

INSTRUCTION MANUAL
FOR

MAGNETOSTRICTIVE LEVEL MEASUREMENT
(Intrinsically Safe Construction)

MODEL : MS 6 0 0


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Issued May, 25, 2000


NOHKEN INC.

IMPORTANT INFORMATION

- A. This manual describes the installation, operation, adjustment and maintenance of model MS MAGNETOSTRICTIVE LEVEL MEASUREMENT. Read and understand this manual before installation. After reading, save to refer when you need.
- B. Specifications are subject to change without any obligation on the part of the manufacturer.
- C. This manual specifies standard specifications of this product. Some specifications may be different from your product if you order the custom-made product.
- D. A variety of specifications are available to meet your process conditions, such as installation conditions, chemical compatibility, and so on. We are glad to offer suggestions to assist your decision.
- E. If you have any questions or comments for the contents of this manual, ask Nohken's sales office.
- F. Nohken Inc. pursues a policy of continuing improvement in design and performance of this product. We will supply the alternative parts or complete new products required to repair or replacement.
- G. Signal words in this manual means as follows:

G-a  W A R N I N G

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

G-b  C A U T I O N

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

G-c N O T E

Indicates exceptional cases and attention for handling of products.

G-d R E F E R E N C E

Indicates technical valuable suggestions, which is unrelated to the hazard.


G-e  Indicates prohibition.

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1. WARRANTY & DISCLAIMER

- A. Nohken Inc. warrants this product against defects in design, material and workmanship for a period of one (1) year from the date of original factory shipment.
- B. If defects occurs during the above-mentioned warranty period, Nohken will, at its option, replace or recondition the product without charge. This shall constitute the exclusive remedy for breach of warranty.
- C. Nohken Inc. makes no warranty with respect to:
 - C-a Failure not to comply with instructions of this manual.
 - C-b Failure or damage due to improper installation, wiring, operation, maintenance, inspection and storing.
 - C-c Product which has been in any way repaired, altered or tampered with by others.
 - C-d Product repaired or modified by using undesignated parts, subassemblies and materials.
 - C-e Direct incidental or consequential damages or losses or expenses resulting from any defective product or the use of any product.
 - C-f Inevitable accident such as acts of God, force majeure, radioactive contamination and so on.

THIS WARRANTY IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

2. PURPOSE OF USE

The MS series is designed for level detection of liquids such as water, oil, chemicals, solvents, and so on. It is used for continuous process control and precise inventory control.

3. INTRODUCTION

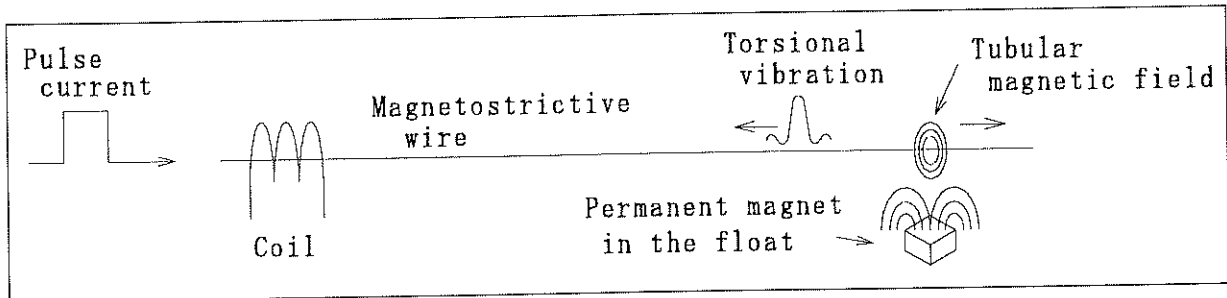
3. 1 Description

The MS continuous level measuring system is constructed from the sensor, Model MS600, and the remote transmitter, Model MS6000 to measure the liquid level in the container. The sensor is mounted onto the container by the mounting flange(*) or mounting Plug(*). As the float(*) rises or falls on the stem(*), continuous electrical signal, 4-20mA DC, is transmitted in proportional to the liquid level.

(*): See section 13 on page 25 for the word explanation.

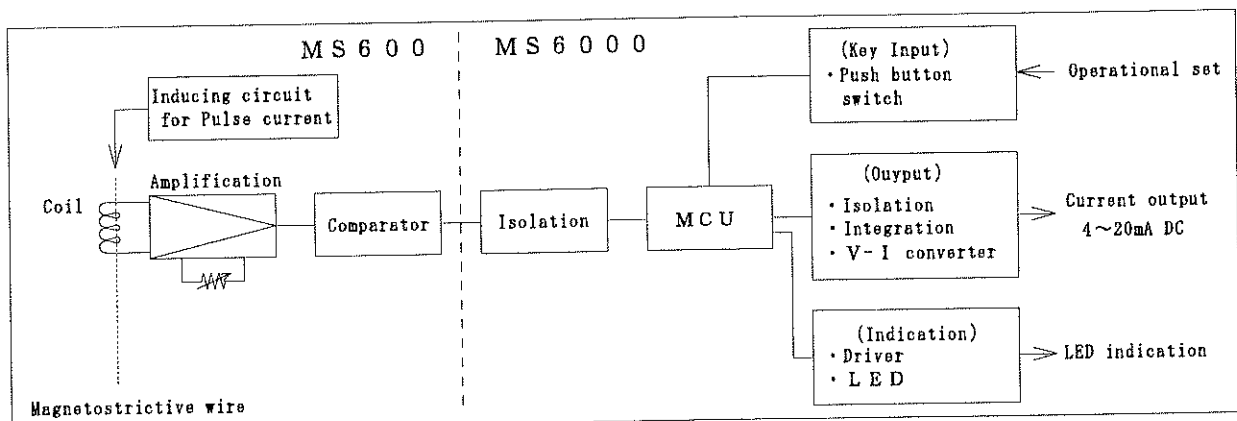
3.2 Principle of Operation

The MS consists of a magnetostrictive wire(*) in the stem and a permanent magnet(*) inside the float. Once a pulse current is induced from the end of the magnetostrictive wire, a tubular magnetic field emanates. As the float travels, torsional vibration is launched by the interaction between the float magnetic field and the magnetostrictive wire. This is so-called Wiedeman effect. The float position is measured by measuring the lapse of time from the launching of the torsional vibration to the arrival to the pick-up.



Component Diagram

3.3 Block Diagram



Block Diagram

(*): See section 13 on page 25 for the word explanation.

