Foxboro Evo™ Process Automation System Hardware

Product Specifications

Foxboro® by Schneider Electric

PSS 31H-2Z3

FBM203/b/c/d Platinum/Nickel/Copper RTD Input Module

The FBM203/b/c/d Platinum/Nickel/Copper RTD Input Modules contain eight resistance temperature detector (RTD) input channels.

OVERVIEW

Each input channel of the FBM203/b/c modules accept a 2- or 3-wire RTD sensor input, within a 0 to 320 ohm (FBM203), 0 to 640 ohm (FBM203b), or 0 to 30 ohm (FBM203c) resistance range. Each input channel of the FBM203d accepts a 4-wire RTD sensor input, within a 0 to 320 ohm resistance range. Each analog input is galvanically isolated from other channels and ground.

The modules perform the signal conversion required to interface the electrical input signals from the field sensors to the optionally redundant fieldbus.

The FBM203/b/c/d modules execute an analog input application program, which provides conversion time (on a per module basis) and configurable options for Rate of Change Limits.

Two types of passive termination assemblies are available for the FBM203/b/c modules:

- DIN rail mounted TAs, similar to those used with the other 200 Series FBMs
- Baseplate-mounted TA, which mounts directly onto the field I/O connectors of the 200 Series baseplate. These TAs provide field I/O wiring

support for two FBM203/b/cs in paired slots (that is, in positions 1 and 2, 3 and 4, 5 and 6, or 7 and 8), as shown in Figure 1.

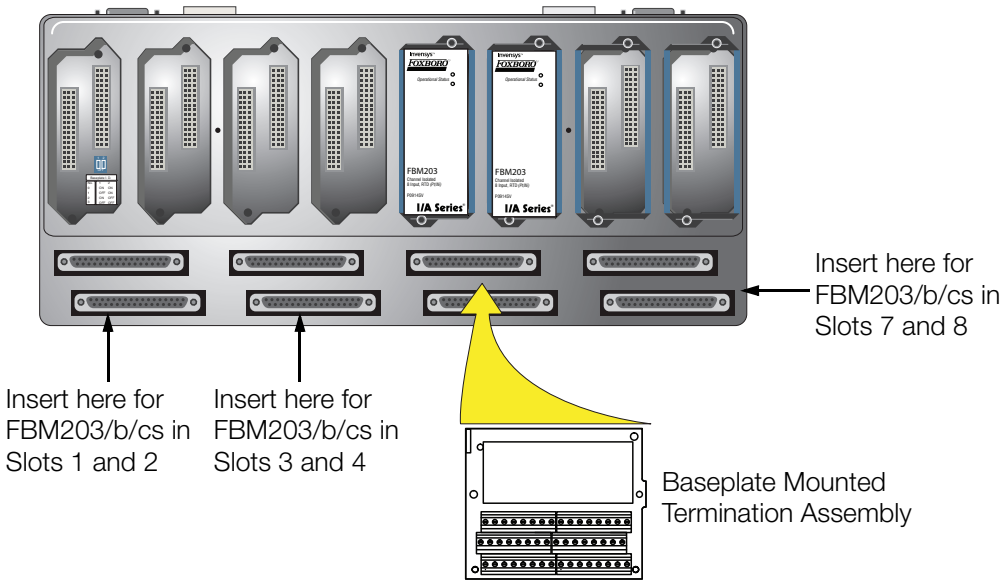


Figure 1. Baseplate-Mounted Termination Assembly

When connected to the appropriate TAs, the FBM203/c/d modules provide functionality formerly provided by the 100 Series FBM I/O subsystem.

The FBM203 can be used with any version of Foxboro Evo™ Control Core Services software that supports I/O FBMs. TAs are available for FBM203 which support the functionality of the 100 Series FBM03A when used with a 3-wire RTD input.

The FBM203c is supported only by I/A Series® software V8.0 to V8.8 or Control Core Services software V9.0 or later. TAs are available for FBM203c, which support the functionality of the 100 Series FBM33A when used with a 3-wire RTD input.

