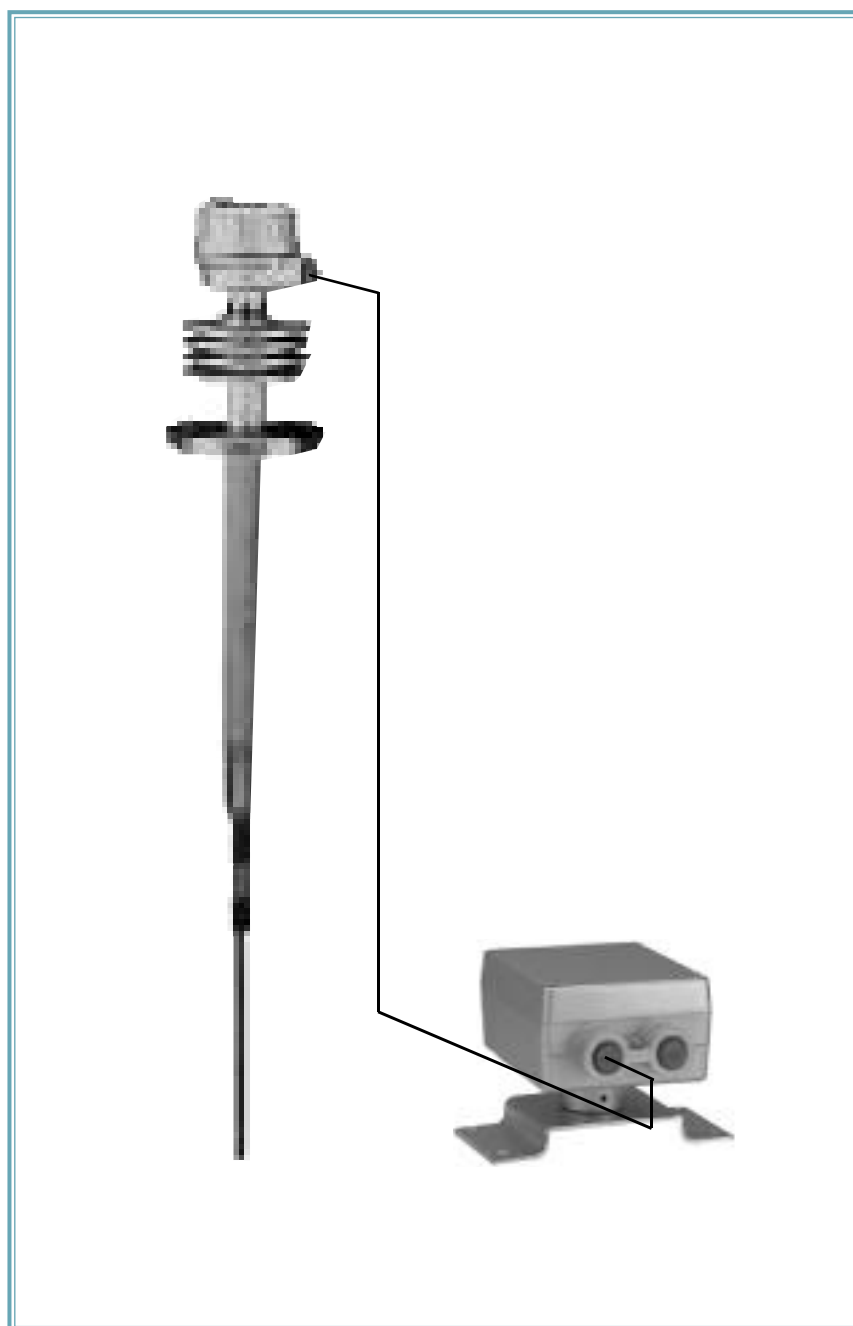


## General Information

# HCC-96RF-R

Radio Frefrequency  
Capacitance Type



**HITROL CO., LTD.**



## General

The HCC-96RF-R and HLC-96RF-R level switches are point level devices used to detect the presence or absence

of material at a point inside the tank, bin or other vessel.

## Operating Principle

Detection circuitry compares the signal flowing from the active sensing probe towards ground(vessel wall) to a reference RF signal.

Since all material has dielectric constants(relative permittivity) and conductance values different from air, the

impedance of the signal circuit changes when material 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.

## Features

The HCC-96RF and HLC-96RF-R utilize the compensation electrode type to prevent false indication from material build-up, moisture and or condensation on the probe.

