

**Position Sensors**

**Honeywell**



**SENSING AND CONTROL**

**Product Range Guide**

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## Table of Contents

|                                                 |       |
|-------------------------------------------------|-------|
| Magnetoresistive Sensor ICs .....               | 3     |
| Hall-effect Digital Sensor ICs .....            | 4-5   |
| Hall-effect Digital and Linear Sensor ICs ..... | 6-7   |
| Value-Added Hall-effect Sensors .....           | 8-9   |
| Linear Potentiometric Sensors .....             | 10-11 |
| SMART Position Sensors .....                    | 12-13 |
| Ultrasonic Sensors .....                        | 14-15 |
| Inertial Measurement Unit .....                 | 16    |

|                                                     |       |
|-----------------------------------------------------|-------|
| Proximity Sensors .....                             | 17-18 |
| Proximity Sensors: Integral Health Monitoring ..... | 19    |
| Encoders and Non-Contact Hall-effect Sensors .....  | 20    |
| Cermet and Wirewound Potentiometers .....           | 21    |
| Conductive Plastic Potentiometers .....             | 22-23 |
| Honeywell S&C Core Industry Segments .....          | 24-25 |
| Honeywell S&C Product Portfolio .....               | 26-27 |



# 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, pneumatic cylinders, and battery-powered equipment including hand-held scanners, computers, and water/gas/electricity meters.



| Series                      | Nanopower                                                                                                                                                                                                   | 2SS52M                                                                                                                                  | SS552MT                                                                                                                                   | VF401                                                                                                                                                               | APS00B                                                                                                                                            |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Description                 | omnipolar MR sensor IC                                                                                                                                                                                      | omnipolar MR digital sensor IC                                                                                                          | omnipolar MR digital sensor IC                                                                                                            | 2-wire MR fine pitch ring magnet sensor IC                                                                                                                          | high resolution magnetic displacement sensor IC                                                                                                   |
| Magnetic actuation type     | omnipolar                                                                                                                                                                                                   | omnipolar                                                                                                                               | omnipolar                                                                                                                                 | differential bridge                                                                                                                                                 | analog, saturated mode                                                                                                                            |
| Package style               | SOT-23                                                                                                                                                                                                      | U-Pack                                                                                                                                  | SOT-89                                                                                                                                    | flat, T0-92-style                                                                                                                                                   | SOIC-8                                                                                                                                            |
| Supply voltage range        | 1.65 Vdc to 5.5 Vdc                                                                                                                                                                                         | 3.8 Vdc to 30 Vdc                                                                                                                       | 3.8 Vdc to 30 Vdc                                                                                                                         | 4.5 Vdc to 16 Vdc                                                                                                                                                   | 1 Vdc to 12 Vdc                                                                                                                                   |
| Supply current              | SM351LT: 360 nA typ.<br>SM353LT: 310 nA typ.                                                                                                                                                                | 11 mA max.                                                                                                                              | 11 mA max.                                                                                                                                | operate: 16.8 mA max.<br>release: 8.4 mA max.                                                                                                                       | 7 mA max.                                                                                                                                         |
| Output type                 | low: 0.03 V typ.<br>high: Vs -0.03 V typ.                                                                                                                                                                   | digital sinking                                                                                                                         | digital sinking                                                                                                                           | digital sourcing                                                                                                                                                    | sin(2Θ), cos(2Θ)                                                                                                                                  |
| Operating temperature range | -40 °C to 85 °C<br>[-40 °F to 185 °F]                                                                                                                                                                       | -40 °C to 150 °C<br>[-40 °F to 302 °F]                                                                                                  | -40 °C to 150 °C<br>[-40 °F to 302 °F]                                                                                                    | -40 °C to 150 °C<br>[-40 °F to 302 °F]                                                                                                                              | -40 °C to 150 °C<br>[-40 °F to 302 °F]                                                                                                            |
| Measurements (H x W)        | 2,80 mm x 2,90 mm<br>[0.110 in x 0.114 in]                                                                                                                                                                  | 4,5 mm x 4,5 mm<br>[0.18 in x 0.18 in]                                                                                                  | 4,2 mm x 4,5 mm<br>[0.16 in x 0.18 in]                                                                                                    | 4,06 mm x 3,00 mm<br>[0.160 in x 0.118 in]                                                                                                                          | 4,9 mm x 6,0 mm<br>[0.19 in x 0.24 in]                                                                                                            |
| Features                    | high sensitivity: 7 Gauss typ., 11 Gauss max. (SM351LT), 14 Gauss typ., 20 Gauss max. (SM353LT); designed to accommodate applications with large air gaps, small magnetic fields and low power requirements | omnipolar magnetics; sinking output, low gauss operation (25 G max.); operating speed of 0 kHz to over 100 kHz; tape and reel available | Low gauss operation (25 G max.) extends sensing distance to one inch or more, depending on size, operating speed of 0 kHz to over 100 kHz | 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 respond 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/<br>SS40A/<br>SS50AT                                                                                                              | SS311PT/<br>SS411P                                                                          | SS340RT/<br>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<br>SS30AT/SS50AT: plastic surface mount (SOT-23 & SOT-89)                                                     | SS311PT: plastic surface mount (SOT-23)<br>SS411P: plastic radial lead                      | SS340RT: plastic surface mount (SOT-23)<br>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 $\mu$ 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>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]<br>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]<br>SS340RT (3 Vdc to 12 Vdc) & SS440R (3 Vdc to 24 Vdc): -40 °C to 150 °C [-40 °C 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]<br>SS40A: 3,0 mm x 4,1 mm [0.12 in x 0.16 in]<br>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]<br>SS411P: 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]<br>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 | high output current and speed capability; reverse polarity protection                                                                    | built-in pull-up resistor; low voltage; enhanced sensitivity                                | simple activation from a South pole and multiple magnetic sensitivities (high, medium, and low)                                                             |



