



# TH2E

Intelligent Ethernet sensor for temperature, humidity and dew point



# TH2E

## Datasheet

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## TABLE OF CONTENTS

|  |    |  |    |
|--|----|--|----|
| Basic information .....                    | 4  | WEB interface .....  | 31 |
| Description.....                           | 4  | Simple version .....   | 32 |
| Features .....                             | 5  | Viewing multiple sensors on a single page.                     | 32 |
| Options for gathering data from TH2E ..... | 6  | WEB on legacy devices without JavaScript support .....         | 33 |
| Detailed characteristics.....              | 7  | XML file .....   | 34 |
| What is new .....                          | 10 | status.....  | 34 |
| Make.....                                  | 10 | sns.....   | 34 |
| Package Contents .....                     | 11 | Inputting measured values on the server using HTTP GET .....   | 36 |
| Accessories .....                          | 11 | HTTP GET .....   | 36 |
| Connection.....                            | 12 | TCP connection – WEB mode .....                                | 38 |
| Thermometer settings .....                 | 13 | Message format .....   | 38 |
| Ethernet configurator .....                | 13 | TCP connection – TCP and UDP mode.....                         | 39 |
| WEB interface settings.....                | 13 | SNMP.....  | 40 |
| Network.....                               | 15 | General.....   | 40 |
| Device mode.....                           | 15 | Using SNMP .....   | 41 |
| Miscellaneous.....                         | 16 | SNMP objects – quantities.....                                 | 41 |
| Device reset.....                          | 17 | SNMP objects – general .....                                   | 42 |
| Security .....                             | 17 | Automatic traps.....   | 43 |
| E-mail.....                                | 18 | Sending e-mails.....   | 44 |
| SMTP authorization .....                   | 18 | Some of the limits is overrun.....                             | 44 |
| Settings Test.....                         | 19 | Memory is full.....  | 44 |
| SNMP.....                                  | 19 | ModBus protocol .....  | 45 |
| Sending.....                               | 20 | Memory table – Input Register .....                            | 45 |
| HTTP GET .....                             | 21 | Values and current states of channels .....                    | 45 |
| HTTP POST.....                             | 21 | Memory.....  | 46 |
| Memory .....                               | 21 | Logging modes .....  | 46 |
| Sensors.....                               | 23 | XML.....   | 47 |
| Values watching.....                       | 23 | CSV file.....  | 47 |
| Memory.....                                | 24 | FAQ .....  | 48 |
| Other .....                                | 25 | What needs to be set for my TH2E to work in the network? ..... | 48 |
| Date and Time .....                        | 26 | How do I get TH2E's IP address? .....                          | 48 |
| Info.....                                  | 27 | Indication .....   | 49 |
| Telnet configuration .....                 | 28 | Hard reset.....  | 49 |
| Connection .....                           | 28 | Technical parameters .....                                     | 50 |
| Unknown IP address.....                    | 28 | Integrated temperature and humidity sensor                     | 50 |
| IP address is known.....                   | 29 | Temperature sensor.....  | 51 |
| Telnet main menu.....                      | 29 | Other parameters.....  | 52 |
| Server .....                               | 29 | Default Ethernet settings.....                                 | 53 |
| Factory Defaults .....                     | 30 |  |    |
| Exit without save .....                    | 30 |  |    |
| Save and exit .....                        | 30 |  |    |
| How to connect to TH2E .....               | 31 |  |    |

## BASIC INFORMATION

### Description

Depending on sensor connected to it, **TH2E is able to measure temperature, humidity and calculate dew point**. Measured-out values can be viewed via WEB browser. Values can be logged in the internal memory with capacity for 1000 records. TH2E is capable to communicate via many standardized protocols, which makes it an ideal component for further integration to an existing system.

Many of TCP/IP family protocols are supported. Available are for example: TCP data channel, SNMP and ModBus protocols, e-mail sending, HTTP GET and POST automatic sending to a remote server. Measured-out values and settings parameters are also available in XML format etc.

All settings can be adjusted via WEB interface. Brief help pops up for all parameters. WEB interface is available in Czech and English.

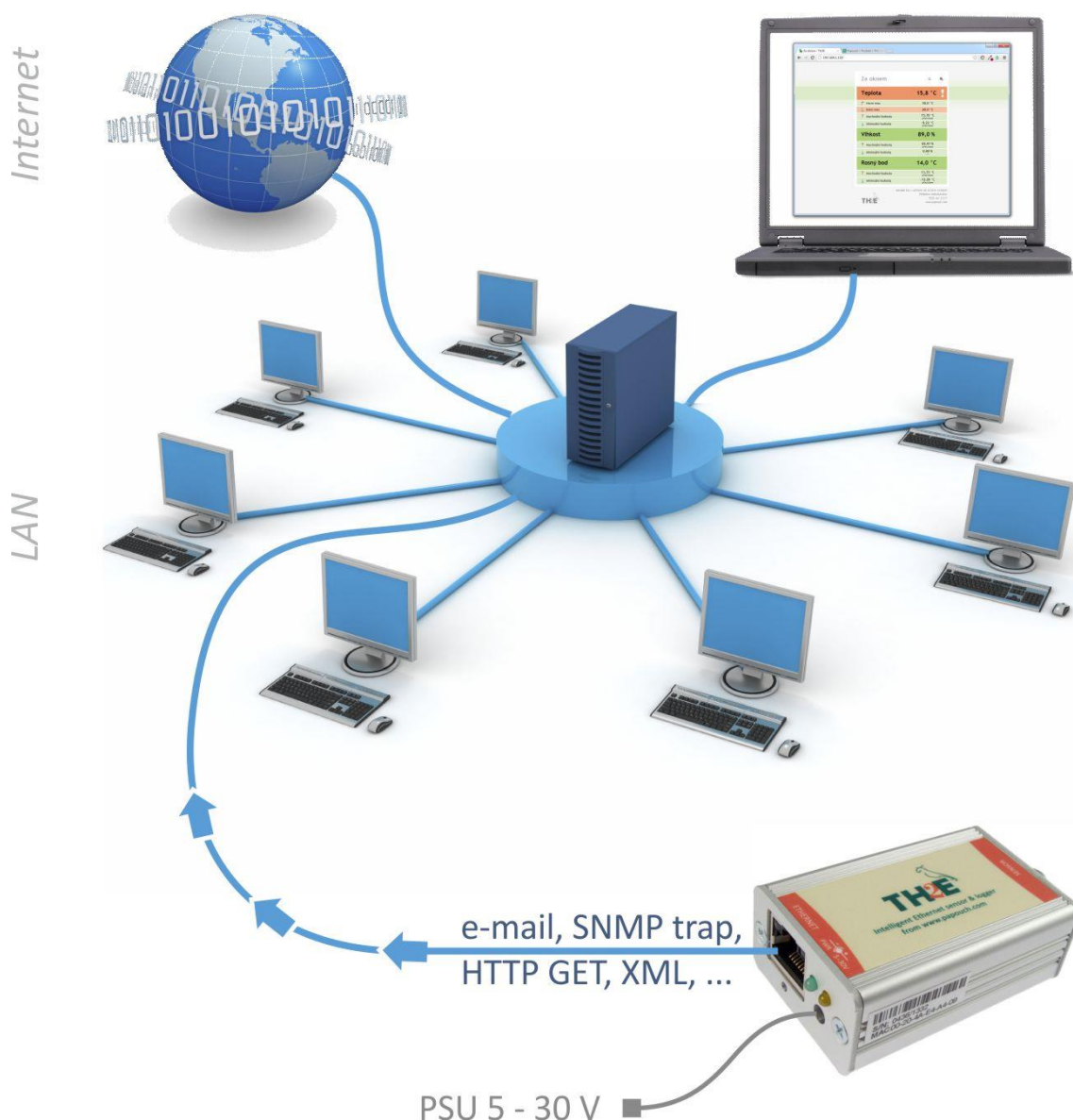


Fig.1 – Connection and Access to the TH2E in computer network

## Features

- Measures relative humidity in range 0 % to 100 %. <sup>1</sup>
- Measures temperature in range -40 to +123.8 °C or -55 to +125.0 °C. <sup>1</sup>
- Calculates dew point. <sup>1</sup>
- Converts temperature in several temperature units.
- Saves measured-out values in an internal memory with capacity of 1000 records. (Values remain saved even if the power goes down.)
- Extreme values memory function – TH2E saves minimal and maximal measured-out value from all quantities.
- Connects and communicates via computer network (Ethernet).
- Data transfer via TCP/IP protocols (10/100 Ethernet).
- WEB based Configuration.
- Sensors:
  - “TH2E”: Coverage IP 54
  - “TH2E thermometer”: Coverage IP 68
- Sensor is connected by a silicon cable with high temperature resistance.
- Powered from 5 V to 30 V (Wall-plug adaptor included).
- DIN rail mountable.

| Feature                                | Devices |                  |               |
|--|---------|------------------|---------------|
|  | TH2E    | TH2E thermometer | TME reference |
| Measuring range -40 to +123,8 °C       | yes     | no               | no            |
| Measuring range -55 to +125,0 °C       | No      | yes              | yes           |
| Humidity measurement                   | yes     | no               | no            |
| Dew point calculation                  | yes     | no               | no            |
| Measured values logging                | yes     | yes              | no            |
| Internal RTC circuit (Real Time Clock) | yes     | yes              | no            |
| Extreme values memory                  | yes     | yes              | no            |

Tab 1 – Differences in TH2E sensors and comparison with [TME](#)

### Possibilities of viewing the measurements:

1. Internal WEB server with current readings.
2. Small WEB page meant to be displayed in a mobile phone or PDA.
3. Multiple TH2E readings can be displayed on a single WEB page.
4. Automatic e-mail sending when pre-set thresholds are overrun.
5. Sending measured-out values via TCP data channel (as a string in Celsius degrees).

<sup>1</sup> Depending on the sensor connected to TH2E. (Please specify when ordering the device. See Tab 1)

6. Communication via Spinel protocol over TCP data channel.
7. SNMP protocol.
8. ModBus TCP protocol.
9. Automatic temperature sending via HTTP GET request.
10. Automatic sending of the memory content via HTTP POST in XML format.
11. Measured-out values and all settings easily accessible in XML format.

## Options for gathering data from TH2E

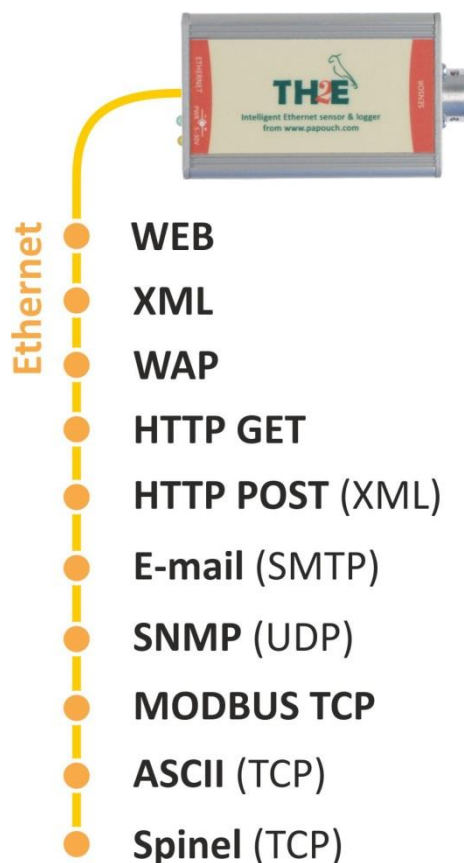


Fig. 2 – Temperature acquisition methods

### 1) Internal website

When the sensor's IP address is set in an Internet browser<sup>2</sup>, a website is brought up displaying the actual temperature value and the set temperature limits. A Czech or English language version of this website can be chosen within the settings. The temperature value can be shown in degrees Celsius, Fahrenheit or Kelvin. Multiple TH2E readings in one WEB page are supported. (See page 31.)

### 2) XML file

At [http://\[IP\\_address\\_of\\_th2e\]/fresh.xml](http://[IP_address_of_th2e]/fresh.xml) the file in XML format contains the actual measured values, the name of the measurement location, etc. (See also page 34.)

<sup>2</sup> WEB interface requires JavaScript turned on. Interface is optimized for Internet Explorer 7.0, Mozilla Firefox, Opera, Google Chrome, iPhone and Android.

### 3) Inserting the temperature value into a website using a script (HTTP GET)

TH2E enables a periodic call for a script (e.g., PHP or ASP) on a given address - for example, a WEB server. (See also page 36.)

### 4) SNMP protocol

TH2E According to the settings, TME sends out SNMP traps if the measured values are outside of the set limits. Regular transmission of a trap with the actual readings is also possible. Data can be obtained from integrated SNMP objects at any time. (See also page 40.)

