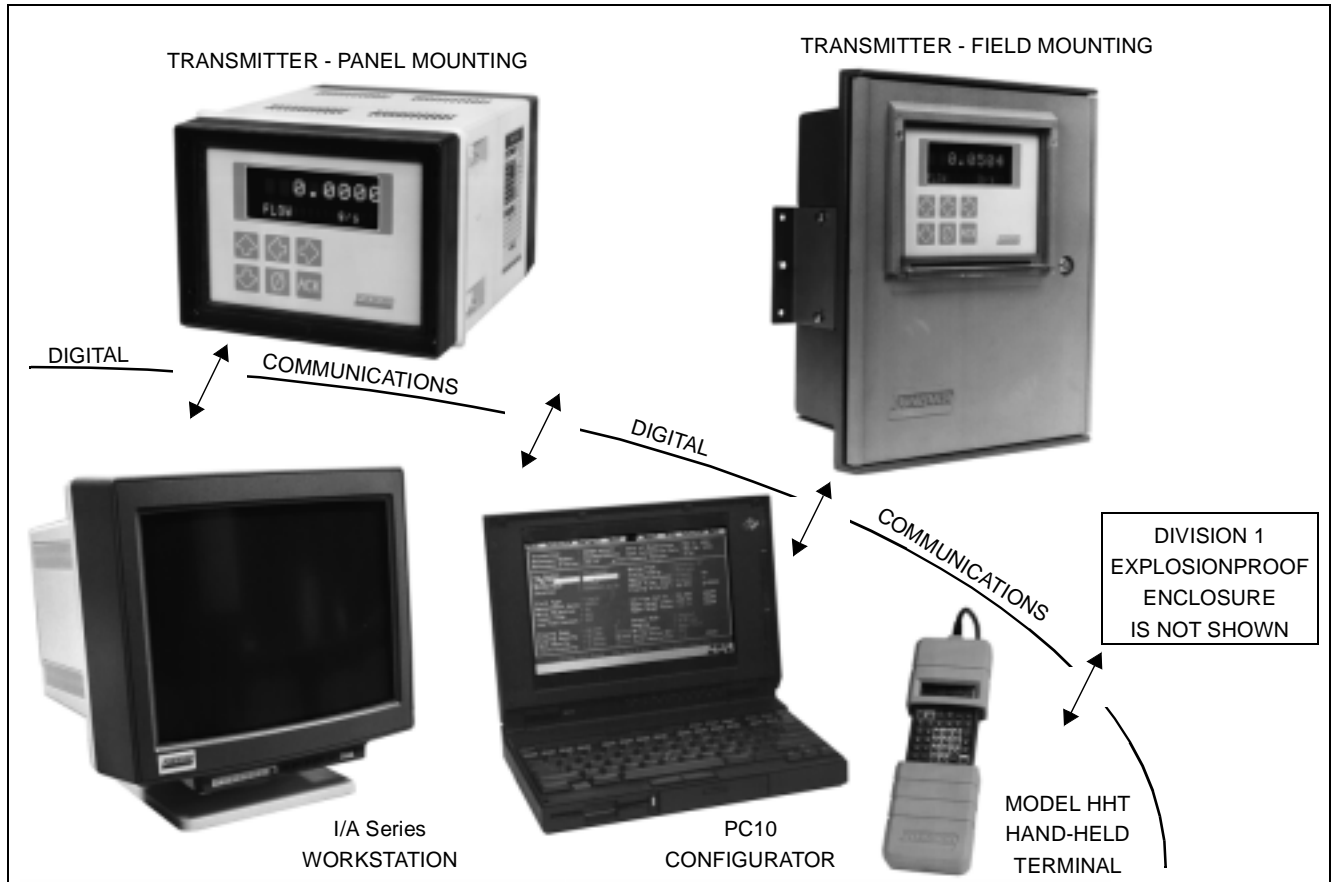


I/A Series[®] Mass Flowmeters

CFT10 Mass Flow Transmitter



The Model CFT10 Mass Flow Transmitter combines with a Model CFS10 or CFS20 Mass Flowtube to form an I/A Series Mass Flowmeter. The principle of Coriolis acceleration is used which allows true mass flow rate measurements to be made, without the need for external temperature, pressure, or specific gravity measurements. As symbolized by the “CE” Logo marking on the product, these transmitters conform to the applicable European Union Directives.

FEATURES

- High Accuracy of $\pm 0.15\%$ of Flow Reading or $\pm 0.015\%$ of Nominal Flow Range, whichever is Greater.
- Wide Rangeability in excess of 100:1.
- Easy to Install.
- Easy to Configure.
- Density, Temperature, % Solids, and Volumetric Rate Measurements Available as Standard.
- Patented Anti-Phase Double Driver System allows Close Sensor Proximity to Inhibit Signal Distortion, and Provides Low Power Consumption per Driver.
- Microprocessor-Based Continuous Self-Diagnostics.
- Built-In barrier protection for intrinsically safe flowtube to transmitter connection.

INTRODUCTION

The I/A Series Mass Flowmeter measures fluid mass flow rate directly, not inferentially as volumetric flowmeters do. With direct measurement of mass, the inaccuracies of multiple process measurements associated with volumetric flow devices are eliminated.

This flowmeter is a new and advanced generation of mass flow devices using Coriolis principles. It incorporates significant improvements in transmitter and flowtube design, including computer modeling, remote communications, automated manufacturing processes, construction and testing that all add up to an ideal product for today and tomorrow's "real world" process liquid flow applications.

APPLICATION VERSATILITY

The flowmeter is insensitive to process density, viscosity, and temperature changes. In addition to conventional liquids, it can also be used with non-Newtonian fluids, viscous and abrasive fluids, slurries.

REAL WORLD CONDITIONS

Exemplified by:

- High Accuracy at Realistic Nominal Velocities means Reduced Erosion
- Immunity to External Pipe Vibrations, Density and Viscosity Changes
- Flowtubes Designed for Low Pressure Loss
- Low Velocities mean Lower Pumping Costs

A PRODUCT FOR TODAY AND TOMORROW

The Mass Flow Transmitter provides a significant advancement path to the future: pulse, current and alarm outputs for today's systems, and full digital communications with the I/A Series System, Model HHT Hand-Held Terminal, and/or Model PC10 Intelligent Transmitter Configurator to address tomorrow's needs.

