ＩＮＳＴＲＵＣＴＩＯＮ　ＭＡＮＵＡＬ

FOR

VIBRATING LEVEL SENSOR

MODEL: ＶＬ１３□□－ＣＥ
ＶＬ２３□□－ＣＥ
ＶＬ３３Ｆ－ＣＥ

CE

Issued 2019-11-28

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.

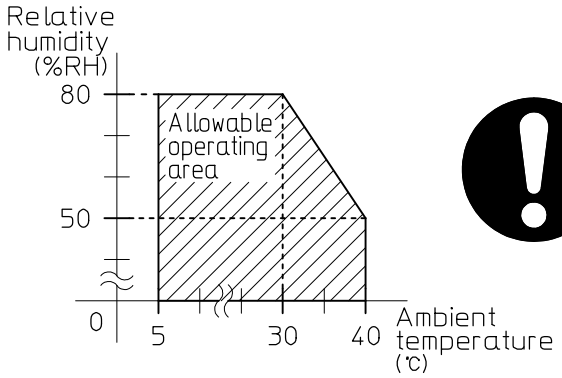
⚠ WARNING

All work described in this manual must be carried out by qualified personnel or those who have been trained and authorized for the task.

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.

Mount, wire, adjust and service the product under conditions shown in the chart on the right.
Not observing this may result in product damage.



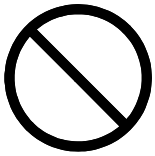
Turn off the equipment before wiring or inspection. Otherwise leakage or short circuit may cause ignition or electric shock.

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.

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.

<u>Equipment 50cm or longer:</u>
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: 100Ω max.)
Without grounding, electric shock may occur in case excessive voltage is applied to the housing.

<u>When connecting to inductive or lamp loads:</u>
Ensure the maximum voltage/current ratings will not be exceeded to avoid damage to the relay contacts.

Use lightening 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.

Table of Contents

1. PURPOSE OF USE

This product is designed to detect fine powders, solids, granular materials, bulk solids or sludge blanket at a desired level, and send signals. The signals are used to trigger alarms or control electromagnetic switches. Do not use the product for any other purpose.

2. DESCRIPTION

2.1 Description

The product is mounted on a hopper using the threaded or flanged connection. When the material reaches the detecting pipe*, the relay inside the housing makes or breaks contact.

2.2 Principle of Operation

The product has a detecting pipe that incorporates a magnet and an electromagnet. The pipe is vibrated by means of these magnets. Current that flows on the electromagnet decreases when the pipe is covered by the material. The product detects this difference in current value on the electromagnet, and sends electric signals.

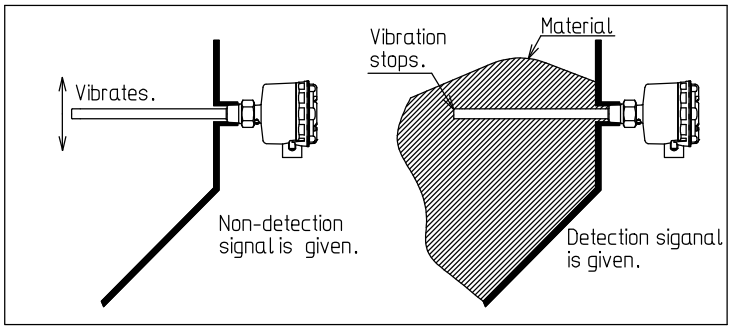


Fig. 2-1

3. SPECIFICATIONS

3.1 Model Code

① ② ③
VL □□ □ □-CE

③	Temperature
(blank)	standard
T	high temperature

②	Mounting
N	threaded
F	flanged
G	guard flanged

①	Detecting pipe
13	standard
23	long
33	flexible

* See chapter 12 GLOSSARY.

3.2 Specifications

Table 3-1

Product	Vibrating Level Sensor		
Model	VL13N, F, G (T)	VL23N, F, G (T)	VL33F
Measured Material	solids, granular materials, bulk solids, sludge blanket (excluding VL33)		
Operating Characteristics			
Sensitivity	Bulk density ≧ 0.2 (excluding sludge blanket applications)		
Operation indicator	Power: green LED, Energized relay: red LED		
Startup behavior	Relay de-energized for approx. 15 seconds after power-up		
Vibration	Approx. 300 to 500Hz		
Electric Characteristics			
Power supply	100 to 240V AC±10%, 50/60Hz 24V DC ±10%		
Power consumption	Approx. 2VA at 100V AC (excluding startup) Approx. 5VA at 240V AC (excluding startup) Approx. 1W at 24V DC		
Relay output	Dry contact (SPDT) Relay energized/de-energized at detection (switchable) Delay time: 3 to 5 seconds when set 3 to 5 seconds when reset		
Contact ratings	Maximum: 250V, 3A AC / 30V, 3A DC (resistive load) Minimum: 5V, 10mA DC (resistive load)		
Insulation resistance	100MΩ Min. at 500V DC, between each terminal and housing (excluding protective earth)		
Withstand voltage	2200V AC for 5 seconds, between each terminal and housing (excluding protective earth)		
Overvoltage protection	Overvoltage category Ⅲ		
Pollution degree	4		
Mechanical Characteristics			
Withstand pressure (static)	2MPa Max. (excluding process connection)		1kPa Max. (excluding process connection)
Lateral load	0.55kN Max.(static)		-
Tensile strength	-		1kN Max. (extension tube)
Environmental			
Working temperature			
Wetted parts	-20 to +150℃ (standard) -20 to +180℃ (high temperature)		-20 to +70℃
Housing	-20 to +60℃ (no dew condensation)		
Humidity	95% RH Max.		
Altitude	2000m Max.		
Protection class			
Wetted parts	IP68 or equivalent		IP65 or equivalent
Housing	IP65 or equivalent		
Material			
Wetted parts	304 stainless steel	304 stainless steel, silicone	304 stainless steel, PVC(with steel core), NBR, POM, silicone
Housing	Aluminum die casting (acrylic coated)		
Cable inlet	G 3/4 or equivalent		

3.3 Outline Drawing

① Detecting pipe
Directly contacts material and detects it. Vibrates without contacting material.
Vibration decreases as material covers the pipe.

② Threaded connection (VL13N/T, VL23N/T)
Process connection to mount the sensor on a hopper.

③ Flange (VL13F/T, 23F/T, 33F)
Process connection to mount the sensor on a hopper.

④ Extension pipe (VL23N/T, VL23F/T)
Component to extend measurement range.

⑤ Extension tube (VL33F)
Component to extend measurement range.

⑥ Housing
Enclose electric circuit.

⑦ Cable inlet
Size: G3/4 or equivalent

⑧ Cover
Cover for the housing.

⑨ External earth terminal
Terminal to ground the product.

