

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

F O R

ROTATING-PADDLE LEVEL SENSOR

MODEL : R B 2 0



R B 2 1

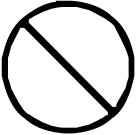

Revision 2015-03-30

Read and understand this manual for safely usage.

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

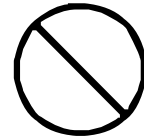
The followings are the description of the terms in this manual.

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

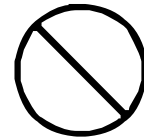
	Indicates prohibited matter. The explanation with this mark shall be followed.
	Indicates instructed matter. The explanation with this mark shall be followed.

—  **WARNING** —

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



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



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



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

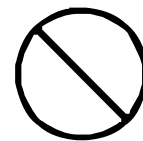


Turn off the power immediately, if the smoke, strange smell and sound are occurred.
Do not use it until the problem is solved.



—  **CAUTION** —

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



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



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



—  CAUTION —

Check and deeply consider the chemical compatibility for material of product in advance. The part especially float, which is very thin, may be malfunctioned by miner corrosion.



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



Hold the stem very close to mounting point, when carrying, installing, and removing. If hold the terminal box, it may be taken off from the flange or plug, and the product may be damaged by dropping.



The product is 50cm or longer

The product shall be kept in horizontally. The product and other goods be damaged, and miner injury may be occurred by falling.



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



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



In case of connecting inductive or lamp load to the product.

Provide protective circuit to the load to avoid over voltage and over current. If not provide, the contact may be damaged.



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1. Intended purpose

Rotating-paddle type level sensor Model RB is a level sensor for powder, of which a detection paddle (※) inserted into a tank/hopper rotates slowly and detects presence of powder in the tank/hopper. This level sensor should never use for any other applications. When powder is absent around the detection paddle, the detection paddle keeps rotating, while powder is present there, the detection paddle stops rotating and an output switch is turned on.

2. Specifications

2.1 Model

Standard type

RB20□

└── F : Flange (※) mounting type
 N : Plug mounting type

Special type

RB21□ □ □ □

└── G : With guard
 Space : Without guard
 └── T : Heat-proof type
 Space :
 └── L : Extended protection pipe type
 (300mm ≤ L ≤ 1000mm ; only flange mounting)
 └── LV : Extended protection pipe type
 (1000mm ≤ L ≤ 3000mm ; only flange mounting)
 └── S : Slide flange type (300mm ≤ L ≤ 1000mm)
 └── SV : Slide flange type (1000mm ≤ L ≤ 3000mm)
 └── BV : Long shaft type (300mm ≤ L ≤ 3000mm)
 └── F : Flange (※) mounting type
 └── P : Pipe mounting (other than flange and plug mounting)

※ : Refer to page 15, 8.Glossary

2.2 Specifications

Model		20N	20F	21FBV	21FL 21FLV	21FS 21FSV
Measuring object		Bulk materials, Powder and Granular materials				
Operation characteristics	Rotational frequency	1 rpm (50Hz), 1.2 rpm (60Hz)				
	Detection torque	120 to 150 mN·m±30%				
	Slip torque	25 to 30 cN·m				
Electrical characteristics	Power supply	100 V or 200 V AC (50/60Hz)				
	Contact rating (Resistive load)	Max.	250 V 5 A AC, 30 V 5A DC			
		Min.	5 V 160 mA DC			
	Power consumption	Approx. 4 W				
	Insulation resistance	100MΩ or more, 500 V DC (between terminal and housing)				
	Withstand voltage test	1500V AC for one minute (between terminal and housing)				
Working temperature	Detection part	0 to +50 °C (Note 1)				
	Housing	0 to +45 °C				
Working pressure		-20 to +20 kPa				
Construction		Detection part : IP45 or equivalent, Housing : IP55 or equivalent				
Mounting		Plug	Flange			
Mounting size		G1	JIS 5K 65A or equivalent (t=5)	JIS 5K 65A or equivalent (t=6)	JIS 5K 65A	
Cable inlet		G 1/2 or equivalent				
Shaft diameter		φ 10	φ 8	φ 10		
Material of Flange			Steel structure (Acrylic coating)	304 stainless steel		
Material of Housing		Aluminum die casting (ADC12)				
Material of Shaft		304 stainless steel				
Material of Detection paddle		304 stainless steel				

Note 1) Detection part temperature of heat-proof type : 0 to +180°C

3. Part names

Fig. 1 through Fig. 4 shows part name and outer shape of each sensor.

