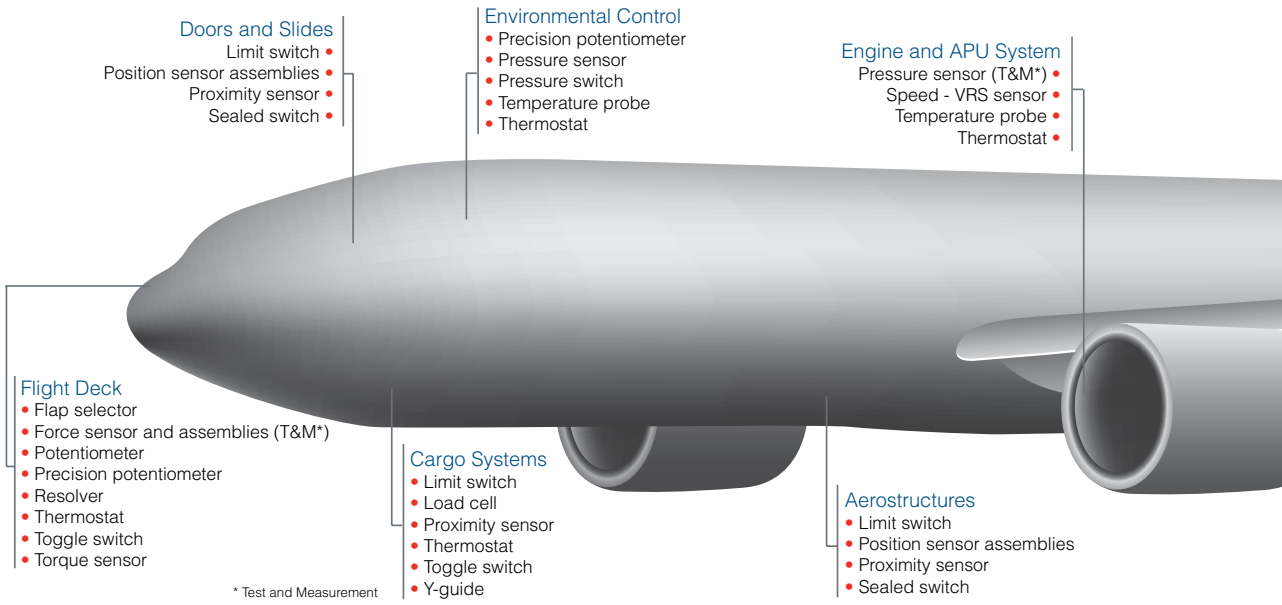
AEROSPACE AND DEFENSE

Sensors and Switches
Product Range Guide

Honeywell

Commercial and Business Aircraft



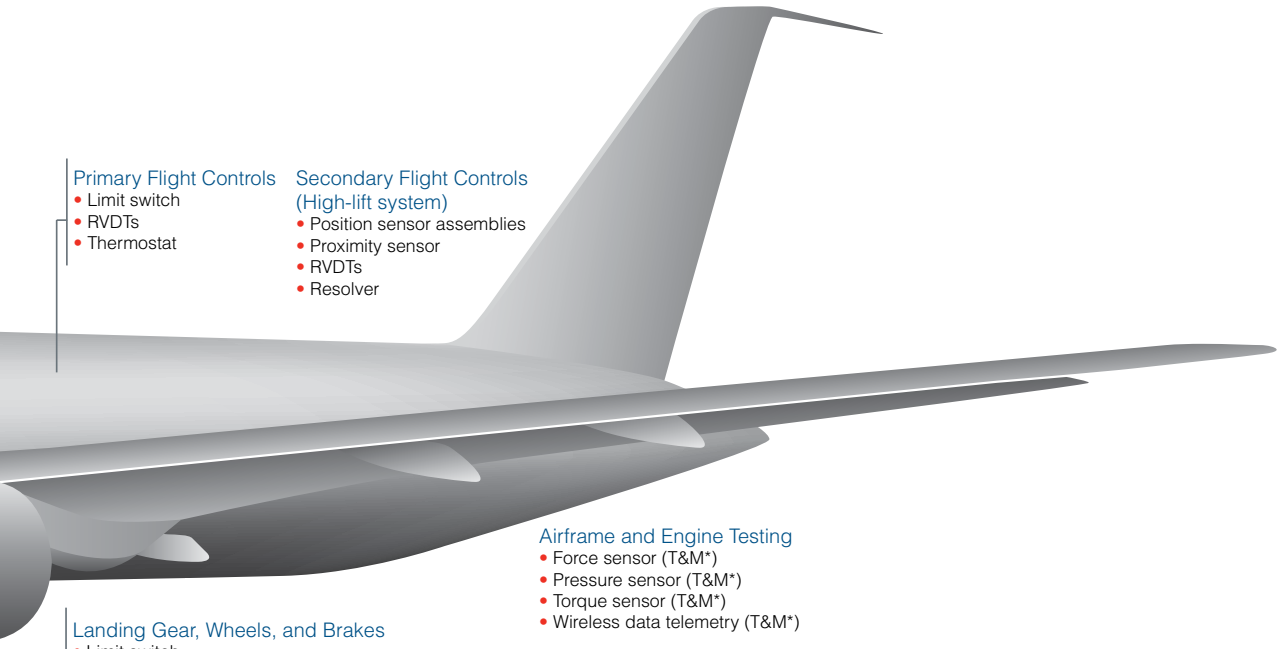
* Test and Measurement

Honeywell Sensing and Productivity Solutions 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 include engineering, sensor development, analog/digital electronics, and environmental packaging. Part and assembly customization is 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 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.



Primary Flight Controls
- Limit switch
- RVDTs
- Thermostat

Secondary Flight Controls (High-lift system)
