THERMAL DISPERSION TYPE
FLOW & LEVEL INSTRUMENTS

HITROL

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◇ THERMAL DISPERSION TYPE FLOW METER

🌱 Overview

HTMF-MF is a multipoint thermal dispersion–type gas flow meter. It enables measuring of gas flow even at an installation location where flow distribution is not even based on multipoint gas flow measurements.

It is designed to have a microprocessor in the flow transmitter for high accuracy and a self-diagnosis function. It is also designed such that it can measure flow continuously by excluding abnormal sensors when some of the multipoint sensors of the flow element become abnormal.

🌱 Operating Principle

Each flow element of this flow meter comprises a reference sensor and an active sensor, which utilize a reference RTD and an active RTD, respectively. The reference sensor measures the fluid temperature, while the active sensor having a heater measures temperatures higher than the fluid temperature. When flow occurs in the fluid, the temperature measured by the active sensor drops, which generates temperature difference, $\triangle T$, between the reference sensor and the active sensor. The flow element converts $\triangle T$ into resistance element $\triangle R$ from the reference RTD and the active RTD, and sends $\triangle R$ to the flow transmitter. The flow transmitter calculates mass flow and volume flow from $\triangle R$ and its relationship with gas mass.

🌱 Specifications

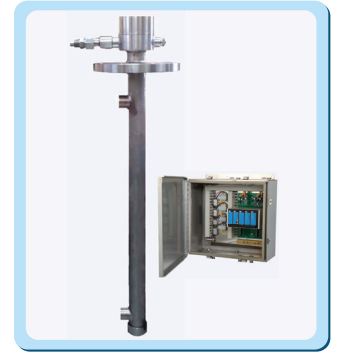| Model	HTMF-MF
Flow Measurement Range	0.1~100,000 SCFM (User Specifiable)
Input Power Voltage	110~130VAC, 50~60Hz, 10%, 20 watts maximum.
Number of Sensor Lines	1~8 (User Specifiable)
Measurable Fluid	Gas (Air, Nitrogen, Oxygen, Carbon Dioxide, Methane, etc.)
Output Signal	DC 4~20mA
Operating Pressure	Max. 10 bar (Higher pressure is as available.)
Operating Temperature : Element	-5^oC ~ 150^oC
Transmitter	0^oC ~ 60^oC
Accuracy	±1.0% FS
Repeatability	±0.5% FS
Response Time	Max. 1.0 sec.
Straight Pipe Run	Upstream : 15D, Downstream : 10D (Min. Upstream : 5D, Min. Downstream : 3D)

🌱 Test

Radiation Test

Dynamic Test

◈ THERMAL DISPERSION TYPE LEVEL TRANSMITTER

🌱 Overview

HTML-TC is designed to measure the liquid level and out the signal. Display through the LCD of the HHT-2000 Loader as well as analogue signal is available.

🌱 Operating Principle

This level transmitter utilizes two types of RTD sensors, namely reference RTD and active RTD, for measuring liquid levels. The reference RTD sensor measures the fluid temperature, while the active RTD sensor having a heater measures temperatures higher than the fluid temperature. When the level of the measured fluid changes, the temperature of the active RTD changes by 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. The level element measures △R for △T, and sends the measured △R to the level transmitter. The level transmitter calculates the level from the received △R, and converts it the level as the output signal. It is designed to have a microprocessor in the flow transmitter for high accuracy and a self-diagnosis function. It is also designed such that anomalies of the level sensor and the boards inside the transmitter can be checked with the LED display of the level transmitter and the HHT-2000 loader.

🌱 Specifications

Model	HTML-TC
Level Measurement Range	10cm ~ 300cm (User Specifiable)
Input Power Voltage	110~130VAC, 50~60Hz, 10%, 20 watts maximum.
Measurable Fluid	Liquid
Output Signal	DC 4~20mA
Sensor Insertion Length	Depending on the pipe size (User Specificable)
Operating Pressure	Max. 10 bar (High Pressure is also available).
Operating Temperature : Sensor	-20°C ~ 230°C
Transmitter	0°C ~ 60°C
Accuracy	±1.0% FS
Repeatability	±0.5% FS
Unit of Liquid Level	Percentage of the total range (%)

🌱 Qualification

This level transmitter is designed to measure the liquid level and out the signal. Display through the LCD of the HHT-2000 Loader as well as analogue signal is available.