| SS345PT/<br>SS445P                                                                          | SS351AT/<br>SS451A/<br>SS551AT                                                                                                                                                    | SS360NT/<br>SS360ST/<br>SS460S                                                                    | SS360PT/<br>SS460P                                                                                                  | SS361CT/<br>SS461C                                                                          | SS361RT/<br>SS461R                                                                                                             | SS400/<br>SS500                                                                                        | SS41/<br>SS51T                                                                          |
|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| unipolar Hall-effect digital sensor IC with built-in pull-up resistor                       | low-cost omnipolar Hall-effect digital sensor IC                                                                                                                                  | high sensitivity, latching Hall-effect digital sensor IC                                          | high sensitivity latching digital Hall-effect sensor IC with built-in pull-up resistor                              | high sensitivity, latching Hall-effect digital sensor IC                                    | low-cost Hall-effect digital sensor IC                                                                                         | SS400: Hall-effect digital sensor IC<br>SS500: unipolar/bipolar/latching Hall-effect digital sensor IC | bipolar Hall-effect digital sensor IC                                                   |
| unipolar                                                                                    | omnipolar                                                                                                                                                                         | latching                                                                                          | latching                                                                                                            | latching                                                                                    | latching                                                                                                                       | unipolar, bipolar, latching                                                                            | bipolar                                                                                 |
| SS345PT: plastic surface mount (SOT-23)<br>SS445P: plastic radial lead                      | SS351AT: plastic surface mount (SOT-23); SS451A: plastic radial lead; SS551AT: plastic surface mount (SOT-89B)                                                                    | SS360NT/SS360ST: plastic surface mount (SOT-23); SS460: plastic radial lead                       | SS360PT: plastic surface mount (SOT-23)<br>SS460P: plastic radial lead (flat TO-92-style)                           | SS361CT: plastic surface mount (SOT-23)<br>SS461C: plastic radial lead                      | SS361RT: plastic surface mount (SOT-23)<br>SS461R: plastic radial lead                                                         | SS400: plastic radial lead<br>SS500: plastic surface mount (SOT-89)                                    | SS41: plastic radial lead<br>SS51T: plastic surface mount (SOT-89)                      |
| 2.7 Vdc to 7.0 Vdc                                                                          | SS351AT/SS551AT (-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 | 3 Vdc to 24 Vdc                                                                                   | 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)                                                                                                                | 8 mA max.                                                                                         | 10 mA                                                                                                               | 6 mA max.                                                                                   | 8 mA                                                                                                                           | SS400: 10 mA<br>SS500: 8.7 mA at 5 Vdc                                                                 | 15 mA max.                                                                              |
| -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]                                                               | -40 °C to 125 °C [-40 °F to 257 °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]<br>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]; SS551AT: 4,2 mm x 4,5 mm [0.16 in x 0.18 in]                                           | SS360NT/SS360ST: 2,8 mm x 2,9 mm [0.11 in x 0.11 in]; SS460S: 3,0 mm x 4,1 mm [0.12 in x 0.16 in] | SS360PT: 2,8 mm x 2,9 mm [0.11 in x 0.11 in]<br>SS460P: 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]<br>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]<br>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]<br>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]<br>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)                      | built-in reverse polarity protection; typical operating point of 85 G at 25 °C [77 °F]                                                                                            | fastest response time in class; no chopper stabilization                                          | fastest response time in its class, no chopper stabilization, operates from only 30 Gauss typical, at 25 °C [77 °F] | enhanced sensitivity; built-in reverse voltage capability                                   | enhanced sensitivity; built-in reverse polarity protection; robust design                                                      | multiple operate/release points available                                                              | 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              | SS42R                                                                                        |
|-----------------------------|----------------------------------------------------------------------------------------------|
| Description                 | latching dual Hall-effect digital sensor IC with active high/active low complementary output |
| Magnetic actuation type     | latching                                                                                     |
| Package material and style  | plastic radial lead                                                                          |
| Supply voltage              | 4.5 Vdc to 16 Vdc                                                                            |
| Supply current              | 11 mA max.                                                                                   |
| Output type                 | digital sinking or sourcing                                                                  |
| Operating temperature range | 0 °C to 100 °C [32 °F to 212 °F]                                                             |
| Measurements (H x W)        | 3,6 mm x 5,1 mm [0.14 in x 0.20 in]                                                          |
| Features                    | latching magnetics; sinking or sourcing outputs; reverse polarity protection                 |



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



## VF526DT

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

latching

plastic surface mount (SOT-89 style)

3.4 Vdc to 24 Vdc

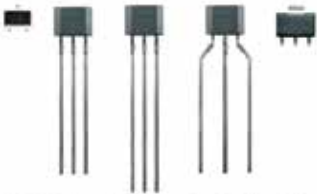
14 mA max.

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]

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)                                                                                                           |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Description                 | Hall-effect digital position sensor                                                                                                      | Hall-effect linear position sensor                                                                                       |
| Package material and style  | aluminum threaded barrel                                                                                                                 | aluminum threaded barrel                                                                                                 |
| Magnetic actuation type     | unipolar, bipolar, latching                                                                                                              | linear                                                                                                                   |
| Operation                   | proximity to external magnet                                                                                                             | proximity to external magnet                                                                                             |
| Supply voltage range        | 4.5 Vdc to 24 Vdc                                                                                                                        | 4.5 Vdc to 10.5 Vdc                                                                                                      |
| Supply current              | 4 mA to 10 mA (inclusive)                                                                                                                | 7 mA                                                                                                                     |
| Output type                 | digital sinking                                                                                                                          | ratiometric sinking/sourcing                                                                                             |
| Operating temperature range | -40 °C to 100 °C [-40 °F to 212 °F]                                                                                                      | -40 °C to 100 °C [-40 °F to 212 °F]                                                                                      |
| Measurements                | Ø 11,9 mm x 25,4 mm H<br>[15/32-2 x 1.0 in H]                                                                                            | Ø 11,9 x 25,4 mm H<br>[15/32-2 x 1.0 in H]                                                                               |
| Features                    | unipolar, bipolar, and 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 |





## SR16/SR17

low-cost Hall-effect vane sensor

SR16: plastic dual tower with variety of terminations  
SR17: plastic side-mount wire exit

—

ferrous metal actuator

3.8 Vdc to 30 Vdc

10 mA max.

digital sinking

-20 °C to 85 °C [-4 °F to 185 °F]

24,6 mm H x 12,4 mm W  
[0.97 in H x 0.49 in W]

sinking output; non-contact position sensing;  
environmentally sealed; three terminations

