**Foxboro Evo™ Process Automation System**

**Product Specifications**

Foxboro®

by Schneider Electric

**PSS 31H-2C237**

# Compact FBM237, 0 to 20 mA Output Module (Redundant Ready)


*The Compact FBM237, 0 to 20 mA Output Module (Redundant Ready) contains eight 0 to 20 mA dc analog output channels.*

## OVERVIEW

The Compact FBM237, 0 to 20 mA Output Interface Module contains eight channel isolated 0 to 20 mA dc analog output channels. The outputs are galvanically isolated from other channels and ground. The module can be used as a single unit, or as a redundant pair. It is part of the Compact 200 Series I/O subsystem described in *Compact 200 Series I/O Subsystem Overview* (PSS 31H-2COV).

When used as a redundant pair, the modules combine to provide redundancy at the FBM level, with field output signals wired to one common termination assembly (see Figure 1). Each module in the pair independently attempts to hold the output(s) at its specified output value(s).

## FEATURES

The key features of the Compact FBM237 are:

- Eight 20 mA dc analog output channels
- Each output channel is galvanically isolated
- Single or redundant modules
- Compact, rugged design suitable for enclosure in Class G3 (harsh) environments
- Termination Assemblies (TAs) for locally or remotely connecting field wiring to the Compact FBM237
- TA for use with Output Bypass Station to maintain outputs during maintenance operations
- 3-tier termination assembly for per channel internally and/or externally loop powered transmitters.

## REDUNDANT ANALOG OUTPUTS

A redundant analog output function block, AOUTR, is used for each redundant pair of outputs. The AOUTR block handles output writes and initialization logic for the redundant channels. On each execution cycle of the AOUTR block, identical reads are sent to each module, fully exercising the fieldbus and the logic circuitry of each module. When 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.

Each output channel drives an external load and produces a 0 to 20 mA output. Transmitter power from each module is diode OR'd together in the redundant adapter to assure redundant power. The microprocessor of each module executes the analog I/O application program, plus security routines that validate the health of the module.

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.

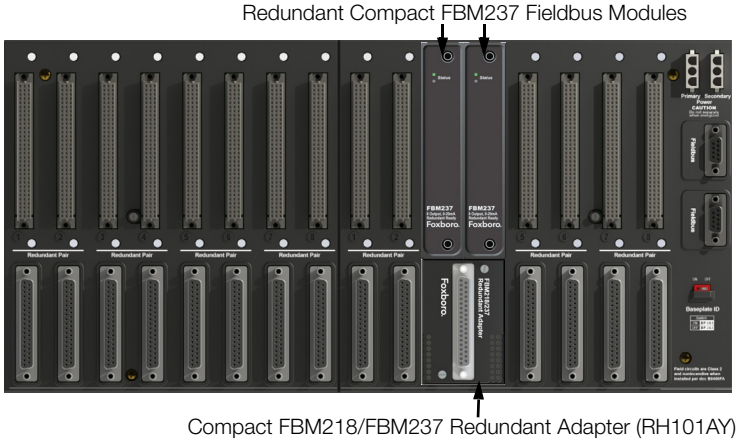



*Figure 1. Compact FBM237 Redundant Module Configuration*

## COMPACT DESIGN

The Compact FBM237'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 (Class G3), per ISA Standard S71.04.

## HIGH RELIABILITY

The redundancy of the module pair, coupled with the high coverage of faults, provides a very high subsystem availability time.

Either module in the redundant pair may be replaced without upsetting field input or output signals to the good module. The module can be removed/replaced without removing field device termination cabling, power, or communications cabling.

## EASY REMOVAL/REPLACEMENT

The module mounts on a Compact 200 Series baseplate. Two screws on the FBM secure the module to the baseplate.

Redundant modules must be located in adjacent positions on the baseplate, with the first module located in an odd-numbered position (for example, the positions labelled "3" and "4"). To achieve redundancy, a redundant adapter module is placed on the two adjacent baseplate termination cable connectors to provide termination for a single cable (see Figure 1). A single termination cable connects from the redundant adapter to the associated termination assembly (TA).

When redundant, either module may be replaced without upsetting field input signals to the good module. Each module can be removed/replaced without removing field termination cabling, power, or communications cabling.

## REDUNDANT MODULES IN FOXBORO EVO HMI

The redundant pair of modules appear as two independent modules to system management software applications (such as System Manager, and System Manager/Display Handler (SMDH)). The functional redundancy for these modules is provided by their associated control blocks.

## VISUAL INDICATORS

Light-emitting diodes (LEDs) incorporated into the front of the module provide visual status indications of fieldbus module functions.