The FBM203d module is supported only by I/A Series software V8.6 to V8.8 or Control Core Services software V9.0 or later. TAs are available for FBM203d, which support the functionality of the 100 Series FBM03B or FBM33B when used with a 2-wire or 4-wire RTD input.

FEATURES

Key features of FBM203/b/c/d modules are:

- Eight resistance temperature detector (RTD) input channels
- Each analog input is galvanically isolated
- Compact, rugged design suitable for enclosure in Class G3 (harsh) environments
- Execution of an analog input application program that provides conversion time and configurable options for Rate of Change Limits
- High accuracy achieved by sigma-delta data conversions for each channel
- Termination Assemblies (TAs) for locally or remotely connecting field wiring to the FBM203/b/c/d.

HIGH ACCURACY

For high accuracy, each channel incorporates a Sigma-Delta converter which can provide new analog input values for each channel every 25 ms, and a configurable integration period to remove any process noise and power line frequencies. Each time period, the FBM converts each analog input to a digital value, averages these values over the time period and provides the averaged value to the controller.

COMPACT DESIGN

FBM203/b/c/d have a compact design, with a rugged extruded aluminum exterior for physical protection of the circuits. Enclosures specially designed for mounting the FBMs provide various levels of environmental protection, up to harsh environments, per ISA Standard S71.04.

EASY REMOVAL/REPLACEMENT

The modules can be removed and replaced without removing field device termination cabling, power, or communication cabling.

VISUAL INDICATORS

Light-emitting diodes (LEDs) incorporated into the front of the modules provide visual status indications of fieldbus module functions.

MODULAR BASEPLATE MOUNTING

The modules mount on a DIN rail mounted Modular Baseplate, which accommodates up to four or eight Fieldbus Modules. The baseplate is either DIN rail mounted or rack mounted, and includes signal connectors for redundant fieldbus, redundant independent dc power, and termination cables.

FIELDBUS COMMUNICATION

A Fieldbus Communications Module or a Control Processor interfaces to the redundant 2 Mbps module Fieldbus used by the FBMs. The FBM203/b/c/d accepts communication from either path (A or B) of the redundant 2 Mbps Fieldbus — should one path fail or be switched at the system level, the module continues communication over the active path.

TERMINATION ASSEMBLIES

Field I/O signals connect to the FBM subsystem via a:

- DIN rail mounted termination assemblies (TAs), or
- Baseplate-mounted TA (FBM203/b/c only).

DIN rail mounted TAs for the FBM203/b/c/d are available in the following forms:

- Compression screw type using Polyamide (PA) material
- Compression screw type using Polyvinyl Chloride (PVC) material
- Ring lug type using Polyamide (PA) material
- Ring lug type using Polyvinyl Chloride (PVC) material

Baseplate-mounted TAs for the FBM203/b/c are available with compression screw type terminals using Polycarbonate/Acrylonitrile Butadiene Styrene (PC/ABS) material.

A removable termination cable connects a DIN rail mounted TA to the FBM via a field connector on the baseplate in which the FBM is installed.

Termination cables are available in the following materials:

- Polyurethane
- Low Smoke Zero Halogen (LSZH).

Termination cables are available in a variety of lengths, up to 30 meters (98 feet), allowing the termination assembly to be mounted in either the enclosure or in an adjacent enclosure.