## SR3

Hall-effect digital position sensor

plastic threaded barrel

unipolar, bipolar

proximity to external magnet

4.5 Vdc to 24 Vdc

10 mA

digital sinking

-40 °C to 85 °C [-40 °F to 185 °F]

Ø 12,4 mm x 25,4 mm L  
[Ø 0.49 in x 1.0 in L]

NEMA 3, 3R, 3S, 4, 4X, 12 and 13; unipolar and bipolar  
magnetics; sinking output; frequencies exceeding 100 Hz

## SR4

magnetoresistive digital  
position sensor

plastic threaded barrel

omnipolar

proximity to external magnet

3.8 Vdc to 30 Vdc

11 mA

digital sinking

-40 °C to 85 °C [-40 °F to 185 °F]

19,0 mm H x 25,4 mm L  
[0.75 in H x 1.0 in L]

NEMA 3, 3R, 3S, 4, 4X, 12 and 13; omnipolar magnetics;  
sinking output

# 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<br>[-40 °F to 176 °F]                                                                                                         | -40 °C to 80 °C<br>[-40 °F to 176 °F]                                                                                                           | -65 °C to 105 °C<br>[-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);<br>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<br>[5 in to 38 in]                                                                                                           | 12,7 mm to 304,8 mm<br>[0.5 in to 12 in]                                                                                                        | 152 mm to 1219 mm<br>[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<br>[6.1 in to 38.1 in]                                                                                                 | 15,24 mm to 307,34 mm<br>[0.6 in to 12.1 in]                                                                                                    | 154,6 mm to 1221,4 mm<br>[6.09 in to 48.09 in]                                                                              |
| <b>Electrical travel</b>           | 152,4 mm to 965,2 mm<br>[6 in to 38 in]                                                                                                       | 12,7 mm to 304,8 mm<br>[0.5 in to 12 in]                                                                                                        | 152,4 mm to 1219,2 mm<br>[6 in to 48 in]                                                                                    |
| <b>Housing length</b>              | electrical travel + 54,87 mm<br>[2.16 in]                                                                                                     | electrical travel + 38,1 mm<br>[1.5 in]                                                                                                         | electrical travel + 81,02 mm<br>[3.19 in]                                                                                   |
| <b>Vibration</b>                   | 20 g / 0,75 mm (rms)<br>5 Hz to 2 kHz                                                                                                         | 20 g / 0,75 mm (rms)<br>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)<br>5 lb (water resistant)                                                                                                           | 28,35 g max. [1 oz max.]<br>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<br>[1.2 in to 6.15 in]                                                                                                          | 26,7 mm to 255,3 mm<br>[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: valve position, material handling, plastic molding, wafer handling, CNC machines, passenger bus level position, truck-mounted crane outrigger position, heavy equipment attachment identification, engine transmissions (35 mm only), marine motors, and aircraft actuators.



| Series                           | SPS Linear                                                                                                                                                                                                              |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Description                      | measures linear movement of a magnet attached to a moving object                                                                                                                                                        |
| Configuration                    | linear                                                                                                                                                                                                                  |
| Sensing range                    | 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]<br>225 mm: 0 mm to 225 mm [0 in to 8.86 in]                                                                                              |
| Actuator sensing location on arc | –                                                                                                                                                                                                                       |
| Resolution                       | 35 mm analog: 0,04 mm [0.0016 in]; 75 mm analog: 0,05 mm [0.002 in]<br>225 mm analog: 0,14 mm [0.0055 in]; 225 mm digital: 0,0035 mm [0.000137 in]                                                                      |
| Supply voltage                   | 35 mm: 4.75 Vdc to 5.25 Vdc<br>all other versions: 6 Vdc to 24 Vdc                                                                                                                                                      |
| Supply current                   | 35 mm analog: 20 mA max.; 75 mm analog: 32 mA max.<br>225 mm analog: 34 mA max.; 225 mm digital: 88 mA max.                                                                                                             |
| Output                           | 35 mm analog: 0.55 Vdc to 4.15 Vdc<br>75 mm and 225 mm analog: 0 Vdc to 5 Vdc<br>225 mm digital: RS232 type                                                                                                             |
| Air gap                          | 35 mm analog: 8,5 ±1,0 mm [0.334 ±0.039 in]<br>all other versions: 3,0 mm ±2,5 mm [0.118 in ±0.098 in]                                                                                                                  |
| Operating temperature range      | -40 °C to 125 °C [-40 °F to 257 °F]                                                                                                                                                                                     |
| Storage temperature range        | -40 °C to 150 °C [-40 °F to 302 °F]                                                                                                                                                                                     |
| Termination                      | 35 mm analog: TYCO Super Seal 282087-1 integral connector<br>all other versions: 18 AWG flying leads                                                                                                                    |
| Sealing                          | IP67, IP69K                                                                                                                                                                                                             |
| Housing material                 | thermoplastic                                                                                                                                                                                                           |
| Approvals                        | CE                                                                                                                                                                                                                      |
| Measurements                     | 35 mm: 85 mm L x 31,95 mm W x 35,5 mm H [3.35 in x 1.26 in x 1.40 in]<br>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]<br>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] |



*Arc Configuration potential applications: 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, telescoping conveyor elevation, power generation contact angle, rail-road crossing arms position, remote weapon systems elevation, chassis suspension systems position height, military vehicle door position, ground-based solar panels elevation and azimuth, ground-based satellite dish elevation and azimuth, robotically-assisted surgery equipment position, patient bed elevation.*

