

**MagneW FLEX+/PLUS+**  
**Electromagnetic Flowmeter**  
**Explosion-proof type Detector**

Model: MGG15/17

**User's Manual**



Azbil Corporation

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**Preface**

Thank you for purchasing the MagneW FLEX+/PLUS+ 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.

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# Unpacking and Inspection

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## **Unpacking the MagneW FLEX+/PLUS+**

This device is a precision instrument and should be handled with care to prevent 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 FLEX+/PLUS+,

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## **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 following:

- 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.

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## **Storage precautions**

When storing this device before use, observe these 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.
  3. Replace the detector in its original packaging.
  4. Store the device indoors at room temperature and humidity, in a place safe from vibration or shock.
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# Safety Precautions

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## 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.

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## Signal words

Safety precautions in this manual are of two kinds —Warning and Caution. The meaning of these flags is as follows:



Potentially hazardous situation which, if not avoided, could result in death or serious injury.



Failure to observe these precautions may produce dangerous conditions that could result in injury to the user or in physical damage.

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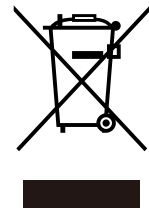
## Cautions to Disposal of Electrical and Electronic Equipment

Disposal of Electrical and Electronic Equipment (for Environmental Protection)

This is an industrial product subject to the WEEE Directive.

Do not dispose of electrical and electronic equipment in the same way as household waste.

Old products contain valuable raw materials and must be returned to an authorized collection point for correct disposal or recycling.



# How this Manual is Organized and Used

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## **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.

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# MEMO

# Chapter 1 - Configuration and Structure of the Measuring System

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## 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

### Introduction

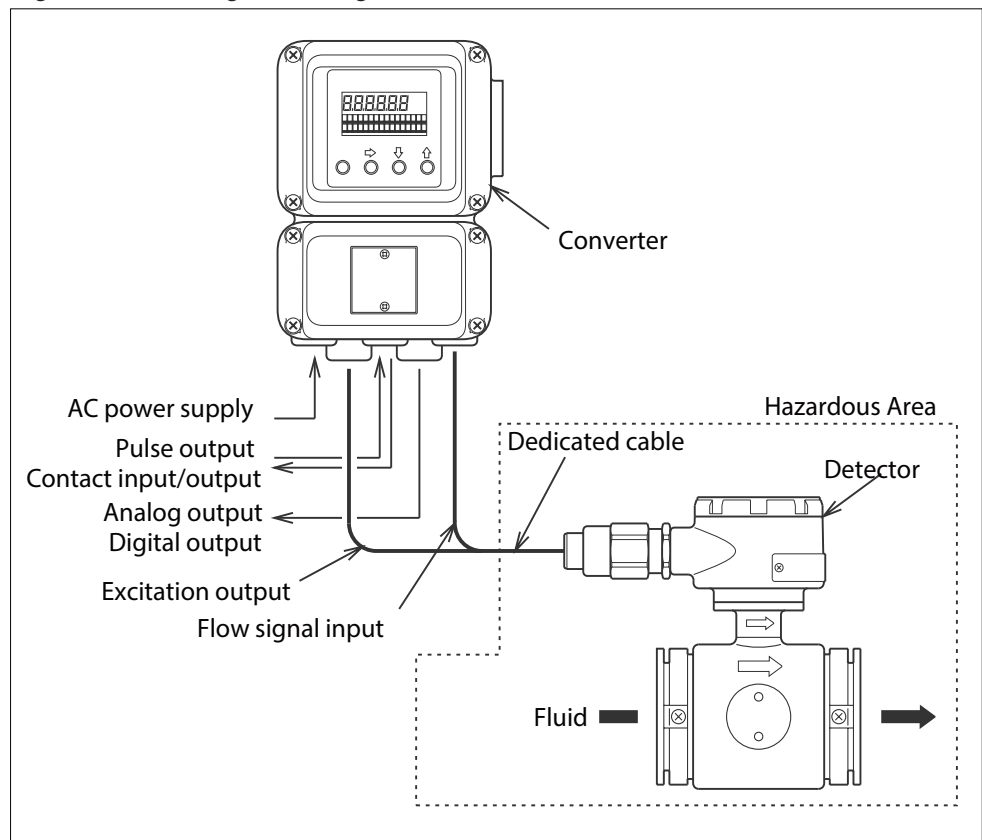
Depending on how it is combined with the converter, this product is available in two configurations, integral and remote.

- Remote: Detector and converter are installed connectly by cable.

### Examples of flow measurement systems

Figures 1-1 show examples of measurement systems using the device.

Figure 1-1 Integral Configuration



## 1-2 Structure of this Unit and Functions of Parts

### Detector

#### Explanation

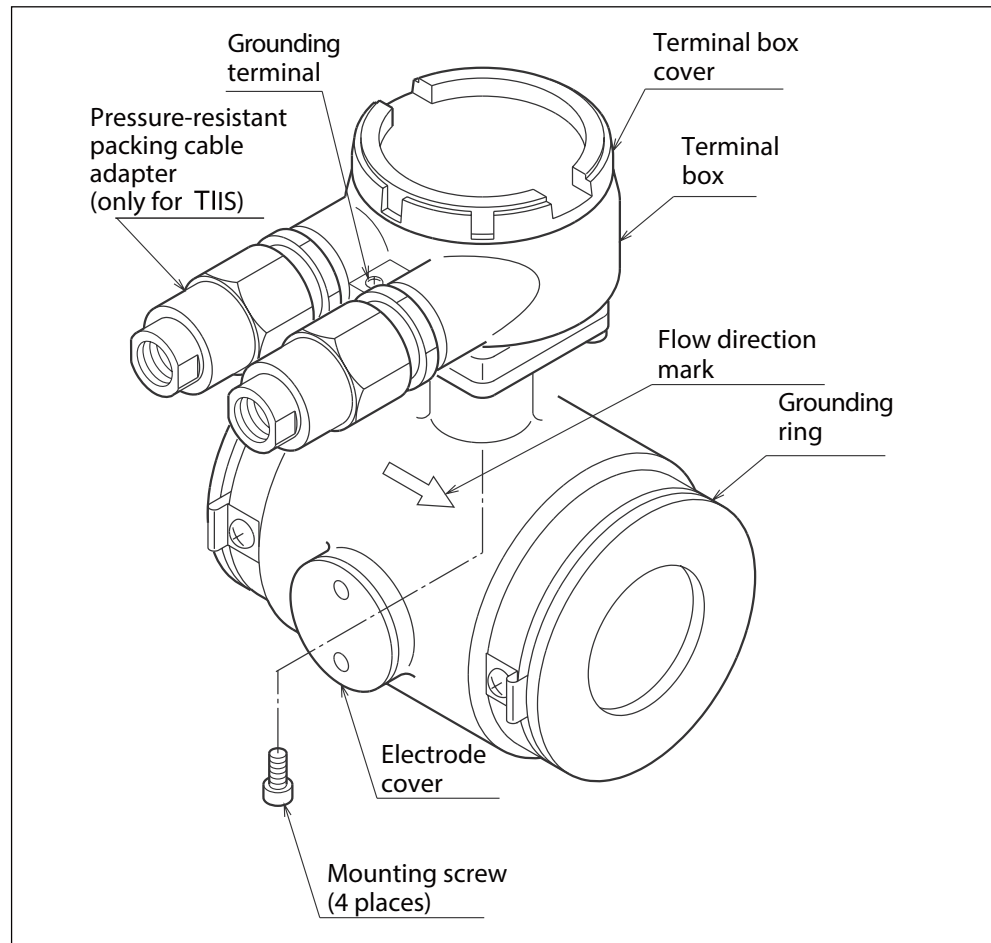
The functions and structure of the device are as follows.

- 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



*Continued on next page*

## Detector Continued

### Names and functions of parts

This table explains the major parts of the detector.

Name	Function
<b>Flow direction mark</b>	<ul style="list-style-type: none"><li>• Indicates the direction of fluid flow.</li><li>• Mount the detector so that the measured fluid flows in the direction indicated by this mark.</li></ul>
<b>Electrodes</b>	<ul style="list-style-type: none"><li>• The electrodes generate an electromotive force signal proportional to the flow rate of the fluid passing through the detector.</li><li>• The electrode material varies depending on the corrosion characteristics of the fluid to be measured.</li></ul>
<b>Electrode cover</b>	<ul style="list-style-type: none"><li>• Houses the electrodes. Do not remove the cover with the detector installed on a pipe.</li></ul>
<b>Grounding ring</b>	<ul style="list-style-type: none"><li>• The electrode material varies according to the corrosive characteristics of the fluid to be measured. Also, the structure varies with the material.</li></ul>
<b>Terminal box</b>	<ul style="list-style-type: none"><li>• Houses the connection terminals used to apply a standard voltage.</li><li>• Houses excitation and signal terminals.</li></ul>
<b>Terminal box cover (remote model only)</b>	<ul style="list-style-type: none"><li>• Keep the terminal box cover on during operation.</li></ul>
<b>Pressure-resistant Packing Cable Adapter</b>	<ul style="list-style-type: none"><li>• Seals the cable terminal to assure and enhance explosion-proof capability, insulation resistance and mechanical strength. Required for any explosionproof instrumentation.</li></ul>

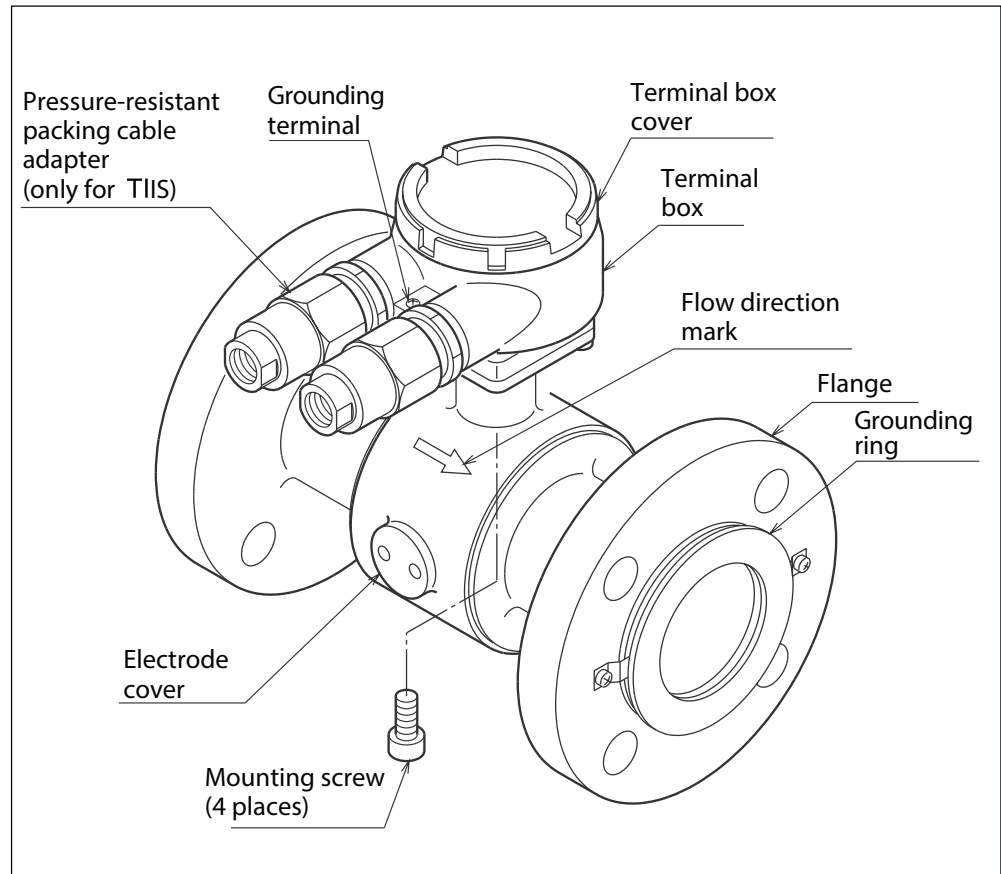
### **Warning**

- 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.

**Names of major parts of the flange type**

Figure 1-3 shows the structure of the detector and the names of its major parts.

Figure 1-3 Details of the Flanged Detector



*Continued on next page*

## Detector Continued

### Names and functions of parts

This table explains the major parts of the detector.