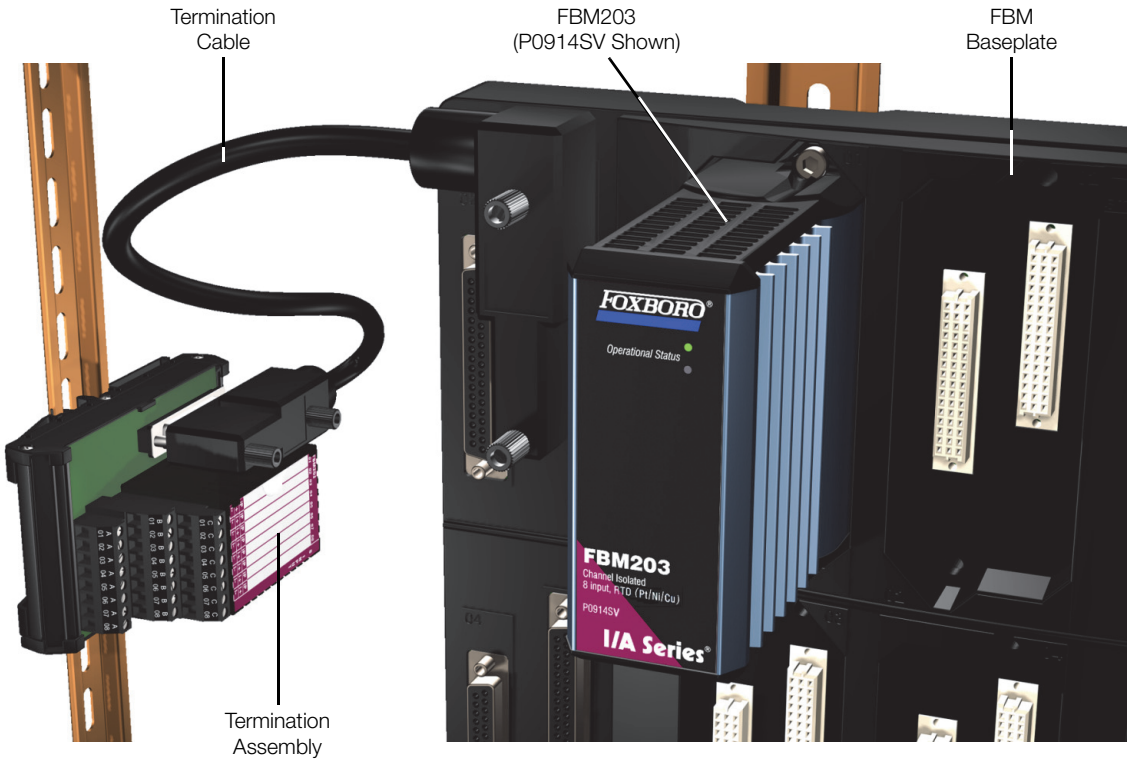


Figure 2. FBM203/b/c/d and DIN Rail Mounted Termination Assembly Installation

FUNCTIONAL SPECIFICATIONS

Input Channels
8 resistance temperature detector (RTD) input channels. Each channel is isolated and independent.

Input Range (Each Channel)

FBM203/203d
0 to 320 ohms. 320 ohms equals 64000 counts. Minimum overrange value is 327.675 ohms at a count of 65535.

FBM203b
0 to 640 ohms. 640 ohms equals 64000 counts. Minimum overrange value is 655.35 ohms at a count of 65535.

FBM203c
0 to 30 ohms. 30 ohms equals 64000 counts. Minimum overrange value is 30.72 ohms at a count of 65535.

Sensor Current

FBM203/203d
0.19 mA dc nominal

FBM203b
0.10 mA dc nominal

FBM203c
0.54 mA dc nominal

Lead Resistance

FBM203/FBM203b
50 ohms maximum each lead. Any imbalance in extension leads will decrease accuracy.

FUNCTIONAL SPECIFICATIONS (CONTINUED)

FBM203c
10 ohms maximum each lead. Any imbalance in extension leads will decrease accuracy.

FBM203d
50 ohms maximum. Any imbalance in extension leads will not affect accuracy.

Input Channels (8)

ANALOG ACCURACY (INCLUDES LINEARITY)

FBM203/d
±0.03% of span
FBM203b
±0.03% of span
FBM203c
±0.1% of span

Input Channels (8) (Cont.)

ACCURACY TEMPERATURE COEFFICIENT
±50 ppm/ºC

INPUT SIGNAL A/D CONVERSION
Each channel performs its own A/D signal conversion, using an independent sigma-delta conversion technique.

INTEGRATION PERIOD
Software configurable.

