

## Position Sensors Line Guide



**Precision, down the line.** Honeywell Sensing and Internet of Things (SIoT) Position Sensors consist of encoders, inertial measurement units, non-contact Hall-effect rotary positions sensors, SMART position sensors, and resolvers.

**Encoders** are available in both mechanical and optical versions, and are best for potential applications requiring panel-mounted, manually-operated rotary sensing.

**Inertial Measurement Units (IMU)** are high-end position sensors with sensitive multi-axis motion control. These sensors measure the motion of the equipment onto which they are attached and deliver the data to the equipment's control module, allowing the operator to focus on other equipment functions, enabling more precise control than can be achieved by using only the human eye, thus increasing safety, stability and productivity.

**Non-Contact Hall-Effect Rotary Position Sensors** respond to the presence or to the interruption of a magnetic field, using a solid-state Hall-effect IC to sense rotary movement of the

actuator shaft and then producing a proportional output. These sensors provide a 360° operating range, low torque actuation, enhanced resistance to damage from incorrect wiring and electrical noise, wide operating angle tolerant to overtravel, and integrated reverse polarity, short circuit and EMC protection.

**SMART Position Sensors** (**S**uperior **M**easurement, **A**ccuracy, **R**eliability, and **T**hinking.) enable highly accurate motion control, improving operational efficiency and safety. They measure linear, angular, or rotary movement of a magnet attached to a moving object. Non-contact design eliminates mechanical failure mechanisms, reducing wear and tear, improving reliability and durability, and minimizing downtime. Robust in most harsh environments. Easy to install, reducing set-up costs.

**Resolvers** provide non-contact measurement for 360° sensing, enhanced accuracy, resolution, and repeatability under severe environmental conditions. They are inherently radiation hardened and offer durable EMC (Electromagnetic Compatibility) performance.

## FEATURES

### ENCODERS

#### 510 Series.

**Features:** Mechanical encoder • High resolution of up to 36 positions • Gray code digital voltage output • Wide operating temperature range of -40°C to 105°C [-40°F to 221°F] • Mounting flexibility

**Benefits:** High resolution of up to 36 positions for applications that require high resolution. Gray code digital voltage output may eliminate the need for analog to digital converters, contributing to a more cost-effective solution. Wide operating temperature range helps minimize thermal performance issues. Horizontal or vertical mounting

terminations promote flexibility in the application. Potential applications include audio/visual equipment, smoke detectors, irrigation controls, oscilloscopes, robotics, EKG and defibrillation machines.

#### 600 Series.

**Features:** Optical encoder • Dual quadrature output generating 128 pulses per channel • Non-contact technology, with a minimum of 10 million shaft rotation: • Digital voltage output • TTL-compatible output • Wide operating temperature range of -40°C to 65°C [-40°F to 149°F] • Choice of mounting terminations

**Benefits:** Non-contact technology promotes long life in the application. Digital voltage output may eliminate the need for analog to digital converters, contributing to a more cost-effective solution. TTL-compatible output prevents triggering of false highs/lows due to ambient noise. Wide operating temperature range promotes flexibility in the applications. Designed to provide mounting flexibility. Potential applications include motor control, flow control, robotics, computer peripherals, welding equipment, portable diagnostic equipment, home healthcare respiratory equipment, surgical equipment and precision joysticks.

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**Encoders:** Our mechanical encoders have 2-bit and 4-bit graycode outputs for absolute electrical reference applications. Manually operated optical encoders output two square waves in quadrature.

**Inertial Measurement Units (IMU):** Designed to Six Sigma standards with industry-leading durability, accuracy, voltage input flexibility, and temperature performance.

**Non-Contact Hall-effect Rotary Position Sensors:** These products use a magnetically biased, Hall-effect integrated circuit to sense rotary movement of the actuator over a set operating range. Integral actuator or external actuator available.

**SMART Position Sensors:** The non-contacting technology is designed to provide enhanced product life and durability with less downtime.

**Resolvers:** These rotary and angle absolute position sensors provide 360° non-contact sensing with enhanced accuracy for precise motion control. Available in standard styles and are fully customizable.



