

AXF Series Magnetic Flowmeter Installation Manual

IM 01E20A01-01EN

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Integral Flowmeter
(AXF□□□G,
AXF□□□C,
AXF□□□H)



Remote Flowtube
(AXF□□□G,
AXF□□□C,
AXF□□□H,
AXF□□□W)



Remote Converter
(AXFA11G)



Remote Converter
(AXFA14G, AXFA14C)

This manual outlines the basic guidelines for installation and wiring procedures of the ADMAG AXF Series. For the items which are not covered in this manual, see the user's manuals in the following table.

Note: For FOUNDATION fieldbus and PROFIBUS PA type, refer to IM 01E20A01-02EN in addition to this manual.

For ATEX or IECEx explosion proof type, refer to IM 01E20A01-11EN in addition to this manual.

Document No.	Document Title
IM 01E20D01-01E	AXF Magnetic Flowmeter Integral Flowmeter/ Remote Flowtube [Hardware Edition]
IM 01E20C01-01E	AXFA11G Magnetic Flowmeter Remote Converter [Hardware Edition/Software Edition]
IM 01E20C02-01E	AXFA14G/C Magnetic Flowmeter Remote Converter [Hardware Edition/Software Edition] AXF Magnetic Flowmeter Integral Flowmeter [Software Edition]

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INSTALLATION AND OPERATING PRECAUTIONS FOR TIIS FLAMEPROOF EQUIPMENT (EX-B03E)

1. Introduction

Thank you for purchasing the ADMAG AXF Magnetic flowmeter.

This manual provides the basic guidelines for installation and wiring procedures of integral flowmeter, remote flowtube, and remote converter of the AXF magnetic flowmeters through front panel, BRAIN protocol, and HART protocol.

It does not provide the product specific functional specifications and explanations, maintenance, troubleshooting, FOUNDATION fieldbus and PROFIBUS PA communication operating procedures. For the items which are not covered in this manual, see the applicable user's manuals as listed in Table 1.1. These manuals can be downloaded from the website of Yokogawa. To ensure correct use of the instrument, read these manuals thoroughly and fully understand how to operate the instrument before operating it. For method of checking the model and suffix code, refer to Section 2.1.

Website address: <http://www.yokogawa.com/fid/doc/>

Table 1.1 Manual List

Model	Document Title	Document No.
AXF□□□G AXF□□□C AXF□□□H AXF□□□W	AXF Magnetic Flowmeter Integral Flowmeter/ Remote Flowtube [Hardware Edition] AXFA14G/C Magnetic Flowmeter Remote Converter [Hardware Edition/Software Edition] AXF Magnetic Flowmeter Integral Flowmeter [Software Edition]	IM 01E20D01-01E IM 01E20C02-01E
AXFA11G	AXFA11G Magnetic Flowmeter Remote Converter [Hardware Edition/Software Edition]	IM 01E20C01-01E
AXFA14G AXFA14C	AXFA14G/C Magnetic Flowmeter Remote Converter [Hardware Edition/Software Edition] AXF Magnetic Flowmeter Integral Flowmeter [Software Edition]	IM 01E20C02-01E

In case of selecting the communication code (The first two characters of suffix code) “-F”, further refer to the following manual.

Model	Communication Code	Document Title	Document No.
AXF□□□G AXF□□□C AXF□□□H AXF□□□W AXFA14G AXFA14C	-F	ADMAG AXF Series FOUNDATION Fieldbus Communication Type Magnetic Flowmeter	IM 01E20F02-01E

In case of selecting the communication code (The first two characters of suffix code) “-G”, further refer to the following manual.

Model	Communication Code	Document Title	Document No.
AXF□□□G AXF□□□C AXF□□□H AXF□□□W AXFA14G AXFA14C	-G	AXF PROFIBUS PA Communication Type Magnetic Flowmeter	IM 01E20F12-01E

Note: “□□□” means any of the following.
002, 005, 010, 015, 025, 032, 040, 050, 065, 080, 100,
125, 150, 200, 250, 300, 350, 400



NOTE

When describing the model name like AXF□□□C in this manual, “□□□” means any of the following.
002, 005, 010, 015, 025, 032, 040, 050, 065, 080, 100,
125, 150, 200, 250, 300, 350, 400

■ Safety and Modification Precautions

- The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific WARNINGS given elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Yokogawa assumes no liability for the customer's failure to comply with these requirements. If this instrument is used in a manner not specified in this manual, the protection provided by this instrument may be impaired.
- Yokogawa will not be liable for malfunctions or damage resulting from any modification made to this instrument by the customer.
- The following safety symbol marks are used in this user's manual and instrument.



WARNING

A WARNING sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death of personnel.



CAUTION

A CAUTION sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.



IMPORTANT

An IMPORTANT sign denotes that attention is required to avoid damage to the instrument or system failure.



NOTE

A NOTE sign denotes information necessary for essential understanding of operation and features.



Protective grounding terminal



Functional grounding terminal
(This terminal should not be used as a protective grounding terminal.)



Alternating current



Direct current



Caution

This symbol indicates that the operator must refer to an explanation in the user's manual in order to avoid the risk of injury or death of personnel or damage to the instrument.

■ Regarding This User's Manual

- This manual should be provided to the end user.
- Before use, read this manual thoroughly to comprehend its contents.
- The contents of this manual may be changed without prior notice.
- All rights are reserved. No part of this manual may be reproduced in any form without Yokogawa's written permission.
- Yokogawa makes no warranty of any kind with regard to this material, including, but not limited to, implied warranties of merchantability and suitability for a particular purpose.
- All reasonable effort has been made to ensure the accuracy of the contents of this manual. However, if any errors or omissions are found, inform Yokogawa.
- Yokogawa assumes no responsibilities for this product except as stated in the warranty.
- Note that this user's manual may not be revised for any specification changes, construction changes or operating part changes that are not considered to affect function or performance.
- If the customer or any third party is harmed by the use of this product, Yokogawa assumes no responsibility for any such harm owing to any defects in the product which were not predictable, or for any indirect damages.

■ Trademarks:

- All the brands or names of Yokogawa Electric's products used in this manual are either trademarks or registered trademarks of Yokogawa Electric Corporation.
- All other company and product names mentioned in this manual are trade names, trademarks or registered trademarks of their respective companies.
- In this manual, trademarks or registered trademarks are not marked with TM or ®.

1.1 Using the Magnetic Flowmeter Safely

(1) Installation



WARNING

- Installation of the magnetic flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to installation.
- The magnetic flowmeter must be installed within the specification conditions.
- The magnetic flowmeter is a heavy instrument. Be careful that no damage is caused to personnel through accidentally dropping it, or by exerting excessive force on the magnetic flowmeter. When moving the magnetic flowmeter, always use a trolley and have at least two people carry it.
- When the magnetic flowmeter is processing hot fluids, the instrument itself may become extremely hot. Take sufficient care not to get burnt.
- Where the fluid being processed is a toxic substance, avoid contact with the fluid and avoid inhaling any residual gas, even after the instrument has been taken off the piping line for maintenance and so forth.
- Do not apply excessive weight, for example, a person stepping on the magnetic flowmeter.
- All procedures relating to installation must comply with the electrical code of the country where it is used.

(2) Wiring



WARNING

- The wiring of the magnetic flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to wiring.
- When connecting the wiring, check that the supply voltage is within the range of the voltage specified for this instrument before connecting the power cable. In addition, check that no voltage is applied to the power cable before connecting the wiring.
- The protective grounding must be connected securely at the terminal with the ⊕ mark to avoid danger to personnel.

(3) Operation



WARNING

- When opening the cover, wait for more than 10 minutes after turning off the power. Only expert engineer or skilled personnel are permitted to open the cover.
- Do not open the cover in wet weather or humid environment. When the cover is open, stated enclosure protection is not applicable.
- Be sure to set parameters as "Protect" on the write protect function after finish of parameter setting work.

Under extremely rare case, the infra-red switches may respond unexpectedly in such conditions as sticking ball of water or extraneous substances on the surface of display panel glass according to the principle of infra-red switch operation.

Its probability rises in such cases as sticking rain water by storm or other similar situation and washing up work near flowmeter installation place. Either to illuminate or stop illuminating the infrared switches by the flashlight may cause the mis-reaction.

Refer to Section 6.3 how to use the write protect function in detail.

(4) Maintenance



WARNING

- Maintenance of the magnetic flowmeter should be performed by the trained personnel having knowledge of safety standard. No operator shall be permitted to perform any operations relating to maintenance.
- When opening the cover, wait for more than 10 minutes after turning off the power.
- Do not open the cover in wet weather or humid environment. When the cover is open, stated enclosure protection is not applicable.
- When maintaining the instrument, refer to user's manual as listed in Table 1.1. Do not perform the maintenance that is not described in the manual. If necessary, contact Yokogawa.
- Care should be taken to prevent the build up of dirt, dust or other substances on the display panel glass or name plate. If these surfaces do get dirty, wipe them clean with a soft dry cloth.

(5) Explosion Protected Type Instrument



WARNING

- Magnetic flowmeters with the model name AXF□□□C and AXFA14C are products which have been certified as explosion proof type instruments. Strict limitations are applied to the structures, installation locations, external wiring work, maintenance and repairs, etc. of these instruments. Sufficient care must be taken, as any violation of the limitations may cause dangerous situations.
Be sure to read Chapter 10 before handling the instruments. The description in Chapter 10 is prior to the other description in this user's manual. For ATEX or IECEx explosion proof type, be sure to read IM 01E20A01-11EN. For TIIS explosion proof type, be sure to read "INSTALLATION AND OPERATING PRECAUTIONS FOR TIIS FLAMEPROOF EQUIPMENT" at the end of this manual.
- Only trained persons use this instrument in the industrial location.
- The protective grounding ⊕ must be connected to a suitable IS grounding system.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

(6) European Pressure Equipment Directive (PED)



WARNING

- When using the instrument in compliance with PED, be sure to read Chapter 9 before use.

(7) Modification

Yokogawa will not be liable for malfunctions or damage resulting from any modification made to this instrument by the customer.

(8) Product Disposal

The instrument should be disposed of in accordance with local and national legislation/regulations.

(9) Authorized Representative in EEA

In relation to the CE Marking, The authorized representative for this product in the EEA (European Economic Area) is:
Yokogawa Europe B.V.
Euroweg 2, 3825 HD Amersfoort, The Netherlands

1.2 Warranty

- The terms of this instrument that are guaranteed are described in the quotation. We will make any repairs that may become necessary during the guaranteed term free of charge.
- Contact our sales office if this instrument requires repair.
- If the instrument is faulty, contact us with concrete details about the problem and the length of time it has been faulty, and state the model and serial number. We would appreciate the inclusion of drawings or additional information.
- The results of our examination will determine whether the meter will be repaired free of charge or on an at-cost basis.

■ The guarantee will not apply in the following cases:

- Damage due to negligence or insufficient maintenance on the part of the customer.
- Problems or damage resulting from handling, operation or storage that violates the intended use and specifications.
- Problems that result from using or performing maintenance on the instrument in a location that does not comply with the installation location specified by Yokogawa.
- Problems or damage resulting from repairs or modifications not performed by Yokogawa or someone authorized by Yokogawa.
- Problems or damage resulting from inappropriate reinstallation after delivery.
- Problems or damage resulting from disasters such as fires, earthquakes, storms, floods, or lightning strikes and external causes.

1.3 Combination for Flowtube and Remote Converter



IMPORTANT

- The AXF remote flowtube (sizes 2.5 to 400 mm (0.1 to 16 in.)) should be combined with one of the following converters:

Table 1.2 Combination for flowtube and remote converter

Remote Flowtube		Combined with the Remote Converter
Model	Communication Code	Model
AXF□□□G AXF□□□C AXF□□□H AXF□□□W	-N	AXFA11G
AXF□□□G AXF□□□C AXF□□□H AXF□□□W	-P	AXFA14G AXFA14C

Note: "□□□" means any of the following.
002, 005, 010, 015, 025, 032, 040, 050, 065, 080, 100, 125, 150, 200, 250, 300, 350, 400

Contact Yokogawa before using it in combination with converters other than those listed above.

- For ATEX, IECEx or TIIS certified AXF remote flowtube, it is only approved to be combined with AXFA14 converter.
- The AXW remote flowtube (sizes 500 to 1800 mm (20 to 72 in.)) should be combined with the AXFA11 remote converter.
- If the converter combined with the AXF magnetic flowmeter's remote flowtube is changed from the AXFA11 to AXFA14 or vice versa, the meter factor of the remote flowtube must be readjusted according to its flow calibration.

2. Handling Precautions

This instrument has been inspected carefully at the factory before shipment. When the instrument is delivered, visually check that no damage has occurred during transportation. Also check that all flowmeters mounting hardware shown below is included.

Integral Flowmeter and Remote Flowtube

Applicable model	Part name	Qty
AXF□□□G AXF□□□C AXF□□□H AXF□□□W	Hexagonal wrench	2 pieces (one each of 1.5 mm and 3 mm nominal sizes)

Note: In case of selecting the process connection code “-AA1”, “-AA2”, “-AD1”, “-AD2”, “-AD4”, “-AJ1”, “-AJ2”, “-AG1” or “-AP1”, a set of centering devices is also attached.

Remote Converter

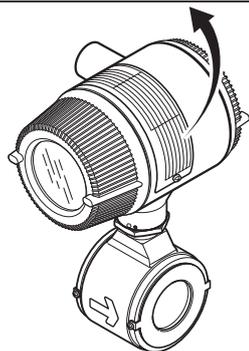
Applicable model	Part name	Qty
AXFA11G	Mounting hardware	1 set
AXFA14G	Mounting hardware	1 set
AXFA14C	Hexagonal wrench	1 piece (nominal size 3 mm)

2.1 Checking Model and Specifications

The model code and specifications are found on the name plate located on the outside of the case. When checking the model code and specifications match what you have ordered, refer to user’s manual as listed in Table 1.1.

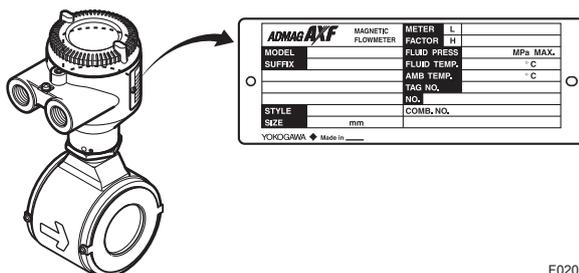
Be sure you have your model number and serial number available when contacting Yokogawa.

ADMAG AXF MAGNETIC FLOWMETER		STYLE		SUPPLY	VDC □□ 12W
MODEL	METER	SIZE	mm	VAC- 50/60Hz 30VA 12W	
SUFFIX	FACTOR	L		OUTPUT	mA (0-750□)
	FLUID PRESS	H			VDC 0.2A MAX.
	FLUID TEMP.		MPa MAX.		
	AMB. TEMP.		C	TAG NO.	
			C	NO.	
				COMB. NO.	
YOKOGAWA ♦ Made in _____					



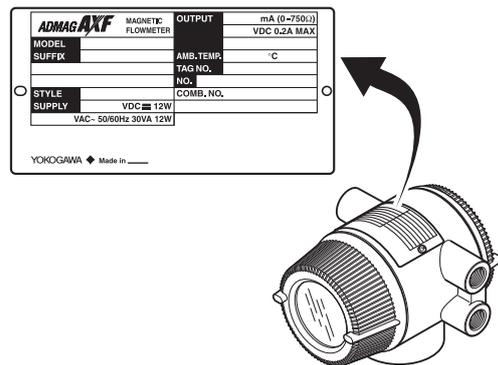
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Figure 2.1.1 Name Plate (AXF Integral Flowmeter)



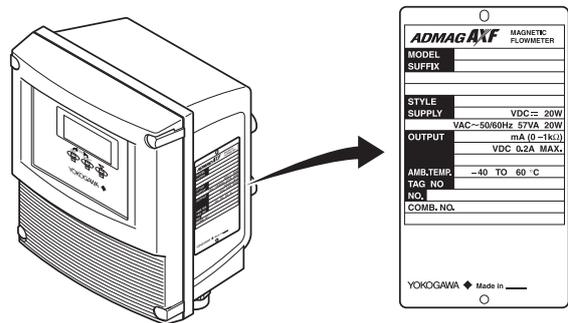
F0202.ai

Figure 2.1.2 Name Plate (AXF Remote Flowtube)



F0203.ai

Figure 2.1.3 Name Plate (AXFA14 Remote Converter)



F0204.ai

Figure 2.1.4 Name Plate (AXFA11 Remote Converter)

2.2 Storage Precautions

If the instrument is to be stored for a long period of time after delivery, observe the following points.

- The instrument should be stored in its original packing condition in the storage location.
- Select a storage location that fulfils the following conditions:
 - A place where it will not be exposed to rain or water
 - A place subject to minimal vibrations or shocks
 - Temperature and humidity levels should be as follows:
 - Temperature: -30 to 70°C
 - Humidity: 5 to 80% RH (no condensation)
 The preferred ambient temperature and humidity levels are 25°C and approximately 65% RH.
- If the instrument is transferred to the installation site and stored without being installed, its performance may be impaired due to the infiltration of rainwater and so forth. Be sure to install and wire the instrument as soon as possible after transferring it to the installation location.

3. Installation

WARNING

Installation of the magnetic flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to installation.

Installation Location Precautions

Select the installation location with consideration to the following items to ensure long-term stable operation of the instrument.

■ Ambient Temperature:

Avoid installing the instrument in locations with constantly fluctuating temperatures. If the location is subject to radiant heat from the plant, provide heat insulation or improve ventilation.

■ Atmospheric Condition:

Avoid installing the instrument in a corrosive atmosphere. In situations where this is unavoidable, consider ways to improve ventilation and to prevent rainwater from entering and being retained in the conduit pipes.

■ Vibrations or Shocks:

Avoid installing the instrument in a place subject to shocks or vibrations.

■ Explosion protected type:

Explosion protect types can be installed in hazardous areas according to the types of gases for which they are certified. See the description in Chapter 10 and "INSTALLATION AND OPERATING PRECAUTIONS FOR TIIS FLAMEPROOF EQUIPMENT" in this user's manual.

3.1 Piping Design Precautions

IMPORTANT

Design piping correctly, referring to the following to prevent damage to flowtubes and to assure accurate measuring.

NOTE

This chapter describes the remote flowtube as an example. The same attention must be paid to the integral flowmeter.

(1) Location

IMPORTANT

Install the flowmeter in a location where it is not exposed to direct sunlight. The minimum ambient temperature is limited by the minimum fluid temperature of the flowtube (the lining). For more information, refer to "OUTLINE" of the appropriate manual which can be downloaded from our website. The flowmeter may be used in an ambient humidity where the relative humidity ranges from 0 to 100%. However, avoid long-term continuous operation at relative humidity above 95%.

(2) Noise Avoidance

IMPORTANT

The flowmeter should be installed away from electrical motors, transformers, and other power sources in order to avoid interference with measurement.

(3) Required Lengths of Straight Runs

To maintain accurate measurement, see JIS B7554 which explains the requirements for upstream piping conditions of magnetic flowmeters.

Based on JIS B7554 and our piping condition test data, we recommend the piping conditions as shown in the following figures.

When installing two or more magnetic flowmeters on a single pipe, provide a run of at least 10D between them.

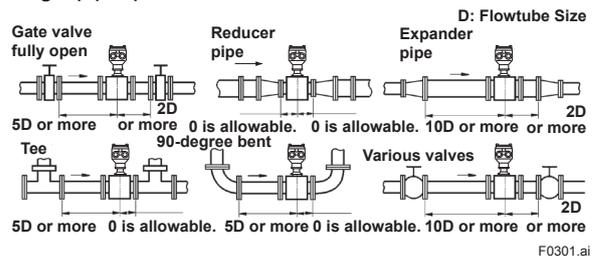


Figure 3.1.1 Required Lengths of Straight Runs

- *1: Do not install anything in the vicinity that may interfere with the magnetic field, induced signal voltages, or flow velocity distributions of the flowmeter.
- *2: A straight run may not be required on the downstream side of the flowmeter. However, if a downstream valve or other fitting causes irregularity or deviation in flows, provide a straight run of 2D to 3D on the downstream side.
- *3: The valves shall be mounted on the downstream side so that deviated flows do not occur in the flowtube and to avoid startup from an empty condition.

(4) Maintaining Stable Fluid Conductivity



IMPORTANT

Do not install the flowmeter where fluid conductivity tends to become uneven. If chemicals are fed near the upstream side of a magnetic flowmeter, they may affect the flow rate's indications. To avoid this situation, it is recommended that the chemical feed ports be located on the downstream side of the flowmeter. If it is unavoidable that chemicals must be fed on the upstream side, provide a sufficient length of straight run (approximately 50D or more) to ensure the proper mixture of fluids.

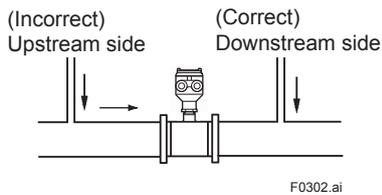


Figure 3.1.2 Chemical Injection

(5) Precautions for Use of Liquid Sealing Compounds



IMPORTANT

Care must be taken in using liquid sealing compounds on the piping, as it may have a negative influence on the flow indications by flowing out and covering the surfaces of an electrode or grounding ring. In particular, care must be taken if a liquid sealing compound is used in the case of vertical piping.

(6) Service Area

Select locations where there is adequate space to service installing, wiring, overhauling, etc.

(7) Bypass Line

It is recommended to install a bypass line to facilitate maintenance and zero adjustment.

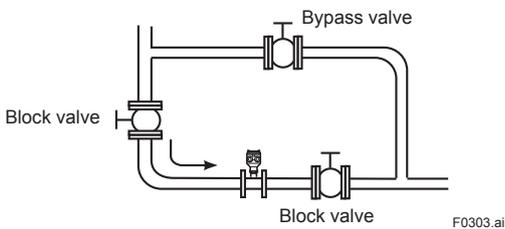


Figure 3.1.3 Bypass Line

(8) Supporting the Flowmeter



CAUTION

Do not secure the flowmeter separately to prevent the vibrations, shocks, and expansion and contraction forces of the piping from affecting it. Fix the pipes first, then support the flowmeter with the pipes. With extra small-sized flowmeters (sizes 2.5 to 10 mm (0.1 to 0.4 in.)), in particular, fix the flowmeter in parallel with the piping on a mounting base.

(9) Mounting Positions

- Pipes must be fully filled with liquids.



IMPORTANT

It is essential that pipes remain fully filled at all times, otherwise flow rate indications may be affected and measurement errors may be caused.

Piping shall be designed so as to maintain the interior of the flowtube filled with fluids.

Vertical mounting is effective in such cases as when fluids tend to separate or solid matter may be precipitated. When employing vertical mounting, direct the fluids from the bottom to the top to ensure that the pipes remain fully filled.

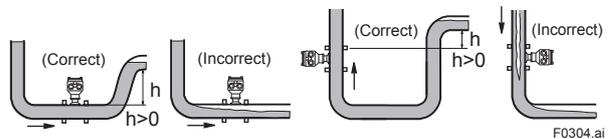


Figure 3.1.4 Mounting Positions

- Avoid air bubbles.



IMPORTANT

If air bubbles enter a measurement pipe, flow rate indications may be affected and measurement errors may be caused.

In cases where fluids contain air bubbles, piping must be designed to prevent them from accumulating in the measurement pipe of a flowtube.

If a valve exists near the flowmeter, try to mount the flowmeter on the valve's upstream side in order to prevent a possible reduction of pressure inside the pipe, thereby avoiding the possibility of air bubbles.

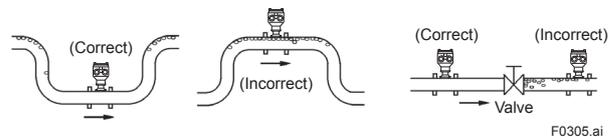


Figure 3.1.5 Avoiding Air Bubbles

● **Mounting orientation**



IMPORTANT

If electrodes are perpendicular to the ground, air bubbles near the top or precipitates at the bottom may cause measurement errors. Ensure that the terminal box of a remote flowtube and converter of an integral flowmeter are mounted above the piping to prevent water from entering them.

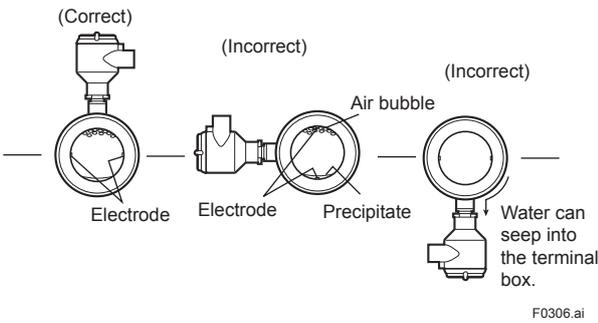


Figure 3.1.6 Mounting Orientation

3.2 Handling Precautions



WARNING

The magnetic flowmeter is a heavy instrument. Be careful that no damage is caused to personnel through accidentally dropping it, or by exerting excessive force on the magnetic flowmeter. When moving the magnetic flowmeter, always use a trolley and have at least two people carry it.



NOTE

This chapter describes the remote flowtube as an example. The same attention must be paid to the integral flowmeter.

3.2.1 General Precautions

(1) Precaution during Transportation

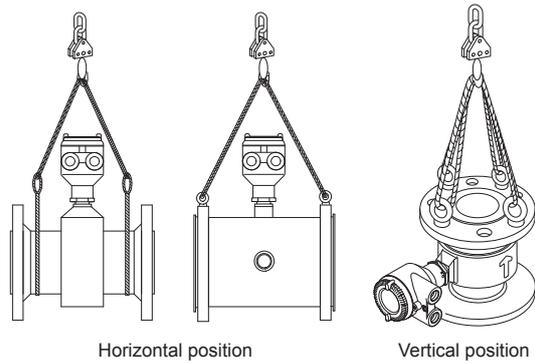
The magnetic flowmeter is packed tightly. When it is unpacked, pay attention to prevent damaging the flowmeter. To prevent accidents while it is being transported to the installing location, transport it to the site in its original packing.



CAUTION

In order to lift a magnetic flowmeter that is fitted with eyebolts, proceed as in Figure 3.2.1. Never lift it using a bar passed through the flowtube as this damages the liner severely.

When lifting the magnetic flowmeter in vertical position, eyebolts (or eyenuts and bolts) are necessary. Attach them to the flange bolt holes, and then lift the magnetic flowmeter.



F0307.ai

Figure 3.2.1 Lifting Flowmeter

(2) Avoid Shocks from Impact



CAUTION

Care should be taken not to drop the flowmeter or expose it to excessive shock. In particular, be careful not to subject the flange surface to shock. This may lead to liner damage which will result in inaccurate readings.

(3) Flange Protection Covers



IMPORTANT

Keep the protective covering (i.e. the corrugated cardboard or other cushioning material) in place over the flange except when mounting the flowmeter to the pipe.

(4) Terminal Box Cover



IMPORTANT

As it is possible that the insulation will deteriorate, do not open the terminal box cover until it is time to wire it.

(5) Long-term Non-use



IMPORTANT

It is not desirable to leave the flowmeter unused for a long term after installation. If this situation is unavoidable, take care of the flowmeter by observing the following.

● **Confirmation of sealing conditions for the flowmeter**

Confirm that the terminal box screw and wiring ports are well sealed. Equip the conduit piping with drain plugs or waterproof glands to prevent moisture or water from penetrating into the flowmeter through the conduit.

● **Regular inspections**

Inspect the sealing conditions as mentioned above, and the inside of the terminal box at least once a year. Also, due to rain, etc. when it is suspected that water may have penetrated into the inside flowmeter perform supplementary inspections.

3.2.2 Flowmeter Piping



CAUTION

Misaligned or slanted piping can lead to leakage and damage to the flanges.

- (1) Correct any misaligned or slanted piping, and any gaps that may exist between mounting flanges before installing the flowmeter (refer to Figure 3.2.2).

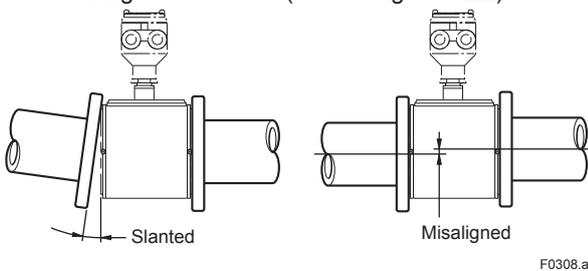


Figure 3.2.2 Slanted and Misaligned Flowmeter Piping

- (2) Inside a newly installed pipeline, there may be some foreign substances such as residue from welding or wood chips. Remove them by flushing the piping before mounting the flowmeter. This prevents the lining from being damaged, as well as the occurrence of erroneous measured signals resulting from foreign substances passing through the flowtube during measurement.

3.3 Installation of Integral Flowmeter and Remote Flowtube



IMPORTANT

Do not forget to insert gaskets from Yokogawa between pipes and flowmeter, which shall be supplied when the flowmeter has ceramics lining with no grounding rings. In case of grounding rings to be supplied and attached later, these gaskets shall be inserted between grounding rings and flowmeter.



NOTE

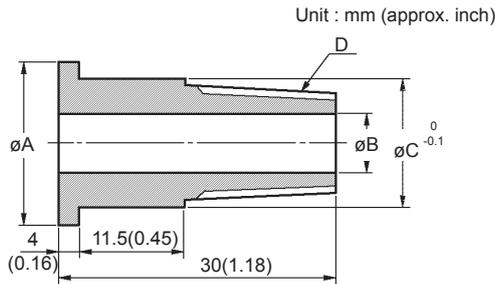
- The tightening torque value to which gaskets must be tightened varies depending on the type and external dimensions of the lining and the gasket. In this section, the tables indicating tightening torque values include the corresponding gasket types. The internal diameters of the gaskets are close to those of the grounding rings (refer to Table 3.3.16).
- For fluids capable of potentially permeating PFA linings (such as nitric acid, hydrofluoric acid, or sodium hydrate at high temperatures), different tightening torque values must be applied. The tables of these torque values is indicated in this section.
- For replacement models for the earlier ADMAG or ADMAG AE, the tightening torque values in the tables can be applied if their process connections, the lining types, and the nominal sizes are the same.

3.3.1 Nominal Diameter 2.5 mm (0.1 in.) to 10 mm (0.4 in.), Union Joint Type

Ceramics linings with diameters of 2.5 mm (0.1 in.), 5 mm (0.2 in.), or 10 mm (0.4 in.) are connected using union joints. Weld or screw the connecting fittings in Table 3.3.1 onto the piping. The external dimensions of the fittings are shown in the table.

Table 3.3.1 Fitting Dimensions

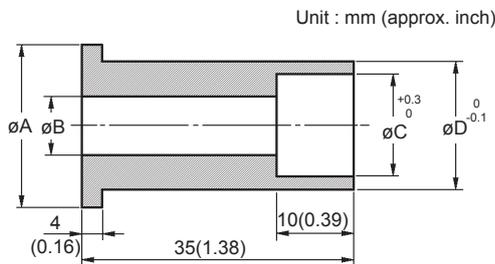
Screw joint (process connection codes: GUR and GUN)



F0309.ai

Size	Code	øA	øB	øC	D
2.5 (0.1)	GUR	22 (0.87)	8 (0.31)	18.5 (0.73)	R1/4
	GUN	22 (0.87)	8 (0.31)	18.5 (0.73)	NPT1/4
5 (0.2)	GUR	22 (0.87)	8 (0.31)	18.5 (0.73)	R1/4
	GUN	22 (0.87)	8 (0.31)	18.5 (0.73)	NPT1/4
10 (0.4)	GUR	25 (0.98)	10 (0.39)	22.5 (0.89)	R3/8
	GUN	25 (0.98)	10 (0.39)	22.5 (0.89)	NPT3/8

Weld joint (process connection code: GUW)



F0310.ai

Size	Code	øA	øB	øC	øD
2.5 (0.1)	GUW	22(0.87)	8(0.31)	14.3(0.56)	18.5(0.73)
5 (0.2)	GUW	22(0.87)	8(0.31)	14.3(0.56)	18.5(0.73)
10 (0.4)	GUW	25(0.98)	10(0.39)	17.8(0.70)	22.5(0.89)

(1) Mounting Direction

Mount the flowmeter so that the flow direction of the fluid to be measured is in line with the direction of the arrow mark on the flowmeter.



If it is impossible to match the direction of the arrow mark, the direction of the electrical connection can be changed. Refer to the applicable user's manuals which can be downloaded from our website.

In case the fluid being measured flows against the arrow direction, change the value from "Forward" to "Reverse" at the parameter [J20: Flow Direction] (refer to Chapter 8).

(2) Connecting Process Piping

Weld or screw the connection fittings to the process piping.



- Be sure to pass the connection fittings through the union joint nuts in advance.
- When welding the fittings, pay attention to the edge preparation, level differences between the fittings and the piping, and the welding current to avoid deforming the piping or causing stagnation portion of the fluid.

(3) Positioning the Flowmeter

Install the flowmeter on a mounting base and position it so that the center axis of the flowtube is aligned with that of the process piping. Then screw the union joint nuts to the connecting ports of the flowmeter.



Ceramics pipes may be damaged if the nuts are tightened when the center axes are not properly aligned.

(4) Tightening Nuts

Use a torque wrench to tighten the union joint nuts.



Tighten the union joint nuts according to the tightening torque values in Table 3.3.2. For permeable fluid (such as nitric acid, hydrofluoric acid or sodium hydrate at high temperature), tighten the nuts according to the torque values in Table 3.3.3.

As the gasket material is fluorocarbon PTFE, it is possible that the nuts may loosen as time passes. Retighten the nuts if this is the case. Be sure to use the gasket (thickness is 1.5 mm) which comes with the flowmeter.

Table 3.3.2 Tightening torque values for Union Joint Type

Size mm (inch)	Torque (N·m / {kgf·cm} / [in·lbf])
2.5 (0.1)	9 to 12 / {91.77 to 122.4} / [79.66 to 106.2]
5 (0.2)	9 to 12 / {91.77 to 122.4} / [79.66 to 106.2]
10 (0.4)	14 to 18 / {142.8 to 183.5} / [123.9 to 159.3]

Table 3.3.3 Tightening torque values for Union Joint Type and Permeable Fluids

Size mm (inch)	Torque (N·m / {kgf·cm} / [in·lbf])
2.5 (0.1)	11 to 15 / {112.2 to 153} / [97.36 to 132.8]
5 (0.2)	11 to 15 / {112.2 to 153} / [97.36 to 132.8]
10 (0.4)	17 to 23 / {173.4 to 234.5} / [150.5 to 203.6]

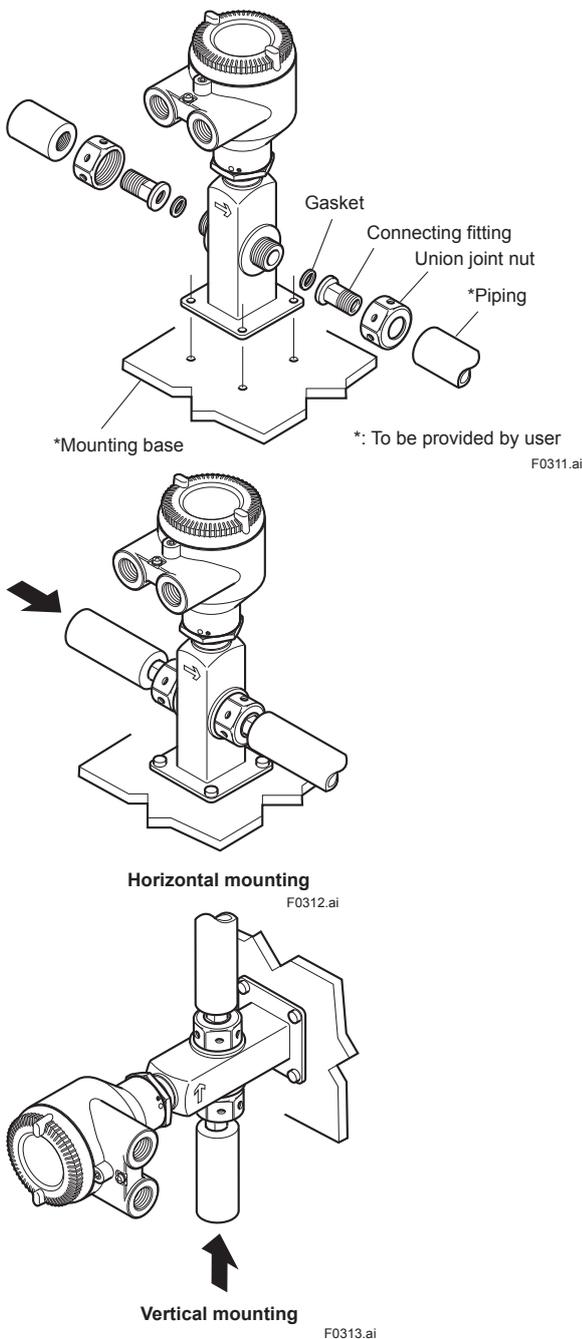


Figure 3.3.1 Mounting Procedure for Union Joint Type (sizes: 2.5 to 10 mm (0.1 to 0.4 in.))

3.3.2 Nominal Diameter 2.5 mm (0.1 in.) to 40 mm (1.5 in.), Wafer Type



IMPORTANT

Use bolts and nuts in compliance with the flange ratings. When stud-type through-bolts are used, be sure the outside diameter of the shank is smaller than that of the thread ridge. Be sure to choose a gasket with inner and outer diameters that does not protrude inside the piping (refer to Table 3.3.16). If the inner diameter of the gasket is too large, or outer diameter of the gasket is too small, fluid leakage may result.

(1) Mounting Direction

Mount the flowmeter so that the flow direction of the fluid to be measured is in line with the direction of the arrow mark on the flowmeter.



IMPORTANT

If it is impossible to match the direction of the arrow mark, the direction of the electrical connection can be changed. Refer to the applicable user's manuals which can be downloaded from our website. In case the fluid being measured flows against the arrow direction, change the value from "Forward" to "Reverse" at the parameter [J20: Flow Direction] (refer to Chapter 8).

(2) Mounting Centering Devices

To maintain concentricity of the flowmeter with the pipes, install centering devices on the Mini-flanges of the flowmeter. Use the appropriate centering devices according to the nominal diameter and the flange ratings.

(3) Positioning the Flowmeter

Pass two through-bolts through the adjacent holes of both flanges and position the flowmeter so that the Mini-flanges and the centering devices come in close contact with each other. Pass the other through-bolts through the other holes (refer to Figure 3.3.2 and Figure 3.3.3). In case stud-type through-bolts are used, position them in such a way that the centering devices come in contact with the bolt threads.

(4) Tightening Nuts

Tighten the nuts according to the torque values for metal piping in Table 3.3.4. For PVC piping, select an optional code of GA, GC, or GD, use rubber gaskets and tighten the nuts to the torque values for PVC piping in Table 3.3.5.

For permeable fluids (such as nitric acid, hydrofluoric acid, or sodium hydrate at high temperatures), tighten the nuts according to the torque values in Table 3.3.6.



CAUTION

For a flowmeter with fluorocarbon PFA lining, it is possible that the nuts may loosen as time passes, so tighten them regularly. Be sure to tighten the nuts according to the prescribed torque values. Tighten them diagonally with the same torque values, step by step up to the prescribed torque value.

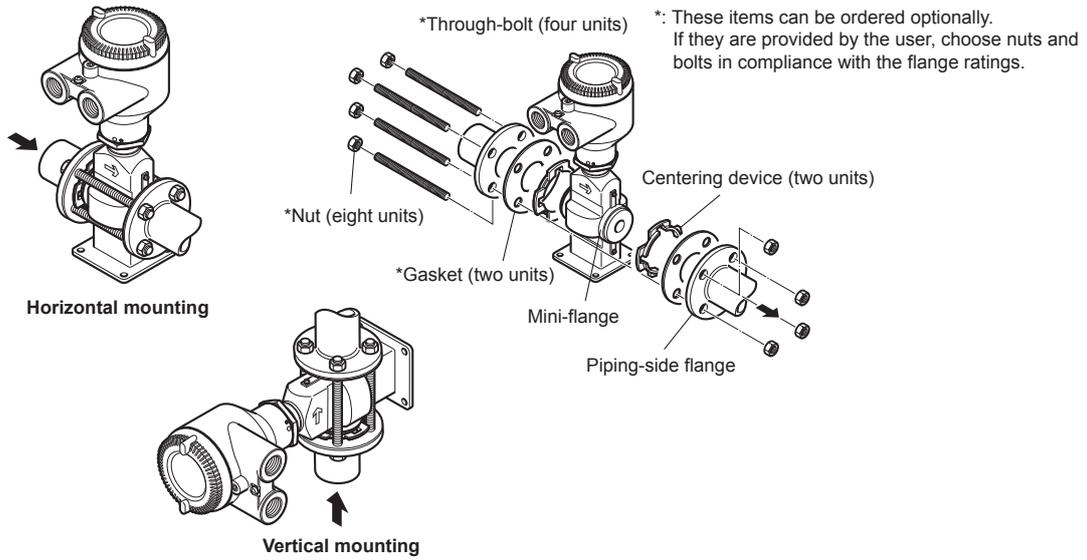


Figure 3.3.2 Mounting Procedure for Wafer Type (sizes: 2.5 to 15 mm (0.1 to 0.5 in.))

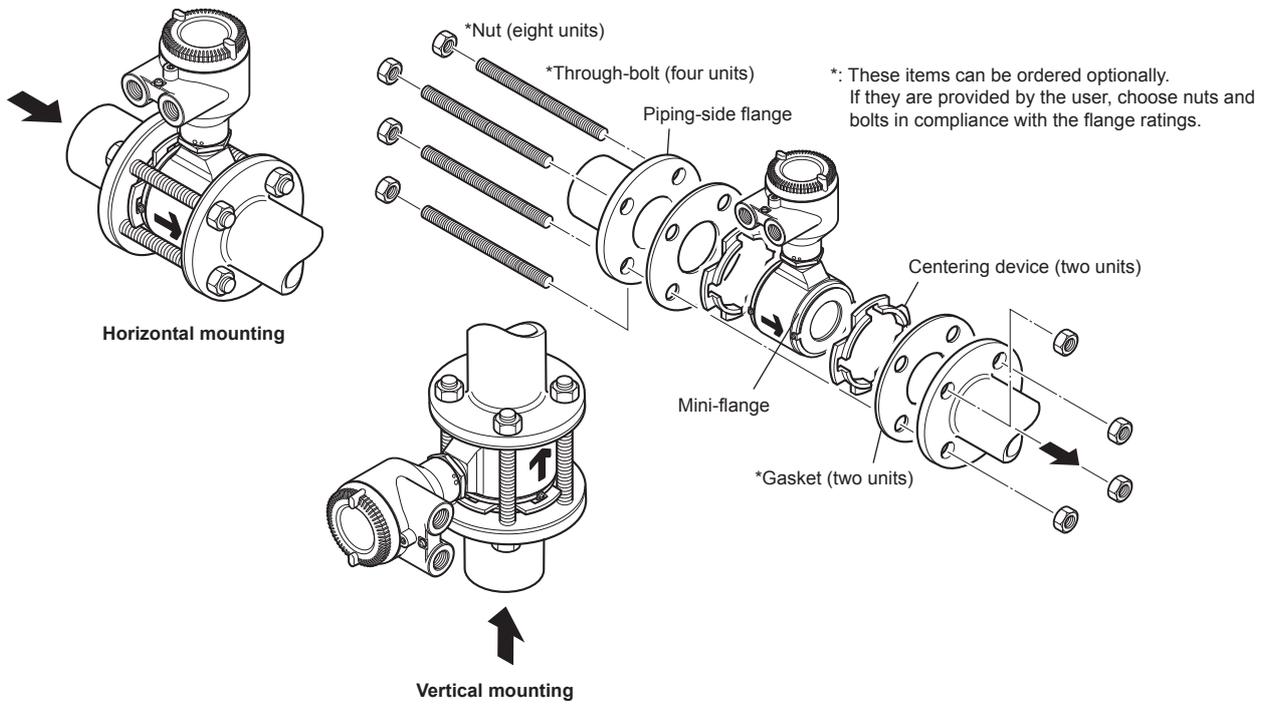


Figure 3.3.3 Mounting Procedure for Wafer Type (sizes: 25, 32 and 40 mm (1.0, 1.25 and 1.5 in.))

