AEROSPACE & DEFENSE

Sensors and Switches Product Range Guide

Honeywell

COMMERCIAL AND BUSINESS AIRCRAFT

Honeywell is an industry leader with a broad portfolio of sensing, switching, and assembly solutions. With over 50 year's experience designing and delivering aerospace products, Honeywell's core expertise includes engineering, sensor development, analog/digital electronics, and environmental packaging. Part and assembly customization is a Honeywell strength. Honeywell:

- **Delivers electrical and mechanical designs quickly** for build-to-print, redesign, new design, and/or testing purposes
- **Integrates features** such as gearing, redundant channels, environmental sealing, and more
- **Creates designs** that are retrofittable while reducing component count (weight savings)
- **Meets demanding schedules** with application knowledge, world-class engineering, and global manufacturing facilities
- **Certifies and qualifies products in-house**, delivering fully compliant reports with all the required documentation
- **Offers customer support** throughout the design process, into production, and beyond

We are a long-term partner.

Honeywell is a leading supplier to engine and auxiliary power unit (APU) manufacturers for fuel, air, and lubrication systems to meet the needs of on-engine sensing and interface for FADEC/DEEC control systems.

- Temperature sensors
- Position transducers
- Speed sensors
- Oil level sensors
- Pressure and level switches

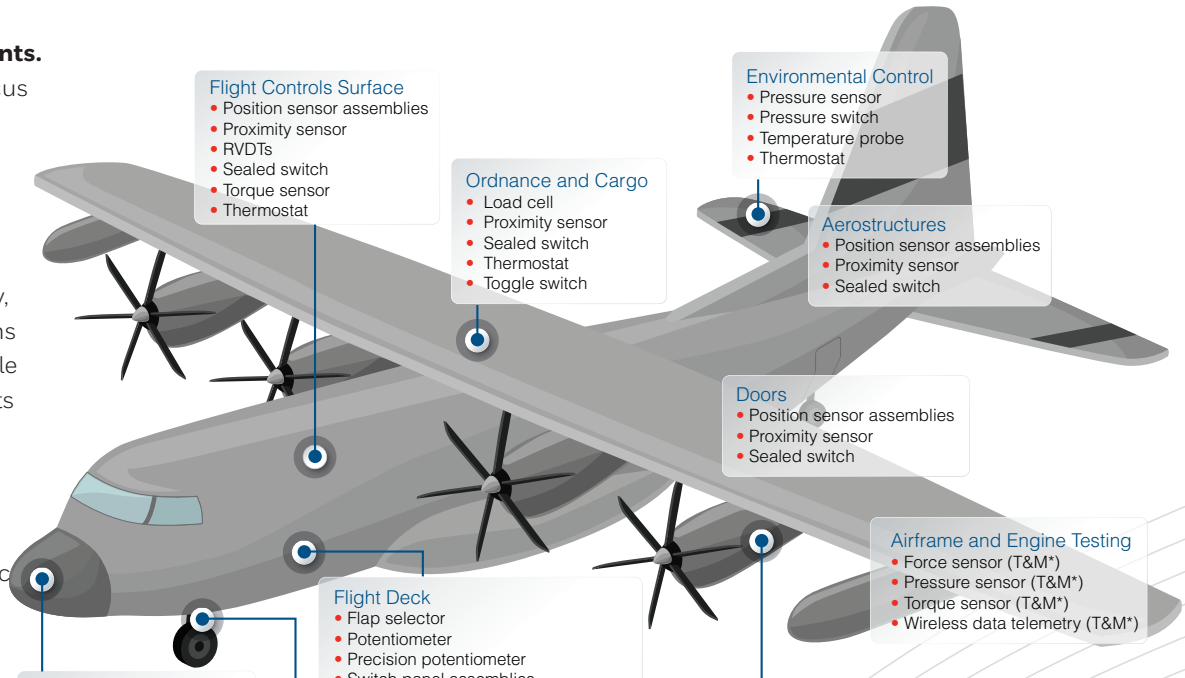
These products are also used in engine valves and hydraulic systems: position and sensing products with enhanced reliability and temperature/vibration performance. Honeywell engineers have industry-wide expertise in the design and integration of switch and sensor assemblies for engine control systems.

Honeywell maintains relevant approvals: ISO 9000; 2000; AS 9100; QS 9000; EASA21 subpart G; EASA 145; ISO 14000; FAA-certified Repair Station; JAA-certified Repair Station.

MILITARY AIRCRAFT

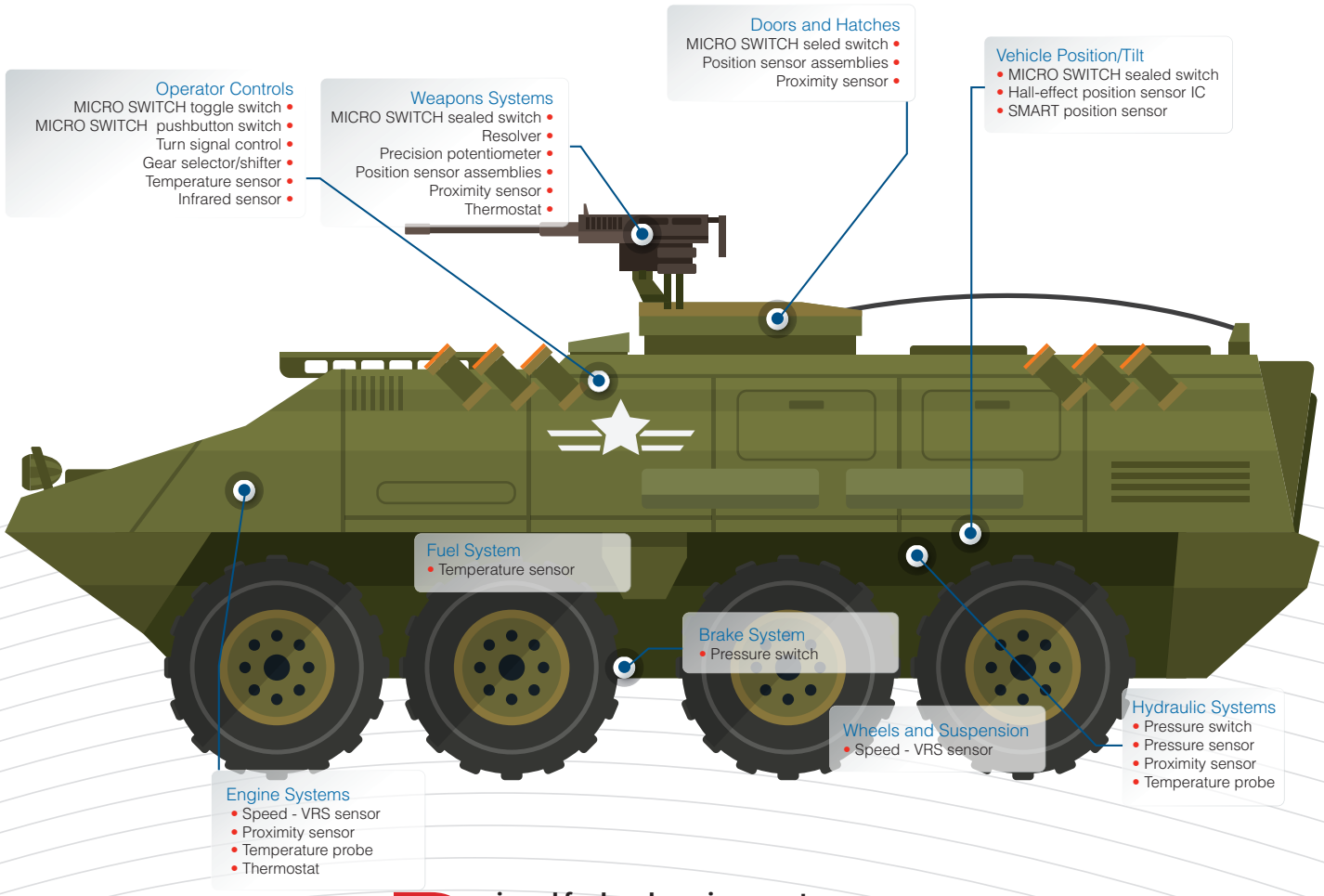
Honeywell aerospace products are designed to meet challenges – whether it is to meet commercial industry standards or unique high performance environments. Honeywell's engineers focus on the requirements for military applications, including pilot safety and comfort, smooth and accurate flight control, weapon systems reliability, and additional applications that demand highly reliable performance. Our products perform over extreme temperature ranges while enduring heavy vibration and shock, and can withstand electromagnetic interference and voltage transients.

