UPCC

Bulletin SS02017 Issue/Rev. 0.3 (7/14)

FMC Technologies

**We put you first.
And keep you ahead.**

SMITH METER® UNIVERSAL PERFORMANCE CURVE COMPENSATOR

The Smith Meter® UPCC Universal Performance Curve Compensator is a microprocessor-based turbine meter preamplifier that has been designed to operate with the Smith line of multi-viscosity turbine meters. It is used to compensate for the viscosity of the product by either directly interfacing to a SolarTron Viscometer Head, by temperature inferred viscosity correction or current proportional to viscosity. It can also be used to convert the low voltage sinusoidal signal into a square wave pulse form that can be used to increase the transmission distance of the output.

The UPCC also functions as a flow computer that provides spontaneous and average flow rates, batch and cumulative totalization, and turbine meter frequency measurements. The pulse output can be raw uncompensated, a high resolution output, or quadrature for output only.

Universal Performance Curve Compensator

FEATURES
» **Electromagnetic Emissions:** EN 61000-6-3.
» **Electromagnetic Immunity:** EN 55022.
» **IEC 61000-4-2:** Electrostatic Discharge (ESD), Level 3+ (8.0 kV by contact, 12 kV by air).
» **IEC 61000-4-3:** Radiated Electromagnetic Field, Level 3 (10 V/m).
» **IEC 61000-4-4:** Electrical Fast Transient (Burst), Level 2 (1kV).
» **IEC 61000-4-5:** Electrical High Energy Pulses (Surge), Installation Class 3, Criterion B.

PRINCIPLE OF OPERATION

Viscosity and flow rate are key features in determining the performance of an MV Series Turbine Meter. By testing a meter over a range of viscosities and flow rates, the meter factor is determined and plotted relative to the log of velocity (flow rate)/viscosity. This data is also programmed in the UPC Compensator at the factory. Each meter has a unique meter factor vs. velocity/viscosity characteristic curve plotted over a specific flow and viscosity range. In actual operation, the product viscosity must be input for each product metered. The viscosity input can be:

» **A Constant** – Manually input a known viscosity value. This is sufficient when the product viscosity varies little over the metered volume.

» **Temperature/Viscosity Input** – The temperature/viscosity input is provided at minimum and maximum operating temperatures. The UPCC constantly reads the temperature and corrects for variations in viscosity. This increases the measurement accuracy when wide temperature variations are experienced.

» **Viscometer Input** – An analog or digital input from an on-line viscometer. This may be necessary where a wide range of products are handled and programming product viscosities is not practical.

SPECIFICATIONS

Electrical Inputs
DC Power[1]
12 to 24 Vdc +/- 10%[2]
Switch: 5-36 Vdc
Current Consumption: Less than 250 mA at 24 volts

Input Signal
Type: Sinusoidal, no DC offset
Sensitivity: 70 mVp-p at 25° C and 10 Hz
Frequency Range: 2000 Hz maximum
Mode: Single
Type: Square wave, no DC offset
Sensitivity: 24 Vp-p
Frequency Range: 2000 Hz maximum

Input Impedance
10 k Ω minimum at 20 Hz

Status Inputs (3)
Type: One 4.7k Ω resistor in series with isolator diode

Input Voltage Range: 4-36 Vdc
Pickup Voltage: 4 Vdc maximum
Dropout Voltage: 2 Vdc maximum
Current: 10 mA maximum
Common Mode: +/- 250 Vdc to chassis ground
Transient Protection: 39 volt Zener diodes

Resistance (Temperature)

Type: Four-wire 100 Ω platinum resistance temperature detector (PRTD)

Temperature Coefficient at 32° F: 0.00214 $\Omega/\Omega/°$ F (0.00385 $\Omega/\Omega/°$ C)

Temperature Range: -148° F to 572° F (-100° C to 300° C)

Temperature Measurement Accuracy: Fluid temperature is measured to within +/- 0.72° F (+/- 0.4° C) over the fluid temperature range of -148° F to 572° F (-100° C to 300° C)

Fluid temperature is measured to within +/- 0.45° F (+/- 0.25° C) over the fluid temperature range of 32° F to 572° F (0° C to 300° C)

Stability: 0.1° F (0.06° C)/year

Self-calibrating: Lead length compensation that requires no resistance balancing of leads

