

**Compact FBM239, Digital 16DI/16DO Module**



*The Compact FBM239 contains 16 discrete input and 16 discrete output channels that are compatible with voltages and currents commonly found in industrial plants. An external power supply is used to energize the field circuits.*

**OVERVIEW**

The Compact FBM239 Discrete 16DI/16DO Module provides 16 digital inputs with sixteen digital output channels. Associated Termination Assemblies (TAs) provide for discrete nominal inputs of 30 V dc, 60 V dc, 120 V ac/125 V dc or 240 V ac and nominal outputs of 60 V dc, 120 V ac/125 V dc or 240 V ac. The module performs signal conversion required to interface the electrical input signals from the field sensors to the Module Fieldbus.

Depending on the type of I/O signal required, the TAs support current limiting devices, high voltage attenuation circuits, optical isolation and external power source connections.

## FEATURES

Key features of the Compact FBM239 are:

- ▶ Sixteen digital input channels, used for either contact sensing, or dc voltage monitoring
- ▶ Sixteen digital output channels, used for either dc output switching with an external source (e.g. to control powering of various external loads), or dc output switching with an internal source only (e.g. to power external solid state relays or other similar devices)
- ▶ Compact, rugged design suitable for enclosure in Class G3 (harsh) environments
- ▶ Supports discrete input signals at voltages of:
  - 30 V dc/60 V dc
  - 120 V ac/125 V dc
  - 240 V ac
- ▶ Supports output switching at voltages of:
  - 60 V dc
  - 120 V ac/125 V dc
  - 240 V ac
- ▶ Executes the programs for Digital I/O (ECB5), and Ladder Logic (ECB8)
- ▶ Various Termination Assemblies (TAs) provide for per-channel isolation and contain:
  - High voltage attenuation and optical isolation for inputs
  - External power connection for device excitation
  - Output current limiting.

## COMPACT DESIGN

The Compact FBM239's design is narrower than the standard 200 Series FBMs. It has a rugged Acrylonitrile Butadiene Styrene (ABS) exterior for physical protection of the circuits. Enclosures specially designed for mounting the FBMs provide various levels of environmental protection, up to harsh environments, 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/output points.

## EASY REMOVAL/REPLACEMENT

The modules mount on a Compact 200 Series baseplate. Two screws on the FBM secure each module to the 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 2 Mbps module Fieldbus used by the FBMs. The Compact FBM239 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.

## FIELD I/O SIGNALS

Field I/O signals connect to the FBM subsystem via DIN rail mounted TA. The TAs used with the FBM239 are described in "TERMINATION ASSEMBLIES AND CABLES" on page 7.

## FUNCTIONAL SPECIFICATIONS

### Input/Output Channels

16 group isolated digital input channels and 16 group isolated digital output channels

### Filter/Debounce Time

Configurable (No Filtering, 4, 8, 16 or 32 ms)

### Voltage Monitor (Compact FBM239 with feed through TA RH924VJ)

#### INPUT

30 V dc maximum applied voltage

#### ON-STATE VOLTAGE

15 to 30 V dc

#### OFF-STATE VOLTAGE

0 to 5 V dc

#### CURRENT INPUT FOR ON-STATE

2.3 mA maximum at 30 V dc

#### SOURCE RESISTANCE LIMITS

##### ON-STATE

1 k  $\Omega$  (maximum) at 15 V dc

##### OFF-STATE

100 k  $\Omega$  (minimum) at 30 V dc

### Contact Sense (Compact FBM239 with feed through TA RH924VM)

#### CONTACT SUPPLY

24 V dc nominal (supplied by FBM through the TA)

#### CONTACT CURRENT

1.8 mA dc nominal

#### SOURCE RESISTANCE LIMITS

##### ON-STATE

1 k  $\Omega$  (maximum) at 15 V dc

##### OFF-STATE

100 k  $\Omega$  (minimum) at 30 V dc

### Output (Compact FBM239 with feed through TAs RH924VJ or RH924VM)

#### APPLIED VOLTAGE (EXTERNAL)

60 V dc maximum

#### LOAD CURRENT

0.24 A dc maximum per channel

2.0 A dc maximum per TA

#### INDUCTIVE LOADS

Outputs may require a protective diode or MOV connected across the load

### Isolation

Input and output channels are group isolated from each other and earth (ground). For details, refer to the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA). The module/TA withstands, without damage, a potential of 600 V ac applied for one minute between the group isolated channels or between either set of group isolated channels and ground.

### 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

## FUNCTIONAL SPECIFICATIONS (CONTINUED)

### Power Requirements

#### INPUT VOLTAGE RANGE

24 V dc +5%, -10%

#### MODULE CONSUMPTION

2.65 W (maximum) at 24 V dc

#### MODULE HEAT DISSIPATION

5.3 W (maximum) at 2 A total load and all inputs at 30 V dc

### Calibration Requirements

Calibration of the module is not required.

