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MagneW 3000 FLEX / PLUS Smart Electromagnetic Flowmeter Explosion-proof type Detector

Model: MGG15 for TIIS, MGG17 for FM/CSA

User's Manual



Azbil Corporation

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Preface

Thank you for purchasing the MagneW 3000 FLEX/PLUS Smart Electromagnetic Flowmeter. This product is a highly reliable, high performance electromagnetic flowmeter developed based on our extensive experience in the field.

The unique high-quality lining molding technique and many other special features make this product deliver outstanding flow rate measurement.

Unpacking and Inspection

Unpacking the MagneW 3000	This device is a precision instrument and should be handled with care to pre- vent damage or breakage.
	After unpacking the device, verify that the following items are included:
	 The detector itself Standard accessories Precautions for Installation sheet If you have any questions regarding the specifications of your MagneW 3000,
Verifying specifications	The specifications of this device are written on its attached identification plate. Compare these specifications with those listed in the Appendix A, "Device Standard Specifications and Model Numbers," and verify that all specifications on the plate are correct, paying special attention to the follow- ing:
	 Detector bore diameter Electrode material Flange rating Grounding ring material
Inquiries	If you have any questions regarding the specifications of this device, contact your nearest Azbil Corporation office or Azbil Corporation representative. When making an enquiry, be sure to provide the model number and product number of this device.
Storage	When storing this device before use, observe these precautions:
precautions	Store it indoors at room temperature and humidity, in a place safe from vibration or shock.Store it in the same condition as it was shipped.
	When storing this device after use, follow these steps:
	1. Rinse the inside of the detector with water to eliminate residual fluids, then allow to dry.
	2. Firmly attach the terminal box cover and the electrode cover in order to keep out moisture.
	 Replace the detector in its original packaging. Store the device indoors at room temperature and humidity, in a place safe from vibration or shock.

Safety Precautions

Introduction	Correct installation, correct operation and regular maintenance are essential to ensure safety during the use of this device. Read and understand the safety precautions described in this manual and be sure to follow the instructions on installation, operation and maintenance.	
Signal words Safety precautions in this manual are of two kinds —Warning as The meaning of these flags is as follows:		his manual are of two kinds —Warning and Caution. flags is as follows:
	\land Warning	Potentially hazardous situation which, if not avoided, could result in death or serious injury.
	A Caution	Failure to observe these precautions may produce dangerous conditions that could result in injury to the user or in physical damage.

How this Manual is Organized and Used

Organization and method of use

This manual explains the use of the device and its associated devices in the following order:

Chapter 1

The configuration of measuring systems using this product, the structure of the detector, and the names and functions of the respective parts.

Chapter 2

Installation and wiring of the device. Persons installing this unit or the pipes or wiring should refer to this chapter.

Chapter 3

Maintenance and inspection procedures and troubleshooting. Items which require routine maintenance are explained here.

Detailed Table of Contents

Chapter 1 -	Configuration and Structure of the Measuring		
	System	1 •	1
	Introduction	1 -	• 1
1-1	System Configuration	1 -	- 2
	Measuring System	1 -	2
1-2	Structure of this Unit and Functions of Parts	1 -	. 3
	Detector	1 -	. 3
	Detector Terminal Box	1 -	8
1-3	Use of Explosion-proof Electromagnetic Flowmeters for TIIS	1	- 9
1-4	Use of Explosion-proof Electromagnetic Flowmeters		
	for FM/CSA	1 -	11
Chapter 2 -	Installing the Device	2 ·	1
	Introduction	2 -	• 1
2-1	Before Installing	2 ·	- 2
	Criteria for Selecting the Installation Site	2 ·	. 3
	Directions of the Terminal Box and the Converter	2 ·	6
2-2	Method of Installation	2 ·	8
2-2-1	Installing a Wafer Detector	2 -	8
	Basic Installation Method	2 ·	. 8
	Parts Necessary for Installation	2 -	11
	Selecting an Installation Method	2 ·	13
	Installation on a Pipe	2 -	14
2-2-2	Installing a Flanged Detector	2 ·	26
	Basic Installation Method	2 ·	26
	Parts Necessary for Installation	2 ·	32
	Selecting an Installation Method	2 ·	33
	Installation on a Pipe	2 -	34
	Electrical Wiring	2 -	42
•		_	
Chapter 3 -	Maintenance of the Device	3.	1
	Introduction	3 -	• 1

Index

Appendixes A

Standard Specifications and Model Numbers External View of the Unit

Figures and Tables

Figure 1-1	Integral Configuration 1 - 2
Figure 1-2	Remote Configuration 1 - 3
Figure 1-3	Details of the Detector 1 - 4
Figure 1-4	Details of the Wafer Detector 1 - 6
Figure 1-5	Details of the Flanged Detector 1 - 8
Figure 1-6	Detector Terminal Box 1 - 10
Figure 2-1	Proper Placement of the Detector 2 - 4
Figure 2-2	Straight Pipe Section on the Upstream Side of the
	Detector 2 - 4
Figure 2-3	Space Allowance for Inspections 2 - 5
Figure 2-4	Repositioning the Terminal Box or Converter 2 - 7
Figure 2-5	Device Installation Example 2 - 8
Figure 2-6	Flange Shape 2 - 9
Figure 2-7	Examples of Unacceptable Installation (1) 2 - 10
Figure 2-8	Examples of Unacceptable Installation (2) 2 - 10
Figure 2-9	Horizontal Centering of the Detector 2 - 11
Figure 2-10	Vertical Centering of the Detector 2 - 11
Figure 2-11	Installation Using SUS Material Grounding Ring and Metal
0	Pipe
Figure 2-12	Installation Using Non-SUS Material Grounding Ring and
0	Metal Pipe 2 - 20
Figure 2-13	Example of Incorrect Installation 2 - 20
Figure 2-14	Installation Using SUS Material Grounding Ring 2 - 22
Figure 2-15	Installation Using SUS Material Grounding Ring
3	(with protective plate)
Figure 2-16	Installation Using SUS Material Grounding Ring
g	(with rubber gasket)
Figure 2-17	Installation Using the Grounding Ring of Non-SUS
	Material
Figure 2-18	Installation Using the Grounding Bing of Non-SUS Material
	(with protective plate)
Figure 2-19	Installation Using the Grounding Bing of Non-SUS Material
riguio 2 ro	(with rubber gasket) 2 - 25
Figure 2-20	Installation Example 2 - 26
Figure 2-21	Flange Shape 2 - 30
Figure 2-22	Example of Incorrect Mounting 2 - 31
Figure 2-23	Installation Using Grounding Bings of SUS Material 2 - 34
Figure 2-23	Installation Using Grounding Ring Made of Non-SUS
	Material 2 - 36
Figuro 2-25	Example of Incorrect Installation 2 - 36
Figure 2-25	Installation Using SUS Matorial Grounding Ding 2, 28
Figure 2-20	Detector Installation Using SUS Material Grounding Fing
Figure 2-27	(with protoctive ploto)
	(with protective plate)
Figure 2-28	Cither becaused at
Figure 0.00	(With rubber gasket)
Figure 2-29	Detector Installation Using Non-SUS Material Grounding
	Hing
⊢igure 2-30	Detector Installation Using Non-SUS Material Grounding Ring
	(with protective plate) 2 - 41

