Honeywell

008046-5-EN IL50 GLO Printed in USA
July 2007

Honeywell

XSCL/XSC Series

Compensated and Calibrated Pressure Sensors

DESCRIPTION

The XSCL/XSC Series sensors integrate silicon micromachined sensing technology, temperature compensation and calibration in a wide variety of low-cost packages. This series offers a cost-effective solution for design requirements.

These piezoresistive pressure sensors use micromachined silicon chips mounted on ceramic and protected with a plastic cap. Several tube arrangements with nylon housings are available for various pressure applications.

On devices of 5 psi and above, the topside of the chip is protected against humidity by a Silgel® coating. While the sensors are designed for use with non-corrosive, non-ionic pressure media, they accommodate many gases that are used in medical applications.

FEATURES

- Low cost, small size, temperature compensated
- Zero and span calibrated
- Millivolt output
- Differential, gage and absolute pressure
- Constant voltage excitation
- High impedence – low current

POTENTIAL APPLICATIONS

- Medical equipment
- Applications requiring small size
- Applications requiring vacuum and positive pressure reference, or both

XSCL/XSC Series
Compensated and Calibrated

ELECTRICAL SPECIFICATIONS AT 12 ±0.01 VDC EXCITATION AT 25 °C [77 °F] (1)

Characteristic	Min.	Typ.	Max.	Unit
Excitation voltage	3.0	12.0	16.0	Vdc
Null	-1.0	0	+1.0	mV
Offset temperature shift 0 °C to 70 °C [32 °F to 158 °F] (2)	–	–	±1.0	mV
Full scale temperature shift 0 °C to 70 °C [32 °F to 158 °F] (2)	–	–	±2	% span
Linearity, hysteresis error (3)	–	0.25	1.0	% span
Input resistance	5.0	–	–	kΩ
Output resistance	–	3.0	–	kΩ
Operating temperature	-25	–	+85	°C
Storage temperature	-40	–	+125	°C
Common mode pressure	–	–	50	psi
Weight	–	2	–	g

Notes:

1. All parameters are measured at 12 Vdc excitation. Pressure specs obtained with pressure applied to the front of the sensor.
2. Shift is relative to 25 ºC [77 ºF].
3. Measured at ½ full scale rated pressure using BFSL.

XSC ABSOLUTE OUTPUT AT 12 VDC ±0.01 EXCITATION AT 25 °C [77 °F]

FS Pressure (psi)	XSC Output Full Scale Span (mV)			Overpressure (psi)
	Min.	Typ.	Max.	Max.
5	57	60	63	15
15	85	90	95	45
30	85	90	95	90
60	85	90	95	180

XSCL/XSC GAGE AND DIFFERENTIAL(1) OUTPUT AT 12 VDC ±0.01 EXCITATION AT 25 °C [77 °F]

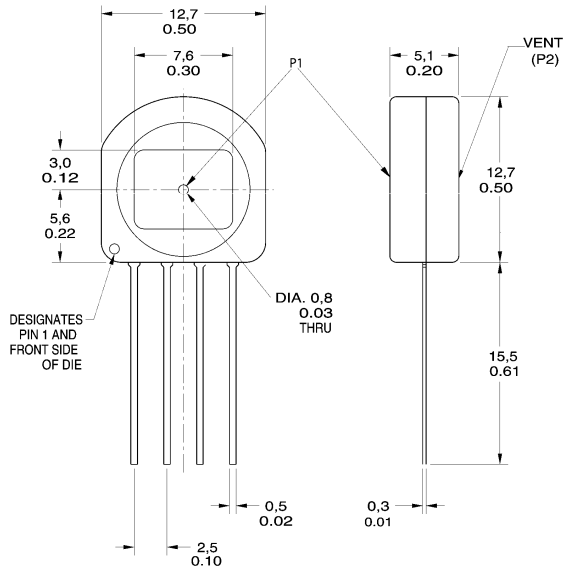
FS Pressure (psi)	XSC Output Full Scale Span (mV)			Overpressure (psi)
	Min.	Typ.	Max.	Max.
4 in H20	23	25	27	3
10 in H20	19	20	21	3
1	17	18	19	3
5	57	60	63	15
15	85	90	95	45
30	85	90	95	90
60	85	90	95	180
100	95	100	105	250

Note:

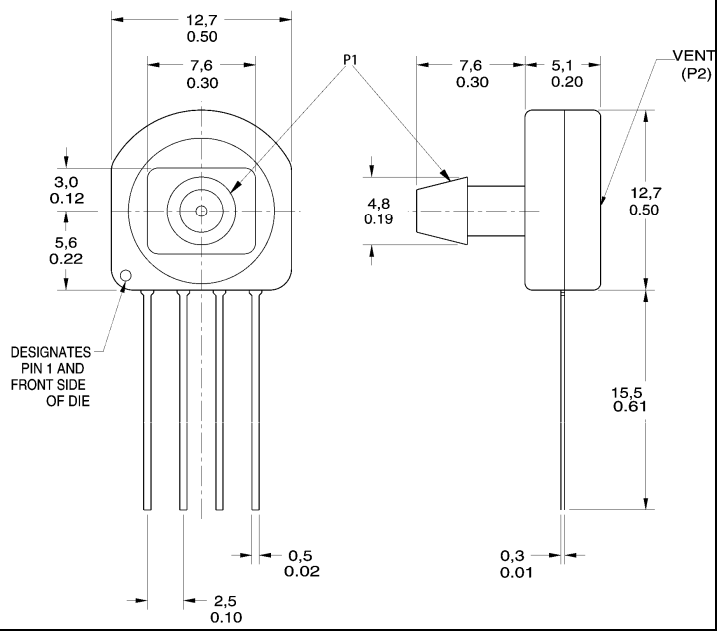
1. Differential common mode pressure should not exceed 50 psi.

MOUNTING DIMENSIONS (For reference only, mm/in.)

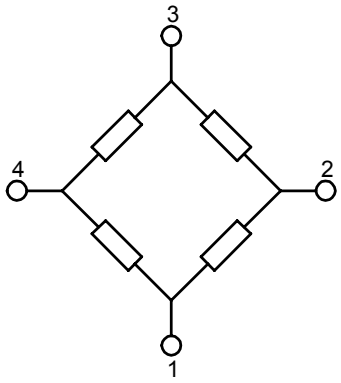
XCS A/D/G/Style



XCS/XCSL WITH PORT, AF/GF STYLE



EQUIVALENT CIRCUIT



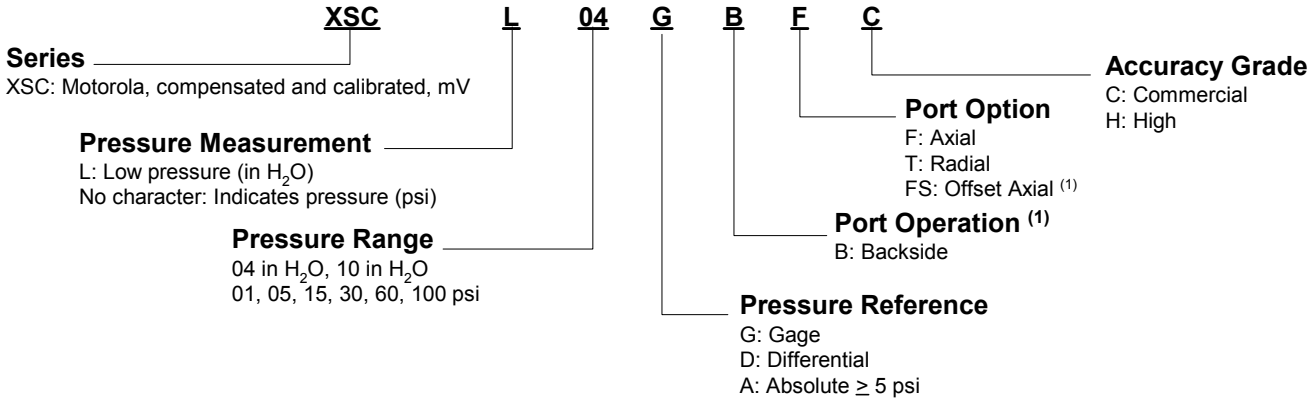
PIN DESIGNATIONS

1. –V Excitation
2. +Output Signal
3. +V Excitation
4. –Output Signal

MEDIA COMPATIBILITY

Dry gasses only. Media must be compatible with nylon housing, epoxy adhesive and silicon.

ORDER GUIDE



Note:

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	+1-305-883-8257 Fax
USA/Canada	+1-800-537-6945
	+1-815-235-6847
	+1-815-235-6545 Fax

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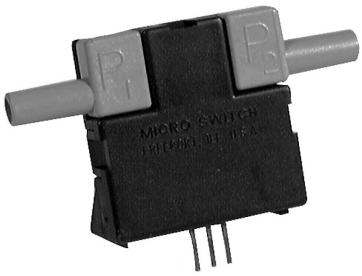
www.honeywell.com/sensing

Honeywell

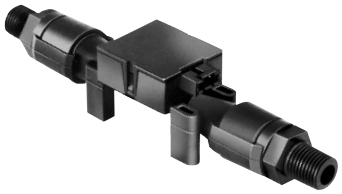
008056-2-EN IL50 GLO Printed in USA
October 2005

Airflow Sensors
Microbridge Mass Airflow



AWM 1000/2000/3000 Series

AWM 40000 Series



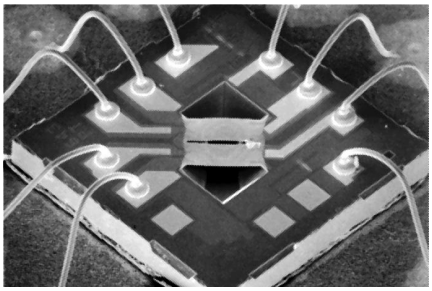
AWM 5000 Series

FEATURES
- State-of-the-art silicon micromachining
- Sensitive to low flows – 0.1 sccm to 20 SLPM
- Adaptable for use with higher flows (See Application Note 2 page 128.)
- Fast response time
- Analog output
- Low power consumption
- Repeatable response
- Laser-trimmed interchangeability
- Accurate, cost effective flow sensing
- In-line printed circuit board terminals
- Standard 0.100″ (2,54mm) mounting centers
- Accurate sensing of low pressure 0.001″ to 4.0″ H_2O (.003 to 10mBar)

APPLICATIONS
- Damper control for heating, ventilation, and air conditioning systems
- Gas analyzers
- Low vacuum control
- Process control
- Medical respirators and ventilators
- Oxygen concentrators
- Leak detection equipment
- Vent hoods
- Anesthesia control
- Gas metering
- Gas chromatography

OPERATION
The microbridge mass airflow sensor operates on the theory of heat transfer. Mass airflow is directed across the surface of the sensing elements. Output voltage varies in proportion to the mass air or other gas flow through the inlet and outlet ports of the package. The specially designed housing precisely directs and controls the airflow across the microstructure sense element. Mechanical design of the package allows it to be easily mounted to printed circuit boards.

The microbridge mass airflow sensor has a unique silicon chip based on advanced microstructure technology. It consists of a thin-film, thermally isolated bridge structure containing heater and temperature sensing elements. The bridge structure provides a sensitive and fast response to the flow of air or other gas over the chip. Dual sensing elements positioned on both sides of a central heating element indicate flow direction as well as flow rate. Laser trimmed thick film and thin film resistors provide consistent interchangeability from one device to the next.



The microbridge mass airflow sensor uses temperature-sensitive resistors deposited within a thin film of silicon nitride. They are suspended in the form of two bridges over an etched cavity in the silicon, shown below. The chip is located in a precisely dimensioned airflow channel to provide a repeatable flow response. Highly effective thermal isolation for the heater and sensing resistors is attained by etching the cavity space beneath the flow sensor bridges. The small size and thermal isolation of the microbridge mass airflow sensor are responsible for the extremely fast response and high sensitivity to flows.

Dual Wheatstone bridges control airflow measurement — one provides closed loop heater control, the other contains the dual sensing elements. The heater circuit minimizes shift due to ambient temperature changes by providing an output proportional to mass flow. The circuit keeps the heater temperature at a constant differential (160°C) above ambient air temperature which is sensed by a heat-sunk resistor on the chip. The ratiometric voltage output of the device corresponds to the differential voltage across the Wheatstone bridge circuit.

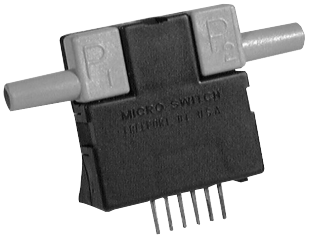
NOTICE
Dust contamination may be possible in some applications, the effects of which can be minimized. By design, dust particles that may be present in the air stream will flow past the chip parallel to the chip surface. In addition, the microstructure chip produces a thermophoretic effect, which repels micrometer-sized dust particles away from the bridge structure.

Dust adherence to chip edges and channel surfaces can be prevented using a simple filter. A disposable five-micron filter used in series on the upstream side of the airflow device will provide adequate filtering in most applications. For a list of possible filter sources, see Filter Manufacturers, page 126.

CAUTION
PRODUCT DAMAGE

AWM Series Microbridge Mass Airflow Sensors are **NOT** designed to sense liquid flow and will be damaged by liquid flow through the sensor.

Microbridge Mass Airflow/Unamplified



FEATURES
- Cost-effective microbridge technology
- Accurate, repeatable airflow sensing
- Bi-directional sensing capability
- Low differential pressure sensing

Take advantage of microbridge mass flow sensor technology. The AWM1000 series mass flow sensor provides all of the outstanding performance benefits of the standard AWM2000 series in a more cost-effective sensor platform. This device provides accurate, repeatable flow sensing. Sensor to sensor interchangeability specifications are approximately twice as large as compared to the AWM2000 series.

The heater control circuit in Figure 1 and the sensing bridge supply circuit in Figure 2 are both required for operation per specification. These two circuits are **NOT** on board the sensor and must be supplied in the application. The differential amplifier circuitry in Figure 3 may be useful in providing output gain and/or introducing voltage offsets to the sensor output (Ref. Equation 1).

NOTE: For applications involving sensing hydrogen (H_2) gas or helium (He) gas, see Application Note 3, page 131.

Figure 1
Heater Control Circuit

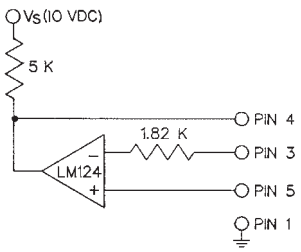


Figure 2
Sensing Bridge Supply Circuit

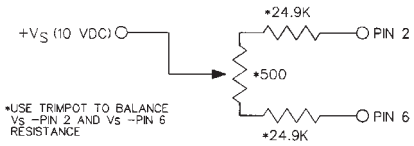
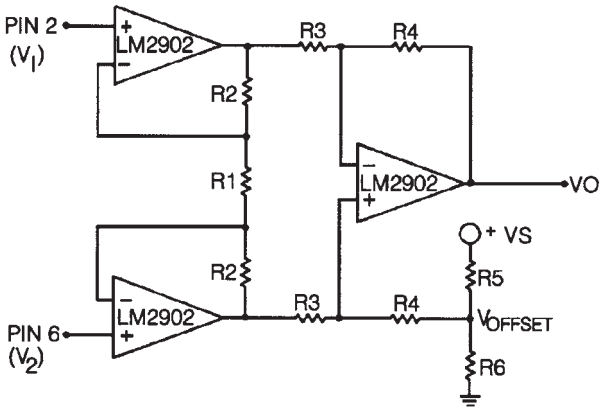


Figure 3
Differential Instrumentation Amplifier Circuit



Equation 1:

$$V_o = \left(\frac{2R_2+R_1}{R_1}\right)\left(\frac{R_4}{R_3}\right)\left(V_2-V_1\right)+V\ \text{offset}$$

$$\text{where } V\ \text{offset} = V_s\left(\frac{R_6}{R_6+R_5}\right)$$

Airflow

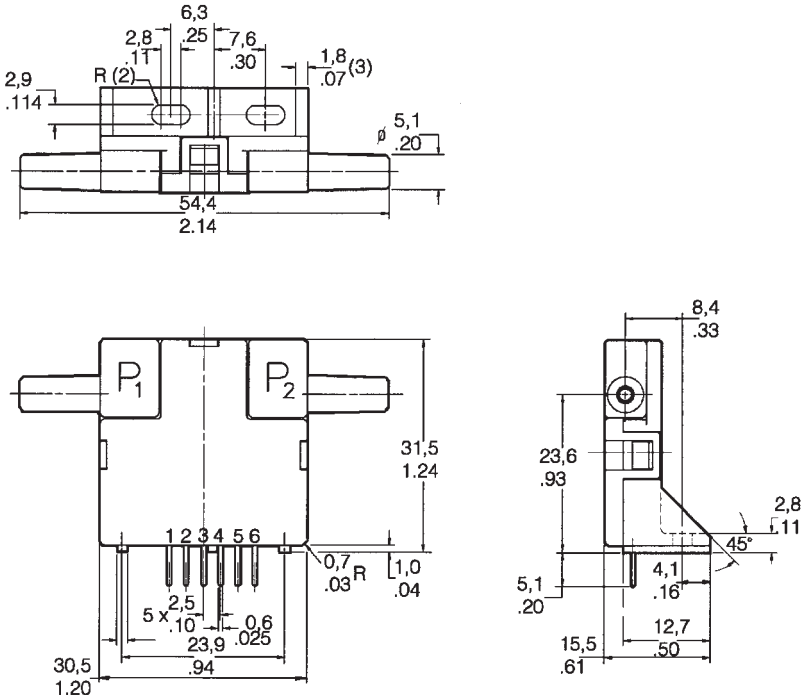
Microbridge Mass Airflow/Unamplified

AWM1000 SERIES ORDER GUIDE (Performance Characteristics @ 10.0 ±0.01 VDC, 25°C)

Catalog Listings	AWM1100V	AWM1200V	AWM1300V
Flow Range (Full Scale)	±200 sccm		+1000 sccm to −600 sccm
Pressure Range (See Application Note #1)		±4.0″ H_2O (10 mBar)	
Output Voltage @ Trim Point	30 mV @ 100 sccm	20 mV @ 2.0″ H_2O	50 mV @ 650 sccm
Null Voltage Shift, Typ. +25 to −25°C, +25 to 85°C	±0.7 mV (max.)	±0.7 mV (max.)	±0.7 mV (max.)
Output Voltage Shift, Max. +25 to −25°C +25 to +85°C	±4% Full Scale ±4% Full Scale	+22% Reading (Note 2) −22% Reading	±4% Full Scale ±4% Full Scale
Repeatability & Hysteresis, Max.	±1% Full Scale	±1% Full Scale	±1% Full Scale
	Min.	**Typ.**	**Max.**
Excitation (VDC) (Note 1)	8.0	10±0.01	15
Power Consumption (mW)	—	30	50
Null Voltage (mV)	−1.0	0.0	+1.0
Response Time (msec)	—	1.0	3.0
Common Mode Pressure (psi)	—	—	25
Sensor Resistance (kΩ) Pin 2-Pin 1, Pin 6-Pin 1	—	5	—
Sensor Current (mA) Pin 2-Pin 1, Pin 6-Pin 1	—	0.3	0.6
Temperature Range	Operating: −25° to +85°C (−13° to +185°F); Storage: −40° to +90°C (−40° to +194°F)		
Termination	2,54 mm (.100″) centers, 0,635 mm (0.025″) square		
Weight (grams)	10.8		
Shock Rating	100 g peak (5 drops, 6 axes)		

Notes:
1. Output Voltage is ratiometric to supply voltage.
2. Temperature shifts when sensing differential pressure correlates to the density change of the gas over temperature. See Application Note 1.
3. Maximum allowable rate of flow change to prevent damage: 5 SLPM/1.0 sec.

MOUNTING DIMENSIONS (for reference only)



NOTE: Positive flow direction is defined as proceeding from Port 1 (P1) to Port 2 (P2) and results in positive output (Pin 6 > Pin 2). Negative flow direction is defined conversely and results in negative output (Pin 6 < Pin 2). Do not exert a force greater than 4.54 kg (10 lbs.) in any direction.

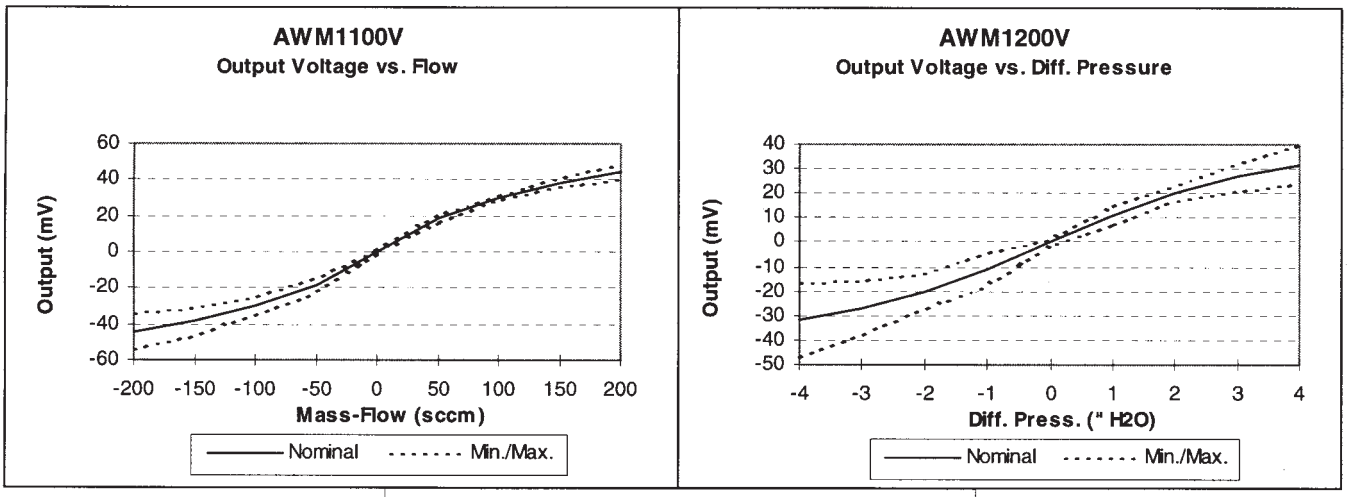
Microbridge Mass Airflow/Unamplified

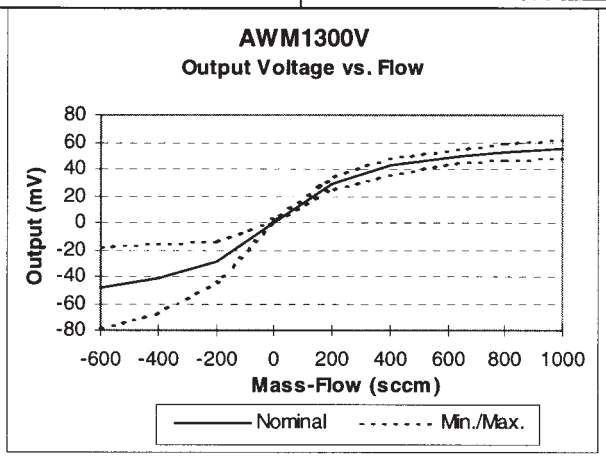
OUTPUT FLOW VS INTERCHANGEABILITY (Note 1) **Performance Characteristics @ 10.0 ±0.01 VDC, 25°C**

AWM1100V				AWM1200V (Note 2)				AWM1300V			
Press mBar	**Flow sccm**	**Nom. mV**	**Tol. ±mV**	Flow sccm	**Press. ″ H_2O**	**Nom. mV**	**Tol. ±mV**	Press mBar	**Flow sccm**	**Nom. mV**	**Tol. ±mV**
0.49	**200**	44.25	4.25	120	**4.00**	31.75	8.0	3.4	**1000**	55.50	7.0
0.35	**150**	38.75	3.00	90	**3.00**	26.75	6.0	2.4	**800**	52.90	6.0
0.21	**100**	30.00	1.00	60	**2.00**	20.00	3.0	1.8	**650**	50.00	5.0
0.09	**50**	18.40	2.00	30	**1.00**	11.20	4.0	0.83	**400**	42.50	6.0
0	**0**	0.00	1.00	0	**0.00**	0.00	1.0	0.31	**200**	29.20	5.0
−0.09	**−50**	−18.40	3.90	−30	**−1.00**	−11.20	7.0	0	**0**	0.00	1.5
−0.21	**−100**	−30.00	5.00	−60	**−2.00**	−20.00	7.0	−0.31	**−200**	−28.90	15.0
−0.35	**−150**	−38.75	7.65	−90	**−3.00**	−26.75	11.0	−0.83	**−400**	−41.20	26.0
−0.49	**−200**	−44.25	9.75	−120	**−4.00**	−31.75	15.0	−1.6	**−600**	−48.20	30.0

Notes:
1. Numbers in **BOLD** type indicate calibration type, mass flow or differential pressure. Tolerance values apply to calibration type only.
2. Differential pressure calibrated devices are not recommended for flow measurement. Use flow calibrated devices for flow measurement.

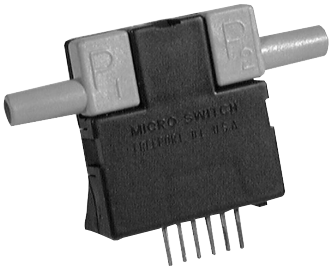
OUTPUT CURVES





Airflow

Microbridge Mass Airflow/Unamplified



FEATURES
- Bidirectional sensing capability
- Actual mass air flow sensing
- Low differential pressure sensing

The AWM2000 Series microbridge mass airflow sensor is a passive device comprised of two Wheatstone bridges. The heater control circuit in Figure 1 is required for operation per specifications. The sensing bridge supply circuit in Figure 2 is also required for operation per specifications. These two circuits are **not on board** the package and must be supplied in the application. The differential amplifier in Figure 3 is a useful interface for the sensing bridge. It can be used to introduce the gain and to introduce voltage offsets to the sensor output as referenced in Equation 1.

Note: For applications sensing hydrogen or helium, see Application Note 3, page 131.

Figure 1
Heater Control Circuit

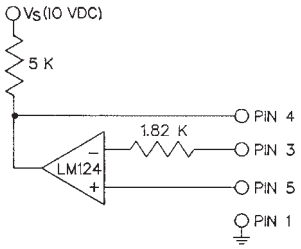


Figure 2
Sensing Bridge Supply Circuit

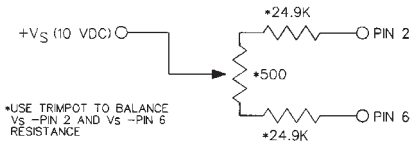
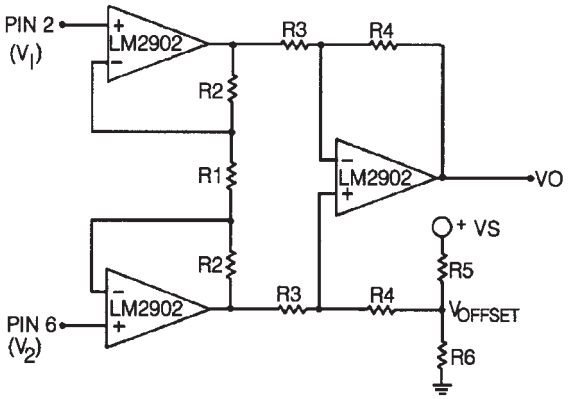


Figure 3
Differential Instrumentation Amplifier Circuit



Equation 1:

$$V_o = \left(\frac{2R_2+R_1}{R_1}\right)\left(\frac{R_4}{R_3}\right)\left(V_2-V_1\right)+V\ \text{offset}$$

$$\text{where } V\ \text{offset} = V_s\left(\frac{R_6}{R_6+R_5}\right)$$

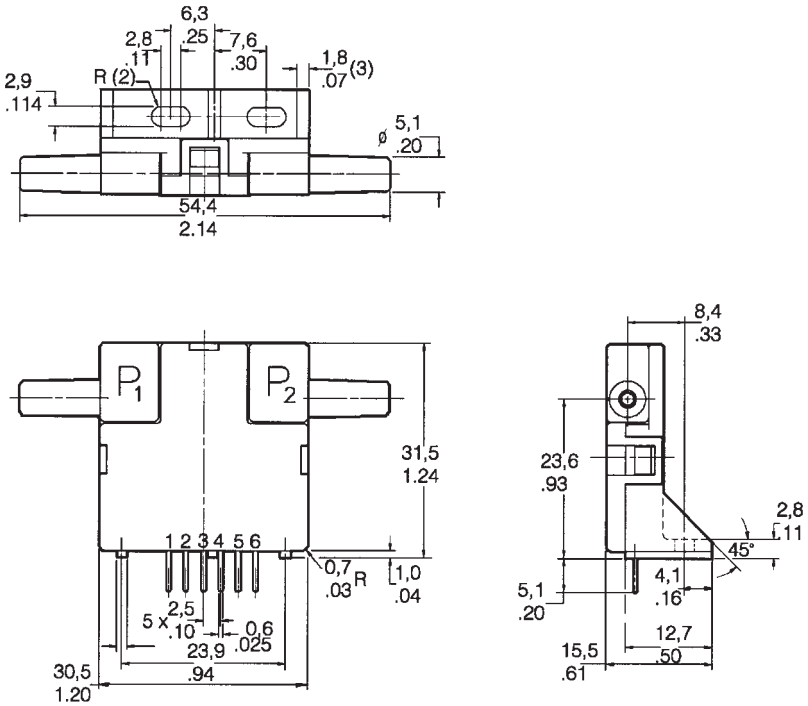
Microbridge Mass Airflow/Unamplified

AWM2000 SERIES ORDER GUIDE (Performance Characteristics @ 10.01 ±0.01 VDC, 25°C)

Catalog Listings	AWM2100V	AWM2150V	AWM2200V	AWM2300V
Flow Range (Full Scale)	±200 sccm	±30 sccm		±1000 sccm
Pressure Range (See Application Note #1)			±4.0″ H_2O (10 mBar)	
Output Voltage @ Trim Point	30 mV @ 100 sccm	11.8 mV @ 25 sccm	20 mV @ 2″ H_2O	50 mV @ 650 sccm
Null Voltage Shift, Typ. +25° to −25°C, +25° to 85°C	±0.20 mV	±0.20 mV	±0.20 mV	±0.20 mV
Output Voltage Shift, Max. +25° to −25°C +25° to +85°C	+2.5% Reading −2.5% Reading	+5% Reading −5% Reading	+22% Reading (Note 2) −22% Reading	+5% Reading −5% Reading
Repeatability & Hysteresis, Max.	±0.35% Reading	±0.35% Reading	±0.35% Reading	±1% Reading
	Min.	**Typ.**	**Max.**	
Excitation (VDC) (Note 1)	8.0	10±0.01	15	
Power Consumption (mW)	—	30	50	
Null Voltage (mV)	−1.0	0.0	+1.0	
Response Time (msec)	—	1.0	3.0	
Common Mode Pressure (psi)	—	—	25	
Sensor Resistance (kΩ) Pin 2-Pin 1, Pin 6-Pin 1	—	5	—	
Sensor Current (mA) Pin 2-Pin 1, Pin 6-Pin 1	—	—	0.6	
Temperature Range	Operating: −25° to +85°C (−13° to +185°F); Storage: −40° to +90°C (−40° to +194°F)			
Termination	2,54 mm (.100″) centers, 0,635 mm (0.025″) square			
Weight (grams)	10.8			
Shock Rating	100 g peak (5 drops, 6 axes)			

Notes:
1. Output Voltage is ratiometric to supply voltage.
2. Temperature shifts when sensing differential pressure correlates to the density change of the gas over temperature. See Application Note 1.
3. Maximum allowable rate of flow change to prevent damage: 5.0 SLPM/1.0 sec.

MOUNTING DIMENSIONS (for reference only)



NOTE: Positive flow direction is defined as proceeding from Port 1 (P1) to Port 2 (P2) and results in positive output (Pin 6 > Pin 2). Negative flow direction is defined conversely and results in negative output (Pin 6 < Pin 2). Do not exert a force greater than 4.54 kg (10 lbs.) in any direction.

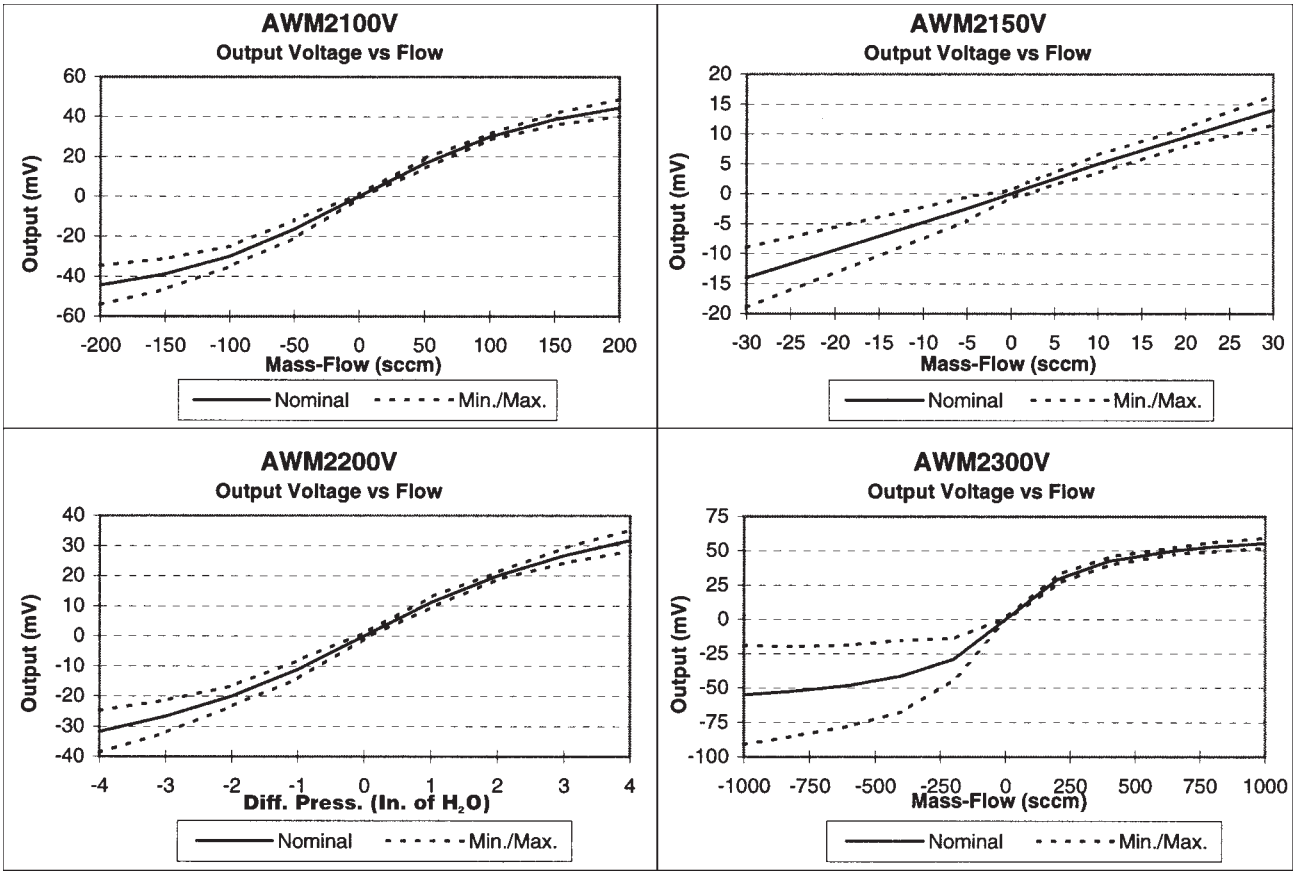
Microbridge Mass Airflow/Unamplified

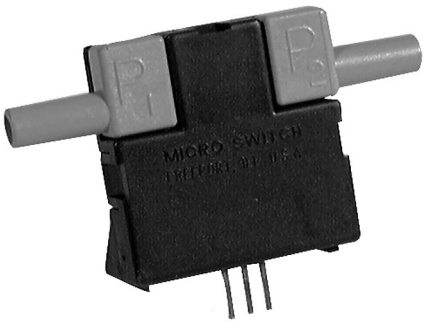
OUTPUT FLOW VS INTERCHANGEABILITY (Note 1) **Performance Characteristics @ 10.0 ±0.01 VDC, 25°C**

AWM2100V				AWM2150V				AWM2200V (Note 2)				AWM2300V			
Press. mBar	**Flow sccm**	**Nom. mV**	**Tol. ±mV**	Press. µBar	**Flow sccm**	**Nom. mV**	**Tol. ±mV**	Flow sccm	**Press. ″ H_2O**	**Nom. mV**	**Tol. ±mV**	Press. mBar	**Flow sccm**	**Nom. mV**	**Tol. ±mV**
0.49	**200**	44.50	4.25	53	**30**	14.0	2.5	120	**4.00**	31.75	3.50	3.4	**1000**	55.50	3.70
0.35	**150**	38.75	3.00	36	**20**	9.5	1.5	90	**3.00**	26.75	2.50	2.4	**800**	52.90	3.50
0.21	**100**	30.00	1.50	17	**10**	5.0	1.5	60	**2.00**	20.00	1.20	1.8	**650**	50.00	2.50
0.09	**50**	16.50	2.50	9.8	**5**	2.5	1.0	30	**1.00**	11.20	1.80	0.83	**400**	42.50	3.00
0.00	**0**	0.00	1.00	7.4	**4**	2.0	1.0	0	**0.00**	0.00	1.00	0.31	**200**	29.20	3.20
−0.09	**−50**	−16.50	4.50	6.2	**3**	1.5	1.0	−30	**−1.00**	−11.20	3.00	0	**0**	0.00	1.00
−0.21	**−100**	−30.00	5.00	5	**2**	1.0	1.0	−60	**−2.00**	−20.00	3.30	−0.31	**−200**	−28.90	15.00
−0.35	**−150**	−38.80	7.65	2.5	**1**	0.5	0.8	−90	**−3.00**	−26.75	5.30	−0.83	**−400**	−41.20	26.00
−0.49	**−200**	−44.50	9.75	0	**0**	0.0	0.6	−120	**−4.00**	−31.75	7.00	−1.6	**−600**	−48.20	29.50
				−9.8	**−5**	−2.5	2.0					−2.4	**−800**	−52.20	32.50
				−53	**−30**	−14.0	5.0					−3.4	**−1000**	−55.00	36.00

Notes:
1. Numbers in **BOLD** type indicate calibration type, mass flow or differential pressure. Tolerance values apply to calibration type only.
2. Differential pressure calibrated devices are not recommended for flow measurement. Use flow calibrated devices for flow measurement.

OUTPUT CURVES





FEATURES
- Laser trimmed for improved sensor interchangeability
- Flow sensing up to 1.0 SLPM
- Low differential pressure sensing

Like the AWM2000 Series, the dual Wheatstone bridges control airflow measurement. The AWM3000 Series is amplified; therefore, it can be used to increase the gain and to introduce voltage offsets to the sensor output. The schematic in Figure 3 depicts the amplification circuitry on board the sensor. Also, the heater control circuit (see Figure 1) and the sensing bridge supply circuit (see Figure 2) are on board the package.

Figure 1
Heater control circuit

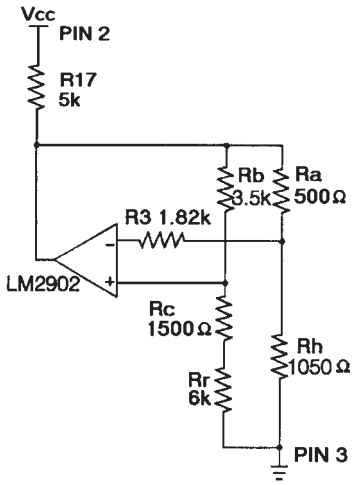


Figure 2
Sensing bridge supply circuit

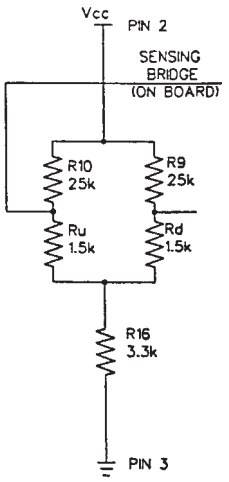
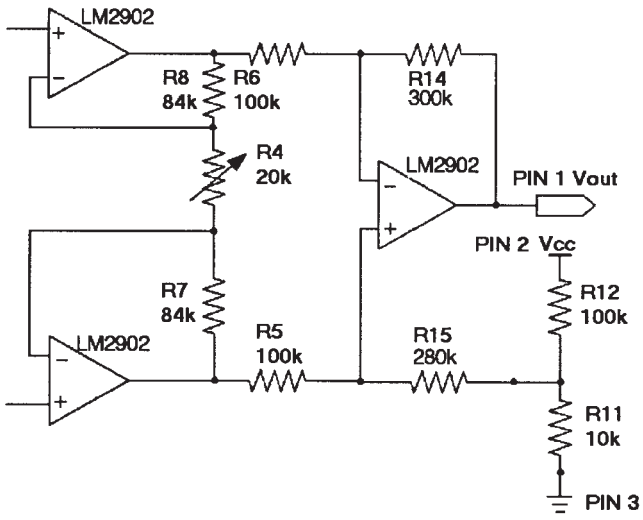


Figure 3
Differential instrumentation amplifier circuit



Airflow

Microbridge Mass Airflow/Amplified

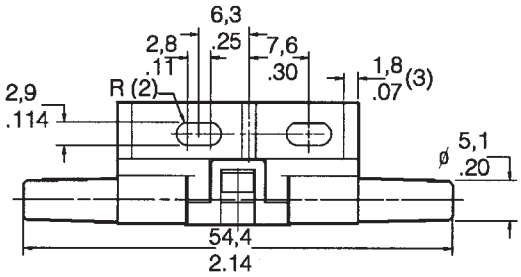
AWM3000 SERIES ORDER GUIDE (Performance Characteristics @ 10.01 ±0.01 VDC, 25°C)

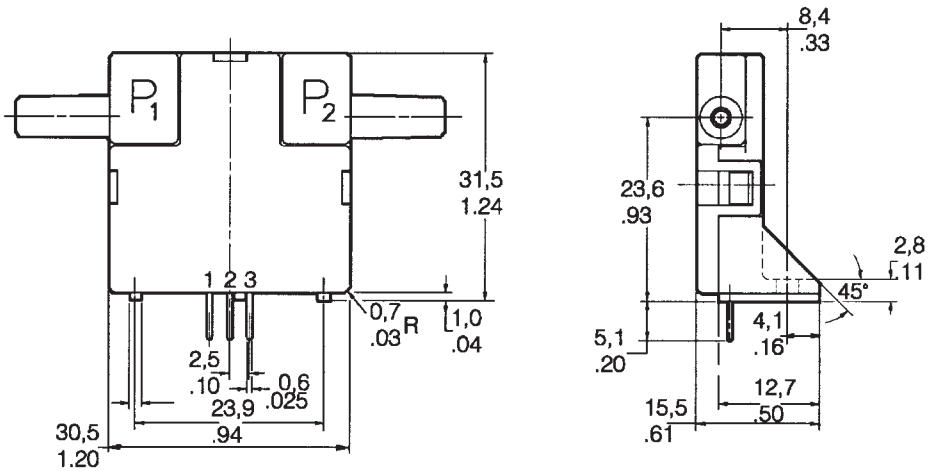
Catalog Listings	AWM3100V	AWM3150V	AWM3200V	AWM3300V
Flow Range (Full Scale)	+200 sccm	+30 sccm		+1000 sccm
Pressure Range (See Application Note 1)			+2.0″ H_2O (5 mBar)	
Output Voltage @ Trim Point	5 VDC @ 200 sccm	3.4 VDC @ 25 sccm	5 VDC @ 2″ H_2O	5 VDC @ 1000 sccm
Null Voltage	1.00 ±0.05 VDC	1.00 ±0.10 VDC	1.00 ±0.08 VDC	1.00 ±0.10 VDC
Null Voltage Shift, Typ. +25° to −25°C, 25° to +85°C	±25 mV	±100 mV	±25 mV	±25 mV
Output Voltage Shift, Max. +25° to −25°C +25° to +85°C	−4% Reading +4% Reading	±5% Reading ±5% Reading	+24% Reading (Note 3) −24% Reading	−5% Reading +5% Reading
Repeatability & Hysteresis, Max.	±0.50% Reading	±1% Reading	±0.50% Reading	±1% Reading

	Min.	Typ.	Max.
Excitation VDC (Note 2)	8.0	10±0.01	15
Power Consumption (mW)	—	50	60
Response Time (msec) (Note 1)	—	1.0	3.0
Common Mode Pressure (psi)	—	—	25
Temperature Range	Operating: −25° to +85°C (−13° to +185°F); Storage: −40° to +90°C (−40° to +194°F)		
Termination	2,54 mm (.100″) centers, 0,635 mm (0.025″) square		
Weight (grams)	10.8		
Shock Rating	100 g peak (5 drops, 6 axes)		

Notes:
1. Initial warm-up time for signal conditioned circuitry is 1 minute max.
2. Output Voltage is ratiometric to supply voltage.
3. Temperature shifts when sensing differential pressure correlates to the density change of the gas over temperature. (See Application Note 1.)
4. Maximum allowable rate of flow change to prevent damage: 5 SLPM/1 sec.

MOUNTING DIMENSIONS (for reference only)





Note: Positive flow direction is defined as proceeding from Port 1 (P1) to Port 2 (P2) and results in positive output. Do not exert a force greater than 4.54kg (10 lbs.) in any direction.

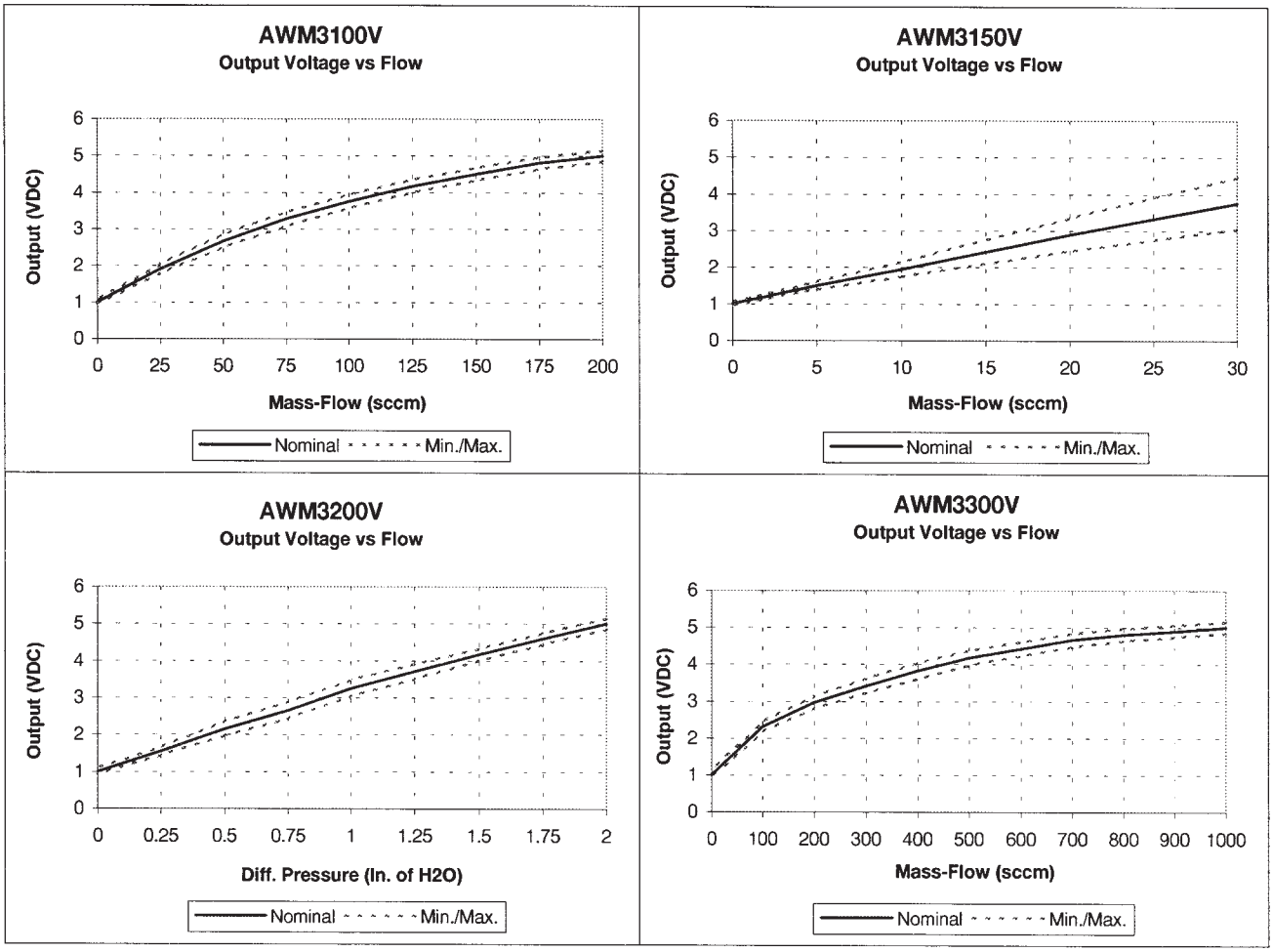
Microbridge Mass Airflow/Amplified

OUTPUT FLOW VS INTERCHANGEABILITY (Note 1) **Performance Characteristics @ 10.0 ±0.01 VDC, 25 C**

AWM3100V				AWM3150V				AWM3200V (Note 2)				AWM3300V			
Press. mBar	**Flow sccm**	**Nom. VDC**	**Tol. ± VDC**	Press mBar	**Flow sccm**	**Nom. VDC**	**Tol. ± VDC**	Flow sccm	**Press ″ H_2O**	**Nom. VDC**	**Tol. ± VDC**	Press. mBar	**Flow sccm**	**Nom. VDC**	**Tol. ± VDC**
0.49	**200**	5.00	0.15	2.50	**30**	3.75	0.70	60.0	**2.00**	5.00	0.15	3.40	**1000**	5.00	0.15
0.42	**175**	4.80	0.16	1.70	**20**	2.90	0.45	53.0	**1.75**	4.59	0.15	2.90	**900**	4.90	0.16
0.35	**150**	4.50	0.17	0.84	**10**	1.95	0.20	46.0	**1.50**	4.16	0.16	2.40	**800**	4.80	0.17
0.28	**125**	4.17	0.18	0.42	**5**	1.50	0.10	38.0	**1.25**	3.70	0.20	2.00	**700**	4.66	0.18
0.21	**100**	3.75	0.19	0.34	**4**	1.40	0.08	30.0	**1.00**	3.25	0.22	1.60	**600**	4.42	0.19
0.14	**75**	3.27	0.19	0.26	**3**	1.30	0.08	23.0	**0.75**	2.65	0.22	1.20	**500**	4.18	0.20
0.09	**50**	2.67	0.17	0.17	**2**	1.20	0.07	16.0	**0.50**	2.15	0.19	0.80	**400**	3.82	0.21
0.04	**20**	1.90	0.13	0.08	**1**	1.10	0.06	8.0	**0.25**	1.55	0.11	0.54	**300**	3.41	0.19
0.00	**0**	1.00	0.05	0.00	**0**	1.00	0.05	0.0	**0.00**	1.00	0.08	0.31	**200**	2.96	0.17
												0.12	**100**	2.30	0.14
												0.00	**0**	1.00	0.10

Notes:
1. Numbers in **BOLD** type indicate calibration type, mass flow or differential pressure. Tolerance values apply to calibration type only.
2. Differential pressure calibrated devices are not recommended for flow measurement. Use flow calibrated devices for flow measurement.

OUTPUT CURVES



Airflow

Microbridge Mass Airflow/Amplified

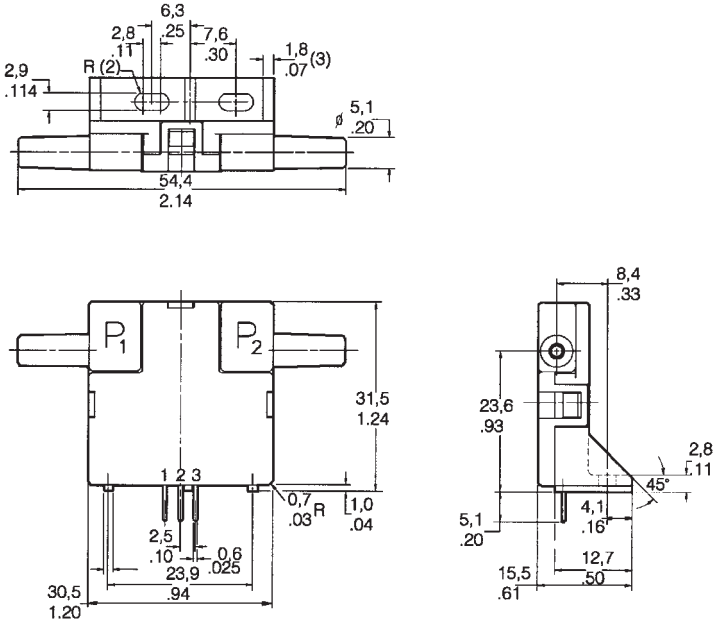
AWM3000 SERIES ORDER GUIDE (Performance Characteristics @ 10.01 ±0.01 VDC, 25°C)

Catalog Listings	AWM3200CR*	AWM3201CR*	AWM3303V
Flow Range (Full Scale)			±1000 sccm (1 SLPM)
Differential Pressure Range	0 - 2″ H_2O (5 mBar)	0 - 0.5″ H_2O (1.25 mBar)	
Output Type	4 - 20 mA DC (linear)	4 - 20 mA DC (linear)	1 - 5 VDC (Note 2)
Output @ Trim Point	20.0 ±1 mA DC @ 2″ H_2O	20.0 ±1 mA DC @ .05″ H_2O	5.00 ±0.150 VDC
Null Output	4.00 ±0.3 mA DC	4.00 ±0.4 mA DC	3.00 ±0.050 VDC
Null Shift +25° to −25°C, +25° to +85°C	±2 mA DC (max.)	±2 mA DC (max.)	±.050 VDC (max.)
Output Shift +25° to −25°C +25° to +85°C	 +24% Reading −31% Reading (Note 3)	 +32% Reading −32% Reading (Note 3)	 −5% Reading +5% Reading
Linearity Error	±5% Reading	±5% Reading	N/A
External Output Load	100 - 300 Ω (Note 4)	100 - 300 Ω (Note 4)	N/A
Response Time (Note 1)	60 msec (max.)	60 msec (max.)	3 msec (max.)
Repeatability & Hysteresis, Max.	±0.50% Reading	±0.50% Reading	±1% Reading
Excitation VDC	10 ±0.01	10±0.01	8-15
Power Consumption (mW)	—	50	100
Common Mode Pressure (psi)	—	—	25
Calibration Gas	Nitrogen		
Temperature Range	Operating: −25° to +85°C (−13° to +185°F); Storage: −40° to +90°C (−40° to +194°F)		
Termination	2,54 mm (.100″) centers, 0,635 mm (0.025″) square		
Weight (grams)	10.8		
Shock Rating	100 g peak (5 drops, 6 axes)		

Notes:
1. Initial warm-up time for signal conditioned circuitry is 1 minute max.
2. Output Voltage is ratiometric to supply voltage.
3. Temperature shifts when sensing differential pressure correlates to the density change of the gas over temperature.
4. Output load connected from V_{OUT} to GND (current sinking).
5. Maximum allowable rate of flow change to prevent damage: 5.0 SLPM/1.0 sec.

* A 5 micron filter must be used on differential pressure sensors.

MOUNTING DIMENSIONS (for reference only)



Note: Positive flow direction is defined as proceeding from Port 1 (P1) to Port 2 (P2) and results in positive output. Do not exert a force greater than 4.54kg (10 lbs.) in any direction.

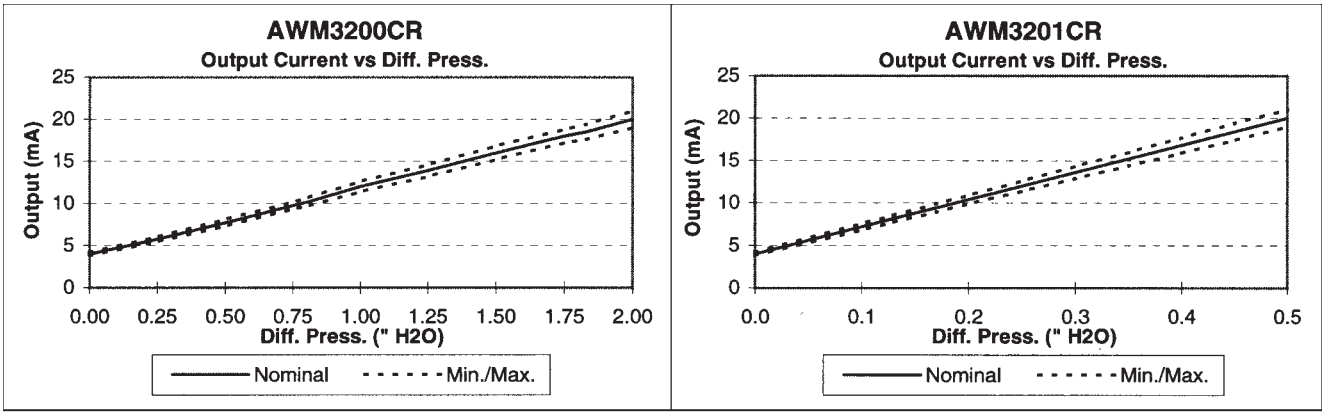
Microbridge Mass Airflow/Amplified

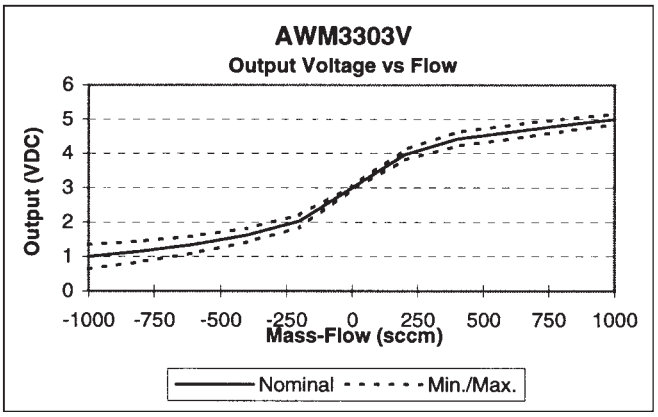
OUTPUT FLOW VS INTERCHANGEABILITY (Note 1) **Performance Characteristics @ 10.0 ± 0.01 VDC, 25 C**

AWM3200CR (Note 2)				AWM3201CR (Note 2)				AWM3303V			
Flow sccm	**Press. ″ H_2O**	**Nom. mA DC**	**Tol. ± mA DC**	Flow sccm	**Press. ″ H_2O**	**Nom. mA DC**	**Tol. ± mA DC**	Press mBar	**Flow sccm**	**Nom. VDC**	**Tol. ± VDC**
0	**0.00**	4.00	0.3	0	**0.00**	4.0	0.4	3.49	**1000**	5.00	0.15
7	**0.25**	5.75	0.3	35	**0.10**	7.2	0.4	2.42	**800**	4.82	0.18
15	**0.50**	7.70	0.4	42	**0.13**	8.0	0.4	1.59	**650**	4.67	0.20
22	**0.75**	9.75	0.4	53	**0.17**	9.4	0.5	0.83	**400**	4.42	0.20
25	**0.81**	10.21	0.5	61	**0.20**	10.4	0.5	0.31	**200**	3.96	0.15
30	**1.00**	12.00	0.6	71	**0.25**	12.0	0.6	0.00	**0**	3.00	0.05
37	**1.25**	13.90	0.7	81	**0.30**	13.6	0.7	-0.31	**-200**	2.03	0.18
45	**1.50**	16.00	0.8	87	**0.35**	15.2	0.8	-0.83	**-400**	1.62	0.20
52	**1.75**	18.00	0.8	97	**0.40**	16.8	0.9	-1.59	**-600**	1.35	0.25
55	**1.83**	18.50	0.9	105	**0.45**	18.4	1.0	-2.42	**-800**	1.15	0.30
60	**2.00**	20.00	1.0	113	**0.50**	20.0	1.0	-3.44	**-1000**	1.00	0.35

Notes:
1. Numbers in **BOLD** type indicate calibration type, mass flow or differential pressure. Tolerance values apply to calibration type only.
2. Differential pressure calibrated devices are not recommended for flow measurement. Use flow calibrated devices for flow measurement.

OUTPUT CURVES





Microbridge Mass Airflow/Unamplified and Amplified

FEATURES

- Manifold mount/o-ring sealed
- Ceramic flow-tube (non-outgassing), 0-1000 sccm
- Plastic flow tube, 0-6 SLPM
- High common mode pressure (150 psi ceramic flow-tube only)
- Operating temperature up to 125°C (unamplified only)
- High stability at null and full-scale

The AWM40000 Series mass flow sensor family is based on proven microbridge technology and includes both amplified signal conditioned devices and unamplified sensor only devices.

When using the unamplified devices (AWM42150VH and AWM42300V), the heater control circuit in Figure 1 and the sensing bridge supply circuit in Figure 2 are both required for operation per specification. These two circuits are **NOT** on board the sensor and must be supplied in the application. The differential amplifier circuitry in Figure 3 may be useful in providing output gain and/or introducing voltage offsets to the sensor output (Ref. Equation 1).

The amplified devices (AWM43300V and AWM43600V) can be used to increase output gain and introduce voltage offsets. The differential instrumentation amplifier circuitry, heater control circuitry and sensing bridge supply circuitry are all provided onboard the amplified sensors.

Figure 1
Heater Control Circuit

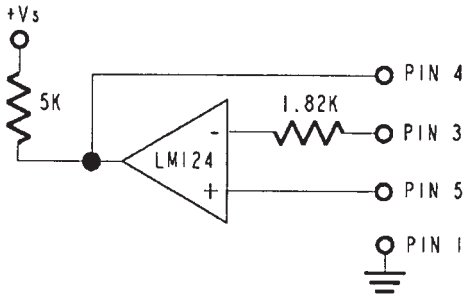


Figure 2
Sensing Bridge Supply Circuit

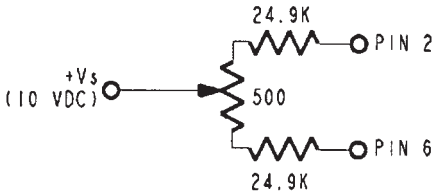
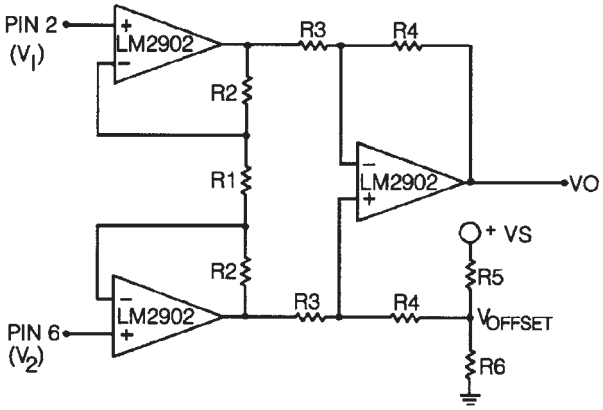


Figure 3
Differential Instrumentation Amplifier Circuit



Equation 1:

$$V_o = \left(\frac{2R_2+R_1}{R_1}\right)\left(\frac{R_4}{R_3}\right)\left(V_2-V_1\right)+V\ \text{offset}$$

$$\text{where } V\ \text{offset} = V_S\left(\frac{R_6}{R_6+R_5}\right)$$

Microbridge Mass Airflow/Unamplified and Amplified

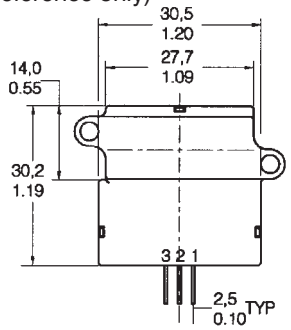
AWM40000 SERIES ORDER GUIDE (Performance Characteristics @ 10.01 ±0.01 VDC, 25°C)

Catalog Listings	AWM42150VH	AWM42300V	AWM43300V	AWM43600V
Flow Range (Full Scale)	±25 sccm	±1000 sccm	+1000 sccm	+6 SLPM
Output Voltage @ Trim Point	8.5 mV ±1.5 mV @ 25 sccm	54.7 mV ±3.7 mV DC @ 1000 sccm	5 V ±0.15 VDC @ 1000 sccm	5 V ±0.15 VDC @ 6 SLPM
Null Voltage	0.0 ±1.0 mVDC	0.0 ±1.5 mVDC	1.0 ±0.05 VDC	1.0 ±0.05 VDC
Null Voltage Shift +25° to −25°C, +25° to +85°C	±0.20 mVDC	±0.20 mVDC	±0.025 VDC	±0.025 VDC
Output Voltage Shift +25° to −25°C +25° to +85°C	+2.5% Reading typ. −2.5% Reading typ.	+2.5% Reading max. −2.5% Reading max.	−5.0% Reading max. +6.0% Reading max.	−6.0% Reading max. +6.0% Reading max.
Power Consumption (mW)	60 (Max.)	60 (Max.)	60 (Max.)	75 (Max.)
Repeatability & Hysteresis	±0.35% Reading (3)	±0.50% Reading	±0.50% Reading	±1.00% Reading
Pressure Drop @ Full Scale (in H_2O)	0.008″ H_2O (Typ.)	1.02 (Typ.)	1.02 (Typ.)	8.00 (Typ.)
	Min.	**Typ.**	**Max.**	
Excitation VDC	8.0	10±0.01	15	
Response Time (msec)	—	1.0	3.0 (Note 1)	
Common Mode Pressure (psi) (max.)	—	—	150 psi (10 Bar)	25 psi (1.7 Bar)
Output Load	NPN (Sinking): 10 mA PNP (Sourcing): 20 mA			
Temperature Range	Operating: −40° to +125°C (−40° to +251°F) Storage: −40° to +125°C (−40° to +251°F)		Operating: −25° to +85°C (−13° to +185°F) Storage: −40° to +90°C (−40° to +194°F)	
Calibration Gas	Nitrogen			
Ratiometricity Error	±0.30% Reading			
Weight (grams)	14 g			11 g
Shock Rating	100 g peak (5 drops, 6 axes)			
Termination	2,54 mm (.100″) centers, 0,635 cm (0.025″) square			

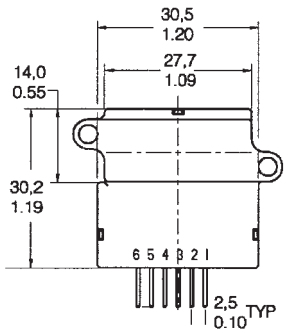
Notes:
1. Response time is typically 1 msec from 10 to 90%.
2. Repeatability & Hysteresis tolerances reflect inherent inaccuracies of the measurement equipment.
3. Maximum allowable rate of flow change to prevent damage: 5.0 SLPM/1.0 sec.

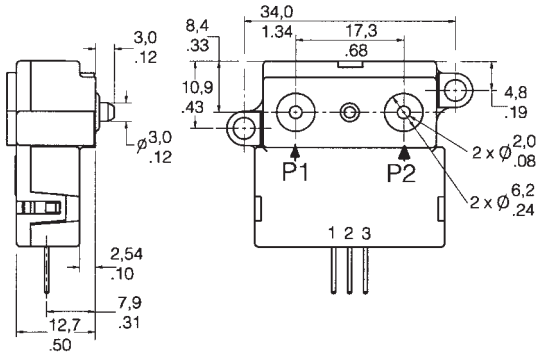
MOUNTING DIMENSIONS (for reference only)

Amplified Sensors



Unamplified Sensors





Note: Positive flow direction is defined as proceeding from Port 1 (P1) to Port 2 (P2), and results in positive output.

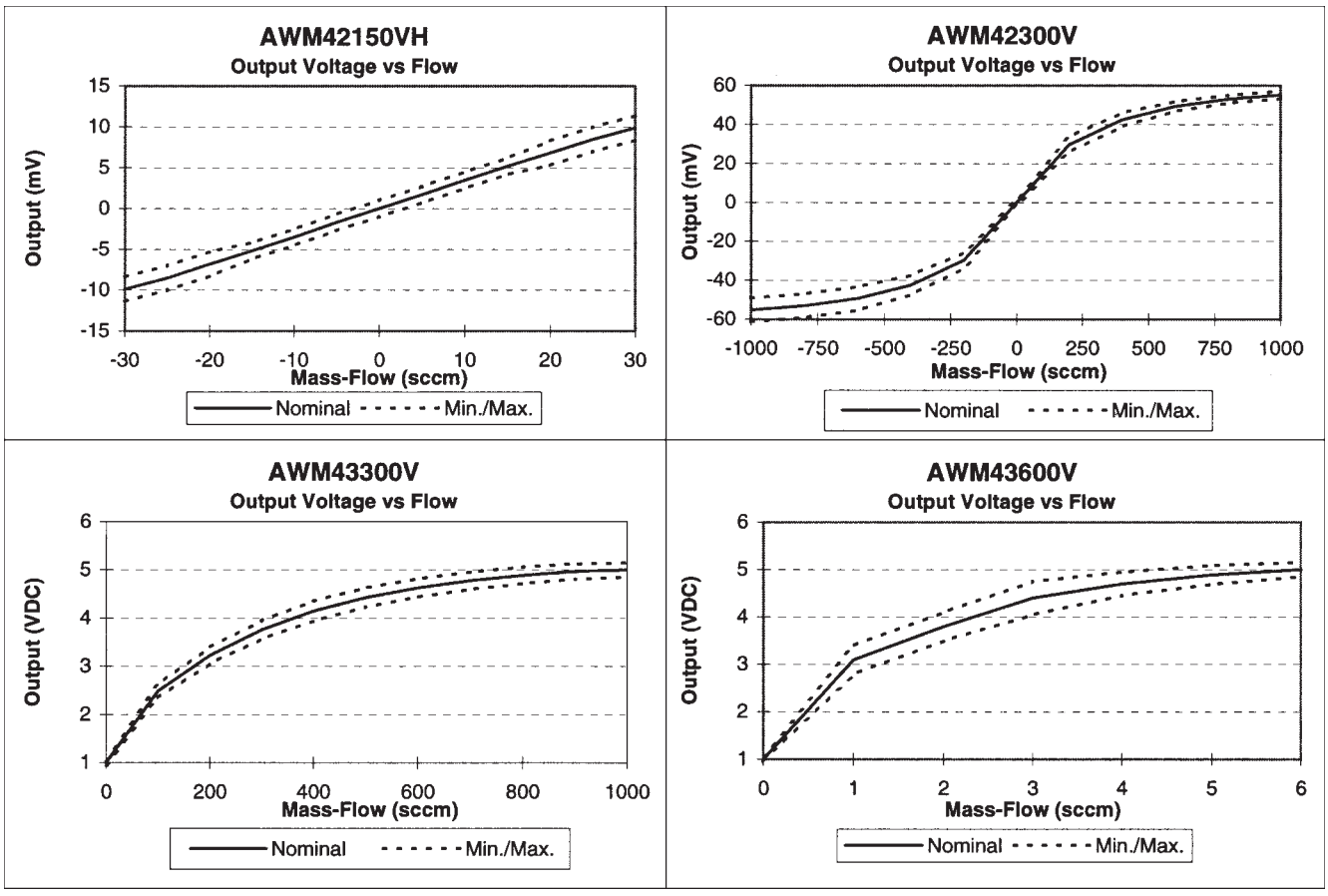
Airflow

Microbridge Mass Airflow/Unamplified and Amplified

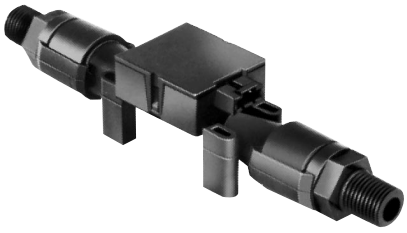
OUTPUT FLOW VS INTERCHANGEABILITY (Note 1) **Performance Characteristics @ 10.0 ± 0.01 VDC, 25°C**

AWM42150VH				AWM42300V				AWM43300V				AWM43600V			
Press μBar	**Flow sccm**	**Nom. mV**	**Tol. ± mV**	Press. mBar	**Flow sccm**	**Nom. mV**	**Tol. ± mV**	Press. mBar	**Flow sccm**	**Nom. VDC**	**Tol. ± VDC**	Press. mBar	**Flow SLPM**	**Nom. VDC**	**Tol. ± VDC**
20	**30**	9.9	1.5	2.23	**1000**	54.7	2.00	2.23	**1000**	5.00	0.15	20.0	**6**	5.00	0.15
17	**25**	8.5	1.5	1.52	**800**	53.0	2.0	1.87	**900**	4.97	0.16	14.7	**5**	4.89	0.20
14	**20**	6.8	1.5	0.94	**600**	49.3	2.5	1.52	**800**	4.89	0.17	9.07	**4**	4.70	0.25
10	**15**	5.2	1.0	0.49	**400**	42.5	3.5	1.16	**700**	4.78	0.18	6.40	**3**	4.40	0.35
7	**10**	3.5	1.0	0.19	**200**	29.8	4.0	0.94	**600**	4.63	0.19	3.35	**2**	3.80	0.30
3	**5**	1.7	1.0	0.00	**0**	0.0	1.5	0.71	**500**	4.43	0.20	1.17	**1**	3.10	0.30
0	**0**	0.0	1.0	-0.19	**-200**	-29.8	4.0	0.50	**400**	4.15	0.21	0.00	**0**	1.00	0.05
				-0.49	**-400**	-42.5	5.0	0.33	**300**	3.76	0.19				
				-0.94	**-600**	-49.3	6.0	0.19	**200**	3.23	0.17				
				-1.52	**-800**	-53.0	6.0	0.08	**100**	2.49	0.14				
				-2.23	**-1000**	-55.2	6.0	0.00	**0**	1.00	0.05				

Notes:
1. Numbers in **BOLD** type indicate calibration type, mass flow or differential pressure.
   Tolerance values apply to calibration type only.



