INSTRUCTION MANUAL

FOR

ROTATING-PADDLE LEVEL SENSOR

MODEL：R7

Revision△2 Sep. 24, 1999
Revision△1 Sep. 23, 1998
Issued Jan. 16, 1998

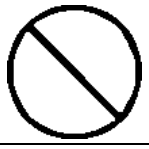
NOHKEN INC.

MUST BE READ BEFORE USING

- This manual is for standard specifications. Read the other manuals for explosion-proof specifications.
- This manual descries the handling, inspection and adjustment of the sensor. Read and understand this manual before installation.
- Any documents and/or directions from Nohken and the agents aside from this manual shall be preceded.
- Save this manual to refer when you need.
- If you have any questions or comments about this manual and/or the sensor, ask Nohken's sales office.

Signal words in this manual means as follows:

⚠ CAUTION	Indicates an potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
⚠ NOTE	Indicates exceptional cases and attention for handling of sensors.

	Indicates prohibition. The explanation with this manual should always be followed.
	Indicates directions. The explanation with this manual should always be followed.

⚠ CAUTIONS

・Since this sensor is not an explosion-proof construction, do not use where flammable gas, explosive gas or the vapor exists. Otherwise, explosion the gases and/or the vapor may cause serious disasters. Use explosion-proof sensors at hazard areas.

・Do not modify or disassemble the sensor. Otherwise, the sensor may be damaged,

・Operating test shall be conducted before practical use. If malfunction occurs and the accident is predicted, the remedy shall be administrated by using another sensor with different operating principle in parallel.

・To prevent from electric shocks such as lightning and the static electricity, provide conductor or the surge absorber. Otherwise, the sensor may cause malfunction, damage, ignition, electric shock and injury.

・When connecting inductive load or the lamp load to the relay output contact.

To prevent overvoltage and overcurrent, provide a protective circuit to the load. Otherwise, the contact may be damaged.

⚠ NOTES

・Do not give strong shocks to the sensor. Dropping, throwing, striking and dragging the sensor, for example, are to cause strong shocks and damage the sensor.

・The specifications such as ambient temperature, maximum voltage and the power rating shall meet the conditions. Otherwise, the sensor may cause malfunction, damage, ignition, electric shock and injury. Read and check the clause of specification in the manual or specification sheets.

・Operating test shall be conducted before practical use. If malfunction occurs and the accident is predicted, the remedy shall be administrated by using another sensor with different operating principle in parallel.

⚠ NOTES

・Check the chemical compatibility with the material you want to use.

・When carrying, installing and removing the sensor, hold the flange or the plug part. Otherwise, the flange or the plug may drop off from the housing and be damaged.

・The sensor which is 50cm or longer
Do not leave the sensor upright, but lay it down on the floor. Otherwise, the sensor and/or the surrounding things may be damaged or get injured if the sensor falls.

・To prevent from electric shocks such as lightning and the static electricity, provide conductor or the surge absorber. Otherwise, the sensor may cause malfunction, damage, ignition, electric shock and injury.

・When connecting inductive load or the lamp load to the output contact.
To prevent overvoltage and overcurrent, provide a protective circuit to the load. Otherwise, the contact may be damaged.

INTRODUCTION

A. This manual specifies standard specifications of this product. Some specifications may be different from your product if you order the custom-made product.

B. A variety of specifications are available to meet your process conditions, such as installation conditions, chemical compatibility, and so on. We are glad to offer suggestions to assist your decision.

C. If you have any questions or comments for the contents of this manual, ask Nohken's sales office written on the front cover.

D. Nohken Inc. pursues a policy of continuing improvement in design and performance of this product. We will supply the alternative parts or complete new products required to repair or replacement.

E. Specifications are subject to change without any obligation on the part of the manufacturer.

WARRANTY & DISCLAIMER

A. Nohken Inc. warrants this product against defects in design, material and workmanship for a period of 1 (one) year from the date of original factory shipment.

