

# Humidity-Temperature Sensor module with serial interface



4 0 1 6 1 3 8 1 8 4 0 3 7  
Ordering No. 183003  
CON-HYTE-SMD



## Characteristics features

- ▶ Combined temperature and humidity measurement
- ▶ Resolution 0.01 % rH, 0.01 °C
- ▶ Accuracy 3% rH, 0.5 K
- ▶ Inclusive of Windows-Software "Recorder"
- ▶ Calibration possibility with salt-reference cells

## Typical areas of application

- ▶ Monitoring of stock rooms, in food industry, quality assurance
- ▶ Temperature and humidity measurement in buildings or in air conditioning systems
- ▶ Humidity measurement system for customer specific projects, micro controller applications under Windows or Linux

## WINDOWS-Software

- ▶ Display of current humidity and temperature
- ▶ Calculation and display of dew point, absolute humidity, vapour pressure, saturated vapour pressure and enthalpy
- ▶ Tabular representation of measured values
- ▶ Storing of data on hard disk

## Description

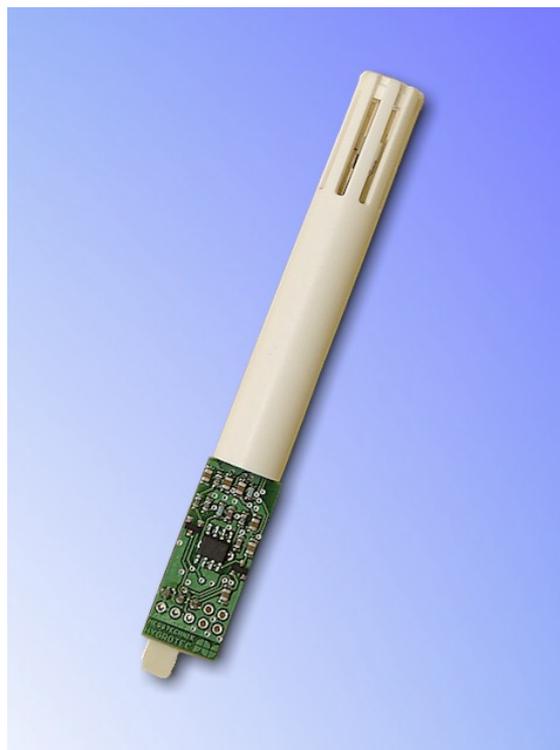
The product offers an efficient measurement and display system for temperature and relative humidity. The SMD module which is only 110 x 14 x 12 mm big can be directly used for operation with a PC, micro controller or any customer specific control and regulation system.

The front area of the sensor is provided with a plastic cover for protection against mechanical damages. An accurate NTC has been used as temperature sensor. The humidity measurement operates with a durable and stable capacitive polymer sensor.

The micro controller of the module compensates the linearity error and temperature drift of the sensor elements. The applied mathematical procedures guarantee outstanding measuring accuracy and long term stability.

The current measured values are sent as ASCII string to the connected PC through the serial interface (RS 232 compatible). The display and graphical representation of the measured values appear on the PC. An easy to use Windows software for display of measured values and data representation is included in the scope of supply.

The ASCII-protocol for data communication is documented and enables integration with user developed programs. More such modules can be operated with a PC, provided more free COM-ports are available at our disposal. The measurement sensor is supplied in calibrated condition. With the help of reference cells available as accessories, the accuracy of the sensing element can be checked by the user himself. Further calibration is also possible.



## Technical Data

Humidity measurement	
Humidity measuring range	0..100 % rH
Humidity resolution	0.01 % rH
Typical accuracy	±3 % rH (at 23°C)
Temperature measurement	
Temperature measuring range	-40..80°C
Temperature resolution	0.01°C
Typical accuracy	±0.5°K between 0 to 40°C
Module	
Operating voltage DC	6-8 V (12V) DC, reverse polarity protected
Operating current	20 mA approx.
Interface	RS 232 compatible, 2400 Baud, 8 N 1
Circuit board dimensions	110 x 14 x 12 mm
EMV-compatibility	89/336/EWG
Noise emission:	EN 61000-6-3:2001
Noise immunity:	EN 61000-6-2:2001
Plug connector	Type NSG, 3-pole, RM2.54
Scope of supply	SMD-Module including Windows-Software and Documentation, without PC-connection cable
Accessories	See key to ordering numbers

