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INSTRUCTION MANUAL

CAPACITANCE TYPE LEVEL TRANSMITTER

HT-100CT Series

HPC-100CT Series

Doc. no. : HT(HPC)-100CT_IM_Eng_Rev. 6.2

Issued date : 2023. 09

Table of contents

You should be well-informed of the contents where WARNING is marked before carrying out the work.

You should be careful where CAUTION is marked to carry out the work.

You should be aware of where NOTICE is marked to carry out the work.

Introduction

The HT(HPC)-100CT-2 Series is a water level transmitter that continuously measures the change of tank level using the permittivity of the liquid. It can be easily installed and calibrated and can simply be used even for corrosive liquid. The HT(HPC)-100CT-2 Series is generally used to measure the liquid in various areas such as pure water, industrial water, oil tanks, and chemical tanks.

Characteristics

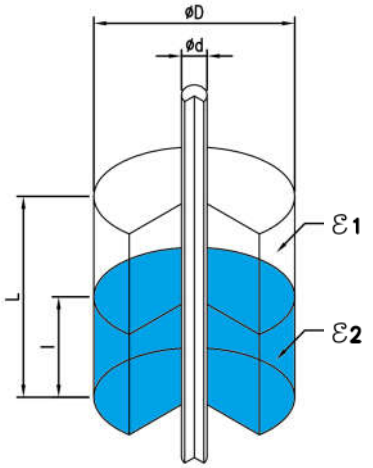
- ■ Excellent degree of precision
- ■ Semipermanent solid structure with no mechanical driving part
- ■ Various probe forms according to the purpose of use
- ■ Effortless installation of wire forms (HT-100CTW-2); easily used for corrosive liquid (solution)
- ■ Interface between water and oil can be measured.
- ■ Explosionproof enclosure available (Ex d IIC T6/T4); (HPC-100CT-2 Series)

Operation Principle

When the level between the electrode probe and electrode wall increases, the air around the electrode probe is replaced by other dielectric substances (measured object), and the value of the electrostatic capacity changes according to the level. The electrode probe has the initial low value of electrostatic capacity when it is in the air, but the value of the electrostatic capacity increases if the measured object increases and covers the electrode probe. If there are two insulated conductors, the electrostatic capacity is decided by the size of the two conductors, relative location, and the permittivity of the medium (contents) existing in the two conductors. The following formula shows the change of the electrostatic capacity (ΔC) when a substance with ε_2 permittivity is filled to l level if the air permittivity is ε_1 between the two conductors on a concentric circle.

$$\Delta C = \frac{(\varepsilon_2 - \varepsilon_1) \times l}{\log_{10} D/d} \text{ [pF]}$$

Here, $\frac{(\varepsilon_2 - \varepsilon_1)}{\log_{10} D/d}$ is constant as initial conditions. Thus, if you regard it as Constant K, **ΔC** is decided only by l, the height of the substance you want to measure. Therefore, if you measure **ΔC,** you can identify the current position of Level.



Specifications

Weather-Proof Version

Model	HT-100CT	HT-100CTH	HT-100CTW	HT-100CTWH
Probe Type	Rod		Wire	
Mounting	Screw & Flange			
Ambient Temperature	-20℃ ~ +60℃			
Process Temperature	-40℃~+80℃	-40℃~+150℃	-40℃~+80℃	-40℃~+150℃
Process Pressure	Vacuum~ 20kg/cm2(300#)			
Combination Unit	HLC-100C-P			
Signal Transmission	ANALOGUE 3-WIRE			
Enclosure	Weather-Proof (IP66)			
Wetted Parts Material	SUS 304, 316L with TEFLON			
Process Connection	PT 1″(M) Screw		50A JIS 10K RF FLANGE	
Housing ; Cable Entry	PBT;PF1/2″(F),IP65	AL.; PF 1/2''(F), IP66	PBT;PF1/2″(F),IP65	AL.; PF 1/2″(F), IP66
	AL;PF1/2″(F),IP66		AL;PF1/2″(F),IP66	
Accuracy	Up to ±1% of F.S			