This Transmitter acquires the Process Flow, Density and Temperature signals from the flowtube and utilizes software correction algorithms to ensure that accuracy is maintained across the widest range of real-world conditions. The flow, density, temperature and total mass data is processed and stored digitally thereby preserving the high accuracy that is available to the user by retransmitting this data digitally.

High accuracy is also available to the stand alone user. The current output may be preset in the operating environment so that any analog conversion errors may be calibrated out by the receiving device. No additional errors are introduced when retransmitting using the frequency output over a one second sampling time. The alarm outputs are inherently digital in operation.

Four user interfaces allowing configuration and the reading of measurement and continuous on-line diagnostics are available: The Model HHT Hand-Held Terminal (HHT), the Model PC10 Intelligent Transmitter Configurator (PC10), the I/A Series System Workstation, and the Integral Display/Keypad. The I/A Series System Interface and the Integral Display/Keypad are optional selections.

The blind (without display/keypad) transmitter provides an optimum, low cost transmitter for integration with the I/A Series System, or for use with the current/pulse/alarm outputs after configuration with the HHT and/or PC10.

EASY-TO-USE MODEL HHT HAND-HELD TERMINAL

A Compact, Environmentally Hardened, Menu-Driven Hand-Held Terminal is common to all Foxboro Intelligent Transmitters. The standard Program Pak software allows measurements to be read and provides for Reconfiguring or Recalibrating the Flowmeter.

The HHT allows the data base from one transmitter to be copied and downloaded to another transmitter. It may also be connected across any point in the current loop, allowing operations to be carried out from the control room end of this interface, if desired.

Transmitters are offered for panel- or field-mounted installations. A selection of Electrical Certifications are also offered for intrinsically safe and nonincendive apparatus for use in hazardous area locations.

MODEL PC10 INTELLIGENT TRANSMITTER CONFIGURATOR

The Model PC10 Intelligent Transmitter Configurator (PC10) is a software package that supports remote communication and configuration for all Foxboro Intelligent Transmitters. It provides all of the functionality of the Foxboro Hand-Held Terminal while taking advantage of the superior display, keyboard, storage, and printing capabilities of a personal computer system.

The use of a personal computer allows additional functionality, such as unlimited transmitter database storage, printouts, output trending, enhanced diagnostic capability, and on-line help screens.

The package includes an external modem that allows operation with any IBM XT compatible computer having 512 K of RAM memory and a serial communication port. Communication with the CFT10 uses proven frequency shift keying (FSK) techniques that have no affect on the transmitter output signal. Operations have two levels of password protection: one level allows recalibration; the other level allows

reconfiguration. For more information on the PC10, refer to PSS 2A-1Z3 C.

PROTECTION AGAINST ELECTRICAL INFLUENCES

The transmitters can withstand surge voltages defined in IEC 801-1 to 5 and ANSI Standards C37.90.1 and C62.41. These include surge voltages up to 2.0 kV on power supply lines, and electrostatic discharges up to 6 kV to operator accessible surfaces.

OPERATING CONDITIONS (Transmitter Only)

Influence	Reference Operating Conditions	Normal Operating Condition Limits	Transportation and Storage Limits
Process Temperature	23 ±8°C (73 ±13°F)	-130 and +180°C (-202 and +356°F)	Not Applicable
Ambient Temperature: • Panel Mounted Transmitter • Field Mounted Transmitter	• 23 ±2°C (73 ±3°F) • 23 ±2°C (73 ±3°F)	• 5 and 50°C (41 and 122°F) • -25 and +60°C (-13 and +140°F)	• -40 and +85°C (-40 and +185°F) • -40 and +85°C (-40 and +185°F)
Ambient Pressure	100 kPa (14.7 psia)	70 and 108 kPa (10.1 and 15.7 psia)	70 and 108 kPa (10.1 and 15.7 psia)
Relative Humidity • Panel Mounted Transmitter • Field Mounted Transmitter	50 ± 10% 50 ± 10%	• 5 and 95% • 5 and 100%(a)	0 and 100% Noncondensing
Supply Voltage, ac and dc	120 or 240 V ac, ± 1% 30 ± 0.5 V dc	Rated ac Voltage +10%, -22% 19 and 52 V dc (b)	Not Applicable
Supply Frequency, ac	50 or 60 Hz, ± 0.5 Hz	47 and 63 Hz	Not Applicable
Mechanical Vibration:	—	5 m/s ² (0.5 "g") at 5 to 200 Hz	Normal Handling of Packaged Transmitter

(a) 100% relative humidity value includes condensation.

(b) 19 and 42 V dc with Electrical Certification Codes CGZ and CNN.

FLOWTUBE NOMINAL CAPACITIES (for Reference)

Flowtube Model	Flowtube Size		Nominal Capacity			
			Standard Range		Extended Range	
	in	mm	kg/min	lb/min	kg/min	lb/min
CFS10	1/8	3	0.03 to 3	0.07 to 7	7	15
	1/4	6	0.09 to 9	0.2 to 20	22	48
	1/2	15	0.4 to 40	0.9 to 90	73	160
	3/4	20	0.9 to 90	2 to 200	119	261
	1	25	1.8 to 180	4 to 400	244	536
	1 1/2	40	4 to 400	9 to 900	607	1335
	2	50	7 to 700	15 to 1500	1023	2250
CFS20	1 1/2	40	4 to 400	9 to 900	485	1070
	3	80	18 to 1815	40 to 4000	2040	4500

SYSTEM PERFORMANCE SPECIFICATIONS

(Under Reference Operating Conditions, unless otherwise specified)

Accuracy (Flow Rate)

$\pm 0.15\%$ of reading, or $\pm 0.015\%$ of nominal flow range, whichever is greater ($\pm 0.1\%$ of reading available as a special).

NOTE

Stated flow rate accuracy includes the combined effects of linearity, hysteresis, repeatability, and zero offset.

Accuracy (Density)

$\pm 0.25\%$ of reading for specific gravities between 0.5 and 2.5; $\pm 0.50\%$ of reading for specific gravities between 0.2 and 0.5, and between 2.5 and 3.0.

Accuracy (Temperature)

$\pm 1^\circ\text{C}$ ($\pm 1.8^\circ\text{F}$) for process fluid temperatures between -60 and $+100^\circ\text{C}$ (-76 and $+212^\circ\text{F}$). Or $\pm 3^\circ\text{C}$ ($\pm 5.4^\circ\text{F}$) for process fluid temperatures from -130 to -60°C (-202 to -76°F) and from 100 to 180°C (212 to 356°F).

