# Foxboro Evo™ Process Automation System

## Product Specifications

Foxboro by Schneider Electric

PSS 31H-2Z41

## FBM241/b/c/d Discrete I/O Modules


*The FBM241 contains eight discrete inputs and eight discrete outputs that are compatible with voltages and currents commonly found in industrial plants.*

### OVERVIEW

The Channel Isolated, Discrete I/O Modules (FBM241/b/c/d) have eight discrete input channels and eight discrete output channels. Associated termination assemblies (TAs) support discrete input or output signals at voltages of under 60 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 is available in four distinct types and each type with its associated TA supports the following discrete inputs and outputs:

| FBM | Inputs | Outputs |
|---|---|---|
| FBM241 | 15 to 60 V dc, 125 V dc, 120 V ac, or 240 V ac Switch (external or internal power source) | 15 to 60 V dc at 2 A, or 30 V dc at 5 A, or 125 V dc at 0.5 A, or 120 V ac at 5 A, or 240 V ac at 5 A Switch (external or internal power source) |
| FBM241b | 15 to 60 V dc Switch | 12 V dc at 12 mA Switch (internal power source) |
| FBM241c | 15 to 60 V dc Contact (unprotected - no fuse, or protected - fused) | 15 to 60 V dc at 2 A, or 240 V ac at 5 A Switch (external or internal power source) |
| FBM241d | 15 to 60 V dc Contact | 12 V dc at 12 mA Switch (internal power source) |

Each type of FBM, without signal conditioning, uses a 15 to 60 V dc input or output signal. Each discrete input and output is galvanically isolated from other channels and ground. When used with external excitation, each discrete input and output is group isolated.

The module performs signal conversion required to interface electrical input signals from field sensors to the optionally redundant Fieldbus. It 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. If the Momentary Output configuration is selected, then Pulse Output Interval is also configurable.

## FEATURES

Key features of the FBM241/b/c/d modules are:

- Eight discrete inputs
- Eight discrete outputs
- Supports discrete inputs/output signals at voltages of:
  - 15 to 60 V dc
  - 120 V ac/125 V dc
  - 240 V ac
- Each input and 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
  - Relay outputs with internal or external power source and fusing
  - Solid state outputs.

## 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 FBM241 accepts communication from either path (A or B) of the redundant 2 Mbps Fieldbus - should one path fail or be switched at the system level, the module continues communication over the active path.

## 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.

## 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 FBM241/b/c/d are described in “5 A at up to 120 V ac (see “GENERAL PURPOSE PLUG-IN RELAY TERMINATION ASSEMBLY SPECIFICATIONS” on page 22)” on page 8.

## FUNCTIONAL SPECIFICATIONS

### Input/Output Channels
8 input and 8 output isolated channels

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

### Voltage Monitor Function (FBM241 and FBM241b)

**INPUT**

*On-State Voltage*
15 to 60 V dc
*Off-State Voltage*
0 to 5 V dc
*Current*
1.4 mA (typical) at 5 to 60 V dc

**SOURCE RESISTANCE LIMITS**

*On-State*
1 k Ω (maximum) at 15 V dc
*Off-State*
100 k Ω (minimum) at 60 V dc

### Contact Sensor Function (FBM241c and FBM241d)

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

**OPEN-CIRCUIT VOLTAGE**
24 V dc ±15%

**SHORT-CIRCUIT CURRENT**
2.5 mA (maximum)

**ON-STATE RESISTANCE**
1.0 k Ω (maximum)

**OFF-STATE RESISTANCE**
100 k Ω (minimum)

### Output Switch with External Source (FBM241 and FBM241c)

**APPLIED VOLTAGE**
60 V dc (maximum)

**LOAD CURRENT**
2.0 A (maximum)

**OFF-STATE LEAKAGE CURRENT**
0.1 mA (maximum)

### Output Switch with Internal Source (FBM241b and FBM241d)

**OUTPUT VOLTAGE (NO LOAD)**
12 V dc ±20%

**SOURCE RESISTANCE**
680 Ω (nominal)

**SHORTED OUTPUT (ON-STATE) DURATION**
Indefinite

**OFF-STATE LEAKAGE CURRENT**
0.1 mA (maximum)

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

### 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. Channels are group isolated when used with external excitation.

**CAUTION**

This does not imply that these channels are intended for permanent connection to voltages of these levels. Exceeding the limits for external 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 HDLC module Fieldbus

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

## FUNCTIONAL SPECIFICATIONS (CONTINUED)

### 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.
Resistor limited (680 Ω) for outputs with internal power.

### Field Terminations Functional Specifications

Refer to "5 A at up to 120 V ac (see "GENERAL PURPOSE PLUG-IN RELAY TERMINATION ASSEMBLY SPECIFICATIONS" on page 22)" on page 8

### Calibration Requirements

Calibration of the modules and TA is not required.

