

**ELECTROMAGNETIC FLOWMETER DETECTOR
FOR PARTIALLY FILLED PIPES**

MODEL LF502

INSTRUCTION MANUAL

TOSHIBA CORPORATION

NOTES

Read this instruction manual and understand the contents thoroughly before operating the product.

- After reading the manual, keep and store it with care so that it can be used any time when needed.
- If the product is transferred to other place or resold to other customers, be sure to attach the manual to the product.

Introduction

Thank you very much for your purchase of our Model LF502 Electromagnetic Flowmeter Detector for partially filled pipes.

This manual is intended for person(s) in charge of installation, operation and maintenance regarding the items such as notes on use, installation, configuration and maintenance.

To use this product properly and safely, read this manual (6F8A0874) thoroughly beforehand. After reading the manual, store it in a place you can bring it out at any time.

The LF502 Electromagnetic Flowmeter Detector for partially filled pipes must be combined with a Model LF232*F Electromagnetic Flowmeter Converter.

As to the items such as the notes on use, installation, operation, configuration and maintenance of the converter, read the instruction manual of the electromagnetic flowmeter converter combined with the detector.

- **About Safety Precautions**

Read the Safety Precautions described at the front and understand the contents thoroughly before operating this product.

The safety signal words used in the Safety Precautions are also indicated at the left end of the corresponding texts in this manual.

NOTES

1. The photocopy or reprints of the contents from this manual, whether wholly or in part, are prohibited without prior consent.
2. The contents of this manual are subject to change without prior notice.
3. Though utmost efforts are made for the contents of this manual, if anything unusual or an error is found, or you have noticed anything about this manual, please contact your nearest Toshiba representative.

September, 2007 First Edition

SAFETY PRECAUTIONS

The product and the instruction manual contain important information for users and persons around them to prevent hazards and damage to property and to use the product safely.

Make yourself familiar with the contents (signal words and symbols) and then read the text and observe the items described.

Store this manual in a place easy to use and easy to refer to the manual whenever needed.

[Explanation of signal words]

Signal words	Description of signal words
 WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
 CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor to moderate injuries or only in property damage.

Notes:

- (1) Series injury refers to an injury such as loss of sight, physical damage, burns (high temperature or low temperature), electric shock, bone fracture and poisoning and the after effect of the injury remains or the injury requires hospitalization or long periods of outpatient treatment.
- (2) Minor to moderate injuries refers to burns, electric shock, and so on, that do not oblige the injured person to be hospitalized or go to a hospital for a long period of time for medical treatment. Property damage refers to extended damage involving breakage of property and damage to equipment.

[Explanation of safety symbols]

Safety symbols	Meaning of safety symbols
	Indicates an action that is prohibited. Simply DON'T do this action. The prohibited action is indicated by a picture or text inside or next to the circle.
	Indicates an action that is mandatory. DO this action. The mandatory action is indicated by a picture or text inside or next to the circle.
	Indicates a potential hazard. The potentially hazardous situation is indicated by a picture or text inside or next to the triangle.

Color explanation

WARNING  Background color: Yellow and Red, Border: Black, Picture display: Black

CAUTION  Background color: Yellow, Border: Black, Picture display: Black

SAFETY PRECAUTIONS (continued)

Safety Precautions for Installation and Wiring

 CAUTION	
<p>■ Do not use the LF502 in an explosive atmosphere.</p> <p> Using this product in an explosive atmosphere can cause explosion.</p> <p>DON'T</p>	<p>■ Use an appropriate device to carry and install the LF502.</p> <p> If this product falls to the ground, injury, or malfunction of or damage to the product, can be caused.</p> <p>DO</p>
<p>■ Turn off mains power before working on pipes.</p> <p> Working on pipes while power is applied can cause electric shock.</p> <p>DO</p>	<p>■ Do not modify or disassemble the LF502 unnecessarily.</p> <p> Modifying or disassembling this product can cause electric shock, malfunction of or damage to this product.</p> <p>DON'T</p>
<p>■ Be sure to install a switch and fuse to isolate the LF502 from mains power.</p> <p> Power supply without a switch and fuse can cause electric shock or defectiveness for maintenance and inspection.</p> <p>DO</p>	<p>■ Be sure to ground the LF502. The grounding must be made independently from that of power equipment. (100Ω or less ground resistance)</p> <p> Operating this product without grounding can cause electric shock, malfunction of the product or system failure due to leak current, etc.</p> <p>DO</p>
<p>■ Turn off mains power before conducting wiring work.</p> <p> Wiring while power is applied can cause electric shock.</p> <p>DO</p>	<p>■ Use crimped terminal lugs with insulation sleeve for the terminals of wiring such as power supply and GND.</p> <p> Disconnections or loose connections can cause electric shock, and fire from excessive current, or system failure may occur.</p> <p>DO</p>
<p>■ Do not conduct wiring work with bare hands.</p> <p> Remaining electric charge even if power is turned off can still cause electric shock.</p> <p>DON'T</p>	<p>■ Do not work on piping and wiring with wet hands.</p> <p> Wet hands may result in electric shock.</p> <p>DON'T</p>
<p> The label shown left is affixed near the terminal area for power input. Be alert to electric shock.</p>	

SAFETY PRECAUTIONS (continued)

Safety Precautions for Maintenance, Inspection and Parts Replacement

 CAUTION	
<p>■ Do not touch the LF502 main body when high temperature fluid is being measured.</p> <p> The fluid raises the main body temperature and can cause burns when touched.</p> <p>DON'T</p>	<p>■ Do not conduct wiring work or replace parts when power is applied.</p> <p> Wiring or replacing parts while power is applied can cause electric shock.</p> <p>DON'T</p>
<p>■ Do not conduct wiring work or replace parts with wet hands.</p> <p> Wet hands may result in electric shock.</p> <p>DON'T</p>	<div style="border: 1px dashed black; padding: 5px;"> <p>The label shown left is affixed near the terminal block for converter to supply power.</p> <p> Be alert to electric shock.</p> </div>
<p>■ Do not use a fuse other than the one specified.</p> <p> Using a fuse other than the one specified can cause an accident, malfunction of the product or system failure.</p> <p>DON'T</p>	<p>Use a rated fuse as follows:</p> <ul style="list-style-type: none"> • For power supply of 100Vac: Rating: 2A/250V one piece, Dimensions: $\phi 5.2 \times 20\text{mm}$ • For power supply of 24Vdc: Rating: 3A/250V one piece, Dimensions: $\phi 5.2 \times 20\text{mm}$ • Use a normal blow type for melting time characteristic.

Usage limitations

- (1) This product is not manufactured for applying to a system requiring safety directly involved human life as follows. Please contact your nearest Toshiba representative if there is a possibility of using this product for such use.
- Main control systems of nuclear power plants, safety protection systems in nuclear facilities or other important systems requiring safety.
 - Medical control systems relating to life support.
- (2) This product is not approved for explosion-protection applications. Please do not use this product in an explosive atmosphere (explosion protection area).

Disclaimer

- Toshiba does not accept liability for any damages such as:
- Damages caused by fire, earthquake, action of a third party, other accidents, negligence of the user whether intentional or accidental, misuse of this product or usage under abnormal conditions.
 - Incidental damages arising from use or nonuse of this product (such as loss of business profit and business interruption).

Handling Precautions

To maintain the performance of the LF502 flowmeter detector and to operate the product safely for a long time, observe the following precautions.

- (1) Do not store or install the flowmeter detector in:
 - Places where there is direct sunlight. (If this is unavoidable, provide a sunshade.)
 - Places where excessive vibration or shock occurs.
 - Places with high temperature or high humidity.
 - Places where a corrosive atmosphere exists.
 - Places submerged under water.
 - To put the detector temporarily on the floor, place it carefully with something, such as a stopper, to support it so that the detector does not roll.
- (2) Connect wires for the detector correctly and securely.
Be sure to ground the flowmeter at the side of the converter to be combined with the detector (100Ω or less ground resistance).
Avoid grounding wires shared with other equipment where earth current may flow. (An independent ground is preferable.).
- (3) Take necessary actions so that the fluid to be measured does not freeze.
(Freezing can cause damage to the lining and the measuring tube.)
- (4) Select a liquid contact material appropriate for the liquid to be measured to prevent liquid leak from corrosion.
- (5) The cable lead-in section of the converter must be connected securely to keep it airtight.
- (6) Do not unnecessarily loosen the cover of the terminal box and cable glands. If they are removed, tighten the screws to close them securely.
(Insulation deterioration or damage can result)
Cautions when opening the terminal box cover:
 - Avoid the wind and rain when opening the cover.
(The wind and rain can cause parts failure and electric shock.)
 - Do not open the cover in a place where temperature and humidity are high or corrosive atmosphere exists.
(This kind of atmosphere can cause deterioration of the system accuracy and parts failure.)
- (7) Though this product satisfies the permissible level of the First class information technology equipment of VCCI (Voluntary Control Council for Interference by Information Technology Equipment), the product may cause interference to devices such as radio and television sets if they are used near the installation site.
If it is necessary to use such devices as above near the installation site, use metal conduits, etc. for cables to connect to the flowmeter converter to prevent this interference problem.

Handling Precautions (continued)

- (8) Wireless transmitters such as transceivers or cellular phones may cause interference to the flowmeter if they are used near the installation site. Observe the following precautions when using them:
- Close the cover of the flowmeter converter when using a wireless transmitter.
 - For a transceiver, use the one with its output power of less than 5W.
 - Move the antenna of a wireless transmitter at least 50cm away from the flowmeter converter and signal cables when using it.
 - Do not use a wireless transmitter near the flowmeter while it is operating online to prevent the influence that the wireless transmitter's sudden change in output may cause.
 - Do not install a wireless transmitter's antenna near the flowmeter converter and signal cables.
- (9) For reasons of flowmeter failure, inappropriate parameters, wrong cable connections or poor installation conditions, the flowmeter may not work correctly. To prevent any of these problems causing a system failure, it is recommended that you have preventive measures designed and installed on the receiving side the flowmeter output signal.
- (10) For operation, installation and maintenance of the flowmeter converter, check the model number of the converter and read its instruction manual.

- ◆ We assume no responsibility for product nonconformity caused by actions contrary to the precautions and notes described in this manual or used in violation of the installation method and the operation method stipulated in a relevant ordinance or other regulations.

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1. Product Inspection and Storage

1.1 Product Inspection

The LF502 electromagnetic flowmeter is shipped in a cardboard container filled with shock-absorbing materials. Open the package carefully and check the product as follows:

- Make sure the following items are included in the package.

Electromagnetic flowmeter converter.....	1 unit
Electromagnetic flowmeter detector	1 unit
Instruction manual.....	One copy each for the converter and the detector

- Inspect the flowmeter for indications of damages that may have occurred during shipment.
- Make sure the type and specifications of the flowmeter are in accordance with the ordered specifications.

Example: Flange standard, color and so on.

If you cannot find the items listed above or any problem exists, contact your nearest Toshiba representative.

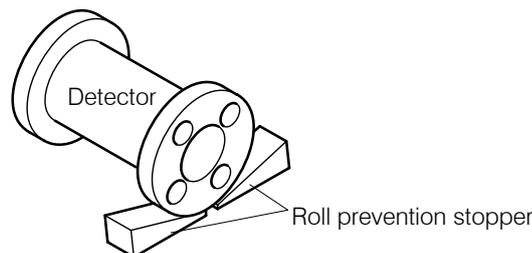
1.2 Storage

To store the product after opening the package until you actually install the product, observe the following precautions described below:

- NOTES
- (1) Avoid places where there is direct sunlight, rain or wind.
 - (2) Store the product in a well-ventilated place. Avoid places of extremely high humidity or extremely high or low temperature. The following environment is recommended:

<ul style="list-style-type: none">• Humidity range: 10 to 90% RH (no condensation)• Storage temperature: -25 to +65° C

- (3) Avoid places where vibration or shock occurs.
- (4) If you leave the cover of the converter opened during storage, the insulation of the product may be deteriorated. Do not open the cover until it is time to connect the wires for the converter.
- (5) To put the detector temporarily on the floor, place it carefully with something, such as a stopper, to support it so that the detector will not roll.



2. Overview

The electromagnetic flowmeter is an instrument that measures the volumetric flow rate of conductive fluid using Faraday's law of electromagnetic induction.

The flowmeter consists of a detector that generates and detects signal electromotive force proportional to the flow rate of the fluid and a converter that receives the signal electromotive force obtained by the detector and converts it to a unified signal output

● Features

Every type of electromagnetic flowmeter has the following features:

- Pressure loss of fluid flow due to flowmeter piping is negligible.
- Flow rate measurement can be performed without being affected by the fluid's temperature, pressure, density and flow conditions.
- There is a linear relationship between the flow rate and the flowmeter output, thus it is easy to read its output.

