

Compact FBM242, Externally Sourced, Discrete Output Interface Module



The Compact FBM242 Discrete Output Interface Module contains 16 discrete output channels which are powered from a customer-selected external power supply of your choosing.

FEATURES

Key features of the Compact FBM242 modules are:

- ▶ Sixteen discrete outputs
 - ▶ Supports discrete output signals at voltages of:
 - 15 to 60 V dc
 - 120 V ac/125 V dc
 - 240 V ac
 - ▶ Each output is galvanically isolated; group isolated when used with external excitation
 - ▶ Compact, rugged design suitable for enclosure in Class G3 (harsh) environments
- ▶ Executes the Discrete I/O or Ladder Logic program, with the following configurable options: Input Filter Time, Fail Safe Configuration, Fail-Safe Fall-Back, and Sustained or Momentary Outputs
 - ▶ Various Termination Assemblies (TAs) that contain:
 - Current limiting devices
 - Fuses
 - Relay outputs with external power source, fusing, and power distribution
 - Solid state outputs
 - Redundant power distribution

OVERVIEW

The Compact FBM242 Discrete Output Interface Module contains 16 discrete output channels, which are sourced externally, rated up to 2 A at 60 V dc. It is part of the Compact 200 Series I/O subsystem described in *Compact 200 Series I/O Subsystem Overview* (Reference 1). (See Table 3, “Reference Documents,” on page 15 at the end of this document.)

Associated termination assemblies (TAs) provide for discrete outputs to loads of 2 A at 60 V dc, relay outputs (120 V ac/125 V dc, or 240 V ac), or relay outputs with power distribution and fusing. Each output is fully isolated from other channels and ground.

The module interfaces electrical output signals from a control processor to the field devices. It executes a digital I/O application program, with ladder logic support, and provides a Fail-Safe Configuration option for the outputs.

COMPACT DESIGN

The Compact FBM242 module's design is narrower than the standard 200 Series FBMs. It has a rugged acrylonitrile butadiene styrene (ABS) 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 module operational status, as well as the discrete states of the individual output points.

EASY REMOVAL/REPLACEMENT

The module mounts on a Compact 200 Series baseplate which is either DIN rail mounted or rack mounted horizontally, and includes signal connectors for redundant Fieldbus, redundant independent dc power, and termination cables. Two screws on the FBM secure the module to the Compact 200 Series baseplate.

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

FIELDBUS COMMUNICATION

A Fieldbus Communications Module or a Control Processor interfaces to the redundant 2 Mbps module Fieldbus used by the FBMs. The Compact FBM242 accepts communication from either path (A or B) of the redundant 2 Mbps Fieldbus — should one path fail or be switched off at the system level, the module continues communication over the active path.

CURRENT LIMITING

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

TERMINATION ASSEMBLIES (TAs)

Field I/O signals connect to the FBM subsystem via DIN rail mounted TAs. The TAs used with the Compact FBM242 are described in “TERMINATION ASSEMBLIES” on page 7.

FUNCTIONAL SPECIFICATIONS

Output Channels

Sixteen isolated channels.

Applied Voltage

15 to 60 V dc (maximum)

Load Current

2.25 A (maximum) per channel

Load Current-In-Rush

8 A (maximum) for 20 ms per channel at 30°C.
6.4 A (maximum) for 20 ms per channel at 70°C.

On-State Voltage Drop

0.2 V (maximum) at 2.25 A

Off-State Leakage Current

0.1 mA (maximum)

Inductive Loads

Module output may require a protective diode or metal oxide varistor (MOV) connected across the inductive load.

Output Channel 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.

Communication

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

Power Requirements

INPUT VOLTAGE RANGE (REDUNDANT)

24 V dc +5%, -10%

CONSUMPTION (MAXIMUM)

3 W (maximum) at 24 V dc

HEAT DISSIPATION (MAXIMUM)

2.5 W (maximum) at 24 V dc (with all outputs at 1.5 A each)

Calibration Requirements

The module and termination assemblies require no calibration.

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 - TERMINATION ASSEMBLIES WITH LOW VOLTAGE INPUTS

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).

Also see, "Certifications for Termination Assemblies" on page 11.

PRODUCT SAFETY - TERMINATION ASSEMBLIES WITH RELAY OUTPUTS OR HIGH VOLTAGE INPUTS

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).