Table 3.3.4 Wafer Type Tightening Torque Values for Metal Piping

Tightening torque values for PFA/Polyurethane Rubber lining type (N-m / (kgf-cm) / (in-lbf))					
Gasket types within flowtube		No gasket (standard)			
Gasket types for user's flange		Non-asbestos fiber gasket, PTFE-sheathed non-asbestos gasket (optional codes BCF and BSF), or the equivalent in hardness			
Size mm (inch)	Flange ratings	JIS 10K	JIS 20K	DIN PN40	JPI Class 150
		ANSI Class 150 DIN PN10	ANSI Class 300 DIN PN16		
2.5 (0.1)		7.2 to 8.4 {73.42 to 85.66} [63.72 to 74.35]	7.3 to 8.4 {74.44 to 85.66} [64.61 to 74.35]	7.6 to 8.4 {77.5 to 85.66} [67.26 to 74.35]	7.9 to 12.7 {80.8 to 129.9} [70.1 to 112.7]
5 (0.2)		7.2 to 8.4 {73.42 to 85.66} [63.72 to 74.35]	7.3 to 8.4 {74.44 to 85.66} [64.61 to 74.35]	7.6 to 8.4 {77.5 to 85.66} [67.26 to 74.35]	7.9 to 12.7 {80.8 to 129.9} [70.1 to 112.7]
10 (0.4)		7.2 to 8.4 {73.42 to 85.66} [63.72 to 74.35]	7.3 to 8.4 {74.44 to 85.66} [64.61 to 74.35]	7.6 to 8.4 {77.5 to 85.66} [67.26 to 74.35]	7.9 to 12.7 {80.8 to 129.9} [70.1 to 112.7]
15 (0.5)		7.2 to 8.4 {73.42 to 85.66} [63.72 to 74.35]	7.3 to 8.4 {74.44 to 85.66} [64.61 to 74.35]	7.6 to 8.4 {77.5 to 85.66} [67.26 to 74.35]	7.9 to 12.7 {80.8 to 129.9} [70.1 to 112.7]
25 (1.0)		23.5 to 27.3 {239.6 to 278.4} [208 to 241.6]	23.7 to 27.3 {241.7 to 278.4} [209.8 to 241.6]	22.3 to 27.3 {227.4 to 278.4} [197.4 to 241.6]	19.6 to 21.8 {200.0 to 222.1} [173.5 to 192.6]
32 (1.25)		26.2 to 30.5 {267.2 to 311} [231.9 to 269.9]	26.6 to 30.5 {271.2 to 311} [235.4 to 269.9]	28.0 to 30.5 {285.5 to 311} [247.8 to 269.9]	—
40 (1.5)		36.2 to 42.4 {369.1 to 432.4} [320.4 to 375.3]	36.9 to 42.4 {376.3 to 432.4} [326.6 to 375.3]	39.1 to 42.4 {398.7 to 432.4} [346.1 to 375.3]	30.1 to 33.4 {307.2 to 341.3} [266.5 to 296.0]

Tightening torque values for Ceramics lining type (N-m / (kgf-cm) / (in-lbf))				
Gasket types within flowtube		Fluororesin with ceramic fillers (Valqua #7020) (standard) gasket, or fluororesin with carbon gasket (optional code GF)		
Gasket types for user's flange		Non-asbestos gasket, PTFE-sheathed non-asbestos gasket (optional codes BCF and BSF), or the equivalent in hardness		
Size mm (inch)	Flange ratings	JIS 10K	JIS 20K	DIN PN40
		ANSI Class 150 DIN PN10	ANSI Class 300 DIN PN16	
15 (0.5)		6.8 to 11.0 {69.3 to 112.2} [60.2 to 97.4]	6.8 to 11.0 {69.3 to 112.2} [60.2 to 97.4]	6.6 to 11.0 {67.3 to 112.2} [58.4 to 97.4]
25 (1.0)		18.9 to 24.5 {192.7 to 249.8} [167.3 to 216.8]	19.1 to 24.5 {194.8 to 249.8} [169.0 to 216.8]	14.7 to 24.5 {149.9 to 249.8} [130.1 to 216.8]
40 (1.5)		34.5 to 45.7 {351.8 to 466.0} [305.4 to 404.5]	41.7 to 57.4 {425.2 to 585.3} [369.1 to 508.0]	34.5 to 57.4 {351.8 to 585.3} [305.4 to 508.0]

Table 3.3.5 Wafer Type Tightening Torque Values for PVC Piping

Tightening torque values for PFA lining type (N-m / (kgf-cm) / (in-lbf))					
Gasket types within flowtube		Fluororubber gasket (optional codes GA, GC, and GD)			
Gasket types for user's flange		Fluororubber gasket, chloroprene rubber gasket (optional codes BSC and BCC), or the equivalent in hardness			
Size mm (inch)	Flange ratings	JIS 10K	JIS 20K	DIN PN40	JPI Class 150
		ANSI Class 150 DIN PN10	ANSI Class 300 DIN PN16		
2.5 (0.1)		1.5 to 2.5 {15.3 to 25.49} [13.28 to 22.13]	1.5 to 2.5 {15.3 to 25.49} [13.28 to 22.13]	1.5 to 2.4 {15.3 to 24.47} [13.28 to 21.24]	1.6 to 2.6 {16.4 to 26.5} [14.2 to 23.0]
5 (0.2)		1.5 to 2.5 {15.3 to 25.49} [13.28 to 22.13]	1.5 to 2.5 {15.3 to 25.49} [13.28 to 22.13]	1.5 to 2.4 {15.3 to 24.47} [13.28 to 21.24]	1.6 to 2.6 {16.4 to 26.5} [14.2 to 23.0]
10 (0.4)		1.5 to 2.5 {15.3 to 25.49} [13.28 to 22.13]	1.5 to 2.5 {15.3 to 25.49} [13.28 to 22.13]	1.5 to 2.4 {15.3 to 24.47} [13.28 to 21.24]	1.6 to 2.6 {16.4 to 26.5} [14.2 to 23.0]
15 (0.5)		1.5 to 2.5 {15.3 to 25.49} [13.28 to 22.13]	1.5 to 2.5 {15.3 to 25.49} [13.28 to 22.13]	1.5 to 2.4 {15.3 to 24.47} [13.28 to 21.24]	1.6 to 2.6 {16.4 to 26.5} [14.2 to 23.0]
25 (1.0)		4.9 to 8.1 {49.97 to 82.6} [43.37 to 71.69]	5.0 to 8.3 {50.99 to 84.64} [44.25 to 73.46]	4.3 to 7.2 {43.85 to 73.42} [38.06 to 63.72]	4.0 to 6.6 {41.3 to 67.0} [35.8 to 58.1]
32 (1.25)		5.5 to 9.2 {56.08 to 93.81} [48.68 to 81.43]	5.7 to 9.5 {58.12 to 96.87} [50.45 to 84.08]	5.4 to 8.9 {55.06 to 90.75} [47.79 to 78.77]	—
40 (1.5)		7.7 to 12.9 {78.52 to 131.5} [68.15 to 114.2]	8.1 to 13.4 {82.6 to 136.6} [71.69 to 118.6]	7.5 to 12.5 {76.48 to 127.5} [66.38 to 110.6]	6.4 to 10.4 {65.4 to 106.6} [56.7 to 92.4]

Tightening torque values for Ceramics lining type (N-m / (kgf-cm) / (in-lbf))				
Gasket types within flowtube		Fluororubber gasket (optional codes GA, GC, and GD)		
Gasket types for user's flange		Fluororubber gasket, chloroprene rubber gasket (optional codes BSC and BCC), or the equivalent in hardness		
Size mm (inch)	Flange ratings	JIS 10K	JIS 20K	DIN PN40
		ANSI Class 150 DIN PN10	ANSI Class 300 DIN PN16	
15 (0.5)		0.8 to 1.4 {8.2 to 14.3} [7.1 to 12.4]	0.8 to 1.4 {8.2 to 14.3} [7.1 to 12.4]	0.8 to 1.4 {8.2 to 14.3} [7.1 to 12.4]
25 (1.0)		2.3 to 3.1 {23.5 to 31.6} [20.4 to 27.4]	2.4 to 3.1 {24.5 to 31.6} [21.2 to 27.4]	1.9 to 3.1 {19.4 to 31.6} [16.8 to 27.4]
40 (1.5)		4.4 to 6.0 {44.9 to 61.2} [38.9 to 53.1]	5.2 to 7.3 {53.0 to 74.4} [46.0 to 64.6]	4.4 to 7.3 {44.9 to 74.4} [38.9 to 64.6]

Table 3.3.6 Wafer Type Tightening Torque Values for Metal Piping and Permeable Fluids

Gasket types within flowtube		Tightening torque values for PFA lining type (N-m / (kgf-cm) / [in-lbf])			
Gasket types for user's flange		No gasket (standard)			
Flange ratings		PTFE-sheathed non-asbestos gasket (optional codes BCF and BSF), or the equivalent in hardness			
Size mm (inch)		JIS 10K ANSI Class 150 DIN PN10	JIS 20K ANSI Class 300 DIN PN16	DIN PN40	JPI Class 150
2.5 (0.1)		10.8 to 12.4 {110.1 to 126.4} [95.59 to 109.7]	10.8 to 12.4 {110.1 to 126.4} [95.59 to 109.7]	11.1 to 12.4 {113.2 to 126.4} [98.24 to 109.7]	11.8 to 12.1 {120.6 to 123.7} [104.6 to 107.3]
5 (0.2)		10.8 to 12.4 {110.1 to 126.4} [95.59 to 109.7]	10.8 to 12.4 {110.1 to 126.4} [95.59 to 109.7]	11.1 to 12.4 {113.2 to 126.4} [98.24 to 109.7]	11.8 to 12.1 {120.6 to 123.7} [104.6 to 107.3]
10 (0.4)		10.8 to 12.4 {110.1 to 126.4} [95.59 to 109.7]	10.8 to 12.4 {110.1 to 126.4} [95.59 to 109.7]	11.1 to 12.4 {113.2 to 126.4} [98.24 to 109.7]	11.8 to 12.1 {120.6 to 123.7} [104.6 to 107.3]
15 (0.5)		10.8 to 12.4 {110.1 to 126.4} [95.59 to 109.7]	10.8 to 12.4 {110.1 to 126.4} [95.59 to 109.7]	11.1 to 12.4 {113.2 to 126.4} [98.24 to 109.7]	11.8 to 12.1 {120.6 to 123.7} [104.6 to 107.3]
25 (1.0)		34.9 to 40.1 {355.9 to 408.9} [308.9 to 354.9]	35.2 to 40.1 {358.9 to 408.9} [311.5 to 354.9]	32.3 to 37.1 {329.4 to 378.3} [285.9 to 328.4]	29.2 to 29.9 {297.6 to 305.5} [258.1 to 265.0]
32 (1.25)		38.8 to 44.6 {395.6 to 454.8} [343.4 to 394.7]	39.2 to 44.6 {399.7 to 454.8} [346.9 to 394.7]	40.6 to 46.7 {414.0 to 476.2} [359.3 to 413.3]	—
40 (1.5)		53.5 to 61.5 {545.5 to 627.1} [473.5 to 544.3]	54.2 to 61.5 {552.7 to 627.1} [479.7 to 544.3]	56.4 to 61.5 {575.1 to 627.1} [499.2 to 544.3]	44.6 to 45.8 {455.0 to 467.3} [394.7 to 405.3]

Gasket types within flowtube		Tightening torque values for Ceramics lining type (N-m / (kgf-cm) / [in-lbf])		
Gasket types for user's flange		Fluororesin with ceramic fillers (Valqua #7020) gasket (standard), or fluororesin with carbon gasket (optional code GF)		
Flange ratings		PTFE-sheathed non-asbestos gasket (optional codes BCF and BSF), or the equivalent in hardness		
Size mm (inch)		JIS 10K ANSI Class 150 DIN PN10	JIS 20K ANSI Class 300 DIN PN16	DIN PN40
15 (0.5)		8.1 to 13.1 {82.6 to 133.6} [71.7 to 115.9]	8.1 to 13.1 {82.6 to 133.6} [71.7 to 115.9]	7.9 to 13.1 {80.6 to 133.6} [69.9 to 115.9]
25 (1.0)		22.5 to 29.0 {228.4 to 295.7} [199.1 to 256.7]	22.7 to 29.0 {231.5 to 295.7} [200.9 to 256.7]	17.4 to 29.0 {177.4 to 295.7} [154.0 to 256.7]
40 (1.5)		40.6 to 53.8 {414.0 to 548.6} [359.3 to 476.2]	49.3 to 67.7 {502.7 to 690.3} [436.3 to 599.2]	40.6 to 67.7 {414.0 to 690.3} [359.3 to 599.2]

3.3.3 Nominal Diameter 50 mm (2.0 in.) to 300 mm (12.0 in.), Wafer Type



IMPORTANT

Use bolts and nuts in compliance with the flange ratings. When stud-type through-bolts are used, be sure the outside diameter of the shank is smaller than that of the thread ridge. Be sure to choose a gasket with inner and outer diameters that does not protrude inside the piping (refer to Table 3.3.16). If the inner diameter of the gasket is too large, or outer diameter of the gasket is too small, fluid leakage may result.

(1) Mounting Direction

Mount the flowmeter so that the flow direction of the fluid to be measured is in line with the direction of the arrow mark on the flowmeter.



IMPORTANT

If it is impossible to match the direction of the arrow mark, the direction of the electrical connection can be changed. Refer to the applicable user's manuals which can be downloaded from our website. In case the fluid being measured flows against the arrow direction, change the value from "Forward" to "Reverse" at the parameter [J20: Flow Direction] (refer to Chapter 8).

(2) Mounting Centering Devices

To maintain concentricity of the flowmeter with the pipes, install centering devices. From the process piping side, pass two through-bolts through the four centering devices (two for each bolt) and the adjacent two holes (the lower two holes for horizontal mounting) of both of the flanges (refer to Figure 3.3.4). Use the appropriate centering devices according to the nominal diameter and the flange ratings. The centering devices are engraved with an identifying character. Use the appropriate ones which meet the required specifications by referring to Table 3.3.10 and Table 3.3.11 (AXF standard models) and Table 3.3.12 (replacement models for the earlier ADMAG or ADMAG AE).

(3) Positioning the Flowmeter

Position the flowmeter so that the Mini-flanges and the centering devices come in close contact with each other. Be careful to prevent the four centering devices from coming into contact with the housing. If stud-type through-bolts are used, position them in such a way that the four centering devices come in contact with the bolt threads (refer to Figure 3.3.4). Pass the other through-bolts through from the process piping side.



NOTE

Precautions for size 125 mm (5 in.), 150 mm (6 in.), replaceable electrode type
When installing this type of flowmeter with JIS F12 (JIS 75M) flanges, turn the flowmeter slightly because the cover of the electrode chambers will interfere with the bolts.

(4) Tightening Nuts

Tighten the nuts according to the torque values for metal piping in Table 3.3.7. For PVC piping, select an optional code of GA, GC, or GD, use rubber gaskets and tighten the nuts to the torque values for PVC piping in Table 3.3.8.

For permeable fluids (such as nitric acid, hydrofluoric acid, or sodium hydrate at high temperatures), tighten the nuts according to the torque values in Table 3.3.9.



CAUTION

For a flowmeter with fluorocarbon PFA lining, it is possible that the nuts may loosen as time passes, so tighten them regularly. Be sure to tighten the nuts according to the prescribed torque values. Tighten them diagonally with the same torque values, step by step up to the prescribed torque value.

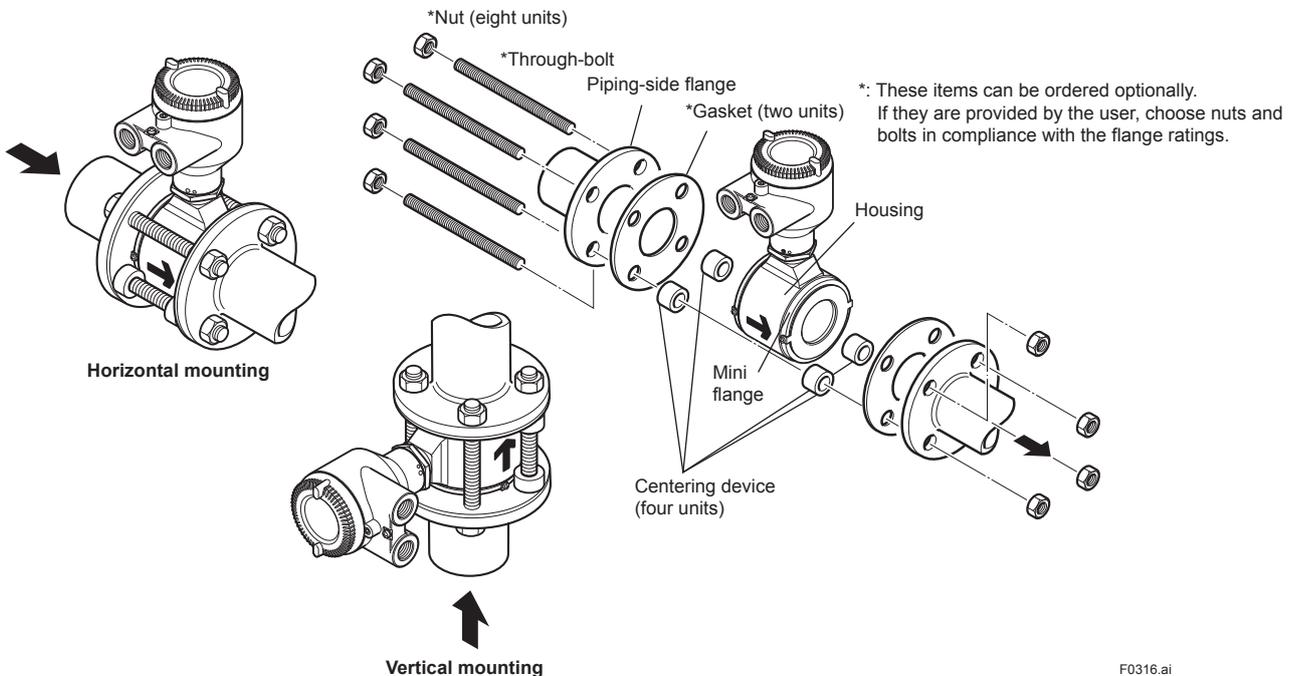


Figure 3.3.4 Mounting Procedure for Wafer Type (sizes: 50 to 300 mm (2.0 to 12 in.))

Table 3.3.7 Wafer Type Tightening Torque Values for Metal Piping

Tightening torque values for PFA/Polyurethane Rubber/Natural Soft Rubber/EPDM Rubber lining type										Unit: $\frac{N \cdot m}{\{kgf \cdot cm\}}$ $\frac{in \cdot lbf}{\{in \cdot lbf\}}$
Gasket types within flowtube	No gasket (standard)									
Gasket types for user's flange	Non-asbestos fiber gasket, PTFE-sheathed non-asbestos gasket (optional codes BCF and BSF), or the equivalent in hardness									
Flange ratings Size mm (inch)	JIS 10K	ANSI Class 150	DIN PN10	JIS 20K	ANSI Class 300	DIN PN16	DIN PN40	JIS F12 (JIS 75M)	JPI Class 150	
50 (2.0)	45.0 to 56.8 {458.9 to 579.2} [398.3 to 502.7]	45.0 to 56.8 {458.9 to 579.2} [398.3 to 502.7]	—	22.5 to 25.9 {229.4 to 264.1} [199.1 to 229.2]	22.5 to 25.9 {229.4 to 264.1} [199.1 to 229.2]	—	50.0 to 57.5 {509.9 to 586.3} [442.5 to 508.9]	—	44.5 to 50.9 {454.1 to 519.8} [393.9 to 450.9]	
65 (2.5)	61.3 to 70.5 {625.1 to 718.9} [542.5 to 624.0]	61.3 to 70.5 {625.1 to 718.9} [542.5 to 624.0]	—	30.8 to 35.4 {314.1 to 361.0} [272.6 to 313.3]	30.8 to 35.4 {314.1 to 361.0} [272.6 to 313.3]	56.1 to 70.8 {572.1 to 722.0} [496.5 to 626.6]	—	—		
80 (3.0)	35.0 to 40.3 {356.9 to 410.9} [309.8 to 356.7]	76.0 to 80.9 {775.0 to 825.0} [672.6 to 716.0]	—	39.9 to 45.9 {406.9 to 468.1} [353.1 to 406.2]	39.9 to 45.9 {406.9 to 468.1} [353.1 to 406.2]	39.9 to 45.9 {406.9 to 468.1} [353.1 to 406.2]	—	68.4 to 78.7 {697.5 to 802.5} [605.4 to 696.5]	70.0 to 80.1 {714.4 to 817.8} [619.6 to 709.3]	
100 (4.0)	46.1 to 53 {470.1 to 540.5} [408.0 to 469.1]	46.1 to 53 {470.1 to 540.5} [408.0 to 469.1]	—	52.9 to 60.8 {539.4 to 620.0} [468.2 to 538.1]	52.9 to 60.8 {539.4 to 620.0} [468.2 to 538.1]	52.9 to 60.8 {539.4 to 620.0} [468.2 to 538.1]	—	88.6 to 101.9 {903.5 to 1039} [784.1 to 901.9]	45.0 to 51.5 {459.0 to 525.2} [398.1 to 455.6]	
125 (5.0)	73.7 to 84.8 {751.5 to 864.7} [652.3 to 750.5]	73.7 to 84.8 {751.5 to 864.7} [652.3 to 750.5]	—	80.5 to 92.6 {820.9 to 944.3} [712.5 to 819.5]	80.5 to 92.6 {820.9 to 944.3} [712.5 to 819.5]	80.5 to 92.6 {820.9 to 944.3} [712.5 to 819.5]	—	75.1 to 86.4 {765.8 to 881.0} [664.7 to 764.7]	—	
150 (6.0)	85.4 to 98.2 {870.8 to 1001} [755.8 to 869.1]	85.4 to 98.2 {870.8 to 1001} [755.8 to 869.1]	—	61.0 to 70.2 {622.0 to 715.8} [539.9 to 621.3]	61.0 to 70.2 {622.0 to 715.8} [539.9 to 621.3]	91.2 to 96.3 {930.0 to 982.0} [807.2 to 852.3]	—	86.3 to 99.2 {880.0 to 1012} [763.8 to 878.0]	78.9 to 86.2 {805.2 to 879.9} [698.4 to 763.2]	
200 (8.0)	78.8 to 90.6 {803.5 to 923.9} [697.4 to 801.8]	113.6 to 135.8 {1158 to 1385} [1005 to 1202]	113.6 to 135.8 {1158 to 1385} [1005 to 1202]	87.5 to 100.6 {892.3 to 1026} [774.4 to 890.3]	87.5 to 100.6 {892.3 to 1026} [774.4 to 890.3]	87.5 to 100.6 {892.3 to 1026} [774.4 to 890.3]	—	88.6 to 101.9 {903.5 to 1039} [784.1 to 901.9]	109.6 to 119.7 {1118 to 1221} [1060]	
250 (10)	119.4 to 137.3 {1218 to 1400} [1057 to 1215]	119.4 to 137.3 {1218 to 1400} [1057 to 1215]	119.4 to 137.3 {1218 to 1400} [1057 to 1215]	—	—	—	—	158.1 to 181.8 {1612 to 1854} [1399 to 1609]	120.8 to 136.4 {1232 to 1392} [1069 to 1207]	
300 (12)	83.0 to 99.2 {846.4 to 1012} [734.6 to 878]	105.2 to 121.0 {1073 to 1234} [931.1 to 1071]	105.2 to 121.0 {1073 to 1234} [931.1 to 1071]	—	—	—	—	146.6 to 168.6 {1495 to 1719} [1297 to 1492]	141.8 to 160.1 {1447 to 1634} [1255 to 1417]	

Tightening torque values for Ceramics lining type									Unit: $\frac{N \cdot m}{\{kgf \cdot cm\}}$ $\frac{in \cdot lbf}{\{in \cdot lbf\}}$
Gasket types within flowtube	Fluororesin with ceramic fillers (Valqua #7020) gasket (standard), or fluororesin with carbon gasket (optional code GF)								
Gasket types for user's flange	Non-asbestos gasket, PTFE-sheathed non-asbestos gasket (optional codes BCF and BSF), or the equivalent in hardness								
Flange ratings Size mm (inch)	JIS 10K	ANSI Class 150	DIN PN10	JIS 20K	ANSI Class 300	DIN PN16	DIN PN40	JIS F12 (JIS 75M)	
50 (2.0)	48.2 to 80.3 {491.5 to 818.8} [426.6 to 710.7]	48.6 to 81.0 {495.6 to 826.0} [430.1 to 716.9]	—	23.5 to 39.1 {239.6 to 398.7} [208.0 to 346.1]	23.7 to 39.5 {241.7 to 402.8} [209.8 to 349.6]	—	48.2 to 80.3 {491.5 to 818.8} [426.6 to 710.7]	—	
80 (3.0)	31.5 to 52.4 {321.2 to 534.3} [278.8 to 463.8]	64.2 to 107.0 {654.7 to 1091.1} [568.2 to 947.0]	—	38.8 to 64.7 {395.6 to 659.8} [343.4 to 572.6]	38.2 to 63.7 {389.5 to 649.6} [338.1 to 563.8]	31.5 to 52.4 {321.2 to 534.3} [278.8 to 463.8]	—	63.7 to 106.2 {649.6 to 1082.9} [563.8 to 939.9]	
100 (4.0)	36.0 to 59.9 {367.1 to 610.8} [318.6 to 530.2]	36.3 to 60.4 {370.2 to 615.9} [321.3 to 534.6]	—	44.3 to 73.8 {451.7 to 752.6} [392.1 to 653.2]	43.6 to 72.7 {444.6 to 741.3} [385.9 to 643.4]	36.0 to 59.9 {367.1 to 610.8} [318.6 to 530.2]	—	73.0 to 121.6 {744.4 to 1240.0} [646.1 to 1076.3]	
150 (6.0)	75.5 to 125.9 {769.9 to 1283.8} [668.2 to 1114.3]	74.4 to 123.9 {758.7 to 1263.4} [658.5 to 1096.6]	—	53.4 to 89.1 {544.5 to 908.6} [472.6 to 788.6]	48.8 to 81.3 {497.6 to 829.0} [431.9 to 719.6]	75.5 to 125.9 {769.9 to 1283.8} [668.2 to 1114.3]	—	82.3 to 137.1 {839.2 to 1398.0} [728.4 to 1213.4]	
200 (8.0)	72.9 to 121.6 {743.4 to 1240.0} [645.2 to 1076.3]	109.1 to 181.8 {1112.5 to 1853.8} [965.6 to 1609.1]	110.9 to 184.9 {1130.9 to 1885.5} [981.5 to 1636.5]	79.0 to 131.6 {805.6 to 1341.9} [699.2 to 1164.8]	80.0 to 133.3 {815.8 to 1359.3} [708.1 to 1179.8]	72.9 to 121.6 {743.4 to 1240.0} [645.2 to 1076.3]	—	89.7 to 149.5 {914.7 to 1524.5} [793.9 to 1323.2]	

Table 3.3.8 Wafer Type Tightening Torque Values for PVC Piping

Tightening torque values for PFA lining type										Unit: $\begin{matrix} \text{N}\cdot\text{m} \\ \text{(kgf}\cdot\text{cm)} \\ \text{(in}\cdot\text{lbf)} \end{matrix}$
Gasket types within flowtube	Fluororubber gasket (optional codes GA, GC, and GD)									
Gasket types for user's flange	Fluororubber gasket, chloroprene rubber gasket (optional codes BSC and BCC), or the equivalent in hardness									
Flange ratings Size mm (inch)	JIS 10K	ANSI Class 150	DIN PN10	JIS 20K	ANSI Class 300	DIN PN16	DIN PN40	JIS F12 (JIS 75M)	JPI Class 150	
50 (2.0)	9.9 to 16.5 {101.0 to 168.3} [87.6 to 146.0]	9.9 to 16.5 {101.0 to 168.3} [87.6 to 146.0]	—	10.6 to 17.6 {108.1 to 179.5} [93.8 to 155.8]	10.6 to 17.6 {108.1 to 179.5} [93.8 to 155.8]	—	9.5 to 15.9 {96.9 to 162.1} [84.1 to 140.7]	—	9.6 to 15.9 {98.1 to 162.2} [85.1 to 140.7]	
65 (2.5)	14.2 to 23.7 {144.8 to 241.7} [125.7 to 209.8]	14.2 to 23.7 {144.8 to 241.7} [125.7 to 209.8]	—	15.5 to 25.9 {158.1 to 264.1} [137.2 to 229.2]	15.5 to 25.9 {158.1 to 264.1} [137.2 to 229.2]	28.2 to 51.8 {287.6 to 528.2} [249.6 to 458.4]	—	—	—	
80 (3.0)	8.0 to 13.3 {81.6 to 135.6} [70.8 to 117.7]	17.4 to 26.7 {177.4 to 272.3} [154.0 to 236.3]	—	9.7 to 16.1 {98.9 to 164.2} [85.8 to 142.5]	9.7 to 16.1 {98.9 to 164.2} [85.8 to 142.5]	9.7 to 16.1 {98.9 to 164.2} [85.8 to 142.5]	—	15.4 to 25.6 {157.0 to 261.0} [136.3 to 226.6]	16.4 to 27.0 {167.1 to 275.9} [145.0 to 239.3]	
100 (4.0)	11.3 to 18.8 {115.2 to 191.7} [100.0 to 166.4]	11.3 to 18.8 {115.2 to 191.7} [100.0 to 166.4]	—	14.2 to 23.6 {144.8 to 240.7} [125.7 to 208.9]	14.2 to 23.6 {144.8 to 240.7} [125.7 to 208.9]	14.2 to 23.6 {144.8 to 240.7} [125.7 to 208.9]	—	21.1 to 35.1 {215.2 to 357.9} [186.7 to 310.6]	10.6 to 17.5 {108.2 to 178.3} [93.8 to 154.7]	
125 (5.0)	18.8 to 31.3 {191.7 to 319.2} [166.4 to 277.0]	18.8 to 31.3 {191.7 to 319.2} [166.4 to 277.0]	—	22.3 to 37.2 {227.4 to 379.3} [197.4 to 329.2]	22.3 to 37.2 {227.4 to 379.3} [197.4 to 329.2]	22.3 to 37.2 {227.4 to 379.3} [197.4 to 329.2]	—	18.5 to 30.8 {188.6 to 314.1} [163.7 to 272.6]	—	
150 (6.0)	22.5 to 37.6 {229.4 to 383.4} [199.1 to 332.8]	22.5 to 37.6 {229.4 to 383.4} [199.1 to 332.8]	—	27.2 to 45.3 {277.4 to 461.9} [240.7 to 400.9]	27.2 to 45.3 {277.4 to 461.9} [240.7 to 400.9]	40.7 to 62.1 {415.0 to 633.2} [360.2 to 549.6]	—	21.8 to 36.3 {222.3 to 370.2} [192.9 to 321.3]	19.9 to 32.0 {202.8 to 326.0} [175.9 to 282.8]	
200 (8.0)	22.1 to 36.9 {225.4 to 376.3} [195.6 to 326.6]	31.9 to 55.3 {325.3 to 563.9} [282.3 to 489.4]	31.9 to 55.3 {325.3 to 563.9} [282.3 to 489.4]	27.3 to 45.3 {278.4 to 461.9} [241.6 to 400.9]	27.3 to 45.3 {278.4 to 461.9} [241.6 to 400.9]	27.3 to 45.3 {278.4 to 461.9} [241.6 to 400.9]	—	23.8 to 39.6 {242.7 to 403.8} [210.6 to 350.5]	30.6 to 49.2 {312.3 to 501.7} [270.9 to 435.2]	

Tightening torque values for Ceramics lining type									Unit: $\begin{matrix} \text{N}\cdot\text{m} \\ \text{(kgf}\cdot\text{cm)} \\ \text{(in}\cdot\text{lbf)} \end{matrix}$
Gasket types within flowtube	Fluororubber gasket (optional codes GA, GC, and GD)								
Gasket types for user's flange	Fluororubber gasket, chloroprene rubber gasket (optional codes BSC and BCC), or the equivalent in hardness								
Flange ratings Size mm (inch)	JIS 10K	ANSI Class 150	DIN PN10	JIS 20K	ANSI Class 300	DIN PN16	DIN PN40	JIS F12 (JIS 75M)	
50 (2.0)	6.2 to 10.4 {63.2 to 106.1} [54.9 to 92.0]	6.3 to 10.5 {64.2 to 107.1} [55.8 to 92.9]	—	2.9 to 4.9 {29.6 to 50.0} [25.7 to 43.4]	2.9 to 4.9 {29.6 to 50.0} [25.7 to 43.4]	—	6.2 to 10.4 {63.2 to 106.1} [54.9 to 92.0]	—	
80 (3.0)	4.4 to 7.3 {44.9 to 74.4} [38.9 to 64.6]	10.6 to 17.7 {108.1 to 180.5} [93.8 to 156.7]	—	5.3 to 8.8 {54.0 to 89.7} [46.9 to 77.9]	5.2 to 8.7 {53.0 to 88.7} [46.0 to 77.0]	4.4 to 7.3 {44.9 to 74.4} [38.9 to 64.6]	—	9.6 to 16.0 {97.9 to 163.2} [85.0 to 141.6]	
100 (4.0)	5.2 to 8.6 {53.0 to 87.7} [46.0 to 76.1]	5.7 to 9.5 {58.1 to 96.9} [50.4 to 84.1]	—	6.0 to 10.0 {61.2 to 102.0} [53.1 to 88.5]	6.0 to 10.0 {61.2 to 102.0} [53.1 to 88.5]	5.2 to 8.6 {53.0 to 87.7} [46.0 to 76.1]	—	11.7 to 19.5 {119.3 to 198.8} [103.6 to 172.6]	
150 (6.0)	10.7 to 17.8 {109.1 to 181.5} [94.7 to 157.5]	11.6 to 19.3 {118.3 to 196.8} [102.7 to 170.8]	—	7.0 to 11.6 {71.4 to 118.3} [62.0 to 102.7]	6.6 to 11.0 {67.3 to 112.2} [58.4 to 97.4]	10.7 to 17.8 {109.1 to 181.5} [94.7 to 157.5]	—	13.3 to 22.2 {135.6 to 226.4} [117.7 to 196.5]	
200 (8.0)	10.2 to 17.1 {104.0 to 174.4} [90.3 to 151.3]	18.9 to 31.5 {192.7 to 321.2} [167.3 to 278.8]	18.7 to 31.2 {190.7 to 318.2} [165.5 to 276.1]	10.6 to 17.7 {108.1 to 180.5} [93.8 to 156.7]	10.8 to 18.0 {110.1 to 183.5} [95.6 to 159.3]	10.2 to 17.1 {104.0 to 174.4} [90.3 to 151.3]	—	15.3 to 25.5 {156.0 to 260.0} [135.4 to 225.7]	

Table 3.3.9 Wafer Type Tightening Torque Values for Metal Piping and Permeable Fluids

Tightening torque values for PFA lining type										Unit: $\begin{matrix} \text{N}\cdot\text{m} \\ \{\text{kgf}\cdot\text{cm}\} \\ [\text{in}\cdot\text{lbf}] \end{matrix}$
Gasket types within flowtube	No gasket (standard)									
Gasket types for user's flange	PTFE-sheathed non-asbestos gasket (optional codes BCF and BSF), or the equivalent in hardness									
Flange ratings	JIS 10K	ANSI Class 150	DIN PN10	JIS 20K	ANSI Class 300	DIN PN16	DIN PN40	JIS F12 (JIS 75M)	JPI Class 150	
Size mm (inch)										
50 (2.0)	66.2 to 76.1 {675.1 to 776.0} [585.9 to 673.5]	66.2 to 76.1 {675.1 to 776.0} [585.9 to 673.5]	—	33.1 to 38.0 {337.5 to 387.5} [292.9 to 336.3]	33.1 to 38.0 {337.5 to 387.5} [292.9 to 336.3]	—	71.2 to 118.6 {726.0 to 1209} [630.1 to 1050]	—	65.7 to 69.7 {670.9 to 711.0} [581.9 to 616.7]	
65 (2.5)	89.5 to 102.9 {912.6 to 1049} [792.1 to 910.7]	89.5 to 102.9 {912.6 to 1049} [792.1 to 910.7]	—	44.9 to 51.6 {457.9 to 526.2} [397.4 to 456.7]	44.9 to 51.6 {457.9 to 526.2} [397.4 to 456.7]	81.8 to 103.2 {834.1 to 1052} [724.0 to 913.4]	—	—		
80 (3.0)	51.3 to 59.0 {523.1 to 601.6} [454.0 to 522.2]	111.3 to 118.4 {1135 to 1207} [985.0 to 1048]	—	58.1 to 66.8 {592.5 to 681.2} [514.2 to 591.2]	58.1 to 66.8 {592.5 to 681.2} [514.2 to 591.2]	—	—	100.8 to 115.9 {1028 to 1182} [892.1 to 1026]	102.5 to 108.7 {1046 to 1109} [907.7 to 962.0]	
100 (4.0)	66.7 to 76.7 {680.2 to 782.1} [590.3 to 678.8]	66.7 to 76.7 {680.2 to 782.1} [590.3 to 678.8]	—	76.1 to 87.5 {776.0 to 892.3} [673.5 to 774.4]	76.1 to 87.5 {776.0 to 892.3} [673.5 to 774.4]	—	—	129.8 to 149.3 {1324 to 1522} [1149 to 1321]	65.7 to 69.6 {670.1 to 710.0} [581.2 to 615.9]	
125 (5.0)	106.1 to 122.0 {1082 to 1244} [939.0 to 1080]	106.1 to 122.0 {1082 to 1244} [939.0 to 1080]	—	114.5 to 131.7 {1168 to 1343} [1013 to 1166]	114.5 to 131.7 {1168 to 1343} [1013 to 1166]	—	—	109.6 to 126.0 {1118 to 1285} [970.0 to 1115]	—	
150 (6.0)	122.2 to 140.5 {1246 to 1433} [1082 to 1243]	122.2 to 140.5 {1246 to 1433} [1082 to 1243]	—	86.8 to 99.8 {885.1 to 1018} [768.2 to 883.3]	86.8 to 99.8 {885.1 to 1018} [768.2 to 883.3]	129.8 to 136.9 {1324 to 1396} [1149 to 1212]	—	125.6 to 144.4 {1281 to 1472} [1112 to 1278]	114.2 to 115.3 {1165 to 1177} [1010 to 1021]	
200 (8.0)	111.6 to 128.3 {1138 to 1308} [987.7 to 1136]	161.0 to 192.3 {1642 to 1961} [1425 to 1702]	161.0 to 192.3 {1642 to 1961} [1425 to 1702]	122.0 to 140.3 {1244 to 1431} [1080 to 1242]	122.0 to 140.3 {1244 to 1431} [1080 to 1242]	—	—	128.0 to 147.2 {1305 to 1501} [1133 to 1303]	156.7 to 158.3 {1599 to 1615} [1387 to 1401]	
250 (10)	167.7 to 192.9 {1710 to 1967} [1484 to 1707]	167.7 to 192.9 {1710 to 1967} [1484 to 1707]	167.7 to 192.9 {1710 to 1967} [1484 to 1707]	—	—	—	—	227.6 to 261.7 {2321 to 2669} [2014 to 2316]	172.3 to 175.8 {1758 to 1794} [1525 to 1556]	
300 (12)	115.2 to 137.6 {1175 to 1403} [1020 to 1218]	146.0 to 167.9 {1489 to 1712} [1292 to 1486]	146.0 to 167.9 {1489 to 1712} [1292 to 1486]	—	—	—	—	209.1 to 240.5 {2132 to 2452} [1851 to 2129]	199.8 to 203.9 {2039 to 2080} [1768 to 1805]	

Tightening torque values for Ceramics lining type									Unit: $\begin{matrix} \text{N}\cdot\text{m} \\ \{\text{kgf}\cdot\text{cm}\} \\ [\text{in}\cdot\text{lbf}] \end{matrix}$
Gasket types within flowtube	Fluororesin with ceramic fillers (Valqua #7020) gasket (standard), or fluororesin with carbon gasket (optional code GF)								
Gasket types for user's flange	PTFE-sheathed non-asbestos gasket (optional codes BCF and BSF), or the equivalent in hardness								
Flange ratings	JIS 10K	ANSI Class 150	DIN PN10	JIS 20K	ANSI Class 300	DIN PN16	DIN PN40	JIS F12 (JIS 75M)	
Size mm (inch)									
50 (2.0)	56.5 to 94.2 {576.1 to 960.6} [500.1 to 833.7]	57.0 to 95.0 {581.2 to 968.7} [504.5 to 840.8]	—	27.7 to 46.1 {282.5 to 470.1} [245.2 to 408.0]	27.9 to 46.5 {284.5 to 474.2} [246.9 to 411.6]	—	56.5 to 94.2 {576.1 to 960.6} [500.1 to 833.7]	—	
80 (3.0)	37.3 to 62.2 {380.4 to 634.3} [330.1 to 550.5]	76.0 to 126.7 {775.0 to 1292.0} [672.7 to 1121.4]	—	46.2 to 77.0 {471.1 to 788.2} [408.9 to 681.5]	45.4 to 75.7 {463.0 to 771.9} [401.8 to 670.0]	37.3 to 62.2 {380.4 to 634.3} [330.1 to 550.5]	—	75.5 to 125.8 {769.9 to 1282.8} [668.2 to 1113.4]	
100 (4.0)	42.2 to 70.3 {430.3 to 716.9} [373.5 to 622.2]	42.5 to 70.8 {433.4 to 722.0} [376.2 to 626.6]	—	52.0 to 86.7 {530.3 to 884.1} [460.2 to 767.4]	51.2 to 85.3 {522.1 to 869.8} [453.2 to 755.0]	42.2 to 70.3 {430.3 to 716.9} [373.5 to 622.2]	—	85.4 to 142.3 {870.8 to 1451.1} [755.9 to 1259.5]	
150 (6.0)	87.8 to 146.4 {895.3 to 1492.9} [777.1 to 1295.7]	86.4 to 144.0 {881.0 to 1468.4} [764.7 to 1274.5]	—	62.4 to 104.0 {636.3 to 1060.5} [552.3 to 920.5]	56.8 to 94.7 {579.2 to 965.7} [502.7 to 838.2]	87.8 to 146.4 {895.3 to 1492.9} [777.1 to 1295.7]	—	95.4 to 159.0 {972.8 to 1621.3} [844.4 to 1407.3]	
200 (8.0)	84.0 to 140.1 {856.6 to 1428.6} [743.5 to 1240.0]	125.4 to 209.1 {1278.7 to 2132.2} [1109.9 to 1850.7]	127.6 to 212.7 {1301.2 to 2168.9} [1129.4 to 1882.6]	91.1 to 151.9 {929.0 to 1548.9} [806.3 to 1344.4]	92.3 to 153.8 {941.3 to 1568.3} [816.9 to 1361.2]	84.0 to 140.1 {856.6 to 1428.6} [743.5 to 1240.0]	—	103.0 to 171.7 {1050.3 to 1750.9} [911.6 to 1519.7]	

Table 3.3.10 Centering Device Identification (AXF Standard Models, PFA/Polyurethane Rubber/Natural Soft Rubber/EPDM Rubber lining)

Flange ratings Size mm (inch)	JIS			ANSI		DIN			JPI
	10K	20K	F12 (75M)	Class 150	Class 300	PN10	PN16	PN40	Class 150
50 (2.0)	B	B	—	B	F	—	—	F	B
65 (2.5)	B	B	—	B	G	—	F	—	—
80 (3.0)	B	F	H	F	C	—	G	—	F
100 (4.0)	B	F	H	C	H	—	F	—	C
125 (5.0)	B	C	C	G	D	—	F	—	—
150 (6.0)	C	D	D	C	E	—	C	—	C
200 (8.0)	C	D	D	D	E	C	C	—	D
250 (10)	C	—	D	N	—	C	C	—	N
300 (12)	C	—	D	P	—	C	C	—	P

*: Each centering device is engraved with a character as identification.

