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INSTRUCTION MANUAL

RADIO FREQUENCY TYPE LEVEL SWITCH

HCC-96RF-R Series

HPC-96RF-R Series

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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.

Overview

HCC (HPC)-96RF-R Series is a radio-frequency type level switch that detects the level of the measured object by detecting the change in capacitance value due to the dielectric constant of each object. As compensation electrode method is adopted, repetitive operation can be smoothly operated even if the content is attached to the sensing part due to the humidity around the sensing part depending on the content itself or the temperature.

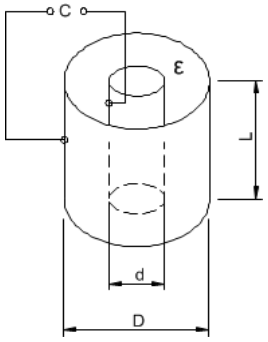
Characteristic

- ■ Solid structure and long service life
- ■ Applicable to high temperature
- ■ Explosion proof version (HPC Series)
- ■ Good reliability of level detection
- ■ Prevention of malfunction caused by material build-up on the sensor
- ■ Applicable to metallic or synthetic resin tank also

Operating Principle and Composition

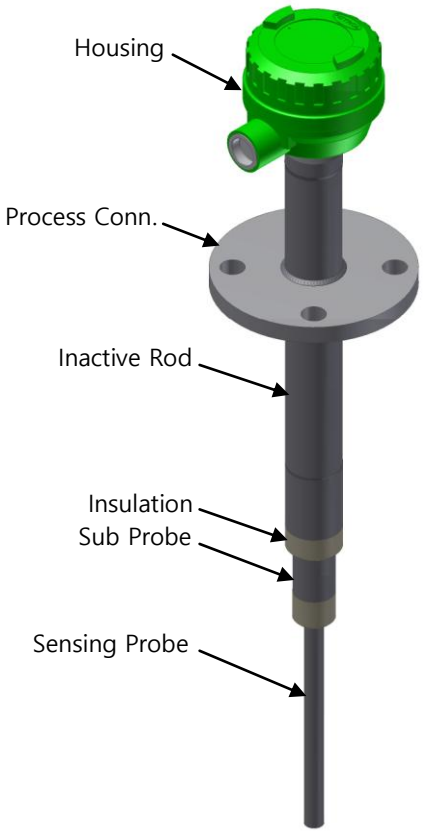
HCC-96RF-R Series compares the signal flowing from active sensing probe towards ground with reference RF signal, when the medium is detecting. Since all material has unique dielectric constant (relative permittivity) and conductance value that are different from air, the impedance of the signal circuit is changed when medium touches the probe. This change causes a shift in phase of the RF signal. A phase difference between the active signal and reference signal causes the output circuitry to operate. (This type can only be applied to solid/dust.)

For cylindrical tanks, the capacitance can be obtained as shown below.



$$C = \varepsilon L / \log\left(\frac{D}{d}\right)$$

C : Capacitance (pF)
ε : Permittivity
L : Probe Length
D : Tank Diameter
d : Probe Diameter



Specification

Sensor

Model		HCC-96RF-R	HCC-96RF-RH	HPC-96RF-R
Installation		Top or Side		
Type		Flange or Screw		
Ambient Temperature		-20˚C ~ +60˚C		
Process Temperature		Max. 240˚C	Max. 500˚C	Max. 240˚C
Process Pressure		Up to 10kg/cm^2	Up to 2kg/cm^2	Up to 10kg/cm^2
Power Consumption		DC +15V / 12mA @ HLC-96RF-R		
Enclosure		Weather-Proof, IP65 (Std.) Weather-Proof, IP66 (Opt.)		Ex-Proof (Ex d IIC T6, IP65)
Fail - Safe		Low, High (Select of Dip Switch)		
Process Connection		50A JIS 10K		
Material	Housing	AL.C		
	Wetted part	SUS 316L + PPS	SUS 316L + CERAMIC	SUS 316L + PPS
Cable Entry		PF 3/4"(F) (Std.) 2-PF 1/2"(F) (Opt.)		
Combination Unit		HLC-96RF-R or HLC-96RF-RACK		