### Regulatory Compliance

#### ELECTROMAGNETIC COMPATIBILITY (EMC)

*European EMC Directive 2014/30/EU*

EN 61326:2013 Class A Emissions and Industrial Immunity levels

#### RoHS COMPLIANCE

Complies with European RoHS Directive 2002/95/EC and Recast RoHS Directive 2011/65/EU.

#### 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.

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 2014/35/EU and Explosive Atmospheres (ATEX) directive 2014/34/EU*

ATEX (DEMKO) Ex nA IIC T4 Gc certified when connected as described in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA). For use in an enclosure suited for an ATEX Zone 2 classified area.

## ENVIRONMENTAL SPECIFICATIONS

### Operating

#### TEMPERATURE

-20 to + 60°C (-4 to +140°F)

#### RELATIVE HUMIDITY

5 to 95% (noncondensing)

#### ALTITUDE

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

### Storage

#### TEMPERATURE

-40 to +85°C (-40 to +185°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<sup>2</sup> (5 to 500 Hz)

## PHYSICAL SPECIFICATIONS

### Mounting

#### MODULE

The Compact FBM239 mounts on a Compact 200 Series 16-slot horizontal baseplate. The baseplate can be mounted on a horizontal DIN rail, or horizontally on a 19-inch rack using a mounting kit.

Refer to *Compact 200 Series 16-Slot Horizontal Baseplate* (PSS 31H-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)

### Weight

#### MODULE

185 g (6.5 oz) approximate

#### TERMINATION ASSEMBLY - COMPRESSION

181 g (0.40 lb) approximate

### Dimensions

#### COMPACT FBM239

##### 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)

#### TERMINATION ASSEMBLIES

Compression Screw - Refer to page 24

### Part Numbers

#### FBM239 MODULE

RH101GK

#### TERMINATION ASSEMBLIES

Refer to "FUNCTIONAL SPECIFICATIONS - Standard TERMINATION ASSEMBLIES" on page 8, "FUNCTIONAL SPECIFICATIONS - Main TERMINATION ASSEMBLIES" on page 9 and "FUNCTIONAL SPECIFICATIONS - Expansion TERMINATION ASSEMBLIES" on page 15.

### 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 - Refer to Table 2

*Main TA to Expansion TA*

Type 6 - Refer to Table 3

#### BASEPLATE TO MAIN TA CABLE CONNECTION

*FBM Baseplate End*

37-pin D-subminiature

*Termination Assembly End*

37-pin D-subminiature

#### MAIN TA TO EXPANSION TA CABLE CONNECTION

*Main TA End*

25-pin D-subminiature

*Expansion TA End*

37-pin D-subminiature

### Construction - Termination Assembly

#### MATERIAL

Polyamide (PA), compression

### Field Termination Connections

#### COMPRESSION - ACCEPTED WIRING SIZES

*Solid/Stranded/AWG*

0.2 to 4 mm<sup>2</sup>/0.2 to 2.5 mm<sup>2</sup>/24 to 12 AWG

*Stranded with Ferrules*

0.2 to 2.5 mm<sup>2</sup> with or without plastic collar

## **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 Compact FBM239 to provide I/O signal connections, signal conditioning, optical isolation from signal surges, and external power connections for field devices 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 "Cable Types and Part Numbers" on page 22 and "Cable Types (Main TA to Expansion TA Cables) and Part Numbers" on page 23 for termination cable part numbers and specifications.

### **Discrete Inputs/Outputs**

Various termination assemblies are available to support the interfacing of field signals to the low level FBM I/O circuits. Active termination assemblies support input/output signal conditioning for the FBM as well as channel isolation. The signal conditioning circuits are located on daughter boards that are mounted under the component covers of the termination assemblies. To condition signals, these termination assemblies provide optical isolation, current limiting, voltage attenuation and optional terminal blocks to connect externally supplied excitation voltage.

## FUNCTIONAL SPECIFICATIONS - STANDARD TERMINATION ASSEMBLIES

| FBM Type       | Input Signal                                                                                                                                                                                                                                                     | Output Signal                                                                                                                                                                                                    | TA Part No. <sup>(a)</sup> | Term. Type <sup>(b)</sup> | BP to TA Cable <sup>(c)</sup> | TA Cert. Type <sup>(d)</sup> |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------|-------------------------------|------------------------------|
|                |                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                  | PA                         |                           |                               |                              |
| Compact FBM239 | 16 channel, Voltage Monitor, external source<br>30 V dc maximum applied voltage<br>Logic Zero – 0 to 5 V dc<br>Logic One – 15 to 30 V dc<br>2.2 mA typical at 30 V dc<br>1 K $\Omega$ Maximum On-state resistance<br>100 K $\Omega$ Minimum Off-state resistance | 16 channel output switch, external source<br>60 V dc maximum voltage<br>0.25 A dc maximum current<br>2.0 A dc maximum current per FBM<br>0.25 mA dc maximum off-state leakage current<br>0.4 A over-current fuse | RH924VJ                    | C                         | 4                             | 1, 2, 4                      |
| Compact FBM239 | 16 channel, Contact Sense, internal source<br>24 V dc nominal open circuit voltage<br>7 mA nominal maximum current<br>2.2 mA typical at 30 V dc<br>1 K $\Omega$ Maximum On-state resistance<br>100 K $\Omega$ Minimum Off-state resistance                       | 16 channel output switch, external source<br>60 V dc maximum voltage<br>0.25 A dc maximum current<br>2.0 A dc maximum current per FBM<br>0.25 mA dc maximum off-state leakage current<br>0.4 A over-current fuse | RH924VM                    | C                         | 4                             | 1, 2, 4                      |