Analog (4-20mA)
Type: Two-wire, 4-20 mA current loop receiver, isolated from ground
Span Adjustment: Program adjustable through communications
Input Impedance: 50 Ω
Accuracy: +/- 0.05% of range
Resolution: One part in 65,536
Voltage Drop: Two volts maximum
Sampling Rate: One sample / second minimum

Electrical Outputs
Pulse Outputs
Type: Push-Pull driver (current sink or current source). Two raw, two programmable

12 Vdc input power supply:
No load: 7 Vp-p minimum square wave
270 Ω load: 4 Vp-p minimum square wave

24 Vdc input power supply:
No load: 14 Vp-p minimum square wave
270 Ω load: 11 Vp-p minimum square wave
Sink Current: 240 mA at 24 Vdc maximum
Source Current: 80 mA at 24 Vdc maximum
Frequency Range: 0 to 2000 Hz at 50/50 duty cycle

Switch Outputs
Type: Two open-collector transistors
Voltage Range: 6-36 Vdc
Sink Current: 240 mA at 24 Vdc maximum
Source Current: 80 mA at 24 Vdc maximum
Common Mode: +/- 250 Vdc to chassis ground
Transient Protection: 39 Volt Zener diodes across Darlington transistors

Analog (4-20 mA)
Type: Two, two-wire, 4-20 mA current loop transmitters
Accuracy: +/- 0.25% of range
Resolution: One part in 65,536
Span Adjustment: Program adjustable through communications

ENVIRONMENT
Ambient Operating Temperature: -58° F to 158° F (-50° C to 70° C)[3]
Ambient Storage Temperature: -58° F to 185° F (-50° C to 85° C)
Humidity: 0 to 95% non-condensing

---

1 DC power available from Smith Meter Electronics Instrumentation.

2 When used with the SolarTron Viscometer Head, the DC input power must be 24 Vdc.

3 For operation below -20° C, input power must be 24 Vdc.

COMMUNICATIONS

General

Configuration: Dip switch selectable between EIA-485 and EIA-232

Data Rates: Programmable to asynchronous data rates of 1200; 2400; 4800; 9600; or 19,200 bps.

Data Format: One start bit, one stop bit, programmable seven or eight data bits — even, odd, or no parity.

Data Structure: Modicon Modbus protocol with two modes of transmission (ASCII or RTU).

EIA-232

Configuration: Three-wire (Tx, Rx, GND); non-multidrop.

Transient Protection: 60 V (bd) bidirectional transorbs across Tx and Rx lines; 1.5 kV maximum

EIA-485

Configuration: Half duplex; jumper selectable

Termination: Dip switch selectable 120 Ω termination resistors of multidrop capabilities.

Transient Protection: 60 V (bd) bidirectional transorbs across Tx lines and across Rx lines, 1.5 kV maximum

Approvals

Electrical

UL/CUL, UL File E23545, Listed 557 N - Class I Groups C and D; Class I, Zone I, Group IIB; Class I, Zone I, AExd IIB T6 IP66; UNL-UL ENCL. 4, CNL-CSA ENCL. 4; Tamb -50°C to 70°C.

ATEX/IEC Ex - PTB 10 ATEX 1039X / IEC Ex PTB 10.0052X – Ex d IIC T6 Tamb -40°C to 70°C IP66.

Essential Health and Safety Requirements

EN/IEC 60079-0: Electrical apparatus for potentially explosive atmospheres – General requirements.

EN/IEC 60079-1: Electrical apparatus for potentially explosive atmospheres – Flameproof enclosures 'd'.

EN 60529: Degrees of protection provided by enclosures (IP code).

EMC Compliance: (by Council Directive 2004/108/EC).

Electromagnetic Emissions: EN 61000-6-3.

Electromagnetic Immunity: EN 55022.

IEC 61000-4-2: Electrostatic Discharge (ESD), Level 3+ (8.0 kV by contact, 12 kV by air).

IEC 61000-4-3: Radiated Electromagnetic Field, Level 3 (10 V/m).

IEC 61000-4-4: Electrical Fast Transient (Burst), Level 2 (1kV).

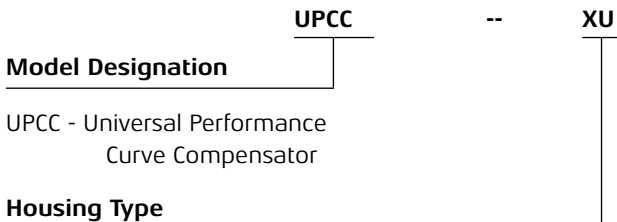**IEC 61000-4-5:** Electrical High Energy Pulses (Surge), Installation Class 3, Criterion B.

