

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, ATEX and CSA certified for hazardous areas
- CE approved
- Optional Modbus

FlatTrak™ 780S



DESCRIPTION

The 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.

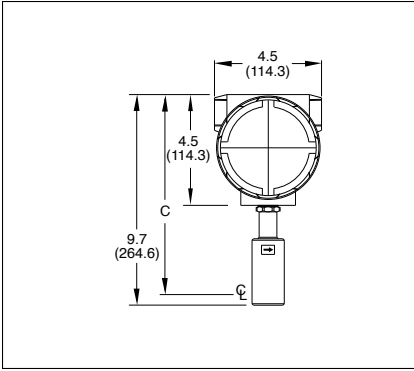
Sierra's Smart Interface™ software guides you through a procedure to fully validate instrument performance. The meter is available with a variety of input power, output signals, mounting and packaging options.



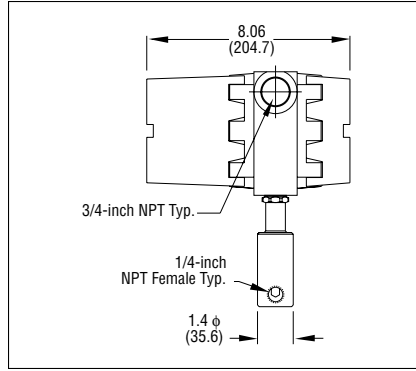
www.sierrainstruments.com

The information contained herein is subject to change without notice.

1/4-inch NPT—Front View (E2)



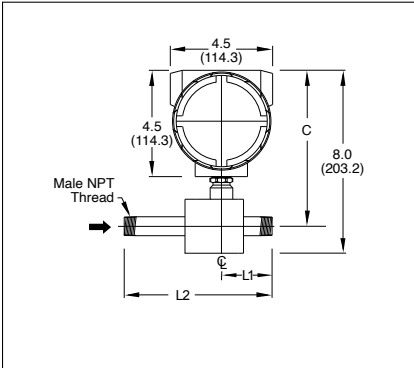
1/4-inch NPT—Side View (E2)



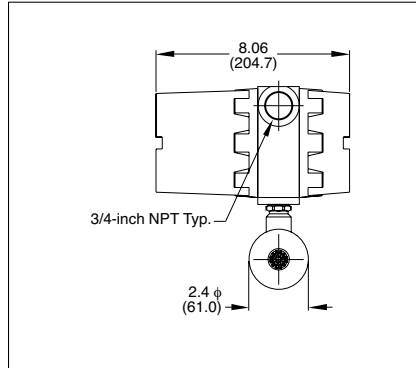
Sizes for NPT

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

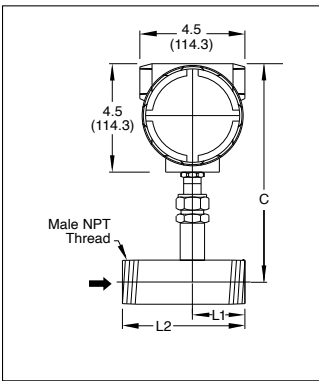
1/2-inch and 3/4-inch NPT—Front View (E2)



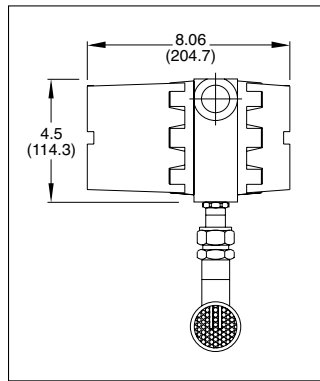
1/2-inch and 3/4-inch NPT—Side View (E2)



