

# Rack mount environment monitor

H3531R

H4531R

H7531R

Monitoring of temperature, humidity, barometric pressure  
and other derived humidity values  
with Ethernet interface

## **Instruction Manual**

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# 1. General safety rules

The following summary is designed to prevent injury hazards or device damage. Operate the instrument in accordance with this manual to prevent electric trauma.

**Service should be performed by a qualified person only.**

**Use a safety ac/dc adapter.** Use only an adapter with the power voltage recommended by its manufacturer and which is approved by proper standards. Check that the adapter has undamaged cables and cover.

**Connect and disconnect correctly.** Do not connect and disconnect a LAN cable or lead-in cables if the device is under electric voltage.

**Do not use the instrument without the cover.**

**Do not use the instrument, if it does not work correctly.** If the instrument seems not to work correctly, have it checked by a qualified service person.

**Do not use the instrument in an explosive environment.**

**Read instruction manual before the first device connection, please.**

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## 2. General description

Monitoring systems of Hx531R line are designed for online monitoring of temperature in °C or °F, relative humidity of air without aggressive ingredients, barometric pressure and three binary inputs for detection of binary signals. Measured temperature and relative humidity are recomputed to following humidity expression: dew point temperature, absolute humidity, specific humidity, mixing ratio and specific enthalpy. It is possible to set correction for altitude (pressure offset) and to choose one of the following pressure units: hPa, kPa, mbar, mmHg, inHg, inH2O, PSI, oz/in2. The device is equipped with two relay outputs for alarming or controlling of external devices. It is possible to assign any input value to each relay, to set comparing limit, delay, hysteresis and acoustic alarm. The device is communicating through Ethernet interface. The device is internally separated into two units. The first unit provides measurement and controlling of output relays – there is possible to change these parameters directly through device’s keys or TSensor software. The second unit provides all Ethernet services, its configuration is possible through Telnet terminal or TSensor software (this setting is impossible to change through device’s keys).

Type	Temperature	Humidity	Pressure	Computed value	Binary inputs
H3531R	✓	✓		✓	3x
H4531R *	✓				3x
H7531R	✓	✓	✓	✓	3x

\* the type H4531R is designed for two wires connection of external Pt1000/3850 ppm temperature sensor.

Measured values are available from Ethernet interface or are displayed on LCD display. If there are two values displayed at one LCD line, they are periodically switched between both readings with period of 4 seconds. Display can be switched OFF totally too. The following formats are supported:

- www pages with user-design possibility
- Modbus protocol
- SNMPv1 protocol
- SOAP

The instrument may send a warning message to several defined points if the measured value gets out of adjusted limits. There are the following possible ways to deliver the warning report:

- to send an e-mail to maximum of three e-mail addresses
- to send a SNMP trap to maximum of three IP addresses
- to display an alarm state on the device www page
- to send a message to Syslog server

Alarm limits may be set via TSensor software, Modbus, Telnet or a SNMPv1 protocol. The alarm state may be read via the device www pages, Modbus or the SNMPv1 protocol.

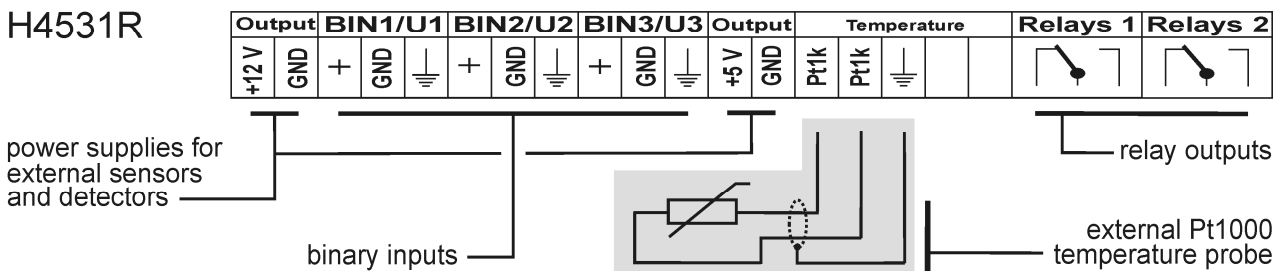
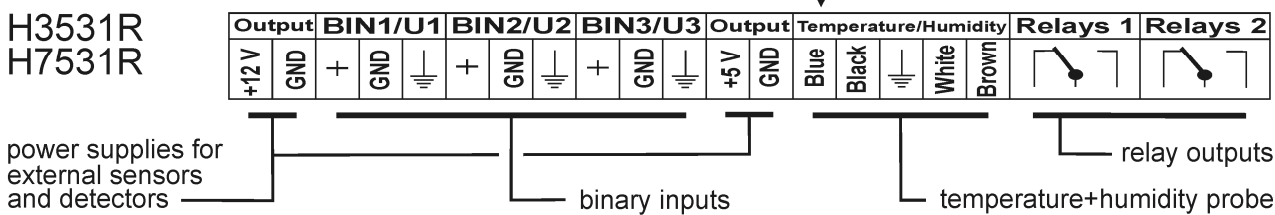
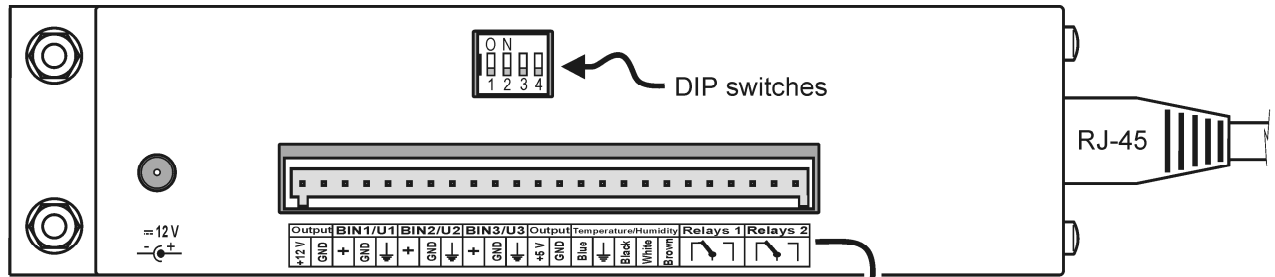
The value assign to each relay is possible through TSensor software or through device’s keys.

If Power over Ethernet is needed, it is necessary to use some PoE Splitter. Tested is e.g. D-Link DWL-P50. Device itself does NOT support PoE internally!

Monitoring system supports Internet protocol version 4 (IPv6 is NOT supported).

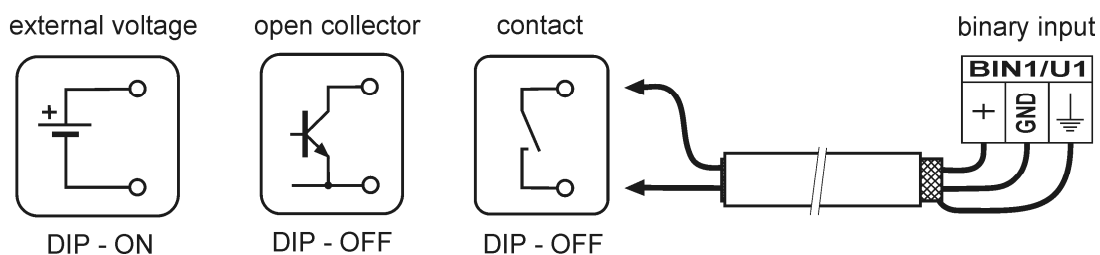
### 3. Monitoring system mounting and connection

The devices are designed for mounting into 19-inch rack (mounting screws and female screws included). At back side of the device there are connectors for power source, 24pins CAGE CLAMP connector and RJ-45 Ethernet connector. There is possible to use +12V and +5V power output for powering of external sensors and detectors – see picture below.



It is NOT recommended to use the device for long time under condensation conditions. It could be the cause of water steam condensation inside the sensor's cover into water phase. This liquid phase stays inside sensor's cover and can't escape from the cover easily. It can dramatically increase response time to relative humidity change. If water condensation occurs for longer time it can cause sensor damage. Similar effect can occur under water aerosol conditions. External temperature probe connectable to H4531R must be type of "two wires with shielding". The probe cable length and size of conductor affects measurement accuracy. If connected probe is equipped with metal stem, we recommend using probes with metal stem not connected to cable shielding. Or else it is necessary to arrange metal stem is not connected to any other circuitry.

Binary inputs are designed for dry contact or external voltage connection – see picture



The maximal length of binary inputs and external Pt1000 temperature probe (H4531R only) is 10 m. Connect probe cable shielding to proper terminal and do not connect it to any other circuitry and do not ground it.

The cables for binary inputs and external sensor must be placed as far as possible from potential interference sources.

It is possible to connect optionally accessory, for more information see [www.cometsystem.cz](http://www.cometsystem.cz). Method of connection is shown in Appendix A of this document.

Electrical system (wiring) may be done only by a worker with required qualification by rules in operation.

## 4. Preparation to operation

To provide all Hx531R monitoring systems functions it is necessary to make its setting through PC to satisfy your requirements. Requested parts necessary for operation:

- ac/dc adapter 12V
- RJ-45 LAN connection
- free IP address in your network
- temperature probe with a Pt1000 sensor for the H4531R monitor

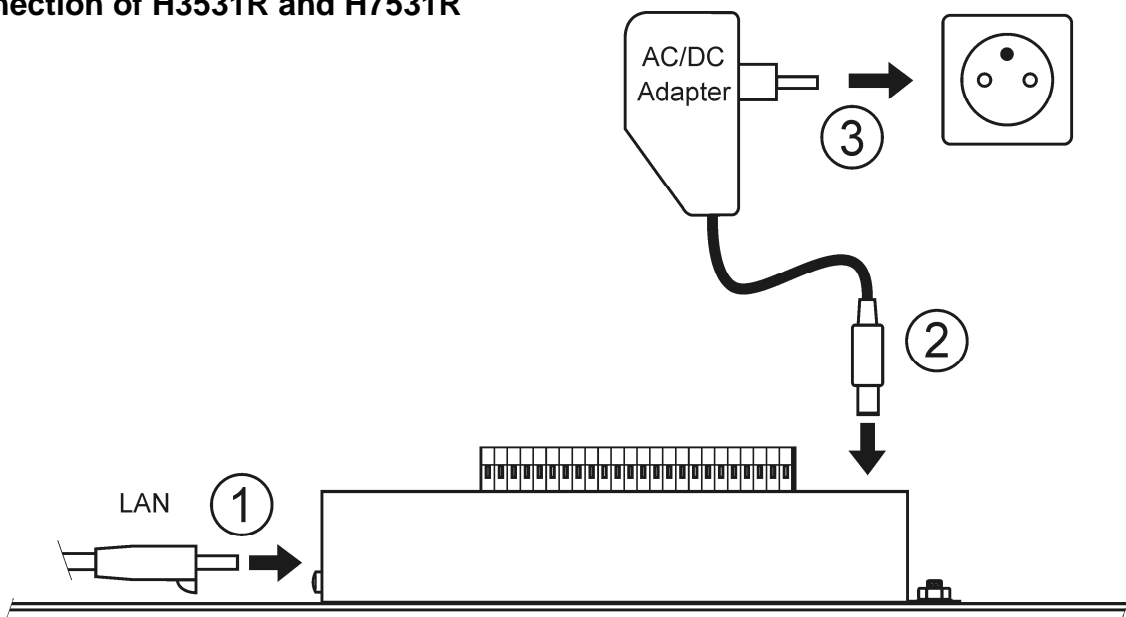
**Contact network administrator to get free IP address.**

**Warning!** Reliability of warning messages reception (e-mail, trap) depends on current accessibility of required network services. It is recommended to protect device from unauthorized access to device settings and cables connection.

