



Honeywell

Product Range Guide

Position Sensors

For innovation that's well apart, there's only Honeywell

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

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

While Honeywell's switch and sensor solutions are suitable for a wide array of basic and complex applications, our custom-engineered solutions offer enhanced precision, repeatability, and ruggedness. We offer domain knowledge and technology resources, along with a close working relationship, to develop and deliver cost-effective, individually tailored solutions. Whether clean-slate development or simple modifications to an existing design are needed, our expertly engineered solutions help to meet the most stringent requirements with world-class product designs, technology integration, and customer-specific manufacturing.

Global service, sourcing, and manufacturing. Industry-leading engineers. Value-added assemblies and solutions. A one-stop, full-service, globally competitive supplier.

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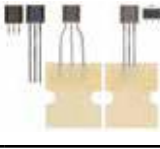


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Magnetic Sensors | Magnetoresistive Sensor ICs

With a built-in magnetoresistive bridge integrated on silicon and encapsulated in a plastic package, magnetoresistive sensor ICs feature an integrated circuit that responds to low fields at large distances. Potential applications include laptops, material handling equipment, pneumatic cylinders, and battery-powered equipment including hand-held scanners, computers, and water/gas/electricity meters.



					
	Nanopower Series	Standard Power Series	2SS52M Series	VF401	APS00B
Description	omnipolar MR sensor IC	omnipolar MR 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 style¹	SOT-23	SM351RT, SM353RT: SOT-23 SM451RT, SM453RT: Flat TO-92-style	SS552MT: SOT-89B all others: leaded U-Pack in bulk or ammpack	VF-401 flat TO-92-style	SOIC-8
Supply voltage range	1.65 Vdc to 5.5 Vdc	3 Vdc to 24 Vdc	3.8 Vdc to 30 Vdc	4.5 Vdc to 16 Vdc	1 Vdc to 12 Vdc
Supply current	SM351LT: 360 nA typ. SM353LT: 310 nA typ.	8 mA max.	11 mA max.	operate: 16.8 mA max. release: 8.4 mA max.	7 mA max.
Output type	low: 0.03 V typ. high: Vs - 0.03 V typ.	digital sinking	digital sinking	digital sourcing	sin(2Θ), cos(2Θ)
Operating temperature range	-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]	-40°C to 150°C [-40°F to 302°F]
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	ultra-high sensitivity: 7 Gauss typ., 11 G Gauss max. (SM351RT, SM451R); very high sensitivity: 14 Gauss typ., 20 Gauss max. (SM353RT, SM453R)	omnipolar magnetics, sinking output, low Gauss operation (25 G max.), 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]

¹Dimensions:

- **SOT-23:** 2,8 mm x 2,9 mm [0.11 in x 0.11 in]
- **Flat TO-92-style:** 3,0 mm x 4,0 mm [0.12 in x 0.16 in] (leads not included)
- **VF-401 flat TO-92-style:** 3,0 mm x 4,06 mm [0.12 in x 0.16 in] (leads not included)
- **SOT-89B:** 4,2 mm x 4,5 mm [0.16 in x 0.18 in]
- **U-Pack:** 4,5 mm x 4,5 mm [0.18 in x 0.18 in] (leads not included)
- **SOIC-8:** 4,9 mm x 6,0 mm [0.19 in x 0.24 in]

Magnetic Sensors | Hall-effect Digital Sensor ICs

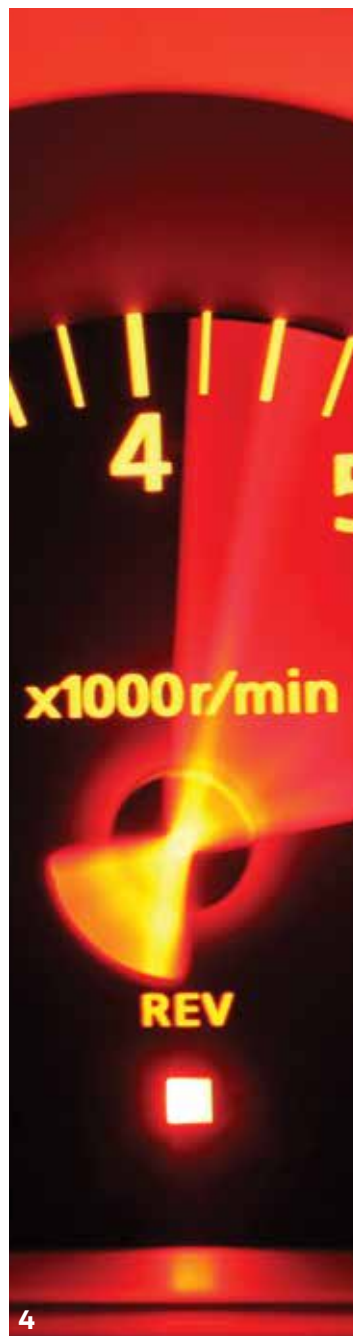
Constructed from a thin sheet of conductive material with output connections perpendicular to the direction of current flow. Include bipolar, latching, omnipolar, or unipolar magnetics in a variety of package styles. Energy-efficient micropower versions for potential applications with low power requirements and/or battery operation.

