FBM219 Discrete I/O Interface Module

The FBM219 Discrete I/O Interface Module has 24 discrete input channels and 8 discrete output channels.

FEATURES

Key features of the FBM219 are:

- Twenty-Four (24) discrete inputs
- Eight (8) discrete outputs
- Supports discrete input/output signals at voltages of:
  - 15 to 60 V dc
  - 120 V ac/125 V dc
  - 240V ac
- Each input/output is group isolated
- 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 high voltage attenuation and optical isolation for inputs

OVERVIEW

The FBM219 Discrete I/O Interface Module has 24 discrete input channels and 8 discrete output channels. Associated termination assemblies (TAs) support discrete input or output signals at voltages of under 30 V dc, 120 V ac/125 V dc, or 240 V ac.

Depending on the type of I/O signal required, the TAs contain current limiting devices, fuses, relays, or relay outputs with internal or external power source and fusing.

The module with its associated TA supports the following discrete inputs and outputs:

FBM	Inputs	Outputs
FBM219	30 V dc, 125 V dc, 120 V ac, or 240 V ac (voltage monitor or contact sense)	30 V dc at 0.25 A, or 30 V dc at 5 A, or 125 V dc at 0.6 A, or 120 V ac at 5 A, or 240 V ac at 5 A Switch (external or internal power source)

When connected to the appropriate TAs, the FBM219 module provides functionality formerly provided by the 100 Series FBM I/O subsystem. TAs are available which support the functionality of the 100 Series main FBM07A/B, FBM08, FBM20, and FBM24A/B/C (16 input main FBMs), when these main FBMs are used with expansion FBM14, FBM15, FBM16, FBM27 or FBM42 (8 input/8/output expansion FBMs).

COMPACT DESIGN

The module has a compact design, with a rugged extruded aluminum exterior for physical protection of the circuits. Enclosures specially designed for mounting the FBMs provide various levels of environmental protection, up to harsh environments, per ISA Standard S71.04.

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 and output points.

EASY REMOVAL/REPLACEMENT

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 FBM219 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 up to 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.

SECURITY

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 FBM219 are described in “TERMINATION ASSEMBLIES AND CABLES” on page 7.

FUNCTIONAL SPECIFICATIONS

Input/Output Channels
24 input and 8 output group isolated channels(1)

Filter/Debounce Time(2)
Configurable (No Filtering, 4, 8, 16, or 32 ms)

Voltage Monitor Function (FBM219)

INPUT

On-State Voltage
15 to 30 V dc
Off-State Voltage
0 to 5 V dc
Current
2.2 mA (typical) at 30 V dc Input

SOURCE RESISTANCE LIMITS

On-State
1 k Ω (maximum) at 15 V dc
Off-State
100 k Ω (minimum) at 30 V dc

Output Switch with External Source (FBM219)

APPLIED VOLTAGE
60 V dc (maximum)

LOAD CURRENT
0.25 A (maximum)

OFF-STATE LEAKAGE CURRENT
0.25 mA (maximum)

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

Isolation
For TAs which provide input and output group isolation (listed in the table on page 9), input and output groups are group isolated from earth (ground). For details, refer to the *I/A Series DIN Rail Mounted Subsystem User's Guide* (B0400FA). The module/TA withstands, without damage, a potential of 600 V ac applied for one minute between any channel and ground, or between any input channel and any output channel.

Isolation (Cont.)
For TAs P0917LL and P0917LP (which provide input channel isolation) and TA P0917LS (which provides output channel isolation), each channel is galvanically isolated from all other channels and earth (ground). The module/TA 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 module Fieldbus.

Power Requirements

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

CONSUMPTION
5 W (maximum) at 24 V dc

HEAT DISSIPATION
6 W (maximum) at 24 V dc

Loop Power Supply Protection
Current limited to 2.5 mA for inputs.

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

(1) As well, Termination Assemblies P0917LL and P0917LP provide input channel isolation for this FBM and Termination Assembly P0917LS provides output channel isolation for this FBM.
(2) 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
Meets: EN 50081-2 Emission standard
EN 50082-2 Immunity standard
EN 61326 EMC Standard (Industrial Levels)

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

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

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

IEC 61000-4-4 Electrical Fast Transient/Burst Immunity
2 kV on I/O, V 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
3 V (rms) at 150 kHz to 80 MHz on I/O, V dc power and communication lines

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

Regulatory Compliance (Continued)

PRODUCT SAFETY

Underwriters Laboratories (UL) for U.S. and Canada
UL/UL-C listed as suitable for use in 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 circuits for Class I, Groups A-D hazardous locations when connected to specified I/A Series® processor modules as described in the ***I/A Series DIN Rail Mounted 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 ***I/A Series DIN Rail Mounted Subsystem User's Guide*** (B0400FA).

European Low Voltage Directive 2006/95/EC and Explosive Atmospheres (ATEX) directive 94/9/EC
CENELEC (DEMKO) certified for use in Zone 2 enclosures and certified as associated apparatus for supplying non-incendive field circuits for Zone 2, Group IIC, potentially explosive atmospheres when connected as described in the ***I/A Series DIN Rail Mounted Subsystem User's Guide*** (B0400FA).

