

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

F O R



G U A R D T Y P E L E V E L S E N S O R



M O D E L : F C

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

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.



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.



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.



In case of connecting inductive or lamp load to the product. Provide protective circuit to the load to avoid over voltage and over current. If not provide, the contact may be damaged.



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.

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1. PURPOSE OF USE

The Guard type level sensor is specifically designed to detect the liquid level in tank.

This sensor consists of a float in a protected guard and a heavy-duty hypalon cable. The switch actuation level are easily adjusted due to moving the cable fixing point and changed to contact close or open as level rises due to inverting the float.

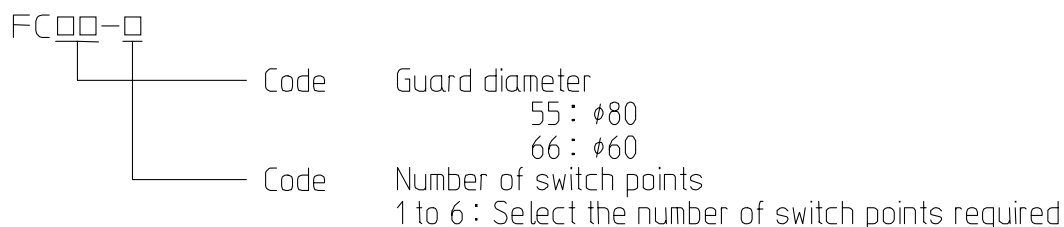
Moreover, this sensor can be used in narrow locations even if where the sensor with rigid stem type will be not installed.

There are two version of model FC. The FC55 series units are larger than the smaller FC66 series.

2. SPECIFICATIONS

2. 1 Model

Standard version



2. 2 Standard specification

2.2.1 Contact ratings (With resistive load)

- a. Max. contact rating : 15 VA 15 W
- b. Max. working current : 1 A AC 1 A DC
- c. Max. working voltage : 264 V AC 200 V DC

2.2.2 Mechanical characteristics

- a. Float withstand pressure : 200 kPa Max.
- b. Allowable impact : 100 m/S²

2.2.3 Operation characteristics

- a. specific gravity : FC55 ; 0.7 Min.
 : FC66 ; 0.95 Min.
- b. Life expectancy : 1 × 10⁶ times or more
 (When the cable is bent 180 degrees.)

2.2.4 Working temperature : -10 to +50 °C

2.2.5 Construction : IP 45

2.2.6 Material

- a. Terminal box : ABS
- b. Flange : PVC
- c. Wetted parts : PVC (Except float and cable)
- d. Float : FC55 ; PVC
 : FC66 ; PP
- e. Cable : CSM

2.2.7 Others

- a. Installation : Flange connection
(JIS 10K 100A or equivalent, proviso 4 holes)
- b. Cable inlet : G 3/4 or equivalent
- c. Standard cable length : 6 m (300 m Max.)

