

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

M O D E L : C L - D

M O D E L : C L - G - □



M O D E L : C L - A

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N O H K E N I N C.

IMPORTANT INFORMATION

- A. This manual describes the installation, operation, adjustment and maintenance of model CL-D sensor and CL-G-□ guidepipe and CL-A converter. Read and understand this manual before installation. After reading, save to refer when you need.
- B. Specifications are subject to change without any obligation on the part of the manufacturer.
- C. This manual specifies standard specifications of this product. Some specifications may be different from your product if you order the custom-made product.
- D. 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.
- E. If you have any questions or comments for the contents of this manual, ask Nohken's sales office.
- F. 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.
- G. Signal words in this manual means as follows:
 - G-a  W A R N I N G
indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
 - G-b  C A U T I O N
indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
 - G-c N O T E
indicates exceptional cases and attention for handling of products.
 - G-d R E F E R E N C E
indicates technical valuable suggestions which is unrelated to the hazard.


- G-e  indicates prohibition.

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1. WARRANTY & DISCLAIMER

- A. Nohken Inc. warrants this product against defects in design, material and workmanship for a period of one (1) 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 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 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.

2. PURPOSE OF USE

The CL capacitive level measurement is used for continuous level measurement of liquids, solids and interface. DO NOT use in any other applications.

3. DESCRIPTIONS

3. 1 DESCRIPTION

It consists of guidepipe which is installed to the container, sensor which follows the actual level and an converter which controls and outputs the sensor's current signals.

The CL measures the variation of the capacitance (*) of measuring material. Since the sensor electrode is sealed in the guidepipe, the CL immunes build-up and ensures high accuracy.

* See section 13 for the word explanation.

3. 2 PRINCIPLE OF OPERATION

Fig.3 shows the block diagram of the principle of operation.

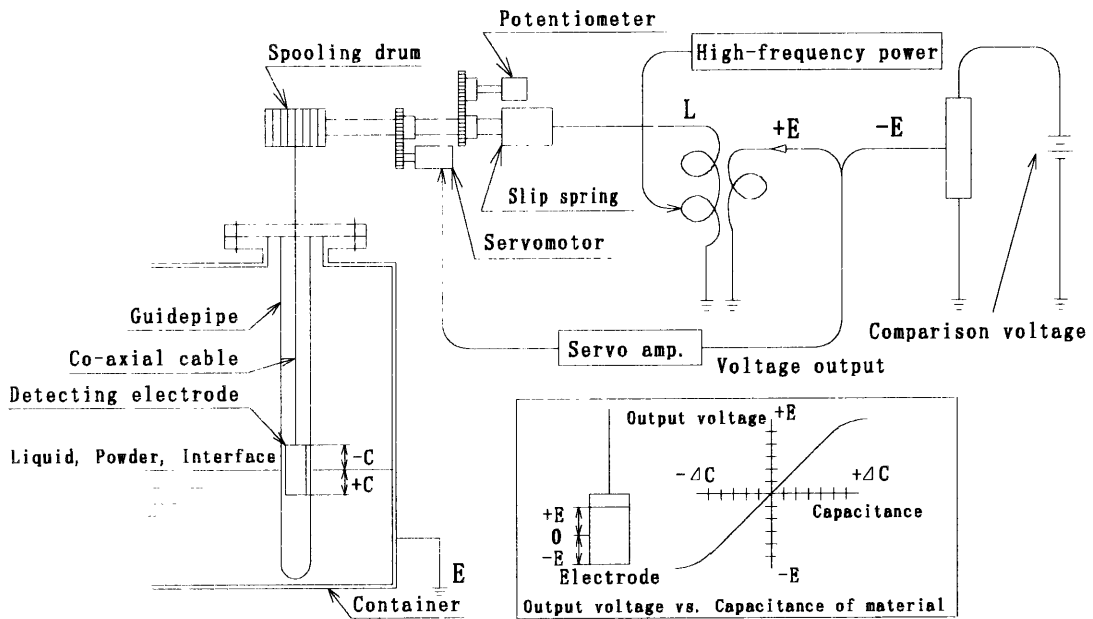


Fig.3

The sensor electrode suspended by the co-axial cable is installed inside the guidepipe. Run the other end of the cable through the spring after winding it to the spooling drum. First, the inductance (L) and the capacitance (C) measured by an electrode tunes with the frequency (f) of the high-frequency voltage sent from the converter. Then parallel resonance circuit synchronizes and Max. high-frequency voltage generates on an electrode. Since there is a capacitance change in measuring material, the high-frequency voltage changes like Fig.3.

The bridge circuit is constructed the voltage output to be 0 when the comparison voltage is adjusted the electrode's center to be 0. When measuring level travels up and down, the sensor electrode generates $+E$ or $-E$ voltage. Due to the servo-balancing operation, the electrode is spooled by the servomotor to follow the measuring level to keep the balance 0.

4. SPECIFICATIONS

4.1 MODEL NUMBERING

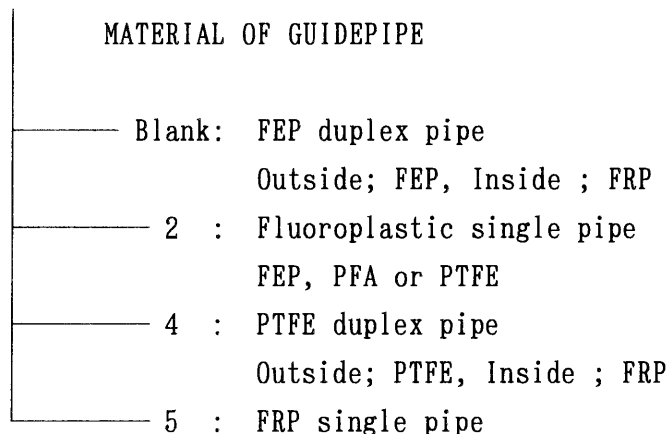
The models on the nameplate are as follows:

4.1.1 SENSOR UNIT

CL-D

4.1.2 GUIDEPIPE

CL-G-□



4.1.3 CONVERTER UNIT

CM-A

A converter designed specially for CL-D.

4.2 SPECIFICATIONS

4.2.1 OPERATION CHARACTERISTICS

- (1) Accuracy : $\pm 1.5\%$ F.S.
- (2) Separated Length : 200 m Max.
- (3) Measuring Range : 0 to 10 m
- (4) Followup Speed : 1.5 m/min.
- (5) Scale : 0 to 100 %

4.2.2 ELECTRICAL CHARACTERISTICS

- (1) Power Supply : 100 V AC $\pm 5\%$ 50/60 Hz
- (2) Power Consumption : Approx. 23 VA
- (3) Contact Rating : 250 V 2 A AC
(Resistive Load) 30 V 2 A DC

- (4) Output Signal : 4 to 20 mA DC (Resistive load 600Ω and under)
- (5) Withstand Voltage : 1500 V AC one minute
Between Housing and power Terminal.
- (6) Insulation Resistance : 500 V DC more than 100 Ω
Between Housing and power Terminal.

4.2.3 MECHANICAL CHARACTERISTICS

- (1) Withstand Pressure : 100 kPa Max.:CL-G,CL-G-2(FEP,PFA)
200 kPa Max.:CL-G-2(PTFE)
500 kPa Max.:CL-G-4,CL-G-5

4.2.4 ENVIRONMENT

- (1) Working Temperature : Sensor ; -10 to + 50 ℃
Guidepipe ; -10 to +120 ℃ : CL-G,CL-G-2(FEP),
CL-G-4
-10 to +150 ℃ : CL-G-2(PFA)
-10 to +200 ℃ : CL-G-2(PTFE)
-10 to + 60 ℃ : CL-G-5
Converter ; -10 to + 50 ℃
- (2) Working Humidity : 85 % RH Max.

