

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

FOR

GUIDED PULSE LEVEL MEASUREMENT



MODEL: G W 1 0 0



Revised 2020-10-28

Read this manual carefully for safe usage.

- This manual applies to general purpose equipment. For equipment intended for use in potentially explosive atmospheres, see applicable manuals.
- This manual contains important information on handling, inspection and operation of the equipment indicated on the cover page. Before handling the equipment, read this manual carefully.
- Instructions in documents submitted by Nohken or its representative have higher priority than those in this manual.
- Keep this manual within easy access.
- Depending on environment, the equipment may not satisfy specifications shown in this manual. Check the application conditions carefully beforehand.
- Please contact our sales office for any questions or comments about the equipment or this manual. Sales offices are shown on the back of the manual.

Safety Symbols:

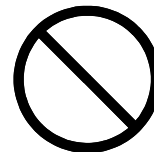
 WARNING	Means a potentially hazardous situation which, if necessary precautions are not observed, can result in death, serious injury and/or considerable material damage.
 CAUTION	Means a hazardous situation which, if necessary precautions are not observed, can result in minor or moderate injury or damage to the device.

	Means prohibited actions.
	Means mandatory actions.



WARNING

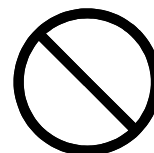
This equipment is NOT intended for use in potentially hazardous atmospheres. Never use it where flammable gas or vapor may be present. Failure to observe this may result in ignition of flammable gas or vapor, causing disaster.



Do not alter or disassemble the equipment, unless you have been instructed to do so by Nohken or its representative.

Failure to observe this may result in:

- malfunction of or damage to the equipment or connected devices;
- ignition;
- electric shock or user injury.



Turn off the equipment before wiring or inspection. Otherwise leakage or short circuit may cause ignition or electric shock.



After wiring is complete, always check for its correctness. Wrong wiring may cause:

- damage to or malfunction of the equipment or connected devices;
- ignition;
- electric shock or user injury.

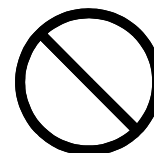


Turn off the equipment immediately in case smoke, unusual smells or sounds are noticed. Do not supply power until problems are solved.



CAUTION

Handle the equipment with care. Do not drop, throw, or give a strong shock to avoid damage.



Observe operation conditions specified in the manual. Use outside the specified conditions may result in malfunction of or damage to the equipment or connected devices, ignition, user injury, or electric shock.



Perform operation tests before actual application to ensure performance. Install back-up instruments based on different technologies if failure of this equipment is expected to result in a serious incident.





CAUTION

Check carefully for chemical compatibility of materials of construction before installation.



Use the flange, thread or somewhere close to the process connection to handle the equipment. Do not use the housing to avoid dropping the equipment, and resultant damage to the equipment or user injury.



Equipment 50cm or longer:

Lay the equipment when not in use. Otherwise it may fall and damage itself or things around it, and cause user injury.



Always ground the equipment. (Grounding resistance: 100 Ω max.) Without grounding, electric shock may occur in case excessive voltage is applied to the housing.



When connecting to inductive or lamp loads:

Ensure the maximum voltage/current ratings will not be exceeded to avoid damage to the relay contacts.



Use lightning arrestors or surge absorbers to prevent:

- malfunction, damage, or ignition of the equipment and connected instruments;
- electric shock or injury.



INTRODUCTION

- A) This manual applies to standard models. Please note that information in this manual may not be applied to customized versions.
- B) We are willing to help customers select a suitable model or provide information about chemical compatibility of materials used, but the customer is responsible for the decisions made.
- C) We always welcome suggestions and comments about this manual. Please contact our sales office when you have questions or comments.
- D) Component replacement:
The equipment design is regularly reviewed and improved. The same components therefore may not be available when replacement is required. In such cases, different components or products may be supplied. Please contact our sales office for detail.
- E) The contents of this manual are subject to change without prior notice as a result of improvement of the equipment.

WARRANTY & DISCLAIMER

- A) Nohken warrants the equipment against defect in design or material, and workmanship for a period of one (1) year from the date of original shipment from Nohken's factory.
- B) Nohken will not assume liability for loss nor damage resulting from the use of the equipment.
- C) Nohken will not assume liability for damage resulting from:
 - C-a) not observing instructions in this manual;
 - C-b) installation, wiring, operation, maintenance, inspection, or storing in a manner not outlined in this manual;
 - C-c) unauthorized alterations and repairs;
 - C-d) the use of or replacement with components not provided by Nohken;
 - C-e) devices or instrument other than those manufactured by Nohken;
 - C-f) the use not described in *Chapter 1 Purpose of Use* of the manual;
 - C-g) force majeure including, but not limited to, fire, earthquake, tsunami, lightning strike, riot, commotion, war, armed conflict or terrorist attack, radioactive pollution, act of God, governmental decisions or actions, and compliance with laws and regulations.

THE PROVISIONS OF THIS SECTION DO NO LIMIT YOUR LEGAL RIGHTS.

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1. PURPOSE OF USE

Guided Pulse Level Measurement GW is a sensor designed to continuously measure liquid level, and provide output for alarms or to control pumps. Do not use the product for any other purpose.

2. DESCRIPTION

2.1 Product Overview

GW comprises of an electronics in a housing, process connection (threaded connection* or flange*) and probe*. The probe is inserted into the tank and used to measure the distance to the material level.

The probe assembly has no moving parts, so the material buildup and resultant adverse affection to measurement are minimized. The user can cut off the end of the rod or wire type probe to a desired length. The sensor is easy to program without needing a tester or other device to configure the zero and span points.

2.2 Principle of Operation

The characteristic impedance of the probe changes when material surface reaches the probe. The sensor electronics transmits high frequency signals that travel down on the probe. The signals are reflected on the material surface, where the characteristic impedance changes, and then received by the sensor electronics. The sensor electronics measures the time taken from transmission to reception of the signals, and calculates the distance from the reference point to the material surface. The distance is then converted to analog output of 4 to 20mA.

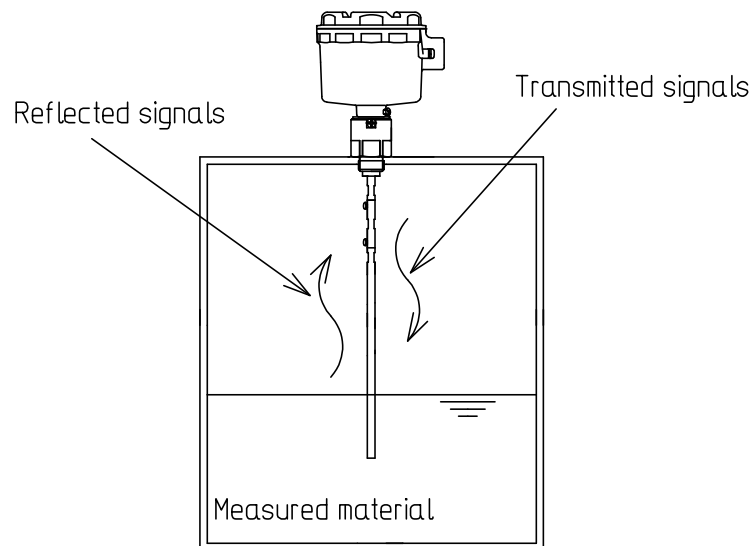


Fig. 2-1

* See 11.1 Glossary.

3. SPECIFICATIONS

3.1 Parts Name and Function

GW100NR□□

Rod type
Threaded (G3/4)
Rod probe

GW100NW□□

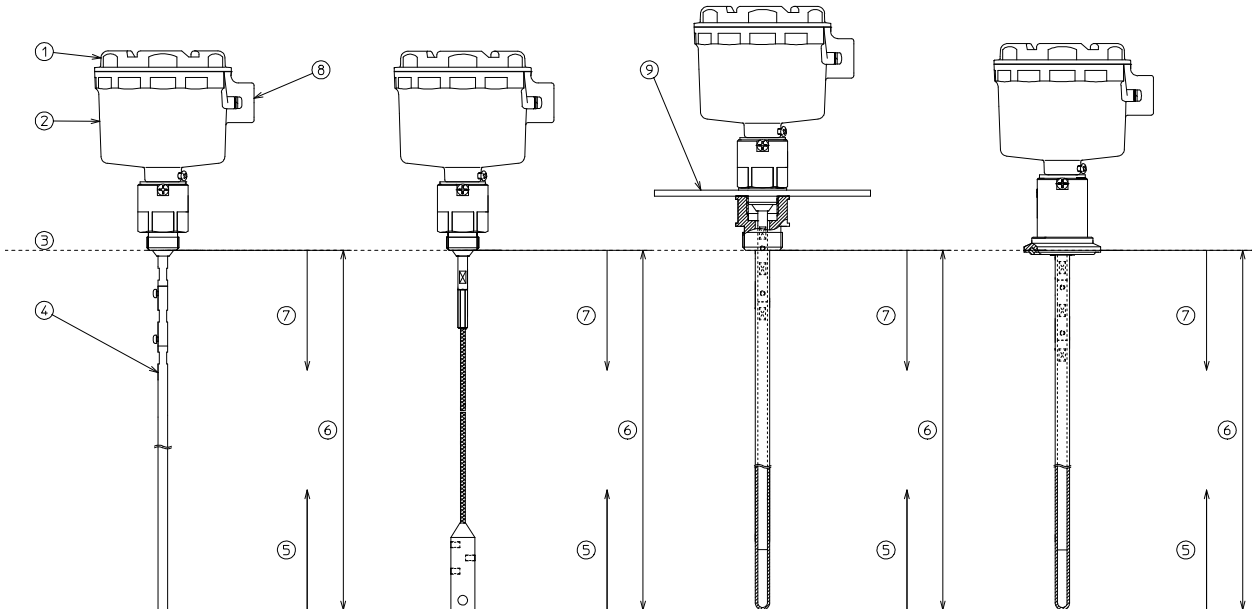
Wire type
Threaded (G3/4)
Wire probe

GW100NP□□

Tubed type
Threaded (G1)
Tubed rod probe

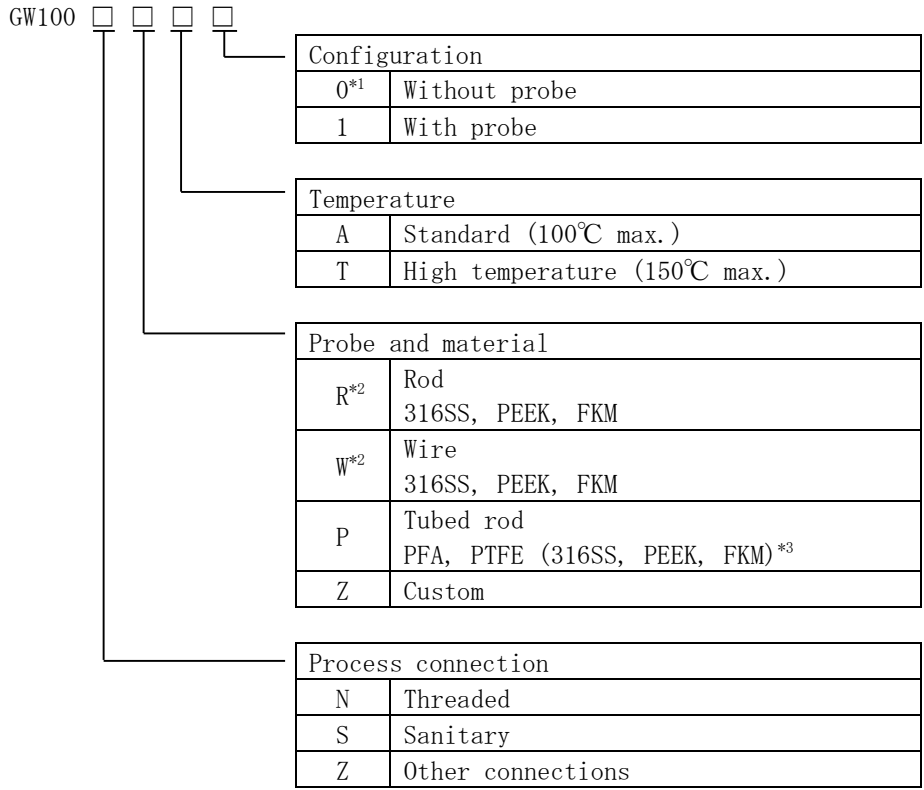
GW100SP□□

Sanitary type
ISO 2.0 or equivalent
Tubed rod probe



- ① Cover
- ② Housing : protects the electronics.
- ③ Reference point : Point referenced to when deciding the measurement range. Location is model dependent.
- ④ Probe : Component in rod or wire that is inserted in the tank and detects liquid surface.
- ⑤ Lower blanking : Area close to the probe end where measurement is not possible or accuracy low.
- ⑥ Probe length : Distance from the reference point to the probe end.
- ⑦ Upper blanking : Area close to the process connection where measurement is not possible or accuracy low.
- ⑧ Cable inlet
- ⑨ Earth plate : Metal plate to stabilize operation. Required for non-metallic mounting connection such as plastic vessel applications.

3.2 Model Numbering



*1 Available only for Probe and material option “R” (rod).

*2 Not available for process connection option “S” (sanitary). Select “Z” here instead.

*3 Not wetted.

Rod and tubed rod probes are NOT factory assembled.

3.3 Specifications

Model	GW100□R□□	GW100□W□□	GW100□P□□
Measured material	Liquids		
Accuracy* ¹ , * ²	up to 2000mm: ±10mm remainder of range: ±0.5% of span		
Temperature characteristics	±0.02% of span/°C		
Dielectric constant*	$\epsilon_r \geq 1.8$		
Probe length* ³	300 to 4000mm		
Upper blanking* ³ with water ($\epsilon_r = 80$)* ⁴	25mm min.	80mm min.	25mm min.
Lower blanking* ³ with water ($\epsilon_r = 80$)* ⁴	10mm min.	165mm min.	(2% x Probe length +50) mm min. or 60mm min., whichever is greater
Wiring	3 wire* ⁵		
Power supply	24V DC ±10%		
Power consumption	Approx. 2.0W		
Output signal	Analog output, 1 point, 4 to 20mA DC		
Load resistance	500Ω max. at 24V DC (Fig.3-1)		
Pressure (static)	-0.08 to +3.0MPa See figure 3-2 for high temperature version.		0 to +200kPa
Working temperature	- Process Standard version: -20 to +100°C (no freezing) High temperature version: -20 to +150°C (no freezing) ----- - Ambient: -20 to +60°C (no condensation)		
Relative humidity	85% max.		
Protection class	Probe: IP68 / Housing: IP65		
Material - process	316SS, PEEK, FKM	316SS, PEEK, FKM	PFA, PTFE (not wetted - 316SS, PEEK, FKM)
- housing	Cast aluminum (ADC12), acrylic coated		
Tensile load	4kN	4kN	-
Lateral load	1.5Nm	-	1.5Nm
Cable inlet	G 3/4		
Cable	Shielded cable (recommended: CVV-S, 3x1.25mm ²)		

*1 Reference conditions

- Environmental: +25°C, 60%RH
- Application: metal tank (I.D. 84.1mm), 1200mm range, water ($\epsilon_r =$ approx. 80)

*2 ±15mm from reference point to 150mm

*3 See 3.4 Outline Drawing.

*4 The lower the dielectric constant of the material, the longer the blanking will be.
 - With Kerosene ($\epsilon_r = 1.8$) upper blanking 200mm min., lower blanking 200mm min.

*5 See 6. Wiring.

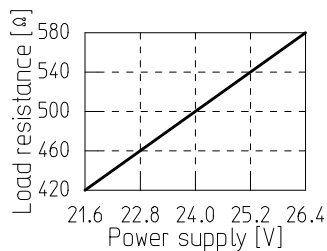


Fig. 3-1: Load resistance

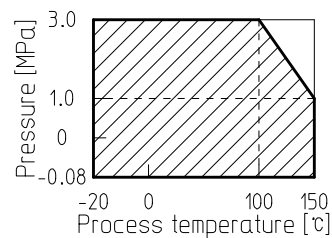


Fig. 3-2: Withstand pressure
(static, excluding process connection)

* See 11.1 GLOSSARY.

3.4 Outline Drawing

Rod and tubed rod probes are NOT factory assembled.

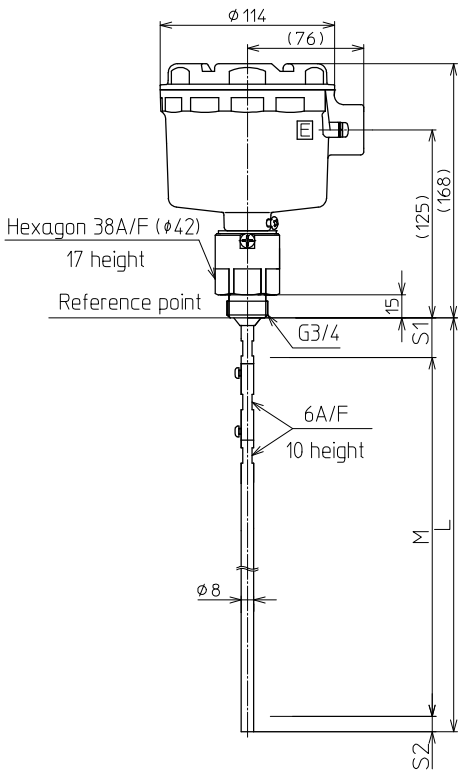


Fig. 3-3: GW100NRA1

Housing, cover : acrylic coated
Cable inlet : G3/4

M : Measurement range
L : Probe length
S1 : Upper blanking (≥25mm)
S2 : Lower blanking (≥10mm)

Probe length (L) can be shortened
by cutting the rod.

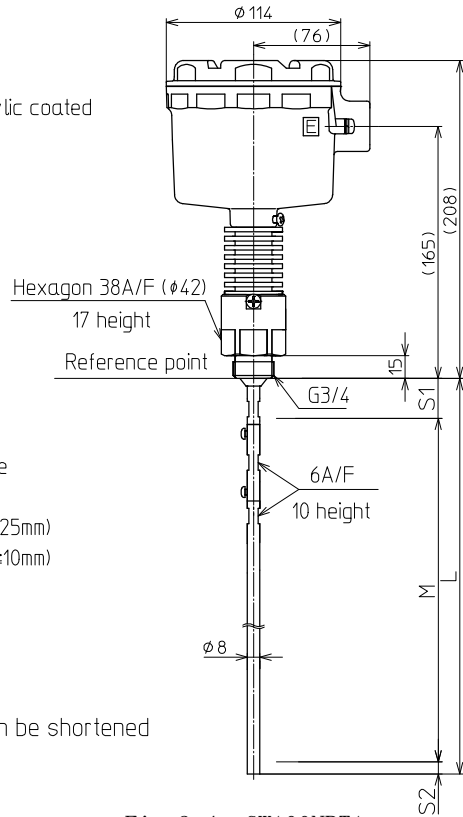


Fig. 3-4: GW100NRT1

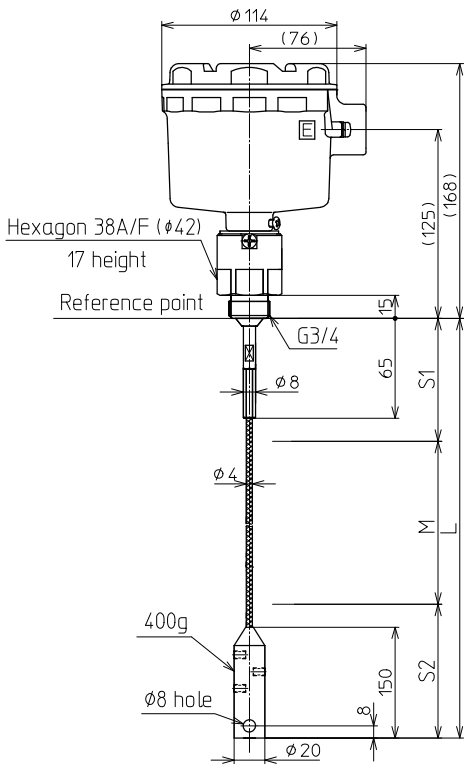


Fig. 3-5: GW100NWA1

Housing, cover : acrylic coated
Cable inlet : G3/4

M : Measurement range
L : Probe length
S1 : Upper blanking (≥80mm)
S2 : Lower blanking (≥165mm)

Probe length (L) can be shortened
by cutting the wire.