FUNCTIONAL SPECIFICATIONS

Pulse Output - when Configured for Flow Rate, Density, Temperature, or % Solids

- 0 kHz maps onto user defined lower range value, and 10 kHz maps onto user defined upper range value (independent of those for current output). Values are selectable in user units.
- Correct number of pulses is transmitted over a one second sampling period.
- Pulse rate low cutoff is 10 Hz, and high cutoff is 10 kHz. Duty cycle 50% nominal.
- Selectable damping of process variations (independent of that for current output).

Pulse Output - when Configured for Totalized Mass Flow Rate

- One pulse is sent each time a user defined quantity is accumulated.
- Pulse rate high cutoff is 5, 10, or 15 Hz, up to 256 pulses are accumulated before "Pulse Overrun" alarm condition occurs (selectable on an alarm output).
- Output (nominal) pulse "ON" state is:
 - 100 ms for 5 Hz
 - 50 ms for 10 Hz
 - 33 ms for 15 Hz

Pulse Output - used as Solid State Switch or Switched Voltage Source

The pulse output is isolated and capable of working through external intrinsically safe barriers. Its two terminal output can be used as a 2-terminal solid state switch, or as a 2-terminal switched voltage source. Upon detection of a hardware failure, the output is disabled.

SOLID STATE SWITCH RATING

- Applied Voltage: 60 V dc maximum
- Off State Leakage: 0.5 mA maximum
- Load Current: 500 mA maximum
- Shorted Load Duration: Continuous
- Isolation: 500 V

SWITCHED VOLTAGE SOURCE RATING

- Open Circuit Voltage: 11 ± 2 V dc
- Short Circuit Current: 10 mA maximum
- Shorted Output Duration: Continuous
- Isolation: 500 V

Current Output

- Used for mass or volume flow rate, density, temperature, or % solids output.
- Selectable to 0 to 20 or 4 to 20 mA. 0 or 4 mA maps onto user defined lower range value, and 20 mA maps onto user defined upper range value. Values are selectable in user units.
- Independent selectable damping of process variations.
- Adjustable so that read-outs indicate correctly.
- Two terminal, internally powered, isolated (500 V), and capable of working into less than 850 Ω total load (load may include external intrinsic safety barriers).

Alarm Output

There are two alarm outputs that are user-selectable for single alarm conditions with configurable alarm limit. The alarm state can be configured open or closed during alarm conditions.

The alarm output is isolated and capable of working through external intrinsically safe barriers. Three output terminals are provided, two for a solid state switch and a third as a low current 12 V pull-up (the common terminal of the switch is also common for the 12 V pull-up). The solid state switch is rated at:

- Applied Voltage: 60 V dc maximum
- Off State Voltage: 0.5 mA maximum
- Load Current: 500 mA maximum
- Shorted Load Duration: Continuous
- Pull-up Current: 10 mA maximum
- Isolation: 500 V

Power Consumption (Transmitter and Flowtube)

Maximum power consumed by the transmitter and flowtube is 15 W. Flowtube drive power is provided by the transmitter.

Hand-Held Terminal or PC10 Configurator Interface

The transmitter communicates bidirectionally over the 4 to 20 mA output lines to the HHT or PC10. The connection may be made at any point in the current loop. The information that can be **remotely displayed** and **reconfigured** is:

- Digital Output (Measured Values) in user-selected Engineering Units
- Current Loop Measurement Variable (Mass and Volumetric Flow, Density, Temperature, and % Solids)
- Current Loop LRV and URV
- Pulse Output Measurement Variable (Mass and Volumetric Flow, Density, Temperature, Total, and % Solids)
- Pulse Output LRV and URV (for Mass and Volumetric Flow, Density, Temperature) or Trip Total (Total Flow or Individual Component)
- Electronic Damping (Independent for Pulse and Current Outputs)
- Alarm Measurement (Mass and Volumetric Flow, Density, Temperature, % Solids, or Fault only) and Sense (High, Low). Independent for each Alarm Output.
- Alarm Limit (Independent for each Alarm Output)
- Module Identifier (for Configuration in I/A Series System)
- Flowtube Calibration Database
- Engineering Units, Flow Direction, and Slug Delay
- Description, Location, and Tag Number

Communication with the HHT or PC10 is achieved by digitally encoding information using the Frequency Shift Keying (FSK) method, and superimposing it on the current loop signal. This method allows connection of the HHT or PC10 up to 900 m (3 000 ft) from the transmitter, and does not disturb normal operation of the current loop.

I/A Series System Fieldbus Interface

Connection to an I/A Series System is by direct connection to the Fieldbus, as with other Foxboro Fieldbus Modules. This bus operates at up to 268 kbaud, and incorporates dual circuits for fault-tolerant operation. The scan rate is determined by the configuration of the I/A Series system. Direct digital communication removes the conversion errors which are inherent in other systems.

The information which can be **modified and displayed** from the I/A Series System Workstation is:

- Digital Output (Measured Values) in user-selected Engineering Units
- Description
- Flowtube Calibration Database
- Engineering Units
- Location
- Tag Number

In addition, the Totalized Mass measurement can be reset to zero, and the Zero point of the Flow measurement calibrated from the Workstation. To ensure system security, once the I/A Series System has switched the transmitter on line, remote operators cannot switch it off line or change its configuration through the HHT or Display/Keypad (though they can still read measurements and examine the configuration). This is to ensure that the operation of a control loop cannot be inadvertently upset by an operator in the field.

Local Display and Keypad

The transmitter can be provided with a plain front panel, or with an alphanumeric display and a keypad. The top line of the Vacuum Fluorescent Display consists of eight 10 mm (0.4 in) high characters, and normally displays the value of one of the measurements. The lower line has sixteen characters each 7 mm (0.25 in) high, and displays a description of the measurement and its engineering units (EGUs).

