11. Appendix3—RTD Module and PT100 Wiring (Module optional)

Note: For SIERRA 205, there are 2 methods to perform energy meter function:

1. If the customer does not select the RTD module, then the AI1 AI2 (4~20mA input ports) are open to connect temperature transmitters supplied by the customer.
2. If the customer chooses to select the RTD module, then the AI1, AI2 inputs can not be used.

11.1. RTD Energy Meter Function

The RTD Module's main function is to input the temperature values for the energy measurement. The SIARRA 205 can automatically calculate the caloric content of water at different temperatures and deriving an instantaneous energy value and totalized energy value. Customers can connect PT100 sensors to the RTD module. The RTD module can convert the signals of temperature transducers to 4-20mA current signals and input them to the flow meter transmitter, or through the temperature transmitter to input 4-20mA signals directly (when RTD function is unavailable, use the ANALOG input).

Caution

When using direct RTD input, the usage of the ANALOG IN Input to the transmitter's power supply board is forbidden.

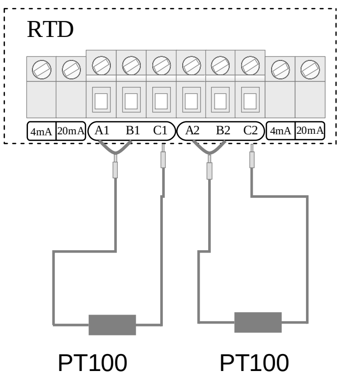
11.2. Wiring

There are 2 wiring methods for the RTD module and PT100 temperature sensors — two-wire and three-wire connections.

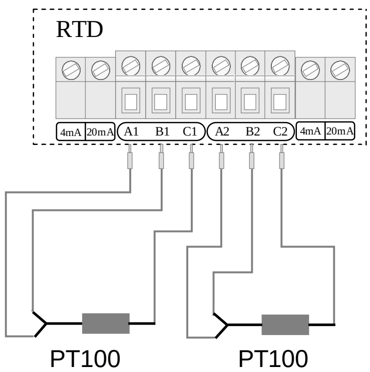
When wiring with two wires, first jumper across A1 and B1and A2 and B2 respectively, then connect PT100 sensors and to the RTD module according to the following diagram on the left. (Note: A1B1, A2B2 and C1C2 have the same wire color).

To connect the three wires, directly connect the PT100 sensors to the RTD module according to the following diagram on the right. (Note: A1, A2, B1, B2 are the same color, C1 and C2 are the same color).

RTD board can be adjusted by 4~20mA ports, the calibration has been completed in factory.



Two wire connection



Three wire connection

The two PT100 temperature sensors are installed on the inlet and return pipes and they will input temperature signals to the SIERRA 205 transmitter.

11.3. Energy Measurement Methods

There are 2 formulas for flow meters to perform energy measurement functions:

Formula 1: $Q = V \times C \times (T_1 - T_2)$

Q—Energy Value

V—Transit time water volume

C—Specific heat of the water

T_1—Temperature value on the inlet side

T2—Temperature value on the return side

Notes:

Select energy units in window M84

Differential temperature: Temperature difference of Analog Input AI1, AI2 (transmitted from 2 temperature sensors)

Specific heat (C): Enter the specific heat in window M86 (generally select the fixed specific heat of 0.0041868GJ/M3 for water.

Formula 2: $Q = m\ (h_1 - h_2)$

Q—Energy value

m—quality of the medium(density× transit time water volume)

h1—enthalpy value of the inlet water

h2—enthalpy value of the return water

The temperature and pressure at the inlet and return water points can be measured by temperature sensors and a transmitter, and pressure sensors and a transmitter. Then the enthalpy value at the inlet and return water points can be calculated through the enthalpy values table. The flow of the medium can be measured via the ultrasonic flow sensors and SIERRA 205 transmitter, and the caloric value can be derived according to the above formulas and the caloric calibration index.

11.4. Temperature Range Adjustment

Temperature signals are input from the 2 PT100 temperature sensors and the values of the measurement range are entered into Windows M63 and M64.

Example: When the PT100 temperature is set to be 0◦C, then the RTD module output is 4mA accordingly; when the PT100 temperature is set to be 180◦C , then RTD module output is 20mA. The 4mA and 20mA corresponding to temperatures 0◦C and 180◦C are entered into window M63. The mADC value and the temperature value of AI1 and AI2 are displayed in Window M06.

Related energy meter windows include:

Window M05: Display transit-time energy value and totalized energy value

Window M06: Display mADC value and the corresponding temperature values of AI1, AI2 or the RTD module

Window M63: Enter the temperature values corresponding to AI1 4mA and 20mA analog inputs

Window M64: Enter the temperature values corresponding to AI2 4mA and 20mA analog inputs

Window M84: Energy units selection

Window M85: Temperature source selection

Window M86: Calorific capacity

Window M87: Energy totalizer switch

Window M88: Energy multiplier

Window M89: Reset energy totalizer

11.5. RTD Module Calibration Methods

There are two methods to calibrate the RTD module (customers can choose the proper one to calibrate according to the actual situation).

Method One: Resistance box calibration method

Note: The purpose is to calibrate the internal circuit of RTD module

Tools needed: one DC resistance box, 3 wires (each wire less than 40mm long), and an instrument screwdriver.

