

Compact FBM215, HART® Communication Output Interface Module



The Compact FBM215 HART® Communication Output Interface Module offers eight output channels, each providing a 4 to 20mA output signal or a digital HART signal superimposed on the analog output.

FEATURES

Key features of the Compact 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™ Control Core Services 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 Compact FBM215.

OVERVIEW

The Compact HART Communication Output Interface Module (FBM215) contains eight channel-isolated output channels. The Compact FBM215 supports any mix of standard 4 to 20 mA devices and HART devices, and is part of the Compact 200 Series I/O subsystem described in *Compact 200 Series I/O Subsystem Overview* (Reference 1). (See Table 3, “Reference Documents,” on page 10 at the end of this document.)

The Compact 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 (IFDC — see *Intelligent Field Device Configurator FoxCom and HART Protocols* (Reference 2) for details).

The Compact FBM215 provides an isolated power supply for each channel.

When connected to the appropriate TAs, the Compact FBM215 provides functionality formerly provided by the 100 Series FBM I/O subsystem. TAs are available which support the functionality of the 100 Series FBM37 when the FBM37 is used with HART devices.

COMPACT DESIGN

The Compact FBM215'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.

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 mounts on a Compact 200 Series baseplate which is either DIN rail mounted or rack mounted horizontally with a kit, and includes signal connectors for redundant Fieldbus, redundant independent dc power, and termination cables. Two screws on the FBM secure the module to the Compact 200 Series baseplate.

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

TERMINATION ASSEMBLIES

Field output signals connect to the FBM subsystem via DIN rail mounted TAs. The TAs used with the Compact 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 +5% -10%

CONSUMPTION

5 W (maximum)

HEAT DISSIPATION

4 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

± 2 kV on ac and dc power lines; ± 1 kV 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. 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

DIN Rail Mounted Subsystem User's Guide (Reference 3).

European Low Voltage Directive 73/23/EEC and Explosive Atmospheres (ATEX) directive 94/9/EC

ATEX (DEMKO) Ex nA IIC T4 Gc certified

when connected as described in the *DIN Rail Mounted Subsystem User's Guide*

(Reference 3). For use in an enclosure suited for an ATEX Zone 2 classified area. Also, see Table 1 on page 8.

ENVIRONMENTAL SPECIFICATIONS

Operating

TEMPERATURE

Module

-20 to +60°C (-4 to +140°F)

Termination Assembly

PVC(2)

-20 to +50°C (-4 to +122°F)

PA (Polyamide)

-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

(2) Do not use this termination assembly when the temperature specification exceeds +50°C (122°F).

PHYSICAL SPECIFICATIONS

Mounting

MODULE

The Compact FBM215 mounts on a Compact 200 Series 16-slot horizontal baseplate. The baseplate can be mounted on a horizontal DIN rail, or on a 19-inch rack using a mounting kit. Refer to *Compact 200 Series 16-Slot Horizontal Baseplate* (Reference 4) 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

185 g (6.5 oz) approximate

TERMINATION ASSEMBLY

Compression

181 g (0.40 lb) approximate

Ring Lug

249 g (0.55 lb) approximate

Dimensions – Module

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)

Dimensions – Termination Assembly

See page 9.

Part Numbers

COMPACT FBM215 MODULE

RH101AC

TERMINATION ASSEMBLIES

See “FUNCTIONAL SPECIFICATIONS – TERMINATION ASSEMBLIES” on page 7.

Termination Cables

CABLE LENGTHS

Up to 30 m (98 ft)

CABLE MATERIALS

Polyurethane (PVC) 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

Compression

PVC, Polyamide (PA)

Ring Lug

PVC

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 Compact FBM215 are available in the following forms:

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

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

The Compact FBM215 provides sufficient loop resistance to allow use of the HART Hand-Held Terminal, or PC20 Intelligent Field Device Configurator (Reference 5).

