

Smart Ultra High Purity Thermal Gas Mass Flow Meter

Features

- Measures mass flow directly, no separate temperature or pressure inputs required
- Built-in flow conditioner which eliminates velocity-profile distortions caused by upstream disturbances
- The Ultra High Purity meters are constructed of 316L electro-polished, stainless-steel with a 7-10 Ra interior finish
- Field adjustment of critical flow meter settings via on-board switches or Smart Interface™ (RS 232)
- Field validation of flow meter calibration
- Outstanding rangeability
- One-second response to changes in flow rate
- FM, CSA and ATEX certified for hazardous areas
- CE approved
- PED available

SIERRA[®]
INSTRUMENTS
THE MASS FLOW COMPANY

ISO
REGISTERED
9001

For information online...

www.sierrainstruments.com

Ultra High Purity Model 780S



Description

Sierra Instruments' ultra high purity (UHP) model 780S gas mass flow meters are the instruments of choice for gas distribution service in semiconductor fabs, pharmaceutical production and other ultra-clean processes. UHP meters are constructed of 316L electro-polished, stainless-steel with a 7-10 Ra interior finish.

The versatile microprocessor-based transmitter integrates the functions of flow-range adjustment, meter validation and diagnostics in either a probe-mounted or remote housing. Mass flow rate and totalized flow, as well as other configuration variables, are displayed on the meter's optional 2 x 12 LCD display. The programmable transmitter is easily configured via RS-232 communication port and Sierra's Smart Interface™ software, or via the display and magnetic switches on the instrument panel.

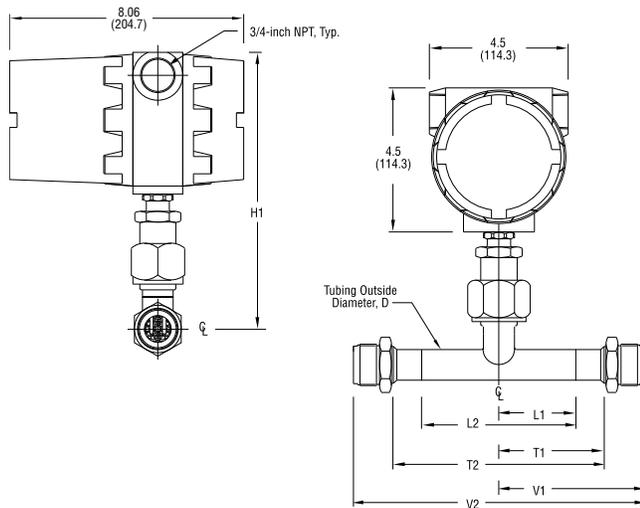
Model 780S smart electronics allow you to easily configure the following performance parameters: flow range, reset totalizer, alarm settings, time response, low flow cut-off and a calibration correction factor. The smart interface also allows for field validation of flow meter performance and calibration.

Model 780S has a built-in flow conditioner which eliminates velocity-profile distortions caused by upstream disturbances.

The meter is FM, CSA, ATEX and PED approved for operation in hazardous areas and is available with a variety of input-power, output-signal, mounting and packaging options.