B. If defects occurs during the above-mentioned warranty period, Nohken will, at its option, replace or recondition the product without charge. This shall constitute the exclusive remedy for breach of warranty.

C. Nohken Inc. makes no warranty with respect to:

C-a Failure not to comply with instructions of this manual.

C-b Failure or damage due to improper installation, wiring, operation, maintenance, inspection and storing.

C-c Product which has been in any way repaired, altered or tampered with by others.

C-d Product repaired or modified by using undesignated parts, subassemblies and materials.

C-e Direct incidental or consequential damages or losses or expenses resulting from any defective product or the use of any product.

C-f Objective of the sensor is clearly specified in chapter 1, PURPOSE OF USE.

C-g Inevitable accident such as acts of God, force majeure, radioactive contamination and so on.

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

IMPORTANT USER NOTE

It is essential for the user to read this manual carefully before installing the R7 bin level sensor to ensure proper operation.

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1. PURPOSE OF USE

The R7 series bin level sensors are manufactured specifically for solid level detection. They are designed for use in the plastics, chemical, food and other industries. They help prevent hopper overflow, empty holding tanks, plugged chutes and damaged equipment. Special features of the R7 series include its compact size and competitive price.

There are two versions of the R7 bin level sensor. One version, the R7-X series, is for indoor use while the other, the R7-Z series is designed for outdoor use.

2. PRINCIPLE OF OPERATION

A rotating paddle on a spindle is connected to a low-torque, slow-speed synchronous motor. The presence of powders and particles is detected as a result of the rotating paddle stalling. The output is an isolated SPDT (Single Pole, Double Throw) microswitch. A special wear-resistant magnetic slip system avoids damage to the motor, even if a significant accidental force is applied to the paddle.

3. SPECIFICATIONS

3.1 MODEL NAME

Indoor use	Outdoor use	Feature
R7－X	R7－Z	Standard
R7－XL	R7－ZL	Extended Shaft: Max. 1000mm(3.28 feet)
R7－XT		For use in high operating temp: Max.120°C(248°F) {393.15K}

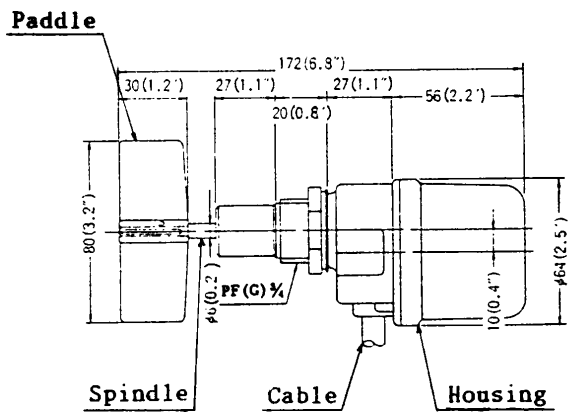
3.2 STANDARD SPECIFICATIONS

Model	R7-X	R7-Z
Power supply	24, 100, 110, 120, 200, 220, 240V AC 50/60Hz	
Power consumption	1.5VA	
Motor rotational frequency	1rpm{0.017s^{-1}}(50Hz) or 1.2rpm{0.020s^{-1}}(60Hz)	
Relay contact	1 SPDT, 250V 3A AC / 30V 4A DC (Resistive load)	
Detection torque:Standard	55mN·m	38mN·m
:Adjustment range	38 to 62mN·m	26 to 50N·m

