

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/c 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.

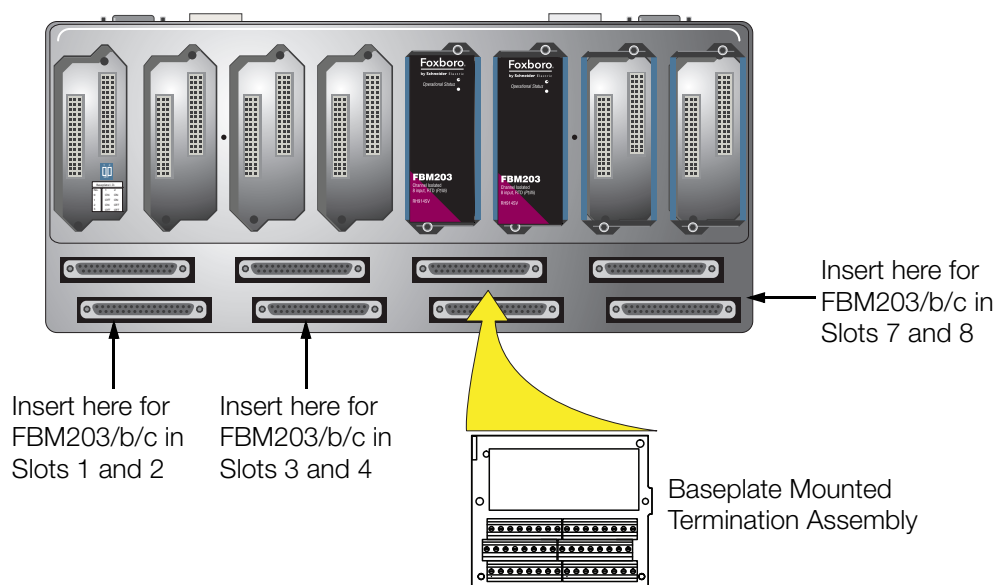


Figure 1. Baseplate-Mounted Termination Assembly

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
- ▶ 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.

STANDARD DESIGN

FBM203/b/c/d have 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
- ▶ Ring lug type using Polyamide (PA) 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.