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 (PVC)
- ▶ 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 Compact 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)
Compact FBM215 Module	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 Ex 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 DIN rail mounted FBMs and field circuits meeting entity parameter constraints specified in <i>DIN Rail Mounted Subsystem User's Guide</i> (Reference 3). 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 DIN Rail Mounted Subsystem User's Guide (Reference 3) 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
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)

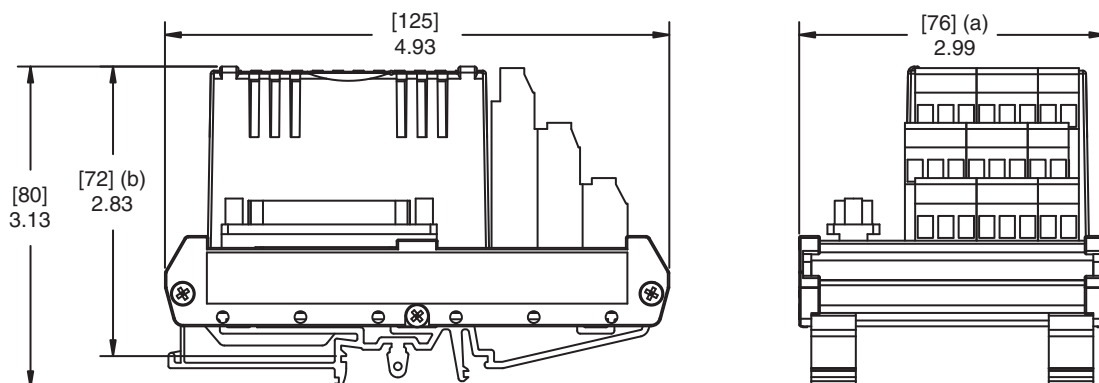
Migration Use of Termination Assemblies

When a Compact 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.

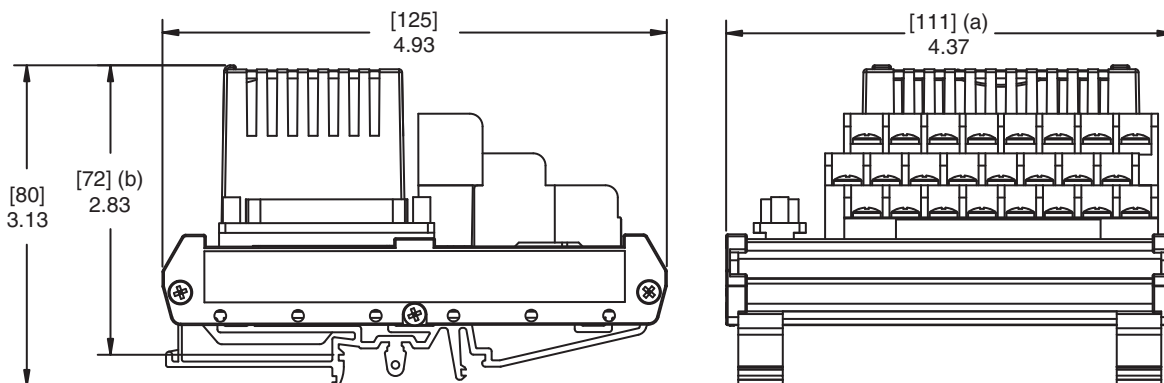
DIMENSIONS – NOMINAL

[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 DOCUMENTS

Table 3. Reference Documents

Reference	Document Number	Description
1	PSS 31H-2COV B3	Compact 200 Series I/O Subsystem Overview
2	PSS 21S-8A3 B3	Intelligent Field Device Configurator FoxCom and HART Protocols
3	B0400FA	DIN Rail Mounted Subsystem User's Guide
4	PSS 31H-2C200 B4	Compact 200 Series 16-Slot Horizontal Baseplate
5	PSS 2A-1Z3E	Model PC20 Intelligent Field Device Configurator for Use with Transmitter with FoxCom or HART Communication Protocol

Table 4. Other Related Documents

Document Number	Description
PSS 31H-2W12 B3	DIN Rail Mounted Compact 200 Series I/O Equipment, Agency Certifications
PSS 31H-2C480 B4	Compact Power Supply - FPS480-24
PSS 31S-3B3 B3	Field Control Processor 280 (FCP280) Integrated Control Software
PSS 21S-3B2 B3	Control Processor 270 (CP270) Integrated Control Software