⑩ Warning sign
Indication to reference the first warning on page ADD 2 of this manual.

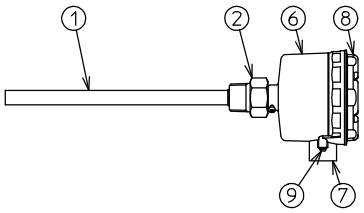
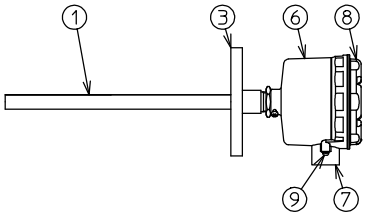
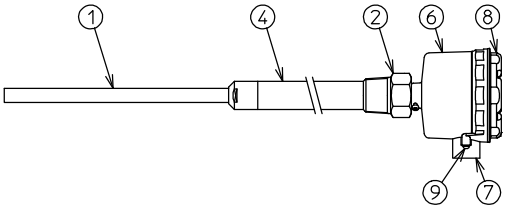
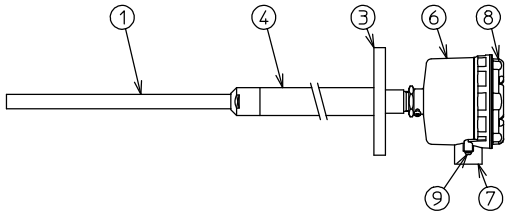
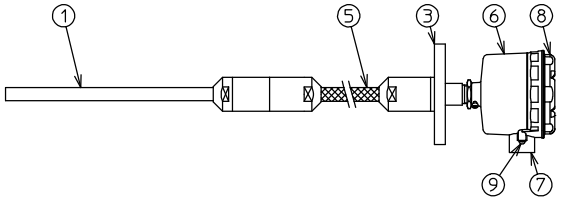
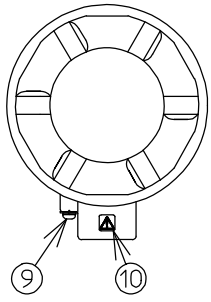
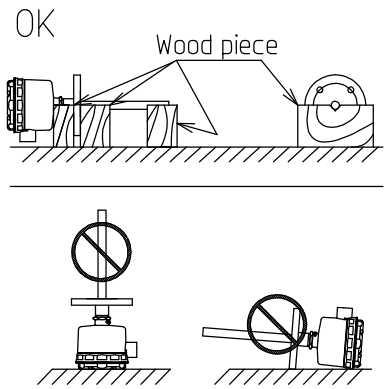
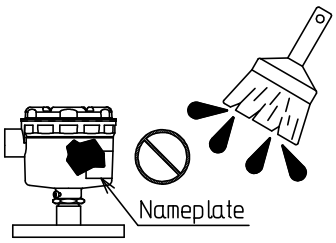
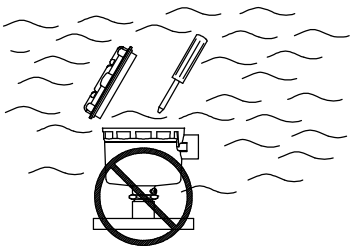
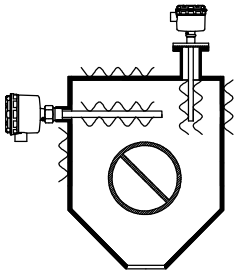
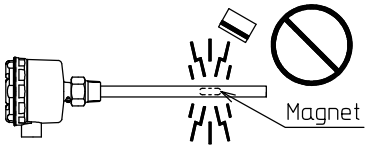
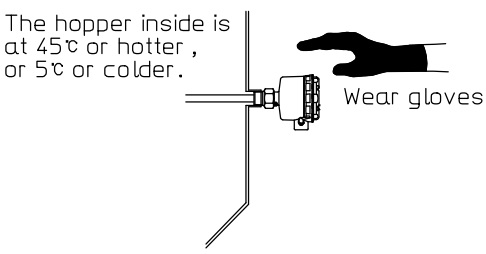
Model	Threaded type	Flanged type
VL13		
VL23		
VL33		
Common	Top view 	

Fig. 3-1

4. HANDLING NOTES

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

(1) Lay the product on a flat surface to prevent it from falling down. Provide support such as wood pieces beneath the product to prevent it from rolling and damaging the detecting pipe. Be extra-careful not to damage the pipe.	
(2) Nameplate contains important information for maintenance and other services. Ensure such information is legible when painting the product.	
(3) Avoid corrosive atmosphere (NH_3, SO_2, Cl_2) for installation, wiring, maintenance or adjustment. Such atmosphere will enter inside when the cover is opened and corrode internal components.	
(4) Avoid places subjected to excessive vibration. If such location is inevitable, remove the source or isolate the sensor from vibration.	
(5) The detecting pipe incorporates a magnet. Ensure magnetic media and other devices are not adversely affected by the magnetic field.	
(6) Wear gloves before touching the housing or process connection if the hopper inside is at 45℃ or hotter, or 5℃ or colder. These components become hot/cold enough to cause a burn/frostbite.	

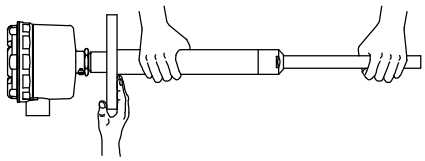
5. INSTALLATION

⚠ WARNING

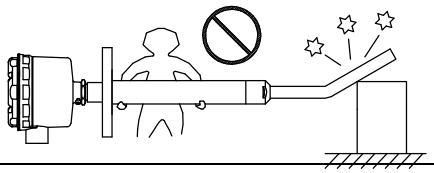
This product is not of the explosion proof model*. Never use it in areas where flammable or explosive gases or vapors are expected to be generated.

5.1 Unpacking

(1) Open the packaging and take out the product.
When handling the product, always hold the process connection (threaded or flanged) or the part of pipe close to the process connection, and somewhere else. Otherwise the detecting pipe may bend due to the heavy process connection and cause vibration failure.



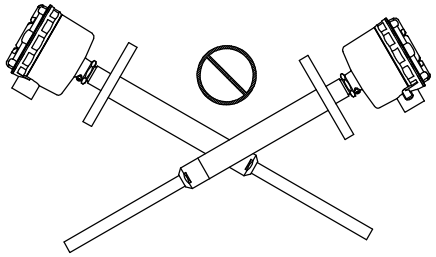
(2) Products longer than 1500mm require two people to carry them.
Otherwise the detecting pipe or the incorporated vibration plate may be damaged by mistake.



(3) Do not drop, throw, crush, drag or give a shock to the product to avoid damage.