- Position sensor assemblies
- Proximity sensor
- RVDTs
- Resolver

Airframe and Engine Testing
- Force sensor (T&M*)
- Pressure sensor (T&M*)
- Torque sensor (T&M*)
- Wireless data telemetry (T&M*)

Landing Gear, Wheels, and Brakes
- Limit switch
- Load cell
- Position sensor assemblies
- Pressure sensor (T&M*)
- Proximity sensor
- RVDT
- Sealed switch
- Speed - VRS sensor
- Thermostat

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.

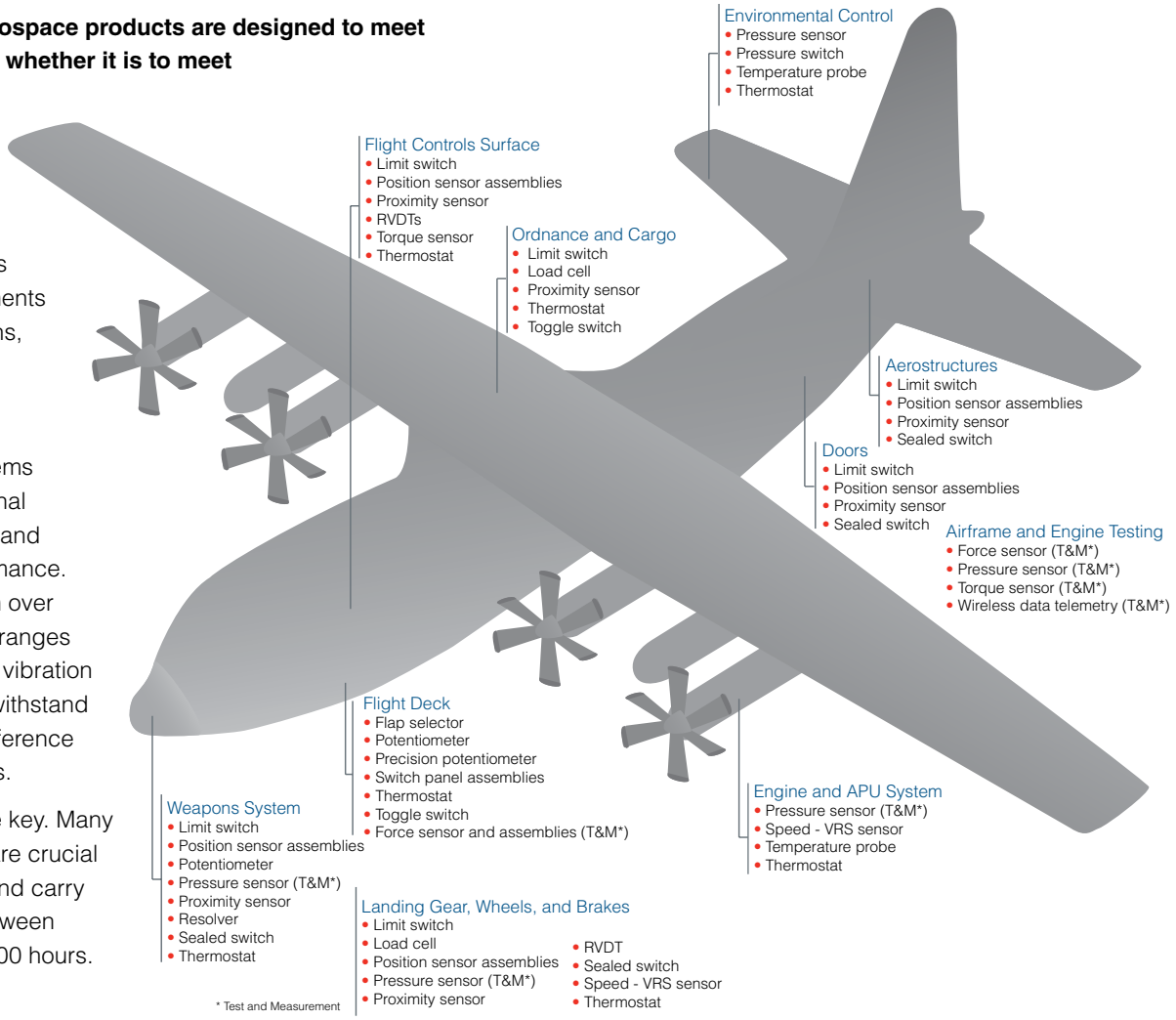
- Temperature sensors
- Pressure transducers
- Position transducers
- Speed sensors
- Oil level sensors
- Pressure and level switches
- Accelerometers

