

FBM206 Pulse Input Module



Measurement of a machine's rotational speed is often accomplished using a device that transmits high speed pulses. The FBM206 provide the means to accept up to eight of these pulse signals (up to 25kHz) and provide the values to the Foxboro Evo™ system. The FBM206b accepts up to four pulse inputs and provides up to four 0 to 20 mA outputs for associated controls.

OVERVIEW

The FBM206 contains eight pulse input channels and the FBM206b, provides four pulse input channels and four 0 to 20 mA analog output channels. Each input channel accepts a 2-wire, pulse input signal from a sensor. Input devices include vortex and turbine meters, solid state or electromechanical contacts, and other sensors with similar pulse outputs.

The modules perform the signal conversion required to interface the electrical input signals from the field sensors to the redundant fieldbus.

FEATURES

Key features of the FBM206/206b modules are:

- ▶ For the FBM206, eight 7 to 27 V dc, configurable, pulse input channels
- ▶ For the FBM206b, four 7 to 27 V dc, configurable, pulse input channels and four 0 to 20 mA analog output channels
- ▶ Each input channel accepts a pulse input with a maximum rate of 25 kHz

- ▶ Each channel is galvanically isolated from the other channels and ground
- ▶ Compact, rugged design suitable for enclosure in Class G3 (harsh) environments
- ▶ Execution of the pulse input application program with configurable options for Pulse Rate Totalization and Resolution (on a per module basis) and Meter Scaling Factor
- ▶ Termination Assemblies (TAs) for locally or remotely connecting field wiring to the FBM206/206b
- ▶ Termination Assemblies for per channel internally and/or externally loop powered devices.

COMPACT DESIGN

The FBM206/206b module has a compact 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.

VISUAL INDICATORS

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

EASY REMOVAL/REPLACEMENT

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

FIELDBUS COMMUNICATION

A Fieldbus Communication Module or a Control Processor interfaces the 2 Mbps module Fieldbus used by the FBMs. FBM206 accepts communication from either path (A or B) of the redundant 2 Mbps Module Fieldbus – should one path fail or be switched at the system level, the module continues communication over the active path.

MODULAR MODULE MOUNTING

The modules mount 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.

TERMINATION ASSEMBLIES

Field I/O signals connect to the FBM subsystem via DIN rail mounted TAs. The TAs used with FBM206 are described in “FUNCTIONAL SPECIFICATIONS – TERMINATION ASSEMBLIES” on page 7.

FUNCTIONAL SPECIFICATIONS

Process I/O Communications

Communicates with its associated FCM or FCP via the redundant 2 Mbps module Fieldbus

Input Channels

FBM206

8 isolated independent pulse input channels

FBM206b

4 isolated independent pulse input channels

Input Pulse Rate

10 Hz to 25 kHz

Input Channels (4 or 8)

ACCURACY

Pulse Count

No missing pulses for pulse rate 0 to 25 kHz

Pulse Rate

0.01% of reading, independent of rate

FIELD DEVICE CABLING DISTANCE

Maximum distance of the field device from the FBM is a function of compliance voltage (22.8 V dc), wire resistance, and voltage drop at the field device.

INPUT PULSE CHARACTERISTICS

See Figure 1.

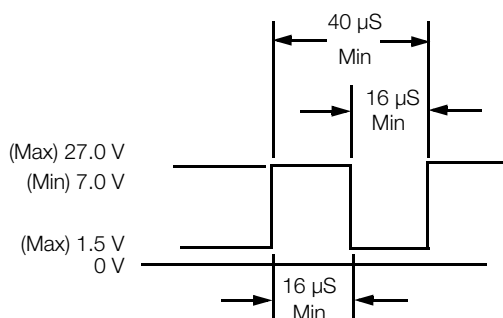


Figure 1. Input Pulse Characteristics

INPUT DUTY CYCLE

Minimum pulse width on/off (see Figure 1)

INPUT CHANNEL IMPEDANCE

10 K Ω

Input Channels (4 or 8) (Cont.)

LOOP POWER SUPPLY PROTECTION

Each channel is channel-to-channel galvanically isolated, current limited, and voltage regulated.

