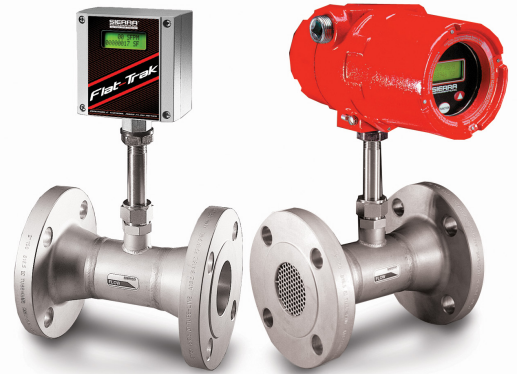


# In-Line Immersible Thermal Gas Mass Flow Meter with Flow Conditioning

## FEATURES

- Direct mass flow monitoring eliminates need for separate temperature and pressure inputs
- Built-in flow conditioner which eliminates velocity-profile distortions caused by upstream disturbances
- Accuracy +/- 1% of reading plus 0.5% of full scale
- Patented Dry-Sense™ technology eliminates sensor drift
- State-of-the-art calibration facility insures a highly accurate calibration that matches the application
- Field validation of meter electronics and sensor resistance verifies flow meter performance
- One-second response to changes in flow rate
- FM, CSA, PED and ATEX certified for hazardous areas
- CE approved
- Optional Modbus

# FlatTrak™ 780S



## DESCRIPTION

**T**he FlatTrak™ 780S flow body eliminates velocity profile distortions, swirl and temperature stratifications in the gas stream and reduces the amount of upstream piping required for accurate flow measurement.

The versatile microprocessor-based transmitter integrates the functions of flow measurement, 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 an RS-232 communication port and Sierra's Smart Interface™ software, or via the display and magnetic switches on the instrument panel.

Sierra's state-of-the-art calibration facility insures that the calibration will match the application, and our patented Dry-Sense™ thermal sensor insures the 780S will hold this calibration over time.

Sierra's Smart Interface™ software guides you through a procedure to fully validate instrument performance. The meter is available with a variety of input power, output signals, mounting and packaging options.

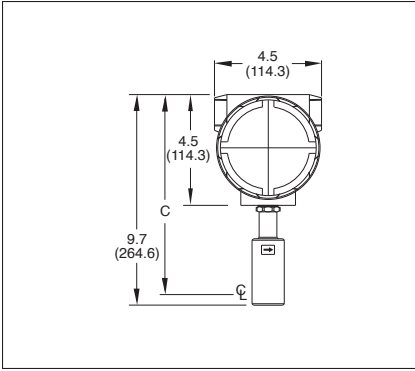


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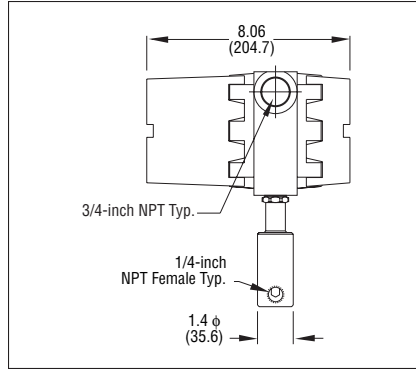


**DIMENSIONAL SPECIFICATIONS**

1/4-inch NPT—Front View (E2)



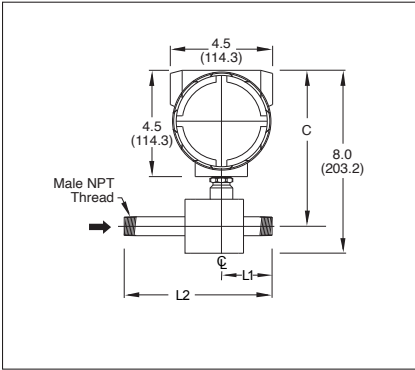
1/4-inch NPT—Side View (E2)



