QuadraTherm®

qMix RealTime Flare Measurement System

qMix RealTime Flare Measurement System Automatically Adjusts to Changing Flare Gas Composition


SIERRA
QuadraTherm
10246.98 SCFM
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Breakthrough in Flare Gas Measurement

Meter Updates Automatically When GAS Composition Changes

640i insertion

780i inline

To decrease pollutants from flare gas emissions, the EPA's Petroleum Refinery Sector Rule 40 CFR 63 requires refineries to measure and report flare gas measurement at flow rates as low as 0.1 fps (0.03 mps).

Traditionally, environmental compliance officers have used mutli-path ultrasonic flow meters to meet these regulations, but these instruments have limitations at flows lower than ~0.1 fps.

Flexibility Meets EPA Regulations

Sierra's breakthrough QuadraTherm® qMix RealTime Flare Measurement System (FMS) delivers real-time flare gas flow measurement to accurately measure flows down to 0.1 fps, meeting the full range of EPA regulations at a fraction of the cost. (See Figure 1).

For the first time with thermal technology, flow rate accuracy adjusts to flare gas composition changes within seconds to match real-time readings from a gas analyzer—retaining accuracy without factory recalibration.

The qMix RealTime FMS harnesses the accuracy and computational power of QuadraTherm thermal mass flow meters and proprietary qMix RealTime software.

Beyond Traditional Thermal

Unlike traditional two-sensor thermal mass flow meters, QuadraTherm has four sensors-three precision platinum temperature sensors and one patented no-drift DrySense mass velocity sensor (See Figure 2). With this sensor technology breakthrough, accuracy is now twice as good as conventional thermal meters at +/- 0.5% of reading. Flow range is extended to ultra-low flows down to 0.1 sfps (0.03 smps) to extreme high flows 120,000 sfpm (600 smps) enabling high accuracy over a wide range.

Sierra's Raptor OS is the true "brain" of the instrument and includes a dynamic algorithm set which interacts with the qMix RealTime App.

An Integrated System

Integration with your current system is fast, easy, and economical. We also offer full commissioning from our team of engineers.

qMix RealTime FMS connects with your current compositional gas sampling device or gas chromatograph to give accurate flows over a wide 1000:1 turndown.

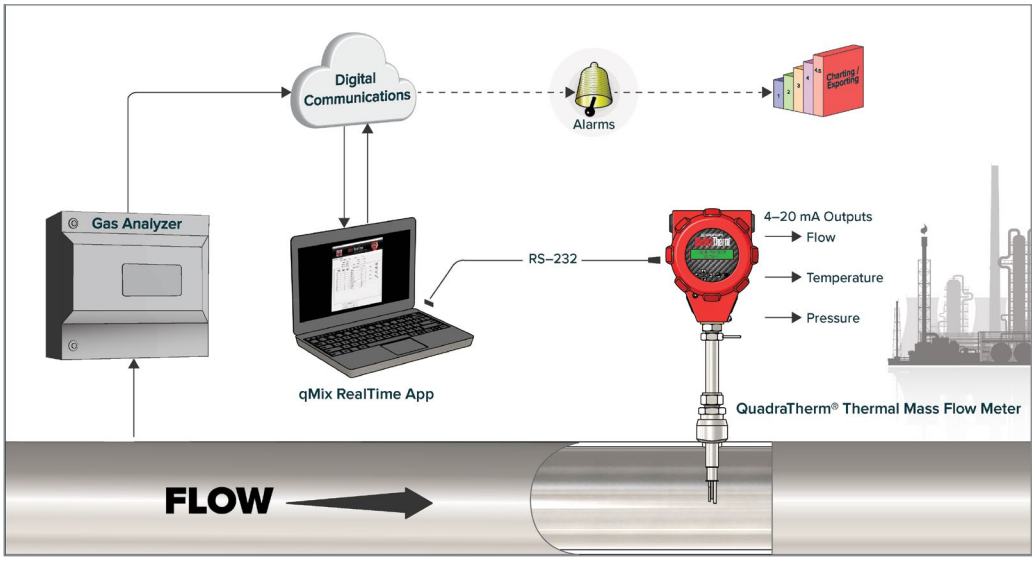


Figure 1. QuadraTherm® qMix RealTime Flare Measurement System (FMS)

System Highlights

- Meet EPA rule 40 CFR 63 for flare gas measurement at ultra-low flows down 0.1 sfps (0.03 smps)
- Easy to install with current ultrasonic flow meters-no process shutdown
- Highest Accuracy:
  +/- 0.5% of reading (inline);
  +/- 0.75% of reading (insertion)
- Measure flows from 0.1 sfps to 120,00 sfpm (0.03-600 smps)
- Mass flow rate turndown 1000:1
- Pipe/duct sizes up to 72 inches (182 cm)
- Hot-tap probe retractor
- Use qMix RealTime App to:
  - o connect, read, and update new flare gas composition from a gas chromatograph in real-time no recalibration needed
  - o Set update frequency by time or by percentage change in the gas composition
- Multivariable: Mass flow rate, temperature & pressure
- In-Situ calibration validation
- No moving parts, low pressure drop
- Patented QuadraTherm four-sensor design
- DrySense no-drift sensor with lifetime warranty
- Raptor OS "Brain" manages all inputs and outputs
- Sierra's fluid library, improves over time
- Multi-language capable
- Digital communications
- Hazardous area approvals

Notable Apps

- qMix
- qMix RealTime
- ValidCal Diagnostics
- Flow Totalizer
- Meter/Signal tuning
- Dial-A-Pipe: Change pipe size

When the gas composition changes, the qMix RealTime App, loaded onto the supplied laptop, reads the outputs from a gas analyzer for an updated flare gas composition.

In real-time, the App creates a new gas composition to match the gas analyzer composition, and automatically updates the 640i/780i thermal mass flow meter to accurately adjust the flow rate for this composition– all without sending the meter back to the factory for recalibration (See Figure 3).

qMix RealTime App-Adjusts on the Fly

Real-time measurements with thermal flow meters are only made possible by utilizing the power of the evolutionary qMix RealTime App. Based on the NIST library gas database, the App has a library of over 120 pure fluid components with gas properties to create any natural gas or mixture.

The qMix RealTime App allows for 20 gas components, 20 Modbus fluid composition registers, and the ability to increase accuracy by using AGA-8 density values. Real-time flare gas measurement intervals can be set to every minute, daily, hourly, and weekly.

Field Calibration Validation

QuadraTherm features field calibration validation through its ValidCal Diagnostic software app. This is only possible with its DrySense no- drift velocity sensor. Costly shutdowns and annual factory recalibration charges are now eliminated.

