

ACID PROOF TURBINE FLOW METER**INSTRUCTION MANUAL**

MNT10451 22.02



Thank you for purchasing a acid proof flowmeter CT4 of our make this time. This instruction manual explains various cautions necessary for operating this flowmeter. The user is kindly requested to read through this manual so that this flowmeter may be used correctly and in safety for a long period of time.

For any inquiry about this flowmeter or order of spare parts, please let us know the type and the serial No. indicated on the nameplate without fail.

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1. Introduction

Thank you for adopting ACID PROOF TURBINE FLOW METER of our make this time.

Before using your instrument, please read carefully this instruction manual which explains specifications, type, installation, etc. of the instrument.

Please note in advance that there may be cases where no revision of this manual is made even for any change in specifications, construction and component parts which is considered as not putting any obstacle from the viewpoints of function and performance.

In case the instrument failed to make normal operation, please inform us of the type and serial No. of the instrument concerned, the contents of trouble, circumstance in which the failure took place, etc. concretely, preferably with presentation of relative sketch, data, etc.

It is to be noted, however, that we cannot assume responsibility for any failure by the instrument of discharging the prescribed functions after a repair made by the user himself regardless of our position.

For any inquiry about troubles, the user is kindly requested to contact our agent from whom you purchased the product or the nearest branch office of our company.



Any unauthorized modification, etc. of this product made by the user presents a risk of spoiling the guarantee of safety or the prescribed function of the product. In case there is any need of modification, etc., the user is kindly requested to inform the dealer from whom you purchased the product or our branch office closest to you of the matter.

In this document, the following symbol marks are used for safe and correct use of the flow meter:



: Indicates a general handling precaution.



Warning

: Indicates contents the neglect of which in the handling may eventually lead to death or serious injury.



Caution

: Indicates contents the neglect of which in the handling may eventually lead to injury or production of material damages.

2. Handling precautions



This instrument is inspected sufficiently in the factory before delivery. When received delivery of this instrument, check well the appearance of the instrument to make sure that there is no damage in it.

In this section are described precautions necessary for the handling of the instrument. Please read this section carefully before using the instrument. For other matters, refer to the relative sections as required. For any inquiry about troubles, please contact our agent from whom you purchased the product or the nearest branch office of our company.

2.1 Matters to be checked about type and specifications



Caution

Please check the type and specifications.

This flow meter is assembled and adjusted individually according to specifications for delivery. Check the name plate provided on the counting unit, etc. to make sure that the type and other specifications are conformable to your

order.

[Name plate mounting position]



[Contents of indication on the name plate]



2.2 Precautions regarding measured



Warning

Take care about the liquid to be measured.

If you use this flow meter for any liquid unfit for the material used for the instrument, it may cause injury or material damage with splashing of liquid leaking due to corrosion which develops from the inside of the instrument.

Check the corrosion resistance of the material of this product and the liquid concerned.



Warning

Use in the range of working pressure and temperature.

If you use your flow meter at any higher pressure or temperature, it may cause breaking of flow meter body or measuring unit or injury or material damage with splashing of broken pieces or liquid.



Warning

Take protective measures against burning.

In the case of use of any high-temperature liquid (40°C or over), the body and the radiating fins may get very hot and cause burning. Be sure to take protective measures against burning in due consideration of heat radiation,

heat preservation and maintenance & inspection.

2.3 Precautions regarding place of installation



Caution

Avoid place with large temperature gradient or large temperature fluctuations.

When the instrument is subject to radiant heat, etc., either take shielding measures or install in a way to secure sufficient ventilation.



Caution

Avoid installing in any corrosive atmosphere.

When using this instrument in a corrosive atmosphere, arrange to secure sufficient ventilation and take protective measures against penetration and accumulation of rain water in the conduit pipe.

2.4 Precautions regarding piping



Caution

Provide a bypass piping.

There is a risk of material damage with breaking of internal component parts of the flow meter due to flushing or exhaustion of air from inside the piping in the initial period of operation.



Caution

Install in a state free from any vibrations or displacement of piping.

If you install the flow meter in a place subject to great vibrations or displacement of piping, it may cause injury or material damage with breaking of flow meter body or measuring unit or splashing of broken pieces or liquid.



Caution

Install piping at a position not subject to any impact pressure.

If any valve instantly closing the piping is provided close to the flow meter in either the upstream or downstream side, it presents a risk of injury or material damage with breaking of flow meter body or measuring unit due to impact pressure by water hammer, etc.



Caution

Provide a strainer also on the downstream side.

Provide a strainer also on the downstream side as required for protection against inflow or mixing in the process liquid resulting from breaking of internal component parts. Otherwise, there is a risk of production of material damage due to mixing in the process liquid.

2.5 Precautions regarding control system



Warning

Supplement a control output function other than the output of this product.

There is a risk of loss of safety and/or process specifications due to operating error or interruption of the control signal.

When using this flow meter on an important process line, it is recommended to supplement another control function to the system so as to avoid danger or material damage due to operating error.

2.6 Precautions regarding maintenance & inspection



Warning

Remove internal pressure and completely eliminate the residual liquid.

If the liquid used is either toxic or corrosive, it may cause injury or material damage at the time of disassembling or inspection of the flow meter.

2.7 Precautions regarding use for high-pressure gas liquid or inflammable gas liquid



Warning

Use flow meter approved for high-pressure gas or flow meter certified as product of explosion-proof type.

For any high-pressure gas liquid or inflammable gas liquid, use flow meter approved for high-pressure gas or article certified as product of pressure resistant and explosion-proof structure, article certified as product of intrinsically safe construction, etc. If you use a model of general structure, it may cause explosion or fire, leading to injury or material damage.

2.8 Precautions regarding transportation & storage



Pack the flow meter for the storage.

The packing style for storage shall be the same as or close to the state in which the product was delivered from us.

Select a place satisfying the following conditions for the storage:

- Place protected against rain or water.
- Place subject to little vibrations or shocks.
- Place with following temperature & humidity conditions during storage:

Preferably a place with normal temperature & humidity.

Temperature : -10 ~ 60°C

Humidity : 5 ~ 80%RH (without dew condensation)



Caution

Clean well the flow meter.

