

FBM215 HART® Communication Output Module



An FBM215 provides up to eight HART® output channels. HART outputs are electrically compatible with 4-20 mA signals, permitting the plant to upgrade field devices without the need to change the control system.

OVERVIEW

The HART Communication Output Module (FBM215) contains eight channel-isolated outputs. The FBM215 supports any mix of standard 4 to 20 mA devices and HART devices.

The FBM215 serves as a HART communications field device host, enabling the Foxboro Evo™ system to request and receive two digital messages per second from each field device. The message pass-through capability can be used to support HART universal, common practice, and device-specific commands, but not the burst communication mode.

These commands are implemented using the *Intelligent Field Device Configurator Foxcom™* and *HART™ Protocols* (IFDC — refer to PSS 21S-8A3 B3 for details).

The FBM215 provides an isolated power supply for each channel.

FEATURES

Key features of the FBM215 module are:

- ▶ Eight channel-isolated output channels, each providing one of the following outputs:
 - Standard 4 to 20 mA analog output signal
 - Digital HART Frequency Shift Keying (FSK) signal superimposed on a 4 to 20 mA analog output signal
- ▶ FSK modem dedicated to each output channel for bi-directional digital communications with a HART field device
- ▶ Galvanic isolation of all output channels from each other, and from ground and module logic
- ▶ Support for HART universal commands necessary to interface the field device with the Foxboro Evo system database
- ▶ Compact, rugged design suitable for enclosure in Class G3 (harsh) environments
- ▶ Termination Assemblies (TAs) for locally or remotely connecting field wiring to the FBM215.

COMPACT DESIGN

The FBM215 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 indication of the module's operational status, and communication activity of the channels.

EASY REMOVAL/REPLACEMENT

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

FIELDBUS COMMUNICATION

A Fieldbus Communication Module or a Control Processor interfaces the redundant 2 Mbps module Fieldbus used by the FBMs. The FBM215 module accepts 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.

MODULAR BASEPLATE MOUNTING

The module mounts on a modular baseplate, 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.

TERMINATION ASSEMBLIES

Field output signals connect to the FBM subsystem via DIN rail mounted TAs. The TAs used with the FBM215 are described in "TERMINATION ASSEMBLIES AND CABLES" on page 7.

FUNCTIONAL SPECIFICATIONS

Field Device Channels

SUPPORTED HART INSTRUMENT TYPES

HART instruments compliant to Version 5, 6, or 7 of the HART specifications may be used

INTERFACE

8 isolated output channels

COMMUNICATIONS TO THE DEVICE

Point-to-point, master/slave, asynchronous, half-duplex, at 1200 baud

ERROR CHECKING

Parity on each byte, and one CRC check byte on each message

SPEED

2 messages per second

FASTEST ALLOWED ECB BLOCK PERIOD

100 msec - However, it is recommended that you refer to the *Sizing Guidelines and Excel Workbook* appropriate for your Control Processor to determine the optimal loading for a 100 msec Block Processing Cycle (BPC).

MAXIMUM DISTANCE (FBM215 TO FIELD DEVICE)

Meets HART FSK physical layer specification HCF_SPEC-54, Revision 8.1 [up to 3030 m (10000 ft)]⁽¹⁾

CURRENT OUTPUTS

Analog Accuracy (Includes Linearity)

±0.05% of span (between 4 mA and 20 mA)

Output Load

750 Ω maximum

Maximum Rate of Change

20 mA in 60 milliseconds

Resolution

13 bits

LOOP POWER SUPPLY PROTECTION

Each channel is channel-to-channel galvanically isolated, current limited, and voltage regulated. All analog outputs are limited by their design to about 25 mA. If the output FET shorts, the output current could increase up to 100 mA.

In normal operation the FBM outputs a constant current into a 0 to 750 ohm load.

ISOLATION

The channels are galvanically isolated (both optical and transformer isolation) from each other, and from ground and module logic. The module withstands, without damage, a potential of 600 V ac applied for one minute between the 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.

Fieldbus Communication

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

Power Requirements

INPUT VOLTAGE RANGE (REDUNDANT)

24 V dc $\pm 5\%$

CONSUMPTION

7 W (maximum)

HEAT DISSIPATION

5 W (maximum)

Calibration Requirements

Calibration of the module and termination assembly is not required.

(1) The maximum allowable distance decreases when the loop is operated through an intrinsic safety barrier. The maximum distance of the field device from the FBM is a function of compliance voltage (19 V dc at 20.4 mA), wire and load resistance, and voltage drop at the field device.

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, 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, 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

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 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 Foxboro Evo processor modules as described in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA). Also, see Table 1 on page 8.

ENVIRONMENTAL SPECIFICATIONS⁽²⁾

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

7.5 m/S² (0.75 g) from 5 to 500 Hz

(2) 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

MODULE

The FBM215 mounts 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, FBM215 mounts on a 100 Series conversion mounting structure. Refer to *Standard 200 Series Baseplates* (PSS 31H-2SBASEPLT) 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

MODULE

284 g (10 oz) approximate

TERMINATION ASSEMBLY

Compression

181 g (0.40 lb) approximate

Ring Lug

249 g (0.55 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 Assembly

See page 9.

Part Numbers

FBM215 MODULE

P0922VU

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

Types 1 – See Table 2 on page 8.