Again, reliability is the key. Many Honeywell products are crucial to aircraft operation and carry MTBF (mean time between failure) beyond 200,000 hours. Honeywell:



- **Provides a strong, supporting infrastructure** with many years of on-time aerospace delivery experience
- **Delivers configurable designs**. From simple packaged sensors to multi-function integrated assemblies, Honeywell can provide a solution
- **Creates integrated assemblies** by providing sensing solutions to the aerospace industry by designing and delivering fully sealed, qualified products complete with a connector and mounting
- **Manufactures rugged solutions**. Field data proves Honeywell designs stand up to the rigors of pressure cycling, wash-down, temperature extremes, and high vibration

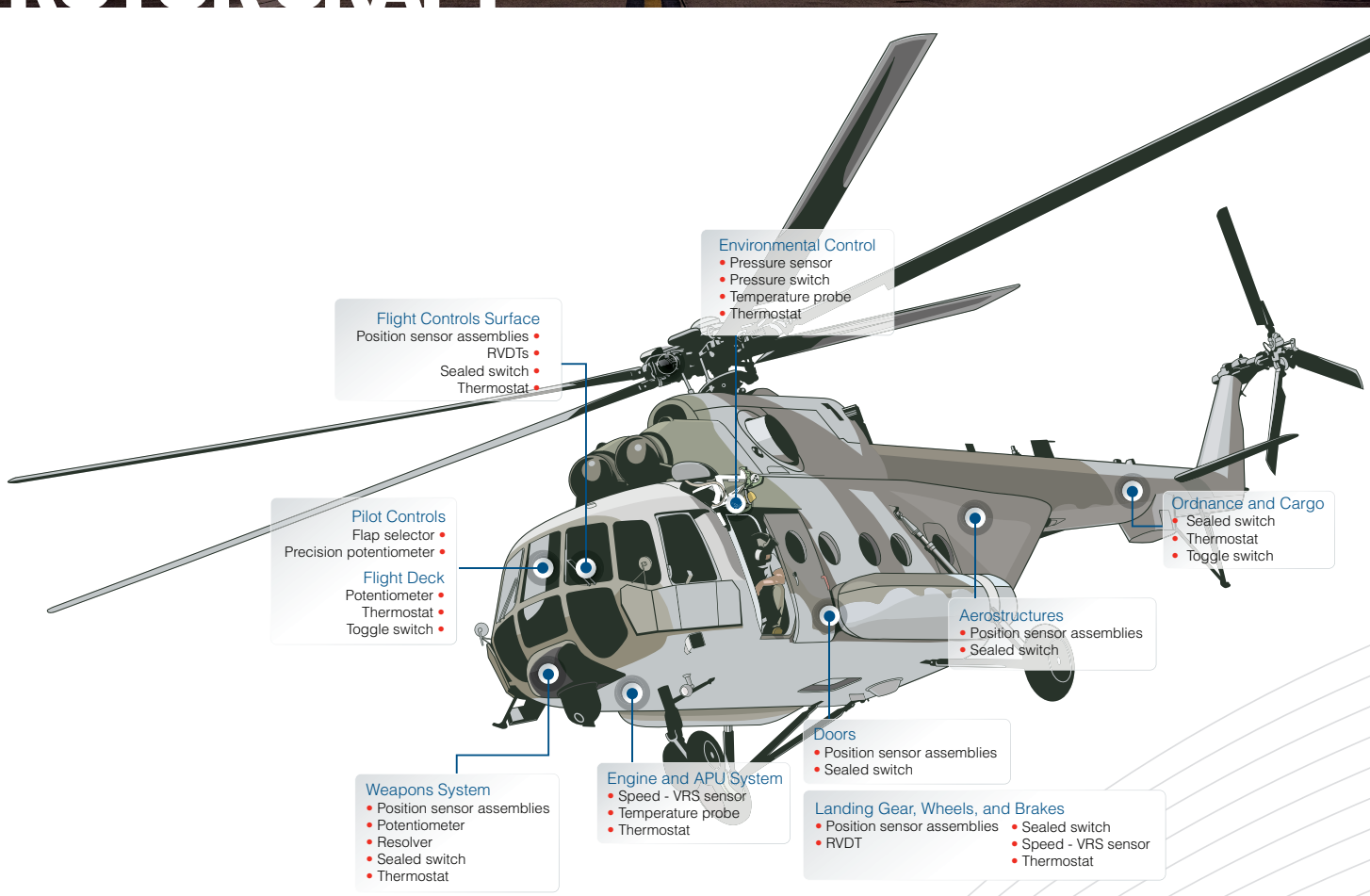
MILITARY GROUND VEHICLES



Designed for harsh environments. When crews are under fire, they should never have to think twice about whether their systems will work properly. With Honeywell sensors, switches, and custom controls, you get performance levels you can rely on.

Honeywell military-specified position sensing and temperature products monitor an armoured vehicle's gun control and ammunition loading systems. Resolvers and proximity sensors provide highly precise position feedback and extremely fast switching frequency for optimal gun system control. Temperature monitoring promotes a safe environment for optimal firing rates.

ROTOR CRAFT



Honeywell offers component design expertise and products for the most complex aerospace and defense systems. Our products and expertise are highly complementary to systems and subsystems designs.

You can depend on Honeywell for precise, accurate, and dependable solutions that have longevity for many of the harshest and most rugged environments.

