
I N S T R U C T I O N M A N U A L

F O R

E L E C T R I C A L C O N D U C T I V I T Y L E V E L S E N S O R



M O D E L : M T 1 0 - Z



M O D E L : R E 9 0 0 0

Read and understand this manual for safely usage.

- This manual describes the product of standard specification. Read the other manual for the product of explosion-proof specification.
- This manual describes the handling, inspection and adjustment of the product which model is mentioned on cover page. Read and understand this manual before handling.
- Follow the additional document and/or direction, submitted by NOHKEN INC. and our distributor or agent, even if the terms are mentioned in this manual.
- Save this manual in proper place being available to refer immediately.
- The specification of product mentioned in this manual may not be satisfied by the condition of environment and usage. Check and consider carefully before using.
- Contact to sales office at NOHKEN INC. for any question or comment about this manual and product.

The followings are the description of the terms in this manual.

 WARNING	Indicates a potentially hazardous situation which, if not pay attention, could result in death, serious injury or serious disaster.
 CAUTION	Indicates a hazardous situation which, if not pay attention, may result in minor or moderate injury or damage to device.

	Indicates prohibited matter. The explanation with this mark shall be followed
	Indicates instructed matter. The explanation with this mark shall be followed.

 **WARNING**

This product is not explosion-proof construction. Do not install this product to the place where the flammable gas or vapor is occurred.

If installed, the flammable gas or vapor may be ignited, and serious disaster may be occurred. Use the product of explosion-proof construction in this case.



Do not modify or disassemble the product. Otherwise, the product and connected device may be malfunctioned, damaged, fired, or miner injury and electric shock may be occurred. (Follow the additional document and/or direction, submitted by NOHKEN INC. and our distributor or agent.)



Turn off the power, before wiring and inspection. Otherwise, electric leakage, fire caused by short circuit, and electric shock may be occurred.



Ensure the wire is properly connected. The product and connected device may be malfunctioned, damaged, fired, or miner injury and electric shock may be occurred by improper wiring.



Turn off the power immediately, if the smoke, strange smell and sound are occurred.

Do not use it until the problem is solved.



 **CAUTION**

Avoid shock and rough handling to this product. The product may be damaged by shock as dropping, falling, throwing, knocking, lugging, and etc.










Follow the specification of operating temperature, operating pressure, switch rating, and etc. Otherwise, the product and connected device may be malfunctioned, damaged, fired, or miner injury and electric shock may be occurred. Check the manual or specification sheet.



Operation test shall be done before practical usage. If the serious accident is expected to occur by malfunction of product, the other operating principle of product shall be installed in parallel.



 **CAUTION**

<p>Check and deeply consider the chemical compatibility for material of product in advance. The part especially float, which is very thin, may be malfunctioned by miner corrosion.</p>	
<p>Check and deeply consider the chemical compatibility for material of product in advance.</p>	
<p>Hold the stem very close to mounting point, when carrying, installing, and removing. If hold the terminal box, it may be taken off from the flange or plug, and the product may be damaged by dropping.</p>	
<p><u>The product is 50cm or longer</u> The product shall be kept in horizontally. The product and other goods be damaged, and miner injury may be occurred by falling.</p>	
<p>Earth terminal shall be grounded to JIS Class D ground (earth resistance less than 100Ω). If not grounded, electric shock may occurred by any accident.</p>	
<p>Provide arrester or surge absorber to avoid electrical impact such as lightning and static electricity. If not provide, the product and connected device May be malfunctioned, damaged, and fired, or miner injury and electric shock may be occurred.</p>	
<p><u>In case of connecting inductive or lamp load to the product.</u> Provide protective circuit to the load to avoid over voltage and over current. If not provide, the contact may be damaged.</p>	

INTRODUCTION

- A) This manual specifies the specification of general product. If you order special product, some details of specification may be different with the manual.
- B) We are glad to suggest and advice for Model selection and chemical resistant of material, but final decision has to be made by the customer.
- C) This manual has prepared with close attention. Ask sales office at NOHKEN INC. for any question or comment about the contents of this manual.
- D) For replacement parts
The quality of product has frequently improved, so same spare part may not be supplied. In this case, replacement part or product may be supplied. Ask sales office at NOHKEN INC. for details.
- E) The contents of this manual are subject to change any time without notice due to the improvement of product.

WARRANTY & DISCLAIMER

- A) NOHKEN INC. warrants this product against defect in design, material and workmanship for a period of 1(one) year from the date of original factory shipment.
- B) The warranty only covers the damage of products. The secondary and third kind disasters are not covered by NOHKEN INC.
- C) NOHKEN INC. shall not be liable for the following.
 - C-a) Do not follow the description and direction in this manual.
 - C-b) Damage due to improper installation, wiring, usage, maintenance, inspection, storing, and etc.
 - C-c) Repair and modification are done by the person who is not employee of NOHKEN INC. and our distributor or agent.
 - C-d) Improper parts are used and replaced.
 - C-e) The damage is occurred by the device or machine except our products.
 - C-f) Improper usage. (See "Proper of usage" in chapter 1 in this manual)
 - C-g) Force Majeure including, but not limited to, fire, earthquake, tsunami, lightning, riots, revolution, war, radioactive pollution, acts of God, acts of government or governmental authorities, compliance with law, regulation, and order.