### 5) MODBUS TCP protocol

TH2E can also communicate via standardized industrial protocol ModBus TCP. (More info on page 45.)

### 6) E-mail

According to the settings, TH2E sends e-mails with information if the measured values go outside of the set limits. (See also page 44.)

### 7) TCP protocol

TH2E can send measured values periodically after establishing a TCP connection on a data port.

### 8) Spinel (TCP protocol)

In a special mode, TH2E can communicate via Spinel protocol. The behavior can be set to either TCP client or TCP server. Spinel protocol uses a standard way of communication: request – response.

### 9) WAP page for legacy cell phone or PDA

TH2E also has a simple page with current read-outs for browsers without JavaScript support. You can display it by entering the IP address of the device in following form: *http://[IP\_address]/wap.html*. (See page 33.)

### 10) Webservice (XML HTTP POST)

Contents of TH2E memory can be sent as a standard HTTP POST in XML format. There is no need to spend time on programming the communication protocol etc. It is only necessary to process the received XML file. (See page 46 for more information)

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## Detailed characteristics

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### Ethernet Part

- IP address, subnet mask, gateway and port number configuration
- Automatically sends current value via TCP connection every 10 seconds or:
- ...TCP server mode, TCP client mode or UDP. This mode enables TH2E to communicate via Spinel protocol. Other functions of TH2E are not available in this mode.
- Local and remote port are configurable
- Device can be set to factory defaults by a button in WEB interface.

## Security

- Two security levels – user (user can only watch the measured temperature) and Administrator (admin can configure the device)
- Each level has its own password.

## E-mails

- An e-mail can be sent when some threshold is exceeded. (E-mail can be forwarded to a mobile phone.<sup>3</sup>)
- E-mails can be sent periodically when the threshold is exceeded.
- SMTP authorization.
- Test e-mail can be sent to verify the settings.

## SNMP

- SNMP trap can be sent when the threshold is exceeded.
- Periodical sending of the measured-out value.
- Configuration of the read and write community.

## HTTP GET a POST

- Periodical sending of the current measured-out values to your WEB server via a simple HTTP GET request.
- For TH2E identification, MAC address is included in TP GET request.
- Sending contents of memory in XML format as a body of HTTP POST.

## Logging in an internal memory

- TH2E saves measured-out values in an internal memory with capacity of 1000 records. (1 record = one measured quantity).
- Each record contains it's time marker.
- Power-up and power-down are stored in the memory as well.
- Three logging modes available: Time mode (periodically saves readings every X minutes), Differential (Saves measured value only if it changes more than X) and Logging limit values (saves the limit values only – regulation loops usage).
- When the memory is full, TH2E sends the data as an XML file to server or sends the data as a CSV file via e-mail.

## Measurement

- Depending on the sensor connected to it, TH2E can measure temperature, humidity and calculate dew point.
- Extreme values memory for each measured quantity. One record for historically higher and lower measured-out value.
- Extreme values memory can be erased.

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<sup>3</sup> This function depends on your mobile service provider.



- Limits can be set separately for each quantity. If the measured-out value goes outside limits, TH2E sends according to the settings e-mail, or SNMP trap.
- Each quantity can be watched separately.
- Temperature units: degrees Celsius, Fahrenheit or Kelvin.
- Hysteresis can be set for localities with fluctuating values.
- Logging can be activated for each measured quantity separately.
- Hysteresis of differential mode can be set separately for each measured quantity as well.

### **Date and time**

- Each record has its own time marker.
- Time can be automatically updated from chosen NTP server.
- Time differential (from GMT) can be also set.
- Automatic DST settings available.
- In case of local networks without access to NTP server, time can be synchronized with PC.

### **Hardware**

- Measures relative humidity from 0 % to 100 %.
- Measures temperature from -40 to +123.8 °C or -55 to +125.0 °C.
- Calculates dew point.
- Sensor cable length is 3 meters. (If required, we can supply other cable lengths.)
- Silicon cable with metal tip containing the sensor.
- Powered from 5 to 30 V (wall plug adaptor included).

### **Other**

- Device can be labeled.
- ModBus TCP port is adjustable.
- WEB interface languages: Czech or English.<sup>4</sup>
- Simple WEB display possible. (For example you can view multiple TH2Es on a single WEB page using HTML iFrame element.)
- WEB interface requires JavaScript turned on. Interface is optimized for Internet Explorer 7.0, Mozilla Firefox, Opera, Google Chrome, iPhone a Android.

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<sup>4</sup> Other Languages available upon request.

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## What is new

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### Version 5.2

- TH2E and TH2E\_LOG unified into one new version with logging and SNMP protocol.
- New version can be differentiated at a first glance by the new label design that has red-orange stripes at both sides of the device (See image on the first page of this document.)
- Telnet configuration restricted to network settings and communication mode.

### Version 2.0

- MODBUS TCP protocol added.

### Version 1.0

- First version.

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## Make

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### Electronics

- In metal box made from eloxal coated aluminum.

### Sensor

- Integrated sensor for temperature and humidity (plus dew point calculation) – placed inside a metal block 40 × 16 × 10 mm.



Fig. 3 – Integrated sensor for temperature and humidity

- Temperature only – hard aluminum rod. Normalized diameter 6 mm and length 60 mm.



Fig. 4 – Temperature sensor

### Cable type

- Silicon cable, diameter 4.3 mm. Temperature resistivity -60 to +200 °C. Blue color.

### Cable length

- 3 m (standard)

- Maximum 20 meters

### Mounting

- Without a holder (*standard*)
- With a DIN rail mount



Fig. 5 – TH2E with DIN rail mount

### Power

- 5 to 30 V DC (Power supply 5V included. PSU as a wall plug adaptor.)

*Please do not hesitate to contact us if you have any specific requirements for TH2E module's workmanship and functionality.*

### Package Contents

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- TH2E electronic (without sensor).
- 5 V Power supply (wall plug adaptor).
- 1 m direct PATCH cable.
- Quick start manual cardboard.

### Accessories

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- Sensor on cable.
- Power-supply cable, 1 m long, with connector for TH2E. The other end is open, with conductors to be wired into the power source.
- A power-supply cable from a USB 2.0 port.

## CONNECTION

Default TH2E's IP address is 192.168.1.254.

- 1) Connect the TH2E to the included power supply or to another 5 – 30V DC power supply.
- 2) Then connect the TH2E to the Ethernet (Computer Network) using an included or other PATCH cable<sup>5</sup>. (If you want to connect the TH2E directly to one PC, please use a crosswired cable.)
- 3) If your network is out of subnet range or TH2E IP range, please set the IP address of the TH2E via Ethernet Configurator software. You can find this software on papouch.com.

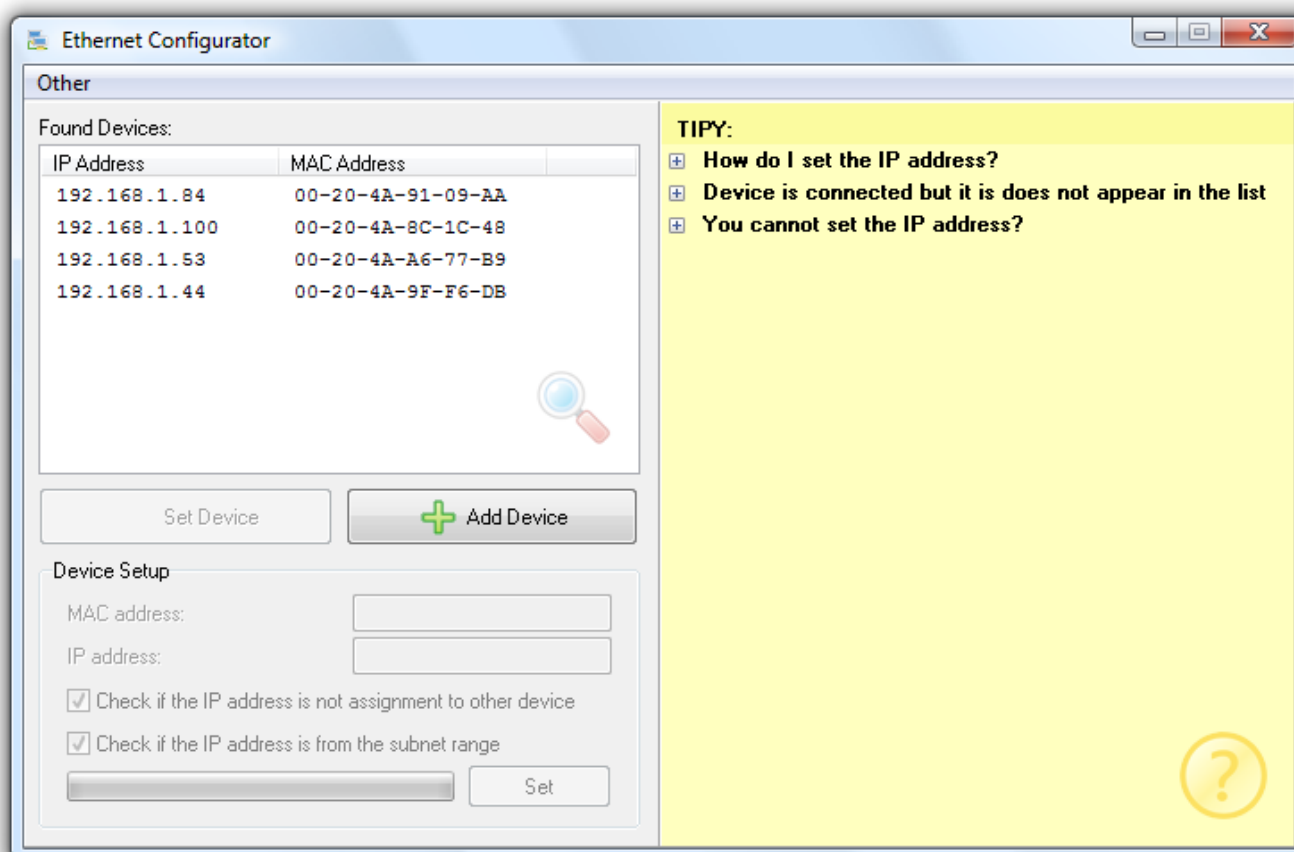


Fig. 6 – Ethernet Configurator software

- 1) After setting the TH2E's IP address, you can connect to it by any WEB browser. (For example by entering `http://192.168.1.254/` - for default IP address.)

<sup>5</sup> Common Ethernet cable.

## THERMOMETER SETTINGS

**WEB interface** is the primary means to configure the thermometer. You can also use Telnet to configure network settings (see page 28). For the first configuration of your TH2E, you can also use **Ethernet Configurator**.

### Ethernet configurator

Ethernet configurator can be used to set TH2E's IP address. You can find the software on your CD.

(Before running the program, please connect your TH2E to a switch, hub or router or directly to your PC using crosswired cable.)

Program is in English and Czech language. It also contains a small help telling you what you need to know when setting your TH2E's IP address.

You can see the program screen on previous page in Fig. 6

## WEB INTERFACE SETTINGS

To enter settings, push "Settings" button in upper right corner of TH2E main WEB page.



Fig. 7 – Settings button on the main page

Settings are arranged in nine panels:

- *Network* – Network interface configuration, IP address, subnet mask, TCP channel, ...
- *Security* – Access passwords settings
- *E-mails* – recipient, authorization, settings test
- *SNMP*
- *Sending* – sending of the measured temperatures to your server using HTTP GET and POST (XML)
- *Memory* – Modes for logging the values to memory, action upon memory full.
- *Sensors* – thresholds, hysteresis and units settings, logging
- *Other* – device label, WEB interface language, temperature units, extreme memory, time settings, ...
- *Info* – device information

Tips for settings:

- You can view the context help by pointing the cursor at the item. It is also displayed when cursor is over the headlines marked with a question-mark at its end.

