EcoStruxure™

Foxboro™ DCS

FBM218 HART® Communication Redundant Output Module

PSS 41H-2S218

Product Specification

January 2021

Schneider Electric™

https://www.se.com

Legal Information

Overview

The FBM218 provides eight channels that support the HART® protocol and/or 4-20 mA outputs (the signals are electrically compatible) user-selectable on a per channel basis. A pair of FBM218 modules supports continued plant operation in the presence of a single failure and through the simple maintenance replacement.

The HART Communication Redundant Output Module (FBM218) contains eight channel-isolated outputs. The FBM218 supports any mix of standard 4 to 20 mA devices and HART devices.

A pair of the modules combines to provide redundancy at the Fieldbus Module (FBM) level, with field outputs wired to one termination assembly (see Figure 1). In this configuration, one FBM218 is the Master, and the other is the Tracker.

The FBM218 can serve as a HART communications field device host, enabling Foxboro™ DCS to request and receive two digital messages per second from the field device. The message pass through capability can support HART universal, common practice, and device-specific commands, but it cannot support the burst communication mode. These commands are implemented using the Foxboro DCS Field Device Expert for HART. For more details, see *Field Device Expert for HART Devices Control and I/O* (PSS 41S-10FDMHRT).

The module provides an isolated power supply for each channel.

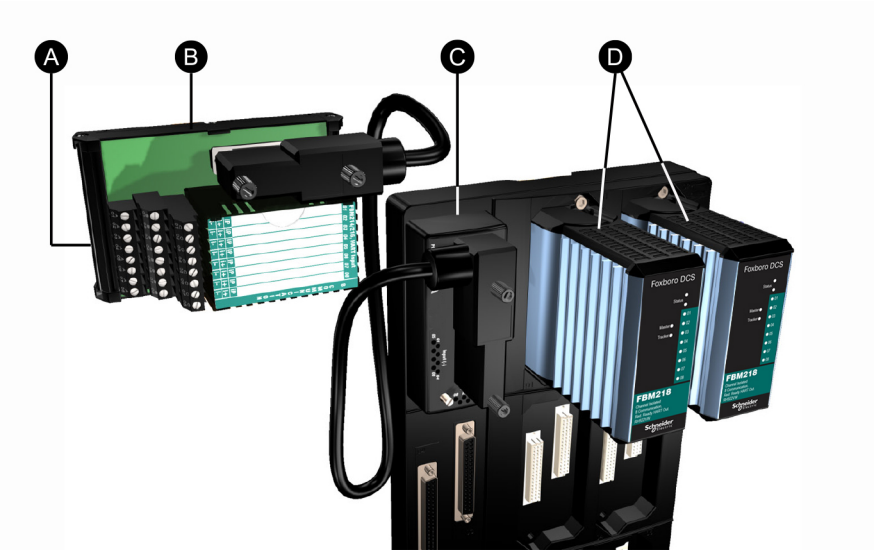
Features

- 8 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
- Module pair offers redundancy at the FBM level
- FSK modem dedicated to each output channel for bi-directional digital communications with a HART field device
- Support for HART universal commands necessary to interface the field device with the Foxboro DCS database
- Galvanic isolation of all output channels from each other, from ground, and module logic
- Rugged design suitable for enclosure in Class G3 (harsh) environments
- Termination Assemblies (TAs) for locally or remotely connecting field wiring to the FBM218

Physical Design

The FBM218 has a modular 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.

Figure 1 - Redundant Module Configuration



Legend	
A	To Intelligent and/or 4-20 mA Field Devices
B	Termination Assembly (TA)
C	FBM218/237 Redundant Adapter (RH916QD)
D	Two FBM218 Fieldbus Modules

High Reliability

The redundancy of the module pair, coupled with the high coverage of faults, provides very high subsystem availability. Either module may be replaced without upsetting field signals to the other module. A module can be removed or replaced without removing field device termination cabling, power, or communications cabling.

Redundant Analog Outputs

Each output channel drives an external load and produces a 0 to 20 mA output. Outputs are combined in series through the redundant adapter. The microprocessor of each module executes the analog I/O application program, plus security routines that validate the health of the FBM.

If a failure is detected in one of the modules, its output is driven to 0 mA and the corresponding channel in the good module automatically continues supplying the proper current to the output current loop.

Configurable options in the modules for output security include Fail-Safe Action (Hold/Fallback), Analog Output Fail-Safe Fallback Data (on a per channel basis), Fieldbus Fail-Safe Enable, and Fieldbus Fail-Safe Delay Time. The Analog Output Fail-Safe Fallback Data option must be set for 0 mA output. This removes one of the pair of redundant output channels from service for detectable problems such as a module not properly receiving output writes or not passing security tests on FBM microprocessor writes to output registers. Setting of the Analog Output Fail-Safe Fallback Data option for 0 mA output also minimizes the possibility of a “fail high” result.

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. Two additional LEDs provide the master or tracker status of the modules.

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 FBM218 module accepts 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.

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.

Redundant modules must be located in adjacent positions on the baseplate (positions 1 and 2, 3 and 4, 5 and 6, or 7 and 8). To achieve redundancy, a redundant adapter module is placed on the two adjacent baseplate termination cable connectors to provide a single termination cable connection (see Figure 1). A single termination cable connects from the redundant adapter to the associated termination assembly (TA).

Termination Assemblies

Field output signals connect to the FBM subsystem via DIN rail mounted TAs. The TAs used with the FBM218 are described in Termination Assemblies And Cables, page 11.