Figure 2-31	Detector Installation Using Non-SUS Material Grounding Ri (with rubber gasket)	ing 2 - 41
Figure 2-32	Connection Using a Special Cable 2	2 - 42
Figure 2-33	Grounding Via the External Grounding Terminal 2	2 - 43
Figure 2-34	Example of Installation (union assembly) 2	2 - 44
Figure 2-35	Example of Installation 2	2 - 45
Table 2-1	Fastening Torque Levels 2	2-9
Table 2-2	Recommended Inner Diameters of Gaskets 2	2 - 12
Table 2-3	Inner and Outside Diameters of Rubber Gaskets	
	(0.5 to 1 mm thick) 2	2 - 12
Table 2-4	Inner and Outside Diameters of Rubber Gaskets	
	(3 to 4 mm thick) 2	2 - 12
Table 2-5	Fastening Torque 2	2 - 27
Table 2-6	Recommended Inner Diameters of Gaskets 2	2 - 32
Table 2-7	Fastening Torque 2	2 - 44

Chapter 1 - Configuration and Structure of the Measuring System

Introduction This chapter explains the configuration of measuring systems using this unit.

• The structure of this unit and the names and functions of its respective parts are explained.

1-1 System Configuration

Measuring System



1-2 Structure of this Unit and Functions of Parts

Detector	
Explanation	 The functions and structure of the device are as follows. When a fluid passes through the detector, the detector generates an electromotive force signal proportional to the flow rate. The electrodes are both mounted horizontally.
Names of major parts of the wafer type	Figure 1-2 shows the structure of the detector and the names of the major parts. Figure 1-2 Details of the Detector Grounding terminal Pressure-resistant packing cable adapter (only for TIIS) Flow direction mark Grounding ring Mounting screw
	\ <u>(4 places)</u>

Names and functions of parts

This table explains the major parts of the detector.

Name	Function
Flow direction mark	 Indicates the direction of fluid flow. Mount the detector so that the measured fluid flows in the direction indicated by this mark.
Electrodes	 The electrodes generate an electromotive force signal proportional to the flow rate of the fluid passing through the detector. The electrode material varies depending on the corrosion characteristics of the fluid to be measured.
Electrode cover	 Houses the electrodes. Do not remove the cover with the detector installed on a pipe.
Grounding ring	 The electrode material varies according to the corrosive characteristics of the fluid to be measured. Also, the structure varies with the material.
Terminal box	 Houses the connection terminals used to apply a standard voltage. Houses excitation and signal terminals.
Terminal box cover (remote model only)	 Keep the terminal box cover on during operation.
Pressure-resistant Pack- ing Cable Adapter	• Seals the cable terminal to assure and enhance ex- plosion-proof capability, insulation resistance and mechanical strength. Required for any explosion- proof instrumentation.

 To prevent the gas or liquid in the pipe from escaping do not remove the electrode cover or the electrodes when the detector is installed on a pipe. Names of major parts of the flange type Figure 1-3shows the structure of the detector and the names of its major parts.





Names and functions of parts

This table explains the major parts of the detector.

Name	Function
Flow direction mark	 Indicates the direction of fluid flow. Mount the detector so that the measured fluid flows in the direction indicated by this mark.
Electrodes	 The electrodes generate an electromotive force signal proportional to the flow rate of the fluid passing through the detector. The electrode material varies depending on the corrosion characteristics of the fluid to be measured.
Electrode cover	 Houses the electrodes. Do not remove the cover with the detector installed on a pipe.
Grounding ring	 The electrode material varies according to the corrosive characteristics of the fluid to be measured. Also, the structure varies with the material.
Terminal box	 Houses the connection terminals used to apply a standard voltage. Houses excitation and signal terminals.
Terminal box cover (remote model only)	 Keep the terminal box cover on during operation.
Pressure-resistant Pack- ing Cable Adapter	• Seals the cable terminal to assure and enhance explosion-proof capability, insulation resistance and mechanical strength. Required for any explosion-proof instrumentation.

Warning

 To prevent the gas or liquid in the pipe from escaping do not remove the electrode cover or the electrodes when the detector is installed on a pipe.





Figure 1-5 Details of the cable adapter with flameproof packing



Detector Terminal Box

Names of parts





Names and explanations of parts

The table below explains the major parts of the detector terminal box.

Name	Explanation
Signal terminals	These are marked A, B, and C.
Excitation terminals	These are marked X and Y.
Conduit wiring connectors	 The excitation cable and the signal cable are wired through these connectors.
Grounding terminal	This terminal is used to ground the detector (class 3 grounding).

• Turn off power to the converter side before wiring, to avoid electric shock.

A Caution

 Be sure to ground the detector without fail (class 3 grounding). Insufficient grounding could cause output fluctuation, instability of the zero point, or output drift.

1.3 Use of Explosion-proof Electromagnetic Flowmeters for TIIS

Before use	This flowmeter is of flameproof structure. Read this item carefully to ensure correct use.
Flameproof structure	Flameproof structure means a totally enclosed housing that is capable of with- standing an explosion of a gas or vapor within it, and of preventing the igni- tion of an explosive gas or vapor that may surround it.
Location guide- lines	Install the flowmeter in accordance with the following guidelines: • The flowmeter can be installed in hazardous areas of grade:
	$\underbrace{\mathbf{HC}}_{1} \underbrace{\mathbf{T4}}_{2}$
	1. Explosive gaseous atmosphere graded IIC

2. Gaseous atmosphere where the ignition temperature is 135°C or greater

This means that the flowmeter can only be installed in Class I and II locations. It cannot be installed in Class 0 locations.

- When installing the flowmeter in a hazardous or non-hazardous area, refer to the installation specifications described in the appendix for the correct wiring.
- The pressure-resistant packing cable adapter must be placed in the signal wire outlet of the flowmeter converter. Use the adapter supplied.
- Handle the flowmeter case and cover carefully to prevent any damage or distortion. Properly tighten the converter cover and never open it during operation.

The specified explosion capability cannot be guaranteed if any of the above guidelines are ignored.

When wiring the flowmeter in a Class 1 Hazardous Area, or in any area where only low voltage wiring work is allowed, follow procedures published by the Research Institute of Industrial Safety. Nameplates

The flowmeter is required to pass a certified examination conducted in accordance with Industrial Safety and Hygiene Regulations. The Industry Safety Engineering Association authorizes the flowmeter to carry a certified nameplate only after passing the examination.

