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INSTRUCTION MANUAL

CAPACITANCE TYPE LEVEL TRANSMITTER

HT-100CT Series

HPC-100CT Series

Doc. no. : HT(HPC)-100CT M_Eng_2016, Rev. 1

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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

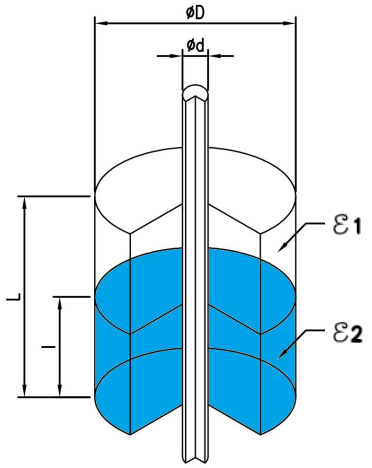
- Excellent degree of precision
- Semipermanent solid structure with no mechanical driving part
- Various probe forms according to the purpose of use
- Effortless installation of wire forms (HT-100CTW-2); easily used for corrosive liquid (solution)
- Interface between water and oil can be measured.
- 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 (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	±0.5% F.S			

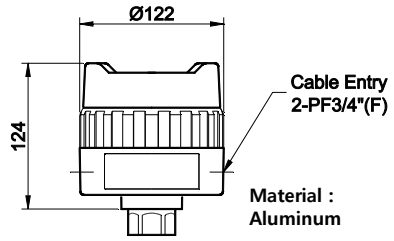
Ex-Proof Version

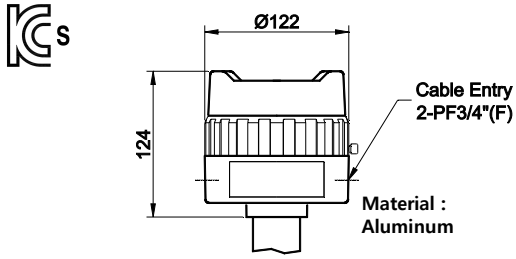
Model	HPC-100CT	HPC-100CTH	HPC-100CTW	HPC-100CTWH
Probe Type	Rod		Wire	
Mounting	Screw & Flange			
Ambient Temperature	-20℃ ~ +60℃			
Process Temperature	-40℃~+80℃	-40℃~+150℃	-40℃~+80℃	-40℃~+150℃
Process Pressure	Vacuum~ 20kg/cm2(300#)			
Combination Unit	HLC-100C-P			
Signal Transmission	ANALOGUE 3-WIRE			
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	±0.5% F.S			

Product Composition and Technical Data

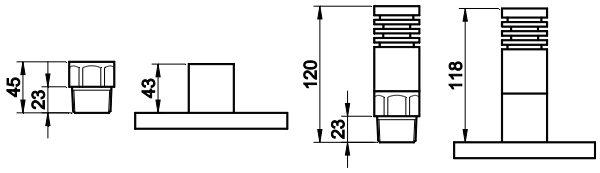
The dimensions on the following pages are indicated in mm

[Housing]

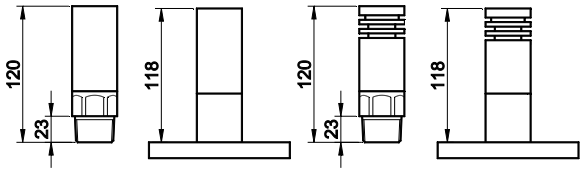




[Connection]



