Foxboro Evo™ Process Automation System

Product Specifications

Foxboro® by Schneider Electric

PSS 31H-2S207

FBM207/b/c Voltage Monitor/Contact Sense Input Modules

Discrete inputs can be sensed across all the usual voltage levels found in industrial facilities. The FBM207/b/c uses one of the several termination assemblies to match to the externally powered voltage level. In cases where the inputs are critical to the plant's control scheme, the FBM 207/b/c may be installed as a redundant pair with standard control blocks used to manage the redundancy.

OVERVIEW

The FBM207/b/c Voltage Monitor/Contact Sense Input Module functions as a 16-channel DC voltage monitor or 16-channel contact sensor. Each channel accepts a 2-wire input from a DC voltage source (FBM207) or pair of contacts or solid state switches (FBM207b/ FBM207c). Associated termination assemblies (TAs) support discrete input signals at voltages of 60 V DC, 120 V AC/125 V DC, or 240 V AC. For voltages higher than 60 V DC, the TAs have additional signal conditioning hardware that provides voltage attenuation and optical isolation.

The module is available in three distinct types, and each type with its associated TA supports discrete inputs as shown below:

FBM207	Provides voltage monitoring at: –60 V DC –120 V ac/125 V DC –240 V AC Provides switch inputs with: –External 120 V AC/125 V DC –External 240 V AC
FBM207b	24 V DC Contact Sense
FBM207c	48 V DC Contact Sense

Each discrete input is galvanically isolated from other channels and ground. Group isolated when used with external excitation.

The module performs signal conversion required to interface electrical input signals from field sensors to the redundant module Fieldbus. In addition, it executes programs for Discrete Input, Ladder Logic, Pulse Count, and Sequence of Events, with configurable options of Input Filter Time.

The module can be used as a single unit, or as a redundant pair (two FBM207s). When used as a redundant pair, the modules combine to provide redundancy at the Fieldbus Module (FBM) level, with field input signals received from one common termination assembly though a redundant adapter affixed to the FBMs' baseplate. The input current for redundant modules is doubled. A redundant digital input block in the Foxboro Evo™ Control Software validates each input in conjunction with information to/from the module, and selects the input with the highest quality for processing in the control strategy.

In a redundant configuration, contact sense power from each module is diode OR'd together in the redundant adapter to assure redundant power.

A redundant contact input function block, CINR, is used for each redundant pair of inputs. The CINR block handles input reads and initialization logic for the redundant channels. On each execution cycle of the CINR block, identical reads are sent to both modules, fully exercising the fieldbus and the logic circuitry of each module.

FEATURES

Key features of the FBM207/b/c modules are:

- Sixteen discrete inputs
- Supports discrete input signals at voltages of:
  - 15 to 60 V DC - contact sense
  - 120 V ac/125 V DC - voltage monitoring or switch inputs
  - 240 V ac - voltage monitoring or switch inputs
- Each input is galvanically isolated. Group isolated with external excitation
- Single or redundant modules
- Rugged design suitable for enclosures in Class G3 (harsh) environments
- Executes programs for Discrete Input, Ladder Logic, Pulse Count, and Sequence of Events with configurable Input Filter Time option
- Termination Assemblies (TAs) for locally or remotely connecting field wiring to the FBM207
- Termination Assemblies for per channel internally and/or externally loop powered devices
- Various Termination Assemblies (TAs) have additional signal conditioning hardware that provides voltage attenuation and optical isolation.

STANDARD DESIGN

FBM207/b/c has 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 (Class G3), per ISA Standard S71.04.

VISUAL INDICATORS

Light-emitting diodes (LEDs) incorporated into the front of the module provide visual indication of the Fieldbus Module operational status, as well as the discrete states of the individual input points.

EASY REMOVAL/REPLACEMENT

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

When redundant, either module may be replaced without upsetting field input signals to the good module. The module can be removed/replaced without removing field device termination cabling, power, or communications cabling.

SEQUENCE OF EVENTS

The Sequence of Events (SOE) software package (for use with I/A Series® software V8.x and Control Core Services software v9.0 or later) is used for acquisition, storage, display, and reporting of events associated with digital input points in a control system. SOE, using the optional GPS based time synchronization capability, supports data acquisition across control processors at intervals of up to one millisecond, depending on the signal source.

