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INSTRUCTION MANUAL

CAPACITANCE TYPE LEVEL SWITCH

HCC-95P Series

Doc. no.: HCC95P_IM_Eng_Rev.1

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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

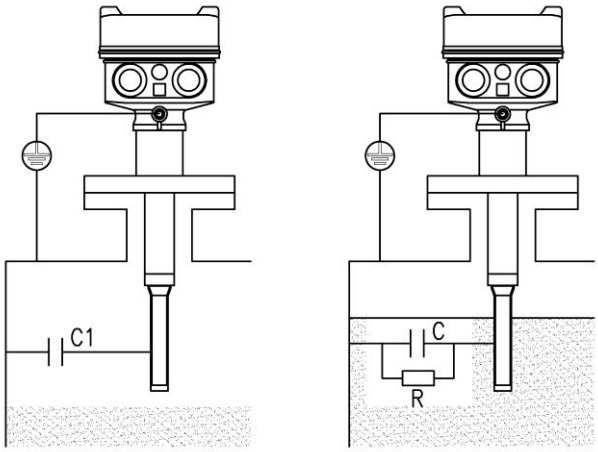
HCC-95P(-Ex) Series is a capacitance type level switch and it detects a level of medium by sensing of capacitance value change by dielectric constant of each medium.

Characteristics

- Widely used for various type of medium such as solid, powder, and liquid
- Semi-permanent life cycle due to moveless parts
- Easy to use in corrosive liquid
- Easy installation for wire type (HCC-95PW)
- Operating can be checked at the site.
- Various probe types can be applied according to installation condition
- Explosive proof version and Dust proof version (HCC-95P-Ex)

Operating Principle & Composition

Where an air surrounding the electrode probe is replaced by other medium, the capacitance value is changed according to the dielectric constant of the medium. Once the electrode probe is touched by the medium, the capacitance value is increased and the level switch activates relay output by converting of the changed capacitance value to the electronic signal.

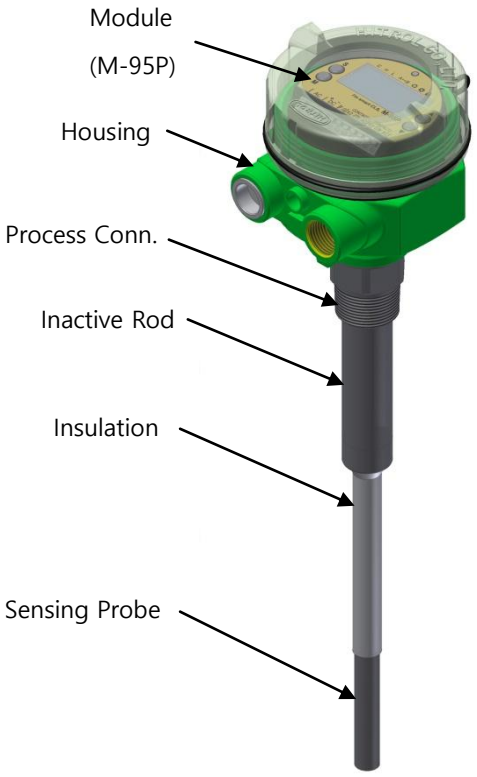


C: Capacitance of Medium

C1: Capacitance of Initial State

R : Conductivity of Medium

[Operating Principle Reference Figure]



Specification

Weather-proof Version

Model	HCC-95P	HCC-95PH	HCC-95PW	HCC-95PWH
Probe Type	Rod(Flat)		Rope	
Mounting	Screw or Flange			
Ambient temperature	-20°C ~ +60°C			
Process temperature	-40°C~+80°C	-40°C~+150°C	-40°C~+80°C	-40°C~+150°C
Process Pressure	Vacuum~ 20kg/cm2(300#)			
Power Source	AC 90~240V, 50/60Hz / DC +24V			
Output Signal	DPDT			
Contact Rating	AC 250V, 5A / DC 30V, 5A			
Enclosure	Weather-Proof (IP65)			
Wetted Parts Material	SUS 304, 316L with Teflon(Peek)		SUS 304, 316L with Teflon	
Process Connection	PT 1"(M) Screw			
Housing; Cable Entry	PBT;PF1/2"(F),IP65 AL;PF1/2"(F),IP66	AL;PF1/2"(F),IP66	PBT;PF1/2"(F),IP65 AL;PF1/2"(F),IP66	AL;PF1/2"(F),IP66

