

FCI Aerospace Division

Liquid Level Element Series: Model AS-LLE

Aerospace and Military Applications



FCI'S Thermal Dispersion Technology Advantage

FCI's sensors detect changes in process condition by monitoring the difference in temperature between a heated temperature sensor and an unheated temperature sensor. The change in temperature difference is a direct indication of the presence or absence of liquid level at the sensor element. This unique method of detection provides the highest reliability for harsh aerospace, military and marine applications with no moving parts in a compact, lightweight, rugged sensor element. This is the FCI Thermal Dispersion Technical (TDT) Advantage.

In liquid level sensing applications the temperature difference between the heated and unheated Resistance Temperature Detectors (RTD) is small, when the element is submerged. When the sensing element is uncovered, the heated RTD quickly warms, while the unheated RTD remains the temperature of the process fluid. This rapid increase in temperature difference is detected as a "dry" signal by the controller electronics, and the output from the electronics indicate the change. Once the element is again submerged, the process is reversed; and the heated RTD is quickly cooled, while the unheated RTD remains the temperature of the process fluid. This rapid decrease in temperature difference is detected as a "wet" signal by the electronics, and the output from the controller indicates the return to the covered condition. This technique may be used in any wet/dry or interface application, because the temperature difference between the heated and unheated RTDs is always different when the element is in contact with immiscible fluids.

FCI's Liquid Level Element Features

- » No Moving parts
- » Gas/Liquid Detection
- » Liquid/Liquid Interface Detection
- » Simple Installation
- » Single and Multipoint Sensing
- » Simultaneous Liquid and Temperature Indication
- » Extreme Temperature, Pressure and Vibration Service
- » High Reliability and Maintenance Free
- » Corrosion, Abrasion and Fouling Resistant
- » Rugged, Light, Compact Design

FCI Liquid Level Elements

FCI Liquid Level Elements have established an unmatched record of superior performance and reliability in the toughest aerospace, military and marine applications. FCI's unique Thermal Dispersion Technology (TDT) provides no moving part dependability and repeatability for monitoring the presence or absence of liquid at critical level elevations in reservoirs, vessels and gearboxes. This is accomplished on an intermittent sampling basis with a single RTD sensor or on a continually monitored basis with a level element equipped with two RTDs and a heater. In both designs, the liquid level element will operate with the customer's electronic control unit or with FCI's control unit.

The FCI Liquid Level Elements are available in many different mounting configurations. They may be mounted through a process connection on the side of a reservoir or gearbox with a flanged or threaded connection and an electrical connector, or they may be mounted within the reservoir or gearbox by attaching the body to an internal surface and using a "flying lead" cable to provide the electrical interface with the sensor. FCI also has a sensor-mounting configuration that mounts beneath an existing sight gauge that is used for visual indication of level in oil reservoirs and gearboxes. This simple mounting method retrofits existing installations with a Remote Oil Level Sensor (ROLS). The sensor elements are available in single, double or triple sensing configurations; so high, low and normal oil elevations may be detected with the same sensor. The sensor bodies are typically fabricated from 316 Stainless Steel, but they are optionally available in titanium and other materials, as well.

Controller Electronics for FCI Liquid Level Elements

FCI Liquid Level Elements will electrically interface with a customer's control electronics to eliminate the need for an independent set of electronics. This saves the weight and complexity of having a separate controller for each level element. FCI will provide an electrical interface specification for its liquid level elements that include the requirements of the customer's electronics. Where customer electronics are not available to operate the liquid level element, FCI can provide an electrical controller that will operate with the sensor and provide outputs of level status and temperature. The electronics may be mounted remotely to provide easy access in a less harsh environment.