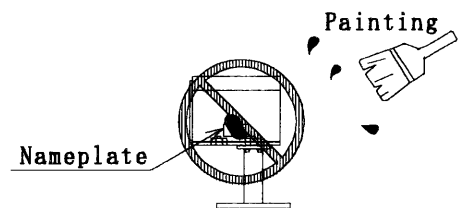
- 4.2.5 CONSTRUCTION : Sensor ; Spray-proof Construction (IP 54)
Guidepipe ; Waterproof Construction (IP 68)
Converter ; Spray-proof Construction (IP 54)

5. HANDLING NOTES

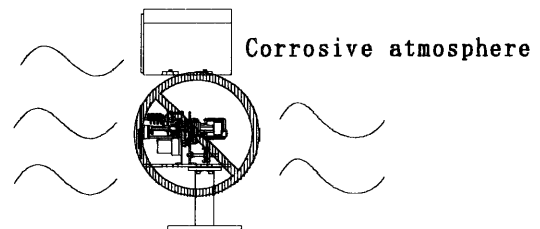
Cautions shall be taken as follows. If not, the sensor shall be damaged.

5. 1 Since the sensor is heavy, handle the sensor with more than 2 people. Otherwise, the sensor may be dropped and may cause malfunction.
5. 2 Avoid physical shock. Dropping, throwing or bumping shall damage the sensor.
5. 3 Do not put things on the sensor. It shall deform and damage the sensor.

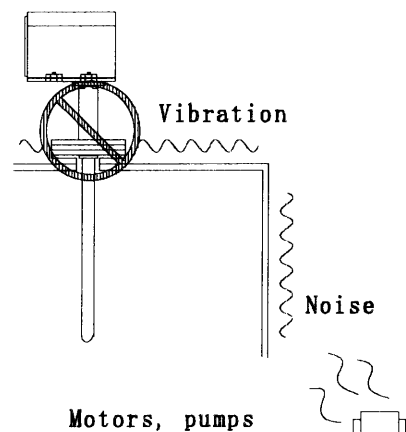
5. 4 When painting the sensor, do not paint on the nameplate to keep the indication of serial number for future reference when ordering parts.



5. 5 Do not use or store in a corrosive atmosphere. (NH_3 , SO_2 , Cl_2 , etc.) Internal parts shall be corroded and conduction failure may occur.



5. 6 Do not use or store where vibration occurs. If inevitable, provide appropriate means to prevent from vibration.



5. 7 Locate away from the noise generator such as motors, pump, inverter and so on or high frequency electric field. The sensor may cause malfunction.

6. INSTALLATION

CAUTION

The model CL-D, CL-G-□ and CL-A is non-explosion-proof construction (*). DO NOT use where the flammable gas, explosive fumes or vapor exists. In hazardous areas, use model CL-ED, CL-EG-□ and CL-EA explosion-proof construction.

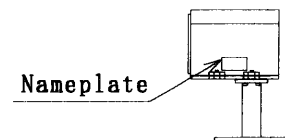
6.1 SENSOR UNPACKING

6.1.1 Take out the sensor from the package carefully. Since the sensor is heavy, handle the sensor with more than 2 people. Otherwise, the sensor may be dropped and may cause malfunction.

6.1.2 If the guidepipe length is more than 1500mm, handle the guidepipe with more than 2 people. Otherwise, the guidepipe may be hit and the bent of an guidepipe may cause malfunction.

6.1.3 Avoid physical shock. Dropping, throwing or bumping shall damage the sensor.

6.1.4 Model numbering of the nameplate.
Check it to be sure as required.



6.1.5 Check the sensor exterior for damage.
If there is, contact Nohken.

6.1.6 Remove all wrapping materials such as tapes, plastic bags, the carton protection etc.

After removing, inspect all components for damage.

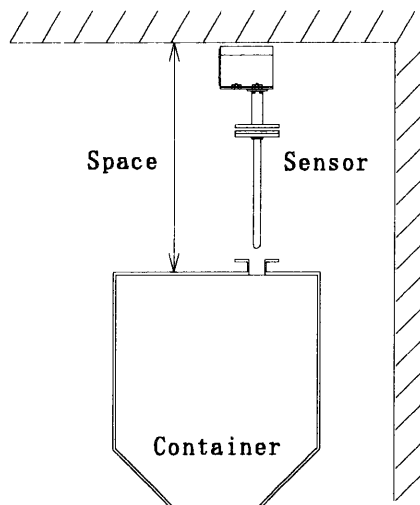
* See section 13 for the word explanation.

6. 2 S E N S O R I N S T A L L A T I O N

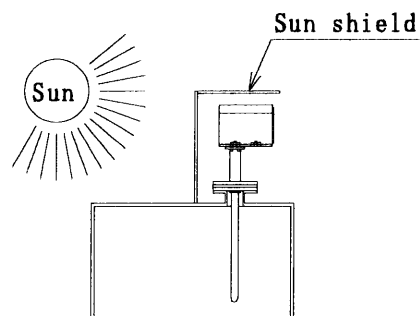
6.2.1 S E N S O R L O C A T I O N

Provide ample space for maintenance/ inspection. (At least the same length as the sensor and the guidepipe.)

Then, check the followings. If not, the sensor may cause malfunction.

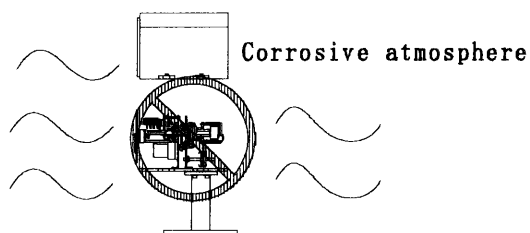


- (1) Max. temperature range for guidepipe is +60 to +200°C, according to material of guidepipe, and +50°C for the housing. Do not install where exceeds the temperature range.



- (2) Do not locate the sensor where exposed to direct sunlight. Install a sun shield (*) over the housing if necessary.

- (3) Do not use or store in a corrosive atmosphere such as NH_3 , SO_2 , Cl_2 , etc. Internal parts shall be corroded and damage the sensor.



- (4) Locate away from splashing water. The housing protection is IP54. Tighten the housing cover and the cable entry to prevent water from intruding.

* See section 13 for the word explanation.

6.2.2 INSTALLATION

Installation of the sensor (CL-D, CL-G-□) is shown on Fig.6-1.

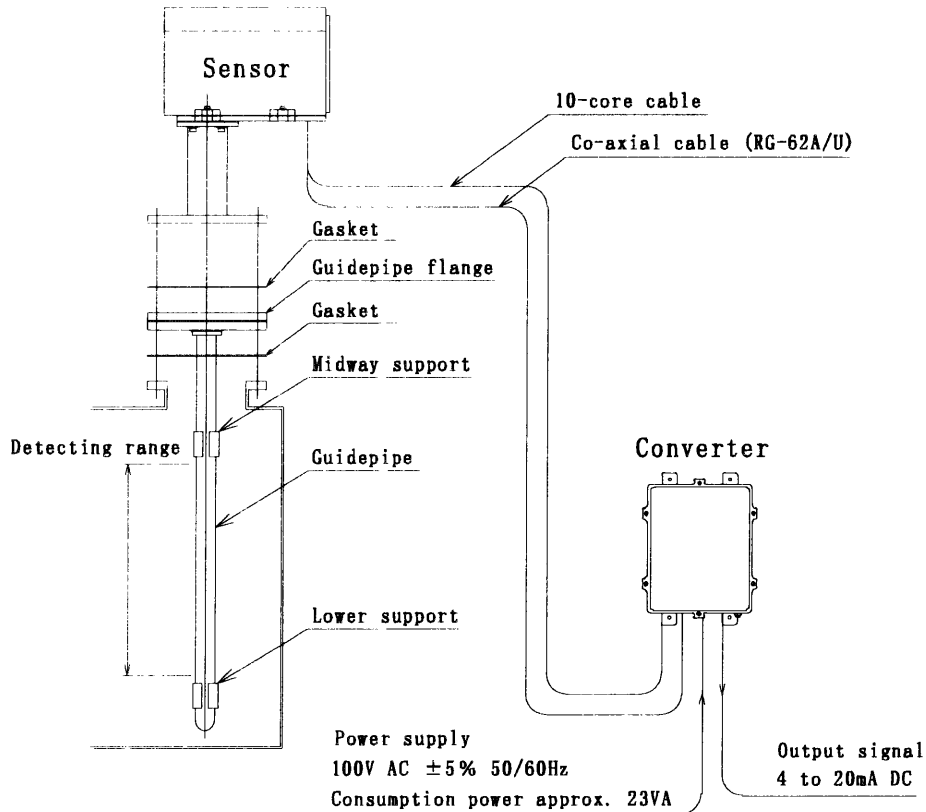


Fig.6-1

The CL requires gasket, bolts and fittings for installation. Provide the compatible mating flange on tank top. Install the sensor with a suitable gasket and conforming bolts by using appropriate tool.

