

Immersible Thermal Gas Mass Flow Meter

FEATURES

- Direct mass flow monitoring eliminates need for separate temperature and pressure inputs
- 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, ATEX, and GOST R/RTN certified for hazardous areas
- CE approved
- High temperature option to 750°F (400°C) available
- Low and high pressure hot taps available
- Optional Modbus

SteelMass® 640S



DESCRIPTION

Sierra Instruments' SteelMass® Model 640S immersible thermal mass flow meter is designed for the toughest industrial gas flow measurement applications.

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 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.

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.

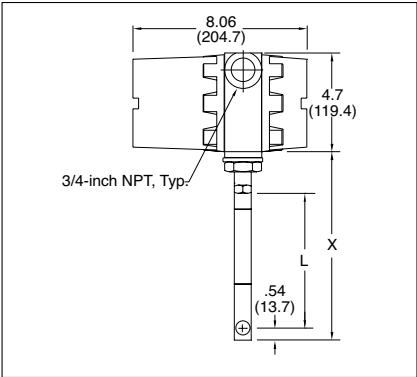
Sierra's Smart Interface™ software guides you through a procedure to fully validate instrument performance, thus field-verifying meter functionality.

The meter is available with a variety of input power, output signal, mounting and packaging options.

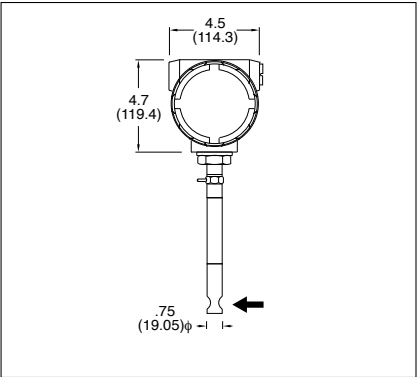


HAZARDOUS-AREA LOCATION ENCLOSURE DIMENSIONAL SPECIFICATIONS

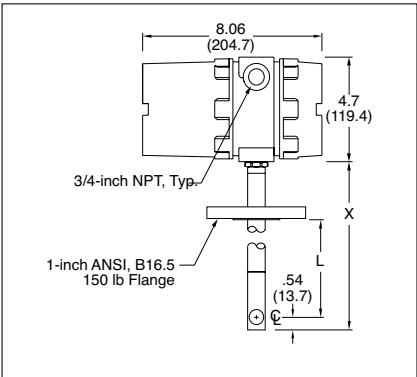
Compression Fitting—Side View (E2)



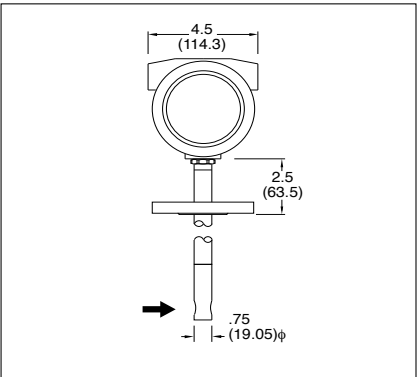
Compression Fitting—Front View (E2)



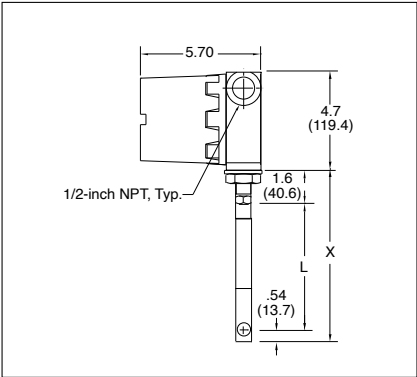
Flange Mounting—Side View (E2)



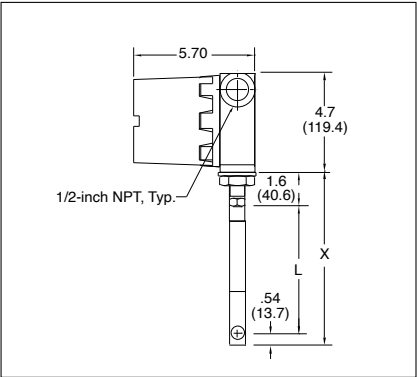
Flange Mounting—Front View (E2)



