

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

F O R

V I B R A T I N G L E V E L S E N S O R

M O D E L : V F

Issued 2011-11-11

Read and understand this manual for safe usage.

- This manual describes the product of standard specification. Read the other manual for the product of explosion-proof specification.
- This manual describes the handling, inspection and adjustment of the product whose model is mentioned on the cover page. Read and understand this manual before handling.
- Follow the additional document and/or direction, submitted by NOHKEN INC. and our distributor or agent, even if the terms are mentioned in this manual.
- Save this manual in a proper place being available to refer to immediately.
- The specification of product mentioned in this manual may not be satisfied by the condition of environment and usage. Check and consider carefully before using.
- Contact to sales office at NOHKEN INC. for any question or comment about this manual and product.

The following are the description of the terms in this manual.

 WARNING	Indicates a potentially hazardous situation which, if not paid attention to, could result in death, serious injury or serious disaster.
 CAUTION	Indicates a hazardous situation which, if not paid attention to, may result in minor or moderate injury or damage to the device.

	Indicates a prohibited matter. The explanation with this mark shall be followed.
	Indicates an instructed matter. The explanation with this mark shall be followed.

⚠ **WARNING**

This product is not explosion-proof construction. Do not install this product to the place where the flammable gas or vapor occurs. If installed, the flammable gas or vapor may be ignited, and serious disaster may occur. Use the product of explosion-proof construction in this case.



Do not modify or disassemble the product. Otherwise, the product and connected device may be malfunctioned, damaged, fired, or minor injury and electric shock may occur.
(Follow the additional document and/or direction, submitted by NOHKEN INC. and our distributor or agent.)



Turn off the power, before wiring and inspection.
Otherwise, electric leakage, fire caused by short circuit, and electric shock may occur.



Ensure the wire is properly connected. The product and connected device may be malfunctioned, damaged, fired, or minor injury and electric shock may occur by improper wiring.



Turn off the power immediately, if the smoke, strange smell and sound occur. Do not use it until the problem is solved.



⚠ **CAUTION**

Avoid strong shock and rough handling to this product. The product may be damaged by strong shock such as dropping, falling, throwing, knocking, lugging, etc.



Follow the specification of operating temperature, operating pressure, switch rating, etc. Otherwise, the product and connected device may be malfunctioned, damaged, fired, or minor injury and electric shock may occur. Check the manual or specification sheet.



Operation test shall be done before practical usage. If the serious accident is expected to occur by malfunction of the product, the other operating principle of product shall be installed in parallel.





CAUTION

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



Hold the stem very close to the mounting point, when carrying, installing, and removing. If held by the housing, it may be taken off from the flange, and the product may be damaged by dropping.



Earth terminal shall be grounded to JIS Class D ground (earth resistance less than 100Ω). If not grounded, electric shock may occur by any accident.



Provide arrester or surge absorber to avoid electrical impact such as lightning and static electricity. If not provided, the product and connected device may be malfunctioned, damaged, and fired, or minor injury and electric shock may occur.



INTRODUCTION

- A) This manual specifies the specification of a general product.
If you order a special product, some details of specification may be different with the manual.
- B) We are glad to suggest and advise for Model selection and chemical resistance of material, but final decision has to be made by the customer.
- C) This manual has been prepared with close attention. Ask sales office at NOHKEN INC. for any question or comment about the contents of this manual.
- D) For replacement parts
The quality of product has frequently improved, so same spare parts may not be supplied. In this case, replacement parts or products may be supplied. Ask sales office at NOHKEN INC. for details.
- E) The contents of this manual are subject to change any time without notice due to the improvement of the product.

WARRANTY & DISCLAIMER

- A) NOHKEN INC. warrants this product against defect in design, material and workmanship for a period of 1(one) year from the date of original factory shipment.
- B) The warranty only covers the damage of products. The secondary and third kind disasters are not covered by NOHKEN INC.
- C) NOHKEN INC. shall not be liable for the following.
 - C-a) Do not follow the description and direction in this manual.
 - C-b) Damage due to improper installation, wiring, usage, maintenance, inspection, storing, etc.
 - C-c) Repair and modification are done by the person who is not an employee of NOHKEN INC. and our distributor or agent.
 - C-d) Improper parts are used and replaced.
 - C-e) The damage is occurred by the device or machine except our products.
 - C-f) Improper usage. (See "Purpose of use" in chapter 1 in this manual)
 - C-g) Force Majeure including, but not limited to, fire, earthquake, tsunami, lightning, riots, revolution, war, radioactive pollution, acts of God, acts of government or governmental authorities, compliance with law, regulation, and order.

THE TERMS OF WARRANTY AND DISCLAIMER SHALL IN NO WAY LIMIT YOUR LEGAL RIGHTS.

Table of Contents

1. PURPOSE OF USE	.....	1
2. DESCRIPTION	.....	1
2.1 Description	.....	1
2.2 Principle of operation	.....	1
3. SPECIFICATIONS	.....	2
3.1 Outline	.....	2
3.2 Model numbering	.....	2
3.3 Specification	.....	3
4. HANDLING NOTES	.....	4
5. INSTALLATION	.....	5
5.1 Unpacking	.....	5
5.2 Mounting	.....	5
6. WIRING	.....	8
6.1 Before wiring	.....	8
6.2 Cable inlet	.....	9
6.3 Wiring	.....	9
6.4 Operation check	.....	9
6.5 Placing the cover	.....	9
7. PART NAMES AND FUNCTION	.....	10
8. ADJUSTMENT	.....	11
8.1 Necessary device and tool	.....	11
8.2 Notes for sensitivity adjustment	.....	11
8.3 Procedure for sensitivity adjustment	.....	12
8.4 Delay time setting	.....	14
9. MAINTENANCE AND INSPECTION	.....	15
9.1 Removing the sensor	.....	15
9.2 Maintenance procedure	.....	15
9.3 Mounting	.....	16
9.4 Wiring	.....	16
9.5 Components replacement	.....	16
9.6 When to replace the sensor	.....	16
10. STORING	.....	17
11. TROUBLE SHOOTING	.....	18
12. GLOSSARY	.....	19

1. PURPOSE OF USE

Vibrating Level Sensor VF is a level instrument to detect presence of solids at a desired level to send signals utilized for alarm output or control of electromagnetic switches. Do not use for any other purpose.

