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INSTRUCTION MANUAL

Thermal Dispersion Type Level Switch

HTML-S

Doc. no. : HTML-S_Kor_2016, Rev. 0
Issued date : 2016. 11

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1. Introduction

This document describes the operating principles of HTML-S, which is a thermal dispersion-type level switch; the procedures for its installation, operation, and maintenance; and the procedures for troubleshooting. This level switch is designed to detect and output existence/inexistence of fluid, which is output to the contact point of a relay.

2. Operating Principles

This level switch utilizes two types of RTD sensors, namely reference RTD and active RTD, for measuring fluid levels. The reference RTD sensor measures the fluid temperature, while the active RTD sensor having a hot-wire measures temperatures higher than the fluid temperature. When the level of the measured fluid is detected by the level element, the temperature of the active RTD changes because the caloric value of the heater is transferred to the measured fluid through the area where the level element contacts the measured fluid. At this time, △T, the difference in the measured temperatures between the reference RTD and the active RTD, is formed. Then, the level transmitter determines if fluid is detected based on the △R of the RTD sensors with regard to △T, and outputs the contact point of the relay.

3. Specifications

3.1 Input power voltage: 110–130 VAC, 50–60 Hz, ±10%, 10 W maximum.

3.2 Number of sensor lines: 1

3.3 Measurable fluid: Liquid

3.4 Measurement method: Thermal dispersion–type

3.5 Depth of the level measuring sensor insertion: Variable depending on the pipe size (user specifiable)

3.6 Operating pressure: Max 10 bar (higher pressure available upon user's request)

3.7 Operating temperature: −40℃ to +75℃

3.8 Response time: 1–100 sec (user specifiable)

3.9 Output signal: Relay 1 DPDT

3.10 Capacity of output contact point: 5 A 30 VDC, 5 A 250 VAC

4. Terms and Definitions

4.1 HTML-S

This refers to the thermal dispersion-type level switch.

4.2 Level Element (L/E)

The L/E is a device that detects the actual fluid.

4.3 Level Transmitter (L/T)

The L/T detects and outputs existence/inexistence of fluid from the data collected from the L/E, and outputs the result to the contact point of the relay.

4.4 Sensors

Sensors are core parts of the L/E, and are categorized into active sensors (Sa) and reference sensors (Sr).

4.5 Sa and Sr

Sa and Sr refer to active sensor and reference sensor, respectively. They are sensors for measuring temperature of heaters and air, respectively.

4.5 Ra and Rr

They refer to resistance values of Sa and Sr, respectively.

4.6 ΔR

This refers to the difference between Ra and Rr (Ra−Rr = ΔR).

4.7 Va and Vr

They refer to the voltage values in electrical signals converted from Ra and Ra, respectively.

4.8 Vd

This refers to the difference between Va and Vr.

5. Composition

This level switch comprises and L/E and an L/T. The L/E detects the actual fluid, while the L/T detects and outputs existence/inexistence of fluid from the data collected from the L/E, and outputs the result to the contact point of the relay.

This instrument is available in two types: all-in-one type and stand-alone type.

The all-in-one type comprises the L/E and the L/T as integrated with the following details.

5.1 The L/E comprises an Sr and Sas of which the number depends on the number of lines.

5.1.1 Sr: The Sr, which comprises an RTD, measures fluid temperature.

5.1.2 Each Sa, which comprises an RTD and a heater, measures temperatures higher than the fluid temperature.

5.2 The L/T comprises two boards: a power board and a relay board.

5.2.1 Power Board: This board supplies power to the boards at constant voltages and at constant currents.

5.2.2 Relay Board: This board outputs signals of calculated data to the contact point of the relay.

The stand-alone type comprises the L/E and the L/T as separated from each other with the following details:

5.3 The L/E details are the same as those of 5.1.

5.4 The L/T comprises a board, which controls both the input and output.

6. Testing Instruments

6.1 MTLM-S 1 Set (Stand-alone or All-in-one type)

6.2 Multimeter 1 EA

6.3 Decade box 2 EA

7. Wiring for Functional Test

7.1 For wiring, refer to the attached wiring diagram.

7.2 For wiring of the thermal dispersion-type level switch, use cables which conform to the product specifications of our company. In addition, special care should be taken in case cables are joined midway.

7.3 For the cable connecting to the L/E, use a core conforming to the specifications of our

company to minimize noise of the signal line by mitigating EMI, etc.

7.4 For the functional test, the detailed wiring shall be as follows:

7.4.1 Remove the sensor lines from the terminal block, and connect the decade box.

7.4.2 Connect the power to terminals AC1−AC2 of the terminal block.

8. Checkpoints for Functional Test

8.1 Check the testing instruments.

8.2 Check the calibration period of the testing instruments.

8.2.1 Simulator (Decade box)

Check that it satisfies the resistance range, and that its calibration period has not expired.

8.2.2 Multimeter

Check that its calibration period has not expired.

