Foxboro Evo™ Process Automation System

Product Specifications

Foxboro by Schneider Electric

PSS 31H-2S244

FBM244, 0 to 20 mA I/O Module with HART® Support

The FBM244 provides four input and four output communications channels, each is galvanically isolated from the others. The channels are capable of communicating HART® messages and are electrically compatible with 4 to 20 mA signals.

OVERVIEW

The FBM244 module contains four 0 to 20 mA galvanically isolated analog input and output channels (eight total). The FBM244 supports any mix of standard 4 to 20 mA devices and HART devices.

Each input channel accepts an analog sensor input such as a 4 to 20 mA transmitter or a self-powered 20 mA source. Each output channel drives an external load and produces a 0 to 20 mA output.

The module performs the signal conversion required to interface the electrical input/output signals from the field sensors and actuators to the redundant Fieldbus.

This module executes the analog I/O application program. The configurable options for this program are Fail-Safe Configuration (Hold/Fallback), Analog Output Fail-Safe Fallback Data, (on a per channel basis), Fieldbus Switching Enable and Fieldbus Switching Time. The module does not provide DPIDA support.

FEATURES

Key features of the FBM244 module are:

- Four 0 to 20 mA analog input channels, used for a HART analog sensor input such as a

4 to 20 mA transmitter or a self-powered 20 mA source

- Four analog output channels, used to drive an external load and produce a 0 to 20 mA output
- Support for the HART universal commands necessary to interface the field device with the Foxboro Evo™ system database
  Both inputs and outputs are galvanically isolated
- Rugged design suitable for enclosure in Class G3 (harsh) environments
- Termination Assemblies (TAs) for locally or remotely connecting field wiring to the FBM244
- Termination Assemblies for per channel internally and/or externally loop powered transmitters.

STANDARD DESIGN

The FBM244 module has 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 (Class G3) per ISA Standard S71.04.

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 (FBM) functions.

MODULAR BASEPLATE MOUNTING

The modules mount on a modular baseplate or conversion mounting structure 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 FBM244 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.

TERMINATION ASSEMBLY

Field I/O signals connect to the FBM subsystem via a DIN rail mounted termination assembly. The TA used with the FBM244 modules is described in “TERMINATION ASSEMBLIES AND CABLES” on page 6.

FUNCTIONAL SPECIFICATIONS

Supported Hart Instrument Types
HART instruments compliant to Version 5, 6, or 7 of the HART specifications may be used.

Process I/O Communications
Communicates with its associated FCM or FCP via the redundant 2 Mbps module Fieldbus.

Input Channels
INPUT
4 isolated and independent channels
INPUT RANGE (EACH CHANNEL)
0 to 20.4 mA dc
ACCURACY
±0.03% of span
COMMUNICATION
Via a redundant Fieldbus
INPUT CONNECTIONS
Two configurations (see Figure 1)

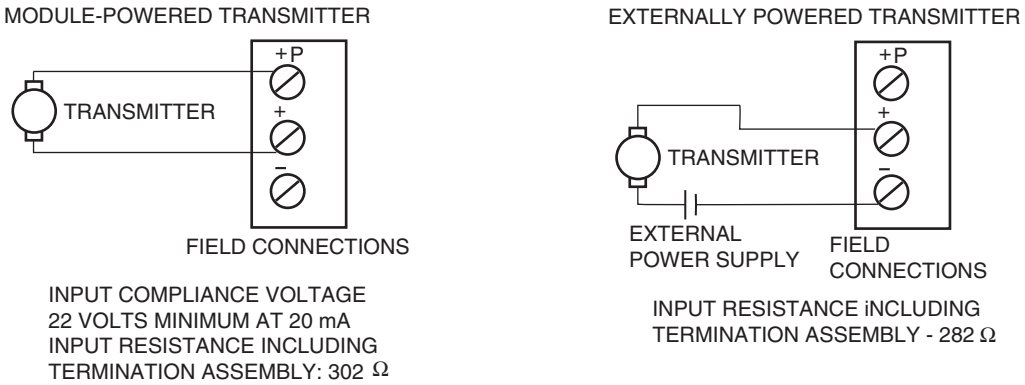


Figure 1. Input Connections

Output Channels
OUTPUT
4 isolated and independent channels
OUTPUT RANGE (EACH CHANNEL)
0 to 20.4 mA dc
OUTPUT LOAD (MAXIMUM)
735 Ω
COMPLIANCE VOLTAGE
18.6 V nominal at 20 mA dc at I/O field terminals
ACCURACY
±0.05% of span (25°C) between 4-20 mA
OUTPUT TEMPERATURE COEFFICIENT
100 ppm/°C
COMMUNICATION
Via a redundant Fieldbus