ENVIRONMENTAL SPECIFICATIONS

Operating

TEMPERATURE

FBM219

-20 to + 70°C (-4 to +158°F)

Termination Assembly

PVC

-20 to + 50°C (-4 to +122°F)

RELATIVE HUMIDITY

5 to 95% (noncondensing)

ALTITUDE

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

Storage

TEMPERATURE

-40 to +70°C (-40 to +158°F)

RELATIVE HUMIDITY

5 to 95% (noncondensing)

ALTITUDE

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

Contamination

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

Vibration

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

PHYSICAL SPECIFICATIONS

Mounting

MODULE

FBM219 mounts on a baseplate or on a 100 Series conversion mounting structure. The baseplate can be mounted on a DIN rail (horizontally or vertically), or horizontally on a 19-inch rack using a mounting kit. Alternative, this FBM mounts on a 100 Series conversion mounting structure. Refer to *DIN Rail Mounted Modular Baseplates* (PSS 21H-2W6 B4) or *100 Series Conversion Mounting Structures* (PSS 21H-2W8 B4) 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

284 g (10 oz) approximate

TERMINATION ASSEMBLY - COMPRESSION

216 mm (8.51 in) – 420 g (0.93 lb, approximate)
267 mm (10.52 in) – 480 g (1.1 lb, approximate)
286 mm (11.25 in) – 908 g (2.0 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 23

Part Numbers

FBM219

P0916RH

TERMINATION ASSEMBLIES

Refer to “FUNCTIONAL SPECIFICATIONS - Main TERMINATION ASSEMBLIES” on page 9

Termination Cables

CABLE LENGTHS

Up to 30 m (98 ft)

CABLE MATERIALS

Polyurethane or Low Smoke Zero Halogen (LSZH)

TERMINATION CABLE TYPE

Baseplate to Main TA
Type 4 or type 4H - Refer to Table 2
Main TA to Expansion TA
Type 6 - Refer to Table 3

CABLE CONNECTION

FBM Baseplate End
37-pin D-subminiature
Termination Assembly End
25-pin D-subminiature

Construction - Termination Assembly

MATERIAL

Polypropylene (PVC), compression

Field Termination Connections

COMPRESSION - ACCEPTED WIRING SIZES

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

RING-LUG - ACCEPTED WIRING SIZES

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

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 (SPST_NO)
Switching Current
5 A at up to 120 V ac (see “GENERAL PURPOSE PLUG-IN RELAY TERMINATION ASSEMBLY SPECIFICATIONS” on page 22)

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 FBM219 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 enclosure or in an adjacent enclosure. Refer to “FUNCTIONAL SPECIFICATIONS - Main TERMINATION ASSEMBLIES” on page 9 for termination cable part numbers and specifications.

Migration Use of Termination Assemblies

When an FBM219 is used to replace 100 Series FBMs, its associated termination assembly is determined based on which 100 Series FBM is being replaced. Typically, the 100 Series FBM being replaced is a main FBM and is used in conjunction with an expansion FBM.

A single FBM219 provides the I/O communications for both the 100 Series equivalent main and expansion TAs. To provide enough terminals for the field I/O wiring, two termination assemblies are used with the FBM219 - one for the field I/O wiring for the replaced main FBM, and one for the field I/O wiring for the replaced expansion FBM.

The “expansion” termination assembly is daisy-chained to the “main” termination assembly via the expansion cables listed in Table 3 on page 22.

The table “FUNCTIONAL SPECIFICATIONS - Main TERMINATION ASSEMBLIES” on page 9 and “FUNCTIONAL SPECIFICATIONS - Expansion TERMINATION ASSEMBLIES” on page 14 list the termination assemblies needed to replace both the 100 Series main FBMs and the expansion FBMs.

Alternatively, the FBM219 can accept field wiring through a Termination Assembly Adapter (TAA) instead of the termination assemblies when replacing 100 Series FBMs. This is discussed in *Termination Assembly Adapter Modules for 100 Series Upgrade* (PSS 21H-2W4 B4).

The output circuits of termination assemblies used in migration/upgrading use active current limiting for circuit protection.

Discrete Inputs

Terminal assemblies with discrete inputs support twenty-four 2-wire discrete input signals at passive low voltage levels of less than 60 V dc and active high voltage levels of 120 V ac, 125 V dc, 240 V ac. Active termination assemblies support input signal conditioning for FBMs. The I/O signal conditioning circuits are designed to emulate the 100 Series FBM I/O subsystem. This provides for functional I/O equivalence during upgrades from 100 Series to 200 Series hardware. The signal conditioning functionality is built into the termination assembly. To condition signals, these termination assemblies provide optical isolation, current limiting, voltage attenuation and 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 can either be voltage monitor, switched or contact sense types. Voltage monitor inputs require an external field

voltage source. Contact sense input use the FBM auxiliary +24 V dc power supply 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 or 120 V ac. Voltage monitor inputs require a field voltage source.

These input circuits are located on daughter boards that are mounted under the component covers of the termination assemblies.

Discrete Outputs

Termination assemblies with discrete outputs support eight 2-wire discrete output signals at passive low voltages of less than 60 V dc and active high voltage levels of 120 V ac, 125 V dc, or 240 V ac. Active termination assemblies support output signal conditioning for FBMs. The signal conditioning functionality is built into the termination assembly. To condition signals, these termination assemblies provide fuse protection, relays 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. Eight 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 must be supplied as detailed in “FUNCTIONAL SPECIFICATIONS - Main TERMINATION ASSEMBLIES” on page 9 and “FUNCTIONAL SPECIFICATIONS - Expansion TERMINATION ASSEMBLIES” on page 14.

High Voltage Discrete Outputs

Some high voltage output (120 V ac, 125 V dc or 240 V ac) termination assemblies use plug-in SPDT (Form C) electromechanical relays. 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. High voltage discrete outputs are always externally sourced power.

The relay 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 relay 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.

The relay termination assembly has a pair of external excitation voltage terminals, which distribute customer-supplied wetting voltage to all input channels on the assembly. These terminals allow the

field power to be daisy chained between terminal assemblies.

The new 100 Series equivalent TAs provide solid state output channels. These provide the identical functionality of the original 100 Series FBM circuits.