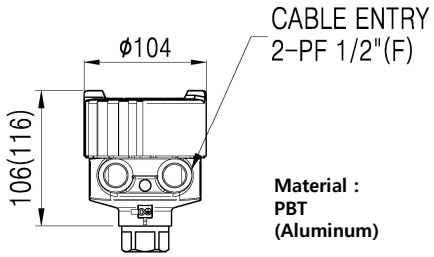
Ex-Proof Version

Model	HPC-100CT	HPC-100CTH	HPC-100CTW	HPC-100CTWH
Probe Type	Rod		Wire	
Mounting	Screw & Flange			
Ambient Temperature	-20℃ ~ +60℃			
Process Temperature	-40℃~+80℃	-40℃~+150℃	-40℃~+80℃	-40℃~+150℃
Process Pressure	Vacuum~ 20kg/cm2(300#)			
Combination Unit	HLC-100C-P			
Signal Transmission	ANALOGUE 3-WIRE			
Enclosure	Ex-Proof (Ex d IIC T6, IP65)	Ex-Proof (Ex d IIC T4, IP65)	Ex-Proof (Ex d IIC T6, IP65)	Ex-Proof (Ex d IIC T4, IP65)
Wetted Parts Material	SUS 304, 316L with TEFLON			
Process Connection	PT 1″(M) Screw		50A JIS 10K RF FLANGE	
Housing ; Cable Entry	AL. ; PF 3/4″(F)			
Accuracy	Up to ±1% of F.S			

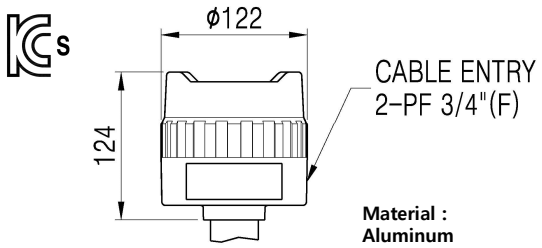
Product Composition and Technical Data

The dimensions on the following pages are indicated in mm

[Housing]

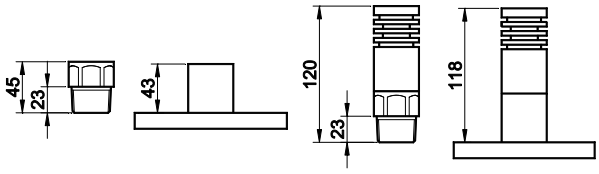


Material :
PBT
(Aluminum)

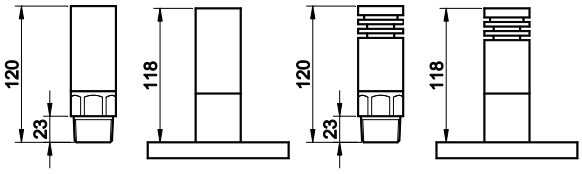


Material :
Aluminum

[Connection]



