User's Manual

ADMAG AE

Models AE100D, AE200D, and AE300D Magnetic Flow Tube [Style:S2]

IM 1E7D0-01E

YOKOGAWA
Yokogawa Electric Corporation

IM 1E7D0-01E
11th Edition

CONTENTS

1. INTRODUCTION

This instrument has been already adjusted at the factory before shipment.

To ensure correct use of the instrument, please read this manual thoroughly and fully understand how to operate the instrument before operating it.

■ Regarding This Manual

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

■ Safety Precautions

- The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific WARNINGS given elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. YOKOGAWA Electric Corporation assumes no liability for the customer's failure to comply with these requirements. If this instrument is used in a manner not specified in this manual, the protection provided by this instrument may be impaired.

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

A IMPORTANT sign denotes an attention to avoid leading to damage to instrument or system failure.

NOTE

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

⏚ Protective grounding terminal.

⏚ Function grounding terminal. This terminal should not be used as a "Protective grounding terminal".

~ Alternating current.

⎓ Direct current.

■ Warranty

- The guaranteed term of this instrument is described in the quotation. We repair the damages that occurred during the guaranteed term for free.
- Please contact with our sales office when this instrument is damaged.
- If the instrument has trouble, please inform us model code, serial number, and concrete substances or situations. It is preferable to be attached a outline or data.
- We decide after the examination if free repair is available or not.
- Please consent to the followings for causes of damages that are not available as free repair, even if it occured during the guaranteed term.

A: Unsuitable or insufficient maintenance by the customer.
B: The handling, using, or storage that ignore the design and specifications of the instrument.
C: Unsuitable location that ignore the description in this manual.
D: Remaking or repair by a person except whom we entrust.
E: Unsuitable removing after delivered.
F: A natural disaster (ex. a fire, earthquake, storm and flood, thunderbolt) and external causes.

■ For Safety Using

For safety using the instrument, please give attention mentioned below.

⚠ WARNING

(1) Installation
- The instrument must be installed by expert engineer or skilled personnel. The procedures described about INSTALLATION are not permitted for operators.
- The Magnetic Flow Tube is a heavy instrument. Please give attention to prevent that persons are injured by carrying or installing. It is preferable for carrying the instrument to use a cart and be done by two or more persons.
- In case of high process temperature, care should be taken not to burn yourself because the surface of body and case reach a high temperature.
- When removing the instrument from hazardous processes, avoid contact with the fluid and the interior of the flow tube.
- All installation shall comply with local installation requirement and local electrical code.

(2) Wiring
- The instrument must be installed by expert engineer or skilled personnel. The procedures described about WIRING are not permitted for operators.
- Please confirm voltages between the power supply and the instrument before connecting the power cables. And also, please confirm that the cables are not powered before connecting.
- The protective grounding must be connected to the terminal ⏚ in order to avoid personal shock hazard.

(3) Operation
- Wait 10 min. after power is turned off, before opening the covers.

(4) Maintenance
- Please do not carry out except being written to a maintenance descriptions. When these procedures are needed, please contact to nearest YOKOGAWA office.
- Care should be taken to prevent the build up of drift, dust or other material on the display glass and data plate. In case of its maintenance, soft and dry cloth is used.

(5) Explosion Protected Type Instrument
- For explosion proof type instrument, the description in Chapter 6 “EXPLOSION PROTECTED TYPE INSTRUMENT” is prior to the other description in this user's manual.
- Only trained persons use this instrument in the industiral location.
- The protective grounding ⏚ must be connected to a suitable IS grounding system.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

(6) The Instrument in Compliance with PED
- For the instrument in compliance with PED, the description in Chapter 7 “PRESSURE EQUIPMENT DIRECTIVE” is prior to the other description in this User’s Manual.

■ ATEX Documentation

This procedure is only applicable to the countries in European Union.

GB

All instruction manuals for ATEX Ex related products are available in English, German and French. Should you require Ex related instructions in your local language, you are to contact your nearest Yokogawa office or representative.

DK

Alle brugervejledninger for produkter relateret til ATEX Ex er tilgængelige på engelsk, tysk og fransk. Skulle De ønske yderligere oplysninger om håndtering af Ex produkter på eget sprog, kan De rette henvendelse herom til den nærmeste Yokogawa afdeling eller forhandler.

I

Tutti i manuali operativi di prodotti ATEX contrassegnati con Ex sono disponibili in inglese, tedesco e francese. Se si desidera ricevere i manuali operativi di prodotti Ex in lingua locale, mettersi in contatto con l'ufficio Yokogawa più vicino o con un rappresentante.

E

Todos los manuales de instrucciones para los productos antiexplosivos de ATEX están disponibles en inglés, alemán y francés. Si desea solicitar las instrucciones de estos artículos antiexplosivos en su idioma local, deberá ponerse en contacto con la oficina o el representante de Yokogawa más cercano.

NL

Alle handleidingen voor producten die te maken hebben met ATEX explosiebeveiliging (Ex) zijn verkrijgbaar in het Engels, Duits en Frans. Neem, indien u aanwijzingen op het gebied van explosiebeveiliging nodig hebt in uw eigen taal, contact op met de dichtstbijzijnde vestiging van Yokogawa of met een vertegenwoordiger.

SF

Kaikkien ATEX Ex -tyyppisten tuotteiden käyttöhjeet ovat saatavilla englannin-, saksan- ja ranskankielisinä. Mikäli tarvitsette Ex -tyyppisten tuotteiden ohjeita omalla paikallisella kielellännne, ottakaa yhteyttä lähimpään Yokogawa-toimistoon tai -edustajaan.

P

Todos os manuais de instruções referentes aos produtos Ex da ATEX estão disponíveis em Inglês, Alemão e Francês. Se necessitar de instruções na sua língua relacionadas com produtos Ex, deverá entrar em contacto com a delegação mais próxima ou com um representante da Yokogawa.

F

Tous les manuels d'instruction des produits ATEX Ex sont disponibles en langue anglaise, allemande et française. Si vous nécessitez des instructions relatives aux produits Ex dans votre langue, veuillez bien contacter votre représentant Yokogawa le plus proche.

D

Alle Betriebsanleitungen für ATEX Ex bezogene Produkte stehen in den Sprachen Englisch, Deutsch und Französisch zur Verfügung. Sollten Sie die Betriebsanleitungen für Ex-Produkte in Ihrer Landessprache benötigen, setzen Sie sich bitte mit Ihrem örtlichen Yokogawa-Vertreter in Verbindung.

S

Alla instruktionsböcker för ATEX Ex (explosionssäkra) produkter är tillgängliga på engelska, tyska och franska. Om Ni behöver instruktioner för dessa explosionssäkra produkter på annat språk, skall Ni kontakta närmaste Yokogawakontor eller representant.

GR

Όλα τα εγχειρίδια λειτονργίας των προϊόντων με ATEX Ex διατίθενται στα Αγγλικά, Γερμανικά και Γαλλικά. Σε περίπτωση που χρειάζεστε οδηγίες σχετικά με Ex στην τοπική γλώσσα παρακαλούμε επικοινωνήστε με το πλησιέστερο γραφείο της Yokogawa ή αντιπρόσωπο της.

2. HANDLING PRECAUTIONS

This instrument has been already tested thoroughly at the factory. When the instrument is delivered, please check externals and make sure that no damage occurred during transportation.

In this chapter, handling precautions are described. Please read this chapter thoroughly at first. And please refer to the relative matter about other ones.

If you have any problems or questions, please make contact with Yokogawa sales office.

2.1 Checking Model and Specifications

The model and specifications are shown on the Data Plate. Please confirm the specifications between the instrument that was delivered and the purchase order (refer to the chapter 5. Outline).

Please let us know Model and Serial No. when making contact with Yokogawa sales office.

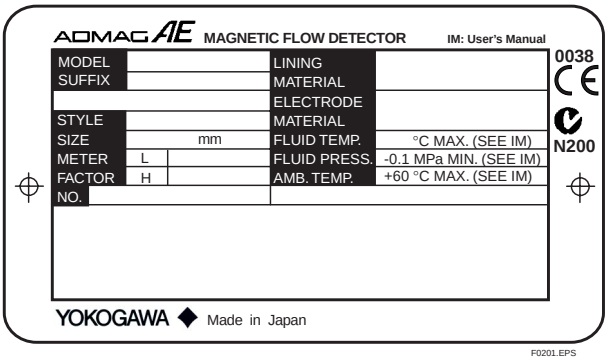


Figure 2.1 Data Plate

2.2 Accessories

When the instrument is delivered, please make sure that the following accessories are in the package.

- Centering device 1-set (for wafer type)
- Hexagonal wrench 1-piece (for hazardous duty type)

2.3 Storage Precautions

In case the instrument is expected to be stored over a long term, please give attention to the followings;

- The instrument should be stored in its original packing condition.
- The storage location should be selected according to the following conditions:
  1) The location where it is not exposed to rain or water.
  2) The location where there is few vibration or shock.
  3) Temperature and humidity should be:
     Temperature: –20 to 60˚C (–4 to 140˚F)
     Humidity: 5 to 80% RH (no condensation)
     Preferable ambient temperature and humidity are 25˚C(77˚F) and about 65% RH.

2.4 Installation Location Precautions

Please select the installation location considering the following items to ensure long term stable operation of the flow tube.

- Ambient Temperature:
  Please avoid to install the instrument at the location where temperature changes continuously. If the location receives radiant heat from the plant, provide heat insulation or improve ventilation.
- Atmospheric Condition:
  Please avoid to install the instrument in an corrosive atmosphere. In case of installing in the corrosive atmosphere, please keep ventilating sufficiently and prevent rain from entering the conduit.
- Vibration or shock:
  Please avoid to install the instrument at the location where there is heavy vibration or shock.

2.5 Terminal Box Reorientation Precautions

Please do not change the terminal box orientation at the customer's site. If the terminal box reorientation is required, please contact Yokogawa office or service center.

3. INSTALLATION

WARNING

This instrument must be installed by expert engineer or skilled personnel. The procedures described in this chapter are not permitted for operators.

3.1 Piping Design Precautions

IMPORTANT

Please design the correct piping referring to the followings to prevent damage for flow tube and to keep correct measuring.

(1) Location

IMPORTANT

Please install the flow tube to the location where it is not exposed to direct sunlight and ambient temperature is –20 to + 60°C (–4 to 140°F).

* The minimum temperature is –10°C (14°F) in case of the 40mm or larger size with the carbon steel flange connection or wafer connection.

(2) Noise Rejection

IMPORTANT

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

(3) Length of Straight Run

To keep accurate measuring, JIS B7554 “Electro Magnetic Flow Tubes” explains about upstream piping condition of Magnetic Flow Tubes.

We recommend to our customers about the piping conditions shown in Figure 3.1.1 based on JIS B7554 and our piping condition test data.

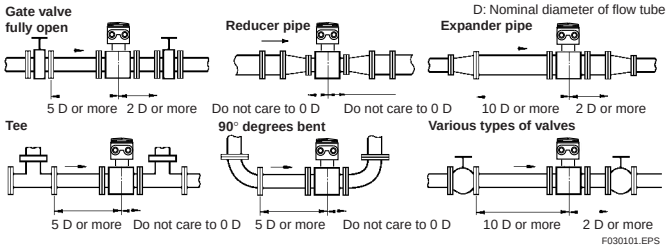


Figure 3.1.1 Minimum Length of Required Straight Run

NOTE

1. Nothing must be inserted or installed in the metering pipe than may interfere with the magnetic field, induced signal voltages, and flow velocity distribution.
2. These straight runs may not be required on the downstream side flowmeter. However, if the downstream valve or other fittings cause channeling on the upstream side, provide a straight run of 2 D to 3 D on the downstream side.

(4) Liquid Conductivity

IMPORTANT

Please avoid to install the flow tube at location where liquid conductivity is likely to be non-uniform. Because it is possible to have bad influences to the flow indication by non-uniform conductivity when a chemical liquid is injected from upstream side close to the flow tube. When this occurs, it is recommended that chemical application ports are installed on the downstream side of the flow tube. In case chemicals must be added upstream side, please keep the pipe length enough so that liquid is properly mixed.

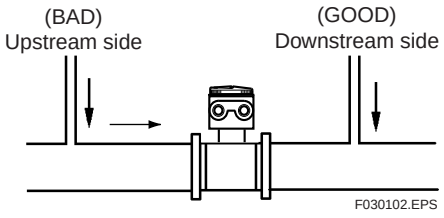


Figure 3.1.2 Chemical Insertion

(5) Liquid Sealing Compound

IMPORTANT

Please give attention in using Liquid Sealing Compound to the piping, because it brings bad influences to measurement by flowing out and cover the surfaces of electrode and earth-ring.

(6) Service Area

Please select the location where there is enough area to service installing, wiring, overhaul, etc.

(7) Bypass Line

It is recommended to install the Bypass Line to facilitate maintenance and zero adjustment.

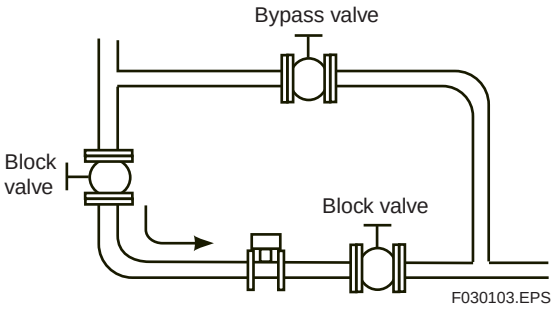


Figure 3.1.3 Bypass Line

(8) Supporting the Flow Tube

CAUTION

Please avoid to support only the flow tube, but fix pipes at first and support the flow tube by pipes to protect the flow tube from forces caused by vibration, shock, expansion and contraction through piping.
For small sized flow tubes, please provide a mounting base so thet the tubes are fixed in the piping. See the section 3.3 Mounting.

(9) Piping Condition

IMPORTANT

The piping should be designed so that a full pipe is maintained at all times to prevent loss of signal and erroneous readings.

Please design the piping that a fluid is always filled in the pipes. The Vertical Mounting is effective for fluids that is easily separate or slurry settles within pipes.

In this case, please flow a fluid from bottom to up.

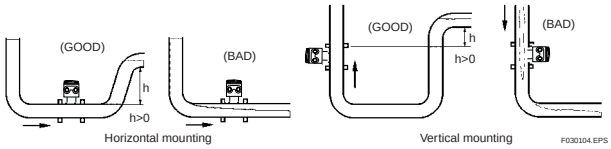


Figure 3.1.4 Filling the Pipe with Liquid

(10) No Air Bubbles

IMPORTANT

Please give attention to prevent bad influences or measuring errors from air bubbles that gathers inside measuring pipes.

In case the fluid includes air bubbles, please design the piping that prevent to gather air bubbles. In case valves are installed upstream of the flow tube, it is possible that a valve causes air bubbles, please install the flow tube upstream side of a valve.

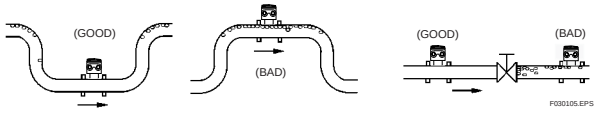


Figure 3.1.5 Avoiding Air Bubbles

(11) Mounting Direction

IMPORTANT

When the electrodes are vertical to ground, the electrode is covered with air bubbles at upper side or slurry at downside, and it may cause the measuring errors.
Please be sure to mount the terminal box upper side of piping to prevent water penetration into terminal box.

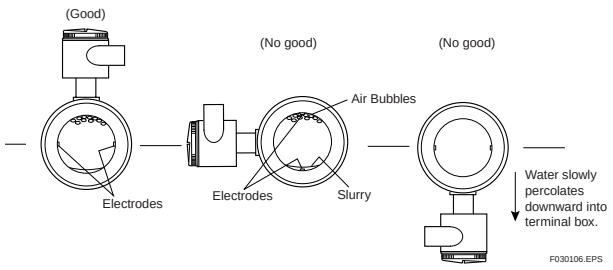


Figure 3.1.6 Mounting Direction

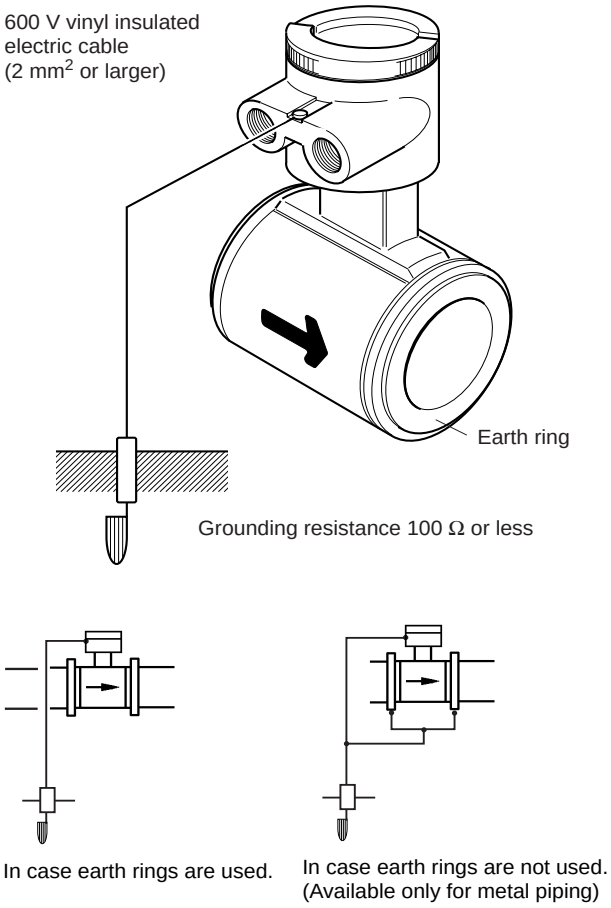
(12) Grounding

IMPORTANT

Improper grounding can have an adverse affect on the flow measurement. Please ensure that the instrument is properly grounded.

The electromotive force of the magnetic flow tube is minute and it is easy to be affected by noise. And also that reference electric potential is the same as the measuring fluid potential. Therefore, the reference electric potential (terminal potential) of the Flow Tube and the Converter/Amplifier also need to be the same as the measuring fluid. And moreover, that the potential must be the same with ground.

Please be sure to ground according to Figure 3.1.7.



Note; See "3.4.1 Protective Grounding" for information on protective grounding.

F030107.EPS

Figure 3.1.7 Grounding

3.2 Handling Precautions

WARNING

The Magnetic Flow tube is a heavy instrument. Please be careful to prevent persons from injuring when it is handled.

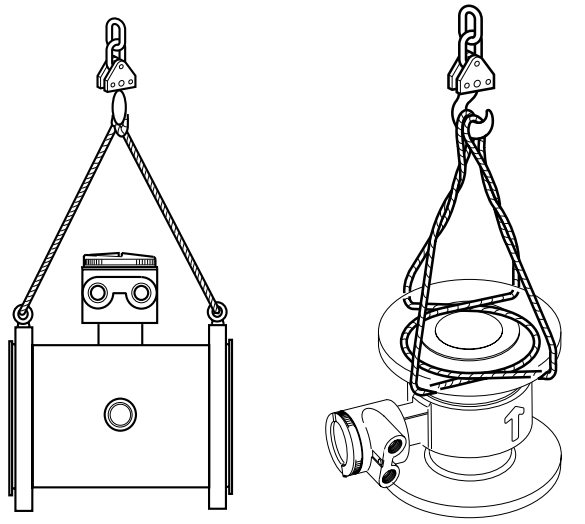
3.2.1 General Precautions

(1) Precaution for Carrying

The Magnetic Flow Tube is packed tightly. When it is unpacked, please give attention to prevent damages to the flow tube. And to prevent the accident during carry to the installing location, please carry it near the location keeping packed as it delivered.

