

**Position Sensors**

**Honeywell**



**SENSING AND CONTROL**

**Product Range Guide**

# For innovation that's well apart, there's only Honeywell Sensing and Control.

With more than 50,000 products ranging from snap-action, limit, toggle, and pressure switches to position, speed, pressure, and airflow sensors, Honeywell Sensing and Control (S&C) has one of the broadest sensing and switching portfolios available.

Honeywell sensor, switch, and control components are tailored to exact specifications for stronger performance, longer productivity, and increased safety. Enhanced accuracy and durability are built into every part, improving output and endurance. For our customers, this can reduce expenditures and operational costs. Our global footprint and channels help to competitively price such components for your chosen application and provide immediate technical support.

Our expertise in aerospace and defense, transportation, medical, and industrial industries means we offer products and solutions for a wide range of applications. But, an impressive product line is only one part. We possess unique engineering expertise and value-added capabilities.

While Honeywell's switch and sensor solutions are suitable for a wide array of basic and complex applications, our custom-



engineered solutions offer enhanced precision, repeatability, and ruggedness. We offer domain knowledge and technology resources, along with a close working relationship, to develop and deliver cost-effective, individually tailored solutions. Whether clean-slate development or simple modifications to an existing design are needed, our expertly engineered solutions help to meet the most stringent requirements with worldclass product designs, technology integration, and customer-specific manufacturing.

With a 75-year legacy in the switch and sensor business, Honeywell S&C has earned a reputation for reliability and excellence. Our strong product designs, Six Sigma Plus manufacturing environment, and robust testing facilities help provide quality out of the box, as well as enhanced, sustainable performance down the line.

Global service, sourcing, and manufacturing. Industry-leading engineers. Value-added assemblies and solutions. Construction to required specifications. A one-stop, full-service, globally competitive supplier... Honeywell Sensing and Control.

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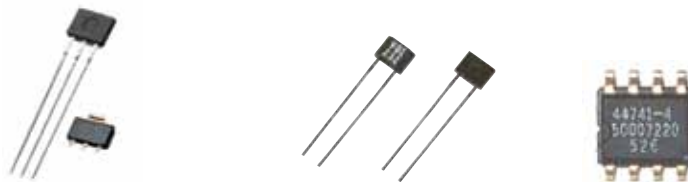
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# Magnetic Sensors

## Magnetoresistive Sensor ICs



With a built-in magnetoresistive bridge integrated on silicon and encapsulated in a plastic package, magnetoresistive sensor ICs feature an integrated circuit that responds to low fields at large distances. Potential applications include laptops, material handling equipment, and pneumatic cylinders.



Series	2SS52M/SS552MT	VF401	APS00B
<b>Description</b>	omnipolar magnetoresistive digital sensor IC	2-wire MR fine pitch ring magnet sensor IC	high resolution magnetic displacement sensor IC
<b>Magnetic actuation type</b>	omnipolar	differential bridge	analog, saturated mode
<b>Package material and style</b>	2SS52M: plastic radial leads SS552MT: plastic surface mount (SOT-89)	plastic flat, TO-92-style	plastic surface mount (SO-8)
<b>Supply voltage range</b>	3.8 Vdc to 30 Vdc	4.5 Vdc to 16 Vdc	1 Vdc to 12 Vdc
<b>Supply current</b>	11 mA max.	Icc operate: 16.8 mA max. Icc release: 8.4 mA max.	7 mA max.
<b>Output type</b>	digital sinking	digital current source	sin(2Θ), cos(2Θ)
<b>Operating 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>Measurements (H x W)</b>	2SS52M: 4,5 mm x 4,5 mm [0.18 in x 0.18 in] SS552MT: 4,2 mm x 4,5 mm [0.16 in x 0.18 in]	2,8 mm x 2,9 mm [0.11 in x 0.11 in]	4,9 mm x 6,0 mm [0.19 in x 0.24 in]
<b>Features</b>	omnipolar magnetics; sinking output, low gauss operation (25 G max.); operating speed of 0 kHz to over 100 kHz; tape and reel available	wide speed capability; output pattern independent of gap between target and sensor; improved insensitivity to run-out, tilt, and twist; reverse polarity protection	dual analog voltages responding to changes in magnetic field angle; sine and cosine output; accurate to 0,102 mm [0.004 in]; tape and reel available

# Magnetic Sensors

## Hall-Effect Digital Sensor ICs

Constructed from a thin sheet of conductive material, Hall-effect sensor ICs have output connections perpendicular to direction of current flow. Potential applications are many, including speed and RPM sensing, brushless dc motors, and fan/motor/robotics.



Series	SL353	SS30AT/ SS40A/ SS50AT	SS311PT/ SS411P	SS340RT/ SS440R
<b>Description</b>	micropower omnipolar Hall-effect digital sensor IC	low-cost bipolar Hall-effect digital sensor IC	low-cost bipolar Hall-effect digital sensor IC with built-in pull-up resistor	low-cost unipolar Hall-effect digital sensor IC
<b>Magnetic actuation type</b>	omnipolar	bipolar	bipolar	unipolar
<b>Package material and style</b>	plastic surface mount (SOT-23)	SS40A: plastic radial lead SS30AT/SS50AT: plastic surface mount (SOT-23 & SOT-89)	SS311PT: plastic surface mount (SOT-23) SS411P: plastic radial lead	SS340RT: plastic surface mount (SOT-23) SS440R: plastic radial lead
<b>Supply voltage</b>	2.2 Vdc to 5.5 Vdc	4.5 Vdc to 24 Vdc	2.7 Vdc to 7 Vdc	3 Vdc to 18 Vdc, except SS340RT >125 °C [247 °F]: 3 Vdc to 12 Vdc
<b>Supply current</b>	SL353LT: 1.8 μ typ. @ 2.8 Vdc; SL353HT: 0.33 mA typ. @ 2.8 Vdc	10 mA max. at 25 °C [77 °F]	14 mA max.	8 mA
<b>Output type</b>	digital	digital sinking	digital sinking	digital sinking
<b>Operating temperature range</b>	-40 °C to 85 °C [-40 °F to 185 °F]	SS40A: -40 °C to 125 °C [-40 °F to 257 °F] SS30AT/SS50AT: -40 °C to 125 °C [-40 °F to 257 °F]	-40 °C to 150 °C [-40 °F to 302 °F]	SS340RT (3 Vdc to 24 Vdc): -40 °C to 125 °C [-40 °F to 257 °F] SS340RT (3 Vdc to 12 Vdc): -40 °C to 150 °C [-40 °C to 302 °F] SS440R (3 Vdc to 24 Vdc): -40 °C to 150 °C [-40 °F to 302 °F]
<b>Measurements (H x W)</b>	2,8 mm x 2,9 mm [0.11 in x 0.11 in]	SS30AT: 2,8 mm x 2,9 mm [0.11 in x 0.11 in] SS40A: 3,0 mm x 4,1 mm [0.12 in x 0.16 in] SS50AT: 4,2 mm x 4,5 mm [0.16 in x 0.18 in]	SS311PT: 2,8 mm x 2,9 mm [0.11 in x 0.11 in] SS441P: 3,0 mm x 4,1 mm [0.12 in x 0.16 in]	SS340RT: 2,8 mm x 2,9 mm [0.11 in x 0.11 in] SS440R: 3,0 mm x 4,1 mm [0.12 in x 0.16 in]
<b>Features</b>	low supply voltage combined with very low average current reduces power consumption, provides extended battery life, and promotes energy efficiency	bipolar magnetics; high output current and speed capability; reverse polarity protection	bipolar magnetics; built-in pull-up resistor; low voltage; enhanced sensitivity	unipolar magnetics; simple activation from a South pole and multiple magnetic sensitivities (high, medium, and low); low voltage; built-in reverse polarity protection



**SS345PT/  
SS445P**

**SS351AT/  
SS451A**

**SS361CT/  
SS461C**

**SS361RT/  
SS461R**

**SS400/SS500**

**SS41/SS51T**

unipolar Hall-effect digital sensor IC

low-cost omnipolar Hall-effect digital sensor IC

high sensitivity, bipolar latching Hall-effect digital sensor IC

low-cost Hall-effect digital sensor IC

SS400: Hall-effect digital sensor IC  
SS500: unipolar/bipolar/bipolar latching Hall-effect digital sensor IC

bipolar Hall-effect digital sensor IC

unipolar

omnipolar

bipolar latching

bipolar latching

unipolar, bipolar, bipolar latching

bipolar

SS345PT: plastic surface mount (SOT-23)  
SS445P: plastic radial lead

SS351AT: plastic surface mount (SOT-23)  
SS451A: plastic radial lead

SS361CT: plastic surface mount (SOT-23)  
SS461C: plastic radial lead

SS361RT: plastic surface mount (SOT-23)  
SS461R: plastic radial lead

SS400: plastic radial lead  
SS500: plastic surface mount (SOT-89)

SS41: plastic radial lead  
SS51T: plastic surface mount (SOT-89)

2.7 Vdc to 7.0 Vdc

SS351AT (-40 °C to 125 °C [-40 °F to 257 °F]): 3 Vdc to 24 Vdc;  
SS351AT (150 °C [302 °F]): 3 Vdc to 12 Vdc  
SS451A (-40 °C to 150 °C [-40 °F to 302 °F]): 3 Vdc to 24 Vdc

4 Vdc to 24 Vdc

3 Vdc to 18 Vdc, except SS361RT >125 °C [247 °F]: 3 Vdc to 12 Vdc

3.8 Vdc to 30 Vdc (inclusive)

4.5 Vdc to 24 Vdc

14 mA

5 mA max. at 25 °C [77 °F] (3 V)  
6 mA max. at 25 °C [77 °F] (5 V)

6 mA max.

8 mA

SS400: 10 mA  
SS500: 8.7 mA at 5 Vdc

15 mA max.

digital sinking

digital sinking

digital sinking

digital sinking

digital sinking

digital sinking

-40 °C to 150 °C [-40 °F to 302 °F]

-40 °C to 150 °C [-40 °F to 302 °F]

-40 °C to 125 °C [-40 °F to 257 °F]

SS361RT (3 V to 12 V) & SS461R: 40 °C to 150 °C [-40 °F to 302 °F];  
SS361RT (3 V to 18 V): -40 °C to 125 °C [-40 °F to 257 °F]

-40 °C to 150 °C [-40 °F to 302 °F]

-40 °C to 150 °C [-40 °F to 302 °F]

SS345PT: 2,8 mm x 2,9 mm [0.11 in x 0.11 in]  
SS445P: 3,0 mm x 4,1 mm [0.12 in x 0.16 in]

SS351AT: 2,8 mm x 2,9 mm [0.11 in x 0.11 in]  
SS451A: 3,0 mm x 4,1 mm [0.12 in x 0.16 in]

SS361CT: 2,8 mm x 2,9 mm [0.11 in x 0.11 in]  
SS461C: 3,0 mm x 4,1 mm [0.12 in x 0.16 in]

SS361RT: 2,8 mm x 2,9 mm [0.11 in x 0.11 in]  
SS461R: 3,0 mm x 4,1 mm [0.12 in x 0.16 in]

SS400: 3,0 mm x 4,1 mm [0.12 in x 0.16 in]  
SS500: 4,2 mm x 4,5 mm [0.16 in x 0.18 in]

SS41: 3,0 mm x 4,1 mm [0.12 in x 0.16 in]  
SS51T: 4,2 mm x 4,5 mm [0.16 in x 0.18 in]

simple activation from a North pole (SS345PT) or a South pole (SS445P); low voltage 2.7 Vdc capability; built-in pull-up resistor

omnipolar (responds to either a North or South pole); built-in reverse polarity protection; thermally balanced integrated circuit; typical operating point of 85 G at 25 °C [77 °F]

enhanced sensitivity; simple activation from a North pole (SS361CT) or a South pole (SS461C); wide operating voltage range; built-in reverse voltage capability

bipolar latching magnetics; enhanced sensitivity; low voltage; built-in reverse polarity protection; robust design

unipolar, bipolar, and bipolar latching; sinking output; multiple operate/release points available

bipolar magnetics; sinking output; high output current; reverse polarity protection

# Magnetic Sensors

## Hall-Effect Digital and Linear Sensor ICs



Constructed from a thin sheet of conductive material, Hall-effect sensor ICs have output connections perpendicular to direction of current flow. Potential applications are many, including speed and RPM sensing, brushless dc motors, and fan/motor/robotics.