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

Military Aircraft

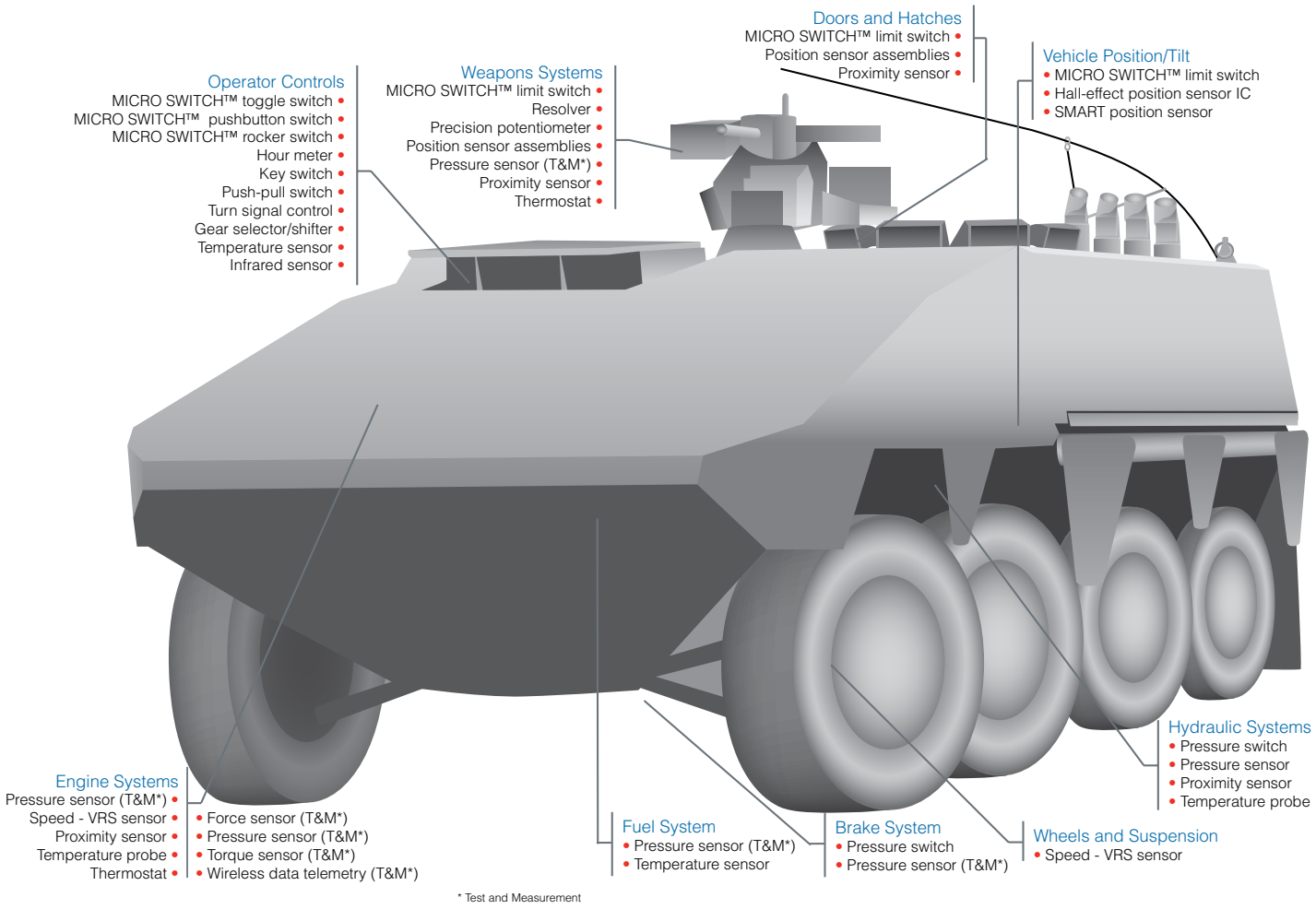
Honeywell aerospace products are designed to meet challenges – whether it is to meet commercial industry standards or unique high performance environments. Honeywell's engineers focus on the requirements for military applications, including pilot safety and comfort, smooth and accurate flight control, 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