Name	Function
<b>Flow direction mark</b>	<ul style="list-style-type: none"> <li>Indicates the direction of fluid flow.</li> <li>Mount the detector so that the measured fluid flows in the direction indicated by this mark.</li> </ul>
<b>Electrodes</b>	<ul style="list-style-type: none"> <li>The electrodes generate an electromotive force signal proportional to the flow rate of the fluid passing through the detector.</li> <li>The electrode material varies depending on the corrosion characteristics of the fluid to be measured.</li> </ul>
<b>Electrode cover</b>	<ul style="list-style-type: none"> <li>Houses the electrodes. Do not remove the cover with the detector installed on a pipe.</li> </ul>
<b>Grounding ring</b>	<ul style="list-style-type: none"> <li>The electrode material varies according to the corrosive characteristics of the fluid to be measured. Also, the structure varies with the material.</li> </ul>
<b>Terminal box</b>	<ul style="list-style-type: none"> <li>Houses the connection terminals used to apply a standard voltage.</li> <li>Houses excitation and signal terminals.</li> </ul>
<b>Terminal box cover (remote model only)</b>	<ul style="list-style-type: none"> <li>Keep the terminal box cover on during operation.</li> </ul>
<b>Pressure-resistant Packing Cable Adapter</b>	<ul style="list-style-type: none"> <li>Seals the cable terminal to assure and enhance explosion-proof capability, insulation resistance and mechanical strength. Required for any explosion-proof instrumentation.</li> </ul>

### **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.

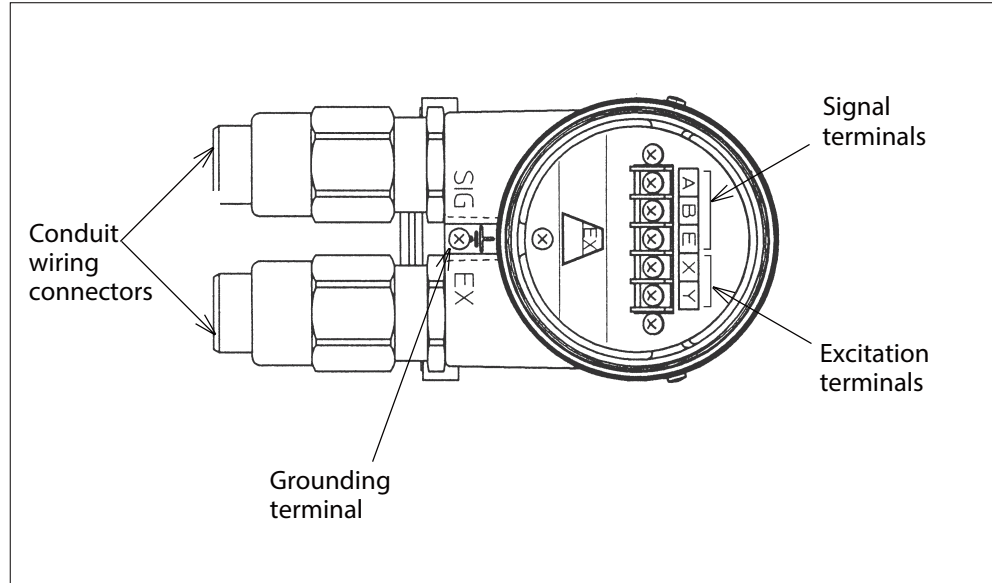




# Detector Terminal Box

## Names of parts

Figure 1-6 Detector Terminal Box



## Names and explanations of parts

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

Name	Explanation
<b>Signal terminals</b>	<ul style="list-style-type: none"> <li>These are marked A, B, and C.</li> </ul>
<b>Excitation terminals</b>	<ul style="list-style-type: none"> <li>These are marked X and Y.</li> </ul>
<b>Conduit wiring connectors</b>	<ul style="list-style-type: none"> <li>The excitation cable and the signal cable are wired through these connectors.</li> </ul>
<b>Grounding terminal</b>	<ul style="list-style-type: none"> <li>This terminal is used to ground the detector (class 3 grounding).</li> </ul>

### **Warning**

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

### **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 ignition of an explosive gas or vapor that may surround it.

---

**Location guidelines**

Install the flowmeter in accordance with the following guidelines:

- The flowmeter can be installed in hazardous areas of grade:



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.

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**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 withstanding an explosion of a gas or vapor within it, and of preventing the ignition 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:

- (1) power supply and internal voltage of ordinary equipment to the earth shall not exceed AC250V 50/60HZ, DC250V in case of normal /formal conditions.
  - (2) ambient temperature is from -10 to 60°C
  - (3) Process temperature is from -40 to 160°C
- 

*Continued on next page*

## 1-5 European Pressure Equipment Directive (2014/68/EU)

This product is subject to the European Pressure Equipment Directive (PED).

Article 4 of the PED differentiates pressure equipment according to the degree of danger.

The maximum allowable pressure of this product is stated in the specification sheet (No. SS2-MGG120-0100). Note, however, that because this product is designed and manufactured in accordance with sound engineering practice (SEP) as described in article 4, section 3 of the PED, there are restrictions on the pressure range when this product is used in a country where PED is applicable.

Determine the maximum allowable pressure by checking the following items.

### (1) Group of the fluid

Check the group of the fluid according to article 13 of the PED.

- Group 1: Hazardous fluids
- Group 2: Non-hazardous fluids

### (2) Vapor pressure at the maximum allowable temperature of the measured fluid

Check the applicable category, (i) or (ii).

(i) Liquid whose vapor pressure at the maximum allowable temperature is greater than 0.5 bar above normal atmospheric pressure (1013 mbar)

(ii) Liquid having a vapor pressure at the maximum allowable temperature of not more than 0.5 bar above normal atmospheric pressure (1013 mbar)

### (3) Nominal size (DN) of the electromagnetic flowmeter

Check the nominal size of the flowmeter.

### (4) Maximum allowable pressure for equipment designed by SEP.

In table 1-1, find the cell where the results of (1), (2), and (3) meet.

“Tables 6–9” shown in table 1-1 below are taken from article 4 and annex II of the PED.

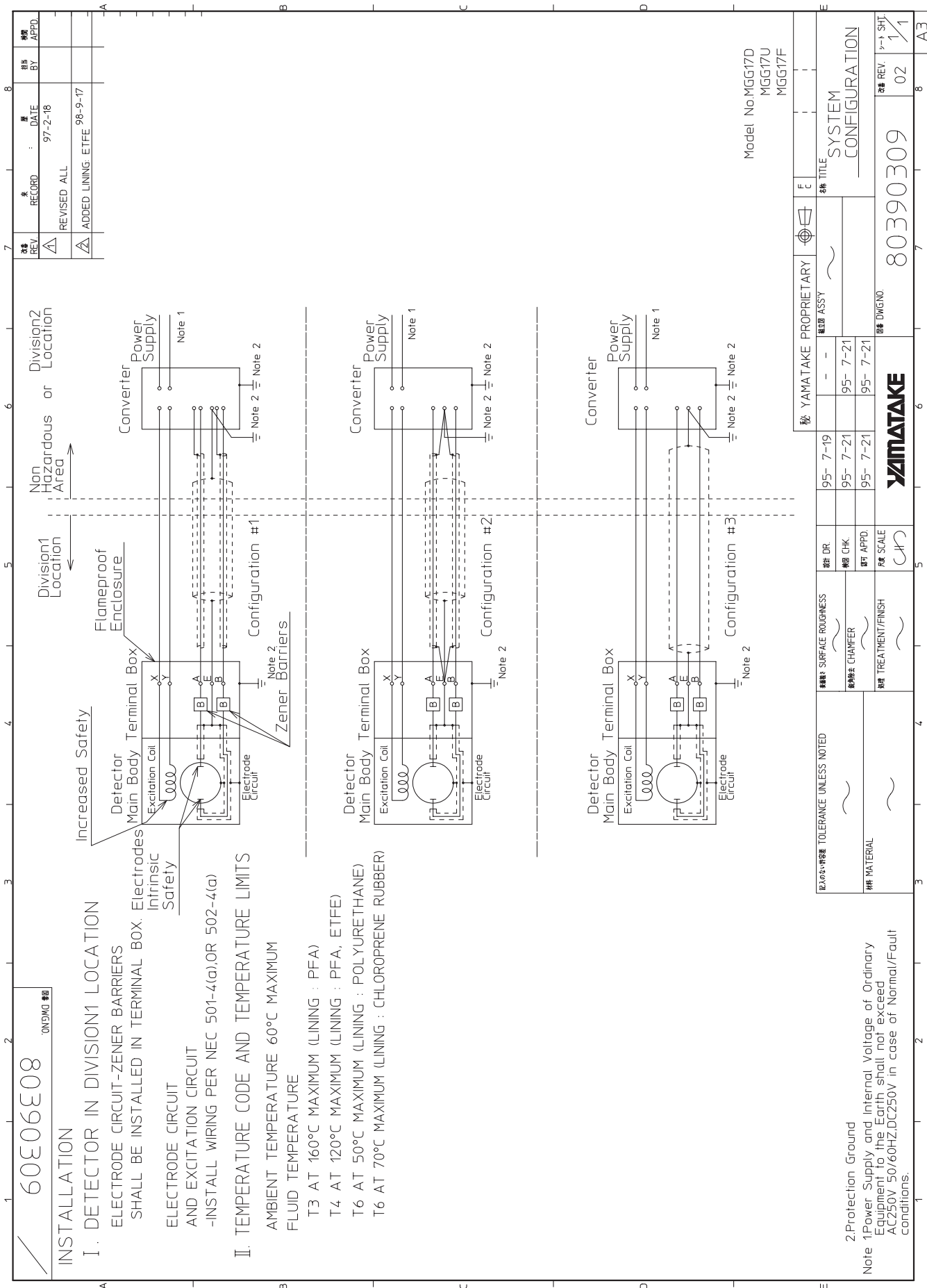
### (5) Maximum pressure

Whichever of the pressures below is the lowest is the applicable pressure.

- Maximum pressure for this product: see specification sheet No. SS2-MGG120-0100
- Maximum pressure for SEP equipment defined by the PED: see (4) above
- Maximum pressure for the flange: see the applicable standard

Table 1-1 Maximum allowable pressure for SEP products

(1) Fluid group	Group 1		Group 2		Group 1		Group 2	
(2) Vapor pressure	(i)		(i)		(ii)		(ii)	
PED table	Table 6		Table 7		Table 8		Table 9	
(3) Nominal size (DN)	(4) Maximum allowable pressure							
mm	bar	MPa	bar	MPa	bar	MPa	bar	MPa
2.5	No limit	No limit	No limit	No limit	No limit	No limit	No limit	No limit
5	No limit	No limit	No limit	No limit	No limit	No limit	No limit	No limit
10	No limit	No limit	No limit	No limit	No limit	No limit	No limit	No limit
15	No limit	No limit	No limit	No limit	No limit	No limit	No limit	No limit
25	No limit	No limit	No limit	No limit	No limit	No limit	No limit	No limit
40	0.5	0.05	25.0	2.50	No limit	No limit	No limit	No limit
50	0.5	0.05	20.0	2.00	No limit	No limit	No limit	No limit
65	0.5	0.05	15.3	1.53	No limit	No limit	No limit	No limit
80	0.5	0.05	12.5	1.25	25.0	2.50	No limit	No limit
100	0.5	0.05	10.0	1.00	20.0	2.00	No limit	No limit
125	0.5	0.05	8.0	0.80	16.0	1.60	No limit	No limit
150	0.5	0.05	6.6	0.66	13.3	1.33	No limit	No limit
200	0.5	0.05	5.0	0.50	10.0	1.00	No limit	No limit
250	0.5	0.05	4.0	0.40	8.0	0.80	20.0	2.00
300	0.5	0.05	3.3	0.33	6.6	0.66	16.6	1.66
350	0.5	0.05	2.8	0.28	5.7	0.57	14.2	1.42
400	0.5	0.05	2.5	0.25	5.0	0.50	12.5	1.25



If an MGG18/19 detector is used with an MGG14C converter as an FM-approved nonincendive product, both the detector and the converter should be FM-approved nonincendive products. If they are not, the MGG18/19 detector cannot be used as an FM-approved nonincendive product.

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## Chapter 2 - Installing the Device

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### 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
-

## 2-1 Before Installing

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### 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  $+60^{\circ}\text{C}$  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

#### **Caution**

The location for your MagneW FLEX+/PLUS+ must satisfy the following conditions. 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 electrochemically 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
- 

*Continued on next page*

## Criteria for Selecting the Installation Site (1) Continued

**Fluid to be measured (continued)**

 **Caution**

- 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 observe after installing**

 **Caution**

- (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**

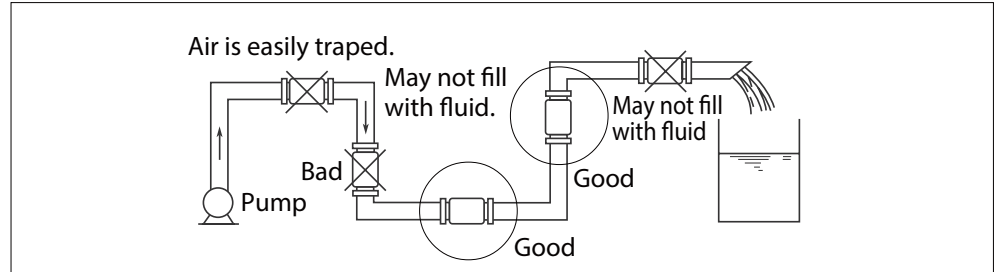
- (1) When removing this unit, make sure there is no residual liquid or pressure inside the piping and the detector. Any residual liquid or pressure can cause injury.