Digital Series	SS421	SS42R
<b>Description</b>	adjustable bipolar Hall-effect digital sensor IC with underspeed detection	bipolar latching dual Hall-effect digital sensor IC with active high/active low complementary output
<b>Magnetic actuation type</b>	bipolar	bipolar latching
<b>Package material and style</b>	plastic radial lead	plastic radial lead
<b>Supply voltage</b>	4.5 Vdc to 16 Vdc	4.5 Vdc to 16 Vdc
<b>Supply current</b>	15 mA max.	11 mA max.
<b>Output type</b>	digital sinking	digital sinking or sourcing
<b>Operating temperature range</b>	-40 °C to 105 °C [-40 °F to 221 °F]	0 °C to 100 °C [32 °F to 212 °F]
<b>Measurements (H x W)</b>	3,6 mm x 5,1 mm [0.14 in x 0.20 in]	3,6 mm x 5,1 mm [0.14 in x 0.20 in]
<b>Features</b>	bipolar magnetics; sinking output; active high and active low versions; adjustable speed trip point	bipolar latching magnetics; sinking or sourcing outputs; reverse polarity protection



Linear Series	91SS	SS490/SS491B
<b>Description</b>	Hall-effect linear sensor IC	Hall-effect linear sensor IC
<b>Magnetic actuation type</b>	linear	linear
<b>Package material and style</b>	ceramic SIP, ceramic with solder bumps	SS490: plastic radial lead, plastic surface pack, ammpack styles T2 and T3; SS491B: plastic radial lead
<b>Supply voltage</b>	8 Vdc to 16 Vdc	4.5 Vdc to 10.5 Vdc
<b>Supply current</b>	19 mA max.	10 mA
<b>Output type</b>	ratiometric sourcing	ratiometric sinking or sourcing
<b>Operating temp. range</b>	-40 °C to 150 °C [-40 °F to 302 °F]	-40 °C to 150 °C [-40 °F to 302 °F]
<b>Measurements (H x W)</b>	15,2 mm x 7,6 mm [0.60 in x 0.30 in]	3,0 mm x 4,1 mm [0.12 in x 0.16 in]
<b>Features</b>	linear magnetics; ratiometric sourcing output; positive temperature coefficient; different styles	linear magnetics; ratiometric sourcing output; positive temperature coefficient; different styles



### SS46

bipolar latching Hall-effect digital sensor IC

bipolar latching

plastic radial lead

4.5 Vdc to 24 Vdc

10 mA max.

digital sinking

-40 °C to 150 °C [-40 °F to 302 °F]

3,0 mm x 4,1 mm [0.12 in x 0.16 in]

bipolar latching magnetics; sinking or sourcing output; high output current capability



### VF526DT

bipolar latching dual Hall-effect digital sensor IC with speed and direction outputs

bipolar latching

plastic surface mount (SOT-89 style)

3.4 Vdc to 24 Vdc

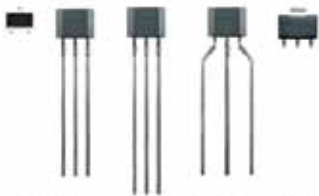
14 mA max.

digital sinking

-40 °C to 125 °C [-40 °F to 257 °F]

4,2 mm x 4,5 mm [0.16 in x 0.18 in]

bipolar latching magnetics; sinking output; tape and reel available



### SS39ET/SS49E/SS59ET

Hall-effect linear sensor IC

linear

SS39ET: plastic surface mount (SOT-23)  
 SS49E: plastic radial lead (SOT-92-style)  
 SS59ET: plastic surface mount (SOT-89)

2.7 Vdc to 6.5 Vdc

10 mA max.

ratiometric sourcing

-40 °C to 100 °C [-40 °F to 212 °F]

SS39ET: 2,8 mm x 2,9 mm [0.110 in x 0.114 in]  
 SS49E: 3,0 mm x 4,1 mm [0.12 in x 0.16 in]  
 SS59ET: 4,2 mm x 4,5 mm [0.16 in x 0.18 in]

linear magnetics; ratiometric sourcing output; low voltage operation;  
 tape and reel available



### SS94

Hall-effect linear sensor IC

linear

ceramic SIP, ceramic with solder bumps

4.5 Vdc to 12.6 Vdc

30 mA max.

ratiometric sinking or sourcing

-40 °C to 150 °C [-40 °F to 302 °F]

15,2 mm x 7,6 mm [0.60 in x 0.30 in]

linear magnetics; ratiometric sourcing output; standard mounting centers;  
 linearity  $\pm 1.5$  % max.

# Magnetic Sensors

## Value-Added Hall-Effect Sensors



Consists of sensors packaged in a variety of housings. Includes vane sensors, digital position sensors, and solid-state switches. Potential applications include position and RPM sensing, cam and crankshaft speed and position, transmissions, tachometers, traction control, and sprocket speed.



Series	103SR (digital)	103SR (linear)	1GT
<b>Description</b>	Hall-effect digital position sensor	Hall-effect linear position sensor	Hall-effect sensor
<b>Package material and style</b>	aluminum threaded barrel	aluminum threaded barrel	plastic probe
<b>Magnetic actuation type</b>	unipolar, bipolar, bipolar latching	linear	–
<b>Operation</b>	proximity to external magnet	proximity to external magnet	ferrous metal actuator
<b>Supply voltage range</b>	4.5 Vdc to 24 Vdc	4.5 Vdc to 10.5 Vdc	4.5 Vdc to 26.5 Vdc (inclusive)
<b>Supply current</b>	4 mA to 10 mA (inclusive)	7 mA	20 mA max.
<b>Output type</b>	digital sinking or sourcing (depends on listing)	ratiometric sinking/sourcing	digital sinking
<b>Operating temperature range</b>	-40 °C to 100 °C [-40 °F to 212 °F]	-40 °C to 100 °C [-40 °F to 212 °F]	-40 °C to 150 °C [-40 °F to 302 °F]
<b>Measurements</b>	Ø 11,9 mm x 25,4 mm H [15/32-2 x 1.0 in H]	Ø 11,9 x 25,4 mm H [15/32-2 x 1.0 in H]	Ø 17,9 mm x 31,8 mm L [Ø 0.70 in x 1.25 in L]
<b>Features</b>	unipolar, bipolar, and bipolar latching magnetics; sinking or sourcing output; aluminum housing; color-coded jacketed cable; adjustable mounting	linear magnetics; ratiometric sinking/sourcing output; aluminum housing; color-coded jacketed cable; adjustable mounting	sinking output; fast operating speed; reverse polarity and transient protection; EMI resistant



4AV	SR16/SR17	SR3	SR4	VX10/VX80
Hall-effect vane sensor	low-cost Hall-effect vane sensor	Hall-effect digital position sensor	magnetoresistive digital position sensor	Hall-effect solid state switch
plastic dual tower wire exit; plastic dual tower with connector	SR16: plastic dual tower with variety of terminations SR17: plastic side-mount wire exit	plastic threaded barrel	plastic threaded barrel	plunger actuated non-contact switch
–	–	unipolar, bipolar	omnipolar	–
ferrous metal actuator	ferrous metal actuator	proximity to external magnet	proximity to external magnet	plunger actuator
4.5 Vdc to 24 Vdc	3.8 Vdc to 30 Vdc	4.5 Vdc to 24 Vdc	3.8 Vdc to 30 Vdc	4 Vdc to 24 Vdc
18.5 mA max.	10 mA max.	10 mA	11 mA	15 mA
digital sinking	digital sinking	digital sinking	digital sinking	digital sinking
-40 °C to 125 °C [-40 °F to 257 °F]	-20 °C to 85 °C [-4 °F to 185 °F]	-40 °C to 85 °C [-40 °F to 185 °F]	-40 °C to 85 °C [-40 °F to 185 °F]	-40 °C to 75 °C [-40 °F to 167 °F]
19,1 mm H x 10,4 mm W [0.75 in H x 0.41 in W]	24,6 mm H x 12,4 mm W [0.97 in H x 0.49 in W]	Ø 12,4 mm x 25,4 mm L [Ø 0.49 in x 1.0 in L]	19,0 mm H x 25,4 mm L [0.75 in H x 1.0 in L]	15,8 mm H x 28,83 mm L [0.62 in H x 1.135 in L]
sinking output; zero speed capability; on and off times programmable	sinking output; non-contact position sensing; environmentally sealed; three terminations	NEMA 3, 3R, 3S, 4, 4X, 12 and 13; unipolar and bipolar magnetics; sinking output; frequencies exceeding 100 Hz	NEMA 3, 3R, 3S, 4, 4X, 12 and 13; omnipolar magnetics; sinking output	UL/CSA; sinking output; non-con- tact, low-force operation; reverse voltage protection; standard levers and actuators available

# Magnetic Sensors

## Speed and Direction Sensors



Provides true zero speed capability, direction sensing, and precise switch point measurement. Speed sensor diagnostics provide information on air gap and sensor failure for increased reliability and functionality. Potential applications include cam/crank shafts, transmissions, tachometers, traction control, dynamometers, process control, and factory automation.