### 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

**ELECTROMAGNETIC COMPATIBILITY (EMC) (CONT.)**

*IEC 61000-4-6 Immunity to Conducted Disturbances induced by Radio-frequency Fields*
10 V (rms) at 150 kHz to 80 MHz on I/O, V dc power and communication lines

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

**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 communication circuits for Class I, Groups A-D hazardous locations when connected to specified Foxboro Evo™ processor modules as described in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA). Communications circuits also meet the requirements for Class 2 as defined in Article 725 of the National Electrical Code (NFPA No.70) and Section 16 of the Canadian Electrical Code (CSA C22.1). Conditions for use are as specified in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA).

*European Low Voltage Directive 2006/95/EC and Explosive Atmospheres (ATEX) directive 94/9/EC*
CENELEC (DEMKO) certified for use in CENELEC certified 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 *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA).

## FUNCTIONAL SPECIFICATIONS (CONTINUED)

**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 ordinary locations and compliant with UL 3121, First Edition, and Canadian Standard, C22.2 No.1010.1-92 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 73/23/EEC*
Certified for use in ordinary locations and compliant with IEC 61010 when connected as described in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA)

## ENVIRONMENTAL SPECIFICATIONS(2)

### Operating

**TEMPERATURE**

*FBM240/b/c/d*
-20 to + 70°C (-4 to +158°F)

*Termination Assembly*
PVC
-20 to +50°C (-4 to 122°F)
PA
-20 to +70°C (-4 to +158°F)

**RELATIVE HUMIDITY**
5 to 95% (noncondensing)

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

### Storage

**TEMPERATURE**
-40 to +70°C (-40 to +158°F)

**RELATIVE HUMIDITY**
5 to 95% (noncondensing)

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

### Contamination

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

### Vibration

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

(2) The environmental 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

**MODULE**

FBM241/241b/241c/241d mounts on a Modular Baseplate. The baseplate can be mounted on a DIN rail (horizontally or vertically), or horizontally on a 19-inch rack using a mounting kit. Refer to PSS 31H-2SBASEPLT 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)
181 mm (7.13 in) – 300 g (0.70 lb, approximate)

**TERMINATION ASSEMBLY - RING LUG OR KNIFE SWITCH**

181 mm (7.13 in) – 363 g (0.80 lb, approximate)
198 mm (7.78 in) – 400 g (0.90 lb, approximate)
251 mm (9.88 in) – 454 g (1.0 lb, approximate)
286 mm (11.25 in) – 908 g (2.0 lb, approximate)

### Part Numbers

**MODULES**

*FBM241*
P0914TG
*FBM241b*
P0914WK
*FBM241c*
P0914WM
*FBM241d*
P0914WP

**TERMINATION ASSEMBLIES**

Refer to “FUNCTIONAL SPECIFICATIONS - TERMINATION ASSEMBLIES” on page 10.

### 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 18.

**RING LUG AND KNIFE SWITCH**

Refer to page 20.

### 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 2.

**CABLE CONNECTION**

37-pin male D-subminiature

### Construction - Termination Assembly

**MATERIAL**

Polypropylene (PVC), compression
PVC, ring lug
Polyamide (PA), ring lug
PVC, knife terminal

**FAMILY GROUP COLOR**

Dark blue - discrete

**TERMINAL BLOCKS**

Inputs - 2 tiers, 8 positions
Outputs- 2 tiers, 8 positions or 3 tiers, 8 positions
Excitation - 2 tiers, 2 positions
Power Distribution - 2 tiers, 2 positions

## PHYSICAL SPECIFICATIONS (CONTINUED)

### 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 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 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 enclosure or in an adjacent enclosure. Refer to “FUNCTIONAL SPECIFICATIONS - TERMINATION ASSEMBLIES” on page 10 for termination cable part numbers and specifications.

### Discrete Inputs

Termination assemblies with discrete inputs support eight 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 my 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 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, 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.

These 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 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. 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 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 and 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.

The 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.

