# Foxboro Evo™ Process Automation System

**Product Specifications**

Foxboro® by Schneider Electric

**PSS 31H-2S201**

## FBM201/b/c/d Analog Input (0 to 20 mA, 0 to 100 mV, 0 to 5 V, 0 to 10 V dc)


*The FBM201/b/c/d Analog Input Modules provide eight dc current or dc voltage input channels.*

## OVERVIEW

Each FBM201/b/c/d Analog Input Module contains eight analog input channels, each channel accepting a 2-wire, dc input from an analog sensor such as a 4 to 20 mA or 0 to 5V transmitter, or a self-powered 20 mA source.

The modules perform the signal conversion required to interface the electrical input signals from the field sensors to the optionally redundant fieldbus. The FBM is electrically compatible with standard HART signals.

## FEATURES

Key features of the FBM201/b/c/d modules are:

- Eight channels for input of analog sensor signals:
  - 0 to 20 mA dc – FBM201
  - 0 to 100 mV dc – FBM201b
  - 0 to 5 V dc – FBM201c
  - 0 to 10 V dc – FBM201d
- Each analog input channel is galvanically isolated from other channels and ground
- 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 FBM201/b/c/d modules
- Termination Assemblies for per channel internally and/or externally loop powered transmitters.

## STANDARD DESIGN

The FBM201/b/c/d modules have 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 of Class G3 as defined in 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 and/or electromagnetic noise.

## EASY REMOVAL/REPLACEMENT

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

## VISUAL INDICATORS

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

## MODULAR BASEPLATE MOUNTING

The modules mount on a modular baseplate (see Figure 1) which accommodates up to four or eight FBMs. 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.

## FIELDBUS COMMUNICATION

A Fieldbus Communication Module or a Control Processor interfaces the redundant 2 Mbps module Fieldbus used by the FBMs. The FBM201/b/c/d modules accept communication from either path (A or B) of the redundant 2 Mbps fieldbus – should one path fail or be 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 (see Figure 1). The TAs used with the FBM201/b/c/d modules are described in “TERMINATION ASSEMBLIES AND CABLES” on page 7.