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

Operating Conditions

TEMPERATURE

Module

-20 to +60°C (-4 to +140°F)

Termination Assembly - PA

-20 to +70°C (-4 to +158°F)

RELATIVE HUMIDITY

5 to 95% (noncondensing)

ALTITUDE

-300 to +3000 m (-1000 to +10 000 ft)

Storage Conditions

TEMPERATURE

-40 to +85°C (-40 to +185°F)

RELATIVE HUMIDITY

5 to 95% (noncondensing)

ALTITUDE

-300 to +12 000 m (-1000 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 (5 to 500 Hz)

PHYSICAL SPECIFICATIONS

Mounting

MODULE

The Compact FBM242 mounts on a Compact 200 Series 16-slot horizontal baseplate. The baseplate can be mounted on a horizontal DIN rail, or on a 19-inch rack using a mounting kit. Refer to *Compact 200 Series 16-Slot Horizontal Baseplate* (Reference 3) 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)

Mass

MODULE

185 g (6.5 oz) approximate

TERMINATION ASSEMBLY

Compression

127 mm (5.02 in) – 272 g (0.60 lb, approximate)

148 mm (5.75 in) – 285 g (0.65 lb, approximate)

216 mm (8.51 in) – 320 g (0.70 lb, approximate)

Ring Lug

196 mm (7.78 in) – 310 g (0.68 lb, approximate)

321 mm (12.64 in) – 600 g (1.6 lb, approximate)

Part Numbers

COMPACT FBM242 MODULE

RH101AG

TERMINATION ASSEMBLIES

Refer to “FUNCTIONAL SPECIFICATIONS - TERMINATION ASSEMBLIES” on page 8

Dimensions - Module

HEIGHT

130 mm (5.12 in)

WIDTH

25 mm (0.98 in)

DEPTH

150 mm (5.9 in) - Including baseplate connectors, 139 mm (5.46 in)

Dimensions - Termination Assembly

COMPRESSION SCREW

Refer to page 12

RING LUG AND KNIFE SWITCH

Refer to page 13

Termination Cables

CABLE LENGTHS

Up to 30 m (98 ft)

CABLE MATERIALS

Polyurethane or Low Smoke Zero Halogen (LSZH)

TERMINATION CABLE TYPE

Type 4 or Type 4H - Refer to Table 1

CABLE CONNECTION

37-pin male D-subminiature

Construction - Termination Assembly

MATERIAL

Polyamide (PA), compression

TERMINAL BLOCKS

Outputs- 2 tiers (switch and solid state), 3 tiers (relay), 16 positions

Power Distribution - 2 tiers, 4 positions

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

PHYSICAL SPECIFICATIONS (CONTINUED)

Termination Assembly Switching Relays

ELECTRICAL SERVICE LIFE

100,000 operations at rated resistive load
5,000,000 operations at no load.

5 A RELAY

Type

Single-Pole, Double-Throw, Normally Open (SPDT_NO)

Switching Current

5 A at up to 120 V ac (see "GENERAL PURPOSE PLUG-IN RELAY TERMINATION ASSEMBLY SPECIFICATIONS" on page 14)

TERMINATION ASSEMBLIES

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 DIN rail mounted termination assemblies connect to the FBM subsystem baseplate by means of removable termination cables. The cables are available in a variety of lengths, up to 30 meters (98 feet), allowing the termination assemblies to be mounted in either the FBM enclosure or in an adjacent enclosure. Refer to "FUNCTIONAL SPECIFICATIONS - TERMINATION ASSEMBLIES" on page 8 for termination cable part numbers and specifications.

Discrete Outputs

Termination assemblies with discrete outputs support sixteen 2-wire discrete output signals at passive low voltages of less than 60 V dc and active high voltage levels of 120 V ac or 240 V ac. Active termination assemblies support output signal conditioning for FBMs. To condition signals, these termination assemblies provide fuse protection, relays, solid-state devices, and terminal blocks to connect externally supplied optional power distribution.

Low Voltage Discrete Outputs

The low voltage outputs (less than 60 V dc) use passive termination assemblies. These assemblies are available with and without output protection (fusing). Termination assemblies with protection have individual user serviceable fuses that are designed to limit the output current to 2 A. Sixteen vertically mounted, one per channel, 3.15 A sand filled fuses (temperature derated) allow a maximum of 2 A current per output channel. Termination assemblies without fusing (unprotected) are intended for use by Foxboro engineers or customers who are using interposing relays or fuse terminal blocks between the termination assembly and the field devices.

Power for the low voltage outputs can be supplied by the FBM +24 V dc auxiliary power supply (internally (FBM) sourced) or by a field voltage source (externally sourced).