## Encoders

	510 Series	600 Series
<b>Type</b>	mechanical	optical
<b>Pulse per revolution</b>	16, 9, 6, 4	128
<b>Output</b>	2- or 4-bit gray code	quadrature square wave
<b>Temperature range</b>	-40°C to 105°C [-40°F to 221°F]	-40°C to 65°C [-40°F to 149°F]
<b>Expected rotational life</b>	100k cycles	10 million rotations min.
<b>Operating speed</b>	50 rpm max.	300 rpm max.
<b>Terminals</b>	PC type C-30 type with/without bracket, B-110 type	PC type B-66, PC type C-24, cable, cable/connector



## Inertial Measurement Units (IMU)

		6DF Series
<b>Description</b>	Transportation Attitude Reference Sensor (TARS Series) Ruggedized Inertial Measurement Unit (IMU)	6 Degrees of Freedom, 6-D Motion Variant
<b>Supply voltage</b>	4.5 V to 5.5 V or 9 V to 36 V	7 V to 32 V
<b>Supply current</b>	100 mA max.	350 mA max.
<b>Startup time</b>	500 mSec min to 2000 mSec max.	700 ms typ.
<b>Output type</b>	SAEJ1939 CAN 29	SAEJ1939 CAN 29
<b>Operating temperature range</b>	-40°C to 85°C [-40°F to 185°F]	-40°C to 85°C [-40°F to 185°F]
<b>Angular rate range</b>	-245 deg/sec to +245 deg/sec	-75 deg/sec to +75 deg/sec
<b>Dimensions</b>	Ø138 mm x 28 mm H [Ø5.43 in x 1.10 in H]	130 mm L x 96,3 mm W x 66,0 mm H [5.12 in L x 3.80 mm W x 2.60 mm H]
<b>Sealing</b>	IP67 & IP69K certified	IP67, IP69K
<b>Housing material</b>	PBT thermoplastic	aluminum
<b>Approvals/testing/qualifications</b>	EMI/EMC, ESD, mechanical and thermal shock, random vibration, humidity, salt spray, chemical compatibility, automotive grade	EMI/EMC, ESD, mechanical and thermal shock, random vibration, humidity, salt spray, chemical compatibility, automotive grade



**RTY Series**



**RTP Series**



**RPN Series**

## Non-Contact Hall-Effect Rotary Position Sensors

<b>Sensing range</b>	50° (±25°), 60° (±30°), 70° (±35°), 90° (±45°), 120° (±60°), 180° (±90°), 270° (±135°), 360° (±180°)	50° (±25°), 60° (±30°), 70° (±35°), 90° (±45°), 120° (±60°), 180° (±90°), 270° (±135°), 350° (±175°), 360° (±180°)	50° (±25°), 60° (±30°), 70° (±35°), 90° (±45°), 120° (±60°), 180° (±90°), 270° (±135°), 360° (±180°)
<b>Input voltage</b>	<b>low voltage:</b> 5 Vdc ±0.5 Vdc <b>high voltage:</b> 10 Vdc to 30 Vdc	low voltage: 5 Vdc ±0.5 Vdc high voltage: 10 Vdc to 30 Vdc	5 Vdc, 8 to 30 Vdc, 10 Vdc to 30 Vdc
<b>Output</b>	<ul style="list-style-type: none"> <li><b>low voltage:</b> 0.5 V to 4.5 V ratiometric (standard); 4.5 V to 0.5 V ratiometric (inverted)</li> <li><b>high voltage:</b> 0.5 V to 4.5 V ratiometric (standard); 4.5 V to 0.5 V ratiometric (inverted)</li> </ul>	<ul style="list-style-type: none"> <li><b>low voltage:</b> 0.5 V to 4.5 V ratiometric (standard); 4.5 V to 0.5 V ratiometric (inverted)</li> <li><b>high voltage:</b> 0.5 V to 4.5 V ratiometric (standard); 4.5 V to 0.5 V ratiometric (inverted)</li> </ul>	0.25 V to 4.75 V, 0.5 V to 4.5 V, 1 V to 9 V, 3 V to 5 V, 4.5 V to 0.5 V, 4.75 V to 0.25 V, 4 mA to 20 mA, 20 mA to 4 mA
<b>Input current</b>	<ul style="list-style-type: none"> <li><b>low voltage:</b> 20 mA max.; during output to ground short, 25 mA max.</li> <li><b>high voltage:</b> 32 mA max.; during output to ground short, 47 mA max.</li> </ul>	<ul style="list-style-type: none"> <li><b>low voltage:</b> 20 mA max.; during output to ground short, 25 mA max.</li> <li><b>high voltage:</b> 32 mA max.; during output to ground short, 47 mA max.</li> </ul>	20 mA max.
<b>Operating temp. range</b>	-40°C to 125°C [-40°F to 257°F]	-40°C to 125°C [-40°F to 257°F]	-40°C to 125°C [-40°F to 257°F]
<b>Termination</b>	AMP super seal	AMP super seal	AMP 1-1419168-1, AMP Superseal 282087-1, Deutsch DT04-3P
<b>Life</b>	35 M cycles	infinite	30 M cycles
<b>EMI/EMC</b>	<ul style="list-style-type: none"> <li><b>EMI radiated immunity:</b> 100 V/m from 200 MHz to 1000 MHz per ISO11452-2</li> <li><b>EMI conducted immunity:</b> <ul style="list-style-type: none"> <li><b>low voltage:</b> 100 mA BCI per ISO11452-4 from 1 MHz to 200 MHz</li> <li><b>high voltage:</b> 100 mA BCI per ISO11452-4 from 1 MHz to 400 MHz</li> </ul> </li> <li><b>EMC:</b> exceeds CE requirements</li> </ul>	<ul style="list-style-type: none"> <li>EMI radiated immunity: 100 V/m from 200 MHz to 1000 MHz per ISO11452-2</li> <li>EMI conducted immunity: <ul style="list-style-type: none"> <li><b>low voltage:</b> 100 mA BCI per ISO11452-4 from 1 MHz to 200 MHz</li> <li><b>high voltage:</b> 100 mA BCI per ISO11452-4 from 1 MHz to 400 MHz</li> </ul> </li> <li>EMC: exceeds CE requirements</li> </ul>	EMC: 200 V/m ISO 11452-3
<b>Housing material</b>	PBT plastic	PBT plastic	PA66 plastic



