

## Smart Ultra High Purity Thermal Gas Mass Flow Meter

### Features

- Measures mass flow directly, no separate temperature or pressure inputs required
- Field adjustment of critical flow meter settings via on-board switches or Smart Interface™ (RS 232)
- Field validation of flow meter calibration
- Immersible sensor technology eliminates zero-drift problems associated with capillary-type mass flow meters
- Outstanding rangeability
- One-second response to changes in flow rate
- FM, CSA and EEx certified for hazardous areas
- CE approved

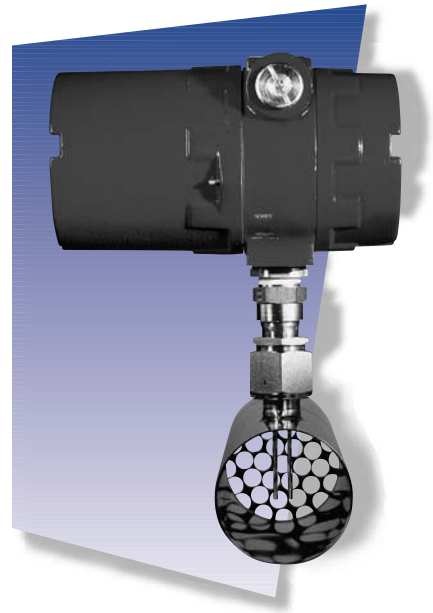
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# 780S Ultra High Purity Series



### Description

**S**ierra Instruments' Series 780S UHP gas mass flow meters are the instruments of choice for gas distribution service in semiconductor fabs, pharmaceutical production and other ultra-clean processes. The Ultra High Purity meters are constructed of 316L electro-polished, stainless-steel with a 7-10 Ra or 20-25 Ra interior finish.

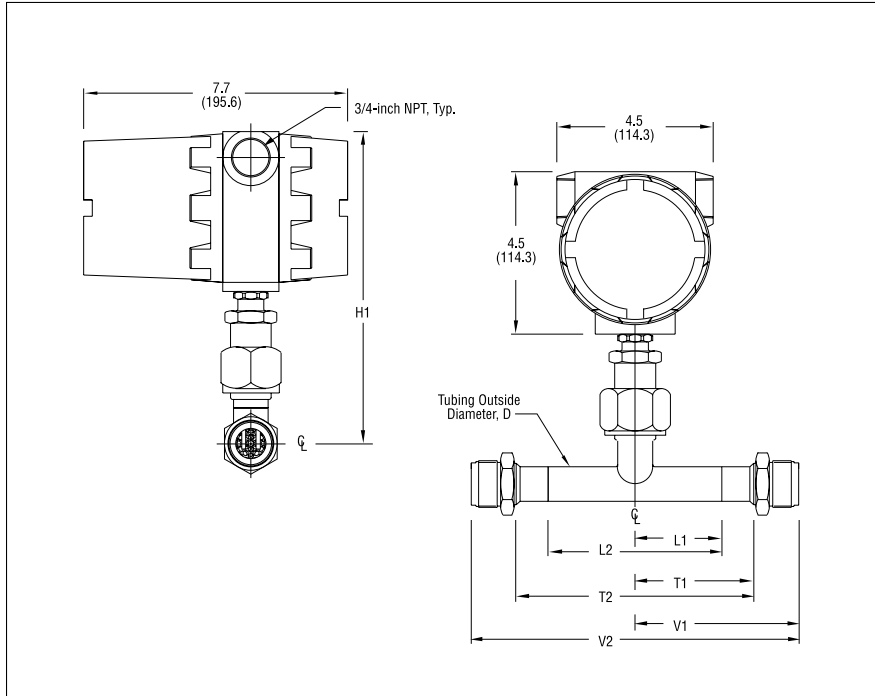
The versatile microprocessor-based transmitter integrates the functions of flow-range adjustment, meter validation and diagnostics in either a probe-mounted or remote housing. Mass flow rate and totalized flow, as well as other configuration variables, are displayed on the meter's optional 2 x 12 LCD panel. 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.