A very important feature of HCC-96RF-R and HLC-96RF-R is the ability to ignore the effect of build-up that can be

adhered to the sensing probe. In most applications, a certain amount of the material being sensed will be adhered to the sensing probe after a period of time. This can be due to the nature of the material itself or to condensed moisture that can cause dry material to bond to the probe surface.

## Applications

- \* Chemical/Petrochemical Industry
- \* Power Utilities Industry
- \* Food/Feed Industry
- \* Grain Industry
- \* Pulp/Paper Industry

- \* Pharmaceutical
- \* Water/Waste Water Industry
- \* Foundry Industry
- \* Other Industry

## Specifications

| Controller(HLC-96RF-R) (Fig. c) |                                                |
|---------------------------------|------------------------------------------------|
| Housing                         | Aluminum                                       |
| Protection                      | IP 65                                          |
| Power Source                    | AC 110 V or 240 V 60 Hz $\pm$ 10 %             |
| Power Consumption               | about 3 VA                                     |
| Contact Rating                  | Max. 250 V 5 A AC                              |
|                                 | Max. 28 V 1 A DC                               |
| Contact Output                  | 1 DPDT                                         |
| Temperature Range               | High Sensitivity(1~2pF) $\rightarrow$ -20 ~+50 |
|                                 | Low Sensitivity(3~0 pF) $\rightarrow$ -30 ~+70 |
| Response Time                   | 5 ms                                           |
| Fail Safe Mode                  | H & L Selection                                |
| Time Delay                      | 0.5~30 sec                                     |
| Adjustable Range                | 1~10 pF                                        |
| Sensitivity                     | 1.0 pF                                         |
| Separation Length               | 100 m (Use cable : CVVS 1.25' $\times$ 3C)     |
| Active Display                  | LED (RED, GREEN)                               |
| Weight                          | about 1.63 kg                                  |

### Insert Amplifier (HCC-96RF-R) (Fig. b)

|                       |                                     |
|-----------------------|-------------------------------------|
| Power Supply          | 15 V DC (From Controller)           |
| Output signal         | 0~5 V DC Max.                       |
| Oscillation Frequency | 153.6 kHz                           |
| Temperature Range     | High Sensitivity(1~2 pF) → -20 ~+50 |
|                       | Low Sensitivity(3~10 pF) → -30 ~+70 |
| Weight                | about 206 g                         |

### Probe Specification (Fig. a)

|                     |                                |
|---------------------|--------------------------------|
| Probe Material      | SUS 304                        |
| Mounting Size       | 1-1/2 "PT(STD)                 |
|                     | Option → Flange Type           |
| Probe Length        | Oil Ash (Ø9.6) → Min. 400 mm   |
|                     | Coal Ash (Ø12.7) → Min. 800 mm |
| Working Pressure    | 10 kgf/cm <sup>2</sup>         |
| Process Temperature | STD. → 80                      |
|                     | Option → 180                   |