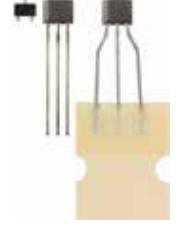
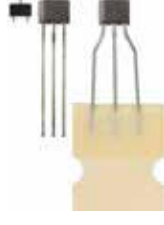


Digital	SL353	SS30AT, SS40A, SS50AT	SS311PT, SS411P	SS340RT, SS440R Series
Description	micropower omnipolar Hall-effect digital sensor IC	low-cost bipolar Hall-effect digital sensor IC	low-cost bipolar Hall-effect digital sensor IC with built-in pull-up resistor	low-cost unipolar Hall-effect digital sensor IC
Magnetic actuation type	omnipolar	bipolar	bipolar	unipolar
Package style¹	SOT-23 (pocket tape and reel)	SS30AT: SOT-23 (pocket tape and reel) SS40A: flat TO-92-style (bulk) SS50AT: SOT-89B (pocket tape and reel)	SS311PT: SOT-23 (pocket tape and reel) SS411P: flat TO-92-style (bulk)	SS340RT: SOT-23 (pocket tape and reel) SS440R: flat TO-92-style
Supply voltage	2.2 Vdc to 5.5 Vdc	4.5 Vdc to 24 Vdc	2.7 Vdc to 7 Vdc	SS340RT >125°C [247°F]: 3 Vdc to 12 Vdc all others: 3 Vdc to 18 Vdc
Supply current	SL353LT: 1.8 m typ. at 2.8 Vdc SL353HT: 0.33 mA typ. at 2.8 Vdc	10 mA max.	14 mA max.	8 mA
Operating temperature range	-40°C to 85°C [-40°F to 185°F]	SS40A: -40°C to 125°C [-40°F to 257°F] SS30AT, SS50AT: -40°C to 125°C [-40°F to 257°F]	-40°C to 150°C [-40°F to 302°F]	SS340RT (3 Vdc to 24 Vdc): -40°C to 125°C [-40°F to 257°F] SS340RT (3 Vdc to 12 Vdc), SS440R (3 Vdc to 24 Vdc): -40°C to 150°C [-40°C to 302°F]
Features	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 North pole (SS340RT) or South pole (SS440R), multiple magnetic sensitivities (high, medium, and low)

¹Dimensions:

- SOT-23: 2.8 mm x 2.9 mm [0.11 in x 0.11 in]
- Flat TO-92-style: 3.0 mm x 4.0 mm [0.12 in x 0.16 in] (leads not included)
- SOT-89B: 4.2 mm x 4.5 mm [0.16 in x 0.18 in]





SS345PT, SS445P

SS351AT, SS451A, SS551AT

SS360NT, SS360ST, SS360ST-10K, SS460S, SS460S-T2

VF360NT, VF360ST, VF460S

SS360PT, SS460P, SS460P-T2

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 Hall-effect digital sensor IC

high sensitivity latching digital Hall-effect sensor IC with built-in pull-up resistor

unipolar

omnipolar

latching

latching

latching

SS345PT: SOT-23 (pocket tape and reel)
SS445P: flat TO-92-style (bulk)

SS351AT: SOT-23 (pocket tape and reel)
SS451A: flat TO-92-style (bulk)
SS551AT: SOT-89B (pocket tape and reel)

SS360NT, SS360ST, SS360ST-10K: SOT-23 (pocket tape and reel)
SS460S: flat TO-92-style (bulk)
SS460S-T2: flat TO-92-style, formed leads (ammopack)

VF360NT, VF360ST: SOT-23 (pocket tape and reel)
VF460S: flat TO-92-style (bulk)

SS360PT: SOT-23 (pocket tape and reel)
SS460P: flat TO-92-style (bulk)
SS460P-T2: flat TO-92-style, formed leads (ammopack)

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

3 Vdc to 24 Vdc

14 mA

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

8 mA max.