CAUTION

In case the Magnetic Flow Tube lifts up, please refer to Figure 3.2.1. Please never lift up by using a bar through the flow tube. It damages liner severely.



F030201.EPS

Figure 3.2.1 Lifting Flow Tubes

(2) Precaution for Shock

CAUTION

Care should be taken not to drop the flow tube or subject it to excessive shock. This may lead to liner damage which will cause inaccurate readings.

(3) Flange Protection Covers

IMPORTANT

Please keep the protection cover (ex. corrugated paper or anything possible to protect) attached with flange except when mounting to the pipe.

(4) Terminal Box Cover

IMPORTANT

Please never leave the terminal box cover open until wiring to prevent insulation deterioration.

(5) Long-term Non-use

IMPORTANT

It is not preferable to leave the flow tube for long term non-use after installation.
In case the flow tube is compelled to do that, please take care of the flow tube by the follow-ings.

- Confirmation of Sealing Condition for the Flow Tube
  Please confirm the sealing conditions of the terminal box screw and wiring ports.
  In case of the Conduit Piping, please provide the drain plugs or waterproof glands to it to prevent that moisture or water penetrates into the flow tube through the conduit.
- Regular Inspections
  Please inspect the sealing condition (as above mentioned) and inside of the terminal box. And when it is suspect that water penetration into the inside flow tube (ex. rain fall), please inspect when it happened.

3.2.2 Flow Tube Piping

CAUTION

Mis-aligned or slanted piping can lead to leakage and damage to flanges.

- Please correct mis-alignment or slanted piping and improper distance between mounting flanges before install the flow tube. (Please refer to Figure 3.2.2)
- Inside a pipeline which is newly installed, some foreign substances (such as welding scrap or wood chips) may exist. Please remove them by flushing piping before mounting the flow tube.

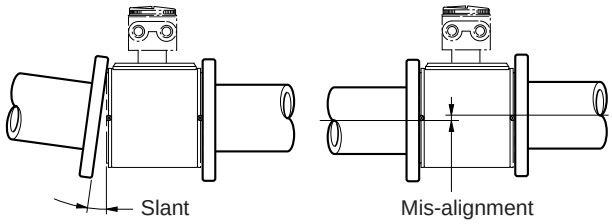


Figure 3.2.2 Slant and Mis-alignment of Flow Tube Piping

3.3 Mounting

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

NOTE

Please ensure to use the attached connecting fittings.

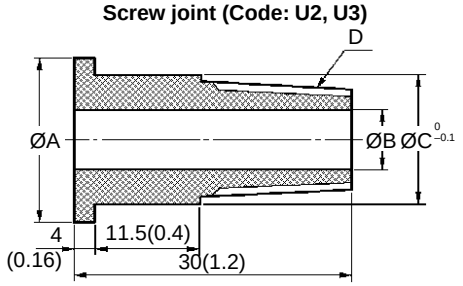
Ceramic linings with a diameter of 2.5, 5 or 10 mm are connected using union joints.

Use the connecting fittings according to the table below. Depending on whether the fitting is to be welded to or screwed on to the piping.

Table 3.3.1 Fitting Dimensions

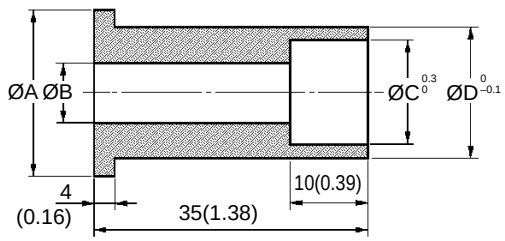
Unit: mm (inch)

Screw joint (Code: U2, U3)



Size mm(inch)	Code	A	B	C	D
2.5(0.1)	U2	22(0.87)	8(0.31)	18.5(0.73)	R1/4(PT1/4)
	U3	22(0.87)	8(0.31)	18.5(0.73)	NPT1/4
5(0.2)	U2	22(0.87)	8(0.31)	18.5(0.73)	R1/4(PT1/4)
	U3	22(0.87)	8(0.31)	18.5(0.73)	NPT1/4
10(0.4)	U2	25(0.98)	10(0.39)	22.5(0.89)	R3/8(PT3/8)
	U3	25(0.98)	10(0.39)	22.5(0.89)	NPT3/8

Weld joint (Code: U1)



Size mm(inch)	Code	A	B	C	D
2.5(0.1)	U1	22(0.87)	8(0.31)	14.3(0.56)	18.5(0.73)
5(0.2)	U1	22(0.87)	8(0.31)	14.3(0.56)	18.5(0.73)
10(0.4)	U1	25(0.98)	10(0.39)	17.8(0.70)	22.5(0.89)

T030301.EPS

(1) Mounting Direction

Please mount the Magnetic Flow Tube matching the flow direction of the fluid to be measured with the direction of the arrow mark on the flow tube.

IMPORTANT

If it is impossible to match the direction, please never remodel by changing direction of the terminal box. In case the measuring fluid flows against the arrow direction, please refer to the section “Reversing Flow Direction” in the Instruction Manual of AE14 Magnetic Flow Converter.

(2) Connecting Process Piping

Weld or screw the connecting fittings to the process piping.

IMPORTANT

- Please be sure to pass the connecting fittings through the union joint nuts in advance. Then connect the connecting fitting to the piping by screwing or welding the connecting fitting to the piping (see Figure 3.3.1).
- In case of weld joint type, please pay attention the welding condition to avoid deforming piping or making the stagnant portion of the fluid; joint preparation, level defference in butt joint, welding current.

(3) Positioning the Flow Tube

Install the magnetic flow tube on a mounting base and position it so that the center axis of the flow tube is aligned with that of the piping. Then mount the flow tube to union joint nuts by screwing the nuts to the connecting ports of the flow tube.

CAUTION

The ceramic pipe will be damaged if they are tightened when they are not properly aligned.

(4) Tightening Nuts

CAUTION

Tighten the union joint nuts according to Torque Values in Table 3.3.1 using a torque wrench. As the gasket material is Fluorocarbon PTFE, it is possible that nuts may loose by it's character as time passes. Please tighten the nuts regularly. The table below shows the tightening torque values. Be sure to use gasket : t=1.5 attached.

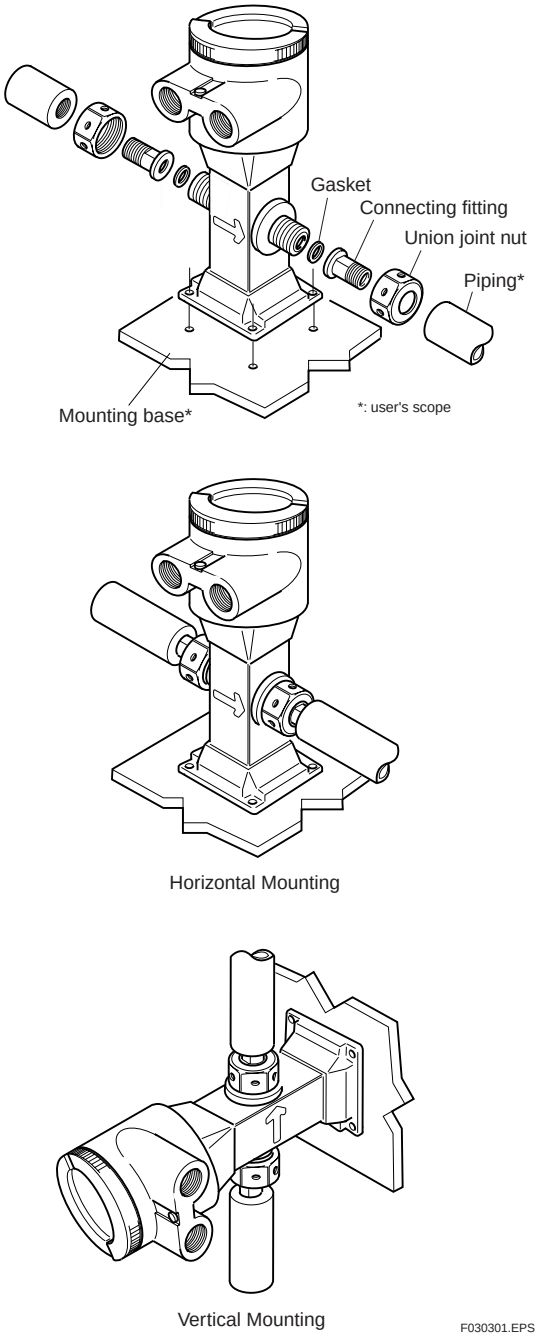


Figure 3.3.1 Mounting Procedure (Size: 2.5 mm(0.1in.) to 10 mm(0.4in.))

Table 3.3.2

Size: mm(inch)	Tightening Torque N-m {kgf-cm} [in-lbf]
2.5(0.1)	Max.12{122}[106]
5(0.2)	Max.12{122}[106]
10(0.4)	Max.18{183}[160]

T030302.EPS

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

IMPORTANT

Please use appropriate bolts and nuts according to process connection. In case stud type of through bolts are used, be sure outside diameter of a shank is smaller than a thread ridge's one. Please use compressed non-asbestos fiber gasket, PTFE gasket or the gasket which has equal elasticity. In case of optional code/FRG, please use rubber gasket or others which has equal elasticity. Be sure the inner diameter of the gasket does not protrude to inner piping. (Refer to Table 3.3.8)

(1) Mounting Direction

Please mount the Magnetic Flow Tube matching the flow direction of the fluid to be measured with the direction of the arrow mark on the flow tube.

IMPORTANT

If it is impossible to match the direction, please never remodel by changing direction of the terminal box. In case the measuring fluid flows against the arrow direction, please refer to the section "Reversing Flow Direction" in the Instruction Manual of AE14 Magnetic Flow Converter.

(2) Mounting Centering Devices

To keep concentricity of the Flow Tube with pipes, please mount centering devices on the Mini-Flanges of the Flow Tube.

Please give attention to the nominal diameter and flange ratings of the centering devices.

(3) Positioning Flow Tube

Please pass two through-bolts to adjacent holes of both flanges and mount the Flow Tube, and pass other through-bolts to other holes. (Refer to Figure 3.3.2/ 3.3.3) In case stud type of through-bolts are used, position them coming in contact centering devices with thread of bolts.

(4) Tightening Nuts

Please tighten the bolts according to Torque Values in Table 3.3.3. In case of PVC piping, please select optional code /FRG, use rubber gasket and tighten with the torque value in Table 3.3.4.

⚠ CAUTION

In case of PFA lining type, as the lining material is Fluorocarbon PFA, it is possible that nuts may loose by its character as time passes. Please tighten the nuts regularly.
Please be sure to tighten the bolts following prescribed torque values. Please tighten the flange bolts diagonally with the same torque values, step by step up to the prescribed torque value.

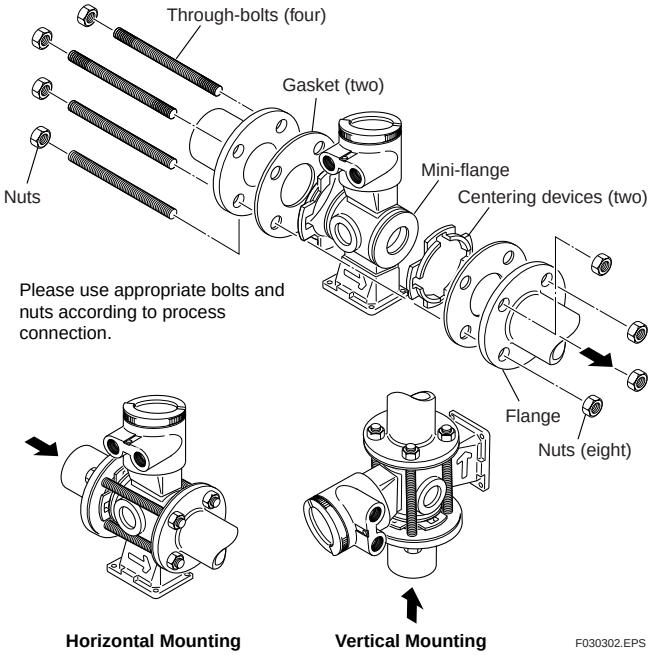


Figure 3.3.2 Mounting Procedure (Size: 2.5 mm(0.1in.) to 15 mm(0.5in.))

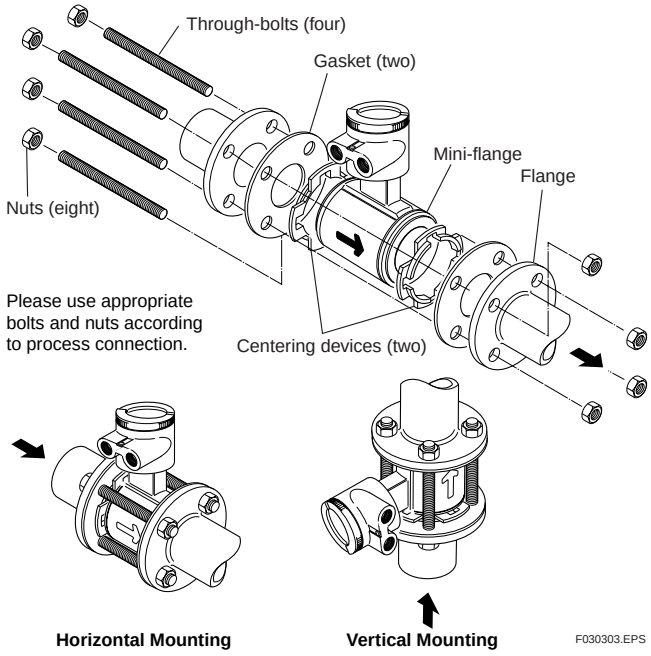


Figure 3.3.3 Mounting Procedure (Size: 25 mm(1in.), 40 mm(1.5in.))

Table 3.3.3 Tightening Torque Values for Metal Piping

Tightening Torque Values for PFA lining / Polyurethane lining Type N-m {kgf-cm} [in-lbf]					
Size / Flange Rating mm(inch)	JIS		ANSI		DIN
	10K	20K	150	300	PN10/16
2.5(0.1), 5(0.2) 10(0.4), 15(0.5)	6 to 9 {61 to 92} [53 to 80]	6 to 9 {61 to 92} [53 to 80]	6 to 9 {61 to 92} [53 to 80]	6 to 9 {61 to 92} [53 to 80]	6 to 9 {61 to 92} [53 to 80]
25(1)	15 to 22 {153 to 224} [133 to 195]	15 to 22 {153 to 224} [133 to 195]	12 to 18 {122 to 184} [106 to 159]	15 to 22 {153 to 224} [133 to 195]	11 to 17 {112 to 173} [97 to 150]
40(1.5)	21 to 32 {214 to 327} [186 to 283]	21 to 32 {214 to 327} [186 to 283]	17 to 26 {173 to 265} [150 to 230]	25 to 38 {255 to 388} [221 to 336]	21 to 32 {214 to 327} [186 to 283]
Maximum Tightening Torque Values for Ceramic lining Type N-m {kgf-cm} [in-lbf]					
Size / Flange Rating mm(inch)	JIS		ANSI		DIN
	10K	20K	150	300	PN10/16
15(0.5)	14 {143} [124]	14 {143} [124]	14 {143} [124]	14 {143} [124]	14 {143} [124]
25(1)	30 {306} [265]	30 {306} [265]	22 {224} [195]	30 {306} [265]	25 {255} [221]
40(1.5)	44 {449} [389]	44 {449} [389]	33 {337} [292]	51 {520} [451]	50 {510} [442]

*Please use compressed non-asbestos fiber gasket, PTFE gasket or the gasket which has equal elasticity.

T030303.EPS

Table 3.3.4 Tightening Torque Values for PVC Piping

Tightening Torque Values for PFA lining / Polyurethane lining Type N-m {kgf-cm} [in-lbf]					
Size / Flange Rating mm(inch)	JIS		ANSI		DIN
	10K	20K	150	300	PN10/16
2.5(0.1), 5(0.2) 10(0.4), 15(0.5)	2.0 {20} [18]	—	2.1 {21} [19]	—	2.0 {20} [18]
25(1)	5.2 {53} [46]	—	4.2 {43} [37]	—	4.0 {41} [35]
40(1.5)	7.4 {76} [65]	—	6.0 {61} [53]	—	7.4 {76} [65]
Maximum Tightening Torque Values for Ceramic Type N-m {kgf-cm} [in-lbf]					
Size / Flange Rating mm(inch)	JIS		ANSI		DIN
	10K	20K	150	300	PN10/16
15(0.5)	1.3 {13} [12]	—	1.3 {13} [12]	—	1.3 {13} [12]
25(1)	3.5 {36} [31]	—	2.8 {29} [25]	—	2.7 {28} [24]
40(1.5)	5.7 {58} [50]	—	4.6 {47} [41]	—	5.7 {58} [50]

*Please select optional code/FRG and use rubber gasket or others which has equal elasticity.

T030304.EPS

3.3.3 Nominal Diameter 50 mm(2in.) to 300 mm(12in.) Wafer Type

IMPORTANT

Please use appropriate bolts and nuts according to process connection. In case stud type of through bolts are used, be sure outside diameter of a shank is smaller than a thread ridge's one. Please use compressed non-asbestos fiber gasket, PTFE gasket or the gasket which has equal elasticity. In case of optional code/FRG, please use rubber gasket or others which has equal elasticity. Be sure the inner diameter of the gasket does not protrude to inner piping. (Refer to Table 3.3.8)

(1) Mounting Direction

Please mount the Magnetic Flow Tube matching the flow direction of the fluid to be measured with the direction of the arrow mark on the flow tube.

IMPORTANT

If it is impossible to match the direction, please never remodel to change direction of the terminal box. In case the measuring fluid flows against the arrow direction, please refer to the section "Reversing Flow Direction" in the Instruction Manual of AE14 Magnetic Flow Converter.

(2) Mounting Centering Devices

To keep concentricity between the Flow Tube and pipes, centering devices must be used. Pass two through-bolts through the four centering devices (two for each) and lower adjacent holes of both flanges. (Refer to Figure 3.3.4)

Please give attention to the nominal size and flange ratings of the centering devices. (Refer to Table 3.3.7)

(3) Positioning Flow Tube

Position the Flow Tube coming in contact four centering devices with Mini-Flanges. At this time, pay attention to avoid four centering devices come in contact with Housing. In case stud type of through-bolts are used, position them coming in contact four centering devices with thread of the bolts. (Refer to Figure 3.3.4) After positioning the Flow Tube, pass remaining through-bolts to remaining holes.

NOTE

When installing a size 150mm with JIS F12 (JIS75M) flange, please displace in circumferential direction slightly because the cover of electrode chamber will interfere against the bolts.

(4) Tightening Nuts

Please tighten the bolts according to Torque Values in Table 3.3.5. In case of PVC piping, please select optional code/FRG, use rubber gasket and tighten with the torque value in Table 3.3.6.

CAUTION

In case of PFA lining type as the lining material is Fluorocarbon PFA, it is possible that nuts loose by its character as time passes. Please tighten the nuts regularly.
Please be sure to tighten the bolts following prescribed torque values. Please tighten the flange bolts diagonally with the same torque values, step by step up to the prescribed torque value.