Figure 1.6 Certified Nameplate



1.4 Use of Explosion-proof Electromagnetic Flowmeters for FM/CSA

Before use	This flowmeter is of flame-proof (Explosion-protection) structure. Read this item carefully to ensure correct use.
Flameproof (Explosion- protection) structure	Flameproof structure means a totally enclosed housing that is capable of with- standing an explosion of a gas or vapor within it, and of preventing the igni- tion of an explosive gas or vapor that may surround it.
Location guidelines	Install the flowmeter in accordance with the following guidelines: 1. FM/CSA
	FM/CSA Explosion-proof model THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS I, II, III, DIVISION 1, GROUPS (B, C, D, E, F, G). CAUTION:
	 power supply and internal voltage of ordinary equipment to the earth shall not exceed AC250V 50/60HZ, DC250V in case of normal /formal condi- tions.
	(2) ambient temperature is from -10 to 60° C
	(3) Process temperature is from -40 to 160°C



Chapter 2 - Installing the Device

Introduction This section describes the installation and wiring of Electromagnetic Flowmeter.

The required parts and method for installing this device may vary slightly depending on the material of the wetting ring and the pipe.

Installation is explained in the following order:

- Criteria for selecting the installation environment
- An outline of the method of installing the device
- Detailed methods of installation depending on the material

Criteria for Selecting the Installation Site (1)

Introduction	In order to make full use of the functions of the device, select an optimal installation site by following the selection criteria below.
Environment	▲ Caution
	 Install the unit in a location with an ambient temperature of -25 to +60°C and a relative humidity of 5% to 100%. Failing to meet these requirements could cause output errors.
	 Install the unit away from high-current power lines, motors and transformers to prevent damage from electromagnetic induction. Failing to meet this requirement could cause output errors.
	 Do not install the unit in a location subject to severe vibration or a highly corrosive atmosphere. Failing to meet this requirement could break the neck of the detector or cause other damage.
	 As far as possible, install the unit out of direct sunlight. Failing to meet this requirement could cause output errors.
Fluid to be	
measured	<u>Caution</u>
	The location for your MagneW 3000 must satisfy the following condi- tions. Failing to meet these requirements could cause output errors and fluctuations.
	• A location where the conductance of the fluid to be measured matches the stated specification (specs. vary according to the converter used) and is more or less constant.
	• A location where the fluid to be measured can be regarded as elec- trochemically uniform. For example, if two fluids are mixed at an upstream point, the two fluids should be uniformly mixed by the time they reach the measurement point.
	 A location where the distribution of suspended matter, if any, can be regarded as nearly uniform

Criteria for Selecting the Installation Site (1) Continued

Fluid to be measured (continued) The fluids listed below could cause measurement trouble. Do not use this device, therefore, even if their conductance, temperature, and pressure fall within the specifications of the device (see Appendix A, "Device Standard Specifications and Model Numbers.") (1) Fluids that have sufficient conductance at high temperatures but do not satisfy the conductance requirements at room temperature (about 20°C) (Examples: fatty acids and soap) (2) Certain fluids that contain surfactants (Examples: rinses, shampoos, and CWM) (3) Conductive adherents (Example: deposition of rosin + conductive material) (4) Insulating adherents (Examples: oil, kaolinite, kaolin, and calcium stearate) **Precautions to ▲** Caution observe after installing (1) After installing this unit, do not use it as a foothold as this can damage the unit. (2) With the integrated detector, be careful not to break the glass in the detector window.

Warning

(1) When removing this unit, make sure there is no residual liquid or pressure inside the piping and the detector. Any residual liquid or pressure can cause injury.

Criteria for Selecting the Installation Site (2)

Detector position

• Position the detector so that its internal detector passage is continuously filled with the fluid being measured. Figure 2-1 shows examples of positions that fulfill this condition.

Figure 2-1 Proper Placement of the Detector



A Caution

- Fill the pipe with liquid and install the detector in a location that satisfies the conditions circled above. If the pipe is not filled it can cause an output error.
- When the fluid to be measured is of high viscosity, connecting the detector to a vertical pipe is recommended (in order to secure an axial symmetrical flow). The fluid must flow from the top down.
- Install a straight pipe section between the upstream and downstream positions. For the length of the straight pipe section, refer to the figure below.

Figure 2-2 Straight Pipe Section on the Upstream Side of the Detector (D: nominal bore diameter of the detector)



Criteria for Selecting the Installation Site (2) Continued

Detector position (continued)

- Although a pipe section is not necessary on the downstream side, secure a section of at least 2D if drift current or similar is likely.
- Select a place where there is no major pulse flow. (Install the detector in a location distant from a pump.)
- Secure the space required for inspection of the terminal box.

Figure 2-3 Space Allowance for Inspections



Directions of the Terminal Box and the Converter

Introduction	In some local unsuitable if t nal box or the After selectir the converter	tions, the direction of the terminal box or the converter may be the detector is installed as it is shipped. In such a case, the termi- e converter can be repositioned. In a installation site, adjust the direction of the terminal box or in advance by the two methods shown below.
Repositioning the terminal box or converter	The terminal the procedure	box or the converter can be repositioned at right angles. Follow e below.
	Step	Procedure
	1	Using an M5 hex wrench, remove the four screws securing the terminal box or converter.
	2	Holding the detector, rotate the terminal box or converter hori- zontally to the desired position.
		∴ Caution
		 Do not rotate the unit more than 180° (one half rotation). Any greater rotation can break wiring parts. If the terminal box or converter is removed, make sure that the O-ring, which provides an air-tight seal, is still fitted into the O-ring groove.
	3	Using a hex wrench, re-tighten the four screws to secure the termi- nal box or converter.

Directions of the Terminal Box and the Converter Continued

Repositioning the terminal box or converter (continued)



• After removing the screws, do not pull hard on the terminal box or converter. Otherwise, the lead wire inside can break.

2-2-1 Installing a Wafer Detector Basic Installation Method



Fastening torque

▲ Caution

• Table 2-1 shows the fastening torque for each pipe bore. Using centering hardware, apply the prescribed fastening torque to prevent any liquid leak from the pipe.

 Table 2-1
 Fastening Torque Levels

Nominal Detector Bore	Fastening Torque
2.5 - 15A	13-18N•m (130-180kgf•cm)
25A	20-30N•m (200-300kgf•cm)
40A 50A 65A 80A	30-50N•m (300-500kgf•cm)
100A	50-70N•m (500-700kgf•cm)
125A 150A	80-100N•m (800-1000kgf•cm)
200A	90-100N•m (900-1000kgf•cm)

Flange shape

The flanges used should be such that the area of contact with the gasket is maximized, as shown in Figure 2-6.

Figure 2-6 Flange Shape



A Caution

- Before installing the detector be sure to flush out any foreign matter that may be present in interior passage of the detector. Residual foreign matter could cause output fluctuations.
- Do not touch the electrodes or allow oil or fat to come into contact with them. It could cause output fluctuations.
- Align the flow direction mark on the detector with the direction of the liquid flow. Misalignment could result in a negative output.

Basic Installation Method Continued

Flange shape

(continued)

A Warning

 Before installing the detector make sure that the pipe is exactly straight and centered. Any irregularity in these respects could cause leakage or other hazards.





