Temperature Model of Resistive Temperature Sensors

01 NTC Thermistor

1.1 Steinhart-Hart Equation-based Method

$$1/(T+273.15)= A_0+ A_1\times\ln(R) + A_2\times[\ln(R)]^2 +A_3\times[\ln(R)]^3 +A_4\times[\ln(R)]^4$$

T	Temperature, in degrees Celsius (℃)
R	Actual resistance of the sensor, in ohms (Ω)
A_0,..., A_4	Sensor coefficient

1.2 Basic Equation-based Method

$$R= R_0\times \exp[\ B\times(1/(T+273.15)-1/298.15)\ ]$$

T	Temperature, in degrees Celsius (℃)
R	Actual resistance of the sensor, in ohms (Ω)
R_0	Resistance of the NTC thermistor at 25°C, denoted as R(25°C), in ohms (Ω)
B	Sensor β value parameter

C language temperature calculation formula：$T= 1/(1/(298.15) +1/A_1*\ln(R/A_0)) -273.15$

02 PT Platinum Resistance Thermometer

1.1 -200~0℃ Temperature Range

$$R= R_0\times[\ 1+A\times T+B\times T_2+C\times(T-100)T_3\ ]$$

T	Temperature, in degrees Celsius (℃)
R	Actual resistance of the sensor, in ohms (Ω)
R_0	Resistance of the PT at 0°C, in ohms (Ω)
A, B, C	Sensor coefficient

1.2 0~800℃ Temperature Range

$$R = R_0 \times [1 + A \times T + B \times T_2]$$

T	Temperature, in degrees Celsius (℃)
R	Actual resistance of the sensor, in ohms (Ω)
R_0	Resistance of the PT at 0°C, in ohms (Ω)
A, B	Sensor coefficient

03 General polynomial

$$T = A_0 + A_1 * R + A_2 * R_2 + A_3 * R_3 + A_4 * R_4 + A_5 * R_5 + A_6 * R_6 + A_7 * R_7$$

T	Temperature, in degrees Celsius (℃)
R	Actual resistance of the sensor, in ohms (Ω)
$A_0,\ldots, A_7$	Sensor coefficient