# 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

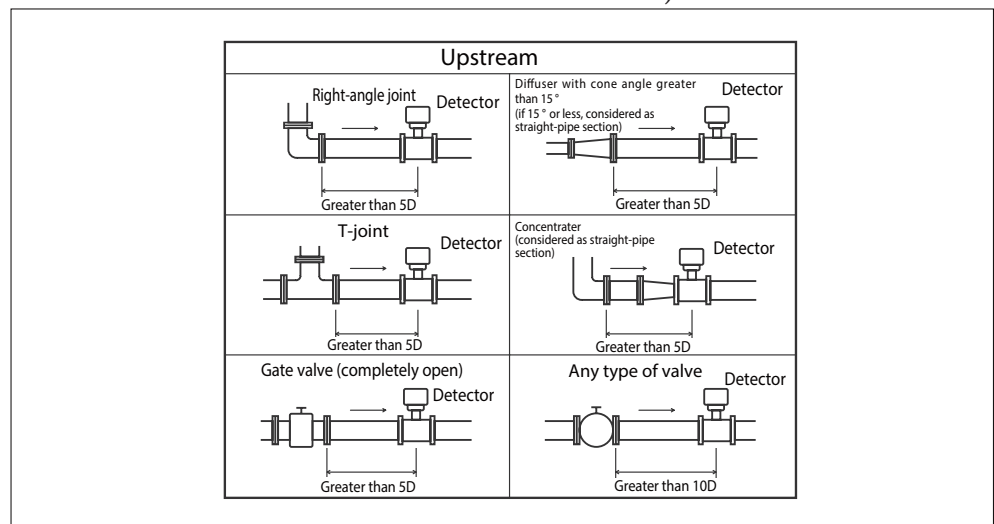


### Caution

- 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)



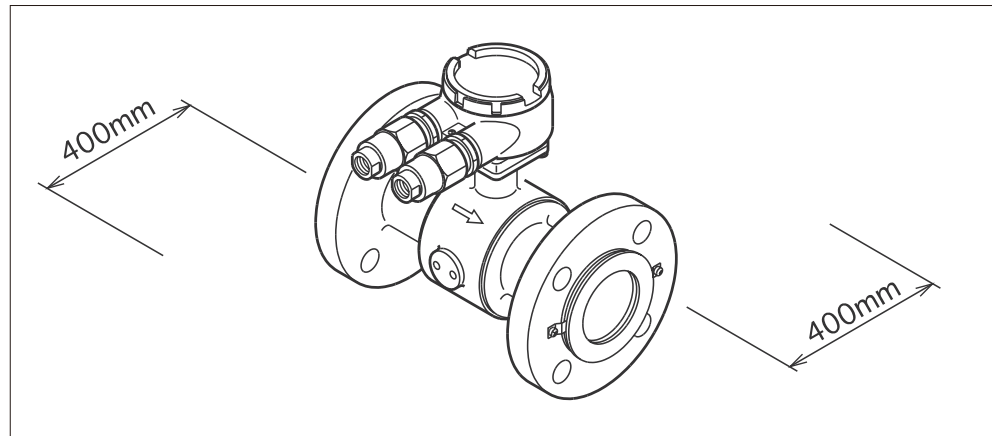
*Continued on next page*

## 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 locations, the direction of the terminal box or the converter may be unsuitable if the detector is installed as it is shipped. In such a case, the terminal box or the converter can be repositioned.

After selecting a installation site, adjust the direction of the terminal box or the converter in advance by the two methods shown below.

## Repositioning the terminal box or converter

The terminal box or the converter can be repositioned at right angles. Follow the procedure below.

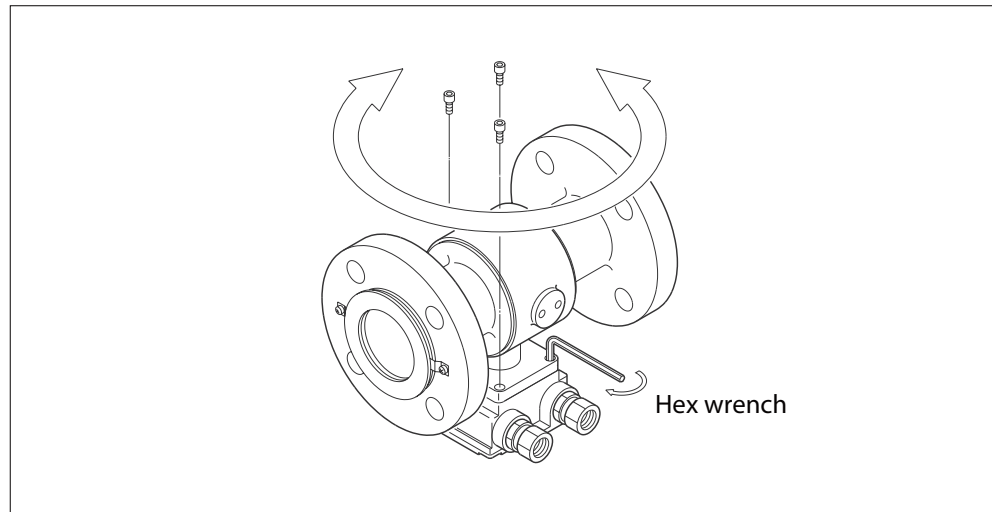
Step	Procedure
1	Using an M5 hex wrench, remove the four screws securing the terminal box or converter.
2	Holding the detector, rotate the terminal box or converter horizontally to the desired position. <div data-bbox="673 916 1444 1198" style="border: 1px solid black; padding: 10px; margin-top: 10px;"><p style="text-align: center;"> <b>Caution</b></p><ul style="list-style-type: none"><li>• Do not rotate the unit more than 180° (one half rotation). Any greater rotation can break wiring parts.</li><li>• 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.</li></ul></div>
3	Using a hex wrench, re-tighten the four screws to secure the terminal box or converter.

*Continued on next page*

## Directions of the Terminal Box and the Converter Continued

### Repositioning the terminal box or converter (continued)

Figure 2-4 Repositioning the Terminal Box or Converter



### **Caution**

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

## 2-2 Method of Installation

### 2-2-1 Installing a Wafer Detector

#### Basic Installation Method

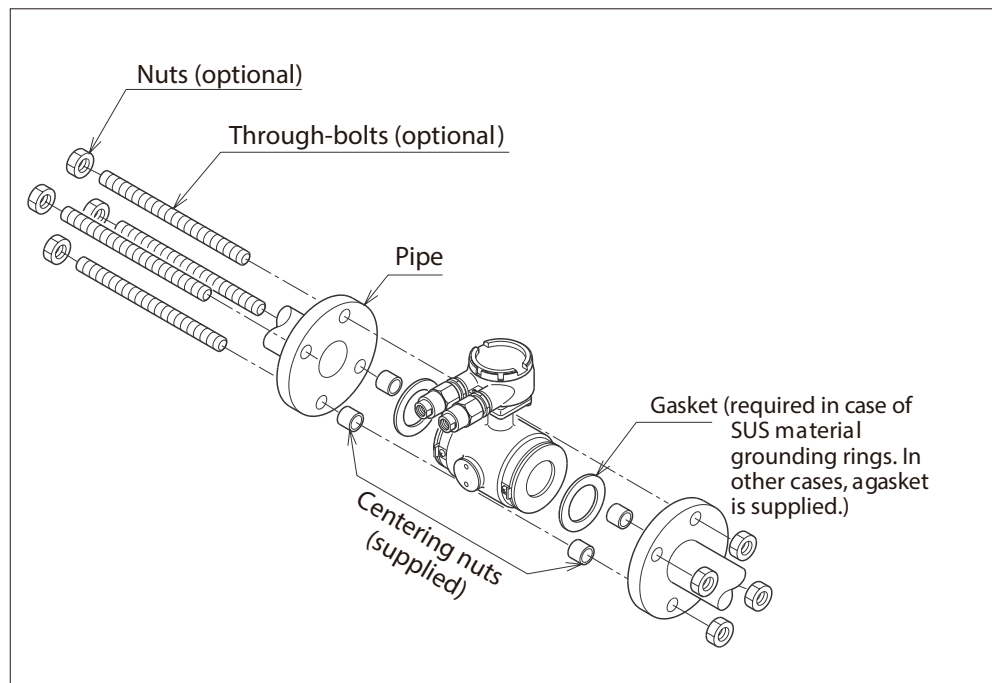
##### Introduction

The device can be installed as a wafer, flange, union, hose, or clamp unit. Referring to the appropriate method of installation, install the unit properly.

##### Installation example

Figure 2-5 shows the basic method for installing the device.

Figure 2-5 Device Installation Example



#### **Caution**

- Be careful in handling this unit. It is heavy, dropping it accidentally could cause injury.

*Continued on next page*



# Basic Installation Method Continued

## Fastening torque


 <b>Caution</b>
<ul style="list-style-type: none"> <li>• 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.</li> </ul>

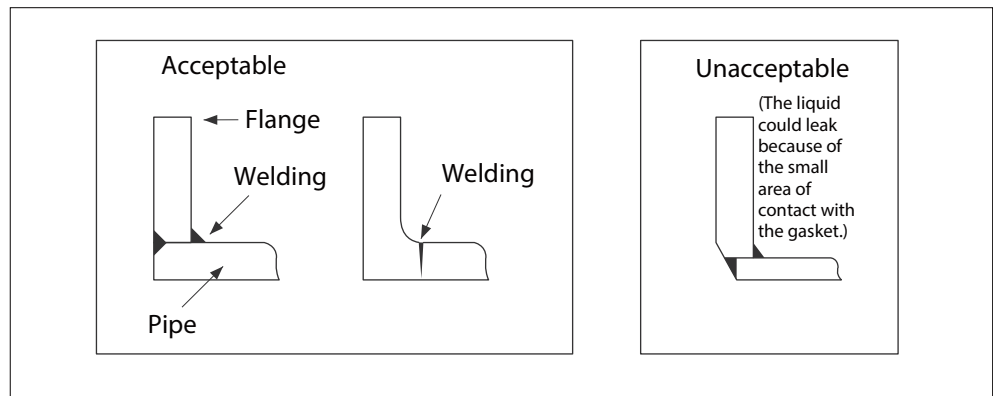
Table 2-1 Fastening Torque Levels


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



 <b>Caution</b>
<ul style="list-style-type: none"> <li>• 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.</li> <li>• Do not touch the electrodes or allow oil or fat to come into contact with them. It could cause output fluctuations.</li> <li>• Align the flow direction mark on the detector with the direction of the liquid flow. Misalignment could result in a negative output.</li> </ul>

*Continued on next page*

**Flange shape**  
(continued)


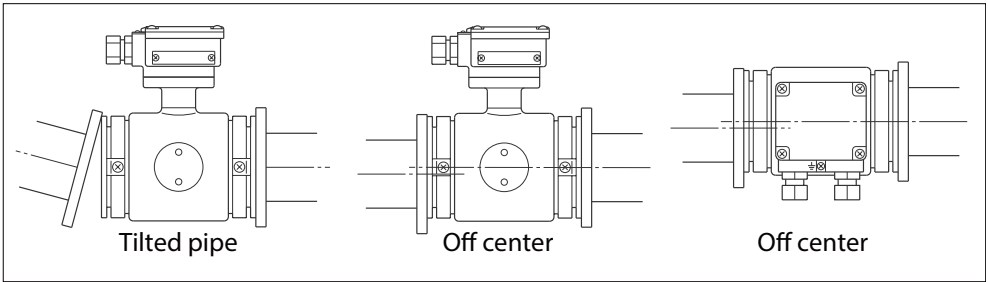
 <b>Warning</b>
<ul style="list-style-type: none"><li>• Before installing the detector make sure that the pipe is exactly straight and centered. Any irregularity in these respects could cause leakage or other hazards.</li></ul>

Figure 2-7 Examples of Unacceptable Installations (1)




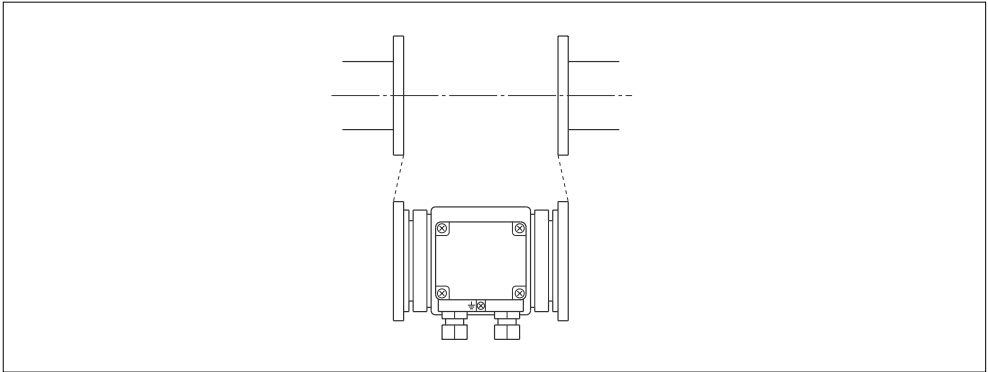


 <b>Caution</b>
<ul style="list-style-type: none"><li>• Never force the device between two flanges when the space is too narrow. It can damage the unit.</li></ul>

Figure 2-8 Example of Unacceptable Installation (2)



 <b>Warning</b>
<ul style="list-style-type: none"><li>• 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.</li></ul>

