

I N S T R U C T I O N M A N U A L
F O R
O P T I C A L I N T E R F A C E S E N S O R
M O D E L : O X 4 0 H



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NOHKEN INC.

MUST BE READ BEFORE USING

- This manual is for standard specifications. Read the other manuals for explosion-proof specifications.
- This manual describes 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.



▲ 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

<ul style="list-style-type: none">• Check the chemical compatibility with the material you want to use.	
<ul style="list-style-type: none">• 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.	
<ul style="list-style-type: none">• <u>The sensor which is 50cm or longer</u> 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.	
<ul style="list-style-type: none">• Earth terminal shall be grounded JIS Class D ground (earth resistance maximum 100 Ω). Otherwise, the electric shock may occur.	
<ul style="list-style-type: none">• 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.	
<ul style="list-style-type: none">• <u>When connecting inductive load or the lamp load to the relay output contact.</u> 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 and using the model OX optical type interface sensor.

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1. PURPOSE OF USE

The OX series optical interface sensor consists of a sensor to detect a measuring material and a converter to convert a detection signal to a relay output signal. It is developed to detect the material deposited mainly in liquid. It employs the transmission system when the deposition passes between the detectors (infrared emitting diode and photodetector) at the ends of the two FEP tubes inserted into liquid, existence of the deposition is detected. This enables also detection of the interface between two liquid with different transparency.

A pulse modulated infrared ray is used as a light source, and it is not almost effected by the smudge on the tube surface, less transparent liquid or noise caused by an external disturbing light.

2. PRINCIPLE OF OPERATION

The operation principle block diagram is shown in Fig. 1.

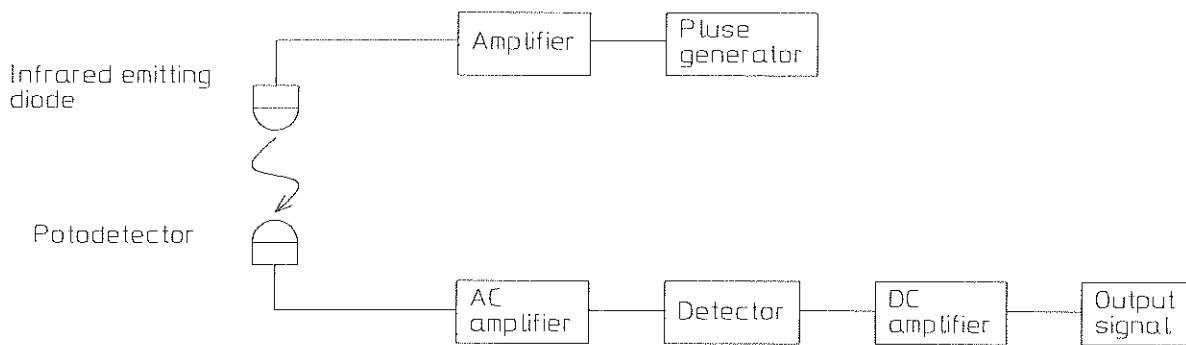


Fig. 1

The infrared emitting diode and photodetector are located opposing each other. The emitted light is interrupted or attenuated by the material passing between these two elements. In other words, when the detectors are set in liquid, the light is interrupted or largely attenuated when the detectors are buried in the deposition though the light passing between and the infrared emitting diode and the photodetector element is little attenuated. This change is detected and converted to an output signal.

3. SPECIFICATIONS

3.1 Standard specifications of sensor

Model	OX40H
Power supply	100/200 V AC 50/60 Hz
Power consumption	Approx. 2.5 VA
Measuring object	Deposition, Interface
Allowable pressure	500 kPa
Temperature of:	
In container	-10 to +70 °C
Housing	-10 to +55 °C
Construction	IP 65
Material of:	
Housing	Aluminum die casting (ADC) (Acrylic coating)
In container	304 Stainless steel (SUS 304) and FEP
Mass	Approx. 4 kg
Flange size	JIS 5 K 65 A
Cable inlet	G 3/4
Indication of operating	By Red LED
Delay time	Adjustable approx. 0.5 to 10 seconds.
Change-over switch	H. ON: When the object is detected, the relay is energized. L. ON: When the object is not detected, the relay is energized.
Contact rating	
Max. contact capacity	250 V 3 A AC (Resistive load) 30 V 3 A DC (Resistive load)
Withstand voltage	1500 V AC 1 min. (Between power supply, output terminal and housing.)
Insulation resistance	500 V DC more than 100 MΩ (Between power supply, output terminal and housing.)