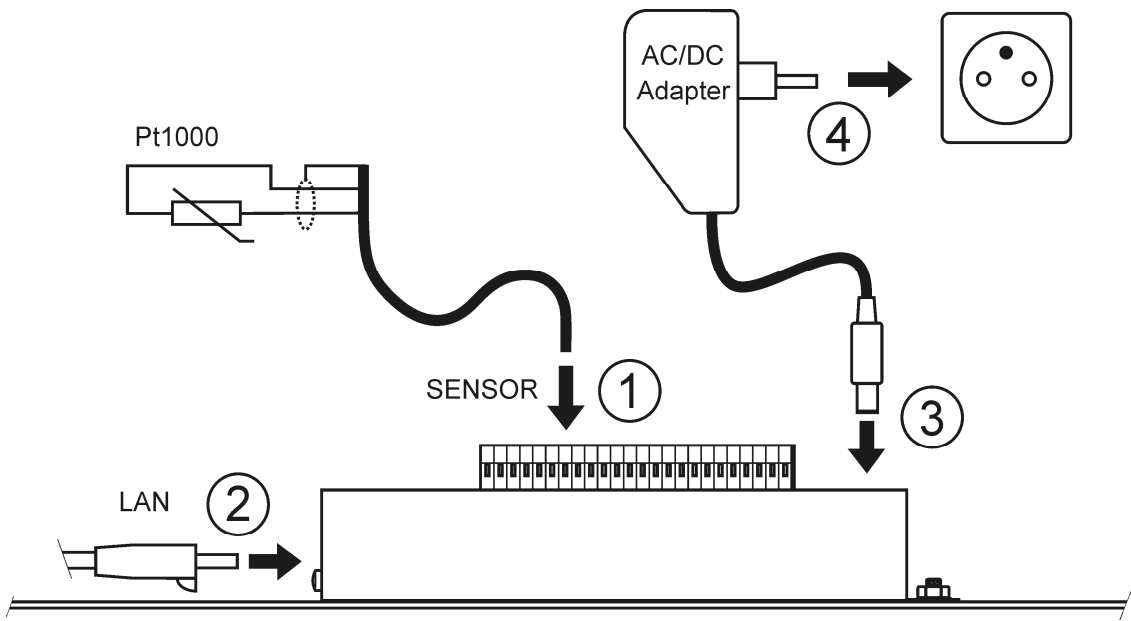
### 4.1. Procedure of instrument connection

The cables and temperature probe for H4531R connect in order as shown in the pictures. After power supply connection, make monitoring system configuration.

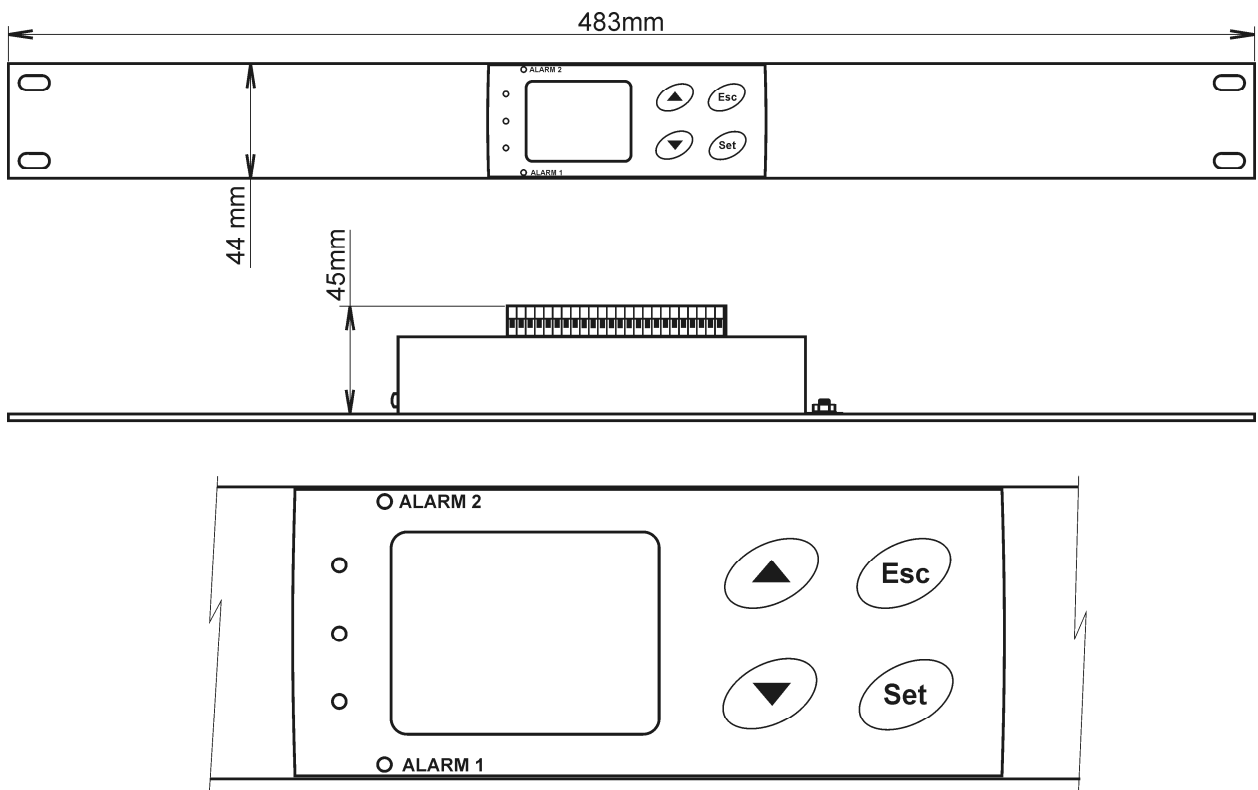
#### Connection of H3531R and H7531R



## Connection of H4531R



## 5. Dimensions





## 6. Installation

It is necessary to assign a new suitable IP address to the device at the first connection to it in order to prevent collisions with already existing network IP addresses, and make the address conform to the local habits. If installing several new devices, connect them to the network one after another! If a suitable IP address is not known, contact your network administrator and ask him for the following:

IP address of monitor	_____.	_____.	_____.	_____.
IP address of gateway	_____.	_____.	_____.	_____.
Network mask	_____.	_____.	_____.	_____.

The IP gate address and the network mask need not be specified if the device will be operated only in a local network. If you set the IP address to one which is already used in the network the device will NOT work correctly and collisions in the network will appear. It is possible to set the IP address by DHCP server.

### Device setting from the manufacturer:

IP address:	<b>192.168.1.213</b>
Value assigned to relay 1 and relay 2:	<b>none</b>
Password for setting through keys (PASS):	<b>0000</b>
LCD display:	<b>on</b>
value shown at first LCD line:	<b>temperature (temperature / pressure) – by device type</b>
value shown at second LCD line:	<b>relative humidity / dew point temperature</b>
temperature unit:	<b>°C</b>
pressure unit:	<b>hPa</b>
correction for altitude:	<b>0 hPa (absolute pressure)</b>
computed value preset:	<b>dew point temperature</b>
relay response for error:	<b>stay unchanged at previous condition</b>
signalization of binary inputs status:	<b>LED diode lights if input contact is open</b>
acoustic alarm:	<b>off</b>

### 6.1. Installation procedure

- run TSensor software (default monitoring system IP address is 192.168.1.213) or use command line at PC with command „telnet 192.168.1.213 9999“. Telnet provides to set all Ethernet services. For setting of measurement and controlling of output relays use keys – see chapter 9.4 at page 12
- assign new device IP address
- make your own device setting by your requirements (alarm settings, used units, email and trap sending ...)
- save setting

## 7. Operation checking

### 7.1. Visual check

When power source is on, there are actually measured values shown on LCD display (if the LCD has not been switched off). When Ethernet cable is connected, there is one light on its connector lighting.

### 7.2. Communication check via a LAN

Open a browser of www pages and enter the devices IP address into appropriate field.

**Example:** `http://192.168.1.213`

Monitoring system shows its name, serial number, measured values, alarm status and alarm settings or shows message `Access denied` in case of web pages are disabled or setting through Telnet is in operation.

## 8. Calibration

Recommended calibration intervals

- H3531R 1 year
- H4531R 2 years
- H7531R 1 year

## 9. Description of device function and setting

Information from device is available directly through LCD or you can read them with one of next communication protocols. For communication through some communication protocol (SNMPv1, Modbus, SOAP) there is necessary to have installed appropriate software supporting appropriate communication protocol on PC. Such software is not included in the delivery! The device is internally separated into two units. The first unit provides measurement and controlling of output relays – these parameters are possible to change directly through device's keys or TSensor software. The second unit provides all Ethernet services, its configuration is possible through TSensor software or Telnet terminal (this setting is impossible to change through device's keys).

### 9.1. Relay outputs

Monitoring system is equipped with two relay outputs. It is possible to assign any input or computed value to each relay, to set comparing alarm limit, if the relay may close if measured value is higher (Hi) or lower (Lo) than preset limit, delay for while must be preset condition true before relay close its contact and hysteresis for return to open status. For binary inputs: if it is preset to „HI“ then output relay is closed when input contact is opened, if it is preset to „Lo“ then output relay is closed when input contact is closed. Each relay status is indicated with LED diode and shown on LCD with corresponding symbols „**ALARM 1**“ or „**ALARM 2**“.

The output relays of device are not able to switch power circuits or higher voltages. In such case we should use suitable type of power relays with coil in accordance to chapter “Common parameters”. For wiring see Appendix A.

### 9.2. Binary inputs

It is possible to read three binary inputs status. It is possible to connect “open contact” or external voltage. Visualization of binary inputs is done by three LED diodes placed on the left side from LCD. Green one represents input Binary 1, yellow input binary 2 and red input binary 3.

Configuration of binary inputs is done by DIP switch one to three placed at backside of the device. DIP switch 1 is assigned to binary input 1, DIP2 to BIN2, DIP3 to BIN3. If corresponding DIP switch is ON, then appropriate binary input is configured as “voltage input”. It means that without connection of external voltage there is binary input read as “0”, after external voltage is applied, there is binary input read as “1”. This setting is for suitable for optional accessory “Power detector SP008” for example. If corresponding DIP switch is OFF, then appropriate binary input is configured as “dry contact input”. It means that if the binary input is open/disconnected then binary input status is read as “1”, if the binary input is closed (closed contact) then binary input status is read as “0”. For each binary input there is possible to set indication LED function – if is lighting when binary input is closed or opened. Binary input status can be assigned to any of output relays. It is possible to choice if output relay is closed or opened when binary input is closed/opened. Binary inputs are not galvanic isolated.

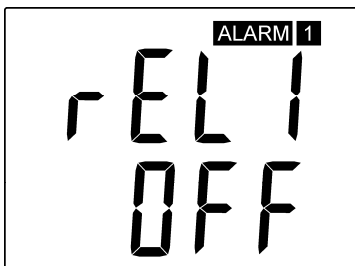
### 9.3. Actual monitoring system preset – measurement part

It is NOT possible to make any changes of Ethernet services, for their setting see chapter 9.6 at page 19.