The front panel keypad contains six keys that include a flow/total zero key, and alarm acknowledge key, and four cursor keys. The cursor keys allow for traversing through the menu and changing configurations. The following information can be **displayed and configured**:

- Digital Output (Measured Values) in User-Selected Engineering Units (for use by HHT, PC10, or I/A Series System)
- Displayed Output in User-Selected EGUs
- Displayed Measurement Format and Damping (to Reduce Unnecessary Display Measurement Fluctuations)
- Current Loop Measurement Variable (Mass and Volumetric Flow, Density, Temperature, and % Solids)
- Current Loop LRV and URV
- Pulse Output Measurement variable (Mass and Volumetric Flow, Density, Temperature, Total, and % Solids)
- Pulse Output LRV and URV (for Mass and Volumetric Flow, Density, Temperature, % Solids) or Trip Total (Total Flow or Individual Component)

- Electronic Damping (Independent for Pulse and Current Outputs)
- Alarm Measurement (Mass and Volumetric Flow, Density, Temperature, % Solids, or Fault only) and Sense (High, Low). Independent for each alarm output.
- Alarm Limit and Hysteresis (Independent for each Alarm Output)
- Module Identifier (for configuration in I/A Series System)
- Flowtube Calibration Database
- Engineering Units, Flow Direction, Slug Delay, and Pulse Rate Cutoff
- Description

- Location
- Tag Number
- Configuration of “Custom” Engineering Units

The Totalized Mass measurement can be reset to zero, and the Zero point of the Flow measurement calibrated from the keypad.

A user-configurable passcode function can be used to prevent unauthorized operators from Zeroing the Total Mass measurement, switching the transmitter off line, or changing its configuration. The passcode can be disabled if not required.

PHYSICAL SPECIFICATIONS

Transmitter

PANEL MOUNTED ENCLOSURE

Noryl thermoplastic resin; light gray case and dark gray bezel and rear cover.

FIELD MOUNTED ENCLOSURE

Polyester resin enclosure housing, ultra violet stabilized, and reinforced with 25% glass. Color is dark gray. The enclosure door is Noryl SE1–GFN material and painted blue.

EXPLOSIONPROOF ENCLOSURE

Aluminum alloy with 80% aluminum (minimum) and 6% Magnesium (maximum). All bolting is stainless steel.

INTERNAL FINISH (PANEL AND FIELD MOUNT ONLY)

Coated or sprayed for RFI/EMI screening (shielding).

INGRESS PROTECTION

The transmitter enclosures are weatherproof as defined by IEC IP66, and provide the watertight and corrosion-resistant protection of NEMA Type 4X (except rear section of panel mounted enclosure).

DIMENSIONS

See “DIMENSIONS – NOMINAL” section.

APPROXIMATE MASS

- Field Mounted Transmitter - 6 kg (13 lb)
- Panel Mounted Transmitter - 3.5 kg (7.5 lb)
- Explosionproof Transmitter - 20 kg (44 lb)

HHT or PC10 Output Connection

The HHT output cable assembly and the PC10 output cable assembly are both terminated with banana plugs. Mini-grabber clips are also provided (the HHT is additionally provided with alligator clips). The connection may be made at any point in the current loop. A minimum of 200 ohms of loop resistance is required to avoid excessive attenuation of HHT or PC10 signal.

Transmitter Output Interface

The transmitter has 14 output connections as follows: two for current output and HHT link, two for pulse output, four for alarm outputs, and six for the I/A Series Fieldbus. All connections are screw terminals. The HHT interface length limit is 900 m (3 000 ft). These transmitter outputs are not intrinsically safe, but they are nonincendive for use in Class I, Division 2 hazardous locations. They may also operate with external intrinsically safe barriers.

Flowtube to Transmitter Interface

The flowtube, apart from signal connections, has a terminal for the local earth (ground) connection. The flowtube is also provided with a 5 m (16 ft) length of wide-temperature range pigtail cable with terminations suitable for the screw terminals on the transmitter. The interface cable assembly consists of two twisted pair cables for sensor return, two pair for coil drive, and two pair for RTD.

Flowtube termination is fitted with a 3/4 NPT (internally threaded) conduit connection for cable protection, if required.

Two flowtube-to-transmitter connection methods are permissible, as follows:

- Direct Connection - the flowtube's 5 m (16 ft) pigtail cable is directly connected to the transmitter.
- Indirect Connection - the flowtube's 5 m (16 ft) pigtail cable is connected, via an extension cable, in a junction box that must comply with the constructional requirements of intrinsically safe equipment. The extension cable must be less than 300 m (1 000 ft) in length.

ELECTRICAL SAFETY SPECIFICATIONS

Electrical Safety - Transmitter

Testing Laboratory, Type of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
CENELEC flameproof for Gas Groups IIB, Zone 1; intrinsically safe connections [EEx ib] for Gas Group IIB, Zone 1.	For Transmitter Mounting Code "X" only. Intrinsically safe flowtube circuits must connect to Foxboro CFS...EBB flowtubes. Circuits to the flowtube must operate within the maximum entity parameters provided in Table 1. Temperature Class per Note 2.	EDB
CENELEC for use in general purpose (ordinary) locations; also as associated apparatus having flowtube circuits intrinsically safe EEx ib for IIB, Zone 1.	Intrinsically safe flowtube circuits must connect to Foxboro CFS...EBB flowtubes. Circuits to the flowtube must operate within the maximum entity parameters provided in Table 1.	EGB
CENELEC associated apparatus having flowtube circuits intrinsically safe EEx ib for IIB, Zone 1. Designed to meet requirements as Ex N for Group IIC, Zone 2 (for field-mounted transmitters "-Q" and "-S" only).	Installation of transmitter must be such that there is a low risk of mechanical damage. Intrinsically safe flowtube circuits must connect to Foxboro CFS...EBB flowtubes. Circuits to the flowtube must operate within the maximum entity parameters provided in Table 1. Temperature Class per Note 2.	ENB
CSA for use in general purpose (ordinary) locations.	Connection to Foxboro Model CFS...CGZ flowtubes.	CGZ
CSA as suitable for use in, and as associated apparatus having flowtube circuits nonincendive for use in Class I, Division 2, Groups A, B, C, and D, hazardous locations.	Connection to Foxboro CFS...CNN Flowtubes. Temperature Class per Note 2.	CNN
FM explosionproof for Class I, Division 1, Groups C and D, hazardous locations. Intrinsically safe connections to Class I, Division 1, Groups C and D; nonincendive connection to Class I, Division 2, Groups C and D, hazardous locations.	For Transmitter Mounting Code "X" only. Devices connected to nonincendive input/output circuits must operate within maximum entity parameters provided in Table 2. Intrinsically safe flowtube circuits must connect to approved Foxboro CFS...FBB flowtubes. Temperature Class per Note 2.	FDS
FM nonincendive for Class I, Division 2, Groups A, B, C, and D; and as associated apparatus having flowtube circuits nonincendive for use in Class I, Division 2, Groups A, B, C, and D, and input/output circuits nonincendive for Class I, Division 2, Groups C and D hazardous locations.	Connection to Foxboro CFS...FNN Flowtubes. Devices connected to nonincendive input/output circuits must operate within the maximum entity parameters provided in Table 2. Temperature Class per Note 2.	FNN

NOTES

1. These transmitters have been designed to meet the electrical safety descriptions listed in the table above. For detailed information or status of the Testing Laboratory Approval/Certifications, contact Foxboro.
2. Temperature Class: T6 at 40°C; T5 at the upper temperature limit of Normal Operating Conditions. See "Operating Conditions" section for details.