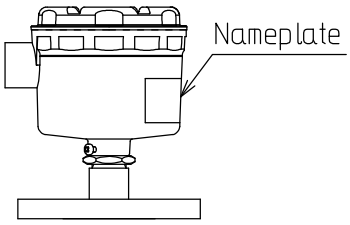
(4) Completely remove tape, vinyl, cupboard and other packing material.
Otherwise they may cause faulty operation.

(5) Do not place anything on the product to avoid applying undesirable force to or deforming the product.



(6) Check against the nameplate if the product is as you have ordered. If not, please contact our sales office.

(7) Check the product for damage.
If any, it may have been caused during transport. Please contact our sales office.



* See chapter 12 GLOSSARY.

5.2 Mounting

5.2.1 Mounting location

Ensure ample space above and around the mounting point for easy handling and maintenance. Note that the space between ceiling/wall and the hopper must be large enough to accommodate overall length of the product. This must be ensured after the product is mounted for future maintenance. (Fig. 5-1)

Also observe the following instructions, otherwise faulty operation may result.

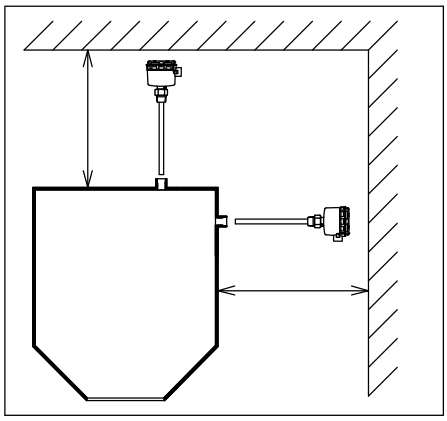


Fig. 5-1

(1) Beware of the angle of repose*.
Avoid locations where the material does not reach the detecting pipe. (Fig. 5-2)

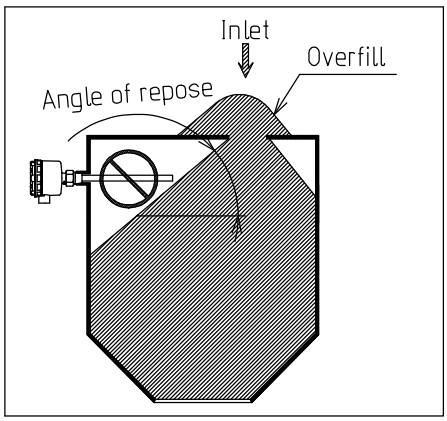


Fig. 5-2

(2) Avoid locations where vibration occurs.
Mounting close to a vibrator* or a knocker* may cause malfunction or damage the product.
(Fig. 5-3)

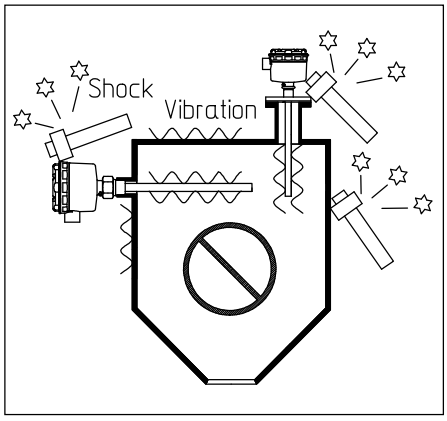


Fig. 5-3

(3) Avoid areas susceptible to deposit* to prevent faulty operation. (Fig. 5-4)

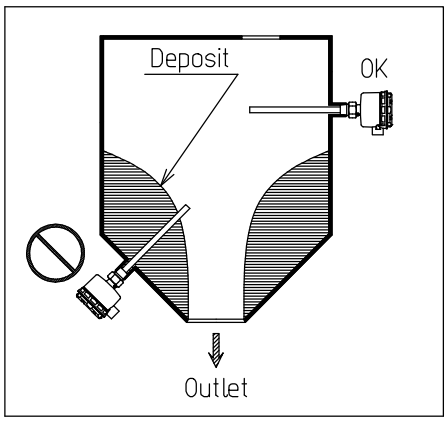


Fig. 5-4

* See chapter 12 GLOSSARY.

(4) Beware of bridge formation*.
Avoid locations adversely affected by bridging. Ensure the product will not be damaged when the bridge falls. (Fig. 5-5)

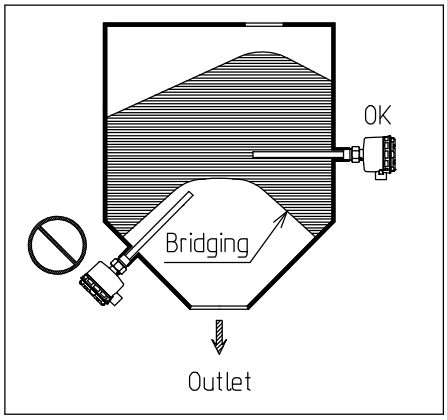


Fig. 5-5

(5) Avoid fill path to prevent faulty operation and product damage.
Provide a guard* above the product, if necessary. (Fig. 5-6)

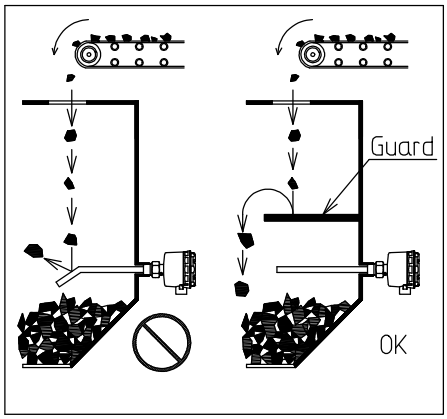


Fig. 5-6

(6) Avoid locations where temperature becomes high. High temperatures may cause faulty operation. The chart below shows maximum temperatures for wetted parts and the housing.

Wetted parts

Model	VL13, 23	VL13T, 23T	VL33
Temperature	+150℃	+180℃	+70℃

Housing: +60℃

(7) Avoid exposure to direct sunlight. In summer especially, direct sunlight causes internal temperature to exceed the ratings. Provide a sunshield* if necessary. (Fig. 5-7)

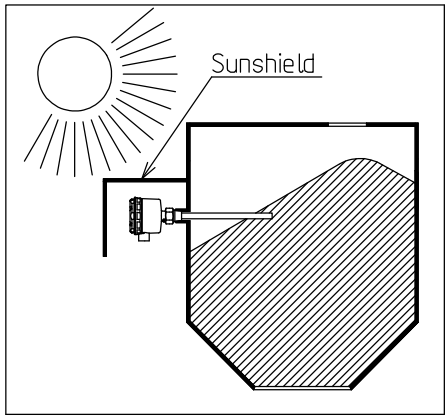


Fig. 5-7

(8) Properly tighten the cover and treat the cable gland. Water entering inside may cause faulty operation. The IP rating (IP65 or equivalent) is achieved only when the cover is properly tightened and the cable inlet properly treated.
If the product is mounted horizontally, ensure the cable inlet points downwards. (Fig. 5-8)

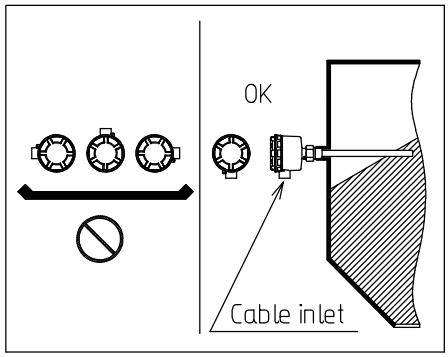


Fig. 5-8

* See chapter 12 GLOSSARY.

