

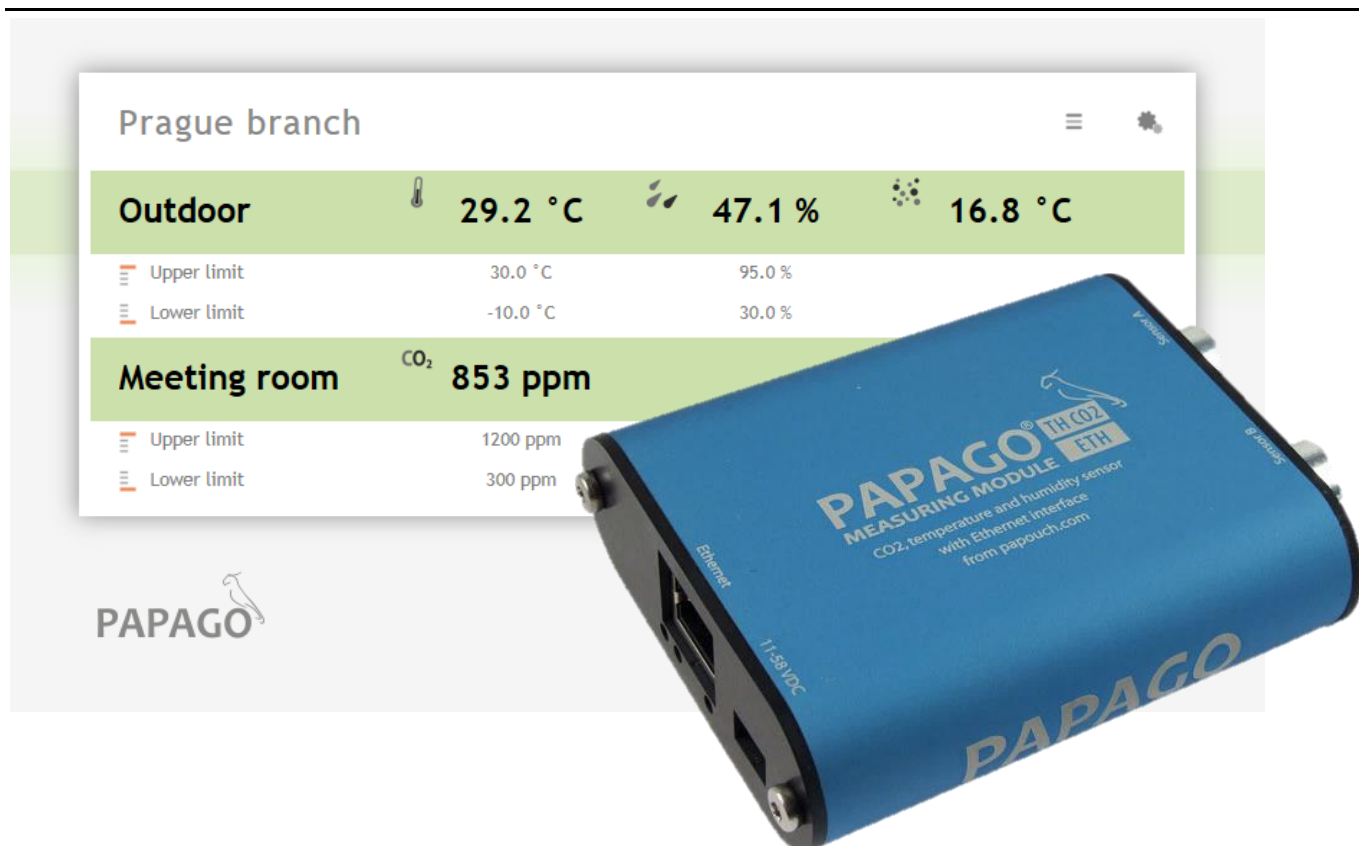


PAPAGO TH CO2

Measure 2x temperature, humidity and dew point
or CO₂ concentration

Ethernet and WiFi connectivity

PoE power or external power supply



PAPAGO TH CO2

Datasheet

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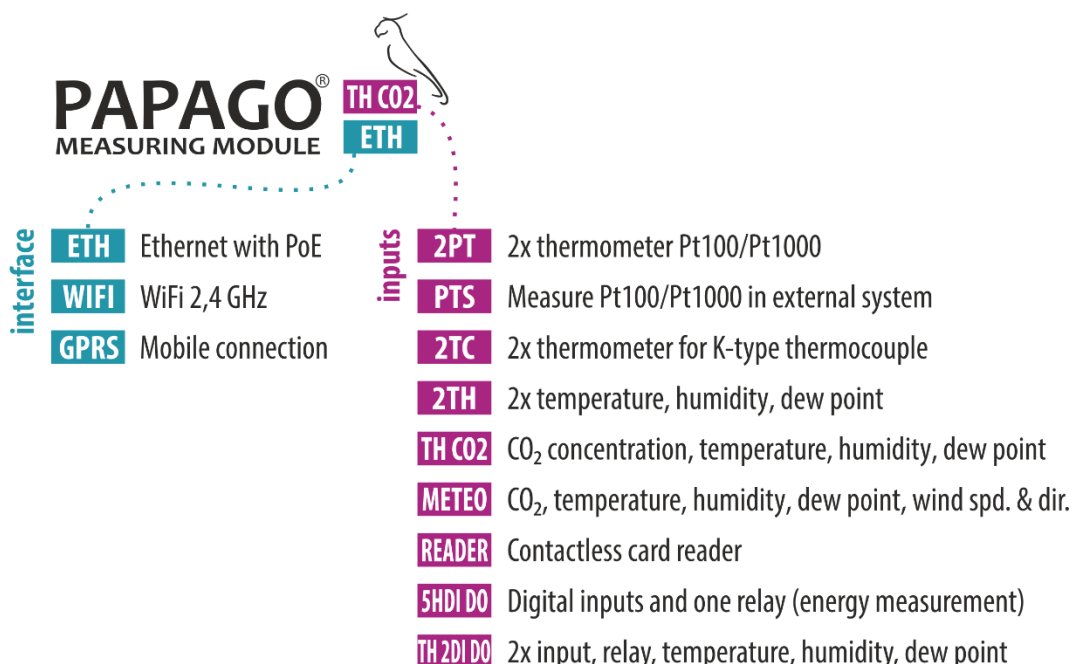
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FIRMWARE VERSIONS