8.3 Check the L/E.

Check the resistance values of the sensors and the heater.

8.3.1 Resistance range of the sensors and the heater

1) R_A: 1,000 Ω = 0℃, ∴ △3.76 Ω/℃ (e.g., 20℃ = 1,075.2 Ω ± 1%)
2) R_R: 1,000 Ω = 0℃, ∴ △3.76 Ω/℃ (e.g., 20℃ = 1,075.2 Ω ± 1%)
3) Heater: 220 Ω ± 1%

8.3.2 Check the output current of the heater.

Apply power to the L/T (warm-up: 20 minutes), and measure the output current at the power supply terminal for checking that it is 75 mA ± 1%. (Use of variable resistor, R2) If the current is beyond the range, adjust it by using R2.

8.4 Check voltage at the TP (test point) of the power board.

8.4.1 Act. At the RTD of 1,000 Ω, check if the voltage between TP1 and TP3 is 0.5 V. If the voltage is beyond the range, adjust it by using R35.

8.4.2 Ref. At the RTD of 1,000 Ω, check if the voltage between TP2 and TP3 is 0.5 V. If the voltage is beyond the range, adjust it by using R23.

8.4.3 Act. At the RTD of 1,500 Ω, check if the voltage between TP1 and TP3 is 4.5 V. If the voltage is beyond the range, adjust it by using R34.

8.4.4 Ref. At the RTD of 1,500 Ω, check if the voltage between TP2 and TP3 is 4.5 V. If the voltage is beyond the range, adjust it by using R22.

9. Procedures for Functional Test

9.1 Functional test

9.2 In the dry state, the normal LED condition is that only the green LED is turned on.

9.3 In the program, the △R of the relay operation is set at 50 Ω. Resistance higher than △R leads to the dry state, and resistance lower than △R leads to the wet state. (△R 50Ω: Active resistance 1050 Ω, reference resistance 1,000 Ω.)

9.4 When the Active and the Reference resistance values of the Decade box are set 1,060 Ω and 1,000 Ω, respectively, if only the green LED is turned on, it means the instrument is normal. If the LED is changed to red, you must repeat the procedures of 8.4 again.

9.5 Set the Active and the Reference resistance values of the Decade box at 1,040 Ω and 1,000 Ω, respectively, and check that the green LED is changed to red. If the LED is not changed into red, you must repeat the procedures of 8.4 again.

9.6 If the measurement subject is not detected, the green LED will be turned on, and the terminals B1 and C1, as well as B2 and C2 of the terminal block from which relay contact point is output, are connected.

9.7 If the measurement subject is detected, the green LED and the red LED will be turned on, the green LED will blink after the delay time set at the timer, and the terminals A1 and C1, as well as A2 and C2 of the terminal block from which relay contact point is output, are connected.

9.8 The test procedures and the time constant are the same for both the all-in-one type and the stand-alone type.

10. Precautions

10.1 Precautions for handling and storage.

10.1.1 Do not knock down the product or give a strong impact.

10.1.2 Do not bend the sensor part.

10.1.3 Items that may cause harmful corrosion during storage

10.2 Precautions for wiring

10.2.1 Wire the cables to the terminal block by referring to the attached wiring diagram.

10.2.2 Take care in wiring, because miss-wiring may lead to malfunction of the instrument.

10.2.3 Check the wired cables at regular intervals.

10.2.4 Wiring should be carried out by a qualified person.

10.2.5 Use the terminal lugs supplied by HITROL.

10.3 Precautions for installation.

10.3.1 When flanges or screws are used for fastening, the size should be the same.

10.3.2 The user should place a washer between each bolt and nut to prevent loosening

10.3.3 When fastening flanges to each other, gaskets should be used.

10.3.4 The power should be supplied when the installation has been completed and the cover has been fastened.

11. Installation method

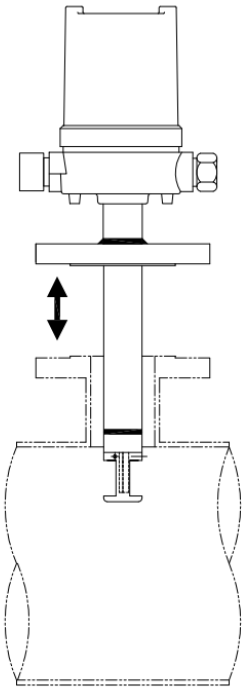
11.1 Installation method of HTML-S

11.1.1 Check the flow direction before inserting the product into the user nozzle.

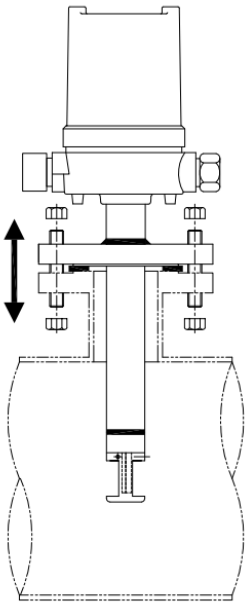
11.1.2 Check the flow direction and insert it into the user nozzle. (See Figures below)