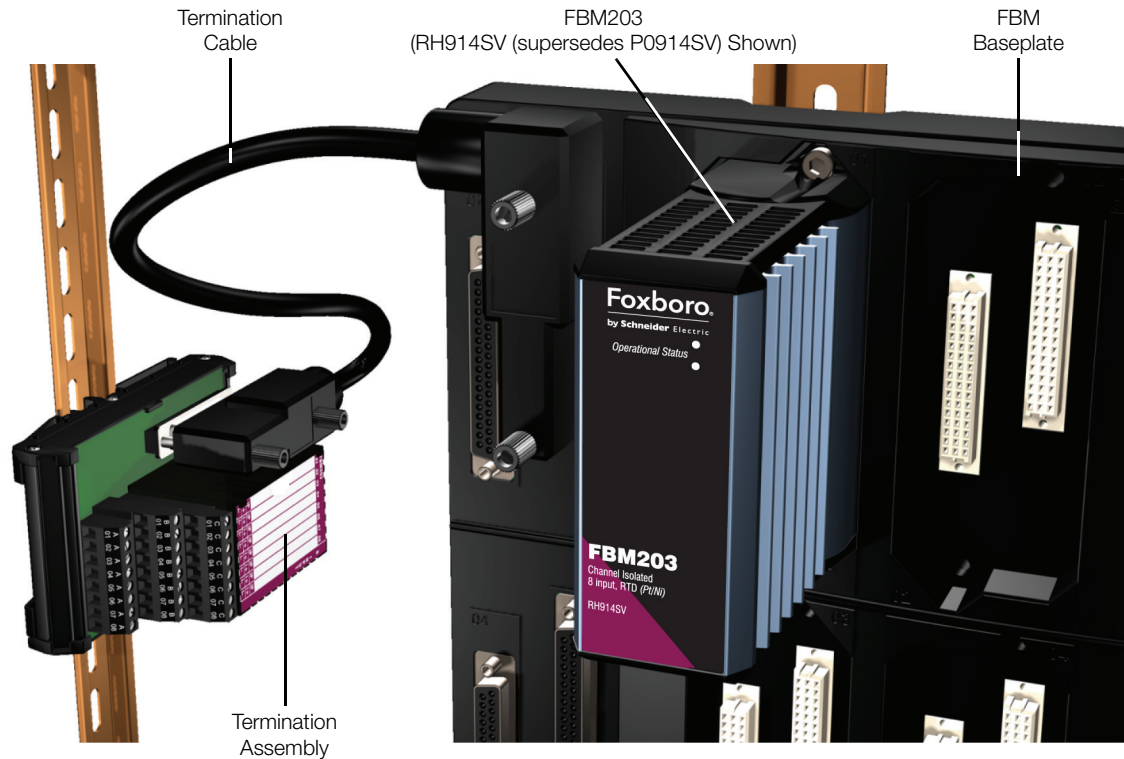


Figure 2. FBM203/b/c/d and DIN Rail Mounted Termination Assembly Installation

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

FBM203/203b

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

ACCURACY TEMPERATURE COEFFICIENT

±50 ppm/°C

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 2004/108/EC

Meets EN61326:2013 Class A Emissions and Industrial Immunity 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

RoHS Compliance

Complies with

European RoHS Directive 2002/95/EC and Recast RoHS Directive 2011/65/EU.

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 2006/95/EC and Explosive Atmospheres (ATEX) directive 94/9/EC

DEMKO certified as EEx nA [nL] IIC T4 for use in 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 certification, refer to PSS 31H-2CERTS.

Calibration Requirements

Calibration of the module or termination assembly is not required.

ENVIRONMENTAL SPECIFICATIONS⁽¹⁾

Operating

TEMPERATURE

Module

-20 to +70° C (-4 to +158° F)

Termination Assemblies - PA

-20°C to +70°C (-4 to +158°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/S² (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-2SBASPLT) 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 14 and page 15.

(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

RH914SV (supersedes P0914SV)

FBM203b

RH922UA (supersedes P0922UA)

FBM203c

RH922UD (supersedes P0922UD)

FBM203d

RH927AM (supersedes P0927AM)

TERMINATION ASSEMBLIES

Compression Screw TAs

Polyamide (DIN rail mounted): RH916XJ

(supersedes P0916XJ)

Polycarbonate/Acrylonitrile Butadiene

Styrene (Baseplate Mounted): RH924WN

(supersedes P0924WN)

FBM203d Compression Screw TA

Polyamide: RH924EX (supersedes P0924EX)

Ring Lug TA

Polyamide: P0917JM

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

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 mm²/0.2 to 2.5 mm²/24 to 12

AWG

*Stranded with Ferrules*0.2 to 2.5 mm² with or without plastic collar

RING-LUG - ACCEPTED WIRING SIZES

#6 size connectors (0.375 in (9.5 mm)

0.5 to 4 mm²/22 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)
		PA	PC/ABS ^(e)			
FBM203	8 channels, 0 to 320 ohm, passive feedthrough with FBM203 channel isolation	RH916XJ (supersedes P0916AE ^(f) , P0916XJ)		C	1	1, 2
		P0917JM (supersedes P0916AF) ^(f)		RL		
	Two sets of 8 channels, 0 to 320 ohm, passive feedthrough with FBM203 channel isolation		RH924WN (supersedes P0924WN)	C (Baseplate-mounted)	n/a	1, 2
FBM203b	8 channels, 0 to 640 ohm, passive feedthrough with FBM203b channel isolation	RH916XJ (supersedes P0916AE ^(f) , P0916XJ)		C	1	1, 2
		P0917JM (supersedes P0916AF) ^(f)		RL		
	Two sets of 8 channels, 0 to 640 ohm, passive feedthrough with FBM203b channel isolation		RH924WN (supersedes P0924WN)	C (Baseplate-mounted)	n/a	1, 2

FBM Type	Input Signal	TA Part Number ^(a)		Termination Type ^(b)	TA Cable Type ^(c)	TA Certification Type ^(d)
		PA	PC/ABS ^(e)			
FBM203c	8 channels, 0 to 30 ohm, passive feedthrough with FBM203c channel isolation	RH916XJ (supersedes P0916AE ^(f) , P0916XJ)		C	1	1, 2
		P0917JM (supersedes P0916AF ^(f))		RL		
	Two sets of 8 channels, 0 to 30 ohm, passive feedthrough with FBM203c channel isolation		RH924WN (supersedes P0924WN)	C (Baseplate-mounted)	n/a	1, 2
FBM203d	8 channels, 0 to 320 ohm, passive feedthrough with FBM203d channel isolation	RH924EX (supersedes P0924EX)		C	4	1, 2

(a) 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).

(f) Polyamide RL supersedes the PVC RL, note this is not a RoHS part.