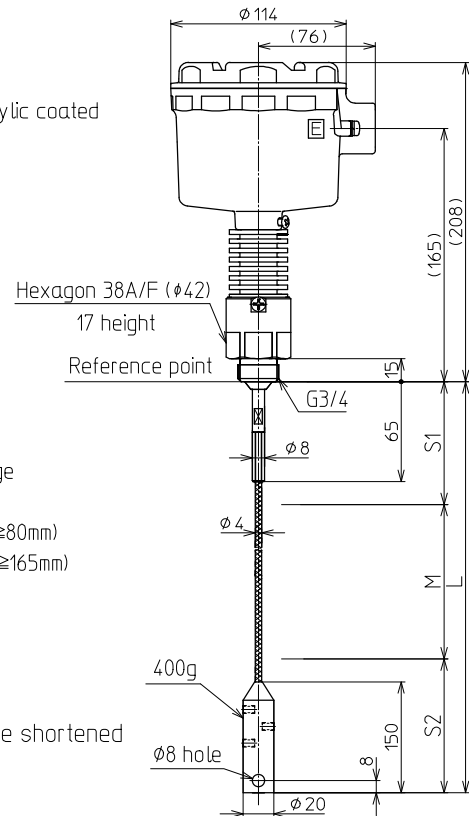


Fig. 3-6: GW100NWT1

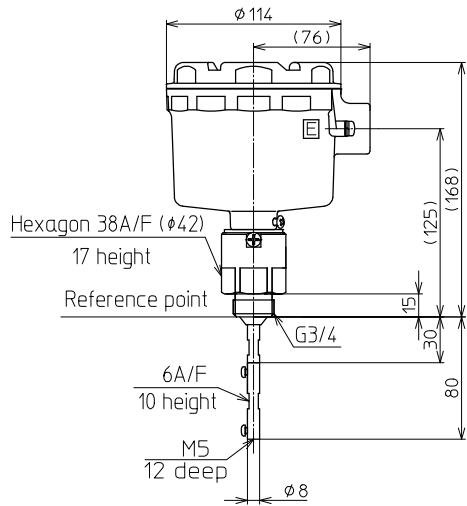


Fig. 3-7: GW100NRA0

Housing, cover : acrylic coated
 Cable inlet : G3/4

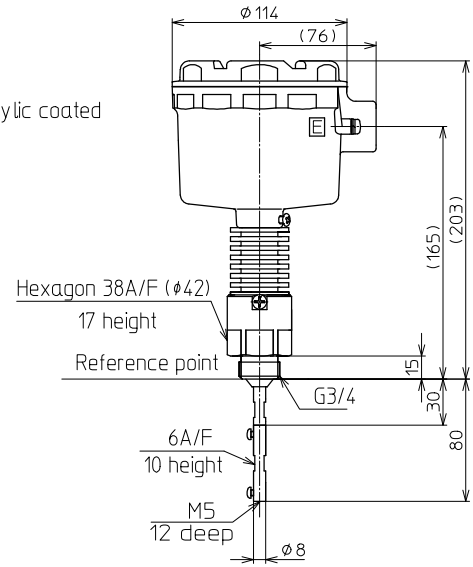


Fig. 3-8: GW100NRT0

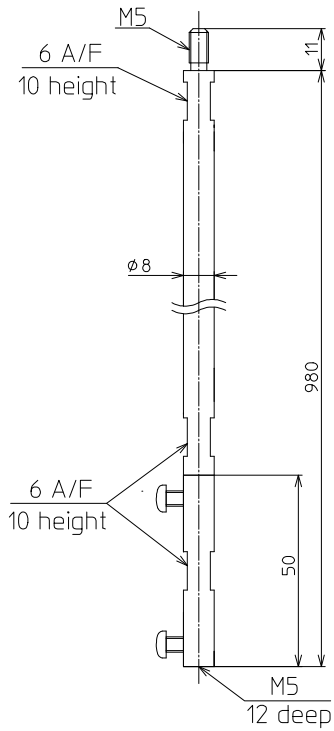


Fig. 3-9: Component E

Probe can be cut to the desired length.

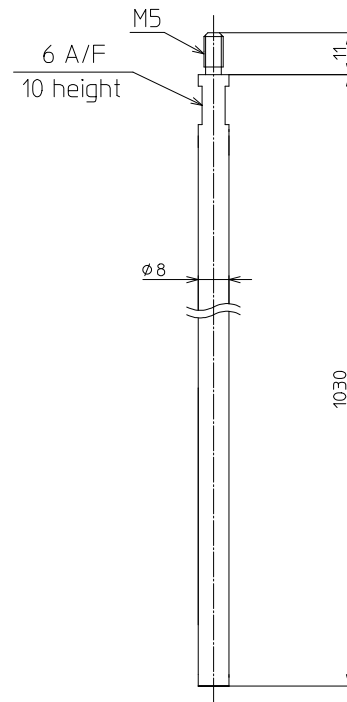
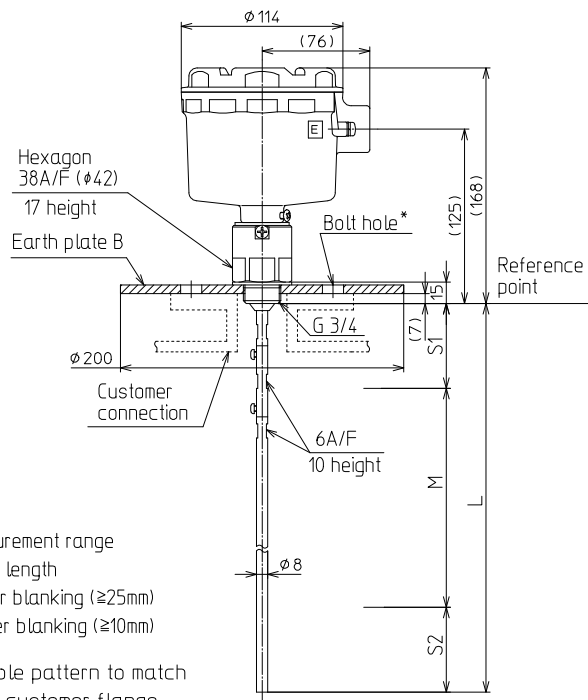
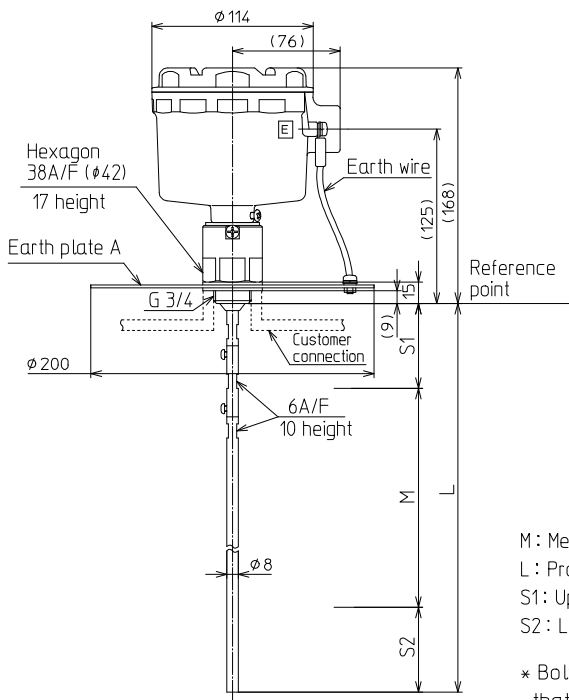


Fig. 3-10: Component L1M

<For non-metallic tank applications>

Tubing, gasket, earth plate, and probe are not factory assembled.



M : Measurement range
 L : Probe length
 S1 : Upper blanking ($\geq 25\text{mm}$)
 S2 : Lower blanking ($\geq 10\text{mm}$)
 * Bolt hole pattern to match that of customer flange.

Fig. 3-11: GW100NRA1 with Earth plate A

Fig. 3-12: GW100NRA1 with Earth plate B

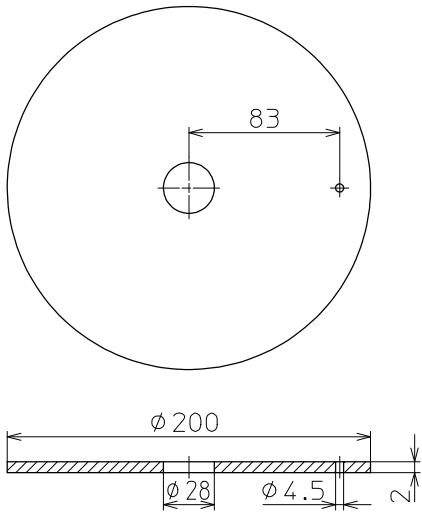
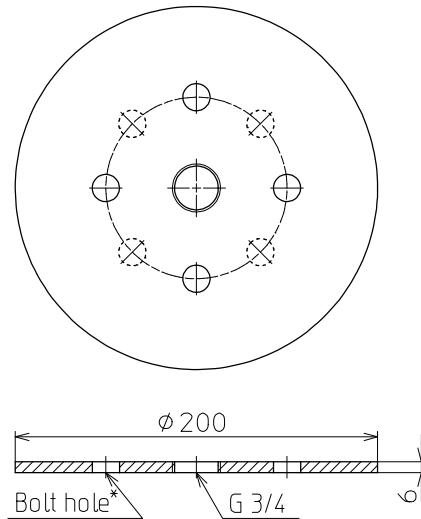


Fig. 3-13: Earth plate A (optional)



*Bolt hole pattern to match that of customer flange

Fig. 3-14: Earth plate B (optional)

Tubing, gasket, earth plate, and probe are not factory assembled.

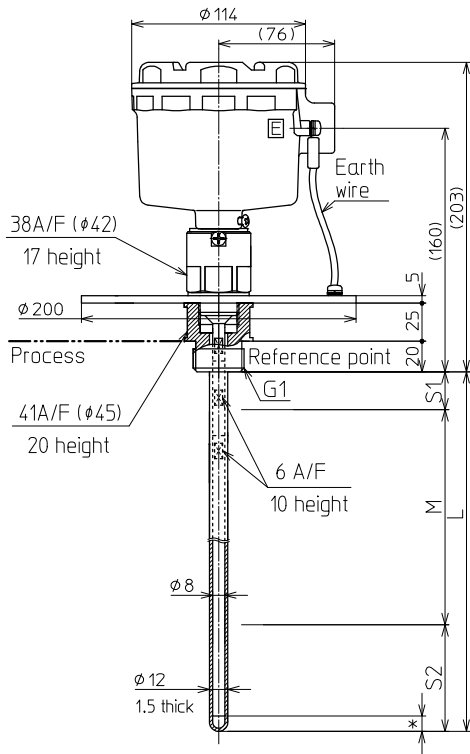


Fig. 3-15: GW100NPA1

Housing, cover : acrylic coated
Cable inlet : G3/4

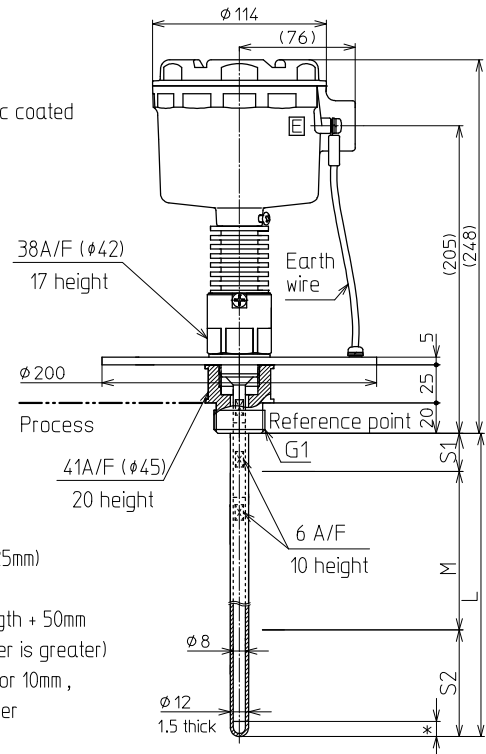


Fig. 3-16: GW100NPT1

M : Measurement range
L : Probe length
S1 : Upper blanking ($\geq 25\text{mm}$)
S2 : Lower blanking
($\geq 2\% \times \text{probe length} + 50\text{mm}$
or 60mm , whichever is greater)
* : $2\% \times \text{probe length}$ or 10mm ,
whichever is greater

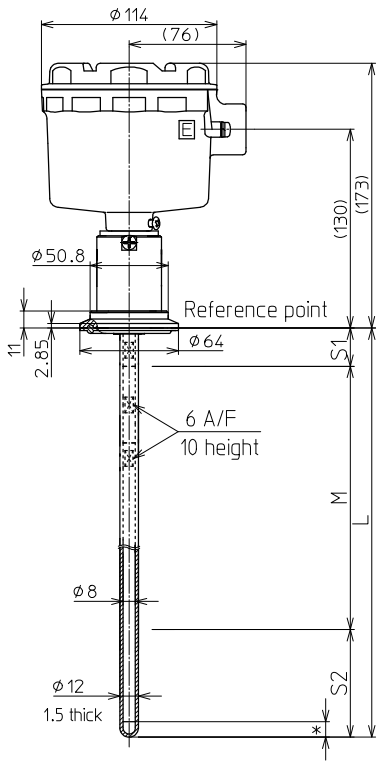


Fig. 3-17: GW100SPA1

Sanitary fitting : ISO 2S or equivalent
Housing, cover : acrylic coated
Cable inlet : G3/4

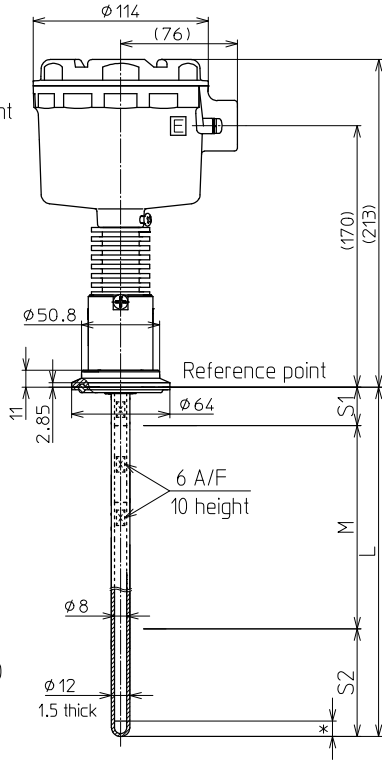


Fig. 3-18: GW100SPT1

M : Measurement range
L : Probe length
S1 : Upper blanking ($\geq 25\text{mm}$)
S2 : Lower blanking
($\geq 2\% \times \text{probe length} + 50\text{mm}$
or 60mm , whichever is greater)
* : $2\% \times \text{probe length}$ or 10mm ,
whichever is greater

3.5 Probe length and Components

GW100NR□□ (threaded, rod probe)

Probe length (L) in mm	Quantity		End rod in mm
	Component E	Component L1M	
300 to 1110	0	1	L - 80
1111 to 2090	1	1	L - 1060
2091 to 3070	2	1	L - 2040
3071 to 4000	3	1	L - 3020

GW100NP□□* (threaded, rod probe)

Probe length (L) in mm	Quantity		End rod in mm
	Component E	Component L1M	
300 to 500	0	1	L - 53
501 to 1095	0	1	L x 0.98 - 43
1096 to 2095	1	1	L x 0.98 - 1023
2096 to 3095	2	1	L x 0.98 - 2003
3096 to 4000	3	1	L x 0.98 - 2983

* Earth plate thickness 5mm, gasket thickness 2mm

GW100SP□□ (sanitary, tubed rod probe)

Probe length (L) in mm	Quantity		End rod in mm
	Component E	Component L1M	
300 to 500	0	1	L - 85
501 to 1128	0	1	L x 0.98 - 75
1129 to 2128	1	1	L x 0.98 - 1055
2129 to 3128	2	1	L x 0.98 - 2035
3129 to 4000	3	1	L x 0.98 - 3015

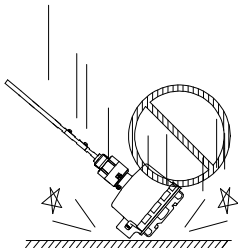
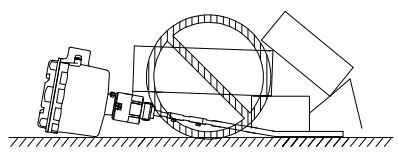
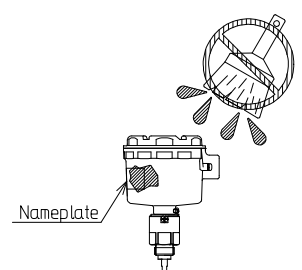
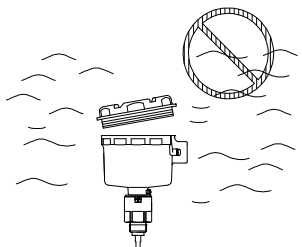
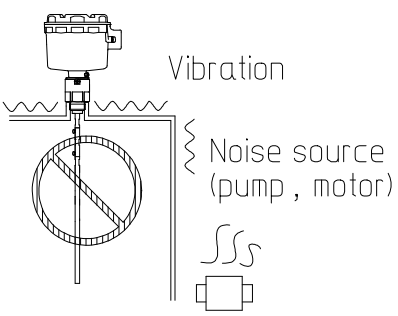
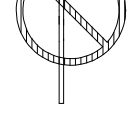
3.6 Optional Components

Item	Description	Remarks
Component E	Extension rod (930mm, 316SS) x 1 Connection rod (50mm, 316SS) x 1 Screw (M4 x L5, 316LSS) x 2	980mm extension kit for rod versions (GW100NR□□).
Component L1M	End rod (1030mm, 316SS) x 1	Extends the probe length of rod versions (GW100NR□□) to 1110mm.
Component L2M	Component E x 1 Component L1M x 1	Extends the probe length of rod versions (GW100NR□□) to 2090mm.
Component L3M	Component E x 2 Component L1M x 1	Extends the probe length of rod versions (GW100NR□□) to 3070mm.
Component L4M	Component E x 3 Component L1M x 1	Extends the probe length of rod versions (GW100NR□□) to 4050mm.
Gasket for G3/4 thread	NBR gasket (Valqua, No.6500) x 1 (ϕ 42mm, ϕ 27mm, 2mm thick)	Standard accessory to GW100NR□□, GW100NW□□, GW100NP□□ versions.
Gasket for G1 thread	PTFE gasket (Valqua, No.7020) x 1 (ϕ 49mm, ϕ 34.5mm, 2mm thick)	Standard accessory to GW100NP□□ versions.
Earth plate A	G3/4 threaded earth plate x 1 (ϕ 200, 2mm thick, 304SS)	Comes with a gasket for G3/4 thread.
Earth plate B	Earth plate for flange x 1 (ϕ 200, 6mm thick, 304SS)	Specify the flange size at the time of order.
Threaded tubing	PFA tubing with G1 threaded connection in PTFE x 1	Standard accessory to GW100NP□□ versions. Specify probe length at the time of order.
Tubing with gasket	PFA tubing with a PTFE gasket fitted to ISO 2.0S connections x 1	Standard accessory to GW100SP□□ versions. Specify probe length at the time of order.

* Probe will be cut to the specified length at factory if requested.

4. HANDLING NOTES

Observe instructions below when handling the sensor, or faulty operation or user injury may result.

<p>Do not drop, throw, drag, or give a strong shock to the sensor to avoid damage.</p>	
<p>Do not place anything on the sensor to avoid deformation or damage.</p>	
<p>The nameplate contains maintenance and other important information. Keep it legible when painting the sensor.</p>	
<p>Avoid corrosive atmosphere (NH_3, SO_2, Cl_2). Such atmosphere may penetrate the housing and damage internal components.</p>	
<p>Avoid or protect against vibration.</p>	
<p>Avoid strong magnetic fields such as proximity to a large motor. Magnetic field may cause faulty operation.</p>	

5. INSTALLATION



WARNING

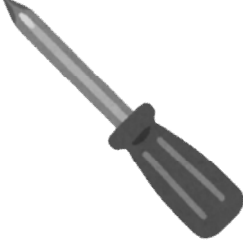



This product is not intended for use in hazardous areas*. Never use it in areas where flammable or explosive gases or vapors may be present.



5.1 Tools for Mounting

Rod probes are not factory assembled. Assemble the probe before installation. Table 5-1 shows the tools to be used for each model.

Table 5-1: Tools for mounting

Model	GW100□R□□ (rod) GW100□P□1 (tubed, sanitary)	GW100□R□□ (rod) GW100□P□1 (tubed, sanitary)	GW100N□□□ (threaded, G3/4 or G1)	GW100NP□1 (threaded, G1)
Tool				
	Phillips screwdriver x 1	Spanner (6mm A/F) x 2	Spanner (38mm A/F) x 1	Spanner (41mm A/F) x 2
Used on	Lock screws	Rod	Threaded connection	Threaded tubing

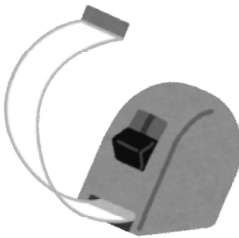



Other tools than those mentioned above are necessary for flange fasteners, or the sanitary clamp. Use suitable tools for your sensors.


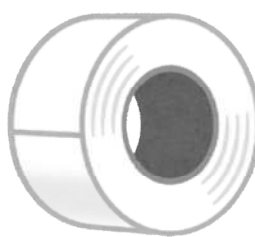
* See 11.1 GLOSSARY.

5.2 Tools for Probe Trimming

Rod or wire probes can be cut on site to a desired length. Table 5-2 shows the tools necessary to cut the probe. See 5.5 *Cutting Probe* on page 20 for how to cut the probe.

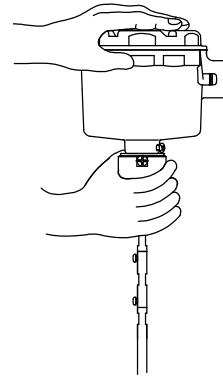
Table 5-2: Tools for cutting the probe

Model	All	GW100□R□□ (rod)	GW100□R□□ (rod)	GW100□W□□ (wire)
Tool	 Tape measure x 1	 Saw or grinder x 1	 Metal file or sandpaper	 Wrench (3mm A/F) x 1
Used to	Measure the probe length.	Cut the rod.	Remove burrs.	Tighten or loosen weight screws.

Model	GW100□W□□ (wire)	GW100□W□□ (wire)
Tool	 Grinder x 1	 Plastic tape
Used to	Cut off the wire.	Bind cut wire tip.

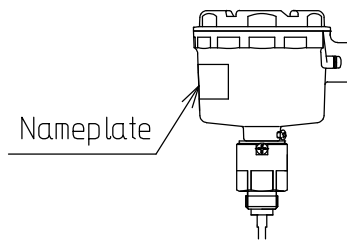
5.3 Unpacking

Open the packaging and take out the sensor. Hold the sensor by the process connection and somewhere else.

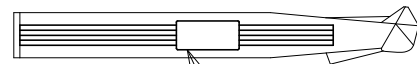


Completely remove tape, vinyl, cardboard, and other packing materials to prevent faulty operation.