CABLE CONNECTION – TA

FBM Baseplate End

37-pin D-subminiature

Termination Assembly End

25-pin D-subminiature

Construction – Termination Assembly

MATERIAL

Polyvinyl Chloride (PVC), compression

PVC, 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 output signals connect to the FBM subsystem via DIN rail mounted Termination Assemblies, which are **electrically passive**. TAs for the FBM215 are available in the following forms:

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

See the following “FUNCTIONAL SPECIFICATIONS – TERMINATION ASSEMBLIES” for a list of TAs used with the FBM215.

The FBM215 provides sufficient loop resistance to allow use of the HART Hand-Held Terminal, or *PC20 Intelligent Field Device Configurator* (PSS 2A-1Z3 E).

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 FBM215.

FUNCTIONAL SPECIFICATIONS – TERMINATION ASSEMBLIES

FBM Type	Output Signal	TA Part Number	TA Part Number	Termination	TA Cable	TA Certification
		PVC ^(a)	PA ^(a)	Type ^(b)	Type ^(c)	Type ^(d)
FBM215	8 output channels, 4 to 20 mA analog signal, alone or with HART signal superimposed	P0917XV P0926EK	P0926SP	C RL	1	1, 2

(a) PVC is polyvinyl chloride rated from -20 to +50°C (-4 to +122°F). 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.

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 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 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 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 *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)	Type 1 H/XLPE ^(c)
0.5 (1.6)	P0916DA	P0928AA	P0916VA
1.0 (3.2)	P0916DB	P0928AB	P0916VB
2.0 (6.6)	P0931RM	P0928AC	P0931RR
3.0 (9.8)	P0916DC	P0928AD	P0916VC
5.0 (16.4)	P0916DD	P0928AE	P0916VD
10.0 (32.8)	P0916DE	P0928AF	P0916VE
15.0 (49.2)	P0916DF	P0928AG	P0916VF
20.0 (65.6)	P0916DG	P0928AH	P0916VG
25.0 (82.0)	P0916DH	P0928AJ	P0916VH
30.0 (98.4)	P0916DJ	P0928AK	P0916VJ

(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)

(c) H/XLPE is Hypalon outer jacket and XLPE (cross-linked polyethylene) primary conductor insulation. Temperature range: -40 to +90°C (-40 to +194°F). Hypalon cables are no longer available for purchase.

Migration Use of Termination Assemblies

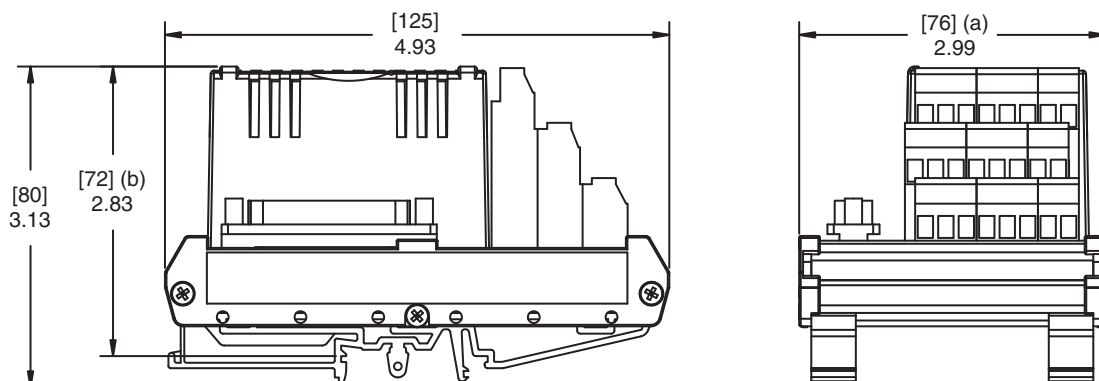
When an FBM215 is used to replace the 100 Series FBM37, it may use any of the appropriate termination assemblies listed above for the FBM37's field I/O wiring.

Alternatively, the FBM215 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).

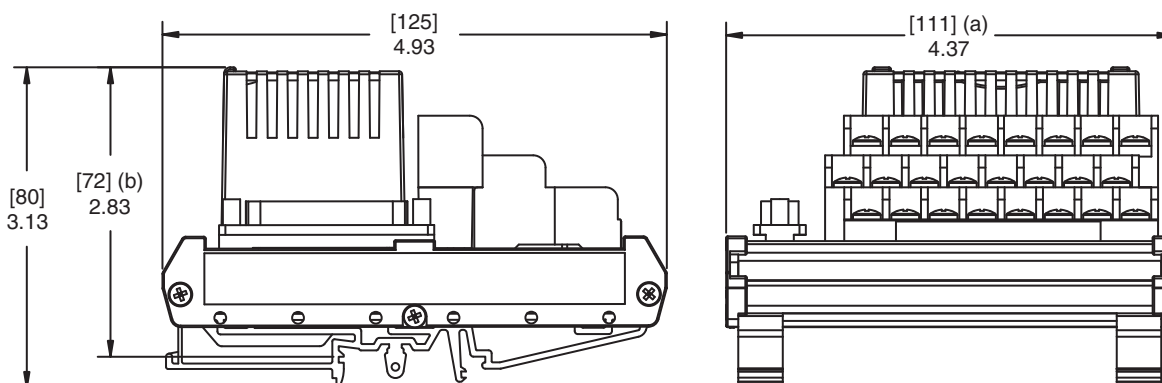
DIMENSIONS – NOMINAL

[mm]
in

Compression 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 Number	Description
PSS 31H-2S200	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-2SBASEPLT	Standard 200 Series Baseplates
PSS 31H-2W8	100 Series Conversion Mounting Structures
PSS 21S-3CP270ICS	Control Processor 270 (CP270) Integrated Control Software



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