(9) Ensure lateral load applied to the detecting pipe will not exceed the rating. Maximum load at the end of the pipe (φ17.3mm, 270mm long) is 0.55kN (static load). Load greater than this may cause faulty operation or product damage. (Fig. 5-9) In applications where material rapidly moves or excessive load is expected, provide a guard* (Fig. 5-6), or mount the product at an angle to avoid load.

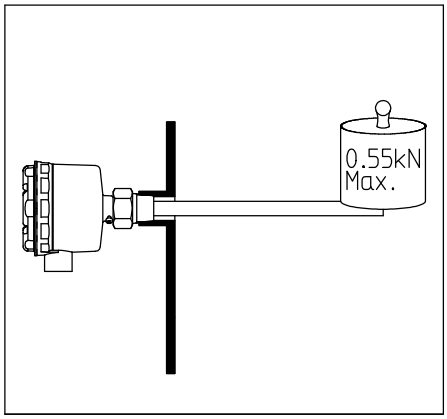


Fig. 5-9

(10) Do not mount VL33 (flexible type) horizontally, or faulty operation may result.

(11) Ensure the detecting pipe (φ17.3mm, 270mm long) will not contact standpipe wall, hopper bottom or walls to avoid faulty operation.

(12) Do not mount VL23 (long type) longer than 1m horizontally. Otherwise the extension pipe may be bent or come off due to material load. (Fig. 5-10)

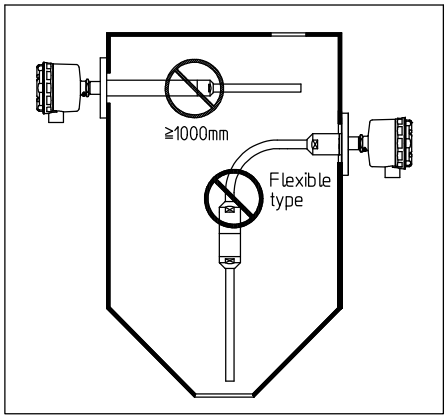


Fig. 5-10

(13) Use a standpipe as short as possible and ensure material will not remain inside. Ensure the detecting pipe projects into the hopper for at least 200 mm. For a standpipe of size 50A and sch20, the maximum length is 70mm. Note that the maximum length depends on material properties and standpipe size. (Fig. 5-11)

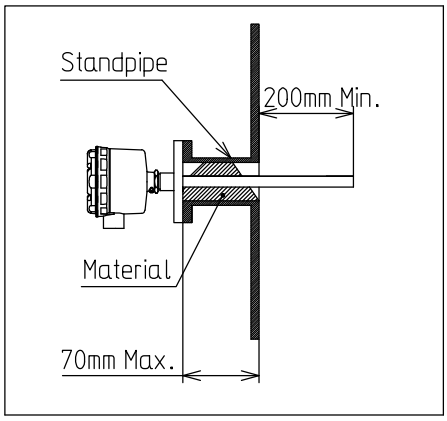


Fig. 5-11

(14) Avoid corrosive atmosphere. Detecting pipe is in stainless steel (304 stainless steel as standard), but most of the electronic components inside the housing uses cupper lead wire. Corrosive atmosphere may attack lead wire and break it, resulting in faulty operation.

(15) If the extension pipe of VL23 (long type) needs to be secured, please contact our sales office.

* See chapter 12 GLOSSARY.

5.2.2 Mounting the Products

(1) Flanged units

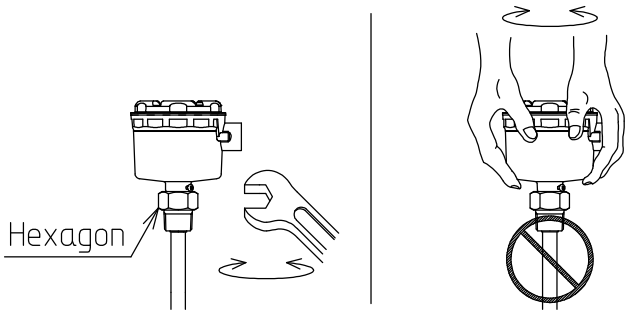
Fit the hopper flange and the product flange, and secure them using bolts according to standards and a suitable tool. Use a gasket in pressure applications to prevent leak. Note that bolts and gaskets are optional parts.

(2) Threaded units

Secure the product using a suitable tool. Always rotate the hexagon above the threaded connection and never the housing. Using the housing may apply excessive force and break wiring inside the housing. For pressure applications, use sealing material on the thread to prevent leak.

⚠ CAUTION

When removing the threaded unit from the hopper, rotate the hexagon above the threaded connection with a suitable tool. Never rotate the housing, otherwise connection between the housing and the threaded connection will be loosened, breaking internal wiring or sealing.



6. WIRING

6.1 Before Wiring

(1) Disconnect power to cabling.

⚠ WARNING

Disconnect power before wiring. Otherwise electric shock, or ignition or human injury due to leakage or short circuit of energized parts may result.

(2) Use cable rated for 35℃ higher than the rated temperatures for the housing.
The cable inlet accommodates cables of 10 to 18mm in diameter.
Suitable conductor sizes are:
0.75 to 2mm^2 for terminal block
2 to 3.5mm^2 for protective earth and external earth terminal on the housing

(3) Always provide a power switch and a fuse close to the product. Connect the fuse to L1+ (Live) line (Fig.6-3). Indicate these components are used for the product.

(4) Relay wiring
Fail-safe setting determines relay operation. See Fig. 6-1.

	FS. SW	Indicator		Relay contact
		DET	POW	
	DET	☼	☼	C NO NC
	NON	●	☼	C NO NC
	DET	●	☼	C NO NC
	NON	☼	☼	C NO NC
POWER OFF		●	●	C NO NC

Fig. 6-1

⚠ CAUTION

Relay ratings are 250V, 3A AC (resistive) or 30V, 3A AC (resistive). Do not exceed these ratings, or relay contacts may be damaged. Provide a suitable relay between the load and the output terminals of the product when switching loads that exceed the product ratings.