NOTE

Since the sensor is heavy, handle the sensor with more than 2 people.

When installing on the metallic container, make sure the flange and the container is electrically conductive.

If installing the sensor near the agitator or where there is flow of the liquid, fix the guidepipe with the midway support and the lower support. Otherwise, the guidepipe may be swung and/or bent. Those supports are provided on the side of the tank wall.

6.3 CONVERTER UNPACKING

Take out the converter from the package carefully and avoid physical shock. Dropping, throwing or bumping shall damage the converter.

6.4 CONVERTER INSTALLATION

6.4.1 CONVERTER LOCATION

When installing the converter, provide ample space for maintenance/inspection. Then, check the followings. If not, the converter may cause malfunction.

(1) The converter shall be used under the following conditions:

Ambient temperature ; $-10\sim+50^{\circ}\text{C}$

Relative humidity ; 85% Rh Max. (No dewing)

(2) Locate away from splashing water. The housing protection is IP54. Tighten the housing cover and the cable inlet to prevent water from intruding.

When installing horizontally, the cable inlet shall be pointing down to the ground. Size for the cable inlet is 4-G 1/2, G 1/4.

6.4.2 INSTALLATION

(1) The dimension of the converter is shown on Fig.6-2.

(2) Use M6 screws or equivalent when installing the converter chassis on the wall.

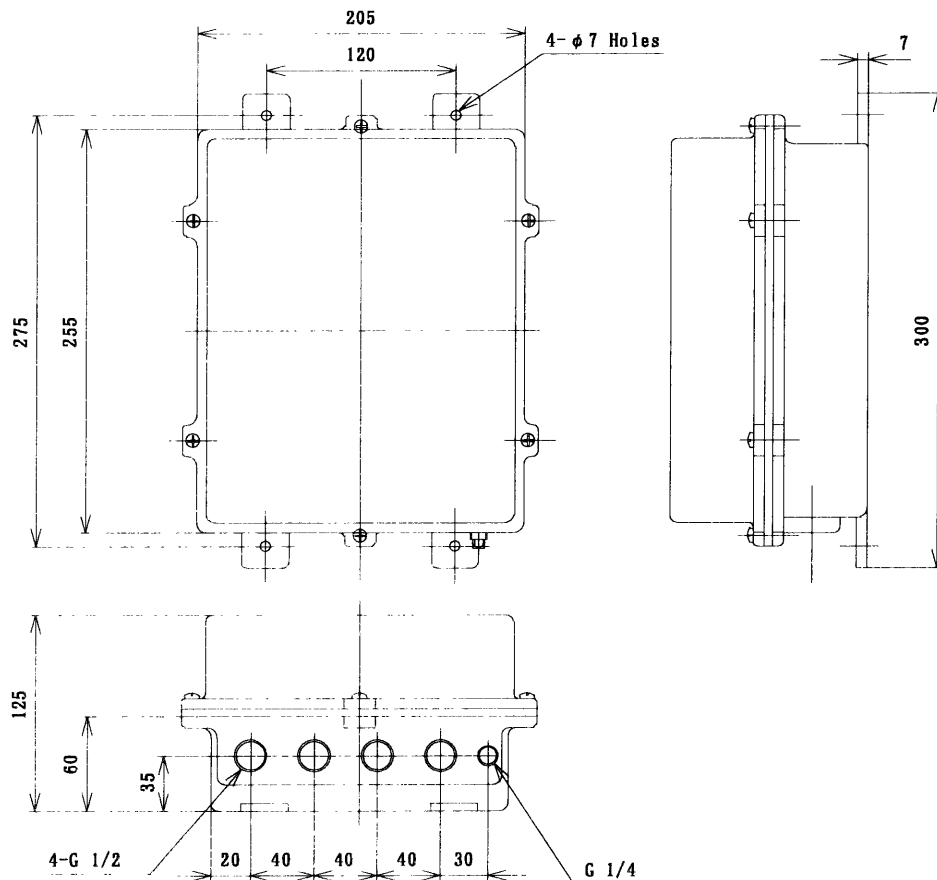



Fig.6-2

7. WIRING

7. 1 PREPARATION

7.1.1 Turn off the power supply.

 **WARNING**

To avoid personal injury, leakage current or short circuit, the power supply shall be always turned off while wiring.

7.1.2 Remove the housing cover.

7. 2 CABLE INLET

The cable gland is G 1/2. It must be properly fitted to preserve IP54 after wiring. In case of the flexible conduit, size of screw is G 1/2. Sealing compound shall be applied onto the screw of the cable inlet to protect water and dust penetration.