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

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

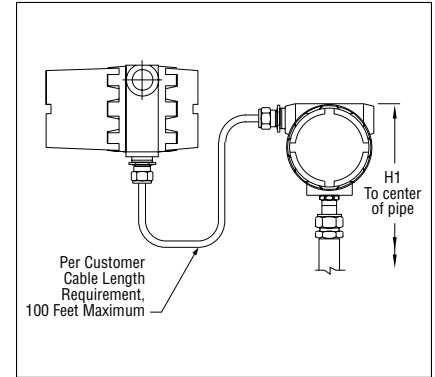
**Dimensional Specifications**

**1 Through 6-inch 780S UHP (E2)**

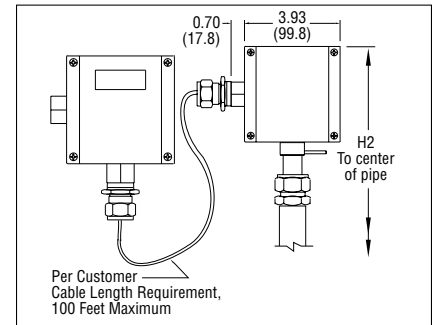


**Remote 780S UHP Specifications**

**Remote Mounted with Junction Box (E4)**



**NEMA 4X Remote Mounted with Junction Box (EN4)**

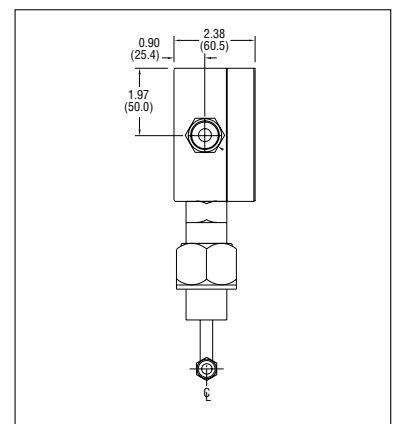


780S UHP DIMENSIONS									
TUBING SIZE	GENERAL		BUTT WELD		TRI-CLAMP		VCR		TUBE WALL
	H1	H2	L1	L2	T1	T2	V1	V2	
.375 (9.5)	10.30 (262)	10.20 (259)	2.85 (72.4)	5.70 (144.8)	—	—	3.48 (88.4)	6.96 (176.8)	.035 (0.9)
.500 (12.7)	10.40 (264)	10.20 (259)	2.90 (73.7)	5.80 (147.3)	—	—	4.00 (101.6)	8.00 (203.2)	.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 (234)	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 (276.9)	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)

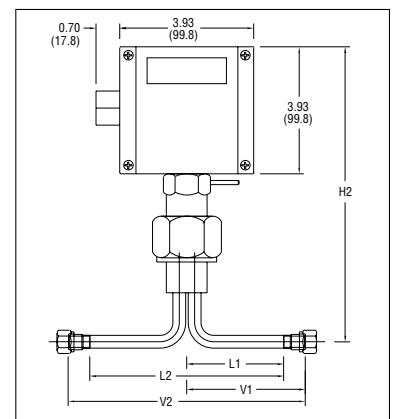
UPSTREAM STRAIGHT PIPE LENGTH REQUIREMENTS <sup>(1)</sup> AT 1 ATM		
Piping Condition	3/8 and 1/2-inch 780SUHP <sup>(2)</sup>	1 to 6-inch 780SUHP <sup>(4)</sup>
Single 90° Elbow or T-Piece	1D	1D
Reduction (4:1)	1D	3D
Expansion (4:1)	3D	3D
After Control Valve	3D	3D
Two 90° Elbows (In Same Plane)	3D	3D
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.

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



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



## Performance Specifications

### Accuracy

- ± 2% of reading from 10 to 100% of calibrated range
- ± 0.5% of full scale below 10% of calibrated range

### 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 (2 limitations)

- Mechanical design pressure:
- Compression fittings: 500 psig (34.5 barg)
- Application gas pressure:
- See mass flow range tables for maximum application gas pressure

### Gas & Ambient Temperature

- Gas ..... 15° F to 250° F (-10° C to 120° C)
- Ambient ..... -5° F to 120° F (-20° C to 50° C)

### Leak Integrity

- 5 X 10<sup>-9</sup> 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 42 VAC or 42 VDC, 140 mA

### Displays

- Alphanumeric 2 x 12 digit backlit LCD
- Adjustable variables via on-board switches (password protected) or with Smart Interface™ software
- Adjustable variables . . . Full scale (50 to 100 %)
- Time Response (1 to 7 seconds)
- Correction factor setting (0.5 to 4)
- Zero and span

### Totalizer

- Eight digits (99,999,999) 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
- Virtual recorder
- Data collection to Excel®
- Flow meter validation