High Flow Mass Airflow/Amplified



FEATURES
- Linear voltage output
- Venturi design
- Remote mounting capability
- Active laser trimming improves interchange ability
- Separate gas calibration types:
  – Ar (argon)
  – N_2 (nitrogen) or
  – CO_2 (carbon dioxide)

In-Line Flow Measurement
AWM5000 Series Microbridge Mass Airflow Sensors feature a venturi type flow housing. They measure flow as high as 20 standard liters per minute (SLPM) while inducing a maximum pressure drop of 2.25″ H_2O. The microbridge chip is in direct contact with the flow stream, greatly reducing error possibilities due to orifice or bypass channel clogging.

Rugged, Versatile Package
The rugged plastic package has been designed to withstand common mode pressures up to 50 psi, and the small sensing element allows 100 gs of shock without compromising performance. The included ''AMP'' compatible connector provides reliable connection in demanding applications.

On-board Signal Conditioning
Each AWM5000 sensor contains circuitry which performs amplification, linearization, temperature compensation, and gas calibration. Figure 1 (Heater Control Circuit) and Figure 2 (Sensor Bridge Circuit and Amplification Linearization Circuit) illustrate the on-board electrical circuitry for the AWM5000 Series. A 1 to 5 VDC linear output is possible for all listings regardless of flow range (5, 10, 15, or 20 SLPM) or calibration gas (nitrogen, carbon dioxide, nitrous oxide, or argon). All calibration is performed by active laser trimming.

Figure 1

Heater Control Circuit

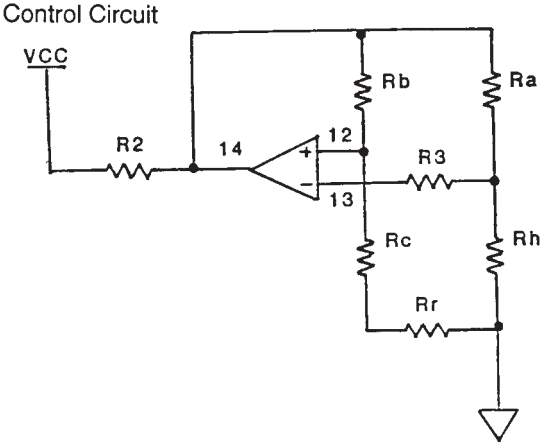
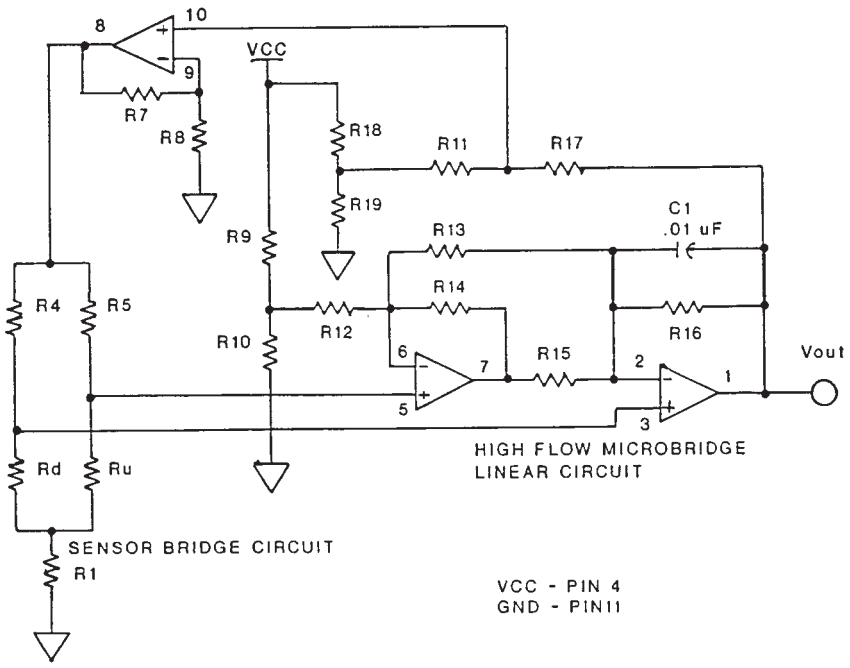


Figure 2

Sensor Bridge Circuit and Amplification Linearization Circuit



Airflow

Highflow Mass Airflow/Amplified

SPECIFICATIONS (Performance Characteristics @ 10.0 ±0.01 VDC, 25°C)

	AWM5101	AWM5102	AWM5103	AWM5104
Flow Range (Note 3)	0-5 SLPM	0-10 SLPM	0-15 SLPM	0-20 SLPM
Suffix - Calibration gas	**VA** - Argon (Ar)		**VC** - Carbon dioxide (CO_2)	**VN** - Nitrogen (N_2)
	Min.	**Typ.**		**Max.**
Excitation VDC	8	10±0.01		15
Power consumption (mW)	—	—		100
Response time (msec)	—	—		60
Null output VDC	0.95	1		1.05
Null output shift −20° to 70°C	—	±0.050 VDC		±.200 VDC
Common Mode Pressure (psi)	—	—		50
Temperature range	−20° to +70°C, (−4° to 158°F)			
Weight	60 grams (2.12 oz.)			
Shock ratings	100 g peak, 6 msec half-sine (3 drops, each direction of 3 axes)			
Output @ laser trim point	5 VDC @ Full Scale Flow			
Output voltage shift +20° to −25°C, +20° to 70°C	Suffix VA or VN ±7.0% Reading, Suffix VC ±10.0% Reading			
Linearity error (2)	±3.0% Reading (max.)			
Repeatability & Hysteresis	±0.5% Reading (max.)			
Connector (Included) —Four pin receptacle	MICRO SWITCH (SS12143)/AMP (103956-3)			
Leak rate, max	0.1 psi/min. at static condition, (Note 2)			

Notes:
1. Linearity specification applies from 2 to 100% full scale of gas flow range, and does not apply to null output at 0 SLPM.
2. The AWM5000 series product has a leakage spec of less than 0.1 psi per minute at 50 psi common mode pressure. If during installation, the end adapters are twisted with respect to the flowtube, this may compromise the seal between the o-ring and the flowtube and may cause a temporary leak. This leak might be as high as 1 psi or might remain in specification. It will self-reseal as the o-ring takes a new set. Approximately 85% of the leakage will dissipate in 24 hours. Within 48 hours, complete recovery will take place.
3. SLPM denotes standard liters per minute, which is a flow measurement referenced to standard conditions of 0°C/1 bar (sea level), 50% RH.

NOTICE

AWM5000—Chimney Effect

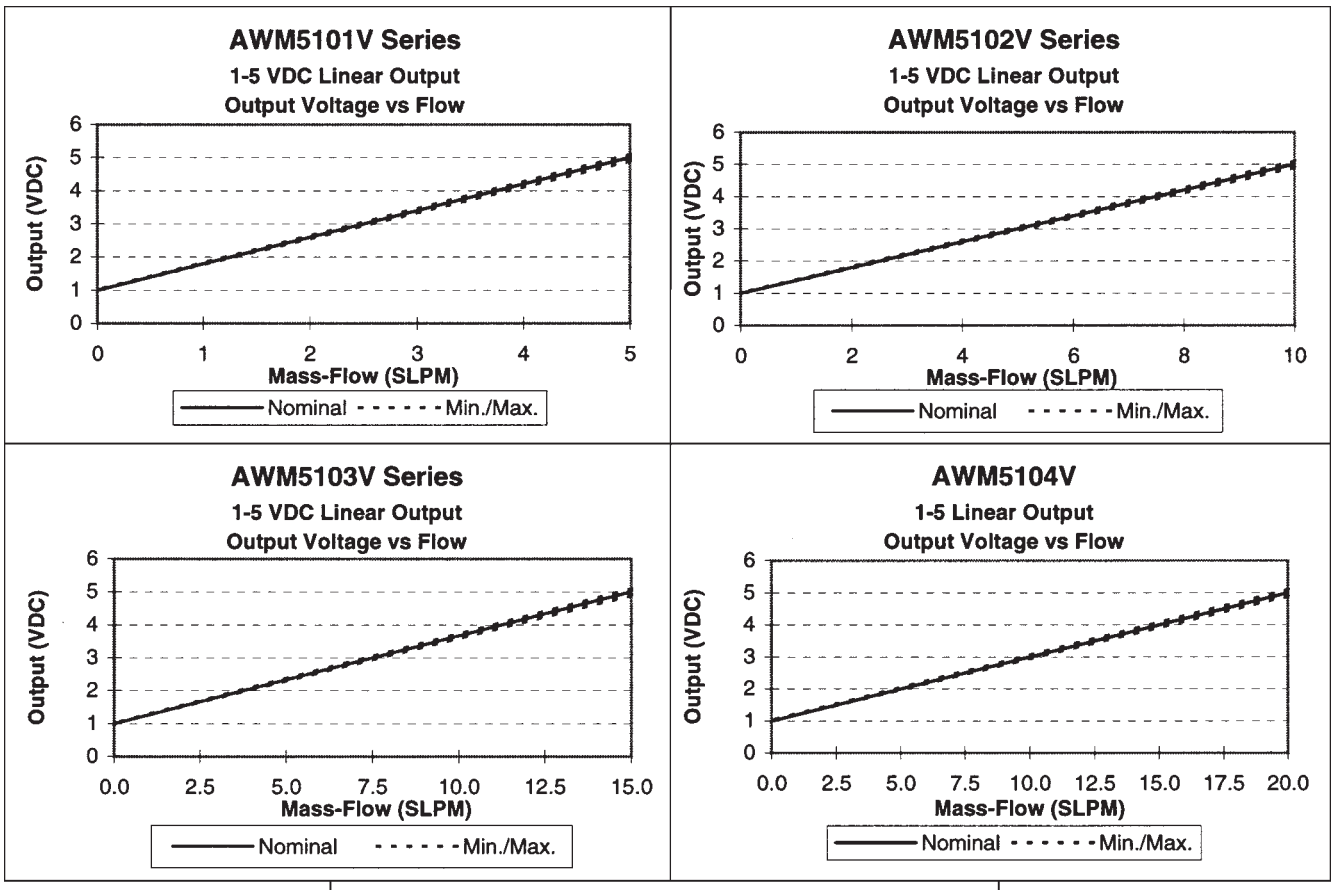
AWM microbridge mass airflow sensors detect mass airflow caused by heat transfer. The thermally isolated microbridge structure consists of a heater resistor positioned between two temperature sensing resistors.

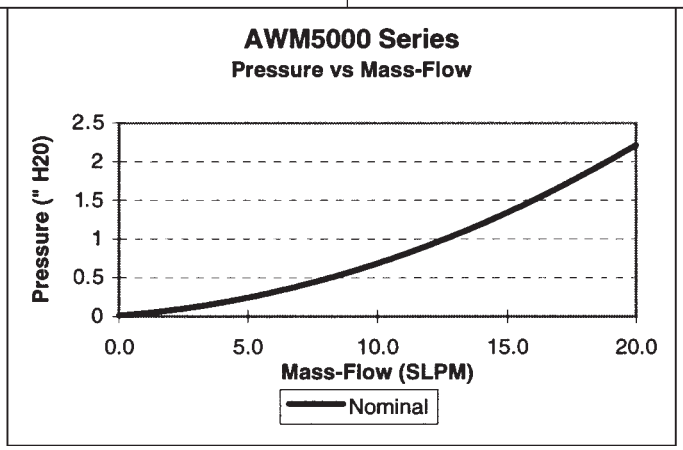
The heater resistor maintains a constant temperature, 160°C above ambient, during sensor operation. Airflow moving past the chip transfers heat from the heater resistor. This airflow warms the downstream resistor and cools the upstream resistor. The temperature change and the resulting change in resistance of the temperature resistors is proportional to the mass airflow across the sensing element.

When the sensor is mounted in a vertical position, under zero flow conditions, the sensor may produce an output that is the result of thermally induced convection current. This occurrence is measurable in the AWM5000 Series, particularly in the 5 SLPM versions. When designing the sensor into applications where null stability is critical, avoid mounting the sensor in a vertical position.

High Flow Mass Airflow/Amplified

OUTPUT CURVES (Performance Characteristics @ 10.0 ±0.01 VDC, 25°C)





Highflow Mass Airflow/Amplified

AWM5000 ORDER GUIDE

Catalog Listing	Flow Range
AWM5101VA	5 SLPM, Argon calibration
AWM5101VC	5 SLPM, CO_2 calibration (2)
AWM5101VN	5 SLPM, N_2 calibration (1)
AWM5102VA	10 SLPM, Argon calibration
AWM5102VC	10 SLPM, CO_2 calibration (2)
AWM5102VN	10 SLPM, N_2 calibration (1)
AWM5103VA	15 SLPM, Argon calibration
AWM5103VC	15 SLPM, CO_2 calibration (2)
AWM5103VN	15 SLPM, N_2 calibration (1)
AWM5104VA	20 SLPM, Argon calibration
AWM5104VC	20 SLPM, CO_2 calibration (2)
AWM5104VN	20 SLPM, N_2 calibration (1)

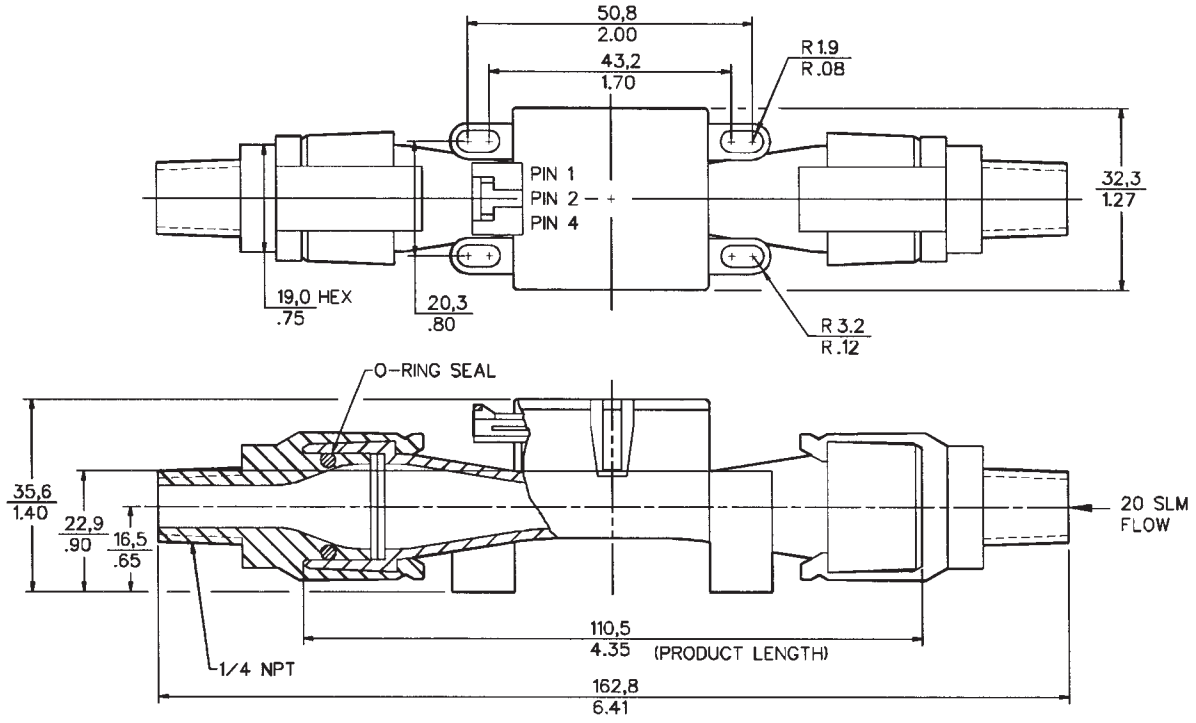
CONNECTOR ORDER GUIDE

Catalog Listing	Description
SS12143	Four pin Electrical connector Connectors use Amp 103956-3

Note: All listings have 1 - 5 VDC linear output with 10 VDC supply over given flow range for a specific calibration gas.
1. N_2 calibration is identical to 0_2 and air calibration.
2. CO_2 calibration is identical to N_2O calibration.
3. For additional gas correction factors, see Application Note 3.

OUTPUT CONNECTIONS
Pin 1 + Supply voltage
Pin 2 Ground
Pin 3 No connection
Pin 4 Output voltage
Arrow on bottom of housing indicates direction of flow.

MOUNTING DIMENSIONS (for reference only)



Honeywell

Mass Airflow Sensors

AWM720P1 Airflow

AWM700 Series

FEATURES

- Flow tubes for ranges up to 200 SLPM
- Highly stable null and full-scale
- Compact package design
- Extremely low hysteresis and repeatability errors, less than 0.35% of reading
- Fast response time, 6 ms typical
- Low power consumption, less than 60 mW

TYPICAL APPLICATIONS

- Oxygen concentrators
- Oxygen conservers
- Respirators and ventilators
- Nebulizers
- Continuous positive airway pressure (CPAP) equipment
- Anesthesia delivery
- Leak detection
- Spectroscopy
- Mass flow controllers
- Telecommunication systems
- Environmental climate controls
- Fuel cell controls

⚠WARNING

PERSONAL INJURY

- DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

AWM700 Series microbridge mass airflow sensors provide in-line flow measurement with a specially designed bypass flow housing. The sensors measure flow as high as 200 standard liters per minute (SLPM) while inducing a pressure drop of 1 inch H_2O, typically. The AWM700 has a high flow range capability in a small package.

The AWM700 has a 6 millisecond response time, requires a 10 Vdc supply, but consumes only 60 mW of power. The compact plastic package withstands overpressures of 25 psi without compromising performance. The snap-in AMP compatible connector provides reliable connection. The sensor is also well suited for use in portable devices and battery-powered applications.

The AWM700 Series provides a combination of time proven reliability, high accuracy, and precision operating characteristics. This inherent accuracy over life reduces need for recalibration. AWM700 sensor circuitry performs amplification and temperature compensation.

The AWM720P1 200 LPM Mass Airflow Sensor, developed primarily for the medical ventilation market, meets the high performance requirements of many medical and analytical instrumentation applications.

⚠WARNING

MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as product installation information.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

PERFORMANCE SPECIFICATIONS

Flow Range (Full Scale)		+ 200 SLPM		
	Min.	**Typ.**	**Max.**	**Units**
Excitation (1)	9.990	10.000	10.010	Vdc
Power Supply	8.000	10.000	15.000	Vdc
Power Consumption			60	mW
Output Load				
Sinking		10		mA
Sourcing		20		mA
Calibration gas		Air		
Null Voltage Shift				
+25°C to -25°C, +25°C to +85°C		± .025 typ.		Vdc
Full Scale Output Shift				
+25°C to +10°C		-2.0		% Reading
+25°C to +40°C		+2.0		% Reading
Ratiometricity Error (1)		± 0.30 typ.		% Reading
Repeatability and Hysteresis (2)		± 0.50		% Reading
Response Time		6 typ.		ms
Pressure Drop @ Full Scale		1.0 typ. 2,5 typ.		inch H_2O mBar
Overpressure		25 max.		psi
Temperature Range				
Operating		-25°C to +85°C [-13°F to +185°F]		
Storage		-40°C to +90°C [-40°F to +194°F]		
Weight		34 [1.20 oz]		gram
Connector—4 pin receptacle		AMP 103956-3 (provided with sensor)		

FLOW SPECIFICATIONS

Flow (SLPM)	Nominal (Vdc) Typical	±Tolerance (Vdc)	Pressure Drop (inch H_2O)	Pressure Drop (mBar)
0	1.00	0.05	0	0
25	2.99	—	0.04	0.10
50	3.82	0.18	0.13	0.33
75	4.30	—	0.21	0.53
100	4.58	—	0.34	0.85
150	4.86	—	0.65	1.64
200	5.00	0.36	1.09	2.74

Notes: 1. Output voltage is ratiometric to supply voltage.

2. Repeatability and Hysteresis tolerances reflect inherent inaccuracies of the measurement equipment.

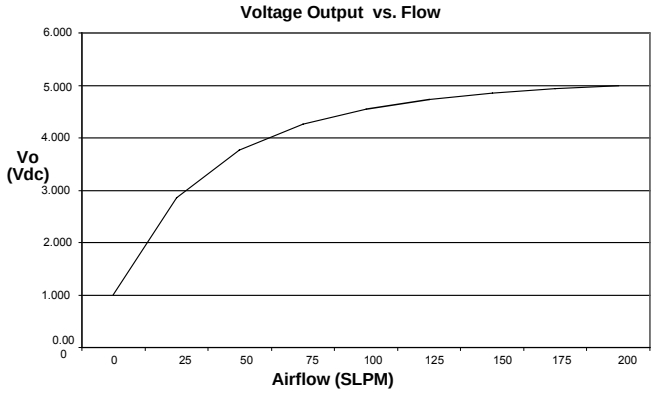


Figure 1. Voltage Output vs. Airflow

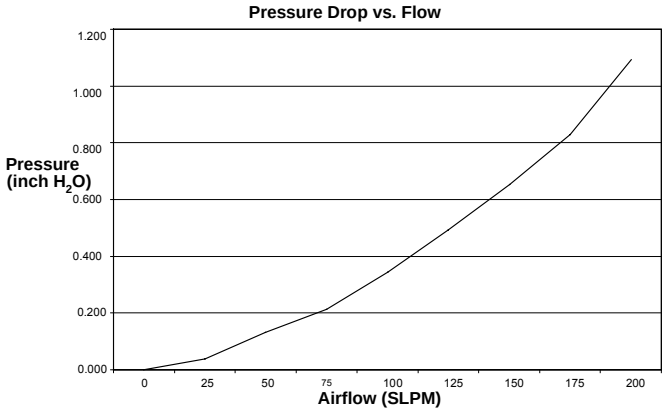


Figure 2. Pressure Drop vs. Airflow

OUTPUT CURVES

Figure 1, Voltage Output vs. Airflow and Figure 2, Pressure Drop vs. Airflow depict performance characteristics for the AWM700 Series sensors at 10.0 ±0.01 Vdc at 25ºC.

NOTICE

LAMINAR FLOW

Due to the fast response time of the sensor, these specifications were generated using laminar flow. Airflow instability or “turbulence” present in the airstream will result in an increase in measurement uncertainty.

The turbulent flow problem can be corrected by either straightening the airflow using flow laminarizing or by slowing the response of the sensor using a simple RC time constant on the output of the sensor. This, of course, slows down the sensor response time. The values needed depend on the amount of turbulence present in the application.

Several techniques for laminarizing the flow include adding hex shaped honeycombs, foam, screen materials or adding constrictors (frits) to the flow stream. There are various commercial laminar flow elements that can be purchased. Unfortunately the greater the efficiency of the laminarizer, the greater the increase in pressure drop in order to establish a given flow rate. Plastic honeycomb material probably gives the most improvement for the least pressure drop. In any test fixture, the avoidance of sharp radii is an absolute requirement.

Failure to comply with these application instructions may result in product failures.

ELECTRICAL CONNECTION

The AWM700 Series accepts a latch detent connector, such as: AMP part number 103956-3. Information on latch detent connectors is available from the AMP Product Information Center, 1-800-522-6752 or the AMP Customer Hotline, 1-800-722-1111.

RELATED AMP LITERATURE

82160	MTE Interconnection System (AMPMODU) Catalog
108-25034	Product Specification (technical performance information)
114-25026	Application Specification (describes product, proper assembly, full tooling information)
IS 6919	Instruction Sheet for assembly procedure

MAKING ELECTRICAL CONNECTIONS

1. Remove (unlatch) the connector from the AWM700.
2. Hand-crimp the interface wire to the appropriate pin on the connector. One possible tool: AMP Hand-Crimp Tool, part number 58342-1.
3. Insert the terminal contacts into the connector housing after carrier strip (lead-frame) is removed.
4. Reconnect (latch) connector to AWM700 device.

MOUNTING INSTRUCTIONS

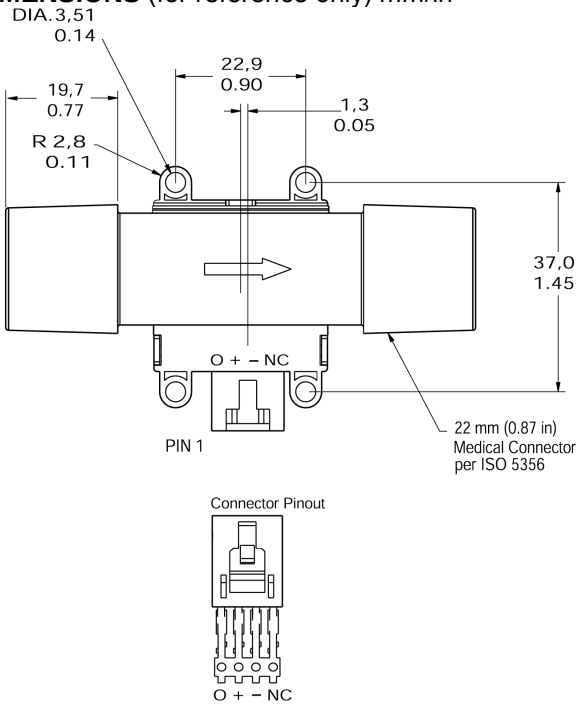
Mount AWM700 Series sensors with 6-32 screws. Honeywell recommends use of washers below screw head. Mounting torque is 0.68 N m [6.0 in lb] max.

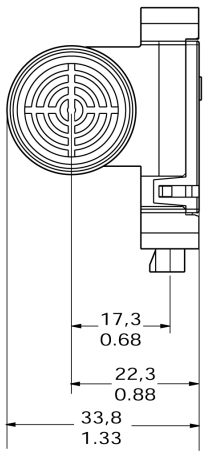
Mass Airflow Sensors

AWM720P1 Airflow

AWM700 Series

MOUNTING DIMENSIONS (for reference only) mm/in





WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

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While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

For application assistance, current specifications, or name of the nearest Authorized Distributor, check the Honeywell web site or call:
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1-815-235-6847 International
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Honeywell

Mass Airflow Sensors

AWM90000 Airflow

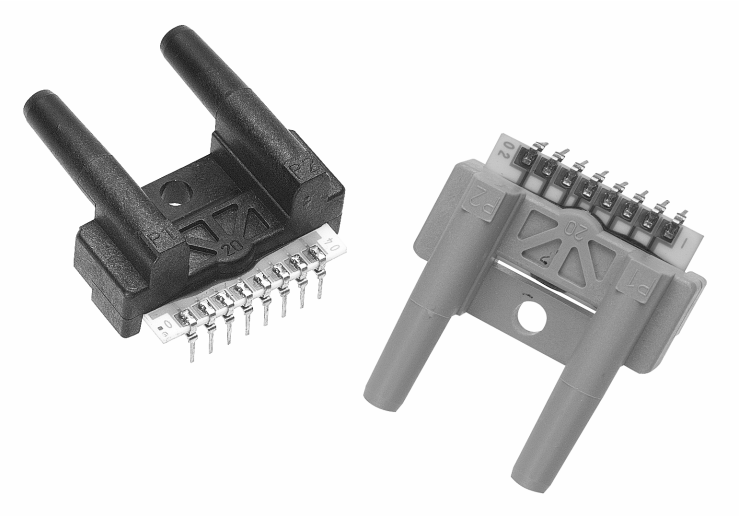
AWM90000 Series

FEATURES

- Mass flow and differential pressure versions
- Bi-directional sensing capability
- Highly stable null and full-scale
- Extremely low pressure drop
- Compact package design
- Extremely low hysteresis and repeatability errors, less than 0.35% of reading
- Fast response time, 1 ms typical
- Low power consumption, 50 mW max.

TYPICAL APPLICATIONS

- Continuous Positive Airway Pressure (CPAP) equipment
- Sleep apnea monitors
- Respirators and ventilators
- Oxygen conservers
- Oxygen concentrators
- Nebulizers
- Spirometers
- Anesthesia delivery
- Variable Air Volume (VAV) – damper control
- Clogged filter detection
- Fuel to air ratio sensing
- Leak detection equipment
- Spectroscopy equipment



AWM90000 Series microbridge mass airflow sensors are available in two versions, Mass Flow and Differential Pressure. The AWM92100V has a flow range of +/- 200 sccm with a pressure drop of only 0.49 mBar, typically. The AWM92200V is a differential pressure version that has a range of +/- 2" H_2O.

The AWM90000 Series sensors have a 1 millisecond response time, operate with a supply voltage from 8.0 Vdc to 15.0 Vdc, while consuming only 50 mW of power. The compact plastic package will withstand a maximum overpressure of 25 psi without compromising performance. The sensor is well suited for use in portable devices and battery-powered applications.

The AWM90000 Series provides customers with a combination of time proven reliability, repeatable flow sensing, and the ability to customize the sensor functions to meet their specific application needs.

⚠WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury. **Failure to comply with these instructions could result in death or serious injury.**

⚠WARNING

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PERFORMANCE SPECIFICATIONS

Catalog Listings	AWM92100V	AWM92200V
Flow Range (Full Scale)	+/- 200 sccm	
Pressure Range		+/- 2.0 H_2O (5 mBar)
Null Voltage Shift, Typ. -25 °C to 25 °C [-13 °F to 77 °F] 25 °C to 85 °C [77 °F to 185 °F]	 +/- 2.0 mV (1) +/- 2.0 mV (1)	 +/- 2.0 mV (1) +/- 2.0 mV (1)
Output Voltage Shift, Typ. -25 °C to 25 °C [-13 °F to 77 °F] 25 °C to 85 °C [77 °F to 185 °F]	 -3.0% FSO (2) +/-1% FSO (2)	 25% Reading -30% Reading

1. Assumes low TCR Bridge resistance used (pins 2 and 8)
2. Requires recommended RC value of 1K Ohm is used (pins 3 to 7) and typ. Heater control circuit. Maximum current RH.

Specifications	Min.	Typ.	Max.
Excitation (1)	8.0 Vdc	10 ±0.01 Vdc	15.0 Vdc
Power Consumption			50 mW
Calibration Gas	Air		
Ratiometricity Error (1)	± 0.30 typ. % Reading		
Repeatability and Hysteresis (2)	± 0.35% Reading		
Response Time	1 ms typ.		
Pressure Drop @ Full Scale (200 sccm)	 0.49 typ. mBar		
Overpressure	25 psi max.		
Operating Temperature Range	-25 °C to 85 °C [-13 °F to 185 °F]		
Storage Temperature Range	-40 °C to 90 °C [-40 °F to 194 °F]		
Vibration	20 g's, 10 Hz to 2000 Hz		
Shock	100 g, 6 ms		
Weight	5.6 grams		

1. Output voltage is ratiometric to supply voltage.
2. Repeatability and Hysteresis tolerances reflect inherent inaccuracies of the measurement equipment.

AWM92100V FLOW SPECIFICATIONS

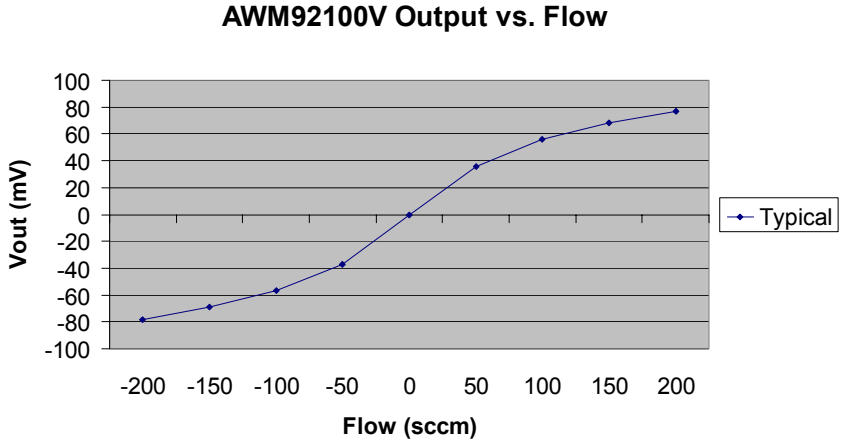
Flow (sccm)	Nominal (mV Typical)	± Tolerance (mV Typical)
200	77	32
150	68	29
100	56	25
50	36	17
0	0	20
-50	-37	18
-100	-57	26
-150	-69	30
-200	-78	33

AWM92200V FLOW SPECIFICATIONS

Pressure (inch H2O)	Nominal (mV) Typical	Typical Min. (mV)	Typical Max. (mV)
2.0	38	22	77
1.5	32	18	66
1.0	23	12	49
.5	12	7	29
0	0	-20	20
-.5	-12	-7	-30
-1.0	-23	-12	-51
-1.5	-32	-18	-68
-2.0	-39	-22	-79

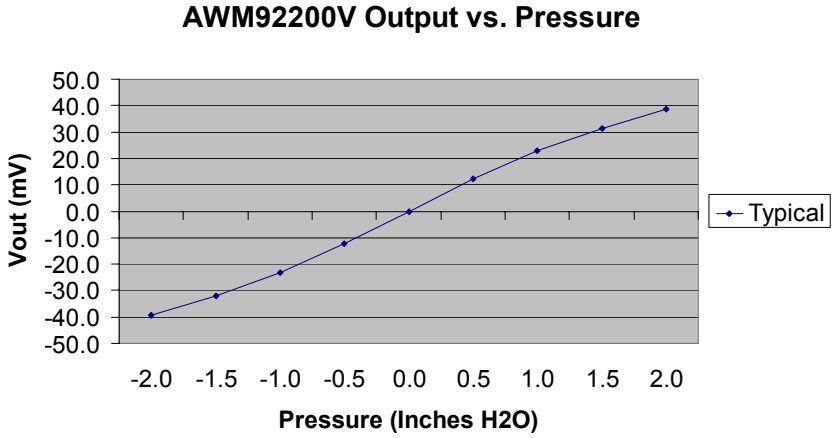
AWM92100V VOLTAGE OUTPUT VS. FLOW CURVE

Depicts performance characteristics for the AWM92100V sensor at 10.0 ±0.01 Vdc at 25 ºC [77 ºF].

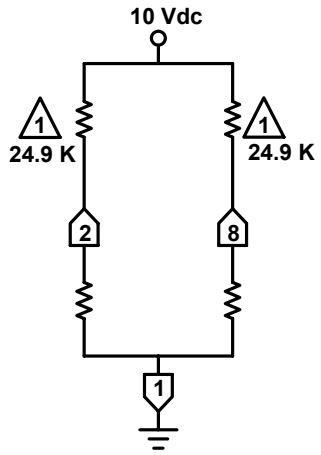
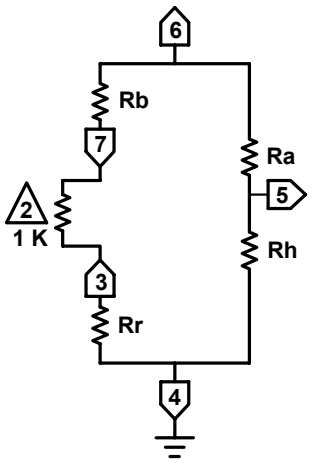
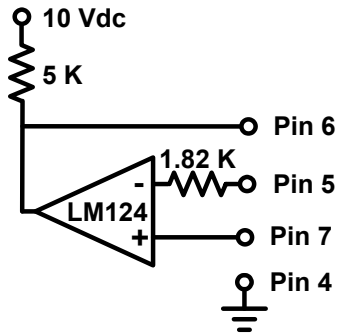


AWM92200V OUTPUT VOLTAGE VS. PRESSURE CURVE

Depicts performance characteristics for the AWM92200V sensor at 10.0 ±0.01 Vdc at 25 °C [77 ºF].

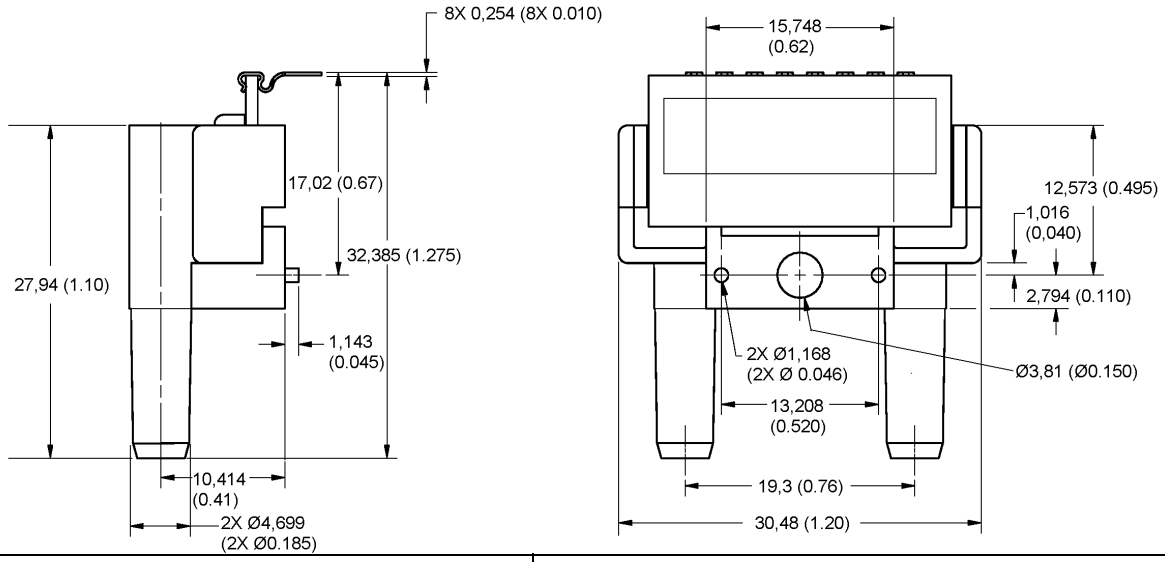


WIRING DIAGRAMS

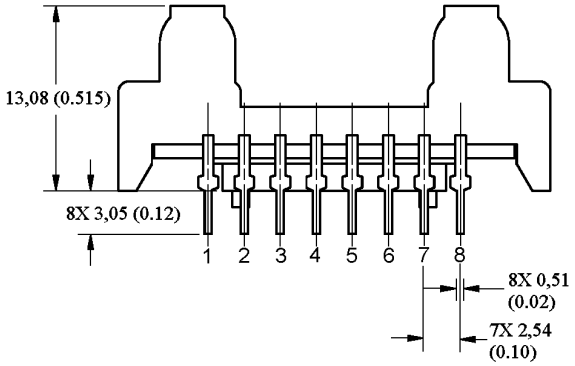
Sensor Bridge Circuit	Used With Heater Control Circuit	Heater Control Circuitry (Suggested)
		

1	Customer supplied 24.9 KΩ matched bridge circuit resistors (affects null output voltage). Output is measured differentially from pins 8 to 2.
2	Customer supplied 1 KΩ resistor (affects temperature compensation and span voltage).

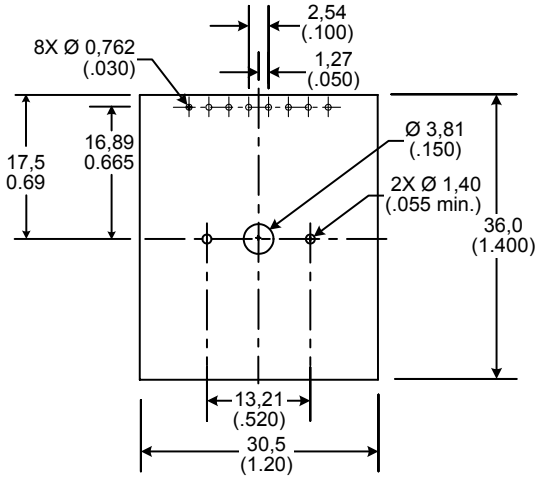
MOUNTING DIMENSIONS (for reference only) mm(in)



Sensor Pinout



PC Board Mounting Dimensions (outer dimensions equal the minimum ciruit board space required.)



Mass Airflow Sensors

AWM90000 Airflow

AWM90000 Series

NOTICE

LAMINAR FLOW

Due to the fast response time of the sensor, these specifications were generated using laminar flow. Airflow instability or "turbulence" present in the airstream will result in an increase in measurement uncertainty.

The turbulent flow problem can be corrected by either straightening the airflow using flow laminarizing or by slowing the response of the sensor using a simple RC time constant on the output of the sensor. This, of course, slows down the sensor response time. The values needed depend on the amount of turbulence present in the application.

Several techniques for laminarizing the flow include adding hex shaped honeycombs, foam, screen materials or adding constrictors (frits) to the flow stream. There are various commercial laminar flow elements that can be purchased. Unfortunately the greater the efficiency of the laminarizer, the greater the increase in pressure drop in order to establish a given flow rate. Plastic honeycomb material probably gives the most improvement for the least pressure drop. In any test fixture, the avoidance of sharp radii is an absolute requirement.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. **The foregoing is Buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

For application assistance, current specifications, or name of the nearest Authorized Distributor, check the Honeywell web site or call:

1-800-537-6945 USA
1-800-737-3360 Canada
1-815-235-6847 International

FAX

1-815-235-6545 USA

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Honeywell

Honeywell Zephyr™ Analog Airflow Sensors: HAF Series–High Accuracy

DESCRIPTION

Honeywell Zephyr™ Analog Airflow Sensors: HAF Series-High Accuracy, provide an analog interface for reading airflow over the specified full scale flow span and temperature range. Their thermally isolated heater and temperature sensing elements help these sensors provide a fast response to air or gas flow.

Zephyr sensors are designed to measure mass flow of air and other non-corrosive gases. They are available in standard flow ranges and are fully calibrated and temperature compensated with an on-board Application Specific Integrated Circuit (ASIC).

The HAF Series is compensated over the temperature range of 0 °C to 50 °C [32 °F to 122 °F] and operates across a temperature range of -20 °C to 70 °C [-4 °F to 158 °F]. The state-of-the-art ASIC-based compensation provides analog outputs with a response time of 1 ms.

These sensors operate on the heat transfer principle to measure mass airflow. They consist of a microbridge Microelectronic and Microelectromechanical System (MEMS) with temperature-sensitive resistors deposited with thin films of platinum and silicon nitride. The MEMS sensing die is located in a precise and calculated airflow channel to provide repeatable flow response.

Zephyr sensors provide customers with enhanced reliability, analog accuracy, repeatable measurements and the ability to customize sensor options to meet many specific application needs. The combination of rugged housings with a stable substrate makes these products extremely robust. They are designed and manufactured according to ISO 9001 standards.

FEATURES AND BENEFITS (★= competitive differentiator)

- ★High ±2.5% accuracy allows for very precise airflow measurement, often ideal for demanding applications with high accuracy requirements
- Full calibration and temperature compensation typically allow customer to remove additional components associated with signal conditioning from the PCB, reducing PCB size as well as costs often associated with those components (e.g., acquisition, inventory, assembly)
- ★Customizable for specific end-user needs
- ★High sensitivity at very low flows allows a customer's application to detect presence or absence of airflow
- ★High stability reduces errors due to thermal effects and null shift to provide accurate readings over time, often eliminating need for system calibration after PCB mount and periodically over time
- ★Low pressure drop typically improves patient comfort in medical applications, and reduces noise and system wear on other components such as motors and pumps
- ★Linear output provides more intuitive sensor signal than the raw output of basic airflow sensors, which can help reduce production costs, design, and implementation time
- Fast response time allows a customer's application to respond quickly to airflow change, important in critical medical (i.e., anesthesia) and industrial (i.e., fume hood) applications
- 11-bit resolution increases ability to sense small airflow changes, allowing customers to more precisely control their application
- Low 3.3 Vdc operating voltage option and low power consumption allow for use in battery-driven and other portable applications
- Bidirectional flow sensing capability eliminates the need for two airflow sensors, helping to reduce production costs and implementation time
- Insensitivity to mounting orientation allows customer to position sensor in most optimal point in the system, eliminating concern for positional effects
- Insensitivity to altitude eliminates customer-implemented altitude adjustments in the system, easing integration and reducing production costs by not having to purchase additional sensors for altitude adjustments
- Small size occupies less space on PCB, allowing easier fit and potentially reducing production costs; PCB size may also be reduced for easier fit into space-constrained applications
- RoHS-compliant materials meet Directive 2002/95/EC

Honeywell Zephyr™ Analog Airflow Sensors

POTENTIAL APPLICATIONS

Medical
- Anesthesia delivery machines
- Ventricular assist devices (heart pumps)
- Hospital diagnostics (spectrometry, gas chromatography)
- Nebulizers
- Oxygen concentrators
- Patient monitoring systems (respiratory monitoring)
- Sleep apnea machines
- Spirometers
- Ventilators

Industrial
- Air-to-fuel ratio
- Analytical instrumentation (spectrometry, chromatography)
- Fuel cells
- Gas leak detection
- Gas meters
- HVAC filters
- VAV system on HVAC systems
- Meteorolgy

Table 1: Absolute Maximum Ratings[1]

Characteristic	Parameter
Supply voltage	-0.3 Vdc to 6.0 Vdc
Voltage on output pin	-0.3 V to Vsupply
Storage temperature range	-40 °C to 125 °C [-40 °F to 257 °F]
Maximum flow change	5.0 SLPM/s
Maximum common mode pressure	25 psi at 25 °C [77 °F]
Maximum flow	10 SLPM

CAUTION

IMPROPER USE

Do not use these products to sense liquid or fluid flow.

Failure to comply with these instructions may result in product damage.

Note 1: Using the sensor at or beyond the Absolute Maximum Ratings may affect the reliability of the device or cause permanent damage. This is a stress rating only. Using the sensor beyond the operational characteristic ranges may still affect the functional operation of the device.

Table 2: Operating Characteristics

Characteristic	Parameter	Note
Supply voltage	3.3 Vdc ±10%; 5.0 Vdc ±10%	–
Current draw	16 mA max. (no load)	–
Power: 3.3 Vdc 5.0 Vdc	 40 mW typ. (no load) 55 mW typ. (no load)	–
Operating temperature range	-20 °C to 70 °C [-4 °F to 158 °F]	–
Compensated temperature range	0 °C to 50 °C [32 °F to 122 °F]	1
Accuracy: forward flow reverse flow	 ±0.25% FSS or ±2.5% Reading, whichever is greater ±0.25% FSS or ±15% Reading, whichever is greater	2, 4
Total error band: forward flow: reverse flow:	 ±0.25% FSS or ±4.5% Reading, whichever is greater ±0.25% FSS or ±15% Reading, whichever is greater	3, 4
Null accuracy	±0.08 %FSS	4, 8
Response time	1 ms typ.	5
Resolution	11 bit	–
Warm up time	15 ms	6
Calibration media	gaseous nitrogen	7
Null stability	±0.06 FSS max. deviation from null output after 1000 hrs at 25 °C	–
Reverse polarity protection	no	–

Notes:
1. Custom and extended compensated temperature ranges are possible. Contact Honeywell for details.
2. Accuracy is the maximum deviation from the nominal digital output over the compensated flow range at a reference temperature of 25 °C. Errors include offset, span, non-linearity, hysteresis and non-repeatability (see Figure 3 for the Accuracy Error Band vs Flow).
3. Total error band includes all errors over the compensated flow range including all effects due to temperature over the compensated temperature range (see Figure 4 for the Total Error Band).
4. Full Scale Span (FSS) is the algebraic difference between the digital output at the forward Full Scale (FS) flow and the digital output at the reverse FS flow. Forward flow is defined as flow from P1 to P2 as shown in Figure 4. The references to mass flow (SCCM) refer to gas flows at the standard conditions of 0 °C and atmospheric pressure 760 (101.3 kPa).
5. Response time: time to electrically respond to any mass flow change at the microbridge airflow transducer (response time of the transducer may be affected by the pneumatic interface).
6. Warm-up time: time to the first valid flow measurement after power is applied.
7. Default calibration media is dry nitrogen gas. Please contact Honeywell for other calibration options.
8. Null accuracy is the maximum deviation in output at 0 SCCM from the ideal transfer function over the compensated temperature range. This includes offset errors, thermal airflow hysteresis and repeatability errors.

Table 3. Suggested Load

Characteristic	Parameter
Minimum suggested resistance:	
3.3 Vdc	3.3 kOhm
5.0 Vdc	5.0 kOhm
Maximum suggested capacitance:	
3.3 Vdc	10 nF
5.0 Vdc	10 nF

CAUTION

LARGE PARTICULATE DAMAGE

Use a 5-micron filter upstream of the sensor to keep media flow through the sensor free of condensing moisture and particulates. Large, high-velocity particles or conductive particles may damage the sensing element.

Failure to comply with these instructions may result in product damage.

Table 4. Environmental Characteristics

Characteristic	Parameter
Humidity	0% to 95% RH, non-condensing
Shock	100 g, 11 ms
Vibration	15 g at 20 Hz to 2000 Hz
ESD	Class 3B per MIL-STD 883G
Radiated Immunity	Level 3 from (80 MHz to 1000 MHz) per spec IEC61000-4-3

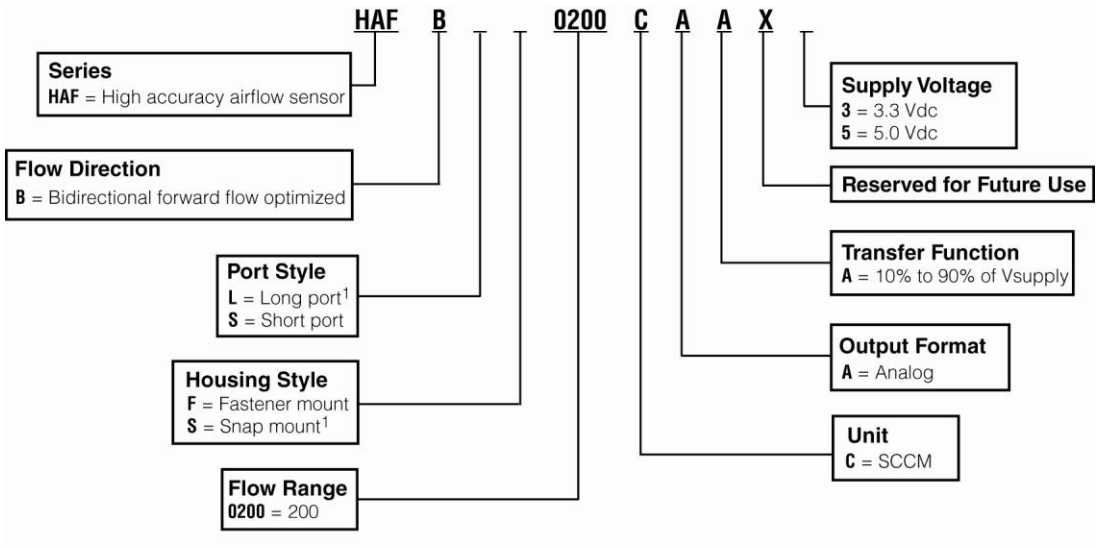
Table 5. Wetted Materials

Characteristic	Parameter
Covers	high temperature polymer
Substrate	PCB
Adhesives	epoxy
Electronic components	silicon, gold
Compliance	RoHS, WEEE

Table 6. Recommended Mounting and Implementation

Characteristic	Parameter
Mounting screw size	5-40
Mounting screw torque	0.68 N m [6 in-lb]
Tubing for long port style	70 durometer, size 0.125 inch inside diameter, 0.250 inch outside diameter silicone tubing
O-ring for short port style	AS568A, Size 7, Silicone, Shore A 70
O-ring for long port style	AS568A, Size 10, Silicone, Shore A 70
Filter recommendation	5-micron filter upstream of the sensor

Figure 1. Nomenclature and Order Guide



Note:

1. The Long Port **Port Style** with the Snap Mount **Housing Style** is not a valid configuration.

Example Catalog Listing

HAFBLS0200CAAX5 = High accuracy airflow sensor, bidirectional forward flow optimized, long port style, snap mount housing, 200 SCCM, analog output, 10% to 90% transfer function, 5.0 Vdc supply voltage.

Customer-specific Requirements

Apart from the general configuration required, other customer-specific requirements are also possible. Please contact Honeywell.

Figure 2. Nominal Analog Output

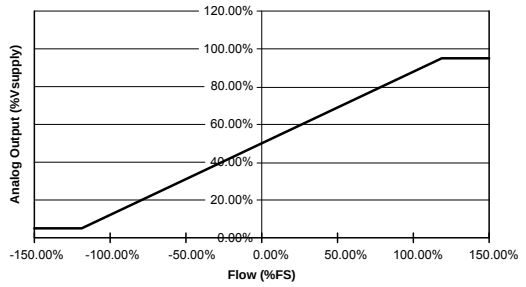


Figure 3. Ideal Transfer Function

$$V_o = V_s\left(0.5 + 0.4\,\frac{F_A}{F_{FS}}\right)$$

$$F_A = \frac{F_{FS}(V_O/V_S - 0.5)}{0.4}$$

Where:
V_O = Output voltage of the device
V_S = Supply voltage measured at the device
F_A = Flow applied across the device
F_{FS} = Full scale flow specified for the device

Figure 4. Accuracy Error Band

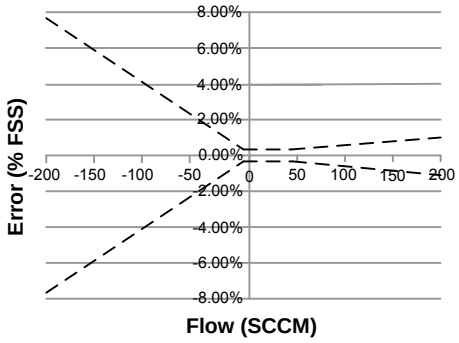


Figure 5. Total Error Band

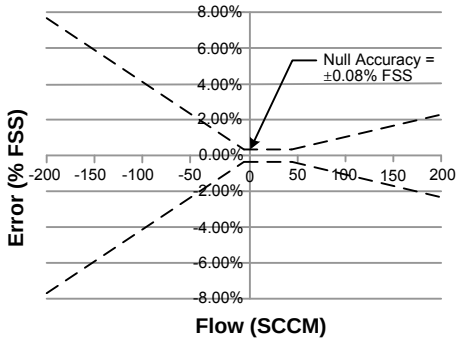
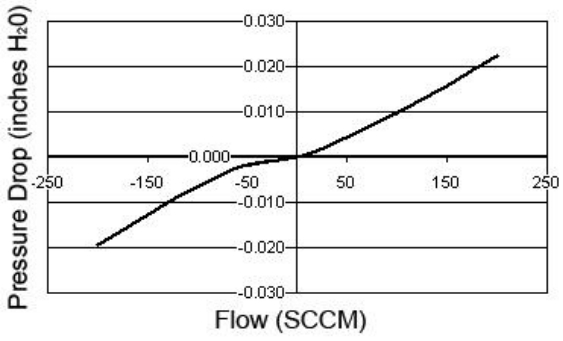
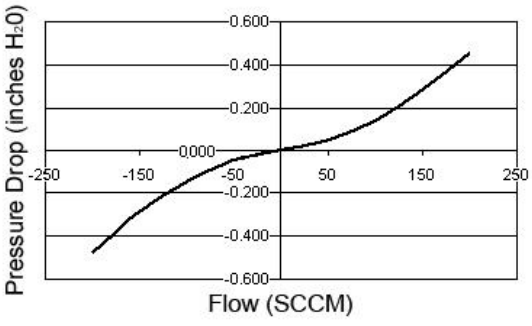


Figure 6. Long Port Style Flow vs Pressure



Flow (SCCM)	Typical Pressure Drop		
	in H_2O	mBar	kPa
-200	-0.019	-0.047	-0.005
-150	-0.013	-0.032	-0.003
-100	-0.007	-0.017	-0.002
-50	-0.001	-0.002	0.000
0	0.000	0.000	0.000
50	0.005	0.012	0.001
100	0.010	0.025	0.002
150	0.016	0.040	0.004
200	0.022	0.055	0.005

Figure .7 Short Port Style Flow vs Pressure



Flow (SCCM)	Typical Pressure Drop		
	in H_2O	mBar	kPa
-200	-0.470	-1.171	-0.117
-150	-0.284	-0.707	-0.071
-100	-0.143	-0.356	-0.036
-50	-0.045	-0.112	-0.011
0	0.000	0.000	0.000
50	0.048	0.120	0.012
100	0.139	0.346	0.035
150	0.287	0.715	0.071
200	0.452	1.126	0.113

Figure 8. Wave Solder Profile

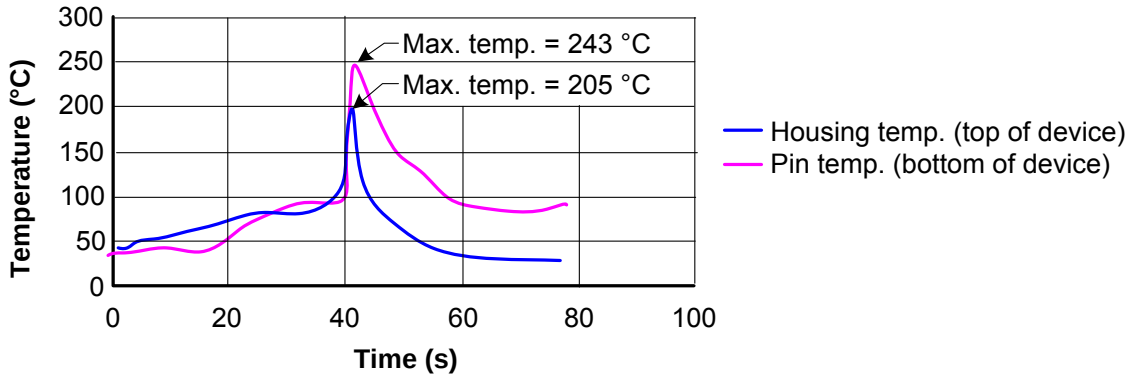
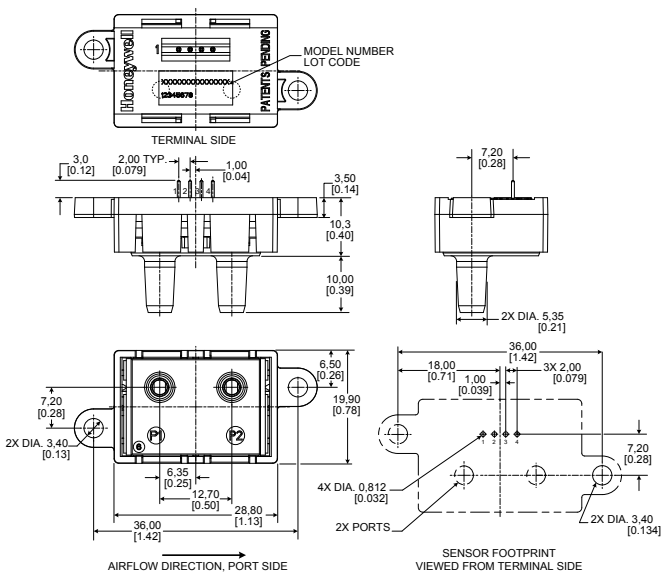
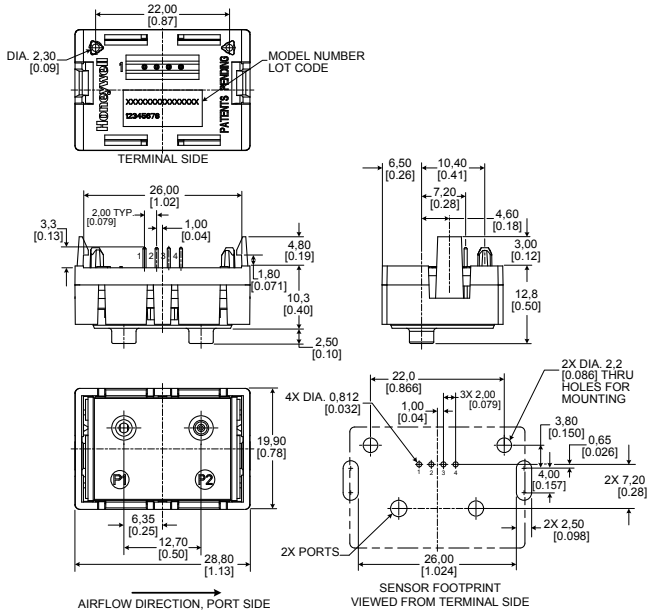


Figure 9. Mounting Dimensions (For reference only: mm [in]). Additional port and housing styles available.

Long Port Style, Fastener Mount



Short Port Style, Snap Mount



Pinout (analog function)	1 = Vout	2 = Vsupply	3 = Ground	4 = NC

⚠ WARNING

PERSONAL INJURY
DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.
Failure to comply with these instructions could result in death or serious injury.

WARRANTY/REMEDY
Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

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⚠ WARNING

MISUSE OF DOCUMENTATION
- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

SALES AND SERVICE
Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

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Honeywell Zephyr™ Digital Airflow Sensors: HAF Series–High Accuracy

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The HAF Series is compensated over the temperature range of 0 °C to 50 °C [32 °F to 122 °F] and operates across a temperature range of -20 °C to 70 °C [-4 °F to 158 °F]. The state-of-the-art ASIC-based compensation provides digital (I^2C) outputs with a response time of 1 ms.

These sensors operate on the heat transfer principle to measure mass airflow. They consist of a microbridge Microelectronic and Microelectromechanical System (MEMS) with temperature-sensitive resistors deposited with thin films of platinum and silicon nitride. The MEMS sensing die is located in a precise and calculated airflow channel to provide repeatable flow response.

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FEATURES AND BENEFITS (★= competitive differentiator)

★ High ±2.5% accuracy allows for very precise airflow measurement, often ideal for demanding applications with high accuracy requirements
- Full calibration and temperature compensation typically allow customer to remove additional components associated with signal conditioning from the PCB, reducing PCB size as well as costs often associated with those components (e.g., acquisition, inventory, assembly)

★ Customizable for specific end-user needs

★ High sensitivity at very low flows allows a customer's application to detect presence or absence of airflow

★ High stability reduces errors due to thermal effects and null shift to provide accurate readings over time, often eliminating need for system calibration after PCB mount and periodically over time

★ Low pressure drop typically improves patient comfort in medical applications, and reduces noise and system wear on other components such as motors and pumps

★ Linear output provides more intuitive sensor signal than the raw output of basic airflow sensors, which can help reduce production costs, design, and implementation time
- Fast response time allows a customer's application to respond quickly to airflow change, important in critical medical (i.e., anesthesia) and industrial (i.e., fume hood) applications
- High 12-bit resolution increases ability to sense small airflow changes, allowing customers to more precisely control their application
- Low 3.3 Vdc operating voltage option and low power consumption allow for use in battery-driven and other portable applications
- ASIC-based I^2C digital output compatibility eases integration to microprocessors or microcontrollers, reducing PCB complexity and component count
- Bidirectional flow sensing capability eliminates the need for two airflow sensors, helping to reduce production costs and implementation time
- Insensitivity to mounting orientation allows customer to position sensor in most optimal point in the system, eliminating concern for positional effects
- Insensitivity to altitude eliminates customer-implemented altitude adjustments in the system, easing integration and reducing production costs by not having to purchase additional sensors for altitude adjustments
- Small size occupies less space on PCB, allowing easier fit and potentially reducing production costs; PCB size may also be reduced for easier fit into space-constrained applications
- RoHS-compliant materials meet Directive 2002/95/EC

Honeywell Zephyr™ Digital Airflow Sensors

POTENTIAL APPLICATIONS

Medical
- Anesthesia delivery machines
- Ventricular assist devices (heart pumps)
- Hospital diagnostics (spectrometry, gas chromatography)
- Nebulizers
- Oxygen concentrators
- Patient monitoring systems (respiratory monitoring)
- Sleep apnea machines
- Spirometers
- Ventilators

Industrial
- Air-to-fuel ratio
- Analytical instrumentation (spectrometry, chromatography)
- Fuel cells
- Gas leak detection
- Gas meters
- HVAC filters
- VAV system on HVAC systems
- Meteorolgy

Table 1: Absolute Maximum Ratings[1]

Characteristic	Parameter
Supply voltage	-0.3 Vdc to 6.0 Vdc
Voltage on output pin	-0.3 V to Vsupply
Storage temperature range	-40 °C to 125 °C [-40 °F to 257 °F]
Maximum flow change	5.0 SLPM/s
Maximum common mode pressure	25 psi at 25 °C [77 °F]
Maximum flow	10 SLPM

CAUTION

IMPROPER USE

Do not use these products to sense liquid or fluid flow.

Failure to comply with these instructions may result in product damage.

Note 1: Absolute maximum ratings are the extreme limits that the device will withstand without damage to the device. However, the electrical and mechanical characteristics are not guaranteed as the maximum limits (above recommended operating conditions) are approached, nor will the device necessarily operate at absolute maximum ratings.

Table 2: Operating Characteristics

Characteristic	Parameter	Note
Supply voltage	3.3 Vdc ±10%; 5.0 Vdc ±10%	–
Supply current	16 mA max.	–
Power: 3.3 Vdc 5.0 Vdc	 23 mW typ. 38 mW typ.	–
Operating temperature range	-20 °C to 70 °C [-4 °F to 158 °F]	–
Compensated temperature range	0 °C to 50 °C [32 °F to 122 °F]	1
Accuracy: forward flow reverse flow	 ±0.25% FSS or ±2.5% of reading, whichever is greater ±0.25% FSS or ±9% of reading, whichever is greater	2, 4
Total error band: forward flow: reverse flow:	 ±0.25% FSS or ±4.5% of reading, whichever is greater ±0.25% FSS or ±9% of reading, whichever is greater	3, 4
Null accuracy	±0.02% FSS	4, 10
Response time	1 ms typ.	5
Resolution	12 bit min.	–
Start up time	17 ms	6
Warm up time	30 ms	7
Calibration media	gaseous nitrogen	8
Bus standards	I^2C, fast mode (400 kHz)	9
Null stability	±0.01% FSS maximum deviation from null output after 1000 hours at 25 °C	–
Reverse polarity protection	no	–

Notes:
1. Custom and extended compensated temperature ranges are possible. Contact Honeywell for details.
2. Accuracy is the maximum deviation from the nominal digital output over the compensated flow range at a reference temperature of 25 °C. Errors include offset, span, non-linearity, hysteresis and non-repeatability (see Figure 3 for the Accuracy Error Band vs Flow).
3. Total error band includes all errors over the compensated flow range including all effects due to temperature over the compensated temperature range (see Figure 4 for the Total Error Band).
4. Full Scale Span (FSS) is the algebraic difference between the digital output at the forward Full Scale (FS) flow and the digital output at the reverse FS flow. Forward flow is defined as flow from P1 to P2 as shown in Figure 4. The references to mass flow (SCCM) refer to gas flows at the standard conditions of 0 °C and atmospheric pressure 760 (101.3 kPa).
5. Response time: time to electrically respond to any mass flow change at the microbridge airflow transducer (response time of the transducer may be affected by the pneumatic interface).
6. Start-up time: time to first valid reading of serial number proceeding streaming 14-bit flow measurements.
7. Warm-up time: time to the first valid flow measurement after power is applied.
8. Default calibration media is dry nitrogen gas. Please contact Honeywell for other calibration options.
9. Refer to Honeywell Technical Note for I^2C protocol information.
10. Null accuracy is the maximum deviation in output at 0 SCCM from the ideal transfer function over the compensated temperature range. This includes offset errors, thermal airflow hysteresis and repeatability errors.

Table 3. Environmental Characteristics

Characteristic	Parameter
Humidity	0% to 95% RH, non-condensing
Shock	100 g, 11 ms
Vibration	15 g at 20 Hz to 2000 Hz
ESD	Class 3B per MIL-STD 883G
Radiated immunity	Level 3 from (80 MHz to 1000 MHz) per spec IEC61000-4-3

Table 4. Wetted Materials

Characteristic	Parameter
Covers	high temperature polymer
Substrate	PCB
Adhesives	epoxy
Electronic components	silicon, gold
Compliance	RoHS, WEEE

Table 5. Recommended Mounting and Implementation

Characteristic	Parameter
Mounting screw size	5-40
Mounting screw torque	0.68 N m [6 in-lb]
Tubing for long port style	70 durometer, size 0.125 inch inside diameter, 0.250 inch outside diameter silicone tubing
O-ring for short port style	AS568A, Size 7, Silicone, Shore A 70
O-ring for long port style	AS568A, Size 10, Silicone, Shore A 70
Filter recommendation	5-micron filter upstream of the sensor

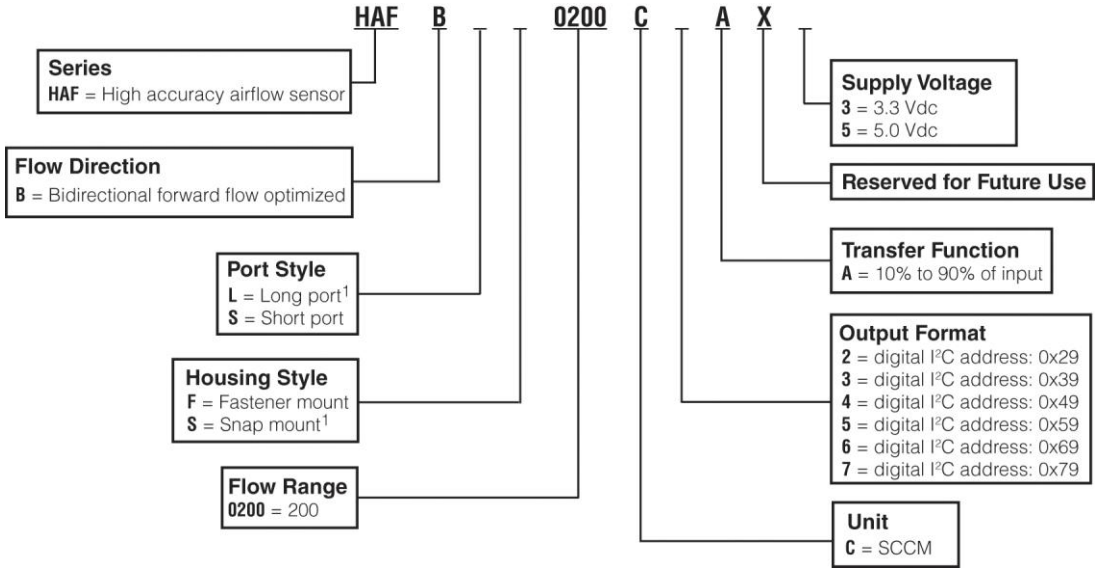
CAUTION

LARGE PARTICULATE DAMAGE

Use a 5-micron filter upstream of the sensor to keep media flow through the sensor free of condensing moisture and particulates. Large, high-velocity particles or conductive particles may damage the sensing element.