2. DESCRIPTION

2.1 Description

The vibration plate at the end of the sensor is inserted in the tank to detect the presence of measured material. With minimum inserted length and no moving parts, VF series sensors can achieve a long service life.

2.2 Principle of operation

A magnet and an electromagnet integrated in the sensor generate a pulsed vibration on the vibration plate. The plate continues vibrating for a while and finally stops. When the plate is covered by a material, the vibration stops faster than when the plate is not covered. Using this time difference, the sensor determines the presence of material.

3. SPECIFICATIONS

3.1 Outline

① Vibration plate

Component that vibrates. Makes direct contact to detect presence of material.

② Flange

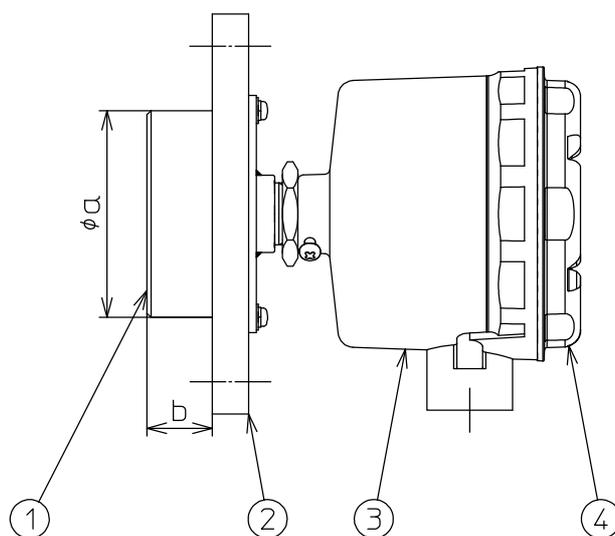
Used to mount the sensor on a tank.

③ Housing

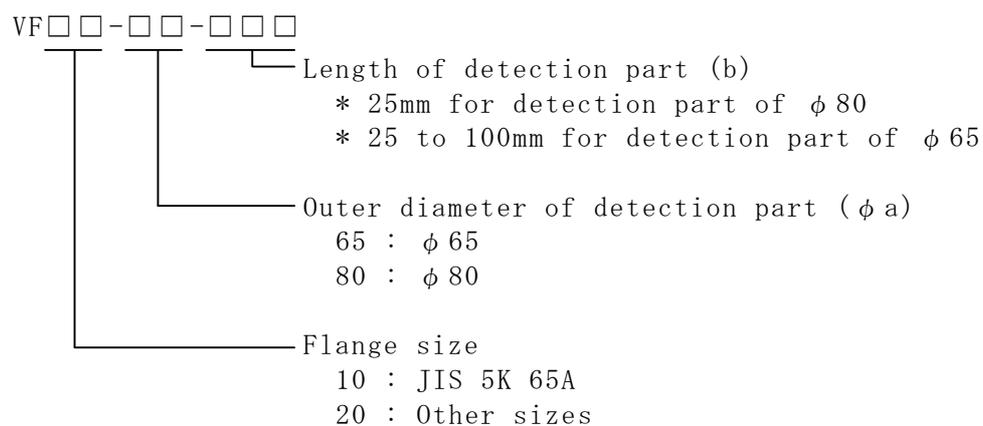
Encases electronics.

④ Cover

Sensor cover



3.2 Model numbering



3.3 Specification

Measured material	Solids
Operation characteristics	
Sensitivity	Apparent density 0.2 Min.
Status indication (LED)	Power : powered ... green, on continuously
	Detection: not detecting ... yellow, flashes detecting ... yellow, off
	Relay : deenergized ... red, off Energized ... red, on continuously
Electric characteristics	
Power supply	100 to 240V AC $\pm 10\%$, 50/60Hz *1
Power consumption	Approx. 4 VA $\pm 10\%$, 50/60Hz (at 100V AC)
Relay output	Relay contact (1 transfer), contact operation can be switched Delay time: 2 seconds for both set and reset *2
Contact rating	250V, 3A AC (resistive load) 30V, 3A AC (resistive load)
Withstand voltage	1500V AC, 1 min. (between each terminal and housing, excluding E terminal.)
Resistance	500V AC, 100M Ω (between each terminal and housing, excluding E terminal.)
Pressure	100kPa Max. (excluding process connection)
Working temperature	
Wetted parts	-20 to +100°C
Housing	-20 to +60°C (no dew condensation)
Operating humidity	95%RH Max.
Protection class	
Wetted parts	IP68 or equivalent
Housing	IP65 or equivalent
Material	
Wetted parts	304 stainless steel, silicone rubber
Housing	Aluminum die casting, acrylic painted
Cable inlet	G 3/4 or equivalent

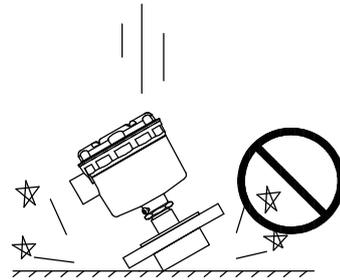
*1 Optional 24V DC version available. (without isolated power)

*2 Optional delay timer (approx. 2.5 to 12.5 sec.) available.

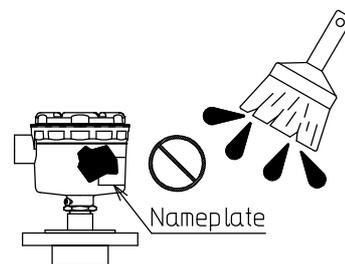
4. HANDLING NOTES

Observe instructions below when handling the sensor, or operation failure or user injury can result.

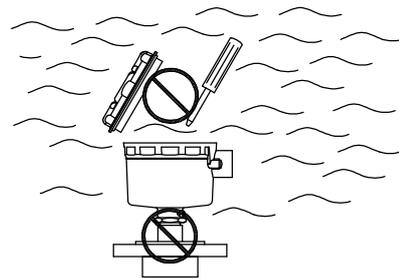
4.1 Do not drop, throw, crush or give strong shock to the sensor to avoid damaging it



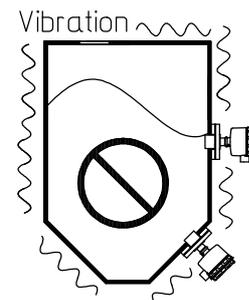
4.2 The nameplate contains maintenance and other important information. When painting the sensor, ensure such information is readable.