(a) 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) Refer to Table 2 for cable part numbers and specifications.

(d) Refer to Table 1 Termination Assembly certification definitions.

### FUNCTIONAL SPECIFICATIONS - MAIN TERMINATION ASSEMBLIES

| FBM Type       | Input Signal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Output Signal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | TA Part Number    | Termination         | BP to TA Cable      | TA Certification    |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------|---------------------|---------------------|
|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | PA <sup>(a)</sup> | Type <sup>(b)</sup> | Type <sup>(c)</sup> | Type <sup>(d)</sup> |
| Compact FBM239 | <p>When replacing a main FBM09A/B: Voltage Monitor external source<br/>130 V dc Maximum voltage<br/>Logic Zero: 0 to 5 V dc<br/>Logic One: 15 to 130 V dc<br/>2.2 mA typical 5 to 130 V dc<br/>1 K<math>\Omega</math> Maximum On-state resistance<br/>100 K<math>\Omega</math> Minimum Off-state resistance</p> <p>When replacing a main FBM09C/D: Contact sense internal source<br/>24 V dc <math>\pm</math>10%<br/>Open circuit voltage 2.5 mA maximum short circuit current<br/>1 K<math>\Omega</math> Maximum On-state resistance<br/>100 K<math>\Omega</math> Minimum Off-state resistance</p> | <p>When replacing a main FBM09A/C: Output Switch external source<br/>60 V dc Maximum voltage<br/>0.5 V maximum voltage drop @ 0.5 A<br/>0.5 A maximum current<br/>0.75 A current limit<br/>Shorted load duration: indefinite (duty-cycle limited)<br/>1.0 mA maximum off-state leakage</p> <p>When replacing a main FBM09B/D: output switch internal source<br/>11 V dc <math>\pm</math>2 V Open circuit voltage<br/>Source resistance 680 <math>\Omega</math> nominal<br/>Shorted load duration: indefinite<br/>0.5 mA maximum off-state leakage</p> | RH924HE           | C                   | 4                   | 1, 2, 4             |

## FUNCTIONAL SPECIFICATIONS - MAIN TERMINATION ASSEMBLIES (CONTINUED)

| FBM Type       | Input Signal                                                                                                                                                                                                                                                                   | Output Signal                                                                                                                                                                                                                                                                                                                                         | TA Part Number    | Termination         | BP to TA Cable      | TA Certification    |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------|---------------------|---------------------|
|                |                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                       | PA <sup>(a)</sup> | Type <sup>(b)</sup> | Type <sup>(c)</sup> | Type <sup>(d)</sup> |
| Compact FBM239 | When replacing a main FBM10: Voltage Monitor, external source<br>132 V ac Maximum voltage<br>Logic Zero: 0 to 20 V ac<br>Logic One: 79 to 132 V ac<br>2.2 mA typical 20 to 132 V ac<br>1 K $\Omega$ Maximum On-state resistance<br>100 K $\Omega$ Minimum Off-state resistance | When replacing a main FBM10: Output Switch external source<br>132 V ac Maximum voltage<br>0.4 V maximum voltage drop @ 1 A<br>2 A maximum current per channel<br>12 A maximum current per TA<br>3 A current limit<br>24 A surge current limit for 10 msec<br>Shorted load duration: indefinite (duty-cycle limited)<br>3 mA maximum off-state leakage | RH924HG           | C                   | 4                   | 1, 4                |