For storing your flow meter after use, clean well the inside of the liquid end and, after drying, put a cover on the entire instrument for the storage.

3. Outline of the product

This is high-accuracy turbine flow meter for measuring strong corrosive liquid, having the wetted parts of which are constructed with extremely corrosion-resistant materials of fluororesin and ceramics.

3.1 Standard specifications

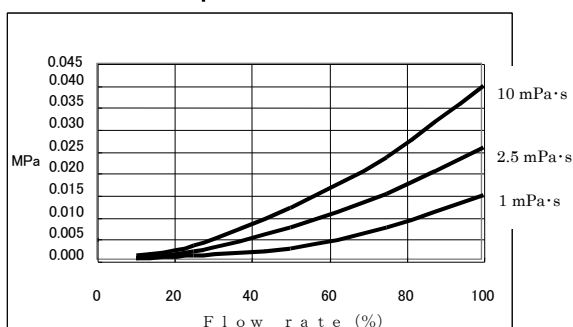
Nominal diameter		20A	25A	40A	50A
Measured liquid		Strong corrosive liquid, Pure water			
Viscosity of liquid		0. 8~10mPa·s			
Liquid temperature		0~80℃			
Liquid pressure		0. 7MPa or under			
Measuring accuracy		±0. 5% RD			
Connection		JIS10K			
Materials	Measuring unit	Body: SCS14、Liner: PTFE、Rotor・Bearing: PTFE Rotor Bearing: Ceramics、Other wetted parts: PTFE			
	Counting unit	Aluminium die casting			
Output	Type of signal	Voltage no-contact			
	Pulse unit(nominal value)	5mL/P	12. 5mL/P	49mL/P	85mL/P
Power supply		Voltage : DC12~24V			
Ambient temperature		0~60℃			
Explosionproof structure		Flameproof enclosure Exd II BT4			
Waterproofing structure		JIS C 0920 Water-resistant			
Paint color	Measuring body	No paint			
	Terminal box	Deep sea moss blue (Equivalent of Munsell 5B3.0/2.0)			

3.2 Range of flow rate

Nominal size symbol	Range of flow rate(L/h)	
	min	max
20A	350	3,500
25A	700	7,000
40A	2,000	12,000
50A	4,000	25,000

Note) The flow rate range given above shows that of a case with a liquid viscosity of 1 mPa·s (specific gravity 1). Please contact us for inquiry in case of any liquid viscosity other than 1 mPa·s.

3.3 Pressure drop



3.4 Type and specification code

CT4

Acid proof turbine flow meter

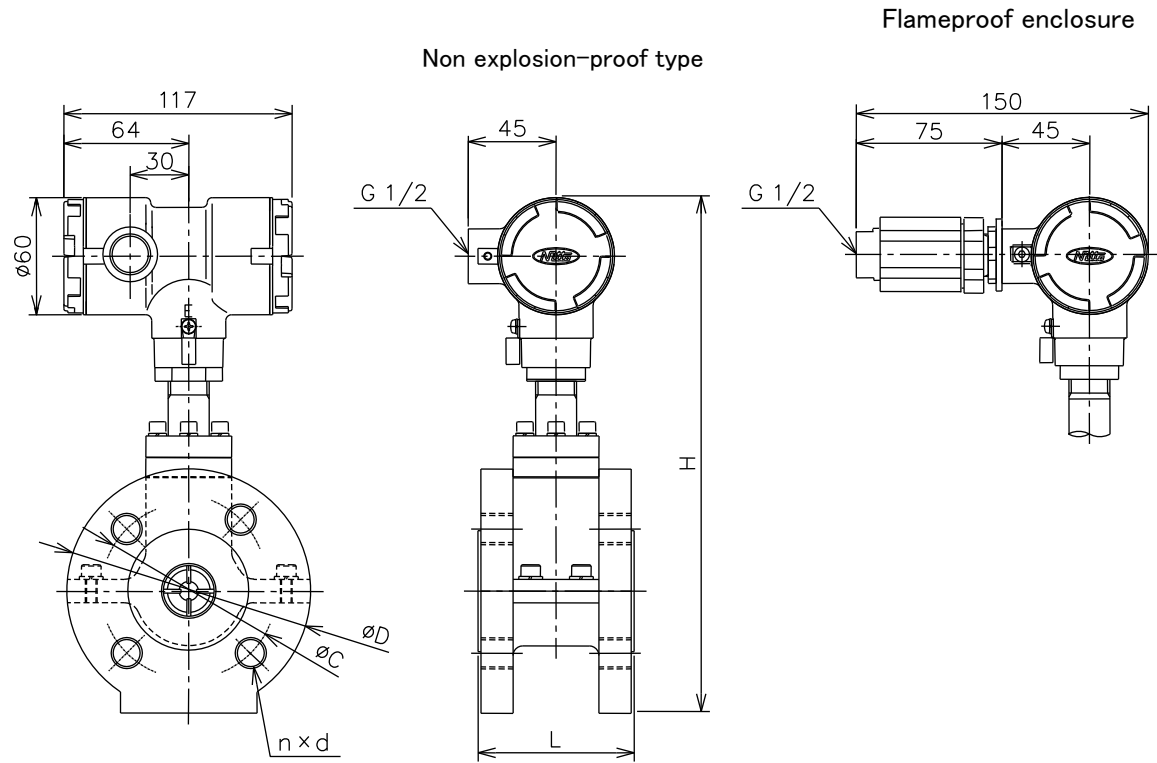
Explosion-proof structure

Nominal size symbol

Material symbol

Type	Specification code			Description
CT4	.....			Acid proof turbine flow meter
Explosion-proof structure	N	.....		Non explosion-proof type
	X	.....		Flameproof enclosure
Nominal size symbol	20A	.....		Nominal size: 20A
	25A	.....		Nominal size: 25A
	40A	.....		Nominal size: 40A
	50A	.....		Nominal size: 50A
Material symbol		TT	....	Body: SCS14、Liner: PTFE

3.5 External dimension drawing



N o m i n a l L s i z e	H	D	C	n	d	
20A	80	250	100	75	4	M12
25A	80	264	125	90	4	M16
40A	110	279	140	105	4	M16
50A	120	290	155	120	4	M16