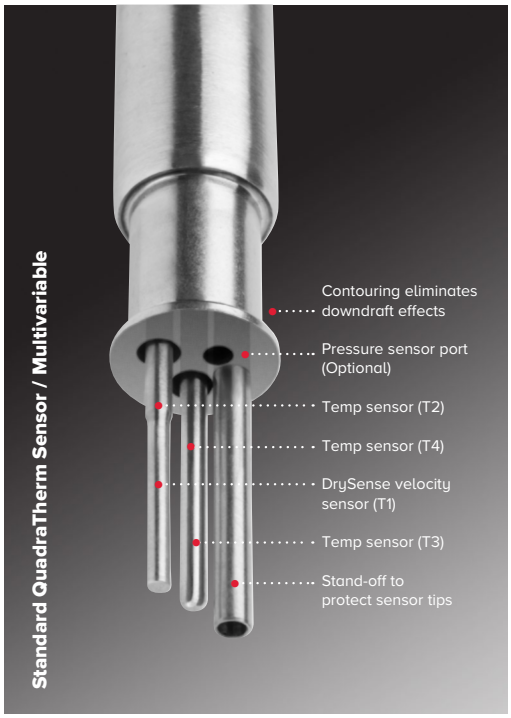


Figure 2. QuadraTherm® Four-Sensor Technology

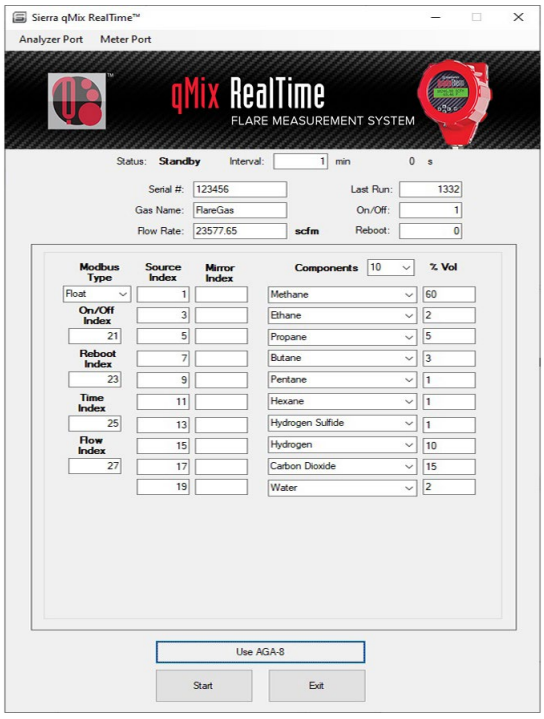


Figure 3. qMix RealTime App-Main Menu

PERFORMANCE SPECIFICATIONS

Gas Measured
All pure gases, flare gases, natural gases, and gas mixtures

Mass Velocity Range for Air
0.1 sfps to 120,000 sfpm (0.03 to 600 smps) at 70°F (21.1°C), 1 atm

Multivariable Outputs
Mass flow rate
Temperature
Pressure
Totalized flow: totalized value is stored in non-volatile memory
Totalize each gas independently with the flow totalizer

Mass Flow Accuracy
780i Inline version accuracy (highest accuracy):*
+/- 0.5% of reading above 50% of the full scale flow
+/- 0.5% of reading plus 0.5% of full scale below 50% of full scale flow

640i Insertion version accuracy:*
+/- 0.75% of reading above 50% of the full scale flow
+/- 0.75% of reading plus 0.5% of full scale below 50% of full scale flow

*Accuracy statements verified by an independent NIST and NVLAP accredited metrology laboratory.

Gas Pressure Accuracy
+/- 1.0% full scale

Gas Temperature Accuracy
+/- 1°C (1.8°F)

Gas Pressure Ranges
30 psia (2.1 bara), 100 psia (6.9 bara), 300 psia (20.7 bara), 500 psia (34.5 bara)

Repeatability
Gas temperature: +/- 0.9°F (0.5°C)
Mass flow rate: +/- 0.15% of full scale
Gas pressure: +/- 0.5% of full scale

Response Time
Three seconds to achieve 63% (one time constant) of final value

Mass Flow Rate Turndown
1000:1

ANALOG AND DIGITAL OUTPUTS

Output Signals
4-20 mA flow, 4-20 mA temperature, 4-20 mA pressure
Alarm output (contact SPST/opto relays)
User definable pulse output for totalized flow

Optional Communications Modules
Modbus, Foundation Fieldbus, Profibus DP, HART

SOFTWARE

Smart Interface Program (SIP) Software
qMix Real Time for gas composition updates
Dial-A-Pipe for easy field setup
Use Meter Tune to optimize performance
Use ValidCal to validate all meter functions
Use flow totalizer to totalize up to four mixtures independently

POWER REQUIREMENTS

Input Power
100 to 240 VAC (0.4 Amps RMS at 230 VAC)
24 VDC +/- 10%, 1.04 Amps

OPERATING SPECIFICATIONS

780i Inline Version Gas Pressure Requirements
NPT: 500 psia (34.5 bara) maximum

Flange process connections defined by the ASME B 16.5a – 1998 spec. group rating of 316L stainless steel ANSI class 150 or 300 class flanges (special)
316L stainless steel 150 class flanges:
230 psig at -20°F to 100°F; 195 psig at 200°F;
175 psig at 300°F; 160 psig at 400°F; and 145 psig at 500°F
Equivalent DN PN16 flanges are available (see page 10 for sizes)
316L stainless steel 300 class flanges (special):
600 psig at -20°F to 100°F; 505 psig at 200°F; 455 psig at 300°F;
415 psig at 400°F

640i Insertion Version Gas Pressure Maximums (or limits)
Compression fittings: 500 psia (34.5 bara)
1-inch 150 class flange (-40°F to 250°F) 185 psia (12.8 bara)
Low pressure hot tap: 150 psia (10.3 bara)
High pressure hot tap: 230 psia (15.9 bara)
Minimum pipe size 2 inches (50 mm)

Gas Temperature Requirements (all versions)
-40°F (-40°C) to 392°F (200°C)

Ambient Temperature (NAA and cFMus versions)
-40F° (-40°C) to 140°F (60°C)
ATEX/IECEx Versions -4°F(-20°C) to 140°F (60°C)

PHYSICAL SPECIFICATIONS

User Interface
Local keypad with a six-button interface
Exit ⊗ Enter ↵ Four-way directional arrows ◀ ▲ ▶ ▼
RS-232 with PC software for communication and programming

Digital Display
UltraBright, backlit, LCD digital display, 2 x 16, 2 x 32 scrolling

780i Inline Version Process Connections
See page 10 and 11 for NPT, ANSI class 150 flange and PN16 DN sizes.

640i Insertion Version Process Connections
See page 7 through 9 for insertion sizes.
ANSI 1-inch - ANSI class 150 flange (optional)
Low pressure hot tap rated to 150 psia (10.3 bara)
High pressure hot tap and retractor 230 psia (15.9 bara)

Wetted Materials
316 SS and 316L SS flow body and Pt/Ir (velocity sensor)
Viton® VTP Pressure Option
Neoprene®, Kal-Rez® optional

Leak Integrity
5 x 10^{-9} sccs of helium maximum

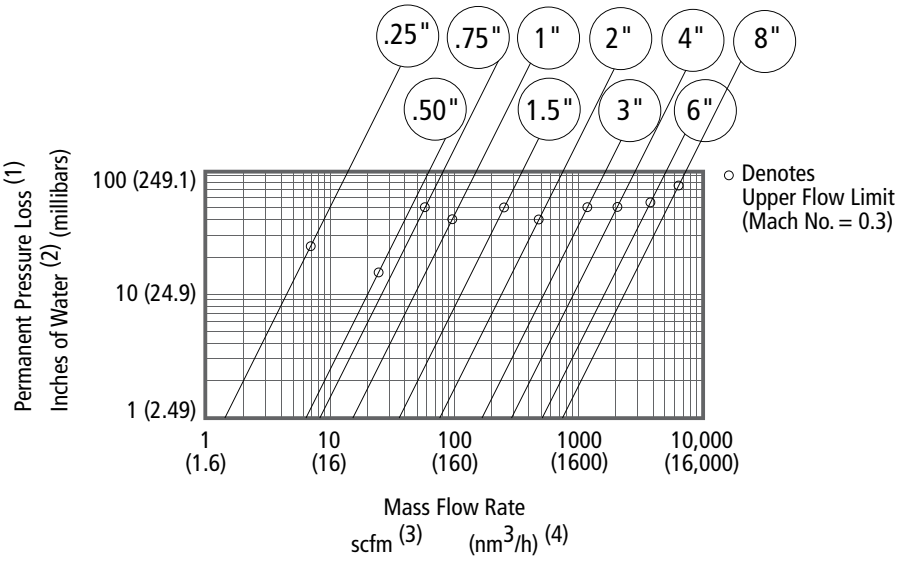
Approval Agencies
cFMus–Explosion proof for Class I, Div I, Groups B,C,D
CE–European Conformity
ATEX/IECEx

Enclosure
NEMA 4X (IP66), hazardous-area explosion proof, flow pointer, meter information tag

TABLE 2: 640i/780i Straight Run Requirements				
Piping Condition	Upstream 640i Insertion	Upstream 780i Inline with Flow Conditioning[1]	640i Downstream[2]	780i Downstream[2]
Single 90° Elbow or T-Piece	15D	1D	1D	0D
Two Elbows (in the same plane)	20D	3D	3D	0D
Two Elbows (in different plane)	40D	3D	3D	0D
Reduction (4:1)	15D	3D	3D	0D
Expansion (4:1)	30D	3D	3D	0D
After Control Valve	40D	5D	5D	0D

