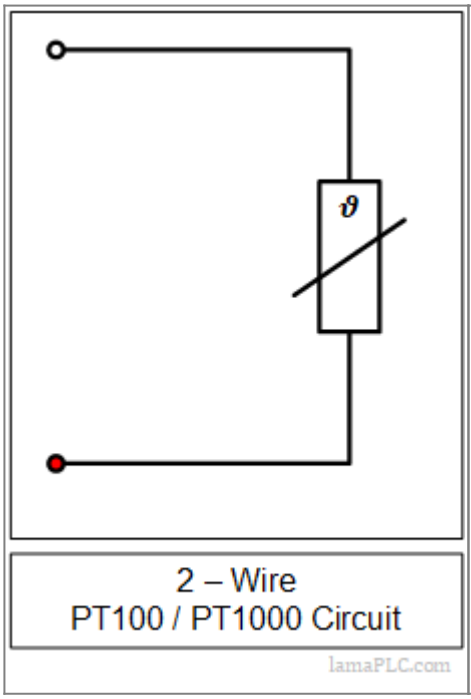
lamaPLC: PT100 / PT1000

The most commonly used method for temperature measurement in industrial technology is the RTD (Resistance Temperature Detector). This type of sensor measures temperature by detecting changes in the electrical resistance of its internal material. As the temperature rises, the resistance of the material also increases, allowing the temperature to be measured. RTDs are typically made of metal, most often platinum, whose resistance varies accurately and predictably with temperature. The most common RTD types are PT100 or PT1000.

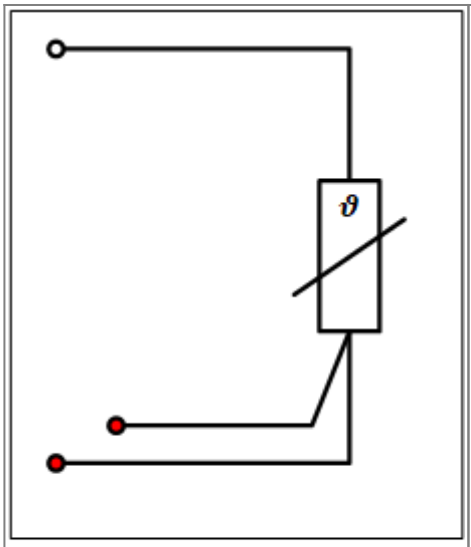
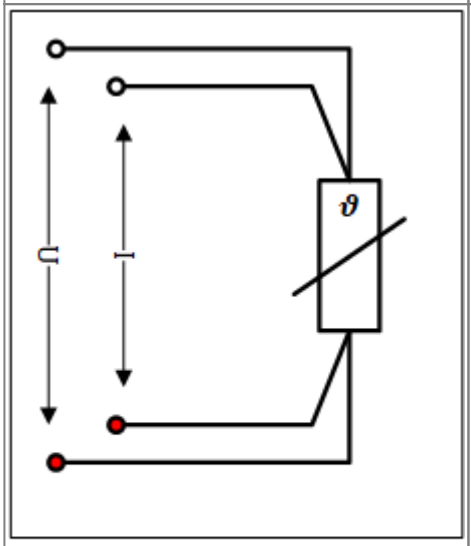
The PT100 is a platinum resistance temperature sensor with a resistance of 100 ohms at 0°C, and it changes linearly with temperature. It is known for high accuracy, stability, and good repeatability, making it popular for industrial temperature measurement. The PT1000, as its name suggests, has a resistance of 1000 ohms at 0°C; however, its operation is identical to that of the PT100.

PT1000 RTDs are less sensitive to temperature changes than PT100 RTDs, meaning they respond more slowly to temperature fluctuations.

PT100 / PT1000 measurements return the measured temperature based on resistance values. The resistance of the wires used up to the measuring point can significantly distort the measurement (especially in the case of longer wire lengths or cross-sections). Therefore, in the case of PT measurements, three wiring solutions are usually distinguished:

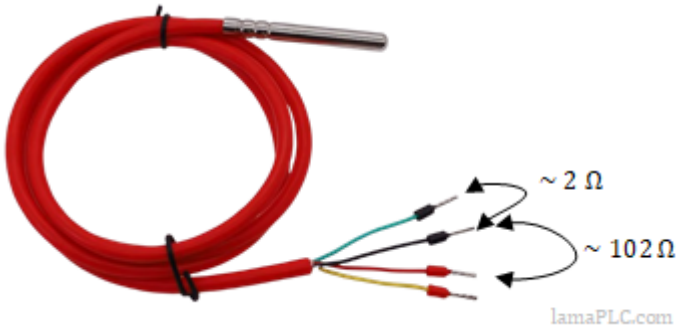


In the case of 2-wire PT100 / PT1000, the resistance of the wire drawn to the measuring point distorts the accuracy of the measurement; therefore, the measurement must be calibrated before use. The easiest way to do this is to replace the measuring unit with a 100 Ω / 1000 Ω resistor. In this case, the measurement will give 0 °C; the measuring system must be calibrated accordingly.

 3 – Wire PT100 / PT1000 Circuit lamaPLC.com	To minimize the influence of cable resistance and its temperature-dependent fluctuations, the 3-wire circuit is frequently used instead of the aforementioned 2-wire circuit. Therefore, an additional cable is led to a contact of the RTD. Thus, two measuring circuits are created, one of which is used as a reference.
 4 – Wire PT100 / PT1000 Circuit lamaPLC.com	The best connection type for resistance thermometers is the 4-wire circuit. The measuring result is neither influenced by the cable resistance nor by its temperature-dependent fluctuations.

PT100 / PT1000 sensor

For example, consider the 4-wire RTD. Each side of the RTD has two wires attached, and each wire may have about 1Ω of resistance. When connected to the amplifier, the smart amp will measure the voltage across the RTD as well as across the wire pairs. For instance, here are the approximate resistances of a 4-wire PT100 RTD at 0°C (for a PT1000, the resistance would be about 1002 Ω rather than 102 Ω).



MAX31865 RTD PT100 or PT1000 Amplifier

Max31865 Rtd Platinum Resistance Temperature Detector Pt100 To Pt1000

The MAX31865 is a user-friendly thermistor-to-digital converter designed for platinum resistance temperature detectors (RTDs). The external resistor determines the RTD sensitivity, and the high-precision Delta ADC converts the RTD resistance ratio into a digital output.

The MAX31865 includes overvoltage protection up to ±45V and features configurable RTD and cable open or short circuit detection. The splitter is 5V compatible and incorporates a 3.3V regulator and level shifting, enabling compatibility with any Arduino or microcontroller. It comes with an assembled RTD amplifier splitter board, two 2-pin terminal blocks for connecting to the RTD sensor, and row pins for insertion into any breadboard or perforated board.

Sources

Pt100 Temperature Sensor in 2-Wire, 3-Wire and 4-Wire Connection:
https://www.sab-cable.com/cables-wires-harnessing-temperature-measurement/technical-data/temperature-measurement-technical-data-instructions/resistance-thermometers/connection-of-resistance-thermometers.html
Adafruit MAX31865 RTD PT100 or PT1000 Amplifier:
https://cdn-learn.adafruit.com/downloads/pdf/adafruit-max31865-rtd-pt100-amplifier.pdf

pt100, pt1000, temperature, sensor, platine, RTD