Ex-proof Version

Model	HCC-95P-Ex	HCC-95PH-Ex	HCC-95PW-Ex	HCC-95PWH-Ex
Probe Type	Rod(Flat)		Rope	
Mounting	Screw or Flange			
Ambient Temperature	-20°C ~ +60°C			
Process Temperature	-40°C~+80°C	-40°C~+150°C	-40°C~+80°C	-40°C~+150°C
Process Pressure	Vacuum~ 20kg/cm2(300#)			
Power Source	AC 90~240V, 50/60Hz (Std.) / DC +24V (Opt.)			
Output Signal	DPDT			
Contact Rating	AC 250V, 5A / DC 30V, 5A			
Enclosure	Ex d IIC T5/T6(*), IP66 Ex tb A21 IP66 80°C	Ex d IIC T3/T4(*), IP66 Ex tb A21 IP66 150°C	Ex d IIC T5/T6(*), IP66 Ex tb A21 IP66 80°C	Ex d IIC T3/T4(*), IP66 Ex tb A21 IP66 150°C
Wetted Parts Material	SUS 304, 316L with Teflon(Peek)		SUS 304, 316L with Teflon	
Process Connection	PT 1"(M) Screw			
Housing; Cable Entry	AL. ; PF 1/2"(F), IP66			

(*) Explosion-proof Fluid Temp. & Grade: Max. 70℃ for T6

Max. 80℃ for T5

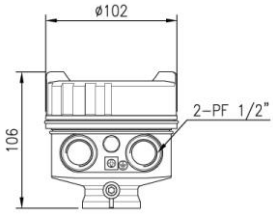
Max. 130℃ for T4

Max. 150℃ for T3

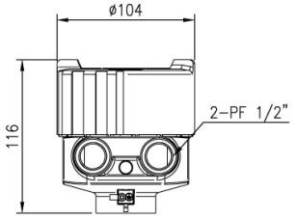
Dimensions & Technical Data

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

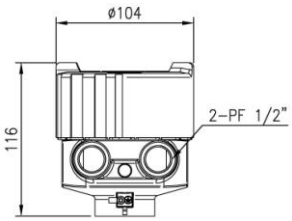
[Housing]



Material: PBT

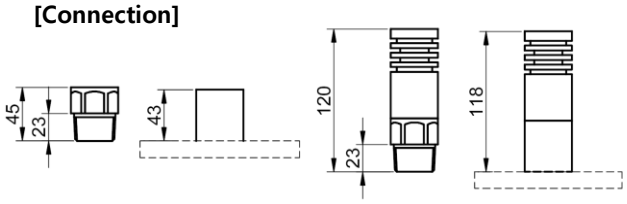


Material: Aluminum

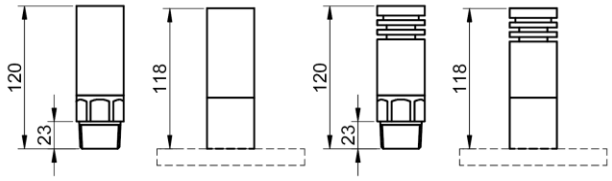


Material: Aluminum

[Connection]



High Temp. Version



High Temp. Version

■ Connection Type

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

-Flange: ANSI, JIS, DIN

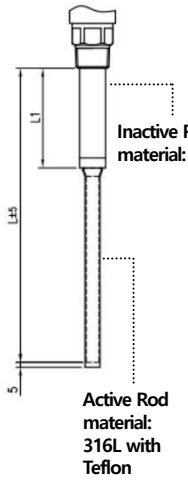
-Tri-Clamp

■ Material

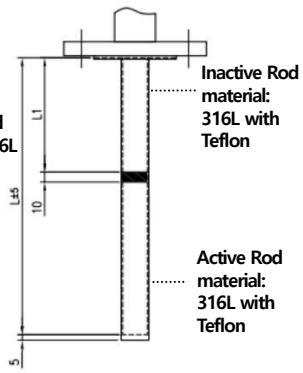
-SUS 316L, Others

[Probe]

For Liquids

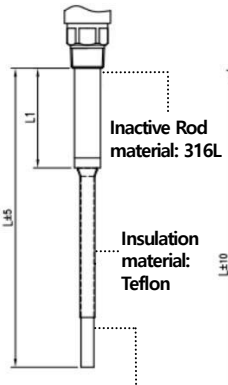


Rod Type

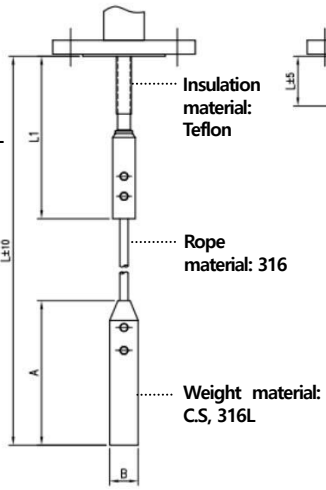


Rod Type (Fully insulated w/ TEFLON)

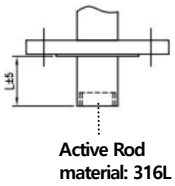
For Solids



Rod Type



Rope Type



Flat Type

* Flat Type can be used in liquids, but further verification is required at the head office as a sample.