In addition to the features above, the Toshiba flowmeter has the following outstanding features:

- (1) High-accuracy measurement is possible for a fluid in pipe filled only slightly to a fully filled condition.
- (2) The flowmeter pipe has no obstacles inside and thus earth and sand, or other foreign materials do not accumulate easily.
- (3) Since the flow rate measurement is not based on the water level of the fluid, it is less affected by suspended solids (scum) and the waves on the fluid surface.
- (4) Since the flow rate measurement of partially filled pipes is possible, it is not necessary to fill the measuring pipe as in the case required before.

3. Names of Parts

3.1 Detector Outline

For converter, check the model number of the converter combined with the detector, and read its instruction manual.

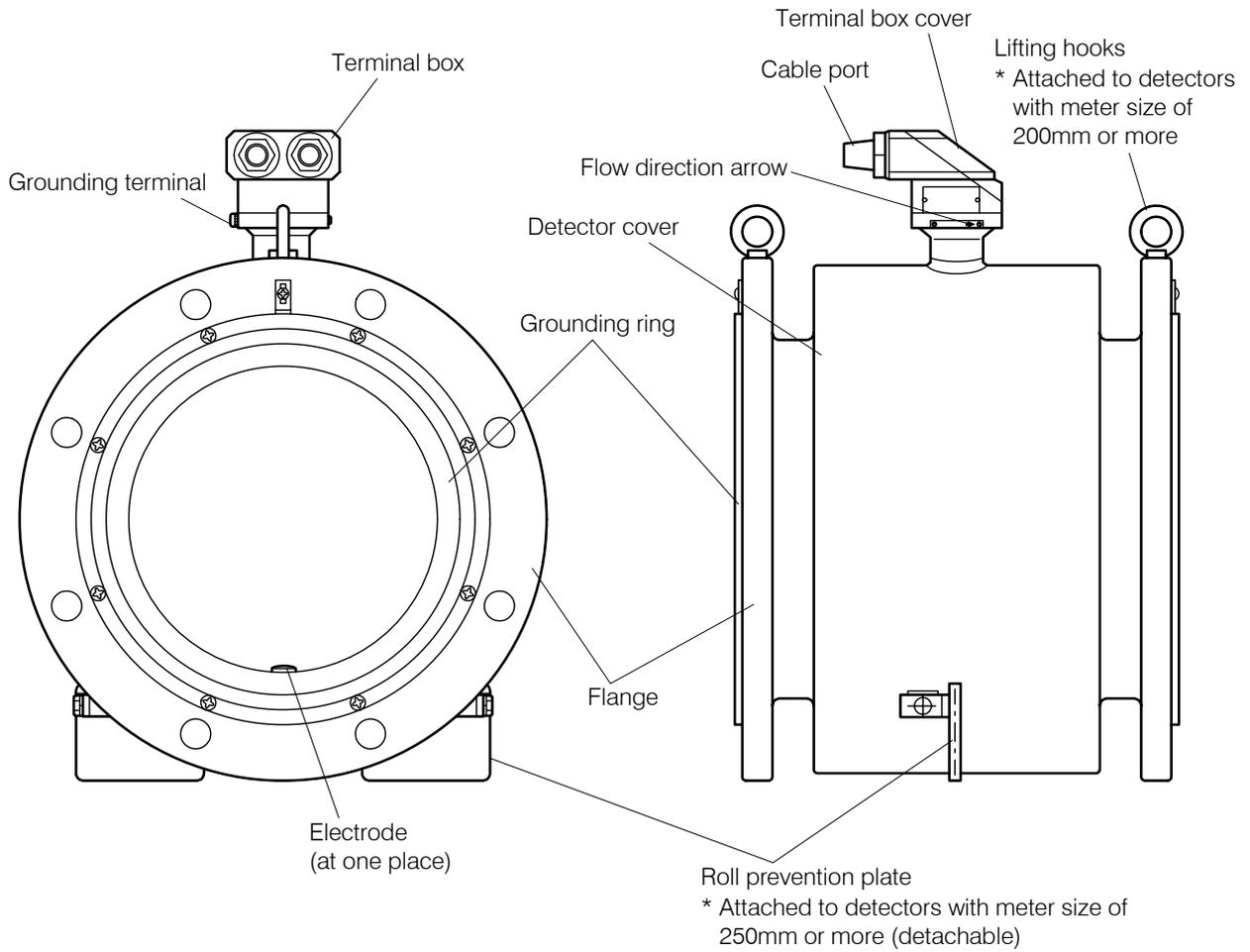


Figure 3.1 Outline Drawing of LF502 Separate Type Detector

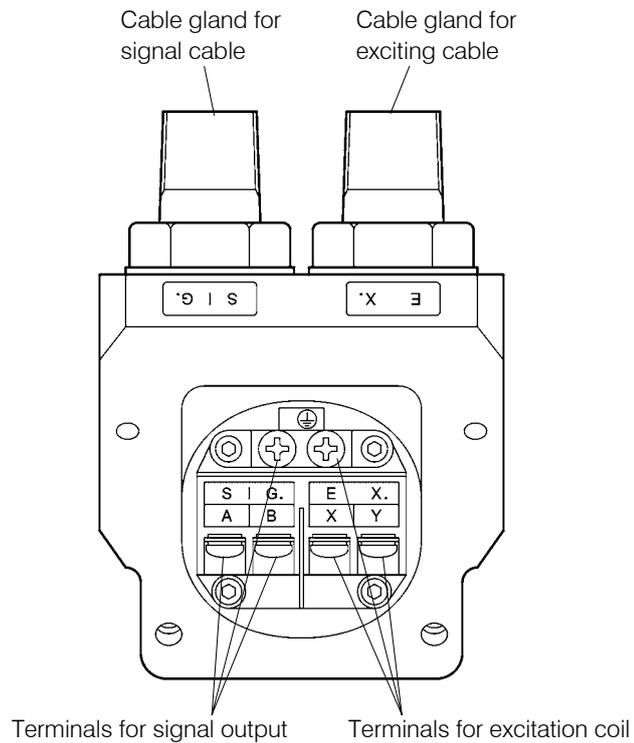
3.2 Terminal Section Structure

3.2.1 Converter terminals

For the structure of converter terminal block, refer to the instruction manual of the convert used with the detector.

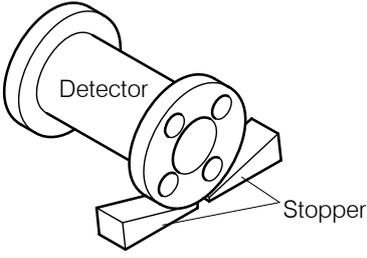
3.2.2 Separate type detector terminals

The structure of the terminals for the separate type detector shown in Figure 3.1 with its cover opened is shown below.



4. Installation

Safety Precautions for Installation

 CAUTION	
<p>■ Do not use the LF502 in an explosive atmosphere.</p> <p> Using this product in an explosive atmosphere can cause explosion.</p> <p>DON'T</p>	<p>■ Use an appropriate device to carry and install the LF502.</p> <p> If his product falls to the ground, injury, or malfunction of or damage to the product, can be caused.</p> <p>DO</p>
<p>■ Do not modify or disassemble the LF502 unnecessarily.</p> <p> Modifying or disassembling this product can cause electric shock, malfunction of or damage to this product.</p> <p>DON'T</p>	<p>■ Be sure to ground the LF502. The grounding must be made independently from that of power equipment. (100Ω or less ground resistance)</p> <p> Operating this product without grounding can cause electric shock, malfunction of the product or system failure.</p> <p>DO</p>
<p>■ Do not work on piping and wiring with wet hands.</p> <p> Wet hands may result in electric shock.</p> <p>DON'T</p>	<p>■ Turn off mains power before working on pipes.</p> <p> Working on pipes while power is applied can cause electric shock.</p> <p>DO</p>
<p> The label shown left is affixed near the terminal block for converter to supply power.</p> <p>Be alert to electric shock.</p>	<p>■ To put the detector temporarily on the floor, place it carefully with something, such as stopper, to support it so that the detector will not roll.</p> <p> </p> <p>DO</p>

* To install the converter, refer to the instruction manual of the converter used with the detector.

4.1 Notes on Selecting the Installation Location

- NOTES
- (1) Avoid places where excessive vibration occurs.
 - (2) Avoid places where there is direct sunlight. If this is unavoidable, provide a sunshade.
 - (3) Avoid places where corrosive atmosphere or high humidity condition exists.
 - (4) Avoid places of too great an elevation or constricted areas where clearance for installation work is not provided.
 - (5) Avoid places within the immediate proximity of equipment (such as motors, transformers, wireless transmitters, electrolytic cells, or other equipment causing electromagnetic or electrostatic interference) that may interfere with flowmeter measurement.
 - (6) The detector has no adjustable piping mechanism. Therefore, install an adjustable short pipe when needed.
 - (7) Chemical injections should be conducted on the downstream side of the flowmeter detector.
 - (8) The standard length of the cable that connects the detector and the converter is 30m. Select the converter installation location so that the distance of the detector and the converter will not exceed 30m.

* For notes on piping such as the installation and orientation of the detector, and the length of a straight pipe section, see Section 4.3.

4.2 Installation

 CAUTION	
<p>■ Use an appropriate device to carry and install the LF502.</p> <div style="display: flex; align-items: center; margin-top: 10px;">  <p>If this product falls to the ground, injury, or malfunction of or damage to the product, can be caused.</p> </div> <p>DO</p>	<p>■ Turn off mains power before working on pipes.</p> <div style="display: flex; align-items: center; margin-top: 10px;">  <p>Working on pipes while power is applied can cause electric shock.</p> </div> <p>DO</p>

4.2.1 Pipe Inspection

- (1) For mating pipes to install the detector on both ends, use the pipes of the same material.
 - An example of improper case is: upstream pipe is steel and downstream pipe is polyvinyl chloride. In this case, symmetry of magnetic property breaks and a large error may occur especially when the fluid to be measured is in low water level and at low flow rate.
- (2) Before installing the detector, make sure that the pipes are not inclined and not misaligned (eccentricity) as shown in Figure 4.1.
 - If the detector is forcefully installed in a place where pipes are inclined as shown in Figure 4.1(A), the detector may be damaged or fluid leaks may occur.

- If the detector is installed with pipes misaligned as shown in Figure 4.1(B), the lining or grounding rings may be partially ground down depending on the nature of the fluid and may result in a measurement error caused by uneven current.
- Before installing the detector, wash the inside of the pipes with water or flush the pipes with steam to remove the foreign materials from the inside.

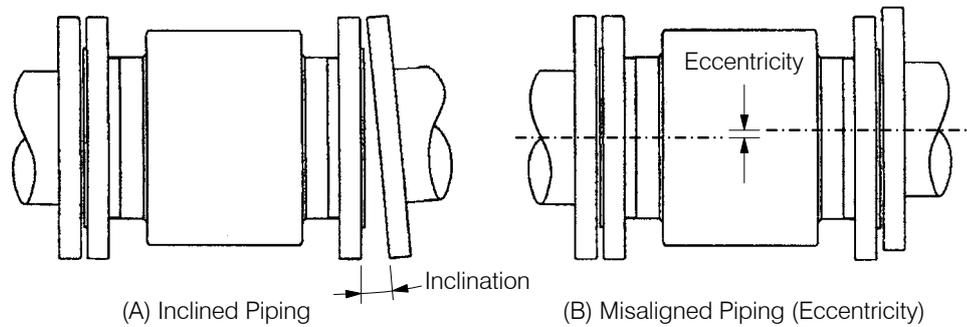


Figure 4.1 Bad Examples of Inclined Piping and Misaligned Piping (Eccentricity)

- (3) Provide a pipe support fitting for each mating pipe on both ends to install the detector and fix the pipes.
 - Supporting the pipes reduces the piping vibration and prevents damage to the piping system and prevents liquid leaks caused by the detector’s own weight plus weight of fluids. (It is particularly effective if the piping is made of nonmetal material such as polyvinyl chloride.)