Table 3.3.11 Centering Device Identification (AXF Standard Models, Ceramics lining)

Flange ratings Size mm (inch)	JIS			ANSI		DIN		
	10K	20K	F12 (75M)	Class 150	Class 300	PN10	PN16	PN40
50 (2.0)	B	B	—	B	F	—	—	F
80 (3.0)	B	F	H	F	C	—	G	—
100 (4.0)	B	F	H	C	H	—	F	—
150 (6.0)	B	C	G	B	D	—	B	—
200 (8.0)	B	C	C	G	J	B	B	—

*: Each centering device is engraved with a character as identification.

Table 3.3.12 Centering Device Identification (Replacement Models, PFA/Polyurethane Rubber lining)

Flange ratings Size mm (inch)	JIS			ANSI		DIN		
	10K	20K	F12(75M)	Class 150	Class 300	PN10	PN16	PN40
50 (2.0)	B	B	—	B	F	—	—	F
80 (3.0)	B	F	H	F	C	—	G	—
100 (4.0)	B	F	H	C	H	—	F	—
150 (6.0)	C	D	D	C	E	—	C	—
200 (8.0)	C	D	D	D	E	C	C	—

*: Each centering device is engraved with a character as identification.

3.3.4 Nominal Diameter 2.5 mm (0.1 in.) to 400 mm (16 in.), Flange Type



IMPORTANT

Use bolts and nuts in compliance with the flange ratings. Be sure to choose a gasket with inner and outer diameters that does not protrude inside the piping (refer to Table 3.3.16). If the inner diameter of the gasket is too large, or outer diameter of the gasket is too small, fluid leakage may result.

(1) Mounting Direction

Mount the flowmeter so that the flow direction of the fluid to be measured is in line with the direction of the arrow mark on the flowmeter.



IMPORTANT

If it is impossible to match the direction of the arrow mark, the direction of the electrical connection can be changed. Refer to the applicable user's manuals which can be downloaded from our website. In case the fluid being measured flows against the arrow direction, change the value from "Forward" to "Reverse" at the parameter [J20: Flow Direction] (refer to Chapter 8).

(2) Tightening Nuts

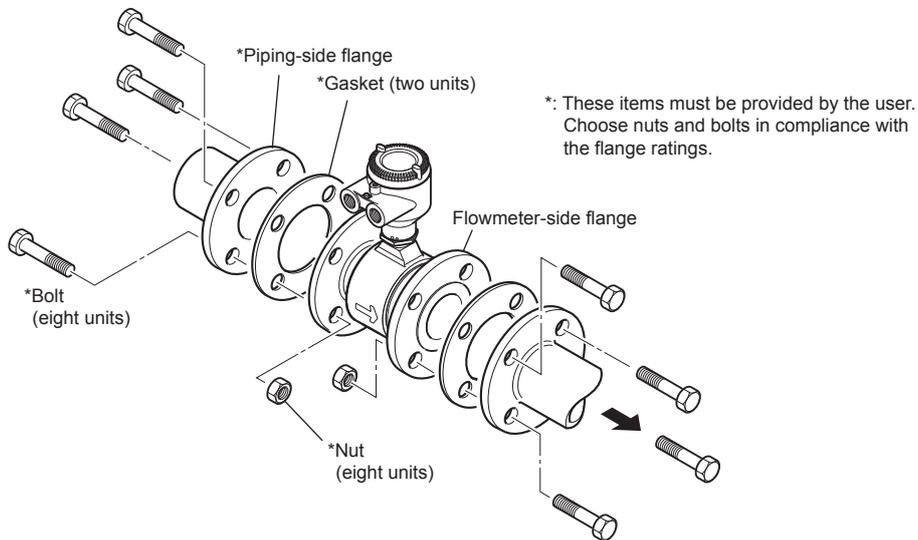
Tighten the bolts according to the torque values for the metal piping in Table 3.3.13. For PVC piping, select an optional code of GA, GC, or GD, use rubber gaskets and tighten the nuts to the torque values for the PVC piping in Table 3.3.14.

For permeable fluids (such as nitric acid, hydrofluoric acid, or sodium hydrate at high temperatures), tighten the nuts according to the torque values in Table 3.3.15.



CAUTION

For a flowmeter with fluorocarbon PFA lining, it is possible that the nuts may loosen as time passes, so tighten them regularly. Be sure to tighten the nuts according to the prescribed torque values. Tighten them diagonally with the same torque values, step by step up to the prescribed torque value.



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Figure 3.3.5 Mounting Procedure for Flange Type (sizes: 2.5 to 400 mm (0.1 to 16 in.))

Table 3.3.13 Flange Type Tightening Torque Values for Metal Piping

Tightening torque values for PFA/Polyurethane Rubber/Natural Soft Rubber/EPDM Rubber lining type												Unit: N·m {kgf·cm} [in·lbf]	
Gasket types within flowtube		No gasket (standard)											
Gasket types for user's flange		Non-asbestos gasket, PTFE-sheathed non-asbestos gasket, or the equivalent in hardness											
Flange ratings Size mm (inch)	JIS 10K	ANSI Class 150	DIN PN10	JIS 20K	ANSI Class 300	DIN PN16	DIN PN40	JIS F12 (JIS 75M)	JPI Class 150	AS Table D	AS Table E		
	2.5 (0.1) (with 10 mm flanges)	3.8 to 6.3 {38.75 to 64.24} [33.63 to 55.76]	3.8 to 6.3 {38.75 to 64.24} [33.63 to 55.76]	—	3.8 to 6.3 {38.75 to 64.24} [33.63 to 55.76]	3.8 to 6.3 {38.75 to 64.24} [33.63 to 55.76]	—	3.8 to 6.4 {38.75 to 65.26} [33.63 to 56.64]	—	—	—	—	
2.5 (0.1) (with 15 mm flanges)	4.6 to 7.7 {46.91 to 78.52} [40.71 to 68.15]	4.6 to 7.7 {46.91 to 78.52} [40.71 to 68.15]	—	4.7 to 7.8 {47.93 to 79.54} [41.6 to 69.03]	4.7 to 7.8 {47.93 to 79.54} [41.6 to 69.03]	—	4.7 to 7.9 {47.93 to 80.56} [41.6 to 69.92]	—	5.1 to 8.5 {52.1 to 86.8} [45.2 to 75.3]	—	—		
5 (0.2) (with 10 mm flanges)	3.8 to 6.3 {38.75 to 64.24} [33.63 to 55.76]	3.8 to 6.3 {38.75 to 64.24} [33.63 to 55.76]	—	3.8 to 6.3 {38.75 to 64.24} [33.63 to 55.76]	3.8 to 6.3 {38.75 to 64.24} [33.63 to 55.76]	—	3.8 to 6.4 {38.75 to 65.26} [33.63 to 56.64]	—	—	—	—		
5 (0.2) (with 15 mm flanges)	4.6 to 7.7 {46.91 to 78.52} [40.71 to 68.15]	4.6 to 7.7 {46.91 to 78.52} [40.71 to 68.15]	—	4.7 to 7.8 {47.93 to 79.54} [41.6 to 69.03]	4.7 to 7.8 {47.93 to 79.54} [41.6 to 69.03]	—	4.7 to 7.9 {47.93 to 80.56} [41.6 to 69.92]	—	5.1 to 8.5 {52.1 to 86.8} [45.2 to 75.3]	—	—		
10 (0.4) (with 10 mm flanges)	3.8 to 6.3 {38.75 to 64.24} [33.63 to 55.76]	3.8 to 6.3 {38.75 to 64.24} [33.63 to 55.76]	—	3.8 to 6.3 {38.75 to 64.24} [33.63 to 55.76]	3.8 to 6.3 {38.75 to 64.24} [33.63 to 55.76]	—	3.8 to 6.4 {38.75 to 65.26} [33.63 to 56.64]	—	—	—	—		
10 (0.4) (with 15 mm flanges)	4.6 to 7.7 {46.91 to 78.52} [40.71 to 68.15]	4.6 to 7.7 {46.91 to 78.52} [40.71 to 68.15]	—	4.7 to 7.8 {47.93 to 79.54} [41.6 to 69.03]	4.7 to 7.8 {47.93 to 79.54} [41.6 to 69.03]	—	4.7 to 7.9 {47.93 to 80.56} [41.6 to 69.92]	—	5.1 to 8.5 {52.1 to 86.8} [45.2 to 75.3]	—	—		
15 (0.5)	4.6 to 7.7 {46.91 to 78.52} [40.71 to 68.15]	4.6 to 7.7 {46.91 to 78.52} [40.71 to 68.15]	—	4.7 to 7.8 {47.93 to 79.54} [41.6 to 69.03]	4.7 to 7.8 {47.93 to 79.54} [41.6 to 69.03]	—	4.7 to 7.9 {47.93 to 80.56} [41.6 to 69.92]	—	5.1 to 8.5 {52.1 to 86.8} [45.2 to 75.3]	—	—		
25 (1.0)	13.1 to 15.1 {133.6 to 154.0} [115.9 to 133.6]	13.1 to 15.1 {133.6 to 154.0} [115.9 to 133.6]	—	13.2 to 15.2 {134.6 to 155.0} [116.8 to 134.5]	13.2 to 15.2 {134.6 to 155.0} [116.8 to 134.5]	—	11.9 to 13.7 {121.3 to 139.7} [105.3 to 121.3]	—	11.0 to 12.6 {112.3 to 128.9} [97.3 to 111.8]	—	—		
32 (1.25)	14.4 to 15.6 {146.8 to 159.1} [127.4 to 138.1]	14.4 to 15.6 {146.8 to 159.1} [127.4 to 138.1]	—	14.6 to 16.8 {148.9 to 171.3} [129.2 to 148.7]	14.6 to 16.8 {148.9 to 171.3} [129.2 to 148.7]	—	15.0 to 17.3 {153.0 to 176.4} [132.8 to 153.1]	—	—	—	—		
40 (1.5)	21.9 to 25.2 {223.3 to 257.0} [193.8 to 223.0]	21.9 to 25.2 {223.3 to 257.0} [193.8 to 223.0]	—	22.2 to 25.5 {226.4 to 260.0} [196.5 to 225.7]	22.2 to 25.5 {226.4 to 260.0} [196.5 to 225.7]	—	23.2 to 26.7 {236.6 to 272.3} [205.3 to 236.3]	—	18.3 to 20.3 {186.6 to 207.4} [161.8 to 179.9]	—	—		
50 (2.0)	28.0 to 32.2 {285.5 to 328.3} [247.8 to 285.0]	28.0 to 32.2 {285.5 to 328.3} [247.8 to 285.0]	—	27.8 to 32.0 {283.5 to 326.3} [246.0 to 283.2]	27.8 to 32.0 {283.5 to 326.3} [246.0 to 283.2]	—	28.8 to 33.1 {293.7 to 337.5} [254.9 to 293.0]	—	27.8 to 31.8 {283.3 to 324.2} [245.7 to 281.2]	26.2 to 30.0 {267.0 to 305.8}	26.6 to 30.5 {271.8 to 311.0} [235.7 to 269.8]		
65 (2.5)	41.6 to 47.8 {424.2 to 487.4} [368.2 to 423.0]	41.6 to 47.8 {424.2 to 487.4} [368.2 to 423.0]	—	19.5 to 28.5 {198.8 to 290.6} [172.6 to 252.2]	19.5 to 28.5 {198.8 to 290.6} [172.6 to 252.2]	41.4 to 47.6 {422.2 to 485.4} [366.6 to 421.3]	—	—	—	—	—		
80 (3.0)	23.2 to 26.7 {236.6 to 272.3} [205.3 to 236.3]	52.7 to 53.6 {536.9 to 546.2} [466.0 to 474.1]	—	26.1 to 30.0 {266.1 to 305.9} [231.0 to 265.5]	26.1 to 30.0 {266.1 to 305.9} [231.0 to 265.5]	26.1 to 30.0 {266.1 to 305.9} [231.0 to 265.5]	—	46.0 to 52.9 {469.1 to 539.4} [407.1 to 468.2]	46.9 to 53.7 {478.8 to 547.6} [415.3 to 475.0]	44.1 to 50.5 {450.2 to 515.4}	45.4 to 51.9 {463.6 to 530.0} [402.1 to 459.7]		
100 (4.0)	30.9 to 35.5 {315.1 to 362.0} [273.5 to 314.2]	30.9 to 35.5 {315.1 to 362.0} [273.5 to 314.2]	—	34.8 to 40.0 {354.9 to 407.9} [308.0 to 354.0]	34.8 to 40.0 {354.9 to 407.9} [308.0 to 354.0]	34.8 to 40.0 {354.9 to 407.9} [308.0 to 354.0]	—	60.9 to 70.0 {621.0 to 713.8} [539.0 to 619.5]	30.5 to 34.8 {311.0 to 355.6} [269.7 to 308.4]	58.1 to 66.5 {593.3 to 678.9} [514.6 to 588.8]	29.6 to 33.8 {301.6 to 344.7} [261.6 to 299.0]		
125 (5.0)	45.6 to 52.4 {465.0 to 534.3} [403.6 to 463.8]	45.6 to 52.4 {465.0 to 534.3} [403.6 to 463.8]	—	48.6 to 55.9 {495.6 to 570.0} [430.1 to 494.7]	48.6 to 55.9 {495.6 to 570.0} [430.1 to 494.7]	48.6 to 55.9 {495.6 to 570.0} [430.1 to 494.7]	—	48.1 to 55.3 {490.5 to 663.9} [425.7 to 489.4]	—	—	—		
150 (6.0)	64.5 to 74.2 {657.7 to 756.6} [570.8 to 656.7]	64.5 to 74.2 {657.7 to 756.6} [570.8 to 656.7]	—	44.8 to 51.5 {456.8 to 525.2} [396.5 to 455.8]	44.8 to 51.5 {456.8 to 525.2} [396.5 to 455.8]	66.7 to 80.8 {680.2 to 823.9} [590.3 to 715.1]	—	67.5 to 77.6 {688.3 to 791.3} [597.4 to 686.8]	60.5 to 66.3 {617.7 to 676.5} [535.8 to 586.8]	47.0 to 53.8 {479.5 to 548.5} [415.9 to 475.8]	60.3 to 66.7 {615.5 to 681.0} [533.8 to 590.7]		
200 (8.0)	59.2 to 68.1 {603.7 to 694.4} [523.9 to 602.7]	100.3 to 102.1 {1023 to 1041} [887.8 to 903.3]	100.3 to 102.1 {1023 to 1041} [887.8 to 903.3]	63.6 to 73.1 {648.5 to 745.4} [562.9 to 647.0]	63.6 to 73.1 {648.5 to 745.4} [562.9 to 647.0]	63.6 to 73.1 {648.5 to 745.4} [562.9 to 647.0]	—	69.9 to 80.4 {712.8 to 819.9} [618.6 to 711.6]	84.9 to 93.0 {866.0 to 949.5} [751.2 to 823.6]	65.5 to 74.9 {668.2 to 763.9} [579.6 to 662.6]	85.9 to 95.2 {876.2 to 972.0} [760.0 to 842.7]		
250 (10)	144.0 to 165.6 {1468 to 1689} [1274 to 1466]	144.0 to 165.6 {1468 to 1689} [1274 to 1466]	144.0 to 165.6 {1468 to 1689} [1274 to 1466]	156.3 to 179.7 {1594 to 1832} [1383 to 1590]	127.2 to 148.8 {1297 to 1517} [1126 to 1317]	156.3 to 179.7 {1594 to 1832} [1383 to 1590]	—	190.5 to 219.1 {1943 to 2234} [1686 to 1939]	142.1 to 160.5 {1450 to 1638} [1258 to 1421]	161.7 to 178.4 {1650 to 1821} [1431 to 1579]	114.1 to 126.3 {1164 to 1289} [1010 to 1118]		
300 (12)	119.3 to 137.2 {1217 to 1399} [1056 to 1214]	163.1 to 197.4 {1663 to 2013} [1443 to 1747]	163.1 to 197.4 {1663 to 2013} [1443 to 1747]	123.1 to 136.3 {1255 to 1390} [1089 to 1206]	152.3 to 169.4 {1553 to 1727} [1348 to 1499]	173.3 to 199.3 {1767 to 2032} [1534 to 1764]	—	168.0 to 193.2 {1713 to 1970} [1487 to 1710]	158.5 to 178.9 {1617 to 1826} [1402 to 1584]	116.9 to 129.2 {1193 to 1318} [1035 to 1143]	149.7 to 163.1 {1527 to 1664} [1325 to 1444]		
350 (14)	164.7 to 189.4 {1679 to 1931} [1458 to 1676]	256.4 to 293.3 {2615 to 2991} [2269 to 2596]	164.7 to 189.4 {1679 to 1931} [1458 to 1676]	—	—	—	—	238.6 to 274.4 {2433 to 2798} [2112 to 2429]	243.0 to 265.2 {2480 to 2706} [2151 to 2347]	204.5 to 223.1 {2087 to 2276} [1810 to 1974]	—		
400 (16)	225.2 to 258.9 {2296 to 2640} [1993 to 2291]	225.2 to 258.9 {2296 to 2640} [1993 to 2291]	225.2 to 258.9 {2296 to 2640} [1993 to 2291]	—	—	—	—	305.8 to 351.7 {3118 to 3586} [2706 to 3113]	233.1 to 254.4 {2378 to 2596} [2063 to 2252]	267.1 to 291.3 {2725 to 2972} [2364 to 2578]	—		

Table 3.3.14 Flange Type Tightening Torque Values for PVC Piping

Tightening torque values for PFA lining type												Unit: N-m {kgf-cm} [in-lbf]	
Gasket types within flowtube		Fluororubber gasket (optional codes GA, GC, and GD)											
Gasket types for user's flange		Fluororubber gasket, chloroprene rubber gasket, or the equivalent in hardness											
Flange ratings Size mm (inch)	JIS 10K	ANSI Class 150	DIN PN10	JIS 20K	ANSI Class 300	DIN PN16	DIN PN40	JIS F12 (JIS 75M)	JPI Class 150	AS Table D	AS Table E		
	2.5 (0.1) (with 10 mm flanges)	0.8 to 1.3 {8.158 to 13.26} [7.08 to 11.51]	0.8 to 1.3 {8.158 to 13.26} [7.08 to 11.51]	—	0.8 to 1.3 {8.158 to 13.26} [7.08 to 11.51]	0.8 to 1.3 {8.158 to 13.26} [7.08 to 11.51]	—	0.8 to 1.3 {8.158 to 13.26} [7.08 to 11.51]	—	—	—	—	
2.5 (0.1) (with 15 mm flanges)	0.9 to 1.6 {9.177 to 16.32} [7.966 to 14.16]	0.9 to 1.6 {9.177 to 16.32} [7.966 to 14.16]	—	0.9 to 1.6 {9.177 to 16.32} [7.966 to 14.16]	0.9 to 1.6 {9.177 to 16.32} [7.966 to 14.16]	—	0.9 to 1.6 {9.177 to 16.32} [7.966 to 14.16]	—	1.0 to 1.7 {10.5 to 16.8} [9.1 to 14.6]	—	—		
5 (0.2) (with 10 mm flanges)	0.8 to 1.3 {8.158 to 13.26} [7.08 to 11.51]	0.8 to 1.3 {8.158 to 13.26} [7.08 to 11.51]	—	0.8 to 1.3 {8.158 to 13.26} [7.08 to 11.51]	0.8 to 1.3 {8.158 to 13.26} [7.08 to 11.51]	—	0.8 to 1.3 {8.158 to 13.26} [7.08 to 11.51]	—	—	—	—		
5 (0.2) (with 15 mm flanges)	0.9 to 1.6 {9.177 to 16.32} [7.966 to 14.16]	0.9 to 1.6 {9.177 to 16.32} [7.966 to 14.16]	—	0.9 to 1.6 {9.177 to 16.32} [7.966 to 14.16]	0.9 to 1.6 {9.177 to 16.32} [7.966 to 14.16]	—	0.9 to 1.6 {9.177 to 16.32} [7.966 to 14.16]	—	1.0 to 1.7 {10.5 to 16.8} [9.1 to 14.6]	—	—		
10 (0.4) (with 10 mm flanges)	0.8 to 1.3 {8.158 to 13.26} [7.08 to 11.51]	0.8 to 1.3 {8.158 to 13.26} [7.08 to 11.51]	—	0.8 to 1.3 {8.158 to 13.26} [7.08 to 11.51]	0.8 to 1.3 {8.158 to 13.26} [7.08 to 11.51]	—	0.8 to 1.3 {8.158 to 13.26} [7.08 to 11.51]	—	—	—	—		
10 (0.4) (with 15 mm flanges)	0.9 to 1.6 {9.177 to 16.32} [7.966 to 14.16]	0.9 to 1.6 {9.177 to 16.32} [7.966 to 14.16]	—	0.9 to 1.6 {9.177 to 16.32} [7.966 to 14.16]	0.9 to 1.6 {9.177 to 16.32} [7.966 to 14.16]	—	0.9 to 1.6 {9.177 to 16.32} [7.966 to 14.16]	—	1.0 to 1.7 {10.5 to 16.8} [9.1 to 14.6]	—	—		
15 (0.5)	0.9 to 1.6 {9.177 to 16.32} [7.966 to 14.16]	0.9 to 1.6 {9.177 to 16.32} [7.966 to 14.16]	—	0.9 to 1.6 {9.177 to 16.32} [7.966 to 14.16]	0.9 to 1.6 {9.177 to 16.32} [7.966 to 14.16]	—	0.9 to 1.6 {9.177 to 16.32} [7.966 to 14.16]	—	1.0 to 1.7 {10.5 to 16.8} [9.1 to 14.6]	—	—		
25 (1.0)	2.7 to 4.5 {27.53 to 45.89} [23.9 to 39.83]	2.7 to 4.5 {27.53 to 45.89} [23.9 to 39.83]	—	2.7 to 4.5 {27.53 to 45.89} [23.9 to 39.83]	2.7 to 4.5 {27.53 to 45.89} [23.9 to 39.83]	—	2.3 to 3.9 {23.45 to 39.77} [20.36 to 34.52]	—	2.2 to 3.6 {22.8 to 36.9} [19.8 to 32.0]	—	—		
32 (1.25)	3.0 to 4.9 {30.59 to 49.97} [26.55 to 43.37]	3.0 to 4.9 {30.59 to 49.97} [26.55 to 43.37]	—	3.0 to 5.0 {30.59 to 50.99} [26.55 to 44.25]	3.0 to 5.0 {30.59 to 50.99} [26.55 to 44.25]	—	2.9 to 4.9 {29.57 to 49.97} [25.67 to 43.37]	—	—	—	—		
40 (1.5)	4.5 to 7.6 {45.89 to 77.5} [39.83 to 67.26]	4.5 to 7.6 {45.89 to 77.5} [39.83 to 67.26]	—	4.7 to 7.8 {47.93 to 79.54} [41.6 to 69.03]	4.7 to 7.8 {47.93 to 79.54} [41.6 to 69.03]	—	4.4 to 7.4 {44.87 to 75.46} [38.94 to 65.49]	—	3.8 to 6.2 {38.6 to 62.8} [33.5 to 54.4]	—	—		
50 (2.0)	5.9 to 9.8 {60.16 to 99.93} [52.22 to 86.74]	5.9 to 9.8 {60.16 to 99.93} [52.22 to 86.74]	—	2.9 to 4.8 {29.57 to 48.95} [25.67 to 42.48]	2.9 to 4.8 {29.57 to 48.95} [25.67 to 42.48]	—	5.5 to 9.2 {56.08 to 93.81} [48.68 to 81.43]	—	5.8 to 9.6 {58.9 to 97.6} [51.1 to 84.6]	5.3 to 8.8 {54.1 to 89.8} [47.0 to 77.9]	5.5 to 9.1 {56.1 to 92.9} [48.7 to 80.6]		
65 (2.5)	9.0 to 15.0 {91.8 to 153.0} [79.7 to 132.8]	9.0 to 15.0 {91.8 to 153.0} [79.7 to 132.8]	—	2.1 to 4.4 {21.4 to 44.9} [18.6 to 38.9]	2.1 to 4.4 {21.4 to 44.9} [18.6 to 38.9]	4.4 to 7.3 {44.9 to 74.4} [38.9 to 64.6]	—	—	—	—	—		
80 (3.0)	4.9 to 8.1 {50.0 to 82.6} [43.4 to 71.7]	11.1 to 16.3 {113.2 to 166.2} [98.2 to 144.3]	—	5.5 to 9.1 {56.1 to 92.8} [48.7 to 80.5]	5.5 to 9.1 {56.1 to 92.8} [48.7 to 80.5]	5.5 to 9.1 {56.1 to 92.8} [48.7 to 80.5]	—	9.7 to 12.2 {98.9 to 124.4} [85.8 to 108.0]	10.2 to 16.8 {103.6 to 171.1} [89.9 to 148.4]	9.1 to 15.1 {92.9 to 153.9} [80.6 to 133.5]	9.7 to 16.0 {98.8 to 163.2} [85.7 to 141.6]		
100 (4.0)	6.7 to 11.2 {68.3 to 114.2} [59.3 to 99.1]	6.7 to 11.2 {68.3 to 114.2} [59.3 to 99.1]	—	7.5 to 12.6 {76.5 to 128.5} [66.4 to 111.5]	7.5 to 12.6 {76.5 to 128.5} [66.4 to 111.5]	7.5 to 12.6 {76.5 to 128.5} [66.4 to 111.5]	—	13.3 to 22.2 {135.6 to 226.4} [117.7 to 196.5]	6.5 to 10.8 {66.7 to 110.1} [57.8 to 95.5]	12.2 to 20.2 {124.6 to 206.1} [108.1 to 178.8]	6.3 to 10.3 {63.9 to 105.6} [55.5 to 91.6]		
125 (5.0)	9.9 to 16.5 {101.0 to 168.3} [87.6 to 146.0]	9.9 to 16.5 {101.0 to 168.3} [87.6 to 146.0]	—	10.7 to 17.8 {109.1 to 181.5} [94.7 to 157.5]	10.7 to 17.8 {109.1 to 181.5} [94.7 to 157.5]	10.7 to 17.8 {109.1 to 181.5} [94.7 to 157.5]	—	10.5 to 17.6 {107.1 to 179.5} [92.9 to 155.8]	—	—	—		
150 (6.0)	14.4 to 24.0 {146.8 to 244.7} [127.4 to 212.4]	14.4 to 24.0 {146.8 to 244.7} [127.4 to 212.4]	—	9.8 to 16.3 {99.9 to 166.2} [86.7 to 144.3]	9.8 to 16.3 {99.9 to 166.2} [86.7 to 144.3]	14.6 to 25.6 {148.9 to 261.0} [129.2 to 226.6]	—	15.2 to 25.3 {155.0 to 258.0} [134.5 to 223.9]	13.3 to 21.4 {135.8 to 218.0} [117.8 to 189.1]	10.0 to 16.4 {101.6 to 167.9} [88.1 to 145.6]	13.1 to 21.2 {133.6 to 216.4} [115.9 to 187.7]		
200 (8.0)	13.4 to 22.3 {136.6 to 227.4} [118.6 to 197.4]	22.7 to 33.4 {231.5 to 340.6} [200.9 to 295.6]	22.7 to 33.4 {231.5 to 340.6} [200.9 to 295.6]	14.6 to 24.3 {148.9 to 247.8} [129.2 to 215.1]	14.6 to 24.3 {148.9 to 247.8} [129.2 to 215.1]	14.6 to 24.3 {148.9 to 247.8} [129.2 to 215.1]	—	16.1 to 26.9 {164.2 to 274.3} [142.5 to 238.1]	19.6 to 31.7 {200.2 to 323.1} [173.7 to 280.3]	14.3 to 23.7 {146.3 to 241.3} [126.9 to 209.3]	19.7 to 32.2 {201.5 to 328.7} [174.8 to 285.1]		

Table 3.3.15 Flange Type Tightening Torque Values for Metal Piping and Permeable Fluids

Tightening torque values for PFA lining type												Unit:	N-m {kgf-cm} [in-lbf]	
Gasket types within flowtube		No gasket (standard)												
Gasket types for user's flange		Non-asbestos gasket, PTFE-sheathed non-asbestos gasket, or the equivalent in hardness												
Flange ratings Size mm (inch)	JIS 10K	ANSI Class 150	DIN PN10	JIS 20K	ANSI Class 300	DIN PN16	DIN PN40	JIS F12 (JIS 75M)	JPI Class 150	AS Table D	AS Table E			
	2.5 (0.1) (with 10 mm flanges)	5.7 to 6.6 {58.12 to 67.3} [50.45 to 58.41]	5.7 to 6.6 {58.12 to 67.3} [50.45 to 58.41]	—	5.7 to 6.6 {58.12 to 67.3} [50.45 to 58.41]	5.7 to 6.6 {58.12 to 67.3} [50.45 to 58.41]	—	5.7 to 6.6 {58.12 to 67.3} [50.45 to 58.41]	—	—	—	—		
2.5 (0.1) (with 15 mm flanges)	6.9 to 7.9 {70.36 to 80.56} [61.07 to 69.92]	6.9 to 7.9 {70.36 to 80.56} [61.07 to 69.92]	—	7.0 to 8.1 {71.38 to 82.6} [61.95 to 71.69]	7.0 to 8.1 {71.38 to 82.6} [61.95 to 71.69]	—	7.0 to 8.1 {71.38 to 82.6} [61.95 to 71.69]	—	7.6 to 7.8 {77.9 to 79.9} [67.6 to 69.3]	—	—			
5 (0.2) (with 10 mm flanges)	5.7 to 6.6 {58.12 to 67.3} [50.45 to 58.41]	5.7 to 6.6 {58.12 to 67.3} [50.45 to 58.41]	—	5.7 to 6.6 {58.12 to 67.3} [50.45 to 58.41]	5.7 to 6.6 {58.12 to 67.3} [50.45 to 58.41]	—	5.7 to 6.6 {58.12 to 67.3} [50.45 to 58.41]	—	—	—	—			
5 (0.2) (with 15 mm flanges)	6.9 to 7.9 {70.36 to 80.56} [61.07 to 69.92]	6.9 to 7.9 {70.36 to 80.56} [61.07 to 69.92]	—	7.0 to 8.1 {71.38 to 82.6} [61.95 to 71.69]	7.0 to 8.1 {71.38 to 82.6} [61.95 to 71.69]	—	7.0 to 8.1 {71.38 to 82.6} [61.95 to 71.69]	—	7.6 to 7.8 {77.9 to 79.9} [67.6 to 69.3]	—	—			
10 (0.4) (with 10 mm flanges)	5.7 to 6.6 {58.12 to 67.3} [50.45 to 58.41]	5.7 to 6.6 {58.12 to 67.3} [50.45 to 58.41]	—	5.7 to 6.6 {58.12 to 67.3} [50.45 to 58.41]	5.7 to 6.6 {58.12 to 67.3} [50.45 to 58.41]	—	5.7 to 6.6 {58.12 to 67.3} [50.45 to 58.41]	—	—	—	—			
10 (0.4) (with 15 mm flanges)	6.9 to 7.9 {70.36 to 80.56} [61.07 to 69.92]	6.9 to 7.9 {70.36 to 80.56} [61.07 to 69.92]	—	7.0 to 8.1 {71.38 to 82.6} [61.95 to 71.69]	7.0 to 8.1 {71.38 to 82.6} [61.95 to 71.69]	—	7.0 to 8.1 {71.38 to 82.6} [61.95 to 71.69]	—	7.6 to 7.8 {77.9 to 79.9} [67.6 to 69.3]	—	—			
15 (0.5)	6.9 to 7.9 {70.36 to 80.56} [61.07 to 69.92]	6.9 to 7.9 {70.36 to 80.56} [61.07 to 69.92]	—	7.0 to 8.1 {71.38 to 82.6} [61.95 to 71.69]	7.0 to 8.1 {71.38 to 82.6} [61.95 to 71.69]	—	7.0 to 8.1 {71.38 to 82.6} [61.95 to 71.69]	—	7.6 to 7.8 {77.9 to 79.9} [67.6 to 69.3]	—	—			
25 (1.0)	19.6 to 22.5 {199.9 to 229.4} [173.5 to 199.1]	19.6 to 22.5 {199.9 to 229.4} [173.5 to 199.1]	—	19.7 to 22.7 {200.9 to 231.5} [174.4 to 200.9]	19.7 to 22.7 {200.9 to 231.5} [174.4 to 200.9]	—	17.5 to 20.1 {178.5 to 205.0} [154.9 to 177.9]	—	16.4 to 16.8 {167.3 to 171.7} [145.1 to 148.9]	—	—			
32 (1.25)	21.5 to 24.7 {219.2 to 251.9} [190.3 to 218.6]	21.5 to 24.7 {219.2 to 251.9} [190.3 to 218.6]	—	21.6 to 24.8 {220.3 to 252.9} [191.2 to 219.5]	21.6 to 24.8 {220.3 to 252.9} [191.2 to 219.5]	—	22.1 to 25.4 {225.4 to 259.0} [195.6 to 224.8]	—	—	—	—			
40 (1.5)	32.5 to 37.4 {331.4 to 381.4} [287.6 to 331.0]	32.5 to 37.4 {331.4 to 381.4} [287.6 to 331.0]	—	32.8 to 37.7 {334.5 to 384.4} [290.3 to 333.7]	32.8 to 37.7 {334.5 to 384.4} [290.3 to 333.7]	—	33.8 to 38.9 {344.7 to 396.7} [299.2 to 344.3]	—	27.2 to 27.9 {277.2 to 284.8} [240.4 to 247.0]	—	—			
50 (2.0)	41.3 to 47.5 {421.1 to 484.4} [365.5 to 420.4]	41.3 to 47.5 {421.1 to 484.4} [365.5 to 420.4]	—	20.6 to 23.7 {210.1 to 241.7} [182.3 to 209.8]	20.6 to 23.7 {210.1 to 241.7} [182.3 to 209.8]	—	42.2 to 48.5 {430.3 to 494.6} [373.5 to 429.3]	—	41.2 to 43.6 {420.2 to 445.3} [364.5 to 386.2]	39.1 to 41.4 {398.7 to 422.7}	39.5 to 41.9 {403.4 to 427.5}			
65 (2.5)	61.2 to 70.4 {624.1 to 717.9} [541.6 to 623.1]	61.2 to 70.4 {624.1 to 717.9} [541.6 to 623.1]	—	14.3 to 21.0 {145.8 to 214.1} [126.6 to 185.9]	14.3 to 21.0 {145.8 to 214.1} [126.6 to 185.9]	—	30.5 to 35.1 {311.0 to 357.9} [269.9 to 310.6]	—	—	—	—			
80 (3.0)	34.2 to 39.3 {348.7 to 400.7} [302.7 to 347.8]	77.6 to 78.8 {791.3 to 803.5} [686.8 to 697.4]	—	38.5 to 44.3 {392.6 to 451.7} [340.7 to 392.1]	38.5 to 44.3 {392.6 to 451.7} [340.7 to 392.1]	—	38.5 to 44.3 {392.6 to 451.7} [340.7 to 392.1]	—	68.1 to 78.3 {694.4 to 798.4} [602.7 to 693.0]	69.1 to 73.2 {704.9 to 746.8}	65.6 to 69.5 {669.3 to 709.4}	66.9 to 70.8 {682.6 to 722.9}		
100 (4.0)	45.2 to 52.0 {460.9 to 530.3} [400.0 to 460.2]	45.2 to 52.0 {460.9 to 530.3} [400.0 to 460.2]	—	51.0 to 58.7 {520.1 to 598.6} [451.4 to 519.5]	51.0 to 58.7 {520.1 to 598.6} [451.4 to 519.5]	—	51.0 to 58.7 {520.1 to 598.6} [451.4 to 519.5]	—	89.6 to 103.0 {913.7 to 1050}	44.9 to 47.5 {457.9 to 484.9}	86.1 to 91.2 {878.3 to 930.7}	43.5 to 46.1 {444.1 to 470.3}		
125 (5.0)	66.8 to 76.8 {681.2 to 783.1} [591.2 to 679.7]	66.8 to 76.8 {681.2 to 783.1} [591.2 to 679.7]	—	70.8 to 81.4 {722.0 to 830.1} [626.6 to 720.4]	70.8 to 81.4 {722.0 to 830.1} [626.6 to 720.4]	—	70.8 to 81.4 {722.0 to 830.1} [626.6 to 720.4]	—	70.7 to 81.3 {720.9 to 829.0}	—	—	—		
150 (6.0)	93.9 to 108.8 {957.5 to 1109}	93.9 to 108.8 {957.5 to 1109}	—	65.4 to 75.2 {666.9 to 766.8}	65.4 to 75.2 {666.9 to 766.8}	—	97.3 to 118.0 {992.2 to 1203}	—	98.8 to 113.6 {1007 to 1158}	88.6 to 89.7 {904.5 to 915.2}	69.4 to 73.5 {708.2 to 750.3}	88.2 to 90.2 {900.5 to 920.0}		
200 (8.0)	85.8 to 98.7 {874.9 to 1006}	145.4 to 147.9 {1483 to 1508}	145.4 to 147.9 {1483 to 1508}	91.5 to 105.2 {933.0 to 1073}	91.5 to 105.2 {933.0 to 1073}	—	91.5 to 105.2 {933.0 to 1073}	—	101.8 to 117.1 {1038 to 1194}	123.1 to 124.6 {1256 to 1272}	96.0 to 101.7 {980.0 to 1038}	124.0 to 126.5 {1265 to 1291}		
250 (10)	207.8 to 239.0 {2119 to 2437}	207.8 to 239.0 {2119 to 2437}	207.8 to 239.0 {2119 to 2437}	222.9 to 256.3 {2273 to 2614}	181.4 to 212.2 {1850 to 2164}	—	222.9 to 256.3 {2273 to 2614}	—	277.9 to 319.6 {2834 to 3259}	207.1 to 211.3 {2113 to 2156}	237.1 to 241.9 {2419 to 2468}	164.3 to 167.7 {1677 to 1711}		
300 (12)	171.0 to 196.7 {1744 to 2006}	233.7 to 283.0 {2383 to 2886}	233.7 to 283.0 {2383 to 2886}	130.7 to 144.8 {1333 to 1477}	161.8 to 180.0 {1650 to 1835}	—	184.1 to 211.7 {1877 to 2159}	—	243.8 to 280.4 {2486 to 2859}	228.7 to 233.4 {2334 to 2382}	170.9 to 174.5 {1744 to 1780}	214.4 to 215.3 {2188 to 2197}		
350 (14)	234.7 to 269.9 {2393 to 2752}	365.4 to 418.0 {3726 to 4262}	234.7 to 269.9 {2393 to 2752}	—	—	—	—	—	350.6 to 403.2 {3575 to 4112}	351.4 to 354.4 {3586 to 3617}	299.8 to 302.2 {3059 to 3084}	—		
400 (16)	320.0 to 368.0 {3263 to 3753}	320.0 to 368.0 {3263 to 3753}	320.0 to 368.0 {3263 to 3753}	—	—	—	—	—	448.3 to 515.5 {4571 to 5257}	336.6 to 339.5 {3435 to 3465}	390.0 to 393.2 {3980 to 4012}	—		

3.3.5 Gaskets size

Be sure to choose a gasket with an inner and outer diameter that does not protrude inside the piping.
If the inner diameter of the gasket is too large, or outer diameter of the gasket is too small, fluid leakage may result.

Table 3.3.16 Inner Diameter of Grounding Ring, Outer Diameter for Effective Sealing and Recommended Inner Diameter of Gasket

AXF Standard: Unit : mm (approx. inch)

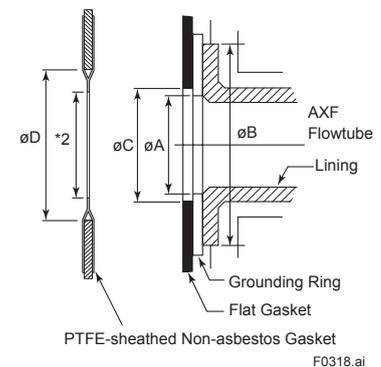
Size	PFA/ Polyurethane Rubber/ Natural Soft Rubber/ EPDM Rubber								Ceramics			
	Wafer				Flange				Inner Diameter of Grounding Ring [øA]	Outer Diameter for Effective Sealing [øB]	Recommended Inner Diameter of Gasket	
	Inner Diameter of Grounding Ring [øA]	Outer Diameter for Effective Sealing [øB]	Recommended Inner Diameter of Gasket		Inner Diameter of Grounding Ring [øA]	Outer Diameter for Effective Sealing [øB]	Recommended Inner Diameter of Gasket				Flat Gasket [øC]	PTFE-sheathed Non-asbestos Gasket [øD]
			Flat Gasket [øC]	PTFE-sheathed Non-asbestos Gasket [øD]			Flat Gasket [øC]	PTFE-sheathed Non-asbestos Gasket [øD]				
2.5 (0.1)	15 (0.59)	38 (1.50)	17 (0.67)	22 (0.87)	15 (0.59) [12 (0.47)] *1	30 (1.18)	17 (0.67) [15 (0.59)]*1	22 (0.87) [19 (0.75)]*1	-	-	-	
5 (0.2)	15 (0.59)	38 (1.50)	17 (0.67)	22 (0.87)	15 (0.59) [12 (0.47)] *1	30 (1.18)	17 (0.67) [15 (0.59)]*1	22 (0.87) [19 (0.75)]*1	-	-	-	
10 (0.4)	15 (0.59)	38 (1.50)	17 (0.67)	22 (0.87)	15 (0.59) [12 (0.47)] *1	30 (1.18)	17 (0.67) [15 (0.59)]*1	22 (0.87) [19 (0.75)]*1	-	-	-	
15 (0.5)	15 (0.59)	38 (1.50)	22 (0.87)		15 (0.59)	34 (1.34)	22 (0.87)		15 (0.59)	33 (1.30)	22 (0.87)	
25 (1.0)	28 (1.10)	53 (2.09)	35 (1.38)		28 (1.10)	53 (2.09)	35 (1.38)		27 (1.06)	50 (1.97)	35 (1.38)	
32 (1.25)	34 (1.34)	58 (2.28)	43 (1.69)		34 (1.34)	58 (2.28)	43 (1.69)		-	-	-	
40 (1.5)	41 (1.61)	71 (2.80)	49 (1.93)		41 (1.61)	71 (2.80)	49 (1.93)		40 (1.57)	68 (2.68)	49 (1.93)	
50 (2.0)	53 (2.09)	84 (3.31)	61 (2.40)		53 (2.09)	84 (3.31)	61 (2.40)		52 (2.05)	82 (3.23)	61 (2.40)	
65 (2.5)	66 (2.60)	103 (4.06)	84 (3.31)		66 (2.60)	103 (4.06)	84 (3.31)		-	-	-	
80 (3.0)	77 (3.03)	114 (4.49)	90 (3.54)		77 (3.03)	114 (4.49)	90 (3.54)		81 (3.19)	112 (4.41)	90 (3.54)	
100 (4.0)	102 (4.02)	140 (5.51)	115 (4.53)		102 (4.02)	140 (5.51)	115 (4.53)		98 (3.86)	134 (5.28)	115 (4.53)	
125 (5.0)	128 (5.04)	165 (6.50)	141 (5.55)		128 (5.04)	165 (6.50)	141 (5.55)		-	-	-	
150 (6.0)	146.1 (5.75)	190 (7.48)	167 (6.57)		146.1 (5.75)	190 (7.48)	167 (6.57)		144 (5.67)	188 (7.40)	167 (6.57)	
200 (8.0)	193.6 (7.62)	240 (9.45)	218 (8.58)		193.6 (7.62)	240 (9.45)	218 (8.58)		192 (7.56)	240 (9.45)	218 (8.58)	
250 (10)	243.7 (9.59)	300 (11.81)	270 (10.63)		243 (9.57)	315 (12.40)	270 (10.63)		-	-	-	
300 (12)	294.7 (11.60)	348 (13.70)	321 (12.64)		291.3 (11.47)	360 (14.17)	321 (12.64)		-	-	-	
350 (14)	-	-	-		323.4 (12.73)	405 (15.94)	359 (14.13)		-	-	-	
400 (16)	-	-	-		373.5 (14.70)	465 (18.31)	410 (16.14)		-	-	-	

*1: The inner diameter of the process connection code: DD4, DJ1, DJ2 is values in brackets [].