Signal Cable

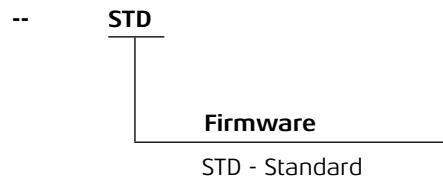| Distance	Wire Size	Resistance/Foot
Up to 2400 ft. (731m)	#20 AWG	0.010150 chm/ft
Up to 3800 ft. (1158m)	#18 AWG	0.006385 chm/ft
Up to 6000 ft. (1828m)	#16 AWG	0.004016 chm/ft

Note 1. *Cable loop resistance should be limited to 50 Ω maximum.*

Note 2. *Loop resistance = 2 times (cable length m/feet) times resistance in Ω/foot of cable.*

UPCC MODELING

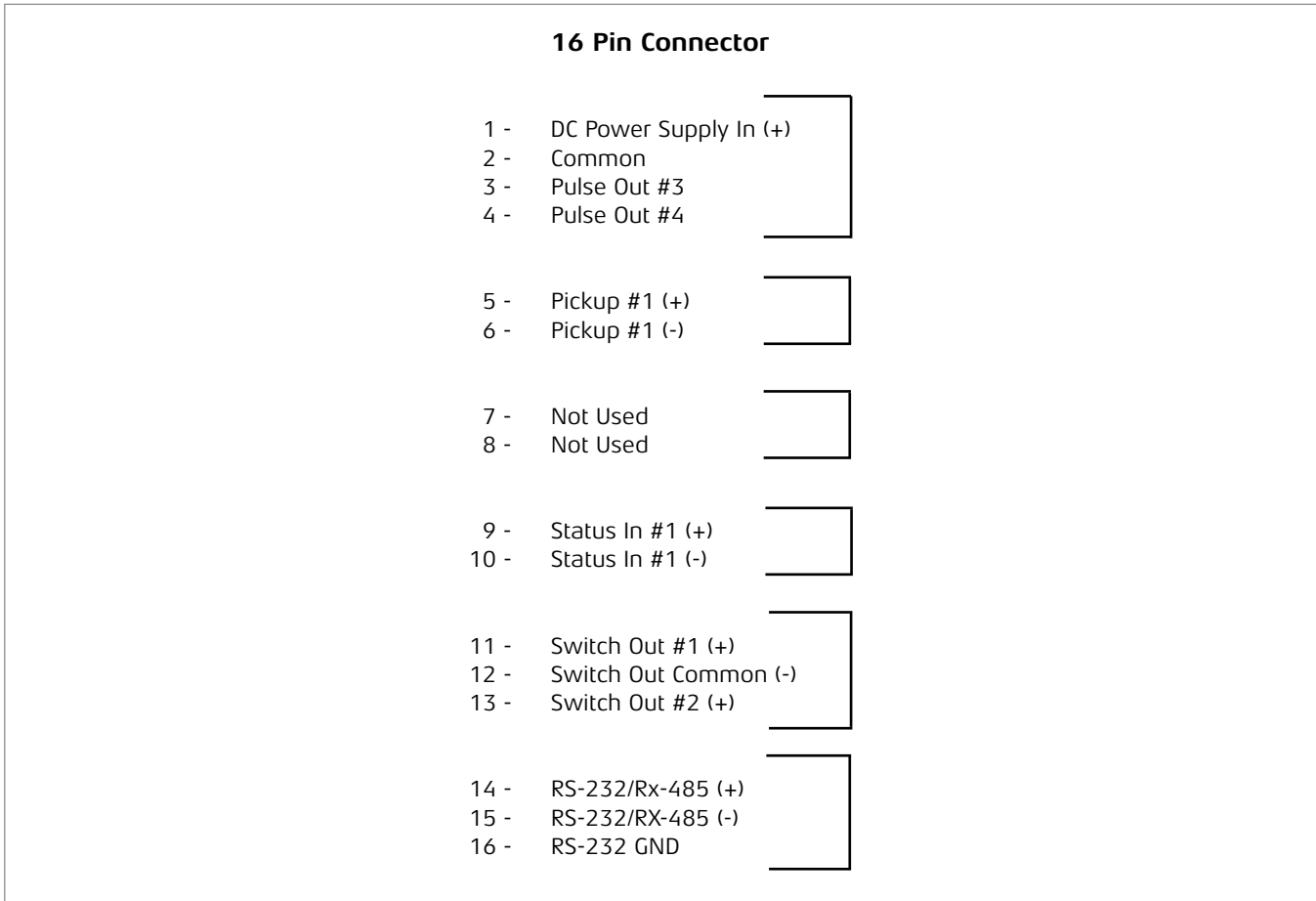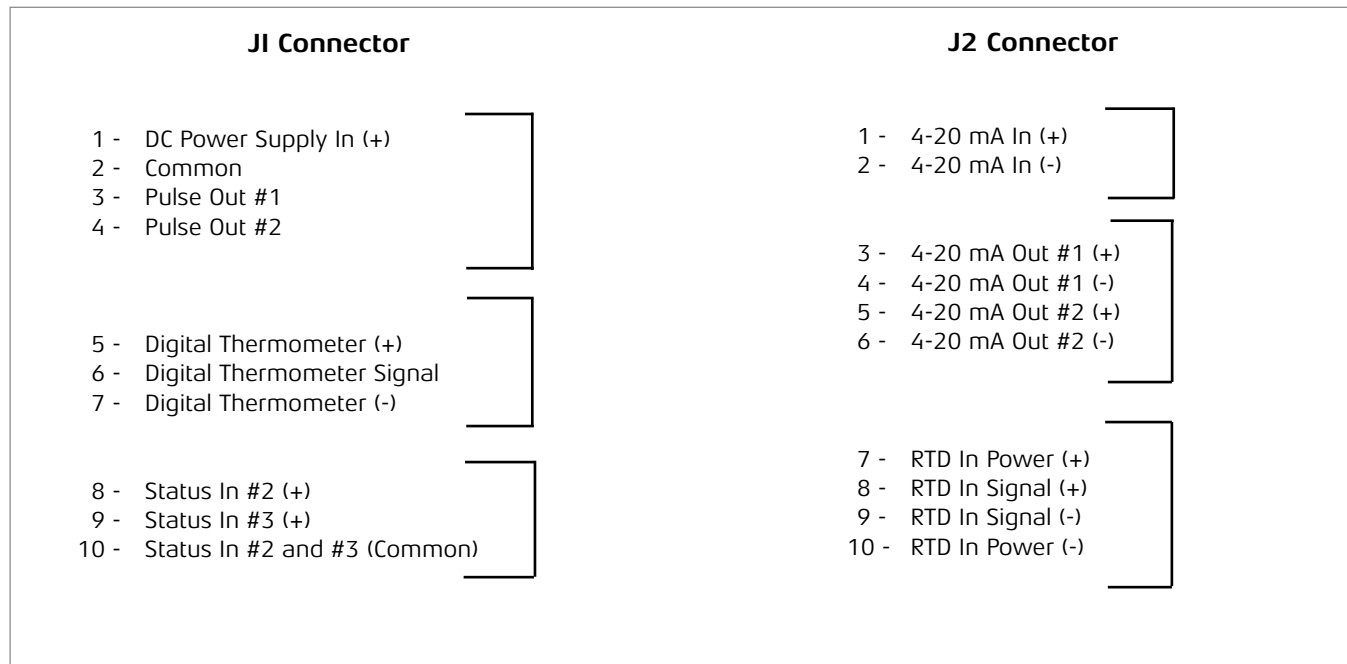| UPCC | -- | XU | -- | STD |