It is possible to display actual device preset on its LCD display by pressing of „▲“ key. LCD shows information about relay 1 and then relay 2 setting step by step. Information about relay 1 are indicated with symbol „ALARM 1“, for relay 2 with symbol „ALARM 2“ (at right top corner of LCD). It is possible to edit parameters after pressing „SET“ key and entering of correct password „PASS“ – see chapter 9.4.2 at page 13. Following examples are for relay 1 setting, similarly are displayed values for relay 2. Pressing of „ESC“ key ends this mode and switch to actual value displaying, the same occur if more than 20 s is not pressed any key.

#### 9.3.1. Value assigned to output relay

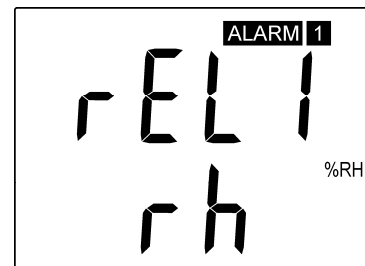
*None, relay is still off*



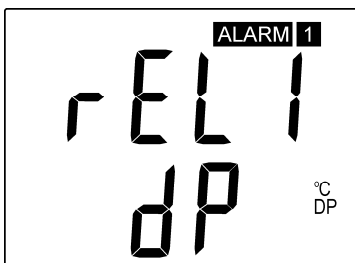
*Temperature at °C*



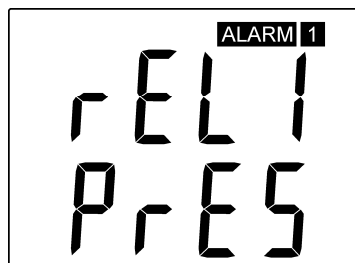
*Relative humidity*



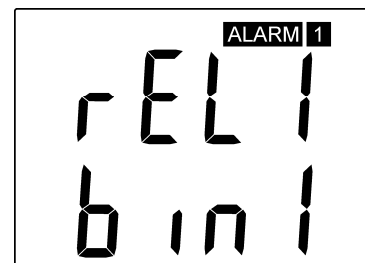
*Computed value – dew point temperature*



*Barometric pressure*



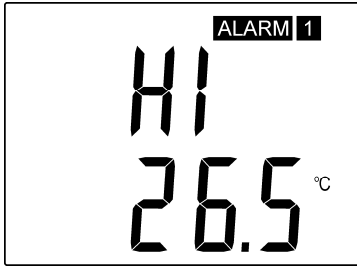
*Binary input 1, input 2 and 3 similarly*



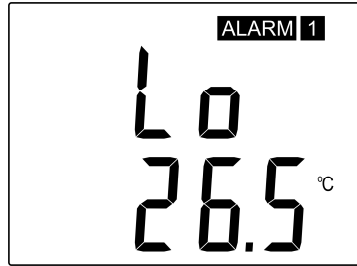
#### 9.3.2. When close output relay

Preset if relay is closed when actual value is higher „HI“ or lower „Lo“ than preset value.

Value higher than 26.5 °C



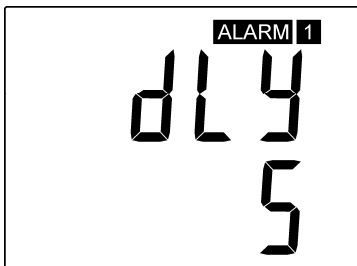
Value lower than 26.5 °C



### 9.3.3. Delay

Time in seconds, when preset condition must be true and after this time output relay is closed (transient reduction of measured value)

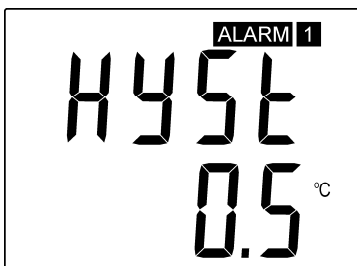
Delay in [s]



### 9.3.4. Hysteresis

The amount of measured value which must go under/over preset value to open appropriate output relay. It means if there is condition: relay 1 must be closed if measure value is “higher then” (HI), then measured value must decrease by this value under preset limit to relay output goes open. If condition of relay is: relay 1 must be closed if measured value is “lower than” (Lo), then measured value must be increased by this value over preset limit to relay output goes open.

Preset hysteresis value



## 9.4. Monitoring system setting change – part of measurement unit

### 9.4.1. Setting with PC and TSensor software

User's software **TSensor** is available free to download at web page [www.cometsystem.cz](http://www.cometsystem.cz). It provides **setting of all device parameters**. Run the TSensor program and follow the program instructions. Device includes hardware write protection of internal setting (except of Ethernet setting which is protected by password), new setting is possible to write only while:

1. during write period press „SET“ key – do requested setting in TSensor software, press „SET“ key on device and keep it down, then click on the button „Save Changes“ into TSensor software and after end of write release „SET“ key, or
  2. when DIP switch 4 is ON – available at back side of the device, if it is ON then you can see small number 3 at left side of LCD and new setting can be write. Don't forget to move DIP switch 4 to OFF after setting procedure finish (restore write protection).
- TSensor software supports to make the adjustment of the device too. This procedure is described at file „*Calibration manual.pdf*“ which is installed commonly with the software.

### 9.4.2. Setting with using monitoring system keys

If „Actual monitoring system preset“ is displayed (see chapter “Actual monitoring system preset – measurement part” at page 11), it is possible to enter into edit mode and edit displayed value by pressing „SET“ key. Then you are asked for valid password (PASS). If password is not valid there is shown for short time message “Err9” on LCD. You can edit selected value if right password is entered. During value editing there is range check executed and edited value is still compared with limits for corresponding value (range). If inserted value is higher or lower then edited number is automatically changed to its maximum / minimum value – for possible range see chapter „Technical parameters“ at page 29. Value can be changed with using „▲“ and „▼“ keys. Edited value is switched in “round” -9, -8, -7, ...-2, -1, 0, 1, 2, ...8, 9. To edit next number digit press „SET“ key, for moving back to previous digit press „ESC“ key. Edited value is stored by next „SET“ key pressing. It is possible to cancel editing by pressing „ESC“ key if necessary. If valid password is once inserted right, then there is possible to edit next items without asking for password insertion again, till “Actual monitoring system preset” is left (till actual measured values are shown). With new entering into edit mode it is necessary to enter Password again. Default password setting is preset from manufacturer to 0000, password change is possible into „Extended setting“. During edit mode device still works and changes are valid immediately after its storing. After storing the Ethernet part is restarted automatically.

### 9.4.3. Extended setting mode

During device operation it is possible to change parameters available through “Actual monitoring system preset” only (see chapter 9.3 at page 11). Rest of device parameters are available through “Extended setting mode”. **In this mode device does NOT communicate, does NOT do any measurements and does NOT service output relays. To leave this mode press „ESC“ key and move DIP switch 4 to OFF.**

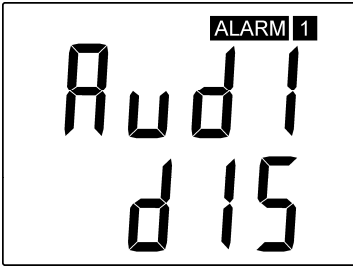
To enter into Extended setting mode do following steps:

1. disconnect power supply
2. move DIP switch 4 to ON (you should see small number 3 at left side of LCD)
3. press „▲“ and „▼“ keys together and keep them down
4. connect power supply to device – you should see message „SEL“ on the top line of LCD and on the bottom line you should see number of Firmware version (e.g. 0404)
5. release „▲“ and „▼“ keys – you are into “Extended setting mode” now

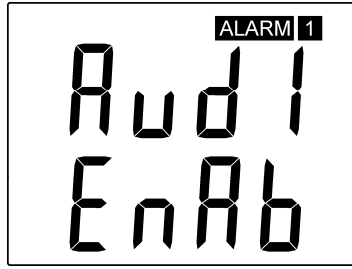
Use „▲“ and „▼“ keys to inspect each items. If you want to change some shown item then press „SET“ key, item starts blink. Now you can edit setting with using „▲“ and „▼“ keys. To store preset value press „SET“ key. Press „ESC“ key to leave editing (changing) without save – last stored value is kept. Into this mode you can set following items:

### Acoustic alarm assign to relay 1

*acoustic indication of relay 1 is OFF*

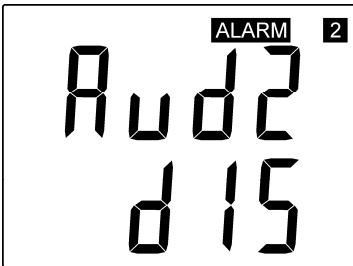


*close of relay 1 contact starts acoustic indication*

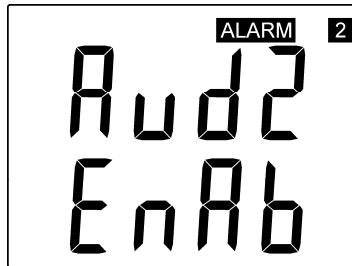


### Acoustic alarm assign to relay 2

*acoustic indication of relay 2 is OFF*

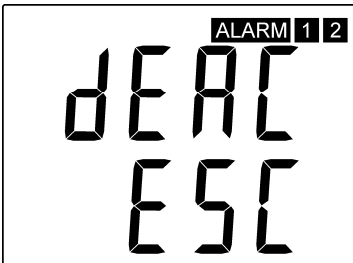


*close of relay 2 contact starts acoustic indication*



### Acoustic alarm deactivation

*activated acoustic alarm is possible to deactivate by pressing „ESC“ key*



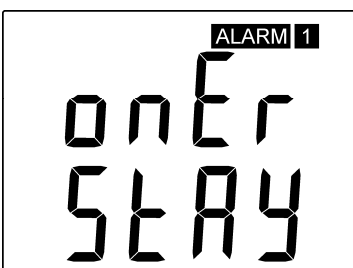
*acoustic alarm is still activated for all time and it is impossible to deactivate it*



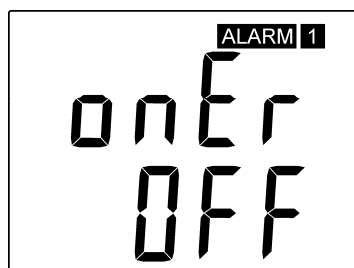
### Relay response for error

Monitoring system continuously checks its state during operation. In case error of assigned value measurement is found then output relay:

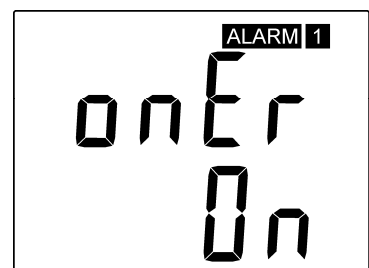
*stays unchanged (in previous status)*



*Relay 1 switch OFF*



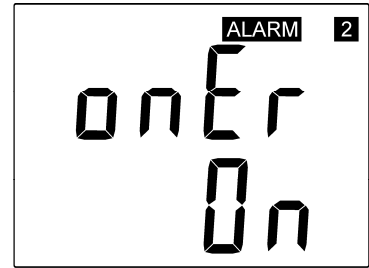
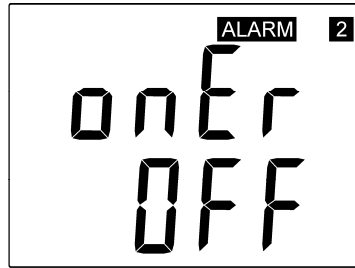
*Relay 1 switch On*



stays unchanged (in previous status)

Relay 2 switch OFF

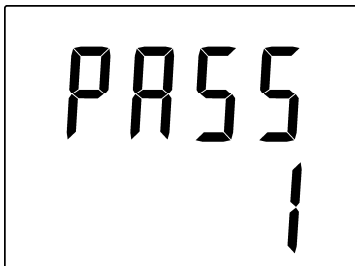
Relay 2 switch On



### Change of “Password for setting through keys” (PASS)

This item shows actual password setting. It is possible to change it after „SET“ key pressing. It is number from range -19999 to +19999.

password setting



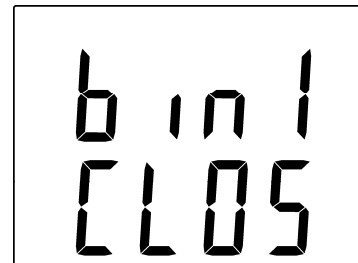
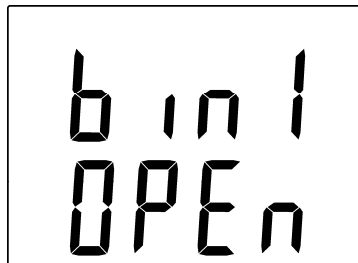
### Visualization of binary inputs

Visualization of binary inputs is done by three LED diodes. This option defines at which binary input status should LED diode indication lights – LED diode lights if binary input is OPEN or CLOSED.