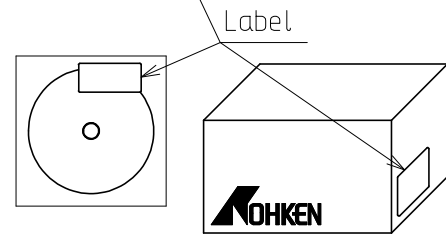
Check against the nameplate that the sensor is what you have ordered. If not, please contact our sales office.



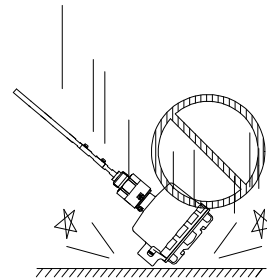
Check the sensor for visible damage. If any, please keep the packaging and contact our sales office.



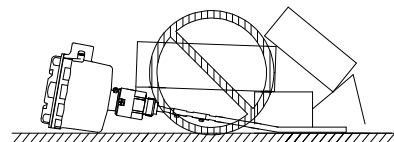
The packaging of the sensor and its accessories has a label with a number. The components belonging to the same unit share the same number. When assembling, use the components with the same number.



Do not drop, throw, drag, or give a strong shock to the sensor to avoid damage.




Do not place anything on the sensor to avoid deformation or damage.

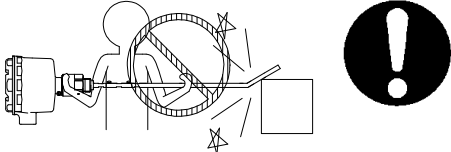


5.4 Assembling Probe

Sensors with a rigid probe are NOT factory assembled. Assemble the sensor before installation. If the space above the tank is not large enough for the overall sensor size, assemble the end rod first and insert it into the tank, and then connect other components.

 **WARNING**

Handling sensors with a rigid probe longer than 1500mm requires more than one person not to damage the sensor. Bent probe will result in faulty operation.



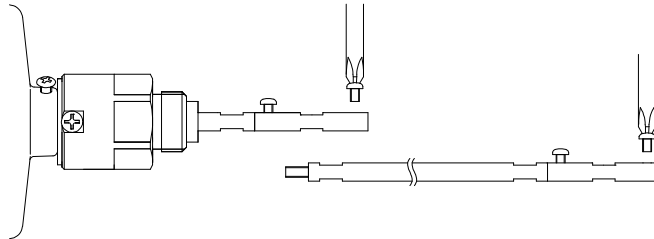
 **CAUTION**

Be careful not to drop components or tools into the tank.

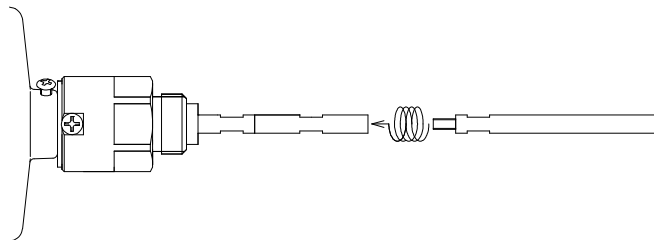


5.4.1 Rod probe sensors (GW100□R□□)

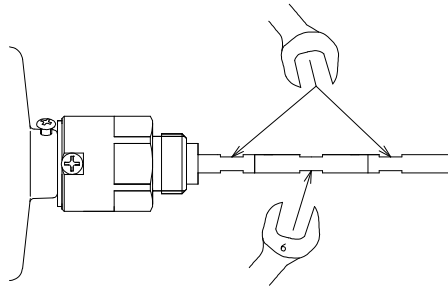
-
- (1) Remove the screws at the females threaded end of the sensor and the connection rod in Component E.



-
- (2) Connect Component E (extension rod and connection rod) and Component L1M (end rod) to the sensor.

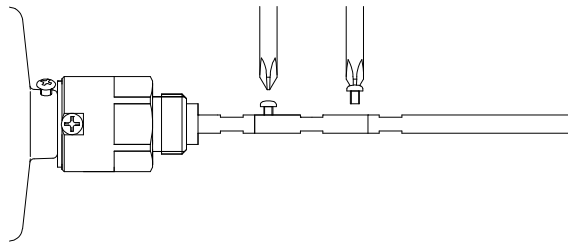


-
- (3) Hold the assembly by the recesses (6mm A/F) with a spanner, and secure all the components connected in step 2. (Torque: 4.5Nm)



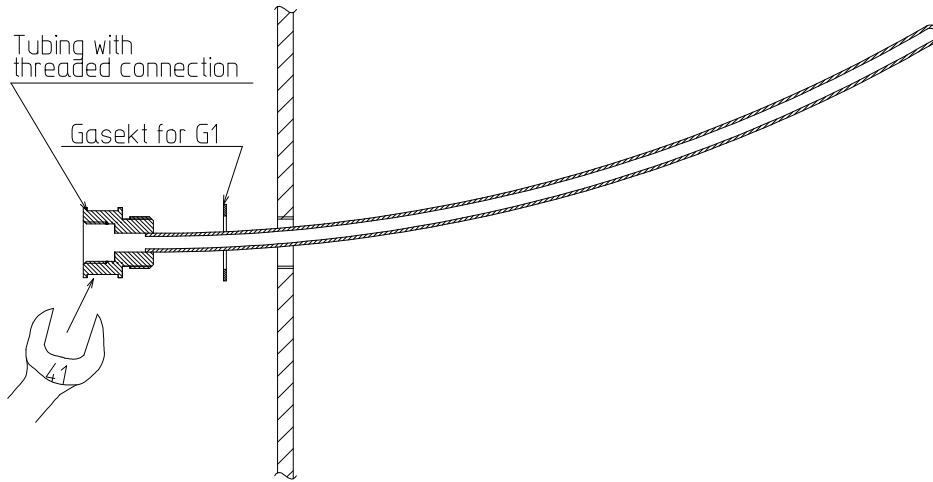
-
- (4) Secure the connection rod with screws (M4, 5mm) with a screwdriver. Use two screws per rod. (Torque: 2.2Nm)

- * If the space above the tank is not large enough for the overall sensor size, assemble the end rod first and insert it into the tank, and then repeat Steps 2 to 4.
- * The screw closest to sensor is factory fitted, but re-tighten on site.

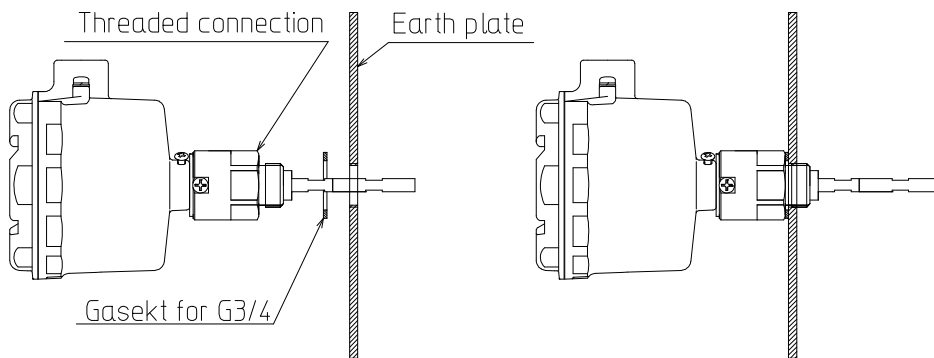


5.4.2 Sensors with tubing with threaded connection (GW100NP□□)

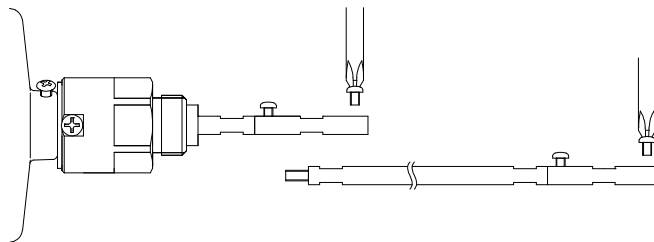
- (1) Place the gasket for G1 thread on the tubing, and screw the tubing into the tank with a spanner (41mm A/F).



- (2) Place the gasket for G3/4 thread on the sensor assembly, and then fit the earth plate to the threaded connection.



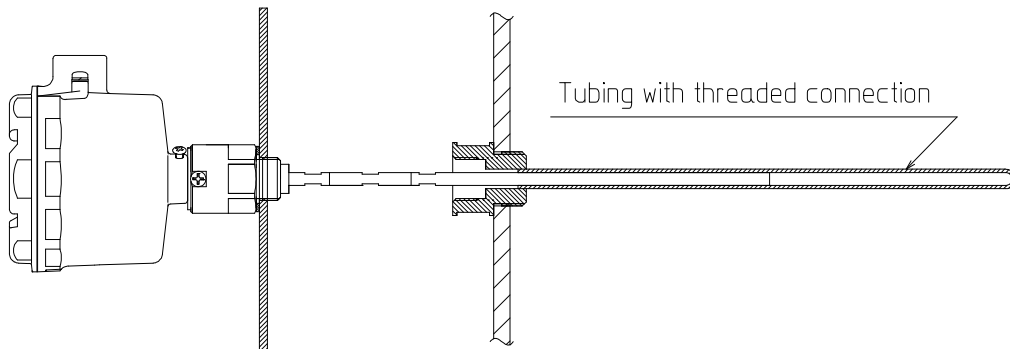
- (3) This version does not require screws (M4, 5mm). Remove the screws on the connection rod, if any.



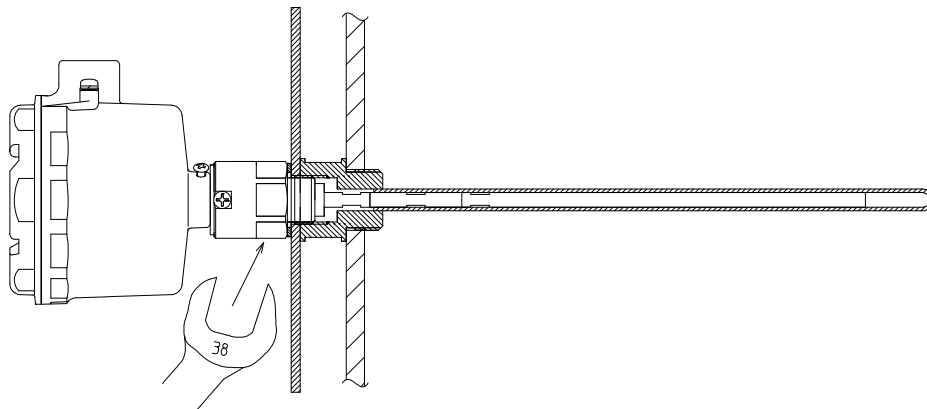
(4) Follow Steps 2 and 3 in *5.4.1 Assembling rod probe sensors* on page 15.

* If the space above the tank is not large enough for the overall sensor size, assemble the end rod first and insert it into the tubing with threaded connection, and then repeat Steps 2 and 3 on page 15.

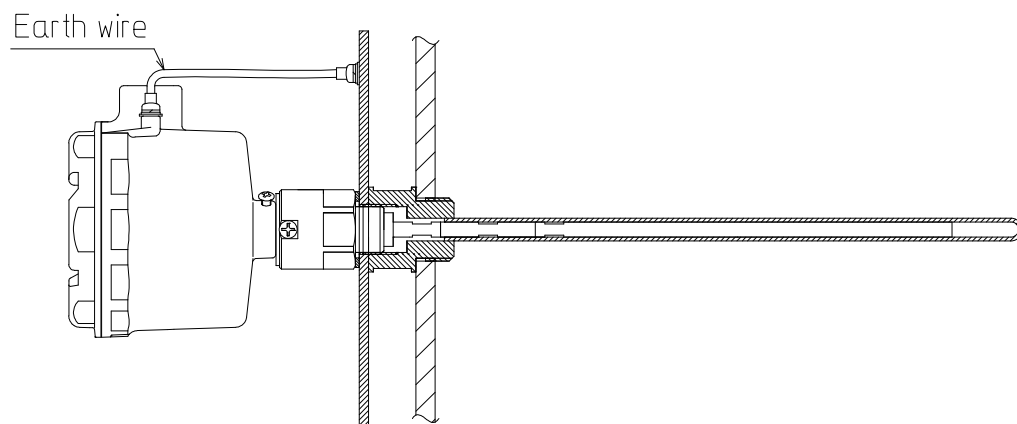
(5) Place the probe from the end rod in the tubing mounted on the tank in Step 1.



(6) Hold the sensor by the hexagon (38mm A/F) with a spanner, and screw the sensor in the tubing.

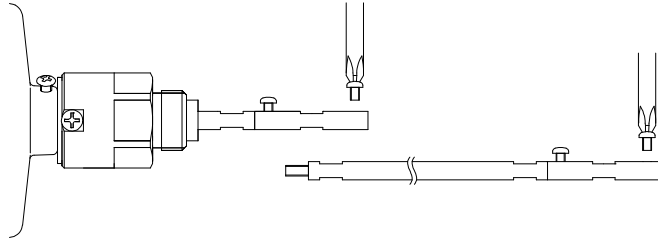


(7) Connect the external earth terminal on the housing and the earth plate with the supplied earth wire.



5.4.3 Sensors with tubing with gasket (GW100SP□□)

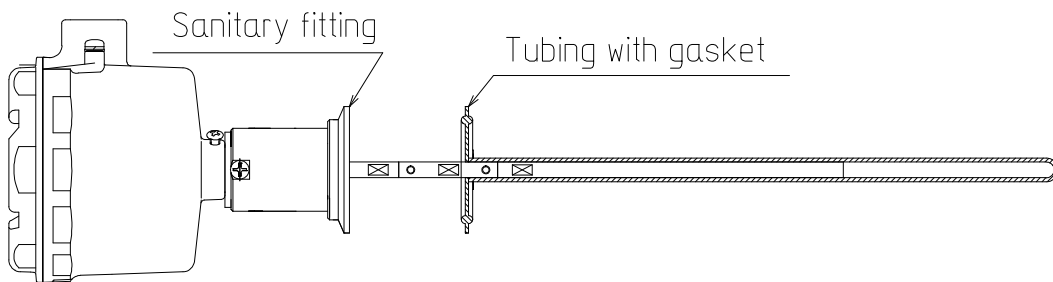
-
- (1) This version does not require screws (M4, 5mm). Remove the screws on the connection rod, if any.



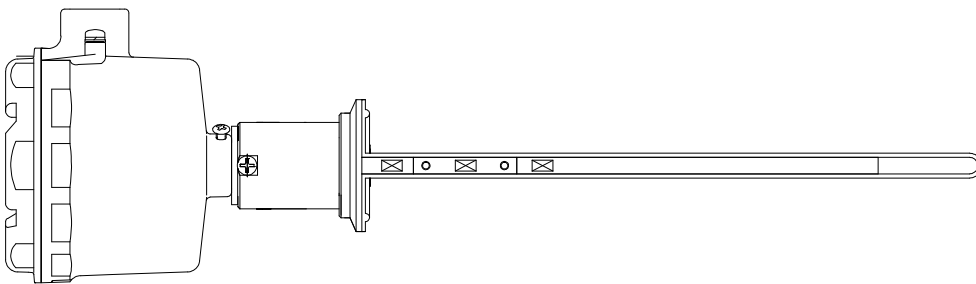
-
- (2) Follow Steps 2 and 3 in *5.4.1 Assembling rod probe sensors* on page 15.

* If the space above the tank is not large enough for the overall sensor size, insert the tubing with gasket into the tank first, and then assemble the end rod and insert it into the tubing with gasket, and then repeat Steps 2 and 3 on page 15.



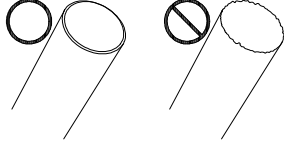





-
- (3) Place the probe to the tubing from the end rod.



-
- (4) Fit the sanitary fitting and the tubing.

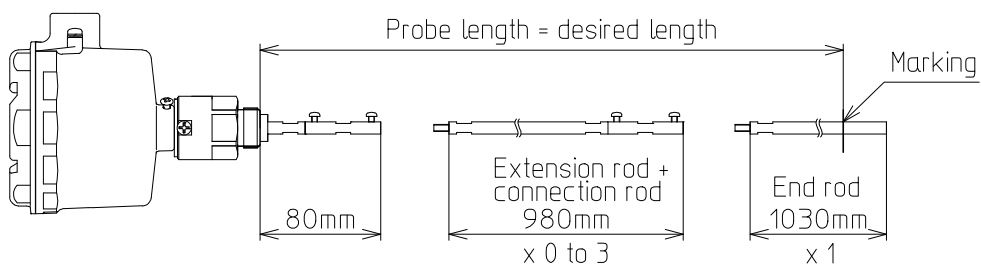


5.5 Cutting Probe

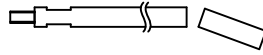
 WARNING	
<p>Disconnect the end rod from the sensor before cutting it. Cutting while the rod connected to the sensor may damage the sensor or deform the rod.</p>	
<p>Remove burrs on the cut rod with a metal file to prevent injury.</p>	 
<p>See the outline drawing for the reference point and the probe length of your sensor.</p>	
<p>Always follow the step in this manual when cutting the probe. Otherwise the sensor may be damaged.</p>	
<p>Wire tip has sharp edges. Use gloves when handling the wire probe to prevent injury.</p>	
<p>Wire probes cannot be disassembled or replaced. If the wire is cut too short, the whole sensor has to be repaired. Make sure you have marked the wire probe at a correct length and cut it carefully. If the required length is not known, leave long enough length so the size can be adjusted later.</p>	

5.5.1 Rod probe (GW100□R□□)

(1) Mark the end rod at the desired length. See below for the size of each component.

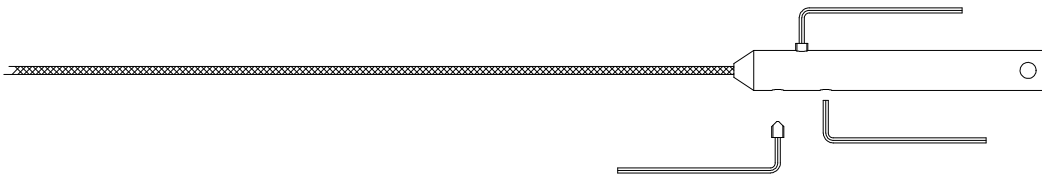


-
- (2) Cut the probe vertically at the marking with a saw or grinder.
Remove burrs with a metal file or sand paper.



5.5.2 Wire probe (GW100□W□□)

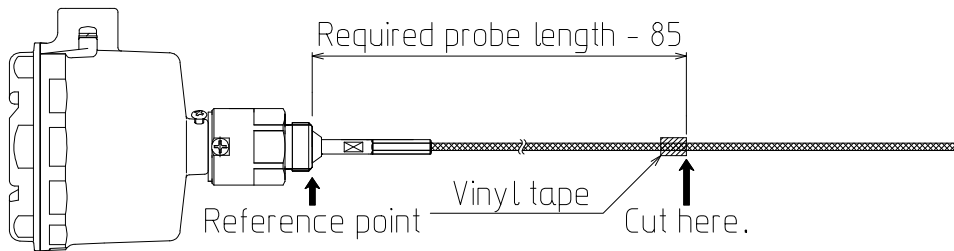
-
- (1) Remove 3 screws (M6, 5mm, pointed) on the weight with a wrench.



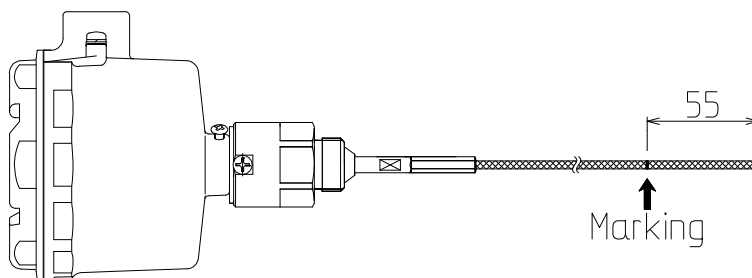
-
- (2) Pull the probe out of the weight.



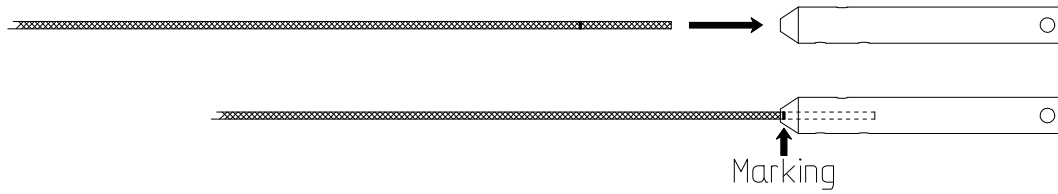
-
- (3) Use tape on the probe where the probe is to be cut to keep the wire bundled.
Straighten the wire and cut it to make the probe length 85mm shorter than required.
If the required length is not known, leave long enough length so the size can be adjusted later.



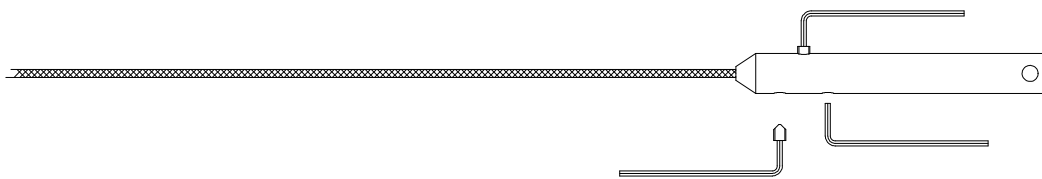
-
- (4) Mark the cut wire at 55mm from the end.



-
- (5) Insert the wire to the weight. Make sure the marking is completely in the weight and not visible. In this state, the probe can be adjusted for about 20mm until the wire end touches the weight bottom. ($\pm 10\text{mm}$ of the point 65mm from the wire end)
If the wire inside the weight is shorter than 55mm, the weight may drop off the wire.