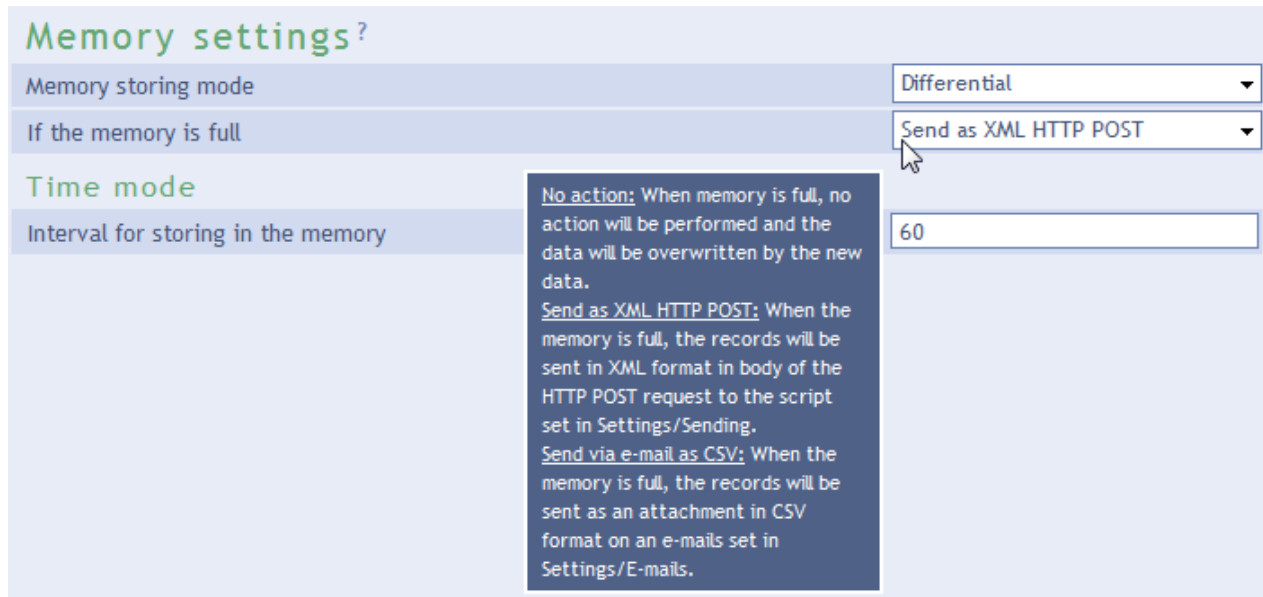


Fig. 8 – Context help for the settings menu items

- Settings window is movable by dragging it by the upper right corner.
- You can also enter the settings menu by pressing S when the browser window is active.
- Settings menu can be closed by Esc key.

## Network

Network settings for TH2E and the TCP data channel.

| Field  | Value                    |
|--|--------------------------|
| Device's IP address                              | 192.168.1.45             |
| Netmask  | 255.255.255.0            |
| Gateway IP address                               | 0.0.0.0                  |
| DNS server's IP address                          | 0.0.0.0                  |
| WEB port   | 80                       |
| Communication mode                               | WEB                      |
| A) E-mail sending                                | <input type="checkbox"/> |
| B) Sending via HTTP protocols to a remote server | <input type="checkbox"/> |
| C) Other Protocols                               | Modbus TCP               |
| ModBus Port                                      | 512                      |
| Data port (Spinel)                               | 10001                    |
| Remote IP address (for TCP/UDP)                  | 0.0.0.0                  |
| Remote port (for TCP/UDP)                        | 0                        |

Fig. 9 – Network settings panel

### Device's IP address

TH2E's IP address. In case you are not sure if the IP address is correct, please consult your Administrator.

### Netmask

Subnet mask of the network TME is connected into.

### Gateway IP address

Network gateway IP address.

### DNS server's IP address

An IP address of your local DNS server.

### WEB port

Number of the port you will access the WEB on. Usually the port number is 80 or 8080.

### Device mode

#### Communication mode

WEB: In this mode, all functions are available except for Spinel protocol.

*In other modes you cannot view current readings on a WEB page, e-mails cannot be sent, HTTP GET and POST are unavailable, SNMP and ModBus protocols are inaccessible. In these modes TH2E only communicates via Spinel protocol.*

**TCP server:** TH2E awaits incoming connection on the set port (Data port).

**TCP client:** TH2E establishes connection to the remote IP address (remote IP address) and port (Remote port).

**UDP:** TH2E communicates via UDP protocol. It awaits incoming messages on the data port.

*Enable two communication protocols from the following three options at a time (choices are only available if the main communication mode is set to WEB.):*

### **A) E-mail sending**

This option allows e-mails to be sent if set in E-mails panel. This option is also affected by *Memory* panel settings if the CSV format e-mail sending is set.

### **B) Sending via HTTP protocols to a remote server**

This option allows the HTTP GET and HTTP POST sending, this can be configured in *Sending* panel. This option is also affected by *Memory* panel settings if the HTTP POST in XML format sending is set.

### **C) Other protocols**

Choose some of the following options:

- *Spinel packet:* Information of the measured-out values is periodically sent to Spinel port. (This option is only active in WEB mode.)
- *Modbus TCP:* Communicates with a superior system via ModBus TCP protocol on assigned port. (This option only works in WEB mode.)
- *Disabled*

## **Miscellaneous**

---

### **ModBus port**

Here you can set the port for ModBus RTU communication. Standard port is 502. (*Port is accessible only if the option is enabled.*)

### **Data port (Spinel)**

Port number. Function of the data port depends on TH2E Mode (see below):

- *WEB mode:* When TCP data port is open, TH2E sends current readings every 10 seconds.
- *TCP server mode:* TH2E waits for incoming connection on this data Port. After establishing connection, TH2E awaits Spinel commands.

### **Remote IP address**

Remote device's IP address (server mostly). TH2E connects to this device in TCP client mode. It communicates via Spinel protocol.

### **Remote port**

Remote device's port number. TH2E connects to this device in TCP client mode. It communicates via Spinel protocol.



## Device reset

This button resets all parameters of the device to factory defaults. IP address does not change, WEB port number will be changed to 80.

## Security

Security settings for accessing the WEB interface and the Mobile view.

Fig. 10 – Security settings panel

### Allow mobile view

WEB page for the mobile view (accessible at /wap.html) is not secured. This setting can allow or disallow the mobile view.

### User's password <sup>6</sup>

Enter password for user access. This level only allows viewing the current temperature. Access to settings is not allowed.

User Name is always “user”

If the user's password is entered, Administrator's password has to be entered as well.

To cancel the password, leave the fields empty.

### Administrator's password <sup>6</sup>

Enter administrator's password here. This level also allows access to the settings.

Administrator's name is always “admin”. To cancel the password, leave the fields empty.

<sup>6</sup> This field is for entering the values only, there is nothing displayed after saving.

## Current administrator's password <sup>6</sup>

If administrator's password has already been saved, enter it here. Otherwise no password changes are allowed.

## E-mail

E-mail sending settings. *This function is activated globally in the Network panel!*

Fig. 11 – E-mail settings panel

### SMTP server's name

Enter SMTP server's name or IP address, this server will be used to send e-mails.

### Sender's e-mail address

Fictional TME address – this address will be shown as “from” in the e-mails about the temperature.

### Recipient's e-mail address

E-mail address of the recipient of the alert e-mails or Memory content after the internal memory is full.<sup>7</sup>

### SMTP authorization

You can enter login data if the SMTP server requires sender's identity check.<sup>8</sup>

<sup>7</sup> Memory contents are sent only if this function is activated in the *Memory* panel.

## Settings Test

This allows you to send a testing e-mail to check the settings.

### SNMP

SNMP communication parameters are entered here. You can set the SNMP traps activation, periodical sending etc.

| Setting                                       | Value                               |
|---|-------------------------------------|
| SNMP manager's IP address                     | 135.12.146.2                        |
| Allow trap sending                            | <input checked="" type="checkbox"/> |
| Send SNMP trap when the threshold is exceeded | <input checked="" type="checkbox"/> |
| Periodical sending of measured-out values     | 0                                   |
| Read community name                           | public                              |
| Write community name                          | private                             |

Fig. 12 – SNMP settings panel

#### SNMP Manager's IP address

Address of the server gathering SNMP messages from all devices.

#### Enable trap sending

This checkbox activates SNMP trap sending.

#### SNMP Manager IP address

IP address of the server, that gathers SNMP messages from devices in the network.

#### Send a trap when threshold is exceeded

If the temperature exceeds the limits, set on *Sensor* panel, SNMP trap will be sent about this event.

#### Periodical sending of the current values

You can enter the interval for sending current temperature data to the SNMP manager. Temperature is sent as a SNMP trap, Interval is entered in minutes. For turning this feature off, please enter 0 as the interval.

<sup>8</sup> This field is for entering the values only, there is nothing displayed after saving.

**Read community name**

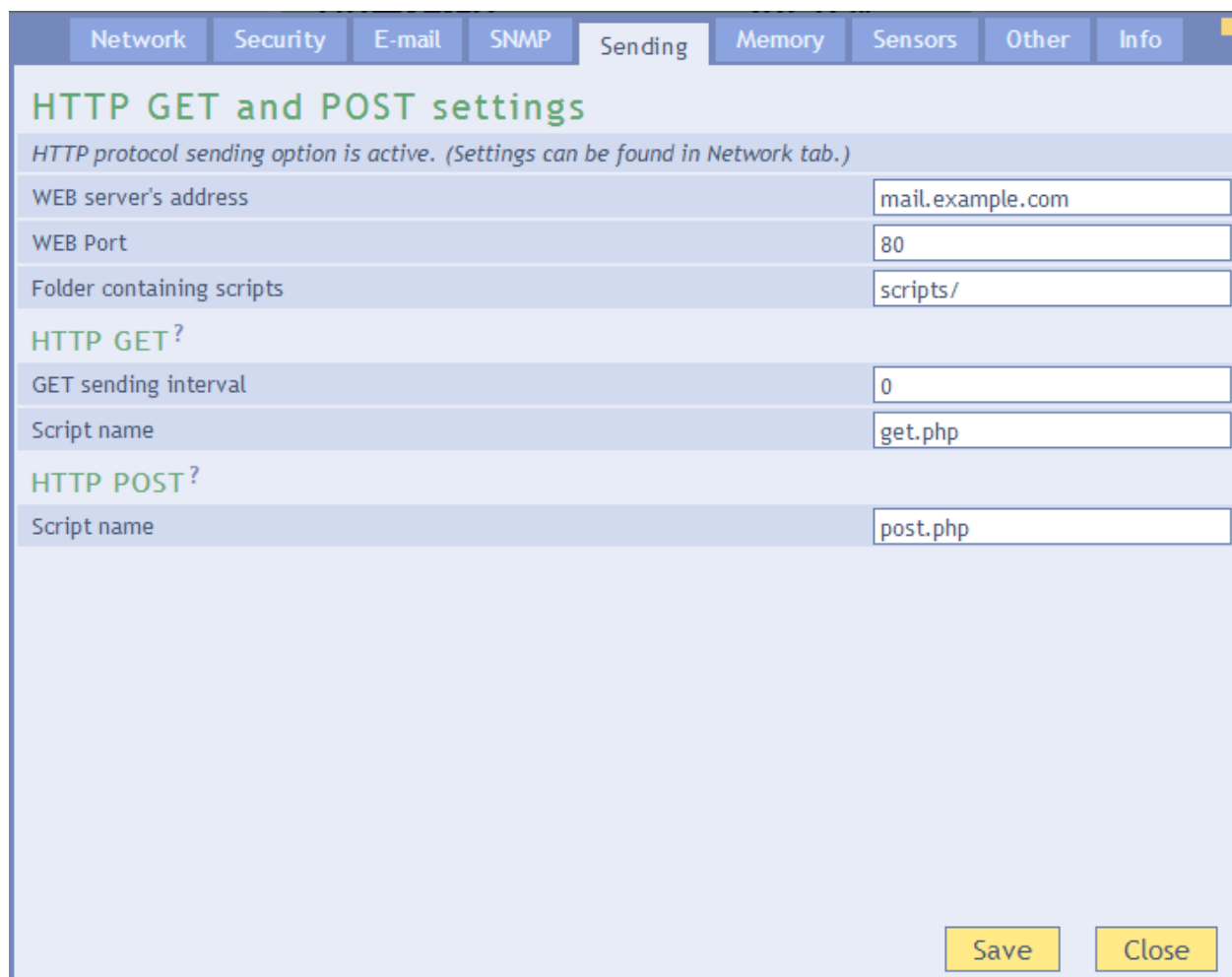
Enter SNMP read community name here.

**Write community name**

Enter SNMP write community name here.

**Sending**

Parameters for automatic sending of the measured-out temperature via HTTP protocol. Temperature can be sent as a HTTP GET or HTTP POST in XML format. *This function is activated globally in the Network panel!*



The screenshot shows a web interface with a navigation bar at the top containing tabs: Network, Security, E-mail, SNMP, Sending, Memory, Sensors, Other, and Info. The 'Sending' tab is active. Below the navigation bar, the title 'HTTP GET and POST settings' is displayed in green. A message states: 'HTTP protocol sending option is active. (Settings can be found in Network tab.)'. The settings are organized into sections:

- General Settings:**
  - WEB server's address: mail.example.com
  - WEB Port: 80
  - Folder containing scripts: scripts/
- HTTP GET ?**
  - GET sending interval: 0
  - Script name: get.php
- HTTP POST ?**
  - Script name: post.php

At the bottom right, there are two yellow buttons: 'Save' and 'Close'.