4. SPECIFICATIONS

4.1 Model Numbering

4.1.1 Model Name of the Sensor

MS 6 0 0 □

MODEL	MATERIALS
S	304 Stainless Steel, Float travel stop(*) or Float 316 Stainless Steel, Stopper screw 316L Stainless Steel
V	PVC

6 : Intrinsically Safe Construction

4.1.2 Model Name of the Transmitter MS 6 0 0 0

4.2 Standard Specifications

4.2.1 Specifications of the Sensor

MODEL		MS 6 0 0 S	MS 6 0 0 V	
OPERATION CHARACTERISTICS	Specific Gravity	0.55 or more	0.75 or more ※1	
	Separated Length ※2	500 m Max.		
ELECTRICAL CHARACTERISTICS	Power Source	Specially for MS6000(Transmitter)		
	Output Signal	Specially for MS6000(Transmitter)		
MECHANICAL CHARACTERISTICS	Pressure	500 kPa	200 kPa	
ENVIRONMENT	Working Temperature	Wetted Parts	-5 ~ +60 °C	
		Housing	-5 ~ +50 °C	
	Working Humidity	5 ~ 95 %RH		
CONSTRUCTION		IP 65		
PHYSICAL	Materials	Wetted Parts	Section 4.1.1	
		Housing	Aluminum die-casting(ADC 12)	
	Dimensions	Flange	JIS 5K 50A	Equivalent JIS 5k 80A
		Stem	φ13.8 mm	φ22.0 mm
		Float	φ49×H50 mm	φ65×H80 mm
	Withstand Pressure	2 MPa		
	Connecting Cable ※3	3C-2V		
Mass ※4	Approx. 3.4 kg	Approx. 3.2 kg		

※1 Volume resistivity should be under $10^9 \Omega \text{cm}$ (Electric conductivity should be over 10^{-7} s/m).

※2 With the use of co-axial cable 3C-2V

※3 Connecting cable : Customer arrangement

※4 With length of L = 1000 mm

(*): See section 13 on page 25 for the word explanation.

4.2.2 Specifications of the Transmitter

MODEL			MS 6 0 0 0
OPERATION CHARACTERISTICS	Accuracy	MS600S	±1 mm (Measuring length ≤ 1000 mm) ±0.1 %F.S.(Measuring length > 1000 mm)
		MS600V	±2 mm (Measuring length ≤ 1000 mm) ±0.2 %F.S.(Measuring length > 1000 mm)
ELECTRICAL CHARACTERISTICS	Power Supply		100~120 V or 200~240 V AC, 50/60 Hz
	Output Signal		4 ~ 20 mA DC (Resistive Load 600 Ω and under)
	Power Consumption		Approx. 5.5 VA
	Withstand Voltage		1500 V AC one minute (Between earth terminal and power terminal)
	Insulation Resistance		500 V DC more than 100MΩ (Between earth terminal and power terminal)
ENVIRONMENT	Working Temperature		-5 ~ +50 °C
	Working Humidity		5 ~ 95 %RH
CONSTRUCTION			IP 20
PHYSICAL	Materials	Case	SPC
		Surface panel	Aluminum
	Dimensions		H187×W278×D77 mm
	Mass		Approx. 2 kg
	Mounting		4-φ6 Holes (167 mm × 240 mm)

4. 3 Specifications of explosion-proof approval

4.3.1 Model: MS600S or MS600V for the sensor

MS6000 for the transmitter

4.3.2 Construction: Intrinsically safe

4.3.3 Applicable gas and vapor classification: Exia II CT5

4.3.4 Approval type number: No. C14130

5. HANDLING NOTES

Since this product is approved as intrinsically-safe construction by combination of the sensor and the transmitter, following shall be observed when handling. Otherwise, explosion with flammable gas or vapor may occur.

5. 1 Handling Notes of Explosion-proof

5.1.1 This product is approved by the combination of the sensor and the transmitter.

Thus, the sensor can be installed in hazardous locations containing the gas atmospheres which the MS is certified to be explosion-proof in.

However, the transmitter shall be installed in non-hazardous locations only.

Since it is indoor use, install in the drip-proof enclosure, more than IP20.

5.1.2 Use the sensor where operation temperature in the container shall be +60°C maximum for the MS600S (Stainless steel), and be +50°C maximum for the MS600V (PVC).

5.1.3 Use a co-axial cable (recommendation: 3C-2V) between the sensor and the transmitter. Take appropriate measures to protect the cable from damage.

5.1.4 For co-axial cable, the wiring inductance shall be 1.0 mH maximum, and capacitance 0.1 μ F maximum.

5.1.5 To keep the superior level of safety against electromagnetic induction or static induction, run in a grounded metal conduit with no other cabling.

5.1.6 Locate the power line or the signal line away when cabling between the sensor and the transmitter. Do not lay with them when more than one unit is used.

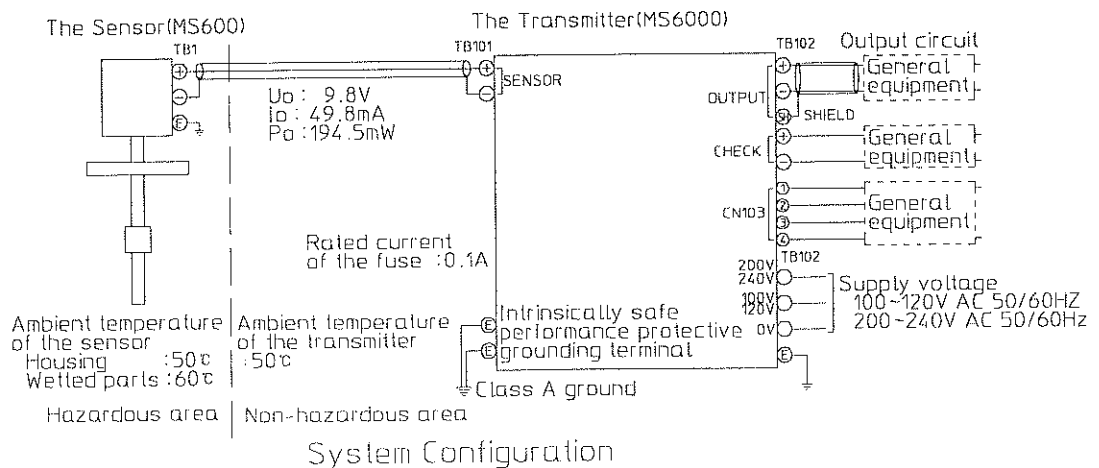
5.1.7 The Intrinsically safe performance protective grounding terminal of the transmitter, JIS Class A ground (max. ground resistance is 10 Ω) shall always be provided in isolation. Other grounding terminals (terminal symbol "E") of the transmitter and the sensor, shall be strictly grounded.

5.1.8 Any modification or disassembly on site is strictly prohibited. Do not open the panel nor modify the sensor and/or the transmitter.

5.1.9 Volume resistivity should be under 10⁹ Ω cm (Electric conductivity should be over 10⁻⁷ s/m) to avoid any accident by static electricity when using the MS600V (PVC).

5.1.10 When cleaning or inspecting the MS600V (PVC), wipe the PVC stem with the wetted cloth to avoid electric shock.

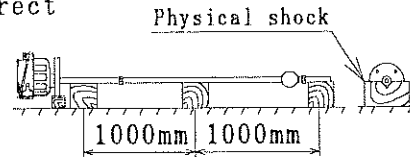
5.1.11 The allowable safety voltage shall be 250V AC/DC maximum. Do not apply excessive voltage to prevent the intrinsically-safe circuit.