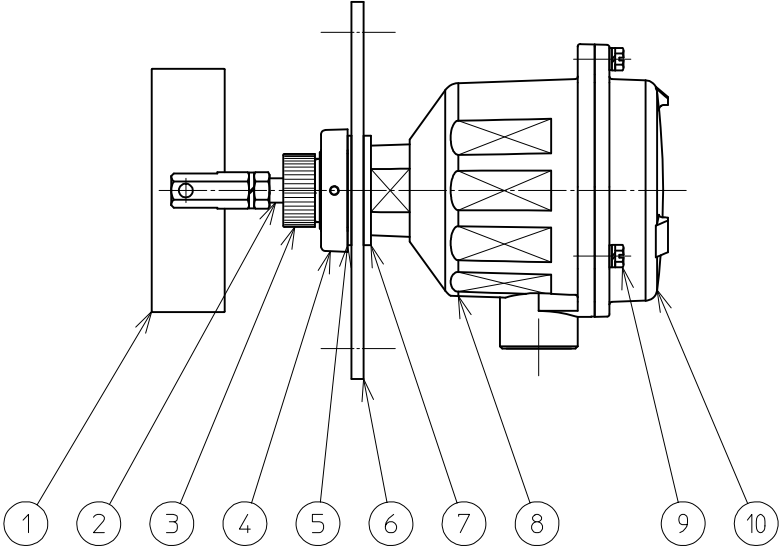


Fig. 1 RB20F

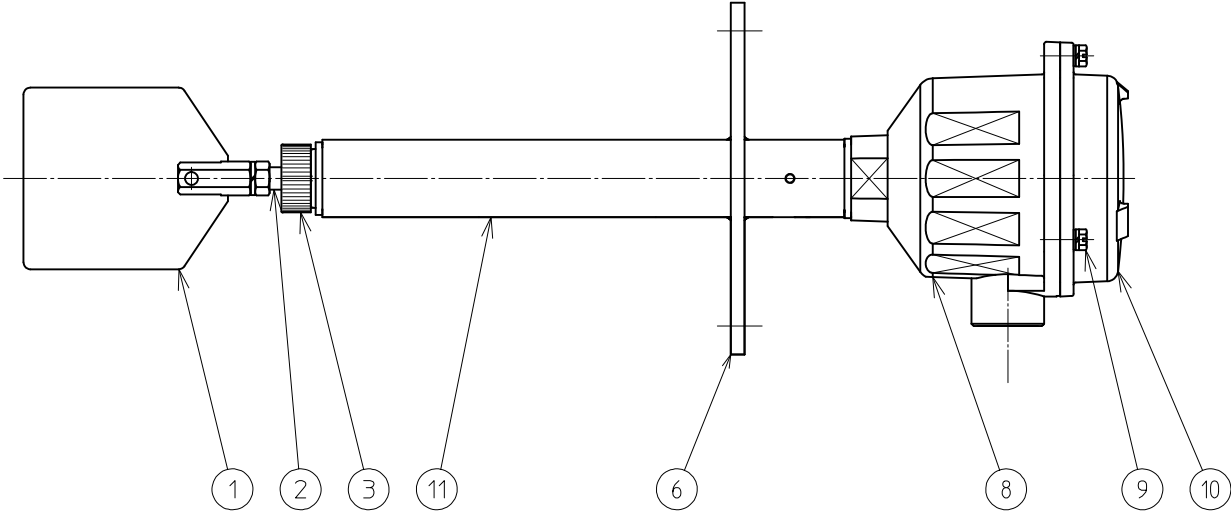


Fig. 2 RB21FL/FLV

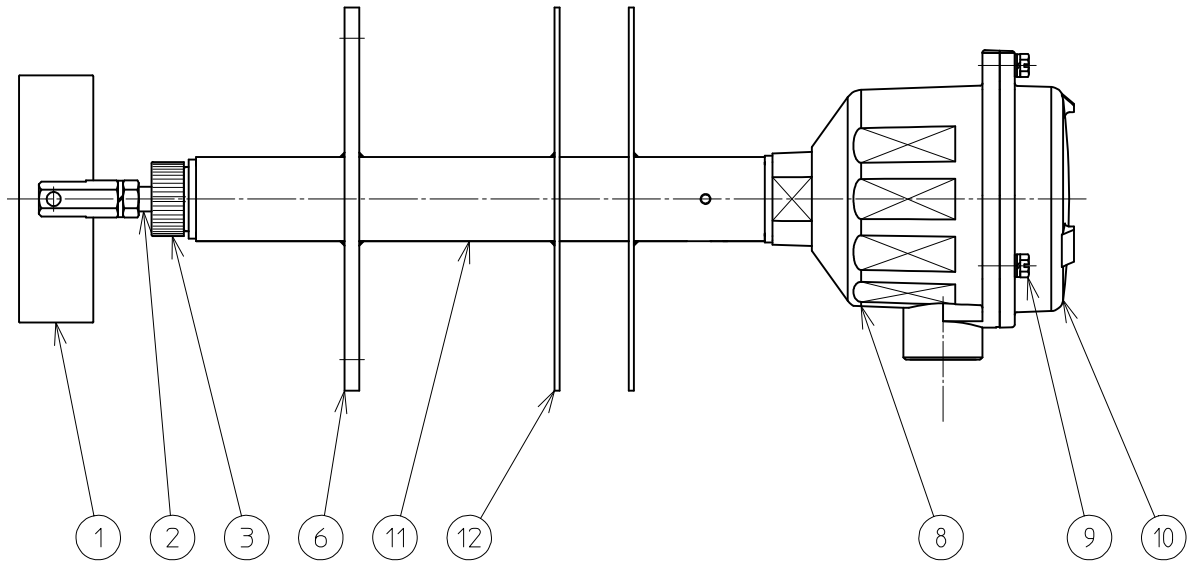


Fig. 3 RB21FT

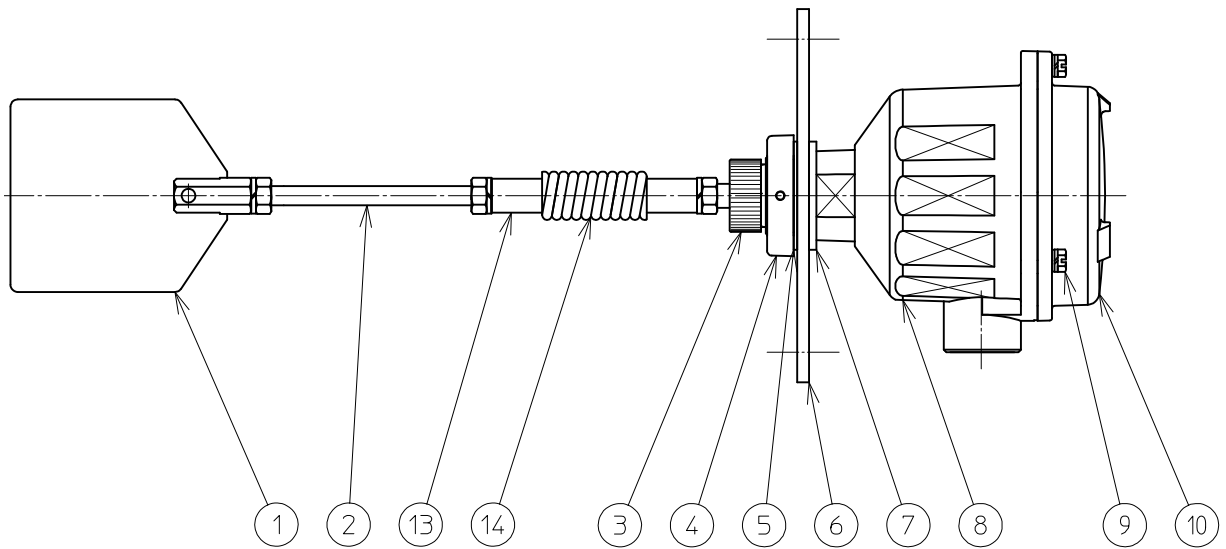


Fig. 4 RB21FBV

P.No.	Name	P.No.	Name
①	Detection paddle	⑧	Housing
②	Shaft	⑨	Cover bolt
③	Seal cap	⑩	Cover
④	Fitting nut	⑪	Pipe
⑤	Washer	⑫	Radiation fin
⑥	Flange	⑬	Connector
⑦	Gasket	⑭	Spring

4. Principle of operation

When powder is empty around the detection paddle, the detection paddle keeps rotating with a motor. When powder arrests the rotational motion of the detection paddle, the motor body rotates along with the shaft and then turns off a micro-switch for the motor with a pin connected with the motor, to stop rotating the motor and to turn on a micro-switch for an output signal to provide an output signal.