2.3 Outline Drawing

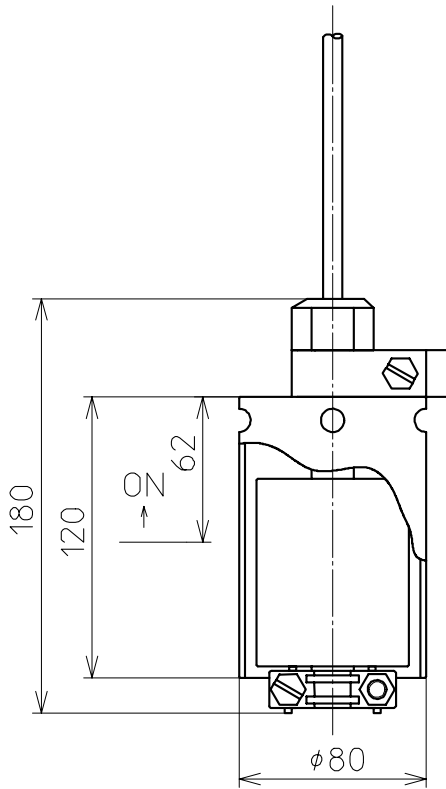


Fig. 1 Model FC-5

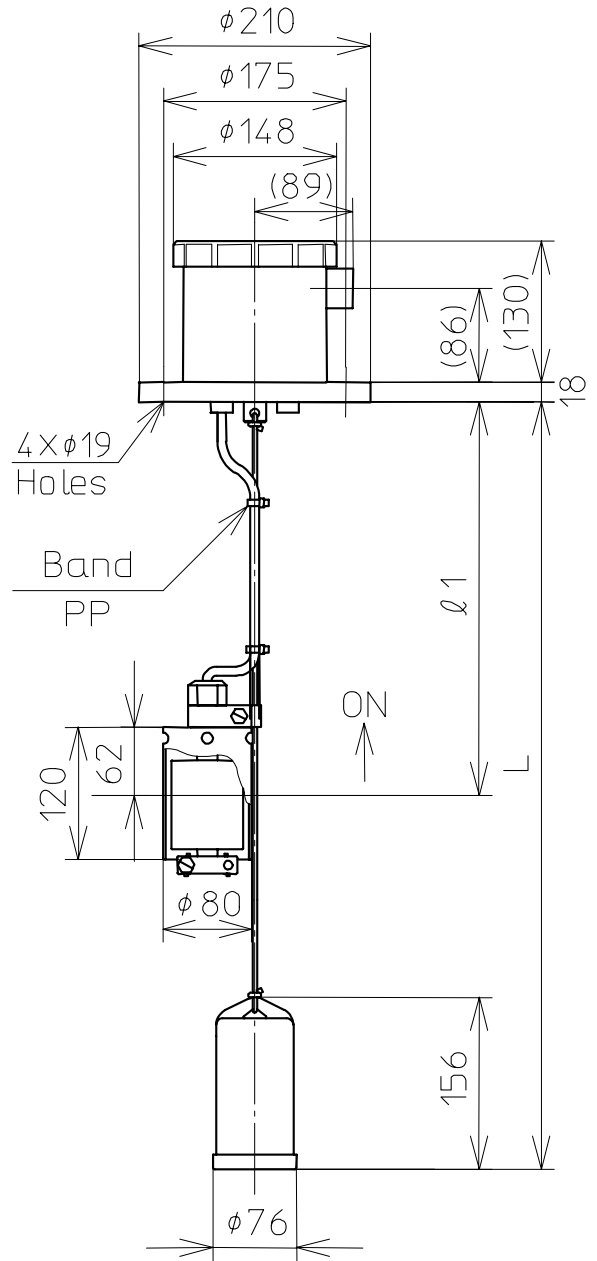


Fig. 2 Model FC55-1

3. PRINCIPLE OF OPERATION

FC series units contain hermetically sealed reed switches in the stem and a permanent magnet in the floats. As the float rises or falls with the level of the liquid, the reed switch is actuated by the magnet in the float.

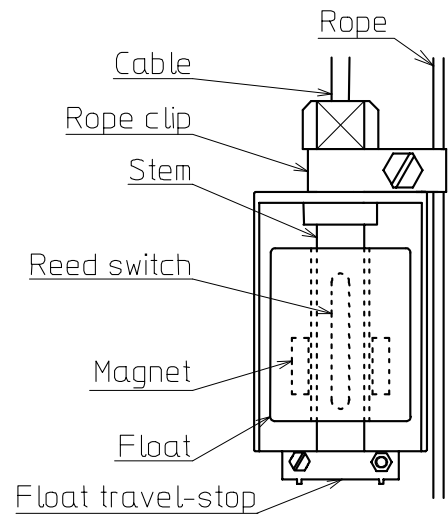


Fig. 3 Construction

4. COMPONENTS NAME

4. 1 External Parts

- ① Terminal box
- ② Flange
- ③ Eyebolt
- ④ Rope clip
- ⑤ Cable
- ⑥ Guard
- ⑦ Rope
- ⑧ Anchor weight
- ⑨ Cable inlet
- ⑩ Float
- ⑪ Float travel-stop