**HRS Series**

## Non-Contact Hall-Effect Rotary Position Sensors

<b>Sensing range</b>	90° ±2°, 180° ±2°
<b>Input voltage</b>	5 Vdc ±10 %
<b>Output</b>	5 % to 95 % of applied Vdd, approx. (programmable) output ratiometric to supply)
<b>Input current</b>	5 mA typ.
<b>Operating temp. range</b>	-40°C to 85°C [-40°F to 185°F]
<b>Termination</b>	solder lug, flying wire leads, cable and connector
<b>Life</b>	10 M cycles
<b>EMI/EMC</b>	EMI: 30 V/m, 10 kHz to 1000 MHz at 3 m
<b>Housing material</b>	stainless steel

# Position Sensors Line Guide



**SMART Position Sensor**  
Superior Measurement.  
Accuracy. Reliability.  
Thinking.

**SPS Series**  
**35 mm Analog, 75 mm Analog,**  
**225 mm Analog, Digital Linear**  
**Configurations**

**SPS Series**  
**100° and 180°**  
**Arc Configurations**

**SPS Series**  
**360° Rotary**  
**Configuration**

<b>Description</b>	Enables highly accurate motion control, improving operational efficiency and safety. Non-contact design eliminates mechanical failure mechanisms, reducing wear and tear, improving reliability and durability, and minimizing downtime. Robust in most harsh environments. Easy to install, reducing set-up costs.		
<b>Configuration</b>	linear	arc	rotary
<b>Sensing range</b>	<b>35 mm:</b> 0 mm to 35 mm [0 in to 1.38 in] <b>75 mm:</b> 0 mm to 75 mm [0 in to 2.95 in] <b>225 mm:</b> 0 mm to 225 mm [0 in to 8.86 in]	<b>100°:</b> 0° to 100° <b>180°:</b> 0° to 180°	0° to 360°
<b>Actuator sensing location on arc</b>	N/A	<b>100°:</b> inside or outside <b>180°:</b> inside	N/A
<b>Resolution</b>	<b>35 mm analog:</b> 0,04 mm [0.0016 in] <b>75 mm analog:</b> 0,05 mm [0.002 in] <b>225 mm analog:</b> 0,14 mm [0.0055 in] <b>225 mm digital:</b> 0,0035 mm [0.000137 in]	<b>100° inside and outside:</b> 0.06° <b>180° inside:</b> 0.11°	0.01°
<b>Supply voltage</b>	<b>35 mm:</b> 4.75 Vdc to 5.25 Vdc <b>all other versions:</b> 6 Vdc to 24 Vdc	<b>100° inside:</b> 6 Vdc to 24 Vdc, 18 Vdc to 40 Vdc <b>100° outside:</b> 5 Vdc <b>180° inside:</b> 6 Vdc to 24 Vdc, 18 Vdc to 40 Vdc	12 Vdc to 30 Vdc
<b>Supply current</b>	<b>35 mm analog:</b> 20 mA max. <b>75 mm analog:</b> 32 mA max. <b>225 mm analog:</b> 34 mA max. <b>225 mm digital:</b> 88 mA max.	<b>100° inside:</b> 45 mA max. <b>100° outside:</b> 30 mA max. <b>180° inside:</b> 45 mA max.	90 mA max.
<b>Output</b>	<b>35 mm analog:</b> 0.55 Vdc to 4.15 Vdc <b>75 mm and 225 mm analog:</b> 0 Vdc to 5 Vdc <b>225 mm digital:</b> RS232 type	0.5 Vdc to 4.5 Vdc	4 mA to 20 mA