High Voltage Discrete Outputs

The high voltage output (120 V ac or 240 V ac) termination assemblies use plug-in SPDT (Form C) electromechanical relays and solid-state switches. The plug-in sockets allow field replacement of individual relays. The relays and associated sockets are located under the component covers of the termination assemblies. The termination assembly's switched outputs use unsealed, general purpose relays. These assemblies are capable of providing mixed voltage and are designed to provide signal segregation by locating the low voltage inputs on the opposite side of the terminal assembly from the outputs. A solid-state output module is optionally available. High voltage discrete outputs are always externally sourced power.

The output termination assemblies come in either output or output with power distribution (user-supplied via terminals on the termination assembly). In both configurations, when the FBM output is on, the relay coil is energized and the relay contact is switched from normally closed (NC) position to the normally open (NO) position. The FBM +24 V dc auxiliary power supply is used to energize the relay coil.

Termination assemblies with power distribution have a dedicated terminal block which provides a connection to externally supplied power and distributed internally on the termination assembly to each of the output channels. The line or positive side of the supply is fused; the neutral or negative side of the supply is connected to the field.

FUNCTIONAL SPECIFICATIONS - TERMINATION ASSEMBLIES

FBM Type	Output Signal(a)	TA Part Number(b)	Term. Type(c)	TA Cable Type(d)	TA Certification Type(e)
		PA			
Compact FBM242	16 channel, switch (protected - fused outputs) 15 to 60 V dc (externally sourced) at 2 A maximum Channel isolation provided by Compact FBM242	RH916JY	C	4	1,2
Compact FBM242	16 channel, switch (unprotected - no fuses) 15 to 60 V dc (externally sourced) at 2 A maximum Channel isolation provided by Compact FBM242	RH917XX	C	4	1,2
Compact FBM242	16 channel, switch (protected - fused outputs) 15 to 60 V dc (externally sourced) at 2 A maximum with power distribution Current is limited to 12A maximum for each group of 8 channels simultaneously Group isolation provided by termination assembly	RH917HX	C	4	1,4

FUNCTIONAL SPECIFICATIONS - TERMINATION ASSEMBLIES (CONTINUED)

FBM Type	Output Signal(a)	TA Part Number(b)	Term. Type(c)	TA Cable Type(d)	TA Certification Type(e)
		PA			
Compact FBM242	16 channel, switch (each channel is protected - fused) Redundant power 15 to 60 V dc (externally sourced) at 2 A maximum with power distribution Group isolation provided by termination assembly	RH923LH(f)	C	4	1,4
Compact FBM242	16 channel, switch (externally sourced) SPDT (Form C) Relays with LED indicators <30 V dc at 5 A maximum, or 125 V dc at 600 mA w/resistive load, or 125 V dc at 240 mA w/inductive load Up to 250 V ac at 5 A maximum Channel isolation provided by termination assembly relays (g)	RH923LL	C	4	5
Compact FBM242	16 channel, switch (externally sourced) SPDT (Form C) Relays <30 V dc at 5 A maximum, or 125 V dc at 600 mA w/resistive load, or 125 V dc at 240 mA w/inductive load Up to 250 V ac at 5 A maximum Channel Isolation provided by termination assembly relays(g)	RH916YY	C	4	5
Compact FBM242	16 channel, switch (externally sourced) with power distribution SPDT (Form C) Relays(g) <30 V dc at 5 A maximum 125 V dc at 600 mA w/resistive load, or 125 V dc at 250 mA w/inductive load, or Up to 250 V ac at 5 A maximum Total current is limited to 12 A maximum for each group of 8 channels simultaneously Group (two groups of eight) isolation provided by termination assembly	RH916YZ	C	4	5

FUNCTIONAL SPECIFICATIONS - TERMINATION ASSEMBLIES (CONTINUED)

FBM Type	Output Signal(a)	TA Part Number(b)	Term. Type(c)	TA Cable Type(d)	TA Certification Type(e)
		PA			
Compact FBM242	16 channel, switch (externally sourced - fused outputs) SPDT (Form C) Relays 125 V ac at 2A /125 V dc at 0.6 A maximum Channel isolation provided by termination assembly relays(g)	RH926DV	Knife (h)	4	5
Compact FBM242	16 channel, switch (externally sourced - fused outputs) Solid State Switch 125 V ac/125 V dc at 2 A maximum Channel isolation provided by termination assembly	RH926BE	Knife (h)	4	5

(a) Maximum current is limited to 12 A per 8 channels. Output inductive load limits based on current of 2 A. Inductance limit increases by a factor of 4, for each factor of 2 reduction in current. For an inductive load above stated limits, a snubber diode is required for a dc inductive load or a MOV (metal oxide varistor) is required for an ac inductive load. Diode current rating must be equal to the maximum load current and voltage rating equal to 1.3X maximum supply voltage. MOV must be rated for 120 V ac use and current rating must be equal to maximum load current.