8 mA

10 mA

-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 150°C
[-40°F to 302°F]

-40°C to 125°C
[-40°F to 257°F]

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 its class, no chopper stabilization

qualified to the AEC-Q100 standard for potential use in automotive applications, fastest response time in its class

fastest response time in its class, no chopper stabilization, operates from only 30 Gauss typical, at 25°C [77°F]

Magnetic Sensors | Hall-effect Digital and Linear Sensor ICs

Potential applications are many, including closure detection; presence-absence, metering, and displacement sensing in laptops, drug carts and and battery-powered equipment including hand-held scanners, computers, and water/gas/electricity meters; and speed and RPM sensing in brushless dc motors.



Digital	SS361CT, SS461C	SS361RT, SS461R	SS400 Series, SS500 Series	SS41, SS51T
Description	high sensitivity, latching Hall-effect digital sensor IC	low-cost Hall-effect digital sensor IC	unipolar/bipolar/latching Hall-effect digital sensor IC	bipolar Hall-effect digital sensor IC
Magnetic actuation type	latching	latching	unipolar, bipolar, latching	bipolar
Package style ¹	SS361CT: SOT-23 (pocket tape and reel) SS461C: flat TO-92-style (bulk)	SS361RT: SOT-23 (pocket tape and reel) SS461R: flat TO-92-style (bulk)	SS400: flat TO-92-style (bulk) SS500: SOT-89B (pocket tape and reel)	SS41: flat TO-92-style (bulk) SS51T: SOT-89B (pocket tape and reel)
Supply voltage	4 Vdc to 24 Vdc	SS361RT >125°C [247°F]: 3 Vdc to 12 Vdc all others: 3 Vdc to 18 Vdc	3.8 Vdc to 30 Vdc (inclusive)	4.5 Vdc to 24 Vdc
Supply current	6 mA max.	8 mA	SS400: 10 mA SS500: 8.7 mA at 5 Vdc	15 mA max.
Operating temperature range	-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]
Features	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

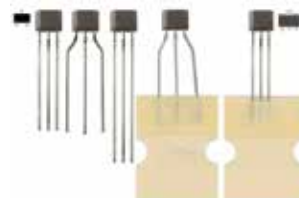
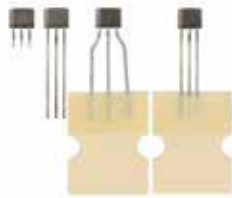
¹Dimensions

- SOT-23: 2,8 mm x 2,9 mm [0.11 in x 0.11 in]
- Flat TO-92-style: 3,0 mm x 4,0 mm [0.12 in x 0.16 in] (leads not included)
- SOT-89B: 4,2 mm x 4,5 mm [0.16 in x 0.18 in]





Digital	VF526DT
Description	latching dual Hall-effect digital sensor IC with speed and direction outputs
Magnetic actuation type	latching
Package style ¹	SOT-89B (pocket tape and reel)
Supply voltage	3.4 Vdc to 24 Vdc
Supply current	14 mA max.
Output type	digital sinking
Operating temperature range	-40°C to 125°C [-40°F to 257°F]
Features	latching magnetics, sinking output, tape and reel available



Linear	SS490 Series	SS39ET, SS49E, SS49E-F, SS49E-L, SS49E-T2, SS49E-T3, SS59ET
Description	Hall-effect linear sensor IC	Hall-effect linear sensor IC
Magnetic actuation type	linear	linear
Package style ¹	flat TO-92-style, surface mount (pocket tape and reel) flat TO-92-style, standard straight leads (bulk) flat TO-92-style, formed leads (ammopack) flat TO-92-style, standard straight leads (ammopack)	SS39ET: SOT-23 (pocket tape and reel) SS49E: flat TO-92-style, standard straight leads (bulk) SS49E-F: flat TO-92-style, formed leads (bulk) SS49E-L: flat TO-92-style, long straight leads (bulk) SS49E-T2: flat TO-92-style, formed leads (ammopack) SS49E-T3: flat TO-92-style, standard straight leads (ammopack) SS59ET: SOT-89B (pocket tape and reel)
Supply voltage	4.5 Vdc to 10.5 Vdc	2.7 Vdc to 6.5 Vdc
Supply current	10 mA	10 mA max.
Output type	ratiometric sinking or sourcing	ratiometric sourcing
Operating temp. range	-40°C to 150°C [-40°F to 302°F]	-40°C to 100°C [-40°F to 212°F]
Features	linear magnetics, ratiometric sourcing output, positive temperature coefficient, different package styles	linear magnetics, ratiometric sourcing output, low voltage operation, different package styles