Fig. 13 – HTTP protocol sending settings panel

**WEB server's address**

Here enter URL or IP address of the WEB server that will receive measured-out values. If you are not certain, please contact your Administrator.

**WEB port**

Server's WEB port. Usually the port number is 80 or 8080.

**Scripts Folder on the server**

Enter a local path to the folder containing the scripts. If the script receiving measured-out values is on *www.server.net/scripts/get.php*, enter only this part to the field: *scripts/*

## HTTP GET

---

HTTP GET allows you to send out measured-out values periodically.

### **Sending interval**

Enter the interval of sending HTTP GET with measured-out values. Enter the value in minutes.

### **Script name**

Name of the script receiving HTTP GET.

## HTTP POST

---

HTTP POST sends the contents of TH2E's internal memory in an XML format, if this is set in *Memory* panel.

### **Script name**

Name of the script receiving HTTP POST.

## Memory

This panel contains parameters for memory operations settings, actions upon memory full. This panel's contents may differ depending on the TH2E sensor. (See Tab 1 on page 5.)

| Network                            | Security | E-mail | SNMP | Sending | Memory | Sensors               | Other | Info |
|------------------------------------|----------|--------|------|---------|--------|-----------------------|-------|------|
| <b>Memory settings?</b>            |          |        |      |         |        |                       |       |      |
| Memory storing mode                |          |        |      |         |        | Differential          |       |      |
| If the memory is full              |          |        |      |         |        | Send as XML HTTP POST |       |      |
| <b>Time mode</b>                   |          |        |      |         |        |                       |       |      |
| Interval for storing in the memory |          |        |      |         |        | 60                    |       |      |
|                                    |          |        |      |         |        | Save Close            |       |      |

Fig. 14 – Memory settings panel

### **Memory saving mode**

Choose the mode that will be used to store data in memory:

Time mode means, that measured-out values are periodically stored in memory once every X minutes.

Differential mode means, that a hysteresis is set for each measured quantity<sup>9</sup>. Record is stored only if the change is bigger than the set hysteresis.

Logging limit values is a mode that only saves the value at which the tendency of measured quantity changes. (For example when temperature tendency changes – it stops growing and starts falling, and vice versa). This mode is particularly convenient when watching regulation systems for temperature or humidity. Hysteresis can also be set for this mode.

### **Action upon memory full**

No action: When the memory is full, the oldest records just become re-written by the new ones.

Send as XML HTTP POST: When the memory is full, all records are sent as a body of an HTTP POST in XML format according to the *Sending* panel settings.

Send as a CSV file via e-mail: All records are sent as a CSV attachment of e-mail according to the *E-mails* panel settings.

### **Logging interval**

Enter here, how often the values shall be stored in the memory. Entry is in minutes. Expected number is in range of 1 to 10080 (that is 1 minute to 1 week). This setting only applies in *Time mode*.

---

<sup>9</sup> Hysteresis principals are explained in Fig. 16 on page 24.

## Sensors

Parameters affecting measuring. Temperature unit, values watching, etc. After choosing this panel, choose the quantity you want to set up.

Fig. 15 – Single quantities settings panel

## Values watching

### Activate values watching

If this field is checked, following threshold values are being watched.

### Maximum value

When this value is exceeded, according to other settings e-mail, SNMP trap etc. will be sent. Value on the WEB page will be highlighted as a warning that some limit was exceeded.

Enter the value in units chosen in panel *Other* at *Temperature units* item.

### Minimum value

When the value drops below this value, according to other settings e-mail, SNMP trap etc. will be sent. Value on the WEB page will be highlighted as a warning that some limit was exceeded.

Enter the value in units chosen in panel *Other* at *Temperature units* item.

### Hysteresis

Hysteresis applied for set thresholds.

Value is entered as an integer and applies below upper threshold and above lower threshold – see Fig. 16.

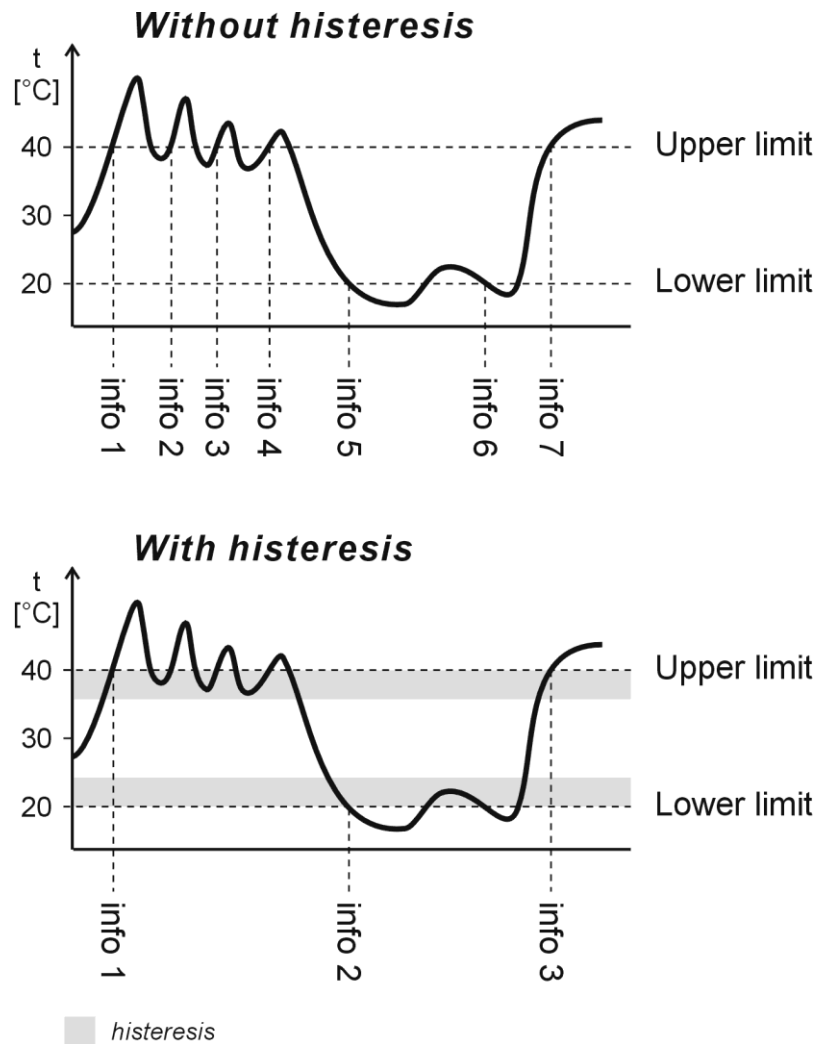


Fig. 16 – Hysteresis

Values marked as “info” are temperatures where a message is sent about exceeding limits.

## Memory

### Log into memory

If this field is checked, quantity is being logged in the memory. It depends on the settings in *Memory* panel.

### Hysteresis for differential logging

Enter hysteresis for the differential saving. Expected entry: number 1 or higher with one decimal accuracy. This setting only applies in *Differential* mode or *Logging limit values* mode.



## Other

Here you can set language, device name, date, time and some other parameters.

Fig. 17 – Other parameters panel

### Device name

This string can be used to label TH2E, for example by its location etc.

### Language

Interface language. English and Czech available.<sup>10</sup>

### Temperature units

Units to display temperatures.

Available are: Celsius, Fahrenheit a Kelvin.<sup>11</sup>

### Erase the extreme memory

If this field is checked, extreme memory for all quantities will be erased upon saving the settings. (Extreme memory saves minimal and maximal values for all quantities)

TH2E versions with RTC circuit have this memory backed up against power loss. Each extreme record has its time marker. (See Tab 1 on page 5.)

<sup>10</sup> More languages can be added if required.

<sup>11</sup> If Fahrenheit degrees (°F) are chosen, an error of 0.1 °F may occur in some cases.

**Display extreme values time in words**

If checked, time of extreme values will be displayed on the main page as a word expression: *An hour ago, Yesterday* etc... If it is unchecked, the time will be displayed as a standard time value in the national format (date and time).

**Date and Time**

---

You can store measured-out values in the memory. Each record has its time marker. Current time can be updated automatically from NTP server or once from the time of the PC you view the WEB interface on.

**Synchronize time with NTP server**

If this field is checked, device synchronizes with NTP server (from Internet). (To make this work, TH2E has to have an Internet connection and set *Gateway's IP address* in *Network* panel.)

**NTP server's IP address**

Enter IP address of the NTP server. This server has to be accessible from the network TH2E is connected to.

**Time zone**

Choose a city that is in the same time zone as your location.

**Auto daylight saving**

Check this box if you want the device to automatically change its internal clock on daylight saving and back.

**Synchronize TH2E's time with your PC's time**

If TH2E is not in a network that has Internet connection, this allows you to synchronize TH2E's internal clock with your PC's clock.

*(ModBus TCP port settings have been moved to Network panel.)*

**Info**

Other information about the device, MAC address, firmware version and useful links.



Fig. 18 – Other information panel

**Links**

This part contains links to XML files and mobile view pages in the device.

**Warning:** Reading history in XML format is very demanding. Reading the history may take several dozens of minutes. If you click multiple links at a time, it may result in system instability and TH2E's WEB interface might be unavailable for a protracted period of time.

## TELNET CONFIGURATION

### Connection

#### Unknown IP address

*For setting the IP address we recommend using Ethernet Configurator (more on page 13).*

- 1) Open a window with command prompt (In Windows OS, click *Run* and type *cmd*.)
- 2) Make a record to ARP table:
  - a. Type `arp -d` and confirm by Enter. That deletes current ARP table.
  - b. Following command assigns IP address to MAC address:  

```
arp -s [new_ip_address] [MAC_address]
```

example: `arp -s 192.168.1.254 00-20-4a-80-65-6e`
- 3) Open Telnet. ( by typing `telnet` and pressing Enter. <sup>12</sup>)
- 4) Type `open [new_ip_address] 1` and confirm.
- 5) Terminal shows an error message after a moment. Nevertheless this action is essential for correct IP address ARP entry.
- 6) Connect to the IP address of the TH2E. (by typing `open [IP address in dot format] 9999` and Enter.)
- 7) Now you have entered to the configuration of the Module. IP address is not yet set. It needs to be set in menu *Server Configuration > IP Address*.
- 8) If the IP address is valid, TH2E writes welcoming information ending by text:  

**Press Enter for Setup Mode**

Now press Enter or the configuration will be terminated.
- 9) Device writes complete settings.
- 10) At the end of the entry you can see „Change setup:” text containing groups of parameters that are configurable. For changing the network parameters choose *Server*. Here you can set a new IP address and other parameters.

---

<sup>12</sup> Telnet client is not standard installed in OS Windows Vista. You can install it by doing following:

- a) Open Control panel/add or remove programs.
- b) On the left, click on Add/remove Windows functions (You have to have administrator's rights to do this.)
- c) Windows Functions window will open. Check “Telnet client” and confirm. Telnet client will be installed to your system.

## IP address is known

- 1) In OS Windows click on Start/Run and type `telnet` and confirm.<sup>12</sup>
- 2) Connect to the IP address of the TME. (by typing `open [IP address in dot format] 9999` and Enter.)
- 3) If the IP address is valid, TME writes welcoming information ending by text:  
**Press Enter for Setup Mode**  
Now press Enter or the configuration will be terminated.
- 4) Device writes complete settings.
- 5) At the end of the entry you can see „Change setup:" text containing groups of parameters that are configurable. For changing the network parameters choose Server.

## Telnet main menu

You can choose the menu items by pressing the number before them and confirming by Enter.

Menu structure is:

```
Change Setup:
 0 Server
   ...
 7 Defaults
 8 Exit without save
 9 Save and exit           Your choice ?
```

## Server

Basic Ethernet settings.

Following items are in this part:

```
IP Address : (192) .(168) .(001) .(122)
Set Gateway IP Address (N) ?
Netmask: Number of Bits for Host Part (0=default) (16)
Change telnet config password (N) ?
```

**IP Address**

TME's IP address. Enter the numbers separately and divide them by Enter.

Default: 192.168.1.254

**Set Gateway IP Address****Gateway IP address**

Type "Y" in the "Set Gateway IP Address" item to change the address. Enter the numbers separately and divide them by Enter.

**Netmask**

You can set here how many bits from IP address make the network part.

Subnet mask is entered as a number of bits determining range of possible IP addresses of the local network. If for example 2 is entered, subnet mask is 255.255.255.252. Entered value indicates number of bits from right. Maximum is 32.

Default: 8

Example:

Mask 255.255.255.0 (binary 11111111 11111111 11111111 00000000) -> number 8.

Mask 255.255.255.252 (binary 11111111 11111111 11111111 11111100) -> number 2.