# FUNCTIONAL SPECIFICATIONS - MAIN TERMINATION ASSEMBLIES (CONTINUED)

| FBM Type       | Input Signal                                                                                                                                                                                                                                                      | Output Signal                                                                                                                                                                                                                                                                                                                                                    | TA Part Number    | Termination         | BP to TA Cable      | TA Certification    |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------|---------------------|---------------------|
|                |                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                  | PA <sup>(a)</sup> | Type <sup>(b)</sup> | Type <sup>(c)</sup> | Type <sup>(d)</sup> |
| Compact FBM239 | When replacing a main FBM11:<br>Voltage Monitor<br>264 V ac Maximum voltage<br>Logic Zero: 0 to 40 V ac<br>Logic One: 164 to 264 V ac<br>2.2 mA typical 40 to 264 V ac<br>1 K $\Omega$ Maximum On-state resistance<br>100 K $\Omega$ Minimum Off-state resistance | When replacing a main FBM11:<br>Output Switch<br>external source<br>264 V ac Maximum voltage<br>0.6 V maximum voltage drop @ 0.5 A<br>1 A maximum current per channel<br>7 A maximum current per TA<br>1.5 A current limit<br>12 A surge current limit for 10 msec<br>Shorted load duration: indefinite (duty-cycle limited)<br>2.5 mA maximum off-state leakage | RH924HJ           | C                   | 4                   | 1                   |

## FUNCTIONAL SPECIFICATIONS - MAIN TERMINATION ASSEMBLIES (CONTINUED)

| FBM Type       | Input Signal                                                                                                                                                                                                                                                                       | Output Signal                                                                                                                                                                                                                                                                                                                                          | TA Part Number    | Termination         | BP to TA Cable      | TA Certification    |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------|---------------------|---------------------|
|                |                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                        | PA <sup>(a)</sup> | Type <sup>(b)</sup> | Type <sup>(c)</sup> | Type <sup>(d)</sup> |
| Compact FBM239 | When replacing a main FBM26A:<br>Voltage Monitor, external source<br>150 V dc Maximum voltage<br>Logic Zero: 0 to 10 V dc<br>Logic One: 33 to 150 V dc<br>2.5 mA typical 10 to 150 V dc<br>1 K $\Omega$ Maximum On-state resistance<br>100 K $\Omega$ Minimum Off-state resistance | When replacing a main FBM26A:<br>Output Switch external source<br>150 V dc Maximum voltage<br>0.4 V maximum voltage drop @ 1 A<br>2 A maximum current per channel<br>12 A maximum current per TA<br>2.3 A current limit<br>20 A surge current limit, 20 ms<br>Shorted load duration: indefinite (duty-cycle limited)<br>2 mA maximum off-state leakage | RH924HU           | C                   | 4                   | 1, 2, 4             |
| Compact FBM239 | When replacing a main FBM26B:<br>Contact Sense internal source<br>48 V dc nominal open circuit voltage<br>2.5 mA $\pm$ 20% short circuit current<br>1 K $\Omega$ Maximum On-state resistance<br>100 K $\Omega$ Minimum Off-state resistance                                        | When replacing a main FBM26B:<br>Output Switch external source<br>150 V dc Maximum voltage<br>0.4 V maximum voltage drop @ 1 A<br>2 A maximum current per channel<br>12 A maximum current per TA<br>2.3 A current limit<br>20 A surge current limit, 20 ms<br>Shorted load duration: indefinite (duty-cycle limited)<br>2 mA maximum off-state leakage | RH924HV           | C                   | 4                   | 1, 2, 4             |

# FUNCTIONAL SPECIFICATIONS - MAIN TERMINATION ASSEMBLIES (CONTINUED)

| FBM Type       | Input Signal                                                                                                                                                                                                                                                                                 | Output Signal                                                                                                                                                                                                                                                                                                                                          | TA Part Number    | Termination         | BP to TA Cable      | TA Certification    |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------|---------------------|---------------------|
|                |                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                        | PA <sup>(a)</sup> | Type <sup>(b)</sup> | Type <sup>(c)</sup> | Type <sup>(d)</sup> |
| Compact FBM239 | When replacing a main FBM26C:<br>Contact Sense external source on channel 1<br>150 V dc Maximum voltage<br>Logic Zero: 0 to 10 V dc<br>Logic One: 33 to 150 V dc<br>2.5 mA typical 10 to 150 V dc<br>1 K $\Omega$ Maximum On-state resistance<br>100 K $\Omega$ Minimum Off-state resistance | When replacing a main FBM26C:<br>Output Switch external source<br>150 V dc Maximum voltage<br>0.4 V maximum voltage drop @ 1 A<br>2 A maximum current per channel<br>12 A maximum current per TA<br>2.3 A current limit<br>20 A surge current limit, 20 ms<br>Shorted load duration: indefinite (duty-cycle limited)<br>2 mA maximum off-state leakage | RH924HW           | C                   | 4                   | 1, 2, 4             |