When the powder is discharged, as the powder releases the detection paddle, a spring (see page 9) turns on the micro-switch for the motor and the detection paddle starts again rotation.

If a falling phenomenon of the powder is occurred inside the tank, the detection paddle is pulled down forcibly to rotate the shaft. This forced torque of the shaft is not transmitted to the motor spindle thanks to a slip mechanism provided between the paddle shaft and the motor spindle so that the motor is protected.

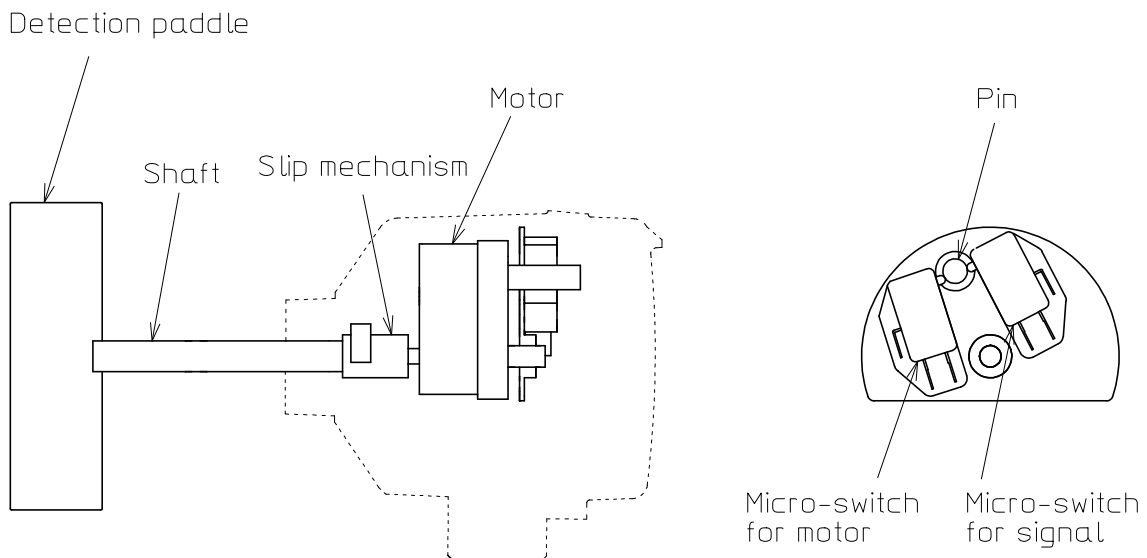


Fig. 5 Principle

5. Handling instruction

5.1 Installation

As shown in fig. 6 and fig. 7, the hole of a diameter of 90 mm or larger is to be made for mounting the level sensor in the mounting plate.