**Change telnet config password****Enter new Password**

This item sets the password that is required before entering the Telnet configuration or via WEB interface (Administrator's password).

Type "Y" at „Change telnet config password“ to change the password

**Factory Defaults**

By pressing number 7 you can set the device to factory defaults.

This option sets the TH2E to defaults. IP address does not change, WEB port number will be changed to 80.

**Exit without save**

Ends the telnet session without saving.

**Save and exit**

This choice saves the changes. If some settings are changed, device restarts. That may take up to 30 seconds.

## HOW TO CONNECT TO TH2E

A brief overview of methods for obtaining temperature values from the TH2E is on page 6.

### WEB interface

After setting the TH2E's IP address in the Internet browser<sup>13</sup> se you will see the page from Fig. 19.<sup>14</sup> There are current values of all measured quantities, sensor name and set limits. If any of those limits is overrun, it shows highlighted. Current measured values can only be viewed in WEB mode.

- ⚙️ There is a *Settings* button in the upper right corner.

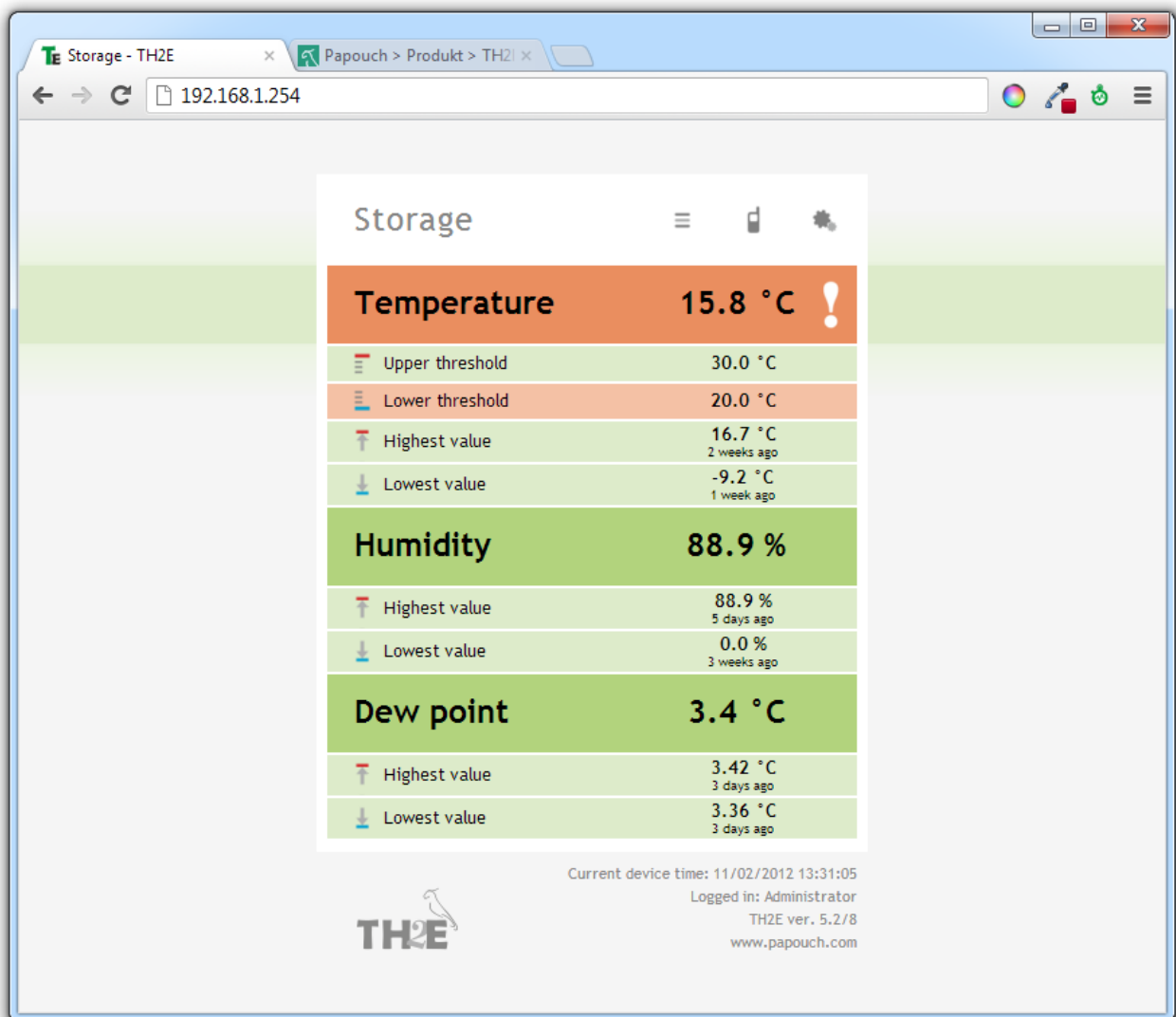


Fig. 19 – WEB main screen and meaning of the displayed values

You can select either English or Czech language.

<sup>13</sup> WEB interface requires JavaScript turned on. Interface is optimized for Internet Explorer 7.0, Mozilla Firefox, Opera, Google Chrome, iPhone a Android. Set the address in the form [http://\[IP\\_address\\_of\\_TH2E\]/](http://[IP_address_of_TH2E]/) For example, <http://192.168.1.254/> if the default configuration of the TH2E has been preserved.

<sup>14</sup> The module's pages can be graphically adapted to your requirements.

## Simple version

Simple form of the displayed page can be activated by clicking the icon with three stripes. This is very useful when you need to have the window smaller or when you view multiple devices on a single page. (More information about that is below following figure.)

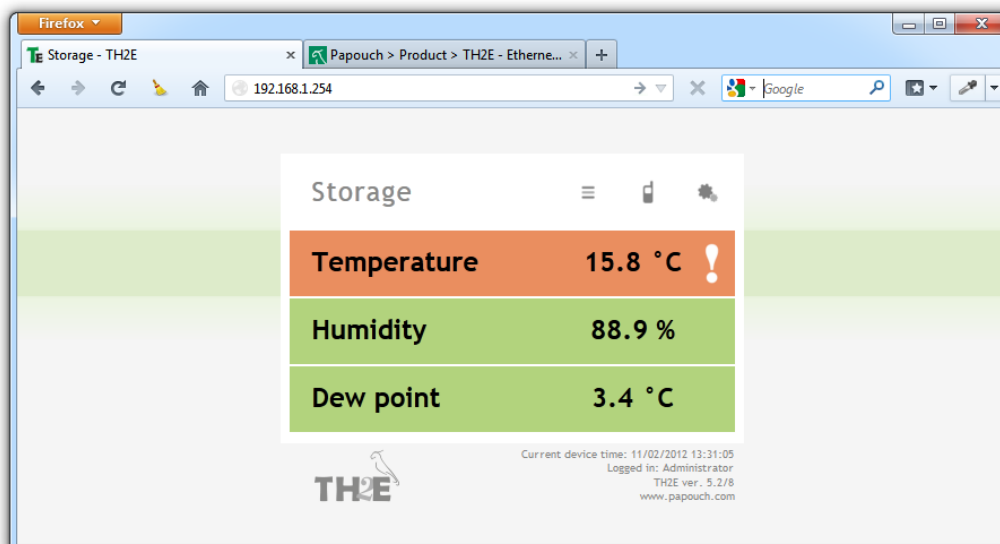


Fig. 20 – Simple view

## Viewing multiple sensors on a single page

If you have more than one device, you can view multiple sensors on one page. Small example is on following figure.

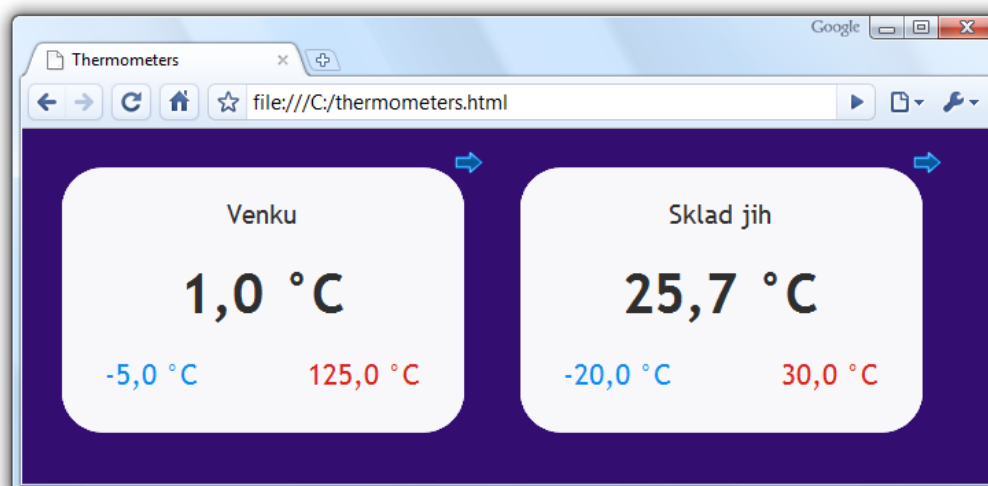


Fig. 21 – Multiple sensors view. (browser: Google Chrome)

If you wish to view multiple thermometers, follow these instructions:

- 1) Create a new file named *thermometers.html*
- 2) Copy following text to the file:

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01//EN"
"http://www.w3.org/TR/html4/strict.dtd">
<html>
<head>
  <meta http-equiv="Content-Type" content="text/html; charset=windows-1250">
  <title>Hygrometers</title>
```




```
</head>
<style>
  body {background-color: WHITE;}
  iframe {border: none; width: 410px; height: 320px;}
</style>
<body>
  <iframe src="http://192.168.1.254/index.html?mini"></iframe>
  <iframe src="http://192.168.1.121/index.html?mini"></iframe>
</body>
</html>
```

- 3) Number of thermometers depends on number of lines starting by text `<iframe>`. You can add as many as you like. Only thing you have to do is to change the IP addresses (highlighted red) by IP addresses of your thermometers.
- 4) You can save the file to any location, but be careful about the absolute path the TME.
- 5) If you have saved the file to your C drive root, you can view the page from your browser by entering: `file:///C:/hygrometers.html`

### **WEB on legacy devices without JavaScript support**

---

 You can display simple WEB page by clicking the phone icon. This simple WEB page supports all the legacy devices that have no support for JavaScript. Mobile version is available on address: `http://[Device's-IP-address]/wap.html`

## XML file

From the TH2E, you can get the currently measured-out values, limits and the sensor's name in a text file in XML format. The file is at [http://\[IP\\_address\\_of\\_sensor\]/fresh.xml](http://[IP_address_of_sensor]/fresh.xml) – for example, <http://192.168.1.254/fresh.xml> for the default settings of TH2E.

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<root xmlns="http://www.papouch.com/xml/th2e/act">
  <sns e-max-dte="10/20/2012 10:56:05" e-min-dte="10/29/2012 12:54:18" e-max-val=" 16.7" e-min-val=" -9.2"
    w-max="30.0" w-min="20.0" val="15.8" unit="0" status="3" type="1" id="1"/>
  <sns e-max-dte="10/30/2012 12:56:05" e-min-dte="10/31/2012 00:00:00" e-max-val=" 88.9" e-min-val=" 0.0"
    w-max="" w-min="" val="87.0" unit="3" status="0" type="2" id="2"/>
  <sns e-max-dte="10/31/2012 10:50:02" e-min-dte="5/30/2012 12:54:18" e-max-val=" 15.3" e-min-val=" -12.2"
    w-max="" w-min="" val="14.0" unit="0" status="0" type="3" id="3"/>
  <status frm="1" time="10/31/2012 13:56:05" location="U Papoucha"/>
</root>
```

Fig. 22 – XML file example

There are XML tags *sns* for each quantity and also *status* tag:

### status

#### location

User defined name of the thermometer.

#### time

Current time within TH2E.<sup>15</sup>

### sns

#### id

number of the quantity. (first number is 1.)

#### type

Quantity type, it can reach these values:

- 1.....temperature from range -40 to +123,8 °C or -55 to +125 °C<sup>16</sup>
- 2.....humidity from 0 to 100 %
- 3.....dew point

### status

Describes status of the measured value. It can be:

- 0.....valid value, currently measured-out value
- 1.....waiting for first measuring
- 2.....measured-out value exceeded user defined upper limit
- 3.....measured-out value dropped below user defined lower limit.
- 4.....measuring error or sensor error (means damaged sensor or cable)

<sup>15</sup> This applies only if your TH2E version supports time.

<sup>16</sup> See Tab 1 on page 5.

**unit**

Currently set temperature units:

- 0 ..... Celsius degrees
- 1 ..... Fahrenheit degrees
- 2 ..... Kelvin

**val**

Current value in units specified in *Unit* parameter, as a number with one decimal. (Validity of the value describes *status* attribute.)