FUNCTIONAL SPECIFICATIONS - MAIN TERMINATION ASSEMBLIES

FBM Type	Input Signal	Output Signal	TA Part No.[a]		Term Type [b]	BP to TA Cable [c]	TA Cert. Type [d]
			PVC	PA			
FBM219	24 channel, Voltage Monitor, external source 132 V ac or 150 V dc Maximum voltage Logic Zero: 0 to 20 V ac or dc Logic One: 79 to 132 V ac Logic One: 75 to 150 V dc 2.2 mA typical 20 to 150 V 1 KΩ Maximum On-state resistance 100 KΩ Minimum Off-state resistance	8 channel, Output Switch, external source with power distribution SPDT (Form C) Relay:[e] ≤30 V dc: 5 A maximum ≤250 V ac: 5 A maximum Maximum total current per TA: 12 A[f]	P0917LP		C	4	5
FBM219	24 channel, Contact Sense, external source with power distribution 132 V ac or 150 V dc Maximum voltage Logic Zero: 0 to 20 V ac or dc Logic One: 79 to 132 V ac Logic One: 75 to 150 V dc 2.2 mA typical 20 to 150 V 1 KΩ Maximum On-state resistance 100 KΩ Minimum Off-state resistance	8 channel, Output Switch, external source SPDT (Form C) Relay:[e] ≤30 V dc: 5 A maximum ≤250 V ac: 5 A maximum Maximum total current per TA: 12 A[f]	P0917LS		C	4	5

FUNCTIONAL SPECIFICATIONS - MAIN TERMINATION ASSEMBLIES

FBM Type	Input Signal	Output Signal	TA Part No.[a]		Term Type [b]	BP to TA Cable [c]	TA Cert. Type [d]
			PVC	PA			
FBM219	24 channel, Contact Sense, external source with power distribution 132 V ac or 150 V dc Maximum voltage Logic Zero: 0 to 20 V ac or dc Logic One: 79 to 132 V ac Logic One: 75 to 150 V dc 2.2 mA typical 20 to 150 V 1 KΩ Maximum On-state resistance 100 KΩ Minimum Off-state resistance	8 channel, Output Switch, external source with power distribution SPDT (Form C) Relay:[e] ≤30 V dc: 5 A maximum ≤250 V ac: 5 A maximum Maximum total current per TA: 12 A[f]	P0917LV		C	4	5
FBM219	24 channel, Voltage Monitor, external source 132 V ac or 150 V dc Maximum voltage Logic Zero: 0 to 20 V ac or dc Logic One: 79 to 132 V ac Logic One: 75 to 150 V dc 2.2 mA typical 20 to 150 V 1 KΩ Maximum On-state resistance 100 KΩ Minimum Off-state resistance	8 channel, Output Switch, external source SPDT (Form C) Relay:[e] ≤30 V dc: 5 A maximum ≤250 V ac: 5 A maximum Maximum total current per TA: 12 A[f]	P0917LL		C	4	5
FBM219	24 channel, Voltage Monitor, external source 30 V dc Maximum voltage Logic Zero: 0 to 5 V dc Logic One: 15 to 30 V dc 2.2 mA typical at 30 V dc 1 KΩ Maximum On-state resistance 100 KΩ Minimum Off-state resistance	8 channel, Output Switch, external source 60 V dc Maximum voltage 0.25 A dc Maximum current 0.25 mA dc Maximum off-state leakage current 0.4 A over-current fuse	P0917LE		C	4	1, 2, 4

FUNCTIONAL SPECIFICATIONS - MAIN TERMINATION ASSEMBLIES

FBM Type	Input Signal	Output Signal	TA Part No.[a]		Term Type [b]	BP to TA Cable [c]	TA Cert. Type [d]
			PVC	PA			
FBM219	24 channel, Contact Sense, internal source 24 V dc Nominal open circuit voltage 7 mA dc nominal current limit 2.2 mA typical at 30 V dc 1 KΩ Maximum On-state resistance 100 KΩ Minimum Off-state resistance	8 channel, Output Switch, external source 60 V dc Maximum voltage 0.25 A dc Maximum current 0.25 mA dc Maximum off-state leakage current 0.4 A over-current fuse	P0917LH		C	4, 4H	1,2, 4
FBM219	When replacing a main FBM07A: Voltage Monitor, external source 130 V dc Maximum voltage Logic Zero: 0 to 5 V dc Logic One: 15 to 130 V dc 2.2 mA typical 5 to 130 V dc 1 KΩ Maximum On-state resistance 100 KΩ Minimum Off-state resistance When replacing a main FBM07B: Contact Sense, internal source 24 V dc ±10% Open circuit voltage 2.5 mA maximum short circuit current 1 KΩ Maximum On-state resistance 100 KΩ Minimum Off-state resistance			P0924HA	C	4	1, 2, 4

FUNCTIONAL SPECIFICATIONS - MAIN TERMINATION ASSEMBLIES

FBM Type	Input Signal	Output Signal	TA Part No.[a]		Term Type [b]	BP to TA Cable [c]	TA Cert. Type [d]
			PVC	PA			
FBM219	When replacing a main FBM08: 16 channel Voltage Monitor, external source 132 V ac or 150 V dc Logic Zero: 0 to 20 V ac; 0 to 20 V dc Logic One: 79 to 132 V ac; 75 to 150 V dc 2.2 mA typical 20 to 132 V ac 1 KΩ Maximum On-state resistance 100 KΩ Minimum Off-state resistance			P0924HC	C	4	1, 4
FBM219	When replacing a main FBM20: 16 channel Voltage Monitor, external source 264 V ac Maximum voltage Logic Zero: 0 to 40 V ac Logic One: 164 to 264 V ac 2.2 mA typical 40 to 264 V ac 1 KΩ Maximum On-state resistance 100 KΩ Minimum Off-state resistance			P0924HL	C	4	1
FBM219	When replacing a main FBM24A: 16 channel Voltage Monitor, external source 150 V dc Maximum voltage Logic Zero: 0 to 10 V dc Logic One: 33 to 150 V dc 2.5 mA typical 10 to 150 V dc 1 KΩ Maximum On-state resistance 100 KΩ Minimum Off-state resistance			P0924HN	C	4	1, 2, 4