In the case of the detection paddle shown in fig. 6, the thickness of the mounting plate must be less than 16 mm.

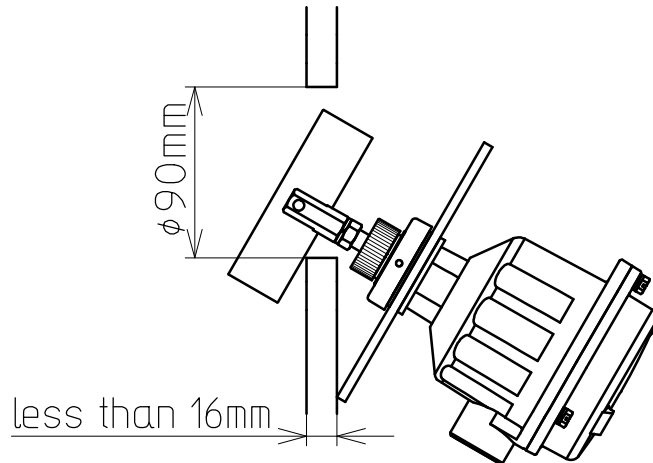


Fig. 6 Handling instruction(1)

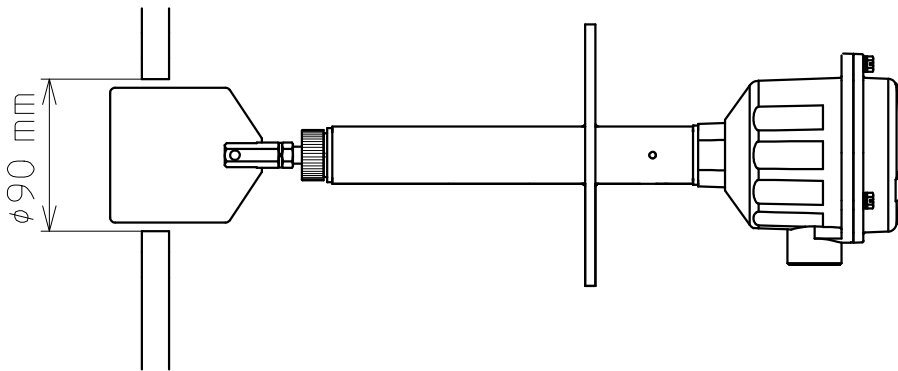


Fig. 7 Handling instruction(2)

If the 90 mm or larger diameter hole is difficult to be made, the detection paddle must be disassembled before the mounting. The mounting method is shown below. Even in this case, the hole must be required to be larger than a 60 mm in diameter. When a nozzle is used, its height must be less than 50 mm.

- a) Required tool:
- Monkey wrench, wrench, etc.

b) Part names

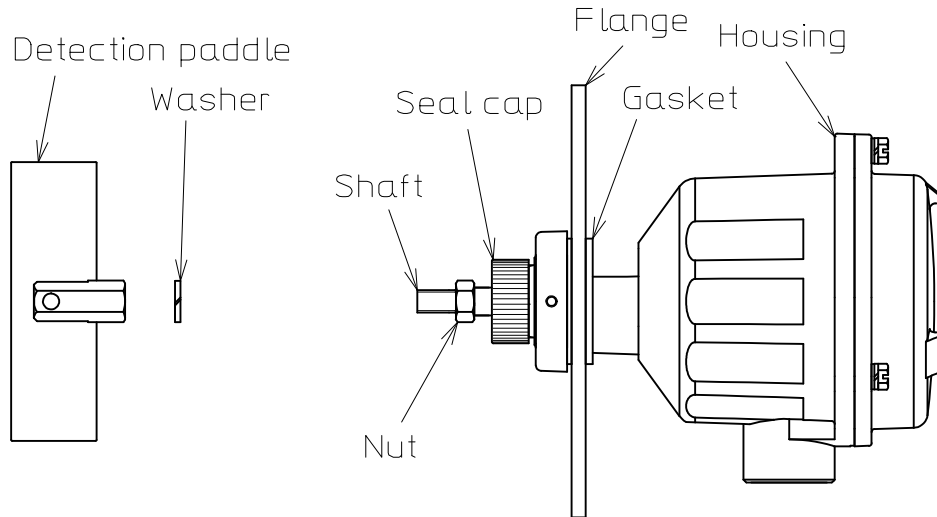


Fig. 8 Part names

c) Installation procedure:

- (1) Remove the detection paddle and the spring washer.
- (2) Install the flange on the hopper wall with bolts and nuts.
- (3) Re-assemble the detection paddle and the spring washer removed in the above (1), inside the hopper.