*Rotary Configuration potential applications: steering angle, articulation angle, boom arm detection, solar panels, wind turbines.*



| SPS Arc                                                                                                                                                  | SPS Rotary                                                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| measure angular movement of a magnet attached to a moving object                                                                                         | measures rotary movement of a magnet attached to a moving object |
| arc                                                                                                                                                      | rotary                                                           |
| 100°: 0° to 100°<br>180°: 0° to 180°                                                                                                                     | 0° to 360°                                                       |
| 100°: inside or outside<br>180°: inside                                                                                                                  | –                                                                |
| 100° inside and outside: 0.06°<br>180° inside: 0.11°                                                                                                     | 0.01°                                                            |
| 100° inside: 6 Vdc to 24 Vdc, 18 Vdc to 40 Vdc<br>100° outside: 5 Vdc<br>180° inside: 6 Vdc to 24 Vdc, 18 Vdc to 40 Vdc                                  | 12 mA to 30 mA                                                   |
| 100° inside: 45 mA max.<br>100° outside: 30 mA max.<br>180° inside: 45 mA max.                                                                           | 90 mA max.                                                       |
| 0.5 Vdc to 4.5 Vdc                                                                                                                                       | 4 mA to 20 mA                                                    |
| 100° inside: 7,8 mm ±2,5 mm [0.307 in ±0.098 in]<br>100° outside: 9,2 mm ±2,5 mm [0.36 in ±0.098 in]<br>180° inside: 8,5 mm ±2,5 mm [0.338 in ±0.098 in] | 3,0 ±2,0 mm [0.118 ±0.079 in]                                    |
| -40 °C to 85 °C [-40 °F to 185 °F]                                                                                                                       | -40 °C to 85 °C [-40 °F to 185 °F]                               |
| -40 °C to 150 °C [-40 °F to 302 °F]                                                                                                                      | -40 °C to 150 °C [-40 °F to 302 °F]                              |
| 100° inside: 4-pin M12 connector, 18 AWG flying leads<br>100° outside: Ampseal 16 connector<br>180° inside: 4-pin M12 connector                          | M12 connector (male 5-pin)                                       |
| IP67, IP69K                                                                                                                                              | IP67, IP69K                                                      |
| thermoplastic                                                                                                                                            | aluminum with powder coating                                     |
| CE                                                                                                                                                       | CE                                                               |
| 100°: 183 mm L x 86 mm W x 31 mm H [7.20 in x 3.39 in x 1.22 in]<br>180°: 222 mm L x 107 mm W x 31 mm H [8.74 in x 4.21 in x 1.22 in]                    | 113,5 mm x 106,5 mm x 22,0 mm [4.46 in x 4.19 in x 0.87 in]      |

# 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 $\pm 1$ mm; 0.2 % or $\pm 2$ mm                                                                                                         | $\pm 1$ mm                                                                                                                                                  | 0.4 % or 2 mm; 0.2 % or $\pm 1$ 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 $\pm 2$ mm                                                                                                                   | 0.4 % or $\pm 2$ mm                                                                                                                                 | < 0.1 %                                                                                                           | —                                                                             |
| no                                                                                                                                    | no                                                                                                                                                  | no                                                                                                                | no                                                                            |
| yes                                                                                                                                   | yes                                                                                                                                                 | yes                                                                                                               | no                                                                            |
| yes                                                                                                                                   | no                                                                                                                                                  | no                                                                                                                | no                                                                            |
| no                                                                                                                                    | no                                                                                                                                                  | no                                                                                                                | no                                                                            |
| —                                                                                                                                     | —                                                                                                                                                   | —                                                                                                                 | —                                                                             |
| M18 or M30<br>(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<br>[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 |

# Inertial Measurement Unit (IMU)



*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.*



| 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                                                                                                                                    |
| <b>Measurement</b>                      | 130 mm L x 96,3 mm W x 66,0 mm H [5.12 in L x 3.80 mm W x 2.60 mm H]                                                                                                                                                                                            |
| <b>Features</b>                         | designed to Six Sigma standards; industry-leading durability, accuracy, voltage input flexibility, application expertise, customization, and temperature performance; eases integration; automotive-grade qualified, long term stability, no calibration needed |



# 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                               | 100 FW                                                                                                                            | 200 FW                                                                                                                                      | 300 FW                                                          |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| <b>Description</b>                   | one-piece 5/8 in proximity sensor                                                                                                 | one-piece 5/8 in proximity sensor                                                                                                           | two-piece proximity sensor                                      |
| <b>Technology</b>                    | ECKO                                                                                                                              | hall                                                                                                                                        | ECKO                                                            |
| <b>Target material</b>               | all metals                                                                                                                        | magnet                                                                                                                                      | ferrous metals                                                  |
| <b>Load current</b>                  | 120 mA, 50 mA lamp                                                                                                                | 100 mA, 50 mA lamp                                                                                                                          | 750 mA                                                          |
| <b>Supply current</b>                | 20 mA max. @ 25 °C                                                                                                                | 20 mA max. @ 25 °C                                                                                                                          | 65 mA max.                                                      |
| <b>Sensing face</b>                  | shielded, unshielded                                                                                                              | shielded                                                                                                                                    | shielded                                                        |
| <b>Housing material</b>              | stainless steel                                                                                                                   | 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]                                                                                                    | 1,78 mm to 3,3 mm [0.07 in to 0.130 in]                         |
| <b>Operating temp. range</b>         | -55 °C to 125 °C [-67 °F to 257 °F]                                                                                               | -54 °C to 100 °C [-65.2 °F to 212 °F]                                                                                                       | -77 °C to 125 °C [-106.6 °F to 257 °F]                          |
| <b>Supply voltage</b>                | 18 Vdc to 32 Vdc                                                                                                                  | 18 Vdc to 32 Vdc                                                                                                                            | 18 Vdc to 32 Vdc                                                |
| <b>Output type</b>                   | normally open, current sinking                                                                                                    | normally open/closed, current sinking                                                                                                       | normally open/closed, current sinking                           |
| <b>Approvals</b>                     | FM Class 1, Division 2, Groups A, B, C, D                                                                                         | FM Class 1, Division 2, Groups A, B, C, D                                                                                                   | MIL-STD-810B                                                    |
| <b>Measurements</b>                  | 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]                                                                                                 | Ø 11,2 mm x 31,8 mm L [Ø 0.44 in x 1.25 in L]                   |
| <b>Features</b>                      | 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 | ferrous metal sensing; two-piece construction; reverse polarity |