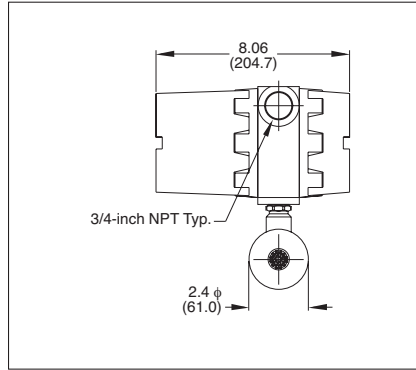
Sizes for NPT

Sizes For NPT			
Size	C	L1	L2
<b>1/4-inch</b>	8.40 (213.4)	—	—
<b>1/2-inch</b>	6.90 (175.3)	2.20 (55.9)	6.50 (165.1)
<b>3/4-inch</b>	6.90 (175.3)	2.20 (55.9)	7.00 (177.8)
<b>1-inch</b>	9.10 (228.6)	1.50 (38.1)	3.50 (88.9)
<b>1.5-inch</b>	9.40 (238.8)	2.25 (57.2)	5.25 (133.4)
<b>2-inch</b>	10.20 (259.1)	3.50 (88.9)	7.50 (190.5)
<b>3-inch</b>	11.20 (284.5)	4.00 (101.6)	10.00 (254)
<b>4-inch</b>	11.20 (284.5)	4.00 (101.6)	12.00 (304.8)
<b>6-inch</b>	12.20 (309.9)	6.00 (152.4)	18.00 (457.2)
<b>8-inch</b>	13.20 (335.3)	8.00 (203.2)	24.00 (609.6)

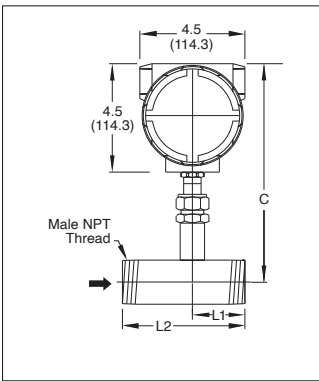
1/2-inch and 3/4-inch NPT—Front View (E2)



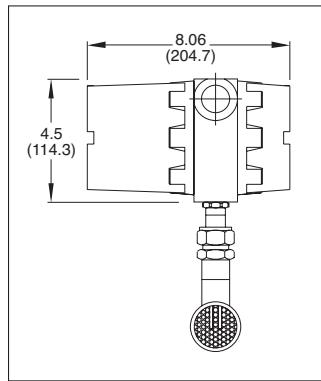
1/2-inch and 3/4-inch NPT—Side View (E2)



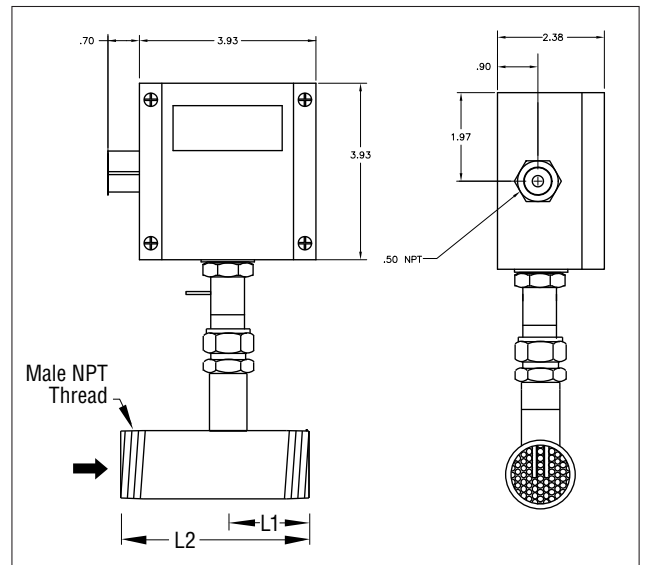
1-inch Through 8-Inch NPT—Front View (E2)