### Dimensions

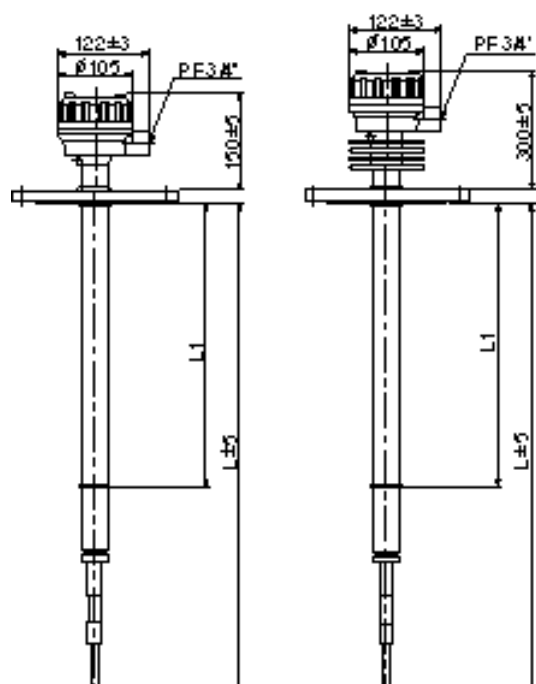


Fig. a

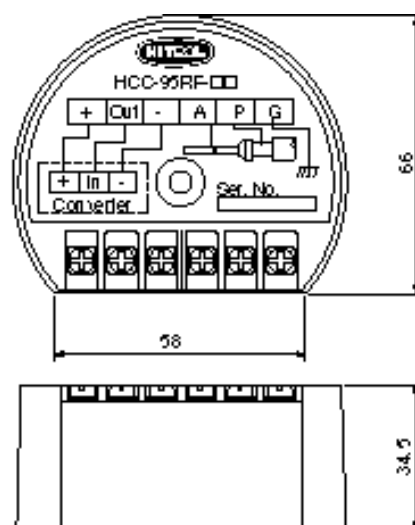
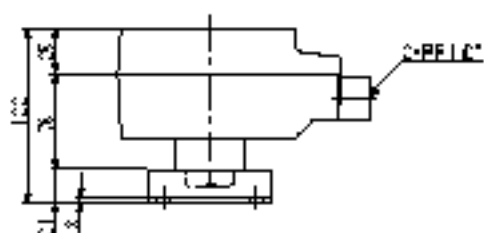


Fig. b

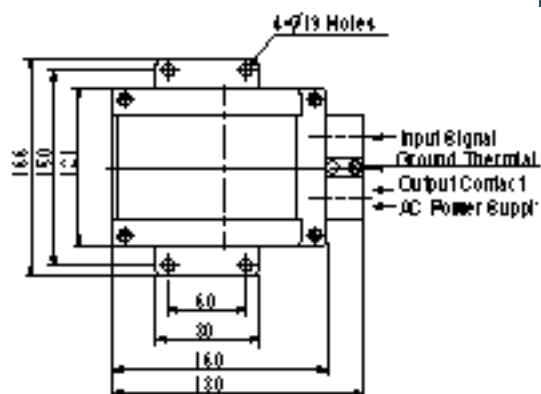


Fig. c

## Installation

The probe should be located out of direct flow of material while the vessel is being filled. Protective shields or an offset mounting procedure may be required. Mounting the probe in a nozzle or location where material bridges excessively may cause false indication. The probe should

be mounted so that the material does not build up excessively on the compensation electrode area of the probe. If the probe is mounted in a nozzle or nipple, the compensation electrode area must be inside the vessel. (Fig. d)