Output Channels (Cont.)
SETTLING TIME
100 ms to settle within a 1% band of steady state for a 10 to 90% input step change.
LINEARITY ERROR
±0.025% of span (monotonic)
RESOLUTION
12 bits

FUNCTIONAL SPECIFICATIONS (CONTINUED)

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.

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).

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).
Also, see Table 1 on page 7.

MARINE CERTIFICATION

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

ENVIRONMENTAL SPECIFICATIONS(1)

Operating

TEMPERATURE

FBM244
-20 to +70°C (-4 to +158°F)
Termination Assembly
-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

PHYSICAL SPECIFICATIONS

Mounting

FBM244

The modules mount on a modular baseplate or a 100 Series conversion mounting structure. 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

FBM244

284 g (10 oz) approximate

TERMINATION ASSEMBLY

181 g (0.40 lb) approximate

Dimensions – FBM244

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

FBM244

RH927AK (supersedes P0927AK)

TERMINATION ASSEMBLIES

See “FUNCTIONAL SPECIFICATIONS – TERMINATION ASSEMBLIES” on page 6

(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 (CONTINUED)

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 8

CABLE CONNECTION

FBM Baseplate End
37-pin D-subminiature
Termination Assembly End
25-pin D-subminiature

Construction – Termination Assembly

MATERIAL
Polyamide (PA), compression

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

TERMINATION ASSEMBLIES AND CABLES

Field input signals connect to the FBM subsystem via DIN rail mounted Termination Assemblies. The TA for the FBM244 module is available as a compression screw type using Polyamide (PA) material.

See "FUNCTIONAL SPECIFICATIONS – TERMINATION ASSEMBLIES" below for the TA used with the FBM244 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 TA for the FBM244 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			
FBM244	Four input and four output channels, 4 to 20 mA analog signal, from HART devices	RH924QU (supersedes P0924QU) RH924QZ (supersedes P0924QZ)	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) 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 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 *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* (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)	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)

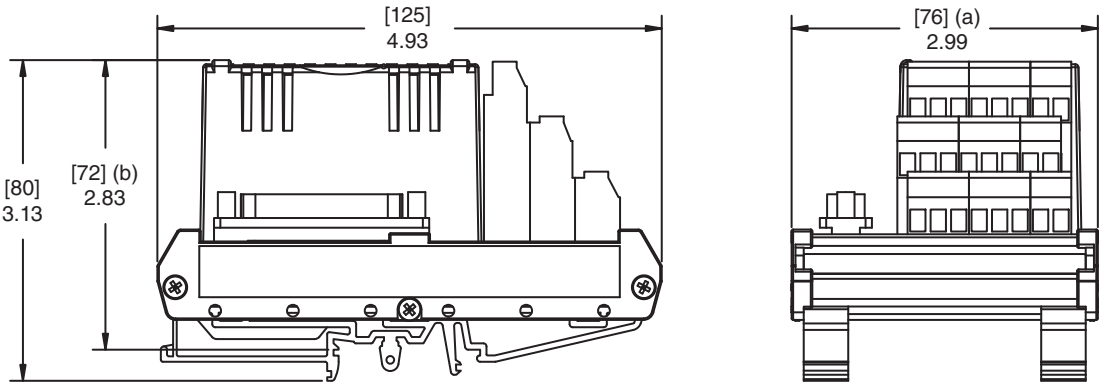
Upgrade Use of Termination Assemblies

When an FBM244 is used to replace the 100 Series FBM04, it may use any of the appropriate termination assemblies listed above for the FBM244's field I/O wiring. Alternatively, the FBM244 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

TERMINATION ASSEMBLY - Compression - RH924QU (supersedes P0924QU), RH924QZ (supersedes P0924QZ)



(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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