Pigtail proximity sensor for aerospace

Overview

Ideal for detecting the position of critical aircraft structures that are mechanically well controlled and have tighter geometric tolerances such as landing gear position. It can be used when others can't can't due to space limitations. It has a single inductive core, providing variable inductive reluctance to sense changes with respect to its distance from a ferrous target. The sensor performs in applications with a gap range up to 0.100 inches.

Key features

- Design for applications where space is otherwise insufficient for a rectangular or round connector
- Hermetically sealed construction
- Stainless steel housing
- Corrosion resistant MIL-SPEC mounting hardware
- Standard or customer specified targets
- Pigtail Sensor with 123" long lead wire 0.2500 lbs
- ATA 32
- DO-160G environmental conditions and test procedures for airborne equipment
- MIL-STD-202G method 213B shock to 1,000g
- 1,000,000 hour reliability
- AS9100 Quality Management System

Technical specification

Feature	Description
Type	Two-wire, passive proximity sensor, variable inductive reluctance
Electrical interface	MIL-DTL-27500 cable (M27500-22SS2Y23) XL-ETFE insulated nickel-coated copper conductor and shield, 123" long in standard configuration
Connector pins	N/A, two flying leads, shield is connected to case (ground)
Principals	The inductance of the sensor changes with respect to its distance from a ferrous target. The sensor inductance increases in an exponential fashion as the target approaches the sensor face. Reference inductance values given at 1V @ 600 Hz at room temperature (25°C).
Target material	17-4 Stainless steel per AMS 5604 heat treated H1050 condition
Inductance, target near	8.76 ±0.16 mH at 0.049” from a 1" diameter round target of thickness 0.1"
Inductance, target far	8.03 ± 0.10 mH at 0.100” from a 1" diameter round target of thickness 0.1"
Side metal effect	The effect of (mild steel) side metal located behind the sensing face and with a 1mm gap (with respect to the threaded portion of the sensor) on the inductance of the sensor with a standard target with a gap of 1 mm shall is less than ± 0.010mH.
Temperature effect	≤ ±0.15 mH throughout the operating temperature range (-55°C to +70°C) referenced from the air inductance value with no target present at +20°C
Stability	≤ ±0.5% of reading change over the qualified life of the sensor referenced from the initial measurement taken at ambient temperature with target in the near state

Technical specification

Feature	Description
AC resistance	13Ω ±10% at room temperature using an excitation frequency of 600 Hz ±0.1%
Dielectric	Dielectric Strength (MIL-STD-202, Method 301) ≤ 1 mA dielectric strength of 1.07 kV RMS (1.5kV Peak) applied for 1 minute between the signal wires and housing
Insulation resistance	Insulation Resistance (MIL-STD-202, Method 302) insulation resistance ≥ 20 MΩ with 1.5 kV DC applied for 1 minute between the signal wires and housing
Bonding and grounding	The maximum resistance between any point on the sensor and the cable shield is 10mΩ. Bonding path to airframe is provided by mounting hardware.
Certification	Refer to RTCA DO-160G Environmental Procedures & Test Conditions for Airborne Equipment unless otherwise stated in this document
Ground survival low temperature	-55°C (Cat F2)
Short time low operating temperature	-55°C (Cat F2)
Low operating temperature	-55°C (Cat F2)
Ground survival high temperature	+85°C (Cat F2)
Short time high operating temperature	+70°C (Cat F2)
High operating temperature	+70°C (Cat F2)
Maximum operating altitude	55,000 ft (Cat F2)

Technical specification

Feature	Description
Decompression	55,000 ft
Overpressure	-15,000 ft
Temperature variation	-55°C to +70°C (Cat A
Humidity	Cat C
Operational shock	Cat B
Crash safety	Cat B
MIL-STD-202-213 shock (specified pulse)	3 shocks, 1,000 g's, in all 6 orthogonal directions (±X, ±Y, and ±Z, 18 shocks total) in accordance with MILSTD-202-213 (MIL-STD-202G Method 213B) Condition E.
High-level, short duration vibration	Cat H, Curve P
Robust vibration (sine)	Cat R, Curve W
Robust vibration (random)	Cat R, Curves E & E1
Explosion proofness	Cat H Zone II
Waterproofness	Cat S & R
Fluid susceptibility	Cat F applicable fluids: hydraulic fluids (phosphate ester-based (synthetic), Type IV, MIL-PRF-5606K hydraulic fluid, petroleum base), lubricating oils (mineral based, ester based), cleaning fluids (isopropanol alcohol, denatured alcohol, cleaning compound for aircraft surfaces), de-icing fluid (ethylene glycol propylene glycol, AEA Type 1, AEA Type 2, SAE Type 1, SAE Type 2, SAE Type 4, and runway deicer

Technical specification

Feature	Description
Sand and dust	Cat S
Fungus resistance	Cat F
Salt fog	Cat S
Magnetic effect	Cat A, test - as part of system
Power input	N/A - no power input
Voltage spike	N/A - no power input
Audio frequency conducted susceptibility	MIL-STD-461E test category CS101 note - N/A power lines only, Test – as part of system.
Induced signal susceptibility	MIL-STD-461E test category CS101, test – as part of system
Radio frequency susceptibility (radiated and conducted)	Cat YG, test – as part of system
MIL-STD-461E CS115 and CS116 (conducted susceptibility)	Test – as part of system.
Emission of radio frequency energy	Cat M except for subsection 21.4. MILSTD-461E test category RE103 in place of subsection 21.4. Cat H, test – As part of system.
Icing	Cat B, C
Static discharge	Cat A
Fire, flammability	Cat C
Storage temperature	+85°C

Technical specification

Feature	Description
Reliability	MTBF ≥ 1,000,000 hours
Housing material	304 stainless steel
Length	1.6" housing, 2.16" including strain relief
Diameter	0.621" O.D.
Mounting threads	.625-24 UNEF-2A threads
Nut	MS21340-05, military standard plain hexagon nut, electrical thin (with lockwire holes), corrosion resisting steel
Washer	MS25081C6, military standard key washer, corrosion resisting steel
Installation torque	8.0 ±2.0 lbf-ft; 10.8 ±2.7 N-m
Weight	0.240 lbs (0.109 kg) - with 2 nuts and 1 washer 0.260 lbs (0.118 kg)
Packaging	Ultra Energy specified packaging is used for shipping and storage. A protective cap is installed over the sensor face prior to shipping. Remove cap prior to installation.
Accessories	Standard ferrous targets

FAQs

What are some aerospace applications for proximity sensors?

Proximity sensors are used on aircraft for sensing the position of critical structures including landing gears and doors, passenger and cargo doors, slats and flaps and thrust reversers.

What target material is suitable for aerospace proximity sensors?

Sensor can detect ferrous metals only. Aluminum will cause deactuation and can therefore serve as a anti-target.

Will Ultra Energy perform a ‘test - as part of system’?

Electrical interface circuitry typically resides in landing gear control unit or proximity sensor electronics unit or proximity sensor module. Note that all tests designated as ‘test – as part of system’ will only be performed at customers’ request.

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