11.1.3 After inserting the product, fasten bolts and nuts.

11.1.4 In case of separation, perform the above method in reverse order.



<Figure1>



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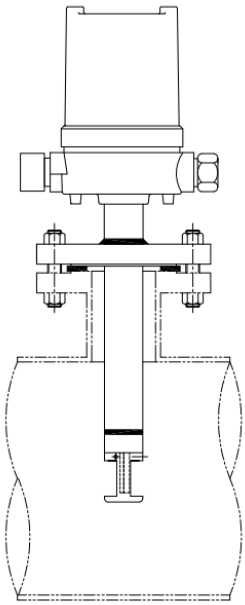
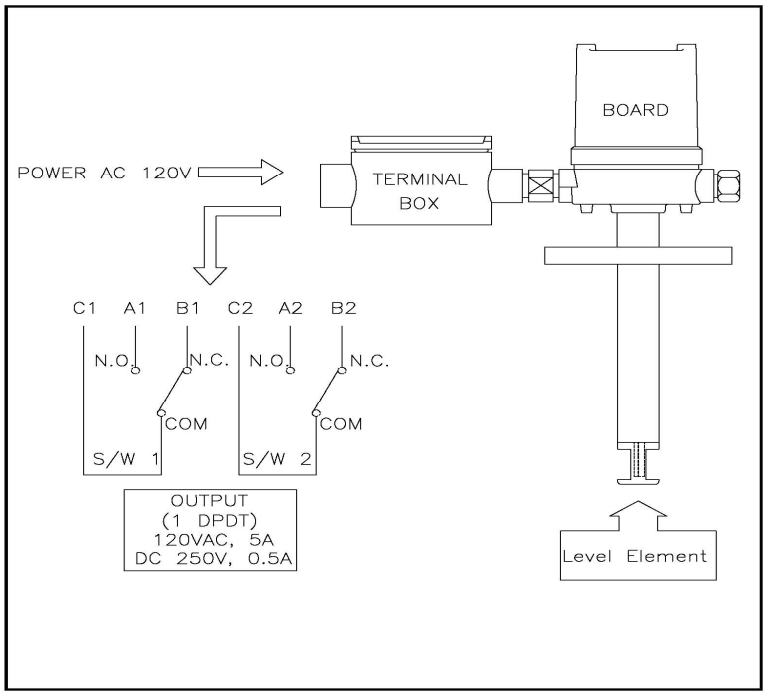
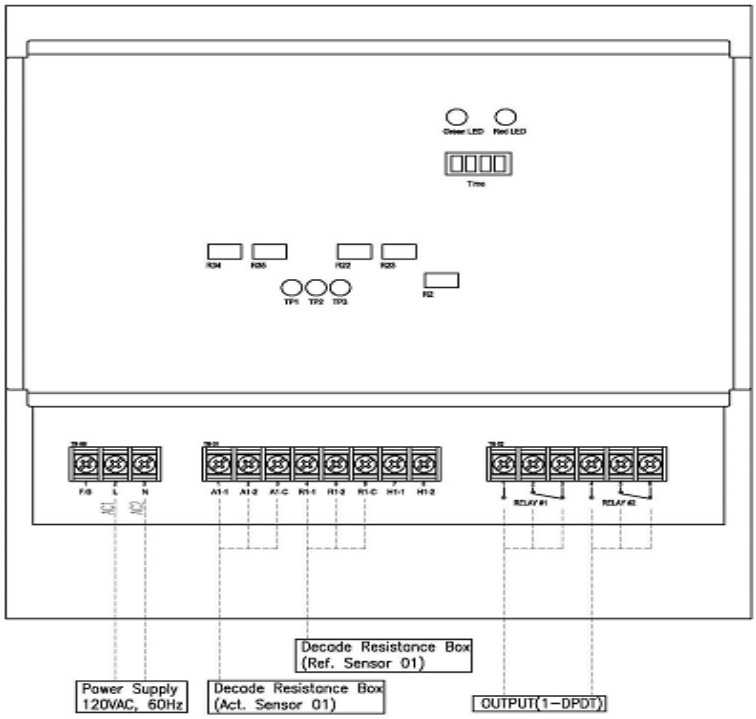


<Figure3>

12. Appendix


BOARD
POWER AC 120V
TERMINAL BOX
C1 A1 B1 C2 A2 B2
N.O
N.C.
N.O
N.C.
COM
COM
S/W 1
S/W 2
OUTPUT
(1 DPDT)
120VAC, 5A
DC 250V, 0.5A
Level Element


Decode Resistance Box
(Ref. Sensor 01)
Power Supply
120VAC, 60Hz
Decode Resistance Box
(Act. Sensor 01)
OUTPUT(1-DPDT)