<b>Air gap (sensor to magnet actuator clearance)</b>	<b>35 mm analog:</b> 8,5 ±1,0 mm [0.334 ±0.039 in] <b>all other versions:</b> 3,0 mm ±2,5 mm [0.118 in ±0.098 in]	<b>100° inside:</b> 7,8 ±2,5 mm [0.307 ±0.098 in] <b>100° outside:</b> 9,2 ±2,5 mm [0.36 ±0.09 in] <b>180° inside:</b> 8,58 ±2,5 mm [0.338 ±0.098 in]	3,0 ±2,0 mm [0.118 ±0.079 in]
<b>Operating temperature range</b>	-40°C to 125°C [-40°F to 257°F]	-40°C to 85°C [-40°F to 185°F]	-40°C to 85°C [-40°F to 185°F]
<b>Storage temperature range</b>	-40°C to 150°C [-40°F to 302°F]	-40°C to 150°C [-40°F to 302°F]	-40°C to 150°C [-40°F to 302°F]
<b>Termination</b>	<b>35 mm analog:</b> TYCO Super Seal 282087-1 integral connector <b>all other versions:</b> 18 AWG flying leads	<b>100° inside:</b> 4-pin M12 connector, 18 AWG flying leads <b>100° outside:</b> Ampseal 16 connector <b>180° inside:</b> 4-pin M12 connector	5-pin male connector
<b>Sealing</b>	IP67, IP69K	IP67, IP69K	IP67, IP69K
<b>Radiated immunity</b>	<b>35 mm analog:</b> 100 V/m per ISO 11452-2 <b>all other versions:</b> n/a	—	—
<b>Conducted immunity</b>	<b>35 mm analog:</b> 100 mA BCI per ISO 11452-4 <b>all other versions:</b> n/a	—	—
<b>Housing material</b>	thermoplastic	thermoplastic	aluminum with powder coating
<b>Approvals</b>	CE	CE	CE

Resolvers



Honeywell Hawk™ 1-Inch Series

Honeywell Hawk™ 3-Inch Series

Configuration	fully housed	pancake (bare and simple housed), fully housed
Diameter	1 in	3 in
Speed	1X	1X; 1X and 16X
Accuracy	±420 arcsec	1X: ±420 arcsec (1800 arcsec in dual speed variants) 16X: ±25 arcsec (3 V to 15 V and 800 Hz to 2500 Hz)
Features	transformer (360°+ mechanical) redundant	transformer (360°+ mechanical) redundant, customizable

## **INERTIAL MEASUREMENT UNIT (IMU)**

### **Transportation Attitude Reference Sensor (TARS Series) Ruggedized Inertial Measurement Unit (IMU) , TARS-IMU Series.**

**Features:** High performance IMU, reports vehicle angular rate, acceleration and inclination (6 degrees of freedom) • Ruggedized PBT thermoplastic housing design for the most demanding applications and environments (IP67 & IP69K certified) • Advanced filtering of raw sensor data to minimize unwanted noise and vibrations, improves positioning accuracy • Optional metal guard for added protection • Supports 5 V and 9 V to 36 V vehicle power systems • Operating temperature of -40 °C to 85 °C [-40 °F to 185 °F] • Reduced power consumption • Small form-factor