THE TERMS OF WARRANTY AND DISCLAIMER SHALL IN NO WAY LIMIT YOUR REGAL LIGHT.

NOTE TO USERS

First of all, it is essential that this manual should be read and understood before installation and start-up of the Electrical conductivity level sensor . This manual covers instructions for the installation, wiring, maintenance, and troubleshooting.

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MUST BE READ BEFORE USING
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1 . P U R P O S E O F U S E

This system consists of the sensor (model MT) and the relay unit(model RE9000).

This system will controls for level detection of sewage, waste, sweet water conductive liquid water, high conductive liquid water in tank.

2 . S P E C I F I C A T I O N S

2 . 1 M o d e l

Sensor : M T 1 0 - Z

Relay unit : R E 9 0 0 0

2 . 2 S p e c i f i c a t i o n s

Table 2-1 Sensor

Name		Electrical conductivity level sensor (sensor)		
Model		MT10-Z		
Measuring object		Discharged or sewage water、 Sweet water (Conductive Liquid、 High conductive Liquid)		
Working temperature		0 ~ +80 (Get rid of dew)		
Construction		IP45		
Materials	Terminal box	ABS		
	Flange	CPVC		
	Sensor	Body	PE	
		Electrode	316 Stainless steel	
	Cable	PVC sheath ()		
	Anchor weight	304 Stainless steel		
	Rope	PP		
	Rope clip	CPVC		
Installation		Flange connection (Equivalent JIS 10K 100A proviso 4 holes)		
Cable inlet		G 3/4 or Equivalent		

: One point sensor has two core cables, Black and White, but these cables are short circuited inside of sensor.

Table 2-2 Relay unit

Name	Electrical conductivity level sensor (relay unit)
Model	RE9000
Operating resistance Reset resistance	Function 1: Drainage control and high alarm (3 or 2 point detection) Function 2: Drainage control, Feeding control, or Alarm output (2 or 1 point detection)
Sensitivity	1k (High conductive Liquid) 4k (Conductive Liquid) 20k (Discharged or sewage water) 80k (Sweet water)
Operating display	Power ON : Green LED lights Pump control relay ON (RY1) : Yellow LED lights Alarm relay ON (RY2) : Red LED lights
Power supply	AC : 100 to 240V AC \pm 10% 50/60Hz DC : 24V DC (20 to 28V DC)
Power consumption	AC : 7VA Max. (240V AC) DC : 7W Max.
Power source to sensor	12V AC (1mA Max.)
Wiring distance between sensor and relay unit	500m Max. (Relay unit earth and tank earth are the same.)
Output signal	2 x (1a + 1b)
ON delay time	Function1 : Alarm relay (RY1) ; 0.5 / 10(sec.) Alarm relay (RY2) ; 0.5 / 15(sec.) Function2 : 0.5 / 2.5 / 5 / 10 / 20 / 40 / 80 / 160 (sec.) (RY1,2 Common)
Contact rating	240V 5A AC (with resistive load)
Life expectancy	1 x 10 ⁵ times or more. (with rating load)
Withstand voltage test	1500V AC for 1 minute (between power supply terminal / relay terminal to grand terminal)
Insulation resistance test	More than 20M at 500V DC (between power supply terminal / relay terminal to grand terminal)
Allowable temperature	-10 ~ +60 (Get rid of dew)
Allowable humidity	95% R.H Max.
Construction	IP 20
Materials	PC / PET
Mass	Approx. 200 g

2.3 Dimensions

2.3.1 Dimension of sensor MT10-Z

Terminal box
 Flange
 Cable clip
 Cable Fulcrum
 Sensor
 Rope
 Anchor weight
 Cable gland
 Eyebolt