Need a customized solution? It's no problem. Our design engineers work with customers to design and manufacture specific aerospace solutions. Honeywell:

- **Works with a wide range of technologies**. We offer RVDT, LVDT, resolver, potentiometer, thermal, speed, and switches as standard sensing elements – the most accepted in the industry. Honeywell has built an unmatched sensing technology portfolio to solve customers' challenging applications.

WEAPONS SYSTEMS

Honeywell components are utilized in military vehicles, aircraft, and launchers to optimize and control weapon systems. They must function correctly every time. There is no margin for error.

Field data proves that Honeywell products are designed to be extremely rugged to stand up to the rigor of pressure cycling, wash-downs, temperature extremes, and high vibration.

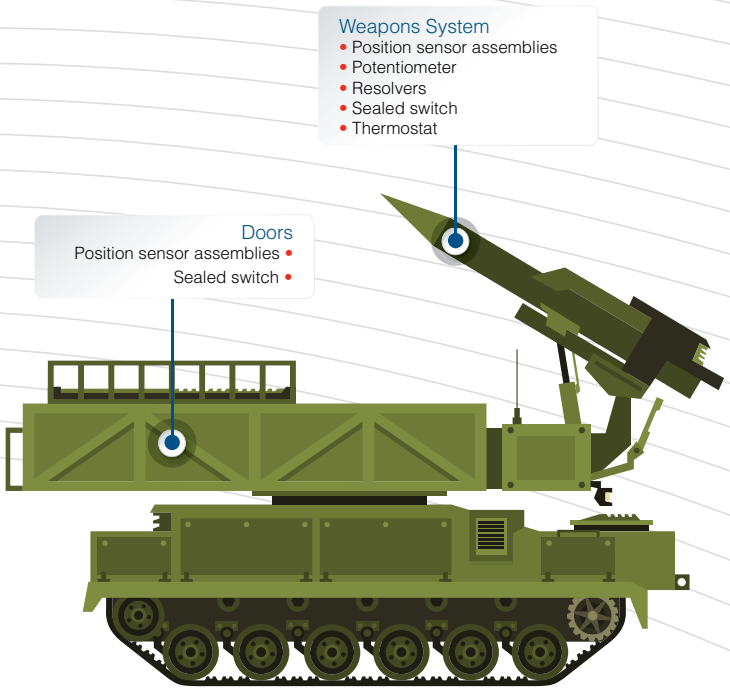
Subsystem interfacing expertise is apparent in our highly accurate and reliable sensors, switches, and control products for weapon systems. Honeywell position sensors in the seeker mechanism allow the system to interpret location in real time. In addition, Honeywell components feature design flexibility and the reuseability of systems on different platforms.

Resolvers deliver non-contact, 360° sensing, along with enhanced accuracy, resolution, and repeatability under severe environmental conditions.

Honeywell precision potentiometers deliver real-time information to a missile guidance system while the missile is en route, providing reliable directional control to the control surfaces. In addition, Honeywell has position sensors in the seeker mechanism that allow the system to interpret the location in real-time.

Honeywell sensing and switch products are often used in the following weapon systems applications:

- Gun aiming systems
- Multiple-launched rocket systems
- Precision pointed systems
- Common Remotely Operated Weapon System (CROWS)
- Lasers
- Integrated assemblies



AFTERMARKET PRODUCTS AND SERVICES

Honeywell is a trusted supplier of precision aerospace assemblies and provides EASA and FAA-Certified repair services.

Our position sensors, sealed, basic, limit, and thermostatic switches are found on a wide range of commercial and military aircraft and carry Parts Manufacturer Approval (PMA) and MilSpec qualification.

PRECISION AEROSPACE ASSEMBLIES AND REPAIR/ OVERHAUL SERVICES

Honeywell offers approved aftermarket spare parts and FAA-certified repair services. All aerospace assembly products listed in our documentation are PMA-approved for operator use as spares and are fully repairable and serviceable.

Our repair facility is staffed by highly experienced technicians and is co-located at the site where the parts are designed and built. Honeywell's repair facility is a FAA-Certified 14 CFR Part 145 repair site; Class 2 & 4 instrumentrated repair certified, Class 1, 2 & 3 accessoryrated repair certified, and EASA Certified. View our aerospace repair station certificates: http://sensing.honeywell.com/quality-certs

OPERATOR CONTROL, SEALED SWITCH, BASIC & LIMIT SWITCH, AND THERMAL COMPONENTS

Honeywell offers FAA-PMA approved aftermarket spare parts. Visit our web site for further details.

CUSTOM CAPABILITIES

PACKAGED SWITCH SOLUTIONS

Honeywell combines our MICRO SWITCH electromechanical switches with ruggedized, application-specific packaging to address unique needs and environmental challenges. These assemblies are fully qualified to DO-160 or MIL-standard environmental test requirements. Applications onboard aircraft today range from Power Door Operating Systems to Landing Gear and Gunport Doors; where extreme reliability and integrity are critical.

Custom engineered packaging design allows for combining features into one interchangeable, precalibrated assembly. Save time, weight, and wiring compared to using independent switches and brackets; and improve environmental resistance with a Honeywell custom-engineered solution.

- Can be custom engineered to survive extremely high shock and vibration
- Uses genuine MICRO SWITCH military-grade electromechanical switches
- Unparalleled experience and library of custom switch devices
- Both hermetic and environmental configurations available

POSITION SENSORS

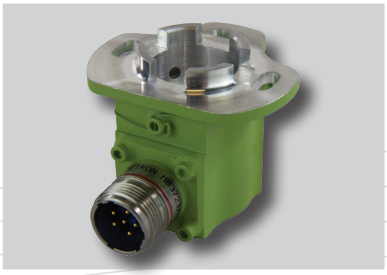
Honeywell Position Transmitters fly on a multitude of commercial and military aircraft, and have become the standard when high integrity and reliability are critical. Products can be custom-configured by Honeywell in cooperation with our customers to help optimize system function. These transmitters are designed for high-lift system applications including flap and slat instrumentation, along with rudder and stabilizer monitoring.

Position transmitters normally utilize RVDT in conjunction with precision gearing, cams, and other mechanisms to deliver accuracy over the full range of flight control operation. Honeywell also supports and offers other sensors including resolvers, synchros, and other rotary sensors and switches that can be configured in many combinations to provide the required system monitoring. We often work with our customers to recommend the most effective solution.

- Environmentally sealed to withstand rapid pressure changes, de-icing fluid and other exposure to the elements
- Up to four redundant sensing channels available for high integrity applications
- Mean time between failures (MTBF) typically between 100k and 200k hours for the entire assembly
- Dissimilar channel option is available to meet common mode fault design requirements

SOLID STATE VALVE POSITION SWITCH

In addition to traditional harsh-duty electromechanical switches, Honeywell now offers a solid-state, non-contact option for sensing butterfly valve open/closed status. Specifically designed for aircraft onboard applications, these devices are fully qualified to DO-160 including harsh EMI and indirect lighting effects. Devices typically include two (redundant) channels within one hermetically sealed enclosure. Devices can be custom configured to fit specific valve characteristics.



