Foxboro™ DCS

Compact FBM242, Externally Sourced, Discrete Output Interface Module

PSS 41H-2C242

Product Specification

August 2019

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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. 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.

Features

- 16 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

Compact Design

The Compact FBM242 module’s design is narrower than the standard 200 Series Fieldbus Modules (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

Green and red 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. If one path is unsuccessful or is 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.

Modular Baseplate Mounting

The module mounts on a DIN rail mounted Modular baseplate, which accommodates up to 16FBMs. The Modular baseplate is either DIN rail mounted or rack mounted, and includes signal connectors for redundant Fieldbus, redundant independent dc power, and termination cables.

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, page 10*.

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. **⚠⚠DANGER** **HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH** 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. **Failure to follow these instructions will result in death or serious injury.**
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	Calibration of the module and termination assembly is not required.
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

Regulatory Compliance: 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 DCS processor modules. 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). For more information, see 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 processor modules as described in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA). Also see Table 1. 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 DCS 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 processor modules as described in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA).
RoHS Compliance	Complies with European RoHS Directive 2011/65/EU, including amending Directives 2015/863 and 2017/2102
Marine Certification	ABS Type Approved and Bureau Veritas Marine certified for Environmental Category EC31.

Environmental Specifications

	Operating	Storage
Temperature	Module: -20 to +60°C (-4 to +140°F) Termination Assembly: -20 to +70°C (-4 to +158°F)	-40 to +70°C (-40 to +158°F)
Relative Humidity	5 to 95% (noncondensing)	5 to 95% (noncondensing)
Altitude	-300 to +3,000 m (-1,000 to +10,000 ft)	-300 to +12,000 m (-1,000 to +40,000 ft)
Vibration	7.5 m/s^2 (5 to 500 Hz)	
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.	

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* (PSS 41H-2C200) 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
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 Assemblies	Refer to *Dimensions - Nominal, page 16*
Part Numbers	• Compact FBM242 Module: RH101AG • Termination Assemblies: Refer to *Functional Specifications - Termination Assemblies, page 12*

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
Termination Assembly Construction	• Material: Polyamide Material, 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 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 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 Replay Termination Assembly Specifications, page 18*)

Termination Assemblies

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, page 12* 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 an 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] PA	Termination Type[c]	TA Cable Type[d]	TA Cert. Type [e]
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 12 A maximum for each group of 8 channels simultaneously Group isolation provided by termination assembly	RH917HX	C	4	1,4
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
Compact FBM242	16 channel, switch (externally sourced - fused outputs) SPDT (Form C) Relays 125 V ac at 2 A /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 to12 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* for Termination Assembly certification definitions.

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

[g] See *General Purpose Plug-In Replay Termination Assembly Specifications, page 18* 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 *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
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

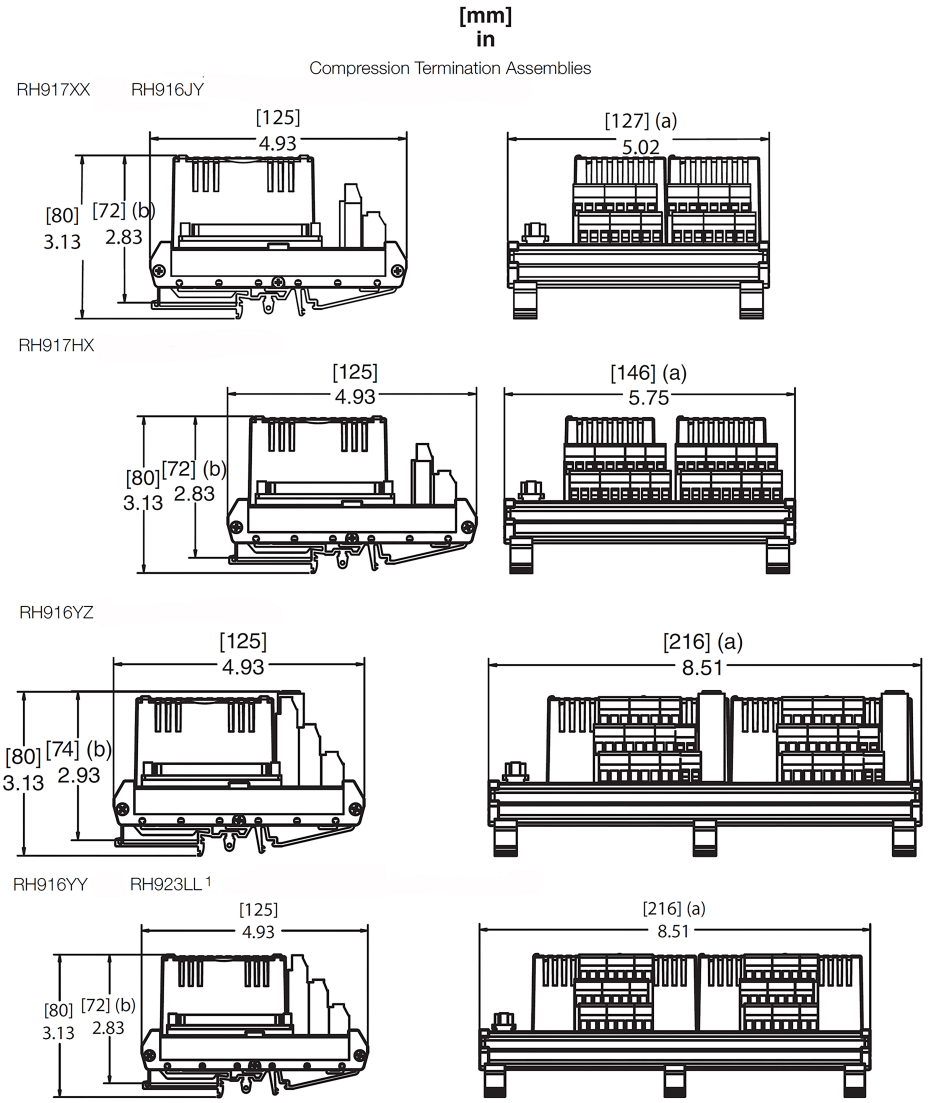
Cable Length m (ft)	Type 4, 26 AWG[a] P/PVC	Type 4H, 22 AWG[a][b] P/PVC	Type 4 LSZH[c]	Type 4H [b][c] LSZH
0.5 (1.6)	RH100CJ	-	RH100BN	-
1.0 (3.2)	RH100CK	-	RH100BP	-
1.5 (4.9)	RH100EQ	-	RH100EN	-
2.0 (6.6)	RH100CL	-	RH100BQ	-
3.0 (9.8)	RH100CM	-	RH100BR	-
5.0 (16.4)	RH100CN	-	RH100BS	-
10.0 (32.8)	RH100CP	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