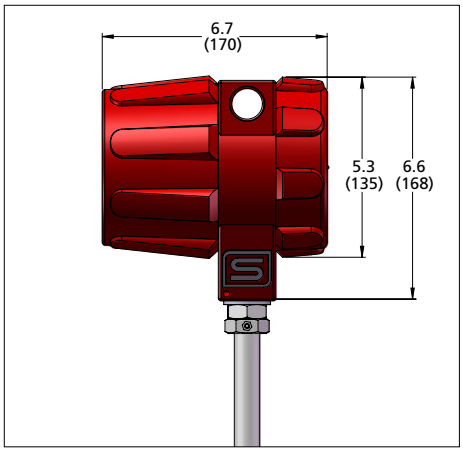
Notes: (1) Number of diameters (D) of straight pipe required between upstream disturbance and the flow meter
(2) Number of diameters (D) of straight pipe required downstream of the flow meter

780i INLINE PRESSURE DROP

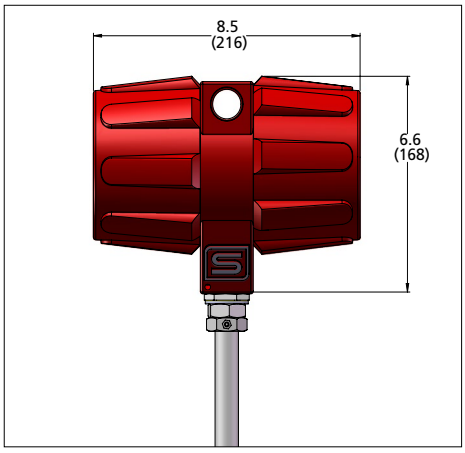


Notes: (1) For air and nitrogen at 20°C temperature and 1 atmosphere pressure
(2) 1 inch of water at 60°F = 0.0361 psi
(3) At base conditions of 21.1°C temperature and 1 atmosphere pressure
(4) At base conditions of 0°C temperature and 1 atmosphere pressure

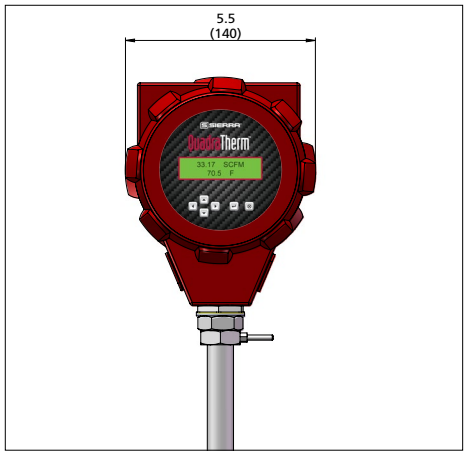
P2-DD—Side View



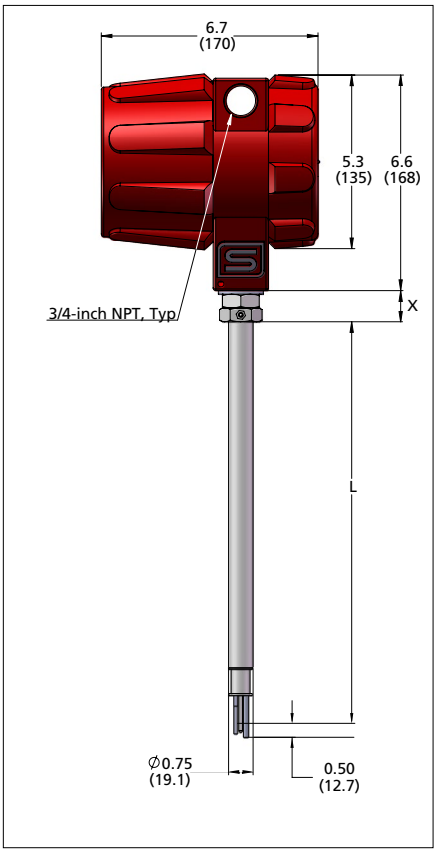
P3-DD—Side View



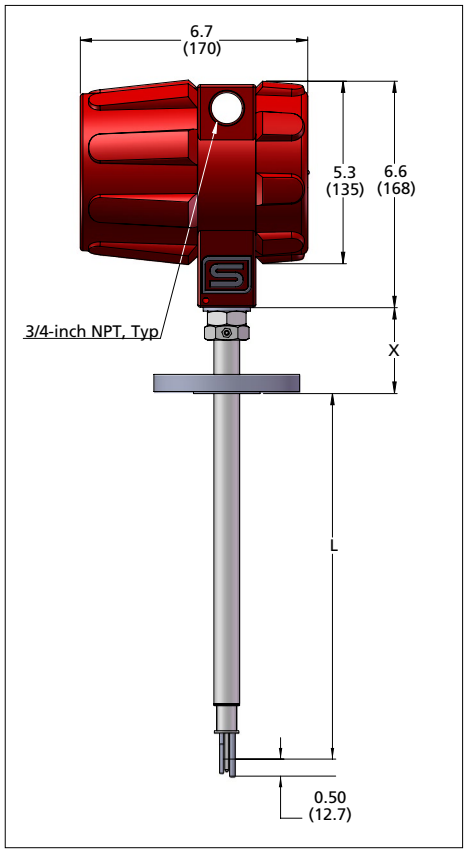
All Versions—Front View



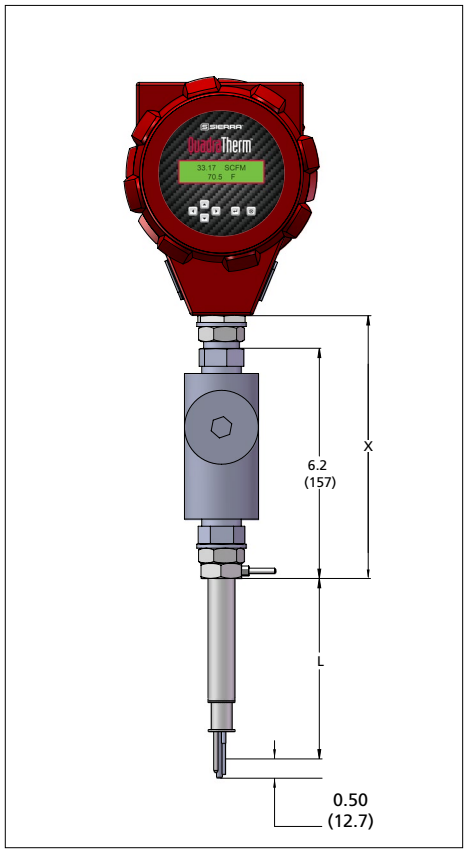
P2-DD Compression Fitting—Side View



P2-DD Flange Fitting—Side View



cFMus, ATEX, IECEx Approved Probes (> 13")



Note: All dimensions in inches with (mm) in brackets; certified drawings available upon request. All drawings have ± .25 inch (6.4 mm) tolerance.