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D-79840 Löffingen Tel: +49(0)76 54/80 89 69-0 Fax: +49(0)76 54/80 89 69-9

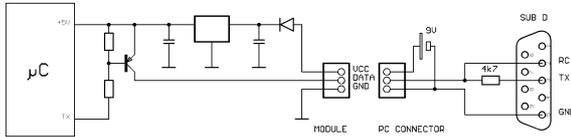
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# Humidity-Temperature Sensor module with serial interface

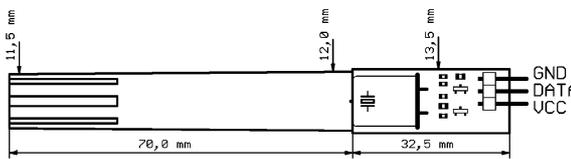
## Connection to PC

For operation with PC, a special connection cable is required as per Ordering No. 183056, The connection cable can be self prepared as per the following circuit diagram:



The circuit diagram of  $\mu\text{C}$  is already available on the module and only shown for clearance.

## Plug connector layout



**VCC:** Connection for operating voltage. The circuit is protected against wrong polarity. In order to restrict the measurement error due to mild internal heating, the operating voltage should be maintained at approx. 6 - 8 V. A higher supply voltage deteriorates the measuring accuracy, but however, it does not cause any damage to the module.

**DATA:** Serial communication with 2400/4800 Baud rate, 8N1. The circuit uses -12 V supply at the TX-line (pin 3) of the Sub-D plug connector on the PC as source voltage for the level transformer. If the module is not operated with a PC, the circuit must be worked out according to the requirements.

**GND:** Reference potential

## WINDOWS-Software RECORDER

With the help of this program, which is covered in the scope of supply, the measured values can be received through the interfaces and displayed on the PC. The displayed data is compatible with any desired spread sheet program, with which it is possible to further process the measured values for statistical evaluation and interpretation.

In addition, the PC-Software also calculates the dew point, absolute humidity, enthalpy and vapour pressure from the measured values of relative humidity and temperature. The calculated figures can also be stored.

**Installation:** The program should be first installed under Windows 98, NT, 2000 or XP system. Place the attached diskette in your drive and run the program "setup.exe" either by selecting "Run" from the START menu or through the windows explorer. Then follow the instructions of the installation program. The setup program creates a new program group "HYGROSENS INSTRUMENTS" in the folder "programs". After successful installation, the software can be accessed and executed through the START menu.

**First time operation:** Connect the cable of interface adapter to a free serial port on the PC. After first time run of the software, in the menu option "settings", select device type as "HYTE-LOG" and also the serial interface used (for example, COM1) under "connections". The remaining settings (Data rate, Parity, Start and Stop bit) are automatically selected and need not be changed. In case, the connection hangs, refer to data communication in the terminal window. Then select "Close". The current settings will be stored.

If you are not able to establish data link between PC and the measuring device and/or the measuring adaptor, then first please check the power supply and also the cable connection to the PC.

**Data recording:** First activate all the measurement channels that are to be recorded. In 'Text 1' and 'Text 2', you can enter a description, which has to appear as heading on the top of data file. The selected separator appears between the individual data elements. Enter the recording interval in seconds in the Field "Every". The data is recorded in the file which is entered as path in the 'Start' button. The recording begins with the 'Start' button.

**EXCEL™:** If you want to use EXCEL for evaluation, then operate the control button EXCEL before start of recording, so that suitable decimal separation characters and field separators are inserted. The created file is compatible with CSV-Format. In order to display the measured data, you can use graphic tools, for example, the diagram-assistant. However, other programs can also be used to evaluate the measured data.

## Calibration

The module is supplied in calibrated condition. The accuracy at 23°C is of the order of  $\pm 0.3^\circ\text{K}$  and  $\pm 3\%$  rH.

Under normal operating conditions, it is not necessary to again calibrate the module. The measuring accuracy of humidity measurement portion can be done by the end user with the salt



reference cells available as special accessories. The checkup must be done in temperature stable environment.

In case, the measured value does not match with the desired value of the cell, the device should be sent to our calibration laboratory for checkup.

HYGROSENS INSTRUMENTS GmbH  
- Calibration Laboratory -  
Maybachstr. 2  
79843 Löffingen

Further information in our website:  
[www.hygrosens.com](http://www.hygrosens.com)

# Humidity-Temperature Sensor module with serial interface

## Format of Data transfer

The interface works at a data rate of 4800 Baud, 8 data-bits, no parity and one stop bit.