* Test and Measurement

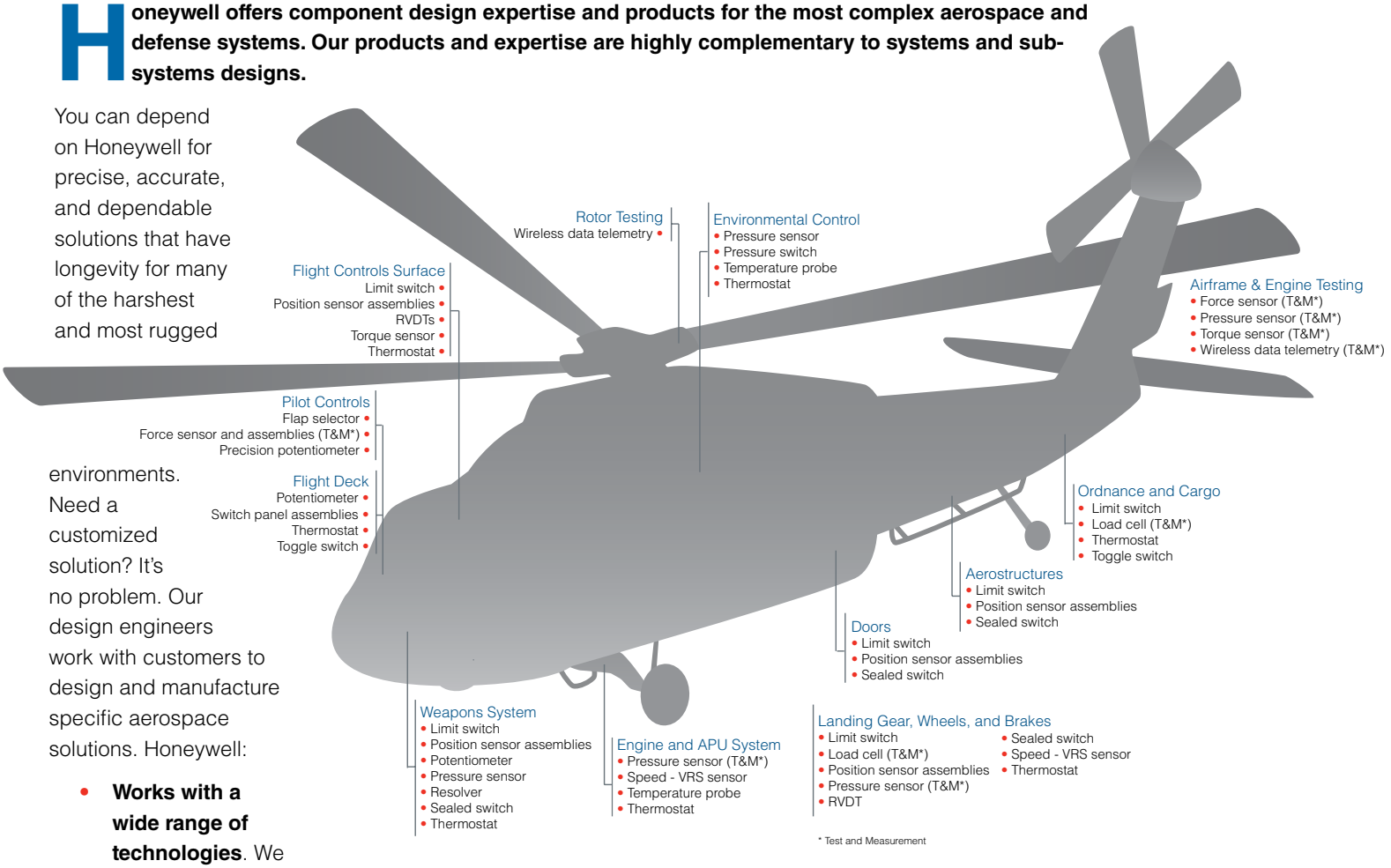
Designed for harsh environments. When crews are under fire, they should never have to think twice about whether their systems will work properly. With Honeywell sensors, switches, and custom controls, you get performance levels you can rely on.

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.

Rotorcraft

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 sub-systems 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:



* Test and Measurement

- **Works with a wide range of technologies**. We offer RVDT, LVDT, resolver, synchro, metal-foil strain gage, high gain thick film gage, and spring-LVDT, potentiometer, 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.
- **Delivers fully interchangeable and integral signal conditioning**. Our linear force measurement products include integrated signal conditions to meet system interface needs. Optional signal conditioning provides calibration and compensation to allow interchangeability of products without the need to re-calibrate the system.

Weapon 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.