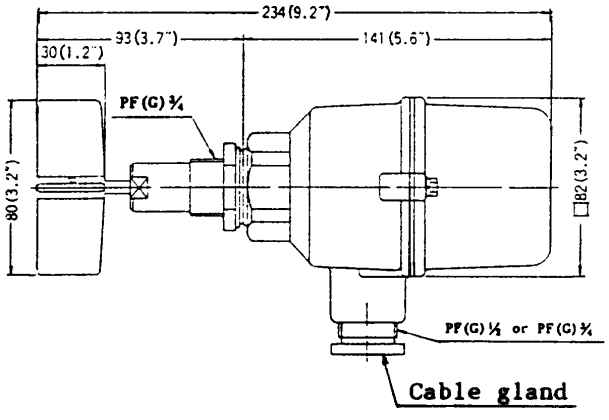
Model	R7-X	R7-Z
Protection	Equivalent IP40	Equivalent IP65
Materials : Housing	ADC12 and polycarbonate	ADC12 and ABS
Mounting section	Brass (galvanized)	
Spindle	304 Stainless steel	
Paddle	Polycarbonate or 304 Stainless steel	
Shaft seal	PTFE washer, NBR oil seal and Molybdenum grease	
Ambient temp.:in container	-10 to +70℃{263.15 to 343.15K} (14 to 142°F)	
Housing	-10 to +45℃{263.15 to 318.15K} (14 to 121°F)	
Humidity	5 to 85% Rh	
Ambient pressure	0 to 30kPa	
Electrical connection	5-core VCTF cable φ10.5×300mm(φ0.41×11.8")	G$\frac{1}{2}$ cable gland
Mounting size	G$\frac{3}{4}$ bulkhead mounting	
Impact resistance	Max. 34m/s^2	
Max. Cable pull load	200N	
Max. Paddle pull load	600N	
Max. load (at paddle tip)	130N	
Housing color	Light blue (Muncell 2.5PB5/6)	

3. 3 COMPONENT NAMES AND DIMENSIONS

Side and Top Mount Models: R7-X and R7-Z unit: mm



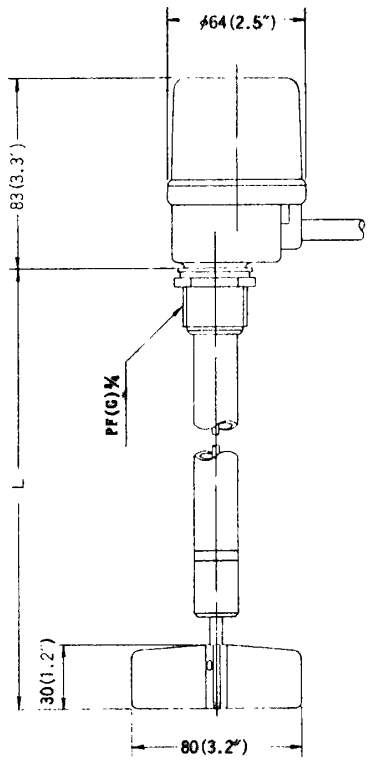
R7-X



R7-Z

For Top mount: R7-L, R7-ZL

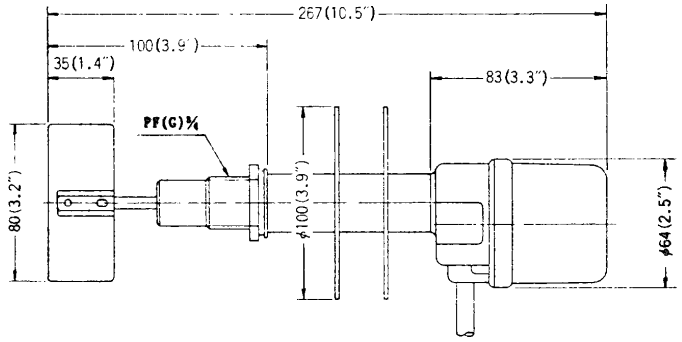
unit: mm(inch)



·Extension length possible (side mounting)
Polycarbonate four vane..250 to 1000mm
(0.82 to 3.28 feet)
304SS two vane ..... 260 to 1000mm
(0.85 to 3.28 feet)
304SS special two vane...300 to 1000mm
(0.98 to 3.28 feet)

NOTE: This drawing shows model R7-L only.

