

Compact FBM201 Analog Input 0 to 20 mA Interface Module



The Compact FBM201 Analog Input Interface Module provides eight 0-20 mA dc current input channels.

OVERVIEW

The Compact FBM201 Analog Input Interface Module contains eight analog input channels, each channel accepting a 2-wire, 0 to 20 mA dc input from an analog sensor. It is part of the Compact 200 Series I/O subsystem described in *Compact 200 Series I/O Subsystem Overview (PSS 31H-2COV)*.

The modules perform the signal conversion required to interface the electrical input signals from the field sensors to the FCP or ZCP.

FEATURES

Key features of the Compact FBM201 module are:

- ▶ Eight channels for input of analog 0 to 20 mA dc sensor signals
- ▶ Each analog input channel is galvanically isolated from other channels and ground
- ▶ 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 integration time and 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 FBM201 module
- ▶ Termination Assemblies for per channel internally and/or externally loop powered transmitters.

COMPACT DESIGN

The Compact FBM201'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.

HIGH ACCURACY

For high accuracy, the modules incorporate sigma-delta data conversion on a per-channel basis, which can provide a new analog input reading every 25 ms, and a configurable integration period to remove any process noise and power-line frequency noise.

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.

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 secure the module to the baseplate.

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

TERMINATION ASSEMBLIES

Field I/O signals connect to the FBM subsystem via DIN rail mounted TAs. The TAs used with the Compact FBM201 modules are described in "TERMINATION ASSEMBLIES AND CABLES" on page 7.

FUNCTIONAL SPECIFICATIONS

Process I/O Communications

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

Input Channels

8 isolated and independent channels

Input Range (each channel)

0 to 20 mA dc

Input Channels (8)

ANALOG ACCURACY (INCLUDES LINEARITY)

$\pm 0.03\%$ of span

Accuracy temperature coefficient: ± 50 ppm/ $^{\circ}\text{C}$

FIELD DEVICE CABLING DISTANCE

Maximum distance of the field device from the FBM is a function of compliance voltage (22.8 V dc), wire resistance, and voltage drop at the field device.

INPUT CHANNEL IMPEDANCE

61.5 Ω nominal

INPUT SIGNAL A/D CONVERSION

Each channel performs A/D signal conversion using an independent Sigma-Delta converter.

INTEGRATION PERIOD

Software configurable.

COMMON MODE REJECTION

>100 db at 50 or 60 Hz

NORMAL MODE REJECTION

>95 db at 50 or 60 Hz

LOOP POWER SUPPLY PROTECTION

Each channel is channel-to-channel galvanically isolated, current limited, and voltage regulated. All analog inputs are limited by their design to less than 40 mA. If the current limit circuit shorted out, the current is limited to about 100mA.

INPUT CHANNEL ISOLATION

Each channel is galvanically isolated from all other channels and earth (ground). The module/TA withstands, without damage, a potential of 600 V ac applied for one minute between any channel and ground, or between a given channel and any other channel.

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.

Power Requirements

INPUT VOLTAGE RANGE (REDUNDANT)

24 V dc +5%, -10%

CONSUMPTION

7 W

HEAT DISSIPATION

4 W

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 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).

MARINE CERTIFICATION

ABS Type Approved and Bureau Veritas Marine certified for Environmental Category EC31.

ENVIRONMENTAL SPECIFICATIONS⁽¹⁾

Operating

TEMPERATURE

Compact FBM201

-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

7.5 m/S² (0.75 g) from 5 to 500 Hz

(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

Mounting

COMPACT FBM201

The Compact FBM201 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.

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

COMPACT FBM201

185 g (6.5 oz) approximate

TERMINATION ASSEMBLY

Compression

181 g (0.40 lb) approximate

Ring Lug

249 g (0.55 lb) approximate

Dimensions

COMPACT FBM201

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)

TERMINATION ASSEMBLY

See page 9.

Part Numbers

COMPACT FBM201

RH101DA

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 1 – See Table 2 on page 8

BASEPLATE TO MAIN TA CABLE CONNECTION

FBM Baseplate End

37-pin D-subminiature

Termination Assembly End

25-pin D-subminiature

Construction – Termination Assembly

MATERIAL

Polyamide (PA), compression

PA, ring lug

Field Termination Connections

COMPRESSION-TYPE ACCEPTED WIRING SIZES

Solid/Stranded/AWG

0.2 to 4 mm²/0.2 to 2.5 mm²/24 to 12 AWG

Stranded with Ferrules

0.2 to 2.5 mm² with or without plastic collar

RING-LUG TYPE ACCEPTED WIRING SIZES

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

0.5 to 4 mm²/22 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 FBM201 modules are available in the following forms:

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

See “FUNCTIONAL SPECIFICATIONS – TERMINATION ASSEMBLIES” below for a list of TAs used with the Compact FBM201 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 Table 2 for a list of termination cables used with the TAs for the Compact FBM201 module.

