

## ADMAG TI Series AXW Magnetic Flowmeter [Size: 25 to 400 mm (1 to 16 in.)] Installation Manual

IM 01E24A01-01EN



**Integral Flowmeter**  
(AXW□□□)



**Remote Sensor**  
(AXW□□□)



**Remote Transmitter**  
(AXFA11G)



**Remote Transmitter**  
(AXW4A)

This manual outlines the basic guidelines for installation and wiring procedures. For the items which are not covered in this manual, see the user's manuals and the general specifications as listed in Table 1.1.

### Contents

<b>1. Introduction</b>	
1.1 For Safe Use of Product .....	3
1.2 Warranty.....	6
1.3 Combination for Remote Sensor and Remote Transmitter .....	6
<b>2. Receiving and Storage</b>	
2.1 Model and Specifications Check .....	8
2.2 Storage Precautions .....	8
<b>3. Installation</b>	
3.1 Piping Design Precautions .....	9
3.2 Handling Precautions.....	11
3.2.1 General Precautions.....	11
3.2.2 Flowmeter Piping.....	12
3.3 Integral Flowmeter and Remote Sensor Installation ..	13
3.3.1 Size 25 to 200 mm (1 to 8 in.), Wafer Type .....	13
3.3.2 Size 25 to 400 mm (1 to 16 in.), Flange Type .....	18
3.3.3 Gasket Size(customer pipe).....	24
3.4 Remote Transmitter Installation .....	25
3.4.1 Installation Location.....	25
3.4.2 Mounting of AXW4A Transmitter .....	25
3.4.3 Mounting of AXFA11 Transmitter.....	25
3.5 Changing Direction of Cable Entry .....	26
3.6 Changing Direction of Display Unit.....	27
<b>4. Wiring</b>	
4.1 Wiring Precautions.....	29
4.2 Cables .....	30
4.3 Cable Entries .....	31
4.4 Connecting to External Instruments of Integral Flowmeter and Remote Transmitter .....	35
4.5 Connecting to Remote Sensor and Remote Transmitter (Sensor Side).....	40
4.6 Input and Output .....	43
<b>5. Basic Operating Procedures</b>	
5.1 Operation by Display unit.....	46
5.2 Display and Basic Configuration.....	46
5.3 Display Mode and Setting Mode.....	49
5.4 Parameter Setting from Display Panel .....	50
5.5 microSD Card Setting .....	51
5.6 BRAIN Configuration Tool .....	51
5.7 HART Configuration Tool .....	52
<b>6. Operation</b>	
6.1 Pre-operation Zero Adjustment.....	54
6.2 Zero Adjustment from Display Unit .....	54
6.3 Hardware Switch Setting .....	55
<b>7. Errors and Countermeasures (Display unit)</b>	

1

2

3

4

5

6

7



# 1. Introduction

This manual provides the basic guidelines for installation, wiring procedures and basic operation of ADMAG TI (Total Insight) Series AXW magnetic flowmeters (size: 25 to 400 mm (1 to 16 in.)) with BRAIN and HART protocol. For the items which are not covered in this manual, read the applicable user's manuals and general specifications as listed in Table 1.1. These documents 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 specifications, read Chapter 2 and general specifications as listed in Table 1.1.

Website address: <http://www.yokogawa.com/fld/doc/>  
These manuals can be downloaded from the website of YOKOGAWA or purchased from the YOKOGAWA representatives.

**Table 1.1 Manual and General Specifications List**

Model	Document Title	Document No.
AXW□□□ AXW4A AX01C	ADMAG TI Series AXG/AXW Magnetic Flowmeter Read Me First	IM 01E21A21-01Z1
	ADMAG TI Series AXG/AXW Magnetic Flowmeter Safety Manual	IM 01E21A21-02EN
	ADMAG TI Series AXW Magnetic Flowmeter [Size: 25 to 400 mm (1 to 16 in.)] Installation Manual	IM 01E24A01-01EN (this manual)
	ADMAG TI Series AXW Magnetic Flowmeter [Size: 25 to 1800 mm (1 to 72 in.)] Maintenance Manual	IM 01E24A01-02EN
	ADMAG TI Series AXW Magnetic Flowmeter BRAIN Communication Type	IM 01E24A02-01EN
	ADMAG TI Series AXW Magnetic Flowmeter HART Communication Type	IM 01E24A02-02EN
	ADMAG TI Series AXW Magnetic Flowmeter [Size: 25 to 400 mm (1 to 16 in.)] General Specifications	GS 01E24A01-01EN
AXFA11G	AXF Series Magnetic Flowmeter Read Me First	IM 01E20A21-01Z1
	AXFA11G Remote Converter [Hardware Edition/Software Edition]	IM 01E20C01-01E
	AXFA11G Remote Converter General Specifications	GS 01E20C01-01E



## NOTE

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

## ■ Precautions Related to the Protection, Safety, and Alteration of the Instrument

The following safety symbol marks are used in this 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.

The following symbols are used in the Instrument and the manual to indicate the accompanying safety precautions:



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.



- For the protection and safe use of the instrument and the system in which this instrument is incorporated, be sure to follow the instructions and precautions on safety that is stated in this manual whenever you handle the instrument. Take special note that if you handle the instrument in a manner that violated these instructions, the protection functionality of the instrument may be damaged or impaired. In such cases, YOKOGAWA does not guarantee the quality, performance, function, and safety of instrument.
- When installing protection and/or safety as lighting protection devices and equipment for the instrument and control system or designing or installing separate protection and/or safety circuits for fool-proof design and fail-safe design of the processes and lines that use the instrument and the control system, the user should implement these using additional devices and equipment.
- Should use the parts specified by YOKOGAWA when replacing. Please contact YOKOGAWA's service office for fuse replacement.
- This instrument is not designed or manufactured to be used in critical applications that directly affect or threaten human lives. Such applications include nuclear power equipment, devices using radioactivity, railway facilities, aviation equipment, air navigation facilities, aviation facilities, and medical equipment. If so used, it is the user's responsibility to include in the system additional equipment and devices that ensure personnel safety.
- Do not modify this instrument.
- YOKOGAWA will not be liable for malfunctions or damage resulting from any modification made to this instrument by the customer.
- The instrument should be disposed of in accordance with local and national legislation/regulations.

## ■ Regarding This User's Manual

- This manual should be provided to the end user.
- The contents of this manual are subject to change without prior notice.
- All rights 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 manual, including, but not limited to, implied warranty of merchantability and fitness for a particular purpose.
- If any question arises or errors are found, or if any information is missing from this manual, inform the nearest YOKOGAWA sales office.
- The specifications covered by this manual are limited to those for the standard type under the specified model number break-down and do not cover custom-made instruments.
- Note that changes in the specifications, construction, or component parts of the instrument may not immediately be reflected in this manual at the time of change, provided that postponement of revisions will not cause difficulty to the user from a functional or performance standpoint.
- This manual is intended for the following personnel; Engineers responsible for installation and wiring of the instrument.  
Personnel responsible for normal daily operation of the instrument.
- To ensure correct use, read this manual and the applicable manuals as listed in Table 1.1 thoroughly before starting operation. Read the general specifications as listed in Table 1.1 for its specification.

## ■ 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 <sup>TM</sup> or <sup>®</sup>.



## 1.1 For Safe Use of Product

For the protection and safe use of the instrument and the system in which this instrument is incorporated, be sure to follow the instructions and precautions on safety that is stated in this manual whenever you handle the instrument. Take special note that if you handle the instrument in a manner that violated these instructions, the protection functionality of the instrument may be damaged or impaired. In such cases, YOKOGAWA shall not be liable for any indirect or consequential loss incurred by either using or not being able to use the Instrument.

### (1) General

- This instrument conforms to IEC safety class I (with Protective grounding terminal), Installation Category (Overvoltage Category) II, No Measurement Category ("O"(Other)), Micro Pollution degree 2, Macro Pollution degree 4.
- This instrument conforms to EN61326-1, EN61326-2-3, EN61000-3-2, and EN61000-3-3 (EMC standard).
- This instrument is an EN61326-1 (EMC standard), Class A (for use in commercial, industrial, or business environments).
- This instrument is complied with IP66 and IP67 in the EN60529.  
YOKOGAWA assumes no liability for the customer's failure to comply with these requirements.
- This instrument is designed for indoor and outdoor use.



### CAUTION

This instrument is a Class A instrument in the EN61326-1(EMC standard). Operation of this instrument in a residential area may cause radio interference, in which case the user is required to take appropriate measures to correct the interference.



### IMPORTANT

The minimum ambient temperature is limited by the minimum fluid temperature of the sensor (the lining). For more information, read the applicable general specifications as listed in Table 1.1.  
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%.



### WARNING

- **Purpose of use**  
This instrument is the Magnetic Flowmeter for use of measuring the liquid flow. Do not use this instrument for other purposes.



### WARNING


- Installation, wiring and maintenance of the magnetic flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to installation, wiring and maintenance.
- Wiring work should be done adequate wire, sleeve crimp and torque force. Use terminal with insulating cover for the power supply wiring and protective grounding wiring. Do not pull the wires too much strongly in order to prevent electric shocks caused by their damage.
- Do not open the cover in wet weather or humid environment. When the cover is open, stated enclosure protection is not applicable.
- Ensure that the power supply is off in order to prevent electric shocks.
- When opening the cover, wait for more than 20 minutes after turning off the power. Only expert engineer or skilled personnel are permitted to open the cover.
- When opening and closing the transmitter cover, be sure to handle the transmitter cover carefully so that there are no damage and foreign matter adhesion at its threads and O-ring.
- This instrument employs the parts which are affected by a function damage caused by static electricity. Thus, you should do the antistatic work using an anti-static wrist band for it and be careful to avoid touching each electrical parts and circuitry directly.
- 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.
- To prevent electric shocks, ensure the electrical wiring cover is completely attached after the wiring work.
- To prevent electric shocks, do not impress over rated voltage to each input/output terminals.
- If there is any unused cable entry, use the blanking plug to cover which comes with this instrument or which is supplied by YOKOGAWA. The blanking plug should be fastened into the unused cable entry without any mistake. If not, stated enclosure protection is not applicable.



**(2) Installation****WARNING**

- The magnetic flowmeter is a heavy instrument. Be careful that no damage is caused 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.
- Do not apply excessive weight, for example, a person stepping on the magnetic flowmeter.
- The magnetic flowmeter must be installed within the specification conditions.
- **Connect the Protective Grounding Terminal**  
Ensure to connect the protective grounding to prevent electric shock before turning on the power.
- **Do Not Impair the Protective Grounding**  
Never cut off the internal or external protective grounding wire or disconnect the wiring of the protective grounding terminal. Doing so invalidates the protective functions of the instrument and poses a potential shock hazard.
- **Do Not Operate with Defective Protective Grounding**  
Do not operate the instrument if the protective grounding might be defective. Also, ensure to check them before operation.
- **Do Not Operate in an Explosive Atmosphere**  
Do not operate the instrument in the presence of flammable gas, vapors, or combustible dust. Operation in such an environment constitutes a safety hazard. Prolonged use in a highly dense corrosive gas ( $H_2S$ ,  $SO_x$ , etc.) will cause a malfunction.
- **Ground the Instrument before Making External Connections**  
Connect the protective grounding before connecting to the item under measurement or control unit.
- **Damage to the Protection**  
Operating the instrument in a manner neither described in this manual nor the manuals as listed in Table 1.1 may damage the instrument's protection.
- The flowmeter should be installed away from electrical motors, transformers, and other power sources in order to avoid interference with measurement.
- 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.
- All procedures relating to installation must comply with the electrical code of the country where it is used.

**(3) Wiring****WARNING**

- In cases where the ambient temperature exceeds 50°C, use external heat resistant wiring with a maximum allowable temperature of 70°C or above.
- When wiring the conduits, pass the conduit through the wiring connection port, and utilize the waterproof gland to prevent water from flowing in. Install a drain valve at the low end of the vertical pipe, and open the valve regularly.
- 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.
- The transmitter case should be removed by YOKOGAWA's qualified personnel only. Opening the transmitter case is dangerous, because some areas inside the instrument have high voltages.
- The protective grounding must be connected securely at the terminal with the  mark to avoid danger to personnel.

**(4) Operation****WARNING**

Be sure to enable the write protect function to prevent the overwriting of parameters after finishing parameter setting.

In rare cases, 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. Blinking light from a flashlight etc. to the infra-red switches may result in the malfunction.

Read Section 6.3 for the hardware write protect function, and the user's manual of applicable communication type as listed in Table 1.1 for the software write protect function.



**(5) Maintenance****WARNING**

- When maintaining the instrument, read the maintenance manual as listed in Table 1.1. Do not perform the maintenance that is not described in the manual. If necessary, contact YOKOGAWA.
- 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.
- If dirt, dust or other substances surfaces on the glass of display cover, wipe them clean with a soft dry cloth.
- Maintenance of this flowmeter should be implemented in a maintenance service shop where the necessary tools and environment condition are provided.  
The necessity of this environmental condition is that ambient temperature is 5 to 40°C (the maximum relative humidity is 80 % for temperature 5 to 31°C, and decreasing linearly to 50 % relative humidity at 40°C).

**(6) Modification**

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

**(7) Product Disposal**

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

**(8) Power Supply**

Ensure that the source voltage matches the voltage of the power supply before turning on the power.

Power Supply Code 1:

- AC Type:  
Rated Power Supply: 100 to 240 V AC, 50/60 Hz
- DC Type:  
Rated Power Supply: 100 to 120 V DC

Power Supply Code 2:

- AC Type:  
Rated Power Supply: 24 V AC, 50/60 Hz
- DC Type:  
Rated Power Supply: 24 V DC

Power Consumption: 13 W

Note: For AXFA11, read the applicable user's manual as listed in Table 1.1.

**(9) microSD Card****IMPORTANT**

- Do not store or use the microSD card in places with static electricity, near electrically charged objects, or where electrical noise is present. Doing so can result in shock or damage.
- Do not disassemble or modify the microSD card.
- Do not physically shock, bend, or pinch the microSD card.
- During reading/writing of data, do not turn off the power, apply vibration or shock, or pull out the card. Data can corrupt or be permanently lost.
- Use only micro SD cards sold by YOKOGAWA. Operation cannot be guaranteed when other cards are used.
- When inserting the microSD card into the instrument, make sure to orient the microSD card correctly (face up or down) and insert it securely. If not inserted correctly, the microSD card will not be recognized by the instrument.
- Do not touch the microSD card with wet hands.
- Do not use the microSD card if it is dusty or dirty.
- The microSD card comes formatted. If you want to format the microSD card, use the instrument's Format function.
- YOKOGAWA provides no warranty for damage to, or loss of data recorded on the microSD card, regardless of the cause of such damage or loss. We recommend making backup copies of your data.



## 1.2 Warranty

- The warranty shall cover the period noted on the quotation presented to the purchaser at the time of purchase. Problems occurred during the warranty period shall basically be repaired free of charge.
- In case of problems, the customer should contact the YOKOGAWA representative from which the instrument was purchased, or the nearest YOKOGAWA office.
- If a problem arises with this instrument, please inform us of the nature of the problem and the circumstances under which it developed, including the model specification and serial number. Any diagrams, data and other information you can include in your communication will also be helpful.
- Responsible party for repair cost for the problems shall be determined by YOKOGAWA based on our investigation.
- The Purchaser shall bear the responsibility for repair costs, even during the warranty period, if the malfunction is due to:
  - Improper and/or inadequate maintenance by the purchaser.
  - Failure or damage due to improper handling, use or storage which is out of design conditions.
  - Use of the product in question in a location not conforming to the standards specified by YOKOGAWA, or due to improper maintenance of the installation location.
  - Failure or damage due to modification or repair by any party except YOKOGAWA or an approved representative of YOKOGAWA.
  - Malfunction or damage from improper relocation of the product in question after delivery.
  - Reason of force majeure such as fires, earthquakes, storms/floods, thunder/lightening, or other natural disasters, or disturbances, riots, warfare, or radioactive contamination.

## 1.3 Combination for Remote Sensor and Remote Transmitter



### IMPORTANT

- The AXW remote sensor (sizes 25 to 400 mm (1 to 16 in.)) should be combined with a remote transmitter according to Table 1.2.
- If the transmitter combined with the AXW magnetic flowmeter's remote sensor is changed from the AXFA11 to AXW4A or vice versa, the meter factor of the remote sensor must be readjusted according to its flow calibration.

**Table 1.2 Combination for sensor and transmitter**

Remote Sensor		Combined with the Remote Transmitter
Model	Construction Code	Model
AXW025 to AXW400	W	AXW4A
	D	AXFA11G

Contact YOKOGAWA before using it in combination with transmitters other than those listed above.



### NOTE

In case of combination with AXFA11 remote transmitter, select "ADMAG AXF" in the parameter "C30" of the AXFA11 remote transmitter.



## 2. Receiving and Storage

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

Model	Part name	Qty.
AXW □□□	Centering Device (*1)	1 set
	Blanking Plug (*2)	1 to 2 pcs.

### Remote Sensor

Model	Part name	Qty.
AXW □□□	Centering Device (*1)	1 set

### Remote Transmitter

Model	Part name	Qty.
AXW4A	Mounting Bracket	1 set
	Blanking Plug (*2)	1 to 2 pcs.
AXFA11G	Mounting Bracket	1 set

\*1: When the following process connection codes (wafer type) have been selected, the centering device is attached.

AA1, AA2, AE1, AE2, AE4, AG1, AJ1, AJ2

\*2: When the following code is specified for "Power Supply" and "Communication and I/O", the following quantity of blind plug is attached.

Power Supply code	Communication and I/O code	Qty.
All	DA or JA	1 pc.
-2	All	1 pc.
-2	DA or JA	2 pcs.



## 2.1 Model and Specifications Check

As shown in Figure 2.1 to Figure 2.4, the model, suffix code, serial number, meter factor, fluid specification, and device information are found on the name plate located on the outside of the housing. And, this instrument can check their information from parameters. Read the user's manual of applicable communication type as listed in Table 1.1 for checking device information from parameters.

When checking the matching of model and specification you ordered, see the applicable general specifications as listed in Table 1.1.

Be sure you have the model code and serial number available when contacting YOKOGAWA.

Note: Description on the nameplate

- Made in \_\_\_\_\_: Country of origin
- COMB No.: Serial number of the combined remote sensor or remote transmitter

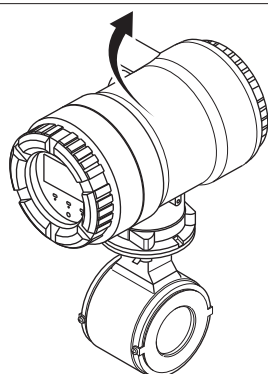
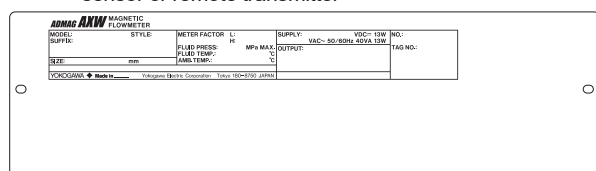


Figure 2.1 Name Plate (AXW Integral Flowmeter)

F0201.ai

## 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. When the PTFE lining is specified, the particle board is attached to the flowmeter. Keep the particle board attached until the flowmeter is install to the pipe.
- 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: -10 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.

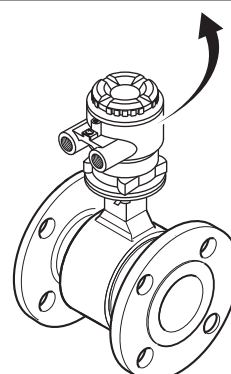
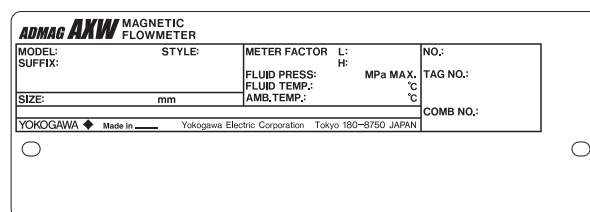


Figure 2.2 Name Plate (AXW Remote Sensor)

F0202.ai

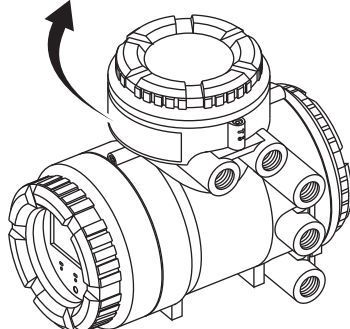
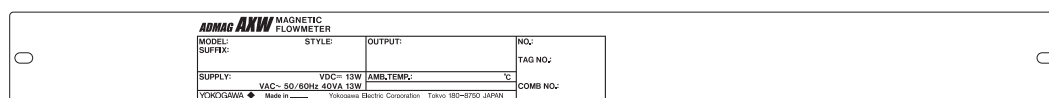


Figure 2.3 Name Plate (AXW4A Remote Transmitter)

F0203.ai

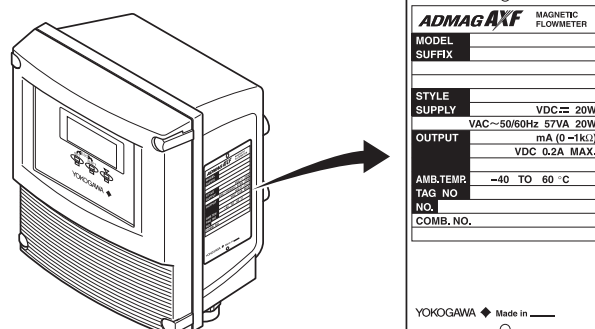


Figure 2.4 Name Plate (AXFA11 Remote Transmitter)

F0204.ai



## 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.

### 3.1 Piping Design Precautions



### IMPORTANT

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



### NOTE

This section describes the remote sensor 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 sensor (the lining). For more information, read the applicable general specification as listed in Table 1.1. 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 95% or higher.

#### (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

Based on JIS B 7554 “Electromagnetic Flowmeters” and our piping condition test data, we recommend the piping conditions as shown in the following figures. This is not always enough when the piping line incorporates multiple conditions at the same time. When installing two or more magnetic flowmeters on a single pipe, provide a run of at least 5D between them.

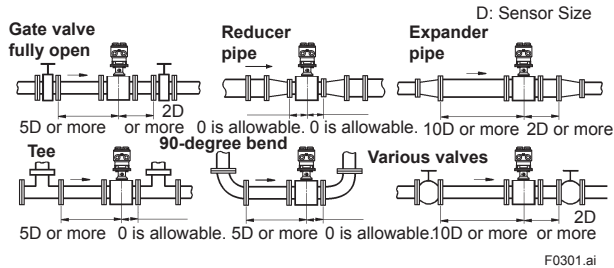


Figure 3.1.1 Required Lengths of Straight Runs

- \*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 sensor and to avoid startup from an empty condition.
- \*4: In case the piping conditions are compounded, install on the straight pipe section where the upstream part is sufficiently rectified.

### (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.

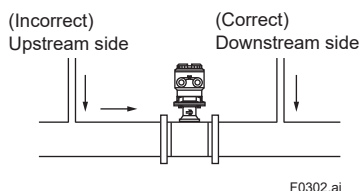


Figure 3.1.2 Chemical Injection

### (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.

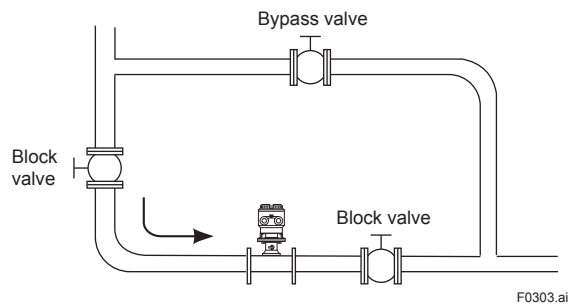


Figure 3.1.3 Bypass Line

### (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.



## (9) Mounting Positions

- Pipes must be fully filled with liquids.