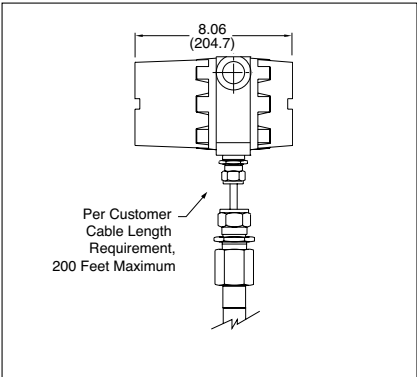
Remote Mount Junction Box—Side View (E4)



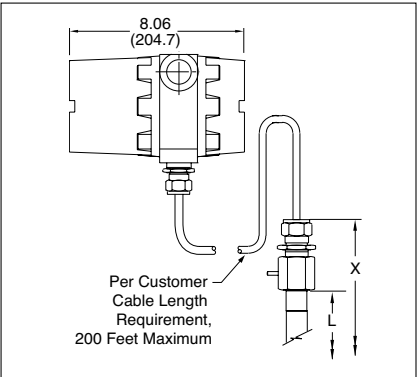
Remote Mount Junction Box—Front View (E4)



Remote Mount—Side View (E3 only)



Remote Mount —Front View (E3 only)



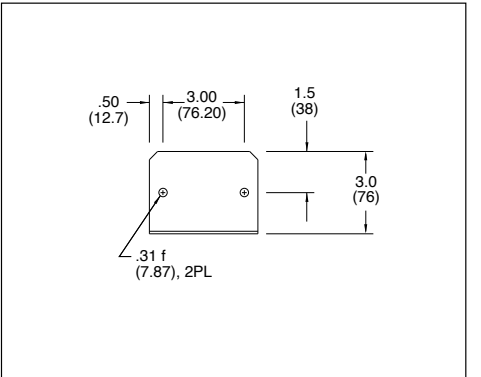
TABLES

Length Chart (Compressions Fittings)		
Code	L	X
L06	6.0 (152.4)	7.5 (190.5)
L09	9.0 (228.6)	10.5 (266.7)
L13	13.0 (330.2)	14.5 (368.3)
L18	18.0 (457.2)	19.5 (495.3)
L24	24.0 (609.6)	25.5 (647.7)
L36	36.0 (914.4)	37.5 (952.5)

Length Chart (Flange Mounting)		
Code	L	X
L06	6.0 (152.4)	9.0 (228.6)
L09	9.0 (228.6)	12.0 (304.8)
L13	13.0 (330.2)	16.0 (406.4)
L18	18.0 (457.2)	21.0 (533.4)
L24	24.0 (609.6)	27.0 (685.8)
L36	36.0 (914.4)	39.0 (990.6)

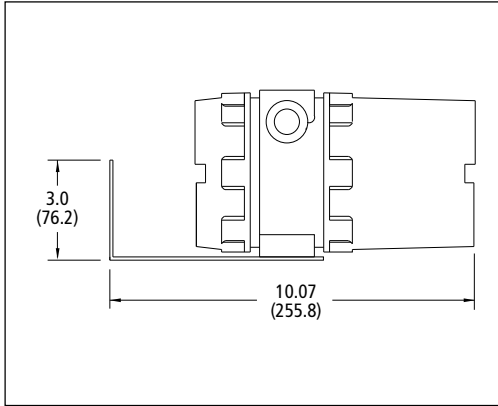
Length Chart (Remote Mount Junction Box)		
Code	L	X
L06	6.0 (152.4)	7.5 (190.5)
L09	9.0 (228.6)	10.5 (266.7)
L13	13.0 (330.2)	14.5 (368.3)
L18	18.0 (457.2)	19.5 (495.3)
L24	24.0 (609.6)	25.5 (647.7)
L36	36.0 (914.4)	37.5 (952.5)

Mounting Holes for Remote Bracket

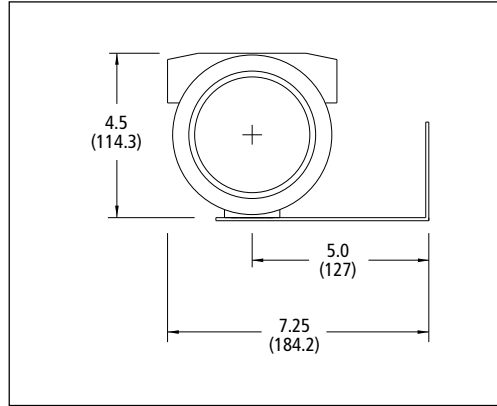


All dimensions are inches. Millimeters are in parentheses. All drawings have a +/- .25-inch (6.4 mm) tolerance. Certified drawings are available on request.

