

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

F O R

ELECTRODE LEVEL SENSOR

MODEL : C E

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 minor 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 minor 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 minor 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

Check and deeply consider the chemical compatibility for material of product in advance.



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.



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.

TABLE OF CONTENTS

	Page No.		Page No.
1. PURPOSE OF USE	..... 1	5.4 Installation of Sensor	..... 8
2. SPECIFICATIONS	..... 1	5.5 Installation of Relay Unit	..... 9
2.1 Model and Suffix Code	..... 1	6. WIRING	..... 9
2.2 Specifications	..... 2	6.1 Cable inlet	..... 9
2.3 Dimensions	..... 3	6.2 Sensor Wiring	.....10
3. PRINCIPLE OF OPERATION	..... 4	6.3 Wiring Diagram	.....10
4. COMPONENTS NAMES	..... 5	7. TECHNICAL NOTE	.....13
4.1 Component Names of Sensor	..... 5	8. INSPECTION / MAINTENANCE	.....13
4.2 Component Names in Terminal Box	..... 5	9. TROUBLESHOOTING	.....14
4.3 Component Names of Relay Unit	..... 5		
5. INSTALLATION	..... 6		
5.1 Unpacking	..... 6		
5.2 Sensor Assembly	..... 6		
5.3 Installation location	..... 8		

1. PURPOSE OF USE

This Cable Type Electrode Level Sensor is designed to measure for conductive liquid level, and prevent erroneous operation due to short-circuit between electrodes compared with Electrode Type Level Sensor. Because of PVC body(outer insulation), it is difficult for short-circuiting to occur. This sensor will be used for conductive liquid where freezing can occur or for deep well use. Cable can be cut required length. This system consists of the sensor (model CE series) and the plug-in relay unit(model RE7□00 series). This system will controls the liquid level in tank.

2. SPECIFICATIONS

2.1 Model and Suffix Code

(1) Detector (Exclude mounting parts)

CE - □

Code	Electrode Material
5	316 Stainless Steel
6	NW0001/NW0665 (Hastelloy B or equivalent)
7	NW0276 (Hastelloy C or equivalent)
8	Titanium

(2) Sensor(Include mounting parts)

CE □ □ - □

Number of detecting points
1 to 6
Select number of detecting points required.

Code	Electrode Material
55	316 Stainless Steel
66	NW0001/NW0665 (Hastelloy B or equivalent)
77	NW0276 (Hastelloy C or equivalent)
88	Titanium

(3) Relay unit

RE 7 □ 0 0

Code	Sensitivity
0	Standard
1	High sensitivity
5	Two points

2.2 Specifications

(1) Detector

Model		CE-5	CE-6	CE-7	CE-8
Measuring object	Conductive Liquid				
Allowable temperature	-20 to +50 ℃				
Material	Body	PVC			
	Electrode	316 Stainless Steel	NW0001/NW0665 (Hastelloy B* ¹ or equivalent)	NW0276 (Hastelloy C* ¹ or equivalent)	Titanium
	Cable	PVC Sheath (VCTF 0.5 mm ² × 2 cores)			
Mass	Body	Approx. 0.6 kg (Include cable 6 m)			
	Cable	65 g/m			

(2) Sensor

Model		CE-55	CE-66	CE-77	CE-88
Measuring object	Conductive liquid				
Allowable temperature	-20 to +50 ℃				
Construction	IP 45				
Electrode withstand pressure	200 kPa Max.				
Flange size	JIS10K100A or equivalent (Proviso 4 holes)				
Material	Terminal box	ABS			
	Flange	PVC			
	Body	PVC			
	Electrode	316 Stainless Steel	NW0001/NW0665 (Hastelloy B* ¹ or equivalent)	NW0276 (Hastelloy C* ¹ or equivalent)	Titanium
	Cable	PVC Sheath (VCTF 0.5 mm ² × 2 cores)			
	Anchor weight	PVC (Built-in Steel Structure)			
	Rope	PE			
Mass	Clip	PVC			
	Mounting part	Approx. 1.6 kg (Include terminal box, Flange)			
	Body	Approx. 0.3 kg (Include cable 1 m)			
	Cable	65 g/m			
	Anchor weight	Approx. 3 kg			
Cable inlet	G 3/4 or equivalent				

Note *1 : Registered trademark of Mitsubishi Metal Corporation.