## FUNCTIONAL SPECIFICATIONS - TERMINATION ASSEMBLIES

| FBM Type | Input Signal | Output Signal[a] | TA Part Number[b] | | Term. Type [c] | TA Cable Type[d] | TA Cert. Type[e] |
|---|---|---|---|---|---|---|---|
| | | | PVC | PA | | | |
| FBM241 | 8 channel, voltage monitor<br>15 to 60 V dc<br>FBM241 channel isolation | 8 channel, switch (externally sourced)<br><60 V dc at 2 A maximum, unprotected - no fuse<br>FBM241 channel isolation | P0916UY<br>P0916UZ | | C<br>RL | 4, 4H | 1,2 |
| FBM241 | 8 channel, voltage monitor<br>15 to 60 V dc<br>FBM241 channel isolation | 8 channel, switch (externally sourced)<br>15 to 60 V dc at 2 A maximum (protected - fused)<br>FBM241 channel isolation | P0916AQ | None/<br>P0916AR | C<br>RL | 4, 4H | 1,2 |
| FBM241 | 8 channel, voltage monitor<br>15 to 60 V dc<br>FBM241 channel isolation | 8 channel, switch (externally sourced)<br>SPDT (Form C) Relays<br><30 V dc at 5 A maximum,<br>Up to 250 V ac at 5 A maximum<br>Total current for all 8 channels simultaneously is 12 A maximum<br>Channel Isolation provided by termination assembly | P0916QE<br>P0916QF | | C<br>RL | 4 | 3 |
| FBM241 | 8 channel, contact sense<br>125 V ac or 125 V dc with external excitation<br>Logic Zero 0 to 20 V ac; 0 to 20 V dc<br>Logic One 80 to 132 V ac; 75 to 150 V dc<br>Input Current for Logic One; 2 mA (typical)<br>Group isolation provided by termination assembly | 8 channel, switch (externally sourced)<br>SPDT (Form C) Relays<br><30 V dc at 5 A maximum<br>Up to 250 V ac at 5 A maximum<br>Total current for all 8 channels simultaneously is 12 A maximum<br>Group isolation provided by termination assembly | P0916QV[f]<br>P0916QW | | C<br>RL | 4 | 5 |

## FUNCTIONAL SPECIFICATIONS - TERMINATION ASSEMBLIES (CONTINUED)

| FBM Type | Input Signal | Output Signal[a] | TA Part Number[b] | | Term. Type [c] | TA Cable Type[d] | TA Cert. Type[e] |
|---|---|---|---|---|---|---|---|
| | | | PVC | PA | | | |
| FBM241 | 8 channel, voltage monitor<br>125 V ac or 125 V dc<br>Logic Zero 0 to 20 V ac; 0 to 20 V dc<br>Logic One 80 to 132 V ac; 75 to 150 V dc<br>Input Current for Logic One; 2 mA (typical)<br>Channel isolation provided by termination assembly | 8 channel, switch (externally sourced)<br>SPDT (Form C) Relays<br><30 V dc at 5 A maximum<br>Up to 250 V ac at 5 A maximum<br>Total current for all 8 channels simultaneously is 12 A maximum<br>Channel isolation provided by termination assembly | P0916AS[f]<br>P0916AT | P0916YH | C<br>RL | 4 | 5 |
| FBM241 | 8 channel, voltage monitor<br>125 V ac or 125 V dc<br>Logic Zero 0 to 20 V ac; 0 to 20 V dc<br>Logic One 80 to 132 V ac; 75 to 150 V dc<br>Input Current for Logic One; 2 mA (typical)<br>Channel isolation provided by termination assembly | 8 channel, switch (externally sourced) with power distribution<br>SPDT (Form C) Relays<br><30 V dc at 5 A maximum<br>Up to 250 V ac at 5 A maximum<br>Total current for all 8 channels simultaneously is 12 A maximum<br>Group isolation provided by termination assembly | P0916QG<br>P0916QH | | C<br>RL | 4 | 5 |
| FBM241 | 8 channel, contact sense<br>125 V ac or 125 V dc with external excitation<br>Logic Zero 0 to 20 V ac; 0 to 20 V dc<br>Logic One 80 to 132 V ac; 75 to 150 V dc<br>Input Current for Logic One; 2 mA (typical)<br>Group isolation provided by termination assembly | 8 channel, switch (externally sourced)<br>SPDT (Form C) Relays<br><30 V dc at 5 A maximum<br>Up to 250 V ac at 5 A maximum<br>Total current for all 8 channels simultaneously is 12 A maximum<br>Channel isolation provided by termination assembly | P0916QT<br>P0916QU | | C<br>RL | 4 | 5 |

## FUNCTIONAL SPECIFICATIONS - TERMINATION ASSEMBLIES (CONTINUED)

| FBM Type | Input Signal | Output Signal[a] | TA Part Number[b] | | Term. Type [c] | TA Cable Type[d] | TA Cert. Type[e] |
|---|---|---|---|---|---|---|---|
| | | | PVC | PA | | | |
| FBM241 | 8 channel, voltage monitor<br>120 V ac or 125 V dc with external excitation<br>Logic Zero 0 to 20 V ac; 0 to 20 V dc<br>Logic One 80 to 132 V ac; 75 to 150 V dc<br>Input Current for Logic One; 2 mA (typical)<br>Channel isolation provided by termination assembly | 8 channel, switch (externally sourced)<br>Solid State Switch<br>125 V ac/125V dc at 2 A maximum<br>Channel isolation provided by termination assembly | P0917MX | | C/ Knife | 4 | 5 |
| FBM241 | 8 channel, voltage monitor<br>120 V ac or 125 V dc with external excitation<br>Logic Zero 0 to 20 V ac; 0 to 20 V dc<br>Logic One 80 to 132 V ac; 75 to 150 V dc<br>Input Current for Logic One; 2 mA (typical)<br>Channel isolation provided by termination assembly | 8 channel, switch (externally sourced)<br>SPDT (Form C) Relays<br><30 V dc at 2 A maximum<br>Up to 250 V ac at 2 A maximum<br>Total current for all 8 channels simultaneously is 12 A maximum<br>Channel isolation provided by termination assembly relay P0165CL.<br>The max current rating is 2 A due to a fuse in each channel. | P0926DS | | Knife | 4 | 5 |