Dimensional Specifications

1 Through 6-inch 780S UHP (E2)



780S UHP DIMENSIONS

TUBING SIZE	GENERAL		BUTT WELD		TRI-CLAMP		VCR		TUBE WALL
	H1	H2	L1	L2	T1	T2	V1	V2	
.375 (9.5)	10.30 (262)	10.20 (259)	2.85 (72.4)	5.70 (144.8)	—	—	3.48 (88.4)	6.96 (176.8)	.035 (0.9)
.500 (12.7)	10.40 (264)	10.20 (259)	2.90 (73.7)	5.80 (147.3)	—	—	4.00 (101.6)	8.00 (203.2)	.049 (1.2)
1.00 (25.4)	9.10 (231.1)	9.20 (234)	2.50 (63.5)	5.00 (127)	3.00 (76.2)	6.00 (152.4)	4.72 (119.9)	9.44 (239.8)	.065 (1.7)
1.50 (38.1)	9.10 (231.1)	9.30 (231.3)	2.00 (50.8)	5.50 (139.7)	2.50 (63.5)	6.50 (165.1)	—	—	.065 (1.7)
2.00 (50.8)	10.90 (276.9)	10.80 (276.9)	2.50 (63.5)	7.00 (177.8)	3.00 (76.2)	8.00 (203.2)	—	—	.065 (1.7)
3.00 (76.2)	10.70 (271.8)	10.90 (276.9)	3.00 (76.2)	10.50 (266.7)	3.50 (88.9)	11.50 (292.1)	—	—	.065 (1.7)
4.00 (101.6)	10.70 (271.8)	10.90 (277)	4.00 (101.6)	14.00 (355.6)	4.62 (116.8)	15.25 (387.4)	—	—	.083 (2.1)
6.00 (152.4)	12.70 (322.6)	11.90 (302)	6.00 (152.4)	21.00 (533.4)	—	—	—	—	.109 (2.8)

UPSTREAM STRAIGHT PIPE LENGTH REQUIREMENTS⁽¹⁾ AT 1 ATM

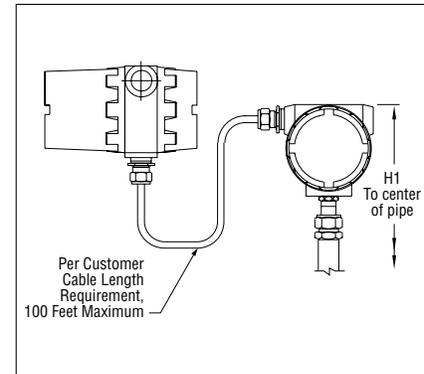
Piping Condition	3/8 and 1/2-inch 780SUHP ⁽²⁾	1 to 6-inch 780SUHP ⁽⁴⁾
Single 90° Elbow or T-Piece	1D	1D
Reduction (4:1)	1D	3D
Expansion (4:1)	3D	3D
After Control Valve	3D	3D
Two 90° Elbows (In Same Plane)	3D	3D
Two 90° Elbows (Different Planes)	5D	5D

- Notes: (1) Number of diameters (D) of straight pipe required between upstream disturbance and the flow meter.
 (2) Requires 1D of straight pipe downstream of the flow meter.
 (3) Requires 3D of straight pipe downstream of the flow meter.
 (4) Requires 0D of straight pipe downstream of the flow meter.
 (5) Consult factory for pressure effect.

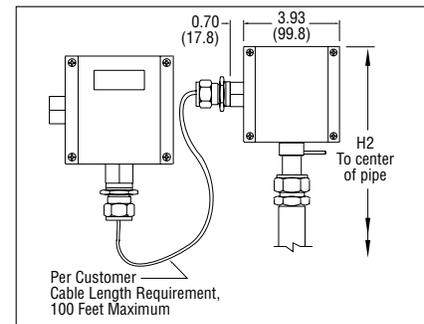
All dimensions are in inches. Millimeters are in parentheses. Certified drawings are available on request.

Remote 780S UHP Specifications

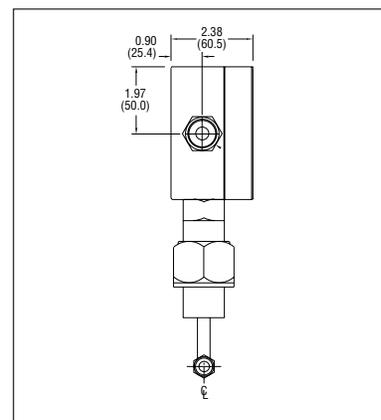
Remote Mounted with Junction Box (E4)



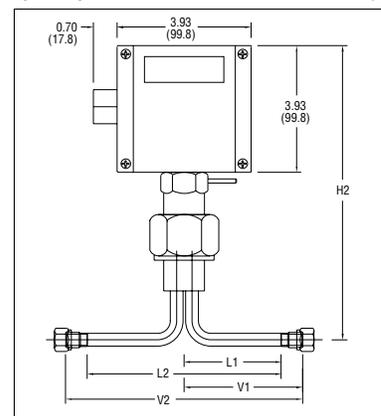
NEMA 4X Remote Mounted with Junction Box (EN4)