The installation procedure for the detection paddle shown in fig. 7 is the same as the above.

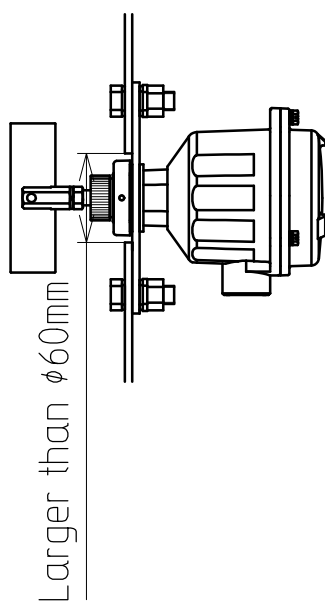


Fig. 9 Handling instruction(3)

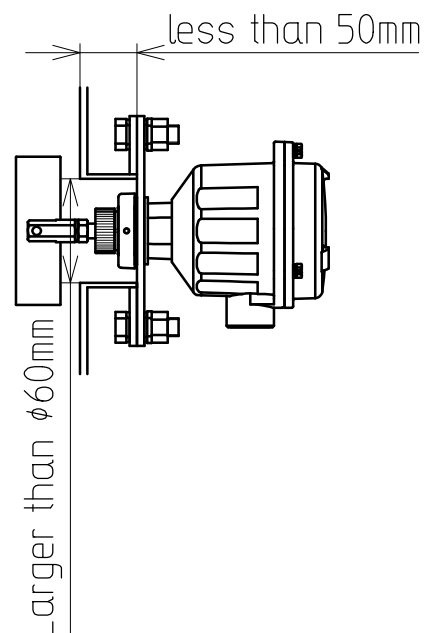


Fig. 10 Handling instruction(4)

5.2 Wiring

First of all, turn off the power supply to the connecting wire.

⚠ WARNING

Turn off the power supply before starting the wire connection. Otherwise, ignition may occur by an electric shock, a leakage of current, and a short circuit of energized components.

5.2.1 Internal circuit

Fig. 11 shows the internal circuit.

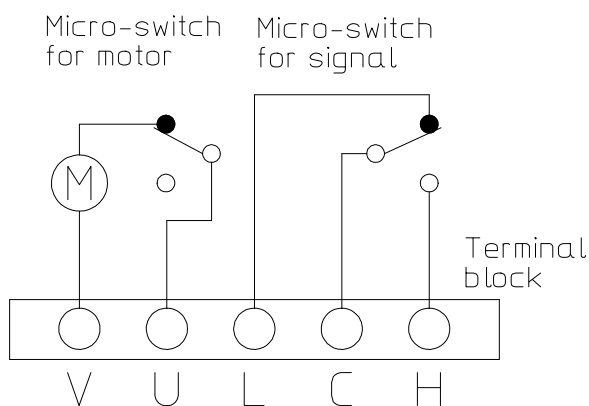


Fig. 11 Internal circuit

5.2.2 Wiring

Connect wiring to the terminals and secure the terminal screws with the tool. As the M3 screw is used for the terminal screw, the pressure terminal of R1.25-3.5 or equivalent should be applied. Fig. 11 shows the terminal No. The CVV1.25 mm² is recommendable as the suitable cable. The output signal contacts should be wired as per the fig. 12.

State	Micro-switch for signal
Powder not detected	
Powder detected	

Fig. 12 Wiring for output signal contacts

5.3 Torque adjustment

The detection torque can be adjusted by the strength of the spring.

The minimum strength can be set at the position A, and the maximum the position D. By changing the position of the spring from A to D, the weight or the size of the powder can be detected.

[Caution]

Before shifting the spring to the other position to adjust the torque, switch off the power supply to the level sensor to prevent an electric shock from touching the terminals.