NOTICE **Actual product may have a tolerance slightly.**

		For Liquids		For Solids			
		Rod Probe	Rod Probe Fully insulated w/ TEFLON	Rod Probe	Rope Probe		
Total length(L)		100~2,500	300~1,000	100~2,500	Min. 1,000, Max. 10,000		
					≤2,500	≤4,500	>4,500
Active Rod Length (L-L1)		100~1,000	150~500	100~1,000	-		
Inactive Rod Length(L1)		~1,500	150~500	~1,500	-		
Active Rod dia.		Φ15 (including Teflon)	Φ28 (including Teflon)	Φ15 (including Teflon)	-		
Inactive Rod dia.		Φ25.4	Φ28 (including Teflon)	Φ25.4	-		
Weight	A	-	-	-	170	300	300
	B	-	-	-	Φ28	Φ28	Φ40
For acid liquids		-	O	-	-		
For high-viscosity liquids		O	O	-	-		

Dielectric Constant Value

Air	1
Nitrogen, Liquid	1~2
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
Methanol	32~33
Glycerin	47~68
Water	81
Sulfuric Acid	84

The data of dielectric constant value can be downloaded from technical data by accessing our website. www.hitrol.com

Installation

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

■ Side Mounting Installation

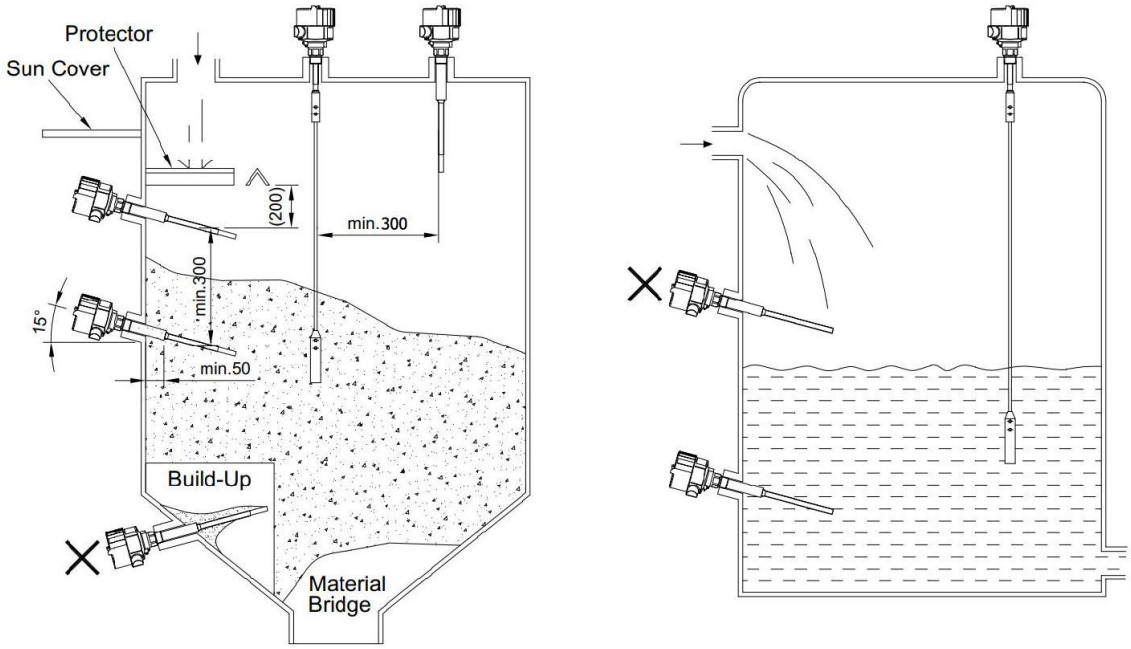
Highly sensitive measurement is available because it measures the level by whole of probe but it shall be installed slopingly, forwarding of sensor to the bottom in order to avoid a malfunction caused by build-up of the medium on the sensing probe.

■ Top Mounting Installation

This installation is not much affected by build-up of the medium on the probe but the sensitivity is lower than side mounting because it measures the level by the end of probe only, and it is not suitable to detect a level of the medium which has a low dielectric constant.