Electrical Safety - Transmitter (Cont.)

Testing Laboratory, Type of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
FM nonincendive for use in Class I, Division 2, Groups C and D; and as associated apparatus having: flowtube circuits intrinsically safe for Class I, Division 1, Groups C and D, and input/output circuits nonincendive for Class I, Division 2, Groups C and D.	Devices connected to nonincendive input/output circuits must operate within the maximum entity parameters provided in Table 2. Intrinsically safe flowtube circuits must connect to approved Foxboro CFS..-...FBB flowtubes. Temperature Class per Note 2.	FNS
SAA flameproof, Ex d, for Gas Group IIB, Zone 1. Intrinsically safe connections [Ex ib] for Gas Group IIB, Zone 1; nonsparking connections for Gas Group IIB, Zone 2.	For Transmitter Mounting Code "X" only. Devices connected to nonsparking input/output circuits must operate within the maximum entity parameters provided in Table 2. Intrinsically safe flowtube circuits must connect to certified Foxboro Model CFS..-...ABB flowtubes. Temperature per Note 2.	ADS
SAA nonsparking Ex n for Group IIB, Zone 2 explosive atmospheres, and as associated electrical equipment [Ex ib] for Group IIB, Zone 1 explosive atmospheres.	Devices connected to nonsparking input/output circuits must operate within the maximum entity parameters provided in Table 2. Intrinsically safe flowtube circuits must connect to certified Foxboro Model CFS..-...ABB flowtubes. Temperature Class per Note 2.	ANS

NOTES

1. These transmitters have been designed to meet the electrical safety descriptions listed in the table above. For detailed information or status of the Testing Laboratory Approval/Certifications, contact Foxboro.
2. Temperature Class: T6 at 40°C; T5 at the upper temperature limit of Normal Operating Conditions. See "Operating Conditions" section for details.

Table 1. Circuit Requirements for Transmitters with Electrical Safety Design Codes EDB, EGB, and ENB, when Connected to Intrinsically Safe Flowtubes with Electrical Safety Design Code EBB

Flowtube Model	Circuits to Flowtube				All Other Circuits		
	Maximum Entity Parameters				EDB Transmitter Version	EGB Transmitter Version	ENB Transmitter Version
	Flowtube Size		C _c (mF) Note (a)	L _c (mH) Note (b)			
	mm	in					
CFS10	3	1/8	1	0.5	May not extend into the hazardous area.	May not extend into the hazardous area.	May not extend into the hazardous area.
	6	1/4	1	0.5			
	15	1/2	1	1.0			
	20	3/4	1	1.0			
	25	1	1	0.2			
	40	1 1/2	1	0.3			
CFS20	50	2	1	0.3			
	40	1 1/2	1	0.2			
	80	3	1	0.3			

(a) C_c = Maximum allowed capacitance per circuit of cable (wire pairs) between transmitter and flowtube.

(b) L_c = Maximum allowed inductance per circuit of cable (wire pairs) between transmitter and flowtube.

Table 2. Maximum Entity Parameters for Transmitters with Electrical Safety Design Codes ADS, ANS, FDS, FNN, and FNS; for Class I, Division 2, Groups C and D (FDS, FNN, and FNS); and for Group IIB, Zone 2 (ADS and ANS)

Input/Output Circuit	Maximum Entity Parameters(a)			
	V_{oc}	I_{sc}	C_a	L_a
0 to 20 mA or 4 to 20 mA dc	26.4 V	309 mA	0.3 μ F	3 mH
I/A Series Fieldbus	Must be connected to the I/A Series Communication Network via Foxboro specified 100 Ω twinaxial cable, within the following maximum entity parameters.			
	5.0 V	0.5 A	1000 μ F	1 mH
Model HHT Hand-Held Terminal	The transmitter HHT terminals must be connected to the Foxboro Model HHT Hand-Held Terminal.			
Internally Powered Alarm	13.2 V	13.2 mA	3 μ F	1 H
Internally Powered 0 to 10 kHz Pulse	13.2 V	13.2 mA	3 μ F	1 H
Input/Output Circuit	V_{max}	I_{max}	C_i	L_i
Externally Powered Alarm	V_{max} and I_{max} must be below the ignition curve for Group C gases.		0 μ F	0 H
Externally Powered 0 to 10 kHz Pulse	$V_{max} = 13.2$ V or V_{max} (ext.) $I_{max} = 13.2$ mA plus I_{max} (ext.) Resultant V_{max} and I_{max} must be below the ignition curve for Group C gases.		0 μ F	0 H

- (a) V_{oc} = Open circuit voltage, V_{max} = Maximum safe operating voltage,
 I_{sc} = Short circuit current, I_{max} = Maximum safe operating current,
 C_a = Capacitance which may be connected, C_i = Unprotected internal capacitance, and
 L_a = Inductance which may be connected, L_i = Unprotected internal inductance.

MODEL CODE

<u>I/A Series Mass Flow Transmitter</u>	CFT10
<u>Transmitter Mounting</u>	
Panel Mounting	-P
Field Mounting - Mounted to Pipe	-Q
Field Mounting - Mounted to Surface	-S
Explosionproof Enclosure (Class I, Division 1) — Mounted to Surface ^(a)	-X
<u>Nominal Supply Voltage and Frequency</u>	
100/120 V ac, 50 or 60 Hz	A
220/240 V ac, 50 or 60 Hz	B
24 to 50 V dc ^(b)	D
<u>Front Panel</u>	
Blind (without Display/Keypad)	B
Keypad and Display, English/German (Shipped in English Mode)	E
<u>Communications</u>	
With I/A Series Fieldbus Interface	F
With No I/A Series Fieldbus Interface	N
<u>Electrical Safety (See Electrical Safety Specifications Section)</u>	
SAA, Flameproof d, Special Connection ^(c)	ADS
SAA, Nonsparking Ex n, Special Connection	ANS
CSA, General Purpose Locations	CGZ
CSA, Class I, Division 2, n Connection	CNN
CENELEC, Flameproof d, ib Connection ^(c)	EDB
CENELEC, General Purpose Locations and EEx ib	EGB
Ex N, IIC, and CENELEC [EEx ib], IIB. Mounting Codes "Q" and "S" only	ENB
FM, Explosionproof d, Special Connection ^(c)	FDS
FM, Nonincendive n, n Connection	FNN
FM, Nonincendive n, Special Connection	FNS
Example: CFT10-PAENFNS	

(a) To be used with Electrical Safety Codes ADS, EDB, and FDS only.