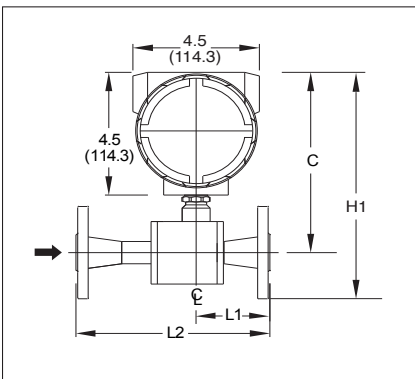
1-inch Through 8-Inch NPT—Side View (E2)



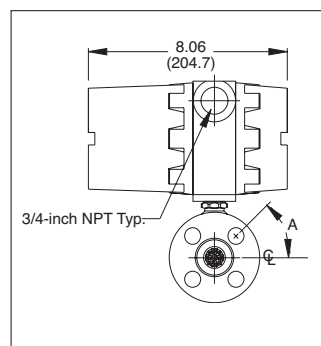
1-inch to 8-Inch NPT—Front/Side View (EN2)



1/2 and 3/4-inch 150 lb Flange—Front View (E2)



1/2 and 3/4-inch 150 lb Flange—Side View (E2)

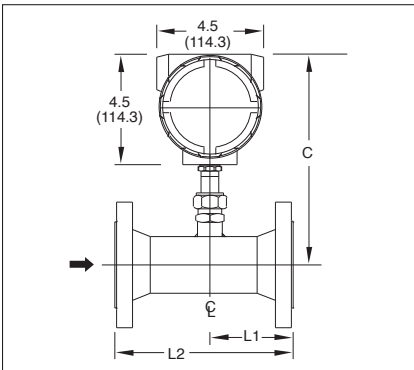


Sizes for 150 lb ANSI Flange

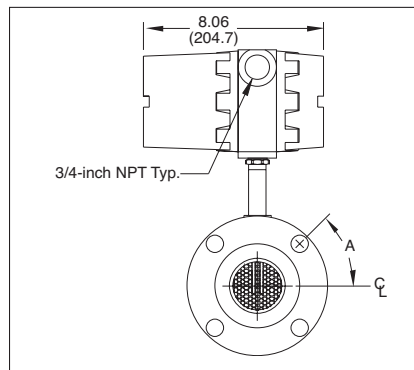
Sizes For 150 Lb Ansi Flanges					
Size	H1	C	L1	L2	A
<b>1/2-inch</b>	7.79 (197.9)	6.94 (176.3)	2.60 (66.0)	6.95 (176.5)	45°
<b>3/2-inch</b>	7.79 (197.9)	6.94 (176.3)	2.78 (70.6)	7.56 (192.0)	45°

All dimensions are inches. Millimeters are in parentheses. All drawings have a +/- .25-inch (6.4 mm) tolerance. Certified drawings are available on request.

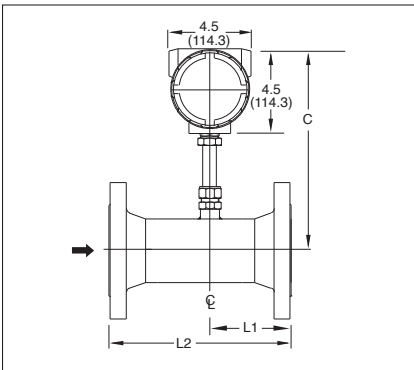
1" Through 8" 150 lb Flange—Front View (E2)



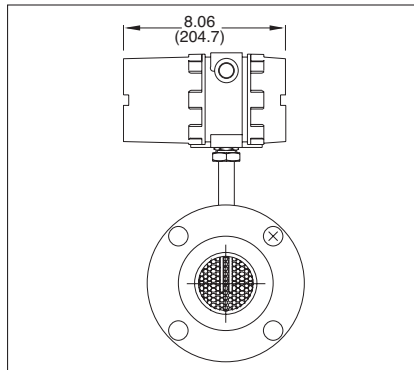
1" Through 8" 150 lb Flange—Side View (E2)



