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General Information

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HLT-2110

Float Actuated Level Gauge



HITROL CO., LTD.

General

Model HLT-2110 level gauge is a float-actuated, purely mechanical instrument utilizing conster springs. The instrment is constructed very simply and designed very compactly so as to assure easy

mounting and maintenance.

It should therefore be installed and adjusted by the user in the procedures described in this manual.

Operating Principle

A float accurately follows liquid level variations in the vertical direction(horizontal movement of the float is restricted by guide wires or protective pipe).

Vertical movement of the float is transmitted through a measuring wire to the gauge head, in which the measuring wire is wound around a wire drum kept under constant torque by conster springs. The vertical movement is converted into rotation of the wire drum in this way. This rotation is transmitted through a gear system to an indicator pointer which reads the liquid level on a scale dial.

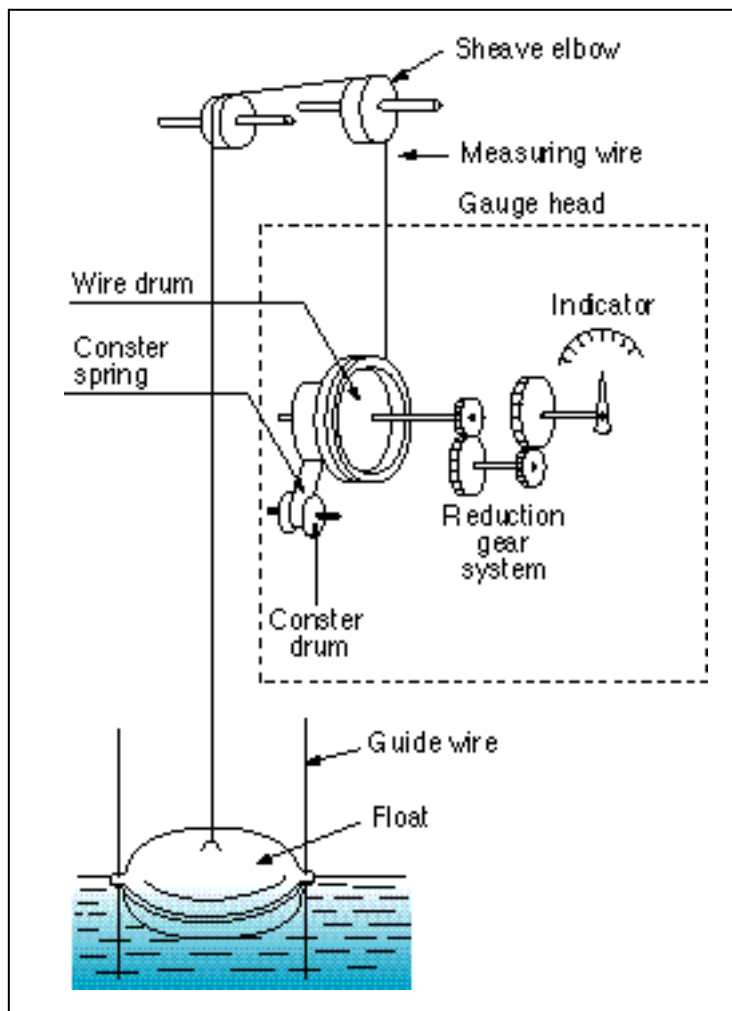
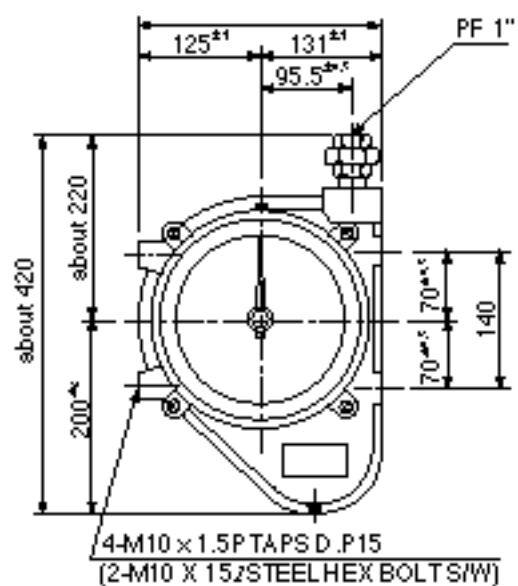