For Side and Top mount unit: mm(inch)



R7-T

·Mass

R7-X		:0.5 kg
R7-Z		:0.7 kg
R7-L		
L-500mm	(1.64 feet)	:1.0 kg
L-1000mm	(3.28 feet)	:1.6 kg
R7-ZL		
L-500mm	(1.64 feet)	:1.2 kg
L-1000mm	(3.28 feet)	:1.8 kg
R7-T		:1.5 kg

NOTE: 1 pounds=2.205 kilograms

3.4 PADDLE TYPES AND DIMENSIONS

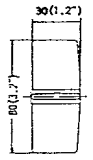
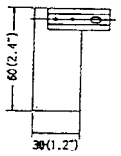
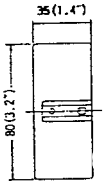
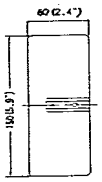
The R7 can be used for solid materials with bulk densities up to 2.0 g/cm³ (124.9Lb./cu.ft.)

The standard polycarbonate four-vane paddle is designed for general use with materials having bulk densities as low as 0.3 g/cm³ (18.7 Lb./cu.ft.). It can be used at high and low levels, for top or side mounting. Stainless steel paddles, 304SS or 316SS, are available in one or two-vane versions.

The one-vane version is designed for general side mounting use. It is suitable for heavy materials with bulk densities as high as 2.0 g/cm³ (124.9Lb./cu.ft.).

The two-vane version is designed for top or side mounting use with heavy materials having bulk densities as low as 0.3 g/cm³ (18.7 Lb./cu.ft.). The model R7-T is especially suitable for use with high operating temperatures.

The special two-vane version is designed for top or side mounting use with very light materials having bulk densities as low as 0.02 g/cm³ (1.25Lb./cu.ft.).

PC four vane	304SS single vane	304SS two vane	Special two vane
			

4. INSTALLATION

4.1 UNPACKING

When unpacking, exercise caution to not subject the unit to mechanical shoc k. After unpacking, visually check the unit's exterior for damage.

4.2 INSTALLATION LOCATION

4.2.1 GENERAL

The R7 should be installed in an area which meets the following conditions:

(1) The ambient temperature range is -10℃ to +45℃{263.15 to 318.15K} (14°F to 121°F).

> NOTE : Install a sun shield over the housing if exposed to direct sunlight. Provide appropriate means to guard against moisture if temperature is low. Otherwise, the unit may be damaged.

(2) There is a Free flow of material both to and away from the paddle and shaft.

CAUTION：Keep the paddle and shaft out of the direct flow. Failure to do this may cause bending of the probe.

(3) Humidity and vibration are low.

(4) Ample space is provided for maintenance/inspection.

4. 2. 2 HIGH LEVEL CONTROL

Top mounting is recommended. The shaft length of model R7-L and R7-ZL are fixed so, prepare a suitable height mount in the field. If you extend a spindle with ϕ6(0.24 inch) pipe, provide a guide tube for support.

NOTE：Determine the maximum angle of repose for the material and locate the R7 low enough to insure complete coverage of the paddle and shaft. See Fig. 1.

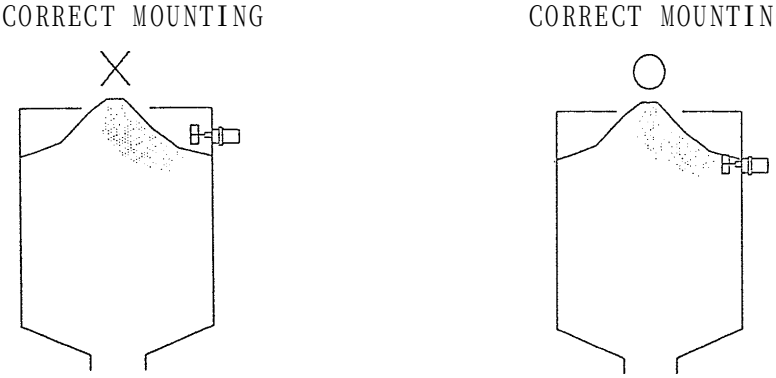


Fig. 1

4. 2. 3 LOW LEVEL CONTROL

Side mounting is customary but top mounting is sometimes easier in small size bins.