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 • System Checking: Parity on each byte, and 32-bit CRC system checking on each message • Speed: 2 messages per second • Fastest Allowed ECB Block Period: 100 ms - However, we recommend 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 (FBM218 to Device): Meets HART FSK physical layer specification HCF_SPEC-54, Revision 8.1 [up to 3,030 m (10,000 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 galvanically isolated, current limited, and voltage regulated. All 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 Ω 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 ground. **⚠⚠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.**

FieldbusCommunication	Communicates with its associated FCM or FCP via the redundant 2 Mbps HDLC fieldbus
Power Requirements	• Input Voltage Range: 24 V dc +5%, -10% • Consumption: 7 W (maximum) • Heat Dissipation: 5 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
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 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 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
Marine Certification	ABS Type Approved and Bureau Veritas Marine certified for Environmental Category EC31
(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.	

Environmental Specifications

	Operating	Storage
Temperature	• Module: -20 to +70°C (-4 to +158°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)	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

	FBM218	Termination Assembly
Mounting	The FBM218 mounts on a baseplate. The baseplate can be mounted on a DIN rail (horizontally or vertically), or horizontally on a 19-inch rack using a mounting kit. See *Standard 200 Series Baseplates* (PSS 41H-2SBASPLT) for details.	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	284 g (10 oz) approximate	• Compression: 181 g (0.40 lb) approximate
Dimensions	• 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)	• Compression: See Dimensions - Nominal, page 14
Part Numbers	• FBM218: RH922VW • Redundant Adapter: RH916QD	See Functional Specifications - Termination Assemblies, page 12
Termination Cables	• Cable Lengths: Up to 30 m (98 ft) • Cable Materials: Polyurethane or Low Smoke Zero Halogen • Termination Cable Type: Type 1 – See Table 2, page 13	
Cable Connection — TA	25-pin male D-subminiature	
Construction - Termination Assembly	• Material: Polyamide (PA), compression • Terminal Blocks: Outputs – 3 tiers, 8 positions	
Field Termination Connections	Compression — 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	

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 FBM218 are available in the following forms:

- Compression screw type using Polyamide material

See Functional Specifications - Termination Assemblies, page 12 for a list of TAs used with the Compact FBM218.

The FBM218 provides sufficient loop resistance to allow use of the HART Hand-Held Terminal or PC20 Intelligent Field Device Configurator.

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, page 13 with the TAs for the FBM218.

Functional Specifications - Termination Assemblies

FBM Type	Output Signal	TA Part Number PA[a]	Term. Type[b]	TA Cable[c]	TA Cert. Type[d]
FBM218	8 output channels 4 to 20 mA analog signal, alone or with HART signal superimposed	RH926SP	C	1	1, 2

(a) PA is polyamide rated from -20 to +70°C (-4 to +158°F).

(b) C = TA with compression terminals.

(c) Refer to Table 2, page 13 for cable part numbers and specifications.

(d) Refer to Table 1, page 12 Termination Assembly certification definitions.

Table 1 - Certifications 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 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 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 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* (Reference 3) and the conditions stated in UL and DEMKO reports.

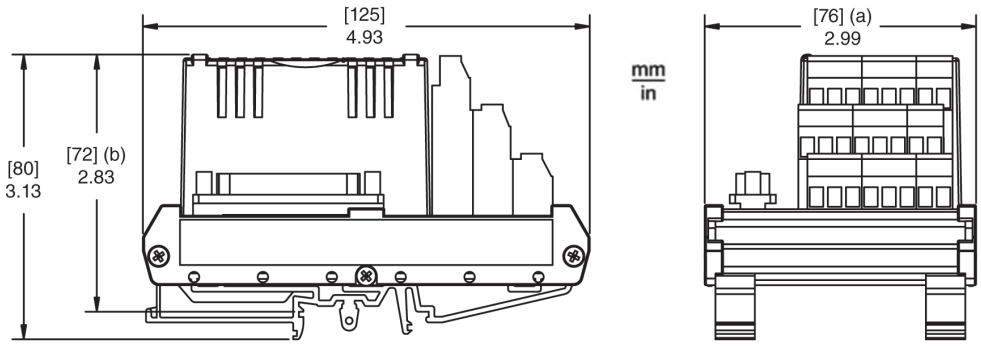
Table 2 - Cables Types and Part Numbers

Cable Length m (ft)	Type 1	Type 1 LSZH[b]
0.5 (1.6)	RH916DA	RH928AA
1.0 (3.2)	RH916DB	RH928AB
2.0 (6.6)	RH931RM	RH928AC
3.0 (9.8)	RH916DC	RH928AD
5.0 (16.4)	RH916DD	RH928AE
10.0 (32.8)	RH916DE	RH928AF
15.0 (49.2)	RH916DF	RH928AG
20.0 (65.6)	RH916DG	RH928AH
25.0 (82.0)	RH916DH	RH928AJ
30.0 (98.4)	RH916DJ	RH928AK

(a) P/PVC is polyurethane outer jacket and semi-rigid PVC primary conductor insulation. Temperature range: -20 to +80°C (-4 to +176°F).

(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



(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-2SOV	*Standard 200 Series Subsystem Overview*
PSS 41S-10FDMHRT	*Field Device Expert for HART Devices Control and I/O*
B0400FA	*Standard and Compact 200 Series Subsystem User's Guide*
PSS 41H-2CERTS	*Standard and Compact 200 Series I/O - Agency Certifications*
PSS 41H-2SBASPLT	*Standard 200 Series Baseplates*
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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As standards, specifications, and design change from time to time, please ask for confirmation of the information given in this publication.

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