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FBM211, 0 to 20 mA Input Interface Module



The FBM211, 0 to 20 mA Input Interface Module contains sixteen 20 mA dc analog input channels.

FEATURES

Key features of the FBM211 are:

- Sixteen 20 mA dc analog input channels
- Each group of eight input channels is group 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 FBM211
- Termination Assemblies for external or FBM powered transmitters.

OVERVIEW

The FBM211, 0 to 20 mA Input Interface Module contains sixteen 20 mA dc analog input channels, each channel accepting a 2-wire analog sensor input such as a 4 to 20 mA transmitter or a self-powered 20 mA source. The input channels are galvanically isolated from ground and module logic. The module performs the signal conversion required to interface the electrical input signals from the field sensors to the redundant module Fieldbus.

FBM211 executes an analog input application program, which provides configurable options for Conversion Time and Rate of Change Limits.

HIGH ACCURACY

For high accuracy, the module incorporates a multiplexed Sigma-Delta converter shared by all channels, which can provide new analog input readings every 100 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.

COMPACT DESIGN

FBM211 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

Light-emitting diodes (LEDs) incorporated into the front of the module provide visual status indications of Fieldbus Module functions.

EASY REMOVAL/REPLACEMENT

The module can be removed/replaced without removing field device termination cabling, or 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 FBM211 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 DIN rail mounted 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.

TERMINATION ASSEMBLIES

Field I/O signals connect to the FBM subsystem via DIN rail mounted TAs. The TAs used with the FBM211 are described in “TERMINATION ASSEMBLIES AND CABLES” on page 6.

FUNCTIONAL SPECIFICATIONS

Input
16 group isolated and independent channels

Input Range (each channel)
0 to 20.4 mA dc (each channel current limited to 33 mA)

Accuracy (includes linearity)
±0.03% of span
Accuracy temperature coefficient: ±50 ppm/° C

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

Integration Period
Software configurable

Common Mode Rejection
>100 db at 50 or 60 Hz

Normal Mode Rejection
>35 db at 50 or 60 Hz

Input Channel Impedance
61.9 Ω nominal

Field Device Cabling Distance
Maximum distance of the field device from the FBM is a function of compliance voltage (23 V for internal power), wire gauge, and voltage drop at the field device.

Loop Power Supply Protection
Each channel is current limited and voltage regulated when used with TA P0916BT or P0916BU that limits short circuit current to 35 mA. If the current limit circuit shorts out, the current is limited to about 385 mA.

HART® Protocol Compatibility
The channels meet the impedance requirements for a HART High Impedance Device and can be used in a HART loop without interfering with the HART signals between the field device and a Hand-Held Communicator (HHC).
If a FoxCom of HART transmitter is used with FBM211, a 200 ohm in-line resistor (assembly part number P0902VY) must be added in series with the transmitter.

Input Channel Isolation
The channels are not galvanically isolated from each other, but are galvanically isolated from ground and module logic. Group isolated inputs use the FBM subsystem power supply for field power.
The module withstands, without damage, a potential of 600 V ac applied for one minute between the group 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
7 W (maximum) at 24 V dc
11 W (maximum) at 24 V dc with all inputs at 20.4 mA (internal power)

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 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 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 m/S^2 (5 to 500 Hz)

PHYSICAL SPECIFICATIONS

Mounting

MODULE

FBM211 mounts on a Modular baseplate. The Modular 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 ASSEMBLIES

Compression
272 g (0.60 lb, approximate)
Ring Lug
363 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 9.

Part Numbers

FBM211 MODULE

P0914TN

TERMINATION ASSEMBLIES

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

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

(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)

Construction - Termination Assembly

MATERIAL
Polypropylene (PVC), compression PVC, ring lug

FAMILY GROUP COLOR
Raspberry red - analog

TERMINAL BLOCKS
Inputs - 2 tiers, 16 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 FBM211 module are available in the following forms:

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

Each FBM211 Termination Assembly and its associated termination cable provide feedthrough connection between sixteen 2-wire analog input signals and the FBM211.