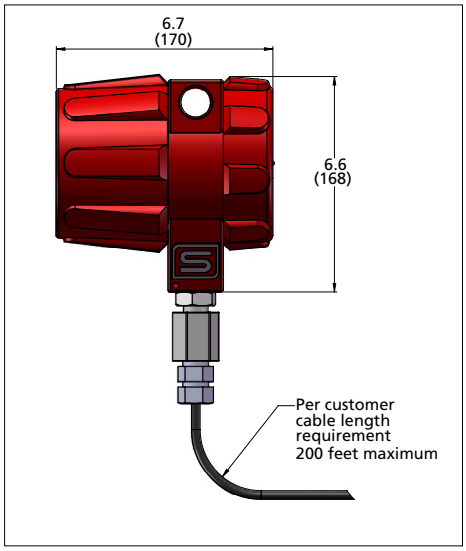
Length Chart 640i Compressions Fittings		
Code	L	X
L06	6.0 (152)	1.25 (31.75)
L09	9.0 (229)	1.25 (31.75)
L13	13.0 (330)	1.25 (31.75)
L18	18.0 (457)	1.25 (31.75)
L24	24 (610)	1.25 (31.75)
L36	36 (914)	1.25 (31.75)
L48	48 (1219)	1.25 (31.75)

Length Chart 640i Flange Mounting		
Code	L	X
L06	6.0 (152)	2.69 (68.33)
L09	9.0 (229)	2.69 (68.33)
L13	13.0 (330)	2.69 (68.33)
L18	18.0 (457)	2.69 (68.33)
L24	24 (610)	2.69 (68.33)
L36	36 (914)	2.69 (68.33)
L48	48 (1219)	2.69 (68.33)

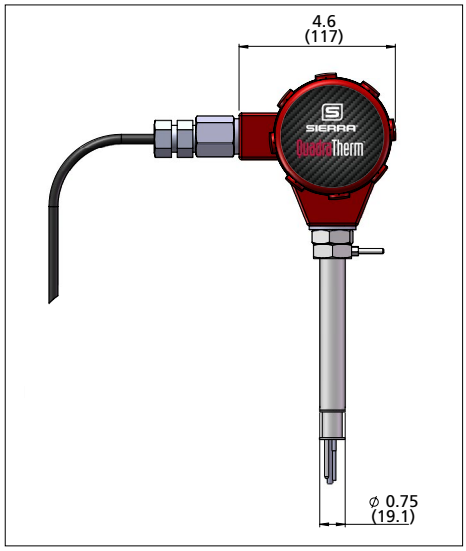
Length Chart 640i FM Version		
Code	L	X
L06	6.0 (152)	10.25 (260.35)
L09	9.0 (229)	10.25 (260.35)
L13	13.0 (330)	10.25 (260.35)
L18	18.0 (457)	10.25 (260.35)
L24	24 (610)	10.25 (260.35)
L36	36 (914)	10.25 (260.35)
L48	48 (1219)	10.25 (260.35)