Failure to comply with these instructions may result in product damage.

Figure 1. Nomenclature and Order Guide



Note:

1. The Long Port **Port Style** with the Snap Mount **Housing Style** is not a valid configuration.

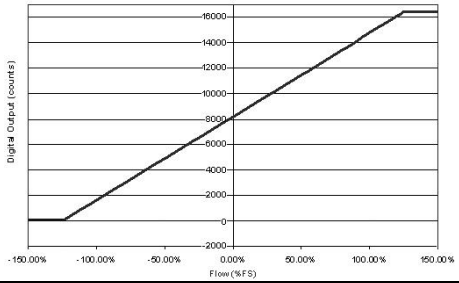
Example Catalog Listing

HAFBLS0200C2AX5 = High accuracy airflow sensor, bidirectional forward flow optimized, long port style, snap mount housing, 200 SCCM, digital I²C output with 0X29 address, 10% to 90% transfer function, 5.0 Vdc supply voltage.

Customer-specific Requirements

Apart from the general configuration required, other customer-specific requirements are also possible. Please contact Honeywell.

Figure 2. Nominal Digital Output



Ideal Transfer Function

Digital Output Code = 16383 * [0.5 + 0.4 * (Flow Applied/Full Scale Flow)]

Flow Applied = Full Scale Flow * [(Digital Output Code/16383) - 0.5]/0.4

Figure 3. Accuracy Error Band

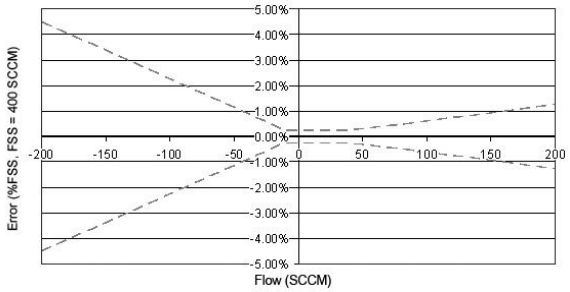


Figure 4. Total Error Band

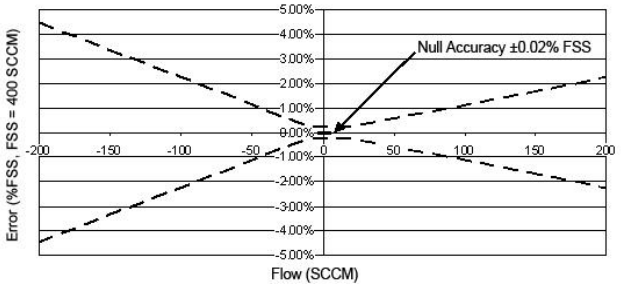
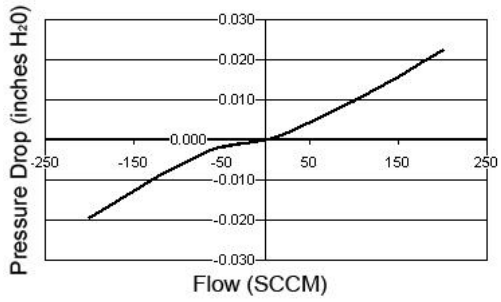
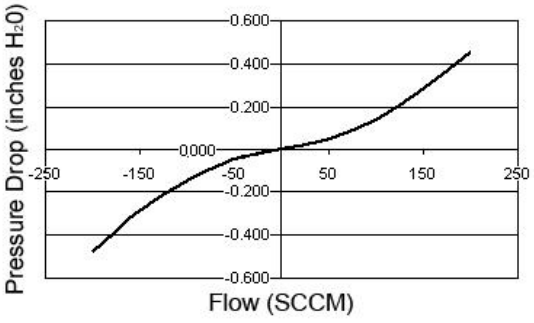


Figure 5. Long Port Style Flow vs Pressure



Flow (SCCM)	Pressure Drop (inches H_2O)
-200	-0.019
-150	-0.013
-100	-0.007
-50	-0.001
0	0.000
50	0.005
100	0.010
150	0.016
200	0.022

Figure 6. Short Port Style Flow vs Pressure



Flow (SCCM)	Pressure Drop (inches H_2O)
-200	-0.470
-150	-0.284
-100	-0.143
-50	-0.045
0	0.000
50	0.048
100	0.139
150	0.287
200	0.452

Figure 7. Wave Solder Profile

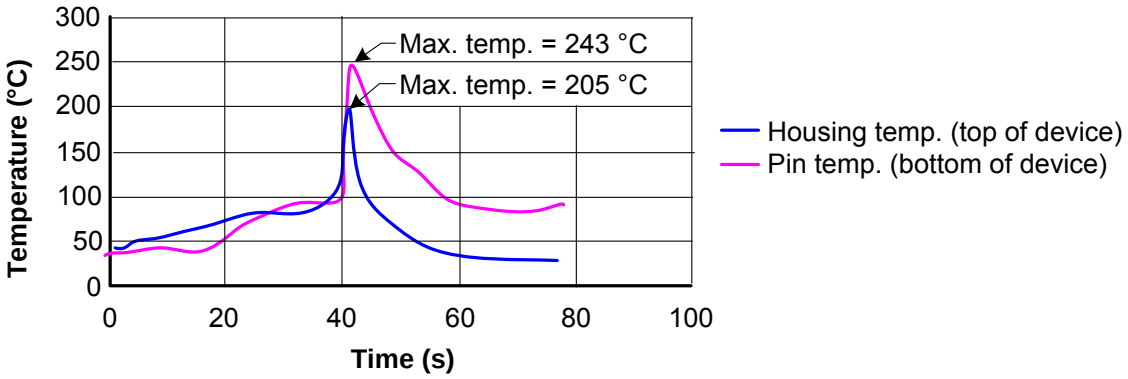
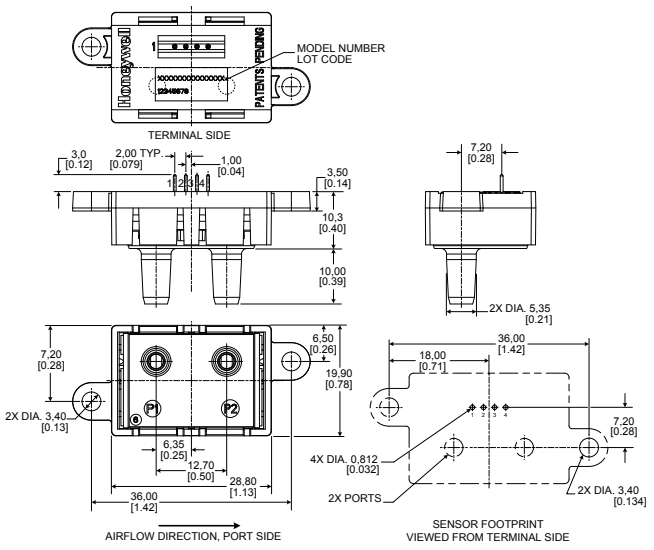
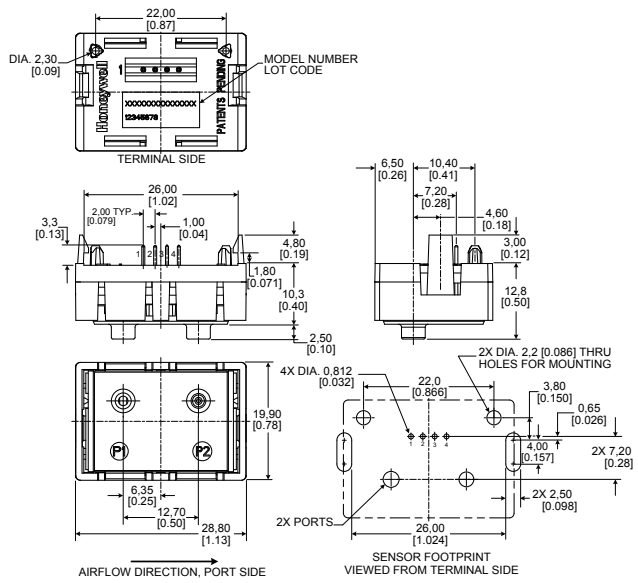


Figure 8. Mounting Dimensions (For reference only: mm [in]). Additional port and housing styles available.

Long Port Style, Fastener Mount



Short Port Style, Snap Mount



Pinout (digital function)	1 = SCL	2 = Vsupply	3 = ground	4 = SDA

⚠ WARNING

PERSONAL INJURY
DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.
Failure to comply with these instructions could result in death or serious injury.

WARRANTY/REMEDY
Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

⚠ WARNING

MISUSE OF DOCUMENTATION
- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

SALES AND SERVICE
Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

E-mail: info.sc@honeywell.com

Internet: www.honeywell.com/sensing

Phone and Fax:

Asia Pacific	+65 6355-2828
	+65 6445-3033 Fax
Europe	+44 (0) 1698 481481
	+44 (0) 1698 481676 Fax
Latin America	+1-305-805-8188
	+1-305-883-8257 Fax
USA/Canada	+1-800-537-6945
	+1-815-235-6847
	+1-815-235-6545 Fax

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May 2010

Honeywell

APPLICATIONS

- RESPIRATORS
- FIRE FIGHTING EQUIPMENT
- DRILLING MUD DENSITY
- KIDNEY DIALYSIS MACHINES
- HYDRAULIC SERVO VALVES
- GAS MONITORING
- TRANSIT VEHICLE BRAKING SYSTEMS
- AIRCRAFT HYDRAULICS
- DIESEL GENERATORS

MODEL AB/HP • *FLUSH MOUNT GENERAL PURPOSE, HIGH PRESSURE TRANSDUCER*

The AB is ideal for a wide range of applications. That's because it has a variety of mounting options, stainless steel construction, and wide pressure ranges. In addition, the AB has two thermally matched strain gages, and it is fully compensated and calibrated. Its output is a stable 0-100 mV from an excitation of 5 Vdc.

The AB may be flush-mounted or fitted with an external adapter. It also may be fitted with an optional integral connector or waterproof cable fitting. The flush mounting capability allows it to be used in applications where sanitary or cleaning requirements exclude using pressure ports.

FEATURES

- Flush mount option
- 0-6 to 0-20,000 PSI ranges
- Custom designs available
- PSIA and bi-directional models

BENEFITS

- Permits maximum cleanliness
- Wide range of applications
- Adaptable to special needs
- Measures vacuum referenced to absolute or atmospheric pressures

HOW TO ORDER

ABH 006 P G C 1 B 3

Model — ABH

Range

006	100	01K	10K
015	200	03K	15K
025	500	05K	20K
050			

Unit

P = PSI

Reference

A = Absolute < 100 PSI
G = Gage < 100 PSI
S = Sealed (PSIS) > 50 PSI

Termination

C = Cable
B = Bendix Connector High Temperature

Cable Length

1 = 3 feet
4 = 12 feet
5 = 15 feet
6 = 30 feet
7 = 50 feet

Output

B = 0-100 mV

Special Features

3 = Barbed Fitting at Cable

Note: Not all combinations are available. Minimum quantity orders apply. Contact the factory for more details.

AB/HP SERIES
FLUSH MOUNT GENERAL PURPOSE, HIGH PRESSURE TRANSDUCER

TECHNICAL SPECIFICATIONS

RANGES

0-6, 15, 25, 50 PSIG or PSIA
0-100, 200, 500, 1000, 2000, 3000, 5000 PSIS
0-10,000, 15,000, 20,000 PSIS

PHYSICAL

Proof Pressure	2 X rated range 30,000 PSIS (2068 B) max.
Burst Pressure	5 X rated range 50,000 PSI (3448 B) max.
Material in Contact with Media	<100 PSI 316L SS ≥100 PSI 15-5 PH SS
Shock	50 g's peak (11 milliseconds)
Vibration	Meets Mil-STD-810-C, Figure 514.2-5, Curve AP, 46.3 g rms min.
Weight	2 oz (57 gm) less cable and adapter

ELECTRICAL

Full Scale Output	100 ± 1 mV at rated excitation @ 25°C
Zero Output	0.0 ± 5.0 mV @ 25°C
Excitation	5.0 Vdc recommended, 6.0 Vdc max.
Input Impedience	150 ± 50 Ω
Output Impedience	115 ± 25 Ω
Insulation Resistance	1000 MΩ @ 50 VDC max.
Electrical Connection	4 Conductor, shielded cable 3 ft (0.91 m) long

PERFORMANCE

Accuracy*	0.25% FSO from best fit straight line including effects of nonlinearity, hysteresis and nonrepeatability
Operating Temperature Range	-54° to 93°C (-65° to 200°F) -54° to 149°C (-65° to 300°F) with Bendix Connector Option
Compensated Temperatrue Range	-1° to 71°C (30° to 160°F)
Thermal Effect on Zero	Less than ±1% FSO per 100°F within compensated temperature range
Thermal Effect on Full Scale Output	Less than ±1% per 100°F within compensated temperature range

Note: All specifications are measured at 25°C and rated excitation unless otherwise stated.

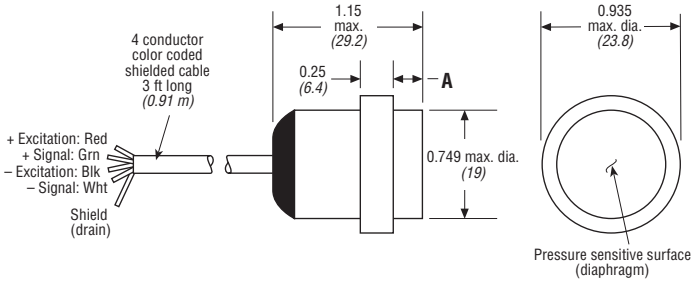
Note: For mounting devices, contact factory.

Note: External O-ring included.

**0.5% Accuracy for <50 PSI and ≥10,000 PSI Units, 1% Accuracy for 20000 PSI Units.*

DIMENSIONS

xx.xx = inches
(xx.x) = mm



Pressure Ranges (PSI)	Dim. A MAX	
0-6	0.271	(6.9)
0-15 to 0-50	0.232	(5.9)
0-100 to 0-1000	0.238	(6.1)
0-2000 to 0-5000	0.273	(6.9)
0-10000 to 0-15000	0.287	(7.3)
0-20000	0.295	(7.5)

PIN AND WIRE CODES
(Pin codes are for optional bendix connector)

Pin Code	Wire Color Code	Function
A	Red	+ Excitation
B	Green	+ Signal
C	White	- Signal
D	Black	- Excitation

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.

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Item # 1075700 M.G. 3/01 Rev. A

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Honeywell
100 Discovery Way
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www.honeywell.com/sensing/products/di

APPLICATIONS

- HVAC
- GAS CHROMATOGRAPHY
- PAINT SPRAYING SYSTEMS
- ELECTRONIC PRESSURE SWITCHES
- MEDICAL DIAGNOSTICS
- HEAT PUMPS
- HYDRAULIC CONTROLS
- IRRIGATION SYSTEMS
- AUTOMOTIVE

MODEL MM • *MEDIAMATE PRESSURE TRANSDUCER*

The MEDIAMATE® pressure transducer provides you with the corrosion resistance of stainless steel at low OEM pricing. It is fully compensated and completely interchangeable without further calibration.

The MEDIAMATE's wetted parts and outer case are made from 300 series stainless steel. It is now being used with a wide variety of corrosive media such as Freon®, ammonia, water, and hydraulic fluids. Its rugged construction and proven reliability make it truly cost effective.

FEATURES

- Low cost
- Rugged, compact configuration
- PC mountable
- Threaded port

BENEFITS

- For use by the OEM
- Easy to package
- Mounting flexibility
- No adapter required

HOW TO ORDER

MM 100 P G 1 Q A

Model — MM

Range — PSI

015	100	01K
025	200	02K
050	500	05K
		07K

Unit — P = PSI

Reference — G = Guage (PSIG)

Pressure Port
- 1 = 1/8-27 NPT
- 3 = 3/8 UNF
- 10 = G-1/8 BSP

Termination
- H = Hirshmann (includes mate)
- Q = Hollingsworth

Output — A = 0-50 mV

Note: Not all combinations are available. Minimum quantity orders apply. Contact the factory for more details.

MEDIAMATE® SERIES PRESSURE TRANSDUCER

TECHNICAL SPECIFICATIONS

RANGE

0-15, 25, 50, 100, 200, 500, 1000, 2000, 5000, 7112 PGIS
(0-1, 2, 3, 3.5, 7, 14, 35, 70, 138, 345, 500 BAR G)
BAR ranges are equivalent

PHYSICAL

Proof Pressure	< 500 psi 2 X rated range	≥ 500 psi 1.5 X rated range
Burst Pressure	< 500 psi 10 X rated range	≥ 500 psi 5 X rated range (30 kpsi max)
Material in Contact with Media	Brazed assembly of 300 series stainless steel parts	
Shock	50 g's peak (5 milliseconds)	
Vibration	Meets MIL-STD-810-C, Figure 514.2-5, Curve AP, 46.3 g rms minimum	
Weight	Less than 3 oz (85 gm)	

ELECTRICAL

Full Scale Output	50 ±1mVdc at rated excitation voltage @ 25° C
Zero Output	0.0 ±2.5 mVdc @ 25° C
Excitation	5.0 Vdc recommended, 6.0 Vdc maximum
Input Impedance	500W (nominal)
Output Impedance	900W (nominal)
Insulation Resistance	≥1000 MW @ 50 Vdc maximum
Electrical Connection	Flat pins, Hollingsworth S09617SF or equivalent (Thomas and Betts AD-183 or BD-183, if using boot)

PERFORMANCE

Accuracy	0.5% FSO BFSL, 50 PSI and UP, ±1% FSO BFSL, 15, 25 PSI Includes effects of nonlinearity, hysteresis and nonrepeatability
Operating Temperature Range	-40° to 100° C (-40° to 212° F) -40° to 90° C (-40° to 194° F) with Hirschmann
Compensated Temperature Range	-1° to 82° C (30° to 180° F)
Thermal Effect on Zero	Less than ±1% FSO for any 55°C (100° F) change within the compensated range
Thermal Effect on Full Scale Output	Less than ±1% for any 55°C (100° F) change within the compensated range

NOTE: All specifications are measured at 25° C (77° F) and at rated excitation unless otherwise specified .

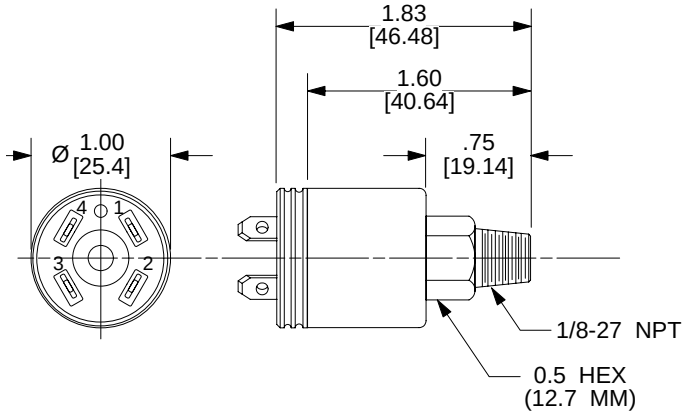
NOTE: Meets IEC-68-2 or MIL-STD 810C.

NOTE: Contact the factory to discuss other pressure ranges.

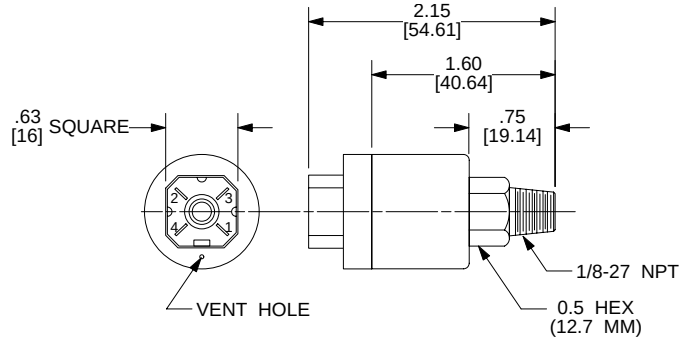
DIMENSIONS

xx.xx = inches
(xx.x) = mm

MEDIAMATE WITH HOLLINGSWORTH



MEDIAMATE WITH HIRSCHMANN



PIN CODES ARE FOR OPTIONAL HIRSCHMANN AND HOLLINGSWORTH CONNECTORS

Hollisworth Pin Code	Hirshmann Pin Code	Function
1	1	+ Signal
2	2	+ Excitation
3	3	- Signal
4	4	- Excitation

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.

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Item # 1076200 M.G. 3/01 Rev. A

Honeywell

Sensing and Control
Honeywell
100 Discovery Way
Acton, MA 01720 USA
Tel: (877) 384-1300; Fax: (978) 263-0630

www.honeywell.com/sensing/products/di

APPLICATIONS

- PRESSURE TRANSDUCERS
- 'SMART' VALVES
- SOLID STATE PRESSURE SWITCHES
- PRESSURE TRANSMITTERS

MODEL SR • *PRESSURE SENSOR*

The Model SR is intended for OEM's requiring a small pressure sensor with high pressure capability and superior corrosion resistance. Constructed of a brazed assembly of 300 series stainless steels, the SR can tolerate a wide variety of corrosive media without risk of leaking.

The SR's design provides high working pressures and high overload and burst pressures at no extra cost. The sensing elements are isolated from the media without using oil-filled isolation technologies.

Unlike other low cost sensors, the SR's output is compensated for changes in temperature.

SR SERIES PRESSURE SENSOR

FEATURES	BENEFIT
• High impedance silicon strain gages	• Low current draw allows use with batteries
• Stainless steel	• Can be used with corrosive media
• 0-15 to 0-2000 psi	• Wide range of pressure measurements
• Constant current excitation	• Works with readily available 4-20 mA amplifier IC's
• Temperature compensated	• Easier, less expensive to use

HOW TO ORDER

SR 100 P G T B

Model — SR

Range — 100

015	100	500
025	200	01K
050	300	02K

Unit — P

P = PSI

Reference — G

G = Gage (PSIG)

Termination — T

T = Pins
(#22 AWG Solid Wire)

Output — B

B = 0-100 mV

Note: Not all combinations are available. Minimum quantity orders apply. Contact the factory for more details.

TECHNICAL SPECIFICATIONS

RANGE

0-15, 25, 50, 100, 200, 300 psig (0-1, 2, 3, 7, 14, 20 bar g) (bar values approximate)	0-500, 1000, 2000 psig (0-35, 70, 140 bar g) (bar values approximate)

PHYSICAL

Proof Pressure	2 X rated range without damage	1.5 X rated range without damage
Burst Pressure	10 X rated range without bursting	5 X rated range without bursting
Material in Contact with Media	> 500 psi, 304 SS <=500 psi, brazed assy of 300 SS	
Shock Resistance	50 g's peak (5 milliseconds)	
Vibration Resistance	Meets MIL-STD 810B, Figure 514-4, Curve AP, Time Schedule II, Random Vibration Test (Overall g rms - 46.3 min)	
Weight	less than 1 oz (approx. 20 gm)	

ELECTRICAL

Span	25 mV/mA (minimum) at 77° F (25° C)
Excitation Current	4 mA, 5 Vdc max
Zero Balance	±5% F.S. at 77° F (25° C)
Input Resistance	1000 ohms (nominal)
Output Resistance	6000 ohms (nominal)
Insulation Resistance	1K megohms at 250 Vdc
Electrical Connection	four #22 AWG solid wires

PERFORMANCE

Accuracy	±1% span from best fit straight line including effects of non-linearity, hysteresis and repeatability
Operating Temperature Range	-40° to 212° F (-40° to l00° C)
Compensated Temperature Range	32° to 167° F (0° to 75° C)
Thermal Effect On Zero	Less than ±1% span -any 90° F (50° C) change within the compensated temperature range
Thermal Effect On Span	Less than ±1% span -any 90° F (50° C) change within the compensated temperature range

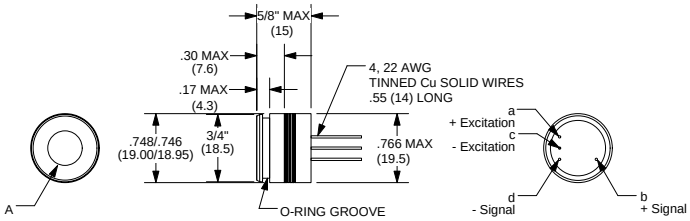
NOTES: (1) All specifications are measured at 25° C and rated excitation unless otherwise specified.

(2) Includes standard Viton O-ring.

(3) Capsule only. Does not include mounting device.

DIMENSIONS

xx.xx = inches
(xx.x) = mm



PRESSURE RANGE (PSI)

Pressure Range (PSI)	* A			
	Bore Dia.	O-Ring	Sealing Depth**	Cavity Depth
15-500	.500 (12.70)	2-012	.21 (5.33)	.22 (5.58)
1000-1500	.375 (9.52)	2-010	.21 (5.33)	.22 (5.58)
2000	.375 (9.52)	2-010	.21 (5.33)	.22 (5.58)

CAUTION: *Contact with sensing surface at bottom of cavity will affect accuracy and may cause damage. The O-ring groove on 2000 psi unit is wider to accommodate a backup ring behind the O-ring.*
All dimensions in inches (mm).

WARRANTY/REMEDY

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Item # 1123700 M.G. 3/01

Honeywell

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Honeywell
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www.honeywell.com/sensing/products/di

APPLICATIONS

- OEM MEDICAL EQUIPMENT
- FOOD & BEVERAGE PROCESSING
- PRESSURE TRANSDUCERS
- 'SMART' VALVES
- SOLID STATE PRESSURE SWITCHES
- PRESSURE TRANSMITTERS

MODEL BX • *OEM PRESSURE SENSOR*

The Model BX pressure capsule is intended for OEM's needing a small, high performance pressure sensor. The unique sensor module design eliminates the need for oil filled capsules and corrugated diaphragms providing a true, robust sensing surface for long life and superior performance. Constructed of a brazed assembly of 300 series stainless steel, the BX can tolerate a wide variety of corrosive media without risk of leaking silicon oil. The small, flush mount diaphragm is ideal for medical, beverage and food processing applications where stringent sanitation requirements are necessary.

Unlike other low cost sensors, the BX's output is compensated for temperature changes, greatly improving system performance at no extra cost.

BX SERIES

OEM PRESSURE SENSOR

FEATURES	BENEFIT
• Small size, low cost	• Ideal for portable equipment
• Oil free isolated sensor	• Eliminates risk of leaking & contamination
• Flush mount, non-corrugated diaphragm	• Satisfies sanitary requirements
• High impedance device	• Low current draw, can be run on batteries
• Constant current	• Works with readily available 4-20 mA amplifier ICs

HOW TO ORDER

BX 100 P G T A

Model — BX

Range — 100

015 050 200
025 100 300
PSI

Unit — P

P = PSI

Reference — G

G = Gage (PSIG)

Termination — T

T = Pins
(#22 AWG Solid Wire)

Output — A

A = 0 - 50 mV

Note: Not all combinations are available. Minimum quantity orders apply. Contact the factory for more details.

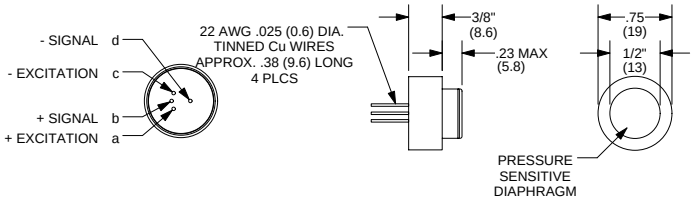
TECHNICAL SPECIFICATIONS

RANGE	
	15, 25, 50,100, 200, 300 psig (1, 2, 3, 7, 14, 20 bar g) (bar values are approximate)
PHYSICAL	
Proof Pressure	2 x rated range
Burst Pressure	10 x rated range
Material in Contact With Media	Brazed assembly of 300 series SS parts
Shock	50 g's peak (5 milliseconds)
Vibration	Meets MIL-STD-810-C, Figure 514.2-5, Curve AP, 46.3 g rms minimum
Weight	Less than 0.5 oz (approx 13 gm)
ELECTRICAL	
Full Scale Output	50 mV ±1 mVdc at rated excitation @ 25° C
Zero Output	0 mVdc ±5% FSO @ 25° C
Excitation	4 mA @ 5.0 Vdc maximum
Input Impedance	900 W (nominal)
Output Impedance	5500 W (nominal)
Insulation Resistance	1000 M W @ 250 Vdc maximum
Electrical Connection	Four #22 AWG solid wires
PERFORMANCE	
Accuracy	±1% FSO BFSL including effects of nonlinearity, hysteresis and nonrepeatability
Operating Temperature Range	-40° to 212° F (-40° to 100° C)
Compensated Temperature Range	50° to 130° F (0° to 80° C)
Thermal Effect on Zero	±1% FSO for any 55° C (100° F) change within the compensated range
Thermal Effect on Full Scale Output	±1% for any 55° C (100° F) change within the compensated range

NOTE: All specifications are measured at 25° C and rated excitation unless otherwise specified.

DIMENSIONS

xx.xx = inches
(xx.x) = mm



WARRANTY/REMEDY

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Item # 1119000 M.G. 3/01

Honeywell

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www.honeywell.com/sensing/products/di

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com

APPLICATIONS

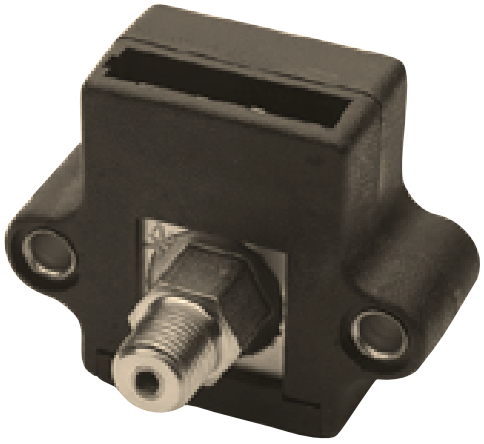
- AGRICULTURAL SPRAYERS AND DUSTERS
- AIR CONDITIONING AND REFRIGERATION
- COMPRESSORS
- ENGINE CONTROLS AND MONITORS
- ENVIRONMENTAL CONTROL SYSTEMS
- HYDRAULIC CONTROLS
- PNEUMATIC CONTROLS
- PROCESS CONTROL EQUIPMENT
- ROBOTICS
- TRANSMISSIONS
- WATER MANAGEMENT

MODEL EA • *PRESSURE TRANSDUCER*

The EA manifold mount is designed for OEM uses requiring high output and corrosion resistance. It has operated through millions of pressure cycles without damage and is well-suited for the high cycle rates found in automatic equipment, robots, and hydraulic systems.

The EA has been approved by Underwriters Laboratories as a component in float and pressure operated motor controllers (file #E93356). Its pressure port, amplifier, and voltage supply regulator are packaged in a Valox case. A mating electrical connector is included with this low price transducer.

The EAF version outputs a low frequency signal which is ideal for electrically noisy environments as well as applications requiring long distance signal transmission or an interface to a microprocessor. The output signal is a frequency modulated square wave set from 1 to 6 kHz.



FEATURES

- Amplified output
- 0-6 to 0-5000 PSIG
- Valox case
- 1-6 Vdc or 1-6 kHz span
- Manifold mount

BENEFITS

- For use by OEM
- Wide range of application
- Rugged, lightweight
- Compatible with microprocessors
- Ease of installation

HOW TO ORDER

EA 100 P G 1 Q D

Model — EA

Range — PSI

006	050	300	02K
015	100	500	05K
025	200	01K	

Unit — P = PSI

Reference — G = Gage (PSIG)

Pressure Port — 1 = 1/8 NPT; 3 = 3/8 UNF; 9 = 1/4 Tube

Termination — Q = Quick Disconnect

Output — D = 1-6 VDC; F = 1-6 KHz

Note: Not all combinations are available. Minimum quantity orders apply. Contact the factory for more details.

EA SERIES PRESSURE TRANSDUCER

TECHNICAL SPECIFICATIONS

RANGE

	0-6, 15, 25 psig (0-.414, 1.03, 1.72 bar g)	0-50, 100, 200, 300 psig (0-3.45, 6.89, 13.8, 20.7 bar g)	0-500,1000, 2000,5000 psig (0-34.5, 68.9, 138, 345 bar g)
	(bar values are approximate)		

PHYSICAL

Proof Pressure	2 x rated range without damage	2 x rated range without damage	1.5 x rated range without damage
Burst Pressure	10 x rated range without bursting	10 x rated range without bursting	5 x rated range without bursting
Material in Contact With Media	Brazed assembly of 300 series stainless steel		
Shock Resistance	50 g's peak, (5 milliseconds)		
Vibration Resistance	Meets MIL-STD 810C, Figure 514-5, Curve AK, Time Schedule II, Random Vibration Test (Overall g rms 20.7 minimum)		
Weight	Less than 3 oz (85 gm) with connector		

ELECTRICAL

ELECTRICAL	Voltage	Frequency
Span	5 ±0.1 Vdc (1-6 Vdc)	5 ±0.1 kHz (1-6 kHz)
Excitation Voltage	8 to 24Vdc	10 to 20 Vdc
Null Offset	1.0 ±0.15 Vdc	1.0 ±0.15 kHz

Supply Current (nominal)	15 mA	15 mA	20 mA
Output Current (nominal)	Source Sink	10 mA 5mA	 8mA
Reverse Polarity Protection	NO		
Insulation Resistance	greater than 1000 megohms at 25 Vdc		
Electrical Connection	Automotive type Valox with crimp pins (Supplied with transducer)		

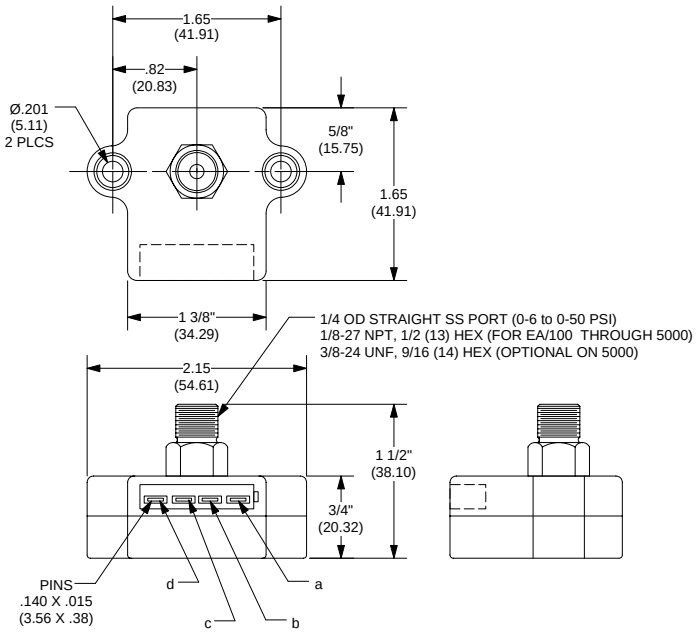
PERFORMANCE

Accuracy	±1% span from best fit straight line including effects of non-linearity, hysteresis and repeatability
Operating Temperature Range	-67° to 212° F (-55° to 100° C)
Compensated Temperature Range	30° to 185° F (-1° to 85° C)
Thermal Effect On Zero	Less than ±1% span -any 100° F (55° C) range within the compensated temperature range.
Thermal Effect On Span	Less than ±1% -any 100° F (55° C) range within the compensated range.

NOTE: All specifications are measured at 25° C and rated excitation unless otherwise specified.

DIMENSIONS

xx.xx = inches
(xx.x) = mm



VOLTAGE / FREQUENCY OUTPUTS

Pins	Voltage Output	Frequency Output
a	+ Excitation	+ Excitation
b	Signal Out	Signal Out
c	N/A	Enable
d	Ground	Ground

WARRANTY/REMEDY

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Item # 1062000 M.G. 3/01 Rev. A

Honeywell

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Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com

APPLICATIONS

- FREON & AMMONIA REFRIGERATION SYSTEMS
- HYDRAULIC CONTROLS
- AGRICULTURAL SPRAYERS AND DUSTERS
- COMPRESSORS
- ENGINE CONTROLS
- ENERGY MANAGEMENT SYSTEMS
- ROBOTICS
- AUTOMATED MACHINING
- PNEUMATIC SYSTEMS

MODEL SA • *HARSH DUTY PRESSURE TRANSDUCER*

The harsh duty SA pressure transducer has a water resistant, stainless steel case for complete protection from harsh environments. Internal hermetic sealing is used to provide measurement of absolute pressures (PSIA) or pressures referenced to a sealed chamber (PSIS).

Underwriters Laboratories has approved the SA as a component in float and pressure-operated motor controllers (File # E93356). The SA produces a high level voltage output of 1-6V output from an unregulated supply. It is fully calibrated and compensated prior to shipment, and is field interchangeable.

FEATURES

- Rugged stainless steel case
- PSIS and PSIA models
- Ranges to 7100 PSIS
- RFI/EMI protection
- Reverse polarity protection

BENEFITS

- For use in industrial environments
- Sealed construction
- Broad range of applications
- For use in high noise environments
- Installation safety

HOW TO ORDER

SA 100 P S 1 C 1 D E

Model — SA

Range

PSI			BAR		
015	100	01K	001	020	100
025	200	03K	007	035	200
050	300	05K	010	050	350
	500	07K	015	070	

Unit — P = PSI, B = BAR

Reference — A = Absolute, G = Gage, S = Sealed

Pressure Connections — 1 = 1/8-27 NPT, 3 = 3/8 UNF, 11 = PT-1/4

Termination — H = Hirshmann, C = Cable

Cable Length — 1 = 3 feet

Output — D = 1-6 Vdc

Special Features — E = CE Approved

Note: Not all combinations are available. Minimum quantity orders apply. Contact the factory for more details.

SA SERIES
HARSH DUTY PRESSURE TRANSDUCER

TECHNICAL SPECIFICATIONS

RANGES

0-15, 25, 50 PSIG
0-15,25, 50, 100, 200 PSIA
0-500, 1000, 2000, 3000, 5000 PSIS
0-1, 7, 10, 15, 20, 35, 50, 70, 100, 200, 350 Bar

PHYSICAL

Proof Pressure	< 500 psi 2 X rated range	≥ 500 psi 1.5 X rated range
Burst Pressure	< 500 psi 10 X rated range	≥ 500 psi 5 X rated range (30kpsi max)
Material in Contact with Media	300 series stainless steel, braze compound	
Weight	Less than 3 oz. without cable	

ENVIRONMENTAL*

Shock	50 g's peak (5 ms), 100 g's peak (11 ms)
Vibration	Meets MIL-STD 810C, Figure 514-5, Curve AK, Time Schedule II Random Vibration Test (Overall g rms = 20.7 minimum)

ELECTRICAL* — Ratiometric Voltage

Zero Output	1.0 ± 0.15 Vdc
Full Scale Output*	5.0 ± 0.1 Vdc (1.0 - 6.0V)
Excitation	9-20 Vdc
Supply Current	15.0 mA typical (>500 PSI 20.0 mA)
Source (nominal)	10.0 mA
Sink (nominal)	5.0 mA

PERFORMANCE*

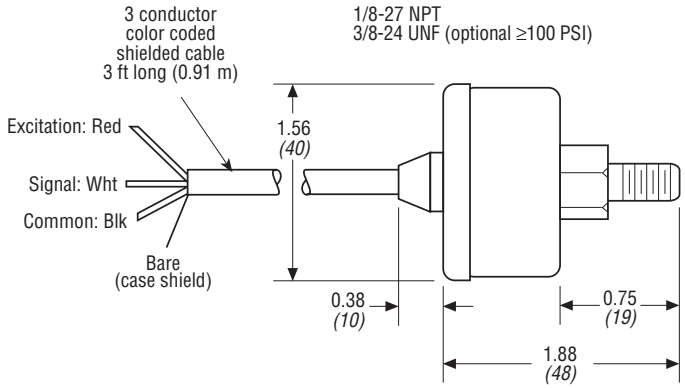
Response Time	< 500 microseconds
EMI/RFI	(10v/m radiated 150kHz-1gHz)
Electrical Connection	3ft sheilded 3-conductor cable 22 AWG Color coded
Accuracy	±1.0% F.S.O. best fit straight line, Includes: non-linearity, hysteresis, non-repeatability. Thermal errors are not included.
Operating Temperature Range	-55° to 105°C (-48° to 221°F)
Compensated Temperature Range	-1° to 85°C (30° to 185°F)
Thermal Effect on Zero	Less than ±1.0% F.S.O. for any 55°C (100°F) change within the compensated range
Thermal Effect on Full Scale	Less than ± 1.0% for any 55°C (100°F) change within the compensated range

**Note: All specifications are measured at 25°C and rated excitation unless otherwise stated.*

DIMENSIONS

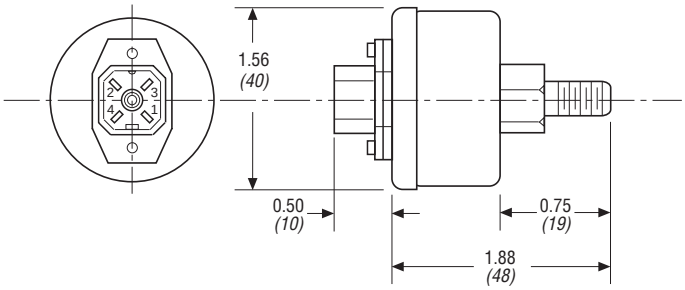
xx.xx = inches
(xx.x) = mm

SA WITH CABLE



1/2 Hex for 1/8-27 NPT port
9/16 Hex for 3/8-24 UNF port

SA WITH HIRSCHMANN CONNECTOR



PIN AND WIRE CODES

Function	Wire Color Code	Hirshmann Pin Code
+ Excitation	Red	4
Signal Output	White / Brown	2
Common	Red	3
Case Shield	Bare	NC

WARRANTY/REMEDY

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Item # 1063100 M.G. 3/01 Rev. A

Honeywell

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Honeywell
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Acton, MA 01720 USA
Tel: (877) 384-1300; Fax: (978) 263-0630

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APPLICATIONS

•
AUTOMOTIVE
brake systems
fuel rail/injection
engine oil
continuously variable
transmissions
active suspensions
•
ENERGY
MANAGEMENT
'smart' compressors

MODEL DG • *PRESSURE TRANSDUCER*

The Model DG is designed to meet the needs of the OEM whose applications demand a pressure transducer for hostile high temperature environments. The DG's combination of rugged packaging, internal signal amplification, and low price make it ideal for many automotive, compressor, and hydraulic applications.

The steel case seals the internal electronics from the surrounding environment. The pressure media contacts only 300 series stainless. From 5V excitation, the DG's 4.5 V ratiometric output can interface directly to many microprocessors with onboard A/D converters. This eliminates typical transducer support circuitry, lowering system cost and speeding system design.

FEATURES

- Meets SAE J1211 specifications for under hood applications
- 100 through 7000 PSIS ranges
- Integral automotive type connector
- Reverse polarity and output protection
- Ratiometric output
- Sealed steel case

BENEFITS

- High reliability in tough, hostile environments
- Suitable for many applications
- Speeds installation
- Not damaged by wiring errors
- Increased accuracy for microprocessor applications
- Complete protection for electronics
- High Temperature 125° C

HOW TO ORDER

DG 100 P S 3 P E

Model — DG

Range — 100

PSI		BAR	
100	01K	007	100
200	03K	015	200
300	05K	020	350
500	7112	035	500

Unit — P = PSI, B = BAR

Reference — S = Sealed (PSIS)

Pressure Port — 3 = 3/8 UNF

Termination — P = Packard

Output — E = 0.25 - 4.75 VDC

Note: Not all combinations are available. Minimum quantity orders apply. Contact the factory for more details.

TECHNICAL SPECIFICATIONS

RANGE

0-100, 200, 300, 500, 1000, 3000, 5000, 7000 PSI
20, 35, 100, 200, 350, 500 BAR
all ranges are sealed

PHYSICAL

Proof Pressure	1.5 x rated range without damage
Burst Pressure	5 x rated range without bursting
Material in Contact with Media	300 series SS
Shock Resistance	50 g's peak (5 milliseconds) resonance search per SAE J1211 Meets MIL-STD 810C, Figure 514-5, Curve AK, Time Schedule II Tandom Vibration Test (Overall g rms = 20.7 minimum)
Weight	approx. 3 oz (85 gm)

ELECTRICAL

Output Voltage	0.25 to 4.75 V min to max pressure
Excitation Voltage	+5 Vdc ±0.25 V
Null Offset	0.25 V nominal
Supply Current (max)	20 mA
Output	
Minimum load	100 K ohms
Sink (max)	0.3 mA
Reverse Polarity Protection	YES
Insulation Resistance	1000 megohms at 25 Vdc
Electrical Connection	Packard Metri-Pack™ Requires Packard #12065287 mating connector (P/N 3685901) Order separately.

PERFORMANCE

Accuracy	±1% of FSO from best fit straight line. Includes effects of non-linearity, hysteresis and repeatability.
Operating and Compensated Temperature Range	-40° to 257° F (-40° to 125° C)
Storage Temperature Range	-40° to 302° F (-40° to 150° C)
Total Error	± 4% of full scale (Includes the effects of zero output error, calibration error, temperature, non-linearity, hysteresis, and repeatability)

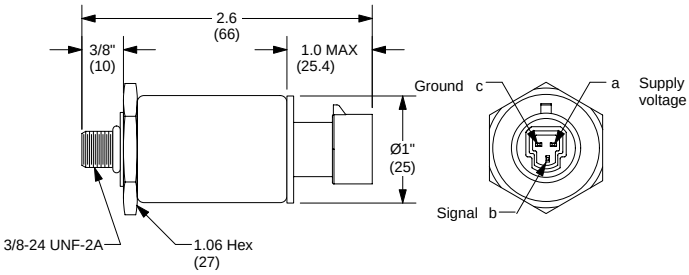
NOTE: All specifications are measured at 25° C and rated excitation unless otherwise specified.

Honeywell Sensing and Control products are protected by one or more of the following patents: U.S. 4,667,158; 4,327,350; 4,368,575; 4,912,409; 4,864,232; 4,866,378; 5,068,607; U.K.2054954; Japan l498268; France 80l4767; 8101087.

Additional U.S. and Foreign patents pending.

DIMENSIONS

xx.xx = inches
(xx.x) = mm



WARRANTY/REMEDY

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Item # 1088400 M.G. 3/01 Rev. A

Honeywell

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APPLICATIONS

- HYDRAULIC/ PNEUMATIC CONTROLS
- AIR COMPRESSORS
- ENERGY MANAGEMENT 'smart' compressors, refrigeration/chiller control
- PROCESS CONTROL SYSTEMS
- ENGINE CONTROLS AND MONITORS

MODEL ECLIPSE • *OEM PRESSURE TRANSDUCER*

The model EC pressure transducer is designed for OEM's who require a reliable pressure transducer for industrial or heavy-duty applications. The model EC features our proven all wetted stainless steel design, rugged packaging, internal signal amplifications, and price which make it an ideal sensor for a variety of applications.

The model EC offers a broad selection of pressure ranges, output ranges, process connections and electrical termination to meet the demanding requirements of customers worldwide. Output options include voltage and current styles. Process connections include English and Metric forms. Electrical terminations include cable and connector styles. The cable style version is suitable for harsh environments that require IP66 type sealing.

The model EC is fully temperature compensated and calibrated and delivers excellent accuracy over a wide temperature range. CE versions are available.

FEATURES

- Voltage or current output
- Broad selection of pressure ranges
- CE, UL and ULc listings are standard for some combinations
- Weather proof type connector
- Reverse polarity protection
- Low excitation voltage
- IP65 sealed steel case, with appropriate connector (IP66 with cable termination)

BENEFIT

- Flexibility for the designer
- Suitable for many applications
- Ready for Europe
- High reliability in tough environments
- Not damaged by reversed excitation
- Suitable for ORV or marine use
- Complete environmental protection for electronics

HOW TO ORDER

EC 100 P S 1 P G

Model — EC

Range

PSI			BAR		
015	100	01K	001	010	100
025	200	02K	004	016	160
050	300	03K	006	025	250
	500	05K		040	350
		07K		060	500

Unit
P = PSI
B = BAR

Reference
G = Gage (PSIG)
S = Sealed (PSIS)

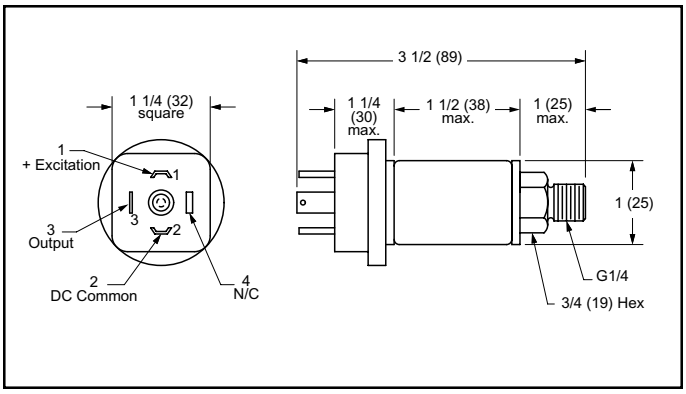
Pressure Connection
1 = 1/8-27 NPT
6 = G1/4-19 BSP
7 = 7/16-20 UNF

Termination
C = Cable
H = Hirschmann
P = Packard
D = Din Connector

Output
C = 0.5-4.5 VDC
G = 4-20 mA
R5 = 1-6 VDC

Note: Not all combinations are available. Minimum quantity orders apply. Contact the factory for more details.

DIN 43650



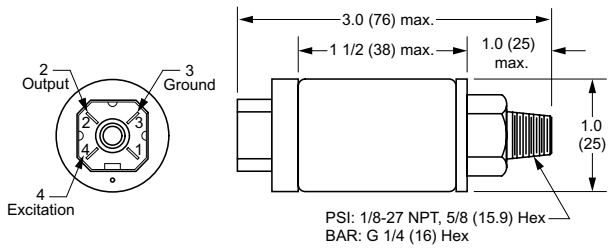
ECLIPSE MODEL DIN 43650

This version of the Model Eclipse features electrical connectors, pressure port threads and pressure ranges attractive to users requiring European standards. The electrical connector meets DIN 43650 and offers the user the advantage of wiring to screw terminals inside the mating connector. The environmental rating is IP 65 when used with the proper cable size and with the mating connector installed on the transducer. The mating connector features a center screw fastener for rigid attachment to the transducer. The pressure port connection is the popular G 1/4 thread and pressure ranges of 0 to 1 bars to 0 to 500 bars are available. The mating connector is included with this version.

DIN CONNECTOR PINS

Pin	Voltage	Current
1	+ Excitation	+ Excitation
2	Common	N / C
3	Output	- Excitation (return)
4	N / C	N / C

HIRSCHMANN



ECLIPSE MODEL HIRSCHMANN

The Model Eclipse is available with a mini DIN style electrical connector. This connection is a popular choice throughout the world and offers quick disconnection but can be rigidly attached with the center screw fastener. The cable exit can be adjusted for any 90-degree direction. The Hirschmann version is rated IP 65 for environmental protection when used with the proper cable size and with the mating connector installed on the transducer. The choice of pressure fittings is 1/8-27 NPT or G 1/4. The mating connector is included with this version.

HIRSCHMANN CONNECTOR PINS

Pin	Voltage	Current
1	N / C	N / C
2	Output	N / C
3	Common	- Excitation (return)
4	+ Excitation	+ Excitation

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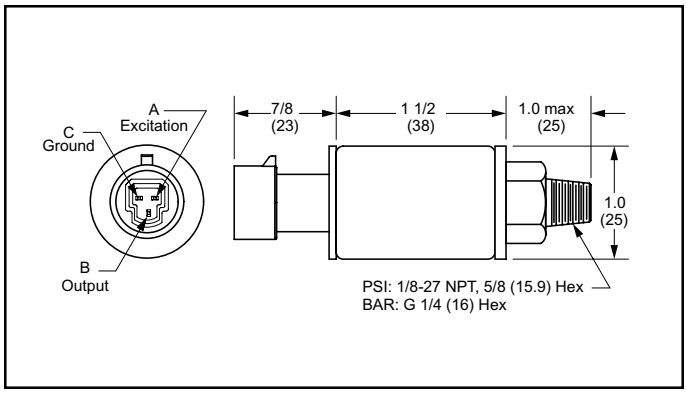
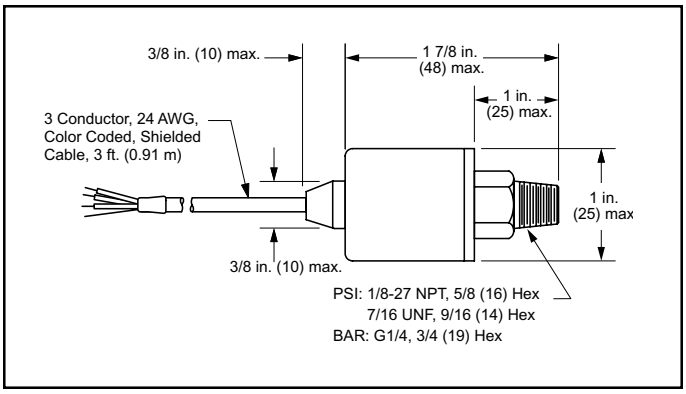
PACKARD



ECLIPSE MODEL PACKARD

To meet the requirements of automotive applications the Model Eclipse is offered with the Packard Metri-Pack™ electrical connector. This connector has been specified for the extreme environments found in engine and hydraulic applications. The connector has a locking lug to maintain connection with the mating plug. This version is available with 1/8-27 NPT or G 1/4 pressure fittings and pressure ranges from 0 to 15 through 0 to 7000 psi. The mating connector is not included with this version.

CABLE



ECLIPSE MODEL CABLE

The Model Eclipse can be provided with an all stainless steel case and an integral cable for electrical connection. The advantage of this arrangement is that the environmental rating is increased to IP66 and would be recommended for extreme outdoor or industrial environments. This version is available with the 1/8-27 NPT or G 1/4 pressure fittings and pressure ranges from 0 to 15 psi through 0 to 7000 psi or 0 to 1 bar to 0 to 500 bars.

PACKARD CONNECTOR PINS

Pin	Voltage	Current
a	+ Excitation	+ Excitation
b	Output	- Excitation (return)
c	Common	N / C

WIRE CODE

Wire	Voltage	Current
Red	+ Excitation	+ Excitation
White	Output	- Excitation (return)
Black	Common	N / A
Bare	Shield	Shield

TECHNICAL SPECIFICATIONS

RANGES	015, 025, 050 psig 100, 200, 300, 500, 1K, 2K, 3K, 5K, 7K psis 1, 2.5, 4 barg 6, 10, 16, 25, 40, 60, 100,160, 250, 350, 500 bars		
PHYSICAL			
Proof Pressure	< 500 psi, 2 X rated range; ≥ 500 psi, 1.5 X rated range		
Burst Pressure	< 500 psi, 10 X rated range; ≥ 500 psi, 10 X rated range (30 kpsi max)		
Material in Contact with Media	300 series SS, braze compound		
Weight	3.0 oz (75 gm)		
ENVIRONMENTAL			
Shock	50 g's peak (5 ms), 100 g's peak (11 ms)		
Vibration	Figure 514.2-5, Curve AK, Table 514.2-V, Random Vibration Test (Overall g rms = 20.7 minimum)		
ELECTRICAL	**Ratiometric Voltage**	**Regulated**	**Current**
Zero Output	0.5 Vdc	1.0 Vdc	4.0 mA
Full Scale Output	4.0 Vdc (0.50-4.50 Vdc)	5.0 Vdc (1.0-6.0 Vdc)	16.0 mA (4-20 mA)
Excitation	5 Vdc ±250 mV (7.0 V max)	7-35 Vdc	9.5-35 Vdc
Supply Current	15.0 mA typical (17.0 mA max)	15.0 mA typical (17.0 mA max)	N/A
Source (nominal)	2.0 mA	2.0 mA	N/A
Sink (nominal)	0.3 mA @ zero output	20 µA @ zero output	N/A
Supply Rejection Ratio	90 db	90 db	90 db
PERFORMANCE			
Response Time	< 500 microseconds		
EMI/RFI	Exceeds CE heavy industrial (30 v/m radiated 150 kHz-1 gHz)		
Electrical Connection	Packard Metri-Pack™ connector requires, Packard #12065287 mating connector, Hirschmann (mating connector supplied), DIN 43650 (mating connector supplied) or 1 meter, 22 AWG Cable		
Accuracy	±0.25% F.S.O. best fit straight line, Includes: non-linearity, hysteresis, non-repeatability. Thermal errors are not included, ±0.5% < 100 psi, 6 gbars		
Total Error Band	±3.0% Typical (±4.0% Max.) F.S.O. Includes: zero offset error, span error, thermal effect on zero and thermal effect on span, non-linearity, hysteresis, non-repeatability		
Compensated Operating and Storage Temperature Range	-40° to 105°C (-40° to 221°F)		

Note: Contact the factory to discuss other pressure ranges.

Note: All specifications are measured at 25° C (77° F) and at rated excitation unless otherwise specified.

Note: Meets IEC-68-2 or MIL-STD 810C.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.

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Item # 1096500 MG 10/01

Honeywell

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APPLICATIONS

- PNEUMATIC EQUIPMENT
- AIR COMPRESSORS
- AIR FILTRATION MONITORING
- INDUSTRIAL CONTROLS

MODEL ST • *OEM PRESSURE TRANSDUCER*

The Model ST pressure transducer combines Honeywell's proven silicon pressure sensing with the latest in ASIC technology in a rugged, industrial package. High value, coupled with outstanding performance, make this an ideal transducer for industrial control applications such as air com-pressors and pneumatic equipment. Temperature compensated, calibrated, and amplified, the ST has pressure ranges from 0-5 to 0-250 PSI.

The ST offers three standard output options for user flexibility, which are as follows: a 0.50 to 4.50 Vdc ratiometric output from 5 Vdc excitation, a 0.50 to 4.50 Vdc regulated output from 7 to 35 Vdc excitation, or a 4-20 mA output from 9.5 - 35 Vdc. TheST transducer delivers ±1.0% full scale accuracy (BFSL) over a wide temperature range of -40° to 100°C and utilizes a proven industry standard connector for high reliability.

FEATURES

- High value and outstanding performance
- Amplified outputs
- Reverse polarity protection
- Less than 500 microseconds response time
- Exceeds CE Heavy Industrial EMC

BENEFIT

- Excellent OEM value
- Eliminates cost of external amplifiers
- Not damaged by reversed excitation
- Accurate high speed measurements

HOW TO ORDER

ST 100 P G 1 S P G F

Model — ST

Range — 100

PSI			BAR		
005	100		R25	1R6	010
010	150		0R4	2R5	016
015	200		0R6	004	
025	250		001	006	
050					

Unit — P

P = PSI B = BAR

Reference — G

G = Gage (PSIG)
V = Vacuum**

Pressure Connection — 1

1 = 1/8-27 NPT
2 = 1/4-18 NPT
6 = G1/4-18 BSP

Port Material — S

S = Stainless Steel
B = Brass

Termination — P

P = Packard

Output — G

G = 4-20 mA
R = 0.5 - 4.5 VDC Regulated
C = 0.5 - 4.5 VDC Ratiometric

Internal Seal Material — F

F = Fluorosilicone

* The character R replaces the decimal point in fractional pressure ranges.
Note: Not all combinations are available. Minimum quantity orders apply. Contact the factory for more details.
** Vacuum for 015 pressure range, full scale output ST-14.7 PSI.

ST SERIES PRESSURE TRANSDUCER

TECHNICAL SPECIFICATIONS

RANGES*	5, 10, 15, 25, 50, 100, 150, 200, 250 psig* 0.25, 0.4, 0.6, 1.0, 1.6 , 2.5, 4.0, 6.0, 10.0, 16.0 bar
PHYSICAL	
Proof Pressure	<100 psi (5 bar), 3 X rated range >100 psi (5 bar), 2 X
Burst Pressure	<100 psi (5 bar), 5 X rated range >100 psi (5 bar), 3 X
Material in Contact With Media	300 Series SS or brass, internal seal, silicon, polyetherimide
Weight	2.0 oz (57 gm)
ENVIRONMENTAL*	
Shock	50 g's peak (5 ms)
Vibration	Figure 514.2-5, Curve AK, Table 514.2-V, Random Vibration Test (Overall g rms = 20.7 minimum)

ELECTRICAL*	**Voltage**	**Current**
Zero Output	0.5 Vdc	4.0 mA
Full Scale Output*	4.0 Vdc (0.50-4.50 Vdc)	16 mA (4-20 mA)
Excitation Ratiomentric Regulated	5 Vdc ±250 mV (7.0 Vdc max.) 7 - 35 Vdc	9.5-35 Vdc
Supply Current	5.0 mA typical (7.0 mA max.)	N/A
Source (nominal)	2.0 mA	N/A
Sink (nominal)	20 µA @ zero output	N/A
Supply Rejection Ratio	90 db	
Output Impedance	25 W max.	N/A

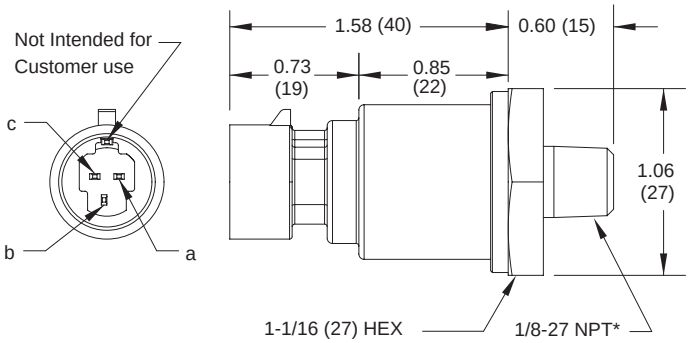
PERFORMANCE*	
Response Time	< 500 microseconds
EMI/RFI	Exceeds CE heavy industrial (30v/m radiated 150kHz-1gHz)
Electrical Connection	Packard Metri-Pack™ Packard Metri-Pack connector requires seperate Packard #12065287 mating connector
Accuracy	±1.0% F.S.O. best fit straight line, Includes: non-linearity, hysteresis, non-repeatability. Thermal errors are not included.
Total Error Band	±2% F.S.O. Includes: zero offset error, span error, thermal effect on zero and thermal effect on span, non-linearity, hysteresis, non-repeatability
Compensated Operating and Storage Temperature Range	-40° to 100°C (-40° to 212°F)

NOTES:

- ** All specifications are measured at 25°C (77°F) and at rated excitation unless otherwise specified.*
- ** Meets IEC-68-2 or MIL-STD 810C.*
- ** Contact the factory to discuss other pressure ranges.*

DIMENSIONS

xx.xx = inches
(xx.x) = mm



** 1/4-18 NPT and G1/4-18 BSP configurations are both optional. Contact the factory to discuss other pressure port options.*

PIN AND WIRE CODES

Pins	Voltage	Current
a	+ Excitation	+ Excitation
b	Output	- Excitation
c	Common	N/C

WARRANTY/REMEDY

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Item # 1122300 M.G. 3/01

Honeywell

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APPLICATIONS

- DIESEL ENGINES
- REFRIGERATION AND HVAC SYSTEMS
- HYDRAULIC FLUID PRESSURES
- GENERAL INDUSTRIAL PRESSURE
- OFF ROAD VEHICLES

MODEL ML • *OEM PRESSURE TRANSDUCER*

The model ML pressure transducer combines the latest in ASIC technology with our proven stainless steel design. This digitally compensated transducer offers an unparalleled value and performance combination making it the ideal pressure sensing solution for demanding automotive and industrial applications. Fully temperature compensated, calibrated, and amplified, the ML is available in 100 to 5000 PSIS pressure ranges.

The ML has three standard output options: a 0.50 to 4.50 Vdc ratiometric output from 5 Vdc excitation, a 1.0 to 6.0 Vdc regulated output from 7-35 Vdc excitation, and a 4-20 mA current from 9-35 Vdc excitation. The ML transducer delivers ±0.25% full scale accuracy (BFSL) over a wide temperature range of -40°C to 105°C and utilizes a proven industry standard connector for high reliability and user flexibility.

FEATURES

- High value and outstanding performance
- No internal elastomeric seals
- Amplified outputs
- Reverse polarity protection
- Less than 500 microseconds response time
- Designed to meet IP65 standards*
- Exceeds CE Heavy Industrial EMC

BENEFITS

- Excellent OEM value
- Eliminates O-Ring compatability issues
- Eliminates cost of external amplifiers
- Not damaged by reversed excitation
- Accurate high speed measurements
- Protected from harsh environments

* With appropriate mating connector, Packard #12065287.

HOW TO ORDER

ML 100 P S 1 P G

Model — ML

Range

PSI			BAR		
15	100	01K	001	016	100
25	200	02K	004	025	160
50	300	03K	006	040	250
	500	05K	010	060	350

Unit — 100
P = PSI
B = BAR

Reference — S
G = Gage (only on < 100 PSI)
S = Sealed

Pressure Connection — 1
1 = 1/8-27 NPT
2 = 1/4-18 NPT

Termination — P
P = Packard

Output — G
C = 0.5-4.5 VDC
G = 4-20 mA
R5 = 1-6 VDC

Note: Not all combinations are available. Minimum quantity orders apply. Contact the factory for more details.

ML SERIES PRESSURE TRANSDUCER

TECHNICAL SPECIFICATIONS

RANGES

15, 25, 50 PSIG; 100, 200, 300, 500, 1000, 2000, 3000, 5000 PSIS
6, 10, 16, 25, 40, 60, 100,160, 250 BAR

PHYSICAL

Proof Pressure	< 500 psi 2 X rated range	≥ 500 psi 1.5 X rated range
Burst Pressure	< 500 psi 10 X rated range	≥ 500 psi (30K psi max) 10 X rated range
Material in Contact with Media	300 series SS, braze compound	
Weight	2.0 oz (57 gm)	

ENVIRONMENTAL

Shock	50 g's peak (5 ms), 100 g's peak (11 ms)
Vibration	Figure 514.2-5, Curve AK, Table 514.2-V Random Vibration Test (Overall g rms = 20.7 minimum)

ELECTRICAL	Ratiometric Voltage	Regulated	Current
Zero Output	0.5 Vdc	1.0 Vdc	4.0 mA
Full Scale Output*	4.0 Vdc (0.50-4.50 Vdc)	5.0 Vdc (1.0-6.0 Vdc)	16 mA (4-20 mA)
Excitation	5 Vdc ±250 mV (7.0 V max)	7-35 Vdc	9.5-35 Vdc
Supply Current	5 mA typical (7 mA max)	5 mA typical (7 mA max)	N/A
Source (nominal)	2.0 mA	2.0 mA	N/A
Sink (nominal)	20 µA @ zero output	20 µA @ zero output	N/A
Supply Rejection Ratio	90 db	90 db	90 db
Output Impedance	25 W max.	25 W max.	N/A

PERFORMANCE

Response Time	< 500 microseconds
EMI/RFI	Exceeds CE heavy industrial (30v/m radiated 150kHz-1gHz)
Electrical Connection	Packard Metri-Pack™ connector requires Packard #12065287 mating connector
Accuracy	±0.25% F.S.O. best fit straight line. Includes: non-linearity, hysteresis, non-repeatability. Thermal errors not included. 0.5% < 100 PSI **
Total Error Band	±2% Typical (±3% Max.) F.S.O. Includes: zero offset error, span error, thermal effect on zero and thermal effect on span, non-linearity, hysteresis, non-repeatability
Compensated Operating and Storage Temperature Range	-40° to 105°C (-40° to 221°F)

** PSIG vented thru vent hole protected by Gortex® filter*

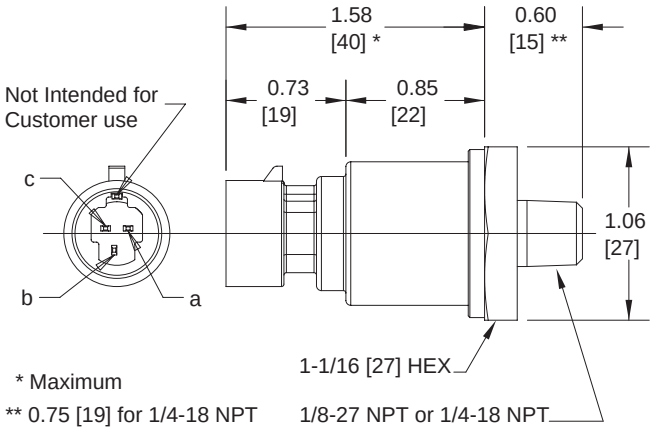
NOTE: All specifications are measured at 25° C (77° F) and at rated excitation unless otherwise specified.

NOTE: Meets IEC-68-2 or MIL-STD 810C.

NOTE: Contact the factory to discuss other pressure ranges.

DIMENSIONS

xx.xx = inches
(xx.x) = mm



* Maximum

** 0.75 [19] for 1/4-18 NPT

PIN AND WIRE CODES

Pins	Voltage	Current
A	+ Excitation	+ Excitation
B	Output	- Excitation
C	Common	NC

WARRANTY/REMEDY

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Item # 1121700 M.G. 3/01 Rev. A

Honeywell

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Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com

APPLICATIONS

- DEPTH SENSING
- WATER RESOURCE MANAGEMENT
- PROCESS CONTROL
- MARINE INSTRUMENTATION
- CHEMICAL MANUFACTURE
- PAINT SPRAYING
- TANK/LIQUID LEVEL

MODEL BL • *PRESSURE TRANSDUCER*

The BL pressure transmitter has a conventional 4-20 mA output and is available with accuracies to 0.25%. The BL is approved for Factory Mutual as an intrinsically safe device for use in hazardous areas. Rated for Class 1, Div. 1 groups H through G.*

All BL's with absolute ranges and all BL's over 50 psi are hermetically sealed. The pressure sensitive diaphragm is either 316L or 15-5 stainless steel, depending on the pressure range selected.

The BL's flush diaphragm is especially suited to measuring viscous fluids, slurries, and media where system flushing is necessary. Its overall price/performance ratio makes it ideal for many process environments.

*When used with approved barriers.

FEATURES

- Accuracies to 0.25%
- Flush diaphragm
- 0-5 to 0-20,000 PSI ranges
- Absolute models available
- I/S certified when used with appropriate barriers

BENEFITS

- For critical applications
- Easily cleaned/adaptable
- Wide range application
- Can measure vacuum

HOW TO ORDER

BL H 100 P S B G

Model — BL

Accuracy* — H

H - 0.5% (005 - 50 PSI)
H - 0.25% (100 - 05K PSI)
H - 0.5% (10K PSI)

Range — 100

005	50	500	03K	20K
015	100	01K	05K	
025	200	02K	10K	

Unit — P

P = PSI

Reference — S

A = Absolute (PSIA) < 100 PSI
G = Gage (PSIG) < 100 PSI
S = Sealed (PSIS) > 50 PSI

Termination — B

B = Bendix

Output — G

G = 4-20 mA

Note: Not all combinations are available. Minimum quantity orders apply. Contact the factory for more details.

* Note: No character represents 1% accuracy.