Replacement Model for earlier ADMAG or ADMAG AE: Unit : mm (approx. inch)

Size	PFA/ Polyurethane Rubber							
	Wafer				Flange			
	Inner Diameter of Grounding Ring [øA]	Outer Diameter for Effective Sealing [øB]	Recommended Inner Diameter of Gasket		Inner Diameter of Grounding Ring [øA]	Outer Diameter for Effective Sealing [øB]	Recommended Inner Diameter of Gasket	
			Flat Gasket [øC]	PTFE-sheathed Non-asbestos Gasket [øD]			Flat Gasket [øC]	PTFE-sheathed Non-asbestos Gasket [øD]
2.5 (0.1)	15 (0.59)	38 (1.50)	17 (0.67)	22 (0.87)	-	-	-	-
5 (0.2)	15 (0.59)	38 (1.50)	17 (0.67)	22 (0.87)	-	-	-	-
10 (0.4)	15 (0.59)	38 (1.50)	17 (0.67)	22 (0.87)	-	-	-	-
15 (0.5)	15 (0.59)	38 (1.50)	22 (0.87)		-	-	-	-
25 (1.0)	27 (1.06)	56 (2.20)	35 (1.38)		-	-	-	-
40 (1.5)	40 (1.57)	71 (2.80)	49 (1.93)		-	-	-	-
50 (2.0)	52 (2.05)	85 (3.35)	61 (2.40)		-	-	-	-
80 (3.0)	81 (3.19)	115 (4.53)	90 (3.54)		-	-	-	-
100 (4.0)	98 (3.86)	144 (5.67)	115 (4.53)		-	-	-	-
150 (6.0)	140.7(5.54)	190 (7.48)	167 (6.57)		140.7 (5.54)	205 (8.07)	167 (6.57)	
200 (8.0)	188.9(7.44)	240 (9.45)	218 (8.58)		188.9 (7.44)	255 (10.04)	218 (8.58)	
250 (10)	-	-	-		243 (9.57)	315 (12.40)	270 (10.63)	

Size of Inner Diameter of Grounding Ring, Outer Diameter for Effective Sealing and Recommended Inner Diameter of Gasket:



*2: Be careful not to be small compared to inner diameter of grounding ring (øA).

3.3.6 Nomial Diameter 15 mm (0.5 in.) to 125 mm (5.0 in.), Sanitary Type

The sanitary type can be mounted to the piping using a clamp, a union, or a welded joint.

 **NOTE**

This section describes the remote flowtube as an example. The same procedure also applies to the integral flowmeter.

Sanitary adapters are engraved with character as identification.

Table 3.3.17 Sanitary Adapter Identification

Identification Character	Material for Adapter
No mark	SUS304
F	SUSF304
L	SUS316L
FL	SUSF316L

(1) Mounting Direction

Mount the flowmeter so that the flow direction of the fluid to be measured is in line with the direction of the arrow mark on the flowmeter.

 **IMPORTANT**

If it is impossible to match the direction of the arrow mark, the direction of the electrical connection can be changed. Refer to the applicable user's manuals which can be downloaded from our website.

In case the fluid being measured flows against the arrow direction, change the value from "Forward" to "Reverse" at the parameter [J20: Flow Direction] (refer to Chapter 8).

(2) Mounting Procedure

(a) Clamp type

(process connection codes: HAB, HDB, and HKB)

1) Welding ferrule

Weld a ferrule to the piping.

 **IMPORTANT**

When welding the ferrule, pay attention to the edge preparation, level differences between the ferrule and the piping, and the welding current to avoid deforming the piping or causing stagnation portion of the fluid.

2) Installing gasket

Install a gasket for clamp to fit in the groove on the ferrule.

3) Positioning flowmeter

Position the flowmeter between the two ferrules.

4) Tightening clamp

Install a clamp to cover the tapered parts of the flowmeter-side adapter and the ferrule, and tighten the clamp screw.

5) Confirmation of adapter mounting screw

After installation of the magnetic flowmeter, be sure to retighten the adapter mounting screw according to Table 3.3.18 or Table 3.3.19.

Be sure to confirm that leakage from adapter connection point does not occur by filling the pipe of the flowtube with fluid.

 **NOTE**

The ferrule, clamp, and gasket are not provided with the flowmeter, and must be provided by the user.

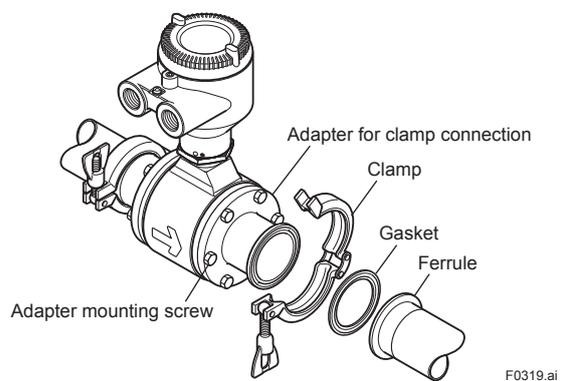


Figure 3.3.6 Mounting Procedure for Clamp Connection Type

(b) Union type

(process connection codes: JDB, JKB, and JSB)

1) Welding sleeve

Pass the piping through a nut and then weld a sleeve to the piping.

 **IMPORTANT**

- Be sure to weld the sleeve after passing the piping through the nut.
- When welding the sleeve, pay attention to the edge preparation, level differences between the sleeve and the piping, and the welding current to avoid deforming the piping or causing stagnation of some of the fluid.

2) Installing gasket

Install a gasket for union to fit in the groove on the sleeve.

3) Positioning flowmeter

Move the nut closer to the piping temporarily and position the flowmeter between the two sleeves.

4) Tightening nut

Install the nut to cover the tapered parts of the flowmeter-side adapter and the sleeve, and tighten it using a wrench.

5) Confirmation of adapter mounting screw

After installation of the magnetic flowmeter, be sure to retighten the adapter mounting screw according to Table 3.3.18 or Table 3.3.19. Be sure to confirm that leakage from adapter connection point does not occur by filling the pipe of the flowtube with fluid.



NOTE

The sleeve, nut, and gasket are not provided with the flowmeter, and must be provided by the user.

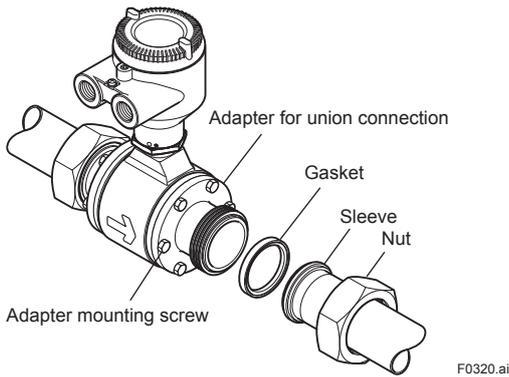


Figure 3.3.7 Mounting Procedure for Union Connection Type

(c) Butt weld adapter type

(process connection codes: KDB and KKB)

1) Removing adapter

Remove the butt weld adapter by loosening the mounting screws.

2) Welding ferrule or sleeve

Weld a ferrule, a sleeve, or an alternative (provided by the user) to the butt weld adapter.



IMPORTANT

- Be sure to weld the ferrule, the sleeve, or the alternative after removing the butt weld adapter from the flowmeter itself.
- When welding the ferrule, the sleeve, or the alternative, pay attention to the edge preparation, level differences between them and the piping, and the welding current to avoid deforming the piping or causing stagnation portion of the fluid.

3) Installing butt weld adapter

Install a gasket to fit in the groove of the butt weld adapter, and tighten the mounting screws.



CAUTION

- In case of standard gasket (EPDM rubber), tighten the adapter mounting screw according to the torque values in Table 3.3.18.
- In case that optional code GH (Silicon rubber) is selected, tighten the adapter mounting screw according to the torque values in Table 3.3.19.
- Tighten the adapter mounting screw in diagonal order step by step.
- After tightening of screw, confirm that gaskets protrude inside adapter. Protruding of gasket is necessary to keep the sanitary requirements.

Table 3.3.18 Tightening Torque Values of adapter for EPDM rubber gasket

Tightening torque values (N-m / {kgf-cm} / [in-lbf])		
Size mm (inch)	Gasket type	EPDM rubber (standard)
15 (0.5), 25 (1.0), 32 (1.25), 40 (1.5)		3.0 to 3.5 / {30.59 to 35.69} / [26.55 to 30.98]
50 (2.0), 65 (2.5)		4.5 to 5.0 / {45.89 to 50.99} / [39.83 to 44.25]
80 (3.0)		8.0 to 9.0 / {81.58 to 91.78} / [70.81 to 79.65]
100 (4.0), 125 (5.0)		10 to 11 / {102.0 to 112.2} / [88.50 to 97.35]

Table 3.3.19 Tightening Torque Values of adapter for silicon rubber gasket

Tightening torque values (N-m / {kgf-cm} / [in-lbf])		
Size mm (inch)	Gasket type	Silicon rubber (optional code GH)
15 (0.5), 25 (1.0), 32 (1.25), 40 (1.5)		2.0 to 2.5 / {20.39 to 25.49} / [17.70 to 22.13]
50 (2.0), 65 (2.5), 80 (3.0)		4.0 to 4.5 / {40.79 to 45.89} / [35.40 to 39.83]
100 (4.0), 125 (5.0)		6.0 to 6.5 / {61.18 to 66.28} / [53.10 to 57.53]

4) Mounting flowmeter to piping

Connect the flowmeter to the piping in a manner appropriate to the ferrule, the sleeve, or the alternative that has been welded to the adapter.

5) Confirmation of adapter mounting screw

After installation of the magnetic flowmeter, be sure to retighten the adapter mounting screw according to Table 3.3.18 or Table 3.3.19. Be sure to confirm that leakage from adapter connection point does not occur by filling the pipe of the flowtube with fluid

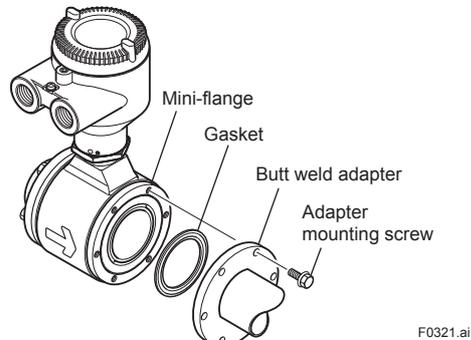


Figure 3.3.8 Mounting Procedure for Weld Joint Adapter Type

3.4 Installation of Remote Converter

WARNING

Installation of the magnetic flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to installation.

3.4.1 Installation Location

IMPORTANT

Install the instrument in a location where it is not exposed to direct sunlight. For ambient temperature, refer to "OUTLINE" of the appropriate manual which can be downloaded from our website. The instrument may be used in an ambient humidity where the RH ranges from 0 to 100%. However, avoid long-term continuous operation at relative humidity above 95%.

3.4.2 Mounting of AXFA14

AXFA14 Remote Converter can be mounted on a 2-inch pipe in a vertical or horizontal position depending on the installation site.

1. Fix the instrument on the mounting fixture using four screws.
2. Fix the mounting fixture with the instrument installed on a 2-inch pipe using a U-bolt.

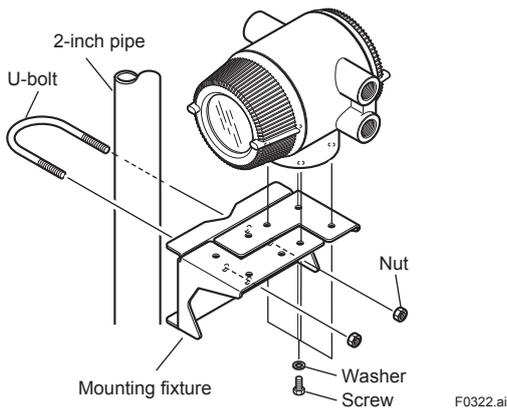


Figure 3.4.1 2-inch Pipe Vertical Mounting

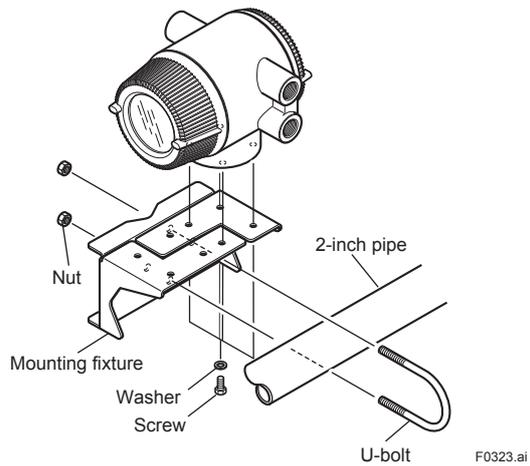


Figure 3.4.2 2-inch Pipe Horizontal Mounting

3.4.3 Mounting of AXFA11

AXFA11 Remote Converter can be mounted using surface mounting, 2-inch pipe mounting, or panel mounting.

● Surface Mounting (Wall Mounting)

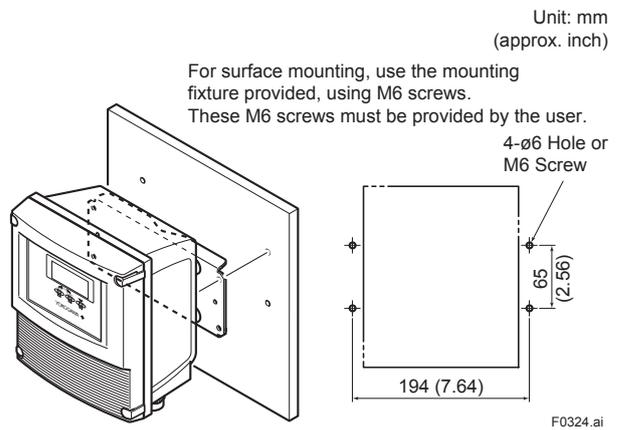
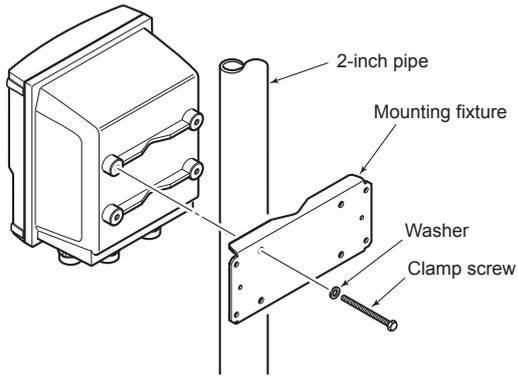


Figure 3.4.3 Surface Mounting

IMPORTANT

Mounting fixture on equipment intended to be mounted on a wall or ceiling shall withstand a force of four times the weight of the equipment (AXFA11: 3.3kg (7.3 lb)).

● 2-inch Pipe Mounting

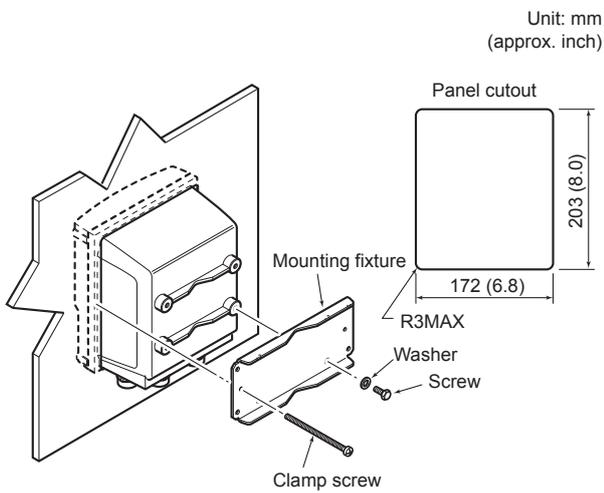


Pass the four clamp screws through the mounting fixture, position it on the 2-inch pipe, and then fasten the AXFA11 in place.

F0325.ai

Figure 3.4.4 2-inch Pipe Mounting

● Panel Mounting



Fit the AXFA11 into the panel. Then attach the mounting fixture to the AXFA11 using the screw and the washer, and secure the instrument with the two clamp screws.

F0326.ai

Figure 3.4.5 Panel Mounting

4. Wiring

4.1 Wiring the Integral Flowmeter

This section describes the wiring of the integral flowmeter.



WARNING

The wiring of the magnetic flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to wiring.



CAUTION

Once all wiring is complete, check the connections before applying power to the instrument. Improper arrangements or wiring may cause a unit malfunction or damage.

4.1.1 Wiring Precautions

Be sure to observe the following precautions when wiring:



CAUTION

- In cases where the ambient temperature exceeds 50°C (122°F), use external heatresistant wiring with a maximum allowable temperature of 70°C (158°F) or above.
- Do not connect cables outdoors in wet weather in order to prevent damage from condensation and to protect the insulation, e.g. inside the terminal box of the flowmeter.
- All the cable ends must be provided with round crimp-on terminals and be securely wired.
- The signal cables must be routed in separate steel conduit tubes 16 (JIS C 8305) or flexible conduit tubes 15 (JIS C 8309).
- Always route the power and output signal cables in separate steel conduit tubes, except when the power supply voltage is 24 V and four-core cables are used for wiring. Keep conduits or flexible tubes watertight using sealing tape.
- When waterproof glands or union equipped waterproof glands are used, avoid tightening the glands with an excessive torque.
- When the power supply voltage is 24V, it comes with a blanking plug. Use this plug to cover the unused wiring port when wiring the instrument with only one, four-core cable.
- Be sure to turn the power off before opening the terminal box cover.
- Before turning the power on, tighten the terminal box cover securely.
- The terminal box cover is locked by the special screw. In case of opening the terminal box cover, use the hexagonal wrench attached. For handling the locking screw, refer to Figure 4.1.5.
- Be sure to lock the cover by the special screw using the hexagonal wrench attached after installing the cover. For handling the locking screw, refer to Figure 4.1.16.
- Explosion protected types must be wired in accordance with specific requirement (and, in certain countries, legal regulations) in order to preserve the effectiveness of their explosion protected features.

4.1.2 Power Cable/Output Cable

JIS C 3401 control cable equivalent
 JIS C 3312 power cable equivalent
 14 AWG Belden 8720 equivalent
 Outer Diameter:

- With no gland option:
6.5 to 12 mm (0.26 to 0.47 in.)
- With gland options EG, EU:
10.5 or 11.5 mm (0.41 to 0.45 in.)
- With gland options EP:
6 to 12 mm (0.24 to 0.47 in.)

Nominal Cross Section:
 Single wire; 0.5 to 2.5 mm²
 Stranded wire; 0.5 to 1.5 mm²

In case of power cable, Green/Yellow covered conductor shall be used only for connection to PROTECTIVE CONDUCTOR TERMINALS. Conform to IEC227, IEC245 or equivalent national authorization.

 **NOTE**

- For power cables, always use a crimp terminal with an insulation cover.
- Use crimp tools from the manufacturer of the crimp terminal you want to use to connect the crimp terminal and cable.
- Use crimp tools that are appropriate for the diameter of the cable to be connected.

4.1.3 Wiring Ports for Integral Flowmeter

This instrument is of watertight construction as stipulated in JIS C 0920. It is shipped with a wiring bracket (waterproof gland or waterproof gland with union) or a plastic gland attached, only in cases where an optional specification is selected for the wiring port. In case of the explosion proof type, refer to Chapter 10.

 **IMPORTANT**

The wiring port is sealed with a cap (not waterproof). Do not remove the cap from the unused wiring port. If waterproof property is necessary, apply a blanking plug to the unused wiring port. The blanking plug may not be attached depending on the specification. If it is necessary, contact YOKOGAWA.

(1) When waterproof property is unnecessary (When there are no particular optional specifications)

The wiring port is sealed with a cap (not water-proof) that must be removed before wiring. At this time, handle the wiring port in accordance with the JIS C 0920 mentioned above. Do not remove the cap from the unused wiring port.

(2) When waterproof property is necessary (Wiring using waterproof glands)

 **IMPORTANT**

To prevent water or condensation from entering the converter housing, waterproof glands are recommended. Do not over-tighten the glands or damage to the cables may result. Tightness of the gland can be checked by confirming that the cable is held firmly in place.

For working on the electric wire tubes or the flexible tubes (G1/2), remove the waterproof gland and attach them directly to the wiring port.

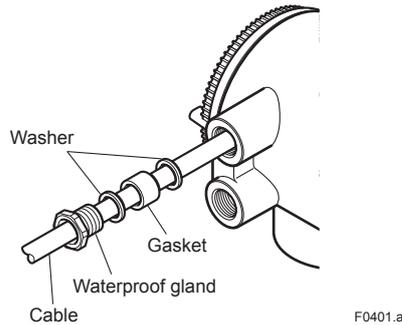


Figure 4.1.1 Waterproof Gland (Optional code EG)

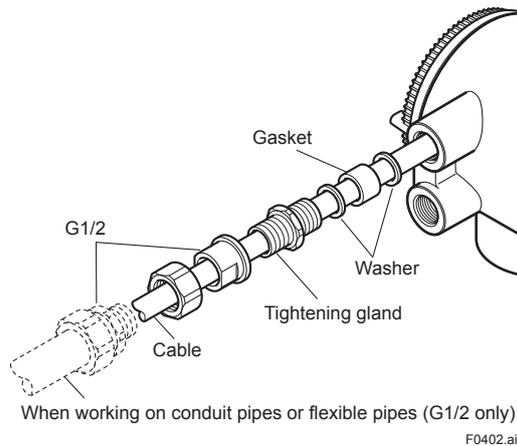


Figure 4.1.2 Waterproof Gland with Union Joint (Optional code EU)

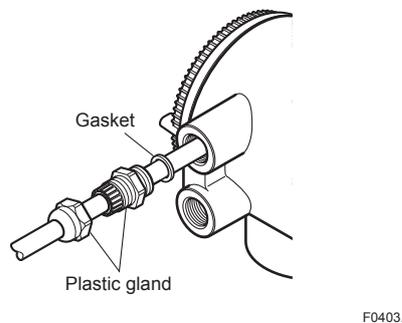


Figure 4.1.3 Plastic Gland (Optional code EP)

(3) Conduit Wiring

When wiring the conduits, pass the conduit through the wiring connection port, and utilize the waterproof gland to prevent water from flowing in. Place the conduit pipe on an angle as shown in Figure 4.1.4. Install a drain valve at the low end of the vertical pipe, and open the valve regularly.

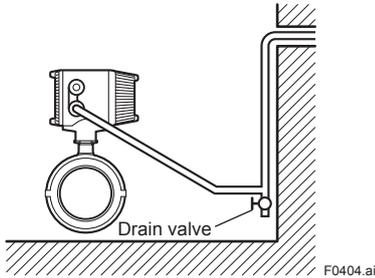


Figure 4.1.4 Conduit Wiring

4.1.4 Wiring Connections for Integral Flowmeter

(1) Removing Cover

Loosen cover locking screw 2 clockwise using a hexagonal wrench (nominal size 3) to unlock the cover. (Upon shipment from the manufacturing plant, the cover is unlocked.) Hold the flowmeter with your hand and remove the cover by turning it in the direction of the arrow as shown below.

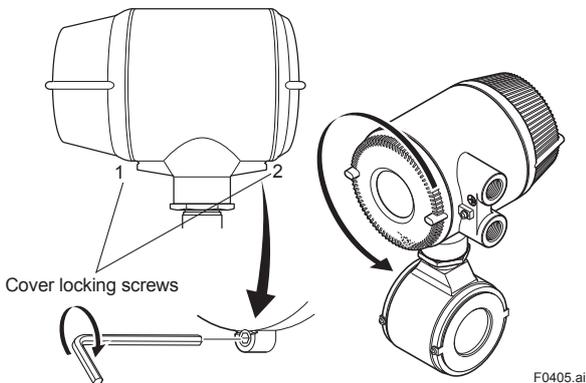


Figure 4.1.5 Removing the Terminal Box Cover for Integral Flowmeter

(2) Terminal Configuration

When the cover is removed, the connection terminals will be visible.

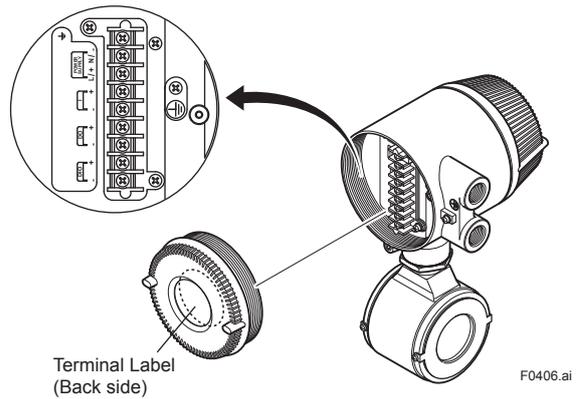


Figure 4.1.6 Terminal Configuration for Integral Flowmeter

The description of the terminal symbols is shown in Table 4.1.1.

For FOUNDATION fieldbus protocol, refer to IM 01E20F02-01E.

For PROFIBUS PA protocol, refer to IM 01E20F12-01E.

Table 4.1.1 Terminal Symbols for Integral Flowmeter

Terminal Symbols	Description
	Functional grounding
N/- L/+	Power supply
I+ I-	
DO+ DO-	Pulse output/Alarm output/ Status output
DIO+ DIO-	
	Protective grounding (Outside of the terminal)

(3) Precautions for Wiring of Power Supply Cables

When connecting to the power supply, observe the points below. Failure to comply with these warnings may result in an electric shock or damage to the instrument.



- Ensure that the power supply is OFF in order to prevent electric shocks.
- Ensure the protective grounding terminal is grounded before turning the power on.
- Use insulating sleeve crimp terminals (for 4-mm screws) for the power supply wiring and protective grounding wiring.
- Install an external switch or circuit breaker as a means to turn the power off (capacitance; 15A, conforming to IEC60947-1 and IEC60947-3). Locate this switch either near the instrument or in other places facilitating easy operation. Affix a "Power Off Equipment" label to this external switch or circuit breaker.

Wiring Procedure for Integral Flowmeter

1. Turn the instrument's power off.
2. Wire the power supply cable and the functional grounding cable to the power supply terminals.

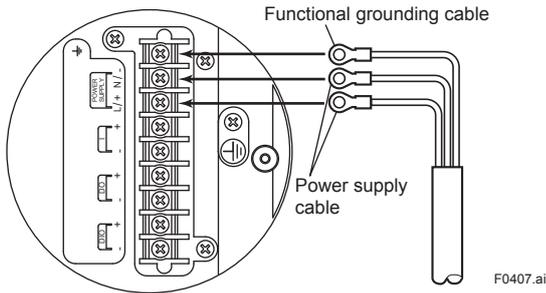


Figure 4.1.7 Electric Cable Wiring for Integral Flowmeter

(4) DC Power Connection

When using DC power as the power supply for the converter, give attention to the following points.

1) Connecting Power Supply



IMPORTANT

Do not connect power supply with reversed polarities.
 L/+ terminal: connect +
 N/- terminal: connect -



IMPORTANT

Do not connect power supply with 100 to 240 V AC or 100 to 120 V DC in the case of a 24 V power supply version (power supply code 2). It will give a damage to the converter.

2) Required Power Supply Voltages



IMPORTANT

When using a 24 V power supply, the specification for the supply voltage is 24 V (-15% to +20%), but the input voltage of the converter drops due to cable resistance therefore it must be used within the following ranges.

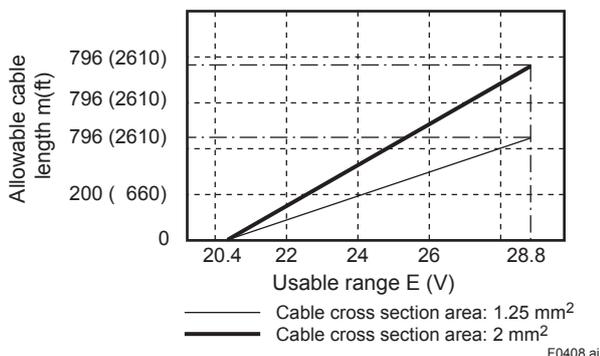


Figure 4.1.8 Supply Voltage and Cable Length for Integral Flowmeter

3) Setting Power Supply Frequency



IMPORTANT

Set the local commercial power frequency in order to eliminate the effect of induction noise from the power supply.

Refer to "Parameter Description" in the user's manual of the AXF Integral Flowmeter [Software Edition] (IM 01E20C02-01E).

Parameter No.: **J30** and **J31**

(5) Grounding



CAUTION

Be sure to connect the protective grounding of the AXF integral flowmeter with a cable of 2mm² or larger cross section in order to avoid electrical shock to the operators and maintenance engineers and to prevent the influence of external noise.

Connect the grounding wire to the ⊕ mark.

The grounding should satisfy Class D requirements (grounding resistance, 100 Ω or less).

In case of TIIS Flameproof type, the grounding should satisfy Class C requirements (grounding resistance, 10 Ω or less) or class A requirements (grounding resistance, 10 Ω or less).

For explosion proof type except TIIS, follow the domestic electrical requirements as regulated in each country.



IMPORTANT

When optional code A (lightning protector) is selected, the ground should satisfy Class C requirements (grounding resistance, 10 Ω or less).

- The protective grounding terminals ⊕ are located on the inside and outside of the terminal area. Either terminal may be used.
- Use 600 V vinyl insulation wires as the grounding wires.

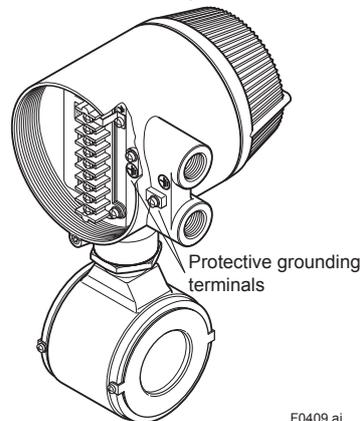


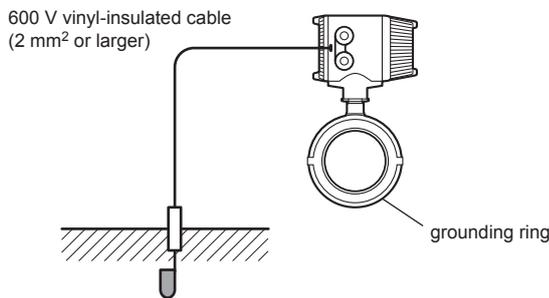
Figure 4.1.9 Protective Grounding Terminal Location for Integral Flowmeter



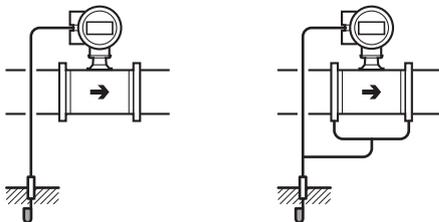
IMPORTANT

Improper grounding can have an adverse effect on the flow measurement. Ensure that the instrument is properly grounded.

The electromotive force of the magnetic flowmeter is minute and it is easily affected by noise, and the reference electric potential is the same as that of the measuring fluid. Therefore, the reference electric potential (terminal potential) of the flowtube and converter also need to be the same as that of the measuring fluid. Moreover, the potential must be the same as the ground. The magnetic flowmeter is equipped with a grounding ring that makes a connection with the charge of the measured fluid for grounding and protects the lining. Be sure to ground the flowmeter according to Figure 4.1.10.



- Class D requirements (grounding resistance, 100 Ω or less).
Optional code A (lightning protector): Class C requirements (grounding resistance, 10 Ω or less).
- TIIS Flameproof type: Class C requirements (grounding resistance, 10 Ω or less) or class A requirements (grounding resistance, 10 Ω or less).
- Explosion proof type except TIIS: Domestic electrical requirements as regulated in each country.



In case grounding rings are used. In case grounding rings are not used. (Available only for metal piping)

Figure 4.1.10 Grounding for Integral Flowmeter

(6) Connecting to External Instruments



WARNING

Before wiring with external instruments, be sure to turn off the magnetic flowmeter and any external instruments.

Connect the AXF integral flowmeter terminal to external instruments, giving attention to the following points. For FOUNDATION fieldbus protocol, refer to IM 01E20F02-01E. For PROFIBUS PA protocol, refer to IM 01E20F12-01E.

● 4 to 20 mA DC Current Output

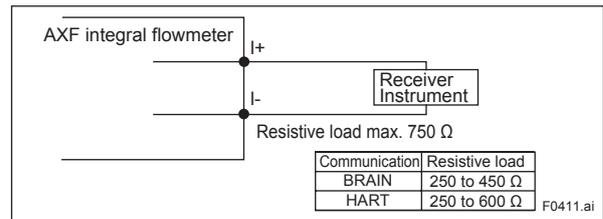


Figure 4.1.11 4 to 20 mA DC Output Connection

● Pulse Output



IMPORTANT

- As this is a transistor contact (insulated type), give attention to proper voltage and polarity when wiring.
- Do not apply a voltage larger than 30V DC or a current larger than 0.2A in order to prevent damage to the instrument.
- When input filter constant of the electronic counter is large in relation to the pulse width, the signal will decrease and the count will not be accurate.
- If the input impedance of the electronic counter is large, an induction noise from the power supply may result in inaccurate counts. Use a shield cable or sufficiently reduce the input impedance of the electronic counter within the magnetic flowmeter pulse output specification range.
- The active pulse output (Optional code EM) cannot be used in conjunction with the standard pulse output.
- When the active pulse output (Optional code EM) is selected, do not be short-circuit between the DO+ and DO- terminals to avoid damaging the instrument.
- When the active pulse output (Optional code EM) is selected, the range of pulse rate must be set to 2 pps maximum.
- To avoid communication (BRAIN/ HART) failure, it is recommended to use the shield cable.

NOTE

For pulse output from the DO terminals, parameters must be set. Refer to “Parameter Description” in the user’s manual of the AXF Integral Flowmeter [Software Edition] (IM 01E20C02- 01E).

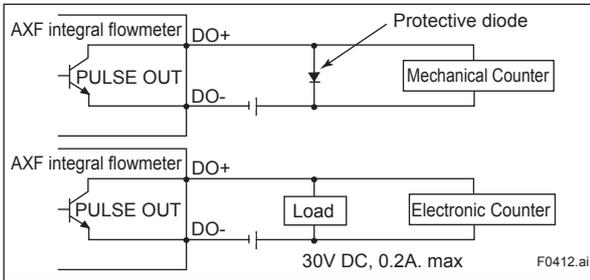


Figure 4.1.12 Pulse Output Connection

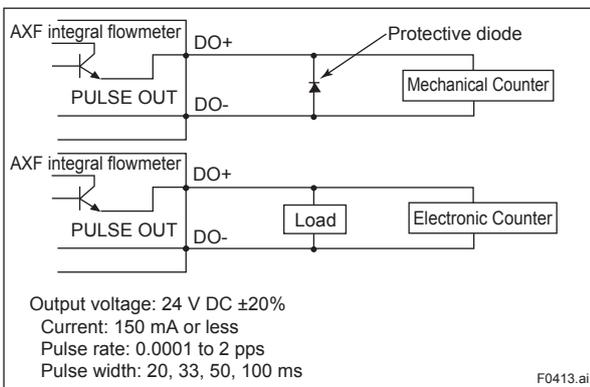


Figure 4.1.13 Active Pulse Output Connection (Optional code EM)

● Status Input

IMPORTANT

Status inputs are designed for use with no-voltage (dry) contacts. Be careful not to connect the status to any signal source carrying voltage. Applying voltage may damage the input circuit.

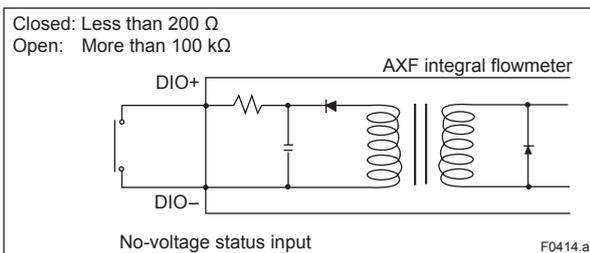


Figure 4.1.14 Status Input Connection

NOTE

For status input to the DIO terminals, parameters must be set. Refer to “Parameter Description” in the user’s manual of the AXF Integral Flowmeter [Software Edition] (IM 01E20C02-01E).

● Status Output / Alarm Output

IMPORTANT

Since this is an isolated transistor output, be careful of voltage and polarity when wiring. Do not apply a voltage larger than 30V DC or a current larger than 0.2A in order to prevent damage to the instrument. This output cannot switch an AC load. To switch an AC load, an intermediate relay must be inserted as shown in Figure 4.1.15.

* The alarm output operates from open (normal) to closed (alarm occurrence) by factory default setting. Changes can be made via the parameter settings.

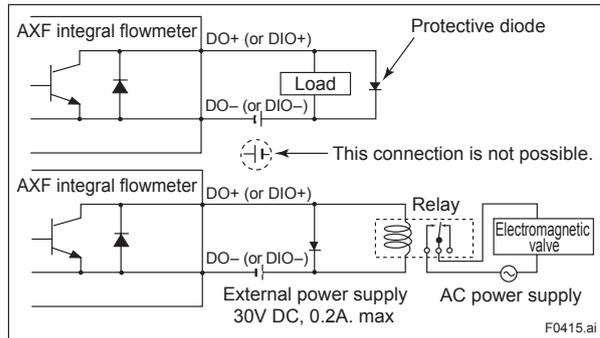


Figure 4.1.15 Status Output / Alarm Output Connection

NOTE

For status and alarm outputs from the DO or DIO terminals, parameters must be set. Refer to “Parameter Description” in the user’s manual of the AXF Integral Flowmeter [Software Edition] (IM 01E20C02-01E).

(7) Installing the Cover

Install the cover to the flowmeter by turning it in the direction of the arrow as shown below. Tighten cover locking screw 2 counterclockwise using a hexagonal locking wrench (nominal size 3) to lock the cover.

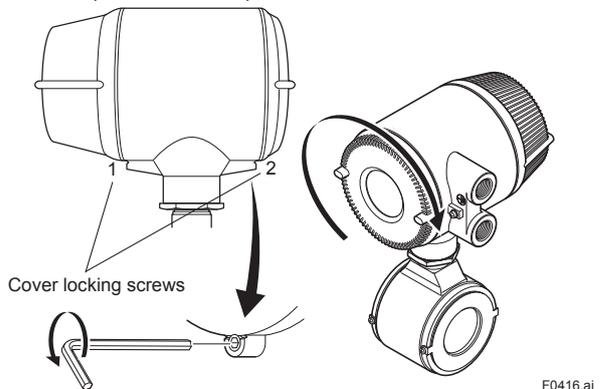


Figure 4.1.16 Installing the Terminal Box Cover for Integral Flowmeter

4.2 Wiring the Remote Flowtube

This section describes the wiring of the remote flowtube only. For information relating to the wiring of the converter, refer to Section 4.3 or Section 4.4 of this manual.



WARNING

The wiring of the magnetic flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to wiring.



CAUTION

Once all wiring is complete, check the connections before applying power to the instrument. Improper arrangements or wiring may cause a unit malfunction or damage.

4.2.1 Wiring Precautions

Be sure to observe the following precautions when wiring:



CAUTION

- In cases where the ambient temperature exceeds 50°C (122°F), use external heat-resistant wiring with a maximum allowable temperature of 70°C (158°F) or above.
- Do not connect cables outdoors in wet weather in order to prevent damage from condensation and to protect the insulation, e.g. inside the terminal box of the flowtube.
- Do not splice the cable between the flowtube terminal and the converter if it is too short. Replace the short cable with a cable that is the appropriate length.
- All the cable ends must be provided with round crimp-on terminals and be securely wired.
- The signal cables must be routed in separate steel conduit tubes 16 (JIS C 8305) or flexible conduit tubes 15 (JIS C 8309).
- Keep conduits or flexible tubes watertight using sealing tape.
- Ground the remote flowtube and the converter separately.
- Cover each shield of the signal cable with vinyl tube or vinyl tape to avoid contact between two shields or between a shield and a case.
- When waterproof glands or union equipped waterproof glands are used, avoid tightening the glands with an excessive torque.
- Be sure to turn the power off before opening the terminal box cover.
- Before turning the power on, tighten the terminal box cover securely.
- The terminal box cover is locked by the special screw. In case of opening the terminal box cover, use the hexagonal wrench attached. For handling the locking screw, refer to Figure 4.2.8.
- Be sure to lock the cover by the special screw using the hexagonal wrench attached after installing the cover. For handling the locking screw, refer to Figure 4.2.16.
- Explosion protected types must be wired in accordance with specific requirement (and, in certain countries, legal regulations) in order to preserve the effectiveness of their explosion protected features.
- When submersible type or optional code DHC is selected, waterproof glands, signal and excitation cables are attached. In order to preserve the effectiveness of waterproof features, the terminal box cover and waterproof glands must not be detached from flowmeter.



IMPORTANT

Prepare the signal cable and the excitation cable almost the same length. It is recommended to lay them together closely.

4.2.2 Cables

(1) Dedicated Signal Cable (AXFC)

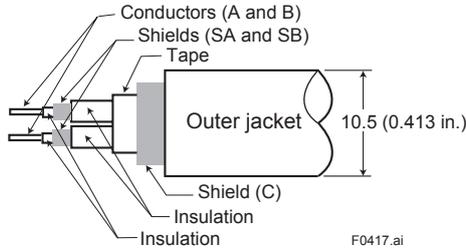


Figure 4.2.1 Dedicated Signal Cable AXFC

The flow signal is transmitted via this dedicated cable. The cable is constructed with double shielding over the two conductors, and heat-resistant vinyl is used for the outer jacket material.

Finished diameter: 10.5 mm (0.413 in.)

Maximum length:

Combination with the AXFA11 converter: 200 m (660 ft)

Combination with the AXFA14 converter: 100 m (330 ft)

Maximum temperature: 80°C (176°F)



IMPORTANT

If the cable is longer than required, cut off any extra length rather than coiling it up, and terminate the conductors as shown in Figure 4.2.2.

Avoid using junction terminal boards to extend the cable length, as this will interrupt the shielding.

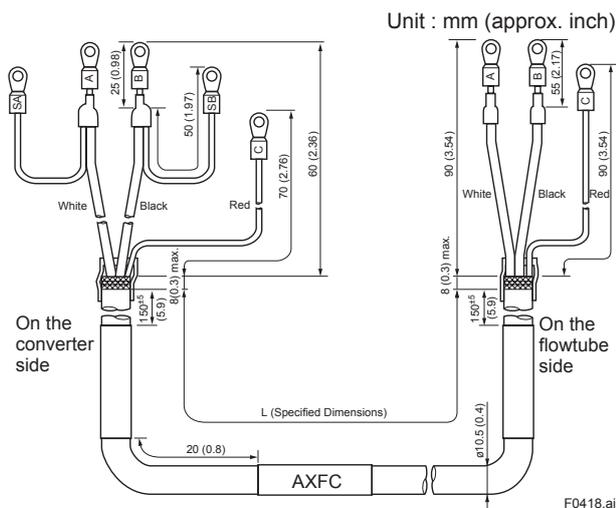


Figure 4.2.2 Treatment of Dedicated Signal Cables



CAUTION

- As crimp terminals A, B, SA, SB and C have their own electrical potentials, securely insulate them so as not to come in contact with one another.
- To prevent a shield from coming in contact with another shield or the case, cover each shield with a vinyl tube or wrap it in vinyl tape.