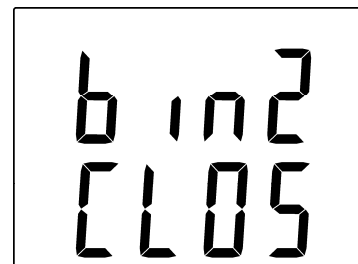
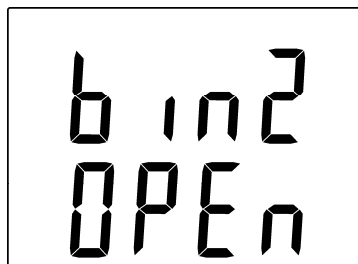
LED lights if binary input is OPEN

LED lights if binary input is CLOSED

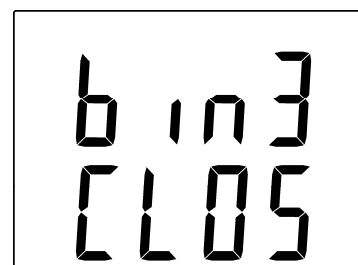
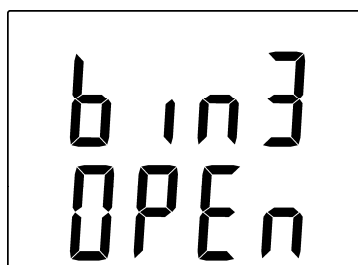
Binary input 1



Binary input 2



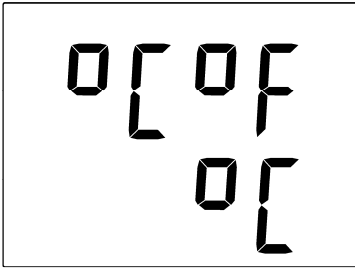
Binary input 3



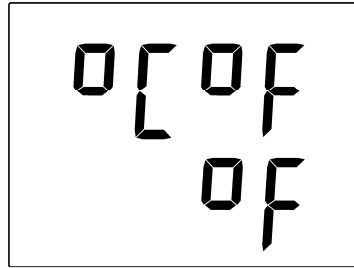
### Temperature unit choice

It is possible to measure temperature at °C or °F. There is shown preset unit. It is possible to change it after „SET“ key pressing.

*preset to °C*



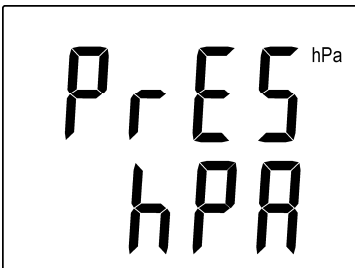
*preset to °F*



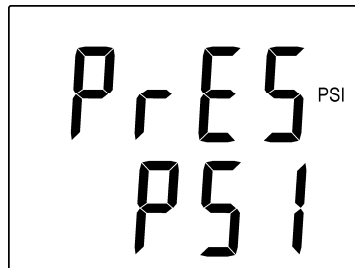
### Barometric pressure unit choice

It is possible to measure barometric pressure at hPa, PSI, inHg, mBar, oz/in<sup>2</sup>, mmHg, inH<sub>2</sub>O and kPa. There is shown preset unit. It is possible to change it after „SET“ key pressing.

*preset to hPa*



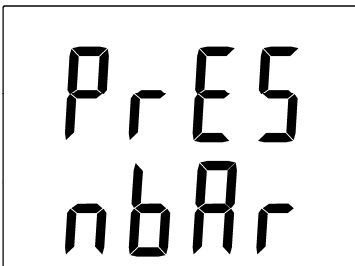
*preset to PSI*



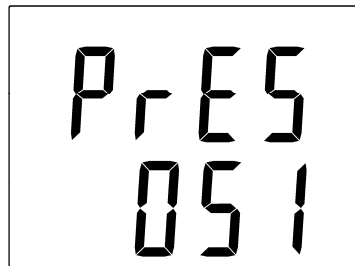
*preset to inHg*



*preset to mBar*



*preset to oz/in<sup>2</sup>*



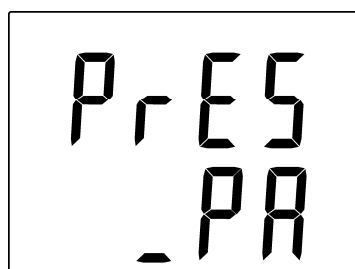
*preset to mmHg*



*preset to inH<sub>2</sub>O*



*preset to kPa*

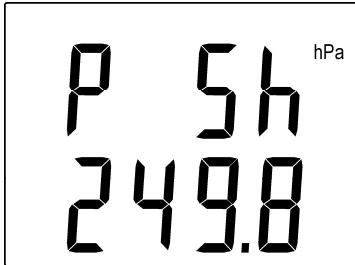




### Setting of pressure correction for altitude

If it is necessary to read value of barometric pressure corrected with respect to altitude, it is possible to set corresponding pressure offset for this altitude. It is possible to change it after "SET" key pressing. Pressure correction value is then automatically added to measured pressure value. See chapter "Error States of the device" at page 27, Error 2.

*correction for altitude*



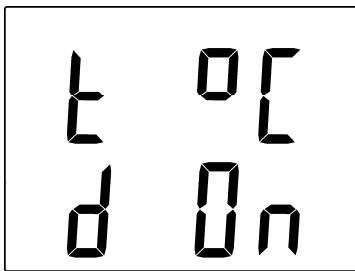
Pressure correction value is from:

- 25,0 to 650,0 hPa
- 0,363 to 9,427 PSI
- 0,74 to 9,19 inHg
- 25,0 to 650,0 mBar
- 5,8 to 150,8 oz/in<sup>2</sup>
- 18,8 to 487,5 mmHg
- 10,0 to 261,0 inH<sub>2</sub>O
- 2,5 to 65 kPa

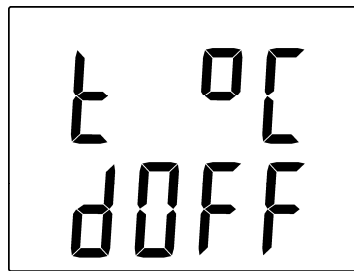
### Show temperature at LCD display

This item provides to choice if actual measured temperature may be displayed at LCD display or not. It is possible to change it after „SET“ key pressing.

*show value on LCD*



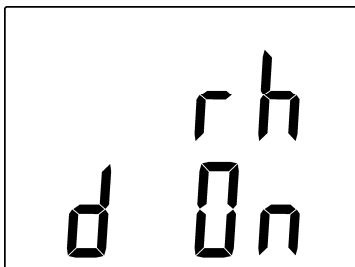
*don't show value on LCD*



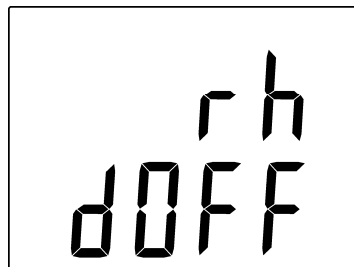
### Show relative humidity at LCD display

This item provides to choice if actual measured relative humidity may be displayed at LCD display or not. It is possible to change it after „SET“ key pressing.

*show value on LCD*



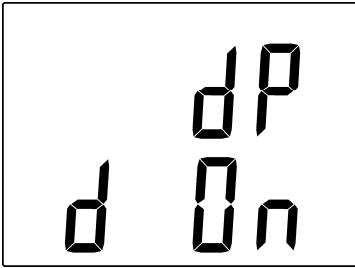
*don't show value on LCD*



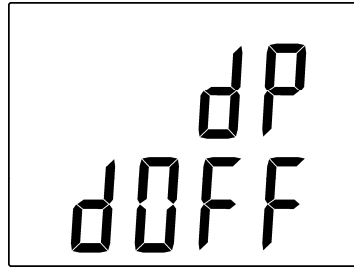
### Show computed value at LCD display

This item provides to choice if actual computed value may be displayed at LCD display or not. There is shown the name of computed value on the top LCD line – see "Computed value selection" below. It is possible to change it after „SET“ key pressing.

*show value on LCD*



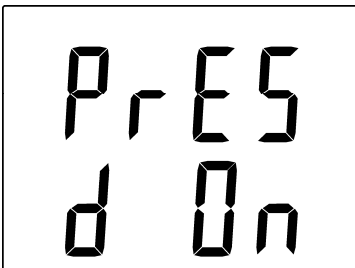
*don't show value on LCD*



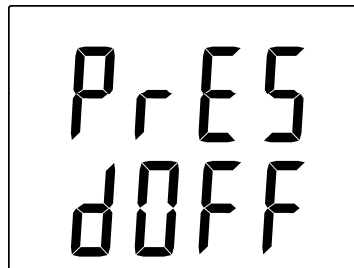
### Show barometric pressure at LCD display

This item provides to choice if actual barometric pressure may be displayed at LCD display or not. It is possible to change it after „SET“ key pressing.

