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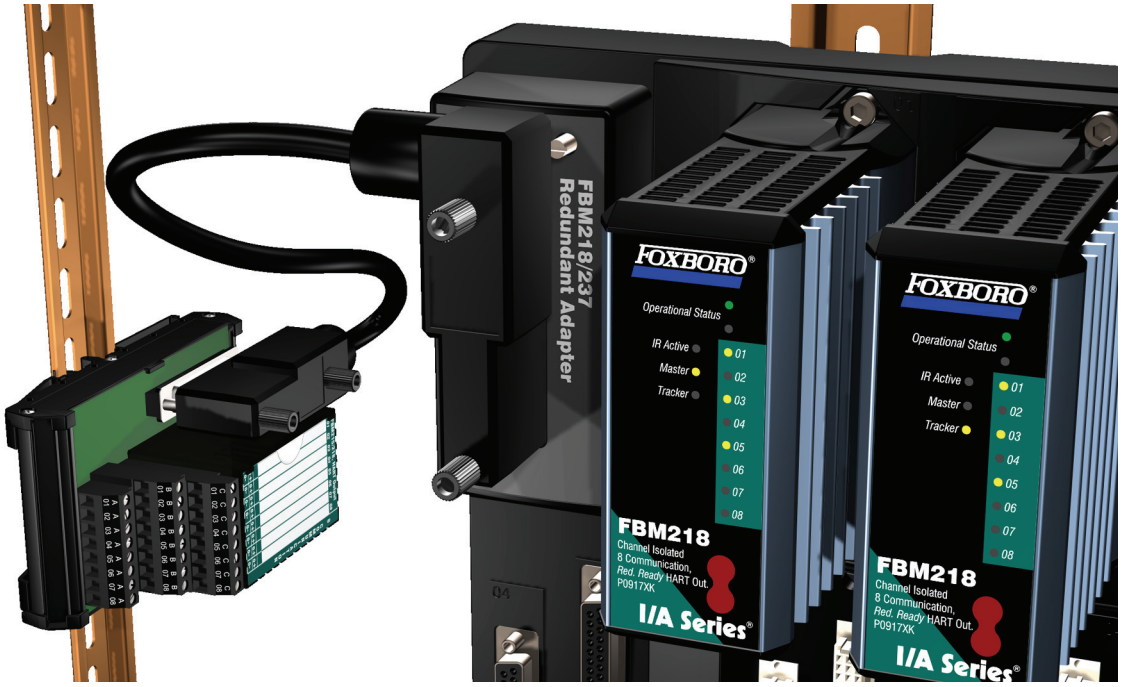
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INVENSYS PROCESS SYSTEMS

PSS 21H-2Z18 B4

FBM218 HART® Communication Redundant Output Interface Module



The FBM218 offers redundant modules for eight output channels, each providing a 4 to 20mA output signal or a digital HART® signal superimposed on a 4 to 20 mA analog output signal.

FEATURES

Key features of the FBM218 module are:

- Eight channel-isolated output channels, each providing one of the following outputs:
  - Standard 4 to 20 mA analog output signal
  - Digital HART Frequency Shift Keying (FSK) signal superimposed on a 4 to 20 mA analog output signal.
- Module pair offers redundancy at the FBM level
- FSK modem dedicated to each output channel for bi-directional digital communications with a HART field device
- Support for HART universal commands necessary to interface the field device with the I/A Series® system database
- Galvanic isolation of all output channels from each other, and from ground and module logic
- Compact, rugged design suitable for enclosure in Class G3 (harsh) environments
- Termination Assemblies (TAs) for locally or remotely connecting field wiring to the FBM218.

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OVERVIEW

The HART Communication Redundant Output Interface Module (FBM218) contains eight channel-isolated output channels. The FBM218 supports any mix of standard 4 to 20 mA devices and HART devices.

A pair of the modules combines to provide redundancy at the Fieldbus Module (FBM) level, with field outputs wired to one common termination assembly (see Figure 1). In this configuration, one FBM218 is the Master, and the other is the Tracker.

The FBM218 serves as a HART communications field device host, enabling the I/A Series system to request and receive two digital messages per second from each field device.

The message pass-through capability can be used to support HART universal, common practice, and device-specific commands, but not the burst communication mode. These commands are implemented using the Intelligent Field Device Configurator (IFDC — refer to PSS 21S-8A2 B3 for details).

The module provides an isolated power supply for each channel.