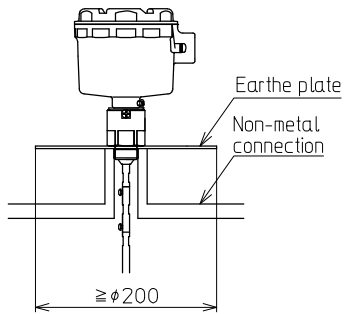
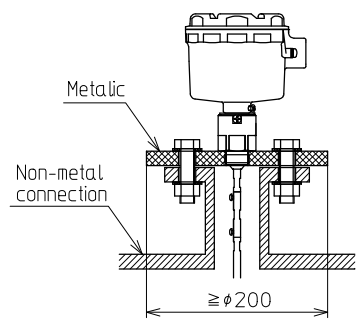
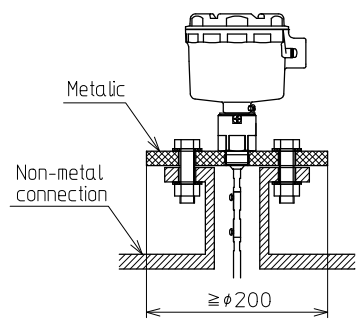
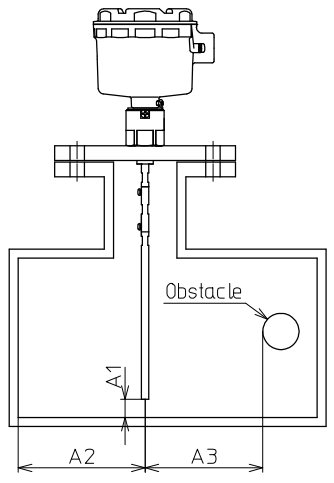
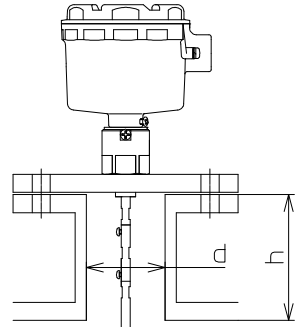
-
- (6) Tighten 3 screws with a tool (3 A/F) onto the weight to secure the wire (Torque: 7.8Nm)



5.6 Mounting Sensor

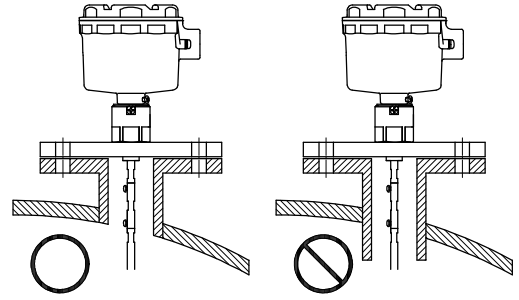
5.6.1 Location

Observe the following, or faulty operation may result.

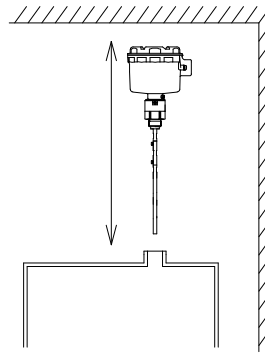
<p><Metal tank/connection> Use metal connection and ensure electrical continuity between the sensor process connection and the tank. If the tank connection is metallic but smaller than $\phi 200\text{mm}$, then use a metal flange ($\geq 100\text{A}/\text{DN}100$) or an earth plate* ($\geq \phi 200\text{mm}$) to ensure electrical continuity.</p>	
<p><Non-metal tank/connection> Use a metal flange ($\geq \text{DN}100$) or an earth plate ($\geq \phi 200\text{mm}$) to ensure electrical continuity between the sensor process connection and the tank.</p>	
<p><Grating> Provide an opening in the grating so that it does not contact the probe or the insulator, and install an earth plate ($\geq \phi 200\text{mm}$). Make sure there is no gap between the grating and the earth plate.</p>	
<p><Clearance in tank></p> <ul style="list-style-type: none"> - A1 $\geq 10\text{mm}$ - A2 $\geq 30\text{mm}$ - A3 $\geq 30\text{mm}$ 	
<p><Standpipe/nozzle design> Size (d): DN50 to DN200 Height (h) : $\leq 200\text{mm}$</p> <p>Contact our sales office for other sizes.</p>	

* See 11.1 GLOSSARY.

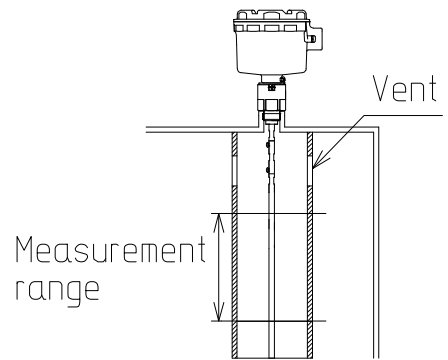
<Note on standpipe/nozzle design>
 Cut off the standpipe/nozzle extending into the tank.



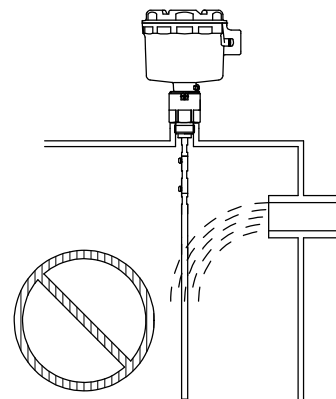
Ensure ample space around the mounting location for easy handling and maintenance.
 Ensuring space large enough for the overall length of the sensor is recommended for easy handling.



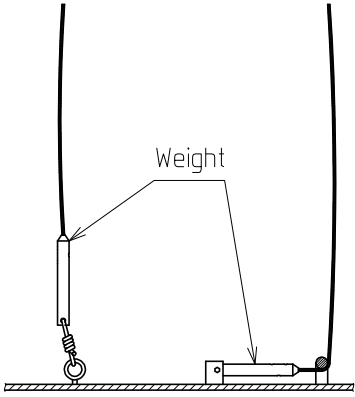
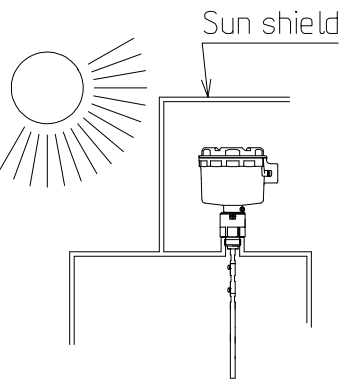
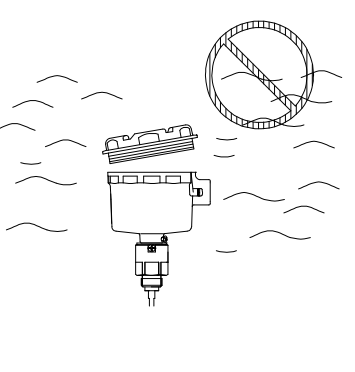
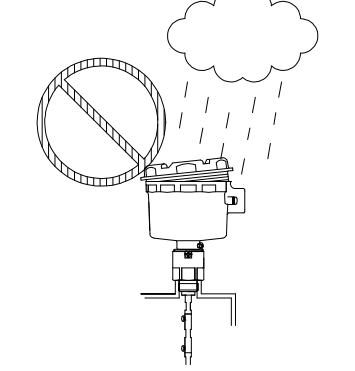



Avoid proximity to inlets/outlets, agitators, or other sources of turbulence, or provide a metal stillpipe*.
 Make ensure electrical continuity between the stillpipe and the sensor process connection. Always provide a vent on the stillpipe at a level higher than the highest expected level. No vent or one in the measurement range will prevent smooth level change inside the pipe.



Avoid filling streams to prevent faulty operation.



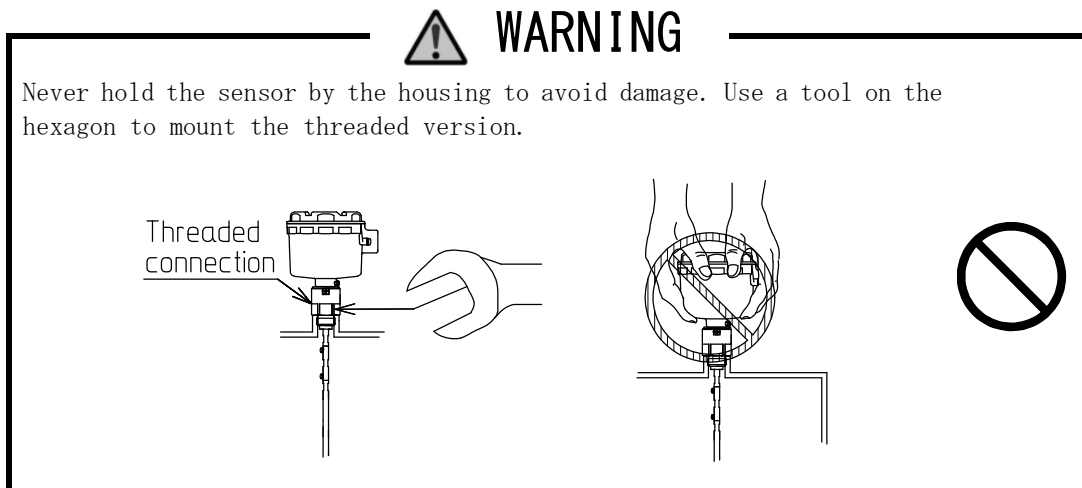
* See 11.1 GLOSSARY.

<p>Secure the weight at the end of wire probe to the tank when high flow is expected.</p>	
<p>When fixing the weight to the tank, ensure either electric continuity or complete isolation between the weight and tank to avoid faulty operation.</p>	
<p>Do not apply tension to the wire.</p>	
<p>Avoid high temperatures.</p>	
<p>Avoid direct sun light. Provide a sun shield* not to exceed ambient temperature ratings.</p>	
<p>Avoid corrosive atmosphere (NH₃, SO₂, Cl₂). Such atmosphere may penetrate the housing and damage internal components.</p>	
<p>Properly tighten the cover and seal the cable inlet. Water enter may cause faulty operation. The IP rating (IP65) is achieved only when the cover is properly tightened and the cable inlet properly sealed.</p>	

* See 11.1 GLOSSARY.

5.6.2 Mounting

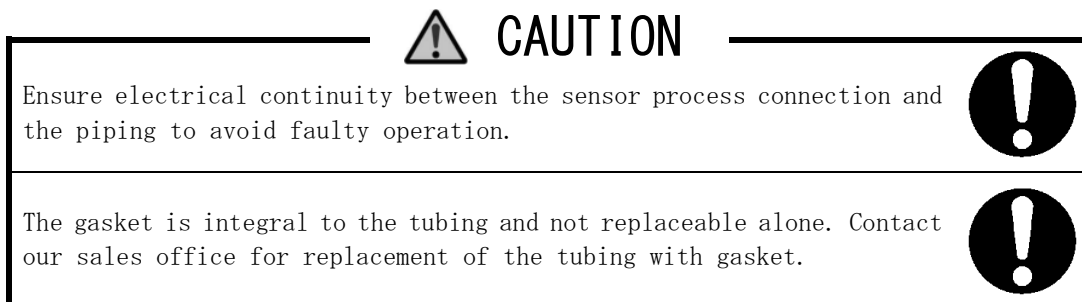
(1) Thread mounting



Take measures to prevent a leak from the process connection by using a gasket for example. Ensure electrical continuity between the sensor process connection and the tank at the same time.

(2) Sanitary

Use a metal clamp to mount the sensor. Tubing has an integral gasket, so no additional gasket is needed. Note that the clamp is an optional component.



(3) Flange mounting

Fit the flanges and secure them using a suitable tool and bolts according to applicable standards. Ensure the sensor is mounted vertically.



Use a gasket suitable for working conditions to prevent a leak. Ensure electrical continuity between the sensor process connection and the tank.



Note that bolts and gaskets are optional.

6. WIRING

6.1 Before Wiring

- (1) Disconnect power to the sensor.

	WARNING	
Disconnect power before wiring, or electric shock may result. Ignition or short circuit may also result due to leakage or charged components contacting each other.		

	CAUTION	
Do not exceed load resistance ratings for the analog output (500Ω max. at 24V DC) to avoid faulty operation.		

- (2) Remove the cover.

6.2 Wiring

- (1) Wire as shown in Figs. 6-1 to 6-3. Use a suitable screwdriver to tighten the terminal screws. Terminal screws are of M4. Use cable lugs of R1.25-4 or equivalent size. (Recommended torque: 1.2Nm for sensor terminals and the external earth terminal)

Notes:

1. Use an instrument power supply.
2. Avoid proximity to inverters, power supplies, or other noise sources.
3. Use shielded cable for input and output lines, and do not run it with power lines and magnet switch cable.
4. Ground the instruments according to local regulations.
5. If grounding is not possible at the sensor end (plastic vessels, etc.), ground at the power supply end (PU2000, MP2000) using shielded cable.
6. Use a socket equivalent to 11PFA from OMRON for Power Unit PU2000.

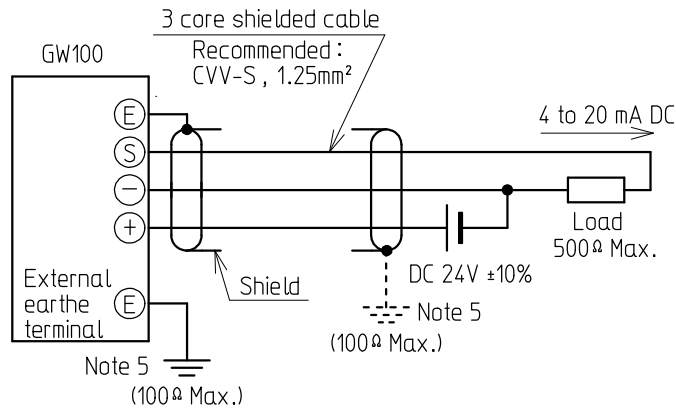


Fig. 6-1: GW100

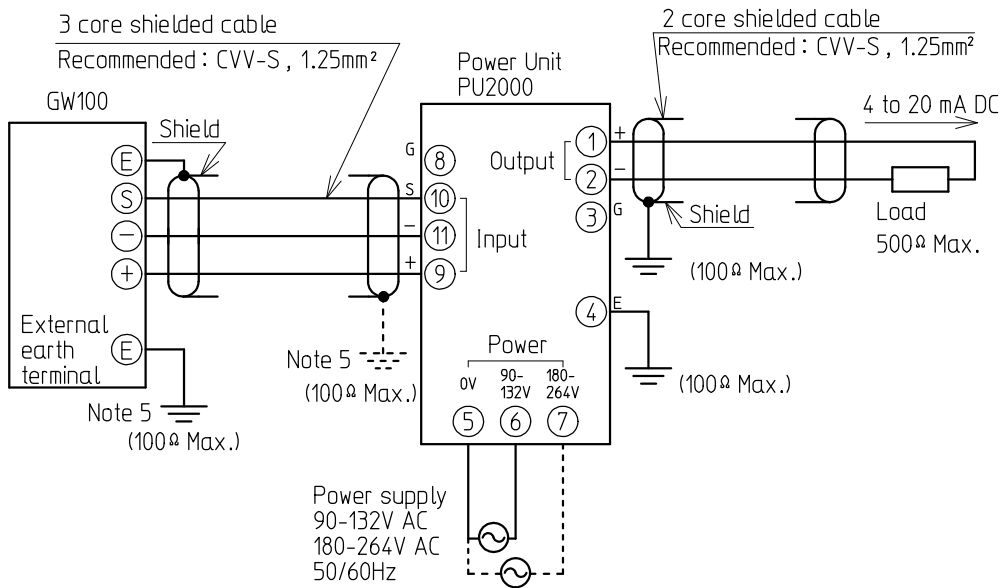


Fig. 6-2: GW100 with PU2000

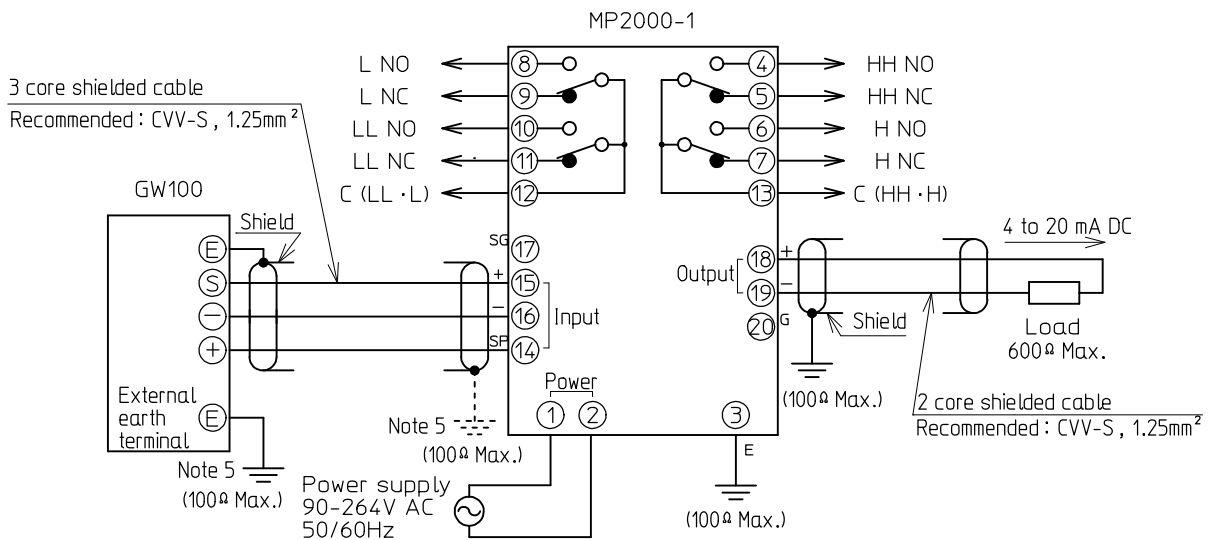


Fig. 6-3: GW100 with MP2000-1

6.3 Cable Inlet

Secure the cable by tightening the gland with a suitable tool when a cable gland is used, and using sealing compound when a conduit is used. In either case, lead the cable downwards in front of the inlet.

This is to prevent entry of dust, or rain into the housing. If water or moisture may enter from inside the conduit, putty the inside.

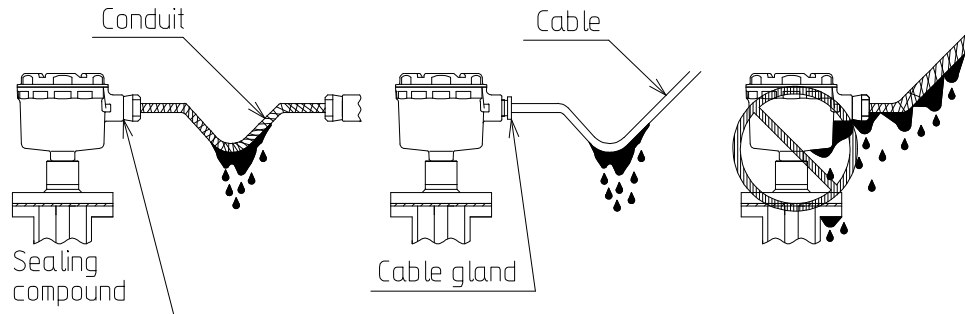


Fig.6-4: cable inlet

6.4 Placing Cover

Remove condensation, dust, or other foreign particles inside the housing, and then place the cover. Tighten the cover until it comes to a stop. Loose cover may allow water or dust entry and cause faulty operation due to short circuit or corrosion.

7. OPERATION



CAUTION

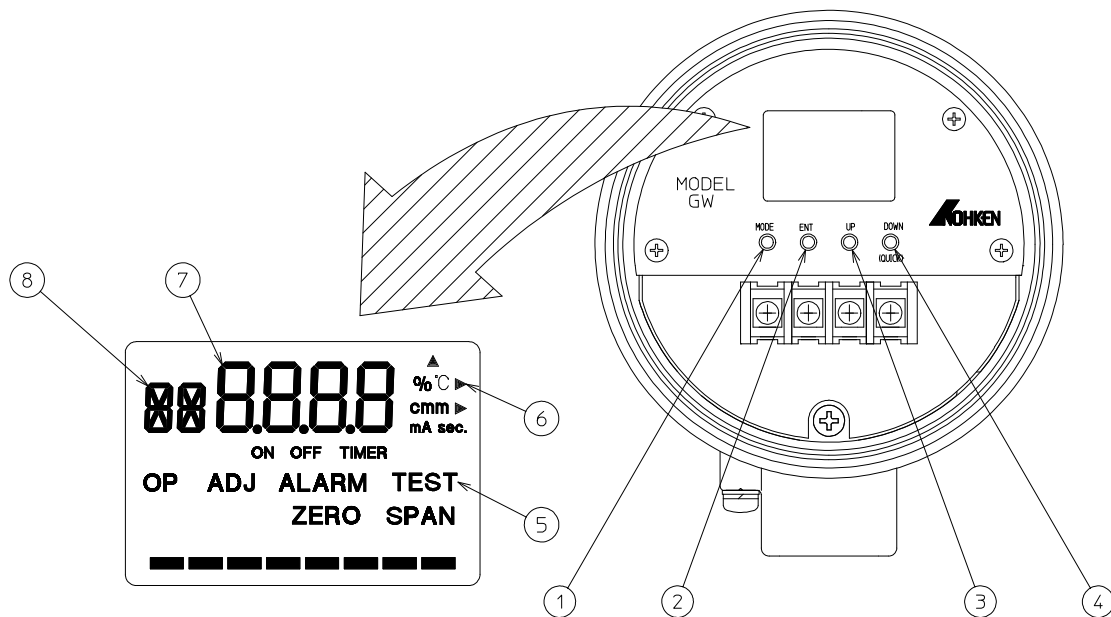
Program the sensor before operation. See 7.2 Commissioning on page 33.