◉ Environmental & Dynamic Qualification

Conditions	Normal	Accident
Duration (Year)	40	1
Pressure (psig)	0.0	60 (Max.)
Temperature (deg.F)	5 to 120	360 (Max.)
Relative Humidity (%)	5 to 90	100 (Max.)
Radiation, TID (Gy)	2 x 10^5	2 x 10^6
Seismic	-	IEEE 344
Design Basis Event	-	LOCA/MSLB
Applicable Codes		

◉ Software Verification and Validation (V&V)

◉ Electro Magnetic Interference (EMC) and Radio Frequency Interference (RFI)

CERTIFICATE OF RADIATION PROCESSING

Radiation Test

Thermal Aging Test
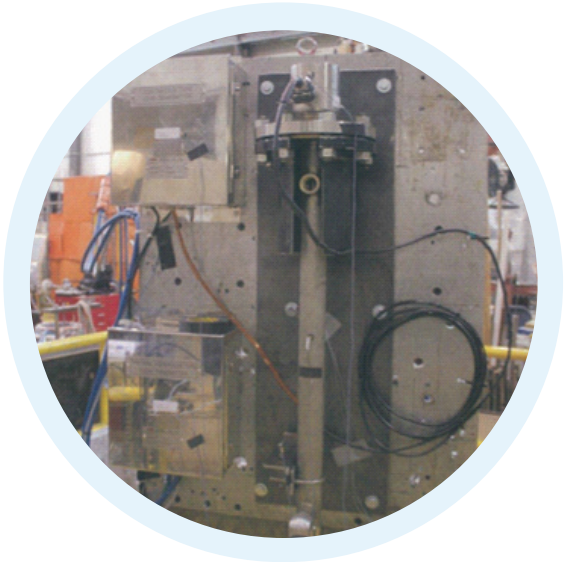
Dynamic Test

LOCA Test

Application

SHIN-HANUL NUCLEAR POWER PLANT #1,2

BARAKA NUCLEAR POWER PLANT #1,2,3,4

◈ THERMAL DISPERSION TYPE LEVEL TRANSMITTER

HTML-TM is a thermal dispersion–type multipoint level meter that measures the level of liquid or suspension with a level element. It is designed to have a microprocessor in the level transmitter for high accuracy and a self-diagnosis function. It is also designed to have an LCD text interface such that it can identify problems rapidly and respond thereto adequately with an error LED or HHT-2000 (loader) when some of the multipoint sensors of the level element become abnormal.

Operating Principle

The level element of this level meter comprises a reference sensor and an active sensor, and utilizes RTDs and a heater. The reference sensor measures the fluid temperature, while the active sensor having a heater measures temperatures higher than the fluid temperature. Because thermal dispersion varies depending on the different densities of two media, which are the measurement subjects, the temperature between the reference sensor and the sensor, $\triangle T$, varies as shown in Figure 1.1. $\triangle T$ is converted by the RTD into $\triangle R$ (resistance difference) and sent to the level transmitter. The level transmitter calculates the relationship between the densities of the media based on $\triangle R$, and determines the measurement subjects.

Delta_T (^{o}C) — AIR — WATER — RESIN — AIR — STATE DISPLAY
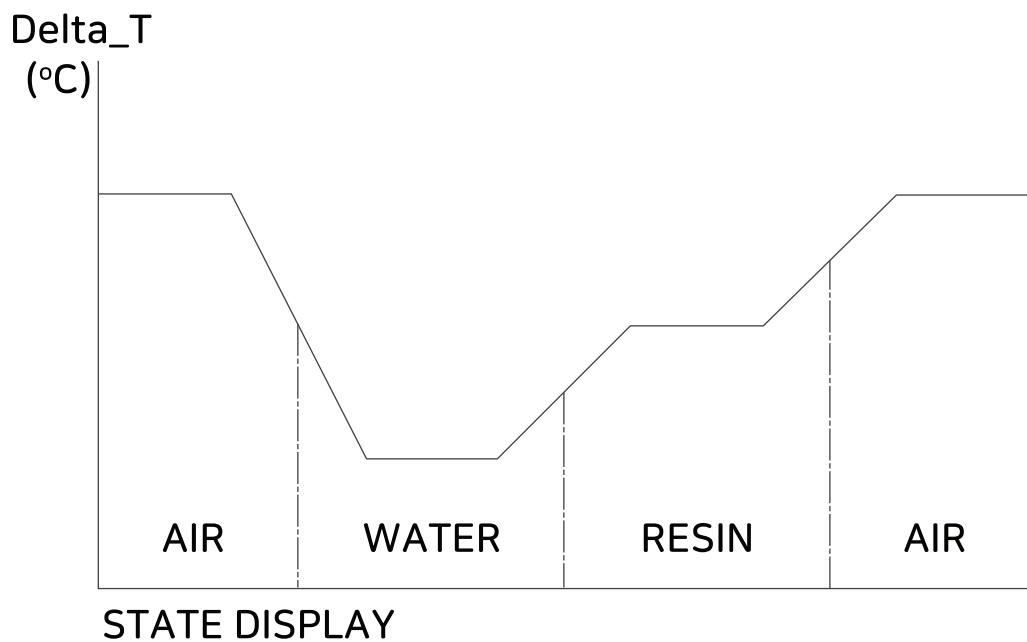
Specifications