FUNCTIONAL SPECIFICATIONS - MAIN TERMINATION ASSEMBLIES

FBM Type	Input Signal	Output Signal	TA Part No.(a)		Term Type (b)	BP to TA Cable (c)	TA Cert. Type(d)
			PVC	PA			
FBM219	When replacing a main FBM24B: 16 channel Contact Sense, internal source 48 V dc nominal open circuit voltage 2.5 mA ±20% short circuit current 1 KΩ Maximum On-state resistance 100 KΩ Minimum Off-state resistance			P0924HP	C	4	1, 2, 4
FBM219	When replacing a main FBM24C: 16 channel Contact sense with external source on Channel 1 150 V dc Maximum voltage Logic Zero: 0 to 10 V dc Logic One: 33 to 150 V dc 2.5 mA typical 10 to 150 V dc 1 KΩ Maximum On-state resistance 100 KΩ Minimum Off-state resistance			P0924HQ	C	4	1, 2, 4

(a) PVC is polyvinyl chloride rated from -20 to +50°C (-4 to 122°F).
(b) C = TA with compression terminals, RL = TA with ring lug terminals. Knife has compression terminals.
(c) Refer to Table 2 for cable part numbers and specifications.
(d) Refer to Table 1 Termination Assembly certification definitions.
(e) Relays used to switch a dc source should have lower current limits. Relays used to switch inductive loads should have protective elements added across the load or contacts.
(f) Refer to the details of the relay specifications in “GENERAL PURPOSE PLUG-IN RELAY TERMINATION ASSEMBLY SPECIFICATIONS” on page 27.

FUNCTIONAL SPECIFICATIONS - EXPANSION TERMINATION ASSEMBLIES

FBM Type	Input Signal	Output Signal	TA Part Number		Termination	Main TA to Exp. TA Cable	TA Certification
			PVC[a]	PA[a]	Type [b]	Type[c]	Type[d]
FBM219	When replacing an expansion FBM14A/B: 8 channel Voltage Monitor external source 130 V dc Maximum voltage Logic Zero: 0 to 5 V dc Logic One: 15 to 130 V dc 2.2 mA typical 5 to 130 V dc 1 KΩ Maximum On-state resistance 100 KΩ Minimum Off-state resistance When replacing an expansion FBM14C/D: Contact sense internal source 24 V dc ±10% Open circuit voltage 2.5 mA maximum short circuit current 1 KΩ Maximum On-state resistance 100 KΩ Minimum Off-state resistance	When replacing an expansion FBM14A/C: 8 channel Output Switch external source 60 V dc Maximum voltage 0.5 V maximum voltage drop @ 0.5 A 0.5 A maximum current 0.75 A current limit Shorted load duration: indefinite (duty-cycle limited) 1.0 mA maximum off-state leakage When replacing an expansion FBM14B/D: output switch internal source 11 V dc ±2 V Open circuit voltage Source resistance 680 Ω nominal Shorted load duration: indefinite 0.5 mA maximum off-state leakage		P0924HF	C	6	1, 2, 4
Connect this TA to the main TA.							

FUNCTIONAL SPECIFICATIONS - EXPANSION TERMINATION ASSEMBLIES (CONTINUED)

FBM Type	Input Signal	Output Signal	TA Part Number		Termination	Main TA to Exp. TA Cable	TA Certification
			PVC[a]	PA[a]	Type [b]	Type[c]	Type[d]
FBM219	When replacing an expansion FBM15: 8 channel Voltage Monitor, external source 132 V ac or 150 V dc Logic Zero: 0 to 20 V ac; 0 to 20 V dc Logic One: 79 to 132 V ac; 75 to 150 V dc 2.2 mA typical 20 to 132 V ac 1 KΩ Maximum On-state resistance 100 KΩ Minimum Off-state resistance	When replacing an expansion FBM15: 8 channel Output Switch external source 132 V ac Maximum voltage 0.4 V maximum voltage drop @ 1 A 2 A maximum current per channel 12 A maximum current per TA 3 A current limit 24 A surge current limit for 10 msec Shorted load duration: indefinite (duty-cycle limited) 3 mA maximum off-state leakage		P0924HH	C	6	1
Connect this TA to the main TA.							

FUNCTIONAL SPECIFICATIONS - EXPANSION TERMINATION ASSEMBLIES (CONTINUED)

FBM Type	Input Signal	Output Signal	TA Part Number		Termination	Main TA to Exp. TA Cable	TA Certification
			PVC[a]	PA[a]	Type [b]	Type[c]	Type[d]
FBM219	When replacing an expansion FBM16: 8 channel Voltage Monitor 264 V ac Maximum voltage Logic Zero: 0 to 40 V ac Logic One: 164 to 264 V ac 2.2 mA typical 40 to 264 V ac 1 KΩ Maximum On-state resistance 100 KΩ Minimum Off-state resistance	When replacing an expansion FBM16: 8 channel Output Switch external source 264 V ac Maximum voltage 0.6 V maximum voltage drop @ 0.5 A 1 A maximum current per channel 7 A maximum current per TA 1.5 A current limit 12 A surge current limit for 10 msec Shorted load duration: indefinite (duty-cycle limited) 2.5 mA maximum off-state leakage		P0924HK	C	6	1
Connect this TA to the main TA.							