Precautions for Installation

- If more than one level switch is installed in a tank, 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 installation, an inactive rod shall be located at least 50mm inside of tank, and it is recommended that the probe be tilted by 15 degrees to the horizontal surface. (A foreign object between the nozzle and the probe may cause malfunction.)
- 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. Protector shall have sufficient area to protect the sensor from incoming medium and be installed at a distance that does not affect sensor operation.
- For side mounting installation, the cable entry shall be installed facing the ground to maintain the waterproof function.
- When installing on the low level, carefully install the dead stock and material bridge.
- If the medium in the tank is liquid, set the Time Delay appropriately to delay the operation of the output relay.
- For outdoor installation, 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.



Precautions for Attachment

- When installing the sensor, avoid shaking or obstacle.
- Do not install in openings that are prone to severe fluid flow, mechanical damage, or chattering.
- Check the specification of temperature and pressure generated inside the tank.
- Condensation may occur if the temperature of the housing differs significantly from the ambient temperature, so dehumidifier shall be filled or ventilated(gortex) before use.
- Connect the flanges or bolts with the same specifications.
- Make sure to insert gaskets between flanges. (Select the gaskets in consideration of the temperature of the content and the pressure inside the container.)

WARNING **For Ex-proof products, it shall be installed with an appropriate grade for environment.**

Wiring

- Connect correctly AC(90~240V) or DC(+24V) power to the power specification.
- Make sure to connect the DC power with correct polarity(+, -).
- Do not connect the wire with the power connected.
- It provides DPDT output by default, wired COM and N.O terminals when using the high alarm.
- External grounding shall be completed.

WARNING **In case of Ex-proof products, apply the power after tightening the cover after wiring.**

Failure Check & 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. Be careful not to damage Teflon part during removal.

■ **Failure Check**

1) Is power voltage connected correct?
2) Is power voltage supplied according to specifications correct?
3) Is cable wiring correct?
4) Is the Fail-Safe Mode setting correct?
5) Does the green LED turn on?

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.
■ 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.

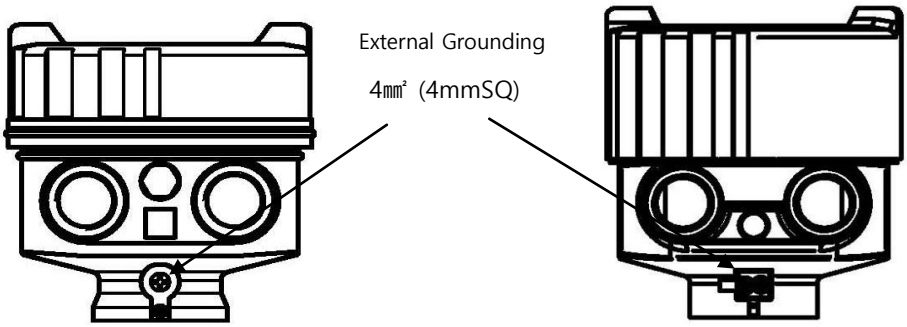
Precautions for Inserted External Wire (Ex-proof)

■ 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 (PBT)

HEAD External Grounding (AL.C)

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.

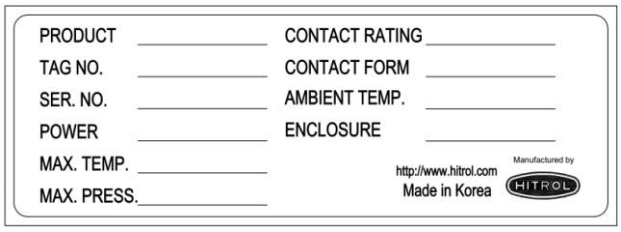
■ Disposal of Product

- 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.

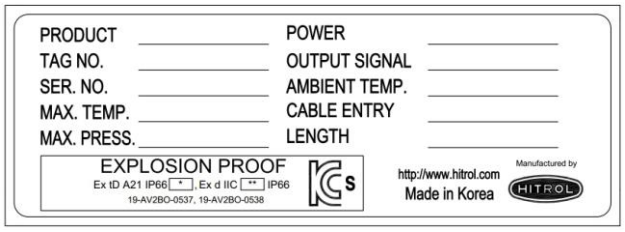
Marking

■ 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**

ADDRESS: HITROL CO., LTD 141, Palhakgol-gil, Jori-eup, Paju-si, Gyeonggi-do, Korea

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APPENDIX

M-95P

User Manual

Capacitance Type Level Switch

Doc. no. : Rev2.1

Always The Best Solution
HITROL CO., LTD.

