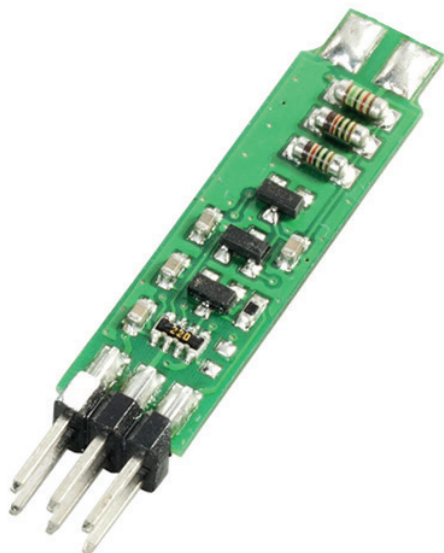


# OPERATION MANUAL

## Sensor module for Pt1000 sensors with voltage output and I<sup>2</sup>C-interface

### Description



### Technical data

Temperature module TEMOD-I <sup>2</sup> C	
Temperature sensor	Pt1000, Class B
Main channel	two wire connection
Measuring range	See table, page 4
Measuring accuracy	See table, page 4
Resolution	I <sup>2</sup> C Bus: 14 bit
Temperature application range	-20...+80 °C for the electronics
Interfaces	I <sup>2</sup> C-Bus and voltage output 0...5 V
Dimensions	ca. 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
CE-Conformance	2014/30/EU
EMV noise emission	EN 61000-6-3:2011
EMV noise immunity	EN 61000-6-1:2007
Article	Article no:
Temperature module	TEMOD-I <sup>2</sup> C... see ordering numbers (p.3)

### Characteristic features

- For Pt1000 sensor element
- Temperature measurement depending on type:  
-32...+96 °C, -32...+224 °C, -32...+480 °C
- Digital I<sup>2</sup>C-Interface, additionally  
voltage output 0...5 V
- calibrated and ready-to-use
- 3-point adjusting
- Miniaturised dimensions
- Operating voltage range 6...24 V DC
- Optimum price-performance-ratio

### Typical areas of application

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

### 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 -200...+850 °C. For our innovative temperature sensor module with ASIC a high quality platinum resistance is used. The ASIC as subsystem with

flexible signal processing performs the job of capturing and linearization of the sensor raw value till delivering of refined and processed output signal, which is made available as binary value over the I<sup>2</sup>C-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 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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## Sensor module for Pt1000 sensors with voltage output and I<sup>2</sup>C-interface



### 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
- I<sup>2</sup>C 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 a housing, with protection tube, with M12 plug connectors or with ready made connection lead. For a customer specific version - please contact us!

### Operating voltage

The standard system is operating with 6 ... 24 V DC which is stabilized in the module on 5 V. The 5 V operating voltage serves also as reference level for the digital I<sup>2</sup>C-communication.

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

### Calibration

In standard practice, the modules are calibrated according to DIN EN 60751 Pt1000 resistance characteristics. Special versions with a Pt100 resistance characteristics are available on request. Furthermore all the modules can be calibrated for a customer specific temperature range. Herfor please contact us!

### Voltage output

On PIN5, the measured temperature is delivered as an analog voltage signal 0 ... 5 V. The displayed measuring range of 0 ... 5 V corresponds to -32 °C ... Fullscale.

The minimum connection impedance should not be less than 10 kΩ.

The output impedance amount is 50 Ω. The output is protected against short time transients. External voltage at the output can cause a damage of the ASIC and have to be avoided.

### I<sup>2</sup>C-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 temperature probe can be addressed.

Two 2 bytes can be read at the address 0x78. This represent the temperature value.

The following allocation is applied:

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

### Scaling of measured values

Byte 0 and 1 represent the temperature value and is transmitted as a 15 bit value (bit 0 - 14).

The most significant bit (bit 15) is always 0 during normal operation and in case of error, bit 15 is set to 1.