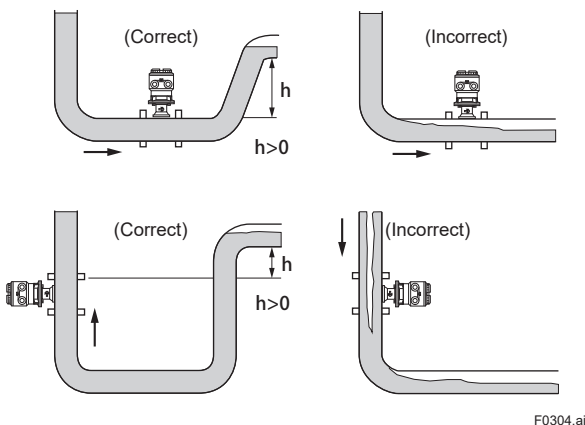


### IMPORTANT

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 sensor 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.



F0304.ai

Figure 3.1.4 Mounting Positions

- Avoid air bubbles.

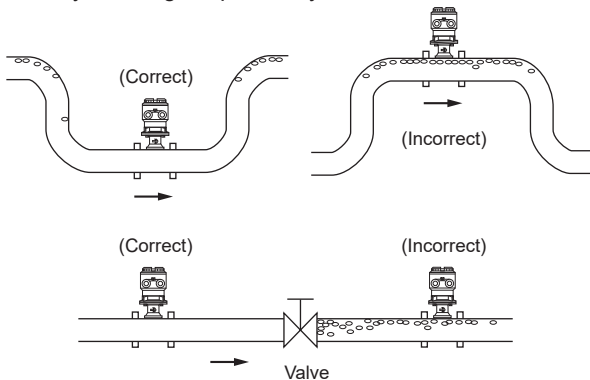


### IMPORTANT

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 sensor.

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.



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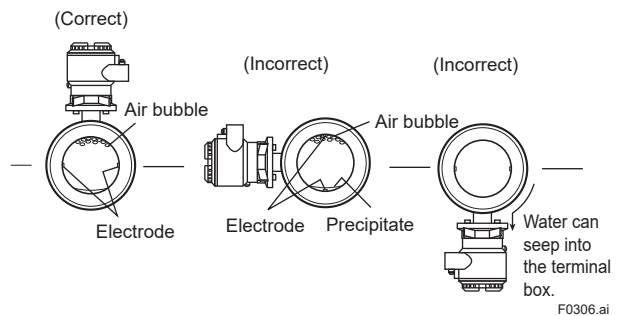
Figure 3.1.5 Avoiding Air Bubbles

- 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 sensor and transmitter of an integral flowmeter are mounted above the piping to prevent water from entering them.



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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 section describes the remote sensor 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 sensor as this damages the lining 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.

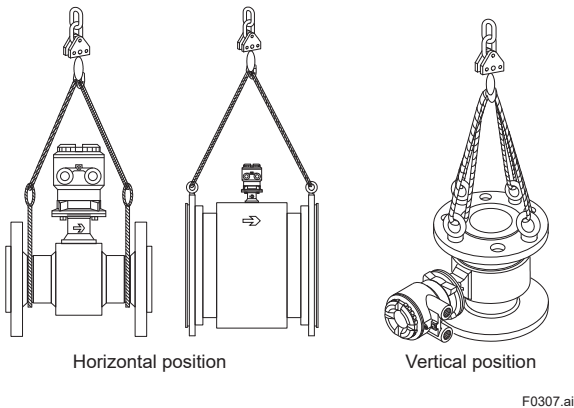


Figure 3.2.1 Lifting Flowmeter

### (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 lining 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) and the attached particle board (when PTFE lining is specified) 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 cable entries 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 of the flowmeter, perform supplementary inspections.

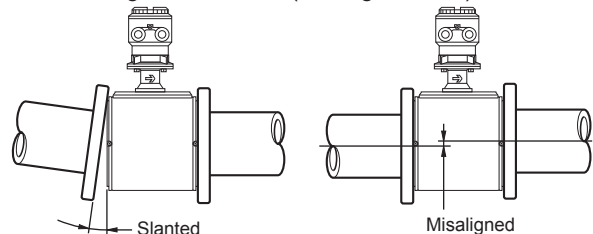
### 3.2.2 Flowmeter Piping



## 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 (see Figure 3.2.2).



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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 sensor during measurement.



### 3.3 Integral Flowmeter and Remote Sensor Installation



#### WARNING

- All gaskets used for piping of magnetic flowmeters should be prepared by customers except in some cases.
- To avoid damaging the flange surface of the sensor, do not use spiral wound gaskets.



#### NOTE

- The tightening torque of gasket varies depending on the type and the external dimensions of the lining and the gasket. The tightening torque values and the corresponding gasket types are indicated in the tables of this section. The dimensions the gasket used for piping-side flange should be decided by referring to Subsection 3.3.3.
- For fluids capable of potentially permeating PTFE linings (such as nitric acid, hydrofluoric acid, or sodium hydrate at high temperatures), do not use the PTFE lining type.
- The PTFE lining has a structure adhering PTFE to the metal inner face of the sensor. When install to the piping, be careful not to bring unequal stress or torque to the PTFE lining.
- For the PTFE lining, it is recommended to be installed with grounding rings, or to be installed with short pipes at upstream and downstream sides.

#### 3.3.1 Size 25 to 200 mm (1 to 8 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 (read Subsection 3.3.3). 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 cable entry can be changed. Read Section 3.5.

In case the fluid being measured flows against the arrow direction, change the value from "Forward" to "Reverse" at the parameter "Flow direct". Read the user's manual of the applicable communication type (for AXW/AXW4A) or the hardware/software edition (for AXFA11) as listed in Table 1.1.

Display Menu Path (AXW/AXW4A):

Device setup ► Detailed setup ► AUX calculation ► Flow direct

#### (2) Mounting Centering Devices

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

- **Size: 25 to 40 mm (1 to 1.5 in.)**

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.

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.

Pass the other through-bolts through the other holes. See Figure 3.3.2 for the mounting.

- **Size: 50 to 200 mm (2 to 8 in.)**

From the process piping side, pass two through-bolts through the adjacent two holes (the lower two holes for horizontal mounting) of both of the flanges and the four centering devices (two for each bolt). Be careful to prevent the four centering devices from coming into contact with the sensor housing.

In case stud-type through-bolts are used, position them in such a way that the four centering devices come in contact with the bolt threads.

Pass the other through-bolts through the other holes. See Figure 3.3.3 for the mounting.



#### NOTE

For Size 50 to 200 mm (2 to 8 in.), the centering devices are engraved with an identifying character. Be sure to use the appropriate ones which meet the required specifications by referring to Table 3.3.3.



### (3) Installation of Gasket and Grounding Device

The gaskets (supplied by customer) used for connection with customer pipes differ by the presence or absence of grounding device (grounding ring) and the specifications selected. Be sure to use the gaskets in compliance with the flange ratings and fluid specification. Install the gaskets as the followings.

Be sure to choose gaskets with inner and outer diameters that do not protrude inside the piping by referring to Subsection 3.3.3.



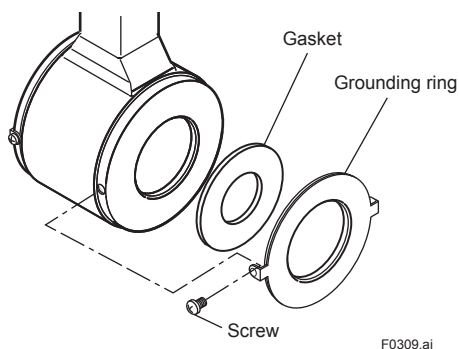
## WARNING

- All gaskets used for piping of magnetic flowmeters should be prepared by customers except in some cases.  
For the following cases, be sure to use a gasket between the grounding ring and the lining flare section, to prevent fluid leaks.
  - Size 50 to 200 mm (2 to 8 in.), natural hard rubber lining, and with grounding ring are specified.
  - Grounding rings are added at a later time.
- Be sure to choose the gasket with hardness comparable to soft rubber or the PTFE-sheathed non-asbestos gasket depending on process pressure. The thickness of the gasket should cover the range shown in Table 3.3.1.

**Table 3.3.1 Gasket thickness**

Size mm	Gasket thickness (mm)
50 to 125 (2 to 5 in.)	2
150 to 200 (6 to 8 in.)	3

For size 25 to 125 mm, the grounding ring has mounting fixing brackets (See Figure 3.3.1).



**Figure 3.3.1 Mounting of grounding ring**

### • Installation: Natural hard rubber lining type and Metal pipe

When a magnetic flowmeter with natural hard rubber lining is installed to metal pipe without lining, installation method without grounding ring is recommended.

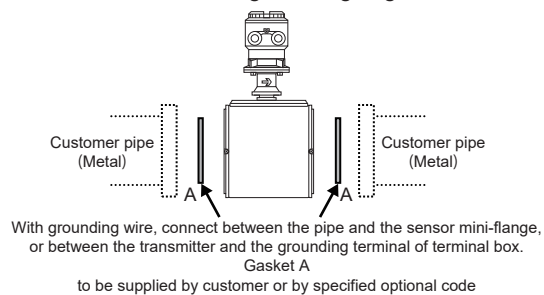
With grounding wire (supplied by customer), connect between the pipe and the sensor mini-flange, or between the transmitter and the grounding terminal of terminal box. For grounding in detail, read Subsection 4.4.3.

For gasket A (customer pipe side), use non-asbestos joint sheet gasket, PTFE-sheathed non-asbestos joint sheet gasket (optional code BSF) or gasket with the equivalent hardness.

In the case grounding ring is used, for gasket B (sensor side), use non-asbestos joint sheet gasket, PTFE-sheathed non-asbestos joint sheet gasket (optional code BSF) or gasket with the equivalent hardness.

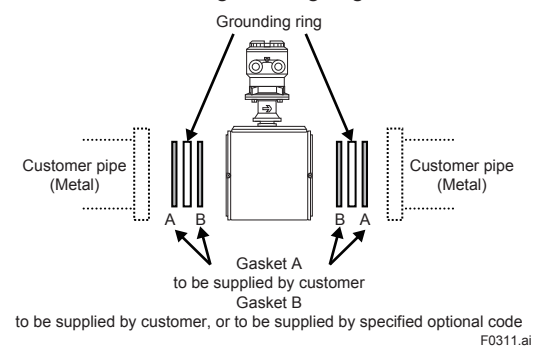
It is recommended to use gasket with same hardness for gasket A and B.

### • Installation without grounding ring



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### • Installation with grounding ring



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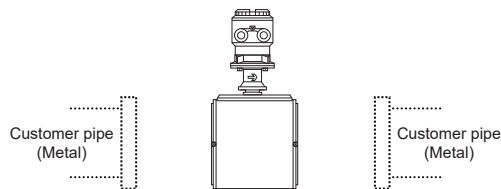
- **Installation: Natural soft rubber/Polyurethane rubber lining type and Metal pipe**

When a magnetic flowmeter with natural soft rubber or polyurethane rubber lining is installed to metal pipe without lining, installation method without grounding ring is recommended.

In the case grounding ring is not used, it is recommended to use no gasket between the pipe and the sensor. With grounding wire (supplied by customer), connect between the pipe and the sensor mini-flange, or between the transmitter and the grounding terminal of terminal box. For grounding in detail, read Subsection 4.4.3.

In the case grounding ring is used, for gasket A (customer pipe side), be sure to use non-asbestos joint sheet gasket, PTFE-sheathed non-asbestos joint sheet gasket (optional code BSF) or gasket with the equivalent hardness.

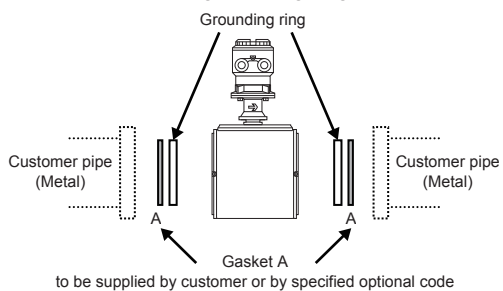
- Installation without grounding ring



With grounding wire, connect between the pipe and the sensor mini-flange, or between the transmitter and the grounding terminal of terminal box.

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- Installation with grounding ring



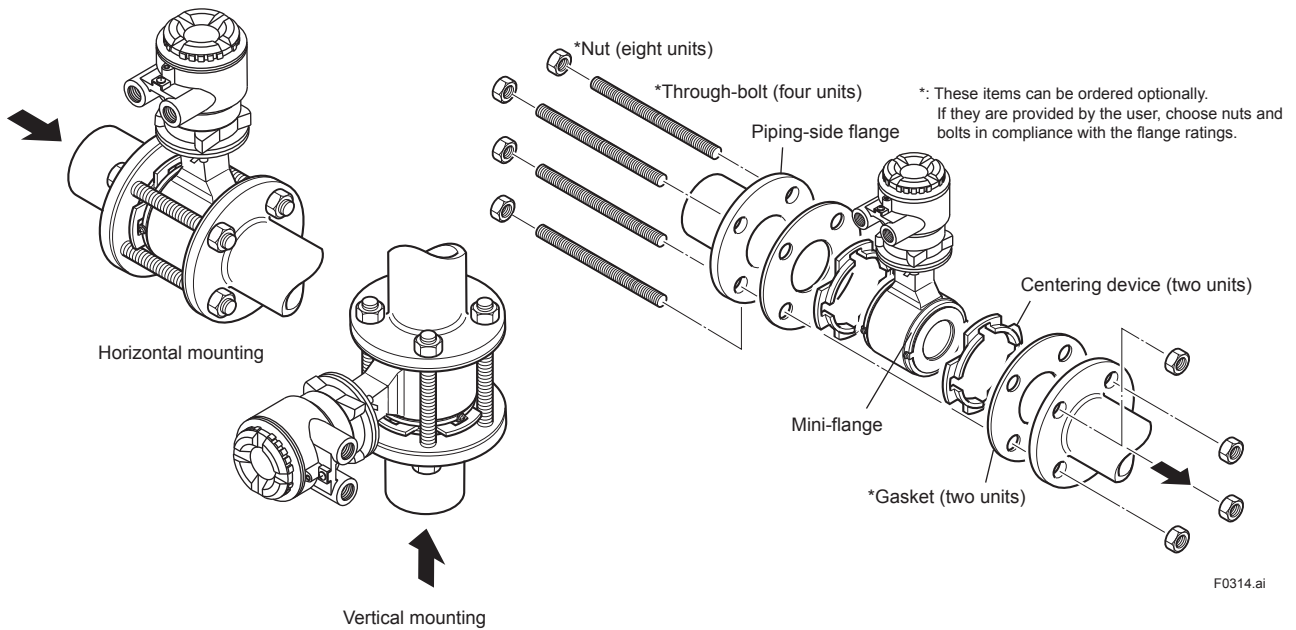
to be supplied by customer or by specified optional code

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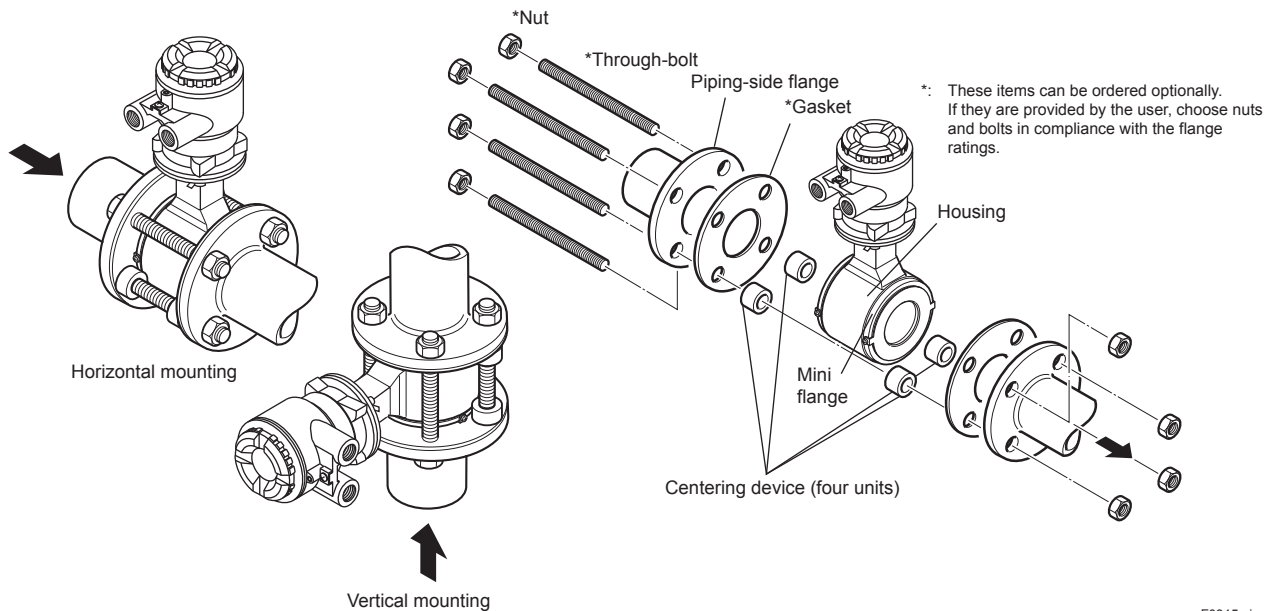
#### (4) Tightening Nuts

Tighten the nuts according to the torque values in Table 3.3.2.





**Figure 3.3.2 Mounting Procedure for Wafer Type (sizes: 25, 32 and 40 mm (1.0, 1.25 and 1.5 in.))**



**Figure 3.3.3 Mounting Procedure for Wafer Type (sizes: 50 to 200 mm (2 to 8 in.))**



Table 3.3.2 Wafer Type Tightening Torque Values for Metal Piping

Tightening torque values for Natural Hard Rubber/Natural Soft Rubber/Polyurethane Rubber lining (N·m)										
Gasket types within sensor	Natural Soft Rubber/Polyurethane Rubber lining: No gasket (Standard)									
	Natural Hard Rubber lining: Non-asbestos gasket, PTFE-sheathed non-asbestos gasket, or the equivalent in hardness									
Gasket types for user's flange	Non-asbestos gasket, PTFE-sheathed non-asbestos gasket (Optional code BSF), or the equivalent in hardness									
Flange Rating	JIS 10K	ASME Class 150		EN PN10	JIS 20K	ASME Class 300		EN PN16	EN PN40	JIS F12
Thread Standards	Metric screw	Metric screw	Unified screw	Metric screw	Metric screw	Metric screw	Unified screw	Metric screw	Metric screw	Metric screw
Size mm										
25	11.2 to 18.4	8.5 to 12.6		—	11.8 to 18.4	11.0 to 16.7		—	8.8 to 12.7	—
32	12.6 to 20.5	8.2 to 11.7		—	13.5 to 20.5	10.8 to 15.5		—	10.5 to 15.2	—
40	19.5 to 31.3	14.3 to 20.2		—	21.3 to 31.3	22.8 to 31.9		—	19.0 to 26.7	—
50	24.8 to 38.7	22.5 to 33.2		—	13.0 to 19.3	13.9 to 19.8		—	25.8 to 33.8	—
65	39.2 to 59.9	36.4 to 51.9		—	19.7 to 30.0	23.2 to 35.5		13.8 to 20.9	—	—
80	21.6 to 33.1	37.0 to 49.2		—	27.4 to 41.4	23.0 to 33.7		14.8 to 21.5	—	43.7 to 66.2
100	29.2 to 42.8	24.2 to 31.6		—	37.7 to 53.5	31.8 to 43.2		20.1 to 26.8	—	58.9 to 85.6
125	45.9 to 65.6	34.1 to 40.5		—	52.9 to 71.7	37.8 to 46.2		26.1 to 32.0	—	49.5 to 69.9
150	44.9 to 58.9	39.4 to 44.9	38.3 to 43.0	—	33.4 to 43.0	27.3 to 32.7		32.2 to 37.6	—	48.7 to 62.9
200	36.3 to 43.3	57.5 to 63.2	56.0 to 61.6	36.7 to 42.1	41.3 to 45.5	41.5 to 45.7	42.9 to 47.2	27.1 to 29.8	—	45.3 to 52.0

Tightening torque values for Natural Hard Rubber/Natural Soft Rubber/Polyurethane Rubber lining (in·lbf)										
Gasket types within sensor	Natural Soft Rubber/Polyurethane Rubber lining: No gasket (Standard)									
	Natural Hard Rubber lining: Non-asbestos gasket, PTFE-sheathed non-asbestos gasket, or the equivalent in hardness									
Gasket types for user's flange	Non-asbestos gasket, PTFE-sheathed non-asbestos gasket (Optional code BSF), or the equivalent in hardness									
Flange Rating	JIS 10K	ASME Class 150		EN PN10	JIS 20K	ASME Class 300		EN PN16	EN PN40	JIS F12
Thread Standards	Metric screw	Metric screw	Unified screw	Metric screw	Metric screw	Metric screw	Unified screw	Metric screw	Metric screw	Metric screw
Size in.										
1.0	99.1 to 162.9	75.2 to 111.5		—	104.4 to 162.9	97.4 to 147.8		—	77.9 to 112.4	—
1.25	111.5 to 181.4	72.6 to 103.6		—	119.5 to 181.4	95.6 to 137.2		—	92.9 to 134.5	—
1.5	172.6 to 277.0	126.6 to 178.8		—	188.5 to 277.0	201.8 to 282.3		—	168.2 to 236.3	—
2.0	219.5 to 342.5	199.1 to 293.8		—	115.1 to 170.8	123.0 to 175.2		—	228.3 to 299.2	—
2.5	346.9 to 530.2	322.2 to 459.4		—	174.4 to 265.5	205.3 to 314.2		122.1 to 185.0	—	—
3.0	191.2 to 293.0	327.5 to 435.5		—	242.5 to 366.4	203.6 to 298.3		131.0 to 190.3	—	386.8 to 585.9
4.0	258.4 to 378.8	214.2 to 279.7		—	333.7 to 473.5	281.5 to 382.4		177.9 to 237.2	—	521.3 to 757.6
5.0	406.2 to 580.6	301.8 to 358.5		—	468.2 to 634.6	334.6 to 408.9		231.0 to 283.2	—	438.1 to 618.7
6.0	397.4 to 521.3	348.7 to 397.4	339.0 to 380.6	—	295.6 to 380.6	241.6 to 289.4		285.0 to 332.8	—	431.0 to 556.7
8.0	321.3 to 383.2	508.9 to 559.4	495.6 to 545.2	324.8 to 372.6	365.5 to 402.7	367.3 to 404.5	379.7 to 417.8	239.9 to 263.8	—	400.9 to 460.2

Table 3.3.3 Centering Device Identification (Natural Hard Rubber/Natural Soft Rubber/Polyurethane Rubber lining)

Flange Rating Size mm (inch)	JIS			ASME		EN		
	10K	20K	F12	Class 150	Class 300	PN10	PN16	PN40
50 (2.0)	B	B	—	B	F	—	—	F
65 (2.5)	B	B	—	B	G	—	F	—
80 (3.0)	B	F	H	F	C	—	G	—
100 (4.0)	B	F	H	C	H	—	F	—
125 (5.0)	B	C	C	G	D	—	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.



