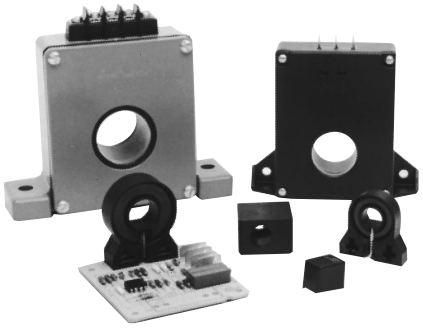


FEATURES
- Digital or linear output
- AC or DC current sensing
- Through-hole design
- Fast response time
- Output voltage isolation from input
- Minimum energy dissipation
- Maximum current limited only by conductor size
- Adjustable performance and built-in temperature compensation assures reliable 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.

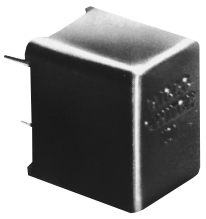
Sensitivity – The change in sensor output to 1 amp change in input. Units are in units/NI where N is number of times sensed current wire is looped thru sensor hole. For example, if sensed current wire is looped thru hole twice then sensitivity doubles; looped thru 3 times, sensitivity triples, etc.

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.

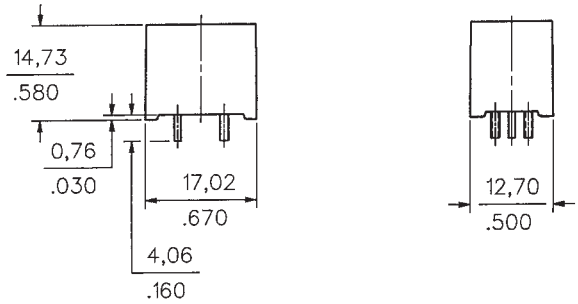
SERIES-CONNECT DIGITAL CURRENT SENSORS ORDER GUIDE, SINKING OUTPUT

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

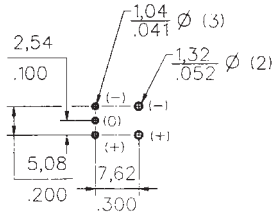
MOUNTING DIMENSIONS

(For reference only)

Key:
0,00=mm
0.00=in.



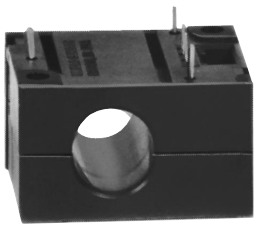
SUGGESTED HOLE CENTERS



View from component side of printed circuit board.

Solid State Sensors
Digital Current Sensors

CS Series



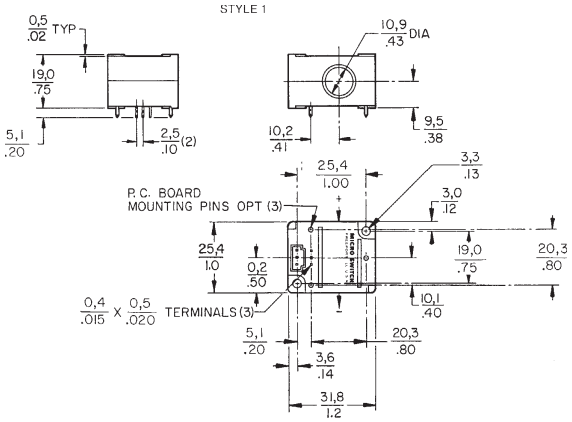
FEATURES
- Digital output
- AC or DC current sensing
- Through-hole design
- Output voltage isolation from input
- Minimum energy dissipation
- Maximum current limited only by conductor size
- Accurate, low cost sensing
- Operating temperature range –25 to 85°C

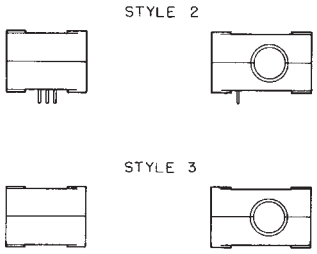
Digital Current Sensors
Each MICRO SWITCH CS series digital current sensor provides a logic level output that changes from approximately Vcc to 0.4 volts when the sensed current exceeds the operate point. Each digital sensor will operate on AC or DC current, but the output will turn off at every zero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

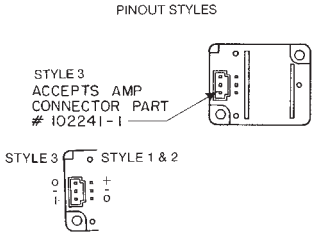
DIGITAL CURRENT DETECTORS ORDER GUIDE, SINKING OUTPUT

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

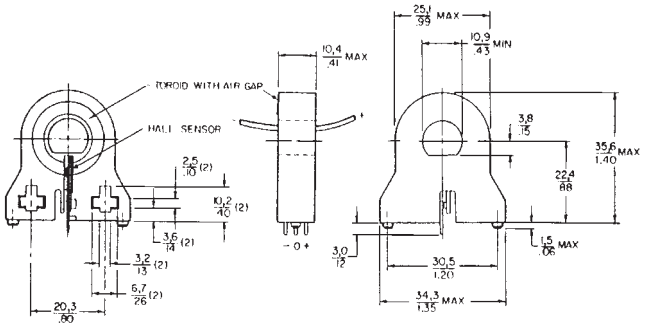


Figure 2

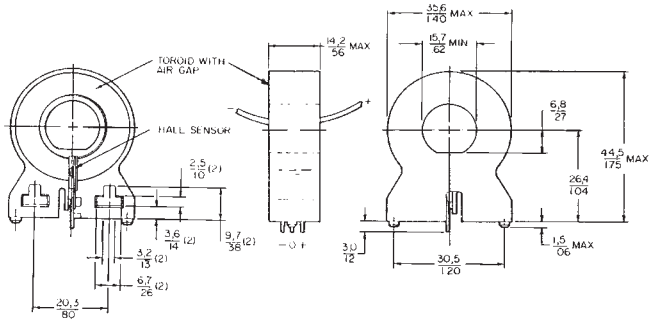


Figure 1a

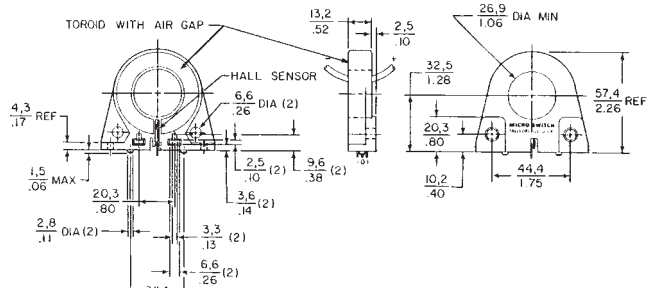
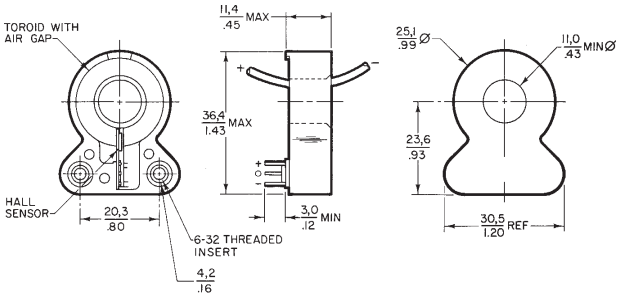


Figure 2a

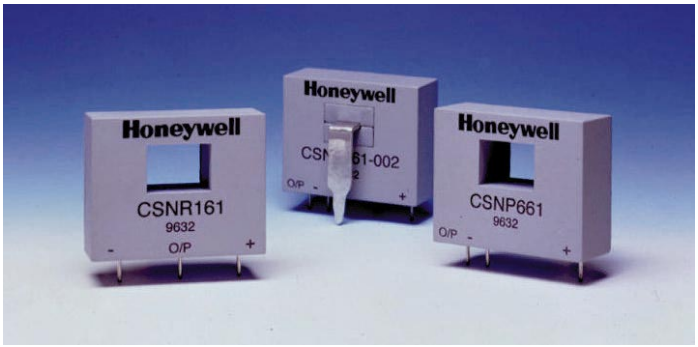


* Application consideration: The output is clamped at the high end. Clamping voltage may be as low as 9VDC. The output will not exceed the clamping voltage regardless of field strength or supply voltage.

Current

Solid State Sensors
Closed Loop Current Sensors

CSN Series



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

Closed Loop Current Sensors

CSNA, CSNB, CSNE SERIES ORDER GUIDE

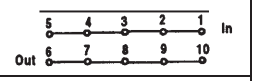
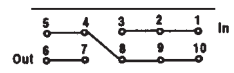
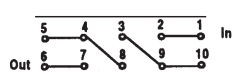
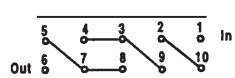
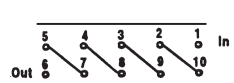
Catalog Listing	Current Range Amps	Supply Voltage VDC ±5%	Coil Characteristics		Meas. Currents Nom.	Meas. Resist (@ I_{nom})
			Turns	Resistance		
CSNA111	±70	±15	1000	90Ω @ 70°C	50 mA for 50 A	40 to 130Ω
CSNB121	±100	±15	2000	160Ω @ 70°C	25 mA for 50 A	40 to 270Ω
CSNB131	±100	±15	2000	130Ω @ 70°C	25 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

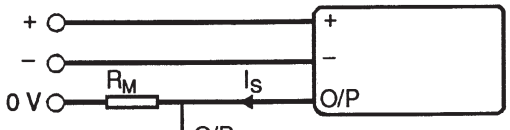
Catalog Listing	CSNA111	CSNB121	CSNB131	CSNE151
Offset Current @ 25°C, mA max.	±0.20	±0.10	±0.10	±0.10
Temperature Drift, 0 to 70°C, mA	±0.35 typ. ±0.60 max.	±0.20 typ. ±0.30 max.	±0.20 typ. ±0.30 max.	±0.17 typ. ±0.60 max.
Linearity	0.1%	0.1%	0.1%	0.2%
Supply Voltage	±15V	±15V	±15V	±15V
Galvanic Isolation @ 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