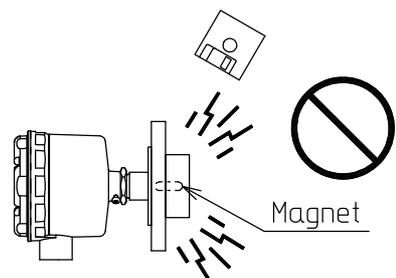
4.3 Avoid using, wiring, maintaining or programming the sensor in corrosive atmosphere (NH_3 , SO_2 , Cl_2). Such atmosphere can ingress into the housing to corrode sensor inside.



4.4 Avoid using, wiring, maintaining or programming the sensor in a place where vibration is expected. If such location is inevitable, remove the source of vibration or protect the sensor from receiving the vibration.



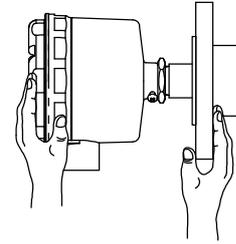
4.5 The sensor has a magnet inside the detection part. Do not place close to the sensor things such as FD that can be adversely affected by a magnetic field.



5. INSTALLATION

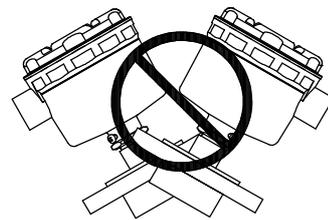
5.1 Unpacking

5.1.1 Open the package and take out the sensor. Hold it on flange, or flange and somewhere else.

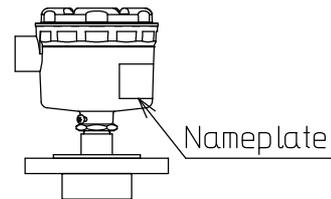


5.1.2 Remove all the packing material such as tape, plastic cover and cardboard. Failure to do so can cause operation failure.

5.1.3 Do not place anything on the sensor, or excessive force can be applied to deform or damage the sensor.



5.1.4 Check against nameplate to ensure the sensor is as ordered. If not, please contact our sales office.



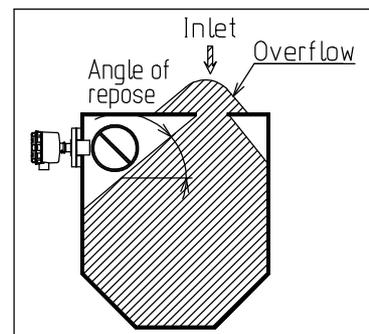
5.1.5 Check the sensor for visible damage. If any, it may have been caused during transportation. Please contact our sales office.

5.2 Mounting

5.2.1 Mounting location

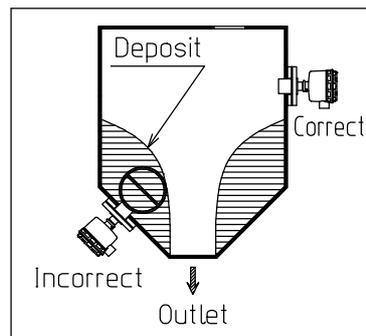
Ensure ample space around the mounting point for easy handling and maintenance. When mounting, observe the following instructions. Failure to do so can result in operation failure.

- (1) Avoid areas where the measured material does not reach the sensor due to the angle of repose(*).

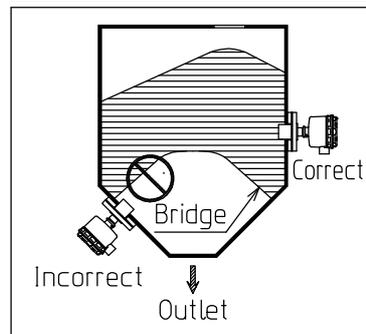


* Refer to 12. GLOSSARY

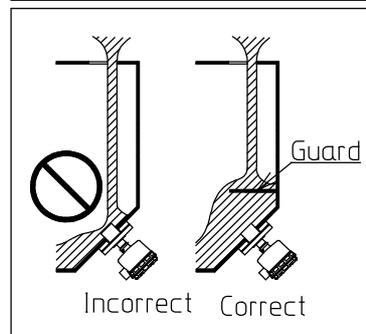
(2) Avoid areas that are susceptible to deposit(*) to prevent operation failure.



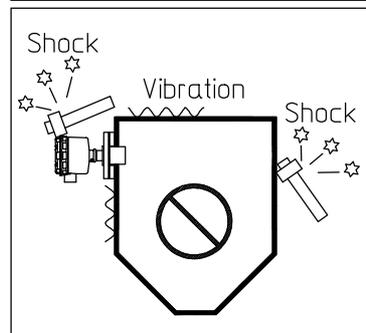
(3) Avoid areas under the bridge(*) to prevent operation failure, and the material from damaging the sensor when the bridge falls.



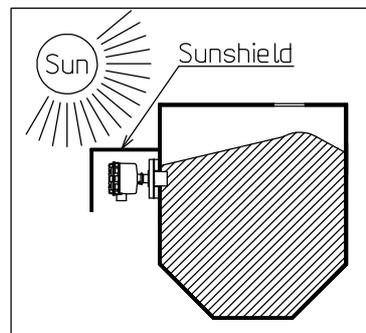
(4) Avoid the path of falling material, or provide a guard(*) over the sensor.



(5) Avoid areas that are susceptible to vibration or shock. Mounting close to a vibrator(*) or a knocker(*) can cause operation failure.



(6) Avoid areas where extreme temperature rise is expected. The maximum working temperatures for the detection part and housing are as follows.
 Detection part: 100°C
 Housing: 60°C

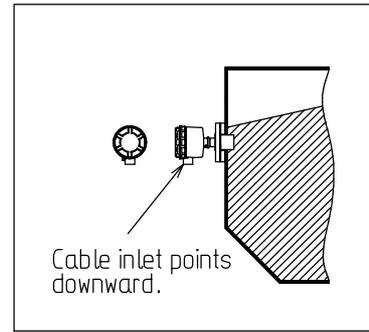


(7) Avoid exposure to direct sunlight. Especially in summer, the temperature inside the sensor can exceed the specified value due to direct sunlight. Use a sunshield(*) if necessary.