Series	1GT	LCZ	ZH10
<b>Description</b>	single Hall-effect sensor	single Hall-effect zero speed sensor	single Hall-effect zero speed sensor
<b>Housing</b>	plastic probe	stainless steel	aluminum
<b>Supply voltage range</b>	4.5 Vdc to 26.5 Vdc (inclusive)	4.5 Vdc to 26 Vdc	4 Vdc to 24 Vdc
<b>Supply current</b>	20 mA	20 mA	6 mA
<b>Output type</b>	digital sinking (open collector)	digital sinking	digital sinking
<b>Operating frequency range</b>	0 Hz to 25 kHz (inclusive)	0 Hz to 15 kHz	0 Hz to 15 kHz
<b>Operating temperature range</b>	-40 °C to 150 °C [-40 °F to 302 °F]	-40 °C to 125 °C [-40 °F to 257 °F]	-40 °C to 125 °C [-40 °F to 257 °F]
<b>Measurements</b>	Ø 17,9 mm x 31,8 mm L [Ø 0.70 in x 1.25 in L]	9,5 mm [3/8 in/0.375 in] and 15,9 mm [5/8 in/0.625 in] diameters; 50,8 mm [2.00 in] and 76,2 mm [3.00 in] lengths	Ø 11,9 mm [15/32 in/0.46875 in] x 25,4 mm [1.00 in] L
<b>Features</b>	fast operating speed; reverse polarity and transient protection; EMI resistant	omni-directional sensor to target; low power consumption; zero speed; digital output	omni-directional sensor to target; low power consumption; zero speed; digital output



SNDH-T	SNDH-H	GTN	SNDJ
dual differential Hall-effect quadrature speed and direction sensor	Hall-effect speed sensor	single Hall-effect sensor	zero speed Hall-effect sensor, differential Hall-effect sensor, dual Hall-effect sensor
stainless steel, plastic	stainless steel, plastic	plastic probe	stainless steel
4.5 Vdc to 18 Vdc	4 Vdc to 24 Vdc, 4.5 Vdc to 24 Vdc, 6.5 Vdc to 24 Vdc	8 Vdc to 32 Vdc (inclusive)	8 Vdc to 32 Vdc (inclusive)
18 mA max.	6 mA max., 14 mA max., 20 mA max.	40 mA	10 mA to 20 mA max. (inclusive)
square wave	digital sinking	digital sinking (open collector)	square wave and one direction signal; square wave signal from NPN output transistor with 2.7 kOhm pull-up; dc-coupled to supply; square wave signal from push-pull stage; dc-coupled to supply
1 Hz to 15 kHz	0 Hz to 12 kHz, 0 Hz to 15 kHz, 2 Hz to 15 kHz	2 Hz to 9 kHz	0 Hz to 15 kHz (inclusive)
-40 °C to 150 °C [-40 °F to 302 °F]	-40 °C to 150 °C [-40 °F to 302 °F] inclusive	-40 °C to 125 °C [-40 °F to 257 °F]	-20 °C to 100 °C [-4 °F to 212 °F]
Ø 15 mm x 45 mm L [Ø 0.6 in x 1.77 in L]	various, depends upon type	Ø 20 mm x probe length (varies) [Ø 0.77 in x probe length (varies)]	Ø 12 mm x 58,7mm L [Ø 0.47 in x 2.31 in L]
advanced performance dynamic offset self calibration; short circuit and reverse voltage protection; low jitter output; near zero speed	rotationally insensitive versions available; zero speed sensing versions available; range of connector options	choice of barrel lengths; integrated electronic diagnostics; enhanced operating speed	backbiased Hall-effect; direct sensing of ferrous metal target; zero speed sensing; rotational orientation independent of sensor

# Position Sensors

## Linear Potentiometric Sensors



Includes potentiometer sensors for linear, rotary position, or displacement measurement with extended life PTFE bearings and precious metal multi-finger contact wipers. Potential applications include robotic control, marine steering, in-tank sensing, injection molding, and printing.



Series	AQLT	AQMLT	LFII
<b>Description</b>	shaftless, waterproof linear position transducer	shaftless, waterproof linear position transducer	vibration-resistant, plunger-driven linear 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]	-65 °C to 105 °C [-85 °F to 221 °F]
<b>Supply voltage</b>	30 Vdc max.	30 Vdc max.	30 Vdc max.
<b>Linearity</b>	±1 %	±1 %	±1 %
<b>Starting force (max.)</b>	56,7 g max. [2 oz max.]	28,35 g max. [1 oz max.]	0,45 kg [1 lb] (standard); LFIW: 2,27 kg [5 lb] (water resistant)
<b>Backlash</b>	–	–	0,025 mm [0.001 in] max.
<b>Total resistance</b>	6K Ohm to 38K Ohm	750 Ohm to 18K Ohm	5000 Ohm
<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]	152 mm to 1219 mm [6 in to 48 in]
<b>Shaft</b>	–	–	Ø 6,35 mm [Ø 0.25 in]
<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]	154,6 mm to 1221,4 mm [6.09 in to 48.09 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]	152,4 mm to 1219,2 mm [6 in to 48 in]
<b>Housing length</b>	electrical travel + 54,87 mm [2.16 in]	electrical travel + 38,1 mm [1.5 in]	electrical travel + 81,02 mm [3.19 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	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)
<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>	500 mOhm @ 500 Vdc	500 mOhm @ 500 Vdc	1000 mOhm @ 500 Vdc
<b>Dielectric strength</b>	250 V rms	250 V rms	1000 V rms
<b>Termination</b>	cable	cable	connector, binder series 681
<b>Features</b>	12,7 mm [0.5 in] body diameter; multiple finger-wiper design; anodized extruded aluminum housing; precious metal contact; sealed construction	9,53 mm [0.375 in] body diameter; multiple finger-wiper design; anodized extruded aluminum housing; precious metal contact; sealed construction	vibration-dampened element; precious metal wipers; stainless steel shaft; enhanced dc level output



SLF	LT	MLT	DR
short stroke version of the LFII	plunger-driven linear transducer	plunger-driven linear transducer	DuraStar rodless, space-saving side actuator
-65 °C to 105 °C [-85 °F to 221 °F]	-40 °C to 80 °C [-40 °F to 176 °F]	-40 °C to 80 °C [-40 °F to 176 °F]	-65 °C to 105 °C [-85 °F to 221 °F]
40 Vdc max.	30 Vdc max.	30 Vdc max.	75 Vdc max.
±1 % or ±0.1 %	±1 %	±1 %	0.1 % from 1 % to 100 % of theoretical electrical travel
1 lb (standard) 5 lb (water resistant)	28,35 g max. [1 oz max.] 12 oz max. (water resistant)	28,35 g max. [1 oz max.]	0,45 kg [1.0 lb]
0,025 mm [0.001 in] max.	0,00508 mm [0.0002 in] max.	0,0127 mm [0.0005 in] max.	0,025 mm [0.001 in] max.
1500 Ohm to 9000 Ohm	1000 Ohm to 10000 Ohm	750 Ohm to 9000 Ohm	2000 Ohm to 10000 Ohm
25 mm to 152 mm [1 in to 6 in]	25 mm to 254 mm [1 in to 10 in]	13 mm to 152 mm [0.5 in to 6 in]	102 mm to 1270 mm [4 in to 50 in]
Ø 6,35 mm [Ø 0.25 in]	Ø 3,18 mm [Ø 0.125 in]	Ø 3,18 mm [Ø 0.125 in]	M5 x 0.8 metric thread
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]	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]
25,4 mm to 152,4 mm [1 in to 6 in]	25,4 mm to 254 mm [1 in to 10 in]	12,7 mm to 152,4 mm [0.5 in to 6 in]	101,6 mm to 1270 mm [4 in to 50 in]
electrical travel + 77,5 mm [3.05 in]	electrical travel + 38,10 mm [1.50 in]	electrical travel + 30,48 mm [1.2 in]	250 mm to 1418 mm [9.84 in to 55.83 in]
20 g / 0,75 mm (rms) 5 Hz to 2 kHz	20 g / 0,75 mm (rms) 5 Hz to 2 kHz	20 g / 0,75 mm (rms) 5 Hz to 2 kHz	20 g / 0,75 mm (rms) 5 Hz to 2 kHz
50 g 11 ms half sine	50 g 11 ms half sine	50 g 11 ms half sine	50 g 11 ms half sine
one billion dither operations	one billion dither operations	one billion dither operations	one billion dither operations
±20 %	±20 %	±20 %	±20 %
–	500 mOhm @ 500 Vdc	500 mOhm @ 500 Vdc	1000 mOhm @ 500 Vdc
–	1000 V rms	1000 V rms	1000 V rms
connector, binder series 681	cable	cable	Hirschmann GDM
precious metal wipers; 2,06 mm [0.081 in] thick housing with 6 mm [0.25 in] shaft; high level dc output; enhanced performance bearings; shaft seals	12,7 mm [0.5 in] diameter; dual-wiper design; stainless steel shaft; anodized extruded aluminum housing; precious metal contact; shaft seals for spray-or-hose-down environments	9,53 mm [0.375 in] diameter; dual-wiper design; stainless steel shaft; internal spring-loaded ball joint; anodized extruded aluminum housing; precious metal contact; infinite resolution	vibration-dampened element; extended side bearing; precious metal wipers; high dc level output; enhanced performance bearings; NEMA 4 sealing

# Position Sensors

## SMART Position Sensors



### **Superior Measurement. Accurate. Reliable. Thinking.**

Honeywell's SMART Position Sensors are some of the most durable and adaptable position devices available in the industry today. These sensors use a patented combination of ASIC (Application-Specific Integrated Circuit) technology and an array of MR (magnetoresistive) sensors to provide absolute position sensing with enhanced speed and accuracy. Their simple, non-contact design eliminates mechanical failure mechanisms, reduces wear and tear, improves reliability and durability, enhances operation efficiency and safety, and minimizes downtime. Linear configuration potential applications: Industrial: valve position, material handling, plastic molding, wafer handling, CNC machines; Transportation: passenger bus level position, truck-mounted crane outrigger position, heavy equipment attachment identification, hydraulic cylinders (225 mm version), marine motors; Medical: syringe pumps; Aerospace: aircraft actuators.



Series	SPS
<b>Description</b>	measures linear movement of a magnet attached to a moving object
<b>Configuration</b>	linear
<b>Sensing range</b>	75 mm: 0 mm to 75 mm [0 in to 3.0 in] 225 mm: 0 mm to 225 mm [0 in to 8.86 in]
<b>Resolution</b>	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]
<b>Supply voltage</b>	6 Vdc to 24 Vdc
<b>Supply current</b>	75 mm analog: 32 mA max. 225 mm analog: 34 mA max. 225 mm digital: 88 mA max.
<b>Output</b>	75 mm and 225 mm analog: 0 Vdc to 5 Vdc 225 mm digital: RS232 type
<b>Air gap</b>	3,0 mm ±2,5 mm [0.118 in ±0.098 in]
<b>Operating temperature range</b>	-40 °C to 125 °C [-40 °F to 257 °F]
<b>Storage temperature range</b>	-40 °C to 150 °C [-40 °F to 302 °F]
<b>Sealing</b>	IP67, IP69K
<b>Housing material</b>	thermoplastic
<b>Approvals</b>	CE
<b>Measurements</b>	75 mm: 145 mm L x 18,0 mm W x 28,2 mm H [5.7 in x 0.71 in x 1.1 in] 225 mm: 287,3 mm L x 18,0 mm W x 28,2 mm H [11.3 in x 0.71 in x 1.1 in]
<b>Features</b>	analog or digital output; small size; self diagnostics; IP67 and IP69K sealing

*Arc Configuration potential applications: Transportation: aerial work lift platform, front end loader and digger/excavator boom position, scissor lift position, refuse truck lift and automatic reach arm position, mobile crane steering, timber harvester/processor equipment cutter arm angle, on-board loader weighing system position; Industrial: telescoping conveyor elevation, power generation contact angle, rail-road crossing arms position; Military: remote weapon systems elevation, chassis suspension systems position height, military vehicle door position; Aerospace: ground-based solar panels elevation and azimuth, ground-based satellite dish elevation and azimuth; Medical: robotically-assisted surgery equipment position, patient bed elevation.*



## SPS

measure angular movement of a magnet attached to a moving object

arc

100°: 0° to 100°

180°: 0° to 180°

100°: 0.06°

180°: 0.11°

6 Vdc to 24 Vdc, 18 Vdc to 24 Vdc

45 mA max.

0.5 Vdc to 4.5 Vdc (analog)

100°: 7,8 mm ±2,5 mm [0.307 in ±0.098 in]

180°: 8,5 mm ±2,5 mm [0.338 in ±0.098 in]

-40 °C to 85 °C [-40 °F to 185 °F]

-40 °C to 150 °C [-40 °F to 302 °F]

IP67, IP69K

thermoplastic

CE

100°: 183 mm L x 86 mm W x 31 mm H [7.20 in x 3.39 in x 1.22 in]

180°: 222 mm L x 107 mm W x 31 mm H [8.74 in x 4.21 in x 1.22 in]

analog output; self diagnostics; IP67 and IP69K sealing

# Position Sensors

## Ultrasonic Sensors



Ultrasonic sensors measure time delay between emitted and echo pulses. Available in analog or digital versions for distance or presence/absence sensing. Programmable versions available. May be used in a variety of rugged presence and absence sensing applications.



