

Smart In-Line Thermal Gas Mass Flow Meter with Flow Conditioner

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
- Multipoint options available
- Integrated purge option available
- Optional MODBUS, Foundation Field BUS and Profibus PA available

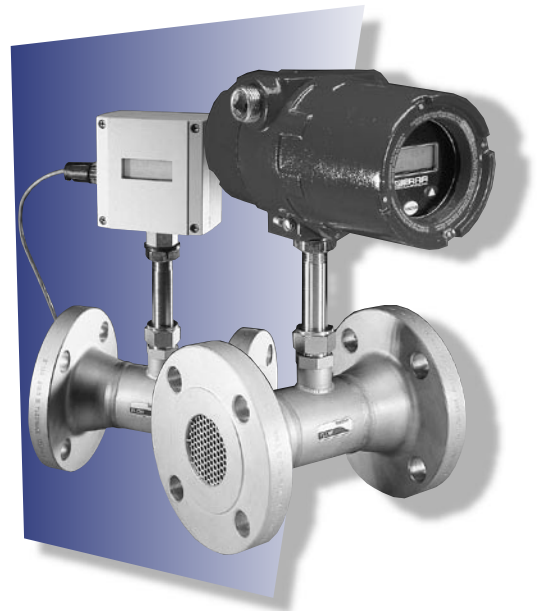
SIERRA[®]
INSTRUMENTS
THE MASS FLOW COMPANY

ISO
REGISTERED
9001

For information online...

www.sierrainstruments.com

7Flat-Trak™ Model 780S



Description

The Flat-Trak™ Model 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.

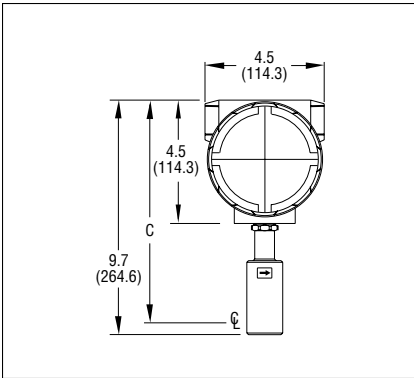
The versatile microprocessor-based transmitter integrates the functions of flow measurement, flow-range adjustment, meter validation and diagnostics, in either a probe-mounted or remote housing. Mass flow rate and totalized flow, as well as other configuration variables, are displayed on the meter's 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 Model 640S will hold this calibration over time.

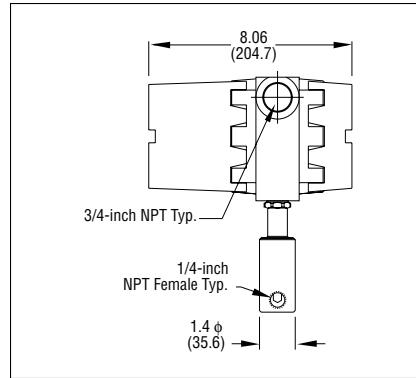
Sierra's Smart Interface™ software guides you through a procedure to fully validate instrument performance. The meter is available with a variety of input power, output signals, mounting and packaging options.

Dimensional Specifications

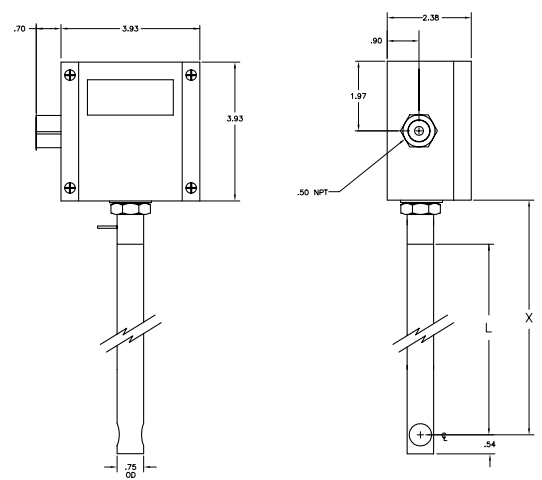
1/4-inch NPT—Front View (E2)



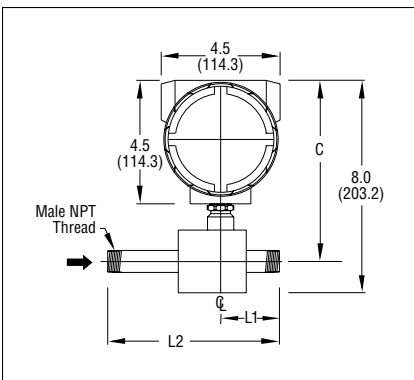
1/4-inch NPT—Side View (E2)