* Refer to 12. GLOSSARY

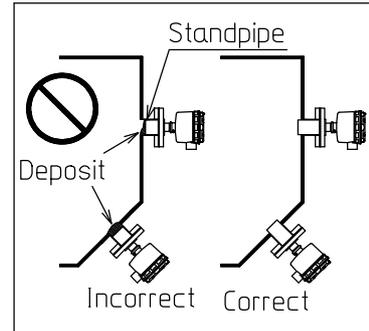
- (8) When mounting the sensor in areas susceptible to rain fall, observe the following.

Although the housing is designed not to have negative effect against water jet (IP65), the rating can be achieved only when the cover is properly placed and the cable inlet properly sealed. Additionally, for vertical mounting, ensure the cable inlet points downward.



- (9) When mounting the sensor on a standpipe, ensure the detection part projects into the tank.

If the detection part is inside the pipe, the sensor can malfunction due to deposit inside the pipe.

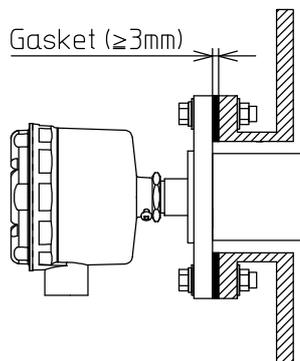


- (10) Do not use the sensor in corrosive atmosphere. The detection part is made in stainless steel (304SS), however, the housing inside can be damaged because of corrosive atmosphere.

5.2.2 Mounting the sensor

Place a gasket thicker than 3mm on the mating flange of tank, and then the sensor on the gasket. Using a proper tool, tighten the bolts in accordance with applicable standards.

Note that bolts and gasket are optional.



6. WIRING

6.1 Before wiring

6.1.1 Disconnect power.

⚠ WARNING

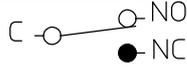
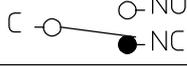
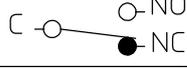
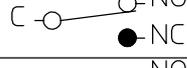
Disconnect power before wiring, or electric shock, leakage, ignition or user injury due to short circuit can result.

6.1.2 Power switch and fuse are not included in the scope of supply.

If necessary, they have to be provided by the user.

6.1.3 Relay wiring

Relay operation can be changed using the failsafe switch. See below.

	Failsafe switch	LED			Relay output
		POW	DET	RY	
 Covered	ON (DET) 	ON	OFF	ON	
	OFF (NON) 	ON	OFF	OFF	
 Uncovered	ON (DET) 	ON	FLASH	OFF	
	OFF (NON) 	ON	FLASH	ON	
Power OFF		OFF	OFF	OFF	

* See 7. Part Names and Functions

⚠ CAUTION

Contact ratings are 250V, 3A AC (resistive load) or 30V, 3A DC (resistive load). Ensure the connected load is within these ratings, or the relay contacts can be damaged. If the load exceeds the ratings, use another relay or a device suitable for the load to protect the sensor.

6.1.4 Wiring of earth terminal

Ground the sensor using E-terminal so that the ground resistance is 100Ω Max.

⚠ CAUTION

Never fail to ground the sensor using the E terminal (resistance: 100Ω Max.). Failure to do so can result in user injury due to a hazardous voltage on housing when the power line contacts the housing in case of trouble inside the sensor.

6.2 Cable inlet

Cable can be fixed with a cable gland or by connecting a conduit to the housing. In both cases, lead the cable downward in front of the cable inlet to prevent water entry to the housing.

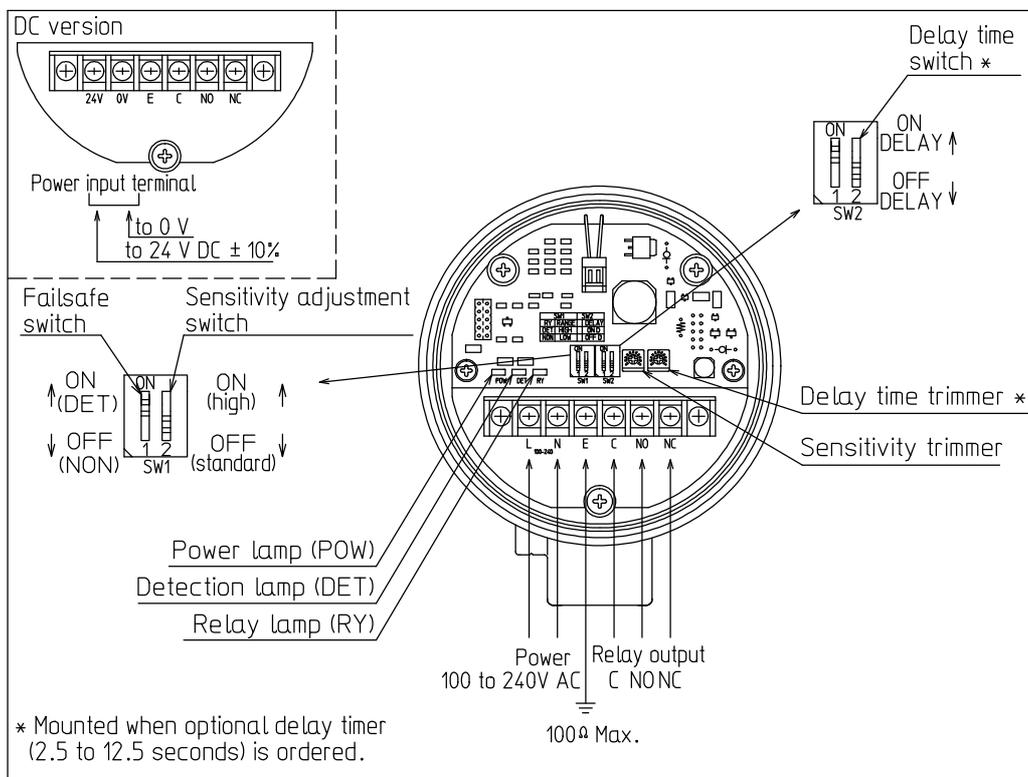
Secure the cable using sealing compound when a conduit is used and by tightening the gland with a proper tool when a cable gland is used, to prevent entry of dust, debris or rain water to the housing.

If water or moisture can enter from inside the conduit, putty the inside.

6.3 Wiring

Remove the cover and connect cable to terminals. (See figure below.)

Secure screws with a tool. The terminal screws are of M3.5. Use a cable lug of R1.25-3.5 or an equivalent size. When wiring is complete, replace the cover.