High Temp. Version



High Temp. Version

Connection Type

-Screw : PT 1"(Std.), NPT 1", PF 1", Other

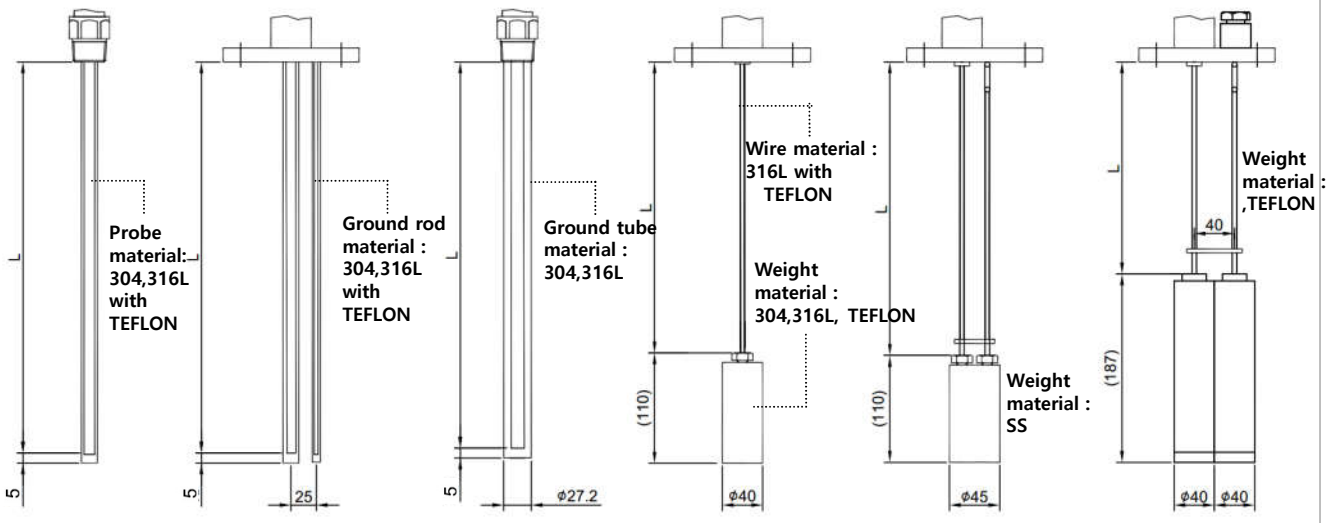
-Flanges : ANSI, JIS, DIN

-Tri-Clamp

Material

-304, 316L, Other

[Probe]



Rod Probe

Rod Probe with Ground rod

Rod Probe with Ground tube

Wire Probe

Wire Probe with Ground Wire

	Rod Probe	Rod Probe with Ground rod	Rod Probe with Ground tube	Wire Probe	Wire Probe With Ground Wire
Total length(L)	100~3,000	100~3,000	100~3,000	1,000~15,000	1,000~15,000
Probe dia. (including TEFLON)	Φ15	Φ15	Φ15	Φ2.5	Φ4
Ground dia.	-	Φ10	Φ27.2	-	Φ4
For acid liquids	O	O	-	O	O
For high-viscosity liquids	O	O	-	-	-
For non_ metal tanks	-	O	O	-	O
For sphere tanks	-	O	O	-	O

Dielectric Constant Value

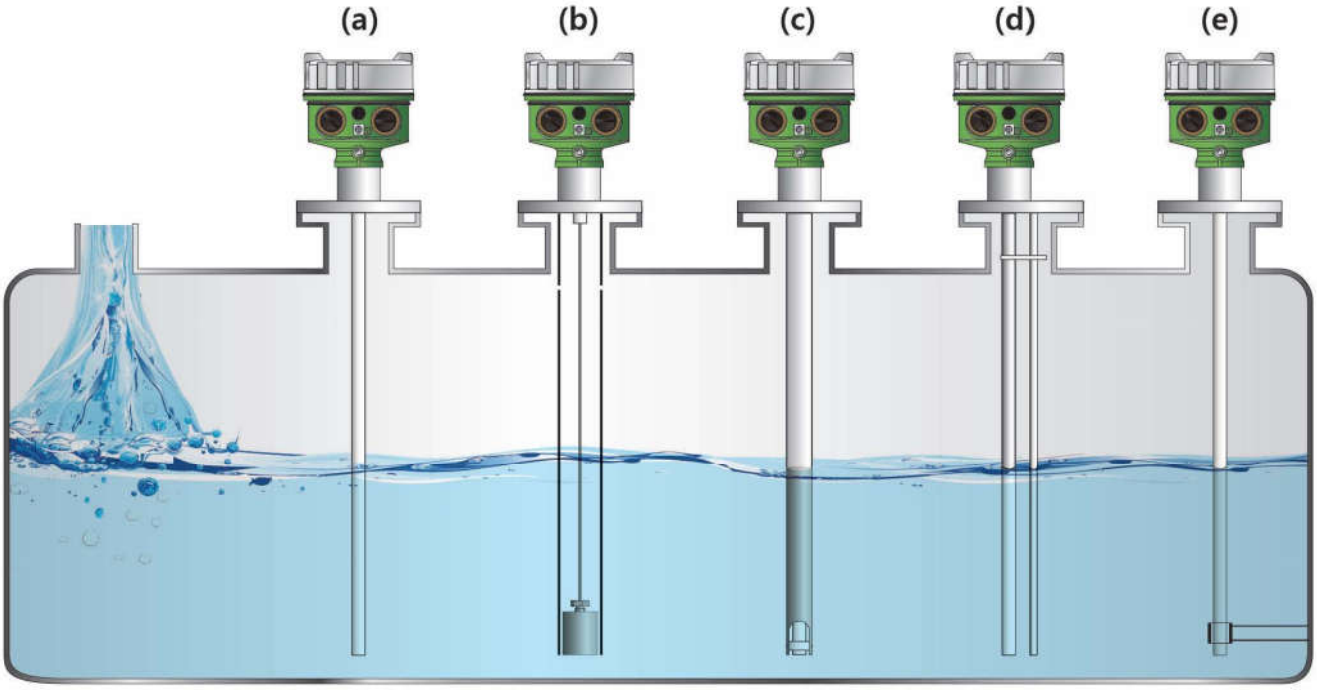
Fuel Oil : Gasoline,Diesel...	2
Hydrogen chloride	4.6~12
Hexane, Liquid	6
Butanol	17~18
Ammonia	16~25
Alcohol	16~31
Acetone	20
Caustic soda	22~26
Ethanol	25
Methano	32~33
Glycerin	47~68
Water	81
Sulfuric acid	84