640i INSERTION DIMENSIONAL DRAWINGS

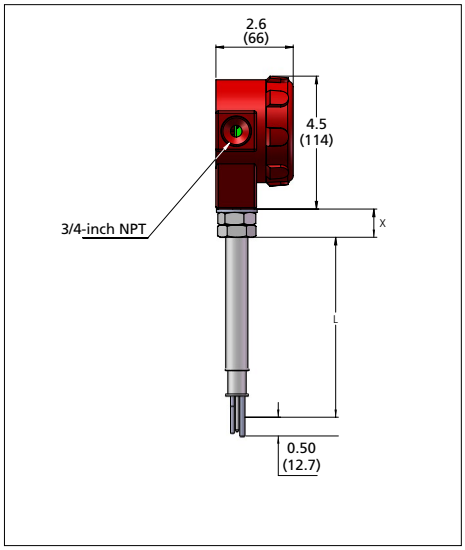
Remote Electronics VT, VTP—Side View



Remote Probe VT—Front View

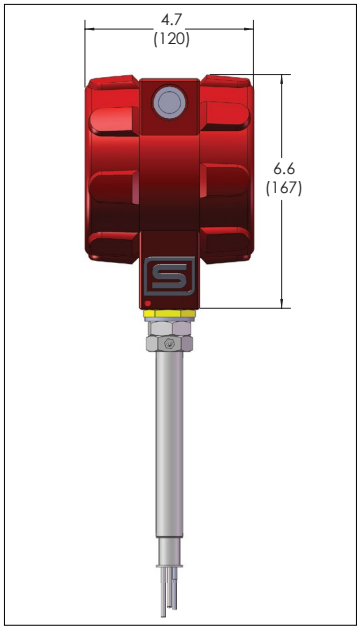


Remote Probe VT—Side View

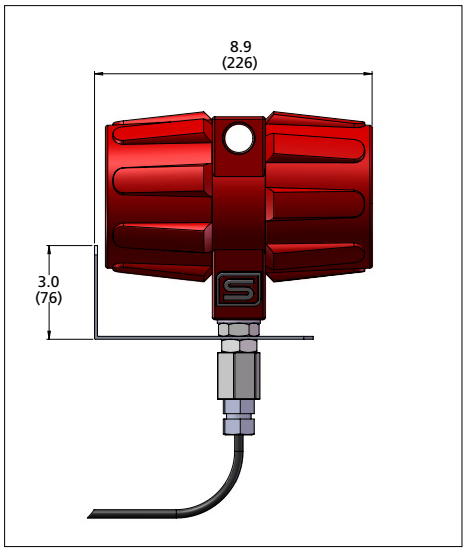


Remote Probe VTP—Front View

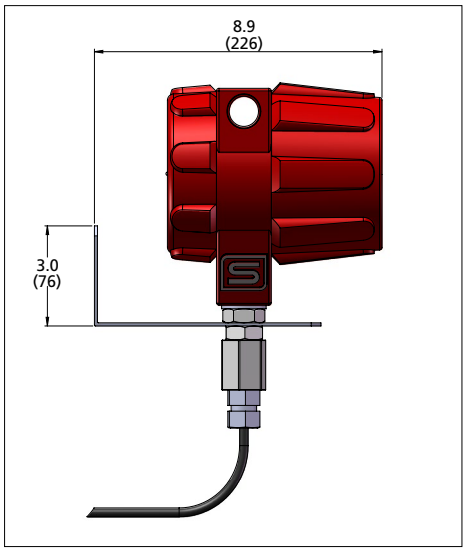
Remote Probe VTP—Side View



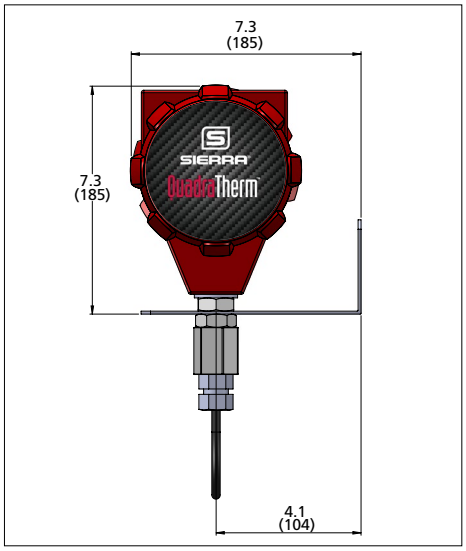
P3-DD Remote Bracket—Side View



P2-DD Remote Bracket—Side View

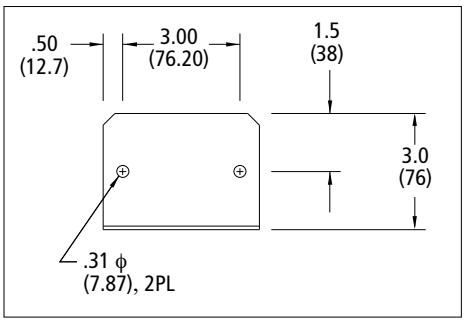


Remote Bracket—Front View



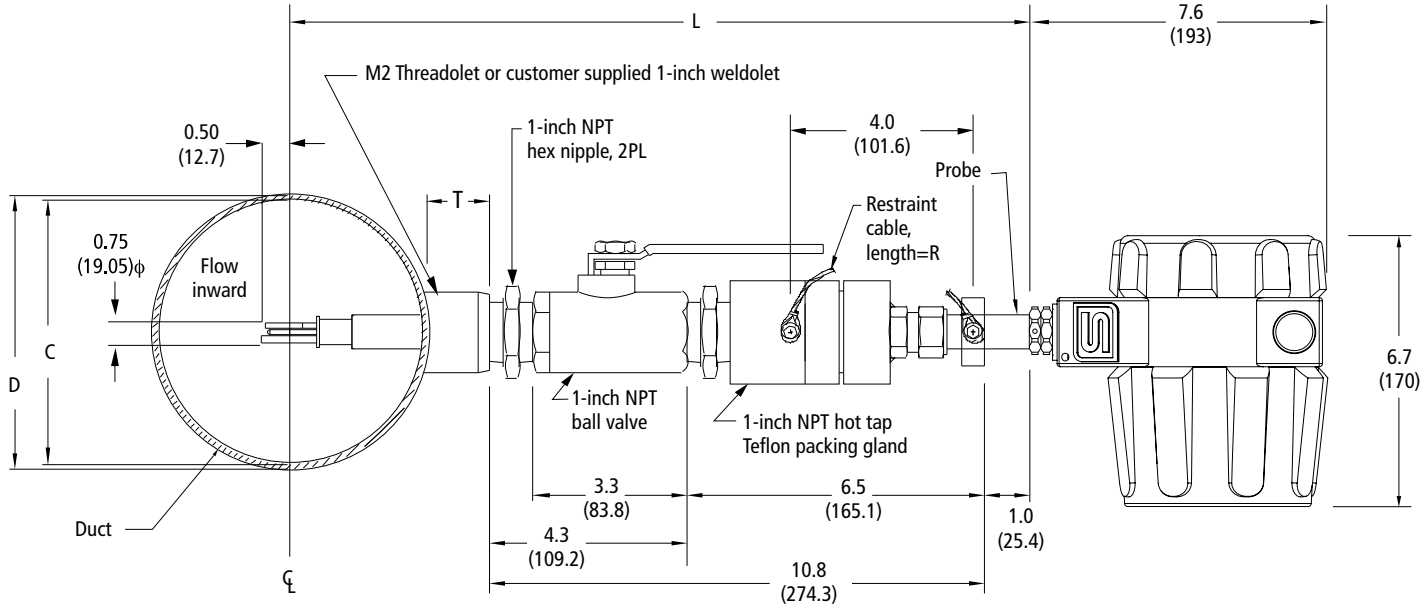
Note: All dimensions in inches with (mm) in brackets; certified drawings available upon request. All drawings have ± .25 inch (6.4 mm) tolerance.

Mounting Holes for Remote Bracket



Length Chart 640i Remote Mount Junction Box		
Code	L	X
L06	6.0 (152)	1.25 (37.75)
L09	9.0 (229)	1.25 (37.75)
L13	13.0 (330)	1.25 (37.75)
L18	18.0 (457)	1.25 (37.75)
L24	24 (610)	1.25 (37.75)
L36	36 (914)	1.25 (37.75)
L48	48 (1219)	1.25 (37.75)

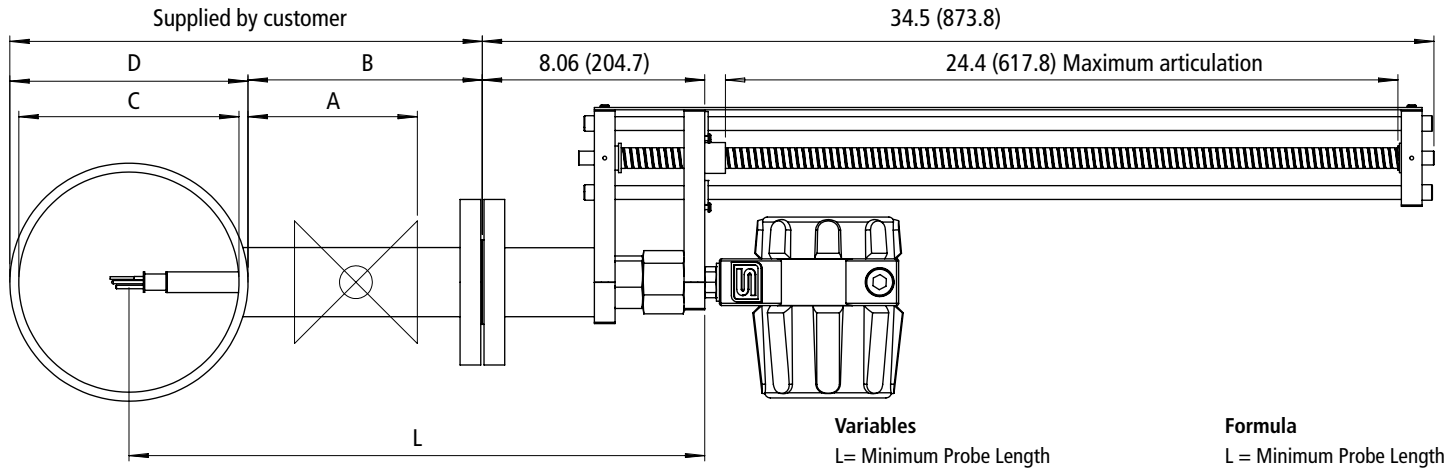
640i INSERTION LOW PRESSURE HOT TAP to 150 psig (10.3 barg)



Variables
L = Nominal Probe Length
D = Duct O.D.
C = Duct I.D.
T = Height of "Threadolet"
or Customer Provided Weldolet
R = Restraint Cable Length

Formula
L > 12.3 + T + D/2
So L must be equal
or greater than 12.3-inches
plus the height of the
"Threadolet" plus half the duct O.D.
R = D/2 + T + 7.3

640i HIGH PRESSURE HOT TAP is flange dependent up to 400 psig (27.6 barg)



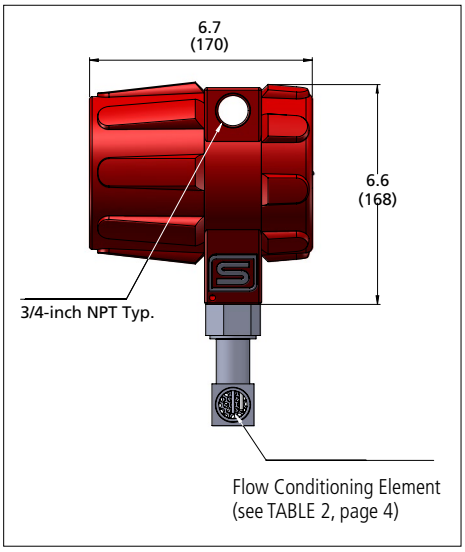
Variables
L= Minimum Probe Length
A= Distance From Duct OD To Valve Outlet
B= Distance From Duct OD To Flange Face
C= Duct Inner Diameter
D= Duct Outer Diameter

Formula
L = Minimum Probe Length
L = 8 + B + 1/2 D
D/2 + A ≤ 24.4

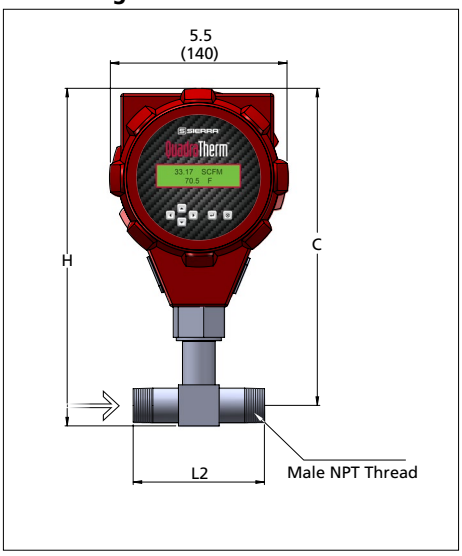
Note: All dimensions in inches with (mm) in brackets; certified drawings available upon request

780i INLINE DIMENSIONAL DRAWINGS

1/2" Through 1 1/2" NPT—Side View

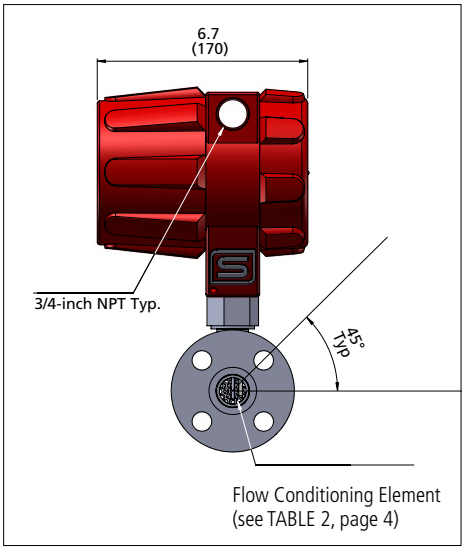


1/2" Through 1 1/2" NPT—Front View

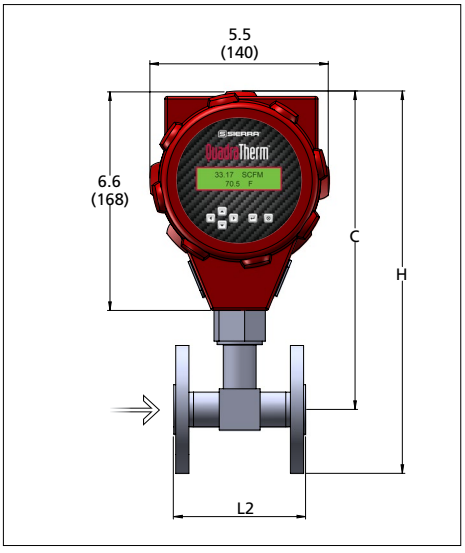


Sizes for NPT			
Size	H	C	L2
1/2-inch	10.5 (267)	9.9 (251)	7.5 (191)
3/4-inch	10.8 (274)	9.9 (251)	7.9 (201)
1-inch	11.2 (284)	9.9 (251)	8.3 (211)
1 1/2-inch	11.5 (292)	9.9 (251)	9.5 (241)