## FUNCTIONAL SPECIFICATIONS - TERMINATION ASSEMBLIES (CONTINUED)

| FBM Type | Input Signal | Output Signal[a] | TA Part Number[b] | | Term. Type [c] | TA Cable Type[d] | TA Cert. Type[e] |
|---|---|---|---|---|---|---|---|
| | | | PVC | PA | | | |
| FBM241 | 8 channel, contact sense 240 V ac with external excitation<br>Logic Zero 0 to 40 V ac<br>Logic One 160 to 280 V ac<br>Input Current for Logic One; 1.6 mA maximum<br>Group isolation provided by termination assembly | 8 channel, switch (externally sourced) SPDT (Form C) Relays <30 V dc at 5 A maximum<br>Up to 250 V ac at 5 A maximum<br>Total current for all 8 channels simultaneously is 12 A maximum<br>Channel isolation provided by termination assembly | P0916QX<br>P0916QY | | C<br>RL | 4 | 5 |
| FBM241 | 8 channel, contact sense 240 V ac with external excitation<br>Logic Zero 0 to 40 V ac<br>Logic One 160 to 280 V ac<br>Input Current for Logic One; 1.6 mA maximum<br>Group isolation provided by termination assembly | Externally sourced) with power distribution SPDT (Form C) Relays <30 V dc at 5 A maximum<br>Up to 250 V ac at 5 A maximum<br>Total current for all 8 channels simultaneously is 12 A maximum<br>Group isolation provided by termination assembly | P0916QZ<br>P0916NZ | | C<br>RL | 4 | 5 |
| FBM241 | 8 channel, voltage monitor<br>240 V ac<br>Logic Zero 0 to 40 V ac<br>Logic One 160 to 280 V ac<br>Input Current for Logic One; 1.6 mA maximum<br>Channel isolation provided by termination assembly | 8 channel, switch (externally sourced) SPDT (Form C) Relays <30 V dc at 5 A maximum<br>Up to 250 V ac at 5 A maximum<br>Total current for all 8 channels simultaneously is 12 A maximum<br>Channel isolation provided by termination assembly | P0916QJ<br>P0916QK | | C<br>RL | 4 | 5 |

## FUNCTIONAL SPECIFICATIONS - TERMINATION ASSEMBLIES (CONTINUED)

| FBM Type | Input Signal | Output Signal[a] | TA Part Number[b] | | Term. Type [c] | TA Cable Type[d] | TA Cert. Type[e] |
|---|---|---|---|---|---|---|---|
| | | | PVC | PA | | | |
| FBM241 | 8 channel, voltage monitor<br>240 V ac<br>Logic Zero 0 to 40 V ac<br>Logic One 160 to 280 V ac<br>Input Current for Logic One; 1.6 mA maximum<br>Channel isolation provided by termination assembly | 8 channel, switch (externally sourced) with power distribution<br>SPDT (Form C) Relays<br><30 V dc at 5 A maximum<br>Up to 250 V ac at 5 A maximum<br>Total current for all 8 channels simultaneously is 12 A maximum<br>Group isolation provided by termination assembly | P0916QL<br>P0916QM | | C<br>RL | 4 | 5 |
| FBM241b | 8 channel, voltage monitor<br>15 to 60 V dc<br>FBM241b channel isolation | 8 channel, switch (internally [FBM] sourced)<br>12 V dc at 15 mA maximum<br>FBM241b channel isolation | P0916JV<br>P0916QN | | C<br>RL | 4 | 1, 2 |
| FBM241c | 8 channel, contact sense<br>24 V dc contact wetting from FBM241c<br>FBM241c channel isolation | 8 channel, switch (externally sourced)<br>15 to 60 V dc at 2 A maximum, protected - fused<br>FBM241c channel isolation | P0916JW<br>P0916QP | | C<br>RL | 4 | 1, 2 |
| FBM241c | 8 channel, contact sense<br>24 V dc contact wetting from FBM241c<br>FBM241c channel isolation | 8 channel, switch (externally sourced)<br><60 V dc at 2 A maximum, unprotected - no fuse<br>FBM241c channel isolation | P0916UD<br>P0916SS | | C<br>RL | 4, 4H | 1, 2 |