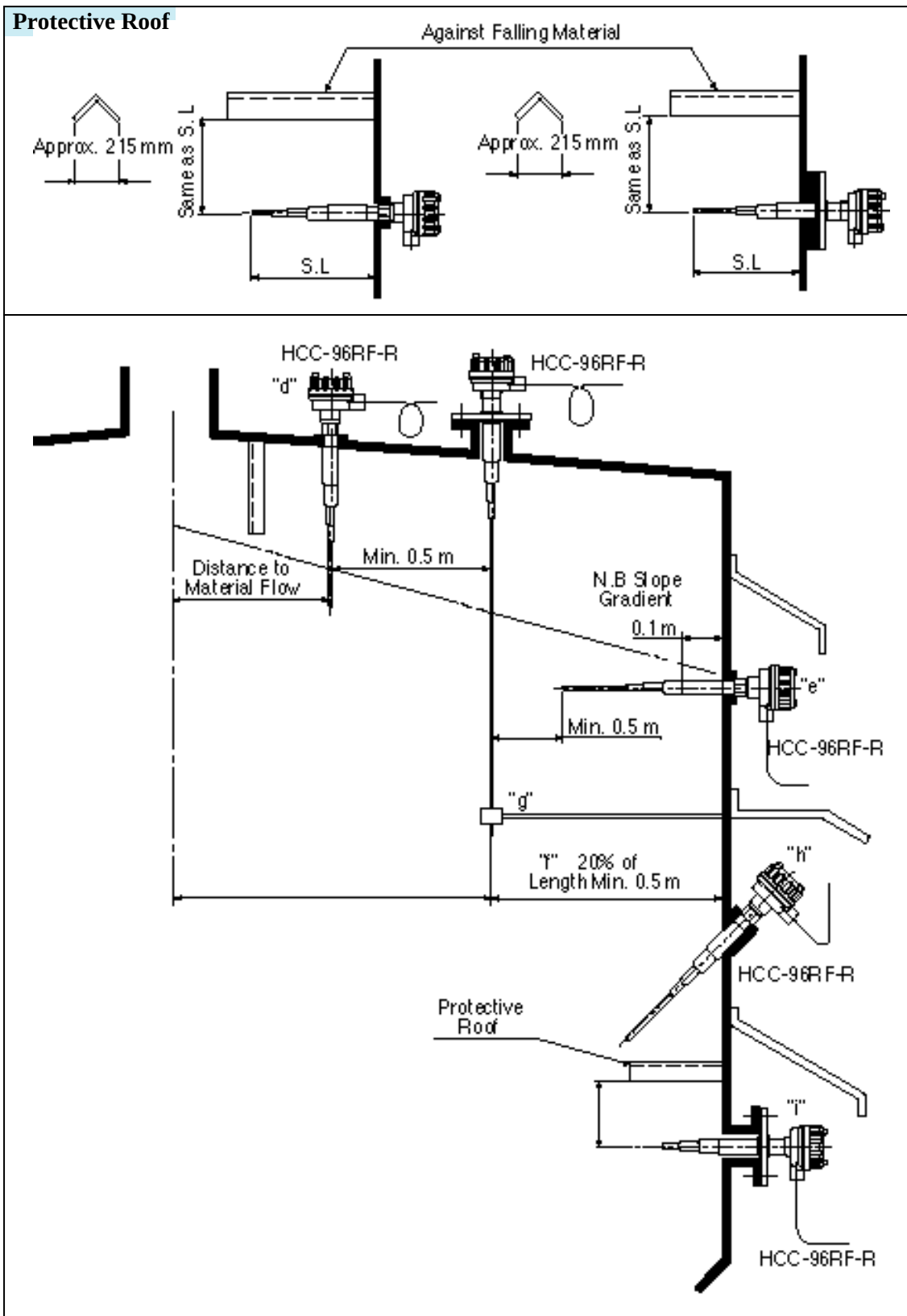


Fig. d~i

### Top Mounting

In case of nozzle, the compensation electrode must be installed min. 100 mm longer than the nozzle length to inside the vessel. (Fig. e)

Probe must be installed min. 500 mm from silo. (Fig. f)

The bracket must be installed with insulation the bottom of probe if length of probe is over 1000 mm. (Fig. g)

### Side Mounting

It must be installed by angle of 45 deg. from wall of silo, if there is worry of build-up. (Fig. h)

It must be installed to protect the probe above 200 mm from the probe if medium density is high (Fig. i)

Top or Side Mounting Cable Grand Direction. (Fig.j)

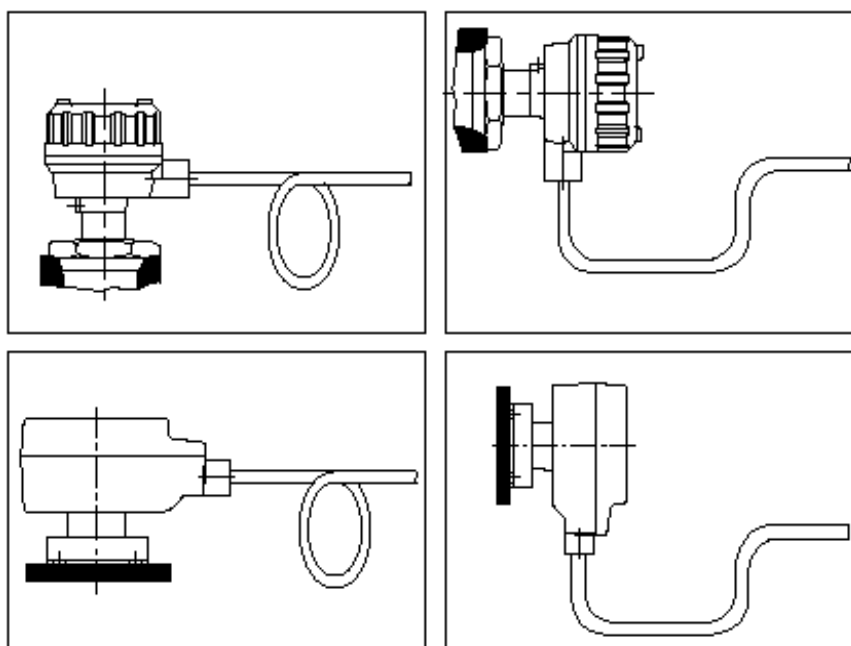


Fig. j

#### \* Please check the followings before wiring.

Please check power source.

The cable between controller and amplifier is CVVS 1.25<sup>2</sup> × 3C.

Please separate the wires for signal and power.