4. Installation

4.1 Piping design

Take account of the following points in the piping design to enable correct measurement:

- (1) Place of mounting
 - Place easy for inspection.
 - Place protected against direct sunshine.
 - Place not subject to rain or dew drops.
 - Place with little corrosive gas.
 - Place with little dust.
 - Place with little electromagnetic noise.
 - Place with little vibrations of piping and fluid.
- (2) Prevention of noise

Select a place not close to any power source such as motor, transformer, etc. as it may cause noise interference to the flow meter.
- (3) Service area

Service area is required for such works as mounting, wiring, inspection, etc. Select a place where a sufficient space can be secured for it.
- (4) Mounting posture

Perform piping design so that the liquid may always flow inside the measuring unit of the flow meter.
- (5) Be sure to install a strainer on the inlet side of the flow meter. To avoid effluence to the downstream side due to damage of internal component parts, install a strainer also on the outlet side of the flow meter, as required.

(Note) 60 - mesh is the standard mesh of the strainer element.

4.2 Mounting

4.2.1 Mounting precautions

- (1) The flow meter is firmly packed. Take good care not to damage the equipment at the time of unpacking. Moreover, to prevent damage due to accident during transportation to the place of installation, carry near the place of installation in the state packed as it was delivered.
- (2) Take care not to drop or add any excessive impact.
- (3) Make the direction of flow of the fluid to be measured agree with the orientation of the direction of flow indicating mark.
- (4) When using liquid packing and seal tape, etc. at the time of piping installation, take good care to prevent the tape, etc. from protruding into the piping.
- (5) In tightening the flange bolt, take care to avoid any uneven tightening or unnecessarily strong tightening. The tightening shall preferably be made in 3 steps, as follows:
 - ① Tighten gently in the order of diagonal lines with a force no larger than one half of the final tightening torque, and adjust the state of tightening of the flow meter, the flange, and the gasket.
 - ② Tighten in the same order as in ① with a force equal to approximately 80% of the final tightening torque.
 - ③ Tighten with the final tightening torque indicated below, while paying due attention to production of unusual noise, etc. (Tighten with a level of force as applied somewhat strongly with a single hand.) After the tightening, make sure that there is no leak of liquid through the gap between the flowmeter and the flange.

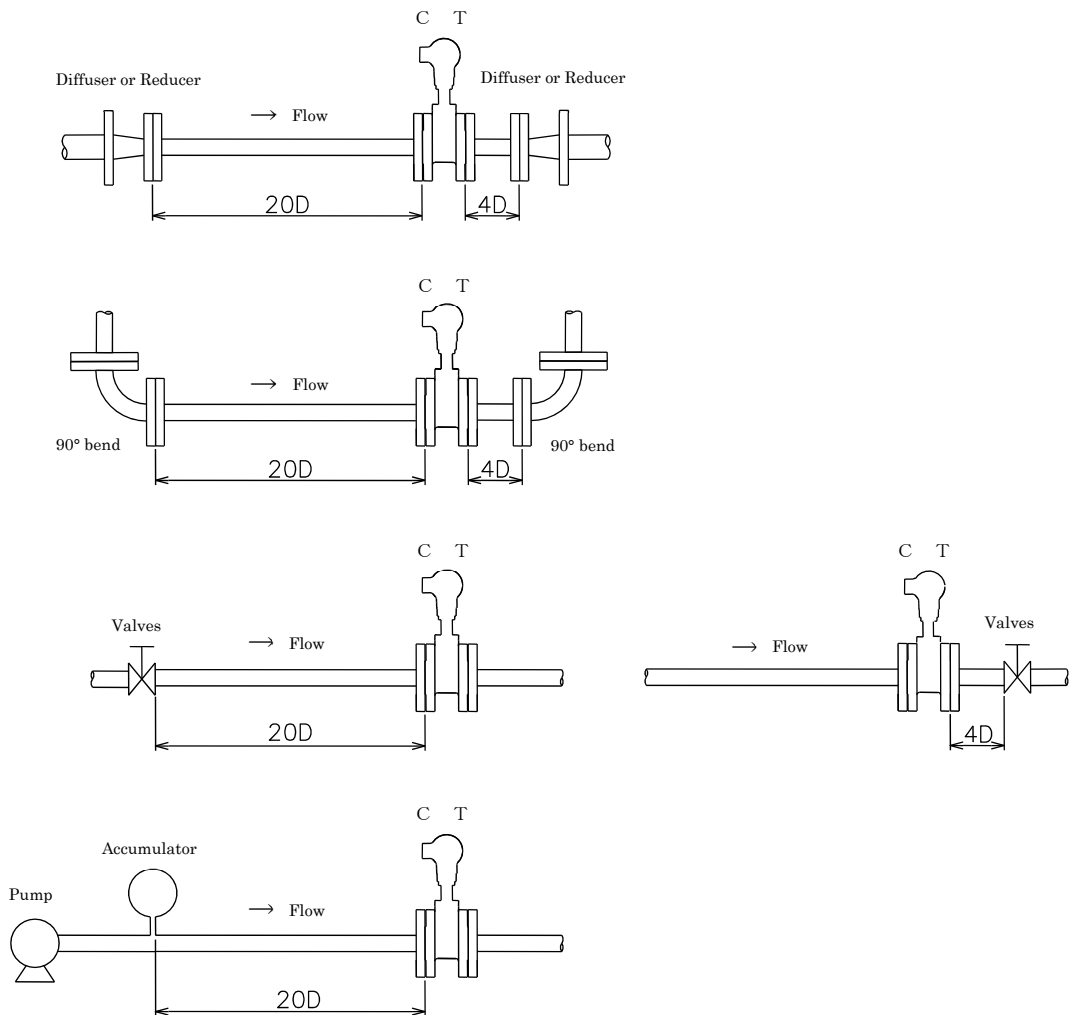
Final tightening torque

[Unit: N·m (kg·m)]

Nominal size	Tightening torque	Recommended tool
20	10~15 (1.0~1.5)	Spanner of nominal size 19; Monkey spanner of nominal size 200
25~50	15~25 (1.5~2.5)	Spanner of nominal size 24; Monkey spanner of nominal size 250

