Foxboro™ DCS

Compact FBM202 Thermocouple/mV Input Module

PSS 41H-2C202

Product Specification

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Overview

The Compact FBM202 Thermocouple/mV Input Interface Module 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 Compact FBM202 is part of the Compact 200 Series I/O subsystem described in the *Compact 200 Series I/O Subsystem Overview* Product Specification (PSS 41H-2COV).

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.

Features

- 8 channels for thermocouple input signals
- 1 isolated RTD reference junction compensation channel (for terminal temperature sensing)
- Each input channel is galvanically isolated
- Compact, 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
- Termination Assemblies (TAs) for locally or remotely connecting field wiring to the Compact 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 Fieldbus Module (FBM) converts each analog input to a digital value, averages these values over the time period and provides the averaged value to the controller.

Compact Design

The Compact FBM202'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 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 mounts on a Compact 200 Series baseplate. Two screws on the FBM fix the module to the baseplate.

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

Modular Baseplate Mounting

The modules mount on a DIN rail mounted modular baseplate, which accommodates up to 16 compact FBMs. The baseplate is either DIN rail mounted or rack mounted, and includes signal connectors for redundant fieldbus, redundant independent DC power, and termination cables.

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.

Termination Assemblies

Field I/O signals connect to the FBM subsystem via DIN rail mounted TAs. The TAs used with the Compact FBM202 are described in Functional Specifications - Termination Assemblies, page 11.

Functional Specifications

Input Channels	8 isolated and independent thermocouple/mV input channels. 1 isolated reference junction temperature compensation channel.
Input Range	-10.5 to +69.5 mV DC (-10.5 to +69.5 mV DC 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 mV DC 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: 2W • Heat Dissipation: 2W
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).
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:* -20 to +60°C (-4 to +140°F) • *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	• Compact FBM202: The Compact FBM202 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. See *Compact 200 Series 16-Slot Horizontal Baseplate* (PSS 41H-2C200) 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).
Weight	• Compact FBM202: 185 g (6.5 oz) approximate • Termination Assemblies: ◦ Compression (Approximate): 159 g (0.35 lb) ◦ Ring Lug: 204 g (0.45 lb)
Dimensions - Compact FBM202	• 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)
Dimensions - Termination Assemblies	See Dimensions - Nominal, page 13.
Part Numbers	• Compact FBM202 Module: RH101DB • Termination Assemblies: See Functional Specifications - Termination Assemblies, page 11.
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 12. • Cable Connection: ◦ FBM Baseplate End: 37-pin D-subminiature ◦ Termination Assembly End: 25-pin D-subminiature

Construction - Termination Assembly	Material: Polyamide (PA), compression and ring lug
Field Termination Connections	• Compression Accepted Wiring Sizes: ◦ Solid/Stranded/AWG: 0.2 to 4 mm^2/0.2 to 2.5 mm^2/24 to 12 AWG ◦ Stranded with Ferrules: 0.2 to 2.5 mm^2 with or without plastic collar • Ring Lug Accepted Wiring Sizes: #6 size connectors (0.375 in (9.5 mm)) 0.5 to 4 mm^2/22 AWG to 12 AWG

Termination Assemblies and Cables

Field input signals connect to the FBM subsystem via DIN rail mounted Termination Assemblies, which are electrically passive. TAs for the Compact FBM202 modules are available in the following forms:

- Compression screw type using Polyamide (PA) material
- Ring lug type using Polyamide (PA) material

Each TA and its associated termination cable provides a feedthrough connection between eight 2-wire thermocouple/mV analog input signals and a Compact FBM202 module reference junction temperature compensation is provided by an isolated resistance temperature detector (RTD) that is integral to the termination assembly.

See Functional Specifications - Termination Assemblies, page 11 for a list of TAs used with the Compact 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 assemblies to be mounted as needed by plant design. See Cable Types and Part Numbers, page 12 for a list of termination cables used with the TAs for the Compact FBM202 module.

