

**SECTION 40 71 66**  
**Inline ULTRASONIC FLOW METERS**

**PART 1- GENERAL**

**1.01 SUMMARY**

A. Ultrasonic flow meters for permanent in line installations. The meters shall utilize a transit time ultrasonic principle of dual cord measurement in wetted contact with the process medium from which the volume flow rate can be derived. The ultrasonic flow meter will be suitable for flow velocities from zero to 33 feet per second.

**1.02 SUBMITTALS**

A. Furnish complete Product Data, Test Reports, Operating Manuals, Record Drawings, Manufacturer's Certifications, Manufacturer's Field Reports

B. Product Data:

1. Dimensional Drawings.
2. Materials of Construction:
  - a. Sensor.
  - b. Internal coating.
  - c. Flanges.
3. Measurement accuracy.
4. Range and rangeability.
5. Enclosure Rating.
6. Classification Rating.
7. Power:
  - a. Voltage.
  - b. Wattage.
8. Output options.

**1.03 QUALITY ASSURANCE**

A. Manufacture facilities certified to the quality standards of ISO Standard 9001 - Quality Systems - Model for Quality Assurance in Design/Development, Production, Installation, and Servicing.

**1.04 DELIVERY, STORAGE, AND HANDLING**

A. Store all instruments in a dedicated structure with space conditioning to meet the recommended storage requirements provided by the manufacturer.

B. Any instruments that are not stored in strict conformance with the manufacturer's recommendation shall be replaced.

#### **1.05 PROJECT OR SITE CONDITIONS**

A. Provide instruments suitable for the installed site conditions including but not limited to material compatibility, site altitude, process and ambient temperature, and humidity conditions.

#### **1.06 WARRANTY**

A. The meter shall have standard one year warranty from date of shipment and if the meter is commissioned by a factory certified technician, the warranty is extended to three years from the date of shipment.

#### **1.07 MAINTENANCE**

A. Provide all parts, necessary for maintenance and calibration purposes throughout the warranty period. Deliver all of these supplies before project substantial completion.

#### **1.08 LIFECYCLE MANAGEMENT**

A. Instrument documentation, like original calibration certificates, manuals and product status information shall be accessed via a web enabled system with a license. The instrument-specific information shall be accessed via its serial number. When services are provided by an authorized service provider the services information like subsequent field calibrations shall be archived and accessible via this web enabled system.

### **PART 2 -- PRODUCTS**

#### **2.01 MANUFACTURER**

A. Endress+Hauser Proline Prosonic Flow 93C Ultrasonic Flowmeter

#### **2.02 MANUFACTURED UNITS**

A. The ultrasonic flow meters shall consist of meter sensing tube and remote transmitter as a system.

B. The meter sensing tube shall be supplied in sizes as shown on the plans or in the instrument schedule.

1. The sensing tube body shall consist of a carbon steel tube with carbon steel flanges and a factory applied epoxy coating to both the interior and exterior.
  - a. The coating shall be approved for drinking water applications.
  - b. The flanges shall be ANSI B16.5 Class 150 or 300 as required on the plans and AWWA Class D, E, or F for sizes over 24"
2. The sensing tube shall be NEMA6P rated and have four transducer holders welded into the meter body. The active part of the transducers shall be replaceable from the holder assembly without dewatering the pipe.
3. Each sensing tube shall have a dual path ultrasonic channels operating independently with two transducers each. The two transit time differentials shall be integrated by the transmitter to improve the linearity and enhance accuracy.

C. The transmitters shall be three stage microprocessor controllers mounted remotely and powered by 85 - 260 VAC or 16 - 62 VDC as indicated in the drawings. Transmitter housings shall be powder coated cast aluminum with NEMA 4X rating.

1. The transmitter shall have a 4-line x 16 character backlight LCD shall simultaneously display flow rate and total flow in user-selectable engineering units. The transmitter display shall be used in conjunction with integral push buttons for configuration and diagnostic messages.
2. Upon any power failure, the transmitter shall retain all setup parameters and accumulated measurements internally in non-volatile memory. All units shall be protected against voltage spikes from the power source with internal transient protection.
3. The transmitter shall monitor the speed of sound in the measured fluid and also indicate the strength of the transducer signals received in decibels.
4. The transmitter shall support remote mounting from the sensing tube body with interconnecting cables up to 95 feet in length.
5. The transmitter output shall be noted in the drawings in one of the following formats:
  - a. 4-20mA HART + Frequency + Relay or Status
  - b. PROFIBUS PA or DP
  - c. FOUNDATION Fieldbus
6. Each output will be galvanically isolated and fully configurable to the users engineering units.
7. Each transmitter shall have three configurable totalizers.