Fig. 1 Operating Principle

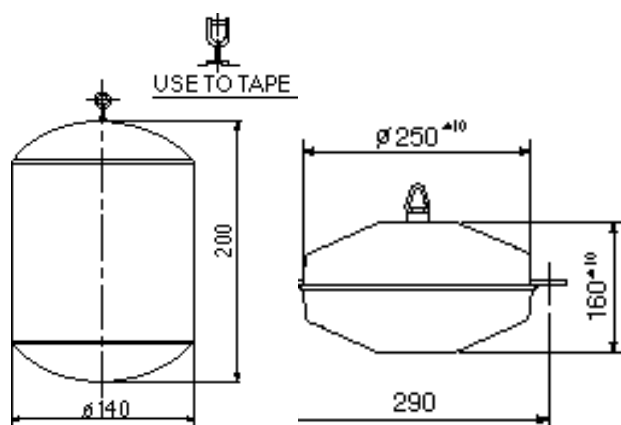
Specifications

Measuring Range	2.5 m, 5 m or 7.5 m
Accuracy	Better than ± 30 mm
Indicator	Dial indicator with one pointer (minimum division : 20 mm)
Specific Gravity of Measuring Liquid	0.5 ~ 2.0
Alloyable Pressure	0.2 kg/cm ² (max. pressure in tank)
Alloyable Temperature	+ 80 max. for wetted parts - 20 ~ + 60 for gauge head
Pipe Connection	PT 1 "

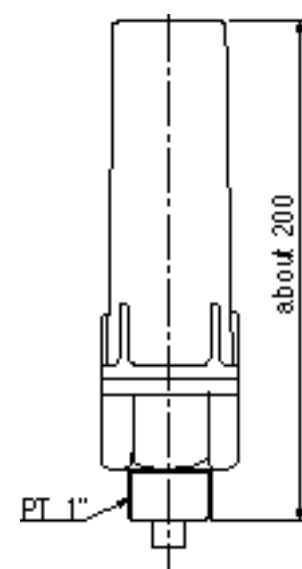
Dimensions



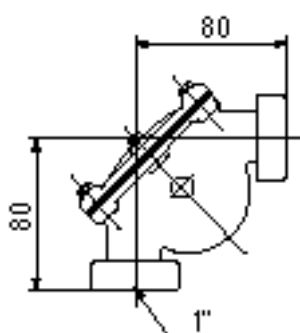
Gauge head



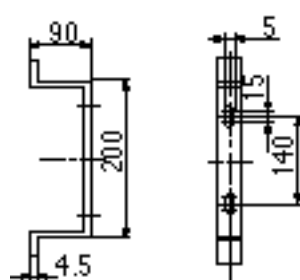
Float



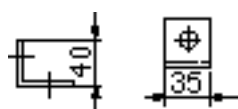
Top anchor



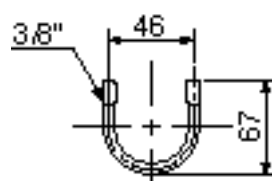
Sheave elbow 90.



Gauge support

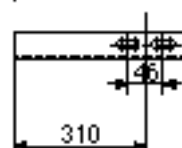
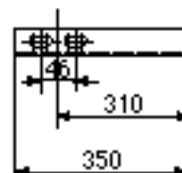


Bottom anchor



1 1/2 inch U-Bolt

"L" 50 x 50 x 4t



Pipe support

Mounting and Adjustments

Piping

In order to obtain highly accurate indications on the level gauge, be sure to flow the instructions given below :

- (1) As the guide pipe, use a galvanized gas pipe.
- (2) Arrange the guide pipe within flexure of ± 5 mm and completely debut cut sections.
- (3) Use sealing tape or activated gasket together with pipe connectors such as union joint and socket for assuring perfect airtightness.

Stretching Guide Wires

- (1) First, weld sockets and bottom anchor bolts as shown in (a) of Fig. 2. The bottom anchor bolts should be welded as they are passing through the bottom anchor.
- (2) Through the sockets attached to the tank top, pass the guide wires with sheave elbows down into the tank. Screw the sheave elbows into the sockets (it is not required to remove the covers from the sheave elbows). Sec (a) of Fig. 2.
- (3) Inside the tank, remove the bottom anchor and nuts from the bottom anchor bolts. Set the bottom anchor again in position as shown in (b) of Fig. Fig. 2. Then pass the guide wires (hanging inside the tank) through the guide rings of the float and holes formed in the bottom anchor. Stretch the guide wires tightly and fasten as shown in (b) of Fig. Fig. 2. Cut off excessive lengths of the guide wires.
- (4) Finally, lower the bottom anchor by tightening the nuts on the bottom anchor bolts for further tensing the guide wires. Then, tighten the additional nuts as shown in (c) of Fig. Fig. 2.