CHANNEL POWER SUPPLY INPUT

24 V dc $\pm 10\%$ at 30 mA maximum to field device

Output Channels (4 - FBM206b Only)

OUTPUT RANGE (EACH CHANNEL)

4 isolated independent 0 to 20.4 mA dc analog output channels

OUTPUT LOAD (MAXIMUM)

735 Ohms

COMPLIANCE VOLTAGE

18.6 V nominal at 20 mA dc at I/O field terminals

ACCURACY

$\pm 0.05\%$ of span (@25°C)

OUTPUT TEMPERATURE COEFFICIENT

100 ppm/°C

COMMUNICATION

Via a redundant Fieldbus.

SETTLING TIME

100 ms to settle within a 1% band of steady state for a 10 to 90% input step change.

LINEARITY ERROR

$\pm 0.025\%$ of span (monotonic)

RESOLUTION

12 bits

Input and Output Channel Isolation

For the FBM206 and FBM206b, each input 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.

FUNCTIONAL SPECIFICATIONS (CONTINUED)

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.

Power Requirements

INPUT VOLTAGE RANGE (REDUNDANT)

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 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. These modules are also UL

and UL-C listed as associated apparatus for

supplying non-incendive communication

circuits for Class I, Groups A-D hazardous

locations 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 73/23/EEC and Explosive Atmospheres (ATEX) directive 94/9/EC

CENELEC (DEMKO) certified as EEx nA IIC

T4 for use in CENELEC certified Zone 2

enclosure certified as associated apparatus

for supplying non-incendive field circuits for

Zone 2, Group IIC, potentially explosive

atmospheres when connected to specified

Foxboro Evo processor modules as

described in the *Standard and Compact*

200 Series Subsystem User's Guide

(B0400FA). Also, see Table 1 on page 7.

ENVIRONMENTAL SPECIFICATIONS⁽¹⁾

Operating

TEMPERATURE

Module

-20 to +70°C (-4 to +158°F)

Termination Assembly

PVC

-20 to +50°C (-4 to +122°F)

PA

-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/S² (0.75 g) from 5 to 500 Hz

PHYSICAL SPECIFICATIONS

Mounting

MODULE

FBM206/206b mounts on a modular 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, FBM206b mounts on a 100 Series conversion mounting structure. Refer to *Standard 200 Series Modular Baseplates* (PSS 31H-2SBASEPLT) 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

MODULE

284 g (10 oz) approximate

TERMINATION ASSEMBLY

Compression

181 g (0.40 lb) approximate

Ring Lug

249 g (0.55 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 Assembly

See page 9.

Part Numbers

FBM206 MODULE

P0916CQ

FBM206b MODULE

P0927AB

TERMINATION ASSEMBLIES

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

(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.

BASEPLATE TO MAIN TA CABLE CONNECTION

FBM Baseplate End

37-pin D-subminiature

Termination Assembly End

25-pin D-subminiature

Construction – Termination Assembly

MATERIAL

Polyvinyl Chloride (PVC), compression

Polyamide (PA), compression

PVC, ring lug

PA, ring lug

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

TERMINATION ASSEMBLIES AND CABLES

Field input signals connect to the FBM subsystem via DIN rail mounted Termination Assemblies, which are electrically passive. TAs for the FBM206 are available in the following forms:

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

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 TAs for the FBM206 and FBM206b.

See “FUNCTIONAL SPECIFICATIONS – TERMINATION ASSEMBLIES” on page 7 for a list of TAs used with the FBM206.

FUNCTIONAL SPECIFICATIONS – TERMINATION ASSEMBLIES

FBM Type	Input Signal	TA Part Number (a)		Termination Type (b)	TA Cable Type(c)	TA Certification Type(d)
		PVC	PA			
FBM206	Eight channels, pulse input, passive feedthrough with FBM206 channel isolation	P0916JQ P0916PG	P0916XM P0917JQ	C RL	1	1,2
FBM206b	Four pulse input channels, Four 0 to 20 mA analog output channels, passive feedthrough with FBM206b channel isolation		P0924QN P0924QP(e)	C C	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.

(e) P0924QP includes output bypass jacks.