Series	940-F/947	941-D	942
<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]	from 1,5 m to 3,5 m [4.9 ft to 11.5 ft]
<b>Output type</b>	analog or switching	analog or switching	analog and switching
<b>Supply voltage</b>	19 Vdc to 30 Vdc	15 Vdc to 30 Vdc	19 Vdc to 30 Vdc
<b>Housing style</b>	plastic M18 and M30	plastic square housing	plastic M30
<b>Termination type</b>	cable or connector	connector	connector
<b>Beam angle</b>	8°	10°	8°, 10°
<b>Response time</b>	50 ms, 90 ms	150 ms	100 ms
<b>Switching frequency</b>	100 ms, 1 Hz, 8 Hz, 25 Hz	10 Hz	5 Hz to 30 Hz; 5 Hz to 8 Hz
<b>Repeatability</b>	0.3 % or ±1 mm; 0.2 % or ±2 mm	±1 mm	0.4 % or 2 mm; 0.2 % or ±1 mm
<b>Software programmable</b>	no	no	yes
<b>Teach in</b>	no	yes	yes
<b>Remote teach in</b>	no	no	no
<b>Synchronization output</b>	yes	yes	yes
<b>Approvals</b>	–	CE, UL, CSA	–
<b>Measurements</b>	M30 x 1,5 (140,0 mm [5.51 in L])	32,5 mm H x 36 mm W x 101 mm L [1.28 in H x 1.42 in W x 3.978 in L]	M30 x 1,5 (140,0 mm [5.51 in L])
<b>Features</b>	IP67; chemical-resistant epoxy head; synchronizing/hold input; adjustment by potentiometer; micro-processor controlled; temperature compensation	IP67; limit switch style sensor; teach in; M12 connector, 5 pin; visual indication; four output options; synchronizing/hold input; temperature compensation	IP65 (connector), IP67 (front face); four models; stainless steel M30 heads; synchronizing/hold input; beam power adjustable by switch



943	944	946	948
from 0,2 m to 3,5 m [0.7 ft to 11.5 ft]	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 [0.93 ft]
analog or switching	analog and switching	analog and switching	switching
15 Vdc to 30 Vdc	19 Vdc to 30 Vdc	10 V to 30 V	18 Vdc to 30 Vdc
metal M12, plastic M18 and M30	plastic M18 and M30	stainless steel M30	2 pieces square plastic
cable or connector	connector	M12 connector	cable
8°	8°	5°	8°
400 ms	–	21 ms, 65 ms, 145 ms, 195 ms, 285 ms, 850 ms	–
100 ms, 250 ms, 1.2 Hz, 4.7 Hz	0.8 Hz, 1 Hz, 8 Hz	1 Hz, 5 Hz, 15 Hz	150 Hz
0.2 % or ±2 mm	0.4 % or ±2 mm	< 0.1 %	–
no	no	no	no
yes	yes	yes	no
yes	no	no	no
no	no	no	no
–	–	–	–
M18 or M30 (depending upon scanning ranges)	M30 x 1,5 (125,0 mm [4.92 in])	various sizes	2,0 mm H x 20,0 mm W x 30,0 mm L [0.08 in H x 0.79 in W x 1.18 in L]
remote teach-in/auto-tuning; Windows and hysteresis mode; two switching outputs; temperature compensation; connector or cable version	eight models; auto-tuning by one switch; slope direction selection; NO/NC selection; two switching outputs; analog output; temperature compensation	IP65; auto-tuning by four position plug; switching output models; two switching outputs; temperature compensation	IP67; four output configurations; switching frequency of 150 Hz; compact size

# Proximity Sensors

Designed to meet demanding temperature, vibration, shock, and EMI/EMP interference specifications. Multiple potential applications are found in aerospace, ordnance, marine, and off-shore equipment.



Series	RDS8004	100 FW	200 FW
<b>Description</b>	rail wheel proximity sensor	one-piece 5/8 in proximity sensor	one-piece 5/8 in proximity sensor
<b>Technology</b>	–	ECKO	hall
<b>Operating frequency</b>	–	–	–
<b>Target material</b>	–	all metals	magnet
<b>Load current</b>	–	120 mA, 50 mA lamp	100 mA, 50 mA lamp
<b>Supply current</b>	–	20 mA max. @ 25 °C	20 mA max. @ 25 °C
<b>Sensing face</b>	–	shielded, unshielded	shielded
<b>Housing material</b>	polyimide “Grilamid LKN5H”	stainless steel	stainless steel
<b>Guaranteed actuation distance</b>	–	1 mm to 1,99 mm [0.039 in to 0.0783 in]; 5 mm to 10 mm [0.197 in to 0.394 in]	2 mm to 2,99 mm [0.0787 in to 0.1177 in]
<b>Operating temperature range</b>	-40 °C to 80 °C [-40 °F to 176 °F]	-55 °C to 125 °C [-67 °F to 257 °F]	-54 °C to 100 °C [-65.2 °F to 212 °F]
<b>Supply voltage</b>	10 Vdc to 30 Vdc	18 Vdc to 32 Vdc	18 Vdc to 32 Vdc
<b>Output type</b>	–	normally open, current sinking	normally open/closed, current sinking
<b>BITE</b>	–	–	–
<b>Short circuit</b>	–	–	–
<b>Pressure proof</b>	–	–	–
<b>Reverse polarity</b>	–	–	–
<b>MTBF (hours)</b>	–	–	–
<b>Oscillating frequency</b>	230 kHz ±10 % 160 kHz ±10 %	–	–
<b>Output current</b>	supply voltage and load dependent; 2 mA/8 mA	–	–
<b>Operating frequency</b>	> 400 Hz	–	–
<b>Vibration</b>	Sinusoidal 10 Hz to 2 kHz, 20 g for 30 min, IEC 68-2-2	–	–
<b>Nom. sensing distance</b>	26,5 mm, 35 mm	–	–
<b>Approvals</b>	IP67	FM Class 1, Division 2, Groups A, B, C, D	FM Class 1, Division 2, Groups A, B, C, D
<b>Measurements</b>	55,0 mm H x 60,0 mm W x 110 mm L [2.16 in H x 2.36 in W x 4.33 in L]	sensing face: 5/8 in x 63,5 mm L [2.5 in L]	sensing face: 5/8 in x 63,5 mm L [2.5 in L]
<b>Features</b>	two-wire dc inductive; available in high and low frequency versions; output of 8 mA when no wheel is detected, and 2 mA when a wheel is detected	all metal sensing; shielded three-wire dc sinking (NPN); high level of electronics protection; lead wire or connector termination	Hall-effect, magnetic field sensitive; high-frequency switching; shielded three-wire dc sinking (NPN); high level of electronics protection



300 FW	21 FW	23 FW	5 FW
two-piece proximity sensor	one-piece 12 mm proximity sensor	one-piece 22,2 mm proximity sensor	target, special, proximity sensor
ECKO	Hall	Hall	magnet
–	2000 Hz	2000 Hz	–
ferrous metals	–	–	–
750 mA	20 mA	20 mA	–
65 mA max.	25 mA	25 mA	–
shielded	stainless steel	stainless steel	stainless steel
stainless steel	stainless steel	stainless steel	stainless steel
1,78 mm to 3,3 mm [0.07 in to 0.130 in]	250 gauss	250 gauss	–
-77 °C to 125 °C [-106.6 °F to 257 °F]	-55 °C to 150 °C [-67 °F to 302 °F]	-55 °C to 125 °C [-67 °F to 257 °F]	-55 °C to 150 °C [-67 °F to 302 °F]
18 Vdc to 32 Vdc	18 Vdc to 32 Vdc	18 Vdc to 32 Vdc	–
normally open/closed, current sinking	normally open, current sinking	normally open, current sinking	–
–	yes	yes	–
–	no	no	–
–	no	no	–
–	no	no	–
–	35000	115000	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
MIL-STD-810B	MIL-STD-461E	MIL-STD-461E	–
Ø 11,2 mm x 31,8 mm L [Ø 0.44 in x 1.25 in L]	Ø 12 mm [Ø 0.47 in]	Ø 22,2 mm [Ø 0.9 in]	Ø 12 mm [Ø 0.47 in]
ferrous metal sensing; two-piece construction; reverse polarity	Hall-effect magnetic field sensitive; single channel; three-wire dc	Hall-effect magnetic field sensitive; triple channel; nine-wire dc	Hall-effect magnetic field sensitive

# Proximity Sensors

## 922, M12, M18, & M30

Designed to meet demanding temperature, vibration, shock, and EMI/EMP interference specifications. Multiple potential applications are found in aerospace, ordnance, marine, and off-shore equipment.



Series	922AA2Y-A6P0Z722A	922FS2-A6N-Z735A	ZS-00361
<b>Description</b>	one-piece 15/32 in proximity sensor	one-piece 12 mm proximity sensor	one-piece M12 proximity sensor
<b>Dimension</b>	11,7 mm [0.46 in]	12 mm [0.47 in]	–
<b>Operating frequency</b>	2000 Hz	2000 Hz	80 mA
<b>Load current</b>	250 mA	250 mA	crastin (plastic)
<b>Gd (mm)</b>	3,6	2,8	2,91
<b>Guaranteed actuation distance</b>	2 mm to 2,99 mm [0.0787 in to 0.1177 in]	1 mm to 1,99 mm [0.039 in to 0.0783 in]	1 mm to 1,99 mm [0.039 in to 0.0783 in]
<b>Operating temp. range</b>	-55 °C to 85 °C [-67 °F to 185 °F]	-55 °C to 85 °C [-67 °F to 185 °F]	-25 °C to 85 °C [-13 °F to 185 °F]
<b>Shock</b>	6 g 11 ms ABD 0007	6 g 11 ms ABD 0007	400 g 11 ms
<b>Supply voltage</b>	14 Vdc to 32,5 Vdc	14 Vdc to 32,5 Vdc	14 Vdc to 33 Vdc
<b>BITE</b>	no	no	no
<b>Short circuit</b>	yes	yes	yes
<b>Pressure proof</b>	no	yes	no
<b>Reverse polarity</b>	no	no	yes
<b>Insulation resistance</b>	–	–	50 mOhm @ 500 Vdc
<b>Output type</b>	normally open, current sourcing	normally open, current sourcing	normally open/closed, current sourcing
<b>Measurements</b>	15/32 in 51 mm L [2.01 in]	12 mm 50 mm L [1.97 in]	M12 x 1 72 mm L [2.83 in L]
<b>Features</b>	stainless steel; high frequency switching; high level of electronics protection; lead wire or connector termination	stainless steel; high pressure capability (> 350 bar); high level of electronics protection; lead wire or connector termination	Hall-effect, magnetic field sensitive; stainless steel; high level of electronics protection; high frequency switching



