Foxboro™ DCS

FBM202 Thermocouple/mV Input Module

PSS 41H-2S202

Product Specification

May 2025



https://www.se.com

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Overview

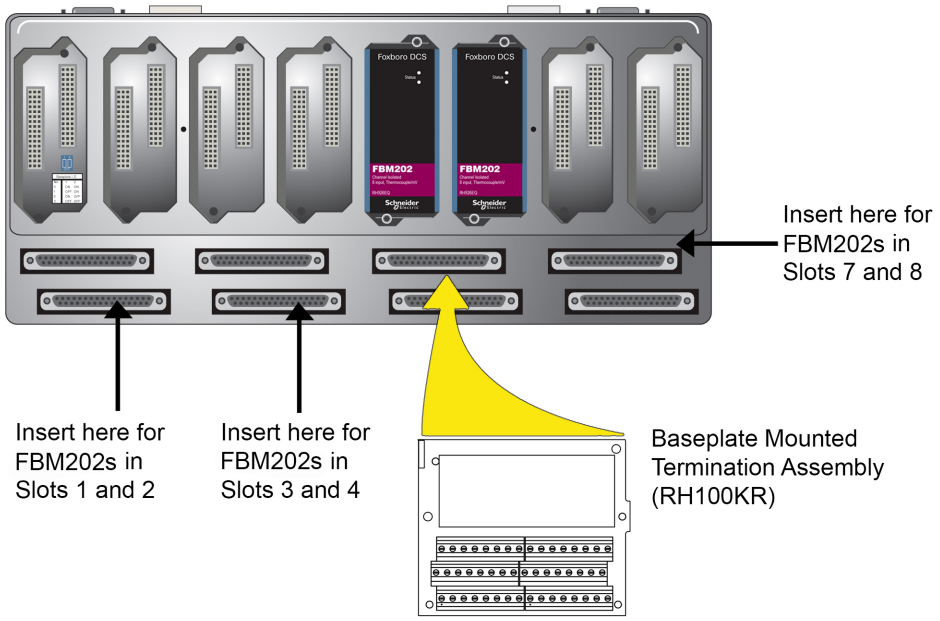
The FBM202 Thermocouple/mV Input contains eight thermocouple input channels, and one isolated RTD reference junction compensation channel (for terminal temperature sensing). Each thermocouple/mV channel accepts standard thermocouples for various temperature ranges, and each provides thermocouple burnout detection (up-scale). The inputs are galvanically isolated from other channels and ground.

The module performs the signal conversion required to interface the electrical input signals from the field sensors to the optionally redundant Fieldbus. It executes an Analog Input application program, which provides integration time and Rate of Change Limits configurable options.

Two types of passive termination assemblies (TAs) are available for the FBM202:

- DIN rail mounted TAs, similar to those used with the other 200 Series FBMs
- Baseplate-mounted TA, which mounts directly onto the field I/O connectors of the 200 Series baseplate. These TAs provide field I/O wiring support for two FBM202s in paired slots (that is, in positions 1 and 2, 3 and 4, 5 and 6, or 7 and 8), as shown in Figure 1.

Figure 1 - Baseplate Mounted Termination Assembly



When connected to the appropriate TAs, the FBM202 module provides functionality formerly provided by the 100 Series Fieldbus Modules (FBMs) I/O subsystem. TAs are available and support the functionality of the 100 Series FBM02.

Features

- 8 channels for thermocouple input signals
- 1 isolated RTD reference junction compensation channel (for terminal temperature sensing)
- Each input channel is galvanically isolated
- Rugged design suitable for enclosure in Class G3 (harsh) environments
- Execution of an analog input application program that provides conversion time and configurable options for Rate of Change Limits
- High accuracy achieved by sigma-delta data conversions for each channel
- TAs for locally or remotely connecting field wiring to the FBM202

High Accuracy

For high accuracy, the module incorporates Sigma-Delta data conversion on a per-channel basis, which can provide new analog input readings every 25 ms, and a configurable integration period to remove any process noise and power line frequencies.

Each time period, the FBM converts each analog input to a digital value, averages these values over the time period and provides the averaged value to the controller.

Standard Design

FBM202 has a rugged extruded aluminum exterior for physical protection of the circuits. Enclosures specially designed for mounting the FBMs can provide various levels of environmental protection, up to harsh environments, per ISA Standard S71.04.

Visual Indicators

Red and green light-emitting diodes (LEDs) incorporated into the front of the module provide visual status indications of the FBM operational status.

Easy Removal/Replacement

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

Fieldbus Communication

A Fieldbus Communications Module or a Control Processor interfaces to the redundant 2 Mbps module Fieldbus used by the FBMs. The FBM accepts communication from either path (A or B) of the 2 Mbps Fieldbus. If one path is unsuccessful or is 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 4 or 8 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.