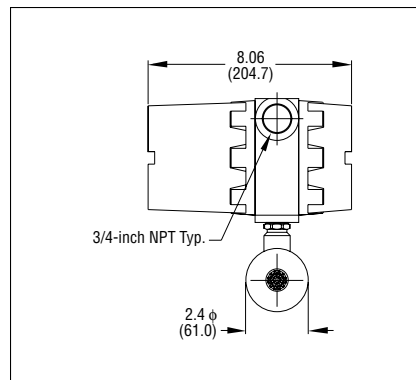
NEMA 4X Enclosure (EN2)



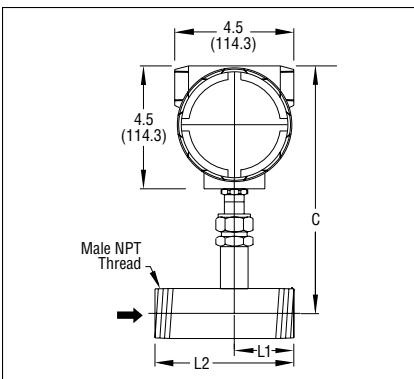
1/2-inch and 3/4-inch NPT—Front View (E2)



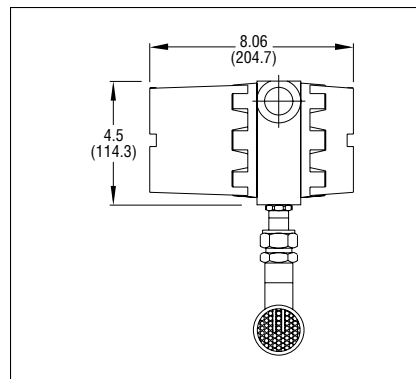
1/2-inch and 3/4-inch NPT—Side View (E2)



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

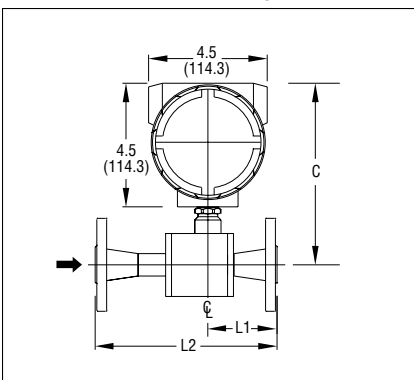


1-inch Through 8-inch NPT—Side View (E2)

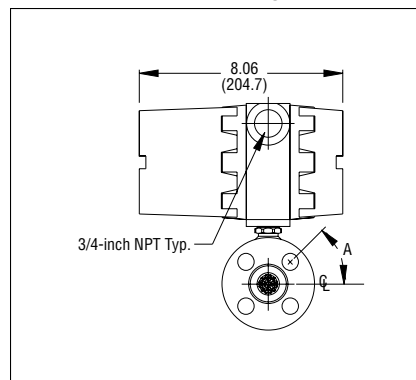


SIZES FOR NPT				
Size	H1	C	L1	L2
1/4-inch	7.80 (198.1)	8.40 (213.4)	—	—
1/2-inch	6.30 (160.0)	6.90 (175.3)	2.20 (55.9)	6.50 (165.1)
3/4-inch	6.30 (160.0)	6.90 (175.3)	2.20 (55.9)	7.00 (177.8)
1-inch	8.50 (215.9)	9.10 (228.6)	1.50 (38.1)	3.50 (88.9)
1.5-inch	8.80 (223.5)	9.40 (238.8)	2.25 (57.2)	5.25 (133.4)
2-inch	9.60 (243.8)	10.20 (259.1)	3.50 (88.9)	7.50 (190.5)
3-inch	10.60 (269.2)	11.20 (284.5)	4.00 (101.6)	10.00 (254)
4-inch	10.60 (269.2)	11.20 (290.8)	4.00 (101.6)	12.00 (304.8)
6-inch	11.60 (294.6)	12.20 (309.9)	6.00 (152.4)	18.00 (457.2)
8-inch	12.60 (320.0)	13.20 (335.3)	8.00 (203.2)	24.00 (609.6)

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



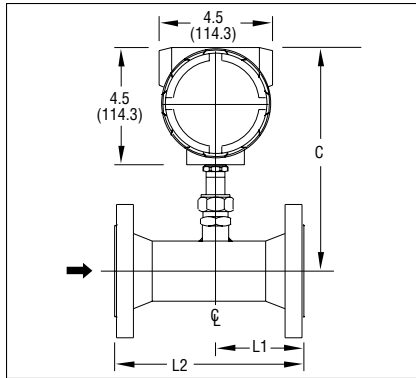
1/2 and 3/4-inch 150 lb Flange—Side View (E2)