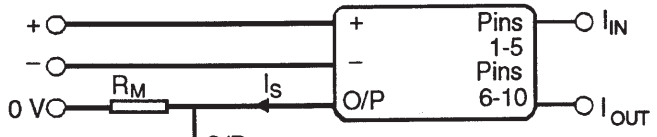
Primary Turns	Primary Current		Output Current (mA)	Primary Resistance (mΩ)	Primary Pin Connections
	Nom. I_{DN} (A)	Max. I_D (A)			
1	24	36	25	0.3	
2	12	18	24	1.1	
3	8	12	24	2.5	
4	6	9	24	4.4	
5	5	7	25	6.3	

WIRING DIAGRAMS

CSNA111/CSNB121/CSNB131



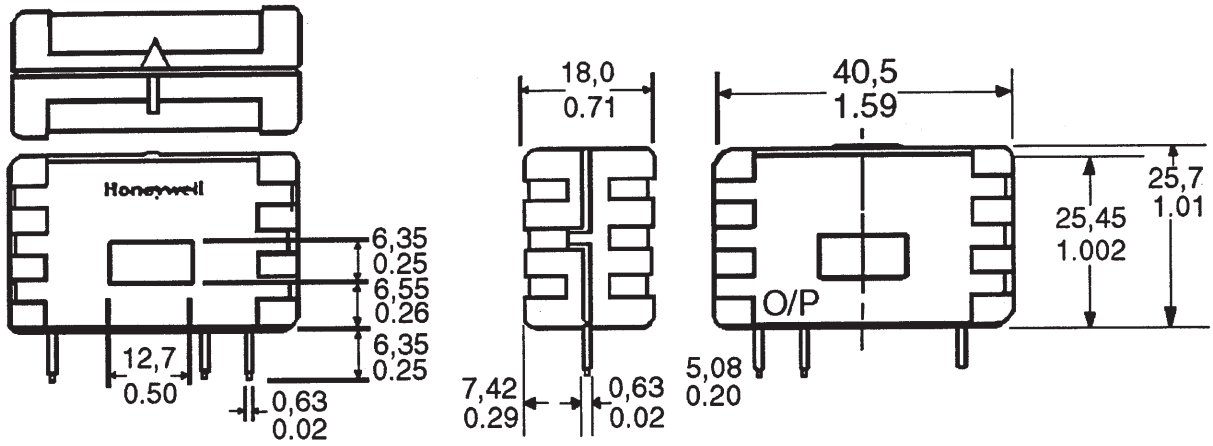
CSNE151



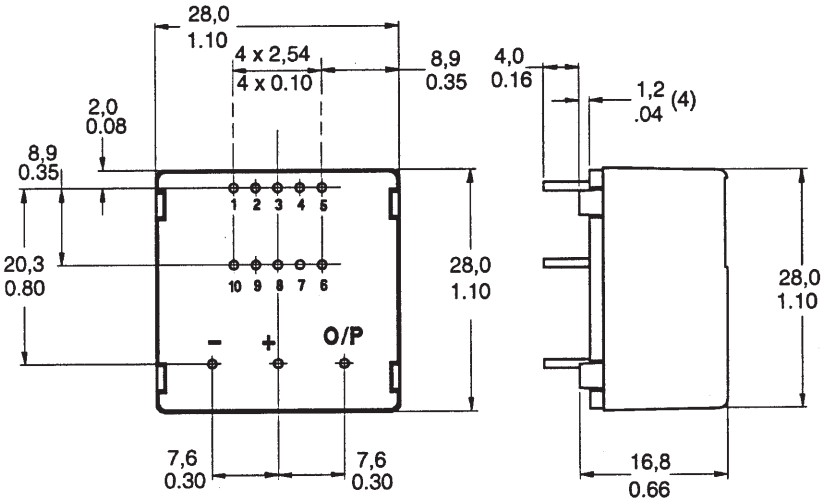
Current

MOUNTING DIMENSIONS (for reference only)

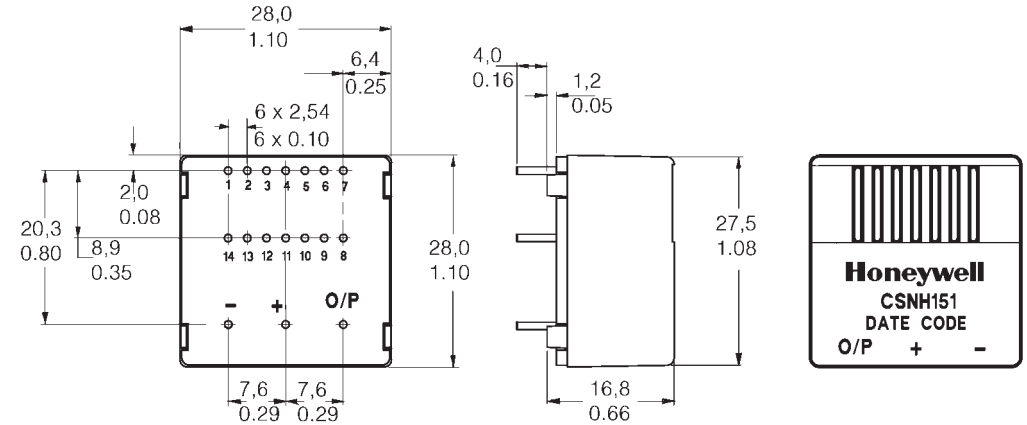
CSNA111, CSNB121, CSNB131



CSNE151/CSNE381



CSNH151



CSNJ, CSNK SERIES ORDER GUIDE

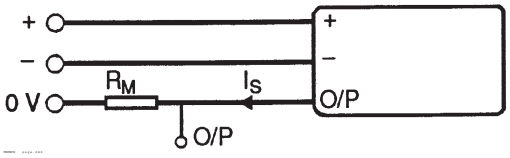
Catalog Listings	Current Range Amps	Supply Voltage VDC ± 5%	Coil Characteristics		Meas. Currents Nom.	Meas. Resist (@ I_{nom})
			Turns	Resistance		
CSNJ481	±600	±12 to 18	2000	25Ω @ 70°C	150 mA for 300 A	0 to 70Ω
CSNJ481-001*	±600	±12 to 18	2000	25Ω @ 70°C	150 mA for 300 A	0 to 70Ω
CSNJ481-002	±600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

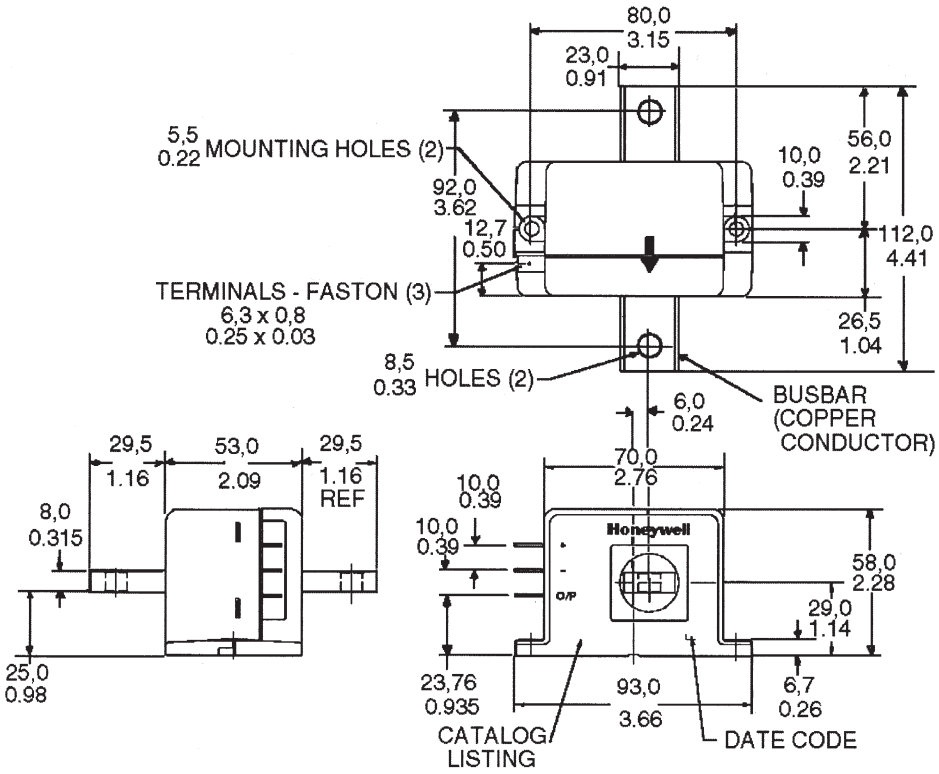
WIRING DIAGRAM



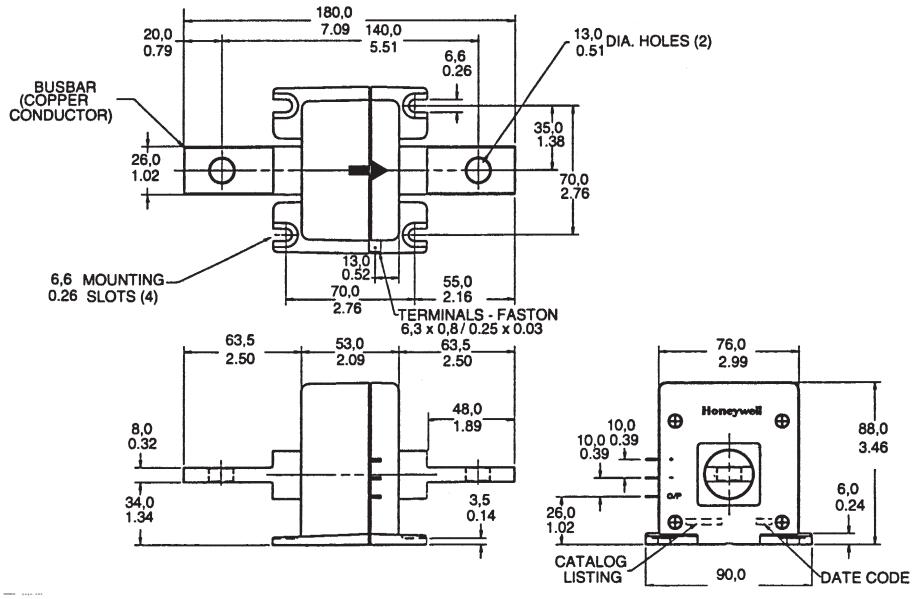
Current

MOUNTING DIMENSIONS (for reference only)

