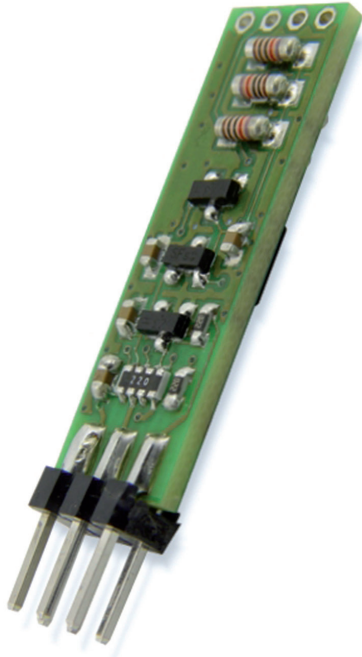


DATA SHEET



Temperature module with Voltage-Output and I²C-Bus

Description



Characteristic features

- For PT 1000 sensor element
- Temperature measurement depending type:
-32 ... +96 °C, -32 ... +224 °C, -32 ... +480 °C
- Digital I²C-interface, additionally
ratiometric or absolute voltage output
- Calibrated and ready-to-use
- Miniaturised dimensions
- Operating voltage range 6... 24 V DC
- Optimum price performance ratio

Typical areas of applications

- Industrial instrumentation
- Building automation
- Ventilation and air conditioning systems
- Automotive, white goods
- OEM products

Technical Data

Temperature module TEMOD-I ² C	
Temperature sensor Main channel	Pt1000 class B, two wire connection
Measuring range	See table
Measuring accuracy	See table
Resolution	I ² C Bus: 14 bit, Analog output 11 bit
Temperature application range	-20 ... +90 °C for the electronics
Interfaces	I ² C-Bus and Voltage output 0 ... 5 V
Dimensions	Approx. 9 x 37 mm, see dimensional drawing
Operating voltage	6 ... 24 V DC
Current input	< 3 mA
Housing	Unpackaged module, housing optional
Connection	6-pole pin strip, connection cable optional
Article	Art.-No.:
Temperature module	TEMOD-I ² C

Features

Temperature is one of the most frequently measured physical parameters. For price sensitive mass applications, fully integrated semiconductor sensors are available which have a limited temperature range of approx. -50 ... +150 °C. In industrial applications, platinum temperature sensors are very common, which offer a large measuring range of -100 ... +500 °C, but are more complex to evaluate because the non-linear behaviour of PTC has to be corrected. Our innovative temperature sensor module with ASIC unites both the worlds: As sensor, a high quality platinum resistance is used. The ASIC as subsystem with flexible signal processing performs the job of capturing, linearization and calibration of the sensor raw value till delivering of refined and processed output signal, which is made available as binary value over the I²C-Bus or alternatively as voltage signal 0 ... 5 V.

The module offers an optimum price performance ratio. The platinum temperature sensor is interchangeable, guarantees a high measuring accuracy, drift stability, environment resistance as well as an outstanding long-term stability. The ASIC provides the temperature measured value as a calibrated signal over the appropriate analog or digital interface with high resolution, which makes simple integration possible into customized products. The calibrated and standardized output signal guarantees simplest integration of the subsystem in the development phase and makes shortest time to market product developments possible.

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Temperature module with Voltage-Output and I²C-Bus

Standard model

The module has a 6-pole plug connector. The model available ex-stock is configured as follows:

- Operating voltage range 6 ... 24 V
- I²C Interface for temperature depending on type
-32 ... +96 °C, -32 ... +224 °C, or -32 ... +480 °C
- Voltage output 0 ... 5 V corresponding to -32 °C ... Fullscale
- Module without housing with contact strip with 6 pins

Product variants

Besides the product variant as unpackaged module, a variety of customer specific models are also available e.g. in stainless steel housing with protection tube, with M12 plug connectors or with ready made connection lead.

The following overview describes the possible options and design variants. Please send us your enquiry for the desired model!

Housing and connection cable

- Unpackaged module, dimensions 37 x 9 mm
- In stainless steel housing Ø 12 x 90 mm
with protection tube Ø 4 mm and connection cable 3 m

The protection tube can be used as immersed probe, air probe or insert probes. The connection cable can be made up either with loose strands at the end or fitted with any type of plug.

Operating voltage

Standard system is with 6 ... 24 V DC operating voltage which is stabilized in the module on 5 V. The 5 V operating voltage serves also as reference level for the digital I²C-communication.

Special variants for 2.7 ... 5.5 V digital communication are available on request.

Calibration

In standard practice, the modules are calibrated as per Pt1000 resistance characteristics. For higher accuracy requirements, the calibration of housed module is possible in temperature bath or calibrator, in which up to 3 temperature points are supported. According to the model, system accuracy of up to 0.05 °C is possible, for example, for medical thermometers.

Voltage output

At PIN6, the measured temperature is delivered as an analog voltage signal 0 ... 5 V. The displayed measuring range of 0 ... 5 corresponds to -32 °C ... Fullscale.