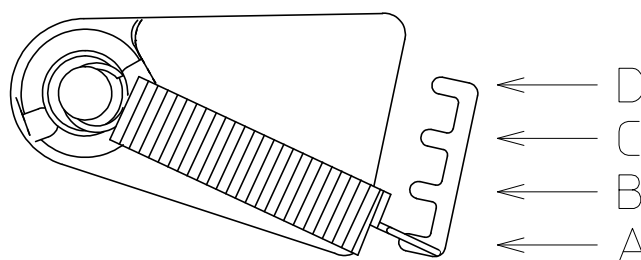


Fig. 13 Detail drawing for torque adjustment

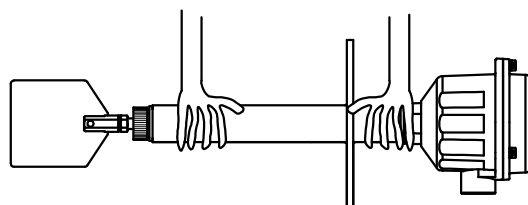
6. Cautions for installation

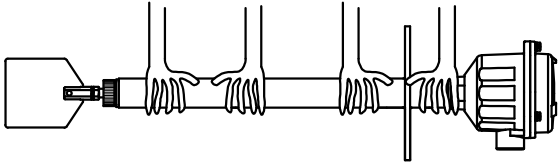
⚠ WARNING

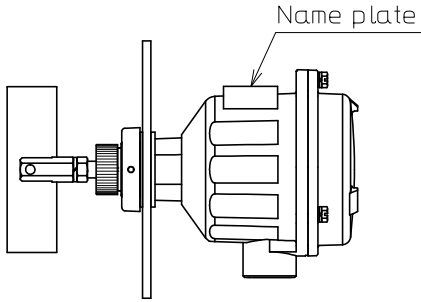
The Rotating paddle type level sensor Model RB is not an explosion-proof type. Do NOT use this product in hazardous area where flammable or explosive gas or vapor generates.

6.1 Unpacking

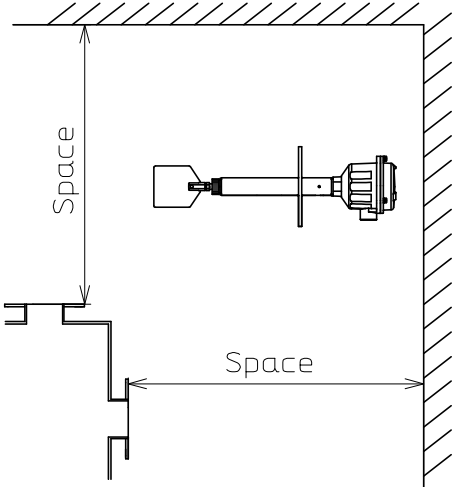
6.1.1 Remove all packaging materials such as tape, vinyl, cardboard, etc. Otherwise, they may cause malfunction of the level sensor. Then, open a commercial packaging and lift out the level sensor from it. For the extended protection pipe type, both sides of the product are to be held.

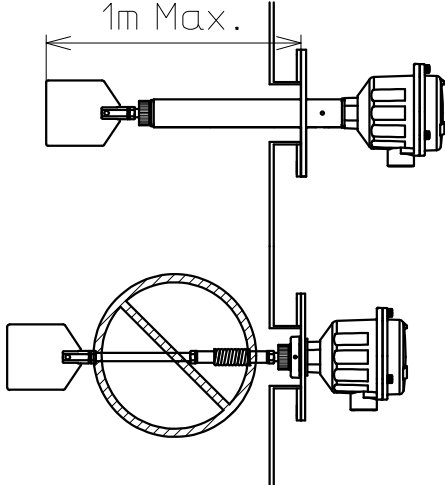


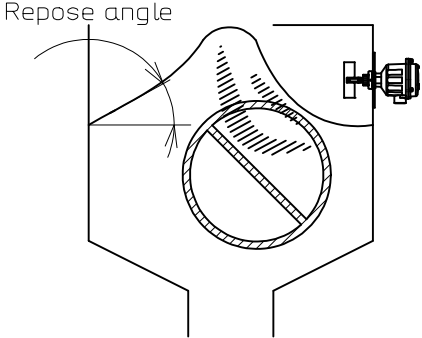
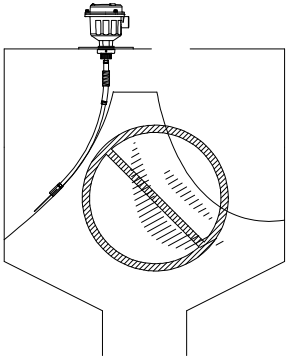
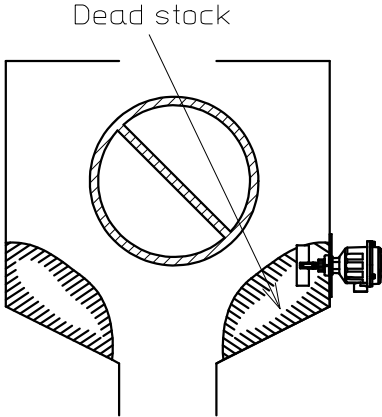
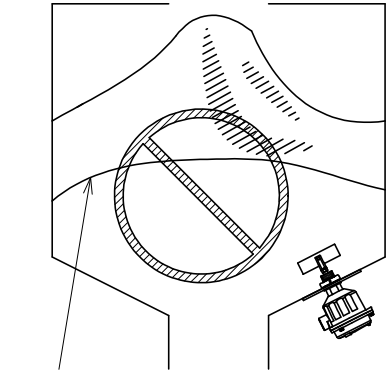
<p>6.1.2 For the level sensor of 1500 mm or longer, two or more persons should hold it. Otherwise, the product may be damaged by hitting against something in error.</p>	
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<p>6.1.3 Check the name plate if it meets the product you ordered. If not, please contact Nohken Inc.</p>	
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6.2 Installation on a tank / hopper