NOTE：If heavy material surges or excessive loads are anticipated, install a protective shield above the paddle. Also, mount the unit high enough to prevent it from being surrounded by dead stock. See Fig. 2.

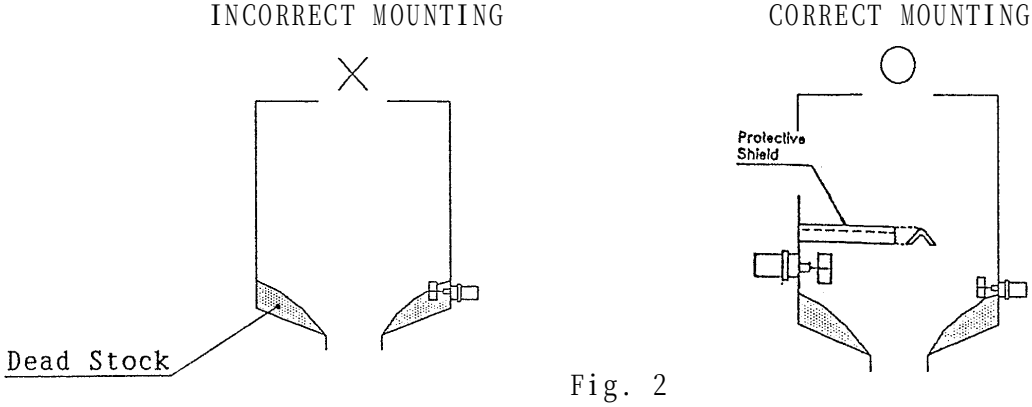


Fig. 2

4. 3 INSTALLATION METHOD

The R7 can be installed by one of the following methods:

- Bulkhead mounting
- Screw-in mounting
- Flange mounting

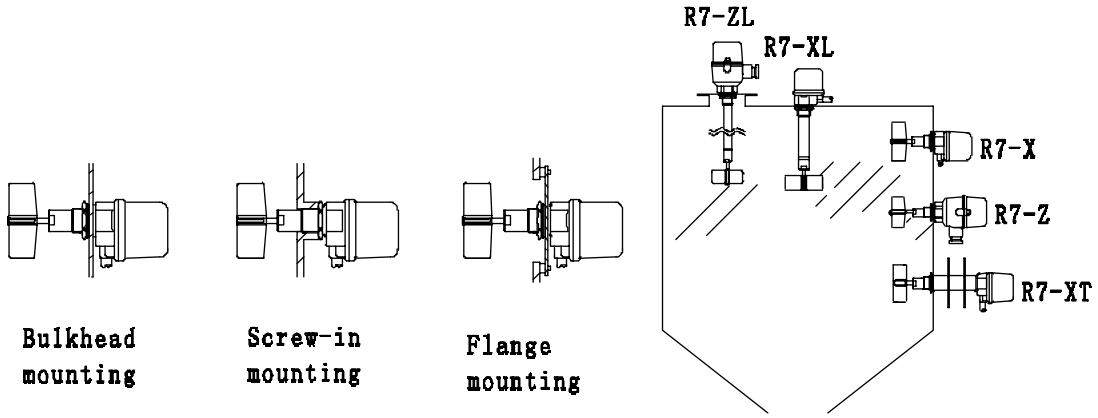


Fig. 3.

For Bulkhead mounting

First, drill a ϕ28(ϕ1.1 inch) hole in the bin wall. Then, insert the shaft and tighten the (1)gasket , (2)washer and (3)nut in these order. After clamping the unit, install the paddle with pin. See Fig.3.

For Screw-in mounting

The R7 is provided with a G$\frac{3}{4}$ threaded mounting. It is screwed laterally into the container wall at the level where you wish to detect material. See Fig. 3.

