RELAYS AND TEMPERATURE VARIATIONS

Most relay parameters are specified as maximum values over the rated temperature range of the specific relay. Users often find that key parameters differ significantly at ambient temperature (20-25°C) and sometimes fall into the trap of specifying their system around these ambient parameters. Additionally the actual temperature experienced by the relay can be far in excess of existing ambient temperatures due to the heat generated by the coil current and the contact load. Figure 1 is the summary of temperature effects on relay electrical characteristics.

Temperature	Resistance	Current	Operating Voltage	Release Voltage	Operate Time	Release Time
Increase	UP	DOWN	UP	UP	UP	UP
Decrease	DOWN	UP	DOWN	DOWN	DOWN	DOWN

Fig. 1

The following formulas are sometimes useful in calculating the effects shown above.

1. Change in coil resistance due to change of ambient temperature can be calculated by the following formula.

$$R = R_{20} [1 + .0039 (T-20)]$$

Where: R = Coil resistance at given temperature
R_{20} = Coil resistance at 20°C
T = °C Ambient temperature

"Rule of Thumb" : For each 10°C change of temperature, coil resistance will change approximately 4%.

2. High and low temperature pick up voltage:

$$E_2 = E_1 K_{2,}$$

Where: E_2 = Pick Up Voltage at T_2 temperature
E_1 = Pick Up Voltage at 20°C
K_2 = Coefficient of correction found on the graph in Fig. 2 at T_2

3. Calculation of coil temperature rise when R initial and R final are known:

Delta T = (234.5 + T_1) (R_2/R_1 - 1)
Delta T = Temperature rise (°C)
T_1 = Initial temperature (°C)
R_1 = Initial resistance (Ohms)
R_2 = Final resistance (Ohms)
$R_2 = K_2R_1$

Temperature can also be found by making the R_2/R_1 ratio = the coefficient of correction graph in Fig. 2, and then finding the corresponding temperature.

TEMPERATURE CORRECTION CHART FOR RESISTANCE

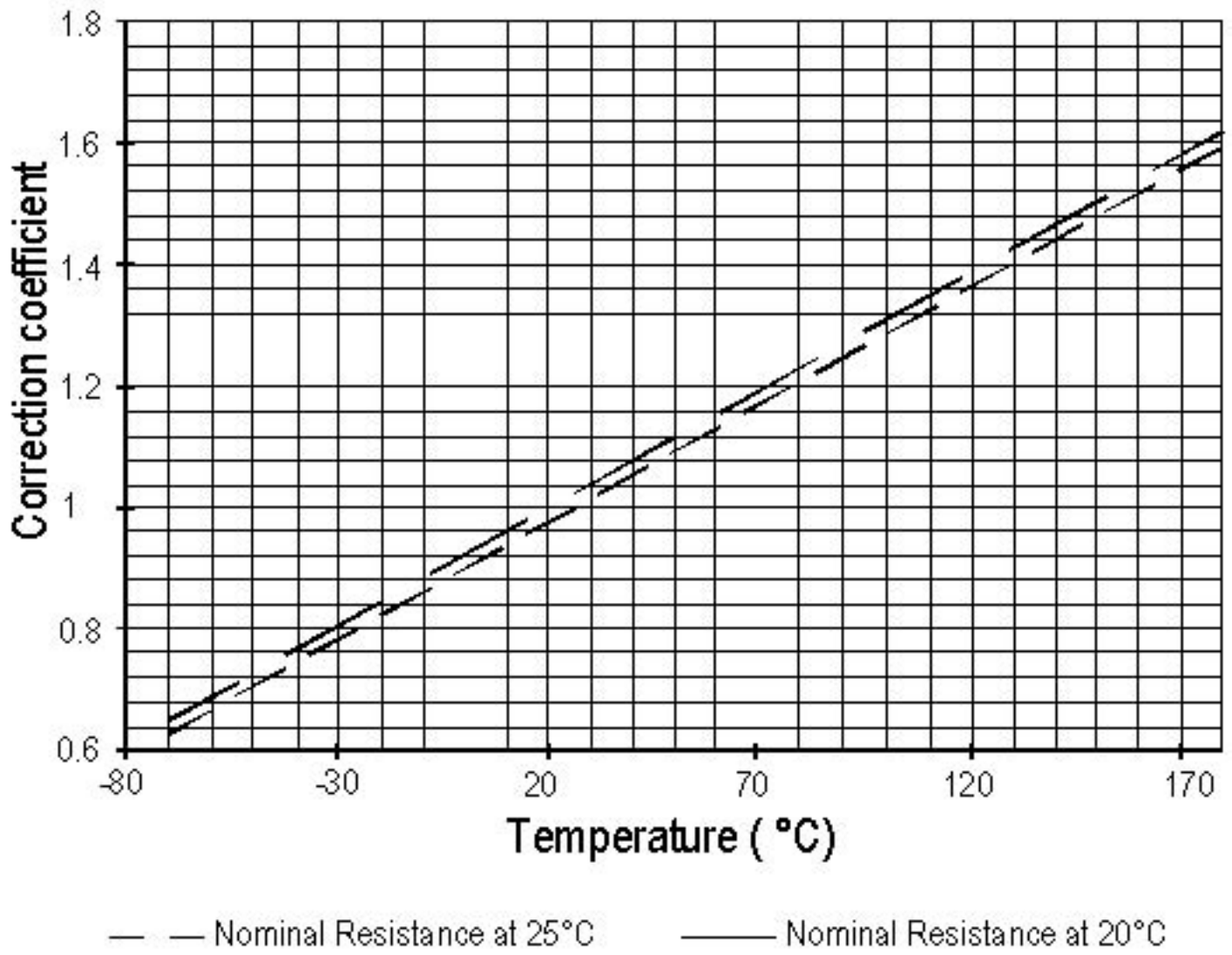

Fig. 2

EXAMPLE:
Catalog indicates coil resistance of 290 ohm at 25°C. What is the value at 125°C?
From the chart: 290 x 1.39 = 403.31 Ohms.