COMPACT DESIGN

The FBM218 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.

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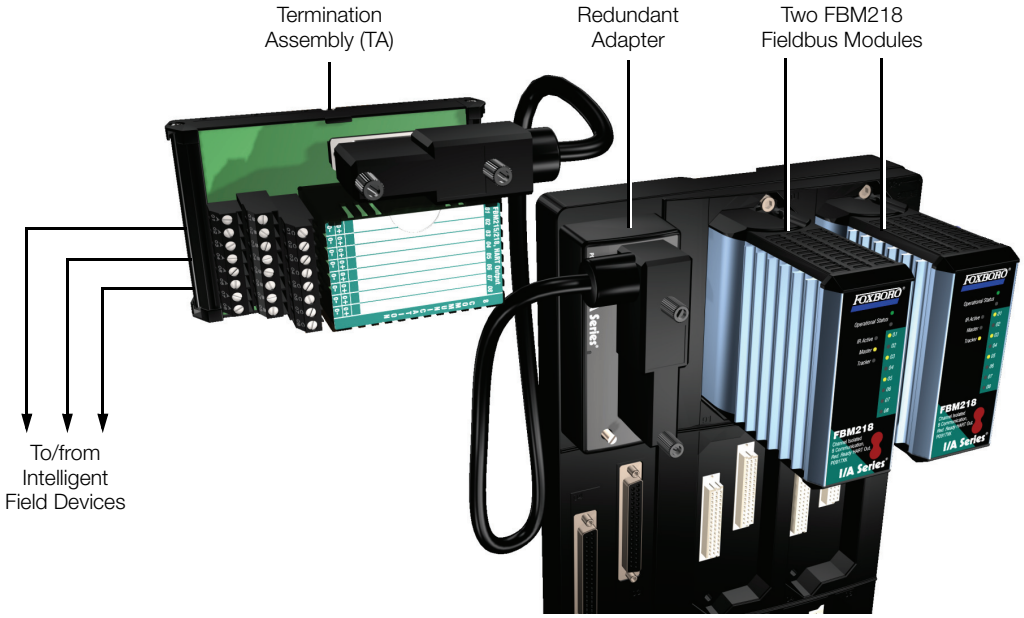


Figure 1. Redundant Module Configuration

REDUNDANT ANALOG OUTPUTS

If a failure is detected in one of the modules, its output is driven to 0 mA and the corresponding channel in the good module automatically continues supplying the proper current to the output current loop

Each output channel drives an external load and produces a 0 to 20 mA output. Outputs are combined in series through the redundant adapter. The microprocessor of each module executes the analog I/O application program, plus security routines that validate the health of the FBM.

Configurable options in the modules for output security include Fail-Safe Action (Hold/Fallback), Analog Output Fail-Safe Fallback Data (on a per channel basis), Fieldbus Fail-Safe Enable, and Fieldbus Fail-Safe Delay Time. The Analog Output Fail-Safe Fallback Data option must be set for 0 mA output. This removes one of the pair of redundant output channels from service for detectable problems such as a module not properly receiving output writes or not passing security tests on FBM microprocessor writes to output registers. Setting of the Analog Output Fail-Safe Fallback Data option for 0 mA output also minimizes the possibility of a “fail high” result.

VISUAL INDICATORS

Light-emitting diodes (LEDs) incorporated into the front of the module provide visual indication of the module’s operational status, and communication activity of the channels. Two additional LEDs provide the master or tracker status of the modules.

EASY REMOVAL/REPLACEMENT

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

FIELDBUS COMMUNICATION

A Fieldbus Communication Module or a Control Processor interfaces the redundant 2 Mbps module Fieldbus used by the FBMs. The FBM218 module 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 modular baseplate, which accommodates up to four or eight FBMs. The modular baseplate is either DIN rail mounted or rack mounted, and includes signal connectors for redundant fieldbus, redundant independent dc power, and termination cables.

Redundant modules must be located in adjacent positions on the baseplate (positions 1 and 2, 3 and 4, 5 and 6, or 7 and 8). To achieve redundancy, a redundant adapter module is placed on the two adjacent baseplate termination cable connectors to provide a single termination cable connection (see Figure 1). A single termination cable connects from the redundant adapter to the associated termination assembly (TA).

TERMINATION ASSEMBLIES

Field output signals connect to the FBM subsystem via DIN rail mounted TAs. The TAs used with the FBM218 are described in “TERMINATION ASSEMBLIES AND CABLES” on page 8.

