NOHKEN

TS02－0181Ⓐ

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

F O R

CABLE SUSPENDED FLOAT SENSOR

MODEL : F T

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 shallbe followed
	Indicates instructed matter. The explanation with this mark shallbe 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.

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.

TABLE OF CONTENTS

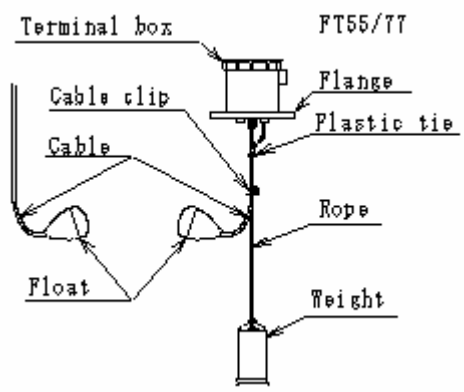
1. PURPOSE OF USE

The cable suspended float sensor, model FT, is designed for point level detection of liquids. It is ideal for pump control or liquid level alarms. Do not use in any other applications. In case of a part of sensor, model are FT-2A/2B or FT-3A/3B.

2. DESCRIPTION

2. 1 PRODUCTS DESCRIPTION

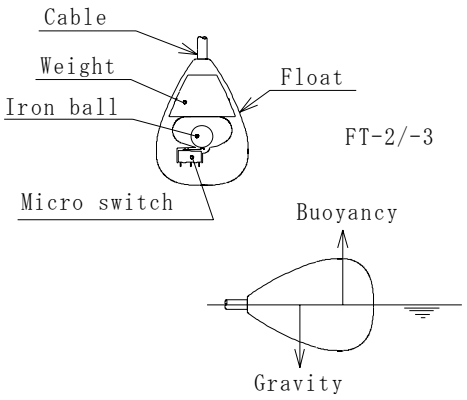
The FT should hang freely in the tank or pit from the top. The tilting action of the suspended float (*) results in the built-in microswitch (*) opening and closing.



2. 2 PRINCIPLE OF OPERATION

The float of the FT is conical in shape and is weighted on one side. But the center of buoyancy is at the side of the float face. By separating the center of buoyancy and gravity, the float follows the movement of the level. As the liquid level rises and falls, the weight which is installed in the float at predetermined angle causes the inclination of the float to change.(FT-2/-3)

This tilting action in a fixed direction makes the microswitch opening and closing. Principle of operation for the FT55/77 is same, but those floats are non-submersible designs at SG=1.0.



*: See section 10 for the word explanation.

3. SPECIFICATIONS

3．1 MODEL NUMBERING

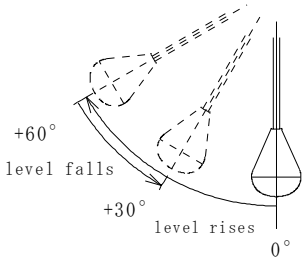
①　②

FT□□－□

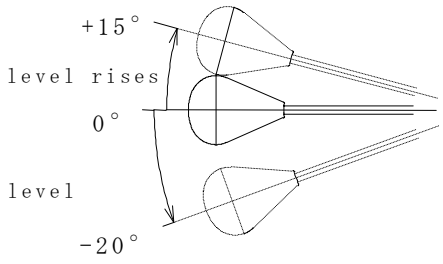
①	Contact capacity and levels
-2A	Small capacity, Single float, Make
-2B	Small capacity, Single float, Break
-3A	High capacity, Single float, Make
-3B	High capacity, Single float, Break
55	Small capacity, Multiple floats
77	High capacity, Multiple floats

②	Number of float
1～6	For model 55 and 77 only

3．2 STANDARD

Model		FT-2A/2B	FT-3A/3B
Electrical	Max. working current	0.1A AC, 0.1A DC	3A AC, 3A DC
	Max. working voltage	125V AC, 30V DC	250V AC, 30V DC
	Min. Resistive load	5mW, but Min. 5V DC	0.8W, but Min. 5V DC
Mechanical	Float withstand Pressure	200 kPa Max.	
	Allowable impact	500 m/s^2	
Operational	Actuation Angle	(*)30～60° (For vertical direction.) 	
	Specific Gravity	Min. 0.9	
	Life Expectancy	Greater than 2×10^5 operations at 180° bent of the cable.	
Operating Temperature		-10℃ to +50℃	
Material	Float	ABS(Sealing material:NBR,Epoxy)	
	Cable	Mild PVC sheathed	

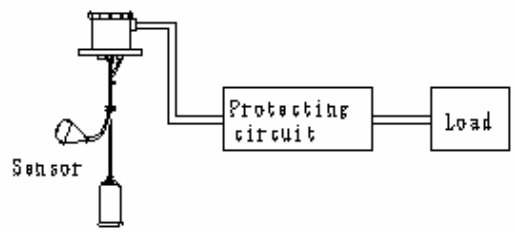
Max. resistive load.