6.4 Operation check

6.4.1 Remove dust or debris inside the housing, if any. Metal debris inside the housing can cause shortcircuit.

6.4.2 Before actual use, check operation using a tank with a solid. If the sensor does not work as it should, verify that the wiring connections are correct, and read this manual again. Contact our sales office if necessary.

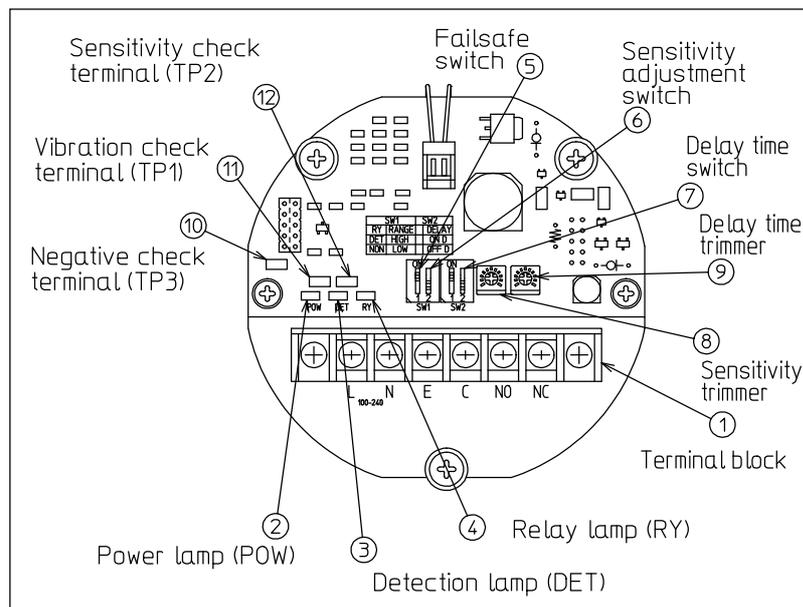
6.5 Placing the cover

Place the cover on the housing. Ensure the cover is tightened until it comes to a stop. If the cover is loose, rain water or dust can enter to the housing to cause corrosion or short circuit, resulting in operation failure.

7. PART NAMES AND FUNCTION

Housing inside

- ① Terminal block
For connection of power and earth, and output of relay signals
- ② Power lamp (POW)
Lights when powered. (green LED)
- ③ Detection lamp (DET)
Indicates if the detection part is covered by material. (yellow LED)
- ④ Relay lamp (RY)
Indicates relay operation status. (red LED)
- ⑤ Failsafe switch
Switches relay operation.
- ⑥ Sensitivity adjustment switch
Switches sensitivity setting between standard and high.
- ⑦ Delay time switch (when optional delay timer (2.5 to 12.5 sec.) is ordered)
Switches delay time setting between ON DELAY and OFF DELAY. The time can be changed using ⑨delay time trimmer.
- ⑧ Sensitivity trimmer
Adjusts detection sensitivity.
- ⑨ Delay time trimmer (when optional delay timer (2.5 to 12.5 sec.) is ordered)
Adjusts the delay time before giving relay output after the detection part is covered (uncovered) by material.
- ⑩ Negative check terminal (TP3)
Negative terminal for vibration and sensitivity check terminals.
- ⑪ Vibration check terminal (TP1)
Gives an output of 0 to 3V DC corresponding to vibration amplitude.
- ⑫ Sensitivity check terminal (TP2)
Gives an output of 0 to 2.5V DC corresponding to sensitivity level.



8. ADJUSTMENT

VF sensors require no adjustment in most cases. Use them in their delivered state. Changing the setting of switches and trimmers inside the housing can result in faulty output signals.

If one or more of the cases shown below apply, adjust sensitivity according to the instructions in the following paragraphs:

- Detection of material is difficult due to its low apparent density or high fluidity;
- Sensor gives false outputs due to buildup on the detection part;
- Switch or trimmer setting is inadvertently changed.

8.1 Necessary device and tool

Adjustment requires the following.

- Digital tester that can measure voltages between 0 and 3V DC.
(with input resistance of 1MΩ Min. Analog devices can also be used if their input resistance is 1MΩ Min.)
- Small slotted screwdriver for sensitivity trimmer

8.2 Notes for sensitivity adjustment

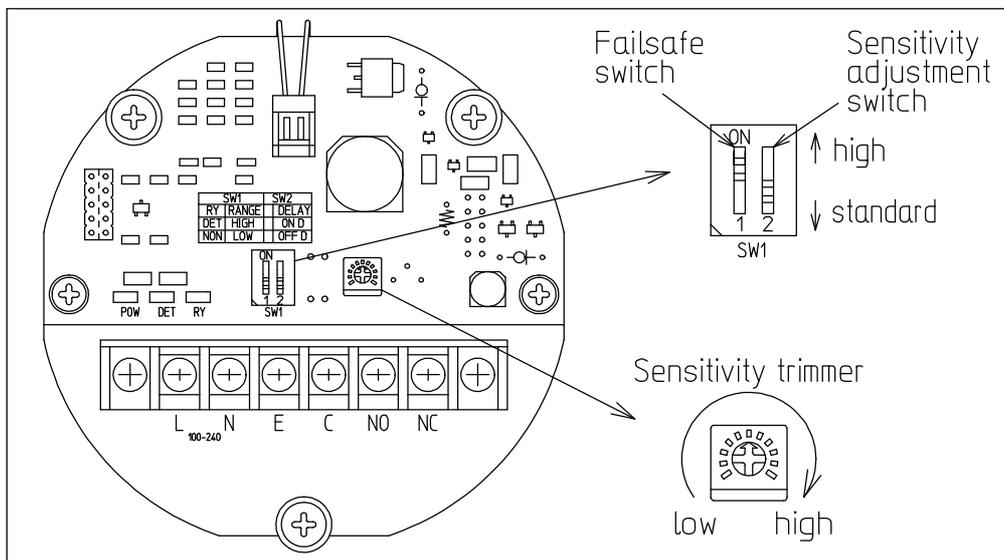
 **CAUTION**

During adjustment, the sensor output can be switched. Before starting adjustment, ensure controlled devices are not adversely affected.

The sensitivity setting can be changed using the sensitivity switch between standard and high.

Set the switch to position 'standard' for normal applications. If material detection is difficult due to low apparent density or high fluidity, then set the switch to position 'high'.

The sensitivity trimmer provides adjustment for both sensitivity levels.