Packaging design allows for ease of installation and calibration, and extremely repeatable channel to channel switchpoint matching. Internal switch points can be custom-configured to operate simultaneously or at different operating angles based on the application.

- Extremely resistant to vibration and shock
- Fully hermetic; robust to handle environmental exposure
- Two sensing channels allow redundant sensing in one bolt-on assembly

ROBUST GAPS & HAPS SERIES PROXIMITY SENSORS

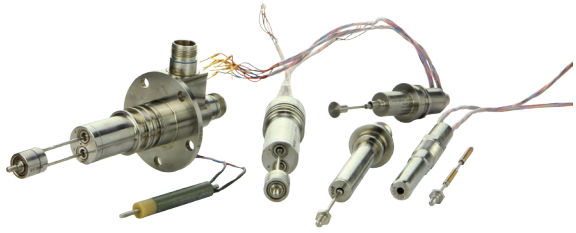
The latest series of proximity sensors are designed to meet the increased EMI, lightning, and vibration requirements of today's modern aircrafts. In addition to being fully qualified to DO-160, we have enhanced traditional eddy current technology with our proprietary FAVCO technology to provide Integral Health Monitoring (IHM) capability. This is available as a special option and effectively provides real-time indication of the health of the sensor through the use of a 3-state output.

Specifically designed for modern composite aircraft structures and engine accessories that carry higher levels of vibration and thermal shock, these sensors are fully hermetic and available with several connector and mounting options.

- Extremely robust to handle vibration and thermal shock
- Fully hermetic; robust to handle environmental exposure
- Health monitoring provides fault indication that is distinct from both target-near and target-far output state
- See page 11 for typical device specifications

LVDT

Honeywell's aero LVDT provides infinite resolution linear position solutions and is designed for use in harsh environments. The pre-validated configurable LVDT platform approach reduces design cycle time and speeds time to market.



SERIES	1LVT
Range	8,89 mm to 35,56 mm [0.35 in to 1.4 in] stroke
Channels	single, dual, and dual-tandem
Housing material	17-4 PH stainless steel
Electrical connections	EN2997YE01005MN, M83723/88P1005N, D38999/27YB5
Accuracy	±0.5% of the full stroke gain from 0 % to 100 % of the LVDT stroke @ 21 °C [70 °
MTBF	1 million hours min.
Current consumption	11 mA max.
Input impedance	650 ohms min. @ 3000 Hz
Output impedance	2000 ohms max. @ 3000 Hz
Mechanical stroke	0,254 mm [0.010 in] (additional to electrical strok
Normal temperature operating range	-55 °C to 200 °C [-67 °F to 392 °F
Features	rig point position eliminates need to shim during installation; series has improved mean time between failure (MTBF) through industry-leading winding techniques, high-strength materials, and industry-leading design

PROXIMITY SENSORS

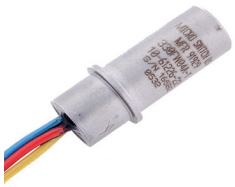
General Aerospace Proximity Sensors (GAPS) and Harsh Aerospace Proximity Sensors (HAPS), incorporate Honeywell's patented Integrated Health Monitoring functionality, however the products have some technical differences that allow them to be used in various aerospace applications. GAPS can be used in less harsh areas of application with some differences of electrical and environmental characteristics when compared to HAPS. Whilst, HAPS Aerospace Proximity Sensors are configurable, non-contact, hermetically sealed devices designed to sense the presence or absence of a target in harsh-duty aircraft applications.

SERIES	GENERAL AEROSPACE PROXIMITY SENSOR (GAPS)	HARSH APPLICATION PROXIMITY SENSOR (HAPS)
Description	configurable one piece 5/8 in proximity sensor	configurable one piece 5/8 in proximity sensor
Technology	FAVCO with integral health monitoring option	FAVCO with integral health monitoring option
Target (typ.)	SS 17-4PH rectangular target with dimensions 25 mm x 18 mm x 3 mm [0.98 in x 0.71 in x 0.12 in]	SS 17-4PH rectangular target with dimensions 25 mm x 18 mm x 3 mm [0.98 in x 0.71 in x 0.12 in]
Connector/leads	D38999/25YA98PN D38999/25YA98PA EN2997Y10803MN	• D38999/25YA98PN • EN2997Y10803MN • M83723/90Y10056 • M83723/90Y10058 • D38999/25YA98PA • M83723/90Y1005N • M83723/90Y10057 • Pigtail
Form factor	• Inline, cylindrical, threaded • Right angle, cylindrical, threaded • Inline, cylindrical, flanged • Right angle, cylindrical, flanged	• Inline, cylindrical, threaded • Right angle, cylindrical, threaded • Inline, cylindrical, flanged • Right angle, cylindrical, flanged
Supply voltage	12 Vdc to 32 Vdc (input)	12 Vdc to 28 Vdc
Supply current	<10 mA	<10 mA
Sensing face	Inconel®	Inconel®
Housing material	stainless steel	stainless steel
Guaranteed actuation distance	see Figure 3 in datasheet for curve	see Figure3 in datasheet for curve
Operating temperature range	-55 °C to 115 °C [131 °F to 239 °F]	-55 °C to 115 °C [131 °F to 239 °F]
Output type	see datasheet	see datasheet
Internal Health Monitoring	available	available
Short circuit protection	available	available
Reverse polarity protection	available	available
MTBF (hours)	500,000 flight hours	500,000 flight hours
Approvals	DO-160	DO-160
Measurements	see datasheet	see datasheet
Features	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	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

PROXIMITY SENSORS

Broad range of robust operational capabilities and package sizes allow added flexibility in applications including ordnance, marine, offshore and aircraft cargo systems.

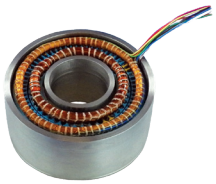
SERIES	100 FW	200 FW
Description	one-piece 5/8 in proximity sensor	one-piece 5/8 in proximity sensor
Technology	ECKO	hall
Target material	all metals	magnet
Load current	120 mA, 50 mA lamp	100 mA, 50 mA lamp
Supply current	20 mA max. @ 25 °C	20 mA max. @ 25 °C
Supply voltage	18 Vdc to 32 Vdc	18 Vdc to 32 Vdc
Sensing face	shielded, unshielded	shielded
Housing material	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]
Operating frequency	–	–
Operating temperature range	-55 °C to 125 °C [-67 °F to 257 °F]	-54 °C to 100 °C [-65.2 °F to 212 °F]
Supply voltage	18 Vdc to 32 Vdc	18 Vdc to 32 Vdc
Output type	normally open, current sinking	normally open/closed, current sinking
BIT diagnostics	–	–
Short circuit	–	–
Pressure proof	–	–
Reverse polarity	–	–
MTBF (hours)	–	–
Approvals	FM Class 1, Division 2, Groups A, B, C, D	FM Class 1, Division 2, Groups A, B, C, D
Measurements	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]
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