1. Configuration of Module (M-95P)

No	Configuration	Function
1	**S Key**	■ Function setting ■ Save the setting
2	**M Key**	■ Mode change ■ Cancellation
3	**▲ Key**	■ High Set ■ Setting the value up
4	**▼ Key**	■ Low Set ■ Setting the value down
5	**LCD**	■ Display of operating and setting status
6	**LED**	■ Display of power and status
7	**Power**	■ For supply power (AC / DC)
8	**Frame Ground**	■ FG
9	**Relay Out**	■ Relay Contact Out (DPDT)

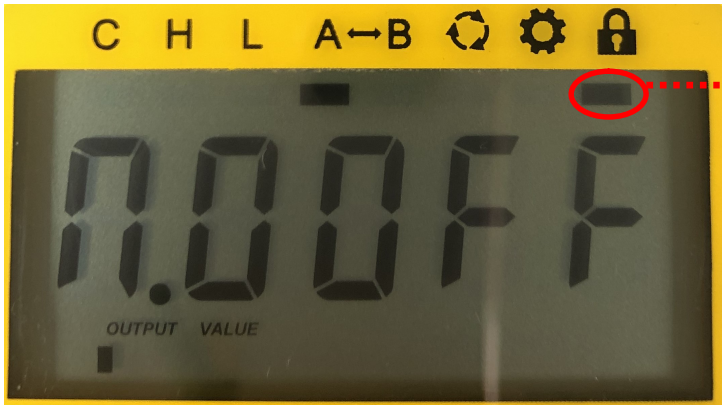
2. Specification

Category	M-95P		
Enclosure	Weather Proof		
Material	PBT / AL.C		
Mounting	COMPACT		
Microprocessor	16Bit Microprocessor		
Supply Voltage	AC Free (90V ~ 240V @ 50/60Hz)		
	DC+17V ~ +35V @ Typ.+24V		
Power Consumption	AC Free (90~240V)	Stand-by	■ AC220V @ 7W ■ AC110V @ 3.1W
		Active	■ AC220V @ 7.6W ■ AC110V @ 3.9W
	DC+24V	Stand-by	■ DC+24V @ 0.2W
		Active	■ DC+24V @ 0.96W
Measurement Accuracy	±1mm		
Oscillation Frequency	1MHz		
Sensitivity Resolution	0.1pF		
Dielectric Constant	2 @ Min. (Powder/Liquid)		
Frame Ground	FG		
Relay Delay Time Range	0.5Sec. @ Min / 1Sec.~ 10Sec. @ 0.1Sec Resolution		
Relay Contact Out Control	Normal Open @ Default		
Relay Contact Rating	DPDT : AC250V/5A, DC30V/5A		
Status Indicator	Tri-Color LED [Green / Red / Orange]		
Setting Method	Setting Menu		
Display	C, H, L, A↔B, Rotation, Setting, Lock		
Ambient Temperature	-20℃ ~ +80℃		

3. Configuration of Setting Menu

No.	Contents	Description
[02]	Low Value Set	Set the Low value by viewing the current Capacitance value
[03]	High Value Set	Set the High value by viewing the current Capacitance value
[08]	Relay Contact Type	N.O or N.C (Default : N.O)
[09]	Relay Delay Time Set	0.5 ~ 10 sec. (Default 0.5 sec @ 0.5 sec Step ADJ.)
[11]	LOW Capacity fine Adjustment	Find adjustment from settled capacitance value. (0.1%, 1%, 10%)
[12]	HIGH Capacity fine Adjustment	
[30]	Rotation Time Set	0.5 ~ 10 sec. (Default 3 sec @ 0.5 sec Step ADJ.)
[31]	'C' Display On/Off	Rotation 'C' select display (Current Capacitance value)
[32]	'H' Display On/Off	Rotation 'H' select display (High Capacitance setting value)
[33]	'L' Display On/Off	Rotation 'L' select display (Low Capacitance setting value)
[34]	'A↔B' Display On/Off	Rotation 'A↔B' select display (Relay Contact Type & ON/OFF)
[90]	Error Number Output	Display of error number according to malfunction
[91]	Capacity value Output	Low, High, display current Capacitance value
[100]	Reset	Reset the all setting

4. M-95P LOCK Turn off/Setting Way



※ When power is applied, the initial screen shows Relay Contact Type, Lock status. (When in the LOCK state, the key does not respond.)

■ Key LOCK Turn off

- (S), (M), (▼), (▲) Press for approximately 1 second at the same time to release.
- In the photo, the cursor bar under the lock disappears.

■ Key LOCK Setting

- (S), (M), (▼), (▲) Press for approximately 1 second at the same time to set it up.

(Set in the unlocked state.)