COMMON MODE REJECTION
>125 db at 50 or 60 Hz

NORMAL MODE REJECTION
>95 db at 50 or 60 Hz

Typical Resistance Temperature Sensors

Platinum (DIN), Platinum (SAMA), Platinum (IEC), or Nickel (SAMA)

FBM203/d
Platinum: 100 ohms nominal at 0°C
Nickel: 235 ohms nominal at 0°C

FBM203b
Platinum: 200 ohms nominal at 0°C
Nickel: 470 ohms nominal at 0°C

FBM203c
Copper: 10 ohms nominal at 25°C

Input Signal

Supports 2-, 3- or 4-wire variable-resistance temperature sensors. For 2-wire inputs, there is no correction for lead resistance or lead resistance temperature changes.

Process I/O Communications

Communicates with its associated FCM or FCP via the redundant 2 Mbps module fieldbus.

Input Channel Isolation

Each channel is galvanically isolated from all other channels and earth (ground). The TA/module withstands, without damage, a potential of 600 V ac applied for one minute between any channel and ground, or between a given channel and any other channel.

CAUTION

This does not imply that these channels are intended for permanent connection to voltages of these levels. Exceeding the limits for input voltages, as stated elsewhere in this specification, violates electrical safety codes and may expose users to electric shock.

Power Requirements

INPUT VOLTAGE RANGE (REDUNDANT)
24 V dc +5%, -10%

CONSUMPTION
3 W (maximum)

HEAT DISSIPATION
3 W (maximum)

FUNCTIONAL SPECIFICATIONS (CONTINUED)

Regulatory Compliance

ELECTROMAGNETIC COMPATIBILITY (EMC)

European EMC Directive 89/336/EEC
Meets: EN 50081-2 Emission standard
EN 50082-2 Immunity standard
EN 61326 Annex A (Industrial Levels)

CISPR 11, Industrial Scientific and Medical (ISM) Radio-frequency Equipment - Electromagnetic Disturbance Characteristics - Limits and Methods of Measurement
Meets: Class A Limits

IEC 61000-4-2 ESD Immunity
Contact 4 kV, air 8 kV

IEC 61000-4-3 Radiated Field Immunity
10 V/m at 80 to 1000 MHz

IEC 61000-4-4 Electrical Fast Transient/Burst Immunity
2 kV on I/O, dc power and communication lines

IEC 61000-4-5 Surge Immunity
2kV on ac and dc power lines; 1kV on I/O and communications lines

IEC 61000-4-6 Immunity to Conducted Disturbances Induced by Radio-frequency Fields
10 V (rms) at 150 kHz to 80 MHz on I/O, dc power and communication lines

IEC 61000-4-8 Power Frequency Magnetic Field Immunity
30 A/m at 50 and 60 Hz

PRODUCT SAFETY

Underwriters Laboratories (UL) for U.S. and Canada
UL/UL-C listed as suitable for use in UL/UL-C listed Class I, Groups A-D; Division 2; temperature code T4 enclosure based systems. These modules are also UL and UL-C listed as associated apparatus for supplying non-incendive communication circuits for Class I, Groups A-D hazardous locations when connected to specified Foxboro Evo processor modules as described in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA). Communications circuits also meet the requirements for Class 2 as defined in Article 725 of the National Electrical Code (NFPA No.70) and Section 16 of the Canadian Electrical Code (CSA C22.1). Conditions for use are as specified in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA).

European Low Voltage Directive 73/23/EEC and Explosive Atmospheres (ATEX) directive 94/9/EC
CENELEC (DEMKO) certified as EEx nA [nL] IIC T4 for use in CENELEC certified Zone 2 enclosure certified as associated apparatus for supplying non-incendive field circuits for Zone 2, Group IIC, potentially explosive atmospheres when connected to specified Foxboro Evo processor modules as described in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA). For details of CENELEC certification, refer to PSS 31H-2CERTS.

Calibration Requirements

Calibration of the module or termination assembly is not required.

ENVIRONMENTAL SPECIFICATIONS(1)

Operating

TEMPERATURE

Module
0 to +70°C (32 to +158°F)
Termination Assemblies
Polyamide TA
0 to +70°C (32 to +158°F)
PVC TA
0 to +50°C (32 to +122°F)

RELATIVE HUMIDITY

5 to 95% (noncondensing)

ALTITUDE

-300 to +3,000 m (-1,000 to +10,000 ft)

Storage

TEMPERATURE

-40 to +70°C (-40 to +158°F)

RELATIVE HUMIDITY

5 to 95% (noncondensing)

ALTITUDE

-300 to +12,000 m (-1,000 to +40,000 ft)

Contamination

Suitable for use in Class G3 (Harsh) environments as defined in ISA Standard S71.04, based on exposure testing according to EIA Standard 364-65, Class III.