(b) When Electrical Safety Codes "CGZ" or "CNN" are selected in conjunction with Nominal Supply Voltage and Frequency Code "-D" (24 to 50 V dc), the Nominal Supply Voltage is limited to 24 to 42 V dc.

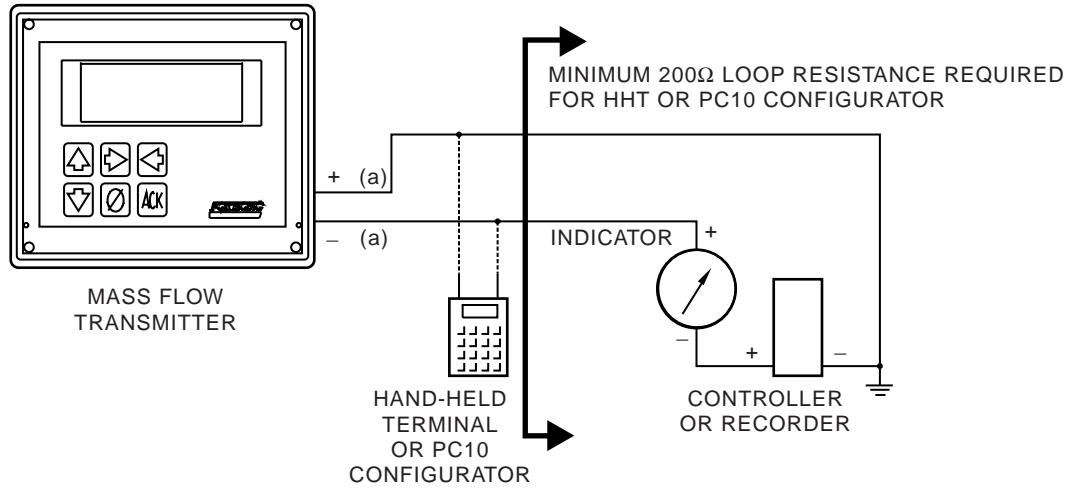
(c) Only available with Enclosure Code "-X".

NOTE

These transmitters have been designed to meet the electrical safety descriptions listed above. For detailed information or status of the Testing Laboratory Approval/Certifications, contact Foxboro.

FUNCTIONAL BLOCK DIAGRAMS

Refer to Figure 1 and Figure 2 for the functional block diagrams of the 4 to 20 mA and digital output transmitters.



(a) Transmitter Current Output No. 1

Figure 1. 4 to 40 mA Output Functional Block Diagram

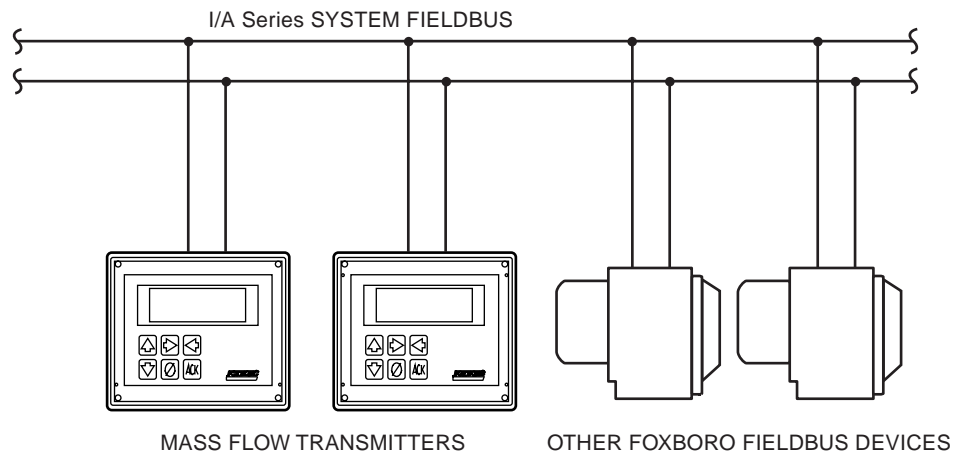
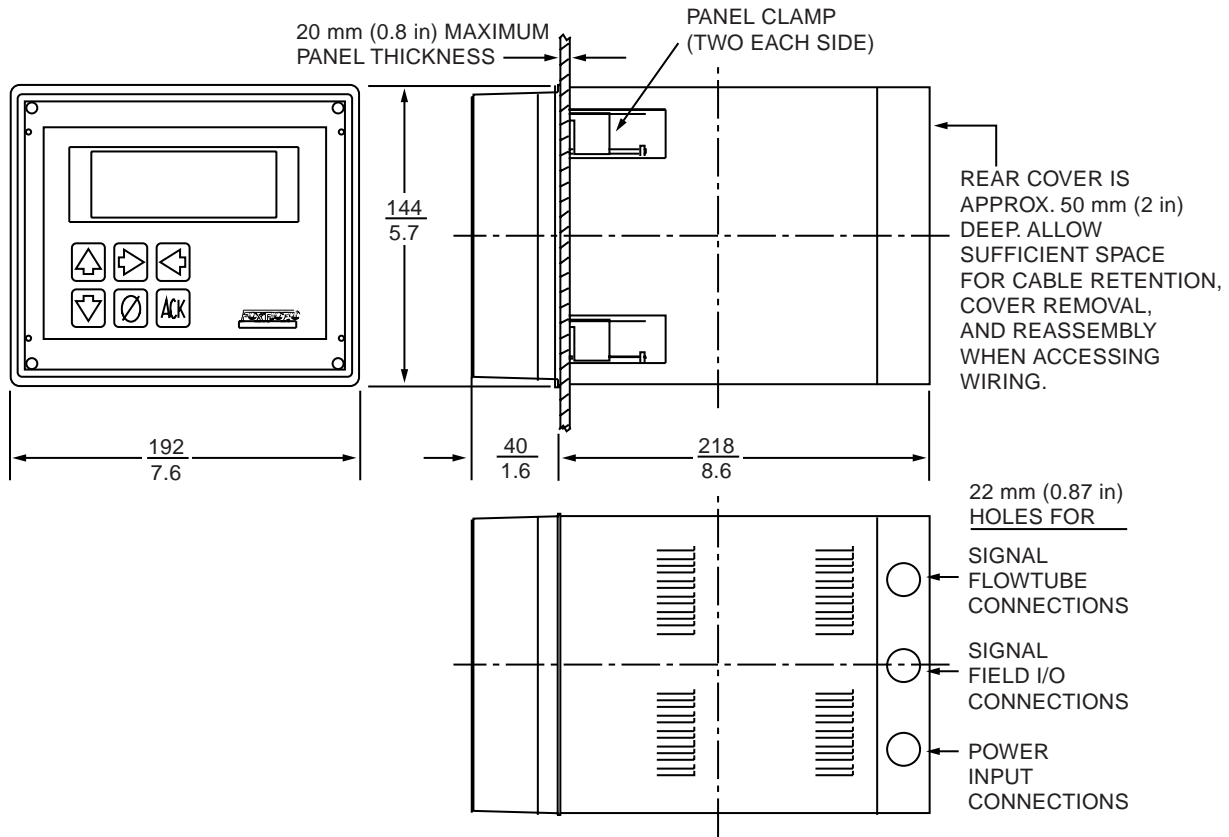