FUNCTIONAL SPECIFICATIONS – TERMINATION ASSEMBLIES

FBM Type	Input Signal	TA Part Number ^(a)	Termination Type ^(b)	TA Cable Type ^(c)	TA Certification Type ^(d)
		PA			
Compact FBM201	8 channels, 0 to 20 mA dc, passive feedthrough with Compact FBM201 channel isolation	RH916XG (supersedes P0916AA ^(e) P0916XG)	C	1	1, 2
		P0917JK (supersedes P0916AB ^(e))	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 specifications.
- (d) See Table 1 for Termination Assembly certification definitions.
- (e) Polyamide RL supersedes the PVC RL, note this is not a RoHS part.

Table 1. Certification for Termination Assemblies

Type	Certification ^(a)
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 [nL] 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 200 Series FBMs and field circuits meeting entity parameter constraints specified in <i>Standard and Compact 200 Series Subsystem User's Guide</i> (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.

(a) All TAs are UL/UL-C listed to comply with applicable ordinary location safety standards for fire and shock hazards. Hazardous location types comply with ATEX directive for II 3 G use. They also comply with the requirements of the European Low Voltage Directive. All listings/certifications require installation and use within the constraints specified in *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA) and the conditions stated in UL and DEMKO reports.

Table 2. Cables Types and Part Numbers

Cable Length m (ft)	Type 1 P/PVC ^(a)	Type 1 LSZH ^(b)
0.5 (1.6)	RH100BY	RH100BC
1.0 (3.2)	RH100BZ	RH100BD
1.5 (4.9)	RH100EP	RH100EL
2.0 (6.6)	RH100CA	RH100BE
3.0 (9.8)	RH100CB	RH100BF
5.0 (16.4)	RH100CC	RH100BG
10.0 (32.8)	RH100CD	RH100BH
15.0 (49.2)	RH100CE	RH100BJ
20.0 (65.6)	RH100CF	RH100BK
25.0 (82.0)	RH100CG	RH100BL
30.0 (98.4)	RH100CH	RH100BM

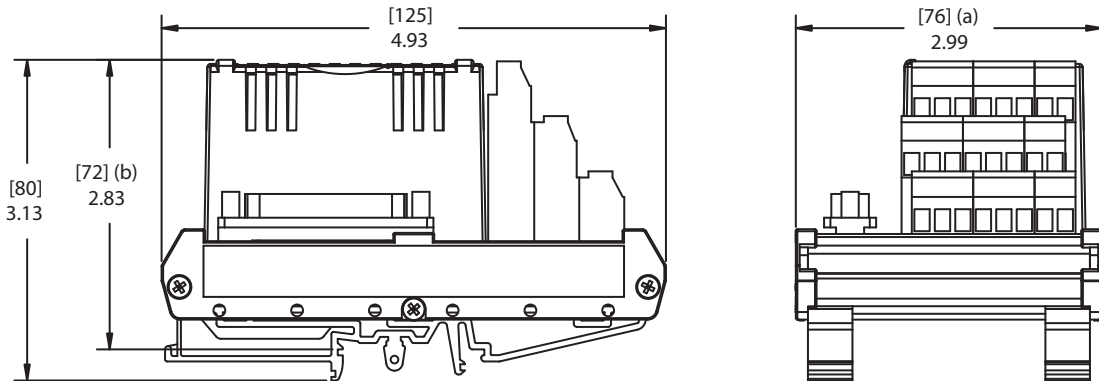
(a) P/PVC is polyurethane outer jacket and semi-rigid PVC primary conductor insulation.

(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)

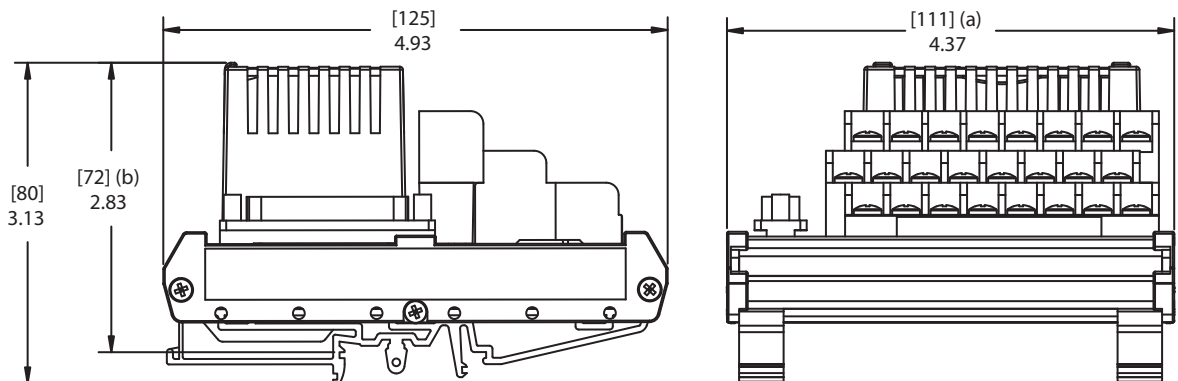
DIMENSIONS – NOMINAL

$\frac{\text{mm}}{\text{in}}$

Compression TA: RH916XG (supersedes P0916AA, P0916XG)



Ring Lug TA: P0917JK (supersedes P0916AB)



- (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-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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