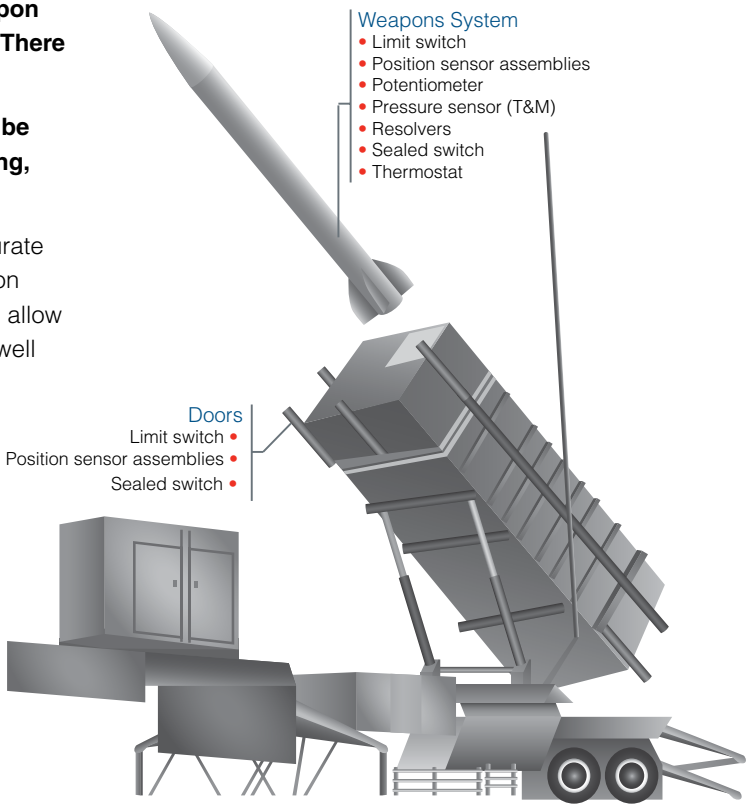
Subsystem interfacing expertise is apparent in our highly accurate and reliable sensors, switches, and control products for weapon systems. Honeywell position sensors in the seeker mechanism allow the system to interpret location in real time. In addition, Honeywell components feature design flexibility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



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

RVDTs

Honeywell Position Transmitters fly on a multitude of commercial and military aircraft, and have become the standard when high integrity and reliability are critical. Always 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

Force and Torque Sensors for Aircraft

Honeywell provides instrumented flight control linkage to monitor pilot input forces for ailerons, rudder, and brakes. Designed to comply with FAA part 135, 121 and other sections, devices are configured in length or envelope to the specific application. Specifically designed for onboard use, all devices are custom-configured and tested to DO-160 aircraft environmental requirements.

Control rods are available with either traditional strain-gage sensing, or spring/LVDT-based instrumentation. Each technology has unique advantages; please contact our application engineering for assistance. To enhance safety, a unique redundant load-path design option is also available.

- High vibration/turbo-prop rugged
- Customizable scale factor, output, and input voltage
- Unique torque quadrant design saves weight and space over control rods
- Entire suites of FAA part 135 position and force sensors

Robust IHM 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 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 13 for typical device specifications

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

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

Series	Honeywell Hawk™ 1-inch	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

Lighted or unlighted, pushbuttons are designed to enhance manual operation with a flexible and attractive interface. Snap-in surface products are easy to apply, operate, and maintain. Often used in control boards and panels found in instrumentation, flight decks, and test equipment.

Series	AML	PB
Housing type	non-lighted, rectangle; 1 lamp circuit, rectangle; 2 lamp circuits, rectangle	based on the AT Series toggle design with a stainless steel housing
Circuitry	SPST, SPDT, DPST, DPDT, 4PDT	2-pole, 3-pole, 4-pole
Action	2 position, 3 position (momentary or maintained action)	–
Mounting	snap-in panel	threaded bushing
Sealing	–	panel-seal version, hermetically sealed switch units
Termination	solder, quick connect, printed circuit, push-on	solder, H58, quick-connect
Ampere/voltage range	0.4 A to 2 A @ 0.5 Vdc to 30 Vdc; 0.4 A to 3 A @ 0.5 Vac to 125 Vac; 0.4 A to 2 A @ 0.5 Vac to 250 Vac	2 A to 5 A, 125/250 Vac
Light (if applicable)	no lamp installed; incandescent 6 V, 14 V, 28 V; neon	–
LED/neon color	red, yellow, green	–
Measurements	panel area: 20,5 mm x 30,5 mm [0.80 in x 1.20 in]	various
Approvals	–	UL, CSA external parts corrosion-resistant per MIL-PRF-8805; meets explosion-proof requirements of MIL-PRF-8805
Features	silver and gold contacts; available with or without diode protection for LEDs; lamp circuit independent of switch circuit	up to four poles; compact or miniature sizes; sealed versions available

Product support and availability are limited to existing products.

