

General Specifications

AXFA11 Magnetic Converter for Remote Flowtube



GS 01E20C01-02E-A

The AXFA11 magnetic converter has been developed based on Yokogawa's decades long experience in magnetic flowmeters. The AXFA11 continues the tradition of high quality and reliability that has become synonymous with the Yokogawa name and in addition features an even higher level of performance and increased functionality.

Retaining all the features and functions of the Admag series of converters, in addition the AXFA11 offers an enhanced dual frequency excitation method as an option for difficult applications as well as new diagnostics to detect electrode coating. Combined with a flowtube utilizing the optional replaceable electrode design, the user benefits through the ability to schedule maintenance for reduced process downtime and in turn a lower total cost of ownership.



■ FEATURES

• **Optional enhanced dual frequency excitation method**

The user can select a 165 Hz high frequency component for very high concentration slurries to ensure greater stability and quicker response.

• **Minimum fluid conductivity of 1 μ S/cm**

With the newly designed AXF flow converter, improvements to the input circuit now permit the measurement of fluids with conductivity as low as 1 μ S/cm.

• **Diagnostics to detect insulating coatings on the electrodes**

By constantly monitoring the change in the impedance of the electrode circuit due to the build-up of insulating coatings, the AXF converter will display 4 different levels of coating and provide an alarm function.

• **Improved accuracy specification**

The standard performance specification for AXF is 0.35% of reading. Also available is an optional high accuracy calibration rated at 0.2% of reading.

• **Three line display with infrared switches**

The LCD indicator employs a large, backlit, full dot matrix display. One to three lines are available and these can be programmed to indicate a wide variety of display possibilities, including a bar graph for flow rate indication and a graphical representation of the extent to which the electrodes may be coating. Infrared switches permit programming through the glass without the need to open the enclosure cover.

• **High speed pulse output**

The pulse output can be programmed up to 10,000 pulses/second for high-speed applications such as short batch processes.

• **“Easy Setup” Parameters**

The most frequently used parameters are arranged in one location for easy, quick access.

■ STANDARD SPECIFICATIONS

Excitation Method:

- Standard dual frequency excitation:
Size 2.5 to 400 mm (0.1 to 16 in.)
Combined with AXF Remote Flowtube
- Enhanced dual frequency excitation:
Size 25 to 200 mm (1.0 to 8.0 in.)
Combined with AXF Remote Flowtube
(Option code HF2)

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Input Signal:

Two Status Inputs: Dry contact
Load resistance: 200 Ω or less (ON), 100 kΩ or more (OFF)

Output Signals:

- One Current Output: 4 to 20 mA DC (load resistance: 0 to 1 kΩ, including cable resistance)
- One Pulse Output:
Transistor contact output (open collector)
Contact capacity: 30 V DC (OFF), 200 mA (ON)
Output rate 0.0001 to 10,000 pps (pulse/second)
- One Alarm Output:
Transistor contact output (open collector)
Contact capacity: 30 V DC (OFF), 200 mA (ON)
- Two Status Outputs:
Transistor contact output (open collector)
Contact capacity: 30 V DC (OFF), 200 mA (ON)

Communication Signals:

BRAIN or HART communication signal
(Superimposed on the 4 to 20 mA DC signal)

Communication Line Conditions:

Load Resistance: 250 to 600 Ω (including cable resistance)
Distance from Power Line: 15 cm (6 in.) or more
(Parallel wiring should be avoided.)

BRAIN:**Communication Distance:**

Up to 2 km (1.25 miles), when polyethylene insulated PVC-sheathed cables (CEV cables) are used.
Communication distance varies depending on the type of cable and wiring used.

Load Resistance: 250 to 600 Ω including cable resistance

Load Capacitance: 0.22 μF or less

Load Inductance: 3.3 mH or less

Input Impedance of Communicating Device:
10 kΩ or more (at 24 kHz)

HART:**Communication Distance:**

Up to 1.5 km (0.9 mile), when using multiple twisted pair cables. Communication distance varies depending on the type of cable used.