Vibration

7.5 m/S^2 (0.75 g) from 5 to 500 Hz

PHYSICAL SPECIFICATIONS

Mounting

MODULES

FBM203/b/c/d modules mount on a Modular Baseplate.The Modular Baseplate can be mounted horizontally or vertically on a DIN rail, or mounted horizontally in a 19-inch rack using a mounting kit. Alternatively, FBM203/c/d mount on a 100 Series conversion mounting structure. Refer to *Standard 200 Series Baseplates* (PSS 31H-2SBASEPLT) or *100 Series Conversion Mounting Structures* (PSS 31H-2W8) for details.

TERMINATION ASSEMBLIES

The DIN rail mounted TA mounts on a DIN rail and accommodates multiple DIN rail styles including 32 mm (1.26 in) and 35 mm 1.38 in) The baseplate-mounted TA mounts on the two field I/O connectors associated with its two FBM203/b/cs on a 200 Series baseplate.

Weight

MODULE

284 g (10 oz) approximate

TERMINATION ASSEMBLIES

Compression Type (DIN rail mounted):
181 g (0.40 lb) approximate
Compression Type (Baseplate Mounted):
245 g (0.57 lb) approximate
Ring Lug Type: 249 g (0.55 lb) approximate

Dimensions

MODULE

HEIGHT
102 mm (4 in)
114 mm (4.5 in) including mounting lugs
WIDTH
45 mm (1.75 in)
DEPTH
104 mm (4.11 in)

TERMINATION ASSEMBLIES

See page 13 and page 14.

(1) The environmental limits of this module may be enhanced by the type of enclosure containing the module. [Refer to the applicable Product Specification Sheet (PSS) which describes the specific type of enclosure that is to be used.]

PHYSICAL SPECIFICATIONS (CONTINUED)

Part Numbers

MODULE

FBM203
P0914SV
FBM203b
P0922UA
FBM203c
P0922UD
FBM203d
P0927AM

TERMINATION ASSEMBLIES

Compression Screw TAs
Polyamide (DIN rail mounted): P0916XJ
Polycarbonate/Acrylonitrile Butadiene Styrene (Baseplate Mounted): P0924WN
PVC: P0916AE
FBM203d Compression Screw TA
Polyamide: P0924EX
Ring Lug TA
Polyamide: P0917JM
PVC: P0916AF

Termination Cables

CABLE LENGTHS

Up to 30 m (98 ft)

CABLE MATERIALS

Polyurethane or Low Smoke Zero Halogen (LSZH)

TERMINATION CABLE TYPE

FBM203/b/c
Type 1 - Refer to Table 2
FBM203d
Type 4 - Refer to Table 3

CABLE CONNECTION

FBM Baseplate End
37-pin D-subminiature
Termination Assembly End
FBM203/b/c
25-pin D-subminiature
FBM203d
37-pin D-subminiature

Construction - Termination Assembly

MATERIAL

DIN Rail Mounted TAs
Poly Vinyl Chloride (PVC), compression and ring lug
Polyamide (PA), compression and ring lug
Baseplate-Mounted TAs
Polycarbonate/Acrylonitrile Butadiene Styrene (PC/ABS), compression

Field Termination Connections

COMPRESSION - ACCEPTED WIRING SIZES

Solid/Stranded/AWG
0.2 to 4 mm^2/0.2 to 2.5 mm^2/24 to 12 AWG
Stranded with Ferrules
0.2 to 2.5 mm^2 with or without plastic collar