ACaution

• Never force the device between two flanges when the space is too narrow. It can damage the unit.





Warning

 Ensure the bore diameters of the pipe and the detector are exactly the same, install the detector so that the gasket does not protrude into the inner bore of the pipe, as this could result in leakage or other hazards.

ACaution

 Tighten each bolt a little at a time and apply uniform pressure to all the bolts while fastening them. If leakage does not stop on completion of fastening, make sure that the pipe is not off center, then tighten the bolts little by little. Install the detector carefully so that the fastening torque does not exceed the prescribed limit; otherwise the unit could be damaged.

Parts Necessary for Installation

Introduction The following parts are necessary for the installation of the detector: • Centering nuts (four supplied) • Connecting bolts and nuts (available separately) • Gaskets: Required when using grounding rings made of SUS material. Not required when using grounding rings made of hastelloy, titanium, tantallum, or platinum. • Protective plate: Required when connecting the detector to polyvinyl chloride (PVC) piping. **Centering nuts** To install the detector, use centering nuts to ensure the exact alignment of the pipe and the detector. Slip the centering bolts onto the through-bolts, and set the detector on top of the nuts so that the nuts are on four sides of the detector. The positions of the centering nuts depend on the direction in which the detector is installed. For the positions of the centering nuts, refer to Figures 2-9 and 2-10. Figure 2-9 Horizontal Centering of the Detector (Position two centering nuts against each flange.) Flange







Gaskets

Gaskets are supplied with the grounding ring, except when it is made of SUS material. Secure gaskets when you use a grounding ring made of SUS material. We recommend gasket material such as joint sheet or PTFE. For the bore diameters of the gaskets, refer to Table 2-2. We do not recommend the use of rubber gaskets. Observe the precautions below.

A Caution

- Too small a gasket diameter may affect the flow velocity distribution resulting in inaccurate measurements.
- Too large a gasket diameter may cause leakage. Also, any solid substance in the fluid to be measured could accumulate between the gasket and the flange, resulting in inaccurate measurements.

Table 2-2 Recommended Inner Diameters of Gaskets

(Unit: mm)

												Unit:	
Bore dia.	2.5A	5A	10A	15A	25A	40A	50A	65A	80A	100A	125A	150A	200A
Dimensions													
Inner	6.5	6.5	11.5	16.5	25.5	40.5	52	65	79	104	127	151	200
diameter	±1	±1	±1	±1	±1	±1	±1	±1	±1	±1	±1	±1	±1

If you install the detector at a lower torque level using rubber gaskets, you must use gaskets with the bore and outside diameters shown in Table 2-5 for the respective pipe bore. Depending on the grounding ring material, two gaskets of different thicknesses may be required. (See Figure 2-16 on page 2-23 and Figure 2-19 on page 2-25.)

 Table 2-3
 Inner and Outside Diameters of Rubber Gaskets (0.5 to 1 mm thick)

 (Unit: mm)

Bore dia. Dimensions	2.5A	5A	10A	15A	25A	40A	50A	65A	80A	100A	125A	150A	200A
Inner	6.5	6.5	11.5	16.5	25.5	40.5	52	65	79	104	127	151	200
diameter	±1	±1	±1	±1	±1	±1	±1	±1	±1	±1	±1	±1	±1
Outside	34	34	34	34	50	75	91	111	121	146	177	207	257
diameter	±1	±1	±1	±1	±1	±1	±1	±1	±1	±1	±1	±1	±1

 Table 2-4 Inner and Outside Diameters of Rubber Gaskets (3 to 4 mm thick)

 (Unit: mm)

Bore dia. Dimensions	2.5A	5A	10A	15A	25A	40A	50A	65A	80A	100A	125A	150A	200A
Inner diameter	6.5 ±1	6.5 ±1	11.5 ±1	16.5 ±1	25.5 ±1	40.5 ±1	52 ±1	65 ±1	79 ±1	104 ±1	127 ±1	151 ±1	200 ±1
Outside diameter	34	34	34	34	50	68	84	104	114	139	166	190	240

ACaution

• The necessary materials and the installation method vary according to the material of the ring and that of the pipe on which the detector is to be installed. Select the appropriate method of installation after confirming the specifications of the detector to be installed and the conditions of installation. Improper installation may result in leakage or damage to the pipe flanges.

Installation method according to materials

Select the appropriate installation method from the table below.

Pipe material	Grounding Ring Material	See Page
Motal	SUS material	2-18
Metal	Non-SUS material	2-19
PVC	SUS material	2-21
	Non-SUS material	2-24

Installation on Horizontal Pipe

• Improper installation may result in leakage or damage to the pipe flanges.

Parts required

The following parts are required:

- Through-bolts and nuts
- Centering nuts
- Gaskets: The required gasket material will vary according to the material of the pipe on which the detector is to be installed. See the installation procedures for different pipe materials described on pages 2-18 to 2-25.

Procedure

Follow this procedure to install the detector on a horizontal pipe.

Step	Action	Drawing
1	Insert through-bolts in the flange holes shown by black dots in the drawing. Slip two centering nuts onto each through-bolt before inserting the bolts.	Flange
2	 Turn the detector so that the direction mark on the detector matches the direction of fluid flow. Insert the detector and gaskets between the pipe flanges. Position the detector so that it sits on top of the centering. 	Gasket

Installation on Horizontal Pipe Continued

Procedure (continued)	Step	Action	Drawing
	3	 Make sure that the detector remains properly centered. Make sure that the gaskets do not protrude beyond the edges of the pipe flanges. When you have checked these items, insert the remaining through-bolts into the flange holes and tighten the bolts evenly using the appropriate fastening torque given on page 2-8. 	
Installation on Vertical Pipe

ACaution

• Improper installation may result in leakage or damage to the pipe flanges.

Parts required

The following parts are required:

- Through-bolts and nuts
- Centering nuts
- Gaskets: The required gasket material will vary according to the material of the pipe on which the detector is to be installed. See the installation procedures for different pipe materials described on pages 2-18 to 2-25.

Procedure

Follow this procedure to install the detector on a horizontal pipe.

Step	Action	Drawing
1	Of the flange holes shown by black dots in the drawing, insert through-bolts into the two holes at the back and fasten them lightly with nuts. Slip one cen- tering nut onto each through bolt before inserting the bolts.	Flange Flange Back Back O Centering nuts
2	 Turn the detector so that the direction mark on the detector matches the direction of fluid flow. Insert the detector and gaskets between the pipe flanges. 	Direction of fluid flow Gaskets

Installation on Vertical Pipe Continued

Procedure (continued)	Step	Action	Drawing
Procedure (continued)	3	Insert through-bolts fitted with one centering nut each into the remaining two flange holes shown by black dots in Steps 1 and 2.	
	4	 Make sure that the detector remains properly centered. Make sure that the gaskets do not protrude beyond the edges of the pipe flanges. When you have checked these items, insert the remaining through-bolts into the flange holes and tighten the bolts evenly using the appropriate fastening torque given on page 2-9. 	