CSNJ481



CSNK591



Closed Loop Current Sensors

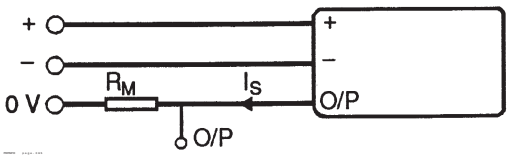
CSNL, CSNM SERIES ORDER GUIDE

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	

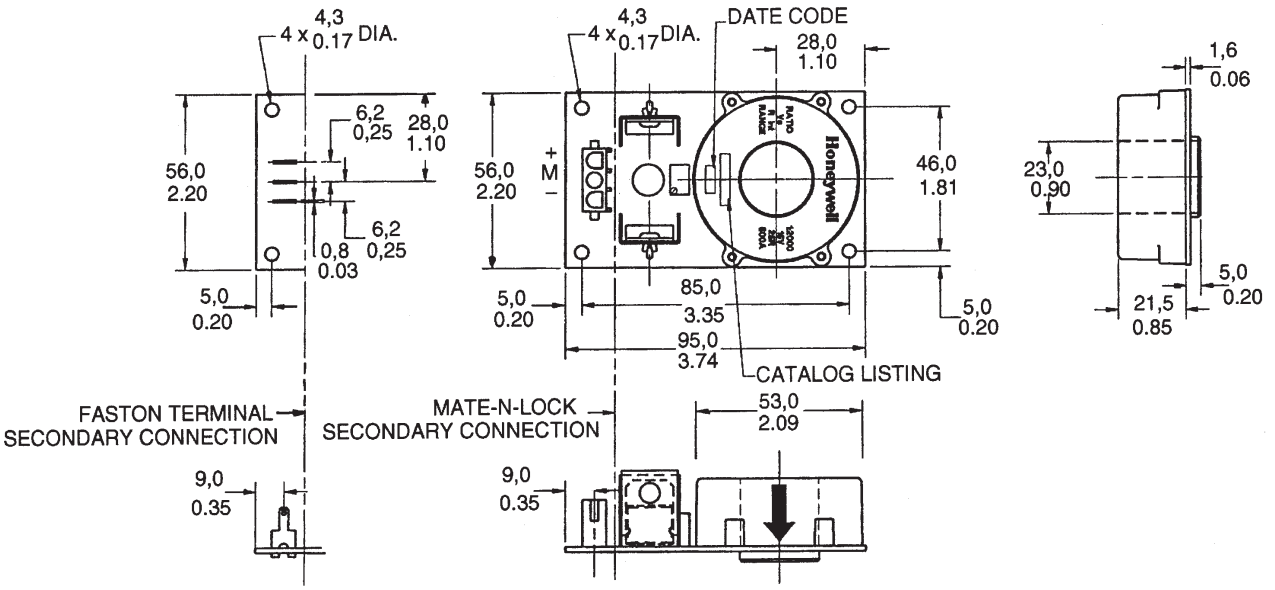
WIRING DIAGRAM



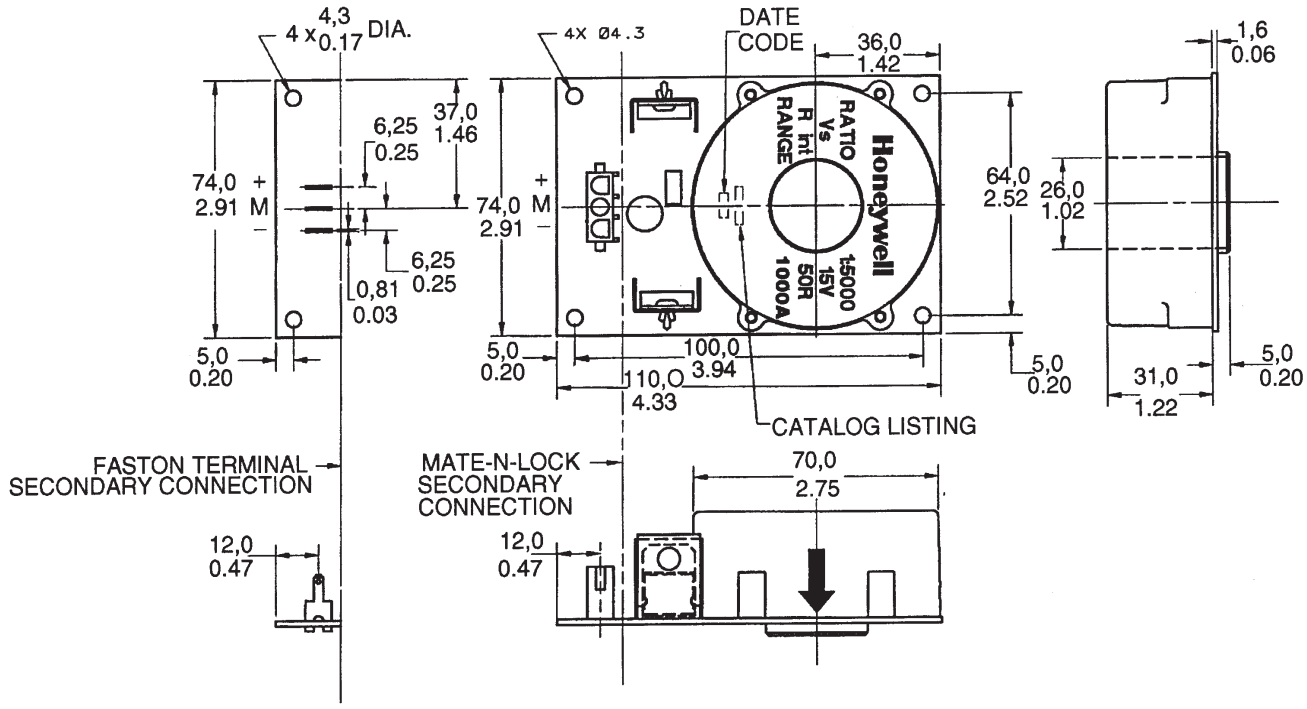
Current

MOUNTING DIMENSIONS (for reference only)

CSNL181



CSNM191



Closed Loop Current Sensors

CSNF, CSNR, CSNP, CSNT SERIES ORDER GUIDE

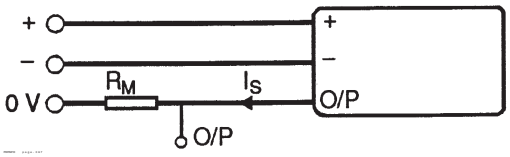
Catalog Listings	Peak Current Range Amps	Supply Voltage VDC ± 5%	Coil Characteristics		Meas. Currents Nom.	Meas. Resist (@ I_{nom})
			Turns	Resistance		
CSNP661	±90	±12 to 15	1000	30Ω @ 70°C	50 mA for 50 A	50 to 100Ω
CSNT651	±150	±12 to 15	2000	100Ω @ 70°C	25 mA for 50 A	40 to 75Ω
CSNF161	±150	±12 to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

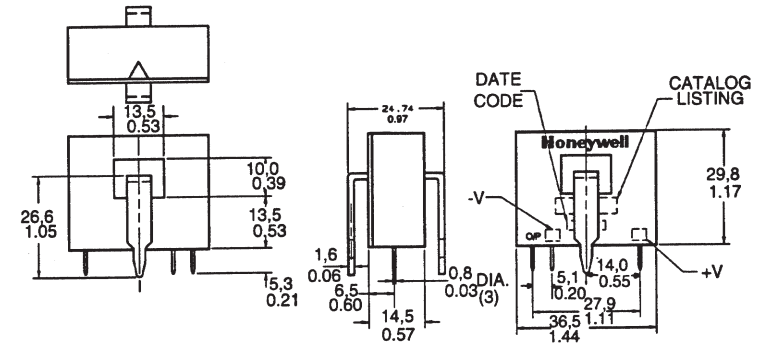
Catalog Listings	CSNP661	CSNT651	CSNF161	CSNF151	CSNR161	CSNR151
Offset Current @ 25°C, mA max.	±0.20	±0.10	±0.20	±0.10	±0.20	±0.10
Temperature Drift, 0 to 70°C, mA	±0.30 typ. ±0.50 max.	±0.15 typ. ±0.25 max.	±0.30 typ. ±0.50 max.	±0.15 typ. ±0.25 max.	±0.30 typ. ±0.60 max.	±0.15 typ. ±0.30 max.
Linearity	±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