 <b>Caution</b>
<ul style="list-style-type: none"><li>• 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.</li></ul>

# 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.)

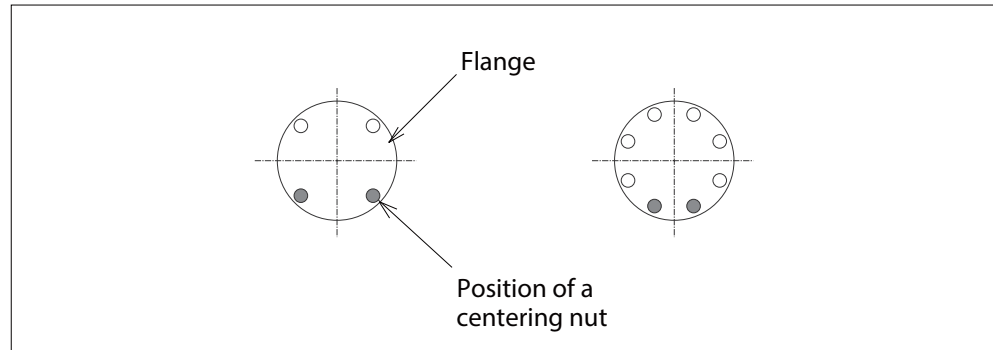
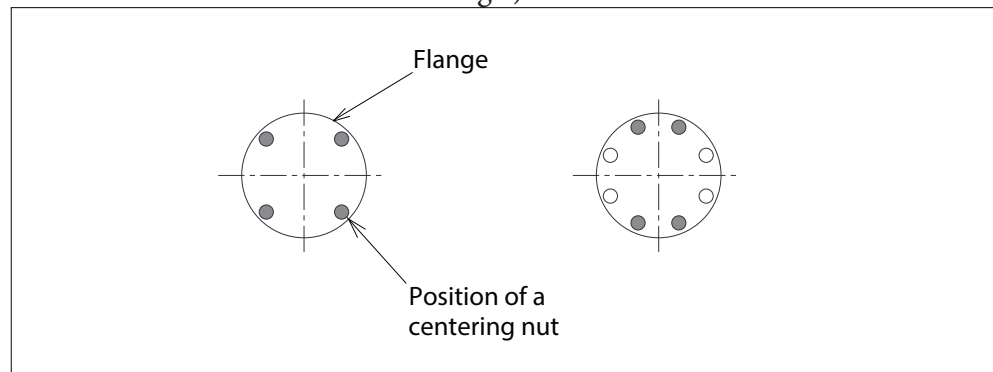


Figure 2-10 Vertical Centering of the Detector (Position the four centering nuts on the bottom flange.)



*Continued on next page*

## Parts Necessary for Installation Continued

### 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.

### **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)

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

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 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 ±1	34 ±1	34 ±1	34 ±1	50 ±1	75 ±1	91 ±1	111 ±1	121 ±1	146 ±1	177 ±1	207 ±1	257 ±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

## Selecting an Installation Method

---

 **Caution**

- 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.

<b>Pipe material</b>	<b>Grounding Ring Material</b>	<b>See Page</b>
Metal	SUS material	2-18
	Non-SUS material	2-19
PVC	SUS material	2-21
	Non-SUS material	2-24

---

# Installation on Horizontal Pipe

 **Caution**

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

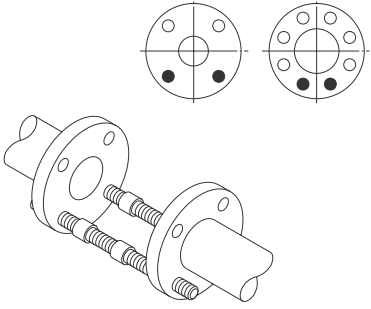
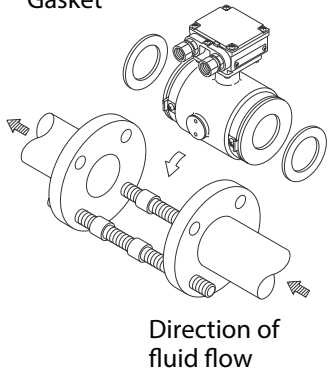
**Parts required**

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**

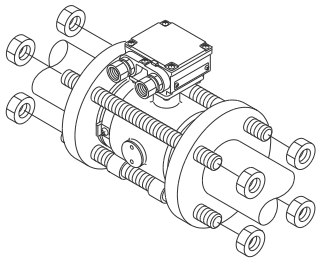
Follow this procedure to install the detector on a horizontal pipe.

Step	Action	Drawing
<b>1</b>	<p>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.</p>	<p>Flange</p> 
<b>2</b>	<ul style="list-style-type: none"> <li>• Turn the detector so that the direction mark on the detector matches the direction of fluid flow.</li> <li>• Insert the detector and gaskets between the pipe flanges.</li> <li>• Position the detector so that it sits on top of the centering.</li> </ul>	<p>Gasket</p>  <p style="text-align: right;">Direction of fluid flow</p>

*Continued on next page*

## Installation on Horizontal Pipe Continued

**Procedure**  
(continued)

Step	Action	Drawing
3	<ul style="list-style-type: none"><li>• Make sure that the detector remains properly centered.</li><li>• Make sure that the gaskets do not protrude beyond the edges of the pipe flanges.</li><li>• 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.</li></ul>	 An exploded view technical drawing of a detector assembly mounted on a pipe flange. The drawing shows the detector unit, a central gasket, and several through-bolts with nuts and washers. The detector is a rectangular box with a circular base. The pipe flange is a circular ring with multiple bolt holes. The drawing illustrates the assembly process, showing the detector being centered on the flange and the gasket being placed between the detector and the flange. The through-bolts are shown being inserted through the flange holes and the detector base.

# Installation on Vertical Pipe

**⚠ Caution**

- 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.

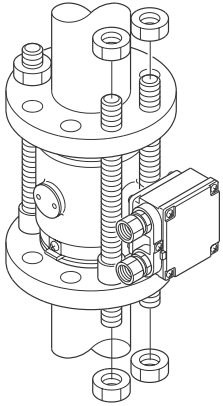
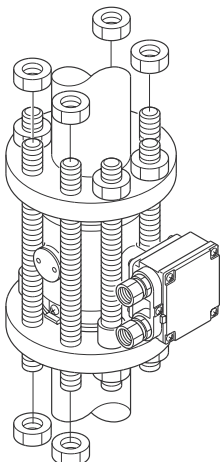
Step	Action	Drawing
1	Of the flange holes shown by black dots in the drawing, insert through-bolts into the two holes at the back and fasten them lightly with nuts. Slip one centering nut onto each through bolt before inserting the bolts.	<p>The drawing shows a perspective view of the detector assembly with two through-bolts and nuts being inserted into the back flange. A circular cross-section to the right shows the 'Terminal box side' and 'Back' views, with black dots indicating the positions of the flange holes. 'Centering nuts' are shown being placed onto the bolts.</p>
2	<ul style="list-style-type: none"> <li>• Turn the detector so that the direction mark on the detector matches the direction of fluid flow.</li> <li>• Insert the detector and gaskets between the pipe flanges.</li> </ul>	<p>The drawing shows the detector being inserted between two pipe flanges. An arrow indicates the 'Direction of fluid flow' passing through the pipe. Two gaskets are shown being placed between the detector and the flanges. The detector's terminal box is also visible.</p>

*Continued on next page*



## Installation on Vertical Pipe Continued

### Procedure (continued)

Step	Action	Drawing
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	<ul style="list-style-type: none"><li>• Make sure that the detector remains properly centered.</li><li>• Make sure that the gaskets do not protrude beyond the edges of the pipe flanges.</li><li>• 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.</li></ul>	

# 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 nuts
- Gaskets: 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.

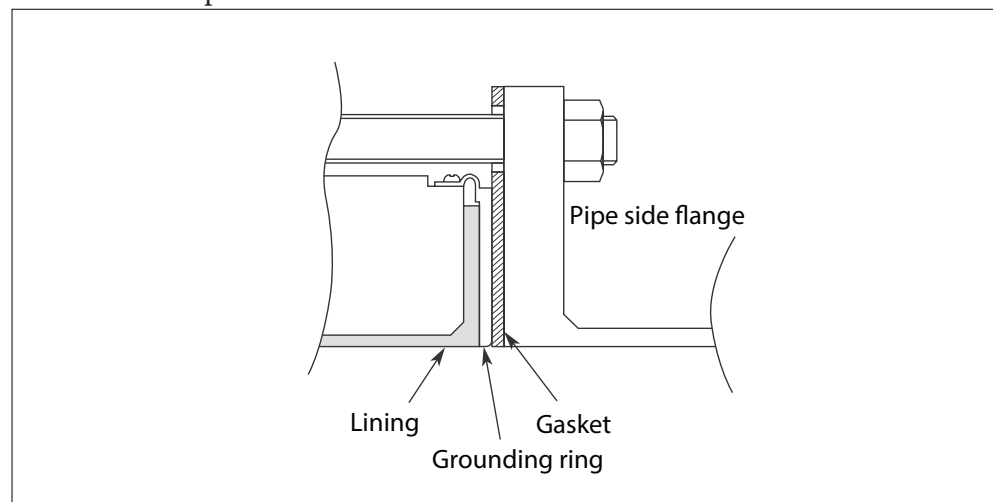
## Installation procedure

- 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.

### **Caution**

- 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 2-11 Installation Using SUS Material Grounding Ring and Metal Pipe



## 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 nuts
  - Centering nuts
- 

*Continued on next page*

## 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.

### **Caution**

- 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

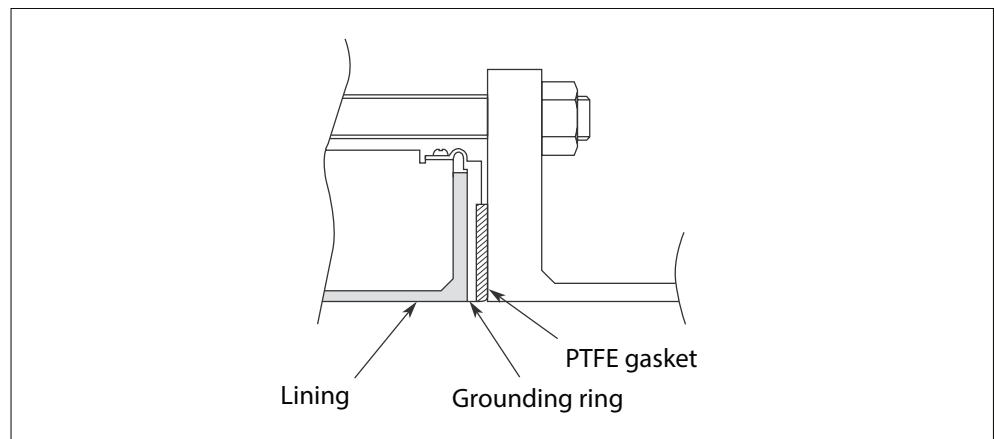
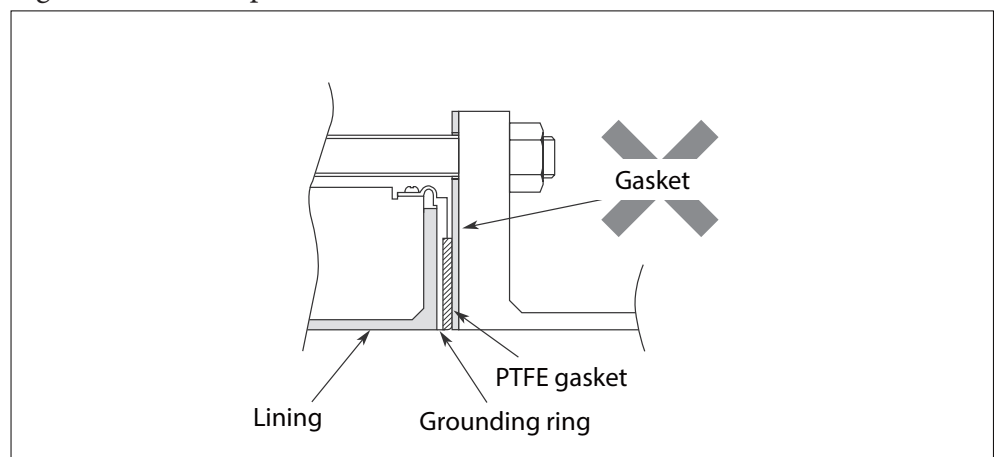


Figure 2-13 Example of Incorrect Installation



# Installation on PVC Pipe (1)

---

## Introduction

The installation method described in this section corresponds to the 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: 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.
- 

*Continued on next page*

## Installation on PVC Pipe (1) Continued

### Installation procedure

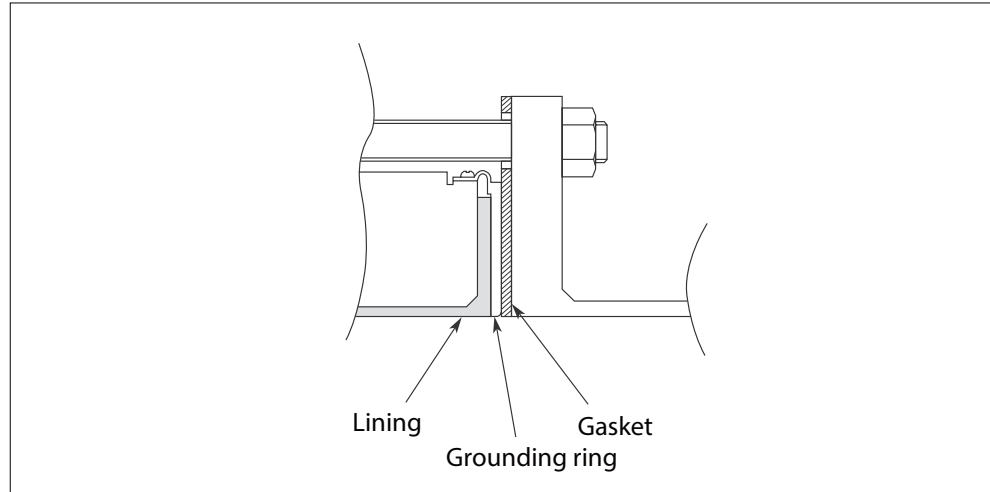
The installation procedure varies with such conditions as the fastening torque and the need for a protective plate. Choose one of the following three methods as applicable.