4.2.2 Precautions regarding the piping

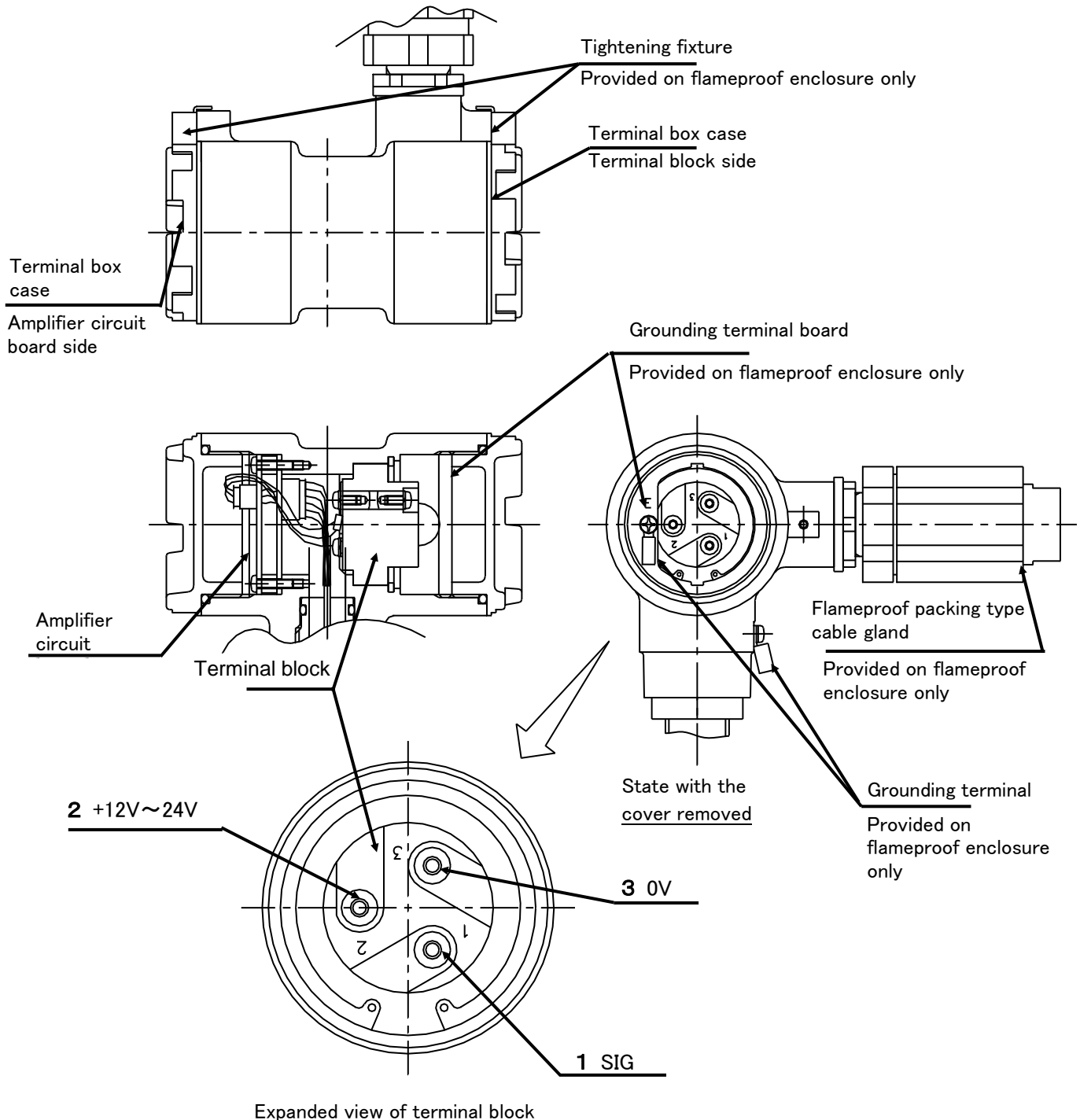
- (1) To avoid giving piping stress to the flow meter, install in a way not to be deviated from the center of the piping. When using liquid packing and sealing tape, etc. at the time of piping installation, take good care to prevent the packing and tape, etc. from protruding into the piping.
- (2) In the case where there is any inclination or eccentricity of the piping or a face-to-face dimension out of tolerance, rectify such irregularity before installing the flow meter without fail.
- (3) Piping method
When piping the flow meter, the straight pipe length should be at least 20 times the pipe diameter on the upper stream side and at least 4 times on the lower stream side of the flow meter.

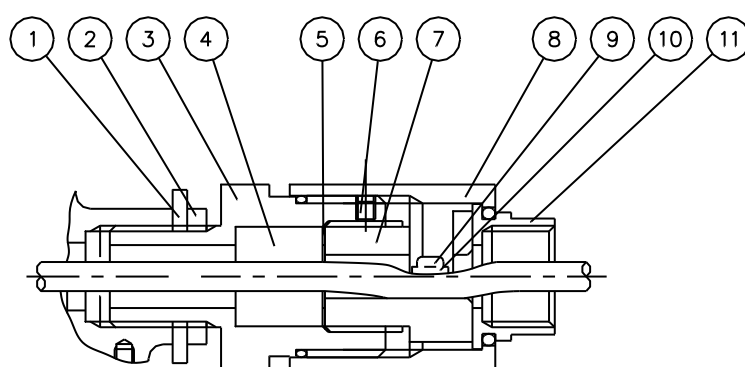


5. Wiring & setting of circuit board

Connect the external output signal line of the flow meter to the terminal block inside the counting unit. The setting of the type of signal can be changed with the set switch of the amplifier circuit board inside the counting unit.