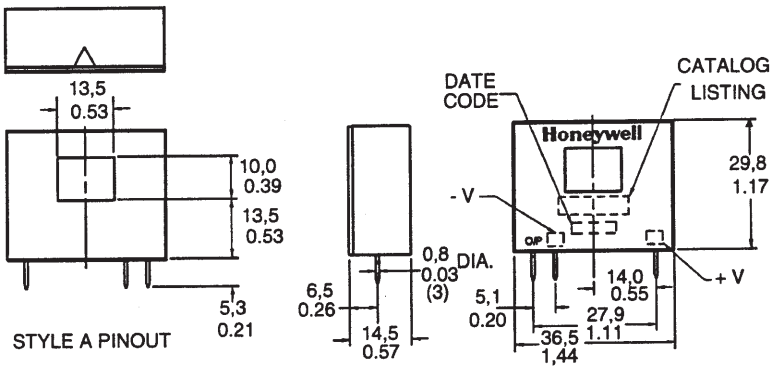
WIRING DIAGRAM

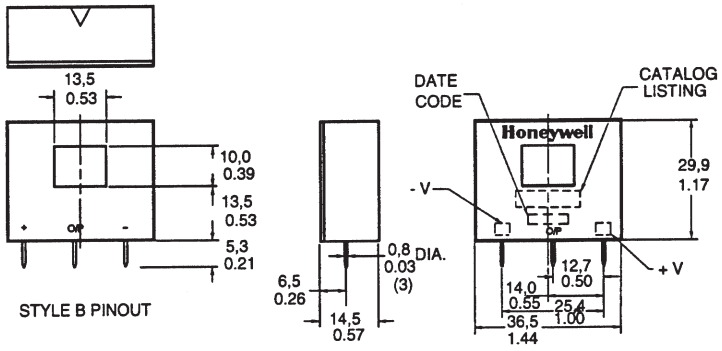


Current

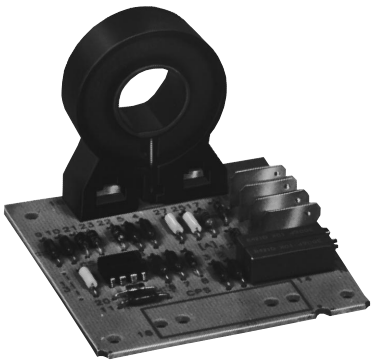
MOUNTING DIMENSIONS (for reference only)







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

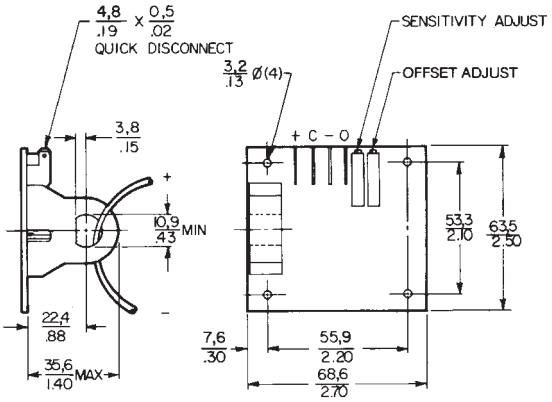
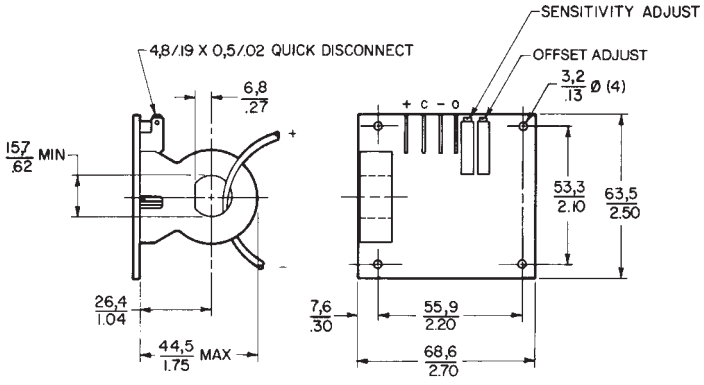


Figure 4



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

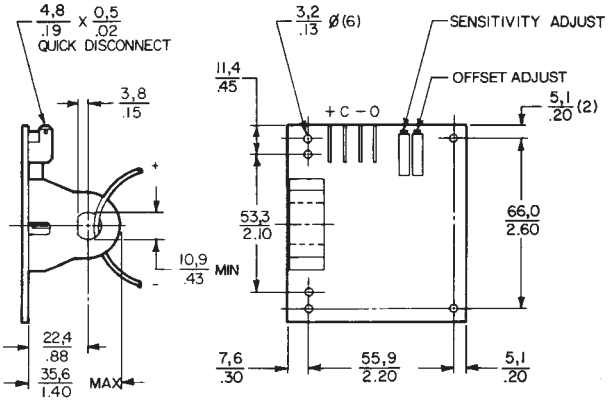
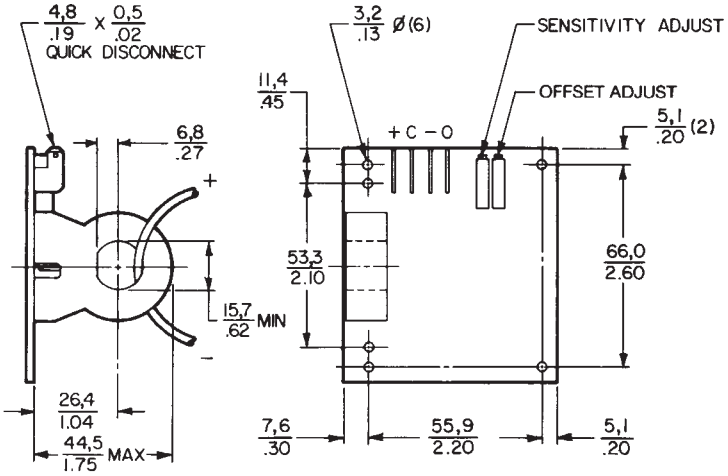


Figure 6



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

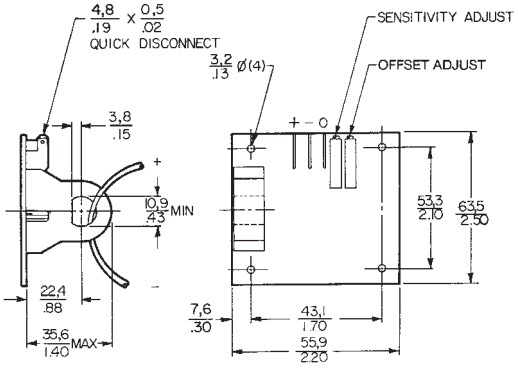


Fig. 2

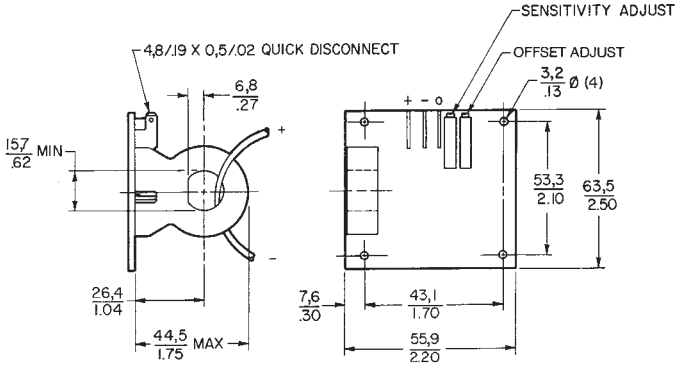
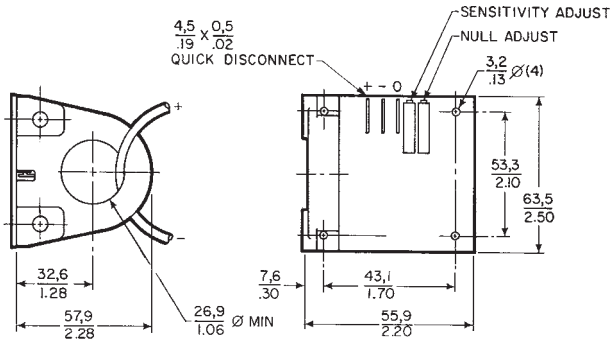
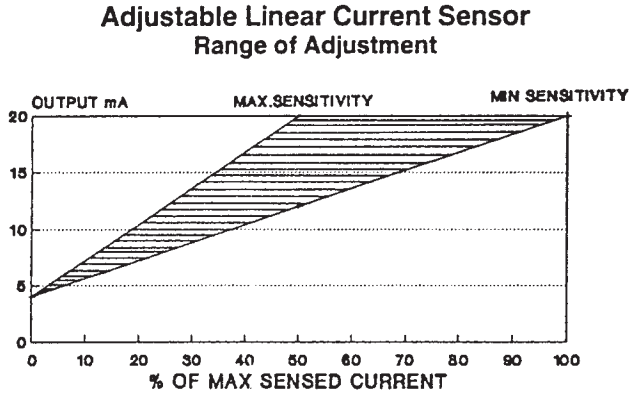