Dimensions:

- **4-Pin SIP:** 3,6 mm x 5,1 mm [0.14 in x 0.20 in]
- **SOT-89B:** 4,2 mm x 4,5 mm [0.16 in x 0.18 in]
- **Flat TO-92-style:** 3,0 mm x 4,0 mm [0.12 in x 0.16 in] (leads not included)

Magnetic Sensors | Value-Added Hall-effect Sensors

Consist of Hall-effect or magnetoresistive sensor ICs packaged in a variety of housings. Include vane sensors and digital position sensors. 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]
Dimensions	Ø11,9 mm x 25,4 mm [15/32-2 x 1.0 in]	Ø11,9 x 25,4 mm [15/32-2 x 1.0 in]
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 x 12,4 mm
 [0.97 in x 0.49 in]

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]

Ø12,4 mm x 25,4 mm
 [0.49 in x 1.0 in]

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



SR4

magneto-resistive 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
 [0.75 in H x 1.0 in]

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

Position Sensors | Linear Potentiometric Sensors

Include potentiometer sensors for linear 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
Description	shaftless, waterproof linear position transducer	shaftless, waterproof linear position transducer, metric specifications	vibration-resistant, plunger-driven linear transducer
Operating temperature range	-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]
Supply voltage	30 Vdc max.	30 Vdc max.	30 Vdc max.
Linearity	±1 %	±1 %	±1 %
Starting force (max.)	56,7 g max. [2 oz max.]	28,35 g max. [1 oz max.]	standard: 0,45 kg [1 lb] LFIIW: 2,27 kg [5 lb] (water resistant)
Backlash	-	-	0,025 mm [0.001 in] max.
Total resistance	6K Ohm to 38K Ohm	750 Ohm to 18K Ohm	5000 Ohm
Measurement range	127 mm to 965 mm [5 in to 38 in]	12,7 mm to 304,8 mm [0.5 in to 12 in]	152 mm to 1219 mm [6 in to 48 in]
Shaft	-	-	Ø6,35 mm [0.25 in]
Total mechanical travel	154,94 mm to 967,74 mm [6.1 in to 38.1 in]	15,24 mm to 307,34 mm [0.6 in to 12.1 in]	154,6 mm to 1221,4 mm [6.09 in to 48.09 in]
Electrical travel	152,4 mm to 965,2 mm [6 in to 38 in]	12,7 mm to 304,8 mm [0.5 in to 12 in]	152,4 mm to 1219,2 mm [6 in to 48 in]
Housing length	electrical travel + 54,87 mm [2.16 in]	electrical travel + 38,1 mm [1.5 in]	electrical travel + 81,02 mm [3.19 in]
Vibration	20 g/0,75 mm (rms) 5 Hz to 2 kHz	20 g/0,75 mm (rms) 5 Hz to 2 kHz	20 g/0,75 mm (rms) 5 Hz to 2 kHz (for vibration levels up to 50 g rms and higher, additional housing clamps are required)
Shock	50 g 11 ms half sine	50 g 11 ms half sine	50 g 11 ms half sine
Expected operating life	one billion dither operations	one billion dither operations	one billion dither operations
Resistance tolerance	±20 %	±20 %	±20 %
Insulation resistance	500 mOhm at 500 Vdc	500 mOhm at 500 Vdc	1000 mOhm at 500 Vdc
Dielectric strength	250 V rms	250 V rms	1000 V rms
Termination	cable	cable	connector, binder series 681
Features	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, metric specifications	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
standard: 1 lb water resistant: 5 lb	standard: 28,35 g max. [1 oz max.] water resistant: 12 oz max.	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]
Ø6,35 mm [0.25 in]	Ø3,18 mm [0.125 in]	Ø3,18 mm [0.125 in]	M5 x 0.8
30,5 mm to 166,2 mm [1.2 in to 6.15 in]	26,7 mm to 255,3 mm [1.05 in to 10.05 in]	13,97 mm to 153,67 mm [0.55 in to 6.05 in]	106 mm to 1275 mm [4.2 in to 50.2 in]
25,4 mm to 152,4 mm [1 in to 6 in]	25,4 mm to 254 mm [1 in to 10 in]	12,7 mm to 152,4 mm [0.5 in to 6 in]	101,6 mm to 1270 mm [4 in to 50 in]
electrical travel + 77,5 mm [3.05 in]	electrical travel + 38,10 mm [1.50 in]	electrical travel + 30,48 mm [1.2 in]	250 mm to 1418 mm [9.84 in to 55.83 in]
20 g/0,75 mm (rms) 5 Hz to 2 kHz	20 g/0,75 mm (rms) 5 Hz to 2 kHz	20 g/0,75 mm (rms) 5 Hz to 2 kHz	20 g/0,75 mm (rms) 5 Hz to 2 kHz
50 g 11 ms half sine	50 g 11 ms half sine	50 g 11 ms half sine	50 g 11 ms half sine
one billion dither operations	one billion dither operations	one billion dither operations	one billion dither operations
±20 %	±20 %	±20 %	±20 %
-	500 mOhm @ 500 Vdc	500 mOhm @ 500 Vdc	1000 mOhm @ 500 Vdc
-	1000 V rms	1000 V rms	1000 V rms
connector, binder series 681	cable	cable	Hirschmann GDM
precious metal wipers, 2,06 mm [0.081 in] thick housing with 6 mm [0.25 in] shaft, high level dc output, enhanced performance bearings, shaft seals	12,7 mm [0.5 in] diameter, dual-wiper design, stainless steel shaft, anodized extruded aluminum housing, precious metal contact, shaft seals for spray-or-hose-down environments	9,53 mm [0.375 in] diameter, dual-wiper design, stainless steel shaft, internal spring-loaded ball joint, anodized extruded aluminum housing, precious metal contact, infinite resolution	vibration-dampened element, extended side bearing, precious metal wipers, high dc level output, enhanced performance bearings, NEMA 4 sealing

