

FCI Aerospace Division

Flow Switch Series: Model AS-FS

Aerospace and Military Applications



FCI's Thermal Dispersion Technology Advantage

FCI flow switches have established an unmatched record of superior performance and reliability in the toughest applications. FCI's unique Thermal Dispersion Technology (TDT) provides exceptional reliability and repeatability for monitoring flow rate in liquids and gases.

The sensing element contains two thermowell-protected Resistance Temperature Detectors (platinum RTDs). When the flow element is installed in the process, the reference RTD measures the temperature of the surrounding fluid, while the active RTD is heated by an adjacent heater to a temperature that is warmer than the surrounding fluid. The temperature difference between the two RTDs is highest at no flow. Flow cools the heated RTD and reduces the temperature difference between the active and reference RTDs. Higher flow results in a small temperature difference and low flow produces a larger temperature difference between the RTDs.

The element RTDs are connected to a bridge circuit that senses the changing temperature difference and switches the signal output when a critical flow rate is reached. This provides a repeatable flow switch point in harsh application conditions without moving parts in the switch.

The mass of the active RTD and heater is balanced on the reference RTD through the use of a passive mass equalizing element. This assures that the FCI flow switch remains accurate even with abrupt process temperature changes.

FCI's Flow Switch Applications

- » Environmental Cooling Systems
- » PACK Air Systems
- » Bleed Air Systems
- » Fuel Transfer
- » Lubricating Oils
- » Hydraulic Fluids
- » Ground and In-flight Refueling
- » Refrigeration

FCI's Flow Switches

FCI flow switches for military/aerospace applications provide a unique set of performance features unavailable in other flow sensing technologies. FCI's thermal mass flow switches monitor mass flow directly in gas or liquid, and do not require pressure and temperature corrections necessary for volumetric flow sensing. The wetted portion of the probe is hermetically sealed, made of 316 SS parts joined by gas tungsten arc weld or nickel braze, with optional titanium or alloy construction available. The element construction provides corrosion resistance that can withstand up to 2000 psig line pressures. It is available with a threaded or flanged mounting and can be provided with a variety of military electrical connectors. The customer specifies the insertion length to position the element in the process flow stream.

The electronics are either hermetically (welded) or environmentally (gasket) sealed in an integral or remote enclosure per customer specifications. Power input is 22-29V per MIL-STD-704. Signal output can be customer specified as an open collector output, and/or a filtered and buffered op-amp output of <1VDC (low flow) or > 17 VDC (high flow). The electronics can be configured for special output signals to match customer requirements including relays or digital outputs. An electrical hysteresis is included to prevent sporadic switching when flow rates are in the vicinity of the set point. Because the flow induced heat dissipation effect is a logarithm function, FCI mass flow switches can perform over a remarkably wide flow range with exceptional low-flow sensitivity. In addition, the temperature compensation feature of the flow switch provides repeatability of $\pm 1\%$ of full flow range. The customer specified set point is factory set at FCI's on-site calibration laboratory to provide the greatest accuracy for the customer's requirement.

FCI's Thermal Dispersion Technology Advantages

- » No Moving Parts
- » Simple Installation
- » Low Flow Sensitivity
- » Wide Turndown Range [100 to 1 or more]
- » Low Pressure
- » Simultaneous Flow and Temperature Indication
- » Extreme Temperature, Pressure and Vibration Service
- » High Reliability and Maintenance Free
- » Corrosion, Abrasion and Fouling Resistant
- » Low Weight Compact Design

Visit FCI Aerospace Division on the Web: www.fluidcomponents.com

1755 La Costa Meadows Drive, San Marcos, California 92069 USA Phone 760-744-6950 800-854-1993 Fax 760-736-6250
European Office: Persephonestraat 3-01 5047 TT Tilburg The Netherlands Phone 31-13-5159989 Fax 31-13-5799036

FCI Aerospace Division

Flow Switch Series: Model AS-FS

Specifications

Service: Flow monitoring of liquid or gas.