Fig. 3

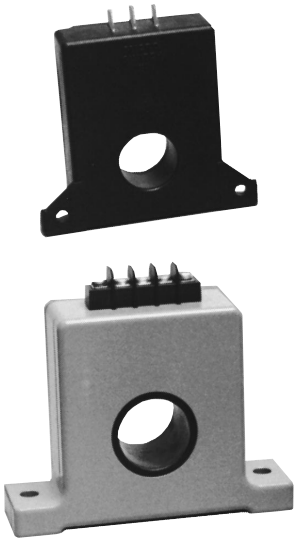




Solid State Sensors

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

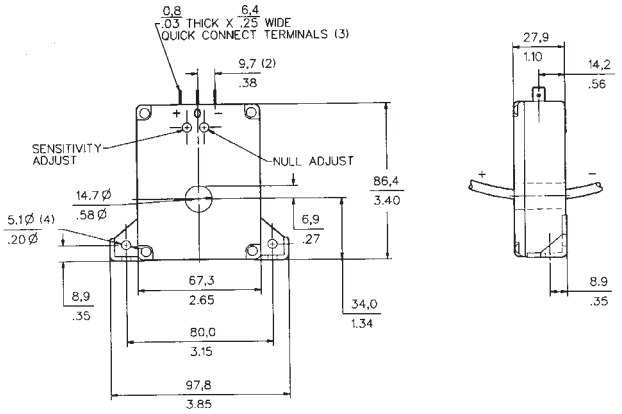


Fig. 5 Plastic Housed

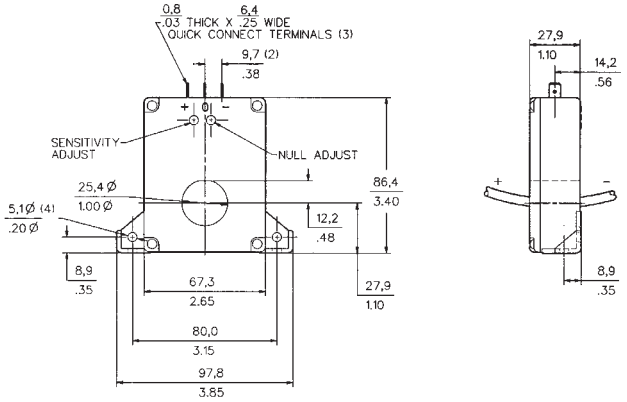
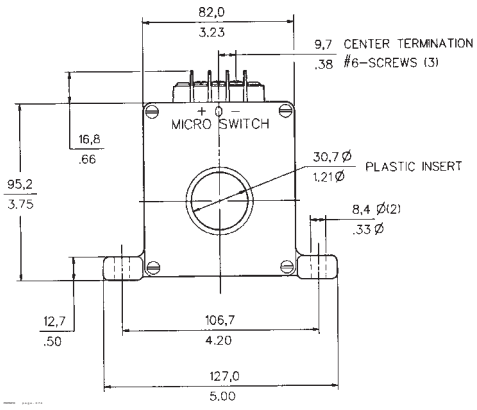
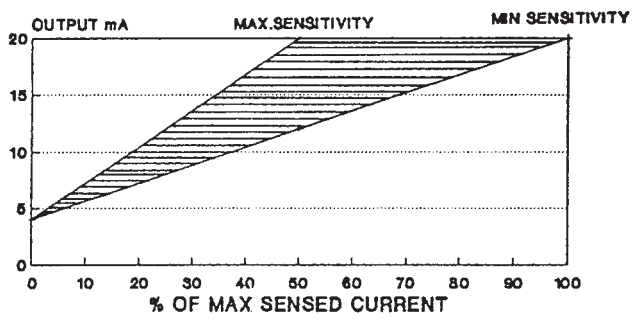


Fig. 6 Metal Housed



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:

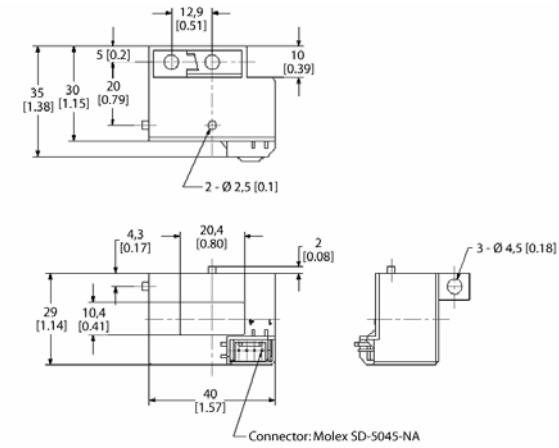
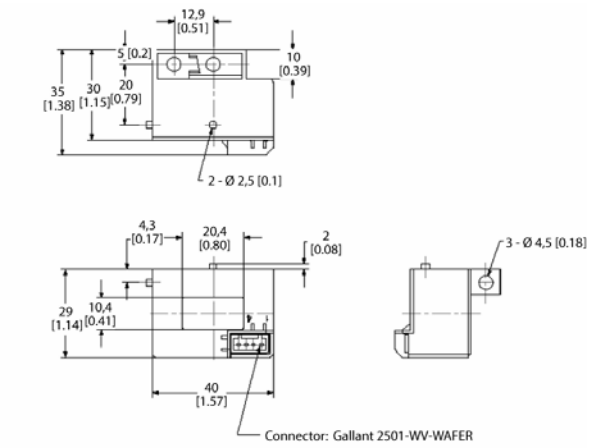
[1] For $I_P > I_{PN}$ then X is the same percentage value but of I_P

[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

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

- 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.

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
Golden Valley, Minnesota 55422
www.honeywell.com/sensing

Honeywell

005872-1-EN IL50 GLO Printed in USA
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

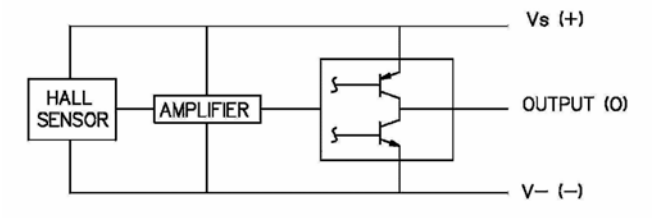
CSLS Series

PRODUCT SPECIFICATIONS

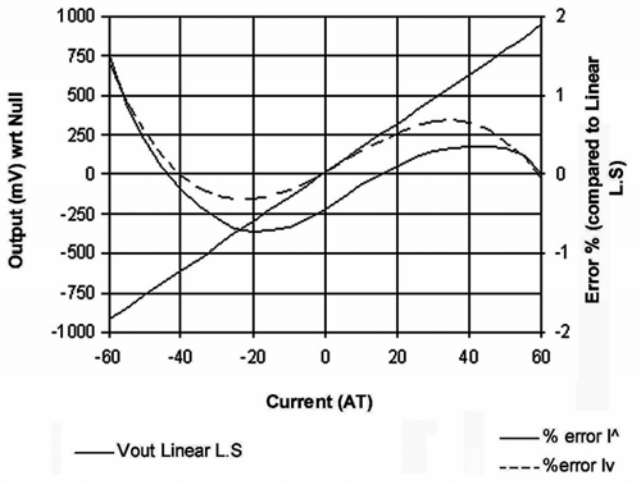
Product type	miniature hall-effect linear open-loop current sensor
Package quantity/type	25 per box
Package style	PC board mount – radial lead IC
Supply voltage	4.5 Vdc to 10.5 Vdc
Output type	sink/source
Magnetic actuation type	analog ratiometric

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

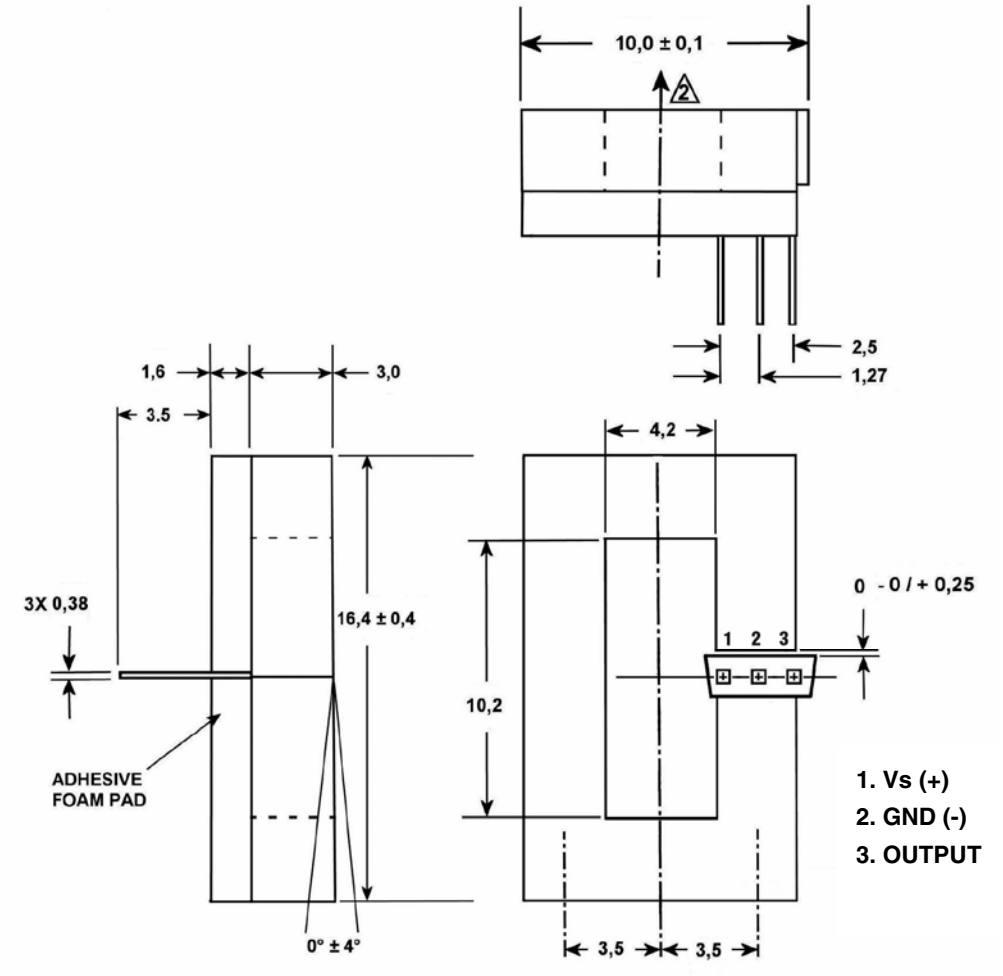
BLOCK DIAGRAM



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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WARRANTY/REMEDY

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	+1-815-235-6545 Fax

Automation and Control Solutions
Sensing and Control
Honeywell
11 West Spring Street
Freeport, Illinois 61032
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

