

TEMPERATURE SENSOR

Description D0511

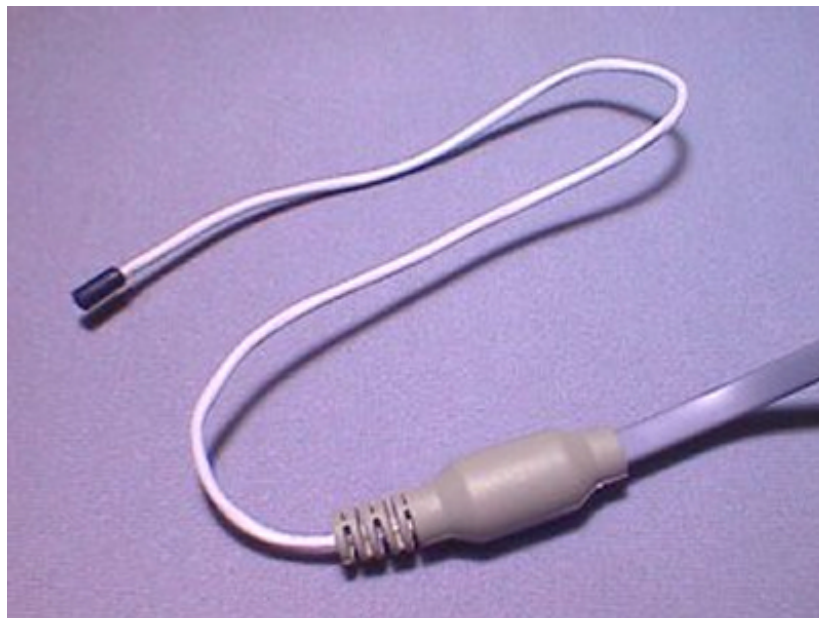


Figure 1. The Temperature Sensor

Description

The temperature sensor uses a thermistor (thermal resistor) to measure temperature. The used temperature unit is °C. The thermistor's output voltage does not vary linearly with temperature. The best-fit approximation of this non-linear characteristic is the so-called Steinhart-Hart equation (see the specifications).

At 25°C, the resistance is 20 kΩ and the sensitivity approximately 3.4% per °C. The sensor is sensitive from -20°C to 125°C. It is water resistant, but do not leave it in water for more than 24 hours. It has a built-in facility for automatic sensor identification.

The temperature sensor is delivered with a BT plug and can be connected to the following interfaces:

- UIA/UIB boards through the Measuring Console (via 0520 adapter)
- CoachLab
- CoachLab II
- SMI (via 0520 adapter)
- Texas Instruments CBL™ data-logger.

There is an adapter (art. 0520) to connect sensors with BT-plugs to 4-mm inputs.

Suggestion for experiments

The temperature sensor is a general-purpose laboratory sensor. It is designed to be used as you would use thermometer for experiments in chemistry, physics, and biology.

Examples of applications are:

- Measuring freezing and boiling points.
- Monitoring endothermic and exothermic reactions.
- Specific heat experiments.

Durability for use with chemicals¹

The temperature sensor was tested with chemicals at room temperature and at the chemical's boiling point. With each chemical, the sensor was tested for 12 hours.

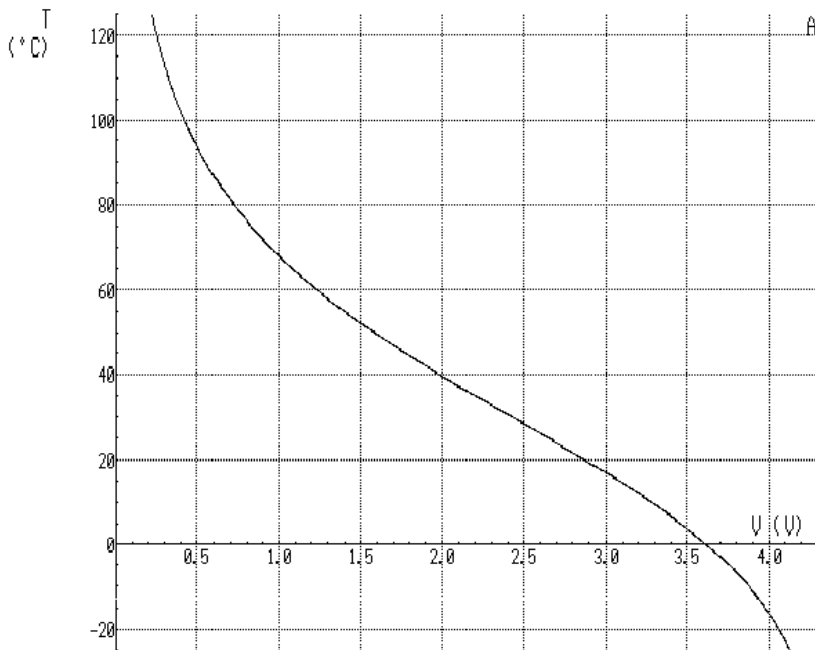
The chemicals listed below did not have any adverse effect on the temperature sensor during the testing period, and are approved for use with this probe.