**w-min, w-max**

Lower (*w-min*) and upper (*w-max*) limit of the value. These are the user defined limits. The value is a number with one decimal.

**e-min-val, e-max-val**

The lowest (*e-min-val*) and the highest (*e-max-val*) measured-out value from the last reset or from when the device was made. (You can reset this memory in [Other](#) panel.)

**e-min-dte, e-max-dte**

Date and time of the extreme records: minimal (*e-min-dte*) and maximal (*e-max-dte*) measured-out values (*e-min-val* a *e-max-val*). (You can reset this memory in [Other](#) panel.)

## Inputting measured values on the server using HTTP GET

All measured values from TH2E can be inserted into a website using a scripting language (such as PHP), which processes the values from the sensor as an HTTP parameter of the GET request. The device periodically calls the script on an Internet (or intranet) server with the actually measured values in the GET parameter. On the server, this value can be stored as a variable and further processed - for example, stored in a log, displayed on the website, etc.

Path to the script and sending interval must be set. Interval can be from 1 to 1440 minutes.

### HTTP GET

This request is sent as parameters in the message address as a standard HTTP GET parameters. Example:

```
http://www.example.com/script.php?mac=00-20-4A-B4-8D-F1&name=Sklad&
tempS=0&tempV=21.8&humS=0&humV=37.4&dewS=0&dewV=6.6
```

As you can see in the example, request is in a format known to the WEB programmers as a standard forms data sending format. There is no need to learn new ways and you can use standard mechanism (`<form name="myform" action=...`).

Request is sent in period set in item [Sending interval](#) on page [21](#).

HTTP GET Parameters are following:

mac ..... MAC address of the device.

name ..... device name defined by user.

tempS ..... Describes the status of currently measured value:

0 ....valid value, currently measured-out value

1 ....awaiting first measurement

2 ....measured-out value exceeded user defined upper limit

3 ....measured-out value dropped below user defined lower limit

4 ....measuring error or sensor error (means damaged sensor or cable)

tempV ..... Measured-out temperature as a number with one decimal. (In degrees Celsius)

humS ..... Status of the measured-out humidity (It is the same as for the temperature)

humV ..... Measured-out value as a decimal number without units.

dewS ..... Status of the dew point. (It is the same as for the temperature)

dewV ..... Dew point as a decimal number without units. (in degrees Celsius)

### HTTP GET settings - examples

Help for entering the path to the script is displayed when cursor is over HTTP GET title.

#### Example 1:

What you need to process:

There is a script *script.asp* on your server awaiting the data from TH2E. Full path to the script is *http://www.example1.com/script.asp*

Script expects the temperature in *temp* parameter.

Solution:

You need to set up these items:

WEB server IP address ..... 218.25.14.3  
Server name ..... www.example1.com  
WEB port ..... 80  
Script folder ..... /ext  
Script name ..... script.asp

Result URL address:

<http://www.example1.com/script.asp?mac=00-20-4A-B4-8D-F1&name=Venku&tempS=0&tempV=22.9 &humS=0&humV=38.4&dewS=0&dewV=8.0>

### Example 2 – measurement error:

What you need to process:

There is a script *get.php* awaiting data from TH2E. Full path to the script is:

<http://www.example2.com/scripts/get.php>

Solution:

You need to set up these items:

WEB server IP address ..... 218.25.14.3  
Server name ..... www.example2.com  
WEB port ..... 80  
Script folder ..... /ext  
Script name ..... get.asp

Result URL address:

<http://www.example2.com/ext/get.php?mac=00-20-4A-B4-8D-F1&name=Sklad&tempS=4&tempV=0.0 &humS=4&humV=0.0&dewS=4&dewV=0.0>

## TCP connection – WEB mode

TH2E allows you to work as TCP client even in WEB mode<sup>17</sup>, awaiting connection on defined port (Adjustable at: *Network/data port*). This mode is particularly convenient if a remote system connects actively to TH2E and requests measured-out values.

TH2E behaves as a server and awaits for a connection on its IP address and data port. After establishing connection, it sends measured-out values every 10 seconds in Spinel protocol.<sup>18</sup>

## Message format

This is a description of the packet's data part in Spinel protocol (example on the next page):

*Acknowledge code:* ACK 0EH

*Parameters:* [(id)(status)(value)] [(id)(status)(value)] [(id)(status)(value)]

| Id  | Quantity identifier | length: 1 byte |
|---|---------------------|----------------|
| Identifier tells you what quantity are the following three bytes about. It can be there values:<br>01H → Temperature, 02H → Humidity, 03H → Dew point |                     |                |

| status   | Status of the measured-out value                                     | length: 1 byte |
|--|--|----------------|
| Status of the measured-out value for the channel with number from previous byte <i>chn</i> . Bits 0 and 1 are set/reset right after any limit is overrun, hysteresis does not apply. |  |                |
| bit 0, 1   | 00 = measured-out value is inside the limits(or the watching is off) |                |
|  | 01 = lower limit is overrun  |                |
|  | 10 = upper limit is overrun  |                |
| bit 3, 2   | 00 = measured-out value is inside the measuring range                |                |
|  | 01 = measured-out value is below measuring range (underflow)         |                |
|  | 10 = measured-out value exceeded the measuring range (overflow)      |                |
| bit 7 (MSb)  | 0 = measured-out value je invalid                                    |                |
|  | 1 = measured-out value je valid                                      |                |

| value   | Value | length: 2 byte |
|---|-------|----------------|
| Current measured-out value as s 16bit integer with sign (signed integer) <sup>19</sup> multiplied tenfold. Bytes are in order MSB:LSB. Current value with one decimal accuracy can be obtained as following:<br>$current\_value = value / 10$ |       |                |

<sup>17</sup> WEB mode is default TH2E's mode. It can be changed in *Network* panel.

<sup>18</sup> Format is compatible with Spinel 97. More info at: <http://spinel.papouch.com/> (Czech only).

<sup>19</sup> Negative numbers are stated as two's complement. Two's complement is a method of coding negative numbers in binary. Absolute value of the negative number can be obtained as following::

Number (two's complement) ...FFC6H

Minus one.....FFC6H – 1 = FFC5H

Negative result .....FFC5H → 003AH, Which is 58 in decimal. The result is -58.

**Examples:**

| Automatic message:  |
|---|
| 2AH, 61H, 00H, 11H, 31H, 45H, 0EH, 01H, 80H, 00H, E4H, 02H, 80H, 01H, 59H, 03H, 80H, 00H, 40H, DBH, 0DH   |
| <p>Measured-out temperature is 1.7 °C and humidity 57.0 %. Dew point is -5.7 °C.</p> <p>Now the highlighted bytes description:</p> <p>0EH → Automatic message flag</p> <p>01H → Temperature:<br/>           80H → value valid and within range<br/>           00H,E4H → 00E4H → 228 → divided by ten → 22.8 °C</p> <p>02H → Humidity:<br/>           80H → value is valid and within range<br/>           01H,59H → 0159H → 345 → divided by ten → 34.5 %</p> <p>03H → dew point:<br/>           80H → value is valid an in range<br/>           00H,40H → 0040H → 64 → divided by ten → 6.4 °C</p> |

**TCP connection – TCP and UDP mode**

In modes TCP server, TCP client and UDP, TH2E communicates via Spinel protocol. It is a standard request-response communication that is most commonly used. This protocol can be used for configuration and reading values form TH2E.

Detailed description of TH2E Spinel protocol is in a separate document, containing examples with comments. It can be found on a CD and on our WEB site [www.papouch.com](http://www.papouch.com) in TH2E part.

## SNMP

### General

SNMP (Simple Network Management Protocol) is a standard protocol for management of various devices in an Ethernet network. It is built on UDP protocol and ensures quick delivery of control codes and responses between devices on which SNMP applications run.

SNMP ensures that requests are delivered to and responses from such applications. It works independently of specific features in lower- or higher-level application. This protocol is based on three entities: administrator (which generates commands and receives messages), agent (which responds to commands and creates messages), and proxy (which transfers network traffic).

The SNMP administrator sends requests to the agent's UDP port 161 and receives non-requested messages (traps) from agents on UDP port 162.

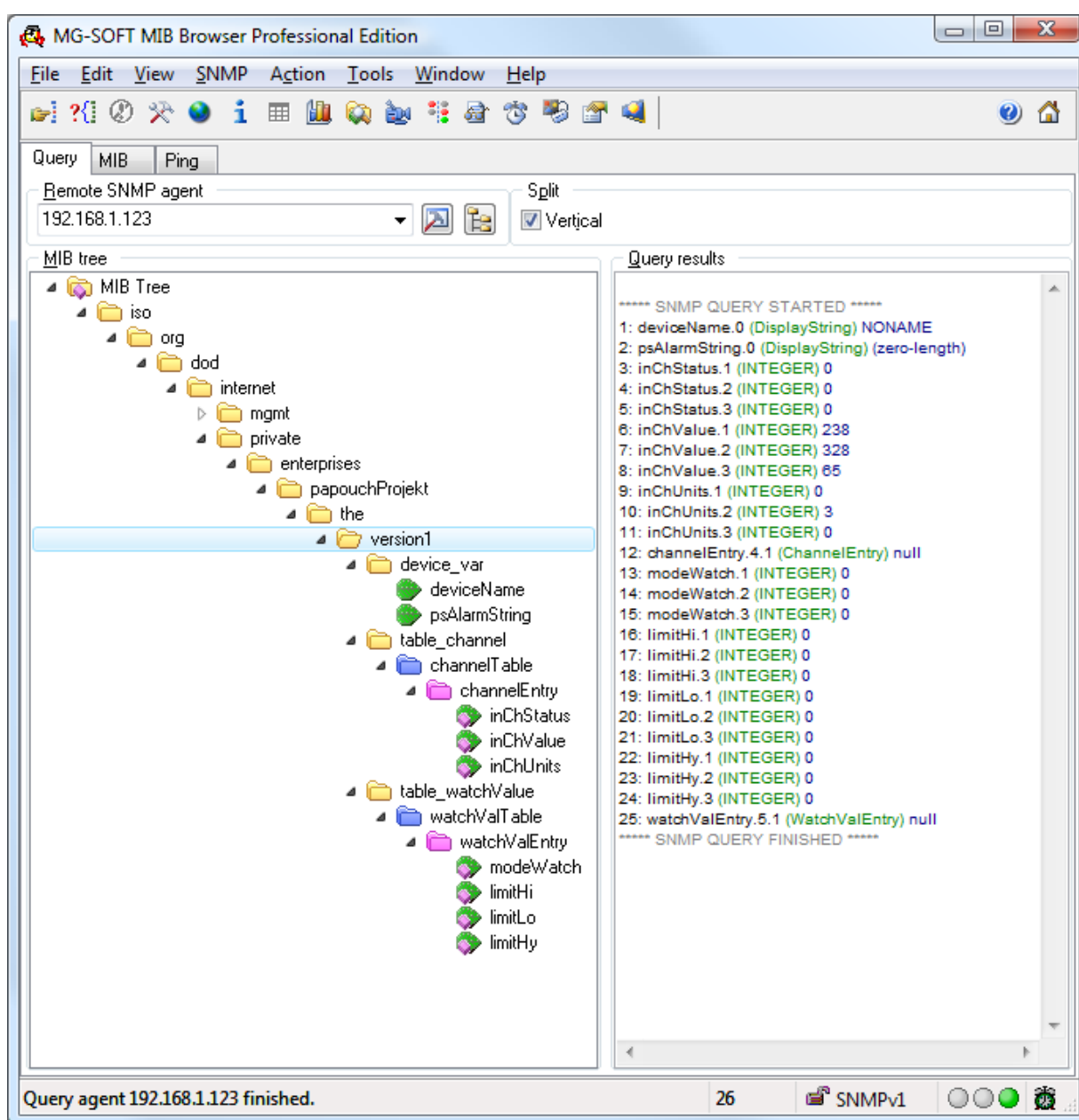


Fig. 23 – MIB tree

TH2E is an SNMP agent. It receives commands from a UDP port 161. The administrator asks about data stored in the local MIB database (Management Information Base, one of the Internet



standards), which consists of a hierarchic tree structure with the administered data. The module does not contain the standard complex database but only a sub-tree with data necessary for processing the TH2E thermometer data.

Descriptions of the MIB table tree and of SMI (Structure of Management Information) are attached in TH2ESNMP.mib text file. The programmer should include these two descriptions into the SNMP administrator structure (SNMP version 1).

Data in the MIB tree can be accessed through the name of the object, expressed as a series of positive integers separated with dots and describing the path to the object in the MIB tree structure.

TH2E as an SNMP agent enables the sending of automatic traps to the administrator via UDP port 162.