**Benefits:** Designed to allow vehicle manufacturers and end users to increase efficiency with the automation of repetitive movements or complex tasks. Enables precise movement, actuation and guidance over severe terrains and vehicle grades. Enhances safety through enablement of monitoring and guidance capabilities that improve productivity of operators. On-board firmware can tailor TARS-IMU to the specific vehicle and the specific application. With top-of-the-line sealing (IP67, IP69K) TARS-IMU is ruggedized to withstand harsh or heavy-duty applications. TARS-IMU can be pre-configured at the Honeywell factory for immediate installation out of the box, or it can be delivered with customizable firmware that allows manufacturers to use a single part number across vehicles and applications

### **6 Degrees of Freedom Inertial Measurement Unit, 6-D Motion Variant, 6DF Series.**

**Features:** Designed to Six Sigma standards • Industry-leading durability • Industry-leading accuracy • Eases integration • 6-dimensional motion sensing • Industry-leading voltage input flexibility (7 V to 32 V) • Industry-leading application expertise • Industry-leading customization • Automotive-grade qualified • Industry-leading temperature

performance • Long-term stability • No calibration needed

**Benefits:** Six Sigma standards provide the highest level of product quality, performance, and consistency. Aluminum housing, corrosion-resistance, chemical compatibility, IP67 and IP69k ratings, wide operating temperature range EMI (electromagnetic interference) and EMC (electromagnetic compatibility) provide industry-leading durability. Industry-leading accuracy provides highly accurate 6-dimensional rotation and acceleration outputs. SAEJ1939 CAN 29 bit identifier communication output, IP67 and IP69k ratings, wide voltage range (7 V to 32 V), Deutsch connector, chemical compatibility eases integration. 6-dimensional motion sensing provides key equipment operating data, frees the operator to focus on equipment functions, enables precise control, increases accuracy, safety, stability, and operator productivity. Industry-leading voltage input flexibility (7 V to 32 V) allows customers to purchase only one catalog listing, allows the IMU to accommodate voltage fluctuation, and provides reverse polarity protection. Honeywell's application engineers are available to provide troubleshooting and product design assistance. For Transportation applications with high volumes over 500 units per year, Honeywell will consider offering customers a choice of any CAN protocol. Industry-leading temperature performance provided by a temperature sensor placed within each rotation rate sensor within the IMU provides a temperature value to the processing module where the data samples are filtered and compensated. Long-term stability minimizes system calibration needs, maximizes system performance, and helps support system uptime. Large batches of the IMU are calibrated to a flat surface, providing calibration consistency between units and eliminating the customer's need to calibrate the IMU.

## **NON-CONTACT HALL-EFFECT POSITION SENSORS RTY Series.**

**Features:** True, non-contact operation • Expected life: 35 M cycles • Solid-state Hall-effect technology • Rugged IP69K-sealed package with integral connector • Automotive-grade EMI/EMC testing, integrated reverse polarity, and short circuit • Industry-standard AMP termination, 32 mm mounting pitch, North American and European pinout styles, and compact package • Eight operating ranges up to 360°

**Benefits:** Non-contact sensing in harsh transportation and industrial applications at a competitive cost. 35 M cycle product life provides long life in the application. Solid-state, Hall-effect technology provides non-contact operation, long service life, low torque actuation and reduces worn-out mechanisms. IP69K sealing and integral connector allows for use in harsh environments. EMI/EMC testing, reverse polarity and short circuit provide protection against installation errors and frequencies in the environment. Industry-standard termination, mounting pitch and pinout provide drop-in replacement for existing applications. Choice of sensing ranges provides flexibility in multiple applications, allowing OEMs the range of travel needed for the application. Potential transportation applications include position and movement detection (pedals, throttles, gear shift, levers, steering, linkages, and hitches) on trucks, buses, off-road vehicles, industrial/construction/agricultural vehicles and equipment, cranes); suspension displacement/kneeling on buses, trucks; tilt/trim position on boat engines, tilling equipment), as well as industrial valve, HVAC damper control, and irrigation pivot control.