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

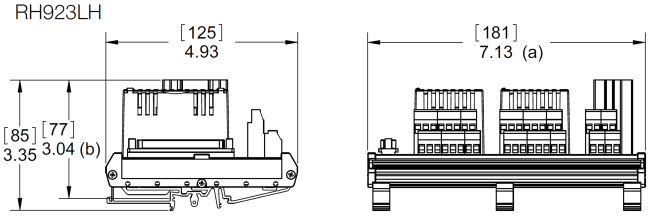
(b) Height above DIN rail (add to DIN rail height for total).

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

[mm]
in

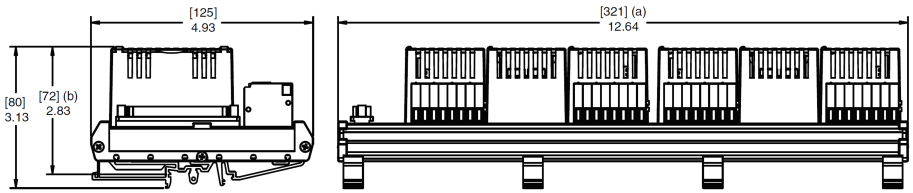
Compression Termination Assemblies (Continued)

RH923LH

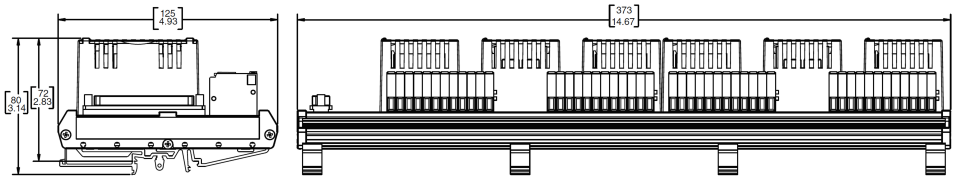


Ring Lug and Knife Switch Termination Assemblies

RH926BE



RH926DV



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

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

General Purpose Plug-In Replay Termination Assembly Specifications

Description	SPDT, plug-in, field replaceable
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
Carry Current	5 A
Maximum Operating Voltage	240 V ac, 125 V dc
Maximum Operating Current	5 A
Minimum Permissible Load	100 mA, 5 V dc
Contact Material	AgCdO
Contact Resistance	30 mW maximum
Life Expectancy	• Mechanical: 20 X 10^6 operations minimum • Electrical: 100 X10^3 (at rated load)
Response Time	• Operate 15 ms maximum • Release ◦ ac: 10 ms maximum ◦ dc: 5 ms maximum

Related Product Documents

Document Number	Description
PSS 41H-2COV	*Compact 200 Series I/O Subsystem Overview*
B0400FA	*Standard and Compact 200 Series Subsystem User's Guide*
PSS 41H-2C200	*Compact 200 Series 16-Slot Horizontal Baseplate*
PSS 41H-2CERTS	*DIN Rail Mounted Compact 200 Series I/O Equipment, Agency Certifications*
PSS 41H-2C480	*Compact Power Supply - FPS480-24*
PSS 41S-3FCPICS	*Field Control Processor 280 (FCP280) Integrated Control Software*

⚠ **WARNING**: This product can expose you to chemicals including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information, go to www.p65warnings.ca.gov/.

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