Loop power is provided to the field devices by a customer-supplied external dc power supply or by the FBM auxiliary +24 V dc power supply depending on the TA selected.

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 FBM211.

FUNCTIONAL SPECIFICATIONS - TERMINATION ASSEMBLIES

FBM Type	Input Signal	TA Part Number (a) PVC	Termination Type (b)	TA Cable Type (c)	TA Certification Type (d)
FBM211	Loop power is provided to the field devices by a customer-supplied external dc power supply.	P0916JT P0916PQ	C RL	4	1,2
FBM211	Loop power is provided to the field devices by the FBM auxiliary +24 V dc power supply.	P0916BT P0916BU	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 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.
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
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).

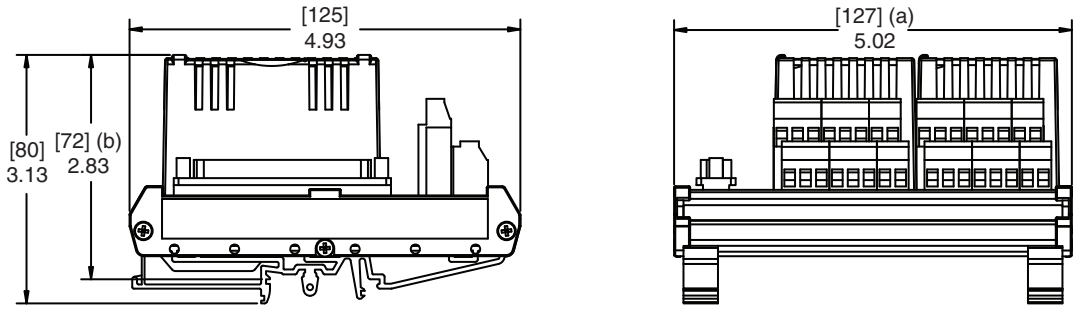
(b) Low smoke zero halogen or low smoke free of halogen (LSZH) is a material classification used for cable jacketing. LSZH is composed of thermoplastic or thermoset compounds that emit limited smoke and no halogen when exposed to high sources of heat. Temperature range; -40 to +105°C (-40 to +221°F)

(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.

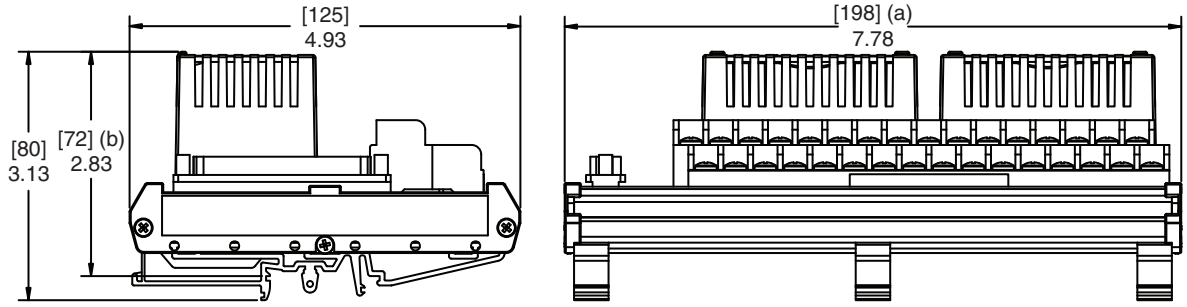
DIMENSIONS – NOMINAL

[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 21H-2W1 B3	DIN Rail Mounted FBM Subsystem Overview
PSS 21H-2W2 B3	DIN Rail Mounted FBM Equipment, Agency Certification
PSS 21H-2W6 B4	DIN Rail Mounted Modular Baseplates
PSS 21S-3B2 B3	Control Processor 270 (CP270) Integrated Control Software

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