### Wiring

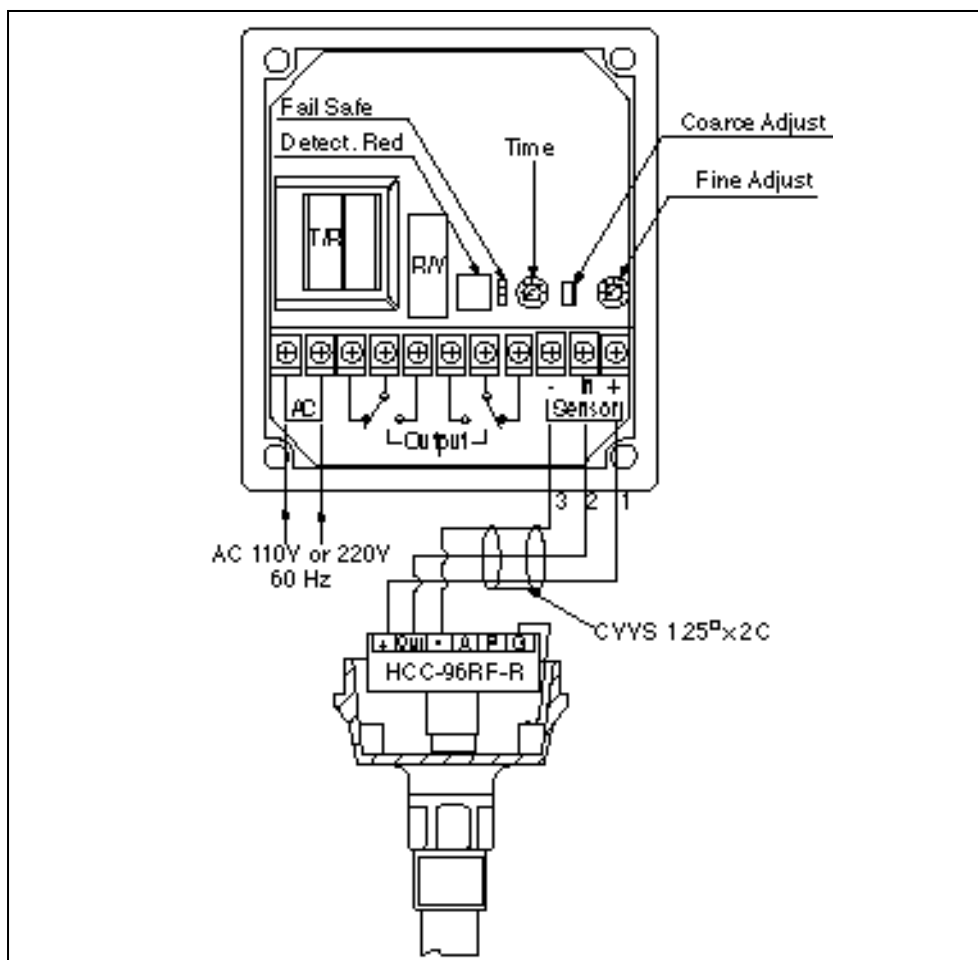


Fig. k

## Fail-Safe Selection

HCC-96RF-R and HLC-96RF-R are shipped from the factory in the low level fail-safe condition.

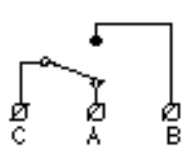
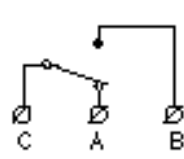
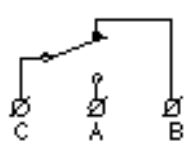
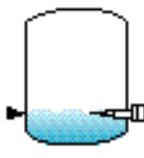
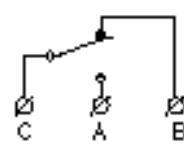
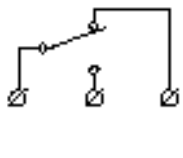
| Fail - Safe Function                                                                      | Level                                                                             | Contacts                                                                          | Fail - Safe Function                                                                     | Level                                                                             | Contacts                                                                            |                                                                                     |
|-------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| High<br> |  |  | Low<br> |  |  | Power off                                                                           |
|                                                                                           |  |  |                                                                                          |  |  |  |

Table 1

## Sensitivity Setting

Due to variations in material characteristics, proper sensitivity selection is critical to assure proper unit operation.