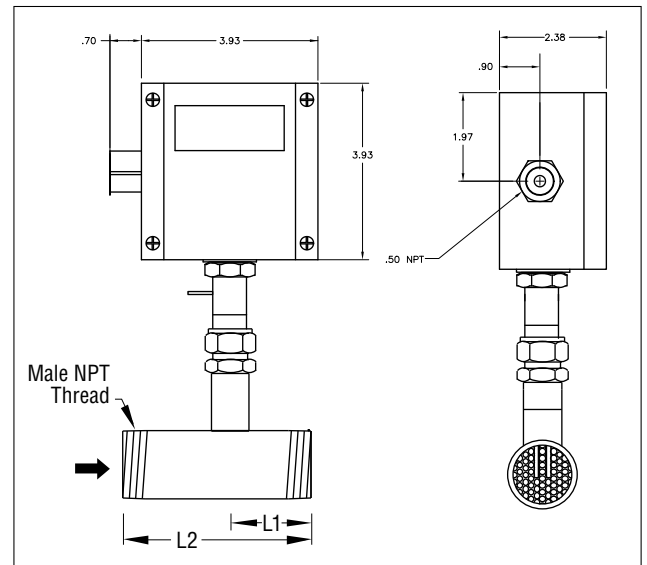
1-inch Through 8-Inch NPT—Front View (E2)



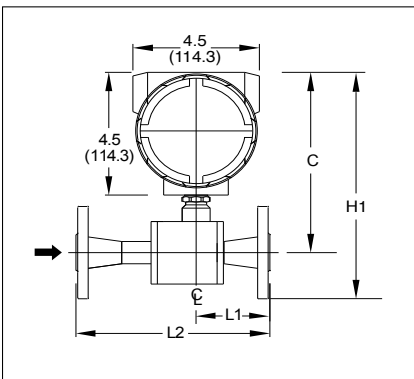
1-inch Through 8-Inch NPT—Side View (E2)



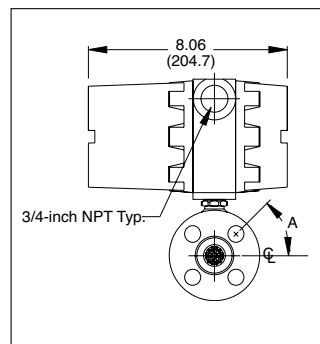
1-inch to 8-Inch NPT—Front/Side View (N2)



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



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

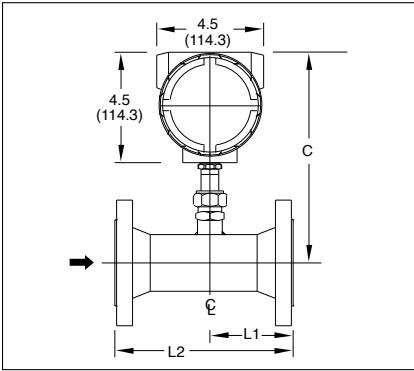


Sizes for 150 lb ANSI Flange

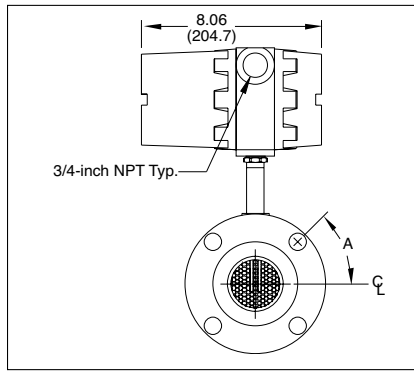
Sizes For 150 Lb Ansi Flanges					
Size	H1	C	L1	L2	A
1/2-inch	7.79 (197.9)	6.94 (176.3)	2.60 (66.0)	6.95 (176.5)	45°
3/2-inch	7.79 (197.9)	6.94 (176.3)	2.78 (70.6)	7.56 (192.0)	45°

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

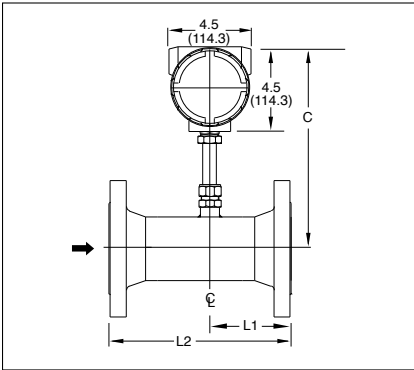
1" Through 8" 150 lb Flange—Front View (E2)