932AB2W	ZS-00351-01	932AA3W	ZS-00240-03B	ZS-00341
one-piece M12 proximity sensor	one-piece M18 proximity sensor	one-piece M18 proximity sensor	one-piece M30 proximity sensor	one-piece underwater proximity sensor
–	–	–	–	–
200 mA	100 mA	≤ 200 mA up to 85 °C to 100 mA at 100 °C	200 mA	≤ 120 mA
ceramic	ceramic	ceramic	stainless steel	stainless steel
6,8	7,27	8,5	ceramic	stainless steel
3 mm to 3,99 mm [0.118 in to 0.157 in]	4 mm to 4,99 mm [0.1574 in to 0.19646 in]	4 mm to 4,99 mm [0.1574 in to 0.19646 in]	5 mm to 10 mm [0.197 in to 0.394 in]	ZS-00341-01: ≥ 0.8 mm; ZS-00341-02: ≥ 21.84 mm
-40 °C to 100 °C [-40 °F to 212 °F]	-35 °C to 63 °C [-31 °F to 145 °F]	-40 °C to 100 °C [-40 °F to 212 °F]	-55 °C to 85 °C [-67 °F to 185 °F]	-55 °C to 90 °C [-67 °F to 194 °F]
100 g 6 ms	500 g 0.5 ms	100 g 6 ms	100 g 6 ms	6 g 11 ms
20 Vdc to 33 Vdc	12 Vdc to 32 Vdc	20 Vdc to 323 Vdc	14 Vdc to 33 Vdc	14 Vdc to 32.5 Vdc
no	yes	no	no	no
yes	yes	yes	yes	yes
no	no	no	no	yes
yes	yes	yes	yes	yes
> 50 mOhm @ 500 Vdc	10 mOhm @ 500 Vdc	> 50 mOhm @ 500 Vdc	–	–
normally open, current sourcing	normally open, current sinking	normally open, current sourcing	normally open/closed, current sourcing	normally open, current sourcing
M12 x 1 77 mm L [3.03 in L]	M18 x 1 73 mm L [2.87 in L]	M18 x 1 80 mm L [3.15 in L]	M30 x 1,5 55 mm L [2.17 in L]	Ø 23 mm x 64 mm L [Ø 0.91 in x 2.52 in L]
stainless steel; high level of electronics protection; high frequency switching; lead wire or connector termination	stainless steel; high level of electronics protection; built-in test function (BITE); lead wire or connector termination	Hall-effect, magnetic field sensitive; stainless steel; high level of electronics protection; high frequency switching	Hall-effect, magnetic field sensitive; stainless steel; high level of electronics protection; high frequency switching	ferrous metal sensing; high level sealing by overmolding; enhanced performance sealed and shielded cable

# Rotary Position Sensors

## Encoders and Non-Contact Hall-Effect Sensors

Mechanical versions with 2-bit and 4-bit gray code outputs for potential use in incremental and absolute electrical reference applications. Optical versions are manually operated, rotary devices. Available with PC terminals or cable leads. Potential applications include controls for audio and lighting, level, cursor, frequency, temperature, time, and position sensing.



Encoder Series	510E	600
Type	mechanical	optical
Pulse per revolution	16, 9, 6, 4	128
Output	2- or 4-bit grey code	quadrature square wave
Expected rotational life	100K cycles	10 million rotations min.
Operating speed	50 rpm max.	300 rpm max.
Terminals	pcb pins	PC type B-66, PC type C-24, cable, cable/connector
Measurements	body: 21,08 mm [0.83 in] square; bushing: Ø 9,52 mm [Ø 0.375 in] x 6,35 mm [0.25 in] L	body: Ø 34,93 mm [Ø 1.375 in]; bushing: Ø 9,52 mm [0.375 in] x 9,52 mm [0.375 in] L
Features	eliminates need for A/D converters; positive detent feel; continuous electrical travel	eliminates need for A/D converter; cable and printed circuit terms; outputs TTL compatible



Non-Contact Hall-Effect	RTY	RPN	HRS100
Sensing range	50° (±25°), 60° (±30°), 70° (±35°), 90° (±45°), 120° (±60°), 180° (±90°), 270° (±135°), 360° (±180°)		90° ±2°, 180° ±2°
Redundant ver.	no	yes	no
Input voltage	LV: 0.5 V to 4.5 V ratiometric; HV: 0.5 V to 4.5 V non-ratiometric	5 Vdc to 30 Vdc (inclusive)	5 Vdc ±10%
Output	LV: 5 Vdc ±0.5 Vdc HV: 10 Vdc to 30 Vdc	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	5% to 95% of applied Vdd, approx. (ratiometric)
Input current (max.)	LV: 20 mA; output to ground short, 25 mA; HV: 32 mA; output to ground short, 47 mA	20 mA	5 mA typ.
Sealing	IP67	IP67 or greater	–
Operating temp. range	-40 °C to 125 °C [-40 °F to 257 °F]	-40 °C to 125 °C [-40 °F to 257 °F]	-40 °C to 85 °C [-40 °F to 185 °F]
Measurements	55 mm L x 43 mm W x 41 mm H [2.17 in L x 1.69 in W x 1.61 in H]	38 mm H x 63 mm W [1.5 in H x 2.48 in W]	32,27 mm H x 27,79 mm W [1.3 in H x 1.1 in W]
Features	variety of supply voltages and output configurations; rugged sealed package with integral connector		90° degree rotation; maximum ESD sensitivity of ±7 kV



# Rotary Position Sensors

## Cermet and Wirewound Potentiometers



Compact and rugged thick film devices, these potentiometers are stable over a range of operating temperatures. Provides high power dissipation and improved resistance temperature coefficient. Potential applications include joysticks, lighting, audio, telecom, manual, medical, and marine equipment, welding, and heating.



Series	309/409	389	43/RA20
Type	309: compact modular housing 409: sealed for board washing	multiple sections available	RA20 meets MIL-R-19
Expected rotational life	25K cycles	25K cycles	10K cycles
Element type	cermet	cermet	wirewound
Power rating	1 W	1 W	2 W
Terminal type	PC, solder hook	PC, solder hook	solder lug
Resistance range	100 Ohm to 5 mOhm	linear: 5 Ohm to 5 mOhm; tapered: 100 Ohm to 2 mOhm	43: 10 Ohm to 50 kOhm; RA20: 50 Ohm to 15 kOhm
Bushing type	standard	standard	standard, locking
Potentiometer type	industrial	industrial	industrial
Electrical taper	linear, tapered	linear, tapered	linear
Measurements	body: 12,7 mm [0.5 in] square; bushing: 6,35 mm [0.25 in] x 32 NEF-2A x 6,35 mm [0.25 in] L	6,35 mm [0.25 in] x 32NEF- 2A standard; 9,53 mm [0.375 in] x 32NEF-2A optional	body: Ø 28,6 mm [Ø 1.125 in]; bushing: 9,53 mm [0.375 in] x 32 NEF-2A x 9,53 mm [0.375 in] L
Features	modular package; enhanced performance	stackable; rotary, push-pull, and momentary options	linear taper; lock-style bushing available



Series	58/RA30	591	73
Type	RA30 meets MIL-R-19	multiple sections available	10-turn construction
Expected rot. life	25K cycles	25K cycles	50K cycles
Element type	wirewound	cermet	wirewound
Power rating	4 W	1 W	2 W
Terminal type	solder lug	PC, solder hook	solder lug
Resistance range	58: 50 Ohm to 50 kOhm; RA30: 25 Ohm to 25 kOhm	500 Ohm to 100 kOhm	100 Ohm to 100 kOhm
Bushing type	standard, locking	standard	standard
Potentiometer type	industrial	commercial	precision
Electrical taper	linear	linear	linear
Measurements	body: Ø 42,93 mm [Ø 1.69 in]; bushing: 9,53 mm [0.375 in] x 32 NEF-2A x 9,53 mm [0.375 in] L	body: 12,7 mm [0.5 in] square; bushing: 6,35 mm [0.25 in] x 32 NEF-2A x 6,35 mm [0.25 in] L	body: Ø 22,23 mm [Ø 0.875 in]; bushing: 9,53 mm [0.375 in] x 32 NEF-2A x 7,92 mm [0.312 in] L
Features	linear taper; lock-style bushing available	temperature stability; linear taper; pc terminals	nickel-plated brass shaft and bushings; linear taper

# Rotary Position Sensors

## Conductive Plastic Potentiometers



Compact and rugged thick-film devices are available in wide range of resistance values. These devices use precision technology developed for military applications. Potential applications include manual controls, audio and lighting consoles, joysticks, telecommunication, and medical equipment.



Series	308/408	380/53/RV4	381
Type	308: compact modular house; 408: sealed for board washing	RV4 meets MIL-PRF-94	metal case and nickel-plated shaft
Expected rotational life	50K cycles	100K cycles, 25K cycles	25K cycles
Element type	conductive plastic	conductive plastic	conductive plastic
Power rating	0.5 W	2 W	1 W
Terminal type	pc, solder hook	solder lug	solder lug
Resistance range	308: 100 Ohm to 1 mOhm; 408: 500 Ohm to 10 kOhm	100 Ohm to 1 mOhm; 500 Ohm to 10 kOhm	100 Ohm to 5 mOhm
Bushing type	standard, locking	standard, locking	standard, locking
Potentiometer type	industrial	industrial	industrial
Electrical taper	CW audio, linear	linear, tapered	CW audio, linear
Measurements	body: 12,7 mm [0.5 in] square bushing: 6,35 mm [0.25 in] x 32 NEF-2A x 6,35 mm [0.25 in] L	380/53: 50,8 mm L [2 in L] shaft, round; RV4: 22,23 mm [0.875 in L] shaft, slotted	body: Ø 15,88 mm [Ø 0.625 in]; bushing: 6,35 mm [0.25 in] x 32 NEF-2A x 6,35 mm [0.25 in] L
Features	nickel-plated brass shaft and bushings; enhanced performance	solder lug terminals; CW audio and linear tapers available	solder lug terminals; nickel-plated brass shaft and bushings



Series	578	585
Type	variable resistor technology	carbon elements/metal shaft
Expected rotational life	2.5M cycles	10K cycles
Element type	conductive plastic	carbon
Power rating	0.5 W	0.05 W
Terminal type	pc	pc
Resistance range	1 kOhm to 10 kOhm	1 kOhm to 10 kOhm
Bushing type	standard	standard
Potentiometer type	precision	commercial
Electrical taper	linear	CW audio, linear
Measurements	body: Ø 22,86 mm [Ø 0.90 in] bushing: 9,52 mm D & L [0.375 in D & L]	body: 9,5 mm [0.37 in] square bushing: M 7 x 0.75 thread, 7 mm L [0.28 in L]
Features	low mounting profile; quiet electrical output; precision control; pc terminals	horizontal mount; pc terminals; metal shaft and bushings; linear taper



