Foxboro Evo™ Process Automation System

Product Specifications

Foxboro® by Schneider Electric

PSS 31H-2C212

Compact FBM212 Thermocouple/mV Differential Input Module

The Compact FBM212 Thermocouple/mV Differential Input Module contains 14 differentially isolated thermocouple input channels, and one differentially isolated RTD reference junction temperature compensation channel.

OVERVIEW

The Compact FBM212, Differential Thermocouple/mV Input Module contains 14 differentially isolated thermocouple input channels, and one differentially isolated RTD reference junction temperature 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). Each channel has a differential input to allow voltage differences between channels without introducing errors.

The Compact FBM212 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 configurable options for Conversion Time and Rate of Change Limits.

FEATURES

Key features of the Compact FBM212 are:

- Fourteen channels for input of thermocouple signals
- One isolated RTD reference junction compensation channel (for terminal temperature sensing)
- Each channel has a differential input
- 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 FBM212.

HIGH ACCURACY

For high accuracy, the module incorporates a multiplexed Sigma-Delta converter, which can provide new analog input readings every 500 ms, and a configurable integration period to remove any process noise and power line frequencies. Each update 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.

COMPACT DESIGN

The Compact FBM212'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

LEDs incorporated into the front of the module provide visual status indications.

EASY REMOVAL/REPLACEMENT

The module mounts 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 redundant 2 Mbps module Fieldbus used by the FBMs. The Compact FBM212 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.

MODULAR BASEPLATE MOUNTING

The modules mount on a Compact 200 Series baseplate which is either DIN rail mounted or rack mounted horizontally, and includes signal connectors for redundant Fieldbus, redundant independent dc power, and termination cables. Two screws on each FBM secure the module to the Compact 200 Series baseplate.

TERMINATION ASSEMBLIES

Field I/O signals connect to the FBM subsystem via DIN rail mounted TAs. The TAs used with the Compact FBM212 are described in "TERMINATION ASSEMBLIES AND CABLES" on page 6.

FUNCTIONAL SPECIFICATIONS

Input
14 group isolated differential thermocouple/mV input channels and one reference junction temperature compensation channel.

Input Range
-10.5 to +69.5 mV dc (-10.5 to +69.5 mV dc equals 0 to 64000 raw counts. Inputs of 71.419 mV dc equals 65535 raw counts (full range of module)).

Reference Junction
3-wire 100 ohm platinum RTD (IEC 751, Class B) is internally provided at the termination assembly. Channel 15 is the cold junction compensation channel. The RTD is in the TA and is not customer accessible.

Accuracy

MILLIVOLT INPUT
±0.03% of span (±27 μV) at 25°C

RTD CHANNEL
±0.03% of span

RTD REFERENCE JUNCTION CONFORMITY
±0.25°C

THERMOCOUPLE CONFORMITY
±0.25°C

ACCURACY TEMPERATURE COEFFICIENT
±50 ppm/°C

RTD REFERENCE JUNCTION MEASUREMENT ACCURACY(B)
±0.50°C (When using the RTD internal to the Foxboro® supplied termination blocks)

DIFFERENTIAL INPUT IMPEDANCE
10 MΩ

COMMON MODE VOLTAGE
±2.5 V dc or peak ac between channels

Input Signal A/D Conversion
Each channel performs A/D signal conversion using a multiplexed Sigma-Delta converter.

Input Conversion Time
Software configurable

Input Open Circuit Voltage
2.5 V dc (mV channels)

Typical Thermocouple Types
B, E, J, K, N, R, S, T, and other millivolt signals. The thermocouples cannot be grounded. For grounded thermocouple applications, the FBM202 and its associated termination assembly must be used.

Input Channel Isolation
Each channel has a differential input to allow voltage differences between channels without introducing errors. The channels are not galvanically isolated from each other, but are galvanically isolated from ground and module logic.
The module withstands, without damage, a potential of 600 V ac applied for one minute between the differentially 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.

Communication
Communicates with its associated FCM or FCP via the redundant 2 Mbps module Fieldbus.

Power Requirements

INPUT VOLTAGE RANGE (REDUNDANT)
24 V dc +5%, -10%

CONSUMPTION
3 W (maximum) at 24 V dc

HEAT DISSIPATION
3 W (maximum) at 24 V dc

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

FUNCTIONAL SPECIFICATIONS (CONTINUED)

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

RoHS COMPLIANCE

Complies with European RoHS Directive 2011/65/EU.

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 when connected to specified I/A Series®/Foxboro Evo™ processor modules as described in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA).
Communications circuits also meet the requirements for Class 2 as defined in Article 725 of the National Electrical Code (NFPA No.70) and Section 16 of the Canadian Electrical Code (CSA C22.1). Conditions for use are as specified in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA).
European Low Voltage Directive 2006/95/EC (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 I/A Series processor modules as described in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA).