Model Designation

UPCC - Universal Performance
      Curve Compensator

Housing Type

XU - UL/CUL Listed
XC - ATEX / IEC Ex Certified

Firmware

STD - Standard

TERMINAL CONNECTIONS

16 Pin Connector

1 -   DC Power Supply In (+)
2 -   Common
3 -   Pulse Out #3
4 -   Pulse Out #4

5 -   Pickup #1 (+)
6 -   Pickup #1 (-)

7 -   Not Used
8 -   Not Used

9 -   Status In #1 (+)
10 -   Status In #1 (-)

11 -   Switch Out #1 (+)
12 -   Switch Out Common (-)
13 -   Switch Out #2 (+)

14 -   RS-232/Rx-485 (+)
15 -   RS-232/RX-485 (-)
16 -   RS-232 GND

Figure 1. Main Board

JI Connector

1 -   DC Power Supply In (+)
2 -   Common
3 -   Pulse Out #1
4 -   Pulse Out #2

5 -   Digital Thermometer (+)
6 -   Digital Thermometer Signal
7 -   Digital Thermometer (-)

8 -   Status In #2 (+)
9 -   Status In #3 (+)
10 -   Status In #2 and #3 (Common)

J2 Connector

1 -   4-20 mA In (+)
2 -   4-20 mA In (-)

3 -   4-20 mA Out #1 (+)
4 -   4-20 mA Out #1 (-)
5 -   4-20 mA Out #2 (+)
6 -   4-20 mA Out #2 (-)

7 -   RTD In Power (+)
8 -   RTD In Signal (+)
9 -   RTD In Signal (-)
10 -   RTD In Power (-)