Model		FT55	FT77
Electrical	Max. working current	0.1A AC, 0.1A DC	3A AC, 3A DC
	Max. working voltage	125V AC, 30V DC	250V AC, 30V DC
	Min. Resistive load	5mW, but Min. 5V DC	0.8W, but Min. 5V DC
Mechanical	Float withstand Pressure	200 kPa Max.	
	Allowable impact	500 m/ s^2	
Operational	Actuation Angle	+15～-20° (For horizontal direction.) 	
	Specific Gravity	Min. 0.8	
	Life Expectancy	Greater than 2×10^5 operations at 180° bent of the cable.	
Operating Temperature		-10℃ to +50℃	
Construction		IP45	
Material	Terminal Box	ABS	
	Flange	PVC	
	Float	ABS(Sealing material:NBR,Epoxy)	
	Cable	Mild PVC sheathed	
	Weight	PVC (Build in : Carbon steel)	
	Rope	PE	
	Cable Clip	PVC	
Installation		Flange (JIS 10K 100A or equivalent, 4 holes)	
Cable inlet		G 3/4 or equivalent	

Max. resistive load.

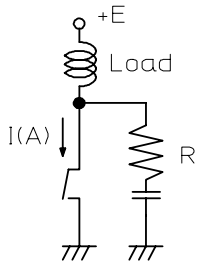
⚠ CAUTION

If the relay is inductive load or lamp load, connect protecting circuit to the load side to avoid overvoltage or overcurrent. If exceeds maximum value, the reed switch shall be damaged.



3. 3 PROTECT CIRCUIT OF SWITCH CONTACT

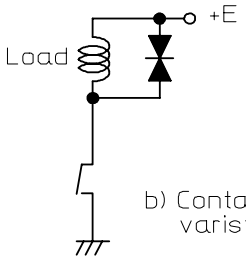
(1) Recommend to set protective circuit against damage of switch contact and a short life by back electromotive voltage in case of using inductive load such as relay, solenoid, and transformer. Refer to the diagram as below.



a) Contact protection by condenser(C) and resister(R).

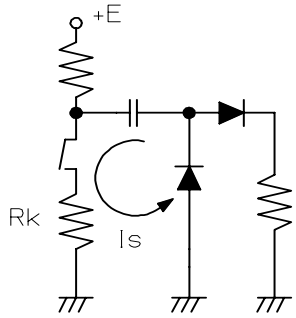
$$C = \frac{I^2}{10} \quad [\mu F]$$

$$R = \frac{E}{10\,I^{(I+E/50)}} \quad [\Omega]$$



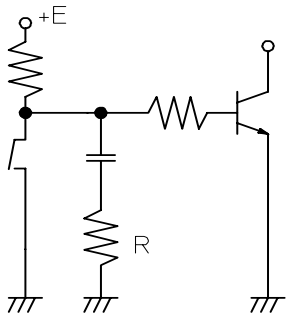
b) Contact protection by varistor.

(2) Recommend to set protective circuit against damage of switch contact and a short life, if the no-load current is flowing by charge and discharge from circuit including condenser to switch. Refer to the diagram as below.



a) Contact protection by current-limiting resister(Rk).

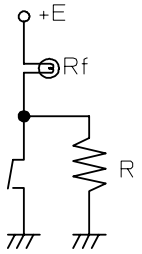
$$Is = \frac{\text{Voltage charged C}}{Rk\ [\Omega]} < 0.1\,(A)$$



b) Contact protection by resister(R).

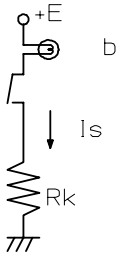
R=50~500Ω

(3) Necessary to set protective circuit to connect with load like a lamp (electric filament lamp and etc.) due to the flowing inrush current right after turned ON. Refer to the diagram as below.



a) Contact protection by resister(R).

$$R < \frac{\text{Filament resister (Rf)}}{3} \quad [\Omega]$$

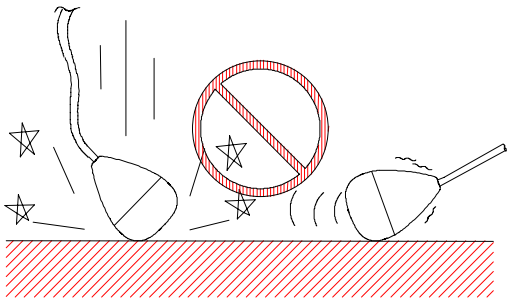
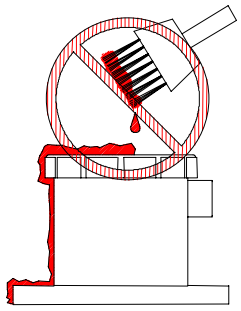
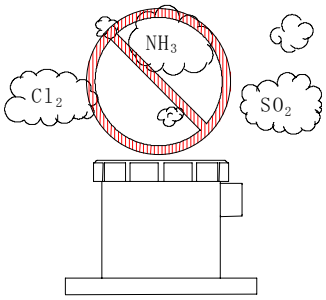
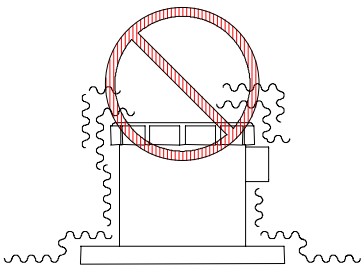


b) Contact protection by current-limiting resister(Rk).