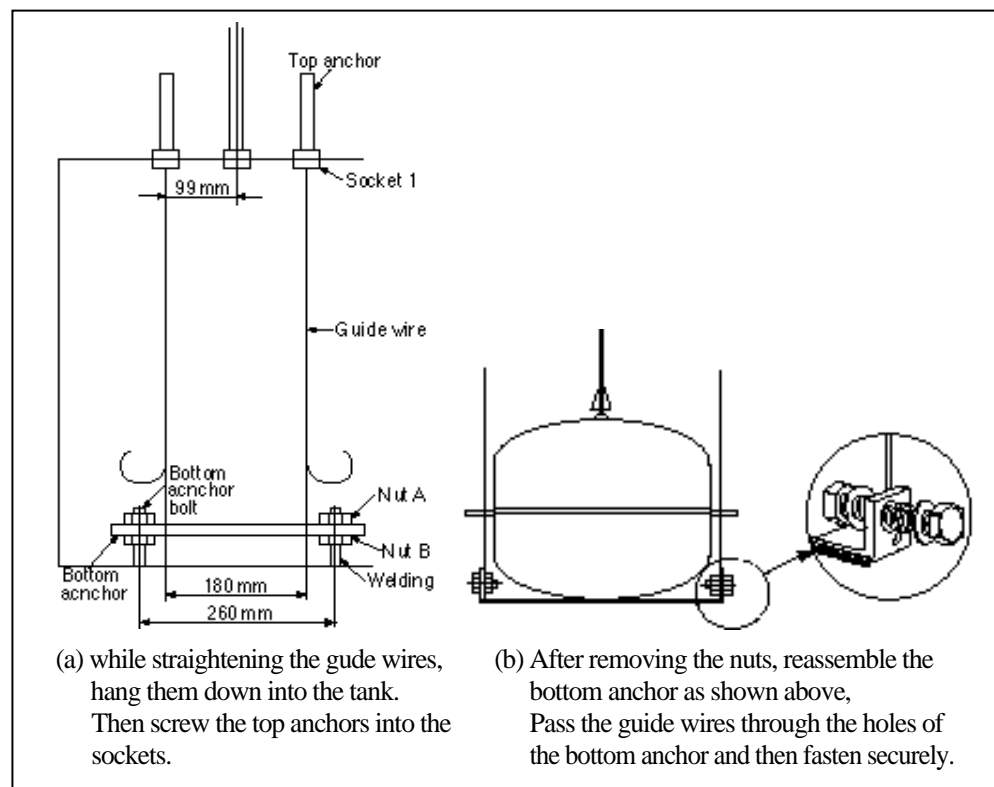


Fig. 2 Stretching Guide Wires

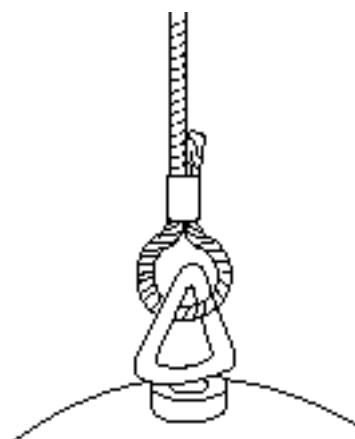
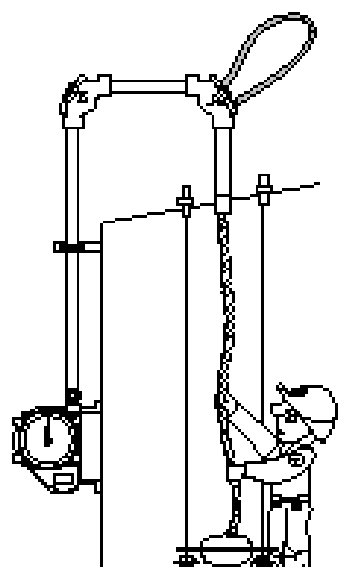
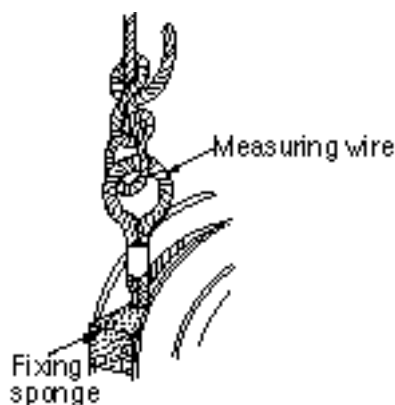
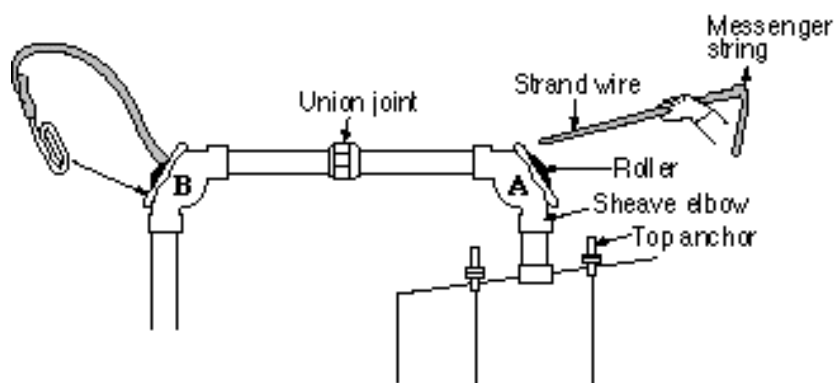
Remarks