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.

### **Caution**

- 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



*Continued on next page*

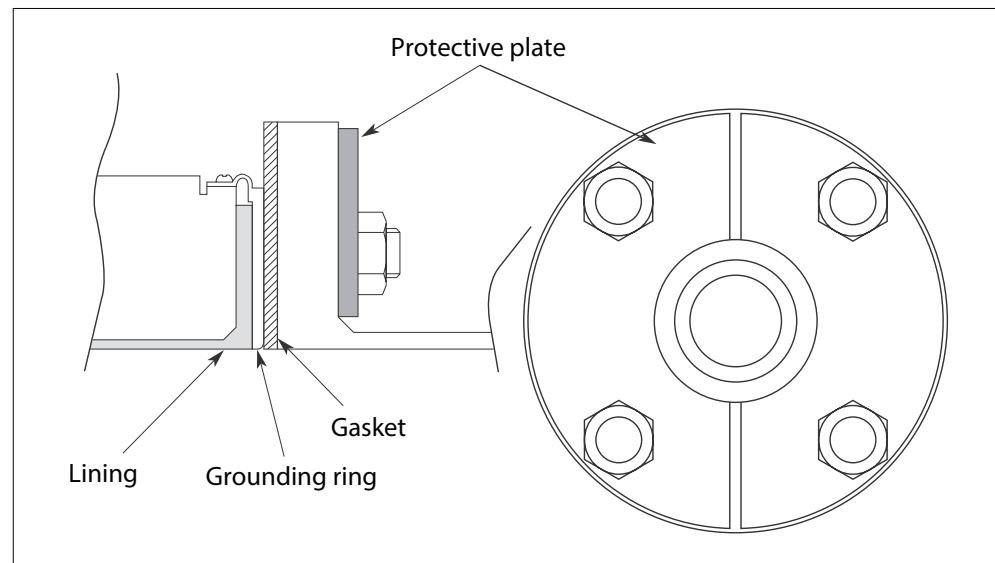
## Installation on PVC Pipe (1) Continued

### 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.

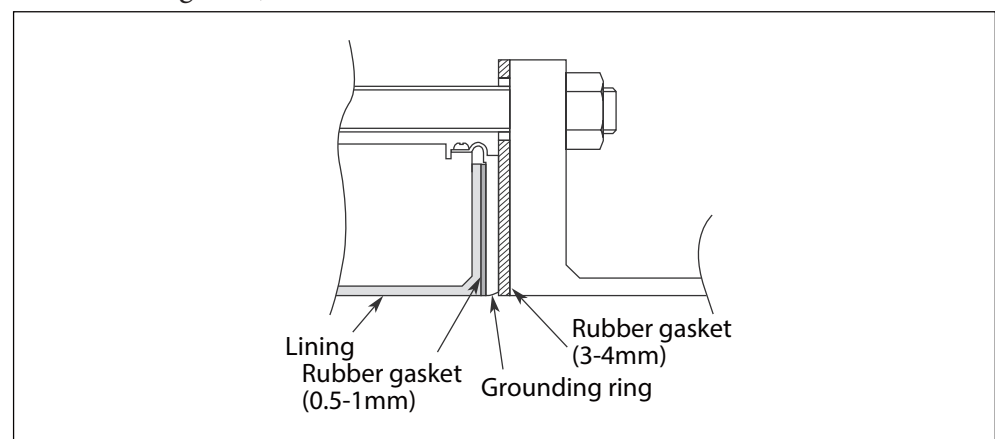
Figure 2-15 Installation Using SUS Material Grounding Ring (with protective plate)



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 leakproof joint. In this case, use the two kinds of rubber gaskets made of the same material.

Figure 2-16 Installation Using SUS Material Grounding Ring (with rubber gasket)



## 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:

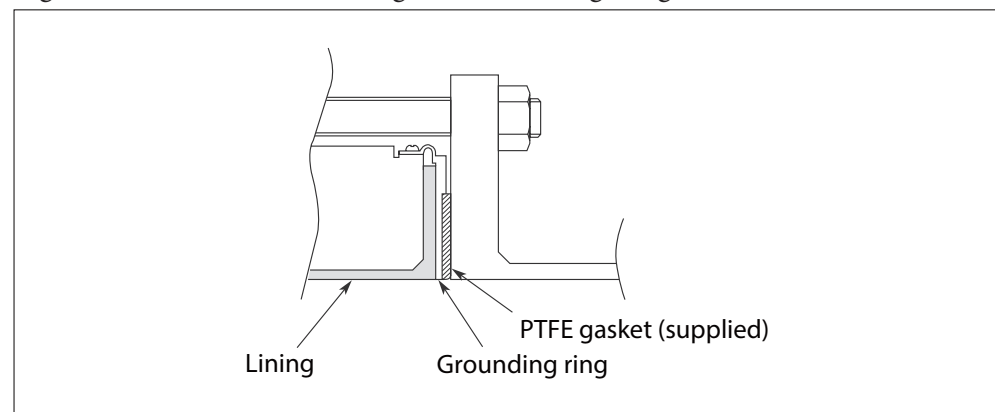
- Through-bolts and nuts
  - Centering nuts
  - Gaskets: No gaskets are necessary due to the provision of a PTFE gasket. When using a rubber gasket, gaskets of the same material and of two thicknesses, 0.5 to 1.0 mm and 3.0 to 4.0 mm, are required. See Table 2-3 and 2-4 on pages 2-12 for the appropriate dimensions.
  - 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 methods 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



*Continued on next page*



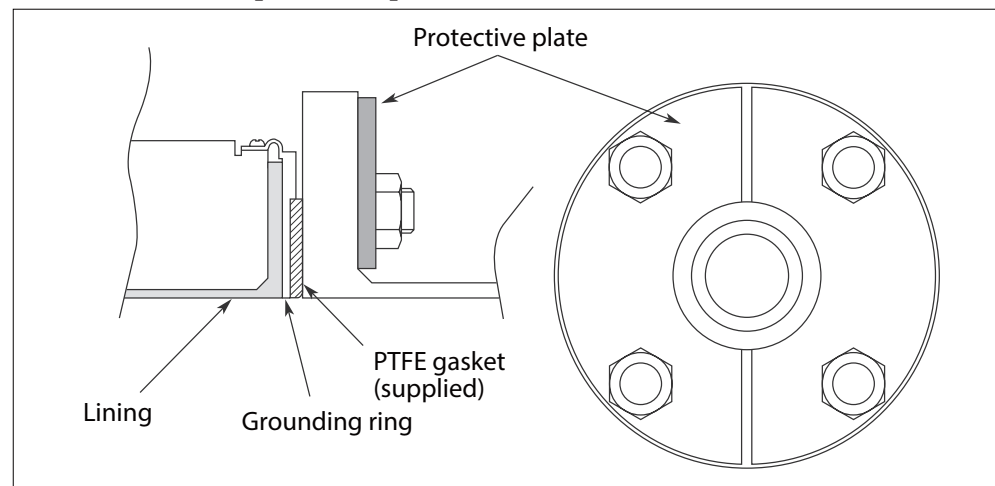
## Installation on PVC Pipe (2) Continued

### 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.

Figure 2-18 Installation Using the Grounding Ring of Non-SUS Material (with protective plate)

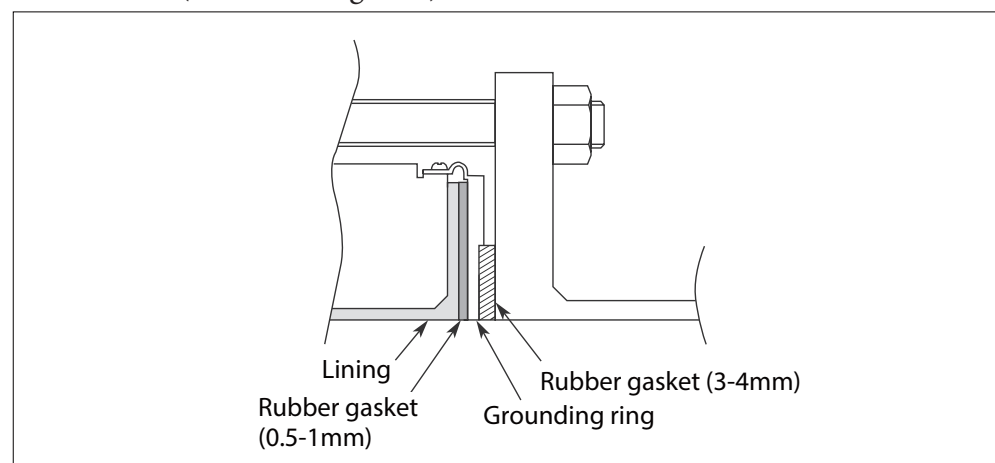


3. Use this method to install the detector using a low fastening torque and rubber gaskets

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.

Figure 2-19 Installation Using the Grounding Ring of Non-SUS Material (with rubber gasket)



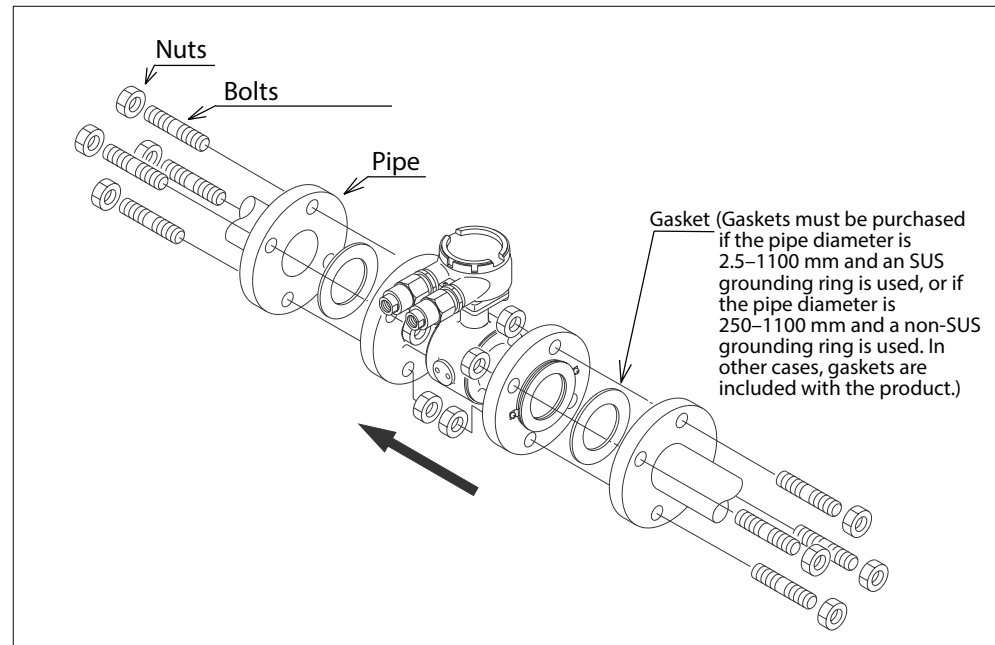
## 2-2-2 Installing a Flanged Detector

### Basic Installation Method

#### Installation example

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

Figure 2-20 Installation Example



#### Fastening torque

#### **Caution**

- 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.