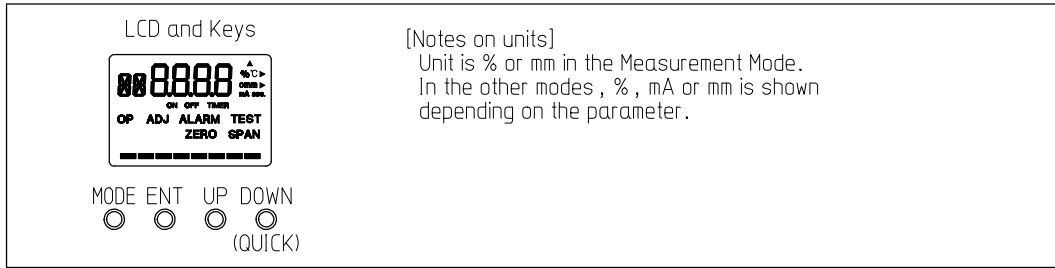
7.1 Before Operation

7.1.1 Key name and function

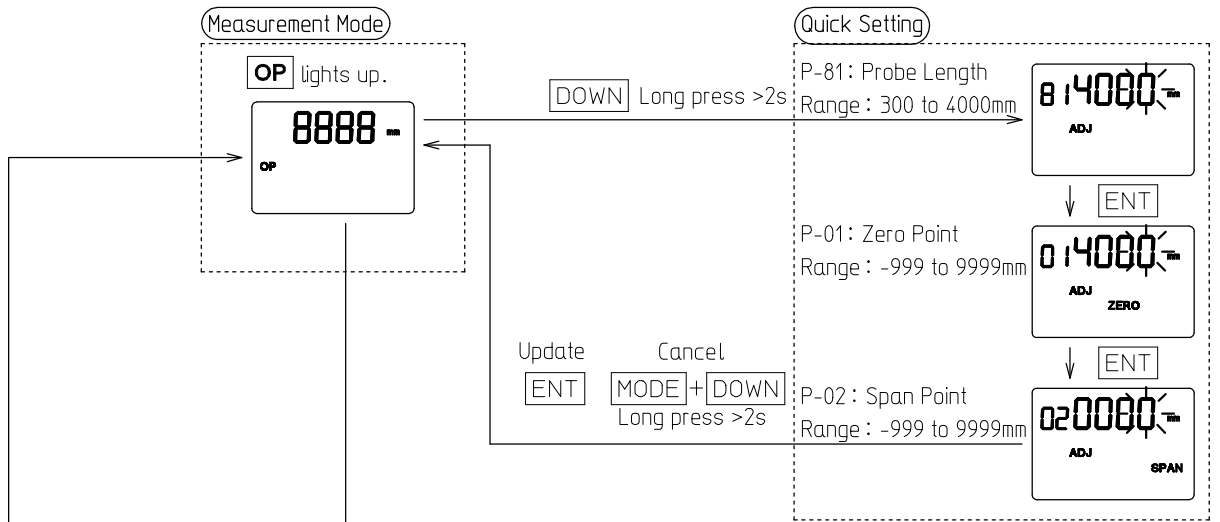
No.	Name	Function
1	MODE key	<p> Cancels the entered value and moves to a higher menu.</p> <p> Changes modes.</p>
2	ENT key	<p> Moves to a lower menu.</p> <p> Accepts the entered value.</p>
3	UP key	Scrolls up modes, parameters, and values.
4	DOWN key	<p>Scrolls down modes, parameters, and values.</p> <p>Opens quick setting mode (long press).</p>
5	Mode area	Displays the current mode.
6	Unit area	Displays the unit.
7	Data area	Displays measured values, settings, and parameters.
8	Maintenance Mode area	Displays maintenance modes and parameters.



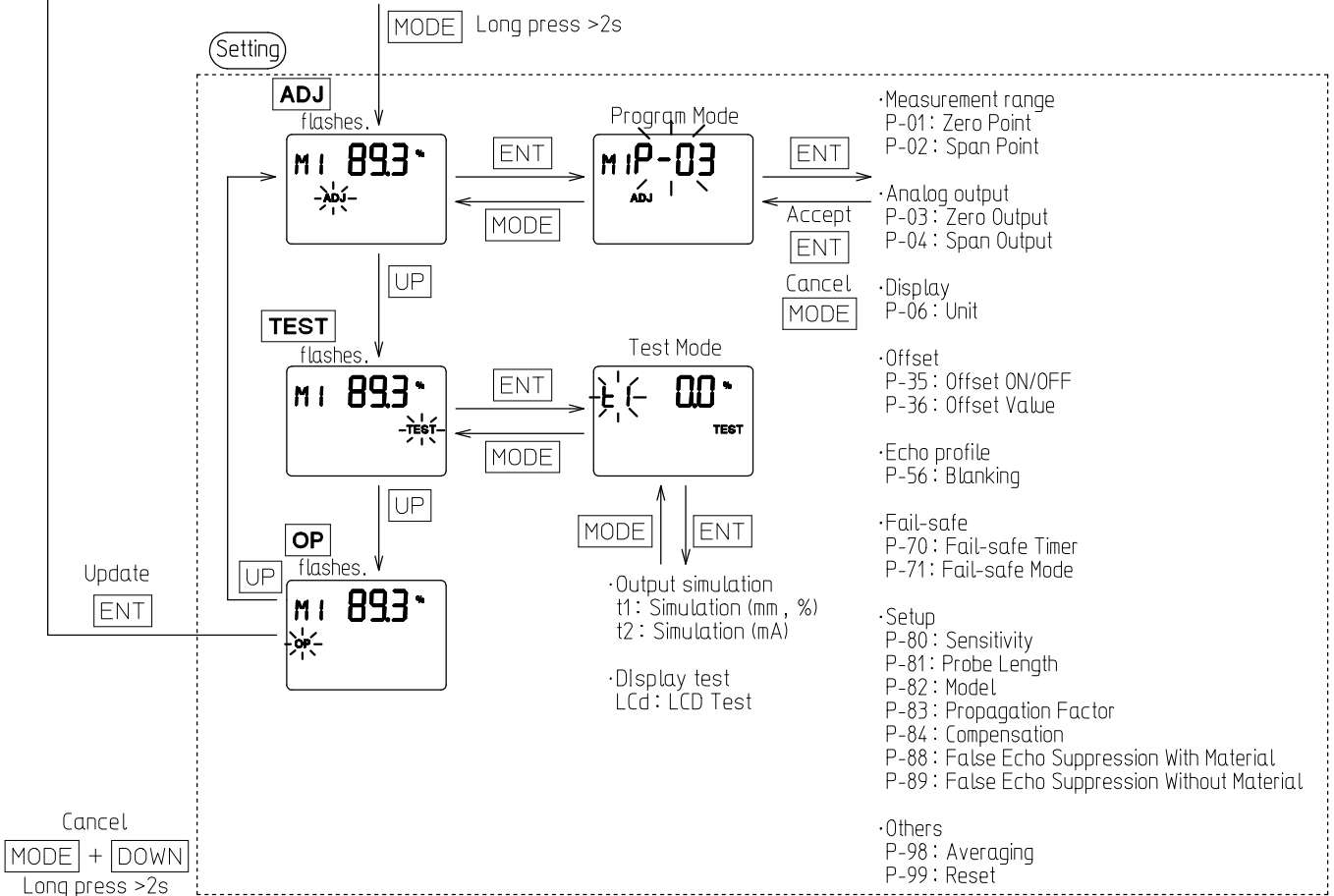
7.1.2 Modes and operation flow



MODE ENT UP DOWN mean keys to press.



Performing Quick Setting first and then use advanced features below if necessary.

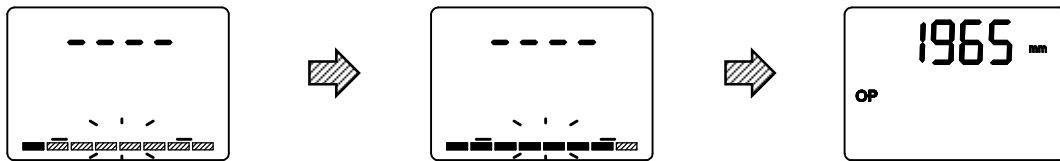


7.1.3 Startup behavior

Ensure correct wiring, and supply power to the sensor.

The sensor will display bars and output 3.8mA. In approximately 10 seconds, the sensor will be in the Measurement Mode and displays “OP” in the mode area.

The sensor displays the measured value and outputs a current according to the reading.



* Value shown as example.

Fig. 7-1: Start-up behavior

WARNING	
Ensure controlled devices are not adversely affected while the sensor is being programmed.	

CAUTION	
The sensor starts measuring approximately 10 seconds after power-up.	
Allow 30 minutes before starting programming.	
Pressing ENT while “OP” is flashing updates the parameter data and changes the modes to the Measurement Mode. To cancel all the entered values, press MODE and DOWN for 2 seconds or longer while “ADJ” and “TEST” are flashing. Program the sensor again if necessary.	
In the case of power interruption during programming, data that has not been updated will be lost. Program the sensor again after supplying power.	

7.2 Commissioning

Mandatory	Recommended	Error → Corrective action
Supply power ↓ Quick Setting ↓ Complete	P-56 Blanking Cancel echoes in the nozzle. P-70 Fail-safe Timer Set according to the speed of process change. P-71 Fail-safe Mode Ensure safety is not compromised.	“E” or “LoE” is displayed and measurement not possible, or reading fluctuates. → Set P-80 Sensitivity to Hi. Reading is incorrect. → P-88 False Echo* Suppression w/ Material or P-89 False Echo Suppression w/o Material.

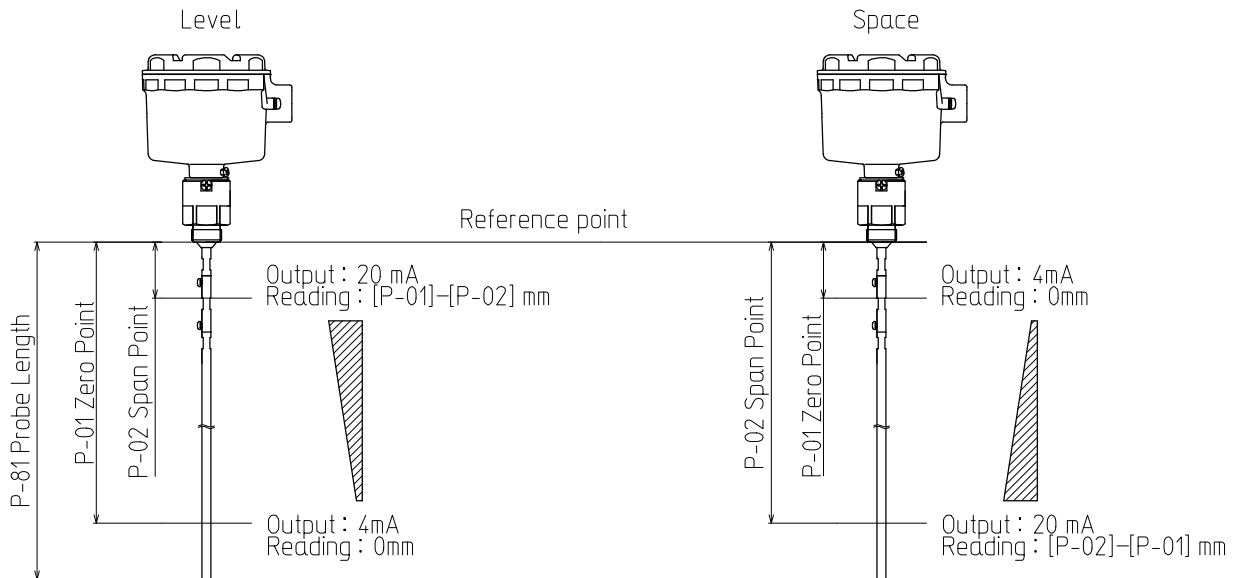
See 10. TROUBLESHOOTING when trouble occurs.

7.3 Quick Setting

Programming three basic parameters, P-81 Probe Length, P-01 Zero Point, and P-02 Span Point, will get the sensor ready for typical level or space measurement applications.

See 7.3.1 Procedures on page 34.

Perform a reset beforehand when reinstalling an already programmed sensor on a different tank.
 See 7.6.9 Reset on page 59.

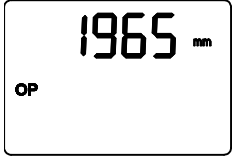
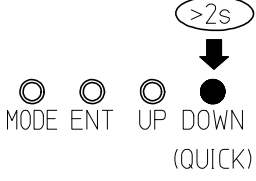
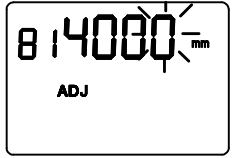
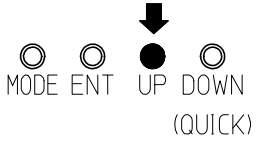
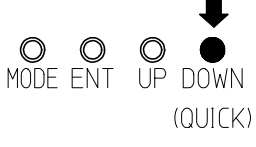
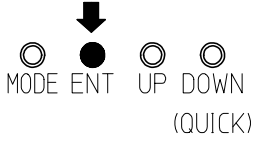
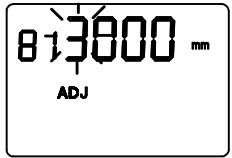


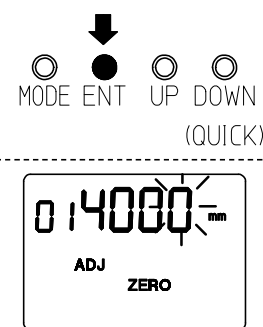
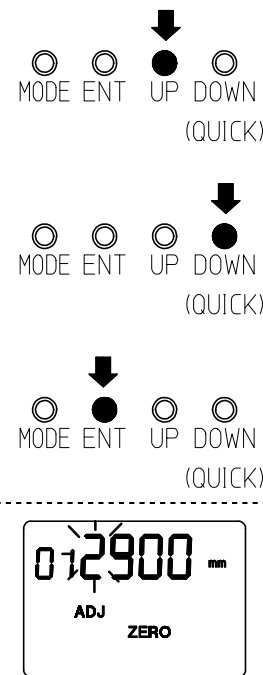
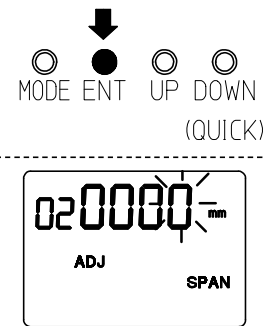
When % is selected as the unit, the zero point will displayed as 0% and the span point 100%.

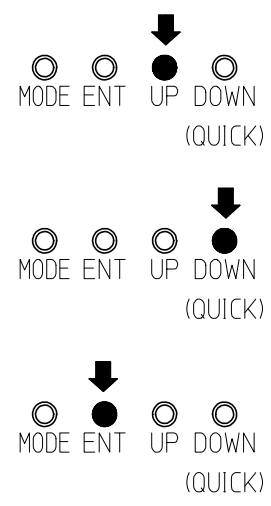
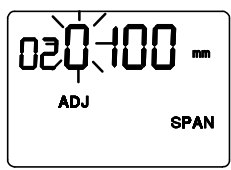
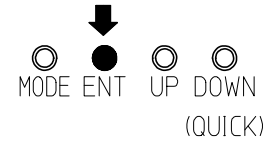
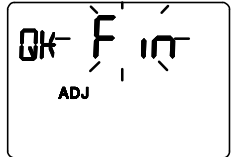
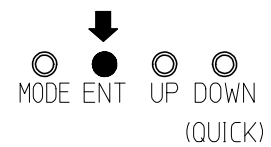

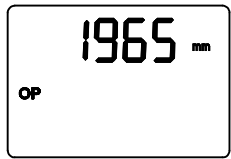
* See 11.1 GLOSSARY.

7.3.1 Procedures

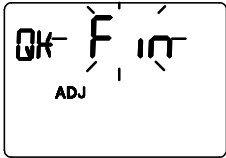
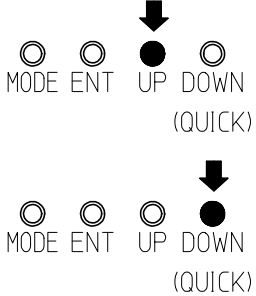
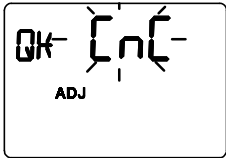
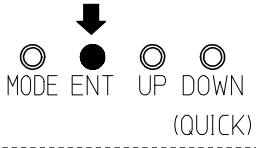
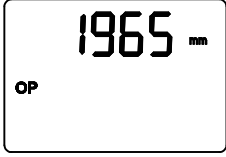
See 7.4.1 Program mode parameter on page 38 for parameter details.

Description	Keys/LCD
<p>(1) Ensure that the sensor is in the Measurement Mode (“OP” displayed). If not, see 10 TROUBLESHOOTING on page 70.</p>	 <p>Example value shown.</p>
<p>(2) Press DOWN for longer than 2 seconds.</p> <hr/> <p>“81” will light up, and the first digit of the probe length flashes.</p>	 <hr/> 
<p>(3) <Setting probe length> Set the probe length (distance from the reference point to the probe end). Press UP to increase and DOWN to decrease the value. Press ENT to accept the value and move to the next digit.</p> <p>«Range: 300 to 4000 mm»</p> <p>* If a wrong value has been accepted, proceed to Step 8 and complete the Quick Setting, and then start from the beginning again. Or, cancel the Quick Setting. See 7.3.2 Canceling Quick Setting on page 37.</p>	   <hr/> 

<p>(4) Press ENT once.</p> <hr/> <p>“01” and “ZERO” will light up, and the right-end digit of the current zero point will flash.</p>	
<p>(5) <Setting the zero point> Set the zero point (distance from the reference point). Press UP to increase and DOWN to decrease the value. Press ENT to accept the value and move to the next digit.</p> <p>«Range: -999 to 999 mm»</p> <p>* If a wrong value has been accepted, proceed to Step 8 and complete the Quick Setting, and then start from the beginning again. Or, cancel Quick Setting. See 7.3.2 <i>Canceling Quick Setting</i> on page 37.</p>	
<p>(6) Press ENT once.</p> <hr/> <p>“02” and “SPAN” will light up, and the right-end digit of the current zero point will flash.</p>	

<p>(7) <Setting the span point> Set the zero point (distance from the reference point). Press UP to increase and DOWN to decrease the value. Press ENT to accept the value and move to the next digit.</p> <p>«Range: -999 to 999 mm»</p> <p>* If a wrong value has been accepted, proceed to Step 8 and complete the Quick Setting, and then start from the beginning again. Or, cancel Quick Setting. See 7.3.2 <i>Canceling Quick Setting</i> on page 37.</p>	 <p>MODE ENT UP DOWN (QUICK)</p> <p>MODE ENT UP DOWN (QUICK)</p> <p>MODE ENT UP DOWN (QUICK)</p> <hr/> 
<p>(8) Press ENT once.</p> <hr/> <p>“Qk” will light up, and “Fin” will flash.</p>	 <p>MODE ENT UP DOWN (QUICK)</p> <hr/> 
<p>(9) <Updating the values> Press ENT once.</p> <hr/> <p>After the values have been updated, “WR” will change to “WR”, and “OP” will flash.</p>	 <p>MODE ENT UP DOWN (QUICK)</p> <hr/> 
<p>(10) When “WR” goes off and “OP” flashes, Quick Start Setting has been complete. Check the sensor displays and outputs as it should. If it does not, see 10. <i>TROUBLESHOOTING</i> on page 70.</p>	 <p>* Example value shown. * “E” displayed for empty tank.</p>

7.3.2 Canceling Quick Setting

<p>(1) At Step 8 in 7.3.1 Procedure on page 34, "Qk" lights up and "Fin" flashes.</p>	
<p>(2) Press UP or DOWN once.</p>	
<p>"CnC" flashes.</p>	
<p>(3) Press ENT once.</p> <p>Flashing "OP" means the settings have been cancelled. Go back to 7.3.1 Procedure if necessary.</p>	 

7.4 Parameter Reference

7.4.1 Program mode parameter

After performing Quick Setting, advanced setting can be done in the Program Mode. The sensor will output a value according to current setting when in the Program Mode.

See 7.6 *Program Mode* for how to use this mode.

Default value in the parameter tables are indicated with an asterisk (*) unless explicitly stated.

P-01 Zero Point

Values	Range	-999 to 9999 mm
	Default	4000 mm

Distance from the reference point to the zero point.
See 7.3.1 *Procedure* on page 34 for detail.

P-02 Span Point

Values	Range	-999 to 9999 mm
	Default	0 mm

Distance from the reference point to the span point.
See 7.3.1 *Procedure* on page 34 for detail.

P-03 Zero Output

Values	Range	3.80 to 20.50 mA
	Default	4.00 mA

Analog output value for the zero point.
Usually the value needs not to be changed.

P-04 Span Output

Values	Range	3.80 to 20.50 mA
	Default	20.00 mA

Analog output value for the span point.
Usually the value needs not to be changed.

P-06 Unit

Values	mm	*	
	%		

Unit for reading in the Measurement Mode.

P-35 Offset ON/OFF

Values	non	*	No offset.
	diSP		Offsets reading.
	ALL		Offsets reading and analog output.

Determines what to offset.

P-36 Offset Value

Values	Range	-999 to 9999 mm
	Default	0 mm

Sets a constant value to add to the measured value.

If the current reading is 2000mm, and the setting in this parameter is changed from “0” to “500”, the reading will be 2000+500 = 2500mm.

☆ If P-35 is set to “non”, the value in this parameter has no effect on reading.