FUNCTIONAL SPECIFICATIONS - EXPANSION TERMINATION ASSEMBLIES (CONTINUED)

FBM Type	Input Signal	Output Signal	TA Part Number		Termination	Main TA to Exp. TA Cable	TA Certification
			PVC[a]	PA[a]	Type [b]	Type[c]	Type[d]
FBM219	When replacing an expansion FBM27A: 8 channel Voltage Monitor, external source 150 V dc Maximum voltage Logic Zero: 0 to 10 V dc Logic One: 33 to 150 V dc 2.5 mA typical 10 to 150 V dc 1 KΩ Maximum On-state resistance 100 KΩ Minimum Off-state resistance	When replacing an expansion FBM27A: 8 channel Output Switch external source 150 V dc Maximum voltage 0.4 V maximum voltage drop @ 1 A 2 A maximum current per channel 12 A maximum current per TA 2.3 A current limit 20 A surge current limit, 20 ms Shorted load duration: indefinite (duty-cycle limited) 2 mA maximum off-state leakage		P0924HX	C	6	1, 2, 4
Connect this TA to the main TA.							

FUNCTIONAL SPECIFICATIONS - EXPANSION TERMINATION ASSEMBLIES (CONTINUED)

FBM Type	Input Signal	Output Signal	TA Part Number		Termination	Main TA to Exp. TA Cable	TA Certification
			PVC[a]	PA[a]	Type [b]	Type[c]	Type[d]
FBM219	When replacing an expansion FBM27B: 8 channel Contact Sense internal source 48 V dc nominal open circuit voltage 2.5 mA ±20% short circuit current 1 KΩ Maximum On-state resistance 100 KΩ Minimum Off-state resistance	When replacing an expansion FBM27B: 8 channel Output Switch external source 150 V dc Maximum voltage 0.4 V maximum voltage drop @ 1 A 2 A maximum current per channel 12 A maximum current per TA 2.3 A current limit 20 A surge current limit, 20 ms Shorted load duration: indefinite (duty-cycle limited) 2 mA maximum off-state leakage		P0924HY	C	6	1, 2, 4
Connect this TA to the main TA.							

FUNCTIONAL SPECIFICATIONS - EXPANSION TERMINATION ASSEMBLIES (CONTINUED)

FBM Type	Input Signal	Output Signal	TA Part Number		Termination	Main TA to Exp. TA Cable	TA Certification
			PVC[a]	PA[a]	Type [b]	Type[c]	Type[d]
FBM219	When replacing an expansion FBM27C: 8 channel Contact Sense external source on channel 1 150 V dc Maximum voltage Logic Zero: 0 to 10 V dc Logic One: 33 to 150 V dc 2.5 mA typical 10 to 150 V dc 1 KΩ Maximum On-state resistance 100 KΩ Minimum Off-state resistance	When replacing an expansion FBM27C: 8 channel Output Switch external source 150 V dc Maximum voltage 0.4 V maximum voltage drop @ 1 A 2 A maximum current per channel 12 A maximum current per TA 2.3 A current limit 20 A surge current limit, 20 ms Shorted load duration: indefinite (duty-cycle limited) 2 mA maximum off-state leakage		P0924HZ	C	6	1, 2, 4
Connect this TA to the main TA.							

FUNCTIONAL SPECIFICATIONS - EXPANSION TERMINATION ASSEMBLIES (CONTINUED)

FBM Type	Input Signal	Output Signal	TA Part Number		Termination	Main TA to Exp. TA Cable	TA Certification
			PVC[a]	PA[a]	Type [b]	Type[c]	Type[d]
FBM219	When replacing an expansion FBM42A: 8 channel Voltage Monitor external source 60 V dc Maximum voltage Logic Zero: 0 to 5 V dc Logic One: 15 to 60 V dc 6 mA maximum input current 1 KΩ Maximum On-state resistance 100 KΩ Minimum Off-state resistance When replacing an expansion FBM42C: Contact sense internal source 24 V dc ±20% Open circuit voltage 5 mA maximum short circuit current 1 KΩ Maximum On-state resistance 100 KΩ Minimum Off-state resistance	When replacing an expansion FBM42A/C: 8 channel Output Switch external source 60 V dc Maximum voltage 0.4 V maximum voltage drop @ 1 A 2.25 A maximum current 12 A maximum current per TA 10 A surge current limit for 20 msec maximum Shorted load duration: indefinite (duty-cycle limited) 0.5 mA maximum off-state leakage		P0924JB	C	6	1, 2, 4
Connect this TA to the main TA.							

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

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 CENELEC (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 DIN rail mounted FBMs and field circuits meeting entity parameter constraints specified in *DIN Rail Mounted Subsystem User's Guide* (B0400FA). They are also CENELEC (DEMKO) certified as associated apparatus for supplying field circuits for Group IIC, Zone 2 potentially explosive atmospheres. Field circuits are also Class 2 limited energy (60 V dc, 30 V ac, 100 VA or less) if customer-supplied equipment meets Class 2
Table 3	Same as Type 2 above except that only input circuits are non-incendive/Class 2.
Type 4	All field circuits are NEC/CEC Class 2 limited energy 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 (Baseplate to Main TA Cables) and Part Numbers

Cable Length - m (ft)	Type 4 P/PVC[a]	Type4 LSZH[b]	Type 4 H/XLPE[c]
0.5 (1.6)	P0916FG	P0928BA	P0916WD
1.0 (3.2)	P0916FH	P0928BB	P0916WE
2.0 (6.6)	P0931RQ	P0928BC	P0931RU
3.0 (9.8)	P0916FJ	P0928BD	P0916WF
5.0 (16.4)	P0916FK	P0928BE	P0916WG
10.0 (32.8)	P0916FL	P0928BF	P0916WH
15.0 (49.2)	P0916FM	P0928BG	P0916WJ
20.0 (65.6)	P0916FN	P0928BH	P0916WK
25.0 (82.0)	P0916FP	P0928BJ	P0916WL
30.0 (98.4)	P0916FQ	P0928BK	P0916WM