Load Resistance: 250 to 600 Ω including cable resistance

Cable Length for Specific Applications:

Use the following formula to determine the cable length for specific applications:

$$L = \frac{65 \times 10^6}{(R \times C)} - \frac{(C_f + 10,000)}{C}$$

where:

- L = length in meters or feet
- R = resistance in Ω (including barrier resistance)
- C = cable capacitance in pF/m or pF/ft
- C_f = maximum shunt capacitance of receiving devices in pF/m or pF/ft

Note: HART is a registered trademark of the HART Communication Foundation.

Data Security During Power Failure:

Data (parameters, totalizer value, etc.) storage by EEPROM. No back-up battery required.

Indicator:

Full dot-matrix LCD (32×132 pixels)

Lightning Protector:

A lightning protector is built into the excitation current output, the current output, the signal common, and the pulse/alarm/status input and output terminals. If option code A is selected, the lightning protector is built into the power terminals.

Protection:

IP67, NEMA4X

Coating:

Case and Cover: Polyurethane corrosion-resistant
Coating Color: Silver gray (Munsell 3.2PB 7.4/1.2 or its equivalent)
Cover Mounting Screws: Polyurethane corrosion-resistant
Coating Color: Mint green (Munsell 5.6BG 3.3/2.9 or its equivalent)

Converter Material:

Case and Cover: Aluminum alloy

Mounting:

2-inch pipe, panel or surface mounting

Electrical Connection:

ANSI 1/2 NPT female

Terminal Connection:

M4 size screw terminal

Grounding:

Grounding resistance 100 Ω or less. When option code A is selected, Class C grounding (grounding resistance 10 Ω or less) shall be applied.

Converter Interchange:

In instances where the AXFA11 converter has been paired with a remote AXF flowtube and the converter is changed to the AXFA14 converter, a flow calibration must be performed to arrive at the meter factors for the new combination. The AXFA11 converter can be combined with remote flowtubes in sizes 2.5 to 260mm (0.1 to 104 in.)

Functions**How to Set Parameters:**

The indicator's LCD and three infra-red switches enable users to set parameters without opening the case cover. Parameters can also be set by means of the HHT.

Displayed Languages:

English, Japanese, German, French, Italian, and Spanish.

Instantaneous Flow Rate/Totalized Value Display**Functions:**

The full dot-matrix LCD enables user selection of displays from one line to three lines for:

- Instantaneous flow rate
- Instantaneous flow rate (%)
- Instantaneous flow rate (bar graph)
- Current output value (mA)

- Totalized value
- Tag No.
- Results of electrode coating diagnostics

Totalizer Display Function:

For forward/reverse ranges, the totalized values of the flow direction (forward or reverse) and the flow rate are displayed on the indicator together with the units. The difference values between the forward and reverse flow rate totalized values can be displayed. The reverse flow rate is not counted for a forward single range.

Damping Time Constant:

Time constant can be set from 0.1 second to 200.0 seconds (63% response).

Span Setting Function:

Span flows can be set in units such as volume flow rate, mass flow rate, time, or flow rate value. The velocity unit can also be set.

Volume Flow Rate Unit: kcf, cf, mcf, Mgal (US), kgal (US), gal (US), mgal (US), kbbl (US)*, bbl (US)*, mbbbl (US)*, μbbbl (US)*, Ml (megaliter), m³, kl (kiloliter), l (liter), cm³

Mass Flow Rate Unit (Density must be set.): klb (US), lb (US), t (ton), kg, g

Velocity Unit: ft, m (meter)

Time Unit: s (sec), min, h (hour), d (day)

* "US Oil" or "US Beer" can be selected

Pulse Output:

Scaled pulse can be output by setting a pulse weight. Pulse Width: Duty 50% or fixed pulse width (0.05, 0.1, 0.5, 1, 20, 33, 50, 100 ms) can be selected. Output Rate: 0.0001 to 10,000 pps (pulse/second)

Multi-range Function:

Status input enables the switching of up to four ranges. For automatic range switching, the status of up to four ranges can be shown via status outputs and on the indicator.

