

SECTION 40 71 76

THERMAL MASS FLOW MEASURING SYSTEM

PART 1- GENERAL

1.01 SUMMARY

A. Thermal mass flow meters consisting of flanged full body or insertion design for the measurement of gas media. The system shall utilize the thermal dispersion principle by monitoring the cooling effect of a gas stream as it passes over a heated transducer from which mass or corrected volume flow can be calculated. The thermal mass flow meter shall be suitable for flow velocities greater than 3.3 ft/s up to a maximum 230 ft/s.

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. Probe.
 - c. Flanges.
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.
- B. Factory Calibration – ISO Standard 17025 accredited – NIST traceable.

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 thermal mass flow meter 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- T-Mass 65F/I

2.02 MANUFACTURED UNITS

- A. The thermal mass flowmeter system shall consist of: a thermal sensing system, integral or remote transmitter, integrated gas engine and DAT modules.
 - 1. The system shall have an easy, safe and menu guided procedure to ensure precise measuring results.
 - 2. The system shall support remote configuration.
- B. The thermal sensing system shall consist of:
 - 1. Wetted materials of 316L stainless steel or Alloy-C22 as standard.
 - 2. A sensor body with standard connections such as ASME B16.5 flanges (65F) or 1" MNPT fittings (65I) as specified by the customer data sheet.
 - 3. A design suitable for the process minimum and maximum temperature, -40 to 212°F (65F) or -40 to 266°F (65I)
 - 4. Wetted O-rings (EPDM, Kalrez 6375, Viton FKM) and/or bushing/ferrule (PEEK GF30 or PVDF) as intended for service.
 - 5. A vibration resistant design up to 1g at 10 to 150 Hz.
 - 6. Dual PT-100 RTD elements capable of providing an update of less than 2 seconds for a step change in measurement up to 63%.
- 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. 4-20mA HART + Frequency + Relay(s) or Status Input
 - 2. 4-20mA HART + Frequency + 4-20mA Input (pressure input)
 - 3. PROFIBUS DP or PA
 - 4. Modbus RS-485 + Status Input
 - 5. Foundation Fieldbus
 - 6. 85 - 260 VAC, 20 - 55 VAC or 11 - 40 VDC
- D. The transmitter shall provide:
 - 1. A powder coated cast aluminum housing with a NEMA 4X rating.
 - 2. A 2-line, backlit LCD display (16 characters) shall indicate flow rate, temperature, and/or up to 2 independent totalized flow values.
 - 3. Low flow cutoff control through the display pushbutton function or via a digital bus (if used).

4. Display notification and history of process or system events.
 5. Interchangeability between 3" to 60" sizes without the need for additional calibration or adjustment.
 6. Remote mount capable option up to 328 feet using standard, shielded twisted pair instrument cable.
 7. Power consumption of no more than 18.2 Watts, independent of meter size, compact or remote transmitter.
- E. The integrated gas engine and DAT modules shall provide:
1. A quick set-up menu capable of accepting up to an 8 component gas mixture of 23 standard gases without recalibration.
 2. Integral sensor and transmitter parameterization protection.
 3. Totalizer and overflow values protected by EEPROM during power outage.
 4. Retainage of key sensor parameters such as pipe type, nominal diameter, flow conditioner when applicable, serial number, K-factor and zero point.
 5. Retainage of key transmitter parameters such as flow unit(s), totalizer unit(s), low flow cut-off values, fail-safe settings.
- F. The thermal mass flowmeter system shall be capable of in-situ verification via a traceable method that tests the sensor and transmitter as separate entities.

2.03 SOURCE QUALITY CONTROL

- 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 mass measured error under factory reference conditions shall be $\pm 1.5\%$ of reading from 100% to 10% of range and $\pm 0.15\%$ of full scale from 10% to 1% of range.
- C. The technique of sensor and transmitter verification must be by a traceable method per NIST or ISO.
- D. Provide complete documentation covering the traceability of all calibration instruments.
- E. Provide ISA data sheet ISA-TR20.00.01. Use the latest revision of form 20F2321. Complete the form with all known data, 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. Optionally, provide a mounting boss for the insertion version sensor, DK6MB - *.
- C. Optionally, provide a remote transmitter mounting set suitable for wall or pipe mounting, or installation at the control panel, DK6WM - *.
- D. Optionally, provide an insertion style thermal mass flow sensor mounting kit, based on the process pressure and required maintenance procedure:
 - 1. Low pressure version for maximum 65 psig, with process connection, ball valve, safety chain and sensor connection, DK6HT - **.
 - 2. Medium pressure version for maximum 235 psig, with process connection, ball valve, extractor assembly and sensor connection, DK6HT - **.
 - 3. Atmospheric version for unpressurized pipes, with sensor connection, ball valve and weld boss, DK6ML - **.
- E. Optionally, the thermal mass flow meter will be installed with a flow conditioner due to inadequate straight run requirements, for the following model:
 - 1. T-mass 65F: 1" to 4" line size to be specified, DK6ST - **.
 - 2. T-mass 65I: 3" to 60" line size to be specified, DK7ST - **.
- F. 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: FM non-incendive for Class I, Division 2, or Class I, Division 1 XP, Group A-D 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.

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.