\* **Before recalibrating the unit, the following conditions should be met;**

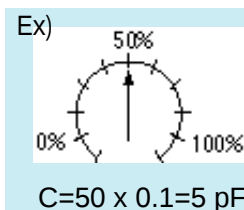
when unit is installed in a vessel and material is well below the probe.

Equipment that may be started or stopped by the unit is locked out.

The relay contacts of the HLC-96RF-R will be opened and closed during recalibration procedures. Remove the wiring from the relay output terminals if necessary. (Input power to the unit is present.)

### General Calibration

- 1) Set the fine sensitivity potentiometer 0 %
- 2) Turn the coarse sensitivity potentiometer 18 turns clockwise(cw).
- 3) Turn until the Coarse Sensitivity potentiometer red detector LED turns on.
- 4) Turn the coarse sensitivity potentiometer very slowly. Turn until the red detector LED just turns off(Green LED ON).
- 5) Slowly turn the Fine Sensitivity Potentiometer clockwise(cw) or count-clockwise(ccw) until the red detector LED turns off or on(approximately 3 times).  
Set red detector LED just turns off(Green LED turns on).
- 6) Turn the fine sensitivity potentiometer from 0 % to 10 %.  
Then setting is for very high Sensitivity(  $C=1\text{pF}$ ) calibration.

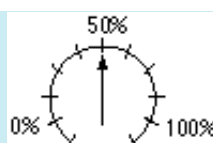


### Fine Volume Adjust Procedure

- 1) Very High Sensitivity (  $C=1 \text{ pF}$  ) : This setting is for sensing very light, non-conductive materials.
- 2) High Sensitivity (  $C=2 \text{ pF}$  ) : This setting is for sensing light, non-conductive materials such as plastic pellets, light powders and dry grains.
- 3) Medium Sensitivity (  $C=5 \text{ pF}$  ) : This setting is for sensing moderately dense or non-conductive liquids such as cement, wet grain and petroleum products.
- 4) Low Sensitivity (  $C=10 \text{ pF}$  ) : This setting is for sensing most aqueous liquid solutions or conductive materials.

HCC-96RF-R and HLC-96RF are shipped from the factory in the minimum time(0.5 sec) delay position. When used in liquid or agitated material where material movement could cause false or premature level indication, an increased time delay volume may be desirable.

Ex)