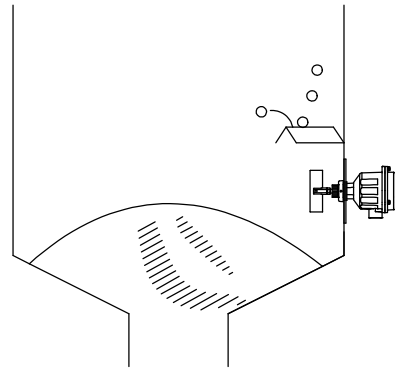
<p>6.2.1 Confirmation of the installation area: For mounting the level sensor on a tank, the sufficient mounting space and the maintenance area should be provided around the tank for easy access.</p>	
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<p>6.2.2 Mounting of the level sensor having the longer measuring length (dimension from the inner flange): The extended protection pipe type or the flexible long pipe type level sensor having the measuring length of 1000 mm or longer must be mounted from the top of the tank. If mounted on the sidewall of the tank, the level sensor may malfunction.</p>	
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<p>6.2.3 The level sensor should be installed for the detection paddle to touch the powder in view of the repose angle (※), especially, for the upper limit alarm.</p>	
<p>6.2.4 When the long shaft type level sensor is used with the powder having the repose angle shown in the figure, the detection paddle may not be buried in the powder. Thus, it should be installed avoiding such a position.</p>	
<p>6.2.5 The level sensor should be installed avoiding the dead stock (※) inside the tank.</p>	
<p>6.2.6 The level sensor should be installed in view of the bridge phenomenon (※) inside the tank. When the bridge collapses, the level sensor experiences a shock and may be fractured.</p>	

※ : Refer to page 15, 8.Glossary

6.2.7 The level sensor should not be installed directly underneath the inlet from which the powder is charged. If it is not possible, a guard angle should be installed above the level sensor to avoid a powder from fitting directly to the sensor.

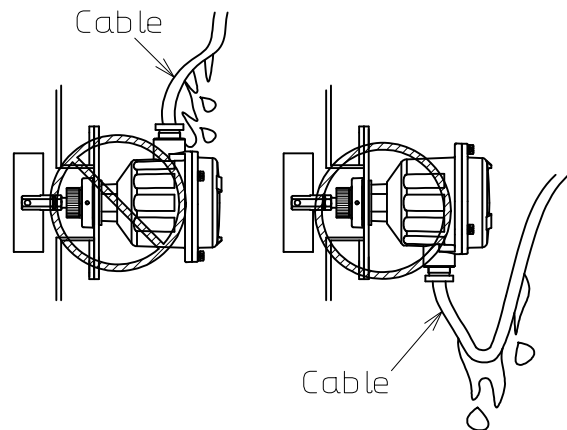


6.2.8 Electric cable inlet:

The electric cable should be fixed with a cable gland or connected with an electrical conduit to the housing.

When the level sensor is installed on the tank side, the cable inlet must be set downward.

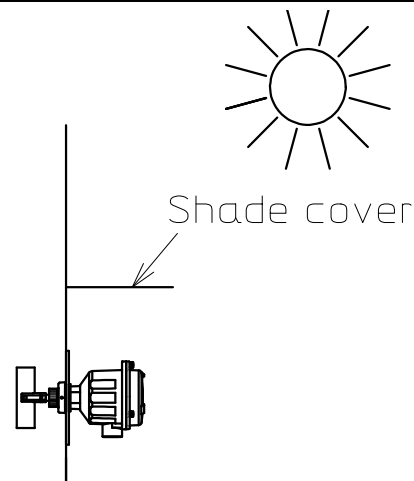
When the level sensor is installed on the tank top, the cable or conduit must sag to stop water coming in.



6.2.9 The level sensor should be installed in an area not exposed to direct sun light.

Otherwise, in the summer, the inside the housing may be heated above the maximum allowable temperature.

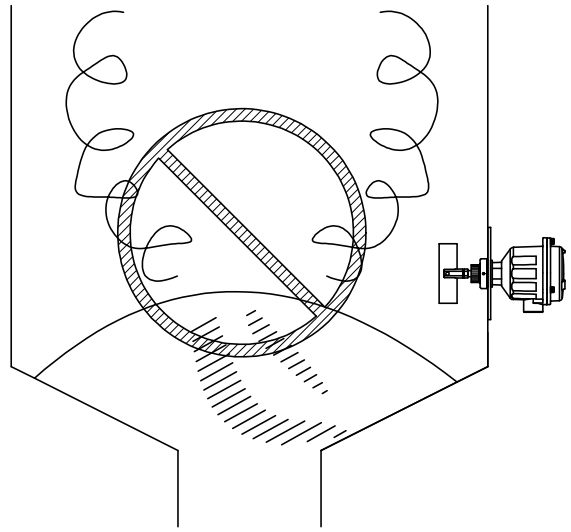
Thus, a shade cover is recommendable, if necessary.



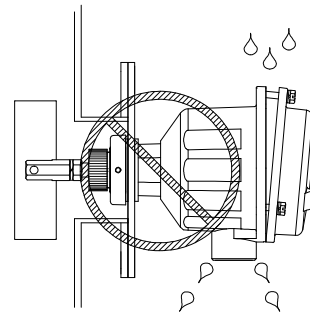
6.2.10 The level sensor should not be installed on the tank whose inside temperature is very high.