TECHNICAL SPECIFICATIONS

RANGE

0-5, 15, 25 50 PSIG or PSIA
(0-.3, 1, 2, 3.5 BAR G or BAR A)

0-100, 200, 500, 1000, 2000, 3000, 5000 PSIS
(0-7, 14, 35, 70, 138, 207, 345 BAR S)

0-10,000, 20,000 PSIS
(0-689, 1380 BAR S)
(bar values approximate)

PHYSICAL

Proof Pressure	2 x rated range without damage 30,000 psi (2068 BAR) maximum
Burst Pressure	5 x rated range without bursting 50,000 psi (3448 BAR) maximum
Material in Contact With Media	316L SS < 100 PSI 15-5 PH SS > 50 PSI
Shock Resistance	50 g's peak (11 milliseconds)
Vibration Resistance	Meets MIL-STD 810C, Figure 514-4, Curve AH, Time Schedule II Random Vibration Test (Overall g rms = 11.9 minimum)
Weight	Less than 2.5 oz (70 gm) without adapter or mating connector

ELECTRICAL

Span	16 ±0.16 mA into 0-1200 ohm loop resistance at 77° F (25° C)
Excitation Voltage	12 to 36 Vdc
Null Offset	4 ±0.4 mA at 77°F (25°C)
Reverse Polarity Protection	YES
Insulation Resistance	Greater than1000 megohms at 25 Vdc
Electrical Connection	6 pin PTIH-10-6P or equivalent. (Mating Connector is PT06E-10-6S; Honeywell P/N MS20455A01) Not included.

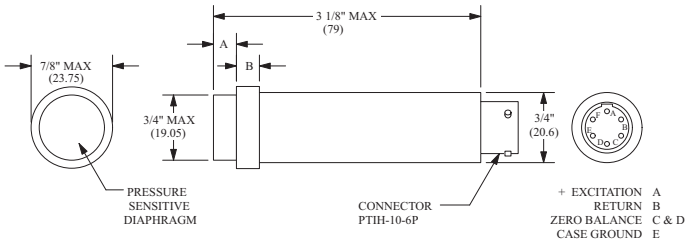
PERFORMANCE

Accuracy	±1% from best fit straight line including effects of non-linearity, hysteresis, and repeatability. Unless otherwise specified by order guide.
Operating Temperature Range	-40° to 180°F (-40° to 82°C)
Compensated Temperature Range	30° to 130°F (-1° to 54°C)
Thermal Effect On Zero	Less than ±2% span within compensated range H version is ±1% span
Thermal Effect On Span	Less than ±1% within compensated range

NOTE: All specifications are measured at 25° C and rated excitation unless otherwise specified.

DIMENSIONS

xx.xx = inches
(xx.x) = mm



PRESSURE RANGE (PSI)

Pressure Range (PSI)	Dim. A MAX		Dim. B	
0-5	.271	(6.9)	.25	(6.4)
1-15 to 0-50	.232	(5.9)	.25	(6.4)
0-100 to 0-200	.238	(6.1)	.25	(6.4)
0-500 to 0-1000	.238	(6.1)	.19	(4.8)
0-2000 to 0-5000	.273	(6.9)	.19	(4.8)
0-10000 to 0-15000	.287	(7.3)	.19	(4.8)
0-20000	.285	(7.5)	.19	(4.8)

WARRANTY/REMEDY

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Item # 1091400 M.G. 3/01 Rev. A

Honeywell

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Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com

APPLICATIONS

- LIQUID LEVEL MEASUREMENT
- PLANT UTILITIES (i.e. Air, Water, Oil)
- GAS TRANSMISSION PIPELINE
- FLOW DETECTION
- GEOPHYSICAL MONITORING
- LUBRICATION SYSTEMS

MODEL DATAMATE • *PRESSURE TRANSMITTER*

The DATAMATE is a two-wire pressure transmitter which is compatible with data loggers and instrumentation used in processing environments. Its 4-20 mA output is ideal for remote monitoring of both primary and secondary process variables.

The DATAMATE is made of series 300 stainless steel. It is suitable for use with a variety of media that would otherwise require isolators. It is also intrinsically safe* for use in Class I, Division I, Groups A thru G hazardous areas.

A threaded conduit connector allows conduit to be easily attached to protect wiring in rugged process plant environments.

*When used with approved barriers.

FEATURES

- Conduit connection
- Waterproof exterior
- Factory calibration
- Compact
- I/S certified when used with approved barriers

BENEFITS

- For the process industry
- No need to 'wet line'
- Can be directly installed
- Easy to package

HOW TO ORDER

DM 100 P G 1 W G

Model — DM

Range — 100

015	100	01K
025	200	03K
050	500	05K

PSI

Unit — P

P = PSI

Reference — G

G = Gage (PSIG)
S = Sealed (PSIS)

Pressure Port — 1

1 = 1/8 NPT

Termination — W

W = Wire (3 Wire 22 AWG)

Output — G

G = 4-20 mA

Note: Not all combinations are available. Minimum quantity orders apply. Contact the factory for more details.

TECHNICAL SPECIFICATIONS

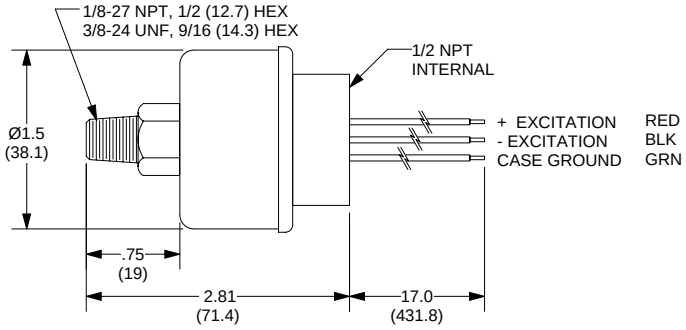
RANGE		
	0-15, 25, 50 psig 0-100, 200 psis	0-500, 1000, 3000, 5000 psis
PHYSCAL		
Proof Pressure	2 x rated range without damage	1.5 x rated range without damage
Burst Pressure	10 x rated range without bursting	5 x rate range without damage
Material in Contact With Media	Brazed assembly of 300 series SS	
Shock Resistance	50 g's peak, (5 milliseconds)	
Vibration Resistance	Meets MIL-STD 810C, Figure 514-5, Curve AK, Time Schedule II, Random Vibration Test (Overall g rms = 20.7 minimum)	
Weight	Less than 5.5 oz (156 gm)	
ELECTRICAL		
Span	16 ±0.32 mA at 77° F (25° C)	
Excitation Voltage	12 to 40 Vdc* linear derating to 35 Vdc from 77° to 121° F (25° to 100° C)	
Null Offset	4 ±0.4 mA at 77°F (25° C)	
Reverse Polarity Protection	YES	
Insulation Resistance	Greater than 1000 megohms at 50 Vdc max	
Electrical Connection	3 leads, including case ground, #22 AWG, XML insulation	
PERFORMANCE		
Accuracy	±1% of FSO from best fit straight line including effects of non-linearity, hysteresis, and repeatability	
Operating Temperature Range	-40° to 212° F (-40° to 100° C)	
Compensated Temperature Range	30° to 130° F (-1° to 54° C)	
Thermal Effect On Zero	Less than ±1% span within compensated range	
Thermal Efffect On Span	Less than ±1% within the compensated range	

NOTE: All specifications are measured at 25° C and rated excitation unless otherwise specified.

** 29.5 V max when used with energy barrier strip*

DIMENSIONS

xx.xx = inches
(xx.x) = mm



WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Item # 1076600 M.G. 3/01 Rev. A

Honeywell

Sensing and Control
Honeywell
100 Discovery Way
Acton, MA 01720 USA
Tel: (877) 384-1300; Fax: (978) 263-0630

www.honeywell.com/sensing/products/di

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com

APPLICATIONS

- FREON® AND AMMONIA REFRIGERATION
- PROCESS CONTROL
- FLOW DETECTION
- PNEUMATIC SYSTEMS
- WATER RESOURCE MANAGEMENT
- LIQUID LEVEL MEASUREMENT

MODEL XPRO • *PRESSURE TRANSMITTER*

The XPRO industrial grade pressure transmitter provides instrument engineers and OEM designers with reliable and affordable measurements. The 4-20 mA output signal is particularly suited for long cable runs in electrically noisy environments.

The XPRO's silicon strain gages are mounted on a beam coupled to a 300 series stainless steel diaphragm for maximum isolation from thermal transients. The pressure cavity is a brazed assembly of 300 series stainless steels with no elastomer seals or adhesive bonds to corrode or deteriorate.

The sensing element and internal electronics are protected from normal industrial environments by a sealed stainless steel case.

Freon® is a registered trademark of E.I. Du Pont deNemours & Co.

FEATURES

- Sealed, rugged package
- 1% accuracy
- All stainless steel
- I/S certified when used with approved barriers

BENEFITS

- Suited for industrial environments
- Useful for secondary process measurements
- Corrosion resistant
- Class 1, division 1, groups H through G when used with approved barriers

HOW TO ORDER

XP 100 P S 1 C 1 G

Model — XP

Range — 100

PSI			BAR		
015	200	02K	001	020	100
025	300	03K	007	035	200
050	500	05K	010	050	350
100	01K	07K	015	070	

Unit — P

P = PSI
B = BAR

Reference — S

A = Absolute; 15 - 200 PSI
G = Gage; 15 - 50 PSI
S = Sealed; 100 - 7000 PSI

Pressure Connection — 1

1 = 1/8-27 NPT
3 = 3/8 UNF
11 = PT-1/4

Termination — C

H = Hirschmann
C = Cable

Cable Length — 1

1 = 3 ft

Output — G

G = 4-20 mA

Note: Not all combinations are available. Minimum quantity orders apply. Contact the factory for more details.

XPRO SERIES PRESSURE TRANSMITTER

TECHNICAL SPECIFICATIONS

RANGE

	0-15, 25, 50 PSIG 0-100, 200 PSIS 0-1 BAR G 7, 10, 15, 20 BAR S	0-500, 1000, 3000, 5000 PSIS 0-35, 50, 70, 100, 200, 350, 500 BAR S

PHYSICAL

Proof Pressure	2 X rated range without damage	1.5 X rated range without damage
Burst Pressure	10 X rated range without bursting	5 X rated range without bursting
Material in Contact with Media	Brazed assembly of 300 series SS	
Shock Resistance	50 g's peak (5 milliseconds)	
Vibration Resistance	Meets MIL-STD 810C, Fig. 514-4, Curve AK, Time Schedule II, Random Vibration Test (Overall g rms = 20.7 min)	
Weight	Less than 3 oz (85 gm) without cable	

ELECTRICAL

Span	16 ±0.32 mA into 0-1400 ohm loop resistance at 77° F (25° C)
Excitation Voltage	12 to 40 Vdc linear derating to 35 Vdc from 77° F (25° C) to 212° F (100° C)
Null Offset	4 ±0.4 mA at 77° F (25° C)
Reverse Polarity Protection	YES
Insulation Resistance	Greater than 100 megohms at 250 Vdc
Electrical Connection	2-conductor, 22 AWG, color coded shielded cable 3 ft. (.91 m) long

PERFORMANCE

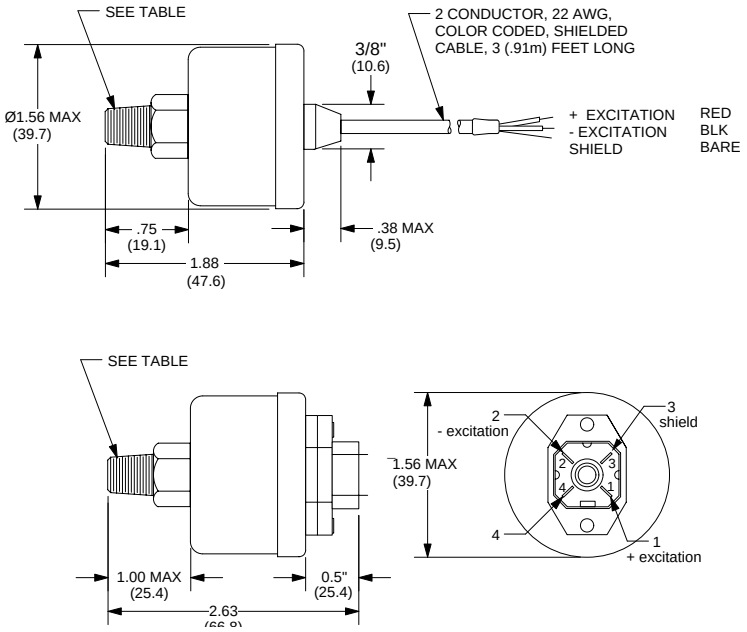
Accuracy	±1% span from best fit straight line including effects of non-linearity, hysteresis and repeatability
Operating Temperature Range	0° to 212° F (-18° to 100° C)
Compensated Temperature Range	30° to 130° F (-1° to 54° C)
Thermal Effect on Zero	Less than ±1% span within compensated range
Thermal Effect on Span	Less than ±1% within compensated range

NOTE: All specifications are measured at 25° C and rated excitation unless otherwise specified.

Honeywell Sensing and Control products are protected by one or more of the following patents: U.S. 4,667,158; 4,327,350; 4,368,575; 4,912,409; 4,864,232; 4,866,378; 5,068,607; U.K. 2054954; Japan 1498268; France 8014767; 8101087. Additional U.S. and Foreign patents pending.

DIMENSIONS

xx.xx = inches
(xx.x) = mm



PRESSURE PORT SIZE / HEX SIZE

Pressure Port Size	Hex Size
1/8 - 27 NPT	1/2 inches
3/8- 24 UNF	9/16 inches

WARRANTY/REMEDY

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Item # 1090700 M.G. 3/01 Rev. A

Honeywell

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Acton, MA 01720 USA
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www.honeywell.com/sensing/products/di

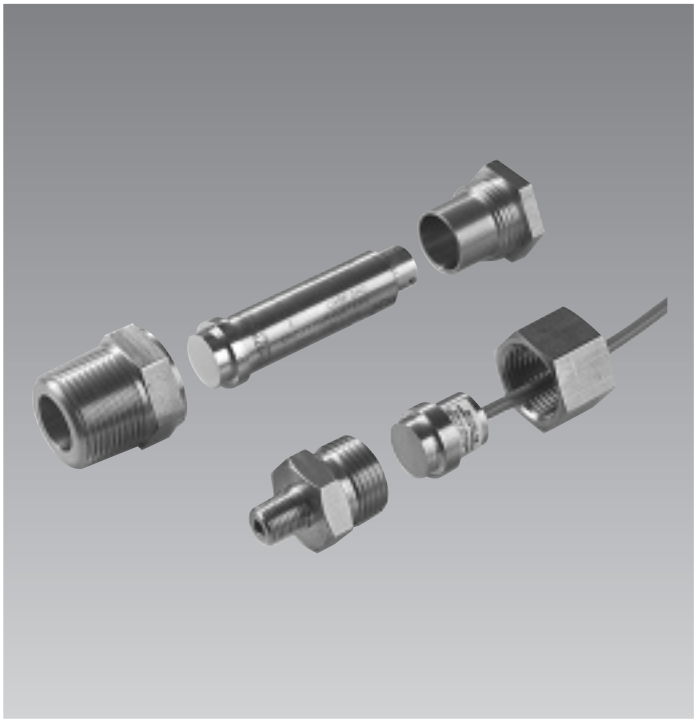
APPLICATIONS

- PROCESS CONTROL
- DRILLING MUD DENSITY
- GEOPHYSICAL RESEARCH
- WATER RESOURCE MANAGEMENT

For ease of installation, Data Instruments offers a choice of nine pressure ports for use with our flush diaphragm models, Model AB, BF and BL. These adapters allow removal of the transducer for cleaning without disturbing the pipe connection.

The adapters are simple two-piece fittings which house the transducer. "O" ring seals are furnished with each adapter and have proven to be leakproof beyond the adapter's pressure rating. Adapters need only be hand tight to withstand these pressures.

For pressure measurements of high viscosity liquids or slurries where a flush diaphragm is required, the AD3SS adapter is recommended.



FEATURES	*BENEFITS*
• Several case materials available	• Compatible with a variety of media
• Wide pressure range	• Can be used in a variety of applications
• Two-piece fittings	• Simple assembly and removal from pipe connection

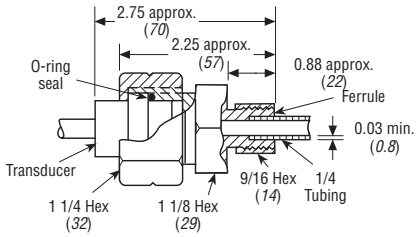
TECHNICAL SPECIFICATIONS

MODELS	Description	Maximum Pressure	Burst Pressure
AD-1SS	300 series stainless steel, 1/4" NPT	10,000 PSI (689 bar)	20,000 PSI (1380 bar)
AD-1SF	300 series stainless steel, 1/4" NPT male with a 40 micron snubber for damping of high pressure spikes	10,000 PSI (689 bar)	400 PSI (27.5 bar)
AD-1N	Nylon 1/4" NPT male	200 PSI (13.8 bar)	400 PSI (27.5 bar)
AD-2SS	300 series stainless steel, tube fitting	3000 PSI (207 bar)	6000 PSI (414 bar)
AD-3SS	300 series stainless steel, 1" NPT permits flush mounting of transducer diaphragm	10,000 PSI (689 bar)	20,000 PSI (414 bar)
AD-4N	Nylon barbed fitting for 1/4" ID hose	100 PSI (6.89 bar)	200 PSI (13.8 bar)
AD-5SS	17-4PH stainless steel, high pressure autocalve fitting, 9/16"-18 x 3/8" female thread	20,000 PSI (1380 bar)	40,000 PSI (2758 bar)
AD-6SS	300 series stainless steel, MS-33656-4 fitting, 7/16"-20 UNF-3A thread	10,000 PSI (689 bar)	20,000 PSI (1380 bar)
AD-7SS	17-4PH stainless steel, 1/4" NPT male high pressure thread	20,000 PSI (1380 bar)	40,000 PSI (2758 bar)

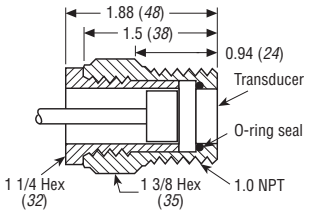
DIMENSIONS

xx.xx = inches
(xx.x) = mm

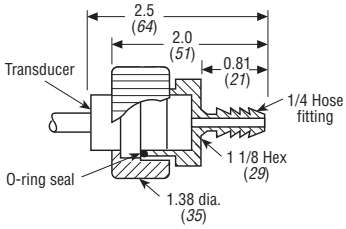
AD-2SS



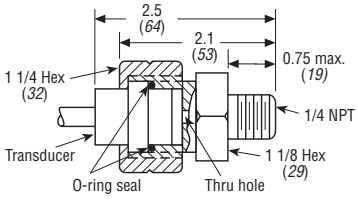
AD-3SS



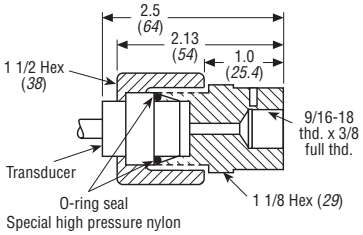
AD-4N



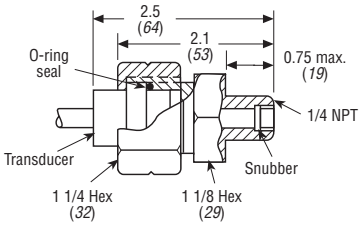
AD-1SS



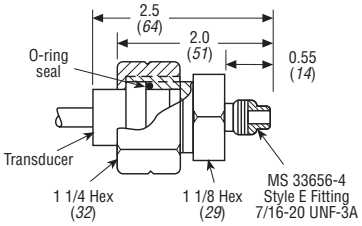
AD-5SS



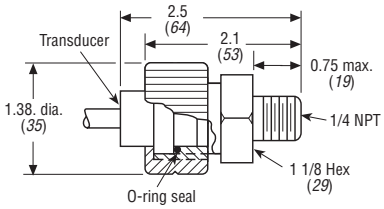
AD-1SF



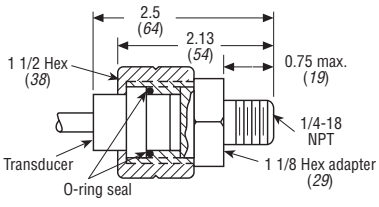
AD-6SS



AD-1N



AD-7SS



Load Cells

Model JP

The JP is a precision load cell that responds to both compression and tension loading—ranges reach from 0-10 lbs. to 0-2000 lbs. It uses germanium strain gages to produce high level outputs (150 mV FSO) which can greatly simplify supportive circuitry.

The JP has unusually low deflection (maximum FS deflection = 0.002 in.) and finds particular usage in situations where deflections must be kept to a minimum.

Model SC

The SC is a medium precision load cell utilizing four active silicon strain gages to provide a direct output of 1.7 volts without amplification.

The SC has an extremely low deflection which allows for its direct insertion in mechanical systems without introducing additional "play." This stiffness, together with the high output, has led to its widespread use as a force feedback element in flight simulators.

FEATURES	BENEFITS
Model JP	
• ± 0.15% accuracy	• Precision measurement in tension and compression loading
• Very low deflection/high natural frequency	• Responds to dynamic inputs over wider frequency ranges
• Unaffected by barometric change	• Increases accuracy
• Small size	• Ease of installation
• Tension and compression loading	• Allows use in "push-pull" systems
Model SC	
• 1.7 full scale output	• Eliminates amplifier
• Very low deflection/high natural frequency	• Responds to dynamic inputs over wider frequency range
• Tension and compression loading	• Allows use in "push-pull" systems
• Unaffected by barometric changes	• Increased accuracy

TECHNICAL SPECIFICATIONS

RANGE

	JP	SC
	0 ± 10, 25, 50, 100, 200, 500, 1000, and 2000 lbs.	0 ± 500, 1000, 2000 lbs.
	(0 ± 4.5, 11, 23, 45, 90, 227, 454, 907, kg)	(0 ± 227, 454, 907 kg)
	(kg values are approximate)	

PHYSICAL

Overload	Up to 150% of rated capacity	Up to 200% of rated capacity
	Structural failure will not occur at loads below 300% of capacity.	
Nominal Full Scale Deflection (values listed are for each range shown above)	0.0009, 0.0006, 0.0008, 0.0008, 0.0010, 0.0010, 0.0015, 0.0020 in	0.0010, 0.0015, 0.0020 in
	(0.0229, 0.0152, 0.0203, 0.0203, 0.0254, 0.02254, 0.0381, 0.0508 mm)	(0.054, 0.0381, 0.0508 mm)
Weight (excluding cable and load button)	1.75 oz (40 gm)- 10-50 lb ranges 7 oz (198 gm)- 100-200 lb ranges 14 oz (397 gm)- 500-2000 lb ranges	14 oz (397 gm)

ELECTRICAL

Excitation Voltage	5 Vdc or Vac rms (6 V max)	24 Vdc or Vac rms
Sensitivity	30 mV/V (min)	70 mV/V (min)
Zero Balance	± 2% FSO	± 1.5% FSO
Bridge Resistance		
Input	125 ± 25 Ω @ 25˚	1000 ± 200 Ω @ 25˚C
Output	125 ± 25 Ω @ 25˚	1000 ± 200 Ω @ 25˚C
Electrical Connection	MS3106B-14S-5P mtd at end of 10 ft (3m) cable-mating connector supplied	MS3100A-14S-5P connector mtd at end of 1 ft (0.3m) cable

PERFORMANCE

Accuracy	Within ± 0.15% FSO including end point nonlinearity and hysteresis	Within ± 1.25% FSO including end point nonlinearity and hysteresis
Repeatability	Within 0.05% FSO	Within 0.1% FSO
Operating Temperature Range	-54˚ to 93˚C (-65˚ to 200˚F)	
Compensated Temperature Range	-1˚ to 54˚C (30˚ to 130˚F)	-12˚ to 49˚C (10˚ to 120˚F)
Thermal Effect on Zero	Less than ± 0.5% FSO within compensated range	
Thermal Effect on Sensitivity	Less than ± 0.5% of reading within compensated range	Less than ± 1.0% of reading within compensated range
Sideload Capacity	No damage up to rated capacity	No damage up to 25% of rated capacity

Note:
- *All specifications are measured at 25˚C and rated excitation unless otherwise stated*

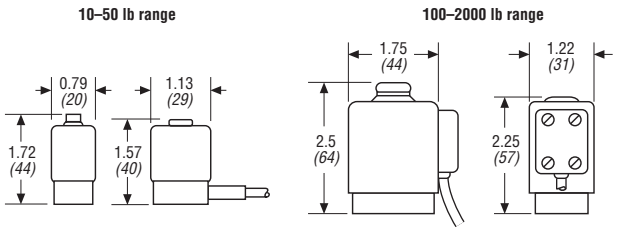
ACCESSORY

Load Button (available for all ranges)

DIMENSIONS

xx.xx = inches
(xx.x) = mm

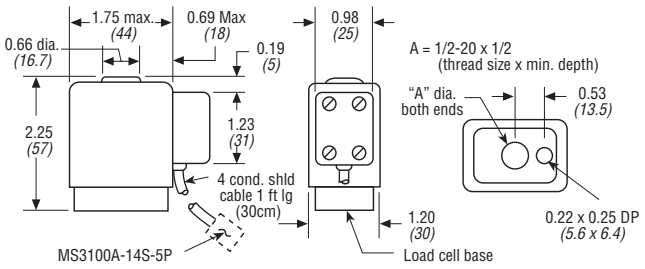
JP



Thread size x min. depth (both sides)
4–40 x 3/16 (10 lb range)
10–32 x 9/32 (25, 50 lb range)

Thread size x min. depth (both sides)
3/8–24 x 3/8 (100, 200 lb range)
1/2–20 x 1/2 (500, 1000, 2000 lb range)

SC

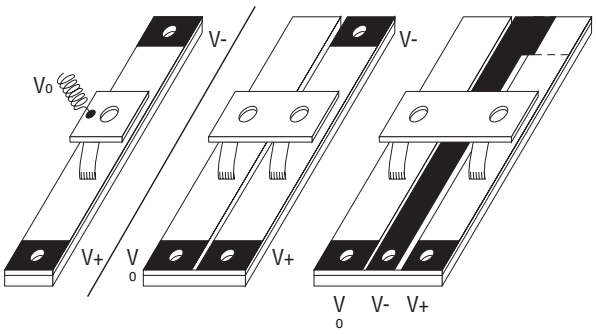


PIN CODES

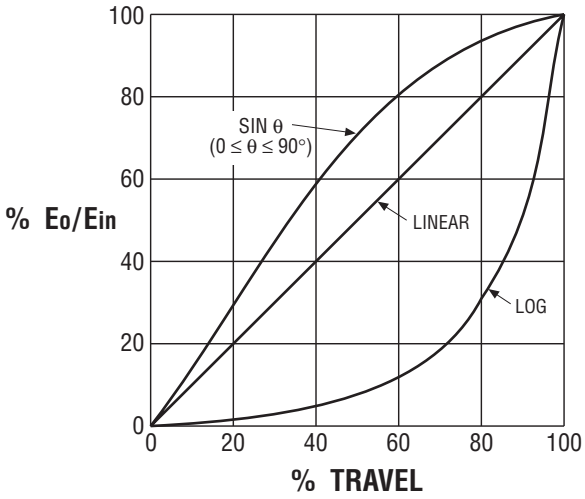
Pin Code	Function
A	+ Excitation
B	+ Signal (in tension), - Signal (in compression)
C	- Signal (in tension), + Signal (in compression)
D	- Excitation
E	Shield (drain)

TECHNICAL SPECIFICATIONS

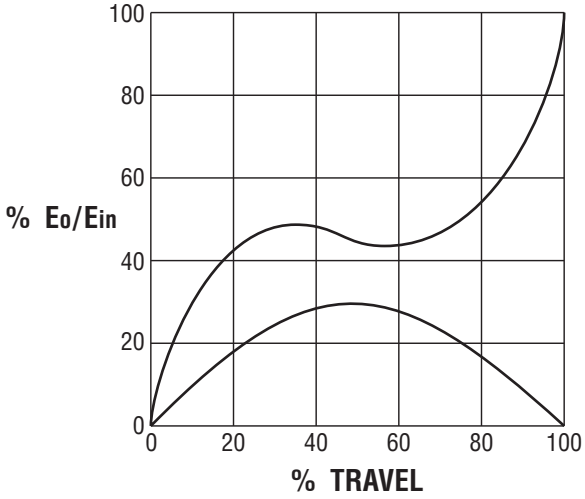
Noise	0.03% output smoothness
Resolution	Essentially infinite
Accuracy	Independent and absolute linearity to ±0.025%
Resistance-Temperature Characteristic	Typically ±5% maximum change in total resistance over standard operating temperature ±200 PPM/°C available in some resistances
Operating Temperature	-55°C to 125°C standard. . . optional to 225°C in some designs
Power Ratings	1 watt/cm²
Resistance Tolerance	±20% standard (±10% optional)
Output Functions	Linear, log, audio, or custom non-linear
Environmental	Operates under wide variety of "hostile" environments
Function Lengths	Up to 160" for linear motion and to 359° for rotary units



Examples of monotonic functions



Examples of non-monotonic functions



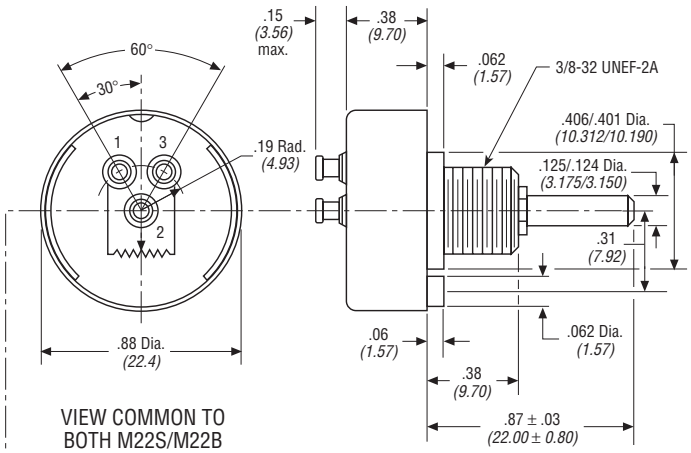
TECHNICAL SPECIFICATIONS

MODELS	M-22B	M-22S
MECHANICAL		
Case Diameter	7/8" (22mm)	
Total Mechanical Travel	330° ±5°	Continous
Starting Torque (max)	1.0 oz. in.	0.3 oz. in.
Shaft Run Out (max)	NA	0.003 in.
Stop Strength	5 in. lb.	NA
Temperature Range	-40° to 85°C (-40° to 185°F)	
Life	50 million operations	
Bearings	Sleeve	
Total Weight	.43 oz. (12 g)	.35 oz. (9.8 g)
Terminals	Gold	
ELECTRICAL		
Theoretical Electrical Travel	320°	340°
Independent Linearity*	±1%	
Total Resistance	2 KΩ	
Resistance Tolerance	±20%	
Output Smoothness	0.10%	
Resistance Temperature Characteristic	±5%	
Resolution	Infinite	
Dielectric Strength	750 V rms	
Insulation Resistance	1000 MΩ @ 500 Vdc	
Power Rating	0.4 Watts	
Wiper Current (max)	<1μA	

OPTIONS**

	M-22B	M-22S
Shaft	Flat, slot	
Shaft Diameter	1/4"	NA
Anti-rotational Pin	Available without	NA
Resistance Values	1K, 5K, 10K ohms	
Resistance Tolerance	±10%	
Independent Linear	± .5%	±.5%, .25%

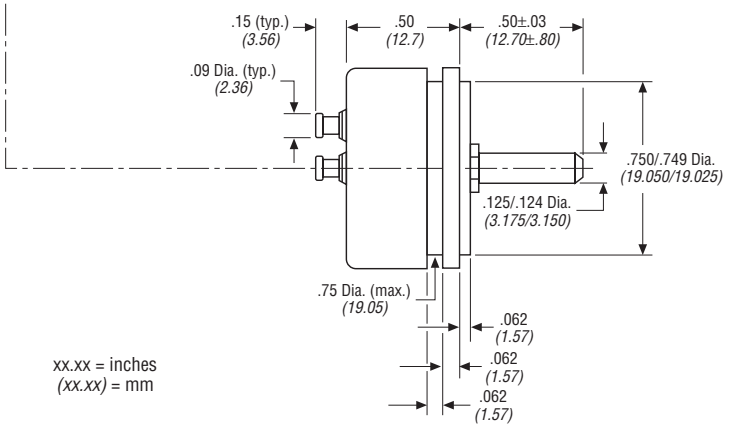
DIMENSIONS



VIEW COMMON TO BOTH M22S/M22B

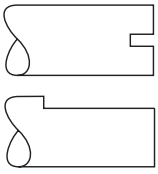
Hardware Kit Supplied

M22B POTENTIOMETER



xx.xx = inches
(xx.xx) = mm

M22S POTENTIOMETER



Slot: 1/32" wide x 1/16" deep

Flat: 1/32" deep x 3/8" long

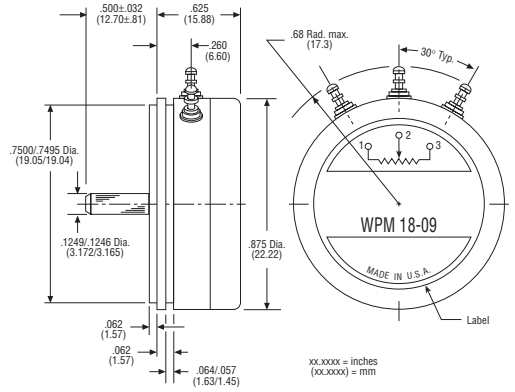
** 5 to 95% of Theoretical Electrical Travel*
***Minimum quantities may be required*
NOTE: Do not test using an Ohmmeter on an RX1 scale or other current devices.
Excessive wiper current can cause output errors or damage.
Zero side load is recommended to achieve maximum performance.

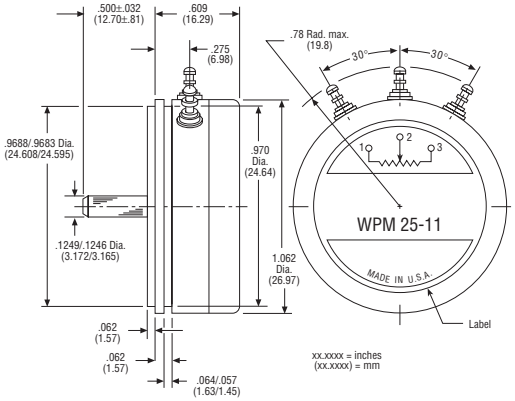
TECHNICAL SPECIFICATIONS

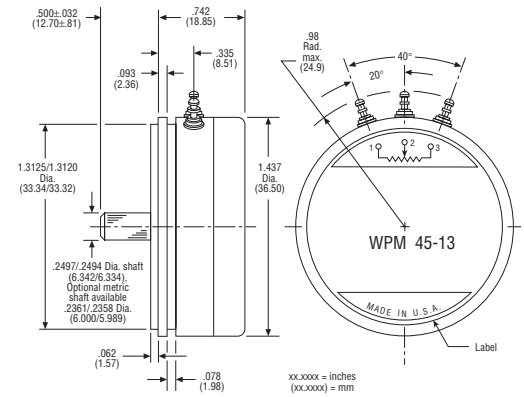
MODEL	18-09	25-11	45-13	65-20
MECHANICAL				
Case Diameter	7/8 " (22mm)	1 1/16" (27mm)	1 7/16" (36mm)	2 " (51mm)
Total Mechanical Travel	Continuous degrees			
Starting Torque	0.4 oz. in.	0.4 oz. in.	0.8 oz. in.	1 oz. in.
Radial Play (max)	.001 in. (.025mm)			
Shaft Runout (max)	.001 in. (.025mm)			
End Play (max)	.005 in. (.127mm)			
Backlash	.01°			
Operating Speed (max)	10,000°/sec			
Temperature Range	-55° to 125°C (-67° to 257°F)			
Life	One billion dither operations			
Vibration	10 Hz to 2 KHz @ 20 g Per MIL-R-39023			
Shock	100g 6 ms			
Weight	0.5 oz. (14.7g)	0.6 oz. (18.13g)	1.8 oz. (51.01g)	2.5 oz. (70.85g)
ELECTRICAL				
Theoretical Electrical Travel	340°	345°	350°	353°
Independent Linearity*	±0.1%	±0.1%	±0.075%	±0.075%
Total Resistance	5 KΩ			
Resistance Tolerance	±20%			
Resistance Temperature Characteristic (max)	±5%			
Resolution	Infinite			
Dielectric Strength	750 V rms	750 V rms	1000 V rms	1000 V rms
Insulation Resistance	1000 MΩ @ 500 Vdc			
Power Rating	1.5 Watts	1.5 Watts	2.0 Watts	3.0 Watts
Output Smoothness	0.03%			
Wiper Current (max)	<1 µA			

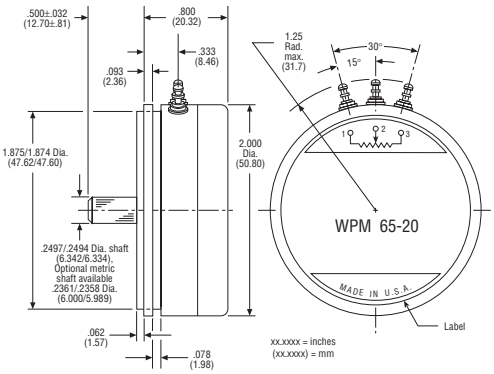
**5-95% of Theoretical Electrical Travel*
NOTE: Do not test using an Ohmeter on Rx 1 scale or other current devices.
Excessive wiper current can cause output errors or damage.
Zero side load is recommended to achieve maximum performance.

DIMENSIONS









APPLICATIONS

- IN-TANK LEVEL SENSING
- ROBOTIC MOTION CONTROL
- WOODWORKING GUIDES
- SEISMOLOGY
- PACKAGING AND PROCESSING EQUIPMENT
- ANIMATED CHARACTERS
- MARINE STEERING SYSTEMS
- OFF-ROAD VEHICLES
- SEMICONDUCTOR PROCESS EQUIPMENT
- MEDICAL EQUIPMENT

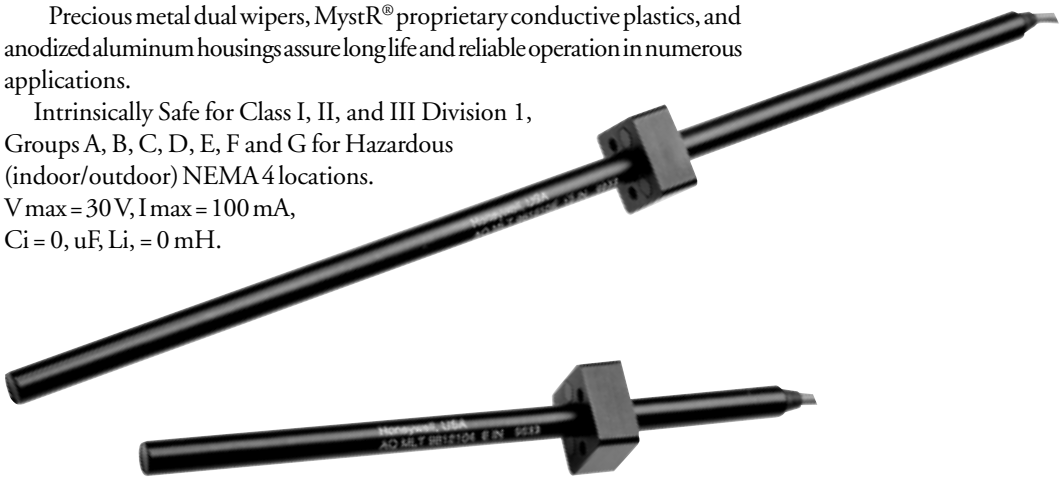
AQMLT • *HARSH DUTY POSITION TRANSDUCER*

The AQMLT is a shaftless waterproof linear potentiometer designed to operate in wet/washdown and in-tank environments.

The AQ series features an external actuator magnetically coupled to a position feedback element. The magnetic actuator replaces the shaft found in traditional linear transducers and eliminates the need for additional stroke length mounting space.

Precious metal dual wipers, MystR® proprietary conductive plastics, and anodized aluminum housings assure long life and reliable operation in numerous applications.

Intrinsically Safe for Class I, II, and III Division 1, Groups A, B, C, D, E, F and G for Hazardous (indoor/outdoor) NEMA 4 locations.
V max = 30 V, I max = 100 mA,
Ci = 0, uF, Li, = 0 mH.



FEATURES

- 3/8 inch diameter
- Multiple finger wiper design
- Extruded wiper block guides
- MystR plastic element
- Anodized extruded aluminum housing
- Sealed construction - IP68 rated
- Precious metal contact
- Absolute continuous measurement

BENEFIT

- Fits into tight spaces, clamps easily to cylinders
- Improves shock and vibration performance
- Smooth quiet motion; extends operating life
- Tested up to one billion dither operations
- Tolerates clamping loads
- Full performance in hostile environments
- Low noise level over entire life
- Accurate position at power up

HOW TO ORDER

AQMLT R5 N 00750 F C

Model — AQMLT

Electrical Travel* — R5 = 00750; 01 = 01500; 03 = 04500; 06 = 09000; 09 = 13500; 12 = 18000

Unit of Measure — N = Inches

Total Resistance* — 0750, 1500, 3000, 4500, 6000, 7500, 9000

Linearity — F = 1.0%

Termination — C = Cable

Note: Not all combinations are available. Minimum quantity orders apply. Contact the factory for more details.

* Note: The *Electrical Travel* correlates to the *Total Resistance (Ohms)*.

MODELS AQMLT
HARSH DUTY POSITION TRANSDUCER

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com

TECHNICAL SPECIFICATIONS

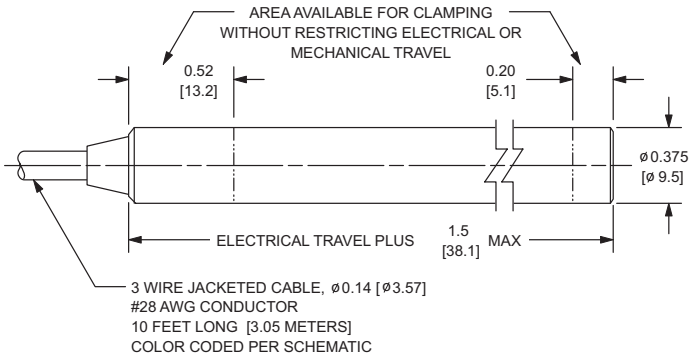
MECHANICAL	
Total Mechanical Travel	0.6 to 12.1 in (min) (15.2 TO 307.3 mm) (min)
Starting Forces	1.0 oz
Shock	50g 1 ms half sine
Vibration	20g rms 5Hz to 2kHz
Life	One Billion dither operations
ELECTRICAL	
Theoretical Electrical Travel	0.5 to 12 in. (12.7 to 304.8 mm)
Independent Linearity*	± 1.0%
Total Resistance	1500 W per inch of electrical travel
Resistance Tolerance	± 20%
Operating Temperature	-40° to 80° C (-40° to 176° F)
Resolution	Infinite
Insulation Resistance	500m W @ 500Vdc
Dielectric Strength	250 V rms
Maximum Applied Voltage	30 Vdc
Recommended Wiper Current †	<1mA

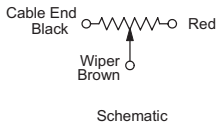
* *5-95% of Theoretical Electrical Travel*

† *Do not test using an Ohmmeter on Rx 1 scale or other current devices. Excessive wiper current can cause output errors or damage. Zero side load is recommended to achieve maximum life.*

DIMENSIONS

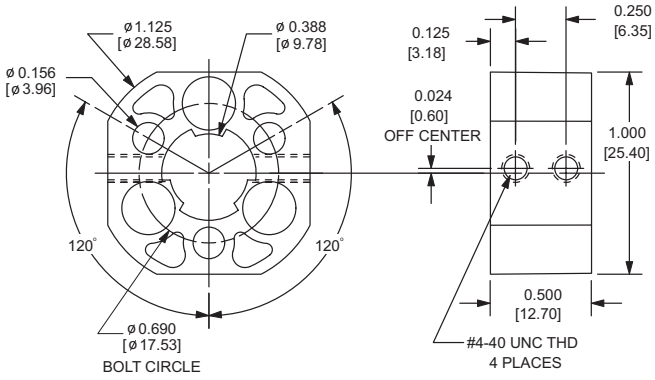
xx.xx = inches
(xx.x) = mm





Schematic

ACTUATOR



NOTE: MECHANICAL TRAVEL = ELECTRICAL TRAVEL +0.10[2.5]

WARRANTY/REMEDY

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While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Item # 1123800 M.G. 10/01

Honeywell

Sensing and Control
Honeywell
100 Discovery Way
Acton, MA 01720 USA
Tel: (877) 384-1300; Fax: (978) 263-0630

www.honeywell.com/sensing/products/di

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com

APPLICATIONS

- INJECTION MOLDING MACHINES
- PRINTING PRESSES
- MEAT PACKING EQUIPMENT
- DRILL PRESSES
- WOODWORKING MACHINES
- CRANES
- FRONT-END LOADERS
- SCALES
- SEMI CONDUCTOR PROCESSING

DURASTAR • *RODLESS LINEAR POSITION TRANSDUCER*

The DuraStar™ rodless linear position transducer incorporates over fifty years of MystR® technology into the longest lasting factory-rugged potentiometer. It allows for a large misalignment of shafts and housing, while providing whisper-quiet operation and smooth, clean signal output. MystR provides the DuraStar excellent durability, especially in dither life which is so often the determining factor in a potentiometer's life. It is the perfect replacement unit to reduce maintenance operations.

The rodless side-sealed DuraStar can also be used to replace a rodded potentiometer in contaminated applications. As a replacement unit, it will improve performance while providing long life.

Intrinsically Safe for Class I, II, and III Division 1, Groups A, B, C, D, E, F and G for Hazardous (indoor/outdoor) NEMA 4 locations. V max = 30 V, I max = 100 mA, Ci = 0, uF, Li, = 0 mH.

FEATURES	BENEFIT
• Vibration damped element	• No wiper bounce in high vibration environments
• Extended side bearing	• Improved life under high misalignment
• Extruded wiper carrier guides	• Smooth operation under large misalignment
• Rugged ribbed housing	• For industrial environment
• Precious metal wipers	• Insures high performance, low noise, no oxidation
• MystR® plastic elements	• Tested up to 1 billion operations
• High DC level output	• Works with simple controllers
• High performance bearings	• Long life even under side-load conditions
• Absolute continuous measurement	• Accurate position at power-up

HOW TO ORDER

DR 04 N 02K B 7 G

Model — DR

Electrical Travel* — 04

04 = 2000	18 = 5000
05 = 2000	20 = 5000
06 = 5000	24 = 5000
08 = 5000	30 = 10000
09 = 5000	36 = 10000
12 = 5000	40 = 10000
14 = 5000	50 = 10000
16 = 5000	

Unit of Measure — N = Inches

Total Resistance* (Ohms) — 02K = 2000, 5000, 10000

Linearity — B = 0.1%

Shaft — 7 = M5 x 0.8 Thread

Termination — G = Hirschmann GDM

Note: Not all combinations are available. Minimum quantity orders apply. Contact the factory for more details.

* Note: The *Electrical Travel* correlates to the *Total Resistance (Ohms)*.

DURASTAR SERIES
RODLESS LINEAR POSITION TRANSDUCER

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com

TECHNICAL SPECIFICATIONS

MECHANICAL

Total Mechanical Travel	4.2 to 50.2 in. (106 to 1275 mm)
Starting Force	1.0 lb (0.45 kg)
Total Weight	0.8 to 4.9 lb (0.36 to 2.2 kg)
Vibration	20 g rms 0.75 mm 5 Hz to 2 kHz
Shock	50 g 11 ms half sine
Backlash	0.001 in. (0.025 mm)
Life	One Billion dither operations

ELECTRICAL

Theoretical Electrical Travel	4.0 to 50 in. (101.6 to 1270 mm)
Independent Linearity	0.1% from 0 to 100% of Theoretical Electrical Travel
Total Resistance	See How To Order
Resistance Tolerance	±20%
Insulation Resistance	1000 M Ohms @ 500 Vdc
Dielectric Strength	1000 Vrms
Operating Temperature	-65° to 105°C (-85° to 221°F)
Resolution	Infinite
Max Applied Voltage	75.0 Vdc
Recommended Wiper Current	<1 µA
Electrical Connection	DIN 43650 Connector or equivalent

Caution: Do not test on an Ohm Meter on the Rx 1 scale or other current devices.

Caution: Excessive Wiper Current can cause Output errors or damage.

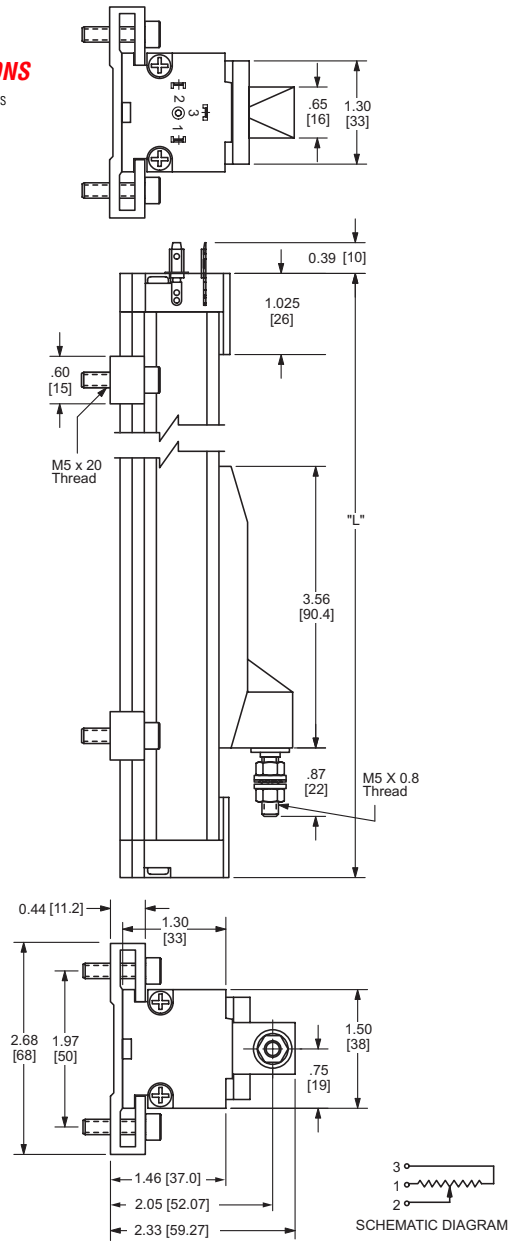
Caution: Zero shaft side load is recommended to achieve maximum life.

Model	Body Length 'L' in inches	Model	Body Length 'L' in inches
DR04	9.84	DR18	23.82
DR05	11.02	DR20	25.83
DR06	11.81	DR24	29.84
DR08	13.86	DR30	35.83
DR09	14.80	DR36	41.83
DR12	17.80	DR40	45.83
DR14	20.24	DR50	55.83
DR16	21.81		

DIMENSIONS

xx.xx = inches

(xx.x) = mm



WARRANTY/REMEDY

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Item # 1101500 M.G. 10/01

Honeywell

Sensing and Control
Honeywell
100 Discovery Way
Acton, MA 01720 USA
Tel: (877) 384-1300; Fax: (978) 263-0630

www.honeywell.com/sensing/products/di

APPLICATIONS

- INJECTION MOLDING MACHINES
- PRINTING PRESSES
- MEAT PACKING EQUIPMENT
- DRILL PRESSES
- WOODWORKING MACHINES
- CRANES
- FRONT-END LOADERS
- SCALES
- SEMI CONDUCTOR PROCESSING

LONGFELLOW II • *LINEAR POSITION TRANSDUCER*

The new Longfellow II has a rugged long-life design featuring greater resistance to vibration and a smooth high quality signal. It has a solid stainless steel shaft, longer front-end bearings, a vibration-free damped element, a spring-loaded ball joint and a high precision precious metal wiper. Carrier guides extruded the full length of the housing insure smooth operation even under severe side load conditions.

The Longfellow II is a direct drop-in replacement for existing Waters, Data Instruments, Novotechnik, Gefran or Sfernice units. The newly designed internal components provide improvements which were developed after worldwide testing and field experience.

Intrinsically Safe for Class I, II, and III Division 1, Groups A, B, C, D, E, F and G for Hazardous (indoor/outdoor) NEMA 4 locations. V max = 30 V, I max = 100 mA, Ci = 0, uF, Li, = 0 mH.

FEATURES

- Vibration damped element
- Spring-loaded ball joint assembly
- Extruded wiper carrier guides
- Precious metal wipers
- MystR® plastic elements
- High DC level output
- High performance bearings
- Absolute continuous measurement
- Shaft seals
- LF2W

BENEFIT

- No wiper bounce in high vibration Environments
- Operation under high side loads
- Smooth operation under large misalignment
- Insures high performance, low noise, no oxidation
- Tested up to one billion operations
- Works with simple controllers
- Long life under side load conditions
- Accurate position at power-up
- Protect internal components from environments
- NEMA 4 and water resistant

HOW TO ORDER

LF2S 06 N 5K B 6 A

Model
LF2S = Standard
LF2W = Water Resistant

Electrical Travel
06, 09, 12, 14, 18, 24, 30, 36, 48

Unit of Measure
N = Inches

Total Resistance (Ohms)
5K = 5000 Ohms

Linearity
B = 0.1%

Shaft
6 = 1/4 - 28 Thread

Termination
A = Binder

Note: Not all combinations are available. Minimum quantity orders apply. Contact the factory for more details.

LONG FELLOW II SERIES
LINEAR POSITION TRANSDUCER

LONG FELLOW II SERIES • *LINEAR POSITION TRANSDUCER*

TECHNICAL SPECIFICATIONS

MECHANICAL

Total Mechanical Travel	6 to 48 in. (150 to 1200 mm)
Starting Forces*	1.0 lb (0.45 kg)
Total Weight	0.8 to 4.9 lb (0.36 to 2 kg)
Vibration**	20 g rms/0.75 mm 5-2 Hz
Shock	50 g, 11 ms half sine
Backlash	0.001 in. (0.025 mm)
Life	One Billion Dither Operations

ELECTRICAL

Theoretical Electrical Travel	6.0 to 48.0 in. (150 to 1200 mm)
Independent Linearity	0.1% over Theoretical Electrical Travel
Total Resistance	5000 Ohms
Resistance Tolerance	20%
Operating Temperature	-65° to 105° C (-85° to 221° F)
Resolution	Infinite
Insulation Resistance	1000 M Ohms @ 500 Vdc
Dielectric Strength	1000 V rms
Recommended Wiper Current	<1 µA
Electrical Connection	Binder Series 681 Connector or Equivalent
Maximum Applied Voltage	30 Vdc

* *Starting force for LFIIW 5 lbs. MAX*
Water resistant LFIIW Models are rated to NEMA 4

** *For vibration levels up to 50 g rms and higher additional housing clamps are required*

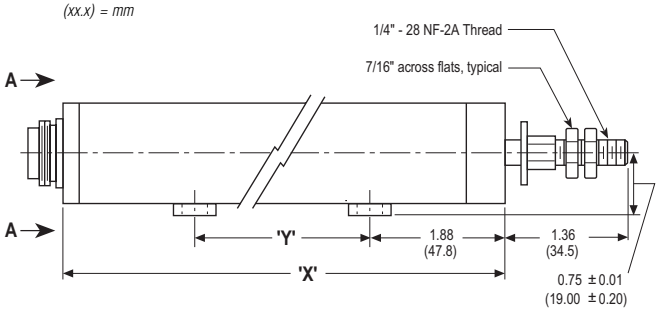
Caution: Do not test on an Ohm Meter on the Rx 1 scale or other current devices.

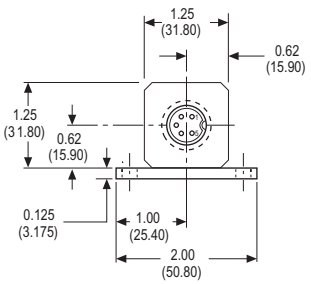
Caution: Excessive Wiper Current can cause Output errors or damage.

Caution: Zero shaft side load is recommended to achieve maximum life.

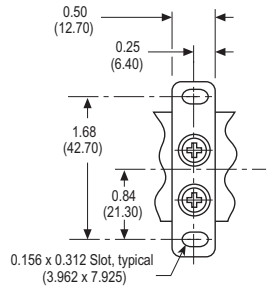
DIMENSIONS

xx.xx = inches
(xx.x) = mm



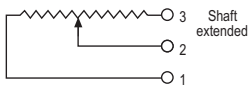


VIEW A-A



MOUNTING FEET (2)

Mounting feet shown above are for standard LF II models only. Mounting feet are not included with water resistant LF II models. Water resistant LF II models are shipped with brackets.



SCHEMATIC

Notes:

1. *Total Mechanical Travel equals Electrical Travel plus 0.090 inches minimum*
2. *'X' Overall Length equals Electrical Travel plus 3.19 inches*
3. *'Y' Equals Electrical Travel minus 1.00 inches*
   (EXCEPT for LF II 09/225: 'Y' Equals Electrical Travel minus 1.12 inches)

SPECIALS AND ACCESSORIES

- *Other Electrical Travels*
- *Other Resistance Values*
- *Rod-end Bearings*
- *Ball Joint Assembly*
- *Dual Element*
- *DIN 43650 Connector*
- *Optional Linearity Values*
- *M6 x 1 Metric Thread*

WARRANTY/REMEDY

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Item # 1102800 M.G. 10/01

Honeywell

Sensing and Control
Honeywell
100 Discovery Way
Acton, MA 01720 USA
Tel: (877) 384-1300; Fax: (978) 263-0630

www.honeywell.com/sensing/products/di

APPLICATIONS

- INJECTION MOLDING MACHINES
- PRINTING PRESSES
- MEAT PACKING EQUIPMENT
- WEATHER INSTRUMENTS
- DRILL PRESSES
- WOODWORKING MACHINES
- CRANES
- FRONT-END LOADERS
- SCALES
- SEMI CONDUCTOR PROCESSING

SHORT LONGFELLOW SERIES • *LINEAR POSITION TRANSDUCER*

The Short Longfellow is frequently used for measuring linear position or displacement up to 6 inches on a wide variety of manufacturing and process equipment. The mechanical design of the unit's front and rear bearings, anodized extruded aluminum housing, stainless steel shaft and precious metal wipers are suitable for a factory's harsh environment.

Based on the proprietary MystR® conductive plastic film, it provides a high resolution, absolute position measurement without external signal conditioners.

Intrinsically Safe for Class I, II, and III Division 1, Groups A, B, C, D, E, F and G for Hazardous (indoor/outdoor) NEMA 4 locations. V max = 30 V, I max = 100 mA, Ci = 0, uF, Li, = 0 mH.

FEATURES

- Precious metal wipers
- 0.081 inch thick housing with 0.25 inch shaft
- Shaft seals
- MystR® plastic element
- Absolute continuous measurement
- High performance bearings
- High level DC output

BENEFIT

- Insures high performance, low noise
- Rugged construction for manufacturing environment
- Protects internal components from factory environment
- Tested up to 1 billion operations
- Accurate position at power up
- Long life even with side load conditions
- Works with simple controls

HOW TO ORDER

SLF 01 N 1500 F 6 A

Model
SLF = Standard
SLW = Water Resistant

Electrical Travel
01 = 1500
02 = 3000
03 = 4500
04 = 6000
05 = 9000

Unit of Measure
N = Inches

Total Resistance
1500, 3000, 4500, 6000, 9000

Linearity
F = 1.0%
B = 0.1%

Shaft
6 = 1/4 - 28 Thread

Termination
A = Binder

Note: Not all combinations are available. Minimum quantity orders apply. Contact the factory for more details.
Note: The *Total Resistance* is determined by *Electrical Travel*, at 1500 Ohms per inch.

SHORT LONGFELLOW SERIES
LINEAR POSITION TRANSDUCER

SHORT LONGFELLOW SERIES • *LINEAR POSITION TRANSDUCER*

TECHNICAL SPECIFICATIONS

MECHANICAL	
Total Mechanical Travel	See table below
Starting Force*	1 lb
Total Weight	0.26 to 0.49 lb
Vibration	20 g / 0.75 mm (rms) 5-2 kHz
Shock	50 g, 11 ms half sine
Backlash	0.001 in.
Life	One Billion operations
ELECTRICAL	
Theoretical Electrical Travel	See table below
Independent Linearity**	±1.0% or ±0.1%
Total Resistance	1500 Ohms per inch theoretical electrical travel
Resistance Tolerance	±20%
Operating Temperature	-65° to 105° C
Resolution	Infinite
Maximum Applied Voltage	40 Vdc
Recommended Wiper Current	<1 µA
Electrical Connection	Binder Series 681 Connector or equivalent

** Starting Force for SLW 5 lbs. (2.3 kg)*

*** 5-95% of Theoretical Electrical Travel*

Caution: Do not test on an Ohm Meter on the Rx 1 scale or other current devices.

Caution: Excessive Wiper Current can cause Output errors or damage.

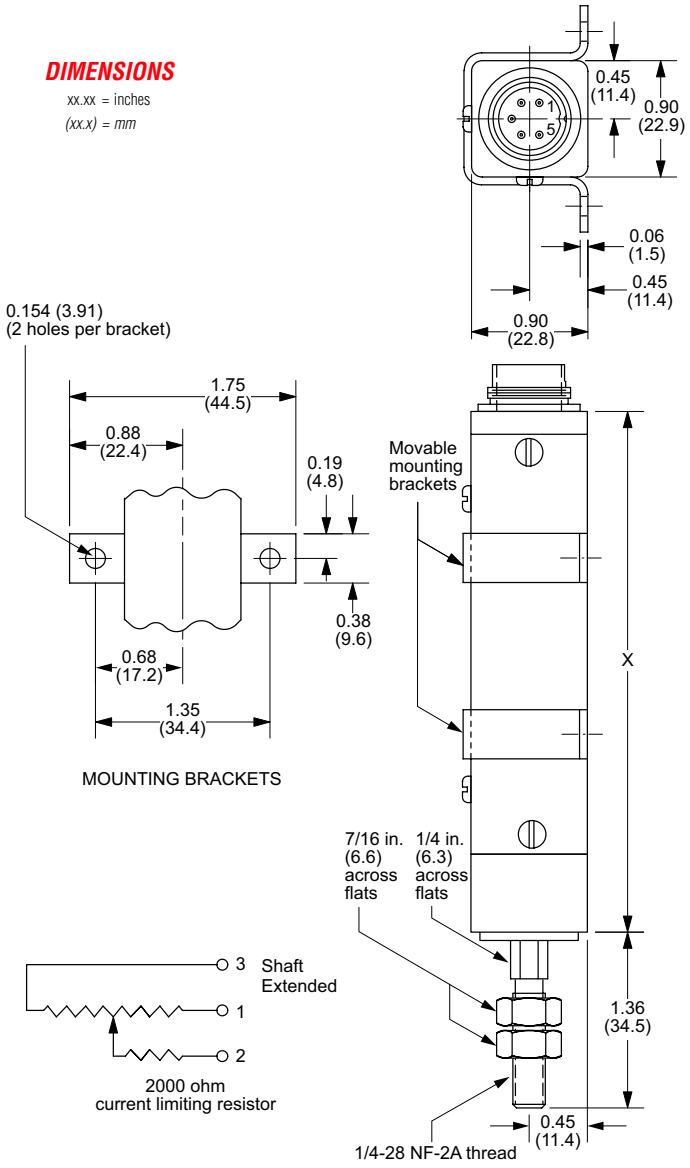
Caution: Zero shaft side load is recommended to achieve maximum life.

Model	Electrical Travel in inches	Mechanical Travel in inches	Total Resistance in Ohms	Body Length 'X' in inches
SLF01 or SLW01	1.0	1.20	1500	4.05
SLF02 or SLW02	2.0	2.20	3000	5.05
SLF03 or SLW03	3.0	3.15	4500	5.95
SLF04 or SLW04	4.0	4.15	6000	6.95
SLF06 or SLW06	6.0	6.15	9000	8.95

DIMENSIONS

xx.xx = inches

(xx.x) = mm



SPECIALS AND ACCESSORIES

- *Other Mechanical Travels*
- *Other Electrical Travels*
- *Other Resistance Values*
- *Rod and Bearings*
- *Ball Joint Assembly*
- *Other Linearity Values*

WARRANTY/REMEDY

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Item # 1098800 M.G. 10/01

Honeywell

Sensing and Control
Honeywell
100 Discovery Way
Acton, MA 01720 USA
Tel: (877) 384-1300; Fax: (978) 263-0630

www.honeywell.com/sensing/products/di

APPLICATIONS

- MEDICAL EQUIPMENT
- HOSPITAL BEDS
- LINEAR ACTUATORS
- ANIMATED CHARACTERS
- GAUGING
- WOODWORKING GUIDES
- FLUID FLOW METERS
- SEISMOLOGY
- SEMI CONDUCTOR PROCESSING

LT • *HALF INCH DIAMETER LINEAR POSITION TRANSDUCER*

The Model LT is a small diameter linear position transducer that is rugged enough to withstand the hostile environment of the factory. Using a proprietary dual wiper and the MystR® conductive plastic film the LT provides usable output at high vibration levels for long periods. The LT transducers use precious metal wipers to further enhance reliability. The LT can be provided with shaft seals for spray of hose.

Intrinsically Safe for Class I, II, and III Division 1, Groups A, B, C, D, E, F and G for Hazardous (indoor/outdoor) NEMA 4 locations. V max = 30 V, I max = 100 mA, Ci = 0, uF, Li, = 0 mH.

FEATURES

- 0.50 inch diameter
- Dual wiper design
- Extruded wiper block guides
- MystR® plastic element
- Anodized extruded aluminum housing
- Stainless steel shaft
- Precious metal contact
- Absolute continuous measurement

BENEFIT

- Fits into tight spaces, clamps easily to cylinders
- Improves shock and vibration performance
- Smooth quiet motion; extends operating life
- Tested up to one billion operations
- Tolerates clamping loads
- Full performance in hostile environments
- Low noise level over entire life
- Accurate position at power up

HOW TO ORDER

LTS 05 N 05K F 5 C

Model
LTS = Standard
LTW = Water Resistant

Electrical Travel*
01 = 1000 06 = 6000
02 = 2000 07 = 7000
03 = 3000 08 = 8000
04 = 4000 09 = 9000
05 = 5000 10 = 10000

Unit of Measure
N = Inches

Total Resistance*
1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000, 9000, 10000

Linearity
B = 0.1%
F = 1.0%

Shaft
5 = 4-40 Thread

Termination
C = Cable

Note: Not all combinations are available. Minimum quantity orders apply. Contact the factory for more details.

* Note: The *Electrical Travel* correlates to the *Total Resistance (Ohms)*.

MODEL LT
HALF INCH DIAMETER LINEAR POSITION TRANSDUCER

MODELS LT • *HALF INCH DIAMETER LINEAR POSITION TRANSDUCER*

TECHNICAL SPECIFICATIONS

MECHANICAL

Total Mechanical Travel	1.05 to 10.05 in. (min) 26.7 to 255.3 mm (min)
Starting Force	1.0 oz (max)*
Shock	50 g 11 ms half sine
Vibration	20 g rms 5 Hz to 2 KHz
Life	One Billion dither operations

ELECTRICAL

Electrical Travel (1 inch increments)	1 to 10 in. (25.4 to 254.0 mm)
Independent Linearity **	±1.0%
Total Resistance	1000 Ohms per inch electrical travel
Resistance Tolerance	±20%
Operating Temperature	-40° to 80°C (-40° to 176°F)
Resolution	Infinite
Insulation Resistance	500 M Ohms @ 500 Vdc
Dielectric Strength	1000 V rms
Max. Applied Voltage	30 Vdc
Backlash	0.0002 in. max
Recommended Wiper Current	<1 µA

** 12 oz. max. for 'LTW' models rated at IPX5*

*** From 5% to 95% of theoretical electrical travel*

Caution: Do not test on an Ohm Meter on the Rx 1 scale or other current devices.

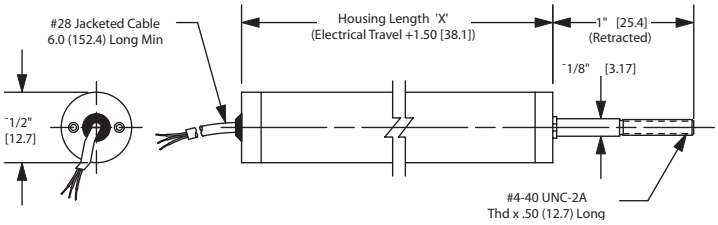
Caution: Excessive Wiper Current can cause Output errors or damage.

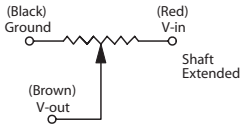
Caution: Zero shaft side load is recommended to achieve maximum life.

DIMENSIONS

xx.xx = inches

(xx.x) = mm





Connect to High Impedance Circuit

Model	Electrical Travel in inches	Total Resistance Ohms	Housing Length 'X' in inches	Weight in grams
LTS01 or LTW01	1.0	1000	2.5	20
LTS02 or LTW02	2.0	2000	3.5	26
LTS03 or LTW03	3.0	3000	4.5	31
LTS04 or LTW04	4.0	4000	5.5	43
LTS05 or LTW05	5.0	5000	6.5	45
LTS06 or LTW06	6.0	6000	7.5	48
LTS07 or LTW07	7.0	7000	8.5	51
LTS08 or LTW08	8.0	8000	9.5	57
LTS09 or LTW09	9.0	9000	10.5	62
LTS10 or LTW10	10.0	10000	11.5	68

SPECIALS AND ACCESSORIES

- *Other Mechanical Travels*
- *Other Electrical Travels*
- *Other Resistance Values*
- *Rod-end Bearing*
- *Metric Shaft Adapter*

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Item # 1124800 M.G. 10/01

Honeywell

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www.honeywell.com/sensing/products/di

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com

APPLICATIONS

- MEDICAL EQUIPMENT
- HOSPITAL BEDS
- LINEAR ACTUATORS
- ANIMATED CHARACTERS
- GAUGING
- WOODWORKING GUIDES
- FLUID FLOW METERS
- SEISMOLOGY
- SEMI CONDUCTOR PROCESSING

MLT • *3/8 INCH DIAMETER LINEAR POSITION TRANSDUCER*

The Models MLT are small diameter linear position transducers rugged enough to withstand the hostile environment of the factory. Using a proprietary dual wiper, internal ball joint and the MystR® conductive plastic film the MLT provides usable output at high vibration levels for long periods. MLT Transducers use precious metal wipers to further enhance reliability.

Intrinsically Safe for Class I, II, and III Division 1, Groups A, B, C, D, E, F and G for Hazardous (indoor/outdoor) NEMA 4 locations. V max = 30 V, I max = 100 mA, Ci = 0, uF, Li, = 0 mH.

FEATURES	BENEFIT
• 0.375 inch diameter	• Fits into tight spaces, clamps easily to cylinders
• Dual wiper design	• Improves shock and vibration performance
• Extruded wiper block guides	• Smooth quiet motion; extends operating life
• MystR® plastic element	• Tested up to one billion operations
• Internal spring loaded ball joint	• Less error from shaft misalignment
• Anodized extruded aluminum housing	• Tolerates clamping loads
• Stainless steel shaft	• Full performance in hostile environments
• Precious metal contact	• Low noise level over entire life
• Absolute continuous measurement	• Accurate position at power up

HOW TO ORDER

MLT 0R5 N 0750 F 5 C

Model — MLT

Electrical Travel* — 0R5 = 750; 001 = 1500; 002 = 3000; 003 = 4500; 004 = 6000; 005 = 7500; 006 = 9000

Unit of Measure — N = Inches

Total Resistance* — 0750, 1500, 3000, 4500, 6000, 7500, 9000

Linearity — B = 0.1%; F = 1.0% (Best possible on 0.5 in. device); D = 0.25% (Best possible on 1.0 in. device)

Shaft — 5 = 4-40 Thread

Termination — C = Cable

Note: Not all combinations are available. Minimum quantity orders apply. Contact the factory for more details.

* Note: The *Electrical Travel* correlates to the *Total Resistance (Ohms)*.