SMART Position Sensors are some of the most durable and adaptable position devices. These sensors use a patented combination 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.



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] 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] 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 all other versions: 6 Vdc to 24 Vdc
Supply current	35 mm analog: 20 mA max.; 75 mm analog: 32 mA max. 225 mm analog: 34 mA max.; 225 mm digital: 88 mA max.
Output	35 mm analog: 0.55 Vdc to 4.15 Vdc 75 mm and 225 mm analog: 0 Vdc to 5 Vdc 225 mm digital: RS232 type
Air gap	35 mm analog: 8,5 ±1,0 mm [0.334 ±0.039 in] all other versions: 3,0 mm ±2,5 mm [0.118 in ±0.098 in]
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 all other versions: 18 AWG flying leads
Sealing	IP67, IP69K
Housing material	thermoplastic
Approvals	CE
Dimensions	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] 75 mm: 145 mm L x 18,0 mm W x 28,2 mm H [5.7 in x 0.71 in x 1.1 in] 225 mm: 287,3 mm L x 18,0 mm W x 28,2 mm H [11.3 in x 0.71 in x 1.1 in]

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



SPS Arc

SPS Rotary

measures 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°
180°: 0° to 180°

0° to 360°

100°: inside or outside
180°: inside

-

100° inside and outside: 0.06°
180° inside: 0.11°

0.01°

100° inside: 6 Vdc to 24 Vdc, 18 Vdc to 40 Vdc
100° outside: 5 Vdc
180° inside: 6 Vdc to 24 Vdc, 18 Vdc to 40 Vdc

12 mA to 30 mA

100° inside: 45 mA max.
100° outside: 30 mA max.
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]
100° outside: 9,2 mm ±2,5 mm [0.36 in ±0.098 in]
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
100° outside: Ampseal 16 connector
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]
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]

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

steering angle, articulation angle, boom arm detection, solar panels, wind turbines.

Position Sensors | Inertial Measurement Units (IMU)

High-end position sensors with sensitive multi-axis motion control. IMUs 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.



	TARS IMU Series	6DF Series
Description	6 degrees of freedom, 6-D motion variant	6 degrees of freedom, 6-D motion variant
Angular rate range	-245 deg/sec to +245 deg/sec	-75 deg/sec to +75 deg/sec
Supply voltage	4.5 V to 5.5 V or 9 V to 36 V	7 V to 32 V
Supply current	100 mA max.	350 mA max.
Startup time	500 mSec min to 2000 mSec max.	700 ms typ.
Output type	SAEJ1939 CAN 29	SAEJ1939 CAN 29
Operating temperature range	-40°C to 85°C [-40°F to 185°F]	-40°C to 85°C [-40°F to 185°F]
Accelerometer	-	2 g, 6 g
Accelerometer range	-78.48 m/s ² to +78.48 m/s ²	-
Accelerometer resolution	0.01 m/s ²	-
Sealing	IP67 & IP69K certified	IP67, IP69K
Housing material	PBT thermoplastic	aluminum
Approvals/testing/qualifications	EMI/EMC, ESD, mechanical and thermal shock, random vibration, humidity, salt spray, chemical compatibility, automotive grade	EMI/EMC, ESD, mechanical and thermal shock, random vibration, humidity, salt spray, chemical compatibility, automotive grade
Dimensions	Ø138 mm x 28 mm H [Ø5.43 in x 1.10 in H]	130 mm L x 96,3 mm W x 66,0 mm H [5.12 in L x 3.80 mm W x 2.60 mm H]
Features	high performance IMU; reports vehicle angular rate, acceleration and inclination (6 degrees of freedom); advanced filtering of raw sensor data; improves positioning accuracy; optional metal guard for added protection; supports 5 V and 9 V to 36 V vehicle power systems	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