Is < 0.5A~1A

4. HANDLING NOTES

Cautions shall be taken as follows. If not, the sensor may cause malfunction.

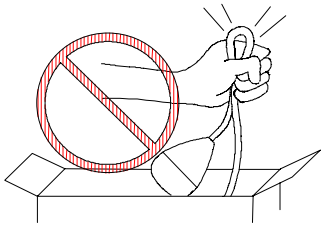
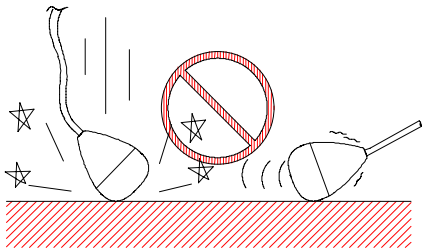
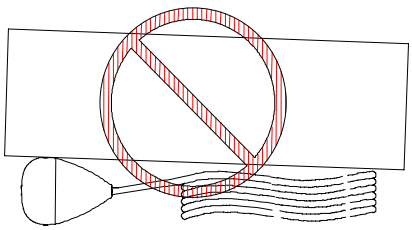
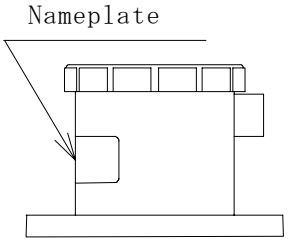
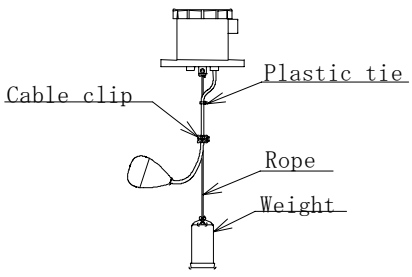
4．1 Avoid physical shock. Dropping, throwing or bumping shall damage the sensor.	
4．2 When painting the sensor, do not paint on the nameplate to keep the indication of serial number for future reference when ordering parts.	
4．3 Do not use or store in a corrosive atmosphere (NH_3, SO_2, Cl_2, etc.). Internal circuit shall be corroded and conduction failure may occur.	
4．4 Locate away from severe vibration. The sensor shall be installed and stored in a vibration-free environment. Provide appropriate means to guard if inevitable.	

5. INSTALLATION

⚠ WARNING

Do not use in hazardous locations. The FT is not an explosion-proof.

5.1 UNPACKING

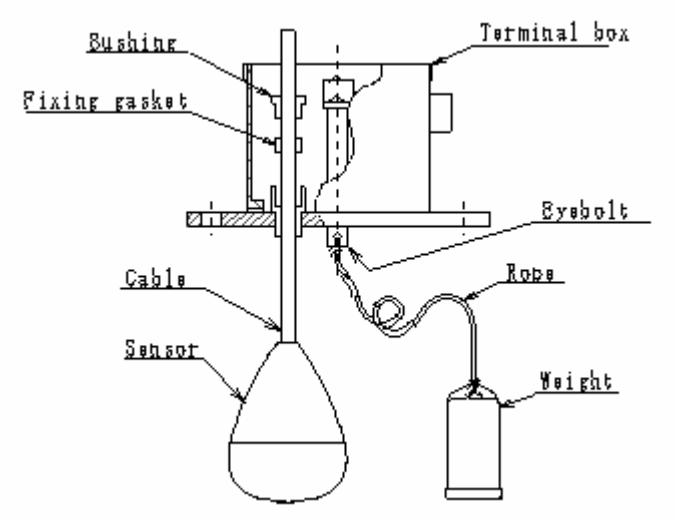
5.1.1 Take out the sensor from the package carefully. Do not bend the cable strongly. Otherwise, the cable may be broken.	
5.1.2 Avoid physical shock. Dropping, throwing or bumping shall damage the sensor.	
5.1.3 Do not put things on the sensor. Otherwise the cable may be nicked.	
5.1.4 Model numbering of the sensor is indicated on the nameplate. Check it to be sure as required.	
5.1.5 Check the sensor exterior for damage and the contents of packing slip. If there is, or any part such as cable clip, rope, weight or plastic tie is missing or wrong, contact Nohken.	

5. 2 ASSEMBLY OF MULTIPLE FLOATS

Usually, the multiple switch points are set specified measuring length before shipment. When not specified, each parts are packed severally. Proceed as follows:

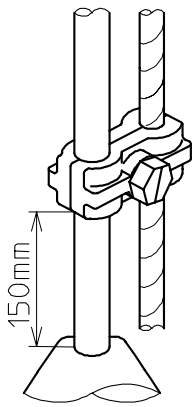
(1) Fasten one end rope to the eyebolt on the flange and another end of rope to the anchor weight according to depth of the tank. Make sure the cable can not with draw from the anchor weight.