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FUNCTIONAL SPECIFICATIONS

Field Device Channels

VERSION SUPPORTED
HART Protocol v6

INTERFACE
8 isolated output channels

COMMUNICATIONS TO THE DEVICE
Point-to-point, master/slave, asynchronous, half-duplex, at 1200 baud.

ERROR CHECKING
Parity on each byte, and 32-bit CRC error checking on each message

SPEED
2 messages per second

FASTEST ALLOWED ECB BLOCK PERIOD
500 msec

MAXIMUM DISTANCE (FBM218 TO DEVICE)
Meets HART FSK physical layer specification HCF_SPEC-54, Revision 8.1 [up to 3030 m (10000 ft)](1)

CURRENT OUTPUTS

Analog Accuracy (Includes Linearity)
±0.05% of span (between 4 mA and 20 mA)

Output Load
750 Ω maximum

Maximum Rate of Change
20 mA in 60 milliseconds

Resolution
13 bits

LOOP POWER SUPPLY PROTECTION
Each channel is channel-to-channel galvanically isolated, current limited, and voltage regulated. All outputs are limited by their design to about 25 mA. If the output FET shorts, the output current could increase up to 100 mA. In normal operation the FBM outputs a constant current into a 0 to 750 ohm load.

ISOLATION
The channels are galvanically isolated (both optical and transformer isolation) from each other, and from ground and module logic. The module withstands, without damage, a potential of 600 V ac applied for one minute between the isolated channels and earth (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.

Fieldbus Communication
Communicates with its associated FCM or FCP via the redundant 2 Mbps HDLC fieldbus

Power Requirements

INPUT VOLTAGE RANGE (REDUNDANT)
24 V dc ±5%

CONSUMPTION
7 W (maximum)

HEAT DISSIPATION
5 W (maximum)

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

(1) The maximum allowable distance decreases when the loop is operated through an intrinsic safety barrier. The maximum distance of the field device from the FBM is a function of compliance voltage (19 V dc at 20.4 mA), wire and load resistance, and voltage drop at the field device.

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FUNCTIONAL SPECIFICATIONS (CONTINUED)

Regulatory Compliance

ELECTROMAGNETIC COMPATIBILITY (EMC)

European EMC Directive 89/336/EEC
Meets: EN 50081-2 Emission standard
EN 50082-2 Immunity standard
EN 61326 Annex A (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, dc power and communication lines

IEC 61000-4-5 Surge Immunity
2kV on ac and dc power lines; 1kV on I/O and communications lines

IEC 61000-4-6 Immunity to Conducted Disturbances Induced by Radio frequency Fields
10 V (rms) at 150 kHz to 80 MHz on I/O, 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 UL/UL-C listed 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 I/A Series® processor modules as described in the *I/A Series DIN Rail Mounted Subsystem User's Guide* (B0400FA). Communications circuits also meet the requirements for Class 2 as defined in Article 725 of the National Electrical Code (NFPA No.70) and Section 16 of the Canadian Electrical Code (CSA C22.1). Conditions for use are as specified in the *I/A Series DIN Rail Mounted Subsystem User's Guide* (B0400FA).

European Low Voltage Directive 73/23/EEC and Explosive Atmospheres (ATEX) directive 94/9/EC
CENELEC (DEMKO) certified as EEx nA IIC T4 for use in CENELEC certified Zone 2 enclosure certified as associated apparatus for supplying non-incendive field circuits for Zone 2, Group IIC, potentially explosive atmospheres when connected to specified I/A Series processor modules as described in the *I/A Series DIN Rail Mounted Subsystem User's Guide* (B0400FA). Also, see Table 1 on page 9.

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ENVIRONMENTAL SPECIFICATIONS(2)

Operating

TEMPERATURE

Module

-20 to +70°C (-4 to +158°F)

Termination Assembly

PVC

-20 to +50°C (-4 to +122°F)

RELATIVE HUMIDITY

5 to 95% (noncondensing)

ALTITUDE

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

Storage

TEMPERATURE

-40 to +70°C (-40 to +158°F)

RELATIVE HUMIDITY

5 to 95% (noncondensing)

ALTITUDE

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

Contamination

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

Vibration

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

(2) The environmental limits of this module may be enhanced by the type of enclosure containing the module. Refer to the applicable Product Specification Sheet (PSS) which describes the specific type of enclosure that is to be used.

