Overview

The FBM204, 0 to 20 mA Input/Output contains four 20 mA dc analog input channels and four 20 mA DC analog output channels.

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 inputs/outputs are galvanically isolated from other channels and ground.

The FBM204 performs the signal conversion required to interface the electrical input/output signals from the field sensors to the optionally redundant fieldbus. The FBM204 executes the Analog I/O application program, which provides the following configurable options: Conversion Time, Fail-Safe Configuration (Hold/Fallback), and Analog Output Fail-Safe Fallback Data (on a per channel basis). The Fieldbus Module (FBM) may instead execute a distributed PIDA (DPIDA) application program to provide a fast control loop running in it.

The FBM204 is electrically compatible with standard HART signals.

Features

- Four 20 mA DC analog input channels
- Four 20 mA DC analog output channels
- Each input and output channel is galvanically isolated
- Rugged design suitable for enclosure in Class G3 (harsh) environments
- Execution of an analog I/O application program that provides conversion time and configurable options for Rate of Change Limits
- High accuracy achieved by sigma-delta data conversions for each channel
- Termination Assemblies (TAs) for locally or remotely connecting field wiring to the Compact FBM204
- 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
- Support for DPIDA control blocks

High Accuracy

For high accuracy, the module incorporates Sigma-Delta data conversion on a per channel basis, which provides new analog input readings every 25 ms, and a configurable integration period to remove any process and/or noise and power line frequencies. Each time period, the FBM converts each analog input to a digital value, averages these values over the time period and provides the averaged value to the controller.

Standard Design

FBM204 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, per ISA Standard S71.04.

Visual Indicators

Red and green light-emitting diodes (LEDs) incorporated into the front of the module provide visual status indications of FBM functions.

Easy Removal/Replacement

The module mounts on a Compact 200 Series baseplate. Two screws on the FBM fix the module to the baseplate. The module can be removed/replaced without removing field device termination cabling, or power or communications cabling.

Fieldbus Communication

A Fieldbus Communications Module or a Control Processor interfaces to the redundant 2 Mbps module Fieldbus used by the FBMs. The FBM accepts communication from either path (A or B) of the 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 DIN rail mounted 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 I/O signals connect to the FBM subsystem via DIN rail mounted TAs. The TAs used with the FBM204 are described in Termination Assemblies and Cables, page 11.

Functional Specifications

Input/Output Channels	Four 20 mA DC analog input channels and four 20 mA DC analog output channels. Each channel is isolated and independent.
Input/Output Range (Each Channel)	0 to 20.4 mA DC (nominal)
Input Channels (Four)	• Accuracy (Includes Linearity): ±0.03% of span • Accuracy Temperature Coefficient: ±50 ppm/ºC • Input Signal A/D Conversion: Each channel performs A/D signal conversion using an independent Sigma-Delta converter. • Input Channel Impedance: 61.5 Ω nominal • Integration Period: Software configurable • Common Mode Rejection: >100 db at 50 or 60 Hz • Normal Mode Rejection: >95 db at 50 or 60 Hz • Field Device Cabling Distance: Maximum distance of the field device from the FBM is a function of compliance voltage (20.2 VDC at 20.4 mA input), wire gauge, and voltage drop at the field device. • Loop Power Supply Protection: Each channel is channel-to-channel galvanically isolated, current limited, and voltage regulated. All analog inputs are limited by their design to less than 30 mA. If the current limit circuit shorts out, the current is limited to about 100mA.

Output Channels (Four)	• Accuracy — Analog (Includes Linearity): ±0.03% of span • Accuracy Temperature Coefficient: ±50 ppm/ºC • Output Load: 750 Ω maximum • Output Processing Delay: 30 ms maximum • Resolution: 13 bits • Field Device Cabling Distance: Maximum distance of the field device from the FBM is a function of compliance voltage (19.6 VDC at 20.4 mA input), wire gauge, and voltage drop at the field device. • 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 35 mA. In normal operation the FBM outputs a constant current into a 0 to 750 ohm load. • 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). If a FoxCom or HART transmitter is used as an “input device” to the Compact FBM204, a 200 ohm in-line resistor (assembly part number RH902VY) must be added in series with the transmitter.
Communication	Communicates with its associated control processor through the redundant 2 Mbps module fieldbus.
Input Channel Isolation	Each channel is galvanically isolated from all other channels and ground. The module withstands, without damage, a potential of 600 VAC applied for one minute between any channel and ground, or between a given channel and any other channel. **⚠⚠DANGER** **HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH** Although the module can withstand a maximum of 600 VAC applied for one minute between any channel, DO NOT apply voltages beyond the published input ranges. The channels are NOT intended for permanent connection to hazardous voltage circuits. Understand that connection of these channels to voltages greater than 30 VAC or 60 VDC violates electrical safety code requirements and may expose users to electric shock. **Failure to follow these instructions will result in death or serious injury.**
Calibration Requirements	Calibration of the module and termination assembly is not required.
Power Requirements	• Input Voltage Range (Redundant): 24 VDC +5%, -10% • Consumption: 7 W

	• Heat Dissipation: 3.5 W
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/ULC 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). **NOTE:** ATEX (DEMKO) Certification does not apply to Termination Assembly RH917QW. See Table 1.
RoHS Compliance	Complies with European RoHS Directive 2011/65/EU, including amending Directives 2015/863 and 2017/2102.
IECEx Certification	IECEx Certified

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)	-20 to +70°C (-4 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)
Vibration	0.75g from 5 to 500 Hz	
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.	

NOTE: The environmental limits of this module may be enhanced by the type of enclosure containing the module. See the applicable Product Specification Sheet (PSS) that describes the specific type of enclosure that is to be used.

Physical Specifications

Mounting	• Module: The FBM204 module 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. Alternatively, FBM204 mounts on a 100 Series conversion mounting structure. See *Standard 200 Series Baseplates* (PSS 41H-2SBASPLT) or *100 Series Conversion Mounting Structures* (PSS 41H-2W8) for details. • Termination Assemblies: 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 Assemblies: ◦ *Compression Type(Approximate)*: 159 g (0.35 lb, approximate) ◦ *Ring Lug Type (Approximate)*: 204 g (0.45 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 Assemblies	See Dimensions - Nominal, page 15.
Part Numbers	• FBM204 Module: RH914SY • Termination Assemblies: 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 (LSZH) • Termination Cable Type: Type 1 — See Table 2, page 13. • 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 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