

## Position Sensors Line Guide



**Precision, down the line.** Honeywell Sensing and Control (S&C) Linear and Distance Position Sensors consist of Linear Potentiometric and Ultrasonic products.

**Potentiometer Sensors** measure linear, rotary position or displacement using technology developed for potential military applications, then adapted to industrial segments. Our proprietary conductive plastic delivers extensive temperature range and infinite resolution, and provides precision position measurement.

**SMART Position Sensors** (Superior Measurement, Accuracy, Reliability, and Thinking.) 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.

**Ultrasonic Sensors** measure time delays between emitted and echo pulses, often accurately determining the sensor-to-target distance. These non-contact-based products solve the toughest sensing problems by detecting targets made of virtually any material — regardless of color, transparency, shine or opacity.

**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.

### FEATURES

#### LINEAR POTENTIOMETRIC SENSORS

##### AQLT Series.

**Features:** 1/2 in body diameter

- Multiple finger-wiper design
- Extruded wiper block guides
- MystR® plastic element
- Anodized extruded aluminum housing
- Sealed construction
- Precious metal contact
- Absolute continuous measurement
- Infinite resolution
- Tolerates clamping loads
- Tested up to one billion operations
- Intrinsically safe for Class I, II and III Division I, Groups A, B, C, D, E, F, and G for hazardous (indoor/outdoor) NEMA 4 locations

**Benefits:** Fits in tight spaces and clamps easily to cylinders. Improves shock and vibration performance. Smooth quiet motion; extends operating life. Enhanced performance in hostile environments. Low noise level often. Accurate position at power up. Magnetic actuator replaces

the shaft found in traditional linear transducers and often eliminates need for additional stroke length mounting space. Enhanced life and often reliable operation in potential applications including in-tank level sensing, robotic motion control, woodworking guides, seismology, packaging and processing equipment, animated characters, marine steering systems, off-road vehicles, semiconductor process equipment, and medical equipment.

##### AQMLT Series.

**Features:** 3/8 in body diameter

- Multiple finger-wiper design
- Extruded wiper block guides
- MystR® plastic element
- Anodized extruded aluminum housing
- Sealed construction
- Precious metal contact
- Absolute continuous measurement
- Infinite resolution
- Tolerates clamping loads
- Tested up to one billion operations
- Intrinsically safe

for Class I, II and III Division I, Groups A, B, C, D, E, F, and G for hazardous (indoor/outdoor) NEMA 4 locations

**Benefits:** Fits in tight spaces and clamps easily to cylinders. Improves shock and vibration performance. Smooth quiet motion; extends operating life. Enhanced performance in hostile environments. Low noise level over entire life. Accurate position at power up. Magnetic actuator replaces the shaft found in traditional linear transducers and often eliminates need for additional stroke length mounting space. Enhanced life and often reliable operation in potential applications including in-tank level sensing, robotic motion control, woodworking guides, seismology, packaging and processing equipment, animated characters, marine steering systems, off-road vehicles, semiconductor process equipment, and medical equipment.

# Position Sensors Line Guide

## Reliable. Quiet. Flexible.

Our position sensors offer every benefit you demand, from resisting extensive vibration to delivering enhanced product life. That's why Honeywell S&C is trusted the world over.

### Linear Potentiometric

**Sensors:** These units feature rugged extruded aluminum housings to withstand harsh chemicals and immersion in oil or water. Potential applications include robotic motion control, marine steering, and in-tank level sensing. Construction features include: extended life PTFE bearings, precious-metal multi-finger contact wipers, and MYSTR® conductive plastic thick film elements.

**SMART Position Sensors:** The non-contacting technology is designed to provide enhanced product life and durability with less downtime. Other benefits are the self-diagnostics feature which reduces equipment downtime and the IP67 and IP69K sealing which allow use in a variety of harsh applications.

**Ultrasonic:** We offer analog or digital units, plus programmable versions for tailored applications — as well as a selection of plastic or stainless-steel housings, and diameters and termination styles. Particularly effective detecting clear or shiny objects, or in particle-laden air and splashing liquid environments. Potential applications include level measurement, height and thickness sensing, and diameter control.