(4) Relay Unit

Model	RE7000	RE7100	RE7500	
			Standard	High
Allowable temperature	0 to +50 °C		-10 to +55 °C	
Allowable humidity	85% RH Max. (Get rid of dew)			
Operating display(Output)	LED(Red)		LED(Red) LED(Green)	
Operating resistance	4 kΩ or less	50 kΩ or less	3 kΩ or less	30 kΩ or less
Reset resistance	15 kΩ or more	100 kΩ or more	11 kΩ or more	220 kΩ or more
Power source to sensor	8 V, 5 mA AC Max.		12 V, 5 mA AC Max.	
Power supply	90 to 132 / 180 to 264 V AC , 50/60 Hz			
Power consumption	1.5 VA Max.		2 VA Max.	
Output signal	Relay contact (S.P.D.T.)		Relay contact	
Contact rating	240 V 5 A AC, 30 V 5 A DC (With resistive load)		250 V 3 A AC, 30 V 3 A DC (With resistive load)	
Wiring distance between sensor and relay unit	1 km Max.	100m Max.	1 km Max.	100m Max.
Dimension	W50mm×H84mm×D109mm			
Installation method	Plug-in			
Socket	Option (Manufacturer: OMRON, Model:11PFA or equivalent)			
Mass	Approx. 280g			