Refer to *Sequence of Events* (PSS 31S-2SOE) to learn more about this package, and to *Time Synchronization Equipment* (PSS 31H-4C2) for a description of the optional time synchronization capability.

I/A Series systems with software earlier than V8.x can support SOE through ECB6 and EVENT blocks. However, these systems do not support GPS time synchronization and use a timestamp sent by the Control Processor which is only accurate to the nearest second and is not synchronized between different Control Processors.

FIELDBUS COMMUNICATION

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

MODULAR BASEPLATE MOUNTING

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

Redundant modules must be located in odd and even adjacent positions on the baseplate (positions 1 and 2, 3 and 4, 5 and 6, or 7 and 8). To achieve the redundancy, a redundant adapter module is placed on the two adjacent baseplate termination cable connectors to provide a single termination cable connection. A single termination cable connects from the redundant adapter to the associated TA.

To system configurator applications and monitoring through SMON, System Manager, and SMDH, redundant modules appear to be separate, nonredundant modules. The functional redundancy for these modules is provided by their associated control blocks.

ROBUSTNESS

Field power, for contacts or solid-state switches, is current limited.

TERMINATION ASSEMBLIES

Field I/O signals connect to the FBM subsystem via DIN rail mounted TAs. The TAs used with the FBM207/b/c are described in “TERMINATION ASSEMBLIES AND CABLES” on page 9.

FUNCTIONAL SPECIFICATIONS

Communication
Communicates with its associated FCM or FCP via the redundant 2 Mbps module Fieldbus

Input
16 isolated and independent channels

Accuracy
Pulse Count
No missing pulses for pulse rate 0 to 250 Hz

Filter/Debounce Time(1)
Configurable (No Filtering, 4, 8, 16, or 32 ms)

Voltage Monitor Function - Input

INPUT
Logic One, On-State Voltage: 15 to 60 V DC
Logic Zero, Off-State Voltage: 0 to 5 V DC
Current: 1.4 mA (typical) at 5 to 60 V DC

SOURCE RESISTANCE LIMITS
Logic One, On-State: 1 k Ω (maximum) at 15 V DC
Logic Zero, Off-State: 100 k Ω (minimum) at 60 V DC

Contact Sensor Function - Input

RANGE (EACH CHANNEL)
Contact open (off) or closed (on)

OPEN-CIRCUIT VOLTAGE
FBM207b, 24 V DC ±15%; FBM207c, 48V DC ±15%

SHORT-CIRCUIT CURRENT
3.2 mA (typical)

LOGIC ONE, ON-STATE RESISTANCE
1.0 k Ω (maximum)

LOGIC ZERO, OFF-STATE RESISTANCE
100 k Ω (minimum)

Isolation
Each channel is galvanically isolated from all other channels and earth (ground). The 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 (MAXIMUM)
FBM207, 3 W; FBM207b, 4 W; FBM207c, 5 W

HEAT DISSIPATION (MAXIMUM)
FBM207, 5.5 W; FBM207b, 4 W; FBM207c, 5 W

Loop Power Supply Protection
Current limited at 3.2 mA (typical)

Field Terminations Functional Specifications
Refer to “TERMINATION ASSEMBLIES AND CABLES” on page 9.

Calibration Requirements
Calibration of the module and termination assembly is not required.

(1) Digital filtering available for 200 Series FBM or competitive migration modules with version 1.25H or later firmware.

FUNCTIONAL SPECIFICATIONS (CONTINUED)

Regulatory Compliance

ELECTROMAGNETIC COMPATIBILITY (EMC)

European EMC Directive 2004/108/EC (Prior to April 20, 2016) and 2014/30/EU (Beginning April 20, 2016)
Meets: EN61326-1:2013 Class A Emissions and Industrial Immunity Levels

RoHS COMPLIANCE

Complies with European 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 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 (Prior to April 20, 2016) and 2014/35/EU (Beginning April 20, 2016) and Explosive Atmospheres (ATEX) directive 94/9/EC (Prior to April 20, 2016) and 2014/34/EU (Beginning April 20, 2016)
DEMKO certified as Ex nA IIC T4 for use in certified Zone 2 enclosure when connected to specified I/A Series processor modules as described in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA).