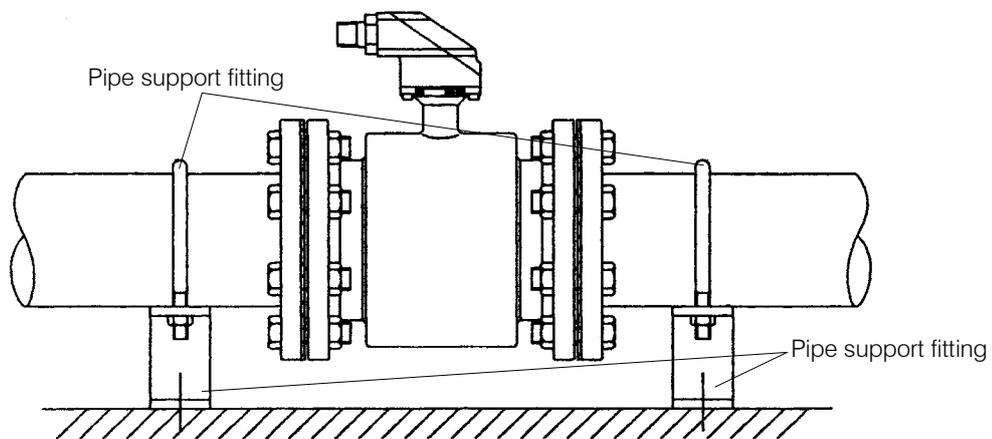


Figure 4.2 Example of Pipe Fixing Method

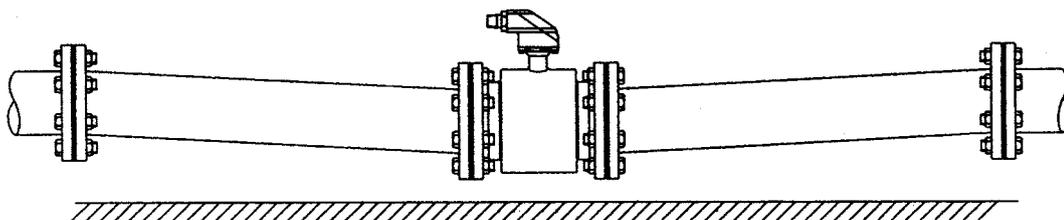


Figure 4.3 Probable Case When Piping is Not Supported

4.2.2 Notes When Moving the Detector

To prevent damage to the detector when moving the detector to the installation site, transport the detector while it is still packaged as was delivered to a location near the installation site.

To move the detector, observe the following precautions in items (1) and (2).

- The weight data for each meter size is shown in Outline Dimensions in Chapter 10.

- (1) Detectors with meter size of 200mm or more
Since lifting hooks are attached to the flange, lift the detector as shown in Figure 4.4(A).
- (2) Detector with meter of less than 150mm
Lift the detector as shown in Figure 4.4(B) below

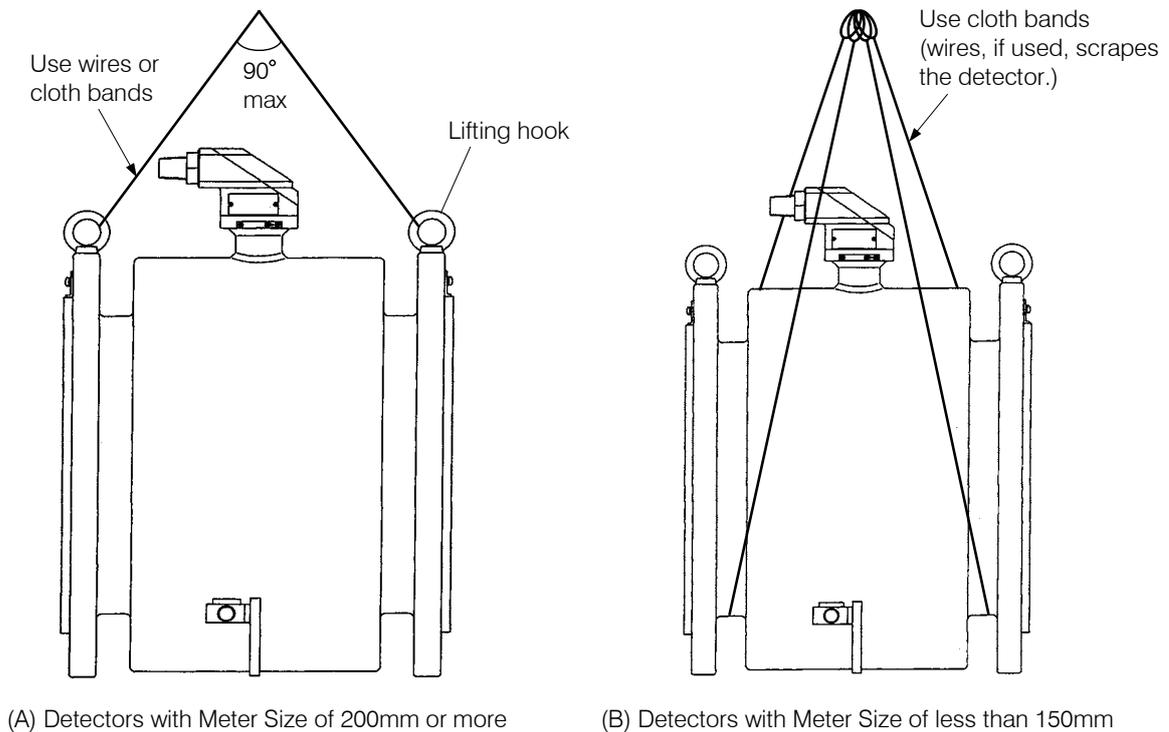


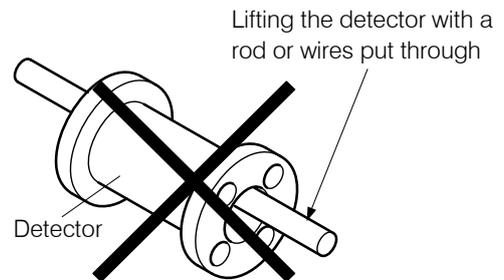
Figure 4.4 How to Lift the Detector

Do absolutely not lift the detector in a manner such as:

- Putting a rod through the detector measuring pipe.
- Putting wires through the detector measuring pipe.

Because the lining will be damaged if the detector is lifted as shown above, and thus stable measurement cannot be performed.

* For lifting work, follow the instructions of a qualified person such as the one who has a license to operate cranes, or a person specialized in picking up loads on a crane hook.



4.2.3 How to Install the Detector

(1) For pipe connection

Pipe connection used here is flange connection. Two methods are provided as follows:

- ① Install a gasket between the detector main body and each of the mating pipes as shown in Figure 4.6 and the detector is sandwiched between the upstream and the downstream pipes.
- ② Install the detector on the wall in a pit as shown in Figure 4.7.

(2) About bolts and nuts

The size and numbers of bolts, and the tightening torques for nuts are shown in Table 4.1 and Table 4.2. (Tightening torques differ depending on the material of gaskets)

Tighten the nuts evenly in torque in the order of one nut after another positioned diagonally across.

When the mating pipe is of nonmetal material such as polyvinyl chloride

If nuts are tightened too much, the mating flange deforms and liquid leaks may occur.

In this case, though depending on the nature of the liquid, use rubber gaskets and if possible select a type of rubber conforming to the nature of the liquid and apply tightening torques for rubber gaskets shown in Table 4.1.

About gaskets

If you use Teflon-enclosed gaskets (PTFE resin jacket gaskets JIS B 2404), bolts may be loosened as time goes by even if tightened once due to plastic behavior of PTFE resin, thus tighten them again when needed.

(3) Observation window

When pipe connection is made as shown in Figure 4.5, It is recommended that an observation window be provided upstream or downstream of the detector (either one is OK) through which the fluid can be checked and in time of emergency the sediments inside the pipe can be removed. For this window, install a lit so that the fluid does not overflow when the pipe is filled.

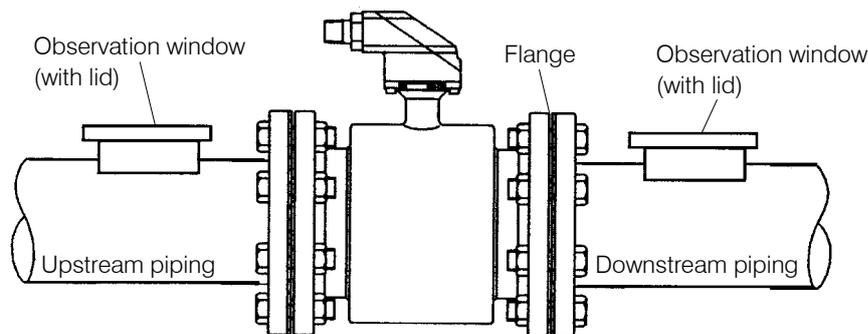


Figure 4.5 Observation Window

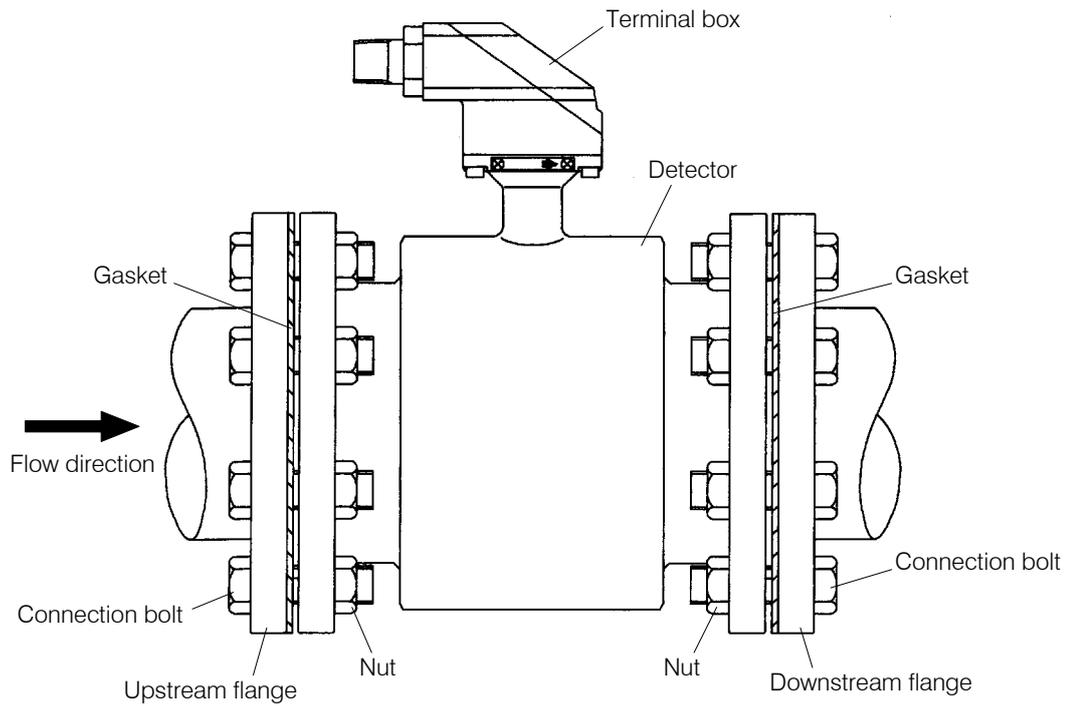


Figure 4.6 Piping Connection Method

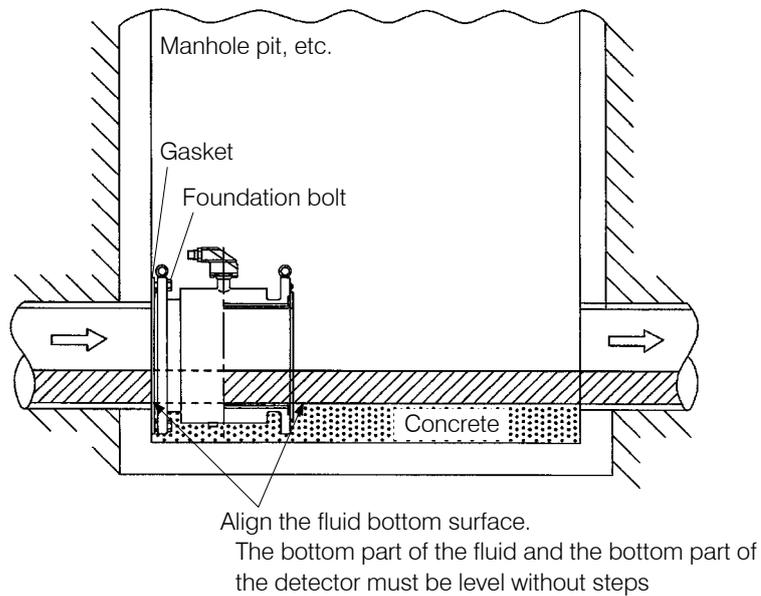


Figure 4.7 Pit Connection Method

Table 4.1 Nut Tightening Torques [N·m]

Nominal meter size	Teflon-enclosed gasket	Rubber gasket
	JIS 10K	JIS 10K
150mm	78 to 98	44 to 55
200mm	77 to 97	47 to 58
250mm	131 to 164	80 to 100
300mm	122 to 153	79 to 99
350mm	155 to 194	101 to 127
400mm	223 to 278	147 to 184
500mm	/	176 to 220
600mm		288 to 359

The torque values in the table above are the ones when new bolts and nuts are used.

