Foxboro™ DCS

Compact FBM201 Analog Input 0 to 20 mA Interface Module

PSS 41H-2C201

Product Specification

August 2019

www.schneider-electric.com

Legal Information

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 41H-2COV).

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

The FBM201 is electrically compatible with standard HART signals.

Features

- 8 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 Fieldbus Modules (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.

Easy Removal/Replacement

The module mounts on a Compact 200 Series baseplate. Two screws on the FBM attach the module to the baseplate.

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

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.

Modular Baseplate Mounting

The modules mount on a DIN rail mounted modular baseplate, which accommodates up to 16 compact FBMs. The baseplate is either DIN rail mounted or rack mounted, and includes signal connectors for redundant fieldbus, redundant independent dc power, and termination cables.

Fieldbus Communication

A Fieldbus Communication Module or a Control Processor interfaces the redundant 2 Mbps module Fieldbus used by the FBMs. The FBM201 modules accept communication from either path (A or B) of the redundant 2 Mbps fieldbus. If one path is unsuccessful or is switched at the system level, the module continues communication over the active path.

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, page 10*.

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): ±0.03% of span Accuracy temperature coefficient: ±50 ppm/ºC • 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 100 mA. • 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. **⚠ DANGER** **HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH** 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. **Failure to follow these instructions will result in death or serious injury.**

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.
Regulatory Compliance: Electromagnetic Compatibility (EMC)	• *European EMC Directive 2014/30/EU*: Meets: EN61326-1:2013 Class A Emissions and Industrial Immunity Levels
Regulatory Compliance, 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 DCS processor modules. 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). For more information, see *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA). • *European Low Voltage Directive 2014/35/EU and Explosive Atmospheres (ATEX) Directive 2014/34/EU*: DEMKO certified as Ex nA IIC T4 for use in certified Zone 2 enclosure when connected to specified processor modules as described in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA).
RoHS Compliance	Complies with European RoHS Directive 2011/65/EU, including amending Directives 2015/863 and 2017/2102
Regulatory Compliance, Marine Certification	ABS Type Approved and Bureau Veritas Marine certified for Environmental Category EC31.

Environmental Specifications

	Operating	Storage
Temperature	• Compact FBM201: -20 to +60°C (-4 to +140°F) • Termination Assembly – PA: -20 to +70°C (-4 to +158°F)	-40° to +70°C (-40° to 158°F)
Relative Humidity	5 to 95% (noncondensing)	
Altitude	-300 to +3,000 m (-1,000 to +10,000 ft)	-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/s^2 (0.75 g) from 5 to 500 Hz	

NOTE: 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) that describes the type of enclosure 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. See *Compact 200 Series 16-Slot Horizontal Baseplate* (PSS 41H-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 *Dimensions - Nominal, page 13*.
Part Numbers	• Compact FBM201 Module: RH101DA • Termination Assemblies: See *Functional Specifications — Termination Assemblies, page 11*.
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, page 12* • 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 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 Type 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 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, page 11* 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, page 12* 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	Termination Type[b]	TA Cable Type[c]	TA Cert. Type[d]
		PA[a]			
Compact FBM201	8 channels, 0 to 20 mA dc, passive feedthrough with Compact FBM201 channel isolation	RH916XG	C	1	1, 2
		P0917JK	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, page 12* for cable part numbers and specifications.

[d] See *Table 1, page 11* for Termination Assembly certification definitions.

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 *Standard and Compact 200 Series 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.

[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 - Cable Types and Part Numbers

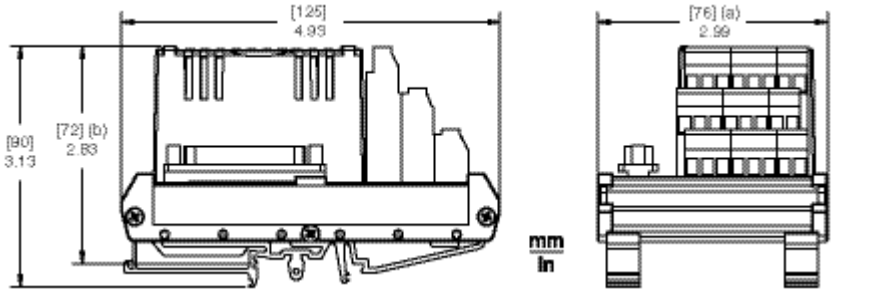
Cable Length m (ft)	Type 1 P/PVC[a]	Type 1 LSZH[b]
0.5 (1.6)	RH100BY	RH100BC
1.0 (3.2)	RH100BZ	RH100BD
1.5 (4.9)	RH100EP	RH100EL
2.0 (6.6)	RH100CA	RH100BE
3.0 (9.8)	RH100CB	RH100BF
5.0 (16.4)	RH100CC	RH100BG
10.0 (32.8)	RH100CD	RH100BH
15.0 (49.2)	RH100CE	RH100BJ
20.0 (65.6)	RH100CF	RH100BK
25.0 (82.0)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

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

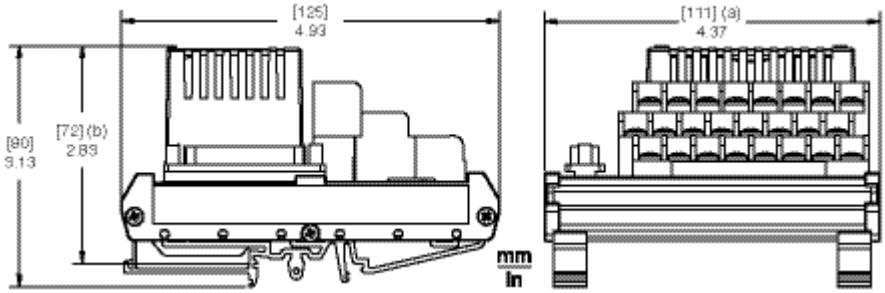
[b] Low smoke zero halogen or low smoke free of halogen (LSZH) is a material classification used for cable jacketing. LSZH is composed of thermoplastic or thermoset compounds that emit limited smoke and no halogen when exposed to high sources of heat. Temperature range; -40 to +105°C (-40 to +221°F).

Dimensions - Nominal

Compression TA: RH916XG



Ring Lug TA: P0917JK



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

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

Related Product Documents

Document Number	Description
PSS 41H-2COV	*Compact 200 Series I/O Subsystem Overview*
B0400FA	*Standard and Compact 200 Series Subsystem User's Guide*
PSS 41H-2C200	*Compact 200 Series 16-Slot Horizontal Baseplate*
PSS 41H-2CERTS	*Standard and Compact 200 Series I/O - Agency Certifications*
PSS 41H-2C480 B4	*Compact Power Supply - FPS480-24*
PSS 41S-3FCPICS	*Field Control Processor 280 (FCP280) Integrated Control Software*

⚠ **WARNING**: This product can expose you to chemicals including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information, go to www.p65warnings.ca.gov/.

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