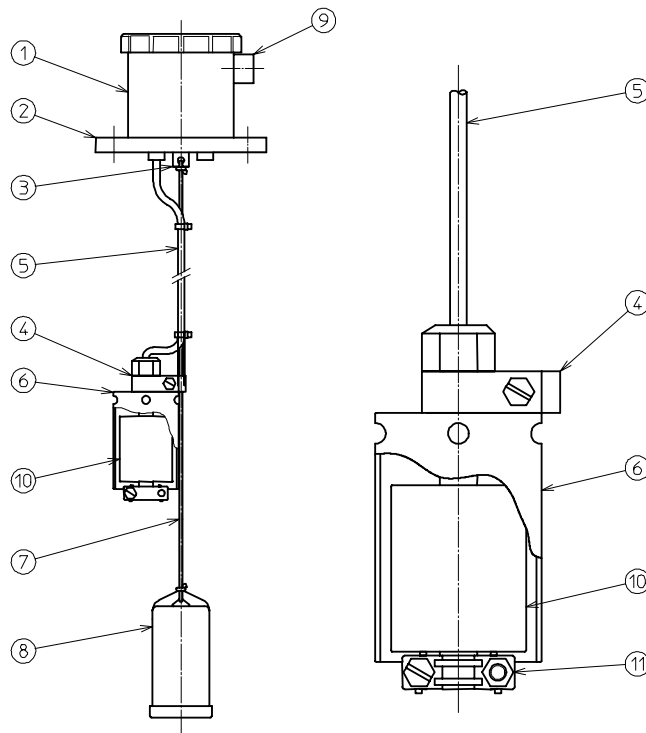


Fig. 4

4. 2 Terminal Box Internal Parts

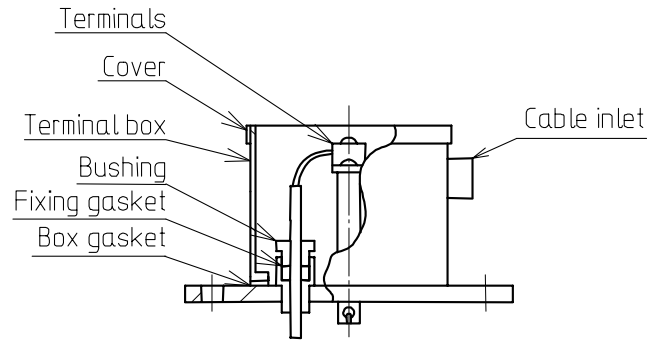


Fig. 5

5. INSTALLATION

5. 1 Unpacking

The Guard Type Level Sensor Model FC series have been thoroughly inspected and carefully packed at the factory to prevent from damage during shipment.

When unpacking, exercise due care not to subject the instrument to mechanical shock.

After unpacking, visually check the instrument exterior for damage.

NOTE the following points ;

- (1) Do not bend and pull the cable extremely during installation.
- (2) Make sure that the Guard Type Level Sensor.

5. 2 Assembly

Usually, the Guard Type Level Sensor is set specified measuring length shipment.

When not specified, each parts are packed severally.

In that case, proceed to assemble as follows.

- (1) Remove the cover (by turning it counter clockwise).
- (2) Fasten one end to the eyebolt on flange and the anchor weight to another end of rope according to depth of the tank.
- (3) Put in the cable into the flange from wetted side, and then put the fixing gasket and the bushing into the cable (Refer to Fig. 6).
- (4) Set the Guard Type Level Sensor on the rope with the rope clip (Refer to Fig. 7).