### Linear Potentiometric Sensors

#### AQLT Series

#### AQMLT Series

	AQLT Series	AQMLT Series
<b>Description</b>	shaftless, waterproof linear position transducer	shaftless, waterproof linear position transducer
<b>Operating temperature range</b>	-40 °C to 80 °C [-40 °F to 176 °F]	-40 °C to 80 °C [-40 °F to 176 °F]
<b>Supply voltage</b>	30 Vdc max.	30 Vdc max.
<b>Linearity</b>	±1%	±1%
<b>Starting force (max.)</b>	56,7 g [2 oz] max.	28,35 g [1 oz] max.
<b>Backlash</b>	NA	NA
<b>Total resistance</b>	6 kOhm to 38 kOhm	750 Ohm to 18 kOhm
<b>Measurement range</b>	127 mm to 965 mm [5 in to 38 in]	12,7 mm to 304,8 mm [0.5 in to 12 in]
<b>Shaft</b>	NA	NA
<b>Total mechanical travel</b>	154,94 mm to 967,74 mm [6.1 in to 38.1 in]	15,24 mm to 307,34 mm [0.6 in to 12.1 in]
<b>Electrical travel</b>	152,4 mm to 965,2 mm [6 in to 38 in]	12,7 mm to 304,8 mm [0.5 in to 12 in]
<b>Housing length</b>	electrical travel + 54,87 mm [2.16 in]	electrical travel + 38,1 mm [1.5 in]
<b>Vibration</b>	20 g/0,75 mm (rms) 5 Hz to 2 kHz	20 g/0,75 mm (rms) 5 Hz to 2 kHz
<b>Shock</b>	50 g 11 ms half sine	50 g 11 ms half sine
<b>Expected operating life</b>	one billion dither operations	one billion dither operations
<b>Resistance tolerance</b>	±20%	±20%
<b>Insulation resistance</b>	500 mOhm at 500 Vdc	500 mOhm at 500 Vdc
<b>Dielectric strength</b>	250 V rms	250 V rms
<b>Termination</b>	cable	cable



## Linear Potentiometric Sensors

	LFII Series	SLF Series	LT Series
<b>Description</b>	vibration-resistant, plunger-driven linear transducer	short stroke version of the LFII	plunger-driven linear transducer
<b>Operating temperature range</b>	-65 °C to 105 °C [-85 °F to 221 °F]	-65 °C to 105 °C [-85 °F to 221 °F]	-40 °C to 80 °C [-40 °F to 176 °F]
<b>Supply voltage</b>	30 Vdc max.	40 Vdc max.	30 Vdc max.
<b>Linearity</b>	±1%	±1% or ±0.1%	±1%
<b>Starting force (max.)</b>	0,45 kg [1 lb] (standard); LFIW: 2,27 kg [5 lb] (water resistant)	1 lb (standard) 5 lb (water resistant)	28,35 g max. [1 oz max.] 12 oz max. (water resistant)
<b>Backlash</b>	0,025 mm [0.001 in] max.	0,025 mm [0.001 in] max.	0,00508 mm [0.0002 in] max.
<b>Total resistance</b>	5 kOhm	1.5 kOhm to 9 kOhm	1 kOhm to 10 kOhm
<b>Measurement range</b>	152 mm to 1219 mm [6 in to 48 in]	25 mm to 152 mm [1 in to 6 in]	25 mm to 254 mm [1 in to 10 in]
<b>Shaft</b>	Ø 6,35 mm [0.25 in]	Ø 6,35 mm [0.25 in]	Ø 3,18 mm [0.125]
<b>Total mechanical travel</b>	154,6 mm to 1221,4 mm [6.09 in to 48.09 in]	30,5 mm to 166,2 mm [1.2 in to 6.15 in]	26,7 mm to 255.3 mm [1.05 in to 10.05 in]
<b>Electrical travel</b>	152,4 mm to 1219,2 mm [6 in to 48 in]	25,4 mm to 152,4 mm [1 in to 6 in]	25,4 mm to 254 mm [1 in to 10 in]
<b>Housing length</b>	electrical travel + 81,02 mm [3.19 in]	electrical travel + 77,5 mm [3.05 in]	electrical travel + 38,10 mm [1.50 in]
<b>Vibration</b>	20 g/0,75 mm (rms) 5 Hz to 2 kHz (for vibration levels up to 50 g rms and higher, additional housing clamps are required)	20 g/0,75 mm (rms) 5 Hz to 2 kHz	20 g/0,75 mm (rms) 5 Hz to 2 kHz
<b>Shock</b>	50 g 11 ms half sine	50 g 11 ms half sine	50 g 11 ms half sine
<b>Expected operating life</b>	one billion dither operations	one billion dither operations	one billion dither operations
<b>Resistance tolerance</b>	±20%	±20%	±20%
<b>Insulation resistance</b>	1000 mOhm at 500 Vdc	NA	500 mOhm at 500 Vdc
<b>Dielectric strength</b>	1000 V rms	NA	1000 V rms
<b>Termination</b>	connector, binder series 681	connector, binder series 681	cable

