

Installation Guide

Introduction:

FSI-T00 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.

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 molded 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. Always install flow arrow on the mounting tee pointed downstream. Allow 3 3/4" clearance to remove flow sensor housing from tee for service. The tee is usually installed with the housing up in the vertical or 12:00 O clock position. However, if necessary, it may be installed with sensor housing at an angle from vertical to provide clearance.
2. 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, provide access for service.

3. Flow sensors are most typically installed below grade in a horizontal section of pipe with the sensor housing up. Do not direct bury the flow sensor. Provide a meter pit or valve box of adequate size and drainage to service the sensor. Provide a service loop in the wire connections to allowing the sensor housing to be brought above grade.
4. Flow sensors may be installed on vertical sections of pipe providing that the piping is full and does not contain trapped air. A vertical pipe with rising flow is preferred over falling flow. The sensor housing may be oriented in any direction radially around the pipe.

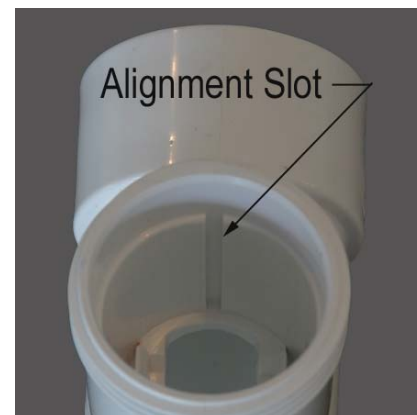
Mechanical Installation– Installing sensor in pipe

1. The PVC flow sensor tee features socket ends intended for solvent welding into PVC piping systems. Use Best Industry Practices to insure that the sensor is installed in the correct position with strong permanent joints.
2. Disassemble the flow sensor before joining the tee to the piping system. Remove the flow sensor housing from the tee by loosening the retaining nut by turning it counter-clockwise and pulling the housing straight out of the tee.

Do not pull on the wire leads!

3. Use appropriate tools to cut the pipe. Remove all chips, filings or cuttings from the pipe.
4. Solvent weld the tee to the pipe using manufacturer's recommendations.
5. After the joints have set, reattach the sensor housing to the tee. Make sure the housing and tee are clean and free from dirt or debris. Align the arrow on the top of the housing 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. Slide the retaining nut over the wire leads and tighten by hand by turning clockwise.

Do not use sealant or Teflon tape on the retaining nut threads!



Electrical Installation

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 stranded 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).

Frequency = (GPM/K) - Offset

FSI-T10-001 **K = 0.320** and **Offset = 0.022**

FSI-T15-001 **K = 0.650** and **Offset = 0.750**

FSI-T20-001 **K = 1.192** and **Offset = 0.938**

Model FSI-T15-002 (Data Industrial match calibration sensor)- Open controller FLOW set-up screen, find FS-150 and select.

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.