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PHYSICAL SPECIFICATIONS

Mounting

MODULE
The FBM218 mounts on a 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 21H-2W6 B4 for details.

TERMINATION ASSEMBLY
The TA mounts on a DIN rail and accommodates multiple DIN rail styles including 32 mm (1.26 in) and 35 mm 1.38 in).

Mass

MODULE
284 g (10 oz) approximate

TERMINATION ASSEMBLY
Compression
181 g (0.40 lb) approximate
Ring Lug
249 g (0.55 lb) approximate

Dimensions – Module

HEIGHT
102 mm (4 in)
114 mm (4.5 in) including mounting lugs

WIDTH
45 mm (1.75 in)

DEPTH
104 mm (4.11 in)

Part Numbers

FBM218 MODULE
P0922VW

TERMINATION ASSEMBLIES
See “FUNCTIONAL SPECIFICATIONS – TERMINATION ASSEMBLIES” on page 8

REDUNDANT ADAPTER
P0916QD

Termination Cables

CABLE LENGTHS
Up to 30 m (98 ft)

CABLE MATERIALS
Polyurethane or Hypalon®/XLP

TERMINATION CABLE TYPE
Type 1 – See Table 2 on page 9

CABLE CONNECTION – TA
25-pin male D-subminiature

Construction – Termination Assembly

MATERIAL
Polyvinyl Chloride (PVC), compression PVC, ring lug

FAMILY GROUP COLOR
Green – communication

TERMINAL BLOCKS
Outputs
3 tiers, 8 positions

Field Termination Connections

COMPRESSION-TYPE 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 TYPE ACCEPTED WIRING SIZES
#6 size connectors (0.375 in (9.5 mm))
0.5 to 4 mm^2/22 AWG to 12 AWG

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TERMINATION ASSEMBLIES AND CABLES

Field output signals connect to the FBM subsystem via DIN rail mounted Termination Assemblies, which are **electrically passive.** TAs for the FBM218 are available in the following forms:

- Compression screw type using Polyvinyl Chloride (PVC) or Polyamide material
- Ring lug type using PVC material

See the following "FUNCTIONAL SPECIFICATIONS – TERMINATION ASSEMBLIES" for a list of TAs used with the FBM218.

The FBM218 provides sufficient loop resistance to allow use of the HART Hand-Held Terminal, or PC20 Intelligent Field Device Configurator (PSS 2A-1Z3 E).

A removable termination cable connects the DIN rail mounted TA to the FBM via a field connector on the baseplate in which the FBM is installed. Termination cables are available in the following materials:

- Polyurethane
- Hypalon XLP.

Termination cables are available in a variety of lengths, up to 30 meters (98 feet), allowing the Termination Assembly to be mounted in either the enclosure or in an adjacent enclosure. See Table 2. for a list of termination cables used with the TAs for the FBM218.

FUNCTIONAL SPECIFICATIONS – TERMINATION ASSEMBLIES

FBM Type	Output Signal	TA Part Number PVC[a]	TA Part Number PA[a]	Termination Type[b]	TA Cable Type[c]	TA Certification Type[d]
FBM218	8 output channels, 4 to 20 mA analog signal, alone or with HART signal superimposed	P0917XV P0926EK	P0926SP	C RL	1	1, 2

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

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Table 1. Certification for Termination Assemblies

Type	Certification[a]
Type 1	TAs are UL/UL-C listed as suitable for use in Class I; Groups A-D; Division 2 temperature code T4 hazardous locations. They are CENELEC (DEMKO) certified EEx nA IIC T4 for use in Zone 2 potentially explosive atmospheres.
Type 2	TAs are UL/UL-C listed as associated apparatus for supplying non-incendive field circuits Class I; Groups A-D; Division 2 hazardous locations when connected to specified DIN rail mounted FBMs and field circuits meeting entity parameter constraints specified in *DIN Rail Mounted Subsystem User's Guide* (B0400FA). They are also CENELEC (DEMKO) certified as associated apparatus for supplying field circuits for Group IIC, Zone 2 potentially explosive atmospheres. Field circuits are also Class 2 limited energy (60 V dc, 30 V ac, 100 VA or less) if customer-supplied equipment meets Class 2 limits.

(a) All TAs are UL/UL-C listed to comply with applicable ordinary location safety standards for fire and shock hazards. Hazardous location types comply with ATEX directive for II 3 G use. They also comply with the requirements of the European Low Voltage Directive. All listings/certifications require installation and use within the constraints specified in *DIN Rail Mounted Subsystem User's Guide* (B0400FA) and the conditions stated in UL and DEMKO reports.