### 3.3.2 Size 25 to 400 mm (1 to 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 (read Subsection 3.3.3). 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 cable entry can be changed. Read Section 3.5.

In case the fluid being measured flows against the arrow direction, change the value from "Forward" to "Reverse" at the parameter "Flow direct". Read the user's manual of the applicable communication type (for AXW/AXW4A) or the hardware/software edition (for AXFA11) as listed in Table 1.1.

Display Menu Path (AXW/AXW4A):

Device setup ► Detailed setup ► AUX calculation ► Flow direct

#### (2) Installation of Gasket and Grounding Device

The gaskets (supplied by customer) used for connection with customer pipes differ by the presence or absence of grounding device (grounding ring) and the specified specifications. Be sure to use the gaskets in compliance with the flange ratings and fluid specification. Install the gaskets as the followings.

Be sure to choose gaskets with inner and outer diameters that do not protrude inside the piping by referring to Subsection 3.3.3.



#### WARNING

- All gaskets used for piping of magnetic flowmeters should be prepared by customers except in some cases.
- For the following cases, be sure to use a gasket between the grounding ring and the lining flare section, to prevent fluid leaks.
  - Size 50 to 400 mm (2 to 16 in.), natural hard rubber lining, and with grounding ring are specified.
  - Size 150 to 400 mm (6 to 16 in.), and PTFE lining, and with grounding ring are specified.
  - Above two conditions, grounding rings are added at a later time.
- Be sure to choose the gasket with hardness comparable to soft rubber or the PTFE-sheathed non-asbestos gasket, or the equivalent in hardness gasket depending on process pressure. The thickness of the gasket should cover the range shown in Table 3.3.4.

Table 3.3.4 Gasket thickness

Size mm	Gasket thickness (mm)
50 to 125 (2 to 5 in.)	2
150 to 400 (6 to 16 in.)	3 to 5

For size 25 to 125 mm, the grounding ring has mounting fixing brackets (See Figure 3.3.4).

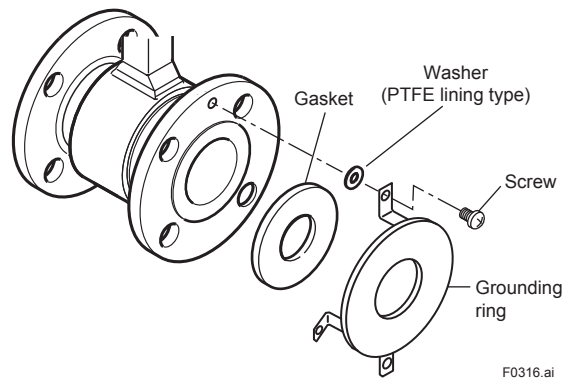


Figure 3.3.4 Mounting of grounding ring

Size 150 to 400 mm (6 to 16 in.), PTFE or natural hard rubber lining, and with grounding ring are specified, the grounding ring has handles (See Figure 3.3.5). Handles of the grounding ring have some holes which correspond to outer diameter of each flange type. There are printings near each hole. The printings show types of flange. See the Table 3.3.5. Confirm the centering pin is fixed to the hole corresponding to flange or fix the centering pin to the correct hole.



Size 150 to 200 mm (6 to 8 in.) is specified, hang the grounding rings with their flange type printings outer side of the magnetic flowmeter.

Set the angle of both handles symmetrically to be top. If there are any bolt-holes under the handles, turn the grounding rings clockwise in order to locate handles between bolt-holes. Center the grounding ring to the center of the magnetic flowmeter.

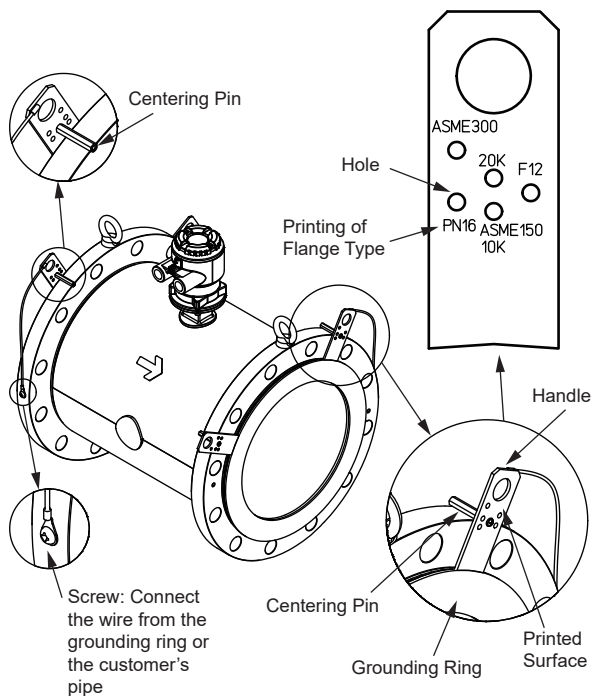
Size 250 to 400 mm (10 to 16 in.) is specified, hang the grounding rings with their flange type printings outer side of the magnetic flowmeter.

Set the angle of both handles symmetrically to be 45 degree from top. If there are any bolt-holes under the handles, turn the grounding rings clockwise in order to locate handles between bolt-holes. Center the grounding ring to the center of the magnetic flowmeter.

Connect the wire from the grounding ring to the screw of the magnetic flowmeter's flange and fix the wire by the screw. This procedure must be done for the both sides of the magnetic flowmeter.

**Table 3.3.5 Printing and Flange Rating**

Printing	Flange Type
ASME 150	ASME Class 150
ASME 300	ASME Class 300
PN10	EN PN10
PN16	EN PN16
10K	JIS 10K
20K	JIS 20K
F12	JIS F12



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Note: Size 150 to 200 mm (6 to 8 in.), PTFE lining, and with grounding ring are specified, the handle is one.

**Figure 3.3.5 Mounting of grounding ring**

### • Installation: PTFE/Natural hard rubber lining type and Metal pipe

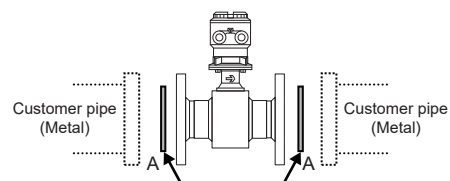
When a magnetic flowmeter with PTFE or natural hard rubber lining is installed to metal pipe without lining, the installation method without grounding ring is recommended.

Size 25 to 125 mm (1 to 5 in.), PTFE lining, and without grounding ring are specified, it is recommended to use no gasket between the pipe and the sensor. With grounding wire (supplied by customer), connect between the pipe and the sensor flange, or between the transmitter and the grounding terminal of terminal box. For grounding in detail, read Subsection 4.4.3.

Size 150 to 400 mm (6 to 16 in.), PTFE or natural hard rubber lining, and without grounding ring are specified, use the gasket A (customer pipe side) for connection with customer pipes. With grounding wire (supplied by customer), connect between the pipe and the sensor flange, or between the transmitter and the grounding terminal of terminal box. For grounding in detail, read Subsection 4.4.3.

For gasket A (customer pipe side), use non-asbestos joint sheet gasket, PTFE-sheathed non-asbestos joint sheet gasket or gasket with the equivalent hardness. For gasket B (sensor side), use non-asbestos joint sheet gasket, PTFE-sheathed non-asbestos joint sheet gasket or gasket with the equivalent hardness. It is recommended to use gasket with same hardness for gasket A and B.

### • Installation without grounding ring

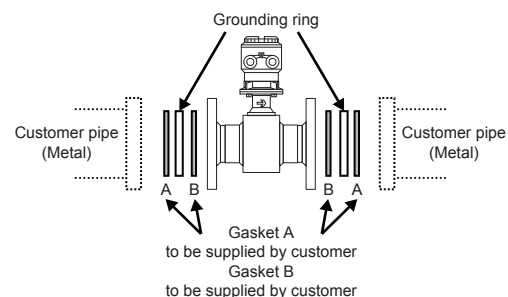


With grounding wire, connect between the pipe and the sensor flange, or between the transmitter and the grounding terminal of terminal box.

Gasket A to be supplied by customer (Size 25 to 125 mm (1 to 5 in.), and PTFE lining are specified, Gasket A is unnecessary.)

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### • Installation with grounding ring



Gasket A to be supplied by customer  
Gasket B to be supplied by customer

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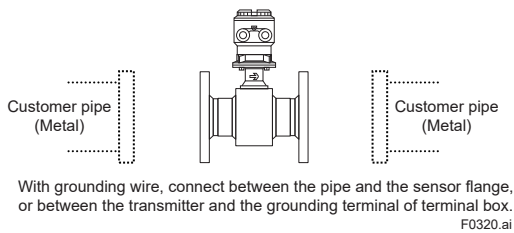
- **Installation: Natural soft rubber/Polyurethane rubber lining type and Metal pipe**

When a magnetic flowmeter with natural soft rubber or polyurethane rubber lining is installed to metal pipe without lining, the installation method without grounding ring is recommended.

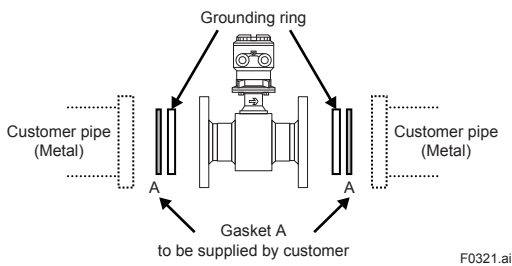
In the case grounding ring is not used, with grounding wire (supplied by customer), connect between the pipe and the sensor flange, or between the transmitter and the grounding terminal of terminal box. For grounding in detail, read Subsection 4.4.3.

For gasket A (customer pipe side), use non-asbestos joint sheet gasket, PTFE-sheathed non-asbestos joint sheet gasket or gasket with the equivalent hardness.

- Installation without grounding ring



- Installation with grounding ring



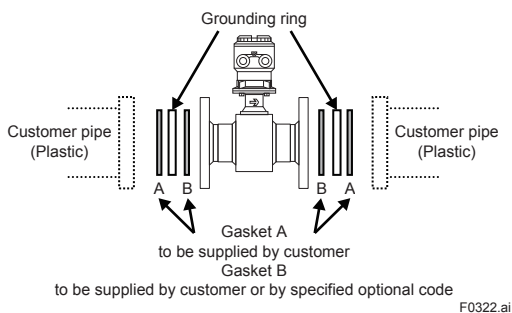
- **Installation: PTFE lining type and Plastic pipe**

When a magnetic flowmeter with PTFE lining is installed to plastic pipe, be sure to use grounding rings.

For gasket A (customer pipe side), use fluororubber gasket, chloroprene rubber gasket or gasket with the equivalent hardness.

For gasket B (sensor side), use fluororubber gasket (optional code GA, GC or GD) or gasket with the equivalent hardness.

It is recommended to use gasket with same hardness for gasket A and B.



### (3) Tightening Nuts

Tighten the nuts according to the torque values for the metal piping in Table 3.3.6. For plastic piping, using the gaskets for plastic piping (optional code GA, GC or GD), tighten the nuts according to the torque values in Table 3.3.7.



## CAUTION

For a flowmeter with fluorocarbon PTFE 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.

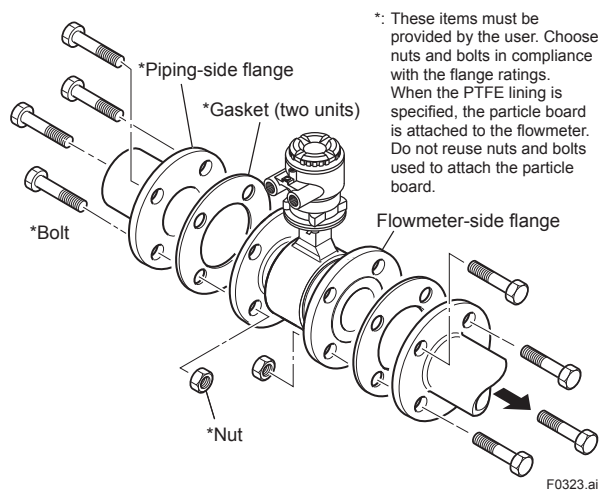


Figure 3.3.6 Mounting Procedure for Flange Type  
(sizes: 25 to 400 mm (1 to 16 in.))



Table 3.3.6 Flange Type Tightening Torque Values for Metal Piping

Tightening torque values for PTFE/Natural Hard Rubber/Natural Soft Rubber lining (N·m)										
Gasket types within sensor	Natural Soft Rubber lining: No gasket (Standard)									
	PTFE/Natural Hard Rubber lining: Non-asbestos gasket, PTFE-sheathed non-asbestos gasket, or the equivalent in hardness									
Gasket types for user's flange	Non-asbestos gasket, PTFE-sheathed non-asbestos gasket, or the equivalent in hardness									
Flange Rating	JIS 10K	ASME Class 150		EN PN10	JIS 20K	ASME Class 300		EN PN16	EN PN40	JIS F12
Thread Standards	Metric screw	Metric screw	Unified screw	Metric screw	Metric screw	Metric screw	Unified screw	Metric screw	Metric screw	Metric screw
Size mm										
25	10.3 to 17.2	8.5 to 13.1		—	10.6 to 17.2	11.1 to 17.8		—	8.4 to 13.1	—
32	15.5 to 25.7	11.6 to 17.7		—	16.1 to 25.7	15.0 to 23.3		—	14.7 to 23.0	—
40	18.0 to 29.7	14.3 to 21.4		—	19.0 to 29.7	22.3 to 33.7		—	18.4 to 28.2	—
50	27.0 to 43.8	12.9 to 21.0		—	13.8 to 21.9	13.7 to 21.0		—	29.1 to 42.7	—
65	41.6 to 66.6	19.7 to 31.4		—	20.7 to 33.3	24.2 to 37.5		16.3 to 26.3	—	—
80	22.2 to 36.0	19.7 to 30.6		—	28.0 to 45.1	24.1 to 36.6		17.3 to 27.5	—	45.3 to 72.1
100	28.9 to 45.8	27.0 to 40.5		—	37.9 to 59.1	33.2 to 48.4		23.2 to 35.7	—	61.0 to 94.6
125	47.1 to 74.4	39.5 to 57.1		—	53.2 to 81.4	41.2 to 57.1		31.0 to 45.9	—	51.7 to 79.4
150	70.4 to 108.0	41.4 to 59.8		—	60.8 to 92.7	51.6 to 72.1		58.0 to 86.4	—	77.1 to 115.2
200	55.8 to 84.1	54.9 to 74.1		69.1 to 103.2	86.4 to 124.4	85.5 to 117.2		47.3 to 68.8	—	70.1 to 100.9
250	95.0 to 139.9	66.3 to 91.8		68.2 to 100.8	140.3 to 193.9	100.3 to 131.0		84.6 to 120.9	—	134.0 to 192.0
300	76.8 to 111.6	75.1 to 97.5		72.4 to 102.3	143.8 to 195.8	158.8 to 201.5		66.0 to 92.1	—	117.3 to 163.3
350	111.9 to 167.8	88.2 to 126.1		82.4 to 117.7	—	—		—	—	184.7 to 268.4
400	169.6 to 251.4	126.4 to 176.9		141.1 to 203.4	—	—		—	—	210.9 to 305.4

Tightening torque values for PTFE/Natural Hard Rubber/Natural Soft Rubber lining (in.·lbf)										
Gasket types within sensor	Natural Soft Rubber lining: No gasket (Standard)									
	PTFE/Natural Hard Rubber lining: Non-asbestos gasket, PTFE-sheathed non-asbestos gasket, or the equivalent in hardness									
Gasket types for user's flange	Non-asbestos gasket, PTFE-sheathed non-asbestos gasket, or the equivalent in hardness									
Flange Rating	JIS 10K	ASME Class 150		EN PN10	JIS 20K	ASME Class 300		EN PN16	EN PN40	JIS F12
<div>Thread Standards</div> <div>Size in.</div>	Metric screw	Metric screw	Unified screw	Metric screw	Metric screw	Metric screw	Unified screw	Metric screw	Metric screw	Metric screw
1.0	91.2 to 152.2	75.2 to 115.9		—	93.8 to 152.2	98.2 to 157.5		—	74.3 to 115.9	—
1.25	137.2 to 227.5	102.7 to 156.7		—	142.5 to 227.5	132.8 to 206.2		—	130.1 to 203.6	—
1.5	159.3 to 262.9	126.6 to 189.4		—	168.2 to 262.9	197.4 to 298.3		—	162.9 to 249.6	—
2.0	239.0 to 387.7	114.2 to 185.9		—	122.1 to 193.8	121.3 to 185.9		—	257.6 to 377.9	—
2.5	368.2 to 589.5	174.4 to 277.9		—	183.2 to 294.7	214.2 to 331.9		144.3 to 232.8	—	—
3.0	196.5 to 318.6	174.4 to 270.8		—	247.8 to 399.2	213.3 to 323.9		153.1 to 243.4	—	400.9 to 638.1
4.0	255.8 to 405.4	239.0 to 358.5		—	335.4 to 523.1	293.8 to 428.4		205.3 to 316.0	—	539.9 to 837.3
5.0	416.9 to 658.5	349.6 to 505.4		—	470.9 to 720.5	364.7 to 505.4		274.4 to 406.2	—	457.6 to 702.7
6.0	623.1 to 955.9	366.4 to 529.3		—	538.1 to 820.5	456.7 to 638.1		513.3 to 764.7	—	682.4 to 1019.6
8.0	493.9 to 744.3	485.9 to 655.8		611.6 to 913.4	764.7 to 1101.0	756.7 to 1037.3		418.6 to 608.9	—	620.4 to 893.0
10	840.8 to 1238.2	586.8 to 812.5		603.6 to 892.2	1241.8 to 1716.2	887.7 to 1159.4		748.8 to 1070.1	—	1186.0 to 1699.3
12	679.7 to 987.7	664.7 to 862.9		640.8 to 905.4	1272.7 to 1733.0	1405.5 to 1783.4		584.1 to 815.2	—	1038.2 to 1445.3
14	990.4 to 1485.2	780.6 to 1116.1		729.3 to 1041.7	—	—		—	—	1634.7 to 2375.5
16	1501.1 to 2225.1	1118.7 to 1565.7		1248.8 to 1800.2	—	—		—	—	1866.6 to 2703.0



Tightening torque values for Polyurethane Rubber lining (N·m)										
Gasket types within sensor	No gasket (Standard)									
Gasket types for user's flange	Non-asbestos gasket, PTFE-sheathed non-asbestos gasket, or the equivalent in hardness									
Flange Rating	JIS 10K	ASME Class 150		EN PN10	JIS 20K	ASME Class 300		EN PN16	EN PN40	JIS F12
Thread Standards	Metric screw	Metric screw	Unified screw	Metric screw	Metric screw	Metric screw	Unified screw	Metric screw	Metric screw	Metric screw
Size mm										
25	10.3 to 17.2	8.5 to 13.1		—	10.6 to 17.2	11.1 to 17.8		—	8.4 to 13.1	—
32	15.5 to 25.7	11.6 to 17.7		—	16.1 to 25.7	15.0 to 23.3		—	14.7 to 23.0	—
40	18.0 to 29.7	14.3 to 21.4		—	19.0 to 29.7	22.3 to 33.7		—	18.4 to 28.2	—
50	27.0 to 43.8	12.9 to 21.0		—	13.8 to 21.9	13.7 to 21.0		—	29.1 to 42.7	—
65	41.6 to 66.6	19.7 to 31.4		—	20.7 to 33.3	24.2 to 37.5		16.3 to 26.3	—	—
80	22.2 to 36.0	19.7 to 30.6		—	28.0 to 45.1	24.1 to 36.6		17.3 to 27.5	—	45.3 to 72.1
100	28.9 to 45.8	27.0 to 40.5		—	37.9 to 59.1	33.2 to 48.4		23.2 to 35.7	—	61.0 to 94.6
125	47.1 to 74.4	39.5 to 57.1		—	53.2 to 81.4	41.2 to 57.1		31.0 to 45.9	—	51.7 to 79.4
150	60.1 to 92.1	34.4 to 49.7		—	51.7 to 78.7	43.0 to 59.8		47.4 to 70.5	—	66.1 to 98.2
200	47.1 to 70.9	45.8 to 61.5		56.2 to 83.4	64.4 to 91.9	62.8 to 84.7		38.4 to 55.6	—	59.7 to 85.0
250	87.1 to 128.0	60.0 to 82.8		61.0 to 89.8	112.5 to 153.6	78.1 to 100.7		75.7 to 107.8	—	123.2 to 175.5
300	66.5 to 96.2	63.8 to 82.1		59.7 to 83.5	92.4 to 122.4	96.9 to 119.5		54.2 to 75.2	—	102.1 to 140.7
350	100.7 to 150.5	77.8 to 110.9		71.9 to 101.9	—	—		—	—	166.7 to 240.8
400	155.4 to 229.5	114.3 to 159.3		126.6 to 181.5	—	—		—	—	193.7 to 278.8

Tightening torque values for Polyurethane Rubber lining (in·lbf)										
Gasket types within sensor	No gasket (Standard)									
Gasket types for user's flange	Non-asbestos gasket, PTFE-sheathed non-asbestos gasket, or the equivalent in hardness									
Flange Rating	JIS 10K	ASME Class 150		EN PN10	JIS 20K	ASME Class 300		EN PN16	EN PN40	JIS F12
Thread Standards	Metric screw	Metric screw	Unified screw	Metric screw	Metric screw	Metric screw	Unified screw	Metric screw	Metric screw	Metric screw
Size in.										
1.0	91.2 to 152.2	75.2 to 115.9		—	93.8 to 152.2	98.2 to 157.5		—	74.3 to 115.9	—
1.25	137.2 to 227.5	102.7 to 156.7		—	142.5 to 227.5	132.8 to 206.2		—	130.1 to 203.6	—
1.5	159.3 to 262.9	126.6 to 189.4		—	168.2 to 262.9	197.4 to 298.3		—	162.9 to 249.6	—
2.0	239.0 to 387.7	114.2 to 185.9		—	122.1 to 193.8	121.3 to 185.9		—	257.6 to 377.9	—
2.5	368.2 to 589.5	174.4 to 277.9		—	183.2 to 294.7	214.2 to 331.9		144.3 to 232.8	—	—
3.0	196.5 to 318.6	174.4 to 270.8		—	247.8 to 399.2	213.3 to 323.9		153.1 to 243.4	—	400.9 to 638.1
4.0	255.8 to 405.4	239.0 to 358.5		—	335.4 to 523.1	293.8 to 428.4		205.3 to 316.0	—	539.9 to 837.3
5.0	416.9 to 658.5	349.6 to 505.4		—	470.9 to 720.5	364.7 to 505.4		274.4 to 406.2	—	457.6 to 702.7
6.0	531.9 to 815.2	304.5 to 439.9		—	457.6 to 696.6	380.6 to 529.3		419.5 to 624.0	—	585.0 to 869.1
8.0	416.9 to 627.5	405.4 to 544.3		497.4 to 738.2	570.0 to 813.4	555.8 to 749.7		339.9 to 492.1	—	528.4 to 752.3
10	770.9 to 1132.9	531.0 to 732.8		539.9 to 794.8	995.7 to 1359.5	691.2 to 891.3		670.0 to 954.1	—	1090.4 to 1553.3
12	588.6 to 851.4	564.7 to 726.6		528.4 to 739.0	817.8 to 1083.3	857.6 to 1057.7		479.7 to 665.6	—	903.7 to 1245.3
14	891.3 to 1332.0	688.6 to 981.5		636.4 to 901.9	—	—		—	—	1475.4 to 2131.3
16	1375.4 to 2031.2	1011.6 to 1409.9		1120.5 to 1606.4	—	—		—	—	1714.4 to 2467.6