(b) 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).

(c) C = TA with compression terminals, RL = TA with ring lug terminals. Knife has compression terminals.

(d) See Table 2 for cable part numbers.

(e) See Table 1 Termination Assembly certification definitions.

(f) The "ON" volt drop for a Compact FBM242 across the Oring diode is typically: 0.498V @ 12A; 0.520V @ 16 A. The typical voltage drop to a channel output is 0.6V at 1.65A per channel.

(g) See page 14 for more detail on the relay contact rating.

(h) This is knife disconnect construction. Knives and test sockets provided for circuit validation only. Knife disconnects are not rated for interrupting loads. Power must be removed before disconnecting circuit.

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 Ex 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 DIN rail mounted FBMs and field circuits meeting entity parameter constraints specified in <i>Standard and Compact 200 Series Subsystem User's Guide</i> (Reference 2). 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
Type 4	All field circuits are Class 2 limited energy (60 V dc, 30 V ac, 100 VA or less) if customer-supplied equipment meets Class 2 limits.
Type 5	The TA and its field circuitry are for use in only ordinary (non-hazardous) locations.

Table 2. Cable Types and Part Numbers

Length m (ft)	Type 4, 26 AWG ^(a) P/PVC	Type 4H, 22 AWG ^{(a)(b)} P/PVC	Type 4 LSZH ^(c)	Type 4H ^{(b)(c)} , LSZH
0.5 (1.6)	RH100CJ	-	RH100BN	-
1.0 (3.2)	RH100CK	-	RH100BP	-
1.5 (4.9)	RH100EQ	-	RH100EN	-
2.0 (6.6)	RH100CL	-	RH100BQ	-
3.0 (9.8)	RH100CM	-	RH100BR	-
5.0 (16.4)	RH100CN	-	RH100BS	-
10.0 (32.8)	RH100CP	RH100CX	RH100BT	RH100DC
15.0 (49.2)	RH100CQ	RH100CY	RH100BU	RH100DD
20.0 (65.6)	RH100CR	RH100CZ	RH100BV	RH100DE
25.0 (82.0)	RH100CS	RH100DA	RH100BW	RH100DF
30.0 (98.4)	RH100CT	RH100DB	RH100BX	RH100DG

(a) P/PVC cable assembles polyurethane outer jacket and semi-rigid PVC primary conductor insulation temperature range: -20 to +70°C (-4 to 158°F)

(b) Type 4H cables are used to reduce voltage drop in long (greater than 5 m (15 ft)) cable run applications.

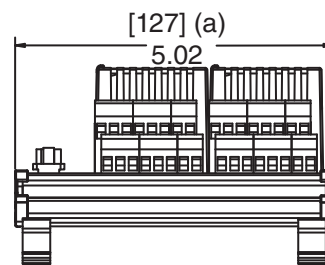
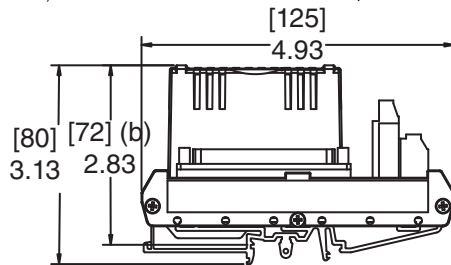
- (c) Low smoke zero halogen or low smoke free of halogen (LSZH) is a material classification used for cable jacketing. LSZH is composed of thermoplastic or thermoset compounds that emit limited smoke and no halogen when exposed to high sources of heat. Temperature range: -40 to +105°C (-40 to +221°F)

DIMENSIONS – NOMINAL

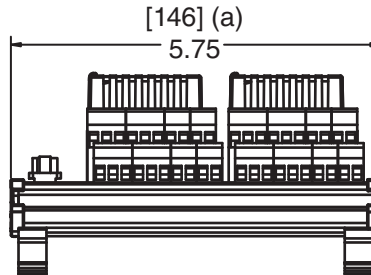
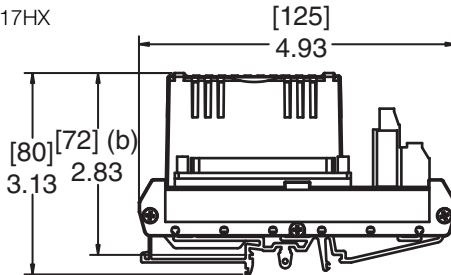
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RH917XX, RH916JY