Table 2. Cables Types and Part Numbers

Cable Length m (ft)	Type 1 P/PVC[a]	Type 1 H/XLPE[b]	Cable Length m (ft)	Type 1 P/PVC[a]	Type 1 H/XLPE[b]
0.5 (1.6)	P0916DA	P0916VA	10.0 (32.8)	P0916DE	P0916VE
1.0 (3.2)	P0916DB	P0916VB	15.0 (49.2)	P0916DF	P0916VF
2.0 (6.6)	P0931RM	P0931RR	20.0 (65.6)	P0916DG	P0916VG
3.0 (9.8)	P0916DC	P0916VC	25.0 (82.0)	P0916DH	P0916VH
5.0 (16.4)	P0916DD	P0916VD	30.0 (98.4)	P0916DJ	P0916VJ

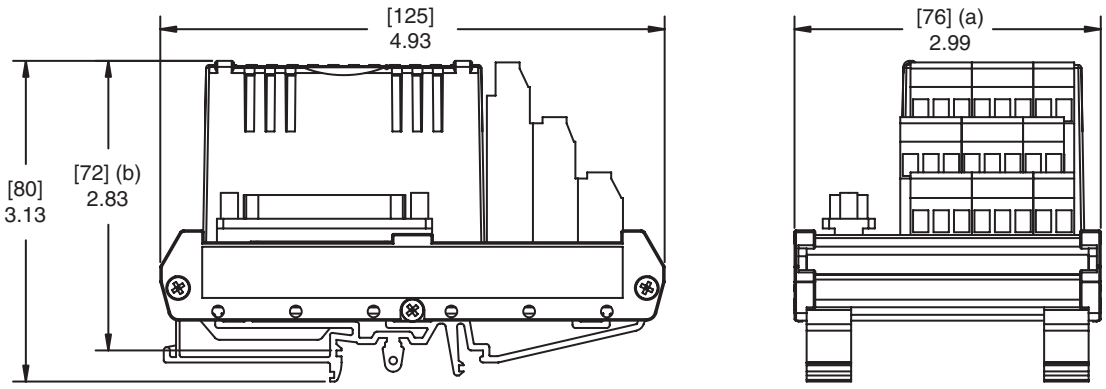
(a) P/PVC is polyurethane outer jacket and semi-rigid PVC primary conductor insulation.
(b) H/XLPE is Hypalon outer jacket and XLPE (cross-linked polyethylene) primary conductor insulation.

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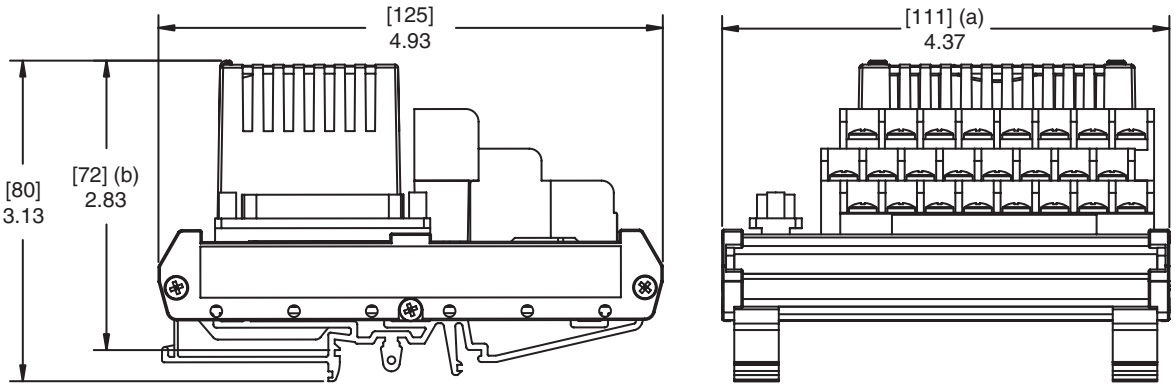
DIMENSIONS – NOMINAL

[mm]
in

Compression Termination Assembly



Ring Lug Termination Assembly



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

RELATED PRODUCT SPECIFICATION SHEETS

PSS Number	Description
PSS 21H-2W1 B3	DIN Rail Mounted FBM Subsystem Overview
PSS 21H-2W2 B3	DIN Rail Mounted FBM Equipment, Agency Certifications

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