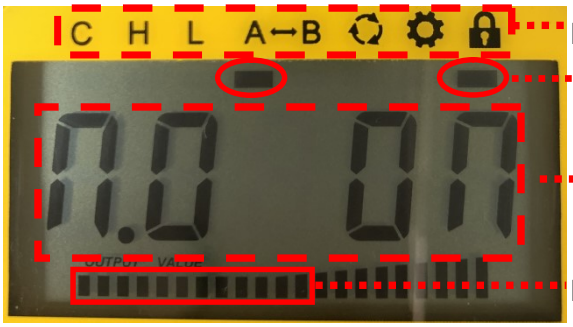
- When locked, it automatically switches to relay display mode.
- In the photo, a cursor bar is displayed under the lock.

■ Display mode automatic switching

- If the button key is not pressed, it automatically switches to the LOCK state after counting 30 seconds.
- If you press the button key along the way, the count will resume after initialization.
- It does not switch when setting the SET Menu.

5. Setting and Operating

■ LCD configuration

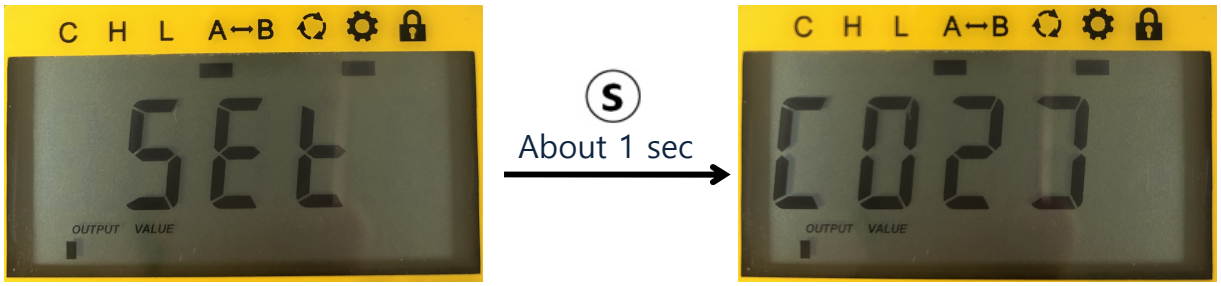


Display Mode	
C	Current Capacitance Value
H	High Setting Value
L	Low Setting Value
A↔B	A : Relay Contact Type N.O B : Relay Contact Type N.C
⟳	Rotation Mode
⚙	Setting Mode
🔒	Key Lock Statu

- The cursor moves sequentially whenever the (M) button is pressed.
- The order of movement is as follows.

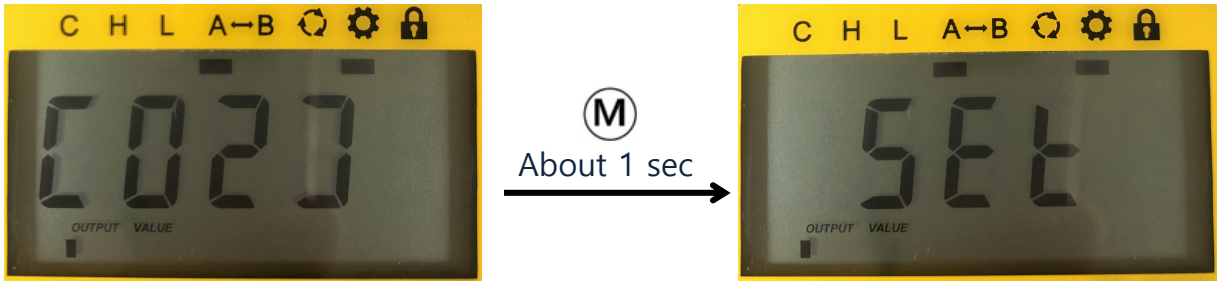
C → H → L → A↔B → ⟳ → ⚙ → C → H →...

■ Into the Setting Menu



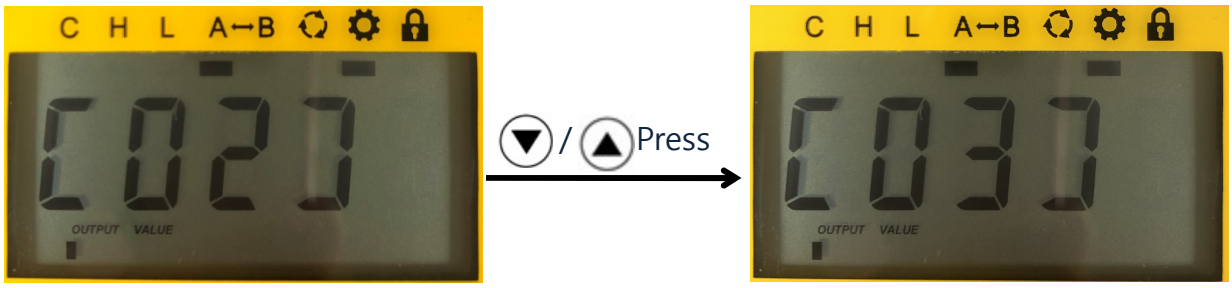
- Press the (M) button to move the display screen to Setting Mode.
- In the Setting Mode, press (S) button for 1 second then the green LED will be flickering and you can go into the Setting Menu.