## FUNCTIONAL SPECIFICATIONS - TERMINATION ASSEMBLIES (CONTINUED)

| FBM Type | Input Signal | Output Signal[a] | TA Part Number[b] | | Term. Type [c] | TA Cable Type[d] | TA Cert. Type[e] |
|---|---|---|---|---|---|---|---|
| | | | PVC | PA | | | |
| FBM241c | 8 channel, contact sense 24 V dc contact wetting from FBM241c FBM241c channel isolation | 8 channel, switch (externally sourced) SPDT (Form C) Relays <30 V dc at 5 A maximum Up to 250 V ac at 5 A maximum Total current for all 8 channels simultaneously is 12 A maximum Channel isolation provided by termination assembly | P0916AW P0916AX | P0917KY RL TA | C RL | 4 | 3 |
| FBM241c | 8 channel, contact sense 24 V dc contact wetting from FBM241c FBM241c channel isolation | 8 channel, switch (externally sourced) SPDT (Form C) Relays <30 V dc at 5 A maximum Up to 250 V ac at 5 A maximum Total current for all 8 channels simultaneously is 12 A maximum Group isolation provided by termination assembly | P0916QQ P0916QR | | C RL | 4 | 1, 2 |
| FBM241d | 8 channel, contact sense 24 V dc contact wetting from FBM241d FBM241d channel isolation | 8 channel, switch (internally sourced) 12 V dc at 15 mA maximum FBM241d channel isolation | P0916JX P0916QS | P0916YW P0917LA | C RL | 4 | 1, 2 |

(a) 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 (polyvinyl chloride) termination assemblies rated from -20 to +50°C (-4 to 122°F); PA (polyamide) termination assemblies 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 and specifications.

(e) See Table 1Termination Assembly certification definitions.

Note: For 120Vac / 240Vac input channel applications, a maximum cable length of 61 m (200 ft) is recommended, in order to minimize customer plant stray physical capacitance, and coupling/ leakage current from possibly effecting channel currents. Additional details are provided in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA).

(f) The 120 V ac/125 V dc termination assemblies (P0916AS and P0916QV) incorporate an improved circuit design. The improved design will operate reliably at distances up to 305 m (1000 ft) when wired with individually twisted or parallel pair wiring. 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).

### 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 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 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. |
| Type 3 | Same as Type 2 above except that only input circuits are non-incendive/Class 2. |
| 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] |
|---|---|---|---|
| 0.5 (1.6) | P0916FG | - | P0928BA |
| 1.0 (3.2) | P0916FH | - | P0928BB |
| 2.0 (6.6) | P0931RQ | - | P0928BC |
| 3.0 (9.8) | P0916FJ | - | P0928BD |
| 5.0 (16.4) | P0916FK | - | P0928BE |
| 10.0 (32.8) | P0916FL | P0916GE | P0928BF |
| 15.0 (49.2) | P0916FM | P0916GF | P0928BG |
| 20.0 (65.6) | P0916FN | P0916GG | P0928BH |
| 25.0 (82.0) | P0916FP | P0916GH | P0928BJ |
| 30.0 (98.4) | P0916FQ | P0916GJ | P0928BK |

(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.

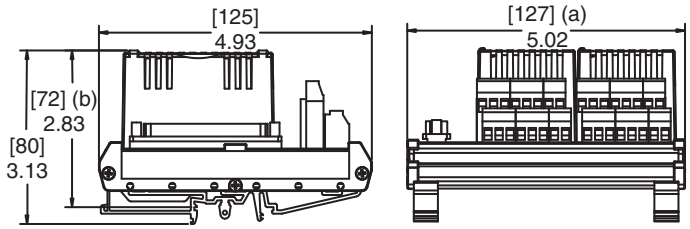
(c) Low smoke zero halogen or low smoke free of halogen (LSZH) is a material classification used for cable jacketing. LSZH is composed of thermoplastic or thermoset compounds that emit limited smoke and no halogen when exposed to high sources of heat. Temperature range: -40 to +105°C (-40 to +221°F).