(a) P/PVC is polyurethane outer jacket and semi-rigid PVC primary conductor insulation. P/PVC cable is rated at -20 to +80°C (-4 to 176°F).
(b) Low smoke zero halogen or low smoke free of halogen (LSZH) is a material classification used for cable jacketing. LSZH is composed of thermoplastic or thermoset compounds that emit limited smoke and no halogen when exposed to high sources of heat. Temperature range: -40 to +105°C (-40 to +221°F).
(c) H/XLPE is Hypalon outer jacket and XLPE (cross-linked polyethylene) primary conductor insulation. H/XLPE is rated from -40 to +90°C (-40 to 194°F). Hypalon cables are no longer available for purchase.

Table 3. Cable Types (Main TA to Expansion TA Cables) and Part Numbers

Cable Length m (ft)	Type 6 P/PVC[a]	Type 6 LSZH[b]	Type 6 H/XLPE[c]
0.75 (2.5)	P0924CK	P0928CQ	P0924CL

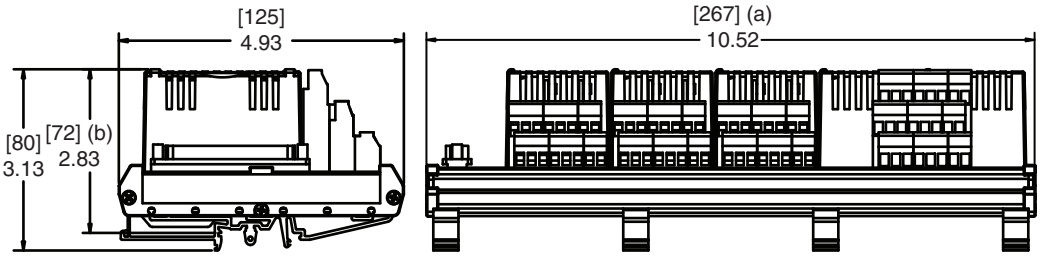
(a) P/PVC is polyurethane outer jacket and semi-rigid PVC primary conductor insulation. P/PVC cable is rated at -20 to +80°C (-4 to 176°F). These cables are no longer available for purchase.
(b) Low smoke zero halogen or low smoke free of halogen (LSZH) is a material classification used for cable jacketing. LSZH is composed of thermoplastic or thermoset compounds that emit limited smoke and no halogen when exposed to high sources of heat. Temperature range: -40 to +105°C (-40 to +221°F).
(c) H/XLPE is Hypalon outer jacket and XLPE (cross-linked polyethylene) primary conductor insulation. H/XLPE is rated from -40 to +90°C (-40 to 194°F). Hypalon cables are no longer available for purchase.

DIMENSIONS – NOMINAL

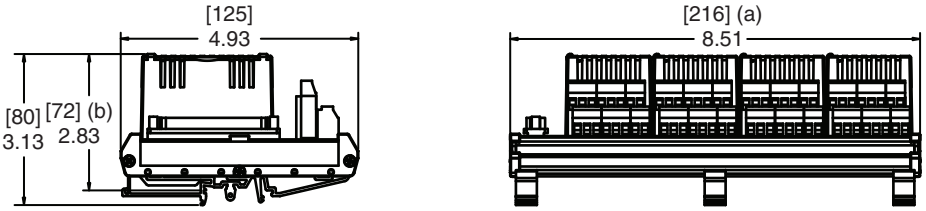
mm
in

Compression Termination Assemblies

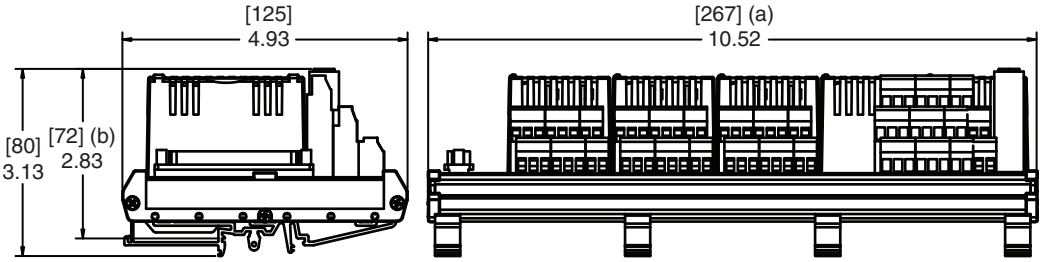
P0917LL



P0917LE, P0917LH



P0917LP



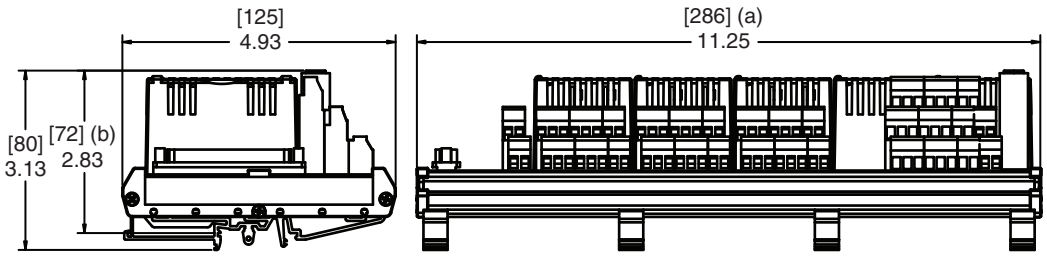
(a) Overall width – for determining DIN rail loading.
(b) Height above DIN rail (add to DIN rail height for total).