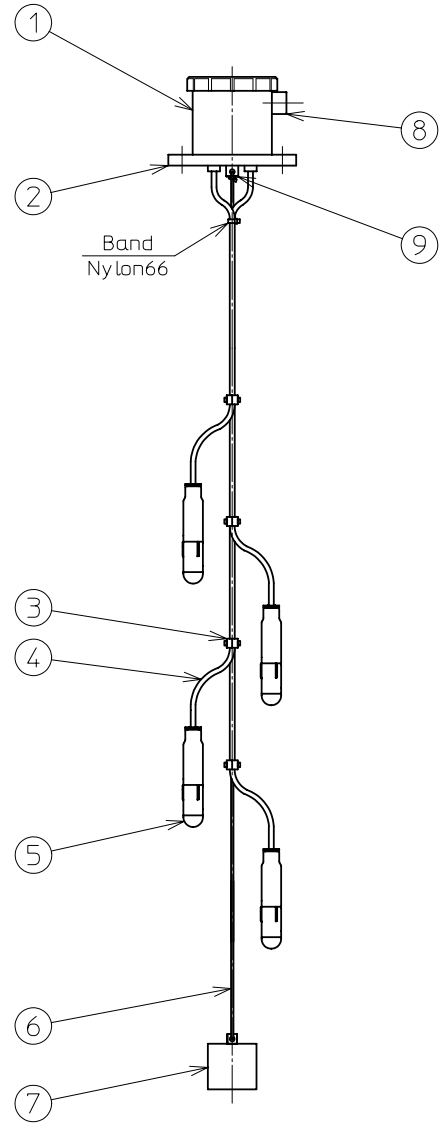


Fig. 2-2

2.3.2 Terminal box internal parts

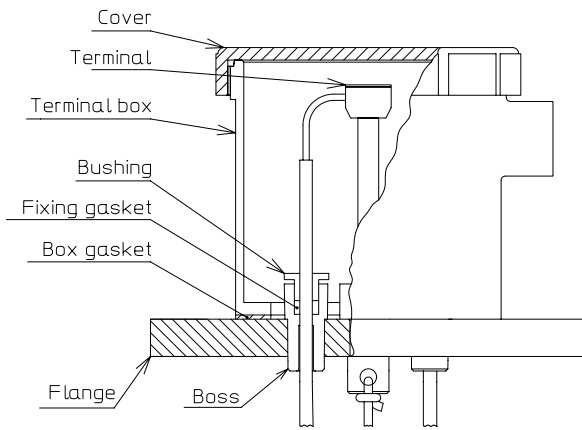


Fig. 2-1

2.3.3 Dimension of relay Unit RE9000

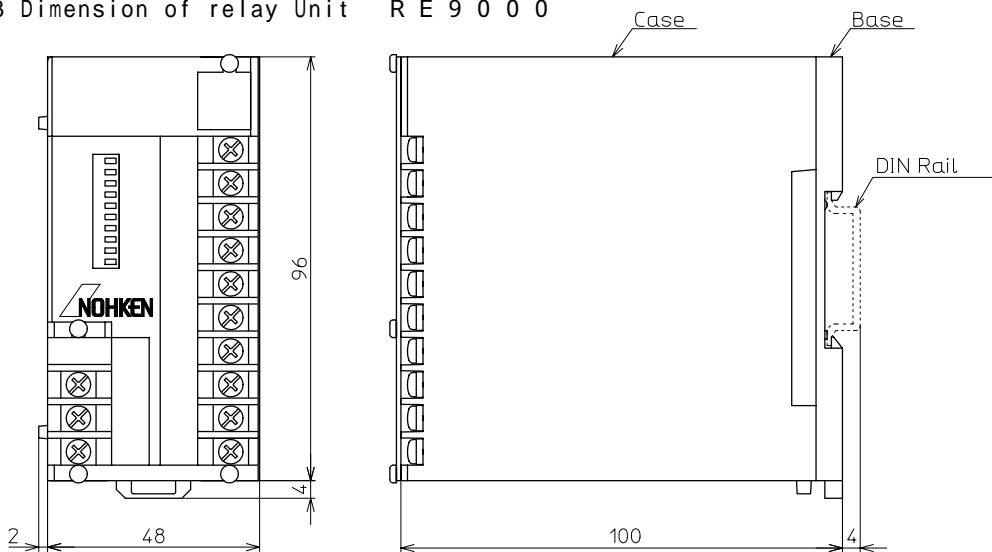


Fig. 2-3

3 . P R I N C I P L E O F O P E R A T I O N

This Electrical conductivity level sensor is installed on the conductivity between the earth (tank) and the electrode.

If the sensor is installed to FRP or plastic tank, the conductor as pump must be used for earth rode. If there is no conductor to use it for earth rode, the earth rode must be provided. The earth rode shall be grounded at earth resistance less than 100 .

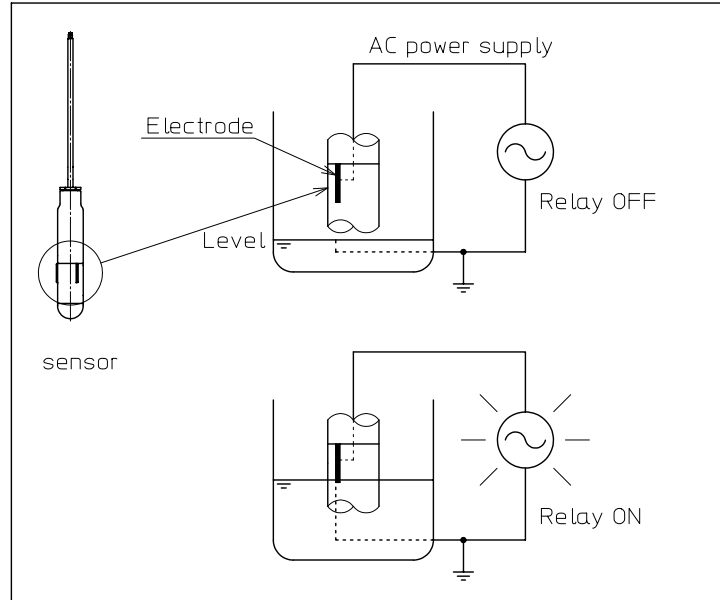


Fig.3-1

4 . H a n d l i n g c a u t i o n s

Following shall be observed when handling the sensor and relay unit. Otherwise, malfunction or accident may occur.