Termination Assemblies

Field I/O signals connect to the FBM subsystem using one of these options:

- DIN rail mounted TA
- Baseplate-mounted TA

The TAs used with the FBM202 are described in Functional Specifications - Termination Assemblies, page 12.

Functional Specifications

Input Channels	Eight isolated and independent thermocouple/mV input channels. One isolated reference junction temperature compensation channel.
Input Range	-10.5 to +69.5 mVDC (-10.5 to +69.5 mVDC equals 0 to 64,000 raw counts. Input of 71.419 mV equals 65,535 raw counts (full range of module)).
Reference Junction	Reference junction temperature compensation is provided by a 4-wire 100 ohm platinum RTD (IEC 751, Class B) at the termination assembly.
Accuracy	• Millivolt Input: ±0.03% of span (±24 µV) at 25°C • RTD Channel: ±0.03% of span • RTD Reference Junction Conformity: ±0.25°C • RTD Thermocouple Conformity: ±0.25°C • Accuracy Temperature Coefficient: ±50 ppm/°C • RTD Reference Junction Measurement Accuracy: ±0.50°C (When using the RTD internal to the Foxboro supplied termination assemblies) • Differential Input Impedance: 10 MΩ • Common Mode Voltage: Up to 30 VAC or 60 VDC
Integration Period	Software configurable
Input Open Circuit Voltage	250 mVDC through 10 M ohms (mV channels)
Input Signal A/D Conversion	Each channel performs A/D signal conversion using an independent Sigma-Delta converter.
Typical Thermocouple Types	B, E, J, K, N, R, S, T and other millivolt signals
Thermocouple Burnout Detection	Full upscale value
Input Channel Isolation	Each channel is galvanically isolated from all other channels and ground. The module withstands, without damage, a potential of 600 VAC applied for one minute between any channel and ground, or between a given channel and any other channel.

	⚠⚠DANGER **HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH** Although the module can withstand a maximum of 600 VAC applied for one minute between any channel, DO NOT apply voltages beyond the published input ranges. The channels are NOT intended for permanent connection to hazardous voltage circuits. Understand that connection of these channels to voltages greater than 30 VAC or 60 VDC violates electrical safety code requirements and may expose users to electric shock. **Failure to follow these instructions will result in death or serious injury.**
Communication	Communicates with its associated FCM or FCP through the redundant 2Mbps module Fieldbus.
Power Requirements	• Input Voltage Range (Redundant): 24 VDC, +5%, -10% • Consumption: 3 W (maximum) • Heat Dissipation: 3 W (maximum)
Calibration Requirements	Calibration of the module and termination assembly is not required.
Regulatory Compliance: Electromagnetic Compatibility (EMC)	• *European EMC Directive 2004/108/EC (Prior to April 20, 2016) and 2014/30/EU (Beginning April 20, 2016)*: Meets: EN61326-1:2013 Class A Emissions and Industrial Immunity Levels
Regulatory Compliance: Product Safety	• *Underwriters Laboratories (UL) for U.S. and Canada*: UL/UL-C listed as suitable for use in UL/ULC listed Class I, Groups A-D; Division 2; temperature code T4 enclosure based systems when connected to specified Foxboro DCS processor modules. Communications circuits also meet the requirements for Class 2 as defined in Article 725 of the National Electrical Code (NFPA No.70) and Section 16 of the Canadian Electrical Code (CSA C22.1). For more information, see *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA). • *European Low Voltage Directive 2006/95/EC (Prior to April 20, 2016) and 2014/35/EU (Beginning April 20, 2016) and Explosive Atmospheres (ATEX) directive 94/9/EC (Prior to April 20, 2016) and 2014/34/EU (Beginning April 20, 2016)*: DEMKO certified as Ex nA IIC T4 for use in certified Zone 2 enclosure when connected to specified processor modules as described in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA). Also, see Certification for Termination Assemblies, page 13.
RoHS Compliance	Complies with European RoHS Directive 2011/65/EU, including amending Directives 2015/863 and 2017/2102.
IECEx Certification	IECEx Certified

Environmental Specifications

	Operating	Storage
Temperature	Module and Termination Assembly - PA and PC/ABS: -20 to +70°C (-4 to +158°F)	-40 to +70°C (-40 to +158°F)
Relative Humidity	5 to 95% (noncondensing)	5 to 95% (noncondensing)
Altitude	-300 to +3,000 m (-1,000 to +10,000 ft)	-300 to +12,000 m (-1,000 to +40,000 ft)
Vibration	0.75g (5 to 500 Hz).	
Contamination	Suitable for use in Class G3 (Harsh) environments as defined in ISA Standard S71.04, based on exposure testing according to EIA Standard 364-65, Class III.	