Remote Rear Bracket Mounted Electronics

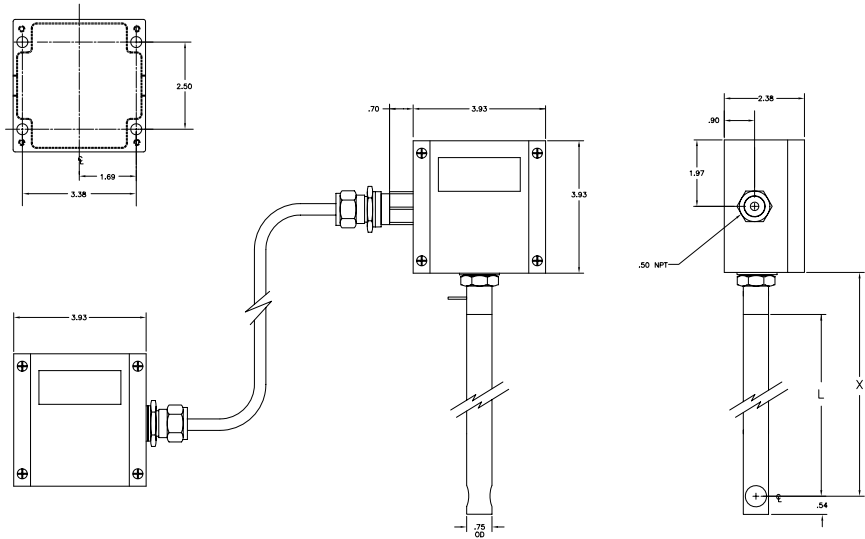


Remote Side Bracket Mounted Electronics



NEMA 4X DIMENSIONAL SPECIFICATIONS

Length Chart (NEMA 4X)		
Code	L	X
L06	6.0 (152.4)	7.25 (184.1)
L09	9.0 (228.6)	10.25 (260.3)
L13	13.0 (330.2)	14.25 (361.9)
L18	18.0 (457.2)	19.25 (488.9)
L24	24.0 (609.6)	25.25 (641.3)
L36	36.0 (980.4)	37.25 (946.1)



LOW PRESSURE HOT TAP TO 150 PSIG (10 BARG)

Side View

Variables

L = Nominal Probe Length

D = Duct O.D.

C = Duct I.D.