- * Take care not to fold or bend the guide wires.
- * Stretch the two guide wires in parallel with each other.
- * For fastening the guide wires to the bottom anchor, fold the tips of the guide wires so that they are not caught in the guide rings of the float.
- * After the guide wires have been fixed to the bottom anchor, check anchoring strength. It is rather difficult to repair them on the tank bottom after the tank is filled with a liquid.

Stretching Measuring Wire

For Tand Tank

- (1) Open the covers of the gauge head and sheave elbows. Straighten a strand wire and pass it from sheave elbow A to sheave elbow B.
- (2) After folding the strand wire several turns, pass it from sheave elbow B to the gauge head (make sure that the messenger string is properly passing on the roller).
- (3) Disconnect the strand wire (passed from sheave elbow B) from the messenger wire. Connect the messenger wire to the measuring wire, (Do not discard the strand wire since it is used once again)
- (4) Connect the strand wire to the messenger string and pass it from sheave elbow A into the tank.
- (5) Pull the messenger string into the tank. The messenger wire is pulled upward by a force of approx. 1 kg, in this condition. Therefore, do not release the messenger string and measuring wire until it is connected to the float.
- (6) After disconnecting the messenger string, displace the crash-joint sleeve upward and connect the measuring wire to the float. Then, move the crash-joint sleeve downward and crash its central portion to prevent the measuring wire from being disconnected.
- (7) Finally, make sure that the measuring wire is properly passing on the rollers in the sheave elbows and close the covers of the sheave elbows. If the fixing sponge (black piece measuring about 16 x 16 x 16 mm) remains in the gauge head, remove it and close the rear cover of the gauge head.