Figure 2. Daughter Board

DIMENSIONS
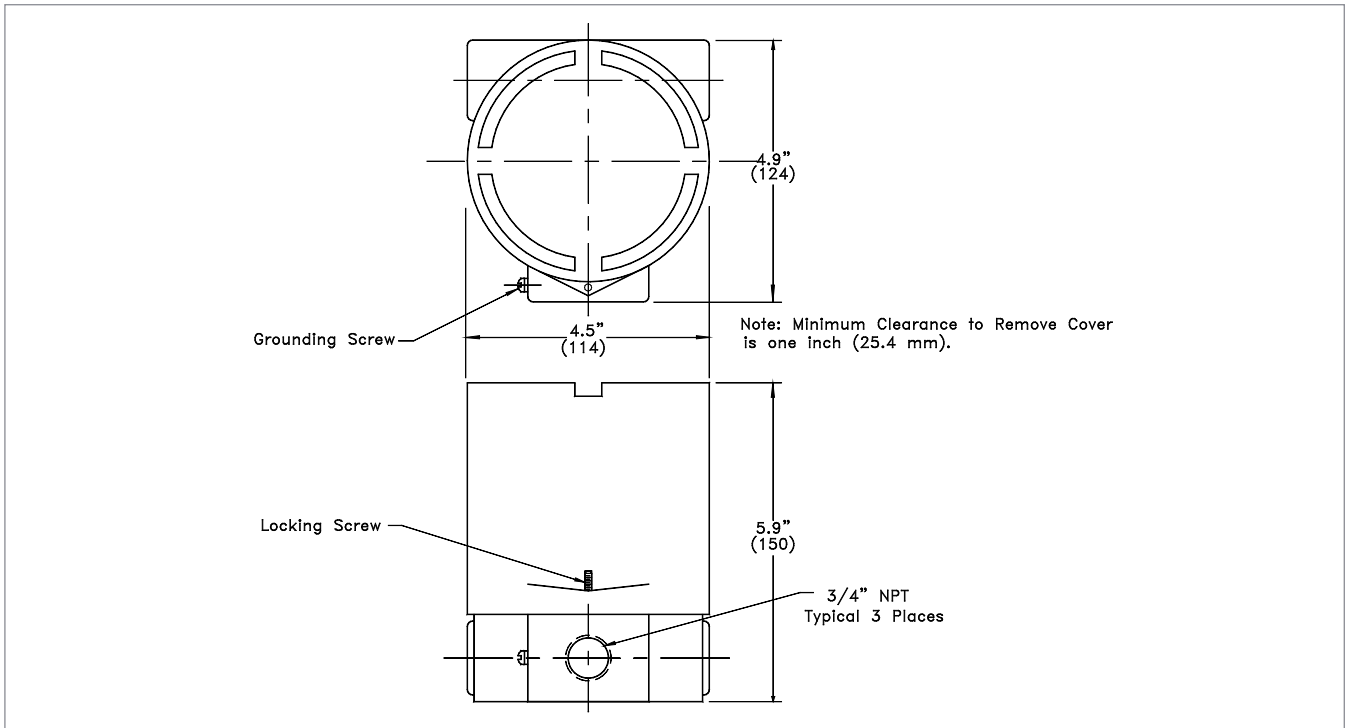
Figure 3. Housing Dimensions

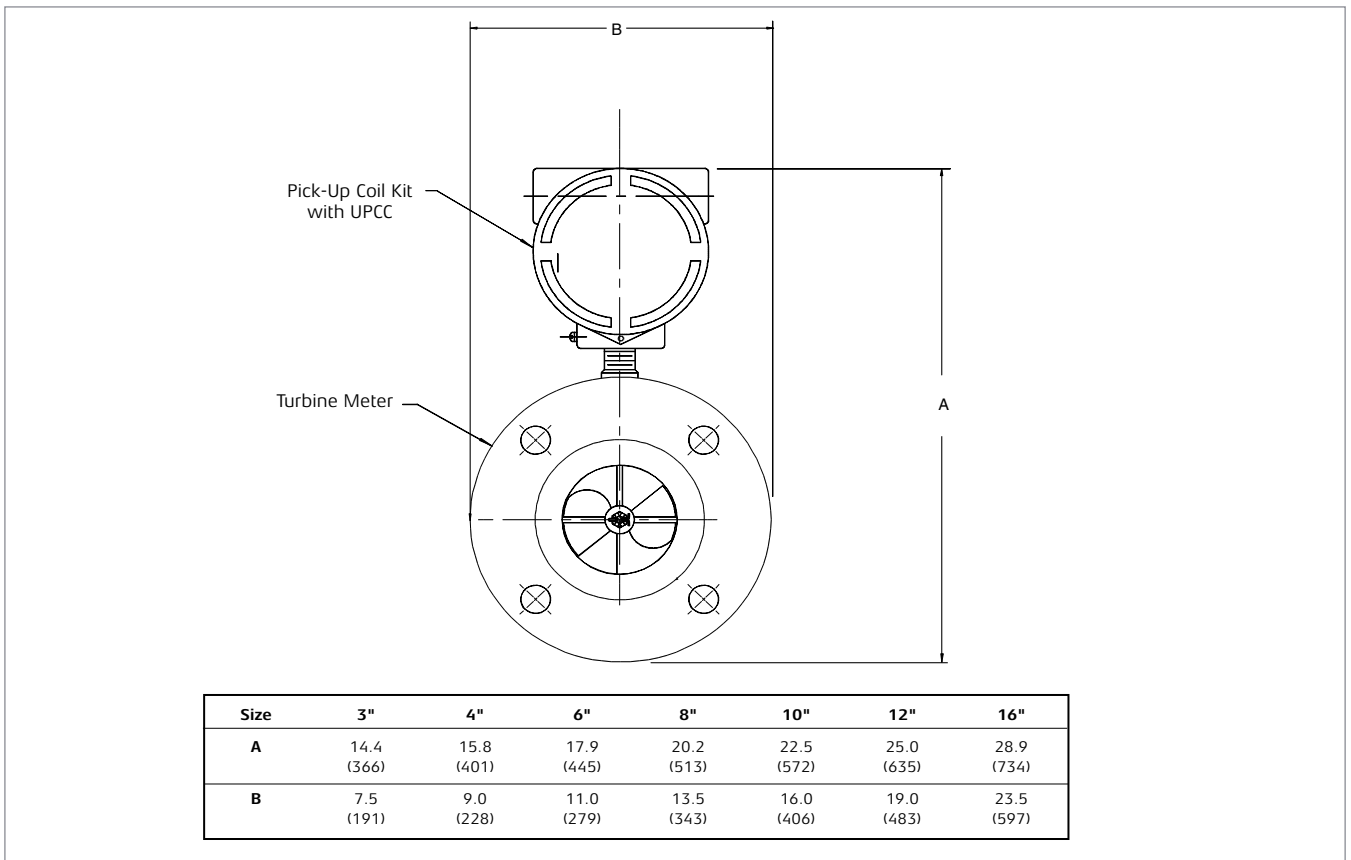| Size	3"	4"	6"	8"	10"	12"	16"
A	14.4 (366)	15.8 (401)	17.9 (445)	20.2 (513)	22.5 (572)	25.0 (635)	28.9 (734)
B	7.5 (191)	9.0 (228)	11.0 (279)	13.5 (343)	16.0 (406)	19.0 (483)	23.5 (597)

Figure 4. Factory-Mounted Envelope Dimensions for 150# Flanged Meter with Single Pickup Coil

**We put you first.
And keep you ahead.**

Revisions included in SS02017 Issue/Rev. 0.3 (7/14):
Page 3: Approvals updated (ATEX / IEC Ex). Footnote 4 removed.
The specifications contained herein are subject to change without notice and any user of said specifications should verify from the manufacturer that the specifications are currently in effect. Otherwise, the manufacturer assumes no responsibility for the use of specifications which may have been changed and are no longer in effect.
Contact information is subject to change. For the most current contact information, visit our website at www.fmctechnologies.com/measurementsolutions and click on the "Contact Us" link in the left-hand column.