## FUNCTIONAL SPECIFICATIONS - MAIN TERMINATION ASSEMBLIES (CONTINUED)

| FBM Type       | Input Signal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Output Signal                                                                                                                                                                                                                                                                                                                                         | TA Part Number    | Termination         | BP to TA Cable      | TA Certification    |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------|---------------------|---------------------|
|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                       | PA <sup>(a)</sup> | Type <sup>(b)</sup> | Type <sup>(c)</sup> | Type <sup>(d)</sup> |
| Compact FBM239 | <p>When replacing a main FBM41A:<br/>Voltage Monitor external source<br/>60 V dc Maximum voltage<br/>Logic Zero: 0 to 5 V dc<br/>Logic One: 15 to 60 V dc<br/>6 mA maximum input current<br/>1 K<math>\Omega</math> Maximum On-state resistance<br/>100 K<math>\Omega</math> Minimum Off-state resistance</p> <p>When replacing a main FBM41C:<br/>Contact sense internal source<br/>24 V dc <math>\pm</math>20%<br/>Open circuit voltage<br/>5 mA maximum short circuit current<br/>1 K<math>\Omega</math> Maximum On-state resistance<br/>100 K<math>\Omega</math> Minimum Off-state resistance</p> | <p>When replacing a main FBM41A/C:<br/>Output Switch external source<br/>60 V dc Maximum voltage<br/>0.4 V maximum voltage drop @ 1 A<br/>2.25 A maximum current<br/>12 A maximum current per TA<br/>10 A surge current limit for 20 msec maximum<br/>Shorted load duration: indefinite (duty-cycle limited)<br/>0.5 mA maximum off-state leakage</p> | RH924JA           | C                   | 4                   | 1, 2, 4             |

(a) 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 for cable part numbers and specifications.

(d) See Table 1 for Termination Assembly certification definitions.