RING-LUG - ACCEPTED WIRING SIZES

#6 size connectors (0.375 in (9.5 mm)
0.5 to 4 mm^2/22 AWG to 12 AWG

FUNCTIONAL SPECIFICATIONS - TERMINATION ASSEMBLIES

FBM Type	Input Signal	TA Part Number[a]			Termination Type[b]	TA Cable Type[c]	TA Certification Type[d]
		PVC	PA	PC/ABS[e]			
FBM203	8 channels, 0 to 320 ohm, passive feedthrough with FBM203 channel isolation	P0916AE P0916AF	P0916XJ P0917JM		C RL	1	1, 2
	Two sets of 8 channels, 0 to 320 ohm, passive feedthrough with FBM203 channel isolation			P0924WN	C (Baseplate-mounted)	n/a	1, 2
FBM203b	8 channels, 0 to 640 ohm, passive feedthrough with FBM203b channel isolation	P0916AE P0916AF	P0916XJ P0917JM		C RL	1	1, 2
	Two sets of 8 channels, 0 to 640 ohm, passive feedthrough with FBM203b channel isolation			P0924WN	C (Baseplate-mounted)	n/a	1, 2
FBM203c	8 channels, 0 to 30 ohm, passive feedthrough with FBM203c channel isolation	P0916AE P0916AF	P0916XJ P0917JM		C RL	1	1, 2
	Two sets of 8 channels, 0 to 30 ohm, passive feedthrough with FBM203c channel isolation			P0924WN	C (Baseplate-mounted)	n/a	1, 2
FBM203d	8 channels, 0 to 320 ohm, passive feedthrough with FBM203d channel isolation		P0924EX		C	4	1, 2

(a) PVC is polyvinyl chloride rated from -20 to +50°C (-4 to +122°F); PA is polyamide rated from -20 to +70°C (-4 to +158°F).
(b) C = TA with compression terminals; RL = TA with ring lug terminals.
(c) See Table 2 and Table 3 for cable part numbers and specifications.
(d) See Table 1 for Termination Assembly certification definitions.
(e) PC/ABS is Polycarbonate/Acrylonitrile Butadiene Styrene (PC/ABS) rated from-20 to +70°C (-4 to +158°F).

Table 1. Certification for Termination Assemblies

Type	Certification[(a)]
Type 1	TAs are UL/UL-C listed as suitable for use in Class I; Groups A-D; Division 2 temperature code T4 hazardous locations. They are CENELEC (DEMKO) certified EEx nA [nL] IIC T4 for use in Zone 2 potentially explosive atmospheres.
Type 2	TAs are UL/UL-C listed as associated apparatus for supplying non-incendive field circuits Class I; Groups A-D; Division 2 hazardous locations when connected to specified 200 Series FBMs and field circuits meeting entity parameter constraints specified in *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA). They are also CENELEC (DEMKO) certified as associated apparatus for supplying field circuits for Group IIC, Zone 2 potentially explosive atmospheres. Field circuits are also Class 2 limited energy (60 V dc, 30 V ac, 100 VA or less) if customer-supplied equipment meets Class 2 limits.

(a) All TAs are UL/UL-C listed to comply with applicable ordinary location safety standards for fire and shock hazards. Hazardous location types comply with ATEX directive for II 3 G use. They also comply with the requirements of the European Low Voltage Directive. All listings/certifications require installation and use within the constraints specified in *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA) and the conditions stated in UL and DEMKO reports.

Table 2. Termination Cable Types and Part Numbers

Cable Length m (ft)	Type 1 P/PVC [a]	Type 1 LSZH [b]	Type 1 H/XLPE[c]
0.5 (1.6)	P0916DA	P0928AA	P0916VA
1.0 (3.2)	P0916DB	P0928AB	P0916VB
2.0 (6.6)	P0931RM	P0928AC	P0931RR
3.0 (9.8)	P0916DC	P0928AD	P0916VC
5.0 (16.4)	P0916DD	P0928AE	P0916VD
10.0 (32.8)	P0916DE	P0928AF	P0916VE
15.0 (49.2)	P0916DF	P0928AG	P0916VF
20.0 (65.6)	P0916DG	P0928AH	P0916VG
25.0 (82.0)	P0916DH	P0928AJ	P0916VH
30.0 (98.4)	P0916DJ	P0928AK	P0916VJ