Table 3.3.7 Flange Type Tightening Torque Values for Plastic Piping

Tightening torque values for PTFE lining (N·m)									
Gasket types within sensor	Fluororubber gasket (Optional codes GA, GC, or GD)								
Gasket types for user's flange	Fluororubber gasket, chloroprene rubber gasket, or the equivalent in hardness								
Flange Rating	JIS 10K	ASME Class 150		JIS 20K	ASME Class 300		EN PN16	EN PN40	JIS F12
Thread Standards	Metric screw	Metric screw	Unified screw	Metric screw	Metric screw	Unified screw	Metric screw	Metric screw	Metric screw
Size mm									
25	3.1 to 5.1	2.5 to 4.0		5.4 to 9.0	6.6 to 11.0		—	5.0 to 8.3	—
32	4.6 to 7.7	3.5 to 5.5		8.2 to 13.7	8.8 to 14.6		—	8.7 to 14.4	—
40	5.4 to 8.9	4.3 to 6.8		9.6 to 16.0	13.2 to 21.1		—	10.7 to 17.9	—
50	8.1 to 13.4	3.8 to 6.4		7.0 to 11.7	8.0 to 13.3		—	16.8 to 28.1	—
65	12.6 to 21.0	5.9 to 9.8		6.4 to 10.7	7.4 to 12.0		4.8 to 8.1	—	—
80	6.6 to 11.1	5.9 to 9.8		8.6 to 14.4	7.4 to 12.0		5.2 to 8.6	—	13.7 to 22.9
100	8.7 to 14.5	8.2 to 13.6		11.8 to 19.6	10.3 to 16.7		7.0 to 11.6	—	18.8 to 31.3
125	14.2 to 23.6	12.0 to 19.4		16.6 to 27.6	13.0 to 21.2		9.5 to 15.8	—	15.9 to 26.5

Tightening torque values for PTFE lining (in·lbf)									
Gasket types within sensor	Fluororubber gasket (Optional codes GA, GC, or GD)								
Gasket types for user's flange	Fluororubber gasket, chloroprene rubber gasket, or the equivalent in hardness								
Flange Rating	JIS 10K	ASME Class 150		JIS 20K	ASME Class 300		EN PN16	EN PN40	JIS F12
Thread Standards	Metric screw	Metric screw	Unified screw	Metric screw	Metric screw	Unified screw	Metric screw	Metric screw	Metric screw
Size in.									
1.0	27.4 to 45.1	22.1 to 35.4		47.8 to 79.7	58.4 to 97.4		—	44.3 to 73.5	—
1.25	40.7 to 68.2	31.0 to 48.7		72.6 to 121.3	77.9 to 129.2		—	77.0 to 127.5	—
1.5	47.8 to 78.8	38.1 to 60.2		85.0 to 141.6	116.8 to 186.8		—	94.7 to 158.4	—
2.0	71.7 to 118.6	33.6 to 56.6		62.0 to 103.6	70.8 to 117.7		—	148.7 to 248.7	—
2.5	111.5 to 185.9	52.2 to 86.7		56.6 to 94.7	65.5 to 106.2		42.5 to 71.7	—	—
3.0	58.4 to 98.2	52.2 to 86.7		76.1 to 127.5	65.5 to 106.2		46.0 to 76.1	—	121.3 to 202.7
4.0	77.0 to 128.3	72.6 to 120.4		104.4 to 173.5	91.2 to 147.8		62.0 to 102.7	—	166.4 to 277.0
5.0	125.7 to 208.9	106.2 to 171.7		146.9 to 244.3	115.1 to 187.6		84.1 to 139.8	—	140.7 to 234.5



### 3.3.3 Gasket Size(customer pipe)



## WARNING

All gaskets used for piping of Magnetic Flowmeters should be prepared by customers except in some cases.

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 3.3.8 Inner Diameter of Grounding Ring, Outer Diameter for Effective Sealing and Recommended Inner Diameter of Gasket**

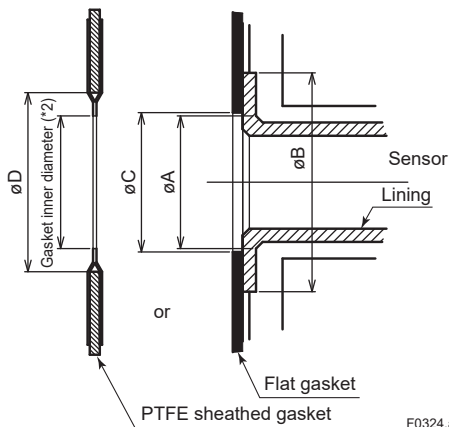
Unit: mm

Size	Natural Hard Rubber/Natural Soft Rubber/Polyurethane Rubber Lining				PTFE/Natural Hard Rubber/Natural Soft Rubber/Polyurethane Rubber Lining			
	Wafer				Flange			
	Inner Diameter for Effective Sealing [øA]	Outer Diameter for Effective Sealing [øB]	Recommended Inner Diameter of Gasket		Inner Diameter for Effective Sealing [øA]	Outer Diameter for Effective Sealing [øB]		Minimum Inner Diameter of Gasket *2
			Flat Gasket [øC]	PTFE-sheathed Gasket [øD]		PTFE/Natural Hard Rubber/ Natural Soft Rubber Lining	Polyurethane Rubber Lining	
25	32	54	35	28	35	54	35	29
32	37	58	43	34	40	64	43	34
40	45	71	49	41	48	72	49	41
50	58	84	61	53	61	89	61	53
65	69	103	84	66	72	108	84	66
80	81	114	90	81	85	119	90	81
100	106	140	115	102	110	146	115	102
125	131	165	141	128	136	173	141	128
150	164	190	167	147	164	209 {216} *1	203 {209} *1	150
200	218	240	218	199	218	259 {272} *1	253 {259} *1	201
250	-	-	-	-	270	320 {332} *1	316 {320} *1	250
300	-	-	-	-	321	367 {392} *1	361 {367} *1	301
350	-	-	-	-	350	412	406	330
400	-	-	-	-	401	475	469	381

Unit: inch

Size	Natural Hard Rubber/Natural Soft Rubber/Polyurethane Rubber Lining				PTFE/Natural Hard Rubber/Natural Soft Rubber/Polyurethane Rubber Lining			
	Wafer				Flange			
	Inner Diameter for Effective Sealing [øA]	Outer Diameter for Effective Sealing [øB]	Recommended Inner Diameter of Gasket		Inner Diameter for Effective Sealing [øA]	Outer Diameter for Effective Sealing [øB]		Minimum Inner Diameter of Gasket *2
			Flat Gasket [øC]	PTFE-sheathed Gasket [øD]		PTFE/Natural Hard Rubber/ Natural Soft Rubber Lining	Polyurethane Rubber Lining	
25	1.26	2.13	1.38	1.10	1.39	2.13	1.38	1.14
32	1.46	2.28	1.69	1.34	1.59	2.53	1.69	1.34
40	1.76	2.80	1.93	1.61	1.89	2.83	1.93	1.61
50	2.26	3.31	2.40	2.09	2.39	3.50	2.40	2.09
65	2.73	4.06	3.31	2.60	2.84	4.25	3.31	2.60
80	3.19	4.49	3.54	3.19	3.33	4.69	3.54	3.19
100	4.19	5.51	4.53	4.02	4.34	5.75	4.53	4.02
125	5.14	6.50	5.55	5.04	5.34	6.81	5.55	5.04
150	6.46	7.48	6.57	5.79	6.46	8.23 {8.50} *1	7.99 {8.23} *1	5.91
200	8.58	9.45	8.58	7.83	8.58	10.20 {10.71} *1	9.96 {10.20} *1	7.91
250	-	-	-	-	10.61	12.60 {13.07} *1	12.44 {12.60} *1	9.84
300	-	-	-	-	12.64	14.44 {15.43} *1	14.21 {14.45} *1	11.85
350	-	-	-	-	13.76	16.22	15.98	12.99
400	-	-	-	-	15.78	18.70	18.46	15.00

\*1: The value varies depending on the selection of process connection code.  
BA2, BJ2, CA2, or CJ2: Value in { }.



\*2: To prevent the gasket from protruding into the flow path, make sure that this length is smaller than the minimum inner diameter of the gasket in the table.



## 3.4 Remote Transmitter 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.

### 3.4.1 Installation Location



### IMPORTANT

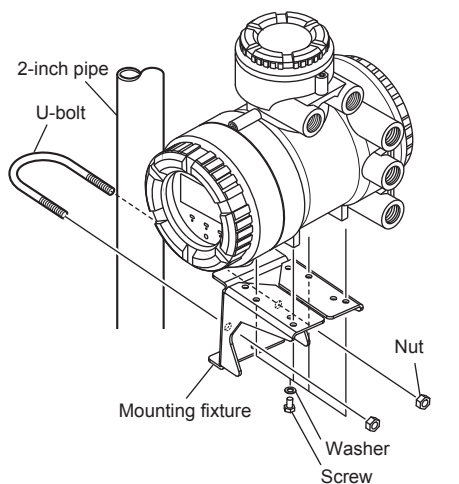
Install the instrument in a location where it is not exposed to direct sunlight. For ambient temperature, read the applicable general specifications as listed in Table 1.1.

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 AXW4A Transmitter

AXW4A Remote Transmitter can be mounted on a 2-inch pipe in a vertical or horizontal position depending on the installation site.

#### ● Vertical Pipe Mounting

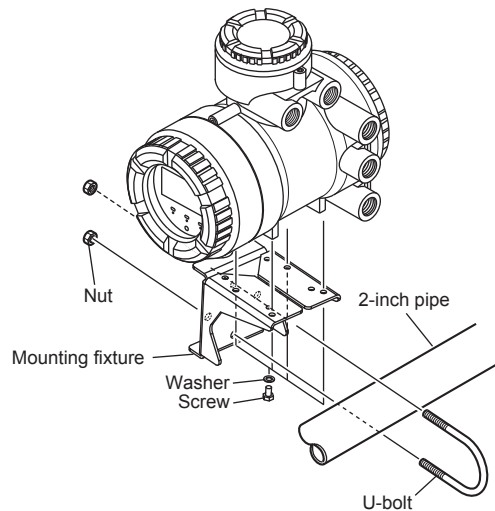


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Figure 3.4.1 2-inch Pipe Vertical Mounting

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.

#### ● Horizontal Pipe Mounting



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Figure 3.4.2 2-inch Pipe Horizontal Mounting

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.

### 3.4.3 Mounting of AXFA11 Transmitter

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

#### ● Surface Mounting (Wall Mounting)

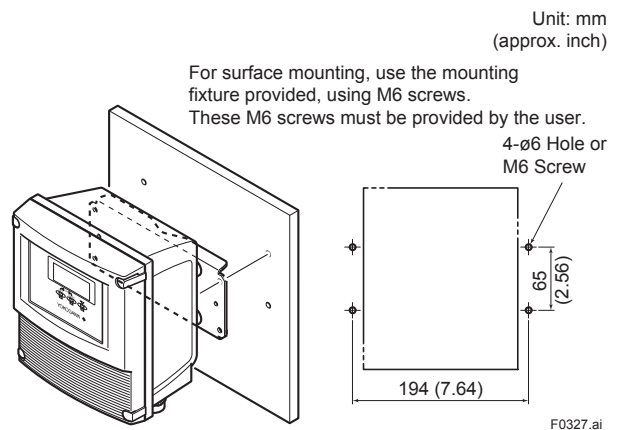


Figure 3.4.3 Surface Mounting

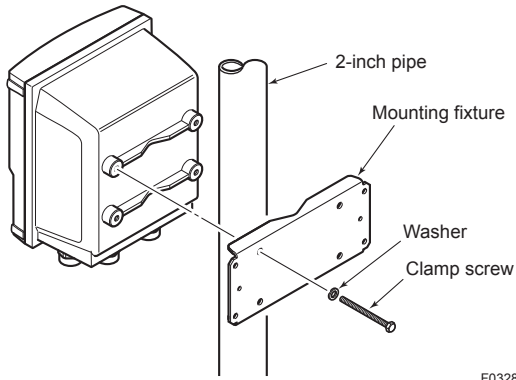


### IMPORTANT

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: 3.3 kg (7.3 lb)).



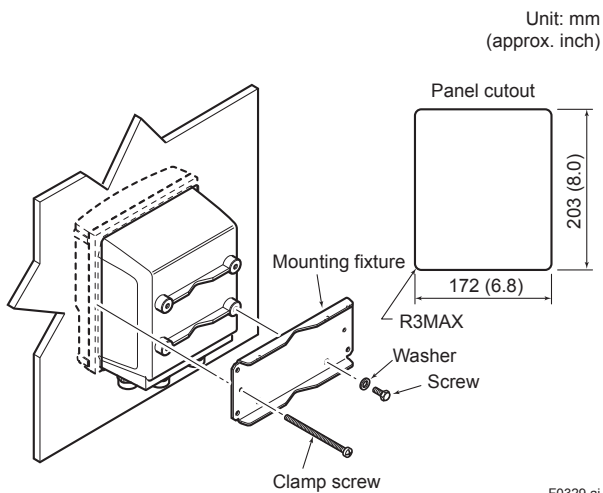
### ● 2-inch Pipe Mounting



**Figure 3.4.4 2-inch Pipe Mounting**

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

### ● Panel Mounting



**Figure 3.4.5 Panel Mounting**

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

## 3.5 Changing Direction of Cable Entry

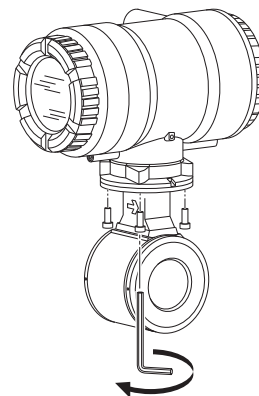


### IMPORTANT

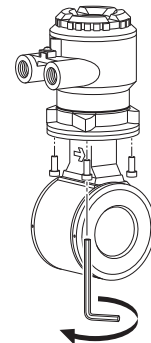
The following types can not be changed direction of cable entry after delivery.

- Submersible Type (Suffix code: -W)
- For District Heating and Cooling or Condensation-proof (Optional code: DHC)

- (1) The following tool is required.
  - Hexagonal wrench (nominal size 5)
- (2) Turn off the power to the flowmeter.
- (3) Using the wrench, unscrew the four hexagonal bolts at the neck of transmitter or terminal box.



**AXW Integral Flowmeter**



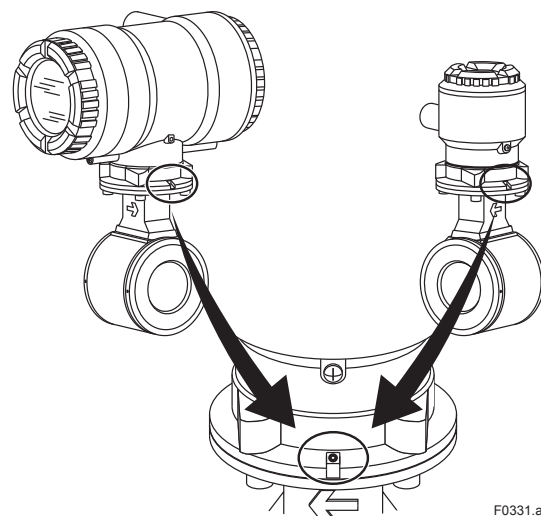
**AXW Remote Sensor**

F0330.ai



### CAUTION

Do not loosen the screw at the opposite side of cable entry (see the figure below).



F0331.ai



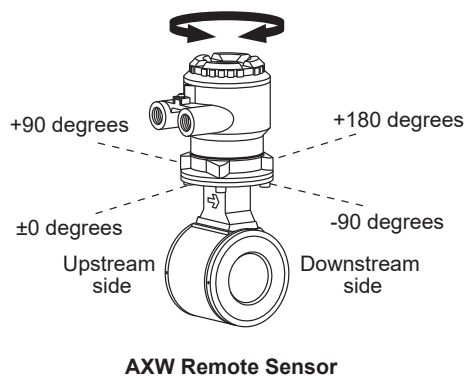
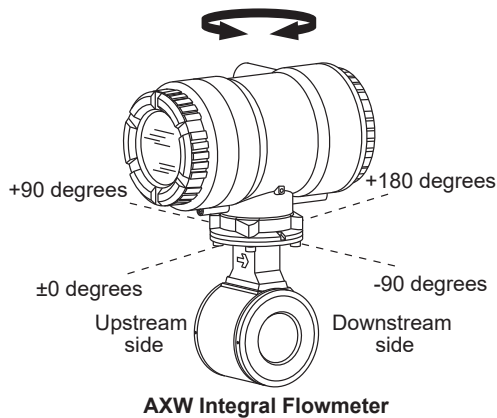
- (4) Rotate the transmitter or the terminal box in the desired direction. The direction can be changed to -90 degrees, +90 degrees or +180 degrees.



## NOTE

The transmitter and the terminal box can be rotated -90 degrees to +180 degrees at every 90 degrees from the arrow mark indicating the flow direction. Do not exceed these angle.

- (5) Tighten diagonally the four hexagonal bolts with the hexagonal wrench, and then be sure to check that the transmitter or the terminal box was firmly fixed to the sensor.



F0332.ai

## 3.6 Changing Direction of Display Unit

### (1) Removing the Cover

- The following tool is required.  
Hexagonal wrench (nominal size 3)
- Turn off the power to the flowmeter.
- Using the wrench, loosen the cover locking screw (1) (See Figure 3.6.1 and Figure 3.6.2) clockwise to unlock the cover. Upon shipment from the manufacturing plant, the cover is locked. Hold the flowmeter with your hand. Remove the cover by rotating it counterclockwise.

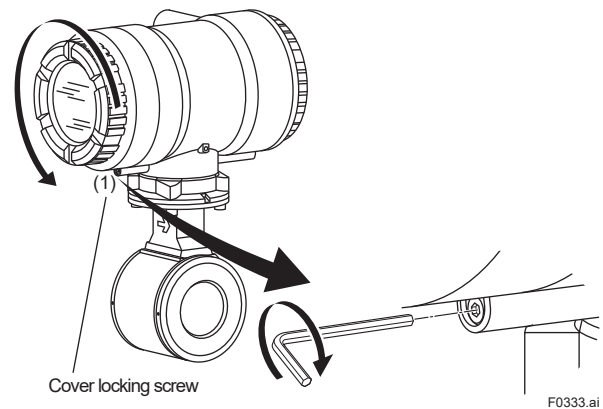


Figure 3.6.1 Removing the Display Cover (Integral Flowmeter)

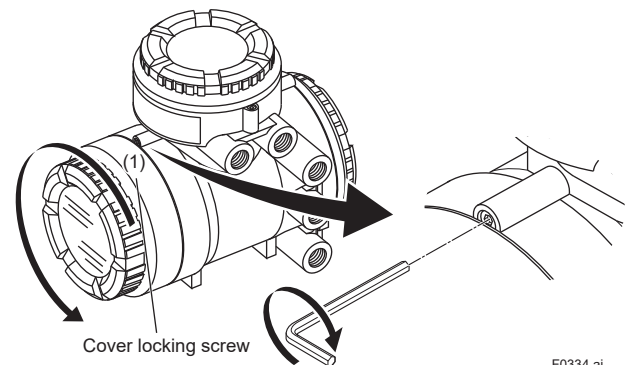


Figure 3.6.2 Removing the Display Cover (AXW4A Remote Transmitter)



## (2) Changing Display Unit Direction 90 degrees

- Hold the display unit with your hand and loosen the two mounting screws.
- Rotate the display unit 90 degrees clockwise and confirm the assembling position, taking care of the connector and wire of the display unit.  
At this time, do not remove the connector.
- Secure the display unit using its two mounting screws.

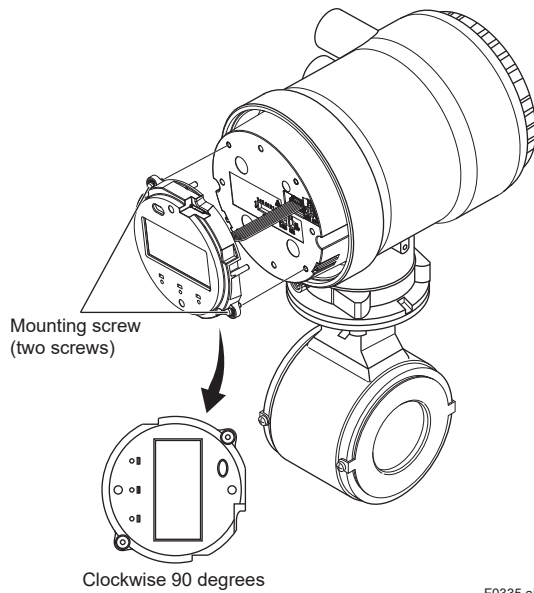


Figure 3.6.3 Changing Display Unit Direction 90 degrees



### IMPORTANT

To preserve the safety, do not touch the electrical circuit and cable of shaded area. ntry after delivery.

## (3) Installing the Cover

- Install the cover to the flowmeter by rotating the cover clockwise.
- Tighten cover locking screw (1) (See Figure 3.6.1 and Figure 3.6.2) counterclockwise using a hexagonal wrench (nominal size 3) to lock the cover.



### IMPORTANT

Be sure to screw the cover firmly into the housing without any space between them.



## 4. 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.



### CAUTION

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

### 4.1 Wiring Precautions

Be sure to observe the following precautions when wiring:



### CAUTION

- When opening the cover, wait for more than 20 minutes after turning off the power.
- In cases where the ambient temperature exceeds 50°C, use external heat resistant wiring with a maximum allowable temperature of 70°C 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.
- Before turning the power on, tighten the terminal box cover securely.
- For the remote type, do not splice the cable between the transmitter and the sensor terminal when it is too short. Replace it with a complete cable of the appropriate length.
- For the remote type, ground the remote sensor and the transmitter separately.
- Terminate all the cable finish with crimp terminal of a round or rod shape (depending on the shape of the terminal block), and connect them reliably.
- 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. For the remote type, route the excitation cable and the signal cable in separate steel conduit tubes. Keep conduits or flexible tubes watertight using sealing tape.
- If there is any unused cable entry, use the blanking plug to cover which comes with this instrument or which is supplied by YOKOGAWA. The blanking plug should be fastened into the unused cable entry without any mistake. If not, stated enclosure protection is not applicable. One or two blanking plug is provided depending on the specifications (24 V for power supply voltage or I/O selection).
- The signal cables must be routed in separate steel conduit tubes 16 (JIS C 8305) or flexible conduit tubes 15 (JIS C 8309).
- When waterproof glands or union equipped waterproof glands are used, avoid tightening the glands with an excessive torque.
- For the instruction of removing/installing the housing covers and handling the locking screws, read Section 4.4 and Section 4.5.





## IMPORTANT

For the remote type, prepare the excitation cable (supplied by customer) and the signal cable of almost the same length. It is recommended to lay them together closely.

## 4.2 Cables

### 4.2.1 Recommended Cable for Excitation, Power and Input/Output:

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 waterproof gland (optional code EG, EG□, EU, EU□, EW):

For excitation cable:

10.5 or 11.5 mm (0.41 or 0.45 in.)