(2) Insert the cable into the flange from wetted side, and then put the fixing gasket and the bushing into the cable.

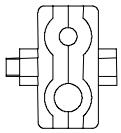


(3) Set the float on the rope according to specified measuring length with the cable clip. See page 6.

⚠ CAUTION

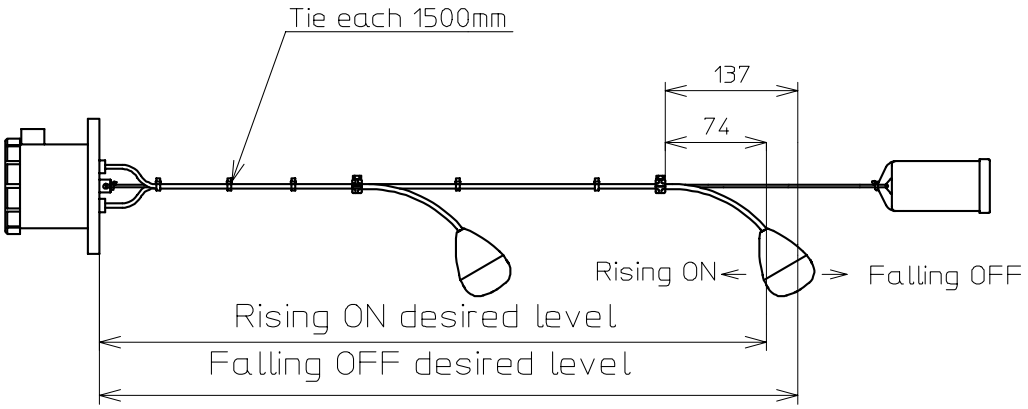


Observe the cable length from the clip on the rope to the float - 150mm is normal. If the length is less than 150mm, the wires in the cable may be weak or broken.

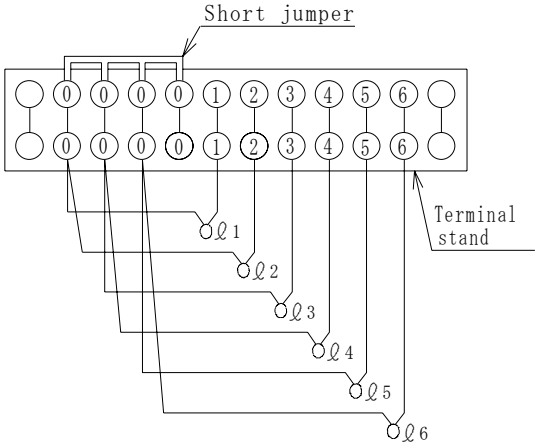


(4) Tighten the bushing not to be loose and/or move the cable.

(5) Bundle the cable and the rope with plastic ties.

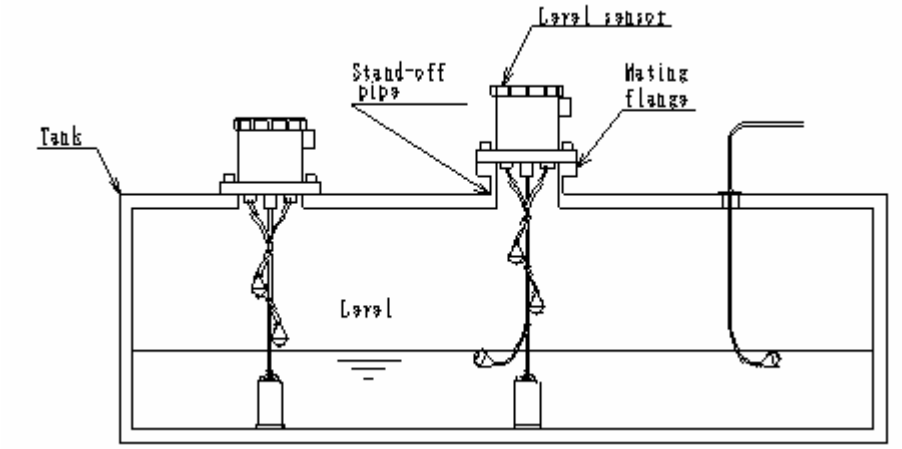


(6) Cut the useless part of cable and connect lead wires to the terminals. In case of triple level detection, wire ℓ 1, ℓ 2 and ℓ 3 are as shown on the right.