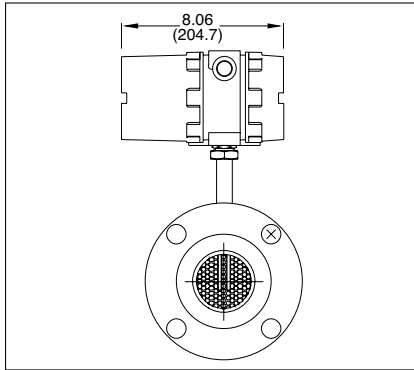
1" Through 8" 150 lb Flange—Side View (E2)



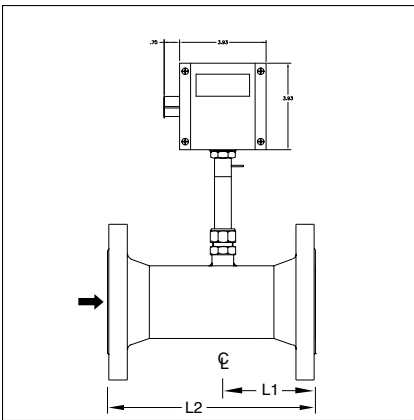
DN Flange—Front View (E2)



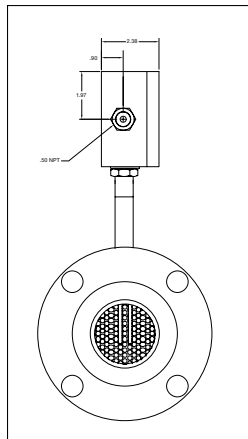
DN Flange—Side View (E2)



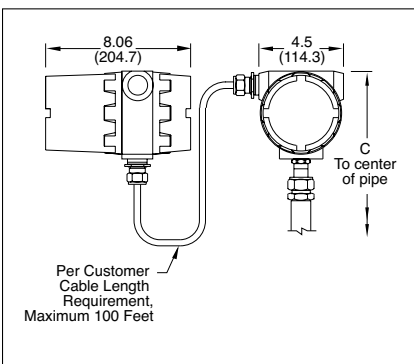
NEMA 4X Enclosure - Front View (N2)



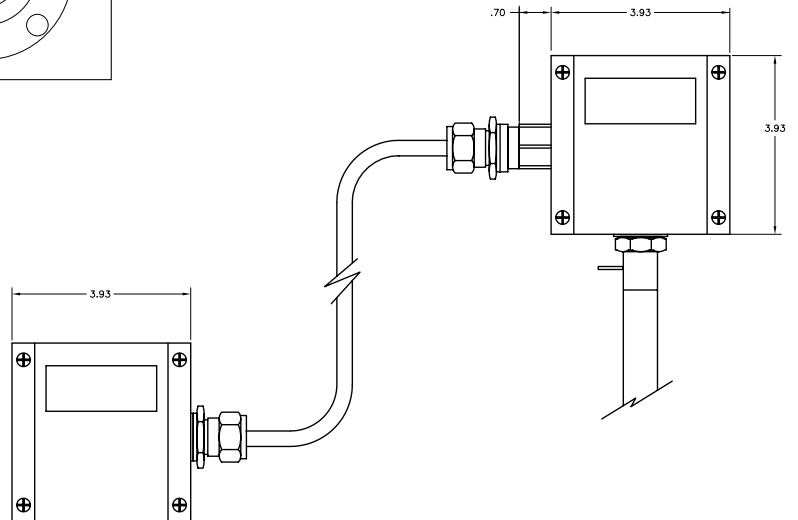
NEMA 4X Enclosure—Side View (N2)



Remote Mounted with Junction Box (E4)



Remote Mounted with Junction Box (N4)



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 DN 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