### **RTP Series.**

**Features:** True, non-contact operation • Expected life: infinite rotation • Solid-state Hall-effect technology • Rugged IP69K-sealed package • Automotive-grade EMI/EMC testing, integrated reverse polarity, and short circuit



protection • Industry-standard AMP termination, 32 mm mounting pitch, North American or European pinout styles, and compact package • Nine operating ranges to 360°

**Benefits:** Non-contact sensing in harsh transportation and industrial applications at a competitive cost. Absence of an actuator shaft removes the wear and tear on the bearings caused by radial forces. IP69K sealing provides durability in most harsh environments. Tolerant to over-travel and allows use in most common applications. Available versions cover an input voltage range of 4.5 Vdc to 30 Vdc. Potential transportation applications include position and movement detection (pedals, throttles, gear shift, levers, steering, linkages, and hitches) in trucks, buses, off-road vehicles, cranes, and industrial/construction/ agricultural vehicles and equipment; suspension/kneeling position in buses and trucks); tilt/trim position in boat engines and tilling equipment. Potential industrial applications include valve, HVAC damper, and irrigation equipment pivot control.

### RPN Series.

**Features:** Solid-state Hall-effect technology • Expected life: 30 M cycles • Eight sensing ranges up to 360° • Reverse polarity, short circuit and EMC protection • Choice of operating ranges, outputs, and levers • IP67- or IP69K-sealed package with integral connector

**Benefits:** Long service life, low torque actuation, and reduced mechanism wear-out. Enhanced resistance to damage from incorrect wiring and electrical noise. Wide choice of sensing ranges provides range of travel for most applications; tolerant to overtravel. Output choices provide flexibility of use within the application. Sealed package with integral connector provides enhanced durability. May be used in potential Transportation applications to detect pedals, throttles, gear shift levers, linkages, suspension and hitches in trucks, offroad vehicles, cranes and construction/ agricultural/industrial equipment.

### HRS Series.

**Features:** Solid-state Hall-effect technology • 10 M cycle product life (typical) • Choice of termination types • Voltage output allows direct connection to the control system • Choice of anti-rotation locating pins • Rotary potentiometer package form factor

**Benefits:** Long service life. Low torque actuation. Enhanced performance in harsh environments, especially those with vibration, shock and extreme temperatures. Reduced mechanical wear concerns. 10 M cycle product life (typical) promotes extended life in the application. Choice of termination types contributes to design flexibility in the application. Voltage output can reduce external circuitry and overall system complexity, lowering overall installation cost to the customer. Choice of anti-rotation locating pins limits rotation of the device in the application, preventing over-travel on levers and throttles. Designed to provide direct replacement for potentiometers, often allowing drop-in conversion to Hall-effect technology. Potential applications include position and movement detection in off-road vehicles and construction/agricultural equipment gear shifters, joysticks, throttles, pedals, hitches, bucket/loaders, steering, auto-pilot/drive-by-wire system feedback, material handling, industrial vehicle attachments, robotic arms and valve actuators.

### SMART POSITION SENSORS

#### SPS Series.

**Features:** • Linear, arc and rotary configurations • Reliable, durable • Easy to install • Rugged • Flexible • Cost effective • Accurate • Adaptable • Lightweight • Simplifies design-in • Self-diagnostics feature • Combined patented MR sensor and ASIC technology • IP67 and IP69K sealing • RoHS compliant

**Benefits:** Variety of configurations provide application flexibility. Non-contact design reduces wear and tear, improving reliability and durability, and minimizing downtime. Easy to install, takes four simple steps vs up to

14 steps some competitive products require, simplifying installation and reducing set-up costs. Because there are no moving parts within the sensor, Honeywell utilizes unique packaging materials that make the sensor more resistant to vibration, shock, and extreme temperatures. Air gap of up to 8,5 mm  $\pm$ 1,0 mm [0.334 in  $\pm$ 0.039 in] between sensor and magnet and variety of available output options (analog standard and other RS232-type baud rates) expand application opportunities. Adaptable, non-contacting design allows customers to eliminate unnecessary connections for installation, thereby reducing installation steps, installation time, and components. Electronics on board allow for flexible packaging and component compatibility with existing systems. Lighter in weight than LVDT (Linear Variable Differential Transformer) technology. High shock and vibration resistance allows for use in a wide variety of tough applications. Combined patented MR sensor and ASIC technology provides enhanced differentiation and performance. IP67 and IP69K sealing allow use in many harsh applications. RoHS-compliant materials meet Directive 2002/95/EC. Potential applications include valve position, material handling, plastic molding, cutting and slitting, wafer handling, CNC machines, passenger bus level position, truck-mounted crane outrigger position, heavy equipment attachment position, hydraulic cylinders, gear shift position in engine transmissions, aerial work lift platform position, rail-road crossing arms position, remote weapon systems elevation, ground-based solar panels elevation and azimuth, robotically-assisted surgery equipment position, steering and articulation angle, boom arm detection, solar panes and wind turbines.