*Continued on next page*

## Basic Installation Method Continued

**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)

*Continued on next page*

## Basic Installation Method Continued

### Fastening torque (continued)

Table 2-5 Fastening Torque (2)

Bore and Flange Ratings		Fastening Torque N•m (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 /150mm	JIS10K	47-67	(479-683)
	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)

*Continued on next page*

## Basic Installation Method Continued

### 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)

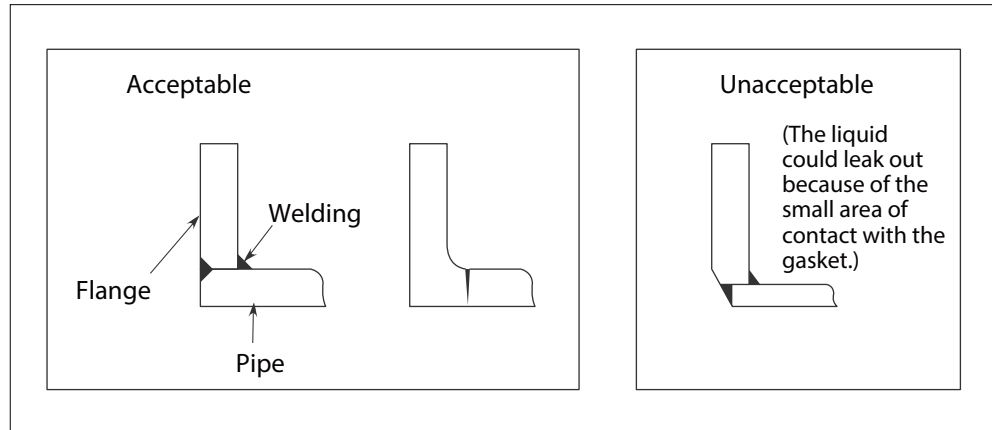
*Continued on next page*

## 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



### **Caution**

- 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.

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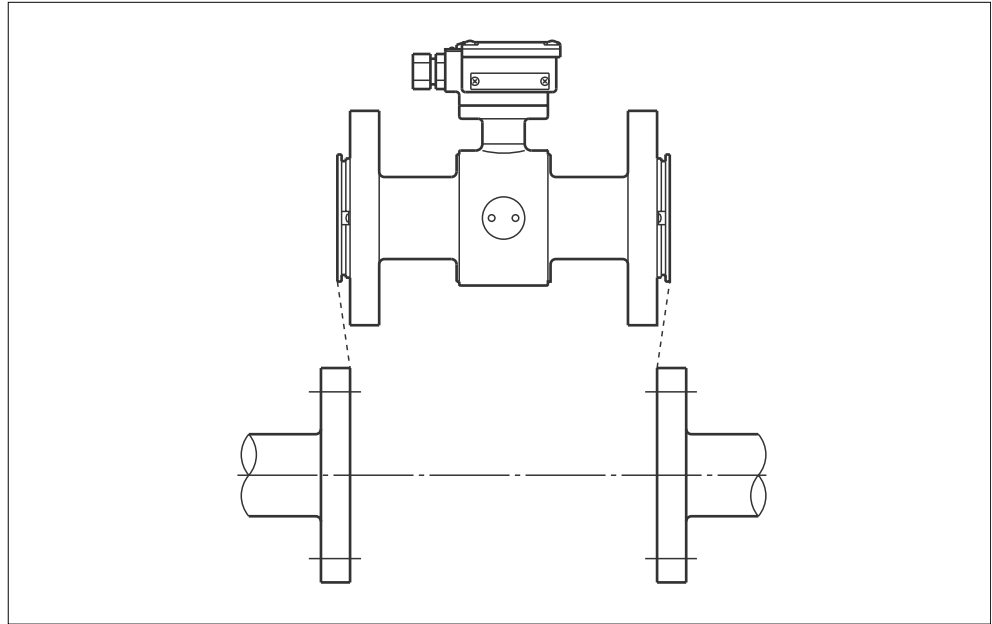
## Basic Installation Method Continued

**Flange shape**  
(continued)

### **Caution**

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

Figure 2-22 Example of Incorrect Mounting



### **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 must be purchased if the pipe diameter is 2.5–1100 mm and an SUS grounding ring is used, or if the pipe diameter is 250–1100 mm and a non-SUS grounding ring is used. For 2.5–200 mm dia. pipe with a non-SUS grounding ring, gaskets are included with the product.

## Gaskets

Gaskets are included with the product if the pipe diameter is 2.5–200 mm and a non-SUS grounding ring is used. Gaskets must be purchased if the pipe diameter is 2.5–1100 mm and an SUS grounding ring is used, or if the pipe diameter is 250–1100 mm and a non-SUS grounding ring is used. 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.


 <b>Caution</b>	
•	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.

Table 2-6 Recommended Inner Diameters of Gaskets

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



## Selecting an Installation Method

### Caution

 **Caution**

- 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 & pipe dia. 2.5–1100 mm, or non-SUS & pipe dia. 250–1100 mm	2-34
	Non-SUS & pipe dia. 2.5–200 mm	2-35
PVC	SUS & pipe dia. 2.5–1100 mm, or non-SUS & pipe dia. 250–1100 mm	2-37
	Non-SUS & pipe dia. 2.5–200 mm	2-38

# Installation on Metal Pipe (1)

## Introduction

The installation method described in this section is to be used with the following grounding ring material. For installation methods for other material combinations, see the table on page 2-33.

Pipe material: Metal

Ground ring material: SUS & pipe dia. 2.5–1100 mm, or non-SUS & pipe dia. 250–1100 mm

## 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.

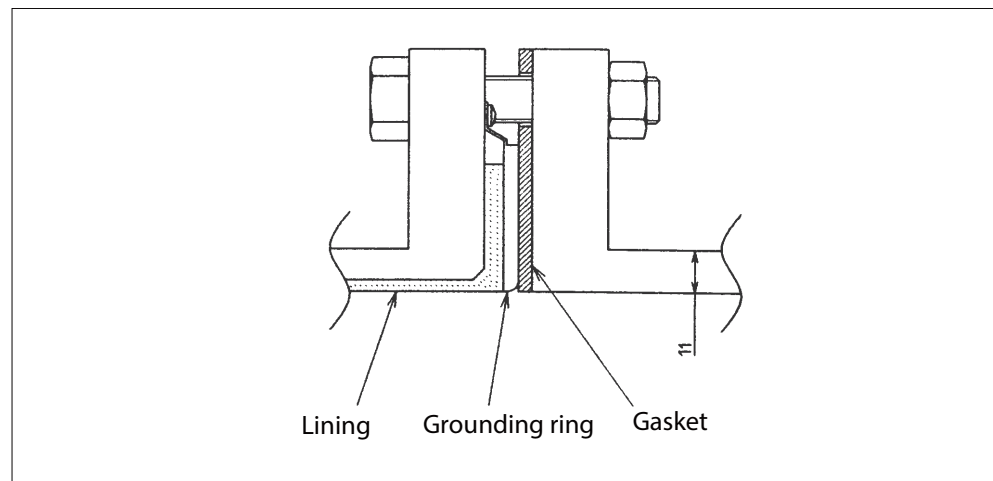
## Installation procedure

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.

Figure 2-23 For SUS Ring & Pipe Dia. 2.5–1100 mm, or Non-SUS Ring & Pipe Dia. 250–1100 mm



## Installation on Metal Pipe (2)

---

### Introduction

The installation method described in this section is to be used with the following grounding ring materials. For installation methods for other material combinations, see the table on page 2-33.

Pipe material: Metal

Grounding ring material: Non-SUS & pipe dia. 2.5–200 mm

---

### Required parts

The following parts are required. No gaskets are necessary since PTFE gaskets are provided.

- Bolts and nuts
- 

*Continued on next page*

## 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 2-24 For Non-SUS Ring & Pipe Dia. 2.5–200 mm

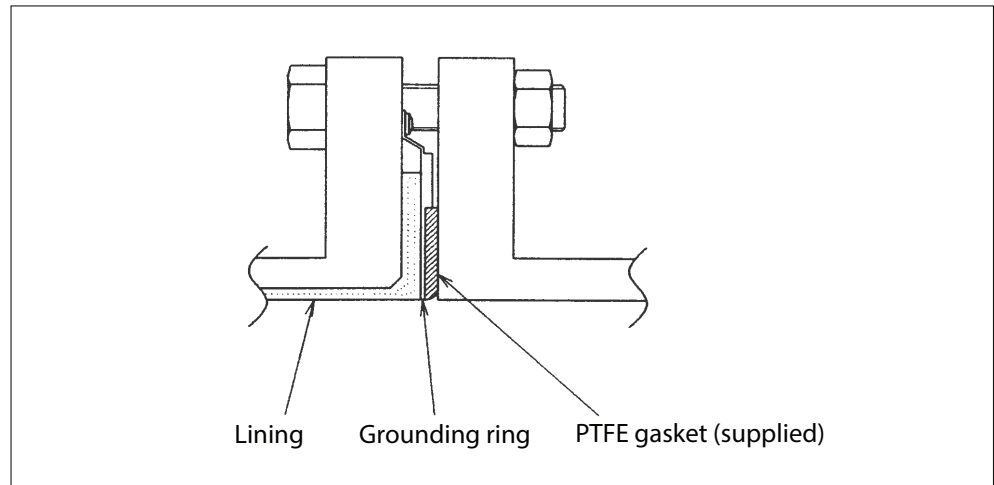
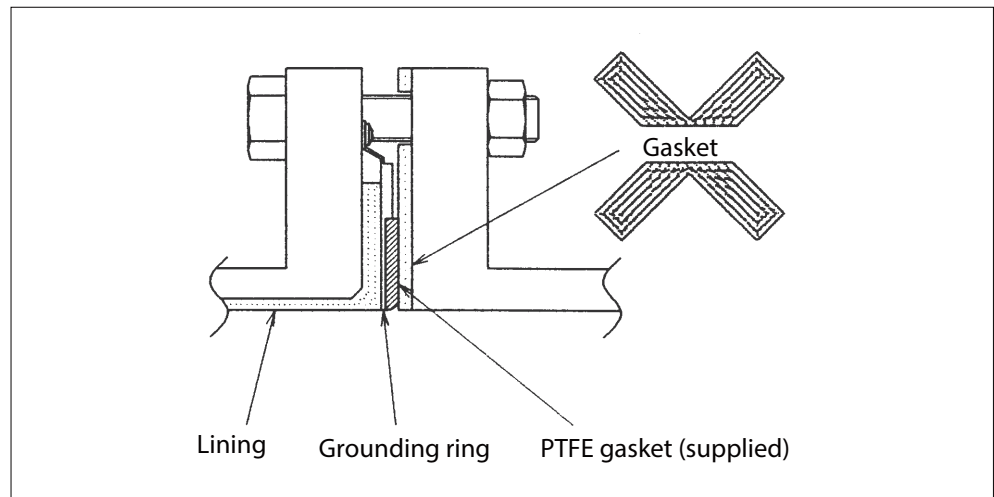


Figure 2-25 Example of Incorrect Installation



# 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 & pipe dia. 2.5–1100 mm, or non-SUS & pipe dia. 250–1100 mm

---

## 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 Figure 2-27.
- 

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## Installation on PVC Pipe (1) Continued

### Installation procedure

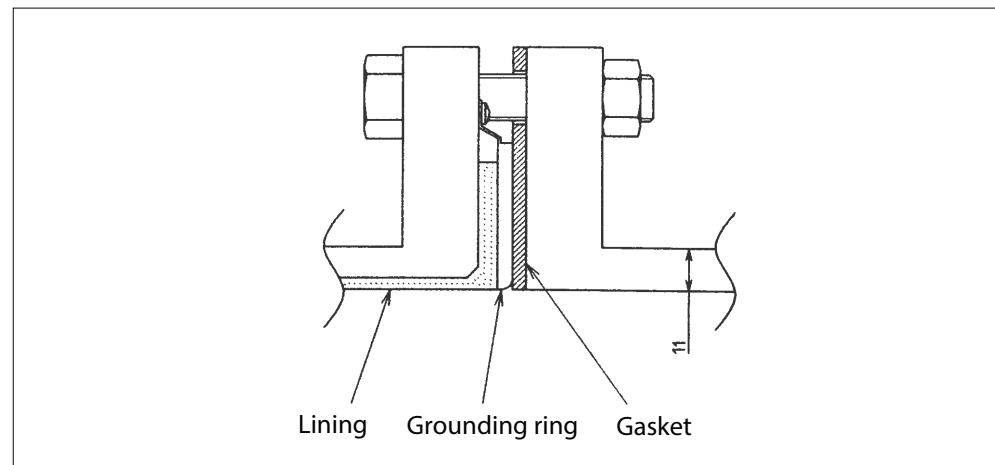
The installation procedure varies depending on conditions such as the fastening torque and the need for a protective plate. Choose one of the following three methods, as applicable.

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.