ENVIRONMENTAL SPECIFICATIONS(1)

Operating

TEMPERATURE

Module
-20 to +60°C (-4 to +140°F)
Termination Assembly - PA
-20 to +70°C (-4 to +158°F)

RELATIVE HUMIDITY

5 to 95% (noncondensing)

ALTITUDE

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

Storage

TEMPERATURE

-40 to +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 /S^2 (5 to 500 Hz)

PHYSICAL SPECIFICATIONS

Mounting

MODULE

The Compact FBM212 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.
For applications which require CE certification, the baseplate and power supplies must be installed in a metal rack. Open wall mounting in that case is not allowed.

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

Weight (Cont.)

TERMINATION ASSEMBLIES

Compression
272 g (0.60 lb, approximate)
Ring Lug
263 g (0.80 lb, approximate)

Dimensions - Module

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

Refer to page 8

Part Numbers

COMPACT FBM212 MODULE

RH101GF

TERMINATION ASSEMBLIES

See “FUNCTIONAL SPECIFICATIONS - TERMINATION ASSEMBLIES” on page 7.

(1) 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.]

PHYSICAL SPECIFICATIONS (CONTINUED)

Termination Cables

CABLE LENGTHS
Up to 30 m (98 ft)

CABLE MATERIALS
Polyurethane or Low Smoke Zero Halogen (LSZH)

TERMINATION CABLE TYPE
Type 4 - Refer to Table 2

CABLE CONNECTION
37-pin male D-subminiature

Construction - Termination Assembly

MATERIAL
Polyamide (PA), compression

TERMINAL BLOCKS
Inputs - 2 tiers, 14 positions

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 I/O signals connect to the FBM subsystem via DIN rail mounted termination assemblies, which are electrically passive. TAs for the Compact FBM212 are available in the following forms:

- Compression screw type using Polyamide (PA) material

Each Compact FBM212 Termination Assembly and its associated termination cable provide feedthrough connection between fourteen 2-wire thermocouple/mV analog input signals and the Compact FBM212. The thermocouples cannot be grounded. For grounded thermocouple applications, the Compact FBM202 and its associated termination assembly must be used.

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” on page 7 for a list of TAs used with the Compact FBM212.

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 for a list of termination cables used with the TAs for the Compact FBM212.

FUNCTIONAL SPECIFICATIONS - TERMINATION ASSEMBLIES

FBM Type	Input Signal	TA Part Number[a] PVC	Termination Type[b]	TA Cable Type[c]	TA Certification Type[d]
Compact FBM212	Fourteen isolated and independent thermocouple/mV channels, passive feedthrough with FBM212 channel isolation with one 4-wire 100 ohm platinum RTD (IEC 751, Class B)	RH916BV	C	4	1,4

(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.
(c) See Table 2 for cable part numbers.
(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 DEMKO certified Ex nA IIC T4 Gc for use in Zone 2 potentially explosive atmospheres.
Type 4	All field circuits are Class 2 limited energy (60 V dc, 30 V ac, 100 VA or less) if customer-supplied equipment meets Class 2 limits.

Table 2. Termination Cable Types and Part Numbers - Type 4

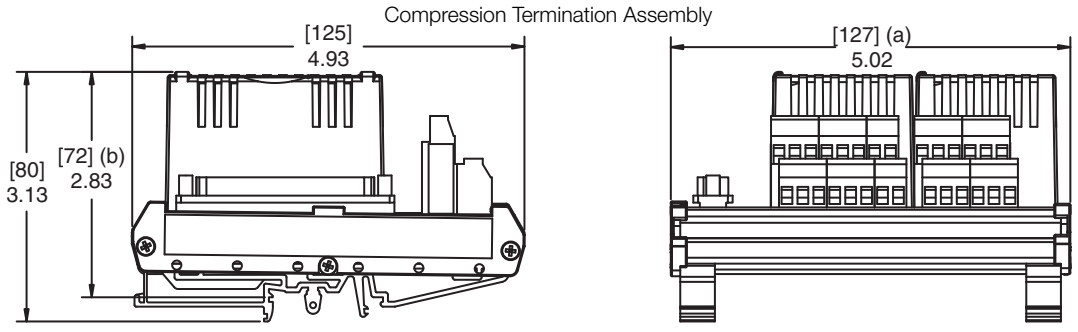
Cable Length m (ft)	Type 4 P/PVC[(a)]	Type 4 LSZH[(b)]
0.5 (1.6)	RH100CJ	RH100BN
1.0 (3.2)	RH100CK	RH100BP
1.5 (4.9)	RH100EQ	RH100EN
2.0 (6.6)	RH100CL	RH100BQ
3.0 (9.8)	RH100CM	RH100BR
5.0 (16.4)	RH100CN	RH100BS
10.0 (32.8)	RH100CP	RH100BT
15.0 (49.2)	RH100CQ	RH100BU
20.0 (65.6)	RH100CR	RH100BV
25.0 (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)

DIMENSIONS – NOMINAL

[mm]
in



(a) Overall width – for determining DIN rail loading.

(b) Height above DIN rail (add to DIN rail height for total).

RELATED PRODUCT DOCUMENTS

Table 3. 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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