P-56 Blanking

Values	Range	0 to 4000 mm
	Default	0 mm

Area in which the sensor ignores echoes. Enter a distance from the reference point. This feature is useful when the false echo from nozzle adversely affects operation. Ensure the liquid surface will not reach this area.

See 7.6.4 *Blanking* on page 48.

P-70 Fail-safe Timer

Values	Range	1 to 5400 seconds
	Default	60 seconds

Sets the time elapsed before the sensor goes into the fail-safe mode.

While the Fail-safe Timer is activated, a rectangular is displayed at the right bottom corner of the display. The sensor uses the last valid measurement to display and output.



Fig. 7-2

*Example value shown.

See 7.6.5 *Fail-safe* on page 50 for detail.

P-71 Fail-safe Mode

Values	Hi		20.5mA
	Lo		3.8mA
	HoLd	*	Last valid value

Sets the output value when the sensor is in the fail-safe mode.

Select the one the safest in your application.

See 7.6.5 *Fail-safe* on page 50 for detail.

For example:

- 1) To avoid overflow in a level measurement application, select “Hi” and stop the filling pump.
- 2) To avoid pump from running dry in a level measurement application, select “Lo” to stop the discharge pump.

P-80 Sensitivity

Values	Hi		High sensitivity
	Lo	*	Low sensitivity

Select “Hi” when the sensor cannot detect the material, or the reading fluctuates.

When averaging is disabled (P-98 set to “0”), measurement interval is 1 second when this parameter is set to “Hi”, and 0.3 seconds when “Lo”

See 7.6.6 *Sensitivity* on page 53 for detail.

P-81 Probe Length


Values	Range	300 to 4000 mm
	Default	4000 mm

Enter the probe length of the sensor in millimeters.


See 7.3.1 *Procedure* on page 34.

☆ Enter the distance from the reference point to the probe end, including the weight.

☆ Enter the distance from the reference point to the tank bottom if the probe end is connected and electrically continued to the metal tank bottom.



CAUTION



Tubed rod can NOT be shortened by the user. Specify the length at the time of order for this probe type.

P-82 Model

Values	100		GW100NR□
	101		GW100NW□
	102		GW100NP□
	110		GW100SR□
	112		GW100SP□

Sets the sensor model (process connection and probe type).

P-83 *Propagation Factor* and P-84 *Compensation* will be set automatically according to the setting in this parameter.



CAUTION



Do not change *P-82 Model* without permission from Nohken.

P-83 Propagation Factor

Values	Range	0.900 to 1.000
	Default	-----

Compensates for change in propagation factor.



CAUTION



Do not change *P-83 Propagation Factor* without permission from Nohken.

P-84 Compensation

Values	Range	-200 to 200 mm
	Default	-----

Fine tunes the reference point.



CAUTION



Do not change *P-84 Compensation* without permission from Nohken.

P-88 False Echo Suppression With Material)

Values	Range	300 to 4000 mm
	Default	-----

Enter the distance from the reference point to the material surface in millimeters.
See *7.6.7 Enabling False Echo Suppression With Material* on page 55.

Echo from the area set in this parameter is canceled to stabilize operation.
Ensure the material surface is at least 300mm below the reference point before setting this parameter.
If the sensor is installed on a nozzle, ensure the material surface is at least 300mm below the nozzle end.
If bubbles cover the material surface, enter the distance to the bubble surface instead of the material surface.

If the material level is below the probe end, or it is possible to empty the tank, use *P-89 False Echo Suppression Without Material* on page 55.

P-89 False Echo Suppression Without Material

Value	Default	run
-------	---------	-----

Cancels the false echo in the range from the reference point to the probe end to stabilize operation.

Set *P-81 Probe Length* first and then use this parameter.
See *7.6.8 False Echo Suppression Without Material* on page 57.

If the probe is in contact with the material, or the probe end is connected and electrically continued to the metal tank bottom, use *P-88 False Echo Suppression With Material*.

P-98 Averaging

Values	0		No averaging.
	1	*	1 second
	2		2 seconds
	3		3 seconds
	4		4 seconds
	5		5 seconds
	10		10 seconds
	20		20 seconds
	30		30 seconds
	60		60 seconds
	120		120 seconds
	180		180 seconds

Measurements over the set time are averaged.

☆ Longer averaging time will improve measurement fluctuations, but decreases response rate to level changes.

P-99 Reset

Values	Range	1965
	Default	1999

Resets all the settings to factory defaults.

Enter "1965" in this parameter, and press ENT.

See 7.6.9 *Reset* on page 59.



CAUTION

If parameters are specified at the time of order, the specified values replaces the default settings in this manual.



7.4.2 Test mode parameter

t1 Simulation (mm, %)

Values	Range	-999 to 9999 mm
	Default	Last displayed value before accessing this parameter

Use this parameter to simulate analog output.

Enter a value, and the sensor will give an analog output corresponding to the value. Enter a level or space value depending on the operation mode.

If *P-06 Unit* is set to "%", input range will be 0.00 to 100.0%.

See 7.7.3 *Simulation (mm, %)* on page 63.

t2 Simulation (mA)

Values	Range	3.80 to 20.50 mA
	Default	Last output value before accessing this parameter

Use this parameter to force the sensor to output a specified value.

See 7.7.4 *Simulation (mA)* on page 65.

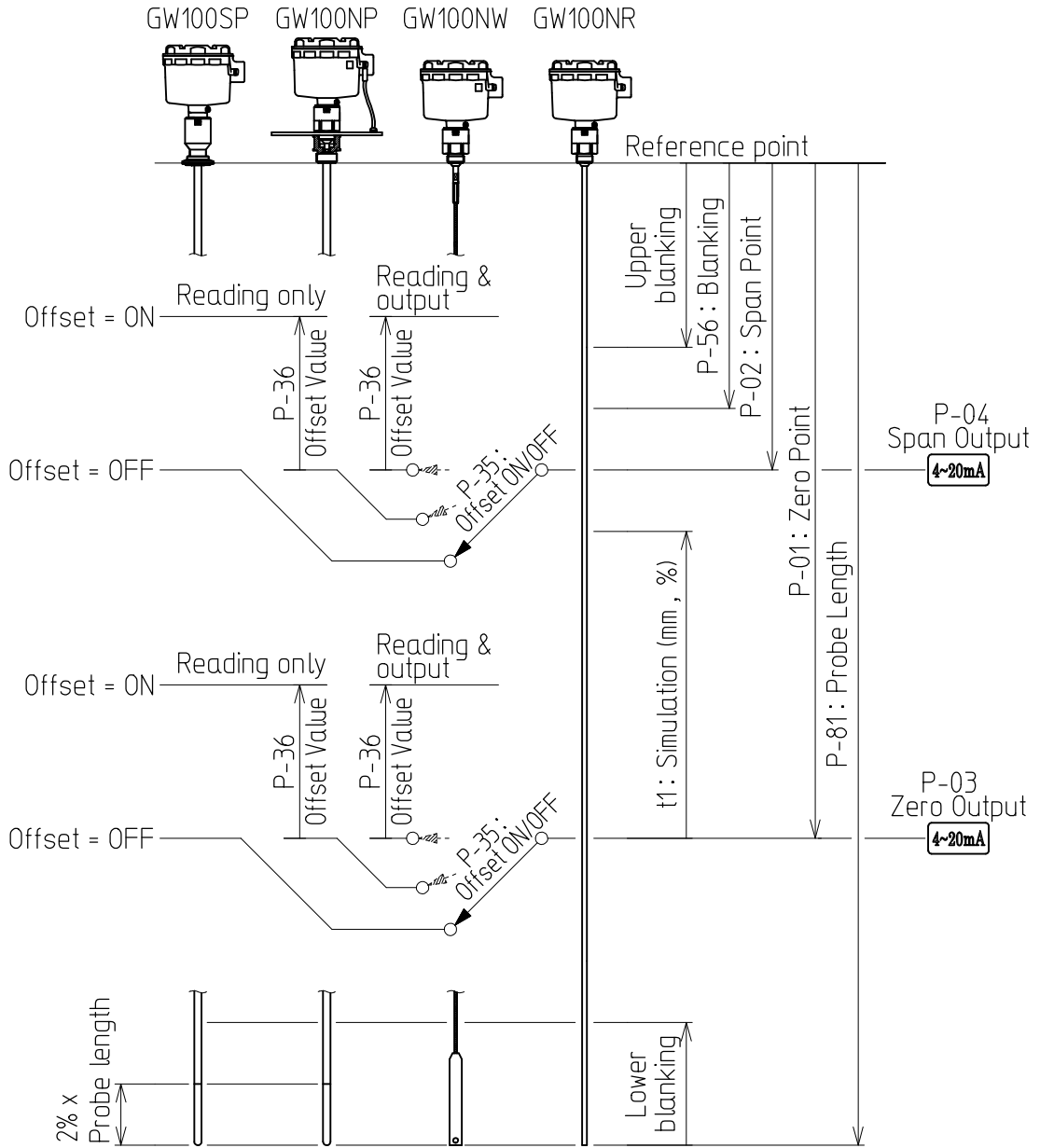
LCd LCD Test

Tests operation of the LCD.

In this test mode, all segments light up, and then each segment lights up and goes out one after another.

See 7.7.5 *LCD Test* on page 67.

7.5 Reference Drawing



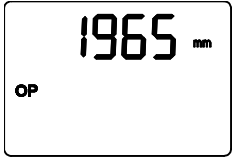
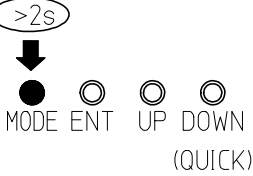
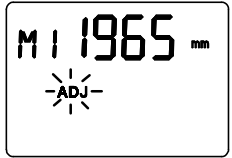
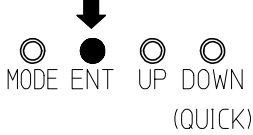
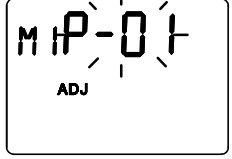
* Level application shown.

7.6 Program Mode

Table of contents:

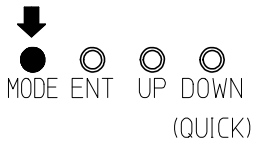
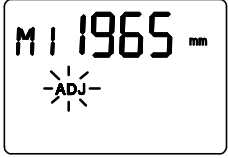
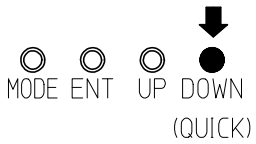
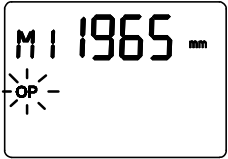
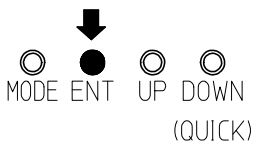
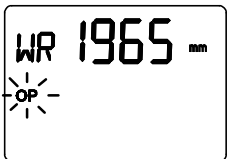
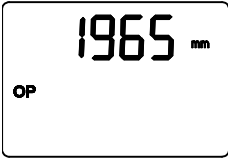
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7.6.1 Switching to Program Mode

Description	Keys/LCD
<p>(1) Ensure that the sensor is in the Measurement Mode (“OP” displayed). If not, see <i>10 TROUBLESHOOTING</i> on page 70.</p>	 <p>Example value shown.</p>
<p>(2) <Switching to the Program Mode> Press MODE for longer than 2 seconds.</p> <p>-----</p> <p>“M1” will light up, and “ADJ” flash.</p>	 
<p>(3) Press ENT.</p> <p>-----</p> <p>“ADJ will light up, and the parameter for zero point setting “P-01” will flash. Now the sensor is in the Program Mode.</p>	 

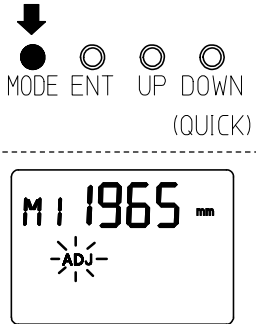
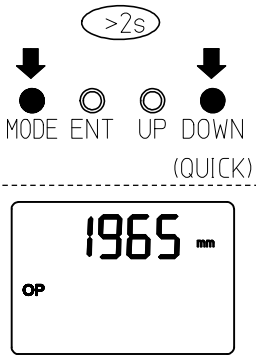
7.6.2 Updating data

The entered values can be cancelled any time until the data is updated according to the instruction in this section.

Description	Keys/LCD
<p>(1) <Saving the entered value> Press MODE once.</p> <hr style="border-top: 1px dashed black;"/> <p>“ADJ” will flash.</p>	 
<p>(2) Press DOWN once.</p> <hr style="border-top: 1px dashed black;"/> <p>“OP” will flash.</p>	 
<p>(3) Press ENT.</p> <hr style="border-top: 1px dashed black;"/> <p>“M” goes out and “WR” will light up while the data is being updated.</p>	 
<p>(4) “OP” will light up when data is updated.</p>	

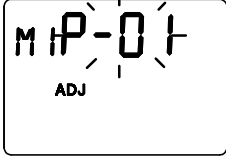
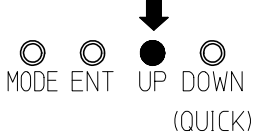
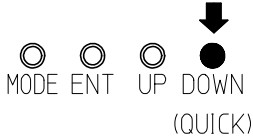
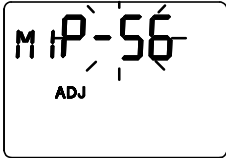
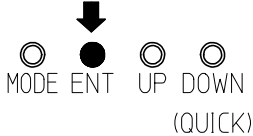
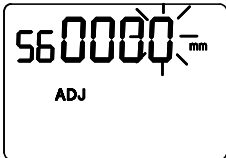
7.6.3 Canceling entry

Before updating the data, the entered values can be cancelled and the last updated value restored.

Description	Keys/LCD
<p>(1) Press MODE until "ADJ" or "TEST" flashes. Proceed to Step 2 if "OP" is flashing.</p> <hr style="border-top: 1px dashed black;"/> <p>"ADJ" or "TEST" will flash.</p>	 <p style="text-align: center;">↓ ● ○ ○ ○ MODE ENT UP DOWN (QUICK)</p>
<p>(2) Press MODE and DOWN for longer than 2 seconds.</p> <hr style="border-top: 1px dashed black;"/> <p>"OP" will light up when the entry is cancelled.</p>	 <p style="text-align: center;">>2s ↓ ○ ○ ↓ MODE ENT UP DOWN (QUICK)</p>

7.6.4 Blanking

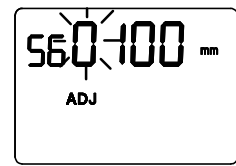
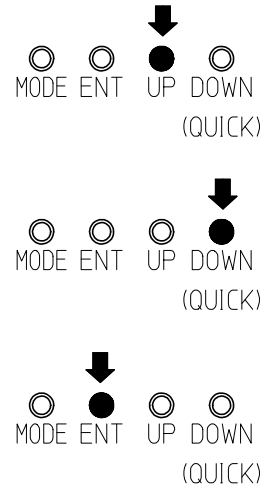
See 7.4.1 Program mode parameter on page 37 for parameter detail.

Description	Keys/LCD
<p>(1) <Switching to the Measurement Mode> Follow steps in 7.6.1 <i>Switching to Measurement Mode</i> on page 45.</p>	
<p>(2) <Scrolling parameters> Press UP or DOWN until “P-56” flashes. UP scrolls forwards and DOWN backwards.</p>	<div style="text-align: center;">  </div> <div style="text-align: center;">  </div> <hr style="border-top: 1px dashed black;"/> 
<p>(3) <Setting the blanking> Press ENT once.</p> <hr style="border-top: 1px dashed black;"/> <p>“56” will light up, and the right-end digit of the value will flash.</p>	<div style="text-align: center;">  </div> <hr style="border-top: 1px dashed black;"/> 

(4) Set the blanking distance in 4 digits.
 UP will increase, and DOWN decrease the value.
 ENT will accept the value and moves the cursor to the next digit.

<Range: 0 to 4000mm>

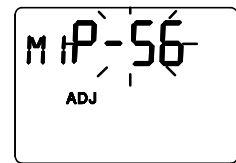
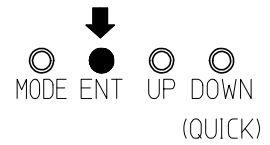
If a wrong number is accepted, press MODE to cancel the entry, or proceed to Step 5 to accept the change and then go back to Step 3 to enter the correct value.



(5) Press ENT once.

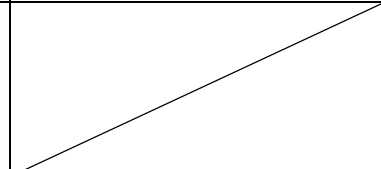
“P-56” will flash again.

The change has now been accepted. Note that at this stage the data has not been updated. Proceed to the next step.



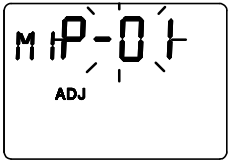
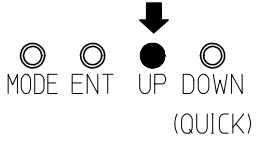
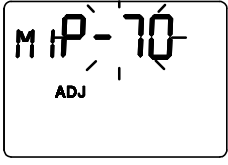
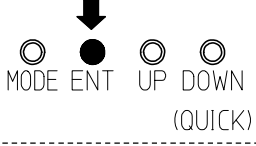
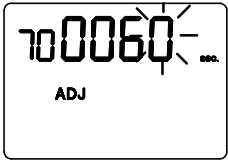
(6) <Updating the data>

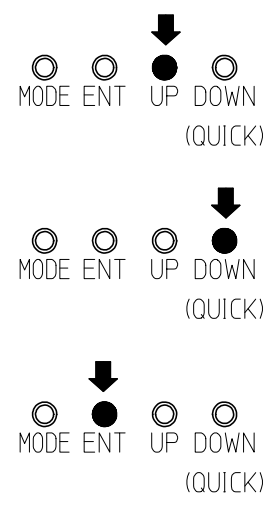
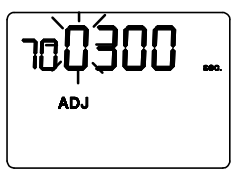
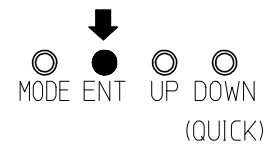
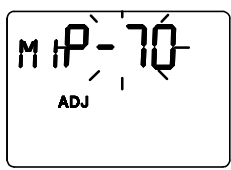
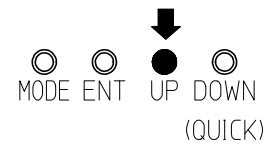
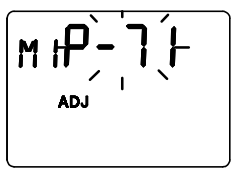
Follow steps in 7.6.2 *Updating data* on page 46.

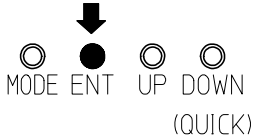
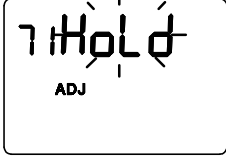
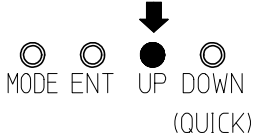
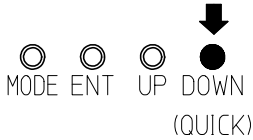
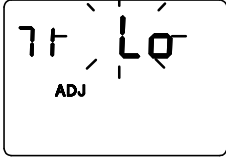
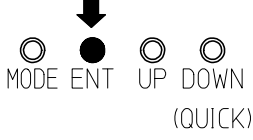
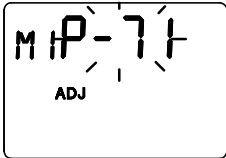
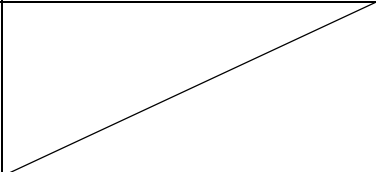


7.6.5 Fail-safe

This section shows how to set Parameters *P-70 Fail-safe Timer* and *P-71 Fail-safe Mode*. See 7.4.1 *Program mode parameter* on page 38 for detail.