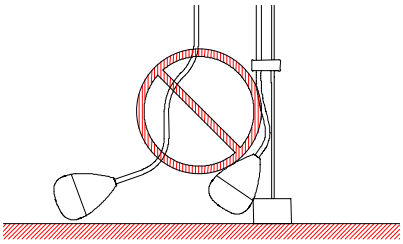
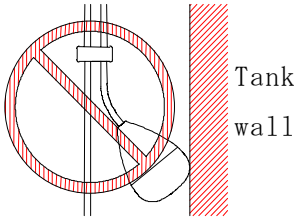


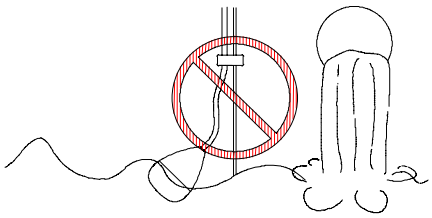
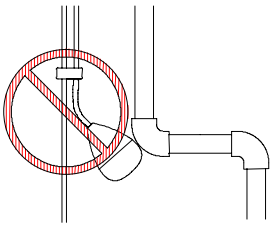
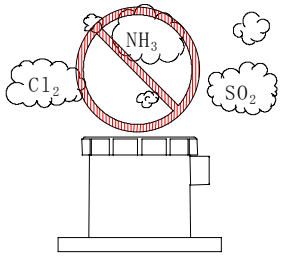
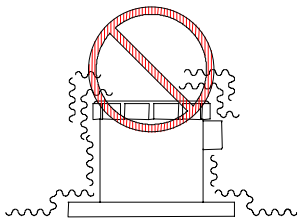
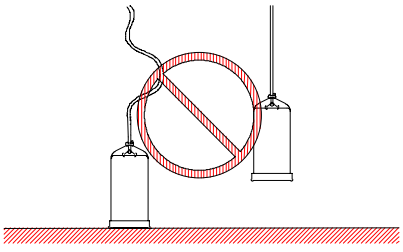
5. 3 MOUNTING

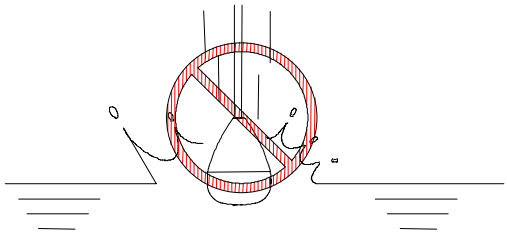
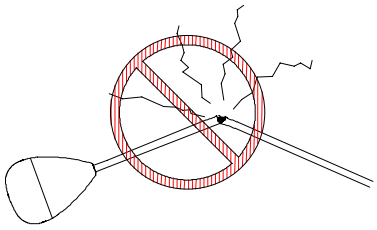
Locate the float at the position where the liquid level variation will actually make contact with it. The FT requires a gasket, bolts and fittings for installation. Provide the compatible mating flange on tank top. Install the sensor with a suitable gasket and conforming bolts by using appropriate tool. Single float use is also available suspend the sensor and from freely in the container from the top and fasten it. Please do not overtighten.



Keep an ample space for maintenance and inspection. Make sure the sensor is installed in an area which meets the following conditions.

5.3.1 When hanging the sensor, the float should be free-moving. Keep it out of contacting with the weight or the tank bottom.	
5.3.2 Keep a certain free surface area to operate without interference. Locate away from the tank wall.	

5.3.3 Do not locate near agitator, liquid inlets/outlets or inlet of pump. The float operation will be unstable.	
5.3.4 Keep a certain free surface area to operate without interference. Locate away from pipe, cable or chain of pump, and so on.	
5.3.5 Do not use or store in a corrosive atmosphere (NH_3, SO_2, Cl_2, etc.). Internal circuit shall be corroded and conduction failure may occur.	
5.3.6 Do not use or store where vibration occurs. If inevitable, provide appropriate means to prevent from vibration.	
5.3.7 The weight must be mounted at the bottom of tank to prevent from streaming or swinging. Tighten the rope to avoid slack.	

5.3.8 When immersing the sensor in liquid, drop it slowly and carefully. Hitting the float may break the sensor.	
5.3.9 Do not nick the cable or bend it extremely.	

6. WIRING

6. 1 PREPARATION

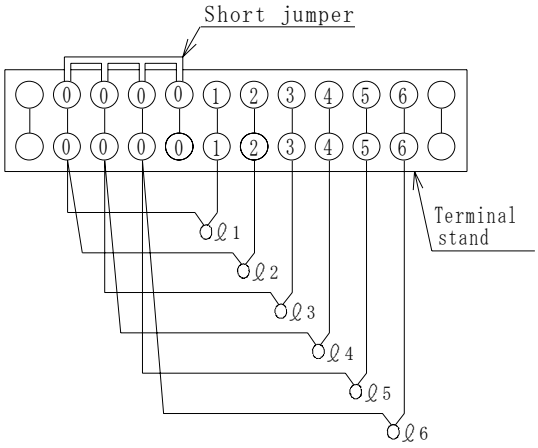
Turn off the power supply.

⚠ WARNING

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

6. 2 INTERNAL WIRING

Indicating connection of the terminal stand and the cable from the float.