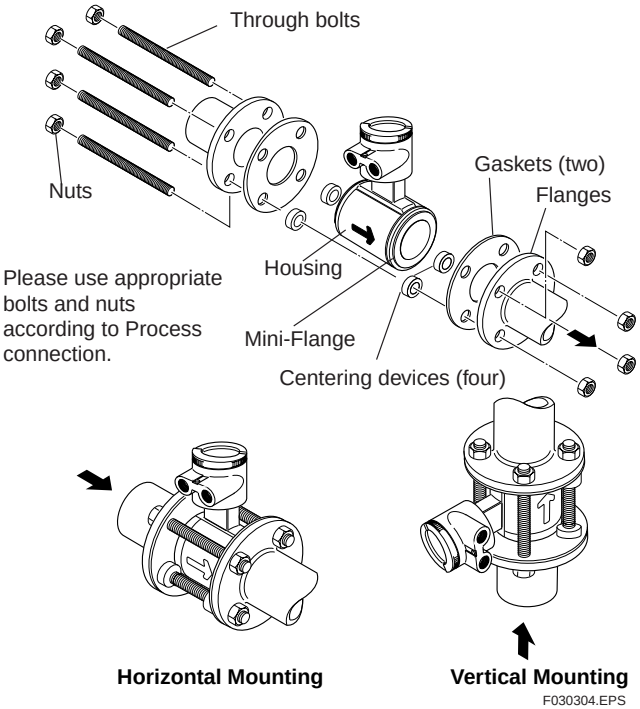


Figure 3.3.4 Mounting Procedure

Table 3.3.5 Tightening Torque Values for Metal Piping

Tightening Torque Values for PFA lining / Polyurethane lining Type N-m {kgf-cm} [in-lbf]

Size / Flange Rating mm(inch)	JIS		ANSI		DIN		JIS G3451 F12
	10K	20K	150	300	PN10	PN16	
50(2)	28 to 42 {286 to 429} [248 to 372]	14 to 21 {143 to 214} [124 to 186]	28 to 42 {286 to 429} [248 to 372]	14 to 21 {143 to 214} [124 to 186]	—	28 to 42 {286 to 429} [248 to 372]	—
65(2.5)	52 to 60 {530 to 610} [460 to 531]	—	52 to 60 {530 to 610} [460 to 531]	—	—	52 to 60 {530 to 610} [460 to 531]	—
80(3)	21 to 31 {214 to 316} [186 to 274]	26 to 39 {265 to 398} [230 to 345]	41 to 61 {418 to 622} [363 to 540]	25 to 37 {255 to 378} [221 to 327]	—	21 to 31 {214 to 316} [186 to 274]	41 to 62 {418 to 633} [363 to 549]
100(4)	35 to 51 {357 to 520} [310 to 451]	43 to 64 {439 to 653} [381 to 566]	35 to 51 {357 to 520} [310 to 451]	41 to 61 {418 to 622} [363 to 540]	—	35 to 52 {357 to 531} [310 to 460]	68 to 102 {694 to 1041} [602 to 903]
125(5)	62 to 75 {630 to 760} [549 to 664]	—	60 to 72 {610 to 730} [531 to 637]	—	—	52 to 60 {530 to 610} [460 to 531]	71 to 80 {720 to 810} [628 to 708]
150(6)	65 to 94 {663 to 959} [575 to 832]	43 to 68 {439 to 694} [381 to 602]	63 to 89 {643 to 908} [558 to 788]	41 to 60 {418 to 612} [363 to 531]	65 to 94 {663 to 959} [575 to 832]	65 to 94 {663 to 959} [575 to 832]	68 to 100 {694 to 1020} [602 to 885]
200(8)	57 to 84 {582 to 857} [504 to 743]	61 to 92 {622 to 939} [540 to 814]	93 to 120 {949 to 1224} [823 to 1062]	65 to 93 {663 to 949} [575 to 823]	94 to 125 {959 to 1276} [832 to 1106]	58 to 84 {592 to 857} [513 to 743]	69 to 101 {704 to 1031} [611 to 894]
250(10)	98 to 128 {996 to 1307} [867 to 1133]	—	89 to 130 {909 to 1329} [788 to 1150]	—	91 to 117 {924 to 1195} [805 to 1035]	—	139 to 176 {1416 to 1792} [1230 to 1558]
300(12)	85 to 108 {871 to 1098} [752 to 956]	—	106 to 146 {1083 to 1489} [938 to 1292]	—	108 to 131 {1103 to 1339} [956 to 1159]	—	131 to 158 {1337 to 1606} [1159 to 1398]

Maximum Tightening Torque Values for Ceramic lining Type N-m {kgf-cm} [in-lbf]

Size / Flange Rating mm(inch)	JIS		ANSI		DIN PN		JIS G3451 F12
	10K	20K	150	300	PN10	PN16	
50(2)	50 {510} [442]	27 {276} [239]	50 {510} [442]	27 {276} [239]	—	63 {643} [558]	—
80(3)	36 {367} [319]	44 {449} [389]	75 {765} [664]	44 {449} [389]	—	36 {367} [319]	80 {816} [708]
100(4)	48 {490} [425]	58 {592} [513]	49 {500} [434]	56 {571} [496]	—	48 {490} [425]	105 {1071} [929]
150(6)	79 {806} [699]	55 {561} [487]	66 {673} [584]	43 {439} [381]	—	76 {776} [673]	84 {857} [743]
200(8)	70 {714} [619]	76 {776} [673]	102 {1041} [903]	76 {776} [673]	103 {1051} [911]	67 {684} [593]	102 {1041} [903]

*Please use compressed non-asbestos fiber gasket, PTFE gasket or the gasket which has equal elasticity.

T030305.EPS

Table 3.3.6 Tightening Torque Values for PVC Piping

Tightening Torque Values for PFA lining / Polyurethane lining Type N-m {kgf-cm} [in-lbf]

Size / Flange Rating mm(inch)	JIS		ANSI		DIN		JIS G3451 F12(75M)
	10K	20K	150	300	PN10	PN16	
50(2)	9.8 {100} [87]	—	9.8 {100} [87]	—	—	9.8 {100} [87]	—
80(3)	7.2 {73} [64]	—	14.4 {147} [127]	—	—	7.2 {73} [64]	14.4 {147} [127]
100(4)	12.2 {124} [108]	—	12.2 {124} [108]	—	—	12.2 {124} [108]	24.4 {249} [216]
150(6)	21.4 {218} [189]	—	20.5 {209} [181]	—	21.4 {218} [189]	21.4 {218} [189]	23.4 {239} [207]
200(8)	19.3 {197} [171]	—	27.6 {282} [244]	—	28.9 {295} [256]	19.3 {197} [171]	31.6 {322} [280]

Maximum Tightening Torque Values for Ceramic lining Type N-m {kgf-cm} [in-lbf]

Size / Flange Rating mm(inch)	JIS		ANSI		DIN		JIS G3451 F12(75M)
	10K	20K	150	300	PN10	PN16	
50(2)	8.2 {84} [73]	—	8.2 {84} [73]	—	—	8.2 {84} [73]	—
80(3)	6.2 {63} [55]	—	12.4 {127} [110]	—	—	6.2 {63} [55]	12.3 {126} [109]
100(4)	8.0 {82} [71]	—	8.1 {83} [72]	—	—	8.0 {82} [71]	16.1 {164} [142]
150(6)	19.8 {202} [175]	—	18.9 {193} [167]	—	19.8 {202} [175]	19.8 {202} [175]	21.6 {220} [191]
200(8)	17.5 {179} [155]	—	25.1 {256} [222]	—	26.2 {267} [232]	17.5 {179} [155]	28.7 {293} [254]

*Please select optional code/FRG and use rubber gasket or others which has equal elasticity.

T030306.EPS

Table 3.3.7 Centering Device Identification

Lining \ Flange Rating	mm(inch)	JIS 10K	JIS 20K	JIS G3451 F12	ANSI 150	ANSI 300	DIN PN 10/16
PFA, Poly-urethane	50(2)	B	B	—	B	F	F
	65(2.5)	B	—	—	B	—	F
	80(3)	B	F	H	F	C	G
	100(4)	B	F	H	C	H	F
	125(5)	G	—	H	C	—	G
	150(6)	C	D	D	C	E	C
	200(8)	C	D	D	D	E	C
	250(10)	C	—	D	K	—	C
	300(12)	C	—	D	L	—	C
Ceramics	50(2)	B	B	—	B	F	F
	80(3)	B	F	H	F	C	G
	100(4)	B	F	H	C	H	F
	150(6)	B	C	G	B	D	B
	200(8)	B	C	C	G	J	B

*Each Centering Devices is engraved a character as identifidation. T030307.EPS

Table 3.3.8 Earth Ring inside diameter

Unit: mm(inch)

Size	PFA/Polyurethane lining	Ceramic lining
2.5(0.1)	ϕ15(0.6)	—
5(0.2)	ϕ15(0.6)	—
10(1.4)	ϕ15(0.6)	—
15(0.5)	ϕ15(0.6)	ϕ15(0.6)
25(1)	ϕ27(1.1)	ϕ27(1.1)
40(1.5)	ϕ40(1.6)	ϕ40(1.6)
50(2)	ϕ52(2.1)	ϕ52(2.1)
65(2.5)	ϕ63.5(2.5)	—
80(3)	ϕ81(3.2)	ϕ81(3.2)
100(4)	ϕ98(3.9)	ϕ98(3.9)
125(5)	ϕ118.6(4.7)	—
150(6)	ϕ140.7(5.6)	ϕ144(5.7)
200(8)	ϕ188.9(7.5)	ϕ192(7.6)
250(10)	Wafer; ϕ243.7(9.6), Flange; ϕ239.1(9.5)	—
300(12)	Wafer; ϕ294.7(11.6), Flange; ϕ291.3(11.5)	—
350(14)	ϕ323.4(12.8)	—
400(16)	ϕ373.5(14.8)	—

T030308.EPS

* Please ensure that the I.D. of the gasket does not protrude into the I.D. of the Earth Ring. (This dimension is also applied when no earth ring is used)

3.3.4 Nominal Diameter 15 mm (0.5in.) to 400 mm (16in.) Flange Type

IMPORTANT

Please use appropriate bolts and nuts according to process connection. Please use compressed non-asbestos fiber gasket, PTFE gasket or the gasket which has equal elasticity. In case of optional code/FRG, please use rubber gasket or others which has equal elasticity. Be sure the inner diameter of the gasket does not protrude to inner piping.(Refer to Table 3.3.8)

(1) Mounting Direction

Please mount the Magnetic Flow Tube matching the flow direction of the fluid to be measured with the direction of the arrow mark on the flow tube.

IMPORTANT

If it is impossible to match the direction, please never remodel to change direction of the terminal box. In case the measuring fluid flows against the arrow direction, please refer to the section “Reversing Flow Direction” in the Instruction Manual of AE14 Magnetic Flow Converter.

(2) Tightening Nuts

Please tighten the bolts according to Torque Values in Table 3.3.9. In case of PVC piping, please select optional code/FRG, use rubber gasket and tighten with the torque value in Table 3.3.10.

CAUTION

In case of PFA lining type as the lining material is Fluorocarbon PFA, it is possible that bolts loose by its character as time passes. Please tighten the nuts regularly.
Please be sure to tighten the bolts following prescribed torque values. Please tighten the flange bolts diagonally with the same torque values, step by step up to the prescribed torque value.

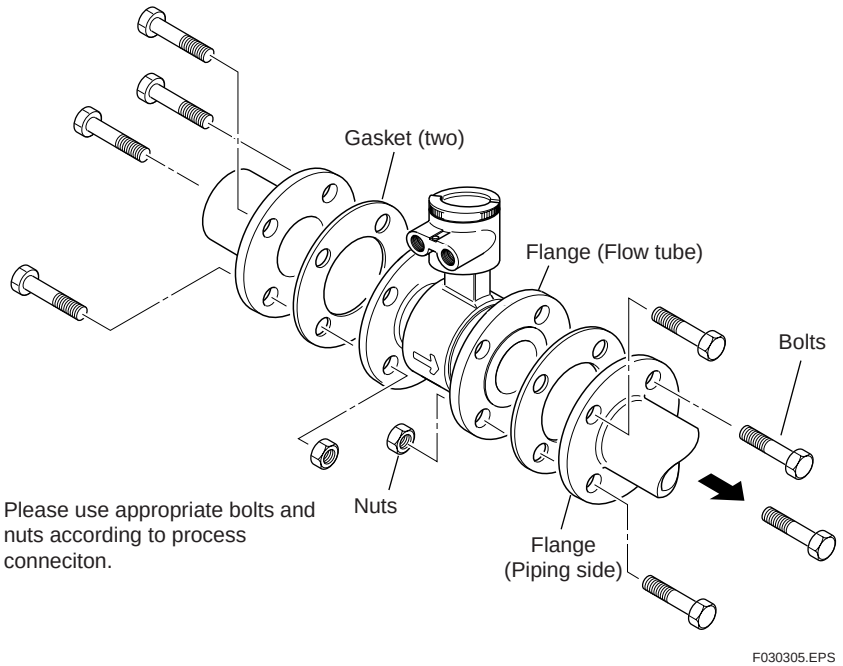


Figure 3.3.5 Mounting Procedure (Size: 15 mm (0.5in.) to 400 mm (16in.))

Table 3.3.9 Tightening Torque Values for Metal Piping in N-m{kgf-cm} [in-lbf]

Size mm(inch) \ Flange Rating	JIS		ANSI		DIN		JIS G3451 F12(75M)
	10K	20K	150	300	PN10	PN16	
15(0.5mm)	3 to 5 {31 to 51} [27 to 44]	3 to 5 {31 to 51} [27 to 44]	3 to 5 {31 to 51} [27 to 44]	3 to 5 {31 to 51} [27 to 44]	—	3 to 5 {31 to 51} [27 to 44]	—
25(1mm)	8 to 13 {82 to 133} [71 to 115]	8 to 13 {82 to 133} [71 to 115]	6 to 10 {61 to 102} [53 to 88]	8 to 13 {82 to 133} [71 to 115]	—	6 to 10 {61 to 102} [53 to 88]	—
40(1.5mm)	18 to 26 {184 to 265} [159 to 230]	18 to 26 {184 to 265} [159 to 230]	15 to 21 {153 to 214} [133 to 186]	21 to 31 {214 to 316} [186 to 274]	—	18 to 26 {184 to 265} [159 to 230]	—
50(2mm)	22 to 31 {224 to 316} [195 to 274]	11 to16 {112 to 163} [97 to 142]	23 to 31 {235 to 316} [204 to 274]	11 to 16 {112 to 163} [97 to 142]	—	23 to 31 {235 to 316} [204 to 274]	—
80(3mm)	15 to 22 {153 to 224} [133 to 195]	18 to 27 {184 to 276} [159 to 239]	35 to 43 {357 to 439} [310 to 381]	18 to 26 {184 to 265} [159 to 230]	—	16 to 22 {163 to 224} [142 to 195]	33 to 47 {337 to 480} [292 to 416]
100(4mm)	21 to 35 {214 to 357} [186 to 310]	25 to 44 {255 to 449} [221 to 389]	22 to 35 {224 to 357} [195 to 310]	25 to 42 {255 to 429} [221 to 372]	—	21 to 35 {214 to 357} [186 to 310]	47 to 75 {480 to 765} [416 to 664]
150(6mm)	65 to 94 {663 to 959} [575 to 832]	43 to 68 {439 to 694} [381 to 602]	63 to 89 {643 to 908} [558 to 788]	41 to 59 {418 to 602} [363 to 522]	65 to 94 {663 to 959} [575 to 832]	65 to 94 {663 to 959} [575 to 832]	65 to 100 {663 to 1020} [575 to 885]
200(8mm)	57 to 84 {582 to 857} [504 to 743]	61 to 92 {622 to 939} [540 to 814]	93 to 120 {949 to 1224} [823 to 1062]	65 to 93 {663 to 949} [575 to 823]	94 to 125 {959 to 1276} [832 to 1106]	58 to 84 {592 to 857} [513 to 743]	69 to 101 {704 to 1031} [611 to 894]
250(10mm)	142 to 174 {1449 to 1776} [1257 to 1540]	154 to 182 {1571 to 1857} [1363 to 1611]	145 to 177 {1480 to 1806} [1283 to 1566]	126 to 151 {1286 to 1541} [1115 to 1336]	136 to 164 {1388 to 1673} [1204 to 1451]	154 to 175 {1571 to 1786} [1363 to 1549]	215 to 270 {2194 to 2755} [1903 to 2389]
300(12mm)	114 to 138 {1163 to 1408} [1009 to 1221]	125 to 145 {1276 to 1480} [1106 to 1283]	164 to 187 {1673 to 1908} [1451 to 1655]	154 to 180 {1571 to 1837} [1363 to 1593]	155 to 199 {1582 to 2031} [1372 to 1761]	175 to 213 {1786 to 2173} [1549 to 1885]	190 to 249 {1939 to 2541} [1681 to 2204]
350(14mm)	158 to 183 {1612 to 1867} [1398 to 1619]	—	245 to 284 {2500 to 2898} [2168 to 2513]	—	152 to 192 {1551 to 1959} [1345 to 1699]	—	274 to 325 {2796 to 3316} [2425 to 2876]
400(16mm)	243 to 261 {2480 to 2663} [2150 to 2310]	—	253 to 275 {2582 to 2806} [2239 to 2434]	—	248 to 331 {2531 to 3378} [2195 to 2929]	—	313 to 395 {3194 to 4031} [2770 to 3496]

*Please use compressed non-asbestos fiber gasket, PTFE gasket or the gasket which has equal elasticity.

T030309.EPS

Table 3.3.10 Tightening Torque Values for PVC Piping in N-m{kgf-cm} [in-lbf]

Size mm(inch) \ Flange Rating	JIS		ANSI		DIN		JIS G3451 F12(75M)
	10K	20K	150	300	PN10	PN16	
15(0.5)	1.1 {11} [10]	—	1.1 {11} [10]	—	—	1.1 {11} [10]	—
25(1)	2.9 {30} [26]	—	2.3 {23} [20]	—	—	2.2 {22} [19]	—
40(1.5)	5.9 {60} [52]	—	4.7 {48} [42]	—	—	5.9 {60} [52]	—
50(2)	7.2 {73} [64]	—	7.2 {73} [64]	—	—	7.2 {73} [64]	—
80(3)	4.9 {50} [43]	—	9.9 {101} [88]	—	—	4.9 {50} [43]	9.9 {101} [88]
100(4)	8.1 {83} [72]	—	8.2 {84} [73]	—	—	8.1 {83} [72]	16.3 {166} [144]
150(6)	29.8 {304} [264]	—	28.5 {291} [252]	—	29.8 {304} [264]	29.8 {304} [264]	32.6 {33} [288]
200(8)	26.3 {268} [233]	—	37.7 {385} [334]	—	39.4 {4,2} [349]	26.3 {268} [233]	43.1 {440} [381]

*Please select optional code/FRG and use rubber gasket or others which has equal elasticity.

T030310.EPS

3.3.5 Mounting Procedure for Sanitary Type

The sanitary type is mounted using ISO(IDF) clamps.

(1) Mounting Direction

Please mount the Magnetic Flow Tube matching the flow direction of the fluid to be measured with the direction of the arrow mark on the flow tube.

IMPORTANT

If it is impossible to macth the direction, please never remodel to change direction of the terminal box. In case the measuring fluid flows against the arrow direction, please refer to the section “Reversing Flow Direction” in the Instruction Manual of AE14 Magnetic Converter.

(2) Welding of Mating Ferrule to Piping

IMPORTANT

Weld the attached ferrules to the piping. Please pay attention to the welding condition to avoid deforming piping or making the stagnant portion of the fluid; joint preparation, level difference in butt joint, welding current.

(3) Mounting Gasket

Mount the attached gasket so it fits into the groove on the ferrule.

(4) Positioning Flow Tube

Position the flow tube between the mating ferrule.

(5) Tightening Clamp

Mount the clamp so they cover the flow tube and mating ferrule tapered part.