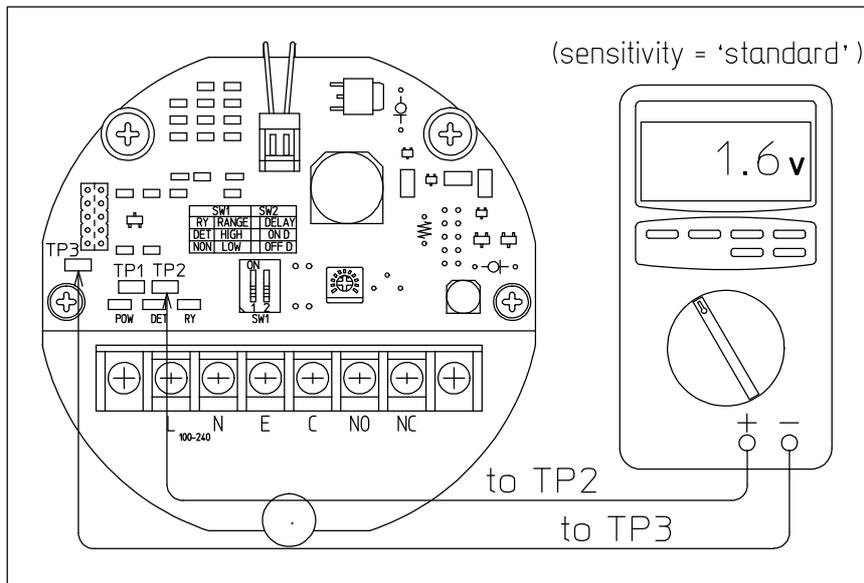


8.3 Procedure for sensitivity adjustment

⚠ CAUTION

Apparent density changes depending on solids conditions.
Adjust sensitivity with the sensor mounted on the same tank and using the same material as the actual application.

- (1) Sensitivity adjustment can be performed with or without the sensor covered the material.
- (2) Supply power to the sensor.
- (3) Set the tester for the range of 0 to 3V DC. Connect the positive lead wire to the sensitivity check terminal (TP2), and the negative lead wire to the negative check terminal (TP3).



(a) Standard sensitivity

Set the sensitivity switch to position “standard” (low side), and the sensitivity trimmer to one-o’clock position (approx. 1.6V). With this the setting is complete. The sensitivity trimmer provides adjustment between approx. 0.1V and 2.5V.

(b) High sensitivity

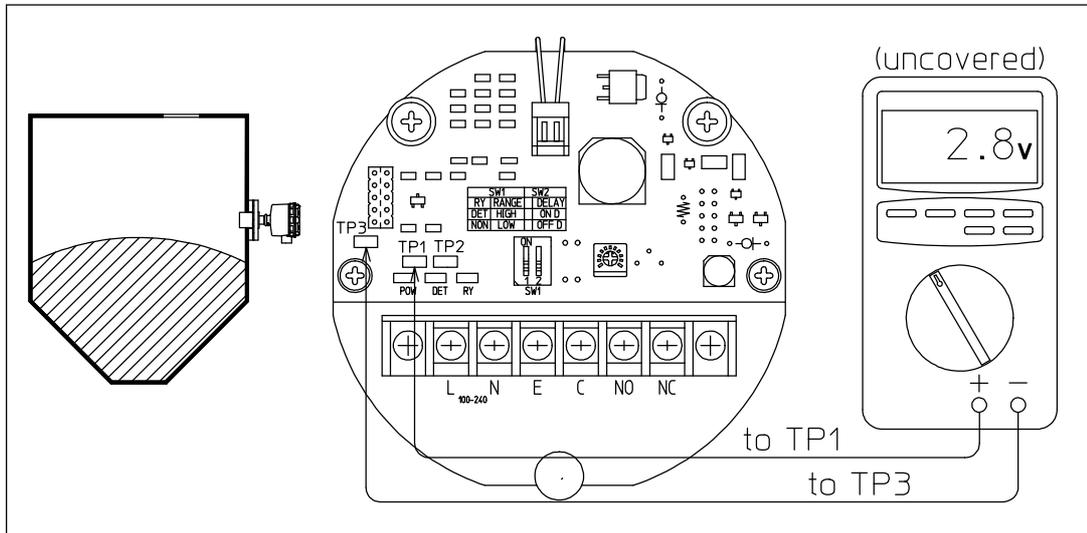
After setting for ‘standard’ sensitivity is complete, set the switch to position “high” (upper side, approx. 0.4V).

Now the sensitivity is set to ‘high’.

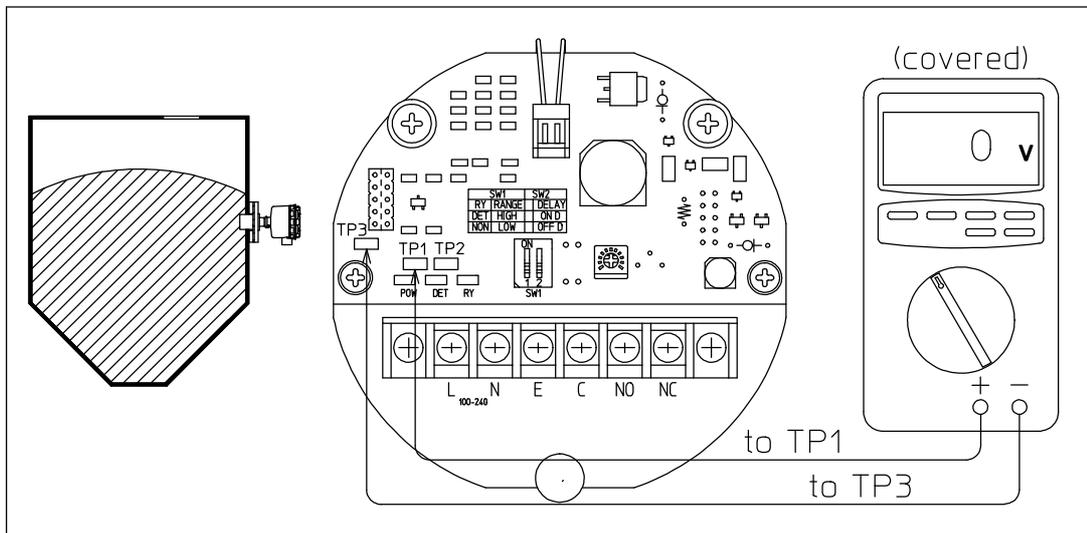
The sensitivity trimmer provides adjustment between approx. 0.0V and 0.6V.