3/8 & 1/2-inch 780S UHP—Side View (EN2)



3/8 & 1/2-inch 780S UHP—Front View (EN2)



Performance Specifications

Accuracy

+/- 1% of reading + 0.5 % of full scale

Repeatability

+/- 0.2% of full scale

Temperature Coefficient

+/- 0.02% of reading per °F within +/- 50° F of customer specified conditions

+/- 0.03% of reading per °F within +/- 50° F to 100° F of customer specified conditions

+/- 0.04% of reading per °C within +/- 25° C of customer specified conditions

+/- 0.06% of reading per °C within +/- 25° C to 50° C of customer specified conditions

Pressure Coefficient

.02% per psi for air, consult factory for other gases

Response Time

One second to 63% of final velocity value

Operating Specifications

Gases

Argon, helium, hydrogen, nitrogen, oxygen (consult factory for other gases)

Gas Pressure

Mechanical design pressure:

Compression fittings: 500 psig (34.5 barg)

Gas & Ambient Temperature

Gas -40° F to 250° F (-40° C to 120° C)

Ambient -40° F to 120° F (-40° C to 50° C)

Leak Integrity

5×10^{-9} cc/sec of helium maximum

Power Requirements

18 to 30 VDC (regulated), 625 mA maximum

100 to 240 VAC, 50/60 Hz, 15 watts maximum

Output Signal

Linear 0–5 VDC or 0-10 VDC proportional to mass flow rate,
1000 ohms minimum load resistance or

Linear 4–20 mA proportional to mass flow rate,
700 ohms maximum resistance power supply dependent
User-selectable. Active non-galvanically separated or
passive galvanically separated (loop power rired)

Alarms

Hard contact user-adjustable high and low

Dead band adjustable with Smart Interface™ software

Relay ratings: Maximum 400 VDC or VAC (peak), 140 mA

Displays

Alphanumeric 2 x 12 digit backlit LCD

Adjustable variables via on-board switches (password protected)
or with Smart Interface™ software

Adjustable variable; Full scale (50 to 100 %)

Time Response (1 to 7 seconds)

Correction factor setting (0.5 to 5)

Zero and span

Totalizer

Seven digits (9,999,999) in engineering units

Resettable by software, on-board switches or external magnet

Software

Smart Interface™ Windows®-based software

Minimum 8 MB of RAM, preferred 16 MB of RAM

RS 232 communication

Additional features: Alarm dead band adjustment

Zero cut-off adjustment

Linearization adjustment

Save / Load configurations

Flow meter validation

Physical Specifications

Wetted Materials

316L stainless steel

UHP: 7 to 10 Ra internal finish

Enclosure

Hazardous-Area location enclosure (IP66) or NEMA 4X (IP65)

Both are powder-coated cast aluminum

Electrical Connection

Two 3/4 inch NPT . . . Hazardous-Area location enclosure (IP66)

One 1/2 inch NPT . . . NEMA 4X Enclosure (IP65)

Certifications

CE (All enclosures)

CSA (Explosion proof for Class I, Division 1, Groups B, C, D)

ATEX (II 2 GD Ex d IIC T6 ... T2

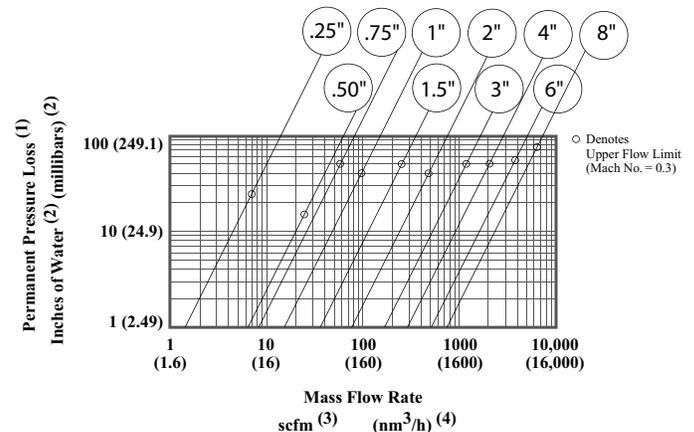
IP 66 T70 °C ... T280 °C)

FM (Explosion proof for Class I, Division 1, Groups B, C, D; dust-ignition proof for Class II, III, Division 1, Groups E, F, G)

IP66, NEMA 4X T6 -40° C to 70° C ambient

PED optional

Pressure Drop for 780S UHP



Notes:

(1) For air and nitrogen at 20 °C temperature and 1 atmosphere pressure.