High Temp. Version



High Temp. Version

Connection Type

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

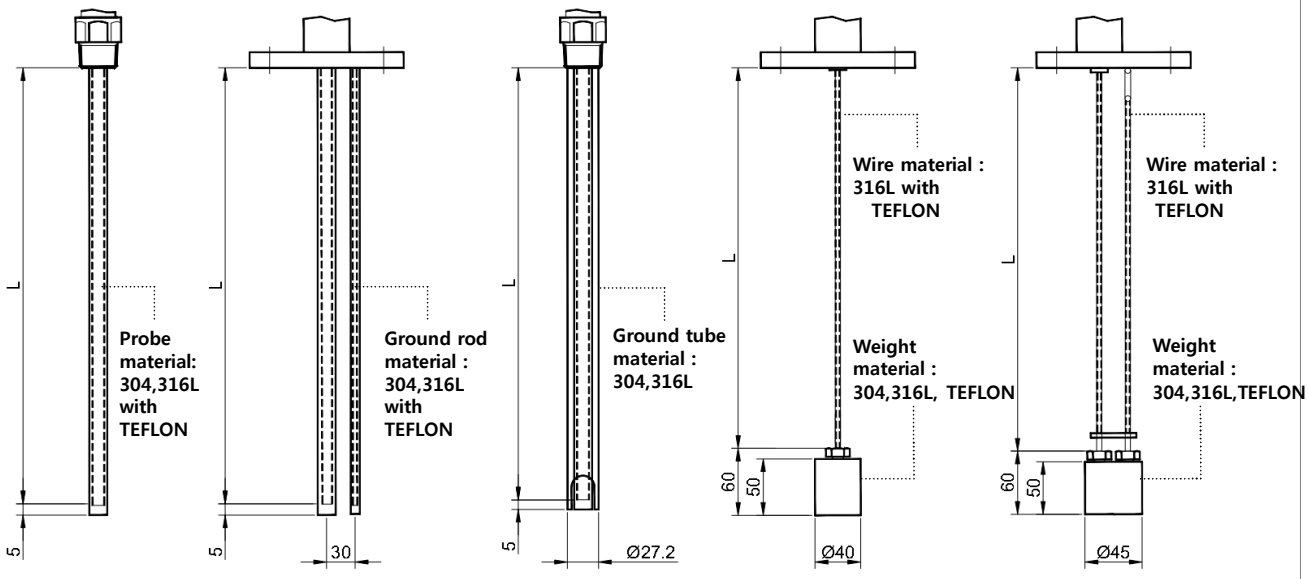
-Flanges : ANSI, JIS, DIN

-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	Φ2.5
Ground dia.	-	Φ8 (including TEFLON)	Φ27.2	-	Φ2.5 (including TEFLON)
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

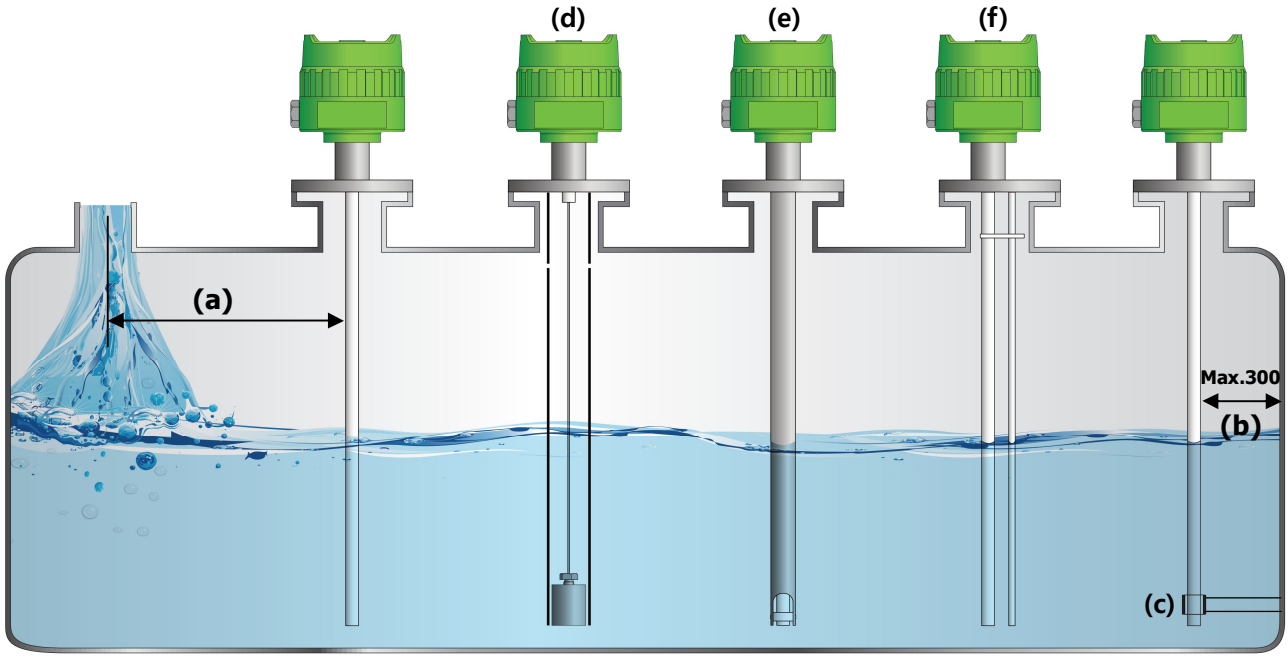
Fuel Oil : Gasoline,Diesel…	2
Hydrogen chloride	4.6~12
Hexane, Liquid	6
Butanol	17~18
Ammonia	16~25
Alcohol	16~31
Acetone	20
Caustic soda	22~26
Ethanol	25
Methano	32~33
Glycerin	47~68
Water	81
Sulfuric acid	84