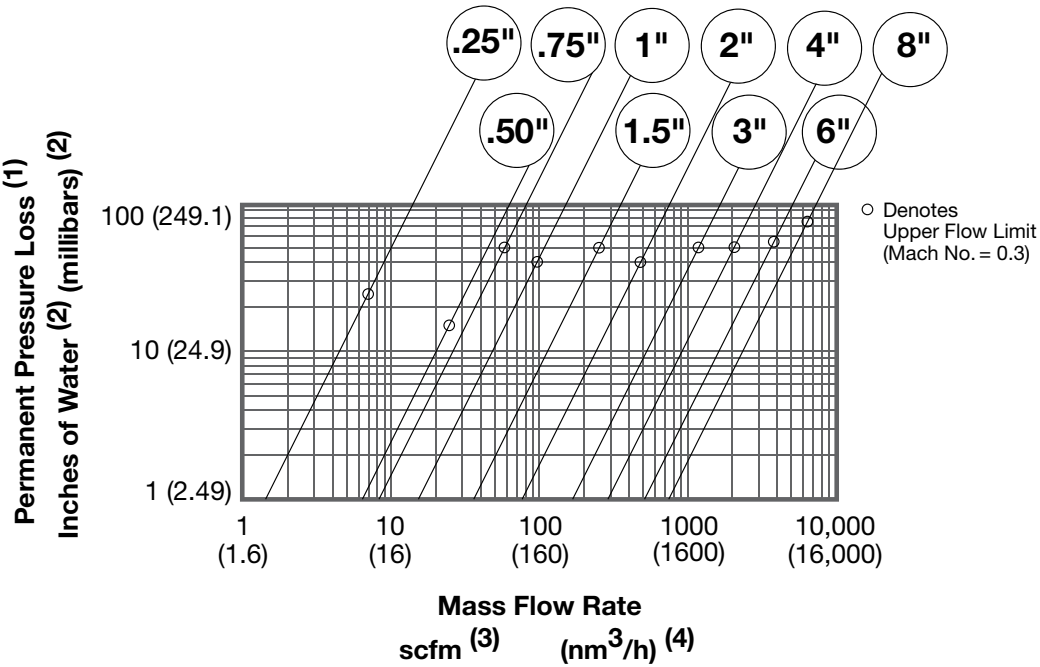
Response Time
One second to 63% of final velocity value

OPERATING SPECIFICATIONS

Gases
Most gases compatible with 316 L stainless steel

Gas Pressure
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)

Note: ATEX units have a minimum Gas and Ambient Temperature rating of -4°F (-20°C). For gas temperatures >149°F (65°C) a remote E3 Electronics Enclosure must be used.

Leak Integrity

5 X 10⁻⁹ cc/sec of helium maximum

Power Requirements

18 to 30 VDC (regulated), 625 mA maximum (ATEX 18 to 24 VDC)

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

DIGITAL COMMUNICATIONS OPTIONS

Pulse (1Hz max, not available with E2/E3/E4-NR)

Modbus RTU (not available with P3 option)

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)

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

Piping Requirements

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

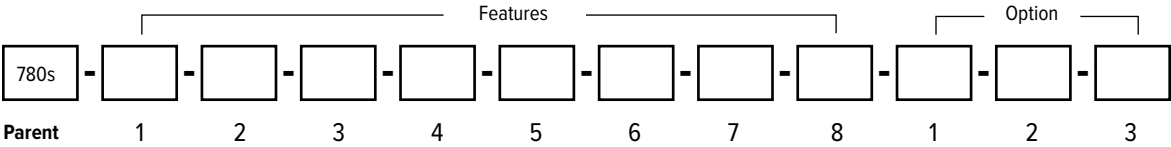
ATEX (II 2G Ex db IIB+H2 T6...T2 Gb / II 2D Ex tb IIIC T85 °C...T226°C Db)

CSA (Class I, Groups B, C and D T3; Class II, Groups E, F and G T3)

FM (Explosionproof for Class I, Division 1, Groups B, C and D; Dust-ignitionproof for Class II, Division 1, Groups E, F and G hazardous (classified) locations, indoors and outdoors (Type 4X). Ambient Temperature Ta = -40°C to +50°C)

IP65, NEMA 4X T6 -40° C to 50° C ambient

ORDERING THE 780S



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

Parent Number	
780S	FlatTrak™ In-line Mass Flow Meter with Flow Conditioner and all 316SS construction. Includes "Smart Electronics" with PC configuration software. Lifetime warranty on Fast Response (FR) sensor.

Note: The following lists standard product. Sierra will work with you for special requests. Contact sales to submit RFQs for specials.