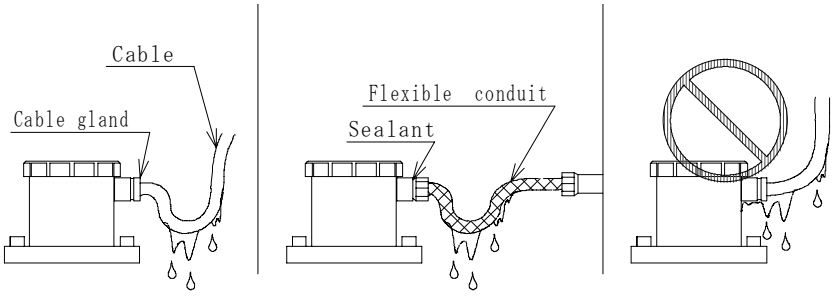
6. 3 CABLE INLET

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.

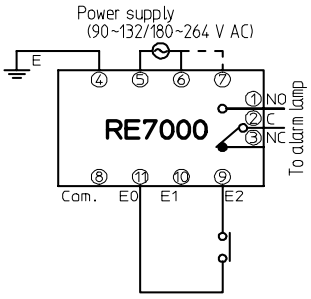


6. 4 MODEL RE RELAY UNIT

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

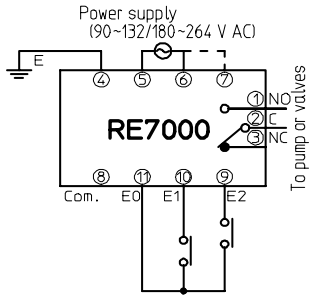
The latching (holding relay) feature allows pumps, valves and other devices to be turned on at one level and off at another. It also contribute to safety since it allows lower voltage and smaller currents to be used with sensor.

·SINGLE LEVEL ALARM



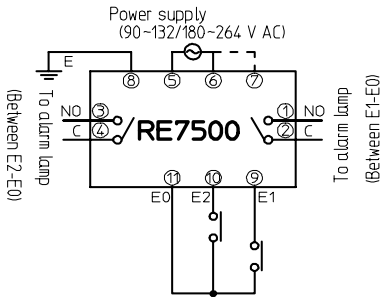
SELECT. SW. H. ON side : High alarm
SELECT. SW. L. ON side : Low alarm

·DUAL LEVEL EMPTY/FILL CONTROL



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

·SINGLE LEVEL ALARM



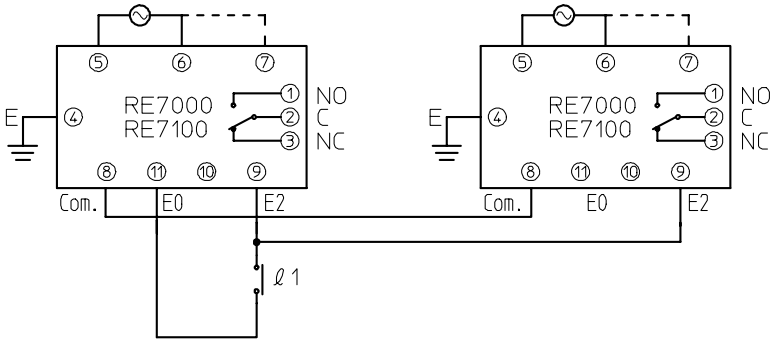
SELECT. SW. H. ON side : High alarm
SELECT. SW. L. ON side : Low alarm

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

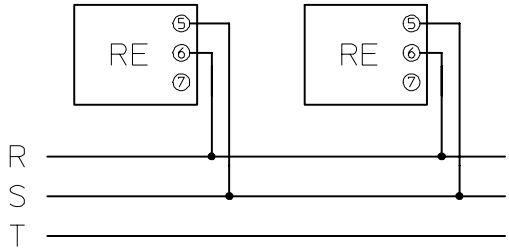
NOTE the following points:

(1) When you use solderless terminals, we recommend to use R1 25-3.5 . Outside diameter of it should be less than 7mm.

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



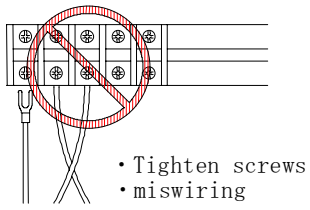
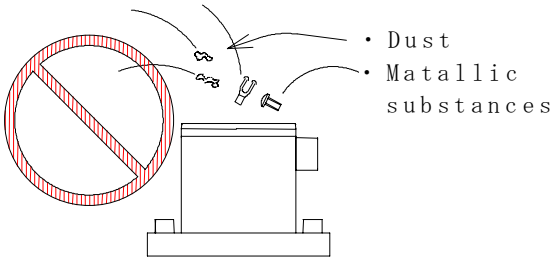
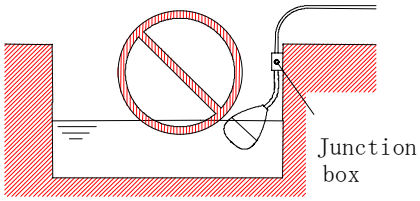
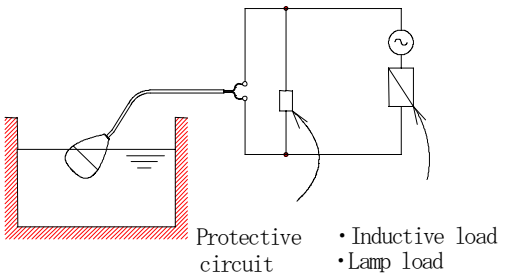
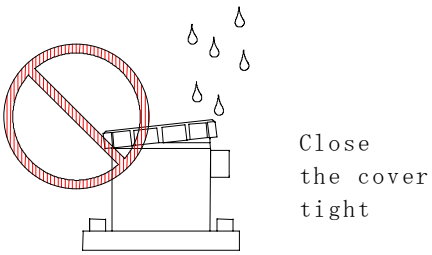
(3) Power supply must be connected in phase.