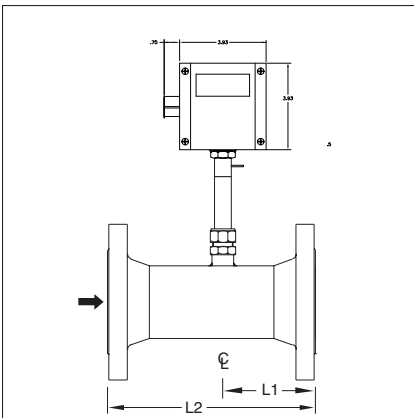
DN Flange—Front View (E2)



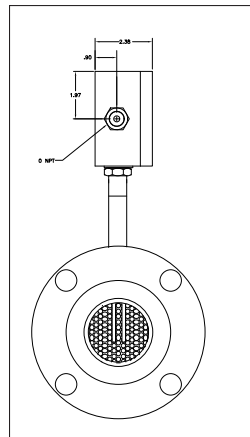
DN Flange—Side View (E2)



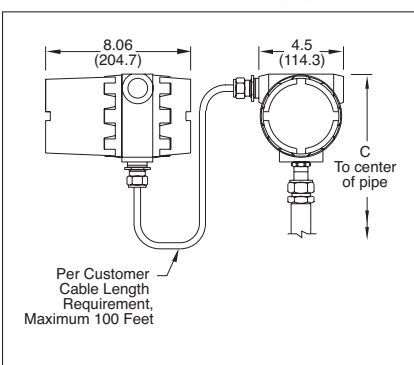
NEMA 4X Enclosure - Front View (EN2)



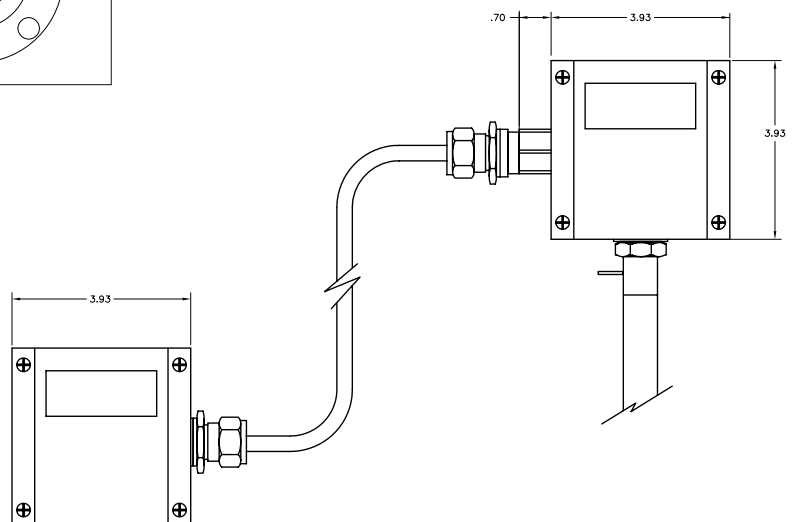
NEMA 4X Enclosure—Side View (EN2)



Remote Mounted with Junction Box (E4)



Remote Mounted with Junction Box (EN4)



Sizes For 150 Lb Ansi Flanges				
Size	C	L1	L2	A
1-inch	9.10 (238.8)	3.60 (91.4)	7.40 (188.0)	45°
1.5-inch	9.40 (238.8)	3.80 (96.5)	7.56 (192.0)	45°
2-inch	10.20 (259.1)	3.50 (88.9)	7.50 (190.5)	45°
3-inch	11.20 (284.5)	4.00 (101.6)	12.00 (304.8)	22.5°
4-inch	11.20 (284.5)	4.00 (101.6)	12.00 (304.8)	22.5°
6-inch	12.20 (309.9)	6.00 (152.4)	18.00 (457.2)	22.5°
8-inch	13.20 (353.3)	8.00 (203.2)	24.00 (609.6)	22.5°

Sizes For PN16 DL Flanges			
Size	C	L1	L2
DN50	10.70 (271.8)	3.34 (84.8)	7.10 (180.3)
DN80	10.50 (266.7)	4.14 (105.2)	10.20 (259.1)
DN100	10.60 (269.2)	4.57 (116.1)	12.60 (320.0)
DN150	12.40 (315.0)	6.77 (172.0)	18.90 (480.1)
DN200	14.50 (368.3)	8.47 (215.1)	24.00 (619.8)