7. 3 WIRING

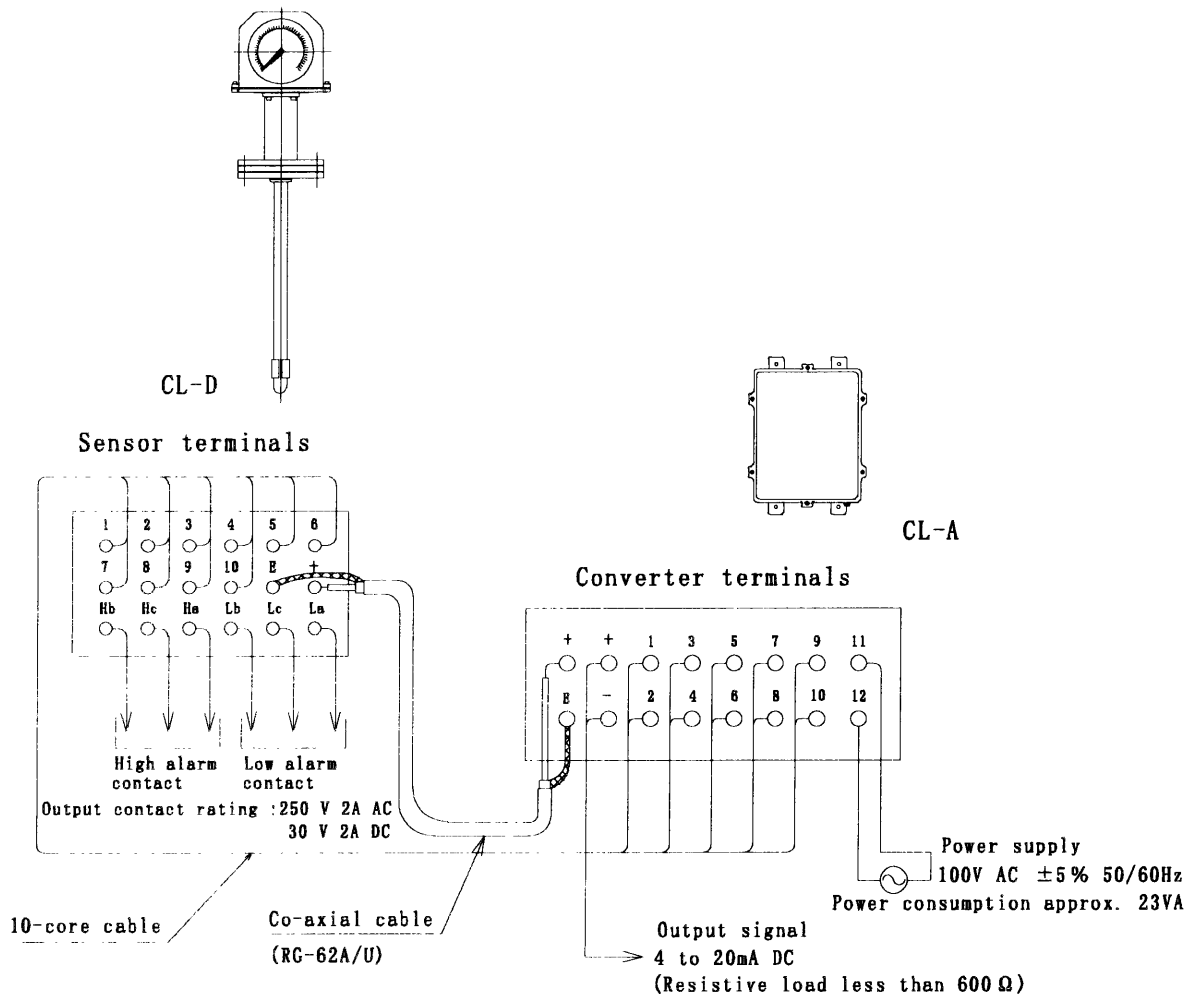


Fig.7-1

7.3.1 Should be connected always using the attached co-axial cable(RG-62A/U) and 10-core cable between the sensor and the converter. Use appropriate tools when fixing screws. Terminal screw is M3. We recommend the following solderless lugs. R1.25-3 or R1.25-3.5 (JIS C 2805-1991).

This cable must be run in conduit and be grounded. Avoid to cut and/or extend the cables. Otherwise, you must adjust the CL by yourself in accordance with section 9, ADJUSTMENT. Do not lay the power cable or the magnet switch cable in parallel.

7.3.2 The power line should be connected to the converter terminal 11 and 12. Power voltage is 100V AC $\pm 5\%$ 50/60Hz.

7.3.3 If using a high alarm contact, be connected to the sensor terminal Hc-Ha or Hc-Hb.

If using a low alarm contact, be connected to the sensor terminal Lc-La or Lc-Lb.



CAUTION

The resistive contact rating of the CL is 250V 2A AC or 30V 2A DC. Do not exceed this rating. Connect the relay or protective circuits between the sensor and the load if necessary.

7.3.4 The output signal should be connected to the converter terminal + and -. Resistive load of the 4 to 20mA DC output is Max. 600 Ω . If exceeds, the converter may cause signal errors and/or malfunction.

7. 4 COVERING

Make sure that there is no dust for metallic substances in the housing. The housing cover shall be tightened to protect from rain, splashing water, dust and so on.

8. NOMENCLATURE

8.1 SENSOR

Nomenclature for the sensor, model CL-D, is shown on Fig.8-1.

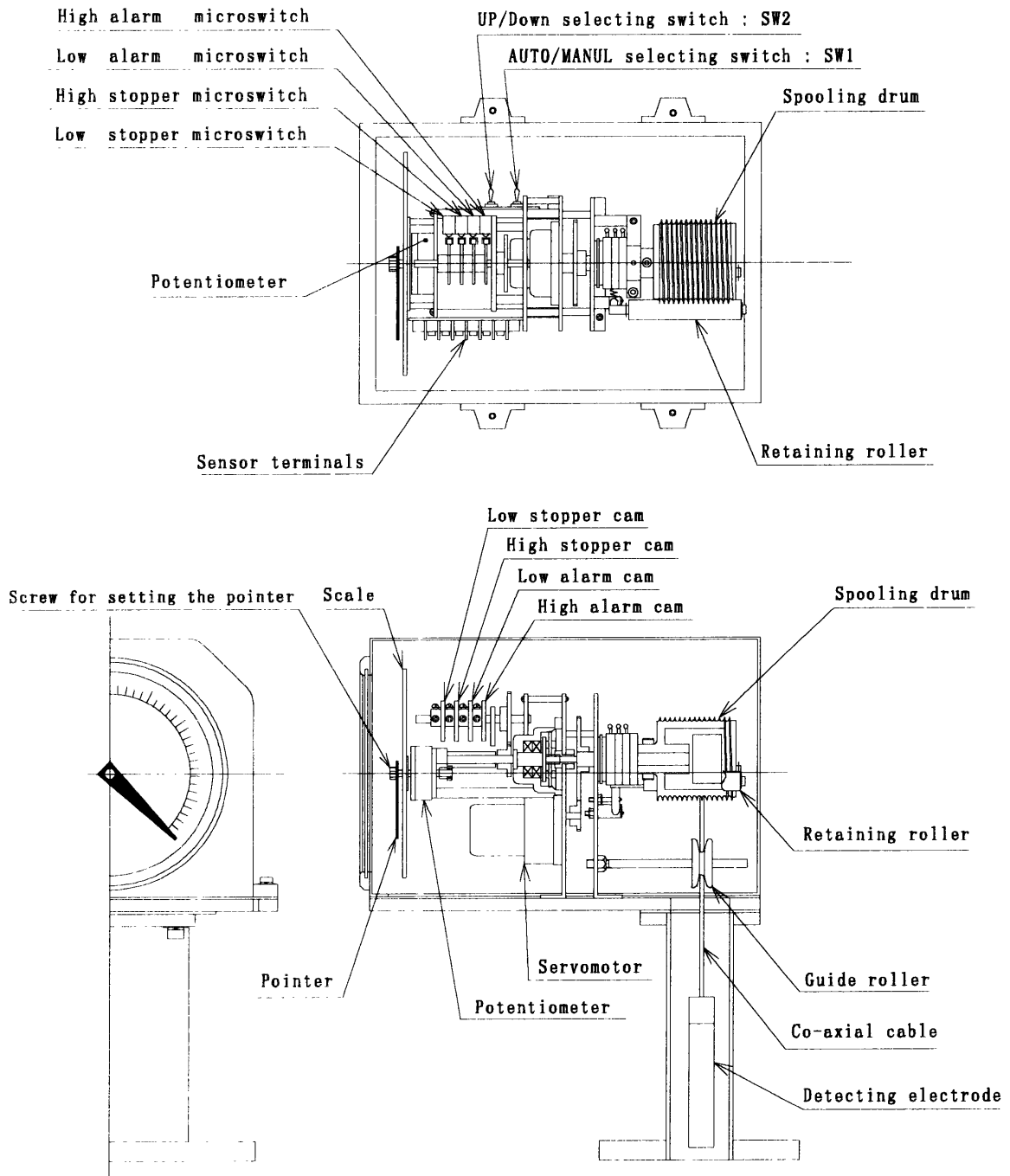


Fig.8-1

8. 2 CONVERTER

Nomenclature for the converter, model CL-A, is shown on Fig.8-2.

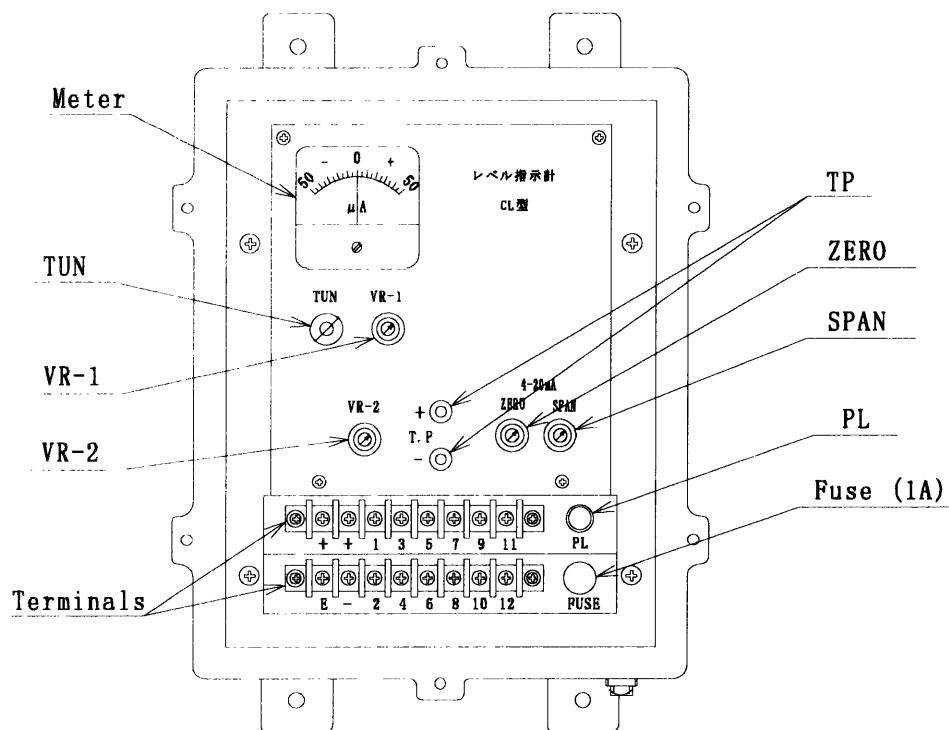


Fig.8-2

- Meter: Adjusting meter $\pm 50 \mu A$
- VR-1 : Detecting sensitivity setting trimmer
- VR-2 : Adjusting trimmer for Gain of servo amp.
- TUN : Tuning adjusting trimmer
- ZERO : Zero adjusting volume for 4mA DC
- SPAN : Span adjusting volume for 20mA DC
- TP : Test points for 4 to 20mA DC output's check
- PL : Power indication LED