MARINE CERTIFICATION

ABS Type Approved and Bureau Veritas Marine certified for Environmental Category EC31.

ENVIRONMENTAL SPECIFICATIONS(2)

Operating Conditions

TEMPERATURE

FBM207/b/c

-20 to + 70°C (-4 to +158°F)

Termination Assembly - PA

-20 to +70°C (-4 to +158°F)

RELATIVE HUMIDITY

5 to 95% (noncondensing)

Storage Conditions

TEMPERATURE

-40 to +70°C (-40 to +158°F)

RELATIVE HUMIDITY

-5 to 95% (noncondensing)

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 from 5 to 500 Hz

(2) The environment ranges can be extended by the type of enclosure containing the module. [Refer to the Product Specification Sheet (PSS) applicable to the enclosure that is to be used.]

PHYSICAL SPECIFICATIONS

Mounting
FBM207/FMB207b/FBM207c mounts on a Modular baseplate. Baseplate can be mounted on a DIN rail (horizontally or vertically), or horizontally on a 19-inch rack using a mounting kit. Redundant modules must be located in odd and even adjacent positions on the baseplate (positions 1 and 2, 3 and 4, 5 and 6, or 7 and 8). See PSS 31H-2SBASPLT for details.

Termination Assembly
The TA mounts on a DIN rail and accommodates multiple DIN rail styles including 32 mm (1.26 in) and 35 mm 1.38 in)

Weight
MODULE
284 g (10 oz) approximate

TERMINATION ASSEMBLY - COMPRESSION
127 mm (5.02 in) – 272 g (0.60 lb, approximate)
146 mm (5.75 in) – 317 g (0.7 lb, approximate)

TERMINATION ASSEMBLY - RING LUG
198 mm (7.78 in) – 400 g (0.90 lb, approximate)
216 mm (8.51 in) – 440 g (1.0 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)

Dimensions - Termination Assembly
COMPRESSION SCREW
Refer to page 14.

RING LUG
Refer to page 15.

Part Numbers
MODULES

FBM207
RH914TD (supersedes P0914TD)

FBM207b
RH914WH (supersedes P0914WH)

FBM207c
RH917GY (supersedes P0917GY)

Part Numbers (Continued)
TERMINATION ASSEMBLIES
Refer to “TERMINATION ASSEMBLIES AND CABLES” on page 9.

REDUNDANT ADAPTER
RH926ZY (supersedes P0926ZY)

Termination Cables
CABLE LENGTHS
Up to 30 m (98 ft)

CABLE MATERIALS
Polyurethane or Low Smoke Zero Halogen (LSZH)

TERMINATION CABLE TYPE
Type 4 - Refer to Table 2

CABLE CONNECTION
37-pin male D-subminiature

Construction - Termination Assembly
MATERIAL
Polyamide (PA), compression
Polyamide (PA), ring lug

FAMILY GROUP COLOR
Dark blue - discrete

TERMINAL BLOCKS
Inputs - 2 tiers, 16 positions
Excitation - 2 tiers, 4 positions

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

TERMINATION ASSEMBLIES AND CABLES

General Description

Field I/O signals connect to the FBM subsystem via DIN rail mounted termination assemblies (TAs). Multiple types of TAs are available with FBMs to provide I/O signal connections, signal conditioning, optical isolation from signal surges, external power connections, and/or fusing for protection of the FBM and/or field device as required by the particular FBM. Since these features are built into the termination assemblies (where required), in most applications there is no need for additional termination equipment for field circuit functions such as circuit protection or signal conditioning (including fusing and power distribution).

The termination assembly can be used with a single FBM207 or with a redundant pair (two FBM207s).

The DIN rail mounted termination assemblies connect to the FBM subsystem baseplate by means of removable termination cables. When used with a redundant module pair, the termination assembly is connected to the baseplate using a redundant adapter (RH926ZY (supersedes P0926ZY)). The DIN rail mounted TAs connect to the redundant adapter by means of a removable termination cable.