1/2" Through 1 1/2" 150 Class Flange-Side View

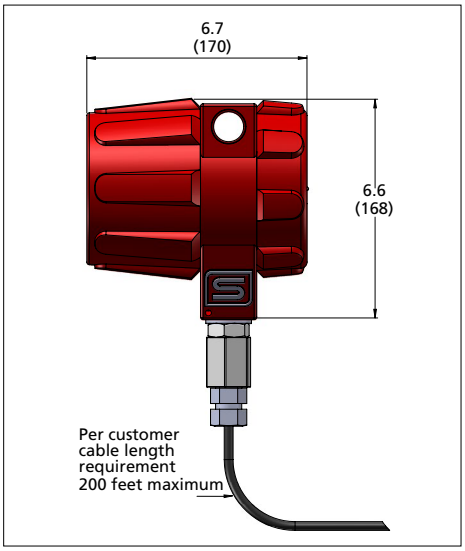


1/2" Through 1 1/2" 150 Class Flange-Front View

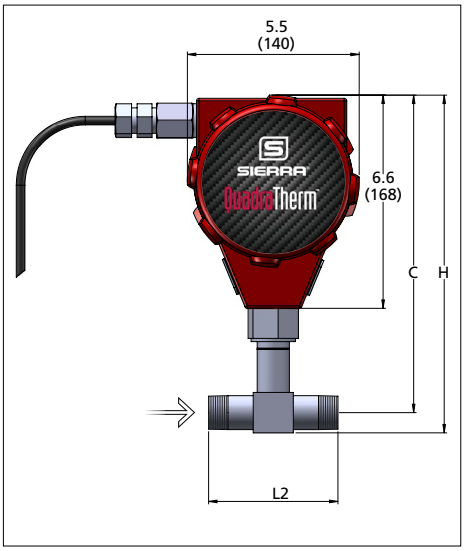


Sizes For ANSI Class 150 Flange			
Size	H	C	L2
1/2-inch	11.6 (295)	9.9 (251)	7.5 (191)
3/4-inch	11.8 (300)	9.9 (251)	7.9 (201)
1-inch	12.0 (304)	9.9 (251)	8.3 (211)
1 1/2-inch	12.2 (310)	9.9 (251)	9.5 (241)

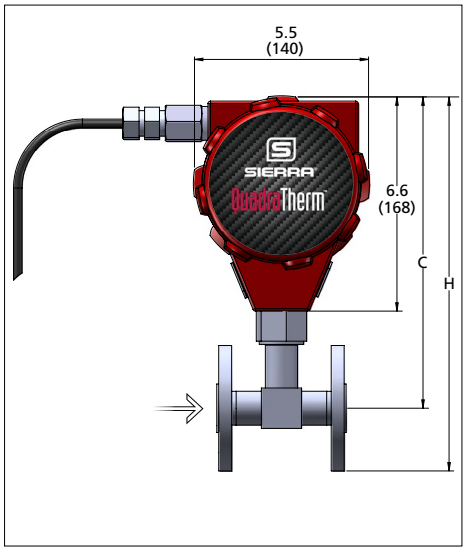
NPT Remote Electronics—Side View



NPT, VTP Remote—Front View

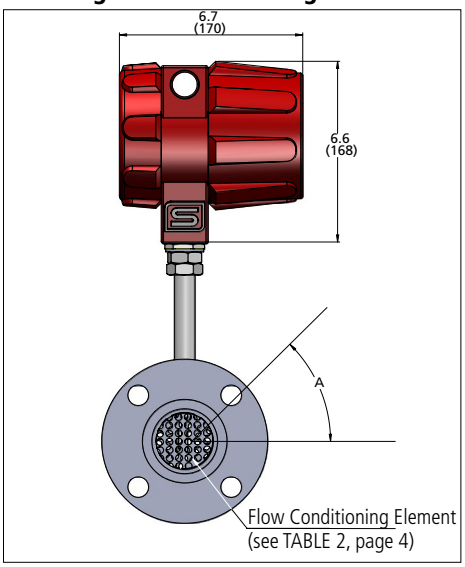


150 Class Flange Remote—Front View

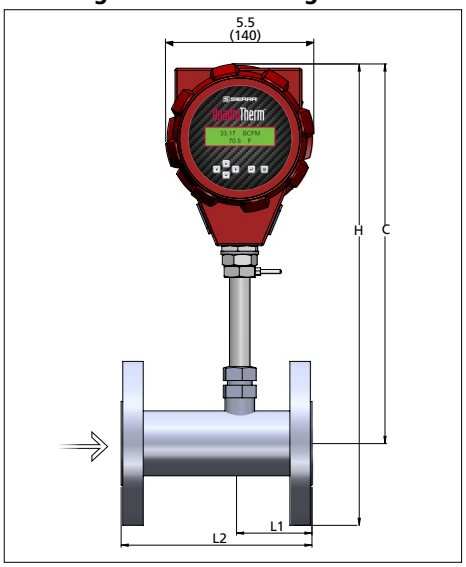


Note: All dimensions in inches with (mm) in brackets; certified drawings available upon request

2" Through 8" 150 Class Flange—Side View

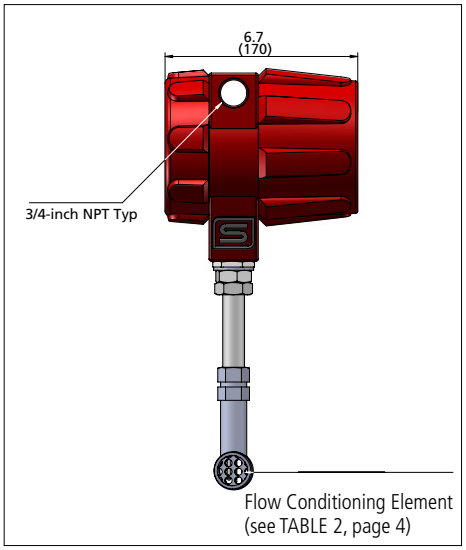


2" Through 8" 150 Class Flange—Front View

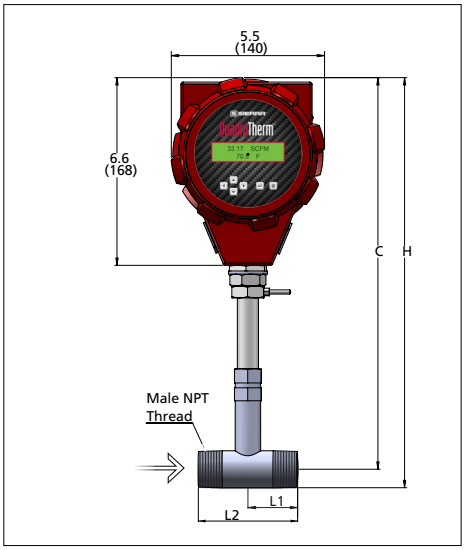


Sizes for ANSI Class 150 Flanges					
Size	H	C	L1	L2	A
2-inch	17.0 (432)	14.0 (356)	2.6 (66)	7.0 (178)	45
3-inch	17.7 (450)	14.0 (356)	2.6 (66)	10.0 (254)	45
4-inch	18.5 (470)	14.0 (356)	3.6 (91)	12.0 (305)	22.5
6-inch	19.5 (495)	14.0 (356)	5.6 (142)	18.0 (547)	22.5
8-inch	20.7 (526)	14.0 (356)	7.6 (193)	24.0 (610)	22.5