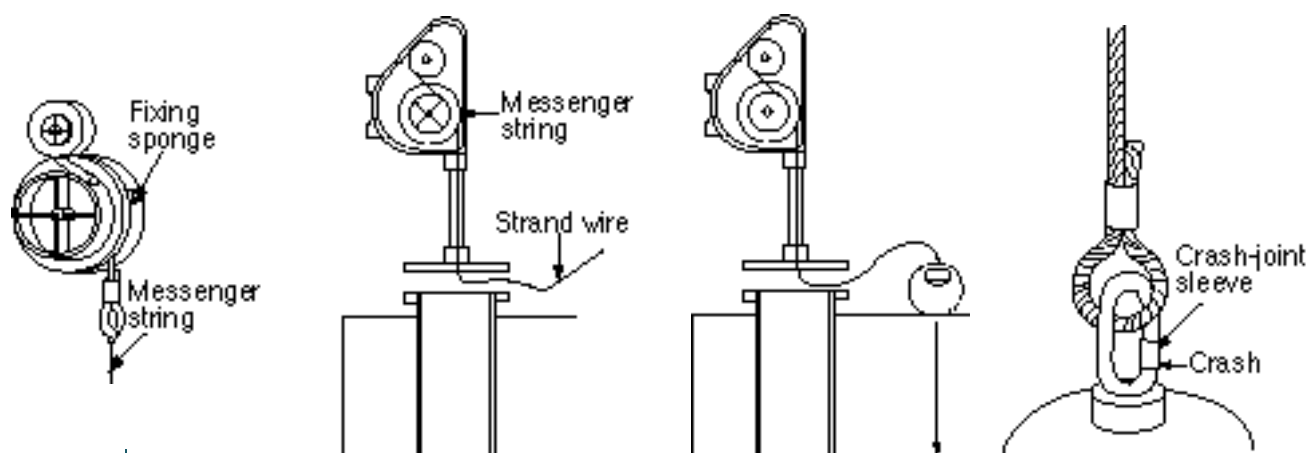


For Level Gauge with Protective Pipe

- (1) After opening the rear cover of the gauge head, connect the messenger string to the measuring wire.
- (2) After connecting a strand wire to the messenger string, pass it from the gauge head as shown on the right side.
- (3) Pull the messenger string until the measuring wire passes through the flange. Disconnect the messenger string and connect the measuring wire to the float. Since the messenger string is pulled upward by a force of approx. 1 kg, do not release the messenger string and measuring wire until the measuring wire is connected completely to the float.
- (4) After displacing the crash-joint sleeve upward, connect the measuring wire to the float. Then move the sleeve downward and crash its central portion to prevent the measuring wire from being disconnected.
- (5) While grasping the measuring wire by hand, carefully hang the float down into the protective pipe until the float reaches the tank bottom.
- (6) If the fixing sponge (black piece measuring about 16 x 16 x 16 mm) remains in the gauge head, remove it and close the cover of the gauge head.

Remarks

- * Take care not to fold or injure the measuring wire.



Calibration

After removing the indicator cover, detach the indicator pointer by pulling it toward you. Then set the indicator pointer in calibrated position by one of the methods instructed below :

(1) Calibration by actual measurement

Fill the tank with actual measuring liquid, desirably to its middle depth. However, calibration is possible when liquid level is very low or close to the upper limit.

By using an accurate measuring tape (JIS Class 1 or equivalent), measure the liquid level a few times so as to obtain a reliable mean value. Set the indicator pointer in calibration with the mean value obtained in this way.

(2) Calibration by calculation (for empty tank)

When the tank is kept empty, calculate value L_f by the equation given below and set the indicator pointer in calibration with the value thus determined.

When liquid level reaches L_f , the float starts floating and the gauge should be placed in operating condition for continuously reading accurate liquid levels.

$$L_f = h + \frac{W - W_1 - Q}{A} \text{ (cm)}$$

Where

h : Lower half height of float10 cm

w : Float weight ... ()g (see Table)

w_1 : Force applied by conster spring ... 1000 g

 : Specific gravity of actual measuring liquid ... ()g/cm³

Q : Lower half volume of float ... 1355 cm³

A : Sectional area of float cylinder ... 154 cm²

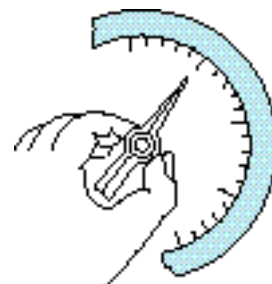


Table. Float Weight as Function of Specific Gravity of Measuring Liquid

Specific Gravity	0.5 ~ 0.93	0.94 ~ 2.0
Float Weight (Allowance : ± 0.3 kg)	2.1 kg	2.4 kg

(3) Calibration in water filling test

The indicator can be calibrated in the convenience of water filling test of the tank. For this purpose, measure water level by using a measuring tape or glass gauge and set the indicator pointer at the measured value. Then correct difference in submersion depth of the float between water (specific gravity = 1) and actual measuring liquid by using the following formula :

$$L_b = \frac{W - W_1}{A} \left(\frac{1}{L} - 1 \right) (\text{cm})$$

Where

: Specific gravity of actual measuring liquid ... () g/cm³

A, W and W₁ : Same as those defined for equation in (2) above.

After calibrating the indicator pointer with the water level actually measured, calculate value L_b. If it is positive, add it to the measured water level. If it is negative, subtract its absolute value from the measured value. Finally, calibrate the indicator with the liquid level determined in this way.

After the level gauge has been mounted and adjusted as instructed above, it can read accurate liquid levels without requiring any operation or routine maintenance.

