TEMPERATURE SENSOR
BT84i

USER'S GUIDE

CENTRE FOR MICROCOMPUTER APPLICATIONS

http://www.cma-science.nl

Short description

The CMA Temperature sensor BT84i measures temperature and temperature differences in the range between -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.
The temperature sensor is not suitable for measurements above 110 °C.

The Temperature sensor can be directly connected to the analog BT inputs of the CMA interfaces. The sensor cable BT - IEEE1394 needed to connect the sensor to an interface is not supplied with the sensor and has to be purchased separately (CMA Article BTsc_1).

Sensor recognition

The Temperature sensor BT84i has a memory chip (EEPROM) with information about the sensor: its name, measured quantity, unit and calibration. Through a simple protocol this information is read by the CMA interfaces and the sensor is automatically recognized when it is connected to these interfaces. If your Temperature sensor is not automatically detected by an interface you have to manually set up your sensor by selecting it from the Coach Sensor Library.

Calibration

The CMA Temperature sensor BT84i is supplied calibrated. The output of the sensor is linear with respect to the measured temperature:

$$T(°C) = 55.6521 * V_{out}(V) - 18.$$

The Coach software allows selecting the calibration supplied by the sensor memory (EEPROM) or the calibration stored in the Coach Sensor Library. For better accuracy the pre-defined calibration can be shifted.

Practical information

The Temperature sensor can be used in a similar way as a thermometer. Here are some general guidelines for usage:

- Do not use the sensor to measure temperatures higher than 110°C, this may damage the sensor.
- Keep the sensor cable away from the heat source.
- Do not put any part of the sensor in a flame or on a hot plate.
- Avoid submerging the sensor probe beyond the stainless steel part. The handle is not waterproof.
- Always clean the sensor thoroughly after use.
- The sensor tube is constructed from stainless steel, which has a high resistance to corrosion from weak acids and alkalis. Some environments e.g. salt water may cause some discoloration of the stainless steel tube but this will not affect the sensor's performance.

- Do not use this sensor in a strong acid or strong base. A chemical reaction may cause permanent damage.
- The sensor can be left in an alkaline solution, such as NaOH, for up to 48 hours, with only minor discoloration. We do not recommend using the sensor in basic solutions which concentration is greater than 3 M.
- The maximum length of time recommended for exposure to an acid is dependent on the acid's concentration. In general we do not recommend sensors be left to soak in acids of between 1 - 3 M concentration for longer than 48 hours. The exceptions to this are Hydrochloric acid HCL and Sulphuric acid H_2SO_4. The maximum exposure time for these acids are:

Acid	Maximum Exposure Time
1 M HCL	20 minutes
2 M HCL	10 minutes
3 M HCL	5 minutes
1 M H_2SO_4	48 hours
2 M H_2SO_4	20 minutes
3 M H_2SO_4	10 minutes

Suggested experiments

The Temperature sensor is a general-purpose laboratory sensor can be used in a variety of experiments, such as:

- Monitoring indoor and outdoor temperatures.
- Monitoring freezing and boiling water.
- Monitoring endothermic and exothermic reactions.
- Specific heat experiments.
- Insulation investigations.
- Solar energy studies.

Technical Specifications

Sensor kind	Analog, generates an output voltage between 0 – 2.5 V
Measurement range	-18 to 110 °C
Resolution using 12 bit AD converter	0.07 °C
Sensitivity	18 mV / °C
Calibration function	T(°C) = 55.6521* V_{out} (V) – 18 The calibration curve can be shifted a few degrees °C upwards or downwards to adjust the calibration for individual sensors.
Response time (time for 90% change in reading)	10 seconds (in water with stirring) 400 seconds (in still air) 150 seconds (in moving air)
Connection	IEEE1394 connector for BT-IEEE1394 sensor cable. Sensor cable not delivered with the sensor.

Warranty:

The Temperature sensor BT84i 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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