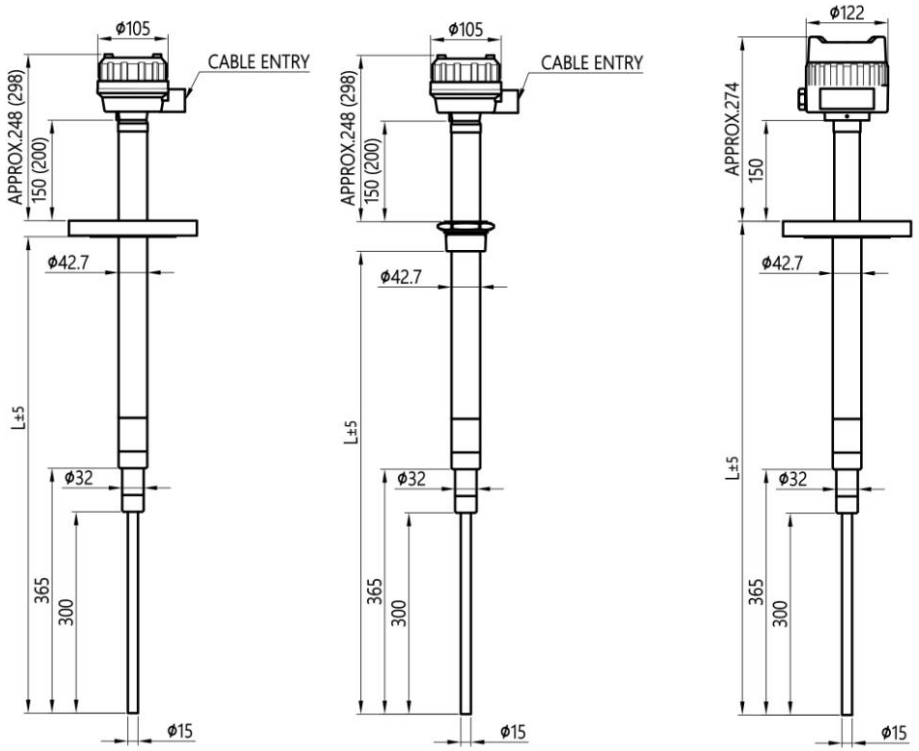
Combination Unit

Model	HLC-96RF-R	HLC-96RF-RACK
Installation	Local Type	(Rack Type)
Power Source	AC 110V or 220V	AC 90V ~ 240V
Contact Form	DPDT	
Contact Rating	AC 250V 5A / DC 30V 5A	
Enclosure	Weather-Proof, IP66	N/A
Cable Entry	2-PF 3/4"(F)	N/A
Remarks		Card Configuration - Power Card : HD-44 Power Source : AC 90V ~ 240V Output : DC 24V, 2.2A - Test Card - Control Card : HLC-96RF-RA

Dimensions

Sensor

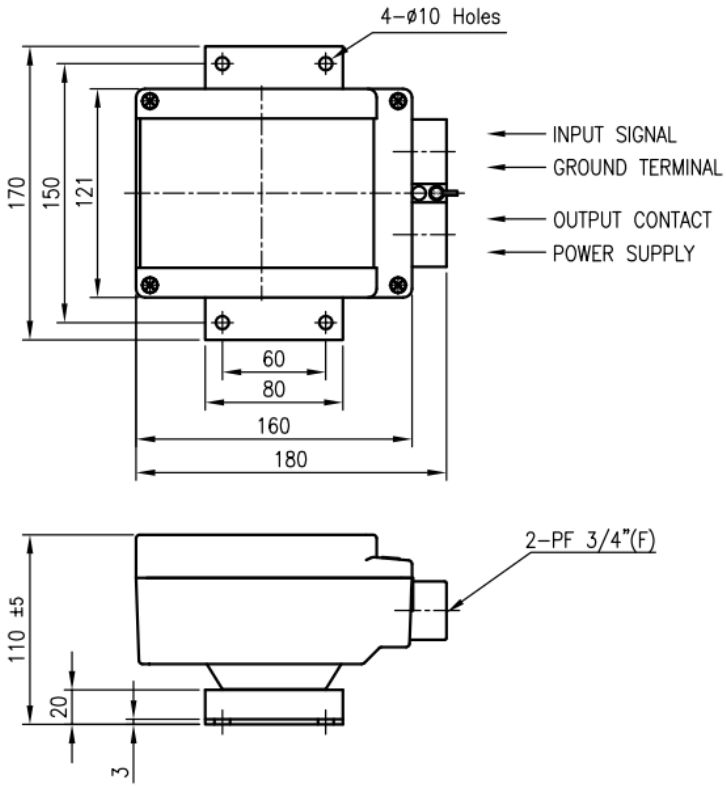
The dimensions on the following pages are indicated in [mm].



