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

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.

For information online...
www.sierrainstruments.com
1 Through 6-inch 780S UHP (E2)

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

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

780S UHP DIMENSIONS

<table>
<thead>
<tr>
<th>TUBING SIZE</th>
<th>GENERAL</th>
<th>BUTT WELD</th>
<th>TRI-CLAMP</th>
<th>VCR</th>
<th>TUBE WALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>.375 (.95)</td>
<td>10.30 (262)</td>
<td>10.20 (259)</td>
<td>2.85 (72.4)</td>
<td>5.70 (144.8)</td>
<td>— —</td>
</tr>
<tr>
<td>.500 (12.7)</td>
<td>10.40 (264)</td>
<td>10.20 (259)</td>
<td>2.90 (73.7)</td>
<td>5.80 (147.3)</td>
<td>— —</td>
</tr>
<tr>
<td>1.00 (25.4)</td>
<td>9.10 (231.1)</td>
<td>9.20 (234)</td>
<td>2.50 (63.5)</td>
<td>5.00 (127)</td>
<td>3.00 (76.2)</td>
</tr>
<tr>
<td>1.50 (38.1)</td>
<td>9.10 (231.1)</td>
<td>9.30 (131.3)</td>
<td>2.00 (50.8)</td>
<td>5.50 (139.7)</td>
<td>2.50 (63.5)</td>
</tr>
<tr>
<td>2.00 (50.8)</td>
<td>10.90 (276.9)</td>
<td>10.80 (183.1)</td>
<td>2.50 (63.5)</td>
<td>7.00 (177.8)</td>
<td>3.00 (76.2)</td>
</tr>
<tr>
<td>3.00 (76.2)</td>
<td>10.70 (271.8)</td>
<td>10.90 (178.1)</td>
<td>3.00 (76.2)</td>
<td>10.50 (266.7)</td>
<td>3.50 (88.9)</td>
</tr>
<tr>
<td>4.00 (101.6)</td>
<td>10.70 (271.8)</td>
<td>10.90 (178.1)</td>
<td>4.00 (101.6)</td>
<td>14.00 (355.6)</td>
<td>4.62 (116.8)</td>
</tr>
<tr>
<td>6.00 (152.4)</td>
<td>12.70 (322.6)</td>
<td>11.90 (302)</td>
<td>6.00 (152.4)</td>
<td>21.00 (533.4)</td>
<td>— —</td>
</tr>
</tbody>
</table>

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.

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)

All dimensions are inches. Millimeters are in parentheses. Certified drawings are available on request.
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 +/- 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 +/- 50°C of customer specified conditions

Pressure Coefficient
0.02% 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 X 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
Deaband 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

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)
IP66 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

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Pressure Drop</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 in</td>
<td>25 (0.64)</td>
</tr>
<tr>
<td>1.5 in</td>
<td>50 (1.27)</td>
</tr>
<tr>
<td>2 in</td>
<td>75 (1.91)</td>
</tr>
<tr>
<td>3 in</td>
<td>100 (2.54)</td>
</tr>
<tr>
<td>4 in</td>
<td>150 (3.81)</td>
</tr>
<tr>
<td>6 in</td>
<td>225 (5.69)</td>
</tr>
</tbody>
</table>

Denotes Upper Flow Limit (Mach No. = 0.3)

Permanent Pressure Loss (1) Inches of Water (2) (millibars) (2)
Mass Flow Rate scfm (3) (nm³/h) (4)

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.
3. 1 millibar = 0.001 bar = 100 Pascal = 0.0145 psi.
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

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 II 2 GD Ex d IIC T6 ... T2
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