DIMENSIONS – NOMINAL (CONTINUED)

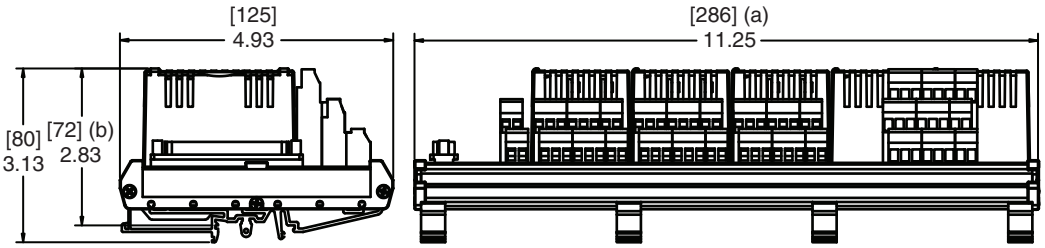
mm
in

Compression Termination Assemblies

P0917LV



P0917LS



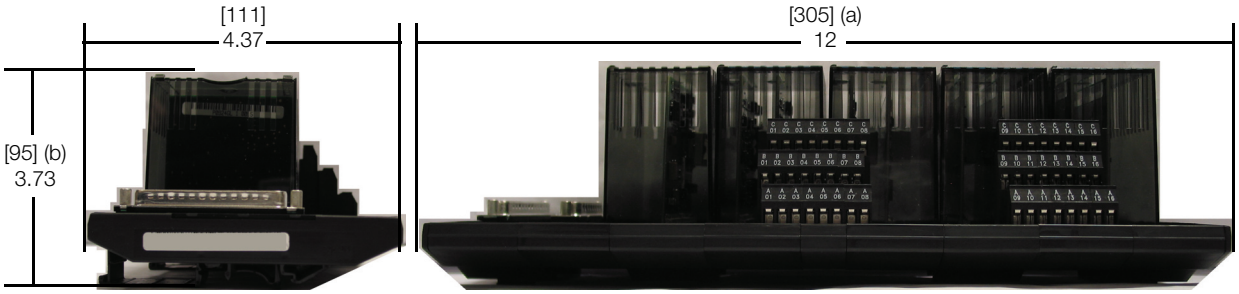
(a) Overall width – for determining DIN rail loading.
(b) Height above DIN rail (add to DIN rail height for total).

DIMENSIONS – NOMINAL (CONTINUED)

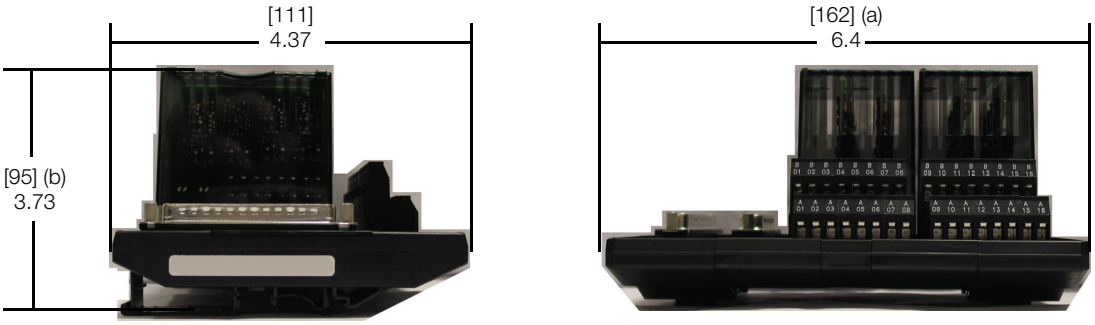
mm
in

Compression Termination Assemblies

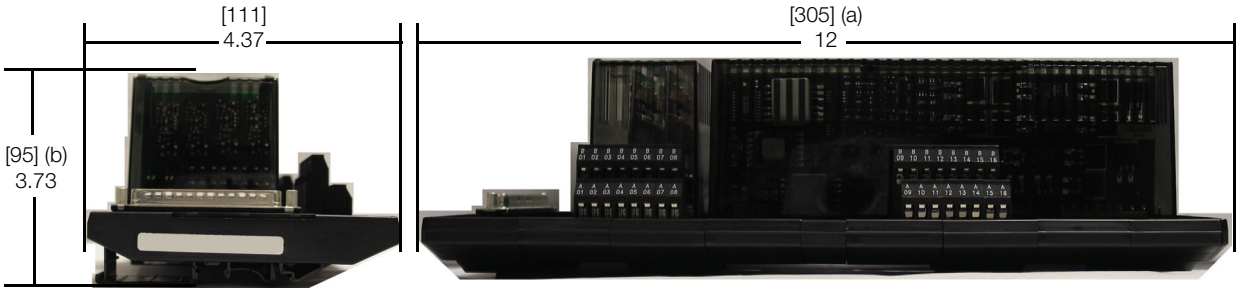
P0924HA/P0924HF



P0924HC/P0924HL/P0924HN/P0924HQ



P0924HH/P0924HK



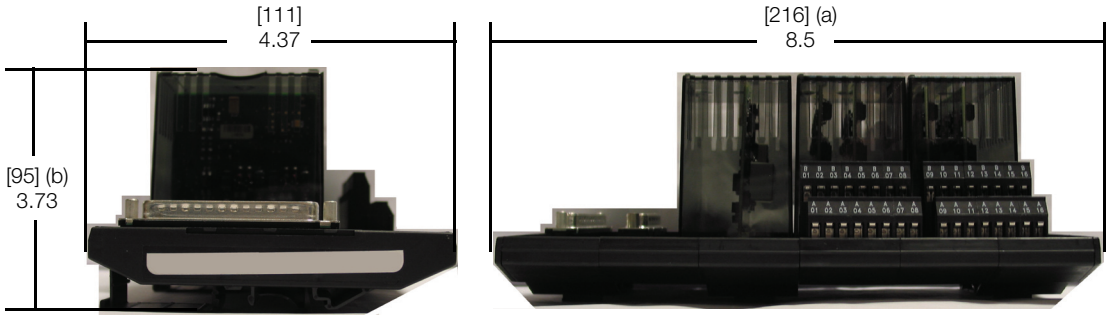
(a) Overall width – for determining DIN rail loading.
(b) Height above DIN rail (add to DIN rail height for total).