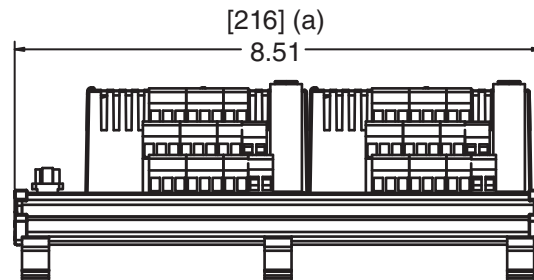
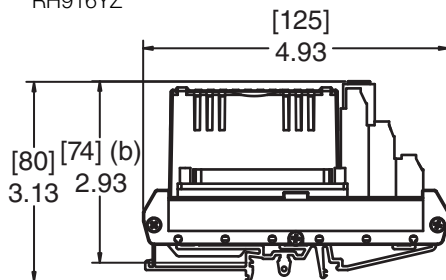
Compression Termination Assemblies



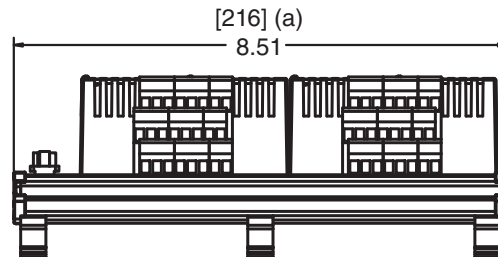
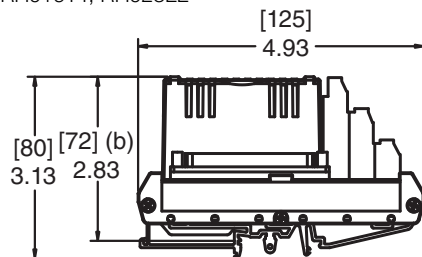
RH917HX



RH916YZ



RH916YY, RH923LL¹



(a) Overall width – for determining DIN rail loading.

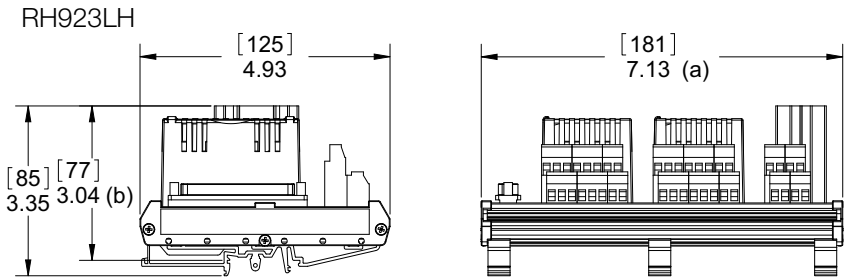
(b) Height above DIN rail (add to DIN rail height for total).

¹Dimensions shown are for the PVC versions. All dimensions for this polyamide termination assembly are smaller.