(a) P/PVC is polyurethane outer jacket and semi-rigid PVC primary conductor insulation. Temperature range; -20 to +80°C (-4 to +176°F)

(b) Low smoke zero halogen or low smoke free of halogen (LSZH) is a material classification used for cable jacketing. LSZH is composed of thermoplastic or thermoset compounds that emit limited smoke and no halogen when exposed to high sources of heat. Temperature range; -40 to +105°C (-40 to +221°F)

(c) H/XLPE is Hypalon outer jacket and XLPE (cross-linked polyethylene) primary conductor insulation. Temperature range; -40 to +90°C (-40 to +194°F). Hypalon cables are no longer available for purchase.

Table 3. Cable Types and Part Numbers

Cable Length m (ft)	Type 4 P/PVC[a]	Type 4 LSZH[b]	Type 4 H/XLPE[c]
0.5 (1.6)	P0916FG	P0928BA	P0916WD
1.0 (3.2)	P0916FH	P0928BB	P0916WE
2.0 (6.6)	P0931RQ	P0928BC	P0931RU
3.0 (9.8)	P0916FJ	P0928BD	P0916WF
5.0 (16.4)	P0916FK	P0928BE	P0916WG
10.0 (32.8)	P0916FL	P0928BF	P0916WH
15.0 (49.2)	P0916FM	P0928BG	P0916WJ
20.0 (65.6)	P0916FN	P0928BH	P0916WK
25.0 (82.0)	P0916FP	P0928BJ	P0916WL
30.0 (98.4)	P0916FQ	P0928BK	P0916WM

(a) P/PVC is polyurethane outer jacket and semi-rigid PVC primary conductor insulation. PVC is rated from -20 to +50°C (-4 to 122°F).
(b) Low smoke zero halogen or low smoke free of halogen (LSZH) is a material classification used for cable jacketing. LSZH is composed of thermoplastic or thermoset compounds that emit limited smoke and no halogen when exposed to high sources of heat. Temperature range; -40 to +105°C (-40 to +221°F)
(c) H/XLPE is Hypalon outer jacket and XLPE (cross-linked polyethylene) primary conductor insulation. H/XLPE is rated from -40 to +90°C (-40 to 194°F). Hypalon cables are no longer available for purchase.

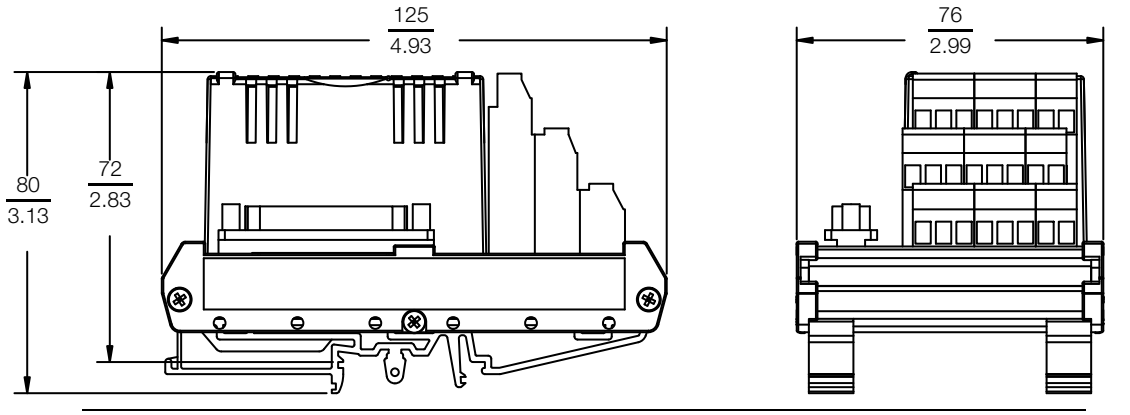
Use of Termination Assemblies in 100 Series Upgrade Subsystem

When an FBM203/c/d is used to replace a 100 Series FBM, it may use any of the appropriate termination assemblies listed above for the FBM's field I/O wiring. Alternatively, the FBM203/c/d can accept this field wiring through a Termination Assembly Adapter (TAA) instead of a termination assembly. This is discussed in *Termination Assembly Adapter Modules for 100 Series Upgrade* (PSS 31H-2W4).

