

I N S T R U C T I O N M A N U A L
F O R
A I R B U B B L E R S Y S T E M L E V E L M E A S U R E M E N T

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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 written on the front cover.

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

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



• When carrying, installing and removing the liquid level switch, 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.



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.

NOTE TO USERS

First of all, it is essential that this manual should be read and understood before installation and start-up of the Air Bubbler System Level Measurement. This manual covers instructions for the installation, wiring, maintenance, and troubleshooting.

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1. PURPOSE OF USE

The Air Bubbler System Level Measurement is designed to measure for corrosive liquid or high viscosity liquid such as waste water.

This unit receives back pressure of liquid from the sensor, converts it into an electrical signal and outputs 4 to 20 mA DC.

Also this unit visually indicates liquid level due to having a indicator.

2. SPECIFICATIONS

2. 1 Standard Specification

(1) Sensor

Table 1

Model		LA100 (Flexible type)	LA110 (Pipe type)
Measuring object		Liquid	
Process connection		Flange mounting	Flange mounting
※ ¹		Equivalent JIS 10K 100A (Proviso 4 holes)	JIS 5K 25A
Piping		Hose nipple for $\phi 8$	Ring joint for $\phi 6$
Dimension		See Fig. 1	See Fig. 2
Material	Flange	PVC	304SS
	Detector	PVC tube	304SS pipe
	Anchor weight	304SS	—

※¹ Other materials or other process connection available.

(2) Converter

Model	: LA1000
Measuring range	: 0 to 10 m
Accuracy	: ± 0.5 % of span
Temp. characteristics	: ± 0.05 % of span
Power supply	: 24 V ± 2 V DC
Power consumption	: Approx. 1 W
Output signal	: 4 to 20 mA DC
Load resistance	: 800 Ω Max.
Amplification	: 1 to 5 times
Working temperature	: 0 to 50 $^{\circ}\text{C}$
Power pressure supply	: 200 to 300 kPa
Air source to sensor	: 0.3 to 1 l/minute variable

Overpressure of sensing element : 300 kPa Max.
 Material of casing : CS plate
 hose nipple : Brass
 Mounting : Wall mounting
 (Pitch W155xH190 4-φ6.5 holes)
 Construction : IP23(Rain proof)
 Mass : Approx. 5.5 kg