## FUNCTIONAL SPECIFICATIONS - EXPANSION TERMINATION ASSEMBLIES

| FBM Type       | Input Signal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Output Signal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | TA Part Number    | Termination         | Main TA to Exp. TA Cable | TA Certification    |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------|--------------------------|---------------------|
|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | PA <sup>(a)</sup> | Type <sup>(b)</sup> | Type <sup>(c)</sup>      | Type <sup>(d)</sup> |
| Compact FBM239 | <p>When replacing an expansion FBM14A/B: 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 K<math>\Omega</math> Maximum On-state resistance 100 K<math>\Omega</math> Minimum Off-state resistance</p> <p>When replacing an expansion FBM14C/D: Contact sense internal source 24 V dc <math>\pm</math>10% Open circuit voltage 2.5 mA maximum short circuit current 1 K<math>\Omega</math> Maximum On-state resistance 100 K<math>\Omega</math> Minimum Off-state resistance</p> | <p>When replacing an expansion FBM14A/C: 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</p> <p>When replacing an expansion FBM14B/D: output switch internal source 11 V dc <math>\pm</math>2 V Open circuit voltage Source resistance 680 <math>\Omega</math> nominal Shorted load duration: indefinite 0.5 mA maximum off-state leakage</p> | RH924HF           | 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 |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------|--------------------------|------------------|
|                |                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                             | PA(a)          | Type(b)     | Type(c)                  | Type(d)          |
| Compact FBM239 | When replacing an expansion FBM15: Voltage Monitor, external source<br>132 V ac Maximum voltage<br>Logic Zero: 0 to 20 V ac<br>Logic One: 79 to 132 V ac<br>2.2 mA typical 20 to 132 V ac<br>1 K $\Omega$ Maximum On-state resistance<br><b>100 K<math>\Omega</math> Minimum Off-state resistance</b> | When replacing an expansion FBM15: Output Switch external source<br>132 V ac Maximum voltage<br>0.4 V maximum voltage drop @ 1 A<br>2 A maximum current per channel<br>12 A maximum current per TA<br>3 A current limit<br>24 A surge current limit for 10 msec<br>Shorted load duration: indefinite (duty-cycle limited)<br>3 mA maximum off-state leakage | RH924HH        | C           | 6                        | 1, 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    |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------|--------------------------|---------------------|
|                |                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                     | PA <sup>(a)</sup> | Type <sup>(b)</sup> | Type <sup>(c)</sup>      | Type <sup>(d)</sup> |
| Compact FBM239 | When replacing an expansion FBM16: Voltage Monitor<br>264 V ac Maximum voltage<br>Logic Zero: 0 to 40 V ac<br>Logic One: 164 to 264 V ac<br>2.2 mA typical 40 to 264 V ac<br>1 K $\Omega$ Maximum On-state resistance<br><b>100 K<math>\Omega</math> Minimum Off-state resistance</b> | When replacing an expansion FBM16: Output Switch<br>external source<br>264 V ac Maximum voltage<br>0.6 V maximum voltage drop @ 0.5 A<br>1 A maximum current per channel<br>7 A maximum current per TA<br>1.5 A current limit<br>12 A surge current limit for 10 msec<br>Shorted load duration: indefinite (duty-cycle limited)<br>2.5 mA maximum off-state leakage | RH924HK           | 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 |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------|--------------------------|------------------|
|                |                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                           | PA(a)          | Type(b)     | Type(c)                  | Type(d)          |
| Compact FBM239 | When replacing an expansion FBM27A: Voltage Monitor, external source<br>150 V dc Maximum voltage<br>Logic Zero: 0 to 10 V dc<br>Logic One: 33 to 150 V dc<br>2.5 mA typical 10 to 150 V dc<br>1 K $\Omega$ Maximum On-state resistance<br><b>100 K<math>\Omega</math> Minimum Off-state resistance</b> | When replacing an expansion FBM27A: Output Switch external source<br>150 V dc Maximum voltage<br>0.4 V maximum voltage drop @ 1 A<br>2 A maximum current per channel<br>12 A maximum current per TA<br>2.3 A current limit<br>20 A surge current limit, 20 ms<br>Shorted load duration: indefinite (duty-cycle limited)<br>2 mA maximum off-state leakage | RH924HX        | 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    |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------|--------------------------|---------------------|
|                |                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                           | PA <sup>(a)</sup> | Type <sup>(b)</sup> | Type <sup>(c)</sup>      | Type <sup>(d)</sup> |
| Compact FBM239 | When replacing an expansion FBM27B: Contact Sense internal source<br>48 V dc nominal open circuit voltage<br>2.5 mA $\pm$ 20% short circuit current<br>1 K $\Omega$ Maximum On-state resistance<br><b>100 K<math>\Omega</math> Minimum Off-state resistance</b> | When replacing an expansion FBM27A: Output Switch external source<br>150 V dc Maximum voltage<br>0.4 V maximum voltage drop @ 1 A<br>2 A maximum current per channel<br>12 A maximum current per TA<br>2.3 A current limit<br>20 A surge current limit, 20 ms<br>Shorted load duration: indefinite (duty-cycle limited)<br>2 mA maximum off-state leakage | RH924HY           | 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 |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------|--------------------------|------------------|
|                |                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                           | PA(a)          | Type(b)     | Type(c)                  | Type(d)          |
| Compact FBM239 | When replacing an expansion FBM27C: Contact Sense external source on channel 1<br>150 V dc Maximum voltage<br>Logic Zero: 0 to 10 V dc<br>Logic One: 33 to 150 V dc<br>2.5 mA typical 10 to 150 V dc<br>1 K $\Omega$ Maximum On-state resistance<br><b>100 K<math>\Omega</math> Minimum Off-state resistance</b> | When replacing an expansion FBM27A: Output Switch external source<br>150 V dc Maximum voltage<br>0.4 V maximum voltage drop @ 1 A<br>2 A maximum current per channel<br>12 A maximum current per TA<br>2.3 A current limit<br>20 A surge current limit, 20 ms<br>Shorted load duration: indefinite (duty-cycle limited)<br>2 mA maximum off-state leakage | RH924HZ        | 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    |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------|--------------------------|---------------------|
|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                             | PA <sup>(a)</sup> | Type <sup>(b)</sup> | Type <sup>(c)</sup>      | Type <sup>(d)</sup> |
| Compact FBM239                  | <p>When replacing an expansion FBM42A:<br/>Voltage Monitor external source<br/>60 V dc Maximum voltage<br/>Logic Zero: 0 to 5 V dc<br/>Logic One: 15 to 60 V dc<br/>6 mA maximum input current<br/>1 K<math>\Omega</math> Maximum On-state resistance<br/>100 K<math>\Omega</math> Minimum Off-state resistance</p> <p>When replacing an expansion FBM42C:<br/>Contact sense internal source<br/>24 V dc <math>\pm</math>20% Open circuit voltage<br/>5 mA maximum short circuit current<br/>1 K<math>\Omega</math> Maximum On-state resistance<br/><b>100 K<math>\Omega</math> Minimum Off-state resistance</b></p> | <p>When replacing an expansion FBM42A/C:<br/>Output Switch external source<br/>60 V dc Maximum voltage<br/>0.4 V maximum voltage drop @ 1 A<br/>2.25 A maximum current<br/>10 A surge current limit for 20 msec maximum<br/>Shorted load duration: indefinite (duty-cycle limited)<br/>0.5 mA maximum off-state leakage</p> | RH924JB           | C                   | 6                        | 1, 2, 4             |
| Connect this TA to the main TA. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                             |                   |                     |                          |                     |

(a) 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 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 DEMKO certified Ex nA IIC T4 Gc for use in Zone 2 potentially explosive atmospheres.                                                                                                                                                                                                                                                                                                                                  |
| Type 2 | TAs are UL/UL-C listed for supplying 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 <i>Standard and Compact 200 Series Subsystem User's Guide</i> (B0400FA). They are also DEMKO certified 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 4 | All field circuits are NEC/CEC Class 2 limited energy if customer-supplied equipment meets Class 2 limits.                                                                                                                                                                                                                                                                                                                                                                                                                                            |

**Table 2. Termination Cable Types (Baseplate to Main TA) and Part Numbers - Type 4**

| Cable Length<br>m (ft) | Type 4<br>P/PVC <sup>(a)</sup> | Type 4<br>LSZH <sup>(b)</sup> |
|------------------------|--------------------------------|-------------------------------|
| 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                        | RH100BT                       |
| 15.0 (49.2)            | RH100CQ                        | RH100BU                       |
| 20.0 (65.6)            | RH100CR                        | RH100BV                       |
| 25.0 (82.0)            | RH100CS                        | RH100BW                       |
| 30.0 (98.4)            | RH100CT                        | RH100BX                       |

(a) P/PVC is polyurethane outer jacket and semi-rigid PVC primary conductor insulation. PVC is rated from -20 to +70°C (-4 to 158°F).

