Foxboro Evo™ Process Automation System

Product Specifications

Foxboro® by Schneider Electric

PSS 31H-2Z12

FBM212 Thermocouple/mV Differential Input Module

The 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 Differential Thermocouple/mV Input Module (FBM212) 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 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 configurable options for Conversion Time and Rate of Change Limits.

FEATURES

Key features of the 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 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

FBM212 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.

VISUAL INDICATORS

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

EASY REMOVAL/REPLACEMENT

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 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 module mounts on a 200 Series baseplate, which accommodates up to four or eight Fieldbus Modules. 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. 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 ASSEMBLIES

Field I/O signals connect to the FBM subsystem via DIN rail mounted TAs. The TAs used with the 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 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, V 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, V 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 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 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 Foxboro Evo processor modules as described in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA). Also see, Table 1 on page 7.

ENVIRONMENTAL SPECIFICATIONS(1)

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

0.75 /S^2 (5 to 500 Hz)

PHYSICAL SPECIFICATIONS

MODULE

FBM212 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 31H-2SBASEPLT 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

284 g (10 oz) approximate

TERMINATION ASSEMBLIES

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

Dimensions - Termination Assemblies

Refer to page 8

Part Numbers

FBM212 MODULE

P0914XL

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
Polypropylene (PVC), compression
PVC, ring lug

FAMILY GROUP COLOR
Raspberry red - analog

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 FBM212 module are available in the following forms:

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

Each FBM212 Termination Assembly and its associated termination cable provide feedthrough connection between fourteen 2-wire thermocouple/mV analog input signals and the FBM212 Differential Thermocouple/mV Input Module. The thermocouples cannot be grounded. For grounded thermocouple applications, the 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 FBM212 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 for a list of termination cables used with the TAs for the FBM212 module.

FUNCTIONAL SPECIFICATIONS - TERMINATION ASSEMBLIES

FBM Type	Input Signal	TA Part Number[a] PVC	Termination Type[b]	TA Cable Type[c]	TA Certification Type[d]
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)	P0916BV P0916BW	C RL	4	1,4

(a) PVC is polyvinyl chloride rated from -20 to +50°C (-4 to +122°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 CENELEC (DEMKO) certified EEx nA IIC T4 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. Cables Types and Part Numbers

Cable Length m (ft)	Type 4 P/PVC[a]	TYPE 4 LSZH[b]	Type 4 H/XLPE[c]
0.5 (1.6)	P0916FG	P0928BA	P0916WD
1.0 (3.2)	P0916FH	P0928BB	P0916WE
2.0 (6.6)	P0931RQ	P0928BC	P0931RU
3.0 (9.8)	P0916FJ	P0928BD	P0916WF
5.0 (16.4)	P0916FK	P0928BE	P0916WG
10.0 (32.8)	P0916FL	P0928BF	P0916WH
15.0 (49.2)	P0916FM	P0928BG	P0916WJ

Table 2. Cables Types and Part Numbers

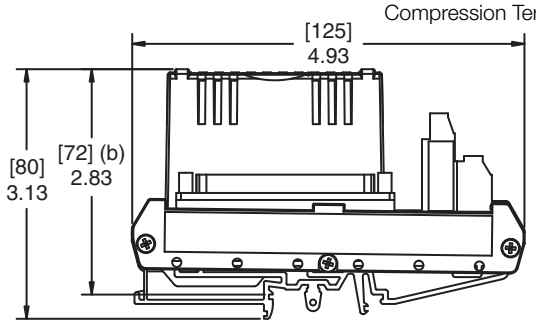
Cable Length m (ft)	Type 4 P/PVC[(a)]	TYPE 4 LSZH[(b)]	Type 4 H/XLPE[(c)]
20.0 (65.6)	P0916FN	P0928BH	P0916WK
25.0 (82.0)	P0916FP	P0928BJ	P0916WL
30.0 (98.4)	P0916FQ	P0928BK	P0916WM

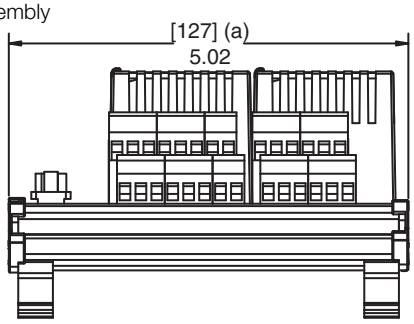
(a) P/PVC is polyurethane outer jacket and semi-rigid PVC primary conductor insulation. PVC is rated from -20 to +50°C (-4 to 122°F).
(b) Low smoke zero halogen or low smoke free of halogen (LSZH) is a material classification used for cable jacketing. LSZH is composed of thermoplastic or thermoset compounds that emit limited smoke and no halogen when exposed to high sources of heat. Temperature range: -40 to +105°C (-40 to +221°F)
(c) H/XLPE is Hypalon outer jacket and XLPE (cross-linked polyethylene) primary conductor insulation. H/XLPE is rated from -40 to +90°C (-40 to 194°F). Hypalon cables are no longer available for purchase.

DIMENSIONS – NOMINAL

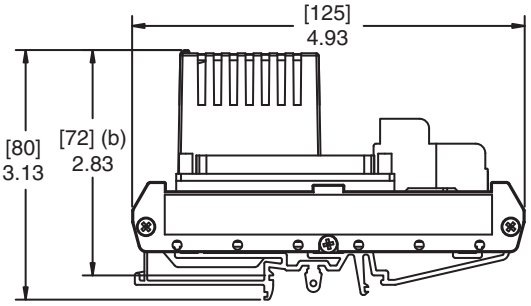
[mm]
in

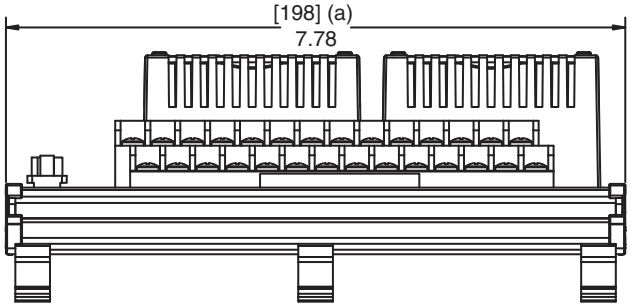
Compression Termination Assembly





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)

PSS Number	Description
PSS 31H-2S200	Standard 200 Series Subsystem Overview
PSS 31H-2CERTS	Standard and Compact 200 Series I/O - Agency Certification
PSS 31H-2SBASEPLT	Standard 200 Series Baseplates
PSS 21S-3CP270ICS	Control Processor 270 (CP270) Integrated Control Software

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