<p>4.1 Avoid physical shock. Dropping, throwing or bumping will damage the sensor and relay unit.</p>	
<p>4.2 During unpacking, care must be taken not to damage cables with sharp object.</p>	
<p>4.3 Do not put the level controller where it will be exposed to direct sunlight. Locate away from condensation, dust and foreign matters.</p>	
<p>4.4 Do not use in a corrosive atmosphere such as NH₃, SO₂, Cl₂, etc. Internal circuit board will be corroded through radiation slots.</p>	
<p>4.5 To avoid personal injury, JIS Class D grounding (less than 100 ohm) should be done.</p>	

5 . I N S T A L L A T I O N

5 . 1 U n p a c k i n g

This unit has been thoroughly inspected and carefully packed at the factory to prevent from damage during shipment. When unpacking, care must be taken not to damage the instrument with mechanical shock. After unpacking, visually check the instrument exterior for damage.

N O T E the following points:

- (1) During unpacking, care must be taken not to damage cables with sharp object.
- (2) Cable must be kept from vending forcefully during unpacking or carrying.
- (3) Be sure that the parts such as clip, rope and anchor weight are attached correctly.

5 . 2 I n s t a l l a t i o n l o c a t i o n

This sensor should be installed in an area where the following conditions :

- (1) No excessive vibration.
- (2) No corrosive gases (Such as NH_3 , SO_2 , Cl_2 and so on).
- (3) Provide ample space for maintenance / inspection.

5 . 3 I n s t a l l a t i o n m e t h o d o f s e n s o r

This sensor is provided with flange. Normally, it is installed on the mating flange which is compatible on the top of the tank.

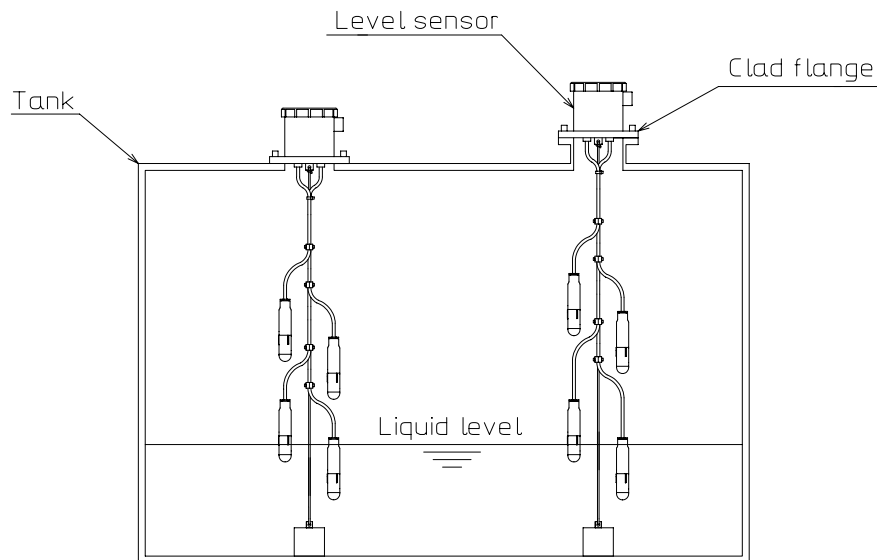


Fig.5-1

N O T E the following points ;

- a) Do not install the sensor near the agitator or liquid inlet or outlet where wave and flow of liquid is heavy. Provide steeling pipe, if it is necessary.
- b) Make sure cable must be properly wired, do not wire faultily. Terminal screw must be tightened properly. Otherwise, loose connection or accident of short circuit may be occurred.
- c) The size of the cable inlet is G 3/4.

There are two ways for connecting the sensor cable. One is fixing the cable with a cable gland. The other is connecting a conduit to the housing. In either case, an adequate sealing should be provided to prevent water or dust ingress into the housing through the sensor cable.

Secure the cable using sealing material for the conduit connection, or a proper tool when the gland is used, to protect the housing inside from dust or water.

When water or moisture comes into the housing from the conduit, use putty to fill the inside of the conduit.

▲ C A T I O N

Do not use lowest point of sensor for earth rode.
The sensor shall be installed closed to the inflow where the surface of liquid is waving. However, the liquid does not inflow directly to sensor. (Normally, the amount of suspended solid as scum around inflow is less than normal condition.)
Keep away sensor for 150mm or more from conductor such as wall of manhole, pump, baffle plate, pipe, or chain. The sensor may be malfunctioned by touching with them.
The sensor must be set on 10mm or higher than lowest operation point of pump. (Serve as prevention against idling of pump.)
The wiring between sensor and relay unit must be connected as short as possible. Avoid Influence of electromagnetic induction, the connection cable must be wired by 50cm away from power cable or using duct and conduit is recommended.
If the sensor is installed to FRP or plastic tank, the conductor as pump must be used for earth rode. If there is no conductor to use it for earth rode, the earth rode must be provided. The earth rode shall be grounded at earth resistance less than 100 .
Use VCTF cable (1,25mm ²) for extension. Do not use shielded cable.
Avoid touching cum on the sensor with structure on bottom of pit.

5 . 4 I n s t a l l a t i o n m e t h o d o f r e l a y u n i t
Before installate ,inspect the MT for shipping damage.

▲ C A T I O N

Locate away from rain and jetting water. RE9000 is not water-proof.
Avoid physical shock. Dropping, throwing or bumping will damage the sensor and relay unit.

