

Gas Mass Flow Measurement



High Purity Mass Flow Measurement

The ST98 High and Ultra High Purity Mass flow meters are ideally suited for the pharmaceutical, biotech, food and beverage, and semiconductor industries. FCI's thermal dispersion technology provides exceptionally accurate and repeatable indications of mass flow rate. The sensing element combines two matched precision resistance temperature detectors (platinum RTDs). The active RTD is preferentially heated with a constant current. The reference RTD senses at the process fluid temperature. As flow passes the element a resistance differential is produced proportional to the mass flow rate.

The transmitter converts the differential temperature into a standard 4-20 mA output signal that has been linearized during the N.I.S.T. traceable calibration of the flow element. Because the ST98 High and Ultra High Purity flow meters are inherently mass flow detectors, no additional components (i.e., pressure and temperature transducers) are required to provide a true mass flow output.

The ST98 HP High Purity features 15 Ra electropolish finish with a 1 inch sanitary flange mated to a 316L inline flow tube. The ST98 UP Ultra High Purity features 10 Ra electropolish finish with a 1 inch VCR connector mated to a 316L inline flow tube. The 316L flow tube features butt weld or sanitary flanged end process connections. The transmitter is housed in a NEMA Type 4, Type 4X or explosion-proof enclosure and may be integrally mounted to the flow element or remotely mounted up to 500 feet away.

ST98 HP FlexMASter High Purity

Features

- No moving parts
- True Mass flow output
- 316L stainless steel with all welded wetted surfaces
- 10 Ra electropolish for ST98 UP Ultra High Purity
- 15 Ra electropolish for ST98 HP High Purity
- Integral electronics configuration
- Gas calibration
- RS232 communication port
- Field scalable 4-20 mA output
- Factory calibrated and certified to N.I.S.T. standards

Optional Features

- 10 Ra electropolish for ST98 HP High Purity
- LCD display indicating flow rate and process temperature and/or totalized flow
- Remote electronics configuration
- HART or Profibus field communications protocol
- Calibration in hydrogen, helium, argon, etc.
- Oxygen cleaning for wetted surfaces

Industries

- Pharmaceutical
- Biotech
- Food and beverage
- Semiconductor
- Clean processes

Applications

- High purity gas monitoring
- Pill coater air flow monitoring.
- CIP and SIP flow and temperature monitoring
- Condenser/evaporator flow control
- Scrubber gas discharge monitoring
- Process flow measurement and monitoring

Instrument Specifications

Flow Range: 2.0 SCFM to 3183 SCFM [3.4 NCMH to 5409 NCMH] in air at standard conditions for 70 °F [21.1 °C] and 14.7 psia [1.01325 bar(a)], typical to most gases. All gases must be compatible with the flow element material.

Accuracy:

Flow: ± 1 % reading, + 0.5 % full scale accuracy (standard)
Temperature: ± 2 °F [± 1 °C] (for display only; flow rate must be greater than 5 AFPS [1.5 AMPS])

Repeatability:

Flow: ± 0.5 % reading
Temperature: ± 1 °F [± 0.6 °C] (flow rate must be greater than 5 AFPS [1.5 AMPS])
Turndown Ratio: Factory set and field adjustable from 10:1 to 100:1 within calibrated flow range

Temperature Compensation:

Standard: ± 30 °F [± 1 °C]
Optional: ± 100 °F [± 38 °C]

Agency Approvals: ASME BPE, Cenelec (T4 Rated), CE Mark per EMC Directive 89/336/EEC; FM, CSA and CRN pending

Calibration: Performed and certified on N.I.S.T. traceable equipment. Typical calibration performed in actual process service gas.

Flow Element

Material of Construction: All welded 316L stainless steel

ST98 HP: 15 Ra electropolish (standard); 10 Ra electropolish (optional);
Hastelloy C with 15 Ra electropolish (optional)
ST98 UP: 10 Ra or 15 Ra electropolish (standard)

Operating Pressure: 0 psig to 250 psig [0 bar to 17 bar(g)]. Design pressure to 1000 psig [69 bar(g)], maximum operating pressure limited by customer specified process connection.

Operating Temperature: Process temperature -40 °F to +350 °F [-40 °C to +177 °C]; Integral electronics rated from 0 °F to 140 °F [-18 °C to +60 °C].

Flow Element Process Connection:

ST98 HP: 1 inch [25 mm] sanitary flange
ST98 UP: 1 inch [25 mm] VCR connector

Flow Element (continued)

Inline Flow Tube:

ST98 HP: 0.75 inch to 4.0 inch [19 mm to 102 mm] with butt weld preparation or sanitary flange end connections

ST98 UP: 0.75 inch to 4.0 inch [19 mm to 102 mm] with butt weld preparation or sanitary flange end connections

Local Enclosure:

Standard: NEMA/CSA Type 4 carbon steel, Type 4X aluminum or Type 4X stainless steel; Nonincendive for Class 1, Division 2, Groups A, B, C, D; Suitable for Class II, Division 2, Groups F and G; Class III, Division 2.

Optional: NEMA/CSA Type 4X aluminum (meets IP66); Nonincendive for Class 1, Division 1, hazardous locations, Groups B, C, D, E, F and G; and EEx d IIC

Remote Configuration: Transmitter may be mounted remotely from flow element using interconnecting cable up to 500 ft [152 m].

Flow Transmitter

Operating Temperature: 0 °F to 140 °F [-18 °C to +60 °C]

Input Power: 85 Vac to 265 Vac or 22 Vdc to 30 Vdc; 7 watts maximum, 230 mA maximum

Output Signal:

Current: 4 mA to 20 mA, 700 ohms maximum load
Voltage: 0 Vdc to 10 Vdc, 0 Vdc to 5 Vdc, 1 Vdc to 5 Vdc, 100 K ohms minimum load

Communication Port:

Standard: RS-232C Serial
Optional: HART or Profibus – DP, Profile 3

Display (optional): 2 line/16 characters per line, indicating flow rate and process and/or totalized flow

Programmer (optional): Hand held plug-in interface (model FC88)

Remote Enclosure (if selected):

Standard: NEMA/CSA Type 4 carbon steel, Type 4X aluminum or stainless steel (meets IP66); Nonincendive for Class 1, Division 2, Groups A, B, C, D; Suitable for Class II, Division 2, Groups F and G; Class III, Division 2

Optional: NEMA/CSA Type 4X aluminum (meets IP66); Nonincendive for Class 1, Division 1, hazardous locations, Groups B, C, D, E, F and G; and EEx d IIC



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