I-ANR TEMPERATURE MEASUREMENT WITH PT100/PT1000

Required knowledge PTC, NTC, Ohm's Law, Voltage Divider

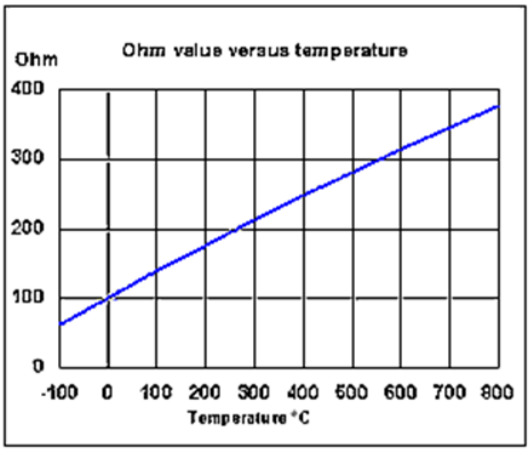
JUST GoogleIt!	**Basic** : Omhs Law, voltage divider PT100, PT1000, Platina, NTC

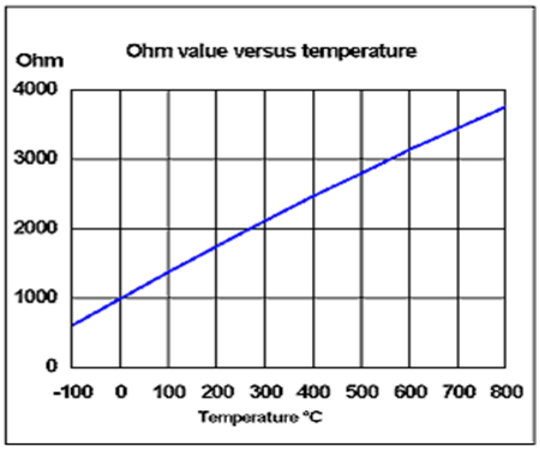
Classic PTC and NTC resistors can be used to switch something at a certain voltage, but due to their non-linearity they are not the obvious choice for temperature measurement over a large range.
PT100 and PT100 are also PTC resistors, but these are almost perfect linear because of the usage of platina.

components

PT1000 temperature sensor	DM-507 Farnell: 7745655
Resistor 1KOhm – 250mWatt	

PT100 & PT1000 sensors come in many shapes. On the left you see a few PT1000 sensors. In the middle and on the right you see these same PT1000 sensors but now built in firm housings so they can be used in industrial environments.



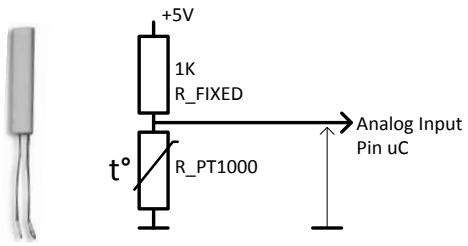


Left: PT100 –exactly 100 Ohm at 0°C

Right: PT1000 –exactly 1000 Ohm at 0°C

We prefer the PT1000 because the current is 10x lower.

1. Our microcontroller can only measure voltages between 0V and 5V on its analog inputs. It can't measure resistance. We need to place our PT1000 in a voltage divider to convert the resistance into a voltage that our uC can measure.



R_FIXED - Kohm	1
PT1000 - Kohm	Analog input pin uC (V)
4	4,00
3	3,75
2	3,33
2,5	3,57
2	3,33
1,5	3,00
1	2,50

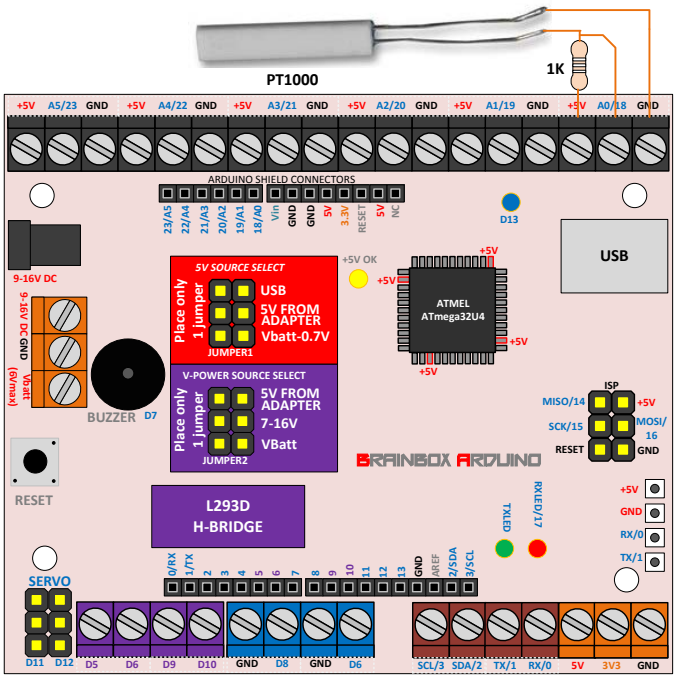
1. The resistance of the PT1000 varies between 4KOhm at 800°C and 600 Ohm at -100°C. We have chosen a fixed resistor of 1KOhm. Use the formula:
   $Voltage\ Analog\ Input\ Pin\ uC = 5V.(\frac{R\_PT1000}{R_{PT1000}+RFIXED})$ to calculate the voltage at any given temperature.

2. This formula can be used to calculate the exact resistance of the PT1000 at any given temperature. Because a PT1000 is not 100% linear, the factors A, B and C are added in this equation.

   Rt = R0 * (1 + A* t + B*t2 + C*(t-100)* t3)

   Rt is the resistance at temperature t
   R0 is the resistance at 0 °C
   A= 3.9083 E-3
   B = -5.775 E-7
   C = -4.183 E-12 (below 0 °C), or
   C = 0 (above 0 °C)

3. Connect the PT1000 to one of the 6 analog inputs (A0, A1, A2, A3, A4, A5)



CODE EXAMPLE: '**I-AN**'