# Position Sensors Line Guide



## Linear Potentiometric Sensors

### MLT Series

### DR Series

	MLT Series	DR Series
<b>Description</b>	plunger-driven linear transducer	Durastar rodless, space-saving side actuator
<b>Operating temperature range</b>	-40 °C to 80 °C [-40 °F to 176 °F]	-65 °C to 105 °C [-85 °F to 221 °F]
<b>Supply voltage</b>	30 Vdc max.	75 Vdc max.
<b>Linearity</b>	±1%	0.1% from 1 to 100 % of theoretical electrical travel
<b>Starting force (max.)</b>	28,35 g [1 oz] max.	0,45 kg [1.0 lb]
<b>Backlash</b>	0,0127 mm [0.0005 in] max.	0,025 mm [0.001 in] max.
<b>Total resistance</b>	750 Ohm to 9 kOhm	2 kOhm to 10 kOhm
<b>Measurement range</b>	13 mm to 152 mm [0.5 in to 6 in]	102 mm to 1270 mm [4 in to 50 in]
<b>Shaft</b>	Ø 3,18 mm [0.125]	M5 x 0.8
<b>Total mechanical travel</b>	13,97 mm to 153,67 mm [0.55 in to 6.05 in]	106 mm to 1275 mm [4.2 in to 50.2 in]
<b>Electrical travel</b>	12,7 mm to 152,4 mm [0.5 in to 6 in]	101.6 mm to 1270 mm [4 in to 50 in]
<b>Housing length</b>	electrical travel + 30,48 mm [1.2 in]	250 mm to 1418 mm [9.84 in to 55.83 in]
<b>Vibration</b>	20 g/0,75 mm (rms) 5 Hz to 2 kHz	20 g/0,75 mm (rms) 5 Hz to 2 kHz
<b>Shock</b>	50 g 11 ms half sine	50 g 11 ms half sine
<b>Expected operating life</b>	one billion dither operations	one billion dither operations
<b>Resistance tolerance</b>	±20%	±20%
<b>Insulation resistance</b>	500 mOhm at 500 Vdc	1000 mOhm at 500 Vdc
<b>Dielectric strength</b>	1000 V rms	1000 V rms
<b>Termination</b>	cable	Hirschmann GDM



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

**SPS Series  
35 mm Analog, 75 mm Analog  
and 225 mm Analog and  
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>	35 mm: 0 mm to 35 mm [0 in to 1.38 in] 75 mm: 0 mm to 75 mm [0 in to 2.95 in] 225 mm: 0 mm to 225 mm [0 in to 8.86 in]	100°: 0° to 100° 180°: 0° to 180°	0° to 360°
<b>Actuator sensing location on arc</b>	N/A	100°: inside or outside 180°: inside	N/A
<b>Resolution</b>	35 mm analog: 0,04 mm [0.0016 in] 75 mm analog: 0,05 mm [0.002 in] 225 mm analog: 0,14 mm [0.0055 in] 225 mm digital: 0,0035 mm [0.000137 in]	100° inside and outside: 0.06° 180° inside: 0.11°	0.01°
<b>Supply voltage</b>	35 mm: 4.75 Vdc to 5.25 Vdc all other versions: 6 Vdc to 24 Vdc	100° inside: 6 Vdc to 24 Vdc, 18 Vdc to 40 Vdc 100° outside: 5 Vdc 180° inside: 6 Vdc to 24 Vdc, 18 Vdc to 40 Vdc	12 Vdc to 30 Vdc
<b>Supply current</b>	35 mm analog: 20 mA max. 75 mm analog: 32 mA max. 225 mm analog: 34 mA max. 225 mm digital: 88 mA max.	100° inside: 45 mA max. 100° outside: 30 mA max. 180° inside: 45 mA max.	90 mA max.
<b>Output</b>	35 mm analog: 0.55 Vdc to 4.15 Vdc 75 mm and 225 mm analog: 0 Vdc to 5 Vdc 225 mm digital: RS232 type	0.5 Vdc to 4.5 Vdc	4 mA to 20 mA
<b>Air gap (sensor to magnet actuator clearance)</b>	35 mm analog: 8,5 ±1,0 mm [0.334 ±0.039 in] all other versions: 3,0 mm ±2,5 mm [0.118 in ±0.098 in]	100° inside: 7,8 ±2,5 mm [0.307 ±0.098 in] 100° outside: 9,2 ±2,5 mm [0.36 ±0.09 in] 180° inside: 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>	35 mm analog: TYCO Super Seal 282087-1 integral connector all other versions: 18 AWG flying leads	100° inside: 4-pin M12 connector, 18 AWG flying leads 100° outside: Ampseal 16 connector 180° inside: 4-pin M12 connector	5-pin male connector
<b>Sealing</b>	IP67, IP69K	IP67, IP69K	IP67, IP69K
<b>Radiated immunity</b>	35 mm analog: 100 V/m per ISO 11452-2 all other versions: –	–	–
<b>Conducted immunity</b>	35 mm analog: 100 mA BCI per ISO 11452-4 all other versions: –	–	–
<b>Housing material</b>	thermoplastic	thermoplastic	aluminum with powder coating
<b>Approvals</b>	CE	CE	CE