Forward and Reverse Flow Measurement Functions:

Flows in both forward and reverse directions can be measured. The status is shown via status outputs and on the indicator during reverse flow measurement.

Totalization Switch:

If a totalized value becomes equal to or greater than the set value, a status output is generated.

Preset Totalization:

A parameter setting or status input enables a totalized value to be reset to a preset value or zero.

0% Signal Lock:

Status input fixes the instantaneous flow rate display, current output, pulse output, and flow rate totalization to 0%.

Alarm Selection Function:

Alarms are classified into System Alarms (hard failures), Process Alarms (such as 'Empty Pipe', 'Signal Overflow' and 'Coating Alarm'), Setting Alarms, and Warnings. Whether alarms should be generated or not can be selected for each item. The current output generated for an alarm can be selected from among 2.4 mA or less, fixed to 4 mA, 21.6 mA or more, or HOLD.

Alarm Output:

Alarms are generated only for the items selected via the 'Alarm Selection Function' if relevant failures occur.

Self Diagnostics Functions:

If alarms are generated, details of the System Alarms, Process Alarms, Setting Alarms and Warnings are displayed together with descriptions of countermeasures.

Flow Upper/Lower Limit Alarms:

If a flow rate is greater or smaller than the set value, this alarm is generated. In addition, two upper limits (H, HH) and two lower limits (L, LL) can be set.

If a flow rate is greater or smaller than any of the set values, the status is output.

Electrode Coating Diagnostics Function:

This function enables monitoring of the coating of insulating substances to the electrodes. Depending on the status, users are notified by a warning or an alarm via status outputs. If replaceable electrodes are used, they can be removed and cleaned if coating occurs.

STANDARD PERFORMANCE

Reference Conditions:

- Similar to BS EN 29104 (1993); ISO9104 (1991)
- Fluid Temperature: +10°C to +30°C (+50°F to +86°F)
- Ambient Temperature: +20°C to +30°C (+68°F to +86°F)
- Warm-up Time: 30 min
- Straight runs: Upstream > 10 × DN Downstream > 5 × DN
- Properly grounded
- Properly centered

Accuracy (Combined with AXF Remote Flowtube, at reference conditions)

Pulse Output:

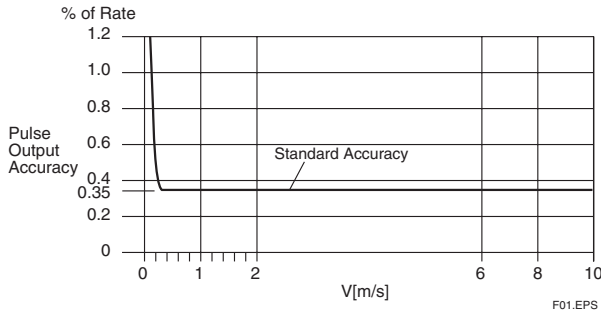
PFA/Ceramics Lining:

Size mm (in.)	Flow Velocity V m/s (ft/s)	Standard Accuracy (Calibration code B)	Flow Velocity V m/s (ft/s)	High grade Accuracy (Calibration code C)
2.5 (0.1) to 15 (0.5)	V < 0.3 (1)	1.0 mm/s	—	—
	0.3 ≤ V ≤ 10 (1) (33)	0.35% of Rate		
25 (1.0) to 200 (8.0)	V < 0.15 (0.5)	0.5 mm/s	V < 0.15 (0.5)	0.5 mm/s
	0.15 ≤ V ≤ 10 (0.5) (33)	0.35% of Rate	0.15 ≤ V < 1 (0.5) (3.3)	0.18% of Rate + 0.2mm/s
			1 ≤ V ≤ 10 (3.3) (33)	0.2% of Rate
250 (10) to 400 (16)	V < 0.15 (0.5)	0.5 mm/s	—	—
	0.15 ≤ V ≤ 10 (0.5) (33)	0.35% of Rate		

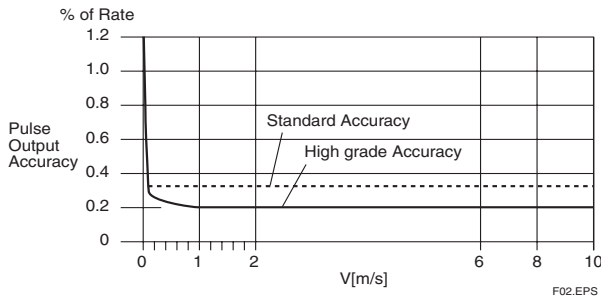
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Enhanced dual frequency excitation (Option code HF2): Standard accuracy + 1 mm/s

Size 2.5 mm (0.1 in.) to 15 mm (0.5 in.)