5.1 Designation of various parts of the counting unit





11	Screwed part of protective tube
10	Clamp
9	Screw
8	Waterproof cover
7	Packing gland
6	Hexagon socket set screw
5	Sheet washer
4	Packing
3	Cable crank fixture
2	Lock nut
1	Waterproof packing
No.	Part name

Sectional view of flameproof packing type cable gland

5.2 Precautions for wiring

Take the following precautions when performing the wiring work:

1. Be sure to cut off the external power source for executing the wiring work.
2. Avoid connecting cables outdoors on rainy days, to secure insulation inside the counting unit and prevent troubles due to penetration of moisture in the unit.
3. Use the cables indicated below as signal lines to be used for the wiring:
 Non explosion-proof type ----- Vinyl insulated vinyl cable for control with antistatic shield.
 Flameproof enclosure type ----- Vinyl insulated vinyl cable for control with antistatic shield, and pressure-resistance packing for external lead wire inlet, but with an allowable temperature of 70°C or over.
 HIV wire of 0.9 mm² stipulated in JIS C 3317, with external lead wire inlet by screw connected conduit pipe.
4. The outside diameter of the screw for cable terminal and the screw for grounding terminal is 4 mm.
5. Avoid connecting the cable outdoors during a rainfall, for securing insulation inside the counter section and prevent trouble due to penetration of humidity.

5.3 Connecting method

1. Remove the terminal box cover on the terminal block side. (In the case of a flameproof enclosure type, remove the fastening fixture on the terminal block side before making this operation.)
2. Turn and remove the grounding terminal board (flameproof enclosure type only).
3. The terminal block indicated in the drawing of paragraph 5.1 will appear.
4. Pass the signal wire through the pressure-resistant packing type fixture (flameproof enclosure type only).
5. Perform wire connections. After the connection, put the grounding terminal board, terminal box cover and fastening fixture back in their original places.
6. Refer to an example of connection with the receiving measuring instrument indicated in paragraph 5.5.

5.4 Change of mounting direction

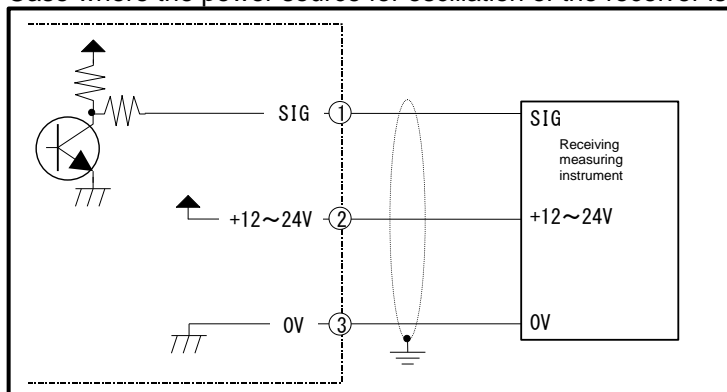
To change the orientation of the counter section (terminal box), remove 4 pieces of 55 (hexagon socket set screw) indicated in the exploded view in paragraph 7.3. The orientation can be changed by 90° each time. There is no fear of spilling of measuring liquid with this work.

5.5 Example of wire connections

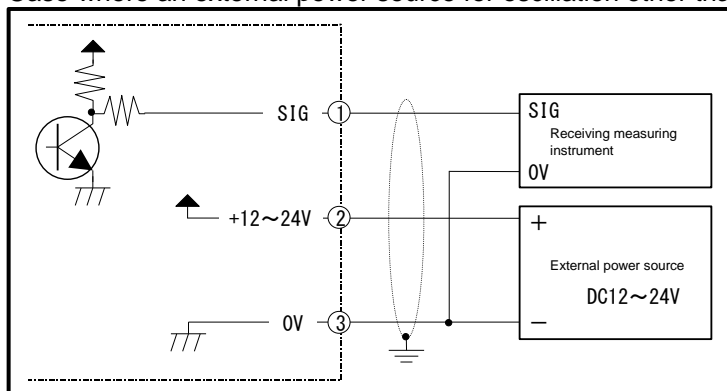
5.5.1 Voltage no-contact output

Perform wiring with due attention to the voltage and the polarity

- Case where the power source for oscillation of the receiver is used



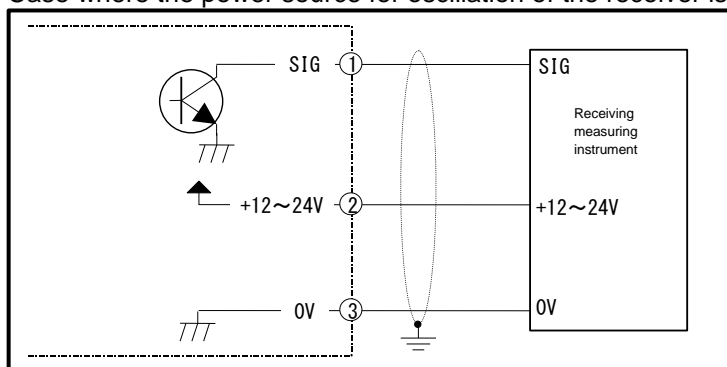
- Case where an external power source for oscillation other than that of the receiver is used



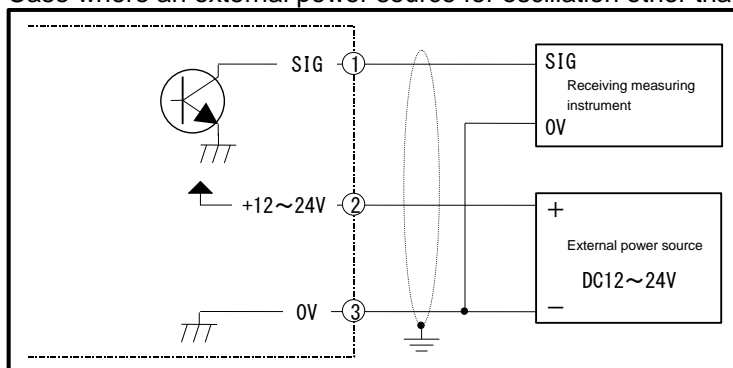
5.5.2 Open-drain output

Perform wiring with due attention to the voltage and the polarity.