2. 2 Dimensions

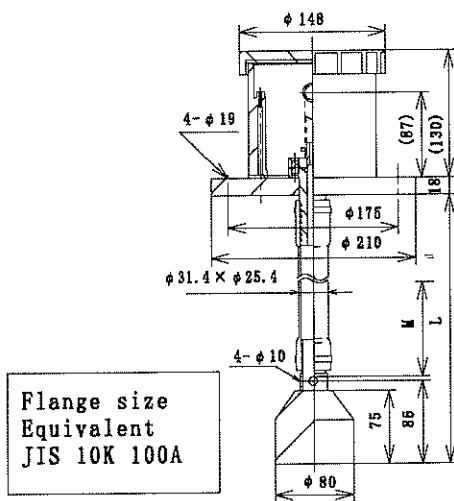


Fig. 1 LA100 Sensor

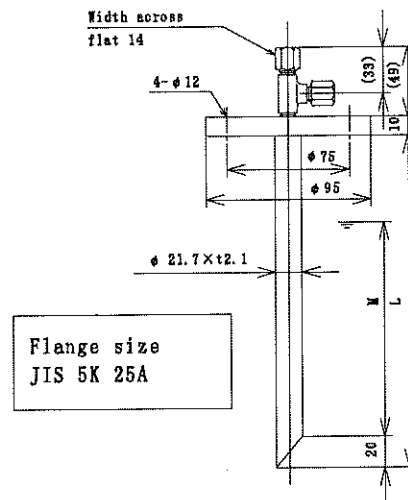


Fig. 2 LA110 Sensor

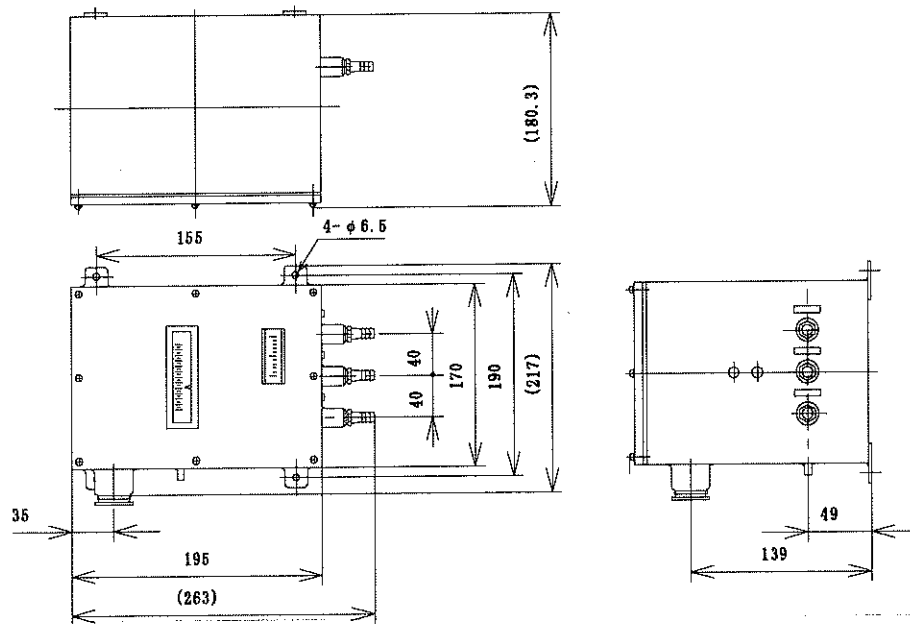


Fig. 3 LA1000 Converter

3. PRINCIPLE OF OPERATION

The Level Measurement contains the pressure element. The pressure element measures the differential pressure between the back pressure equivalent the depth of water and atmospheric pressure.

Built-in purge set consists of needle valve and constant differential valve, supplies constant air to sensor. The converter measures back pressure from sensor with pressure element due to spouting this air source through the sensor into liquid, converts it into an electrical signal (4 to 20 mA DC).