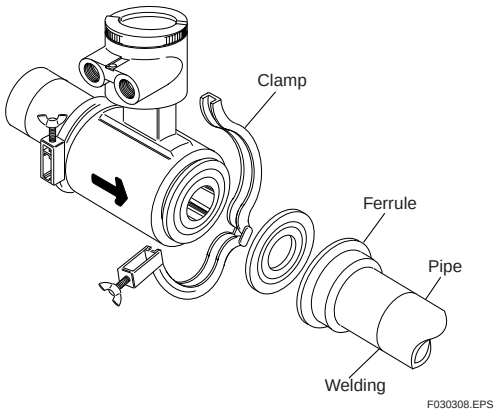


Figure 3.3.8 Mounting Procedure

3.4 Wiring Precautions

This section is described wiring only for flow tube side. Please see "Wiring" in AE14 Magnetic Flow Converter Instruction Manual for converter side.

3.4.1 Protective Grounding

CAUTION

Please be sure to connect protective grounding of ADMAG AE with cable of 2mm^2 or larger cross section in order to avoid the electrical shock to the operators and maintenance engineers and prevent the influence of external noise. And further connect the grounding wire to the ⏚ mark (100Ω or less).

3.4.2 General Precautions

Please give attention to the followings in wiring.

CAUTION

- Please pay attention to avoid the cable is bended excessively.
- Please do not connect cables outdoors in case of rain to prevent damages from dew formation and to keep insulation inside the terminal box of the flow tube.
- Please do not splice the cable between a flow tube and a converter if it is too short. Please replace the short cable with the cable which is appropriate length wholly.
- The all cable ends are to be provided with round crimp-on terminal.
- The signal cables must be routed in separate steel conduit tubes or flexible tubes.
- Please keep conduit or flexible tube water-tight using sealing tape.
- Please ground each of a flow tube and a converter separately.
- Please cover each shield of the signal cable with PVC tube or PVC tape to avoid contacting between two shields; shield and case.
- When waterproof glands or union equipped waterproof glands are used, the glands must be properly tightened to keep the box watertight.
- Please be sure to fully tighten the terminal box cover before the power is turned on.
- Please be sure to turn off the power before opening the terminal box cover.

3.4.3 Cable Types

(1) Dedicated Signal Cable(AM011)

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

Finished diameter: 10.5 mm (0.413in.)
Maximum length: 30 m (98 ft)
Maximum temperature: 80°C (176°F)

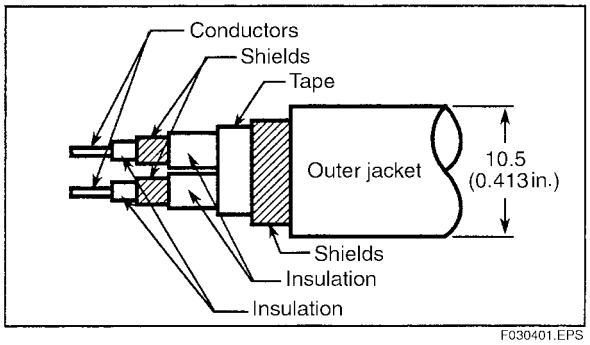


Figure 3.4.1 Dedicated Signal Cable AM011

IMPORTANT

If the cable is longer than required, cut off any extra length, rather coiling it up, and terminate the conductors as shown in Figure 3.4.2. Avoid using intermediate terminal boards to extend the cable length, or this will interrupt the shielding.

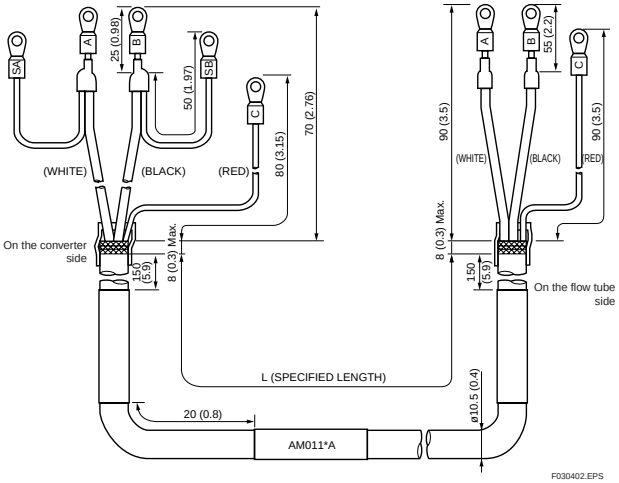


Figure 3.4.2 Treatment of Dedicated Signal Cable

CAUTION

Since A, B, SA, SB, and C all operate at different electrical potentials, securely insulate them from each other so they do not touch.
The shields must not be allowed to touch each other or to touch the case.
Cover each shield with vinyl tube or wrap in vinyl tape.

NOTE

Conductors A and B carry the signal from the electrodes, and C is at the potentials of the liquid it self (signal common) . Shields SA and SB are kept at the same potentials as the individual electrodes (these are actively driven shields). This is done to reduce the effect of the distributed capacitance of the cable at long cable length. Note that, since the signals from the individual electrodes are impedance converted inside the converter, errors will result if they come in contact with any other component. Great care must be taken in the cable end treatment.

(2) Excitation Cable

Please use Polyvinyl chloride insulated and sheathed control cables (JIS C3401) or Polyvinyl chloride insulated and sheathed portable power cables (JIS C3312) or equivalents.

Outer Diameter

- 6.5 to 12mm in diameter (10.5 to 11.5 mm for waterproof gland / ECG, /ECU)

Nominal Cross Section

- Single wire; 0.5 to 2.5mm^2 , Stranded wire; 0.5 to 2.5mm^2

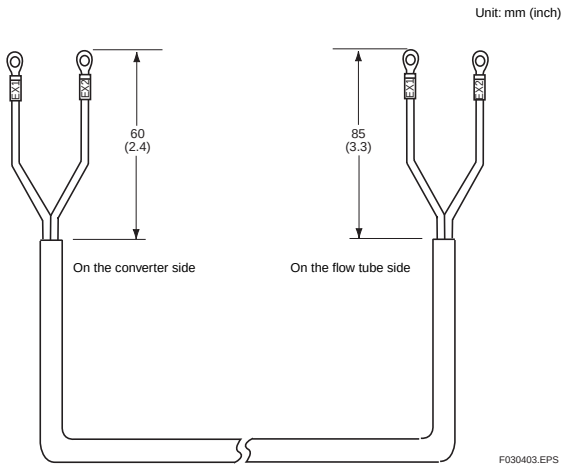
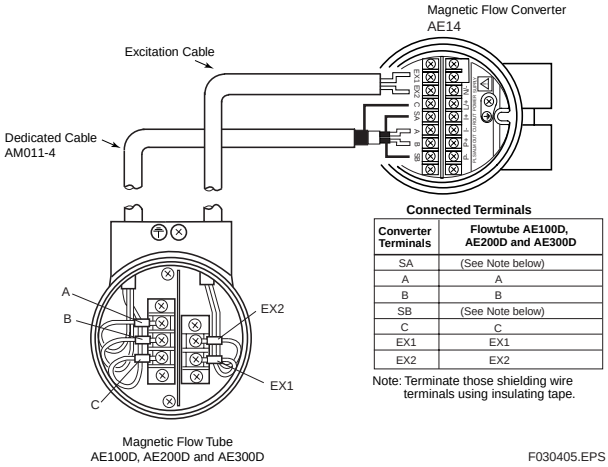


Figure 3.4.3 End Treatment of Excitation Cable

3.4.4 Connnection to AE14 Magnetic Flow Converter

Flow Tube Model AE100D, AE200D and AE300D

Connect the flow tube and converter in the following method.



Connected Terminals

Converter Terminals	Flowtube AE100D, AE200D and AE300D
SA	(See Note below)
A	A
B	B
SB	(See Note below)
C	C
EX1	EX1
EX2	EX2

Note: Terminate those shielding wire terminals using insulating tape.

Figure 3.4.4 Connection

3.4.5 Wiring Ports

Please select the most suitable standard of wiring procedure for the wiring ports by customer's own.

A : Using the Waterproof Gland

IMPORTANT

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

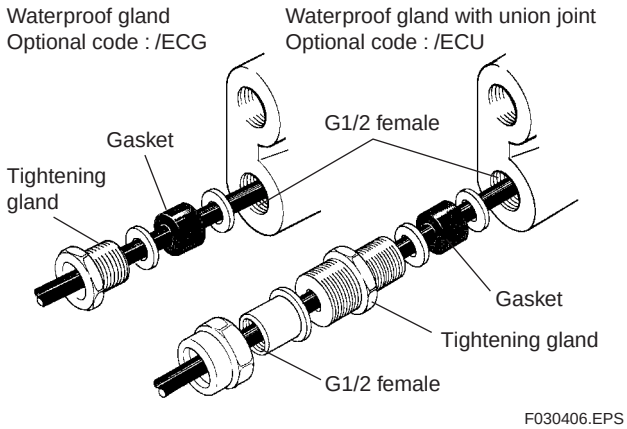


Figure 3.4.5 Waterproof Gland

B : Insulation Check

After wiring is completed, check insulation of the following terminals together with the wiring under the condition of the converter side wiring terminals disconnected.

Between terminal EX1 and terminal A, B, C
Between terminal C and terminal A, B
Between terminal A and terminal B
Between terminal EX1 and ground
Between terminal EX2 and ground

All insulation measurements must be performed with a 500V megger. Insulation resistances must be 100MΩ or more each.

IMPORTANT

Be sure to disconnect the cables at the terminal of the converter when checking insulation.

C : Conduit Wiring

In case of conduit wiring, please use the waterproof gland to prevent water flowing through the conduit pipe into the wiring connection.

Please slope the conduit pipe down, and install a drain valve at the low end of the vertical pipe.

Please open the drain valve regularly.

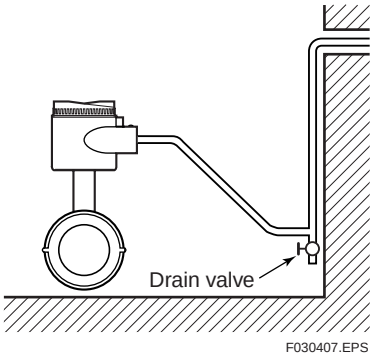


Figure 3.4.6 Conduit Wiring

4. MAINTENANCE

WARNING

This instrument must be repaired or maintenance-serviced by expert engineer or skilled personnel. The procedures described in this chapter are not permitted for operators.

Regular maintenance and inspection should be carried out to fully utilize all functions and to obtain maximum performance from the magnetic flowmeter.

4.1 Regular Inspection Items

(1) Inspection of moisture-proofing inside the terminal box: Once/year

(2) Refastening of piping joint screws: About twice/year

(3) Inspection of electrodes and lining (in case of adhesive and/or abrasive fluid, etc.)

Determine the period of regular inspection as necessary.

4.2 Trouble Shooting

Since the ADMAG AE magnetic flowmeter has “self diagnostic functions”, if a failure occurs, it is displayed on the AE14 magnetic flow converter. Please refer to Instruction Manual of AE14 magnetic flow converter.

IMPORTANT

Be sure to disconnect the cables at the terminals of the flow tube when checking.

(1) Excitation Coil Check

Check that the resistance between terminals EX1 and EX2 in the terminal box is 150 Ω or less with a multimeter. If it is not, coils may be broken down, and replacement or repair of the flow tube is needed.

(2) Insulation Resistance Check

Check the insulation resistances in accordance with the tables below. If one of them falls below the value in the tables, replacement or repair of the flow tube is needed.

Coil Circuit

Checking is possible even if the pipe is filled with fluid.

Test Terminals	Test Voltage	Specification
Between Terminals EX1 and C	500 V DC	1MΩ or more

T0401.EPS

Signal Circuit

Be sure to empty and dry the pipe inside, and release wiring connection of converter side before checking.

Test Terminals	Test Voltage	Specification
Between Terminals A and C Between Terminals B and C	500 V DC	100MΩ or more for each

T0402.EPS

5. OUTLINE

■ STANDARD SPECIFICATIONS

Protection: IP67, NEMA4X, JISC0920 water tight type
Size:

• General Purpose Type

Lining	PFA	Ceramic	Polyurethane
Size in mm (inch)	2.5(0.1), 5(0.2), 10(0.4), 15(0.5), 25(1), 40(1.5), 50(2), 65(2.5), 80(3), 100(4), 125(5), 150(6), 200(8), 250(10), 300(12), 350(14), 400(16)	2.5(0.1), 5(0.2), 10(0.4), 15(0.5), 25(1), 40(1.5), 50(2), 80(3), 100(4), 150(6), 200(8)	25(1), 40(1.5), 50(2), 80(3), 100(4), 150(6), 200(8), 250(10), 300(12), 350(14), 400(16)

T01.EPS

• Explosion Proof Type

Lining	PFA	Ceramic
Size in mm (inch)	2.5(0.1), 5(0.2), 10(0.4), 15(0.5), 25(1), 40(1.5), 50(2), 65(2.5), 80(3), 100(4), 125(5), 150(6), 200(8), 250(10)*, 300(12)*, 350(14)*, 400(16)*	2.5(0.1), 5(0.2), 10(0.4), 15(0.5), 25(1), 40(1.5), 50(2), 80(3), 100(4), 150(6), 200(8)

T02.EPS

*250 to 400mm with flange connection are only for ATEX or SAA. 250 and 300mm with wafer connection are only for general purpose use.
*65 and 125mm are only for ATEX.

• Sanitary Type

Lining	PFA
Size in mm(inch)	25(1), 40(1.5), 50(2), 65(2.5), 80(3), 100(4)

T03.EPS

* 15 and 125mm flow tubes are available on request.

Coating:
Terminal box:
Polyurethane corrosion-resistant coating
Cover; Deep sea moss green(Munsell 0.6GY3.1/2.0)
Case; Frosty white (Munsell 2.5Y8.4/1.2)
Body:
Size 2.5 to 100 mm(0.1 to 4 in.)
No coating(Stailess steel surface)
Size 125 to 400 mm(5 to 16 in.)
Polyurethane corrosion-resistant coating
Frosty white (Munsell 2.5Y8.4/1.2)

Flow Tube Material:
Size 2.5 to 15 mm(0.1 to 0.5 in.)
Housing: Stainless steel (SCS11)
Mini-flange for wafer conn.: Stainless steel (SUS430)
Flange (15 mm(0.5 in.) only): Stainless steel (SUS304)
Pipe: Stainless steel (SCS13) or Alumina ceramic (99.9%)
Terminal box : Aluminum alloy
Size 25 to 100 mm(1 to 4 in.)
Housing: Stainless steel (SUS304)
Mini-flange for wafer conn.: Stainless steel (SUS430)
Flange: Stainless steel (SUS304)
Pipe: Stainless steel (SUS304)* or Alumina ceramic (99.9%)
Terminal box : Aluminum alloy
Size 125 to 400 mm(6 to 16 in.)
Housing: Carbon steel (SS400)
Mini-flange for wafer conn.: Carbon steel (SS400)
Flange: Carbon steel (SS400)
Pipe: Stainless steel (SUS304)* or Alumina ceramic (99.9% — Sizes 150 and 200 mm only)
Terminal box : Aluminum alloy
* For PFA or Polyurethane lining

Wetted Part Material:
Lining: Fluorocarbon PFA, Alumina ceramic, Polyurethane.
Electrode: Stainless steel (SUS316L), Hastelloy C (equivalent to Hastelloy C-276), Titanium, Tantalum, Platinum-Iridium, Platinum-alumina cermet only for ceramic lining.
* For sanitary type, SUS316L only
Earth Ring/Earth Electrode: Stainless steel (SUS316), Hastelloy C (equivalent to Hastelloy C-276), Titanium, PFA lining + Earth electrodes (Tantalum, Platinum-Iridium)
Gasket:
- VALQUA#7020 : Fluoro resin with filler (between flow tube body and earth ring; for ceramic lining)
- VALQUA#4010 : Fluoro rubber, viton (between flow tube body and earth ring; for optional code /FRG)
- Non-asbestos joint sheet sheathed with fluoro resin (between earth ring and process flange; for optional code /BCF or /BSF)
- Chloroprene rubber (between earth ring and process flange; for optional code / BCC or /BSC)
- EPDM, ethylene propylene rubber (for sanitary type)

* Other gaskets between flow tube body and earth ring;
- VALQUA#7026 : corrosion resistance gasket (Fluoro resin with carbon)
- VALQUA#4010 (Mixing#RCD970) :Alkali resistance gasket for PVC piping (Fluoro rubber)
- VALQUA#4010 (Mixing#RCD470) : Acid resistance gasket for PVC piping (Fluoro rubber)

Contact Yokogawa office. (Refer to TI 1E6A0-06E.)
Union Joint: Stainless steel (SUS316L) for ceramic lining size 10 mm(0.4in.) or less.*
* Contact Yokogawa office if PVC union joints are required.
Ferrule (for sanitary type): SCS13

Electrode Construction:
• General Purpose/Ex-proof Type
PFA, Polyurethane Lining: External insertion type.
Ceramic Lining: Integral type.
• Sanitary Type
Internal insertion type
* Only PFA lining is available for sanitary type.

Electrical Connection:
ANSI 1/2NPT female, DIN Pg 13.5 female, ISO M20×1.5 female, JIS G1/2 female.

Note: Hastelloy is a registered trademark of Haynes International Inc.

Accuracy:

PFA and Ceramic Lining

Size in mm (inch)	Span in m/s (ft/s)	Accuracy
2.5 to 15 (0.1 to 0.5)	0.3 to 1 (1 to 3)	0.5% of span
	1 to 10 (3 to 33)	0.25% of span (at indications below 50% of span)
		0.5% of flowrate (at indications 50% of span or more)
25 or larger (1)	0.3 to 1 (1 to 3)	0.25% of span (at indications below 50% of span)
		0.5% of flowrate (at indications 50% of span or more)
	1 to 10 (3 to 33)	0.1% of span (at indications below 20% of span)
		0.5% of flowrate (at indications 20% of span or more)

T04.EPS

Polyurethane Lining

Size in mm (inch)	Span in m/s (ft/s)	Accuracy
25 or larger (1)	0.3 to 1 (1 to 3)	0.5% of span
	1 to 10 (3 to 33)	0.25% of span (at indications below 50% of span)
		0.5% of flowrate (at indications 50% of span or more)

T05.EPS

Repeatability: 0.1% of flowrate (minimum 1 mm/s)
Maximum Power Consumption: 12.5W
Insulation Resistance:

- 100MΩ between excitation terminal and each signal terminal at 500 V DC.
- 100MΩ among signal terminals at 500V DC.

Withstand Voltage :

- 1500 V AC between excitation terminal and ground terminal for 1minute. (for ex-proof type).
- 500 V AC between signal terminal and ground terminal for 1minute for ex-proof type except CENELEC ATEX , in case of CENELEC ATEX 1500 V AC for 1minute is applied.
- 1760 V AC between each signal terminal and each excitation terminal for 1minute. (for ex-proof type).
- 1000 V AC between excitation terminal and ground terminal for 1minute.(except for ex-proof type).

CAUTION

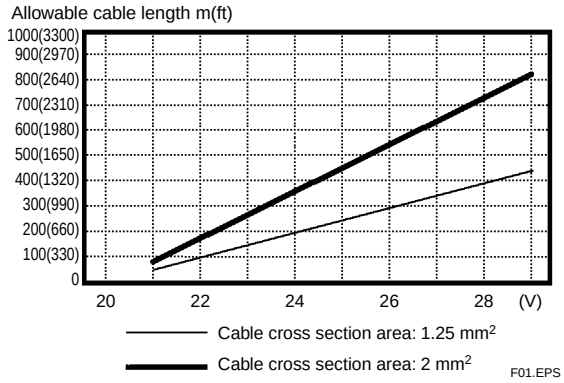
When performing the Voltage Breakdown Test, Insulation Resistance Test or any unpowered electrical test, wait 10 seconds after the power supply is turned off before removing the housing cover. Be sure to remove the Short Bar at terminal “G”. After testing, return the Short Bar to its correct position. Screw tightening torque should be 1.18N-m(0.88ft-lb)or more, because the G-terminal is thought as a protective grounding and should conform to the Safety Requirements.