2.3 Dimensions

(1) Dimension of detector and sensor

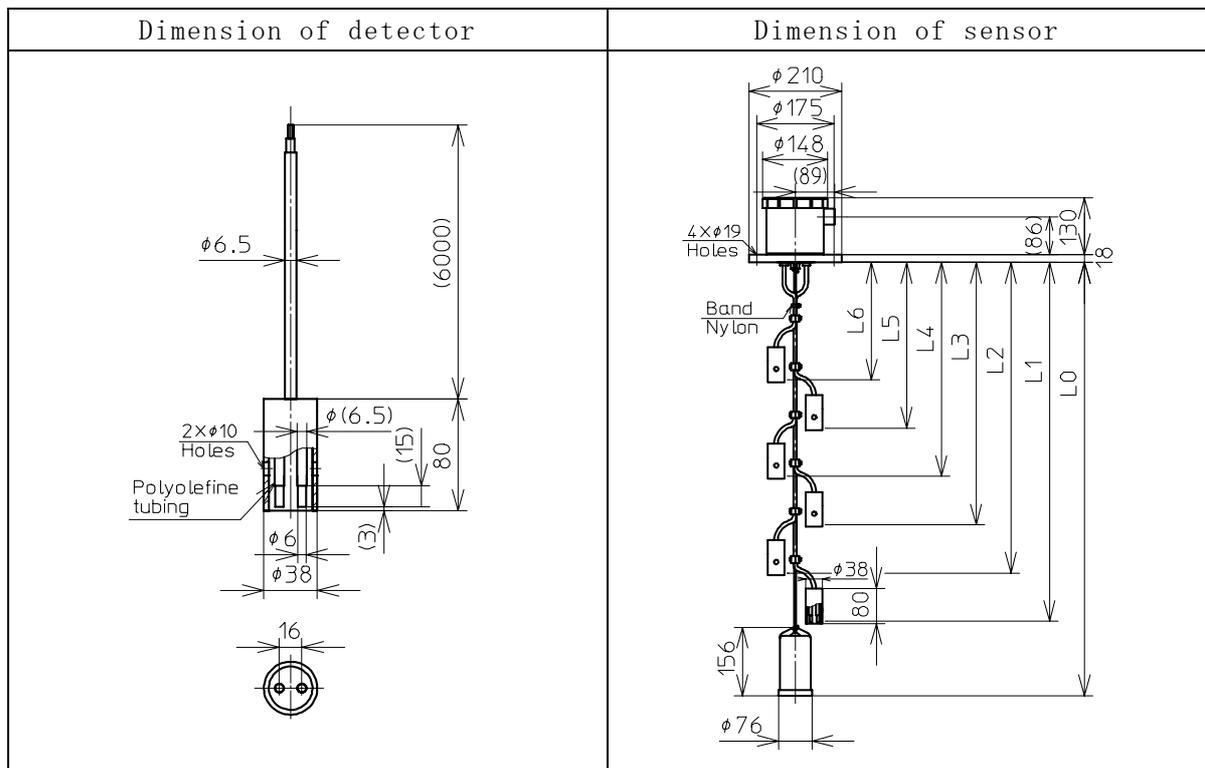


Fig. 1

(2) Dimension of relay unit

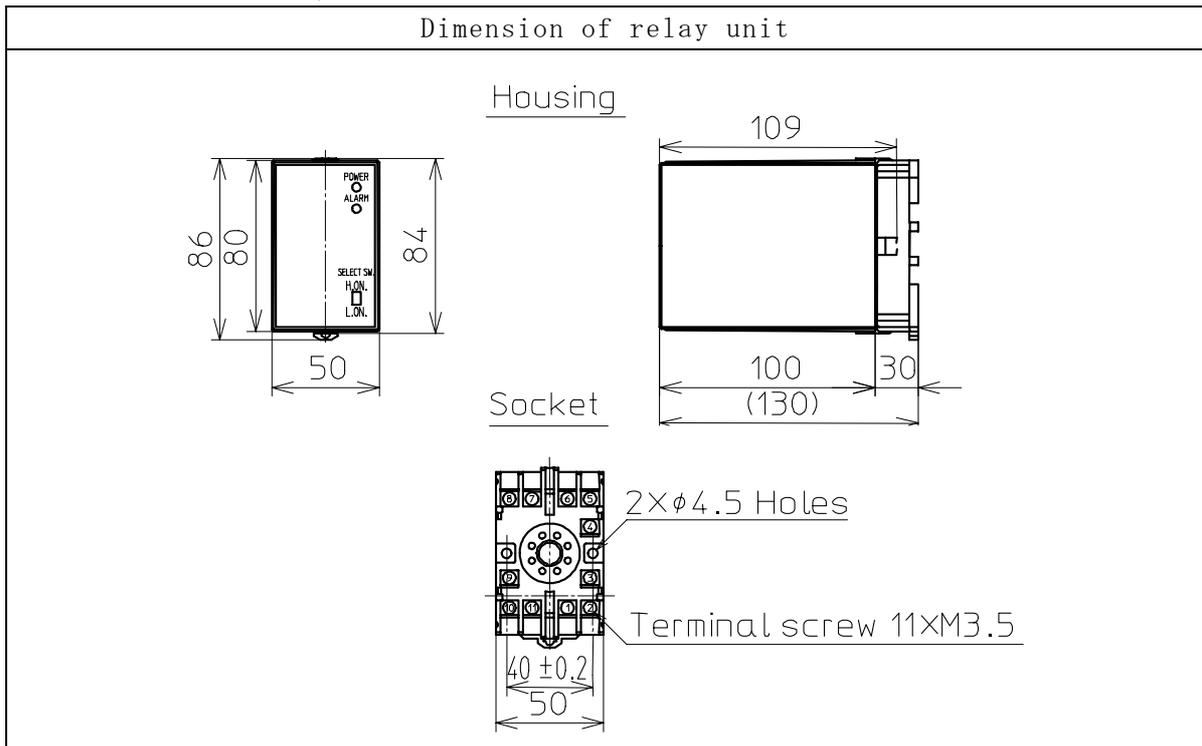


Fig. 2

3. PRINCIPLE OF OPERATION

Low AC voltage applied between electrodes, this system used to control functions such as latching for pump control or alarm setpoints. AC voltage is utilized to prevent electrical corrosion.