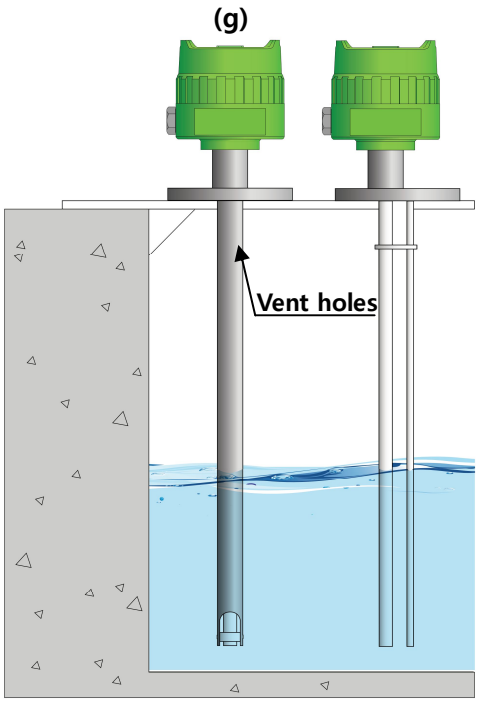
Information about the relative dielectric constant can be downloaded from our website by accessing the Knowledge Base www.hitrol.com.

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)
- If the fluidity exists in the contents of the wire probe, install the guide tube. (d)
- 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.
- If the tank wall has a structure (ex. angle), use the probe with the ground tube (e)