Position Sensors | 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
Description	one-piece 5/8 in proximity sensor	one-piece 5/8 in proximity sensor	two-piece proximity sensor
Technology	ECKO	hall	ECKO
Target material	all metals	magnet	ferrous metals
Load current	120 mA, 50 mA lamp	100 mA, 50 mA lamp	750 mA
Supply current	20 mA max. at 25°C	20 mA max. at 25°C	65 mA max.
Sensing face	shielded, unshielded	shielded	shielded
Housing material	stainless steel	stainless steel	stainless steel
Guaranteed actuation distance	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]
Operating temp. range	-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]
Supply voltage	18 Vdc to 32 Vdc	18 Vdc to 32 Vdc	18 Vdc to 32 Vdc
Output type	normally open, current sinking	normally open/closed, current sinking	normally open/closed, current sinking
Approvals	FM Class 1, Division 2, Groups A, B, C, D	FM Class 1, Division 2, Groups A, B, C, D	MIL-STD-810B
Dimensions	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]
Features	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



Position Sensors | 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-OZ722A	922FS2-A6N-Z735A	932AB2W	932AA3W	ZS-00341
Description	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
Dimension	11,7 mm [0.46 in]	12 mm [0.47 in]	-	-	-
Operating frequency	2000 Hz	2000 Hz	200 mA	≤200 mA to 85°C to 100 mA at 100°C	≤120 mA
Load current	250 mA	250 mA	ceramic	ceramic	stainless steel
Gd (mm)	3,6	2,8	6,8	8,5	stainless steel
Guaranteed actuation distance	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; ZS-00341-02: ≥21.84 mm
Operating temp. range	-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]
Shock	6 g 11 ms ABD 0007	6 g 11 ms ABD 0007	100 g 6 ms	100 g 6 ms	6 g 11 ms
Supply voltage	14 Vdc to 32.5 Vdc	14 Vdc to 32.5 Vdc	20 Vdc to 33 Vdc	20 Vdc to 33 Vdc	14 Vdc to 32.5 Vdc
BITE	no	no	no	no	no
Short circuit	yes	yes	yes	yes	yes
Pressure proof	no	yes	no	no	yes
Reverse polarity	no	no	yes	yes	yes
Insulation resistance	-	-	>50 mOhm at 500 Vdc	>50 mOhm at 500 Vdc	-
Output type	normally open, current sourcing	normally open, current sourcing	normally open, current sourcing	normally open, current sourcing	normally open, current sourcing
Dimensions	15/32 in 51 mm L [2.01 in]	12 mm 50 mm L [1.97 in]	M12 x 1 77 mm L [3.03 in L]	M18 x 1 80 mm L [3.15 in L]	Ø23 mm x 64 mm L [0.91 in x 2.52 in L]
Features	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 options available include a true hermetic cable exit and a unique continuous health monitoring function.



Series	IHM	IHM - 2 State ¹	IHM - 3 State ¹
Description	one piece 5/8 in proximity sensor	one piece 5/8 in proximity sensor	one piece 5/8 in proximity sensor
Technology	integral health monitoring	enhanced ECKO ¹	enhanced ECKO with health monitoring option ¹
Target material	stainless steel	stainless steel	stainless steel
Load current	-	up to 250 mA depending on model	4 mA to 20 mA current loop standard ¹
Supply current	<10 mA	15 mA max., <6 mA typ.	4 mA typ. (does not include load current)
Sensing face	Inconel®	shielded	shielded
Housing material	stainless steel	hermetic - stainless steel	hermetic - stainless steel
Guaranteed actuation distance	5 mm max.	to 4 mm	to 4 mm
Operating temperature range	-55°C to 115°C [-67°F to 239°F]	-55°C to 125°C [-67°F to 257°F]	-55°C to 125°C [-67°F to 257°F]
Supply voltage	12 Vdc to 28 Vdc	18 Vdc to 32 Vdc or 11 Vdc to 18 Vdc standard	15 Vdc to 32 Vdc standard
Output type	current sinking; open collector output, NC; open collector output, NO	normally open/closed, current sinking (NPN)	current loop
BIT diagnostics	optional third output state to indicate the health of the sensor	available (non standard)	health monitoring (3-state output) standard; disabled as option ¹
Short circuit	yes	yes	yes
Pressure proof	yes	custom option ²	custom option ²
Reverse polarity	yes	yes	yes
MTBF (hours)	>1,000,000 flight hours	-	-
Approvals	RTCA/DO-160	DO-254, DO-160 ¹	DO-254, DO-160 ¹
Dimensions	dependent on body style	5/8 in diameter x ~2 in length (depends on model)	5/8 in diameter x ~2 in length (depends on model)
Features	platform approach; industry-leading indirect lightning and dielectric ruggedness; superior vibration ruggedness; fully hermetic package; integral health monitoring capability; non-contact design; supplier stability	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