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

Physical Specifications

Mounting	• Module: FBM202 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. Alternatively, FBM202 mounts on a 100 Series conversion mounting structure. See *Standard 200 Series Baseplates* (PSS 41H-2SBASPLT) or *100 Series Conversion Mounting Structures* (PSS 41H-2W8) for details. • Termination Assembly: The DIN rail mounted TA mounts on a DIN rail and accommodates multiple DIN rail styles including 32 mm (1.26 in) and 35 mm 1.38 in) The baseplate-mounted TA mounts on the two field I/O connectors associated with its two FBM202s on a 200 Series baseplate.
Weight	• Module: 284 g (10 oz) approximate • Termination Assemblies: ◦ Compression (Approximate): (For DIN Rail Mounted TAs) 159 g (0.35 lb) (For Baseplate Mounted TAs) 245 g (0.57 lb) ◦ Ring Lug: 204 g (0.45 lb)
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 Assemblies	See Dimensions - Nominal, page 14.
Part Numbers	• FBM202 Module: RH926EQ • Termination Assemblies: See Functional Specifications - Termination Assemblies, page 12.

Termination Cables	• Cable Lengths: Up to 30 m (98 ft) • Cable Materials: Polyurethane or Low Smoke Zero Halogen (LSZH) • Termination Cable Type: Type 2 - See Cable Types and Part Numbers, page 13. • Cable Connection: ◦ FBM Baseplate End: 37-pin D-subminiature ◦ Termination Assembly End: 25-pin D-subminiature
Construction - Termination Assembly	Material: • DIN Rail Mounted TAs: Polyamide (PA), compression and ring lug • Baseplate-Mounted TAs: Styrene (PC/ABS), compression
Field Termination Connections	• DIN RAIL TA 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 • Baseplate Mounted TA Compression-Type Accepted Wiring Sizes: ◦ Solid/Stranded/AWG: 0.2 to 1.5 mm^2/0.2 to 1.5 mm^2/24 to 16 AWG ◦ Stranded with Ferrules: 0.25 to 0.75 mm^2 with plastic collar 0.25 to 1.5 mm^2 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 Assemblies and Cables

Field input signals connect to the FBM subsystem via DIN rail mounted or baseplate mounted termination assemblies (TAs). Both these types of TAs are electrically passive. The TAs for the FBM202 are available in the following forms:

- Compression screw type (DIN rail mounted) using Polyamide (PA) material
- Compression screw type (baseplate mounted) using Polycarbonate/Acrylonitrile Butadiene Styrene (PC/ABS)
- Ring lug type (DIN rail mounted) using Polyamide (PA) material

Each DIN rail mounted TA and its associated termination cable provides a feedthrough connection between eight 2-wire thermocouple/mV analog input signals and an FBM202 Thermocouple/mV Input Module. Each baseplate mounted TA provides a feedthrough connection between sixteen 2-wire thermocouple/mV analog input signals and two FBM202 Thermocouple/mV Input Modules.

Reference junction temperature compensation is provided by an isolated resistance temperature detector (RTD) that is integral to the termination assembly. The baseplate mounted TA contains an RTD for each FBM202.

See Functional Specifications - Termination Assemblies, page 12 for a list of TAs used with the FBM202 module.

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
- Low Smoke Zero Halogen (LSZH)

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, page 13 for a list of termination cables used with the TAs for the FBM202 module.

Functional Specifications - Termination Assemblies

FBM Type	Input Signal	TA Part Number[a]	PC/ABS[b]	Termination Type[c]	TA Cable Type[d]	TA Cert. Type[e]
		PA				
FBM202	Eight isolated and independent thermocouple/ mV channels, passive feedthrough with FBM202 channel isolation with one 4-wire 100 ohm platinum RTD (IEC 751, Class B)	RH916XH		C	2	1
		P0917JL		RL		
	Two sets of eight isolated and independent thermocouple/ mV channels, passive feedthrough with FBM202 channel isolation with one 4-wire 100 ohm platinum RTD (IEC 751, Class B)		RH928CN	C (Baseplate-mounted)	NA	1

(a) PA is polyamide rated from -20 to +70°C (-4 to +158°F).

(b) PC/ABS is Polycarbonate/Acrylonitrile Butadiene Styrene (PC/ABS) rated from-20 to +70°C (-4 to +158°F).

(c) C = TA with compression terminals; RL = TA with ring lug terminals.

(d) See Table 2 for cable part numbers and length.

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

Table 1 - Certification for Termination Assemblies

Type	Certification
Type 1	TAs are UL/UL-C listed as suitable for use in Class I; Groups A-D; Division 2 temperature code T4 hazardous locations. They are DEMKO certified Ex nA IIC T4 for use in Zone 2 potentially explosive atmospheres.