For Flange mounting

The R7 is provided with a JIS5K65A flange for ϕ80(ϕ3.2 inch) paddle. It is installed on a compatible mating flange on the container wall at the level where you wish to detect material. See Fig. 3.

4. 4 MOUNTING ATTITUDE

This unit may be mounted in any position or orientation. However we reccomend that the cable and cable are point down in order to protect the unit from rain, splashing water, etc.

5. WIRING

5．1 R7－X SERIES

Proceed as follows:

(1) Check the wiring color.

Electrical circuit	Power supply		Normally open	Normally closed	Common
Conductor sheath color	Black	White	Red	Blue	Yellow

NOTE：Normally open switch is open when the material is absent and closes as the material is present. Normally closed switch operates with the opposite action.

(2) This unit provids a 5-conductor vinyl-insulated flexible cord (VCTF) with a finished outside diameter of ϕ10.5(0.41 inch), conductors are 0.5mm² (equivalent 20AWG). Install solderless terminals or sleeves to the end of conductors.

5．2 R7－Z SERIES

Proceed as follows:

(1) Prepare a 4- or 5-conductor vinyl-insulated vinyl-sheathed cable. The cable finished outside diameter should be between 8 to 11mm(0.31 to 0.43 inch) and conductors should be between 0.5 to 3.5mm² (equivalent 20 to 12AWG).

(2) Remove approximately 100mm(3.94 inch)of cable sheath from the end of the cable and approximately 10mm(0.39 inch)of conductor sheath.

(3) Check that the cable gland is pointing down.

(4) Remove the housing cover (loosen the 2 screws).

(5) Bring the cable into housing.

(6) Connect cables to the terminals. See Fig. 4.

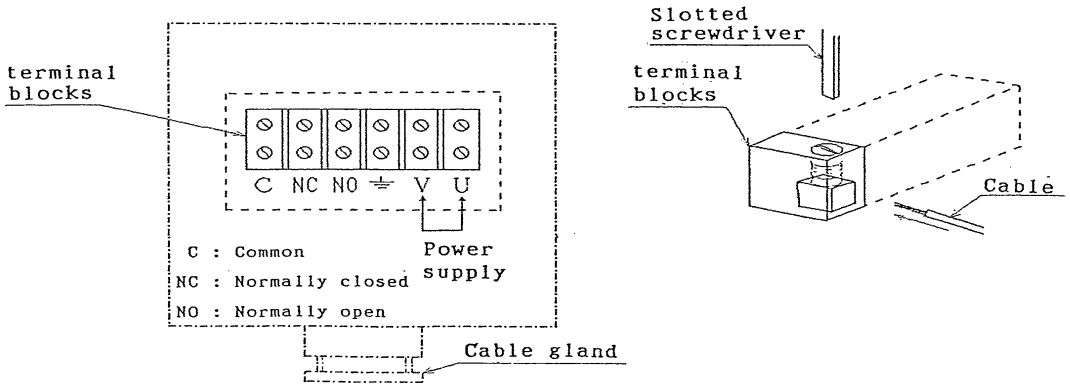


Fig. 4

NOTE：The cable gland must be properly fitted to preserve the protection category IP65, and to protect the unit from rain, splashing water, and so on.

(7) Double-check wiring connections.

(8) Replace and tighten the housing cover.

6. DETECTION TORQUE ADJUSTMENT

This sensitivity can be adjusted to suit diverse level control installations and variations in material characteristics. By changing the spring position on the set plate, the amount of torque required to signal an output can be altered. The positions may be changed by means of pliers or by hand. See below table and Fig. 5 and 6.