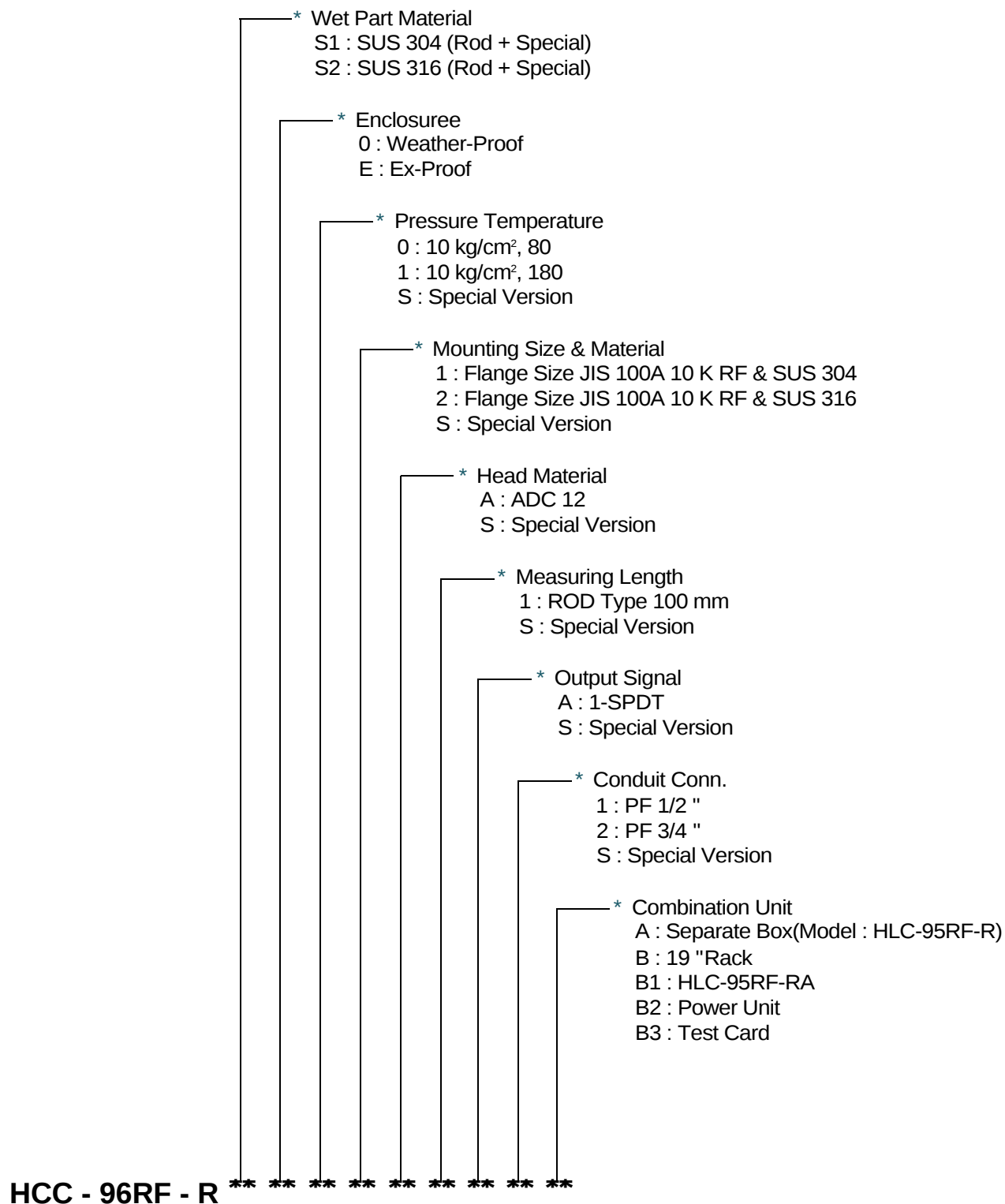
TIME=50x0.2=10 sec

### Time Delay Setting

### Troubleshooting Guide

| Symptom / Problem                                                             | Possible Cause                                                                                                                                          | Corrective Action                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LED will not illuminate, even sensing probe detect process material.          | <ol style="list-style-type: none"> <li>1. Antenna lead wire loose or disconnected.</li> <li>2. Faulty sensing circuit.</li> </ol>                       | <ol style="list-style-type: none"> <li>1. Connect lead wire securely into sensor.</li> <li>2. Replace P.C.B board.</li> </ol>                                                                                                      |
| LED remains illuminated, even sensing probe will not detect process material. | <ol style="list-style-type: none"> <li>1. Sensing probe is shorted to housing or ground.</li> <li>2. Faulty sensing circuit.</li> </ol>                 | <ol style="list-style-type: none"> <li>1. Ensure that bare end of sensing probe lead wire is not touching any metallic part.</li> <li>2. Replace P.C.B board.</li> </ol>                                                           |
| LED remains illuminated and goes out, but output relay is inoperative.        | <ol style="list-style-type: none"> <li>1. Bad fail-safe switch contact.</li> <li>2. Bad driver transistor.</li> <li>3. Relay contact damage.</li> </ol> | <ol style="list-style-type: none"> <li>1. Replace fail-safe switch.</li> <li>2. Replace P.C.B board.</li> <li>3. Check condition of relay contacts and max load of external switched circuit. Replace relay if failure.</li> </ol> |
| Device will not detect process material.                                      | <ol style="list-style-type: none"> <li>1. Sensitivity improperly set.</li> <li>2. Highly conductive product.</li> </ol>                                 | <ol style="list-style-type: none"> <li>1. Recalibrate according to 9. Sensitivity setting.</li> <li>2. Use coated sensor.</li> </ol>                                                                                               |
| Corroded sensor.                                                              | Process material has chemically attacked sensor                                                                                                         | Use coated sensor to provide corrosion resistance.                                                                                                                                                                                 |
| Eroded or abraded sensor.                                                     | Fast flowing or agitated process has physically attacked sensor.                                                                                        | Consider other sensor material or design, relocating sensor or a stilling well in liquid process.                                                                                                                                  |

## ORDER CODES



**HITROL CO., LTD.**

**HEAD OFFICE · FACTORY · R & D INSTITUTE**

62-182 BONGILCHEON-RI CHORI-MYUN

PAJU CITY KYUNGGI-DO KOREA

**TEL** : (031) 943-0875~7

**FAX** : (031) 943-0878, 5600

<http://www.hitrol.co.kr>

[hitrol@hitrol.co.kr](mailto:hitrol@hitrol.co.kr)