## FIELDBUS COMMUNICATION

A Fieldbus Communications Module or a Control Processor interfaces to the redundant 2 Mbps module Fieldbus used by the FBMs. The Compact FBM237 accepts communication from either path (A or B) of the 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. The TAs used with the Compact FBM237 are described in "TERMINATION ASSEMBLIES AND CABLES" on page 8.

## FUNCTIONAL SPECIFICATIONS

### Output Channels
Eight 20 mA dc analog output channels. Each channel is isolated and independent.

**NOTE**

Redundant pairs (output) are connected by a common field I/O connector, and therefore are not isolated from each other.

### Accuracy - Analog (includes linearity)
±0.05% of Span (between 0.1 mA and 20 mA)
Accuracy temperature coefficient: ±50 ppm/°C

### Output Load
750 Ω maximum

### Output Processing Delay
30 ms maximum

### Output Range (each channel)
0 to 20.4 mA dc

### Resolution
13 bits

### Field Device Cabling Distance
Maximum distance of the field device from the FBM is a function of compliance voltage (18 V dc at 20.4 mA output), wire gauge, and voltage drop at the field device.

### HART® Protocol Compatibility
The channels meet the impedance requirements for a HART high Impedance Device and can be used in a HART loop without interfering with the HART signals between the field device and a Hand-Held Communicator (HHC).

### 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.

### Isolation
Each channel is galvanically isolated from all other channels and earth (ground). The module 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.

### Communication
Communication with its associated FCM or FCP via the module fieldbus.

### Power Requirements

**INPUT VOLTAGE RANGE (REDUNDANT)**
24 V dc +5%, -10%

**CONSUMPTION (MAXIMUM)**
7 W

**HEAT DISSIPATION (MAXIMUM)**
5 W

### Calibration Requirements
Calibration of the module and termination assembly is not required.

## FUNCTIONAL SPECIFICATIONS (CONTINUED)

### 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).

**NOTE**

DEMKO Certification does not apply to Termination Assembly RH917QZ (supersedes P0917QZ). See Table 1 on page 8.

**MARINE CERTIFICATION**

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

## ENVIRONMENTAL SPECIFICATIONS(1)

### Operating Conditions

#### TEMPERATURE

*Module*
-20 to +60°C (-4 to +140°F)
*Termination Assembly-PA*
-20 to +70°C (-4 to +158°F)

#### RELATIVE HUMIDITY

5 to 95% (noncondensing)

#### ALTITUDE

-300 to +3000 m (-1000 to +10 000 ft)

### Storage Conditions

#### TEMPERATURE

-40 to +85°C (-40 to +185°F)

#### RELATIVE HUMIDITY

5 to 95% (noncondensing)

#### ALTITUDE

-300 to +12 000 m (-1000 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 $m/s^2$ (5 to 500 Hz)

## PHYSICAL SPECIFICATIONS

### Mounting

#### MODULE

The Compact FBM237 mounts on a Compact 200 Series 16-slot horizontal baseplate. The baseplate can be mounted on a horizontal DIN rail, or horizontally on a 19-inch rack using a mounting kit.
Redundant modules must be located in odd and even adjacent positions on the baseplate (positions 1 and 2, 3 and 4, 5 and 6, 7 and 8, 9 and 10 (the second 1 and 2), 11 and 12 (the second 3 and 4), 13 and 14 (the second 5 and 6), or 15 and 16 (the second 7 and 8)). Refer to *Compact 200 Series 16-Slot Horizontal Baseplate* (PSS 31H-2C200) 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

#### COMPACT FBM237

185 g (6.5 oz) approximate

#### TERMINATION ASSEMBLIES

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

### Dimensions

#### COMPACT FBM237

*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)

#### TERMINATION ASSEMBLY

Refer to page 10

(1) The environment ranges can be extended by the type of enclosure containing the module. Refer to the Product Specification Sheet (PSS) applicable to the enclosure that is to be used.

## PHYSICAL SPECIFICATIONS (CONTINUED)

### Part Numbers

**COMPACT FBM237**
RH101ET

**TERMINATION ASSEMBLIES**
See "FUNCTIONAL SPECIFICATIONS - TERMINATION ASSEMBLIES" on page 8.

**REDUNDANT ADAPTER**
RH101AY

### Termination Cables

**CABLE LENGTHS**
Up to 30 m (98 ft)

**CABLE MATERIALS**
Polyurethane or Low Smoke Zero Halogen (LSZH)

**TERMINATION CABLE TYPE**
Type 1 - Refer to Table 2

**CABLE CONNECTION**
*FBM Baseplate End*
37-pin D-subminiature
*Termination Assembly End*
25-pin D-subminiature

### Construction - Termination Assembly

**MATERIAL**
Polyamide (PA), compression

**TERMINAL BLOCKS**
Outputs - 3 tiers, 8 positions
Output Bypass Jacks - 8 (P0917QZ)

### 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

**RING-LUG - 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 I/O signals connect to the FBM subsystem via DIN rail mounted termination assemblies, which are electrically passive. TAs for the Compact FBM237 are available in the following forms:

- Compression screw type using Polyamide (PA) material.