3. 2 Component names and dimensions of sensor
The sensor component names and dimensions are shown in Fig. 2.

unit: mm

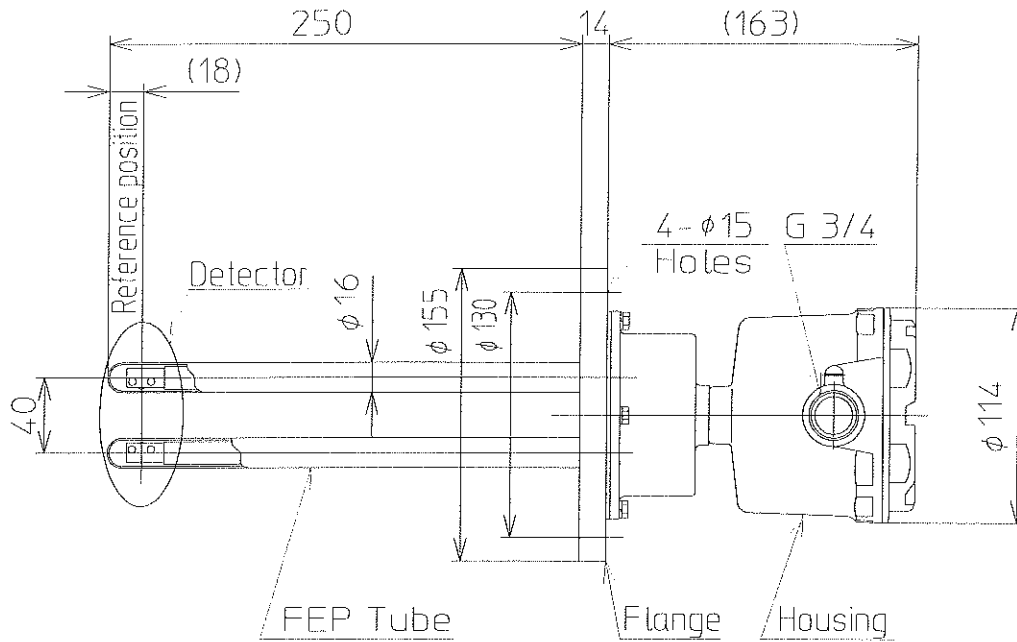


Fig. 2

4. INSTALLATION

4. 1 Unpacking

When unpacking, exercise caution and do not subject the sensor to mechanical shock by dropping it on hard surface. After unpacking, visually check the sensor exterior for damage.

4. 2 Installation location

This unit should be installed in an area which meets the following conditions:

- (1) The temperature range in container is -10°C to 70°C .
- (2) The ambient temperature range of housing is -10°C to 55°C .
- (3) Humidity and vibration are low.
- (4) Ample space is provided for maintenance and inspection.

4. 3 Installation of sensor

A typical installation example is shown in Fig. 3.

The OX 40 is provided with a JIS 5K 65A flange. It is installed on a compatible mating flange on the container wall at the interface where you wish to detect material.

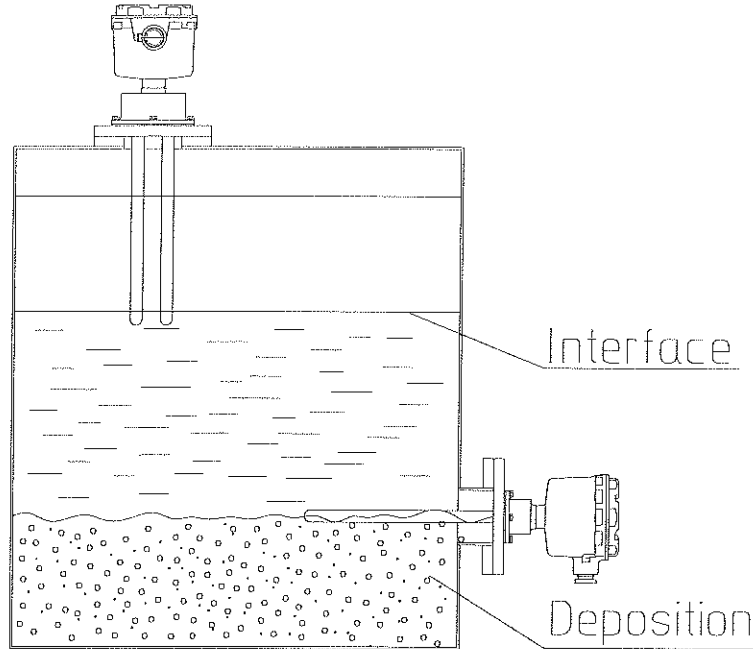


Fig. 3

CAUTION : When using the unit outdoor, install it in a place so that the detector is not exposed to direct sunlight. Otherwise, cover the detector with a shielding plate to block the sunlight.