¹ Broad range of features available; specifications may vary with feature combinations - contact technical support.

² Contact technical support for details.

Rotary Position Sensors | Encoders

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.



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
Dimensions	body: 21,08 mm x [0.83 in] square bushing: Ø9,52 mm [0.375 in] x 32 UNEF-2A	body: Ø34,93 mm [1.375 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



Rotary Position Sensors | Non-Contact Hall-effect Sensors

Respond to the presence or to the interruption of a magnetic field, using a solid-state Hall-effect IC to sense rotary movement of the actuator shaft and then producing a proportional output. The IC, circuitry and magnets are galvanized with an integral connector – more than a match for the most unforgiving conditions.



Series	RTY	RTP	HRS
Sensing range	50° (±25°), 60° (±30°), 70° (±35°), 90° (±45°), 120° (±60°), 180° (±90°), 270° (±135°), 360° (±180°)	50° (±25°), 60° (±30°), 70° (±35°), 90° (±45°), 120° (±60°), 180° (±90°), 270° (±135°), 350° (±175°), 360° (±180°)	90° ±2°, 180° ±2°
Input voltage	<ul style="list-style-type: none"> • low voltage: 5 Vdc ±0.5 Vdc • high voltage: 10 Vdc to 30 Vdc 	<ul style="list-style-type: none"> • low voltage: 5 Vdc ±0.5 Vdc • high voltage: 10 Vdc to 30 Vdc 	5 Vdc ±10 %
Output	<ul style="list-style-type: none"> • low voltage: 0.5 V to 4.5 V ratiometric (standard); 4.5 V to 0.5 V ratiometric (inverted) • high voltage: 0.5 V to 4.5 V ratiometric (standard); 4.5 V to 0.5 V ratiometric (inverted) 	<ul style="list-style-type: none"> • low voltage: 0.5 V to 4.5 V ratiometric (standard); 4.5 V to 0.5 V ratiometric (inverted) • high voltage: 0.5 V to 4.5 V ratiometric (standard); 4.5 V to 0.5 V ratiometric (inverted) 	5 % to 95 % of applied Vdd, approx. (ratiometric)
Input current	<ul style="list-style-type: none"> • low voltage: 20 mA max.; during output to ground short, 25 mA max. • high voltage: 32 mA max.; during output to ground short, 47 mA max 	<ul style="list-style-type: none"> • low voltage: 20 mA max.; during output to ground short, 25 mA max. • high voltage: 32 mA max.; during output to ground short, 47 mA max. 	5 mA typ.
EMI/EMC	<ul style="list-style-type: none"> • EMI radiated immunity: 100 V/m from 200 MHz to 1000 MHz per ISO11452-2 • EMI conducted immunity: <ul style="list-style-type: none"> - low voltage: 100 mA BCI per ISO11452-4 from 1 MHz to 200 MHz - high voltage: 100 mA BCI per ISO11452-4 from 1 MHz to 400 MHz • EMC: exceeds CE requirements 	<ul style="list-style-type: none"> • EMI radiated immunity: 100 V/m from 200 MHz to 1000 MHz per ISO11452-2 • EMI conducted immunity: <ul style="list-style-type: none"> - low voltage: 100 mA BCI per ISO11452-4 from 1 MHz to 200 MHz - high voltage: 100 mA BCI per ISO11452-4 from 1 MHz to 400 MHz • EMC: exceeds CE requirements 	-
Life	35 M cycles	infinite	10 M cycles
Sealing	IP69K	IP69K	-
Operating temp. range	-40°C to 125°C [-40°F to 257°F]	-40°C to 125°C [-40°F to 257°F]	-40°C to 85°C [-40°F to 185°F]
Dimensions	55 mm L x 43 mm W x 41 mm H [2.17 in L x 1.69 in W x 1.61 in H]	59,6 mm L x 43,3 mm W x 17,8 mm H [2.24 in L x 1.70 in W x 0.70 in H]	body: Ø27,43 mm x 13,20 mm [1.080 in x 0.52 in] bushing: Ø9,52 mm [0.375 in] x 32 NEF-2A
Features	magnetically biased, Hall-effect integrated circuit (IC) senses rotary movement of the actuator over a set operating range; activated by integral shaft (available with or without lever)	magnetically biased, Hall-effect integrated circuit (IC) senses rotary movement of the actuator over a set operating range; activated by a separate magnet (available bare or housed)	maximum ESD sensitivity of ±7 kV