Model	HTML-TM
Measurement Range	User Specifiable
Input Power Voltage	90~240VAC, 50~60Hz, 10%, 10 watts maximum.
Number of Sensor Lines	1~7
Measurable Fluid	Gas, Liquid and Suspension
Output Signal	DC 4~20mA, Alarm (1-DPDT and 3-SPDT)
Operating Pressure	Max. 10 bar (Higher pressure is as available.)
Operating Temperature : Element	-5^oC ~ 150^oC
Transmitter	0^oC ~ 60^oC
Accuracy	±1.0% FS
Response Time	As low as 5.0 sec. (1″/min decrease)

◈ THERMAL DISPERSION TYPE LEVEL SWITCH

🍃 Overview

HTML-S is designed to detect and output existence/inexistence of fluid, which is output to the contact point of a relay.

🍃 Operating Principle

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, $\triangle T$, 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 $\triangle R$ of the RTD sensors with regard to $\triangle T$, and outputs the contact point of the relay.

🍃 Specifications

Model	HTML-S
Input Power Voltage	110~130VAC, 50~60Hz, 10%, 10 watts maximum.
Number of Sensor Lines	1
Measurable Fluid	Liquid
Measurement Method	Thermal Dispersion Type
Output Signal	1-DPDT
Operating Pressure	Max. 10 bar (Higher pressure is as available.)
Operating Temperature	-40°C ~ +75°C
Response Time	1~100 sec. (User Specifiable)
Contact Rating	AC 250V 5A, DC 30V 5A

🍃 Installation

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

2. Check the flow direction and insert it into the user nozzle.

3. After inserting the product, fasten bolts and nuts.

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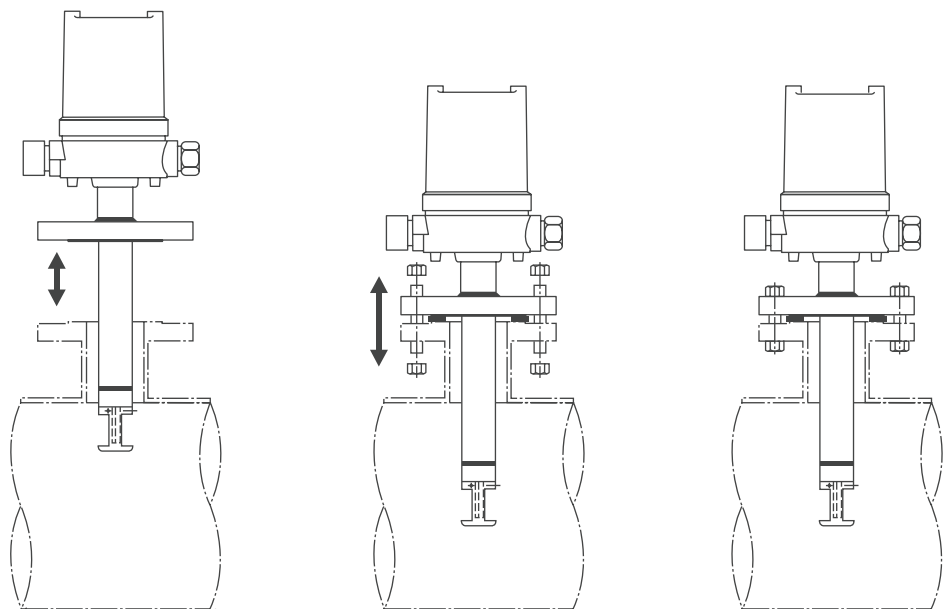
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