MODELS MLT
SMALL DIAMETER LINEAR POSITION TRANSDUCER

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com

MODELS MLT • *SMALL DIAMETER LINEAR POSITION TRANSDUCER*

TECHNICAL SPECIFICATIONS

MECHANICAL	
Total Mechanical Travel	0.55 to 6.05 in. (min) 13.9 to 153.7 mm (min)
Starting Force	1.0 oz (max)
Shock	50 g 11 ms half sine
Vibration	20 g rms 5 Hz to 2 KHz
Life	One Billion dither operations
ELECTRICAL	
Theoretical Electrical Travel (1 inch increments)	0.5 to 6 in. (12.7 to 152.4 mm)
Independent Linearity	See How to Order
Total Resistance	1500 Ohms per inch electrical travel
Resistance Tolerance	±20%
Operating Temperature	-40° to 80°C (-40° to 176°F)
Resolution	Infinite
Insulation Resistance	500 M Ohms @ 500 Vdc
Dielectric Strength	1000 V rms
Max. Applied Voltage	30 Vdc
Backlash	0.0005 in. max
Recommended Wiper Current	<1 µA

Caution: Do not test on an Ohm Meter on the Rx 1 scale or other current devices.

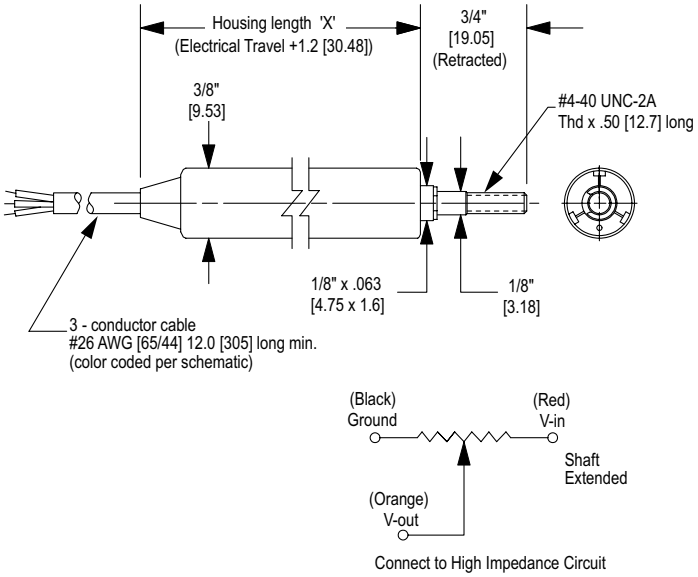
Caution: Excessive Wiper Current can cause Output errors or damage.

Caution: Zero shaft side load is recommended to achieve maximum life.

DIMENSIONS

xx.xx = inches

(xx.x) = mm



Model	Electrical Travel in inches	Total Resistance Ohms	Housing Length 'X' in inches	Weight in grams
MLT0R5	0.5	750	1.7	11
MLT001	1.0	1500	2.2	14
MLT002	2.0	3000	3.2	20
MLT003	3.0	4500	4.2	23
MLT004	4.0	6000	5.2	28
MLT005	5.0	7500	6.2	30
MLT006	6.0	9000	7.2	31

SPECIALS AND ACCESSORIES

- *Other Mechanical Travels*
- *Other Electrical Travels*
- *Other Resistance Values*
- *Rod-end bearing*
- *Metric Shaft Adapter*

WARRANTY/REMEDY

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HIGH PURITY FLOW - THROUGH PRESSURE TRANSDUCER

SERIES F1

All F1 pressure transducers are manufactured in our Class 10 clean room environment. Our flow through pressure transducers are specifically designed for the semiconductor industry. Their long life, coupled with long-term stability, can greatly reduce or eliminate the need for zero and span adjustments.

All DI-CFG transducers are CE certified with EMI/RFI protection and are manufactured to an electropolished wetted surface finish of 5 micro inch Ra maximum. They are available in pressure ranges from 25-3,000 psi with special fittings furnished upon request.

APPLICATIONS

- SEMICONDUCTOR PROCESSING
- HIGH-PURITY GAS DELIVERY
- PURGE PANEL SYSTEMS
- HIGH-PURITY LIQUID DELIVERY

FEATURES	BENEFITS
• Isolated sensor	• Reduces calibration drift
• Precise temperature compensation	• Reliable performance over wide temperature range
• NEMA 4 option	• Designed for outdoor use
• Gauge, compound and absolute versions	• Meets a variety of measurement needs
• Supplied as class I product	• Minimizes particle contamination
• 316L VIM VAR stainless steel	• Corrosion resistant and improved weld-ability
• Multiple configurations	• Flexibility in installation
• Small footprint	• Space savings
• Multiple signal outputs	• Compatible with a wide variety of systems
• Low moisture	• Fast dry down

HOW TO ORDER

F14VFV025CP

Product Family
F1: Flow-through high purity pressure transducer

Output Signal
4 : 4-20 mA
5 : 0-5 VDC

Connections Size and Style
T4 : 1/4" OD 0.035" wall, 1/4" long tube stub
T6 : 3/8" OD 0.035" wall, 1/4" long tube stub
T8 : 1/2" OD 0.049" wall, 1/4" long tube stub
VF : 1/4" female face seal
VM : 1/4" male face seal
VP : 1/4" male fixed by female face seal
VS : 1/4" male face seal, swivel
WF : 1/2" female face seal
WM: 1/2" male face seal
WP : 1/2" male fixed by female face seal
WS : 1/2" male face seal, swivel

Pressure Range
V025 : -14.7- 0 - 25 psig
V050 : -14.7- 0 - 50 psig
V100 : -14.7- 0 - 100 psig
V200 : -14.7- 0 - 200 psig
V250 : -14.7- 0 - 250 psig
V500 : -14.7- 0 - 500 psig
0025 : 0-25 psi
0050 : 0-50 psi
0100 : 0-100 psi
0200 : 0-200 psi
0250 : 0-250 psi
0500 : 0-500 psi
1000 : 0-1000 psi
2000 : 0-2000 psi
3000 : 0-3000 psi

Electrical Connection
B : Bendix, male
P : 6' pigtail

Pressure Range Scale
A : absolute
C : compound
G: gauge

All Series F1 Transducers are CE CERTIFIED for heavy industrial use.

ISO 9001 APPROVED!

DATA INSTRUMENTS
Critical Fluids Group

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com

SERIES F1 • HIGH PURITY FLOW-THROUGH PRESSURE TRANSDUCER

TECHNICAL SPECIFICATIONS

RANGES

From 25 psi to 3,000 psi in 15 selectable ranges shown on front.

PHYSICAL

Overload Pressure	2 x rated range
Burst Pressure	10 x rated range < 50 psig 5 x rated range for > 50 psig
Wetted Parts	316L VIM-VAR, <5 micro inch Ra maximum, electropolished
Fittings	1/4" or 1/2" face seal male and female
Helium Leak Rate	< 2 x 10^{-9} atm. std cc /sec

ELECTRICAL	F14	F15
Output	4 to 20 mA	0 to 5 VDC
Excitation	12 to 36 VDC	12 to 36 VDC
Full Scale Output	16 ±0.16 mA	5 ±0.1 VDC
Zero Offset	4 mA ±0.4 mA	0 ±0.1 VDC
Electrical Connection	electrical connector available or cable, 6 ' long (2 meter)	
Zero and span adjustment	±10% F.S.O.	

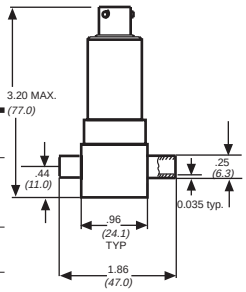
PERFORMANCE

Accuracy	±0.5% F.S.O. ±0.25% F.S.O. for devices ≥ 100 psig
Operating and Storage Temperature Range	- 40˚ to 85˚C (- 40˚ to 185˚F)
Compensated Temperature Range	0˚ to 70˚C (32˚ to 158°F)
Thermal Effect on Zero	< ±0.01% F.S.O. /°F
Thermal Effect on Full Scale Output	< ±0.01% F.S.O. /°F
Life	>100 Million Cycles
Mean Time Between Failure	350,000 hours

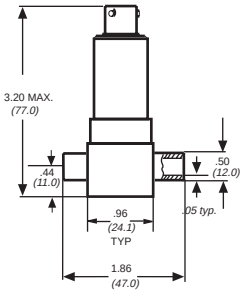
DIMENSIONS

XX.XX = inches
(xx.x) = mm

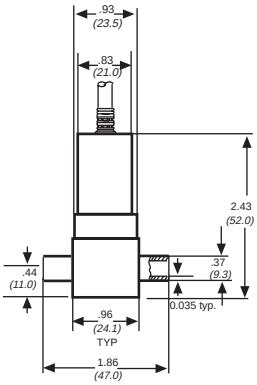
Tube stub ends



1/4 tube stub

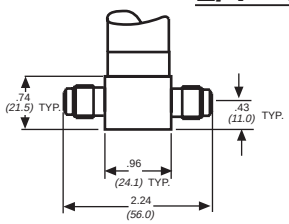


1/2 tube stub

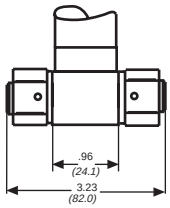


3/8 tube stub

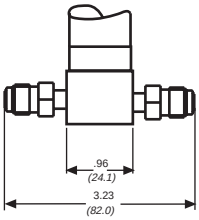
1/4" fittings



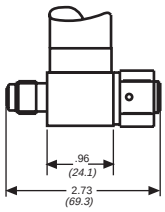
1/4 male face seal



1/4 female face seal

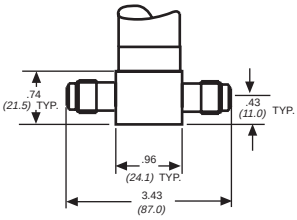


1/4 male face seal swivel

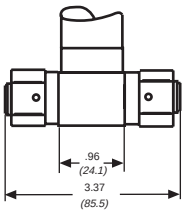


1/4 male by female face seal

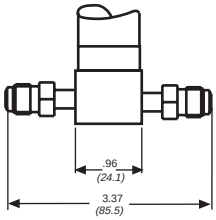
1/2" fittings



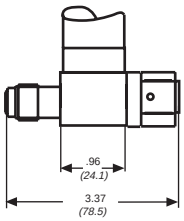
1/2 male face seal



1/2 female face seal



1/2 male face seal swivel



1/2 male by female face seal

WARRANTY

All DI-CFG products are warranted against defective materials and workmanship for a period of two years from the date of delivery to the original purchaser. Any product that is found within the two year period not to meet these standards will be replaced or repaired at the discretion of DI-CFG. No other warranty is expressed or implied. DI-CFG accepts no responsibility for misuse, misapplication or unauthorized modification of its products. DI-CFG accepts no liability for damages, including, any anticipated or lost profits, incidental damages, consequential damages, costs, time charges or other losses incurred in connection with the purchase, installation, repair or operation of our products, or any part thereof.

DI-CFG products are protected by one or more of the following patents: U.S. 4,203,074; 4,327,350; 4,368,575; 4,912,409; 4,667,158; 4,864,232; 4,866,378; 5,068,607; 5,115,193; 5,174,014; 5,317,923; European 0338966; U.K. 2054954; Japan 1498268; France 8014767. Additional U.S. and Foreign patents pending.

ISO 9001 APPROVED!

DATA INSTRUMENTS
Critical Fluids Group

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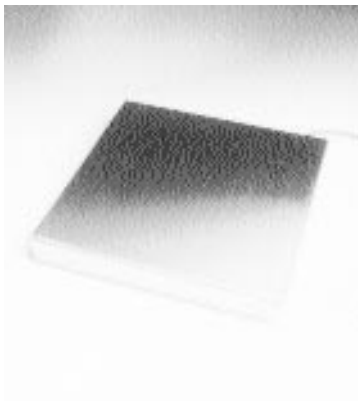
Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com

SERIES
LPS1

Low Profile Scale

The Series LPS1 low profile scale is designed for high purity applications in gas cabinets and other locations within a wafer fab facility. The LPS1 design provides a stainless steel platform with a height of 1.5 inches and reduced sensitivity to load placement, making gas cylinder changes quick, easy and with minimal lifting.



All LPS1 scales are fully calibrated and temperature compensated, and are manufactured with EMI/RFI protection. The scales feature output signals of 4-20 mA or 0-5 VDC with standard load capacities of 0-60 and 0-300 pounds.

APPLICATIONS

- Semiconductor Processing
- High Purity Gas Delivery
- Purge Panel Systems
- High Purity Liquid Delivery

Features

- Low profile 1.5 inch platform height
- Reduced sensitivity to load position
- Stainless steel platform
- EMI/RFI protection
- Temperature compensated

Benefits

- Reduces cylinder lift height for easy installation
- Simplifies installation
- High strength/high corrosion resistance
- Reduces error due to external "noise"
- Holds accuracy over wide temperature range

How To Order

LPS1 4 300 9X9 P

Product Family
LPS1: low profile scale

Output Signal
4: 4-20 mA
5: 0-5 VDC

Load Range
60: 0-60 lb.
300: 0-300 lb.
(other ranges available: consult factory)

Platform Size
9x9: 60 lb.
9x9: 300 lb.

Electrical Connection
P: 12' pigtail
E: 15' pigtail and shielded cable

DATA INSTRUMENTS
Critical Fluids Group

Low Profile Scale

Technical Specifications

RANGES		
Load Capacity	0 to 60 lb.	0 to 300 lb.

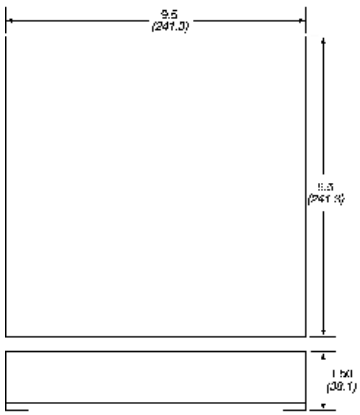
PHYSICAL	
Overload Rating	150% of rated range
Platform Size	9.5 x 9.5 inch
Platform Material	Stainless Steel
Scale Height	1.5 inch

ELECTRICAL	LPS14	LPS15
Output Signal	4-20 mA	0-5 VDC
Excitation	12-30 VDC	12-30 VDC
Full Scale Output	16 mA	5 VDC
Zero Offset	4 mA	0 VDC
Zero Shift	±0.1 mA	±0.01 VDC
Electrical Connection	cable, 12 ft or 15 ft	cable, 12 ft or 15 ft
Zero and Span Adjustment	± 5% F.S.O.	± 5% F.S.O.
EMI/RFI Protection	Shield cable & base plate must be connected to ground	

PERFORMANCE	
Accuracy	±0.25% F.S.O.
Repeatability	±0.1% F.S.O.
Long Term Drift	±1% F.S.O.
Operation & Storage Temp. Range	-10° to 65°C (14° to 140°F)
Compensated Temperature Range	0° to 45°C (32° to 133°F)
Thermal Effect on Zero	<±0.02% F.S.O./°C
Thermal Effect on Full Scale Output	<±0.02% F.S.O./°C
Humidity	0 to 95% RH noncondensing

DIMENSIONS

xx.xx = inches, (xx.x) = mm



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DATA INSTRUMENTS
Critical Fluids Group
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Acton, Massachusetts 01720-3648
USA

HIGH PURITY PRESSURE TRANSDUCER

SERIES S1

All S1 pressure transducers are manufactured in our Class 10 clean room environment. Our single port pressure transducers are specifically designed for the semiconductor industry. Their long life, coupled with long-term stability, can greatly reduce or eliminate the need for zero and span adjustments.

All DI-CFG transducers are CE certified with EMI/RFI protection and are manufactured to an electropolished wetted surface finish of 5 micro inch Ra maximum. They are available in pressure ranges from 25-3,000 psi with special fittings furnished upon request.

APPLICATIONS

- SEMICONDUCTOR PROCESSING
- HIGH-PURITY GAS DELIVERY
- PURGE PANEL SYSTEMS
- HIGH-PURITY LIQUID DELIVERY

FEATURES	BENEFITS
• Isolated sensor	• Reduces calibration drift
• Precise temperature compensation	• Reliable performance over wide temperature range
• NEMA 4 option	• Designed for outdoor use
• Gauge, compound and absolute versions	• Meets a variety of measurement needs
• Supplied as class I product	• Minimizes particle contamination
• 316L VIM VAR stainless steel	• Corrosion resistant and improved weld-ability
• Multiple configurations	• Flexibility in installation
• Small footprint	• Space savings
• Multiple signal outputs	• Compatible with a wide variety of systems
• Low moisture	• Fast dry down

HOW TO ORDER

S14VFV025CP

Product Family
S1: Single port high purity pressure transducer

Output Signal
4 : 4-20 mA
5 : 0-5 VDC

Connections Size and Style
T4 : 1/4" OD 0.035" wall, 1/4" long tube stub
VF : 1/4" female face seal
VM: 1/4" male face seal
VS : 1/4" male face seal, swivel

Pressure Range
V025 : -14.7- 0 - 25 psig
V050 : -14.7- 0 - 50 psig
V100 : -14.7- 0 - 100 psig
V200 : -14.7- 0 - 200 psig
V250 : -14.7- 0 - 250 psig
V500 : -14.7- 0 - 500 psig
0025 : 0-25 psi
0050 : 0-50 psi
0100 : 0-100 psi
0200 : 0-200 psi
0250 : 0-250 psi
0500 : 0-500 psi
1000 : 0-1000 psi
2000 : 0-2000 psi
3000 : 0-3000 psi

Pressure Range Scale
A : absolute
C : compound
G: gauge

Electrical Connection
B : Bendix, male
P : 6' pigtail

All Series S1 Transducers are CE CERTIFIED for heavy industrial use.

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DATA INSTRUMENTS
Critical Fluids Group

SERIES S1 • HIGH PURITY PRESSURE TRANSDUCER

TECHNICAL SPECIFICATIONS

RANGES

From 25 psi to 3,000 psi in 15 selectable ranges shown on front.

PHYSICAL

Overload Pressure	2 x rated range
Burst Pressure	10 x rated range < 50 psig 5 x rated range for > 50 psig
Wetted Parts	316L VIM-VAR, <5 micro inch Ra maximum, electropolished
Fittings	1/4" face seal male & female
Helium Leak Rate	< 2 x 10^{-9} atm. std cc /sec

ELECTRICAL	S14	S15
Output	4 to 20 mA	0 to 5 VDC
Excitation	12 to 36 VDC	12 to 36 VDC
Full Scale Output	16 ±0.16 mA	5 ±0.1 VDC
Zero Offset	4 mA ±0.4 mA	0 ±0.1 VDC
Electrical Connection	electrical connector available or cable, 6 ' long (2 meter)	
Zero and span adjustment	±10% F.S.O.	

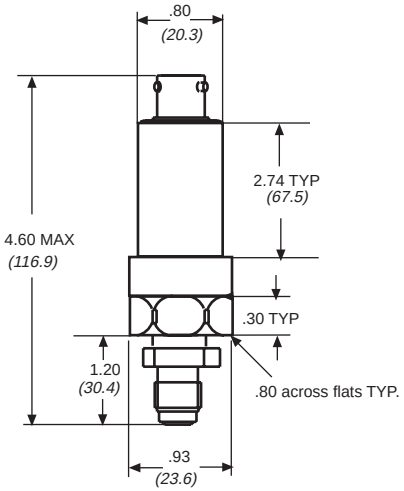
PERFORMANCE

Accuracy	±0.5% F.S.O. ±0.25% F.S.O. for devices ≥ 100 psig
Operating and Storage Temperature Range	- 40˚ to 85˚C (-40˚ to 185˚F)
Compensated Temperature Range	0˚ to 70˚C (32˚ to 158°F)
Thermal Effect on Zero	< ±0.01% F.S.O. /°F
Thermal Effect on Full Scale Output	< ±0.01% F.S.O. /°F
Life	>100 Million Cycles
Mean Time Between Failure	350,000 hours

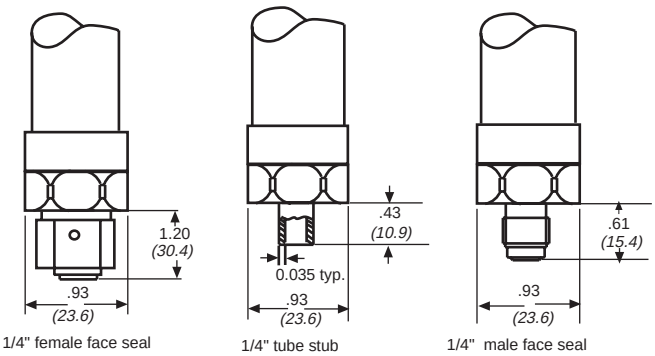
DIMENSIONS

xx.xx = inches
(xx.x) = mm

Connection Styles



Fitting Options



WARRANTY

All DI-CFG products are warranted against defective materials and workmanship for a period of two years from the date of delivery to the original purchaser. Any product that is found within the two year period not to meet these standards will be replaced or repaired at the discretion of DI-CFG. No other warranty is expressed or implied. DI-CFG accepts no responsibility for misuse, misapplication or unauthorized modification of its products. DI-CFG accepts no liability for damages, including, any anticipated or lost profits, incidental damages, consequential damages, costs, time charges or other losses incurred in connection with the purchase, installation, repair or operation of our products, or any part thereof.

DI-CFG products are protected by one or more of the following patents: U.S. 4,203,074; 4,327,350; 4,368,575; 4,912,409; 4,667,158; 4,864,232; 4,866,378; 5,068,607; 5,115,193; 5,174,014; 5,317,923; European 0338966; U.K. 2054954; Japan 1498268; France 8014767. Additional U.S. and Foreign patents pending.

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DATA INSTRUMENTS
Critical Fluids Group

100 Discovery Way
Acton, MA 01720-3648 USA
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Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com

SERIES PG1

HIGH PURITY PRESSURE GAUGES

PG1 high purity pressure gauges are specifically designed for the semiconductor industry. They feature 316L VAR stainless steel wetted parts and a 300 series stainless steel case. PG1 pressure gauges are available in ranges from 30" Hg vacuum to 6,000 psig.

PG1 gauges are available in a variety of connection sizes and styles to meet most installation needs. Special fittings and pressure ranges are available upon request.

Flange mount and panel mount versions are available in a center back mount configuration for all standard pressure ranges.

APPLICATIONS

- SEMICONDUCTOR PROCESSING
- HIGH-PURITY GAS DELIVERY
- PURGE PANEL SYSTEMS
- HIGH-PURITY LIQUID DELIVERY

FEATURES	BENEFITS
• 316L VAR stainless steel wetted parts	• Corrosion resistant
• 2.0 inch dial	• Fits in tight gas manifold systems
• Gauge and compound versions	• Meets a variety of measurement needs
• Modular manufacturing	• Fast response to urgent deliveries
• Clearly marked pressure divisions	• Easy to read
• All stainless steel mechanical movements and connecting links	• Long life and durability
• Dual scale ranges available	• Meets international needs

HOW TO ORDER

PG1L VF V030 B

Product Family
PG1 : 2" dial high purity pressure gauge

Connection Location and Case Style
C : center back mount
F : center back mount, with front face flange
L : lower stem mount
P : center back mount, with panel mount ring and C-clamp

Connections Size and Style
M : 1/4 " male NPT
VF : 1/4 " female face seal
VM : 1/4 " male face seal
VS : 1/4 " male face seal, swivel

Pressure Range
V000 : 0-30" Hg vacuum
V015 : 30" Hg vac.- 0 - 15 psig
V030 : 30" Hg vac.- 0 - 30 psig*
V060 : 30" Hg vac.- 0 - 60 psig*
V100 : 30" Hg vac.- 0 - 100 psig*
V160 : 30" Hg vac.- 0 - 160 psig*
V200 : 30" Hg vac.- 0 - 200 psig
V300 : 30" Hg vac.- 0 - 300 psig
V600 : 30" Hg vac.- 0 - 600 psig
0015 : 0 - 15 psig
0030 : 0 - 30 psig*
0060 : 0 - 60 psig*
0100 : 0 - 100 psig*
0160 : 0 - 160 psig*
0200 : 0 - 200 psig
0300 : 0 - 300 psig
0400 : 0 - 400 psig
0600 : 0 - 600 psig
1000 : 0 - 1000 psig
1500 : 0 - 1500 psig
2000 : 0 - 2000 psig
3000 : 0 - 3000 psig
4000 : 0 - 4000 psig
5000 : 0 - 5000 psig

Optional Dual Scale
C=kg/cm²
B=bar
K=kPa

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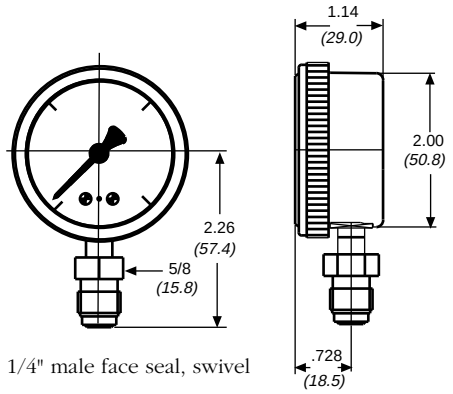
DATA INSTRUMENTS
Critical Fluids Group

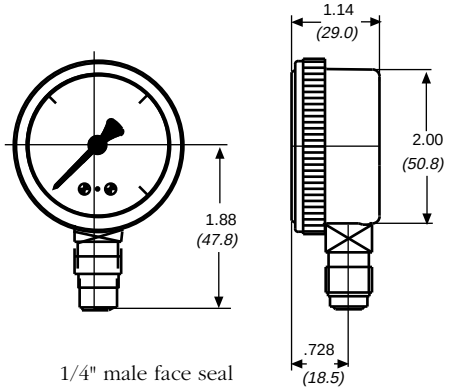
*Refer to dial range table on back for standard dual gauge information.

LOWER MOUNT GAUGES, SERIES PG1L

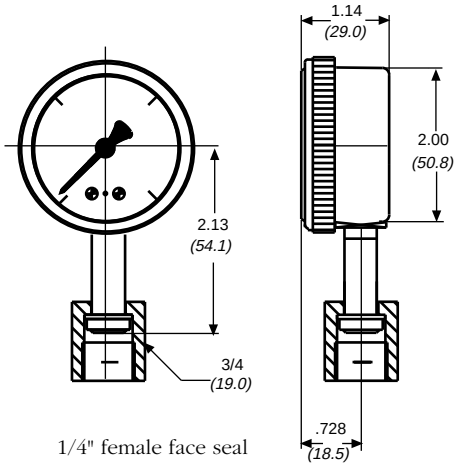
DIMENSIONS
xx.xx = inches
(xx.x) = mm



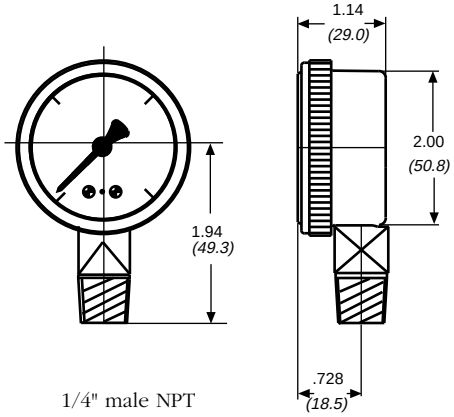
1/4" male face seal, swivel



1/4" male face seal



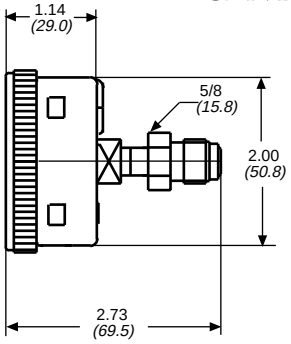
1/4" female face seal



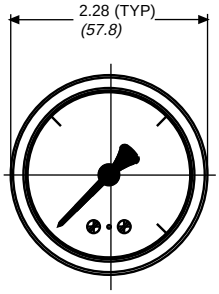
1/4" male NPT

CENTER BACK MOUNT GAUGES, SERIES PG1C

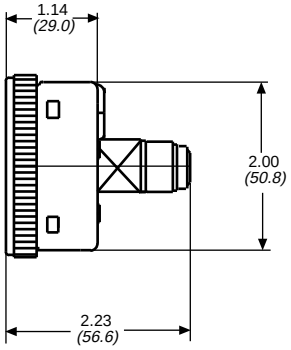
DIMENSIONS
xx.xx = inches
(xx.x) = mm



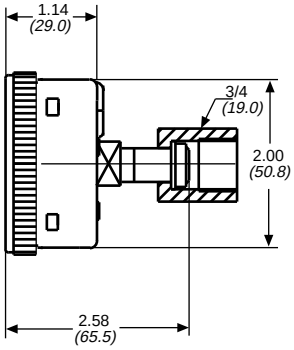
1/4" male face seal, swivel



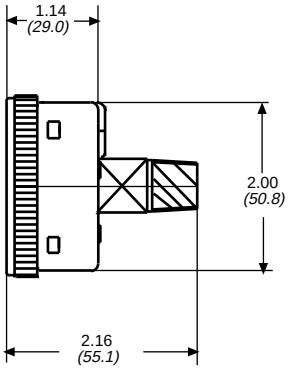
Typical face for all lower and center back mount gauges.



1/4" male face seal



1/4" female face seal



1/4" male NPT

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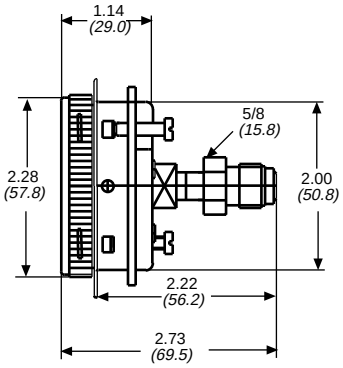
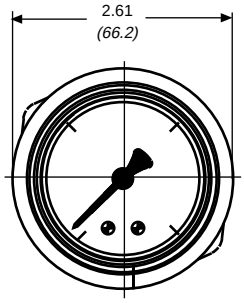
PANEL MOUNT GAUGES WITH C-CLAMP, SERIES PG1P

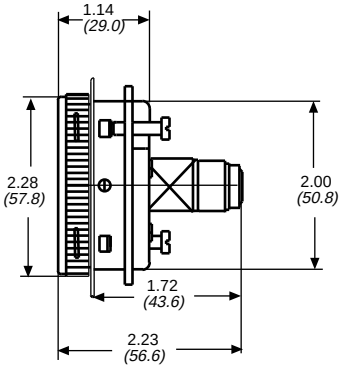
DIMENSIONS
xx.xx = inches
(xx.x) = mm



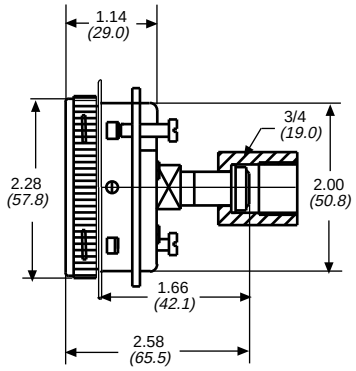
1/4" male face seal, swivel



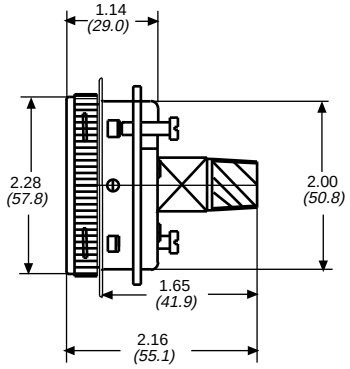
Typical face for all panel gauges.



1/4" male face seal



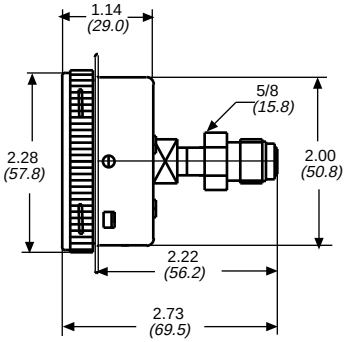
1/4" female face seal



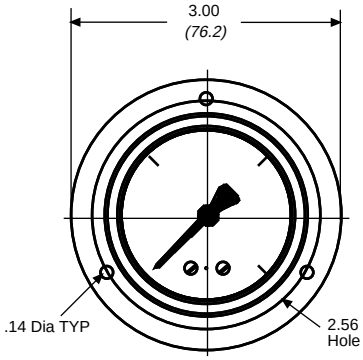
1/4" male NPT

FLANGE MOUNT GAUGES, SERIES PG1F

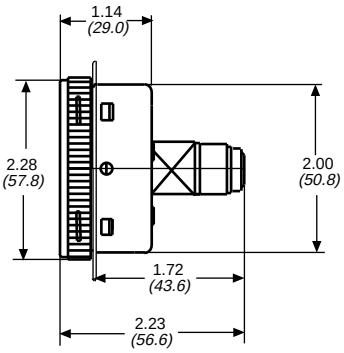
DIMENSIONS
xx.xx = inches
(xx.x) = mm



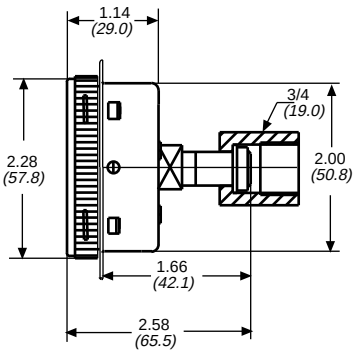
1/4" male face seal, swivel



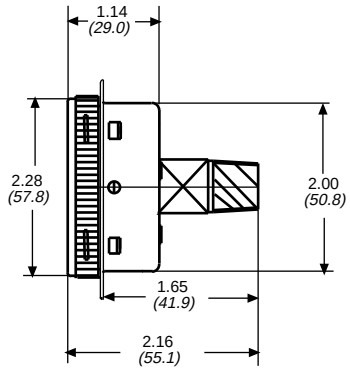
Typical face for all flange gauges.



1/4" male face seal



1/4" female face seal



1/4" male NPT

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TECHNICAL SPECIFICATIONS

RANGES

From 30 " Hg vacuum to 6,000 psig in 25 selectable ranges shown on front.

PHYSICAL

Overload Pressure	1.3 x rated range
Burst Pressure	10 x rated range < 50 psig 5x rated range for > 50 psig
Wetted Parts	socket and connection: 10 Ra maximum electropolished Bourdon tube: 15 Ra maximum, chempolished
Pressure Port Connections	1/4 " male and female face seal compatible and 1/4 " MNPT
Case	2" diameter, nominal
Window	polycarbonate
Dial	white aluminum
Pointer	black aluminum

PERFORMANCE

Accuracy	lower quarter of range: 2% of full scale middle half of range: 1% of full scale upper quarter of range: 2% of full scale
Operating and Storage Temperature Range	-40˚ to 85˚C (-40˚ to 185˚F)

Dial Range and Intervals

			C	B	K
Range	Figure Intervals	Smallest Interval	Dual Scale kg/cm²	Dual Scale bar	Dual Scale kPa
30" Hg	5"	1"	-1	-1	-100
30-0-15	10" - 3 psi	2" - 1 psi	-1/+1	-1/ +1	-100/+102
30-0-30	10" - 5 psi	2" - 1 psi	-1/+2.1	-1/ +2	-100/+205*
30-0-60	30" - 10 psi	5" - 2 psi	-1/ +4.2	-1/ +4	-100/+410*
30-0-100	30" - 20 psi	5" - 2 psi	-1/ +7	-1/ +6.8*	-100/ +680
30-0-160	30" - 25 psi	10" - 5 psi	-1/ +11	-1/ +11	-100/ +1,100*
30-0-200	30" - 40 psi	10" - 5 psi	-1/ +14	-1/ +13.5	-100/ +1,380
30-0-300	30" - 50 psi	15" - 10 psi	-1/ +21	-1/ +20.5	-100/ +2050
30-0-600	30" - 100 psi	30" - 20 psi	-1/ +43	-1/ +41	-100/ +4,100
0-15	3	.5	0-1.04	0-1.02	0-100
0-30	5	1	0-2.1*	0-2.05	0-200
0-60	10	2	0-4.2*	0-4.1*	0-410*
0-100	20	2	0-7*	0-6.8	0-690*
0-160	40	5	0-11.2	0-11*	0-1,100
0-200	40	5	0-14	0-13.5	0-1,350
0-300	50	10	0-21	0-20.5	0-2,050
0-400	100	10	0-28	0-27	0-2,700
0-600	100	20	0-43	0-41	0-4,100
0-1000	200	20	0-70	0-68	0-6,800
0-1500	250	50	0-104	0-102	0-10,200
0-2000	400	50	0-140	0-135	0-13,500
0-3000	500	100	0-210	0-205	0-20,500
0-4000	1000	100	0-280	0-280	0-28,000
0-5000	1000	100	0-350	0-340	0-34,000
0-6000	1000	200	0-400	0-400	0-40,000

*Available as standard

WARRANTY

All DI-CFG products are warranted against defective materials and workmanship for a period of two years from the date of delivery to the original purchaser. Any product that is found within the two year period not to meet these standards will be replaced or repaired at the discretion of DI-CFG. No other warranty is expressed or implied. DI-CFG accepts no responsibility for misuse, misapplication or unauthorized modification of its products. DI-CFG accepts no liability for damages, including, any anticipated or lost profits, incidental damages, consequential damages, costs, time charges or other losses incurred in connection with the purchase, installation, repair or operation of our products, or any part thereof.

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DATA INSTRUMENTS
Critical Fluids Group

100 Discovery Way
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SERIES
PGS1

High Purity Pressure Gauge Switch

The PGS1 high purity pressure gauge switch is specifically designed for the semiconductor industry. It features 316L VAR stainless steel wetted parts and a low profile stainless steel case. At less than half the depth of many competitive switches, the PGS1 is the right choice when installation space is limited.

The PGS1 pressure gauge switch is available in ranges from 30" Hg vacuum to 3,000 psig, with a variety of process connections to meet most installation needs.

APPLICATIONS

- Semiconductor Processing
- High Purity Gas Delivery
- Purge Panel Systems
- High Purity Liquid Delivery

Features

- 316L VAR stainless steel wetted parts
- 2.0 inch dial
- Setpoint adjust on dial
- Gauge face LED
- Quick disconnect

Benefits

- Corrosion resistant
- Fits in space limited gas manifolds
- Easy set point adjustments
- High visibility on reaching set points
- Easy to install and connect

How To Order

PGS1 A VF V030 E B

Product Family
PGS1: 2" dial high purity pressure gauge switch

Output Signal
A: ascending (normally open)
B: descending (normally open)
C: ascending (normally closed)
D: descending (normally closed)

Connections Size and Style
M: 1/4" male NPT
VF: 1/4" female face seal
VM: 1/4" male face seal, fixed
VS: 1/4" male face seal, swivel
(other connections available: consult factory)

Pressure Range
V030: 30" Hg vac.-0-30 psig
V060: 30" Hg vac.-0-60 psig
V100: 30" Hg vac.-0-100 psig
V160: 30" Hg vac.-0-160 psig
V200: 30" Hg vac.-0-200 psig
0015: 0-15 psig
0030: 0-30 psig
0060: 0-60 psig
0100: 0-100 psig
0160: 0-160 psig
0200: 0-200 psig
0400: 0-400 psig
0600: 0-600 psig
1000: 0-1000 psig
2000: 0-2000 psig
3000: 0-3000 psig

Electrical Connection
E = modular jack
P = 6' pigtail

Optional Dual Scale *(see back pg.)*
C = kg/cm²
B = bar
K = kPa

DATA INSTRUMENTS
Critical Fluids Group

SERIES PGS1

High Purity Pressure Gauge Switch

Technical Specifications

RANGES

From 30" Hg vacuum to 3,000 psig in 16 selectable ranges shown in detail in the How to Order section.

PHYSICAL

Overload Pressure	1.3x rated range
Burst Pressure	10x rated range < 50 psig, 5x rated range > 50 psig
Wetted Parts	316L VAR (socket/connections) <10 Ra electropolished
Fittings	1/4" NPT, 1/4" face seal, male/female
Helium Leak Rate	<2 x 10^{-9} std cc/sec
Case	2" diameter, nominal
Window	polycarbonate
Dial	white aluminum
Pointer	black aluminum

ELECTRICAL

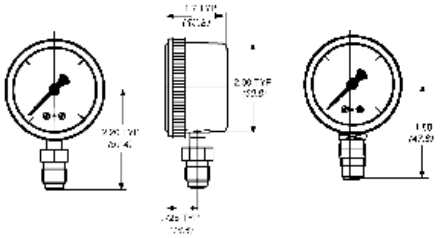
	PGS1A	PGS1B	PGS1C	PGS1D
Output	ascending-normally open	descending-normally open	ascending-normally closed	descending-normally closed
Supply	8.6 to 45 VDC	8.6 to 45 VDC	8.6 to 45 VDC	8.6 to 45 VDC
Max. Supply Current LED on LED off	16 mA 4 mA	16 mA 4 mA	16 mA 4 mA	16 mA 4 mA
Max. Switching Current	2.0 Amp	2.0 Amp	2.0 Amp	2.0 Amp
Max. Switching Voltage	50 VDC	50 VDC	50 VDC	50 VDC
Electrical Connection	4-pin modular jack (mates w/FCC 68 clip plug) – 6' cable w/mating connector included, or standard 6' pigtail cable			

PERFORMANCE

Accuracy	lower and upper quarter of range: 2% of full scale middle half of range: 1% of full scale
Operation & Storage Temp. Range	-40° to 85°C (-40° to 185°F)

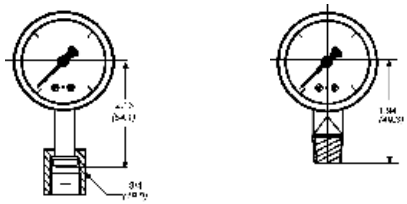
DIMENSIONS

xx.xx = inches, (xx.x) = mm



1/4" male face seal, swivel

1/4" male face seal, fixed



1/4" female face seal

1/4" male NPT

DIAL RANGE AND INTERVALS

Range	Figure Intervals	Smallest Interval	Dual Scale kg/cm²	Dual Scale bar	Dual Scale kPa
30-0-30	10" - 5 psi	2"-1 psi	-1/+2.1	-1/2 +2	-100/+205*
30-0-60	30" - 5 psi	5" -2 psi	-1/+4.2	-1/ +4	-100/+410*
30-0-100	30" - 20 psi	5" - 2 psi	-1/ +7	-1/ +6.8*	-100/+680
30-0-160	30" - 25 psi	10" - 5 psi	-1/ +11	-1/ +11	-100/ +1100*
30-0-200	30" - 40 psi	10" - 5 psi	-1/ +14	-1/ +13.5	-100/ +1380
0-15	3	.5	0-1.04	0-1.02	0-100
0-30	5	1	0-2.1*	0-2.05	0-200
0-60	10	2	0-4.2*	0-4.1*	0-410*
0-100	20	2	0-7*	0.6.8	0-690*
0-160	40	5	0-11.2	0-11*	0-1100
0-200	40	5	0-14	0-13.5	0-1350
0-400	100	190	0-28	0-27	0-2700
0-600	100	20	0-43	0-41	0-4100
0-1000	200	20	0-70	0-68	0-6800
0-2000	400	50	0-140	0-135	0-13500
0-3000	500	100	0-210	0-205	0-20500

*Available as standard

DATA INSTRUMENTS
Critical Fluids Group

100 Discovery Way
Acton, Massachusetts 01720-3648
USA

SERIES
PGT1

High Purity Pressure Gauge Transmitter

The PGT1 high purity pressure gauge transmitter is designed for the semiconductor industry. It features 316L VAR stainless steel wetted parts and a low profile stainless steel case. At less than half the depth of many competitive transmitters, the PGT1 is the right choice when installation space is limited.

The PGT1 pressure gauge transmitter is available in ranges from 30" Hg vacuum to 3,000 psig, with 4-20 mA or 0-5 VDC outputs, and a variety of connections to meet most installation needs.

APPLICATIONS

- Semiconductor Processing
- High Purity Gas Delivery
- Purge Panel Systems
- High Purity Liquid Delivery

Features

- 316L VAR stainless steel wetted parts
- 2.0 inch dial
- Zero and span adjustment on gauge face
- Quick disconnect
- Low profile case

Benefits

- Corrosion resistant
- Fits in space limited gas manifolds
- Accessible, can be adjusted in place
- Easy to install or remove
- Saves space

How To Order

PGT1 4 VF V030 E B

Product Family
PGT1: 2" dial high purity pressure gauge transmitter

Output Signal
4: 4-20 mA
5: 0-5 VDC

Connections Size and Style
M: 1/4" male NPT
VF: 1/4" female face seal
VM: 1/4" male face seal, fixed
VS: 1/4" male face seal, swivel
(other connections available: consult factory)

Pressure Range
V030: 30" Hg vac.-0-30 psig
V060: 30" Hg vac.-0-60 psig
V100: 30" Hg vac.-0-100 psig
V160: 30" Hg vac.-0-160 psig
V200: 30" Hg vac.-0-200 psig
0015: 0-15 psig
0030: 0-30 psig
0060: 0-60 psig
0100: 0-100 psig
0160: 0-160 psig
0200: 0-200 psig
0400: 0-400 psig
0600: 0-600 psig
1000: 0-1000 psig
2000: 0-2000 psig
3000: 0-3000 psig

Electrical Connection
E = modular jack
P = 6' pigtail

Optional Dual Scale *(see back pg.)*
C = kg/cm²
B = bar
K = kPa

DATA INSTRUMENTS
Critical Fluids Group

SERIES PGT1 High Purity Pressure Gauge Transmitter

Technical Specifications

RANGES

From 30" Hg vacuum to 3,000 psig in 16 selectable ranges shown in detail in the How to Order section.

PHYSICAL

Overload Pressure	1.3x rated range
Burst Pressure	10x rated range < 50 psig, 5x rated range > 50 psig
Wetted Parts	316L VAR (socket/connections) <10 Ra electropolished
Fittings	1/4" NPT, 1/4" face seal, male/female
Helium Leak Rate	<2 x 10^{-9} std cc/sec
Case	2" diameter, nominal
Window	polycarbonate
Dial	white aluminum
Pointer	black aluminum

ELECTRICAL

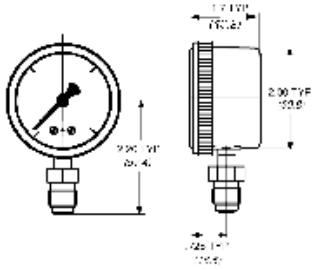
	PGT14	PGT15
Output	4-20 mA	0-5 VDC
Excitation	12 - 36 VDC	12 - 36 VDC
Full Scale Output	16 ± 0.16 mA	5 ± 0.1 VDC
Zero Offset	4 mA ± 0.4 mA	0 ± 0.1 VDC
Zero and Span Adjustment	± 10% F.S.O.	± 10% F.S.O.
Electrical Connection	4-pin modular jack (mates w/FCC 68 clip plug) – 6' cable w/mating connector included, or standard 6' pigtail cable	

PERFORMANCE

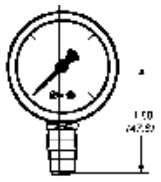
Accuracy	lower and upper quarter of range: 2% of full scale middle half of range: 1% of full scale
Operation & Storage Temp. Range	-40° to 85°C (-40° to 185°F)

DIMENSIONS

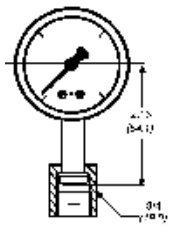
xx.xx = inches, (xx.x) = mm



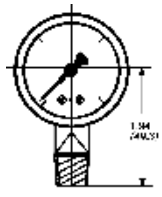
1/4" male face seal, swivel



1/4" male face seal, fixed



1/4" female face seal



1/4" male NPT

DIAL RANGE AND INTERVALS

Range	Figure Intervals	Smallest Interval	Dual Scale kg/cm²	Dual Scale bar	Dual Scale kPa
30-0-30	10" - 5 psi	2"-1 psi	-1/+2.1	-1/2 +2	-100/+205*
30-0-60	30" - 5 psi	5" -2 psi	-1/+4.2	-1/ +4	-100/+410*
30-0-100	30" - 20 psi	5" - 2 psi	-1/ +7	-1/ +6.8*	-100/+680
30-0-160	30" - 25 psi	10" - 5 psi	-1/ +11	-1/ +11	-100/ +1100*
30-0-200	30" - 40 psi	10" - 5 psi	-1/ +14	-1/ +13.5	-100/ +1380
0-15	3	.5	0-1.04	0-1.02	0-100
0-30	5	1	0-2.1*	0-2.05	0-200
0-60	10	2	0-4.2*	0-4.1*	0-410*
0-100	20	2	0-7*	0.6.8	0-690*
0-160	40	5	0-11.2	0-11*	0-1100
0-200	40	5	0-14	0-13.5	0-1350
0-400	100	190	0-28	0-27	0-2700
0-600	100	20	0-43	0-41	0-4100
0-1000	200	20	0-70	0-68	0-6800
0-2000	400	50	0-140	0-135	0-13500
0-3000	500	100	0-210	0-205	0-20500

*Available as standard

DATA INSTRUMENTS
Critical Fluids Group
100 Discovery Way
Acton, Massachusetts 01720-3648
USA

SERIES
PG2

Miniature High Purity Pressure Gauge

The PG2 sets a new industry standard for high purity gauges in a compact package. It features 316L VAR stainless steel wetted parts and a 300 series stainless steel case. The gauge socket and connection fittings are internally electropolished to a 10 Ra maximum surface finish. Its compact 1 ½ inch diameter allows it to fit directly into manifold arrangements without the need to offset the display from the centerline. The tee configuration face seal dimension is built to industry standards for easy interchangeability with an in-line transducer. The PG2 pressure gauge is available in a variety of connection styles with ranges from 30" Hg vacuum to 200 psig.

APPLICATIONS

- Semiconductor Processing
- High Purity Gas Delivery
- Purge Panel Systems
- High Purity Liquid Delivery

Features

- 316L VAR stainless steel wetted parts
- 1 ½ inch dial
- Tee configurations
- Modular manufacturing
- Clearly marked pressure divisions
- All stainless steel mechanical movements
- Industry standard face seal dimension

Benefits

- Corrosion resistant
- Fits in space limited gas manifolds
- Eliminates additional welding
- Fast response to urgent deliveries
- Easy to read
- Long life and durability
- Fits into industry standard spacing

How To Order

PG2 C VF V030

Product Family
PG2: 1 ½" dial high purity pressure gauge

Connection Location
C: center back mount
VT:vertical tee mount
HT: horizontal tee mount

Pressure Range
V030: 30" Hg vac.-0-30 psig
V060: 30" Hg vac.-0-60 psig
V100: 30" Hg vac.-0-100 psig
V160: 30" Hg vac.-0-160 psig
V200: 30" Hg vac.-0-200 psig

Connections Size and Style
VF: ¼" female face seal
VM: ¼" male face seal, fixed
VS: ¼" male face seal, swivel
VP: ¼" fixed male by swivel female face seal

DATA INSTRUMENTS
Critical Fluids Group

Miniature High Purity Pressure Gauge

Technical Specifications

RANGES

From 30" Hg vacuum to 200 psig in 5 selectable ranges shown in the How to Order section.

PHYSICAL

Overload Pressure	1.3x rated range
Burst Pressure	10x rated range < 50 psig, 5x rated range for > 50 psig
Wetted Parts	316L VAR (socket/connections) <10 Ra maximum electropolished
Pressure Port Connections	1/4" male and female face seal compatible
Case	1 1/2" diameter, nominal
Window	polycarbonate
Dial	white aluminum
Pointer	black aluminum

PERFORMANCE

Accuracy	lower and upper quarter of range:	3% of full scale
	middle half of range:	2% of full scale
Operating & Storage Temp. Range	-40°to 85°C (-40° to 185°F)	

DIMENSIONS

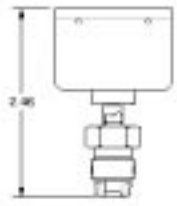
(in inches)

TEE MOUNT

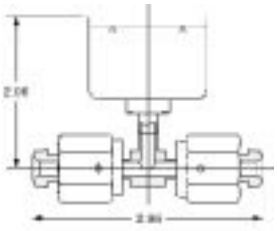
Vertical Tee (VT)

Horizontal Tee (HT)

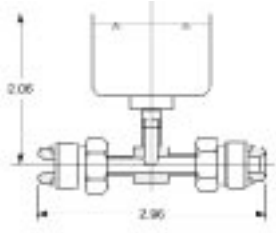
BACK MOUNT



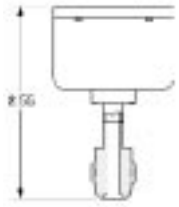
VS



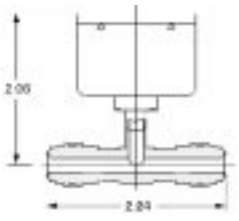
(HT or VT) VF



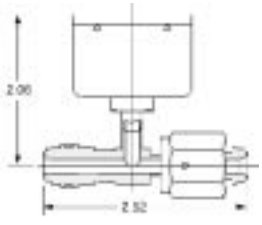
(HT or VT) VS



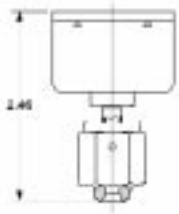
VM



(HT or VT) VM



(HT or VT) VP *



VF

*For VP version, male connection is located at 12 o'clock on VT and 9 o'clock on HT.

DATA INSTRUMENTS
Critical Fluids Group

100 Discovery Way
Acton, Massachusetts 01720-3648
USA

SERIES LD1

LOCAL DISPLAY

The LD1 local display is compact, easy to install and comes calibrated in engineering units.

It has a unique large, bright red LED display on a black background for easy viewing when mounted inside low light gas cabinets or wafer manufacturing tools.

Designed specifically for integral mounting to the Series F1 and S1 transducers, it can be ordered for either vertical or horizontal orientation.

Its 1.5 inch width allows it to fit in tight gas manifold systems.

The LD1 can be mounted to its matching pressure transducer without the need to rotate its case. If necessary, the case may be rotated for proper display alignment.

APPLICATIONS

- SEMICONDUCTOR PROCESSING
- HIGH-PURITY GAS DELIVERY
- PURGE PANEL SYSTEMS
- HIGH-PURITY LIQUID DELIVERY

FEATURES

- Loop power (4-20mA only)
- Compact 1.5 inch x 1.5 inch face
- Push-on connector
- Gauge, compound and absolute versions

BENEFITS

- No additional power necessary
- Fits in tight gas manifold systems
- Easy installation, no turning necessary
- Meets a variety of sensing needs

HOW TO ORDER

LD14CTV025BP

Product Family
LD1 : Local Digital Display

Input/Output Signal
4 : 4-20 mA
5 : 0-5 VDC

Location of Transducer connection and lock nut
BB: transducer at bottom, lock nut at back
CR : transducer at center back, lock nut at right
CT : transducer at center back, lock nut at top

Pressure Range
V025 : -14.7 -0 -25 psig
V050 : -14.7 -0 -50 psig
V100 : -14.7 -0 -100 psig
V200 : -14.7 -0 -200 psig
V250 : -14.7 -0 -250 psig
V500 : -14.7.-0 -500 psig
0025 : 0-25 psi
0050 : 0-50 psi
0100 : 0-100 psi
0200 : 0-200 psi
0250 : 0-250 psi
0500 : 0-500 psi
1000 : 0-1000 psi
2000 : 0-2000 psi
3000 : 0-3000 psi

Transducer Connection
B : Bendix, female

Power Connection
P : 6' Pigtail*

*Pigtail is on same side as input

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DATA INSTRUMENTS
Critical Fluids Group

SERIES LD1 • *LOCAL DISPLAY*

TECHNICAL SPECIFICATIONS

RANGES

From 25 psi to 3,000 psi in 15 selectable ranges shown on front.

PHYSICAL

Applicable Transducer	Series F1 & S1
Dimensions	1.5" wide x 1.5" high x 1.78" deep
Weight	30 grams
Display	3 1/2 digit LED

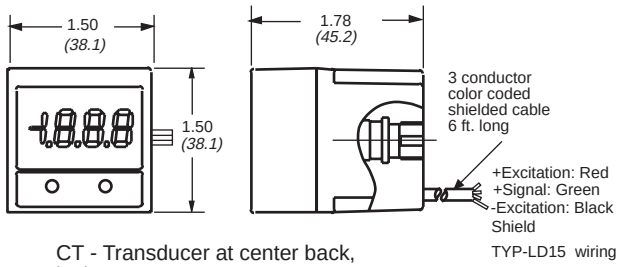
ELECTRICAL	**LD14**	**LD15**
Output	4 to 20 mA	0 to 5 VDC
Loop Voltage Drop	+5 VDC max	+5 to +40 VDC 2 to 6 mA typ, 8 mA max
Maximum Allowable Input	±40 mA	±40 V
Input/Output	4 to 20 mA	0 to +5 VDC, 100K Ω min
Sampling Rate	0.4 secs	0.4 secs

PERFORMANCE		
Accuracy	±0.05% F.S. + 1 count	±0.05% F.S. + 1 count
Thermal Effect on Output	±0.15 count/°F typ ±0.3 count/°F max	±0.15 count/°F typ ±0.3 count/°F max
Storage Temperature	-40° to 75°C (-40° to 167°F)	- 40° to 75°C (-40° to 167°F)
Operating Temperature	0° to 60°C (32° to 140°F)	0° to 60°C (32° to 140°F)
Humidity	0 to 95% noncondensing	0 to 95% noncondensing

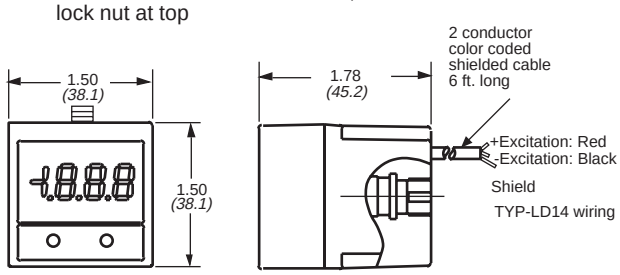
DIMENSIONS

xx.x = inches
(xx.x) = mm

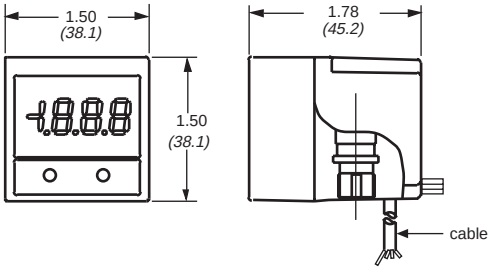
CR - Transducer at center back
lock nut at right



CT - Transducer at center back,
lock nut at top



BB - Transducer at bottom,
lock nut at back



WARRANTY
All DI-CFG products are warranted against defective materials and workmanship for a period of two years from the date of delivery to the original purchaser. Any product that is found within the two year period not to meet these standards will be replaced or repaired at the discretion of PPI. No other warranty is expressed or implied. DI-CFG accepts no responsibility for misuse, misapplication or unauthorized modification of its products. DI-CFG accepts no liability for damages, including, any anticipated or lost profits, incidental damages, consequential damages, costs, time charges or other losses incurred in connection with the purchase, installation, repair or operation of our products, or any part thereof.

DI-CFG products are protected by one or more of the following patents: U.S. 4,203,074; 4,327,350; 4,368,575; 4,912,409; 4,667,158; 4,864,232; 4,866,378; 5,068,607; 5,115,193; 5,174,014; 5,317,923; European 0338966; U.K. 2054954; Japan 1498268; France 8014767. Additional U.S. and Foreign

DATA INSTRUMENTS
Critical Fluids Group
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100 Discovery Way
Acton, MA 01720-3648 USA
Tel: (888) 328-2234; Fax: (978) 263-0630

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com

MODEL AD824

EIGHT CHANNEL MONITOR / DISPLAY

The AD824 is a microprocessor based monitor that combines an easy to read, four-line LCD with a user-friendly keypad.

Preprogrammed with over 25 semiconductor gas designations, the unit monitors up to eight channels of analog data transmitted from pressure transducers, temperature sensors, flow transmitters and other field sensors.

The compact design allows for easy panel mounting in constricted areas and accommodates input termination at a series of connector blocks on the rear of the housing.

APPLICATIONS

- SEMICONDUCTOR PROCESSING
- HIGH-PURITY GAS DELIVERY
- PURGE PANEL SYSTEMS
- HIGH-PURITY LIQUID DELIVERY

FEATURES	BENEFITS
• Four-line LCD readout	• Maximizes display of information
• Eight input channels of process data	• Optimizes monitoring of multiple processes on a single unit
• Compact size and mounting flexibility	• Allows installation in panels where space is at a premium
• Dual (NO/NC) high & low relays per channel	• Allows remote alarm or control
• Comprehensive alarm indication	• Handles a variety of needs
• Audible warning	• Alerts operator while performing other tasks
• Red LED out-of-limit indicators	• Alert information stands out for quick action
• Easy to use, intuitive programming	• Minimizes training
• Preprogrammed gas information	• Simplifies setup
• RFI/EMI certified	• Protects against external interference
• Scaled inputs	• Increases reliable readouts
• Dual password protection	• Assures setpoint security, protects against accidental or unauthorized changes
• Serial port connection	• Allows simple connection to RS-232 or RS-485 protocols

All AD824 Eight Channel Monitor/Displays are

CE

CERTIFIED

for heavy industrial use.

ISO 9001 APPROVED!

DATA INSTRUMENTS

Critical Fluids Group

MODEL AD824 • *EIGHT CHANNEL MONITOR / DISPLAY*

TECHNICAL SPECIFICATIONS

DIMENSIONS
xx.xx = inches
(xx.x) = mm

PHYSICAL

Dimensions	
Front Panel **Cutout** **Depth Overall**	4.5" high x 7.0" wide x 0.38" thick 3.8" high x 6.2" wide 5.0" deep
Weight	2 pounds
Display	Four line LCD, 20 characters per line Back-lit grey on light amber Red LED alert characters

ELECTRICAL

Input Power	24 VDC ±5%
Sensor Excitation	12 VDC or 24 VDC
Channel Input	Up to 8 channels simultaneously, 0-5.1 VDC, 25 ohms impedance 0- 20.5 mADC, 51K ohms impedance
Relay Contacts	1.0 amp at 30 VDC resistive load NO or NC, non-latching
Sampling Rate	3 times / second
Serial Outputs	RS-232 or RS-485 software selectable 9600 baud
Memory	Non-volatile, Battery RAM

PERFORMANCE

Storage Temperature Range	0°F to 120°F (-17°C to 49°C) 30 to 90% RH noncondensing
Operating Temperature Range	60°F to 90°F (15°C to 32°C) 30 to 90% RH noncondensing

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DATA INSTRUMENTS
Critical Fluids Group

100 Discovery Way
Acton, MA 01720-3648 USA
Tel: (888) 328-2234; Fax: (978) 263-0630

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com

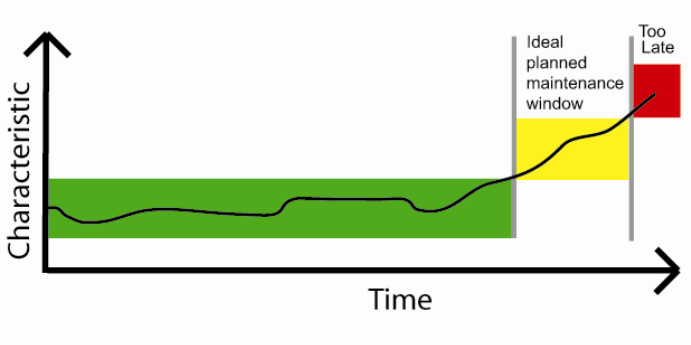
Honeywell

Equipment Health Monitoring (EHM) Systems

Detectors

DESCRIPTION

Honeywell Equipment Health Monitoring (EHM) System Detectors are designed to monitor equipment steady state physical characteristics and provide the output to generate an alarm when these characteristics deviate from pre-defined settings. The fault may then be quickly investigated and the problem corrected before it becomes so serious that a line is shut down, production is lost and costs spiral.



The EHM's output is expressed in two ways:

- The device's dual color LED changes from normal green to red.
- At the same time, the device's output changes state from open to closed. This output may be connected to an alarm or PLC input, allowing the alarm to be graphically shown and to generate a "system" alarm.

Ten versions of the EHM are available for potential applications requiring independent system monitoring of such physical characteristics as temperature loss or rise, vibration, fluid flow or leak, mechanical noise or wear, slope change, mechanical insertion or audible noise.

Installation is simple. The EHM detectors are ready to be attached directly to equipment and, after a quick calibration, will begin monitoring for faults immediately.

A demonstration kit, as well as accessory/replacement connector pins and cables are also available.

FEATURES

- Enhanced reliability designed to provide early warning fault detection for protection of valuable equipment
- Visual and electrical alarm output is simple to integrate and makes current equipment status easy to monitor
- Digital output means no time-consuming data collection and analysis required
- Internal monitoring circuitry means no outside design needed
- Easy installation and calibration provides quick set-up and immediate use

POTENTIAL APPLICATIONS

- Wide variety of stationary and mobile equipment health monitoring. See page two for specifics

Equipment Health Monitoring (EHM) Systems

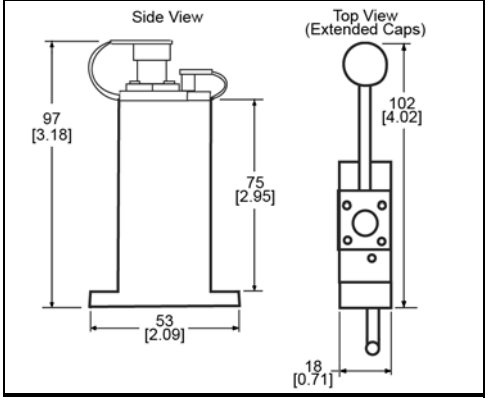
SELECTION GUIDE

Catalog Listing	Detector Cap Color	Detector Function	Description	Potential Applications
EHM-D-COOL		Temperature Loss	Monitors steady state temperature within a range of -40 °C to 85 °C [-40 °F to 185 °F] and provides an alarm if the desired temperature measurement drops below the set point.	• Heating systems • Hot water supplies • Oil coolers • Air conditioning outlets • Exhaust venting systems • Chimneys
EHM-D-FLOW		Fluid Flow	Acoustically monitors the flow of liquid in a pipe to verify that upstream components are functioning correctly. Often suitable for areas around turbid flow (valves, joints, elbows, etc.).	• Heating systems • Process pipes • Feeder pipes • Vessels • Valves
EHM-D-HEAT		Temperature Rise	Monitors steady state temperature within a range of -40 °C to 85 °C [-40 °F to 185 °F] and provides an alarm if the desired temperature measurement rises above the set point.	• Gearboxes • Temperature control failure • Electrical switchgears • Perishable goods cold storage • Equipment under test
EHM-D-HISS		Fluid Leak	Monitors for pressurized leaks in joints, vessels, seals and gaskets. Able to detect the the sonic signature of leaks from several meters away from the source.	• Process equipment • Compressed air systems • Steam leaks
EHM-D-KNOCK		Mechanical Noise	Monitors machine knocks, clicks and other spurious noises from equipment that might indicate loosening or wearing components about to fail.	• Water hammers • Cavitation in pumps • Lubrication failure • Machine resonance shift • Worn brake pads/shoes
EHM-D-RUMBLE		Bearing Wear	Monitors the high frequency and low frequency signature from bearings and rotating equipment. It is designed to detect ovoid wear before it becomes a serious issue.	• Conveyor systems • Marine • Power generation • Mining/quarrying • Rolling mills • Paper production
EHM-D-SNAP		Mechanical Insertion	Monitors for the 'ultrasonic' sound of click-t- fit assembly components which may be more reliable than relying on audible sound, especially in noisy industrial/factory environments.	• Automotive harness assembly • Snap fit assembly (plastic hose, fittings, retaining rings, connectors, etc.)
EHM-D-SONIC		Audible Noise	Monitors human acoustic noise levels. Detects increases in applications where the characteristic can be heard and other methods are not possible.	• Any audible 'listening' application
EHM-D-TILT		Slope Change	Monitors when an angle drifts from the set point and provides an alarm.	• Bridges • Temporary structures • Ships • Cranes • Fork lift trucks • Land moving equipment
EHM-D-VIBRATION		Vibration	Monitors a steady state vibration and provides an alarm if the desired vibration measurement rises above the set point.	• Cranes • Conveyors • Wind turbines • Turbines • Compressors

SPECIFICATIONS

Characteristic	Parameter
Power supply	10 Vdc to 32 Vdc at 20 mA typical
Storage temperature.	-40 °C to 90 °C [-40 °F to 194 °F]
Operating temperature	-25 °C to 70 °C [-13 °F to 158 °F]
Mounting	(2) M4 (#6 UNF) screws or cable ties for pipes
Body material	nylon 66 and ABS
Output	• green/red LED • isolated volt free contact rated at 48 V (max.) 100 mA (max.) ac or dc switching
Approvals	CE compliant to EN610101
Sealing	IP67 when installed according to instructions

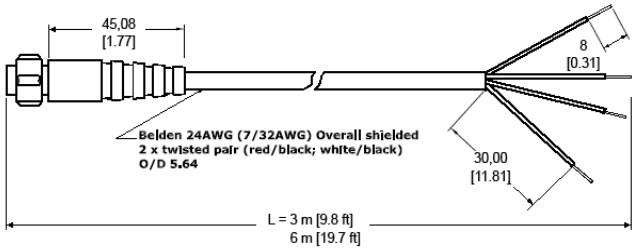
DIMENSIONS (For reference only. mm/[in])

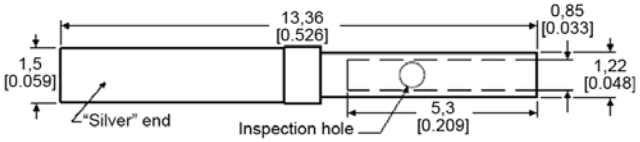


ACCESSORIES/REPLACEMENTS

Item	Description
Demonstration case	Includes EHM-D-KNOCK

Item	Description (Dimensions for reference only. mm/[in])	Item (Dimensions for reference only. mm/[in])
Cable	3 m [9.8 ft] or 6 m [19.7 ft]	Connector pins





ORDER GUIDE

Catalog Listing	Description
EHM-D-COOL	Temperature Loss Detector
EHM-D-FLOW	Fluid Flow Detector
EHM-D-HEAT	Temperature Rise Detector
EHM-D-HISS	Fluid Leak Detector
EHM-D-KNOCK	Mechanical Noise Detector
EHM-D-RUMBLE	Bearing Wear Detector
EHM-D-SNAP	Mechanical Insertion Detector
EHM-D-SONIC	Audible Noise Detector
EHM-D-TILT	Slope Change Detector
EHM-D-VIBRATION	Vibration Detector
EHM-C-003	Cable, 3 m [9.8 ft]
EHM-C-006	Cable, 6 m [19.7 ft]
EHM-D-DEMO	Demonstration kit (includes EHM-D-KNOCK)

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	+1-305-883-8257 Fax
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Honeywell

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June 2007

Honeywell

HG1171 Series

6DF Inertial Measurement Unit

DESCRIPTION

The HG1171 Series is a six degrees of freedom (6DF) inertial measurement unit (IMU) that senses rotation rate about the roll, pitch and yaw axes (X, Y and Z axes) and acceleration along the longitudinal, lateral and vertical axes (X, Y and Z axes, see Figure 1 on page 2). This product is designed for enhanced accuracy of tracking and monitoring of vehicle/platform (up/down, left/right, forward/backward) in a hard mounted configuration.

It provides key data for automated steering and vehicle controls, freeing the operator to focus on machine functions, one of the main reasons customers use IMUs.

The HG1171 contains high performance MEMS (Micro Electromechanical Systems) rotation rate sensors (gyroscopes), whose function is based on the physical properties of the Coriolis effect, as well as enhanced precision integrated accelerometers for each axis.