(5) Grounding
Always ground the protective earth (PE) inside the housing.
(grounding resistance: 100Ω Max.)

⚠ CAUTION

Always ground the protective earth (PE) inside the housing (grounding resistance: 100Ω Max.). Without grounding, electric shock or injury may result due to high voltages on the housing in case of the power line contacting the housing.
Ground the external earth terminal on the housing when necessary (grounding resistance: 100Ω Max.).

(6) Remove the cover of the sensor housing.

6.2 Wiring

(1) Loosen the two fixing screws on the terminal cover, and remove the cover.
Do not lose the cover as it is used after wiring is complete.

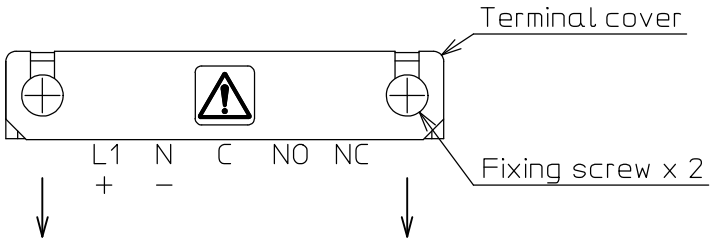
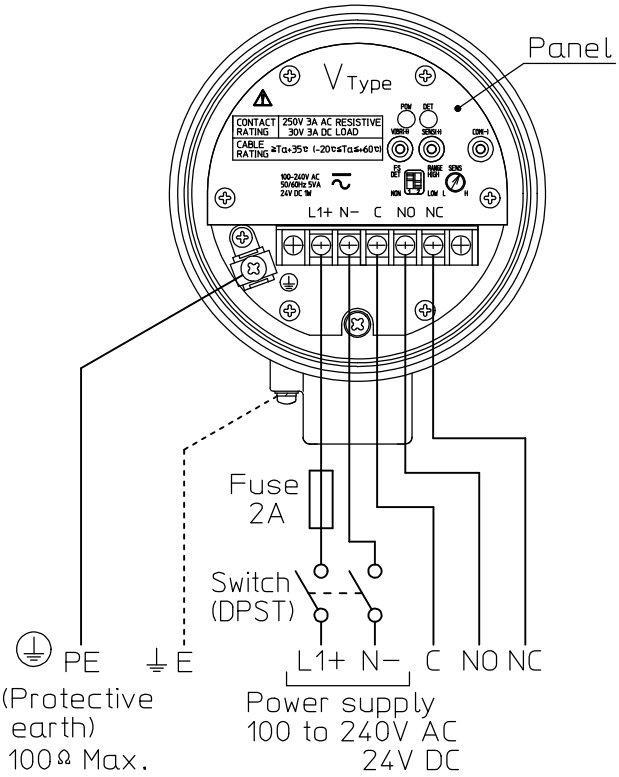


Fig. 6-2

(2) Figure 6-3 shows wiring diagrams. Use a suitable tool when wiring.
Terminal screws are of M3.5. Use cable lug of R1.25-3.5 or equivalent size.
The screws of protective earth (PE) and the external earth terminal on the housing are of M4. Use cable lugs of R1.25-4 or equivalent size.



Terminal	Torque
Terminal block	1.0 N·m Max.
Protective earth	1.2 N·m Max.
External earth	

Fig. 6-3

This product is polarity insensitive.

⚠ WARNING

The panel prevents contact with the internal circuit. Never remove it.

Voltages exceeding the rating may result in product damage or injury due to overvoltage on the product.

(3) Place the terminal cover, and secure it with the two fixing screws.

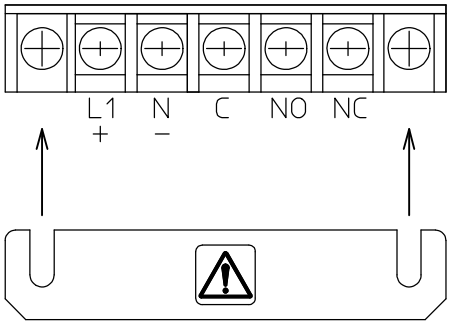


Fig. 6-4

6.3 Cable Inlet

Cable inlet is of G 3/4 or equivalent size.

Use a cable gland or a conduit to secure the cable. In either case, lead the cable downward in front of the cable inlet to prevent water entry.

Secure the cable using a sealing compound when a conduit is used, and by tightening the gland with a suitable tool when a cable gland is used, to prevent entry of dust, debris or rain into the housing. If water or moisture can enter from inside the conduit, putty the inside. (Fig. 6-5)

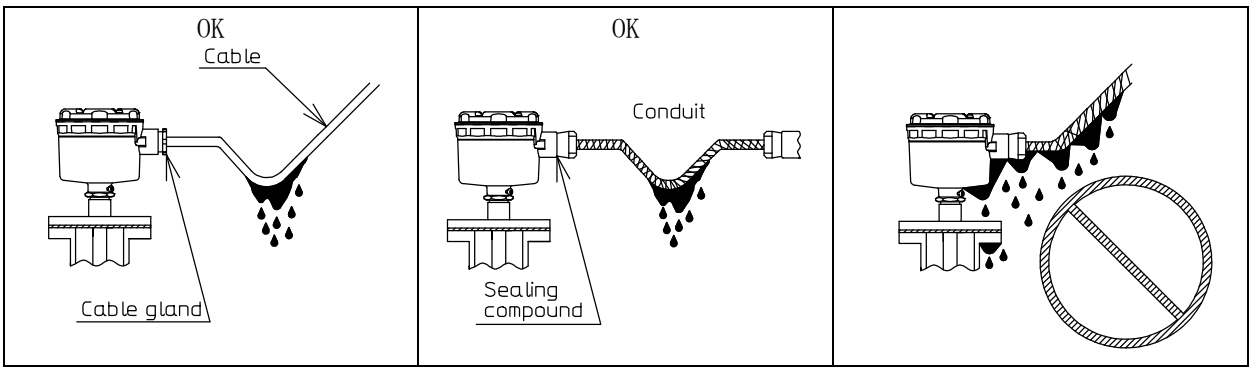


Fig. 6-5

6.4 Operation Check

(1) Remove dust and debris from the housing. Ensure metal debris is not left since it may cause shortcircuit.

(2) Before actual operation, fill the hopper with the material and check product performance. If the product does not operate as it should, check for incorrect wiring, and read this instruction manual once again. Please contact our sales office for any questions.

6.5 Placing the Cover

Properly tighten the cover on the housing. If loose, rain or dust may enter and corrode inside components, causing short circuit or faulty operation.