Size 25 mm (1.0 in.) to 400 mm (16 in.)

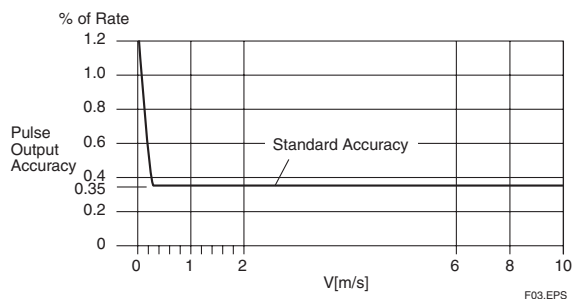


Polyurethane Lining

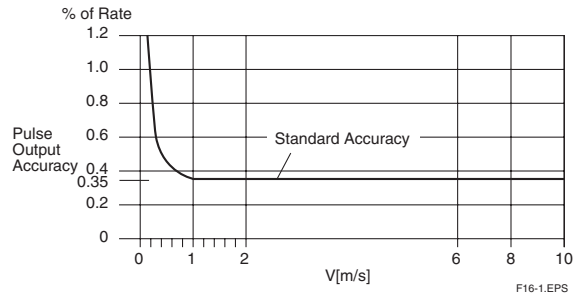
Size mm (in.)	Flow Velocity V m/s (ft/s)	Standard Accuracy (Calibration code B)
25 (1.0) to 400 (16)	$V < 0.3$ (1.0)	1.0 mm/s
	$0.3 \leq V \leq 10$ (1.0) (33)	0.35% of Rate
500 (20) to 1000 (40)	$V < 0.3$ (1.0)	1.75 mm/s
	$0.3 \leq V < 1$ (1.0) (3.3)	0.25% of Rate + 1 mm/s
	$1 \leq V \leq 10$ (3.3) (33)	0.35% of Rate
1100 (44) to 2000 (80)	$V < 0.3$ (1.0)	2.2 mm/s
	$0.3 \leq V < 1$ (1.0) (3.3)	0.4% of Rate + 1 mm/s
	$1 \leq V \leq 10$ (3.3) (33)	0.5% of Rate
2200 (88) to 2600 (104)	$V < 1$ (3.3)	8.5 mm/s
	$1 \leq V \leq 10$ (3.3) (33)	0.85% of Rate

Enhanced dual frequency excitation (Option code HF2): Standard accuracy + 1 mm/s

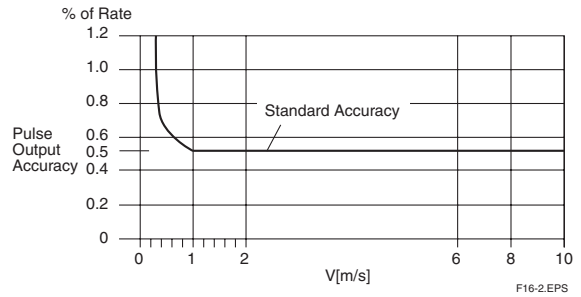
Size 25 mm (1.0 in.) to 400 mm (16 in.)



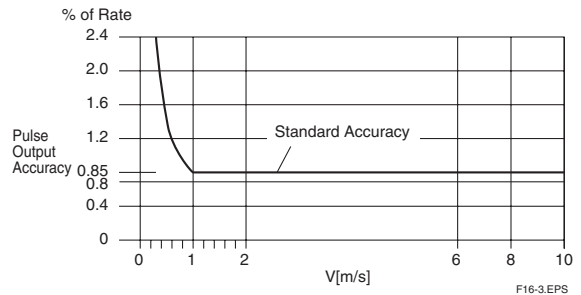
Size 500 mm (20 in.) to 1000 mm (40 in.)