The cables for both single and redundant configurations are available in a variety of lengths, up to 30 meters (98 feet), allowing the termination assemblies to be mounted in either the enclosure or in an adjacent enclosure. Refer to Table 2 on page 12 for termination cable part numbers and specifications.

Discrete Inputs

Termination assemblies with discrete inputs support sixteen 2-wire discrete input signals at passive low voltage levels of less than 60 V DC and active high voltage levels of 125 V DC, 120 V AC, or 240 V AC. Active termination assemblies support input signal conditioning for FBMs. To condition signals, these termination assemblies may provide optical isolation, current limiting, noise reduction, voltage attenuation, or optional terminal blocks to connect externally supplied excitation voltage.

Low Voltage Discrete Inputs

The low voltage inputs (less than 60 V DC) use passive termination assemblies. Inputs for FBM207 are voltage monitor types. Voltage monitor inputs require an external field voltage source. Contact sense inputs use the FBM auxiliary +24 V DC or +48 V DC, supplied to all input channels on the assembly, to wet field contacts.

A load may not be required for proper operation of the input channels. A diode may be required for a DC inductive load only.

High Voltage Discrete Inputs

The high voltage input circuits support 125 V DC, 120 V AC, or 240 V ac. Inputs can be either voltage monitor or switched types. Voltage monitor inputs require a field voltage source. Switch inputs use customer supplied excitation voltage applied to dedicated terminals on the termination assembly and distributed on the termination assembly to each of the input channels.

To condition signals, voltage attenuation circuits are located on daughter boards mounted under the component covers of the termination assemblies.

FUNCTIONAL SPECIFICATIONS - TERMINATION ASSEMBLIES

FBM Type	Input Signal	TA Part No.[a] PA	Termination Type[b]	TA Cable Type[c]	TA Certification Type[d]
FBM207	16 channel, voltage monitor (external source) 15 to 60 V DC FBM207 channel isolation	RH916XN (supersedes P0916XN, P0916AL)[e]	C	4	1,2
		P0917JR[e] (supersedes P0916AN)	RL		
FBM207	16 channel, voltage monitor 120 V AC or 125 V DC Logic Zero 0 to 20 V AC; 0 to 20 V DC Logic One 80 to 132 V AC; 75 to 150 V DC Input Current for Logic One; 2 mA typical FBM207 channel isolation	RH916XP (supersedes P0916XP, P0916AM)[e]	C	4	1
		P0917JS[e] (supersedes P0916AP)	RL		
FBM207	16 channel, voltage monitor 240 V AC Logic Zero 0 to 40 V AC Logic One 160 to 280 V AC Input Current for Logic One; 1.6 mA maximum FBM207 channel isolation	RH916PH (supersedes P0916PH)	C	4	1
FBM207	16 channel, voltage monitor 120 V AC or 125 V DC with external excitation Logic Zero 0 to 20 V AC; 0 to 20 V DC Logic One 80 to 132 V AC; 75 to 150 V DC Input Current for Logic One; 2 mA typical Group isolation provided by termination assembly	RH916PK (supersedes P0916PK)	C	4	1
		P0917JT (supersedes P0916PL)[e]	RL		

FUNCTIONAL SPECIFICATIONS - TERMINATION ASSEMBLIES (CONTINUED)

FBM Type	Input Signal	TA Part No.[a] PA	Termination Type[b]	TA Cable Type[c]	TA Certification Type[d]
FBM207	16 channel, voltage monitor 240 V AC with external excitation Logic Zero 0 to 40 V AC Logic One 160 to 280 V AC Input Current for Logic One; 1.6 mA maximum Group isolation provided by termination assembly	RH916PM (supersedes P0916PM)	C	4	1
FBM207b	16 channel, contact sense 24 V DC contact wetting from FBM207b FBM207b channel isolation	RH916XT (supersedes P0916XT, P0916JS)[e]	C	4	1, 2
FBM207c	16 channel, contact sense 48 V DC contact wetting from FBM207c FBM207c channel isolation	RH917MG (supersedes P0917MG, P0917MF)[e]	C	4	1, 2
		P0917MJ (supersedes P0917MH)[e]	RL		