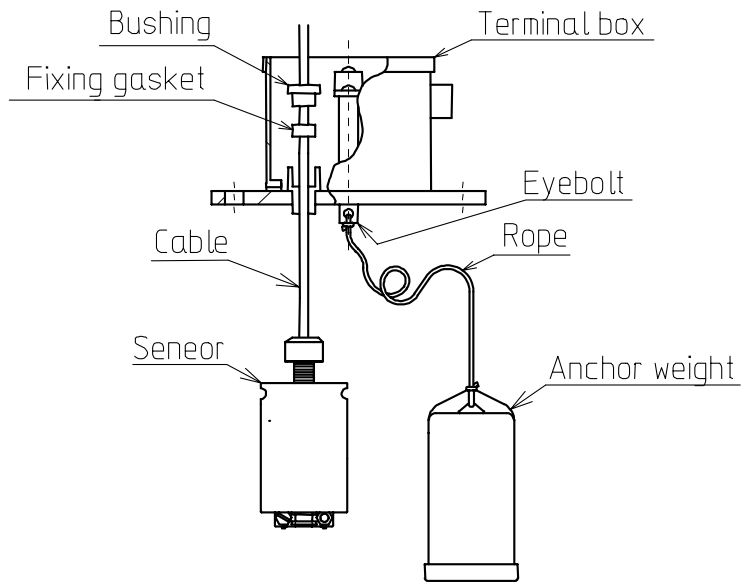


Fig. 6

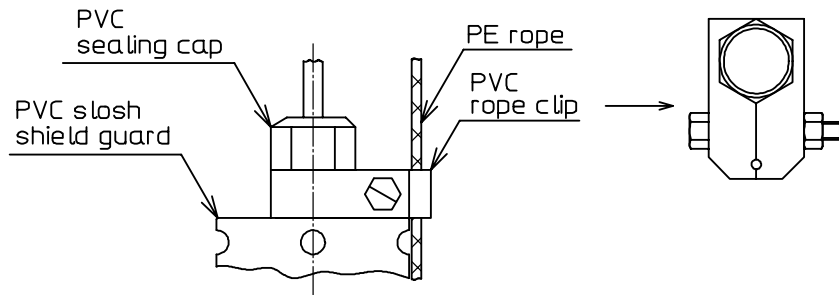


Fig. 7

- (5) The rope clip should be fastened at a location about “a” above an actuation level. See Fig. 8 and Table 1.

For example : FC55

Required actuation level : 500 mm Rising ON

Location of rope clip (bottom surface)

$$= 500 - 62 = 438 \text{ mm}$$

Table 1 Operating point

Model	Operation	a
FC55	Rising ON	62 mm
	Falling ON	
FC66	Rising ON	30 mm
	Falling ON	60 mm

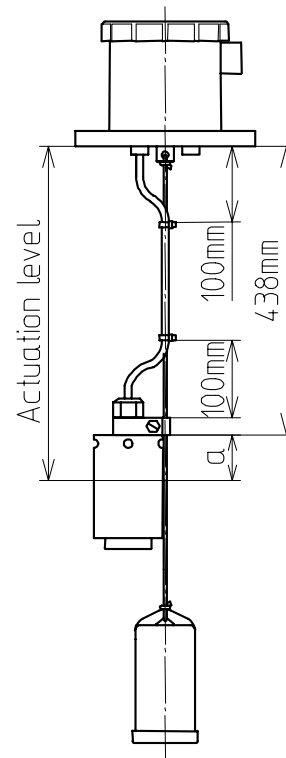


Fig. 8

NOTE

- ① The switch operation, rising ON or falling ON, are easily changed by inverting the float.
In case of FC66, reset the rope clip to match actuation levels.
- ② Keep the following length. (Refer to Fig. 9)
 - From the inner surface of flange to highest actuation level : 200 mm or more
 - Intervals of each actuation levels : 200 mm or more
 - From the lowest actuation level to the bottom of anchor weight : 300 mm or more

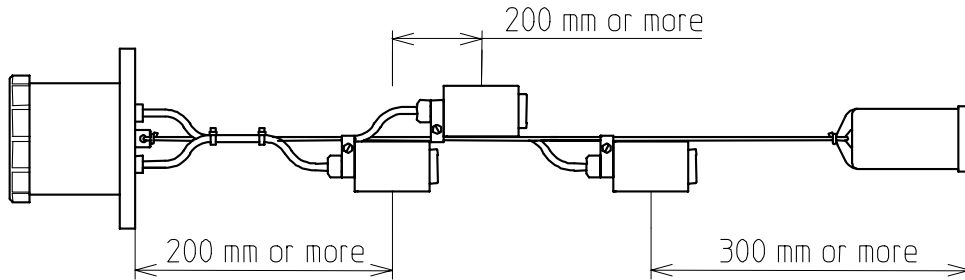


Fig. 9

- (6) Tighten the bushing not to loose and not to move the cable.
- (7) Bundle the cable and the rope with band.
- (8) Cut the useless part of cable and install compression terminals fitted to M3.5 screws to the end of lead wires.
- (9) Connect each lead wires to the terminals.
Ex. In case of 3 points version, wiring is only 11, 12, and 13.