*show value on LCD*



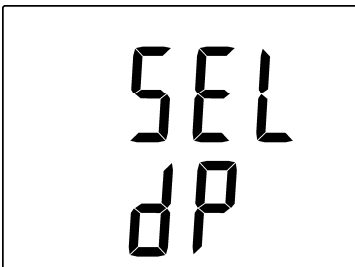
*don't show value on LCD*



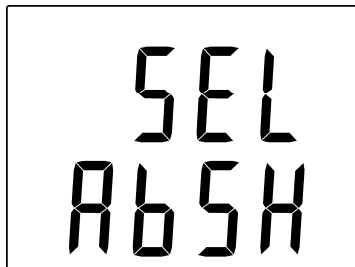
### Computed value selection

It shows the actually selected computed value name. It is possible to change it after „SET“ key pressing. There is possible choice one of the following computed values:

*dew point temperature*



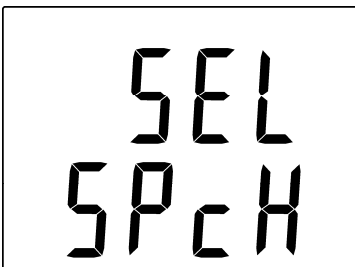
*absolute humidity*



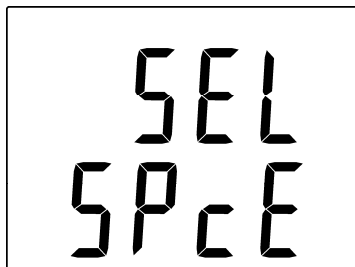
*mixing ratio*



*specific humidity*



*specific enthalpy*

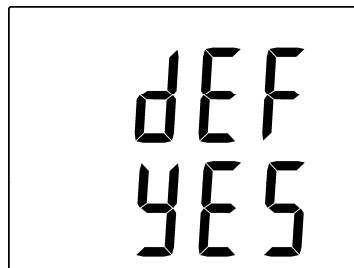
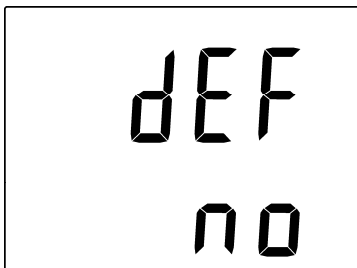


## 9.5. Restore to „Factory default“ – measurement part

This item provides device restoring to factory setting. Press „SET“ key, select „YES“ and confirm it by pressing of „SET“ key. It reset device parameters to following values:

Value assigned to relay 1 and relay 2:	<b>none</b>
Password for setting through keys (PASS):	<b>0000</b>
display:	<b>on</b>
temperature unit:	<b>°C</b>
pressure unit:	<b>hPa</b>
correction for altitude:	<b>0 hPa</b> (absolute pressure)
computed value preset:	<b>dew point temperature</b>
relay response for error:	<b>stay unchanged at previous condition</b>
signalization of binary inputs status:	<b>LED diode lights if input contact is open</b>
acoustic alarm:	<b>off</b>

*restore to factory default*



## 9.6. Monitoring system configuration – Ethernet interface

The Ethernet configuration is performed by TSensor software<sup>1</sup> or Telnet setup. Setting through the Telnet is described in separated document. Access to the Setup can be protected by a password. TSensor program you can find on manufacture web <http://www.cometsystem.cz> or on the installation CD. This program is free for use and supports firmware update too. The newest firmware is available at web pages too.

Parameter		Item name
Ethernet interface	Device IP address	IP Address
	Gateway IP address	Set Gateway IP Address
	Subnet mask	Net mask
	Access password for Telnet setup	Telnet config password
	The device description (name)	Device name
	Maximal transmit unit length	MTU size
	RSS feed IP address	RSS feed IP

<sup>1</sup> In telnet some settings are not allowed (display settings, computed value selection), see chapter 9.4

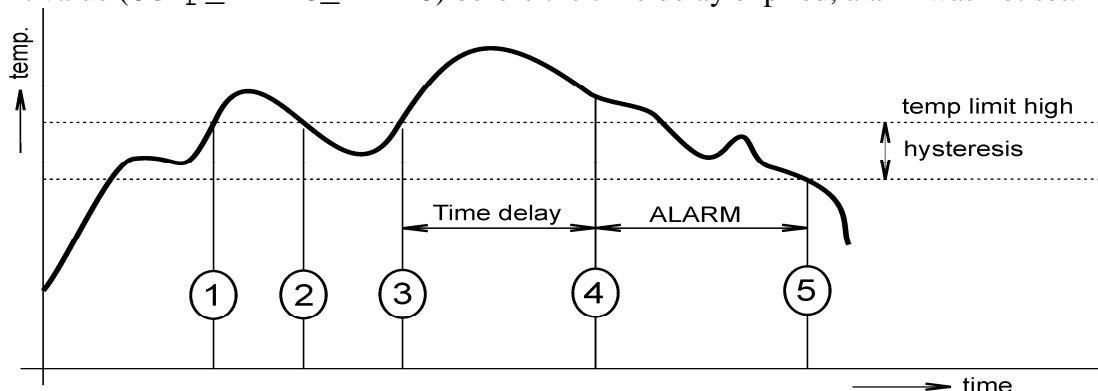
Parameter		Item name
SMTP	Warning e-mails sending enable	E-mail sending enable
	SMTP server IP address	IP address of SMTP server
	Short e-mail sending?	Short e-mail
	Default e-mail sender	Default mailfrom address
	SMTP authentication	SMTP authentication
	Recipient 1-3 e-mail address	E-mail address of rcv. 1-3
Syslog	Enable sending messages to Syslog server	SysLog enable
	Syslog server IP address	SysLog server IP address
SNMP	Enable/disable SNMP traps sending	SNMP Traps Enable
	Password for SNMP reading	SNMP community name for read
	Password for SNMP write to the device	SNMP community name for write
	IP address of trap receivers	Trap IP address 1-3
SOAP	SOAP protocol enable/disable	SOAP enable
	SOAP server IP address	SOAP server IP address
	Destination path of SOAP receiver script	Target web page
	Device source port	Source port
	Web server port	Destination port
	Sending interval to web server	Sending interval
WWW	Device web pages enable	WWW Enable
	Interval for automatic web page refresh	Web Refresh time
Alarm relay – see 9.7.2	Open or close relay indication. If e-mail, SNMP trap or Syslog protocols are enabled, warning message is sent.  Communication protocols are described below.	Send alarm when relay REx closed/open
Modbus	Enable/disable Modbus protocol	Modbus Enable
	Modbus protocol access TCP port (default : 502)	Set port
NTP	Enable synchronization with SNTP time server	Time synchronization Enable
	SNTP server IP address	IP address of NTP server
	Time shift (in minutes) between device place and UTC (GMT) time.	UTC time shift
History Interval	Time interval of data storage to history table and graphs. All values are stored only with this trigger interval (incl. BIN inputs).	History Storage Time
BIN inputs setup – see 9.7.2	Name for binary input	Input BINx name
	Enable raising edge indication	Send alarm when input BINx low -> high
	Enable falling edge indication	Send alarm when input BINx high -> low
	Time delay for binary inputs	Input BINx alarm delay

Parameter	Item name	
Analogue alarm configuration - see 9.7.1	Upper limit settings	xxx upper limit
	Lower limit settings	xxx lower limit
	Hysteresis	xxx hysteresis
	Time delay for alarm activation	xxx alarm delay
Factory default	Apply manufacturer settings for Ethernet interface of device.	Factory defaults

## 9.7. Alarms – Ethernet interface

### 9.7.1. Analogue values

It is possible to set an upper limit, lower limit, hysteresis and time delay to each measured value. Figure shows a temperature curve with some specified upper limit (`temp_limit_high`) and hysteresis. At point 1 temperature exceeds the limit. From that moment a time delay is counted (`time_delay`) after which an alarm is set. Because at point 2 the temperature dropped below the limit value (`temp_limit_limit`) before the time delay expired, alarm was not set.



At point 3 the temperature again exceeded the limit, and because it did not drop below the limit value (`temp_limit_high`) before the time delay ended, the alarm was set at point 4. At this moment the alarm e-mails and traps are sent, if they are enabled, and the alarm flag is set (the flag is set when the alarm is active and reset when inactive). The state of the flag can be found on the www pages or via Modbus or the information console. The alarm lasted to point 5, where the temperature

dropped below the limit value given by the adjusted hysteresis (`temp_limit_high-hysteresis`).

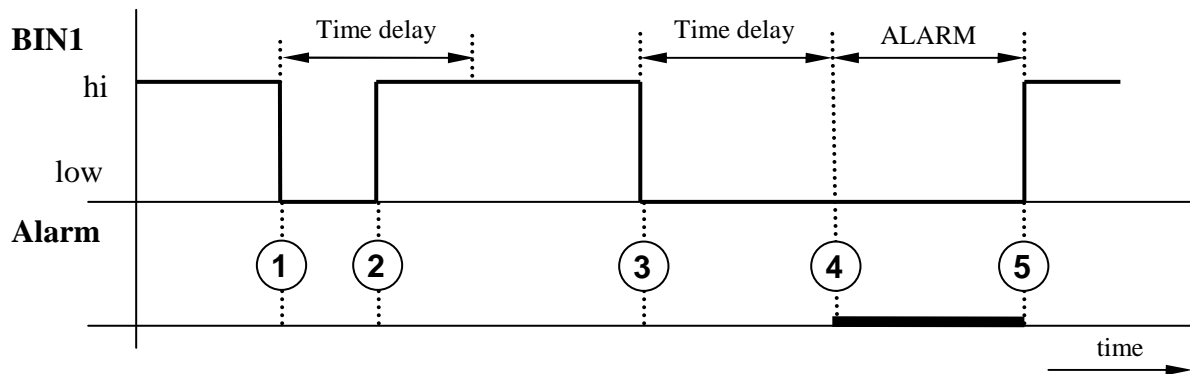
For other measured values the principle of alarm activity is analogical.

An alarm report is always sent right after an alarm appears. The device memorizes sent alarm reports of current alarms while the power is connected. In case of power disconnection or a reset of the device (e.g. by modification of configuration) a new alarm evaluation is performed and new alarm reports are sent again, if any.

It is possible to set the alarm parameters via telnet, Modbus protocol or a SNMPv1 protocol, TSensor program. Detailed description of setting via these protocols can be found in chapters informing about particular services.

### 9.7.2. Binary values

The binary values mean status of relay and binary inputs. Device can send warning message (e-mail, SNMP trap or Syslog message) in the course of relay or binary input change state. Every binary value has own time delay (relay – see chapter 9.3, binary inputs – 9.6). Binary inputs can have a name (max. 14 characters).



A figure shows a simple example. Binary input 1 is configured to send an e-mail if input change state from high to low (lower edge). At point 1 a binary input was opened. Because at point 2 input was closed before the time delay expired, alarm was not set. At point 3 was input opened again. At point 4 the time delay expires and at this moment e-mail, SNMP traps are sent. The alarm lasted to point 5, where the input was closed.

### 9.8. Factory default – Ethernet interface

This procedure describe how set Ethernet interface of device to factory defaults (new IP address: 192.168.1.213, mask: 255.255.255.0).

1. power off device
2. close the jumper near the Ethernet connector
3. power on the device
4. wait approximately 15s
5. remove/open the jumper

## 10. Communication protocols

### 10.1. Modbus protocol

The device contains support for the Modbus TCP protocol to communicate with control systems. The port is set to 502. The Modbus address of the device is always set to 1. Port 502 enables full access, i.e. both read and write operations are supported. Access to port can be disabled in the Setup. Maximal number of client transaction is set to 1.