300 FW	21 FW	23 FW	5 FW	SERIES
two-piece proximity sensor	one-piece 12 mm proximity sensor	one-piece 22,2 mm proximity sensor	target, special, proximity sensor	**Description**
ECKO	hall	hall	magnet	**Technology**
ferrous metals	–	–	–	**Target material**
750 mA	20 mA	20 mA	–	**Load current**
65 mA max.	25 mA	25 mA	–	**Supply current**
18 Vdc to 32 Vdc	18 Vdc to 32 Vdc	18 Vdc to 32 Vdc	–	**Supply voltage**
shielded	stainless steel	stainless steel	stainless steel	**Sensing face**
stainless steel	stainless steel	stainless steel	stainless steel	**Housing material**
1,78 mm to 3,3 mm [0.07 in to 0.130 in]	250 gauss	250 gauss	–	**Guaranteed actuation distance**
–	–	–	–	**Operating frequency**
-77 °C to 125 °C [-106.6 °F to 257 °F]	-55 °C to 150 °C [-67 °F to 302 °F]	-55 °C to 125 °C [-67 °F to 257 °F]	-55 °C to 150 °C [-67 °F to 302 °F]	**Operating temperature range**
18 Vdc to 32 Vdc	18 Vdc to 32 Vdc	18 Vdc to 32 Vdc	–	**Supply voltage**
normally open/closed, current sinking	normally open, current sinking	normally open, current sinking	–	**Output type**
–	yes	yes	–	**BIT diagnostics**
–	no	no	–	**Short circuit**
–	no	no	–	**Pressure proof**
–	no	no	–	**Reverse polarity**
–	35000	115000	–	**MTBF (hours)**
MIL-STD-810B	MIL-STD-461E	MIL-STD-461E	–	**Approvals**
Ø 11,2 mm x 31,8 mm L [Ø 0.44 in x 1.25 in L]	Ø 12 mm [Ø 0.47 in]	Ø 22,2 mm [Ø 0.9 in]	Ø 12 mm [Ø 0.47 in]	**Measurements**
ferrous metal sensing; two-piece construction; reverse polarity	Hall-effect magnetic field sensitive; single channel; three-wire dc	Hall-effect magnetic field sensitive; triple channel; nine-wire dc	Hall-effect magnetic field sensitive	**Features**

RESOLVER & PRECISION POTS

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



SERIES	HONEYWELL HAWK™ 1-INCH	HONEYWELL HAWK™ 3-INCH
Type	fully housed	multiple configurations: pancake (bare and simple housed), fully housed, and configurations with rotary transformers
Size diameter	1.06 in	2.75 in, 3.0 in
Speed	1X	1X; 1X and 16X
Accuracy	±7 arcmin	±420 arcsec (1X); ±25 arcsec (16X)
Transformation ratio	–	1X: 1.0; 16X: 0.25
Operating temperature range	50.8 °C to 93.3 °C [-60 °F to 200 °F]	50.8 °C to 93.3 °C [-60 °F to 200 °F]
Measurements	1.06 in dia. x 2.77 in L	various
Features	non-contact magnetic technology eliminates mechanical contact, reducing wear and improving reliability and durability by enhancing operation in harsh environments; meets multiple military/aerospace specifications: DO-160D, MIL-STD-202G, MIL-STD-810G, MIL-STD-81963B, MIL-STD-461F; complies with space outgassing requirement SP-R0022	non-contact magnetic technology eliminates mechanical contact, reducing wear and improving reliability and durability by enhancing operation in harsh environments; meets multiple military/aerospace specifications: DO-160D, MIL-STD-202G, MIL-STD-810G, MIL-STD-81963B, MIL-STD-461F; complies with space outgassing requirement SP-R0022

Compact and rugged thick-film devices are available in a wide range of resistance values. These devices use precision technology developed for military applications. Often used in missile fin, track vehicle transmission height, and FLIR mirror position.

SERIES	MKV	CUSTOM PRECISION
Type	conductive plastic element	conductive plastic
Expected rotational life	10 million cycles	50 million cycles
Element type	conductive plastic	conductive plastic
Power rating	1 W	1 W
Terminal type	turret	various
Resistance range	500 Ohm to 20 kOhm	500 Ohm to 20 kOhm
Bushing type	no bushing, standard	bushing or servo
Governing standard	MIL-PRF-39023/DO-160	MIL-PRF-39023/DO-160
Electrical taper	linear	linear
Measurements	body: Ø 22,23 mm [Ø 0.875 in]	body: 12,7 mm to 76,3 mm [0.5 in to 3 in]
Features	linearity 0.5 % or less; Servo and bushing mounting; custom electrical travels	linearity 0.5 % to 0.05 %; custom lead wire and connectors

VARIABLE RELUCTANCE SPEED SENSORS

Simple, rugged devices that do not require an external voltage source for operation, Variable Reluctance sensors provide direct conversion of actuator speed to output frequency. Potential applications include engine and motor RPM, and gear-speed measurement.

VARIABLE RELUCTANCE SPEED SENSORS	AEROSPACE SPEED
Output voltage range	4 Vp-p to 500 Vp-p (inclusive)
Housing diameter	3/8 in to 15/16 in
Housing material/style	stainless steel threaded or smooth
Termination	MS3106, D38999, M83723 connectors and leadwires
Operating temperature range	-73 °C to 232 °C [-100 °F to 450 °F]
Coil resistance	10 Ohm to 2300 Ohm
Inductance	2 mH to 600 mH
Gear pitch range	various
Min. surface speed	0,38 ms [15 in/s] typ.
Max. operating freq.	50 kHz
Vibration	MIL-STD-810G, Method 514
Features	self-powered operation; simple installation; no moving parts; operates over wide speed range; customized versions available

TARS-IMU

The Transportation Attitude Reference Sensor or TARS-IMU is a packaged sensor array designed to report vehicle angular rate, acceleration, and inclination for demanding transportation applications. TARS-IMU enables autonomous vehicle characteristics and enhances efficiency and productivity by reporting key data required to automate and monitor movements of vehicle systems and components.

SERIES	TARS-IMU
Measures	angular rate, acceleration, and inclination (6 degrees of freedom)
Supply voltage	5 V, 9 V to 36 V power systems
Angular rate range	-245 deg/sec to +245 deg/sec
Angular rate resolution	7.8125 mdps
Acceleration range	-78.48 m/s^2 to +78.48 m/s^2
Acceleration resolution	0.01 m/s^2
Range (2 axis x & y)	-85° to +85°
Resolution	0.058°
Start-up time	500 mSec to 2000 mSec
CAN Bus data rate	250 kBaud
Signal update rate	100 Hz
Operating temperature range	-40 °C to 85 °C [-40 °F to 185 °F]

MICRO SWITCH SEALED SWITCHES

Military performance standard and most global approvals. Environmental and hermetic sealing to resist many severe environment conditions, changes in atmospheric pressures/temperatures. Potential applications include aircraft landing gear and flap/stabilizer controls, de-icers, doors/slides, engine thrust reversers, space vehicles, armored personnel carriers, weapon systems, and wingfold actuators.