Size 1100 mm (44 in.) to 2000 mm (80 in.)



Size 2200 mm (88 in.) to 2600 mm (104 in.)



Enhanced dual frequency excitation (Combined with AXF Remote Flowtube Optional code HF2):
Standard Accuracy + 1 mm/s

Current Output: Plus 0.05% of Span

Repeatability:

- 0.1% of Rate ($V \geq 1$ m/s (3.3 ft/s))
- 0.05% of Rate + 0.5 mm/s ($V < 1$ m/s (3.3 ft/s))

Maximum Power Consumption:

Combined with AXF Remote Flowtube: 20 W

Insulation Resistance (*1):

- 100 M Ω between power terminals and ground terminal at 500 V DC
- 100 M Ω between power terminals and each output/status input terminal at 500 V DC
- 20 M Ω between ground terminal and each output/status input terminal at 100 V DC
- 20 M Ω between output/status input terminals at 100 V DC

Withstand Voltage (*1):

- 1350 V AC between power terminals and ground terminal for two seconds
- 160 V AC between excitation terminals and ground terminal for two seconds
- 200 V AC between excitation terminals and each output/status input terminal for two seconds



CAUTION

*1: Before performing the Insulation Resistance Test or the Voltage Breakdown Test, disconnect the ground terminal if the power terminal has a lightning protector (option code A). Following the relevant test, wait for more than 10 seconds after the power supply has been turned off before removing the cover. After testing, be sure to use a resistance for discharge and return the short bar to its correct position. Screws must be tightened to a torque of 1.18 N-m or more. After closing the cover, the power supply can be restored.

Safety Requirement Standards:

- EN61010
- Altitude at installation site: Max. 2000 m above sea level
- Installation category based on IEC1010: Overvoltage category II ("II" applies to electrical equipment which is supplied from a fixed installation-like distribution board.)
- Pollution degree based on IEC1010 Pollution degree 2 ("Pollution degree" describes the degree to which a solid, liquid, or gas which deteriorates dielectric strength or surface resistivity is adhering. "2" applies to a normal indoor atmosphere.)

EMC Conformity Standards:

- EN61326
- EN61000-3-2, EN61000-3-3
- AS/NZS 2064

■ NORMAL OPERATING CONDITIONS

Ambient Temperature: -40°C to +60°C (-40°F to +140°F)

Indicator's operating range: -20°C to +60°C (-4°F to +140°F)

Ambient Humidity: 0 to 100%

Lengthy continuous operation at 95% or more is not recommended.

Power Supply:

Power supply code 1:

- AC specifications
Rated power supply: 100 to 240 V AC, 50/60 Hz
(Operating voltage range: 80 to 264 V AC)
- DC specifications
Rated power supply: 100 to 120 V DC
(Operating voltage range: 90 to 130 V DC)

Vibration Conditions:

Level of vibration in conformity with IEC 60068-2-6 (SAMA31. 1-1980)
0.5 G or less (frequency 500 Hz or less)

Note: Avoid locations with high vibration (with a vibration frequency of 500 Hz or more), which may cause damage to the equipment.

■ ACCESSORIES

- Fuse (T2.5A, 250 V): 1 pc.
- *Time lag fuse
- Mounting bracket: 1 set

■ MODEL AND SUFFIX CODE

AXFA11 Magnetic Flowmeter Remote Converter:

Model	Suffix Code	Description
AXFA11		Magnetic Flowmeter Remote Converter
Use	G	General-Purpose Use For AXF Remote Flowtube of size 2.5 to 2600 mm (0.1 in. to 104 in.)
Output Signal and Communication	-D	4 to 20 mA DC, BRAIN Communication
	-E	4 to 20 mA DC, HART Communication
Power Supply	1	100 V to 240 V AC or 100 to 120 V DC
Electrical Connections	-2	ANSI 1/2 NPT female
Indicator	1	With Indicator
	/□ .	Option code (See the Table of Optional Specifications)

