

SECTION 40 71 66

ULTRASONIC TRANSIT TIME CLAMP-ON FLOW MEASURING SYSTEM

PART 1-GENERAL

1.01 SUMMARY

- A. Ultrasonic clamp-on flow measurement system designed for non-intrusive external to pipe measurement of water and wastewater media. The system shall utilize a transit time ultrasonic principle of measurement mounted on the customer pipe from which the volume flow rate can be derived. The ultrasonic flow meter will be suitable for flow velocities from 0 - 33 fps.

1.02 SUBMITTALS

- A. Furnish complete Product Data, Test Reports, Operating Manuals, Record Drawings, Manufacturer's Certifications, and Manufacturer's Field Reports
- B. Product Data:
 - 1. Dimensional Drawings.
 - 2. Materials of Construction:
 - 3. Measurement accuracy.
 - 4. Range and range ability.
 - 5. Enclosure Rating.
 - 6. Classification Rating.
 - 7. Power:
 - a. Voltage.
 - b. Wattage.
 - 8. Output options.

1.03 QUALITY ASSURANCE

- A. Manufacture instruments 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 by the purchaser.

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, materials, fluids, etc. necessary for maintenance and calibration purposes throughout the warranty period. Deliver all of these supplies before project substantial completion.

B. The ultrasonic transducers may require to be re-coupled to the pipe with new acoustic gel every 12 to 24 month depending on the installation location.

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- Prosonic Flow 91W or 93W

2.02 MANUFACTURED UNITS

A. The flow measuring system shall consist of: a clamp-on sensor pair(s), sensor holders, sensor cables, transmitter, mounting clamps/straps, installation aids.

1. The flow measuring system shall have an easy, safe and menu-guided ultrasonic sensor mounting procedure to ensure precise measuring results.
 2. The flow measuring system shall support remote configuration.
- B. The sensors shall be selectable for pipe diameters in the range of 2" to 160" (DN 50 to 4000) and meet the application requirements.
1. The sensor shall be rated for NEMA 4X service OR as an option shall be submersible NEMA 6P rated. If NEMA 6P is specified in the instrument schedule, the transmitter shall be remotely mounted and specified length cables shall be attached at the factory.
 2. The sensors shall be manufactured from materials suitable for continuous submersion.
 3. The sensors shall be suitable for composite, metal, plastic, lined or unlined pipes.
 4. The sensors shall utilize an integral spring mechanism to maintain correct contact pressure with the mating pipe surface during operation.
 5. The sensor positioning on the pipe shall be prescribed by the transmitter via the HMI display and communications protocol (where employed)
 6. The sensors shall locate mechanically and lock within the sensor holder to preclude incorrect sensor orientation during installation or accidental dislocation due to vibration during operational service.
 7. The sensor shall be of the proper nominal operating frequency to measure the design flow rate thru the mating piping and shall be noted in the instrument schedule.
- C. The transmitter shall integrate, control and allow setup of the measurement system. The outputs and source power shall be noted in the drawings in one of the following formats:
1. 4-20mA HART + Pulse/Frequency
 2. PROFIBUS PA or DP
 3. FOUNDATION Fieldbus
 4. 85 - 260 VAC, 20 - 55 VAC or 11 - 40 VDC
- D. The transmitter shall provide:
1. A NEMA 4X die cast, aluminum powder coated housing
 2. Guided user programming via simple push-button operation (91W) or an optical touch-control (93W) that can be operated through the enclosure window, without opening the electrical enclosure.

3. A minimum a 2-line x 16 character backlit LCD display (91W) or 4-line x 16 character backlit LCD display (93W).
 4. A simultaneous display of flow rate and total flow in user-selectable engineering units, readout of diagnostic error messages, selectable from either five (91W) or twelve (93W) standard languages.
 5. A safeguard against entering invalid data for the particular meter size and all programming parameters.
 6. An AUTOGAIN function to ensure adequate signal strength for reliable measurement during liquid condition variations.
 7. Protection against voltage spikes from the power source with internal transient protection.
 8. Power consumption of no more than 12 VA, independent of process line size.
 9. User access-code protection.
- E. The flow measuring system shall automatically adjust its nominal operating frequency within an available frequency band, so as to optimize the actual operational frequency in respect of pipe material, wall thickness, liner (if present) and fluid condition.
- F. The flow measuring system shall retain all setup parameters and accumulated measurements internally in non-volatile memory.

2.03 SOURCE QUALITY CONTROL & CALIBRATIONS

- A. Each flow measuring system shall be verified at a facility traceable to the National Institute of Standards and Technology (NIST) accredited to ISO 17025.
- B. The flow measuring system maximum measured error under factory reference conditions shall be $\pm 0.5\%$ of reading at any flow velocity greater than 1 ft/sec to the stated maximum.
- C. When installed in the field, measurement error becomes a function of additional sources of uncertainty; the additional error should typically not exceed $\pm 1.5\%$ of reading giving an overall error of $\pm 2\%$.
- D. The technique of sensor and transmitter verification must be by a traceable method per NIST or ISO.
- E. Provide complete documentation covering the traceability of all calibration instruments.
- F. Provide ISA data sheet ISA-TR20.00.01. Use the latest revision of form 20F2321. Complete the form with all known data and model codes, and dash out the inapplicable fields. Incomplete data sheets submitted will be result in a rejected submittal.

2.04 ACCESSORIES

- A. Stainless steel tag - labeled to match the Contract Documents.
- B. Provide sun shield for outdoor installations.
- C. Acoustic coupling medium suitable for ultrasonic sensor supplied
- D. During mounting and commissioning a clamp-on measuring point, information on the liquid and piping is needed. If liquid or pipe data is not already programmed, additional accessories may be needed.

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: FM non-incendive for Class I, Division 2, Groups A-D
- C. All devices shall be suitable for use as non-incendive devices when used with appropriate non-incendive associated equipment.
- 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, ETL, CSA, etc. for the specified electrical area classification.

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. Proper undisturbed straight run before and after the point of measurement.

3.03 FIELD QUALITY CONTROL

- A. Demonstrate the performance of all instruments to the ENGINEER before commissioning.
- B. ENGINEER may witness all instrument calibration and verification performed in the field.
- C. Each instrument shall be tested before commissioning and the ENGINEER shall witness the interface capability in the PLC control system and associated registers.
 1. The manufacturer shall offer an FDT based and FDT Group certified FDT frame tool capable of supporting HART, Profibus and Foundation fieldbus protocols.
 2. Each instrument shall be supported with a device type manager (DTM) allowing direct integration in the PLC
 3. Each instrument shall be capable of operational configuration directly through the PLC
 4. Each instrument shall provide direct control of totalizer reset functions through the PLC
- D. Manufacturer's Field Services:
 1. Manufacturer's representative shall verify installation of all installed sensors and transmitters.
 2. Notify the ENGINEER in writing of any problems or discrepancies and proposed solutions.
 3. Manufacturer's representative shall perform an electronic verification at the time of installation in respect of the transmitter, with simulated flow values, to confirm correct function of device amplifier, display and outputs. A report will be generated for each meter.

3.04 ADJUSTING

- A. Verify factory set up 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.