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 EEx 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 <i>Standard and Compact 200 Series Subsystem User's Guide</i> (B0400FA). 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 *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA) 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)	Type 1 H/XLPE ^(c)
0.5 (1.6)	P0916DA	P0928AA	P0916VA
1.0 (3.2)	P0916DB	P0928AB	P0916VB
2.0 (6.6)	P0931RM	P0928AC	P0931RR
3.0 (9.8)	P0916DC	P0928AD	P0916VC
5.0 (16.4)	P0916DD	P0928AE	P0916VD
10.0 (32.8)	P0916DE	P0928AF	P0916VE
15.0 (49.2)	P0916DF	P0928AG	P0916VF
20.0 (65.6)	P0916DG	P0928AH	P0916VG
25.0 (82.0)	P0916DH	P0928AJ	P0916VH
30.0 (98.4)	P0916DJ	P0928AK	P0916VJ

(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)

(c) H/XLPE is Hypalon outer jacket and XLPE (cross-linked polyethylene) primary conductor insulation. Temperature range; -40 to +90°C (-40 to +194°F). Hypalon cables are no longer available for purchase.

Use of Termination Assemblies in 100 Series Upgrade Subsystem

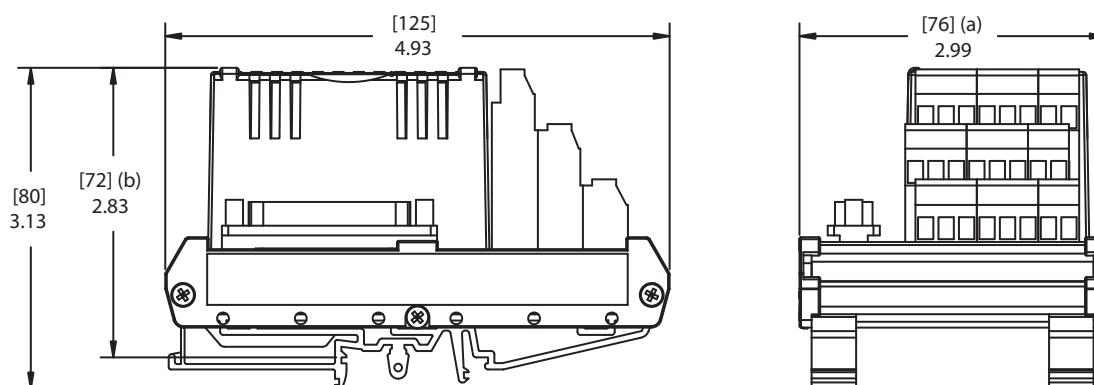
When an FBM206b is used to replace the 100 Series FBM06, it may use any of the appropriate termination assemblies listed above for the FBM06's field I/O wiring.

Alternatively, the FBM206b 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).

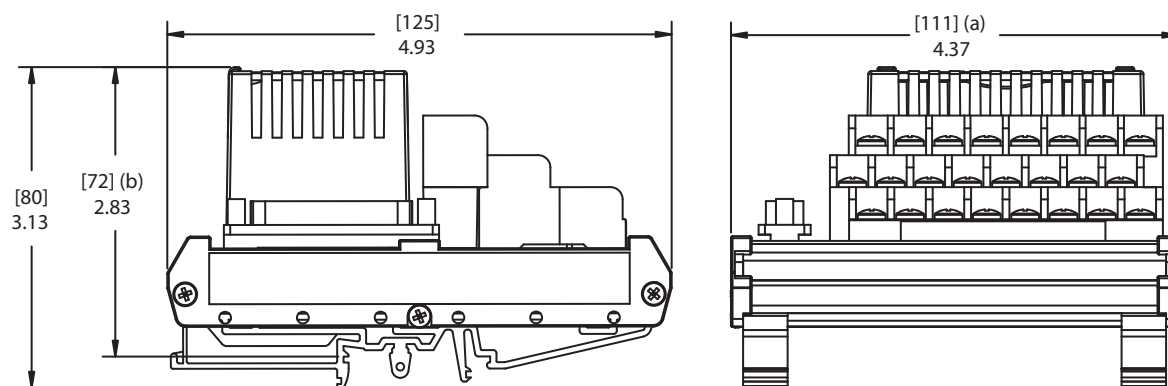
DIMENSIONS – NOMINAL

[mm]
in

Compression Termination Assembly - P0916JQ, P0916X, P0924QN, P0924QP (with Output Bypass Jacks)



Ring Lug Termination Assembly - P0916PG, P0917JQ



- (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-2S200	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-2SBASEPLT	Standard 200 Series Baseplates
PSS 31H-2W8	100 Series Conversion Mounting Structures
PSS 21S-3CP270ICS	Control Processor 270 (CP270) Integrated Control Software
PSS 31S-3FCPICS	Field Control Processor 280 (CP280) Integrated Control Software