# Position Sensors Line Guide



## Ultrasonic Sensors

### 940-F/947 Series

### 941-D Series

<b>Range type</b>	from 0,6 m to 3 m [2 ft to 10 ft]	from 0,4 m to 3,5 m [1.3 ft to 11.5 ft]
<b>Output type</b>	analog or switching	analog or switching
<b>Supply voltage</b>	19 Vdc to 30 Vdc	15 Vdc to 30 Vdc
<b>Housing style</b>	plastic M18 and M30	plastic square housing
<b>Termination type</b>	cable or connector	connector
<b>Beam angle</b>	8°	10°
<b>Response time</b>	50 ms, 90 ms	150 ms
<b>Switching frequency</b>	100 ms, 1 Hz, 8 Hz, 25 Hz	10 Hz
<b>Repeatability</b>	0.3% or ±1 mm; 0.2% or ±2 mm	±1 mm
<b>Software programmable</b>	no	no
<b>Teach in</b>	no	yes
<b>Remote teach in</b>	no	no
<b>Synchronization output</b>	yes	yes



## Ultrasonic Sensors

### 942 Series

### 943 Series

<b>Range type</b>	from 1,5 m to 3,5 m [4.9 ft to 11.5 ft]	from 0,2 m to 3,5 m [0.7 ft to 11.5 ft]
<b>Output type</b>	analog and switching	analog or switching
<b>Supply voltage</b>	19 Vdc to 30 Vdc	15 Vdc to 30 Vdc
<b>Housing style</b>	plastic M30	metal M12, plastic M18 and M30
<b>Termination type</b>	connector	cable or connector
<b>Beam angle</b>	8°, 10°	8°
<b>Response time</b>	100 ms	400 ms
<b>Switching frequency</b>	5 Hz to 30 Hz; 5 Hz to 8 Hz	100 ms, 250 ms, 1.2 Hz, 4.7 Hz
<b>Repeatability</b>	0.4% or 2 mm; 0.2% or ±1 mm	0.2% or ±2 mm
<b>Software programmable</b>	yes	no
<b>Teach in</b>	yes	yes
<b>Remote teach in</b>	no	yes
<b>Synchronization output</b>	yes	no

## Ultrasonic Sensors



**944 Series**

**946 Series**

**948 Series**

<b>Range type</b>	from 0,4 m to 3,5 m [1.2 ft to 11.5 ft]	from 0,3 m to 6 m [0.93 ft to 19.69 ft]	0,3 m [1 ft]
<b>Output type</b>	analog and switching	analog and switching	switching
<b>Supply voltage</b>	19 Vdc to 30 Vdc	10 V to 30 V	18 Vdc to 30 Vdc
<b>Housing style</b>	plastic M18 and M30	stainless steel M30	2 pieces square plastic
<b>Termination type</b>	connector	M12 connector	cable
<b>Beam angle</b>	8°	5°	8°
<b>Response time</b>	–	21 ms, 65 ms, 145 ms, 195 ms, 285 ms, 850 ms	–
<b>Switching frequency</b>	0,8 Hz, 1 Hz, 8 Hz	–	–
<b>Repeatability</b>	0.4% or ±2 mm	< 0.1%	–
<b>Software programmable</b>	no	no	no
<b>Teach in</b>	yes	yes	no
<b>Remote teach in</b>	no	no	no
<b>Synchronization output</b>	no	no	no