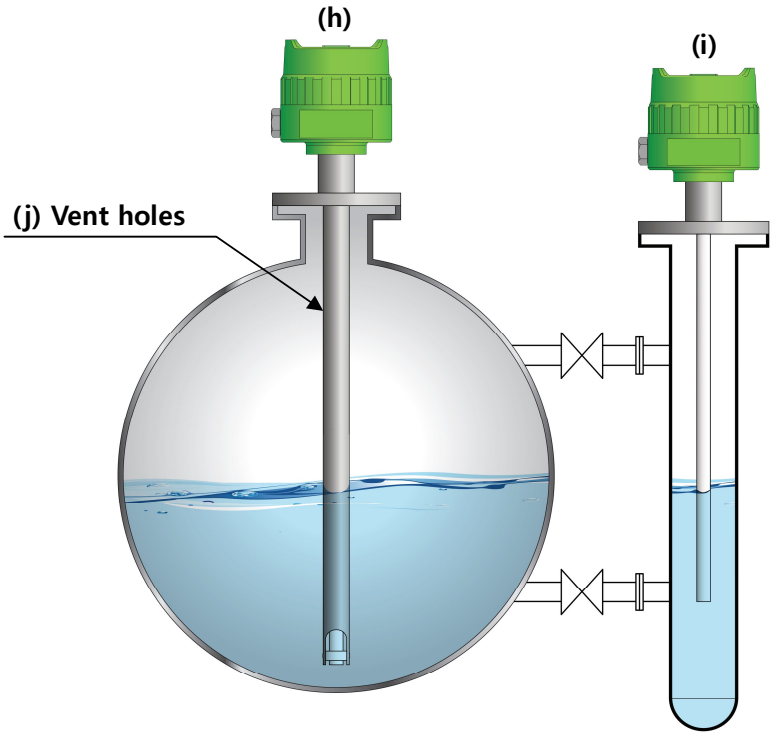


■ If the concrete tank or the installation place is a nonconductive structure, use the probe with the ground tube. (g)

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

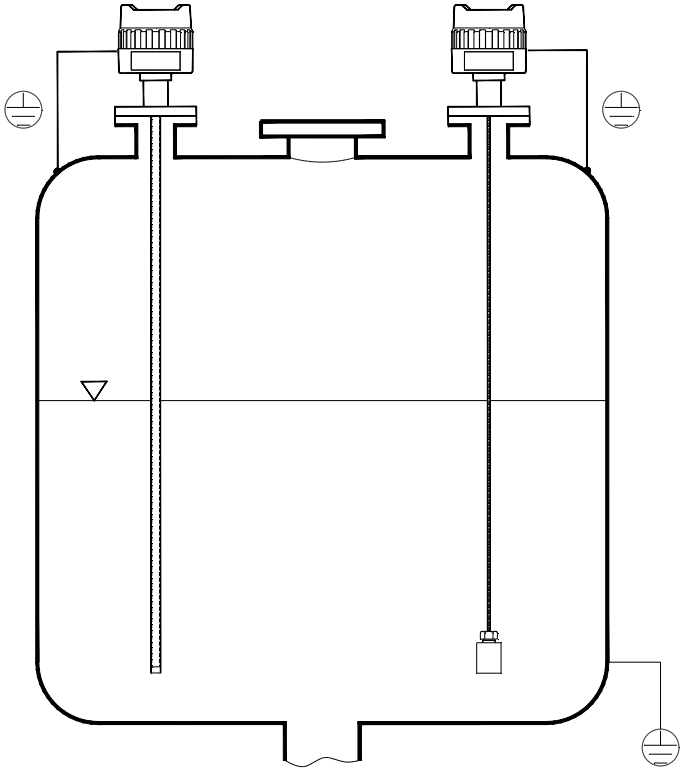
■ If the probe is installed at the tank side, install the chamber. (i)

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



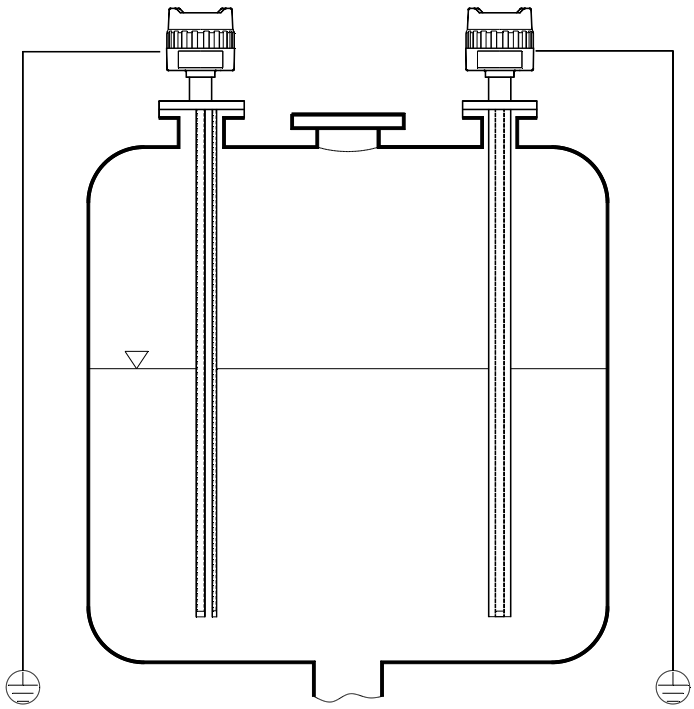
Conductive Tanks (Metal Tanks)