5. WIRING

Connect the wires according to Fig. 4.

The terminal screw is M3.

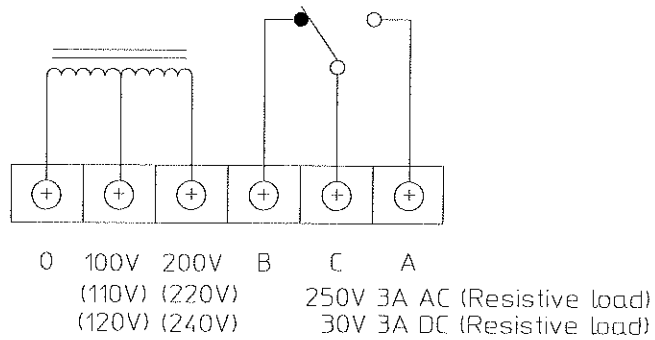


Fig. 4

6. ADJUSTMENT

6.1 Names and functions of adjustment

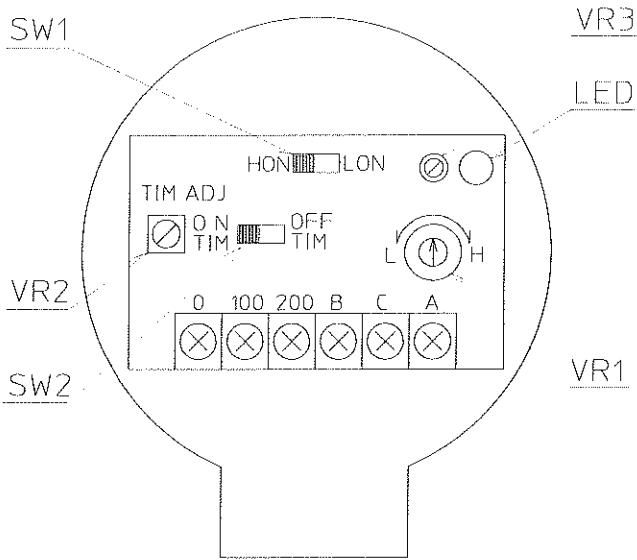


Fig. 9

VR 1: Sensitivity adjustment trimmer
Adjusts the amplifier gain in the converter

VR 2: Time trimmer
Adjusts the delay time from the relay operation.

VR 3: Optical current adjustment trimmer
Adjusts the current supplied to the infrared emitting diode of the sensor.

SW 1: Operation change-over switch
H. ON: When the object is detected, the relay is energized.
L. ON: When the object not is detected, the relay is energized.

SW 2: ONTIM, OFFTIM change-over switch
Adjusts the delay time from detection of measuring material to relay operation or non-detection of measuring material

LED : Operation indicator
Lights up when the relay is energized.

6.2 Adjustment

(1) Initial setting

Set each adjustment as follow before adjustment.

VR 1: Middle (12 O'clock position)

VR 2: Min. (counterclockwise)

VR 3: Min. (counterclockwise)

SW 1: H. ON (left side)

SW 2: ONTIM (left side)

(2) Sensitivity adjustment

The sensitivity of this unit is determined by the current supplied to the infrared emitting diode and the amplifier gain.

First, make rough adjustment with the optical current adjustment trimmer (VR 3), then make fine adjustment with the sensitivity adjustment trimmer (VR 1).

Make adjustment in the following procedural from the initial setting.

CAUTION: In the case of detection of the interface between two liquid, the detection is impossible when there is no difference in color or transparency between the two liquid.

- a. Separate the detector at the sensor end from the measuring material (set in the liquid of higher transparency in the case of detection of the interface between two liquid), and confirm that the LED out.
- b. Bury the detector in the measuring material (set in the liquid of lower transparency in the case of detection of the interface between two liquid), and turn VR 3 gradually clockwise (↻) and stop when the the LED on.

Rotating direction	Optical current
Clockwise (↻)	Weak (high sensitivity)
Counterclockwise (↺)	Strong (low sensitivity)

When the LED on without turning VR 3 (fully counterclockwise position↺), adjustment is unnecessary.

Usually, the unit is operable in this state, but when the sensitivity needs to adjust slightly with the liquid is turbid or the measuring material stuck to the sensor, use VR 1.

