

SCOPE: This specification covers a Clamp-On Transit-Time Ultrasonic Flow Meter as manufactured by Pulsar Measurement, Malvern, UK / Largo, FL / Long Sault, Ontario. The meter shall provide for non-intrusive flow measurement, direction indication, volume totalizing, and transmitting of the flow rate in a full pipe.

1. PERFORMANCE SPECIFICATIONS

1.1 The ultrasonic flow meter shall have an accuracy of $\pm 1\%$ of reading or ± 0.015 ft/sec (± 0.0046 m/sec), whichever is greater. Repeatability and linearity: $\pm 0.25\%$.

1.2 Shall operate on relatively clean liquids in full pipes with less than 2% solids or undissolved gasses at flow velocities from ± 0.07 to 40 ft/sec (± 0.02 to 12 m/sec).

1.3 Operate on any metal, plastic, or sonic conducting material including carbon steel, stainless steel, ductile iron, concrete lined ductile iron, cast iron, PVC, PVDF, fiberglass, galvanized steel, copper, brass and pipes with bonded liners including epoxy, rubber and Teflon.

2. TRANSDUCERS (FLOW SENSORS)

2.1 The flow meter shall have a dual transmitting/receiving, clamp-on transducers.

2.2 The transducers shall operate continuously at temperatures from -40°F to 300°F (-40°C to 150°C).

2.3 Multiple transducer sizes shall be available for optimal performance in the application. The SE16A pair shall be recommended for 0.5 to 1.5 inch (12 to 40mm) nominal diameters, the SE16B pair shall be recommended for 2 to 10 inch (50 to 200mm) nominal pipe sizes, and the SE16C pair shall be recommended for 12 to 48 inch (100 to 1,200mm) nominal pipe diameters. Switching transducer sizes after installation only requires a change to the sensor selection in the configuration setup.

2.4 Have 25 ft (7.6 m) length triaxial cables from the electronics with BNC connectors to transducers.

2.5 Shall include manufacturer's recommended sensor coupling compound. Shall include stainless steel mounting hardware with pipe clamps or track mount depending on transducer size.

2.6 Shall include BNC seal jackets or threaded connection with seal-tight grommet for transducer operation in IP67 conditions.

2.7 Transducers shall be rated non-incendive for Class I, Division 2, Groups A, B, C & D locations.

3. ELECTRONICS

3.1 The electronics shall be housed in a watertight and dust tight NEMA4X (IP 66) polyester and polycarbonate enclosure with a gasketed shatter proof window, and suitable for wall mounting.

3.2 Flow meter electronics shall be designed to operate at temperatures from -5°F to 140°F (-20°C to 60°C). The transmitter circuit and calibration frequency standard shall be crystal

controlled. The transmitter shall be powered by 100-240VAC 50/60Hz requiring less than 10VA.

3.3 The transmitter shall include a built-in 5-Key calibration system with operator selection of parameters through visual prompts from a Menu calibration system. Systems requiring calibration by Parameter codes or external calibrators shall not be accepted.

3.4 The 4-20mA shall be flow proportional and isolated, with programmable zero and full-scale offsets. Maximum resistive load shall be 1000 ohms.

3.5 Electronics shall have a white, backlit matrix LCD display indicating flow rate in user-selected engineering units, units of calibration, relay states, signal strength, measured fluid speed of sound, automatic gain control, 365 day data log information, and 14-digit totalizer.

3.6 Electronics shall have 2 control relays rated 5 amps SPDT. Relays shall be programmable for flow proportional pulse output, flow direction, or as flow rate alarms with separate ON/OFF set points.

3.7 Electronics shall display forward and reverse flow.

3.8 Electronics shall have built-in data logger capable of storing up to 26 million samples. Data can be downloaded to flash drive via USB type-A port on the meter's front panel in .LG2 or .CSV format.

3.9 Electronics shall be modular and field replaceable by means of plug-in circuit boards. The instrument shall detect and load software menus automatically for field-installed options.

4. OPTIONAL FEATURES FOR INSERTION IN SPECIFICATION AS REQUIRED:

4.1 Transducer cables shall be 50 ft (15m) length triaxial with BNC transducer connections.

4.2 Transducer cables shall be 100 ft (30m) length triaxial with BNC transducer connections.

4.3 Transducer cable shall be extended length shielded triaxial pair up to 500 ft (150 m) with NEMA4X (IP 66) Junction Box.

4.4 Electronics shall include a MODBUS® RTU output via RS-485 or HART. Data points for Modbus shall include flow rate, flow total, previous day's average flow rate, previous day's volume total, totalizer reset, relay output status, signal strength, measured fluid speed of sound, run time, transducer connection status, logger status, and percent log used. HART shall be version 7.0, with DD files compatible with Emerson 475 HART Field.

4.5 Transducers shall be rated Intrinsically Safe for Class I, Division 1, Groups C and D; Class II, Groups E, F and G; Class III; Type 4 hazardous locations.

4.6 Electronics shall have a thermostatically controlled AC-powered enclosure heater for condensation protection in locations with temperature below -5°F (-20°C).

4.7 Electronics shall have power input of 9-32VDC requiring less than 10 Watts.

4.8 Electronics shall have 4 additional (6 total) control relays, rated 5 amps SPDT and programmable for flow rate alarms, flow direction, or flow totalizer pulse.

5. MANUFACTURER

The instrument shall be a Model Greyline TTFM 6.1 Clamp-On Transit-Time Flow Meter as manufactured by Pulsar Measurement, and warranted against defects in materials and workmanship for two years.

Specifications are subject to change without notice.