7. PART NAME AND FUNCTION

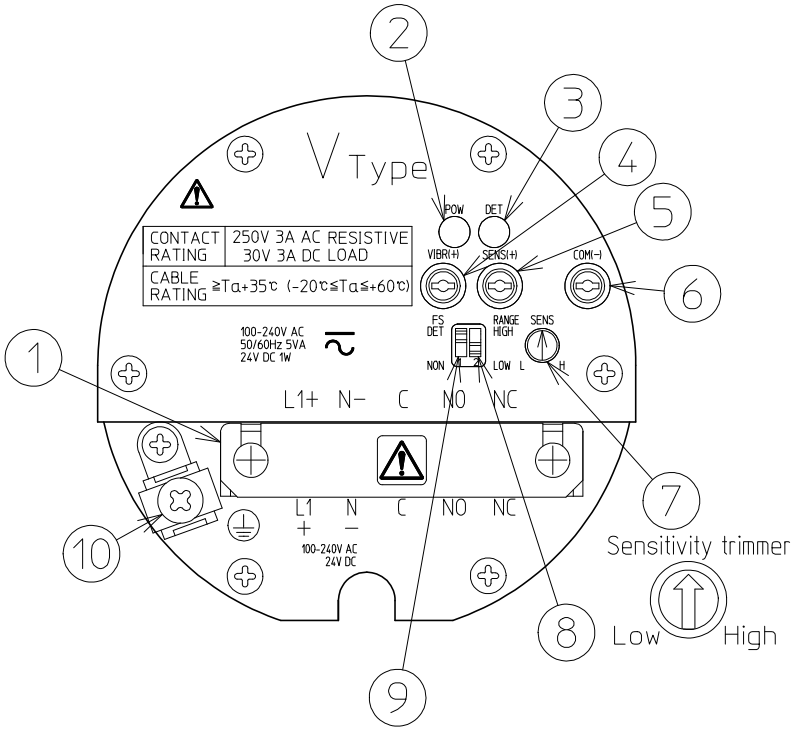


Fig. 7-1

① Terminal block
For power and relay output connection.

② Power lamp [POW]
Lights when powered. (green LED)

③ Alarm lamp [DET]
Lights when relay is energized. (red LED)

④ Vibration check terminal [VIBR(+)]
Gives output of 0 to 5V DC that represents sensor vibration level.

⑤ Sensitivity check terminal [SENS(+)]
Gives output of 0 to 5V DC that represents sensitivity level.

⑥ COM terminal [COM(-)]
Negative terminal used to check vibration or sensitivity level.

⑦ Sensitivity trimmer [SENS]
Sets sensitivity level.

⑧ Sensitivity range switch [RANGE]
Switches high and standard sensitivity ranges.

⑨ Fail-safe switch [FS]
Reverses output signals.

⑩ Protective earth terminal
Grounds the product. Connect this terminal to ground.
(Grounding resistance: 100Ω Max.)

8. OPERATION

This product is basically adjustment free. Use them in the as-delivered state. Changing switch or trimmer setting may cause faulty operation.
Sensitivity adjustment may be necessary when:
- Material has low bulk density or high fluidity, and the product cannot detect the level.
- Material builds up on the detecting pipe and erratic signals are sent.
- Switch is switched or trimmer turned accidentally.

In these cases, follow instructions below and make adjustment.

8.1 Tools Used for Sensitivity Adjustment/Check

- Digital tester for measuring 0 to 5V DC and with input resistance 1MΩ or greater. Analog testers and voltmeters can also be used if their input resistance is 1MΩ or greater.
- Slotted screwdriver for sensitivity trimmer. Slot on the trimmer is 0.7mm x 5mm.

8.2 Notes on Sensitivity Adjustment/Check

⚠ CAUTION

Sensor output may switch during adjustment. Ensure controlled devices are not adversely affected.

The product gives detection signal when voltage at the vibration check terminal* undershoots voltage at the sensitivity check terminal*.
Voltage at the vibration check terminal decreases when detecting pipe vibration is restricted by material. The tighter the restriction, the further the voltage decreases. This means high voltages at the sensitivity check terminal result in high sensitivity level, and vice versa.
Voltage at the sensitivity check terminal is changed using the sensitivity range switch and the sensitivity trimmer. Fig. 8-1 shows how the voltage changes.

		Trimmer		
		↙	↑	↘
Sensitivity range switch	High	approx. 0V	approx. 2.5V	approx. 5V
	Standard	approx. 0V	approx. 1.25V	approx. 2.5V

Fig. 8-1

* See chapter 12 GLOSSARY.

8.3 Adjusting Sensitivity

⚠ CAUTION

Adjust sensitivity with the product mounted on the same hopper and using the same material as in the actual application. If different, adjusted sensitivity may not suit the actual application due to bulk density difference.

(1) Sensitivity can be adjusted with or without the product detecting the material.

(2) Ensure that the product is powered up. Initial reset time is approximately 15 seconds and the relay is de-energized during that time.

(3) Prepare the digital meter so that it measures voltages between 0 and 5V DC with 0.1V resolution. Connect the positive wire to the sensitivity check terminal, and the negative wire to the COM terminal. See figure 8-2.

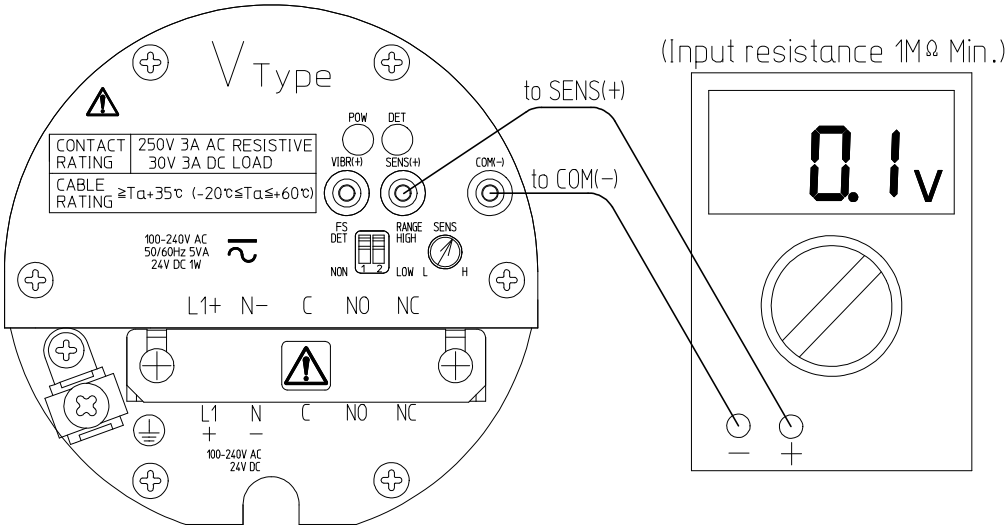


Fig. 8-2

(a) Standard sensitivity setting

Set the sensitivity range switch to LOW (lower side), and set the sensitivity volume to 1±0.3V.