- Case where the power source for oscillation of the receiver is used

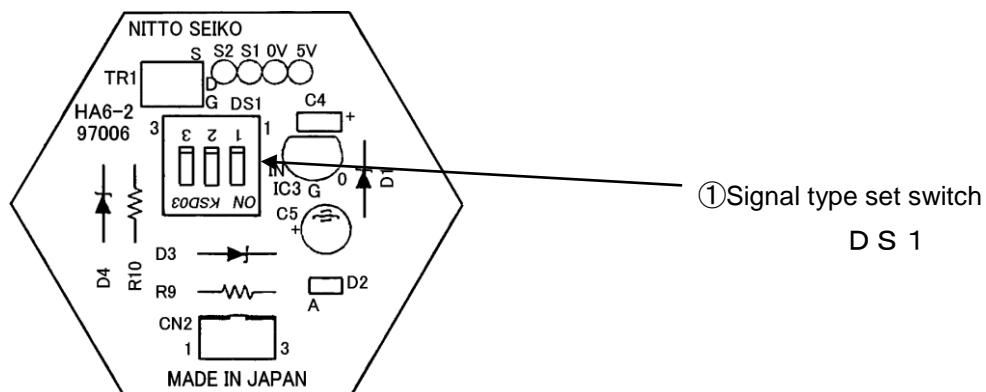


- Case where an external power source for oscillation other than that of the receiver is used



5.6 How to set the amplifier circuit board

1. Remove the terminal box cover on the amplifier circuit board side. (In the case of a pressure-resistant & explosion-proof type, remove the fastening fixture on the amplifier circuit board side before making this operation.)
2. The amplifier circuit board will appear.



- ① Signal type set switch (DS1)
This switch is used for setting the signal type.

3. Contents of setting

● Type of signals

Contents of setting of DS1	Type of signal
ON <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3	Voltage no-contact
ON <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3	Open-drain

6. Operation

6.1 Treatment before flowing of liquid

6.1.1 Checking after piping installation & wiring



Check the nameplate of the flow meter to make sure that its contents are conformable to the operating conditions. Also confirm that there is no error in the method of installation, piping connection and wiring.

6.1.2 Flushing



To completely remove dust, weld refuse, etc. produced with piping work, remove the flow meter, install a short pipe of the same length as the distance between flow meter faces and perform flushing. After that, clean the strainer element and install the flow meter.

6.2 Precautions to take before start of operation

In the early period of operation, air inside the piping is discharged at high speed, and there are cases where the internal rotors are damaged because of high-speed operation. To prevent such damage, open the respective valves slowly and evacuate air sufficiently.

[Valve opening/closing procedure]

- ① Upstream & downstream side valves → Fully close.
- ② Bypass valve → Fully open.
- ③ Upstream side valve → Slightly open.
- ④ Downstream side valve → Slightly open.
- ⑤ Flow the liquid.
- ⑥ Bypass valve → Gradually close.
- ⑦ Upstream & downstream side valves → Gradually open up to a proper flow rate in the prescribed range.



Check for any leakage from various parts, or unusual noise and vibrations in the flow meter.

6.3 Operating precautions

6.3.1 Working flow rate



Considering a fluctuation of flow and life of the flow meter, flow meter shall be used in a way to have a normal flow rate corresponding to 40-60% of the maximum flow rate.

7. Maintenance

7.1 Measuring unit checking manual

This instrument has excellent durability thanks to its simple construction and use of fluororesin and ceramics for the bearing section. However, because there are cases where its functions are hampered with adhesion of scale, etc. to the rotor (impeller) due to penetration of impurities or foreign matter in the operating fluid, inspect by the following procedure:

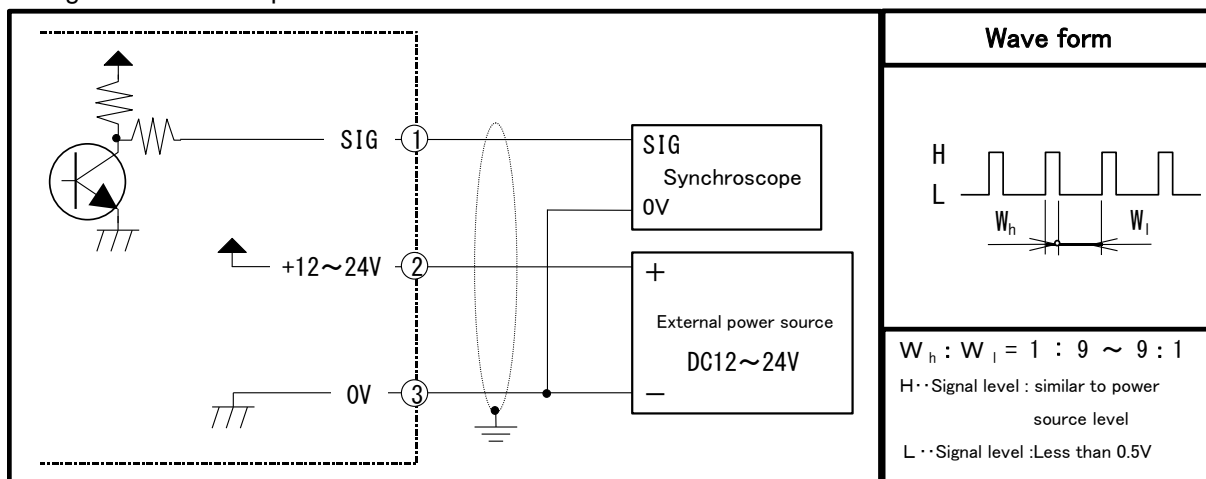
- (1) Close the valve before and after the flowmeter, remove the flowmeter, and clean the counter section.
- (2) Check for adhesion of foreign matter to the rotor.
- (3) Blow a little bit of air on the rotor (with a force about equal to that of breathing), to make sure that the rotor turns lightly.