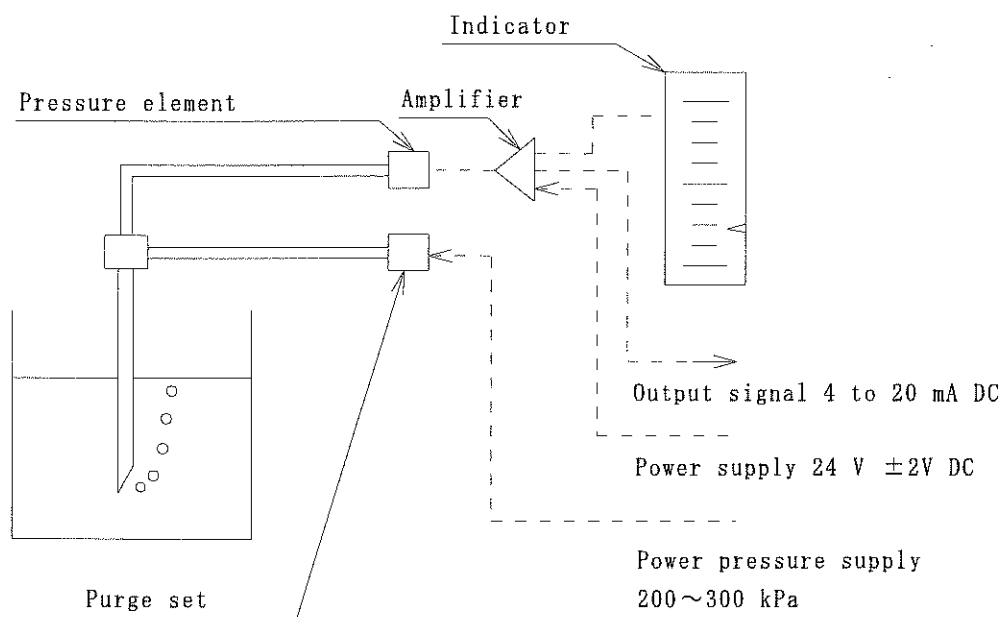


Fig. 4 Principle of operation

4. INSTALLATION

4.1 Unpacking

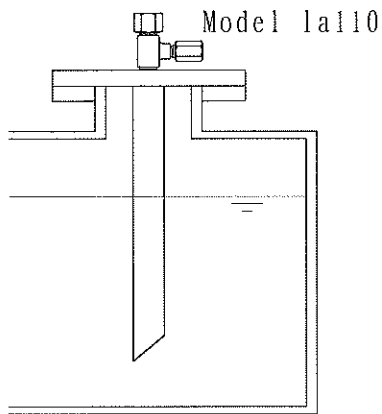
This Level Measurement have been thoroughly inspected and carefully packed at the factory to prevent from damage during shipment. When unpacking, exercise due care not to subject the instrument to mechanical shock. After unpacking, visually check the instrument exterior for damage.

4.2 Installation Location

This Level Measurement should be installed in an area where the following condition.

- (1) Provide ample space for maintenance / inspection.
- (2) Low relative humidity and no exposure to moisture.
- (3) No corrosive gases. (Such as NH_3 , SO_2 , Cl_2 etc)
- (4) No excessive vibration.

4.3 Installation of Sensor



NOTE ; When the liquid level falls below bubble outlet the sensor, the output current will remain at 4 mA DC nominal.

Fig. 5 Example of sensor installation



CAUTION

Do not bend or clog the sensor. Otherwise sensor operation may be incorrect or damaged.

4.4 Installation of Converter

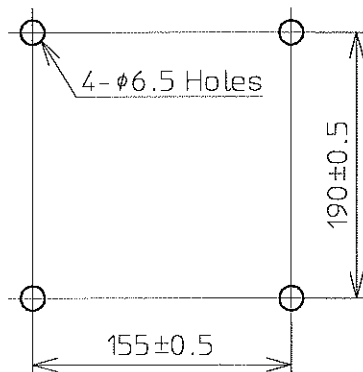


Fig. 6 Mounting pitch

Install the converter on a wall.

Fig. 6 shows mounting pitch of the converter.

NOTE ; Install the converter as cable inlet position is toward ground to protect from rain or splashing water.