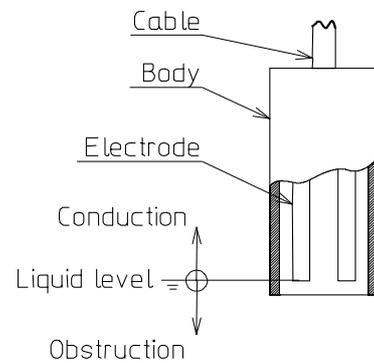


Fig. 3

4. COMPONENT NAMES

4.1 Component Names of Sensor

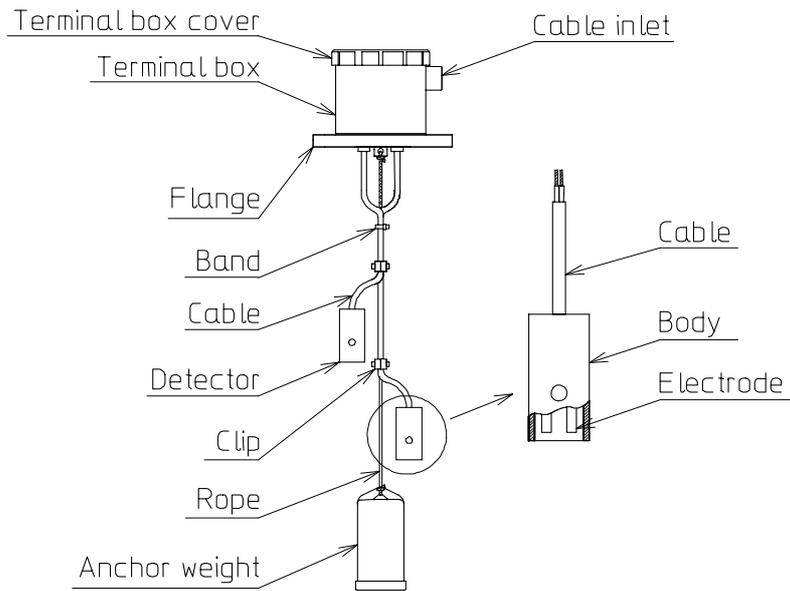


Fig. 4

4.2 Component Names of Terminal box

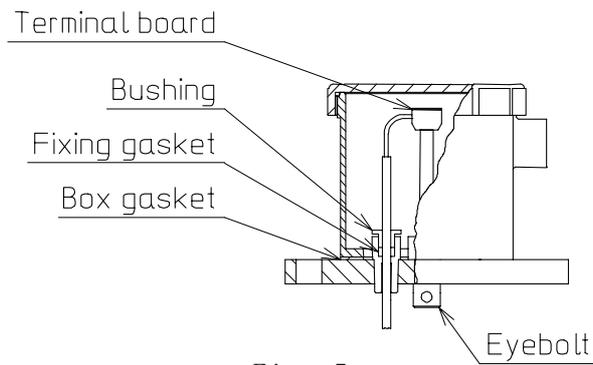


Fig. 5

4.3 Component Names of Relay Unit

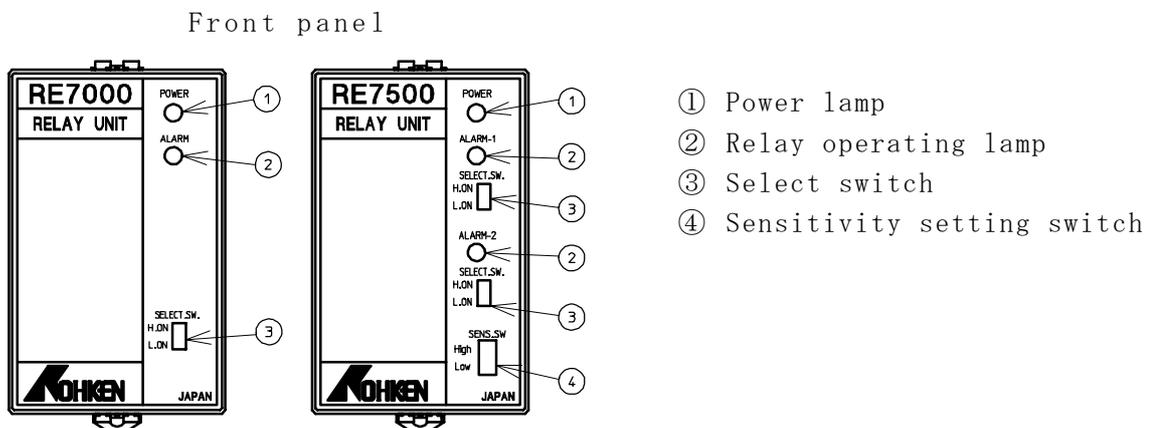


Fig. 6

5. INSTALLATION

5.1 Unpacking

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.

NOTE 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 Sensor Assembly

Usually, the cable type electrode level sensor is set specified length before shipment. When not specified, each parts are packed separately. When that case, assemble this sensor to required measuring length.