High speed CAN bus (2.0 A or B) provides cost-effective, high-integrity serial data communications bus for real-time control applications operating at data rates up to 1 Mbit/s. This capability allows enhanced error detection and confinement.

KWP (Keyword Protocol) is used for self-test, health reporting, software loading and related tasks. KWP 2000 (or ISO14230) is a defined protocol for monitoring health and status of a unit on a CAN bus (primary use is for off-vehicle test equipment). It supports high speed IMU flashing for re-reprogramming.)

Customization of I/O timing, CAN labels, connectors, and other parameters allows the customer to specify changes in the IMU so it more readily fits into existing architecture on vehicle.

A temperature sensor in each rotation rate sensor provides a temperature value to the processing module where the samples are filtered and compensated. This information allows the customer's system to perform over a wide temperature range.

The tough metal housing is often ideal for demanding environments. The user may mount the product on the vehicle frame outside the cabin, anywhere an IMU is needed.

FEATURES

- 3-dimensional rotation rate and acceleration outputs (roll, pitch, yaw)
- High speed CAN bus
- Broad dynamic range
- Low noise
- High resolution
- Customizable
- Enhanced temperature performance
- Tough metal housing

POTENTIAL APPLICATIONS

Vehicle stability control systems on:

- Agricultural equipment such as tractors and harvesters to:
  - Provide motion control feedback (attitude/accleration) for leveling cutting blades, planters, tillers and other equipment when on slopes or hills
  - Improve automated steering capabilities by providing rotational rate change data to vehicle controls
  - Smooth GPS data (position and velocity) for use in high accuracy planting/tilling
- Construction equipment such as excavators, trucks, forestry equipment, loaders and graders to:
  - Improve operator awareness relative to equipment loading and extension envelopes on cranes and material/ telescopic handlers
  - Provide real time stability control in rugged and steep terrain
  - Provide active depth and angle control for graders
  - Provide motion compensation in GPS-guided automated vehicles

HG1171 Series

Table 1. General Specifications

Characteristic	Minimum	Typical	Maximum	Unit
Supply voltage (normal operation)	+7	+13.5	+17	V
Over voltage (output halted)	—	—	+26	V
Reverse voltage	—	—	-18	V
Supply current	—	—	+75	mA
Start up time	—	700	—	ms
Operating temperature	-40 [-40]	20 [68]	85 [185]	°C [°F]
Storage temperature	-40 [-40]	—	95 [203]]	°C [°F]
Vibration (10 Hz to 1000 Hz)	—	—	3.1	g (RMS)
Shock	—	100	—	g (half sine for 6 ms)
Humidity(1))	—	—	95%	—
Sealing	IP62K			
ESD (Electrostatic Discharge)(2)	Meets ISO 10605: – at ≤8 kV ESD protection for handling – at ≤15 kV protection for power			
Connector	AMP: 3-967-616-1, keying C mating cable harness			

Notes:

1. After exposure, including a condensing environment.
2. All exposed ports have low-pass filtering using trade-off methods which consider ESD protection, RF filtering and bandwidth. The ESD simulator waveform verification complies with ISO 10605 except for contact discharge rise time < 1 ns and air discharge rise time ≤ 20 ns.

Table 2. Rotation Rate Sensor Specifications

Characteristic	Minimum	Maximum	Unit
Measurement range	-75	75	°/s
Overload range(<60 ms recovery)	-1000	1000	°/s
Sensitivity error	-4	4	%
Linearity	-1	1	%
Offset (total)	-2.5	2.5	°/s
Offset drift (over temperature range)	-1	1	°/s
Offset drift speed (t > 3 min)	-0.2	0.2	°/s/min
Noise	—	0.2	°/s
Cross axis sensitivity	—	2	%
Turn on time	—	750	ms

Table 3. Acceleration Sensor Specifications

Characteristic	Minimum	Maximum	Unit
Measurement range	-17	17	m/s^2
Overload range(<60 ms recovery)	-100	100	m/s^2
Sensitivity error	-5	5	%
Linearity	-4	4	%
Offset (total)	-1	1	m/s^2
Offset drift (over temperature range)	-0.35	0.35	m/s^2
Offset drift speed (over 60 °K interval)	-0.2	0.2	m/s^2/min
Noise	—	0.1	m/s^2 (RMS)
Cross axis sensitivity	5	5	%
Turn on time	—	250	ms

Table 4. Software Resolution for Rotation Rates and Accelerations

Bit Position	Number of Bits
Vehicle Dynamic Rates	
34-47	14
—	—
—	—
Vehicle Dynamic Lateral and Longitudinal Acceleration	
22-31	10
—	—
—	—
Vehicle Dynamic Vertical Acceleration	
22-31	10
—	—
—	—

Figure 1. Axes of Motion

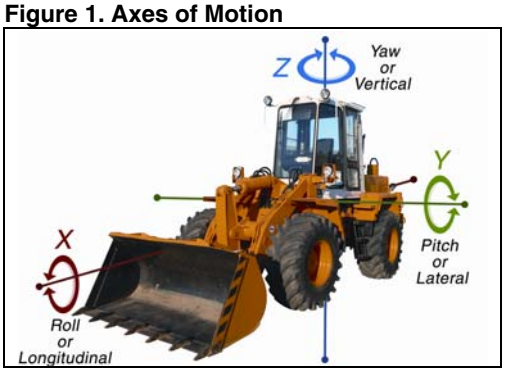


Figure 2. Block Diagram

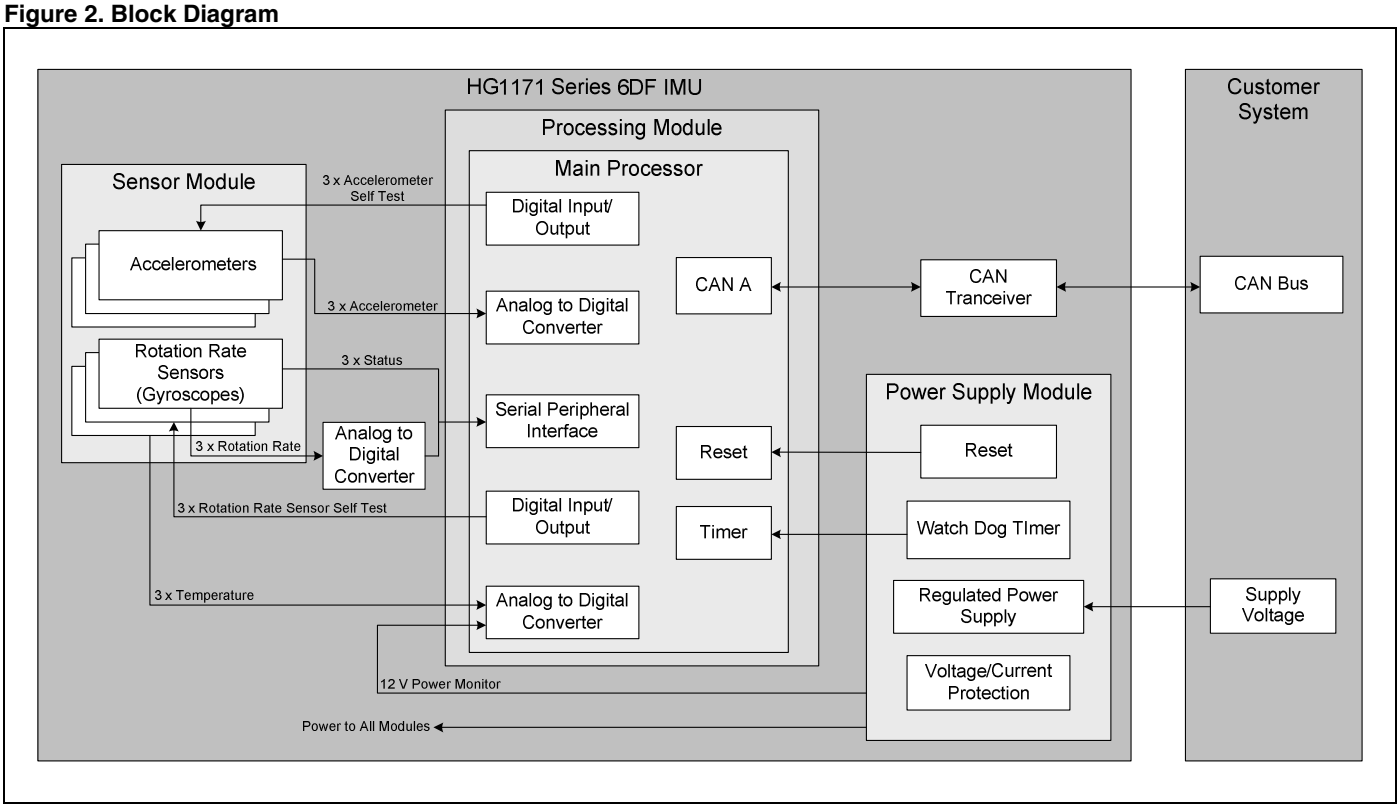
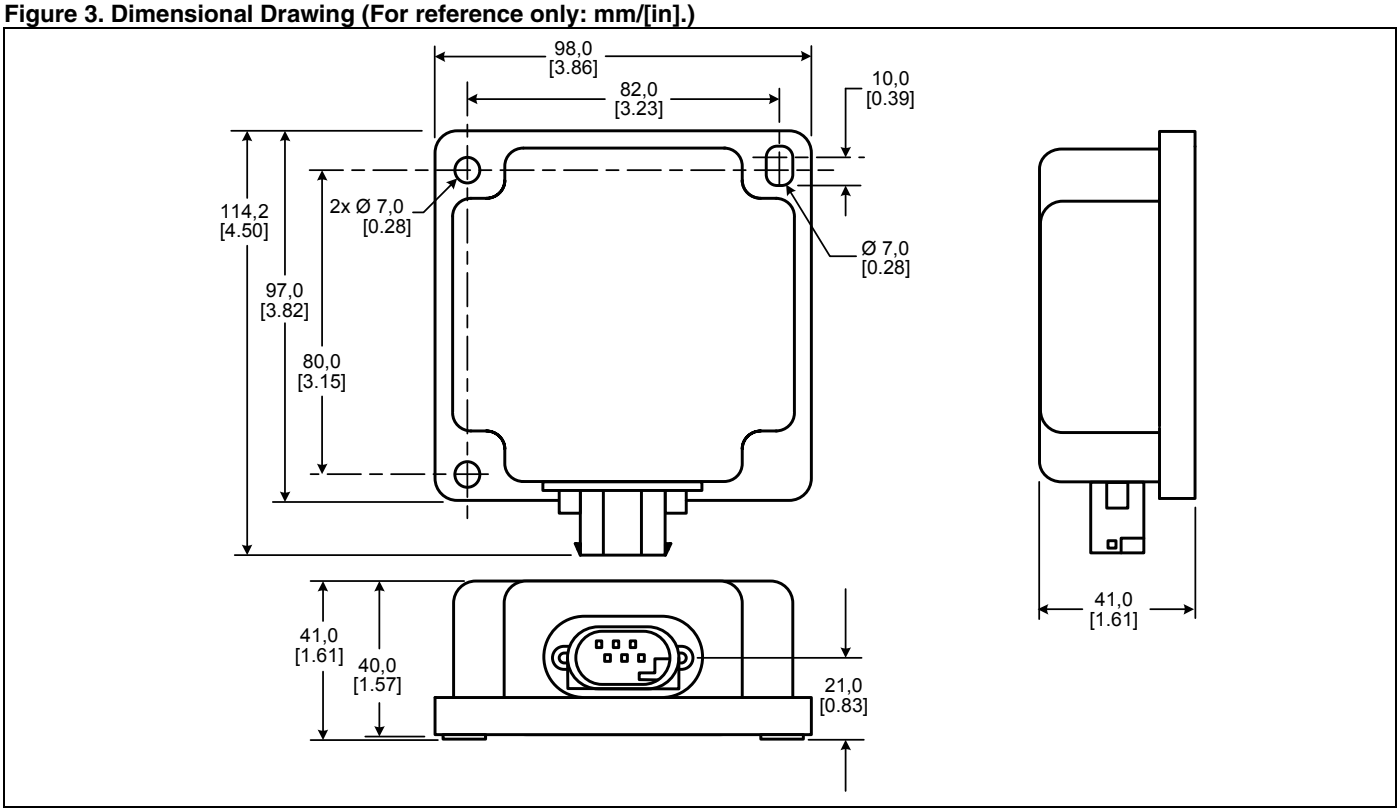


Figure 3. Dimensional Drawing (For reference only: mm/[in].)



Order Guide

Catalog LIsting	Description
HG1171BA01	HG1171 Series 6DF inertial measurement unit

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Honeywell

LLE Series

Liquid level sensors

DESCRIPTION

The enhanced series of liquid level sensors incorporates a photo-transistor trigger which provides a digital output that denotes the presence or absence of liquid.

The mode of operation is derived from the principle of total internal reflection. An LED and photo-transistor are housed within a plastic dome at the head of the device. When no liquid is present, light from the LED is internally reflected from the dome to the photo-transistor. When liquid covers the dome, the effective refractive index at the dome-liquid boundary changes, allowing some light from the LED to escape. Thus the amount of light received by the photo-transistor is reduced and the output switches, indicating the presence of liquid. This method of liquid level sensing is very fast, and almost instantaneous for water.

FEATURES

- Solid state technology
- Small size
- Digital output
- Pre-wired
- Electrically robust

BENEFITS

- Accurate, repeatable switching point
- Can be mounted in applications where space is limited
- Microprocessor compatible
- Easy to install, saving assembly time
- Reverse polarity, over voltage, short circuit and transient protection

TYPICAL APPLICATIONS

- Home appliances
- Spa baths
- Vending machines
- Food and beverage
- Medical
- Compressors
- Machine tools
- Automotive

ORDER GUIDE

		Catalogue Listing	
Description		**Standard temperature**	**High temperature**
Screw In, M12 Thread, Plastic	(Type 1)	LLE101000	LLE101101
	(Type 2)	LLE102000	LLE102101
	(Type 3)	LLE103000	LLE103101
Push In, Plastic	(Type 5)	LLE105000	LLE105100
Screw In, ½ in, Metal	Nickel plated brass	LLE205000	LLE205100
	Stainless steel	LLE305000	LLE305100

LLE Series

TECHNICAL INFORMATION

Specifications		
Operation mode	User defined single point on/off switch (Output is high in air)	
Repeatability (mm)	± 1	
Hysteresis (mm)	2 (dependent on liquid)	
Response time	Rising liquid level - 50 µs Falling liquid level - 1 s max (in ethanol) Response in other liquids dependent on viscosity	
Mechanical		
Mounting	Type 1 and 2 - mounted from outside; Type 3 and 5 - mounted from inside	
Termination	250 mm flying leads (180 mm for metal versions)	
	Blue 0 V	
	Red +5 V to +12 V supply	
	Green Output	
Material [Note 1]	Polysulphone	
Dimensions	**Plastic** **LLE101/102/103 Series**	**Metal** **LLE205/305 Series**
Dome	3,5 mm radius (includes LLE105 Series)	
Thread	M12x1	½ in BSPT
Hex	19 mm	24 mm (See mounting drawings on page 3)
Environmental	**Standard temperature**	**High temperature**
Operating temperature (°C)	-25 to 80 (-13 °F to 176 °F)	-40 to 125 (-40 °F to 257 °F)
Storage temperature (°C)	-30 to 85 (-22 °F to 185 °F)	-40 to 125 (-40 °F to 257 °F)
Thermal testing	As per BS EN60068-2-33	
Humidity	As per BS EN60068-2-30	
Vibration	As per BS EN60068-2-6 Part S3: 1996	
Mechanical shock	As per BS EN60068-2-27 Part 2 Ea: 1987	
Pressure range (bar)	0 to 5 (plastic housing) [Note 2] 0 to 25 (metal housing)	
Ambient IR light limit (@ 940 nm) [Note 3]	10 mW/cm^2 in operation	
Electrical	**Standard temperature**	**High temperature**
Supply voltage (Vcc)	+5 Vdc to +12 Vdc ± 5 %	
Supply current (mA)	15 mA nominal @ +5 Vdc	5 mA nominal @ +5 Vdc
Output sink current [Note 4]	@ 25 °C 10 mA max.	@ 25 °C 40 mA max.
@ 5 Vdc supply	@ 80 °C 3 mA max.	@ 125 °C 7 mA max.

Notes:

[Note 1] Material compatibility information available on request.

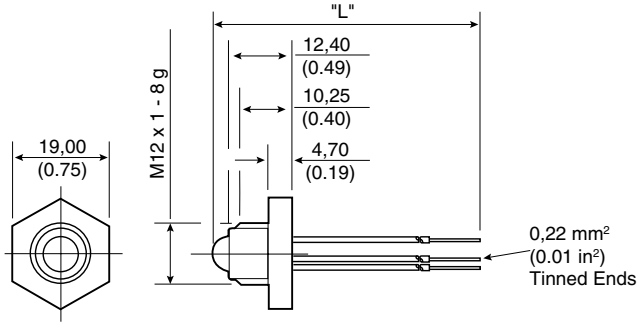
[Note 2] Threaded sensors only.

[Note 3] For other ambient light environments the user should test the sensor under application conditions to verify compatibility.

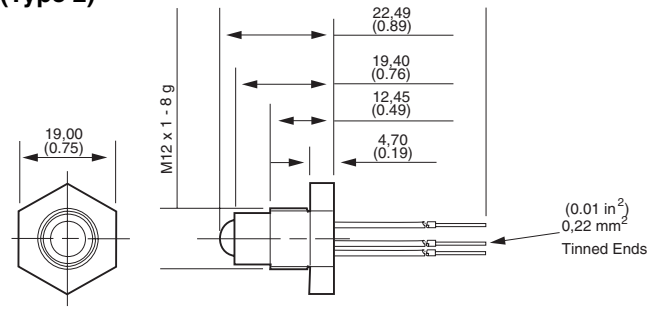
[Note 4] The output is intended as a TTL compatible output signal, for interfacing to logic systems. For interfacing with other types of circuitry an appropriate buffer circuit must be used.

MOUNTING DRAWING (IN MM AND INCHES)

LLE101000/LLE101101 (Type 1)



LLE102000/LLE102101 (Type 2)

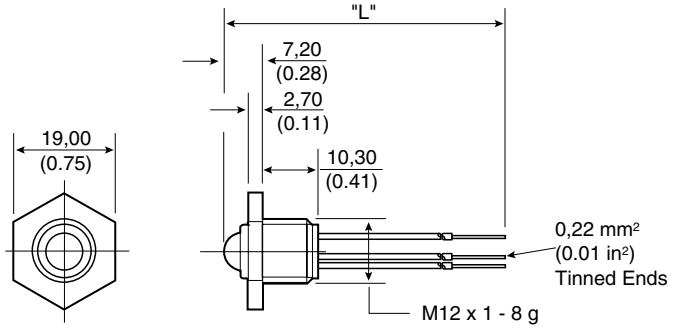


Notes

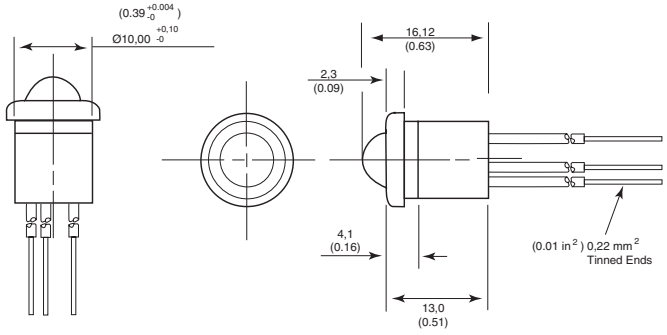
1 Recommended panel hole size Ø 12,5 ±0.3 mm (0.49 ±0.01 in)

2 'O' ring seal supplied Unassembled

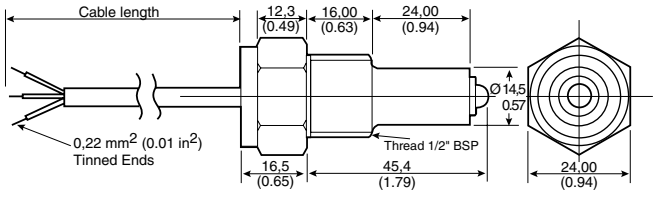
LLE103000/LLE103101 (Type 3)



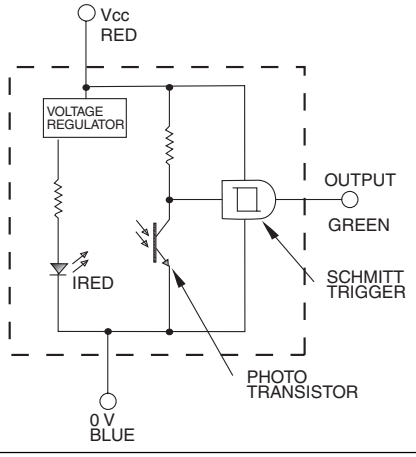
LLE105000/LLE105100 (Type 5)



LLE205000/LLE205100 LLE305000/LLE305100



ELECTRICAL DIAGRAM



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Honeywell

100437-EN UK07 GLO
Issue 3 June 2005

Honeywell

HFE4070-5021
High power fibre optic LED

Features

- High power LED
- Emitting window diameter 50 um
- With ball-lens
- Designed to operate with Honeywell fibre optic receivers
- Mounting options
  - SMA single hole
  - ST single hole
  - SMA PCB
  - ST PCB
  - SMA 4 hole

Typical applications

- Linear and rotary encoders (measuring systems)
- Edge sensing (coin dispenser)
- Optical communications

Description

The HFE4070-5021 is a high radiance GaAlAs 850 nanometer LED optimized for coupling into small fibre core diameters at a forward current of up to 80 mA. The peak wavelength is matched for use with Honeywell silicon fibre optic detectors and receivers.

The HFE4070-5021 LED is packaged in a fibre optic connector that aligns the optical axis of the base component to the axis of the optical fibre. Data rates can vary from dc to above 40 MHz depending upon component application. The LED converts electrical current into optical power that can be used in fibre optic communications. As the current varies (typically from 10 mA to 80 mA), the light intensity increases proportionally.

The HFE4070-5021 LED provides the maximum amount of radiance for the amount of forward current in the industry. A 0,55 mm diameter glass microlens over the “Caprock”™ junction collimates the light, increasing the intensity. Thus, greater power is directed toward standard fibre optic cables.

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Technical information

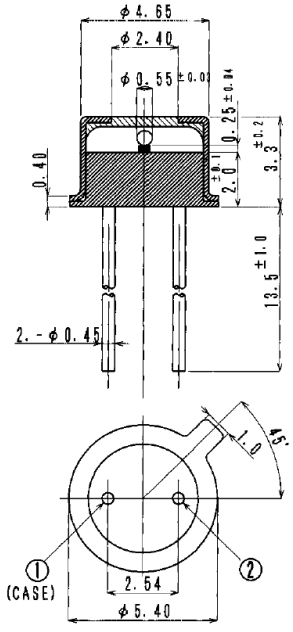
Absolute maximum ratings (Ta = 25 °C)

	Symbol	Ratings
Forward current (dc)	IF	80 mA
Forward current (pulse) [1]	IFP	0.4 A
Reverse voltage	VR	5 V
Power dissipation	PD	150 mW
Operating temperature	Topr	-30 °C to 100 °C
Storage temperature	Tstg	-40 °C to 125 °C
Junction temperature	Tj	125 °C
Lead soldering temperature [2]	Tls	260 °C

1. Tw = 10 us, T = 10 ms

2. Time 5 sec max., position up to 3 mm from the body

Mounting dimensions (in millimetres)



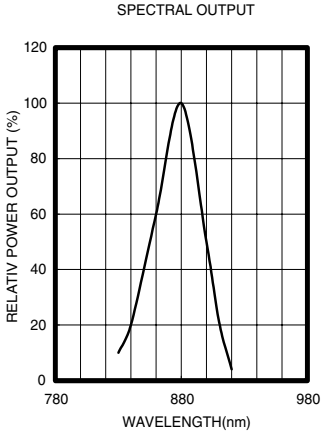
Technical information

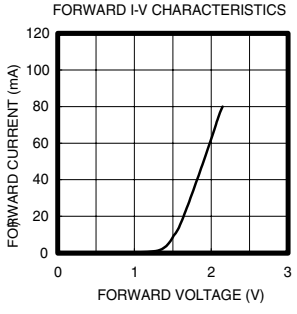
Electrical and Optical Characteristics (Ta = 25 °C)

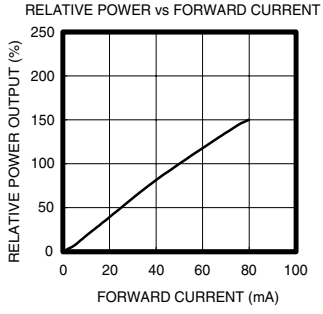
	Symbol	Conditions	Min.	Typ.	Max.
Power output	PO	IF = 50 mA	2.5mW	3.5 mW	
Forward voltage	VF	IF = 50 mA		1.9 V	2.4 V
Reverse current	IR	VR = 5 V			10 uA
Peak wavelength	λ p	IF = 50 mA	850 nm	880 nm	
Spectral line half width	△ λ	IF = 50 mA		40 nm	
Half intensity beam angle	Θ	IF = 50 mA		± 6°	
Bandwidth	fc	IF = 50 mA + 20 mA p-p		20 MHz	
Junction capacitance	c_j	1 MHz, V = 0 V		40 pF	
Temperature coefficient of PO	P/T	IF = 10 mA		-0.05 %/°C	
Temperature coefficient of VF	V/T	IF = 10 mA		-2.3 mV/°C	
Fibre coupled power [1]	Pf	IF = 50 mA		600 uW	
Fibre coupled power [2]	Pf	IF = 50 mA		20 uW	

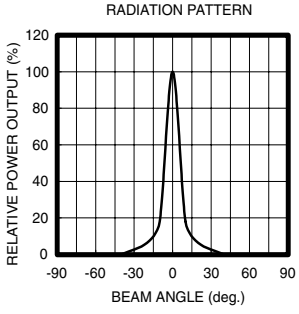
1. 200/230 NA = 0.4

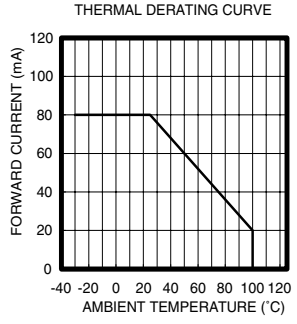
2. Measured with 50/125 um optical fibre

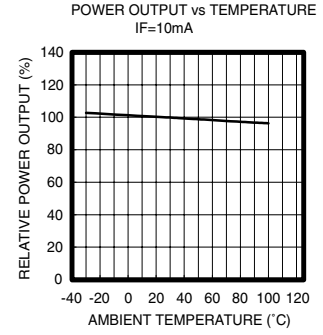


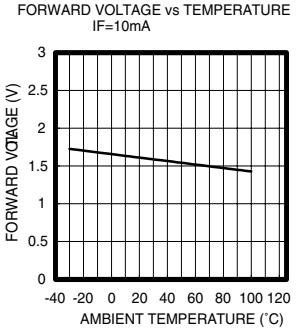












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While we provide application assistance, personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change at any time without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

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Honeywell

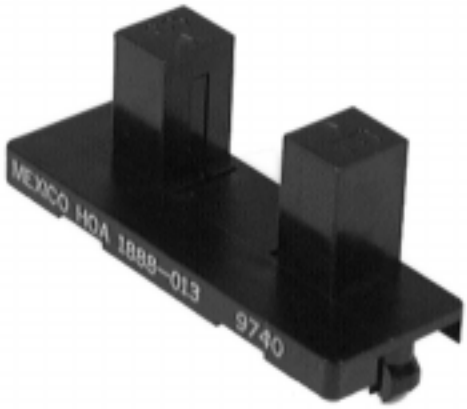
Infrared Assemblies

Wide Gap Transmissive Sensor

HOA1888 Series

FEATURES

- Choice of phototransistor or photodarlington output
- Visible ambient light and dust protective filter
- 12 mm (0.47 in.) slot width
- Snap-in housing



The HOA1888 Series consists of an infrared emitting diode facing an NPN silicon phototransistor (HOA1888-011) or photodarlington (HOA1888-013) encased in a black thermoplastic housing. Detector switching takes place whenever an opaque object passes through the slot between emitter and detector. Both emitter and detector have 1,52 mm (0.060 in.) x 1,52 mm (0.060 in.) vertical apertures.

The sensor housing contains IR (Infrared) transmissive optical windows. This arrangement provides excellent protection against visible ambient light while eliminating aperture openings which could be clogged by airborne contaminants.

Housing material is polycarbonate. Housings are soluble in chlorinated hydrocarbons and ketones. Recommended cleaning agents are methanol and isopropanol.

ABSOLUTE MAXIMUM RATINGS (25°C free-air temperature unless otherwise noted)

Operating Temperature Range	-40°C to 85°C	
Storage Temperature Range	-40°C to 85°C	
Soldering Temperature (5 sec)	240°C	
IR EMITTER		
Power Dissipation	100 mW(1)	
Reverse Voltage	3 V	
Continuous Forward Current	50 mA	
DETECTOR	**TRANSISTOR**	**DARLINGTON**
Collector-Emitter Voltage	30 V	15 V
Emitter Collector Voltage	5 V	5 V
Power Dissipation	100 mW(1)	100 mW(1)
Collector DC Current	30 mA	30 mA

Note:
1. Derate linearly at 0.78 mW/°C above 25°C.

CAUTION
STRESS DAMAGE
Functional operation of the device at or above "Absolute Maximum Ratings" for extended periods of time may affect reliability.
Failure to comply with these instructions may result in product damage.

ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
IR EMITTER						
Forward Voltage	V_F			1.6	V	I_F=20 mA
Reverse Leakage Current	I_R			10	µA	V_R=3 V
DETECTOR						
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$				V	I_C=100 µA
HOA1888-011		30				
HOA1888-013		15				
Emitter-Collector Breakdown Voltage	$V_{(BR)ECO}$	5.0			V	I_E=100 µA
Collector Dark Current	I_{CEO}				nA	V_{CE}=10 V
HOA1888-011				100		I_F=0
HOA1888-013				250		
COUPLED CHARACTERISTICS						
On-State Collector Current	$I_{C(ON)}$				mA	V_{CE}=5 V
HOA1888-011		0.5				I_F=20 mA
HOA1888-013		2.0				
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$				V	I_F=20 mA
HOA1888-011				0.4		I_C=60 µA
HOA1888-013				1.1		I_C=250 µA
Rise And Fall Time	t_r, t_f				µs	V_{CC}=5 V, I_C=1 mA
HOA1888-011			15			R_L=1000 Ω
HOA1888-013			75			R_L=100 Ω

SCHEMATIC

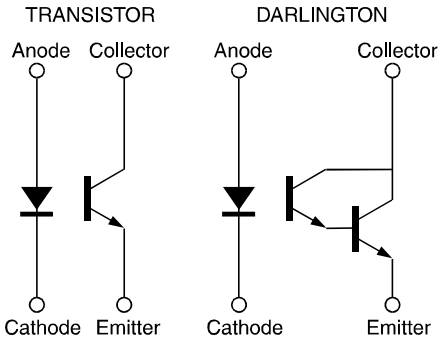


Figure 1: IRED Forward Bias Characteristics

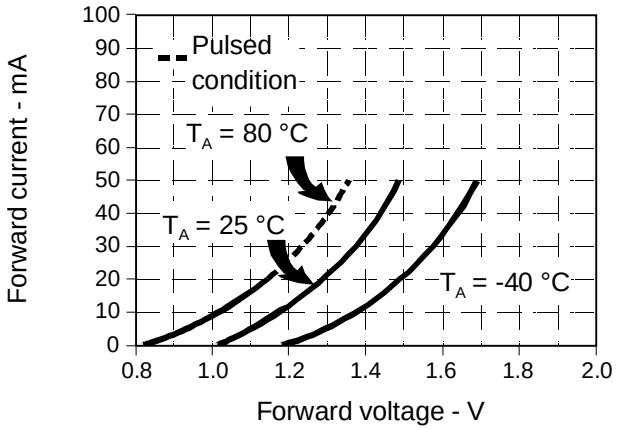


Figure 2: Non-saturated Switching Time vs Load Resistance

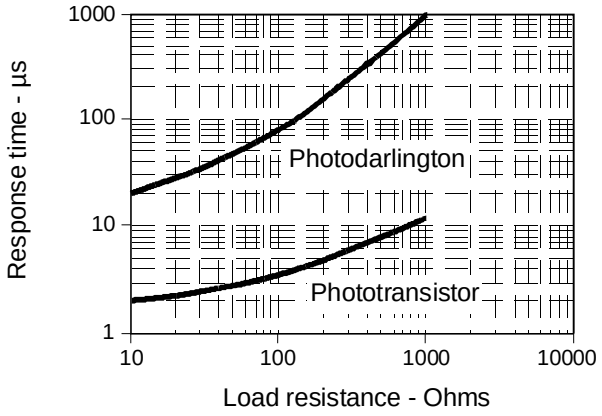


Figure 3: Detector Dark Current vs Temperature

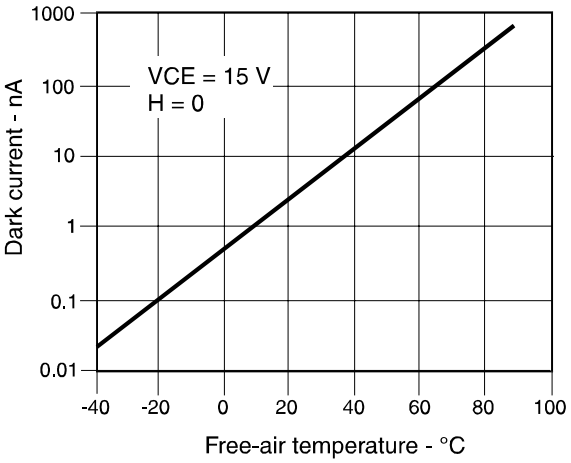
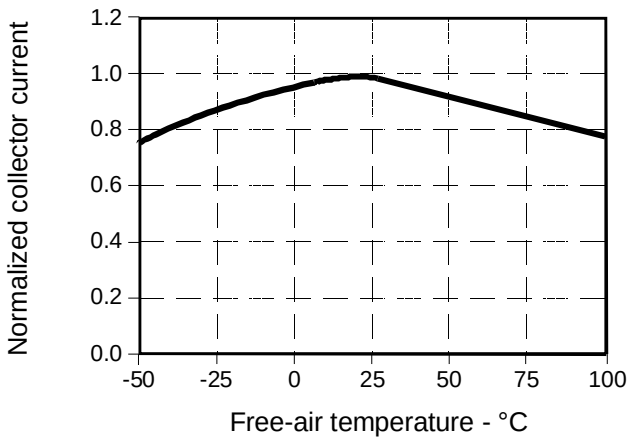


Figure 4: Collector Current vs Ambient Temperature



Infrared Assemblies

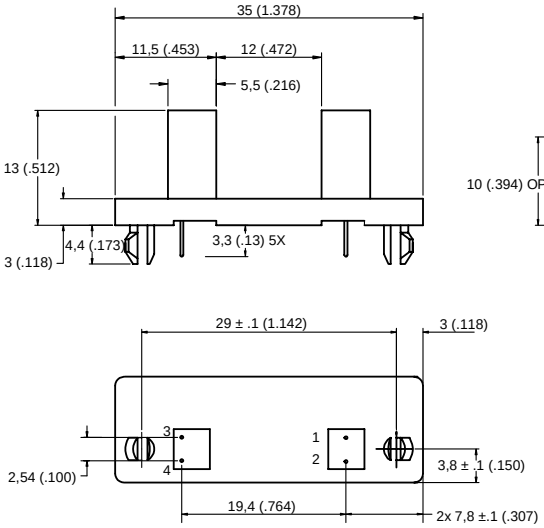
Wide Gap Transmissive Sensor

HOA1888 Series

ORDER GUIDE

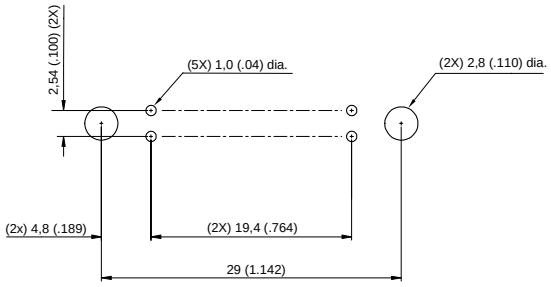
Catalog Listing	Description
HOA1888-011	Wide Gap Transmissive Sensor, Phototransistor
HOA1888-013	Wide Gap Transmissive Sensor, Photodarlington

OUTLINE DIMENSIONS mm (in.) (for reference only)



LEADS:
1. ANODE
2. CATHODE
3. EMITTER
4. COLLECTOR

RECOMMENDED PCB MOUNTING HOLE DIMENSIONS mm (in.)



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Honeywell

Infrared Assemblies

Dual Channel Transmissive Sensor

HOA1889 Series

FEATURES

- Choice of phototransistor or photodarlington output
- PCB mount package
- Polarized locator pins
- Accurate position sensing
- 0,5 mm (0.020 in.) aperture windows
- 1,78 mm (0.070 in.) slot width
- Available in shipping tubes

The HOA1889 Series consists of two infrared emitting diodes facing two NPN silicon phototransistors (HOA1889-011) or two photodarlington transistors (HOA1889-013) encased in a black thermoplastic housing. Detector switching takes place whenever an opaque object passes through the slot between the the emitter and the detector. The dual channels allow both the speed and the direction of the interrupter to be sensed. Emitters and detectors have a 0,5 mm (0.020 in.) vertical aperture. This feature is ideal for use in applications in which high position resolution is desired.

The sensor housing is an opaque thermoplastic with aperture openings for use in applications in which maximum rejection of ambient light is important and maximum position resolution is desired. The HOA1889 Series contains plastic molded components. For additional component information see SEP8506, SDP8406, and SDP8106.

Housing material is Valox®. Housings are soluble in chlorinated hydrocarbons and ketones. Recommended cleaning agents are methanol and isopropanol.

Valox is a registered trademark of General Electric Company.

ABSOLUTE MAXIMUM RATINGS (25°C free-air temperature unless otherwise noted)

Operating Temperature Range	-40°C to 85°C	
Storage Temperature Range	-40°C to 85°C	
Soldering Temperature (5 sec)	240°C	
IR EMITTER		
Power Dissipation	100 mW(1)	
Reverse Voltage	3 V	
Continuous Forward Current	50 mA	
DETECTOR	**TRANSISTOR**	**DARLINGTON**
Collector-Emitter Voltage	30 V	15 V
Emitter Collector Voltage	5 V	5 V
Power Dissipation	100 mW(1)	100 mW(1)
Collector DC Current	30 mA	30 mA

Note:
1. Derate linearly at 0.78 mW/°C above 25°C.

CAUTION
STRESS DAMAGE
Functional operation of the device at or above "Absolute Maximum Ratings" for extended periods of time may affect reliability.
Failure to comply with these instructions may result in product damage.

ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
IR EMITTER (each)						
Forward Voltage	V_F			1.6	V	I_F=20 mA
Reverse Leakage Current	I_R			10	µA	V_R=3 V
DETECTOR (each)						
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$				V	I_C=100 µA
HOA1889-011		30				
HOA1889-013		15				
Emitter-Collector Breakdown Voltage	$V_{(BR)ECO}$	5.0			V	I_E=100 µA
Collector Dark Current	I_{CEO}				nA	V_{CE}=10 V
HOA1889-011				100		I_F=0
HOA1889-013				250		
COUPLED CHARACTERISTICS						
On-State Collector Current	$I_{C(ON)}$				mA	V_{CE}=5 V
HOA1889-011		0.5				I_F=20 mA
HOA1889-013		2.0				
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$				V	I_F=20 mA
HOA1889-011				0.4		I_C=40 µA
HOA1889-013				1.1		I_C=250 µA
Rise And Fall Time	t_r, t_f				µs	V_{CC}=5 V, I_C=1 mA
HOA1889-011,			15			R_L=1000 Ω
HOA1889-013			75			R_L=100 Ω

SCHEMATIC

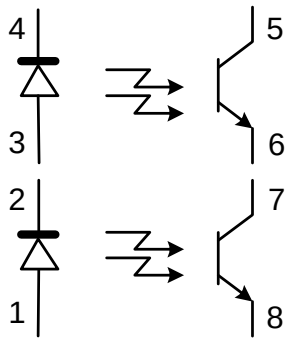


Figure 1: IRED Forward Bias Characteristics

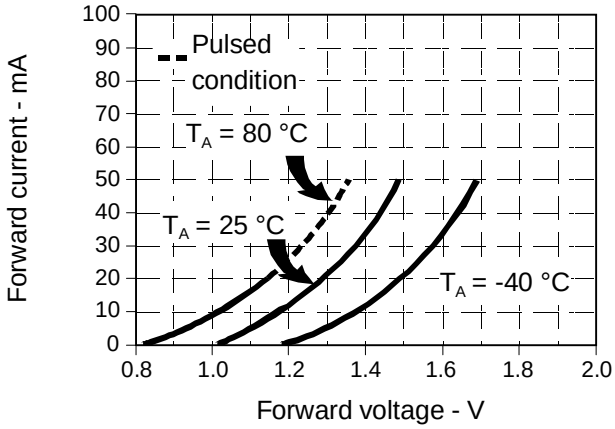


Figure 2: Non-saturated Switching Time vs Load Resistance

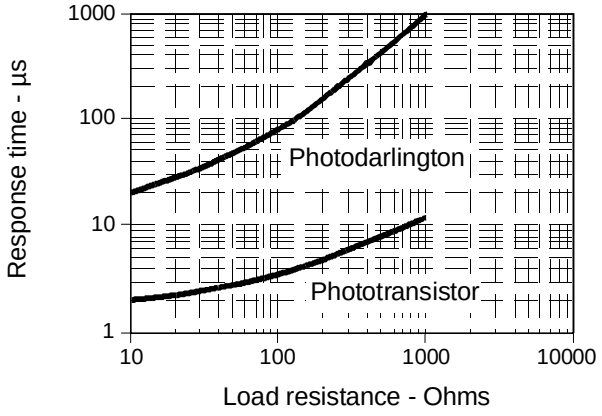


Figure 3: Detector Dark Current vs Temperature

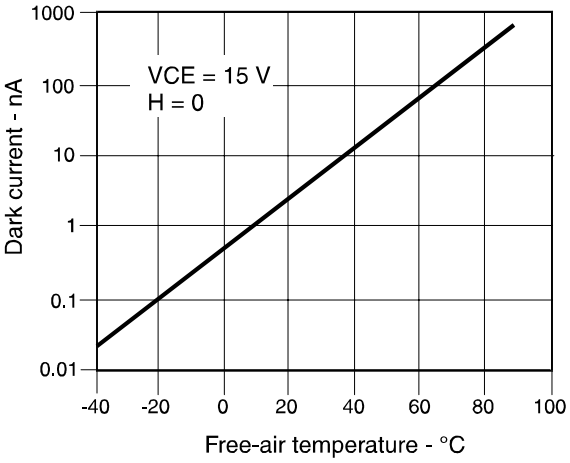
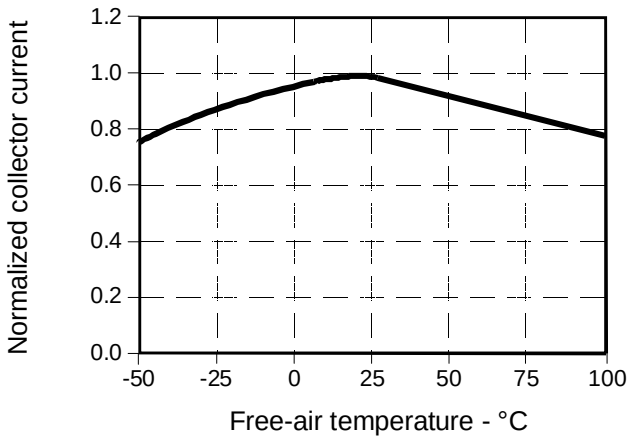


Figure 4: Collector Current vs Ambient Temperature



Infrared Assemblies

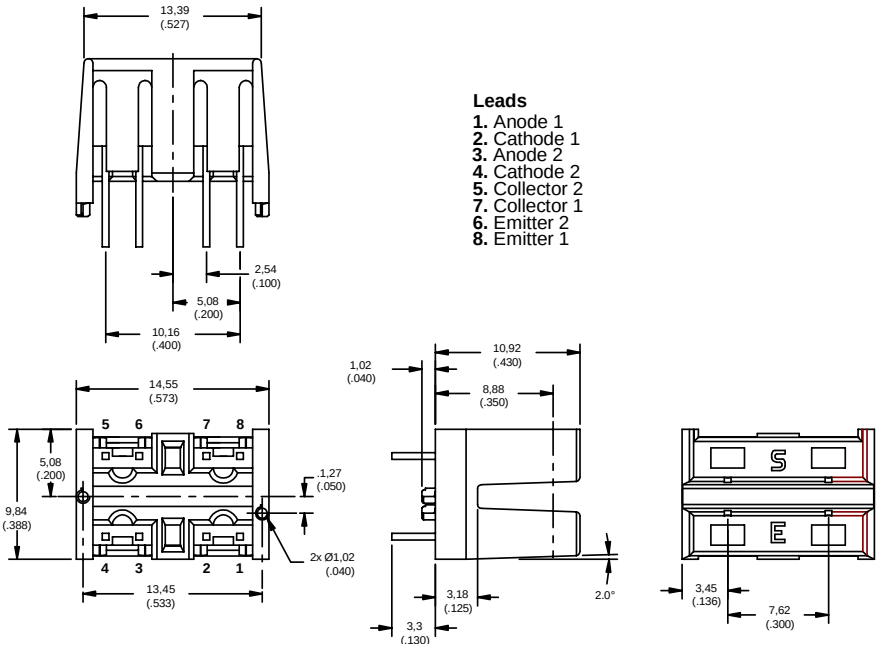
Dual Channel Transmissive Sensor

HOA1889 Series

ORDER GUIDE

Catalog Listing	Description
HOA1889-011	Dual Channel Transmissive Sensor, Phototransistor
HOA1889-013	Dual Channel Transmissive Sensor, Photodarlington

OUTLINE DIMENSIONS mm/(in.)
(for reference only)



Leads
1. Anode 1
2. Cathode 1
3. Anode 2
4. Cathode 2
5. Collector 2
7. Collector 1
6. Emitter 2
8. Emitter 1

WARRANTY/REMEDY

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Specifications may change at any time without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

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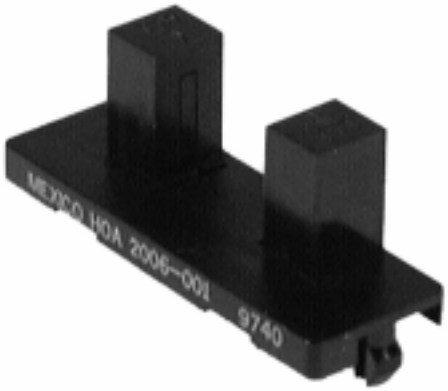
Infrared Assemblies

Wide Gap Transmissive Optoschmitt Sensor

HOA2006 Series

FEATURES

- Direct TTL interface
- Buffer logic
- Visible ambient light and dust protective filter
- 12 mm (0.47 in.) slot width
- Snap-in housing



The HOA2006 consists of an infrared emitting diode facing an Optoschmitt detector encased in a black thermoplastic housing. The photodetector consists of a photodiode, amplifier, voltage regulator, schmitt trigger, and an NPN output transistor with a 10 K ohm (nominal) pull-up resistor. The buffer logic provides a high output when the optical path is clear, and a low output when the path is blocked. Both emitter and detector have 1,52 mm (0.060 in.) x 1,52 mm (0.060 in.) vertical apertures.

The sensor housing contains IR (Infrared) transmissive optical windows. This arrangement provides excellent protection against visible ambient light while eliminating aperture openings which could be clogged by airborne contaminants.

Housing material is polycarbonate. Housings are soluble in chlorinated hydrocarbons and ketones. Recommended cleaning agents are methanol and isopropanol.

ABSOLUTE MAXIMUM RATINGS (25°C free-air temperature unless otherwise noted)

Operating Temperature Range	-40°C to 70°C
Storage Temperature Range	-40°C to 85°C
Soldering Temperature (5 sec)	240°C
IR EMITTER	
Power Dissipation	100 mW(1)
Reverse Voltage	3 V
Continuous Forward Current	50 mA
DETECTOR	
Supply Voltage	12 V(2)
Output Sink Current	18 mA
Duration of Output Short to V_{CC} or Ground	1.0 sec.

Notes:
1. Derate linearly at 0.78 mW/°C above 25°C.
2. Derate linearly from 25°C to 5.5 V at 70°C.

CAUTION
STRESS DAMAGE
Functional operation of the device at or above "Absolute Maximum Ratings" for extended periods of time may affect reliability.
Failure to comply with these instructions may result in product damage.

ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

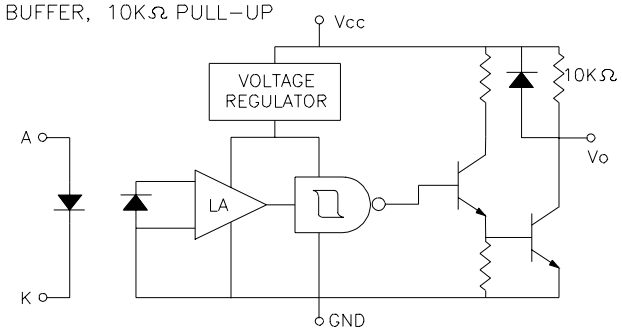
Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
IR EMITTER						
Forward Voltage	V_F			1.7	V	I_F=20 mA
Reverse Leakage Current	I_R			10	µA	V_R=3 V
DETECTOR						
Operating Supply Voltage	V_{CC}	4.5		12	V	
Low Level Supply Current	I_{CCL}	4.0		12	mA	V_{CC}=5 V
		5.0		15		V_{CC}=12 V
High Level Supply Current	I_{CCH}	2.0		10	mA	V_{CC}=5 V
		3.0		12		V_{CC}=12 V
Low Level Output Voltage	V_{OL}			0.4	V	I_{OL}=12.8 mA, I_F=0 mA
High Level Output Voltage	V_{OH}	2.4			V	I_{OH}=0, I_F=20 mA
Hysteresis(1)	HYST		10		%	
Propagation Delay Low-High, High-Low	t_{PLH}, t_{PHL}		5		µs	V_{CC}=5 V, I_F=20 mA
Rise Time	t_r		60		ns	R_L=390 Ω, C_L=50 pF
Fall Time	t_f		15		ns	R_L=390 Ω, C_L=50 pF
COUPLED CHARACTERISTICS						
IRED Trigger Current	I_{FT}			20	mA	V_{CC}=5 V

Notes:
*Add a bypass capacitor, 0.1 µF typical, between V_{CC} and GND near the device in order to stabilize the power supply line.
1. Hysteresis is defined as the difference between the operating and release threshold intensities, expressed as a percentage of the operate threshold intensity.

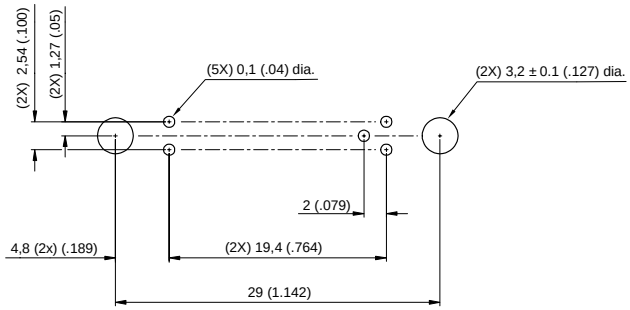
Infrared Assemblies

Wide Gap Transmissive Optoschmitt Sensor *HOA2006 Series*

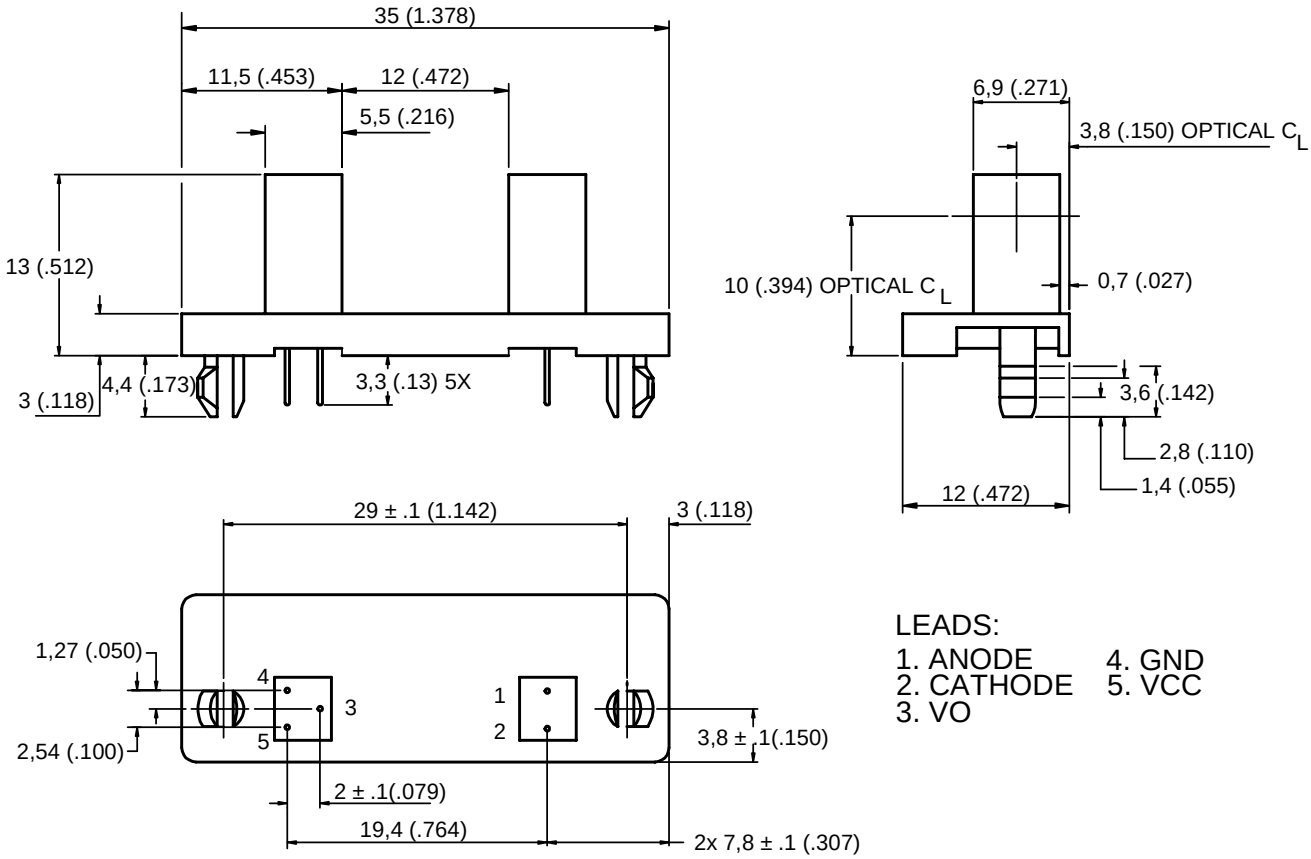
SCHEMATIC



RECOMMENDED PCB MOUNTING HOLE DIMENSIONS mm (in.)



OUTLINE DIMENSIONS mm (in.) (for reference only)



LEADS:

1. ANODE
2. CATHODE
3. VO
4. GND
5. VCC

Infrared Assemblies

Wide Gap Transmissive Optoschmitt Sensor *HOA2006 Series*

ORDER GUIDE

Catalog Listing	Description
HOA2006-001	Wide Gap Transmissive Optoschmitt Sensor

WARRANTY/REMEDY

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Honeywell

Infrared Assemblies

Dual Channel Transmissive Optoschmitt Sensor *HOA2007 Series*

FEATURES

- Direct TTL interface
- Two channel operation
- Buffer logic
- PCB mount package
- Polarized locator pins
- Accurate position sensing
- 0,5 mm (0.020 in.) aperture windows
- 1,78 mm (0.070 in.) slot width
- Available in shipping tubes

The HOA2007 Series consists of two infrared emitting diodes facing two Optoschmitt detectors encased in a black thermoplastic housing. The photodetector consists of a photodiode, amplifier, voltage regulator, schmitt trigger and an NPN phototransistor with a 10 kΩ (nominal) pull-up resistor. Detector switching takes place whenever an opaque object passes through the slot between the emitter and the detector. The buffer logic provides a high output when the optical path is clear. The dual channels allow both the speed and the direction of the interrupter to be sensed. Emitters and detectors have a 0,5 mm (0.020 in.) vertical aperture. This feature is ideal for use in applications in which high position resolution is desired.

The sensor housing is an opaque thermoplastic with aperture openings for use in applications in which maximum rejection of ambient light is important and maximum position resolution is desired. The HOA2007 series contains plastic molded components. For additional component information see SEP8506 and SDP8601.

Housing material is Valox®. Housings are soluble in chlorinated hydrocarbons and ketones. Recommended cleaning agents are methanol and isopropanol.

ABSOLUTE MAXIMUM RATINGS (25°C free-air temperature unless otherwise noted)

Operating Temperature Range	-40°C to 70°C
Storage Temperature Range	-40°C to 85°C
Soldering Temperature (5 sec)	240°C
IR EMITTER	
Power Dissipation	100 mW(1)
Reverse Voltage	3 V
Continuous Forward Current	50 mA
DETECTOR	
Supply Voltage	12 V(2)
Output Sink Current	18 mA
Duration of Output Short to V_{CC} or Ground	1.0 sec

Notes:
1. Derate linearly at 0.78 mW/°C above 25°C.
2. Derate linearly from 25°C to 5.5 V at 70°C.

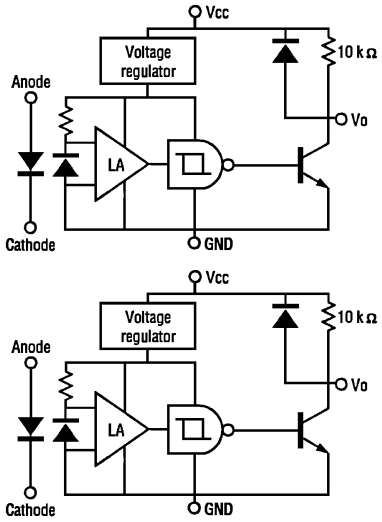
CAUTION
STRESS DAMAGE
Functional operation of the device at or above "Absolute Maximum Ratings" for extended periods of time may affect reliability.
Failure to comply with these instructions may result in product damage.

ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
IR EMITTER (each)						
Forward Voltage	V_F			1.6	V	I_F=20 mA
Reverse Leakage Current	I_R			10	µA	V_R=3 V
DETECTOR (each)						
Operating Supply Voltage	V_{CC}	4.5		12	V	
Low Level Supply Current	I_{CCL}	4.0		12	mA	V_{CC}=5 V
		5.0		15		V_{CC}=12 V
High Level Supply Current	I_{CCH}	2.0		10	mA	V_{CC}=5 V
		3.0		12		V_{CC}=12 V
Low Level Output Voltage	V_{OL}			0.4	V	I_{OL}=12.8 mA, I_F=0 mA
High Level Output Voltage	V_{OH}	2.4			V	I_{OH}=0, I_F=20 mA
Hysteresis(1)	HYST		10		%	
Propagation Delay Low-High, High-Low	t_{PLH}, t_{PHL}		5		µs	V_{CC}=5 V, I_F=20 mA
Rise Time	t_r		60		ns	R_L=390 Ω, C_L=50 pF
Fall Time	t_f		15		ns	R_L=390 Ω, C_L=50 pF
COUPLED CHARACTERISTICS						
IRED Trigger Current, HOA2007-001	I_{FT}			20	mA	V_{CC}=5 V

Notes:
*Add a bypass capacitor, 0.1 µF typical, between V_{CC} and GND near the device in order to stabilize the power supply line.
1. Hysteresis is defined as the difference between the operating and release threshold intensities, expressed as a percentage of the operate threshold intensity.

SCHEMATIC



SWITCHING WAVEFORM

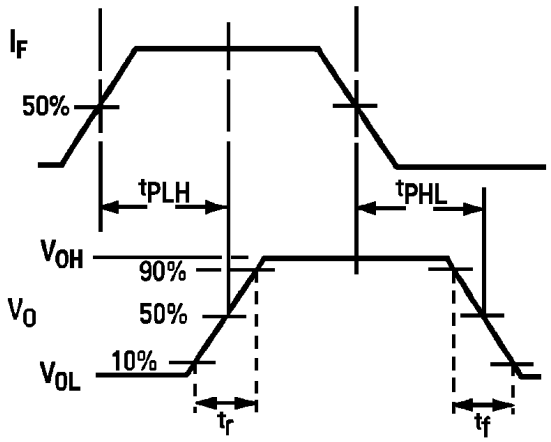
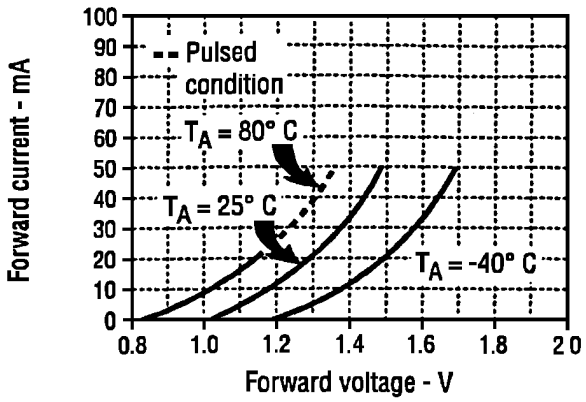
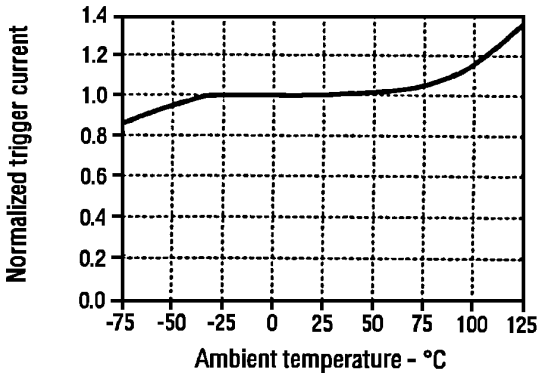


Figure 1
IRED Forward Bias Characteristics

Figure 2
IRED Trigger Current vs Temperature





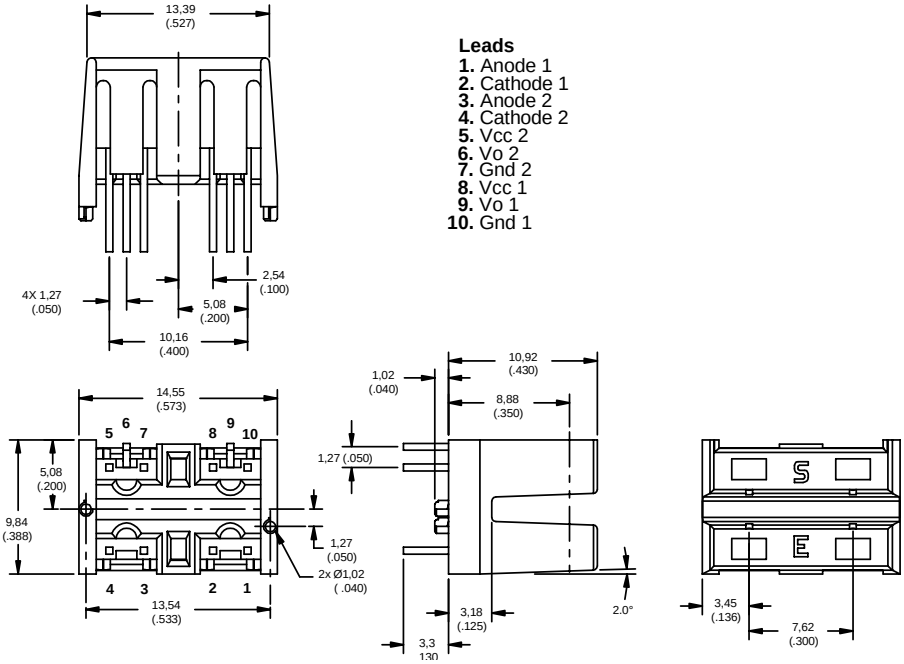
Infrared Assemblies

Dual Channel Transmissive Optoschmitt Sensor *HOA2007 Series*

ORDER GUIDE

Catalog Listing	Description
HOA2007-001	Dual Channel Transmissive Optoschmitt Sensor

OUTLINE DIMENSIONS mm/(in.)
(for reference only)



Leads
1. Anode 1
2. Cathode 1
3. Anode 2
4. Cathode 2
5. Vcc 2
6. Vo 2
7. Gnd 2
8. Vcc 1
9. Vo 1
10. Gnd 1

WARRANTY/REMEDY

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Honeywell

Infrared Products

Single Fiber Duplex Modules

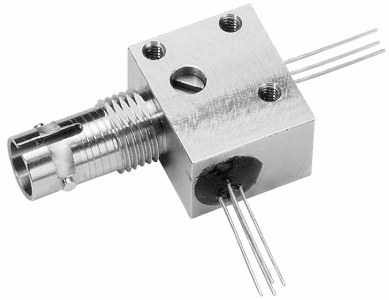
HOD2236-111/BBA
HOD4090-111/BBA

FEATURES

- Full duplex over single fiber
- DC to 160 MHz link bandwidth
- Link budgets of 2 km [1.24 miles] or greater
- 40 dB isolation
- Low profile ST housing
- Other options available
- VCSEL is Class 1 eye safe

APPLICATIONS

- Full duplex data transmission
- Multiplexing two signals to a single fiber
- LED coupled power measurements and reflected power measurements (depending upon the configuration of the duplex module)



A pair of Honeywell HODXXXX-XXX/BBA series of dual wavelength fiber duplex modules allows full duplex communication over a single fiber link. They may also be used where a dual fiber solution is neither possible nor economical. Alternatively, one duplex module may be used to double the capacity of an existing system.

Each duplex module consists of one on-axis port and one off-axis port, each configured with the appropriate devices. These devices are coupled to the single fiber via integral lenses and a 3 dB wavelength differentiating mirror within the duplex module body. In this configuration, two duplex modules can communicate in opposing directions simultaneously and independently of each other. Depending upon the receiver circuitry used, links of 2 km [1.24 miles] or greater are possible.

The following catalog listings indicate the two devices used in each duplex module.

- HOD2236-111/BBA:
  - 1300 nm multimode laser
  - 850 nm PIN diode
- HOD4090-111/BBA (corresponding duplex module):
  - 850 nm VCSEL (Vertical Cavity Emitting Surface Laser)
  - 1300 nm PIN diode

Other options are available on request. These include two LEDs or lasers in one duplex module for single fiber multiplexing, PIN+Preamp receivers (P+P) or any other preferred devices. Housing options include SC and ST optical ports or a high profile housing for mounting duplex modules side by side. Future connectors will likely include SMA, FC, LC and E2000. See the catalog listing numbering scheme on the back page for complete list of available configurations.

⚠ WARNING

MISUSE OF DOCUMENTATION

- The information presented in this product sheet (or catalog) is for reference only. DO NOT USE this document as product installation information.
- Complete installation, operation and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

PERSONAL INJURY

- DO NOT USE these products as safety or emergency stop devices, or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

ELECTRO-OPTICAL CHARACTERISTICS FOR THE HOD2236-111/BBA

CAUTION
STRESS DAMAGE
Functional operation of the device at or above "Absolute Maximum Ratings" for extended periods of time may affect reliability.
Failure to comply with these instructions may result in product damage.

Absolute Maximum Ratings (25 °C unless otherwise noted)

Continuous Forward Current	150 mA
Lead Solder Temperature	260 °C [500 °F], 10 sec
Operating Temperature	0 °C to 70 °C (32 °F to 158 °F)
Storage Temperature	-40°C to 85 °C (-40 °F to 185 °F)

Transmit: 1300 nm Laser (All tests made at 25 °C unless otherwise specified.)

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Fiber Coupled Power	P_{OC}	40 -14	65 -12	100 -10	µW dBm	I_F=17 mA 50/125 µm fiber
Laser Diode Reverse Voltage	V_{RLD}			2.0	V	
Photo Diode Reverse Voltage	V_{RPD}			10	V	
Photo Diode Forward Current	V_{FPD}			1	mA	
Slope Efficiency	SE	0.3	0.35		mW/mA	CW, Po=5 mW
Threshold Current	I_{TH}		12	20	mA	CW, Po=5 mW
Peak Wavelength	λp	1290	1310	1330	nm	CW, Po=5 mW
Spectral Bandwidth	Δλ		2	5	nm	CW, Po=5 mW
Forward Voltage	V_F		1.2	1.5	V	CW, Po=5 mW
Response Time	t_r/t_f			0.5	ns	$I_{BIAS}=I_{TH}$, 10%-90%
Photo Diode Monitor Current	Im	100			µA	CW, Po=5 mW, V_{RPD}=2 V
Photo Diode Dark Current	I_{DARK}			0.1	µA	V_{RLD}=5 V
Photo Diode Capacitance	C		6	15	pF	V_{RLD}=5 V, f=1 MHz

Receive: 850 nm PIN Diode (All tests made at 25 °C unless otherwise specified.)

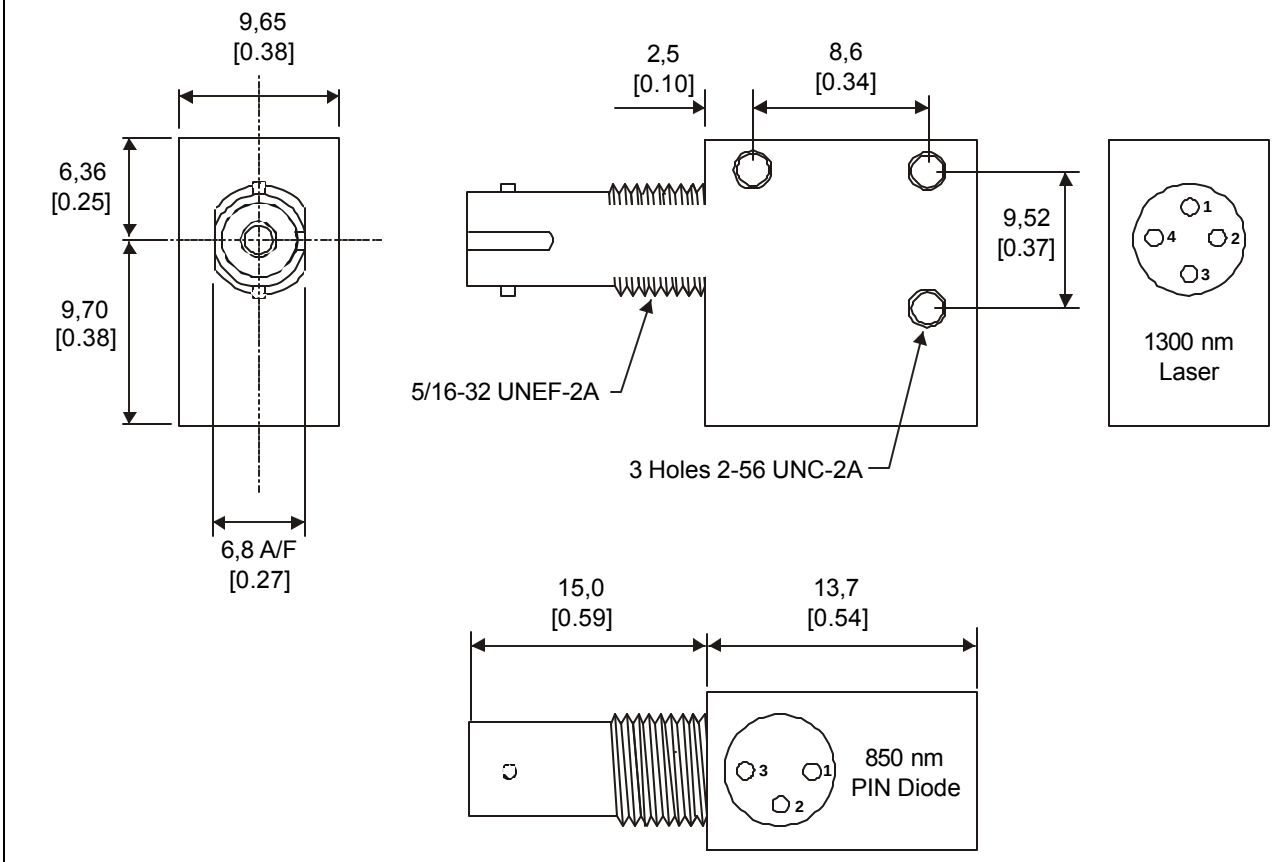
Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Flux Responsivity	R	0.2	0.3		A/W	λ=850 nm
Dark Current	I_D		0.05	1.5	nA	V_R=30 V
Reverse Voltage	BVR			50	V	
Response Time 10%-90% 90%-10%	 t_r t_f		 1.2 1.2	 3 3	 ns	 V_R=3.5 V
Capacitance	C		1.5		pF	V_R=5 V

CAUTION

PRODUCT DAMAGE DUE TO ESD

Ensure normal ESD (Electrostatic Discharge) precautions are followed when handling this product.
Failure to comply with these instructions may result in product damage.