Sizes For Remote Mounted	
Size	C
1/4-inch	8.4 (198.1)
1/2-inch	6.9 (175.3)
3/4-inch	6.9 (175.3)
1-inch	9.10 (231.1)
1.5-inch	9.40 (238.8)
2-inch	10.20 (259.1)
3-inch	11.20 (284.5)
4-inch	11.20 (284.5)
6-inch	12.20 (309.9)
8-inch	13.20 (335.3)

## 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

Most gases compatible with 316 L stainless steel

### Gas Pressure (2 limitations)

Mechanical design pressure:

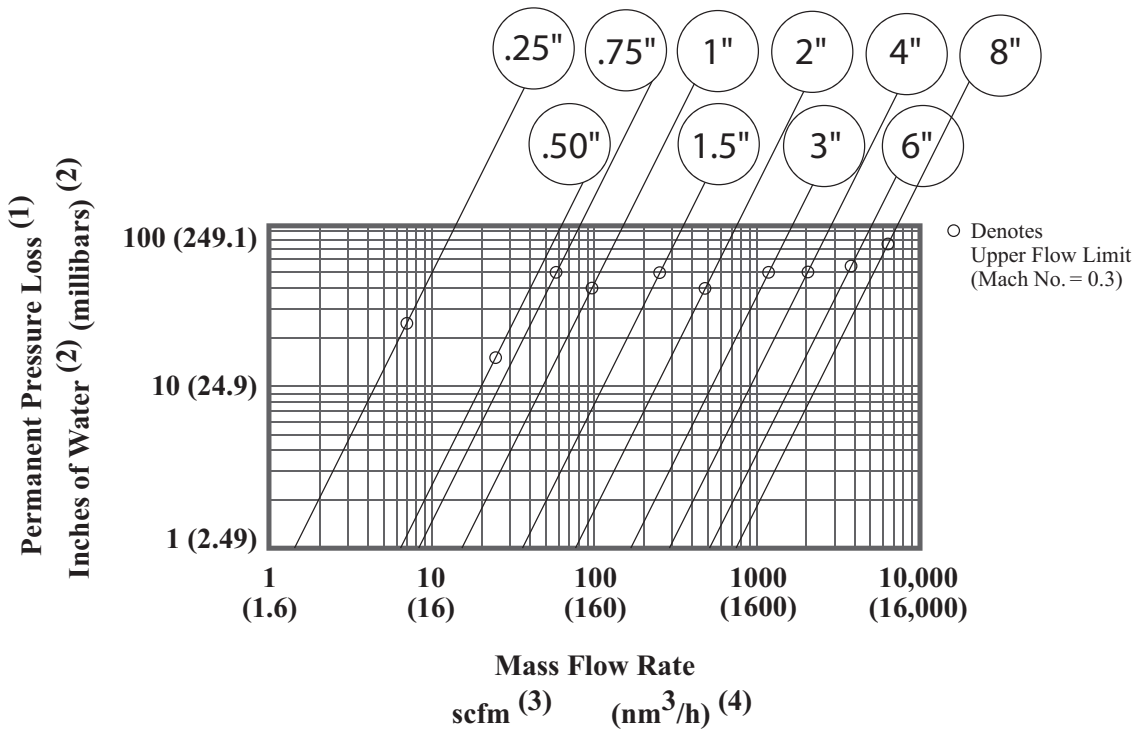
150 lb flange or PN16 DN (-40° F to 100° F): 230 psig (15.9 barg)

150 lb flange or PN16 DN (250° F): 185 psig (12.8 barg)

150 lb flange or PN16 DN (450° F): 155 psig (10.7 barg)

NPT (-40° F to 250° F): 500 psig (34.5 barg)

## PERFORMANCE SPECIFICATIONS



### 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.

## OPERATING SPECIFICATIONS (CONTINUED)

### Gas & Ambient Temperature

Gas . . . . . -40° F to 350° F (-40° C to 177° C)  
Ambient . . . . . -40° F to 120° F (-40° 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  
625 mA maximum operating current at 24 VDC and full scale flow  
Maximum in rush current of 2 Amps at 24 VDC