■ Return to Setting Menu



- In the Setting Menu, press (M) button for 1 second then the green LED will be flickering and you can go back to the Setting Mode.

■ Select the Setting Menu



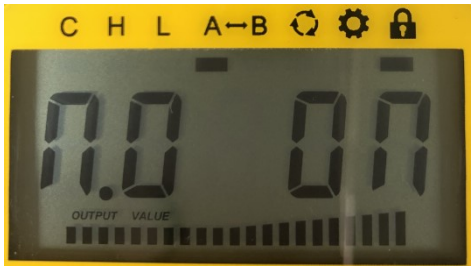
- In the Setting Menu, use ▼/▲ button to select the user setting function.
- Pressing (S) button for 1 second will enter the function.

Key Button	Function
▲ Press shortly	Increasing numerical value
▼ Press shortly	Decreasing numerical value
(S) Press more than 1 sec	Save and Leave
(M) Press more than 1 sec	Leave without Save

6. SETTING Way

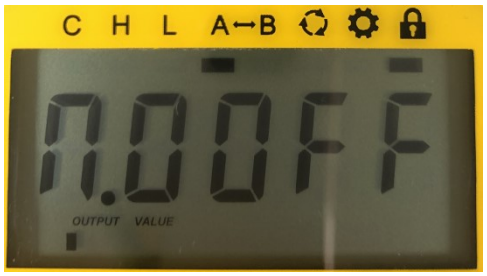
6. EASY SETTING

■ When the Fluid is touched the Sensor.



- Ⓢ, Ⓜ, ▲ When pressed at the same time for about 1 second, The LED turns on and off and the value is set.
- Because the initial value is OFF, setting the current value to HIGH Changes to ON and the LED keeps blinking.

■ When the Fluid is not touched the Sensor.



- Ⓢ, Ⓜ, ▼ When pressed at the same time for about 1 second, the LED turns on and off and the value is set.
- Since the initial value is OFF, if the current value is set to a LOW value, the LED stays on while maintaining the OFF state.

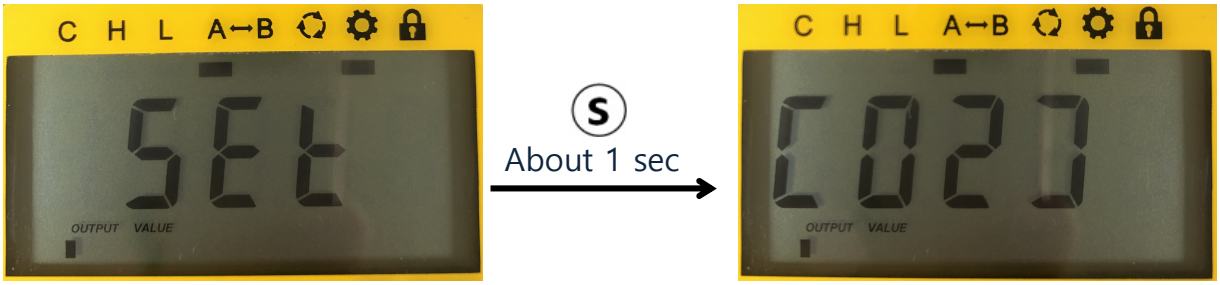
■ Auto Setting and confirm

1. Press Ⓜ to confirm C(current value), H(High value), and L(Low value).
2. If the value of C is higher than H, the Relay ON status LED keeps blinking.
3. If the value of C is lower than L, the Relay OFF status LED is ON.