2" Through 8" NPT—Side View

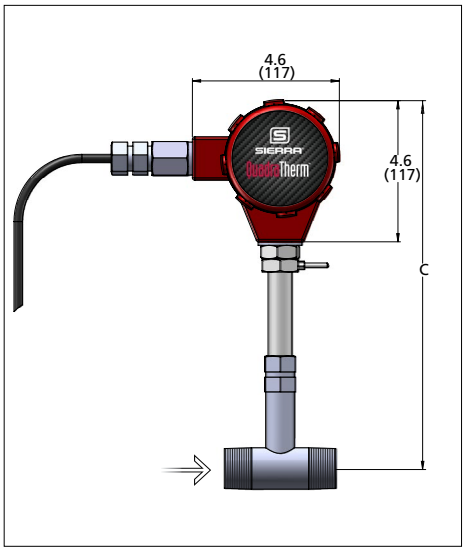


2" Through 8" NPT—Front View

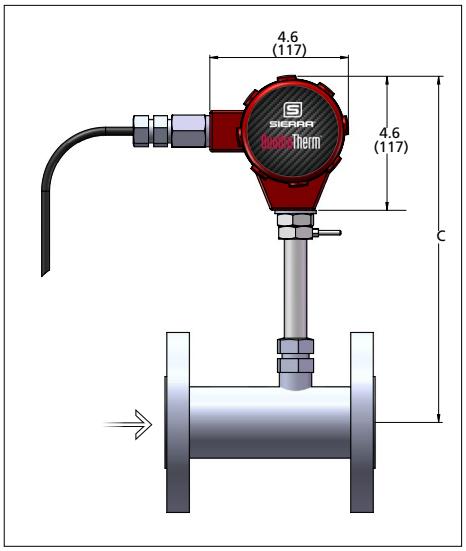


Sizes for 1-inch Through 8-inch NPT				
Size	H	C	L1	L2
2-inch	15.1 (384)	14.0 (356)	3.50 (89)	7.50 (191)
3-inch	15.7 (399)	14.0 (356)	4.00 (102)	10.00 (254)
4-inch	16.2 (411)	14.0 (356)	4.00 (102)	12.00 (305)
6-inch	17.3 (439)	14.0 (356)	6.00 (152)	18.00 (457)
8-inch	18.3 (465)	14.0 (356)	8.00 (203)	24.00 (610)

NPT Remote—Front View



Flange Remote—Front View



Sizes for PN16 DN Flanges				
Size	H	C	L1	L2
DN50	17.2 (437)	14.0 (356)	3.34 (85)	7.10 (180)
DN80	17.9 (455)	14.0 (356)	4.14 (105)	10.20 (259)
DN100	18.3 (465)	14.0 (356)	4.57 (116)	12.60 (320)
DN150	19.6 (498)	14.0 (356)	6.77 (172)	18.90 (480)
DN200	20.7 (526)	14.0 (356)	8.47 (215)	24.40 (620)

640i - [ ]-[ ]-[ ]-[ ]-[ ]-[ ]-[ ]-[ ]-[ ]

Feature 1 2 3 4 5 6 7 8 9

Instructions: To order a 640i, please fill in each feature number block by selecting the codes from the corresponding features below.

Feature 1: Multivariable	
640i VT	Thermal Insertion Mass Flow Meter; all 316L stainless steel construction; linear 4-20 mA output signals for Mass Flow Velocity and Temperature, temperatures -40°F to 392°F (-40°C to 200°C); pressure to 500 psig (34.5 barg); standard accuracy (air) +/- 0.75% of reading above 50% of full scale flow and +/- 0.75% of reading plus 0.5% of full scale below 50% of full scale flow; includes qTherm™ Electronics with PC configuration software; 24 VDC +/- 10.0% or 100-240 VAC input power with a 3/4-inch (2 cm) diameter 316 SS insertion sensor probe; configurable alarm and pulse outputs; CE, cFMus, ATEX, IECEx approved
640i VTP	Add a pressure output to the 640i VT version; three 4-20 mA linear outputs for mass flow velocity, temperature, and pressure; includes pressure sensor to 500 psia (34.5 bara)

Note: Minimum pipe size for insertions is 2 inches (50 mm) diameter.

Feature 2: Approvals	
1	**NAA.** Non-agency approved.
2	**cFMus.** Process Temperature Range: -40°C to 200°C (-40°F to 392°F). Class I, Division 1, Groups B,C, and D T3C Ta = -40°C to 60°C (-40°F to 140°F). Type 4x. Maximum probe length is 48 inches (1.22 m). Note: Requires Killark seal for probes >L13, see Note 1
3	**ATEX and IECEx.** II 2 G Ex d IIC T3 Gb. II 2 D Ex tb IIIC T200°C Db. Ta = -20°C to 60°C (-4°F to 140°F). Process Temperature Range: -40°C to 200°C (-40°F to 392°F). Maximum probe length is 48 inches (1.22 m)

Feature 3: Probe Length	
L06	6-inch (15 cm)
L09	9-inch (23 cm)
L13	13-inch (33 cm)
L18	18-inch (46 cm) If agency approved, see Note 1.
L24	24-inch (61 cm) If agency approved, see Note 1.
L36	36-inch (91 cm) If agency approved, see Note 1.
L48	48-inch (122 cm) If agency approved, see Note 1.
L(x)	Special length not listed above or over 48 inches (122 cm). specify length in parentheses; maximum probe length 72 inches (1.83 m). Maximum for agency approved 48 inches (1.22 m). **This price applies to sizes below 48 inches (1.22 m) not listed above. If agency approved, see Note 1.**
L( )M5 Adder	Probe with 1-inch, ANSI class 150 flange If agency approved, see Note 1. Specify length in parentheses; includes M5 option diagram with ADS

Note 1: Killark seal is required for agency approved meters with >L13. Adds 6.2 in (157 mm) to probe length listed above.

Feature 4: Mounting Options: Standard 3/4" (19.1mm) Diameter Sensor Probe. Note: If you want the optional sensor shield, skip this section and specify proper Sensor Shield Mounting Kit below in Feature 4B.	
M0	Customer to supply own mounting hardware
M1	Compression fitting, 3/4-inch (2 cm) with 1-inch (2.5 cm) male NPT
M2( )	Threadolet 1-inch Female NPT; specify pipe O.D. in parenthesis
M1-M2( )	Compression fitting plus Threadolet. 3/4-inch probe feed through by 1-inch male NPT. Threads into 1-inch Female NPT, which is welded to the pipe. Specify pipe O.D. in parenthesis. **We strongly advise to purchase this as a set, since we've seen non compatible NPT threads in the past.**
M3	Flat duct bracket, 3/4-inch (2 cm) tube compression fitting
M4( )	Curved duct bracket, 3/4-inch (2 cm) tube compression fitting; specify duct O.D. in parentheses
M8( )	**Low pressure hot tap,** includes ball valve and packing gland; maximum 150 psig (10.3 barg); specify duct O.D. in parenthesis. **Note: M8 option not available for probes less than 18 inches**
L( )M9	High pressure hot-tap with removable retractor kit assembly includes probe (probe length L in parentheses, MINIMUM length is process connection dependent, maximum as desired), removable retractor assembly, packing gland probe seal with a 2-inch ANSI class 150 process connection (other classes available, contact factory) and Conax fitting. Max pressure flange dependent or 400 psig (27.6 barg). Contact factory for 1000 psig (68.9 barg) option.
M15	Quick removal hot-tap, includes ball valve and compression fitting rated for 40 psig (2.8 barg)

