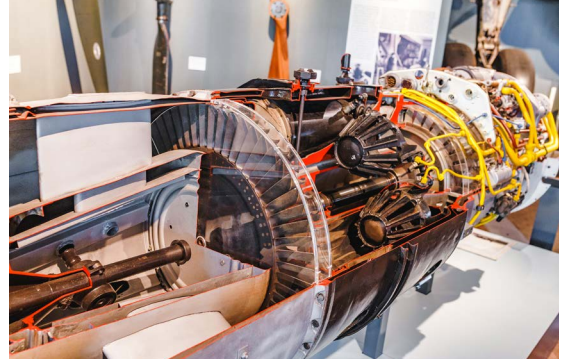


APPLICATION NOTE

Aircraft Bleed Air Systems, Air Flow and Temperature Switches and Transmitters



Safe and reliable operation of Aircraft Bleed Air Systems is vital to support aircraft subsystems including pilot and passenger cabin air control, thermal management of vital electronic equipment, and support of accessories cooled by Air Cycle Machines (ACM) or PACK air conditioning systems. Low flow detection and measured flow rate in these key conditioned air applications is a challenge due to the requirement of mass flow measurement, wide range capability and high temperature operation. In addition, high reliability and no maintenance service is vital to the continual, economic safe operation of the aircraft and its systems. Simultaneous detection of flow and temperature is an additional design benefit to reduce the number of measurement sensors required to meet system operation parameters. FCI has the perfect solution for this important requirement with its fully qualified Bleed Air Flow Switch and Transmitter product lines.



Application Challenges

- Bleed Air Systems require extremely reliable high mass flow rate sensing capability in very high temperature and vibration service to alarm inadequate cooling of key aircraft systems.
- Air Flow Switches and Transmitters must operate in the harsh aircraft environments found around operating engines including widely varying temperature, pressure, and vibration conditions.
- Commercial and military aircraft components must meet stringent qualification requirements including vibration, Electrical Magnetic Interference (EMI), Radio Frequency Interference (RFI), and high MTBF in salt/fog environments defined by the commercial and military specifications.
- Traditional mechanical and electronic flow sensors do not provide a single, calibrated, independent mass flow rate and temperature output.
- Mechanical flow switches and turbine flow meters are inherently unreliable due to fouling and wear of moving parts resulting in very low Mean Time Between Failure (MTBF) performance.
- Differential pressure and mechanical turbine meters have narrow flow range capability, not sensitive to low flow rate detection, and require additional pressure and temperature sensors to measure mass flow rate.

Aircraft Installation Requirements

- **Pipe and Duct Diameters:** 1 to 10 inches+ (25 to 250 millimeter+) air ducts
- **Typical Air Flow/Temperature Range:** 0.5 to 600 Standard Feet/Second (.15 to 183 Standard Meters/Second) available with independent temperature range between -40 to 600+° F (-40° to 315+° C)
- **Media:** Bleed Air
- **Fluid Operating Pressures:** 0 to 200 PSIG (0 to 1,380 kpa)
- **Fluid Operating Temperatures:** -40° to 600° F (-40° to 315° C)
- **Environmental Temperatures:** -40° to 250° F (-40 to 125° C)
- **Signal Outputs:** AS-FT 0.5 to 4.5 Volts DC and 0.5 to 9.5 Volts DC, AS-FS Open/Closed Open Collectors
- **Power Input:** 28 Volts DC Aircraft Power Input





Solution and Benefits: FCI Thermal Dispersion Air Flow Switch and Transmitters

- No moving part thermal dispersion technology provides maintenance free operation and direct mass flow measurement
- Full commercial and aircraft qualification: DO160G, MIL810
- Single flange mount for independent flow and optional temperature outputs – AS-FS & AS-FT Transmitter
- Stainless Steel wetted parts and enclosures resist corrosive salt water/fog exposure
- Factory Calibrated across wide integrated mass flow and temperature range to customer's specified output
- Normally Open or Normally Closed open collector configurations available – AS-FS Switch
- Proven reliability: 50,000+ hours MTBF maintenance free service life