SERIES	MICRO SWITCH SE/XE	MICRO SWITCH HM	MICRO SWITCH HS
Type	anodized aluminum snap-action switch	stainless steel snap-action switch	stainless steel, phenolic snap-action switch
Sealing	MIL-PRF-8805, symbol 3	MIL-PRF-8805, symbol 5 hermetic	MIL-PRF-8805, symbol 5 hermetic
Operating temperature range	-53 °C to 105 °C [-65 °F to 221 °F]	-65 °C to 121 °C [-85 °F to 250 °F] high temp available: 500 °F	-54 °C to 121 °C [-65 °F to 250 °F]
Actuators/levers	auxiliary actuators available	integral lever; aux. actuators: leaf, roller leaf, straight, roller lever	integral lever
Termination	solder, leadwire	solder, leadwire	screw, leadwire
Circuitry	SPDT	SPDT	SPDT
Contacts	silver, gold, bifurcated gold	silver, gold, bifurcated gold	silver
Amp rating	7 A max.	0.5 A to 3 A	1 A to 25 A
Approvals	CE, UL/CSA, MIL-PRF-8805 (selected listings)	MIL-PRF-8805	UL, CSA, MIL-PRF-8805
Measurements	SE: 19,05 mm H x 8,64 mm W x 22,35 mm L [0.75 in H x 0.34 in W x 0.88 in L] XE: 19,05 mm H x 8,13 mm W x 15,75 mm L [0.75 in H x 0.32 in W x 0.62 in L]	12,7 mm H x 6,35 mm W x 20,3 mm L [0.5 in H x 0.25 in W x 0.8 in L]	25,4 mm H x 17,8 mm W x 50,8 mm L [1.0 in H x 0.7 in W x 2.0 in L]
Features	watertight and military standard construction per MIL-PRF-8805; corrosion-resistant aluminum housing	hermetically sealed per MIL-S-8805; high temperature construction; reduced sensitivity to changes in altitude or pressure	hermetically sealed per MIL-S-8805; high temperature construction; reduced sensitivity to changes in altitude or pressure

MICRO SWITCH EN	MICRO SWITCH HE	MICRO SWITCH HR	SERIES
military-grade stainless steel with environmental seals limit switch	hermetically sealed stainless steel limit switch	hermetically sealed stainless steel limit switch	**Type**
MIL-PRF-8805, symbol 4 hermetic	MIL-PRF-8805, symbol 5 hermetic	MIL-PRF-8805, symbol 5 hermetic	**Sealing**
-55 °C to 85 °C [-65 °F to 185 °F]	-55 °C to 125 °C [-67 °F to 257 °F]	-65 °C to 315 °C [-85 °F to 600 °F]	**Operating temperature range**
top plunger, top roller, top rotary	top plunger, top roller plunger, nylon button	top plunger, top roller plunger	**Actuators/levers**
screw, leadwire, leadwire with connector, pin receptacle, side receptacle	screw, leadwire, bottom receptacle	screw, leadwire (receptacle termination available)	**Termination**
SPDT, DPDT	two or four SPDT circuits	SPNO, DPDT	**Circuitry**
silver, gold	silver, gold	silver, gold	**Contacts**
1 A to 15 A (resistive	1 A, 5 A, 7 A (resistive)	5 A (resistive)	**Amp rating**
MIL-PRF-8805 symbol 4 hermetic (MIL-PRF-8805 QPL listings available)	MIL-PRF-8805, symbol 5 hermetic	MIL-PRF-8805, symbol 5 hermetic	**Approvals**
bottom receptacle: 114,3 mm H x 25,4 mm dia [4.5 in H x 1.0 in dia] side receptacle: 57,2 mm H x 26,7 mm W x 58,9 mm L [2.25 in H x 1.05 in W x 2.32 in L]	top pin plunger: 60,1 mm H x 25,4 mm dia [2.36 in H x 1.0 in dia] top roller plunger: 32,8 mm H x 17,5 mm dia [1.29 in H x 0.69 in dia]	screw termination: 80,8 mm H x 25,4 mm dia [3.18 in H x 1.0 in dia] leadwire termination: 103,7 mm H x 27,0 mm dia [4.08 in H x 1.06 in dia]	**Measurements**
top & roller plunger actuators have internal ice scraper ring	features true hermetic sealing (metal-to-metal, glass-to-metal construction); meets sand and dust, explosion, icing, minimum current, and moisture resistance requirements; top & roller plunger actuators have internal ice scraper ring	meets moisture resistance, explosion, and salt spray requirements; top plunger actuator has internal ice scraper ring	**Features**

MICRO SWITCH PUSHBUTTON & TOGGLE SWITCHES

Hermetic and environmentally sealed pushbutton and toggle switches offer reliable operations with MICRO SWITCH technology. Often used in applications where a panel-mount switch with an environment-proof rating is needed, including military and commercial aviation and process control.

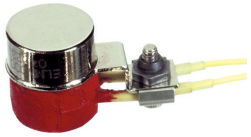
SERIES	PB	AT
Type	based on the AT Series toggle design with a stainless steel housing	stainless steel toggle
Sealing	panel-seal version, hermetically sealed switch units	MIL-S-8805/26/98
Operating temperature	various	various
Actuator/lever	–	standard, locking, tab, special design
Action	–	2-position, momentary & maintained
Mounting	threaded bushing	15/32 in bushing, 1/4 in bushing, 3-hole, above panel
Termination	solder, H58, quick-connect	solder, solder T2, screw, quick connect, leadwire, H58
Circuitry	2-pole, 3-pole, 4-pole	SPDT, DPDT, DPNO, 3PDT, 4PDT, 6PDT, 7PDT, 8PDT, 10PDT
Contacts	–	silver, gold
Amp rating	2 A to 5 A, 125/250 Vac	0.01 A to 5 A (resistive)
Measurements	various	various
Approvals	UL, CSA, external parts corrosion-resistant per MIL-PRF-8805; meets explosion-proof requirements of MIL-PRF-8805	qualified to MIL-S-8805/26/98
Features	up to four poles; compact or miniature sizes; sealed versions available	choice of sealed bushing; short behind panel depth