Feature 1a: Body Size-NPT*	
N025	1/4-inch NPT Female 316SS
N050	1/2-inch NPT Male 316SS
N075	3/4-inch NPT Male 316SS
N100	1-inch NPT Male 316SS
N150	1.5-inch NPT Male 316SS
N200	2-inch NPT Male 316SS
N300	3-inch NPT Male 316SS
N400	4-inch NPT Male 316SS
N600	6-inch NPT Male 316SS
N800	8-inch NPT Male 316SS

Feature 1b: Body Size-ANSI 150*	
F050	1/2-inch ANSI class 150 flange 316SS
F075	3/4-inch ANSI class 150 flange 316SS
F100	1-inch ANSI class 150 flange 316SS
F150	1.5-inch ANSI class 150 flange 316SS
F200	2-inch ANSI class 150 flange 316SS
F300	3-inch ANSI class 150 flange 316SS
F400	4-inch ANSI class 150 flange 316SS
F600	6-inch ANSI class 150 flange 316SS
F800	8 inch ANSI class 150 flange 316SS

Feature 1d: Body Size-PN 16*	
FD200	DN50, PN16, DIN flange 316SS
FD300	DN80, PN16, DIN flange 316SS
FD400	DN100, PN16, DIN flange 316SS
FD600	DN150, PN16, DIN flange 316SS
FD800	DN200, PN16, DIN flange 316SS

Feature 1e: Body Size-PN 40	
GD100	DN25, PN40, DIN flange 316SS
GD150	DN40, PN40, DIN flange 316SS
GD200	DN50, PN40, DIN flange 316SS
GD300	DN80, PN40, DIN flange 316SS
GD400	DN100, PN40, DIN flange 316SS
GD600	DN150, PN40, DIN flange 316SS
GD800	DN200, PN40, DIN flange 316SS

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

Feature 2: Electronics Enclosure	
E2	Hazardous-area location enclosure (IP66) Mounted directly on probe
E3	Remote probe and flow body. Cable sold separately.
E4	Remote Hazardous-Area Location Enclosure (IP66) with Junction Box. Cable sold separately.
N2	NEMA 4X (IP65) Enclosure. Mounted directly on probe.
N4	Remote NEMA 4X (IP65) Enclosure with Junction Box. Cable sold separately.

Feature 3: Input Power	
P2	18-30 VDC (ATEX 18-24 VDC)
P3	100–240 VAC. Not available with N enclosures.

Feature 4: Output	
V1	0–5 VDC, linear
V3	0-10 VDC, linear
V4	4-20 mA, linear (default)

Feature 5 : Display	
NR	No Readout
DD	Digital display, 2 lines x 12 digits, backlit LCD

Feature 6 : Digital Communications	
XX	None.
P1	Totalizer pulse output (available on N2/N4 enclosures or on E2/E3/E4 enclosures with DD)
MB	Modbus RTU. DC power (P2) required. Not available with CSA approvals.

Feature 7: Approvals	
NA	Non-agency approved meter
AT	780S with ATEX Approval. Requires E2 or E3 enclosure. E3 required for gas temperatures >149°F (65°C)
FM	780S with FM approval. Requires E2 or E4 enclosure
CS	780S with CSA approval. Requires E2 or E4 enclosure

Note: ATEX units have circuit energy limitations that limit maximum flows to approx. 50% of non-ATEX units. Consult gas tables for actual values.

Feature 8: Calibration (Gas)	
00	Air
01	Argon
02	Carbon dioxide
03	Chlorine ¹
04	Digester gas
05	Digester gas ¹
06	Helium
07	Hydrogen
08	Methane
09	Methane ¹
10	Nitrogen
11	Oxygen ¹
12	Propane
13	Propane ¹
14	Ammonia ¹
99	Other--Consult Factory Gas Table

Option 1 : Non-Resettable Totalizer	
NRT	Totalizer cannot be reset in the field.

Option 2: Remote Cable	
C010	Remote cable, 10-foot length, 20AWG
C025	Remote cable, 25-foot length, 20AWG
C050	Remote cable, 50-foot length, 16AWG
C100	Remote cable, 100-foot length, 16AWG

Option 3: O2 Cleaning	
O2C	Flow meter cleaned and bagged for oxygen (O2) service. Meters up to 4 inches (DN100). Includes inspection certificate.

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

¹Correlation calibration - consult Gas Table for accuracy.

Note: Consult this Product Data Sheet for flow rate, pressure, and temperature limits.



Measurably Different.

Sierra Instruments

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