Installation on Metal Pipe (1)

Introduction	The installation method described in this section corresponds to the following combination of pipe and grounding ring materials. For the installation method corresponding to any other combination, refer to the table on page 2-13.
	Pipe material: Metal Grounding ring material: SUS material
Required parts	The following parts are required:
	Through-bolts and nuts
	Centering nutsGaskets: We recommend non-rubber gaskets such as those made of joint
	sheet or PTFE. For recommended bore diameters, refer to Table 2-2 on page 2- 12. Although rubber gaskets may be used, it is not possible to reduce the fastening torque.
Installation	
procedure	 Install the detector as shown in Figure 2-11. The torque level for tightening the bolts is not related to the gasket material. See Table 2-1 on page 2-9 for the appropriate torque. For the inner diameter of the gaskets, see Table 2-2 on page 2-12. To use rubber gaskets for a low fastening torque, refer to page 2-23.
	 Please note that the use of rubber gaskets and a lower fastening torque may result in insufficient surface pressure between the lin- ing and the grounding ring, resulting in leakage.
	Figure 2-11 Installation Using SUS Material Grounding Ring and Metal



Installation on Metal Pipe (2)

Introduction	The installation method described in this section corresponds to the following combination of pipe and grounding ring materials. For the installation method corresponding to any other combination, refer to the table on page 2-13.
	Pipe material: metal Grounding ring material: other than SUS material
Required parts	The following parts are required. No gaskets are necessary since PTFE gaskets are provided.
	Through-bolts and nutsCentering nuts

Installation on Metal Pipe (2) Continued

Installation procedure

- Install the detector as shown in Figure 2-12. See Table 2-1 on page 2-9 for the appropriate fastening torque.
- To use rubber gaskets for a low fastening torque, refer to page 2-25.

ACaution

• Please note that the use of an additional gasket besides the existing PTFE gasket may result in leakage (see Figure 2-13).

Figure 2-12 Installation Using Non-SUS Material Grounding Ring and Metal Pipe



Figure 2-13 Example of Incorrect Installation



Installation on PVC Pipe (1)

Introduction	 The installation method described in this section corresponds to the follow combination of pipe and grounding ring materials. For the installa method corresponding to any other combination, refer to the table on p 2-13. Pipe material: PVC 	
	Grounding ring material: SUS material	
Required parts	The following parts are required:	
	 Through-bolts and nuts Centering nuts Gaskets: Non-rubber gaskets are recommended (i.e. joint sheet or PTFE). See Table 2-2 on page 2-12 for the recommended bore diameters. When using rubber gaskets, another gasket of the same material and with a thickness of 0.5 to 1.0 mm is required. See Table 2-3 on page 2-12 for the appropriated dimensions. Protective plate: Use the protective plate if bolt tightening at the specified torque threatens to warp or damage the PVC pipe. See Figure 2-15 for an illustration of the protective plate. 	

Installation procedure The installation procedure varies with such conditions as the fastening torque and the need for a protective plate. Choose one of the following three methods as applicable.

1. Use this method to install the detector with a specified fastening torque. Install the detector as shown in Figure 2-14. The torque level for tightening the bolts is not related to the gasket material. See Table 2-1 on page 2-9 for the appropriate torque. For the inner diameter of the gaskets, see Table 2-2 on page 2-12.



• Please note that the use of rubber gaskets and a lower fastening torque may result in insufficient surface pressure between the lining and the grounding ring, resulting in leakage.

Figure 2-14 Installation Using SUS Material Grounding Ring



Installation on PVC Pipe (1) Continued

Installation procedure (continued) 2. Use this method to install the detector using a protective plate to prevent the PVC pipe from being deformed or damaged when the bolts are tightened with the specified torque.

Install the protective plate between the outer side of the PVC flange and the detector, as shown in Figure 2-15. The protective plate protects the PVC pipe from deformation or damage when secured at the specified torque. The torque level is unrelated to the pipe or grounding ring material. See Table 2-1 on page 2-9 for the appropriate torque.

Figure 2-15 Installation Using SUS Material Grounding Ring (with protective plate)



3. Use this method to install the detector using a low fastening torque and rubber gaskets.

Remove the grounding ring from the detector, insert a rubber gasket 0.5 to 1.0 mm thick, then reinsert the grounding ring on top of the rubber gasket. With the rubber gasket in the position shown in Figure 2-16, attach the detector to the pipe. Fasten the bolts with a torque that provides a leak-proof joint. In this case, use the two kinds of rubber gaskets made of the same material.





Installation on PVC Pipe (2)

Introduction	The installation method described in this section corresponds to the following combination of pipe and grounding ring materials. For the installation method corresponding to any other combination, refer to the table on page 2-13.		
	Pipe material: PVC Grounding ring material: Other than SUS material		
Required parts	The following parts are required:		
	 Through-bolts and nuts Centering nuts Gaskets: No gaskets are necessary due to the provision of a PTFE gasket. 		
	When using a rubber gasket, gaskets of the same material and of two thicknesses, 0.5 to 1.0 mm and 3.0 to 4.0 mm, are re- quired. See Table 2-3 and 2-4 on pages 2-12 for the appropriate		
	 Protective plate: A protective plate is required if tightening the bolts to the specified torque may deform or damage the PVC pipe. Use stainless steel or similar hard metal 1 mm thick or over. For the shape, see Figure 2-18. 		
Installation procedure	The installation procedure varies with such conditions as the fastening torque and the need for a protective plate. Choose one of the following three meth- ods as applicable.		
	1. Use this method to install the detector with the specified fastening torque. Install the detector as shown in Figure 2-17. See Table 2-1 on page 2-9 for the appropriate fastening torque.		
	Figure 2-17 Installation Using the Grounding Ring of Non-SUS Material		

PTFE gasket (supplied)

Grounding ring

Continued on next page

Lining

Installation procedure (continued) 2. Use this method to install the detector along with a protective plate to prevent PVC pipe from being deformed or damaged when the bolts are tightened to the specified torque.

Insert a protective plate between the outer side of the PVC flange and the detector as shown in Figure 2-18. The protective plate protects the PVC pipe from deformation or damage when it is secured to the specified torque. For the appropriate torque, see Table 2-1 on page 2-9.





3. Use this method to install the detector using a low fastening torque and rubber gaskets

First, remove the grounding ring from the detector, then insert a rubber gasket with a thickness of 0.5 to 1.0 mm. Then reinsert the grounding ring on top of the rubber gasket.

Next, remove the PTFE gasket and insert a rubber gasket 3.0 to 4.0 mm thick to replace it. Under these conditions, install the detector on the pipe as shown in Figure 2-19. Tighten the bolts to the torque required to achieve a fluid seal for the rubber gasket. In this case, the two kinds of rubber gaskets that are used should be made of the same material. For the dimensions of the rubber gaskets, refer to Table 2-3 and Table 2-4 on page 2-12.