## DIMENSIONS – NOMINAL

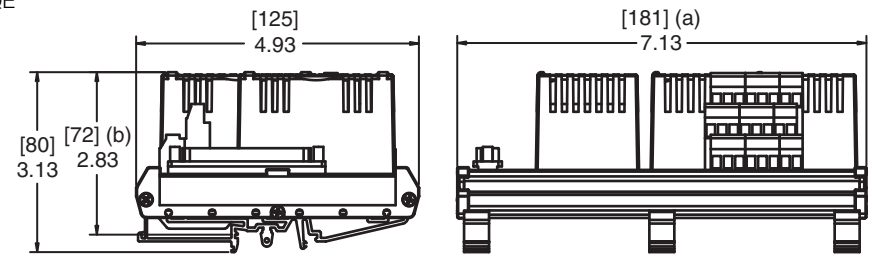
[mm]
in

Compression Termination Assemblies

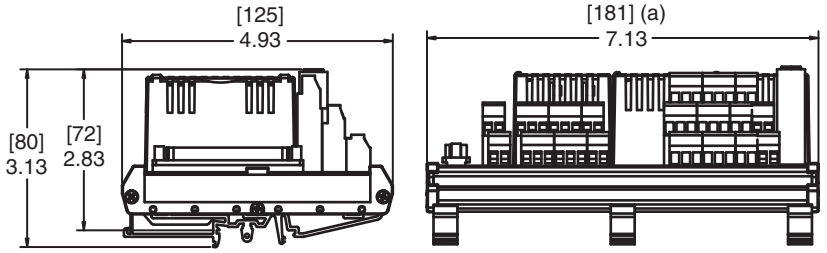
P0916UY, P0916AQ, P0916JV, P0916JW, P0916UD, P0916JX, P0916YW1



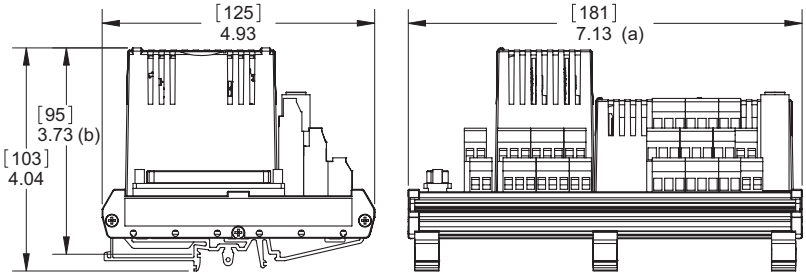

P0916QE




P0916QZ




P0916QV




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

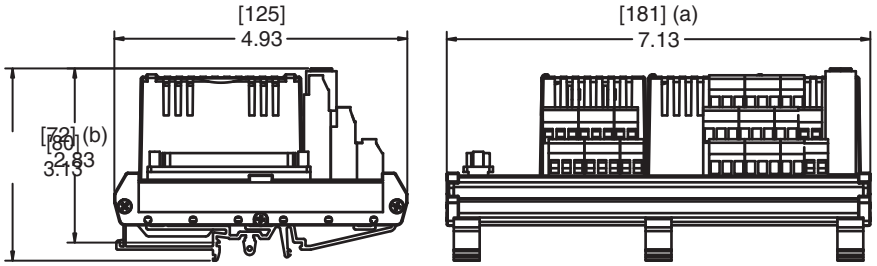
NOTE: Dimensions shown are for the PVC versions. All dimensions for this polyamide termination assembly are smaller.

## DIMENSIONS – NOMINAL (CONTINUED)

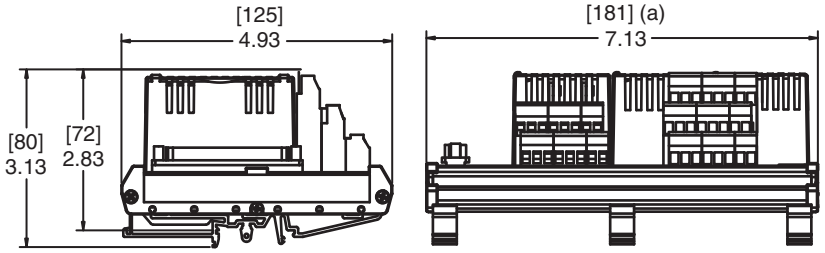
[mm]
in

Compression Termination Assemblies (Continued)