5.2.1 Assembly procedure

Proceed as follows:

- (1) Tie one end of rope to the eyebolt on flange, and another end of rope to the anchor weight in accordance with tank depth.
- (2) Remove the terminal box cover.
- (3) Pass the cables into terminal box through the boss located on flange.
- (4) Put the fixing gasket and the bushing into the cable. (Refer to Fig. 7)

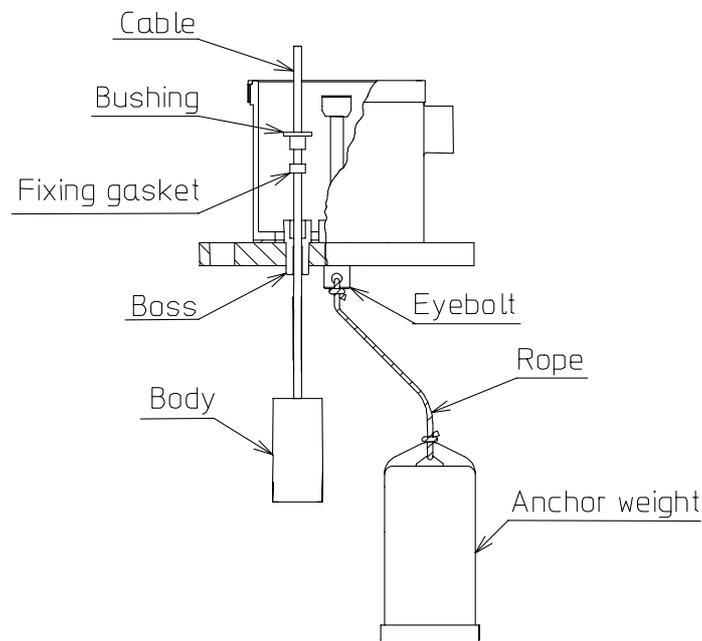


Fig. 7

- (5) Set the detector with the clip in accordance with required measuring length.
(Refer Fig. 8 and Fig. 9)
- (6) Bundle the cable and rope with band. (Refer to Fig. 9)

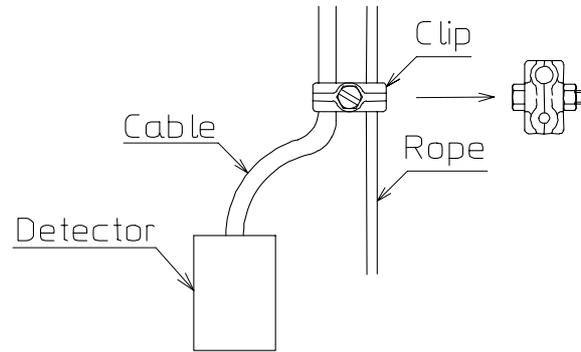


Fig. 8

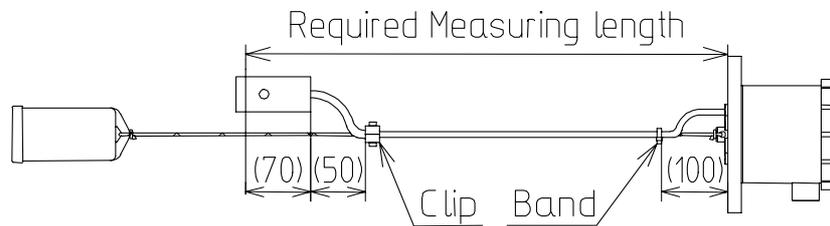


Fig. 9

NOTE : Setting length must be kept following Fig. 10.

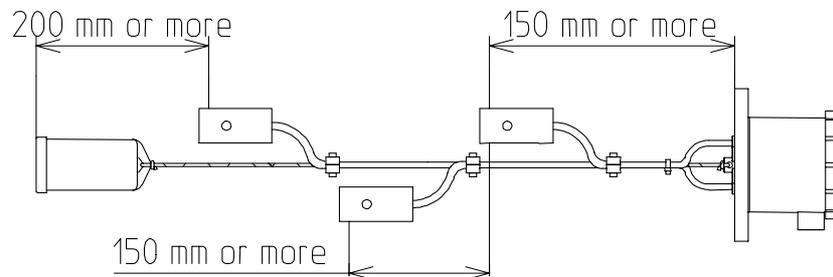


Fig. 10

- (7) Tighten the bushing securely.
- (8) Cut the useless part of cables.
- (9) Install solderless lugs fitted M3.5 screw to end of lead wire.

NOTE : The outline of diameter of solderless lugs must be used 7 mm or less.