## Inertial Measurement Units (IMU)

**6DF Series**

<b>Description</b>	6 Degrees of Freedom, 6-D Motion Variant
<b>Supply voltage</b>	7 V to 32 V
<b>Supply current</b>	350 mA max.
<b>Startup time</b>	700 ms typ.
<b>Output type</b>	SAEJ1939 CAN 29
<b>Operating temperature range</b>	-40 °C to 85 °C [-40 °F to 185 °F]
<b>Accelerometer</b>	2 g, 6 g
<b>Sealing</b>	IP67, IP69K
<b>Housing material</b>	aluminum
<b>Approvals/testing/qualifications</b>	EMI/EMC, ESD, mechanical and thermal shock, random vibration, humidity, salt spray, chemical compatibility, automotive grade

## **LFII Series.**

**Features:** Vibration-damped element

- Extruded wiper carrier guides • Precious metal wipers • MystR® plastic elements
- Stainless-steel shaft • Enhanced dc level output • Enhanced performance bearings
- Infinite resolution • Absolute continuous measurement • Shaft seals • Water-resistant option available • Metric Series available • Tested up to one billion operations • Intrinsically safe for Class I, II and III Division I, Groups A, B, C, D, E, F, and G for hazardous (indoor/outdoor) NEMA 4 locations

**Benefits:** No wiper bounce in high vibration environments. Smooth, easy operation under high side loads and large misalignment. Provides enhanced performance, low noise, no oxidation. Works with simple controllers. Enhanced life even under side load conditions. Often accurate position at power-up. Protects internal components from harsh environments. Potential applications include injection molding machines, printing presses, meat packing equipment, drill presses, woodworking machines, cranes, front-end loaders, and scales.

## **SLF Series.**

**Features:** Precious metal wipers • 0.081 in thick housing with 6 mm [0.25 in] shaft

- MystR® plastic elements • High level dc output • Enhanced performance bearings
- Absolute continuous measurement
- Shaft seals • Infinite resolution • Water-resistant option available • Tested up to one billion operations • Intrinsically safe for Class I, II and III Division I, Groups A, B, C, D, E, F, and G for hazardous (indoor/outdoor) NEMA 4 locations

**Benefits:** Provides enhanced performance, low noise. Rugged construction for manufacturing environment. Enhanced life even with side load conditions. Protects internal components from factory environment. Often accurate position at power-up. Works with simple controls. Provides a high resolution, often absolute position measurement without external signal conditioners. Potential applications include

injection molding machines, printing presses, meat packing equipment, drill presses, woodworking machines, cranes, and front-end loaders.

## **LT Series.**

**Features:** 1/2 in diameter • Dual-wiper design • Extruded wiper-block guides

- MystR® plastic element • Stainless-steel shaft • Anodized extruded aluminum housing • Precious metal contact
- Absolute continuous measurement
- Shaft seals for spray-or-hose-down environments • Infinite resolution
- Enhanced reliability • Tested up to one billion operations • Intrinsically safe for Class I, II and III Division I, Groups A, B, C, D, E, F, and G for hazardous (indoor/outdoor) NEMA 4 locations

**Benefits:** Fits into tight spaces, clamps easily to cylinders. Improves shock and vibration performance. Smooth, quiet motion; enhances operating life. Tolerates clamping loads. Rugged construction to withstand hostile environments. Often accurate position at power up. Provides usable output at high vibration levels for long periods. Diameter is among the smallest available and can replace displacement transducers in many applications. Potential applications include animated characters, gauging, fluid flow meters, seismology, semiconductor processing, linear actuators, hospital beds, and other medical equipment.