■ Manual SETTING

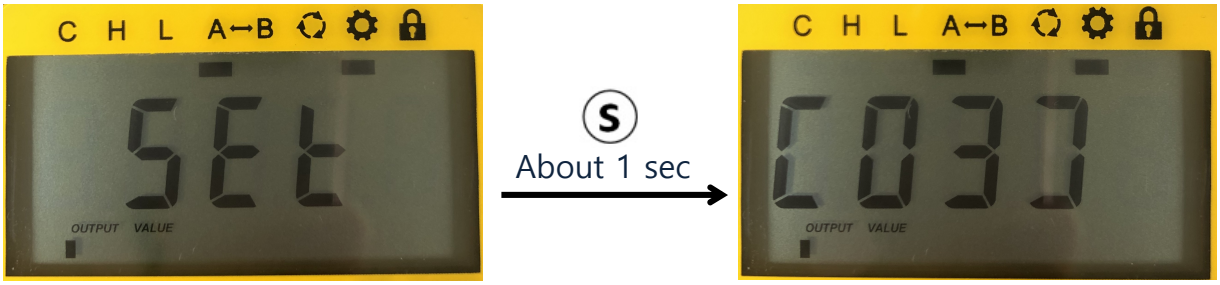
- SETTING Condition : HIGH value ≥ LOW value
- HIGH value < LOW value : LED RED is briefly turned on and off witho

■ LOW Manual SETTING



- Enter item 2 in Setting Mode.
- The value displayed on the LCD is the current Capacitance value.
- When the desired value is reached, press the (S) button for About 1 second to save it.
- For safe operation, set it to 0.1% greater than the current value..

■ HIGH Manual SETTING



- Enter item 3 in Setting Mode.
- The value displayed on the LCD is the current Capacitance value.
- When the desired value is reached, press the (S) button for About 1 second to save it.
- For safe operation, set it to 0.1% less than the current value.

■ SETTING fine Adjustment

- Use when you want to adjustment values.

0.1% Up / Down : ▲ / ▼ Press shortly

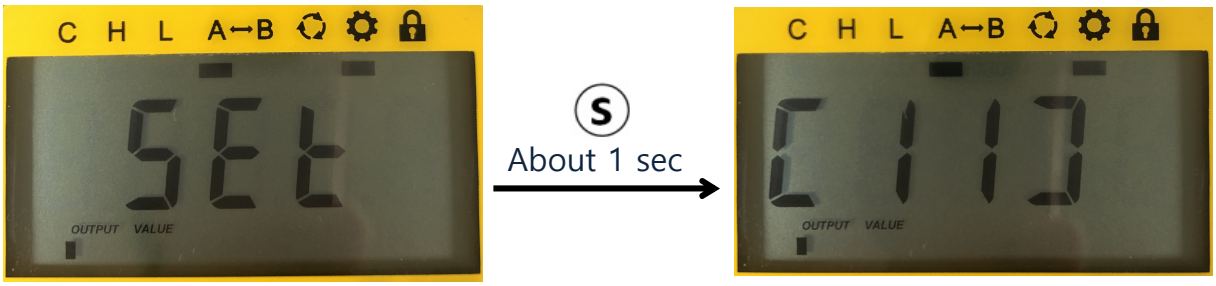
1% Up / Down : ▲ / ▼ Press for 1 sec.

10% Up / Down : ▲ / ▼ Pressing the button for 1 second

Changes the value.

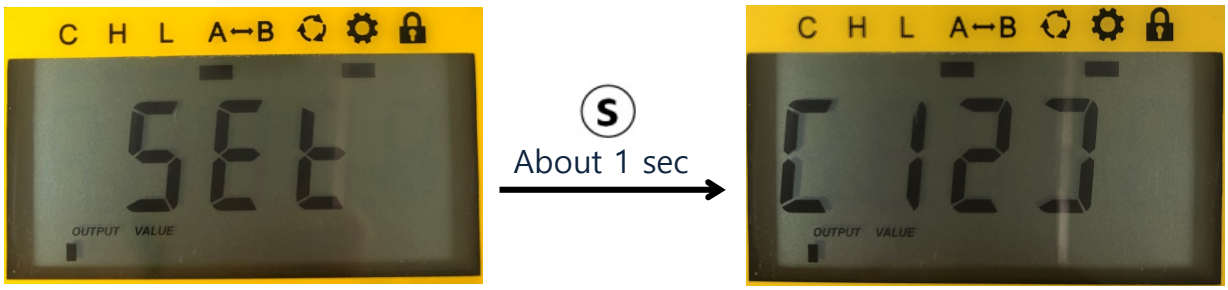
Press S button to save the value.

■ LOW value fine Adjustment



- Enter item 11 in Setting Mode.
- The value displayed on the LCD is the set LOW value.
- Use button operation to increase and decrease values and save them.

■ HIGH value fine Adjustment



- Enter item 11 in Setting Mode.
- The value displayed on the LCD is the set HIGH value.
- Use button operation to increase and decrease values and save them.

7. Precautions for Use

- Do not impact the product.
- Wiring must be done according to the polarity of the power supply.
- Wire and supply the power to the device after checking the specifications.
- Pay attention to prevent electric shock.
- Please refer to the Instruction Manual of this product for more information.

◈ More product information can be acquired at our website. (www.hitrol.com)