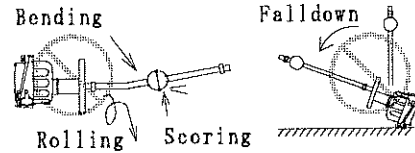
5.2 Handling notes

5.2.1 When keeping in stock the sensor in your inventory, lay the sensor horizontally. Put the wood piece or adequate materials under the sensor to avoid rolling, bending, scoring the sensor. If the stem length is longer than 2000 mm, we highly recommend you to put them 1000 mm each.

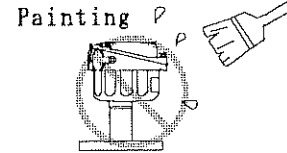
Correct



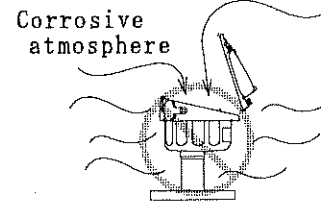
Incorrect



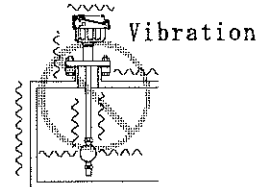
5.2.2 When painting the sensor and/or the transmitter, do not paint on the nameplate to keep the indication of serial number for future reference when ordering parts.



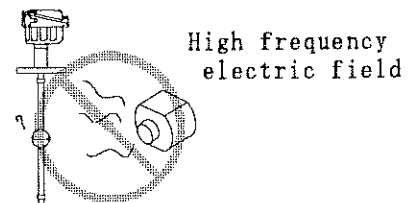
5.2.3 Do not use or store in a corrosive atmosphere. (NH₃, SO₂, Cl₂, etc.) Internal circuit shall be corroded and conduction failure may occur.



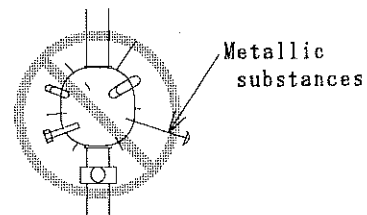
5.2.4 Do not use or store where vibration occurs. If inevitable, provide appropriate means to prevent from vibration.



5.2.5 Locate away from the noise generator such as motors, pump, inverter and so on or high frequency electric field. The sensor may cause malfunction.



5.2.6 Do not use in the liquid which has metallic substances. Otherwise the sensor will cause malfunction.



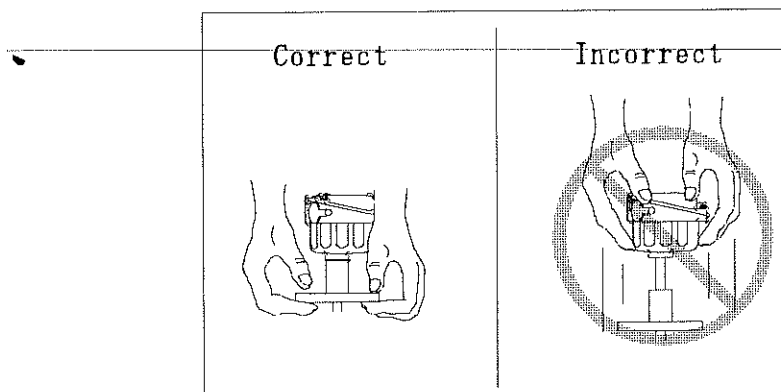
6. INSTALLATION

⚠ CAUTION

This product is approved by the combination of the sensor and the transmitter. Thus, the sensor can be installed in hazardous locations containing the gas atmospheres which the MS is certified to be explosion-proof in. However, the transmitter shall be installed in non-hazardous locations only.

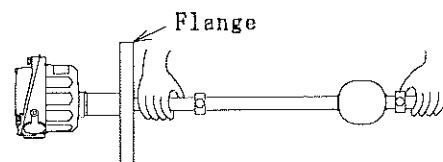
⚠ CAUTION

Turn the mounting plug only when installing. Do not turn the housing. Otherwise, the housing connection to the mounting plug will be broken.

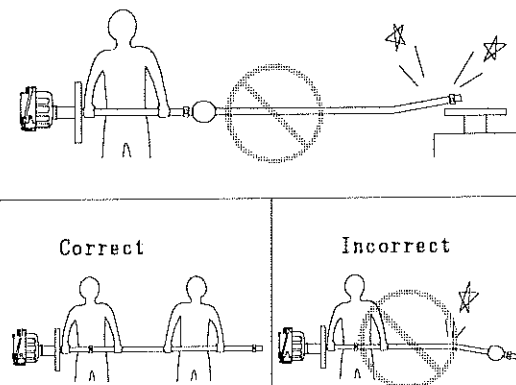


6.1 Sensor Unpacking

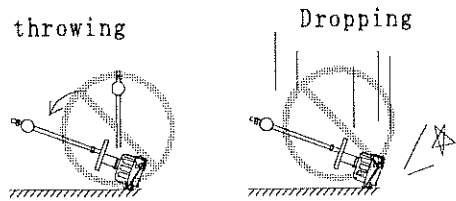
6.1.1 When unpacking, grab the flange or the stem base near by the flange to keep the balance of mass. Otherwise, you will drop the sensor or bend the stem.



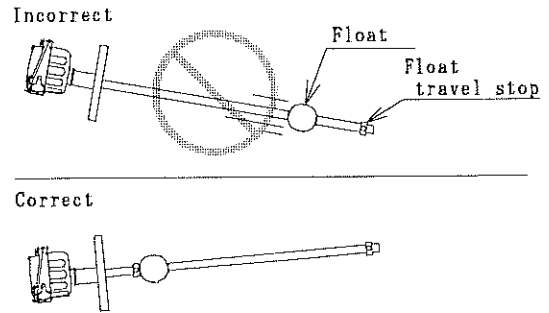
6.1.2 Avoid physical shock for the stem tip or the enclosure. We recommend to handle at least two person for the long stem, more than 1500 mm.



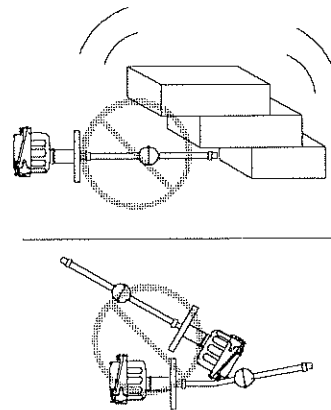
6.1.3 Avoid physical shock. Dropping, throwing or bumping shall damage the sensor.