2-2-2 Installing a Flanged Detector Basic Installation Method

Installation example Figure 2-20 shows the basic method for installing the device.

Figure 2-20 Installation Example



Fastening torque

ACaution

 Be careful in handling flanged detectors. Dropping it could cause injury.

Warning

 Table 2-5 shows the fastening torque for each pipe bore. Apply the prescribed fastening torque to prevent leakage.

Fastening torque

(continued)

Table 2-5 Fastening Torque (1)

Bore and Flange Ratings		Fastening Torque N∙m (kgf∙cm)	
2.5-15mm	JIS10K	6-9	(82-132)
	JIS20K	6-9	(82-132)
	JIS30K	18-31	(184-316)
	ANSI150	6-9	(82-132)
	ANSI300	6-9	(82-132)
	DIN10/16	6-9	(82-132)
	DIN25/40	9-14	(92-143)
25mm	JIS10K	21-31	(214-316)
	JIS20K	21-32	(214-326)
	JIS30K	23-36	(234-367)
	ANSI150	11-17	(112-173)
	ANSI300	22-34	(224-347)
	DIN10/16	10-14	(102-143)
	DIN25/40	12-18	(122-184)
40mm	JIS10K	22-32	(224-326)
	JIS20K	22-34	(224-347)
	JIS30K	41-65	(418-663)
	ANSI150	13-18	(132-184)
	ANSI300	36-57	(367-581)
	DIN10/16	22-32	(224-326)
	DIN25/40	25-38	(255-388)
50/65mm	JIS10K	24-34	(245-347)
	JIS20K	19-31	(194-316)
	JIS30K	22-34	(224-347)
	ANSI150	23-32	(235-326)
	ANSI300	20-32	(204-326)
	DIN10/16	24-34	(245-347)
	DIN25/40	28-42	(286-428)
80mm	JIS10K	20-31	(204-316)
	JIS20K	37-61	(377-622)
	JIS30K	42-66	(428-673)
JIS	G3451 F12	18-37	(184-377)
	ANSI150	26-35	(265-357)
	ANSI300	37-57	(377-581)
	DIN10/16	20-31	(204-316)
	DIN25/40	25-39	(255-398)

Fastening	torque
-----------	--------

(continued)

Table 2-5 Fastening Torque (2)

Bore and Flange Ratings		Fastenii N•m (ng Torque (kgf∙cm)
100mm	JIS10K	22-33	(224-337)
	JIS20K	41-66	(418-673)
	JIS30K	61-95	(622-969)
	ANSI150	21-31	(214-316)
	ANSI300	43-66	(439-673)
	DIN10/16	22-33	(224-337)
	DIN25/40	48-74	(490-755)
125mm	JIS10K	47-67	(479-683)
/150mm	JIS20K	58-91	(592-928)
	JIS30K	80-123	(816-1254)
	ANSI150	42-60	(428-612)
	ANSI300	50-74	(510-755)
	DIN10/16	47-67	(479-683)
	DIN25/40	97-145	(989-1479)
200mm	JIS10K	44-65	(449-663)
	JIS20K	66-102	(673-1040)
	JIS30K	94-142	(959-1448)
	ANSI150	42-59	(428-602)
	ANSI300	81-120	(826-1224)
	DIN10/16	47-68	(479-694)
	DIN25/40	123-189	(1255-1928)
250mm	JIS10K	51-63	(520-643)
	JIS20K	81-99	(826-1010)
	ANSI150	69-85	(704-867)
	ANSI300	82-97	(840-990)
	DIN10/16	57-69	(581-704)
	DIN25	108-127	(1100-1300)

Fastening	torque
-----------	--------

(continued)

Table 2-5 Fastening Torque (3)

Bore and Flange Ratings		Fastening Torque N∙m (kgf∙cm)	
300mm	JIS10K	50-62	(510-632)
	JIS20K	79-97	(806-989)
	ANSI150	56-68	(592-694)
	ANSI300	116-136	(1180-1390)
	DIN10/16	45-55	(459-561)
	DIN25	105-122	(1070-1250)
350mm	JIS10K	54-66	(551-673)
	JIS20K	143-167	(1460-1710)
	ANSI150	80-98	(816-1000)
	ANSI300	116-136	(1180-1390)
	DIN10/16	42-52	(428-530)
	DIN25	160-189	(1640-1930)
400mm	JIS10K	72-88	(734-898)
	JIS20K	160-189	(1640-1930)
	ANSI150	80-98	(816-1000)
	ANSI300	166-195	(1690-1990)
	DIN10/16	72-88	(734-898)
	DIN25	199-234	(2030-2390)

Basic Installation Method Continued

Flange shape

Use flanges that will maximize the area of contact with the gasket, as shown in Figure 2-21.

Figure 2-21 Flange Shape



ACaution

- Before installing the detector, make sure any foreign matter is flushed from the interior passage of the detector. Residual foreign matter could cause output fluctuations.
- Do not touch the electrodes or allow oil or fat to come into contact with them. This could cause output fluctuations.
- Align the flow direction mark on the detector in the direction of the liquid flow. Misalignment could result in a negative output.

Flange shape

(continued)

Caution

 Never force the device between two flanges when the space is too narrow.





Warning

 After ensuring that the bore diameter of the pipe and that of the detector are the exactly the same, install the detector so that the gasket does not protrude into the inner bore of the pipe. Failing to do so could result in leakage or other hazards.

Caution

 Tighten each bolt a little at a time, apply uniform pressure to all the bolts while fastening them. If leakage does not stop on completion of fastening, make sure that the pipe is not off center, then tighten the bolts little by little. Install the detector carefully so that the fastening torque does not exceed the prescribed limit. Otherwise, the unit could be damaged.

Parts Necessary for Installation

Introduction The following Parts are necessary for the installation of the device:

• Gaskets: Gaskets are required when using grounding rings made of SUS material. Gaskets are supplied when using grounding rings made of other material.

Gaskets Gaskets are supplied with the grounding ring, except when it is made of SUS material. Supply the gaskets when you use a grounding ring made of SUS material. We recommend a non-rubber gasket material such as joint sheet or PTFE.

For the bore diameters of the gaskets, refer to Table 2-6.

A Caution

- Too small a gasket diameter may affect the flow velocity distribution, resulting in inaccurate measurements.
- Too large a gasket diameter may cause leakage. Also, if there are any solids in the fluid to be measured, these may build up between the gasket and the flange, resulting in inaccurate measurements.

Bore diameter (mm)	Inner diameter (mm)
2.5	11±1
5	11±1
10	11±1
15	16±1
25	25±1
40	40±1
50	51±1
65	64±1
80	76±1
100	101±1
125	124±1
150	148±1
200	196±1
250	246±1
300	296±1
350	346±1
400	396±1

Table 2-6 Recommended Inner Diameters of Gaskets

Selecting an Installation Method

Caution

ACaution

The necessary materials and the method of installation vary depending on the material of the grounding ring and the material. Select the applicable method of installation after checking the specifications of the detector to be installed and the conditions of installation. Improper installation may result in leakage or damage to the pipe flanges.