- (10) Connect each lead wires to the terminals. (Refer to Fig. 11)
- (11) Reinstall the terminal box cover.

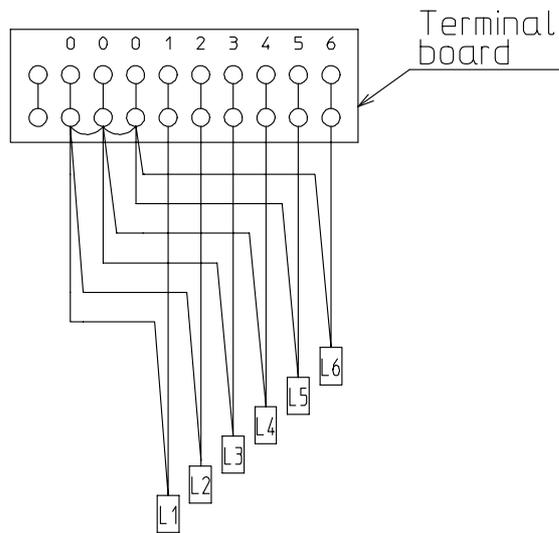


Fig. 11

5.3 Installation Location

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

- (1) Provide ample space for maintenance/inspection.
- (2) Low relative humidity and no exposure to moisture.
- (3) No corrosive gases. (Such as NH_3 , SO_2 , Cl_2 etc)
- (4) No excessive vibration.

5.4 Installation of Sensor

This Level sensor installation method depend on flange type. (See Fig. 12)

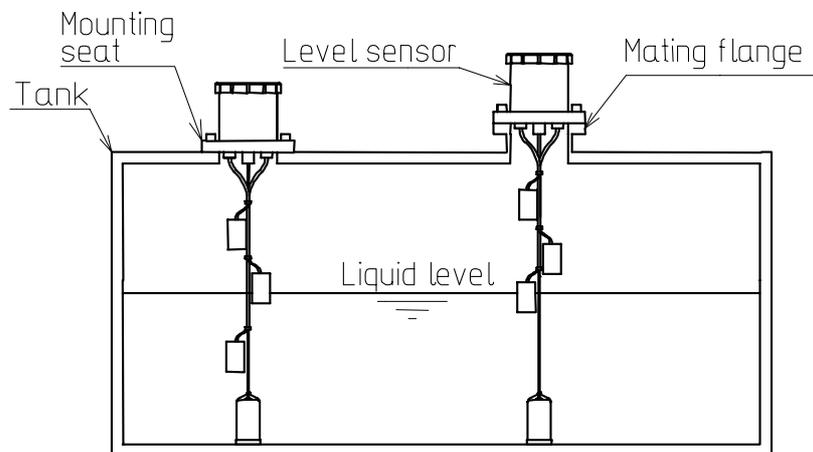


Fig. 12

NOTE the following points:

- (1) This sensor should be installed in an area where the ambient temperature range is -20 to 50 $^{\circ}\text{C}$.

⚠ CAUTION

Install a sun shield over the terminal box if temperature is high. Provide appropriate means to guard against moisture if temperature is low. Otherwise, the sensor may be damage.

- (2) Keep this sensor out of the direct flow of liquid. Failure to do this may cause the sensor to break. If necessary, install a baffle in order to divert the liquids.
- (3) Locate the sensor keep away from inlets or outlets, where excessive turbulence may exist. If necessary, install a stilling tube in order to divert the liquids.



CAUTION

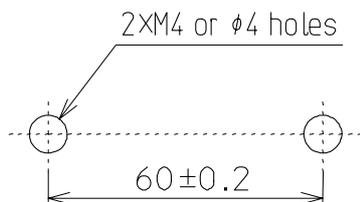
During installation, care must be taken not to damage cables with sharp object.

5.5 Installation of Relay Unit

This relay unit installation method depend on plug-in type. The socket (Manufacturer: OMRON, Model:11PFA or equivalent) must be prepared to install the relay unit. The socket for relay unit is option.

5.5.1 Installation of Socket

(1) Wall installation



(2) Rail installation

Use the DIN rail (35mm).

6. WIRING

6.1 Cable inlet

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.

6.2 Sensor Wiring

Proceed as follows:

- (1) Remove the terminal box cover.
- (2) Bring the cable into the terminal box.
- (3) Connect the cable to the terminals as shown Fig. 13.
- (4) Make sure that there are no miswiring.
- (5) Reinstall the terminal box cover.
- (6) The cable inlet must be protected the sensor from rain splashing water and so on.