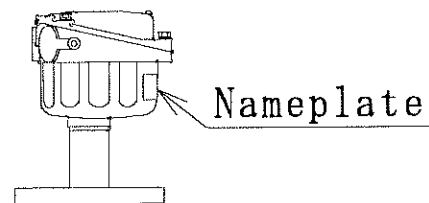
6.1.4 Remove all sealed plastic bags or tapes from the sensor. After removing and tilting the stem, avoid physical shock to the float due to slip on the stem. Otherwise magnetic strength of the float will vary or the float will collapsed.



6.1.5 Do not put on the sensor. It shall damage and deform the sensor.



6.1.6 Make sure that it is the right product you required. Model numbering of the sensor is indicated on the nameplate. If incorrect, ask Nohken or our distributor.

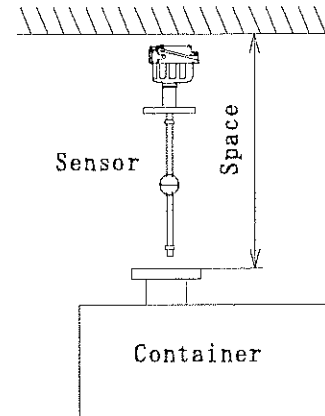


6.1.7 After unpacking, inspect the sensor for shipping damage. If there is evidence of damage, notify the carrier immediately and ask Nohken.

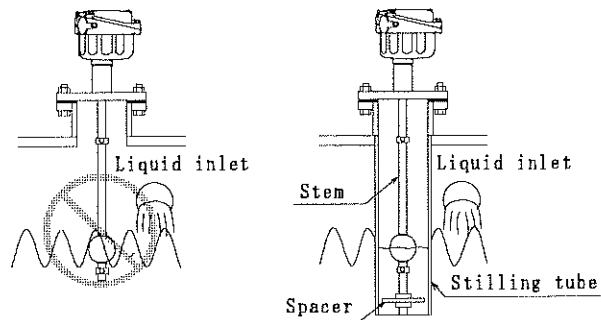
6.2 Sensor Installation

6.2.1 Location

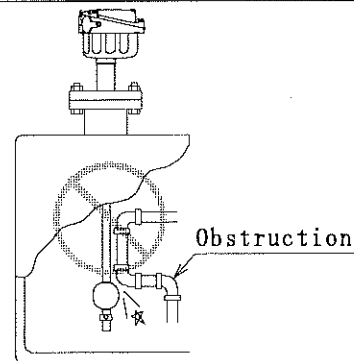
The sensor should be installed in the area where ample overhead space is provided for maintenance. Minimum space allowance is as same as the sensor overall dimensions. When using the MS600V (PVC made), wipe the PVC stem with the wetted cloth to avoid electric shock. Locate the sensor at the position which meets the following conditions:



- (1) Do not locate near liquid inlets or outlets. Optimally provide a stilling tube(*). Inner diameter of the stilling tube should be larger than 20 mm of the float outside diameter. Drill vent holes in the tube and use the spacer(*) to keep the float travelling.

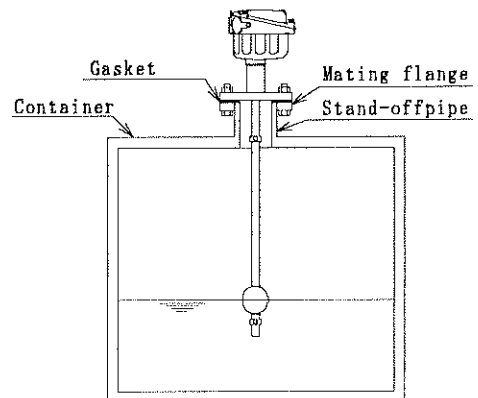


- (2) Locate away from the obstruction (pipe, plumbing, pump, and so on) to the float travelling.



6.2.2 Flange mounting

Provide the compatible mating flange on the container top. Install the sensor to the container using appropriate tool and suitable bolt and nuts. If there is a pressure in the container, the appropriate seal gasket shall be provided. Bolt, nuts, and gasket shall be ordered separately if necessary.



(*): See section 13 on page 25 for the word explanation.

6.3 Transmitter Unpacking

Avoid physical shock. Dropping, throwing or bumping will damage the transmitter.

6.4 Transmitter Installation

6.4.1 Location

Do not locate the transmitter in hazardous locations. Since it is indoor use, install in the drip-proof enclosure, more than IP20. Keep ample space around the transmitter for maintenance.

Locate it at the position which meets the following conditions:

(1) Ambient temperature is from $-5 \sim +50^{\circ}\text{C}$.

Ambient humidity is 95% RH Max. (without dew).

(2) Locate away from rain and splashing water. The transmitter is non-drip proof.

6.4.2 Installation Method

(1) Cut mounting holes to the panel. Panel-cut dimensions and transmitter's outline dimensions are shown Figure 5-1.

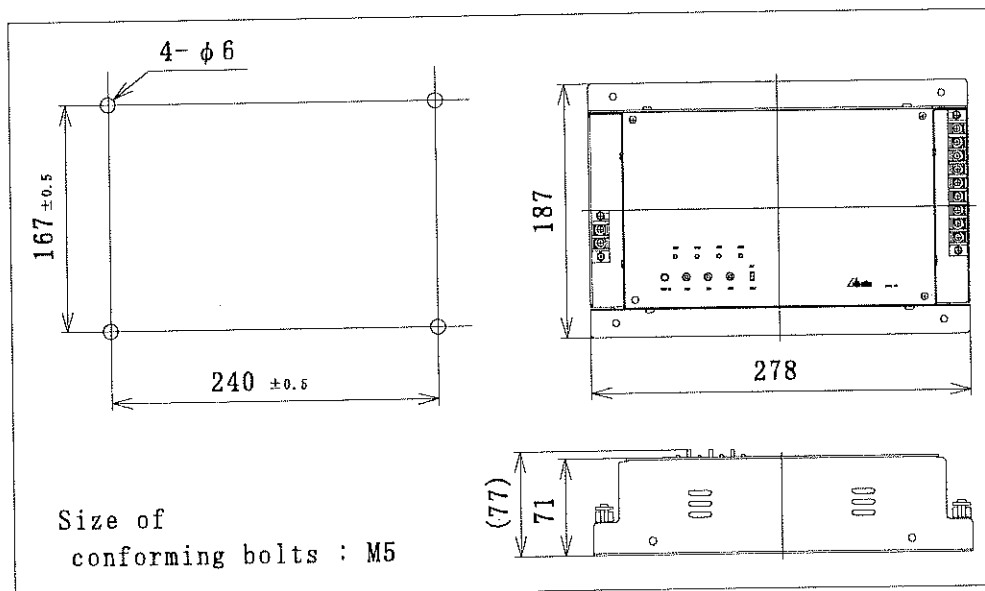


Fig 5-1

(2) Mount the transmitter by using M5 bolts.