**388**

**392/RV6**

**574**

**575**

multiple sections available

RV6 meets MIL-PRF-94

low mounting profile

thermoplastic panel mount

50K cycles

50K cycles

50K cycles

50K cycles

conductive plastic

conductive plastic

conductive plastic

conductive plastic

0.5 W

0.5 W

0.5 W

0.5 W

pc, solder hook

pc, solder hook

pc with bracket

pc, solder hook

linear: 100 Ohm to 5 mOhm;  
tapered: 500 Ohm to 2 mOhm

100 Ohm to 5 mOhm

1 kOhm to 100 kOhm

1 kOhm to 50 kOhm

standard

standard

standard

standard

industrial

industrial

commercial

commercial

linear, tapered

linear, tapered

linear

linear, tapered

body: 12,7 mm [0.5 in] square;  
bushing: 6,35 mm [0.25 in] x 32 NEF-2A x  
6,35 mm [0.25 in] L

body: Ø 12,7 mm [Ø 0.50 in]  
bushing: 6,35 mm [0.25 in] x 6,35 mm  
[0.25 in]

body: 21,08 mm [0.83 in] square  
bushing: M9 x 6,35 mm L [0.25 in L]

body: 21,08 mm [0.83 in] square  
bushing: 9,35 mm [0.375 in] x  
6,35 mm L [0.25 in L]

stackable; up to six modules; single, dual-  
concentric, or trimmer configurations

nickel-plated shaft and bushings; pc and  
solder hook terminals

reduced mounting profile; quiet electrical  
output; pc style mounting

reduced mounting profile; quiet electrical  
output; solder hook terminals



**590**

**MKV**

**SensorCube**

**TH100**

multiple sections available

conductive plastic element

sealed construction

special electrical & mechanical configurations

50K cycles

10 million cycles

10 million cycles

1 million cycles

conductive plastic

conductive plastic

conductive plastic

conductive plastic

0.5 W

1 W

1 W

0.5 W

pc, solder hook

turret

turret

three 20 AWG; 152,4 mm [6.0 in] leads

100 Ohm to 1 mOhm

500 Ohm to 20 kOhm

1 kOhm to 10 kOhm

10000 ohms (total resistance)

standard

no bushing, standard

standard

slotted rotor

commercial

precision

precision

position transducer

linear

linear

linear

linear

body: 12,7 mm [Ø 0.50 in] square  
bushing: 6,35 mm D & L [0.25 in D & L]

body: Ø 22,23 mm [Ø 0.875 in];  
bushing: 6,35 mm [0.25 in] x 32 NEF-2A

body: Ø 18,92 mm [Ø 0.745 in]; bushing:  
9,53 mm [0.375 in] x 32 NEF-2A

38,1 mm W x 45,72 mm L  
[1.5 in W x 1.8 in L]

linear taper, pc terminals; brass shaft and  
bushings

linearity 0.5 % or less; Servo and bushing  
mounting; custom electrical travels

linearity 2 % or less; sealed construction;  
custom electrical travels

fully sealed construction; variable resistor  
technology

# Rotary Position Sensors

## Resolvers



Variable transformers in which both rotor and stator usually have two phase windings mechanically displaced by 90°. Typically sine and cosine channel outputs. Provide non-contact measurement for 360° sensing, enhanced accuracy, resolution, and repeatability under severe environmental conditions. Often used in ATOM – gunners site position (azimuth and elevation), forward looking radar, missile guidance, solar panel position, and antenna position applications.



Series	Honeywell Hawk™ 1-inch	Cased - Brushless Dual Speed	Cased - Brushless Single Speed
<b>Type</b>	fully housed	one-speed and multi-speed resolver and rotary transformer	one-speed, one-pole pair resolver and rotary transformer
<b>Size diameter</b>	1.06 in	(1/10 in) 30	(1/10 in) 17
<b>Speed</b>	1X	1&32	1X
<b>Accuracy</b>	±7 arcmin	1&32	1.25 arcmin to 3.50 arcmin
<b>Transformation ratio</b>	–	various	various
<b>Operating temperature range</b>	50.8 °C to 93.3 °C [-60 °F to 200 °F]	-46 °C to 71 °C [-51 °F to 160 °F]	-46 °C to 71 °C [-51 °F to 160 °F]
<b>Measurements</b>	1.06 in dia. x 2.77 in L	various	various
<b>Features</b>	non-contact magnetic technology eliminates mechanical contact, reducing wear and improving reliability and durability by enhancing operation in harsh environments; 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	non-contact measurement for enhanced reliability; 360° sensing range; multi-speed designs available; variety of excitation voltages and frequencies; environmentally sealed and qualified to RTCA DO-160D	non-contact measurement for enhanced reliability; 360° sensing range; multi-speed designs available; variety of excitation voltages and frequencies; environmentally sealed and qualified to RTCA DO-160D



**Pancake -  
Brushless  
Multi-Speed**

**Pancake -  
Brushless Dual-  
Speed**

**Pancake - Dual-  
Speed**

**Pancake - Multi-  
Speed**

**Pancake - Single  
Speed**

multiple pole pairs resolver and rotary transformer

one-speed and multi-speed resolver and rotary transformer

one-speed and multiple-speed

multiple pole pairs

one-speed, one-pole pair

(1/10 in) 38 to 63

(1/10 in) 92

(1/10 in) 31 to 130

(1/10 in) 16 to 67

(1/10 in) 24 to 68

1-64

1&64

1&8, 1&16, 1&32, 1&36, 2&36, 1&64, 1&128

4, 8, 16, 32, 64

1

3 arcmin to 30 arcsec (low distortion harmonic)

(multi-speed) 30 arcsec

(multi-speed) 36 arcsec to 4 arcsec

1 arcmin to 5 arcsec

3 arcmin to 30 arcsec

various

various

0.45 ±5 %

0.45 ±5 %

various

-46 °C to 71 °C  
[-51 °F to 160 °F]

-46 °C to 71 °C [-51 °F to 160 °F]

-29 °C to 75 °C [-21 °F to 167 °F]

-29 °C to 75 °C [-21 °F to 167 °F]

-29 °C to 75 °C [-21 °F to 167 °F]

various

various

12 in x 10.5 in

26 in

various

non-contact measurement for enhanced reliability; 360° sensing range; multi-speed designs available; variety of excitation voltages and frequencies; environmentally sealed and qualified to RTCA DO-160D

non-contact measurement for enhanced reliability; 360° sensing range; multi-speed designs available; variety of excitation voltages and frequencies; environmentally sealed and qualified to RTCA DO-160D

non-contact measurement for enhanced reliability; 360° sensing range; multi-speed designs available; variety of excitation voltages and frequencies; environmentally sealed and qualified to RTCA DO-160D

non-contact measurement for enhanced reliability; 360° sensing range; multi-speed designs available; variety of excitation voltages and frequencies; environmentally sealed and qualified to RTCA DO-160D

non-contact measurement for enhanced reliability; 360° sensing range; multi-speed designs available; variety of excitation voltages and frequencies; environmentally sealed and qualified to RTCA DO-160D

# Safety Electronic Products

## Safety Light Curtains



Photoelectric barriers composed of several infrared beams aligned on an emitting column and a receiving column. Separate or self-contained control units, various housing sizes, resolutions, scanning ranges, and protection heights are available. Designed to meet the specifications of potential machine guarding applications from point-of-operation protection, access detection, and presence sensing to electrical-to-machine-circuitry interfacing.



Series	FF-ST2 Standard A	FF-ST2 Standard M	FF-ST4 Basic
<b>Safety category</b>	Type 2 per IEC61496 (similar to SIL2 per IEC61508)	Type 2 per IEC61496 (similar to SIL2 per IEC61508)	Type 4 per IEC61496 (similar to SIL3 per IEC61508)
<b>Application (resolution)</b>	finger (18 mm [0.71 in]) hand (30 mm [1.18 in]) limb and body (80 mm [3.15 in])	finger (18 mm [0.71 in]) hand (30 mm [1.18 in]) limb and body (80 mm [3.15 in])	finger (14 mm [0.55 in] and 18 mm [0.71 in]) hand (30 mm [1.18 in]) limb and body (80 mm [3.15 in])
<b>Scanning range (resolution)</b>	0,25 m to 10 m [0.82 ft to 32.81 ft]	0,25 m to 10 m [0.82 ft to 32.81 ft]	0 m to 3.5 m [0 ft to 11.48 ft] (14 mm [0.55 in]); 0,25 m to 10 m [0.82 ft to 32.81 ft]
<b>Beam separation distance</b>	–	–	–
<b>Product cross section</b>	42 mm x 55 mm [1.65 in x 2.17 in]	42 mm x 55 mm [1.65 in x 2.17 in]	42 mm x 55 mm [1.65 in x 2.17 in]
<b>Protected height (resolution)</b>	200 mm to 1400 mm [7.87 in to 55.12 in] (18 mm [0.71 in]); 200 mm to 1800 mm [7.87 in to 70.87 in] (30 mm [1.18 in] and 80 mm [3.15 in])	200 mm to 1400 mm [7.87 in to 55.12 in] (18 mm [0.71 in]); 200 mm to 1800 mm [7.87 in to 70.87 in] (30 mm [1.18 in] and 80 mm [3.15 in])	200 mm to 1400 mm [7.87 in to 55.12 in] (14 mm [0.55 in] and 18 mm [0.71 in]); 200 mm to 1800 mm [7.87 in to 70.87 in] (30 mm [1.18 in] and 80 mm [3.15 in])
<b>Differentiator</b>	robust housing	robust housing	robust housing
<b>Connectors</b>	M12/5 pole (100 m [328.08 ft])	M12/5 pole (100 m [328.08 ft])	M12/5 pole (100 m [328.08 ft])
<b>Basic interface module</b>	FF-SRE60292	FF-SRE60292	FF-SRL60252 or AS-i Safe
<b>External device monitoring (EDM)</b>	yes	yes	no
<b>Automatic restart</b>	yes	no	yes
<b>Restart interlock</b>	no	yes	no
<b>Muting (or bypass)</b>	–	–	no
<b>1- or 2-beam floating blanking</b>	–	–	no
<b>AS-i safe module</b>	–	–	yes
<b>PSDI<sup>1</sup> module</b>	–	–	yes
<b>Emergency stop auxiliary inputs</b>	–	–	no

<sup>1</sup> For the automatic machine cycle start upon beam clearance (Presence Sensing Device Initiation).