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 demanding applications. 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[1]	IHM - 3 State[1]
Description	one piece 5/8 in proximity sensor	one piece 5/8 in proximity sensor
Technology	enhanced ECKO[1]	enhanced ECKO with health monitoring option[1]
Target material	stainless steel	stainless steel
Load current	up to 250 mA depending on model	4 mA to 20 mA current loop standard[1]
Supply current	15 mA max., <6 mA typ.	4 mA typ. (does not include load current)
Sensing face	shielded	shielded
Housing material	hermetic - stainless steel	hermetic - stainless steel
Guaranteed actuation distance	to 4 mm	to 4 mm
Operating temperature range	-55 °C to 125 °C [-67 °F to 257 °F]	-55 °C to 125 °C [-67 °F to 257 °F]
Supply voltage	18 Vdc to 32 Vdc, or 11 Vdc to 18 Vdc standard	15 Vdc to 32 Vdc standard
Output type	normally open/closed, current sinking (NPN)	current loop
BIT diagnostics	available (non standard)	health monitoring (3-state output) standard; disabled as option[1]
Short circuit	yes	yes
Pressure proof	custom option[2]	custom option[2]
Reverse polarity	yes	yes
MTBF (hours)	–	–
Approvals	DO-254, DO-160[1]	DO-254, DO-160[1]
Measurements	5/8 in diameter x ~2 in length (depends on model)	5/8 in diameter x ~2 in length (depends on model)
Features	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

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

Series	932AB2W	ZS-00351-01	932AA3W
Description	one-piece M12 proximity sensor	one-piece M18 proximity sensor	one-piece M18 proximity sensor
Technology	ECKO	ECKO	ECKO
Target material	metallic	metallic	metallic
Load current	200 mA	100 mA	≤200 mA up to 85 °C to 100 mA at 100 °C
Supply current	–	–	–
Supply voltage	20 Vdc to 33 Vdc	12 Vdc to 32 Vdc	20 Vdc to 323 Vdc
Sensing face	ceramic	ceramic	ceramic
Housing material	stainless steel	stainless steel	stainless steel
Guaranteed actuation distance	3 mm to 3,99 mm [0.118 in to 0.157 in]	4 mm to 4,99 mm [0.1574 in to 0.19646 in]	4 mm to 4,99 mm [0.1574 in to 0.19646 in]
Operating frequency	200 mA	100 mA	≤ 200 mA up to 85 °C to 100 mA at 100 °C
Operating temperature range	-40 °C to 100 °C [-40 °F to 212 °F]	-35 °C to 63 °C [-31 °F to 145 °F]	-40 °C to 100 °C [-40 °F to 212 °F]
Supply voltage	20 Vdc to 33 Vdc	12 Vdc to 32 Vdc	20 Vdc to 323 Vdc
Output type	normally open, current sourcing	normally open, current sinking	normally open, current sourcing
BIT diagnostics	no	yes	no
Short circuit	yes	yes	yes
Pressure proof	no	no	no
Reverse polarity	yes	yes	yes
MTBF (hours)	144000 hr @ 20 °C, NU/GM application	106000 hr @ 20 °C, GM	144000 hr @ 20 °C, NU/GM application
Approvals			
Measurements	M12 x 1 77 mm L [3.03 in L]	M18 x 1 73 mm L [2.87 in L]	M18 x 1 80 mm L [3.15 in L]
Features	stainless steel; high level of electronics protection; high frequency switching; lead wire or connector termination	stainless steel; high level of electronics protection; built-in test function (BITE); lead wire or connector termination	Hall-effect, magnetic field sensitive; stainless steel; high level of electronics protection; high frequency switching






100 FW	200 FW	300 FW	21 FW	23 FW	5 FW
one-piece 5/8 in proximity sensor	one-piece 5/8 in proximity sensor	two-piece proximity sensor	one-piece 12 mm proximity sensor	one-piece 22,2 mm proximity sensor	target, special, proximity sensor
ECKO	hall	ECKO	hall	hall	magnet
all metals	magnet	ferrous metals	–	–	–
120 mA, 50 mA lamp	100 mA, 50 mA lamp	750 mA	20 mA	20 mA	–
20 mA max. @ 25 °C	20 mA max. @ 25 °C	65 mA max.	25 mA	25 mA	–
18 Vdc to 32 Vdc	18 Vdc to 32 Vdc	18 Vdc to 32 Vdc	18 Vdc to 32 Vdc	18 Vdc to 32 Vdc	–
shielded, unshielded	shielded	shielded	stainless steel	stainless steel	stainless steel
stainless steel	stainless steel	stainless steel	stainless steel	stainless steel	stainless steel
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]	250 gauss	250 gauss	–
–	–	–	–	–	–
-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]	-55 °C to 150 °C [-67 °F to 302 °F]	-55 °C to 125 °C [-67 °F to 257 °F]	-55 °C to 150 °C [-67 °F to 302 °F]
18 Vdc to 32 Vdc	18 Vdc to 32 Vdc	18 Vdc to 32 Vdc	18 Vdc to 32 Vdc	18 Vdc to 32 Vdc	–
normally open, current sinking	normally open/closed, current sinking	normally open/closed, current sinking	normally open, current sinking	normally open, current sinking	–
–	–	–	yes	yes	–
–	–	–	no	no	–
–	–	–	no	no	–
–	–	–	no	no	–
–	–	–	35000	115000	–
FM Class 1, Division 2, Groups A, B, C, D	FM Class 1, Division 2, Groups A, B, C, D	MIL-STD-810B	MIL-STD-461E	MIL-STD-461E	–
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]	Ø 12 mm [Ø 0.47 in]	Ø 22,2 mm [Ø 0.9 in]	Ø 12 mm [Ø 0.47 in]
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	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