TW	ET	TL	SERIES
miniature stainless steel toggle	magnetically held toggle	military-grade toggle	**Type**
qualified to MIL-S-83781	most listings qualified to MIL-S-5594	qualified to MIL-S-3950	**Sealing**
-65 °C to 71 °C [-85 °F to 160 °F]	-65 °C to 71 °C [-85 °F to 160 °F]	-65 °C to 71 °C [-85 °F to 160 °F]	**Operating temperature**
standard, locking, special design, tab	standard, pull/push-to-unlock, tab	standard, special design, tab, paddle, none	**Actuator/lever**
2- or 3-position, momentary & maintained	2- or 3-position, momentary & maintained	2- or 3-position, momentary & maintained	**Action**
bushing 15/32 in or 1/4 in	bushing 15/32 in	bushing 15/32 in	**Mounting**
IWTS, solder, screw, quick connect, H58, T2	screw, leadwire, turret	IWTS, solder, screw, quick connect, leadwire	**Termination**
SPST, SPDT, DPST, DPDT	SPDT, DPDT, 4PDT	SPST, SPDT, DPST, DPDT, 3PST, 3PDT, 4PST, 4PDT	**Circuitry**
silver alloy, gold-plated	silver alloy, gold-plated	silver alloy, gold-plated	**Contacts**
0.1 A to 5.0 A @ 0.5 Vdc to 28 Vdc; 0.1 A to 5.0 A @ 0.5 Vac to 115 Vac	7 A max. (resistive)	up to 20 A (resistive)	**Amp rating**
49,78 mm H x 14,61 mm W x 14,61 mm D [1.96 in H x 0.575 in W x 0.575 in D]	51,56 mm H x 25,4 mm W x 25,4 mm D [2.03 in H x 1.0 in W x 1.0 in D]	26,7 mm H x 33,5 mm W x 22,6 mm D [1.05 in H x 1.32 in W x 0.89 in D]	**Measurements**
UL, qualified to MIL-S-83781	qualified to MIL-S-5594	UL, CSA, CE, qualified to MIL-S-3950	**Approvals**
saves space and weight; sealed bushing versions	holding coil replaces mechanical holding mechanisms to maintain toggle in operate	environment-proof sealing; qualified to MIL-DTL-3950	**Features**

PRECISION THERMOSTATS

Hermetic/non-hermetic devices available. High reliability versions meet stringent requirements of military and aerospace industries for dielectric strength, moisture, resistance, vibration, and shock. Often used in environmental and flight controls, aerospace engines, flight decks, cargo holds, landing gear, and space craft.

SERIES	3000 CUSTOM PACKAGED	3153 HERMETIC
Description	custom packaged	hermetic low silhouette
Amperage	dependent on the internal device	2.0 A/2.0 A/1.0 A
Housing material	stainless steel or brass	steel housing hermetically sealed with glass-to-metal seal at terminal junction
Operating temperature range	-29 °C to 260 °C [-20 °F to 500 °F]	-29 °C to 176 °C [-20 °F to 350 °F]
Environmental exposure range	-62 °C to 288 °C [-80 °F to 550 °F]	-65 °C to 260 °C [-85 °F to 500 °F]
Dielectric strength	MIL-STD-202, Method 301; 1250 Vac 60 Hz - terminal to case	MIL-STD-202, Method 301; 1250 Vac 60 Hz - terminal to case
Insulation resistance	MIL-STD-202, Method 302; 50 MOhm min. terminal to case	MIL-STD-202, Method 302; Cond. B - 50 MOhm - 500 Vdc applied
Contact resistance	MIL-STD-202, Method 307; 0.050 Ohm	MIL-STD-202, Method 307; 0.050 Ohm
Hermetic seal	MIL-STD-202, Method 112; Cond. A, 1×10^{-5} atm cc/s	MIL-STD-202, Method 112; Cond. C
Moisture resistance	MIL-STD-202, Method 106	MIL-STD-202, Method 106
Shock	MIL-STD-202, Method 213; 100 G	MIL-STD-202, Method 213; 100 G
Vibration	MIL-STD-202, Method 204; 20 G	MIL-STD-202, Method 204; 20 G
Thermal shock	MIL-STD-202, Method 107; Cond. B	MIL-STD-202, Method 107; Cond. B
Salt spray	MIL-STD-202, Method 101; Cond. B	MIL-STD-202, Method 101; Cond. B
Acceleration	–	–
Approvals	customer specific and MIL-PRF-24236	Meets or exceeds requirements of MIL-PRF-24236
Features	custom packaging; hermetically sealed; tight tolerances and differentials; hermetic connector or potted construction	hermetically sealed; tight tolerances and differentials; pre-set and tamper proof; SPST contacts



3MS1 SERIES	3500 SERIES	3200 AEROSPACE	SERIES
QPL series military thermostats	military thermostat	aerospace	**Description**
5.0 A resistive	5.0 A resistive	5.0 A resistive	**Amperage**
steel housing hermetically sealed with glass-to-metal seal at terminal junction	steel housing hermetically sealed with glass-to-metal seal at terminal junction	steel housing hermetically sealed with glass-to-metal seal at terminal junction	**Housing material**
-46 °C to 190 °C [-50 °F to 375 °F]	-46 °C to 204 °C [-50 °F to 400 °F]	-51 °C to 163 °C [-60 °F to 325 °F]	**Operating temperature range**
-65 °C to 260 °C [-85 °F to 500 °F]	-65 °C to 260 °C [-85 °F to 500 °F]	-65 °C to 177 °C [-85 °F to 350 °F]	**Environmental exposure range**
MIL-STD-202, Method 301; 1250 Vac 60 Hz - terminal to case	MIL-STD-202, Method 301; 1250 Vac 60 Hz - terminal to case	MIL-STD-202, Method 301; 1250 Vac	**Dielectric strength**
MIL-STD-202, Method 302; 500 MOhm	MIL-STD-202, Method 302; 500 MOhm	MIL-STD-202, Method 302; 500 MOhm	**Insulation resistance**
MIL-STD-202, Method 307; 0.050 Ohm max.	MIL-STD-202, Method 307; 0.050 Ohm max.	MIL-STD-202, Method 307; 0.025 Ohm max.	**Contact resistance**
MIL-STD-202, Method 112; Cond. C	MIL-STD-202, Method 112; Cond. C	MIL-STD-202, Method 112; Cond. C	**Hermetic seal**
MIL-STD-202, Method 106	MIL-STD-202, Method 106	MIL-STD-202, Method 106	**Moisture resistance**
MIL-STD-202, Method 213; 100 G	MIL-STD-202, Method 213; 400 G	MIL-STD-202, Method 213; 750 G	**Shock**
MIL-STD-202, Method 204; 20 G	MIL-STD-202, Method 204; 20 G	MIL-STD-202, Method 204; 30 G; MIL-STD-202, Method 214; 50 G	**Vibration**
MIL-STD-202, Method 107; Cond. B	MIL-STD-202, Method 107; Cond. B	MIL-STD-202, Method 107; Cond. B	**Thermal shock**
MIL-STD-202, Method 101; Cond. B	MIL-STD-202, Method 101; Cond. B	MIL-STD-202, Method 101; Cond. B	**Salt spray**
MIL-STD-202, Method 212; 20 G	MIL-STD-202, Method 212; 20 G	MIL-STD-202, Method 212; 20 G	**Acceleration**
MIL-PRF-24236/1 and QPL	meets or exceeds requirements of MIL-PRF-24236	MIL-S-24236/NASA S-311-641/01	**Approvals**
hermetically sealed; tight tolerances and differentials; hi-rel; QPL listed	hermetically sealed; tight tolerances and differentials; hi-rel	NASA certified; space qualified; hermetically sealed; tight tolerances and differentials; pre-set and tamper proof; SPST contacts	**Features**

PACKAGED TEMPERATURE PROBES

Compact, lightweight. Operate with enhanced sensitivity, reliability, and stability under diverse conditions of shock, vibration, humidity, and corrosion. Variety of custom packages available for air, liquid, and solid temperature sensing applications. Often used for engine bleed air, operator controls, environmental control systems, and weather stations.