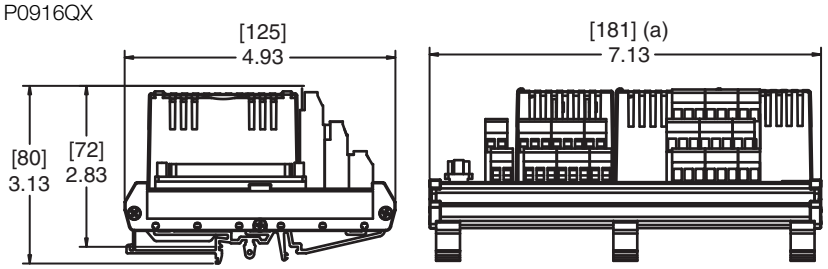
P0916QG, P0916QL, P0916QQ



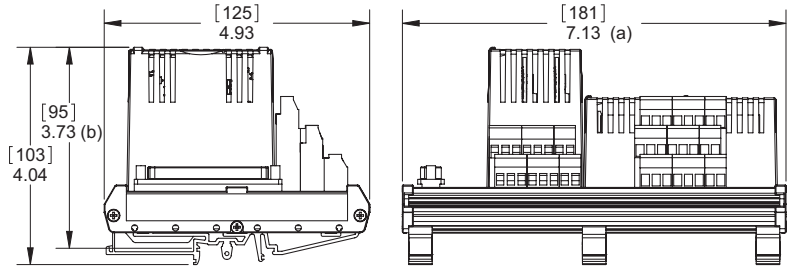

P0916AW, P0916YH1, P0916QJ




P0916QT, P0916QX




P0916AS




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

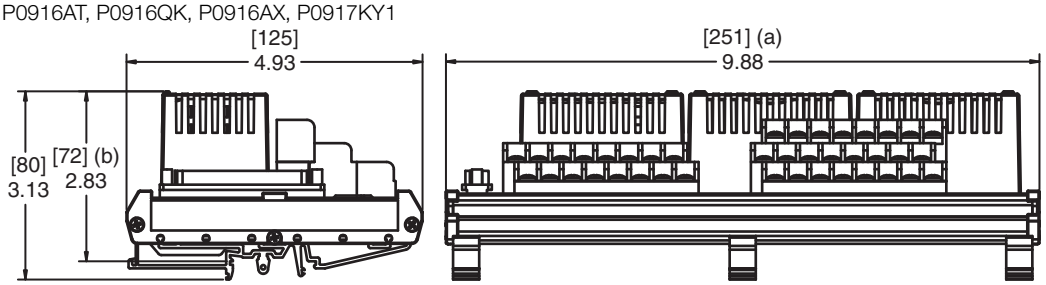
NOTE: Dimensions shown are for the PVC versions. All dimensions for this polyamide termination assembly are smaller.