### RESOLVERS

#### Honeywell Hawk™ 1-Inch Series.

**Features:** Non-contact magnetic technology • Fully-housed configuration with bearing/shaft • Small outer diameter of 1 inch • Single speed operation (1 magnetic pole pair) • Excitation

voltage range of 2 V to 15 V • Excitation frequency range of 2000 Hz to 5000 Hz • Transformation ratio of 0.45 or 1.0 • Accuracy of  $\pm 420$  arcsec • Operating temperature range of  $-50.8^{\circ}\text{C}$  to  $93.3^{\circ}\text{C}$  [ $-60^{\circ}\text{F}$  to  $200^{\circ}\text{F}$ ] • Meets multiple military/aerospace specifications: DO-160D, MIL-STD-202G, MIL-STD-810G, MIL-STD-81963B, MIL-STD-461F; complies with space outgassing requirement SP-R0022

**Benefits:** Non-contact magnetic technology eliminates mechanical contact, reducing wear and improving reliability and durability by enhancing operation in harsh environments (performance is not affected by sand, dust or water). Small outer diameter of 1 inch allows for use in size-restricted applications. Single speed operation (1 magnetic pole pair) allows for cost-effective angle resolution over a  $360^{\circ}+$  range. Wide voltage range allows customers to standardize on a resolver that meets their excitation voltage needs, simplifying sourcing and delivery, and saving time. Frequency range provides a wide variety of choices with which to power the device. Transformation ratios offer customers two choices, increasing flexibility of use within the application. Accuracy enables precise motion control of weapon systems and space positioning devices. Wide operating temperature range allows for use in harsh environments and meets standard military and space application requirements. Product delivery up to 1.5 times faster than many competitive products. Customization due to Honeywell's manufacturing process. Global support due to Honeywell's worldwide presence. Engineering expertise due to Honeywell's 30+ years' experience providing accurate, reliable, and durable resolvers for the aerospace and defense industries. Potential applications include providing absolute position feedback of the azimuth and/or elevation angular planes for military

electro-optical systems, fire control systems, gimbals, infrared systems, ordnance delivery and test equipment, as well as satellite, space station, space vehicle solar panel array and antennae positioning for optimum function.

### **Honeywell Hawk™ 3-Inch Series.**

**Features:** Single and dual speed operation (1 and/or 16 magnetic pole pairs) • Multiple configurations (pancake bare and pancake simple housed, fully housed) with rotary transformers • Operating temperature range of  $-50.8^{\circ}\text{C}$  to  $93.3^{\circ}\text{C}$  [ $-60^{\circ}\text{F}$  to  $200^{\circ}\text{F}$ ] • Accuracy of  $\pm 420$  arcsec (1X),  $\pm 25$  arcsec (16X) • Excitation frequency range of 800 Hz to 5000 Hz • Excitation voltage range of 3 V to 15 V • Transformation ratio of 0.25 or 1.0 • Shock of 50 g, 11 ms • Vibration of 15 g, 10 Hz to 2000 Hz • Non-contact magnetic technology • Endurance testing to MIL-hdbk-218 (6.2) (1200 hr at 1150 rpm) • Meets multiple military/aerospace specifications: DO-160D, MIL-STD-202G, MIL-STD-810G, MIL-STD-81963B, MIL-STD-461F; complies with space outgassing requirement SP-R0022, product delivery, customizable, global support, engineering expertise. Potential applications include defense electro-optical and fire control systems, gimbals position and infrared feedback, aerospace space vehicle solar panels and antennae positioning, medical oncology equipment positioning, and industrial CNC/precision tooling.

**Warranty.** Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship during the applicable warranty period. 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

### **⚠ 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 document 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.**

that Honeywell, in its sole discretion, 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 Honeywell may provide application assistance personally, through our literature and the Honeywell web site, it is buyer's sole responsibility 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 writing. However, Honeywell assumes no responsibility for its use

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004453-14 | 15 | 10/17  
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