For power and input/output cable:

7.5 to 12 mm (0.30 to 0.47 in.)

With plastic gland (optional code EP, EP□):

6 to 12 mm (0.24 to 0.47 in.)

#### Nominal Cross Section:

Single wire; 0.5 to 2.5 mm<sup>2</sup>

Stranded wire; 0.5 to 1.5 mm<sup>2</sup>

#### Excitation cable for submersible use and optional code DHC:

Heat resistant vinyl resin sheath cable

Outer diameter ø 10.5 mm

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.

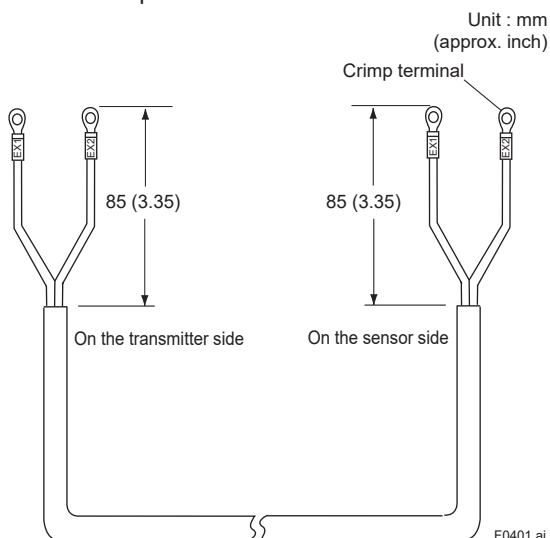


Figure 4.2.1 Cable Finish for Excitation Cable



## NOTE

- For excitation cable and power cable, always use a crimp terminal with an insulation cover.
- Use crimp tools supplied by 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.

### 4.2.2 Dedicated Signal Cable (AX01C)

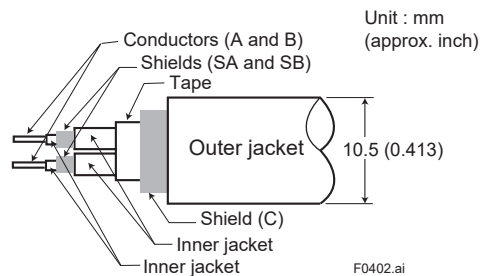


Figure 4.2.2 Dedicated Signal Cable

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 transmitter:

200 m (660 ft)

Combination with the AXW4A transmitter:

100 m (330 ft)

Maximum temperature: 80°C (176°F)



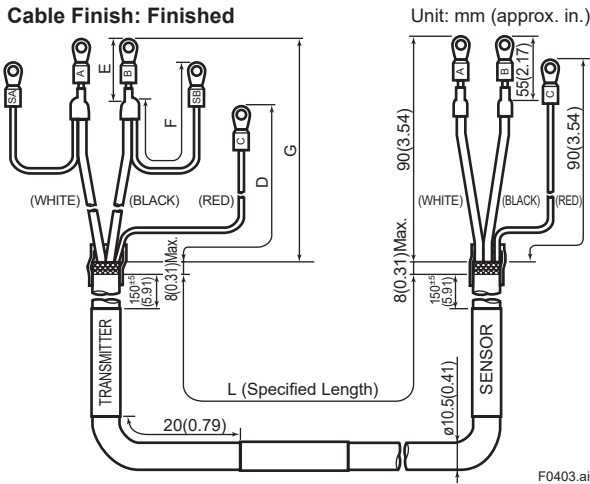
## IMPORTANT

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 4.2.3.

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



Cable Finish: Finished



Specification Code	Length				Description
	D	E	F	G	
AX01C-C□□□	60 (2.4)	25 (1.0)	70 (2.8)	50 (2.0)	For AXW4A
AX01C-D□□□	70 (2.8)	25 (1.0)	50 (2.0)	60 (2.4)	For AXFA11

Cable Finish: Unfinished

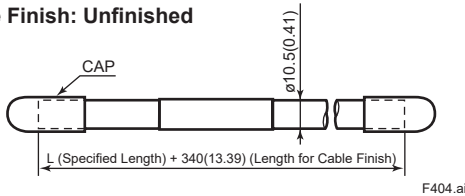


Figure 4.2.3 Cable Finish for Signal Cable



- 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.

### 4.3 Cable Entries

This instrument is of watertight construction as stipulated in JIS C 0920. It is shipped with a wiring bracket (waterproof gland, waterproof gland with union or a plastic gland attached), only in cases where an optional specification is selected for the cable entry. Cable gland has the following kinds depending on the type and size.

#### Integral Type Flowmeter

AXW (Size: 25 to 400 mm (1 to 16 in.))

Optional Code	Description
EG2	2 pcs. of waterproof gland, and a blanking plug
EG3	3 pcs. of waterproof gland
EU2	2 pcs. of waterproof gland with union joint, and a blanking plug
EU3	3 pcs. of waterproof gland with union joint
EP2	2 pcs. of plastic gland, and a blanking plug
EP3	3 pcs. of plastic gland

#### Remote Sensor

AXW (Size: 25 to 400 mm (1 to 16 in.))

Optional Code	Description
EW	2 pcs. of waterproof gland with JIS G3/4 female
EG	2 pcs. of waterproof gland
EU	2 pcs. of waterproof gland with union joint
EP	2 pcs. of plastic gland

#### Remote Transmitter

AXW4A

Optional Code	Description
EG4	4 pcs. of waterproof gland, and a blanking plug
EG5	5 pcs. of waterproof gland
EU4	4 pcs. of waterproof gland with union joint, and a blanking plug
EU5	5 pcs. of waterproof gland with union joint
EP4	4 pcs. of plastic gland, and a blanking plug
EP5	5 pcs. of plastic gland

#### Remote Transmitter

AXFA11G

Optional Code	Description
EW	5 pcs. of waterproof gland with JIS G3/4 female
EG	5 pcs. of waterproof gland
EU	5 pcs. of waterproof gland with union joint
EP	5 pcs. of plastic gland



Apply a blanking plug to the unused cable entry. Seal the cable entries properly comply to usage state.



### 4.3.1 When waterproof property is necessary (Wiring using waterproof glands)



## IMPORTANT

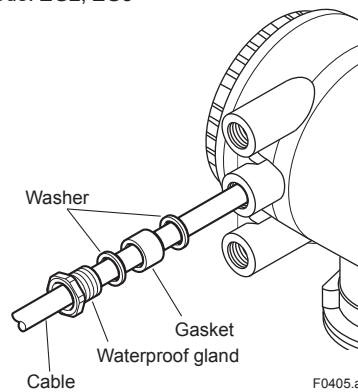
To prevent water or condensation from entering the transmitter housing, waterproof glands are recommended. Do not over-tighten the glands or damage to the cables may result. Tightness of the gland can be checked by confirming that the cable is held firmly in place.

For working on the conduit or the flexible tubes (G1/2), remove the waterproof gland and attach them directly to the cable entry.

#### (1) Waterproof Gland

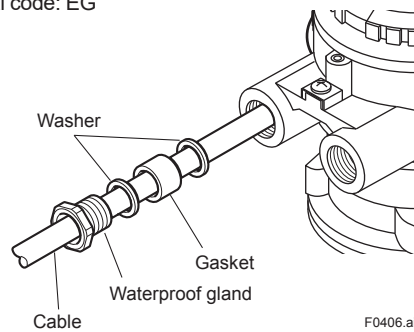
##### Integral Flowmeter

Optional code: EG2, EG3



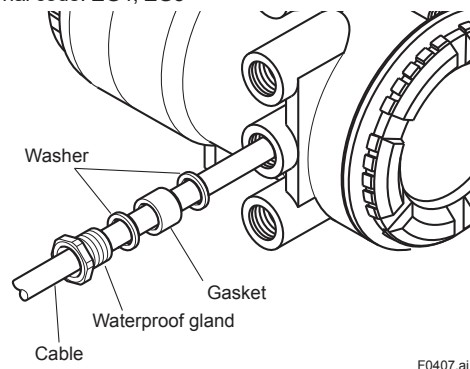
##### Remote Sensor

Optional code: EG



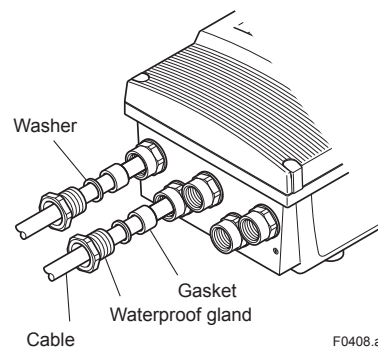
##### Remote Transmitter (AXW4A)

Optional code: EG4, EG5



##### Remote Transmitter (AXFA11)

Optional code: EG

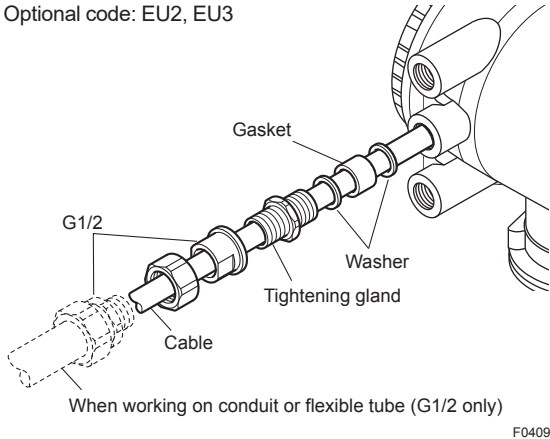




(2) Waterproof Gland with Union Joint

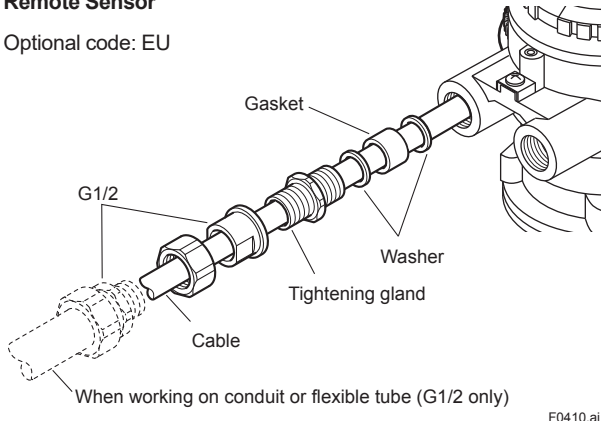
Integral Flowmeter

Optional code: EU2, EU3



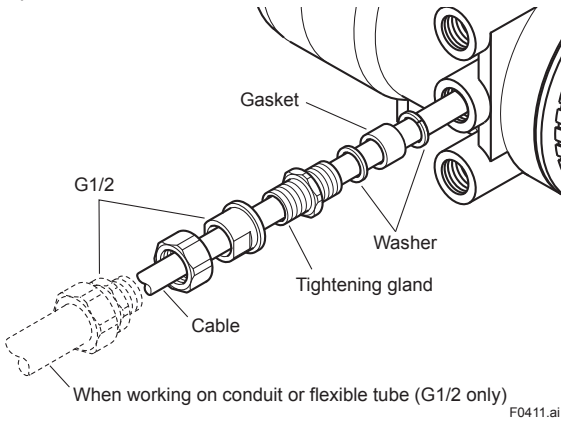
Remote Sensor

Optional code: EU



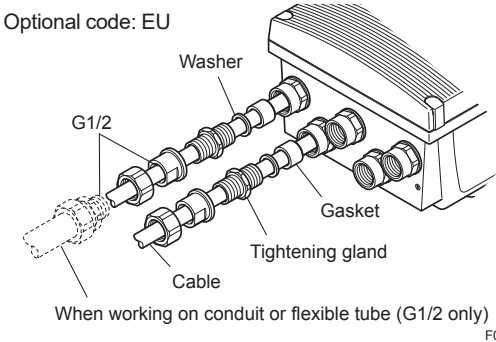
Remote Transmitter (AXW4A)

Optional code: EU4, EU5



Remote Transmitter (AXFA11)

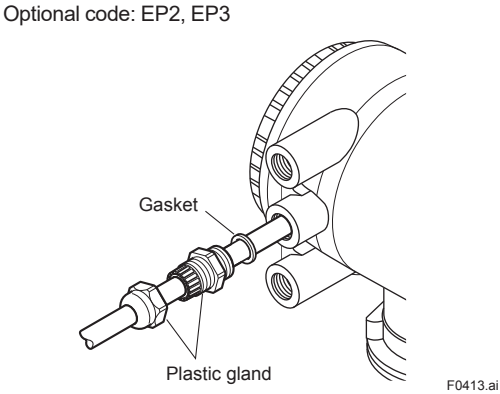
Optional code: EU



(3) Plastic Gland

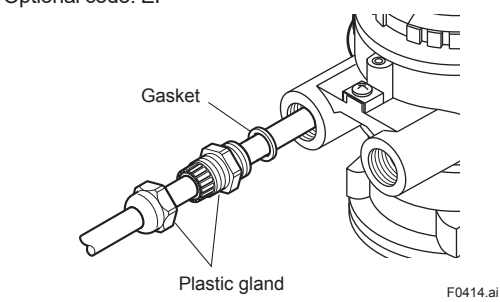
Integral Flowmeter

Optional code: EP2, EP3



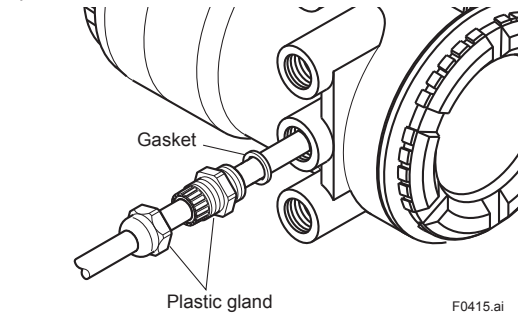
Remote Sensor

Optional code: EP



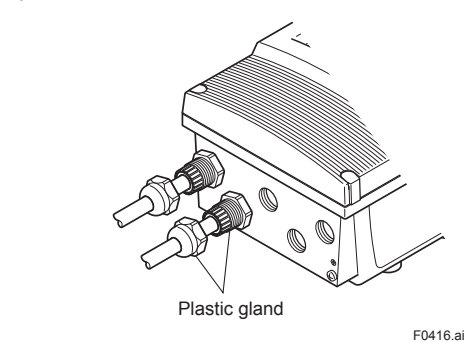
Remote Transmitter (AXW4A)

Optional code: EP4, EP5



Remote Transmitter (AXFA11)

Optional code: EP

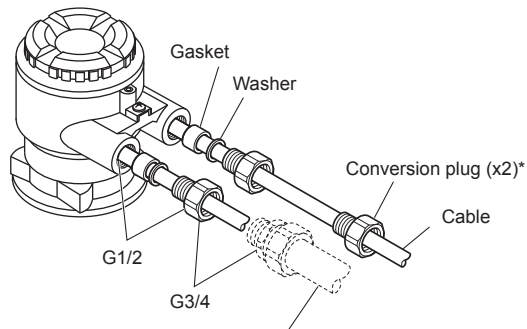




#### (4) Waterproof Gland with JIS G3/4 Female

##### Remote Sensor

Optional code: EW



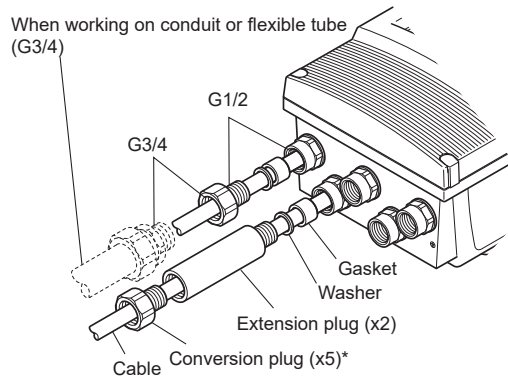
When working on conduit or flexible tube (G3/4)

\* When connecting G1/2, remove the conversion plug and connect directly to cable entry.

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##### Remote Transmitter (AXFA11)

Optional code: EW



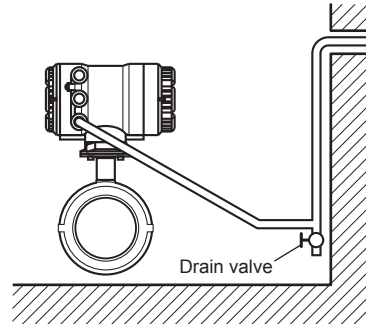
\* When connecting G1/2, remove the conversion plug and connect directly to cable entry.

F0418.ai

#### 4.3.2 Conduit Wiring

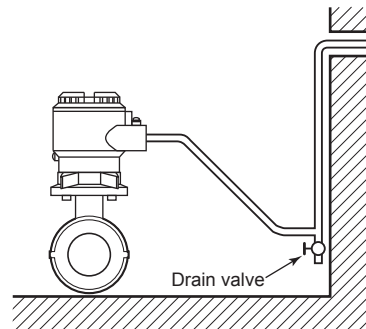
When wiring the conduits, utilize the waterproof gland to prevent water from flowing in through the conduit. Place the conduit pipe on an angle as shown in the following figures.

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



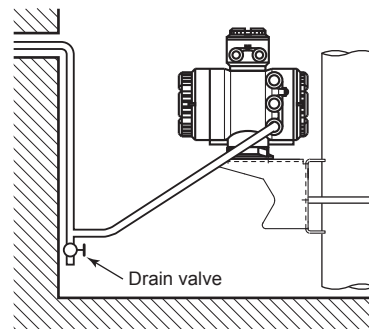
F0419.ai

Figure 4.3.1 Integral Flowmeter



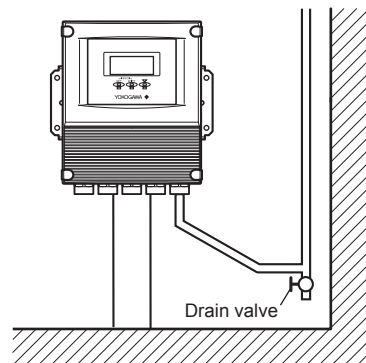
F0420.ai

Figure 4.3.2 Remote Sensor



F0421.ai

Figure 4.3.3 Remote Transmitter (AXW4A)



F0422.ai

Figure 4.3.4 Remote Transmitter (AXFA11)



## 4.4 Connecting to External Instruments of Integral Flowmeter and Remote Transmitter

### 4.4.1 Wiring Precautions for 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.

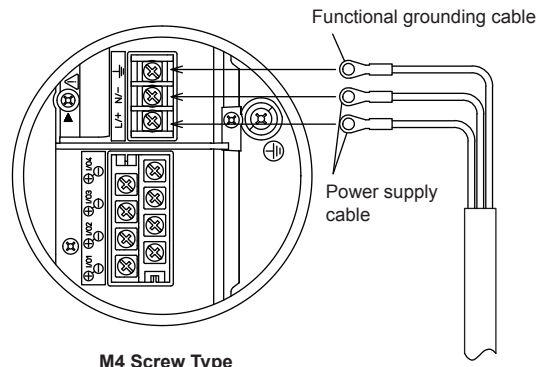


#### WARNING

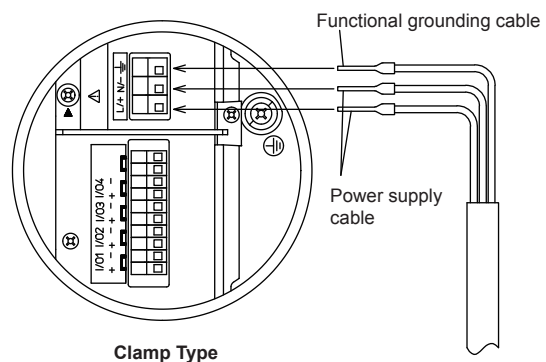
- Ensure that the power supply is off in order to prevent electric shocks.
- When opening the cover, wait for more than 20 minutes after turning off the power.
- Ensure the protective grounding terminal is grounded before turning on the power.
- Terminate all the cable finish with round or rod shaped crimp terminal (depending on the shape of the terminal block) with insulation cover, and connect them reliably.
- 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

1. Check the instrument's power is off, then remove the terminal cover (transparent).
2. Wire the power supply cable and the functional grounding cable to the power supply terminals.
3. Install the terminal cover.



M4 Screw Type



Clamp Type

F0423.ai

Figure 4.4.1 Power Cable Wiring

### 4.4.2 DC Power Connection

When using DC power as the power supply for the transmitter, pay attention to the following points.

#### (1) Connecting Power Supply



#### IMPORTANT

Do not connect power supply with reversed polarities.

L/+ terminal: connect to + (power supply)

N/- terminal: connect to - (power supply)



#### IMPORTANT

For the 24 V power supply version (power supply code -2), power supply with 100 to 240 V AC and 100 to 120 V DC cannot be connected.

The wrong connection results in a damage to the transmitter.

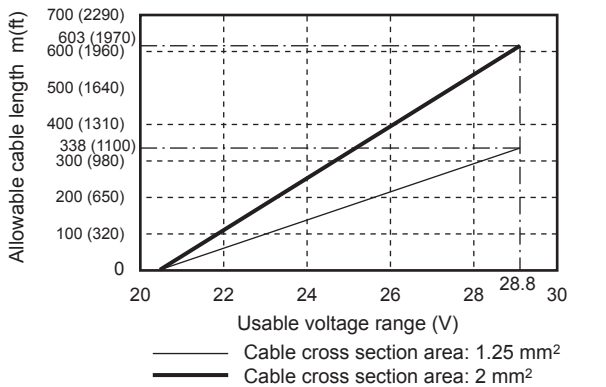


## (2) Required Power Supply Voltages



### IMPORTANT

- For the 24 V power supply version (power supply code -2), the specification of 24 V (–15% to +20%) is the supply voltage between the terminals on the transmitter. Because of voltage drop by cable resistance, the supply voltage must be applied within the range of Figure 4.4.2.
- For AXFA11, read the applicable user's manual as listed in Table 1.1.



**Figure 4.4.2** Supply Voltage and Power Supply Cable Length (Integral Flowmeter and AXW4A Remote Transmitter)

## (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.

For detailed parameter setting, read the user's manual of the applicable communication type (for AXW/AXW4A) or the hardware/software edition (for AXFA11) as listed in Table 1.1.

Display Menu Path (AXW/AXW4A):

Device setup ► Detailed setup ► AUX calculation ► Power sync on/off  
 Device setup ► Detailed setup ► AUX calculation ► Set power freq

## 4.4.3 Grounding



### WARNING

For the wiring of protective grounding, terminate the cable finish with round shaped crimp terminal with insulation cover (for M4 screw), and connect it to the protective grounding terminal reliably.



### CAUTION

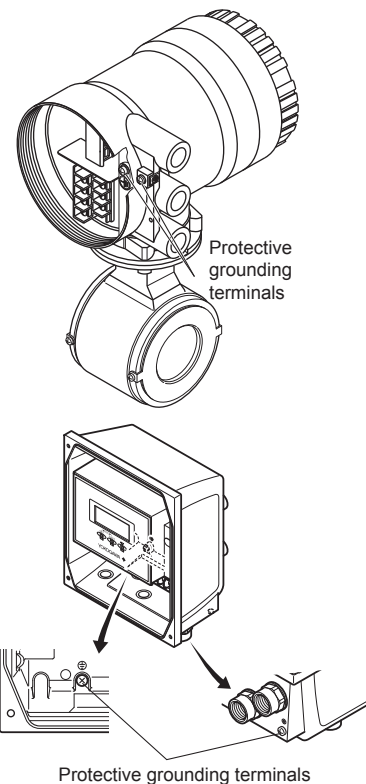
The grounding should satisfy Class D requirements (grounding resistance, 100 Ω or less).