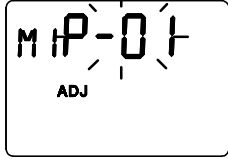
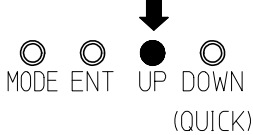
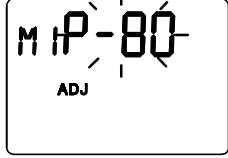
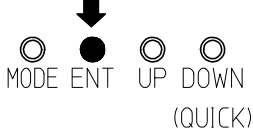
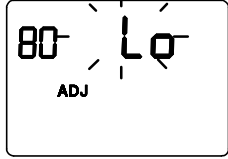
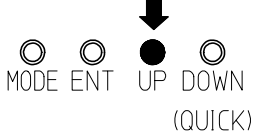
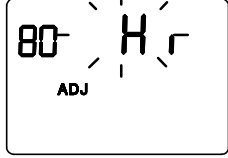
Description	Keys/LCD
<p>(1) <Switching to the Measurement Mode> Follow steps in 7.6.1 <i>Switching to Measurement Mode</i> on page 45.</p>	
<p>(2) <Scrolling parameters> Press UP or DOWN until “P-70” flashes. UP scrolls forwards and DOWN backwards.</p>	<div style="text-align: center;">  </div> <hr style="border-top: 1px dashed black;"/> <div style="text-align: center;">  </div>
<p>(3) <Setting the fail-safe timer> Press ENT once.</p> <hr style="border-top: 1px dashed black;"/> <p>“70” will light up, and the right-end digit of the value will flash.</p>	<div style="text-align: center;">  </div> <hr style="border-top: 1px dashed black;"/> <div style="text-align: center;">  </div>

<p>(4) Set the fail-safe timer. UP will increase, and DOWN decrease the value. ENT will accept the value and moves the cursor to the next digit.</p> <p><Range: 1 to 5400 sec.></p> <p>If a wrong number is accepted, press MODE to cancel the entry, or proceed to Step 5 to accept the change and then go back to Step 3 to enter the correct value.</p>	 <hr style="border-top: 1px dashed black;"/> 
<p>(5) Press ENT once.</p> <hr style="border-top: 1px dashed black;"/> <p>“P-70” will flash again.</p>	 <hr style="border-top: 1px dashed black;"/> 
<p>(6) <Scrolling parameters> Press UP once.</p> <hr style="border-top: 1px dashed black;"/> <p>“P-71” will flash.</p>	 <hr style="border-top: 1px dashed black;"/> 

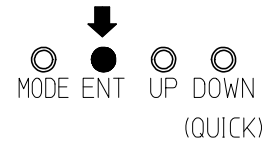
<p>(7) <Setting Fail-safe Mode> Press ENT once.</p> <p>-----</p> <p>“71” will light up, and the right-end digit of the value will flash.</p>	 <p>MODE ENT UP DOWN (QUICK)</p> <hr/> 
<p>(8) Set the fail-safe mode. UP will scroll forwards and DOWN backwards.</p> <p><Options: Hi, Lo, HoLD></p>	 <p>MODE ENT UP DOWN (QUICK)</p>  <p>MODE ENT UP DOWN (QUICK)</p> <hr/> 
<p>(9) Press ENT once.</p> <p>-----</p> <p>“P-71” will flash again. The change has now been accepted. Note that at this stage the data has not been updated. Proceed to the next step.</p>	 <p>MODE ENT UP DOWN (QUICK)</p> <hr/> 
<p>(10) <Updating the data> Follow steps in 7.6.2 <i>Updating data</i> on page 46.</p>	

7.6.6 Sensitivity

See 7.4.1 Program mode parameter on page 38 for detail.

Description	Keys/LCD
<p>(1) <Switching to the Measurement Mode> Follow steps in 7.6.1 Switching to Measurement Mode on page 45.</p>	
<p>(2) <Scrolling parameters> Press UP or DOWN until "P-80" flashes. UP scrolls forwards and DOWN backwards.</p>	<div style="text-align: center;">  </div> <hr style="border-top: 1px dashed black;"/> <div style="text-align: center;">  </div>
<p>(3) <Setting sensitivity> Press ENT once.</p> <hr style="border-top: 1px dashed black;"/> <p>"80" will light up, and the current setting will flash.</p>	<div style="text-align: center;">  </div> <hr style="border-top: 1px dashed black;"/> <div style="text-align: center;">  </div>
<p>(4) Press UP or DOWN until the desired option is displayed. UP will increase, and DOWN decrease the value.</p> <p><Option: Hi, Lo></p>	<div style="text-align: center;">  </div> <hr style="border-top: 1px dashed black;"/> <div style="text-align: center;">  </div>

(5) Press ENT once.



“P-80” will flash again.

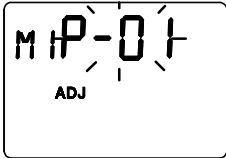
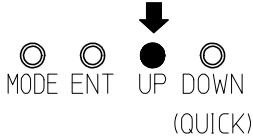
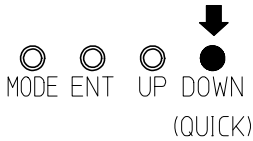
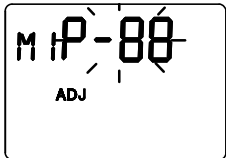
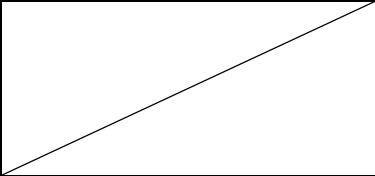
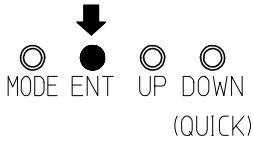
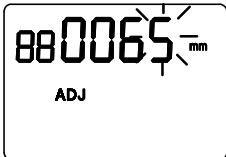
The change has now been accepted. Note that at this stage the data has not been updated. Proceed to the next step.

(6) <Updating the data>

Follow steps in *7.6.2 Updating data* on page 46.

7.6.7 False echo suppression with material

See 7.4.1 Program mode parameter on page 38 for detail.

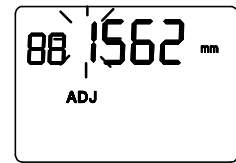
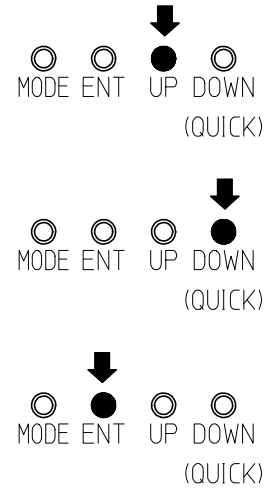
Description	Keys/LCD
<p>(1) <Switching to the Measurement Mode> Follow steps in 7.6.1 <i>Switching to Measurement Mode</i> on page 45.</p>	
<p>(2) <Scrolling parameters> Press UP or DOWN until “P-88” flashes. UP scrolls forwards and DOWN backwards.</p>	<div style="text-align: center;">   </div> <hr style="border-top: 1px dashed black;"/> 
<p>(3) Measure the distance between the reference point to the material surface. If bubbles cover the surface, measure the distance to the bubble surface. If the probe end is connected to the bottom of metal tank and the tank is empty, measure the distance to the tank bottom.</p>	
<p>(4) <False echo suppression with material> Press ENT once.</p> <hr style="border-top: 1px dashed black;"/> <p>“88” will light up, and the right-end digit of current reading will flash.</p>	<div style="text-align: center;">  </div> <hr style="border-top: 1px dashed black;"/> 

(5) Enter the distance measured in Step 3.
 If the probe end is connected to the metal tank bottom and electrically continued, enter the probe length.

UP will increase, and DOWN decrease the value.
 ENT will accept the value and moves the cursor to the next digit.

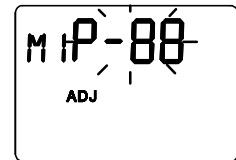
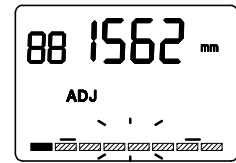
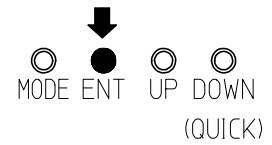
<Range: 300 to 4000mm>

If a wrong number is accepted, press MODE to cancel the entry, or proceed to Step 4 to accept the change and then go back to Step 3 to enter the correct value.



(6) Press ENT once.

Bar graph appears to show the progress.
 When the change is accepted, "P-88" will flash again.
 Note that at this stage the data has not been updated. Proceed to the next step.

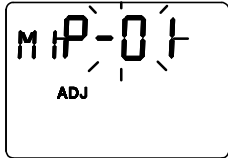
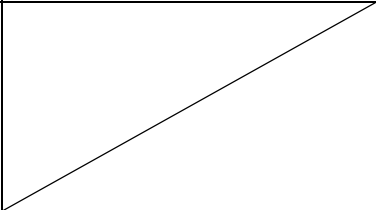
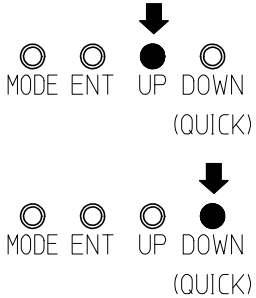
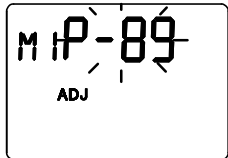
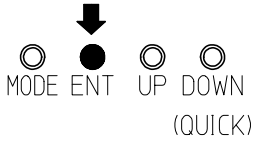
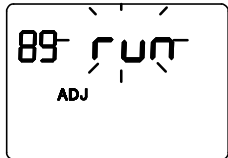


(7) <Updating the data>

Follow steps in 7.6.2 *Updating data* on page 46.

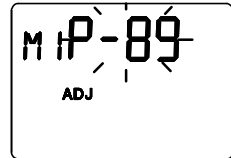
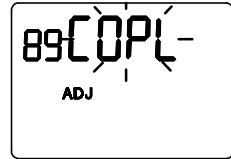
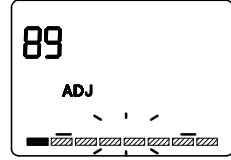
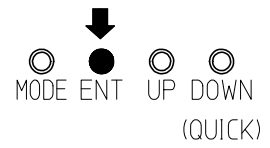
7.6.8 False echo suppression without material

See 7.4.1 Program mode parameter on page 38 for detail.

Description	Keys/LCD
<p>(1) <Switching to the Measurement Mode> Follow steps in 7.6.1 <i>Switching to Measurement Mode</i> on page 45.</p>	
<p>(2) <Checking probe length> Press UP or DOWN until “P-81” flashes. Press ENT. The current value flashes. Ensure the correct probe length is entered. If the probe is in contact with the material, or the probe end is connected to the metal tank bottom, follow steps in 7.6.7 <i>False echo suppression with material</i> on page 55.</p>	
<p>(3) <Scrolling parameters> Press UP or DOWN until “P-89” flashes. UP scrolls forwards and DOWN backwards.</p>	 <hr style="border-top: 1px dashed black;"/> 
<p>(4) <False echo suppression without material> Press ENT once.</p> <hr style="border-top: 1px dashed black;"/> <p>“89” will light up, and “run” will flash.</p>	 <hr style="border-top: 1px dashed black;"/> 

(5) Press ENT once.

Bar graph appears to show the progress.
When the setting is complete, "P-89" will flash again.
Note that at this stage the value has not been saved. Proceed to the next step.

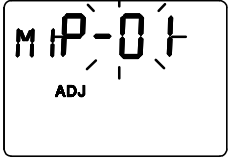
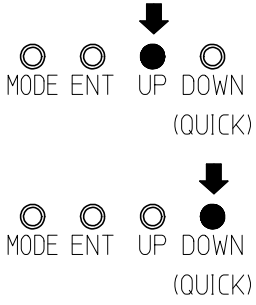
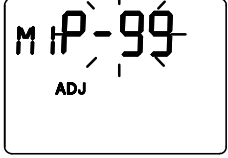
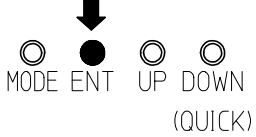
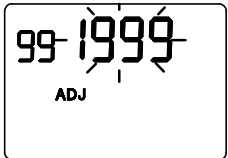


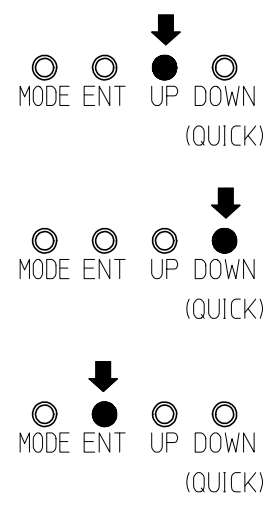
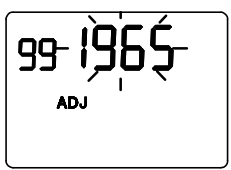
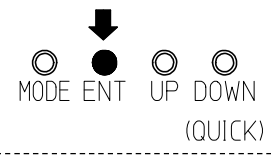
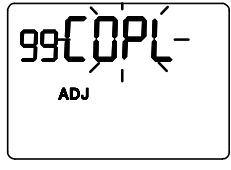
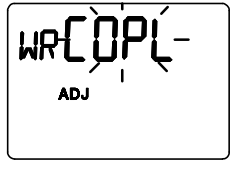
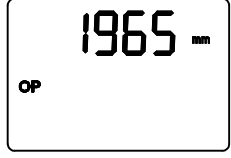
(6) <Updating the data>

Follow steps in 7.6.2 *Updating data* on page 46.

7.6.9 Reset

Perform a reset when the sensor is re-installed on a different tank, or before re-programming the sensor.

Description	Keys/LCD
<p>(1) <Switching to the Measurement Mode> Follow steps in 7.6.1 <i>Switching to Measurement Mode</i> on page 45.</p>	
<p>(2) <Scrolling parameters> Press DOWN once.</p> <p>-----</p> <p>“P-99” will flash. If another parameter is displayed, press UP or DOWN until “P-99” flashes. UP scrolls forwards and DOWN backwards.</p>	 
<p>(3) <Performing a reset> Press ENT once.</p> <p>-----</p> <p>The right-end digit of the pass code will flash.</p>	 

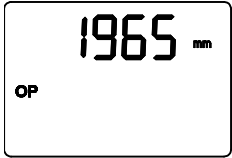
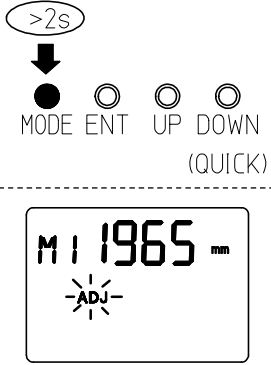
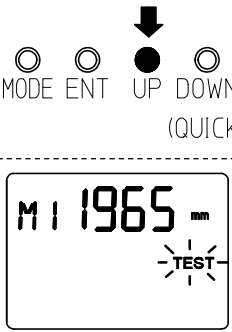
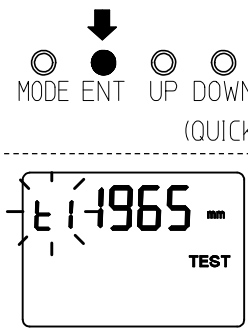
<p>(4) Enter the password (1965). UP will increase, and DOWN decrease the value. ENT will accept the value and moves the cursor to the next digit.</p> <p>If a wrong number is accepted, press MODE once to cancel the entry, or proceed to Step 5 to update the data and then go back to Step 4 to enter the correct value.</p>	 <p>MODE ENT UP DOWN (QUICK)</p> <p>MODE ENT UP DOWN (QUICK)</p> <p>MODE ENT UP DOWN (QUICK)</p> <hr/> 
<p>(5) Press ENT once.</p> <hr/> <p>Parameter settings will be reset to the factory defaults. “99” will disappear and “WR” will appear while the reset is in progress.</p>	 <p>MODE ENT UP DOWN (QUICK)</p> <hr/>  
<p>(6) “OP” will light up when the reset is complete.</p>	

7.7 Test Mode

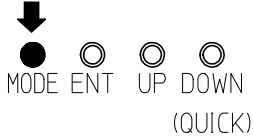
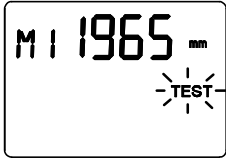
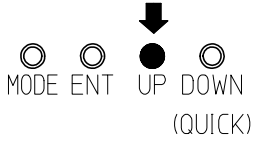
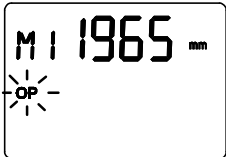
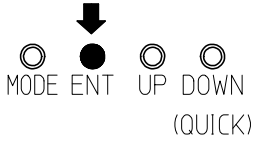
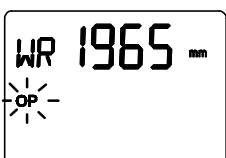
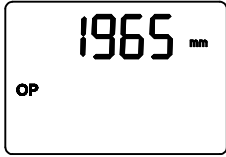
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7.7.1 Switching to Test Mode 61
 7.7.2 Exiting Test Mode 62
 7.7.3 Simulation (mm, %) 63
 7.7.4 Simulation (mA) 65
 7.7.5 LCD test 67

7.7.1 Switching to Test Mode

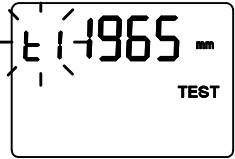
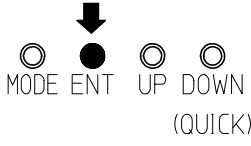
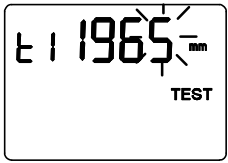
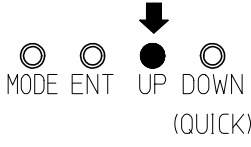
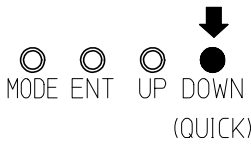
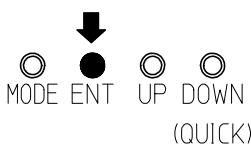
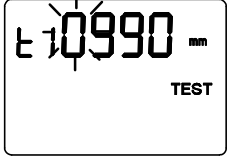
Description	Keys/LCD
(1) Ensure that the sensor is in the Measurement Mode (“OP” displayed). If not, see 10 TROUBLESHOOTING on page 70.	 Example value shown.
(2) <Switching to the Test Mode> Press MODE for longer than 2 seconds. ----- “M1” will light up, and “ADJ” flash.	
(3) Press UP once. ----- “TEST” will flash.	
(4) Press ENT. ----- “TEST” will light up, and “t1” will flash. Now the sensor is in the Test Mode.	

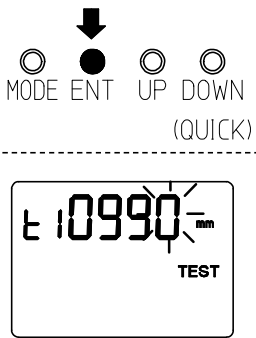
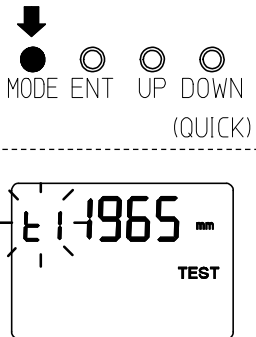
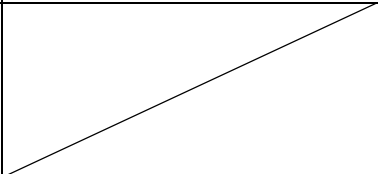
7.7.2 Exiting Test Mode

Description	Keys/LCD
<p>(1) <Returning to the Measurement Mode> Press MODE once.</p> <p>-----</p> <p>“TEST” will flash.</p>	 
<p>(2) Press UP once.</p> <p>Long pressing MODE and DOWN at once also switches the modes, without updating data.</p> <p>-----</p> <p>“OP” will flash.</p>	 
<p>(3) Press ENT once.</p> <p>-----</p> <p>“MI” goes out and “WR” will light up while the data is being updated.</p>	 
<p>(4) “WR” will go out and “OP” will light up. Now the sensor is in the Measurement Mode.</p>	

7.7.3 Simulation (mm, %)

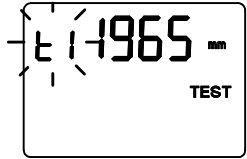
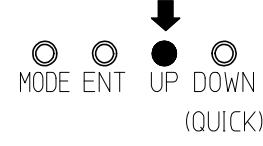

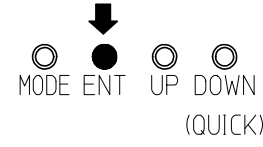
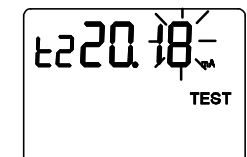
See 7.4.2 Test mode parameter for detail on page 43.

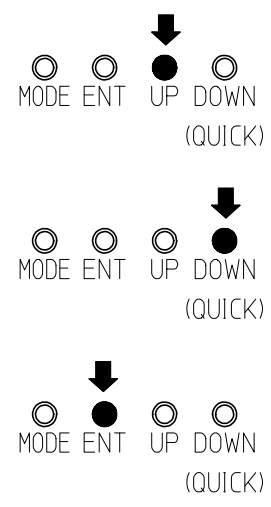
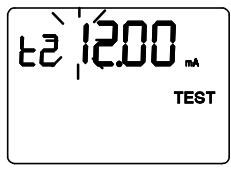
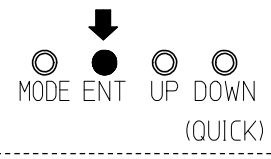
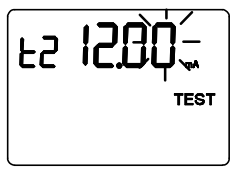
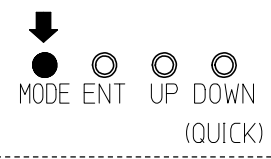
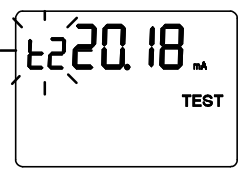
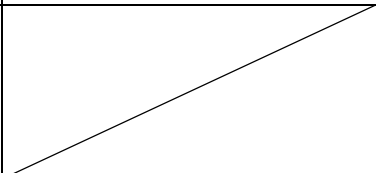
Description	Keys/LCD
<p>(1) <Switching to the Test Mode> Follow steps in 7.7.1 Switching to Test Mode on page 61.</p>	 <p>* Example value shown.</p>
<p>(2) <Simulation (mm, %)> Press ENT once.</p> <p>-----</p> <p>“t1” will light up, and the right-end digit of current output value will flash.</p>	 <p>MODE ENT UP DOWN (QUICK)</p> <hr/> 
<p>(3) Enter the desired value.</p> <p>UP will increase, and DOWN decrease the value. ENT will accept the value and moves the cursor to the next digit.</p> <p><Range: -999 to 9999mm, 000.0 to 100.0%></p>	 <p>MODE ENT UP DOWN (QUICK)</p>  <p>MODE ENT UP DOWN (QUICK)</p>  <p>MODE ENT UP DOWN (QUICK)</p> <hr/> 

<p>(4) Press ENT once.</p> <p>-----</p> <p>The sensor will output according to the entered value, and on the display the right end digit will flash.</p> <p>Repeat Steps 3 and 4 to simulate other values.</p>	 <p>Control panel diagram showing buttons: MODE, ENT (highlighted with a downward arrow), UP, and DOWN. Below the buttons is the text "(QUICK)". The display shows "t 10990 mm" with the last digit "0" flashing, and "TEST" below it.</p>
<p>(5) <Ending Simulation (mm, %)> Press MODE once.</p> <p>-----</p> <p>The sensor stops simulation, and "t1" will flash.</p>	 <p>Control panel diagram showing buttons: MODE (highlighted with a downward arrow), ENT, UP, and DOWN. Below the buttons is the text "(QUICK)". The display shows "t 11965 mm" with "t1" flashing, and "TEST" below it.</p>
<p>(6) <Returning to the Measurement Mode> Follow steps in 7.7.2 <i>Exiting Test Mode</i> on page 62.</p>	 <p>A diagonal slash indicating that the content continues on another page or is referenced elsewhere.</p>

7.7.4 Simulation (mA)

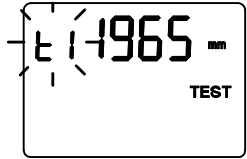
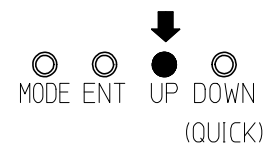
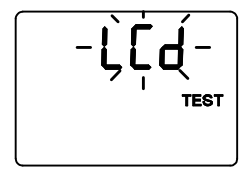
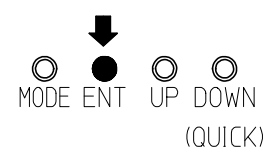
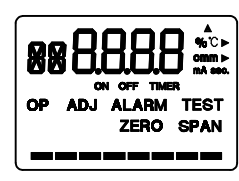
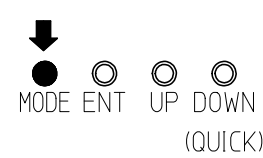
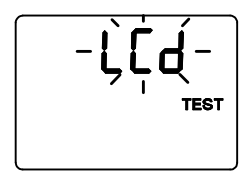
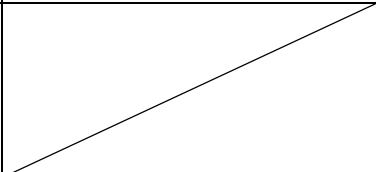
See 7.4.2 *Test mode parameter* for detail on page 43.