(a) PA (polyamide) termination assemblies rated from -20 to +70°C (-4 to +158°F).
(b) C= TA with compression terminals; RL = TA with ring lug terminals.
(c) See to Table 2 for cable part numbers and specifications.
(d) See to Table 1 Termination Assembly certification definitions.
Note: To avoid false tripping of AC type inputs, care should be taken in routing long wiring or bundled runs to minimize coupling from adjacent signals and/or noise from heavy equipment. When possible, DC excitation of input circuits is recommended for runs greater than 305 m (1000 ft).
(e) Polyamide RL supersedes the PVC RL, note this is not a RoHS part.

Table 1. Certifications for Termination Assemblies

Type	Certification
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 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 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.

Table 2. Termination Cable Types and Part Numbers

Length m (ft)	Type 4 P/PVC Cable, 26 AWG[(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 2. Termination Cable Types and Part Numbers (Continued)

Length m (ft)	Type 4 P/PVC Cable, 26 AWG[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 cable assemblies polyurethane outer jacket and semi-rigid PVC primary conductor insulation temperature range: -20 to +70°C (-4 to 158°F)

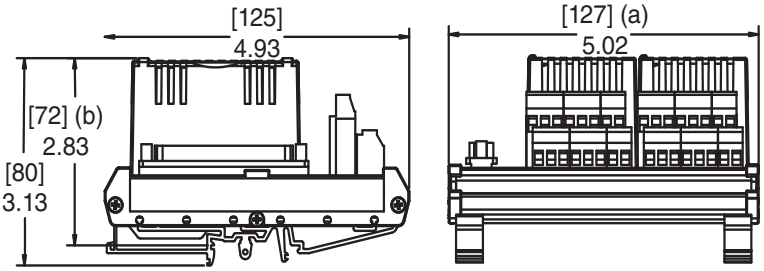
(b) Low smoke zero halogen or low smoke free of halogen (LSZH) is a material classification used for cable jacketing. LSZH is composed of thermoplastic or thermoset compounds that emit limited smoke and no halogen when exposed to high sources of heat. Temperature range: -40 to +105°C (-40 to +221°F)

DIMENSIONS–NOMINAL

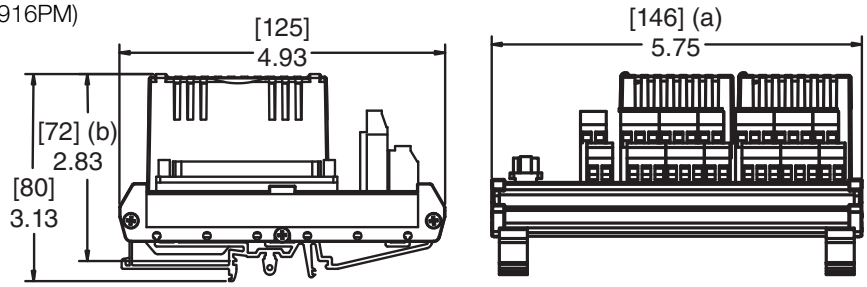
[mm]
in

Compression Termination Assemblies

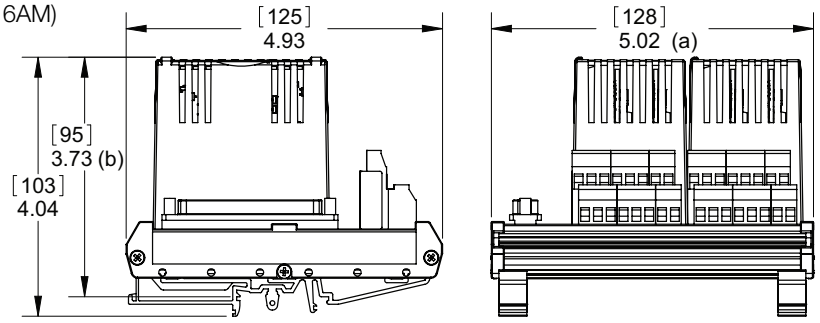
RH916XN (supersedes P0916XN, P0916AL), RH916XT (supersedes P0916XT, P0916JS), RH916XP (supersedes P0916XP), RH916PH (supersedes P0916PH), RH917MG (supersedes P0917MG, P0917MF)