9. ADJUSTMENT

9.1 INITIAL CHECK

⚠ CAUTION

After checking the wiring connections and then apply the power. Set the SW1 to be at MANUAL position and the SW2 to be turned off. If you apply the power first, the motor starts rotating upon the power is turned on and the cable may be wounded and/or cut.

⚠ CAUTION

When moving the detecting electrode manually, pay caution for further winding and unwinding of the cable. The spooling drum does not stop automatically while manual operation.

- 9.1.1 While the SW1 is on Manual position, the detecting electrode can be travelled up and down manually by SW2. By using the SW2, make sure that:
- (1) Cable is in the groove of the spooling drum.
 - (2) There is no slack and/or the twist in the cable.
 - (3) Cable is in the groove of the guide roller.

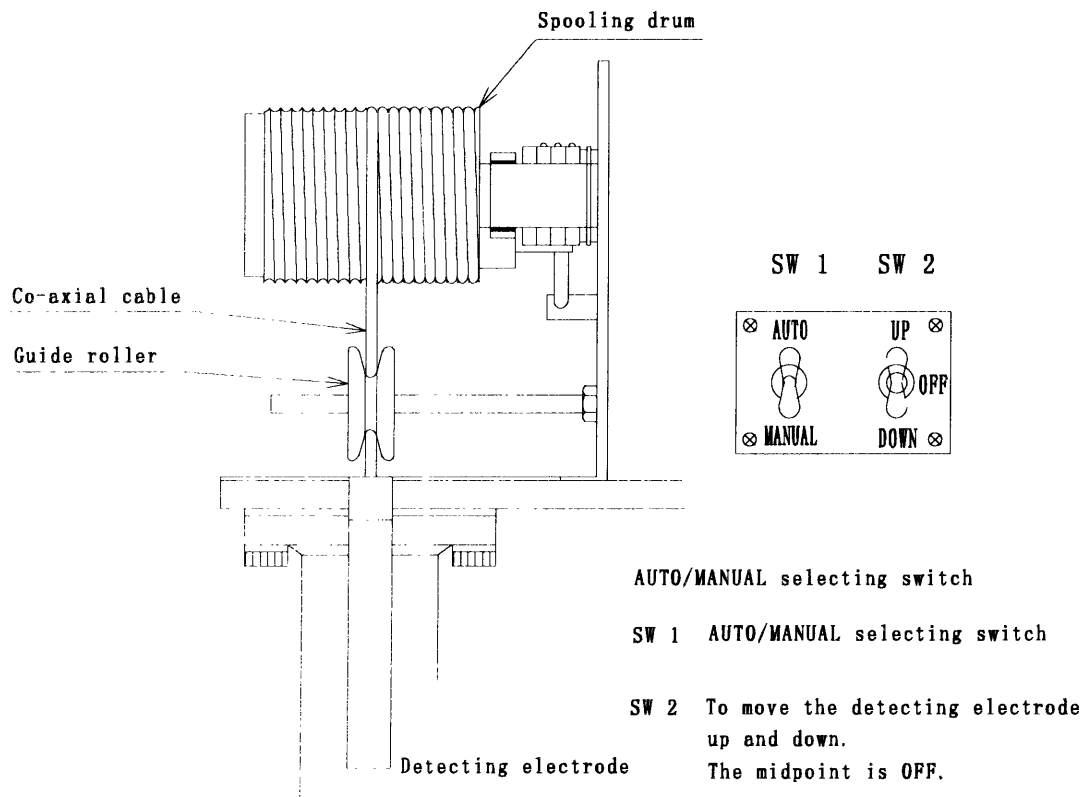


Fig.9-1

9. 2 SENSITIVITY ADJUSTMENT

By MANUAL operation, move the detecting electrode up and down to check the chatter of an converter adjusting meter for each measuring material.

If the meter point is as written below, set the SW1 to AUTO side. The sensor electrode will catch the measuring material and the converter's adjusting meter point stops at the 0 (Zero) position.

- Meter point is in negative direction ($-50\mu\text{A}$ or less) in the air or in the upper liquid.
- Meter point is in positive direction ($+50\mu\text{A}$ or more) in the measuring material or in the lower liquid.

The sensor electrode follows the measuring material or the liquid interface. Make sure the meter is chattering the same range to both positive and negative side. If not, adjust via the sensitivity setting trimmer (VR-1).

For stable detection, variation in $\pm 30\mu\text{A}$ or more is necessary. If not, see "9.3, Tune adjustment".

If the guidepipe is coated by build-up and/or the suspended solids, lower the sensitivity.