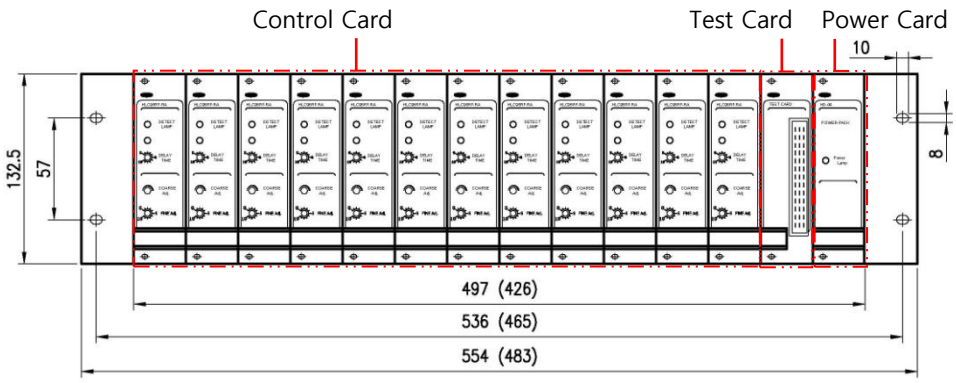
HCC-96RF-R (HCC-96RF-RH) HPC-96RF-R

NOTICE **Some tolerances may occur with actual products.**

Combination Unit



HLC-96RF-R (LOCAL TYPE)



HLC-96RF-RACK (RACK TYPE)

CONTROL CARD : HLC-96RF-RA

TEST CARD

POWER CARD : HD-44

The dimensions in ( ) are when there are 10ea of Control Card (*HLC-96RF-RA*).
The Control Card (*HLC-96RF-RA*) can be used up to 12ea.

Some tolerances may occur with actual products.

Installation

■ Side Mounting Installation

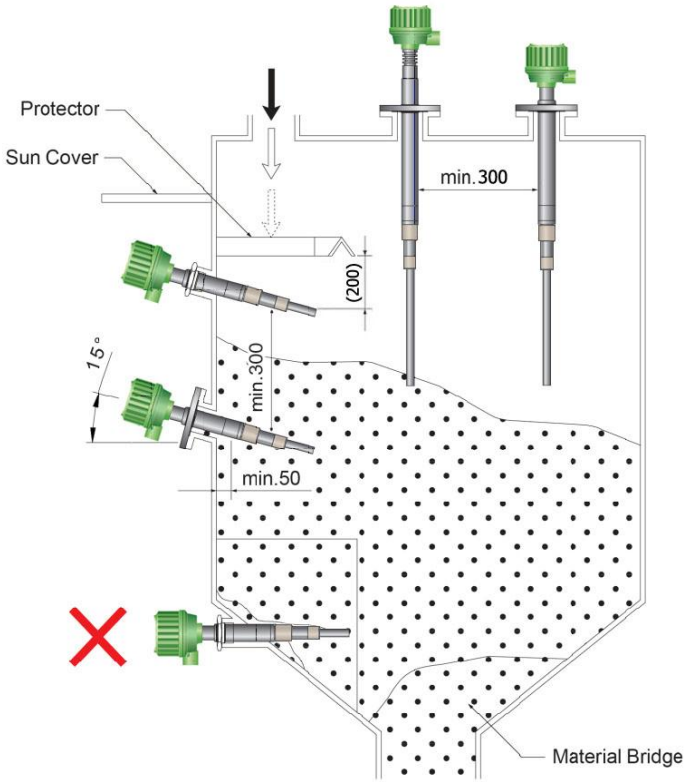
- If the content has the characteristics of creating an excess sediment layer, the product shall be installed at an angle of about 45 degrees.
- If the content has a high density, a protector shall be installed at least 200mm above from the probe in order to protect the probe.

■ Top Mounting Installation

- If the probe length is more than 1000mm, install a fixed bracket insulated at the bottom.
- Sensing probe shall be installed at least 500mm away from the side of tank.

