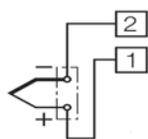


Thermocouples

External Cold Junction Compensation on the V624—How and Why?



Thermocouple with
External
cold junction
compensation

Figure 1

Thermocouples generate very low voltages, between 8 & 40 $\mu\text{V}/\text{Deg C}$ and at best are only accurate to within ± 1 to 2.5 Deg C , depending on the type. They are susceptible to interference and it is extremely important to ensure that calibration is carried out with accurate equipment. For example if a voltage of 100.1mV were applied during calibration, instead of 100mV (0.1mV error). Typically for a sensor with a 30 $\mu\text{V}/\text{Deg C}$ characteristic, an error in the temperature reading of over 3 Deg. C would result. Internal cold junction compensation offers the most convenient method, but is susceptible to errors caused by temperature gradient at the back of the instrument, i.e. if the junctions at the rear connector are at 25 degrees C, but the cold junction compensation (CJC) sensor is at 22 degrees C because it's in a draft, an error of 3 Degrees C would result. External compensation offers improved performance as all errors associated with the CJC are removed. However, due to the addition of an external cold junction, cost and complexity is added. When using an external CJC circuit on the V624 there are two things to be done. They are 1) when programming the unit change the measuring method to "external compensated Thermocouple" and 2) DO NOT add the jumper between terminals 2 and 4.

TEMPERATURE CONVERSION

$$\text{DEGREES F} = (\text{DEGREES C} \times 9/5) + 32$$

$$\text{DEGREES C} = (\text{DEGREES F} - 32) \times 5/9$$

Common Thermocouples

Type	Polarity & Material	Wire ID Properties	Wire Color	Practical Temp Range
J	+ Iron	Very magnetic	White	32 to 1336°F
	- Constantan		Red	0 to 724°C
K	+ Chromel	Slightly magnetic	Yellow	32 to 2282°F
	- Alumel		Red	0 to 1250°C
N	+ NICROSIL	Greater stiffness	Orange	32 to 2282°F
	- NISIL		Red	0 to 1250°C
T	+ Copper	Copper color	Blue	-299 to 700°F
	- Constantan		Red	-184 to 371°C
E	+ Chromel	Greater stiffness	Purple	32 to 1652°F
	- Constantan		Red	0 to 900°C
R	+ Pt 13%Rh	Greater stiffness	Black	32 to 2700°F
	- Platinum		Red	0 to 1482°C
S	+ Pt 10%Rh	Greater stiffness	Black	32 to 2700°F
	- Platinum		Red	0 to 1482°C