### Output Signal

Linear 0–5 VDC or 0-10 VDC, 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 required)  
See Digital Communications options below

### 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 variables Full scale (50 to 100 %)  
Time Response (1 to 7 seconds)  
Correction factor setting (0.5 to 5)  
Zero and span  
High and low alarm settings

### 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  
Fully guided flow meter validation

## PHYSICAL SPECIFICATIONS

### Wetted Materials

316L stainless steel  
Carbon steel flow bodies available in some sizes

### Enclosure

Hazardous-Area Location Enclosure (IP66) and NEMA 4X (IP65) are  
powder-coated cast aluminum

### Electrical Connections

Two 3/4 inch NPT . . . . . Hazardous-Area Location Enclosure (IP66)  
One 1/2 inch NPT . . . . . NEMA 4X Enclosure (IP65)

### Piping Requirements

Straight Pipe Length Requirements at 1 ATM			
Piping Condition	780S FlatTrak™		Orifice Plate (3)
	Upstream	Downstream	
Single 90° Elbow or T-Piece	1D	0D	28D
Reduction (4:1)	3D	0D	14D
Expansion (4:1)	3D	0D	30D
After Control Valve	3D	0D	32D
Two 90° Elbows (In Same Plane)	3D	0D	36D
Two 90° Elbows (Different Plane)	5D	0D	62D

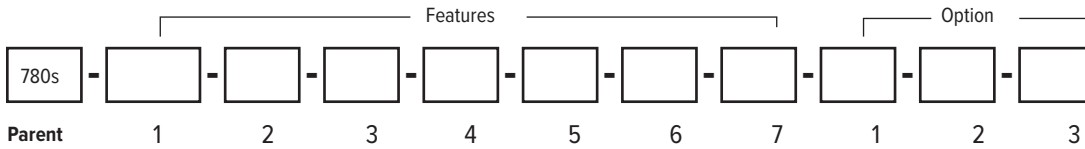
Notes: (1) Number of diameters (D) of straight pipe required between upstream disturbance and the flow meter.  
(2) Number of diameters (D) of straight pipe required downstream of the flow meter.  
(3) For comparison purposes only. Table shows number of diameters (D) of upstream straight pipe length required for an ISO Standard 5167 Orifice Plate with a Beta Ratio of 0.7.  
(4) Consult factory for pressure effects.

### Certifications

CE  
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)  
IP65, NEMA 4X T6 -40° C to 70° C ambient  
PED optional

## DIGITAL COMMUNICATIONS OPTIONS

Pulse (1Hz max, not available with E2-NR)  
Modbus RTU (not available with P3 option)



Instructions: To order a 780S please fill in each number block by selecting the codes from the corresponding features below and following pages.

Parent Model Number	
<b>780S</b>	FlatTrak™ In-line Mass Flow Meter with Flow Conditioner. All 316 stainless steel construction. UHP 5-10 RA available. 18-30 VDC or 100-240VAC input power with 3/4-inch diam 316SS probe. Includes "Smart Electronics" with PC configuration software. Calibration temperatures up to 350°F (176°C) and pressure to 500 psig (34.5 barg). CE, FM, CSA, ATEX approvals. Linear 0-5 VDC or 4-20 mA output signals. Lifetime warranty on non-UHP Fast Response (FR) sensor

Note: The following lists standard product/pricing. Sierra will work with you for special requests. Please submit your request using the RFQ/Specials tab in this price list.