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
military-grade stainless steel with environmental seals limit switch	hermetically sealed stainless steel limit switch	hermetically sealed stainless steel limit switch
MIL-PRF-8805, symbol 4 hermetic	MIL-PRF-8805, symbol 5 hermetic	MIL-PRF-8805, symbol 5 hermetic
-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]
top plunger, top roller, top rotary	top plunger, top roller plunger, nylon button	top plunger, top roller plunger
screw, leadwire, leadwire with connector, pin receptacle, side receptacle	screw, leadwire, bottom receptacle	screw, leadwire (receptacle termination available)
SPDT, DPDT	two or four SPDT circuits	SPNO, DPDT
silver, gold	silver, gold	silver, gold
1 A to 15 A (resistive	1 A, 5 A, 7 A (resistive)	5 A (resistive)
MIL-PRF-8805 symbol 4 hermetic (MIL-PRF-8805 QPL listings available)	MIL-PRF-8805, symbol 5 hermetic	MIL-PRF-8805, symbol 5 hermetic
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]
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

Hermetic and environmentally sealed 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	AT
Type	stainless steel toggle
Sealing	MIL-S-8805/26/98
Operating temperature	various
Actuator/lever	standard, locking, tab, special design
Action	2-position, momentary & maintained
Mounting	15/32 in bushing, 1/4 in bushing, 3-hole, above panel
Termination	solder, solder T2, screw, quick connect, leadwire, H58
Circuitry	SPDT, DPDT, DPNO, 3PDT, 4PDT, 6PDT, 7PDT, 8PDT, 10PDT
Contacts	silver, gold
Amp rating	0.01 A to 5 A (resistive)
Measurements	various
Approvals	qualified to MIL-S-8805/26/98
Features	choice of sealed bushing; short behind panel depth

TW	ET	TL
miniature stainless steel toggle	magnetically held toggle	military-grade toggle
qualified to MIL-S-83781	most listings qualified to MIL-S-5594	qualified to MIL-S-3950
-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]
standard, locking, special design, tab	standard, pull/push-to-unlock, tab	standard, special design, tab, paddle, none
2- or 3-position, momentary & maintained	2- or 3-position, momentary & maintained	2- or 3-position, momentary & maintained
bushing 15/32 in or 1/4 in	bushing 15/32 in	bushing 15/32 in
IWTS, solder, screw, quick connect, H58, T2	screw, leadwire, turret	IWTS, solder, screw, quick connect, leadwire
SPST, SPDT, DPST, DPDT	SPDT, DPDT, 4PDT	SPST, SPDT, DPST, DPDT, 3PST, 3PDT, 4PST, 4PDT
silver alloy, gold-plated	silver alloy, gold-plated	silver alloy, gold-plated
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)
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]
UL, qualified to MIL-S-83781	qualified to MIL-S-5594	UL, CSA, CE, qualified to MIL-S-3950
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

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

Known for enhanced quality, reliability, and durability. Engineered with fully steel media isolating with stainless steel and no internal elastomeric seals. Resistant to harsh, aggressive media, and challenging environments. Potential applications include aerospace (environmental 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

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 x 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
QPL series military thermostats	military thermostat	aerospace
5.0 A resistive	5.0 A resistive	5.0 A resistive
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
-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]
-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]
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
MIL-STD-202, Method 302; 500 MOhm	MIL-STD-202, Method 302; 500 MOhm	MIL-STD-202, Method 302; 500 MOhm
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.
MIL-STD-202, Method 112; Cond. C	MIL-STD-202, Method 112; Cond. C	MIL-STD-202, Method 112; Cond. C
MIL-STD-202, Method 106	MIL-STD-202, Method 106	MIL-STD-202, Method 106
MIL-STD-202, Method 213; 100 G	MIL-STD-202, Method 213; 400 G	MIL-STD-202, Method 213; 750 G
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
MIL-STD-202, Method 107; Cond. B	MIL-STD-202, Method 107; Cond. B	MIL-STD-202, Method 107; Cond. B
MIL-STD-202, Method 101; Cond. B	MIL-STD-202, Method 101; Cond. B	MIL-STD-202, Method 101; Cond. B
MIL-STD-202, Method 212; 20 G	MIL-STD-202, Method 212; 20 G	MIL-STD-202, Method 212; 20 G
MIL-PRF-24236/1 and QPL	meets or exceeds requirements of MIL-PRF-24236	MIL-S-24236/NASA S-311-641/01
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