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

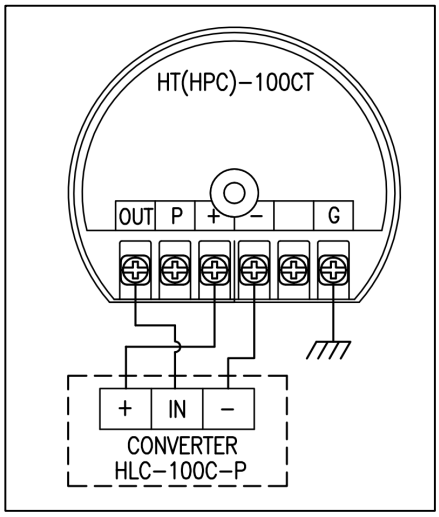


Nonconductive Tanks (Nonmetal tanks)

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.

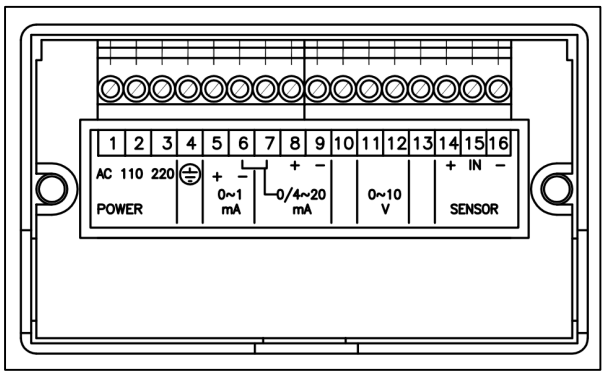


Wire Connection and AMP Composition



→ 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).



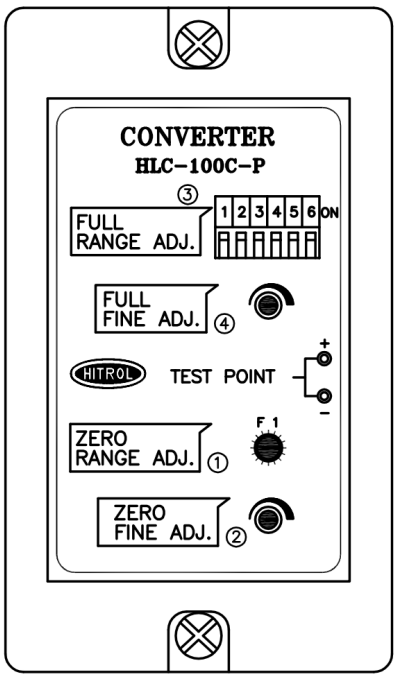
└> The above figure shows the HLC-100C-P Terminal block.

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)

Precautions in Installation

■ The same size should be used in flange or screw fastening.
■ The user should fasten the washer between the bolt and nut to prevent loosening.
■ Gasket should be used when fastening the flange.
(Select the gasket in consideration of the contents temperature and container pressure.)
■ The user should install the proper product after deciding whether the area is explosion district.
■ Supply the power after the installation is complete and the product cover has been assembled.

Precautions in Separation

■ Check the tank level and presence of the measured object before separation.
■ The product can overheat and cause burns. Thus, use of gloves, etc., is necessary in separation.
■ Do not open the product cover if explosive gas seems to be present around the product.
■ For an explosionproof product, open the cover after dismantling the set screw (explosionproof key).
■ Carry out the dismantling work in the power OFF state.
■ When opening/closing the product cover, pay attention not to damage the O-ring or gasket.