Feature 1: Approvals	
<b>NAA</b>	Non-agency approved meter
<b>ATEX</b>	780S with II 2 GD Ex d IIC T2...T6 ATEX Approval. Requires E2 or E3 enclosure. Note: ATEX units have circuit energy limitations that limit maximum flows to approx. 50% of non-ATEX units. Consult gas tables for details.
<b>FM</b>	780S with FM approval. Requires E2 or E4 enclosure
<b>CSA</b>	780S with CSA approval. Requires E2 or E4 enclosure

Feature 2: Body Size-NPT*	
<b>N1</b>	1/4-inch NPT Female 316SS
<b>N2</b>	1/2-inch NPT Male 316SS
<b>N3</b>	3/4-inch NPT Male 316SS
<b>N4</b>	1-inch NPT Male 316SS
<b>N5</b>	1.5-inch NPT Male 316SS
<b>N6</b>	2-inch NPT Male 316SS
<b>N7</b>	3-inch NPT Male 316SS
<b>N8</b>	4-inch NPT Male 316SS
<b>N9</b>	6-inch NPT Male 316SS
<b>N10</b>	8-inch NPT Male 316SS

Feature 2: Body Size-ANSI 150*	
<b>F2</b>	1/2-inch ANSI class 150 flange 316SS
<b>F3</b>	3/4-inch ANSI class 150 flange 316SS
<b>F4</b>	1-inch ANSI class 150 flange 316SS
<b>F5</b>	1.5-inch ANSI class 150 flange 316SS
<b>F6</b>	2-inch ANSI class 150 flange 316SS
<b>F7</b>	3-inch ANSI class 150 flange 316SS
<b>F8</b>	4-inch ANSI class 150 flange 316SS
<b>F9</b>	6-inch ANSI class 150 flange 316SS
<b>F10</b>	8 inch ANSI class 150 flange 316SS

Feature 2: Body Size-PN 16*	
<b>FD6</b>	DN50, PN16, DIN flange
<b>FD7</b>	DN80, PN16, DIN flange
<b>FD8</b>	DN100, PN16, DIN flange
<b>FD9</b>	DN150, PN16, DIN flange
<b>FD10</b>	DN200, PN16, DIN flange

Feature 2: Body Size-PN 40	
<b>GD4</b>	DN25, PN40, DIN flange
<b>GD5</b>	DN40, PN40, DIN flange
<b>GD6</b>	DN50, PN40, DIN flange
<b>GD7</b>	DN80, PN40, DIN flange
<b>GD8</b>	DN100, PN40, DIN flange
<b>GD9</b>	DN150, PN40, DIN flange
<b>GD10</b>	DN200, PN40, DIN flange

Note: Carbon steel, Hastelloy®, PVC, and Kynar flow bodies are available. Consult Factory for information.

Feature 3: Electronics Enclosure	
<b>E2</b>	Hazardous-area location enclosure (IP66) Mounted directly on probe
<b>E3 ( )</b>	Remote probe and flow body 10, 25, 50, 100 feet (select one) away from the probe
<b>E4 ( )</b>	Remote Hazardous-Area Location Enclosure (IP66) with Junction Box 10, 25, 50, 100 feet (select one) away from the probe with junction box mounted on probe.
<b>EN2</b>	NEMA 4X (IP65) Enclosure. Mounted directly on probe.
<b>EN4 ( )</b>	Remote NEMA 4X (IP65) Enclosure with Junction Box. 10, 25, 50, 100 feet (select one) away from the probe with junction box mounted on probe.

Note: E4, EN4: Customer may cut cable length with no effect on accuracy.

Feature 4: Input Power	
<b>P2</b>	18–30 VDC
<b>P3</b>	100–240 VAC. Not available with EN enclosures.

Feature 5: Output	
<b>V1</b>	0–5 VDC, linear
<b>V3</b>	0-10 VDC, linear
<b>V4</b>	4-20 mA, linear

Feature 6 : Display	
<b>NR</b>	No Readout
<b>DD</b>	Digital display. 2 x 12 digit, backlit, LCD display indicates flow rate and totalized mass in engineering units. Simplifies configuration settings and provides system status information
<b>DD-NRT</b>	Totalizer cannot be reset in the field.
<b>SS</b>	Sun shield. Note: This option does not include display. See DD above.