# 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                               | 922AA2Y-A6P-0Z722A                                                                                                  | 922FS2-A6N-Z735A                                                                                                                | 932AB2W                                                                                                             | 932AA3W                                                                                                                | ZS-00341                                                                                                 |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| <b>Description</b>                   | one-piece 15/32 in proximity sensor                                                                                 | one-piece 12 mm proximity sensor                                                                                                | one-piece M12 proximity sensor                                                                                      | one-piece M18 proximity sensor                                                                                         | one-piece under-water proximity sensor                                                                   |
| <b>Dimension</b>                     | 11,7 mm [0.46 in]                                                                                                   | 12 mm [0.47 in]                                                                                                                 | —                                                                                                                   | —                                                                                                                      | —                                                                                                        |
| <b>Operating frequency</b>           | 2000 Hz                                                                                                             | 2000 Hz                                                                                                                         | 200 mA                                                                                                              | ≤ 200 mA up to 85 °C to 100 mA at 100 °C                                                                               | ≤ 120 mA                                                                                                 |
| <b>Load current</b>                  | 250 mA                                                                                                              | 250 mA                                                                                                                          | ceramic                                                                                                             | ceramic                                                                                                                | stainless steel                                                                                          |
| <b>Gd (mm)</b>                       | 3,6                                                                                                                 | 2,8                                                                                                                             | 6,8                                                                                                                 | 8,5                                                                                                                    | stainless steel                                                                                          |
| <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]                                                                                         | 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]                                                                              | ZS-00341-01: ≥ 0.8 mm;<br>ZS-00341-02: ≥ 21.84 mm                                                        |
| <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]                                                                                              | -40 °C to 100 °C [-40 °F to 212 °F]                                                                                 | -40 °C to 100 °C [-40 °F to 212 °F]                                                                                    | -55 °C to 90 °C [-67 °F to 194 °F]                                                                       |
| <b>Shock</b>                         | 6 g 11 ms ABD 0007                                                                                                  | 6 g 11 ms ABD 0007                                                                                                              | 100 g 6 ms                                                                                                          | 100 g 6 ms                                                                                                             | 6 g 11 ms                                                                                                |
| <b>Supply voltage</b>                | 14 Vdc to 32.5 Vdc                                                                                                  | 14 Vdc to 32.5 Vdc                                                                                                              | 20 Vdc to 33 Vdc                                                                                                    | 20 Vdc to 323 Vdc                                                                                                      | 14 Vdc to 32.5 Vdc                                                                                       |
| <b>BITE</b>                          | no                                                                                                                  | no                                                                                                                              | no                                                                                                                  | no                                                                                                                     | no                                                                                                       |
| <b>Short circuit</b>                 | yes                                                                                                                 | yes                                                                                                                             | yes                                                                                                                 | yes                                                                                                                    | yes                                                                                                      |
| <b>Pressure proof</b>                | no                                                                                                                  | yes                                                                                                                             | no                                                                                                                  | no                                                                                                                     | yes                                                                                                      |
| <b>Reverse polarity</b>              | no                                                                                                                  | no                                                                                                                              | yes                                                                                                                 | yes                                                                                                                    | yes                                                                                                      |
| <b>Insulation resistance</b>         | —                                                                                                                   | —                                                                                                                               | > 50 mOhm @ 500 Vdc                                                                                                 | > 50 mOhm @ 500 Vdc                                                                                                    | —                                                                                                        |
| <b>Output type</b>                   | normally open, current sourcing                                                                                     | normally open, current sourcing                                                                                                 | normally open, current sourcing                                                                                     | normally open, current sourcing                                                                                        | normally open, current sourcing                                                                          |
| <b>Measurements</b>                  | 15/32 in<br>51 mm L [2.01 in]                                                                                       | 12 mm<br>50 mm L [1.97 in]                                                                                                      | M12 x 1<br>77 mm L [3.03 in L]                                                                                      | M18 x 1<br>80 mm L [3.15 in L]                                                                                         | Ø 23 mm x 64 mm L<br>[Ø 0.91 in x 2.52 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 | stainless steel; high level of electronics protection; high frequency switching; lead wire or connector termination | 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 |



# Proximity Sensors

## Integral Health Monitoring (IHM)



Designed specifically to meet the increased indirect lightning, EMI, and vibration requirements of today's modern aircraft, IHM series proximity sensors are the first choice for your most demanding applications.

Potential applications include landing gear, thrust reverser, door monitoring, and flight controls. Other innovative options available within the IHM series include a true hermetic cable exit and a unique continuous health monitoring function.



| Series                               | IHM - 2 State <sup>1</sup>                                                                                                                                                                                   | IHM - 3 State <sup>1</sup>                                                                                                                                                                                                                 |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b>                   | one piece 5/8 in proximity sensor                                                                                                                                                                            | one piece 5/8 in proximity sensor                                                                                                                                                                                                          |
| <b>Technology</b>                    | enhanced ECKO <sup>1</sup>                                                                                                                                                                                   | enhanced ECKO with health monitoring option <sup>1</sup>                                                                                                                                                                                   |
| <b>Target material</b>               | stainless steel                                                                                                                                                                                              | stainless steel                                                                                                                                                                                                                            |
| <b>Load current</b>                  | up to 250 mA depending on model                                                                                                                                                                              | 4 mA to 20 mA current loop standard <sup>1</sup>                                                                                                                                                                                           |
| <b>Supply current</b>                | 15 mA max., <6 mA typ.                                                                                                                                                                                       | 4 mA typ. (does not include load current)                                                                                                                                                                                                  |
| <b>Sensing face</b>                  | shielded                                                                                                                                                                                                     | shielded                                                                                                                                                                                                                                   |
| <b>Housing material</b>              | hermetic - stainless steel                                                                                                                                                                                   | hermetic - stainless steel                                                                                                                                                                                                                 |
| <b>Guaranteed actuation distance</b> | to 4 mm                                                                                                                                                                                                      | to 4 mm                                                                                                                                                                                                                                    |
| <b>Operating temperature range</b>   | -55 °C to 125 °C [-67 °F to 257 °F]                                                                                                                                                                          | -55 °C to 125 °C [-67 °F to 257 °F]                                                                                                                                                                                                        |
| <b>Supply voltage</b>                | 18 Vdc to 32 Vdc, or 11 Vdc to 18 Vdc standard                                                                                                                                                               | 15 Vdc to 32 Vdc standard                                                                                                                                                                                                                  |
| <b>Output type</b>                   | normally open/closed, current sinking (NPN)                                                                                                                                                                  | current loop                                                                                                                                                                                                                               |
| <b>BIT diagnostics</b>               | available (non standard)                                                                                                                                                                                     | health monitoring (3-state output) standard; disabled as option <sup>1</sup>                                                                                                                                                               |
| <b>Short circuit</b>                 | yes                                                                                                                                                                                                          | yes                                                                                                                                                                                                                                        |
| <b>Pressure proof</b>                | custom option <sup>2</sup>                                                                                                                                                                                   | custom option <sup>2</sup>                                                                                                                                                                                                                 |
| <b>Reverse polarity</b>              | yes                                                                                                                                                                                                          | yes                                                                                                                                                                                                                                        |
| <b>MTBF (hours)</b>                  | —                                                                                                                                                                                                            | —                                                                                                                                                                                                                                          |
| <b>Approvals</b>                     | D0-254, D0-160 <sup>1</sup>                                                                                                                                                                                  | D0-254, D0-160 <sup>1</sup>                                                                                                                                                                                                                |
| <b>Measurements</b>                  | 5/8 in diameter x ~2 in length (depends on model)                                                                                                                                                            | 5/8 in diameter x ~2 in length (depends on model)                                                                                                                                                                                          |
| <b>Features</b>                      | hermetic, all metal package; high degree of vibration, EMI, and lightning protection; lead wire or connector termination; range of configurable features; preferred device for onboard aircraft applications | integrated health monitoring; hermetic, all metal package; high degree of vibration, EMI, and lightning protection; lead wire or connector termination; range of configurable features; preferred device for onboard aircraft applications |