NOTE

Conductors A and B carry the signal from the electrodes, and C is at the potential of the liquid (signal common). Shields SA and SB are kept at the same potentials as the individual electrodes (these are actively driven shields). This is done to reduce the effect of the distributed capacitance of the cable at long cable length.

Note that, since the signals from the individual electrodes are impedance converted inside the converter, errors will result if they come in contact with any other component. Great care must be taken in the cable end treatment.

(2) Excitation Cable

JIS C 3401 control cable equivalent

JIS C 3312 power cable equivalent

14 AWG Belder 8720 equivalent

Outer Diameter:

With no gland option:

6.5 to 12 mm (0.26 to 0.47 in.)

With gland options EG, EU and EW:

10.5 or 11.5 mm (0.41 to 0.45 in.)

With gland options EP:

6 to 12 mm (0.24 to 0.47 in.)

Nominal Cross Section:

Single wire; 0.5 to 2.5 mm²

Stranded wire; 0.5 to 1.5 mm²

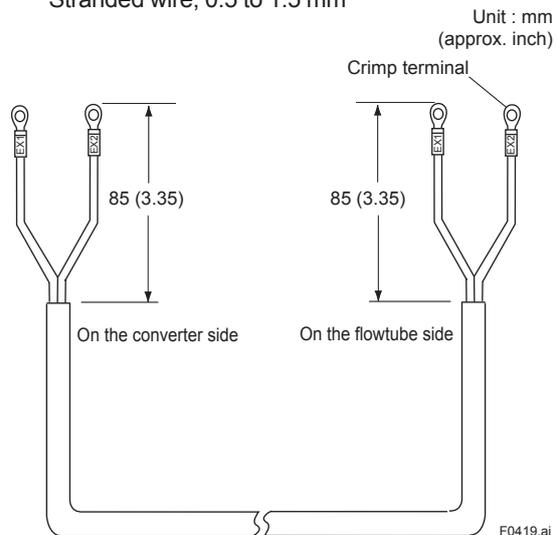


Figure 4.2.3 End Treatment of Excitation Cable



NOTE

- For excitation cables, always use a crimp terminal with an insulation cover.
- Use crimp tools from the manufacturer of the crimp terminal you want to use to connect the crimp terminal and cable.
- Use crimp tools that are appropriate for the diameter of the cable to be connected.

4.2.3 Wiring Ports for Remote Flowmeter

This instrument is of watertight construction as stipulated in JIS C 0920. It is shipped with a wiring bracket (waterproof gland or waterproof gland with union) or a plastic gland attached, only in cases where an optional specification is selected for the wiring port. In case of the explosion proof type, refer to chapter 10.



IMPORTANT

The wiring port is sealed with a cap (not waterproof). Do not remove the cap from the unused wiring port. If waterproof property is necessary, apply a blanking plug to the unused wiring port. The blanking plug may not be attached depending on the specification. If it is necessary, contact YOKOGAWA.

(1) When waterproof property is unnecessary (When there are no particular optional specifications)

The wiring port is sealed with a cap (not water-proof) that must be removed before wiring. At this time, handle the wiring port in accordance with the JIS C 0920 mentioned above. Do not remove the cap from the unused wiring port.

(2) When waterproof property is necessary (Wiring using waterproof glands)



IMPORTANT

To prevent water or condensation from entering the converter housing, waterproof glands are recommended. Do not over-tighten the glands or damage to the cables may result. Tightness of the gland can be checked by confirming that the cable is held firmly in place.

For working on the electric wire tubes or the flexible tubes (G1/2), remove the waterproof gland and attach them directly to the wiring port.

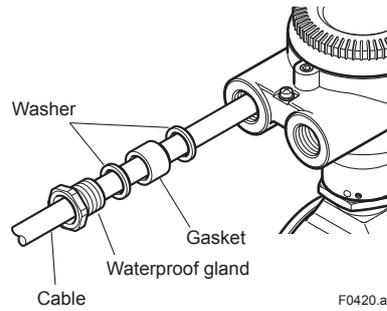


Figure 4.2.4 Waterproof Gland (Optional code EG)

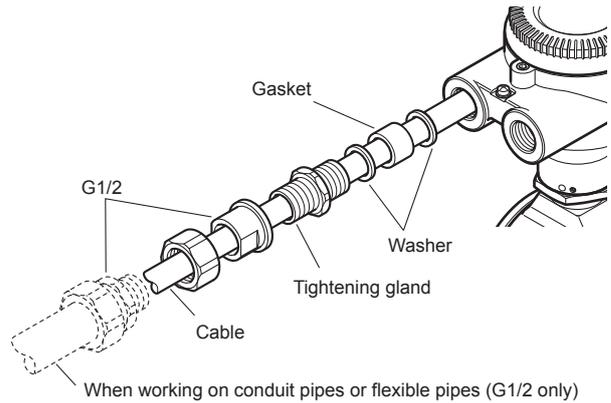


Figure 4.2.5 Waterproof Gland with Union Joint (Optional code EU)

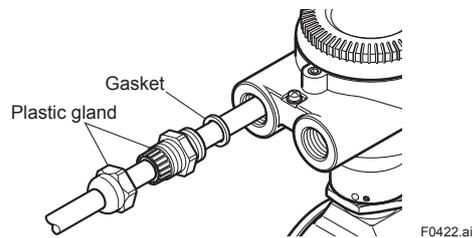


Figure 4.2.6 Plastic Gland (Optional code EP)

(3) Conduit Wiring

When wiring the conduits, pass the conduit through the wiring connection port, and utilize the waterproof gland to prevent water from flowing in. Place the conduit pipe on an angle as shown in Figure 4.2.7

Install a drain valve at the low end of the vertical pipe, and open the valve regularly.

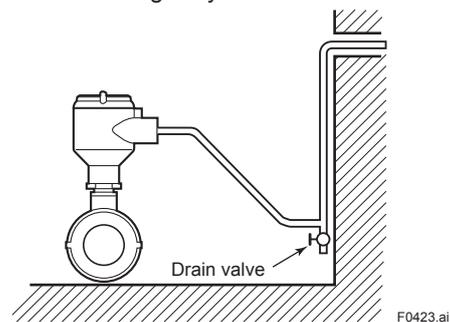


Figure 4.2.7 Conduit Wiring

4.2.4 Wiring Connections for Remote Flowtube

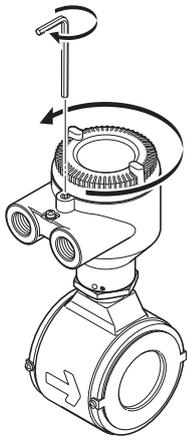


WARNING

Before wiring, be sure that the power supply for AXFA11 or AXFA14 converter has been turned off to prevent an electrical shock.

(1) Removing Cover

Loosen the cover locking screw clockwise using a hexagonal wrench (nominal size 3) to unlock the cover. (Upon shipment from the manufacturing plant, the cover is unlocked.) Hold the flowtube with your hand and remove the cover by turning it in the direction of the arrow as shown below.

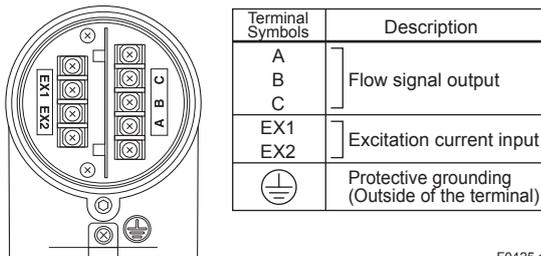


F0424.ai

Figure 4.2.8 Removing the Terminal Box Cover for Remote Flowtube

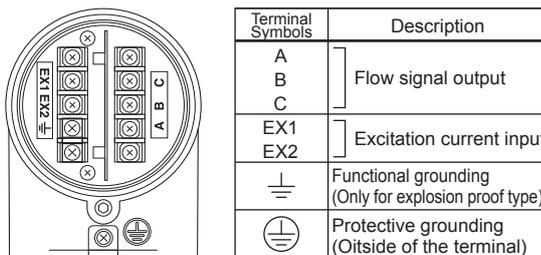
(2) Terminal Configuration

When the cover is removed, the connection terminals



F0425.ai

Figure 4.2.9 Terminal Configuration for Remote Flowtube (General-Purpose Use, Submersible Type, Sanitary Type)



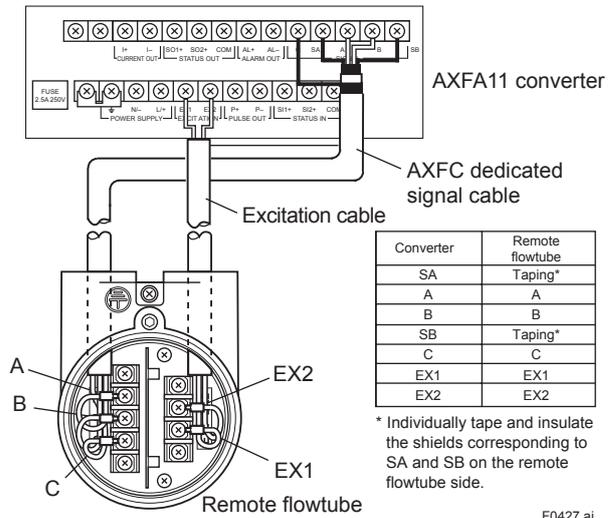
F0426.ai

Figure 4.2.10 Terminal Configuration for Remote Flowtube (Explosion proof Type)

(3) Wiring the Remote Flowtube (General-Purpose Use, Submersible Type, Sanitary Type) with Converters

1) Connection with the AXFA11 converter

Connect wiring as shown in the figure below.

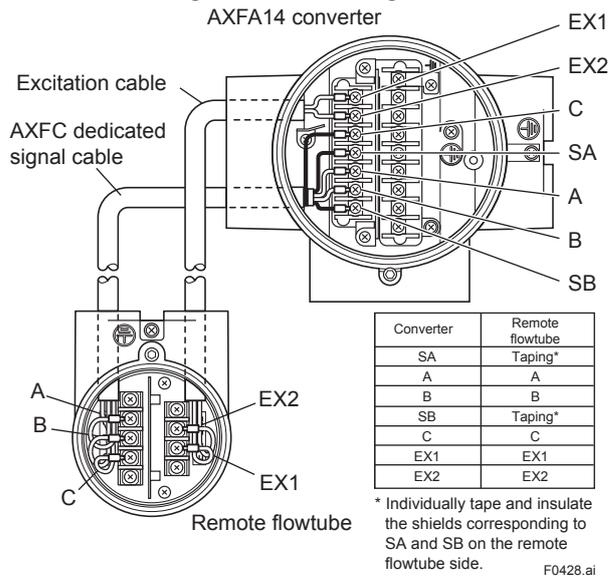


F0427.ai

Figure 4.2.11 Wiring Diagram

2) Connection with the AXFA14 converter

Connect wiring as shown in the figure below.



F0428.ai

Figure 4.2.12 Wiring Diagram

(4) Wiring the Remote Flowtube (Explosion Proof Type) with Converters



IMPORTANT

In case of ATEX, IECEx or TIIS certified AXF remote flowtube, it is only approved to be combined with AXFA14 converter.

1) Connection with the AXFA11 converter

In case of FM or CSA certified AXF remote flowtube, connect wiring as shown in the figure below.

In case of the explosion proof type, the protective grounding \oplus of remote flowtube must be connected to a suitable IS grounding system. In that case, $\underline{\underline{\oplus}}$ (functional grounding terminal) need not be connected.

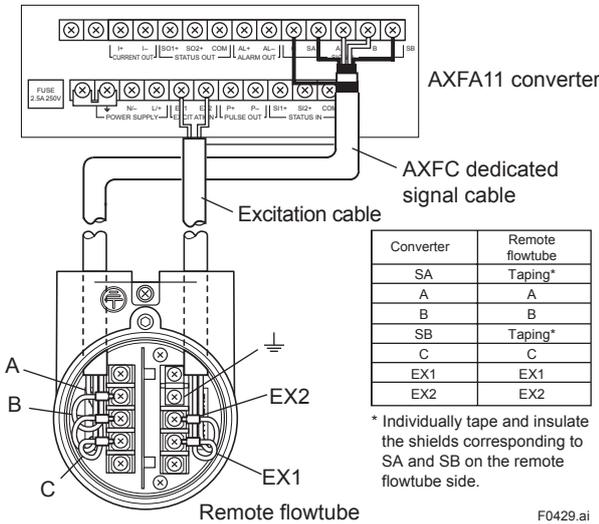


Figure 4.2.13 Wiring Diagram

2) Connection with the AXFA14 converter

In case of ATEX, FM, CSA, IECEx or TIIS certified AXF remote flowtube, connect wiring as shown in the figure below.

In case of the explosion proof type, the protective grounding \oplus of remote flowtube must be connected to a suitable IS grounding system. In that case, $\underline{\underline{\oplus}}$ (functional grounding terminal) need not be connected.

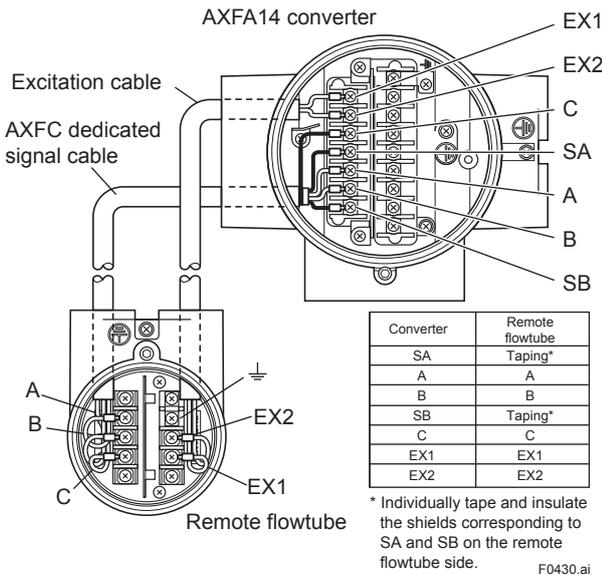


Figure 4.2.14 Wiring Diagram

(5) Grounding



Be sure to connect the protective grounding of the AXF remote flowtube with a cable of 2mm² or larger cross section in order to avoid electrical shock to the operators and maintenance engineers and to prevent the influence of external noise.

Connect the grounding wire to the \oplus mark. The grounding should satisfy Class D requirements (grounding resistance, 100 Ω or less). In case of TIIS Flameproof type, the grounding should satisfy Class C requirements (grounding resistance, 10 Ω or less) or class A requirements (grounding resistance, 10 Ω or less).

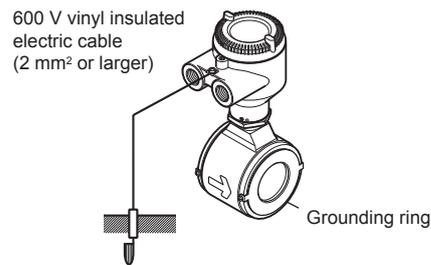
For explosion proof type except TIIS, follow the domestic electrical requirements as regulated in each country.



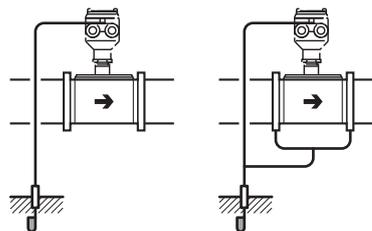
Improper grounding can have an adverse effect on the flow measurement. Ensure that the instrument is properly grounded.

The electromotive force of the magnetic flowmeter is minute and it is easy to be affected by noise. And also that reference electric potential is the same as the measuring fluid potential. Therefore, the reference electric potential (terminal potential) of the flowtube and the converter also need to be the same as the measuring fluid. Moreover, that the potential must be the same with ground. The magnetic flowmeter is equipped with a grounding ring that makes a connection with the charge of the measured fluid for grounding and protects the lining.

Be sure to ground according to Figure 4.2.15.



- Class D requirements (grounding resistance, 100 Ω or less).
- TIIS Flameproof type: Class C requirements (grounding resistance, 10 Ω or less) or Class A requirements (grounding resistance, 10 Ω or less)
- Explosion proof type except TIIS: Domestic electrical requirements as regulated in each country.



In case grounding rings are used.

In case grounding rings are not used. (Available only for metal piping)

Figure 4.2.15 Protective Grounding Terminal Location

(6) Installing the Cover

Install the cover to the flowtube by turning it in the direction of the arrow as shown below. Tighten the cover locking screw counterclockwise using a hexagonal wrench (nominal size 3) to lock the cover.

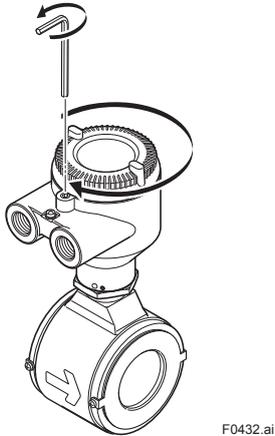


Figure 4.2.16 Installing the Terminal Box Cover for Remote Flowtube

4.3 Wiring the AXFA14 Remote Converter

This section describes the wiring on the AXFA14 remote converter side only. For information relating to wiring on the flowtube side, refer to Section 4.2 of this manual.

WARNING

The wiring of the magnetic flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to wiring.

CAUTION

Once all wiring is complete, check the connections before applying power to the instrument. Improper arrangements or wiring may cause a unit malfunction or damage.

4.3.1 Wiring Precaution for AXFA14

Be sure to observe the following precautions when wiring:

CAUTION

- In cases where the ambient temperature exceeds 50°C (122°F), use external heat-resistant wiring with a maximum allowable temperature of 70°C (158°F) or above.
- Do not connect cables outdoors in wet weather in order to prevent damage from condensation and to protect the insulation.
- Do not splice the cable between the flowtube terminal and the converter if it is too short. Replace the short cable with a cable that is the appropriate length.
- All the cable ends must be provided with round crimp-on terminals and be securely wired.
- The signal cables must be routed in separate steel conduit tubes 16 (JIS C 8305) or flexible conduit tubes 15 (JIS C 8309).
- Always route the power and output signal cables in separate steel conduit tubes, except when the power supply voltage is 24 V and four-core cables are used for wiring. Keep conduits or flexible tubes watertight using sealing tape.
- Ground the remote flowtube and the converter separately.
- Cover each shield of the signal cable with vinyl tube or vinyl tape to avoid contact between two shields or between a shield and a case.
- When waterproof glands or union equipped waterproof glands are used, avoid tightening the glands with an excessive torque.
- When the power supply voltage is 24V, it comes with a blanking plug. Use this plug to cover the unused wiring port when wiring the instrument with only one, four-core cable.
- Be sure to turn power off before opening the cover.
- Before turning the power on, tighten the cover securely.
- The terminal box cover is locked by the special screw. In case of opening the terminal box cover, use the hexagonal wrench attached. For handling the locking screw, refer to Figure 4.3.5.
- Be sure to lock the cover by the special screw using the hexagonal wrench attached after installing the cover. For handling the locking screw, refer to Figure 4.3.15.
- Explosion protected types must be wired in accordance with specific requirement (and, in certain countries, legal regulations) in order to preserve the effectiveness of their explosion protected features.



IMPORTANT

Prepare the signal cable and the excitation cable almost the same length. It is recommended to lay them together closely.

4.3.2 Power Cable/Output Cable

JIS C 3401 control cable equivalent
 JIS C 3312 power cable equivalent
 14 AWG Belden 8720 equivalent
 Outer Diameter:

- With no gland option:
6.5 to 12 mm (0.26 to 0.47 in.)
- With gland options EG, EU:
10.5 or 11.5 mm (0.41 to 0.45 in.)
- With gland options EP:
6 to 12 mm (0.24 to 0.47 in.)

Nominal Cross Section:

- Single wire; 0.5 to 2.5 mm²
- Stranded wire; 0.5 to 1.5 mm²

In case of power cable, Green/Yellow covered conductor shall be used only for connection to PROTECTIVE CONDUCTOR TERMINALS. Conform to IEC227, IEC245 or equivalent national authorization.



NOTE

- For power cables, always use a crimp terminal with an insulation cover.
- Use crimp tools from the manufacturer of the crimp terminal you want to use to connect the crimp terminal and cable.
- Use crimp tools that are appropriate for the diameter of the cable to be connected.

4.3.3 Wiring Ports for AXFA14

This instrument is of watertight construction as stipulated in JIS C 0920. It is shipped with a wiring bracket (waterproof gland or waterproof gland with union) or a plastic gland attached, only in cases where an optional specification is selected for the wiring port. In case of the explosion proof type, refer to Chapter 10.



IMPORTANT

The wiring port is sealed with a cap (not waterproof). Do not remove the cap from the unused wiring port. If waterproof property is necessary, apply a blanking plug to the unused wiring port. The blanking plug may not be attached depending on the specification. If it is necessary, contact YOKOGAWA.

(1) When waterproof property is unnecessary (When there are no particular optional specifications)

The wiring port is sealed with a cap (not water-proof) that must be removed before wiring. At this time, handle the wiring port in accordance with the JIS C 0920 mentioned above. Do not remove the cap from the unused wiring port.

(2) When waterproof property is necessary (Wiring using waterproof glands)



IMPORTANT

To prevent water or condensation from entering the converter housing, waterproof glands are recommended. Do not over-tighten the glands or damage to the cables may result. Tightness of the gland can be checked by confirming that the cable is held firmly in place.

For working on the electric wire tubes or the flexible tubes (G1/2), remove the waterproof gland and attach them directly to the wiring port.

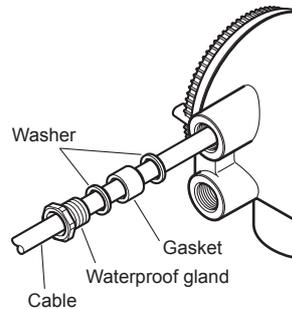


Figure 4.3.1 Waterproof Gland (Optional code EG)

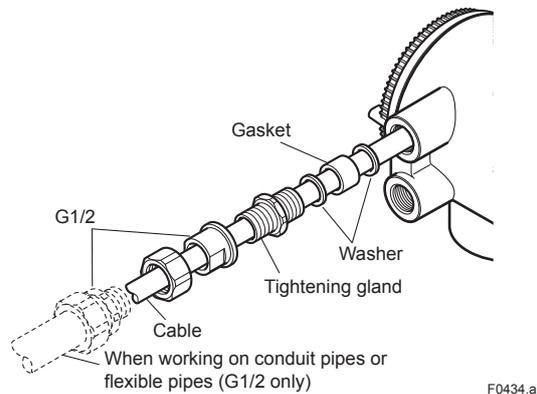


Figure 4.3.2 Waterproof Gland with Union Joint (Optional code EU)

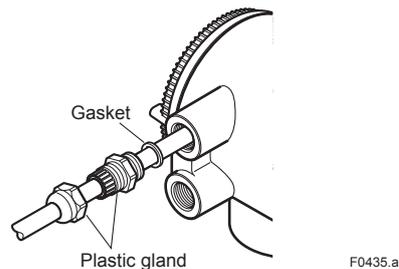


Figure 4.3.3 Plastic Gland (Optional code EP)

(3) Conduit Wiring

When wiring the conduits, pass the conduit through the wiring connection port, and utilize the waterproof gland to prevent water from flowing in. Place the conduit pipe on an angle as shown in Figure 4.3.4.

Install a drain valve at the low end of the vertical pipe, and open the valve regularly.

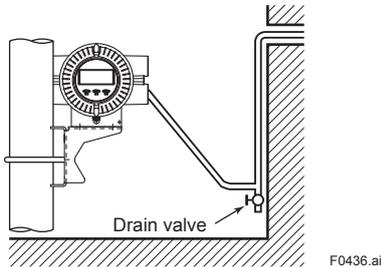


Figure 4.3.4 Conduit Wiring

4.3.4 Wiring Connections for AXFA14

(1) Removing Cover

Loosen cover locking screw 2 clockwise using a hexagonal wrench (nominal size 3) to unlock the cover. (Upon shipment from the manufacturing plant, the cover is unlocked.) Hold the flowmeter with your hand and remove the cover by turning it in the direction of the arrow as shown below.

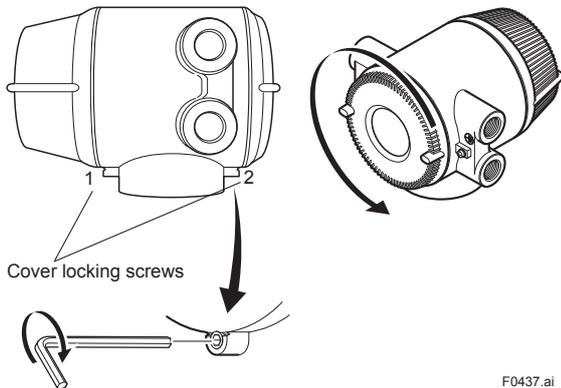


Figure 4.3.5 Removing the Terminal Box Cover for AXFA14 Remote Converter

(2) Terminal Configuration

When the cover is removed, the connection terminals will be visible. The terminal configuration labels are attached in the locations shown in Figure 4.3.6.

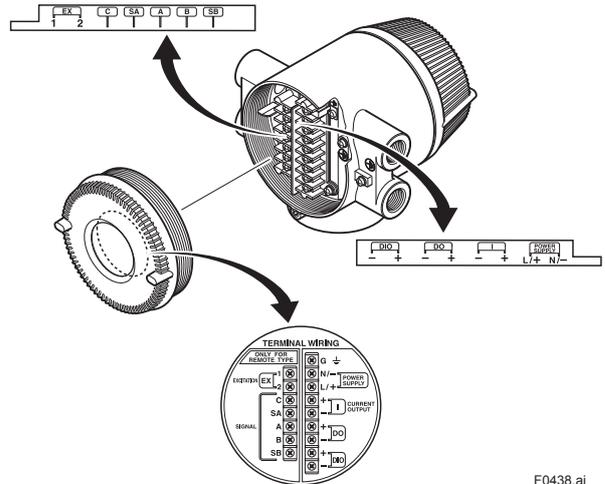


Figure 4.3.6 Terminal Configuration for AXFA14 Remote Converter

The description of the terminal symbols is shown in Table 4.3.1.

For FOUNDATION fieldbus protocol, refer to IM 01E20F02-01E.

For PROFIBUS PA protocol, refer to IM 01E20F12-01E.

Table 4.3.1 Terminal Symbols for AXFA14 Remote Converter

Terminal Symbols	Description	Terminal Symbols	Description
EX1 EX2	Excitation current output		Functional grounding
C SA A B SB	Flow signal input	N/- L/+	Power supply
		I+ I-	Current output 4 to 20mA DC
		DO+ DO-	Pulse output/ Alarm output/ Status output
		DIO+ DIO-	Alarm output/ Status output/ Status input
			Protective grounding (Outside of the terminal)

(3) Precautions for Wiring of Power Supply Cables

When connecting to the power supply, observe the points below. Failure to comply with these warnings may result in an electric shock or damage to the instrument.

WARNING

- Ensure that the power supply is OFF in order to prevent electric shocks.
- Ensure the protective grounding terminal is grounded before turning the power on.
- Use insulating sleeve crimp terminals (for 4-mm screws) for the power supply wiring and protective grounding wiring.
- Install an external switch or circuit breaker as a means to turn the power off (capacitance; 15A, conforming to IEC60947-1 and IEC60947-3). Locate this switch either near the instrument or in other places facilitating easy operation. Affix a “Power Off Equipment” label to this external switch or circuit breaker.

Wiring Procedure for AXFA14

1. Turn the instrument’s power off.
2. Wire the power supply cable and the functional grounding cable to the power supply terminals.

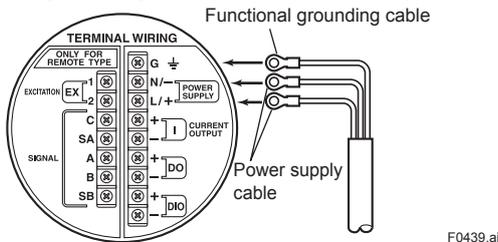


Figure 4.3.7 Electric Cable Wiring for AXFA14 Remote Converter

(4) DC Power Connection

When using DC power as the power supply for the converter, give attention to the following points.

1) Connecting Power Supply

IMPORTANT

Do not connect power supply with reversed polarities.
 L/+ terminal: connect +
 N/- terminal: connect -

IMPORTANT

Do not connect power supply with 100 to 240 V AC or 100 to 120 V DC in the case of a 24 V power supply version (power supply code 2). It will give a damage to the converter.

2) Required Power Supply Voltages

IMPORTANT

When using a 24 V power supply, the specification for the supply voltage is 24 V (–15% to +20%), but the input voltage of the converter drops due to cable resistance therefore it must be used within the following ranges.

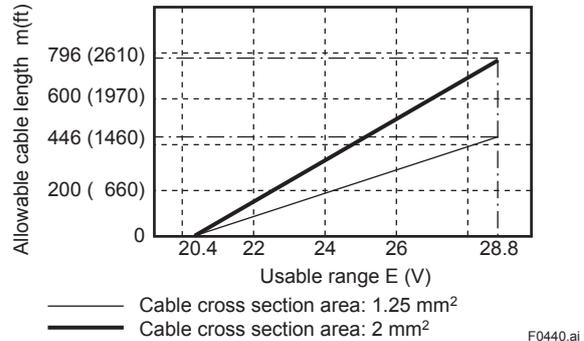


Figure 4.3.8 Supply Voltage and Cable Length for AXFA14 Remote Converter

3) Setting Power Supply Frequency

IMPORTANT

Set the local commercial power frequency in order to eliminate the effect of induction noise from the power supply. Refer to “Parameter Description” in the user’s manual of the AXFA14G/C Magnetic Flowmeter Remote Converter [Hardware Edition/ Software Edition] (IM 01E20C02-01E).
 Parameter No.: **J30** and **J31**

(5) Grounding

CAUTION

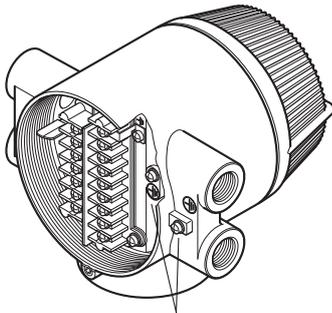
Be sure to connect the protective grounding of the AXFA14 Remote Converter with a cable of 2mm² or larger cross section in order to avoid electrical shock to the operators and maintenance engineers and to prevent the influence of external noise. Connect the grounding wire to the ⊕ mark. The grounding should satisfy Class D requirements (grounding resistance, 100 Ω or less). In case of TIIS Flameproof type, the grounding should satisfy Class C requirements (grounding resistance, 10 Ω or less) or class A requirements (grounding resistance, 10 Ω or less). For explosion proof type except TIIS, follow the domestic electrical requirements as regulated in each country.



IMPORTANT

When optional code A (lightning protector) is selected, the ground should satisfy Class C requirements (grounding resistance, 10 Ω or less).

- The protective grounding terminals (⊕) are located on the inside and outside of the terminal area. Either terminal may be used.
- Use 600 V vinyl insulation wires as the grounding wires.



Protective grounding terminals
F0441.ai

Figure 4.3.9 Protective Grounding Terminal Location for AXFA14 Remote Converter

(6) Connecting to External Instruments



WARNING

Before wiring with external instruments, be sure to turn off the power supply for AXFA14 Remote Converter and any external instruments.

Connect the AXFA14 Remote Converter terminal to external instruments, giving attention to the following points.

For FOUNDATION fieldbus protocol, refer to IM 01E20F02-01E.

For PROFIBUS PA protocol, refer to IM 01E20F12-01E.

● **4 to 20 mA DC Current Output**

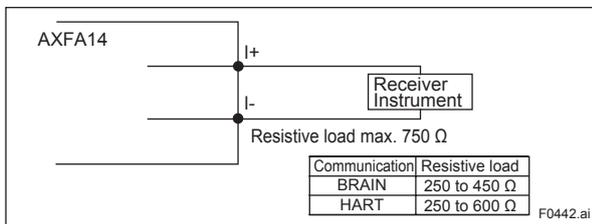


Figure 4.3.10 4 to 20 mA DC Output Connection

● **Pulse Output**



IMPORTANT

- As this is a transistor contact (insulated type), give attention to proper voltage and polarity when wiring.
- Do not apply a voltage larger than 30V DC or a current larger than 0.2A in order to prevent damage to the instrument.
- When input filter constant of the electronic counter is large in relation to the pulse width, the signal will decrease and the count will not be accurate.
- If the input impedance of the electronic counter is large, an induction noise from the power supply may result in inaccurate counts. Use a shield cable or sufficiently reduce the input impedance of the electronic counter within the magnetic flowmeter pulse output specification range.
- The active pulse output (Optional code EM) cannot be used in conjunction with the standard pulse output.
- When the active pulse output (Optional code EM) is selected, do not be short-circuit between the DO+ and DO- terminals to avoid damaging the instrument.
- When the active pulse output (Optional code EM) is selected, the range of pulse rate must be set to 2 pps maximum.
- To avoid communication (BRAIN/ HART) failure, it is recommended to use the shield cable.



NOTE

For pulse output from the DO terminals, parameters must be set. Refer to "Parameter Description" in the user's manual of the AXFA14G/C Magnetic Flowmeter Remote Converter [Hardware Edition/ Software Edition] (IM 01E20C02-01E).

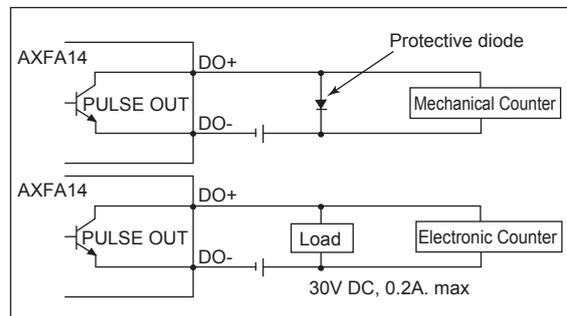


Figure 4.3.11 Pulse Output Connection

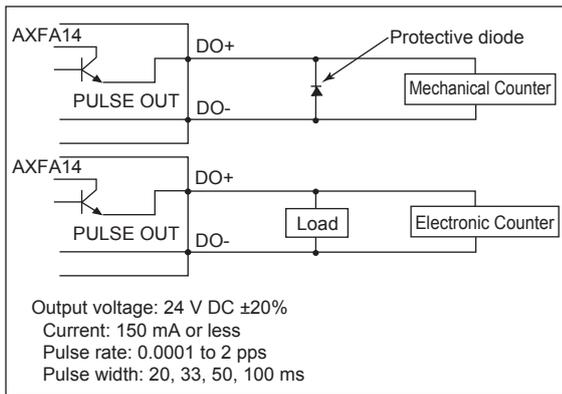


Figure 4.3.12 Active Pulse Output Connection (Optional code EM)

*The alarm output operates from open (normal) to closed (alarm occurrence) by factory default setting. Changes can be made via the parameter settings.

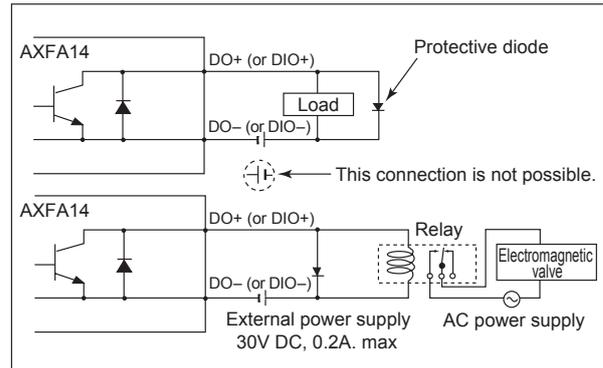


Figure 4.3.14 Status Output Connection

● Status Input



IMPORTANT

Status inputs are designed for use with no-voltage (dry) contacts. Be careful not to connect the status to any signal source carrying voltage. Applying voltage may damage the input circuit.

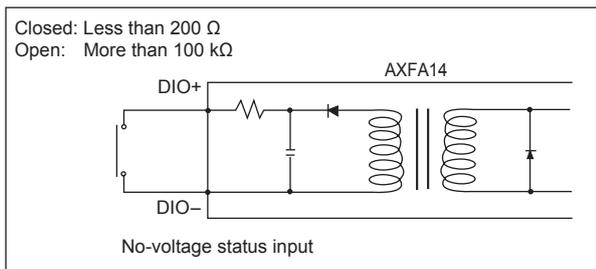


Figure 4.3.13 Status Input Connection



NOTE

For status input to the DIO terminals, parameters must be set. Refer to “Parameter Description” in the user’s manual of the AXFA14G/C Magnetic Flowmeter Remote Converter [Hardware Edition/ Software Edition] (IM 01E20C02-01E).

● Status Output / Alarm Output



IMPORTANT

Since this is an isolated transistor output, be careful of voltage and polarity when wiring. Do not apply a voltage larger than 30V DC or a current larger than 0.2A in order to prevent damage to the instrument. This output cannot switch an AC load. To switch an AC load, an intermediate relay must be inserted as shown in Figure 4.3.14.



NOTE

For status and alarm outputs from the DO or DIO terminals, parameters must be set. Refer to “Parameter Description” in the user’s manual of the AXFA14G/C Magnetic Flowmeter Remote Converter [Hardware Edition/ Software Edition] (IM 01E20C02-01E).

(7) Installing the Cover

Install the cover to the AXFA14 Remote Converter by turning it in the direction of the arrow as shown below. Tighten cover locking screw 2 counterclockwise using a hexagonal wrench (nominal size 3) to lock the cover.

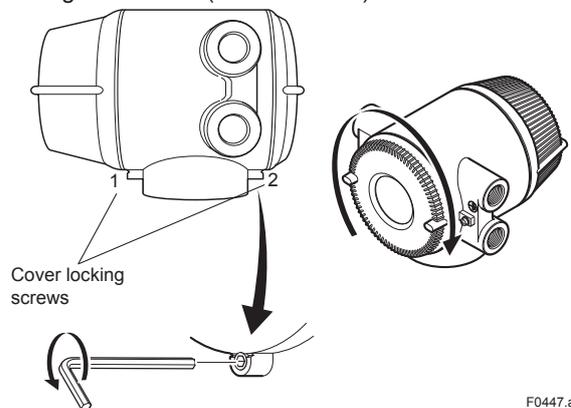


Figure 4.3.15 Installing the Terminal Box Cover for AXFA14 Remote Converter

4.4 Wiring the AXFA11 Remote Converter

This section describes the wiring of the AXFA11 Remote Converter side only. For information relating to wiring on the flowtube side, refer to Section 4.2 of this manual.



WARNING

The wiring of the magnetic flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to wiring.



CAUTION

Once all wiring is complete, check the connections before applying power to the instrument. Improper arrangements or wiring may cause a unit malfunction or damage.

4.4.1 Wiring Precaution for AXFA11

Be sure to observe the following precautions when wiring:



CAUTION

- In cases where the ambient temperature exceeds 50°C (122°F), use external heat-resistant wiring with a maximum allowable temperature of 70°C (158°F) or above.
- Do not connect cables outdoors in wet weather in order to prevent damage from condensation and to protect the insulation.
- Do not splice the cable between the flowtube terminal and the converter if it is too short. Replace the short cable with a cable that is the appropriate length.
- All the cable ends must be provided with round crimp-on terminals and be securely wired.
- The signal cables must be routed in separate steel conduit tubes 16 (JIS C 8305) or flexible conduit tubes 15 (JIS C 8309).
- Always route the power and output signal cables in separate steel conduit tubes, except when the power supply voltage is 24 V and four-core cables are used for wiring. Keep conduits or flexible tubes watertight using sealing tape.
- Ground the remote flowtube and the converter separately.
- Cover each shield of the signal cable with vinyl tube or vinyl tape to avoid contact between two shields or between a shield and a case.
- When waterproof glands or union equipped waterproof glands are used, avoid tightening the glands with an excessive torque.
- Be sure to turn power off before opening the cover.
- Before turning the power on, tighten the cover securely.



IMPORTANT

Prepare the signal cable and the excitation cable almost the same length. It is recommended to lay them together closely.

4.4.2 Power Cable/Output Cable

JIS C 3401 control cable equivalent

JIS C 3312 power cable equivalent

14 AWG Belden 8720 equivalent

Outer Diameter:

With no gland option:

6.5 to 12 mm (0.26 to 0.47 in.)

With gland options EG, EU and EW:

10.5 or 11.5 mm (0.41 to 0.45 in.)

With gland options EP:

6 to 12 mm (0.24 to 0.47 in.)

Nominal Cross Section:

Single wire; 0.5 to 2.5 mm²

Stranded wire; 0.5 to 1.5 mm²

In case of power cable, Green/Yellow covered conductor shall be used only for connection to PROTECTIVE CONDUCTOR TERMINALS. Conform to IEC227, IEC245 or equivalent national authorization.

NOTE

- For power cables, always use a crimp terminal with an insulation cover.
- Use crimp tools from the manufacturer of the crimp terminal you want to use to connect the crimp terminal and cable.
- Use crimp tools that are appropriate for the diameter of the cable to be connected.

4.4.3 Wiring Ports for AXFA11

This instrument is of watertight construction as stipulated in JIS C 0920. It is shipped with a wiring bracket (waterproof gland or waterproof gland with union) or a plastic gland attached, only in cases where an optional specification is selected for the wiring port.

IMPORTANT

The wiring port is sealed with a cap (not waterproof). Do not remove the cap from the unused wiring port. If waterproof property is necessary, apply a blanking plug to the unused wiring port. The blanking plug may not be attached depending on the specification. If it is necessary, contact YOKOGAWA.

(1) When waterproof property is unnecessary (When there are no particular optional specifications)

The wiring port is sealed with a cap (not water-proof) that must be removed before wiring. At this time, handle the wiring port in accordance with the JIS C 0920 mentioned above. Do not remove the cap from the unused wiring port.

(2) When waterproof property is necessary (Wiring using waterproof glands)

IMPORTANT

To prevent water or condensation from entering the converter housing, waterproof glands are recommended. Do not over-tighten the glands or damage to the cables may result. Tightness of the gland can be checked by confirming that the cable is held firmly in place.

For working on the electric wire tubes or the flexible tubes (G1/2), remove the waterproof gland and attach them directly to the wiring port.

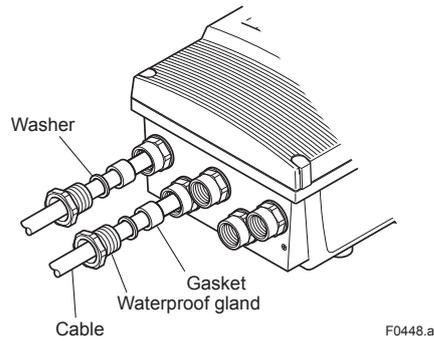


Figure 4.4.1 Waterproof Gland (Optional code EG)

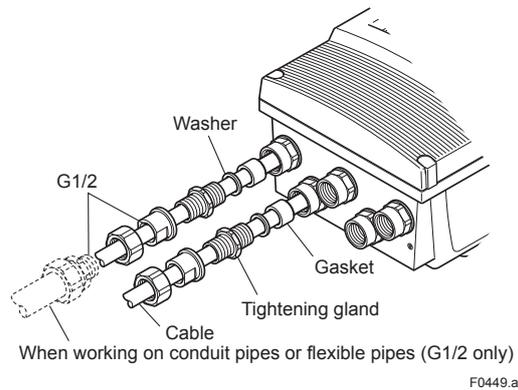


Figure 4.4.2 Waterproof Gland with Union Joint (Optional code EU)

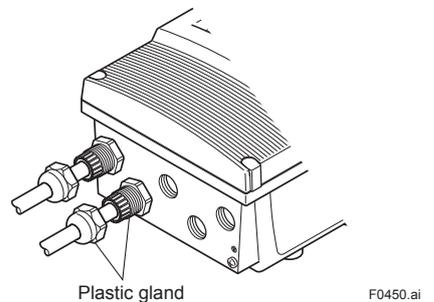


Figure 4.4.3 Plastic Gland (Optional code EP)

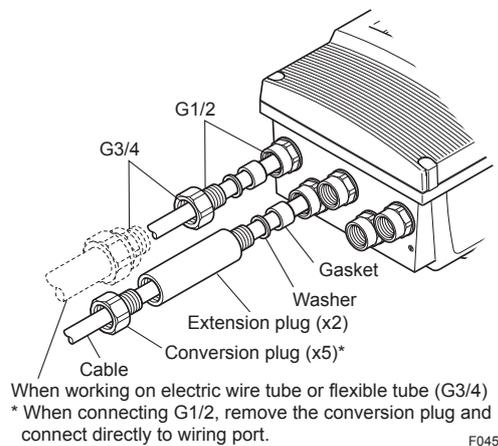


Figure 4.4.4 G3/4 Waterproof Gland (Optional code EW)

(3) Conduit Wiring

When wiring the conduits, pass the conduit through the wiring connection port, and utilize the waterproof gland to prevent water from flowing in. Place the conduit pipe on an angle as shown in Figure 4.4.5. Install a drain valve at the low end of the vertical pipe, and open the valve regularly.