Feature 7: Gas	
<b>0</b>	Air
<b>1</b>	Argon
<b>2</b>	Carbon dioxide
<b>3</b>	Chlorine <sup>1</sup>
<b>4</b>	Digester gas
<b>5</b>	Digester gas <sup>1</sup>
<b>6</b>	Helium
<b>7</b>	Hydrogen
<b>8</b>	Methane
<b>9</b>	Methane <sup>1</sup>
<b>10</b>	Nitrogen
<b>11</b>	Oxygen <sup>1</sup>
<b>12</b>	Propane
<b>13</b>	Propane <sup>1</sup>
<b>14</b>	Ammonia <sup>1</sup>
<b>99</b>	Other--Consult Factory Gas Table

Option 1 : Digital Communications	
<b>Pulse</b>	Totalizer pulse output (Only available with E2/E3/E4 enclosures WITH DD. Available on ALL EN2 Enclosures)
<b>MB</b>	Modbus RTU with full device description (P2 only); ATEX and FM approvals available

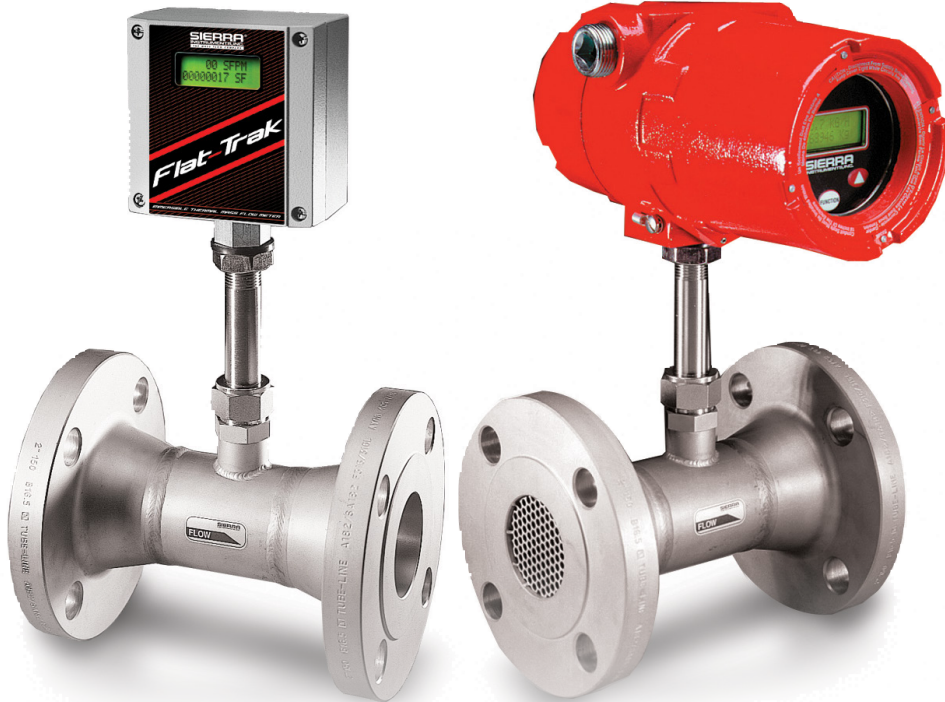
Note: All except Pulse require DC power (P2).

Option 2: Certificates	
<b>MC</b>	Material certificates--US Mill certs on all wetted parts
<b>PED</b>	Manufactured according to PED directive
<b>CC</b>	Certificate of conformance
<b>NACE</b>	NACE certificate for sour gas
<b>LT</b>	Leak test certificate
<b>PT</b>	Pressure test certificate
<b>CO</b>	Stamped Certificate of Origin

Option 3: O2 Cleaning	
<b>O2C</b>	O2 Cleaning. Meters up to 4 inches (DN100). Includes certification. Product cleaned for O2 service. Inspected with Ultra-Violet light, double-bagged prior to shipment. CERTIFICATION INCLUDED

Note: Consult factory for O2 Cleaning of meters over 4-inches (DN100).

<sup>1</sup>Correlation calibration - consult Gas Table for accuracy.  
Note: Consult Product Data Sheet for flow rate, pressure, and temperature limits.



[www.sierrainstruments.com](http://www.sierrainstruments.com)

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