HOD2236-111/BBA Duplex Module
Mounting and Dimensional Drawing (for reference only mm[in])



PINOUTS			
850 nm PIN Diode		**1300 nm Laser**	
1	Anode	1	LD Anode
2	Cathode	2	PD Anode
3	Case (Ground)	3	PD Cathode
		4	LD Cathode

ELECTRO-OPTICAL CHARACTERISTICS FOR THE HOD4090-111/BBA

CAUTION
STRESS DAMAGE
Functional operation of the device at or above "Absolute Maximum Ratings" for extended periods of time may affect reliability.
Failure to comply with these instructions may result in product damage.

Absolute Maximum Ratings (25 °C unless otherwise noted)

Continuous Forward Current	100 mA
Lead Solder Temperature	260 °C [500 °F], 10 sec
Operating Temperature	-0 °C to 70 °C (32 °F to 158 °F)
Storage Temperature	-45 °C to 85 °C (-49 °F to 185 °F)

Transmit: 850 nm VCSEL (All tests made at 25 °C unless otherwise specified.)

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Fiber Coupled Power	P_{OC}	200 -7	300 -5.2	400 -4	µW	I_F=12 mA 50/125 µm fiber
Laser Classification				Class 1		If<15 mA dc
Threshold Current	I_{TH}		3.6	6	mA	
I_{TH} Temperature Variation	ΔI_{TH}	-1		1	mA	T_A=0 °C to 70 °C
Slope Efficiency	η	0.1	0.2	0.4	mW/mA	Po=1.3 mW
η Temperature Variation	Δη		-0.4		%/°C	T_A=0 °C to 70 °C
Peak Wavelength	λp	820	850	860	nm	I_F=12 mA dc
λp Temperature Coefficient	Δλp/ΔT		0.06		nm/°C	I_F=12 mA
Spectral Bandwidth	Δλ			0.85	nm	I_F=12mA
Laser Forward Voltage	V_F	1.6	1.8	2.2	V	I_F=12mA
Laser Reverse Voltage	BVR_{LD}	5	10		V	I_R=10µA
Response Time -40 °C<T<100 °C, 10%-90% -40 °C<T<100 °C, 90%-10%	 t_r t_f		 100 100	 300 300	ps	Bias above threshold
Relative Intensity Noise	RIN		-128	-122	dB/Hz	1 GHz BW
Series Resistance	R_S	15	25	50	Ohms	I_F=12 mA
Monitor Current	I_{PD}	0.020		0.044	mA	Po=1.3 mW
I_{PD} Temperature Variation	$\Delta I_{PD}/\Delta T$		0.2		%/°C	Po= 0.5 mW
Dark Current	I_D			20	NA	Po=0 mW, V_R=3 V
PD Reverse Voltage	BVR_{PD}	30	115		V	Po=0 mW, I_R=10 µA
PD Capacitance	C		100 55		pF	V_R=0 V, Freq=1 MHz V_R=3 V, Freq=1 MHz

Receive: 1300 nm PIN Diode (All tests made at 25 °C unless otherwise specified.)

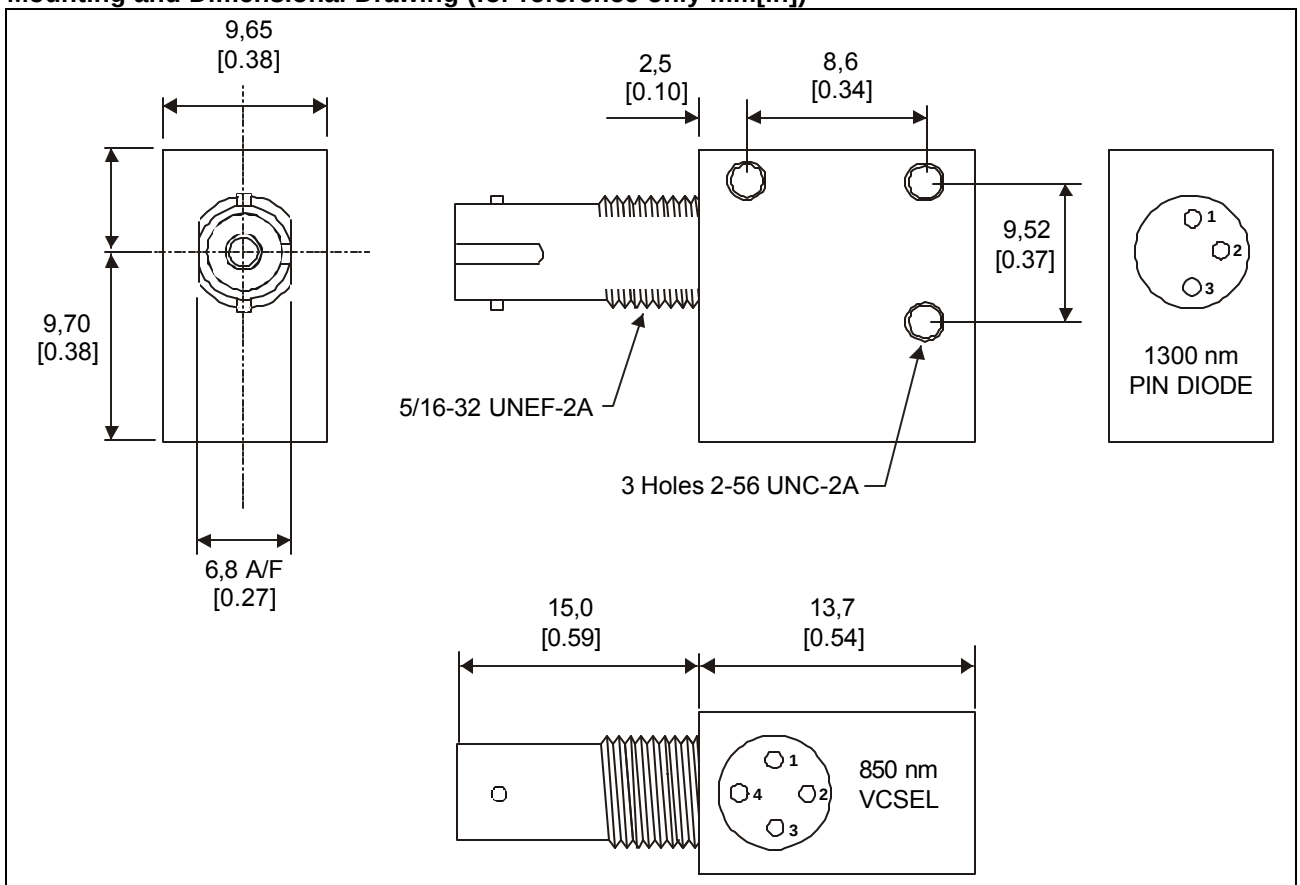
Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Flux Responsivity	R	0.45	0.50		A/W	λ=1300 nm
Dark Current	I_D		2.0	5.0	nA	V_R=5 V, f=1 MHz
Response Time 10%-90% 90%-10%	 t_r t_f			 1 1	ns	λ=1300 nm
Cut Off Frequency	FC		1500		MHz	V_R= 5 V, RL=50 Ω
Capacitance	C		1.5	1.7	pF	V_R= 5 V, f=1 MHz
Maximum Reverse Voltage	V_{Rmax}			20	V	
Isolation	I_{CX}		40		dB	I_F (LED)=100 mA dc

CAUTION

PRODUCT DAMAGE DUE TO ESD

Ensure normal ESD (Electrostatic Discharge) precautions are followed when handling this product.
Failure to comply with these instructions may result in product damage.

HOD4090-111/BBA Duplex Module
Mounting and Dimensional Drawing (for reference only mm[in])



PINOUTS			
850 nm VCSEL		**1300 nm PIN Diode**	
1	Case (Ground)	1	Anode
2	Cathode	2	Cathode
3	Anode	3	Case (Ground)
4	Cathode		

Infrared Products

Single Fiber Duplex Modules

HOD2236-111/BBA

HOD4090-111/BBA

Duplex Module Catalog Listing Numbering Scheme

HOD	XX*	XX*	-	X	X	X	/	X	X	X
	Port 1 Device	Port 2 Device		Port 1 Speed (Rise/Fall Time)	Port 2 Speed (Rise/Fall Time)	Optical Budget		Connector	Mounting	Leads
	1x 850 nm LED	**1x** 850 nm LED		**1** <3 ns	**1** <3 ns	**1** <10 dB		**A** SMA	**B** PCB	**A** Normal
	2x 1300 nm LED/Laser	**2x** 1300 nm LED/Laser		**2** <6 ns	**2** <6 ns	**2** <20 dB		**B** ST Low Profile	**X** Special	**B** Formed
	3x 850 nm PIN	**3x** 850 nm PIN		**3** <10 ns	**3** <10 ns	**3** <30 dB		**C** FC		**C** Special
	4x 1300 nm PIN	**4x** 1300 nm PIN		**4** <20 ns	**4** <20 ns	**4** <40 dB		**D** ST Close Mount		
	5x 850 nm P+P	**5x** 850 nm P+P						**E** SC		
	6x 1300 nm P+P	**6x** 1300 nm P+P						**F** LC		
	7x Future	**7x** Future						**G** E2000		
	8x Future	**8x** Future						**X** Special		
	9x Honeywell VCSEL	**9x** Honeywell VCSEL								

*The second digit of each pair of port device numbers corresponds to the specific device used.

Example: HOD4013-132/BBA defines:

40	1300 nm PIN in Port 1 (on axis)
13	850 nm LED in Port 2 (perpendicular axis)
-	
1	<3 ns Rise/Fall Time (1300 nm PIN)
3	<10 ns Rise/Fall Time (850 nm LED)
2	20 dB link budget when used with corresponding duplexer
/	
B	ST Low profile connector
B	PCB mounting
A	Normal leads

WARRANTY/REMEDY

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Honeywell

Infrared Assemblies

Through Beam Modules

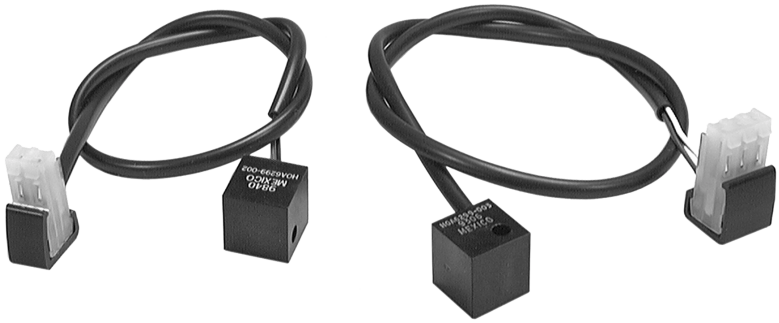
HOA6299 Series

FEATURES

- Emitter and detector in separate modules for variable spacing
- Internal current limiting resistor
- Direct TTL interface
- Buffer logic
- Fast response time
- Dust protective housing

APPLICATIONS

- Edge detection
- Position control
- Parts counting
- Mail sorting



The HOA6299 Series through beam infrared sensor modules operate as a pair. The infrared emitting diode, HOA6299-002, and the detector, HOA6299-003, are encased in black thermoplastic housings. Both the emitter and detector modules employ 24 AWG wire leads which are terminated with a Panduit CE156F24-2 connector for the HOA6299-002, and a Panduit CE156F24-3 connector for the HOA6299-003.

The detector's NPN output switches whenever an opaque object blocks the beam path. The buffer logic provides a logic high when the optical path is clear, and a logic low when the optical path is blocked. The internal current limiting resistor in the emitter module eliminates the need for an external interface circuit. The HOA6299 series employs an IR transmissive housing which features smooth optical faces without external aperture openings; this feature is desirable when aperture blockage from airborne contaminants is a possibility.

The HOA6299 Series through beam modules are tested to ensure operation at minimum separation of (63,5 mm) 2.5 in. This gap can easily be changed for applications with other spacing requirements. Housing material is IR transmissive polysulfone. Housings are soluble in chlorinated hydrocarbons and ketones. Recommended cleaning agents are methanol and isopropanol.

ABSOLUTE MAXIMUM RATINGS (25 °C free-air temperature unless otherwise noted)

Operating Voltage	
Emitter	2 to 7 V
Detector	5 to 12 V
Operating Temperature	0 °C to 50 °C (32 °F to 122 °F)
Storage Temperature	-20 °C to 85 °C (-4 °F to 185 °F)

CAUTION
STRESS DAMAGE
Functional operation of the device at or above "Absolute Maximum Ratings" for extended periods of time may affect reliability.
Failure to comply with these instructions may result in product damage.

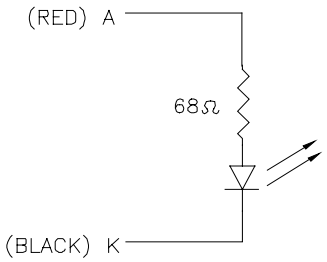
ELECTRICAL CHARACTERISTICS (25 °C unless otherwise noted)

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Operating Supply Voltage	V_{CC}	4.5		12	V	T_A=25 °C
Low Level Output Voltage	V_{OL}			0.4	V	V_{CC}=5 V, I_{OH}=10 mA Light path blocked (Note 1)
High Level Output Voltage	V_{OH}	4.5			V	V_{CC}=5 V, I_{OH}=0 mA Light path not blocked (Note 1)
Output Sink Current	I_{OL}	10			mA	V_{CC}=5 V, V_{OL}=0.4 V
Response Time	t_{ON}		5		µs	V_{CC}=5 V

Note:
1. Emitter and detector modules are tested to ensure operation at minimum separation of 63,5 mm (2.5 in) when properly aligned.

SCHEMATIC

HOA6299-002



HOA6299-003

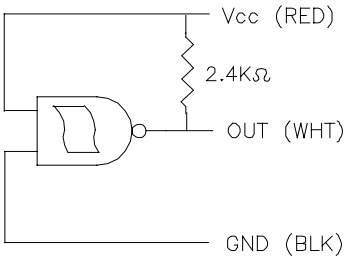


Figure 1
Emitter Module Drive Current vs Applied Voltage

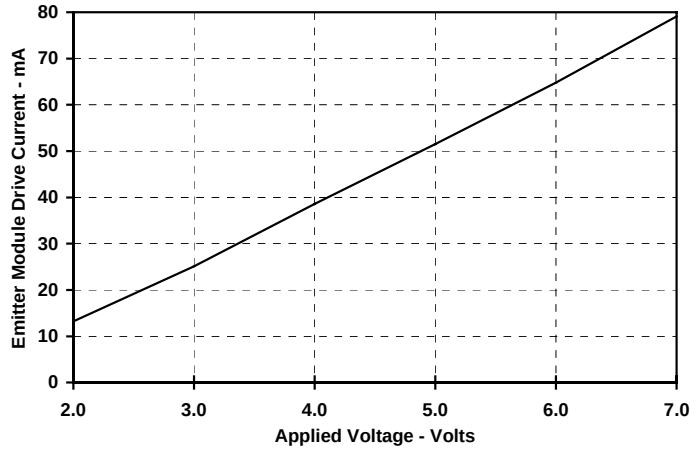
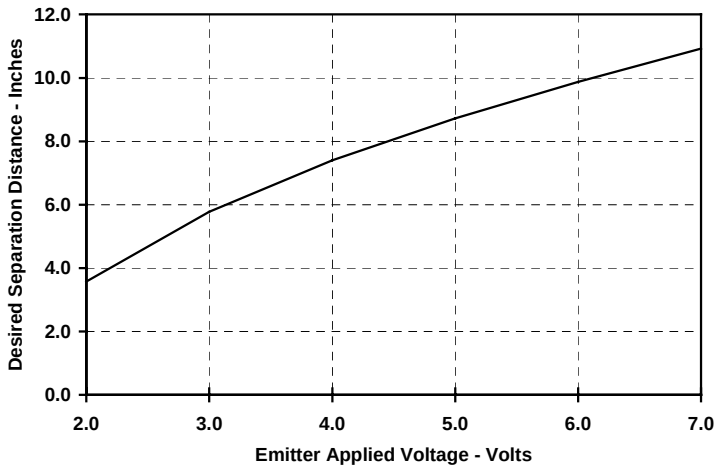


Figure 2
Desired Separation Distance vs Emitter Applied Voltage



Infrared Assemblies

Through Beam Modules

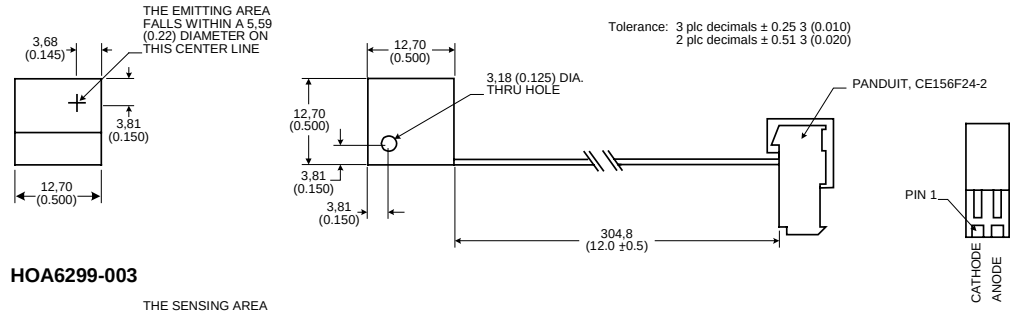
HOA6299 Series

ORDER GUIDE

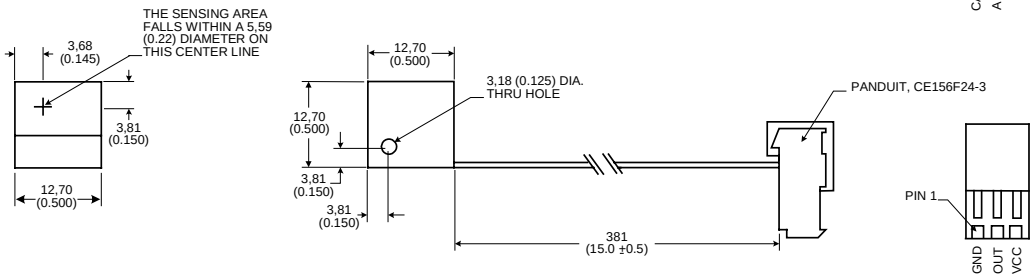
Catalog Listing	Description
HOA6299-002	Through beam, IR emitting diode
HOA6299-003	Through beam, IR detector module

OUTLINE DIMENSIONS (mm/in)

HOA6299-002



HOA6299-003



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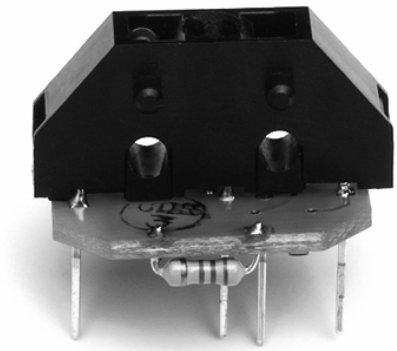
Honeywell

HOA6480 Series Barcode Sensor

Infrared Products



DESCRIPTION

The HOA6480 Series is a reflective barcode sensor that incorporates a VCSEL (Vertical Cavity Surface-emitting Laser) emitter and phototransistor detector in a custom-molded plastic package. The VCSEL technology allows the sensor to operate with a very low drive current. The phototransistor drives an operational amplifier with an open-collector output, providing users with flexibility in their interface designs.

The HOA6480 Series provides a digital output that allows it to be interfaced with most decoding equipment. The 4,5 mm [0.180 in] focal length allows measurement with no contact and the 0,254 mm [0.010 in] resolution works well in most barcode applications. The HOA6480 typical scan speed is 254,0 mm [10.0 in] per second.

A choice of pin, wire or custom termination allows flexible interconnections and the reflective sensor configuration promotes easy mounting.

FEATURES

- Class IIIB VCSEL
- Digital output
- Depth of field: 4,5 mm ±0,5 mm [0.180 in ±0.20 in]
- Focal length: 4,5 mm [0.180 in]
- Resolution: 0,254 mm [0.010 in]
- Choice of pin, wire or custom termination

POTENTIAL APPLICATIONS

- Barcode verification in dispensing and processing equipment
- Line or edge detection
- Encoding
- Data collection from manufacturing lines, robotic operations, production instrumentation/control units, automated sorting and screening equipment and analytical systems such as medical analysis. (Note that carbon black ink is required for this device to sense lines.)

HOA6480 Series Barcode Sensor

TESTING PROCESS
Each HOA6480 Barcode Sensor is precisely tested using automated testing equipment and a custom fixture.

During the testing process, the test fixture holds each sensor at a distance of approximately 4,5 mm [0.180 in] from a rotating wheel with a diameter of 89,0 mm [3.5 in] and a height of 15,2 mm [0.600 in].

One half of the wheel consists of a 50 % duty cycle barcode of alternating black and white stripes of the same size (0,38 mm [0.015 in] wide and 16,2 mm [0.600 in] tall). The other half of the wheel has a sample barcode of a known value.

The wheel rotates at 1 RPS (~254,0 mm [10.0 in] per second). Power, ground and output connections are applied to the sensor loaded into the test fixture.

Custom software in the test system evaluates the duty cycle collected by the sensor and sets the desired duty cycle between 40 % and 60 %. The software then reads a sample barcode and verifies that an accurate and complete barcode signal has been collected.

REFLECTIVITY
The sensor output will be below 1.1 V when presented with a 50 % reflective surface at 6,35 mm [0.250 in] (Kodak Grey Scale #3, CAT 152 7662).

ELECTRICAL CHARACTERISTICS (25 ºC [77 ºF] unless otherwise noted)

Parameter	Min	Typ.	Max	Unit	Condition
Supply current	–	–	15	mA	all
Voltage high	4.5	–	–	Vdc	black surface
Voltage low	–	–	1.0	Vdc	white surface
Voltage low (d=6,35 mm [0.250 in])	–	–	1.1	Vdc	50 % reflective surface
Output short circuit (sourcing) Vo = 0 V	2	16	–	mA	–
Output short circuit (sinking) Vo = 5 V	20	60	–	mA	–

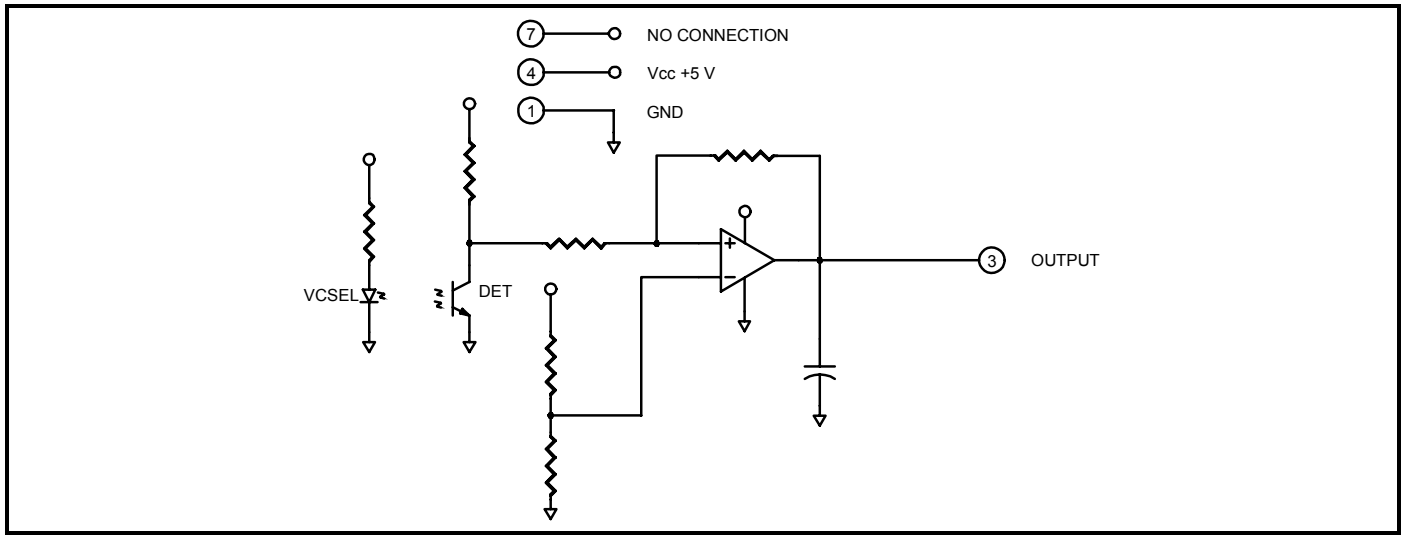
ABSOLUTE MAXIMUM RATINGS

Operating temperature range	-40 ºC to 85 ºC [-40 ºF to 185 ºF]

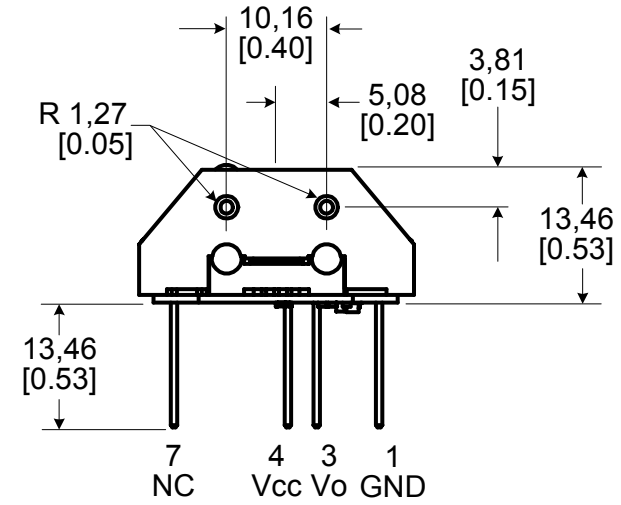
ELECTRICAL CONNECTIONS

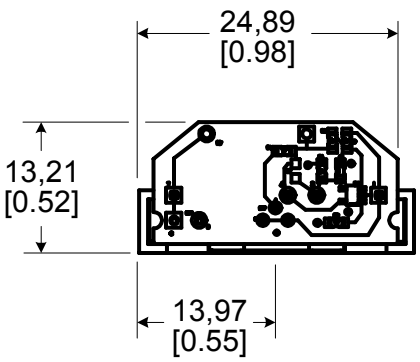
Vcc	5 Vdc
Ground	–
Output	open collector

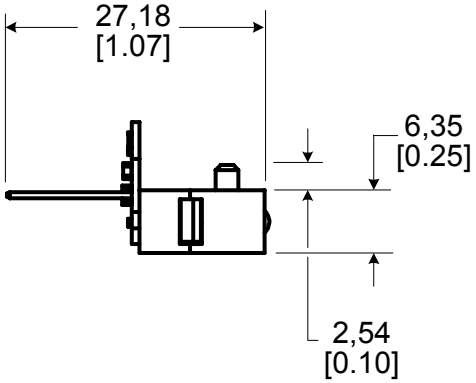
SCHEMATIC

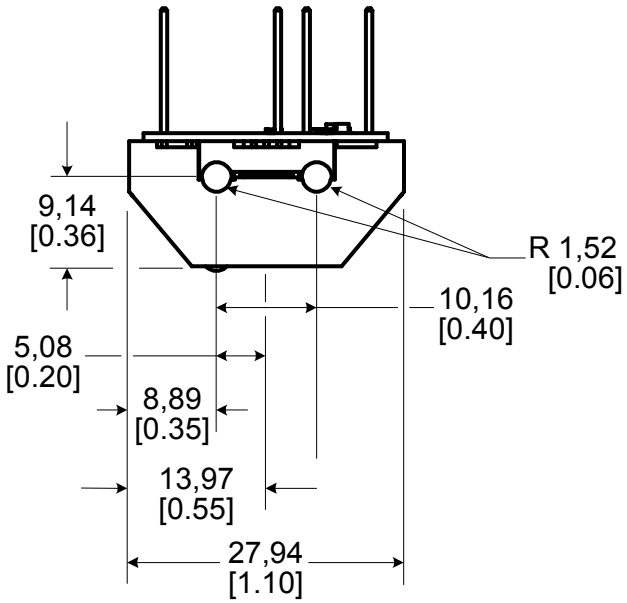


MOUNTING DIMENSIONS (For reference only mm/[in].)









ORDER GUIDE

Catalog Listing	Description
HOA6480-001	Barcode sensor with pins
HOA6480-002	Barcode sensor with 609,6 mm [24.0 in] wires

⚠ WARNING

PERSONAL INJURY
DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.
Failure to comply with these instructions could result in death or serious injury.

WARRANTY/REMEDY
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June 2005

Honeywell

Infrared Products

Single Fiber Duplex Modules

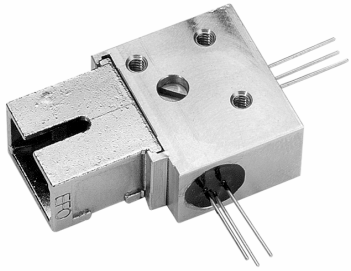
HOD2294-111/EBA
HOD1121-411/EBA

FEATURES

- Full multiplex over single fiber
- DC to 160 MHz link bandwidth
- Link budgets of 2 km [1.24 miles] or greater
- 40 dB isolation
- SC connector
- Other options available
- VCSEL is Class 1 eye safe

APPLICATIONS

- Full duplex data transmission
- Multiplexing two signals to a single fiber
- LED and laser coupled power measurements and reflected power measurements (depending upon the configuration of the duplex module)



A pair of Honeywell HODXXXX-XXX/EBA series dual wavelength fiber duplex modules allows full duplex communications over a single fiber link. They may also be used where a dual fiber solution is neither possible nor economical.

Each duplex module consists of one on-axis port and one off-axis port, each configured with the appropriate devices. These devices are coupled to the single fiber via integral lenses and a 3 dB wavelength differentiating mirror within the duplex module body. In this configuration, two duplex modules can communicate in the same direction simultaneously and independently of each other. Depending upon the receiver circuitry used, links of 2 km [1.24 miles] or greater are possible.

The following catalog listings indicate the two devices used in each duplex module.

- HOD2294-111/EBA:
  - 850 nm VCSEL (Vertical Cavity Surface Emitting Laser)
  - 1300 nm laser
- HOD1121-411/EBA (corresponding duplex module):
  - 850 nm LED
  - 1300 nm LED

Other standard options are available on request. These include two LEDs in one duplex module for single fiber multiplexing, PIN diodes, VCSEL emitters or any other preferred devices. Housing options include SC and ST optical ports or a high profile housing for mounting duplex modules side by side. Future connectors will likely include SMA, FC, LC and E2000 options. See the catalog listing numbering scheme on the back page for a complete list of available configurations.

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⚠ WARNING

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Failure to comply with these instructions could result in death or serious injury.

ELECTRO-OPTICAL CHARACTERISTICS FOR THE HOD2294-111/EBA

Absolute Maximum Ratings (25 °C unless otherwise noted)

Continuous Forward Current	20 mA (VCSEL), 100 mA (850 nm LED)
Reverse Voltage	5 V (VCSEL), 1 V at 10 µA (850 nm LED)
Lead Solder Temperature	260 °C [500 °F], 10 sec
Operating Temperature	0 °C to 70 °C (32 °F to 158 °F)
Storage Temperature	-40 °C to 100 °C (-40 °F to 212 °F)

CAUTION
STRESS DAMAGE
Functional operation of the device at or above "Absolute Maximum Ratings" for extended periods of time may affect reliability.
Failure to comply with these instructions may result in product damage.

Transmit: 1300 nm Laser (All tests made at 25 °C unless otherwise specified.)

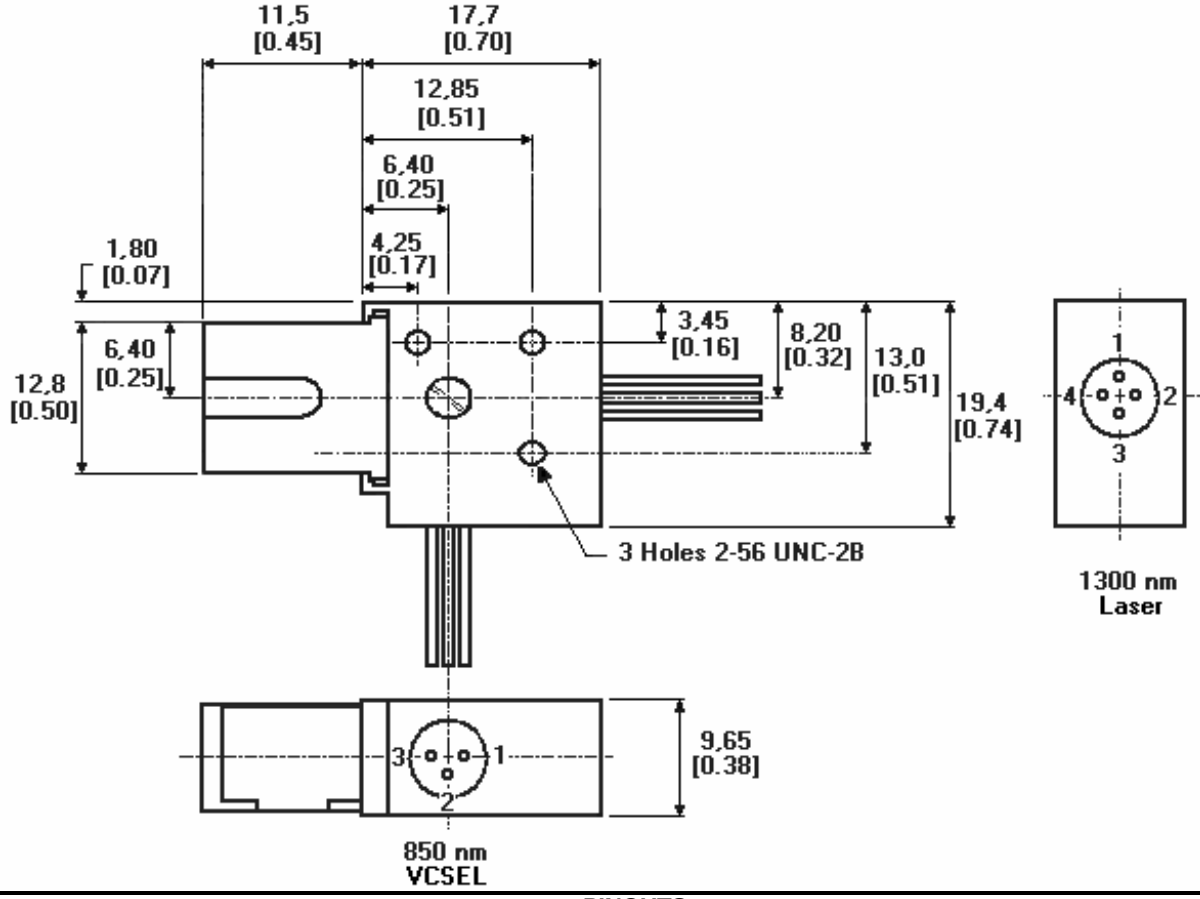
Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Fiber Coupled Power	P_{OC}	200 -7.0	280 -5.5		µW dBm	I_F=20 mA 50/125 µm fiber
Laser Diode Reverse Voltage	V_{RLD}			2.0	V	
Photo Diode Reverse Voltage	V_{RPD}			10	V	
Photo Diode Forward Current	V_{FPD}			1	mA	
Slope Efficiency	SE	0.3	0.35		mW/mA	CW, Po=5 mW
Threshold Current	I_{TH}		12	20	mA	CW, Po=5 mW
Peak Wavelength	λp	1290	1310	1330	nm	CW, Po=5 mW
Spectral Bandwidth	Δλ		2	5	nm	CW, Po=5 mW
Forward Voltage	V_F		1.2	1.5	V	CW, Po=5 mW
Response Time	t_r/t_f			0.5	ns	$I_{BIAS}=I_{TH}$ 10%-90%
Photo Diode Monitor Current	Im	100			µA	CW, Po=5 mW, V_{RPD}=2 V
Photo Diode Dark Current	I_{DARK}			0.1	µA	V_{RLD}=5 V
Photo Diode Capacitance	C		6	15	pF	V_{RLD}=5 V, f=1 MHz

Transmit: 850 nm VCSEL (All tests made at 25 °C unless otherwise specified.)

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Fiber Coupled Power	P_{OC}	200	280		µW	I_F=12 mA 50/125 µm fiber
Threshold Current	I_{TH}		3.6	6	mA	
I_{TH} Temperature Variation	ΔI_{TH}	-1		1	mA	T_A=0 °C to 70 °C
Slope Efficiency	η	0.1	0.2	0.4	mW/mA	Po=1.3 mW
η Temperature Variation	Δη		-0.4		%/°C	T_A=0 °C to 70 °C
Peak Wavelength	λp	820	850	860	nm	I_F=12 mA dc
λp Temperature Coefficient	Δλp/ΔT		0.06		nm/°C	I_F=12 mA
Spectral Bandwidth	Δλ			0.85	nm	I_F=12mA
Laser Forward Voltage	V_F	1.6	1.8	2.2	V	I_F=12mA
Laser Reverse Voltage	BVR_{LD}	5	10		V	I_R=10µA
Response Time -40 °C<T<100 °C, 10%-90% -40 °C<T<100 °C, 90%-10%	 t_r t_f		 100 100	 300 300	Ps	bias above threshold
Relative Intensity Noise	RIN		-128	-122	dB/Hz	1 GHz BW
Series Resistance	R_S	15	25	50	Ohms	I_F=12 mA
Monitor Current	I_{PD}	0.020		0.044	mA	Po=1.3 mW
I_{PD} Temperature Variation	$\Delta I_{PD}/\Delta T$		0.2		%/°C	Po= 0.5 mW
Dark Current	I_D			20	nA	Po=0 mW, V_R=3 V
PD Reverse Voltage	BVR_{PD}	30	115		V	Po=0 mW, I_R=10 µA
PD Capacitance	C		100 55		p	V_R=0 V, Freq=1 MHz V_R=3 V, Freq=1 MHz

CAUTION
PRODUCT DAMAGE DUE TO ESD
Ensure normal ESD (Electrostatic Discharge) precautions are followed when handling this product.
Failure to comply with these instructions may result in product damage.

HOD2294-111/EBA Duplex Module
Mounting and Dimensional Drawing (for reference only mm[in])



PINOUTS			
850 nm VCSEL		**1300 nm Laser**	
1	LD Anode	1	LD Anode
2	LD Cathode/PD Cathode	2	PD Anode
3	PD Cathode	3	PD Cathode
		4	LD Cathode

ELECTRO-OPTICAL CHARACTERISTICS FOR THE HOD1121-411EBA

Absolute Maximum Ratings (25 °C unless otherwise noted)

Continuous Forward Current	20 mA (VCSEL), 100 mA (850 nm LED)
Reverse Voltage	5 V (VCSEL), 1 V at 10 μA (850 nm LED)
Lead Solder Temperature	260 °C [500 °F], 10 sec
Operating Temperature	0 °C to 70 °C (32 °F to 158 °F)
Storage Temperature	-40°C to 100 °C (-40 °F to 212 °F)

CAUTION
STRESS DAMAGE
Functional operation of the device at or above "Absolute Maximum Ratings" for extended periods of time may affect reliability.
Failure to comply with these instructions may result in product damage.

Transmit: 850 nm LED (all tests made at 25 °C unless otherwise specified)

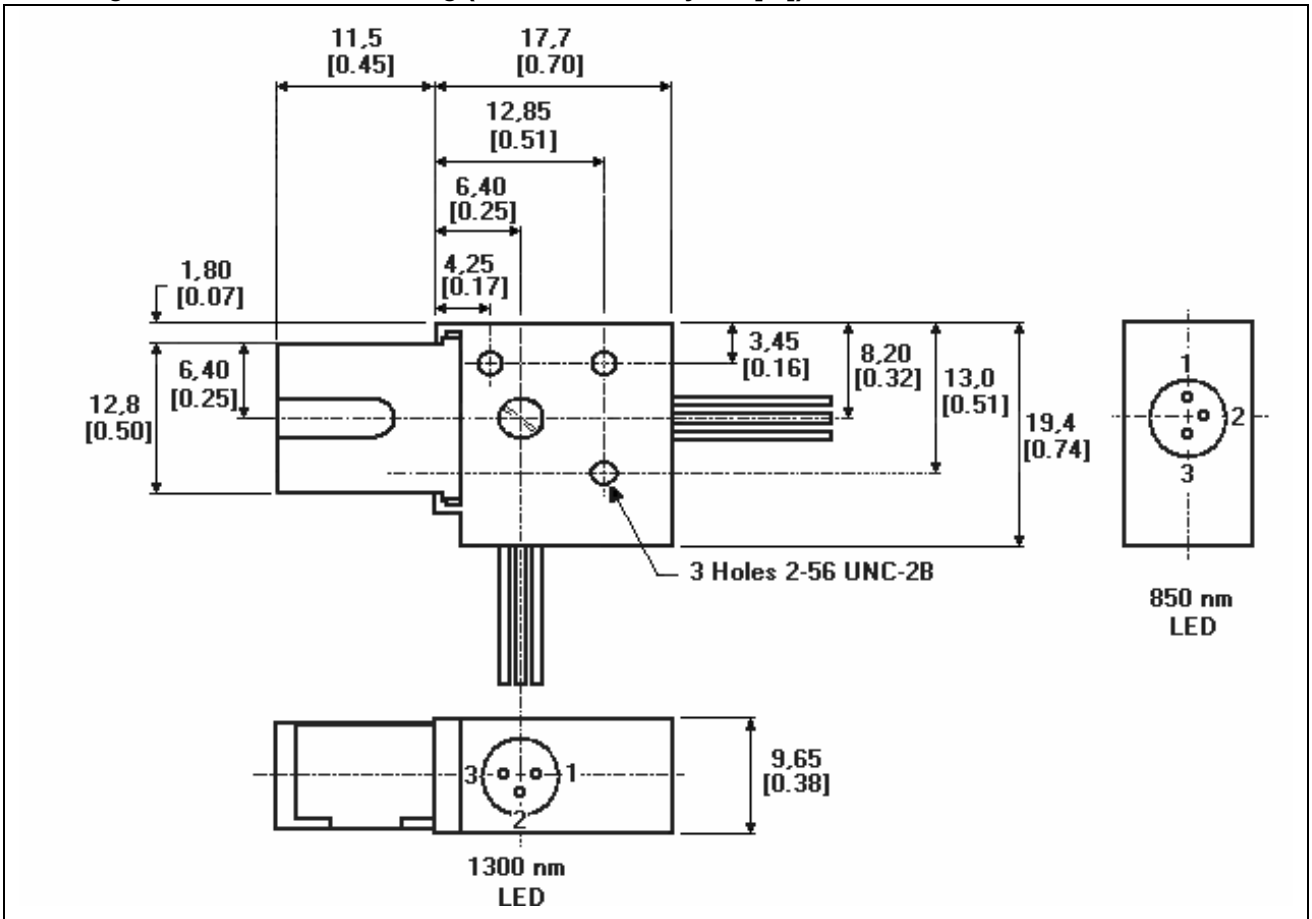
Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Fiber Coupled Power	P_{OC}		16 -18.0		μW dBm	I_F=20 mA 62.5/125 μm fiber
Forward Voltage	V_F		1.5		V	I_F=10 mA
Reverse voltage	BVR	1.0	5.0		V	I_F=10 μA
Peak Wavelength	λp		850		nm	I_F=25 mA dc
Spectral Bandwidth	Δλ		60		nm	I_F=25 mA dc
Response Time 10%-90% 90%-10%	 t_r t_f		 12 12	 20 20	ns	1 V prebias, 50 mA peak
Analog Bandwidth	BWE		70		MHz	I_F=50 mA dc
Po Temperature Coefficient	$\Delta_{PO}/\Delta T$		-0.007		dB/°C	I_F=50 mA
Capacitance	C		70		pF	V_R=0 V, f=1 mHz
Thermal Resistance			250		°C/W	heatsinked

Transmit: 1300 nm LED (All tests made at 25°C unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Fiber Coupled Power	P_{OC}		16 -18.0		μW dBm	I_F=40 mA 62.5/125 μm fiber
Forward Voltage	V_F		1.4	1.7	V	I_F=100 mA
Reverse voltage	V_R			2.0		I_F=2 μA
Peak Wavelength	λp	1290		1350	nm	I_F=100 mA dc
Spectral Bandwidth	Δλ			170	nm	I_F=100 mA dc
Response Time 10%-90% 90%-10%	 t_r t_f		 2.5 2.5	 4 4	ns	 I_F=100 mA, 50% duty cycle, f=12.5 MHz
Analog Bandwidth	BWE		115		MHz	I_F=100 mA
Po Temperature Coefficient	$\Delta_{PO}/\Delta T$		-0.03		dB/°C	I_F=100 mA
Capacitance	C		15	50	pF	V_R=3 V, f=1 MHz

CAUTION
PRODUCT DAMAGE DUE TO ESD
Ensure normal ESD (Electrostatic Discharge) precautions are followed when handling this product.
Failure to comply with these instructions may result in product damage.

HOD1121-411/EBA Duplex Module
Mounting and Dimensional Drawing (for reference only mm[in])



PINOUTS			
1300 nm LED		**850 nm LED**	
1	Anode	1	Anode (Case)
2	Cathode	2	Cathode
3	Case	3	Not Connected

Infrared Products

Single Fiber Duplex Modules

HOD2294-111/EBA

HOD1121-411/EBA

Duplex Module Catalog Listing Numbering Scheme

HOD	XX*	XX*	-	X	X	X	/	X	X	X
	Port 1 Device	Port 2 Device		Port 1 Speed (Rise/Fall Time)	Port 2 Speed (Rise/Fall Time)	Optical Budget		Connector	Mounting	Leads
	1x 850 nm LED	**1x** 850 nm LED		**1** <3 ns	**1** <3 ns	**1** <10 dB		**A** SMA	**B** PCB	**A** Normal
	2x 1300 nm LED/Laser	**2x** 1300 nm LED/Laser		**2** <6 ns	**2** <6 ns	**2** <20 dB		**B** ST Low Profile	**X** Special	**B** Formed
	3x 850 nm PIN	**3x** 850 nm PIN		**3** <10 ns	**3** <10 ns	**3** <30 dB		**C** FC		**C** Special
	4x 1300 nm PIN	**4x** 1300 nm PIN		**4** <20 ns	**4** <20 ns	**4** <40 dB		**D** ST Close Mount		
	5x 850 nm P+P	**5x** 850 nm P+P						**E** SC		
	6x 1300 nm P+P	**6x** 1300 nm P+P						**F** LC		
	7x Future	**7x** Future						**G** E2000		
	8x Future	**8x** Future						**X** Special		
	9x Honeywell VCSEL	**9x** Honeywell VCSEL								

*The second digit of each pair of port device numbers corresponds to the specific device used.

Example: HOD5721-412/EBA defines:

57	850 nm P+P in Port 1 (on axis)
21	1300 nm LED in Port 2 (perpendicular axis)
-	
4	<20 ns Rise/Fall Time (850 nm P+P)
1	<3 ns Rise/Fall Time (1300 nm LED)
2	20 dB link budget when used with corresponding duplex module
/	
E	SC connector
B	PCB mounting
A	Normal leads

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

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While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

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1-815-235-6847 International

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Honeywell

Infrared Components

Ceramic Discrete Surface Mount Emitters and Detectors

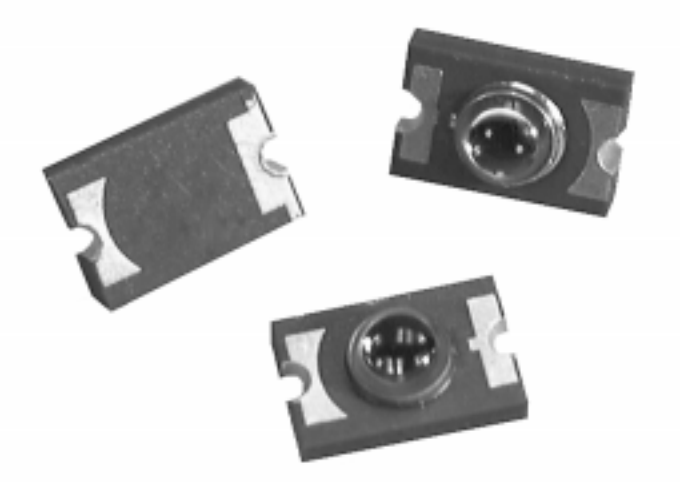
SME/SMD Series

FEATURES

- Small package size
- Glass lensed optics for efficient optical coupling
- Upright or inverted mounting capability
- Low profile, small size for flexible layout of multiple channels and custom arrays
- Compatible with automated solder processes:
  - IR reflow
  - vapor phase
  - solder wave
  - convection oven
- Choice of photodiode or phototransistor detectors
- IRED features high power dissipation capability
- Tape and reel packaging option – pick and place machine compatible

APPLICATIONS

- Optical encoders for motion control
- Computer peripherals
- Vending and point-of-sale applications
- Smoke detectors
- Medical equipment



The SME2470, SMD2440 and SMD2420 Series surface mount infrared components are small ceramic packages (0.15 x 0.10 x 0.083 in. / 3,81 x 2,54 x 2,1 mm) with glass lenses. The lens minimizes cross talk and often eliminates the need for apertures in non-critical applications. The low profile components may be mounted on the printed circuit board, lens up or inverted, allowing flexibility in layouts for multiple channel and custom arrays. When mounted lens down over a hole in the PC board, the lens is hidden, lowering overall package height.

The SME2470 is a high intensity aluminum gallium arsenide infrared emitting diode (IRED) which can be used with either the SMD2440 phototransistor or the SMD2420 photodiode. It supplies optimum optical characteristics and efficient optical coupling. The small size and high power dissipation properties of the IRED promote PC board miniaturization and high density placement.

The SMD2440 Series phototransistor's gain characteristics make it useful for applications requiring high responsivity. The SMD2420 Series photodiode is especially useful in applications requiring linear response or high switching speed.

These components are available in bulk, or on tape and reel for use with automatic placement equipment.

SME2470 SERIES IRED ABSOLUTE MAXIMUM RATINGS

Power dissipation @ 25 °C*	150 mW
Continuous forward current	75 mA (mounted on a PC board)
Reverse voltage (I_F = 10 µA)	3 V
Operating free air temperature range	-55° to +125°C (-67° to +257°F)
Storage temperature	-65° to +150°C (-85° to +302°F)
Soldering temperature	260°C (500°F), 5 seconds max.

*Derate 1.43 mW/°C above 25°C ambient.

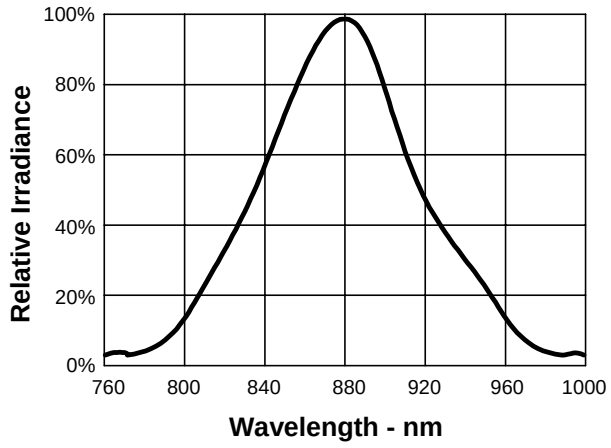
CAUTION
STRESS DAMAGE
Functional operation of the device at or above "Absolute Maximum Ratings" for extended periods of time may affect reliability.
Failure to comply with these instructions may result in product damage.

SME2470 SERIES IRED ELECTRICAL CHARACTERISTICS (at 25°C unless otherwise noted)

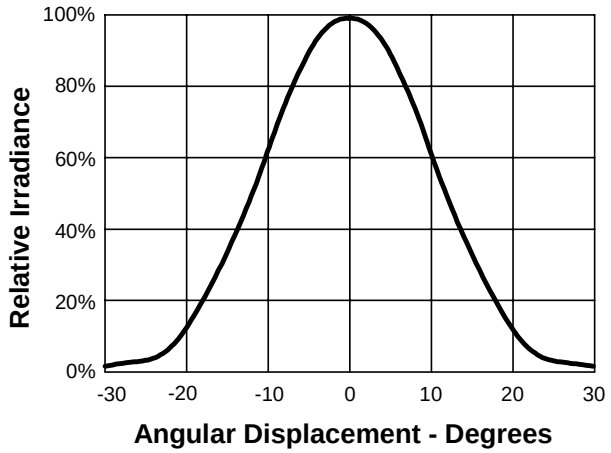
Parameter	Test Conditions	Sym.	Min.	Typ.	Max.	Units
Irradiance	Measured into 0.104 in. (2.64 mm) dia. aperture @ 0.535 in. (13.59 mm) from lens tip. I_F = 50 mA	H	0.6			mW/cm^2
Forward voltage	I_F = 50 mA	V_F		1.5	1.8	Volts
Reverse breakdown voltage	I_R= 10 µA	BV_R	3.0			Volts
Peak output wavelength	I_F = 50 mA	λ		880		nm
Spectral bandwidth	I_F = 50 mA			80		nm
Rise time	10 µsec pulse width	t_R		800		ns
Fall time		t_F		700		ns

TYPICAL IRED PERFORMANCE CHARACTERISTICS

SME2470 Spectral Bandwidth

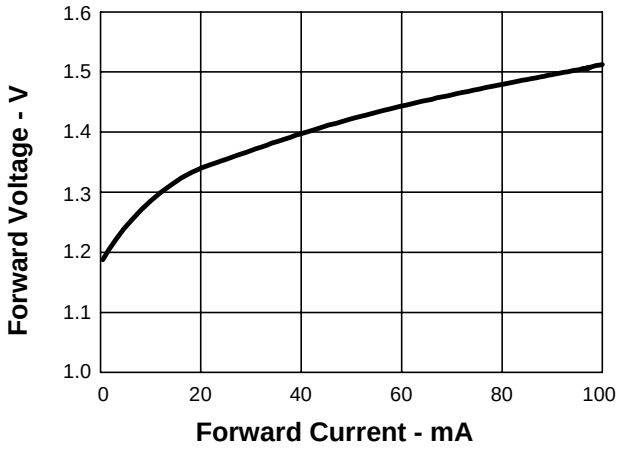


SME2470 Irradiance vs Angular Displacement

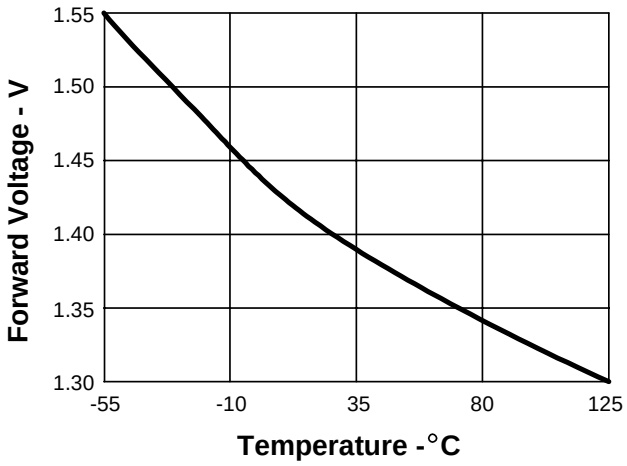


TYPICAL IRED PERFORMANCE CHARACTERISTICS (when solder mounted to PC board)

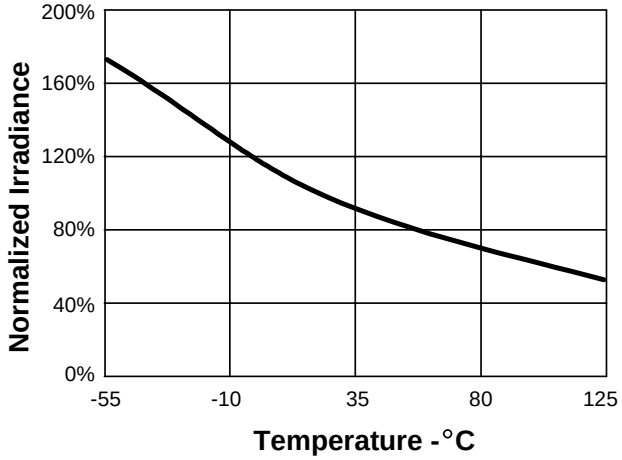
SME2470 Forward Current vs Forward Voltage



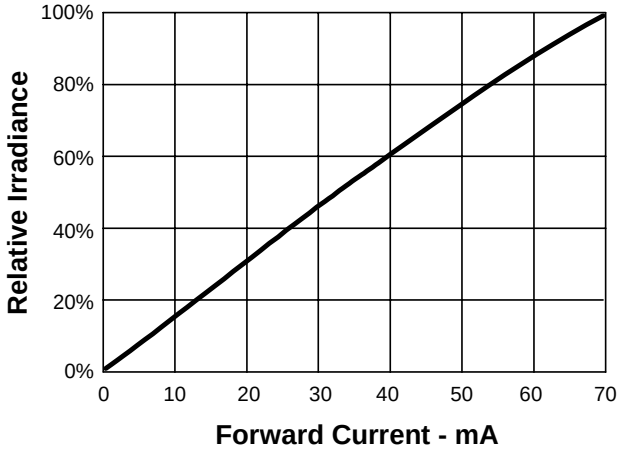
SME2470 Forward Voltage vs Temperature



SME2470 Irradiance vs Temperature



SME2470 Irradiance vs Forward Current



SMD2440 SERIES PHOTOTRANSISTOR ABSOLUTE MAXIMUM RATINGS

Collector-Emitter voltage	30 V
Emitter-Collector voltage	5 V
Continuous device dissipation*	125 mW
Operating free air range	-55° to +125°C (-67° to +257°F)
Storage temperature	-65° to +150°C (-85° to +302°F)
Soldering temperature	260°C (500°F), 5 seconds max.

*Derate 1.43 mW/°C above 25°C ambient.

SMD2440 SERIES PHOTOTRANSISTOR ELECTRICAL CHARACTERISTICS

Parameter		Test Conditions	Sym.	Min.	Typ.	Max.	Units
Light current	-0X1	V_{CE} = 5 V, H = 1 mW/cm^2,	I_L	1.5		4.0	mA
	-0X2	880 nm light source		3.0		8.0	mA
Dark current		V_{CE} = 10 V, H = 0	I_D			100	nA
Collector breakdown voltage		I_C = 100 µA, H = 0	BV_{CEO}	30			Volts
Emitter breakdown voltage		I_E = 100 µA, H = 0	BV_{ECO}	5			Volts
Saturation voltage (C to E)		I_C = 0.04 mA, H = 1 mW/cm^2	$V_{CE(SAT)}$		0.2	0.4	Volts
Peak response wavelength			λ		880		nm
Rise time		V_{CC} = 5 V, R_L = 1000 Ω, I_L = 1 mA	t_R		15		µs
Fall time			t_F		15		µs

SMD2420 SERIES PHOTODIODE ABSOLUTE MAXIMUM RATINGS

Cathode-Anode voltage	50 V
Continuous device dissipation*	125 mW
Operating free air range	-55° to +125°C (-67° to +257°F)
Storage temperature	-65° to +150°C (-85° to +302°F)
Soldering temperature	260°C (500°F), 5 seconds max.

*Derate 1.43 mW/°C above 25°C ambient.

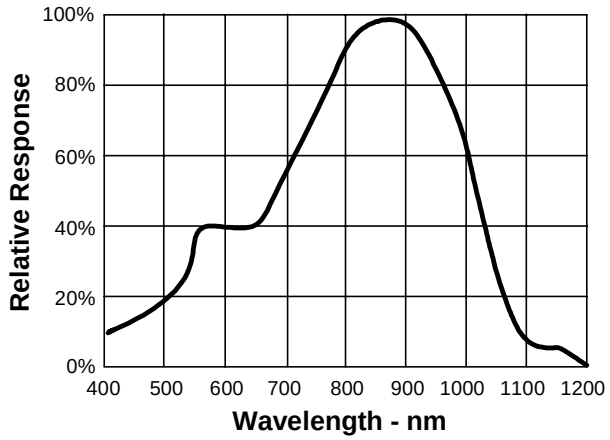
SMD2420 SERIES PHOTODIODE ELECTRICAL CHARACTERISTICS

Parameter	Test Conditions	Sym.	Min.	Typ.	Max.	Units
Light current	V_R = 20 V, H = 1 mW/cm^2*	I_L	6			µA
Dark current	V_R = 20 v, h = 0	I_D			5	nA
Reverse breakdown voltage	I_R = 10 µA, H = 0	BV_R	50			Volts
Peak response wavelength		λ		880		nm
Rise time	V_R = 20 V, R_L 100 Ω, I_L = 10 µA	t_R		20		ns
Fall time		t_F		20		ns

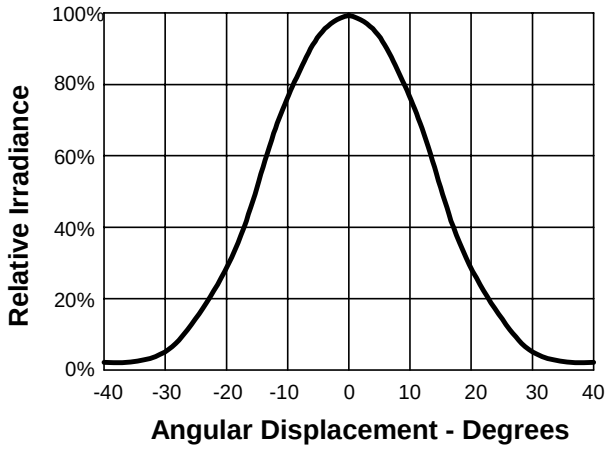
*From 880 nm source

TYPICAL SMD2440 AND SMD2420 SERIES PERFORMANCE CHARACTERISTICS (when solder mounted to PC board)

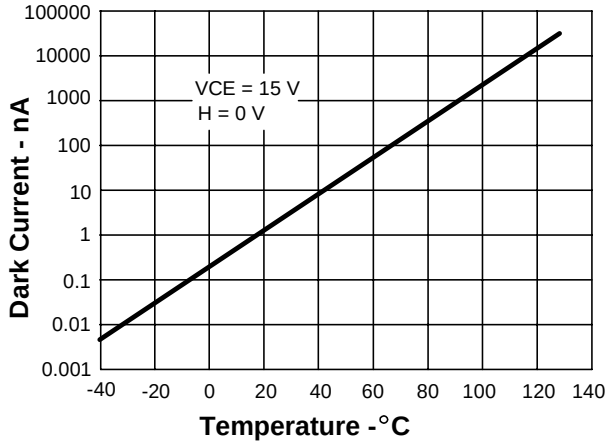
SMD2440 and SMD2420 Spectral Responsivity



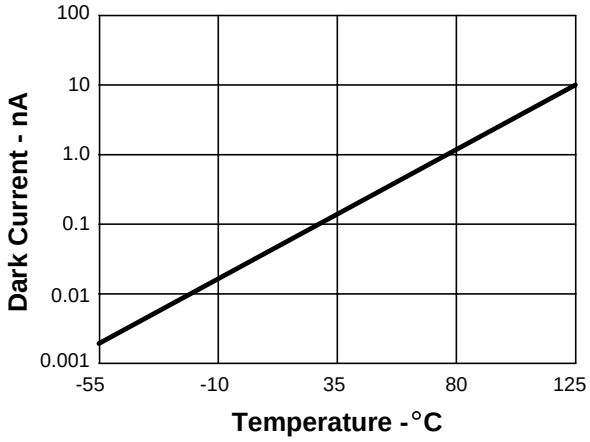
SMD2440 and SMD2420 Responsivity vs Angular Displacement



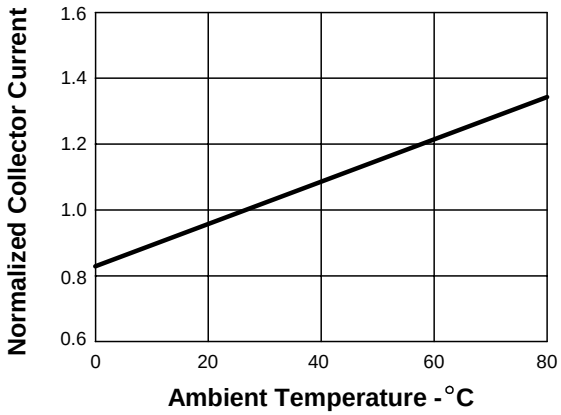
SMD2440 Dark Current vs Temperature



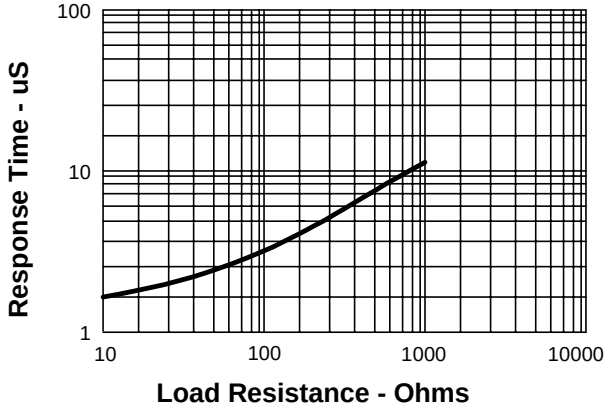
SMD2420 Dark Current vs Temperature



SMD2440 Collector Current vs Ambient Temperature

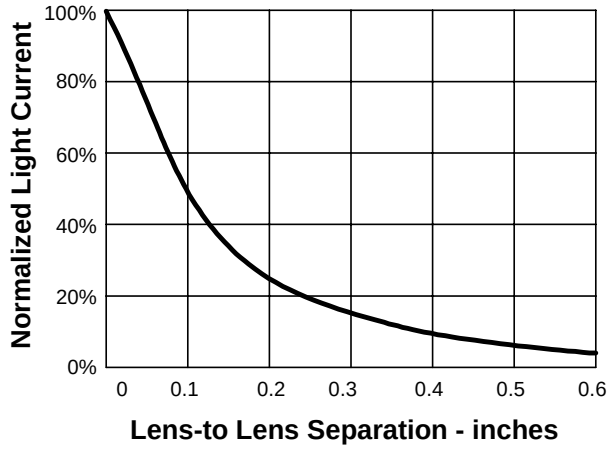


SMD2440 Non-saturated Switching Time vs Load Resistance

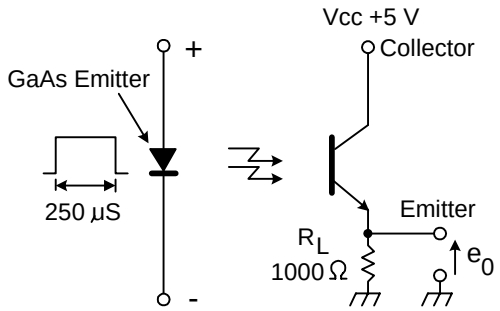


TYPICAL SMD2440 AND SMD2420 SERIES PERFORMANCE CHARACTERISTICS (when solder mounted to PC board)

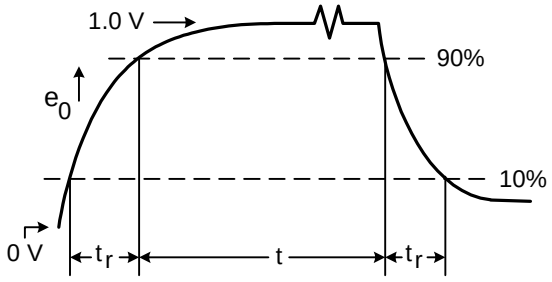
SME to SMD Coupling Characteristics



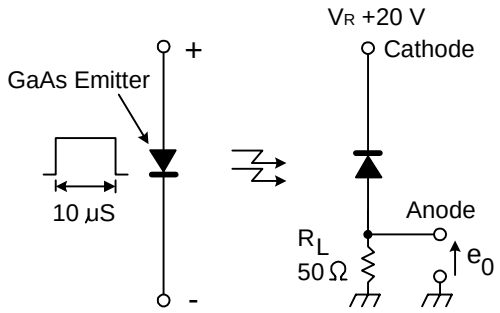
SMD2440 Switching Time Test Circuit



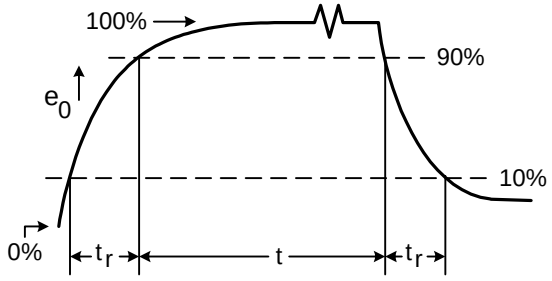
SMD2440 Switching Waveform



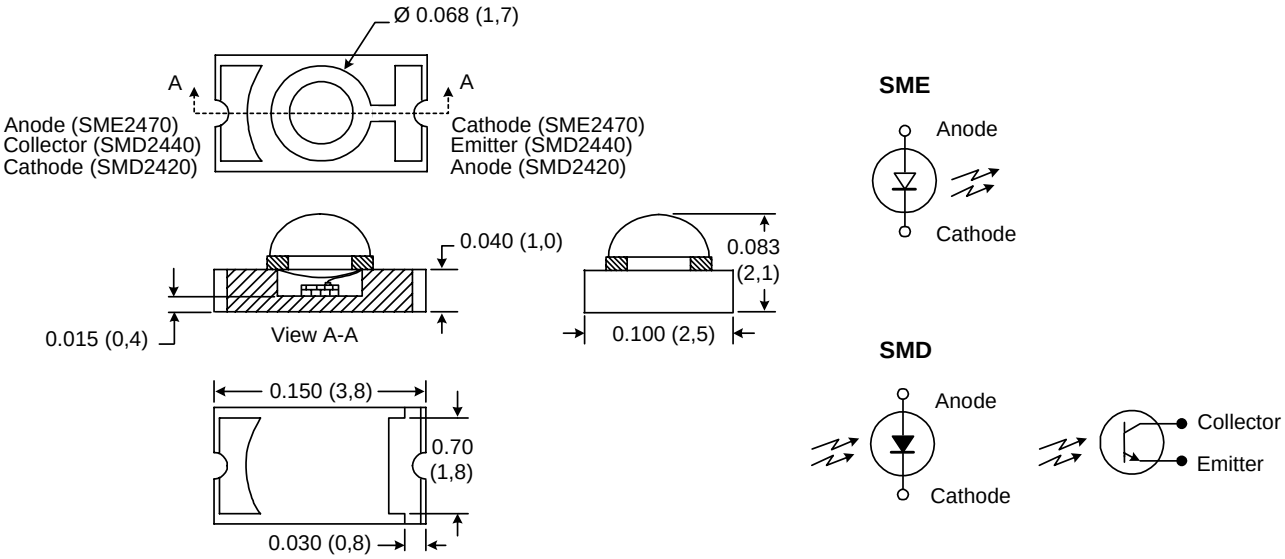
SMD2420 Switching Time Test Circuit



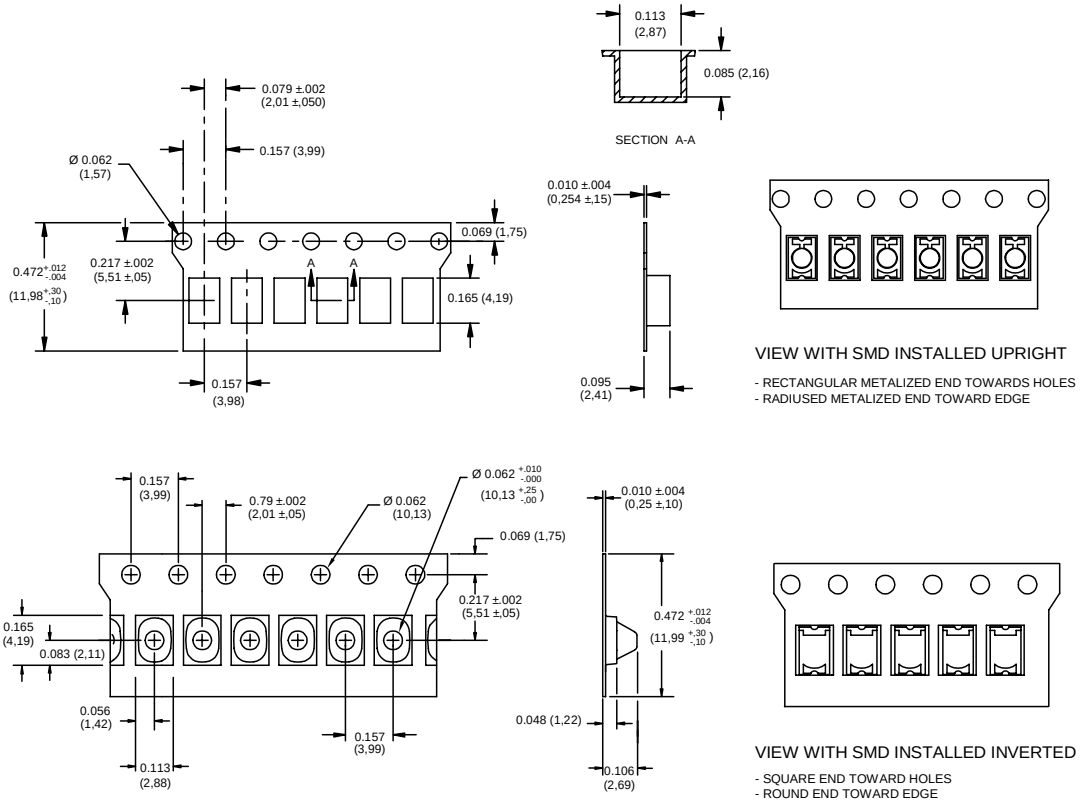
SMD2420 Switching Waveform



SME2470, SMD2440, SMD2420 OUTLINE DIMENSIONS in./(mm) (for reference only)



TAPE AND REEL MOUNTING CONFIGURATIONS: EIA STD 12 mm tape and reel with a 4 mm pitch in.(mm)



Infrared Components

Ceramic Discrete Surface Mount

SME/SMD Series

ORDER GUIDE

Catalog Listing	Description
SME2470-001	Bulk Packaged, Surface Mount IR Emitter
SMD2420-001	Bulk Packaged, Surface Mount Photodiode
SMD2440-001	Bulk Packaged, Surface Mount Phototransistor
SMD2440-002	Bulk Packaged, Surface Mount Phototransistor
SME2470-011	Tape and Reel, Inverted, Surface Mount IR Emitter
SMD2420-011	Tape and Reel, Inverted, Surface Mount Photodiode
SMD2440-011	Tape and Reel, Inverted, Surface Mount Phototransistor
SMD2440-012	Tape and Reel, Inverted, Surface Mount Phototransistor
SME2470-021	Tape and Reel Upright, Surface Mount IR Emitter
SMD2420-021	Tape and Reel, Upright, Surface Mount Photodiode
SMD2440-021	Tape and Reel, Upright, Surface Mount Phototransistor
SMD2440-022	Tape and Reel, Upright, Surface Mount Phototransistor

WARRANTY/REMEDY

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1-800-737-3360 (Canada)
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1-815-235-6545 (USA)

INTERNET

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info@micro.honeywell.com

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Infrared Components

Plastic Discrete Surface Mount Emitters and Detectors

SME/SMD Series

FEATURES

- Small package size
- Compatible with automated solder processes:
  - IR reflow
  - conductive epoxy
  - vapor phase reflow
  - convection oven
- Helps eliminate mixed technology PC boards
- Will operate in a DC or pulse mode for increased output
- Light pipe compatible
- Top-emitting and sensing area
- Low profile, small size for flexible layout of multiple channels and custom arrays
- Tape and reel packaging option - pick and place machine compatible

APPLICATIONS

- Optical encoders for motion control
- Computer peripherals
- Vending and point-of-sale applications
- Smoke detectors
- Medical equipment

The SME6700 and SMD6400 Series surface mount infrared components are small plastic packages (2,8 mm x 3,2 mm x 1,5 mm/ 0.110 in x 0.126 in x 0.073 in) in an un-lensed, top emitting and sensing package.