(2) 1 inch of water at 60 °F = 0.0361 psi.

1 millibar = 0.001 bar = 100 pascal = 0.0145 psi.

(3) At base conditions of 21.1 °C temperature and 1 atmosphere pressure.

(4) At base conditions of 0 °C temperature and 1 atmosphere pressure.

(5) Built-in flow conditioner consists of two separate perforated plates in series.

Ordering the Model 780S UHP

780S									
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PARENT MODEL NUMBER
780S Ultra High Purity In-Line Mass Flow Meter with built-in flow conditioner

AGENCY APPROVALS
NAA Non-Agency Approved Meter
CSA Explosion Proof for Class I, Division 1, Groups B, C, D
ATEX **ATEX** II 2 GD Ex d IIC T6 ... T2
 IP 66 T70 °C ... T280 °C
FM Explosion Proof for Class I, Division 1, Groups B, C, D

RA FINISH
UHP 7-10 Ra Internal Finish

MOUNTING
BW1 3/8-inch Tube O.D. Butt Weld Prep
VCR1 3/8-inch Tube O.D. Female VCR Fitting
BW2 1/2-inch Tube O.D. Butt Weld Prep
VCR2 1/2-inch Tube O.D. Female VCR Fitting
BW4 1-inch Tube O.D. Butt Weld Prep
VCR4 1-inch Tube O.D. Male VCR Fitting
TR4 1-inch Tube O.D. Tri-Clamp Connection
BW5 1.5-inch Tube O.D. Butt Weld Prep
TR5 1.5-inch Tube O.D. Tri-Clamp Connection
BW6 2-inch Tube O.D. Butt Weld Prep
TR6 2-inch Tube O.D. Tri-Clamp Connection
BW7 3-inch Tube O.D. Butt Weld Prep
TR7 3-inch Tube O.D. Tri-Clamp Connection
BW8 4-inch Tube O.D. Butt Weld Prep
TR8 4-inch Tube O.D. Tri-Clamp Connection
BW9 6-inch Tube O.D. Butt Weld Prep (Available in HP Finish Only)

ENCLOSURES
E2 Hazardous-Area Location Enclosure
E3(ft) Remote Hazardous-Area Location Enclosure (Required with EEx Meters)
E4(ft) Remote Hazardous-Area Location Enclosure with Junction Box
EN2 NEMA 4X
EN4(ft) Remote NEMA 4X with Junction Box
 Specify Cable Length in Parentheses, Maximum 200 feet (60 m), Length in Feet using 5 ft. increments to 20 ft., 10 ft. increments to 200 ft.

INPUT POWER
P2 19-30 VDC
P3 100-240 VAC (Not Available on EN Enclosures)

OUTPUT SIGNAL
V1 0-5 VDC, Linear
V3 0-10 VDC, Linear
V4 4-20 mA, Linear

DISPLAY
NR No Readout
DD Digital Display

GAS CODE
0 Air
1 Argon
2 CO₂
6 Helium
7 Hydrogen
10 Nitrogen
11 Oxygen (Correlation)
99 Other

OPTION 1 (DIGITAL COMMUNICATIONS)
PULSE Pulse (not avail. w/ E2-NR)
MB MODBUS (not avail. w/ P3)
FF Foundation Fieldbus (E2/P2 only)
PB Profibus (E2/P2 only)

OPTION 2 (PURGE)
PURGE Includes valve, tube and purge nozzle.

OPTION 3 (CERTIFICATES)
PT Pressure Test Certificate
CC Certificate of Conformance
NC NACE Certificate
MC Materials Certificate
NC NACE Certificate

