Technical Note

The reason why the shunts feature 5ppm/K

What is Temperature coefficient, ppm/°C

1. Temperature coefficient of resistor

All resistor change resistance depend on the ambient temperature. Fig 1 shows typical resistance change of thin film resistor. A rate of change defines as TCR (ppm/°C). In Fig. 1, 1000 OHM resistance at 20 °C changes to 1001 OHM at 100°C, it is just +0.1% change from 20°C to 100°C. TCR of the resistor is +0.1%/80°C, in other words, 0.00125%/°C. Since [%/°C] notation finds difficulties understanding by many zeros, using ppm is more easy to know.

0.01 = 1% = 10000 ppm.

Then 0.00125%/°C equals 12.5 ppm/°C

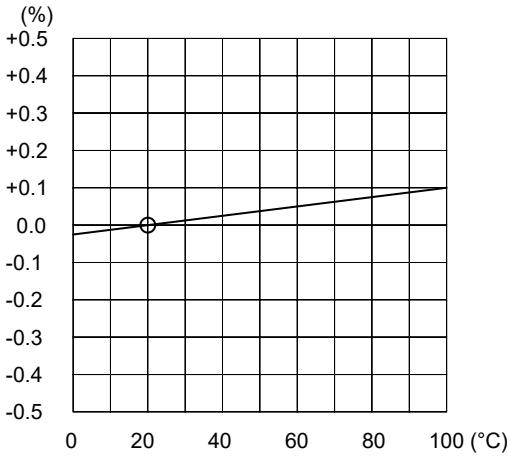

FIG 1. Typical resistance change depend on ambient temperature.

2. TCR of shunt resistor

Usually, metal foil resistor and shunt resistor have a better performance of TCR, it depends on the such material of resistor as Manganin (manganese copper nickel alloy). In this material relation between temperature and resistance change is not linear and is curved as Fig. 2. Then in this case TCR defines under temperature range, in the other word;

from 0°C to 20°C, TCR = +1000ppm/°C/20 = +50ppm/°C,

from 20 to 30 TCR = 0ppm/°C

30°C to 100°C TCR = -2000ppm/°C/70°C = -28ppm/°C

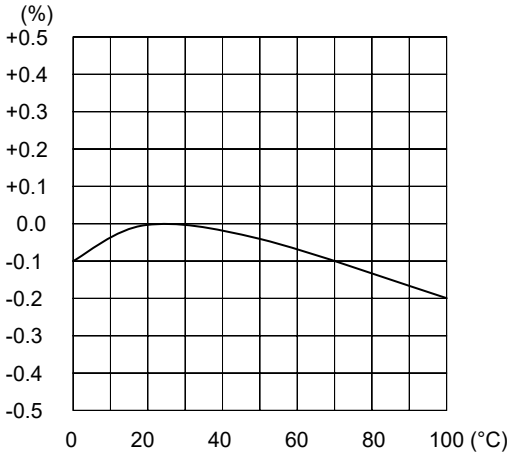

FIG 2. Typical resistance change depend on ambient temperature in typical manganin.

3. TCR of the precision shunt resistor

TCR of the precision shunt resistor is arranged by material of resistor, terminal material, joint structure of terminal and resistive material.

Typical TCR characteristics of resistor material shows Fig. 3.

TCR of shunt resistor made from the material can be specified 5ppm/°C (+/- 2.5ppm) between 0°C to 70°C temperature range.

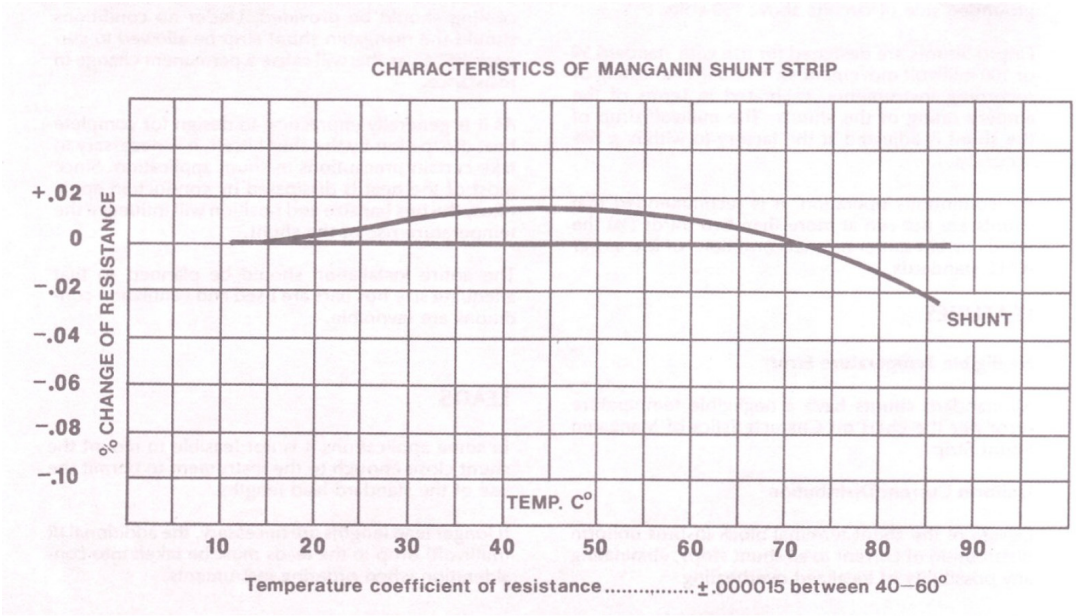

Fig. 3 Temperature characteristics of manganin shunt.

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