

Series TFXM

Transit Time Ultrasonic Flow Meter, Clamp-on, Liquid, Multi-Channel

Part 1. General

1.1 Scope

- A. This section describes the requirements for an ultrasonic flow measurement transmitter plus transducers.
- B. Under this item, the contractor shall furnish and install the flow measurement equipment and accessories as indicated on the plans and as herein specified.

1.2 Submittals

- A. The following information shall be included in the submittal for this section:
 - 1. Data sheets and catalog literature for microprocessor-based transmitter and transducers.
 - 2. Interconnection and dimensional drawings.
 - 3. List of spare parts

Part 2. Products

2.1 Transit Time Ultrasonic Flow Meter

- A. The transit time ultrasonic flow measurement system shall be a dual microprocessor-based transit time (time of flight) measuring type providing electronic output signals proportional to the flow of liquid in closed piping systems as may be required. It shall consist of a transmitter and two transducer sets connected by up to 990 feet [300 meters] of cable. The flow meter shall have digital communication provisions that will permit the flow meter to display and configure external, secondary, flow meters on a two-wire network. Interchannel mathematical manipulation of flow measurement channels shall allow sum, difference, proportion and averaging of discrete channel measurements.
- B. **Transducer:**

1. Operating principle: Two ultrasonic transducers function as both transmitters and receivers. Flow measurement is made by transmitting acoustic impulses alternately between two ultrasonic transducers positioned lineally, a known distance apart, on the outside pipe wall of a closed conduit. Pulse travel time between the two transducers is measured and the difference time calculated – contrapropagation. Difference time is directly proportional to fluid velocity, with a system Reynolds Numbers correction factor applied.
2. Primary Sensor: The compression-mode acoustic transducer shall contain a polarized Zirconium crystal with impedance matched wave-guide.
 - a. Universal transducers shall operate on pipe sizes ranging from 2” through 100” [50 through 2540 mm].
 - b. Small-pipe transducers shall operate on pipe sizes from 1/2” through 2” [12 through 50 mm] and are specific to a pipe outside diameter.
 - c. Transducer housing shall be PVC, CPVC, Teflon, Ultem or Vespel.
 - d. Process connection shall be 1/2” NPT
 - e. Standard operating temperature shall be -40° to 250°F [-40° to +121° C]
 - f. Optional operating temperature shall be -40° to 400°F [-40° to +200° C]

C. Transmitter

1. Enclosure shall be NEMA 4X, zinc-plated, powder-coated steel
2. Power supply shall be 115/230 VAC +/- 15% @ 50/60 Hz or 10-28 VDC
3. Power consumption shall be 14 VA

4. Operating temperature shall be -40° to 185° F [-40° to 85° C.
5. Input/output: The transmitter shall provide integral and [*optional*] input/output interfaces for integration with external instruments or computer systems. Input/output configuration is provided for each measurement channel.
 - a. 4-20ma into 800 ohms; jumper configurations for internal or external power
 - b. Two form C, SPDT multi-purpose relays rated 0.5 A /200 VAC non-inductive
 - c. RS485, 1/4-node, 126 drops max
 - d. [*optional*] Pulse rate output, 0-2,500 Hz, open-collector and turbine meter simulation
 - e. [*optional*] Data Logger, 200,000-events, Windows® software utility
 - f. [*optional*] Dual-RTD input for liquid energy measurements
6. Control and Programming
 - a. A 14-key tactile keypad permits configuration of all flow measurement channels connected to the RS485 network.
 - b. An expanded set of configuration parameters, calibration and commands shall be entered via a personal computer, Windows® software utility and infrared communicator from outside the enclosure without opening the enclosure.
7. Transmitter shall output a digitally synthesized waveform from a discrete, field uploadable file.
8. Measurements shall be made by measuring differential time of contrapropogating waveforms using cross-correlation of data sets. Automatic Reynolds Number corrections are applied.

9. Data collection shall be 20 MHz to 40 MHz.

6. Transmitter and Transducer Performance

1. Measuring range -40 to +40 FPS [-12 to +12 MPS]
2. Accuracy shall be $\pm 1\%$ of reading or ± 0.01 FPS [± 0.003 MPS], whichever is greater.
3. Sensitivity is 0.001 FPS [0.001 MPS]
4. Maximum separation between transmitter and transducer shall be 990 feet

E. Indication

7. Graphics display module shall be 128 x 64 pixels and LED backlit. Two, user selectable, font sizes 0.35" [8.9mm] or 0.2" [5.0mm]; configure for two or four data lines.
8. Data display is configured by the user to display flow rate (8-digit), flow total (8-digit), liquid sound speed, signal strength, supply temperature (if equipped) and return temperature (if equipped) for each measurement channel.

F. Equipment

The transit time ultrasonic flow meter shall be a Dynasonics Series DTFXM transmitter and Dynasonics Series DTTN (standard temperature multi-size pipe), DTTH (high temperature multi-size pipe) or DTTS (standard temperature small-pipe) ultrasonic transducer.

Part 3. Operator Functions

3.1 Calibration

- A. Flow meter calibration data shall be entered via a personal computer, Windows® software utility and infrared communicator. No additional equipment shall be required.
- B. Internal self-diagnostics shall be available to assist in installation and maintenance of the flow meter.

3.2 Transmitter Function Details

The following functions shall be provided:

- A.** The flow meter shall output, via infrared communications, flow rate, positive, negative and net flow accumulations and diagnostic data.
- B.** A local display shall display flow rate, total accumulated flows, signal strength, liquid sound speed, supply temperature (if equipped) and return temperature (if equipped).
- C.** The transducers shall be mounted at the measuring site and shall be installed in accordance with the manufacturers recommendations.
- D.** The transducers shall transmit and receive acoustic signals to accurately measure liquid flow.
- E.** Operational range shall be adjustable by entering new data via infrared communicator or keypad.
- F.** The flow meter shall be capable of zero to full scale output simulation to assure proper operation with regards to flow charts or pump control parameters.
- H.** There shall be no internal potentiometers used in programming or adjusting the transmitter.
- I.** The power to operate the transducers shall come solely from the transmitter over the signal interconnection cable.
- J.** Dual alarm relays shall be programmable for rate of flow, batch/total accumulation, loss of signal strength or system error.
- K.** The flow meter shall have a FLASH memory and shall not require a battery to ensure protection of stored data.
- L.** Flow meter shall provide automatic Reynolds Number and speed of sound compensation.

Part 4. Execution

4.1 Installation

- A. Follow manufacturers recommendation upstream and downstream straight pipe diameters and transducer orientation.
- B. Enter pipe and liquid configuration information into the flow meter. The flow meter will calculate transducer separation from the data entered.
- C. Mount the transducers onto the pipe at the calculated separation distance.
- D. Additional cable for the transducers shall be RG59 coaxial. All connections shall be 75 Ohm.

Part 5. Warranty

5.1 Terms

- A. The manufacturer of the above specified equipment shall guarantee for twelve (12) months from date of shipment that the equipment shall be free from defects in design, workmanship or materials.
- B. In the event a component fails to perform as specified or is proven defective in service during the warranty period, the manufacturer shall promptly repair or replace the defective part at no cost to the owner.

Part 6. Options

6.1 Related Equipment

- A. Infrared Communicator DB-9 connection
- B. USB to DB-9 converter
- C. 36" [915 mm] x 1/2" [12 mm] stainless steel transducer mounting straps
- D. Dow 111 silicone grease
- E. Transducer mounting track

Part 7. Spare Parts

7.1 Recommended Spare Parts

- A.