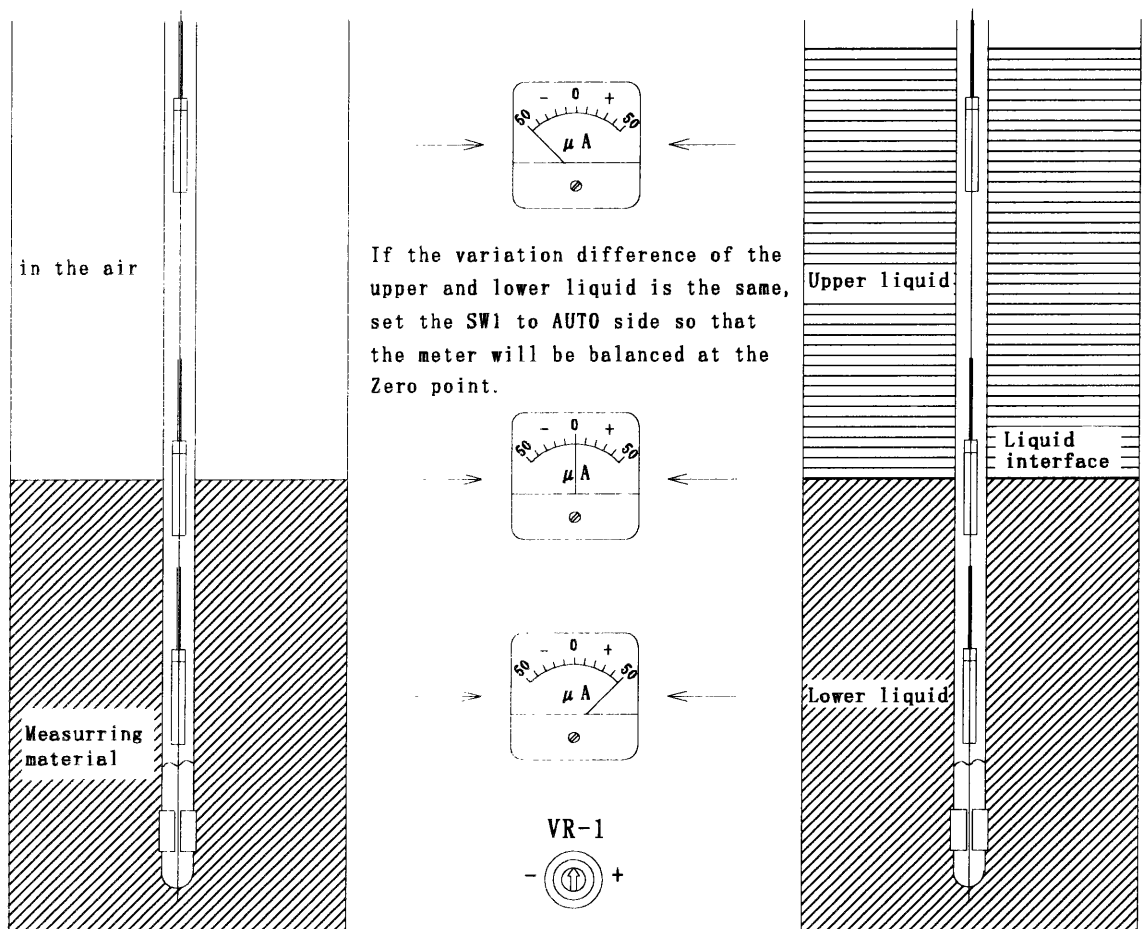


Fig.9-2

9. 3 TUNE ADJUSTMENT

9.3.1 By MANUAL operation, unwind the sensor electrode 20~30cm or more from the actual level or the liquid interface.

(The sensor electrode is not in the measuring liquid or in the lower liquid.)

9.3.2 Set the current to be about $+30\mu\text{A}$ by sensitivity adjusting trimmer (VR-1).

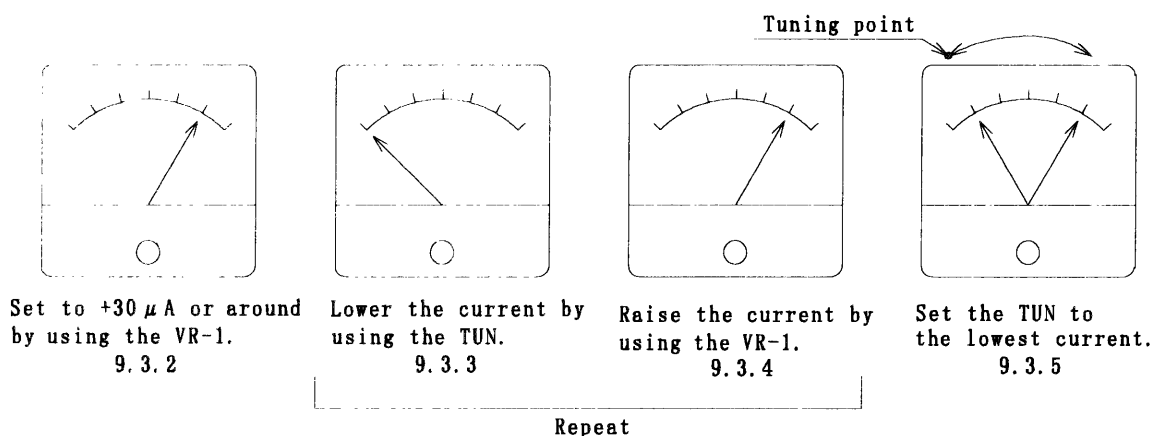
(This is to make the tuning adjustment easy)

9.3.3 Turn the tuning adjusting trimmer (TUN) and set it to the lowest point.

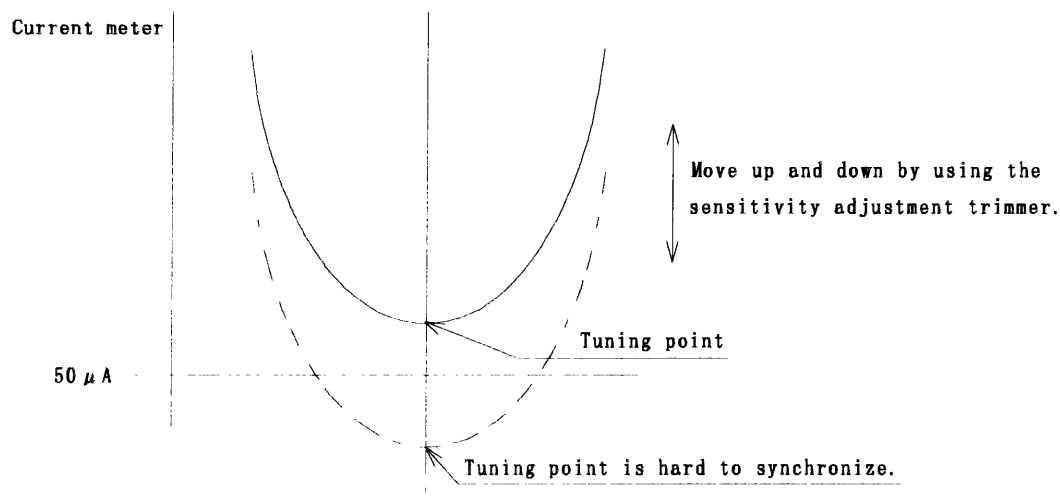
9.3.4 Re-adjust and set the sensitivity adjusting trimmer (VR-1) where the current is about $+30\mu\text{A}$.

9.3.5 Repeat steps 9.3.3 and 9.3.4. Set the tuning adjusting trimmer (TUN) where the current is the lowest point (tuning point).

9.3.6 Tune adjustment is finished.



※ If the tuning point current shows $-50\mu\text{A}$ or around, it will be hard to synchronize. Therefore, raise the current by the sensitivity adjusting volume (VR-1) to synchronize the tuning point easily.



9.3.7 If the tuning point is synchronized, proceed "9.2, Sensitivity adjustment".

9.4 SETTING OF THE HIGH - LOW STOPPER CAM AND CHECK OF THE 4 TO 20mA DC OUTPUT SIGNAL

The measuring range of the CL is in accordance with the size and drum's rotation number of the sensor. When the measuring level is below Zero or above Span, the High/Low stopper cam pushes the microswitch to stop the spooling drum automatically and prevents the cable from further winding/unwinding and/or the break of the cable. Therefore, the High/Low stopper cam position and adjustment of the Zero/Span, are preset before shipment from our factory. But for safety, make sure 9.4.1 and 9.4.2 written below.

CAUTION

When moving the detecting electrode manually, pay caution for further winding and unwinding of the cable. The spooling drum does not stop automatically while manual operation.

9.4.1 Make sure the setting level of the High/Low stopper cam.

- (1) Unwind the detecting electrode manually. Make sure the Low stopper microswitch (MS4) is ON when below the Zero point.
- (2) Also, wind the detecting electrode and make sure the High stopper microswitch (MS3) is ON when above the Span point.

9.4.2 Make sure the 4 to 20mA DC output signal.

- (1) When checking the output signal with the TP terminal on the converter, the ammeter will not indicate unless the external load is connected to the output terminal. If the external load is not connected, short-circuit the + and - converter terminals.
- (2) Set the SW1 to AUTO side. Put the measuring medium to the lowest level within the measuring range. Make sure that the output signal is 4mA DC by TP terminal of the converter.
- (3) Similarly, put the measuring medium to the highest level within the measuring range. Make sure that the output signal is 20mA DC by TP terminal of the converter.

9.4.3 If above-mentioned checks are insufficient, adjust as follows.

- (1) Potentiometer Zero adjustment (Refer to P.22, Fig.9-5~9-6)
 - i) Set the SW1 to AUTO side and put the measuring material to the lowest level within the measuring range.
 - ii) Loosen the pointer setting screw on the potentiometer.