(4) To avoid malfunction, the wiring distance should be used within specifications. If the wring distance exceed specifications, the relay unit may be malfunction by stray cpacitance between cables or noise.

⚠ NOTE

In case of overload, wire to miniature relays, suppressors or similar devices as a protective circuit.
In case of low-load, electrical contact failure may occur. We recommend to use our model RE7000 relay unit with low-contact type model FT-2A/2B or FT55 See the RE7000's instruction manual.

6.4.1 Make sure there is no miswiring. Tighten screws on the terminal.	
6.4.2 Locate the housing away from splashing water, moisture, dirt, dust and metallic substances.	
6.4.3 When installing the FT-2A/2B or T-3A/3B without housing, wiring shall be done outside of the avoid personal injury or leakage current, do not locate the junction box near drop, splash or vapor of water.	
6.4.4 Microswitch may be damaged by the direct starting of lump loads and inductive loads such as relay, motor, contactor, solenoid valve and so on. Wire to diode, suppressor or similar device as a protective circuit.	
6.4.5 The housing cover shall be tightened to protect the housing from rain, splashing water, dust, and so on.	

6. 5 OPERATIONAL CHECK

Make sure the sensor operation in the test stage. If the operation is unsuccessful, check wiring or ask Nohken.

7. MAINTENANCE & INSPECTION

Remove the sensor from the tank before maintenance. See section 4. Keep the ample space for maintenance.

7. 1 REMOVING

7.1.1 Turn off the power supply.

> **⚠ WARNING**
>
> To avoid personal injury, the power supply shall be always turned off while wiring.

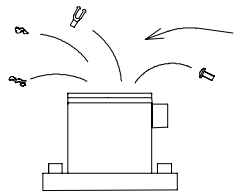
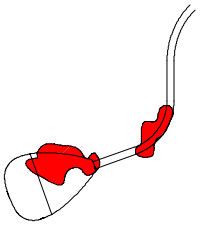
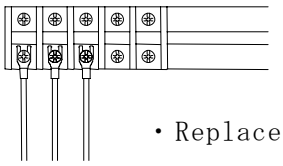
7.1.2 Remove the housing cover. Disconnect all wires and the flexible conduit.

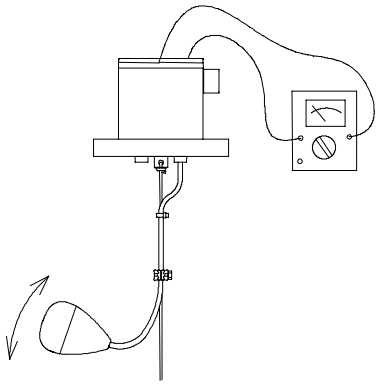
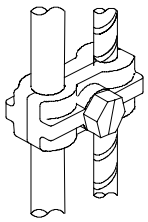
7.1.3 Unscrew the fixing bolts and remove the sensor carefully from the tank.

7.1.4 Put the sensor on the flat and ample space.

7. 2 MAINTENANCE & INSPECTION

Inspect the sensor semi-annually or annually. Since inspection intervals varies with applications and process conditions such as pressure, temperature and so on, we recommend you to inspect periodically.

7.2.1 Clean contaminant or sticky material build-up on the float. 7.2.2 Check for and replace damaged/ collapsed parts. 7.2.3 Clean dirt, dust and moisture from housing.	 Clean dust and metallic substances Clean sticky material build up 
7.2.4 Check for and replace the corroded terminal and corroded wires. 7.2.5 Tighten loose terminals.	 ・Replace if corroded. ・Tighten screws.

7.2.6 Connect an ohmmeter to lead wires or terminals. Check the sensor operation by moving floats. Reading value is ∞ at break (open) and 1Ω or less at make (close). If correct value is not read, see section 9.	
7.2.7 Tighten loose cable clips.	

7．3　RE－INSTALLATION

See 5.3, MOUNTING

7．4　WIRING

See 6, WIRING.

7．5　REPLACEMENT　PARTS　&　CYCLE

Replace to our special-purpose parts if the following symptoms occur. Since the FT-2A/2B and the FT-3A/3B outwardly looks much the same, check the model number and specifications carefully.

