



FSI-B Series Flow Sensor

Installation Guide

Introduction:

Creative Sensor Technologys impeller flow sensors provide accurate digital output signals proportional to the velocity of the liquid flowing through the mounting tee. The square wave digital signal is converted to flow rate by the receiving monitor or control device using calibration constants supplied by CST. SEE PAGE 3

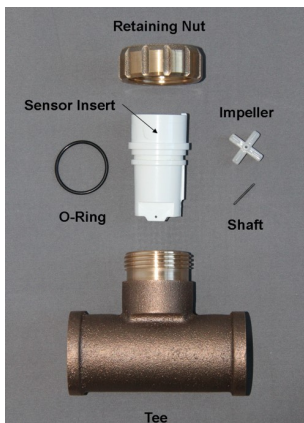
The sensor uses the same two wire path for power supply and signal output. The sensor circuit contains a pre-amplifier allowing the signal to travel up to 2,000 feet using shielded, twisted pair cable.



The flow sensor housing, held in place with a retaining nut, contains the detection circuitry and carries the unique four-bladed impeller on a transverse axle. The housing and mounting tee are custom made to form an integrated measurement chamber resulting in highly accurate, repeatable flow measurements through a wide range of velocities. The axle and impeller along with the sealing o-ring are replaceable in the field.

Mechanical Installation– Location and Orientation:

Because an impeller sensor measures the velocity of the liquid and converts it to a flow measurement based on area, proper flow measurement depends on the condition of the pipe interior and the sensor's location in the piping system. The pipeline must be full, free from trapped air, floating debris and built up sediment. The mounting tee should be installed with a minimum of 10 diameters of straight pipe (ex. 15 inches for 1 1/2 inch pipe), upstream and a minimum of 5 diameters of straight pipe (ex. 7 1/2 inches for 1 1/2 inch pipe) downstream to eliminate irregular flow profiles caused by valves, fittings or pipe bends.



1. Flow sensors may be installed inside a building, outside above grade or underground. If installed above grade, consider security issues to prevent damage or disassembly. If installed below grade, do not direct bury, provide a meter pit or valve box for service. Always provide a service loop in the wire connections to allow the flow sensor insert to be brought above grade.
2. Always install the sensor with the arrow on the tee pointing in the direction of flow. Below grade the sensor is usually installed with the sensor housing up in the vertical or 12:00 O'clock position.

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Rev FSI-B ins 419



4. Flow sensors may be installed on horizontal or vertical sections of pipe providing that the piping remains full and does not contain trapped air. A vertical pipe with rising flow is preferred over falling flow. The sensor insert may be oriented in any direction radially around the pipe. The least favorable mounting position on a horizontal pipeline is straight down or the 6:00 O'clock position due to the chance of sediment fouling the impeller. Allow 3 3/4" of clearance over the sensor insert so it can be serviced.

Mechanical Installation– Installing sensor in pipe

1. The brass flow sensor mounting tee features female NPT threads for connection to metallic piping systems. Use a thread sealant and "best industry practices" to insure that the sensor is installed in the correct position with strong permanent joints.

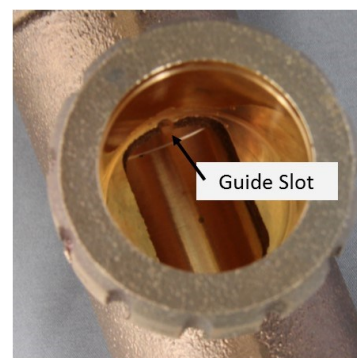


Sensor Insert

2. Before joining the tee to the piping system disassemble the flow sensor to prevent damage. Remove the flow sensor insert from the tee by loosening the retaining nut, turning it counter-clockwise and pulling the housing straight out of the tee.

Do not pull on the wire leads!

3. Use threaded pipe nipples or cut and thread the existing pipe. Remove all chips, filings or cuttings from the pipe before installing the sensor tee. For copper pipe, use soldered male thread adapters.
4. Install the sensor tee with the arrow pointed in the direction of flow. Tighten both joints with a wrench leaving the area over the branch of the tee clear to install the sensor insert.
5. Make sure the insert and mounting tee are clean and free from dirt or debris before reassembly. Align the arrow on the top of the sensor insert with the downstream direction. This will align the guide key on the housing with the slot inside the tee. Push straight in so that the key enters the slot until the o-ring seals the opening. Reapply silicon grease to the o-ring if necessary. Slide the retaining nut over the wire leads and tighten by hand by turning clockwise.