### Caution

- 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 For SUS Ring & Pipe Dia. 2.5–1100 mm, or Non-SUS Ring & Pipe Dia. 250–1100 mm



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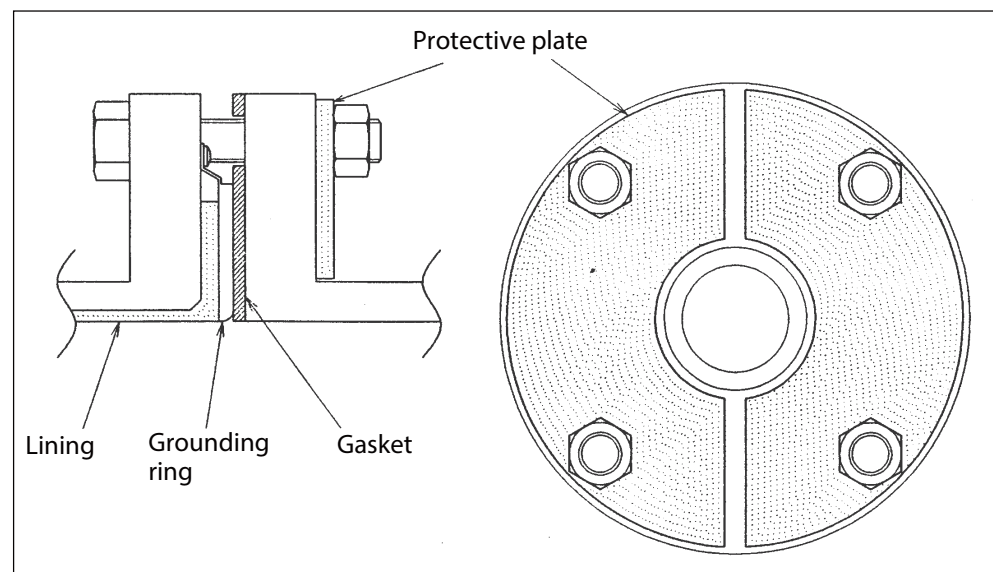
## Installation on PVC Pipe (1) Continued

### 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 For SUS Ring & Pipe Dia. 2.5–1100 mm, or Non-SUS Ring & Pipe Dia. 250–1100 mm (with protective plate)

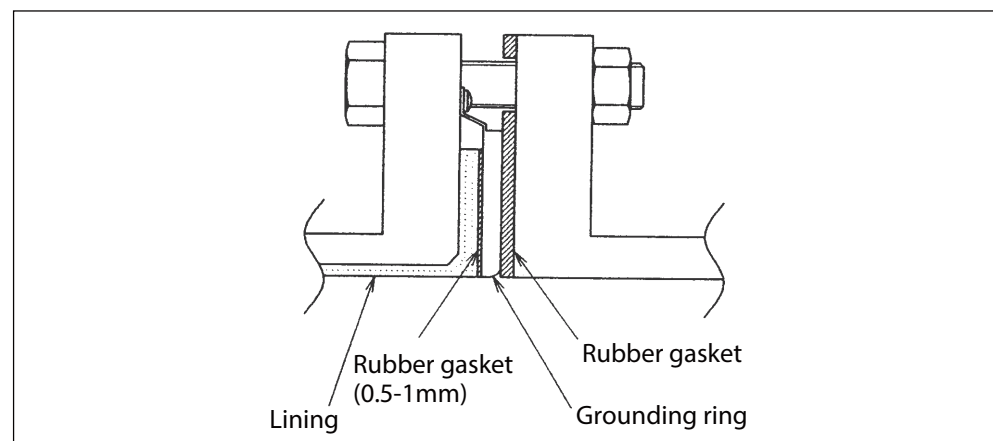


3. Use this method to install the detector using a low-fastening torque and rubber gaskets.

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 For SUS Ring & Pipe Dia. 2.5–1100 mm, or Non-SUS Ring & Pipe Dia. 250–1100 mm (with rubber gasket)



## Installation on PVC Pipe (2)

---

### Introduction

The installation method described in this section is to be 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: Non-SUS & pipe dia. 2.5–200 mm

---

### Required parts

The following parts are required.

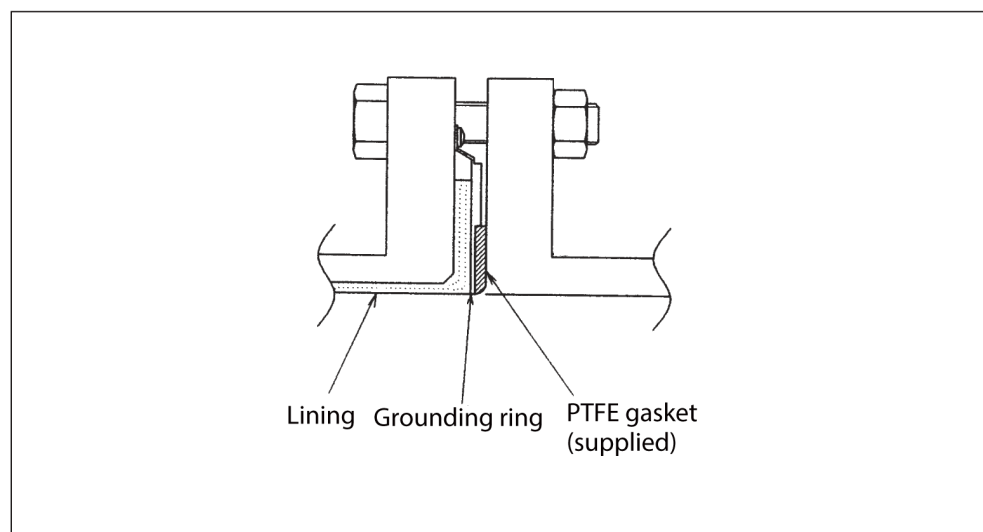
- Through-bolts and nuts
  - Centering nuts
  - Gaskets: No gaskets are necessary due to the provision of a PTFE gasket. When using a rubber gasket, gaskets of the same material and of two thicknesses, 0.5 to 1.0 mm and 3.0 to 4.0 mm, are required. See Table 2-3 and 2-4 on page 2-12 for the appropriate dimensions.
  - 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 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 2-29. See Table 2-5 on pages 2-27 to 2-29 for the appropriate fastening torque.

Figure 2-29 For Non-SUS Ring & Pipe Dia. 2.5–200 mm



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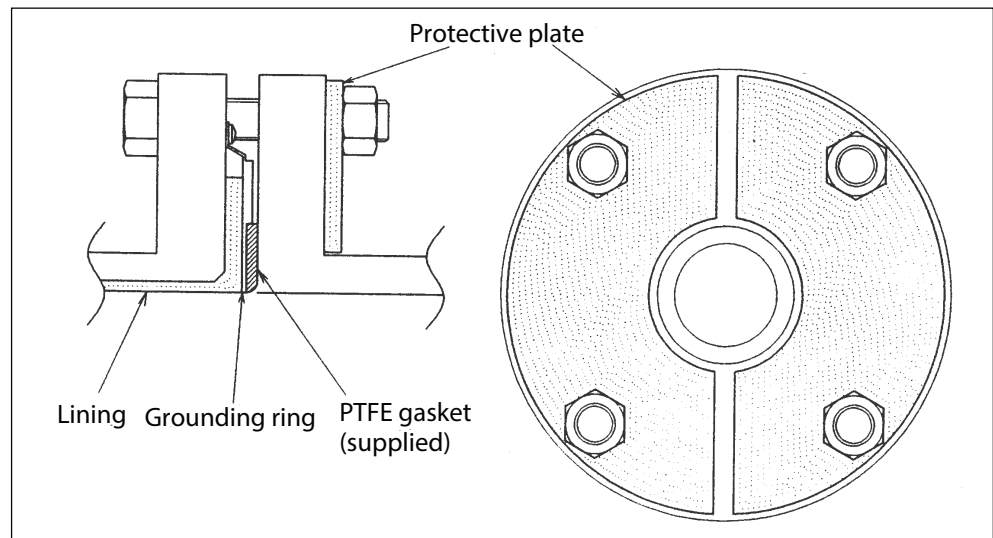


## Installation on PVC Pipe (2) Continued

### Installation procedure (continued)

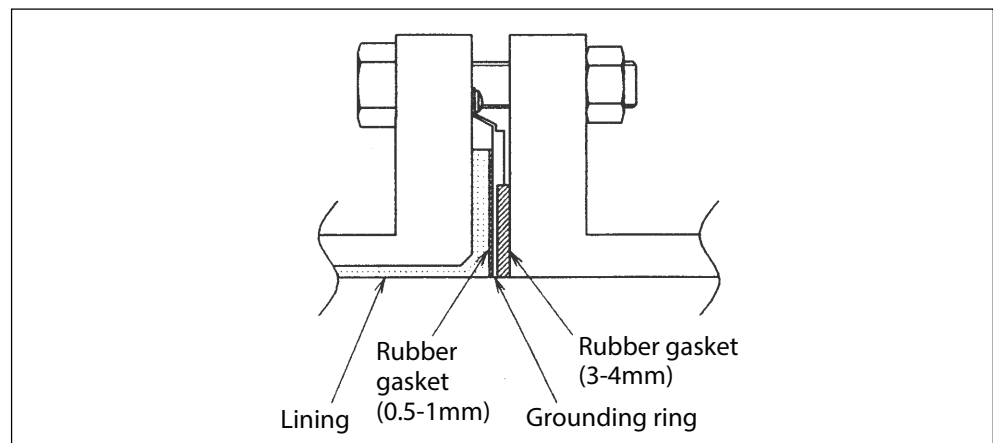
- Use this method to install the detector along with a protective plate to prevent the PVC pipe from being deformed or damaged when the bolts are tightened to the specified torque.  
Insert a protective plate between the outer side of the PVC flange and the detector as shown in Figure 2-30. The protective 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.

Figure 2-30 For Non-SUS Ring & Pipe Dia. 2.5–200 mm (with protective plate)



- 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 For Non-SUS Ring & Pipe Dia. 2.5–200 mm (with rubber gasket)

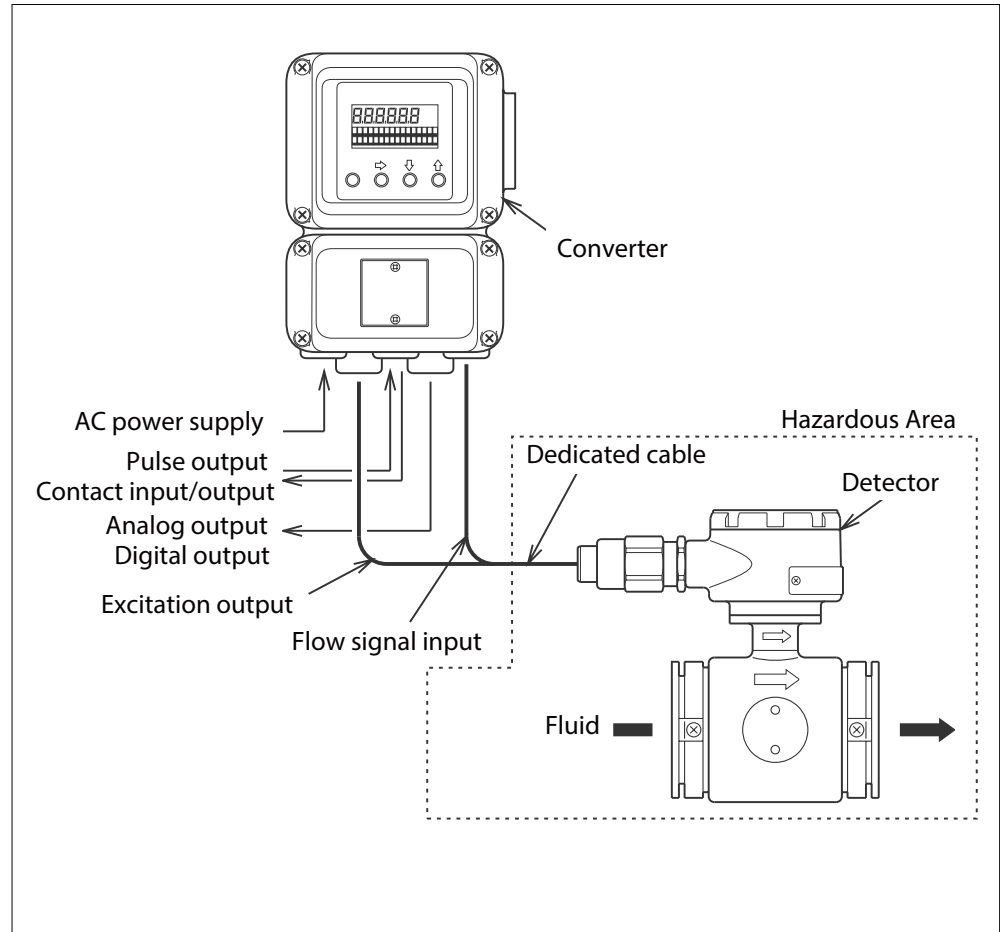


# Electrical Wiring (1)

## 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.

Figure 2-32 Connection Using a Special Cable



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.

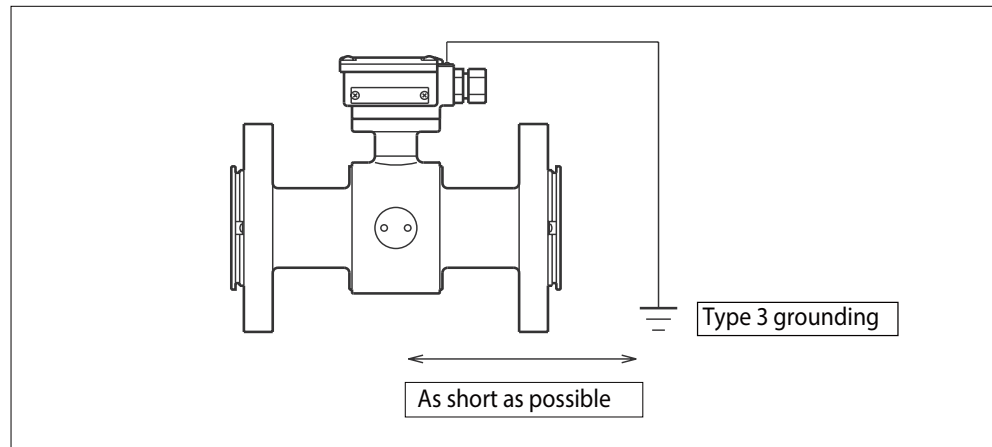
## Electrical Wiring (2)

### Grounding (remote models)

Attach a type 3 grounding (with a grounding resistance of  $100\Omega$  or less) to the ground terminal.