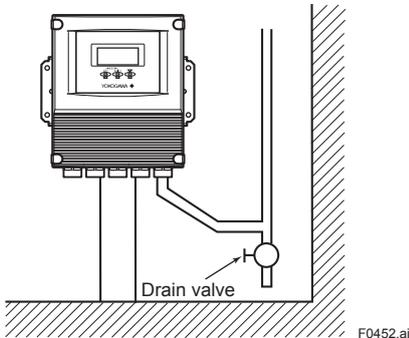
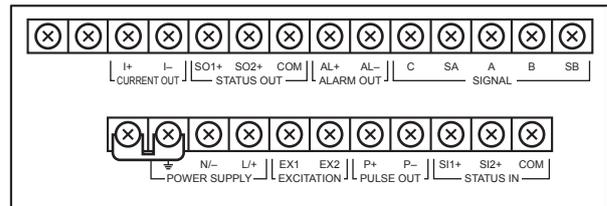
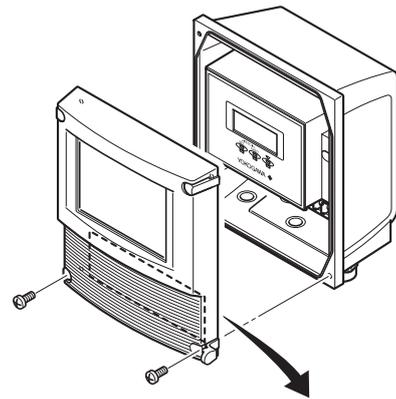


Figure 4.4.5 Conduit Wiring



F0455.ai

Figure 4.4.8 Terminal Configuration Labels position for AXFA11 Remote Converter

4.4.4 Wiring Connections

(1) Removing Cover

While supporting the front of the cover with your hand, flip the connecting screw protective cover over, and remove the four connecting screws.

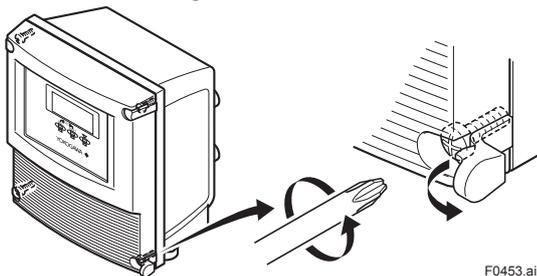
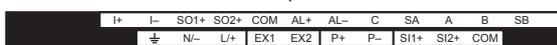
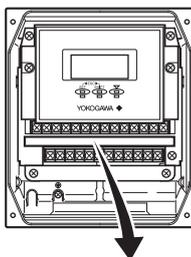


Figure 4.4.6 Removing the Front Cover for AXFA11 Remote Converter

(2) Terminal Configuration

When the cover is removed, the connection terminals will be visible as shown in Figure 4.4.7. The terminal configuration labels are attached in the position shown in Figure 4.4.8. The description of the terminal symbols is shown in Table 4.4.1.



F0454.ai

Figure 4.4.7 Terminal Configuration for AXFA11 Remote Converter

Table 4.4.1 Terminal Symbols for AXFA11 Remote Converter

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



IMPORTANT

Do not wire the terminal without terminal symbols in terminal layout labels.

(3) Precautions for Wiring of Power Supply Cables

When connecting to the power supply, observe the points below. Failure to comply with these warnings may result in an electric shock or damage to the instrument.

WARNING

- Ensure that the power supply is OFF in order to prevent electric shocks.
- Ensure the protective grounding terminal is grounded before turning the power on.
- Use insulating sleeve crimp terminals (for 4-mm screws) for the power supply wiring and protective grounding wiring.
- To prevent electric shocks, ensure the electrical wiring cover (transparent) is attached.
- Install an external switch or circuit breaker as a means to turn the power off (capacitance; 15A, conforming to IEC60947-1 and IEC60947-3). Locate this switch either near the instrument or in other places facilitating easy operation. Affix a “Power Off Equipment” label to this external switch or circuit breaker.

Wiring Procedure for AXFA11

1. Turn the instrument’s power off, and remove the wiring cover (transparent).
2. Wire the power supply cable and the functional grounding cable to the power supply terminals.

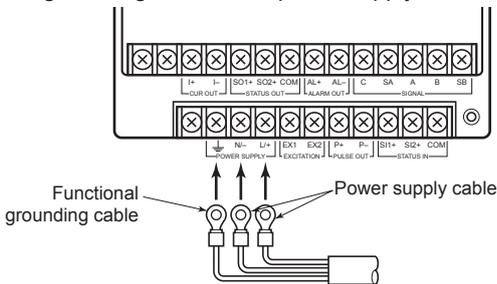


Figure 4.4.9 Electric Cable Wiring for AXFA11 Remote Converter

3. Reattach the electrical wiring cover (transparent).

(4) DC Power Connection

When using DC power as the power supply for the converter, give attention to the following points.

1) Connecting Power Supply

IMPORTANT

Do not connect power supply with reversed polarities.
L/+ terminal: connect +
N/- terminal: connect -

IMPORTANT

Do not connect power supply with 100 to 240 V AC or 100 to 120 V DC in the case of a 24 V power supply version (power supply code 2). It will give a damage to the converter.

2) Required Power Supply Voltages

IMPORTANT

When using a 24 V power supply, the specification for the supply voltage is 24 V (–15% to +20%), but the input voltage of the converter drops due to cable resistance therefore it must be used within the following ranges.

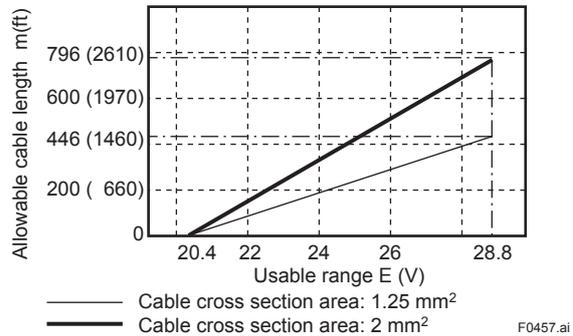


Figure 4.4.10 Supply Voltage and Cable Length for AXFA11 Remote Converter

3) Setting Power Supply Frequency

IMPORTANT

Set the local commercial power frequency in order to eliminate the effect of induction noise from the commercial power supply.

Refer to “Parameter Description” in the user’s manual of the AXFA11G Magnetic Flowmeter Remote Converter [Hardware Edition/ Software Edition] (IM 01E20C01-01E).

Parameter No.: **J30** and **J31**

(5) Grounding

CAUTION

Be sure to connect the protective grounding of the AXFA11 with a cable of 2mm² or larger cross section in order to avoid electrical shock to the operators and maintenance engineers and to prevent the influence of external noise. Connect the grounding wire to the mark ⊕ (100 Ω or less).

IMPORTANT

When optional code A (lightning protector) is selected, the ground should satisfy Class C requirements (grounding resistance, 10 Ω or less).

- The protective grounding terminals ⊕ are located on the inside and outside of the terminal area. Either terminal may be used.
- Use 600 V vinyl insulation wires as the grounding wires.

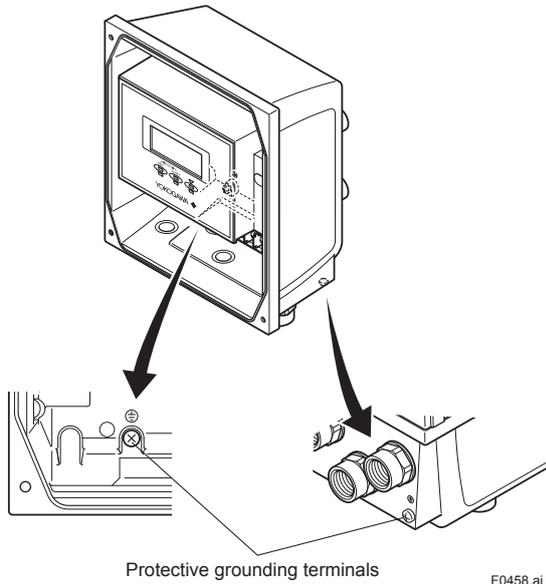


Figure 4.4.11 Protective Grounding Terminal Location for AXFA11 Remote Converter

(6) Connecting to External Instruments

WARNING

Before wiring with external instrument, be sure to turn off the power supply for AXFA11 converter and any external instruments.

Connect the AXFA11 terminal to external instruments, giving attention to the following points.

● 4 to 20 mA DC Current Output

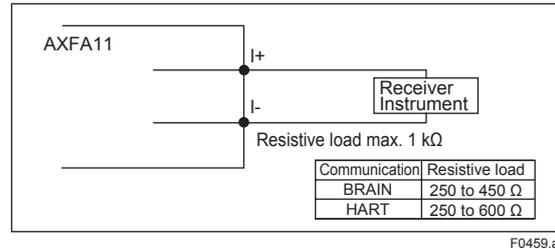


Figure 4.4.12 4 to 20 mA DC Output Connection

● Pulse Output

IMPORTANT

- As this is a transistor contact (insulated type), give attention to proper voltage and polarity when wiring.
- Do not apply a voltage larger than 30V DC or a current larger than 0.2A in order to prevent damage to the instrument.
- When input filter constant of the electronic counter is large in relation to the pulse width, the signal will decrease and the count will not be accurate.
- If the input impedance of the electronic counter is large, an induction noise from the power supply may result in inaccurate counts. Use a shield cable or sufficiently reduce the input impedance of the electronic counter within the electromagnetic flowmeter pulse output specification range.
- The active pulse output (Optional code EM) cannot be used in conjunction with the standard pulse output.
- When the active pulse output (Optional code EM) is selected, do not be short-circuit between the P+ and P- terminals to avoid damaging the instrument.
- When the active pulse output (Optional code EM) is selected, the range of pulse rate must be set to 2 pps maximum.
- To avoid communication (BRAIN/ HART) failure, it is recommended to use the shield cable.

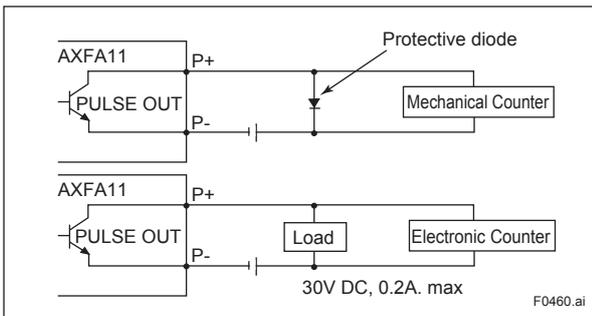


Figure 4.4.13 Pulse Output Connection

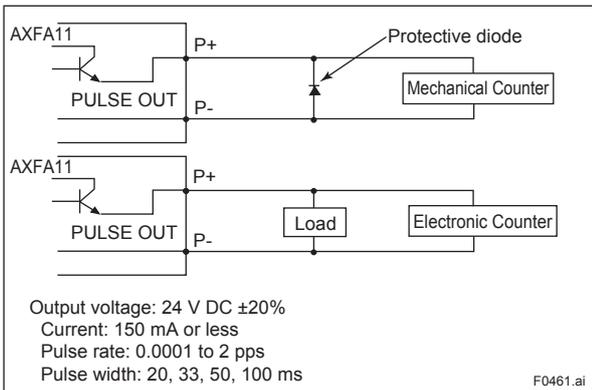


Figure 4.4.14 Active Pulse Output Connection (Optional code EM)

● Status Input



IMPORTANT

Status inputs are designed for use with no-voltage (dry) contacts. Be careful not to connect the status to any signal source carrying voltage. Applying voltage may damage the input circuit.

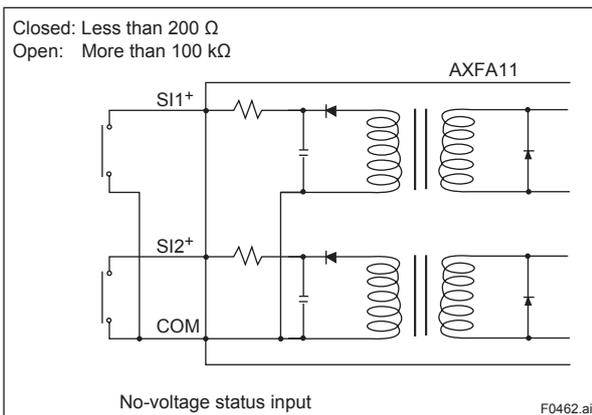


Figure 4.4.15 Status Input Connection

● Status Output / Alarm Output



IMPORTANT

Since this is an isolated transistor output, be careful of voltage and polarity when wiring.

Do not apply a voltage larger than 30V DC or a current larger than 0.2A in order to prevent damage to the instrument.

This output cannot switch an AC load. To switch an AC load, an intermediate relay must be inserted as shown in Figure 4.4.16 or Figure 4.4.17.

*The alarm output operates from closed (normal) to open (alarm occurrence) by factory default setting. Changes can be made via the parameter settings.

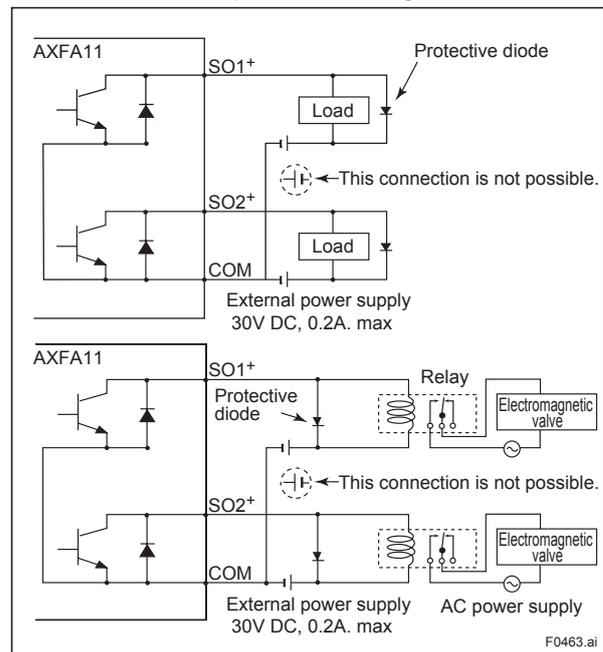


Figure 4.4.16 Status Output Connection

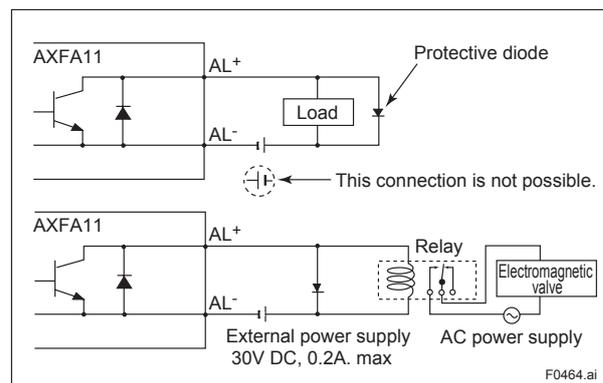


Figure 4.4.17 Alarm Output Connection

5. Basic Operating Procedures

5.1 Operating Procedures Using the Display Unit

The modification of data settings from the display unit can be carried out using the three setting switches (infra-red switches) - namely, the “” “” and “” switches. The infra-red switches enable the user to set parameters without opening the cover.

This chapter will provide a description of basic data configuration and the methods to be used with the three setting switches. This instrument can also be operated using a handheld BRAIN Terminal (BT200) or a HART Configuration tool. (Refer to Section 5.5 for operation via BRAIN Terminal or HART Configuration tool.)



WARNING

Be sure to set parameters as “Protect” on the write protect function after finish of parameter setting work. Under extremely rare case, the infra-red switches may respond unexpectedly in such conditions as sticking ball of water or extraneous substances on the surface of display panel glass according to the principle of infra-red switch operation. Its probability rises in such cases as sticking rain water by storm or other similar situation and washing up work near flowmeter installation place.

Either to illuminate or stop illuminating the infra-red switches by the flashlight may cause the mis-reaction. Refer to Section 6.3 how to use the write protect function in detail.



IMPORTANT

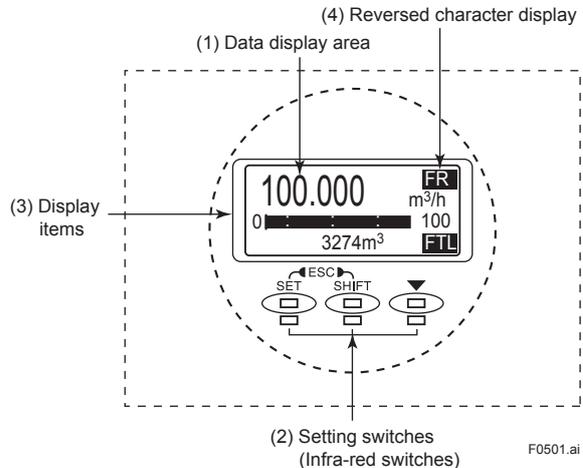
Operate the display unit under the condition where direct sunlight, etc... do not shine to the setting switches directly when the parameter setting operation is carried out.



NOTE

- Always use the setting switches with the cover closed.
- Use these switches with them covered by the glass window.
- If dirt, dust or other substances surfaces on the display panel glass, wipe them clean with a soft dry cloth.
- The operation with dirty gloves may cause a switch response error.

5.2 Operating Panel Configuration and Functions

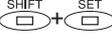


(1) Data display area

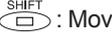
1st line (Display Select1), 2nd line (Display Select2), and 3rd line (Display Select3) can be displayed using parameter settings. The content corresponding to selected item is shown with the reversed-character on the right of the line.

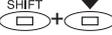
(2) Setting switch operations

 : Move the layer down, select, and confirm

 : Move the layer up (Press the  switch while holding down the  switch)

 : Move the cursor down (for selection-type parameters) or increase values (for numeric-type parameters)

 : Move the cursor to the right (for numeric-type parameters)

 : Move the cursor up (for selection-type parameters)

(3) Display items

○: Display, ×: Not display

Displayed items and reversed-character indication		Content	Disp Select1	Disp Select2 Disp Select3
Instantaneous flow rate: %	FR	Displays the instantaneous flow rate for the span as a percentage.	○	○
Actual instantaneous flow rate	FR	Displays the actual reading for instantaneous flow rate.	○	○
Instantaneous flow rate: mA	FR	Displays the instantaneous flow rate for the span as a current output value.	○	○
Bar graph indicating instantaneous flow rate	None	Displays the instantaneous flow rate for the span as a percentage using bar graph.	×	○
Totalized forward-direction flow rate	FTL	Displays the totalized value for flow rate in the forward direction.	○	○
Totalized reverse-direction flow rate	RTL	Displays the totalized value for flow rate in the reverse direction.	○	○
Totalized differential flow rate	DTL	Displays the differential totalized value for flow rate between forward totalization and reverse totalization.	○	○
Tag number	TAG	Display the tag number (using up to 16 characters).	×	○
Diagnosis of electrode adhesion	ADH	Displays the adhesion condition in the form of a bar graph. (See the description for parameters K10 through K15 from Chapter 8: Parameter Description for more details.)	×	○
Communication type	COM	Displays the communication type.	×	○

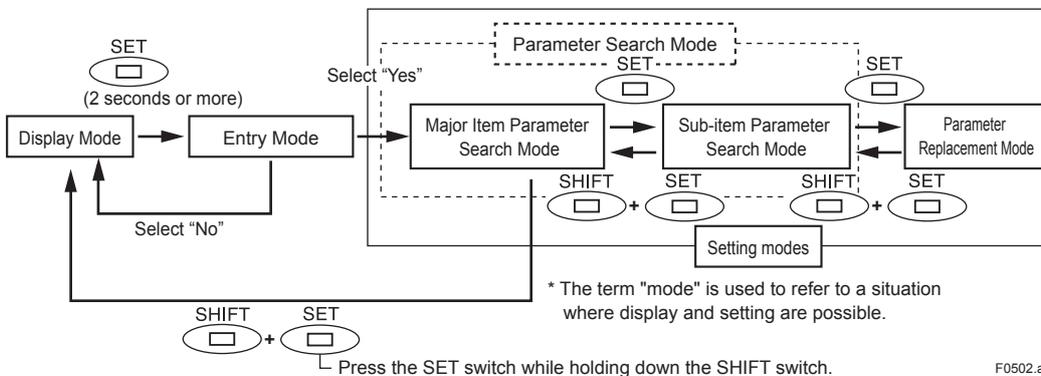
(4) Reversed character display

5.3 Display Unit Setting Methods



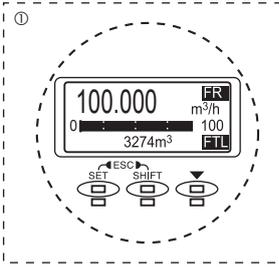
NOTE

This manual shows the confirmation of the set value. In the case of changing setting, refer to "Parameter Description" of user's manual as listed in Table 1.1.



5.3.1 Display Mode → Setting Mode

Display Mode will be adopted when the power is turned on, and the Setting Mode can be activated using the following procedure.

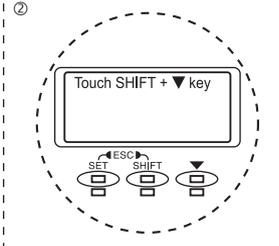


①

1st line: Actual instantaneous flow rate [FR]
 2nd line: Bar graph indicating instantaneous flow rate
 3rd line: Totalized forward flow rate [FTL]

Hold the  switch for 2 seconds. Then, this display is changed to "Entry Mode".

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②

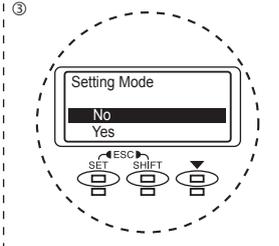
Touch SHIFT +  key

According to the screen, touch  and  switches simultaneously.

F0504.ai

NOTE

- When other operations are carried out, the system will automatically return to the Display Mode. When no operations in this display are carried out for 20 seconds, the system will automatically return to the Display Mode.
- The Major Item Parameter which is set just before will be shown when entering the Setting Mode again within 1 minute after returning from Setting Mode to Display Mode.



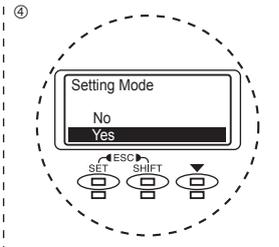
③

A screen is displayed to confirm whether or not the system is to enter Setting Mode.

The reversed-character (i.e. the cursor position) indicates the item that is currently selected.

Press the  switch and select [Yes].

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④

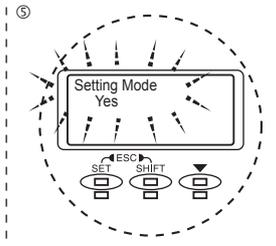
When [Yes] has been selected, touch the  switch.

F0506.ai

NOTE

When the operations except  and  switches are carried out, the system will automatically return to the Display Mode.

When no operations in this display are carried out for 20 seconds, the system will automatically return to the Display Mode.



⑤

In order to request confirmation, the entire display flashes on and off.

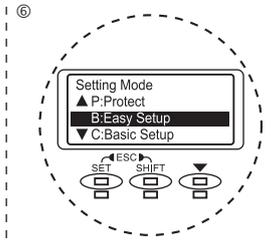
Touch the  switch once again at this time to fix your selection.

F0507.ai

NOTE

When no operations in the flashed display are carried out for 20 seconds, the system will automatically return to the Display Mode.

When the operations except  switch are carried out, the system will automatically return to the Display Mode.



⑥

The system enters Setting Mode. Parameters to be set can be selected.

F0508.ai

This completes the procedure for changing from the Display Mode to the Parameter Search Mode.

5.3.2 Setting Mode

When the Setting Mode has been activated using the procedure from Section 5.3.1, parameters can be selected for setting.

NOTE

If no operations are carried out for a period of 10 minutes in Setting Mode, the system will automatically return to the Display Mode.

Format for Parameter Data

Depending on the type of parameter, data is formatted in one of the following three ways.

Format	Typical display	Content
(i) Selection-type	<p>F0509.ai</p>	The desired data item is selected from a predefined list.
(ii) Numeric-type	<p>F0510.ai</p>	Data is set using the values in each digit and using the decimal point.
(iii) Alphanumeric-type	<p>F0511.ai</p>	Data is composed using alphanumeric characters (in the case of tag numbers, special units, and the like). With this format, setting can be carried out using up to 16 characters shown below.

Regarding the alphanumeric-type format (iii), the following alphanumerics are displayed in the following sequence:

#%&*+-. / 0123456789:<> ABCDEFGHIJKLMNOPQRST
UVWXYZ abcdefghij klmnopqrstuvwxy z[space]

5.4 Parameter Setting Procedure

Usually the parameters necessary for basic operation is set according to the specified values when ordering. However, if parameters relating to flow span have not been set, see the following procedure.

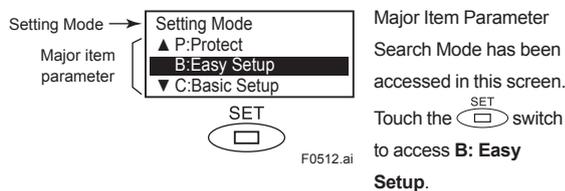
When changing other parameter values, refer to “Parameter Description” of relevant user’s manual from Table 1.1.

For overviewing the parameters, refer to Chapter 8.

5.4.1 Setting Example for Selection-Type Data: Flow rate units

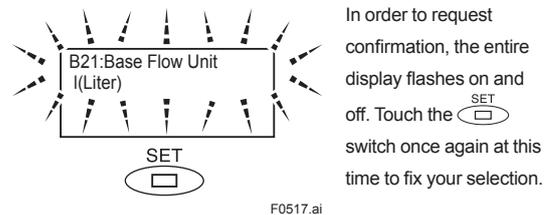
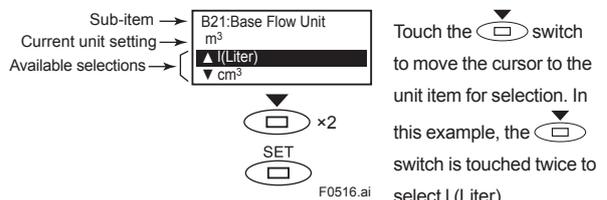
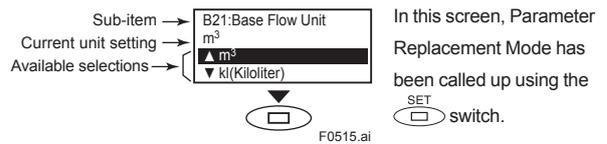
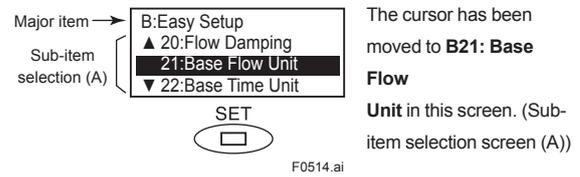
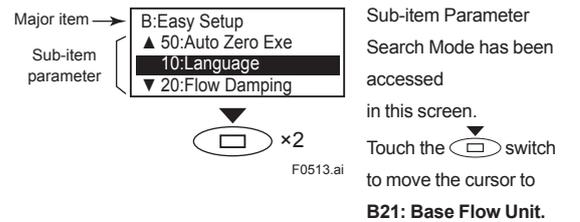
This example describes the setting of the flow rate units for the selection-type parameter **B21: Base Flow Unit** from m³ to l (Liter).

Now, the system is in the Setting Mode. Parameters to be set can be selected.



NOTE

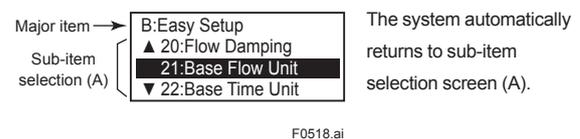
The ▲ and ▼ symbols to the left of the parameters indicate that additional setting items to those being currently displayed may also be selected. Use the SET switch to cycle through these items.



NOTE

When no operations are carried out for 20 seconds in the flashing state, the system will automatically return to the Sub-item Parameter Search Mode.

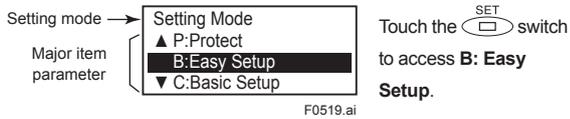
When the operations except SET switch are carried out, the parameter cannot be set.



5.4.2 Setting Example for Numeric-Type Data: Flow rate span

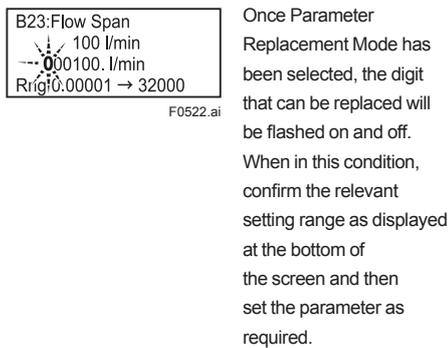
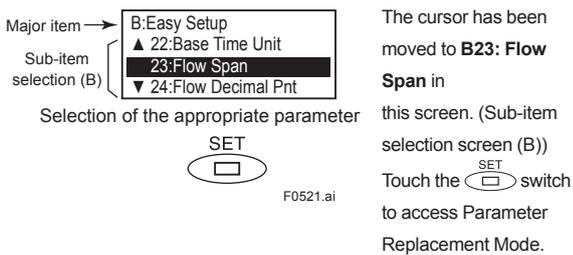
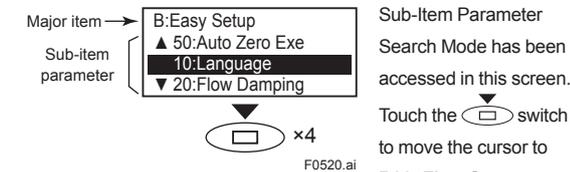
This example describes the setting of the flow rate span for the numeric-type parameter **B23: Flow Span** from 100 l/min to 120 l/min.

Now, the system is in the Setting Mode. Parameters to be set can be selected.

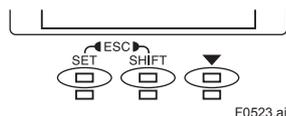


NOTE

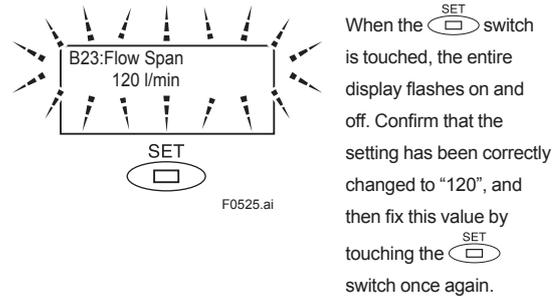
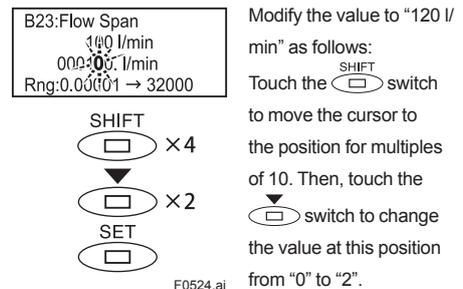
The ▲ and ▼ symbols to the left of the parameters indicate that additional setting items to those being currently displayed may also be selected. Use the switch to cycle through these items.



NOTE



When setting a new value, use the switch to move from digit to digit, and use the switch to cycle through values for each individual digit. In addition to digit, it is also possible to select a decimal point, and this allows the position of the decimal point to be changed.

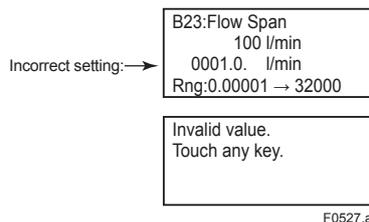


NOTE

When no operations are carried out for 20 seconds in the flashing state, the system will automatically return to the Sub-item Parameter Search Mode. When the operations switch except are carried out, the parameter cannot be set.



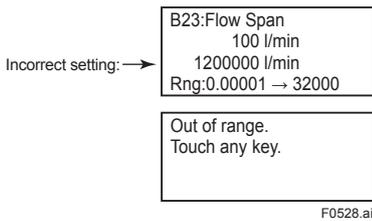
NOTE



If the input value is outside the valid selection range, the message "Out of range. Touch any key." will be displayed. In such a case, touch any switch to return to Parameter Replacement Mode and redo the setting.



NOTE



If more than one decimal point has been input, the message “Invalid value. Touch any key.” will be displayed. In such a case, touch any switch to return to Parameter Replacement Mode and redo the setting.

5.5 BRAIN / HART Connection

5.5.1 Connecting the BT200

The connection for a BRAIN Terminal (BT200) is shown as below.
 Refer to its manual (IM 01C00A11-01E) for the operation of the BT200.

The communication signal of the AXF is superimposed onto the 4 to 20mA DC analog signals to be transmitted. The communication can be done through the BT200 set at any point between the 4 to 20 mA DC signal terminals of magnetic flowmeter and the input terminals of receiving instruments.

Working as a master, the BT200 Permits:

1. Setting and changing parameters for the magnetic flowmeter
2. Monitoring PV and MV values and self-check information on the magnetic flowmeter, and
3. Directing the magnetic flowmeter to enter the constant current output mode.

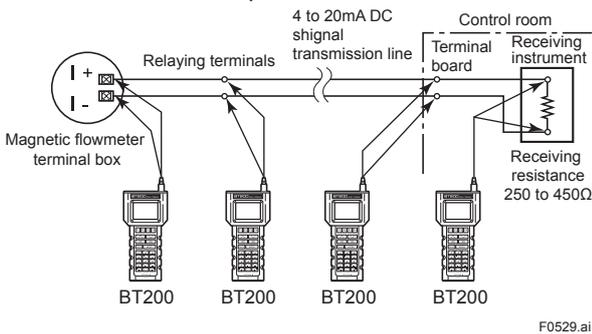


Figure 5.5.1 Connecting the BT200



IMPORTANT

Communication signal is superimposed on analog output signal. It is recommended to set a low-pass filter (approximately 0.1s) to the receiver in order to reduce the output effect from communication signal. Before online-communication, confirm that communication signal does not give effect on the upper system.



IMPORTANT

Restrictions exist with regard to the distance over which communication is possible.
 Refer to “OUTLINE” of the appropriate manual which can be downloaded from our website.



IMPORTANT

If the power of flowmeter is turned off within 30 seconds after parameters have been set, these settings will be canceled. Accordingly, keep the power on for at least 30 seconds after setting parameters.



IMPORTANT

After approximately 5 minutes of inactivity, the Auto Power-Off function will operate to turn your BT200 off.



NOTE

In case of BT200, the parameters are displayed in English only.
 Even if the language with the exception of English is selected at B10/H30: Language, the parameters are displayed in English upon BT200.

5.5.2 Connecting the HART Configuration Tool

The HART Configuration Tool can interface with the magnetic flowmeter from the control room, the magnetic flowmeter site, or any other wiring termination point in the loop, provided there is a minimum load resistance of 250 Ω between the connection and the receiving instrument. To communicate, it must be connected in parallel with the magnetic flowmeter, and the connections must be non-polarized. Figure 5.5.2 illustrates the wiring connections for a direct interface at the magnetic flowmeter site. The HART Configuration Tool can be used for remote access from any terminal strip as well.

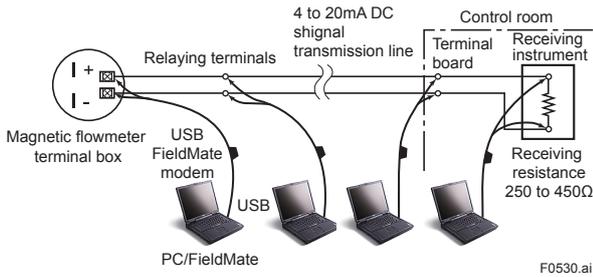


Figure 5.5.2 Connecting the HART Configuration Tool



NOTE

Before updating any setting, remember to always check the data content you want to change as described in Chapter 8.

For details, refer to “Parameter Description” of the appropriate manual which can be downloaded from our website.



NOTE

In case of HART Configuration, the parameters are displayed in English only.

Even if the language with the exception of English is selected at “Language” setting display, the parameters are displayed in English upon HART Configuration Tool.



WARNING

Be sure to set parameters as “Protect” on the write protect function after finish of parameter setting work. Under extremely rare case, the infra-red switches may respond unexpectedly in such conditions as sticking ball of water or extraneous substances on the surface of display panel glass according to the principle of infra-red switch operation.

Its probability rises in such cases as sticking rain water by storm or other similar situation and washing up work near flowmeter installation place.

Either to illuminate or stop illuminating the infra-red switches by the flashlight may cause the mis-reaction. For details, refer to “Parameter Description” of the appropriate manual which can be downloaded from our website.



IMPORTANT

- Restrictions exist with regard to the distance over which communication is possible. Refer to “OUTLINE” of the appropriate manual which can be downloaded from our website.
- If the power of magnetic flowmeter is turned off within 30 seconds after parameters have been set, these settings will be canceled. Accordingly, keep the power on for at least 30 seconds after setting parameters.

6. Operation

After you have installed the flowtube into the process piping, wired the input/output terminals, set up the required parameters, and performed a pre-operation zero adjustment, the magnetic flowmeter should output an accurate flow signal from its terminals as soon as flow of the fluid to be measured begins. This section describes zero adjustment and the corresponding procedures.

6.1 Pre-operation Zero Adjustment

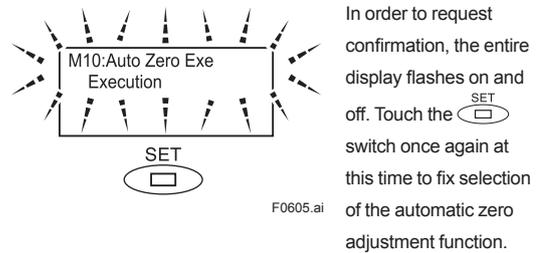
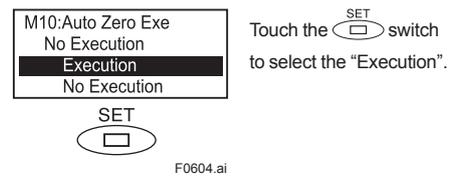
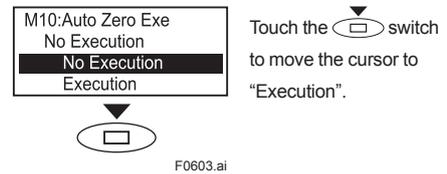
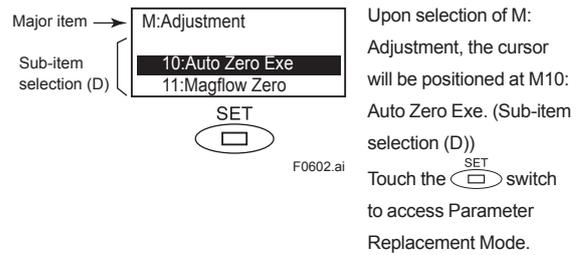
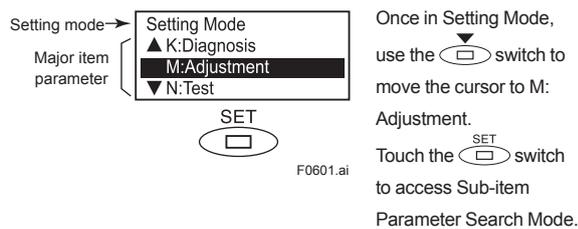
Zero adjustment is carried out to ensure that the output for zero flow is 0% (i.e., 4 mA). Although adjustment to zero is performed at the manufacturing plant prior to shipment, this procedure must be carried out once again following the installation of piping in order to match the magnetic flowmeter to its operating conditions. This section describes the zero adjustment procedure using display unit switches from the converter. Also, it can be operated using the BT200 Handheld Terminal. Accordingly, one of these methods should be selected and implemented.

IMPORTANT

- Zero adjustment should be carried out before actual operation. Note that setting and update functions cannot be carried out during this procedure (i.e., for approximately 30 seconds).
- Zero adjustment should only be carried out when the flowtube has been filled with measurement fluid and the fluid velocity is completely zero by closing the valve.
- Each time that the fluid being measured is changed, it will be necessary for zero adjustment to be carried out for the new fluid.

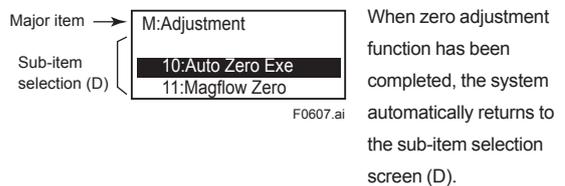
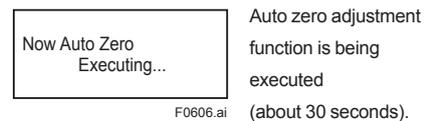
6.2 Zero Adjustment Using Display Unit Switches

The parameters for zero adjustment are B50/M10: Auto Zero Exe (and either of these can be used to carry out this procedure). The parameter M10: Auto Zero Exe will be used in the following description.



NOTE

When no operations are carried out for 20 seconds in the flashing state, the system will automatically return to the Sub-item Parameter Search Mode. When the operations except SET switch are carried out, the parameter cannot be set.



NOTE

The results of "M10: Auto Zero Exe" can be displayed using "M11: Magflow Zero". Alternatively, if the results of the automatic zero adjustment exceed the rated value, the warning "82: Auto Zero" Wng will be displayed.

6.3 Write Protect Switch

By setting the write protect function to "Protect" it is possible to prevent the overwriting of parameters. Write protection can be carried out using either the hardware switch on the CPU board (i.e., Switch 2) (See Figure 6.3.2) or software parameter settings. If either of these items is set to "Protect," the overwriting of parameters will be prohibited.



NOTE

- If the hardware switch is set to "Protect," it will not be possible to overwrite parameters; furthermore, this condition will be maintained until the switch is set to "Enable."
- In the case of fieldbus communication type, setting of the hardware switch (Enable or Protect) is ineffective and write protection can be carried out only by software parameter settings.

For more details regarding usage of the write protect function and the software's parameter switches, refer to "Parameter Description" of the appropriate manual which can be downloaded from our website.

6.3.1 Setting Hardware Switch of Integral Magnetic Flowmeter or AXFA14 Remote Converter



IMPORTANT

To preserve the safety, do not touch the electrical circuit and the cables except the setting switches.

- (1) Turn off the power.
- (2) Loosen cover locking screw 1 clockwise using a hexagonal wrench (nominal size 3) to unlock the cover. (Upon shipment from the manufacturing plant, the cover is locked.) Hold the flowmeter with your hand and remove the cover by turning it in the direction of the arrow as shown below.

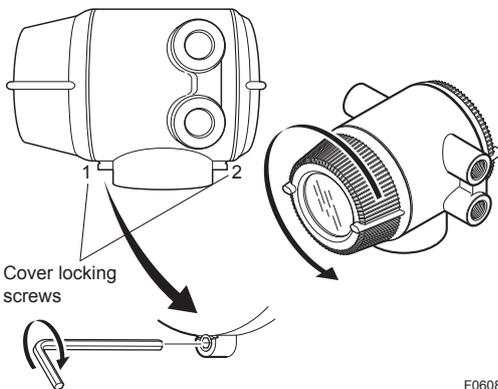


Figure 6.3.1 Removing the Display Cover for Integral Flowmeter and AXFA14 Remote Converter

- (3) Set the switches. There are two switches (See Figure 6.3.2). One is for burnout setting and the other for write protect setting, located adjacent to each other.
- (4) Taking care not to entangle the cables, install the cover to the flowmeter by turning it in the backward direction of the arrow as shown Figure 6.3.1.
- (5) Tighten cover locking screw 1 counterclockwise using a hexagonal wrench (nominal size 3) to lock the cover.