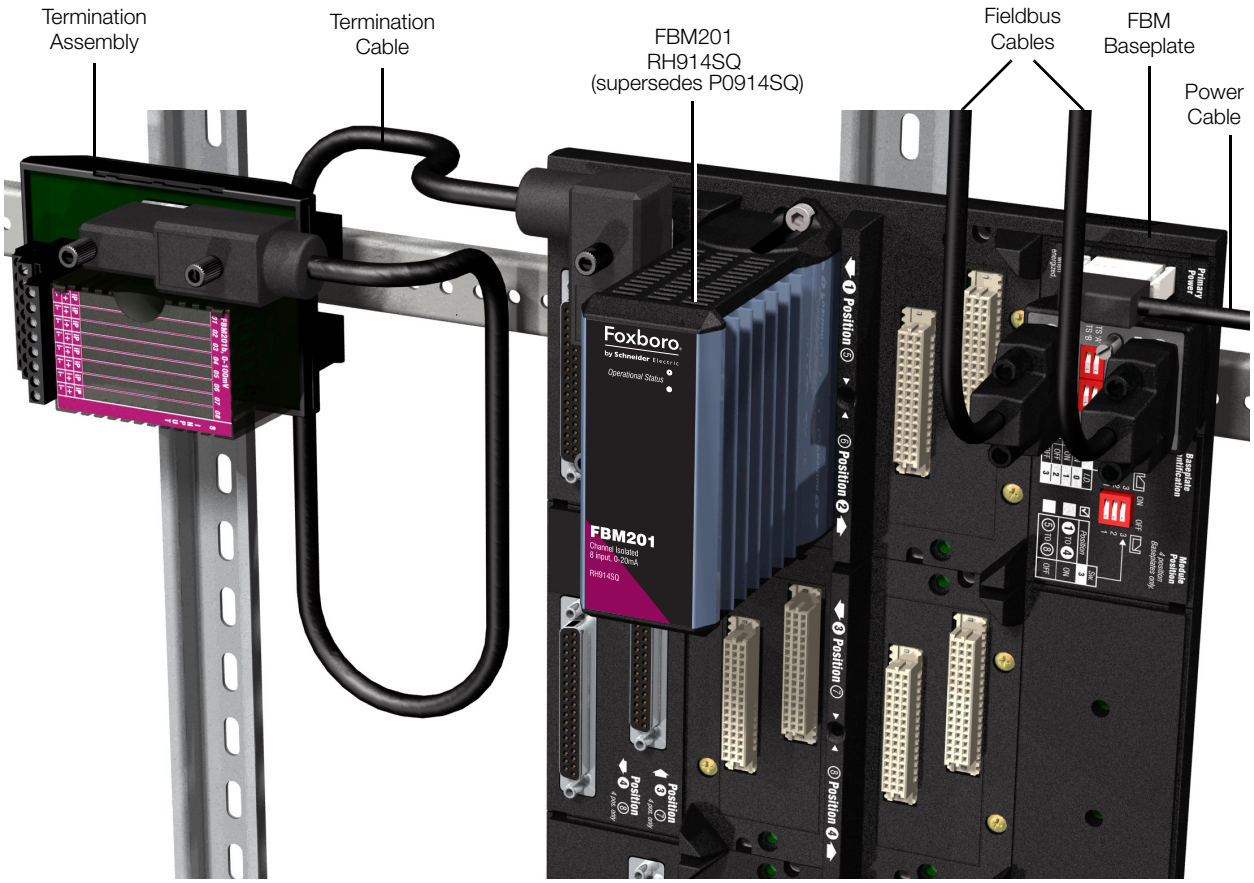



*Figure 1. FBM201 Subsystem – Typical*

## 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)
FBM201: 0 to 20 mA dc
FBM201b: 0 to 100 mV dc
FBM201c: 0 to 5 V dc
FBM201d: 0 to 10 V 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
FBM201: 61.5 Ω nominal
FBM201b: 10 MΩ
FBM201c: 10 MΩ
FBM201d: 10 MΩ

## FUNCTIONAL SPECIFICATIONS (CONTINUED)

**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 30 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 (maximum)

**HEAT DISSIPATION**
3 W (maximum)

### Calibration Requirements

Calibration of the module and termination assembly is not required.

### 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)

## FUNCTIONAL SPECIFICATIONS (CONTINUED)

### MARINE CERTIFICATION

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

## ENVIRONMENTAL SPECIFICATIONS(1)

### Operating

#### TEMPERATURE

*FBM201/b/c/d*

-20 to +70°C (-4 to +158°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 +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

7.5 $m/S^2$ (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

**FBM201/b/c/d**
The modules mount on a modular baseplate. The baseplate can be mounted on a DIN rail (horizontally or vertically), or horizontally on a 19-inch rack using a mounting kit. Alternatively, the modules mount on a 100 Series conversion mounting structure. Refer to *Standard 200 Series Baseplates* (PSS 31H-2SBASPLT) or *100 Series Conversion Mounting Structures* (PSS 31H-2W8) 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

**FBM201/b/c/d**
284 g (10 oz) approximate

**TERMINATION ASSEMBLY**
*Compression*
181 g (0.40 lb) approximate
*Ring Lug*
249 g (0.55 lb) approximate

### Dimensions – FBM201/b/c/d

**HEIGHT**
102 mm (4 in)
114 mm (4.5 in) with mounting lugs

**WIDTH**
45 mm (1.75 in)

**DEPTH**
104 mm (4.11 in)

### Dimensions – Termination Assembly

See page 10

### Part Numbers

**FBM201**
RH914SQ (supersedes P0914SQ)

**FBM201b**
RH922YH (supersedes P0922YH)

**FBM201c**
RH922YJ (supersedes P0922YJ)

**FBM201d**
RH922YK (supersedes P0922YK)

**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 9

**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 (see Figure 1). TAs for the FBM201/b/c/d 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" on page 7 for a list of TAs used with the FBM201/b/c/d modules.

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 FBM201/b/c/d modules.

## FUNCTIONAL SPECIFICATIONS – TERMINATION ASSEMBLIES

| FBM Type | Input Signal | TA Part Number[a] | Termination Type[b] | TA Cable Type[c] | TA Certification Type[d] |
|---|---|---|---|---|---|
| | | PA | | | |
| FBM201 | 8 channels, 0 to 20 mA dc, passive feedthrough with FBM201 channel isolation | RH916XG (supersedes P0916AA[e], P0916XG) | C | 1 | 1, 2 |
| | | P0917JK (supersedes P0916AB)[e] | RL | | |
| FBM201b | 8 channels, 0 to 100 mV dc, passive feedthrough with FBM201b channel isolation | RH922ZM (supersedes P0922ZM) | C | 1 | 1, 2 |
| FBM201c | 8 channels, 0 to 5 V dc, passive feedthrough with FBM201c channel isolation | RH922ZN (supersedes P0922ZN) | C | 1 | 1, 2 |
| FBM201d | 8 channels, 0 to 10 V dc, passive feedthrough with FBM201d channel isolation | RH922ZP (supersedes P0922ZP) | C | 1 | 1, 2 |
| | | P0926SQ | 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 DEMKO certified EEx 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 the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA). They are also 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. |