### IMPORTANT

A lightning protector is built-in for integral flowmeter or AXW4A remote transmitter. When the lightning protection is needed, the ground should satisfy Class C requirements (grounding resistance, 10 Ω or less). For AXFA11, read the applicable user's manual as listed in Table 1.1.

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



**Figure 4.4.3** Position of Protective Grounding Terminal



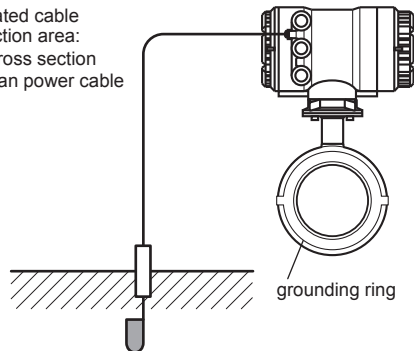


## IMPORTANT

Improper grounding may result in 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 sensor and transmitter 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. Grounding rings are supplied with the instruments when specified with dedicated optional code.

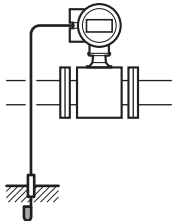
600 V vinyl-insulated cable  
Cable cross section area:  
2 mm<sup>2</sup>, and cross section  
area larger than power cable



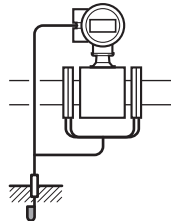
Grounding Resistance: 10  $\Omega$  or less (Class C requirements)

Note: When lightning protection performance by the built-in lightning protectors is not required, grounding resistance 100  $\Omega$  or less (Class D requirements) can be applied.

F0426.ai



In case grounding rings are used.



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

F0427.ai

Figure 4.4.4 Grounding (Integral Flowmeter)

## 4.4.4 Connecting to External Instruments



## WARNING

- Before wiring with external instruments, be sure to turn off the power supply of the magnetic flowmeter.
- Be sure the power supply of the external instruments is turned off, and then start wiring.

Read Section 4.6 for connection to external instruments.

## 4.4.5 Wiring Procedures

### (1) For Integral Flowmeter and AXW4A Remote Transmitter

#### 1) Removing the Cover

Loosen the cover locking screw (1 and 3) (See Figure 4.4.5 and Figure 4.4.6) 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.

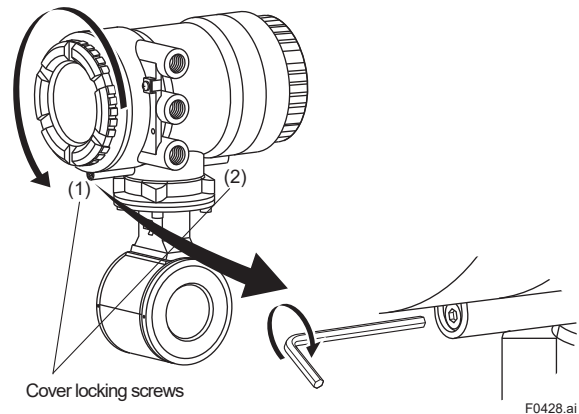


Figure 4.4.5 Removing the Terminal Box Cover for Integral Flowmeter

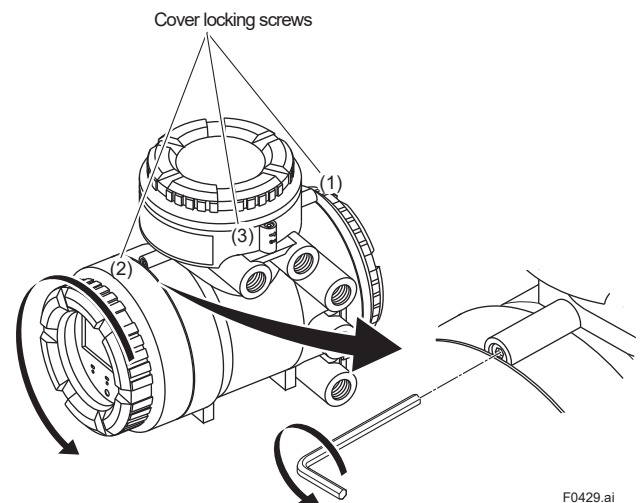


Figure 4.4.6 Removing the Terminal Box Cover for AXW4A Remote Transmitter



**2) Terminal Configuration**

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

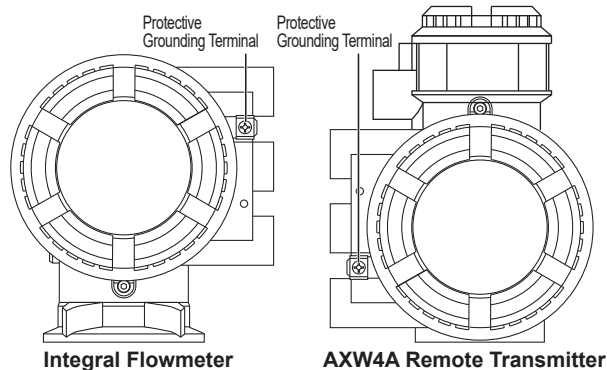
The description of the terminal symbols is shown in Figure 4.4.7 or Figure 4.4.8.

**3) Wiring Procedure**

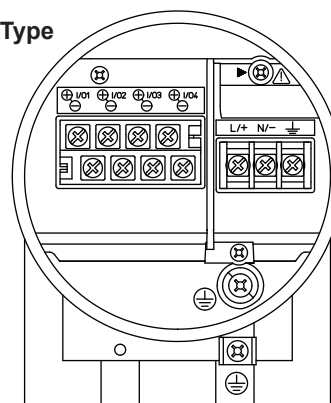
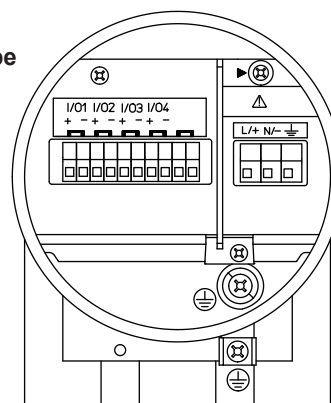
1. Check the instrument's power is off.
2. Wire the signal cable and excitation cable to each terminal.
3. Install the terminal cover.

**4) Installing the Cover**

Install the cover to the flowmeter by turning it clockwise. Tighten the cover locking screw (1 and 3) (See Figure 4.4.5 and Figure 4.4.6) counterclockwise using a hexagonal wrench (nominal size 3) to lock the cover.

**(2) Terminal Configuration****(Integral Flowmeter and AXW4A Transmitter)****Integral Type/AXW4A Remote Transmitter:**

<To be wired to Power Supply and I/Os>

**M4 Screw Type****Clamp Type**

Terminal Symbol	Description
	Shorting Screw (Need to be fixed for normal operation)
	Functional Grounding
N/- L/+	<input type="checkbox"/> Power Supply
I/O4 - I/O4 + I/O3 - I/O3 + I/O2 - I/O2 + I/O1 - I/O1 +	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Refer to Input/Output Table <input type="checkbox"/>
	Protective Grounding (Inside and outside of the terminal box)

F0430.ai



**Figure 4.4.7 Terminal Configuration (Integral Flowmeter and AXW4A Remote Transmitter)**







**Table 4.4.1 Terminal Symbols  
(AXFA11 Remote Transmitter)**

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



## IMPORTANT

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

### 3) Installing the Cover

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

## 4.5 Connecting to Remote Sensor and Remote Transmitter (Sensor Side)

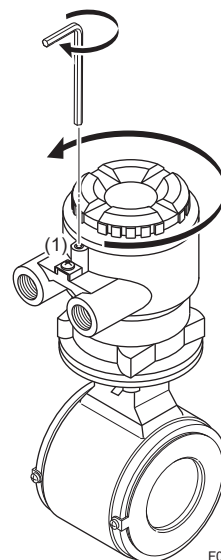


## WARNING

Before wiring, be sure that the power supply to magnetic flowmeter has been turned off to prevent an electrical shock.

### (1) Removing the Cover

Loosen the cover locking screw (1) (See Figure 4.5.1) clockwise using a hexagonal wrench (nominal size 3) to unlock the cover. Upon shipment from the manufacturing plant, the cover is unlocked. Hold the sensor with your hand and remove the cover by turning it in the direction of the arrow as shown below.



F0435.ai

**Figure 4.5.1 Removing the Terminal Box Cover (Remote Sensor)**

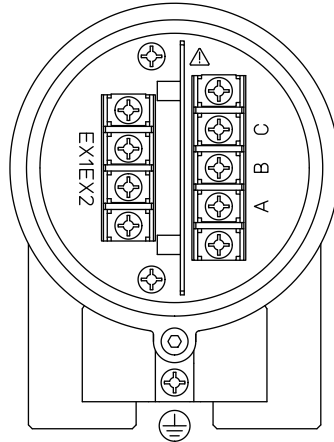


## (2) Terminal Configuration

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

### Remote Sensor:

<To be wired to Remote Transmitter>



Terminal Symbol	Description
A B C	Flow Signal Output
EX1 EX2	Excitation Current Input
	Protective Grounding (Outside of the terminal box)

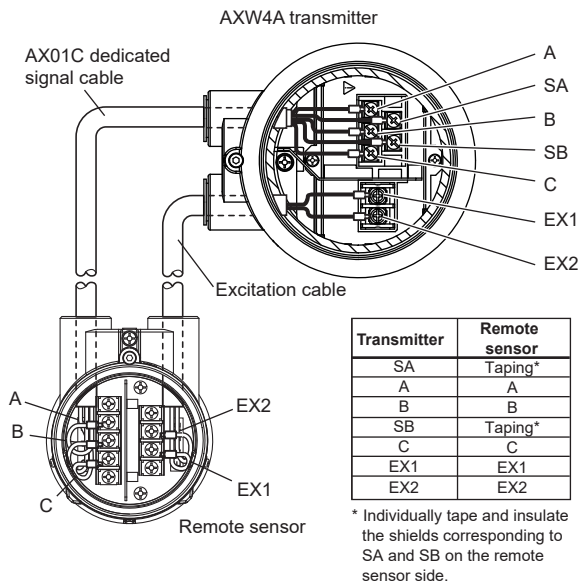
F0436.ai

Figure 4.5.2 Terminal Configuration (Remote Sensor)

## (3) Wiring of Remote Sensor and Remote Transmitter

### 1) Connection with AXW4A Remote Transmitter

Connect wiring as shown in the figure below.

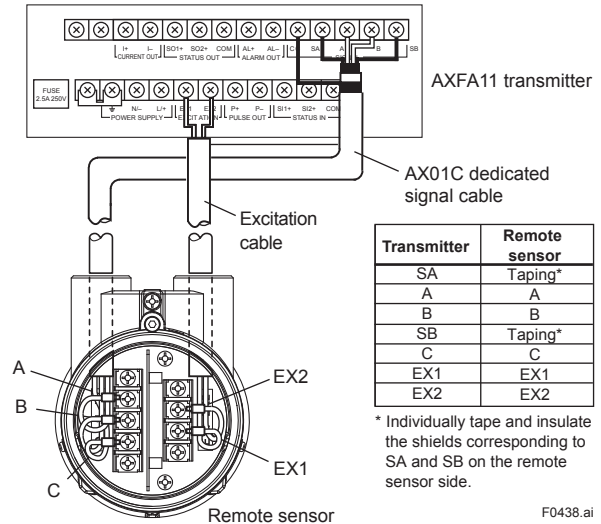


F0437.ai

Figure 4.5.3 Wiring Diagram (AXW4A Remote Transmitter)

### 2) Connection with AXFA11 Remote Transmitter

Connect wiring as shown in the figure below.



F0438.ai

Figure 4.5.4 Wiring Diagram (AXFA11 Remote Transmitter)

## (4) Grounding



### WARNING

For the wiring of protective grounding, terminate the cable finish with round shaped crimp terminal with insulation cover (for M4 screw), and connect it to the protective grounding terminal reliably.



### CAUTION

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



### IMPORTANT

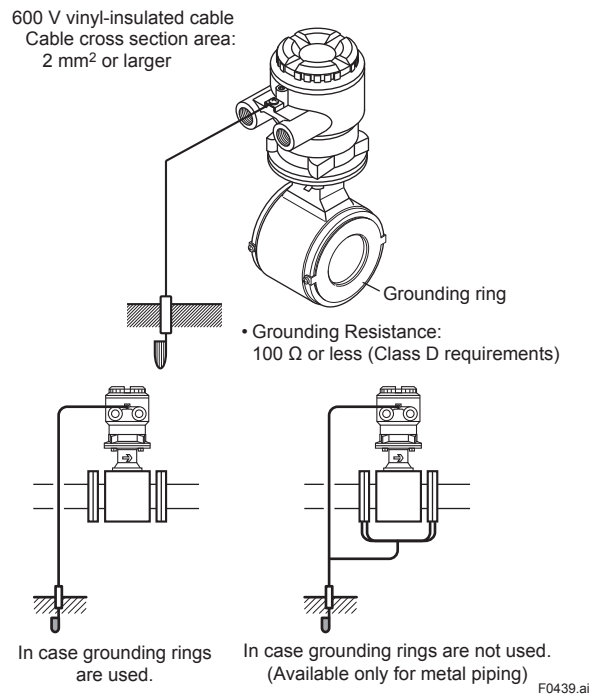
Improper grounding may result in an adverse effect on the flow measurement. Ensure that the instrument is properly grounded.

The electromotive force of the magnetic flowmeter is minute and it is easy to be affected by noise. Therefore, be sure to ground according to Figure 4.5.5. The reliable grounding equalize the reference electric potentials (terminal potential) of the sensor and the transmitter, the measuring fluid potential and the ground potential, and then reduce the affection by noise.

The grounding rings make a connection between the measured fluid and the ground and protects the flared face of lining.

Grounding rings are supplied with the instruments when specified with dedicated optional code.





**Figure 4.5.5 Grounding (Remote Sensor)**

### (5) Installing the Cover

Install the cover to the terminal box by turning it clockwise. Tighten the cover locking screw (1) (See Figure 4.5.1) counterclockwise using a hexagonal wrench (nominal size 3) to lock the cover.



## 4.6 Input and Output

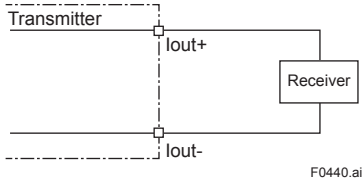
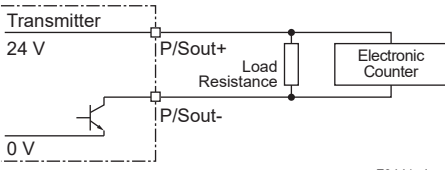
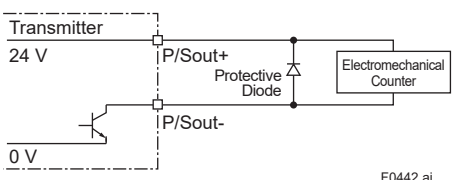
This section provides descriptions of the specification and wiring of the input and output signals.

In accordance with the communication and I/O code specified, the function assigned to each terminal is different. For the specification and terminal configuration, read Section 4.4 and the applicable general specifications as listed in Table 1.1. For AXFA11, read the applicable user's manual as listed in Table 1.1.

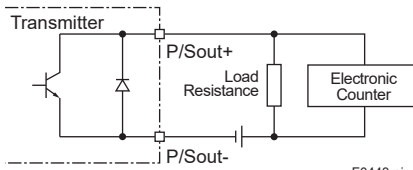
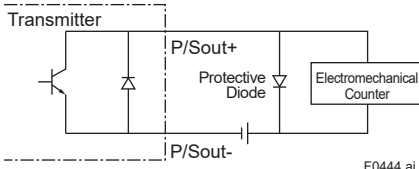
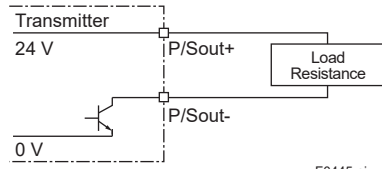
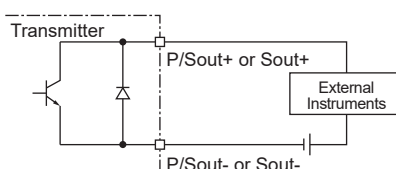
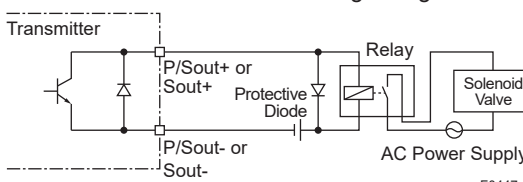
### (1) Output Signal

#### Galvanic isolation:

All circuits for inputs, outputs and power supply are galvanically isolated from each other.

Output signal type	Specification
<b>Active current output [Iout]:</b>	One or two current outputs are available depending on the specification. Depending on the measured value, the active current output delivers 4 to 20 mA.
	Output current
	4 to 20 mA DC
	Load resistance
	750 $\Omega$ or less
	Load resistance for BRAIN communication
<b>Active pulse output [P/Sout]:</b>	250 to 450 $\Omega$
	Load resistance for HART communication
	230 to 600 $\Omega$
	Current output accuracy
	$\pm 8 \mu\text{A}$ ( $\pm 0.05\%$ of span)
	 <p>F0440.ai</p>
<b>Active pulse output [P/Sout]:</b>	<b>Connection of an electronic counter</b>
	Observe that maximum allowable voltage and voltage polarity are correct when wiring.
	Load resistance
	1 k $\Omega$ or more
	Internal power supply
	24 V DC $\pm 20\%$
<b>Active pulse output [P/Sout]:</b>	Maximum pulse rate
	10,000 pulses/s
	Maximum frequency output rate
	12,500 Hz
	 <p>F0441.ai</p>
	<b>Connection of an electromechanical counter</b>
<b>Active pulse output [P/Sout]:</b>	Maximum current
	150 mA or less
	Average current
	30 mA or less
	Internal power supply
	24 V DC $\pm 20\%$
<b>Active pulse output [P/Sout]:</b>	Maximum pulse rate
	2 pulses/s
	Pulse width
	20, 33, 50, 100 ms
	 <p>F0442.ai</p>
	<p><b>Figure 4.6.3 Connection diagram: Active pulse output [P/Sout] (Electromechanical counter)</b></p> <p>When Communication and I/O code DG or JG is specified, upon shipment from the manufacturing plant, the output is set for electromechanical counter. If the output is set for electronic counter, the following parameter is change from “For magnetic counter” to “Normal”. For detailed parameter setting, read the user's manual of the applicable communication type as listed in Table 1.1.</p> <p>Display Menu Path (AXW/AXW4A): Device setup ▶ Detailed setup ▶ Pulse/Status out ▶ PO2/SO2 ▶ Active pulse</p>



Output signal type	Specification								
Passive pulse output [P/Sout]:	<b>Connection of an electronic counter</b> Maximum voltage and correct polarity must be observed for wiring.								
	<table><tr><td>Maximum load current</td><td>200 mA or less</td></tr><tr><td>Power supply</td><td>30 V DC or less</td></tr><tr><td>Maximum pulse rate</td><td>10,000 pulses/s</td></tr><tr><td>Maximum frequency output rate</td><td>12,500 Hz</td></tr></table>	Maximum load current	200 mA or less	Power supply	30 V DC or less	Maximum pulse rate	10,000 pulses/s	Maximum frequency output rate	12,500 Hz
	Maximum load current	200 mA or less							
	Power supply	30 V DC or less							
	Maximum pulse rate	10,000 pulses/s							
Maximum frequency output rate	12,500 Hz								
									
F0443.ai									
<b>Figure 4.6.4 Connection diagram: Passive pulse output [P/Sout] (Electronic counter)</b>									
Passive pulse output [P/Sout]:	<b>Connection of an electromechanical counter</b>								
									
	F0444.ai								
	<b>Figure 4.6.5 Connection diagram: Passive pulse output [P/Sout] (Electromechanical counter)</b>								
	Active status output [P/Sout]:	Because of connecting to a transister, observe that maximum allowable current, voltage polarity and output current level are correct.							
<table><tr><td>Load resistance (External instruments)</td><td>1 kΩ or more</td></tr><tr><td>Internal power supply</td><td>24 V DC ±20%</td></tr></table>		Load resistance (External instruments)	1 kΩ or more	Internal power supply	24 V DC ±20%				
Load resistance (External instruments)		1 kΩ or more							
Internal power supply		24 V DC ±20%							
									
F0445.ai									
<b>Figure 4.6.6 Connection diagram: Active status output [P/Sout]</b>									
Passive status output [P/Sout or Sout]:	Because of connecting to a transister, observe that maximum allowable voltage, voltage polarity and maximum allowable current are correct.								
	<table><tr><td>Maximum load current</td><td>200 mA or less</td></tr><tr><td>Power supply</td><td>30 V DC or less</td></tr></table>	Maximum load current	200 mA or less	Power supply	30 V DC or less				
	Maximum load current	200 mA or less							
	Power supply	30 V DC or less							
									
F0446.ai									
<b>Figure 4.6.7 Connection diagram: Passive status output [P/Sout or Sout]</b>									
Passive status output [P/Sout or Sout]:	A relay must be connected in series to switch alternating voltage.								
									
	F0447.ai								
	<b>Figure 4.6.8 Connection diagram: Passive status output [P/Sout or Sout] (Solenoid valve)</b>								



(2) Input signals


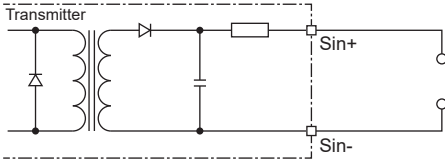
Input signal type	Specification						
Status input [Sin]:	<div><div> <b>IMPORTANT</b></div><div>The status input detects a signal without voltage. Loading voltage during the switching status "Close" may result in damage on the electrical circuit.</div><div>The status input is used for connecting to the following no-voltage contacts.</div><table><tr><th>Switching status</th><th>Resistance</th></tr><tr><td>Closed</td><td>200 Ω or less</td></tr><tr><td>Open</td><td>100 kΩ or more</td></tr></table><div><div>F0448.ai</div></div></div>	Switching status	Resistance	Closed	200 Ω or less	Open	100 kΩ or more
Switching status	Resistance						
Closed	200 Ω or less						
Open	100 kΩ or more						

Figure 4.6.9 Connection diagram: Status input [Sin]



# 5. Basic Operating Procedures

## 5.1 Operation by Display unit

The parameter settings from display unit can be carried out using the three IR (infra-red) switches - namely, the [SET] [SHIFT] and [▼] switches. The IR switches enable the user to set parameters from the outside of the glass of the display cover.

This section provides descriptions of basic parameter configuration and operation procedures of IR switches. This instrument can be also operated using the dedicated handheld terminal or the FieldMate (Versatile Device Management Wizard). For operation in details, read the user's manual of the applicable communication type (for AXW/AXW4A) or the hardware/software edition (for AXFA11) as listed in Table 1.1.



### WARNING

Be sure to enable the write protect function to prevent the overwriting of parameters after finishing parameter setting.

In rare cases, the IR switches may respond unexpectedly to water drops or extraneous substances sticking on the surface of display panel, due to the operating principal. The possibility of malfunction arises after rain or cleaning operation near the place where the flowmeter is installed. Turning on and off the flashlight etc. towards the IR switch may also be a cause of malfunction.

Read Section 6.3 for the hardware write protect function, and the user's manual of applicable communication type as listed in Table 1.1 for the software write protect function.