Description	Keys/LCD
<p>(1) <Switching to the Test Mode> Follow steps in 7.7.1 <i>Switching to Test Mode</i> on page 61.</p>	 <p>* Example value shown.</p>
<p>(2) <Simulation (mA)> Press UP once.</p> <p>-----</p> <p>“t2” will flash.</p>	 <p>MODE ENT UP DOWN (QUICK)</p> <hr/> 
<p>(3) Press ENT once.</p> <p>-----</p> <p>“t2” will stop flashing and light continuously, and the current output value will be displayed with the right end digit flashing.</p> <p>Default value of this parameter will be the one when the ENT is pressed in Step 2.</p>	 <p>MODE ENT UP DOWN (QUICK)</p> <hr/> 

<p>(4) Enter the desired value.</p> <p>UP will increase, and DOWN decrease the value. ENT will accept the value and moves the cursor to the next digit.</p> <p><Range: 3.80 to 20.50mA></p>	 
<p>(5) Press ENT once.</p> <p>The sensor will output the entered value, and on the display the right end digit will flash.</p> <p>If the entered value is outside the input range, this parameter does not affect the output and the last valid value will be displayed.</p> <p>Repeat Steps 4 and 5 to simulate other values.</p>	 
<p>(6) <Ending Simulation (mA)> Press MODE once.</p> <p>The sensor stops simulation, and "t2" will flash.</p>	 
<p>(7) <Returning to the Measurement Mode> Follow steps in 7.7.2 <i>Exiting Test Mode</i> on page 62.</p>	

7.7.5 LCD test

See 7.4.2 *Test mode parameter* for detail on page 43.

Description	Keys/LCD
<p>(1) <Switching to the Test Mode> Follow steps in 7.7.1 <i>Switching to Test Mode</i> on page 61.</p>	 <p>* Example value shown.</p>
<p>(2) <LCD test> Press UP twice.</p> <p>-----</p> <p>“LCd” will flash.</p>	 <p>MODE ENT UP DOWN (QUICK)</p> <hr/> 
<p>(3) Press ENT once.</p> <p>-----</p> <p>All the segments will light up and go off. Then each segment will light up one after another.</p>	 <p>MODE ENT UP DOWN (QUICK)</p> <hr/> 
<p>(4) <Ending LCD test> Press MODE once.</p> <p>-----</p> <p>The test will stop and “LCd” will flash.</p>	 <p>MODE ENT UP DOWN (QUICK)</p> <hr/> 
<p>(5) <Returning to the Measurement Mode> Follow steps in 7.7.2 <i>Exiting Test Mode</i> on page 62.</p>	

8. MAINTENANCE AND INSPECTION

Remove the sensor from the tank and read through 4. *HANDLING NOTES* on page 11 before starting maintenance. Ensure ample space.



WARNING

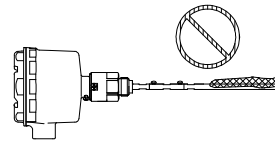
Disconnect power before wiring, or electric shock may result. Ignition or short circuit may also result due to leakage or charged components contacting each other.



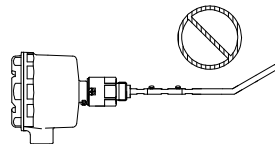
8.1 Maintenance Procedure

Perform maintenance every half or one year. More frequent maintenance will be required depending on frequency of use, material type, temperature, pressure and other conditions.

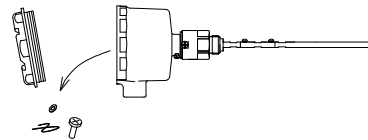
Remove buildup on the probe.



Check the sensor for visible damage that may impair performance. If any, repair or replace the damaged components. *1

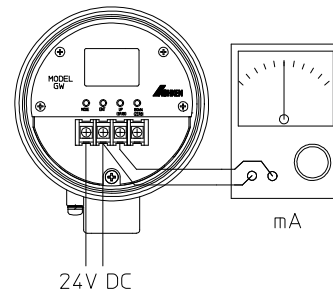


Remove condensation, dust, and metal particle in the housing.



Connect an ammeter to the sensor as shown and perform 7.7.4 *Simulation (mA)* on page 65 to see if the sensor outputs correctly.

If incorrect, see if the supplied voltage and load are within specified range. If the sensor has a problem, repair is needed.



*1: Please contact our sales office for repair or replacement.

8.2 When to Replace Components

Replace components when they exhibit corrosion or damage that may impair functionality.

Rod of the rod version can be supplied by the user. All the other components must be of the same specifications as the original ones and provided by Nohken. Be careful of components looking the same but of different specifications.

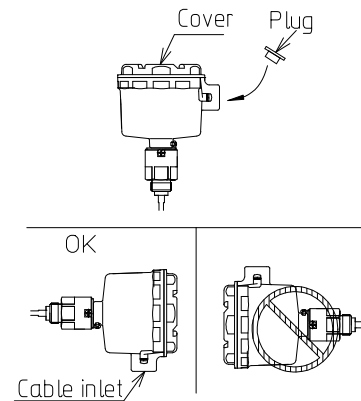
9. STORING

Observe the following instructions when storing the sensor before use, or after removing from service. Failure to do so may result in faulty operation.

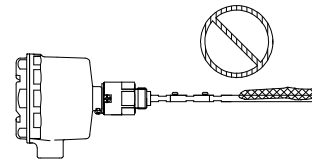
9.1 Conditions

- Temperature: -10 to +60 °C (no dew condensation)
- Relative humidity: 85% max.
- Atmosphere: not corrosive (without NH₃, SO₂, or Cl₂) or dusty
- No vibration, no shock

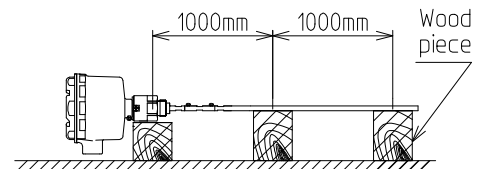
Place the cover on the housing and a plug on the cable inlet to prevent dust entry. Orient the sensor so that the cable inlet points downwards.



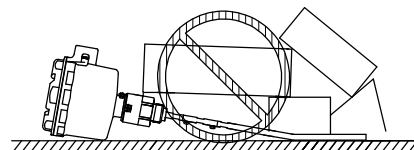
Remove buildup, since it may solidify and adversely affect operation the next time the sensor is used.



Support the rigid probe with wood piece to prevent rolling, bent, or damage. Support sensors with a probe longer than 2000mm at a 1000mm interval to prevent sagging.



Do not place anything on the sensor to prevent deformation or damage.



NOTE:

Wrap the sensor in sheet and seal it to protect from moisture and dust. If the sensor is stored where temperature change is enormous, enclose desiccant such as silica gel in the sheet.

10. TROUBLESHOOTING

10.1 Error Code

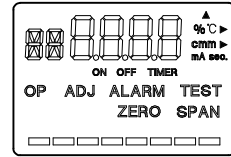
Code	LCD	Description
E (empty)		Material surface is below the probe or in the lower blanking, and cannot be measured. Probe end signal*1 will be output.
LoE* (loss of echo*)		Measurement error. Causes will include too weak reflection from the material surface. The sensor will output the value set in <i>P-71 Fail-safe Mode</i> .
Er03 (error 03)		Zero point (P-01) and span point (P-02) are too close to each other (<50mm). Change either of the setting.
Er99 (error 99)		Sensor cannot successfully start up or has some kind of problem. The sensor will output the value set in <i>P-71 Fail-safe</i> .
M3		Maintenance mode for the manufacturer. Press MODE and DOWN for longer than 2 seconds to return to the Measurement mode.
ER (error)		The data could not be updated successfully. Cycle power. If error persists, contact our sales office.

*1 Between 3.8mA and 20.5mA.

* See 11.1 GLOSSARY.

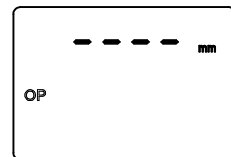
10.2 Troubleshooting

Blank LCD.



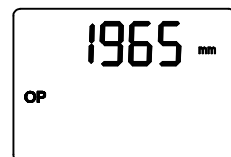
Possible cause	Corrective action	Reference
Incorrect wiring	- Connect a voltmeter between “+” and “-” terminals on the sensor, and see if 24V DC±10% is supplied.	6.2 Wiring (p.27)
Power too low	- Change the power supply. Power consumption is 2.0W.	
Sensor damaged.	- Contact our sales office.	

“OP” not displayed after switching to Program Mode.



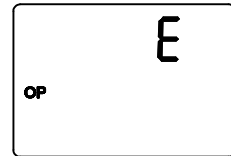
Possible cause	Corrective action	Reference
Key was pressed inadvertently, or parameters have not been updated the previous time.	- Update the data if necessary. - Cancel the entry or cycle power and program the sensor.	7.6.2 Updating data (p.46) 7.6.3 Canceling entry (p.47)
Power too low	- Change the power supply. Power consumption is 2.0W.	
Sensor damaged.	- Perform the LCD test. If “OP” does not light up during the test, the sensor may be damaged. Contact our sales office if this is the case.	7.7.5 LCD test (p.67)

Reports a level when the sensor is dry.



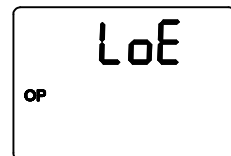
Possible cause	Corrective action	Reference
False echo	- Ensure the probe does not make contact with the tank wall or installations. - Perform False Echo Suppression (P-88, P-89). - Ensure correct nozzle size (inner diameter, height). - Cut off the nozzle protruding into the tank and perform False Echo Suppression (P-88, P-89).	7.6.7 False echo suppression with material (p.55) 7.6.8 False echo suppression without material (p.57)

Displays “E” when the sensor is wet.



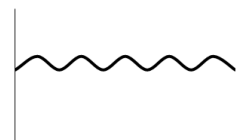
Possible cause	Corrective action	Reference
Low dielectric constant.	- Set sensitivity (P-80) to “Hi” .	7.6.6 Sensitivity (p. 53)

“LoE” displayed.



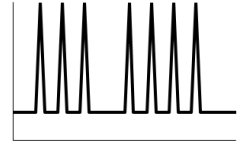
Possible cause	Corrective action	Reference
Low dielectric constant.	- Set P-80 Sensitivity to “Hi” .	7.6.6 Sensitivity (p. 53)
Foam	- Thick foam attenuates the signal and the sensor cannot measure the level. Set the P-80 Sensitivity to “Hi” . If error persists, lower inlet or use additives to prevent foam.	7.6.6 Sensitivity (p. 53)
Probe length	- Ensure difference between the value in P-81 and the actual length of your probe is 10mm or smaller.	7.3.1 Quick setting (p. 34)
Material surface in the blanking area	- Material surface in the blanking area cannot be measured. Reduce the blanking or ensure the material surface will not reach the blanking area.	7.6.4 Blanking (p. 48)

Reading fluctuates.



Possible cause	Corrective action	Reference
Low dielectric constant.	- Set P-80 Sensitivity to “Hi” .	7.6.6 Sensitivity (p. 53)
Zero and span points set too close to each other.	- Correct P-01 or P-02 settings.	7.3.1 Quick setting (p. 34)
Probe too close to or makes contact with tank wall or installations.	- Relocate the sensor.	5.4 Assembling Probe (p. 15)
Weight keep making and breaking contact with tank wall.	- Secure the weight to ensure it is in or never comes into contact with the tank.	5.4 Assembling Probe (p. 15)
Turbulent surface.	- Increase the value in P-98 Averaging.	
Zero and span output set too close to each other.	- Correct P-03 or P-04 settings.	

Output spikes



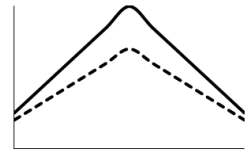
Possible cause	Corrective action	Reference
Zero and span points set too close to each other.	- Correct P-01 or P-02 settings.	
Zero and span output set too close.	- Correct P-03 or P-04 settings.	
False echo	<ul style="list-style-type: none"> - Perform False Echo Suppression (P-88, P-89). - Ensure correct nozzle size (inner diameter, height). - Cut off the nozzle protruding into the tank and perform False Echo Suppression (P-88, P-89). - If error persists, extend the blanking (P-56). 	<p>7.6.7 False echo suppression with material (p. 55)</p> <p>7.6.8 False echo suppression without material (p. 57)</p>
Foam	- Thick echo on a material surface can cause multiple echoes and thus spikes in output. Lower the inlet or use additives to prevent foam.	
Probe too close to tank wall or installation	- Relocate the sensor.	5.4 Assembling Probe (p. 15)
Weight keep making and breaking contact with tank wall.	- Secure the weight to ensure it is in or never comes into contact with the tank.	5.4 Assembling Probe (p. 15)
Probe in the filling streams.	- Relocate the sensor, or change the inlet location.	5.4 Assembling Probe (p. 15)

Poor linearity



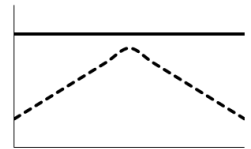
Possible cause	Corrective action	Reference
Zero and span points set too close to each other.	- Correct P-01 or P-02 settings.	
Zero and span output set too close.	- Correct P-03 or P-04 settings.	
False echo	<ul style="list-style-type: none"> - Perform False Echo Suppression (P-88, P-89). - Ensure correct nozzle size (inner diameter, height). - Cut off the nozzle protruding into the tank and perform False Echo Suppression (P-88, P-89). - If error persists, extend the blanking (P-56). 	<p>7.6.7 False echo suppression with material (p. 55)</p> <p>7.6.8 False echo suppression without material (p. 57)</p>

Output and reading not corresponding



Possible cause	Corrective action	Reference
Incorrect wiring	<ul style="list-style-type: none"> - Wire correctly. - Connect a voltmeter between “+” and “-” terminal on the sensor to see if 24V DC±10% is supplied. 	6.2 Wiring (p.27)
Load resistance too large.	- Disconnect cable from output terminal (S) on the sensor, and connect an ammeter. If the sensor outputs properly, reduce the load resistance smaller.	7.7.4 Simulation (mA) (p.65)
Offset feature activated.	- Deactivate offset (P-35, P-36) if not required.	

Reading stays same regardless of the level.

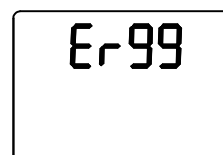


Possible cause	Corrective action	Reference
False echo	<ul style="list-style-type: none"> - Perform False Echo Suppression (P-88, P-89). - Ensure correct nozzle size (inner diameter, height). - Cut off the nozzle protruding into the tank and perform False Echo Suppression (P-88, P-89). - If error persists, extend the blanking (P-56). 	7.6.7 False echo suppression with material (p.55) 7.6.8 False echo suppression without material (p.57)
Low dielectric constant.	- Set P-80 Sensitivity to “Hi” .	7.6.6 Sensitivity (p.53)
Foam	- The sensor normally detects the material surface below the foam. If foam poses problem, lower the inlet or use additives to prevent foam.	

Reading changes along with the level but is faulty.



Possible cause	Corrective action	Reference
Incorrect zero or span point.	- Ensure the distance between the reference point to the zero/span point is correctly entered in P01/01.	
Foam	- The sensor normally detects the material surface below the foam. If foam poses problem, lower the inlet or use additives to prevent foam.	
Low dielectric constant.	- Low dielectric constant can increase offset error. Select "ALL" in P-35. Check deviation at a point 300mm away from the reference point and also 200mm away from the probe end, and enter the value in P-36.	7.4.1 Program mode parameter (p.38)
Offset feature activated.	- Deactivate offset (P-35, P-36) if not required.	7.4.1 Program mode parameter (p.38)
Material surface in the blanking area.	- Decrease the blanking or ensure the material will not reach the blanking area. The sensor does not measure the material surface in the blanking area and detects multiple echoes instead. In this case the sensor reading will be (correct level times integer).	7.6.4 Blanking (p.48)



"Er99" is displayed.

Possible cause	Corrective action	Reference
Supplied voltage too low.	- Change the power supply. The sensor consumes 2.0W.	
Damaged sensor	- Contact our sales office.	

11. APPENDIX

11.1 Glossary

Terms used in this manual are listed below. Those that have already been defined earlier in this manual are not included.

Earth plate	Metal plate attached to the sensor to stabilize echo from the material surface.
Echo	Reflection of high frequency signals the sensor has transmitted.
Dielectric constant	The ability of a dielectric to store electrical potential energy under the influence of an electric field. Increase in the dielectric constant is directly proportional to increase in echo amplitude. Dielectric constant of air is 1, and water 80,
Sun shield	Component placed over the housing to protect it from direct sunlight.
False echo	Reflection from something that is not the material level, such as nozzle/tank wall or installation in the tank.
Threaded connection	Threaded component to mount the sensor on the tank.
Flange	Component to mount the sensor on the tank with bolts and nuts.
Probe	Rod or wire that detects material level.
Hazardous area	Areas where explosive gas or vapor exists or is likely to exist. Equipment used in hazardous areas has to be designed to prevent ignition to such atmosphere. (This sensor is not intended for use in hazardous areas.)
Stillpipe	Pipe to protect the probe from excessive turbulence or flow, to prevent faulty operation or increase accuracy. Use a metallic one for GW100.
LOE	Stands for Loss Of Echo. State in which the sensor cannot make measurements due to too small echo for example.

11.2 Parameter List

Use this list to record parameter values.

See 7.4 *Parameter Reference* from pages 38 on for detail.

No.	Parameter	Default	Unit	Range	Value
P-01	Zero Point	4000	mm	-999 to 9999	
P-02	Span Point	0	mm	-999 to 9999	
P-03	Zero Output	4.00	mA	3.80 to 20.50	
P-04	Span Output	20.00	mA	3.80 to 20.50	
P-06	Unit	mm	-	mm, %	
P-35	Offset ON/OFF	Non	-	non, diSP, ALL	
P-36	Offset Value	0	mm	-999 to 9999	
P-56	Blanking	0	mm	0 to 4000	
P-70	Fail-safe Timer	60	sec.	1 to 5400	
P-71	Fail-safe Mode	HoLd	-	Hi, Lo, HoLd	
P-80	Sensitivity	Lo	-	Hi, Lo	
P-81	Probe Length	4000	mm	300 to 4000	
P-82	Model	*	-		
P-83	Propagation Factor	*	-	0.900 to 1.000	
P-84	Compensation	*	mm	-200 to 200	
P-88	False Echo Suppression With material	-	mm	300 to 4000	
P-89	False Echo Suppression without material	run	-	-	
P-98	Averaging	1	sec.	0 (OFF), 1, 2, 3, 4, 5, 10, 20, 30, 60, 120, 180	
P-99	Reset	1999	-	1965	
t1	Simulation (mm, %)	-	P-06	-999 to 9999	
t2	Simulation (mA)	-	mA	3.80 to 20.50	
LCd	LCD Test	-	-	-	

* Model dependent.

NOHKEN INC.

OSAKA HEAD OFFICE : 15-29 Hiroshiba-cho, Suita, Osaka 564-0052, Japan
TEL: 81-6-6386-8141 FAX: 81-6-6386-8140

TOKYO HEAD OFFICE : 67 Kandasakumagashi, Chiyoda-ku, Tokyo 101-0026, Japan
TEL: 81-3-5835-3311 FAX: 81-3-5835-3316

NAGOYA SALES OFFICE: 3-10-17 Uchiyama, Chikusa-ku, Nagoya, Aichi 464-0075, Japan
TEL: 81-52-731-5751 FAX: 81-52-731-5780

KYUSHU SALES OFFICE: 2-14-1 Asano, Kokurakita-ku, Kitakyushu, Fukuoka 802-0001, Japan
TEL: 81-93-521-9830 FAX: 81-93-521-9834