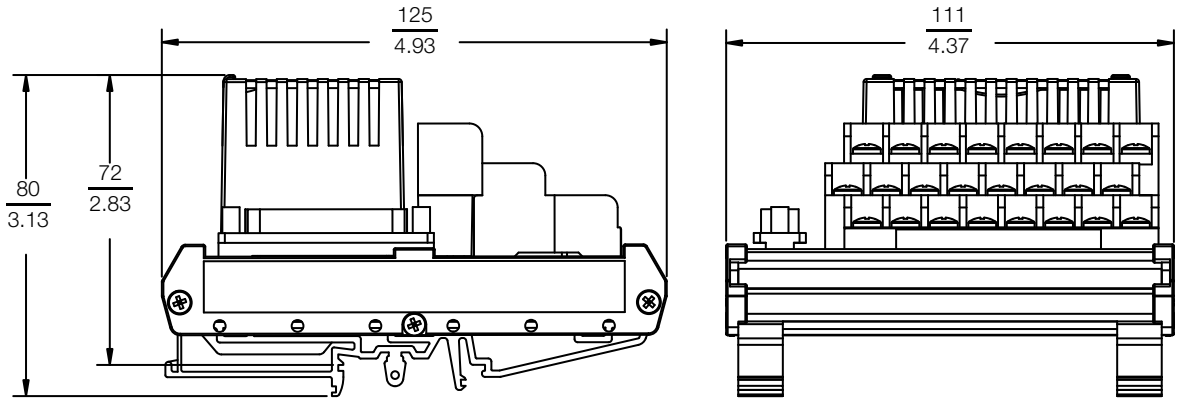
DIMENSIONS – NOMINAL

mm
in

Compression Termination Assemblies



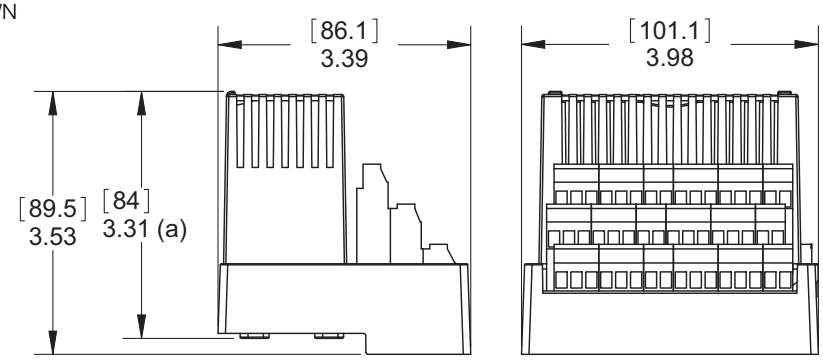
Ring Lug Termination Assemblies



DIMENSIONS – NOMINAL (CONTINUED)

[mm]
in
Baseplate Mounted Termination Assemblies

P0924WN



(a) Overall width – for determining DIN rail loading.
(b) Height above DIN rail (add to DIN rail height for total).

RELATED PRODUCT SPECIFICATION SHEETS (PSS)

PSS Number	Description
PSS 31H-2S200	Standard 200 Series Subsystem Overview
PSS 31H-2W100	100 Series FBM Upgrade Subsystem Overview
PSS 31H-2CERTS	Standard and Compact 200 Series I/O - Agency Certifications
PSS 31H-2W4	Termination Assembly Adapter Modules for 100 Series Upgrade
PSS 31H-2SBASEPLT	Standard 200 Series Baseplates
PSS 31H-2W8	100 Series Conversion Mounting Structures
PSS 21S-3CP270ICS	Control Processor 270 (CP270) Integrated Control Software

Foxboro®

by Schneider Electric

Invensys Systems, Inc
10900 Equity Drive
Houston, TX 77041
United States of America
http://www.invensys.com

Global Customer Support
Inside U.S.: 1-866-746-6477
Outside U.S.: 1-508-549-2424
Website: https://support.ips.invensys.com

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