### Connector configuration

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

6-pole pin strip		
1	VDD	Supply Voltage +6 ... 24 V DC
2	GND	Ground
3	SDA	Serial Data I2C
4	SCL	Serial Clock I2C
5	V_TEMP	Temperature Voltage Output
6	GND	Ground

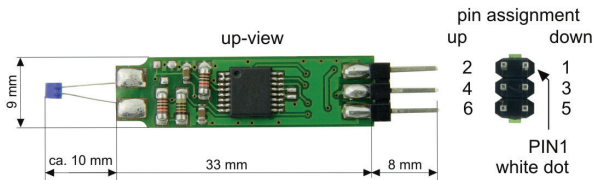
The standard calibration of Temperature signals V\_TEMP (PIN5) is 0 ... 5 V.

# OPERATION MANUAL

## Sensor module for Pt1000 sensors with voltage output and I<sup>2</sup>C-interface



### Dimensions



### Ordering number keys

Article	Art.-No.:
Temperature module with voltage output 0 ... 5 V and I <sup>2</sup> C-Bus	
Calibration / Measuring range	
-32,00 ... +96,00 °C	TEMOD-I <sup>2</sup> C- R1
-32,00 ... +224,00 °C	TEMOD-I <sup>2</sup> C- R2
-32,00 ... +480,00 °C	TEMOD-I <sup>2</sup> C- R3
Scope of delivery: Module and Pt1000, F0,3	
Accessories	Art.-No.:
USB-I <sup>2</sup> C-adapter incl. Software and connection cables; Scope of delivery: See picture below	USB-I <sup>2</sup> C-KAB*
Pt1000 Temperature Sensor, F 0,15	0364 0102-30

### Application notes

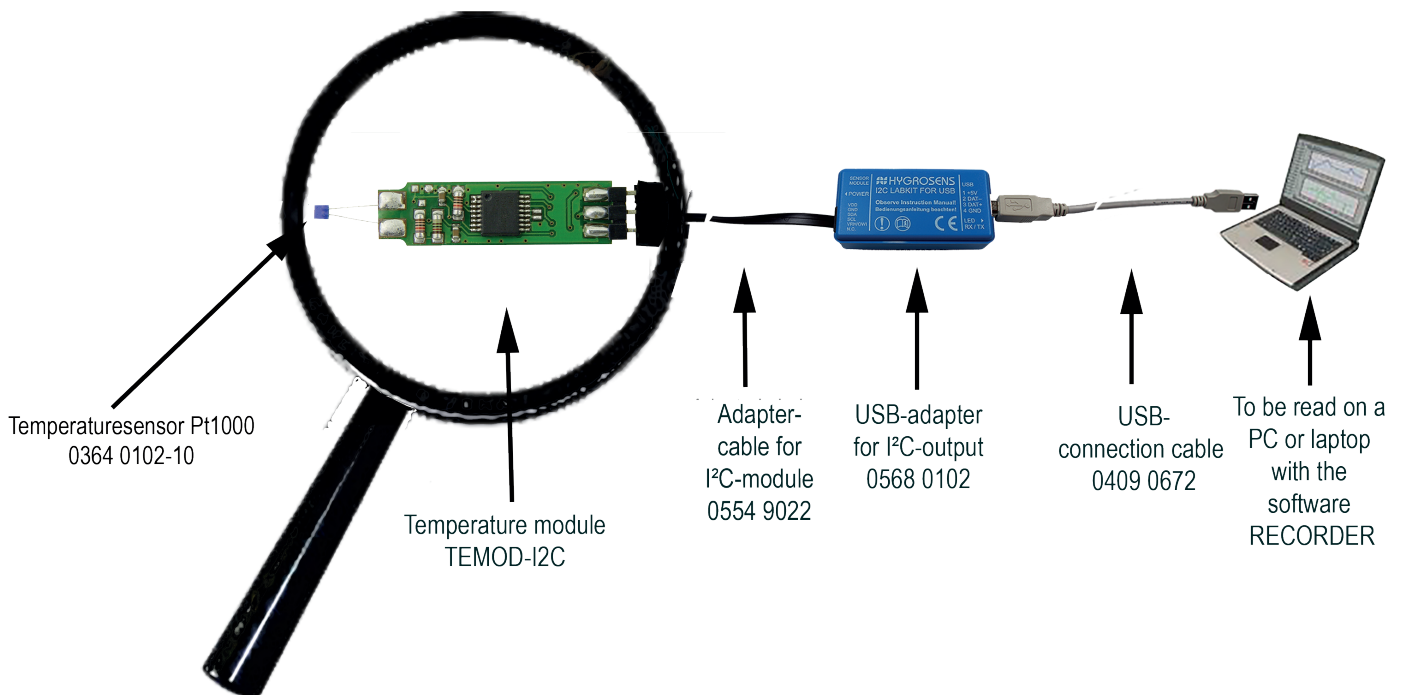
The Pt1000 sensor should be installed set off from the module, in order to avoid measuring errors by internal heat dissipation of electronics.