### IMPORTANT

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



### NOTE

- Always keep the cover closed and operate the setting switches from the outside of the glass window.
- If dirt, dust or other substances surfaces on the glass of display cover, wipe them clean with a soft dry cloth.
- The operation with dirty gloves may cause a switch response error.



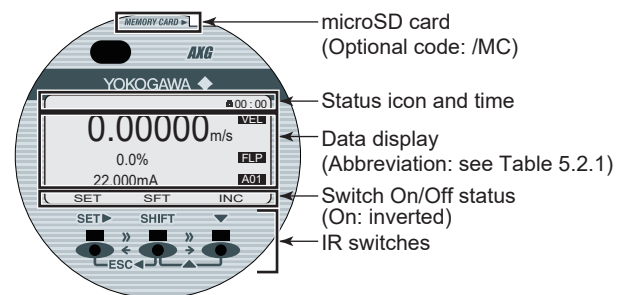
### NOTE

The language on the display is set to "English" as default at the factory shipment. Select the adequate language referring to the Subsection 5.2.2. The menu pass of the display on this manual is selected to "English".

## 5.2 Display and Basic Configuration

The display unit of AXW Integral Flowmeter and AXW4A Remote transmitter has various functions below.

### 5.2.1 Display



F0501.ai

#### (1) Basic operation of IR switches

The operation from display panel is done by using the three IR switches; [SET], [SHIFT] and [▼]. The combination of the two switches provides a different function, and the function is indicated on the display.

IR switch (Note 1)	Indicate of switch (Note 2)	Function
[SET▶]	SET	<ul style="list-style-type: none"> <li>• Apply parameter (Note 3)</li> <li>• Enter data (Note 3)</li> <li>• Move to next menu</li> </ul>
[SHIFT]	SFT	<ul style="list-style-type: none"> <li>• Move cursor right (Numeric type parameter)</li> </ul>
[▼]	INC	<ul style="list-style-type: none"> <li>• Move cursor down (Select type parameter)</li> <li>• Increment value (Numeric type parameter)</li> <li>• Change position of decimal point (Numeric type parameter)</li> </ul>
[SHIFT] + [▼] (= [▲])	DEC	<ul style="list-style-type: none"> <li>• Move cursor up (Select type parameter)</li> <li>• Decrement value (Numeric type parameter)</li> </ul>
SHIFT + SET▶ (= [ESC◀])	ESC	<ul style="list-style-type: none"> <li>• Cancel</li> <li>• Back to previous menu</li> </ul>

Note 1: [A] + [B] (= [C]): The function is changed to switch [C] when switch [B] is pushed while pushing switch [A].

Note 2: [SET], [SFT], [INC], [DEC] and [ESC] indicate the assigned function in accordance with display mode at that time.

Note 3: "Apply" and "Enter" are executed by pushing a switch twice. If a switch after first pushing a switch.



## (2) Status icons

Icon	Contents	Icon	Contents
	Write protect Invalid		Write protect Valid
	Device Busy		Device Fault
	Ready for microSD card		Accessing microSD card
	Disable to access microSD card		Uploading parameters
	Downloading parameters		Trend graph executing
	BRAIN communication		HART communication
	System alarm occurs		Setting alarm occurs
	Process alarm occurs		Information occurs
	Warning occurs		Operation level: Operator
	Display Damping Valid		Operation level: Specialist
	Operation level: Maintenance		

## (3) Data indication part

The process values are available to select 8 items maximum on the display. It is possible to indicate 4 items maximum on the display at the same time, and the rest 4 items are able to show by scrolling.

**Table 5.2.1 Abbreviation table of process values to be indicated on the display.**

Abbreviation	Contents
FLP(*1)	Flow rate %
PRV(*1)	Process value
VEL(*1)	Flow velocity
VFL(*1)	Volumetric flow
MFL(*1)	Mass flow
FLB	Flow rate in % bar graph
TL1(*1)	Totalization value 1
TL2(*1)	Totalization value 2
TL3(*1)	Totalization value 3
TAG	Tag No.
LTG	Long Tag (for HART communication type only)
COM	Communication protocol
ADH	Adhesion diagnostic Level (Alarm at Level 4)
AO1(*1)	Analog output value 1

\*1: Available to display the online trend graph.

## 5.2.2 Basic Configuration for Display

For parameter setting from display panel, configurable parameters differ by the three operational levels specified in Table 5.2.2, and a passcode is needed to enter into Setting mode. No passcode requires for “Operator”, and a passcode corresponding to each level requires for “Maintenance” or “Specialist”.

For parameter in details, read the user’s manual of applicable communication type as listed in Table 1.1.

**Table 5.2.2 Parameter setting from display panel and operation level**

Operation Level	Reading parameters	Writing parameters
Operator	All parameters	Parameters related with basic display settings including display language.
Maintenance	All parameters	Parameters allowed for Operator level. Parameters related with Zero adjustment.
Specialist	All parameters	All Parameters

The following parameters are available to “Operator” level without passcode.

### (1) Display Language Setting

Display Menu Path:  
Device setup ▶ Language

The language on the display is set to “English” as default at the factory shipment. Select the adequate language.

The selectable display language is different by the model and suffix code (display code) specified when ordering.

Position of the display code:

Integral Type:

AXW□□□-□□□□□□□□□□□□□□□□-□□□□■

Remote Transmitter:

AXW4A-□□□□□□□□□□■

Display code	Selectable display language
1	English, French, German, Italian, Spanish, Portuguese, Japanese, or Russian
2	English or Chinese

### (2) Display Contrast Setting (shading)

Display Menu Path:  
Device setup ▶ Detailed setup ▶ Display set ▶ Optional config ▶ Contrast

Available to change the contrast of the display.

Setting item	Contents
-5 to +5	Set the contrast of the display (The value is small: Low, and the value is big: High)



### (3) Display Line Setting

Display Menu Path:  
Device setup ▶ Detailed setup ▶ Display set ▶ Optional config ▶ Line mode

Available to select the number of lines of process value to be indicated on the display.

Up to four lines can be displayed at the same time. The character size changes depending on the number of line.

Setting item	Contents
1 line(big)	Number of displayable process value : One (without unit)
1 line	Number of displayable process value : One (with unit)
2 line	Number of displayable process values : Two
3 line	Number of displayable process values : Three
4 line	Number of displayable process values : Four

**Table 5.2.3 Display line setting and display example**

Lines of display	Example 1	Example 2
1 line(big)		 * Not indicate the Flow noise status. * Indicate 32 characters of the Long Tag.
1 line		 * Indicate 32 characters of the Long Tag.
2 line		 * Indicate 32 characters of the Long Tag.
3 line		 * Indicate 32 characters of the Long Tag in the first line. * Indicate 16 characters in the first half of 32 characters of the Long Tag in the second and third lines.
4 line		 * Indicate 16 characters in the first half of 32 characters of the Long Tag only

### (4) Date Display Formant Setting

Display Menu Path:  
Device setup ▶ Detailed setup ▶ Display set ▶ Optional config ▶ Format date

The date display format can be specified below.

Setting item	Contents
MM/DD/YYYY	Displays the date in "month/day/year".
DD/MM/YYYY	Displays the date in "day/month/year".
YYYY/MM/DD	Displays the date in "year/month/day".

The date needs to be set every time when the power is turned on.

In case the date is not set:

- BRAIN communication: Date counting starts from the date stored in the memory.
- HART communication: Date counting starts from 1900/01/01 00:00:00, according to HART specification.

### (5) Inverse Display Setting

Display Menu Path:  
Device setup ▶ Detailed setup ▶ Display set ▶ Optional config ▶ Inversion

Available to change from normal display to white/black reverse display.

Setting item	Contents
Normal	Characters in the display is Black.
Inverse	Outline characters

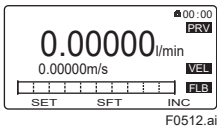


### 5.3 Display Mode and Setting Mode

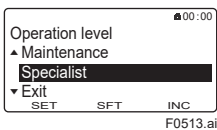
The device runs in the Display Mode when the power is turned on. For check or change of parameters, the Setting Mode must be activated. The following procedure explains how to change to the Setting Mode. For the function of IR switches, read Subsection 5.2.1.

[Procedure]

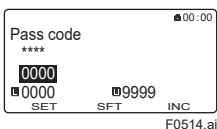
- 1) Turn on the power and wait for several seconds to move to display mode.



- 2) Keep touching [SET] switch for two seconds. The screen moves to the menu of Operation Level.



- 3) Select an appropriate operation level by moving the cursor with [INC] or [DEC] switch. Passcode is not necessary for "Operator". For "Maintenance" and "Specialist", passcode is necessary for each. For passcode setting, [SFT] is for position change, and [INC] is for number, then twice [SET] is for entry completion. The default passcode at the factory shipment is set to "0000".



- 4) When the Operation Level is determined, the screen moves to "Device setup" as the Setting Mode where parameters can be configured.
- 5) After completing parameter setting, push [ESC] switch. The screen returns to the Display Mode.

[Passcode Confirmation and Change]

The confirmation and change of the passcode are allowed only by parameter setting from the display unit.

Display Menu Path:  
Device setup ▶ Detailed setup ▶ Access cfg ▶ Chg mainte  
Device setup ▶ Detailed setup ▶ Access cfg ▶ Chg special

- (1) Passcode for "Maintenance" operation level  
To change the passcode (Maintenance code), "Maintenance" or "Specialist" as the operational level is required.
- (2) Passcode for "Specialist" operation level  
To change the passcode (Specialist code), "Maintenance" or "Specialist" as the operational level is required.

**IMPORTANT**

Display Menu Path:  
Device setup ▶ Wizard

When parameters are changed in the Wizard of Easy setup, "Setting download" in the menu of each parameter must be executed after parameter is changed. Without the execution, any parameter changed is not stored into the device.

**NOTE**

If 10 minutes past without operation in the Setting Mode, the screen goes back to the Display Mode.

Parameter form

There are three types of parameter form below.

Type	Example of display	Contents
Select type		Select the adequate data from among alternatives which are determined in advance.
Numeric type		Specify the data with a combination of number and a decimal point into each digit.
Alphanumeric type		Configure the data with a combination of alphanumeric characters. (Tag No., Special unit, etc...)

The alphanumeric type indicates alphanumeric characters in the following order.

0123456789ABCDEFGHIJKLMNQRSTUvwxyz!"#\$%&'()\*+,-./:;<=>?@[]^\_`{|}~"space"



## 5.4 Parameter Setting from Display Panel

This section explains how to specify the parameters from display panel. Select “Specialist” at the Operation Level referring to Section 5.3. And select the parameters to be specified in the Setting Mode.



### NOTE

For the device with the ordering information specified at ordering, the specified parameters (flow span and unit, tag number, etc.) are stored in the device at the factory shipment. Without the ordering information specified, parameter setting needs to be done by user.

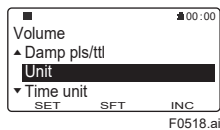
### 5.4.1 Setting example of Select type Data: Flow rate unit

The following is the procedure of changing the flow rate unit as Select type parameter.

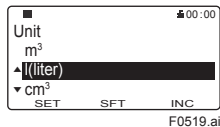
The flow rate unit needs to be specified with “Physical unit” and “Time unit” individually. When the flow rate unit needs to be set “l/min”, select “l (litter)” at the Physical unit and “/min” at the Time unit.

Display Menu Path:

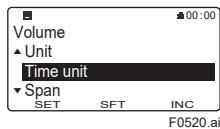
Device setup ► Detailed setup ► Pro var ► Volume ► Unit  
Device setup ► Detailed setup ► Pro var ► Volume ► Time Unit



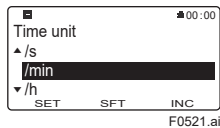
Specify the Physical unit for volumetric flow. Move cursor with [INC] and [DEC] according to the menu path above, and select the “unit” then push [SET].



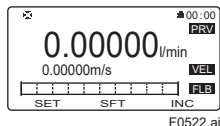
Move cursor with [INC] and [DEC], and select the “l(liter)” then push [SET]. As the selected unit is blinking, push [SET] to determine. The screen returns to the setting page.



Specify the Time unit for volumetric flow. Move cursor with [INC] and [DEC] according to the menu path above, and select the “Time unit” then push [SET].



Move cursor with [INC] and [DEC], and select the “/min” then push [SET]. As the selected unit is blinking, push [SET] to determine. The screen returns to the setting page after the setting.



After completing the parameter setting, push [ESC] then the screen returns to the Display Mode.



### NOTE

Be sure to set the Flow rate unit in the beginning when the Flow rate unit and Flow span value are changed at the same time.

When the unit is changed, the value of flow rate span is converted to related values automatically according to the unit change.

### 5.4.2 Setting example of Numeric type Data: Flow rate span

The following is the procedure of changing the Flow rate span as Numeric type parameter.

Display Menu Path:

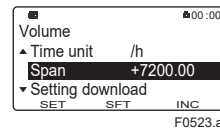
Device setup ► Detailed setup ► Pro var ► Volume ► Span



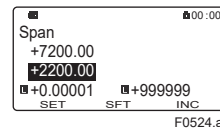
### NOTE

Be sure to set the Flow rate unit in the beginning when the Flow rate unit and Flow span value are changed at the same time.

When the unit is changed, the value of flow rate span is converted to related values automatically according to the unit change.



Specify the Flow rate span unit. Move cursor with [INC] and [DEC] according to the menu path above, and select the “Span” then push [SET].



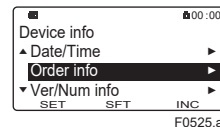
The switch's functionality of setting the Flow rate span is as below:  
Plus/minus and numeric change: [INC]  
Movement on digits: [SFT]  
Determination of parameter: [SET]  
[ ]: Minimum value  
[ ]: Maximum value  
Push [SET] to decide while the value of Flow rate span is blinking. The screen returns to the setting page after the setting.

### 5.4.3 Setting Example of Alphanumeric type Data: Tag No.

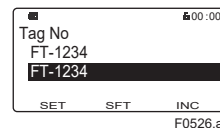
The following is the procedure of changing the Tag No. as Alphanumeric type parameter.

Display Menu Path:

Device setup ► Detailed setup ► Device info ► Order info ► Tag No.



Specify the Tag No.. Move cursor with [INC] and [DEC] according to the menu path above, and select the “Order info” then push [SET].




For Tag No., up to 8 characters can be entered from display panel.  
The switch's functionality of setting the Flow rate span is as below:  
Plus/minus and numeric change: [INC]  
Movement on digits: [SFT]  
Determination of parameter: [SET]  
Available characters: ASCII characters  
Push [SET] to decide while the value of Tag No. is blinking. The screen returns to the setting page after the setting.



### 5.5 microSD Card Setting

For the device with optional code MC, by setting the dedicated microSD card into the slot on the display unit, the parameter setting can be stored into it. The stored data can be restored to the device. For the detailed function, read the user’s manual of applicable communication type as listed in Table 1.1.



**WARNING**

Use only micro SD cards sold by YOKOGAWA.  
Operation cannot be guaranteed when other cards are used.

#### (1) Installing microSD Card

Carefully insert the dedicated microSD card into the slot on the display unit until the slot holds the card. (see Figure 5.5).

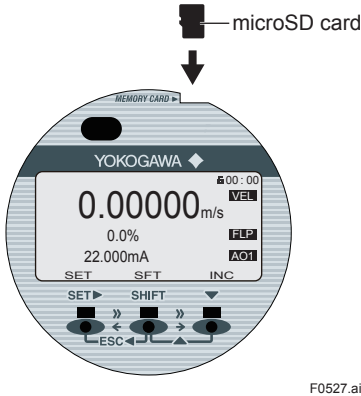



Figure 5.5    microSD setting

#### (2) Removing microSD Card

The microSD is released from the slot by pushing it. To prevent from losing the microSD card, be careful to handle the card.



**IMPORTANT**

If the microSD card is removed without execution of “Unmount” on parameter setting, it may result in the corruption of stored data and the abnormal operation of device.

Display Menu Path:  
Device setup▶microSD▶Unmount

### 5.6 BRAIN Configuration Tool

The connection of the BRAIN configuration tool (BRAIN TERMINAL (BT200) or FieldMate (Versatile Device Management Wizard)) is shown as below. Read the user’s manual of BT200 (IM 01C00A11-01E) for the operation, and the user’s manual of BRAIN communication type as listed in Table 1.1 for the detailed parameter setting via BRAIN communication.

The communication signal is superimposed onto the 4 to 20 mA DC analog signal to be transmitted. The BRAIN configuration tool can interface with this device from the control room, this device 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 this device, and the connections must be non-polarized. See Figure 5.6.

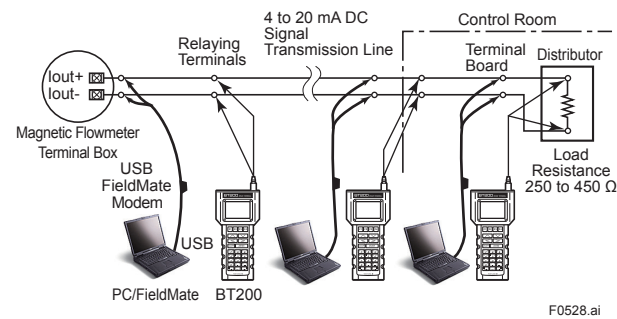




Figure 5.6    Connecting the BRAIN Configuration Tool



**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. Read the general specifications as listed in Table 1.1.



## 5.7 HART Configuration Tool

The connection of the HART configuration tool (FieldMate (Versatile Device Management Wizard)) is shown as below. Read the user's manual of HART communication type as listed in Table 1.1 for the detailed parameter setting via HART communication.



### NOTE

- For more details regarding the operations of the HART configuration tool, read the manual of HART configuration tool.
- When using FieldMate, be sure that the revision is R3.02.00 or later.



### NOTE

Parameters on HART configuration tool are displayed in English only. Even if any language other than English is selected as "display language" from display panel, parameters are displayed in English on HART configuration tool.

### 5.7.1 Connections with HART Configuration Tool

The HART configuration tool can interface with this device from the control room, this device site, or any other wiring termination point in the loop, provided there is a minimum load resistance of 230  $\Omega$  between the connection and the receiving instrument. To communicate, it must be connected in parallel with this device, and the connections must be non-polarized. Read Figure 5.7.

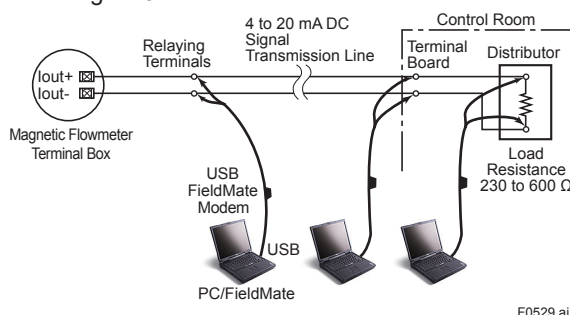


Figure 5.7 Connecting the HART Configuration Tool



### 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.

### 5.7.2 HART Configuration Tool and Device Revision



### IMPORTANT

Protocol revision supported by HART configuration tool must be the same protocol revision or later than that of the device. If it is not, communication error occurs.

#### (1) Device Description (DD) and Device Revision

Before using the HART configuration tool, confirm that the DD (Device Description) of this device is installed in the configuration tool.

If correct DD is not installed to the configuration tool, install a correct DD from the HART official site, otherwise, contact the respective vendors of the configuration tool for its upgrade information.

The device revision is as follows.

DD Revision	1 or later
Device Type	AXW4A (0x371B)
Device Revision	1

#### Confirmation of DD revision

- Turn on the power of the configuration tool under the standalone condition.
- Confirm the device revision from the installed DD file name according to the procedure provided for the configuration tool.

DD file name is four digits, upper two digits are device revision and lower two digits are DD revision.



### NOTE

Device revision of DD file is given in hexadecimal.

#### Confirmation of Device revision

Connect the configurator to this device and confirm the revision by the following parameter.

HART Communication Menu Path:
Device root menu ▶ Detailed setup ▶
Device information ▶ HART setup ▶ Fld dev rev

#### (2) Device Type Manager (DTM) and Device Revision

When configure the parameters using FieldMate, use the DTM (Device Type Manager) reading the following table.

DTM Name	AXW HART 7 DTM
DTM Revision	5.6.4.0 or later *
Device Type	AXW4A (0x371B)
Device Revision	1

\* : The DTM is included in Yokogawa DTM Library HART 6.5 or later.



**NOTE**

The DTM revision can be confirmed by “DTM setup”.  
Device Files is a Media included in FieldMate. The user registration site provides Device Files with the latest update programs.

(URL: <https://voc.yokogawa.co.jp/PMK/>)

In case update, following operation by “DTM setup” is required.

- Update DTM catalog
- Assign corresponding DTM to the device.

For details, read the user's manual of FieldMate.



## 6. Operation

After the installation of sensor into process piping, the wiring of input/output terminals, the configuration of required parameters, and the zero adjustment prior to operation, the flowmeter outputs a flow signal from its terminals as soon as the fluid is sent in the pipe.

### 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 the display unit. For AXFA11, read the applicable user's manual as listed in Table 1.1.



#### IMPORTANT

- Zero adjustment should be carried out before actual operation. Note that parameter setting or change cannot be carried out during execution of zero adjustment (i.e., for approximately 30 seconds).
- Zero adjustment should only be carried out when the sensor 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, be sure to carry out zero adjustment with the new fluid.

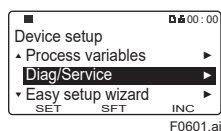
### 6.2 Zero Adjustment from Display Unit

A procedure of executing zero adjustment is as follows;

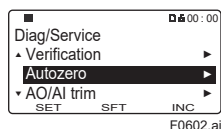
Display Menu Path:

Device setup ► Diag/Service ► Autozero ► Execute  
Device setup ► Diag/Service ► Autozero ► Result ► Zero value

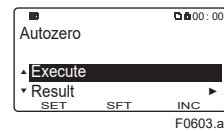
Enter the Setting Mode. (Read Section 5.3)



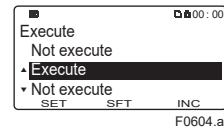
Select "Diag/Service" according to the menu path above.



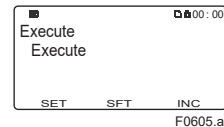
Select "Autozero".



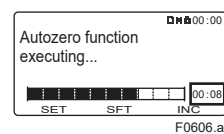
Select "Execute".



Select "Execute".

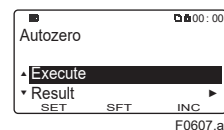


When "Execute" blinks, touch [SET] to execute.



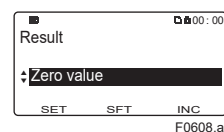
Autozero starts, and the progress is displayed with a remaining time and a bar graph. Wait for the completion.

The time remaining until the end.

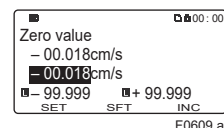


After Autozero finished, the display returns to "Autozero" menu.

#### • Confirmation of zero adjustment result



For the result of Autozero, select "Result" and then "Zero value".



Result of Autozero is indicated as on the left.



#### NOTE

When the zero adjustment result exceeds defined value, the warning [092: AZ warn] is indicated.

Zero adjustment can be executed with the following parameter.