Functional Specifications - Termination Assemblies

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

(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.

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

(d) 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 CENELEC (DEMKO) certified Ex nA IIC T4 for use in Zone 2 potentially explosive atmospheres.

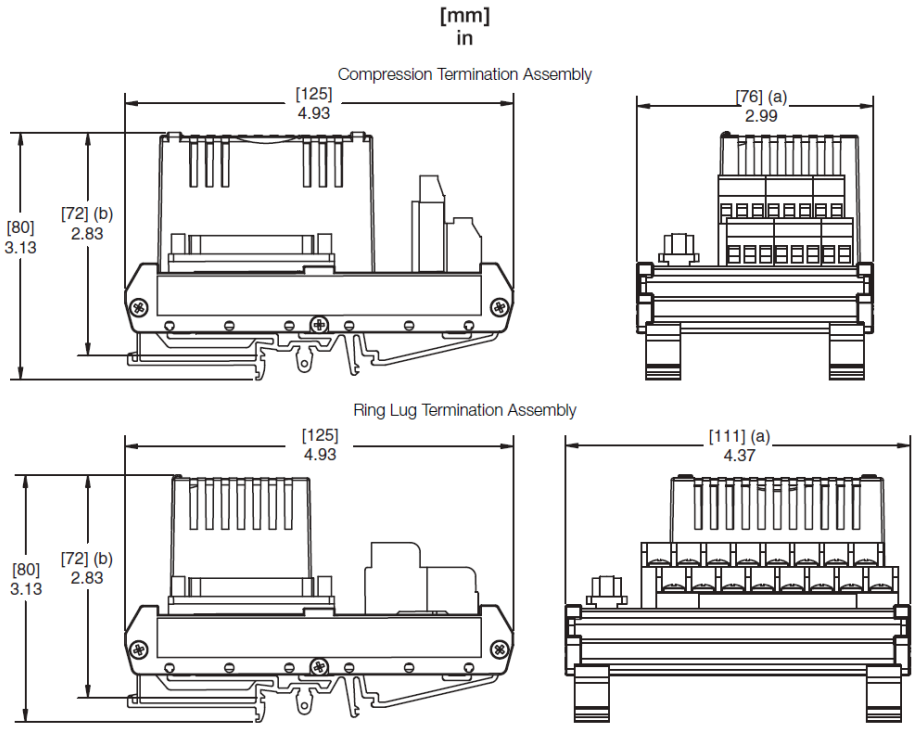
Table 2 - Cable Types and Part Numbers

Cable Length m (ft)	Type 2 P/PVC[a]	Type 2 LSZH[b]
0.5 (1.6)	RH100FC	RH100ER
1.0 (3.2)	RH100FD	RH100ES
1.5 (4.9)	RH100FE	RH100ET
2.0 (6.6)	RH100FF	RH100EU
3.0 (9.8)	RH100FG	RH100EV
5.0 (16.4)	RH100FH	RH100EW
10.0 (32.8)	RH100FJ	RH100EX
15.0 (49.2)	RH100FK	RH100EY
20.0 (65.6)	RH100FL	RH100EZ
25.0 (82.0)	RH100FM	RH100FA
30.0 (98.4)	RH100FN	RH100FB

(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).

Dimensions - Nominal



(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-2COV	*Compact 200 Series I/O Subsystem Overview*
B0400FA	*Standard and Compact 200 Series Subsystem User's Guide*
PSS 41H-2C200	*Compact 200 Series 16-Slot Horizontal Baseplate*
PSS 31H-2S200	*Standard 200 Series Subsystem Overview*
PSS 41H-2CERTS	*Standard and Compact 200 Series I/O - Agency Certifications*
PSS 41H-2C480	*Compact Power Supply - FPS480-24*
PSS 41S-3FCPICS	*Field Control Processor 280 (FCP280) 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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