## Physical Specifications

### Wetted Materials

- 316L stainless steel
- UHP ..... 7 to 10 Ra internal finish
- HP ..... 20 to 25 Ra internal finish

### Enclosure

- Hazardous-Area Location Enclosure (IP67) or NEMA 4X (IP65)
- Both are powder-coated cast aluminum

### Electrical Connection

- Two 3/4 inch NPT . . . Hazardous-Area Location Enclosure (IP67)
- 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)
- EEx (EEx d IIC T6...T2) Genelec
- FM (Explosion proof for Class I, Division 1, Groups B, C, D)
- Hazardous-Area Location Enclosures must be specified for CSA, EEx or FM approved products.

## Mass Flow Ranges

EEx approved meters maximum velocities and flow rates are 50% of standard values shown in charts

### 780S-UHP-Air - Gas Code 0

Spec (%rdg)	Pipe Size	Area (SqFt)	Max Vel (SFPM)	Max (SCFM)	Max nm3/hr	Max PSIG
standard accuracy	3/8"	0.00043	20,000	9	14	120
standard accuracy	1/2"	0.00093	20,000	19	29	120
standard accuracy	1"	0.00410	20,000	82	129	120
standard accuracy	1-1/2"	0.01020	20,000	204	322	120
standard accuracy	2"	0.01910	20,000	382	602	120
standard accuracy	3"	0.04490	20,000	898	1416	120
standard accuracy	4"	0.08020	20,000	1604	2530	120
standard accuracy	6"	0.18235	20,000	3647	5752	120

### 780S-UHP-Argon - Gas Code 1

Spec (%rdg)	Pipe Size	Area (SqFt)	Max Vel (SFPM)	Max (SCFM)	Max nm3/hr	Max PSIG
standard accuracy	3/8"	0.00043	28,000	12	19	120
standard accuracy	1/2"	0.00093	28,000	26	41	120
standard accuracy	1"	0.00410	28,000	115	181	120
standard accuracy	1-1/2"	0.01020	28,000	286	450	120
standard accuracy	2"	0.01910	28,000	535	843	120
standard accuracy	3"	0.04490	28,000	1257	1983	120
standard accuracy	4"	0.08020	28,000	2246	3542	120
standard accuracy	6"	0.18235	28,000	5106	8052	120

### 780S-UHP-CO<sub>2</sub> - Gas Code 2

Spec (%rdg)	Pipe Size	Area (SqFt)	Max Vel (SFPM)	Max (SCFM)	Max nm3/hr	Max PSIG
standard accuracy	3/8"	0.00043	19,800	9	13	120
standard accuracy	1/2"	0.00093	19,800	18	29	120
standard accuracy	1"	0.00410	19,800	81	128	120
standard accuracy	1-1/2"	0.01020	19,800	202	319	120
standard accuracy	2"	0.01910	19,800	378	596	120
standard accuracy	3"	0.04490	19,800	889	1402	120
standard accuracy	4"	0.08020	19,800	1588	2504	120
standard accuracy	6"	0.18235	19,800	3611	5694	120

## Mass Flow Ranges

EEx approved meters maximum velocities and flow rates are 50% of standard values shown in charts

### 780S-UHP-Helium - Gas Code 3

Spec (%rdg)	Pipe Size	Area (SqFt)	Max Vel (SFPM)	Max (SCFM)	Max nm3/hr	Max PSIG
standard accuracy	3/8"	0.00043	12,400	5	8	120
standard accuracy	1/2"	0.00093	12,400	12	18	120
standard accuracy	1"	0.00410	12,400	51	80	120
standard accuracy	1-1/2"	0.01020	12,400	126	199	120
standard accuracy	2"	0.01910	12,400	237	374	120
standard accuracy	3"	0.04490	12,400	557	878	120
standard accuracy	4"	0.08020	12,400	994	1568	120
standard accuracy	6"	0.18235	12,400	2261	3566	120