Information about the relative dielectric constant can be downloaded from our website by accessing the Knowledge Base www.hitrol.com.

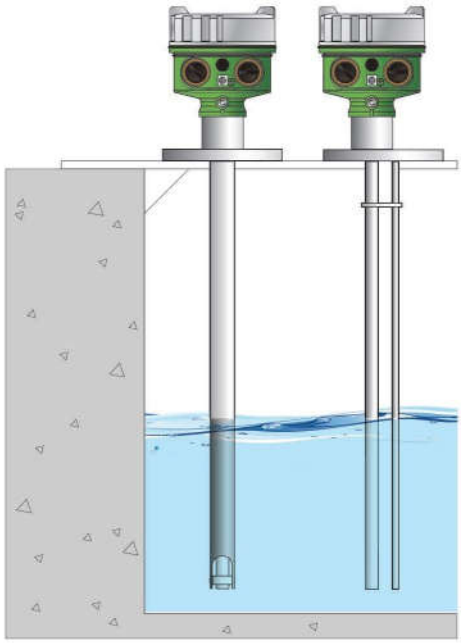
Installation and Precautions

The electrostatic capacity–type level gauge can be installed in screw (PT, NPT, PF) and flange (ANSI, JIS, DIN) as well as tri-clamp and other various locations. Pay attention to the following matters during installation;

- Never install the probe in a place where the measured object flows in. (a)
- Protection tube must be installed on the wire probe if the contents are fluid or if there is an agitator nearby. (b)
- Install the probe within max. 300 mm from the tank wall, (b) and if the installation distance is far from the tank wall, install it in the ground tube type (e).
- If the probe is long or its contents have fluidity, install a fixing bracket completely insulated from the sensing probe at the lower part of the probe. (c)
- If the tank material is nonconductive (ex. FRP), use the probe with the ground tube (e) (d), and if the measured object is a corrosive chemical substance, use the probe with the ground rod (f).
- If the tank has a mixer, install the probe at a safe distance from the mixer.



(g)



■ If the concrete tank or the installation place is a nonconductive structure, use the probe with the ground tube. (g)

■ If the tank structure is a sphere tank type, use the probe with the ground tube. (h)

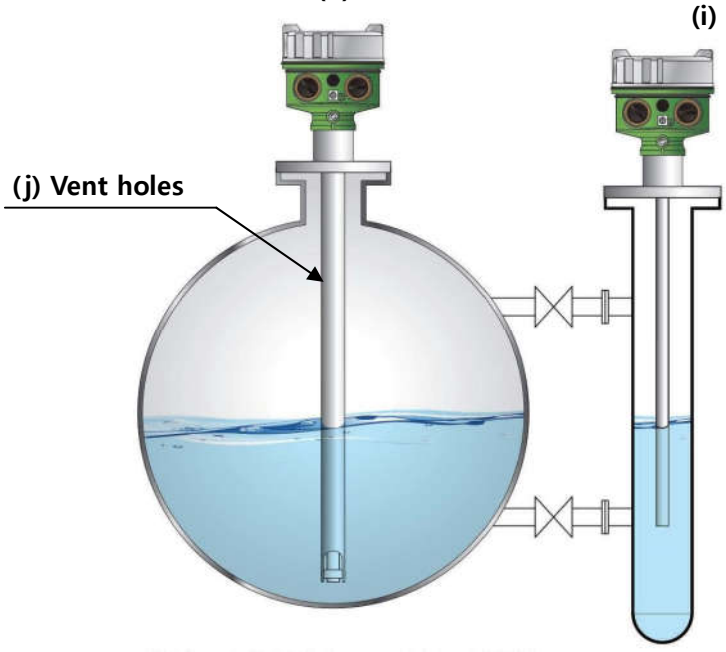
■ If the probe is installed at the tank side, install the chamber. (i)