T = Height of "Threadolet" or
Customer Provided Weldolet

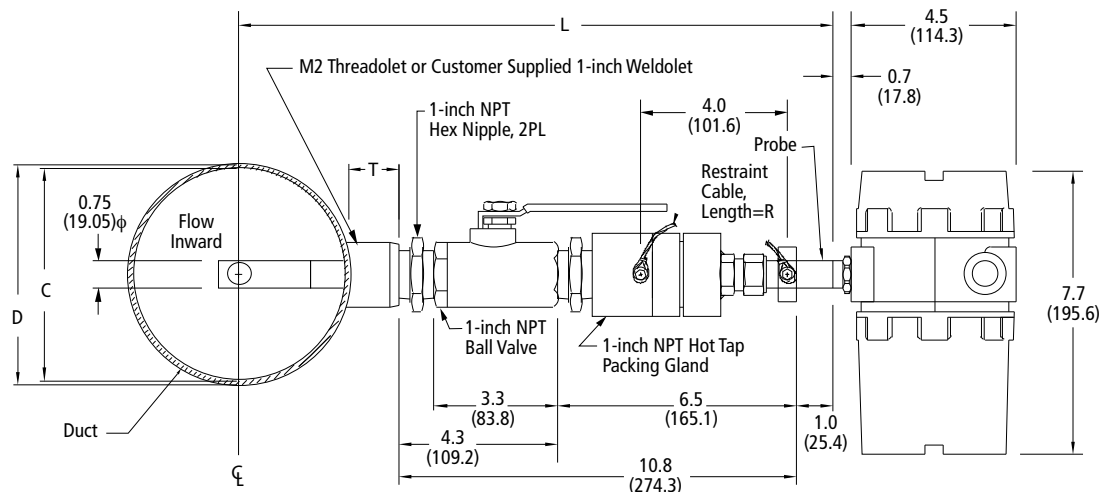
R = Restraint Cable Length

Formula

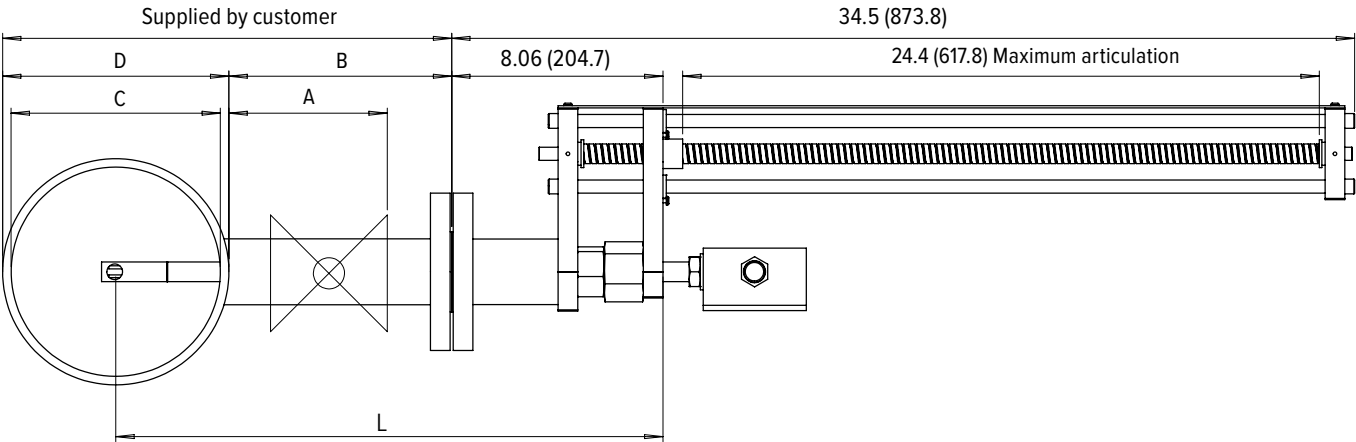
$$L \geq 12 + D/2 + T$$

So L must be equal or
greater than 12-inches
plus the height of the
"Threadolet" plus half
the duct O.D.

$$R = D/2 + T + 8.8$$



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

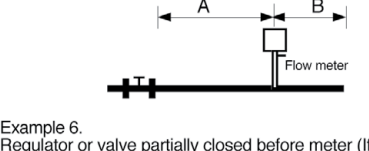
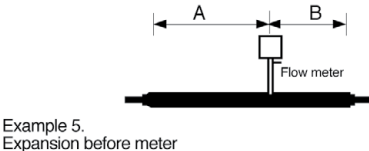
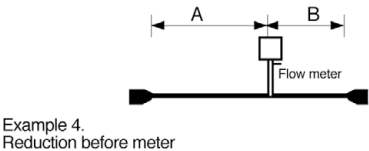
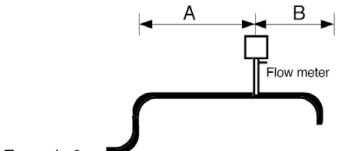
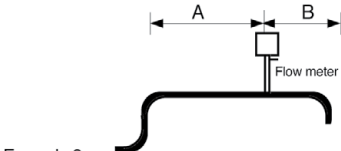
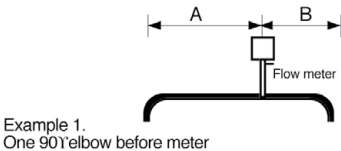


UNOBSTRUCTED FLOW REQUIREMENTS

Select an installation site that will minimize possible distortion in the flow profile. Valves, elbows, control valves and other piping components may cause flow disturbances. Check your specific piping condition against the examples shown below. In order to achieve accurate and repeatable performance install the flow meter using the recommended number of straight run pipe diameters upstream and downstream of the sensor. If you cannot meet these requirements please refer to the Flat-Trak™ Model 780S with flow conditioning plates (flow conditioning plates reduce upstream requirements to as little as 2 diameters).