Precautions for Installation

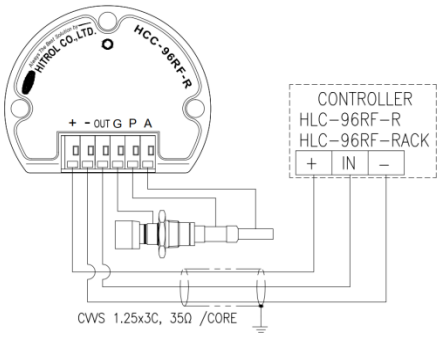
- If more than one level switch is installed in a container, the distance between each probe shall be at least 300mm apart. (If the distance between probes is short, it may be affected by the interconnection of the instrument, causing unstable operation.)
- For side mounting installations, an inactive rod shall be exposed to the inside of the tank by at least 50mm, and it is recommended that the probe be tilted by 15 degrees to the horizontal surface. (A foreign object may cause malfunction between the nozzle and the probe)
- Probe shall be installed to avoid the inlet side of the measuring instrument, and the protector shall be installed to prevent damage to the probe.
- For side mounting installations, the entrance to the electric wire shall be installed facing the ground to maintain the waterproof function.
- When installing on the low level, carefully install the dead stock and the material bridge.
- For outdoor installations, it is recommended to install the sun cover to avoid the effects of temperature increases.
- In case of tank with stirrer, the probe shall be installed at a safe distance from the stirrer.



Wiring

■ Connection of Sensor and Controller

- Prepare the cable (CVVS 3C) that connects the sensor (HCC-96RF-R) and controller (HLC-96RF-R/HLC-96RF-RACK) and connect as shown below. (The distance between HCC-96RF-R and HLC-96RF-R is available up to 500m.)



■ Power Connection

- The power specification of the instrument consists of AC 110V/220V (for HLC-96RF-R) or AC 90V ~ 240V (for HLC-96RF-RACK), which energizes the sensor power supply.
- Be sure to check the following items before wiring:

  Is the specified power voltage used?

  Has the CCVS wires been used for the wires between the controller and the amplifier?

  Are separate conduits other than power lines used when the controller and amplifier are engaged?

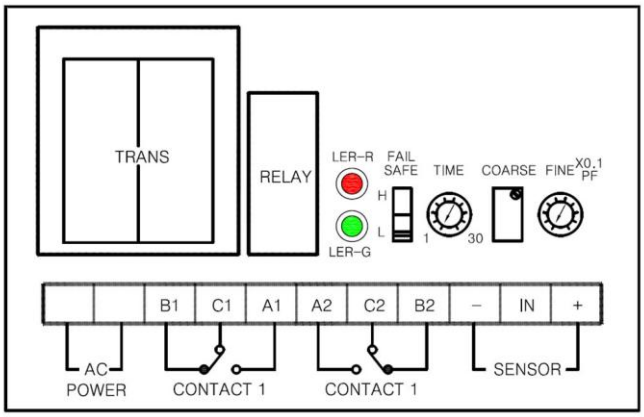
■ Output Connection

- The contact capacity of relay is AC 250V, 5A / DC 30V, 5A, and larger capacity values require connecting external relay.

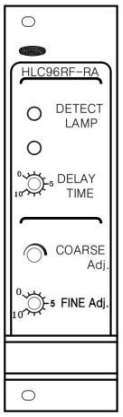
Settings

■ Initial / General Adjustment

1. Set the *Fine* variable resistor to 0%.
2. Turn the *Coarse* variable resistor clockwise 18 times.
3. Slowly rotate the *Coarse* variable resistor clockwise until the detect LED changes from yellow to red.
4. Rotate clockwise or counter-clockwise, repeat the detect LED to operate from red to yellow or from yellow to red 3 times, then set it at the point where the yellow light is on.
5. Moving the *Fine* variable resistor from 0% to 10% indicates setting at ultra-high sensitivity (∠c 1pF).
6. From now on, turn the *Fine* variable resistor to set according to the dielectric ratio of the measuring instrument.



HLC-96RF-R (LOCAL TYPE)



HLC-96RF-RACK (RACK TYPE)

■ Adjustment of *Fine* Variable Resistor According to Measuring Object

- Ultra-high sensitivity (∠c 1pF): Set when detecting very light and almost no dielectric constant.
- High sensitivity (∠c 2pF): Set when detecting light, low dielectric materials such as plastic grains and dry grains.
- Medium sensitivity: Set when detecting heavy or dielectric liquids such as cement, moist grain, and petrochemical product.
- Low sensitivity (∠c 10pF): Set when detecting most aqueous solution and high dielectric materials.