7. WIRING

7.1 Preparation

7.1.1 Turn off the power supply.

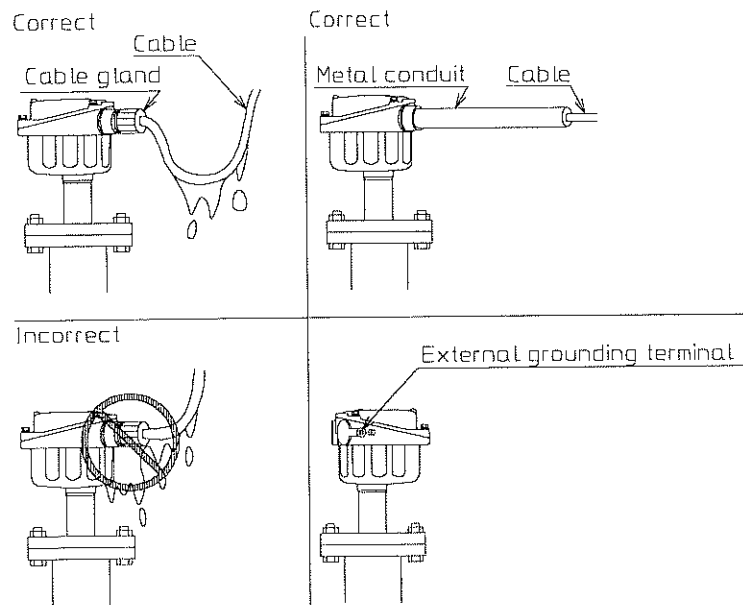
⚠ WARNING

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

7.1.2 Remove the cover from the housing. Do not mix when removing more than two sensors on the same location. Model number, serial number, total length and measuring range are indicated on the back of the cover.

7.2 Cable Gland

The cable gland must be properly fitted to preserve IP65 after wiring. In case of the flexible conduit, size of screw is G 1/2. Sealing compound shall be applied onto the screw of the cable inlet to protect water and dust penetration. In case of the flexible conduit, external grounding terminal shall be grounded.



7.3 Wiring

⚠ CAUTION

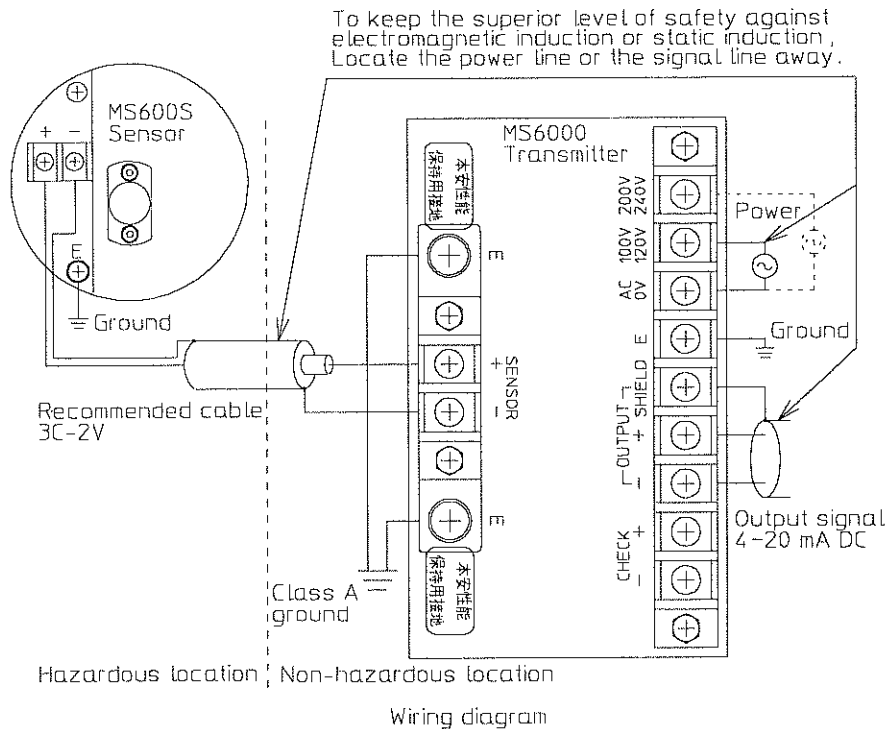
The Intrinsically safe performance protective grounding terminal of the transmitter, JIS Class A ground (max. ground resistance is 10Ω) shall always be provided in isolation.

Other grounding terminals (terminal symbol "E") of the transmitter and the sensor, JIS Class D ground (max. ground resistance is 100Ω) or higher shall always be provided.

Otherwise, personal injury or short-circuit may be occur.

- 7.3.1 Power supply is 100V AC or 200V AC depending on you required. Connect line power to terminals designated "0V" and "100/120V", or "0V" and "200/240V" correctly. Otherwise the transmitter will be damaged by miswiring.
- 7.3.2 Maximum separation distance between the sensor and the transmitter is 600 m with the use of co-axial cable 3C-2V. The wiring inductance shall be 1.0 mH maximum, and capacitance 0.1 μ F maximum. Do not lay it in parallel with power cable or control cable for the magnetic switch.
- 7.3.3 Wiring shall be in accordance with all local codes. When you use solderless terminals, we recommend to use of R1.25-3.5 (JIS C 2805 for M3.5 terminal screw). Refer to below Hook-up and connect co-axial cable, matching wires to terminals as follows:

Sensor Terminal	Transmitter Terminal Designations
+	Sensor +
-	Sensor -



- 7.3.4 The sensor shall be grounded separately by using the internal or external grounding terminal (terminal symbol "E"). Otherwise, the sensor may cause signal errors or be damaged by the electrical surge.
- 7.3.5 Maximum load resistance for output signal (4-20mA DC) is 600 Ω . Excessive load will cause malfunction.

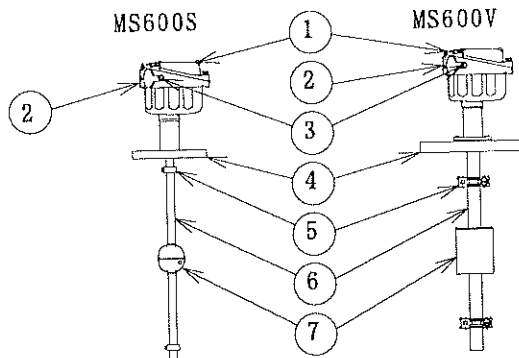
7. 4 Covering

- 7.4.1 Re-install the cover. Ensure that there is no metallic dust in the housing. The housing cover shall be tightened to protect from rain, splashing water, dust, and so on. Do not mix covers more than two sensors on the same location.
- 7.4.2 Install the protector onto the terminal plate of the transmitter.