(1)Screw mounting

Prepare M3 screw tap, and fixed by M3 screw. The base is separated from body by push button A.
(See fig.5-2)

(2)Rail mounting

Use DIN rail 35mm and fixed.

Note: If relay unit is taken off from rail, push button A to take off body and take off the base.
(See fig.5-3)

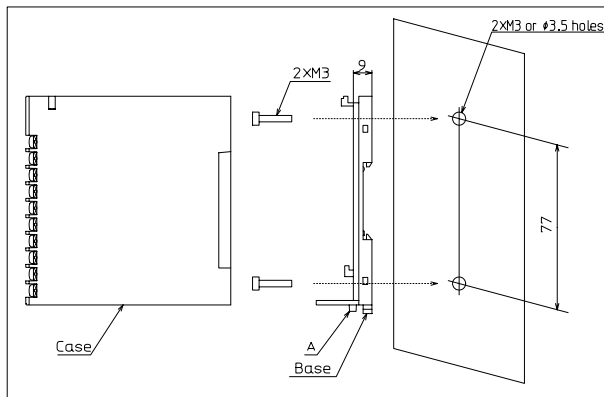


Fig.5-1

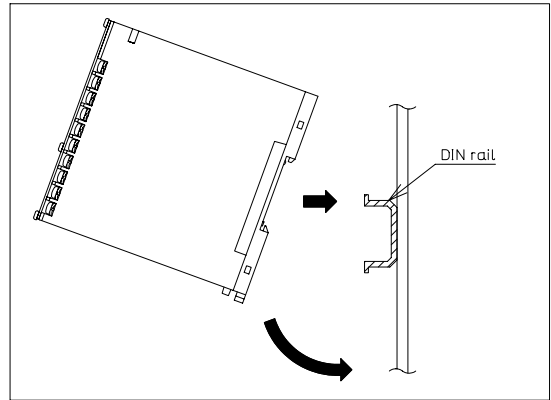


Fig.5-2

6 . COMPONENT NAMES OF RELAY UNIT

- : Power lamp (power / green LED)
Light up, when power supply is on.
- : Dip switch
Correcting for function, sensitivity, on delay
- : Terminal
Power supply terminal、Input terminal、Relay terminal、Ground terminal、and com terminal
- : Alarm relay operating display (RY1 / yellow LED)
Light up, when pump control relay is on.
- : Alarm relay operating display (RY2 / red LED)
Light up, when alarm relay is on.

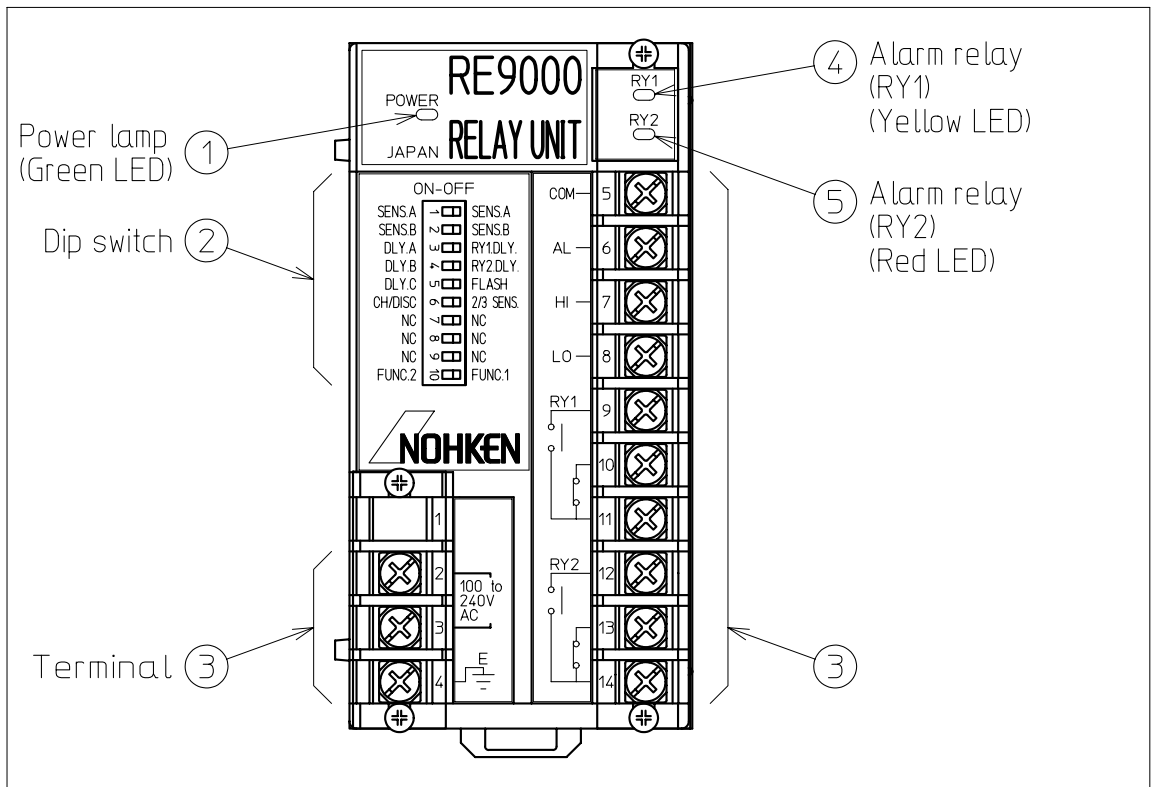


Fig.6-1

7 . SETTING

The sensitivity, On delay, or operation mode shall be set by turning On or OFF for dip switch No. 1 to No. 10 on front panel of unit. Refer to the drawing 3-1 for detail.