■ The ground tube should have ventholes at proper places. (j)

(h)

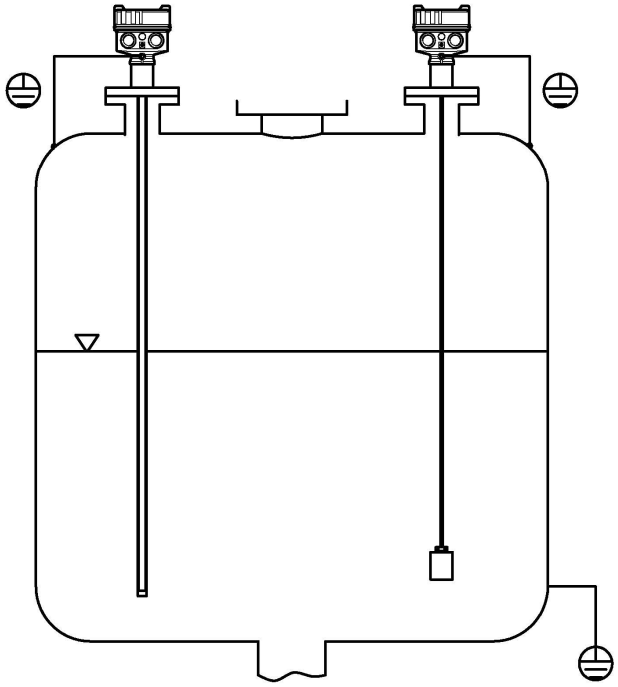
(i)

(j) Vent holes



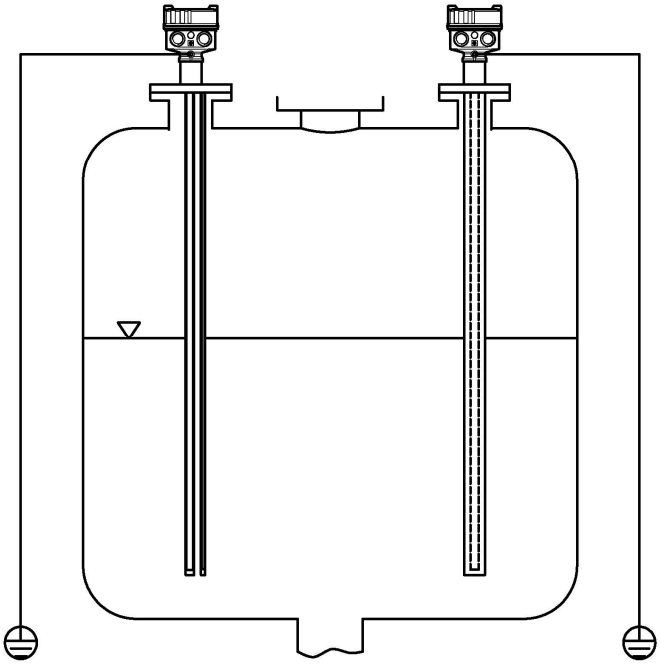
Conductive Tanks (Metal Tanks)

When installing the probe in a conductive tank, the transmitter housing and tank should be grounded like in the figure below.

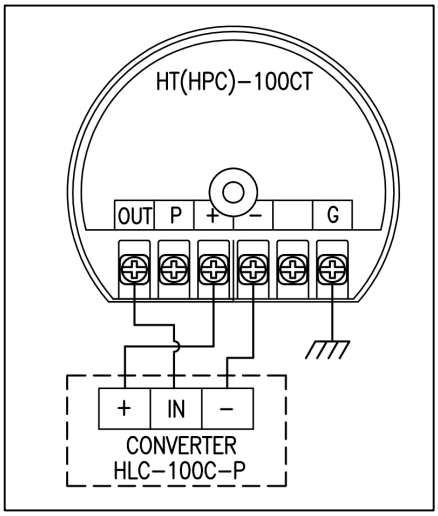


Nonconductive Tanks (Nonmetal tanks)

When installing the probe in a nonconductive tank, the ground tube (rod) or ground wire should be used and grounded with a transmitter housing like in the figure below.