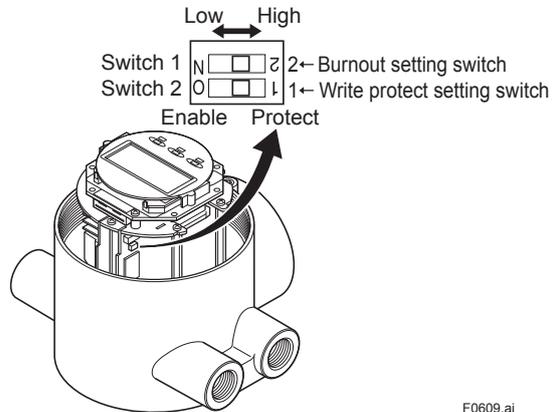


Figure 6.3.2 Switch Configuration for Integral Flowmeter and AXFA14 Remote Converter



NOTE

On the amplifier's CPU board, the burnout setting switch (i.e., Switch 1) and the write protect switch (i.e., Switch 2) are located adjacent to each other. Accordingly, special care should be taken when making switch settings.

6.3.2 Setting Hardware Switch of AXFA11 Remote Converter



IMPORTANT

To preserve the safety, do not touch the electrical circuit and the cables except the setting switches.

- (1) Turn off the power.
- (2) While supporting the front of the cover with your hand, flip the connecting screw protective cover over, and remove the four connecting screws.
- (3) Loosen the amplifier assembly's two screws while supporting it with your hand (See Figure 6.3.3).

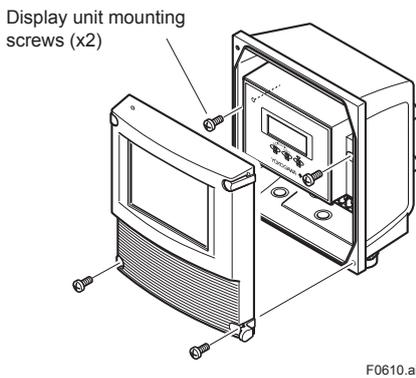


Figure 6.3.3 Removing the Front Cover and Mounting Screws of Display Unit for AXFA11 Remote Converter

- (4) Lift the display unit (See Figure 6.3.4).
At this time, do not remove the connector.

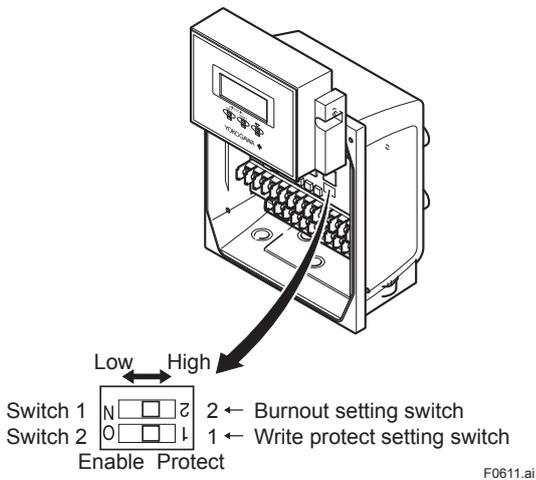


Figure 6.3.4 Switch Configuration for AXFA11 Remote Converter

- (5) Set the switches. There are two switches (See Figure 6.3.4). One is for burnout setting and the other for write protect setting, located adjacent to each other.
- (6) Taking care not to entangle the cables, install the display unit with two mounting screws.
- (7) Install the cover.



NOTE

On the amplifier's CPU board, the burnout setting switch (i.e., Switch 1) and the write protect switch (i.e., Switch 2) are located adjacent to each other. Accordingly, special care should be taken when making switch settings.

7. Errors and Countermeasures for Display unit and BRAIN protocol



NOTE

For FOUNDATION fieldbus protocol, refer to IM 01E20F02-01E. For PROFIBUS PA protocol, refer to IM 01E20F12-01E. For HART protocol, refer to the applicable user's manuals which can be downloaded from our website.

The table below shows a summary of error messages for Display unit and BRAIN protocols.

Note: □:Alphabet

System Alarms (Device breakdown or inability to obtain correct measurements.)			
Display unit/BRAIN (□60) content	Alarm countermeasure message on display unit	Alarm description	Countermeasure
10:uP Fault	Contact nearest office or service center	Microprocessor (CPU) failure	Contact your nearest Yokogawa office or service center.
11:EEPROM Fault	Contact nearest office or service center	EEPROM failure	
12:A/D(H) Fault	Contact nearest office or service center	A/D converter failure	
13:A/D(L) Fault	Contact nearest office or service center		
14:A/D(Z) Fault	Contact nearest office or service center		
15:Coil Open	Cut the power and check coil & EX cable	Flowtube coil is open-circuit	Turn off the AXFA11 or the AXFA14 power supply and examine the excitation cable for breakage. If there is no breakage, contact your nearest Yokogawa office or service center.
16:EEPROM Dflt	Contact nearest office or service center	EEPROM default values	Contact your nearest Yokogawa office or service center.

Process Alarms (Device is normal but process-related errors make correct measurement impossible.)			
Display unit/BRAIN (□60) content	Alarm countermeasure message on display unit	Alarm description	Countermeasure
30:Sig Overflow	Check signal cable and grounding	Input signal error	Carry out an investigation as follows: <ul style="list-style-type: none"> • Check the signal cable for breakage. • Check for contact between signal cable, power cable, and excitation cable. • Check for stray currents in the fluid. Check the grounding.
31:Empty Pipe	Fill flow tube with fluid	Flowtube is not filled with fluid	Fill the flowtube with fluid.
32:HH/LLAlm	Check flow rate and setting value	Flow rate alarm for greater than High-High limit value or less than Low-Low limit value.	Check the flow rate and setting value of High High limit and Low Low limit.
33:Adhesion Alm	Clean electrodes	Electrode adhesion alarm	Clean the electrodes.

Setting Alarms (Device is normal but errors have been made in the setting of parameters.)			
Display unit/BRAIN (□60) content	Alarm countermeasure message on display unit	Alarm description	Countermeasure
50:Span > 10m/s	Check parameter C40, C41, and C42	Span flow velocity setting is 11 m/s or more	Check whether parameters C40, C41, and C42 are correct. In case that multiple range or forward and reverse flow measurement functions is used, check whether parameters F30 through F34 {F36} are correct.
51:Span < 0.1m/s	Check parameter C40, C41, and C42	Span flow velocity setting is 0.05 m/s or less	Check whether parameters F30 through F34 {F36} are correct.
52:TTL>10000p/s	Check parameter D10 and D11	Totalization rate is 11000 pps or more	Check whether parameters D10 and D11 are correct.
53:TTL<0.0001p/s	Check parameter D10 and D11	Totalization rate is 0.00005 pps or less	Check whether parameters D10 and D11 are correct.
54:4-20 Lmt Err	Check parameter J11 and J12	The condition [4-20 low limit (J11) < 4-20 high limit (J12)] is not satisfied.	Check whether parameters J11 and J12 are correct.
55:Multi Rng Err	Check parameter F30 to F34 {F36}	The condition [No. 1 range < No. 2 range < No. 3 range < No. 4 range] is not satisfied for multiple ranges.	Check whether parameters F30 through F34 {F36} are correct.
56:H/L HH/LL Set	Check parameter G10 to G14	The condition [High Alarm (G11) – Low Alarm (G10) > H/L Alarm Hys (G14)] or the condition [High High Alarm (G13) – Low Low Alarm (G12) > H/L Alarm Hys (G14)] is not satisfied.	Check whether parameters G10 through G14 are correct.
57:Dens Set Err	Check parameter C40, C45, and C46	Mass units have been selected for Base Flow Unit (C40) but density is set to 0.	Check whether parameters C40, C45, and C46 are correct.
60:PLS > 10000p/s	Check parameter E10, E11, and E12	Pulse rate is 11000 pps or more with 50% duty selection. Pulse rate is 10000 pps or more with 0.05 ms selection.	Check whether parameters E10, E11, and E12 are correct.
61:PLS > 5000p/s	Check parameter E10, E11, and E12	Pulse rate is 5000 pps or more with 0.1 ms selection.	
62:PLS > 1000p/s	Check parameter E10, E11, and E12	Pulse rate is 1000 pps or more with 0.5 ms selection.	
63:PLS > 500p/s	Check parameter E10, E11, and E12	Pulse rate is 500 pps or more with 1 ms selection.	
64:PLS > 25p/s	Check parameter E10, E11, and E12	Pulse rate is 25 pps or more with 20 ms selection.	
65:PLS > 15p/s	Check parameter E10, E11, and E12	Pulse rate is 15 pps or more with 33 ms selection.	
66:PLS > 10p/s	Check parameter E10, E11, and E12	Pulse rate is 10 pps or more with 50 ms selection.	
67:PLS > 5p/s	Check parameter E10, E11, and E12	Pulse rate is 5 pps or more with 100 ms selection.	
70:PLS<0.0001p/s	Check parameter E10, E11, and E12	Pulse rate is 0.00005 pps or less.	
71:Meas Mod Set	Check parameter C20	Measure Mode (C20) is set to Enhanced DF without selecting an optional code HF1 or HF2.	Check whether parameter C20 is correct.
72: Size Set Err	Check parameter C32	A value of 3000.1 mm or more is set for Nominal Size (C32).	Check whether parameter C32 is correct.
73: Adh Set Err	Check parameter K11 to K14	The condition in Adhesion detection level, Level:1<Level:2<Level:3<Level:4 is not satisfied.	Check whether parameters K11, K12, K13 and K14 are correct.
80:Adhesion Wng	–	Slight adhesion to electrodes.	Clean and check the electrodes. Refer to parameter K13.
82:Auto Zero Wng	–	Results of automatic zero adjustment are higher than the rated values.	Carry out adjustment as follows: • Check if the flowtube is filled with fluid. • Check if the flow velocity is completely zero. • Check the condition of grounding.
83:Fix Cur Wng	–	The current value is fixed.	Confirm whether the flow rate is in excess of the upper limit (108%) or below the lower limit (-8%), or whether upon entry to the Test Mode or not.
84:Disp Over Wng	–	Overflow in the display digits during instantaneous flow rate display.	Check whether parameter C43 is correct.
90:Disp SW Wng (only for display unit)	–	Display unit switches are not operating.	Investigate whether the display unit cover is fitted or whether the cover's glass surface is dirty.

Note: In case of the AXFA11 Remote Converter, parameter number is values in brackets { }.

8. Parameter Summary



NOTE

For FOUNDATION fieldbus protocol, refer to IM 01E20F02-01E. For PROFIBUS PA protocol, refer to IM 01E20F12-01E. For HART protocol, refer to the applicable user's manuals which can be downloaded from our website.



IMPORTANT

Make sure to keep the instrument's power on at least for 30 seconds after you set the parameters. If you turn the power off immediately after the parameters are set, the settings will be canceled.

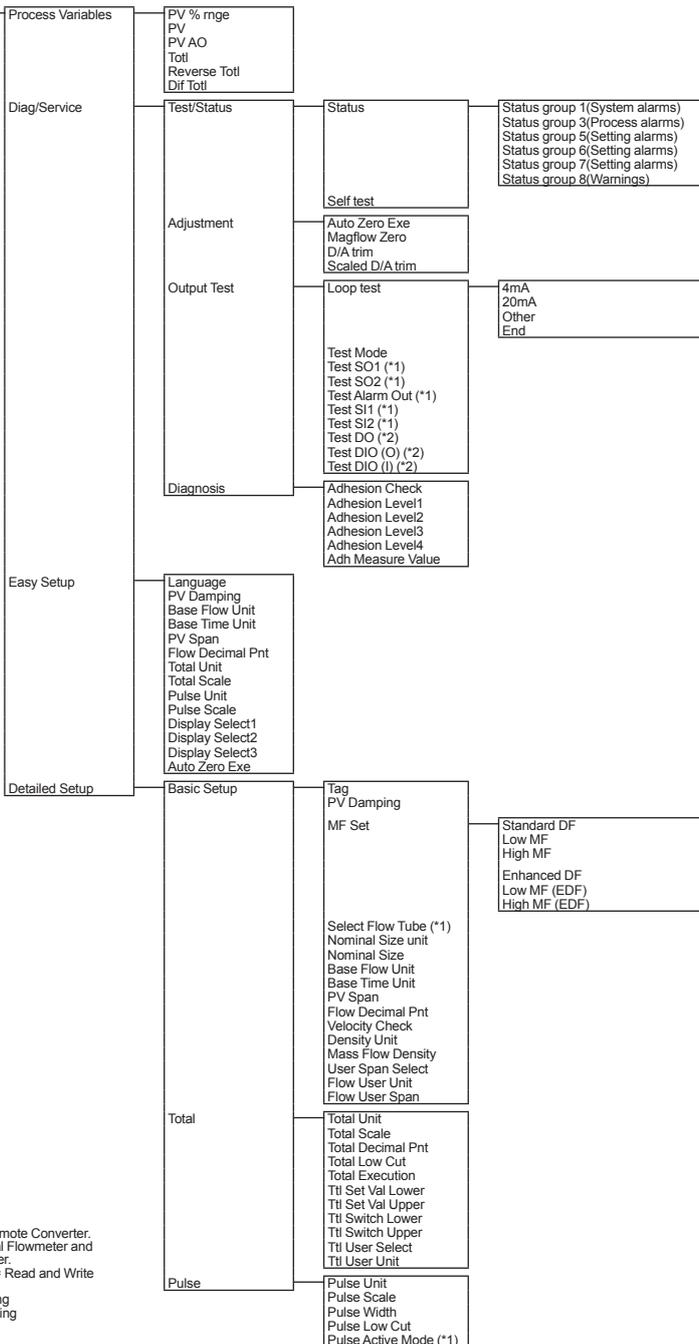
8.1 Menu tree for DD (HART 5)

Offline menu

- New Configuration
- Saved Configuration

Online menu

- Device setup
- PV
- PV AO
- PV Span



R/W (*3)	Parameter No. (BRAIN protocol)	Data (*4)
R	A10	P
R	A20	P
R	A21	P
R	A30	P
R	A31	P
R	A32	P
R		-
R		-
R	See Chapter 7	-
R		-
R		-
W	-	-
W	M10/B50	-
R/W	M11	-
W	-	-
W	-	-
W	-	-
W	-	-
W	-	-
W	N10	-
W	N20	-
W	N21	-
W	N22	-
R	N23	P
R	N24	P
W	N30	-
W	N31	-
R	N32	P
W	K10	-
W	K11	-
W	K12	-
W	K13	-
W	K14	-
R	K15	-
W	B10/H30	u/d
W	B20/C11	u/d
W	B21/C40	u/d
W	B22/C41	u/d
W	B23/C42	u/d
W	B24/C43	u/d
W	B30/D10	u/d
W	B31/D11	u/d
W	B32/E10	u/d
W	B33/E11	u/d
W	B40/H10	u/d
W	B41/H11	u/d
W	B42/H12	u/d
W	B50/M10	-
W	C10	u/d
W	C11/B20	u/d
W	C20	-
W	C21	-
W	C22	-
W	C20	-
W	C23	-
W	C24	-
W	C30	-
W	C31	u/d
W	C32	u/d
W	C40/B21	u/d
W	C41/B22	u/d
W	C42/B23	u/d
W	C43/B24	u/d
R	C44	P
W	C45	u/d
W	C46	u/d
W	C47	u/d
W	C48	u/d
W	C49	u/d
W	D10/B30	u/d
W	D11/B31	u/d
W	D12	u/d
W	D13	u/d
W	D20	u/d
W	D21	u/d
W	D22	u/d
W	D23	u/d
W	D24	u/d
W	D30	u/d
W	D31	u/d
W	E10/B32	u/d
W	E11/B33	u/d
W	E12	u/d
W	E13	u/d
W	E20	u/d

*1 : Applicable for AXFA11 Remote Converter.
 *2 : Applicable for AXF Integral Flowmeter and AXFA14 Remote Converter.
 *3 : R/W : R = Read only, W = Read and Write
 *4 : Data Renewing
 P : Periodic Data Renewing
 u/d : Discretionary Renewing
 - : Others (Method etc...)

(continued on next page)

8.2 Parameter List (BRAIN)

Item	Name	R/W (*3)	Data range	Units	Position of decimal point	Default value (*): Indicated item	Description
	Display unit (BRAIN)		Display unit/BRAIN				
A00	Display (DISPLAY)						
A10	FR (FLOW RATE (%))	R	-110.0 to 110.0	%	1		For Display Mode only
A20	FR (FLOW RATE)	R	-999999 to 999999	B21/B22 (C40/C41)	0 to 3		For Display Mode only
A21	FR (FLW RATE (mA))	R	2.400 to 21.600	mA	3		For Display Mode only
A30	FTL (TOTAL)	R	0 to 99999999	B30 (D10)	0 to 7		For Display Mode only
A31	RTL (REV TOTAL)	R	0 to 99999999	B30 (D10)	0 to 7		For Display Mode only
A32	DTL (DIF TOTAL)	R	-99999999 to 99999999	B30 (D10)	0 to 7		For Display Mode only
A60	— (SELF CHECK)	R	Good Error				See Chapter 7.
B00	Easy Setup (EASY SETUP)						
B10	Language (LANGUAGE)	W	English Japanese French German Italian Spanish			English	Selects the language used for the display unit. Linked with H30.
B20	Flow Damping (FLOW DAMPING)	W	0.1 to 200.0	s	1	3.0 s	Sets damping time. Linked with C11.
B21	Base Flow Unit (FLOW UNIT)	W	Ml(Megaliter) m ³ kl (Kiloliter) l (Liter) cm ³ m t kg g kcf cf mcf Mgal (US) kgal (US) gal (US) mgal (US) kbbbl (US Oil) bbbl (US Oil) mbbl (US Oil) ubbl (US Oil) kbbbl (US Beer) bbbl (US Beer) mbbl (US Beer) ubbl (US Beer) ft klb (US) lb (US)			m (*)	Selects flow units for the flow rate span. Linked with C40.
B22	Base Time Unit (TIME UNIT)	W	/d /h /min /s			/s (*)	Selects time units for the flow rate span. Linked with C41.
B23	Flow Span (FLOW SPAN)	W	0.0001 to 32000	B21/B22 (C40/C41)	0 to 4	1 m/s (*)	Sets flow rate span (with units from B21 and B22). Linked with C42.
B24	Flow Decimal Pnt (FLOW DECIMAL)	W	Auto 0 1 2 3			Auto (*)	Selects decimal point position for the display unit's instantaneous flow rate. Linked with C43.
B30	Total Unit (TOTAL UNIT)	W	n Unit/P u Unit/P m Unit/P Unit/P k Unit/P M Unit/P Pulse/s			Pulse/s (*)	Selects the flow rate unit per one pulse as used for totalization display. Linked with D10.
B31	Total Scale (TOTAL SCALE)	W	0 to 32000	B30 (D10)	0 to 4	0 (*)	Sets the flow rate per one pulse for the totalization display. Linked with D11.

*3: R/W: R = Read only, W = Read and Write

Item	Name	R/W (*3)	Data range	Units	Position of decimal point	Default value (*): Indicated item	Description
	Display unit (BRAIN)		Display unit/BRAIN				
B32	Pulse Unit (PULSE UNIT)	W	n Unit/P u Unit/P m Unit/P Unit/P k Unit/P M Unit/P Pulse/s			Pulse/s (*)	Selects the flow rate unit per one pulse as used for pulse output. Linked with E10.
B33	Pulse Scale (PULSE SCALE)	W	0 to 32000	B32 (E10)	0 to 4	0 (*)	Sets the flow rate per one pulse as used for pulse output. Linked with E11.
B40	Display Select1 (DISP SELECT1)	W	Flow Rate(%) Flow Rate Flow Rate(mA) Forward Total Reverse Total Dif Total			Flow Rate	Selects content of the first line for Display Mode. Linked with H10.
B41	Display Select2 (DISP SELECT2)	W	Off Flow Rate(%) Flow Rate Flow Rate(mA) Flow Rate(Bar) Forward Total Reverse Total Dif Total Tag No Adhesion Check Communication			Off	Selects content of the second line for Display Mode. Linked with H11.
B42	Display Select3 (DISP SELECT3)	W	Same as B41 (Display Select2)			Off	Selects content of the third line for Display Mode. Linked with H12.
B50	Auto Zero Exe (AUTOZERO EXE)	W	No Execution Execution			No Execution	Selects whether or not automatic zero adjustment is carried out. Linked with M10.
B60	— (SELF CHECK)	R	Good Error				See Chapter 7.
C00	Basic Setup (BASIC SETUP)						
C10	Tag No (TAG NO)	W	ASCII 16 characters				Sets Tag number up to 16 characters.
C11	Flow Damping (FLOW DAMPING)	W	0.1 to 200.0	s	1	3.0 s	Sets damping time. Linked with B20.
C20	Measure Mode (MEASURE MODE)	W	Standard DF Enhanced DF			Standard DF	Selects measurement mode for dual frequency excitation
C21	Low MF (LOW MF)	W	0.0100 to 3.0000		4	1.0000 (*)	Sets low-frequency meter factor for standard dual frequency excitation
C22	High MF (HIGH MF)	W	0.0100 to 3.0000		4	1.0000 (*)	Sets high-frequency meter factor for standard dual frequency excitation
C23	Low MF(EDF) (LOW MF(EDF))	W	0.0000 to 3.0000		4	1.0000 (*)	Sets low-frequency meter factor for enhanced dual frequency excitation
C24	High MF(EDF) (HIGH MF(EDF))	W	0.0000 to 3.0000		4	1.0000 (*)	Sets high-frequency meter factor for enhanced dual frequency excitation
C30 (*1)	Select Flow Tube (FLOW TUBE)	W	ADMAG AXF ADMAG ADMAG AE ADMAG SE YEW MAG Calibrator Other			ADMAG AXF	Selects the flowtube's model name. Note: Select "ADMAG AXF" for ADMAG AXW flowtube.
C31	Nominal Size Unit (SIZE UNIT)	W	mm inch			mm inch	Selects the nominal size units for the flowtube.
C32	Nominal Size (NOMINAL SIZE)	W	0.99 to 3000.1 0.01 to 120.1	mm inch	0 to 2	100 (*)	Sets flowtube nominal size in selected unit at C31.

*1: Applicable for AXFA11 Remote Converter.

*3: R/W: R = Read only, W = Read and Write

Item	Name	R/W (*3)	Data range	Units	Position of decimal point	Default value (*): Indicated item	Description
	Display unit (BRAIN)		Display unit/BRAIN				
C40	Base Flow Unit (FLOW UNIT)	W	Ml(Megaliter) m ³ kl(Kiloliter) l(Liter) cm ³ m t kg g kcf cf mcf Mgal (US) kgal (US) gal (US) mgal (US) kbbbl (US Oil) bbbl (US Oil) mbbl (US Oil) ubbl (US Oil) kbbbl (US Beer) bbbl (US Beer) mbbl (US Beer) ubbl (US Beer) ft klb (US) lb (US)			m (*)	Selects flow units for the flow rate span. Linked with B21.
C41	Base Time Unit (TIME UNIT)	W	/d /h /min /s			/s (*)	Selects time units for the flow rate span. Linked with B22.
C42	Flow Span (FLOW SPAN)	W	0.0001 to 32000	C40/C41 (B21/B22)	0 to 4	1 m/s (*)	Sets flow rate span (with units from C40 and C41). Linked with B23.
C43	Flow Decimal Pnt (FLOW DECIMAL)	W	Auto 0 1 2 3			Auto (*)	Selects decimal point position for the display unit's instantaneous flow rate. Linked with B24.
C44	Velocity Check (VELOCITY CHK)	R	0.000 to 99.999	m/s	3		Display of the span setting using flow velocity (m/s).
C45	Density Unit (DENSITY UNIT)	W	kg/m ³ lb/gal lb/cf			kg/m ³	Sets units for density when mass flow rate is selected.
C46	Mass Flow Density (MASS DENSITY)	W	0 to 32000	C45	0 to 4	0	Sets density when mass flow rate is selected (with units from C45).
C47	User Span Select (USER SPN SEL)	W	No Yes			No	Selects whether or not special units are used for flow rate units.
C48	Flow User Unit (FL USER UNIT)	W	8 alphanumeric characters			ALL SPACE	Sets the special flow rate units.
C49	Flow User Span (FL USER SPAN)	W	0.0001 to 32000	C48	0 to 4	100	Sets span when using special flow rate units.
C60	— (SELF CHECK)	R	Good Error				See Chapter 7.
D00	Total Set (TOTAL SET)						
D10	Total Unit (TOTAL UNIT)	W	n Unit/P u Unit/P m Unit/P Unit/P k Unit/P M Unit/P Pulse/s			Pulse/s (*)	Selects the flow rate unit per one pulse as used for totalization display. Linked with B30.
D11	Total Scale (TOTAL SCALE)	W	0 to 32000	D10 (B30)	0 to 4	0 (*)	Sets the flow rate per one pulse for the totalization display. Linked with B31.
D12	Total Decimal Pnt (TL DECIMAL)	W	0 1 2 3 4 5 6 7			0	Selects position of decimal point for totalization display
D13	Total Low Cut (TOTAL LOWCUT)	W	0 to 100	%	0	3 %	Sets the range in vicinity of 0% within which the totalization display will be halted.

*3: R/W: R = Read only, W = Read and Write

Item	Name		R/W (*3)	Data range		Units	Position of decimal point	Default value (*): Indicated item	Description
	Display unit (BRAIN)			Display unit/BRAIN					
D20	Total Execution (TOTAL EXEC)		W	Start Stop Preset Total Preset Rev Total				Start	Executes "Start" or "Stop" of the totalization function, or executes "Preset Total" or "Preset Rev Total".
D21	Ttl Set Val Lower (TL SET VAL L)		W	0 to 999999			0	0	Sets the totalization preset value in the lower 6 digits of the 8-digit totalized value.
D22	Ttl Set Val Upper (TL SET VAL U)		W	0 to 99			0	0	Sets the totalization preset value in the upper 2 digits of the 8-digit totalized value.
D23	Ttl Switch Lower (TL SWITCH LO)		W	0 to 999999			0	0	Sets the totalization switch value in the lower 6 digits of the 8-digit totalized value.
D24	Ttl Switch Upper (TL SWITCH UP)		W	0 to 99			0	0	Sets the totalization switch value in the upper 2 digits of the 8- digits totalized value.
D30	Ttl User Select (TL USER SEL)		W	No Yes				No	Selects whether or not special units are used as totalized units.
D31	Ttl User Unit (TL USER UNIT)		W	8 alphanumeric characters				ALL SPACE	Sets the special totalized units.
D60	— (SELF CHECK)		R	Good Error					See Chapter 7.
E00	Pulse Set (PULSE SET)								
E10	Pulse Unit (PULSE UNIT)		W	n Unit/P u Unit/P m Unit/P Unit/P k Unit/P M Unit/P Pulse/s				Pulse/s (*)	Selects the flow rate unit per one pulse as used for pulse output. Linked with B32.
E11	Pulse Scale (PULSE SCALE)		W	0 to 32000		E10 (B32)	0 to 4	0 (*)	Sets the flow rate per one pulse as used for pulse output. Linked with B33.
E12	Pulse Width (PULSE WIDTH)		W	50% Duty 0.05 ms 0.1 ms 0.5 ms 1 ms 20 ms 33 ms 50 ms 100 ms				50% Duty	Selects the pulse width for pulse output.
E13	Pulse Low Cut (PULSE LOWCUT)		W	0 to 100		%	0	3 %	Sets the range in vicinity of 0% within which pulse output will be halted.
E20 (*1)	Pulse Active Mode (PLS ACT MODE)		W	Closed(On) Act Open(Off) Act				Closed(On) Act	Selects whether pulse output will be set to "On Active" or "Off Active."
E60	— (SELF CHECK)		R	Good Error					See Chapter 7.
F00	Status Function (STATUS FUNC)								
F10 (*1)	SO1 Function (SO1 FUNCTION)		W	No Function Warning Output Total Switch H/L Alarm HH/LL Alarm Fwd/Rev Ranges Auto 2 Ranges Auto 3 Ranges Auto 4 Ranges Ext 2 Answer Ext 3 Answer Ext 4 Answer				No Function	Selects function for the SO1 terminal
F11 (*1)	SO2 Function (SO2 FUNCTION)		W	No Function Warning Output Total Switch H/L Alarm HH/LL Alarm Fwd/Rev Ranges Auto 2 Ranges Auto 3 Ranges Auto 4 Ranges Ext 2 Answer Ext 3 Answer Ext 4 Answer				No Function	Selects function for the SO2 terminal

*1: Applicable for AXFA11 Remote Converter.

*3: R/W: R = Read only, W = Read and Write

Item	Name	R/W (*3)	Data range	Units	Position of decimal point	Default value (*): Indicated item	Description
	Display unit (BRAIN)		Display unit/BRAIN				
F12 (*1)	SI1 Function (SI1 FUNCTION)	W	No Function 0% Singal Lock Ext Auto Zero Ext Ttl Preset Ext Rev Ttl Set Ext 2 Ranges Ext 3 Ranges Ext 4 Ranges			No Function	Selects function for the SI1 terminal
F13 (*1)	SI2 Function (SI2 FUNCTION)	W	No Function 0% Singal Lock Ext Auto Zero Ext Ttl Preset Ext Rev Ttl Set Ext 2 Ranges Ext 3 Ranges Ext 4 Ranges			No Function	Selects function for the SI2 terminal
F14 (*1)	SO1/2 Active Mode (SO ACT MODE)	W	Closed(On) Act Open(Off) Act			Closed(On) Act	Selects whether SO1/SO2 output will be set to "On Active" or "Off Active."
F15 (*1)	SI1/2 Active Mode (SI ACT MODE)	W	Short Active Open Active			Short Active	Selects whether SI1/SI2 input will be set to "Short Active" or "Open Active."
F20 (*2)	DO Function (DO FUNCTION)	W	No Function Pulse Output Alarm Output Warning Output Total Switch (O) H/L Alarm (O) HH/LL Alarm (O) Fwd/Rev Rngs (O) Auto 2 Rngs (O) Auto 3 Rngs (O) Auto 4 Rngs (O) Ext 2 Answer (O)			Pulse Output	Selects function for the DO terminal
F21 (*2)	DIO Function (DIO FUNCTION)	W	No Function Alarm Output Warning Output Total Switch (O) H/L Alarm (O) HH/LL Alarm (O) Fwd/Rev Rngs (O) Auto 2 Rngs (O) Auto 3 Rngs (O) Auto 4 Rngs (O) Ext 2 Answer (O) 0% Singal Lock (I) Ext Auto Zero (I) Ext Ttl Set (I) Ext R Ttl Set (I) Ext 2 Ttl Set (I)			No Function	Selects function for the DIO terminal
F22 (*2)	DO Active Mode (DO ACT MODE)	W	Closed(On) Act Open(Off) Act			Closed(On) Act	Selects whether DO terminal will be set to "On Active" or "Off Active".
F23 (*2)	DIO Active Mode (DIO ACT MODE)	W	Closed/Short Act Open/Open Act			Closed/Short Act	Selects whether DIO terminal will be set to "Closed/Short Active" or "Open/Open Active".
F30	Forward Span2 (FWD SPAN2)	W	0.0001 to 32000	C40/C41	0 to 4	1	Sets flow rate span for forward No. 2 range
F31	Forward Span3 (FWD SPAN3)	W	0.0001 to 32000	C40/C41	0 to 4	1	Sets flow rate span for forward No. 3 range
F32	Forward Span4 (FWD SPAN4)	W	0.0001 to 32000	C40/C41	0 to 4	1	Sets flow rate span for forward No. 4 range
F33	Reverse Span1 (REV SPAN1)	W	0.0001 to 32000	C40/C41	0 to 4	1	Sets flow rate span for reverse No. 1 range
F34	Reverse Span2 (REV SPAN2)	W	0.0001 to 32000	C40/C41	0 to 4	1	Sets flow rate span for reverse No. 2 range
F35 (*1)	Reverse Span3 (REV SPAN3)	W	0.0001 to 32000	C40/C41	0 to 4	1	Sets flow rate span for reverse No. 3 range
F36 (*1)	Reverse Span4 (REV SPAN4)	W	0.0001 to 32000	C40/C41	0 to 4	1	Sets flow rate span for reverse No. 4 range
F40	Auto Range Hys (AUTO RNG HYS)	W	0 to 15	%	0	10 %	Sets hysteresis width for automatic range switching
F41	Bi Direction Hys (BI DIREC HYS)	W	0 to 8	%	0	2 %	Sets hysteresis width for forward/reverse switching
F60	— (SELF CHECK)	R	Good Error				See Chapter 7.

*1: Applicable for AXFA11 Remote Converter.

*2: Applicable for AXF Integral Flowmeter and AXFA14 Remote Converter.

*3: R/W: R = Read only, W = Read and Write

Item	Name	R/W (*3)	Data range	Units	Position of decimal point	Default value (*): Indicated item	Description
	Display unit (BRAIN)		Display unit/BRAIN				
G00	Alarm (ALARM)						
G10	Low Alarm (LOW ALARM)	W	-110 to 110	%	0	-110 %	Sets level setting value for low flow rate limit (L)
G11	High Alarm (HIGH ALARM)	W	-110 to 110	%	0	110 %	Sets level setting value for high flow rate limit (H)
G12	Low Low Alarm (LO LO ALARM)	W	-110 to 110	%	0	-110 %	Sets level setting value for low- low flow rate limit (LL)
G13	High High Alarm (HI HI ALARM)	W	-110 to 110	%	0	110 %	Sets level setting value for high- high flow rate limit (HH)
G14	H/L Alarm Hys (H/L ALM HYS)	W	0 to 10	%	0	5 %	Sets hysteresis width for high-low flow rate limit alarm
G20 (*1)	Alm Out Act Mode (ALM OUT ACT)	W	Closed(On) Act Open(Off) Act			Open(Off) Act	Selects whether alarm output will be set to "On Active" or "Off Active."
G21	4-20mA Alarm Out (4-20 ALM OUT)	W	2.4mA or Less 4.0mA Hold 21.6mA or More			21.6mA or More	Selects the current output during alarm occurrence.
G22	4-20mA Burn Out (4-20 BURNOUT)	R	High Low			—	Displays the current output during a CPU failure.
G30	Alm-Setting (ALM-SETTING)	W	No Yes			Yes	Selects whether a setting alarm is to be specified as an alarm.
G31	Alm-Sig Over (ALM-SIG OVER)	W	No Yes			Yes	Selects whether a signal overflow alarm is to be specified as an alarm.
G32	Alm-Emp Pipe (ALM-EMP PIPE)	W	No Yes			Yes	Selects whether an empty pipe alarm is to be specified as an alarm.
G33	Alm-HH/LL (ALM-HH/LL)	W	No Yes			No	Selects whether a flow rate high-high or low-low alarm is to be specified as an alarm.
G34	Alm-Adhesion (ALM-ADHESION)	W	No Yes			No	Selects whether an electrode adhesion alarm is to be specified as an alarm.
G40	Operation Time (OPERATE TIME)	R	0D 00:00 to 99999D 23:59				Operation time
G41	Alm Record1 (ALM RECORD1)	R	10:uP Fault 11:EEPROM Fault 12:A/D(H) Fault 13:A/D(L) Fault 14:A/D(Z) Fault 15:Coil Open 16:EEPROM DfIt 18:Power Off 19:Inst Pwr Fail 28:WDT 30:Sig Overflow 31:Empty Pipe 33:Adhesion Alm				Displays the content of the most recent alarm.
G42	Alm Record Time1 (ALM TIME 1)	R	0D 00:00 to 99999D 23:59				Displays the operation time at the occurrence of the most recent alarm.
G43	Alm Record2 (ALM RECORD2)	R	Same as G41 (Alm Record 1)				Displays the content of the second most recent alarm.
G44	Alm Record Time2 (ALM TIME 2)	R	0D 00:00 to 99999D 23:59				Displays the operation time at occurrence of the second most recent alarm.
G45	Alm Record3 (ALM RECORD3)	R	Same as G41 (Alm Record 1)				Displays the content of the third most recent alarm.
G46	Alm Record Time3 (ALM TIME 3)	R	0D 00:00 to 99999D 23:59				Displays the operation time at the occurrence of the third most recent alarm.
G47	Alm Record4 (ALM RECORD4)	R	Same as G41 (Alm Record 1)				Displays the content of the fourth most recent alarm.
G48	Alm Record Time4 (ALM TIME 4)	R	0D 00:00 to 99999D 23:59				Displays the operation time at the occurrence of the fourth most recent alarm.
G60	— (SELF CHECK)	R	Good Error				See Chapter 7.
H00	Display Set (DISP SET)						
H10	Display Select1 (DISP SELECT1)	W	Flow Rate(%) Flow Rate Flow Rate(mA) Forward Total Reverse Total Dif Total			Flow Rate	Selects content of the first line for Display Mode. Linked with B40.

*1: Applicable for AXFA11 Remote Converter.

*3: R/W: R = Read only, W = Read and Write

Item	Name	R/W (*3)	Data range	Units	Position of decimal point	Default value (*): Indicated item	Description
	Display unit (BRAIN)		Display unit/BRAIN				
H11	Display Select2 (DISP SELECT2)	W	Off Flow Rate(%) Flow Rate Flow Rate(mA) Flow Rate(Bar) Forward Total Reverse Total Dif Total Tag No Adhesion Check Communication			Off	Selects content of the second line for Display Mode. Linked with B41.
H12	Display Select3 (DISP SELECT3)	W	Same as H11 (Display Select2)			Off	Selects content of the third line for Display Mode. Linked with B42.
H20	Display Cycle (DISP CYCLE)	W	200ms 400ms 1s 2s 4s 8s			400ms	Selects the display cycle.
H30	Language (LANGUAGE)	W	English Japanese French German Italian Spanish			English	Selects the language used by the display unit. Linked with B10.
H60	— (SELF CHECK)	R	Good Error				See Chapter 7.
J00	Aux (AUX)						
J10	4-20mA Low Cut (4-20 LOW CUT)	W	0 to 10	%	0	0 %	Sets the range in vicinity of 0% within which the current output will be 4 mA
J11	4-20mA Low Lmt (4-20 LOW LMT)	W	-20.0 to 100.0	%	1	-20.0 %	Sets the low limit for current output
J12	4-20mA High Lmt (4-20 HI LMT)	W	0.0 to 120.0	%	1	120.0 %	Sets the high limit for current output
J20	Flow Direction (FLOW DIRECT)	W	Forward Reverse			Forward	Selects the flow direction.
J21	Rate Limit (RATE LIMIT)	W	0 to 10	%	0	5 %	Sets the level to reduce output fluctuation.
J22	Dead Time (DEAD TIME)	W	0 to 15	s	0	0 s	Sets the dead time to reduce output fluctuation. When "0" is set, rate limit function is not available.
J23	Pulsing Flow (PULSING FLOW)	W	No Yes			No	Selects whether pulsing flow is to be supported.
J24	T/P Damp Select (T/P DAMP SEL)	W	Damping No Damping			Damping	Selects whether the flow rate value obtained through damping calculation for total/pulse or the instantaneous flow rate value (no damping) for total/pulse is to be used.
J30	Power Synch (POWER SYNCH)	W	No Yes			Yes	Selects whether or not the internal frequency is to be synchronized with the power supply frequency.
J31	Power Frequency (POWER FREQ)	R/W	47.00 to 63.00	Hz	2	50.00	Displays the power-supply frequency (for Power Synch = "Yes"), or sets the power-supply frequency (for Power Synch="No").
J40	Memo 1 (MEMO 1)	W	ASCII 16 characters			ALL SPACE	Memo field
J41	Memo 2 (MEMO 2)	W	ASCII 16 characters			ALL SPACE	Memo field
J42	Memo 3 (MEMO 3)	W	ASCII 16 characters			ALL SPACE	Memo field
J50	Software Rev No (SOFTWARE REV)	R	—				Software revision number
J60	— (SELF CHECK)	R	Good Error				See Chapter 7.
K00	Diagnosis (DIAGNOSIS)						
K10	Adhesion Check (ADHESION CHK)	W	No Yes			No	Selects whether or not to perform diagnosis of adhesion to the electrode.
K11	Adhesion Level1 (ADH LEVEL1)	W	0.00 to 100.00	M Ω	2	0.10	Sets the resistance value for adhesion Level 1 to the electrode.

*3: R/W: R = Read only, W = Read and Write

Item	Name	R/W (*3)	Data range	Units	Position of decimal point	Default value (*): Indicated item	Description
	Display unit (BRAIN)		Display unit/BRAIN				
K12	Adhesion Level2 (ADH LEVEL2)	W	0.00 to 100.00	M Ω	2	0.50	Sets the resistance value for adhesion Level 2 to the electrode.
K13	Adhesion Level3 (ADH LEVEL3)	W	0.00 to 100.00	M Ω	2	1.00	Sets the resistance value for adhesion Level 3 to the electrode.
K14	Adhesion Level4 (ADH LEVEL4)	W	0.00 to 100.00	M Ω	2	3.00	Sets the resistance value for adhesion Level 4 to the electrode.
K15	Adh Measure Value (ADH MEAS VAL)	R	—	M Ω	2		Displays the resistance value for adhesion to the electrode.
K60	— (SELF CHECK)	R	Good Error				See Chapter 7.
M00	Adjustment (ADJUSTMENT)						
M10	Auto Zero Exe (AUTOZERO EXE)	W	No Execution Execution			No Execution	Selects whether or not automatic zero adjustment is carried out. Linked with B50.
M11	Magflow Zero (MAGFLOW ZERO)	R/W	-99.999 to 99.999		3	0.000	Displays the result of the automatic zero adjustment, or sets the zero point.
M60	— (SELF CHECK)	R	Good Error				See Chapter 7.
N00	Test (TEST)						
N10	Test Mode (TEST MODE)	W	Normal Test			Normal	Selects whether mode will be set to "Normal" or "Test".
N11	Test Output Value (TEST OUT VAL)	W	-10 to 110	%	0	0 %	Sets the test output value.
N20 (*1)	Test SO1 (TEST SO1)	W	Open(Off) Closed(On)			Open(Off)	Selects the test condition for SO1 terminal.
N21 (*1)	Test SO2 (TEST SO2)	W	Open(Off) Closed(On)			Open(Off)	Selects the test condition for SO2 terminal.
N22 (*1)	Test Alarm Out (TEST ALM OUT)	W	Open(Off) Closed(On)			Closed(On)	Selects the test condition for alarm output terminal.
N23 (*1)	Test SI1 (TEST SI1)	R	Open Short				Displays the test condition for SI1 terminal.
N24 (*1)	Test SI2 (TEST SI2)	R	Open Short				Displays the test condition for SI2 terminal.
N30 (*2)	Test DO (TEST DO)	W	Open(Off) Closed(On) Pulse			Open(Off)	Selects the test condition for DO terminal.
N31 (*2)	Test DIO (O) (TEST DIO (O))	W	Input Mode Open(Off) Closed(On)			Input Mode	Selects the test condition for DIO terminal used for output.
N32 (*2)	Test DIO (I) (TEST DIO (I))	R	Open Short				Displays the test condition for DIO terminal used for input.
N60	— (SELF CHECK)	R	Good Error				See Chapter 7.
P00	Protect (PROTECT)						
P10	Key Code (KEY CODE)	W	0 to 9999			0	Parameter of the display restriction
P20	Write Protect (W PROTECT)	R	No Yes			No	Displays whether or not overwriting of parameter data is prohibited.
P21	Enable Wrt Passwd (ENABLE WRITE)	W	ASCII 8 characters				Sets the correct password so that write protection function will be released.
P22	New Password (NEW PASSWORD)	W	ASCII 8 characters				Sets the password for write protection function
P23	Software Seal (SOFT SEAL)	R	Break Keep			Keep	Displays whether or not a Joker password was used (Break).
P60	— (SELF CHECK)	R	Good Error				See Chapter 7.