Material: Wetted parts 316 stainless steel with nickel braze per AMS 4777 or all welded construction; passivation finish per QQ-P-35; special alloys including titanium available.

Electronics enclosure: Environmentally sealed units-electroless nickel plated aluminum with o-ring seal; Hermetically sealed units-316 stainless steel.

Electrical Connection: Military connector.

Process Connection: Flanged or threaded.

Insertion Length: Per customer requirement.

Signal Output Options: Op Amp totem pole output: High flow: Source 2 mA at 17 VDC minimum; Low or no flow: Sink 2 mA at 1 VDC maximum

Open collector output: High flow: Closed, Sinking up to 100 mA at less than 1 VDC; Low or no flow: open, leakage <10 μ a at 28 VDC.

Electrical Power Input: 28VDC nominal per MIL-STD-704.

Power Consumption: 50 to 85 mA depending on type of output signal(s).

Weight: Typical 0.35 to 0.45 lb.

Proof Pressure: Up to 2000 psig as required by application.

Switch Point Adjustment: Factory set at customer specified switch point, within flow range listed in the table below.

Flow Range

Process Fluid	Switch Point Range Standard Feet Per Second
Air	0.25 to 600+ sfps
Fuel (JP4, JP5 or JP8)	0.01 to 6+ sfps
Coolant (PAO)	0.01 to 6+ sfps
Water	0.01 to 3+ sfps

Operating Temperature Range:

Flow Element: -65 to +500°F (Specify actual requirement)

Electronics: -40 to 160°F (higher temperatures optionally available).

Repeatability: \pm 1% of full signal range.

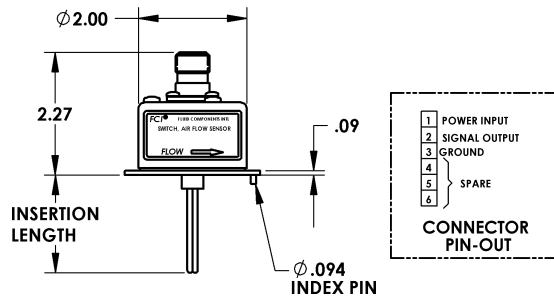
Time Response: 1 Second or greater depending on switch point setting.

EMI and Lightening Protection: MIL-STD-462 and RTCA/DO-160.

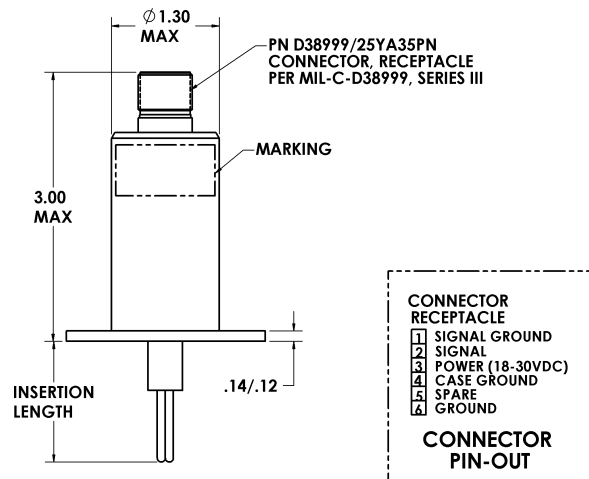
Options: Temperature Switch output calibration; material certificates.

Qualifications: MIL-STD-810 and RTCA/DO-160.

Quality Systems Approval: ISO 9001, AS9000



Typical Environmentally Sealed Flow Switch



Typical Hermetically Sealed Flow Switch



Visit FCI Aerospace Division on the Web: www.fluidcomponents.com

1755 La Costa Meadows Drive, San Marcos, California 92069 USA Phone 760-744-6950 800-854-1993 Fax 760-736-6250
European Office: Persephonestraat 3-01 5047 TT Tilburg The Netherlands Phone 31-13-5159989 Fax 31-13-5799036