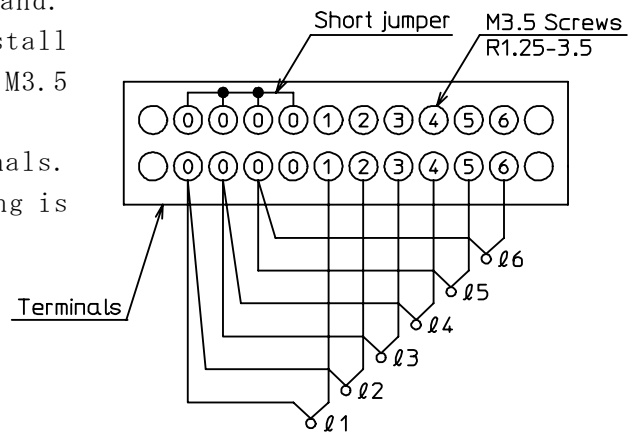


Fig. 10 Internal wiring

5. 3 Installation Location

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

- (1) Sensor should be installed in an area where the ambient temperature is $-10\text{ }^{\circ}\text{C}$ to $60\text{ }^{\circ}\text{C}$.
- (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) Provide ample space for maintenance / inspection.

5. 4 Installation

This sensor is provided with JIS 10K 100A or another specified flange. Normally, it is installed on the mating flange which is compatible on the top of the tank.

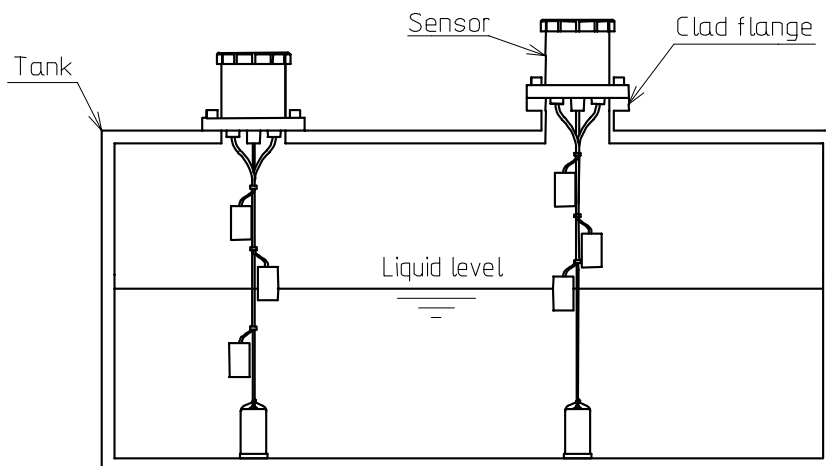


Fig. 11

NOTE the following points :

- (1) This sensor should be located away from strong magnetic fields such as those produced by motors or solenoid valves.
- (2) Please use caution during installation. Hitting the switch or pulling the cable may break the reed switches.

6. WIRING

Fig. 12 denote wiring of internal terminal box.

NOTE the following points:

- (1) Install compression terminals fitted to M3.5 screw to the inner conductor.

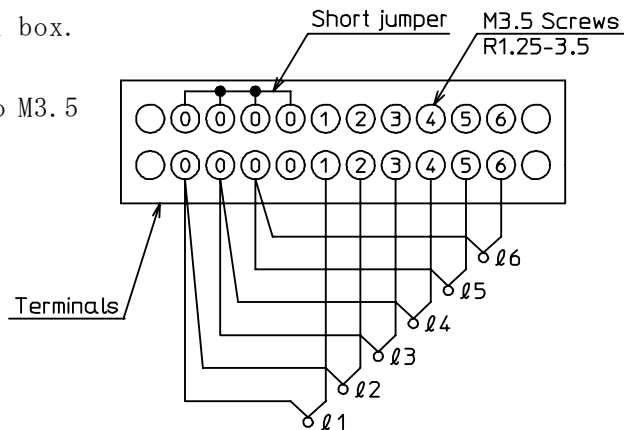


Fig. 12

(2) 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.

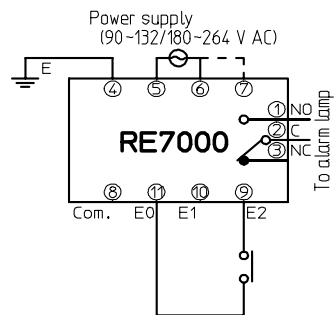
(3) Reed switches are not designed for the direct starting of pumps, valves and alarms. They are susceptible to damage from electric surges.