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

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

| Cable Length m (ft) | Type 6 P/PVC <sup>(a)</sup> | TYPE 6 LSZH <sup>(b)</sup> |
|---------------------|-----------------------------|----------------------------|
| 0.75 (2.5)          | RH924CK                     | RH928CQ                    |

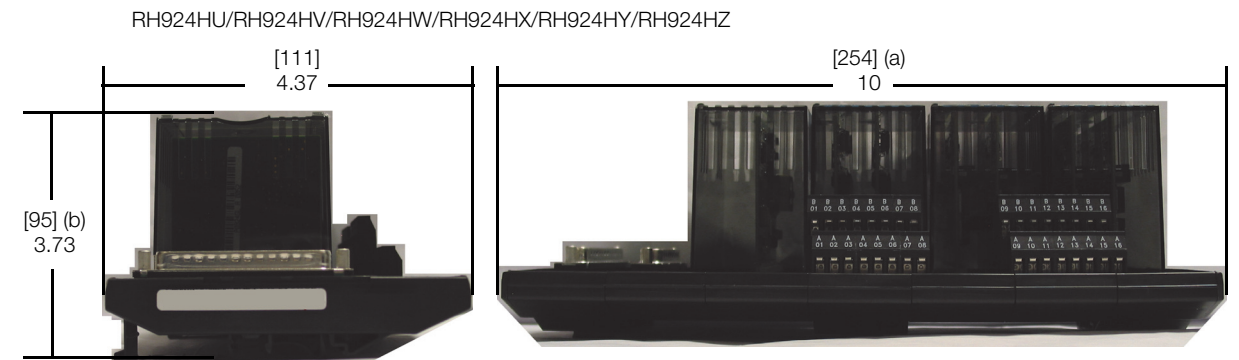
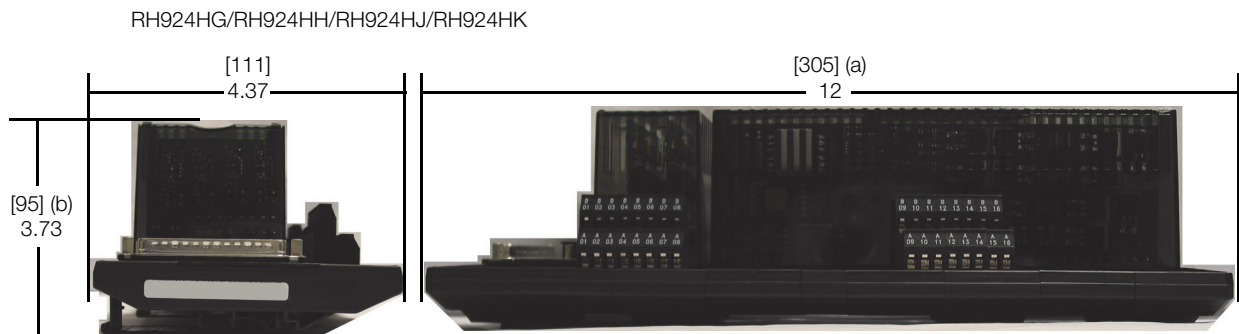
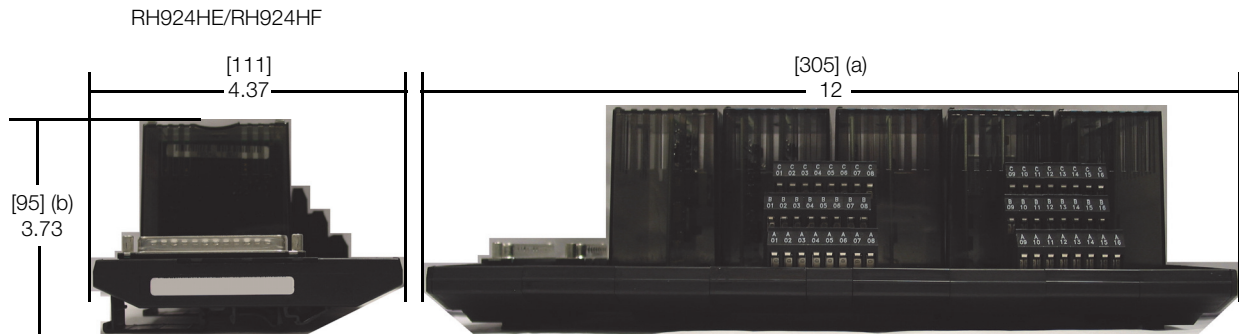
(a) P/PVC is polyurethane outer jacket and semi-rigid PVC primary conductor insulation. PVC is rated from -20 to +70°C (-4 to 158°F). These cables are no longer available for purchase.