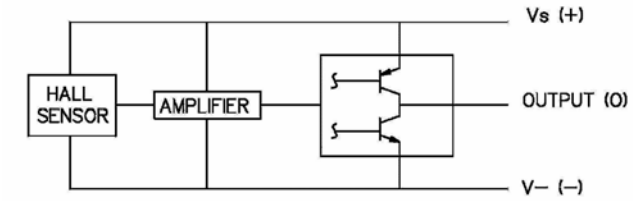
CSLT Series

PRODUCT SPECIFICATIONS

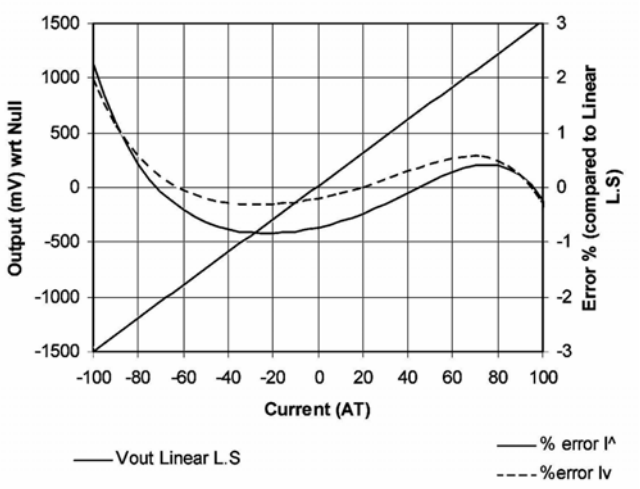
Product type	miniature hall-effect linear open-loop current sensor
Package quantity/type	25 per box
Package style	PC board mount – radial lead IC
Supply voltage	4.5 Vdc to 10.5 Vdc
Output type	sink/source
Magnetic actuation type	analog ratiometric

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

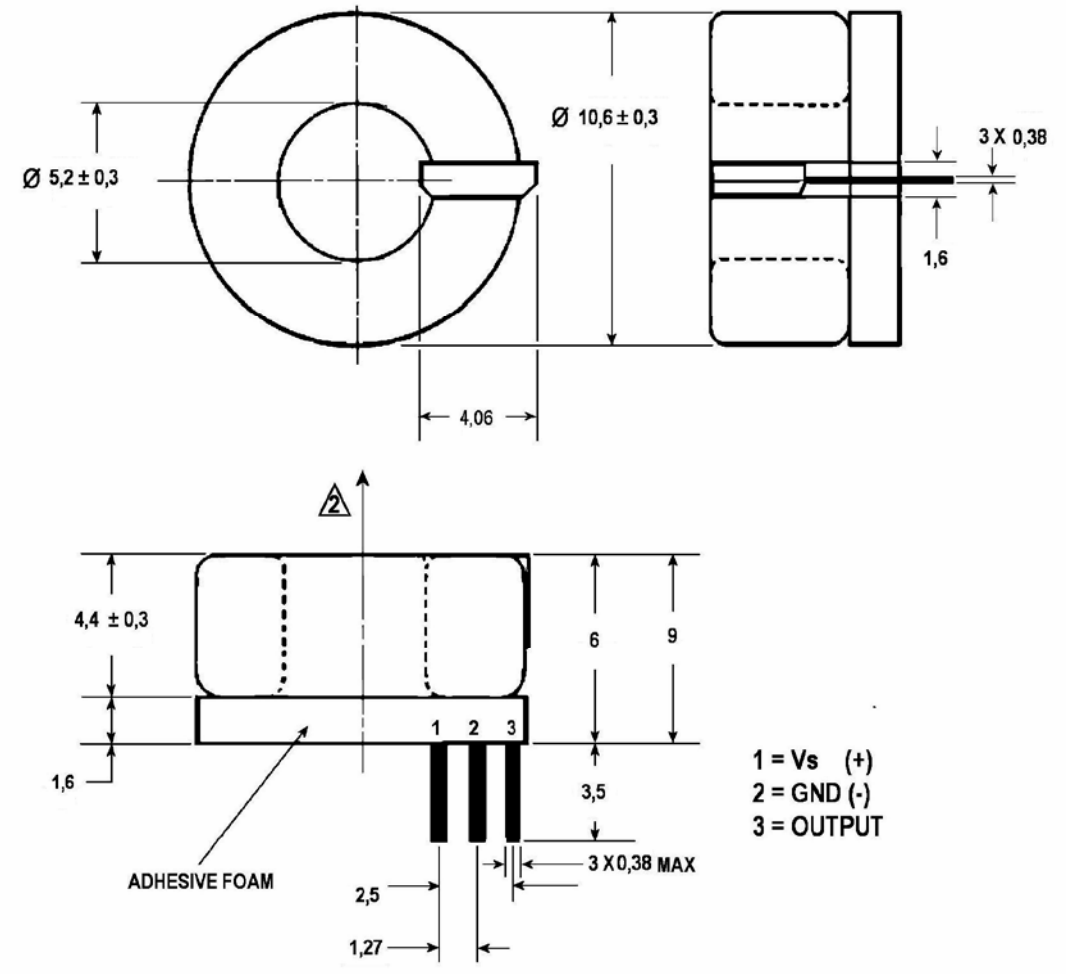
BLOCK DIAGRAM



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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Sensing and Control
Honeywell
11 West Spring Street
Freeport, Illinois 61032
www.honeywell.com/sensing

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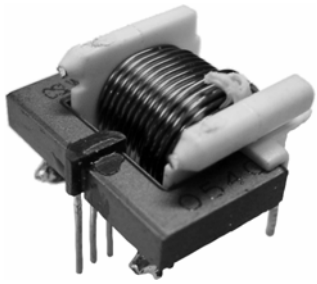
November 2005

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

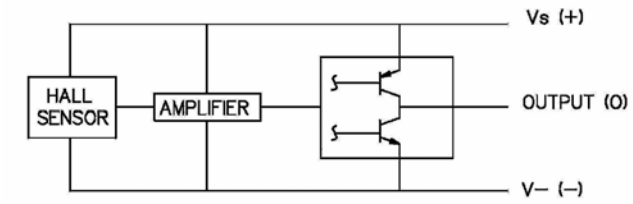
CSLW Series

PRODUCT SPECIFICATIONS

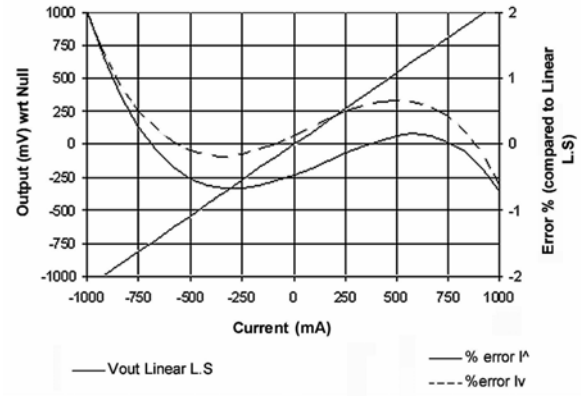
Product type	miniature hall-effect linear open-loop current sensor
Package quantity/type	25 per box
Package style	PC board mount – radial lead IC
Supply voltage	4.5 Vdc to 10.5 Vdc
Output type	sink/source
Magnetic actuation type	analog ratiometric

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

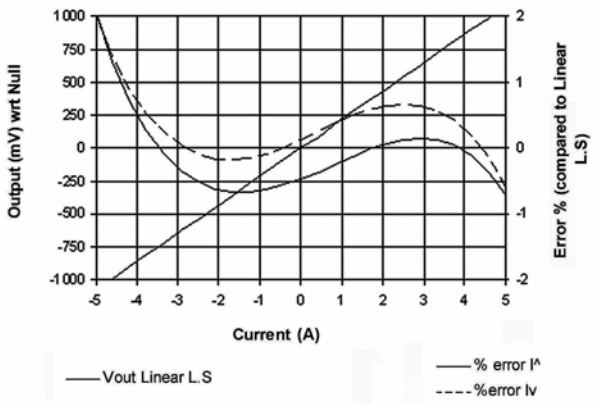
BLOCK DIAGRAM



CSLW6B1 TYPICAL TRANSFER FUNCTION [25 °C]

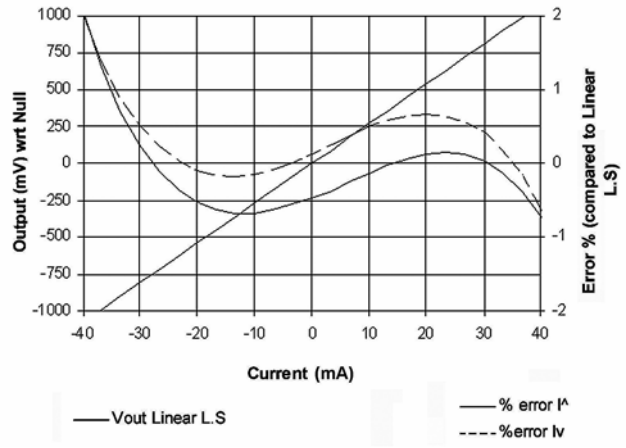


CSLW6B5 TYPICAL TRANSFER FUNCTION [25 °C]