#### Supported Modbus commands:

Command	Code	Description
Read multiple register(s)	0x03	Reads 16 bit register(s)
Write multiple register(s)	0x10	Writes 16 bit register(s)

#### Modbus registers of monitoring system:

Variable	Unit	Format	Address	Size[bits]	Status
measured temperature	°C, °F	Int*10	0x0031	16	r
measured relative humidity (RH)	%	Int*10	0x0032	16	r
computed value (CV)	CV depend	Int*10	0x0033	16	r
measured barometric pressure <sup>2</sup>	CV depend	Int*X	0x0034	16	r
device serial number Hi	[-]	BCD	0x1035	16	r
device serial number Lo	[-]	BCD	0x1036	16	r
relay 1 status [0/1]	[-]	Int	0x003B	16	r
relay 2 status [0/1]	[-]	Int	0x003C	16	r
binary input 1 status [0/1]	[-]	Int	0x003D	16	r
binary input 2 status [0/1]	[-]	Int	0x003E	16	r
binary input 3 status [0/1]	[-]	Int	0x003F	16	r
status of all binary inputs (bit0, 1, 2)	[-]	Int	0x0008	16	r
status word (described below)	[-]	Int	0x0007	16	r
firmware version Hi	[-]	BCD	0x3001	16	r
firmware version Lo	[-]	BCD	0x3002	16	r
lower limit for temperature	°C, °F	Int*10	0x5001	16	r/w
upper limit for temperature	°C, °F	Int*10	0x5002	16	r/w
lower limit for humidity	%	Int*10	0x5003	16	r/w
upper limit for humidity	%	Int*10	0x5004	16	r/w
lower limit for computed value	CV depend	Int*10	0x5005	16	r/w
upper limit for computed value	CV depend	Int*10	0x5006	16	r/w
temperature hysteresis	°C, °F	Int*10	0x5007	16	r/w
temperature time delay	s	uInt	0x5008	16	r/w
RH hysteresis	%	Int*10	0x5009	16	r/w
RH time delay	s	uInt	0x500A	16	r/w
computed value hysteresis	CV depend	Int*10	0x500B	16	r/w
computed value time delay	s	uInt	0x500C	16	r/w
temperature alarm status	-	ASCII <sup>a)</sup>	0x500D	16	r
RH alarm status	-	ASCII <sup>a)</sup>	0x500E	16	r
computed value alarm status	-	ASCII <sup>a)</sup>	0x500F	16	r

lower pressure limit	CV depend	Int*X	0x5010	16	r/w
upper pressure limit	CV depend	Int*X	0x5011	16	r/w
pressure hysteresis	CV depend	Int*X	0x5012	16	r/w
pressure limit status	-	ASCII <sup>a)</sup>	0x5013	16	r
pressure time delay	s	uInt	0x5014	16	r/w
relay 1 alarm status	-	ASCII <sup>b)</sup>	0x5015	16	r
relay 2 alarm status	-	ASCII <sup>b)</sup>	0x5016	16	r
binary input 1 alarm status	-	ASCII <sup>c)</sup>	0x5017	16	r
binary input 2 alarm status	-	ASCII <sup>c)</sup>	0x5018	16	r
binary input 3 alarm status	-	ASCII <sup>c)</sup>	0x5019	16	r
binary input 1 time delay	s	uInt	0x501A	16	r/w
binary input 2 time delay	s	uInt	0x501B	16	r/w
binary input 3 time delay	s	uInt	0x501C	16	r/w

Legend:

- r register is designed for read
- w register is designed for write
- Int\*10 register is in format of integer\*10
- Int\*X register is in format of integer\*10, int\*100, int\*1000 depend on type<sup>2</sup>
- BCD register is in format of BCD
- uInt register is at range of 0-65535
- ASCII character, where:
  - a) Temperature, RH, computed value, pressure alarm status
    - no no alarm
    - lo value is bigger than specified upper limit
    - hi value is lower than specified lower limit
  - b) Relay alarm status:
    - op no alarm
    - cl relay is closed, alarm is signaled
  - c) Binary inputs alarm status:
    - no no alarm
    - lo alarm on falling edge
    - hi alarm on raising edge
- Status word: 16b value return, bite description:
  - Bit0 0/1 jumper open/closed
  - Bit1 - unused
  - Bit2 0 always 0
  - Bit3 0/1 relay 1 open/closed
  - Bit4 0/1 relay 2 open/closed
  - Bit5 0/1 internal acoustic alarm status
  - Bit6 0/1 binary input 1 status
  - Bit7 0/1 binary input 1 status
  - Bit8 0/1 binary input 1 status
  - Bit9 to 15 unused

<sup>2</sup> hPa, mBar, mmHg, inH<sub>2</sub>O, oz/in<sup>2</sup> are Int\*10, inHg, kPa are Int\*100, PSI are Int\*1000



## 10.2. SMTP

In case of exceeding adjusted limits of measured values the device can send e-mails to maximum of three addresses. Maximum length of an e-mail address is 55 characters. It is necessary to set your SMTP server address (IP address, authentication, etc.) for correct function of e-mail sending.

If limits of several measured values are exceeded a special alarm e-mail is sent for each alarm state. Dummy address `sensor@[device IP address]` is displayed as a sender of the e-mail. It is not possible to reply to this address. In the Subject field of the message the sentence Alarm [Description of the device] is displayed or Test message [Description of the device] in the case of sending a test e-mail.

The description of the device is preset to the string `TPRh-Sensor+Relay`, `TRh-Sensor+Relay`, or `T-Sensor+Relay` depending on the device model.

## 10.3. SNMPv1

By means of the SNMPv1 protocol it is possible to find currently measured values, read and set parameters concerning alarms. In case of alarm activation, warning message (a trap) can be sent to specified addresses. By means of the SNMPv1 protocol it is also possible to display history of last 100 measured values.

For read and write the device communicates via UDP port 161. Traps are sent via port UDP port 162. Sending of traps can be disabled in the Setup. The following traps sent:

- 0/0 device restart
- 1/0 testing trap
- 1/1 SNTP time synchronization error
- 1/2 Ethernet firmware was uploaded
- 1/3 – 1/5 SOAP communication error
- 1/6 – 1/8 e-mail sending error
- 1/9 Configuration changed via SNMP or Modbus
- 6/3 – 6/55 report on a measured value being outside of the limits or a return of the measured value to the limits

For the correct function of the SNMPv1 server it is necessary to store the MIB table `Hx5xx.mib` and `RFC-1213.mib` to the MIB client. The path to the device is then:

```
iso.org.dod.internet.private.enterprises.comet.products.hx5xx
```

MIB tables are available at www pages <http://www.cometsystem.cz> or on the installation CD in the MIB directory. Password for a read operation is set by the manufacturer to `public`, password for write is set to `private`. These passwords may be changed in the setup.

### History

By means of the SNMPv1 protocol it is possible to display history of the last 100 measured values, stored in adjusted time interval. This interval is set by configuration program. If a value has not been measured yet or an error was detected the value is 9999, or -9999, if pressure is measured. The history is erased after each restart of the device. Restart occurred if device configuration is changed via keyboard or `TSensor` software.

## 10.4. WWW

The device supports display of measured values, adjusted limits and alarm states on its www pages. The address of the www pages is identical with its IP address. It is possible to upload self-

made web pages to device. More info about user-defined web you can find on <http://cometsystem.cz> section programs.

**Example:** The device has an IP address 192.168.1.204. Enter <http://192.168.1.204> to the browser address field and confirm it with the Enter key.

WWW pages have adjustable automatic refresh interval. The manufacturer sets it to 60 seconds. The value can be modified in the setup in a range of 10–65535s. If the device has www pages display disabled screen with message Access denied.

## 10.5. SNTP

The device allows time synchronization with SNTP server. The time synchronization is set to one per day. If the time synchronization failed in next three hours, SNTP trap, e-mail and Syslog message will be sent.

## 10.6. Syslog protocol

Device allows send messages to selected Syslog server (UDP protocol, port 514). Events are described below.

Event	Text
device restart	Device restart
test message	Testing message
alarm occurred	Alarm ...
SNTP connection error	NTP connection error
write to device via Modbus, SNMP	Settings changed
firmware was changed	Firmware uploaded
alarm is down	Clearing ...
SOAP server communication error	SOAP ...
e-mail sending error	EMAIL ...

## 10.7. SOAP

Device allows sending SOAP messages with measured values to user defined remote web server in preset time intervals 10-65535 s. If the device cannot establish connection with the web server in the whole delay interval, device sends trap 1/3 – 1/5. The file with XML schema is on [www.cometsystem.cz/schemas/soapHx5xx.xsd](http://www.cometsystem.cz/schemas/soapHx5xx.xsd).

### How to configure sending SOAP messages example:

There is SOAP service at address <http://my.hosting.com/soap/server.php> where the device shall send SOAP messages each 10s. IP address of the server my.hosting.cz is 111.247.121.123. Then sending SOAP messages needs to be set like this:

**SOAP enable:** Yes  
**Target web page:** my.hosting.cz/soap/server.php  
**SOAP server IP address:** 111.247.121.123  
**Source port:** 8080 (never set to 80, causes it web server collision)  
**Destination port:** 80 (http servers usually listens at this port)  
**Sending interval:** 10

## 11. What to do when...

### 11.1. I forgot the IP address of the device

#### Finding the device IP address

IP address is set to the value 192.168.1.213 by the manufacturer. If you changed it and forgot the new IP address, run the TSensor program and press the “Find...” button. In a new window all sensors will be show.

### 11.2. It is not possible to connect to the device from a LAN

#### In the “Find device” window is only IP and MAC address displayed

The next information is displayed as N/A. This problem will be occurred, when the device IP is set to another LAN.

In TSensor program choose Find device/Change IP address. Follow the program instruction.

#### The sensor IP address in Find device window is not displayed

In TSensor program select Find device/Help my device Wasn't found! Follow the program instruction.

#### Finding the MAC address

The MAC address is a unique address of a device which is necessary to be known e.g. in case when there are several devices connected to the network. MAC address is on device label.

#### It is not possible to find meter after manual MAC enter

In TSensor program select Find device/Help my device Wasn't found. In this select Set IP to ARP only. Into device MAC address enter the meters MAC address (e.g. 00-20-4A-84-F0-80) and press the Set IP button.

Open telnet to the IP address you assigned to the device MAC address by running a telnet command `telnet [IP_address_assigned_to_MAC_address] 9999` and confirm with the Enter key. Choose 0 - Global Settings, set the meters IP address, clear the gate IP, no. of net mask set to 0. Pres the Enter key, until you are not back into a menu. Press - 9 Save and Exit. The connection will be closed. Now you can connect to meter by the TSensor program.

### 11.3. LCD display is Off

- Check if power supply is connected properly
- disconnect and connect the power supply - watch the display at the moment of connecting the power. If all LCD segments light for 1 second and go out again, the display is turned off by the software

### 11.4. Error States of the device

Device continuously checks its state during operation. In case error is found LCD displays corresponding error code:

### **Error 0**

First line of LCD displays „Err0“. Check sum error of stored setting inside device's memory. This error appears if incorrect writing procedure to device's memory occurred or if damage of calibration data appeared. At this state device does not measure and calculate values. It is a serious error, contact distributor of the device to fix.

### **Error 1**

Measured or calculated value except in pressure is over upper limit of allowed full scale range. There is a reading „Err1“ on LCD display. Value read from the device is +999.9. This state appears in case of:

- Measured temperature is higher than approximately 600 °C (i.e. high non-measurable resistance of temperature sensor, probably opened circuit).
- Relative humidity is higher than 100%, i.e. damaged humidity sensor, or humidity calculation of humidity is not possible (due to error during temperature measurement).
- Computed value – calculation of the value is not possible (error during measurement of temperature or relative humidity or value is over range).

The value of pressure +999.9 hPa is correct value!

### **Error 2**

There is a reading „Err2“ on LCD display. Measured or calculated value is below lower limit of allowed full scale range. Value read from the device is -999.9. This state appears in case of:

- Measured temperature is lower than approximately -210°C (i.e. low resistance of temperature sensor, probably short circuit).
- Relative humidity is lower than 0%, i.e. damaged sensor for measurement of relative humidity, or calculation of humidity is not possible (due to error during temperature measurement).
- Measured pressure value **with added correction for altitude** is outside of range from 300 hPa to 1350 hPa (from 4.351 PSI to 19.580 PSI) or the pressure sensor is damaged. Please check setting of pressure correction for altitude with User's software.
- Computed value – calculation of computed value is not possible (error during measurement of temperature or relative humidity).

### **Error 3**

There is a reading „Err3“ on LCD display upper line.

Error of internal A/D converter appeared (converter does not respond, probably damage of A/D converter). This error does NOT affect pressure measurement. Rest values are NOT measured. It is a serious error, contact distributor of the device.

