

SECTION 40 71 49
VORTEX – Shedding Flow Meter

PART 1- GENERAL

1.01 SUMMARY

A. Provide a loop powered vortex flow meter consisting of flanged full body or wafer design for the measurement of liquid, gas, or steam media. The system shall utilize the vortex measurement principle by monitoring the shedding frequency of vortices in fluids which are created by a bluff body.

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. Metering Tube.
 - b. Flanges.
3. Measurement accuracy.
4. Range and range ability.
5. Enclosure Rating.
6. Classification Rating.
7. Calibration certificates.
8. Power:
 - a. Voltage.
 - b. Wattage.
9. 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.

B. Factory Calibration – Vortex flowmeters shall be factory calibrated on an approved test stand with certified accuracy traceable to National Institute of

Standards and Technology (NIST), compliant with ISO 17025 laboratory standard accredited by a national verification agency such as A2LA.

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, process and ambient temperature, and humidity conditions.

1.06 WARRANTY

- A. The vortex flowmeter shall have a standard one year warranty from date of shipment; 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 and materials 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- Prowirl 200

2.02 MANUFACTURED UNITS

A. The vortex flowmeter system shall consist be a flanged or wafer design (by application and instrument schedule) and transmitter which may be mounted integral (compact) to the sensor or remote with interconnecting cables up to 98 feet in length

1. The system shall have an easy, safe and menu guided procedure to ensure precise measuring results.
2. The system shall support remote configuration.
3. The system shall require no regular maintenance, contain no moving parts, and must possess a lifetime calibration with no zero-point drift.
4. The system shall have the capability of measuring steam quality or detecting the presence of wet steam as specified.
5. The system shall have SIL 2 in accordance with IEC 61508.
6. The system shall also have an optional dualsens version for redundant measurements with two sensors and transmitters designed for SIL 3 in accordance to IEC 61508.
7. The system shall include a method to verify both the sensor and transmitter to confirm the flowmeter performance to the original manufacturer specifications.
 - i. The verification method shall be traceable to factory calibration using a third party attested onboard system pursuant to ISO standards.
 - ii. The verification technique shall not require but will support external handhelds, interfaces, special tooling or electrical access for a verification to be performed.
 - iii. The transmitter shall store up to eight verifications in its non-volatile memory
 - iv. A verification of the system shall be possible at any time, locally or remotely, on demand, and under process conditions and shall not interrupt the signal to the control system.
 - v. The verification report shall be compliant to common quality systems such as ISO 9000 section 7.6a to prove reliability of the meter specified accuracy.

B. The vortex sensing system shall consist of:

1. The flow metering system shall possess a non-volatile memory to store the sensor calibration and transmitter setup information. The electronics shall be interchangeable for meter sizes ½" – 12".

2. The sensor shall be the proper size to measure the design flow rate of the piping.
 3. Wetted materials of 316L stainless steel, CF3M SS, and graphite seal as standard.
 4. Wetted materials of Alloy C22 and seals of Viton, Kalrez, and Gylon as options
 5. A sensor body with standard connections such as ASME B16.5 flanges (C, F, O, R sensors) or wafer mounted (D sensor) as specified by the customer data sheet.
 6. The sensor shall be rated for NEMA 4X service as standard.
 7. The sensor to count the vortices shall be of the differential switched capacitance (DSC) type and shall be capable of withstanding temperatures ranging from -40o to 500 °F (or -328° to 752 °F where specified).
 8. The DSC sensor shall be identical for all meter sizes.
 9. The DSC sensor shall have an option to include a Pt 1000 element for integral temperature measurement.
 10. The meter shall be rated for pressures up to Class 300 for vortex sensor bodies with proper process connections.
 11. The reducer version (R) shall have an optional meter with integrated line size reduction.
 12. Resistant to mechanical shock such as water hammer and vibration resistant design up to 2g at 10 to 150 Hz as specified.
 13. Temperature shock resistant up to 270 °F/s.
- C. The integral or remote transmitter shall integrate, control and allow setup of the measurement system. The output and source power shall be noted in the drawings in one of the following formats:
1. 4–20 mA HART
 2. 4-20mA HART, pulse/frequency/switch
 3. 4-20mA HART, 4–20 mA output
 4. 4-20 mA HART, pulse/frequency/switch, 4-20 mA input
 5. PROFIBUS PA, pulse/frequency/switch
 6. FOUNDATION Fieldbus, pulse/frequency/switch
 7. 12 to 35 VDC (1, 2, 4 above); 12 to 30 VDC (3 above); 9 to 32 VDC (5, 6 above)
- D. The transmitter shall:

1. Include a powder coated cast aluminum housing with a NEMA 4X rating.
2. Allow local programming that can be operated through the enclosure window without opening the electrical enclosure as specified.
3. Be capable of displaying instantaneous flow rate and total flow with user-selectable engineering units, readout of diagnostic events and remedies, and support 16 standard languages.
4. Include a low flow cutoff control through the display pushbutton function or via a digital bus (if used).
5. Allow no limitation of transmitter operational capability or diagnostic dependency between integral and remote mounting orientation.
6. Be supported by device drivers (DD), general station description (GSD) files, instructions and pre-engineered code based on selected output variant.
7. Retain all setup parameters and accumulated measurements internally in non-volatile memory in the event of power failure. The memory unit shall be transferrable from a damaged unit or used for a duplicate device with no loss of device parameters or data stored via the use of the display.
8. Include an integral flow computer with calculations for natural gas, industrial gases, or steam as specified.
9. Display notification and history of process or system events.

2.03 SOURCE QUALITY CONTROL

- A. Vortex flowmeters shall be factory calibrated on an approved test stand with certified accuracy traceable to NIST, compliant with ISO 17025 laboratory standard accredited by a national verification agency such as A2LA.
- B. Each meter shall ship with a certificate of a 3-point calibration report exceeding stated standard accuracy of 0.75% of rate.
- C. 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.
- D. The manufacturer shall provide complete documentation covering the traceability of all calibration instruments.
- E. 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. Optionally, provide a remote transmitter mounting set suitable for post mounting.
- C. Optionally, the vortex flowmeter will be installed with a flow conditioner due to inadequate straight run requirements.
- D. Optionally, provide sun shield for outdoor installations.

2.04 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 as: CSA C/US non-incendive for Class I, Division 2, Group A-D or Class I, II, III, Division 1 XP or IS, Group A-DG services.
- 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.
- 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 the sensor is installed according to the Manufacturer's recommendations per TI00069D and ISO 14511 as to the required inlet and outlet run diameters distance from flow disturbances.

3.03 FIELD QUALITY CONTROL

- A. Demonstrate the performance of all instruments to the ENGINEER before commissioning.
- B. ENGINEER to witness all instrument calibration verifications in the field.
- C. Each instrument shall be tested before commissioning and the ENGINEER shall witness the response in the PLC control system and associated registers.
- D. Manufacturer's Field Services:
 - 1. Manufacturer's representative shall verify installation of all installed flow sensors and transmitters.
 - 2. Notify the ENGINEER in writing of any problems or discrepancies and proposed solutions.

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.