(b) High sensitivity setting

Ensure the sensitivity is set to standard. Then set the sensitivity range switch to HIGH (upper side). The voltage increases to approximately 2V, and the sensitivity is now set to high.

(c) Low sensitivity setting

Set the sensitivity range switch to LOW (lower side), and the sensitivity volume to 0.6±0.1V.

(4) Operation check

After setting sensitivity, check operation using the measured material. Set the tester so that it measures 0 to 5V DC with 0.1V resolution. Then connect the positive wire to the vibration check terminal, and the negative wire to the COM terminal.

(a) Without material contacting the detecting pipe, the product gives approximately 5V and non-detection signal.

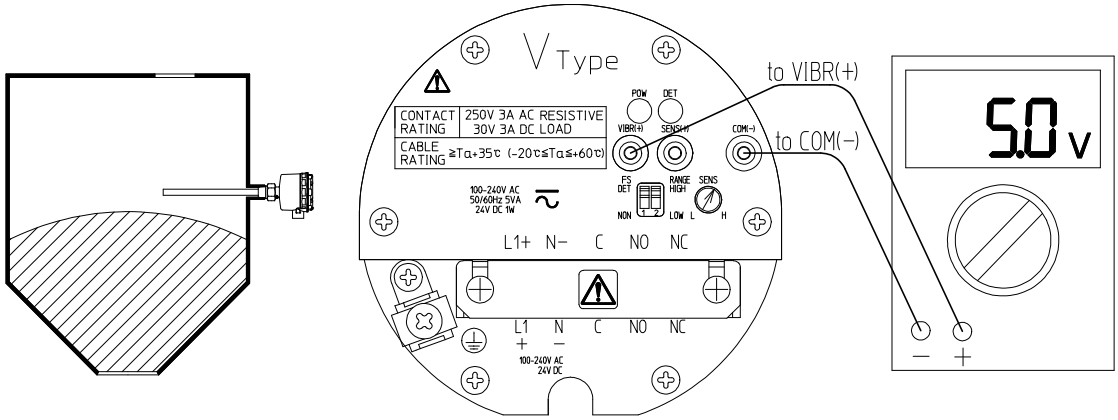


Fig. 8-3

(b) The following shows correct operation when the detecting pipe is covered by material.

- Standard sensitivity
  Voltage at the vibration check terminal is smaller than 1V and the detection signal is given.
- High sensitivity
  Voltage at the vibration check terminal is smaller than 2V and the detection signal is given.
- Low sensitivity
  Voltage at the vibration check terminal is smaller than 0.6V and the detection signal is given.

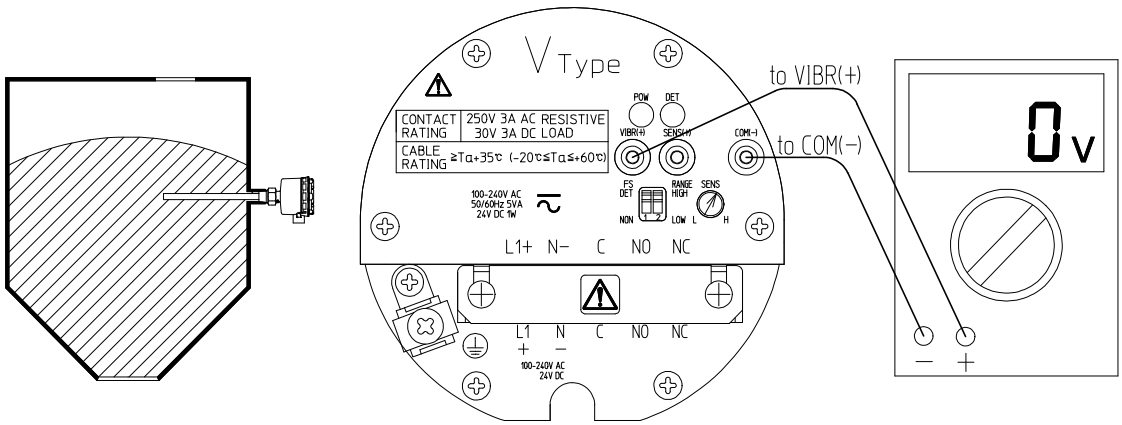


Fig. 8-4

9. MAINTENANCE AND INSPECTION

Perform maintenance and inspection after removing the product from the hopper.
Read section 4 HANDLING NOTES before staring. Ensure ample space for maintenance.

9.1 Removing from Process

(1) Remove the product from the hopper. Disconnect power before starting maintenance.

⚠ WARNING

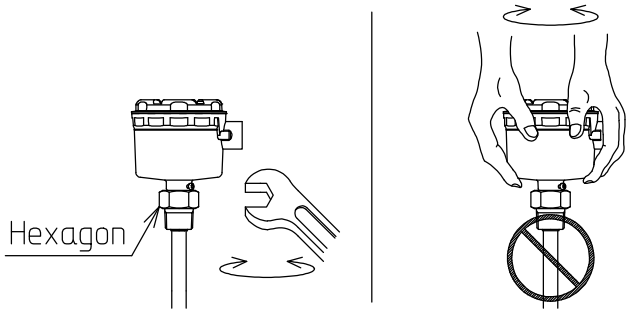
Disconnect power before starting maintenance. Otherwise electric shock, or ignition or human injury due to leakage or short circuit may result.

Before servicing, stop operation and wait until the temperature and the pressure inside the hopper are reduced to an ambient level to prevent high temperatures and pressures from causing injury.

(2) Remove the cover from housing and disconnect wiring inside. Remove, if used, the conduit from the housing.

⚠ CAUTION

When removing the threaded unit from the hopper, rotate the hexagon above the threaded connection with a suitable tool. Never rotate the housing, otherwise connection between the housing and the threaded connection is loosened, breaking internal wiring or sealing.



(3) Hold the process connection and remove the product from the hopper.

(4) Place the product on a flat surface.

⚠ CAUTION

Do not loosen screws other than terminal screws on the terminal block and for grounding. Loose screws will result in product damage or faulty operation.

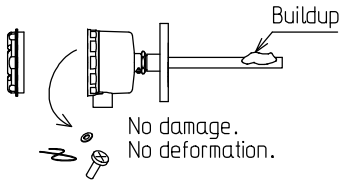
9.2 Maintenance

Perform maintenance and inspection once or twice a year. More frequent maintenance will be required depending on the measured material, temperature, pressure and other conditions.

(1) Check the product for visible damage that may impair performance.

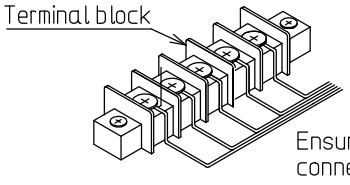
(2) Remove buildup on the detecting pipe.