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 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 <i>Standard and Compact 200 Series Subsystem User's Guide</i> (B0400FA). They are also 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)
0.5 (1.6)	RH916DA (supersedes P0916DA)	RH928AA (supersedes P0928AA)
1.0 (3.2)	RH916DB (supersedes P0916DB)	RH928AB (supersedes P0928AB)
2.0 (6.6)	RH931RM (supersedes P0931RM)	RH928AC (supersedes P0928AC)
3.0 (9.8)	RH916DC (supersedes P0916DC)	RH928AD (supersedes P0928AD)
5.0 (16.4)	RH916DD (supersedes P0916DD)	RH928AE (supersedes P0928AE)
10.0 (32.8)	RH916DE (supersedes P0916DE)	RH928AF (supersedes P0928AF)
15.0 (49.2)	RH916DF (supersedes P0916DF)	RH928AG (supersedes P0928AG)

Table 2. Termination Cable Types and Part Numbers (Continued)

Cable Length m (ft)	Type 1 P/PVC (a)	Type 1 LSZH (b)
20.0 (65.6)	RH916DG (supersedes P0916DG)	RH928AH (supersedes P0928AH)
25.0 (82.0)	RH916DH (supersedes P0916DH)	RH928AJ (supersedes P0928AJ)
30.0 (98.4)	RH916DJ (supersedes P0916DJ)	RH928AK (supersedes P0928AK)

(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)

Table 3. Termination Cable Types and Part Numbers

Cable Length m (ft)	Type 4 P/PVC(a)	Type 4 LSZH(b)
0.5 (1.6)	RH916FG (supersedes P0916FG)	RH928BA (supersedes P0928BA)
1.0 (3.2)	RH916FH (supersedes P0916FH)	RH928BB (supersedes P0928BB)
2.0 (6.6)	RH931RQ (supersedes P0931RQ)	RH928BC (supersedes P0928BC)
3.0 (9.8)	RH916FJ (supersedes P0916FJ)	RH928BD (supersedes P0928BD)
5.0 (16.4)	RH916FK (supersedes P0916FK)	RH928BE (supersedes P0928BE)
10.0 (32.8)	RH916FL (supersedes P0916FL)	RH928BF (supersedes P0928BF)
15.0 (49.2)	RH916FM (supersedes P0916FM)	RH928BG (supersedes P0928BG)
20.0 (65.6)	RH916FN (supersedes P0916FN)	RH928BH (supersedes P0928BH)

Table 3. Termination Cable Types and Part Numbers (Continued)

Cable Length m (ft)	Type 4 P/PVC^(a)	Type 4 LSZH^(b)
25.0 (82.0)	RH916FP (supersedes P0916FP)	RH928BJ (supersedes P0928BJ)
30.0 (98.4)	RH916FQ (supersedes P0916FQ)	RH928BK (supersedes P0928BK)

(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)

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

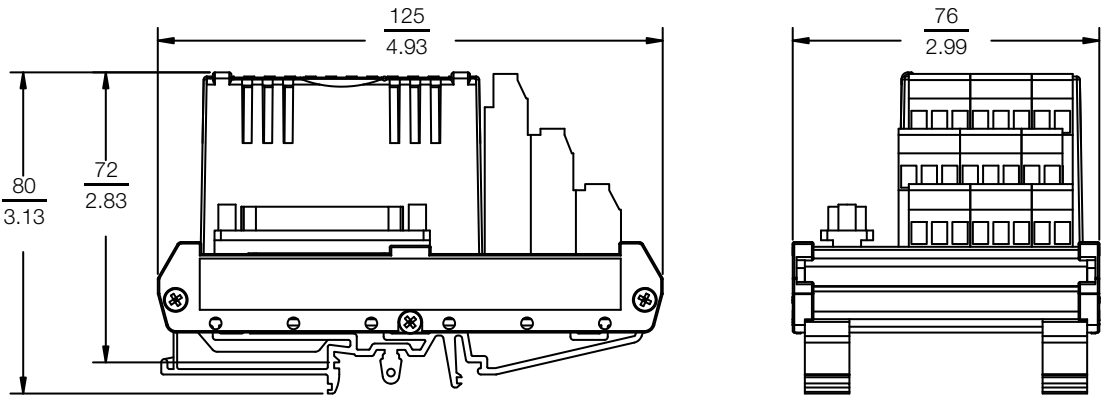
accept this field wiring through a Termination Assembly Adapter (TAA) instead of a termination assembly. This is discussed in *Termination Assembly Adapter Modules for 100 Series Upgrade* (PSS 31H-2W4).