<sup>1</sup> Broad range of features available; specifications may vary with feature combinations - contact technical support

<sup>2</sup> Contact technical support for details

# 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, 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 gray code                                                                  | quadrature square wave                                                                     |
| Rotational life      | 100k cycles                                                                            | 10 million rotation, min.                                                                  |
| Operating speed      | 50 rpm max.                                                                            | 300 rpm max.                                                                               |
| Terminals            | pc pins                                                                                | pc type B-66, pc type C-24, cable, cable/connector                                         |
| Measurements         | body: 21,08 mm x [0.83 in] square<br>bushing: Ø9,52 mm [Ø0.375 in] x 32 UNEF-2A        | body: Ø34,93 mm [Ø1.375 in]; bushing: Ø9,52 mm [0.375 in] x 32 NEF-2A                      |
| 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                                                                                                                                                                                           | HRS                                                                                          |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| Sensing range           | 50° (±25°), 60° (±30°), 70° (±35°), 90° (±45°), 120° (±60°), 180° (±90°), 270° (±135°), 360° (±180°)                                                                                          | 90° ±2°, 180° ±2°                                                                            |
| Input voltage           | low voltage 5 Vdc ±0.5 Vdc<br>high voltage: 10 Vdc to 30 Vdc                                                                                                                                  | 5 Vdc ±10 %                                                                                  |
| Output                  | low voltage: 0.5 V to 4.5 V ratiometric (standard);<br>4.5 V to 0.5 V ratiometric (inverted)<br>high voltage: 0.5 V to 4.5 V ratiometric (standard);<br>4.5 V to 0.5 V ratiometric (inverted) | 5 % to 95 % of applied Vdd, approx. (ratio-metric)                                           |
| Input current           | low voltage: 20 mA max.; during output to ground short, 25 mA max.<br>high voltage: 32 mA max.; during output to ground short, 47 mA max.                                                     | 5 mA typ.                                                                                    |
| Life                    | 35 M cycles                                                                                                                                                                                   | 10 M cycles                                                                                  |
| Sealing                 | IP67                                                                                                                                                                                          | —                                                                                            |
| Operating temp. range   | -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<br>[2.17 in L x 1.69 in W x 1.61 in H]                                                                                                                            | body: Ø27,43 mm x 13,20 mm [Ø1.080 in x 0.52 in]<br>bushing: Ø9,52 mm [0.375 in] x 32 NEF-2A |
| Features                | available with or without lever                                                                                                                                                               | 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                                                                           |
|------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| Type             | 309: compact modular housing<br>409: sealed for board washing                               | multiple sections available                                                   |
| Rotational life  | 25K cycles                                                                                  | 25K cycles                                                                    |
| Element type     | cermet                                                                                      | cermet                                                                        |
| Power rating     | 1 W                                                                                         | 1 W                                                                           |
| Terminal type    | PC, solder hook                                                                             | PC, solder hook                                                               |
| Resistance range | 100 Ohm to 5 mOhm                                                                           | linear: 5 Ohm to 5 mOhm;<br>tapered: 100 Ohm to 2 mOhm                        |
| Bushing type     | standard                                                                                    | standard                                                                      |
| Electrical taper | linear, tapered                                                                             | linear, tapered                                                               |
| 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 |
| Features         | modular package; enhanced performance                                                       | stackable; rotary, push-pull, and momentary options                           |

# 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/RV4/485/53C/385                                                                                                                                     |
|------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Type             | 308: compact modular house<br>408: sealed for board washing             | 380: original version<br>RV4: military version of 380<br>485: custom version of 380<br>53C: cost-effective version of 380<br>385: custom version of 53C |
| Rotational life  | 50k cycles                                                              | tested to 25k cycles                                                                                                                                    |
| Element type     | conductive plastic                                                      | conductive plastic                                                                                                                                      |
| Power rating     | 0.5 W                                                                   | 2 W                                                                                                                                                     |
| Terminal type    | pc, solder hook                                                         | solder lug, pc pin, fast-on, custom                                                                                                                     |
| Resistance range | 308: 100 Ohm to 1 mOhm;<br>408: 500 Ohm to 10 kOhm                      | 100 Ohm to 5 MOhm, inclusive                                                                                                                            |
| Bushing type     | standard, locking                                                       | standard, high torque, custom                                                                                                                           |
| Electrical taper | CW audio, linear                                                        | log, reverse log, linear                                                                                                                                |
| Measurements     | body: 12,7 mm [0.5 in] square<br>bushing: 6,35 mm [0.25 in] x 32 NEF-2A | body: Ø27,79 mm x 14,30 mm [Ø1.094 in x 0.583 in]<br>bushing: 9,53 mm [0.375 in] x 32 NEF-2A                                                            |
| Features         | nickel-plated brass shaft and bushings                                  | cost-effective, wide range of resistance values                                                                                                         |



| Series           | 578                                                                            | 590                                                                      |
|------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| Type             | variable resistor technology                                                   | multiple sections available                                              |
| Rotational life  | 2.5M cycles                                                                    | 50k cycles                                                               |
| Element type     | conductive plastic                                                             | conductive plastic                                                       |
| Power rating     | 0.5 W                                                                          | 0.5 W                                                                    |
| Terminal type    | pc                                                                             | pc, solder hook                                                          |
| Resistance range | 1 kOhm to 10 kOhm                                                              | 100 Ohm to 1 MOhm                                                        |
| Bushing type     | standard                                                                       | standard                                                                 |
| Electrical taper | linear                                                                         | linear                                                                   |
| Measurements     | body: Ø22,86 mm [Ø 0.90 in]<br>bushing: 9,52 mm D & L [0.375 in D & L]         | body: 12,7 mm [0.50 in] square<br>bushing: 6,35 mm D & L [0.25 in D & L] |
| Features         | low mounting profile; quiet electrical output; precision control; pc terminals | linear taper, pc terminals; brass shaft and bushings                     |