(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 the *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) | RH916DA (supersedes P0916DA) | RH928AA (supersedes P0928AA) |
| 1.0 (3.2) | RH916DB (supersedes P0916DB) | RH928AB (supersedes P0928AB) |
| 2.0 (6.6) | RH931RM (supersedes P0931RM) | RH928AC (supersedes P0928AC) |
| 3.0 (9.8) | RH916DC (supersedes P0916DC) | RH928AD (supersedes P0928AD) |
| 5.0 (16.4) | RH916DD (supersedes P0916DD) | RH928AE (supersedes P0928AE) |
| 10.0 (32.8) | RH916DE (supersedes P0916DE) | RH928AF (supersedes P0928AF) |
| 15.0 (49.2) | RH916DF (supersedes P0916DF) | RH928AG (supersedes P0928AG) |
| 20.0 (65.6) | RH916DG (supersedes P0916DG) | RH928AH (supersedes P0928AH) |
| 25.0 (82.0) | RH916DH (supersedes P0916DH) | RH928AJ (supersedes P0928AJ) |
| 30.0 (98.4) | RH916DJ (supersedes P0916DJ) | RH928AK (supersedes P0928AK) |

(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).

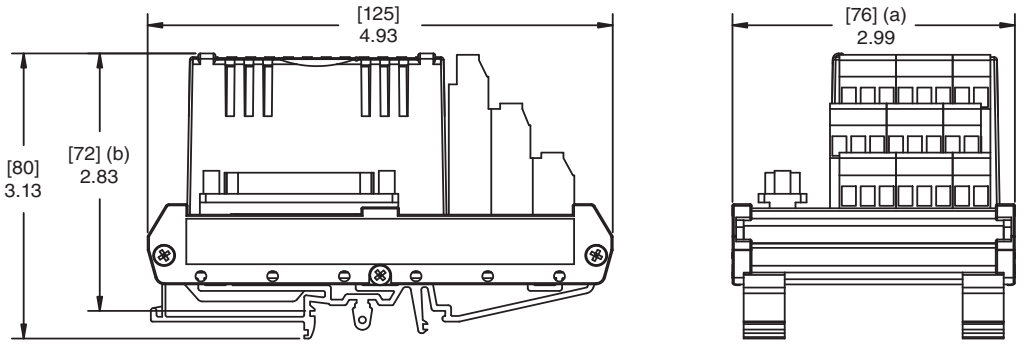
### Use of Termination Assemblies in 100 Series Upgrade Subsystem

When an FBM201 is used to replace the 100 Series FBM01, it may use any of the appropriate termination assemblies listed above for the FBM01's field I/O wiring. Alternatively, the FBM201 can accept this field wiring through a Termination Assembly Adapter (TAA) instead of a termination assembly. This is discussed in *Termination Assembly Adapter Modules for 100 Series Upgrade* (PSS 31H-2W4).

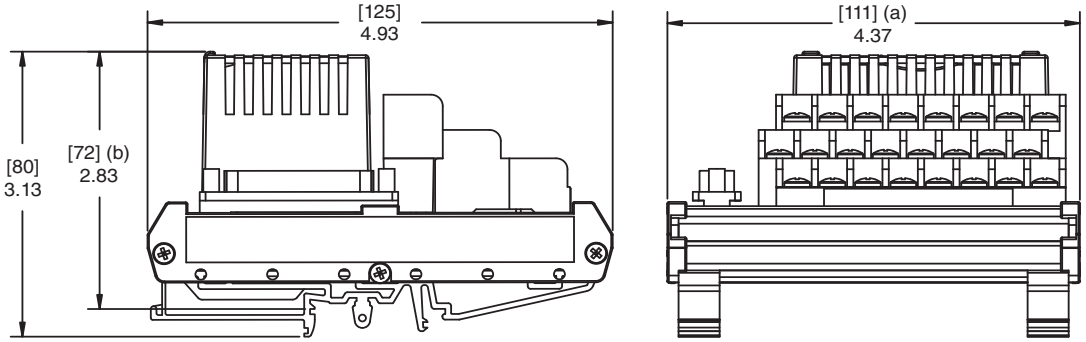
## DIMENSIONS – NOMINAL

[mm]
in

Compression TA: RH916XG (supersedes P0916AA, P0916XG), RH922ZM (supersedes P0922ZM), RH922ZN (supersedes P0922ZN), RH922ZP (supersedes P0922ZP)




Ring Lug TA: P0917JK (supersedes P0916AB), P0926SQ




(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-2SOV | Standard 200 Series Subsystem Overview |
| PSS 31H-2W100 | 100 Series Fieldbus Module Upgrade Subsystem Overview |
| PSS 31H-2CERTS | Standard and Compact 200 Series I/O - Agency Certifications |
| PSS 31H-2W4 | Termination Assembly Adapter Modules for 100 Series Upgrade |
| PSS 31H-2SBASPLT | Standard 200 Series Baseplates |
| PSS 31H-2W8 | 100 Series Conversion Mounting Structures |
| PSS 21S-3CP270IC | Control Processor 270 (CP270) Integrated Control Software |
| PSS 31S-3FCPICS | Field Control Processor 280 (CP280) Integrated Control Software |

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