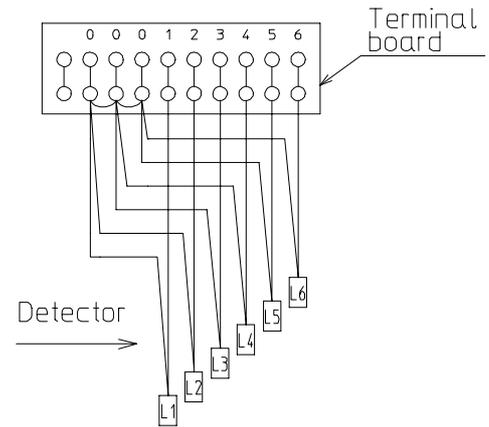
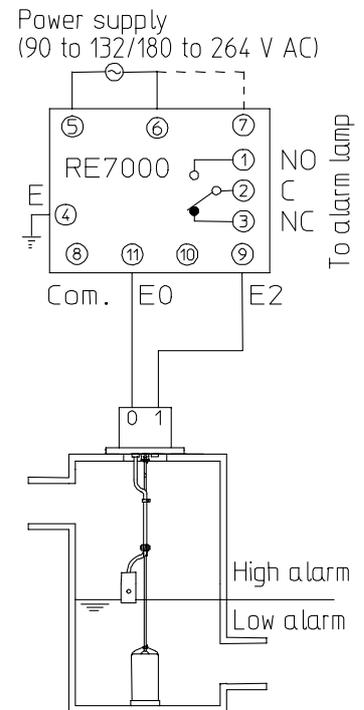


Fig. 13

6.3 Wiring Diagram

6.3.1 Wiring diagram for high or low level alarm (see Fig. 14).

- (1) High level alarm (SELECT. SW.: H. ON side)
 - (a) When the liquid level reaches detecting point, relay energize.
 - (b) When the liquid level falls below detecting point, relay de-energize.
- (2) Low level alarm (SELECT. SW.: L. ON side)
 - (a) When the liquid level falls below detecting point, relay energize.
 - (b) When the liquid level reaches detecting point, relay de-energize.



SELECT.SW.H.ON side :High alarm
 SELECT.SW.L.ON side :Low alarm

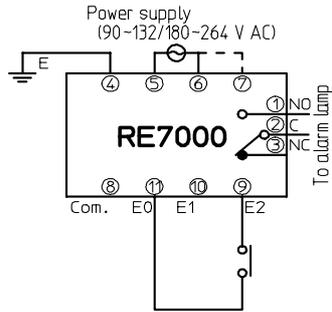
Fig. 14

6.3.4 Model RE relay unit

We recommend the use of our relay unit model RE. It is single level (alarm) and / or dual level (empty/fill control) relay.

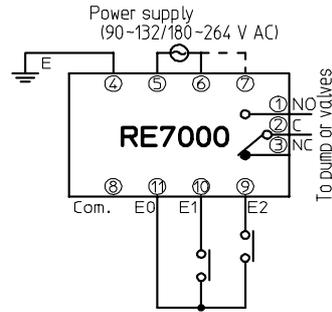
The latching (holding relay) feature allows pumps, valves and other devices to be turned on at one level and off at another. It also contribute to safety since it allows lower voltage and smaller currents to be used with sensor.

· SINGLE LEVEL ALARM



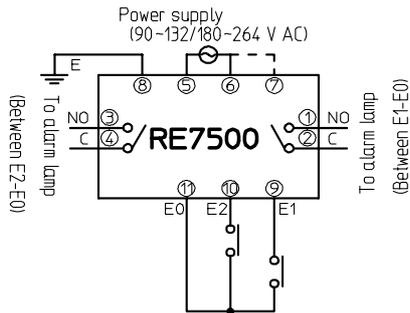
SELECT. SW. H.ON side : High alarm
SELECT. SW. L.ON side : Low alarm

· DUAL LEVEL EMPTY/FILL CONTROL



SELECT. SW. H.ON side : Filling control
SELECT. SW. L.ON side : Emptying control

· SINGLE LEVEL ALARM



SELECT. SW. H.ON side : High alarm
SELECT. SW. L.ON side : Low alarm

Fig. 16

For the relay unit Model RE, refer to Instruction Manual.