Rotating direction	Sensitivity
Clockwise (↻)	high
Counterclockwise (↺)	low

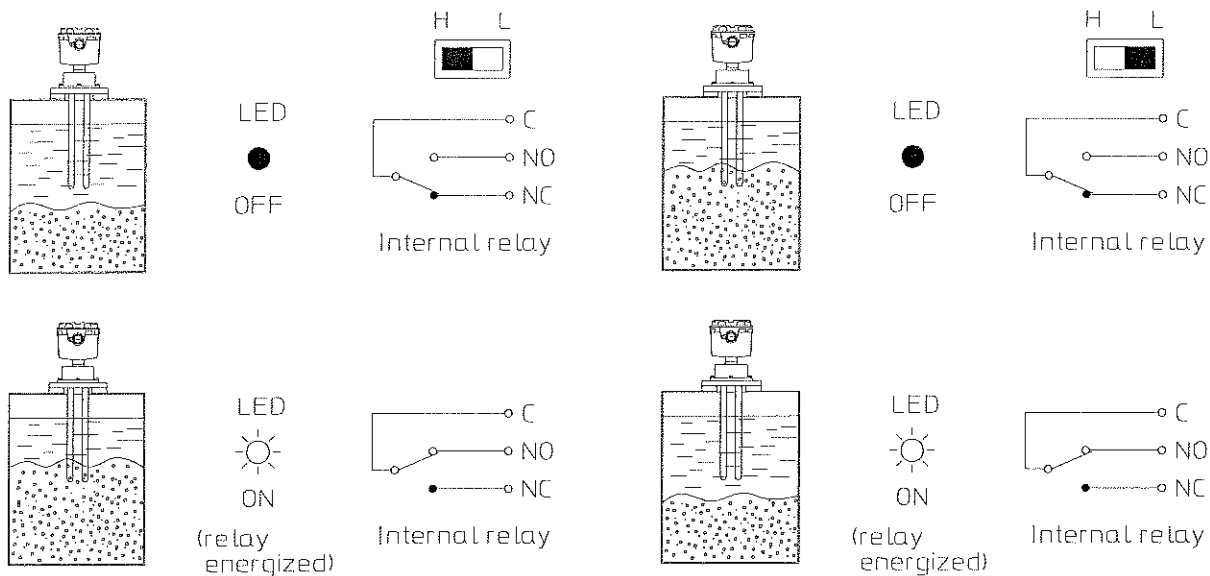
(3) Setting of the operation change-over switch

The relay operation state can be changed with this switch.

- H.ON: The relay is energized when the measuring material is detected.
- L.ON: The relay is energized when the measuring material is not detected.

Operation change-over switch : H.ON

Operation change-over switch : L.ON



(4) Setting of delay time

Delay time from detection of measuring material to the relay operation can be set with Time trimmer (VR 2).

- ONTIM (SW2, left side) : Sets a delay time from detection of measuring material to the relay operation.
- OFFTIM (SW2, right side) : Sets a delay time from non-detection of measuring material to the relay operation.

The setting range is about 0.5 to 10 seconds for both trimmer.

(Rotating direction: Clockwise (↻) makes a delay time longer.)

NOTE: With ONTIM and OFFTIM trimmer, the roles of ON and OFF delay for the relay are switched as follows according to the setting of the operation change-over switch.

	H. ON	L. ON
ONTIM	ON delay	OFF delay
OFFTIM	OFF delay	ON delay

7. MAINTENANCE

A unit used in sticky materials must be cleaned the detector at periodic intervals. Tighten the housing cover and cable gland to protect the sensor from rain, splashing water, and so on.

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
Detector is covered by materials. Relay de-energized. LED out.	Power supply not connected.	Connect the power.
	Insufficient power supplied.	Repair or replace supply.
	Miswiring.	Wire correctly.
	Wiring leading to control may be defective.	Replace cable and wire correctly.
	Set for improper the change-over switch.	Change the change-over switch.
	Material too transparent.	Change the proper sensor.
	Detector is damaged.	Replace sensor.
Detector is not covered by materials. Relay energized. LED on.	Insufficient power supplied.	Repair or replace power supply.
	Miswiring.	Wire correctly.
	Set for improper the change-over switch.	Change the change-over switch.
	Heavy stuck to the detector.	Clean detection parts.
	Temperature of in container (exceed 70 °C).	Replace sensor or change the proper sensor.
	Detector is bent or damaged.	Replace sensor.
Relay chattered.	Insufficient power supplied.	Repair or replace power supply.
	Loose cable.	Tighten connection.
	Material too fluctuant.	Use a time-delay relay.

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