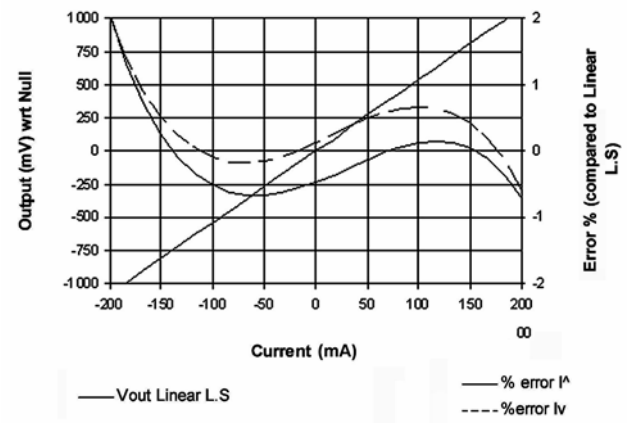


Miniature Wired Open-Loop Current Sensors

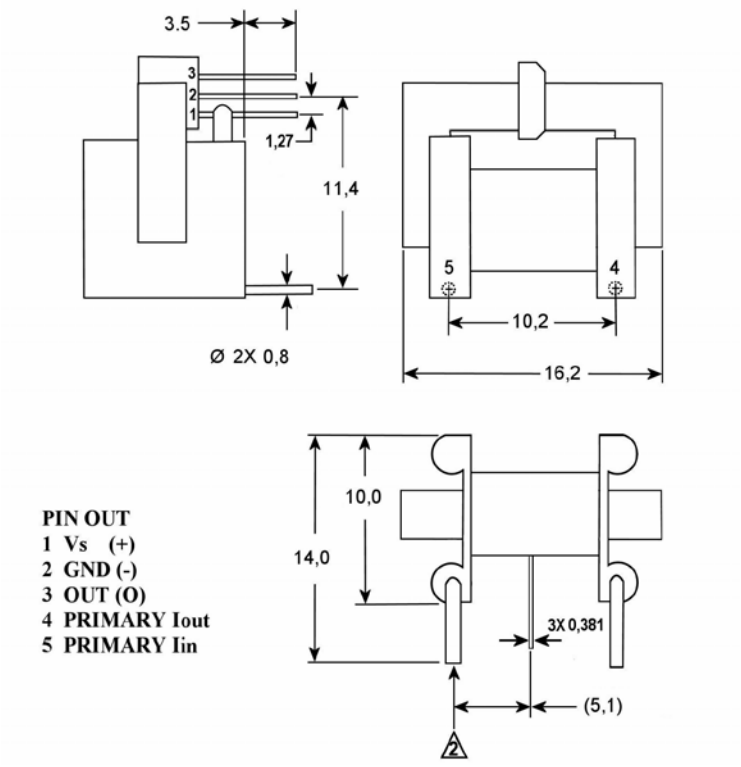
CSLW6B40M TYPICAL TRANSFER FUNCTION [25 °C]



CSLW6B200M TYPICAL TRANSFER FUNCTION [25 °C]



DIMENSIONAL DRAWING (For reference only [mm])



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

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WARRANTY/REMEDY

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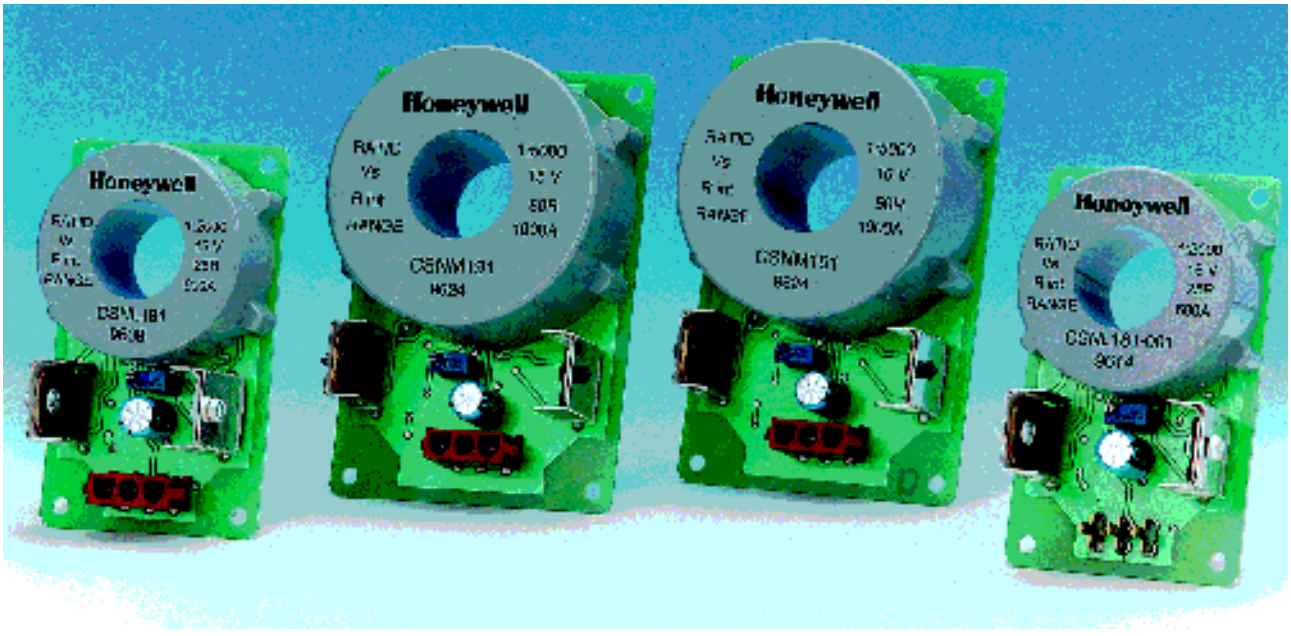
Honeywell

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	

⚠ WARNING

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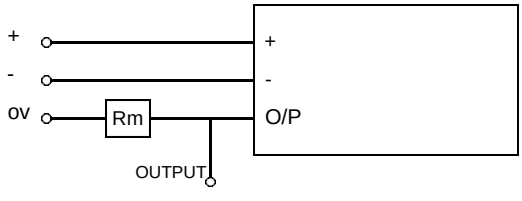
Electrical Connection



Termination

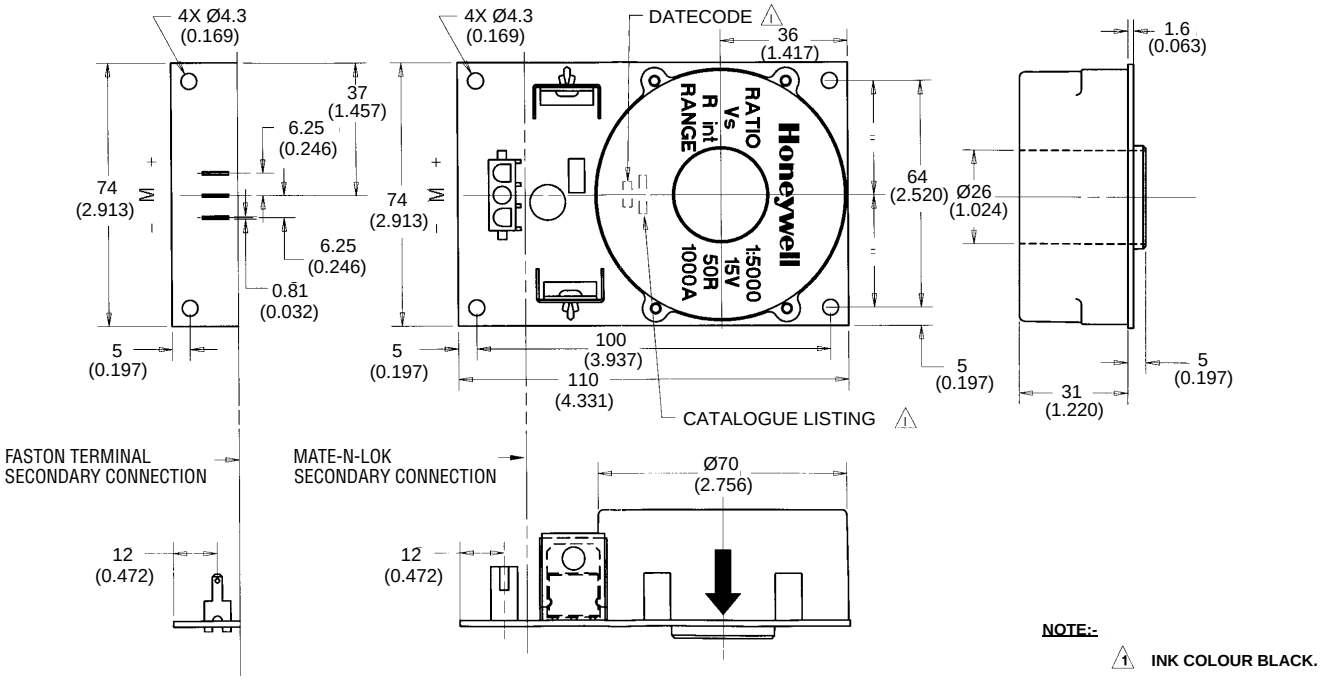
300A: Supply Voltage ±12V to ±18V

500A: Supply Voltage ±12V to ±18V

O/PMeasured output signal

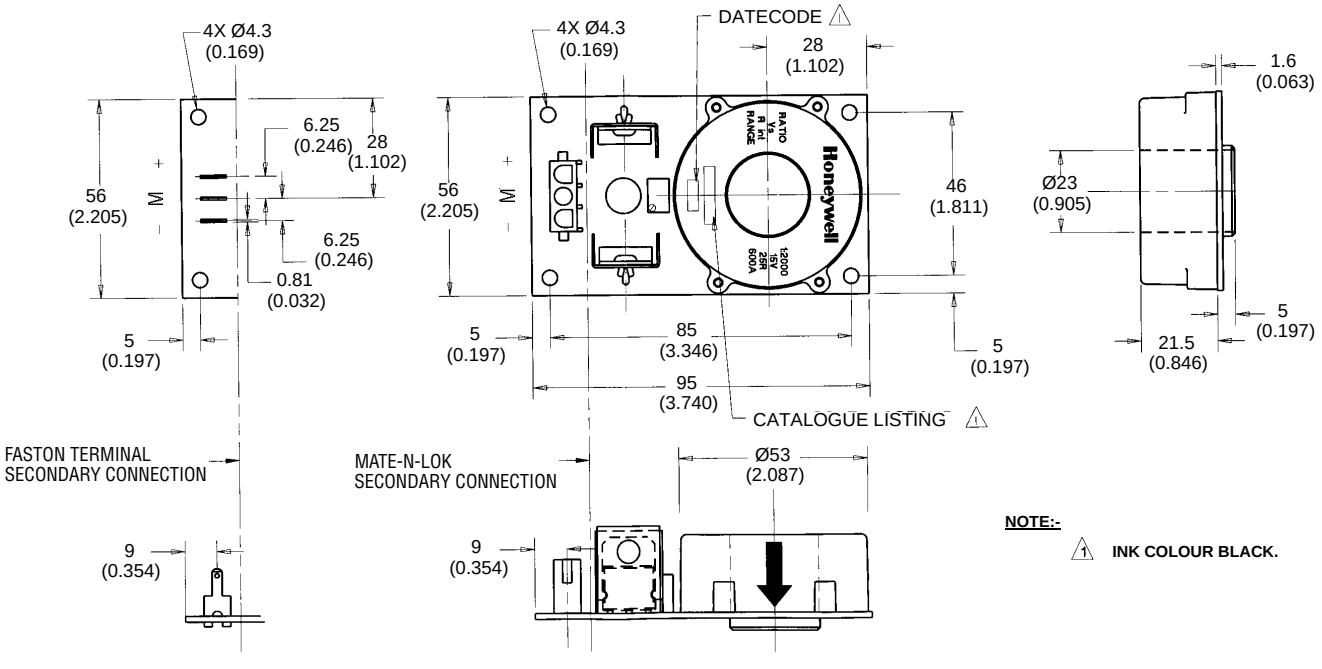
CHARACTERISTICS		
Catalogue Listing	**Secondary Connection**	**Conformal Coating**
CSNL181	**Amp 3-Way Pin Mate-N-Lok Connector**	**No**
CSNL181-001	**Amp Tab, 2.79(.110) Series Faston Terminal**	**No**
CSNL181-002	**Amp 3-Way Pin Mate-N-Lok Connector**	**Humiseal 1R32**
CSNL181-003	**Amp Tab, 2.79(.110) 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.**