## Using SNMP

---

Include in your SNMP manager the description of the MIB table from the Papouch-SMI.mib and TH2E\_v01.MIB files.<sup>20</sup>

Then you must set the "Read community" option to "public"

All SNMP objects in TH2E are accessible for reading only.

## SNMP objects – quantities

---

Following objects are available for each quantity. Temperature has *object id* 1, humidity is 2 and dew point is 3.

### Status of the Quantity

*Name:* inChStatus

*Object ID:* 1.3.6.1.4.1.18248.20.1.2.1.1.1.1 to 3

*description:* Quantity status. It describes current status of measurement. Following states can occur:

- 0 → Value is valid and within limits.
- 1 → Value was not measured-out yet.
- 2 → Value is valid and upper limit was exceeded.
- 3 → Value is valid and below lower limit.
- 4 → Value is invalid – measurement error.

### Measured-out value

*Name:* inChValue

*Object ID:* 1.3.6.1.4.1.18248.20.1.2.1.1.2.1 to 3

*Description:* Measured-out value as an integer. Real value can be obtained by dividing the number by ten.

### Unit

*Name:* inChUnits

*Object ID:* 1.3.6.1.4.1.18248.20.1.2.1.1.3.1 to 3

---

<sup>20</sup> These files can be downloaded from: [www.papouch.com](http://www.papouch.com) .

*Description:* Unit of the value. It can be:

- 0 → degrees Celsius.
- 1 → degrees Fahrenheit.
- 2 → Kelvins.
- 3 → percents (humidity)

### Values Watch

*Name:* modeWatch

*Object ID:* 1.3.6.1.4.1.18248.20.1.3.1.1.1.1 to 3

*Description:* It indicates the status of values watching on this channel. 1: watching is active, 0: watching is inactive.

### Upper limit

*Name:* limitHi

*Object ID:* 1.3.6.1.4.1.18248.20.1.3.1.1.2.1 to 3

*Description:* Upper limit of the value watching. When this limit is overrun, action is executed due to other settings. Value is always in degrees Celsius for temperature.

### Lower limit

*Name:* limitLo

*Object ID:* 1.3.6.1.4.1.18248.20.1.3.1.1.3.1 to 3

*Description:* Lower limit of the value watching. When this limit is overrun, action is executed due to other settings. Value is always in degrees Celsius for temperature.

### Hysteresis

*Name:* limitHy

*Object ID:* 1.3.6.1.4.1.18248.20.1.3.1.1.4.1 to 3

*Description:* Hysteresis of both limits. Description of hysteresis and principal explanation can be found on page 24. Value is always in degrees Celsius for temperature.

## SNMP objects – general

---

Following objects apply to whole device.

### Device name

*Name:* deviceName

*Object ID:* 1.3.6.1.4.1.18248.20.1.1.1.0

*Description:* User defined name of TH2E.

### Alarm text

*Name:* psAlarmString

*Object ID:* 1.3.6.1.4.1.18248.20.1.1.2.0

*Description:* text of the alarm message when some of the limits is overrun.

## Automatic traps

The TH2E enables sending out automatic traps. There are two settings for the traps: enable/disable sending, and the receiver's IP address (SNMP manager).

Depending on the settings, the traps are sent when the quantity goes out of the preset quantity limits, and a trap with the measured quantity value is sent out regularly.

### Trap 1 – Quantity outside of limits

The trap contains the quantity value that has overrun a limit and the limit value.

This trap is only sent out if the quantity goes beyond the preset limits. The trap can only be delivered if the SNMP manager's IP address is set correctly.

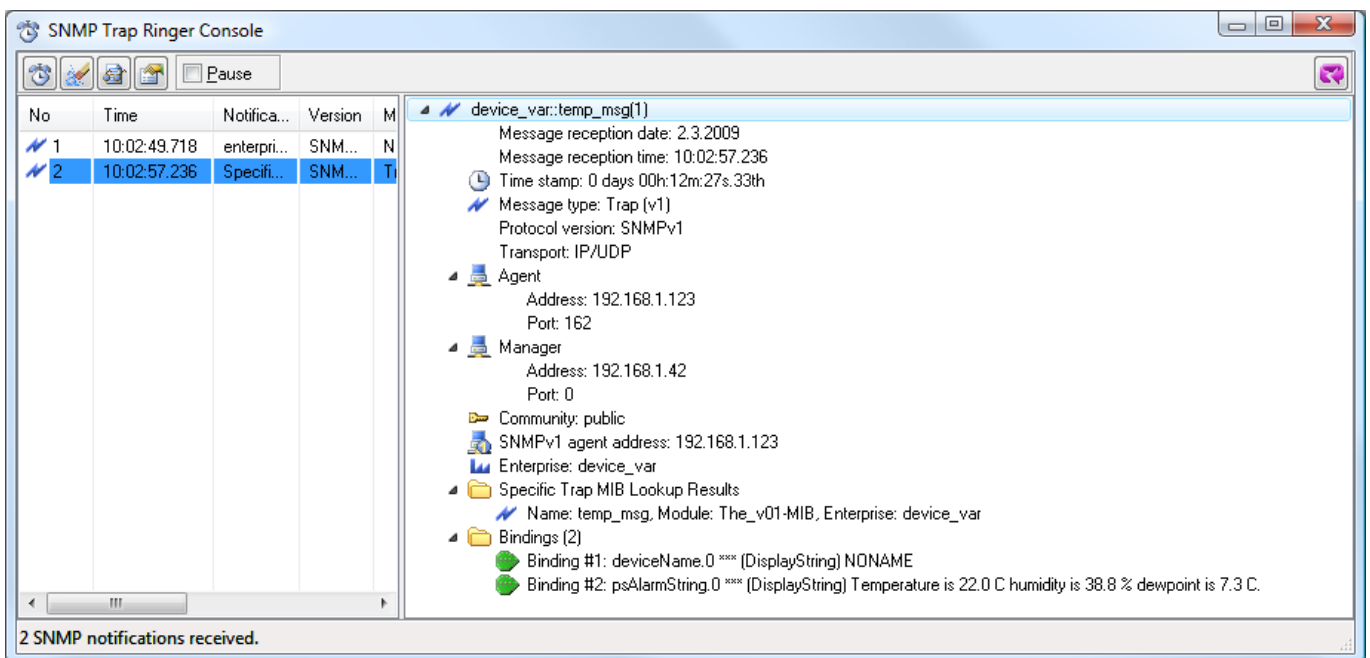


Fig. 24 – SNMP trap upon overrunning the specified limit

### Trap 2 – Current measured values

In this trap all current values are sent, also the name of the device.

The trap is only sent if a non-zero period is set.

**Sending e-mails**

---

TME can send an e-mail with information upon these events:

- Some of the limits is overrun
- Memory is full

**Some of the limits is overrun**

---

TH2E can send e-mail information that some of the limits have been overrun.

This e-mail message can be easily forwarded to a mobile phone as an SMS using variety of mobile providers.

**Memory is full**

---

When the memory is full, e-mail can be sent containing CSV file attachment with all the records from memory. This function can be adjusted in *Memory* panel.

## ModBus protocol

MODBUS TCP is a standard industrial protocol. TH2E can communicate via ModBus TCP. Complete information about the protocol can be found at: [www.modbus.org](http://www.modbus.org).

### Memory table – Input Register

| Address  | Access | Function | Name                                     |
|--|--------|----------|--|
| <b>Values and states of each channel – sorted by channel</b> |        |          |  |
| 0x0000   | read   | 0x04     | Temperature – Status                     |
| 0x0001   | read   | 0x04     | Temperature – Value signed integer       |
| 0x0002   | read   | 0x04     | Temperature – Value float (3. a 2. byte) |
| 0x0003   | read   | 0x04     | Temperature – Value float (1. a 0. byte) |
| 0x0004   | read   | 0x04     | Humidity – Status                        |
| 0x0005   | read   | 0x04     | Humidity – Value signed integer          |
| 0x0006   | read   | 0x04     | Humidity – Value float (3. a 2. byte)    |
| 0x0007   | read   | 0x04     | Humidity – Value float (1. a 0. byte)    |
| 0x0008   | read   | 0x04     | Dew point – Status                       |
| 0x0009   | read   | 0x04     | Dew point – Value signed integer         |
| 0x000A   | read   | 0x04     | Dew point – Value float (3. a 2. byte)   |
| 0x000B   | read   | 0x04     | Dew point – Value float (1. a 0. byte)   |

### Values and current states of channels

Values are available in two formats simultaneously: As a 16bit signed integer (MSB:LSB – decimal value multiplied tenfold).

Second value is a decimal number in 32bit float format according to IEEE 754 standard<sup>21</sup>.

#### Function codes:

0x04 – Read Input register

#### Memory position and length:

|                  |         |  |
|------------------|---------|--|
| Starting address | 2 Bytes | Temperature: 0x0000<br>Humidity: 0x0004<br>Dew point: 0x0008 |
| Register count   | 2 Bytes | 4  |

#### Parameters:

|                 |        |   |
|-----------------|--------|---|
| Number of bytes | 1 Byte | 8   |
| Status          | 2 Byte | 0x0000 – value is valid and in range<br>0x0001 – value not available yet<br>0x0002 – upper limit exceeded<br>Other values – other error |
| Value INT       | 2 Byte | Measured-out value as signed integer.   |
| Value float     | 4 Byte | Measured-out value. 32 bit float by IEEE 754  |

<sup>21</sup> IEEE 754 description is available here: [http://en.wikipedia.org/wiki/IEEE\\_754](http://en.wikipedia.org/wiki/IEEE_754)

## MEMORY

Memory in TH2E is for saving measured-out values. Contents of the memory can be read at any time as an XML file, they can be sent as an XML file to your server or they can be sent by e-mail as a CSV file.

Memory storing for each value can be set individually. Record with time stamp is stored in the internal memory on startup as well.

Memory has a capacity for 1000 records. (One record is a value from one quantity, so the memory has a capacity of 333 records for all quantities.) Memory behaves as a circle buffer, meaning that when it is full, the oldest records are subsequently re-written by the recent ones.

After the whole content of the memory is sent as an XML or CSV file, memory is erased.

Each record has its own precise time marker.

## Logging modes

Logging is done in three different modes:

### Time mode

Log is created once every X minutes.

### Differential mode

In differential mode, hysteresis is set. Log is stored once the value changes more than the pre-set hysteresis and this from the last stored value. Only significant changes are logged and memory is saved.

Example: We measure temperature and humidity in a refrigerator box. Temperature for inside the box has been set to -18 °C. Fluctuations up to 1°C are irrelevant. Therefore, hysteresis is set to 1.0 °C. If the temperature fluctuates from -17.1°C to -18.9 °C no value is logged. If however temperature goes up to -17.0 °C, record will be stored in the memory. Next log will be created when temperature goes outside the range of -16.1 °C to -17.9 °C. Not only temperature will be logged, but all quantities set to log. (You can of course set a specific hysteresis for humidity and dew point as well.)

### Logging limit values

This is a mode that only saves the value at which the tendency of measured quantity changes. (For example when temperature tendency changes – it stops growing and starts falling, and vice versa). This mode is particularly convenient when watching regulation systems for temperature or humidity. Hysteresis can also be set for this mode.

**WARNING:** Reading history in XML format is very demanding. Reading the history may take several dozens of minutes. If you click multiple links at a time, it may result in system instability and TH2E's WEB interface might be unavailable for a protracted period of time.

## XML

---

Memory contents can be obtained as follows:

### HTTP POST

Whole memory content can be sent as an HTTP POST in XML format. (This function is configured in *Memory* panel.)

### History.xml file

Whole memory content is accessible in *history.xml*.

- All memory contents in XML format can be obtained by reading *history.xml* (with no parameter).
- Last 30 records can be obtained by entering the *last* parameter.  
( Example: <http://192.168.1.254/history.xml?last> )

XML file contains main *root* element which contains *event* elements with individual records. *event* element is in following format:

```
<event type="tmp" value=" 22.40" time="02/25/2009 04:55:13" />
<event type="hum" value=" 38.50" time="02/25/2009 04:55:13" />
<event type="dew" value=" 7.60" time="02/25/2009 04:55:13" />
<event type="res" value=" 0.0" time="02/25/2009 04:57:00" />
```

*type* attribute defines elements as follows:

- tmp..... temperature
- hum..... humidity
- dew..... dew point
- res..... last time record (time when the device has been turned off)

## CSV file

---

TH2E can also send the content of its memory as a CSV file. After sending the CSV file, memory is automatically erased.

Each row contains these records divided by semicolon:

### record id

Number of the record for identification purposes.

### date and time

Date and time of the record.

### measured-out value

Value of the measured quantity.

## FAQ

### **What needs to be set for my TH2E to work in the network?**

---

Only thing you have to set-up for TH2E to work is the network parameters for your Network. (IP address and Subnet mask.) Settings are described for Windows OS.