In the case of used bolts and nuts, though depends on the conditions of rust, it is recommended that the values above multiplied by 1.7 to 2 be used.

Table 4.2 Numbers of Bolts × Size × Length [mm]

Nominal meter size	JIS 10K
150mm	8 × M20 × 75
200mm	12 × M20 × 75
250mm	12 × M22 × 80
300mm	16 × M22 × 80
350mm	16 × M22 × 85
400mm	16 × M24 × 90
500mm	20 × M24 × 95
600mm	24 × M33 × 105

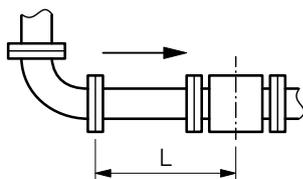
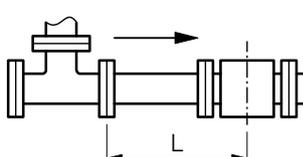
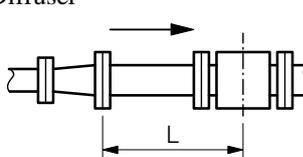
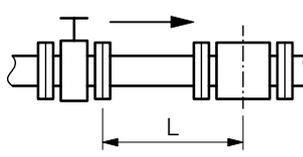
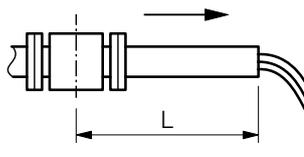
4.3 Notes When Performing Piping Work

4.3.1 Length of Straight Pipe Section

If various joints are used upstream of the detector, or the fluid is discharged from the downstream of the detector, a straight pipe section is required between the detector and the joints or the flow discharge section as shown in Table 4.3 is required.

- NOTES a. Here, L is the length of a straight pipe section and D is the meter size of the detector.
 The length of the straight pipe section is the length of the straight pipe plus half length of the detector.
- b. The length of the reducer, if connected, can be counted as a part of the straight pipe section.
- c. If a straight pipe section cannot be provided, contact your nearest Toshiba representative.

Table 4.3 Required Straight Pipe Length on Upstream and Downstream Sides

$L = 10D$	$L = 5D$
<p>(1) 90° bent</p>  <p>(2) Tee</p>  <p>(3) Diffuser</p>  <p>(4) Various valves</p> 	<p>(5) Downstream side (when fully opened)</p> 

4.3.2 Detector Mounting Orientation

The electrode must be positioned right at the bottom of the piping. (See Figure 4.8 below.)

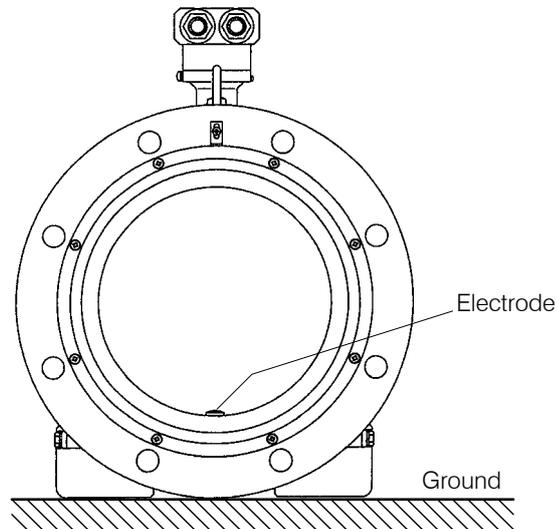


Figure 4.8 Detector Mounting Orientation

4.3.3 About Flow Direction

Install the detector in accordance with the flow direction arrow on the detector.

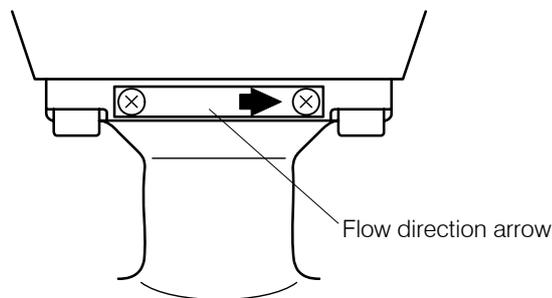


Figure 4.9 Flow Direction Arrow of Detector

4.3.4 About Water Level

The water level of liquid must be kept always more than the specified level. (See Figure 4.10 below.)

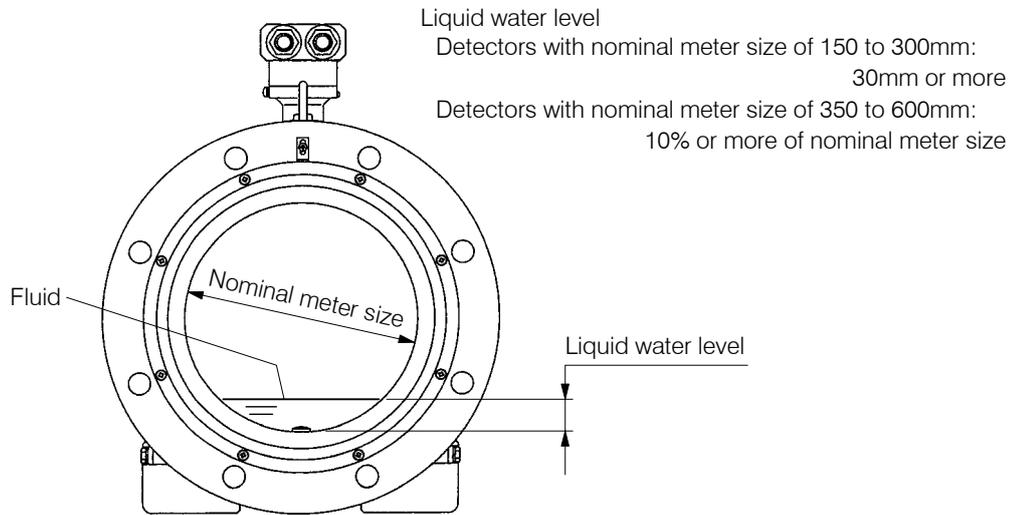


Figure 4.10 Liquid Water Level at the time of Measurement

For an example to maintain the water level, see the Figures 4.11 and 4.12 below.

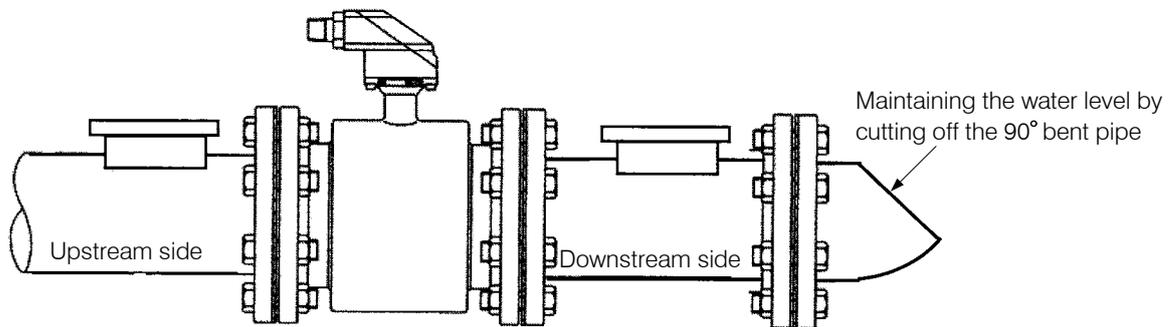


Figure 4.11 Example of Cutting Off a 90° Bent Pipe

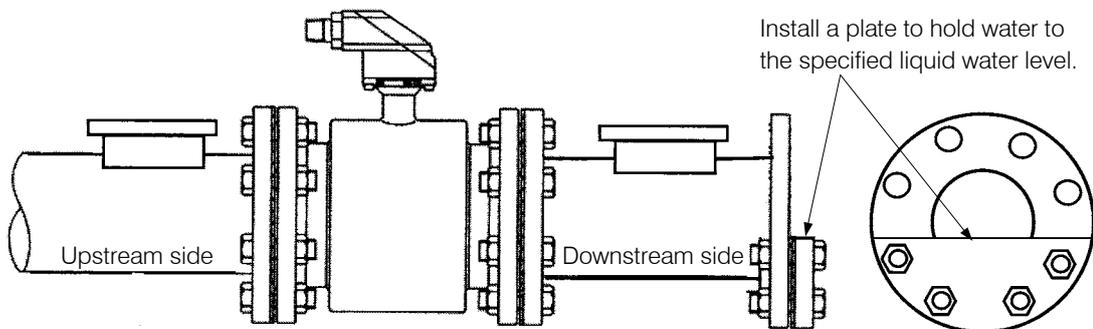


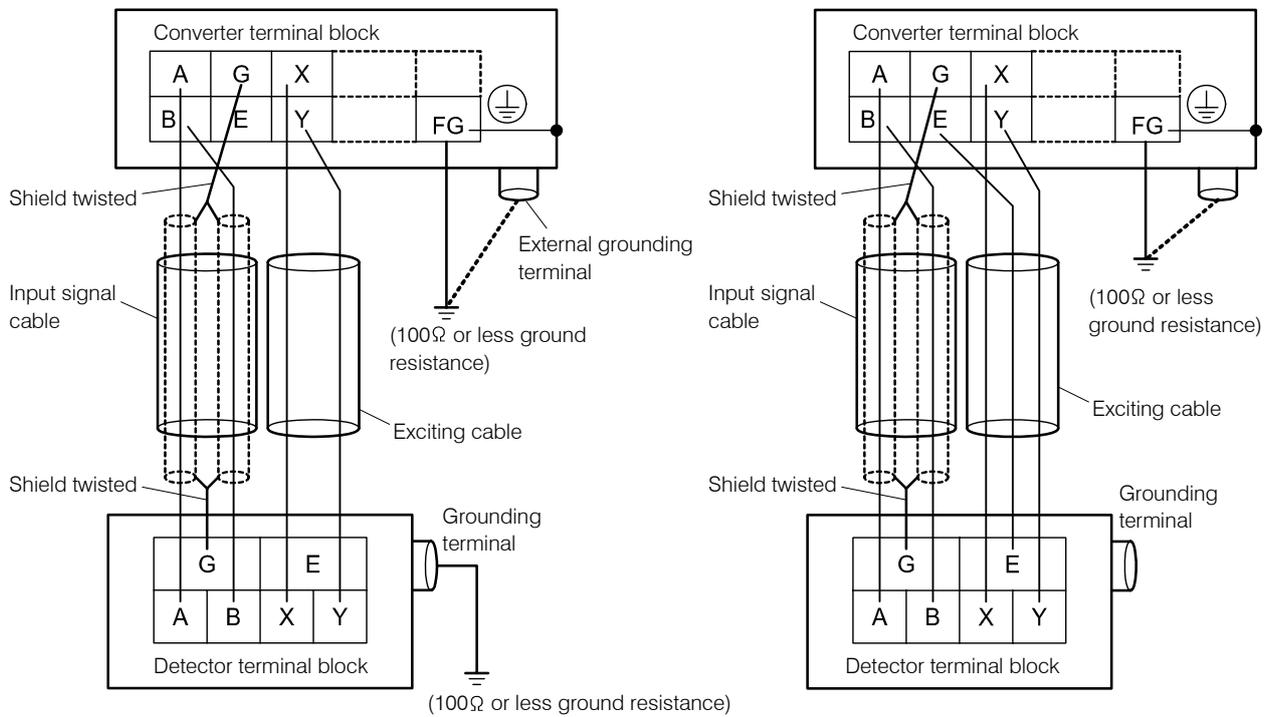
Figure 4.12 Example of Installing a Plate to Hold Water

4.4 Grounding

NOTES: Ground the detector securely with ground resistance 100Ω or lower referring to the installation method of the detector.

Use type IV wire 5.5mm² or more for grounding wires and the wires should be connected as short as possible. In addition, do not share a grounding wire with other equipment where grounding current may flow. (An independent grounding is preferable.)