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 on request.

For connection of probes in longer routes, the I<sup>2</sup>C-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! The use of shielded cables is recommended.

Due to short time interruption of operating voltage, a RESET of the ASIC can be initiated. If the operating voltage is switchable, then the pull up resistors of I<sup>2</sup>C Bus must be connected to the triggering voltage. For simplifying your product development a USB-I<sup>2</sup>C-adapter is available – please contact us!



\*TEMOD-I2C is not included in the scope of delivery

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## Sensor module for Pt1000 sensors with voltage output and I<sup>2</sup>C-interface



### Assignment of I<sup>2</sup>C output register

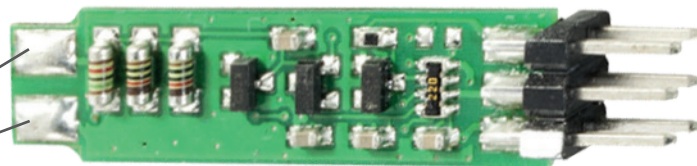
Model	Byte 0,1 (MSB/LSB)	Byte 2,3	Byte 4,5
	Pt1000 Temperature	ASIC Temperature	T2 channel
Type -R1	0x0000 - 0x7FFF -32,00 ... +96,00 °C	Not used	Not used
Type -R2	0x0000 - 0x7FFF -32,00 ... +224,00 °C	Not used	Not used
Type -R3	0x0000 - 0x7FFF -32,00 ... +480,00 °C	Not used	Not used

### Output scaling Pt1000 temperature

Model	Output	Value range HEX	Scaling	Formula	Increment	Accuracy
Type -R1	I <sup>2</sup> C analogue:	0x0000 ... 0x7FFF	-32,00 ... 96,00 °C	$T(^{\circ}\text{C})=V/256-32$	1/256 °C	±0,15 K
		0x000X ... 0x3FFF	-32,00 ... 96,00 °C		1/16 °C	
Type -R2	I <sup>2</sup> C analogue:	0x0000 ... 0x7FFF	-32,00 ... 224,00 °C	$T(^{\circ}\text{C})=V/128-32$	1/128 °C	±0,25 K
		0x000X ... 0x3FFF	-32,00 ... 224,00 °C		1/8 °C	
Type -R3	I <sup>2</sup> C analogue:	0x0000 ... 0x7FFF	-32,00 ... 480,00 °C	$T(^{\circ}\text{C})=V/64-32$	1/64 °C	±0,5 K
		0x000X ... 0x3FFF	-32,00 ... 480,00 °C		1/4 °C	

The accuracy refers to the digital I<sup>2</sup>C-output, calibrated by 23 °C. The modules are justified by 20%, 50% and 80 % of the measurement range.

### Connection of the sensor



The Pt1000 needs to be connected on on this side. Attention the soldering pads have no connection to the otherside!