Never apply impact to the product while being transported.

Outside Wire Entry Method and Precautions (Explosionproof Product)

■ The user should use the cable grand connection method or metal tube entry method at the wire entrance. In addition, when the user connects the wire using the outside wire entry method, he/she should use an explosion proof certified product with performance that is equivalent to or higher than the relevant explosion proof product.
■ For the outside wire entrance that is not in use, use the clogging plug that passed the safety test with performance that is equivalent to or higher than the relevant explosion proof product.

Precautions in Ground Connection (Explosionproof Product)

■ The grounding includes outside grounding and inside grounding. For outside ground connection, the grounding wire size should be 4 ㎟ (4 mmSQ).
■ The inside grounding wire should have the same size as the power line, and the size of the inside grounding terminal lug should be 3.1 ㎟ (3.1 mmSQ). If the power line is longer than 3.1 ㎟, connect the grounding wire after pulling out the terminal lug.

Be sure to use a washer when connecting the inside ground terminal after pulling out the terminal lug.

Safety and Environment

■ Precautions during transportation and assembling

When fastening a product to a container, be sure to use tools to achieve maximum adhesion.

Do not lose the lock during use, and make sure it is always fastened.

Do not apply impact to the product.

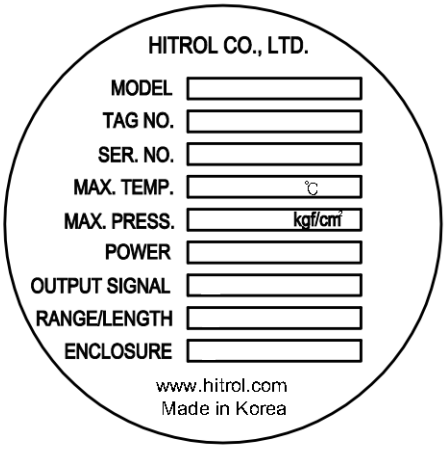
■ Product Disposal

When disposing of a product because it is no longer appropriate for use, separate the AMP in the product housing and body part. There is no need to pay special attention because there are no components affecting the environment (ex. mercury switch).

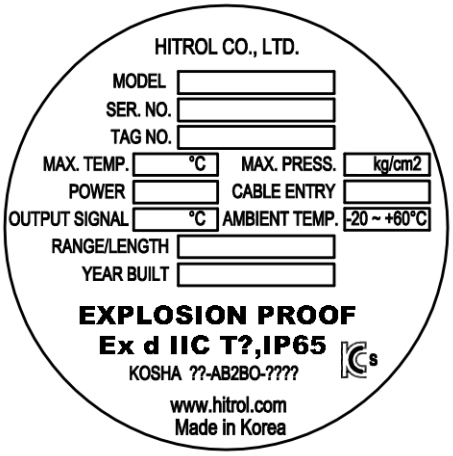
Product Labeling

■ Product Label

The product label is attached to the housing, and it indicates the model name, serial number, service temperature, service pressure, and output. The serial number is a unique manufacture number that distinguishes the product.



<Weather - Proof>



< Ex-Proof >

User Education

The user should be fully aware of the matters described above, and the fluid temperature in the product container should not exceed max. +80℃ for the general type and max. +150℃ for the high-temperature type. In addition, the temperature around the housing should not exceed −20℃ to +60℃. (The explosion proof product is an internal pressure explosion proof product. Therefore, never open the product cover during use.)

The explosion proof product was designed according to Article 34 of the Occupational Safety and Health Act, and Article 58 of its Enforcement Ordinances.

WARNING Never apply general non-explosion proof proaducts to an explosion district.

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.

Warranty and Contact

Warranty and Service

The warranty period for this product is 2 years after the shipment, and the consumer can receive free after-sales (A/S) service if the failure occurred in normal use. Service requests other than the product failure A/S service may incur service charges regardless of warranty.

Contact our home page or head office for A/S requests.

Telephone Number of Head Office, Factory, and Research Center

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