**381**

metal case and nickel-plated shaft

25k cycles

conductive plastic

1 W

solder lug

100 Ohm to 5 MOhm

standard, locking

CW audio, linear

body: Ø15,88 mm [Ø0.625 in]  
bushing: 6,35 mm [0.25 in] x 32 NEF-2A

solder lug terminals; nickel-plated brass shaft and bushings



**388**

multiple sections available

50k cycles

conductive plastic

0.5 W

pc, solder hook

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

standard

linear

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

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



**392/RV6**

392: original version  
RV6: military version of 392

50k cycles

conductive plastic

0.5 W

solder hook, pc pin, custom

100 Ohm to 5 MOhm, inclusive

threaded metal with/without metal panel seal: standard, split locking; unthreaded plastic: standard, trimmer, custom

log, reverse log, linear

body: Ø12,7 mm x 11,51 mm [Ø0.50 in x 0.453 in]  
bushing: 6,35 mm [0.25 in] x 32 NEF-2A

wave solderable, PCB washable, cost-effective, wide range of resistance values, small package size



**MKV**

conductive plastic element

10 million cycles

conductive plastic

1 W

turret

500 Ohm to 20 kOhm

no bushing, standard

linear

body: Ø22,23 mm [Ø0.875 in]  
bushing: 6,35 mm [0.25 in] x 32 NEF-2A

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



**SensorCube**

sealed construction

10 million cycles

conductive plastic

1 W

turret

1 kOhm to 10 kOhm

standard

linear

body: Ø18,92 mm [Ø0.745 in]  
bushing: 9,53 mm [0.375 in] x 32 NEF-2A

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



**640**

thru-shaft

>1 million full cycles

conductive plastic

0.5 W, max.

lead wires

1 kOhm to 1 MOhm

none

linear, quadrature

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

reinforced, low-profile housing, dust sealed with splash- or moisture-sealed options, long rotational life



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

With more than 50,000 sensing, switching and control products ranging from snap-action, limit, toggle and pressure switches to position, speed and vibration sensors.

## SENSORS



**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 • HVAC Equipment



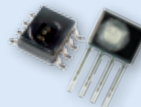
**Pressure transducers – heavy duty:** Provide a complete amplified and compensated pressure measurement solution. Choice of ports, connectors, outputs and pressure ranges, engineered to be resistant to a wide variety of media for use in most harsh environments.

**May be used in:** Industrial HVAC/R and Air Compressors • General System and Factory Automation Pump, Valve and Fluid Pressure • Transportation (Heavy Equipment and Alternative Fuel Vehicles) System • Pneumatics • Hydraulics



**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 • Industrial Automation



**Humidity sensors:** Digital, analog, and combined humidity/temperature sensing versions. Provide on-chip signal conditioning with accuracy capability to  $\pm 1.7$  %RH. Stable, reliable, low-drift performance. Standardized, platform-based sensors.

**May be used in:** Medical • HVAC/R • Weather Stations • Air Compressors • Telecommunications • Grain Storage • Incubators



**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 • Wattmeters



**Flexible heaters:** Flat or custom geometry configurations with single, multiple and variable watt densities. Stable, uniform heating. Can be bonded parts or combined in value-added assemblies.

**May be used in:** Medical • HVAC/R • LCD Displays • Power Generation • Telecommunication



**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 • Transmissions



**Temperature sensors:** Customized probes, thermistors and RTD sensors. Plastic/ceramic, miniaturized, surface-mount housings and printed circuit board terminations.

**May be used in:** Semi-Conductor Protection • Vending Machines • Power Generation • Hydraulic Systems • Thermal Management • Temperature Compensation



**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 • Weight Sensing

## ELECTROMECHANICAL SWITCHES



**MICRO SWITCH™ basic switches:** Snap-action precision switches.

Compact. Lightweight. Designed for repeatability and enhanced life. Basic switches: large, standard, miniature, subminiature, hermetically sealed, water-tight and high-temperature versions.

**May be used in:** Vending Machines • Communication Equipment • HVAC • Appliances • Automotive • Electronic Gaming Machinery • Valve Controls • Irrigation Systems • Foot Switches • Pressure • Temperature Controls



**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 • Underwater



**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 • Hazardous Waste Handling Facilities



**Key and rotary switches:** Environmentally sealed, 2-3-4 position switches. 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



**Pressure and vacuum switches:** Feature setpoints from 3 psi to 4500 psi. Rugged components have enhanced repeatability, flexibility and wide media capability. Uses diaphragm or quad seal/piston.

**May be used in:** Transmissions • Hydraulics • Brakes • Steering • Generators/Compressors • Dental Air • Embalming Equipment • Oxygen Concentrators • Air Cleaners • Fuel Filters • Pool Water Pressure



**MICRO SWITCH™ toggle switches:** Hermetic and environmentally sealed options. Enhanced reliability. Center pin for ultimate stabilization. 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 • Military/Commercial Aviation

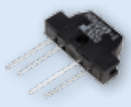
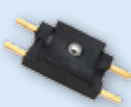
## LIMITLESS™ WIRELESS SOLUTIONS



**Limitless™ switches and receivers:** Combines the best of MICRO SWITCH™ limit switches with 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.

**Limitless™ Operator Interface:** Adds a human interface device to the product-driven interfaces of Limitless™ switches and receivers. Choose and install a desired operator or utilize one of Honeywell's pushbuttons.

