

**SUGGESTED SPECIFICATIONS FOR THERMAL CONVECTION
MASS FLOW METERS FOR WASTE WATER TREATMENT
FACILITIES**



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A. Description: The Thermal Convection Mass Flow Meter will include a Single Point Insertion Mass Flow Element, microprocessor-based mass Flow Computer/Transmitter, Flow Conditioning Body (In-Line type with a bell-mouth flow nozzle, measurement section, diffuser for pressure recovery, or insertion sleeve type using perforated plates, and/or flow nozzles), packing gland and ball valve for mounting the Flow Element. It shall directly measure, totalize and transmit linear 4-20mA signal corresponding to the mass flow rate of air or digester gas. In-Situ Flow Calibration using the Tracer Gas Dilution Method is required.

- 1. Type:** Constant temperature thermal convection anemometer sensor and circuit using two industrial grade, all-welded, metal-clad rugged Platinum RTD's having directly attached or remote sensor electronics, automatic sensor lead wire resistance compensation, process temperature compensation, CE and Y2K compliance and hazardous gas safety approvals.

B. Required Features:

1. Performance Requirements:

- a) Velocity Accuracy:** $\pm[(1\% + .025\%/^{\circ}\text{C}) \text{ of Reading} + (20 \text{ SFPM} + 0.25 \text{ SFPM}/^{\circ}\text{C})]$ above and below 25°C .
- b) Repeatability:** $\pm 0.25\%$
- c) Signal Outputs:** 4-20 mADC, 800 Ohms maximum load resistance at 24 VDC.
- d) Pressure Rating:** 300 PSIG.
- e) Maximum Pressure Drop at Full Scale Flow Rate:** 0.5" w.c. for Digester Gas, 4" w.c. for air.
- f) Process Temperature Rating:** -40°C to $+200^{\circ}\text{C}$.
- g) Response Time:**
 - 1) To mass velocity changes: 1 second.
 - 2) To temperature changes: 3 seconds.
- h) Sensitivity to Velocity Vector Angle of Incidence:** Less than $\pm 2\%$ of reading for yaw or pitch flow angles of up to $\pm 20^{\circ}$.

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- i) **In-Situ Flow Calibration:** Each mass flow meter shall be field calibrated using the Tracer Gas Method with SF₆ with an accuracy of $\pm 3\%$ of reading. Seller to recommend the location of the Trace Gas Injection and Concentration Sample points. Ports for the injection and sample points to be provided by customer. Calibration procedure to follow the guidelines of ASTM E2029. Seller to verify proper operation of the equipment and enter calibration data into Mass Flow Computer/Transmitter during field start-up service.
- j) **Input Power:**
 - a) 115 VAC, $\pm$ VAC, 50/60 Hz, or 24 VDC, 20 Watts maximum.
- k) **Ambient Temperature Range:**
 - a) Mass Flow Computer/Transmitter Enclosure: -25°C to +65°C.
 - b) Mass Flow Sensors: -40°C to +125°C.
- l) **Velocity Calibration:** Factory calibrated in air over required velocity range using NIST Traceable Wind Tunnel.
- m) The Mass Flow Computer/Transmitter shall be microprocessor-based with an easy-to-use Menu-Driven self-contained LCD/Keypad entry to permit field calibration and configuration changes for variable line sizes and flow rates. With two-line, sixteen character LCD display and a weatherproof 20 character Keypad mounted on the enclosure cover, battery back-up of all data, twelve character I.D., built-in input/output calibration using LCD/Keypad, LCD to include flow rate (SCFM), totalized flow (SCF), time, date, Meter I.D., user entry of flow area, flow units, alarm set-points, 12 bit analog outputs, 18 bit input signal resolution, automatic sensor out-of-tolerance indication, security access code, firmware shall use Lagrangian polynomial interpolation for maximum accuracy between calibration data points, with DB9 connector for connecting to laptop computer to ECHO the keypad and allow uploading and downloading configuration and calibration data. A copy of the configuration and data including the software shall be provided on a 3 1/2" floppy disk. Year 2000 and CE Compliance.

2. Construction Features:

- a) **Sensor Insertion Length:** Per manufacturer's recommendation.
- b) **Process Wetted Parts:**
 - 1) Mass Flow Sensor Sensors: Alloy C-276, all-welded, Helium leak checked.
 - 2) Mass Flow Sensor Support, packing gland, ball valve: 316L Stainless Steel.
 - 3) Packing Gland sealing material: Gortex Expanded PTFE.

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- 4) Flow Conditioning Body: Type 316L Stainless Steel, pressure and leakage tested at 120 PSIG.
- c) **Mass Flow Element or Mass Flow Transmitter Enclosures:** Explosion-Proof Class 1, Division 1, Groups B, C, D, T1, Nema 7/4X rating.
- d) **Series 155 Mass Flow Computer:** Nema 4X, Non-Incendive.
- e) **Mounting:** The Flow Element shall be mounted to the Flow Conditioning Body with a Ball Valve and Packing Gland for removal/insertion of the Flow Element without shutting down the pipe line.
- f) **Identification:** Stainless Steel tags indicating Part Number, Serial Number and Tag Number for Flow Element, or Flow Transmitter, Flow Computer and Flow Body.
- g) **Drawings and Calculations:** provide scaled dimensioned drawings and pressure drop calculations with submittal data.

3. Accessories:

- a) **Interconnecting Cable:** Provide manufacturer's recommended interconnecting cable between the Mass Flow Element and the Mass Flow Computer/Transmitter. Cable length as required.

C. Product Manufacturer:

- 1. Kurz Instruments, Inc.: Series 452 Insertion Mass Flow Elements with Series 155 Mass Flow Computer, or Series 454FT Insertion Mass Flow Transmitter, Series 550C, 550E In-Line Flow Conditioning Body or Series 560 Insertion Flow Conditioning Body.