## **MLT Series.**

**Features:** 3/8 in diameter • Dual-wiper design • Extruded wiper-block guides

- MystR® plastic element • Stainless-steel shaft • Internal spring-loaded ball joint
- Anodized extruded aluminum housing
- Precious metal contact • Absolute continuous measurement • Infinite resolution • Enhanced reliability • Tested up to one billion operations • Intrinsically safe for Class I, II and III Division I, Groups A, B, C, D, E, F, and G for hazardous (indoor/outdoor) NEMA 4 locations

**Benefits:** Fits into tight spaces, clamps easily to cylinders. Improves shock and vibration performance. Smooth, quiet motion; extends operating life. Tolerates

clamping loads. Rugged construction to withstand hostile environments. Often accurate position at power up. Provides usable output at high vibration levels for long periods. Reduces error from shaft misalignment. Diameter is among the smallest available and can replace displacement transducers in many applications. Potential applications include animated characters, gauging, fluid flow meters, seismology, semiconductor processing, linear actuators, hospital beds, and other medical equipment.

## **DR Series.**

**Features:** Vibration-damped element

- Extended side bearing • Extruded wiper-carrier guides • Rugged ribbed housing
- Precious metal wipers • MystR® plastic elements • High dc level output
- Enhanced performance bearings
- Absolute continuous measurement
- Infinite resolution • NEMA 4 sealing
- Tested up to one billion operations
- Intrinsically safe for Class I, II and III Division I, Groups A, B, C, D, E, F, and G for hazardous (indoor/outdoor) NEMA 4 locations

**Benefits:** No wiper bounce in high vibration environments. Improved life under high misalignment. Smooth, whisper-quiet operation under large misalignment. Rugged construction to withstand hostile environments. Provides enhanced performance, low noise, no oxidation. Works with simple controllers. Enhanced life even under side load conditions. Often accurate position at power-up. This long lasting, rodless, side-sealed transducer may be used to replace rodless potentiometers in contaminated applications. Potential applications include injection molding machines, printing presses, meat packing equipment, drill presses, woodworking machines, cranes, front-end loaders, and scales.

## **SMART POSITION SENSOR**

### **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 materials

**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  $8,5 \pm 1,0$  mm [ $0.334 \pm 0.039$  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 panels and wind turbines.

## ULTRASONIC SENSORS

### 940-F/947 Series.

**Features:** Maximum scan ranges from 0,6 m to 3,0 m [1.96 ft to 19.68 ft] • Plastic housing M18 (for 0,6 [1.96 ft] and 1,5 m [4.92 ft] models), M30 (for 3,5 m [11.48 ft] models) • Chemical-resistant epoxy heads • High sealing IP67 • Pre-leaded 2,0 m [78.75 in] or M12 connector models • Synchronizing/hold input • Adjustment by potentiometer • Micro-processor controlled • Temperature compensation

**Benefits:** Easy to use. Provide unprecedented ultrasonic power in a very small package. Provide one switching output (PNP or NPN open collector). Powerful ultrasonic beam detects even targets with bad ultrasonic characteristics (angled, soft, absorbent, and pulverulent). M18 or M30 package allows mounting in narrow places. Adjustment is simply performed by a potentiometer. The high-sealing IP67, plastic housing, and the epoxy head provide enhanced resistance in aggressive environments like food and beverage or raw materials processing factories. Other potential applications include bottle counting, food processing machinery, filling machinery, crop handling machinery, and ground flatness detection for vehicles.

### 941-D Series.

**Features:** Limit switch-style sensor • Maximum scan range is 3,5 m [11.48 ft] • Plastic housing • Teach in • Sealing to IP67 • M12 connector, 5 pin • Visual indication • Four output options; analog (0 Vdc to 10 Vdc and 4 mA to 20 mA) and 2 PNP or 2 NPN switching outputs • Synchronizing/hold input • Two switch point adjustment via teach-in sequence • Temperature compensation • Easy installation • Competitively priced • Not affected by dust, light, and color • CE and UL/CSA approved

**Benefits:** Provides all high-end sensor features in a limit switch-style housing. Longer scanning distance than inductive technology. Up to 3500 mm scanning distance with significantly reduced dead zones. Hysteresis adjustment and Microsoft® Windows® function are

available, making this sensor an excellent replacement for more expensive devices. 32 mm thickness allows installation even if the space in potential application is reduced. Meets demanding application requirements including presence detection, applications with restricted space, slitter and rewinder machines, cranes, and loop control.