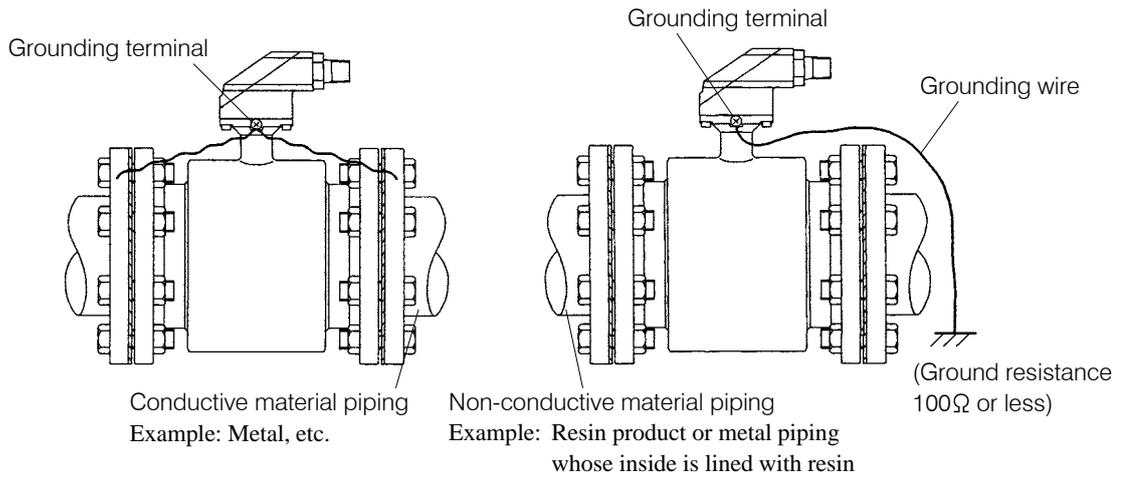
If it is difficult to perform grounding work at the detector side because of a pit installation or other reasons, use a 3-core cable for exciting cable and connect the E terminal of the detector to the E terminal of the converter. (The E terminal of the converter is internally connected to the FG terminal and the converter case.)



(A) When Detector can be grounded
(For detector grounding, see Figure 4.14.)

(B) When Detector Grounding is difficult

Figure 4.13 Wiring between Detector and Converter



- When piping material is conductive, connect the grounding wires to both ends of the piping flange.

- When piping material is non-conductive (grounding resistance 100Ω or less).

Figure 4.14 How to Ground the Detector

5. Wiring

Precautions for Wiring

 CAUTION	
<p>■ Be sure to install a switch and fuse to isolate the LF502 from mains power.</p> <p> Power supply without a switch and fuse can cause electric shock or defectiveness for maintenance and inspection.</p> <p>DO</p>	<p>■ Turn off mains power before conducting wiring work.</p> <p> Wiring while power is applied can cause electric shock.</p> <p>DO</p>
<p>■ Do not work on piping and wiring with wet hands.</p> <p> Wet hands may result in electric shock.</p> <p>DON'T</p>	<p>■ Be sure to ground the LF502. The grounding must be made independently from that of power equipment. (100Ω or less ground resistance).</p> <p> Operating this product without grounding can cause electric shock, malfunction of the product or system failure due to leak current, etc.</p> <p>DO</p>
<p>■ Do not conduct wiring work with bare hands.</p> <p> Remaining electric charge even if power is turned off can still cause electric shock.</p> <p>DON'T</p>	<p>■ Use crimped terminal lugs with insulation sleeve for the terminals of wiring such as power supply and GND.</p> <p> Disconnections or loose connections can cause electric shock, and fire from excessive current, or system failure may occur.</p> <p>DO</p>
<p>■ Do not modify or disassemble the LF502 unnecessarily.</p> <p> Modifying or disassembling this product can cause electric shock, malfunction of or damage to this product.</p> <p>DON'T</p>	<div style="border: 1px dashed black; padding: 5px;"> <p> The label shown left is affixed near the terminal block for converter to supply power. Be alert to electric shock.</p> </div>

Flowmeter performance may be affected by the way wiring is conducted. Proceed with wiring work referring to the items described on the following pages.

- NOTES**
- (1) Select the cable runs away from electrical equipment (motors, transformers, or wireless transmitters) which causes electromagnetic or electrostatic interference.
 - (2) Deterioration of flowmeter circuit insulation occurs if the converter interior or cable ends get wet or humidified. This in turn causes malfunction of flowmeter or noise problems. Avoid a rainy day if the flowmeter is to be installed outdoors. Even indoors, prevent water from splashing over the flowmeter. Try to finish the wiring as quickly as possible.
 - (3) Do not remove the blind plug from the cable connectors that are not used.
 - (4) The converter has an arrestor installed inside. Therefore, do not conduct a

withstand voltage test for the converter. To check the insulation of the converter, use a voltage of 250Vdc maximum.

- (5) After wiring, be sure to install the terminal block protection cover.
- (6) Because the exciting cable and flow rate signal cable transmit very small signals, install each of them independently through a thick-walled steel tube and keep them away from the large current wiring as far as possible, and do not install them in parallel.

5.1 Cables

Use the kind of cables shown in Table 5.1 to connect the detector.

Table 5.1 Installation Cables

Name	Cable name	Nominal cross-sectional area	Overall diameter	Description
Power cable	3-core vinyl sheathed cable or 2-core vinyl sheathed cable	2mm ²	11 to 13mm	CVV JIS C 3401 or equivalent
Output signal cable	The number of cores for the cable differs depending on the specification of the output signal cable. Use a shielded cable of overall diameter 11 to 13mm and nominal cross-sectional area 1.25mm ² .			CVV-S JIS -258-C or equivalent
Flow rate signal cable	2-core shielded chloroprene cabtyre cable	0.75mm ²	11 to 13mm	2PNCT-S JIS C 3327 or equivalent
Exciting cable	3-core shielded chloroprene cabtyre cable	2mm ² 1.25mm ²	11 to 13mm	2PNCT JIS C 3327 or equivalent

5.2 External Connections

For external connections of converter, refer to the instruction manual of the converter and connect wires correctly.

5.3 Notes on Wiring

5.3.1 Notes on Wiring between Receiving Instruments and Converter

- To avoid 2-point grounding, as a rule, ground the shield of output cable at the receiving instrument side.
- Use type IV wire 5.5mm² or more for grounding wires. In addition, do not share a grounding wire with other equipment where grounding current may flow. (An independent grounding is preferable. To ground the flowmeter, see Section 4.4 “Grounding”.)
- Power cable
When a 3-core cable is used: Use the FG terminal for grounding.
When a 2-core cable is used: Use the external grounding terminal for grounding and make the grounding wire as short as possible.

5.3.2 Notes on Wiring for Detector

- The detector is shipped with a flow rate signal cable and an exciting cable. Be sure to use these cables attached to the detector.
Note: When the cable length exceeds 30m, cables may not be attached. Check whether the cables are provided or not by referring to the specification.
- The allowable cable length between the detector and the converter varies depending on the conductivity of the fluid to be measured. See Figure 9.1 in Chapter 9.
- The terminals at the converter side of the attached cables are capped to prevent infiltration of moisture. Do not remove the cap from the cable until immediately before connecting the wires to the converter.
- When installing the cables from the detector to the converter, connect the exciting cable first and then the flow rate signal cable.
- Because the exciting cable and the flow rate signal cable transmit very small signals, install each of them independently through a thick-walled steel tube (22mm) and keep them away from the large current wiring as far as possible. And do not install them in parallel. The cable tube port is G (PF) 1/2 female thread.
- The detector side terminals of the attached cables are already wired at the factory. Since the terminal box of the detector is in airtight structure, do not remove the wired cables from the detector.
- When replacing the exciting cable and the flow rate signal cable, refer also to the instruction manual of the converter. When replacing cables, place an order and obtain new packings for detector terminal box cover and for cable gland through Toshiba representative and be sure to replace these packings.

5.4 Wiring

⚠ CAUTION	
<p>■ Do not connect wires and replace parts while power is supplied.</p> <p> Wiring work and replacing parts while power is applied can cause electric shock.</p> <p>DON'T</p>	<p>■ Turn off mains power before conducting wiring work.</p> <p> Wiring while power is applied can cause electric shock.</p> <p>DO</p>
<p>■ Do not conduct wiring work with bare hands.</p> <p> Remaining electric charge even if power is turned off can still cause electric shock.</p> <p>DON'T</p>	<p>■ Do not work on piping and wiring with wet hands.</p> <p> Wet hands may result in electric shock.</p> <p>DON'T</p>

5.4.1 Terminal Treatment of Cables

Follow the procedures below to treat the terminals (at the converter side) of various cables and install the cables to the terminal block. Use appropriate cables based on the description in Section 5.1 “Cables”. Attach and crimp a round terminal lug with insulation sleeve to each wire of cables.

(1) Power cable, current output cable and digital I/O cables

The necessary cables should be ordered from the person responsible for the installation work.

Strip the sheath of each conductor as shown in Figure 5.1, and attach and crimp a terminal lug with insulation sleeve for each conductor. The size of the terminal lug is M3.5.

- Connect the power cable to L1 and L2 of terminal block.
- Connect the current output cable to (+) and (–) of terminal block.
- Connect the digital I/O cable to D1, D01, D02 and COM of terminal block, as required.

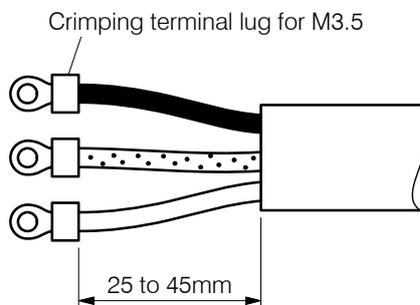


Figure 5.1 Terminal Treatment for Power Cable, Current Output Cable and Digital I/O cable

(2) Exciting cable

Strip the sheath of each conductor as shown in Figure 5.2, and attach and crimp an M3.5 terminal lug with insulation sleeve for each conductor, and then connect them to X and Y of the terminal block. Connect the red conductor to E of the terminal block.

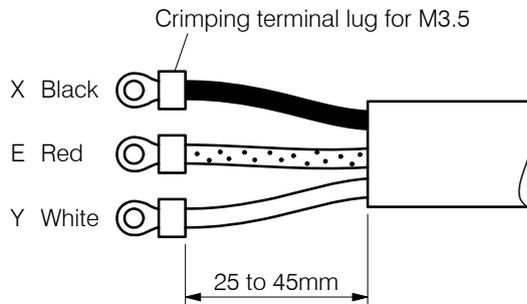


Figure 5.2 Terminal Treatment for Exciting Cable

(3) Connecting the flow rate signal cable

Strip the sheath from each conductor of a 2-core individually shielded cable as shown in Figure 5.4. Twist each shield together and slip a thermal contraction tube or vinyl tube onto the twisted shield to insulate from the case or other conductors, and then attach and crimp an M3.5 terminal lug with insulation sleeve for each conductor and the twisted shield as shown in Figure 5.3. Connect the crimped terminal lugs to the A and B terminals on the terminal block and to each G terminal of the detector and the converter.

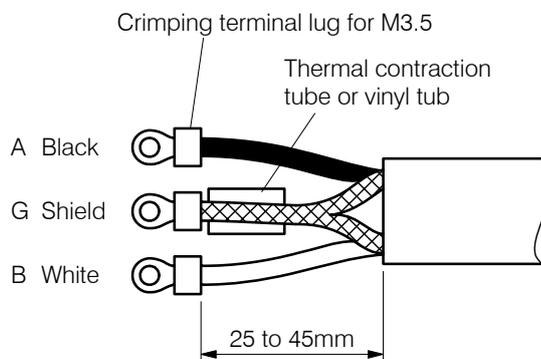


Figure 5.3 Terminal Treatment for Flow Rate Signal Cable

● Notes on shield processing work for flow rate signal cable

- When stripping the outer insulation, filler and sheath for each conductor, be careful not to scratch or cut the internal conductors and shield braid.
- Do not disjoint the shield braid but treat it as shown in Figure 5.4. dishevel

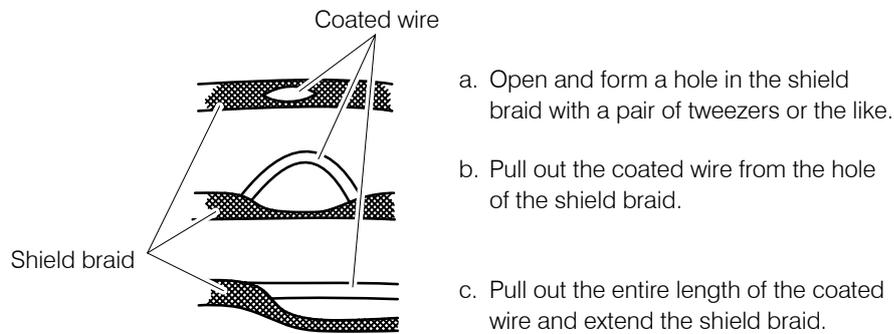
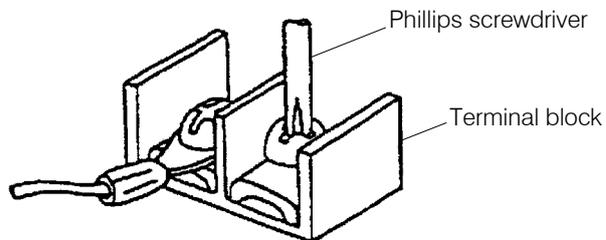


Figure 5.4 Treating the Shield Braid for Flow Rate Signal Cable

5.4.2 Converter terminal block connection

For connection of wires to the converter, refer to the instruction manual of the converter and connect the wires correctly.