- 1.) Connect your TH2E to the network and run [Ethernet Configurator](#) program (see Fig. 6).
- 2.) Click “Add device” and enter MAC address of your TH2E and desired IP address.
- 3.) Click “Set”
- 4.) Now you can open the WEB interface of your TH2E using any browser.

### **How do I get TH2E's IP address?**

---

- 1.) Default IP address is 192.168.1.254. If you have changed the address before of you cannot connect to the TH2E, follow these instructions:
- 2.) Run [Ethernet Configurator](#) program (see Fig. 6). If your TH2E is in the network and has a compatible IP address, you will be able to see it in *visible devices* list.
- 3.) If you cannot see the TH2E is the *list*, check the connection and assign it a new IP address according to the previous question.



## INDICATION

### ON Indicator (green)

Indicates that power is connected. It also flashes to indicate the proper function of the device. In TCP mode indicator flashes as the data channel is active. (Fig. 25: right LED.)

### DCD Indicator (yellow)

Indicates established TCP/IP connection. (Fig. 25: left LED.)

### DCD Indicator (yellow)

(Left indicator on the Ethernet connector)

Nothing ..... disconnected

Yellow ..... connected 10 Mbps

green..... connected 100 Mbps

### DCD Indicator (yellow)

(Right indicator on the Ethernet connector)

Nothing ..... no communication

Yellow ..... Half-Duplex

Green..... Full-Duplex

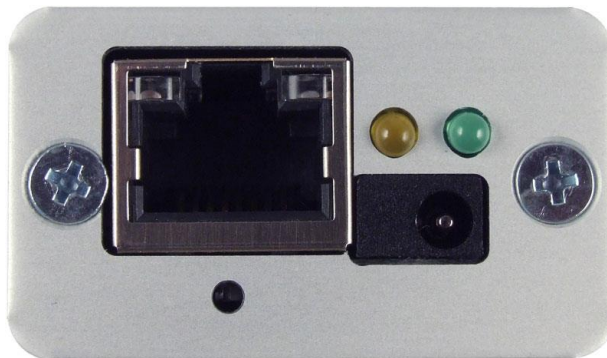


Fig. 25 – Indicators, power connector and the Ethernet connector

## HARD RESET

If you want to hard-reset the TH2E, follow these instructions:

(When hard-resetting the device, all parameters are set into factory defaults, including the IP address.)

- 1) Disconnect the power supply.
- 2) Push the button under Ethernet connector (see Fig. 25).
- 3) Turn the power on and wait for 10 seconds.
- 4) Release the button.
- 5) Hard reset done.

## TECHNICAL PARAMETERS

### Integrated temperature and humidity sensor

(Applicable to „TH2E“ version according to Tab 1 on page 5.)

**Important Notice:** Polymer sensor is a highly sensitive element that reacts with chemicals. Do not expose even the outer shell of the sensor to chemicals or their vapors (cleaning with alcohol, petrol etc.). Especially organic solvents and compounds can negatively affect the sensor accuracy by as tens of percents RH.

Coverage ..... IP 54  
 Dimensions ..... 40 × 16 × 10 mm  
 Material ..... hardened aluminum

### Humidity sensor

Humidity range ..... 0 % to 100 % RH <sup>22</sup>  
 Resolution ..... 1% RH  
 Measurement repeatability ..... ± 0.1 % RH  
 Temperature stability ..... 0.5 % RH in a year typically  
 Sensor element ..... polymer sensor  
 Sensor mechanical finish ..... inside hardened aluminum block

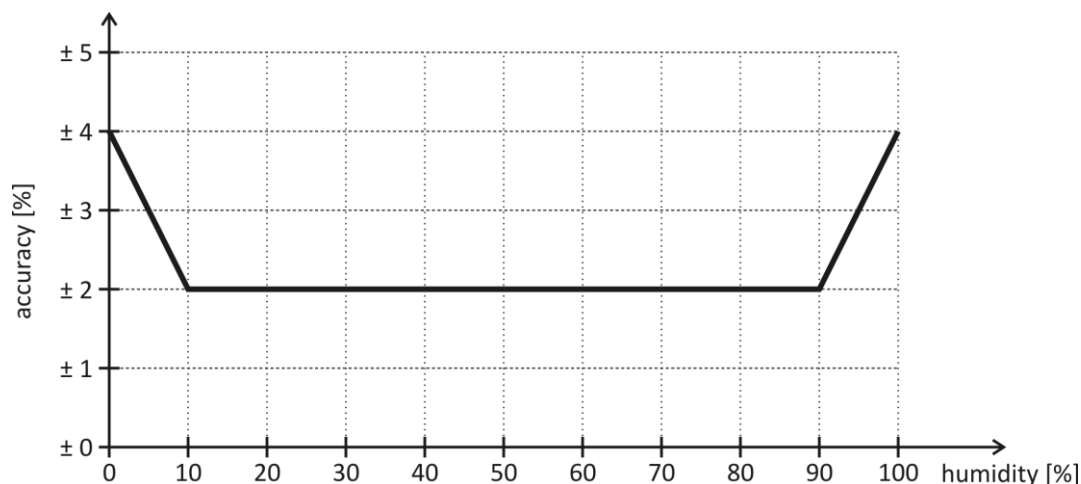


Fig. 26 – Accuracy of humidity measuring

### Temperature sensor

Range ..... -40.0 °C to +123.8 °C <sup>22</sup>  
 Resolution ..... 0.1 °C  
 Measurement repeatability ..... ± 0.1 °C  
 Sensor element ..... semiconductor  
 Sensor mechanical finish ..... inside hardened aluminum block

<sup>22</sup> See *Operating and Maximum Range of Values* on page 53!

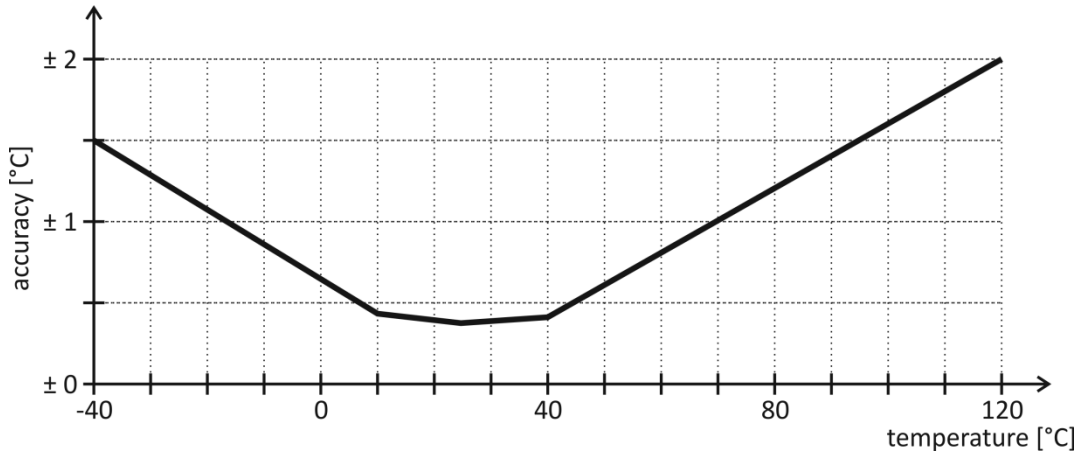


Fig. 27 – Accuracy of temperature measurement

**Operating and Maximum Range of Values**

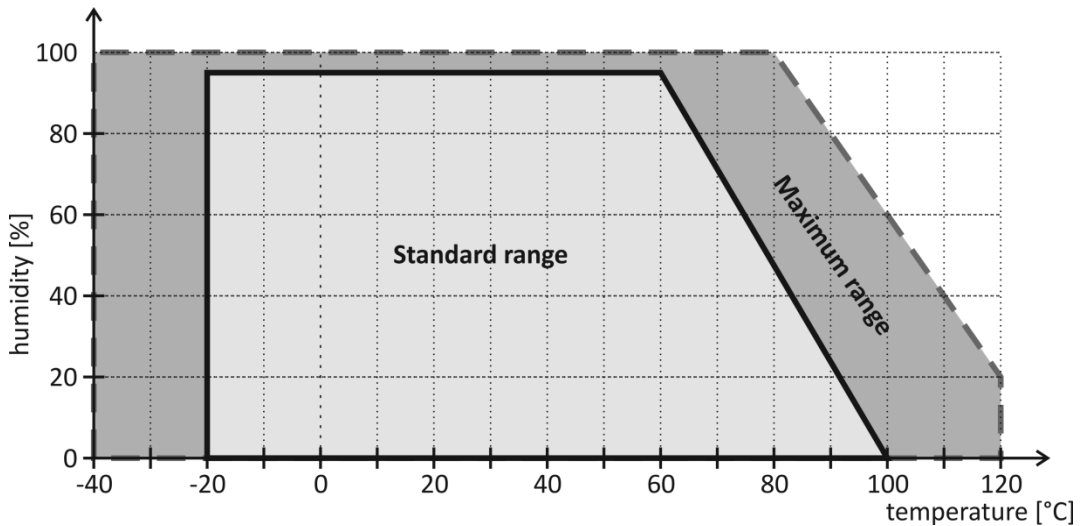


Fig. 28 – working and maximum temperature range

- Sensor is stable in standard range of values (see Fig. 28). Long-term exposure to conditions outside these values (humidity above 80% in particular) can temporarily shift the measured-out values (by +3% for 60 hours). When the sensor is back to standard ranges, it returns to its pre-calibrated state slowly.<sup>23</sup>
- Long-term exposure to extreme conditions or to chemically aggressive vapor can speed up the aging process of the sensor significantly. It can also shift the measurements.

**Temperature sensor**

(Applicable to „TH2E“ version according to Tab 1 on page 5.)

Sensor type .....semiconductor  
 Measuring range.....-55 °C to +125 °C  
 Accuracy.....±0.5 °C within the range -10 °C to +85 °C; otherwise ±2 °C

<sup>23</sup> You can speed up this process by doing following:

- 1) Leave the sensor in environment above 100 to 105 °C and humidity below 5 % for at least 10 hours.
- 2) Leave the sensor in environment above 20 to 30 °C and humidity approximately 75 % for around 12 hours. (Humidity 75% can be achieved with saturated solution of NaCl.)

|                         |  |
|-------------------------|--|
| Temperatures drift..... | ±0.2 °C over 1000 hours at 125 °C        |
| Dimensions .....        | normalized 6 mm diameter, 60 mm length   |
| Cover material.....     | Hard Duralumin                           |
| Coverage .....          | IP68 (indefinite submerge into 1m depth) |

## Other parameters

---

### Sensor cable

|  |   |
|--|---|
| Coating.....   | Silicon                                     |
| Wires isolation.....   | FEP polymer                                 |
| Length .....   | 3 m standard (up to 20 meters upon request) |
| Working temperatures range.....  | -60 °C to +200 °C                           |
| Cable diameter.....  | 4.7 mm (±0.1 mm)                            |
| Cable is highly resistant against moisture, chemicals and carbohydrates. |   |

### Ethernet interface

|                 |                       |
|-----------------|-----------------------|
| Connection..... | TBase 10/100 Ethernet |
| Connector ..... | RJ45                  |

### Obvod hodin a interní paměť měření

|                                      |  |
|--------------------------------------|--|
| Real-time clock (RTC) backup .....   | GoldCap (cannot be replaced by user)   |
| No power RTC backup time .....       | 5 days<br>(provided the device has been connected for at least 3 hours without interruption) |
| Data life expectancy in Memory ..... | 10 - 45 yrs. (depends on ambient temperature)  |
| Memory writes count.....             | virtually unlimited in normal conditions   |

### Thermometer electronics

|  |  |
|--|--|
| Power supply voltage .....                 | 5 to 30 V (Polarity reversal protection) |
| Power consumption at 5 V .....             | typ. 150 mA                              |
| Power consumption at 12 V .....            | typ. 70 mA                               |
| Power consumption at 24 V .....            | typ. 45 mA                               |
| Maximum power consumption .....            | 1.5 W                                    |
| Power connector .....                      | jack 3.8 × 1.3 mm; + inside              |
| Electronics working temperature range..... | -20 °C to +70 °C                         |
| Electronics dimensions .....               | 41.5 × 24 × 72 mm                        |
| Enclosure material .....                   | eloxal aluminum                          |
| Coverage .....                             | IP30                                     |

### Other parameters

|             |                       |
|-------------|-----------------------|
| Weight..... | 80 g (without sensor) |
|-------------|-----------------------|

---

**Default Ethernet settings**

---

IP address .....192.168.1.254

Subnet mask.....255.255.255.0 (8 bits; C mask)

Gateway .....0.0.0.0





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