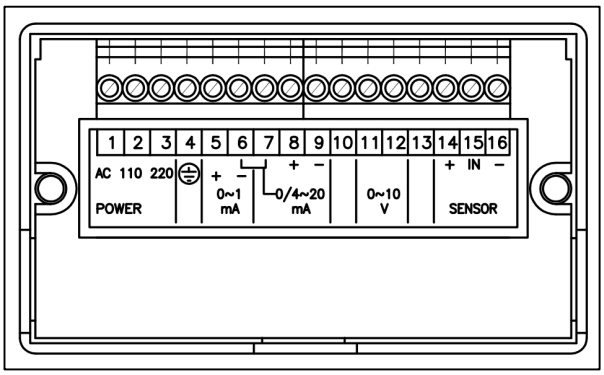


Wire Connection and AMP Composition



→ This product is a separation type.

Refer to the left figure for the wire connection between the sensor (HT(HPC)-100CT) and the control unit (HLC-100C-P).



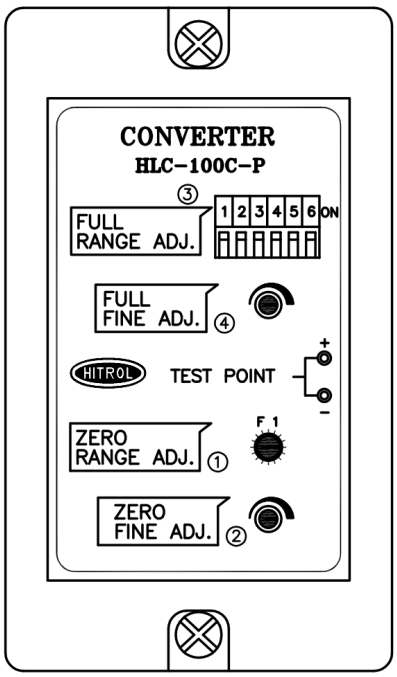
└> The above figure shows the HLC-100C-P Terminal block.

1, 2, 3: AC power terminal

8, 9: DC 4–20 mA output terminal

14, 15, 16: Sensor connection terminal

Adjustment Method



ZERO Adjust

[1] Connect the DC 4–20 mA indicator.

[2] While watching the connected indicator, turn Zero Range ADJ. (①) to the clockwise direction, and set it at near 0%.

[3] Set it at accurate 0% using Zero Fine ADJ. (②) for fine adjustment.

SPAN Adjust

[1] While watching the indicator after completely filling the contents in the container, turn ON/OFF the Full Range ADJ. (③) in the order of 6->5->4->3->2->1, and adjust it until the indicator points near 100%.

[2] Set it at accurate 0% using Full Range ADJ. (④) for fine adjustment.

(Span adjustment range: 40–4,000pF)

Failure Check and Repair/ Maintenance

■ Product Test

The major checking part for the electrostatic capacity–type level transmitter includes the sensor part and the transmission part.

The life span of the major parts varies according to user environment, and they can be used in optimum condition through periodic checking. Therefore, the user should conduct periodic checking at least once a year for repair and maintenance. Carry out a visual inspection on the damage, etc., on the product, and periodically remove foreign substances attached to the probe as these can degrade accuracy. When removing the foreign substances, be careful not to damage the Teflon part.

■ Failure Check

The level of measured object changes, but the output does not change.

- ▶ Insufficient power supply
- ▶ Wrong adjustment of ZERO and SPAN

Only a slight change of output to the change of level of measured object

- ▶ Wrong adjustment of ZERO and SPAN
- ▶ Slight change of probe ΔC value

No change of level, but output fluctuation is present

- ▶ Wrong grounding
- ▶ Noise on the lines
- ▶ Extreme fluctuation of measuring device
- ▶ Bad insulation of probe

Output indicates Full (20 mA) of higher regardless of the change of level of the measured object.

- ▶ Wrong adjustment of ZERO and SPAN

Never separate the cover in an environment exposed to explosive gas.

Precautions for Removal

- ■ Check the level and presence of measure object in the tank before removing it.
- ■ Wear gloves when removing it, to prevent a burn.
- ■ Unlock the lock key before removing the cover. (Ex-proof)
- ■ Disassemble work shall be done with the power off.
- ■ Make sure that any O-ring or gasket is not damaged while opening or closing the cover of product.

Make sure that it is not subject to any high impact while moving.

If there is an atmosphere of explosive gas, do not open the cover of the product.