- iii) Rotate the shaft and adjust the voltage between 2~3 of the sensor terminal to 0.05~0.1V DC. Tighten the screw for setting the potentiometer.
(2: Positive (+), 3: Negative (-), Range: About 1V DC)
- (2) Pointer Zero adjustment (Refer to P.22, Fig.9-5)
 - i) Set the SW1 to AUTO side and put the measuring material to the lowest level within the measuring range.
 - ii) Loosen the pointer setting screw and adjust the pointer to Zero. Tighten the screw for setting the pointer.
- (3) Low stopper cam setting. (Refer to P.21, Fig.9-3)
 - i) Set the SW1 to AUTO side and put the measuring material to the lowest level within the measuring range.
 - ii) Set the SW1 to MANUAL side and lower the detecting electrode a little.
 - iii) By using Low stopper cam, fix the Low stopper microswitch (MS4) with the cam fixing screw to make it OFF to ON at the position determined in section ii).
- (4) Output Zero adjustment
 - i) Set the SW1 to AUTO side and put the measuring material to the lowest level within the measuring range.
 - ii) Connect an ammeter to TP terminal on the converter. Then, turn the Zero adjusting volume (ZERO) until 4mA DC can be read.
(Refer to P.21, Fig.9-4)
- (5) High stopper cam setting (Refer to P.21, Fig.9-3)
 - i) Set the SW1 to AUTO side and put the measuring material to the highest level within the measuring range.
 - ii) Set the SW1 to MANUAL side and raise the detecting electrode a little.
 - iii) By using High stopper cam, fix the High stopper microswitch (MS3) with the cam fixing screw to make it OFF to ON at the position determined in section ii).
- (6) Output Span adjustment
 - i) Set the SW1 to AUTO side and put the measuring material to the highest level within the measuring range.
 - ii) Connect an ammeter to TP terminal on the converter. Then, turn the Span adjusting volume (SPAN) until 20mA DC can be read.
(Refer to P.21, Fig.9-4)

If you can move the liquid and/or powder level up and down, check (4)output zero adjustment and (6)output span adjustment 2~3 times.

9.5 HIGH · LOW ALARM SETTING

If using an alarm output, set as in the case of 9.4, Setting of the High · Low stopper cam. (Refer to Fig.9-3)

It can be set anywhere within the measuring range.

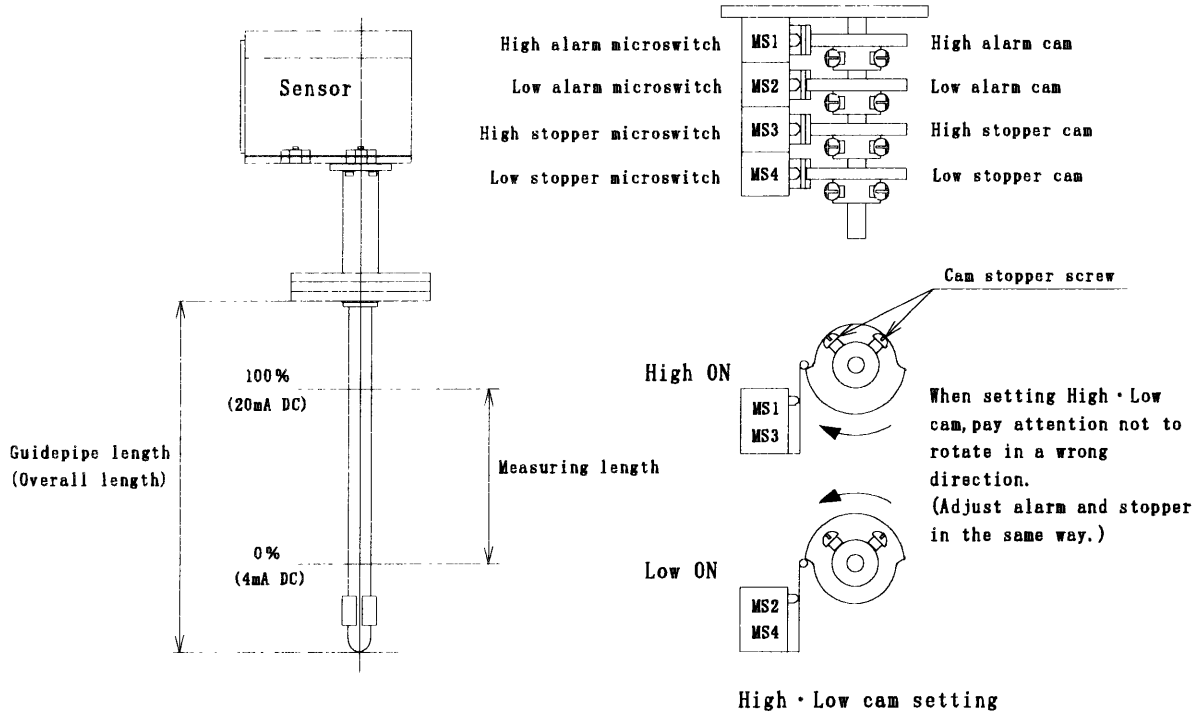


Fig.9-3

Output signal (4 to 20mA DC) adjustment

When checking the output signal with the TP terminal on the converter, the ammeter will not indicate unless the external load is connected to the output terminal. If the external load is not connected, short-circuit the + and - converter terminals.