(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).

DIMENSIONS – NOMINAL

[mm]  
in

Compression Termination Assemblies

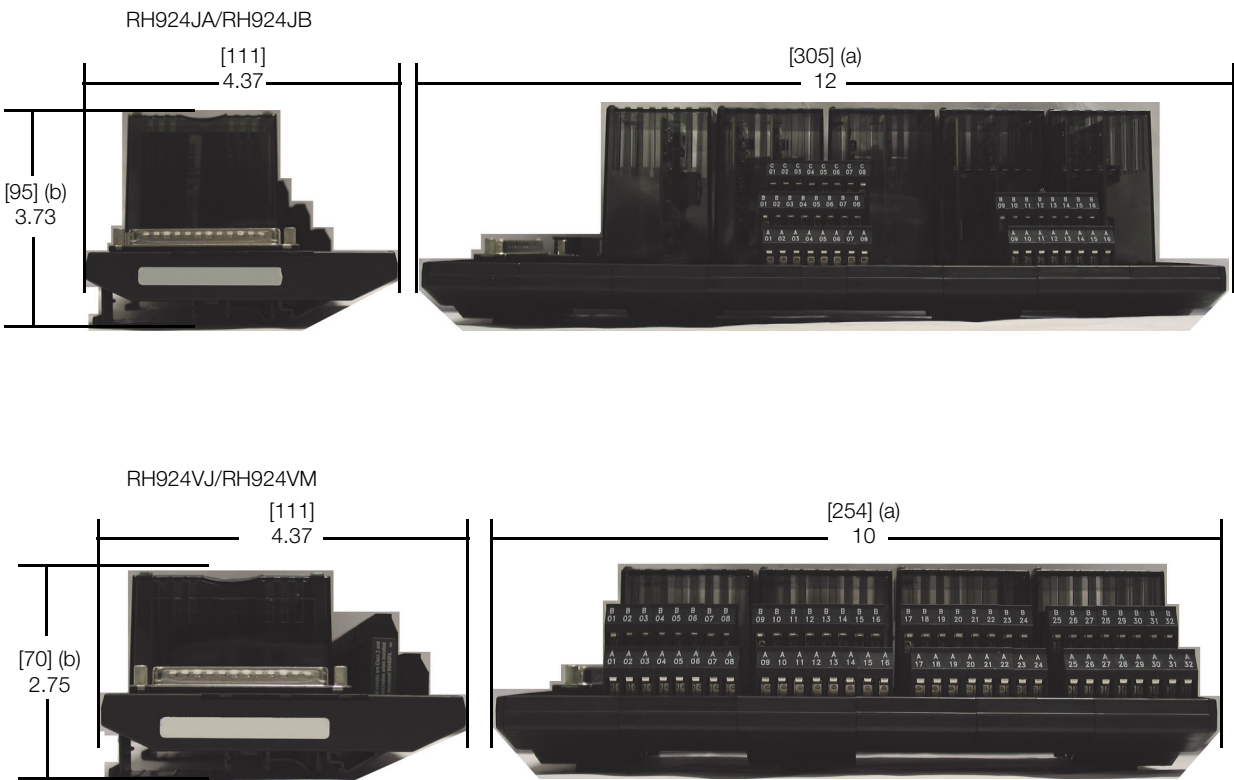


(a) Overall width — for determining DIN rail loading.  
(b) Height above DIN rail (add to DIN rail height for total).

DIMENSIONS – NOMINAL (CONTINUED)

[mm]  
in

Compression Termination Assemblies



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

## RELATED PRODUCT DOCUMENTS

Table 4. Other Related Documents

| PSS Number        | Description                                                      |
|-------------------|------------------------------------------------------------------|
| PSS 31H-2COV      | Compact 200 Series I/O Subsystem Overview                        |
| B0400FA           | Standard and Compact 200 Series Subsystem User's Guide           |
| PSS 31H-2C200     | Compact 200 Series 16-Slot Horizontal Baseplate                  |
| PSS 31H-2SOV      | Standard 200 Series Subsystem Overview                           |
| PSS 31H-2CERTS    | Standard and Compact 200 Series I/O - Agency Certifications      |
| PSS 31H-2C480 B4  | Compact Power Supply - FPS480-24                                 |
| PSS 31S-3FCPICS   | Field Control Processor 280 (FCP280) Integrated Control Software |
| PSS 21S-3CP270ICS | Control Processor 270 (CP270) Integrated Control Software        |



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