Safety Requirement Standards:
IEC1010, EN61010
EMC Conformity Standards:
EN61326
EN61000-3-2, EN61000-3-3
AS/NZS 2064

■ NORMAL OPERATING CONDITIONS

Ambient Temperature: -20 to 60˚C (–4 to 140˚F)
Ambient Humidity: 5 to 95%RH (no condensation)
Note: The minimum temperature is –10°C (14°F) in case of the 40mm or larger sizes with the carbon steel flange connection or wafer connection.
Power Supply Voltage: -A1; Range 80 to 264 V AC, 47 to 63Hz/100 to 130 VDC,
-D1; Range 20.4 to 28.8 V DC

Supplied Power and Max. Cable Length for 24 V DC version:



F01.EPS

Altitude at installation side: Max.2000m above sea level
Installation category based on IEC1010: II(See Note)
Pollution level based on IEC1010: 2(See Note)
Note: • The “Installation category“ implies the regulation for impulse withstand voltage. It is also called the“Overvoltage category“. “II“ applies to electrical equipment.
• “Pollution level“describes the degree to which a solid, liquid or gas which deteriorates dielectric strength is adhering. “2“ applies to normal indoor atmosphere.
Fuse: 2A, 250V(Time - Lag type)
Fluid Conductivity:
Size 15 to 200mm(0.5 to 8in.); 5µS/cm or larger
Size 2.5 to 10mm(0.1 to 0.4in.); 20µS/cm or larger
*In case that size 250 or 300mm is used for high conductivity fluid (ex. caustic soda, seawater), please use the flange type.
Measurable Flow Rate Range:
SI Units (Size: mm, Flowrate: m³/h)

Size	Min. Range @0.3m/s	Max. Range @10m/s
2.5	0.0054	0.1767
5	0.0213	0.7068
10	0.0849	2.8274
15	0.1909	6.361
25	0.5302	17.671
40	1.3572	45.23
50	2.1206	70.68
65	3.584	119.45
80	5.429	180.95
100	8.483	282.74
125	13.254	441.7
150	19.086	636.1
200	33.93	1,131
250	53.02	1,767.1
300	76.35	2,544.6
350	103.91	3,463
400	135.72	4,523

T06.EPS

English Units (Size: inch, Flowrate: GPM)

Size	Min. Range @1.0ft/s	Max. Range @33ft/s
0.1	0.0241	0.8031
0.2	0.0964	3.212
0.4	0.3856	12.850
0.5	0.6024	20.078
1	2.4095	80.31
1.5	5.422	180.70
2	9.638	321.2
2.5	15.06	501.9
3	21.685	722.8
4	38.56	1,285.0
5	60.24	2007.8
6	86.74	2,891.3
8	154.21	5,140
10	240.95	8,031
12	347.0	11,565
14	472.3	15,741
16	616.9	20,560

T07.EPS

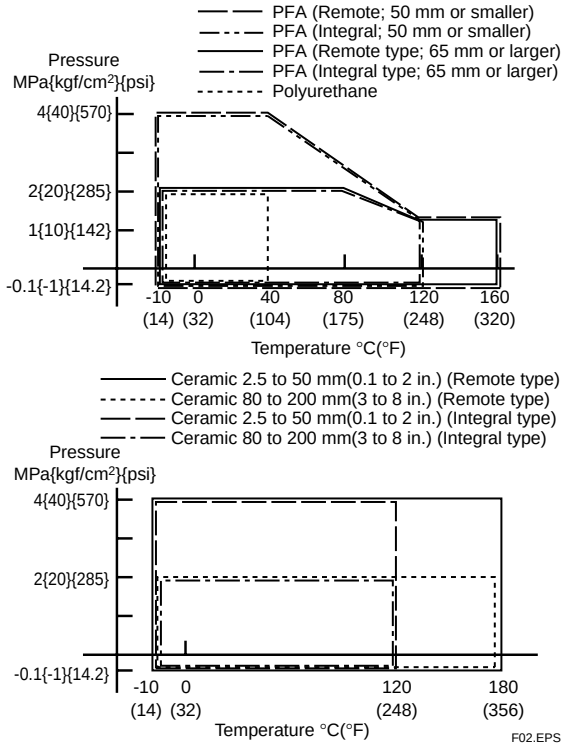
Note: Those limits show maximum allowable fluid pressure for Flow Tube itself. Further fluid pressure should also be limited according to process connection.

■ TERMINAL CONNECTION

Terminal Symbols	Description
A, B	Flow signal output
C	Common
EX1, EX2	Excitation current intput
⏚	Protective grounding (Outside of the terminal box)

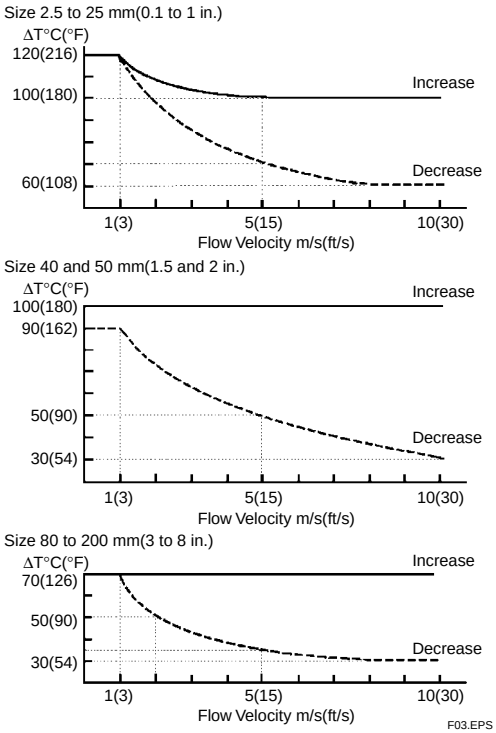
T10.EPS

Fluid Temperature and Pressure:



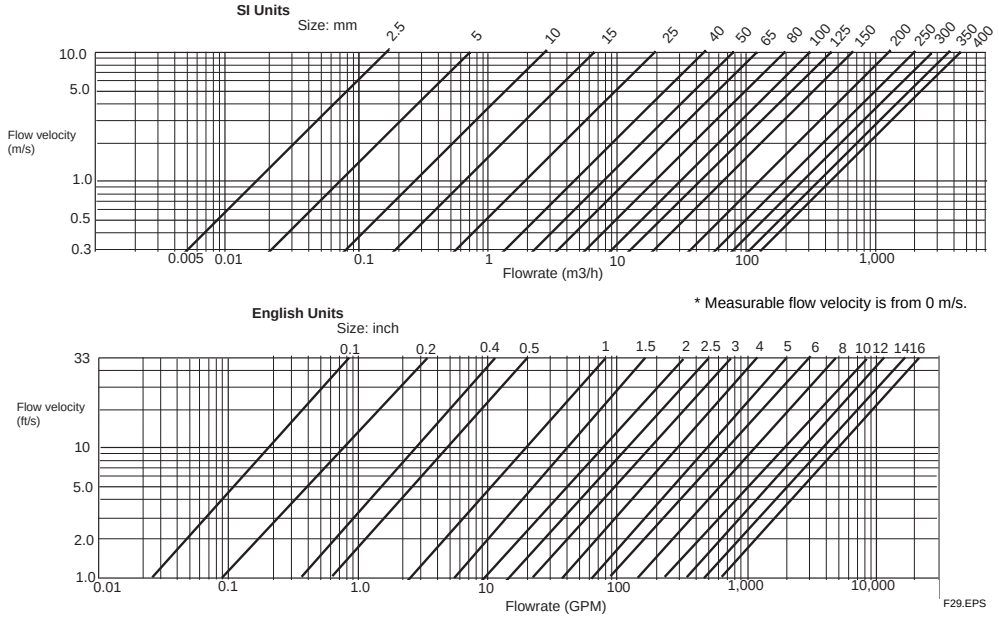
F02.EPS

Reasonable Figures for Thermal Shock of Ceramic Lining:



F03.EPS

■ SIZING DATA



F29.EPS

■ MODEL AND SUFFIX CODE

General Purpose/Explosion Proof, Remote Type Flow Tube AE100/200 series

○: Available —: Not available

Model	Suffix Code	Description	Use					
			DG			DN		
			Lining					
			A	U	C	A	C	
AE102	·····	Size 2.5 mm (0.1in.)	○	—	○	○	○	Note 1
AE105	·····	Size 5 mm (0.2in.)	○	—	○	○	○	Note 1
AE110	·····	Size 10 mm (0.4in.)	○	—	○	○	○	Note 1
AE115	·····	Size 15 mm (0.5in.)	○	—	○	○	○	Note 1
AE202	·····	Size 25 mm (1in.)	○	○	○	○	○	
AE204	·····	Size 40 mm (1.5in.)	○	○	○	○	○	
AE205	·····	Size 50 mm (2in.)	○	○	○	○	○	
AE206	·····	Size 65 mm (2.5in.)	○	—	—	○	—	
AE208	·····	Size 80 mm (3in.)	○	○	○	○	○	
AE210	·····	Size 100 mm (4in.)	○	○	○	○	○	
AE212	·····	Size 125 mm (5in.)	○	—	—	○	—	
AE215	·····	Size 150 mm (6in.)	○	○	○	○	○	
AE220	·····	Size 200 mm (8in.)	○	○	○	○	○	
Use DG	·····	General Purpose	○	○	○	—	—	
Use DN	·····	Ex-proof(ATEX,FM,CSA,SAA)	—	—	—	○	○	Note 4
Lining -A	·····	Fluorocarbon PFA	○	—	—	○	—	
Lining -U	·····	Polyurethane	—	○	—	—	—	
Lining -C	·····	Ceramic	—	—	○	—	○	
Process Connection (Note 3) K1	·····	JIS 10K wafer	○	○	○	○	○	
Process Connection (Note 3) K2	·····	JIS 20K wafer	○	○	○	○	○	Not available with 65/125mm
Process Connection (Note 3) B1	·····	ANSI 150 wafer	○	○	○	○	○	
Process Connection (Note 3) B2	·····	ANSI 300 wafer	○	○	○	○	○	Not available with 65/125mm
Process Connection (Note 3) E2	·····	DIN PN10/16 wafer	○	○	○	○	○	
Process Connection (Note 3) H1	·····	JIS F12(JIS75M) wafer	○	○	○	○	○	Size 80 mm(3in.) or larger
Process Connection (Note 3) J1	·····	JIS 10K flange	○	○	—	○	—	Not available with 65/125mm
Process Connection (Note 3) J2	·····	JIS 20K flange	○	○	—	○	—	
Process Connection (Note 3) A1	·····	ANSI 150 flange	○	○	—	○	—	
Process Connection (Note 3) A2	·····	ANSI 300 flange	○	○	—	○	—	
Process Connection (Note 3) D1	·····	DIN PN10 flange	○	○	—	○	—	Size 150/200mm (6/8in.)only
Process Connection (Note 3) D2	·····	DIN PN16 flange	○	○	—	○	—	Note 2
Process Connection (Note 3) G1	·····	JIS F12(JIS75M) flange	○	○	—	○	—	Size 80/100/150/200mm only
Process Connection (Note 3) U1	·····	Union Joint (weld joint)	—	—	○	—	○	Ceramic lining, size 2.5/ 5/10mm only
Process Connection (Note 3) U2	·····	Union Joint (R1/4 or R3/8)	—	—	○	—	○	
Process Connection (Note 3) U3	·····	Union Joint (1/4NPT or 3/8NPT)	—	—	○	—	○	
Electrode Material -L	·····	Stainless Steel (SUS316L)	○	○	—	○	—	
Electrode Material -P	·····	Platinum-iridium	○	—	—	○	—	Not available with 65/125mm
Electrode Material -E	·····	Platinum-alumina cermet	—	—	○	—	○	
Electrode Material -H	·····	Hastelloy C276 equivalent	○	—	—	○	—	
Electrode Material -T	·····	Tantalum	○	—	—	○	—	
Electrode Material -V	·····	Titanium	○	—	—	○	—	
Earth Ring/Earth Electrode Material S	·····	Stainless Steel (SUS316)	○	○	○	○	○	
Earth Ring/Earth Electrode Material P	·····	Platinum-iridium	○	—	○	○	○	Note 5
Earth Ring/Earth Electrode Material N	·····	None	○	○	○	○	○	Must for ceramic, 2.5/ 5/10mm
Earth Ring/Earth Electrode Material H	·····	Hastelloy C276 equivalent	○	—	○	○	○	Not available with 65/125mm
Earth Ring/Earth Electrode Material T	·····	Tantalum	○	—	○	○	○	Note 5
Earth Ring/Earth Electrode Material V	·····	Titanium	○	—	○	○	○	Not available with 65/125mm
Electrical Connection J	·····	JIS G1/2 female	○	○	○	—	—	
Electrical Connection A	·····	ANSI 1/2NPT female	○	○	○	○	○	
Electrical Connection D	·····	DIN Pg13.5 female	○	○	○	○	○	
Electrical Connection M	·····	ISO M20 X1.5 female	○	○	○	○	○	
Optional Code	/□	Refer to "Optional Specifications."						

T15.EPS

Note 1: Process connection for size 2.5 to 10mm(0.1 to 0.4in.), wafer type is equal to one for 15mm(0.5in.). Provide 15mm process flanges for these flow tubes.

Note 2: Select PN16 when requirement of PN10 for size 100mm (4in.)or less becuase of same mating dimensions. Not available with 65, 125mm.

Note 3: Flange type is available for size 15mm or larger, PFA or Polyurethane lining.

Note 4: Select ANSI 1/2 NPT female electrical connection(code A), in case of requirement of FM/CSA explosion proof type. For ATEX explosion proof type, select ANSI 1/2NPT(codeA) or ISO M20×1.5 (code M) electrical connection.

Note 5: Platinum-Iridium and tantalum earth electrodes are not available with 65, 125mm and ceramics 150, 200mm.

General Purpose /Explosion Proof, Remote Type Flow Tube AE300 series

○: Available –: Not available

Model	Suffix Code	Description	Use DG Lining A	Use DG Lining U	Use DN Lining A	
AE325	·····	Size 250mm (10in.)	○	○	○	
AE330	·····	Size 300mm (12in.)	○	○	○	
AE335	·····	Size 350mm (14in.)	○	○	○	
AE340	·····	Size 400mm (16in.)	○	○	○	
Use **DG**	·····	General Purpose	○	○	–	
Use **DN**	·····	Ex-proof(ATEX,SAA)	–	–	○	Note
Lining **-A**	·····	Fluorocarbon PFA	○	–	○	
Lining **-U**	·····	Polyurethane	–	○	–	
Process Connection **K1**	·····	JIS 10K Wafer	○	○	–	Only for size 250, 300mm
Process Connection **B1**	·····	ANSI 150 Wafer	○	○	–	Only for size 250, 300mm
Process Connection **E2**	·····	DIN PN10/16 Wafer	○	○	–	Only for size 250, 300mm
Process Connection **H1**	·····	JIS F12 Wafer	○	○	–	Only for size 250, 300mm
Process Connection **J1**	·····	JIS 10K flange	○	○	○	
Process Connection **J2**	·····	JIS 20K flange	○	○	○	Only for size 250, 300mm
Process Connection **A1**	·····	ANSI 150 flange	○	○	○	
Process Connection **A2**	·····	ANSI 300 flange	○	○	○	Only for size 250, 300mm
Process Connection **D1**	·····	DIN PN10 flange	○	○	○	
Process Connection **D2**	·····	DIN PN16 flange	○	○	○	
Process Connection **G1**	·····	JIS F12(JIS75M) flange	○	○	○	
Electrode Material **-L**	·····	Stainless Steel (SUS316L)	○	○	○	
Electrode Material **-P**	·····	Platinum-iridium	○	–	○	Only for flange type
Electrode Material **-H**	·····	Hastelloy C276 equivalent	○	–	○	Only for flange type
Electrode Material **-T**	·····	Tantalum	○	–	○	Only for flange type
Electrode Material **-V**	·····	Titanium	○	–	○	Only for flange type
Earth Ring Material **S**	·····	Stainless Steel (SUS316)	○	○	○	
Earth Ring Material **H**	·····	Hastelloy C276 equivalent	○	–	○	Only for flange type
Earth Ring Material **V**	·····	Titanium	○	–	○	Only for flange type
Earth Ring Material **N**	·····	None	○	○	○	
Electrical Connection **J**	·····	JIS G1/2 female	○	○	–	
Electrical Connection **A**	·····	ANSI 1/2NPT female	○	○	○	
Electrical Connection **D**	·····	DIN Pg13.5 female	○	○	○	
Electrical Connection **M**	·····	ISO M20 x 1.5 female	○	○	○	
Optional Code	/□	Refer to "Optional Specifications."				

T16.EPS

Note : For ATEX explosion proof type, select ANSI1/2NPT(code A) or ISO M20x 1.5(code M) electrical connection.

Sanitary, Remote Type Flow Tube:

Model	Suffix code	Description
AE202	·····	Size 25 mm(1in.)
AE204	·····	Size 40 mm(1.5in.)
AE205	·····	Size 50 mm(2in.)
AE206	·····	Size 65 mm(2.5in.)
AE208	·····	Size 80 mm(3in.)
AE210	·····	Size 100 mm(4in.)
Use **DH**	·····	Sanitary type
Lining **-A**	·····	PFA
Process Connection **C1**	·····	ISO(IDF) clamp
Electrode Material **-L**	·····	Stainless steel (SUS316L)
Earth Ring **N**	·····	None
Electrical Connection **J**	·····	JIS G1/2 female
Electrical Connection **A**	·····	ANSI 1/2 NPT female
Electrical Connection **D**	·····	DIN Pg13.5 female
Electrical Connection **M**	·····	ISO M20 X1.5 female
Optional Code	/□	Refer to “Optional Specifications.”