NOTE:-

1 **INK COLOUR BLACK.**

⚠ WARNING

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- Complete installation, operation and maintenance information is to be referenced for each product.

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

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For more information:
WWW http://www.honeywell.com/sensing/
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Hungary
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Poland
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Portugal
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Commonwealth of Independent States (CIS)
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FAX: (46) 8 775 56 00

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Turkey
Honeywell AS
Emirhan Cad No 145
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80700 Dikilitas Istanbul
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FAX: 90-212 259 0465

United Kingdom
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Fax: (39) 2 921 46 233

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Fax: (9712) 327718

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FAX: (809) 792-0053

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FAX: (58-2) 238-3391

Honeywell

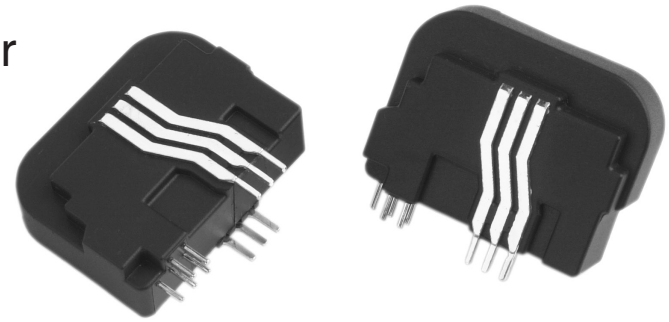
Helping You Control Your World

Honeywell Control Systems Ltd.
Newhouse Industrial Estate
Motherwell ML1 5SB
Scotland, UK
Tel: (44) 1698 481400
Fax: (44) 1698 481014

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.

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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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

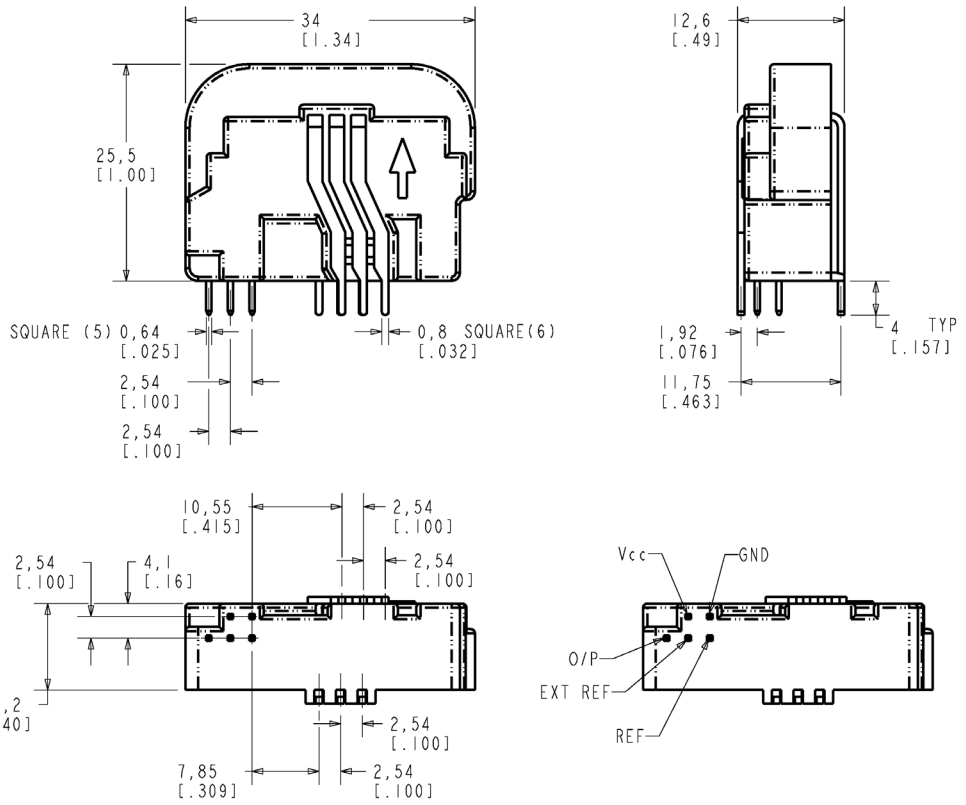
[1] ac peak. Maximum dc or ac rms range is 40 A.t.

[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.

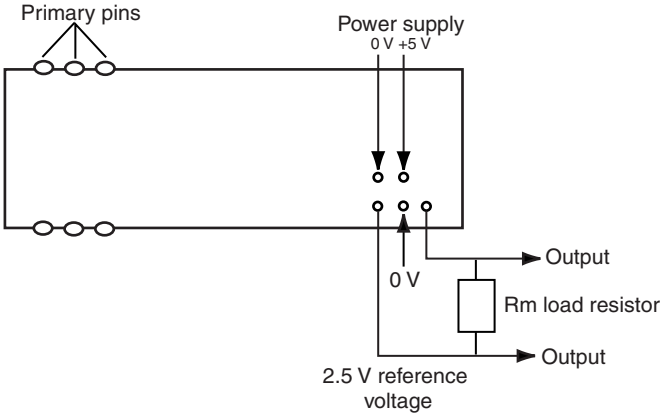
CSN Series MR Current Sensor

Mounting drawing in mm and [inches]

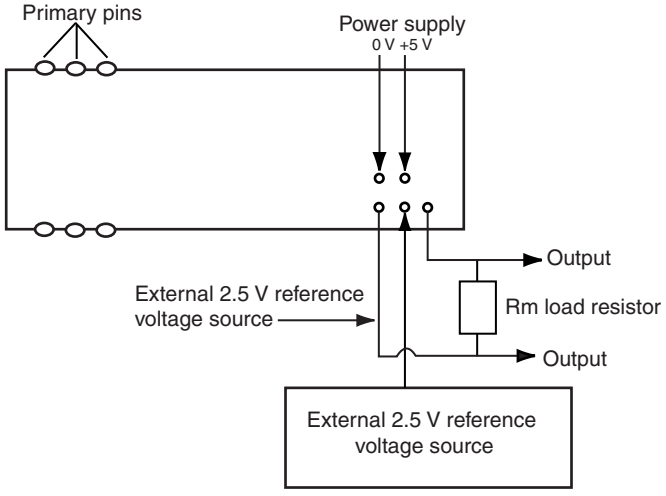


Electrical wiring diagram

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).

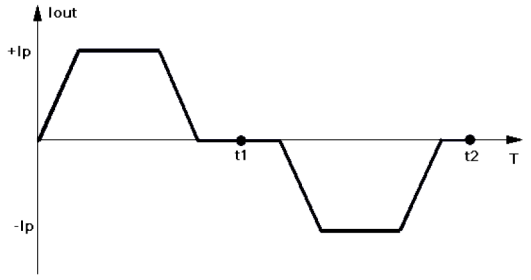
Measuring Range

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

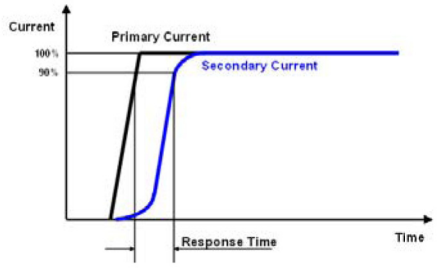
The thermal drift of the offset current is the variation of the offset from 25 °C to the considered temperature:

$I_{OT} = I_T - I_0$
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

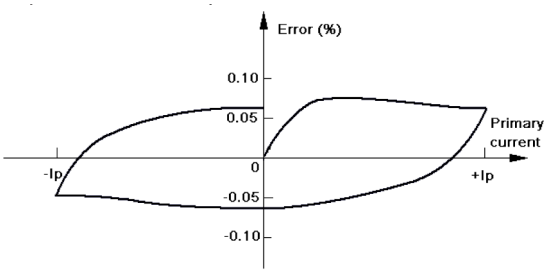
The response time t_r is shown in the figure below. Response time is related with both product performance and primary current di/dt. So, they are measured at nominal ampere-turns and maximum di/dt.



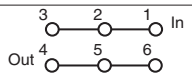
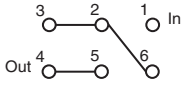
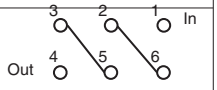
Linearity

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	

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USA:	1-815-537-6945
Europe:	+44 (0)1698 481 481
Asia Pacific:	+65 6355-2828
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INTERNET:
www.honeywell.com/sensing

Sensing and Control
Honeywell
1985 Douglas Drive North
Golden Valley, MN 55422 USA
www.honeywell.com

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June 2010