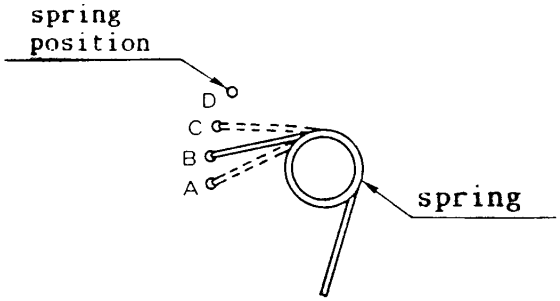


Fig. 5

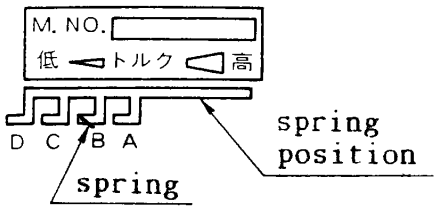


Fig. 6

	R7-X series	R7-Z series	Features
A	62N·m	50N·m	For light or fine materials
B	55N·m	38N·m	Standard(preadjusted)
C	46N·m	30.9N·m	For heavy and sticky materials or high vibrated location
D	38N·m	26N·m	

7. MAINTENANCE

When cleaning and checking the container, free the paddle and shaft from material deposits. A unit which detects the level of sticky materials or is installed in a humid location must be cleaned at periodic intervals.

Check that the housing cover and cable entry is tightened to protect the unit from rain, splashing water, and so on.

To replace the micro switch of R7-X series, use the following procedure:

(1) Make sure that the power supply is turned off.

(2) Remove the housing cover (by turning it counterclockwise).

(3) Remove lead wires by melting the soldered area with a soldering iron.

(4) Remove the microswitch (loosen one screw).

(5) Install the replacement switch and tighten the screw.
(6) Re-solder lead wires. Refer to Fig. 7.
(7) Check wiring and operation.
(8) Replace and tighten the housing cover.

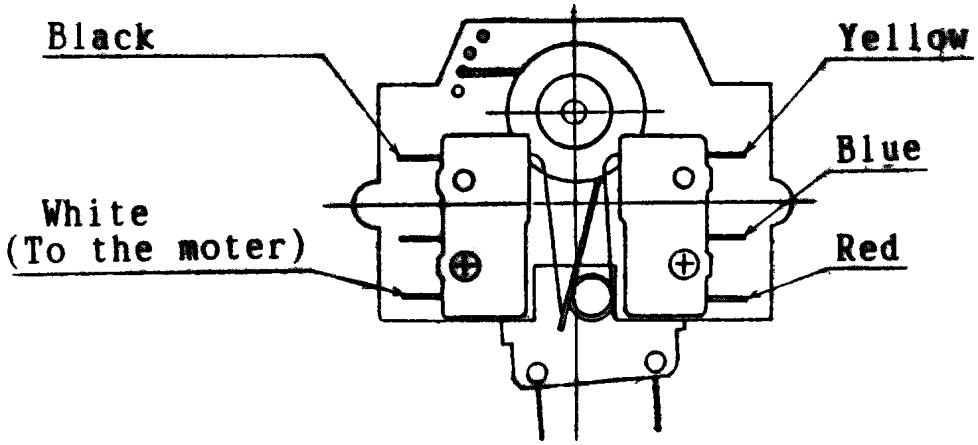


Fig. 7

8. TROUBLESHOOTING

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

Problems	Possible causes	Remedies
Paddle is covered by materials Relay de-energized	Power supply not connected.	Connect the power
	Insufficient power supplied	Repair power supply
	Miswiring	Wire correctly
	Wiring leading to control may be defective	Replace cable and wire correctly
	Material too light. (less than 0.2 g/cm^3)	Calibrate sensitivity or replace paddle
	Material has bridge or angle of repose	Install sensor in better location
	Shaft and spindle are damaged	Replace unit
Paddle is not covered by materials Relay energized	Insufficient power supplied	Repair power supply
	Miswiring	Wire correctly
	Heavy deposit on shaft	Clean shaft
	Material has dead stock	Install sensor in better location or isolate dead stock
	Temperature too high	Replace unit or change the proper sensor
	Shaft is bent or damaged	Replace unit

Problems	Possible causes	Remedies
Relay chatters	Insufficient power supplied	Repair power supply
	Loose cables	Tighten connections
	Material too fluid	Use a time-delay relay

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