8. NOMENCLATURE

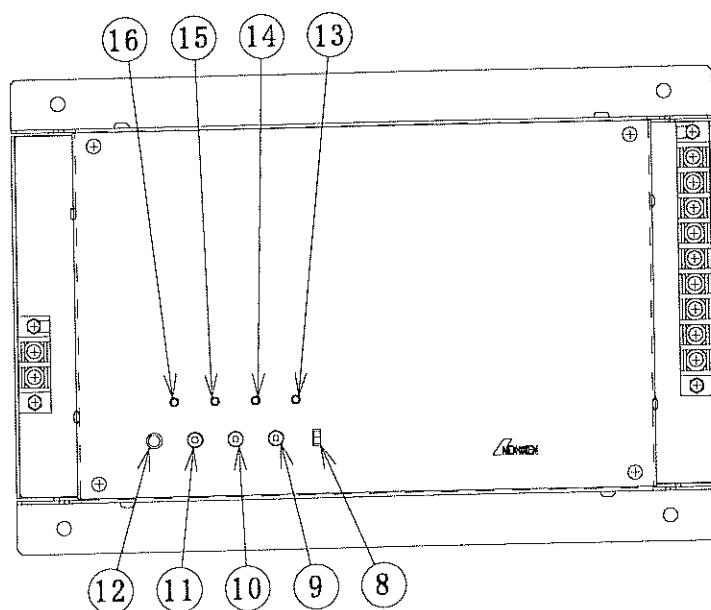
8.1 Sensor parts Name

No.	Name
①	Housing
②	Cable inlet (G 1/2)
③	External grounding terminal (M4 female)
④	Flange
⑤	Float travel stop
⑥	Stem
⑦	Float



8.2 Control panel Layout of the Transmitter

No.	Name	Function
⑧	Mode switch	Measuring mode or Calibration/Test mode
⑨	MODE key	Choose desired parameter
⑩	ENT key	Entry desired value
⑪	TEST key	Use when testing
⑫	Test volume	Adjust test signal
⑬	LED[MEAS.]	Lit at Measuring mode
⑭	LED[ZERO]	Lit at Zero calibration
⑮	LED[SPAN]	Lit at Span calibration
⑯	LED[TEST]	Lit at Test mode






9. CALIBRATION

Once power is ON, operation of the MS is completely automatic.

Our pre-operational calibration when shipping from factory, Zero at the float's bottom rest position, and Span at the float's top position.

If you want to change Zero and Span position, or Fine calibration is required, you must calibrate as described this section.

9.1 Preparation

See section 12 for troubleshooting of operational malfunction.	
Connect the multi-tester (less than 10 Ω ※5) to the Check terminals when wiring the receiver to Output terminals. If not, connect the multi-tester to Output terminals directly.	
Push the key slowly in a step-by-step manner. Do not zap keys. Otherwise incorrect value will be entered.	

※5 Use the multi-tester which has maximum 10 Ω internal resistance.

9.1.1 Pre-calibration check

Make sure the following:

- (1) there is no miswiring.
- (2) Mode switch sets to MEAS. position.
- (3) LED[MEAS.] is lit.

9.2 Zero and Span Calibration

Memory the float position at your desired Zero and Span. Our factory setting is that Zero at the float's bottom rest position, and Span at the float's top position. Output signal will hold the value when setting the Mode switch to the SET. side. Refer to section 9.3 for Test mode.

See section 12 for troubleshooting of operational malfunction.



Push the key slowly in a step-by-step manner. Do not zap keys. Otherwise incorrect value will be entered.



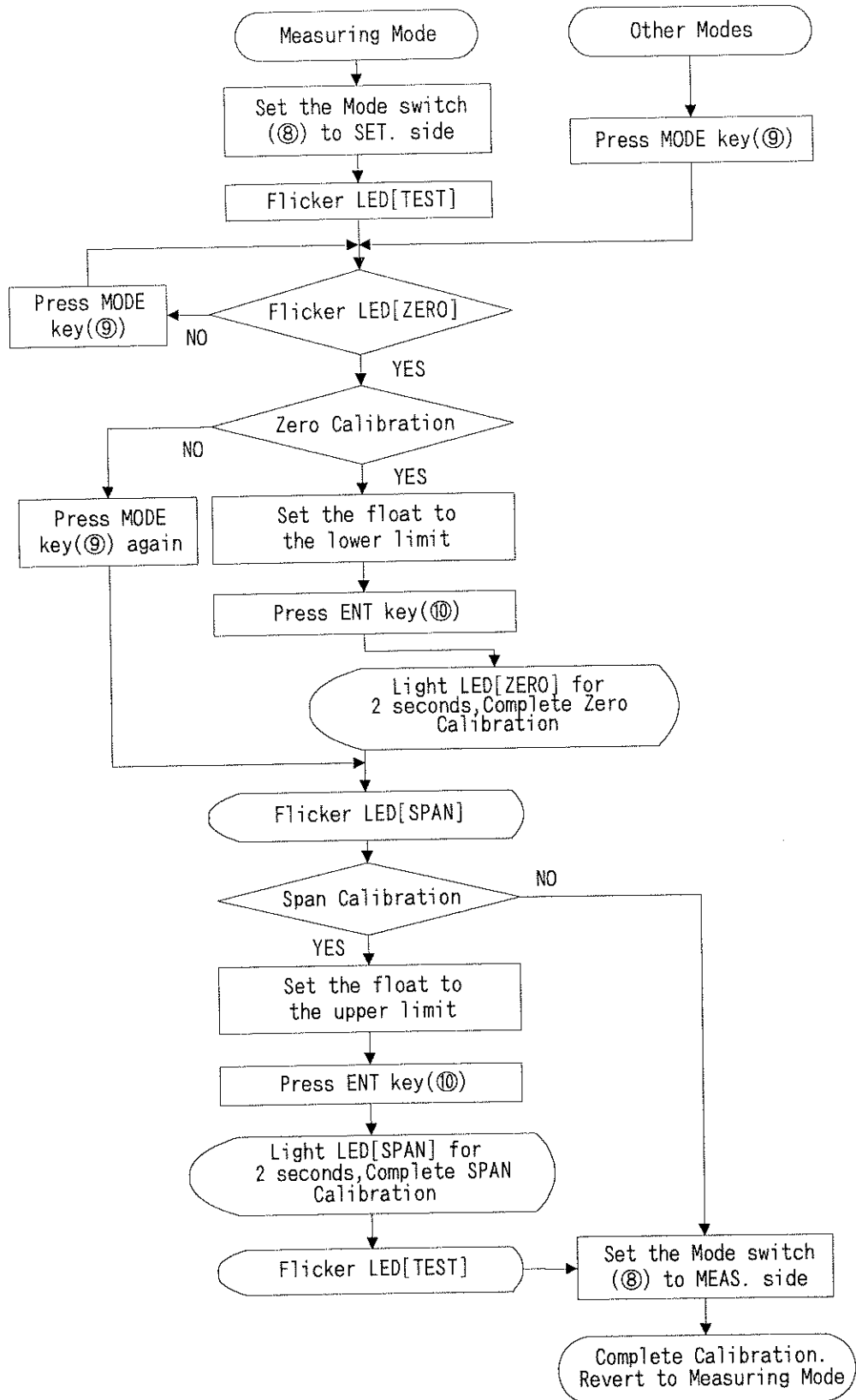
Zero and Span re-calibration can be done at Calibration Mode. Set the Mode switch to the SET. position. However, if you want to stop calibration and revert to the original factory setting, keep MODE key pressing, and set the Mode key to the MEAS. position at the same time.