T18.EPS

Optional Specifications

○: Available –: Not available

Item	Specification	Applicable Model									Code
		General			Ex-proof				Sanitary		
		AE***MG	AE14	AE***DG	AE***MN	AE***SC	AE14	AE***DN	AE***MH	AE***DH	
Waterproof Gland	Waterproof glands are attached to all wiring ports. For JIS G1/2 only.	○	○	○	–	–	–	–	○	○	/ECG
Waterproof Gland with Union Joint	Waterproof glands (union joint) are attached to all wiring ports. For JIS G1/2 only.	○	○	○	–	–	–	–	○	○	/ECU
Gaskets for PVC pipe	Gaskets are attached between earth ring and flow tube. (Not available with 65, 125mm)	○	–	○	○	○	–	○	–	–	/FRG
DC Noise Suppression	Eliminating DC Noise (Size 15mm(0.5in.) or larger: Conductivity 50μS/cm or higher.)	○	○	–	○	○	○	–	○	○	/ELC
Lightning Protector	Built-in Lightning Protector(Only for 24VDC version)	○	○	–	○	○	○	–	○	○	/A
BRAIN Communication(Note 1)	Digital Communication with BRAIN protocol	○	○	–	○	○	○	–	○	○	/BR
HART Communication(Note 1)	Digital Communication with HART protocol	○	○	–	○	–	○	–	○	○	/HART
FOUNDATION Fieldbus Communication (Note 1)	Digital Communication with FOUNDATION Fieldbus protocol (except 24 VDC version)	○	○	–	Note 7 ○	○	Note 7 ○	–	○	–	/FB
PID/LM function for FOUNDATION Fieldbus (Note 6)	PID control function and Link Master function	○	○	–	Note 7 ○	○	Note 7 ○	–	○	–	/LC1
Epoxy Coating	Coating is changed to epoxy coating.	○	○	○	○	○	○	○	–	–	/EPF
High Anti-corrosion Coating	Coating is changed to three-layer coating(Urethane coating on two-layer Epoxy coating)	○	○	○	○	○	○	○	–	–	/X2
Material Certificate(Note 2)	Reproduced material certificate for pipe, electrode, earth ring, mini-flange and flange (depends on spec.).	○	–	○	○	○	–	○	–	–	/M01
Bolt & Nut Assembly(Note 3)	Carbon steel bolts/nuts and chloroprene gaskets assembly for wafer type	○	–	○	○	○	–	○	–	–	/BCC
	Carbon steel bolts/nuts and non-asbestos PTFE-wrapped gaskets assembly for wafer type	○	–	○	○	○	–	○	–	–	/BCF
	wStainless steel bolts/nuts and chloroprene gaskets assembly for wafer type	○	–	○	○	○	–	○	–	–	/BSC
	Stainless steel bolts/nuts and non-asbestos PTFE-wrapped gaskets assembly for wafer type	○	–	○	○	○	–	○	–	–	/BSF
DHC use (for size 100 to 400mm)	Condensation proof for District Heating and Cooling use. Terminal box; urethane resin potting. Wired 30m signal cable at factory.	–	–	○	–	–	–	–	–	–	/DHC
FM Approval(Note 4)	FM Explosion proof/FM Nonincendive	–	–	–	○	–	○	○	–	–	/FF1/FN1
CENELEC ATEX Certification (KEMA Approval)	CENELEC ATEX Explosion proof	–	–	–	○	–	○	○	–	–	/KF2
CSA Certification(Note 4)	CSA Explosion proof/CSA Nonincendive	–	–	–	○	–	○	○	–	–	/CF1/CN1
SAA Certification	SAA Explosion proof	–	–	–	○	–	○	○	–	–	/SF1
TIIS(JIS) Flameproof (Note 4)(Note 5)	TIIS(JIS) Flameproof type	–	–	–	–	(Note 5)	–	–	–	–	/JF3
Flameproof Packing Adapter for TIIS(JIS) Flameproof (Note 5) (Only for JIS G1/2 electrical connection)	One Flameproof Packing Adapter and a blind plug are attached.(only for DC power supply)	–	–	–	–	(Note 5)	–	–	–	–	/G11
	Two Flameproof Packing Adapters are attached.(Not apply for one port wiring.)	–	–	–	–	(Note 5)	–	–	–	–	/G12
GOST Certification	Calibration Certificate for GOST (only for products produced at YMF)	○	○	○	○	–	○	○	○	○	/GOS
Silicon Rubber Gasket for sanitary type	In case of fluid temp. over 120°C (248°F), 160°C (320°F) max. (Not available with 65mm)	–	–	–	–	–	–	–	–	○	/SRG
Mirror Finished Ceramics	Mirror Finishing on the inside of ceramic tube (Rmax.<=1 micro-meter)	○	–	○	○	○	–	○	–	–	/MRR
180deg. Rotated Converter	180deg. rotated converter for reversed flow direction	○	–	–	○	○	–	–	○	–	/CRC
Oil-prohibited Use	Degreased cleansing treatment	○	–	○	○	○	–	○	–	–	/K1
Oil-prohibited Use with Dehydrating Treatment	Degreased cleansing treatment; Packing with desiccant	○	–	○	○	○	–	○	–	–	/K5
Hydrostatics Test Certificate	Test pressure depends on process connection (Test duration 10 minutes) Test result is full in NOTE of QIC.	○	–	○	○	○	–	○	–	–	/T01
Calibration Certificate	Level 2:Declaration and Calibration Equipment List	○	○	○	○	○	○	○	○	○	/L2
	Level 3:Declaration and Primary Standard List	○	○	○	○	○	○	○	○	○	/L3
	Level 4:Declaration and YOKOGAWA Measuring	○	○	○	○	○	○	○	○	○	/L4

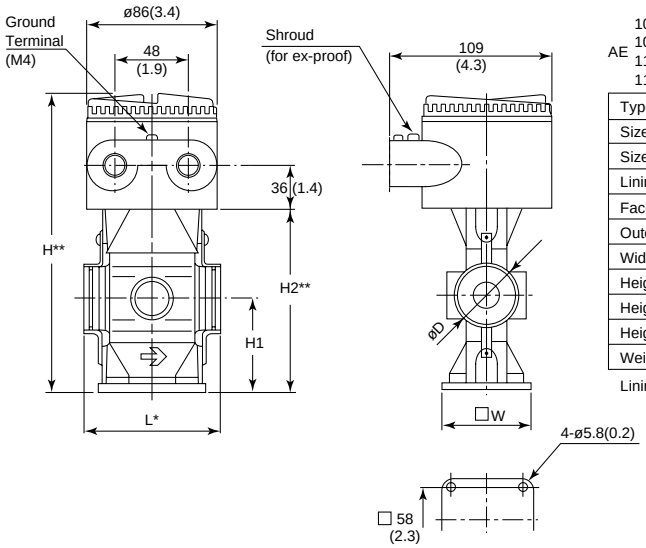
T19.EPS

Note 1: Either BRAIN, HART, or FOUNDATION Fieldbus communication can be selected.
Note 2: In case of requirement of EN10204 3.1B for Material Certificate, contact Yokogawa office.
Note 3: It is available only for JIS 10K wafer, JIS 20K wafer or ANSI 150 wafer type, not available with 65, 125, 250 or 300mm.
Note 4: It is available only for size 2.5 to 200mm(0.1 to 8 in).
Note 5: Select optional code /JF3 with /G11 or /G12 in case of requirement of TIIS (former JIS) Flameproof type.
/G11 is selectable only for DC power supply and 4-conductor cable use.
Note 6: Optional code /LC1 is a function for Fieldbus communication. Optional code /FB must be selected together with /LC1.
Note 7: Ex-proof Fieldbus communication is available for CENELEC ATEX, FM and TIIS (former JIS) ex-proof version.

■ EXTERNAL DIMENSIONS

Magnetic Flow Tube

2.5 to 15mm(0.1 to 0.5in.) Wafer Type:



Unit: mm (approx. inch)

AE 102/105/110/115 D G/N -A K/B/E AE 115 D G/N -C K/B/E

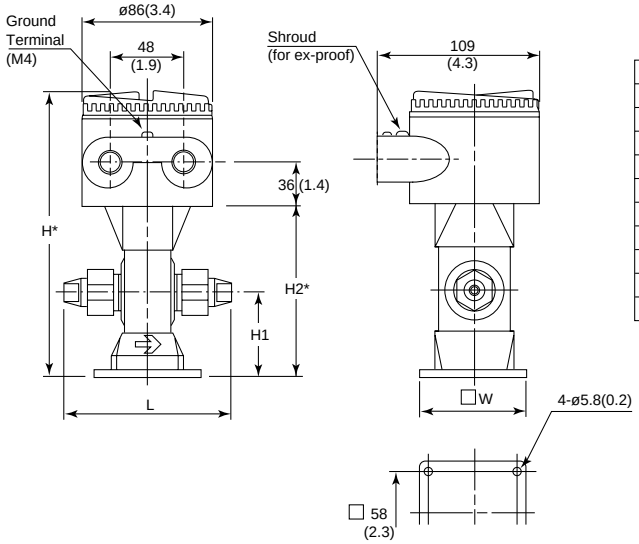
Type		General (G), Ex-proof(N)			
Size code		102	105	110	115
Size		2.5(0.1)	5(0.2)	10(0.4)	15(0.5)
Lining code		A			A.C
Face-to-face	L*	85(3.3)*			
Outer dia.	øD	44(1.7)			
Width	W	72(2.8)			
Height	H**	214(8.4)**			
Height	H1	66(2.6)			
Height	H2**	128(5.0)**			
Weight kg(lb)		2.4(5.3)			

Lining code A : PFA lining
C : Ceramics pipe

* The face-to-face length is longer by approx.22mm(0.89 in.) for earth ring P,T.
* The face-to-face length is shorter by approx. 6mm(0.24 in.) for non earth ring type.
* The face-to-face length is longer by approx.2mm(0.08 in.) for PFA lining with optional code/FRG.
** The height marked as ** is shorter by 3mm(0.12 in.) for ex-proof type.

F15.EPS

2.5 to 10mm(0.1 to 0.4in.) Union Joint Type:



Unit: mm (approx. inch)

Type		General (G), Ex-proof(N)					
Size code		102		105		110	
Size		2.5(0.1)		5(0.2)		10(0.4)	
Lining code		C					
Process connection		U1	U2, U3	U1	U2, U3	U1	U2, U3
Face-to-face	L	140(5.5)	130(5.1)	140(5.5)	130(5.1)	140(5.5)	130(5.1)
Width	W	72(2.8)					
Height	H*	202(8.0)*					
Height	H1	60(2.4)					
Height	H2*	116(4.6)*					
Weight kg(lb)		2.4(5.3)					

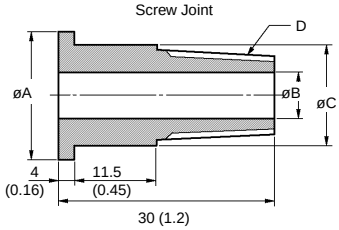
Lining code C : Ceramics pipe
The height marked as is shorter by 3mm(0.12")
for ex-proof type.

AE 102/105/110 D G/N -C U

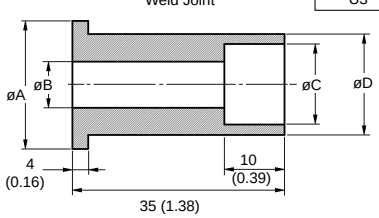
Process Connection

Size code	102	105	110
U1	Weld joint		
U2	R1/4		R3/8
U3	1/4NPT		3/8NPT

Screw Joint



Weld Joint

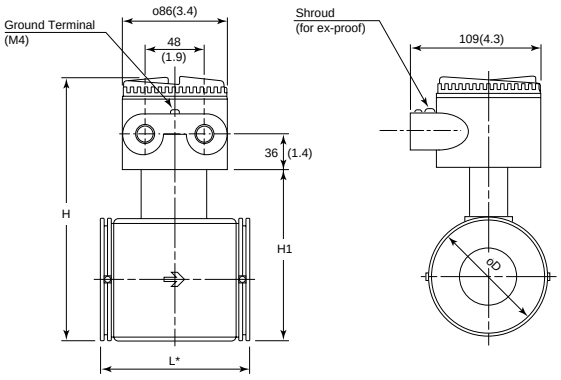


Size	A	B	C	D
2.5 (0.1)	22(0.87)	8(0.31)	18.5(0.73)	R1/4
	22(0.87)	8(0.31)	18.5(0.73)	NPT1/4
5 (0.2)	22(0.87)	8(0.31)	18.5(0.73)	R1/4
	22(0.87)	8(0.31)	18.5(0.73)	NPT1/4
10 (0.4)	25(0.98)	10(0.39)	22.5(0.89)	R3/8
	25(0.98)	10(0.39)	22.5(0.89)	NPT3/8

Size	A	B	C	D
2.5(0.1)	22(0.87)	8(0.31)	14.3(0.56)	18.5(0.73)
5(0.2)	22(0.87)	8(0.31)	14.3(0.56)	18.5(0.73)
10(0.4)	25(0.98)	10(0.39)	17.8(0.70)	22.5(0.89)

F16.EPS

25 to 100mm(1 to 4in.) Wafer Type:



Unit: mm
(approx. inch)

* The face-to-face length is longer by approx.22mm(0.89 in.) for earth ring P,T.
* The face-to-face length is shorter by approx. 6mm(0.24 in.) for non earth ring type.
* The face-to-face length is longer by approx.2mm(0.08 in.) for PFA or Polyuretane lining with optional code/FRG.

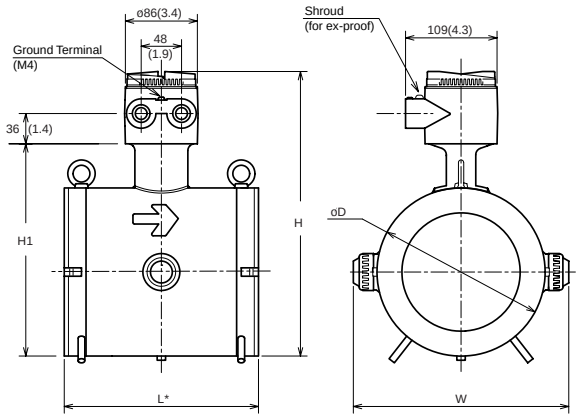
AE 202/204/205/206/208/210 D G/N - A/U/C K/B/E/H

Type		General(G)								Ex-proof(N)							
Size code		202	204	205	206	208	210	208	210	202	204	205	206	208	210	208	210
Size		25(1)	40(1.5)	50(2)	65(2.5)	80(3)	100(4)	80(3)	100(4)	25(1)	40(1.5)	50(2)	65(2.5)	80(3)	100(4)	80(3)	100(4)
Lining code		A, U, C			A	A, U		C		A, C			A			C	
Face-to-face	L*	93(3.7)*	106(4.2)*	120(4.7)*	120(4.7)	160(6.3)*	180(7.1)*	160(6.3)*	180(7.1)*	93(3.7)*	106(4.2)*	120(4.7)*	120(4.7)	160(6.3)*	180(7.1)*	160(6.3)*	180(7.1)*
Outer dia	D	68(2.7)	86(3.4)	99(3.9)	117(4.6)	129(5.1)	155(6.1)	129(5.1)	155(6.1)	68(2.7)	86(3.4)	99(3.9)	117(4.6)	129(5.1)	155(6.1)	129(5.1)	155(6.1)
Height	H	197(7.8)	217(8.5)	230(9.1)	248(9.8)	270(10.6)	296(11.7)	260(10.2)	296(11.7)	195(7.7)	214(8.4)	228(9.0)	246(9.7)	268(10.6)	296(11.7)	258(10.2)	294(11.6)
Height	H1	111(4.4)	131(5.2)	144(5.7)	162(6.4)	184(7.2)	210(8.3)	174(6.9)	210(8.3)	109(4.3)	128(5.0)	142(5.6)	160(6.3)	182(7.2)	208(8.2)	172(6.8)	208(8.2)
Weight kg(lb)		2.3(5.5)	3.2(7.1)	4.2(9.3)	5.2(11.5)	7.3(16.1)	10.2(22.5)	6.9(15.2)	10(22.1)	2.3(5.5)	3.2(7.1)	4.2(9.3)	5.2(11.5)	7.3(16.1)	10.2(22.5)	6.9(15.2)	10(22.1)

Lining code A : PFA lining
U : Polyurethane rubber lining
C : Ceramics pipe

F17.EPS

125 and 200mm(5 and 8in.) Wafer Type:



Unit: mm
(approx. inch)

AE 212/215/220 D G/N - A/U K/B/E/H

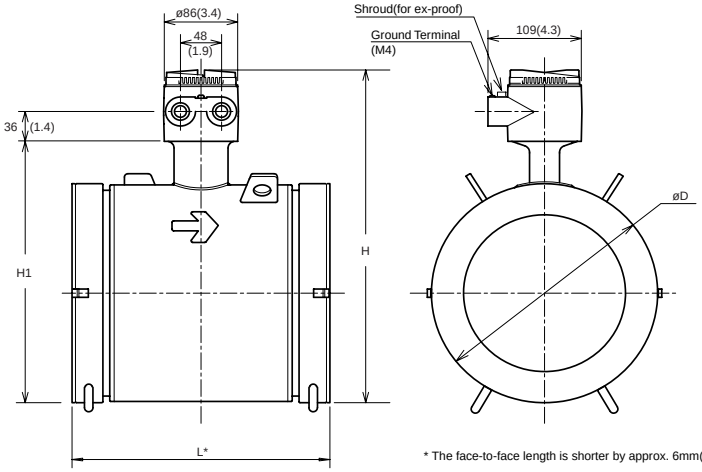
Type		General(G)			Ex-proof(N)		
Size code		212	215	220	212	215	220
Size		125(5)	150(6)	200(8)	125(5)	150(6)	200(8)
Lining code		A	A, U		A	A, U	
Face-to-face	L*	230(9.1)	230(9.1)*	300(11.8)*	230(9.1)	230(9.1)*	300(11.8)*
Outer dia	D	175(6.9)	200(7.9)	250(9.8)	175(6.9)	200(7.9)	250(9.8)
Height	H	313(12.3)	339(13.3)	389(15.3)	311(12.2)	336(13.2)	386(15.2)
Height	H1	227(8.9)	253(10.0)	303(11.9)	225(8.9)	250(10.1)	300(11.8)
Width	W	230(9.1)	256(10.1)	307(12.1)	230(9.1)	256(10.1)	307(12.1)
Weight kg(lb)		15.7(34.6)	17.9(39.4)	28.4(62.6)	15.7(34.6)	20.9(46.1)	33.4(73.6)

Lining code A : PFA lining
U : Polyurethane rubber lining

* The face-to-face length is longer by approx.30mm(1.2 in.) for earth ring P,T.
* The face-to-face length is shorter by approx. 6mm(o.24 in.) for non earth ring type.
* The face-to-face length is longer by approx.2mm(0.08 in.) for optional code/FRG.

F18.EPS

150 and 200mm(6 and 8in.) Ceramic Lining:



Unit: mm
(approx. inch)

AE 215/220 D G/N - C K/B/E/H

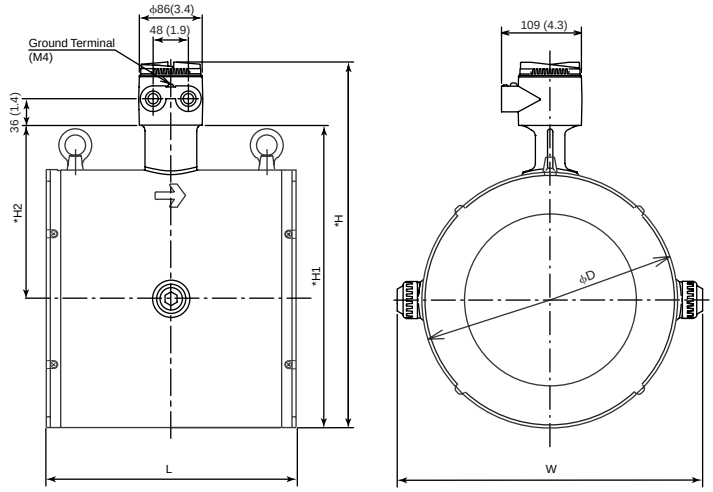
Type		General(G)		Ex-proof(N)	
Size code		215	220	215	220
Size		150(6)	200(8)	150(6)	200(8)
Lining code		C			
Face-to-face	L*	232(9.2)*	302(11.9)*	232(9.1)*	302(11.9)*
Outer dia	øD	214(8.5)	264(10.4)	214(8.4)	264(10.4)
Height	H	352.5(13.9)	402.5(15.8)	350(13.8)	400(15.7)
Height	H1	266.5(10.5)	316.5(12.5)	264(10.4)	314(12.4)
Weight kg(lb)		21.6(47.7)	33.6(74.1)	24.6(54.2)	38.6(85.1)

Lining code C : Ceramics pipe

* The face-to-face length is shorter by approx. 6mm(0.24 in.) for non earth ring type.