FCI Liquid Level Element Applications

- » Remote Oil Level Sensor (ROLS)
- » Automation of Sight Gauge Level Detection
- » Hydraulic Reservoirs
- » Fuel Level Detection
- » Collection Sumps
- » Coolant Reservoirs
- » Oil/Water Interface Detection

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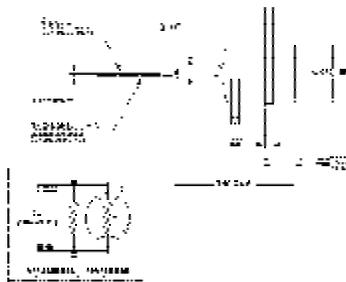
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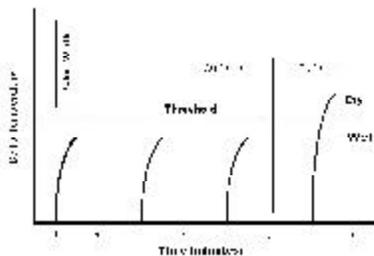
Liquid Level Element Series: Model AS-LLE

Liquid Level Element General Specifications

- Service:** Liquid Level monitoring/detection of liquid/gas and liquid/liquid interfaces. Single RTD (intermittent) and dual RTD (continuous) monitored applications standard
- Number of Active Level Element Elevations:** Single, double and triple level sensing configurations standard. Four or more sensing elevations also available
- Material of Construction:** 316 Stainless Steel, all welded. Optionally available in titanium, Hastelloy C or other alloys
- Process Connection:** Flanged, threaded per AS930-03, AS4395E8, MS33656E8; surface mounted for internal applications; sight gauge retrofit mounting, or other as required by customer
- Level Element Insertion Length:** Flush mounted to 150 inches as required by customer.
- Operating Pressure:** to 3000 PSIG; Proof Pressures to 6000 PSIG
- Operating Temperatures:** -65 to 400°F, higher temperature service optionally available
- Repeatability:** +/- 0.1 inches level elevation
- Interchangeability:** Level elements normalized for interchangeability with customer's or FCI supplied electronics
- Proven Reliability:** Field Mean Time Between Failure (MTBF) of 100,000 to 250,000+ hours in gearbox service depending on configuration
- Electrical Connection:** Military, commercial connector or potted flying lead
- Weight:** 0.05 to 0.2 lbs. Depending on configuration
- Time Response:** Single RTD intermittent detection sample frequency may be every two (2) minutes or longer; dual RTD continuously monitored detection response time is one (1) second or greater depending upon switch point setting



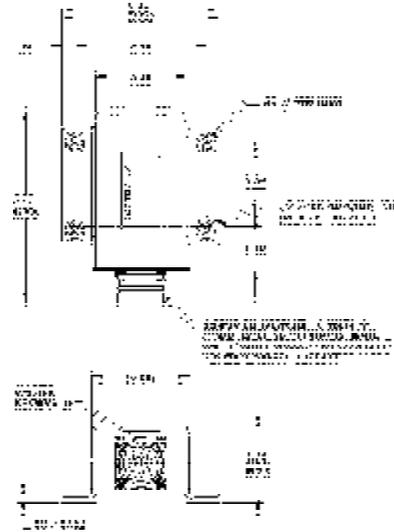
Typical Single RTD Level Element



Single RTD Sensing Technique

FCI Liquid Level Element Controller General Specifications

- Service:** Liquid Level monitoring/detection of liquid/gas and liquid/liquid interfaces. Single RTD (intermittent) and dual RTD (continuous) monitored applications standard
- Material of Construction:** Enclosure is fabricated of anodized aluminum and environmentally sealed
- Operating Temperatures:** -40 to 175 °F
- Electrical Power Input:** 28 VDC Nominal per MIL STD-704
- Electrical Connection:** Military or commercial connector.
- Signal Output:** Source/Sink or Open Collector
- Electrical Current Consumption:** 50 to 85 milliamps depending on signal output
- Weight:** 0.8 lbs
- Switch Point Adjustment:** Factory set for customer specified switch point.
- Qualification:** MIL STD 810 and ROTC/DO-160, customer project qualification support optionally available, ISO 9001, AS 9000
- EMI and Lightning Protection:** MIL STD-462 and RTCA/DO-160
- Options:** Process temperature output, LED drivers, controller functions (time delays, etc.)



Typical Level Controller Electronics



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