The transfer of useful data takes place in lines. All characters are ASCII coded. All information is sent continuously without separation characters. In a line, only information of one channel is transferred. At the end of the line, the last two ASCII characters are sent for the check sum (CRC) of the current line. Each line closes with the character 'Carriage return' '<CR>'. Several lines form a data-block. A data-block can have the following contents, for example:

```
@<CR>
I01010100B00725030178<CR>
V010892A1<CR>
I02020100B00725030148<CR>
V0216B0EA<CR>
$<CR>
```

The data block has a following structure:

- A synchronization pattern for the beginning of a Data block. For synchronization, the sequence '@ <CR>' is used.
- The configuration data ('Identifier') of a channel. The data line begins with the character 'I', followed by the logical channel number, and then followed by configuration data and the Sensor serial number. The line is closed with the check sum and the character <CR>.
- The measured values of a channel. The data line begins with the character 'V', followed by the logical channel number, followed by useful data. Only numerical measurement values and the check sum (CRC) at the end of the line, are transferred. All other information like number format, number of characters, physical unit, etc. are contained in the configuration data (sensor coding).
- The configuration data and measurement values follow the same scheme for all other channels.
- The continuation character '\$' <CR> is sent at the end of a data-block.

## Structure of Configuration Dataline

The configuration data line contains all information of the sensor working on the corresponding channel. The line has a following structure:

- Identification character 'I' at the beginning of the line.
- 8 bits (two ASCII characters) logical channel number. The logical channel number is used to co-relate configuration data with the measured values. In the Humidity-Temperature module, the temperature values are transmitted through channel 01 and humidity values are transmitted through channel 02.
- 8 bits (two ASCII characters) physical sensor coding. Based on sensor coding, the number format, scale, physical unit and allowable range of values are specified. For the described device, sensor coding is 01 for temperature channel and 02 for humidity channel.

- 8 bits (two ASCII characters) hardware coding (type of the measurement sensor). The Temperature/Humidity module has the code number 01.
- 48 bits (twelve ASCII characters) serial number of the sensor. Each serial number is allotted only once.
- 8 bits (two ASCII characters) CRC (check sum)
- '<CR>' as line termination

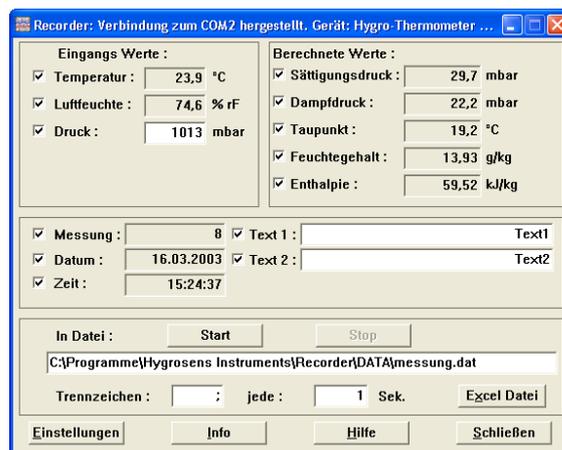
## Structure of measured values Datalines

The measured value dataline contains the current measurements of the sensor operating on the corresponding channel. All information are represented in binary and is transferred in ASCII coded format without separation characters. For the sensor marking 01, the line has following a structure:

- Identification character 'V' at the beginning of the line
- 8 bits (two ASCII characters) logical channel number (01 for temperature, 02 for humidity)
- 2 Byte (4 ASCII-characters) measurement data. For the temperature with 0.01°C resolution. The hexadecimal value is to be converted into a decimal number and to be divided by 100. With this, the temperature value is obtained in °C with two decimals.  
For the humidity value with 0,005 % resolution. The hexadecimal value is to be converted into a decimal number and to be divided by 200. With this, the relative humidity rH value is obtained in % with two decimals.
- 8 bits (two ASCII characters) check sum (CRC)
- '<CR>' as line termination

As per the opposite column in the given example, the measured temperature is equal to 21.94° C and humidity of air is 29.04% rH.