F19.EPS

250 and 300mm(10 and 12in.) Wafer Type:



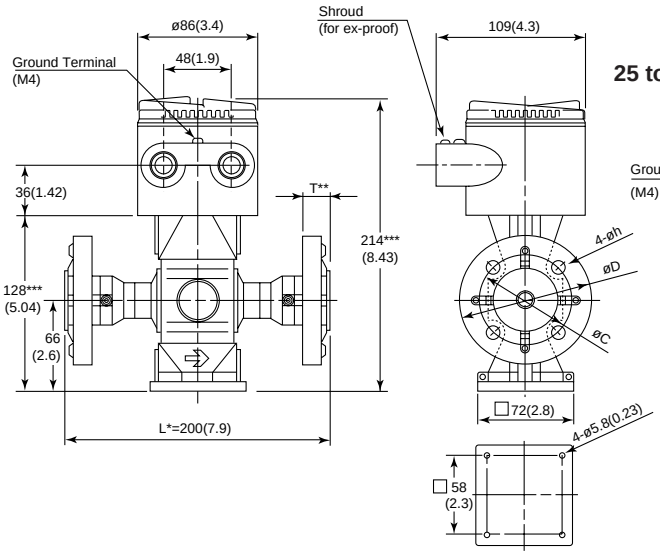
AE 325D / 330D G - A / U K / B / E / H

Type		General (G)	
Size code		325	330
Size		250(10)	300(12)
Lining code		A, U	
Face-to-face	L	300(11.8)	350(13.8)
Outer dia.	D	310(12.2)	358(14.1)
Height	*H	449(17.7)	497(19.6)
Height	*H1	363(14.3)	411(16.2)
Height	*H2	208(8.2)	232(9.1)
Width	W	366(14.4)	415(16.3)
Weight kg (lb)		33(72.8)	42.3(93.3)

Lining code A : PFA lining
U : Polyurethane rubber lining

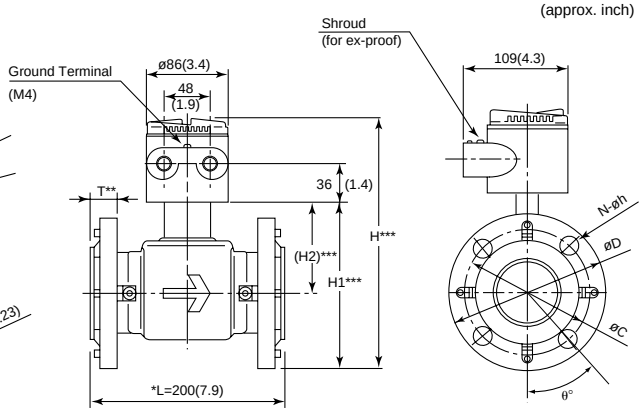
F20.EPS

15mm(0.5in.) Flange Type:



25 to 50mm(1 to 2in.) Flange Type:

Unit: mm
(approx. inch)



AE 115 D G / N - A / U J / A / D

Type		General(G) Ex-proof(N)				
Size code		115				
Size		15(0.5)				
Lining code		A				
Process Connection		J1	J2	A1	A2	D2
Outer dia.	øD	95(3.7)	95(3.7)	89(3.5)	95(3.7)	95(3.7)
Thickness	T**	19(0.7)~ 24(0.9)**	21(0.8)~ 26(1.0)**	18(0.7)~ 25(1.0)**	21(0.8)~ 28(1.1)**	20(0.8)~ 26(1.0)**
Pitch circle dia.	øC	70(2.8)	70(2.8)	61(2.4)	67(2.6)	65(2.6)
Hole dia.	øh	15(0.6)	15(0.6)	16(0.6)	16(0.6)	14(0.6)
Weight kg(lb)		4.0(8.8)	4.2(9.3)	3.8(8.4)	4.2(9.3)	4.2(9.3)

Process connection : J1 ; JIS10K J2 ; JIS20K A1 ; ANSI 150
A2 ; ANSI 300 D2 ; DIN PN16
Lining code A : PFA lining

AE 202 / 204 / 205 D G / N - A / U J / A / D

Type		General(G), Ex-proof(N)														
Size code		202					204					205				
Size		25(1)					40(1.5)					50(2)				
Lining code		A, U					A, U					A, U				
Process Connection		J1	J2	A1	A2	D2	J1	J2	A1	A2	D2	J1	J2	A1	A2	D2
Height	H***	226(8.9)***	226(8.9)***	217(8.5)***	225(8.9)***	221(8.7)***	244(9.6)***	244(9.6)***	237(9.3)***	251(9.9)***	249(9.8)***	258(10.2)***	258(10.2)***	257(10.1)***	263(10.4)***	263(10.4)***
Height	H1***	140(5.5)***	140(5.5)***	131(5.2)***	139(5.5)***	135(5.3)***	158(6.2)***	158(6.2)***	151(5.9)***	165(6.5)***	163(6.4)***	172(6.8)***	172(6.8)***	171(6.7)***	177(7.0)***	177(7.0)***
Height	H2***	77(3.0)***					87.5(3.4)***					94.5(3.7)***				
Outer dia.	øD	125(4.9)	125(4.9)	108(4.3)	124(4.9)	115(4.5)	140(5.5)	140(5.5)	127(5.0)	155(6.1)	150(5.9)	155(6.1)	155(6.1)	152(6.0)	165(6.5)	165(6.5)
Thickness	T**	21(0.8) ~26(1)**	23(0.9) ~28(1.1)**	21(0.8) ~28(1.1)**	25(1) ~31(1.2)**	22(0.9) ~28(1.1)**	23(0.9) ~28(1.1)**	25(1) ~30(1.2)**	25(1) ~31(1.2)**	28(1.1) ~34(1.3)**	22(0.9) ~28(1.1)**	23(0.9) ~29(1.1)**	25(1) ~31(1.2)**	26(1) ~33(1.3)**	30(1.2) ~37(1.5)**	24(0.9) ~30(1.2)**
Pitch circle dia.	øC	90(3.54)	90(3.54)	79(3.11)	89(3.50)	85(3.35)	105(4.13)	105(4.13)	99(3.90)	114(4.49)	110(4.33)	120(4.72)	120(4.72)	121(4.76)	127(5.00)	125(4.92)
Hole dia.	øh	19(0.75)	19(0.75)	16(0.63)	19(0.75)	14(0.55)	19(0.75)	19(0.75)	16(0.63)	22(0.87)	18(0.71)	19(0.75)	19(0.75)	19(0.75)	19(0.75)	18(0.71)
Number of holes	N	4	4	4	4	4	4	4	4	4	4	4	8	4	8	4
Bolt hole pitch	θ°	45	45	45	45	4	45	45	45	45	45	45	22.5	45	22.5	45
Weight kg(lb)		5.2(11.4)	5.5(12.1)	4.6(10.1)	5.6(12.3)	5.1(11.2)	7.4(16.3)	7.7(16.9)	7.0(15.4)	9.2(20.2)	8.0(18.5)	9.0(19.8)	9.1(20)	9.4(20.7)	10.8(23.8)	10.2(22.5)

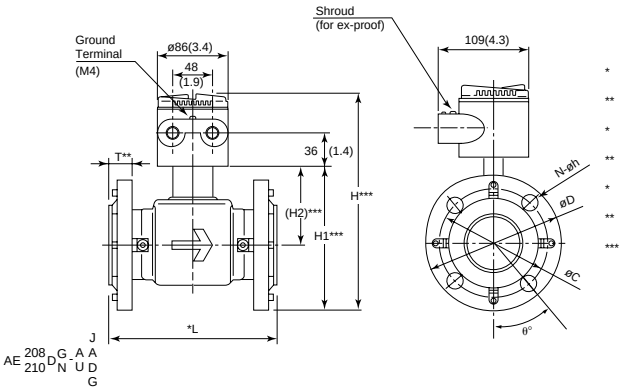
Process connection : J1 ; JIS10K J2 ; JIS20K A1 ; ANSI 150 A2 ; ANSI 300 D2 ; DIN PN16
Lining code A : PFA Lining
U : Polyurethane lining

* The face-to-face length is longer by approx.22mm(0.89 in.) for earth ring P,T.
** The thickness(T)is longer by approx.11mm(0.43 in.) for earth ring P,T.
* The face-to-face length is shorter by approx. 6mm(0.24 in.) for non earth ring type.
** The thickness (T) is shorter by approx. 3mm(0.12 in.) for non earth ring type.
* The face-to-face length is longer by approx.2mm(0.08 in.) for optional code/FRG.
** The thickness(T)is longer by approx.1mm(0.04 in.) for optional code/FRG.
*** The height marked as *** is shorter by 3mm(0.12 in.) for ex-proof type.

F21.EPS

80 and 100mm(3 and 4in.) Flange Type:

Unit: mm
(approx. inch)



AE 208 210 D G N - J A U A D G

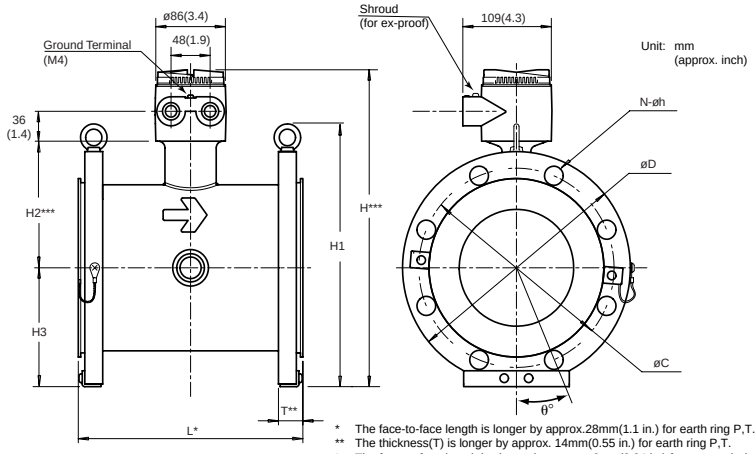
* The face-to-face length is longer by approx.22mm(0.89 in.) for earth ring P,T.
** The thickness(T) is longer by approx. 11mm(0.43 in.)for earth ring P,T.
* The face-to-face length is shorter by approx. 6mm(0.24 in.) for non earth ring type.
** The thickness(T) is shorter by approx. 3mm(0.12 in.) for non earth ring type.
* The face-to-face length is longer by approx.2mm(0.08 in.) for optional code/FRG.
** The thickness(T) is longer by approx. 1mm(0.04 in.) for optional code/FRG.
*** The height is shorter by 2.5mm(0.1 in.)for ex-proof type.

Type		General(G), Ex-proof(N)											
Size code		208						210					
Size		80(3)						100(4)					
Lining code		A(PFA), U(Polyurethane)											
Process Connection		J1	J2	A1	A2	D2	G1	J1	J2	A1	A2	D2	G1
Height	H***	288(11.3)***	296(11.7)***	291(11.4)***	300(11.8)***	296(11.7)***	301(11.9)***	324(12.8)***	331(13.0)***	333(13.1)***	346(13.6)***	329(13.0)***	338(13.3)***
Height	H1***	202(8.0)***	210(8.3)***	205(8.1)***	214(8.4)***	210(8.3)***	215(8.5)***	238(9.4)***	245(9.6)***	247(9.7)***	260(10.2)***	243(9.6)***	252(9.9)***
Height	H2***	109.5(4.3)***						132.5(5.2)***					
Outer dia.	øD	185(7.2)	200(7.9)	191(7.5)	210(8.3)	200(7.9)	211(8.3)	210(8.3)	225(8.9)	229(9.1)	254(10)	220(8.7)	238(9.4)
Thickness	T**	25(1) ~31(1.2)**	29(1.1) ~35(1.4)**	31(1.2) ~38(1.5)**	36(1.4) ~43(1.7)**	26(1) ~32(1.3)**	25(1) ~32(1.3)**	25(1) ~31(1.2)**	31(1.2) ~37(1.5)**	31(1.2) ~38(1.5)**	39(1.5) ~46(1.8)**	26(1) ~32(1.3)**	25(1) ~32(1.3)**
Pitch circle dia.	øC	150(5.1)	160(6.3)	152(6.0)	168(6.6)	160(6.3)	168(6.6)	175(6.9)	185(7.3)	191(7.5)	200(7.9)	180(7.1)	195(7.7)
Hole dia.	øh	19(0.7)	23(0.9)	19(0.7)	22(0.9)	18(0.7)	19(0.7)	19(0.7)	23(0.9)	19(0.7)	22(0.9)	18(0.7)	19(0.7)
Number of holes	N	8	8	4	8	8	4	8	8	8	8	8	4
Bolt hole pitch	θ°	22.5	22.5	45	22.5	22.5	45	22.5	22.5	22.5	22.5	22.5	19
Face-to-face	L*	200(7.9)*						250(9.8)*					
Weight kg(lb)		13(28.6)	15(33.0)	15.3(33.7)	18.3(40.3)	15(33.1)	15.5(34.2)	21.0(46.3)	24.2(53.4)	25.0(55.1)	32.4(71.4)	22.7(50.1)	24.1(53.1)

F22.EPS

Process connection : J1 ; JIS10K J2 ; JIS20K A1 ; ANSI 150 A2 ; ANSI 300 D2 ; DIN PN16 G1 ; JIS F12

150 and 200mm(6 and 8in.) Flange Type:



AE 215 220 D G N - J A U A D G

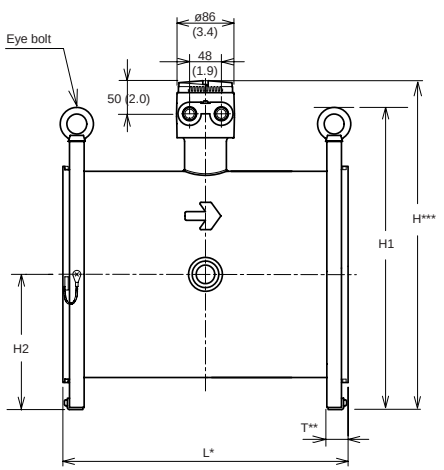
* The face-to-face length is longer by approx.28mm(1.1 in.) for earth ring P,T.
** The thickness(T) is longer by approx. 14mm(0.55 in.) for earth ring P,T.
* The face-to-face length is shorter by approx. 6mm(0.24 in.) for non earth ring type.
** The thickness(T) is shorter by approx. 3mm(0.12 in.) for non earth ring type.
* The face-to-face length is longer by approx.2mm(0.08 in.) for optional code/FRG.
The thickness(T) is longer by approx. 1mm(0.04 in.) for optional code/FRG.
*** The height is shorter by approx.2.5mm(0.1 in.) for ex-proof type.

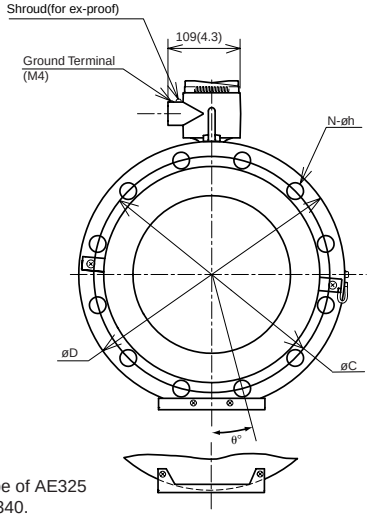
Type		General(G), Ex-proof(N)													
Size code		215							220						
Size		150(6)							200(8)						
Lining code		A(PFA), U (Polyurethane)													
Process connection		J1	G1	A1	J2	A2	D1	D2	J1	G1	A1	J2	A2	D1	D2
Face-to-face	L	270(10.6)*							340(13.4)*						
Outer dia.	øD	280(11)	290(11.4)	279(11.0)	305(12)	318(12.5)	285(11.2)	285(11.2)	330(13)	342(13.5)	343(13.5)	350(13.8)	381(15.0)	340(13.4)	340(13.4)
Height	H**	382(15)***	387(15.2)***	381(15.0)***	394(15.5)***	401(15.8)***	384(15.1)***	384(15.1)***	432(17.0)***	438(17.2)***	438(17.3)***	442(17.4)***	457(18.0)***	437(17.2)***	437(17.2)***
Height	H1	317(12.5)	327(12.9)	316(12.4)	342(13.4)	354(13.9)	322(12.7)	322(12.7)	367(14.4)	379(14.9)	379(14.9)	387(15.2)	418(16.4)	377(14.8)	377(14.8)
	H2***	152.5(6.0) ***							177.5(7.0)***						
	H3	143(5.6)	148(5.8)	143(5.6)	156(6.1)	162(6.4)	146(5.7)	146(5.7)	168(6.6)	174(6.9)	175(6.9)	178(7.0)	194(7.6)	173(6.8)	173(6.8)
Pitch circle dia.	øC	240(9.4)	247(9.7)	241(9.5)	260(10.2)	270(10.6)	240(9.4)	240(9.4)	290(11.4)	299(11.8)	298(11.7)	305(12)	330(10.6)	295(11.6)	295(11.6)
Number of holes	N	8	6	8	12	12	8	8	12	8	8	12	12	8	12
Bolt hole pitch	θ°	22.5	30	22.5	15	15	22.5	22.5	15	22.5	22.5	15	15	22.5	15
Hole dia.	øh	23(0.9)	19(0.7)	23(0.9)	25(1)	22(0.9)	22(0.9)	22(0.9)	23(0.9)	19(0.9)	23(0.9)	25(1.0)	25(1.0)	22(0.9)	22(0.9)
Thickness(A)	T**	30(1.2)**	30(1.2)**	33.4(1.3)**	36(1.4)**	44.5(1.8)**	30(1.2)**	30(1.2)**	30(1.2)**	32(1.3)**	36.4(1.4)**	38(1.5)**	49.1(1.9)**	32(1.3)**	32(1.3)**
Thickness(U)	T**	31(1.2)**	31(1.2)**	34.4(1.4)**	37(1.5)**	45.5(1.8)**	31(1.2)**	31(1.2)**	31(1.2)**	33(1.3)**	37.4(1.5)**	39(1.5)**	50.1(2.0)**	33(1.3)**	33(1.3)**
Weight(General) kg(lb)		29(63.9)	31(68.3)	31(68.3)	37(81.6)	48(105.8)	30(66.1)	31(68.3)	41(90.2)	46(101.2)	49(107.8)	52(114.4)	73(160.6)	45(99.2)	46(101.2)
Weight(Ex-proof) kg(lb)		32(70.6)	34(75.0)	34(75.0)	40(88.2)	51(112.5)	33(72.8)	34(75.0)	46(101.4)	51(112.5)	54(119.1)	57(125.7)	78(172.0)	50(110.3)	51(112.5)

F23.EPS

Process connection : J1 ; JIS10K J2 ; JIS20K A1 ; ANSI 150 A2 ; ANSI 300 D1 ; DIN PN10 D2 ; DIN PN16 G ; JIS F12

250 to 300mm (10 to 16in.) Flange Type





Unit: mm
(approx. inch)

for AE330, AE335, AE340

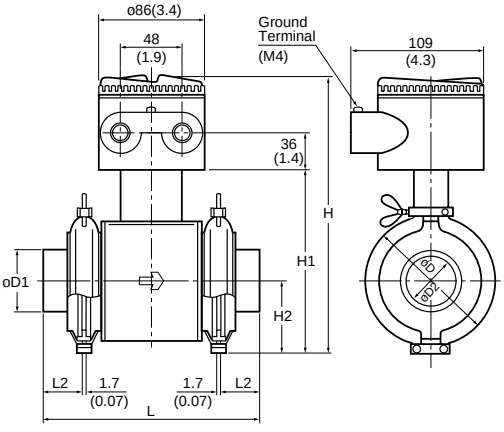
* The face-to-face length is shorter by approx. 6mm(0.24 in.) for non earth ring type of AE325 and AE330, by approx. 10mm(0.39 in.) for non earth ring type of AE335 and AE340.
** The thickness(T) is shorter by approx. 3mm(0.12 in.) for non earth ring type of AE325 and AE330, by approx. 5mm(0.20 in.) for non earth ring type of AE335 and AE340.
*** The height(H) is shorter by approx. 2mm(0.08 in.) for ex-proof type.