*1: Applicable for AXFA11 Remote Converter.

*2: Applicable for AXF Integral Flowmeter and AXFA14 Remote Converter.

*3: R/W: R = Read only, W = Read and Write

9. Approvals

This chapter describes further requirements and notices concerning the approval. The description in this chapter is prior to other description in this User's Manual.

(1) PED (Pressure Equipment Directive) (AXF Integral Flowmeter), (AXF Remote Flowtube)

• Technical Data

Module: H

Type of Equipment: Piping

Type of Fluid: Liquids and gas

Group of Fluid: 1 and 2 (*4)

General-purpose Use / Submersible Type / Explosion Proof Type

MODEL	DN (mm) (*1)	PS (MPa) (*1)	PS DN (MPa • mm)	CATEGORY (*2) (*4)
AXF002G	2.5	4	10	Sound Engineering Practice (SEP) (*3)
AXF002C				
AXF005G	5	4	20	Sound Engineering Practice (SEP) (*3)
AXF005C				
AXF010G	10	4	40	Sound Engineering Practice (SEP) (*3)
AXF010C				
AXF015G	15	4	60	Sound Engineering Practice (SEP) (*3)
AXF015C				
AXF015W				
AXF025G	25	4	100	Sound Engineering Practice (SEP) (*3)
AXF025C				
AXF025W				
AXF032G	32	4	128	II
AXF032C				
AXF032W				
AXF040G	40	4	160	II
AXF040C				
AXF040W				
AXF050G	50	4	200	II
AXF050C				
AXF050W				
AXF065G	65	2	130	II
AXF065C				
AXF065W				
AXF080G	80	2	160	II
AXF080C				
AXF080W				
AXF100G	100	2	200	II
AXF100C				
AXF100W				
AXF125G	125	2	250	II
AXF125C				
AXF125W				
AXF150G	150	2	300	II
AXF150C				
AXF150W				
AXF200G	200	2	400	III
AXF200C				
AXF200W				
AXF250G	250	2	500	III
AXF250C				
AXF250W				
AXF300G	300	2	600	III
AXF300C				
AXF300W				
AXF350G	350	1	350	II
AXF350C				
AXF350W				
AXF400G	400	1	400	III
AXF400C				
AXF400W				

Sanitary Type

MODEL	DN (mm) (*1)	PS (MPa) (*1)	PS DN (MPa • mm)	CATEGORY (*2) (*4)
AXF015H	15	1	15	Sound Engineering Practice (SEP) (*3)
AXF025H	25	1	25	Sound Engineering Practice (SEP) (*3)
AXF032H	32	1	32	I
AXF040H	40	1	40	I
AXF050H	50	1	50	I
AXF065H	65	1	65	I
AXF080H	80	1	80	I
AXF100H	100	1	100	I
AXF125H	125	1	125	II

*1: PS: Maximum allowable pressure for Flowtube
DN: Nominal size

*2: For details, refer to the following.
Table 6 covered by ANNEX II of Directive 97/23/EC (until July 18th, 2016)

Table 6 covered by ANNEX II of Directive 2014/68/EU (from July 19th, 2016)

*3: Article 3, paragraph 3 of Directive 97/23/EC (until July 18th, 2016)

Article 4, paragraph 3 of Directive 2014/68/EU (from July 19th, 2016)

*4: Models classified in categories I or II shall not be used for unstable gases of Group 1.

• Installation



WARNING

- Tighten the bolts of the piping joints according to the prescribed torque values.
- Take measures to protect the flowmeters from forces caused by vibration channeled through the piping.

• Operation



WARNING

- The instrument should be operated with the temperature and pressure of the fluid under normal operating conditions.
- The ambient temperature should be that of normal operating conditions.
- Take measures to prevent excessive pressure such as water hammer, etc. To avoid water hammer prevent the pressure from exceeding the PS (maximum allowable pressure) by setting the system's safety valves, etc. appropriately.
- Should external fire occur, take safety measures at the device itself or system-wide prevent it having an effect on the flowmeters.
- Avoid using fluids exceeding the corrosion proof limitations of the lining and electrodes.
- Take measures not to abrade the metal pipe, and avoid abrading the lining by using fluids such as slurry and sand are contained.

(2) Safety Requirement Standards

EN61010-1

EN61010-2-030

- Altitude at installation site: Max. 2000 m above sea level
- Installation category (Overvoltage category): II
- Pollution degree: 2
- Indoor/Outdoor use

(3) EMC Conformity Standards

EN61326-1 Class A, Table 2 (For use in industrial locations)

EN61326-2-3

EN61326-2-5 (for FOUNDATION fieldbus/PROFIBUS only)

EN61000-3-2 ClassA

EN61000-3-3

- Performance Specification during immunity test
Flowrate output: Output fluctuation within $\pm 5\%$ of default (1m/s) span

**CAUTION**

This instrument is a class A product, and it is designed for use in the industrial environment.

Please use this instrument in the industrial environment only.

10. Explosion Protected Type Instrument

In this chapter, further requirements and differences for explosion proof type instrument are described.



NOTE

When describing the model name like AXF□□□C in this manual, "□□□" means any of the following. 002, 005, 010, 015, 025, 032, 040, 050, 065, 080, 100, 125, 150, 200, 250, 300, 350, 400



WARNING

Magnetic flowmeters with the model name AXF□□□C magnetic flowmeter and AXFA14C remote converter are products which have been certified as explosion proof type instruments. Strict limitations are applied to the structures, installation locations, external wiring work, maintenance and repairs, etc. of these instruments. Sufficient care must be taken, as any violation of the limitations may cause dangerous situations.

Be sure to read this chapter before handling the instruments.

For explosion proof type instrument, the description in this chapter is prior to other description in this user's manual.

For ATEX or IECEx explosion proof type, be sure to read IM 01E20A01-11EN.

For TIIS explosion proof type, be sure to read "INSTALLATION AND OPERATING PRECAUTIONS FOR TIIS FLAMEPROOF EQUIPMENT" at the end of this manual.



WARNING

The terminal box cover and display cover is locked by special screw. In case of opening the cover, use the hexagonal wrench attached.

The covers of explosion proof type products are locked. Use the attached hexagonal wrench to open and close the cover. Before opening the cover, be sure to check that the power of flowmeter has been turned off. Once the cover is closed, be sure to re-lock the product.

Be sure to lock the cover with the special screw using the hexagonal wrench attached after tightening the cover.

10.1 ATEX



NOTE

For ATEX explosion proof type specification, refer to IM 01E20A01-11EN.

10.2 FM

(1) Technical Data

(AXF Integral Flowmeter), (AXF Remote Flowtube)

Applicable Standard:

FM3600, FM3610, FM3615,
FM3810, ANSI/NEMA 250

(AXF Integral Flowmeter)

Explosion proof for Class I, Division 1, Groups A, B, C & D.

Dust-ignition proof for Class II/III, Division1, Groups E, F & G.

Intrinsically safe (electrodes) for Class I, Division 1, Groups A, B, C & D.

"SEAL ALL CONDUITS WITHIN 18 INCHES"

"WHEN INSTALLED IN DIV. 2, SEALS NOT REQUIRED"

Electrode Circuit Um: 250 Vac/dc

Maximum power supply voltage: 250 Vac/130 Vdc

Excitation Circuit: 140V max

Enclosure: NEMA 4X

Temperature Code: T6

Note: Temperature Code T5 to T3 included in the scope of application and its approval

Refer to following table;

Temperature Code	Maximum Process Temperature	Minimum Process Temperature
T6	+70°C (+158F)	-40°C (-40°F)
T5	+85°C (+185F)	-40°C (-40°F)
T4	+120°C (+248F)	-40°C (-40°F)
T3	+130°C (+266F)	-40°C (-40°F)

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

(AXF Remote Flowtube)

Explosion proof for Class I, Division 1, Groups A, B, C & D.

Dust-ignition proof for Class II/III, Division 1, Groups E, F & G.

Intrinsically safe (electrodes) for Class I, Division 1, Groups A, B, C & D.

“SEAL ALL CONDUITS WITHIN 18 INCHES”

“WHEN INSTALLED IN DIV. 2, SEALS NOT REQUIRED”

Electrode Circuit Um: 250 Vac/dc

Excitation Circuit: 170V max

Enclosure: NEMA 4X

Temperature Code: T6

Note: Temperature Code T5 to T3 included in the scope of application and its approval

Refer to following table;

Temperature Code	Maximum Process Temperature	Minimum Process Temperature
T6	+70°C (+158°F)	-40°C (-40°F)
T5	+85°C (+185°F)	-40°C (-40°F)
T4	+120°C (+248°F)	-40°C (-40°F)
T3	+150°C (+302°F)	-40°C (-40°F)

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

(AXFA14 Remote Converter)

Applicable Standard:

FM3600, FM3615, FM3810, ANSI/NEMA 250

Explosion proof for Class I, Division 1, Groups A, B, C & D.

Dust-ignition proof for Class II/III, Division 1, Groups E, F & G.

“SEAL ALL CONDUITS WITHIN 18 INCHES”

“WHEN INSTALLED IN DIV. 2, SEALS NOT REQUIRED”

Maximum power supply voltage: 250 Vac/130 Vdc

Excitation Circuit: 140V max

Enclosure: NEMA 4X

Temperature Code: T6

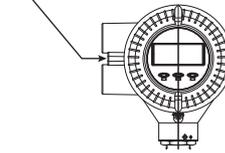
Ambient Temp.: -40°C to +60°C (-40°F to +140°F)

(2) Electrical Connection

The type of electrical connection is stamped near the electrical connection port according to the following codes.

(AXF Integral Flowmeter)

Screw Size	Marking
ISO M20x1.5 female	M Δ
ANSI 1/2NPT female	N Δ



(AXF Remote Flowtube)

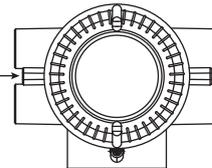
Screw Size	Marking
ISO M20x1.5 female	M Δ
ANSI 1/2NPT female	N Δ



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(AXFA14 Remote Converter)

Screw Size	Marking
ISO M20x1.5 female	M Δ
ANSI 1/2NPT female	N Δ



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(3) Installation

! WARNING

- All wiring shall comply with National Electrical Code ANSI/NFPA 70 and Local Electrical Code.
- In hazardous locations, wiring to be in conduit as shown in Figure 10.2
- When installed in Division 2, “SEALS NOT REQUIRED”
- In case the electrodes and/or grounding rings are made of titanium, the flowtube should be kept away from impacts and frictions in hazardous locations.

(5) Maintenance and Repair

! WARNING

- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the approval of Factory Mutual Research Corporation.
- In case the electrodes and/or grounding rings are made of titanium, the flowtube should be kept away from impacts and frictions in hazardous locations.

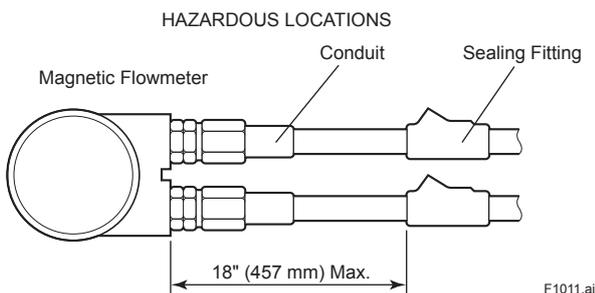


Figure 10.2 Conduit Wiring

(4) Operation

! WARNING

- “OPEN CIRCUIT BEFORE REMOVING COVERS.”
- “SEALS ALL CONDUITS WITHIN 18 INCHES” in hazardous locations.
- When installed in Division 2, “SEALS NOT REQUIRED”
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.
- In case the electrodes and/or grounding rings are made of titanium, the flowtube should be kept away from impacts and frictions in hazardous locations.

10.3 CSA

(1) Technical Data

(AXF Integral Flowmeter), (AXF Remote Flowtube)

Applicable Standard:

- For CSA C22.2 Series;
 - C22.2 No 0, C22.2 No 0.4, C22.2 No 0.5,
 - C22.2 No 25, C22.2 No 30, C22.2 No 94,
 - C22.2 No 157, C22.2 No.61010-1-12,
 - C22.2 No.61010-2-030-12

- For CSA E79 Series;
 - CAN/CSA-E79-0, CAN/CSA-E79-1,
 - CAN/CSA-E79-7, CAN/CSA-E79-11,
 - CAN/CSA-E79-18

Certificate: 1481213

Process Sealing Certification:

- Dual Seal certified by CSA to the requirements of ANSI/ISA 12.27.01.
- No additional sealing required.
- Primary seal failure annunciation;
 - Deterioration of the flowrate output at nonzero flow point.
 - Unstable flowrate output at zero flow point.

(AXF Integral Flowmeter)

For CSA C22. 2 Series

Explosion proof for Class I, Division 1, Groups A, B, C & D.
 Dust-ignition proof for Class II/III, Division 1, Groups E, F & G.

Intrinsically safe (electrodes) for Class I, Division 1, Groups A, B, C & D.
 "SEAL ALL CONDUITS WITHIN 50 cm OF THE ENCLOSURE"
 "WHEN INSTALLED IN DIV. 2, SEALS NOT REQUIRED"

Electrode Circuit Um: 250 Vac/dc
 Maximum power supply voltage: 250 Vac/130 Vdc
 Excitation Circuit: 140V max
 Enclosure: Type 4X
 Temperature Code:

Temperature Code	Maximum Process Temperature	Minimum Process Temperature
T6	+70°C (+158°F)	-40°C (-40°F)
T5	+85°C (+185°F)	-40°C (-40°F)
T4	+120°C (+248°F)	-40°C (-40°F)
T3	+130°C (+266°F)	-40°C (-40°F)

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

For CSA E79 Series

Flameproof for Zone 1, Ex dme [ia] IIC T6...T3
 Intrinsically safe (electrodes), Ex ia IIC T6...T3
 Electrode Circuit Um: 250 Vac/dc
 Maximum power supply voltage: 250 Vac/130 Vdc
 Excitation Circuit: 140V max
 Enclosure: IP66, IP67

Temperature Code:

Temperature Code	Maximum Process Temperature	Minimum Process Temperature
T6	+70°C (+158°F)	-40°C (-40°F)
T5	+85°C (+185°F)	-40°C (-40°F)
T4	+120°C (+248°F)	-40°C (-40°F)
T3	+130°C (+266°F)	-40°C (-40°F)

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

(AXF Remote Flowtube)

For CSA C22.2 Series

Explosion proof for Class I, Division 1, Groups A, B, C & D.
 Dust-ignition proof for Class II/III, Division 1, Groups E, F & G.
 Intrinsically safe (electrodes) for Class I, Division 1, Groups A, B, C & D.

"SEAL ALL CONDUITS WITHIN 50 cm OF THE ENCLOSURE"
 "WHEN INSTALLED IN DIV. 2, SEALS NOT REQUIRED"

Electrode Circuit Um: 250 Vac/dc
 Excitation Circuit: 170V max
 Enclosure: Type 4X
 Temperature Code:

Temperature Code	Maximum Process Temperature	Minimum Process Temperature
T6	+70°C (+158°F)	-40°C (-40°F)
T5	+85°C (+185°F)	-40°C (-40°F)
T4	+120°C (+248°F)	-40°C (-40°F)
T3	+150°C (+302°F)	-40°C (-40°F)

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

For CSA E79 Series

Flameproof for Zone 1, Ex dme [ia] IIC T6...T3
 Intrinsically safe (electrodes), Ex ia IIC T6...T3
 Electrode Circuit Um: 250 Vac/dc
 Excitation Circuit: 170V max
 Enclosure: IP66, IP67
 Temperature Code:

Temperature Code	Maximum Process Temperature	Minimum Process Temperature
T6	+70°C (+158°F)	-40°C (-40°F)
T5	+85°C (+185°F)	-40°C (-40°F)
T4	+120°C (+248°F)	-40°C (-40°F)
T3	+150°C (+302°F)	-40°C (-40°F)

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

(AXFA14 Remote Converter)

Applicable Standard:

- For CSA C22.2 Series;
 - C22.2 No 0, C22.2 No 0.4, C22.2 No 0.5,
 - C22.2 No 25, C22.2 No 30, C22.2 No 94,
 - C22.2 No 61010-1-12, C22.2 No 61010-2-030-12
- For CSA E79 Series;
 - CAN/CSA-E79-0, CAN/CSA-E79-1

Certificate: 1481213

For CSA C22.2 Series

Explosion proof for Class I, Division 1, Groups A, B, C & D.
Dust-ignition proof for Class II/III, Division 1, Groups E, F & G.

“SEAL ALL CONDUITS WITHIN 50 cm OF THE ENCLOSURE”

“WHEN INSTALLED IN DIV. 2, SEALS NOT REQUIRED”

Maximum power supply voltage: 250 Vac/130 Vdc

Excitation Circuit: 140V max

Enclosure: Type 4X

Temperature Code: T6

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

For CSA E79 Series

Flameproof for Zone 1, Ex d IIC T6

Maximum power supply voltage: 250 Vac/130 Vdc

Excitation Circuit: 140V max

Enclosure: IP66, IP67

Temperature Code: T6

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

(2) Installation

For CSA C22.2 Series



WARNING

- All wiring shall comply with Canadian Electrical Code Part I and Local Electrical Codes.
- In hazardous location, wiring shall be in conduit as shown in Figure 10.3

WARNING : SEAL ALL CONDUITS WITHIN 50cm OF THE ENCLOSURE'.
UN SCÉLLEMENT DOIT ÊTRE INSTALLÉ À MOINS DE 50cm DU BOÎTIER.

- When installed in Division 2, “SEALS NOT REQUIRED”

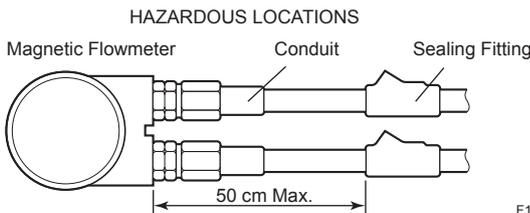


Figure 10.3 Conduit Wiring

For CSA E79 Series



WARNING

- All wiring shall comply with local installation requirements and local electrical code.
- In hazardous locations, the cable entry devices shall be of a certified flameproof type, suitable for the conditions of use and correctly installed.
- Unused apertures shall be closed with suitable flameproof certified blanking elements. (The plug attached is flameproof certified.)

(3) Operation

For CSA C22.2 Series



WARNING

WARNING : OPEN CIRCUIT BEFORE REMOVING COVER.

OUVRIR LE CIRCUIT AVANT D'ENLEVER LE COUVERCLE.

- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

For CSA E79 Series

(AXF Integral Flowmeter), (AXFA14 Remote Converter)



WARNING

WARNING : AFTER DE-ENERGIZING, DELAY 20 MINUTES BEFORE OPENING.

APRÈS POWER-OFF, ATTENDRE 20 MINUTES AVANT D'OUVRIR.

- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

(AXF Remote Flowtube)



WARNING

WARNING : DE-ENERGIZE BEFORE OPENING. OUVRIR LE CIRCUIT AVANT D'ENLEVER LE COUVERCLE.

D'ENLEVER LE COUVERCLE.

- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

(4) Maintenance and Repair



WARNING

The instrument modification or parts replacement by other than authorized representative of YOKOGAWA Electric Corporation or YOKOGAWA Corporation of AMERICA is prohibited and will void Canadian Standards Explosionproof Certification.

10.4 IECEx



NOTE

For IECEx explosion proof type specification, refer to IM 01E20A01-11EN.

10.5 TIIS



CAUTION

The model AXF□□□C magnetic flowmeter and AXFA14C remote converter with optional code JF3, which have obtained certification according to technical criteria for explosion-protected construction of electric machinery and equipment (Standards Notification No. 556 from the Japanese Ministry of Labor) conforming to IEC standards, are designed for hazardous areas where inflammable gases or vapors may be present. (This allows installation in Division 1 and 2 areas)

To preserve the safety of flameproof equipment requires great care during mounting, wiring, and piping. Safety requirements also place restrictions on maintenance and repair activities. Users absolutely must read "INSTALLATION AND OPERATING PRECAUTIONS FOR TIIS FLAMEPROOF EQUIPMENT" at the end of this manual.

(1) Technical Data

(AXF Integral Flowmeter), (AXF Remote Flowtube)

- Certificate:

Wafer Type;

Lining / Process Connection code	Integral Flowmeter		Remote Flowtube	
	PFA Lining	Ceramics Lining	PFA Lining	Ceramics Lining
Size: mm (inch)	-A**	-A**	-A**	-A**
2.5 (0.1)	TC18966	TC16645	TC18982	TC16669
5 (0.2)	TC18966	TC16645	TC18982	TC16669
10 (0.4)	TC18966	TC16645	TC18982	TC16669
15 (0.5)	TC18966	TC16646	TC18982	TC16670
25 (1.0) (Lay length code 1)	TC16631	TC16647	TC16655	TC16671
25 (1.0) (Lay length code 2)	TC18967	—	TC18983	—
32 (1.25)	TC16632	—	TC16656	—
40 (1.5)	TC16633	TC16648	TC16657	TC16672
50 (2.0)	TC16634	TC16649	TC16658	TC16673
65 (2.5)	TC16635	—	TC16659	—
80 (3.0)	TC16636	TC18978	TC16660	TC18994
100 (4.0)	TC16637	TC18979	TC16661	TC18995
125 (5.0)	TC16638	—	TC16662	—
150 (6.0)	TC18968	TC18980	TC18984	TC18996
200 (8.0)	TC18970	TC18981	TC18986	TC18997
250 (10)	TC18972	—	TC18988	—
300 (12)	TC18974	—	TC18990	—
350 (14)	—	—	—	—
400 (16)	—	—	—	—

Flange Type (PFA lining only);

Lining / Process Connection code	Integral Flowmeter	Remote Flowtube
	PFA Lining	PFA Lining
Size: mm (inch)	-B**, -D**	-B**, -D**
2.5 (0.1)	TC18966	TC18982
5 (0.2)	TC18966	TC18982
10 (0.4)	TC18966	TC18982
15 (0.5)	TC18966	TC18982
25 (1.0)	TC16631	TC16655
32 (1.25)	TC16632	TC16656
40 (1.5)	TC16633	TC16657
50 (2.0)	TC16634	TC16658
65 (2.5)	TC16635	TC16659
80 (3.0)	TC16636	TC16660
100 (4.0)	TC16637	TC16661
125 (5.0)	TC16638	TC16662
150 (6.0)	TC18969	TC18985
200 (8.0)	TC18971	TC18987
250 (10)	TC18973	TC18989
300 (12)	TC18975	TC18991
350 (14)	TC18976	TC18992
400 (16)	TC18977	TC18993

(AXF Integral Flowmeter)

- Construction: Ex de[ia] IIC T4
 - : Converter; Explosion proof
 - Flowtube; Increased Safety and Intrinsically Safety(ia)
 - Electrode; Intrinsically Safety(ia)
 - Um=250VAC 50/60Hz, 250VDC, Uo=250V*, Io=3.37mA*, Po=0.211W
 - *Uo and Io are rms value.
- Gas Group and Temperature Class: IIC T4
- Ambient Temperature: -20 to 60°C (power supply code 1)
 - : -20 to 50°C (power supply code 2)
- Fluid Temperature: 120°C max
- Electrode Circuit: 250 V AC/DC
- Maximum power supply voltage: 250V AC/130V DC
- Grounding: JIS Class C (grounding resistance 10Ω or less) or JIS Class A (grounding resistance 10Ω or less)



WARNING

In case that ambient temperature exceeds 50°C, use heat-resistant cables with maximum allowable temperature of 70°C or above.

(AXF Remote Flowtube)

- Construction: Ex de[ia] IIC T4
 - : Terminal box; Explosion proof
 - Flowtube; Increased Safety and Intrinsically Safety(ia)
 - Electrode; Intrinsically Safety(ia)
 - Um=250VAC 50/60Hz, 250VDC, Uo=250V*, Io=3.37mA*, Po=0.211W
 - *Uo and Io are rms value.

- Gas Group and Temperature Class: IIC T4
- Ambient Temperature: -20 to 60°C
- Fluid Temperature: 120°C max
- Electrode Circuit: 250 V AC/DC
- Grounding: JIS Class C (grounding resistance 10Ω or less) or JIS Class A (grounding resistance 10Ω or less)

(AXFA14 Remote Converter)

- Certificate: TC16678
- Construction: Ex d IIC T6
: Explosion proof
- Gas Group and Temperature Class: IIC T6
- Ambient Temperature: -20 to 60°C (power supply code 1)
: -20 to 50°C (power supply code 2)
- Maximum power supply voltage: 250V AC/130V DC
- Grounding: JIS Class C(grounding resistance 10V or less) or JIS Class A(grounding resistance 10V or less)

! WARNING

In case that ambient temperature exceeds 50°C, use heat-resistant cables with maximum allowable temperature of 70°C or above.

! WARNING

In case of TIIS Flameproof type, a remote flowtube is available for combined use with the AXFA14 converter only.

(2) Wiring Installation

For the external wiring of flameproof types, use a flameproof packing adapter approved by Yokogawa (refer to Figure 10.5.2) or cable wiring using a flameproof metal conduit (refer to Figure 10.5.4 and "INSTALLATION AND OPERATING PRECAUTIONS FOR TIIS FLAMEPROOF EQUIPMENT" at the end of this manual).

! NOTE

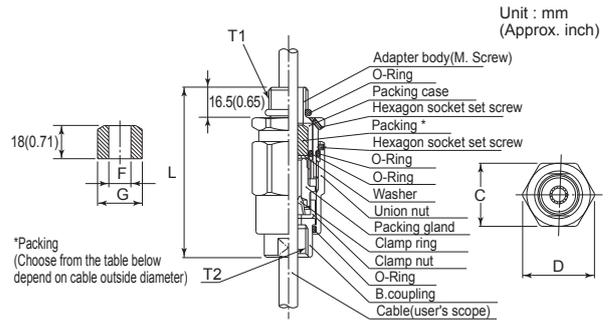
This section describes the Integral flowmeter as an example. The same attention must be paid to the remote flowtube and remote converter.

(2-1) Wiring Cable through Flameproof Packing Adapter

! WARNING

For the TIIS flameproof type with wiring using a flameproof packing adapter, wire cables through the packing adapters approved by Yokogawa (optional code G12, G11, G14 or G13).

In case that optional code G11 or G13 is selected, it comes with a blanking plug. Then always apply it to the unused wiring port.

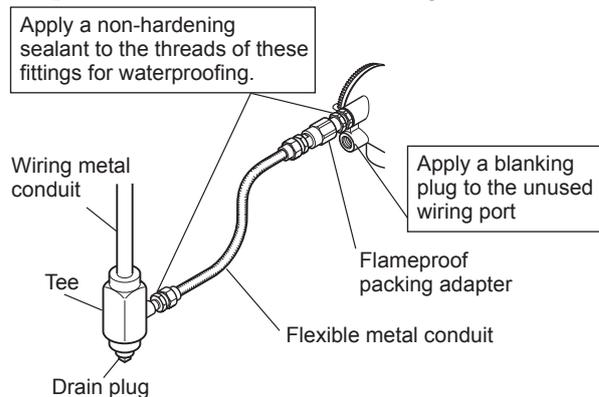


Nominal diameter		Dimension			Cable outer diameter	Packing diameter		Identification mark	Weight kg (lb)	Parts No.
T1	T2	C	D	L		F	G			
G 1/2	G 1/2	35 (1.38)	39 (1.54)	94.5 (3.72)	ø8.0 to ø10.0 (0.31 to 0.39)	ø10.0(0.39)	ø20.0 (0.79)	16 8-10	0.26 (0.57)	G9601AM
					ø10.0 to ø12.0 (0.39 to 0.47)	ø12.0(0.47)		16 10-12		

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Figure 10.5.1 Flameproof Packing Adapter

- Apply a non-hardening sealant to the terminal box connection port and to the threads on the flameproof packing adapter for waterproofing.
- Either a flameproof packing adapter or a blanking plug must be applied to every wiring port. In case that optional code G11 or G13 is selected, it comes with a blanking plug. Then always apply it to the unused wiring port. If the blanking plug is necessary, always purchase it (parts number: G9330DP) from Yokogawa.



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Figure 10.5.2 Typical Wiring Using Flexible Metal Conduit

Follow the procedure below when a flameproof packing adapter (optional code G12, G11, G14 or G13) is applied. Refer to Figure 10.5.3.

If a blanking plug is applied, follow the same procedure when the flameproof packing adapter is applied.

CAUTION

Before tightening, confirm cable length from terminal to flameproof packing adapter when setting. Once it is tightened, loosening and re-tightening may damage its sealing performance.

- (a) Loosen the locking screw and remove the terminal box cover.
- (b) Measure the cable outer diameter in two directions to within 0.1 mm.
- (c) Calculate the average of the two diameters, and use packing with an internal diameter nearest to this value (see the table of Figure 10.5.1).
- (d) Screw the flameproof packing adapter into the terminal box until the O-ring touches the wiring port (at least 6 full turns), and firmly tighten the lock nut.
- (e) Insert the cable through the union cover, the union coupling, the clamp nut, the clamp ring, the gland, the washer, the rubber packing, and the packing box, in that order.
- (f) Insert the end of the cable into the terminal box.
- (g) Tighten the union cover to grip the cable. When tightening the union cover, tighten approximately one turn past the point where the cable will no longer move up and down.
Proper tightening is important. If it is too tight, a circuit break in the cable may occur; if not tight enough, the flameproof effectiveness will be compromised.
- (h) Fasten the cable by tightening the clamp nut.
- (i) Tighten the lock nut on the union cover.
- (j) Connect the cable wires to each terminal.

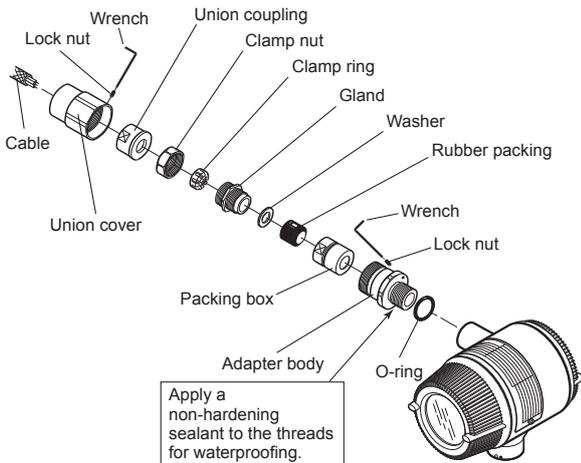


Figure 10.5.3 Installing Flameproof Packing Adapter

(2-2) Cable Wiring Using Flameproof Metal Conduit

- A seal fitting must be installed near the terminal box connection port for a sealed construction.
- Apply a non-hardening sealant to the threads of the terminal box connection port, flexible metal conduit and seal fitting for waterproofing.
- Every wiring port must apply the same wiring as Figure 10.5.4.

Apply a blanking plug to the unused wiring port of a 24V power supply version when a four-wire cable is used for both power input and signal output.

If the blanking plug is necessary, always purchase it (parts number: G9330DP) from Yokogawa.

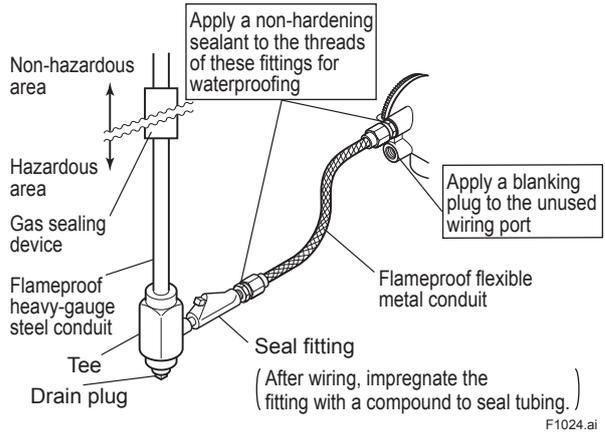


Figure 10.5.4 Typical Wiring Using Flameproof Metal Conduit

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F1023.ai

INSTALLATION AND OPERATING PRECAUTIONS FOR TIIS FLAMEPROOF EQUIPMENT

Apparatus Certified Under Technical Criteria (IEC-compatible Standards)

1. General

The following describes precautions on electrical apparatus of flameproof construction (hereinafter referred to as flameproof apparatus) in explosion-protected apparatus.

Following the Labour Safety and Health Laws of Japan, flameproof apparatus is subjected to type tests to meet either the technical criteria for explosionproof electrical machinery and equipment (standards notification no. 556 from the Japanese Ministry of Labour) (hereinafter referred to as technical criteria), in conformity with the IEC Standards, or the "Recommended Practice for Explosion-Protected Electrical Installations in General Industries," published in 1979. These certified apparatus can be used in hazardous locations where explosive or inflammable gases or vapours may be present.

Certified apparatus includes a certification label and an equipment nameplate with the specifications necessary for explosion requirements as well as precautions on explosion protection. Please confirm these precautionary items and use them to meet specification requirements. For electrical wiring and maintenance servicing, please refer to "Internal Wiring Rules" in the Electrical Installation Technical Standards as well as "USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry," published in 1994.

To meet flameproof requirements, equipment that can be termed "flameproof" must:

- (1) Be certified by a Japanese public authority in accordance with the Labour Safety and Health Laws of Japan and have a certification label in an appropriate location on its case, and
- (2) Be used in compliance with the specifications marked on its certification label, equipment nameplate and precautionary information furnished.

2. Electrical Apparatus of Flameproof Type of Explosion-Protected Construction

Electrical apparatus which is of flameproof construction is subjected to a type test and certified by the Japanese Ministry of Labour aiming at preventing explosion caused by electrical apparatus in a factory or any location where inflammable gases or vapours may be present. The flameproof construction is of completely enclosed type

and its enclosure shall endure explosive pressures in cases where explosive gases or vapours entering the enclosure cause explosion. In addition, the enclosure construction shall be such that flame caused by explosion does not ignite gases or vapours outside the enclosure. In this manual, the word "flameproof" is applied to the flameproof equipment combined with the types of protection "e", "o", "i", and "d" as well as flameproof equipment.

3. Terminology

(1) Enclosure

An outer shell of an electrical apparatus, which encloses live parts and thus is needed to configure explosion-protected construction.

(2) Shroud

A component part which is so designed that the fastening of joint surfaces cannot be loosened unless a special tool is used.

(3) Enclosure internal volume

This is indicated by:— the total internal volume of the flameproof enclosure minus the volume of the internal components essential to equipment functions.

(4) Path length of joint surface

On a joint surface, the length of the shortest path through which flame flows from the inside to outside of the flameproof enclosure. This definition cannot be applied to threaded joints.

(5) Gaps between joint surfaces

The physical distance between two mating surfaces, or differences in diameters if the mating surfaces are cylindrical.

Note: The permissible sizes of gaps between joint surfaces, the path length of a joint surface and the number of joint threads are determined by such factors as the enclosure's internal volume, joint and mating surface construction, and the explosion classification of the specified gases and vapours.

4. Installation of Flameproof Apparatus

(1) Installation Area

Flameproof apparatus may be installed, in accordance with applicable gases, in a hazardous area in Zone 1 or 2, where the specified gases are present. Those apparatus shall not be installed in a hazardous area in Zone 0.

Note: Hazardous areas are classified in zones based upon the frequency of the appearance and the duration of an explosive gas atmosphere as follows:

Zone 0: An area in which an explosive gas atmosphere is present continuously or is present for long periods.

Zone 1: An area in which an explosive gas atmosphere is likely to occur in normal operation.

Zone 2: An area in which an explosive gas atmosphere is not likely to occur in normal operation and if it does occur it will exist for a short period only.

(2) Environmental Conditions

The standard environmental condition for the installation of flameproof apparatus is limited to an ambient temperature range from -20°C to $+40^{\circ}\text{C}$ (for products certified under Technical Criteria). However, some field-mounted instruments may be certified at an ambient temperature up to $+60^{\circ}\text{C}$ as indicated on the instrument nameplates. If the flameproof apparatus are exposed to direct sunshine or radiant heat from plant facilities, appropriate thermal protection measures shall be taken.

5. External Wiring for Flameproof Apparatus

Flameproof apparatus require cable wiring or flameproof metal conduits for their electrical connections. For cable wiring, cable glands (cable entry devices for flameproof type) to wiring connections shall be attached. For metal conduits, attach sealing fittings as close to wiring connections as possible and completely seal the apparatus. All non-live metal parts such as the enclosure shall be securely grounded. For details, see the "USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry," published in 1994.

(1) Cable Wiring

- For cable wiring, cable glands (cable entry devices for flameproof type) specified or supplied with the apparatus shall be directly attached to the wiring connections to complete sealing of the apparatus.
- Screws that connect cable glands to the apparatus are those for G-type parallel pipe threads (JIS B 0202) with no sealing property. To protect the apparatus from corrosive gases or moisture, apply nonhardening sealant such as liquid gaskets to those threads for waterproofing.
- Specific cables shall be used as recommended by the "USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry," published in 1994.
- In necessary, appropriate protective pipes (conduit or flexible pipes), ducts or trays shall be used for preventing the cable run (outside the cable glands) from damage.
- To prevent explosive atmosphere from being propagated from Zone 1 or 2 hazardous location to any different location or non-hazardous location through the protective pipe or duct, apply sealing of the protective pipes in the vicinity of individual boundaries, or fill the ducts with sand appropriately.
- When branch connections of cables, or cable connections with insulated cables inside the conduit pipes are made, a flameproof or increased-safety connection box shall be used. In this case, flameproof or increased-safety cable glands meeting the type of connection box must be used for cable connections to the box.

(2) Flameproof Metal Conduit Wiring

- For the flameproof metal conduit wiring or insulated wires shall be used as recommended by the USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry, published in 1994.
- For conduit pipes, heavy-gauge steel conduits conforming to JIS C 8305 Standard shall be used.
- Flameproof sealing fittings shall be used in the vicinity of the wiring connections, and those fittings shall be filled with sealing compounds to complete sealing of the apparatus. In addition, to prevent explosive gases, moisture, or flame caused by explosion from being propagated through the conduit, always provide sealing fittings to complete sealing of the conduit in the following locations:
 - (a) In the boundaries between the hazardous and non-hazardous locations.
 - (b) In the boundaries where there is a different classification of hazardous location.
- For the connections of the apparatus with a conduit pipe or its associated accessories, G-type parallel pipe threads (JIS B 0202) shall be used to provide a minimum of five-thread engagement to complete tightness. In addition, since these parallel threads do not have sealing property, nonhardening sealant such as liquid gaskets shall thus be applied to those threads for ensuring waterproofness.
- If metal conduits need flexibility, use flameproof flexible fittings.

6. Maintenance of Flameproof Apparatus

To maintain the flameproof apparatus, do the following. (For details, see Chapter 10 "MAINTENANCE OF EXPLOSION-PROTECTED ELECTRICAL INSTALLATION" in the USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry.)

(1) Maintenance servicing with the power on.

Flameproof apparatus shall not be maintenance-serviced with its power turned on. However, in cases where maintenance servicing is to be conducted with the power turned on, with the equipment cover removed, always use a gas detector to check that there is no explosive gas in that location. If it cannot be checked whether an explosive gas is present or not, maintenance servicing shall be limited to the following two items:

- (a) Visual inspection
Visually inspect the flameproof apparatus, metal conduits, and cables for damage or corrosion, and other mechanical and structural defects.
- (b) Zero and span adjustments
These adjustments should be made only to the extent that they can be conducted from the outside without opening the equipment cover. In doing this, great care must be taken not to cause mechanical sparks with tools.

(2) Repair

If the flameproof apparatus requires repair, turn off the power and transport it to a safety (non-hazardous) location. Observe the following points before attempting to repair the apparatus.

- (a) Make only such electrical and mechanical repairs as will restore the apparatus to its original condition. For the flameproof apparatus, the gaps and path lengths of joints and mating surfaces, and mechanical strength of enclosures are critical factors in explosion protection. Exercise great care not to damage the joints or shock the enclosure.
- (b) If any damage occurs in threads, joints or mating surfaces, inspection windows, connections between the transmitter and terminal box, shrouds or clamps, or external wiring connections which are essential in flameproofness, contact Yokogawa Electric Corporation.



CAUTION

Do not attempt to re-process threaded connections or refinish joints or mating surfaces.

- (c) Unless otherwise specified, the electrical circuitry and internal mechanisms may be repaired by component replacement, as this will not directly affect the requirements for flameproof apparatus (however, bear in mind that the apparatus must always be restored to its original condition). If you attempt to repair the flameproof apparatus, company-specified components shall be used.
- (d) Before starting to service the apparatus, be sure to check all parts necessary for retaining the requirements for flameproof apparatus. For this, check that all screws, bolts, nuts, and threaded connections have properly been tightened.

(3) Prohibition of specification changes and modifications

Do not attempt to change specifications or make modifications involving addition of or changes in external wiring connections.

7. Selection of Cable Entry Devices for Flameproof Type



CAUTION

The cable glands (cable entry devices for flameproof type) conforming to IEC Standards are certified in combination with the flameproof apparatus. So, Yokogawa-specified cable entry devices for flameproof type shall be used to meet this demand.

References:

- (1) Type Certificate Guide for Explosion-Protected Construction Electrical Machinery and Equipment (relating to Technical Standards Conforming to International Standards), issued by the Technical Institution of Industrial Safety, Japan
- (2) USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry (1994), issued by the Japanese Ministry of Labour, the Research Institute of Industrial Safet

Revision Information

- Title : AXF Series Magnetic Flowmeter Installation Manual
- Manual No. : IM 01E20A01-01EN

Edition	Date	Page	Revised Item	
1st	Dec. 2014	—	New publication	
2nd	Aug. 2015	Cover	Cover	Changed the Contents. Added the model.
		1	1.	Changed the sentences for this manual. Changed the sentences for this manual. Changed the website address. Changed the table in Table 1.1 Added the NOTE for this manual.
		3	1.1 (4)	Added the NOTE for maintenance.
		4	1.1 (7) to (9)	Added the WARNING and sentences.
		6	1.3	Changed the IMPORTANT for combination remote converters.
			2.	Changed the sentences for the attached parts.
			2.1	Changed the sentences for checking model and specifications. Changed the name plate and deleted the note in Figure 2.1.1 to Figure 2.1.4.
		39	4.2.4 (4)	Changed the IMPORTANT for combination remote converters.
		76	9. (1)	Changed the table and note for PED.
		77	9. (3)	Added applied "EN" standard and the performance specification in EMC Conformity Standards.
		78	10.	Added the NOTE for this manual.
		78 to 82	10.1	Added and changed the sentences, notes and figure for ATEX certification.
		87 to 90	10.4	Added and changed the sentences, notes and figure for IECEx certification.
3rd	May 2016	Cover	Cover	Added the sentences for this manual.
		1	1.	Corrected the sentences for this manual.
		3	1.1 (5)	Corrected the WARNING for explosion proof type.
		5	2.	Added the process connection code "-AP1".
		13 to 14	3.3.2 (4)	Added the JPI flange rating in Table 3.3.4 to Table 3.3.6.
		16 to 18	3.3.3 (4)	Added the JPI flange rating in Table 3.3.7 to Table 3.3.10.
		21 to 23	3.3.4 (2)	Added the JPI and AS flange ratings in Table 3.3.13 to Table 3.3.15.
		29	4.1.1	Corrected the CAUTION for a blanking plug.
		40	4.3.1	Corrected the CAUTION for a blanking plug.
		75	9.	Corrected the table and notes for PED.
		77	10.	Corrected the WARNING for explosion proof type.
			10.1	Deleted the sentences for ATEX explosion proof type. Added the NOTE for ATEX explosion proof type.
		82	10.4	Deleted the sentences for IECEx explosion proof type. Added the NOTE for IECEx explosion proof type.



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