<b>FF-ST4 Standard</b>	<b>FF-ST4 Advanced B</b>	<b>FF-ST4 Advanced M</b>	<b>FF-SYB (point of op.)</b>	<b>FF-SYB (long range)</b>	<b>FF-SYB (short range)</b>
Type 4 per IEC61496 (similar to SIL3 per IEC61508)	Type 4 per IEC61496 (similar to SIL3 per IEC61508)	Type 4 per IEC61496 (similar to SIL3 per IEC61508)	Type 4 per IEC61496 (similar to SIL3 per IEC61508)	Type 4 per IEC61496 (similar to SIL3 per IEC61508)	Type 4 per IEC61496 (similar to SIL3 per IEC61508)
finger (14 mm [0.55 in] and 18 mm [0.71 in]); hand (30 mm [1.18 in]); limb and body (80 mm [3.15 in])	finger (14 mm [0.55 in] and 18 mm [0.71 in]); hand (30 mm [1.18 in])	finger (14 mm [0.55 in] and 18 mm [0.71 in]); hand (30 mm [1.18 in]); limb and body (80 mm [3.15 in])	finger (14 mm [0.55 in]) hand (30 mm [1.18 in])	body (2, 3, or 4 beams)	body (2 beams)
0 m to 3.5 m [0 ft to 11.48 ft] (14 mm [0.55 in]); 0,25 m to 10 m [0.82 ft to 32.81 ft]	0 m to 3.5 m [0 ft to 11.48 ft] (14 mm [0.55 in]); 0,25 m to 10 m [0.82 ft to 32.81 ft]	0 m to 3.5 m [0 ft to 11.48 ft] (14 mm [0.55 in]); 0,25 m to 10 m [0.82 ft to 32.81 ft]	0 m to 6 m [0 ft to 19.69 ft] (14 mm [0.55 in]); 0 m to 20 m [0 ft to 65.62 ft] (30 mm [1.18 in])	0 m to 30 m [0 ft to 98.43 ft] (standard range) 5 m to 80 m [16.40 ft to 262.47 ft] (long range)	0 m to 7 m [0 ft to 22.97 ft] with passive mirrors
–	–	–	–	2-beam: 500 mm [19.69 in] spacing (body/access) 3-beam: 400 mm [15.75 in] spacing (body/access) 4-beam: 300 mm [11.81 in] spacing (body/access)	2-beam: 500 mm [19.69 in] beam spacing (body/access)
42 mm [1.65 in] x 55 mm [2.17 in]	42 mm [1.65 in] x 55 mm [2.17 in]	42 mm [1.65 in] x 55 mm [2.17 in]	42 mm [1.65 in] x 55 mm [2.17 in]	42 mm [1.65 in] x 55 mm [2.17 in]	42 mm [1.65 in] x 55 mm [2.17 in]
200 mm to 1400 mm [7.87 in to 55.12 in] (14 mm [0.55 in] and 18 mm [0.71 in]); 200 mm to 1800 mm [7.87 in to 70.87 in] (30 mm [1.18 in] and 80 mm [3.15 in])	200 mm to 1400 mm [7.87 in to 55.12 in] (14 mm [0.55 in] and 18 mm [0.71 in]); 200 mm to 1800 mm [7.87 in to 70.87 in] (30 mm [1.18 in])	200 mm to 1400 mm [7.87 in to 55.12 in] (14 mm [0.55 in] and 18 mm [0.71 in]); 200 mm to 1800 mm [7.87 in to 70.87 in] (30 mm [1.18 in] and 80 mm [3.15 in])	300 mm to 1800 mm [11.81 in to 70.87 in] (14 mm [0.55 in], 30 mm [1.18 in])	–	–
robust housing, selection through wiring	robust housing, selection through wiring	robust housing, selection through wiring	fully bundled functionality, selections through micro-cards, long scanning ranges	fully bundled functionality, selections through micro-cards	fully bundled functionality, selections through micro-cards
M12/5 and 8 pole (100 m [328.08 ft])	M12/5 and 8 pole (100 m [328.08 ft])	M12/5 and 8 pole (100 m [328.08 ft])	M12/5 and 8 pole (100 m [328.08 ft])	M12/5 and 8 pole (100 m [328.08 ft])	M12/8 pole (100 m [328.08 ft])
FF-SRE60292	FF-SRE60292	FF-SRE60292	FF-SRE60292	FF-SRE60292	FF-SRE60292
yes	yes	yes	yes	yes	yes
yes	yes	yes	yes	yes	yes
yes	yes	yes	yes	yes	yes
no	no	yes	yes	yes	yes
no	yes	no	yes	yes	no
no	no	no	yes	–	–
no	no	no	yes	–	–
no	no	no	yes	yes	yes

# Safety Electronic Products

## Safety Modules



Provide an interface between safety sensors and machine control circuitry. Module functionality includes safety door monitoring, emergency stop, two-hand control, extension, standstill and low speed monitoring, time delay, and muting.



Series	FF-SRS Emergency Stop	FF-SRST Emerg. Stop (del. contacts)	FF-SR2 Two-hand Controls
<b>Potential applications</b>	emergency stop device; door monitoring	delayed emergency stop device; door monitoring with solenoid key switch	machine cycle start
<b>Safety category</b>	Cat. 2 or 4 per EN954-1	Cat. 3 and 4 per EN954-1	Cat. IIIA and IIIC per EN574
<b>Housing width</b>	22,5 mm [0.89 in] 45 mm [1.77 in] 100 mm [3.94 in]	45 mm [1.77 in]	22,5 mm [0.89 in], 45 mm [1.77 in]
<b>Supply voltage</b>	24 Vdc, 120 Vac, 230 Vac	24 Vac/dc	24 Vdc, 120 Vac, 230 Vac
<b>Output contact</b>	3 NO/1 NC, 6 NO/1 NC	2 NO/1 NC direct, 2 NO/1 NC delayed	2 NO, 2 NO/1 NC, 3 NO/1 NC
<b>Switching capacity</b>	10 mA to 5 A, 1 mA to 10 A	1 mA to 5 A	1 mA to 5 A, 1 mA to 10 A
<b>Embedded functions</b>	input short-circuit and cross- fault detection; manual/auto restart with EDM loop	manual/auto restart with EDM loop; selectable time ranges	0.5 s input time monitoring
<b>Differentiator</b>	removable terminal strips; enhanced switching capacity; ac supply voltages	removable terminal strips	removable terminal strips; enhanced switching capacity; ac supply voltages
<b>Approvals</b>	complies with EU directive for machines 98/37/EC, IEC/EN 60501, DIN VDE 0113, and UL 508	complies with EU directive for machines 98/37/EC, IEC/EN 60501, DIN VDE 0113, and UL 508	complies with machinery direc- tive 98/37/EC and UL 508



### FF-SR0 Standstill Monitoring

### FF-SRT Delayed Extension

### FF-SRL Basic

### FF-SRL59022 PSDI

### FF-SRM Muting

### FF-SRE Extension

motor control	delayed emergency stop device; contact multiplication; current switching capacity	safety device with solid state outputs	automatic machine cycle start	momentary deactivation of the safety light curtain	contact multiplication; current switching capacity
Cat. 1 and 3 per EN954-1	Cat. 1 per EN954-1	Cat. 4 per EN954-1	Cat. 4 per EN954-1	Cat. 4 per EN954-1	Cat. 1 per EN954-1
45 mm [1.77 in]	45 mm [1.77 in]	22,5 mm [0.89 in] 45 mm [1.77 in]	45 mm [1.77 in]	45 mm [1.77 in]	22,5 mm [0.89 in], 100 mm [3.94 in]
24 Vdc, 120 Vac, 230 Vac	24 Vdc	24 Vdc	24 Vdc	24 Vdc	24 Vac/dc, 120 Vac, 230 Vac
2 NO/1 NC, 2 NO/2 NC	1 NO/1 NC	3 NO/1 NC	3 NO	3 NO	4 NO + 2 NC, 7 NO + 1 NC
1 mA to 4 A, 10 mA to 10 A	Up to 8 A	10 mA to 5 A, 1 mA to 10 A	1 mA to 5 A	1 mA to 5 A	10 mA to 5 A, 1 mA to 10 mA
motor back EMF monitoring or rotation frequency measurement	selectable time ranges	manual/auto restart with EDM loop	manual restart with EDM loop; presence sensing device initiation: single or dual stroke with selectable time window	manual/auto restart with EDM loop; 2 or 4 muting inputs; 1 or 2 light curtains; muting lamp; auxiliary emergency stop circuit	redundant relay outputs (pair of safety relays with guided contacts)
removable terminal strips; enhanced switching capacity; ac supply voltages	dual timing circuit	removable terminal strips; enhanced switching capacity	removable terminal strips	removable terminal strips	removable terminal strips; high switching capacity; ac supply voltages
complies with machinery 98/37/EC and UL 508; designed for category 1 emergency stop functions per EN 418 and NFPA79	complies with machinery directive 98/37/EC, IEC 255, VDE 0435 and UL 508	complies with EU machinery directive 98/37/EC, IEC 204, EN 60204, DIN VDE 0113	complies with IEC 61508 and EN 61496-1 European standards; meets applicable parts of the US and Canadian regulations and standards	per the EN 354-1 and EN 61496-1 European standards; meets applicable parts of the US and Canadian regulations and standards ANSI/RIA/OSHA	complies with the machinery directive 98/37/EC, IEC 204, EN 60204, DIN VDC 0113, and UL 508



As one of the world's leading providers of sensors and switches, Honeywell understands and meets the requirements of a wide variety of industries.

Honeywell Sensing and Control is a global leader in providing reliable, cost-effective sensing and switching solutions for our customers' applications. We serve thousands of customers in four core industry segments: industrial, medical equipment, transportation, and aerospace/military products.

### **Aerospace**

Aerospace applications are among the most demanding for any type of product. Rigorous FAA requirements, extreme environments (temperature, shock, vibration, the need for hermetic sealing), and the ability to customize devices are just a few of the parameters often required of sensors and switches in these applications. Aerospace customers typically value speed in prototyping and development, and Honeywell's vertically integrated, AS9100-approved manufacturing locations enhance our ability to produce devices in a wide variety of packages. The precision output of our products helps reduce risk and cost in key applications while also minimizing the need for unscheduled maintenance.

Honeywell's in-depth aerospace engineering experience allows us to work with customers in the design and development of

products that best meet the specified requirements of their individual applications. Making products simple to install makes the job easier every step of the way. And, the odds are that Honeywell is already on the list of trusted suppliers for many aerospace companies, underscoring the decades of experience we bring to this field.

Honeywell products for this industry (many of them PMA-certified) include force sensors, load cells, potentiometers, pilot controls, pressure sensors, pressure switches, resolvers, sensor/actuator assemblies for systems ranging from aerostructures to fuel control to flight surfaces, speed sensors, temperature probes, thermostats, torque sensors, y-guides for cargo systems, MICRO SWITCH™ sealed and high-accuracy switches, MICRO SWITCH™ pushbutton switches, and MICRO SWITCH™ rocker and toggle switches.

## Medical

Medical applications typically require sensors and switches that are highly stable and extremely reliable to enhance patient safety and comfort. Stability is often essential to minimize long term drift, reduce the need for recalibration, and improve ease of use for medical equipment operators. Reliability enhances patient safety in life-critical applications, reduces downtime, and improves test throughput in applications such as clinical diagnostics. The product needs to be easy to use and easy to design into a system, so Honeywell's extensive customization and built-in calibration/amplification capabilities are strong benefits. Confidence in Honeywell's product performance, reliability, and availability provide peace of mind for medical equipment manufacturers who choose Honeywell.

Honeywell offerings for this industry include airflow sensors, board mount and stainless steel media isolated pressure sensors, Hall-effect magnetic position sensors, humidity sensors, flexible heaters, force sensors, thermostats, commercial solid state sensors, infrared sensors, oxygen sensors, pressure and vacuum switches, potentiometers and encoders, MICRO SWITCH™ pushbutton, rocker, and toggle switches, and hour meters.

## Industrial

The industrial arena can be a rough one. From high-speed food processing to high-force stamping applications, reliable and cost-effective sensors and switches often help minimize repair costs, maximize system life, and reduce overall system expense. Durability can mean the difference between smooth-running processes and expensive downtime. Accurate, repeatable sensor or switch output can reduce the need for calibration once the device is applied. Because of the wide variety of potential applications, Honeywell's ability to deliver a customized product that can meet virtually any size, weight, and power requirement – as well as any packaging stipulations for tough, harsh environments – often makes it easy to incorporate and use our devices. Safety is another important consideration for industrial

users, and our products meet a wide variety of regulatory safety requirements.

Honeywell's industrial product line includes airflow sensors, current sensors, humidity sensors, fiber-optic and liquid-level sensors, linear position sensors, oxygen sensors, pressure sensors, potentiometers and encoders, speed sensors, temperature probes, ultrasonic sensors, wirewound resistors, thermostats, commercial solid state sensors, flex heaters, SMART position sensors, board mount and stainless steel media isolated pressure sensors, force sensors, safety light curtains, push-pull switches, and MICRO SWITCH™ basic switches, hazardous area switches, safety switches, key and rotary switches, limit switches, sealed and high-accuracy switches, pushbutton, rocker, toggle switches, and relays.

## Transportation

Getting from Point A to Point B is often challenging for end-customers of transportation providers – Honeywell aims to make the trip easier with highly reliable, cost-effective switches and sensors. Our products are designed to support rigorous engine requirements, and their efficiency can also help optimize engine performance. Customization is often required to allow a switch or sensor to be mounted in tight or challenging environments including vibration, temperature extremes, and road contamination. The durability of Honeywell products enhances system reliability, which is also boosted by the stable, accurate output of our devices. All of these capabilities allow demanding customers to rely on Honeywell's many years of experience in the transportation industry.