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
Temp. sensing type	immersion	air/gas
Thermistor type	RTD	NTC
Nominal resistance at 25 °C [77 °F]	100 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]
Housing material	stainless steel	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
Features	enhanced response, reliability, and accuracy; stainless steel construction	exposed thermistor; rugged design; brass encapsulation





ES-120	512	526	534	590
immersion	surface/immersion	surface/air/immersion	surface	surface
NTC or KTY	NTC	NTC	NTC	NTC
2000 Ohm	various	various	various	various
-40 °C to 150 °C [-40 °F to 302 °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]
brass	aluminum or stainless steel	aluminum or stainless steel	various	aluminum or stainless steel
overmolded connector with M10 x 1.25, M10 x 1.0, M12 x 1.5, M14 x 1.50 thread, or 1/8 PTF	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
enclosed thermistor; rugged design; brass encapsulation	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

Test & Measurement Capabilities

When designing, testing, and building the latest products for the aerospace industry, sensors must stand up to the job and be able to perform under harsh and demanding conditions, fit in extremely tight spaces, and be rugged enough to withstand multiple testing runs to provide precise, accurate results over time, every time.

See why more aerospace manufacturers turn to Honeywell whenever they need sensors for their aerospace test and measurement applications. Honeywell offers...

- Nearly 80 years of experience serving the aerospace industry
- A comprehensive portfolio of test and measurement sensor products
- High product accuracy, reliability, and robustness
- Calibration, repair, and warranty service for all Honeywell test and measurement sensors
- Extensive custom engineering capabilities
  - In-house design ability
  - Global engineering and manufacturing expertise
  - Fast delivery for both large and small custom orders
- Custom designs for:
  - Extreme operating conditions
  - Demanding specifications
  - Specific physical configuration requirements

Comprehensive Portfolio

Honeywell has one of the broadest product portfolios on the planet. This amazing breadth of solutions covers a wide array of technical platforms, eliminating the need for multiple suppliers. We also offer products that comply with specific agency approvals or other industry standards for trusted product performance.

Application Expertise

Honeywell delivers extensive expertise to help address sensing challenges. Whether it's assisting in determining which existing product best serves an existing need or designing a new sensor, we ensure superior performance from each product and solution.

Custom Engineering

When no "standard" part seems just right, our engineers will design a custom solution by performing minor – or sometimes major – modifications to our sensors. In-house design, engineering, and manufacturing expertise means fast delivery for both large and small batches of custom-engineered solutions.

Our application expertise and custom engineering help our customers find solutions!

An aerospace controls system developer had a problem… and they came to Honeywell to solve it.

This manufacturer required specialized load cells for throttle controls used in military aircraft and the supplier was not meeting product specification requirements.

Looking for a vendor that had the expertise to customize products, they approached Honeywell. Honeywell's engineering team developed a miniature load cell with a special thread, internal amplifier, and specialized connector to meet the customer's exact specification requirements – something their previous supplier could not do.

By designing a superior load cell to meet the customer's specifications for the application, along with ongoing service and support as a single-source supplier, Honeywell has been this customer's supplier for more than 13 years.
Problem solved.

Load Cell/Miniature Load Cell Applications

- In-flight refueling*
- Flight test airframe testing and structural support
- Pilot force input (stick, wheel pedals) to black box*
- Hook load sensor for helicopters*
- Airframe testing
- Throttle control sensors*
- Landing gear, systems, and doors
- Braking systems

Pressure Sensor/ Miniature Pressure Sensor Applications

- Aircraft environmental control system pressure sensors*
- Various hydraulic systems on flight test aircraft*
- Ground testing of aerospace support systems
- Component test validation and quality assurance
- Surface aerodynamic testing
- Tire pressure testing

Torque Applications

- Aircraft hydraulic pump testing
- Flap actuator testing
- Satellite panel actuator torque monitoring sensor*
- Torque measurement of propeller of a turboprop aircraft engine*
- Customized, strain-gaged torque sensors for demanding, individualized customer applications

Wireless Telemetry Applications

- Main rotor / tail rotor drive torque measurement
- Space shuttle fuel pump testing
- Dynamic strain measurement on turbine blades for jet engines

* on board position

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.**

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 switching products, call **+1-815-235-6847**, email inquiries to **info.sc@honeywell.com**, or visit **sensing.honeywell.com**

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