7.2 Output signal checking manual

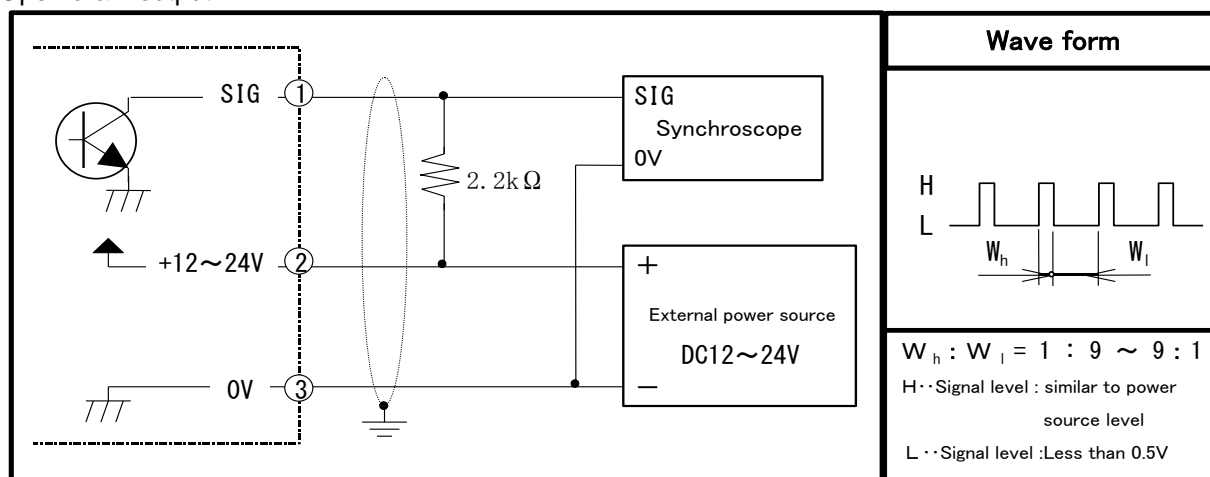
Despite the rotor rotating, the meter seems not oscillate output signal correctly, check it with following steps.

- (1) Check if the external power is DC12V~24V.
- (2) When a external power is supplied, check if a voltage between terminal②-③ is same voltage with power source voltage.
- (3) Make the following wire connection, check if a signal wave is output correctly when rotor rotates.