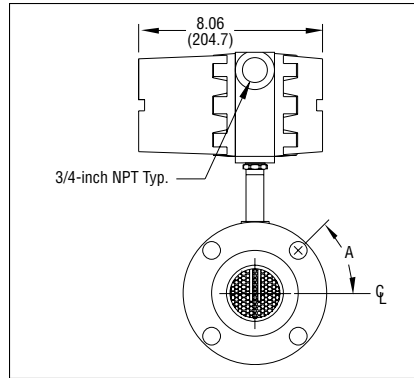
SIZES FOR 150 LB ANSI FLANGES					
Size	H1	C	L1	L2	A
1/2-inch	7.79 (197.9)	6.94 (176.3)	2.60 (66.0)	6.95 (176.5)	45°
3/4-inch	7.79 (197.9)	6.94 (176.3)	2.78 (70.6)	7.56 (192.0)	45°

Dimensional Specifications

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



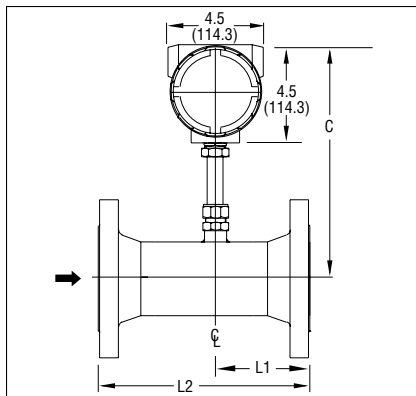
1" Through 8" 150 lb Flange—Side View (E2)



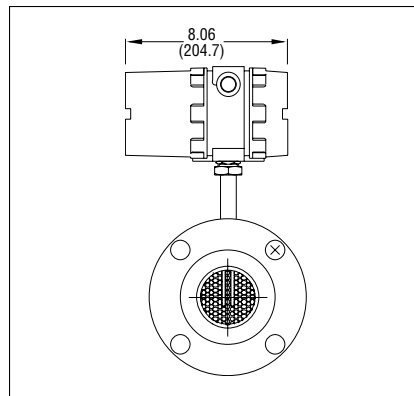
SIZES FOR 150 LB ANSI FLANGES

Size	H1	C	L1	L2	A
1-inch	8.50 (215.9)	9.10 (238.8)	3.60 (91.4)	7.40 (188.0)	45°
1.5-inch	8.80 (223.5)	9.40 (238.8)	3.80 (96.5)	7.50 (190.5)	45°
2-inch	9.60 (243.8)	10.20 (259.1)	3.50 (88.9)	7.50 (190.5)	45°
3-inch	10.60 (269.2)	11.20 (284.5)	4.00 (101.6)	10.00 (254.0)	45°
4-inch	10.60 (269.2)	11.20 (284.5)	4.00 (101.6)	12.00 (304.8)	22.5°
6-inch	11.60 (294.6)	12.20 (309.9)	6.00 (152.4)	18.00 (457.2)	22.5°
8-inch	12.60 (320.0)	13.20 (335.3)	8.00 (203.2)	24.00 (609.6)	22.5°

DN Flange—Front View (E2)



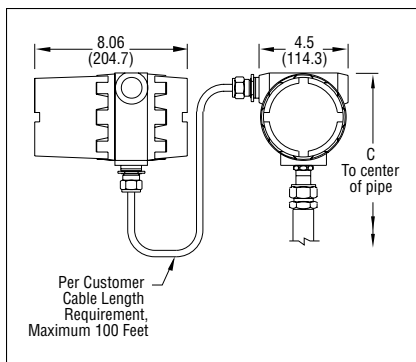
DN Flange—Side View (E2)