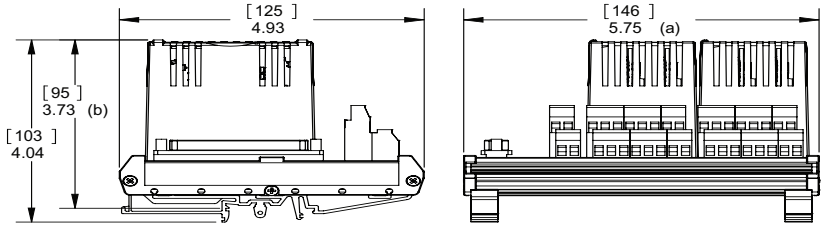
RH916PM (supersedes P0916PM)



RH916XP (supersedes P0916AM)



RH916PK (supersedes P0916PK)



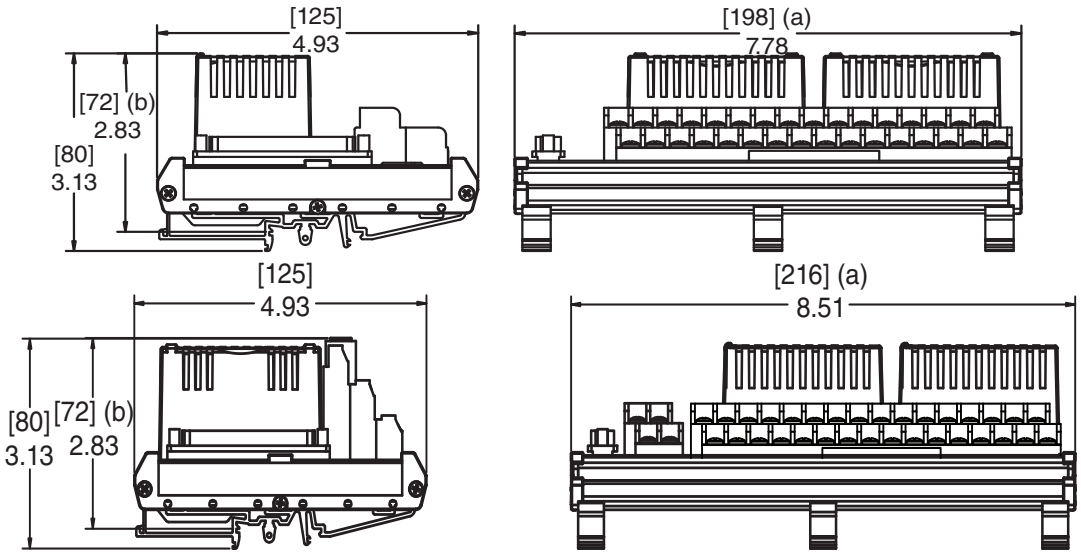
(a) Overall width – for determining DIN rail loading.
(b) Height above DIN rail (add to DIN rail height for total).

DIMENSIONS–NOMINAL (CONTINUED)

[mm]
in

Ring Lug Termination Assemblies

P0917JS[1] (supersedes P0916AP[2]) P0917JT, (supersedes P0916PL[2]), P0917JR[1] (supersedes P0916AN[2])
P0917JR[1] (supersedes P0916AN[2]), P0917MJ[1] (supersedes P0917MH[2])



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

[1]Dimensions shown are for the PVC versions. All dimensions for this polyamide termination assembly are smaller.
[2]Polyamide RL supersedes the PVC RL, note this is not a RoHS part

RELATED PRODUCT SPECIFICATION SHEETS (PSS)

PSS Number	Description
PSS 31H-2SOV	Standard 200 Series Subsystem Overview
PSS 31H-2CERTS	Standard and Compact 200 Series I/O - Agency Certification
PSS 31H-2SBASPLT	Standard 200 Series Baseplates
PSS 21S-3CP270IC	Control Processor 270 (CP270) Integrated Control Software
PSS 31S-3FCPICS	Field Control Processor 280 (CP280) Integrated Control Software

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