Table 2 - Cable Types and Part Numbers

Cable Length m (ft)	Type 2 P/PVC[a]	Type 2 LSZH[b]
0.5 (1.6)	RH916DU	RH928AL
1.0 (3.2)	RH916DV	RH928AM
2.0 (6.6)	RH931RN	RH928AN
3.0 (9.8)	RH916DW	RH928AP
5.0 (16.4)	RH916DX	RH928AQ
10.0 (32.8)	RH916DY	RH928AR
15.0 (49.2)	RH916DZ	RH928AS
20.0 (65.6)	RH916EA	RH928AT
25.0 (82.0)	RH916EB	RH928AU
30.0 (98.4)	RH916EC	RH928AV

(a) P/PVC is polyurethane outer jacket and semi-rigid PVC primary conductor insulation. Temperature range; -20 to +80°C (-4 to +176°F).

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

Use of Termination Assemblies in 100 Series

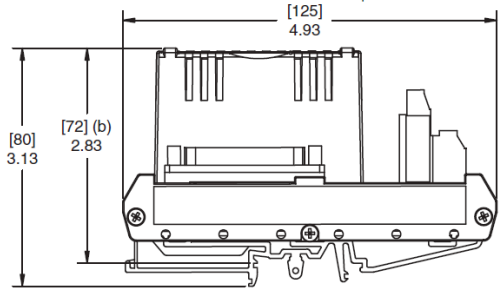
When an FBM202 is used to replace the 100 Series FBM02, it may use any of the appropriate termination assemblies listed above for the FBM02's field I/O wiring. Alternatively, the FBM202 can accept this field wiring through a Termination Assembly Adapter (TAA) instead of a termination assembly. See *Termination Assembly Adapter Modules for 100 Series Upgrade* (PSS 41H-2W4).

Dimensions - Nominal

[mm]
in

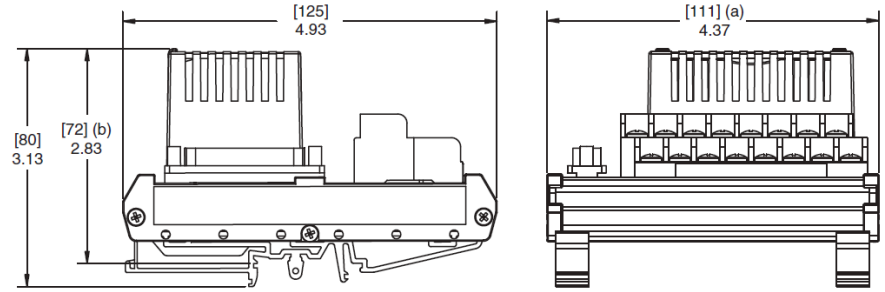
RH916XH

Compression Termination Assembly



RH928CN

Ring Lug Termination Assembly

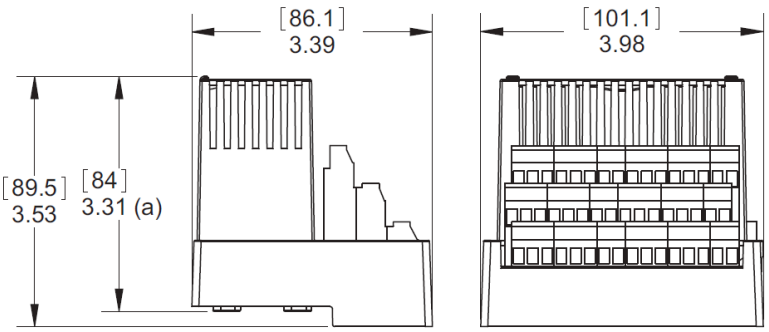


(a) Overall width – for determining DIN rail loading.
(b) Height above DIN rail (add to DIN rail height for total).

[mm]
in

Baseplate Mounted Termination Assemblies

RH928CN



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

Related Documents

Document Number	Description
PSS 41H-2SOV	*Standard 200 Series Subsystem Overview*
B0400FA	*Standard and Compact 200 Series Subsystem User's Guide*
PSS 41H-2W100	*100 Series Fieldbus Module Upgrade Subsystem Overview*
PSS 41H-2CERTS	*Standard and Compact 200 Series I/O - Agency Certification*
PSS 41H-2W4	*Termination Assembly Adapter Modules for 100 Series Upgrade*
PSS 41H-2SBASPLT	*Standard 200 Series Baseplates*
PSS 41H-2W8	*100 Series Conversion Mounting Structures*
PSS 41S-3FCPICS	*Field Control Processor 280 (CP280) Integrated Control Software*

Proposition 65

WARNING: This product can expose you to chemicals including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

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