- * Connect each wire of the cable securely to the terminal block. Improper connections such as loose connection may cause incorrect measurement. After connecting a cable, try to pull it to see whether it has been connected securely.



* The appropriate torque for tightening the terminal block screw is 5N·m.

Figure 5.5 Ho to Connect a Wire to Terminal Block

5.4.3 Detector terminal connection

⚠ CAUTION	
<p>■ Do not modify or disassemble the LF502 unnecessarily.</p>	
 DON'T	<p>Modifying or disassembling this product can cause electric shock, malfunction of or damage to this product.</p>

NOTE Terminal treatment and wiring for the detector are already completed when the product is shipped from the factory. Do not remove the wires unless it is necessary to replace the cable.

- (1) Remove the cable gland and slip the cable gland, slip ring, and then gasket onto the terminal-end treated cable and then lead the cable into the terminal box of the detector.

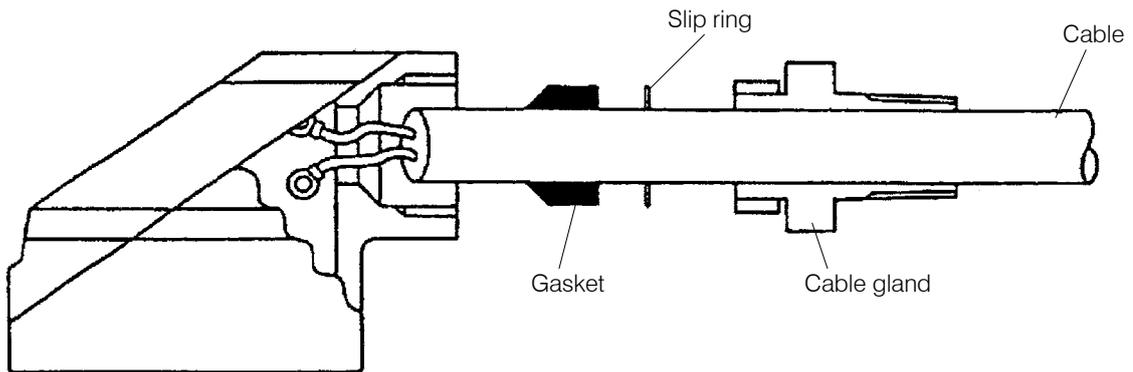
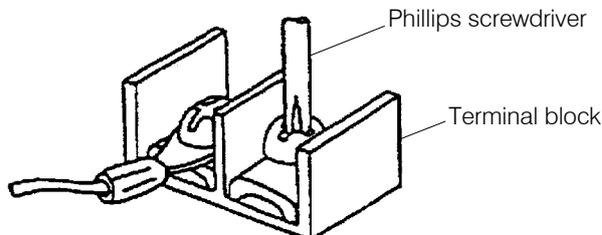


Figure 5.6 How to Connect a Cable

- (2) Connect each wire of the cable to the terminal block
 Connect each wire of the cable securely to the terminal block. Improper connections such as loose connection may cause incorrect measurement. After connecting a cable, try to pull it to see whether it has been connected securely.



* The appropriate torque for tightening the terminal block screw is 5N·m.

Figure 5.7 How to Connect a Wire to Terminal Block

- After connecting each cable to the terminal block, pull it to take up the slack of the cable and tighten the cable gland. At this time, if the stripped sheath section of the cable stays at the gasket section, air-tightness may not be maintained and thus check that the cable has been put through enough to pass the gasket section.

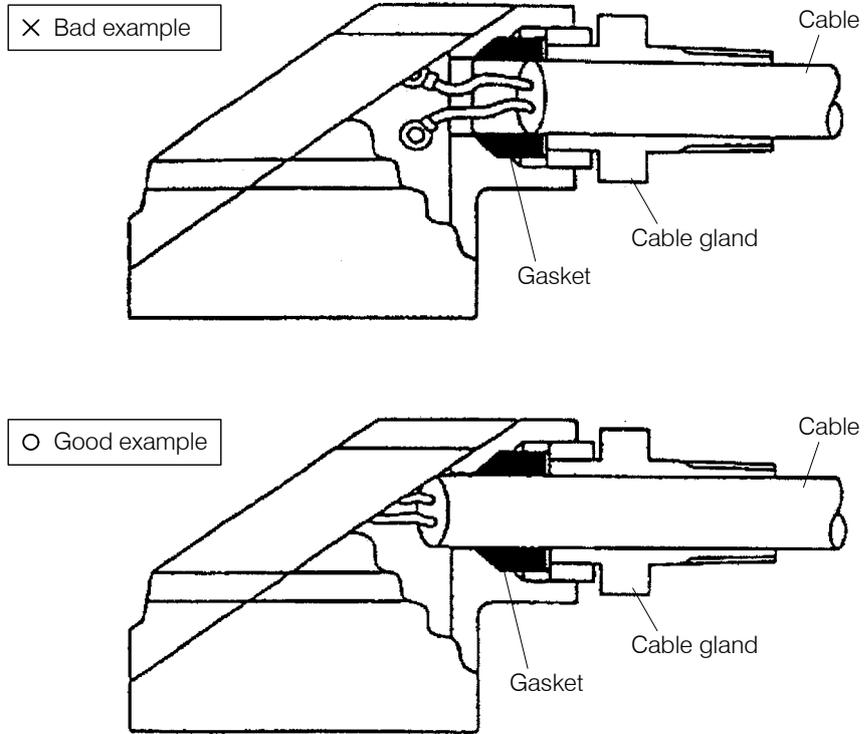


Figure 5.8 Cabling Procedure

6. Operation

 CAUTION	
<ul style="list-style-type: none"> ■ Do not touch the main body when high temperature fluid is being measured. 	<div style="display: flex; align-items: center;">  <p>The fluid raises the main body temperature and can cause burns.</p> </div> <p>DON'T</p>

6.1 Operation

Follow the procedure described below to operate the flowmeter.

Inspection of each part

- Is the wiring between the detector and converter correct?
- Is the wiring between the converter and related instruments correct?
- Isn't there any of the bolts forgotten to tighten between the detector and mating pipes?
- Is the flow direction arrow on the detector in accordance with actual flow?
- Are the flowmeter detector and the converter grounded securely?
- Are the converter cover and the detector terminal box cover securely tightened?

Check the following items.

Placing System On-Stream

- Let the fluid go through the detector pipe.
- Wait until the water level reaches as high as 30% or above, and then stop the fluid and keep it still in the detector pipe.

Supplying Electric Power

- Is the power supply as specified?

Checking the Converter Settings

* See the instruction manual of the converter combined.

Zero Adjustment

Wait for 30 minutes to warm up the flowmeter and then perform zero adjustment.
 (Check that the fluid stays still in the pipe.)
 * See the instruction manual of the converter combined.

Operation

After checking the items and adjustments listed above, let the fluid go through the detector pipe. An output (4 to 20 mA dc) proportional to the flow rate, etc. can be obtained.

7. Maintenance and Inspection

 CAUTION	
<p>■ Do not conduct wiring work or replace parts when power is applied.</p> <p> Wiring or replacing parts while power is applied can cause electric shock.</p> <p>DON'T</p>	<p>■ Do not touch the LF502 main body when high temperature fluid is being measured.</p> <p> The fluid raises the main body temperature and can cause burns.</p> <p>DON'T</p>
<p>■ Do not work on piping and wiring with wet hands.</p> <p> Wet hands may result in electric shock.</p> <p>DON'T</p>	<div style="border: 1px dashed black; padding: 5px;"> <p> The label shown left is affixed near the terminal block for converter to supply power. Be alert to electric shock.</p> </div>
<p>■ Do not use a fuse other than the one specified.</p> <p> Using a fuse other than the one specified can cause an accident, malfunction of the product or system failure.</p> <p>DON'T</p>	<p>Use a rated fuse as follows:</p> <ul style="list-style-type: none"> ● For power supply of 100Vac: Rating: 2A/250V one piece, Dimensions: $\phi 5.2 \times 20\text{mm}$ ● For power supply of 24Vdc: Rating: 3A/250V one piece, Dimensions: $\phi 5.2 \times 20\text{mm}$ ● Use a normal blow type for melting time characteristic.

7.1 Maintenance

7.1.1 Cleaning the inside of the detector measuring pipe

If the fluid to be measured contains such materials as conductive solids and the flowmeter is used for a long time, deposits accumulate inside of the detector measuring pipe and this may cause lowered output readings. If a lowered output occurs during operation, and even if calibration and checks are carried out and no sign of abnormality is found, check whether or not deposits are accumulated inside the detector measuring pipe.

To remove the deposits, use a soft brush, etc. to clean and remove the deposits. The output reading returns to normal by removing the deposits.

If the flowmeter is used in a process line where this kind of problem occurs often, it is recommended that a periodic cleaning for the inside of the detector measuring pipe is conducted.

- * It is recommended that you conduct cleaning once a year as a guideline cycle, though the cycle depends on the nature of the fluid.
- * If you have to install the detector again after removing it from the pipeline, be sure to replace the gaskets with new ones.
- * For gaskets, use Teflon-enclosed gaskets (PTFE resin jacket gaskets (JIS B 2404) or equivalent) or gaskets of the same shape as that of full face type gaskets (JIS B 2238).

- * In general, deposits can be prevented by increasing the fluid velocity. For a process line where deposits occur often, it is recommended that you select the meter size of the detector so that the flow rate becomes 3m/s or more.

When you remove the detector from the pipeline, check the temperature and the nature of the fluid and empty the fluid completely before removing the detector.

Since burns from high temperature fluid or injury from chemicals may occur, take protective measures in accordance with the temperature and the nature of the fluid to prevent any harm to operators or devices nearby in case the remaining fluids leaks.

7.1.2 Operating life

The operating life of the flowmeter is 10 years from the date of shipment. The life of the flowmeter differs depending on the environmental conditions and the way it was used. To extend the life of the flowmeter, inspect the flowmeter periodically and clean or replace the parts if necessary.

7.1.3 Calibration / Checks (Converter side)

The converter has a built-in reference signal generation circuit that generates dummy flow rate signals. This reference signal can be used to check and adjust the zero and span of the converter at the time of maintenance and periodic inspection.

Refer to the instruction manual of the converter.

7.1.4 Checking or Replacing Fuse (Converter side)

The fuse can be taken out by unscrewing the cap of the fuse holder. Check that the fuse is not damaged. In addition, since fuse is a consumable part, replace it periodically. The recommended replacement cycle is 3 years.

- Applicable type of fuse: Glass tube fuse (normal blow type)

Rating: For converter power supply rating of 100Vac: 2A/250 V 1 piece

For converter power supply rating of 24Vdc: 3A/250V 1 piece

Dimensions: $\phi 5.2\text{mm} \times 20\text{mm}$

7.1.5 Checking or Replacing the Display Unit (Converter side)

If the characters displayed on the LCD display become thin or blur occurs, the LCD has reached the life limit. Please replace the display unit with a new one. In order to use the flowmeter stably for a long time, it is preferable to replace it early. For inspection and replacement of the display unit, please contact your nearest Toshiba representative.