(4) Operation check

After setting the sensitivity, check operation using the measured material. Connect the positive lead wire of the tester to the vibration check terminal (TP1), and the negative lead wire to the negative check terminal (TP3). Without the detection part covered by the material, ensure the sensor gives a voltage output from approx. 2 to 3V, and a signal indicating no detection.



With the detection part covered by the material, ensure the sensor gives a voltage output of close to 0V and a signal indicating detection of material.

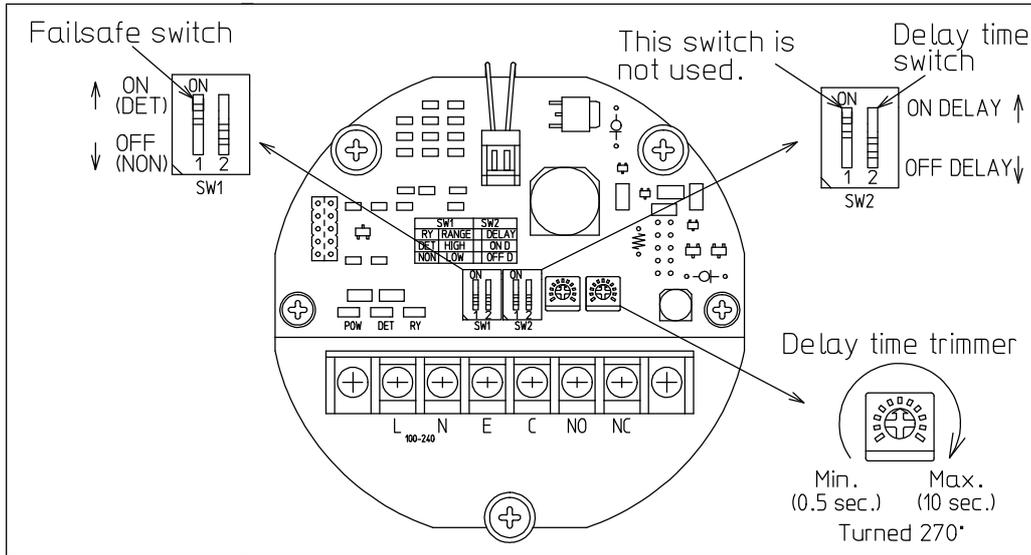


8.4 Delay time setting (when optional delay timer is ordered)

Using the delay time switch and delay time trimmer, the delay time for relay output after the change in the state of detection part (covered / uncovered) can be set to a value gained from the following formula.

Fixed time (approx. 2 seconds) + Adjustable time (approx. 0.5 to 10 seconds)

See below for the time chart.



Fail-safe switch	Delay time switch	Time chart Fixed time : approx. 2 seconds Td : adjustable time : approx. 0.5 to 10 seconds										
ON (DET)	ON DELAY	<table border="1"> <thead> <tr> <th>Covered Detection</th> <th>Not covered No detection</th> </tr> </thead> <tbody> <tr> <td>Relay ON</td> <td>Relay ON</td> </tr> <tr> <td>Relay OFF</td> <td>Relay OFF</td> </tr> <tr> <td>Delay time</td> <td>Delay time</td> </tr> <tr> <td>$T_d+2 \text{ sec.}$</td> <td>2 sec.</td> </tr> </tbody> </table>	Covered Detection	Not covered No detection	Relay ON	Relay ON	Relay OFF	Relay OFF	Delay time	Delay time	$T_d+2 \text{ sec.}$	2 sec.
	Covered Detection	Not covered No detection										
Relay ON	Relay ON											
Relay OFF	Relay OFF											
Delay time	Delay time											
$T_d+2 \text{ sec.}$	2 sec.											
OFF DELAY	<table border="1"> <thead> <tr> <th>Covered Detection</th> <th>Not covered No detection</th> </tr> </thead> <tbody> <tr> <td>Relay ON</td> <td>Relay ON</td> </tr> <tr> <td>Relay OFF</td> <td>Relay OFF</td> </tr> <tr> <td>Delay time</td> <td>Delay time</td> </tr> <tr> <td>2 sec.</td> <td>$T_d+2 \text{ sec.}$</td> </tr> </tbody> </table>	Covered Detection	Not covered No detection	Relay ON	Relay ON	Relay OFF	Relay OFF	Delay time	Delay time	2 sec.	$T_d+2 \text{ sec.}$	
Covered Detection	Not covered No detection											
Relay ON	Relay ON											
Relay OFF	Relay OFF											
Delay time	Delay time											
2 sec.	$T_d+2 \text{ sec.}$											

Fail-safe switch	Delay time switch	Time chart Fixed time : approx. 2 seconds Td : adjustable time : approx. 0.5 to 10 seconds										
OFF (NON)	ON DELAY	<table border="1"> <thead> <tr> <th>Covered Detection</th> <th>Not covered No detection</th> </tr> </thead> <tbody> <tr> <td>Relay ON</td> <td>Relay ON</td> </tr> <tr> <td>Relay OFF</td> <td>Relay OFF</td> </tr> <tr> <td>Delay time</td> <td>Delay time</td> </tr> <tr> <td>2 sec.</td> <td>$T_d+2 \text{ sec.}$</td> </tr> </tbody> </table>	Covered Detection	Not covered No detection	Relay ON	Relay ON	Relay OFF	Relay OFF	Delay time	Delay time	2 sec.	$T_d+2 \text{ sec.}$
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Relay ON	Relay ON											
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Delay time	Delay time											
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OFF DELAY	<table border="1"> <thead> <tr> <th>Covered Detection</th> <th>Not covered No detection</th> </tr> </thead> <tbody> <tr> <td>Relay ON</td> <td>Relay ON</td> </tr> <tr> <td>Relay OFF</td> <td>Relay OFF</td> </tr> <tr> <td>Delay time</td> <td>Delay time</td> </tr> <tr> <td>$T_d+2 \text{ sec.}$</td> <td>2 sec.</td> </tr> </tbody> </table>	Covered Detection	Not covered No detection	Relay ON	Relay ON	Relay OFF	Relay OFF	Delay time	Delay time	$T_d+2 \text{ sec.}$	2 sec.	
Covered Detection	Not covered No detection											
Relay ON	Relay ON											
Relay OFF	Relay OFF											
Delay time	Delay time											
$T_d+2 \text{ sec.}$	2 sec.											