### **Error 4**

There is a reading „Err4“ on LCD display. It is internal device error during pressure sensor initialization. Under this condition device does NOT measure atmospheric pressure. Value read from device is -999.9. Pressure sensor is probably damaged. It is a serious error, contact distributor of the device.

### **Error 5, 6**

There is problem with assigned value to output relay, there is some wrong setting (mismatch). This error appears if incorrect writing procedure to device's memory occurred.

### **Error 9**

Inserted password is not valid, there is shown for short time message “Err9” on LCD display. Try to insert password again. If you forgot the password see chapter Change of “Password for setting through keys” (PASS) at page 15.

## 11.5. It is not possible to write new setting into monitoring system

See chapter “Setting with PC and TSensor software” at page 12.

## 12. Readings on LCD display

°C, °F - reading next to this symbol is measured temperature or error state of value

%RH - reading next to this symbol is measured relative humidity or error state of value

**hPa, PSI, inHg** - reading next to this symbol is measured pressure or error state of value. If selected pressure unit is **mBar** or **oz/in<sup>2</sup>** or **mmHg** or **inH<sub>2</sub>O** or **kPa**, there is shown only value (number) without corresponding pressure unit!

°C / °F **DP** - reading next to this symbol is calculated dew point temperature or error state of value

**g/m<sup>3</sup>** - reading next to this symbol is calculated absolute humidity or error state of value

**g/kg** - reading next to this symbol is calculated specific humidity or mixing ratio (depends on device setting) or error state of value

If specific enthalpy is selected, there is shown only value (number) without corresponding unit

**3** - this symbol is on if DIP switch 4 is ON

## 13. Preventive maintenance

Pay heed to recommended calibration interval. Do not subject the device to mechanical stress.

## 14. Technical specification

### 14.1. Technical parameters

#### 14.1.1. Common parameters

<b>Power voltage:</b>	12 V DC
<b>Power consumption:</b>	approx. 1 W
<b>Power connector:</b>	coaxial connector, diameter 5,5 x 2,1 mm, (+) internal contact
<b>Measuring interval:</b>	1 s
<b>Display switching interval:</b>	4 s (when more than two values are displayed)
<b>Communication with computer:</b>	Ethernet connection (RJ-45 connector)
<b>Protection:</b>	IP30

#### Relay outputs:

Amount:	2
Maximal voltage:	50 V
Maximal current:	2A
Maximal power:	60 VA
Relays contact is not designed for direct control of line voltage!	
(output relay contact parameters: max 220Vdc, 125Vac, 2A, 60 W, 62.5 VA)	

**Binary inputs:**

Amount: 3

Signal for binary input: from floating contact or binary voltage

Caution! Binary inputs are NOT galvanic isolated!

Minimal input pulse duration: 500 ms (detection of shorter pulses is not guaranteed)

Current through closed contact: 25  $\mu$ A

Open contact voltage: &lt; 3,3 V

Maximal input voltage: +30 V

Low level input voltage: 0 to +0,5 V

Hi level input voltage: +3,0 to +30 V

Cable for input signal wiring: shielded, max. 10 m long, cable should not be led in parallel along power cabling.

**Power output +12 V and +5 V for powering of external sensors and detectors:**

Total load max. 5 W ( +12 V/ max. 400 mA, +5V / max. 500 mA )

**EMC:** EN 61326-1:2006, EN 55011:2007, EN55022:2006 + A1:2007

EN 61326-1:2005, chap.6.2, tab.1

**14.1.2. Accuracy, range and resolution of monitoring systems****Temperature:**

	<b>H3531R</b>	<b>H4531R</b>	<b>H7531R</b>
accuracy	$\pm 0,4$ °C ( $\pm 0,7$ °F)	$\pm 0,2$ °C ( $\pm 0,4$ °F)	$\pm 0,4$ °C ( $\pm 0,7$ °F)
range	-30 to +105 °C (-22 to 221 °F), includes probe cable	-200 to +600 °C (-328 °F to 998.6°F)	-30 to +105 °C (-22 to 221 °F), includes probe cable
resolution	0,1 °C (0,2 °F)	0,1 °C (0,2 °F)	0,1 °C (0,2 °F)

**Relative humidity:**

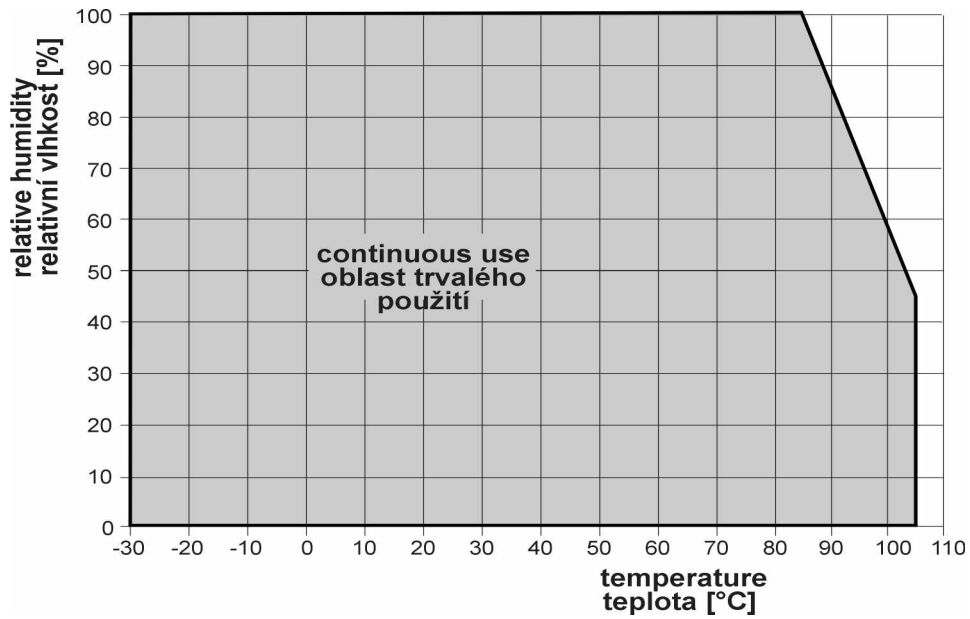
	<b>H3531R</b>	<b>H4531R</b>	<b>H7531R</b>
accuracy	$\pm 2,5$ %RH from 5 to 95 %RH at 23 °C (73,4 °F)	-----	$\pm 2,5$ %RH from 5 to 95 %RH at 23 °C (73,4 °F)
range	0 to 100 %RH	-----	0 to 100 %RH
resolution	0,1 %RH	-----	0,1 %RH

**Barometric pressure H7531R:**

<b>Unit</b>	<b>hPa, mBar</b>	<b>PSI</b>	<b>mmHg</b>	<b>inHg</b>	<b>inH<sub>2</sub>O</b>	<b>oz/in<sup>2</sup></b>	<b>kPa</b>
<b>Range</b>	600	8,70	450,0	17,72	240,9	139,2	60,00
	1100	15,95	825,1	32,48	441,6	255,3	110,00
<b>accuracy</b>							
<b>T=23°C (73,4°F)</b>	$\pm 1,3$	$\pm 0,02$	$\pm 1,0$	$\pm 0,04$	$\pm 0,5$	$\pm 0,3$	$\pm 0,13$
<b>0≤T≤40°C (32≤T≤104°F)</b>	$\pm 1,5$	$\pm 0,02$	$\pm 1,1$	$\pm 0,04$	$\pm 0,6$	$\pm 0,3$	$\pm 0,15$
<b>Else</b>	$\pm 2,0$	$\pm 0,03$	$\pm 1,5$	$\pm 0,06$	$\pm 0,8$	$\pm 0,5$	$\pm 0,20$

**Response time** with stainless steel mesh sensor cover (F5200B) and bronze sensor cover (F0000 - selectable option), air flow approximately 1 m/s:temperature:  $t_{90} < 9$  min (temperature step 20 °C (36 °F))relative humidity:  $t_{90} < 30$  s (humidity step 65 %RH, constant temperature)**Response time**<sup>3</sup>: pressure:  $t_{90} < 44$ s<sup>3</sup> There is possible to change response time. For more details see file "Description of calibration and adjustment procedure.pdf", which is installed together with Users software.

Measuring temperature and humidity range is limited in accordance with the graph below!



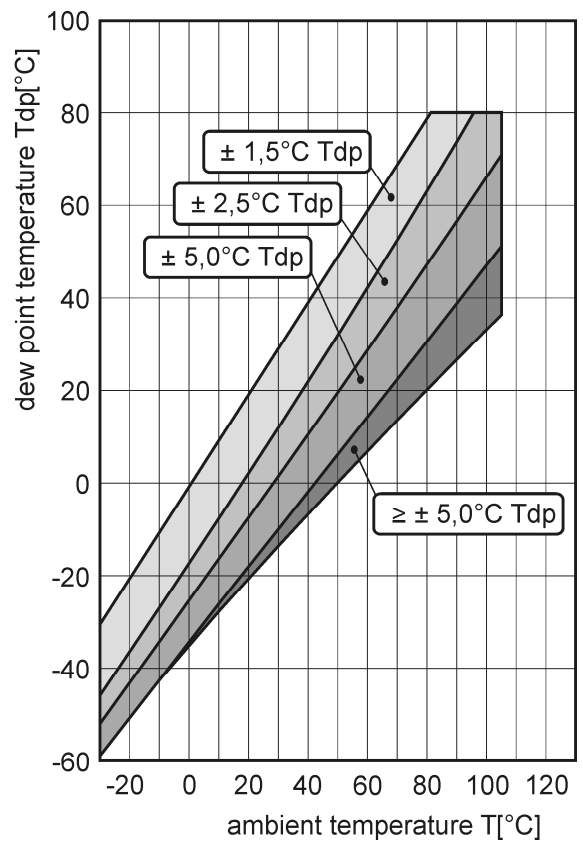
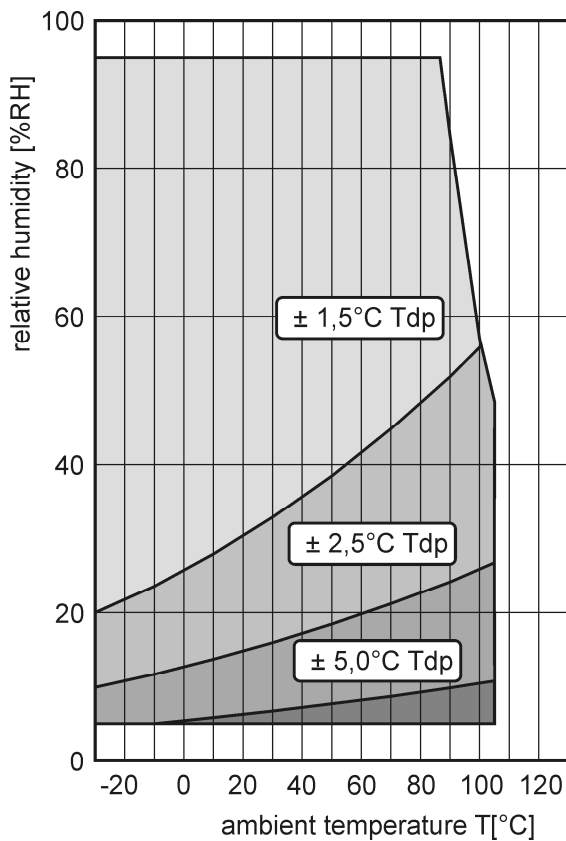
### 14.1.3. Value computed from measured relative humidity and temperature