Installation method according to material

Select the appropriate installation method from the table below.

Pipe material	Grounding Ring Material	See Page
Metal	SUS material	2-34
	Other than SUS material	2-35
PVC	SUS material 2-37	
	Other than SUS material	2-38

Installation on Metal Pipe (1)

Introduction	The installation method described in this section is to be used with the follow- ing grounding ring material. For the installation method used for any other grounding ring material, refer to the table on page 2-35.
	Pipe material: Metal Ground ring material: SUS material
Required parts	The following parts are required:
	 Nuts and bolts Gaskets: We recommend non-rubber gaskets such as those made of joint sheet or PTFE. For the recommended bore diameters, refer to Table 2-6 on page 2-6. For the recommended inner diameters of the gaskets, see Table 2-2 on page 2-32.
Installation procedure	Install the detector as shown in Figure 2-23. The torque level for tightening the bolts is not related to the gasket material. See Table 2-5 on pages 2-27 to 2-29 for the appropriate torque. For the inner diameter of the gaskets, see Table 2-2 on page 2-12.
	▲ Caution

 A lower fastening torque may result in insufficient surface pressure between the lining and the grounding ring, resulting in leakage.





Installation on Metal Pipe (2)

Introduction	The installation method described in this section is to used with the following grounding ring materials. For the installation method used with grounding rings of SUS material, refer to the table on page 2-33.
	Pipe material: Metal Grounding ring material: other than SUS material
Required parts	The following parts are required. No gaskets are necessary since PTFE gaskets are provided.
	Bolts and nuts

Installation on Metal Pipe (2) Continued

Installation procedure

Install the device as shown in Figure 2-24. See Table 2-5 on pages 2-27 to 2-29 for the appropriate fastening torque.

Warning

• Please note that the use of an additional gasket besides the existing PTFE gasket may result in leakage (see Figure 2-25).





Figure 2-25 Example of Incorrect Installation



Installation on PVC Pipe (1)

Introduction	The installation method described in this section is used for the following combination of pipe and grounding ring materials. For the installation method used for any other combination, refer to the table on page 2-33. Pipe material: PVC Grounding ring material: SUS material
Required parts	 The following parts are required: Through-bolt and nuts Centering nuts Gaskets: Non-rubber gaskets are recommended (i.e. joint sheet or PTFE). See Table 2-6 on page 2-32 for the recommended bore diameters. When using rubber gaskets, another gasket of the same material and with a thickness of 0.5 to 1.0 mm is required. See Table 2-3 on page 2-12 for the appropriate dimensions. Protective plate: Use a protective plate if bolt tightening to the specified torque threatens to warp or damage the PVC pipe. The plate material must be metal (such as stainless steel at least 6 mm thick) that will not deform when the nuts are tightened. For the shape of the protective plate, see Fig- ure 2-27.

procedure

Installation The installation procedure varies depending on conditions such as the fastening torque and the need for a protective plate. Choose one of the following three methods, as applicable.

> 1. Use this method to install the detector to the specified fastening torque. Install the detector as shown in Figure 2-26. The torque level for tightening the bolts is not related to the gasket material. See Table 2-5 on pages 2-27 to 2-29 for the appropriate torque. For the inner diameter of the gaskets, see Table 2-2 on page 2-12.



 Please note that the use of rubber gaskets and a lower fastening torque may result in insufficient surface pressure between the lining and the grounding ring, resulting in leakage.

Figure 2-26 Installation Using SUS Material Grounding Ring



Installation on PVC Pipe (1) Continued

Installation procedure (continued) 2. Use this method to install the detector using a protective plate to prevent PVC pipe from being deformed or damaged when the bolts are tightened to the specified torque.

Install the protective plate between the outer side of the PVC flange and the detector, as shown in Figure 2-27. The protective plate protects the PVC pipe from deformation or damage when secured at the specified torque. The torque level is unrelated to the pipe or grounding ring material. See Table 2-5 on page 2-27 to 2-29 for the appropriate torque. For the inner diameters of the gaskets, see Table 2-6 on page 2-32.

Figure 2-27 Detector Installation Using SUS Material Grounding Ring (with protective plate)



3. Use this method to install the detector using a low-fastening torque and rubber gaskets.

Remove the grounding ring from the detector, insert a rubber gasket 0.5 to 1.0 mm thick between the lining and the grounding ring, then reinsert the grounding ring.

Then remove the PTFE gasket, and attach a gasket 3 to 4 mm thick instead. Under these conditions, attach the detector to the pipe as shown in Figure 2-28. Fasten the bolts to a torque that provides a leakproof joint.

Figure 2-28 Detector Installation Using SUS Material Grounding Ring (with rubber gasket)



Installation on PVC Pipe (2)

Introduction	The installation method described in this section is to be used for the follow- ing combination of pipe and grounding ring materials. For the installation method used for any other combination, refer to the table on page 2-33.
	Pipe material: PVC Grounding ring material: Other than SUS material
Required parts	The following parts are required.
	• Through-bolts and nuts
	• Centering nuts
	• Gaskets: No gaskets are necessary due to the provision of a PTFE gasket. When using a rubber gasket, gaskets of the same material and of two thicknesses, 0.5 to 1.0 mm and 3.0 to 4.0 mm, are required. See Table 2-3 and 2-4 on page 2-12 for the appropriate dimen- sions.
	• Protective plate: A protective plate is required if tightening the bolts to the specified torque may deform or damage the PVC pipe. Use stainless or a hard metal material 1 mm thick or more. For the shape of the metal, see Figure 2-30.
Installation procedure	The installation procedure varies depending on conditions such as the fasten- ing torque and the need for a protective plate. Choose one of the following three methods, as applicable.
	1. Use this method to install the detector to the specified fastening torque. Install the detector as shown in Figure 2-29. See Table 2-5 on pages 2-27 to 2-29 for the appropriate fastening torque. For the dimensions of the rubber gaskets, see Table 2-3 and Table 2-4 on page 2-12.

Figure 2-29 Detector Installation Using Non-SUS Material Grounding Ring



Installation on PVC Pipe (2) Continued

Installation procedure (continued) 2. Use this method to install the detector along with a protective plate to prevent the PVC pipe from being deformed or damaged when the bolts are tightened to the specified torque.

Insert a protective plate between the outer side of the PVC flange and the detector as shown in Figure 2-30. The protective plate protects the PVC pipe from deformation or damage when it is secured to the specified torque. For the appropriate torque, see Table 2-5 on pages 2-27 to 2-29.





3. Use this method to install the detector using a low fastening torque and rubber gaskets

First, remove the grounding ring from the detector, then insert a rubber gasket with 0.5 to 1.0 mm thick. Then reinsert the grounding ring on top of the rubber gasket.