For prolonging service lives of the parts (depending on ambient conditions and operating frequency), however, check the level gauge as detailed in the table below :

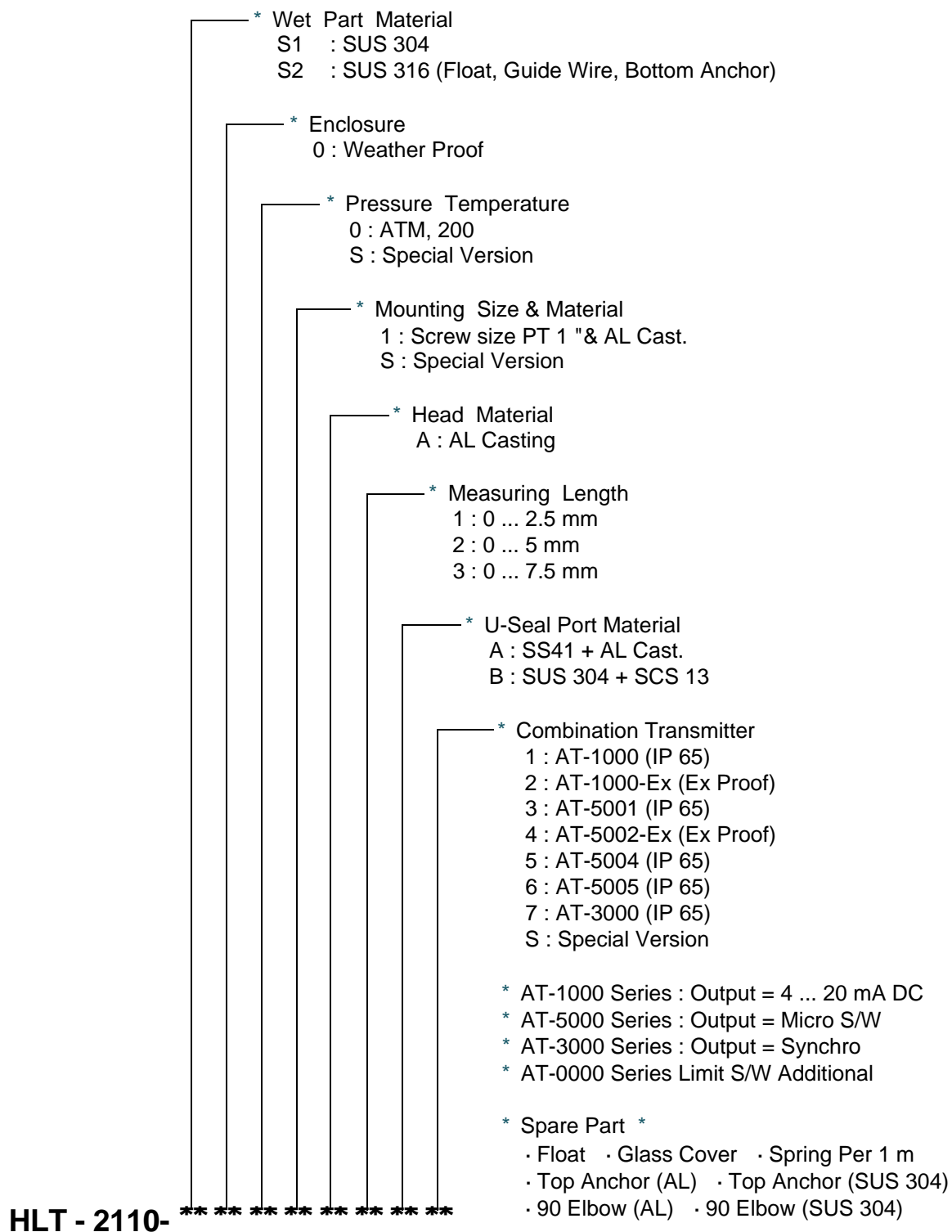
Operation and Maintenance

Check Item	Check Procedure
Deterioration of conster springs	Check surfaces of the conster springs for accumulation of foreign matters and cracks. Remove foreign matters if accumulated, or replace spring if cracked.
Water drop or dimming on indicator window	Check the indicator cover for water tightness and foreign matters caught on the gasket surface.

Trouble shooting

Symptom	Possible Cause	Corrective Measure
Indication does not change at all	1) Measuring wire broken 2) Conster spring broken 3) Float sinks	1) Replace measuring wire 2) Replace conster spring 3) Replace float
Frequent indication errors	1) Conster spring deteriorated 2) Indicator pointer loosened	1) Replace conster spring 2) Remove indicator cover and check pointer
Indication deviates from liquid level actually measured	1) Level gauge faulty 2) Level gauge not faulty	1) Check and replace parts as instructed above 2) Measurement inaccurate <ul style="list-style-type: none"> Measuring technique unskillful Sludge accumulated on tank bottom Strong wind affects measurement Error due to measuring scale

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