(3) Remove condensation, dust, debris and metal pieces.



(4) Re-tighten loose terminal screws with a screwdriver.

(5) Replace corroded terminals and lead wire.

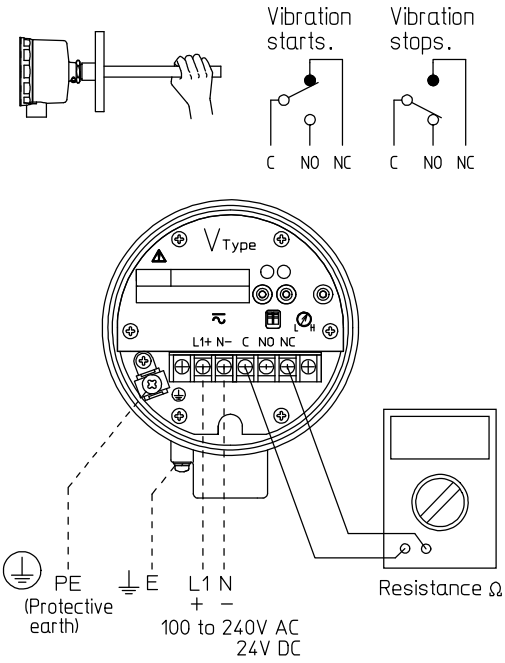


(6) Test the product for correct operation.

[Procedure]

Connect a tester (for resistance value) or an electric buzzer to the product. Hold the end of detecting pipe to stop vibration. See if the relay opens or closes correctly by the connected devices.

If the product does not operate correctly, repair is required.



9.3 Mounting

See section 5.2 Mounting.

9.4 Wiring

See chapter 6 Wiring.

9.5 Component Replacement

Component replacement has to be carefully carried out using suitable components from Nohken not to impair performance. Therefore replacement is done in our factory. Please contact our sales office when component replacement is required.

9.6 When to Replace

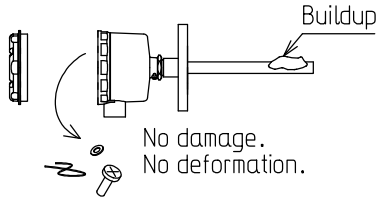
Component replacement is recommended 3 to 5 years after installation. This is because the relay and the detecting pipe wear out or erode over time. This time period will differ depending on frequency of use, material type, temperature, pressure and other conditions.

10. STORING

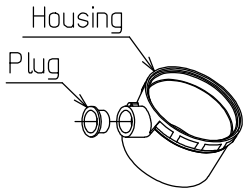
Observe the following instructions if the product is not used right after delivery and stored, or is removed from service and stored. Failure to observe these instructions may result in product damage or cause faulty operation.

(1) Store the product in the following conditions.
- Temperature: -10 to +60℃
- Humidity: 85%RH Max. (no dew condensation)
- Atmosphere: not corrosive (without NH_3, SO_2, or Cl_2)
- Vibration: not excessive

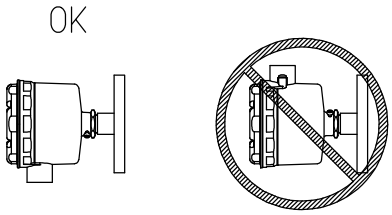
(2) Remove buildup. Buildup may harden over time and adversely affect performance the next time used.



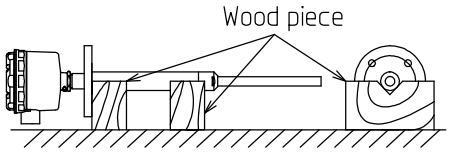
(3) Place the cover on the housing, and a plug on the cable inlet to prevent dust entry.



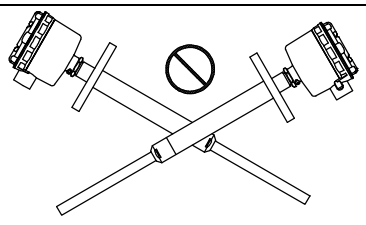
(4) Ensure rain will not enter inside the product. Always place the product so that the cable inlet points downwards to prevent rain entry.



(5) Provide support such as wood pieces beneath the product to prevent it from rolling and damaging the detecting pipe.
Support the detecting pipe of 2000mm or longer at a 1000mm interval.



(6) Do not place anything on the product to avoid applying undesirable force to or deforming the product.



Note:
Wrap the product with polyethylene sheet and seal it to protect from moisture or dust.
If the product is stored where temperature changes enormously, place 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 questions, please contact our sales office.

Trouble	Possible cause	Corrective action	Reference
Does not measure a level. (Overfill resulted.)	Material bulk density too low (<0.2).	Use High sensitivity setting.	8.3 (3) (b) on p.15
	Angle of repose.	Relocate the product so that material reaches detecting pipe.	5.2.1 (1) on p.6
	Bridge formation.	Use a knocker to prevent bridge from forming.	5.2.1 (4) on p.7
	Material movement.	Use High sensitivity setting.	8.3 (3) (b) on p.15
	External vibration.	Relocate the product to isolate it from external vibration.	5.2.1 (2) on p.6
Keeps giving detection signal. (Empty hopper resulted.)	Incorrect wiring.	Wire correctly.	6.2 (2) on p.11
	Material buildup on the detecting pipe.	Remove buildup. Use Low sensitivity setting.	8.3 (3) (c) on p.15
	Deposit in the hopper.	Relocate the product.	5.2.1 (3) on p.6

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.

Detecting pipe	Component that vibrates to detect material. Decreases vibration as material covers the detecting pipe.
Explosion proof model	Electrical device designed not to ignite explosive gases or vapors in the surrounding. (This manual is not for explosion proof models.)
Angle of repose	Angle between the horizontal surface and the surface of pile formed by granular substance poured on a horizontal surface. See Fig.5-2.
Vibrator	Device that vibrates a hopper from outside to remove buildup or deposit on the inside wall.
Knocker	Device that gives shocks to a hopper from outside to remove buildup or deposit on the inside wall.
Deposit	Solid remaining inside the cone of a hopper. The amount depends on the angle of the cone. See Fig.5-4
Bridge formation	Material forming itself into a shape of bridge in a hopper. See Fig.5-5.
Guard	Board or semi-circular pipe that protects detecting pipe from falling or flowing material.
Sunshield	Component to be placed over the housing and protect the housing from direct sunlight. See Fig.5-7.
Voltage at vibration check terminal	Indicates status of detecting pipe vibration as 0 to 5V DC. 5V DC without material covering the pipe. Decreases as vibration decreases.
Voltage at sensitivity check terminal	Indicates sensitivity level as 0 to 5V DC. High values mean high sensitivity, and vice versa. Adjusted using sensitivity range switch and sensitivity trimmer in combination.

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