Do not exceed the contact ratings.

Contacts should be wired to relays or similar devices.

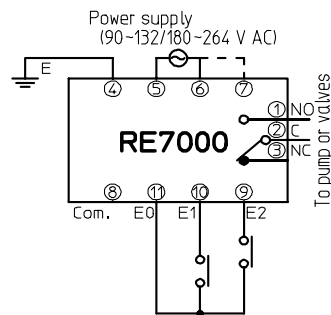
(4) We recommend the use of our relay unit model RE. It is single level (alarm) and / or dual level (empty/fill control) relay. The latching (holding relay) feature allows pumps, valves and other devices to be turned on at one level and off at another. It also contribute to safety since it allows lower voltage and smaller currents to be used with sensor.

· SINGLE LEVEL ALARM



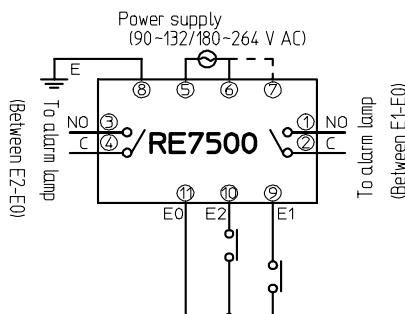
SELECT. SW. H.ON side : High alarm
SELECT. SW. L.ON side : Low alarm

· 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. 13

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.

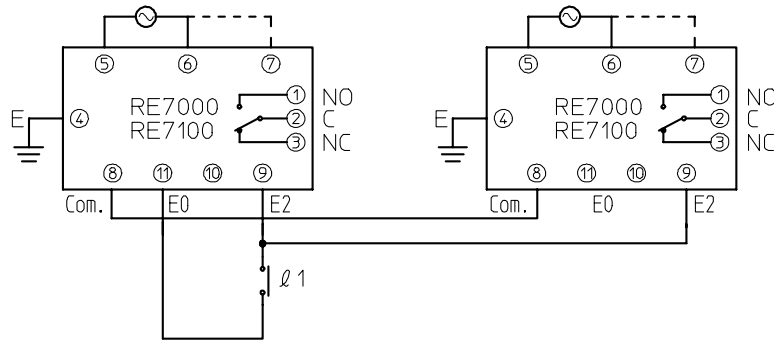


Fig. 14

7. TECHNICAL NOTES

- (1) This sensor should be located away from excessive wave as inlet and outlet, or strong magnetic fields such as those produced by motors or solenoid valves.
- (2) Tighten terminals not to cause a trouble of miswiring.
- (3) Keep inside terminal box free from liquid, dust, metallic matter and so on.
- (4) Do not throw the sensor, and do not drop that during installation.
- (5) Do not damage or splice the cable.

8. MAINTENANCE / INSPECTION

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

- (1) Visually check the sensor exterior for damage.
- (2) If sediment or other foreign matter are stained on wetted parts of sensor, keep wetted parts of sensor clean.
- (3) Connect ohmmeter or electronic buzzer to terminals, check the sensor actuation corresponding to float operation.

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

9. TROUBLE SHOOTING

▲ CAUTION

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

Table 2

Problems	Possible causes	Remedies
Liquids exceeds the actuating level, switch de-activated	Miswiring	Wire correctly
	Improper the direction of float	Change the direction of float
	Sensor is not fixed on the rope	Fix the rope clip
	Float is damage	Replace the sensor ※1
	Reed switch is damage	Replace the sensor ※2
	Set for improper length of the sensor	Adjust the length
	Insulation failure	Check the insulation
Liquids does not exceed the actuating level, switch de-activated	Miswiring	Wire correctly
	Improper the direction of float	Change the direction of float
	Reed switch is damage	Replace the sensor
Switch chatter	Improper position of rope clip	Adjust position of the rope clip
	Loose cables (especially latching / holding sensors)	Tighten connections
	Miswiring between sensor and relay	Wire correctly

※1 There are some liquids that are not compatible with PVC or PP.

In assessing corrosion, key factors are concentration, liquid's temperature and the amount of time the sensor immersed. Please check them.

※2 Reed switch was damaged over current by miswiring, re-wire correctly.

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

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