■ High and Low Limit Settings and Output

Limit	Measurements	Red	Green
High	Contact	On	Off
	Non-contact	Off	On
Low	Contact	On	Off
	Non-contact	Off	On

Failure Check

■ Failure Check

- Is the power connection correct?
- Is the power voltage supplied correctly?
- Is the cable wiring correct?
- Is the *Fail-Safe* mode transition correct?

Operation Status	Cause	Solution
The measurement was detected by the detector, but the LED is still in yellow.	- The lead wire is not connected between probe and amplifier.	- Connect the lead wire.
	- There is an abnormality in the detection circuit.	- Replace the board.
The measurement was not detected by the detector, but the LED is red.	- The sensing part contacts the case or the ground.	- Check if installation is successful.
	- There is an abnormality in the detection circuit.	- Replace the board.
The detect LED works but output relay does not work.	- Dip switch for Fail-Safe contact is abnormal.	- Replace the dip switch.
	- Output relay drive transmitter is abnormal.	- Replace the board.
	- Relay contact is damaged.	- Check the condition of the relay contacts and the maximum load on the external switch circuit.
The measurement cannot detected.	- Sensitivity setting is wrong.	- Readjust in accordance with sensitivity adjustment sequence.
	- The measurement has high conductivity.	- Use a concealed sensing part.
The detector was corroded.	- Corrosion occurs due to chemical action.	- Use a concealed sensing part to prevent corrosion.
The detector eroded or worn out.	- Sensor is physically damaged because of the high speed of the measurement.	- Change the material or structure of the sensing part and replace the installation location.

Maintenance

The life span of key parts depends on user's environment and can be used optimally through periodic check. Therefore, regular inspection ensures optimal performance of product, so take regular inspection and maintenance at least every year. Inspection of the appearance of the product shall be visually checked to see if there is any damage, and the attachment of the medium or foreign substances to the sensor will make it worse, so they shall be removed regularly.

■ Inspection of Products

- When cleaning the tank, remove any attachments that attach to the instrument.
- If the measurement is moving fast or stirring, check the probe for mechanical damage or insulation.
- The water resistance of the probe shall be checked periodically, as the insulation of the probe may cause errors and malfunctions.

Turn off the power of the product for maintenance.
In an explosion area, do not disassemble when power is applied.

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.
- Make sure that any O-ring or gasket is not damaged while opening or closing the cover of product.
- Unlock the lock key before removing the cover. (Ex-proof)
- Disassemble work shall be done with the power off.

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 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)

- External ground is located on top of cable entry, and the grounding wire to connect external ground shall be 4㎟ (4mmSQ). (Internal ground is connected before shipment.)
- The internal grounding wire shall be the same size as the power line, and the size of the internal grounding terminal lug shall be 3.1㎟ (3.1mmSQ). If the power line is larger than 3.1㎟, connect the ground wire without terminal lug.

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

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.
- Pay attention to prevent electric shock.

■ Disposal of Product

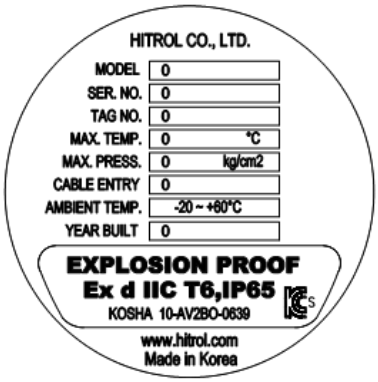
- Make sure to separate the amplifier and main unit from housing before disposing the products.
- No part (ex. Mercury switch) has influence on the environment, so no special attention is required.

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>

Model Notation

The model configuration of the HCC-96RF-R Series is shown below.

H*C-96RF-R*

- Connection - N/A: For General
  H: For High Temperature
- Enclosure - C: Weather-proof
  P: Ex-proof

User Training

Understand the aforementioned and do not exceed +240℃ and +500℃ respectively for the liquid in the general and high-temperature vessels to use the product. In addition, make sure that the ambient temperature of housing is kept at -20 - +60℃. An Ex-proof product is a pressure-resistant and Ex-proof type, so never open the cover during operation. 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.

Do not apply a Non-ex-proof product in an Ex-proof zone.
An ex-proof product can be used where the environment and liquid inside the containers are of types 1 and 2.

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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