● Voltage no-contact output



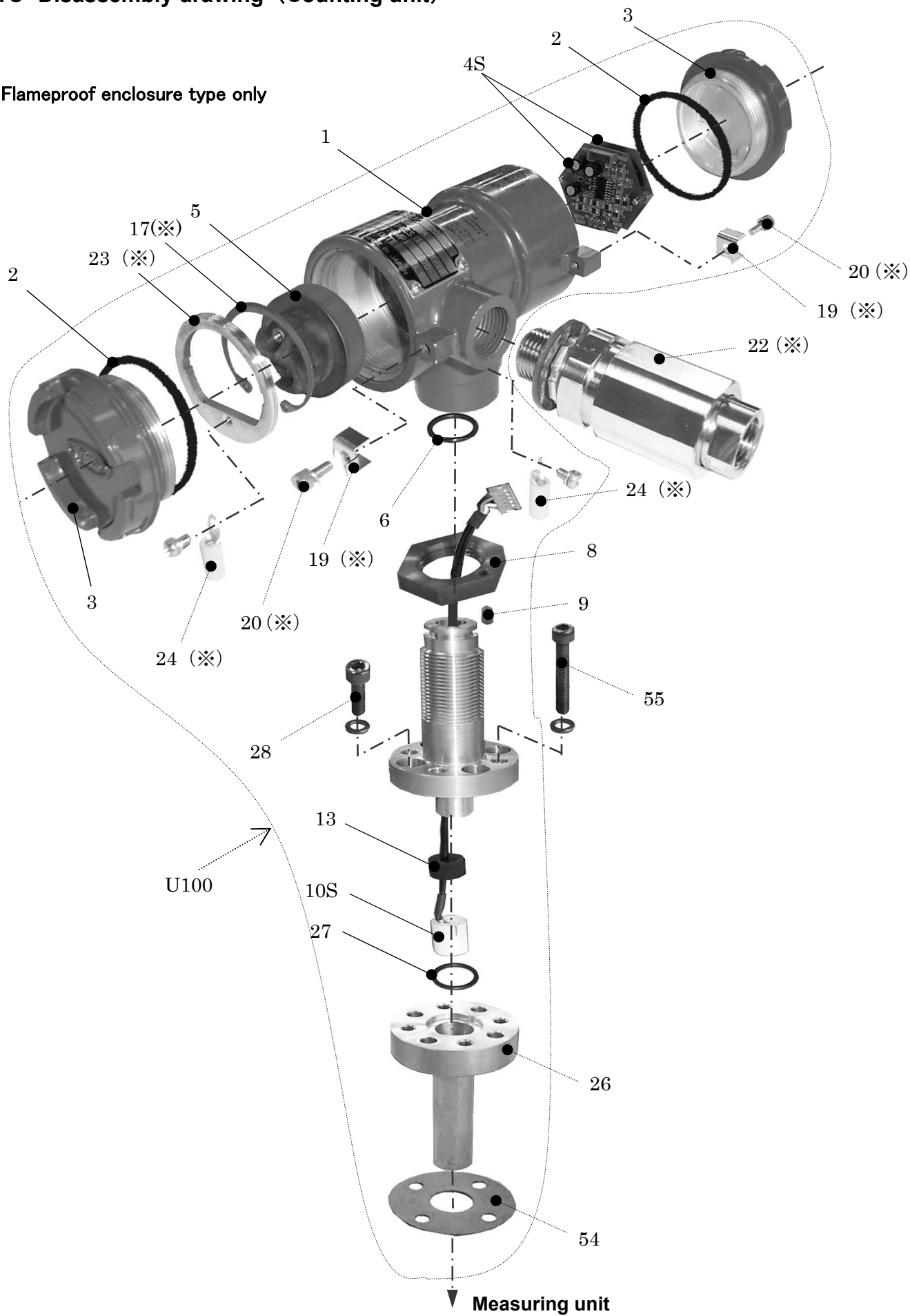
● Open drain output



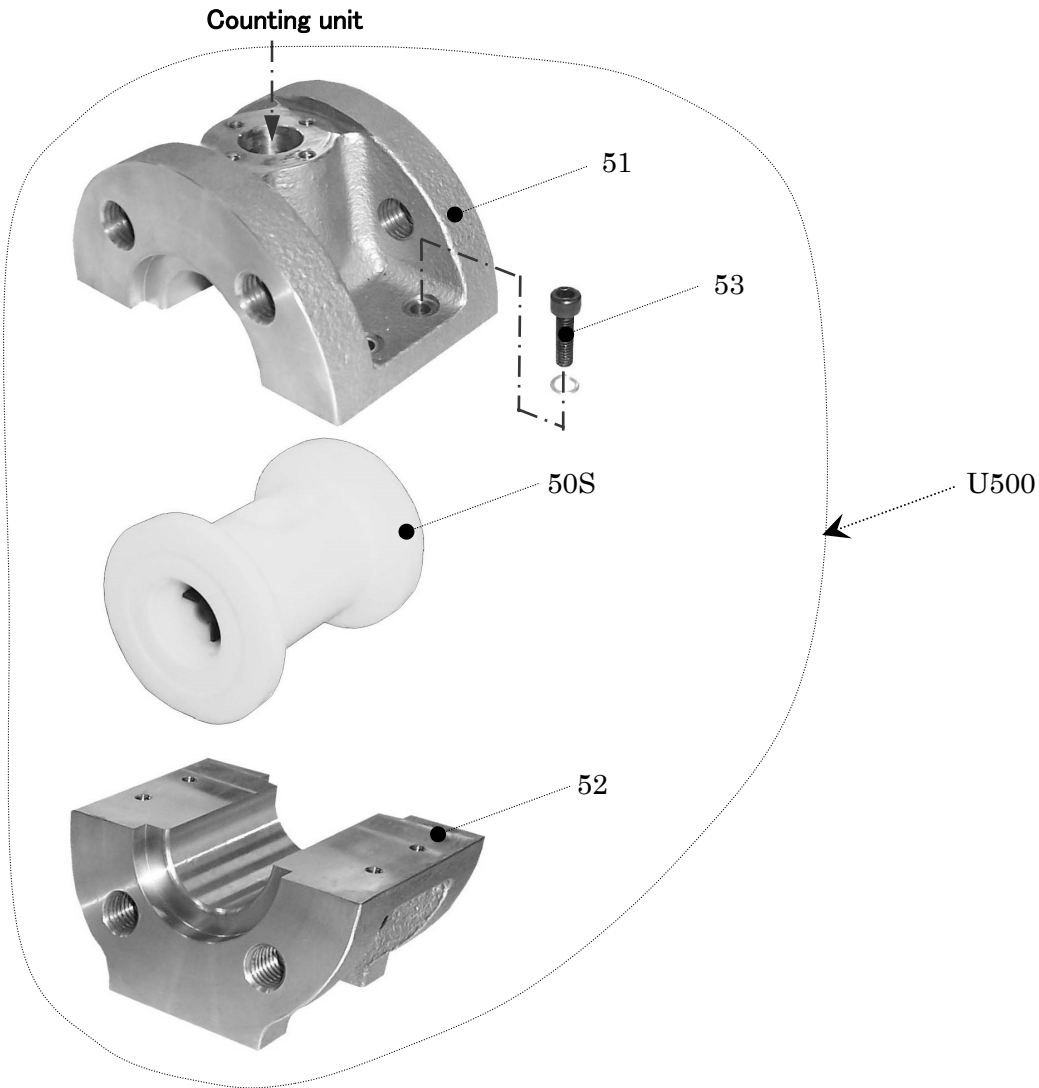
At a test of output signal, when the output signal is not oscillated even though external power source is correctly supplied and connection is proper, damage of amplifier circuit, or trouble of sensor or magnet is considerable. Please contact to us with informing a detail condition.

7.3 Disassembly drawing (Counting unit)

※Flameproof enclosure type only



Disassembly drawing (Measuring unit)



※Flameproof enclosure type only

No.	Parts name	Q'ty	No.	Parts name	Q'ty	No.	Parts name	Q'ty
U100	Counting unit	1 set	10S	Sensor set	1 set	28	Cap screws	4
1	Terminal box	1	13	Sensor holder	1			
2	O ring	2	17(※)	Retaining ring-c type	1	U500	Measuring unit	1 set
3	Terminal box case	2	19(※)	End-cap clamp	2	50S	Liner set	1 set
4S	Amplifier circuit set	1 set	20(※)	Cap screws	2	51	body upper	1
5	Terminal board	1	22(※)	Cable gland	1 set	52	body lower	1
6	O ring	1	23(※)	Earth board	1	53	Cap screws	4
7	Joint	1	24(※)	Grounding terminal	2	54	Insulation packing	1
8	Joint nut	1	26	Top lid	1	55	Cap screws	4
9	Hexagon socket set screws	1	27	O ring	1			

Product warranty

The products and specifications described in this document are subject to change (including specification change and production termination) without notice for product improvement. When you consider using or ordering the product described in this document, please contact us as appropriate to confirm that the information described in this document is the latest.

This product is manufactured and inspected under the appropriate quality control as an industrial instrument, and delivered. However, failure may occur due to an unexpected cause. When this product is used for process control that may cause serious problems in terms of safety, safety can be achieved by duplicating the control system, such as adding equipment that performs the same function in addition to this product. Acceptance inspection will be conducted promptly for the purchased product, and with regard to the handling before or during the acceptance inspection of this product, please give due consideration to management and maintenance.

Warranty period

The warranty period for this product is one year after delivery.

The warranty period shall start from the date of the form (delivery note, installation commission confirmation, receipt).

Scope of warranty

If a failure or defect is found in our product during this warranty period due to our responsibility, we will provide replacement products, or replace or repair the defect part free of charge.

However, if any failure or damage falls under any of the following articles, this warranty does not apply.

1. When it originates in the specification and the standard specified you, your handling method, etc.
2. In the case where the change in structure, performance, specifications, etc which carried out after purchase or delivery, and in which we are not involved.
3. When it is due to a phenomenon that cannot be foreseen by the technology that has been put into practical use on or before the time of purchase or contract.
4. When used out of range of conditions and environment described in catalogs and specifications.
5. In case where this product is used incorporated into your device and the damage could be avoided by the device function which should have in general concept.
6. Due to natural disasters or force majeure
7. Consumables such as batteries and relays, and optional items such as cables.

In addition, the warranty mentioned here is limited to the warranty of the product purchased or delivered, and the damage caused by the failure of this product or damage is excluded.

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