- Bleach (5,25% NaHClO)
- Calcium Chloride, CaCl₂ (10 g in 100 ml water)
- Calcium Oxide, CaO (10 g in 100 ml water)
- Cyclohexane, C₆H₁₂ (100%)

¹ CMA does not accept any responsibility for damage, alteration or any other defect caused to temperature sensor subjected to chemicals that are not on the above list.

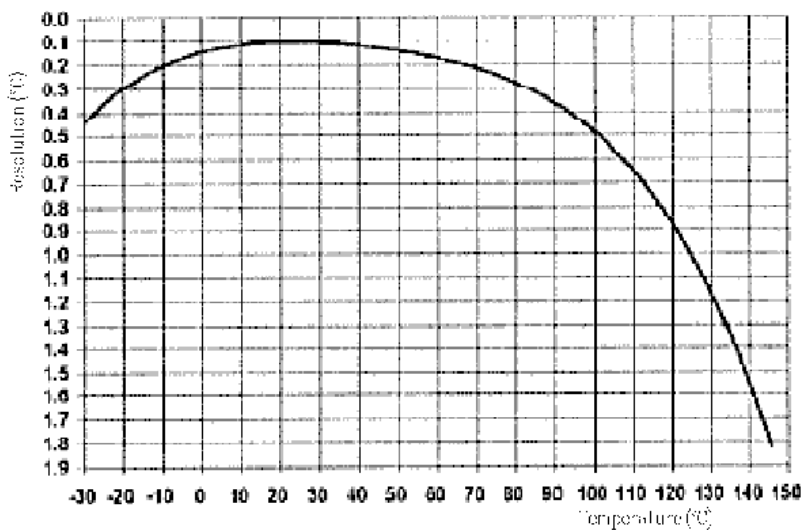
- De-ionized water (100%)
- Hydrofluoric Acid, HF (49%)
- Hydrochloric Acid, HCl (1M)
- Isopropanol (100%)
- Magnesium Oxide, MgO (1 g in 100 ml 1M HCl)
- Potassium Iodide, KI (10 g in 100 ml of water)
- Sodium Hydroxide, NaOH (2M)

Calibration



Calibration curve of the Temperature sensor.


Resolution



The resolution of the temperature sensor, which depends on the temperature, is represented in the graph. For instance, the resolution of the sensor at -20°C is 0.29, at 0°C approx. 0.15, at 20°C approx. 0.1, and at 70°C approx. 0.2.

The name of the temperature sensor in the sensor library of Coach 5 program is **Temperature sensor (0511bt) (CoachLab)**.

Technical data

Principle, calibration type	Thermistor; non-linear
Maximum current drain	0.5 mA
Temperature range	-20 °C to 125 °C
Chemical tolerance	Tap water, salt water and some chemicals (see below)
Calibration curve (Steinhart-Hart equation)	$T = [K_0 + K_1(\ln 1000R) + K_2(\ln 1000R)^3]^{-1}$ with T the temperature in °C, and R the measured resistance in kΩ
Coefficients	$K_0 = 1.02119E-03;$ $K_1 = 2.22468E-04;$ $K_2 = 1.33342E-07$
Accuracy	± °C 2.50 from -20 °C to 0 °C ± 1.25 °C from 0 °C to 85 °C ± 2.50 °C from 85 °C to 125 °C
Connection	 BT (British Telecom) plug
Connection pins	2 GND 4 AUTOIdent resistor 3 V _R 6 Signal

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