DIMENSIONS – NOMINAL

mm
in

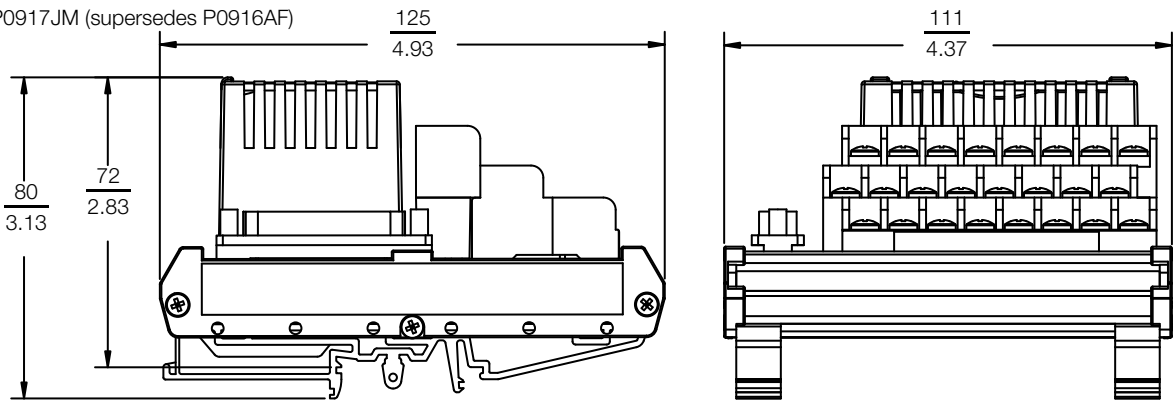
Compression Termination Assemblies

RH916XJ (supersedes P0916XJ, P0916AE)



Ring Lug Termination Assemblies

P0917JM (supersedes P0916AF)

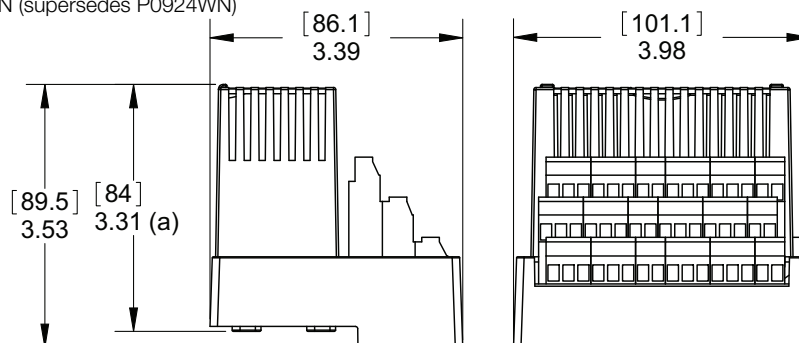


DIMENSIONS – NOMINAL (CONTINUED)

[mm]
in

Baseplate Mounted Termination Assemblies

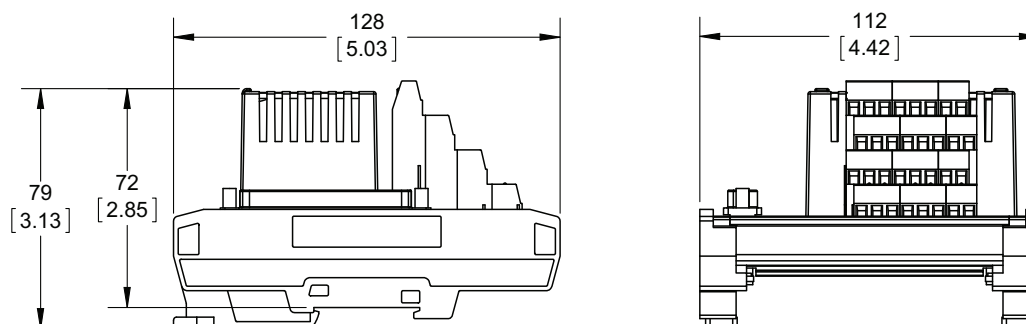
RH924WN (supersedes P0924WN)



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

RH924EX Termination Assembly

RH924EX (supersedes P0924EX)



RELATED PRODUCT SPECIFICATION SHEETS (PSS)

PSS Number	Description
PSS 31H-2SOV	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-2SBASPLT	Standard 200 Series Baseplates
PSS 31H-2W8	100 Series Conversion Mounting Structures
PSS 21S-3CP270IC	Control Processor 270 (CP270) Integrated Control Software
PSS 31S-3FCPICS	Field Control Processor 280 (CP280) Integrated Control Software