5. PIPING AND WIRING

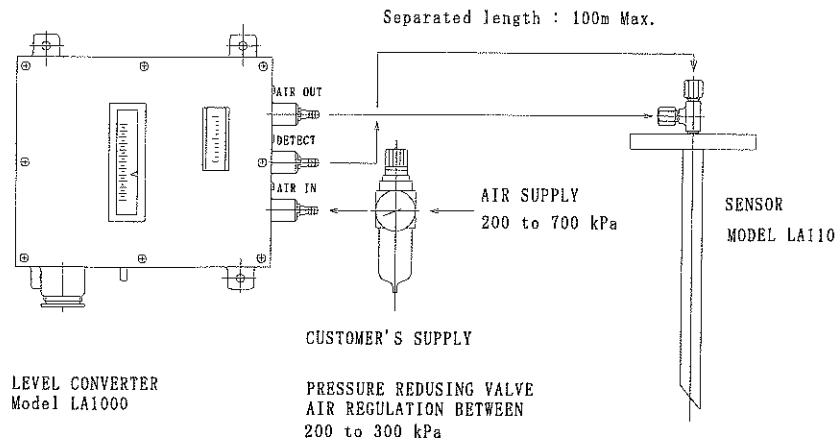


Fig. 7 Piping

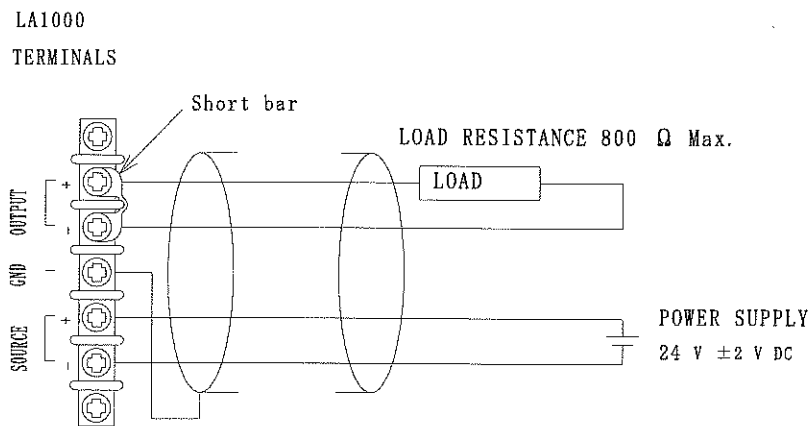


Fig. 8 Wiring



CAUTION

Short bar is installed on output terminals because of connected with indicator and output terminals in series. The load should be connected with converter after removed the short bar.

NOTE the following points:

- (1) This converter unit is designed to operate with load resistance 800 Ω Max.
- (2) Cable inlet are made JIS F 20a (G3/4). The cable finished outside diameter should be used between 11 to 12 mm.
- (3) Install solderless lugs fitted to M3 screw to the end of lead wires.
Recommended lugs R1.25-3 or R1.25-3.5 (JIS C 2805-1986).

6. ADJUSTMENT

6. 1 Start-up

Proceed as follows:

- (1) Make sure that there are no miswiring.

⚠ CAUTION

Supply voltage must match the terminals indicated on the terminal block. Incorrect voltage miswiring will damage the converter.

- (2) The sensor and the converter have been adjusted before shipment. If it need fine adjustment or if specification is changed, adjust output signal in accordance with adjustment procedure described blow.

NOTE ; When adjustment, the sensor should be connected to power supply and allowed to stabilize for one hour in air.

6. 2 Component Names

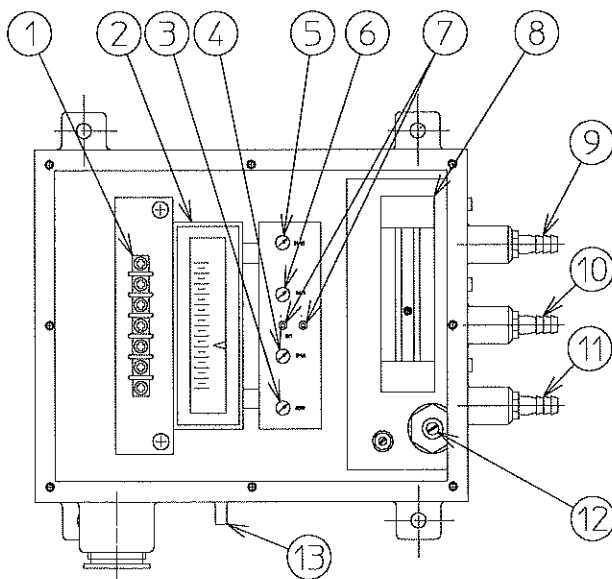


Fig. 9 Operational panel

- ① Terminals
- ② Indicator
- ③ ZERO adjusting trimmer
For output current (4 to 20 mA DC) of zero position.
- ④ SPAN adjusting trimmer
For output current (4 to 20 mA DC) of span position.
- ⑤ GAIN adjusting trimmer
Correcting for input signal of span position. (0 to 2 V DC)
- ⑥ OFFSET adjusting trimmer
Correcting for input signal of zero position. (0 to 2 V DC)
- ⑦ CHECK point
Using at adjustment for OFFSET and GAIN.
- ⑧ Flow gauge
- ⑨ Pipe fitting for "AIR OUT"
- ⑩ Pipe fitting for "DETECT"
- ⑪ Pipe fitting for "AIR IN"
- ⑫ Needle valve
- ⑬ Vent pipe

6. 3 Air Source Adjustment

Set 0.5 l/minute the air source with needle valve looking for flow gage.

NOTE ; When measuring liquid is high viscosity, set 0.8 l/minute the air source with needle valve.