**May be used in:** Valve Position • Crane Boom/Jib/Skew Position • Lifts • Material Handling • Presses • Construction/Ag Machines • Conveyors • Industrial Environments • Remote/Temporary Equipment • Grain Diverters or Flaps • Door Position

|                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>Position sensors:</b> The <b>SMART position sensor</b> measures linear, angular or rotary 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, and improves reliability and durability.</p> <p><b>May be used in:</b> Valve Position</p> <ul style="list-style-type: none"><li>• Material Handling • Plastic Molding • Passenger Bus Level Position • Truck-Mounted Crane Outrigger Position • Aerial Work Lift Platform • Front Loader and Digger/Excavation Boom Position</li></ul> <p><b>Potentiometer sensors:</b> Measure linear, rotary position or displacement. Honeywell's proprietary conductive plastic delivers extensive temperature range and infinite resolution, and provides precision position measurement.</p> <p><b>May be used in:</b> Robotic Motion Control • Marine Steering • In-Tank Level Sensing</p> <p><b>Ultrasonic sensors:</b> Measure time delays between emitted and echo pulses, often accurately determining the sensor-to-target distance.</p> <p><b>May be used in:</b> Level Measurement • Height and Thickness Sensing • Diameter Control</p> |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|  | <p><b>Infrared sensors:</b> IREDs, sensors and assemblies for object presence, limit and motion sensing, position encoding and movement encoding. Variety of package styles, materials and terminations.</p> <p><b>May be used in:</b> Printers/Copiers • Motion Control Systems • Metering</p> <ul style="list-style-type: none"><li>• Data Storage Systems • Scanning • Automated Transaction • Drop Sensors</li><li>• Non-Invasive Medical Equipment</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  | <p><b>Force sensors:</b> Variety of package styles and various electrical interconnects including pre-wired connectors, printed circuit board mounting and surface mounting for flexibility.</p> <p><b>May be used in:</b> Infusion and Syringe Pumps • Blood Pressure Equipment</p> <ul style="list-style-type: none"><li>• Pump Pressure • Drug Delivery Systems • Occlusion Detection • Kidney Dialysis Machines</li></ul>                                                                                                                  |
|  | <p><b>Proximity sensors:</b> Designed to meet demanding temperature, vibration, shock and EMI/EMP interference requirements. Number of housing materials and termination styles.</p> <p><b>May be used in:</b> Aircraft Landing Gear • Gun Turret Position Control</p> <ul style="list-style-type: none"><li>• Door/Hatch Monitoring</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  | <p><b>Speed sensors:</b> Measure speed, position and presence detection utilizing magnetoresistive, variable reluctance, and Hall-effect technologies.</p> <p><b>May be used in:</b> Cam and Crankshafts • Transmissions • Fans • Pumps</p> <ul style="list-style-type: none"><li>• Mixers • Rollers • Motors</li></ul>                                                                                                                                                                                                                        |
|  | <p><b>Airflow sensors:</b> 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.</p> <p><b>May be used in:</b> HVAC • Respirators • Process Control • Oxygen Concentrators • Gas Metering • Chromatography • Leak Detection Equipment</p> <ul style="list-style-type: none"><li>• Medical/Analytical Instrumentation • Ventilation Equipment</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  | <p><b>Rotary position sensors:</b> 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.</p> <p><b>May be used in:</b> Audio and Lighting • Frequency • Temperature • Position</p> <ul style="list-style-type: none"><li>• Medical/Instrumentation • Computer Peripherals • Manual Controls</li><li>• Joysticks • Telecom • Welding • Heating • Aerospace</li></ul> |

|                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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|  | <p><b>MICRO SWITCH™ aerospace-grade pressure switches:</b> Lightweight, compact pressure switches. Meets military and DO-160 standards. Lower operating force provides application versatility with enhanced precision. Design modularity allows for configuration of the switch, facilitating rapid customization.</p> <p><b>May be used in:</b> Aerospace Systems • Engines, Fuel Pressure and Hydraulic Systems • Military Ground Vehicles • Ordnance and Munitions Release Systems • Military Maritime Systems</p> |  <p><b>MICRO SWITCH™ limit switches:</b> Broadest and deepest limit switch portfolio. Rugged, dependable position detection solutions. MICRO SWITCH™ heavy-duty limit switches (HDLS), medium-duty and global limit switches. Hermetically and environmentally sealed switches.</p> <p><b>May be used in:</b> Machine Tools • Woodworking • Textile • Printing Machinery</p> <p>• Metal Fabrication • Balers/Compactors • Forklifts • Bridges • Robotics • Wind Turbines • Elevators • Moving Stairs • Doors • Dock Locks/Levelers • Aerial Lifts</p> <p>• Cranes • Conveyors • Rail • Shipboards • Dock Side</p> |
|  | <p><b>MICRO SWITCH™ pushbutton switches:</b> Lit or unlit. Wide range of electrical and display design, pushbuttons and manual switches. Many shapes, sizes and configurations. Easy to apply, operate and maintain.</p> <p><b>May be used in:</b> Control Boards and Panels • Industrial and Test Equipment • Flight Decks • Medical Instrumentation • Process Control</p>                                                                                                                                            |  <p><b>MICRO SWITCH™ sealed and standard rocker switches:</b> Wide range of electrical and display design. Many shapes, sizes, buttons and configurations to enhance manual operation.</p> <p><b>May be used in:</b> Transportation • Agricultural and Construction Equipment • Test Equipment • Heavy-Duty Machinery • Marine Equipment • Small Appliances</p> <p>• Telecom • Medical Instrumentation • Commercial Aviation</p>                                                                                                                                                                                  |

## SAFETY PRODUCTS

|                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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|  | <p><b>MICRO SWITCH™ safety switches:</b> For operator point-of-operation protection, access detection, presence sensing, gate monitoring and electrical interfacing. High-quality, dependable, cost-effective solutions.</p> <p><b>May be used in:</b> Packaging and Semi-Conductor Equipment • Plastic-Molding Machinery • Machine Tools • Textile Machines • Lifts • Industrial Doors • Balers • Compactors • Aircraft Bridges • Telescopic Handlers</p> <p>• Refuse Vehicles</p> |
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## **Warranty/Remedy**

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order 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 **sensing.honeywell.com**

## **Honeywell Sensing and Control**

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The Honeywell logo, consisting of the word "Honeywell" in a bold, red, sans-serif font.

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