DIMENSIONS – NOMINAL (CONTINUED)

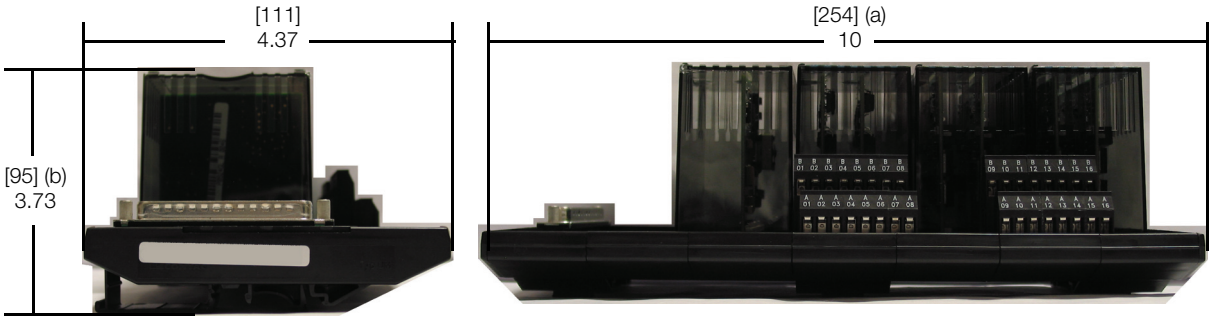
[mm]
in

Compression Termination Assemblies

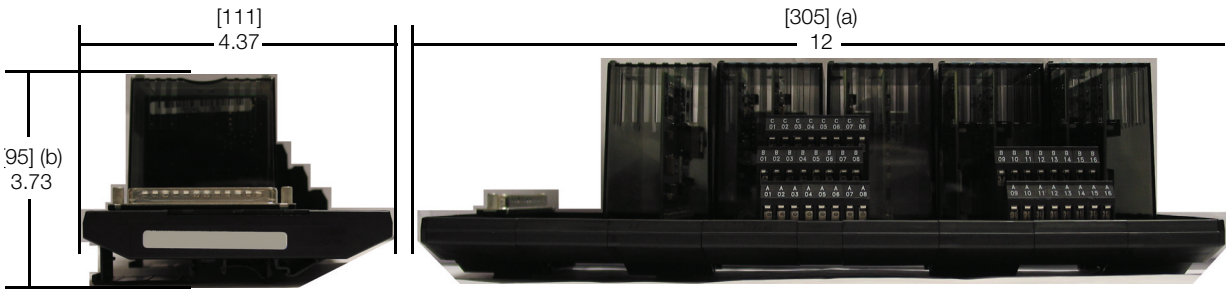
P0924HP



P0924HX/P0924HY/P0924HZ



P0924JB



(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

Part Number
P0165CL

Description
SPDT, plug-in, field replaceable

Maximum Rated Load(3)(4)

dc RESISTIVE
5 A at 30 V dc, 0.6A @ 125 V dc

dc INDUCTIVE (L/R = 7 MS)
5 A at 30 V dc, 0.4 @ 125 V dc

ac RESISTIVE
5 A at 240 V ac

ac INDUCTIVE (P.F. = 0.4)
5 A at 240 V ac

Carry Current (3)
5 A

Maximum Operating Voltage(3)
240 V ac, 125 V dc(4)

Maximum Operating Current (3)
5 A

Maximum Switching Capacity (3)
1200 VA, 150 W

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)

Response Time

OPERATE
15 ms maximum

RELEASE

ac
10 ms maximum

dc
5 ms maximum

RELATED PRODUCT SPECIFICATION SHEETS (PSS)

PSS Number	Description
PSS 21H-2W1 B3	DIN Rail Mounted FBM Subsystem Overview
PSS 21H-2W1 B4	100 Series Fieldbus Module Upgrade Subsystem Overview
PSS 21H-2W2 B3	DIN Rail Mounted FBM Equipment, Agency Certification
PSS 21H-2W4 B4	Termination Assembly Adapter Modules for 100 Series Upgrade
PSS 21H-2W6 B4	DIN Rail Mounted Modular Baseplates
PSS 21H-2W8 B4	100 Series Conversion Mounting Structures
PSS 21S-3B2 B3	Control Processor 270 (CP270) Integrated Control Software

(3) The manufacturer's rated load is derated; the Termination Assembly maximum rated load is 5 A at 240 V ac/5 A at 30 V dc per channel, or 12 A maximum per group of eight outputs.

(4) The relay load must be derated at the higher dc voltages. Refer to the "5 A Relay (P0165CL)" section in *DIN Rail Mounted Subsystem User's Guide* (B0400FA) for a graph illustrating the maximum switching capacity of the 5 A relays used in the termination assemblies.

Invensys Operations Management
5601 Granite Parkway Suite 1000
Plano, TX 75024
United States of America
http://iom.invensys.com

Global Customer Support
Inside U.S.: 1-866-746-6477
Outside U.S.: 1-508-549-2424 or contact your local Invensys representative.
Website: http://support.ips.invensys.com