Next, remove the PTFE gasket and insert a rubber gasket 3.0 to 4.0 mm thick to replace it. Under these conditions, install the detector on the pipe as shown in Figure 2-31. Tighten the bolts to the torque required to achieve a fluid seal on the rubber gasket. In this case, the two kinds of rubber gaskets used should be made of the same material. For the dimensions of the rubber gaskets, refer to Table 2-3 and Table 2-4 on page 2-12.

Figure 2-31 Detector Installation Using Non-SUS Material Grounding Ring (with rubber gasket)



Electrical Wiring (1)

Connection of the detector and the converter (remote models) The use of a special purpose cable (MGA 12W) is recommended for the connection of the detector and the converter. For the details of the electrical wiring (including the special purpose cable), see the Instruction Manual for the converter that is to be used in combination with the detector.





Note for the installation of the special cable

• Although the special purpose cable is shielded, install it away from any possible sources of noise, such as a large capacity transformer, motors, or motor power supplies.

Electrical Wiring (2)

Grounding (remote models) Attach a type 3 grounding (with a grounding resistance of 100Ω or less) to the ground terminal.

The grounding should be a single-point grounding at as short a distance as possible from the detector.





ACaution

- Insufficient grounding can cause output fluctuations, instability of the zero point, or output drift. Secure single-point type 3 grounding is recommended.
- Do not ground a welder to the detector. It can cause damage to the detector.

Electrical Wiring (3)

Grounding

This flowmeter is of flameproof structure and exhibits the specified explosion-proof capability only when it is used strictly in accordance with the following installation specifications:





Chapter 3 - Maintenance of the Device

Introduction

For the device loop diagrams for troubleshooting and maintenance, refer to the Converter user manual .

MEMO

D

Detector 1-4,1-6,1-8	3
connection to the converter	2

Ε

Electrical conduit connectio	n1-10
Electrodes	1-5,1-7,1-9
cover	1-5,1-7,1-9
installation position	1-4,1-6
Excitation terminal	1-10

F

1-9
2-30
5,1-7,1-9
1-2
2-2

G

Gasket	2-32
Grounding ring	1-7,1-9
Grounding terminal	1-10

I

Installation, selection of method
according to material 2-13,2-33
Installation on pipe2-14
Installation of the device2-1
Grounding of the device 1-10,2-43
Installation position2-4
Installation site, criteria for selection of
2-2

S

Т

Terminal box	
cover	
direction	2-6
Torque fastening	

W

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 - ※4.フォールトトレランス:冗長性技術を利用する
- 3. 用途に関する注意制限事項

原子力管理区域(放射線管理区域)には一部の適用製品(原子力用リミットスイッチ)を除き使用しないでください。 医療機器には、原則使用しないでください。

産業用途製品です。一般消費者が直接設置・施工・使用する用途には利用しないでください。なお、一部製品 は一般消費者向け製品への組み込みにご利用になれますので、そのようなご要望がある場合、まずは当社販売 員にお問い合わせください。

また、

次の用途に使用される場合は、事前に当社販売員までご相談の上、カタログ、仕様書、取扱説明書などの技術 資料により詳細仕様、使用上の注意事項などを確認いただくようお願いいたします。

さらに、当社製品が万が一、故障、不適合事象が生じた場合、お客さまの機械・装置において、フールプルーフ設計、 フェールセーフ設計、延焼対策設計、フォールトアボイダンス、フォールトトレランス、その他保護・安全回 路の設計および 設置をお客さまの責任で実施することにより、信頼性・安全性の確保をお願いいたします。

- ① カタログ、仕様書、取扱説明書などの技術資料に記載のない条件、環境での使用
- (2) 特定の用途での使用
 - * 原子力·放射線関連設備
 - 【原子力管理域外での使用の際】【原子力用リミットスイッチ使用の際】
 - *宇宙機器/海底機器
 - * 輸送機器
 - 【鉄道・航空・船舶・車両設備など】
 - * 防災・防犯機器
 - * 燃焼機器
 - * 電熱機器
 - * 娯楽設備
 - * 課金に直接関わる設備/用途
- ③ 電気、ガス、水道などの供給システム、大規模通信システム、交通・航空管制システムで高い信頼性が 必要な設備
- ④ 公官庁 もしくは 各業界の規制に従う設備
- ⑤ 生命・身体や財産に影響を与える機械・装置
- ⑥ その他、上記①~⑤に準ずる高度な信頼性、安全性が必要な機械・装置

4. 長期ご使用における注意事項

一般的に製品を長期間使用されますと、電子部品を使用した製品やスイッチでは、絶縁不良や接触抵抗の増大 による発熱などにより、製品の発煙・発火、感電など製品自体の安全上の問題が発生する場合があります。お 客さまの機械、装置の使用条件・使用環境にもよりますが、仕様書や取扱説明書に特記事項のない場合は、10 年以上は使用しないようお願いいたします。

5. 更新の推奨

当社製品に使用しているリレーやスイッチなど機構部品には、開閉回数による磨耗寿命があります。 また、電解コンデンサなどの電子部品には使用環境・条件にもとづく経年劣化による寿命があります。当社製 品のご使用に際しては、仕様書や取扱説明書などに記載のリレーなどの開閉規定回数や、お客さまの機械、装 置の設計マージンのとり方や、使用条件・使用環境にも影響されますが、仕様書や取扱説明書に特記事項のな い場合は5~10年を目安に製品の更新をお願いいたします。

一方、システム機器、フィールド機器(圧力、流量、レベルなどのセンサ、調節弁など)は、製品により部品の 経年劣化による寿命があります。経年劣化により寿命ある部品は推奨交換周期が設定してあります。推奨交換 周期を目安に部品の交換をお願いいたします。

6. その他の注意事項

当社製品をご使用するにあたり、品質・信頼性・安全性確保のため、当社製品個々のカタログ、仕様書、取扱 説明書などの技術資料に規定されています仕様(条件・環境など)、注意事項、危険・警告・注意の記載をご理 解の上厳守くださるようお願いいたします。

7. 仕様の変更

本資料に記載の内容は、改善その他の事由により、予告なく変更することがありますので、予めご了承ください。 お引き合い、仕様の確認につきましては、当社支社・支店・営業所 または お近くの販売店までご確認くださ るようお願いいたします。

8. 製品・部品の供給停止

製品は予告なく製造中止する場合がありますので、予めご了承ください。 修理可能な製品について、製造中止後、原則5年間修理対応いたしますが修理部品がなくなるなどの理由でお 受けできない場合があります。 また、システム機器、フィールド機器の交換部品につきましても、同様の理由でお受けできない場合があります。

9. サービスの範囲

当社製品の価格には、技術者派遣などのサービス費用は含んでおりませんので、次の場合は、別途費用を申し 受けます。

- ① 取り付け、調整、指導 および 試運転立ち会い
- ② 保守・点検、調整 および 修理
- ③ 技術指導 および 技術教育
- ④ お客さまご指定の条件による製品特殊試験 または 特殊検査

なお、原子力管理区域(放射線管理区域)および被爆放射能が原子力管理区域レベル相当の場所においての上記 のような役務の対応はいたしません。

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