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Signal Cable: Model AXFC

- Note:
- The cable is constructed with double shielding over the two conductors, and uses heat-resistant vinyl as the outer covering material.
Finished diameter: 10.5 mm (0.413 in.)
Maximum temperature: +80°C (+176°F)
 - Unnecessary to order the above cable for submersible type flowtube because the flowtube is wired with 30 m (98 ft) cable.
 - Excitation cable is supplied by the customer

Recommended Excitation Cable:

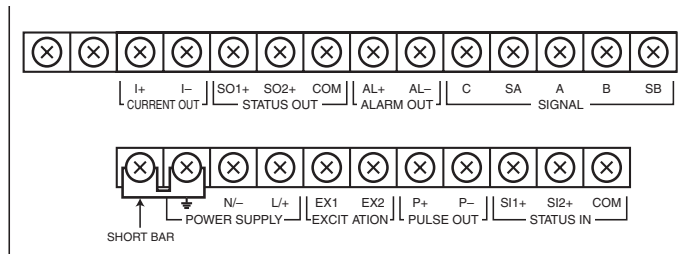
- Use Polyvinyl chloride insulated and sheathed control cable or Polyvinyl chloride insulated and sheathed portable power cables or equivalents.
- Outer Diameter: 6.5 to 12 mm (0.26 to 0.47 in.)
 - Nominal Cross Section: 0.5 to 2.5 mm²

OPTIONAL SPECIFICATIONS FOR AXFA11 REMOTE CONVERTER

Item	Specification	Code	
Lightning Protector	A lightning protector is built into the power terminals.	A	
Burn Out Down	The output level is set to 0 mA during a CPU failure and is set 2.4 mA or less during an alarm. Standard products are delivered with a setting 25 mA during a CPU failure and 21.6 mA or more during an alarm.	C1	
NAMUR NE43 Compliance	Output signal limits: 3.8 to 20.5 mA	Failure alarm down-scale: The output level is set to 0 mA during a CPU failure and is set 2.4 mA (-10%) or less during an alarm.	C2
		Failure alarm up-scale: The output level is set to 25 mA during a CPU failure and is set 21.6 mA (110%) or more during an alarm.	C3
Active Pulse Output	Active pulses are output in order to drive an external electromagnetic or electronic counter directly using the converter's internal power supply. (Nullifies the standard transistor contact pulse output.) Output voltage: 24 V DC ±20% Pulse specifications: • The drive current of 30 to 150 mA Pulse rate: 0.0001 to 2 pps (pulse/second); Pulse width: 20, 33, 50, or 100 ms	EM	
Stainless Steel Mounting Bracket	Provided with a JIS SUS304 (AISI 304 SS/EN 1.4301 equivalent) stainless steel mounting bracket in lieu of the standard carbon steel bracket.	SB	
AM11 Replacement Bracket	Provided with a special mounting bracket for replacing an AM11 converter with an AXFA11.	RK	
Stainless Steel Tag Plate	Screwed JIS SUS304 (AISI 304 SS/EN 1.4301 equivalent) stainless steel tag plate. Choose this option when an SS tag plate is required in addition to the standard nameplate with the tag number inscribed on it.	SCT	
Epoxy Resin Coating	Epoxy resin coating instead of standard polyurethane resin coating. The color is same as standard type.	X1	
CSA Mark	CSA Mark for general purpose AXF converters and flow tubes.	CGP	