Potentiometers | Cermet, Wirewound, and Conductive Plastic

Compact and rugged thick-film devices, these potentiometers are stable over a range of operating temperatures and available in a variety of resistance values. Provides high power dissipation and improved resistance temperature coefficient.



Series	309, 409	389	308, 408
Type	309: compact modular housing 409: sealed for board washing	multiple sections available	308: compact modular house 408: sealed for board washing
Rotational life	25K cycles	25K cycles	50k cycles
Element type	cermet	cermet	conductive plastic
Power rating	1 W	1 W	0.5 W
Terminal type	PC, solder hook	PC, solder hook	pc, solder hook
Resistance range	100 Ohm to 5 mOhm	linear: 5 Ohm to 5 mOhm; tapered: 100 Ohm to 2 mOhm	308: 100 Ohm to 1 mOhm; 408: 500 Ohm to 10 kOhm
Bushing type	standard	standard	standard, locking
Electrical taper	linear, tapered	linear, tapered	CW audio, linear
Dimensions	body: 12,7 mm [0.5 in] square; bushing: 6,35 mm [0.25 in] x 32 NEF-2A x 6,35 mm [0.25 in] L	6,35 mm [0.25 in] x 32NEF-2A standard; 9,53 mm [0.375 in] x 32NEF-2A optional	body: 12,7 mm [0.5 in] square bushing: 6,35 mm [0.25 in] x 32 NEF-2A
Features	modular package; enhanced performance	stackable; rotary, push-pull, and momentary options	nickel-plated brass shaft and bushings



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
Dimensions	body: Ø22,86 mm [Ø 0.90 in] bushing: 9,52 mm D & L [0.375 in D & L]	body: 12,7 mm [0.50 in] square 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



380, RV4, 485, 53C, 385

381

388

392, RV6

380: original version
 RV4: military version of 380
 485: custom version of 380
 53C: cost-effective version of 380
 385: custom version of 53C

metal case and nickel-plated shaft

multiple sections available

392: original version
 RV6: military version of 392

tested to 25k cycles

25k cycles

50k cycles

50k cycles

conductive plastic

conductive plastic

conductive plastic

conductive plastic

2 W

1 W

0.5 W

0.5 W

solder lug, pc pin, fast-on, custom

solder lug

pc, solder hook

solder hook, pc pin, custom

100 Ohm to 5 MOhm, inclusive

100 Ohm to 5 MOhm

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

100 Ohm to 5 MOhm, inclusive

standard, high torque, custom

standard, locking

standard

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

log, reverse log, linear

CW audio, linear

linear

log, reverse log, linear

body: Ø27,79 mm x 14,30 mm [1.094 in x
 0.583 in]
 bushing: 9,53 mm [0.375 in] x 32 NEF-2A

body: Ø15,88 mm [0.625 in]
 bushing: 6,35 mm [0.25 in] x 32 NEF-2A

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

body: Ø12,7 mm x 11,51 mm [0.50 in x
 0.453 in]
 bushing: 6,35 mm [0.25 in] x 32 NEF-2A

cost-effective, wide range of resistance
 values

solder lug terminals; nickel-plated brass
 shaft and bushings

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

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



MKV

SensorCube

640

conductive plastic element

sealed construction

thru-shaft

10 million cycles

10 million cycles

>1 million full cycles

conductive plastic

conductive plastic

conductive plastic

1 W

1 W

0.5 W, max.

turret

turret

lead wires

500 Ohm to 20 kOhm

1 kOhm to 10 kOhm

1 kOhm to 1 MOhm

no bushing, standard

standard

none

linear

linear

linear, quadrature

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

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

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

linearity 0.5 % or less, servo and bushing mounting,
 custom electrical travels

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

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

Warranty/Remedy

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship during the applicable warranty period. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order 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 that Honeywell, in its sole discretion, finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

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