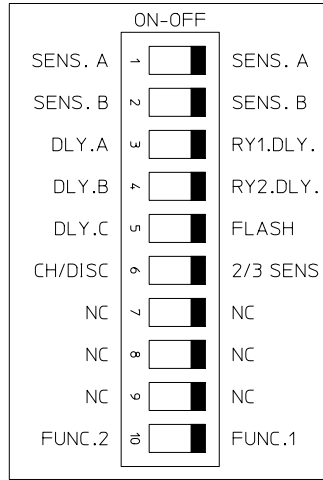


Fig.7-1

7.1 Function switch (SW No. 10)

Select switch with matching of function. Refer to Table 7-1 for function selection.

Table 7-1

SW.No.10	Function
OFF (FUNC.1)	Function 1: Drainage control and high alarm (3 or 2 point detection)
ON (FUNC.2)	Function 2: Drainage control, Feeding control, or Alarm output (2 or 1 point detection)

7.2 Setting of function 1

The following is step of function setting for selecting of Function 1 (SW 10-OFF).

Sensitivity setting (SW. No. 1 / No. 2)

Set sensitivity by matching with medium. When the resistance between sensor electrode and E terminal of RE9000 is below setting value, the function shall be detected. The sensitivity can not be set for each sensor. This function is common for both function 1 and 2.

Table 7-2

SW.No.1 (SENS.A)	SW.No.2 (SENS.B)	Sensitivity		
OFF	OFF	1k	High conductive liquid	Low sensitivity ↑ ↓ High sensitivity
OFF	ON	4k	Conductive liquid	
ON	OFF	20k	Discharged or sewage water	
ON	ON	80k	sweet water	

ON delay setting of relay for pump control (SW No. 3)

Set ON delay time of pump control relay (RY1). The delay time shown on table 7-3 may have an error of $\pm 10\%$ Max.

Table 7-3

SW.No.3 (RY1.DLY.)	ON delay time (sec.)
OFF	0.5
ON	10

ON delay setting of relay for high alarm (SW No. 4)

Set ON delay time of high alarm relay (RY2). The delay time shown on table 7-4 may have an error of $\pm 10\%$ Max.

Table 7-4

SW.No.4 (RY2.DLY.)	ON delay time (sec.)
OFF	0.5
ON	15

Mode setting of high alarm (SW. No. 5)

Set operation of high alarm relay (RY2). Operation of high alarm relay is flicker operation (*) in 2 seconds with ON setting.

(*): Repeat operation of ON and OFF.

Table 7-5

SW.No.5 (FLASH)	High alarm operation mode
OFF	Normal operation
ON	Flicker operation

Input Mode setting (SW No. 6)

Set the number of sensor connected.

Table 7-6

SW.No.6 (2/3 SENS.)	Number of sensor connected
OFF	3 point
ON	2 point

a) Three points input mode

Connect three sensors. The sensor at high and low position operates discharge, and the sensor at high position operates high alarm.

b) Two points input mode

Connect two sensors. The sensor at high and low position operates discharging, and the sensor in high position operates high alarm. High alarm relay (RY2) shall be operated, when the level of liquid is decreased to below high level within setting delay time from sensor going under the liquid to going out from liquid. This delay time is set by delay time for pump operation and high alarm relay.

*: Recommended delay time of high alarm is 15 seconds.

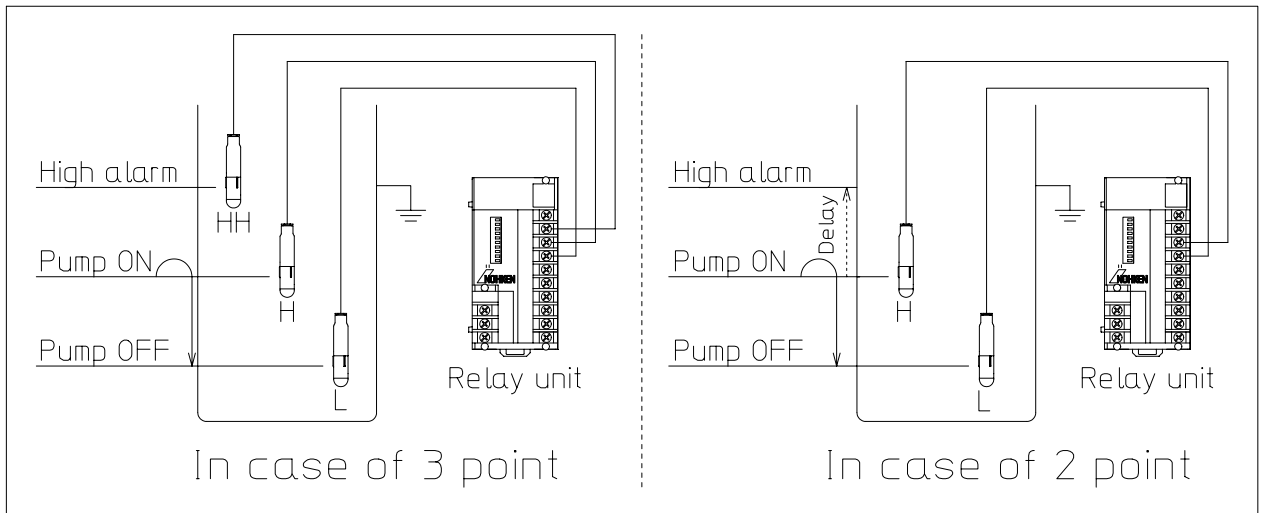


Fig.7-2

CAUTION

Take the delay time for fifteen seconds or more.