Figure 2. Digital Output Functional Block Diagram

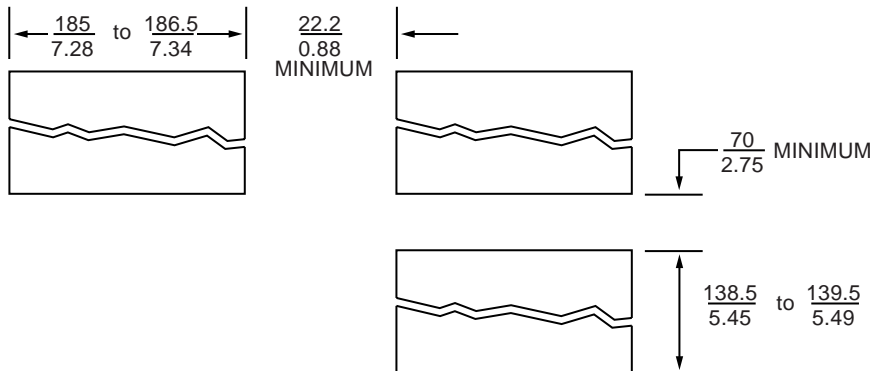
DIMENSIONS-NOMINAL

**mm
in**

PANEL-MOUNTED TRANSMITTER



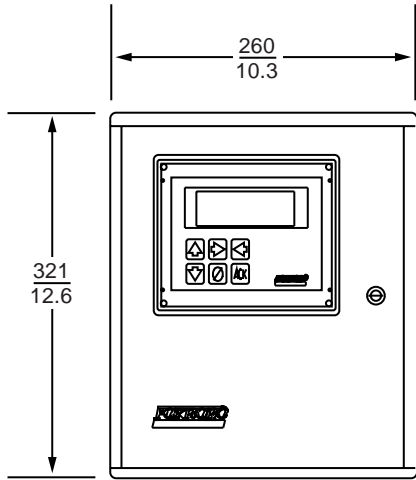
PANEL CUTOUT DIMENSIONS FOR TRANSMITTERS



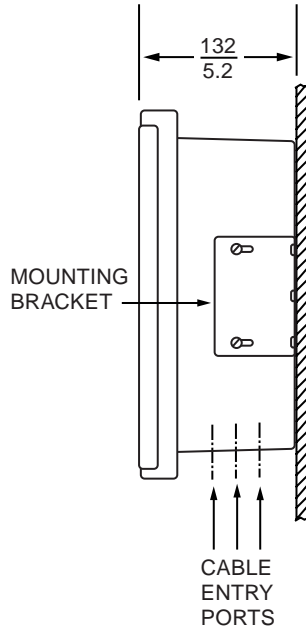
DIMENSIONS-NOMINAL (Cont.)