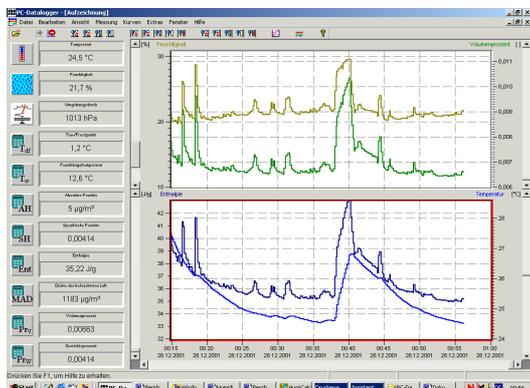
View of the Software "RECORDER"



# Humidity-Temperature Sensor module with serial interface

## Accessories (Optional)

### Software PCLOG



Besides storing data on hard disk, the software offers a most important feature of graphical representation of all measured and recorded channels in the form of a temperature Vs time chart (online scriber function). By means of Drag & Click, the window section can be enlarged and the time or temperature axis can be scaled as desired. Besides the graphic view, the representation is also possible in the form of a table. The Windows scratchpad is used for capturing measured data series into a spreadsheet program (for example EXCEL™) or into WORD™. All tables and graphic representations can be printed out in color. In addition, simple monitoring and regulation functions are also integrated in the software. Limits can be set for each channel. An acoustic signal (Wave file) is given when the values are exceeded. Control of up to eight external actuators is possible by a relay card, to be attached at the parallel port.

A speciality of the program is the hx-calculator. This further calculates 15 other figures like the dew point, absolute humidity, enthalpy, the wet bulb temperature, the vapour pressure and saturated vapour pressure etc.

### Software Profilab

With this software, professional measurement projects can be realized in a simple, graphics based development platform. You can simply draw the wiring diagram of the measurement circuit and do the project design. Without any knowledge of programming, the measurement values of temperature and humidity can be easily used in the measurement circuit. Arithmetic and logical components take care of linking and processing of the measured values. Modules like impulse generators, timers and relay cards etc. provide extensive possibilities for control and regulation. Various instruments, scribes and tables serve as the storage and representation of measured values and you can monitor the measurement system with display and control elements. The system is operated through a self designed front panel, on which you can arrange switches, potentiometers, displays, LED's, instruments etc. The software also enables compilation of the project into an EXE-file, which can run without "Profilab".

### Relay cards

The output of control information is given by the WINDOWS software "PCLOG" or "PROFILAB" over the LPT-Port as a control signal. The relay cards supplied as accessories are needed for giving connection for heavier actuators like heater valves, servomotors or signal generators. The switching status is indicated through LED's. The relay boards are also used for many other applications.

The contact rating of Model 183084 is 15 W (max. 30 V/0.5A). This model is suitable for only low voltages. A external Power supply 12V/300mA is required. The higher rating version REL-T2 is suitable for switching of mains voltage. The permissible operating current is 10 A. The mains power supply is integrated on the circuit board.

### Humidity reference cells

The HYGROSENS Humidity reference cells provides specific humidity conditions, in order to create stable humidity values for experimental purposes or for calibration of the measuring device.



The accuracy possible under stable temperature environment conditions is in the range of 1 % relative humidity. The working principle is based on a saturated salt solution, over which a specific relative humidity value

adjusts itself. The cells also contain a semi-permeable Teflon membrane (diaphragm) through which the salt solution is separated from the measurement area.

### Index to ordering numbers

Humidity-Temp. Module with Stainless steel sensor, RS232	183017
SMD Humidity-Temperature module, RS 232	183003
* Hand measuring instrument with LCDisplay and RS 232	HM 307
* Hand measuring instrument with LCDisplay and RS 232 with Dew point and Absolute humidity display	HM 309
* AC power supply 9V/500 mA	NG 9V
<b>Software</b>	
WINDOWS-Software PCLOG	183030
Windows-Software PROFILAB EXPERT	183044
Driver for LABVIEW	LABVIEW-HYTELOG
<b>Relay cards</b>	
8 Relays Low voltage	183084
* 8 Relays Mains voltage	REL-T2
<b>Accessories</b>	
Connection cable (only for SMD-Module 183003)	183056
* Humidity reference cells, Setting 33% und 75 %	REF-SET
* Humidity reference cells, various values	ag. order

Items marked \* are not available at CONRAD-ELECTRONIC. Procure directly from HYGROSENS.

The supply range is constantly upgraded. For further information, visit our website: [www.hygrosens.com](http://www.hygrosens.com)