If the float travels more than 5 cm during calibration due to surface wave motion, your calibration will override. Calibration again after calming. Revert to MEAS. mode by setting the mode switch to MEAS. position or by pressing the MODE key.



9.2.1 Calibration Procedure



▲ CAUTION

Output signal will hold the value when setting the Mode switch to the SET. side.

9.3 TEST Mode

To adjust the receiver, the transmitter can output the simulated rise and fall of the liquid level through its calibrated Zero and Span range. Fixed or Adjustable current output are enabled during simulation at TEST Mode.

- Fixed output is forceful 4mA or 20mA DC output.
- Adjustable output is variable output between 4mA and 20mA DC.

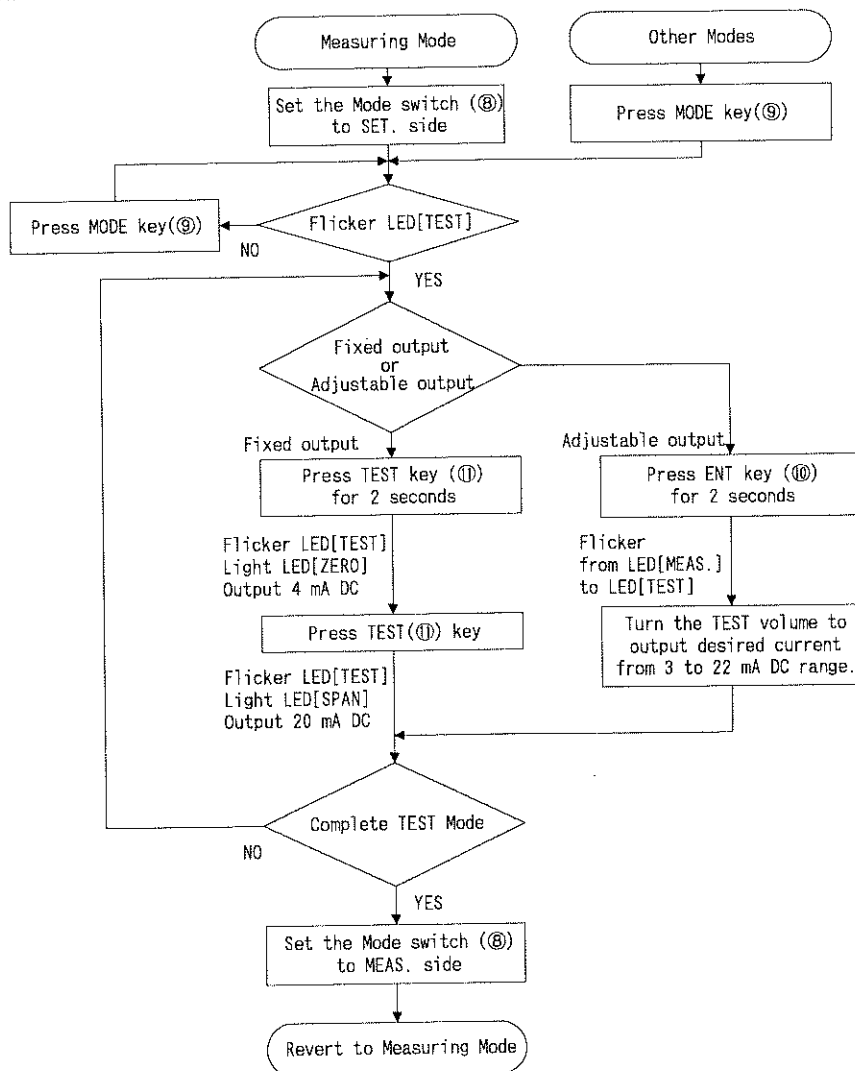
See section 12 for troubleshooting of operational malfunction.



Push the key slowly in a step-by-step manner. Do not zap keys. Otherwise incorrect value will be entered.



9.3.1 TEST Mode Procedure



REFERENCE: You can read output current during TEST mode. Connect the multi-tester (less than 10 Ω) to the Check terminals when wiring the receiver to Output terminals. If not, connect the multi-tester to Output terminals directly.

If you want to stop TEST and revert to Measuring mode, set the Mode key to the MEAS. position. The MS immediately starts to measure and outputs in proportional to actual liquid level. Refer to section 9.2, Zero and Span calibration (page 18, 19), for calibration.

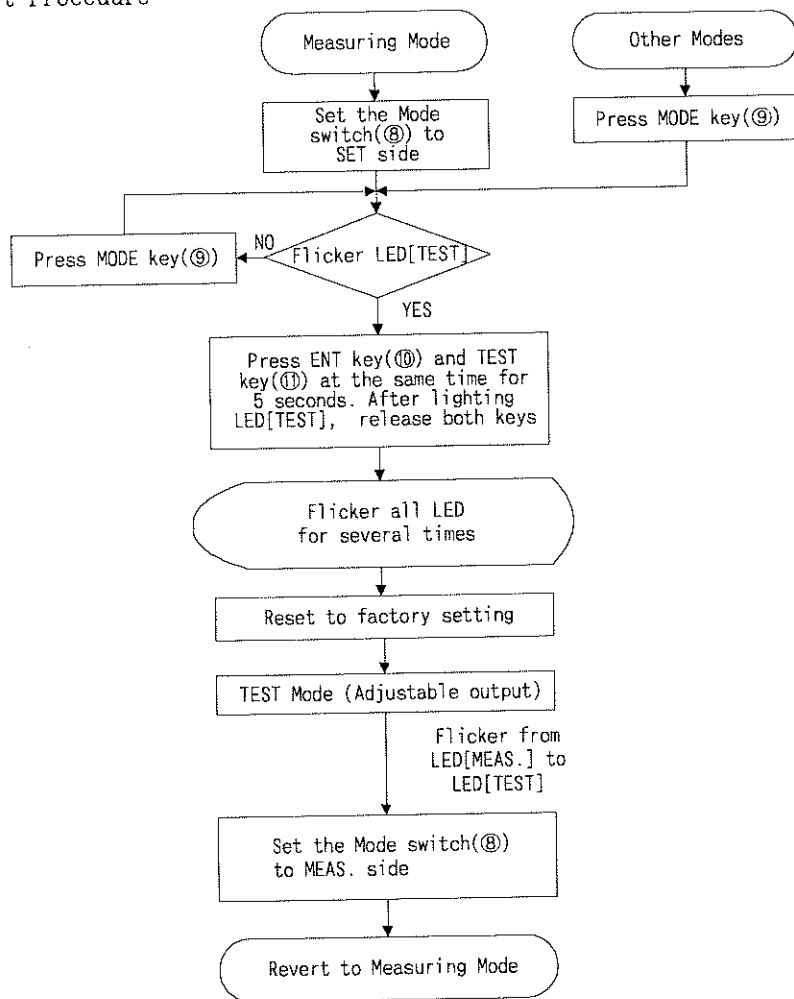
⚠ CAUTION

Output signal will hold the last value at TEST mode when calibrating Zero and Span after TEST mode.