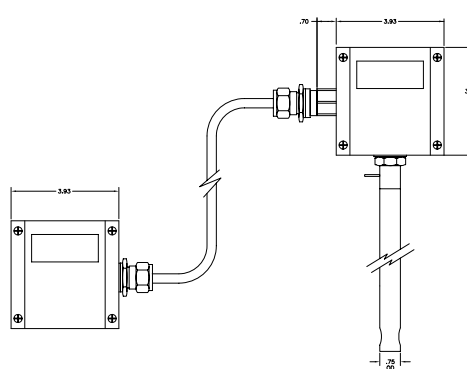
SIZES FOR PN16 DN FLANGES

Size	H1	C	L1	L2
DN25	8.30 (210.8)	8.88 (225.6)	3.18 (80.8)	7.40 (188.0)
DN40	8.90 (226.1)	9.50 (241.3)	3.61 (91.7)	7.40 (188.0)
DN50	10.10 (256.5)	10.70 (271.8)	3.34 (84.8)	7.10 (180.3)
DN80	9.90 (251.5)	10.50 (266.7)	4.14 (105.2)	10.20 (259.1)
DN100	10.00 (254.0)	10.60 (269.2)	4.57 (116.1)	12.60 (320.0)
DN150	11.80 (299.7)	12.40 (315.0)	6.77 (172.0)	18.90 (480.1)
DN200	13.90 (353.1)	14.50 (368.3)	8.47 (215.1)	24.40 (619.8)

Remote Mounted with Junction Box (E4)



Remote Mounted with Junction Box (EN4)



SIZES FOR REMOTE MOUNTED

Size	H2
1/4-inch	6.28 (159.5)
1/2-inch	5.21 (132.3)
3/4-inch	5.21 (132.3)
1-inch	6.41 (162.8)
1.5-inch	6.41 (162.8)
2-inch	7.32 (185.9)
3-inch	8.32 (211.3)
4-inch	6.32 (160.5)
6-inch	8.32 (211.3)
8-inch	10.32 (262.1)

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 (consult factory)

Gas Pressure (2 limitations)

Mechanical design pressure:

Compression fittings: 500 psig (34.5 barg)

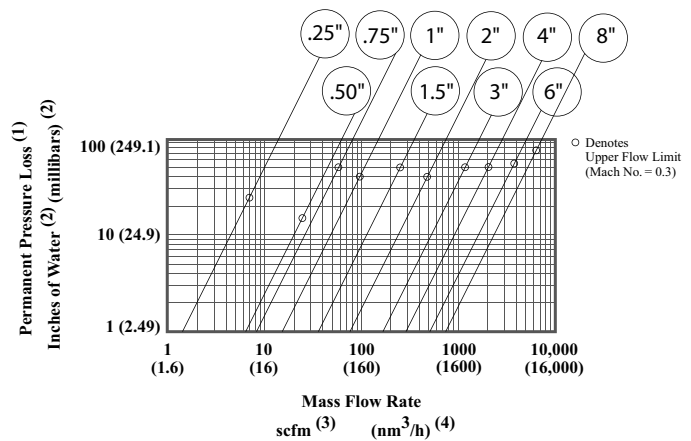
150 lb flange or PN16 DN (-40° F to 100° F): 230 psig (15.9 barg)

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)

Pressure Drop



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.

Gas & Ambient Temperature

Gas -40° F to 350° F (-40° C to 177° C) Gas dependent,
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, 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)

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

Foundation Fieldbus (read only; flow and totalized flow)
Profibus PA (read only; flow and totalized flow)
MOBDBUS RTU (read/write most parameters)
RS 232 (standard; command set available)

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 Flat-Trak™		Orifice Plate ⁽³⁾
	Upstream ⁽¹⁾	Downstream ⁽²⁾	
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 Planes)	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 (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

Ordering the Model 780S

780S

Parent MODEL Number
780S Flat-Trak™ Industrial In-Line Meter

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
 IP 66 T70 °C ... T280 °C
FM Explosion Proof for Class I, Division 1, Groups B, C, D

FLOW BODY—STAINLESS STEEL

NPT	ANSI Flange	DIN Flange		Size
	150 lb	PN16	PN40	
N1	N/A			1/4-inch
N2	F2			1/2-inch
N3	F3			3/4-inch
N4	F4	D4	DD4	1-inch (DN25)
N5	F5	D5	DD5	1.5-inch (DN40)
N6	F6	D6	DD6	2-inch (DN50)
N7	F7	D7	DD7	3-inch (DN80)
N8	F8	D8	DD8	4-inch (DN100)
N9	F9	D9	DD9	6-inch (DN150)
N10	F10	D10	DD10	8-inch (DN200)

ENCLOSURES
E2 Hazardous-Area Location Enclosure
E3(ft) Remote Hazardous-Area Location Enclosure (Only 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 18–30 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	CO ₂
3	Chlorine (Correlation)
4	Digester
5	Digester (Correlation)
6	Helium
7	Hydrogen
8	CH ₄
9	CH ₄ (Correlation)
10	Nitrogen
11	Oxygen (Correlation)
12	Propane
13	Propane (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