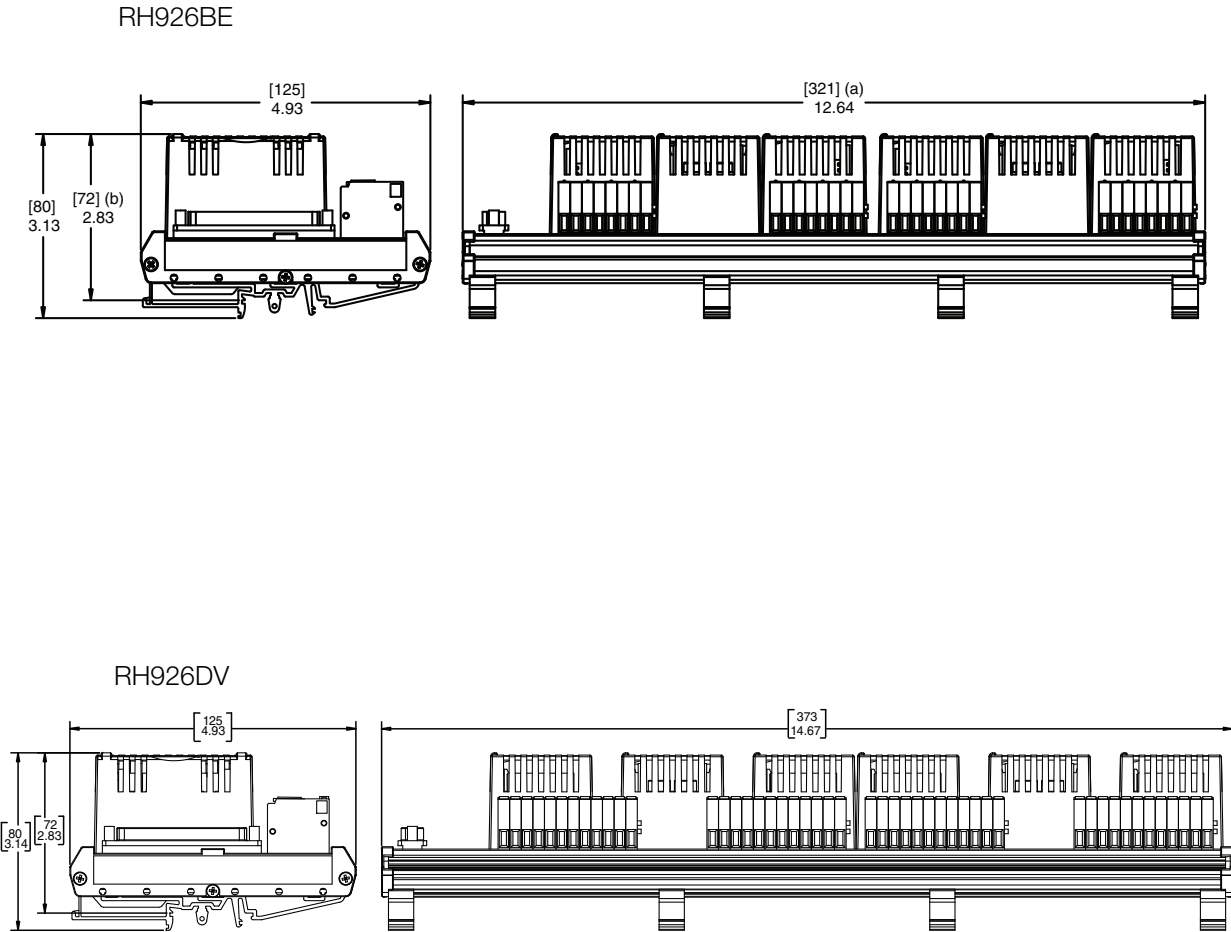
DIMENSIONS – NOMINAL (CONTINUED)

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Compression Termination Assemblies (Continued)



Ring Lug and Knife Switch Termination Assemblies



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

GENERAL PURPOSE PLUG-IN RELAY TERMINATION ASSEMBLY SPECIFICATIONS

Description SPDT, plug-in, field replaceable	Maximum Switching Capacity 1200 VA, 150 W
Rated Load dc RESISTIVE 5 A at 30 V dc 0.6 A at 125 V dc dc INDUCTIVE (L/R = 7 MS) 5 A at 30 V dc 0.4 A at 125 V dc ac RESISTIVE 5 A at 240 V ac ac INDUCTIVE (P.F. = 0.4) 2 A at 240 V ac	Minimum Permissible Load 100 mA, 5 V dc Contact Material AgCdO Contact Resistance 30 m Ω maximum Life Expectancy MECHANICAL 20 X 10 ⁶ operations minimum ELECTRICAL 100 X10 ³ (at rated load)
Carry Current 5 A Maximum Operating Voltage 240 V ac, 125 V dc Maximum Operating Current 5 A	Response Time OPERATE 15 ms maximum RELEASE <i>ac</i> 10 ms maximum <i>dc</i> 5 ms maximum

RELATED PRODUCT DOCUMENTS

Table 3. Reference Documents

Reference	Document Number	Description
1	PSS 31H-2COV	Compact 200 Series I/O Subsystem Overview
2	B0400FA	Standard and Compact 200 Series Subsystem User's Guide
3	PSS 31H-2C200	Compact 200 Series 16-Slot Horizontal Baseplate

Document Number	Description
PSS 31H-2W12 B3	DIN Rail Mounted Compact 200 Series I/O Equipment, Agency Certifications
PSS 31H-2C480 B4	Compact Power Supply - FPS480-24
PSS 31S-3B3	Field Control Processor 280 (FCP280) Integrated Control Software
PSS 21S-3B2 B3	Control Processor 270 (CP270) Integrated Control Software

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