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

Figure 2-33 Grounding Via the External Grounding Terminal



### **Caution**

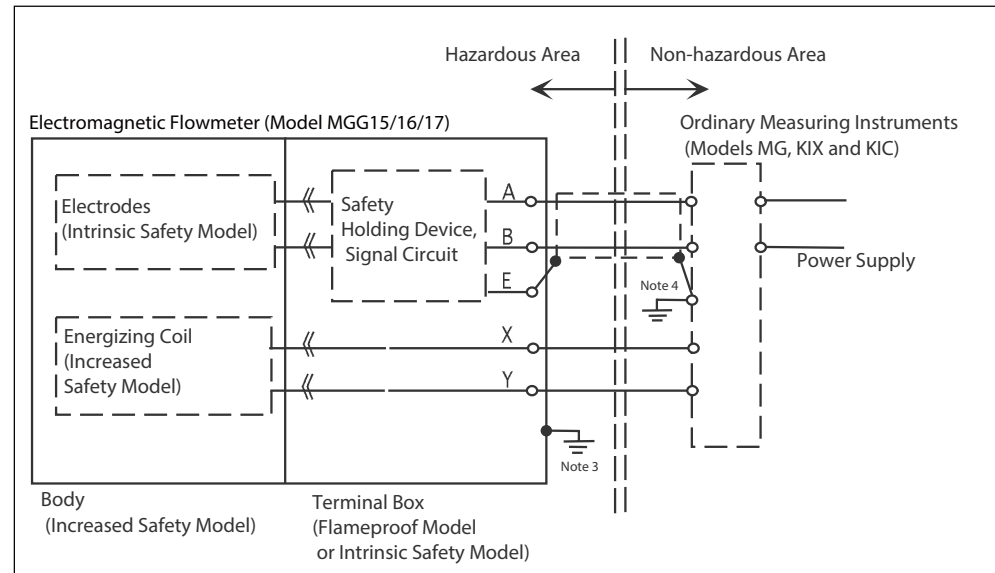
- Insufficient grounding can cause output fluctuations, instability of the zero point, or output drift. Secure single-point type 3 grounding is recommended.
- Do not ground a welder to the detector. It can cause damage to the detector.

## 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:

Figure 2-34 Grounding



### Caution for TIS

- Note 1. Neither input power supply voltage to ground, nor voltage inside the ordinary measuring instruments should exceed 250V ac (50/ 60 Hz) or 250V dc during normal or abnormal operation. The energizing voltage should not exceed 45V dc, and the energizing current should not exceed 200mA.
2. Ambient temperature for the flowmeter should be 60°C.
  3. Classification 3 Grounding should be employed.
  4. Classification 4 Grounding should be employed.

### Caution for FM/ CSA

- Note 1. Power supply and internal voltage of ordinary equipment to the earth shall not exceed AC250V 50/60Hz, DC250V in case of normal/formal conditions.
2. Ambient temperature is from -10 to 60°C
  3. Process temperature is from -40 to 160°C
  4. Power supply and internal voltage of Ordinary Equipment to the Earth shall not exceed AC250V 50/60Hz. DC260V in case of Normal/Fault.
  5. Protection Ground.

## Chapter 3 - Maintenance of the Device

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### **Introduction**

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

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# MEMO

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# MEMO



# Terms and Conditions

We would like to express our appreciation for your purchase and use of Azbil Corporation's products.

You are required to acknowledge and agree upon the following terms and conditions for your purchase of Azbil Corporation's products (system products, field instruments, control valves, and control products), unless otherwise stated in any separate document, including, without limitation, estimation sheets, written agreements, catalogs, specifications and instruction manuals.

## 1. Warranty period and warranty scope

### 1.1 Warranty period

Azbil Corporation's products shall be warranted for one (1) year from the date of your purchase of the said products or the delivery of the said products to a place designated by you.

### 1.2 Warranty scope

In the event that Azbil Corporation's product has any failure attributable to azbil during the aforementioned warranty period, Azbil Corporation shall, without charge, deliver a replacement for the said product to the place where you purchased, or repair the said product and deliver it to the aforementioned place. Notwithstanding the foregoing, any failure falling under one of the following shall not be covered under this warranty:

- (1) Failure caused by your improper use of azbil product (noncompliance with conditions, environment of use, precautions, etc. set forth in catalogs, specifications, instruction manuals, etc.);
- (2) Failure caused for other reasons than Azbil Corporation's product;
- (3) Failure caused by any modification or repair made by any person other than Azbil Corporation or Azbil Corporation's subcontractors;
- (4) Failure caused by your use of Azbil Corporation's product in a manner not conforming to the intended usage of that product;
- (5) Failure that the state-of-the-art at the time of Azbil Corporation's shipment did not allow Azbil Corporation to predict; or
- (6) Failure that arose from any reason not attributable to Azbil Corporation, including, without limitation, acts of God, disasters, and actions taken by a third party.

Please note that the term "warranty" as used herein refers to equipment-only-warranty, and Azbil Corporation shall not be liable for any damages, including direct, indirect, special, incidental or consequential damages in connection with or arising out of Azbil Corporation's products.

## 2. Ascertainment of suitability

You are required to ascertain the suitability of Azbil Corporation's product in case of your use of the same with your machinery, equipment, etc. (hereinafter referred to as "Equipment") on your own responsibility, taking the following matters into consideration:

- (1) Regulations and standards or laws that your Equipment is to comply with.
- (2) Examples of application described in any documents provided by Azbil Corporation are for your reference purpose only, and you are required to check the functions and safety of your Equipment prior to your use.
- (3) Measures to be taken to secure the required level of the reliability and safety of your Equipment in your use

Although azbil is constantly making efforts to improve the quality and reliability of Azbil Corporation's products, there exists a possibility that parts and machinery may break down. You are required to provide your Equipment with safety design such as fool-proof design,<sup>\*1</sup> and fail-safe design<sup>\*2</sup> (anti-flame propagation design, etc.), whereby preventing any occurrence of physical injuries, fires, significant damage, and so forth. Furthermore, fault avoidance,<sup>\*3</sup> fault tolerance,<sup>\*4</sup> or the like should be incorporated so that the said Equipment can satisfy the level of reliability and safety required for your use.

\*1. A design that is safe even if the user makes an error.

\*2. A design that is safe even if the device fails.

\*3. Avoidance of device failure by using highly reliable components, etc.

\*4. The use of redundancy.

## 3. Precautions and restrictions on application

### 3.1 Restrictions on application

Please follow the table below for use in nuclear power or radiation-related equipment.

	Nuclear power quality <sup>*5</sup> required	Nuclear power quality <sup>*5</sup> not required
Within a radiation controlled area <sup>*6</sup>	Cannot be used (except for limit switches for nuclear power <sup>*7</sup> )	Cannot be used (except for limit switches for nuclear power <sup>*7</sup> )
Outside a radiation controlled area <sup>*6</sup>	Cannot be used (except for limit switches for nuclear power <sup>*7</sup> )	Can be used

\*5. Nuclear power quality: compliance with JEAG 4121 required

\*6. Radiation controlled area: an area governed by the requirements of article 3 of "Rules on the Prevention of Harm from Ionizing Radiation," article 2 2 4 of "Regulations on Installation and Operation of Nuclear Reactors for Practical Power Generation," article 4 of "Determining the Quantity, etc., of Radiation-Emitting Isotopes," etc.

\*7. Limit switch for nuclear power: a limit switch designed, manufactured and sold according to IEEE 382 and JEAG 4121.

Any Azbil Corporation's products shall not be used for/with medical equipment.

The products are for industrial use. Do not allow general consumers to install or use any Azbil Corporation's product. However, azbil products can be incorporated into products used by general consumers. If you intend to use a product for that purpose, please contact one of our sales representatives.

### 3.2 Precautions on application

you are required to conduct a consultation with our sales representative and understand detail specifications, cautions for operation, and so forth by reference to catalogs, specifications, instruction manual, etc. in case that you intend to use azbil product for any purposes specified in (1) through (6) below. Moreover, you are required to provide your Equipment with fool-proof design, fail-safe design, antifiame propagation design, fault avoidance, fault tolerance, and other kinds of protection/safety circuit design on your own responsibility to ensure reliability and safety, whereby preventing problems caused by failure or nonconformity.

- (1) For use under such conditions or in such environments as not stated in technical documents, including catalogs, specification, and instruction manuals
- (2) For use of specific purposes, such as:
  - \* Nuclear energy/radiation related facilities  
[When used outside a radiation controlled area and where nuclear power quality is not required]  
[When the limit switch for nuclear power is used]
  - \* Machinery or equipment for space/sea bottom
  - \* Transportation equipment  
[Railway, aircraft, vessels, vehicle equipment, etc.]
  - \* Antidisaster/crime-prevention equipment
  - \* Burning appliances
  - \* Electrothermal equipment
  - \* Amusement facilities
  - \* Facilities/applications associated directly with billing
- (3) Supply systems such as electricity/gas/water supply systems, large-scale communication systems, and traffic/air traffic control systems requiring high reliability
- (4) Facilities that are to comply with regulations of governmental/public agencies or specific industries
- (5) Machinery or equipment that may affect human lives, human bodies or properties
- (6) Other machinery or equipment equivalent to those set forth in items (1) to (5) above which require high reliability and safety

#### 4. Precautions against long-term use

Use of Azbil Corporation's products, including switches, which contain electronic components, over a prolonged period may degrade insulation or increase contact-resistance and may result in heat generation or any other similar problem causing such product or switch to develop safety hazards such as smoking, ignition, and electrification. Although acceleration of the above situation varies depending on the conditions or environment of use of the products, you are required not to use any Azbil Corporation's products for a period exceeding ten (10) years unless otherwise stated in specifications or instruction manuals.

#### 5. Recommendation for renewal

Mechanical components, such as relays and switches, used for Azbil Corporation's products will reach the end of their life due to wear by repetitious open/close operations.

In addition, electronic components such as electrolytic capacitors will reach the end of their life due to aged deterioration based on the conditions or environment in which such electronic components are used. Although acceleration of the above situation varies depending on the conditions or environment of use, the number of open/close operations of relays, etc. as prescribed in specifications or instruction manuals, or depending on the design margin of your machine or equipment, you are required to renew any Azbil Corporation's products every 5 to 10 years unless otherwise specified in specifications or instruction manuals. System products, field instruments (sensors such as pressure/flow/level sensors, regulating valves, etc.) will reach the end of their life due to aged deterioration of parts. For those parts that will reach the end of their life due to aged deterioration, recommended replacement cycles are prescribed. You are required to replace parts based on such recommended replacement cycles.

#### 6. Other precautions

Prior to your use of Azbil Corporation's products, you are required to understand and comply with specifications (e.g., conditions and environment of use), precautions, warnings/cautions/notices as set forth in the technical documents prepared for individual Azbil Corporation's products, such as catalogs, specifications, and instruction manuals to ensure the quality, reliability, and safety of those products.

#### 7. Changes to specifications

Please note that the descriptions contained in any documents provided by azbil are subject to change without notice for improvement or for any other reason. For inquiries or information on specifications as you may need to check, please contact our branch offices or sales offices, or your local sales agents.

#### 8. Discontinuance of the supply of products/parts

Please note that the production of any Azbil Corporation's product may be discontinued without notice. After manufacturing is discontinued, we may not be able to provide replacement products even within the warranty period.

For repairable products, we will, in principle, undertake repairs for five (5) years after the discontinuance of those products. In some cases, however, we cannot undertake such repairs for reasons, such as the absence of repair parts. For system products, field instruments, we may not be able to undertake parts replacement for similar reasons.

#### 9. Scope of services

Prices of Azbil Corporation's products do not include any charges for services such as engineer dispatch service. Accordingly, a separate fee will be charged in any of the following cases:

- (1) Installation, adjustment, guidance, and attendance at a test run
- (2) Maintenance, inspection, adjustment, and repair
- (3) Technical guidance and technical education
- (4) Special test or special inspection of a product under the conditions specified by you

Please note that we cannot provide any services as set forth above in a nuclear energy controlled area (radiation controlled area) or at a place where the level of exposure to radiation is equivalent to that in a nuclear energy controlled area.

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**Document Number:** CM2-MGG120-2001

**Document Name:** MagneW<sup>FLEX+/PLUS+</sup>  
Electromagnetic Flowmeter Explosion-proof type Detector  
Model: MGG15/17  
User's Manual

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