

User guide

1-Wire Temperature Sensor with PVC cable

Performance characteristics

- Assembled, pluggable temperature probes with DALLAS semiconductor sensor DS 18B20
- Sensor in stainless steel protective sleeve (1.4571)
- Connection via PVC cable
- Operating temperature duration:
moving -10 ... +50 °C,
unmoved -40 ... +70 °C, briefly 90 °C
- Resolution 0.06 °C
- Accuracy $\pm 0.5^{\circ}\text{C}$ typ. (from 0 ... 70 °C),
according to data sheet of sensor manufacturer

Typical fields of application

- Heating control, central building control and air conditioning systems
- quality assurance
- Laboratory equipment, scientific equipment
- General temperature measurement



1 Introduction

Before you begin mounting the 1-Wire temperature sensor and putting the device into operation, read these operating instructions carefully until the end, especially the section on safety instructions.

2 Product description

The inexpensive quality probes with PVC connection cable are designed for measurement outdoors, on surfaces or in non-aggressive gases. The sensors are sealed and may come into contact with water for a short time, but are not permanently waterproof. Immersion in liquid is not recommended.

Individual 1-wire sensors can be operated via an adapter cable with a 1-Wire Adapter or 1-Wire Bus coupler. For a larger number, we recommend using our 1-Wire Hub.

Sensor

A calibration of the temperature sensors is not necessary. Each temperature sensor has an individual serial number. We recommend to connect a 100nF capacitor in parallel to the +5V and ground (GND) connections.

Connection cable

PVC connection cable with open cable ends.

3 Technical data Sensor

1-Wire component:	DS18B20
Accuracy:	+/- 0,5° in the range of -10°C - 85°C
Resolution:	12 Bit, 0.5°C - 0.0625°C/Bit depending on readout method
Operating voltage:	3-5,5 VDC
Current consumption:	ca. 1mA
Connection cable:	ca. 1,8m

4 Ambient conditions

Temperature range:	Moving -10 ... +50 °C, unmoved -40 ... +70 °C, briefly 90°C
Protection system:	IP54
Protection class:	III

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5 Conformity

EN 50090-2-2
EN 61000-4-2, ESD
EN 61000-4-3, HF
EN 61000-4-4, Burst
EN 61000-4-5, Surge
EN 61000-6-1, interference immunity
EN 61000-6-3, Interference radiation
RoHS

6 1-Wire Network

No special requirements are placed on the cable used for short connection lengths. With unshielded cable, a longer connection length can be achieved in an undisturbed environment, as the capacitive bus load is lower. A total length of 60 m and more can be easily achieved without additional measures.

In a disturbed environment, the cable should be shielded in order to improve the system's sensitivity to interference. The higher capacitive load reduces the maximum possible connection length.

The special thing about the wiring of the sensors is the "BUS technology": All sensors are operated in parallel on a three-core cable, which is used for both power supply and data communication

Increasing the connection length:

The sum of all connection cables should be less than approx. 100m to ensure safe operation. By connecting an additional pull-up resistor with 4.7 ... 10 kOhm (DATA cable against +5 V), the cable length can be increased, but with a slight deterioration in measurement accuracy due to the higher self-heating of the sensor.

7 Measuring accuracy

The sensors are calibrated during manufacture and have a typical measurement accuracy of $\pm 0.5^\circ\text{C}$ at 23°C operating temperature. The accuracy deteriorates towards the upper and lower measuring range limits. Further information can be found in the data sheet of the module on the homepage of the manufacturer.

As with all temperature measurements, however, the physical background must also be taken into account in order to avoid measurement errors which have a significant influence on the precision of the measurement setup:

7.1 Thermal Contact Resistance Target Sensor

This measurement error occurs primarily with surface measurements. Good thermal contacting can be remedied by mounting in a hole, using heat-conducting paste or using heat-conducting adhesive.

7.2 Thermal heat dissipation Sensor ambient temperature:

For surface measurements, the measuring arrangement should be thermally insulated from the environment, for example by foam or mineral wool.

7.3 Thermal heat dissipation Sensor connecting wires:

This measurement error can be minimized, for example, by making the connecting cable as thin as possible and made of thermally poorly conductive material, or by tempering the connecting cable with the measured object. In principle, the highest measuring accuracy can be achieved by immersion in liquids or in a mounting hole. On the other hand, an additional measurement error should be taken into account for measurements on surfaces.

8 Operating conditions

The sensor is intended for temperature measurement of gases or solids.

The Dallas temperature sensors are semiconductor sensors. These temperature values are limit data and must not be exceeded or fallen short of, otherwise the component may be damaged. The specified operating voltage values must be observed.

9 Safety instructions

When using products that come into contact with electrical voltage, the valid VDE regulations must be observed, especially VDE 0100, VDE 0550/0551, VDE 0700, VDE 0711 and VDE 0860

- All final or wiring work must be carried out with the power turned off.
- Before opening the device, always unplug or make sure that the unit is disconnected from the mains.
- Components, modules or devices may only be put into service if they are mounted in a contact proof housing. During installation they must not have power applied.
- Tools may only be used on devices, components or assemblies when it is certain that the devices are disconnected from the power supply and electrical charges stored in the components inside the device have been discharged.
- Live cables or wires to which the device or an assembly is connected, must always be tested for insulation faults or breaks.

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- If an error is detected in the supply line, the device must be immediately taken out of operation until the faulty cable has been replaced.
- When using components or modules it is absolutely necessary to comply with the requirements set out in the accompanying description specifications for electrical quantities.
- If the available description is not clear to the non-commercial end-user what the applicable electrical characteristics for a part or assembly are, how to connect an external circuit, which external components or additional devices can be connected or which values these external components may have, a qualified electrician must be consulted.
- It must be examined generally before the commissioning of a device, whether this device or module is basically suitable for the application in which it is to be used.
- In case of doubt, consultation with experts or the manufacturer of the components used is absolutely necessary.
- For operational and connection errors outside of our control, we assume no liability of any kind for any resulting damage.
- Kits should be returned without their housing when not functional with an exact error description and the accompanying instructions. Without an error description it is not possible to repair. For time-consuming assembly or disassembly of cases charges will be invoiced.
- During installation and handling of components which later have mains potential on their parts, the relevant VDE regulations must be observed.
- Devices that are to be operated at a voltage greater than 35 VDC / 12mA, may only be connected by a qualified electrician and put into operation.
- Commissioning may only be realized if the circuit is built into a contact proof housing.
- If measurements with an open housing are unavoidable, for safety reasons an isolating transformer must be installed upstream or a suitable power supply can be used.
- After installing the required tests according to DGUV / regulation 3 (German statutory accident insurance, https://en.wikipedia.org/wiki/German_Statutory_Accident_Insurance) must be carried out.

10 Warranty

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12 Contact

ESERA GmbH
Adelindastrasse 20
87600 Kaufbeuren
GERMANY
Tel.: +49 8341 999 80-0
Fax: +49 8341 999 80-10
www.esera.de
info@esera.de
WEEE-Number: DE30249510