Precautions for Use

- ■ Check whether the product would be installed in the Ex-proof zone, and use the appropriate product.
- ■ Do not bend or extend the sensor randomly.
- ■ Make sure to install the product and the cover first before supplying the power.
- ■ Do not use if the temperature range of the installation exceeds -20℃ to +60 ℃.
- ■ Do not use if the protection grade requires a higher grade than its product. (IP66 for AL. Housing or IP65 for PBT Housing)
- ■ Do not use where vibration is present.

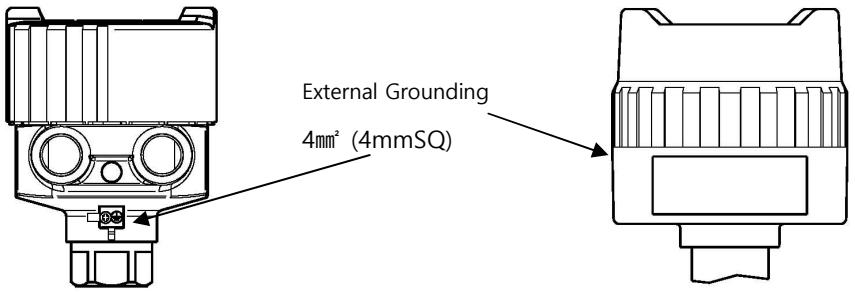
Precautions for Inserted External Wire (Ex-proof)

- ■ Use the cable gland connection or metal pipe line lead-in on the wire inlet, and use a product with equivalent Ex-proof certificate to connect it with the external line lead-in method.
- ■ For non-use external wire inlet, use a closed plug that passes safety certificate above equivalent performance with the product.

Precautions for Grounding (Ex-proof)

- ■ The grounding has an external and an internal grounding. When connecting to an external ground, the ground wire shall be 4㎟ (4mmSQ). (The internal grounding shall be wiring to the same specification as the connected cable.)

WARNING **Make sure to insert a washer if the terminal lug is removed from ground terminal and then re- connected. (Loosening prevention)**



HEAD External Grounding (WEATHER PROOF)

HEAD External Grounding (EX PROOF)

Safety and Environment

■ Precautions for Use

- Make sure to connect the product and vessel using required tools for sure.
- Keep the lock key safe and make sure that it is locked.
- Do not apply high impact to the product.

■ Precautions for Wiring

- Make sure to connect contacts with the correct terminals. (Refer to Wiring)
- Wire and supply the power to the device after checking the specifications.
- Incorrect power voltage may cause damage to the product.
- Pay attention to prevent electric shock.

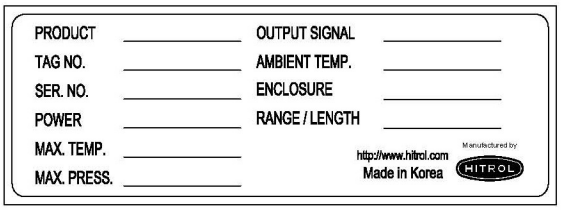
■ Disposal of Product

- Make sure to separate the amplifier and main unit from housing before disposing the products.
- No part (ex. Mercury switch) has influence on the environment, so no special attention is required.

Marking

■ Product Identification

- The product identification mark is attached onto the housing and shows the model name, serial number, working temperature, working pressure, and matters regarding output. The serial number is a unique manufacturing number for the identification of products.



< Weather-proof Version >

<Ex-proof Version>

User Training

Under the aforementioned, the temperature of fluids in the tank where the product is used shall not be exceed 80℃ for general type and 150℃ for high-temperature type. In addition, make sure that the ambient temperature of housing is kept at -20 - +60℃. In the case of an explosion-proof type product, never open the cover of the product during use. Ex-proof products are designed according to Article 34 of the Industrial Safety and Health Act and Article 58.4 of the Enforcement Rules of the same Act.

⚠ WARNING **Do not apply a Non-ex-proof product in an Ex-proof zone. Ex-proof products can only be installed at zone 1 and 2 of locations where explosive gas atmosphere exists. It shall be installed in compliance with the ex-proof temperature rating and the applied fluid temperature.**

Warranty and Contact

■ **Warranty and Service**

This product is subject to the warranty for 2 years of shipment and unpaid service will be provided for any damage found under normal operating conditions. If it is not about the failure of product, the service charge will be payable.

You can request A/S at our website or by contacting our headquarters.

■ **Headquarters . Factory . Laboratory Contact Number**

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