### 780S-UHP-Hydrogen - Gas Code 4

Spec (%rdg)	Pipe Size	Area (SqFt)	Max Vel (SFPM)	Max (SCFM)	Max nm3/hr	Max PSIG
standard accuracy	3/8"	0.00043	9,600	9	13	135
standard accuracy	1/2"	0.00093	9,600	18	29	135
standard accuracy	1"	0.00410	9,600	98	128	135
standard accuracy	1-1/2"	0.01020	9,600	100	155	135
standard accuracy	2"	0.01910	5,235	100	158	135
standard accuracy	3"	0.04490	2,227	100	158	135
standard accuracy	4"	0.08020	1,246	100	158	135
standard accuracy	6"	0.18235	548	100	158	135
See chart below for flows greater than 100 SCFM						
standard accuracy	2"	0.01910	9,600	188	289	85
standard accuracy	3"	0.04490	5,568	250	395	85
standard accuracy	4"	0.08020	3,117	250	395	85
standard accuracy	6"	0.18235	1,370	250	395	85
See chart below for flows greater than 250 SCFM						
standard accuracy	3"	0.04490	8,908	400	632	ambient
standard accuracy	4"	0.08020	4,988	400	632	ambient
standard accuracy	6"	0.18235	2,194	400	632	ambient

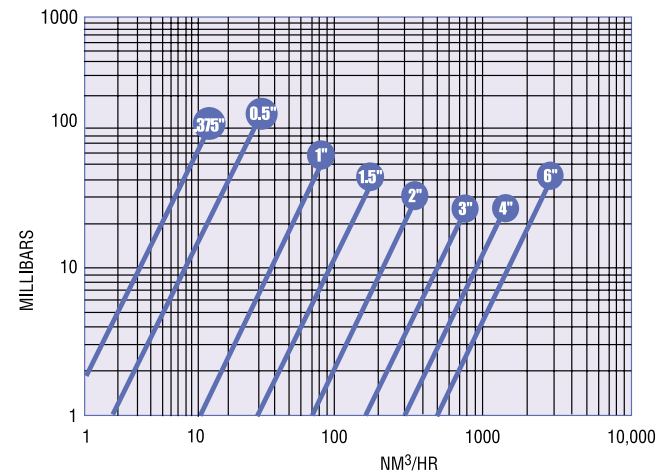
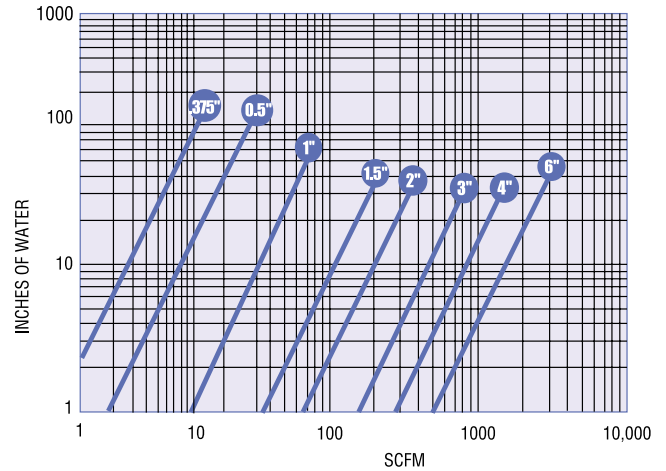
### 780S-UHP-Nitrogen - Gas Code 5

Spec (%rdg)	Pipe Size	Area (SqFt)	Max Vel (SFPM)	Max (SCFM)	Max nm3/hr	Max PSIG
standard accuracy	3/8"	0.00043	19,800	9	13	120
standard accuracy	1/2"	0.00093	19,800	18	29	120
standard accuracy	1"	0.00410	19,800	81	128	120
standard accuracy	1-1/2"	0.01020	19,800	202	319	120
standard accuracy	2"	0.01910	19,800	378	596	120
standard accuracy	3"	0.04490	19,800	889	1402	120
standard accuracy	4"	0.08020	19,800	1588	2504	120
standard accuracy	6"	0.18235	19,800	3611	5694	120

### 780S-UHP-Oxygen - Gas Code 6

Spec (%rdg)	Pipe Size	Area (SqFt)	Max Vel (SFPM)	Max (SCFM)	Max nm3/hr	Max PSIG
4% correlation	3/8"	0.00043	19,800	9	13	120
4% correlation	1/2"	0.00093	19,800	18	29	120
4% correlation	1"	0.00410	19,800	81	128	120
4% correlation	1-1/2"	0.01020	19,800	202	319	120
4% correlation	2"	0.01910	19,800	378	596	120
4% correlation	3"	0.04490	19,800	889	1402	120
4% correlation	4"	0.08020	19,800	1588	2504	120
4% correlation	6"	0.18235	19,800	3611	5694	120

## Pressure Drop for 780S UHP



## Ordering the Model 780S UHP