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Terminal Configuration



T06.EPS

Terminal Wiring

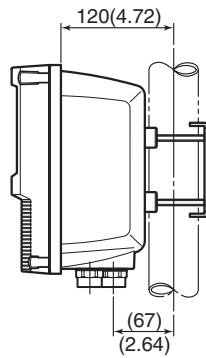
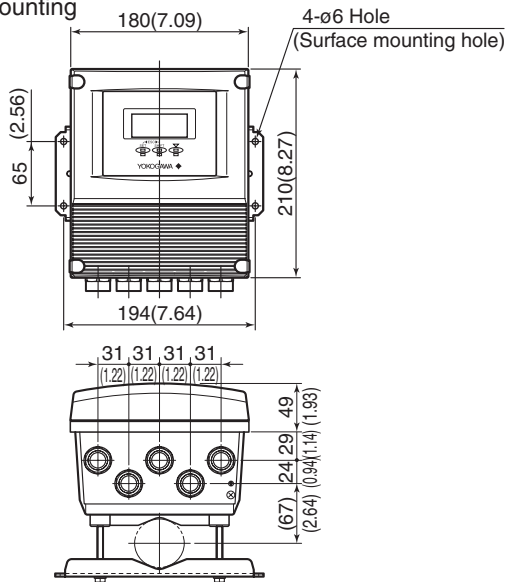
Terminal Symbols	Description	Terminal Symbols	Description
SIGNAL C SA A B SB	Flow signal input	STATUS IN SI1+ SI2+ COM	Status input (Two input)
ALARM OUT AL+ AL-	Alarm output	PULSE OUT P+ P-	Pulse output
STATUS OUT SO1+ SO2+ COM	Status output (Two output)	EXCITATION EX1 EX2	Excitation current output
CURRENT OUT I+ I-	Current output 4 to 20mA DC	POWER SUPPLY L/+ N/-	Power supply
		⏏	Functional grounding
		⏏	Protective grounding (Outside of the terminal)

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EXTERNAL DIMENSIONS

Remote Converter AXFA11

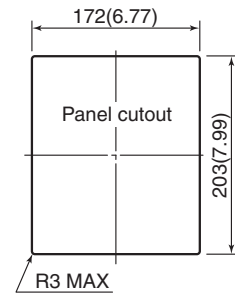
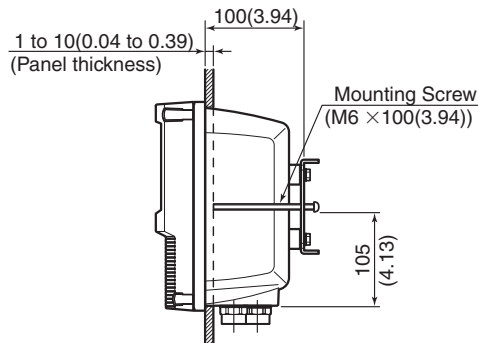
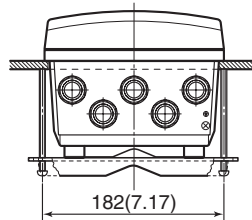
Pipe mounting



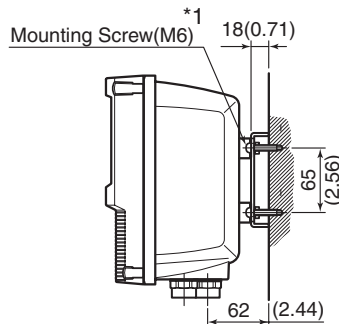
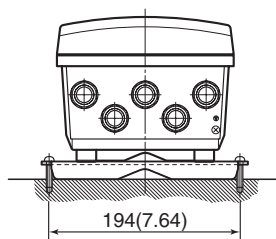
Unit: mm
(approx. inch)

Weight 3.2 kg (7.1 lb)

Panel mounting



Surface mounting

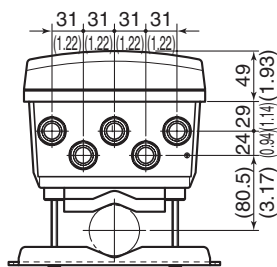


*1: These screws must be provided by user.