7.1.6 Checking or Replacing the Power Supply Unit (Converter side)

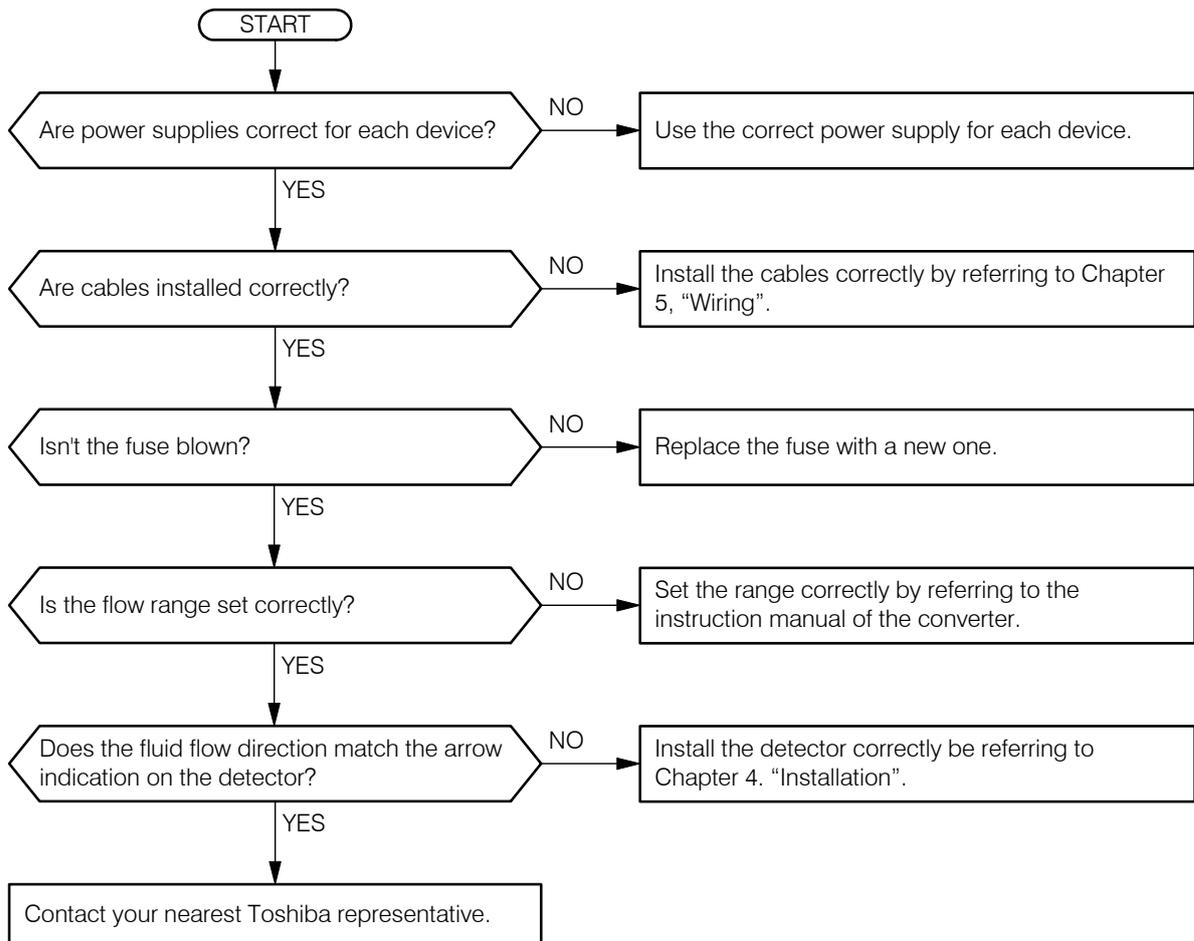
Electronic components deteriorate faster when the ambient temperature is high. The life of the power supply unit is about 10 years if the ambient temperature is 40°C, and 5 to 6 years if the temperature is 50°C or more. In order to use the flowmeter stably for a long time, it is preferable to replace it early. For inspection and replacement of the power supply unit, please contact your nearest Toshiba representative.

Note: If you dispose of electrolytic capacitors to replace parts, have it done by an agent who is licensed to handle industry waste materials.

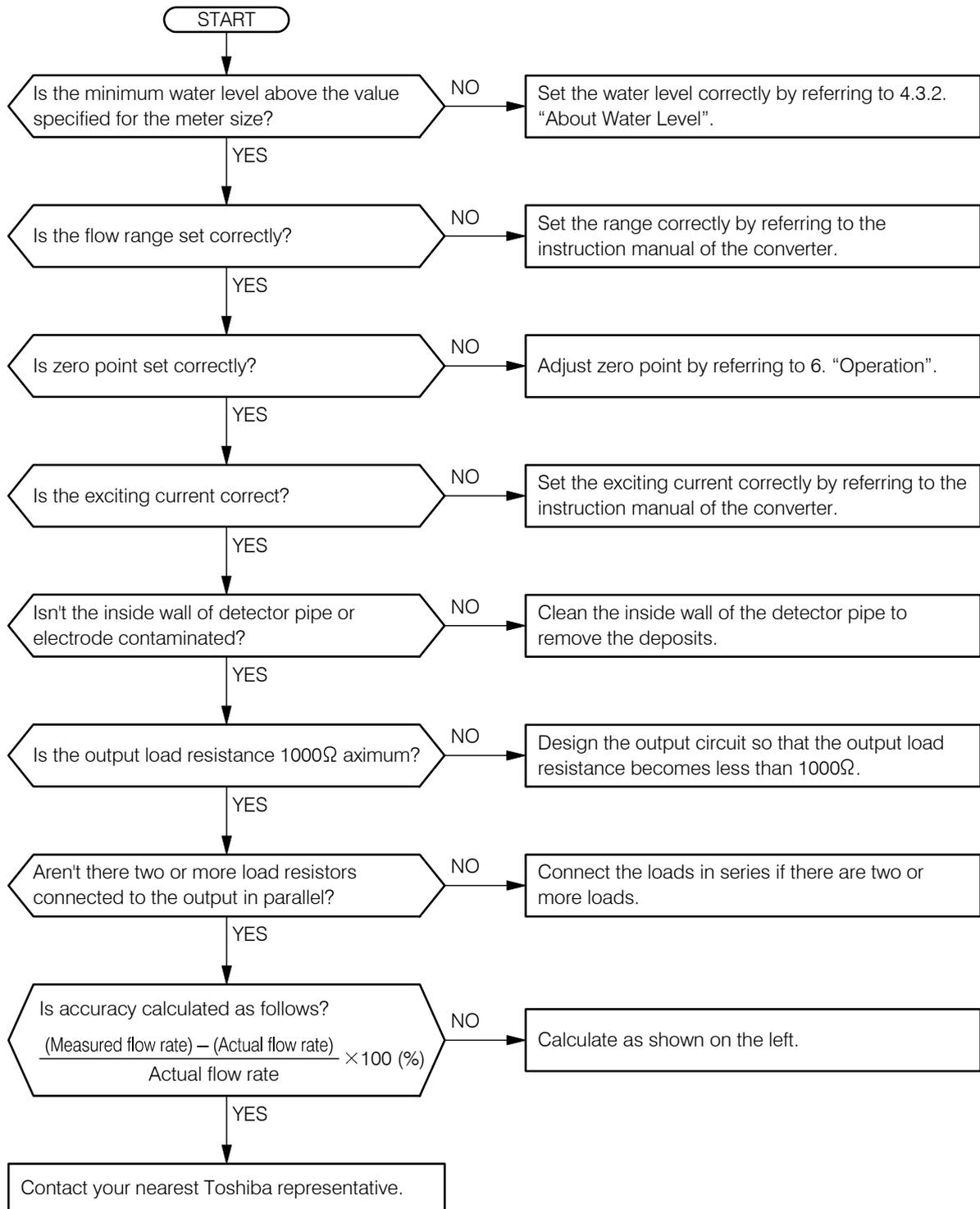
7.2 Troubleshooting

If a problem occurs while using the LF502, follow the flowcharts described below. You may find a way to solve the problem before you call for repair.

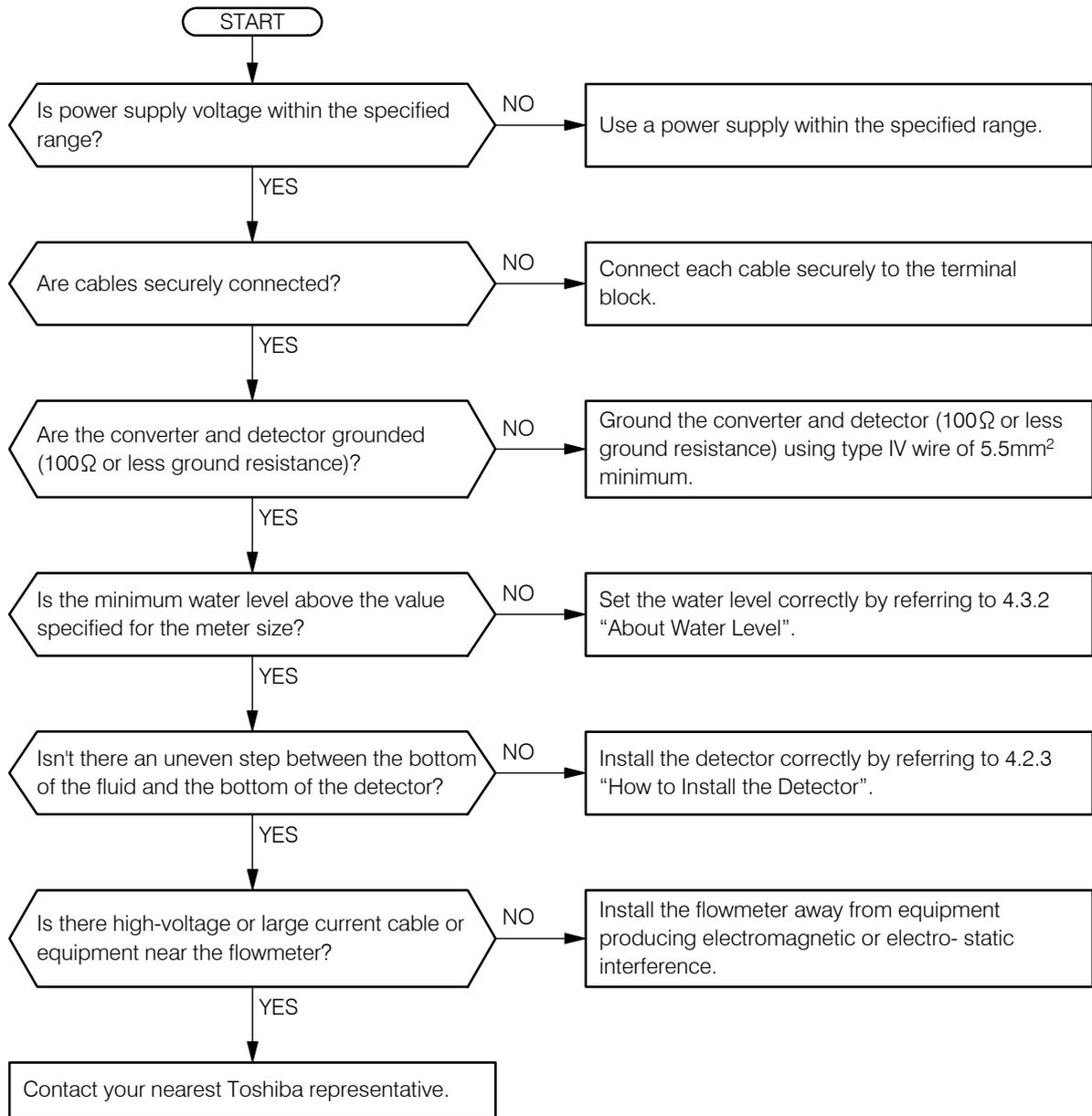
7.2.1 Flow rate is not indicated



7.2.2 Flow rate indication is not correct



7.2.3 Flow rate indication is not stable



8. Principle of Operation

The electromagnetic flowmeter is an instrument to measure the volumetric flow rate of fluid based on Faraday's Law of electromagnetic induction. Its principle of operation is as follows. An insulated pipe of diameter D is placed vertically to the direction of a magnetic field with flux density B as shown in Figure 8.1, and when an electrically conductive fluid flows in the pipe, signal electromotive force E will be induced between an electrode and a grounding ring placed at right angles to the direction of magnetic field. The signal electromotive force E is proportional to the average fluid velocity V and, the flowmeter detects this signal electromotive force.

The above can be expressed in equations as follows:

$$E = K \times B \times D \times V \text{ [V]} \dots\dots\dots (\text{Eq. 8.1})$$

- E: Signal electromotive force [V]
- K: Constant
- B: Magnetic flux density [T]
- D: Pipe inner diameter [m]
- V: Fluid velocity [m/s]

Volumetric flow rate of fluid Q [m³/s] is:

$$Q = \frac{\pi \times D^2}{4} \times V \dots\dots\dots (\text{Eq. 8.2})$$

Using the Equations 8.1 and 8.2,

$$E = K \times B \times D \times \frac{4}{\pi \times D^2} \times Q$$

$$E = \frac{4 \times K \times B}{\pi \times D} \times Q \dots\dots\dots (\text{Eq. 8.3})$$

Therefore, the signal electromotive force E proportional to flow rate can be obtained.

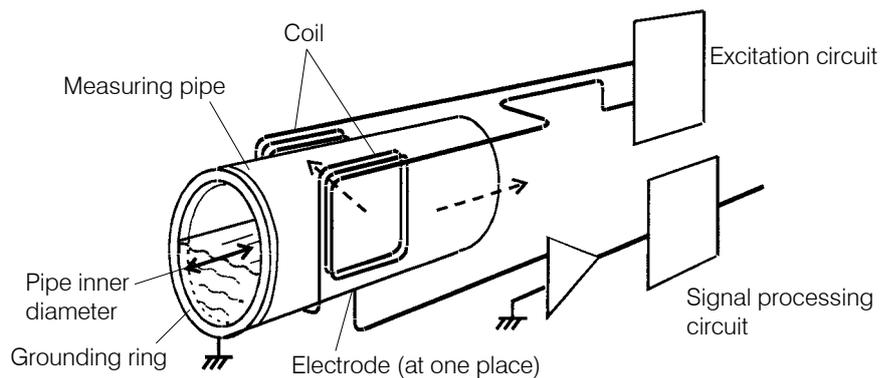


Figure 8.1 Principle of Operation

The electromagnetic flowmeter converter uses the square-wave excitation method. With square-wave excitation method, the flowmeter can offer reliable measurement for a long time without being affected by electrostatic or electromagnetic interference, or electrochemical polarization between the electrode and the fluid to be measured.