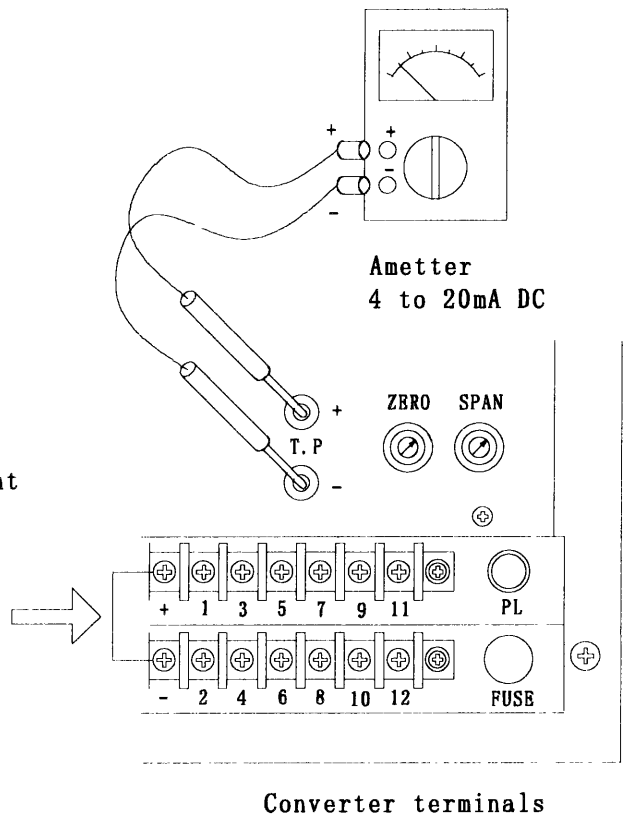


Fig.9-4

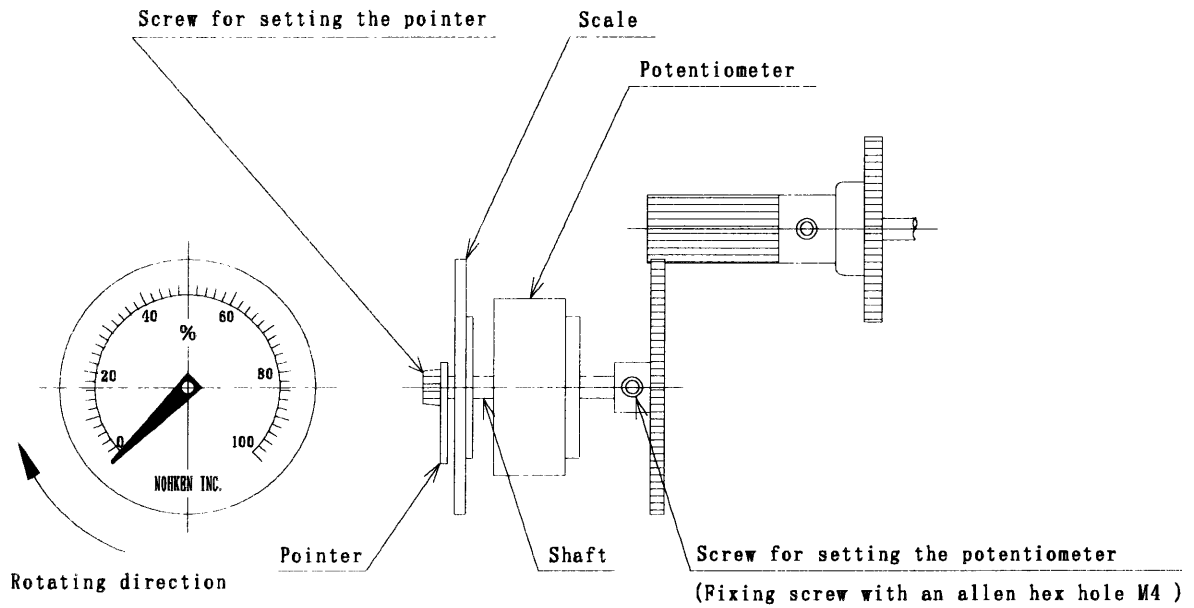
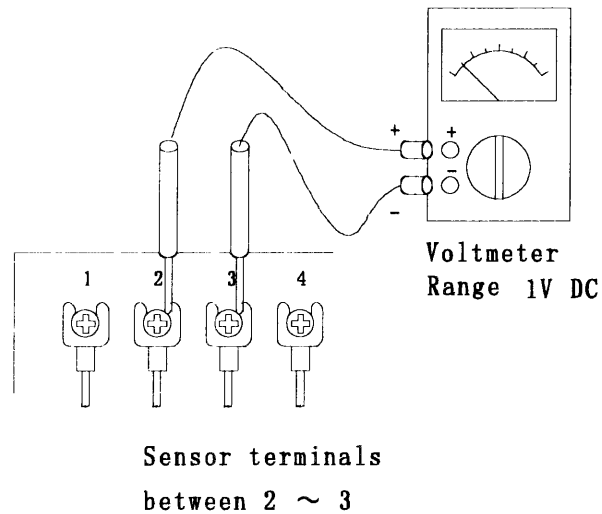


Fig.9-5



Potentiometer Zero adjustment

Fig.9-6

9. 6 GAIN OF SERVO AMP. ADJUSTMENT

If the liquid turbulence and/or the vibration causes chattering to the spooling drum, adjust the Gain of servo amp. on the converter.

Lower the Gain of servo amp. by turning the Gain of servo amp. adjusting trimmer (VR-2) on the converter to the left.

Do not turn the VR-2 too much. Otherwise, the sensor can not operate properly.

10. MAINTENANCE & INSPECTION

Remove the sensor from the tank before maintenance. See section 5. Keep the ample space for maintenance.

10.1 REMOVING

10.1.1 Remove the housing cover.

10.1.2 While the SW1 is on Manual position, the detecting electrode can be travelled up manually by SW2 near sensor flange.

▲ CAUTION

When moving the detecting electrode manually, pay caution for further winding and unwinding of the cable. The spooling drum does not stop automatically while manual operation.

10.1.3 Turn off the power supply.

▲ WARNING

To avoid personal injury, the power supply shall be always turned off while wiring.

10.1.4 Disconnect all wires and the flexible conduit.

10.1.5 Unscrew the fixing bolts and remove the sensor and the guidepipe carefully from the tank.

10.1.6 Put the sensor and the guidepipe on the flat and ample space.

10.2 MAINTENANCE & INSPECTION

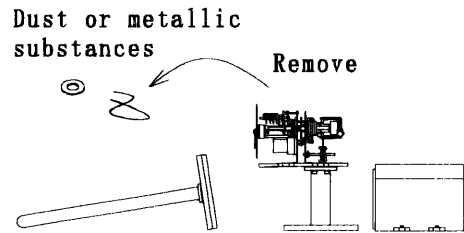
Inspect the sensor semi-annually or annually. Since inspection intervals varies with applications and process conditions such as pressure, temperature and so on, we recommend you to inspect periodically.

10.2.1 Check for and replace damaged/
collapsed parts.



10.2.2 Clean contaminant or sticky material.

10.2.3 Clean dirt, dust and moisture from housing.



1 0 . 3 RE - I N S T A L L A T I O N

See 6.2, SENSOR INSTALLATION.

1 0 . 4 W I R I N G

See 7, WIRING.

1 0 . 5 R E P L A C E M E N T P A R T S & C Y C L E

Replace to our special-purpose parts if the following symptoms occur. The life expectancy of the CL may be 5 years due to the deterioration of electric parts or corrosion of the insulation tube.

1 0 . 6 R E P L A C E M E N T P A R T S L I S T

Parts Name	Replacement Cycle
Housing	When it is damaged or corroded.
Internal parts	
Guidepipe	
Electrode	
Co-axial cable	

1 0 . 7 A D J U S T M E N T

See 9, ADJUSTMENT.

11. STORING

The sensor(guidepipe) and the converter shall be stored under the following conditions when it is not used for a long time:

1 1 . 1 Environmental conditions are as follows:

- The storing temperature range is -10℃ to +60℃.
- Relative humidity is 85% Max.
- No corrosive gases (such as NH₃, SO₂, Cl₂, etc.).
- Locate away from condensation, dust and foreign matters.
- Vibration is low.

1 1 . 2 Keep the sensor and the converter out of rain, splashing water.

1 1 . 3 Put the cover on the housing and the blind lid on the cable gland. Otherwise, the dust will intrude into the housing. For precaution, the cable entry shall be pointing down to the ground.

1 1 . 4 Clean deposit or sticky material build-up on the guidepipe. Otherwise, the float operation will be affected after solidifying.

1 1 . 5 Deposit the guidepipe on the appropriate seating such as wood. Otherwise, the guidepipe rolls, guidepipe will be bent and damage an insulation tube. Especially for the guidepipe with more than 2000mm, bear each 1000mm to prevent from bending.

1 1 . 6 Do not put things on the sensor and the guidepipe. It shall damage the sensor and the guidepipe.

REFERENCE

Keep the sensor and the converter in sealed plastic bags with desiccant or other moisture-proof packing.

12. TROUBLESHOOTING



CAUTION

Use the following chart to troubleshoot the malfunctioning sensor.

If your remedies are unsuccessful, ask Nohken for repair and replacement.

- ◆ NO SIGNAL OUTPUT (Output signal 4mA DC or less)
 - Cable is broken. Replace the cable.
 - The terminal screw is loosen. Tighten the terminal screw.
 - SW1 on the sensor is on MANUAL side. Set it to AUTO side.
 - Guidepipe is damaged and/or deformed. Contact Nohken for repair or replacement.

- ◆ OUTPUT DOES NOT CHANGE
 - Cable is broken. Replace the cable.
 - The terminal screw is loosen. Tighten the terminal screw.
 - SW1 on the sensor is on MANUAL side. Set it to AUTO side.
 - Guidepipe is coated by build-up. Remove them. (Refer to 10. MAINTENANCE & INSPECTION)

- ◆ INCORRECT LEVEL INDICATION
 - Incorrect setting of the converter adjusting volume. Re-adjust the level. (Refer to 9. ADJUSTMENT)
 - Guidepipe is coated by build-up. Remove them. (Refer to 10. MAINTENANCE & INSPECTION)

- ◆ INDICATION CHATTER
 - The terminal screw is loosen. Tighten the terminal screw.
 - Check for turbulence. See "9.6, Gain of servo amp. adjustment".

- ◆ INDICATION EXCEEDS SPAN (Output signal 20mA DC or more)
 - Cable is broken. Replace the cable.
 - The terminal screw is loosen. Tighten the terminal screw.
 - SW1 on the sensor is on MANUAL side. Set it to AUTO side.
 - Incorrect setting of the converter adjusting volume. Re-adjust the level. (Refer to 9. ADJUSTMENT)
 - Guidepipe is coated by build-up. Remove them. (Refer to 10. MAINTENANCE & INSPECTION)
 - Guidepipe is damaged and/or deformed. Contact Nohken for repair or replacement.

13. GLOSSARY

- Capacitance : When positive and negative electric charge Q is supplied between two metallic electrodes, and the potential is V , it can be shown as $C=Q/V$.
- Explosion-proof construction : The sensor does not explode even if the sensor sparked and/or short-circuited under an explosive hazardous atmosphere.
(This instruction is not for explosion-proof construction.)
- Sun shield : A shield or baffle to deflect the direct sunlight from the housing.

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