The minimum connection impedance should not be less than 10 kΩ. The output impedance is of the order of 50 Ω. The output is protected against short time transients. External voltage at the output can cause a damage of the ASIC and is absolutely to be avoided.

I²C-Interface

The default address of the component is 0x78 and the component can always be communicated at this address. In addition, a second address can also be programmed during configuration at works, under which the humidity probe can be addressed.

Up to 4 bytes can be read at the address 0x78. If temperature values are not required, it is enough to read only the first two bytes.

The following allocation is adopted:

Data		
0 x 78	Byte_0	MSB PT1000 Temperature
	Byte_1	LSB PT1000 Temperature

Scaling of measured value

Both humidity and temperature values are transferred as 15 bit values (bit 0 ... 14). From the 15 bit measured value, maximum 14 bit resolution is to be used, hence the least significant bit can be ignored.

Under normal operation, the most significant bit (15) is always 0 and in case of error, it is set to 1. Further details on error codes can be obtained from the document "Serial interface of HYGROSENS ASIC".

Connector configuration

Pin 1 of the pin strip is marked with a white spot.

6-pole pin strip		
1	VDD	Supply Voltage +6 ... 24 V DC
2	GND	Ground
3	SDA	Serial Data I ² C
4	SCL	Serial Clock I ² C
5	V_TEMP	Temperature Voltage Output
6	GND	Ground

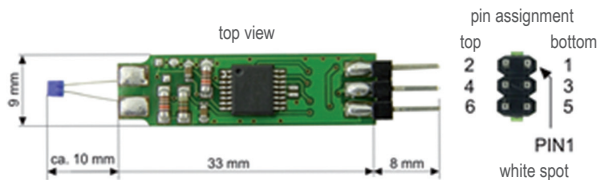
The standard calibration of Temperature signals V_TEMP (PIN6) is 0 ... 5 V.

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Temperature module with Voltage-Output and I²C-Bus

Dimensions



Ordering number keys

Articel	Art.-No.:
Temperature module with voltage output 0 ... 5 V and I ² C-Bus	
Calibration / Measuring range	
-32,00 ... +95,9961 °C	TEMOD-I ² C- R1
-32,00 ... +223,992 °C	TEMOD-I ² C- R2
-32,00 ... +479,984 °C	TEMOD-I ² C- R3
Accessories	Art.-No.:
USB-Connection cable for I ² C- humiditysensors length 1,5 m	USB-I ² C-KAB

Application notes

The PT1000 sensor should be installed set off from the module, in order to avoid measuring errors by internal heat dissipation of electronics.

To long sensor connecting cables are to be avoided, because these can be received into the two conductor resistor measurement and cause EMV interference coupling.

The calibration at works is done at 8 V. The specified technical data are valid for this operating voltage. Other configurations and special calibrations as per customer requirements are also possible.

For connection of probes in longer routes, the I²C-Bus, which is used outside the device, should not be used internally, to avoid effect of inter-connection disturbances on internal device communication. The EMV-guidelines are to be followed; use of shielded lines is recommended.

Due to short time interruption of operating voltage, a RESET of humidity probe can be initiated. If the operating voltage is adjustable, then the pull up resistors of I²C Bus must be connected to the triggering voltage. For simplifying your product development, a communication board and also an USB-I²C-adapter is available – please contact us!

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Temperature module with Voltage-Output and I²C-Bus

Assignment of I²C output register

Model	Byte 0,1 (MSB/LSB)	Byte 2,3	Byte 4,5
	Pt1000 Temperature	ASIC Temperature	T2 channel
Typ – R1	0x0000 – 0x7FFF -32.00 ... +95.9961 °C	Not used	Not used
Typ – R2	0x0000 – 0x7FFF -32.00 ... +223.992 °C	Not used	Not used
Typ – R3	0x0000 – 0x7FFF -32.00 ... +479.984 °C	Not used	Not used

Output scaling Pt1000 temperature

Model	Output	Value range HEX	Scaling	Formula	Increment	Accuracy
Typ – R1	I ² C:	0x0000 ... 0x7FFF	-32,00 ... 95,9961 °C	$T(^{\circ}\text{C})=V/256-32$	1/256 °C	±0,15 K
	analog:	0x000X ... 0x3FFF	-32,00 ... 95,9375 °C		1/16 °C	
Typ – R2	I ² C:	0x0000 ... 0x7FFF	-32,00 ... 223,992 °C	$T(^{\circ}\text{C})=V/128-32$	1/128 °C	±0,25 K
	analog:	0x000X ... 0x3FFF	-32,00 ... 223,875 °C		1/8 °C	
Typ – R3	I ² C:	0x0000 ... 0x7FFF	-32,00 ... 479,984 °C	$T(^{\circ}\text{C})=V/64-32$	1/64 °C	±0,5 K
	analog:	0x000X ... 0x3FFF	-32,00 ... 479,750 °C		1/4 °C	

The physical resolution is approximately half of the arithmetical resolution at the output. The actual temperature range is dependent on the sensor element used.

The accuracy refers to the digital I²C-output of the module in the measuring range center in purchase to the IEC resistance characteristic of the sensor element.