9. MAINTENANCE AND INSPECTION

The sensor has to be removed from the tank for maintenance.

Read section 4 Handling Notes beforehand and ensure ample space for maintenance.

9.1 Removing the sensor

9.1.1 Disconnect power to the sensor before maintenance.

 <b style="font-size: 1.2em;">WARNING
<p>Disconnect power before maintenance, or electric shock, leakage, or ignition or user injury due to short circuit can result.</p>

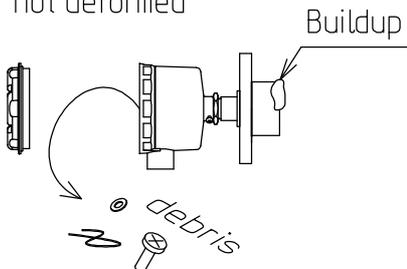
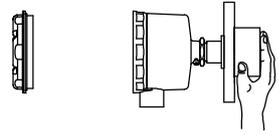
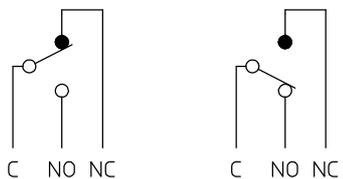
9.1.2 Remove cover from the housing, and disconnect cable. Remove the conduit, if used, from the housing.

9.1.3 Holding on the flange, remove the sensor from the tank.

9.1.4 Put the sensor on a flat place.

9.2 Maintenance procedure

Perform maintenance and inspection once or twice a year. More frequent maintenance will be required depending on operating conditions such as frequency of use, solid type, temperature and pressure.

<p>9.2.1 Check for visible damage which may impair performance.</p>	<p>No visible damage, not deformed</p> 
<p>9.2.2 Check for buildup on detection part and remove if any.</p>	
<p>9.2.3 Check housing inside for condensation, dust or metal debris, and remove if any.</p>	
<p>9.2.4 Check terminals and internal components for corrosion, and replace if corroded or damaged.</p>	
<p>9.2.5 Supply power to the sensor, and then place a hand on the vibration plate to stop vibration, to ensure correct relay operation. Use a tester (for resistance) or an electric buzzer for this check. If incorrect operation is observed, the sensor needs repair.</p>	 <p>Failsafe switch = ON(DET)</p> <p>Vibration starts. Vibration stops.</p> 

9.3 Mounting

Refer to 5.2 Installation.

9.4 Wiring

Refer to 6 Wiring.

9.5 Components replacement

To ensure correct operation, all replaced components must be provided by Nohken and of the proper specification. For this reason, all replacement is performed at our factory.

Please contact our sales office when replacement of component is required.

9.6 When to replace the sensor

The sensor will have to be replaced generally 3 to 5 years after installation. This is because of the relay contact degradation, or corrosion or abrasion of detection part. Note that the time frame depends on operating conditions such as frequency of use, solid type, temperature and pressure.

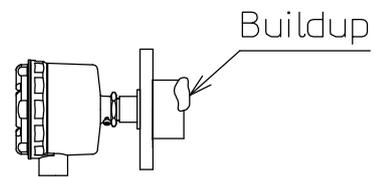
10. STORING

Observe instructions below when storing the sensor after delivery before use, or after removing from the tank. Failure to do so can result in operation failure.

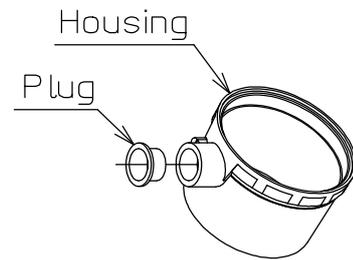
10.1 Store the sensor in the following conditions.

- Temperature: -20 to +60°C
- Humidity: 95%RH Max.
- Atmosphere: not corrosive (without NH₃, SO₂, or Cl₂)
- No vibration

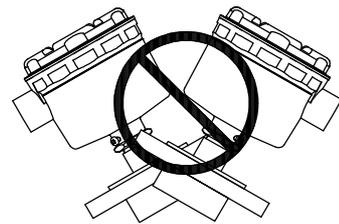
10.2 Remove buildup. Buildup on the detection part can harden and adversely affect operation.



10.3 Store with cover on the housing and the cable gland with the plug on the cable inlet to prevent dust from entering. Protect the sensor from rainwater.



10.4 Do not place anything on the sensor, or excessive force can be applied to deform or damage the sensor.



Note:

Wrap the sensor with polyethylene 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 polyethylene sheet.

11. TROUBLESHOOTING

⚠ CAUTION

In the event of trouble, perform the following and nothing else.
If you have any question, please contact our sales office.

Trouble	Possible cause	Corrective action	Reference
Failed to detect. (Overflow resulted)	Apparent density too low. Material with apparent density lower than 0.2 cannot be detected.	Increase sensitivity.	8.3 (3) (b)
	Angle of repose adversely affected.	Mount the sensor where the detection part can be covered by material.	5.2.1 (1)
	Bridge adversely affected.	Use a knocker etc. to prevent forming a bridge.	5.2.1 (3)
	Material is flowing.	Increase sensitivity	8.3 (3) (b)
	Sensor vibrates due to external vibration.	Replace the sensor at an area that is not susceptible to vibration.	5.2.1 (5)
Detected falsely. (Empty tank and thus material shortage resulted)	Incorrect wiring.	Wire correctly.	6.3
	Buildup on the detection part.	Remove build up. Decrease sensitivity.	8.2
	Deposit adversely affected.	Replace the sensor in an area that is not susceptible to deposit.	5.2.1

12. GLOSSARY

Terms used in this manual are defined in the chart below. This chart excludes the terms which have already been defined earlier in this manual.

Angle of repose	Angle between the horizontal surface and the surface of pile formed by granular substance poured on a horizontal surface.
Deposit	Solid remaining inside the tank. Occurs mainly in the cone. The amount depends on the angle of the cone.
Bridge	State of solid in a tank clogging in a shape of a bridge.
Guard	Plate or semicircular pipe to protect the detection part against being deformed by force due to falling or flowing material.
Vibrator	Device that vibrates the tank from outside to remove buildup or deposit on the tank wall.
Knocker	Device that gives shock to the tank from outside to remove buildup or deposit on the tank wall.
Sunshield	Component to be placed over the housing to protect it from direct sunlight.

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