Example - Upstream Requirements (A)	
1	15D
2	20D
3	40D
4	15D
5	30D
6	40D

Example - Downstream Requirements (B)	
1	5D
2	5D
3	10D
4	5D
5	10D
6	5D



DESCRIPTION

Accuracy of Point Velocity

+/- 1% of reading + 0.5% of full scale.

Note: Overall accuracy of HT meters may be de-rated due to temperature and velocity conditions.

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 stainless steel

Hastalloy® available

Gas Pressure (2 limitations)

Mechanical design pressure:

Compression fittings: 500 psig (34 barg)

1-inch 150 lb flange (-40° to 250° F): 185 psig (12.8 barg)

Low Pressure Hot Tap: 150 psig (10 barg)

High Pressure Hot Tap: 275 psig (18 barg)

Pressure Drop

Negligible for pipes three inches in diameter or larger

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)

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

HIGH TEMPERATURE OPTION

Up to 750° F (400° C) air only; consult factory for other gases

DIGITAL COMMUNICATIONS OPTIONS

Pulse (not available with E2/E3/E4-NR)

Modbus RTU (not available with P3 option)

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

Eight digits (99,999,999) 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

Flow meter validation

PHYSICAL SPECIFICATIONS

Wetted Materials

316 stainless steel

Enclosure

Hazardous-Area Location Enclosure (IP66) or NEMA 4X (IP65)

Both 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)

Mounting (optional)

ANSI 1-inch 150 lb flange

3/4-inch tube compression fitting with 1-inch male NPT

Hot tap systems

Certifications

CE (All enclosures)

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-ignition

proof 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

Chinese pattern approval

GOST R/RTN (1ExdIICT6...T2)

ORDERING THE 640S

Features

Options

640S

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Parent

1

2

3

4

5

6

7

8

1

2

3

4

Instructions: To order the 640S please fill in each number block by selecting the codes from the corresponding features below and following pages.

Parent Number	
640S	Steel Mass Industrial Insertion Mass Flow Meter. 18-30 VDC (ATEX 18-24 VDC) or 100-240VAC input power with 3/4-inch diameter 316SS probe. Includes "Smart Electronics" with PC configuration software. Calibration temperatures up to 350°F (176°C). See gas table for pressure limits. HT option to 750°F (400°C) available (contact factory). CE, FM, ATEX, CSA approvals. Linear 0-5 VDC, 0-10 VDC or 4-20 mA output signals. Lifetime warranty on non-HT Fast Response (FR) sensor)

Feature 1: Probe Length			
L06	6 inch (15 cm)	L24	24 inch (61 cm)
L09	9 inch (23 cm)	L36	36 inch (92 cm)
L13	13 inch (33 cm)	L42	42 inch (122 cm)
L18	18 inch (46 cm)		

Note 1: Killark seal is required for FM and CSA agency approved meters greater than L13 (33 cm).
Adds 6.2 in (157 mm) to probe length listed above.

Feature 2: Electronics Enclosure	
E2	Hazardous-area location enclosure (IP66), direct mount on probe.
E3	Remote probe. 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	NEMA 4X (IP65) Enclosure with Junction Box. Cable sold separately.

Feature 3: Input Power		Feature 4: Output	
P2	18-30 VDC (ATEX 18-24 VDC)	V1	0-5 VDC, linear
P3	100–240 VAC. Not available with N enclosures	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	640S ATEX Approval. Requires E2 or E3 enclosure. E3 required for probe lengths greater than 13 inches or gas temperatures >149°F (65°C). Maximum probe length is 36 inch (92 cm).
FM	640S with FM Approval. Requires E2 or E4 enclosure. Maximum probe length is 72 inches (1.83 m)
CS	640S with CSA Approval. Requires E2 or E4 enclosure. Maximum probe length is 72 inches (1.83 m)

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

Note: ¹Correlation calibration - consult Gas Table for accuracy.

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

Option2: High Temperature	
HT	HT option to 750°F (400°C). Requires remote (E4 or EN4). Contact factory for probe length.

Note: Overall accuracy of HT may be de-rated due to temperature and velocity conditions. **NAA only.**

Option 3: 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 4: O2 Cleaning	
O2C	O2 Cleaning. Includes certification. Product cleaned for O2 service. Inspected with Ultra-Violet light only, double-bagged prior to shipment.



Measurably Different.®



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