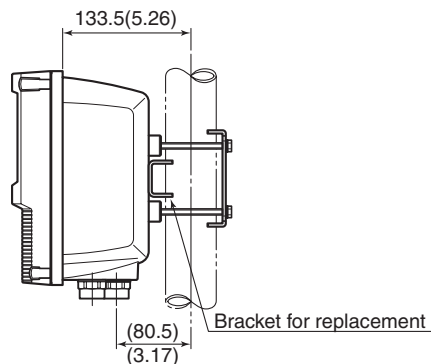
T08.EPS

Remote Converter AXFA11 /RK (AM11 Replacement Bracket)

Pipe mounting



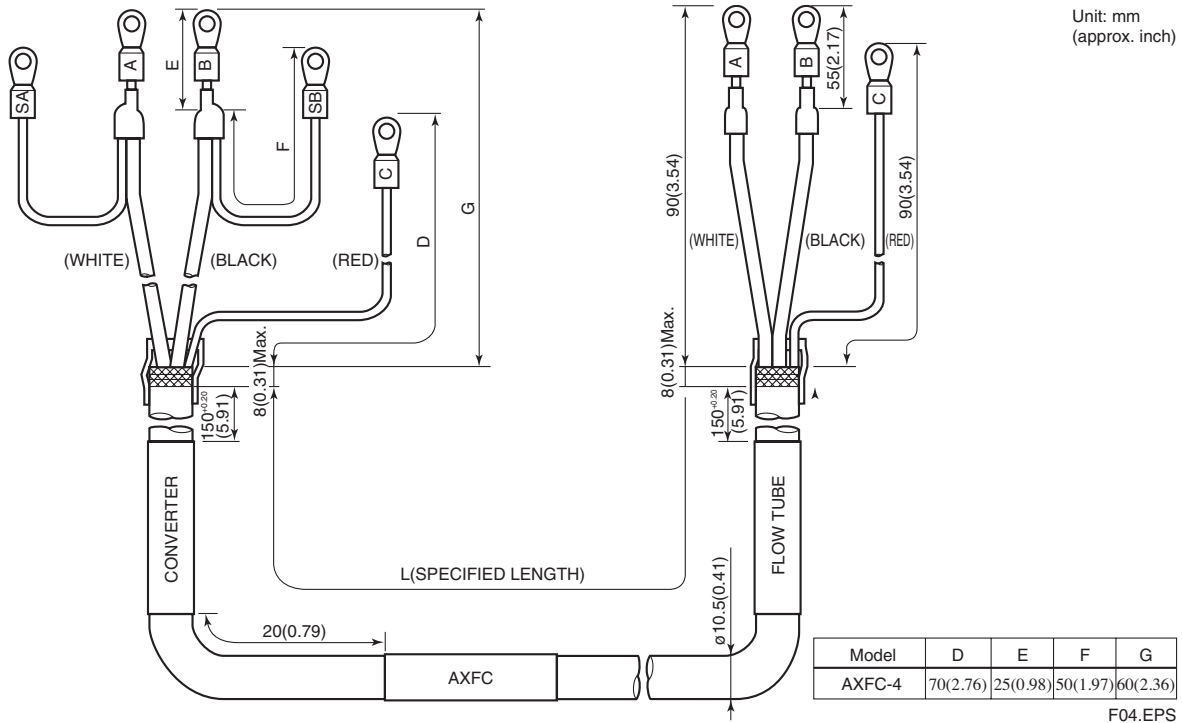
T09.EPS



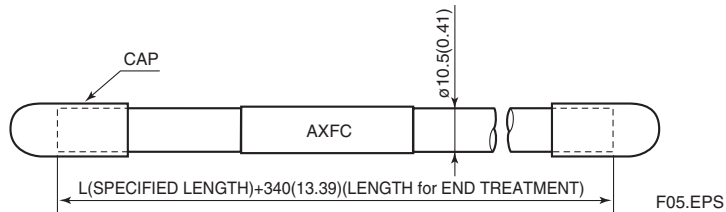
T10.EPS

● Dedicated Signal Cable

AXFC-4-L□□□



AXFC-0-L□□□



■ ORDERING INFORMATION

Note 1: When ordering a remote flowtube and a remote converter, specify the flow span, unit, pulse weight, and totalizer display pulse weight.

Note 2: Some options, if ordered, require the relevant specifications be supplied.

1. Model, specification and option codes.
2. Tag number

Each tag number can be specified up to 16 characters in a combination of letters (upper or lower case), numbers, “-” and “.”. If specified, the tag number is inscribed on the product’s name plate and tag plate (if optional code SCT is selected). For HART protocol, up to 8 characters can be specified.