UNIVERSITÀ DEGLI STUDI DI TRIESTE

Dipartimento di Ingegneria e Architettura

CORSO DI MISURE ELETTRICHE TERMICHE E COLLAUDI

LABORATORIO:
MISURE DI TEMPERATURA

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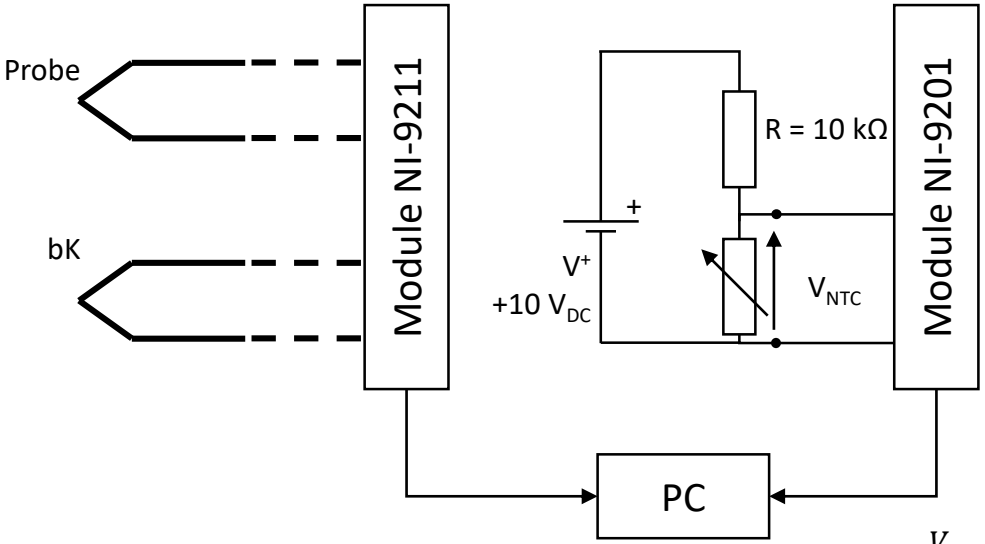
AIM

Record and compare the behaviour of four different temperature sensors:

1. One insulated K-type thermocouple (Probe)
2. Bare K-type thermocouple (bK)
3. One calibrated K-type thermocouple (cK)
4. An NTC thermistor (10kΩ)

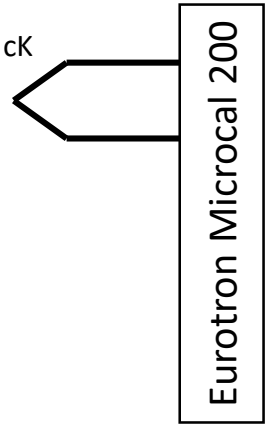
THE SETUP

Eurotron Microcal 500

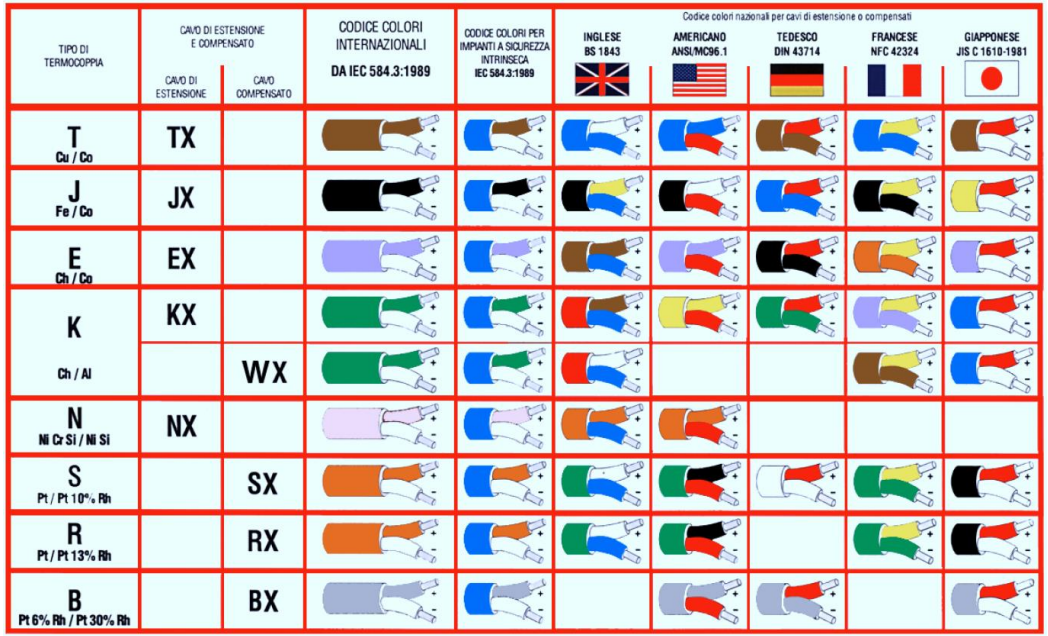


$$R_{NTC} = \frac{V_{NTC}}{I}$$

$$I = \frac{V^+ - V_{NTC}}{R}$$



THERMOCOUPLES AND NTC



TIPO DI TERMOCOPPIA	CAVO DI ESTENSIONE E COMPENSATO: CAVO DI ESTENSIONE	CAVO DI ESTENSIONE E COMPENSATO: CAVO COMPENSATO	CODICE COLORI INTERNAZIONALI DA IEC 584.3:1989	CODICE COLORI PER IMPIANTI A SICUREZZA INTRINSECA IEC 584.3:1989	Codice colori nazionali per cavi di estensione o compensati: INGLESE BS 1843	AMERICANO ANSI/MC96.1	TEDESCO DIN 43714	FRANCESE NFC 42324	GIAPPONESE JIS C 1610-1981
T Cu / Co	TX								
J Fe / Co	JX								
E Ch / Co	EX								
K Ch / Al	KX								
		WX							
N Ni Cr Si / Ni Si	NX								
S Pt / Pt 10% Rh		SX							
R Pt / Pt 13% Rh		RX							
B Pt 6% Rh / Pt 30% Rh		BX							

$$T = f(\Delta V)$$

TEMPERATURE VS RESISTANCE CHARACTERISTICS [ITS-90]

Resistance 10.0k ohms at 25 deg. C

Resistance Tolerance + / - 0.5 %

B Value 3 435K at 25/85 deg. C

B Value Tolerance + / - 0.5 %

For thermistors (Steinhart–Hart equation):

$$\frac{1}{T} = a + b\ln(R) + c\ln(R)^3$$

With $a=1/T_0$, $b=1/B$, $c=0$:

$$\frac{1}{T} = \frac{1}{T_0} + \frac{1}{B}\ln\left(\frac{R_{NTC}}{R_0}\right)$$

THE EXPERIMENT

The hoven will be set to reach 80°C at first and then to cool down to 30°C; the following data are going to be recorded

time (s, min)	T_{REF} (°C)*	T_{PROBE} (°C)	T_{bK} (°C)	T_{cK} (°C)*	V_{NTC} (V)	T_{NTC} (°C)

$$T_{PROBE} = f(t)$$
$$T_{bK} = f(t)$$
$$T_{cK} = f(t)$$
$$T_{NTC} = f(t)$$
$$T_{ref} = f(t)$$

Results have to be commented in function of rising time and entity of the overshoot (if present, in terms of percentage variation from the set point).

* To be plot as point dispersion

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