9. 4 Reset

All factory setting parameter value are memorized. To reset all value you entered to the factory setting, proceed as below.

9.4.1 Reset Procedure



You can revert to Measuring mode by setting the Mode key to the MEAS. position. The MS outputs in proportional to actual liquid level. Refer to section 9.2, Zero and Span calibration (page 18, 19), for calibration.

⚠ CAUTION

Once all parameter value are reset, TEST mode automatically starts and outputs a test signal.

10. MAINTENANCE AND INSPECTION

Remove the sensor from the container before maintenance. See section 5, Handling Notes. Keep the ample space for maintenance.

10.1 Removing

10.1.1 Turn off the power supply to the transmitter.



WARNING

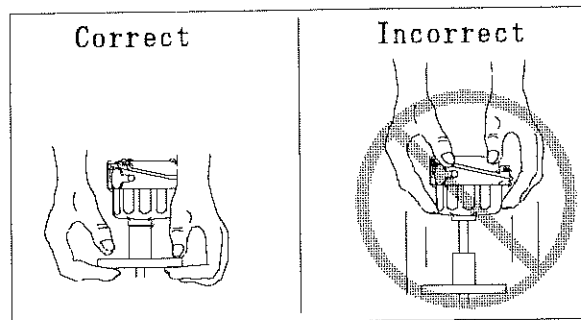
To avoid personal injury, leakage current or short circuit, the power supply shall be always turned off while wiring.

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



CAUTION

Turn the mounting plug only when installing. Do not turn the housing. Otherwise, the housing connection to the mounting plug will be broken.



10.1.3 Unscrew the fixing bolts and nuts or loosen the plug and remove the sensor carefully from the container.

10.1.4 Put the sensor on the flat and ample space.

10.2 Maintenance and Inspection

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.

10.2.1 When performing maintenance or inspection of the MS600V (PVC made), wipe the PVC stem with the wetted cloth to avoid electric shock.

10.2.2 Check for and replace damaged and collapsed parts.

10.2.3 Clean contaminant or sticky.

10.2.4 Clean dirt, dust and moisture from the housing.

10.2.5 Tighten terminals and make sure that there is no miswiring.

10.2.6 Tighten float travel stops using appropriate tool.

10.3 Re-Installation

See section 6.2, Sensor Installation (page 12).

10.4 Wiring

See section 7, Wiring (page 14 and 15).

10.5 Replacement Parts and Cycle

Replace parts if the following symptoms occur. Use a genuine name brand parts carefully.

10.6 Replacement Parts

Float: When it is damaged, collapsed or corroded.

10.7 Calibration

See section 9, Calibration (page 17 to 21).

11. STORING

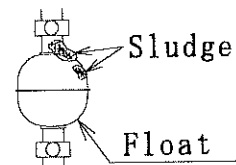
The MS shall be stored under the following conditions when it is not used for a long time.

11.1 Environmental conditions are as follows:

- The storing temperature range is -10°C to $+50^{\circ}\text{C}$.
- Relative humidity is Max. 95% RH.
- No corrosive gases (such as NH_3 , SO_2 , Cl_2 , etc.)
- Vibration is low.

11.2 Locate the sensor away from rain or splashing water. Tighten the housing cover and the cable gland to protect from dust or moisture. Put the cable gland to point down to the ground as a precaution. See "Reference" specified below at the highly humid or dusty area.

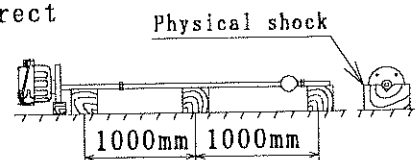
11.3 Clean the floats and stem periodically when detecting liquid is high viscous, presence of the sludge, adhesive and/or crystalline. Otherwise, the MS may cause malfunction.



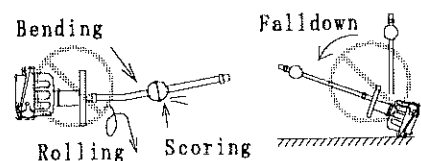
11.4 When keeping in stock the sensor in your inventory, lay the sensor horizontally. Put the wood piece or adequate materials under the sensor to avoid rolling, bending, scoring the sensor.

If the stem length is longer than 2000 mm, we highly recommend you to put them 1000 mm each.

Correct



Incorrect



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

12. TROUBLESHOOTING

⚠ CAUTION

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

Problem	Causes	Solutions	Reference
LED does not light	Miswiring Power	Wire correctly	Section 7
	Power not turned on	Supply the power	Page 14 - 15
3-LED flashes at 3 mA DC output	Miswiring	Wire correctly	Section 7 Page 14 - 15
	Cable between the sensor and the transmitter short-circuited or broken	Wire correctly	
Both LED [MEAS.] and [TEST] flashes at the same time	Float travels more than 5cm during Zero or Span Calibration	Re-Calibrate when calming (no surface wave motion)	Section 9 Page 17 - 21
Both LED [ZERO] and [SPAN] flashes at the same time	Measuring range is too narrow: Less than 3 cm between Zero and Span	Calibrate the spacing between Zero and Span more than 3 cm	Section 9 Page 17 - 21
LED[TEST] flashes and LED[MEAS.] lights at 3 mA output	Float falls out	Re-Install the float and tighten the float travel stop	Section 10 page 22 - 23
Output signal does not match liquid level or Non-Linear output	Improper position of MODE switch	Set MODE switch to MEAS. side.	Section 9 Page 17 - 21
	Contaminant, sediment, scale or foreign matters builds up onto the float, or the float sticks to the stilling tube or obstructions	Clean the float. Use the spacer in the stilling tube or provide baffles.	Section 10 Page 22 - 23
	Float damaged or collapsed	Replace the float	Section 6 Page 10 - 13
	Float corroded	Replace the sensor to the compatible material against corrosion	
Output current unstable	Waves or disturbance in the container.	Use the stilling tube or re-install at the good location	Section 6 Page 10 - 13

13. GLOSSARY

The list of explanation of words on this manual is shown below.

Flange	The flat edge parts to install the sensor in the container by using bolts and nuts.
Plug	A part to secure the sensor on the container by thread.
Float	Light objects that floats on the surface of a liquid. It moves as liquid level changes.
Stem	A protective outer pipe for the magnetostrictive wire, and supports the float movement.
Magnetostrictive wire	Nickel wire twisted by the intersection of magnetic field from float magnets. This twist is detected as return pulse to determine the level measurement.
Magnet	Metallic piece in the float with a magnetic field to distort the magnetostrictive wire.
Float travel stop	Upper and lower limit to control travel of the float.
Stilling tube	A depression in a container enough to reduce turbulence or flow of the liquid.
Spacer	The flat plate to keep the float from contact with the stilling tube.

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