Type			General(G), Ex-proof(N)			
Size code			325	330	335	340
Size			250	300	350	400
Lining code			A(PFA) , U(Polyurethane)			
Face-to-face		L*	430(16.9)	500(19.7)	550(21.7)	600(23.6)
Eye bolt hole dia.		e	30(1.2)	30(1.2)	35(1.4)	35(1.4)
JIS 10K	Height	H***	497(19.6)	544(21.4)	587(23.1)	650(25.6)
		H1	454(17.9)	499(19.7)	553(21.8)	623(24.5)
		H2	203(7.9)	226(9.0)	248(9.8)	283(11.1)
	Outer dia.	øD	400(15.8)	445(17.5)	490(19.3)	560(22.0)
	Pitch circle dia.	øC	355(14.0)	400(15.8)	445(17.5)	510(20.1)
	Number of holes	N	12	16	16	16
	Bolt hole pitch	θ°	15	11.25	11.25	11.25
	Hole dia.	øh	25(1.0)	25(1.0)	25(1.0)	27(1.1)
	Thickness(A)	T**	32(1.3)	34(1.3)	36(1.4)	38(1.5)
	Thickness(U)	T**	33(1.3)	35(1.4)	37(1.4)	39(1.5)
	Weight (General) kg(lb)		64(141.1)	81(178.6)	94(207.2)	122(269.0)
	Weight (Ex-proof) kg(lb)		68(149.9)	85(187.4)	100(220.5)	129(284.4)
JIS 20K	Height	H***	512(20.2)	561(22.1)	–	–
		H1	484(19.1)	534(21.0)	–	–
		H2	218(8.6)	243(9.6)	–	–
	Outer dia.	øD	430(16.9)	480(18.9)	–	–
	Pitch circle dia.	øC	380(15.0)	430(16.9)	–	–
	Number of holes	N	12	16	–	–
	Bolt hole pitch	θ°	15	11.25	–	–
	Hole dia.	øh	27(1.1)	27(1.1)	–	–
	Thickness(A)	T**	42(1.7)	44(1.7)	–	–
	Thickness(U)	T**	43(1.7)	45(1.8)	–	–
	Weight (General) kg(lb)		67(147.7)	85(187.4)	–	–
	Weight (Ex-proof) kg(lb)		71(156.5)	89(196.2)	–	–
JIS F12	Height	H***	502(19.8)	553(21.8)	607(23.9)	661(26.0)
		H1	464(18.3)	518(20.4)	593(23.4)	645(25.4)
		H2	208(8.2)	235(9.3)	268(10.6)	294(11.6)
	Outer dia.	øD	410(16.1)	464(18.3)	530(20.9)	582(22.9)
	Pitch circle dia.	øC	360(14.2)	414(16.3)	472(18.6)	524(20.6)
	Number of holes	N	8	10	10	12
	Bolt hole pitch	θ°	22.5	18	18	15
	Hole dia.	øh	23(0.9)	23(0.9)	25(1.0)	25(1.0)
	Thickness(A)	T**	32(1.3)	34(1.3)	36(1.4)	36(1.4)
	Thickness(U)	T**	33(1.3)	35(1.4)	37(1.5)	37(1.5)
	Weight (General) kg(lb)		64(141.1)	81(178.6)	94(207.2)	122(269.0)
	Weight (Ex-proof) kg(lb)		68(149.9)	85(187.4)	100(220.5)	129(284.4)

Type			General(G), Ex-proof(N)			
Size code			325	330	335	340
Size			250	300	350	400
Lining code			A(PFA) , U(Polyurethane)			
Face-to-face		L*	430(16.9)	500(19.7)	550(21.7)	600(23.6)
Eye bolt hole dia.		e	30(1.2)	30(1.2)	35(1.4)	35(1.4)
ANSI 150	Height	H***	500(19.7)	563(22.2)	609(24.0)	668(26.3)
		H1	461(18.1)	537(21.1)	597(23.5)	660(26.0)
		H2	206(8.1)	245(9.7)	270(10.6)	302(11.9)
	Outer dia.	øD	406(16.0)	483(19.0)	533(21.0)	597(23.5)
	Pitch circle dia.	øC	362(14.3)	432(17.0)	476(18.7)	540(21.3)
	Number of holes	N	12	12	12	16
	Bolt hole pitch	θ°	15	15	15	11.25
	Hole dia.	øh	26(1.0)	26(1.0)	29(1.1)	29(1.1)
	Thickness(A)	T**	38(1.5)	40(1.6)	45(1.8)	47(1.9)
	Thickness(U)	T**	39(1.5)	41(1.6)	46(1.8)	48(1.9)
	Weight (General) kg(lb)		70(154.3)	90(198.4)	110(242.5)	145(319.7)
	Weight (Ex-proof) kg(lb)		74(163.1)	94(207.2)	116(255.7)	152(335.1)
ANSI 300	Height	H***	519(20.4)	582(22.9)	–	–
		H1	499(19.7)	575(22.6)	–	–
		H2	225(8.9)	264(10.4)	–	–
	Outer dia.	øD	445(17.5)	521(20.5)	–	–
	Pitch circle dia.	øC	387(15.2)	451(17.8)	–	–
	Number of holes	N	16	16	–	–
	Bolt hole pitch	θ°	11.25	11.25	–	–
	Hole dia.	øh	29(1.1)	32(12.6)	–	–
	Thickness(A)	T**	56(2.3)	59(2.3)	–	–
	Thickness(U)	T**	57(2.2)	60(2.4)	–	–
	Weight (General) kg(lb)		75(165.4)	98(216.1)	–	–
	Weight (Ex-proof) kg(lb)		79(174.2)	102(224.9)	–	–
DIN PN10	Height	H***	495(19.5)	544(21.4)	595(23.4)	652(25.7)
		H1	449(17.7)	499(19.7)	568(22.4)	628(24.7)
		H2	201(7.9)	226(9.0)	256(10.0)	286(11.3)
	Outer dia.	øD	395(15.6)	445(17.5)	505(20.0)	565(22.2)
	Pitch circle dia.	øC	350(13.8)	400(15.8)	460(18.1)	515(20.3)
	Number of holes	N	12	12	16	16
	Bolt hole pitch	θ°	15	15	11.25	11.25
	Hole dia.	øh	22(0.9)	22(0.9)	22(0.9)	26(1.0)
	Thickness(A)	T**	34(1.3)	34(1.3)	36(1.4)	36(1.4)
	Thickness(U)	T**	35(1.4)	35(1.4)	37(1.5)	37(1.5))
	Weight (General) kg(lb)		64(141.1)	81(178.6)	94(207.2)	122(269.0)
	Weight (Ex-proof) kg(lb)		68(149.9)	85(187.4)	100(220.5)	129(284.4)
DIN PN16	Height	H***	500(19.7)	551(21.7)	–	–
		H1	459(18.1)	514(20.2)	–	–
		H2	206(8.1)	233(9.2)	–	–
	Outer dia.	øD	405(15.9)	460(18.1)	–	–
	Pitch circle dia.	øC	355(14.0)	410(16.1)	–	–
	Number of holes	N	12	12	–	–
	Bolt hole pitch	θ°	15	15	–	–
	Hole dia.	øh	22(0.9)	22(0.9)	–	–
	Thickness(A)	T**	34(1.3)	36(1.4)	–	–
	Thickness(U)	T**	35(1.4)	37(1.5)	–	–
	Weight (General) kg(lb)		65(143.3)	82(180.8)	–	–
	Weight (Ex-proof) kg(lb)		69(152.1)	86(189.6)	–	–

F24.EPS

Sanitary, Remote Magnetic Flow Tube AE200DH



Unit: mm
(approx. inch)

Type		Sanitary(H)					
Size code		202	204	205	206	208	210
Size		25(1)	40(1.5)	50(2)	65(2.5)	80(3)	100(4)
Lining		PFA lining					
Face-to-face	L	176(6.9)	186(7.3)	206(8.1)	206(8.1)	246(9.7)	272(10.7)
Ferrule length	L2	43(1.7)	41(1.6)	44(1.7)	44(1.7)	44(1.7)	44(1.7)
Ferrule outer dia.	D1	25(1.0)	38(1.5)	51(2.0)	64(2.5)	76(3.0)	102(4.0)
Ferrule inner dia.	D2	23(0.9)	36(1.4)	48(1.9)	60(2.4)	72(2.8)	98(3.9)
Clamp outer dia.	D	74(2.9)	90(3.5)	103(4.1)	122(4.8)	131(5.2)	171(6.7)
Height	H	212(8.3)	235(9.3)	248(9.8)	260(10.2)	277(10.9)	329(13.0)
Height	H1	126(5.0)	149(5.8)	162(6.4)	174(6.9)	191(7.5)	243(9.6)
Height	H2	49(1.7)	61(2.4)	67(2.6)	70(2.8)	81(3.2)	111(4.4)
Weight kg (lb)		3.5(7.7)	4.6(10.1)	6.0(13.2)	7.6(16.8)	9.9(21.8)	15.4(33.8)

F28.EPS

6. EXPLOSION PROTECTED TYPE INSTRUMENT

In this section, further requirements and differences for explosion proof type instrument are described. For explosion proof type instrument, the description in this chapter is prior to other description in this User's Manual.

NOTE

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

CAUTION

Be sure to lock the cover with the special screw using the Hexagonal Wrench attached after tightening the cover.

6.1 ATEX Directive

WARNING

Only trained persons use this instrument in industrial locations.

(1) Technical Data

- No. KEMA 02ATEX2022
  Type of Protection : EEx dem[ia]IIC T6...T3 Group II Category 2 G
  Electrode circuit Um : 250V ac/dc
  Excitation Circuit : 130Vmax. 72/75Hz

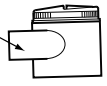
Temp. Class	T6	T5	T4	T3
Process Temp	70	85	120	150°C

  Enclosure : IP67

(2) Electrical Connection

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

Screw Size	Marking
ISO M20x1.5 female	⚠ M
ANSI 1/2NPT female	⚠ A



(3) Installation

WARNING

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

(4) Operation

WARNING

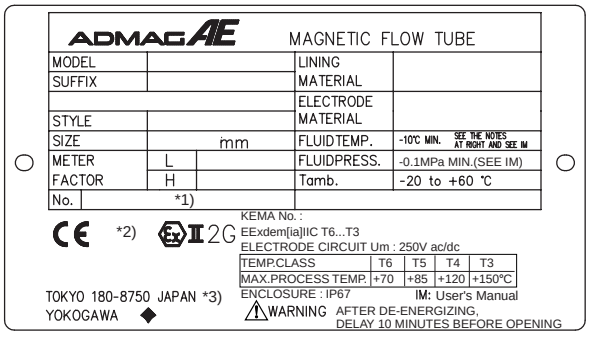
- Wait 10min. after power is turned off, before opening the covers.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

(5) Maintenance and Repair

WARNING

The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the certification.

(6) Data Plate



MODEL : Specified model code
SUFFIX : Suffix codes of the model code
STYLE : Specified style code

SIZE : Nominal size of apparatus
METER FACTOR : Sensor constant number of apparatus
LINING MATERIAL : Material of liner
ELECTRODE MATERIAL : Material of electrodes
FLUIDTEMP. : Fluid temperature of apparatus
FLUIDPRESS : Fluid pressure of apparatus
Tamb : Ambient temperature
No. : Manufacturing serial number
CE : CE marking
ExII 2G : Group II Catergory 2 Gas atomosphere
KEMA No. : KEMA 02ATEX2022 : Certificate number
EExdem[ia]IICT6...T3 : Protection type and temp. class
ELECTRODE CIRCUIT Um : Voltage of electrode circuit
ENCLOSURE : Enclosure protection number
IM : User's Manual

⚠ **WARNING**: Warning to apparatus
YOKOGAWA ◆ TOKYO 180-8750 JAPAN :
Name and address of manufacturer

*1) The third figure from the last shows the last one figure of the year of production. For example, the year of production of the product engraved as follows is year 1998.

No. F261GA091 813
↑
Produced in 1998

*2) The identification number of the notified body : 0344

*3) The product-producing country

6.2 FM

(1) Technical Data

- Explosionproof for Class I Division 1 Groups A, B, C & D. Dust-ignitionproof for Class II/III Division 1 Groups E, F & G. Intrinsically safe (electrode) for Class I Division 1 Groups A, B, C & D
  Electrode circuit Vmax : 250V ac/dc
  Temp. Class. T6
  Enclosure : NEMA 4X
- Nonincendive for Class I, Division 2, Groups A, B, C & D ; Suitable for Class II, Division 2, Groups F & G ; Class III, Division 1 and 2
  Intrinsically safe (electrode) for Class I Division 1 Groups A, B, C & D
  Electrode Circuit Vmax : 250V ac/dc
  Excitation Circuit : 130Vp 72/75Hz
  Temp. Code : T5
  Enclosure : NEMA 4X

(2) Installation

⚠ **WARNING**

- All wiring shall comply with national electrical code ANSI/NFPA 70 and local electrical code.
- In hazardous locations, wiring to be in conduit as shown in Figure 12.2.1.

(3) Operation

⚠ **WARNING**

- Open circuit before opening the covers and seal all conduits with in 18 inches in hazardous locations.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

(4) Maintenance and Repair

⚠ **WARNING**

The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the approval of Factory Mutual Research Corporation.

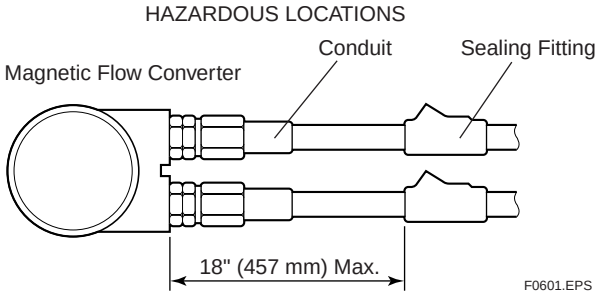


Figure 6.2.1 Conduit Wiring

6.3 CSA

(1) Technical Data

- Explosionproof for Class I, Division 1, Groups C & D ; Dust-ignitionproof Class II/III, Division 1 Groups E, F & G. Intrinsically safe (electrode) for Class I Division 1 Groups A, B, C & D
  Electrode Circuit Vmax: 250V ac/dc

Temp. Code	T6	T5	T4	T3
Process Temp	70	85	120	150°C

  Enclosure: Type 4
- Nonincendive for Class I, Division 2, Groups A, B, C & D ; Suitable for Class II, Division 2, Groups E, F and G ; Class III, Division 1
  Intrinsically safe (electrode) for Class I Division 1 Groups A, B, C & D
  Electrode Circuit Vmax: 250V ac/dc
  Excitation Circuit: 130Vp 72/75Hz, 11VAmax

Temp. Code	T5	T4	T3
Process Temp	85	120	150°C

  Enclosure: Type 4

(2) Installation

WARNING

All wiring shall comply with Canadian Electrical Code Part I and Local Electrical Codes.
In hazardous location, wiring shall be in conduit as shown in Figure 12.3.1.

CAUTION : SEAL ALL CONDUITS WITHN 50cm OF THE ENCLOSURE' UN SCELLEMENT DOIT ÉTRE INSTALLÉ À MOINS DE 50cm DU BOÎTIER.

(3) Operation

WARNING

CAUTION : OPEN CIRCUIT BEFORE REMOVING COVER.
OUVRIR LE CIRCUIT AVANT D'ENLEVER LE COUVERCLE.

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

(4) Maintenance and Repair

WARNING

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

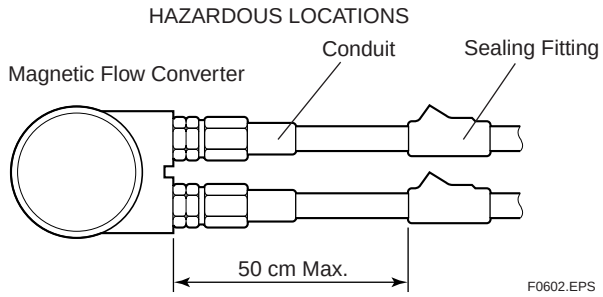


Figure 6.3.1 Conduit Wiring

6.4 SAA

WARNING

Only trained persons use this instrument in industrial locations .

(1) Technical Data

- **SAA :**

SA Certificate No.	AUS Ex 3210X			
Type of Protection	Ex dm(ia)II C T6 IP67			
Electrode Circuit Um	250V ac/dc			
Excitation Circuit130Vp	72/75Hz			
Temperature Class	T6	T5	T4	T3
Process Temperature	70	85	120	150°C

(2) Installation

WARNING

- All wiring shall comply with local installation requirements and local electrical code.
- In hazardous locations, the cable entry devices shall be of a certified flameproof type, suitable for the contidions of use and correctrly installed.

(3) Operation

WARNING

- Open circuit before opening the covers.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

(4) Maintenance and Repair

WARNING

The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the certification.

7. PRESSURE EQUIPMENT DIRECTIVE

This chapter is described further requirements and notices concerning the PED (Pressure Equipment Directive). The description in this chapter is prior to other description in this User's Manual.

(1) Technical Data

Module : H
Type of Equipment : Piping
Type of Fluid : Liquid and Gas
Group of Fluid : 1 and 2

General Purpose / Explosion Proof

MODEL	DN (mm)*	PS (MPa)*	PS·DN (MPa·mm)	CATEGORY**
AE102DG/DN	2.5	4	10	Article 3, *** paragraph 3
AE105DG/DN	5	4	20	Article 3, *** paragraph 3
AE110DG/DN	10	4	40	Article 3, *** paragraph 3
AE115DG/DN	15	4	60	Article 3, *** paragraph 3
AE202DG/DN	25	4	100	Article 3, *** paragraph 3
AE204DG/DN	40	4	160	II
AE205DG/DN	50	4	200	II
AE206DG/DN	65	2	130	II
AE208DG/DN	80	2	160	II
AE210DG/DN	100	2	200	II
AE212DG/DN	125	2	250	II
AE215DG/DN	150	2	300	II
AE220DG/DN	200	2	400	III
AE325DG/DN	250	2	500	III
AE330DG/DN	300	2	600	III
AE335DG/DN	350	1	700	III
AE340DG/DN	400	1	800	III

T0701.EPS

Sanitary

MODEL	DN (mm)*	PS (MPa)*	PS·DN (MPa·mm)	CATEGORY**
AE202DH	25	1	25	Article 3, *** paragraph 3
AE204DH	40	1	40	I
AE205DH	50	1	50	I
AE206DH	65	1	65	I
AE208DH	80	1	80	I
AE210DH	100	1	100	I

T0702.EPS

* PS: Maximum allowable pressure for Flow Tube
DN: Nominal size

** Referred to Table 6 covered by ANNEX II of EC Directive on Pressure Equipment Directive 97/23/EC)

*** AE102DG/DN to AE202DG/DN, and AE202DH are not attached CE mark of PED because they do not come under CE marking of PED.

(2) Installation

WARNING

- Please tighten the bolts for piping-joint according to the prescribed torque values.
- Please take measure to protect the flowmeters from forces caused by vibration through piping.

(3) Operation

WARNING

- The temperature and pressure of fluid should be applied under the normal operating condition.
- The ambient temperature should be applied under the normal operating condition.
- Please pay attention to prevent the excessive pressure like water hammer, etc. When water hammer is to be occurred, please take measures to prevent the pressure from exceeding PS(maximum allowable pressure) by setting the safety valve, etc. at the system and the like.
- When external fire is to be occurred, please take safety measures at the device or system not to influence the flowmeters.
- Please avoid the fluid exceeding the corrosion proof of lining and electrode.
- Please pay attention not to be abrade the metal pipe, when the fluid to abrade the lining such as slurry and sand are contained.