7.3 Setting of function 2

The following is step of function setting for selecting of Function 1 (SW 10-ON).

Sensitivity setting (SW. No. 1 / No. 2)

Set Sensitivity by matching with medium. When the resistance between sensor electrode and E terminal of RE9000 is below setting value, the function shall be detected. The sensitivity can not be set for each sensor. This function is common for both function 1 and 2. (See table 7-7)

Table 7-7

SW.No.1 (SENS.A)	SW.No.2 (SENS.B)	Sensitivity		
OFF	OFF	1k	High conductive liquid	Low sensitivity ↕ High sensitivity
OFF	ON	4k	Conductive liquid	
ON	OFF	20k	Discharged or sewage water	
ON	ON	80k	sweet water	

ON delay setting (SW. No. 3 / No. 4 / No. 5)

Set delay time for each operation. The delay time shown on table 7-8 may have an error of ±10% Max.

*: Recommended delay time is 5 seconds or longer.

Table 7-8

SW.No.3 (DLY.A)	SW.No.4 (DLY.B)	SW.No.5 (DLY.C)	ON遅延時間(秒)
OFF	OFF	OFF	0.5
OFF	OFF	ON	2.5
OFF	ON	OFF	5
OFF	ON	ON	10
ON	OFF	OFF	20
ON	OFF	ON	40
ON	ON	OFF	80
ON	ON	ON	160

⚠ C A T I O N

Take the delay time for five seconds or more.

Operation mode setting (SW. No. 6)

Set operation mode. (See table 7-9)

a) Discharging / high alarm (SW. No.6-OFF)

Connect two sensors at high and low position operates discharging. Connect one sensor operates high alarm. The relay output of RY1 and RY2 are identical operation.

b) Feeding / low alarm (SW. No.6-ON)

Connect two sensors at high and low position operates feeding. Connect one sensor operates low alarm. The relay output of RY1 and RY2 are identical operation.

Table 7-9

SW.No.6 (CH/DISC)	Operation Mode
OFF	Discharging or high alarm
ON	Feeding or low alarm

8 . W I R I N G

⚠ WARNING

Turn off the power supply during wiring.

Make sure that the supply voltage is sufficient, within 100 to 240 V AC range. Otherwise, the MP may cause malfunction or damage.

⚠ C A T I O N

The wiring between sensor and relay unit must be connected as short as possible. Avoid Influence of electromagnetic induction, the connection cable must be wired by 50cm away from power cable or using duct and conduit is recommended.

If the sensor is installed to FRP or plastic tank, the conductor as pump must be used for earth rode. If there is no conductor to use it for earth rode, the earth rode must be provided. The earth rode shall be grounded at earth resistance less than 100 .
Use VCTF cable (1,25mm²) for extension. Do not use shielded cable.

8.1 Wiring

Wiring shall be in accordance with all local codes. Since the terminal screw is M 3.5, We recommend to use shielded control cable of 1.25mm² with R1.25-3.5 (JIS C 2805) solderless rugs. This product does not provide fuse. If needed, it shall be additionally prepared.

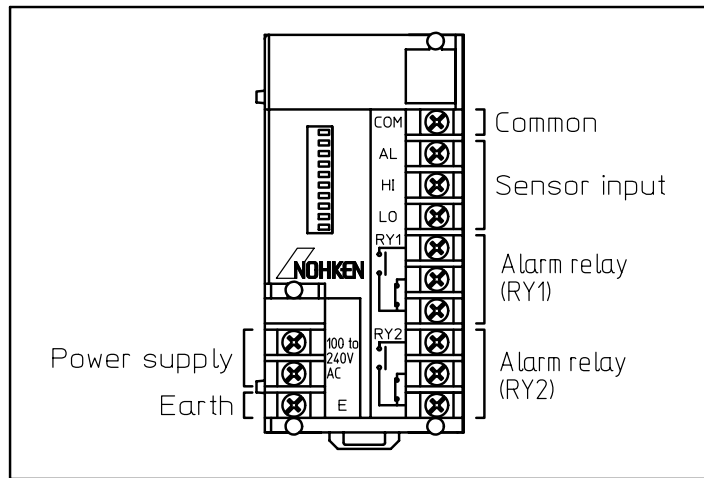


Fig.8-1

CAUTION

Contact rating for relay output is 240 V 3 A AC or 30 V 3A DC. Provide external relays when exceeding.