SERIES	R300	ES-110	ES-120
Temp. sensing type	immersion	air/gas	immersion
Thermistor type	RTD	NTC	NTC or KTY
Nominal resistance at 25 °C [77 °F]	100 Ohm	2000 Ohm	2000 Ohm
Operating temperature range	-40 °C to 275 °C [-40 °F to 572 °F] continuous, excursion to 300 °C [572 °F] for 10 minutes max.	-40 °C to 150 °C [-40 °F to 302 °F]	-40 °C to 150 °C [-40 °F to 302 °F]
Housing material	stainless steel	brass	brass
Electrical and mechanical interface	overmolded connector with M14 x 1.50 thread	overmolded connector with M10 x 1.25 or M12 x 1.50 thread	overmolded connector with M10 x 1.25, M10 x 1.0, M12 x 1.5, M14 x 1.50 thread, or 1/8 PTF
Features	enhanced response, reliability, and accuracy; stainless steel construction	exposed thermistor; rugged design; brass encapsulation	enclosed thermistor; rugged design; brass encapsulation

512	526	534	590	SERIES
surface/immersion	surface/air/immersion	surface	surface	**Temp. sensing type**
NTC	NTC	NTC	NTC	**Thermistor type**
various	various	various	various	**Nominal resistance at 25 °C [77 °F]**
-60 °C to 204 °C [-76 °F to 399 °F]	-60 °C to 160 °C [-76 °F to 320 °F]	-30 °C to 50 °C [-22 °F to 122 °C]	-60 °C to 150 °C [-76 °F to 302 °F]	**Operating temperature range**
aluminum or stainless steel	aluminum or stainless steel	various	aluminum or stainless steel	**Housing material**
threaded bodies with two flying leads	various connector options, threaded bodies, protective shrouds	network configuration: two thermistors in a thermoplastic housing with two flying leads	adhesion with two flying leads; ring tongue (#5, #6, #10) with two flying leads; ring tongue with Molex connector; threaded body with flying leads	**Electrical and mechanical interface**
wide variety of probe assembly styles; choice of custom or existing designs; enhanced sensitivity, accuracy, stability/low drift; RTD linear output available	wide variety of probe assembly styles; choice of custom or existing designs; enhanced sensitivity, accuracy, stability/low drift; RTD linear output available	simplifies circuitry in digital readout systems; delivers relatively linear resistance output and offers the enhanced sensitivity and accuracy of a thermistor; can be used in a resistance or voltage mode	wide variety of probe assembly styles; choice of custom or existing designs; enhanced sensitivity, accuracy, stability/low drift; RTD linear output available	**Features**

PRESSURE SENSORS AND SWITCHES

Engineered with fully steel media isolating with stainless steel and no internal elastomeric seals. Resistant to harsh, aggressive media, and challenging environments. Applications include aerospace (environmenatal systems, engines, fuel pressure, and hydraulic systems), military ground vehicles, ordnance and munitions release systems, and military maritime systems.

SERIES	MLH	1HP
Pressure connection	1/4-18 NPT; M12 x 1.5 (ISO 6149); M14 x 1.5 (ISO 6149); 3/8-24 UNF (SAE-3 o-ring boss); M18 x 1.5 (ISO 6149); 1/8 in-27 NPT; 1/2 in-20 UNF (SAE-5 o-ring boss); M10 x 1 (ISO 6149); 1/4 in SAE female Schrader; 7/16-20 UNF (SAE-4 o-ring boss); 1/2 in NPT; 9/16-18 UNF (SAE-6 o-ring boss); PT 1/4-19 BSP tapered thread; G 1/4-19 (DIN 3852-2); G 1/8 with o-ring groove; M16 x 1.5 (ISO 6149); G 1/4 with o-ring groove; G 1/8 (DIN 3852-2); PT1/8-28 BSP tapered thread; M20 x 1.5 (ISO 6149); 1/2-20 37° Flare (SAE JIC)	MS33656E4 MS33514E4 MS33656E3 AS5202-04
Measurement	gage, sealed gage	gage, sealed gage
Construction	port - 304L stainless steel; diaphragm - Haynes 214 alloy	stainless steel
Pressure range	0 psi to 50 psi through 0 psi to 8000 psi	150 psi to 5000 psi
Output signal	0.5 Vdc to 4.5 Vdc ratiometric output at 5 Vdc excitation; 4 mA to 20 mA current from 9.5 Vdc to 30 Vdc excitation; 1.0 Vdc to 6.0 Vdc regulated output from 8 Vdc to 30 Vdc excitation; 0.25 Vdc to 10.25 Vdc regulated output from 14 Vdc to 30 Vdc excitation; 0.5 Vdc to 4.5 Vdc regulated output from 7 Vdc to 30 Vdc excitation; 0 mV to 50 mV from 5 Vdc excitation; 1 Vdc to 5 Vdc output from 8 Vdc to 30 Vdc excitation	28 Vdc excitation
Accuracy	±0.25 % full scale BFSL (±0.5 % full scale BFSL on ranges below 100 psi)	set point precision: ±10 %
Amplified	yes	no
Temp. range	-40 °C to 125 °C [-40 °F to 257 °F] (comp.)	-55 °C to 70 °C [-67 °F to 158 °F]
Termination	Packard MetriPak 150; Hirschmann; M12 x 1 (Brad Harrison micro); DIN 72585 (Cannon APD type); DIN 43650-C (IP65); Amp Superseal 1.5 (IP67); cable; flying leads; Deutsch DTM04-3P (integral)	back exit, M22759/7-20 wire; right angle exit, M27759-7-20 wire MS3106A-10SL-3S connector
Measurements	27,0 mm H x 27,0 mm W x 55 mm D [1.06 in H x 1.06 in W x 2.18 in D]	Ø 21 mm x 70 mm L [Ø 0.825 in x 2.77 in L]
Approvals	UL, CE (for many models) **Product is not DO-160/DO-254 compliant.**	qualified to RTCA DO-160D; MIL-PFR-8805 rated switch mechanism
Features	all-wetted parts; no internal elastomeric seals; stable and creep-free; reverse voltage and output short circuit protected; less than 2 ms response time	suitable for air, fuel, water, oil, or Skydrol™; easily configurable to different pressure set points and differentials; burst pressure rating of 12000 psi; high current or logic-level loads; configurable with multiple pressure fittings and electrical connectors

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 acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all 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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