Honeywell products for transportation applications include Hall-effect rotary position sensors, inertial measurement units, infrared sensors, keyless entry sensors, magnetic position sensors, pressure sensors, speed and direction sensors, ultrasonic sensors, thermostats, temperature probes, commercial solid state sensors, SMART position sensors, and MICRO SWITCH™ pushbutton, rocker, and toggle switches.



# Sensing and Control Product Portfolio

Product reliability. Industry knowledge. Expertise. Standard with every order.

With more than 50,000 sensing, switching, and control products ranging from snap-action, limit, toggle, and pressure switches to position, speed, pressure, and airflow sensors, Honeywell Sensing and Control has one of the broadest sensing and switching portfolios available.

## SENSORS



**Airflow sensors:** Advanced microstructure technology. Sensitive and fast response to flow, amount/direction of air or other gas. Analog or digital output. Thin-film, thermally isolated bridge structure consists of a heater and temperature sensing elements. **May be used in:** HVAC, respirators, process control, oxygen concentrators, gas metering, chromatography, leak detection equipment, medical/analytical instrumentation, and ventilation equipment.



**Current sensors:** Accurate and fast response. Almost no thermal drift or offset with temperature. Adjustable linear, null balance, digital, and linear current sensors. **May be used in:** Variable speed drives, overcurrent protection, power supplies, ground fault detectors, robotics, industrial process control, and wattmeters.



**Flexible heaters:** Flat, molded-to-shape, spiral wrap, transparent, composite, and high temperature configurations with single, multiple, and variable watt densities. Can be bonded parts or combined. **May be used in:** Airborne valves, outdoor cameras, LCD displays, scanners, and telecommunication.



**Force sensors:** Variety of package styles and various electrical interconnects including pre-wired connectors, printed circuit board mounting, and surface mounting for flexibility. **May be used in:** Infusion and syringe pumps, blood pressure equipment, pump pressure, drug delivery systems, occlusion detection, and kidney dialysis machines.



**Humidity sensors:** Configured with integrated circuitry. Provide on-chip signal conditioning with interchangeability of  $\pm 3\%$  accuracy and out-of-the-box reliability. Standardized, platform-based sensors. **May be used in:** Air compressors, food and beverage packaging and processing, HVAC, printing presses, and office equipment.



**Infrared sensors:** IREs, sensors, and assemblies for object presence, limit and motion sensing, position encoding, and movement encoding. Variety of package styles, materials, and terminations. **May be used in:** Printers/copiers, motion control systems, metering, data storage systems, scanning, automated transaction, drop sensors, and non-invasive medical equipment.



**Magnetic sensors:** Digital and analog Hall-effect position ICs, magnetoresistive position ICs, Hall-effect vane, gear-tooth, and magnetic sensors. **May be used in:** Speed and RPM sensing, motor/fan control, magnetic encoding, disc speed, tape, flow-rate sensing, conveyors, ignitions, motion control/detection, power/position, magnetic code reading, vibration, and weight sensing.



**Position sensors:** The **SMART position sensor** measures linear or angular position of a magnet attached to a moving object so that the object's position can be determined or controlled. Its simple, non-contact design eliminates mechanical failure mechanisms, reduces wear and tear, improves reliability and durability. **May be used in:** valve position, material handling, plastic molding, passenger bus level position, truck-mounted crane outrigger position, aerial work lift platform, front loader and digger/excavation boom position. **Potentiometer sensors** measure linear, rotary position or displacement. Honeywell's proprietary conductive plastic delivers extensive temperature range and infinite resolution, and provides precision position measurement. **May be used in:** robotic motion control, marine steering, and in-tank level sensing. **Ultrasonic sensors** measure time delays between emitted and echo pulses, often accurately determining the sensor-to-target distance. **May be used in:** level measurement, height and thickness sensing, and diameter control.



**Pressure sensors – board mount:** Full line of industrial-grade sensors: media-isolating design, multiple ports and outlets, and electrical configurations. **May be used in:** Pneumatic controls, air compressors, process monitoring, hydraulic controls, VAV controls, clogged filter detection, presence/absence of flow, and transmissions.



**Pressure sensors – heavy duty:** Small, allowing use on their own in tight packages or as the building block for a complete transducer. Developed for potential use in pressure applications that involve measurement of hostile media in harsh environments compatible with 316 stainless steel. **May be used in** industrial controls, process control systems, and industrial automation.



**Pressure transducers – heavy duty:** Provide a complete amplified and compensated pressure measurement solution. Choice of ports, connectors, outputs and pressure ranges, engineered to be resistant to a wide variety of media for use in most harsh environments. **May be used in:** Industrial HVAC/R and air compressors; general system and factory automation pump, valve and fluid pressure; and transportation (heavy equipment and alternative fuel vehicles) system, pneumatics, and hydraulics.



**Proximity sensors:** Designed to meet demanding temperature, vibration, shock, and EMI/EMP interference requirements. Number of housing materials and termination styles. **May be used in:** Aircraft landing gear, gun turret position control, and door/hatch monitoring.



**Rotary position sensors:** Digital and analog Hall-effect, magnetoresistive, and potentiometric devices and resolvers for sensing presence of a magnetic field or rotary position. Directly compatible with electronic circuits for application flexibility. **May be used in:** Audio and lighting, frequency, temperature, position, medical/instrumentation, computer peripherals, manual controls, joysticks, telecom, welding, heating, and aerospace.



**Speed sensors:** Measure speed, position, and presence detection utilizing magnetoresistive, variable reluctance, Hall-effect, variable inductance, and Spiral technologies. **May be used in:** Cam and crankshafts, transmissions, fans, pumps, mixers, rollers, and motors.



**Temperature sensors:** Customized probes, thermistors, and RTD sensors. Plastic/ceramic, miniaturized, surface-mount housings, and printed circuit board terminations. **May be used in:** Semiconductor protection, vending machines, power generation, hydraulic systems, thermal management, and temperature compensation.



**Thermostats:** Commercial and precision snap-action. Automatic or manual reset options, phenolic or ceramic housings. **May be used in:** Telecommunications, battery heater controls, computers, copy machines, fax machines, food service, food carts, small and major appliances, heat and smoke detectors, and HVAC equipment.



**MICRO SWITCH™ rocker switches:** Wide range of electrical and display design. Many shapes, sizes, and configurations to enhance manual operation. **May be used in:** Transportation, agricultural and construction equipment, test equipment, heavy-duty machinery, marine equipment, small appliances, telecom, medical instrumentation, and commercial aviation.



**MICRO SWITCH™ toggle switches:** Wide range of electrical and display design. Available in many shapes, sizes, and configurations. **May be used in:** Aerial lifts, construction equipment, agriculture and material-handling equipment, factory-floor controls, process control, medical instrumentation, test instruments, and military/commercial aviation.



**MICRO SWITCH™ aerospace-grade pressure switches:** lightweight, compact pressure switches sense changes in gas/pressure. Qualified to MIL-PFR-8805. Lower operating force provides application versatility with enhanced precision. Design modularity allows for configuration of the switch, facilitating rapid customization to the precise, demanding requirements. **May be used in:** aerospace systems -including engines, fuel pressure, and hydraulic systems, military ground vehicles, ordnance and munitions release systems, military maritime systems.



**Pressure and vacuum switches:** Feature set points from 0.5 psi to 3000 psi. Rugged components have enhanced repeatability, flexibility, and wide media capability. **May be used in:** Transmissions, hydraulics, brakes, steering, generators/compressors, dental air, embalming equipment, oxygen concentrators, air cleaners, fuel filters, and pool water pressure.

## ELECTROMECHANICAL SWITCHES



**MICRO SWITCH™ snap-action series:** Snap-action precision switches. Compact. Lightweight. Designed for repeatability and enhanced life. Premium and standard snap-action switches: standard, miniature, subminiature, hermetically sealed, and high-temperature versions. **May be used in:** Vending machines, communication equipment, HVAC, appliances, electronic gaming machinery, valve controls, irrigation systems, foot switches, pressure, and temperature controls.



**MICRO SWITCH™ hazardous area switches:** Flame path designed to contain and cool escaping hot gases that could cause an explosion. MICRO SWITCH™ EX, BX, CX, and LSX Series. **May be used in:** Grain elevators and conveyors, off-shore drilling, petrochemical, waste-treatment plants, control valves, paint booths, and hazardous waste handling facilities.



**Key and rotary switches:** Used on machinery in harsh environments. O-rings help keep dirt and moisture out and prolong life. **May be used in:** All-terrain vehicles, golf carts, snowmobiles, scissor lifts, telehandlers, construction and marine equipment, skid loaders, agricultural equipment, material handlers.



**MICRO SWITCH™ limit switches:** Broadest and deepest limit switch portfolio. Rugged, dependable position detection solutions. MICRO SWITCH™ heavy-duty limit switches (HDLS) and global limit switches. Hermetically and environmentally sealed switches. **May be used in:** Machine tools, woodworking, textile, and printing machinery, metal fabrication, balers/compactors, forklifts, bridges, robotics, wind turbines, elevators, moving stairs, doors, dock locks/levelers, aerial lifts, cranes, conveyors, rail, shipboards, and dock side.



**MICRO SWITCH™ sealed and high accuracy switches:** Precision 'snap action' mechanisms. Wide variety of actuators, terminations, circuitry configurations, electrical ratings, contact materials, and operating characteristics. **May be used in:** Landing gear, flap/stabilizer controls, thrust reversers, space vehicles, armored personnel carriers, de-icer controls, wingfold actuators, industrial environments, valves, and underwater.



**MICRO SWITCH™ pushbutton switches:** Lighted or unlighted. Wide range of electrical and display design, pushbuttons, and manual switches. Many shapes, sizes, and configurations. Easy to apply, operate, and maintain. **May be used in:** Control boards and panels, industrial and test equipment, computers, medical instrumentation, and aerospace.

## WIRELESS SWITCHES



**Limitless™ Series:** Combines the best of MICRO SWITCH™ limit switches with latest commercial wireless technology. Beneficial for remote monitoring where wiring/maintenance is not physically possible or economically feasible. Used for position sensing and presence/absence detection. **May be used in:** valve position, crane boom/jib/skew position, lifts, material handling, presses, construction/ag machines, conveyors, remote/temporary equipment, grain diverters or flaps, and door position.

## SAFETY PRODUCTS



**MICRO SWITCH™ safety switches:** For operator point-of-operation protection, access detection, presence sensing, gate monitoring, and electrical interfacing. High-quality, dependable, cost-effective solutions. **May be used in:** Packaging and semi-conductor equipment, plastic-molding machinery, machine tools, textile machines, lifts, industrial doors, balers, compactors, aircraft bridges, telescopic handlers, refuse vehicles.



**Safety light curtains:** Different resolutions permit detection of an approaching finger, hand, limb, or body. Separate or self-contained control units, various housing sizes, resolutions, scanning ranges, and protection heights. **May be used in:** Point-of-operation protection, access detection, presence sensing, gate monitoring, electrical-to-machine-circuitry interfacing, emergency stop circuits on machines, sliding door protection, conveyors, and transfer lines.

## **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 acknowledgment 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.

## **Find out more**

To learn more about Honeywell's sensing and control products, call **+1-815-235-6847**, email inquiries to **info.sc@honeywell.com**, or visit **www.honeywell.com/sensing**

## **Honeywell Sensing and Control**

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