NOTE the following points:

- (1) Do not connect the plural relay unit to identical switch. Otherwise, the relay unit may be malfunction.

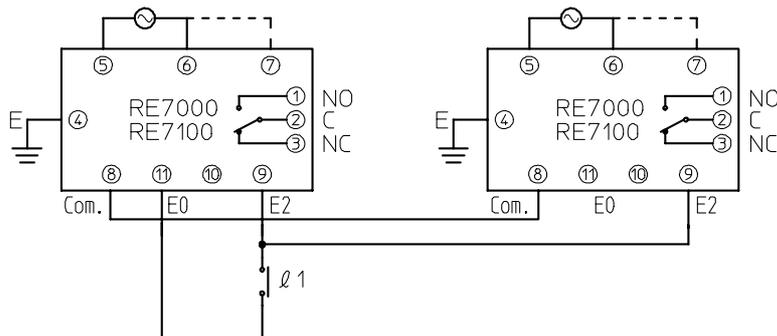


Fig. 17

(2) Power supply must be connected in phase.

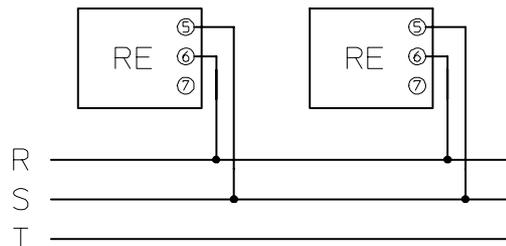


Fig. 18

(3) To avoid malfunction, the wiring distance should be used within specifications. If the wiring distance exceeds specifications, the relay unit may malfunction by stray capacitance between cables or noise.

7. TECHNICAL NOTE

- (1) This relay unit can not detect the level of non-conductive liquids, such as oil, gasoline, and distilled water.
- (2) Inside of level sensor and relay unit shall be kept free from rain, splashing water, liquid, dust, dirt, metallic substances, and any other foreign matter.
- (3) This product must be stored in a dry, warm place where condensation of humidity will not occur.

8. INSPECTION/MAINTENANCE

The following annual servicing tasks should be carried out on the sensor and relay unit.

- (1) Remove the sensor from tank carefully.
- (2) Ensure there is no damage.
- (3) If sediment or other foreign matters are stained between electrodes, clean the electrode in detector.
- (4) Make contact between electrodes, and check the relay unit operation.
- (5) Spare parts should be ordered from NOHKEN Inc. whose address appears on the title page.

9. TROUBLESHOOTING

Use the following chart to troubleshoot a malfunctioning.

Problems	Possible causes	Remedies
Relay unit de-energize	Setting for improper length of detectors	Adjust the proper measuring length
	Miswiring between sensor and relay unit	Ensure the wiring correctly
	Short-circuit between electrodes	Clean electrodes in detector
	Insulation failure	Check the insulation
	Affection by stray capacitance	Re-wire as short as possible
	Loosing terminal screws	Tighten terminal screws
	Affection by deposit or oil film	Clean electrodes in detector
	Install in improper stilling tube	Drill vent holes in the stilling tube
Set for improper select switch (SELECT. SW.) mode of relay unit	Change the select switch mode(H ON/L ON).	
Relay chatter	Loosing terminal screws	Tighten terminal screws
	Miswiring between sensor and relay unit	Ensure the wiring correctly

If above remedies are unsuccessful, ask NOHKEN Inc. to repair and replace.

NOHKEN INC.

HEAD OFFICE : 15-29, Hiroshiba-cho, Suita-city, Osaka 564-0052, Japan.

TEL:06-6386-8141 FAX:06-6386-8140

TOKYO BRANCH OFFICE : 67, Kandasakumagashi, Chiyoda-ku, Tokyo 101-0026, Japan.

TEL:03-5835-3311 FAX:03-5835-3316

NAGOYA OFFICE : 3-10-17, Uchiyama, Chikusa-ku, Nagoya-city, Aichi 464-0075, Japan.

TEL:052-731-5751 FAX:052-731-5780

KYUSHU OFFICE : 14-1, 2-chome, Asano, Kokurakita-ku, Kitakyushu-city, Fukuoka 802-0001, Japan.

TEL:093-521-9830 FAX:093-521-9834