Feature 4B: Sensor Shield & Mounting Option Kits: Add 1-inch (25.4 mm) diameter stainless steel welded-on sensor shield to the end of the insertion probe for improved sensor protection.	
S1( )	This assembly includes a sensor shield and a captured Conax fitting 3/4-inch (19.1 mm) with 1-inch (25.4 mm) male NPT. Max pressure 400 psig (27.6 barg). Contact factory for 1000 psig (68.9 barg) option. Specify probe length in parenthesis
S2( )	Assembly is a 1-inch (25.4 mm) Female NPT weldolet, which customer welds to the pipe. Commonly used with S1, Specify pipe O.D. in Parenthesis for S2. Max pressure 400 psig (27.6 barg). Contact factory for 1000 psig (68.9 barg) option.
S1-S2( )	This assembly includes a sensor shield and a captured Conax fitting plus weldolet. 3/4-inch (19.1 mm) probe with 1-inch (25.4 mm) male NPT. Threads into 1-inch (25.4 mm) Female NPT weldolet, which customer welds to the pipe. Specify probe lenth in parenthesis for S1 and specify pipe O.D. in parenthesis for S2. Max pressure 400 psig (27.6 barg). Contact factory for 1000 psig (68.9 barg) option.
S1( )-S8( )	**Low pressure hot tap** assembly includes a sensor shield, a ball valve and packing gland with Conax fitting plus weldolet. Maximum 150 psig (10.3 barg). Retractor is required for greater than >150 psig (10.3 barg) if hot tapping (see S9 ()) Specify probe length in parenthesis for S1 and Specify pipe O.D. in Parenthesis for S8. **The ball valve is one and a quarter inches vs our standard 1-inch m8 ball valve. This is so a hot tap tool can cut a 1 inch hole for the cage diameter.**
S9( )	**High pressure hot-tap with removable retractor kit** assembly includes a sensor shield, removable retractor assembly, packing gland probe seal with a 2-inch ANSI class 150 process connection (other classes available, contact factory), and Conax fitting. Specify probe length in parentheses, MINIMUM length is process connection dependent. Max pressure flange dependent or 400 psig (27.6 barg). Contact factory for 1000 psig (68.9 barg) option.

Feature 5: Electronics Enclosure	
E2	Hazardous-area location enclosure NEMA 4X (IP66) mounted directly on probe
E4( )	Remote hazardous-area location enclosure, includes NEMA 4X (IP66) junction box mounted on probe and mounting bracket for remote electronics enclosure; maximum 200 feet (61 m) housing mounted up to 200 feet (61 m) from flow body; specify cable length in parenthesis.

Feature 6: Input Power	
P2	24 VDC +/- 10.0%
P3	100-240 VAC

Feature 7: Output	
V4	Two linear 4-20mA outputs for mass flow velocity and temperature
V6 (VTP only)	Three linear 4-20mA outputs for mass flow velocity, temperature and pressure (only available with Feature 1: Multivariable 640i VTP)

Feature 8: Display	
DD	Digital Display: UltraBright LCD indicates mass flow velocity, T, P, alarms and totalized mass flow in engineering units; 6-push button user interface makes selection easy: Dial-A-Gas, Dial-A-Pipe, change units, change language, set alarms and much more…
SS	Sun Shield

Feature 9: Pressure (VTP only)	
MP1	30 psia (2.1 bara), VTP only
MP2	100 psia (6.9 bara), VTP only
MP3	300 psia (20.7 bara), VTP only
MP4	500 psia (34.5 bara), VTP only

Note: Put N/A in feature block 9 for VT. Maximum operating pressure must not exceed the full scale of the pressure transducer if the VTP option is ordered or damage may occur.

780i - [ ]-[ ]-[ ]-[ ]-[ ]-[ ]-[ ]-[ ]

Feature 1 2 3 4 5 6 7 8

Instructions: To order a 780i, please fill in each feature number block by selecting the codes from the corresponding features below.

Feature 1: Multivariable	
VT	Inline Thermal Mass Flow Meter with Flow Conditioning; all 316L stainless steel construction; linear 4-20 mA output signals for Mass Flow Rate and Temperature; temperature range -40°F to 392°F (-40°C to 200°C) and pressure to 500 psig (34.5 barg); standard accuracy +/- 0.5% of reading above 50% of full scale flow and +/- 0.5% of reading plus 0.5% of full scale below 50% of full scale flow; configurable alarm and pulse outputs; CE, cFMus, ATEX, and IECEx approved
VTP	Add a pressure output to the 640i VT version; three 4-20 mA linear outputs for mass flow velocity, temperature, and pressure; includes pressure sensor to 500 psia (34.5 bara)

Feature 2: Approvals	
1	**NAA.** Non-agency approved.
2	**cFMus.** Process Temperature Range: -40°C to 200°C (-40°F to 392°F). Class I, Division 1, Groups B,C, and D T3C Ta = -40°C to 60°C (-40°F to 140°F). Type 4x.
3	**ATEX and IECEx.** II 2 G Ex d IIC T3 Gb. II 2 D Ex tb IIIC T200°C Db. Ta = -20°C to 60°C (-4°F to 140°F). Process Temperature Range: -40°C to 200°C (-40°F to 392°F).

Feature 3: Inline Flow Bodies with Flow Conditioning	
N2	1/2-inch (1 cm) NPT male 316 SS
N3	3/4-inch (2 cm) NPT male 316 SS
N4	1-inch (2.5 cm) NPT male 316 SS
N5	1.5-inch (4 cm) NPT male 316 SS
N6	2-inch (5 cm) NPT male 316 SS
N7	3-inch (8 cm) NPT male 316 SS
N8	4-inch (10 cm) NPT male 316 SS
N9	6-inch (15 cm) NPT male 316 SS
N10	8-inch (20 cm) NPT male 316 SS
F2	1/2-inch ANSI class 150 flange 316 SS
F3	3/4-inch ANSI class 150 flange 316 SS
F4	1-inch ANSI class 150 flange 316 SS
F5	1.5-inch ANSI class 150 flange 316 SS
F6	2-inch ANSI class 150 flange 316 SS
F7	3-inch ANSI class 150 flange 316 SS
F8	4-inch ANSI class 150 flange 316 SS
F9	6-inch ANSI class 150 flange 316 SS
F10	8-inch ANSI class 150 flange 316 SS
FD6	DN50, PN16, flange
FD7	DN80, PN16, flange
FD8	DN100, PN16, flange
FD9	DN150, PN16, flange
FD10	DN200, PN16, flange
GD4	DN25, PN40, DIN flange
GD5	DN 40, PN40, DIN flange
GD6	DN50, PN40, DIN flange
GD7	DN80, PN40, DIN flange
GD8	DN100, PN40, DIN flange
GD9	DN150, PN40, DIN flange
GD10	DN200, PN40, DIN flange

Feature 4: Electronics Enclosure	
E2	Hazardous-area location enclosure NEMA 4X (IP66) mounted directly on probe
E4( )	Remote hazardous-area location enclosure includes NEMA 4X (IP66) junction box mounted on probe and mounting bracket for remote electronics enclosure; specify cable length in parenthesis; maximum 200 feet (61m) housing mounted up to 200 feet (61m) from flow body.

Feature 5: Input Power	
P2	24 VDC +/- 10.0%
P3	100-240 VAC

Feature 6: Output	
V4	Two linear 4-20mA outputs for T and mass flow rate
V6 (VTP only)	Three linear 4-20mA outputs for T, P, mass flow rate

Feature 7: Display	
DD	UltraBright, local LCD display indicates mass flow rate, T, P and totalized mass in engineering units
SS	Sun Shield

Feature 8: Pressure	
MP1	30 psia (2.1 bara), VTP only
MP2	100 psia (6.9 bara), VTP only
MP3	300 psia (20.7 bara), VTP only
MP4	500 psia (34.5 bara), VTP only

Note: Put N/A in feature block 8 for VT.
Maximum operating pressure must not exceed the full scale of the pressure transducer if the VTP option is ordered or damage may occur.

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NORTH AMERICA

5 Harris Court, Building L / Monterey, CA 93940 / USA
831.373.0200

EUROPE

Bijlmansweid2 / 1934RE Egmond aan den Hoef / The Netherlands
+31 72 5071400

ASIA-PACIFIC

Second Floor Building 5 / Senpu Industrial Park
25 Hangdu Road Hangtou Town / Pu Dong New District
Shanghai, P.R. China Post Code 201316
+8621 5879 8521/22