One point sensor has two core cables, Black and White, but these cables are short circuited inside of sensor. It is possible to connect one or two cable to relay unit. Connect two core cables in one terminal. Connect one core cable in one terminal and the other must be isolated, do not connect to COM terminal.

8.2 Example of wiring

The drawing as below shows the typical wiring for electrical conductivity level sensor Model MT and relay unit RE9000.

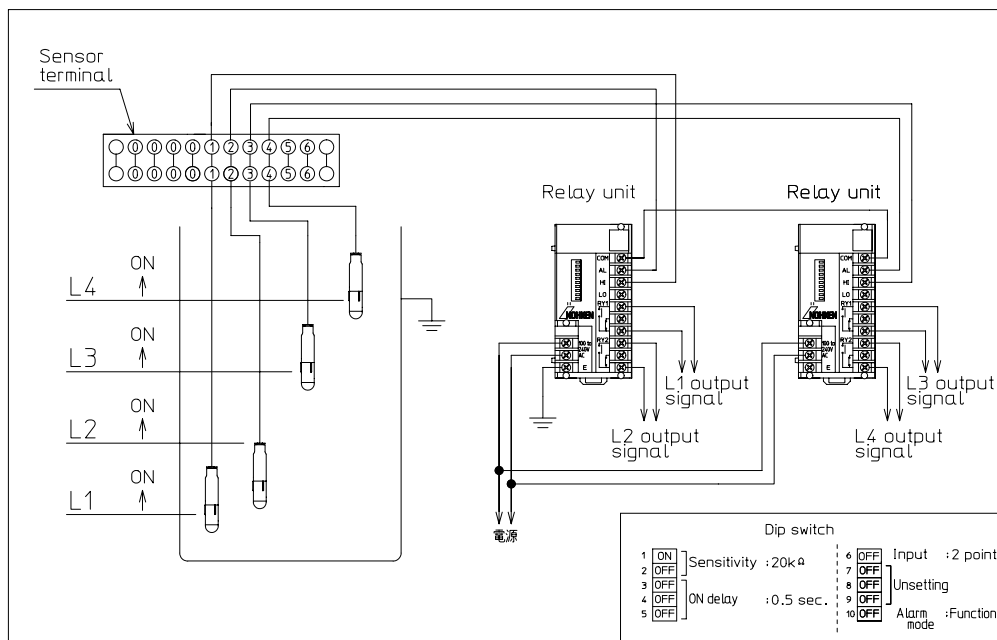


Fig.8-2

⚠ CAUTION

One point sensor has two core cables, Black and White, but these cables are short circuited inside of sensor. It is possible to connect one or two cable to relay unit. Connect two core cables in one terminal. Connect one core cable in one terminal and the other must be isolated, do not connect to COM terminal.
E terminal must be grounded to JIS D Class. Relay unit measures the alteration of conductivity between electrode and E terminal.

In case of only two or more sensors can be installed, connect to COM terminal. Connect earth only one relay unit.

9 . MAINTENANCE AND INSPECTION

Re-install and re-wiring the sensor after maintenance / inspection in accordance with "5.4 Installation method" and "6.WIRING".

⚠ WARNING

To avoid personal injury, leakage current or short circuit, the power supply shall be always turned off while wiring.

Inspect the sensor semi-annually or annually. Since inspection intervals varies with applications and process conditions such as pressure, temperature etc., we recommends periodical inspection.

- (1)Check for and replace damaged and collapsed parts.
- (2)Clean contaminant or sticky.
- (3)Clean dirt, dust and moisture from the housing.

10 . STORAGE

10.1 Storage of the sensor

- (1)The sensor shall be stored under the following conditions when it is not used for a long time.

Environmental conditions are as follows:

- temperature : -10 ~ +60
- humidity : 85 % RH Max. (No condensing)
- No corrosive atmosphere such as NH₃, SO₂, Cl₂ etc.
- No excessive vibration.
- Locate away from rain, condensation, dust and foreign matters.

- (2)Tighten the housing cover and the cable gland. Do not remove the blind plate from the cable gland to protect from dust or moisture.

We recommend to put the cable gland pointing down.

REFERENCE: Keep the sensor in sealed plastic bags with desiccant or other moisture-proof packing.

1 1 . T R O U B L E S H O O T I N G

⚠ C A T I O N

Use the following chart to troubleshoot the malfunctioning sensor.
If your remedies are unsuccessful, ask Nohken for repair and replacement.

Table 11-1

Problems	Possible causes	Remedies	Refernce
Liquids exceeds the actuation level, relay does not activate.	Disconnection of cable	Wire correctly and replace the cable.	
	Relay unit is damage.	Replace the relay unit.	
	Sensitivity shortage.	Set high sensitivity.	Section 7.2 Page 8 to 9
Liquids does not exceed the actuation level, relay activate.	Affected by deposit.	Clean the sensor.	
	Relay unit is damage.	Replace the relay unit.	
	Sensitivity shortage.	Set high sensitivity.	Section 7.2 Page 8 to 9
Relay chatter.	Affected by deposit.	Clean the sensor.	
		ON delay setting. Set low sensitivity.	Section 7.2 Page 8 to 9
Liquids does not exceed the actuation level, relay activate. (in case of two or more use)	Miswiring	Connect between com and com.	Section 8 Page 10 to 12

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