You can choose one of the following value:

#### Dew point temperature

Range: -60 to +80 °C (-76 to 176 °F)

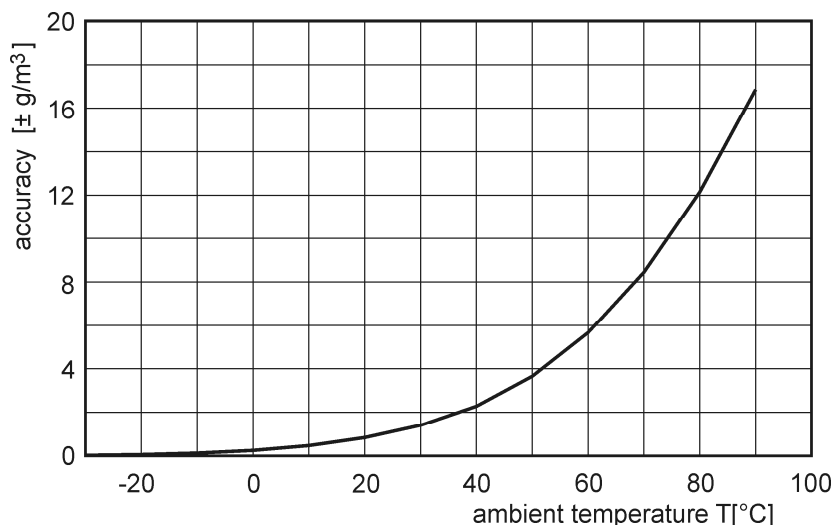
Accuracy:  $\pm 1,5^{\circ}\text{C}$  ( $\pm 2,7^{\circ}\text{F}$ ) at ambient temperature  $T < 25^{\circ}\text{C}$  ( $77^{\circ}\text{F}$ ) and relative humidity  $\text{RH} > 30\%$ , for more details see graphs below



### Absolute humidity

Range: 0 to 400 g/m<sup>3</sup>

Accuracy:  $\pm 1,5 \text{ g/m}^3$  at ambient temperature  $T < 25^\circ\text{C}$  (104 °F), for more details see graph below



### Specific humidity<sup>4</sup>

Accuracy:  $\pm 2 \text{ g/kg}$  at ambient temperature  $T < 35^\circ\text{C}$  (95 °F)

Range: 0 to 550 g/kg

### Mixing ratio<sup>4</sup>

Accuracy:  $\pm 2 \text{ g/kg}$  at ambient temperature  $T < 35^\circ\text{C}$  (95 °F)

Range: 0 to 995 g/kg

### Specific enthalpy<sup>4</sup>

Accuracy:  $\pm 3 \text{ kJ/kg}$  at ambient temperature  $T < 25^\circ\text{C}$  (77 °F)

Range: 0 to 995 kJ/kg<sup>5</sup>

## 14.2. Operating conditions

### Operating temperature and relative humidity:

**electronics** -30 to +80 °C (-22 to 176 °F), 0 to 100 % RH (without condensation)

**probe:** H3531R, H7531R: -30 to +105 °C (-22 to 221 °F) probe cable included,  
0 to 100 %RH

**external probe** for H4531R: by probe type (not included)

**It is recommended to switch off the LCD display at ambient temperatures above 70°C (158 °F) – around electronics.**

### Outer characteristics in accordance with Czech National Standard 33-2000-3:

Normal environment with the specifications: AE1, AN1, AR1, BE1

**Not allowed manipulations:** It is not allowed to operate the device under conditions other than specified in technical parameters. Devices are not designed for locations with chemically aggressive environment. Temperature and humidity sensors must not be exposed to direct contact with water or other liquids. It is not allowed to remove the sensor cover to avoid any mechanical damage of the sensors.

<sup>4</sup> This value depends on the atmospheric pressure. For computing is used constant value stored in device memory. Default value preset by manufacturer is 1013hPa and can be changed by user's software.

<sup>5</sup> This maximum is reached under conditions about 70°C/100%RH or 80°C/70%RH



**Dimensions:** see dimensional drawing

**Weight:** approximately:

H4531R	1025g	
H3531R/1m probe, H7531R/1m probe	1090g	
H3531R/2m probe, H7531R/2m probe	1100g	
H3531R/4m probe, H7531R/4m probe	1130g	

### 14.3. End of operation

Device itself (after its life) is necessary to liquidate ecologically!

### 14.4. Technical support and service

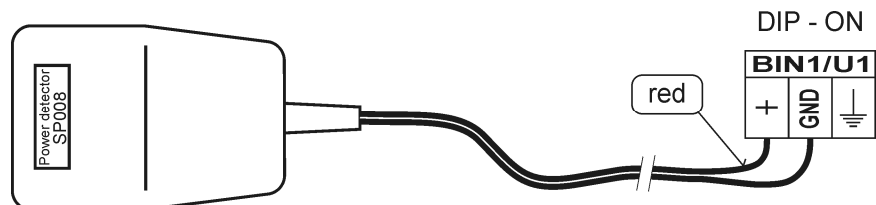
The adjustment procedure is described at file „*Calibration manual.pdf*“ which is installed commonly with the TSensor software.

Technical support and service is provided by distributor. For contact see warranty certificate. You can use discussion forum at web address: <http://www.forum.cometsystem.cz/>, short description is at <http://www.cometsystem.cz/english/forum.htm>

## 15. Appendix A

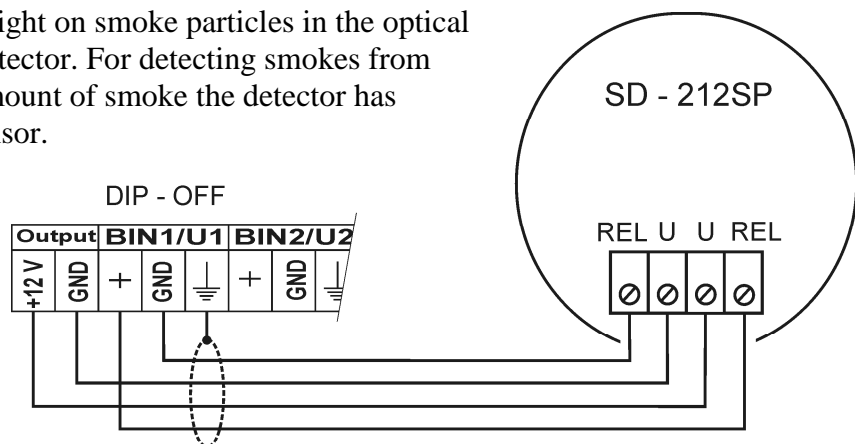
### 15.1. AC voltage presence sensor SP008

Plug in the detector into power cord, which you are going to monitor.



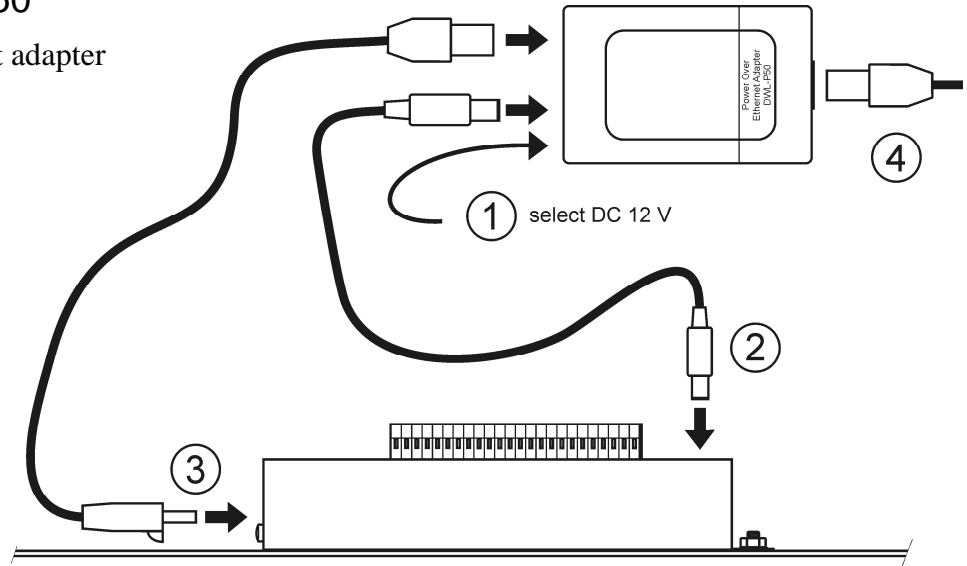
### 15.2. Optical smoke detector SD212SP

A dispersion of infrared light on smoke particles in the optical chamber is used in the detector. For detecting smokes from sources creating small amount of smoke the detector has a built-in temperature sensor.



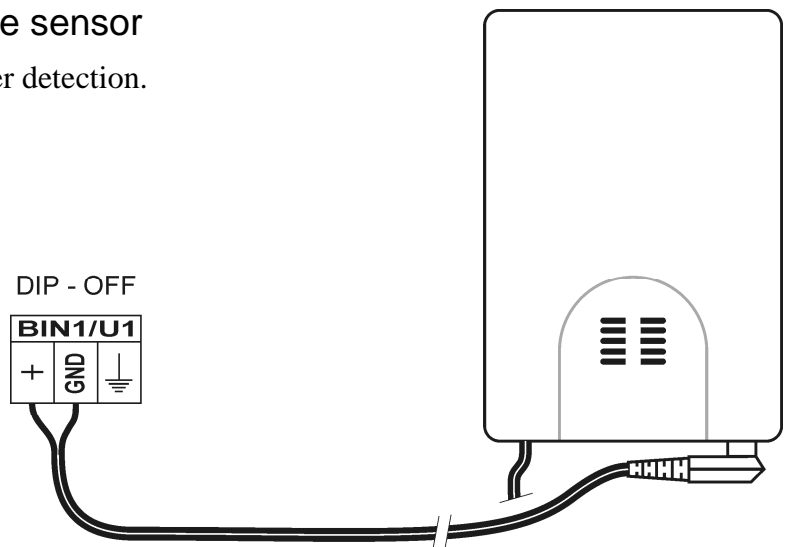
### 15.3. PoE DWL-P50

Power over Ethernet adapter



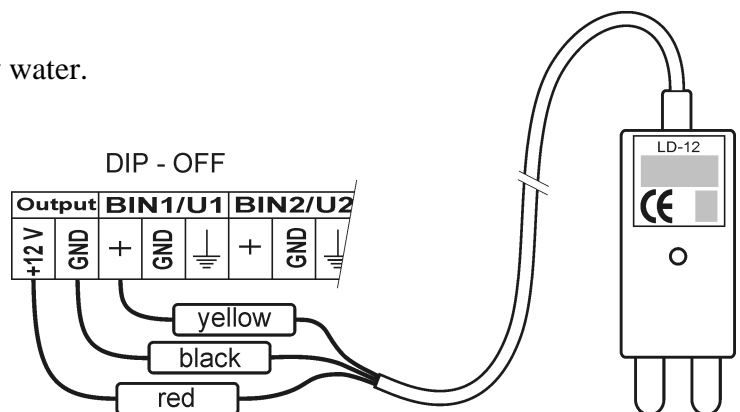
### 15.4. LD-63HS water leakage sensor

Overflow alarm detector for water detection.



### 15.5. LD-12 flood detector

Indicator of a room being flooded by water.



## 15.6. Connection of external power relay

### Coil data chart of external power relay:

nominal voltage : max. 50V  
nominal power: max. 60VA  
current: max. 2A