$\frac{\text{mm}}{\text{in}}$

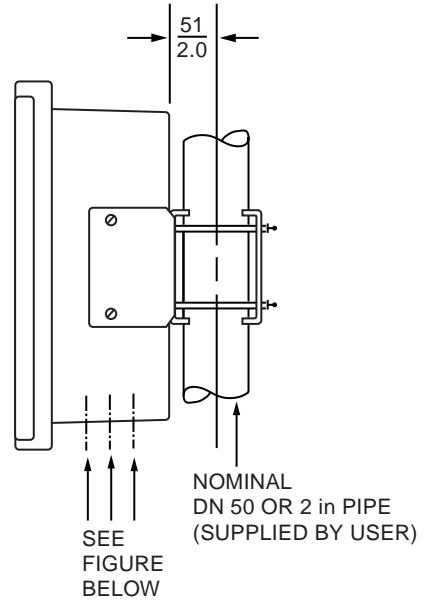
FIELD-MOUNTED TRANSMITTER



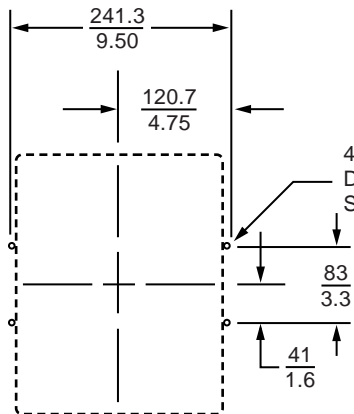
FIELD-MOUNTED ENCLOSURE



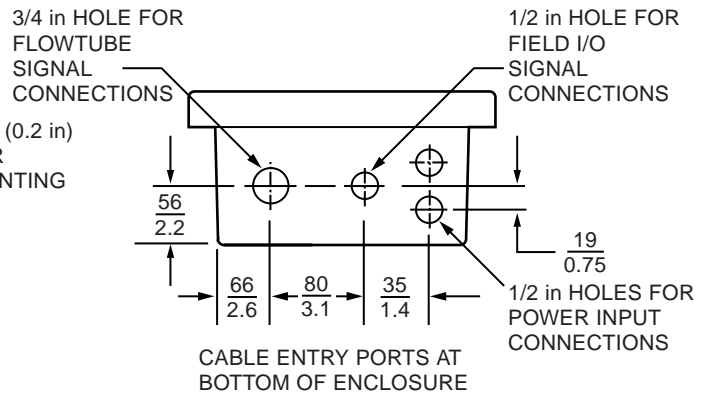
SURFACE MOUNTING, CFT10-S



PIPE MOUNTING, CFT10-Q



SURFACE DRILLING FOR 9000TA-S

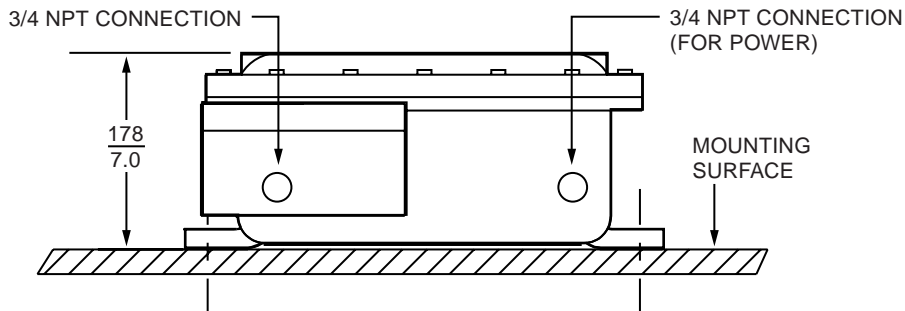
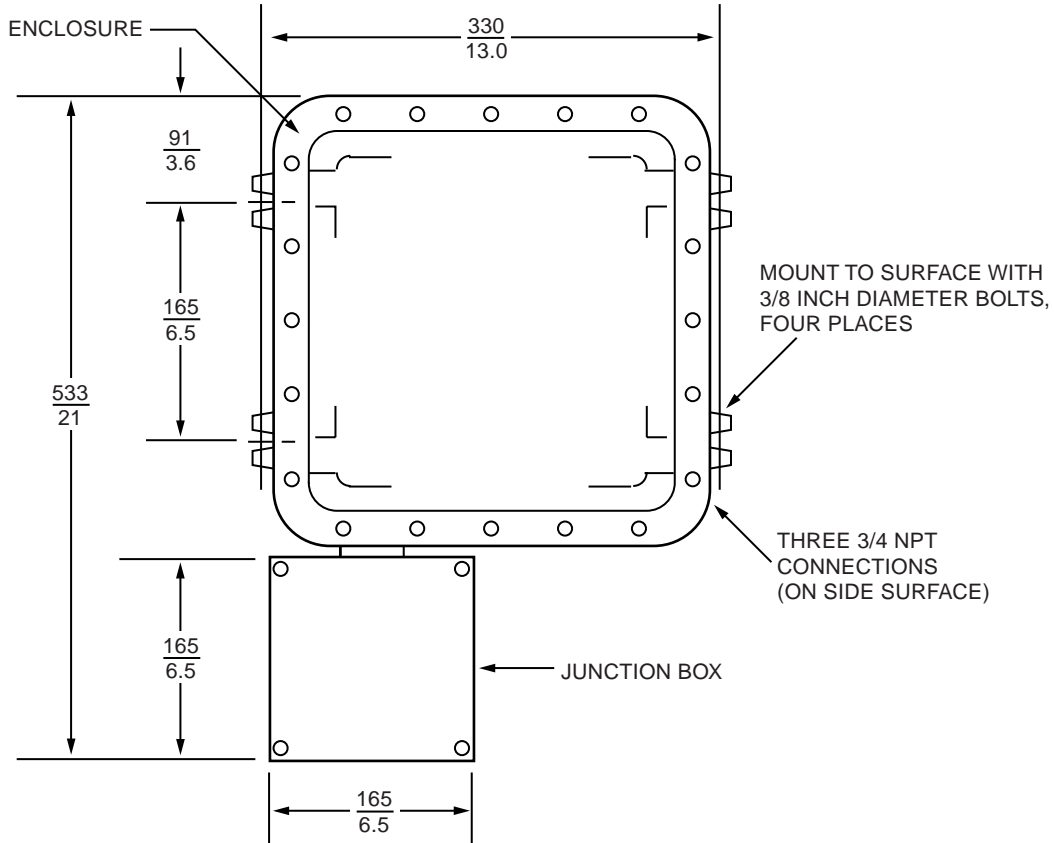


CABLE ENTRY PORTS AT BOTTOM OF ENCLOSURE

DIMENSIONS-NOMINAL (Cont.)

$\frac{\text{mm}}{\text{in}}$

SURFACE-MOUNTED, EXPLOSIONPROOF TRANSMITTER (CFT10-X)



ORDERING INSTRUCTIONS

1. Model Number - Flowtube
2. Model Number - Transmitter
3. Flow Data (Rate, pressure, temperature, etc.)
4. User Tag Data

I/A Series Intelligent Transmitters



PRODUCT SPECIFICATION SHEETS (PSSs) FOR INTELLIGENT TRANSMITTERS

Category	Device Types	Models	PSS Numbers
Mass Flow	Flowtubes	CFS10; CFS20	1-2B1 A; 1-2B4 A
	Transmitters	CFT10; CFT15	1-2B3 C; 1-2B3 D
Magnetic Flow	Transmitters	IMT20; IMT25	1-6F3 B; 1-6F5 A
Vortex	Flowmeters	83 Series	1-8A1 E
Pressure	Transmitters	820 Series	2A-1A1 C; 2A-1A3 E; 2A-1A3 F; 2A-1A3 G; 2A-1A4 C 2A-1Z3 K (Conversion Kit); 2A-1Z9 C (Options)
		860 Series	2A-1C3 A; 2A-1C5 A; 2A-1C6 A; 2A-1C7 A; 2A-1Z9 A (Options)
		I/A Series	2A-1C13 A; 2A-1C14 A; 2A-1C16 A; 2A-1C16 B; 2A-1Z9 E (Options)
Electrochemical	Transmitters	870IT Series	6-1B1 B; 6-3N2 A
Temperature	Transmitters	RTT10	2A-1F3 A
		RTT20	2A-1F4 A; 2A-1Z9 F (Options)
Remote Communication	Configurators	HHT	2A-1Z3 A
		PC10	2A-1Z3 C
	I/A Series Interfaces	FBM18 & FBM39	21H-2D5 B4; 21H-2C4 B4
		FBM43 & FBM44	21H-2D8 B4; 21H-2D4 B4

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