6. 4 Offset and Gain Adjustment

(1) Connect digital voltmeter (measuring range ; 0 to 2 V DC) to the check point terminals on operational panel.

NOTE ; The red colored terminal is positive, the black colored terminal is negative.

(2) When the liquid level is zero, adjust 0 V DC between the check point terminals with OFFSET trimmer . (When turning a trimmer to the right, the voltage rises.)

NOTE ; If the tank is already filled with liquid, lift up the sensor and adjust that above.

(4) When the liquid level is span, adjust 2 V DC between the check point terminals with GAIN trimmer. (When turning a trimmer to the left, the voltage rises.)

NOTE ; If the tank is not filled up with liquid, measure the liquid level and adjust calculated value according to expression of ①.

6. 5 Output Signal Adjustment

(1) Connect digital ammeter (measuring range ; 4 to 20 mA DC) to output terminals reference with Fig. 8.

(2) When the liquid level is zero, adjust 4 mA DC with ZERO trimmer. (When turning a trimmer to the right, the indication and the output rises.)

NOTE ; If the tank is already filled with liquid, lift up the sensor and adjust that above.

(3) When the liquid level is span, adjust 20 mA DC with SPAN trimmer. (When turning a trimmer to the right, the indication and the output rises.)

NOTE ; If the tank is not filled up with liquid, measure the liquid level and adjust calculated value according to expression of ②.

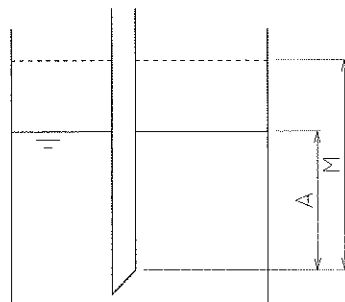


Fig. 10

For example

$M=8m$ [Measuring range]

$A=6m$ [Measured length]

$A/M \times 2 = 6/8 \times 2 = 1.5$ (V) [GAIN] . . . ①

$A/M \times 16 + 4 = 6/8 \times 16 + 4 = 16$ (mA) [SPAN]

. . . ②

7. TECHNICAL NOTES

- (1) Do not install the sensor near inlet or outlet of liquid.
- (2) Keep the sensor to protect away from mechanical shocks during carrying or installation.
- (3) When the liquid level falls below bubble outlet of the sensor, the output current will remain at 4 mA DC nominal.
- (4) After installation, provide the products to protect from rain or splashing water until completion the wiring and piping.

8. INSPECTION/MAINTENANCE

The following annual servicing tasks should be carried out on the sensor and control unit.

8.1 Sensor

- a. Visually check the sensor exterior for damage.
- b. Make sure that there are no leak from piping connection with as soapy water.

8.2 Converter

- a. Make sure that output current is 4 mA DC, when sensor is lifted up.
- b. Make sure that output current is correct equivalent to calculated value with expression of ②, when the sensor is installed.

NOTE ; If out put signal is incorrect, re-adjust the control unit in accordance with " 6. ADJUSTMENT ".

9. TROUBLESHOOTING

▲ CAUTION

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

Table 2

Problems	Causes	Remedies
No output current.	There are broken of wire.	Replace the wire.
	Loosening terminals	Tighten terminals.
Indication(graduator) is correct, but no output.	Short bar is installed.	Remove the short bar on output terminals reference with " 5 WIRING ".
Output current does not follow with level falling or rising.	Installation on improper level.	Re-install in proper level.
	Supplied air is little.	Re-set air source according to " 6.3 Air source Adjustment.
	Air leakage.	Check air leak on part of piping connection.
	Improper adjustment.	Adjust correctly according to " 6 ADJUSTMENT ".
	Change of liquid S.G.	Re-adjust according to " 6 ADJUSTMENT ".
	Sensor (detection pipe) is stopped up.	Clean the sensor.
Output current is instability.	Loosening terminals.	Tighten terminals.
	Affection wave motion of liquid.	Install stilling tube.
Excess current.	Short circuit.	Make sure that there are no miswiring.

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