Electrical Installation—001 suffix sensors

1. Two conductors are required to connect the flow sensor to the monitor or control device.
2. The **RED** lead from the sensor is the **+** (**Positive**) lead and the **BLACK** lead from the sensor is the **-** (**Negative**) lead. Observe polarity when extending these conductors and connect them to the **+** and **-** leads or terminals of the FLOW SENSOR INPUT of the monitor or controller. **Do not connect flow sensor to Power or Valve circuits!**
3. Use a shielded Direct Burial cable with at least one twisted pair of conductors. Multiple pair cable may be used. Use #20 AWG or larger solid copper wire conductors to extend the distance up to 2,000 feet.
4. Waterproof the splices. The preferred method is the two part epoxy kit, Scotchlok 3570 as manufactured by 3M. Follow all manufacturer's instructions.
5. Make sure that the flow sensor housing is installed in the tee or the retaining nut is on the wire leads before making the splices.
6. Provide a service loop in the cable to allow the flow sensor housing to be removed from the tee and brought above grade for servicing.
7. Avoid making splices in the direct burial cable.

Calibration Constants

To program the monitor to read flow rate in GPM (gallons per minute)

Open controller FLOW set-up screen and find flow sensor "OTHER". Then, when prompted enter the following:

1 inch flow sensor	FSI-B10-001	K = 0.222 and Offset = 0.600
1.5 inch flow sensor	FSI-B15-001	K = 0.762 and Offset = 0.126

Operation

1. Make sure the flow sensor is assembled and the retaining nut is tightened (hand tight) before pressurizing system.
2. Fill pipeline and eliminate trapped air.
3. Flow sensor should begin transmitting flow immediately, however most monitors and control devices have a flow averaging routine that requires several seconds before the device begins to display flow.
4. Always wait for flow to stabilize before setting control limits. Stabilization may take several minutes in large piping systems.

Specifications

Wetted Materials

- Impeller – HDPE (High Density Polyethylene)
- Shaft – Tungsten Carbide
- O-ring — BUNA N
- Sensor Housing — Type 1 PVC
- Retaining Nut — Lead free Bronze Alloy C89833 Federalloy® I-836

Temperature Range

- 32°F to 140° F (0° to 60° C)

Output Signal

- Frequency Range 0.3 Hz to 200 Hz

Transducer Excitation - all electronics versions except – sensor suffix 009

- Quiescent current 120 uA@8 VDC to 35 VDC max.
- Off State (VHigh) = Supply Voltage - (120 uA X Source Resistance)
- On State (VLow) = Max. 0.85 Volts@50mA (10Ω+0.7VDC)

Flow Range

- 1" — 0.8 to 50 gpm (3 to 190 lpm)
- 1.5" — 3 to 90 gpm (90 to 340 lpm)

Electrical Cable

- Standard electronics –001 version is equipped with 2 single conductor solid copper #18 AWG leads with direct burial insulation.
- Lead length 48 inches.
- Wiring may be extended up to 2,000 feet with direct burial, twisted pair shielded cable.

Ordering Information

Description

Part number

Flow sensor Complete

1" FSI-B10-001

1.5" FSI-B15-001



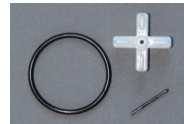
Flow insert only

FSI-EAB-001



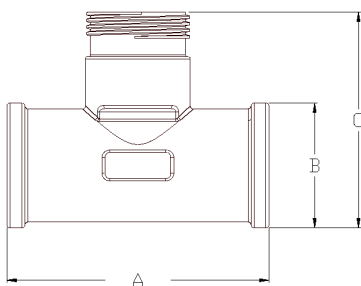
Impeller Repair Kit

FSI-T00-001



Flow Sensor Dimensions

The B type brass sensor has FNPT thread connections.



SIZE	A Length Overall	B Width w/ Retaining Nut	C Height Tee only	D Height w/ Insert & Nut
1"	5.5" 140 mm	2.5" 64 mm	3.75" 95 mm	4.75" 120 mm
1 1/2"	6.188" 157 mm	2.5" 64 mm	4.125" 105 mm	5.125" 130 mm