Uint and float of the FT55/77 multiple sensor are designed as a matched set.

FT-2A/-2Band FT-3A/-3B are manufactured as a single submersible sensor.

DO NOT mix floats of FT55/77 and others for any reason.

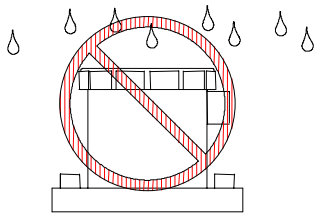
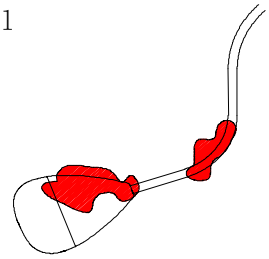
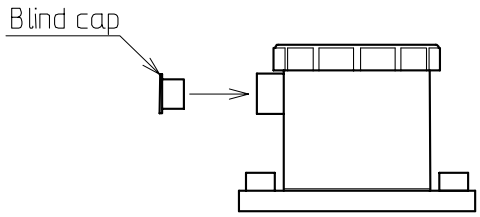
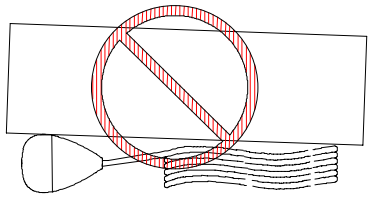
Parts Name	Replacement Cycle
Terminals	When it is corroded.
Bushing Gasket Rope Cable clip Weight Float	When it is damaged or corroded.

8. STORING

The sensor shall be stored under the following conditions when it is not used for a long time:

8．1 Environmental conditions are as follows:

- The storing temperature range is -10℃ to +50℃.
- Relative humidity is 85% Max.
- No corrosive gases (such as NH３, S０４, Ｃｌ２, etc.).
- Locate away from condensation, dust and foreign matters.
- Vibration is low.

8．2 Locate the sensor away from rain and splashing water.	
8．3 Clean deposit or sticky material build-up on the float. Otherwise, the float operation will be affected after solidifying.	Clean sticky material build up 
8．4 Tighten the housing cover . Do not remove the blind cap from the cable inlet to protect from dust or moisture.	
8．5 Do not put things on the sensor. It shall damage the float or nick the cable.	

REFERENCE

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

9. TROUBLESHOOTING

9.1 NO CONTACT OUTPUT WITH LEVEL CHANGE

- Check for miswiring or loose wiring. ⇒ Wire correctly. See section 6.
- Cable is broken or stiffened. ⇒ Replace the sensor. Check the chemical compatibility and replace to the proper material if necessary. ※ NOTE
- Float is collapsed, dissolved, swelled or damaged. ⇒ Replace the sensor. Check the chemical compatibility and replace to the proper material if necessary.

※ NOTE

- Microswitch is broken. ⇒ Replace it and check the load. Provide the protective circuit if necessary. See section 3.
- Electrical contact is at fault due to low-load. ⇒ Change the sensor to the FT-2. See section 3
- Float is touching the tank wall or another. ⇒ Install in good location.
- Sediments or other foreign matters on float. ⇒ Clean it.

9.2 CONTACT ALWAYS OUTPUTS WITHOUT LEVEL CHANGE

- Miswiring or short-circuited wiring. ⇒ Wire correctly. See section 6.
- Cable is broken or stiffened. ⇒ Replace the float. Check the chemical compatibility and replace to the proper material if necessary. ※ NOTE
- Microswitch is broken. ⇒ Replace it and check the load. Provide the protective circuit if necessary. See section 3.
- Float is stuck to the tank wall or another. ⇒ Install in good location.

9.3 CONTACT OUTPUTS AT UNDESIRED POSITION

- Check for improper setting position or length of float and cable.

9.4 SWITCH CHATTER

- Check for turbulence. Use baffle or stilling well or connect the time-delay relay.
- Check for loose wiring. Tighten terminals.

NOTE

The ABS covered float and mild PVC-jacketed cable are compatible with a wide range of liquids. However, there are some liquids that are not effected by these materials.

- Aromatics (benzene, toluene, xylene) may cause to dissolve ABS.
- Esters and ketones may cause to swelling ABS.

- Oils, especially vegetable oils and fats, tends to absorb the plasticizer of mild PVC-jacketed cable. Consequently the cable stiffens. As the duration of immersion and temperature increases, the flexibility decreases. Besides, the sensor is effected by some chemicals such as Hydrochloric acid, Sodium Hydroxide, Sulfuric acid, etc.

10. GLOSSARY

Cable clip : To fix the sensor at desired actuation levels by fastening cable and rope together through it's holes.

Float (FT-2/-3) : Floating body. The float of the FT is submerged in water (SG=1.0). But it afloats with liquid level due to its own turning moment.

Float (FT55/77) : The floats of model FT55/77 are non-submersible designs at SG=1.0.

Microswitch: Miniature switch which consists of a precisely spaced snap-action mechanism with a prescribed force.

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