### **2.03 SOURCE QUALITY CONTROL & CALIBRATION**

- A. Ultrasonic flow meters shall be factory calibrated on an ISO 17025 accredited test stand per "General Requirements for the Competence of Testing and Calibration Laboratories" with certified accuracy traceable to NIST.
- B. Evidence of accreditation must originate from a national verification agency such as A2LA.
- C. Each meter shall ship with a 2-point calibration certificate exceeding stated standard accuracy of 0.5% of rate.
- D. A real-time computer generated printout of the actual calibration data points shall indicate apparent and actual flows. The flow calibration data shall be confirmed by the manufacturer and shipped with the meters to the project site.
- E. The manufacturer shall provide complete documentation covering the traceability of all calibration instruments.
- F. The manufacturer shall provide ISA data sheet ISA-TR20.00.01 as latest revision of form 20F2321. The manufacturer shall complete the form with all known data and model codes and dash out the inapplicable fields. Incomplete data sheets submitted will result in a rejected submittal.

### **2.04 ACCESSORIES**

- A. Stainless steel tag - labeled to match the contract documents.
- B. Provide pipe wall mounting kit for the transmitter as required per the instrument schedule.

### **2.05 SAFETY**

- A. All electrical equipment shall meet the requirements of ANSI/NFPA 70, National Electric Code latest edition.
- B. All devices shall be certified for use in hazardous areas: Class 1, Div. 2, Groups B/C; temperature rating T3 (200 deg. C)
- C. All devices shall be suitable for use as non-incendive devices when used with appropriate non-incendive associated equipment. Devices with intrinsically safe ratings will normally be acceptable with vendor's approval.
- D. Electrical equipment housing shall conform to NEMA 4X classification.
- E. Non-intrinsically safe electrical equipment shall be approved by a Nationally Recognized Testing Laboratory (NRTL) such as FM, UL, CSA, etc. for the specified electrical area classification.
- F. Electrical equipment specified as intrinsically safe shall qualify as "simple apparatus" or NRTL approved intrinsically safe equipment per ANSI/ISA-RP12.6

"Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations," latest edition.

### **PART 3-EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine the complete set of plans, the process fluids, pressures, and temperatures and furnish instruments that are compatible with installed process condition.
- B. Examine the installation location for the instrument and verify that the instrument will work properly when installed.

#### **3.02 INSTALLATION**

- A. As shown on installation details and mechanical Drawings.
- B. As recommended by the manufacturer's installation and operation manual.
- C. Specific attention should be given to the following technical requirements:
  - 1. Verify that the ultrasonic meter is installed with sufficient straight run diameters of 10D to the inlet of the inline sensor

#### **3.03 FIELD QUALITY CONTROL**

- A. Each instrument shall be tested before commissioning and the ENGINEER shall witness the interface capability in the PLC control system and associated registers.
  - 1. Each instrument shall provide direct programming capability through the PLC
  - 2. Each instrument shall provide direct control of totalizer reset functions through the PLC
  - 3. Each instrument shall be supported with a device profile permitting direct integration in the PLC
- B. The ENGINEER shall witness all instrument verifications in the field.
- C. Manufacturers Field Services are available for start-up and commissioning by a Factory field service representative or manufacturers authorized service provider (ASP) – the warranty against manufacturing defects is three years.
  - 1. Manufacturer representative shall verify installation of all installed flow tubes and transmitters.
  - 2. Manufacturer representative shall notify the ENGINEER in writing of any problems or discrepancies and proposed solutions.

3. Manufacturer representative shall perform field verification at the time of installation for long-term analysis of device linearity, repeatability and electronics health.
4. Manufacturer representative shall generate a configuration report for each meter.

#### **3.04 ADJUSTING**

- A. Verify factory calibration of all instruments in accordance with the Manufacturer's instructions.

#### **3.05 PROTECTION**

- A. All instruments shall be fully protected after installation and before commissioning. Replace any instruments damaged before commissioning:
  1. The ENGINEER shall be the sole party responsible for determining the corrective measures