The maximum allowable temperature for the detection part (to be inserted into the tank) of the Model RB20/21 is 50°C (but 180°C for Model 21FT, 21FLT and 21FLVT)

The maximum allowable temperature for the housing part is 45°C. Thus, the level sensor should not be installed in the area whose temperature may exceed these temperatures.



6.2.11 The housing cover or cable inlet must be surely handled to avoid water from coming in.



7. Troubleshooting and measures

⚠ WARNING

Every trouble must be dealt with according to the following table but no other measures. Should you have any question, please contact Nohken Inc.

Trouble	Cause	Measure
<ul style="list-style-type: none"> • The level sensor does not provide an output signal when the detection paddle is buried under the powder. 	<ul style="list-style-type: none"> • The detection paddle does not buried under the powder due to the repose angle. 	<ul style="list-style-type: none"> • The mounting location should be changed. (Refer to page 10, 6. Cautions for Installation, 6.2.2).
	<ul style="list-style-type: none"> • The detection paddle does not buried under the powder due to the bridge phenomenon. 	<ul style="list-style-type: none"> • The mounting location should be changed. (Refer to page 11, 6. Cautions for Installation, 6.2.6).
	<ul style="list-style-type: none"> • Bulk density of the powder is too small. 	<ul style="list-style-type: none"> • The torque should be adjusted with changing of the position of the spring. (Refer to page 9, 5. Handling instruction, 5.3 Torque adjustment.)
	<ul style="list-style-type: none"> • The micro-switch is defective. 	<ul style="list-style-type: none"> • The inner mechanism(※) must be replaced with the new one. Please contact Nohken Inc.
<ul style="list-style-type: none"> • The level sensor does not recover nor rotate the detection paddle despite appearance of the detection paddle over the powder level. 	<ul style="list-style-type: none"> • The detection paddle is buried under the dead stock. 	<ul style="list-style-type: none"> • The mounting location should be changed. (Refer to page 11, 6. Cautions for Installation, 6.2.5).
	<ul style="list-style-type: none"> • The micro-switch is defective. 	<ul style="list-style-type: none"> • The inner mechanism(※) must be replaced with the new one. Please contact Nohken Inc.
	<ul style="list-style-type: none"> • The spring is too weak to recover. 	<ul style="list-style-type: none"> • The inner mechanism(※) must be replaced with the new one. Please contact Nohken Inc.

※ : Refer to page 15, 8.Glossary

Trouble	Cause	Measure
<ul style="list-style-type: none"> • The detection paddle has never rotated. 	<ul style="list-style-type: none"> • The wire connection is faulty. 	<ul style="list-style-type: none"> • The wire connection should be corrected. (Refer to page 8, 5. Handling instruction, 5.2.1 Internal circuit, 5.2.2 wiring.)
	<ul style="list-style-type: none"> • The motor is faulty. 	<ul style="list-style-type: none"> • The inner mechanism (※) must be replaced with the new one. Please contact Nohken Inc.
	<ul style="list-style-type: none"> • The micro-switch is faulty. 	<ul style="list-style-type: none"> • The inner mechanism (※) must be replaced with the new one. Please contact Nohken Inc.
	<ul style="list-style-type: none"> • The power supply voltage is wrong. 	<ul style="list-style-type: none"> • The proper power supply voltage should be supplied.

8. Glossary

The following table is a glossary of the main terms described in this instruction manual.

Detection paddle	A part which rotates to detect medium.
Flange	A part which mounts the sensor on the hopper with bolts and nuts.
Repose angle	A base angle of a mountain which a free falling powder builds.
Dead stock	A residual powder in the cone portion of the hopper, whose amount changes depending on the cone angle.
Bridge	A phenomenon which a hopper is blocked with a powder forming a bridge inside the tank.
Inner mechanism	The designation of the internal mechanism consisting of a motor, a micro-switch, etc. in the sensor housing.

--- End ---

INTRODUCTION

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

WARRANTY & DISCLAIMER

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

THE TERMS OF WARRANTY AND DISCLAIMER SHALL IN NO WAY LIMIT YOUR REGAL LIGHT.

NOHKEN INC.

HEAD OFFICE : 15-29, Hiroshiba-cho, Suita-city, Osaka 564-0052, Japan.

TEL:06-6386-8141 FAX:06-6386-8140

TOKYO BRANCH OFFICE : 67, Kandasakumagashi, Chiyoda-ku, Tokyo 101-0026, Japan.

TEL:03-5835-3311 FAX:03-5835-3316

NAGOYA OFFICE : 3-10-17, Uchiyama, Chikusa-ku, Nagoya-city, Aichi 464-0075, Japan.

TEL:052-731-5751 FAX:052-731-5780

KYUSHU OFFICE : 14-1, 2-chome, Asano, Kokurakita-ku, Kitakyushu-city, Fukuoka 802-0001, Japan.

TEL:093-521-9830 FAX:093-521-9834