1. RTD module A1 and B1 will need to be jumpered, and then connect B1 to one end of the DC resistance box, and C1 to the other end of the DC resistance box.
2. Power on the SIERRA 205 transmitter, set menu M63 and menu M64 to be "0-180" and then enter menu M06.
3. Set the resistance value of the DC resistance box to be 100.00Ω.
4. Adjust the 4mA potentiometer on the left of A1, and make sure the display of AI1 is 4.0000 (as long as the displayed value is to be 4.00, the latter 2 decimal can be omitted).
5. Set resistance value of the DC resistance box to be 168.46Ω.
6. Adjust the 20mA potentiometer on the left of A1, and make sure the display of AI1 is 20.0000 (as long as the displayed value is to be 20.00, the latter 2 decimal can be omitted).
7. Jumper A2 and B2 the RTD module and then connect B2 to one end of the DC resistance box and C2 to the other end of the DC resistance box.
8. Power on the SIERRA 205 transmitter, set menu M63 and menu M64 to "0-180" and then enter menu M06.
9. Set the resistance value on the DC Resistance box to be 100.00Ω.
10. Adjust the 4mA potentiometer on the right of C2 to make the display of AI2 is 4.0000, as long as the displayed value is 4.00, the latter 2 decimal can be omitted.
11. Set the resistance value of the DC Resistance box to be 168.46Ω.
12. Adjust the 20mA potentiometer on the right of C2 and make sure the display of AI2 reads 20.0000 (as long as the displayed value is to be 20.00, the latter 2 decimal can be omitted).

Method Two: Liquid standard temperature calibration method

Note: It is used to calibrate the internal circuit of RTD module and the PT100 temperature sensors together

1. Directly put the sensor end of a PT100 temperature sensor into a mixture of ice and water (the temperature is 0◦**C**), and the other end connects with the RTD module (adjust the electric potentiometer to 4mA accordingly to ensure the display of M63 is 4.00).
2. After the restoring the temperature sensors back to room temperature, put them into a constant temperature oil/water bath (the temperature is 180◦**C**.) NOTE: The customer can choose the liquid temperature according to the actual requirements. Adjust the 20mA electric potentiometer accordingly to ensure the display in M63 is 20.00.
3. The calibration method of the other PT100 temperature sensor is the same as above.

11.6. Installation of RTD Module

Before installation of the RTD module（as indicated in the picture below）:

Attention

Do not touch or move the red switch, otherwise the RS232 output and the flowmeter will be damaged!

After installation（as indicated in the picture below):

Attention

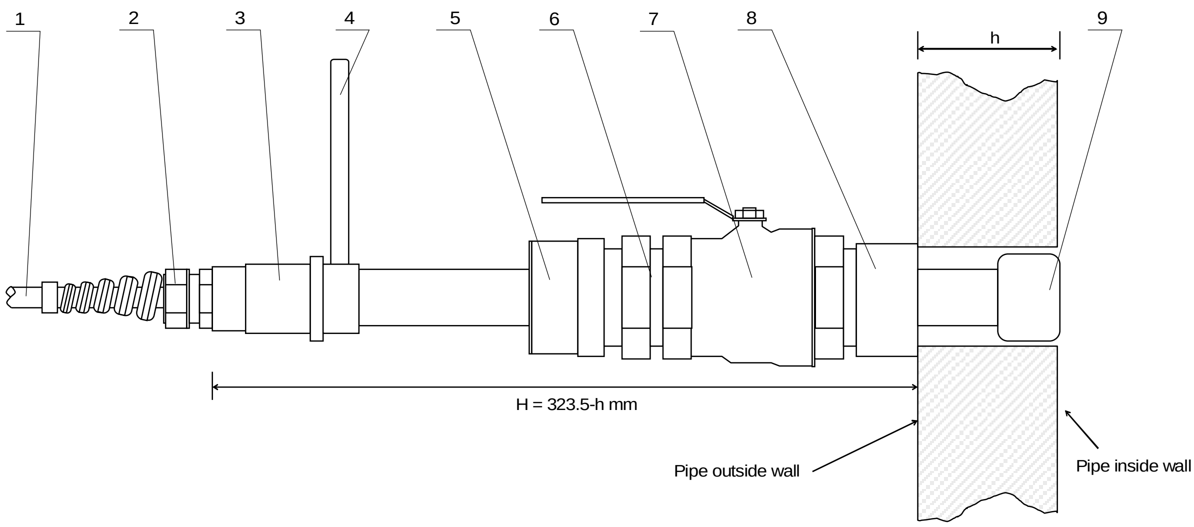
Do not touch or move the red switch, otherwise the RS232 output and the flowmeter will be damaged!

12. Appendix4 - Wetted Transducer

12.1. Overview

Insertion transducers can be installed into metal pipelines via an isolation ball valve (installation into pipelines of plastic or other materials may require an optional coupling). The maximum pipe diameter in which insertion transducers can be installed is DN5000mm. Sensor cable length (9m standard) normally can be extended to as long as 305m. Follow the procedure below to install insertion transducers (If hot tapping is required, refer to the operating instructions of the manufacturer of hot tapping devices. Note that the pipe tap size should not be smaller than φ38mm).

Figure 1 shows a diagram of the Insertion Transducer (Ordering option – W). The insertion transducer is attached to its mounting base (which is welded to the pipe section at the measurement point) via a ball valve. When the transducer is removed, pipe fluids can be contained by shutting off the ball valve. Therefore, installation and extraction of the transducer can be performed without relieving pipeline pressure. An O-ring seal and joint nut guarantee user safety while installing or operating the transducer.



1. Cable
2. Flexed-resistance revolved piece
3. Connector
4. Orientation handle
5. Locating sleeve
6. Joint nut
7. Ball valve
8. Mounting base
9. Transducer housing

Fig.1 Construction Drawing of W type Transducer

12.2. Measurement Point Selection

To guarantee highly accurate measurement results, it is necessary to select an appropriate measurement point before installing the transducer. For examples of measuring point selection, see the related section in the manual.