

**FBM211, 0 to 20 mA Input Interface Module**

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*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)

$\pm 0.03\%$  of span

Accuracy temperature coefficient:  $\pm 50$  ppm/ $^{\circ}$ 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  $\Omega$  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<sup>®</sup> 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 VO, V dc power and communication lines

*IEC 61000-4-5 Surge Immunity*

2kV on ac and dc power lines; 1kV on VO 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 VO, 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

VA Series® processor modules as described

in the *VA 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 *VA 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 *VA Series DIN Rail*

*Mounted Subsystem User's Guide*

(B0400FA). Also see, Table 1 on page 7.

#### ENVIRONMENTAL SPECIFICATIONS<sup>(1)</sup>

##### 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)

###### 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<sup>2</sup> (5 to 500 Hz)

##### Storage

###### TEMPERATURE

-40 to +70° C (-40 to +158° F)

#### 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<sup>2</sup>/0.2 to 2.5 mm<sup>2</sup>/24 to 12  
AWG

*Stranded with Ferrules*

0.2 to 2.5 mm<sup>2</sup> with or without plastic collar

###### RING-LUG - ACCEPTED WIRING SIZES

#6 size connectors (0.375 in (9.5 mm))

0.5 to 4 mm<sup>2</sup>/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.