These surface mount infrared components are designed for high density placement by automatic assembly machinery.

The SME6700 is an aluminum gallium arsenide infrared emitting diode (IRED). This component supplies optimum optical characteristics and can be used with the SMD6400 phototransistor. The small size and high power dissipation properties of the IRED promote PC (Printed Circuit) board miniaturization and high density placement.

These surface mount infrared components are available in bulk, or on tape and reel for use with automatic placement equipment.

SME6700 SERIES IRED ABSOLUTE MAXIMUM RATINGS

Power dissipation @ 25 °C[1]	100 mW
Continuous forward current	100 mA (mounted on a PC board)
Reverse voltage (I_F = 10 µA)	5 V
Operating free air temperature range	-40 °C to +85 °C (-104 °F to +185 °F)
Storage temperature	-40 °C to +85 °C (-104 °F to +185 °F)
Soldering temperature	260 °C (500 °F), 10 seconds max.

CAUTION
STRESS DAMAGE
Functional operation of the device at or above "Absolute Maximum Ratings" for extended periods of time may affect reliability.
Failure to comply with these instructions may result in product damage.

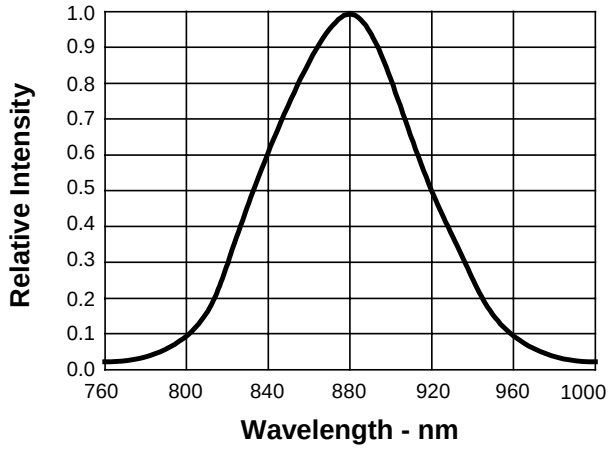
Note:
1. Derate 0.78 mW/°C above 25 °C ambient.

SME6700 SERIES IRED ELECTRICAL CHARACTERISTICS (at 25 °C unless otherwise noted)

Parameter	Test Conditions	Sym.	Min.	Typ.	Max.	Units
Irradiance -001	I_F = 50 mA measured into 2,06 mm (0.081 in) dia. aperture located 18,16 mm (0.715 in) from the emitting surface	I_e	.40	.52		mW/cm^2
Forward voltage	I_F = 50 mA	V_F			1.8	V
Reverse breakdown voltage	I_R = 1 µA	V_R	5.0			V
Peak output wavelength	I_F = 50 mA	λ		880		nm
Spectral bandwidth	I_F = 50 mA	$-\lambda$		80		nm
Temperature coefficient of λ_P		$-\lambda_P/-\lambda$		0.2		nm/°C
Beam angle[1]	I_F = constant	θ		120		deg.
Radiation rise/fall time	10 µsec pulse width	t_R t_F		0.7		Ts

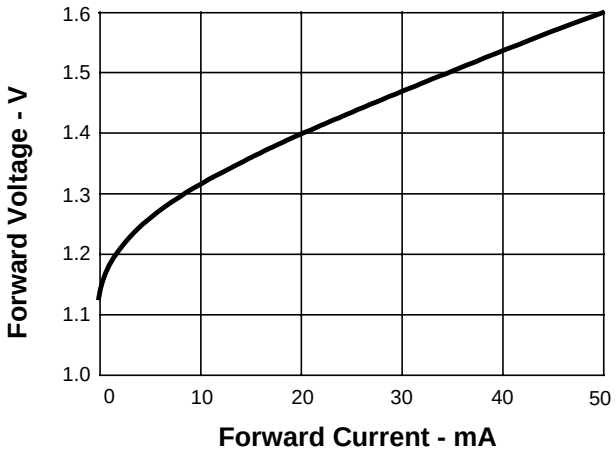
Note:
1. Beam angle is defined as the total included angle between the half power points.

TYPICAL IRED PERFORMANCE CHARACTERISTICS
SME6700 Spectral Bandwidth

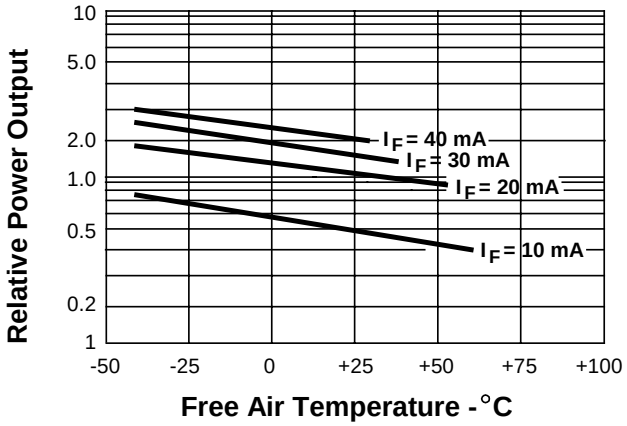


TYPICAL IRED PERFORMANCE CHARACTERISTICS (when solder mounted to PC board)

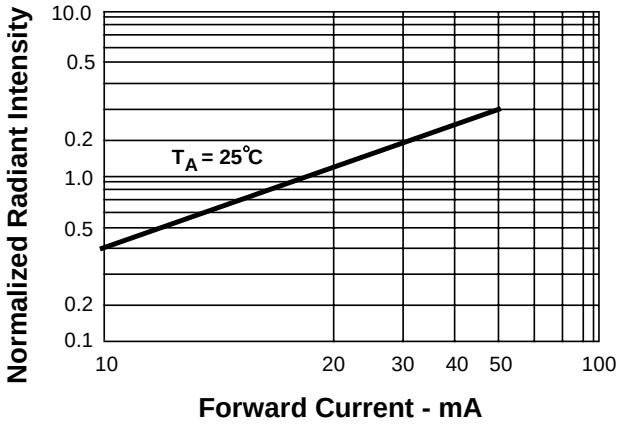
SME6700 Forward Current vs Forward Voltage



SME6700 Irradiance vs Temperature



SME6700 Irradiance vs Forward Current



SMD6400 SERIES PHOTOTRANSISTOR ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

Collector-emitter voltage	35 V
Emitter-collector voltage	5 V
Continuous device dissipation(1)	100 mW
Operating free air range	-40 °C to +85 °C (-104 °F to +185 °F)
Storage temperature	-40 °C to +85 °C (-104 °F to +185 °F)
Soldering temperature	260 °C (500 °F), 5 seconds max.

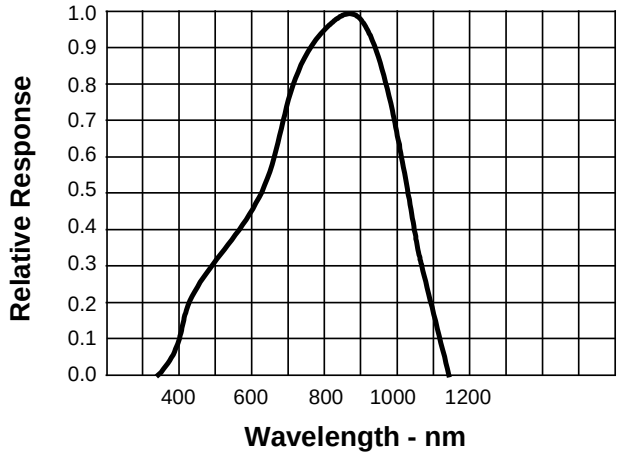
Note:
1. Derate 2.2 mW/°C above 25 °C ambient.

SMD6400 SERIES PHOTOTRANSISTOR ELECTRICAL CHARACTERISTICS

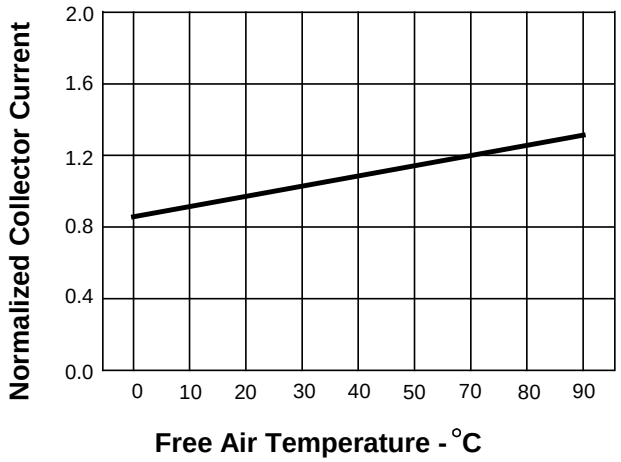
Parameter		Test Conditions	Sym.	Min.	Typ.	Max.	Units
Light current(1)	-001	H = 0.1 mW/cm^2, V_{ce} = 5 V	I_c	16			µA
	-002			16		32	µA
	-003			25		50	µA
	-004			40			µA
Dark current		V_{ce} = 25 V, H = 0	I_{ceo}			200	nA
Collector breakdown voltage		I_c = 100 µA, H = 0	BV_{ceo}	35			V
Emitter breakdown voltage		I_e = 100 µA, H = 0	BV_{eco}	5			V
Saturation voltage (C to E)		I_c = 0.3 x $I_{C\ MINIMUM}$, H = 0.1 mW/cm^2	$V_{ce(SAT)}$			0.15	V
Peak response wavelength			λ		935		nm
Angular response(2)		I_f = constant	θ		120		deg.
Rise time		I_c = 1 mA, V_{ce} = 5 V, R_L = 1000 Ω	t_R		6 - 8		µs
Fall time			t_F		6 - 8		µs

Notes:
1. The radiation source is an IRED with a peak wavelength of 935 nm.
2. Angular response is defined as the total included angle between the half sensitivity points.

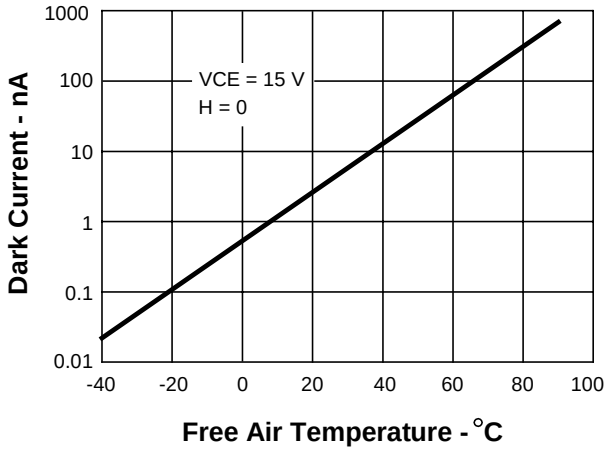
SMD6400 Spectral Responsivity



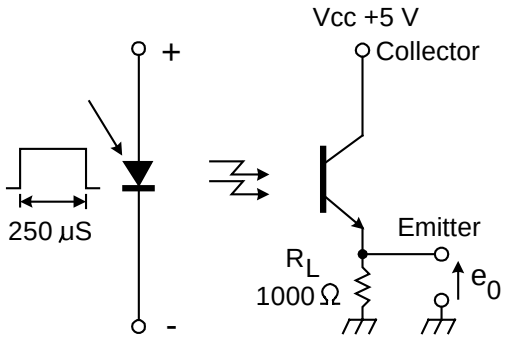
SMD6400 Collector Current vs Ambient Temperature



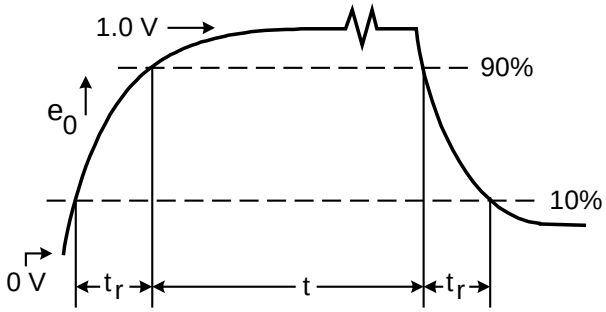
SMD6400 Dark Current vs Temperature



SMD6400 Switching Time Test Circuit



SMD6400 Switching Waveform



Infrared Components

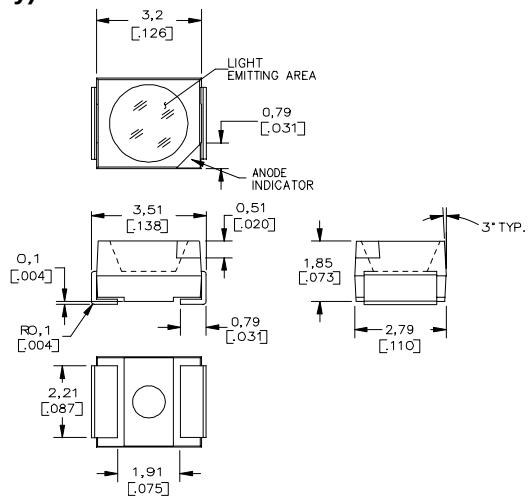
Plastic Discrete Surface Mount Emitters and Detectors *SME/SMD Series*

ORDER GUIDE

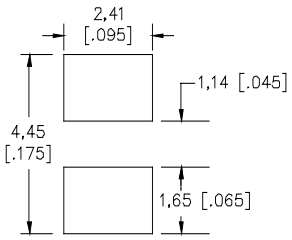
Catalog Listing	Description
SME6700-001B	Bulk Packaged, Surface Mount IR Emitter
SMD6400-001B	Bulk Packaged, Surface Mount Phototransistor
SMD6400-002B	Bulk Packaged, Surface Mount Phototransistor
SMD6400-003B	Bulk Packaged, Surface Mount Phototransistor
SMD6400-004B	Bulk Packaged, Surface Mount Phototransistor
SME6700-001T	Tape and Reel*, Surface Mount IR Emitter
SMD6400-001T	Tape and Reel*, Surface Phototransistor
SMD6400-002T	Tape and Reel*, Surface Phototransistor
SMD6400-003T	Tape and Reel*, Surface Phototransistor
SMD6400-004T	Tape and Reel*, Surface Phototransistor

*EIA STD 12 mm Tape and Reel with a 4 mm pitch. Consult factory for details.

SME6700 and SMD6400 OUTLINE DIMENSIONS mm/(in) (for reference only)



RECOMMENDED SOLDER PAD LAYOUT mm/(in)



WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective material and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during that period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

While we provide application assistance, personally, through our literature, and through the Honeywell website, it is up to the customer to determine the suitability of the product in the application.

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For application assistance, current specifications, or name of the nearest Authorized Distributor, contact a nearby sales office. Or call:

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1-815-235-6847 International

FAX

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Honeywell

GMS-10 RVS Series

Oxygen Sensors
Accurate oxygen measurement

DESCRIPTION

The GMS-10 is a high-accuracy oxygen sensor suitable for many applications. Originally developed for boiler applications, the product range has been extended to offer versions suitable for oxygen monitoring on board commercial and military aircraft, exhaust gas testing for automotive and medical test equipment. The sensor employs two ZrO_2 discs with a small hermetically sealed chamber in between. One of the discs functions as a reversible oxygen pump, which is used to successively fill and empty the chamber. The second disc measures the ratio of the partial pressure difference and generates a corresponding sense voltage. A heat element produces the 700 °C required for the ZrO_2 to operate as an O_2 pump. The time taken for the pump to achieve specific minimum and maximum pressures within this chamber is a measure of the partial oxygen pressure of the environment.

The GMS-10 has to be operated by an electronic measuring circuit that controls the sensor operation and signal processing. This circuit can either be incorporated into the customer's own electronics, or be purchased as a separate box of electronics from Honeywell.

FEATURES

- High-accuracy measurement
- Low power consumption
- No reference gas required
- Linear output signal
- No need for temperature stabilization
- Function testing and calibration in ambient air
- Long life

TYPICAL APPLICATIONS

- Heating boiler control
- Industrial process control
- Control of aircraft on board oxygen generation systems
- Automotive exhaust gas diagnostics
- Service instruments
- Monitoring environmental oxygen

⚠ WARNING

MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

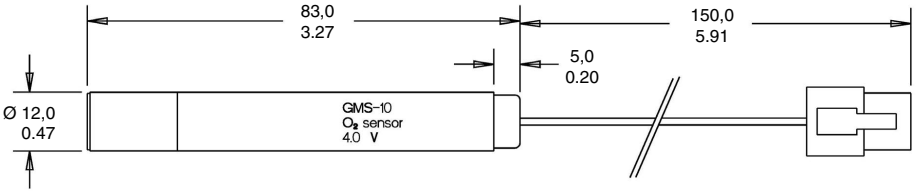
⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

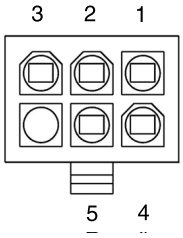
Failure to comply with these instructions could result in death or serious injury.

MOUNTING DIMENSIONS IN MM/INCHES (FOR REFERENCE ONLY)



WIRING DIAGRAM

Heater	(3&5)	Yellow
Pump	(1)	Red
Common	(2)	Black
Sense	(4)	Blue



TECHNICAL DATA

Electrical Characteristics	
Sensor voltage levels (recommended), V	45-64-85 mV
Pump current (recommended), A	40 uA
Heater supply, V/A	4.0 V (1.7A)
Heater supply (stand by)	2.0 V
Pump resistance at 700 °C, Ohm	dc 1 kOhm (typ.) ac 1 kHz 120 Ohm (typ.)
Operational specifications	
Oxygen pressure range	2 mbar – 3 bar
Operational temperature	700 °C
Stand by temperature	500 °C (typ.)
Sensitivity	1.05 ms/mbar
Accuracy	< 5 mbar
Response time	< 15 s
Warm up time	< 100 s
Warm up time (from stand by)	< 20 s
Permissable gas temperature	-100 /+250 °C
Gas flow rate	0-10 m/s
Mechanical characteristics	
Repetitive permissable acceleration	5 g
Incidental permissable acceleration	30 g

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

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SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

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Internet: www.honeywell.com/sensing

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USA/Canada	+1-800-537-6945
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September 2004

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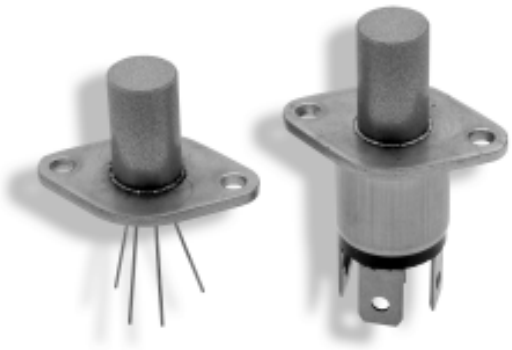

KGZ-10 Series

Oxygen Sensors
Accurate oxygen measurement

DESCRIPTION

The KGZ-10 is a high-accuracy oxygen sensor suitable for many applications. Originally developed for boiler applications, the product range has been extended to offer versions suitable for oxygen monitoring on board commercial and military aircraft, exhaust gas testing for automotive and medical test equipment. The sensor employs two ZrO_2 discs with a small hermetically sealed chamber in between. One of the discs functions as a reversible oxygen pump, which is used to successively fill and empty the chamber. The second disc measures the ratio of the partial pressure difference and generates a corresponding sense voltage. A heat element produces the 700 °C required for the ZrO_2 to operate as an O_2 pump. The time taken for the pump to achieve specific minimum and maximum pressures within this chamber is a measure of the partial oxygen pressure of the environment.

The KGZ-10 has to be operated by an electronic measuring circuit that controls the sensor operation and signal processing. This circuit can either be incorporated into the customer's own electronics, or be purchased as a separate box of electronics from Honeywell.

FEATURES

- High-accuracy measurement
- Low power consumption
- No reference gas required
- Linear output signal
- No need for temperature stabilization
- Function testing and calibration in ambient air
- Long life

TYPICAL APPLICATIONS

- Heating boiler control
- Industrial process control
- Control of aircraft on board oxygen generation systems
- Automotive exhaust gas diagnostics
- Service instruments
- Monitoring environmental oxygen
- Agriculture, composting, fruit storage

ORDER GUIDE

Description	Catalogue Listing
Oxygen Sensor	KGZ-10
Oxygen Sensor	KGZ-10SP

⚠ WARNING

MISUSE OF DOCUMENTATION

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Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

PERSONAL INJURY

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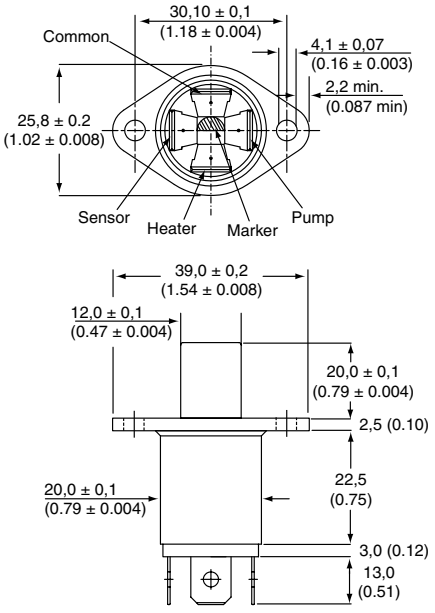
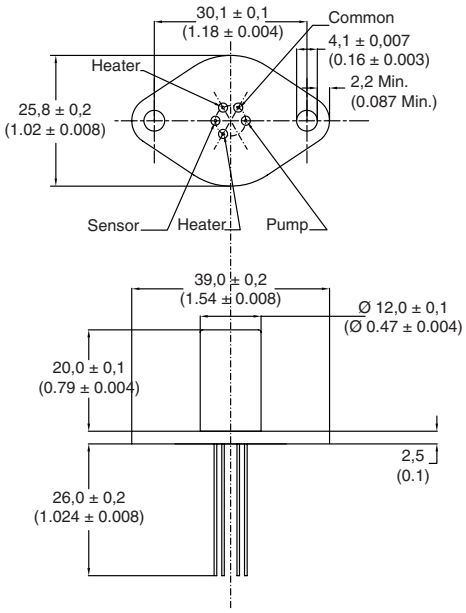
MOUNTING DIMENSIONS IN MM (INCHES) FOR REFERENCE ONLY

KGZ-10



KGZ-10SP



TECHNICAL DATA

Electrical Characteristics	
Sensor voltage levels (recommended), V	45-64-85 mV
Pump current (recommended), A	40 uA
Heater supply, V/A	4.35 V (1.85 A)
Heater supply (stand by)	2.0 V
Pump resistance at 700 °C, Ohm	dc 1 kOhm (typ.) ac 1 kHz 120 Ohm (typ.)
Operational specifications	
Oxygen pressure range	2 mbar – 3 bar
Operational temperature	700 °C
Stand by temperature	500 °C (typ.)
Sensitivity	1.05 ms/mbar
Accuracy	< 5 mbar
Response time	< 4 s
Warm up time	< 100 s
Warm up time (from stand by)	< 20 s
Permissable gas temperature	-100 /+250 °C
Gas flow rate	0-10 m/s
Mechanical characteristics	
Repetitive permissable acceleration	5 g
Incidental permissable acceleration	30 g

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September 2004

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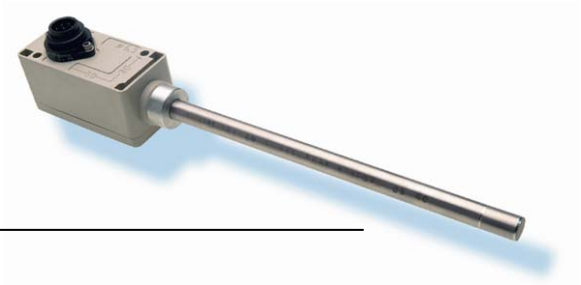
MF010 Series Low Temperature and MF020 Series High Temperature

Oxygen Sensors



DESCRIPTION

The MF010 Series Low Temperature Oxygen Sensors is designed to determine the oxygen concentration in air or inert gas mixtures with temperatures of -100 °C to 250 °C [-148 °F to 482 °F] max. The MF020 Series High Temperature Oxygen Sensors is designed to determine the oxygen concentration in air or inert gas mixtures with temperatures of -100 °C to 400 °C [-148 °F to 752 °F] max.

These products are particularly suitable for measuring oxygen in areas that are not easily accessible, or in closed systems, such as ventilation pipes and containers. The MF010 and MF020 Series may both be supplied with a measuring range of 0.1 vol%O_2 to 25 vol%O_2 and 0.1 vol%O_2 to 100 vol%O_2. The entire measurement range is linear for both series.

The sensor detects the gas mixture's oxygen partial pressure (absolute oxygen content) by using a dynamic process that occurs on two zirconium dioxide discs which form a hermetically sealed chamber. Because no chemical substances are used, the sensor exhibits significantly longer service life than an electrochemical sensor.

The actual oxygen sensor is mounted in the tip of the bar probe and is protected by a stainless-steel sintered disk which serves as a flame back-flash stop. The water-proof plastic housing accommodates the electronics and is mechanically connected to the bar probe.

Sensor electronics include:

1. Signal amplifier
2. Control for the ionic pump with an analog component
3. Test component
4. Internal monitoring logic component
5. Power supply for the sensor heating element and the analog and digital components
6. Reset
7. Voltage monitor
8. Analog output
9. Bi-directional digital output
10. Internal potentiometer

The sensor outputs the measured values via an analog channel (4 mA to 20 mA or 0 V to 10 V) and a digital channel (also provides any error signals) which are evaluated and further processed in a user-specified external mounting device such as a fuel controller, display, measuring instrument, programmable logic controller or ventilation system.

Both series may be calibrated manually or self-calibrated using atmospheric air instead of a reference gas. The sensor can also conduct external operational self-tests.

Both series may also operate in a fault-proof mode. The sensor self-monitors during operation and provides error signal output. A second oxygen sensor is not necessary.

FEATURES

- No moving parts
- Low power consumption
- No need for temperature stabilization
- Functional testing and calibration in ambient air
- Long life

POTENTIAL APPLICATIONS

- Furnace/heating boiler control
- Industrial process control
- Combustion systems
- Compost systems
- Environmental control

TABLE 1. MF010 SERIES SPECIFICATIONS AND ORDER INFORMATION

Characteristic	Catalog Listing			
	MF010-0-LC1 MF010-1-LC1 MF010-2-LC1	**MF010-0-LC2 MF010-1-LC2 MF010-2-LC2**	**MF010-0-LC3 MF010-1-LC3 MF010-2-LC3**	**MF010-0-LC4 MF010-1-LC4 MF010-2-LC4**
Temperature range at probe tip	-100 °C to 250 °C [-148 °F to 482 °F]			
Output	0 Vdc to 10 Vdc		4 mA to 20 mA	
O_2 range (O_2 partial pressure) with equivalent O_2 output	1 mbar to 250 mbar 0.1 vol%O_2 to 25 vol%O_2	1 mbar to 1000 mbar 0.1 vol%O_2 to 100 vol%O_2	1 mbar to 250 mbar 0.1 vol%O_2 to 25 vol%O_2	1 mbar to 1000 mbar 0.1 vol%O_2 to 100 vol%O_2
Probe length:				
-0-LXX	220 mm [8.7 in]			
-1-LXX	400 mm [15.7 in]			
-2-LXX	600 mm [23.6 in]			

TABLE 2. MF020 SERIES SPECIFICATIONS AND ORDER INFORMATION

Characteristic	Catalog Listing			
	MF020-0-LC1 MF020-1-LC1 MF020-2-LC1	**MF020-0-LC2 MF020-1-LC2 MF020-2-LC2**	**MF020-0-LC3 MF020-1-LC3 MF020-2-LC3**	**MF020-0-LC4 MF020-1-LC4 MF020-2-LC4**
Temperature range at probe tip	-100 °C to 400 °C [-148 °F to 752 °F]			
Output	0 Vdc to 10 Vdc		4 mA to 20 mA	
O_2 range (O_2 partial pressure) with equivalent O_2 output	1 mbar to 250 mbar 0.1 vol%O_2 to 25 vol%O_2	1 mbar to 1000 mbar 0.1 vol%O_2 to 100 vol%O_2	1 mbar to 250 mbar 0.1 vol%O_2 to 25 vol%O_2	1 mbar to 1000 mbar 0.1 vol%O_2 to 100 vol%O_2
Probe length:				
-0-LXX	220 mm [8.7 in]			
-1-LXX	400 mm [15.7 in]			
-2-LXX	600 mm [23.6 in]			

TABLE 3. MF010 AND MF020 SERIES GENERAL SPECIFICATIONS

Characteristic	Parameter
Supply voltage	24 Vdc ±5%
Supply current	500 mA
Ambient temperature (includes solar radiation	-10° C to 50° C [14 °F to 122 °F]
Resolution	12 bit
Heat-up time	approx. 10 min
Accuracy	±2% FS (Full Scale)
Reproducibility	±1% FS (Full Scale)
Gas flow rate	0 m/s to 10 m/s
Reaction time	approx. 3 s
Incidental permissible acceleration	30 g
Repetitive permissible acceleration	5 g
Bar probe material	stainless steel 1.4301
Housing material	Makrolon 8030 (30% GV), UL94 V-1
Housing sealing	IP65
Connector sealing	IP67
Weight (without bar probe)	150 g [5.3 oz]
Termination (female connector)	99-4226-14-07 (Binder 693 series)
Certification	complies with EMC directives EN 50082-2 and EN 50081-1 and directives 89/336/EWG and 92/31/EWG

FIGURE 1. DIMENSIONAL DRAWING AND PINOUT (For reference only: mm/in.)

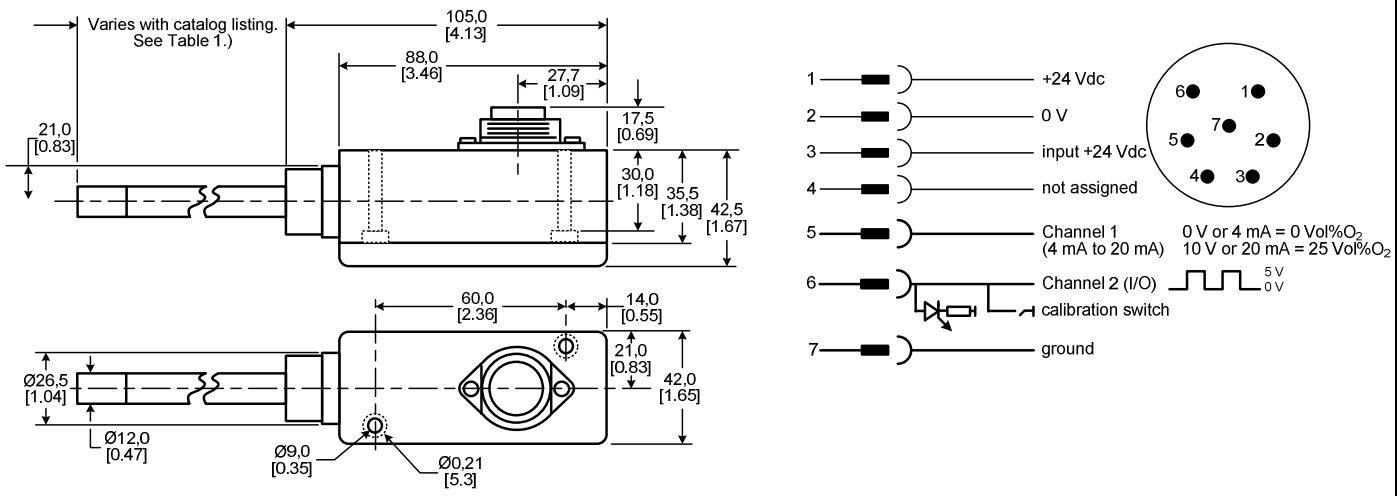


FIGURE 2. SYSTEM BLOCK DIAGRAM

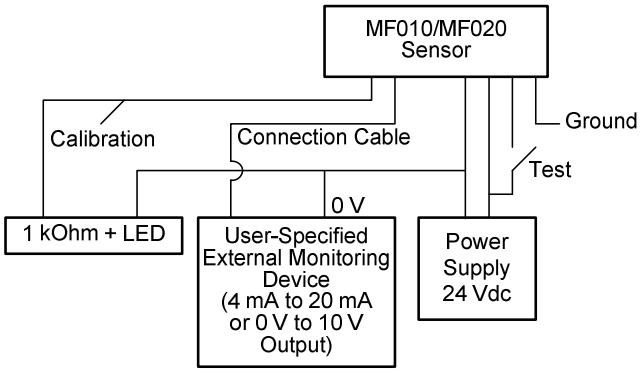
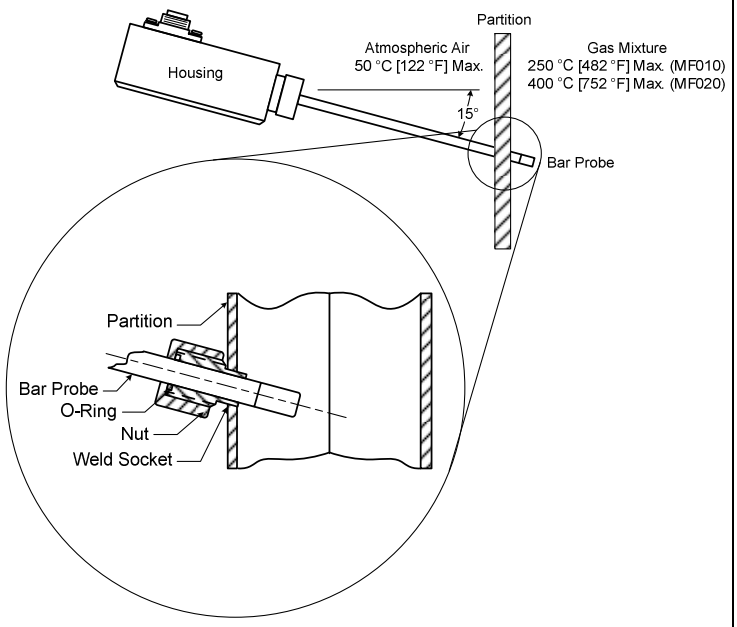


FIGURE 3. SENSOR MOUNTING



ORDER GUIDE

Catalog Listing	Description
MF010 Series	Low temperature oxygen sensor (See Table 1 for specifics.)
MF020 Series	High temperature oxygen sensor (See Table 2 for specifics.)

⚠ WARNING

PERSONAL INJURY

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WARRANTY/REMEDY

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Honeywell

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Honeywell

Oxymac50, DE800 and Elecdit

Oxygen Sensor Interface Boards
Accurate oxygen measurement

DESCRIPTION

The Oxymac 50, Elecdit and DE800 sensor interface boards are control and measurement devices for Honeywell's range of dynamic highly accurate oxygen sensors. The ability of these sensors to operate without any reference gas makes them ideal for many applications including combustion and environmental control.

Honeywell oxygen sensors using zirconia based sensing elements require external connection to an electronic measuring circuit to control sensor operation and signal processing. A heating element on the sensor produces the 700 °C required for the ZrO_2 to achieve its operational temperature. These interface boards supply the sensor with the necessary circuits to provide this control and processing, while also providing sensor calibration. The DE800 interface also includes the heater supply, Oxymac50 and Elecdit require an external heater power supply .

Oxymac50 is a recently upgraded interface that offers similar performance to the Elecdit board but operates from a 24 Vdc power supply.

The DE800 interface offers the features of the Oxymac50 but also contains the heating element power source.

The Elecdit interface was developed for Industrial applications and offers a level of noise protection. It operates from a ±15 V supply.

Oxymac50 and DE800 are the recommended interfaces for new applications.

The interfaces are supplied ready for mounting into customers' enclosures. Oxymac50 a 15-pin D type connector, DE800 has screw connector block and Elecdit has 2,5 mm x 2,5 mm (0.1 in x 0.1 in) pin connector.

FEATURES

- Provides the necessary circuits to control Honeywell oxygen sensors
- Functional testing and calibration in ambient air
- PCB board format
- Linear output of measured oxygen content in voltage or current format
- Low power consumption

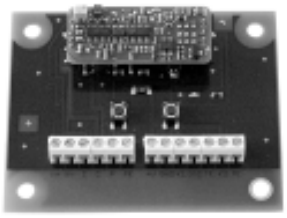
BENEFITS

- Removes the need to implement sensor control circuits within customers' equipment
- Removes effects of barometric or application pressure changes and sensor drift for best accuracy
- Ease of mounting and access for calibration
- Flexible interconnection
- Lower running costs

TYPICAL APPLICATIONS

- Heating boiler control
- Industrial process control
- Combustion systems
- Compost systems
- Environmental control
- Medical
- Aerospace

Oxymac50, DE800 and Elecdit



TECHNICAL DATA

	Oxymac50	DE800	Elecdit
Measuring range	0 % to 25 % oxygen (standard) 0 % to 100 % oxygen (option)		
Power source	+24 Vdc ±20 %	+24 Vdc ±20 %	±15 Vdc ±10 %
Other inputs	Ext Calibration, Sensor Pump, Sense and Common, Test	Ext Calibration, Sensor Pump, Sense, Common, Heater, Test	Ext Calibration, Sensor Pump, Sense and Common
Power consumption (interface)	<250 mW	<500 mW	<250 mW
Outputs	0 V to 10 V, 4 mA to 20 mA(1)	4 mA to 20 mA, 0 V to 10 V(1), Pulse	0 V to 10 V, LED drive
Accuracy	2 % full scale		
Resolution	0.04 V		
Operating temperature	-10 °C to 60 °C		
Storage temperature	-10 °C to 50 °C		
Dimensions	63 mm x 108 mm, 4 mm Ø mounting holes	80 mm x 100 mm, 6,5 mm Ø mounting holes	60 mm x 42 mm x 17 mm
Connector	15 pin male D connector	Screw connector block	2 x 5 pin 2,5 mm x 2,5mm
Mates with type	GMS-10, KGZ-10, KGZ-12		

Notes: For warm up time and other sensor characteristics refer to datasheet 100470-EN

(1) Factory set to voltage or current output

OPERATING AND CALIBRATION NOTES

Oxymac50

1. Reset of the Oxymac50 is possible by putting the power off/on.
2. The output signal can be 0 V to 10 V or 4 mA to 20 mA. The output signal is factory set by the solder bridge JP1.
3. A proper operation of a connected sensor and electronic circuit can be tested with the test switch or with an external signal. After switching the test function the output signal should indicate a 20 % lower value.
4. LED indication - proper sensor operation is indicated by blinking of LED D3.
5. Calibration - sensor and Oxymac circuit can be calibrated in normal air. After a loss of power the Oxymac50 circuit stores the calibration value.

DE800

1. Heater adjustment - the heater voltage of the sensor can be adjusted with pot meter PC419.
2. Test function - after pressing the test button, the output has to go to a 20% lower output signal. Testing with an external (24 V) signal is possible via terminal TE.
3. Calibration - the sensor can be calibrated in normal air with the calibration button. Calibration is lost after power loss.
4. LED -if the sensor is functioning properly, the LED D4 is blinking.
5. Signal out - if the sensor is functioning properly a pulse signal can be measured at terminal K2.

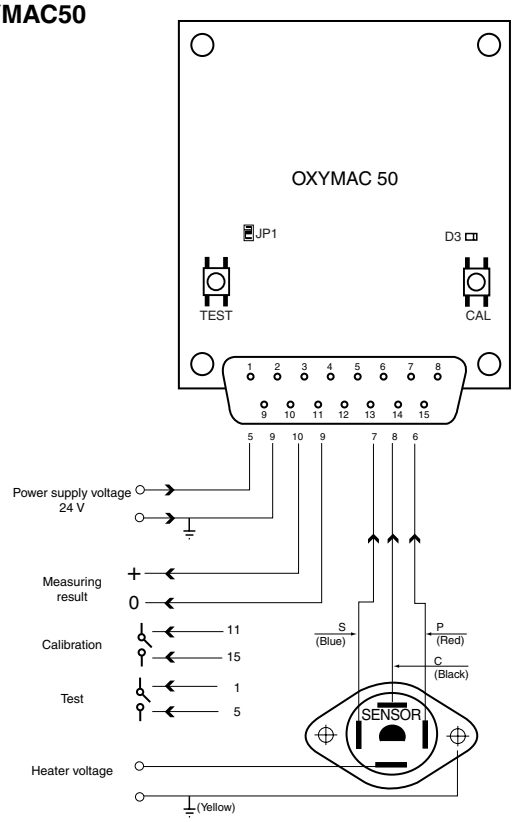
Elecdit

Adjustment/calibration procedure. *The interface is factory set, for sensor replacement follow these instructions.*

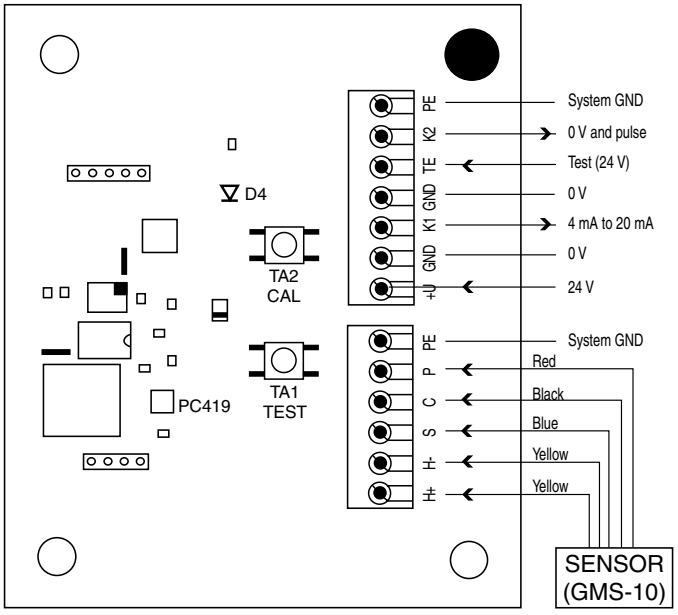
1. Adjust with Pot1 12 V (internal ±6 V) at Pin 2.
2. Adjust with Pot2 reference at Pin 1 to 10 V ±0.2 V.
3. After approx 60 s an impulse (blinking) signal should be present at Pin 1. Apply at the sensor 95 mbar air, adjust with Pot5 at Pin 9 to 0.8 V. Then apply at the sensor 1013 mbar air and adjust with Pot3 at Pin 9 Uout to 8.3 V.
4. Adjust with Pot4 0 mV at Pin 10.
5. Adjust with Pot5 Uout to 0 V at Pin 9.

MOUNTING DRAWINGS, FOR REFERENCE ONLY

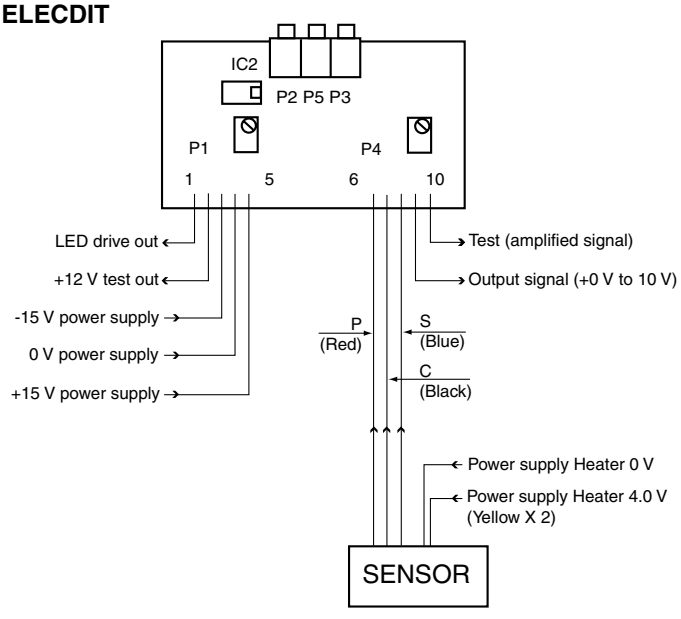
OXYMAC50



DE800



ELECDIT



ORDER GUIDE

Oxymac 50.V.1	Oxymac50 circuit, output 0 V to 10V, measuring range 0 % to 25 %
Oxymac 50.V.2	Oxymac50 circuit, output 0 V to 10V, measuring range 0 % to 100 %
Oxymac 50.A.1	Oxymac50 circuit, output 4 mA to 20mA, measuring range 0 % to 25 %
Oxymac 50.A.2	Oxymac50 circuit, output 4 mA to 20mA, measuring range 0 % to 100 %
DE800.V.1	DE800 circuit, output 0 V to 10V, measuring range 0 % to 25 %
DE800.V.2	DE800 circuit, output 0 V to 10V, measuring range 0 % to 100 %
DE800.A.1	DE800 circuit, output 4 mA to 20mA, measuring range 0 % to 25 %
DE800.A.2	DE800 circuit, output 4 mA to 20mA, measuring range 0 % to 100 %
Elecdit.V.1	Elecdit circuit, ouput 0 V to 10V, measuring range 0 % to 25 %
Elecdit.V.2	Elecdit circuit, ouput 0 V to 10V, measuring range 0 % to 100 %

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100480-EN UK07 GLO
May 2005

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HG1171 Series

6DF Inertial Measurement Unit

DESCRIPTION

The HG1171 Series is a six degrees of freedom (6DF) inertial measurement unit (IMU) that senses rotation rate about the roll, pitch and yaw axes (X, Y and Z axes) and acceleration along the longitudinal, lateral and vertical axes (X, Y and Z axes, see Figure 1 on page 2). This product is designed for enhanced accuracy of tracking and monitoring of vehicle/platform (up/down, left/right, forward/backward) in a hard mounted configuration.

It provides key data for automated steering and vehicle controls, freeing the operator to focus on machine functions, one of the main reasons customers use IMUs.

The HG1171 contains high performance MEMS (Micro Electromechanical Systems) rotation rate sensors (gyroscopes), whose function is based on the physical properties of the Coriolis effect, as well as enhanced precision integrated accelerometers for each axis.

High speed CAN bus (2.0 A or B) provides cost-effective, high-integrity serial data communications bus for real-time control applications operating at data rates up to 1 Mbit/s. This capability allows enhanced error detection and confinement.

KWP (Keyword Protocol) is used for self-test, health reporting, software loading and related tasks. KWP 2000 (or ISO14230) is a defined protocol for monitoring health and status of a unit on a CAN bus (primary use is for off-vehicle test equipment). It supports high speed IMU flashing for re-reprogramming.)

Customization of I/O timing, CAN labels, connectors, and other parameters allows the customer to specify changes in the IMU so it more readily fits into existing architecture on vehicle.

A temperature sensor in each rotation rate sensor provides a temperature value to the processing module where the samples are filtered and compensated. This information allows the customer's system to perform over a wide temperature range.

The tough metal housing is often ideal for demanding environments. The user may mount the product on the vehicle frame outside the cabin, anywhere an IMU is needed.

FEATURES

- 3-dimensional rotation rate and acceleration outputs (roll, pitch, yaw)
- High speed CAN bus
- Broad dynamic range
- Low noise
- High resolution
- Customizable
- Enhanced temperature performance
- Tough metal housing

POTENTIAL APPLICATIONS

Vehicle stability control systems on:

- Agricultural equipment such as tractors and harvesters to:
  - Provide motion control feedback (attitude/accleration) for leveling cutting blades, planters, tillers and other equipment when on slopes or hills
  - Improve automated steering capabilities by providing rotational rate change data to vehicle controls
  - Smooth GPS data (position and velocity) for use in high accuracy planting/tilling
- Construction equipment such as excavators, trucks, forestry equipment, loaders and graders to:
  - Improve operator awareness relative to equipment loading and extension envelopes on cranes and material/ telescopic handlers
  - Provide real time stability control in rugged and steep terrain
  - Provide active depth and angle control for graders
  - Provide motion compensation in GPS-guided automated vehicles

HG1171 Series

Table 1. General Specifications

Characteristic	Minimum	Typical	Maximum	Unit
Supply voltage (normal operation)	+7	+13.5	+17	V
Over voltage (output halted)	—	—	+26	V
Reverse voltage	—	—	-18	V
Supply current	—	—	+75	mA
Start up time	—	700	—	ms
Operating temperature	-40 [-40]	20 [68]	85 [185]	°C [°F]
Storage temperature	-40 [-40]	—	95 [203]]	°C [°F]
Vibration (10 Hz to 1000 Hz)	—	—	3.1	g (RMS)
Shock	—	100	—	g (half sine for 6 ms)
Humidity(1))	—	—	95%	—
Sealing	IP62K			
ESD (Electrostatic Discharge)(2)	Meets ISO 10605: – at ≤8 kV ESD protection for handling – at ≤15 kV protection for power			
Connector	AMP: 3-967-616-1, keying C mating cable harness			

Notes:

1. After exposure, including a condensing environment.
2. All exposed ports have low-pass filtering using trade-off methods which consider ESD protection, RF filtering and bandwidth. The ESD simulator waveform verification complies with ISO 10605 except for contact discharge rise time < 1 ns and air discharge rise time ≤ 20 ns.

Table 2. Rotation Rate Sensor Specifications

Characteristic	Minimum	Maximum	Unit
Measurement range	-75	75	°/s
Overload range(<60 ms recovery)	-1000	1000	°/s
Sensitivity error	-4	4	%
Linearity	-1	1	%
Offset (total)	-2.5	2.5	°/s
Offset drift (over temperature range)	-1	1	°/s
Offset drift speed (t > 3 min)	-0.2	0.2	°/s/min
Noise	—	0.2	°/s
Cross axis sensitivity	—	2	%
Turn on time	—	750	ms

Table 3. Acceleration Sensor Specifications

Characteristic	Minimum	Maximum	Unit
Measurement range	-17	17	m/s^2
Overload range(<60 ms recovery)	-100	100	m/s^2
Sensitivity error	-5	5	%
Linearity	-4	4	%
Offset (total)	-1	1	m/s^2
Offset drift (over temperature range)	-0.35	0.35	m/s^2
Offset drift speed (over 60 °K interval)	-0.2	0.2	m/s^2/min
Noise	—	0.1	m/s^2 (RMS)
Cross axis sensitivity	5	5	%
Turn on time	—	250	ms

Table 4. Software Resolution for Rotation Rates and Accelerations

Bit Position	Number of Bits
Vehicle Dynamic Rates	
34-47	14
—	—
—	—
Vehicle Dynamic Lateral and Longitudinal Acceleration	
22-31	10
—	—
—	—
Vehicle Dynamic Vertical Acceleration	
22-31	10
—	—
—	—

Figure 1. Axes of Motion

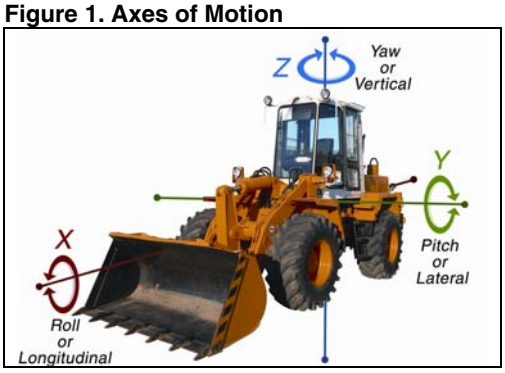


Figure 2. Block Diagram

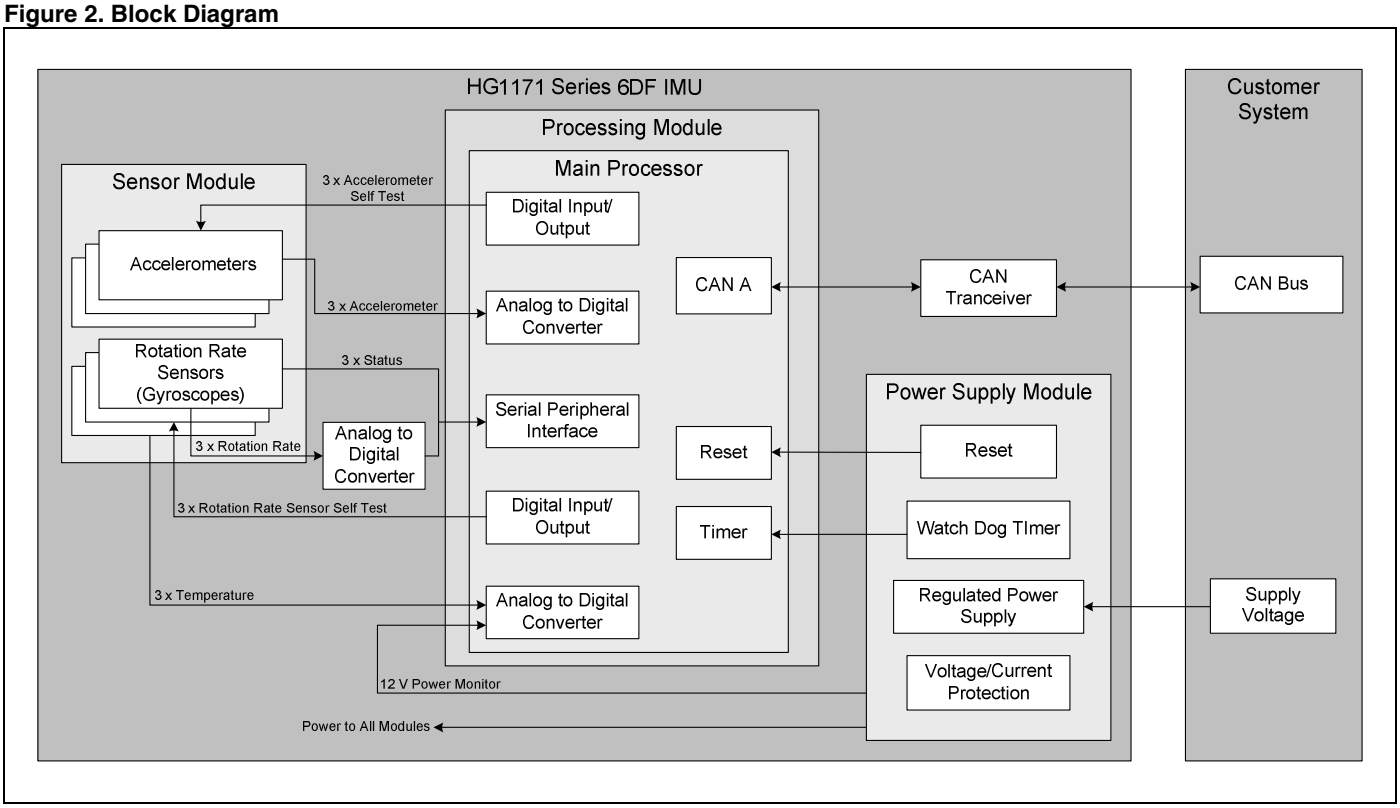
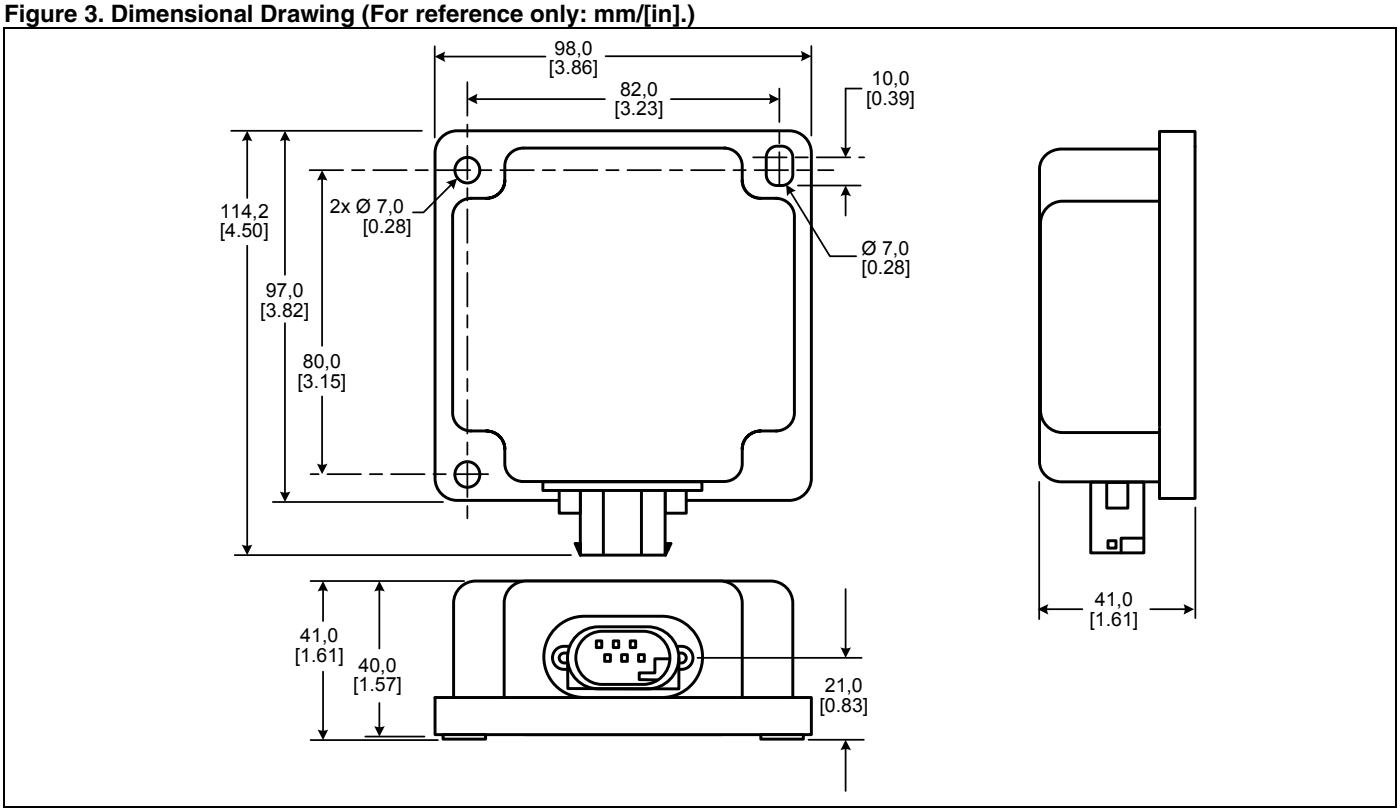


Figure 3. Dimensional Drawing (For reference only: mm/[in].)



Order Guide

Catalog LIsting	Description
HG1171BA01	HG1171 Series 6DF inertial measurement unit

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February 2008

Honeywell

LLE Series

Liquid level sensors

DESCRIPTION

The enhanced series of liquid level sensors incorporates a photo-transistor trigger which provides a digital output that denotes the presence or absence of liquid.

The mode of operation is derived from the principle of total internal reflection. An LED and photo-transistor are housed within a plastic dome at the head of the device. When no liquid is present, light from the LED is internally reflected from the dome to the photo-transistor. When liquid covers the dome, the effective refractive index at the dome-liquid boundary changes, allowing some light from the LED to escape. Thus the amount of light received by the photo-transistor is reduced and the output switches, indicating the presence of liquid. This method of liquid level sensing is very fast, and almost instantaneous for water.

FEATURES

- Solid state technology
- Small size
- Digital output
- Pre-wired
- Electrically robust

BENEFITS

- Accurate, repeatable switching point
- Can be mounted in applications where space is limited
- Microprocessor compatible
- Easy to install, saving assembly time
- Reverse polarity, over voltage, short circuit and transient protection

TYPICAL APPLICATIONS

- Home appliances
- Spa baths
- Vending machines
- Food and beverage
- Medical
- Compressors
- Machine tools
- Automotive

ORDER GUIDE

		Catalogue Listing	
Description		**Standard temperature**	**High temperature**
Screw In, M12 Thread, Plastic	(Type 1)	LLE101000	LLE101101
	(Type 2)	LLE102000	LLE102101
	(Type 3)	LLE103000	LLE103101
Push In, Plastic	(Type 5)	LLE105000	LLE105100
Screw In, ½ in, Metal	Nickel plated brass	LLE205000	LLE205100
	Stainless steel	LLE305000	LLE305100

LLE Series

TECHNICAL INFORMATION

Specifications		
Operation mode	User defined single point on/off switch (Output is high in air)	
Repeatability (mm)	± 1	
Hysteresis (mm)	2 (dependent on liquid)	
Response time	Rising liquid level - 50 µs Falling liquid level - 1 s max (in ethanol) Response in other liquids dependent on viscosity	
Mechanical		
Mounting	Type 1 and 2 - mounted from outside; Type 3 and 5 - mounted from inside	
Termination	250 mm flying leads (180 mm for metal versions)	
	Blue 0 V	
	Red +5 V to +12 V supply	
	Green Output	
Material [Note 1]	Polysulphone	
Dimensions	**Plastic** **LLE101/102/103 Series**	**Metal** **LLE205/305 Series**
Dome	3,5 mm radius (includes LLE105 Series)	
Thread	M12x1	½ in BSPT
Hex	19 mm	24 mm (See mounting drawings on page 3)
Environmental	**Standard temperature**	**High temperature**
Operating temperature (°C)	-25 to 80 (-13 °F to 176 °F)	-40 to 125 (-40 °F to 257 °F)
Storage temperature (°C)	-30 to 85 (-22 °F to 185 °F)	-40 to 125 (-40 °F to 257 °F)
Thermal testing	As per BS EN60068-2-33	
Humidity	As per BS EN60068-2-30	
Vibration	As per BS EN60068-2-6 Part S3: 1996	
Mechanical shock	As per BS EN60068-2-27 Part 2 Ea: 1987	
Pressure range (bar)	0 to 5 (plastic housing) [Note 2] 0 to 25 (metal housing)	
Ambient IR light limit (@ 940 nm) [Note 3]	10 mW/cm^2 in operation	
Electrical	**Standard temperature**	**High temperature**
Supply voltage (Vcc)	+5 Vdc to +12 Vdc ± 5 %	
Supply current (mA)	15 mA nominal @ +5 Vdc	5 mA nominal @ +5 Vdc
Output sink current [Note 4]	@ 25 °C 10 mA max.	@ 25 °C 40 mA max.
@ 5 Vdc supply	@ 80 °C 3 mA max.	@ 125 °C 7 mA max.

Notes:

[Note 1] Material compatibility information available on request.

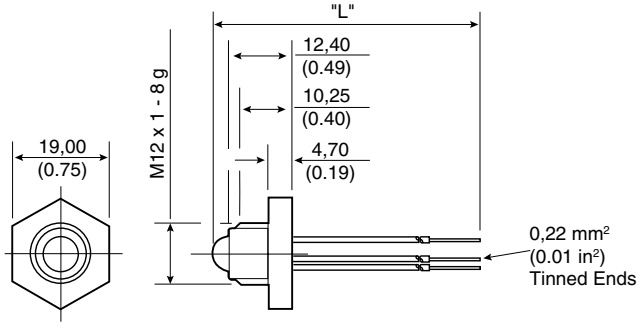
[Note 2] Threaded sensors only.

[Note 3] For other ambient light environments the user should test the sensor under application conditions to verify compatibility.

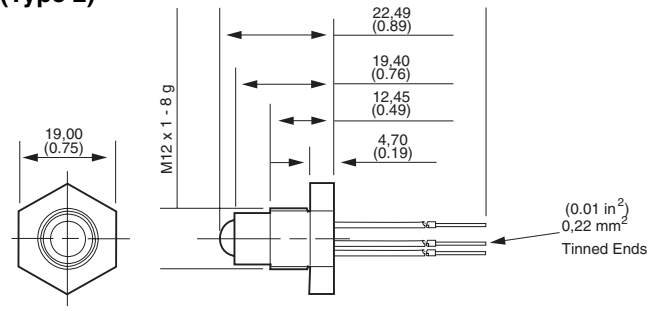
[Note 4] The output is intended as a TTL compatible output signal, for interfacing to logic systems. For interfacing with other types of circuitry an appropriate buffer circuit must be used.

MOUNTING DRAWING (IN MM AND INCHES)

LLE101000/LLE101101 (Type 1)



LLE102000/LLE102101 (Type 2)

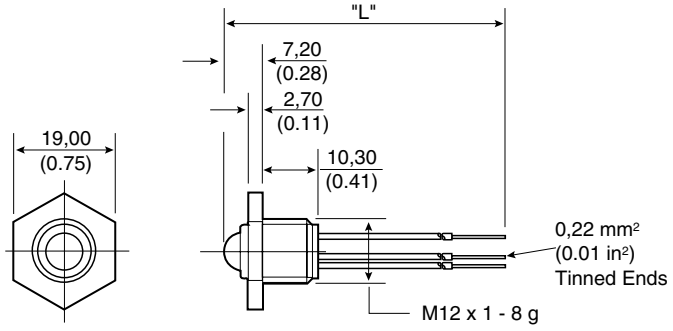


Notes

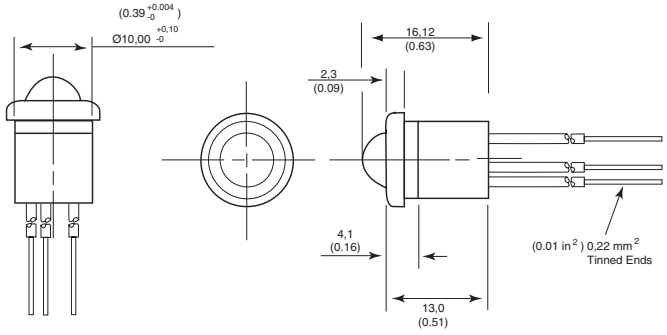
1 Recommended panel hole size Ø 12,5 ±0.3 mm (0.49 ±0.01 in)

2 'O' ring seal supplied Unassembled

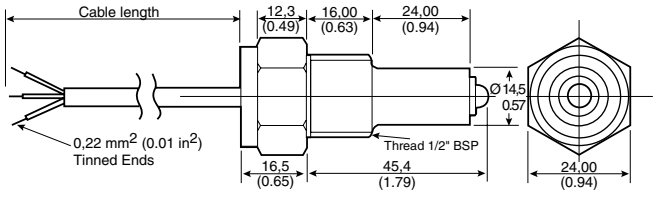
LLE103000/LLE103101 (Type 3)



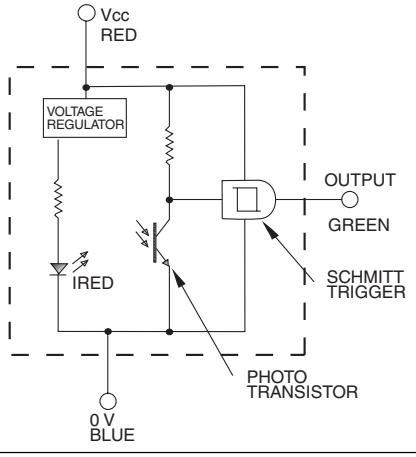
LLE105000/LLE105100 (Type 5)



LLE205000/LLE205100 LLE305000/LLE305100



ELECTRICAL DIAGRAM



⚠ WARNING

MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

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Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

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