Each Compact FBM237 Termination Assembly and its associated termination cable provide feedthrough connection between eight 2-wire analog output signals and the Compact FBM237 Channel Isolated 0 to 20 mA Module.

The termination assembly can be used with a single Compact FBM237 or with a redundant pair. When used with a redundant module pair, the termination assembly is connected to the baseplate using a Compact FBM237 redundant adapter (RH101AY).

Termination Assembly (P0917QZ) includes built-in bypass jacks for each output channel. The bypass jacks accept a bypass plug from the Output Bypass Station (Foxboro P/N P0900HJ) or other external 20 mA sources. This option should be considered for applications where maintaining output during maintenance operations is desired.

See page 8 for a list of TAs used with the Compact FBM237.

A removable termination cable connects the DIN rail mounted TA to the FBM via a field connector on the Modular 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 assemblies to be mounted as needed by plant design. See Table 2 for a list of termination cables used with the TAs for the Compact FBM237.

## FUNCTIONAL SPECIFICATIONS - TERMINATION ASSEMBLIES

| FBM Type | Output | | TA Part Number[a] | Termination | TA Cable | TA Certification |
|---|---|---|---|---|---|---|
| | Qty. | Signal | PA | Type[b] | Type[c] | Type[d] |
| Compact FBM237 | 8 | 0 to 20 mA | RH916YE (supersedes P0916YE, P0916CC) | C | 1 | 1,2 |
| Compact FBM237 | 8 | 0 to 20 mA | RH917QZ (supersedes P0917QZ) with bypass jacks | C | 1 | 4,5 |

(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.

### Table 1. Certification for Termination Assemblies

| Type | Certification |
|---|---|
| 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. |

### Table 1. Certification for Termination Assemblies

| Type | Certification |
|---|---|
| Type 4 | All field circuits are Class 2 limited energy (60 V dc, 30 V ac, 100 VA or less) if customer-supplied equipment meets Class 2 limits. |
| Type 5 | The TA and its field circuitry are for use in only ordinary (non-hazardous) locations. |

### 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 |
| 1.5 (4.9) | RH100EP | RH100EL |
| 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 |

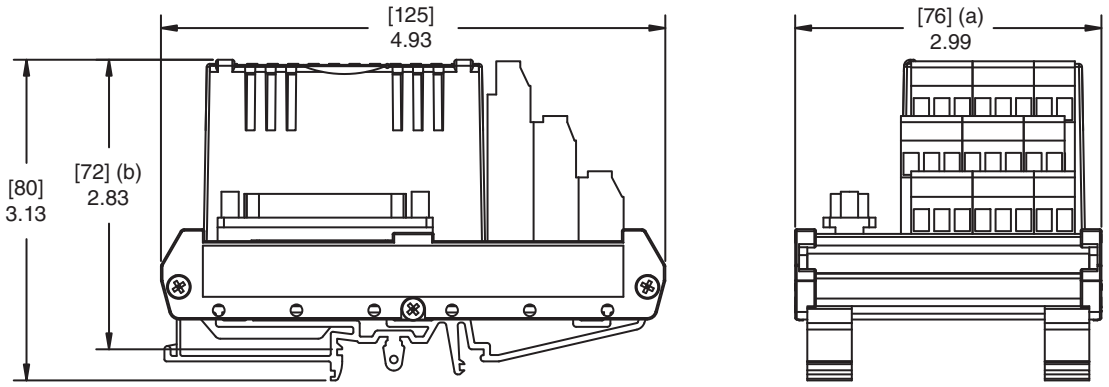
(a) P/PVC is polyurethane outer jacket and semi-rigid PVC primary conductor insulation. Temperature range: -20 to +80°C (-4 to +176°F).

(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

[mm]
in

Compression 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. Other Related Documents

| PSS Number | Description |
|---|---|
| PSS 31H-2COV | Compact 200 Series I/O Subsystem Overview |
| B0400FA | Standard and Compact 200 Series Subsystem User's Guide |
| PSS 31H-2C200 | Compact 200 Series 16-Slot Horizontal Baseplate |
| PSS 21H-2S200 | Standard 200 Series Subsystem Overview |
| PSS 31H-2CERTS | Standard and Compact 200 Series I/O - Agency Certifications |
| PSS 31H-2C480 B4 | Compact Power Supply - FPS480-24 |
| PSS 31S-3FCPICS | Field Control Processor 280 (FCP280) Integrated Control Software |
| PSS 21S-3CP270ICS | Control Processor 270 (CP270) Integrated Control Software |

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