9. Specifications

* For converter specifications, refer to the instruction manual of the converter used with the detector.

9.1 Detector Specifications

Meter size : 150, 200, 250, 300, 350, 400, 500 and 600mm
 Measurement range : Under a condition equivalent to fluid velocity of to 0–1m/s (standard) to 0–5m/s with detector pipe filled with fluid

Meter size	Measurement range	
150mm	0–60 m ³ /h (Standard)	to 0–300m ³ /h
200mm	0–110m ³ /h (Standard)	to 0–550m ³ /h
250mm	0–175m ³ /h (Standard)	to 0–875m ³ /h
300mm	0–250m ³ /h (Standard)	to 0–1250m ³ /h
350mm	0–350m ³ /h (Standard)	to 0–1750m ³ /h
400mm	0–450m ³ /h (Standard)	to 0–2250m ³ /h
500mm	0–710m ³ /h (Standard)	to 0–3550m ³ /h
600mm	0–1000m ³ /h (Standard)	to 0–5000m ³ /h

Fluid water level range : Meter size 150 to 300mm Water level 30mm to fully filled condition
 Meter size 400 to 600mm 10% of meter size to fully filled condition
 * Fully filled condition is assumed as fluid level of 100%

Measurement accuracy : ±2% FS
 Note: Accuracy is measured under standard operating conditions at Toshiba’s calibration facility.

Fluid conductivity : 100µS/cm or more

Fluid temperature : 0 to +55°C

Ambient temperature : –10 to +50°C

Fluid pressure : –0.1MPa to the pressure limited by flange standard

Connection flange standard : See the Type Specification Code Table.

Principal materials : Case..... Carbon steel
 Measuring pipe..... SUS304
 Lining..... Teflon PFA (standard for meter size 150 to 400mm)
 Chloroprene rubber (standard for meter size 500 and 600mm)
 Electrode SUS316L (standard)
 Grounding ring..... SUS316 (standard)
 Flange..... Carbon steel

- Separate type terminal box.....SCS14 (equivalent to SUS316)
- * See the Type Specification Code Table for optional materials and other related information.
- Structure : Standard IP67 (watertight)
 Option IP68 (submersible)
- * The specifications for submersible type are as follows:
 Submersible water range: Within 5m under water
 Coating: Tar epoxy resin coating, 0.5mm thick
- Evaluation test: Leaving the detector at 5m in depth for 2800 hours (about 4 months) and check that moisture does not enter the inside.
- Coating : Phthalic resin coating (standard), Color: Pearl gray
 Tar epoxy resin coating, 0.2mm thick(option), Color: Black
- Dimensions and weight : See the Outline Dimensions.
- Cable port : R(PT) 1/2 male thread
- Allowable cable length : 300m
- Actual calibration range : If the flow rate range is not specified, actual calibration is performed under the “Standard range and partially filled condition” listed in the table below.
 If the flow rate range and fully filled/partially filled conditions are specified by the customer, actual calibration is performed under the customer specified flow rate range and conditions.

Meter size (mm)	Standard range	
	Flow rate (m ³ /h)	Flow velocity (m/s)
150	60	0.943
200	120	1.061
250	200	1.132
300	300	1.179
350	450	1.299
400	600	1.326
500	1000	1.415
600	1500	1.474

9.2 Type Specification Code Table

● Detector LF502 Type Specification Code Table

Model					Specification code								Description	Applicable size	
1	2	3	4	5	6	7	8	9	10	11	12	150mm to 400mm		500mm 600mm	
L	F	5	0	2								LF502 Flowmeter Detector for partially filled pipes			
					K							150mm			
					L							200mm			
					M							250mm			
					N							300mm			
					P							350mm			
					Q							400mm			
					R							500mm			
					S							600mm			
						A						Standard			
							J					Connection flange standard JIS 10K	○ ○		
								C				Lining material Chloroprene rubber	— ○		
								D				EPDM rubber	○ △		
								T				Teflon PFA	△ —		
									B			Electrode + Grounding Materials SUS316L + SUS316	○ △		
									C			Ti + Ti	△ △		
									F			Hastelloy C + Hastelloy C (Note 1)	△ △		
									H			SUS316L + SUS304	△ ○		
										A		Flow velocity range for calibration Standard range calibration	○ ○		
											B	Coating Phthalic resin coating, color: pearl gray	○ ○		
											C	Tar epoxy resin coating, 0.3mm thick, color: black	△ △		
											D	Tar epoxy resin coating, 0.5mm thick, color: black	△ △		
											E	Submersible type (tar epoxy resin coating, 0.5mm thick), color: black	△ △		

○: Standard △: Option —: Not available

Note 1: Hastelloy C is a registered trademark of Haynes International Inc.

● Bolts, Nuts and Gaskets for piping (B, N and P)

Model			Specification code							Description	
1	2	3	4	5	6	7	8	9	10		
B	N	P									Bolts, Nuts and Gaskets
			F								Flange type
											Meter size
				0	1	5					150mm
				0	2	0					200mm
				0	2	5					250mm
				0	3	0					300mm
				0	3	5					350mm
				0	4	0					400mm
				0	5	0					500mm
				0	6	0					600mm
							J				Connection flange standard JIS10K
								A			Bolts and Nut Material SS400
								B			SUS304
								C			Not provided
								Z			Other (Note 1)
									A		Gasket Material EPDM rubber
									B		Chloroprene
									C		Teflon-enclosed gasket
									D		Not provided
									Z		Other (Note 1)

Note 1: For code Z selection, contact Toshiba beforehand.

● Dedicated Cable

Model			Specification code					Description
1	2	3	4	5	6	7	8	
A	C	C						Dedicated cable for separate type detector
			A					Nominal cross-sectional area of exciting cable (3-core chloroprene cabtyre cable) (Note 1) 1.25mm ²
			B					2mm ²
			A					Nominal cross-sectional area of eignal cable (2-core shielded chloroprene cabtyre cable) 0.75mm ²
								Cable length
				0	0	1		1m
				0	0	2		2m
				0	0	3		3m
				0	0	4		4m
				0	0	5		5m
				0	0	6		6m
				0	0	7		7m
				0	0	8		8m
				0	0	9		9m
				0	1	0		10m
				0	1	5		15m
				0	2	0		20m
				0	2	5		25m
				0	3	0		30m
				0	3	5		35m
				0	4	0		40m
				0	4	5		45m
				0	5	0		50m
				0	6	0		60m
				to				to
				3	0	0		300m

(Note 1) Relation between the nominal cross-sectional area of exciting cable and its cable length

Nominal cross-sectional area	Exciting cable length
1.25mm ²	1 to 200m
2mm ²	210 to 300m

● Function code

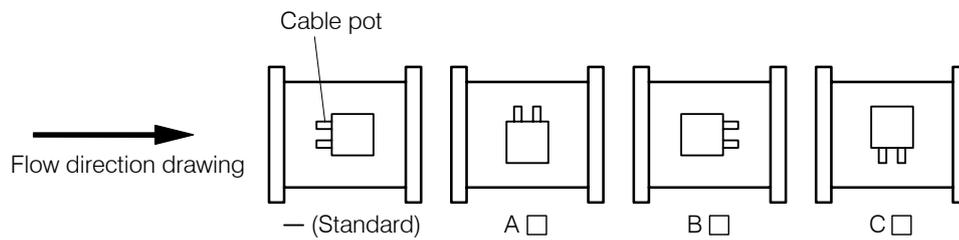
[Example of function code specification]

When the cable port is facing toward downstream side FUNC: B2
 (If there is more than one function code, enter the codes, left justified)

Items of function code	Function code (FUNC)
Orientation of cable port	
Toward upstream	— (Standard)
Toward right (facing upstream)	A <input type="checkbox"/> (See the note below.)
Toward downstream	B <input type="checkbox"/> (See the note below.)
Toward left (facing upstream)	V <input type="checkbox"/> (See the note below.)
Flow direction for vertical piping system	
Down → Up	E <input type="checkbox"/>
Up → Down	D <input type="checkbox"/> (Note)

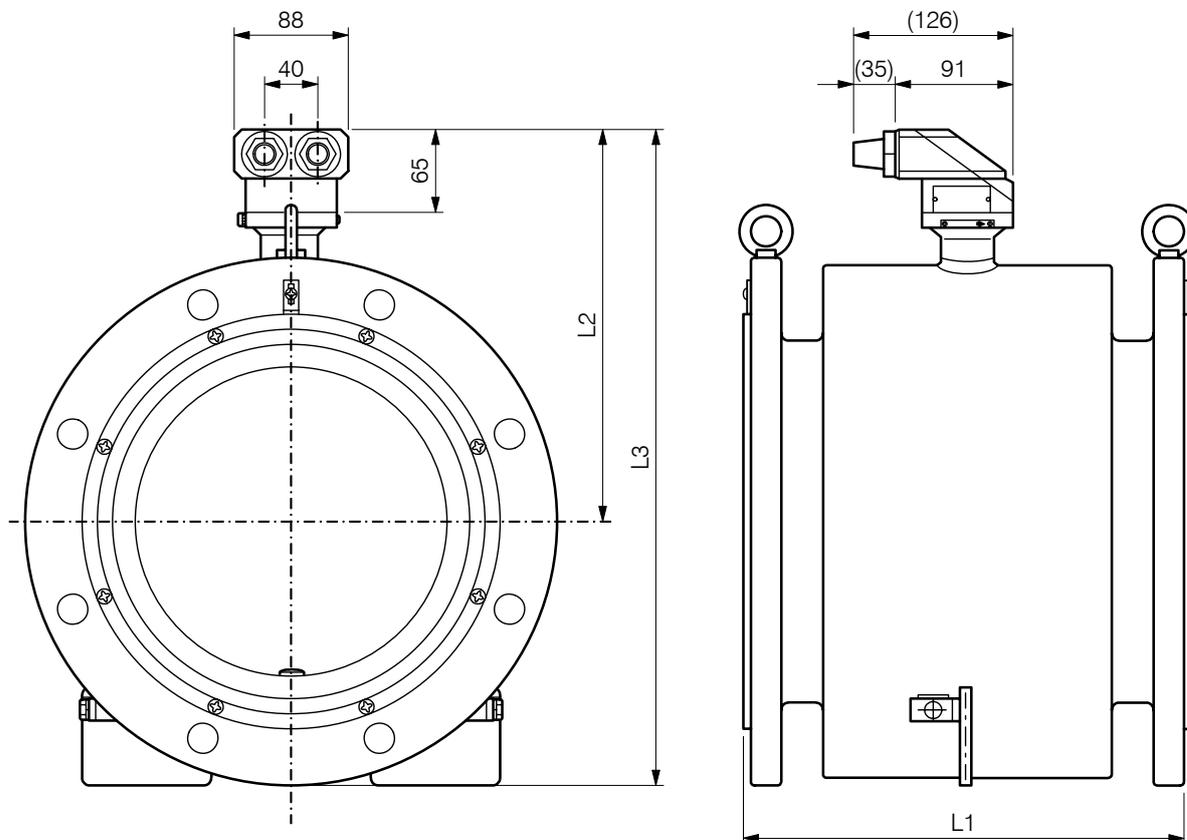
: For separate type detector → 2

- Orientation of cable port (orientation when viewed from the above of the converter and detector)



Note: If the cable port is facing toward downstream side, the specification code is B2.

10. Outline Dimensions



Meter size	Distance between flange faces L1 (mm)	Pipe axis height L2 (mm)	Total height L3 (mm)	Mass *1 (kg)
			JIS10K	
150mm	266	246	386	Approx. 35
200mm	300	271	436	Approx. 80
250mm	350	306	506	Approx. 110
300mm	400	329	551	Approx. 120
350mm	450	351	596	Approx. 130
400mm	500	386	666	Approx. 180
500mm	600	417	754	Approx. 190
600mm	600	469	866	Approx. 250

*1: The weight differs depending on the flange standard. The values in the table are the ones when the flange standard is JIS 10K).

USER'S FORM NOTES

Write down the address and phone number of the distributor from which you purchased this product, the product code, SER.NO. and so on.

Distributor Address _____
Name _____
Phone number () - _____
Product code <u>LF</u> _____
SER.NO. _____

TOSHIBA CORPORATION