### 942 Series.

**Features:** Four models with scan ranges from 0,9 m to 3,0 m [2.95 ft to 9.84 ft] • Stainless steel M30 heads, IP65 • Plastic control box with screw terminals, IP40 • Synchronizing/hold input • Ultrasonic beam power (sensitivity) adjustable by switch • Four switching outputs, open collector PNP: set points 1 and 2, adjustable by coded wheels; under-range (target close), over-range (target far or absent) • NO/NC adjustable by switch • Two analog outputs (4 mA to 20 mA and 0 Vdc to 10 Vdc) • Temperature compensation • Most versatile sensors of all the product range • May be mounted in remote or difficult places (top of tanks, inside of machinery, hot places, etc.)

**Benefits:** Control box is mountable on DIN rail and houses all the adjustments. Adjustment can be performed in a matter of seconds via the coding wheels and switches on the front panel of the control box. Advanced programming is done on a PC, connected with the RS-232 link. The software (under Microsoft® Windows®) provides a very easy man-machine interface with extended possibilities: digital signal processing parameters, cycle time, slope, etc. Potential applications include loop control, tank level measurement (liquids, crops, etc.), reel diameter measurement, and tire manufacturing.

### 943 Series.

**Features:** Remote teach-in/auto-tuning Windows and hysteresis mode • Scanning distances with minimized dead zone and extended maximum ranges from 60 mm to 3500 mm [2.4 in to 137.7 in] • Two switching outputs (each can be either NO or NC) or analog outputs (either voltage, 0 Vdc to 10 Vdc or current 4 mA to 20 mA)

are available • Temperature compensation • Connector (M12, 5 pin) or cable version available • Plastic M18 or M30 (depending on the scanning ranges) with IP67

**Benefits:** Remote teach-in/auto-tuning of the switching or analog outputs. High power, small package, high sealing and chemical resistance. Can be located where space is at a premium. Ideal for potential industrial applications including reel diameter measurement, tank level measurement, presence absence of a person or object, loop control, product height measurement, and tire manufacturing.

#### 944 Series.

**Features:** Eight models with scan ranges from 0,35 m to 3,5 m [1.14 ft to 11.48 ft] • Auto-tuning by one switch • Slope direction selection • NO/NC selection • Two switching outputs (open collector PNP) • Analog output (4 mA to 20 mA or 0 Vdc to 10 Vdc) • Temperature compensation • M12 five-pin connector • M12 female connector included • Plastic M30 housing, IP67

**Benefits:** Provides the fullest range of functions in a complete package. Solves an even wider range of applications due to its very simple programming by auto-tuning. High power, small package, high sealing, chemical resistance. Potential applications include loop control, product height measurement, tank level measurement (liquids, crops, etc.), reel diameter measurement, and tire manufacturing.

#### 946 Series.

**Features:** Scan ranges from 0,3 m to 6,0 m [0.93 ft to 19.68 ft] • Auto-tuning by four positions plug • Independent/Windows® output choice (switching output models) • Stainless steel M30 housing, IP65 • Two switching outputs, open collector PNP • Temperature compensation • M12 four-pin connector • Connector cable 2,0 m [78.75 in] included

**Benefits:** Provides a compromise between easy usage and advanced features. Adjustment is easily done by auto-tuning.

By inserting a plug with four positions, one can program the sensor in a matter of seconds; the parameters are stored in a non-volatile memory (EEPROM). Potential applications include loop control, product height measurement, tank level measurement (liquids, crops, etc.), reel diameter measurement, and tire manufacturing.

#### 948 Series.

**Features:** Sensing distance up to 300 mm [12 in] • Available in four output configurations: NO PNP, NO NPN, NC PNP, NC NPN • Switching frequency of 150 Hz • 2 m [78.8 in] cable • IP67 sealing • Compact size

**Benefits:** Easy to install in limited space applications. Thru-scan detection regardless of the object material for enhanced detection. Non-contact distance sensing for use in non-invasive measurement. Reduced sensitivity to light intensity/reflectivity/opacity of target for enhanced flexibility and certainty of measurement. Detects over a much longer distance than other detection methods reducing the need for close proximity to the target. Presence absence, tank-fill level and diameter measurement provides a robust and flexible measurement method. Potential applications include food and beverage, rapid presence/absence detection, bottle counting, and loop control.

#### INERTIAL MEASUREMENT UNIT (IMU)

##### 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.

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

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.

For more information about Sensing and Control products, visit [sensing.honeywell.com](http://sensing.honeywell.com) or call +1-815-235-6847. Email inquiries to [info.sc@honeywell.com](mailto:info.sc@honeywell.com).

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