## DIMENSIONS – NOMINAL (CONTINUED)

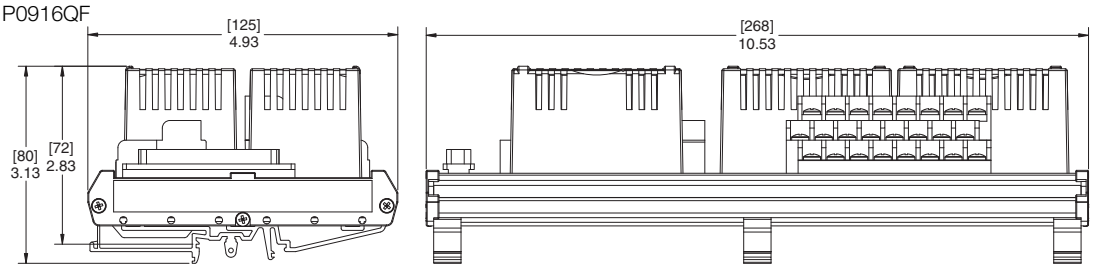
[mm]
in

RIng Lug and Knife Switch Termination Assemblies

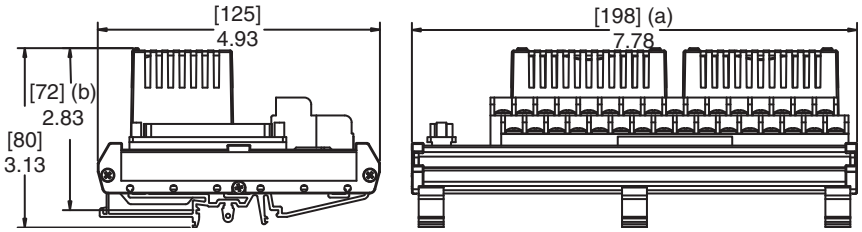
P0916AT, P0916QK, P0916AX, P0917KY1



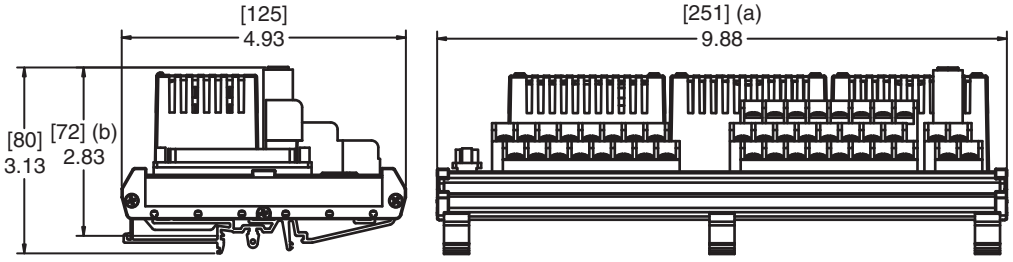

P0916QF




P0916UZ, P0916AR, P0916QN, P0916QP, P0916SS, P0916QS, P0917LA1




P0916QH, P0916QM, P0916QR




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

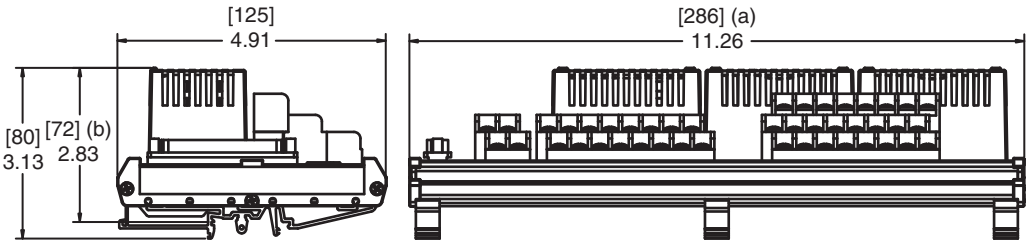
NOTE: Dimensions shown are for the PVC versions. All dimensions for this polyamide termination assembly are smaller.

## DIMENSIONS – NOMINAL (CONTINUED)

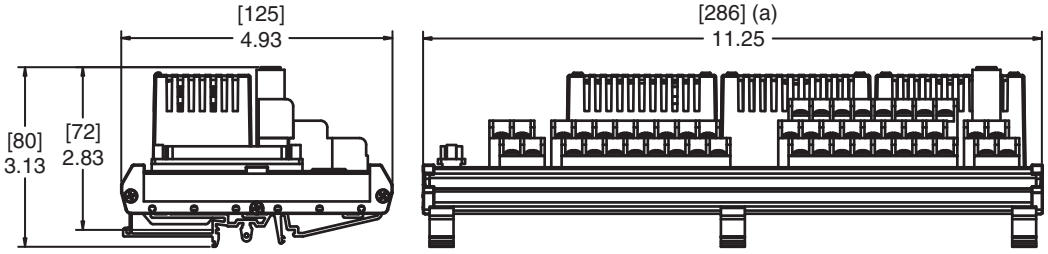
[mm]
in

RIng Lug and Knife Switch Termination Assemblies (Continued)

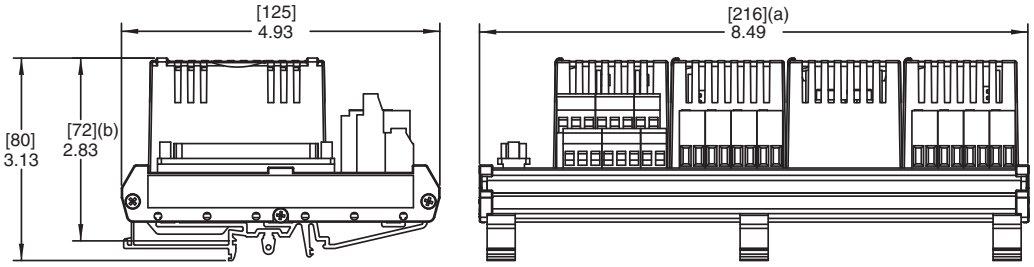
P0916QU, P0916QY



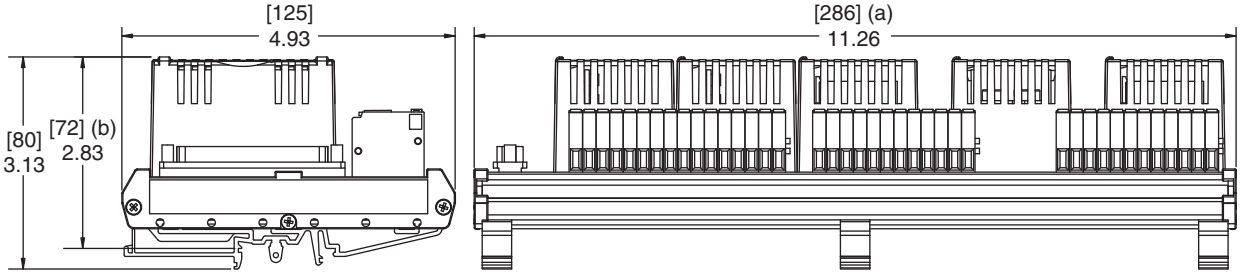

P0916QW, P0916NZ




P0917MX




P0926DS




(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

**Rated Load(3)**

**dc RESISTIVE**
5 A at 30 V dc

**dc INDUCTIVE (L/R = 7 MS)**
5 A at 30 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, 30 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 X$10^3$ (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 31H-2S200 | Standard 200 Series Subsystem Overview |
| PSS 31H-2CERTS | Standard and Compact 200 Series I/O - Agency Certifications |
| PSS 21S-3CP270ICS | 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 higher dc voltages.

Foxboro®

by Schneider Electric

Invensys Systems, Inc
10900 Equity Drive
Houston, TX 77041
United States of America
http://www.invensys.com

Global Customer Support
Inside U.S.: 1-866-746-6477
Outside U.S.: 1-508-549-2424
Website: https://support.ips.invensys.com



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