

TEMPERATURE SENSOR 016I

-18 .. 110 °C

User's Guide



Figure 1. Temperature sensor 016i



CENTRE FOR MICROCOMPUTER APPLICATIONS

<http://www.cma-science.nl>

Description

Temperature sensor 016i measures temperature and temperature differences in the range of -18 °C to 110 °C. This sensor uses the LM34 solid-state temperature transducer. It is a precision integrated-circuit temperature sensor, whose output is linearly proportional to the temperature. The transducer is positioned in the point of a stainless steel tube. Thermal contact between the transducer and the steel tube is realized by means of a heat conducting paste. In liquids the response of the temperature sensor is quite fast (see technical specifications). In air the response is significantly slower since heat can only be transmitted or absorbed by means of radiation.

The temperature sensor is not suitable for measurements above 110 °C.

The sensor is equipped with a BT plug and can be connected to the following CMA interfaces: €Lab, CoachLab II/II⁺ and ULAB. Furthermore the sensor can be used with Texas Instruments CBL™, CBL2™ and Vernier LabPro.

Sensor specifications

The Temperature sensor has a memory chip (EEPROM) with information about the sensor. Through a simple protocol (I²C) the sensor transfers its data: name, quantity, unit and calibration to the interface¹.

Suggested experiments

The Temperature sensor is a general-purpose laboratory sensor. It is designed to be used as you would use a thermometer for experiments in Biology, Chemistry and Physics. Typical applications are:

- Measuring freezing and boiling points;
- Monitoring endothermic and exothermic reactions;
- Specific heat experiments;
- Measuring temperatures in the range of the human body;
- Solar energy studies.

Sensor Chemical Tolerance

A strong acidic environment will corrode the housing slowly. After three days in 2.0 M hydrochloric acid a slight loss of color of the steel could be observed. This indicates a certain amount of corrosion.

¹ This is valid for the following interfaces: CMA €Lab, BT inputs of CoachLab II/II⁺ and ULAB, TI CBL™ and CBL2™, and Vernier LabPro.

Calibration

The output of Temperature sensor 016i is linear with respect to temperature. To collect data you can:

1. Use the calibration supplied by the sensor EEPROM memory.
2. Use the calibration supplied in the standard sensor library of the Coach program.
The name of the temperature sensor in the sensor library of Coach is Temperature sensor (016i) (CMA).
3. This calibration curve can be shifted a few degrees °C upwards or downwards.
4. Calibrate the Temperature sensor. The calibration can be performed in the Coach program.

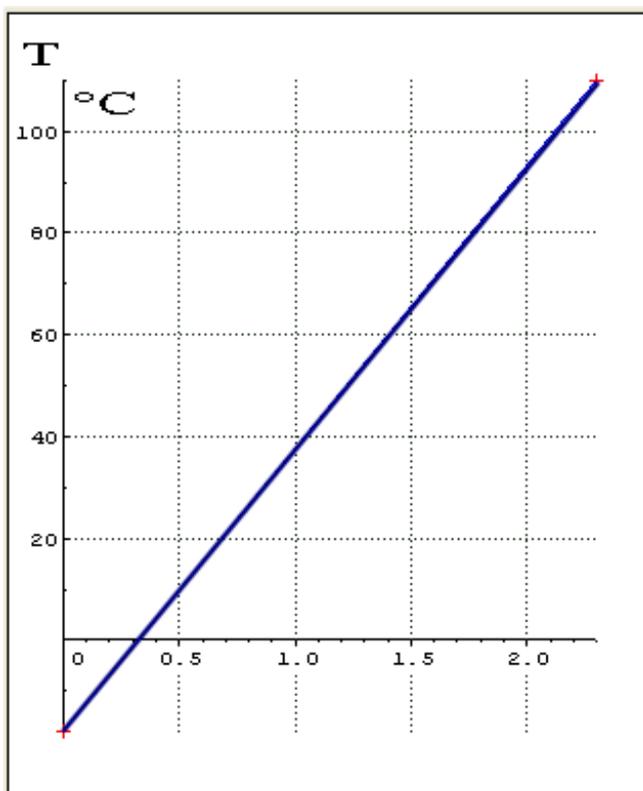


Figure 2.

Default calibration graph of Temperature sensor 016i (used in the standard Coach sensor library in the sensors' memory):

$$T(^{\circ}\text{C}) = 55.6521 * V_{\text{out}} (\text{V}) - 18$$

Coefficients of the calibration function:
 $a = 55.6521$; $b = -18$

Technical data

Temperature range	-18 to 110 °C
Voltage output range	0 .. 2.5V
Calibration function	$T(^{\circ}\text{C}) = 55.6521 * V_{\text{out}}(\text{V}) - 18$ The calibration curve can be shifted a few degrees °C upwards or downwards to adjust the calibration for individual sensors.
Sensitivity	18 mV / °C
Resolution using 12 bit 5V A/D converter	0.07 °C
Response time	When the temperature is changed in a stepwise fashion, the time the sensor signal needs to tide over half the final difference amounts to about 3 s. This only holds for measurements in liquids.
Probe dimensions	Stainless steel body: Length: 13.5 cm Diameter: 6 mm
Connection	Right-hand BT (British Telecom) connector

Warranty:

The 016i Temperature sensor is warranted to be free from defects in materials and workmanship for a period of 12 months from the date of purchase provided that it has been used under normal laboratory conditions. This warranty does not apply if the sensor has been damaged by accident or misuse.

Note: This product is to be used for educational purposes only. It is not appropriate for industrial, medical, research, or commercial applications.

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