BRAIN Communication:

B50:AUTOZERO EXE

HART Communication Menu Path:

Device root menu ► Basic setup ► Autozero ► Autozero Exe



## 6.3 Hardware Switch Setting

### 6.3.1 Integral Type and AXW4A Remote Transmitter



#### NOTE

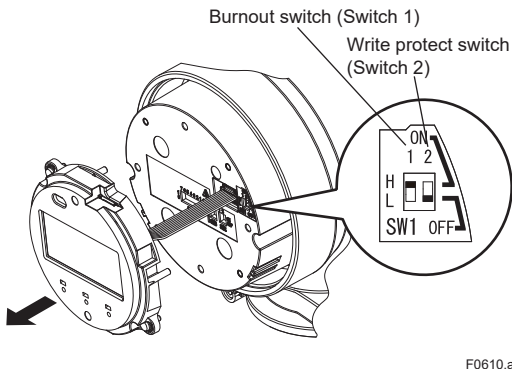
The integral type is explained as an example. Pay same attention to the AXW4A remote transmitter.



#### IMPORTANT

- Removing and installing the cover are necessary for hardware switches. Perform removing and installing the cover as described in Section 3.6. When opening the cover, wait for more than 20 minutes after turning off the power. This work must be carried out by the trained personnel having knowledge of safety standard.
- To preserve the safety, do not touch the electrical circuit and the cables except the setting switches.
- When installing the cover, in order to contact the housing and the cover, be sure to screw it firmly into the housing without any space between them.

- (1) Remove the cover.
- (2) While holding the display by hand, loosen the two mounting screws.
- (3) While holding the display by hand (careful for connecting cable), set the switches. Never remove connector in this case.



F0610.ai

Figure 6.3.1 Hardware switches

- (4) Taking care not to entangle the cables, tighten the two screws on the display.
- (5) Install the cover.



#### NOTE

On the front of the amplifier, the burnout 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.

#### (1) Setting of Burnout Switch

The burnout function sets the direction of current output in situations where the CPU has become damaged. Upon shipment from the manufacturing plant, the burnout direction is set to High (i.e., >21.6 mA); however, in cases where the optional codes C1 or C2 have been specified, the output direction will be set to Low (i.e., <2.4 mA). Modification of the burnout direction must be carried out using the burnout switch (i.e., Switch 1) (See Figure 6.3.1).

Table 6.3.1 Burnout switch (Switch 1)

Position of Switch	Burnout Direction	Burnout Output	Description
	High	> 21.6 mA	When optional code C1 or C2 is not specified, the setting is "High".
	Low	< 2.4 mA	When optional code C1 or C2 is specified, the setting is "Low".

#### (2) Setting of Write Protect Switch

The write protect function is to prevent the overwriting of parameters.

Write protection can be carried out using either the write protect switch (Switch 2) (See Figure 6.3.1) or software function with parameter setting. If either of these items is activated, the overwriting of parameters will be prohibited.

Table 6.3.2 Write protect switch (Switch 2)

Position of Switch	Write Protect Function
	OFF (Factory setting) Parameter can be overwritten.
	ON Parameter can not be overwritten.



#### NOTE

- If the hardware switch is set to "ON", the condition of preventing parameter overwriting kept until the switch is set to "OFF".
- For the software write protect, read the user's manual of applicable communication type as listed in Table 1.1.



### 6.3.2 AXFA11 Remote Transmitter

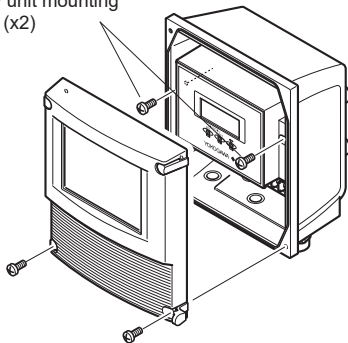


#### IMPORTANT

- Removing and installing the cover are necessary for hardware switches. Perform removing and installing the cover as described in Subsection 4.4.5. When opening the cover, wait for more than 20 minutes after turning off the power. This work must be carried out by the trained personnel having knowledge of safety standard.
- To preserve the safety, do not touch the electrical circuit and the cables except the setting switches.

- (1) Loosen the two display unit mounting screws while supporting it with your hand (See Figure 6.3.2).

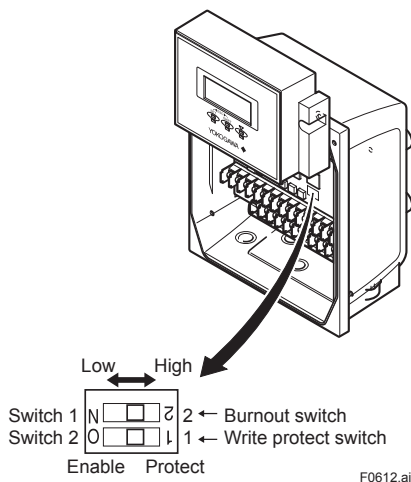
Display unit mounting screws (x2)



F0611.ai

Figure 6.3.2 Removing Mounting Screws of Display Unit

- (2) Taking care of the connector and cable connecting to the display unit, move the display unit as shown in Figure 6.3.3, and set the switches. Never remove connector in this case.



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Figure 6.3.3 Hardware switches

- (3) After setting the switches, taking care not to entangle the cables, install the display unit with two mounting screws.
- (4) Install the cover.



#### NOTE

On the front of the amplifier, the burnout 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.

#### (1) Setting of Burnout Switch

The burnout function sets the direction of current output in situations where the CPU has become damaged. Upon shipment from the manufacturing plant, the burnout direction is set to High (i.e., 25 mA); however, in cases where the optional codes C1 have been specified, the output direction will be set to Low (i.e., 0 mA). Modification of the burnout direction must be carried out using the burnout switch (i.e., Switch 1) (See Figure 6.3.3).

Table 6.3.3 Burnout switch (Switch 1)

Position of Switch	Burnout Direction	Burnout Output	Description
Low High 	High	25 mA	When optional code C1 is not specified, the setting is "High".
Low High 	Low	0 mA	When optional code C1 is specified, the setting is "Low".

#### (2) Setting of Write Protect Switch

The write protect function is to prevent the overwriting of parameters.

Write protection can be carried out using either the write protect switch (Switch 2) (See Figure 6.3.3) or software function with parameter setting.

If either of these items is activated, the overwriting of parameters will be prohibited.

Table 6.3.4 Write protect setting switch (Switch 2)

Position of Switch	Write Protect Function
 Enable Protect	Enable (Factory setting) Parameter can be overwritten.
 Enable Protect	Protect Parameter can not be overwritten.



#### NOTE

- If the hardware switch is set to "Protect", the condition of preventing parameter overwriting kept until the switch is set to "Enable".
- For AXFA11, read the user's manual of applicable communication type as listed in Table 1.1.



# 7. Errors and Countermeasures (Display unit)

The error messages are following table. For AXFA11, read the applicable user's manual as listed in Table 1.1.

Alarm Item	Description
System Alarm	Device breaks down and causes abnormal measurement. Device replacement is needed.
Process Alarm	The device works normally and some issue of process causes abnormal measurement. Maintenance work is needed.
Setting Alarm	The device works normally but parameter setting error occurs. Parameter setting is needed.
Warning	The device works normally and measurement is also normal but warning occurs.
Information	The device works normally and measurement is also normal. Just reference information.

NE107 Status		Status of the Device
F	Failure	Device malfunction, Parts malfunction
C	Function Check	The output signal is temporarily invalid for the local operation or manual operation.
S	Out of Specification	The device works in out of specification. The output signal is uncertain for the process or the ambience.
M	Maintenance Required	The maintenance is required in the near future.
N	No Effect	Other issue

Alarm Item	NE107 Status	Error Message			Error Description	Countermeasure Message		Countermeasure	Operation at the time of error						
		Display	BRAIN	HART		Display	Alarm		Warning	Current	Pulse / Status	Total	Process Value	Display	
F		010: Main CPU FAIL	10: Main CPU FAIL	Main board CPU failure	CPU (Main board) failure was detected.	Contact Yokogawa service center.	Contact Yokogawa service center.	Contact Yokogawa service center.	Active	Non-Active	Burnout	Stop	Stop	Stop	Not defined
F		011: Rev calc FAIL	11: Rev cal FAIL	Reverse calculation failure	Failure of reverse calculation was detected.	Contact Yokogawa service center.	Contact Yokogawa service center.	Contact Yokogawa service center.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Normal Operation	Alarm
F		012: Main EEP FAIL	12: Main EEP FAIL	Main board EEPROM failure	Failure of EEPROM (Main board) was detected.	Contact Yokogawa service center.	Contact Yokogawa service center.	Turn on the power again within the temperature range. If the problem does not improve, contact Yokogawa service center.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Normal Operation	Alarm
System Alarm	F	013: Main EEP dft	13: Main EEP dft	Main board EEPROM default	EEPROM (Main board) was reseted to default values.	Contact Yokogawa service center.	Contact Yokogawa service center.	Contact Yokogawa service center.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Normal Operation	Alarm
	F	014: Snst bd FAIL	14: Snst bd FAIL	Sensor board failure	Failure of sensor board was detected.	Contact Yokogawa service center.	Contact Yokogawa service center.	Contact Yokogawa service center.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Hold prior setting	Alarm
	F	015: Snst comm ERR	15: Snst comm ERR	Sensor communication error	Communication error of sensor was detected.	Contact Yokogawa service center.	Contact Yokogawa service center.	Contact Yokogawa service center.	Active	Non-Active	Burnout	Alarm Out	Based on "FailOpts"	Hold prior setting	Alarm
F		016: AD 1 FAIL[Sig]	16: AD1 FAIL	AD1 failure[Signal]	Failure of A/D transmitter 1 [flow velocity signal] was detected.	Contact Yokogawa service center.	Contact Yokogawa service center.	Contact Yokogawa service center.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Hold prior setting	Alarm
F		017: AD 2 FAIL[Excl]	17: AD2 FAIL	AD2 failure[Exciter]	Failure of A/D transmitter 2 [Exciting current] was detected.	Contact Yokogawa service center.	Contact Yokogawa service center.	Contact Yokogawa service center.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Hold prior setting	Alarm



Alarm Item	NE107 Status	Error Message			Error Description	Countermeasure Message	Countermeasure	Operation at the time of error						
		Display	BRAIN	HART				Output						
						Alarm		Warning	Current	Pulse / Status	Total	Process Value	Display	
System Alarm	F	018: Coil open	18: Coil open		Coil of sensor was disconnected.	Cut the power and check coil & EX cable.	Turn of the power, check coil of sensor and excitation cable.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Hold prior setting	Alarm
	F	019: Coil short	19: Coil short		Coil of sensor was shorted.	Contact Yokogawa service center.	Contact Yokogawa service center.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Hold prior setting	Alarm
	F	020: Exciter FAIL	20: Exciter FAIL		Failure of excitation circuit was detected.	Contact Yokogawa service center.	Contact Yokogawa service center.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Normal Operation	Alarm
	F	021: PWM 1 stop	21-22: PWM stop		Error of pulse width modulation 1 was detected.	Contact Yokogawa service center.	Contact Yokogawa service center.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Normal Operation	Alarm
	F	022: PWM 2 stop	22: PWM2 stop		Error of pulse width modulation 2 was detected.	Contact Yokogawa service center.	Contact Yokogawa service center.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Normal Operation	Alarm
	F	023: Opt bd mismatch	23: Opt mismatch		Mismatch of option board was detected.	Contact Yokogawa service center.	Contact Yokogawa service center.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Normal Operation	Alarm
	F	024: Opt bd EEP FAIL	24: Opt EEP FAIL		Failure of EEPROM (option board) was detected.	Contact Yokogawa service center.	Contact Yokogawa service center.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Normal Operation	Alarm
	F	025: Opt bd A/D FAIL	25: Opt A/D FAIL		Failure of A/D (option board) was detected.	Contact Yokogawa service center.	Contact Yokogawa service center.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Normal Operation	Alarm
	F	026: Opt bd SPI FAIL	26: Opt SPI FAIL		Failure of SPI (option board) was detected.	Contact Yokogawa service center.	Contact Yokogawa service center.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Normal Operation	Alarm
	F	027: Restore FAIL	27: Restore FAIL		Restore of parameters was failed.	Retry parameter restoration.	Retry parameter restoration.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Normal Operation	Alarm
	F	028: Ind bd FAIL			Failure of indicator board was detected.	Contact Yokogawa service center.	Check the ambient temperature of display is within the range. If the problem does not improve, contact Yokogawa service center.	Non-Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Normal Operation	Alarm
	F	029: Ind bd EEP FAIL	28-32: Indct FAIL		Failure of EEPROM (indicator board) was detected.	Contact Yokogawa service center.	Turn on the power again within the temperature range. If the problem does not improve, contact Yokogawa service center.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Normal Operation	Alarm
	F	030: LCD drv FAIL			Failure of LCD driver was detected.	Contact Yokogawa service center.	Contact Yokogawa service center.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Normal Operation	Alarm
	F	031: Ind bd mismatch			Mismatch of Indicator board was detected.	Contact Yokogawa service center.	Contact Yokogawa service center.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Normal Operation	Alarm
	F	032: Ind comm ERR			Communication error of indicator board was detected.	Check connection of indicator & main board.	Check connection of Indicator & main board.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Normal Operation	Alarm
	F	033: microSD FAIL	33: microSD FAIL		Failure of microSD card was detected.	Change microSD card.	Change microSD card.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Normal Operation	Alarm



Alarm Item	NE107 Status	Error Message			Error Description	Countermeasure Message	Countermeasure	Operation at the time of error					Process Value	Display
		Display	BRAIN	HART				Output						
						Alarm		Warning	Current	Pulse / Status	Total			
Process Alarm	S	050: Signal overflow	50: Sig overflow	50: Signal overflow	Failure of input signal was detected.	Display Check signal cable and grounding.	Check signal cable and grounding.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Hold prior setting	Alarm
	S	051: Empty detect	51: Empty detect	51: Empty pipe detection	Empty inside of sensor was detected. (Empty pipe detection)	Fill flow tube with fluid.	Fill flow tube with fluid.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Hold prior setting	Alarm
	N	052: H/L HH/LL alm	52: H/L HH/LL alm	52: H/L or HH/LL alarm	Flow rate exceeded upper limit or lower limit.	Check flow rate and setting value.	Check flow rate and setting value.	Active	Non-Active	Normal	Normal	Continue	Normal Operation	Alarm
	S	053: Adh over lv4	53: Adh over lv4	53: Adhesion over level 4	The resistance value of the electrodes exceeded Level 4. (Adhesion detection of insulation to electrode)	Clean electrodes.	Clean electrodes.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Normal Operation	Alarm
	S	060: Span cfg ERR	60: Span cfg ERR	60: Span configuration error	Setting error of flow span was detected. (fulfill "0.05 m/s < Span < 16 m/s")	Change span parameter setting.	Check or change span parameter setting.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Normal Operation	Alarm
Setting Alarm	S	062: AO 1 4-20 lmt	62: AO1 4-20 lmt	62: Analog output 1 4-20 mA limit error	Setting error of Current output 1 was detected. (fulfill "LRV < HRV")	Change Analog output 1 parameter setting.	Check or change Analog output 1 parameter setting.	Active	Non-Active	Normal	Normal	Continue	Normal Operation	Alarm
	S	064: AO 1 mlt rng	64: AO1 mlt rng	64: Analog output 1 multi range error	Setting error of Multi range function was detected. (fulfill "1st range <= 2nd range" and select "either multi range or absolute range".)	Change multi range parameter setting.	Check or change multi range parameter setting.	Active	Non-Active	Alarm Out	Normal	Based on "FailOpts"	Normal Operation	Alarm
	N	065: H/L cfg ERR	65: AO H/L cfg	65: H/L HH/LL configuration error	Setting error of alarm high/low limit function was detected. (fulfill "Hi Alarm - Lo Alarm > H/L Hys" and "HH Alarm - LL Alarm > HH/LL Hys")	Change H/L, HH/LL parameter setting.	Check and change H/L, HH/LL parameter setting.	Active	Non-Active	Alarm Out	Normal	Based on "FailOpts"	Normal Operation	Alarm
	S	066: Density cfg ERR	66: Dens cfg ERR	66: Density configuration error	Setting error of density value was detected when PV was set to mass flow rate.	Change Density parameter setting.	Check and change Density parameter setting.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Normal Operation	Alarm
	S	067: Pls 1 cfg ERR	67: Pls1 cfg ERR	67: Pulse output 1 configuration error	Setting error of Pulse output 1 was detected.	Change Pulse output 1 parameter setting.	Change Pulse output 1 parameter setting.	Active	Non-Active	Alarm Out	Alarm Out	Continue	Normal Operation	Alarm
Setting Alarm	C	069: Nomi size cfg	69: Nomi size cfg	69: Nominal size configuration error	Configuration error of nominal size was detected. (fulfill "0.99 mm < nominal size < 3000.10 mm (0.01 inch < nominal size < 120.10inch)")	Change nominal parameter setting.	Check and change nominal parameter setting.	Active	Non-Active	Alarm Out	Alarm Out	Based on "FailOpts"	Normal Operation	Alarm
	C	070: Adh cfg ERR	70: Adh cfg ERR	70: Adhesion configuration error	Setting error of electrode adhesion detection function was detected. (fulfill "Level1 < Level2 < Level3 < Level4")	Change adhesion parameter setting.	Check and change adhesion parameter setting.	Active	Non-Active	Normal	Normal	Continue	Normal Operation	Alarm



Alarm Item	NE107 Status	Error Message				Error Description	Countermeasure Message		Countermeasure	Operation at the time of error					Process Value	Display
		Display			Alarm		Warning	Current		Pulse / Status	Total					
Setting Alarm	C	072: Log not start	72: Log not start		Data logging failed to start.	Insert microSD card.	Display	Insert microSD card.	Active	Non-Active	Normal	Normal	Continue	Normal Operation	Alarm	
	S	080: AO 1 saturate	80-81: AO saturt		Saturation of Analog output 1 was detected.	Check process or parameter setting.		Check process value and current output 1 parameter setting.	Non-Active	Active	Normal	Normal	Continue	Normal Operation	Warning	
	S	082: Pls 1 saturate	82-83: Pls saturt		Saturation of Pulse output 1 was detected.	Check process or parameter setting.		Check process value and pulse output 1 parameter setting.	Non-Active	Active	Normal	Normal	Continue	Normal Operation	Warning	
	C	085: Cable miscon	85: Cable miscon		Misconnection of cable was detected.	Check the signal/EX cable connection.		Check the signal cable and excitation cable connection.	Non-Active	Active	Normal	Normal	Continue	Normal Operation	Warning	
	C	086: Coil insulation	86: Coil insulate		Insulation deterioration of coil was detected.	Coil insulation is detected.		Contact Yokogawa service center.	Non-Active	Active	Normal	Normal	Continue	Normal Operation	Warning	
	M	087: Adhesion lv 3	87: Adh over lv3		The resistance value of electrode exceeded Level 3. (Adhesion detection of insulation to electrode)	Recommend cleaning electrode		Recommend cleaning electrode.	Non-Active	Active	Normal	Normal	Continue	Normal Operation	Warning	
Warning	C	092: AZ warn	92: AZ warn		Result of Autozero adjustment (Mag Flow Zero) exceeded 10 cm/s.	Check environment.		Check fluid is stopped when executing zero adjustment.	Non-Active	Active	Normal	Normal	Continue	Normal Operation	Warning	
	C	093: Verif warn	93: Verif warn		Interruption of verification function was detected.	Last Verification was interrupted.		Execute Verification again.	Non-Active	Active	Normal	Normal	Continue	Normal Operation	Warning	
	C	095: Simulate active	95: Sim active		Test mode was executed for any of Flow velocity, Volumetric flow rate, Mass flow rate, Current output, Pulse output, Status input, Status output/	Simulation running.		Release simulation or test mode.	Non-Active	Active	Normal	Normal	Continue	Normal Operation	Warning	
	S	096: AO 1 fix	96-97: AO fixed		It was detected that fixed value is set to Current output 1.	Please cancel the fixed output.		Check current output 1 is test mode or not.	Non-Active	Active	Normal	Normal	Continue	Normal Operation	Warning	
	S	098: Pls 1 fix	98-99: Pls fixed		It was detected that fixed value is set to Pulse output 1.	Please cancel the fixed output.		Check pulse output 1 is test mode or not.	Non-Active	Active	Normal	Normal	Continue	Normal Operation	Warning	
	C	101: Param restore run	101: Prm restore		Restore function of parameter is running.	—		—	Non-Active	Active	Normal	Normal	Continue	Normal Operation	Execute	
	N	102: Disp over	102: Disp over		Number of digits available for display exceeded the limit.	Check Display format parameter.		Check Display format parameter.	Non-Active	Active	Normal	Normal	Continue	Normal Operation	Warning	
	N	103: SD size warn	103: SD size warn		Free space of microSD card decreased to less than 10%.	microSD card may run out of memory space.		microSD card may run out of memory space.	Non-Active	Active	Normal	Normal	Continue	Normal Operation	Warning	
M	104: Bkup incmplt	104: Bkup incmplt		Parameter backup failed.	Retry parameter backup.		Retry parameter backup.	Non-Active	Active	Normal	Normal	Continue	Normal Operation	Warning		



Alarm Item	NE107 Status	Error Message			Error Description	Countermeasure Message	Countermeasure	Operation at the time of error					Process Value	Display
		Display	BRAIN	HART				Output						
						Alarm		Warning	Current	Pulse / Status	Total			
S	Warning	105: SD mismatch	105: SD mismatch	microSD card mismatch	Mismatch of microSD card was detected.	Change microSD card.	Change microSD card.	Non-Active	Active	Normal	Normal	Continue	Normal Operation	Warning
		106: SD removal ERR	106: SD removal ERR	microSD card removal procedure error	Removal of microSD card failed.	Remove microSD in appropriate procedure.	Remove microSD in appropriate procedure.	Non-Active	Active	Normal	Normal	Continue	Normal Operation	Warning
N	Information	131: Trans mismatch	131: Trn mismatch	Transmitter type mismatch	Mismatch of sensor and transmitter was detected.	Contact Yokogawa service center.	Contact Yokogawa service center.	Non-Active	Active	Normal	Normal	Continue	Normal Operation	Normal
N		120: Watchdog	120: Watchdog	120 Watchdog	Error of Watchdog timer was detected.	—	Contact Yokogawa service center.	Non-Active	Active	Normal	Normal	Continue	Normal Operation	Normal
N		121: Power off	121: Power off	121 Power off	Power-off was detected.	—	—	Non-Active	Active	Normal	Normal	Continue	Normal Operation	Normal
N		122: Inst power FAIL	122: Inst PW FAIL	122: Instant power failure	Instantaneous power failure was detected.	—	—	Non-Active	Active	Normal	Normal	Continue	Normal Operation	Normal
N		123: Param bkup run	123: bkup run	123: Parameter backup running	Parameter backup is running.	—	—	Non-Active	Active	Normal	Normal	Continue	Normal Operation	Execute
N		124: Data log run	124: Data log run	124: Data logging running	Data log is running.	—	—	Non-Active	Active	Normal	Normal	Continue	Normal Operation	Icon
N		130: DevID not enter	—	130: Device ID not enter	No data entry of Device ID was detected.	Contact Yokogawa service center.	Contact Yokogawa service center.	Non-Active	Active	Normal	Normal	Continue	Normal Operation	Normal



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# Revision Information

- Title : ADMAG TI Series AXW Magnetic Flowmeter [Size: 25 to 400 mm (1 to 16 in.)]  
Installation Manual
- Manual No. : IM 01E24A01-01EN

Edition	Date	Page	Revised Item
1st	June 2017	—	New publication