GETTING TO KNOW PAPAGO

PAPAGO is a family of devices with uniform appearance and communication capabilities. It allows to combine communication interfaces on one side and measuring sensors (inputs) on the other side.



Applications

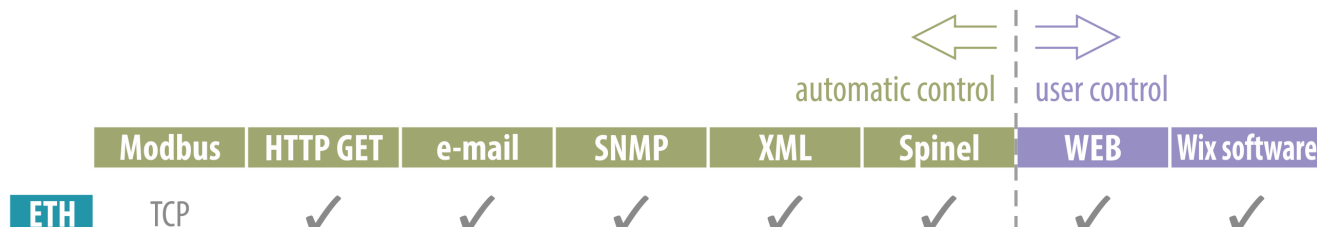
- Watching CO₂ concentration and its evaluation
- CO₂ levels measurement, temperature and humidity measurement in industry, buildings, server rooms and other environments.
- Intelligent ventilation systems
- Environmental monitoring via the internet.
- Measurement for the HACCP system.

Common Features

- Ethernet or WiFi interface to an internal website and many standard communication protocols.
- Ethernet versions with PoE power supply. This eliminates the need to use an external power supply, but the possibility to connect the AC adapter is available.
- Configuration of WiFi parameters via USB interface.
- Internal memory and real-time clock. Measured data including the time of measurement is automatically stored in the memory in the event that communication is lost. The data is automatically sent after the connection is restored.
- Elegant but robust metal box that can be mounted on a DIN rail. The box bears descriptions that allow connection without having to consult the manual. Also LED indicators for all important states help commissioning.
- The possibility to display, store and analyze data in the Wix program.

Communication Options

PAPAGO features different communication options depending on the used interface. PAPAGO can be controlled via a web interface or via software for Windows. Machine data-reading is possible using various standard methods, so PAPAGO can be easily integrated into your existing systems. You can choose the option that is appropriate for your location:



Machine data-reading: [Modbus TCP](#), [HTTP GET](#) with encryption, [e-mail](#), [SNMP](#), [XML](#), [Spinel](#)

User control: [Web interface](#), Wix software

Properties

Papago TH CO2 can measure CO₂ concentration, temperature, humidity and dew point from up to two sensors.

Each of the two inputs can be fitted with either of these two sensors:

TH sensor temperature: -40 to 125 °C; humidity 0 to 100 %

T sensor..... temperature: -55 to 125 °C

CO₂ sensor CO₂ concentration

- Family of measuring devices with Ethernet or WiFi interface.
- Modern web interface.
- Data reading via a web interface or Wix software.
- Machine data reading via Modbus, HTTP GET, SNMP, XML, e-mail or Spinel protocol.
- The ability to encrypt data in HTTP GET by 128bit encryption.
- Measurements via external thermometer, combined temperature and humidity sensor or CO₂ concentration sensor (Sensors are not included.)
- Power supply from PoE (Ethernet versions only) or external source.
- PoE standard according to IEEE 802.3af.
- WiFi 2,4 GHz.
- External DC power supply 11 to 58 V.
- Current consumption typically 72 mA at 24 V.

CONNECTION

- 1) Ethernet version: Connect the device by a normal uncrossed cable for computer networks to the switch.
- 2) Ethernet version: If the device cannot be powered by the switch via PoE according to the IEEE 802.3af standard, connect an power adapter to the coaxial connector next to the connector for the Ethernet. DC voltage in the range of 11-58 V is expected. (The positive pole is inside, the input for the power supply has reverse polarity protection.)
WiFi version: Connect an power adapter to the coaxial connector next to antenna. DC voltage in the range of 11-58 V is expected. (The positive pole is inside, the input for the power supply has reverse polarity protection.)
- 3) Connect either a temperature sensor or a combined temperature and humidity sensor to both or one of the terminals *sensor a* and *sensor b*.¹
- 4) Ethernet version: Now it is necessary to set the correct IP address of the device. The default IP address is 192.168.1.254 and network mask 255.255.255.0. If your network is not compatible with this range, set the IP address of the device using [Ethernet Configurator](#).

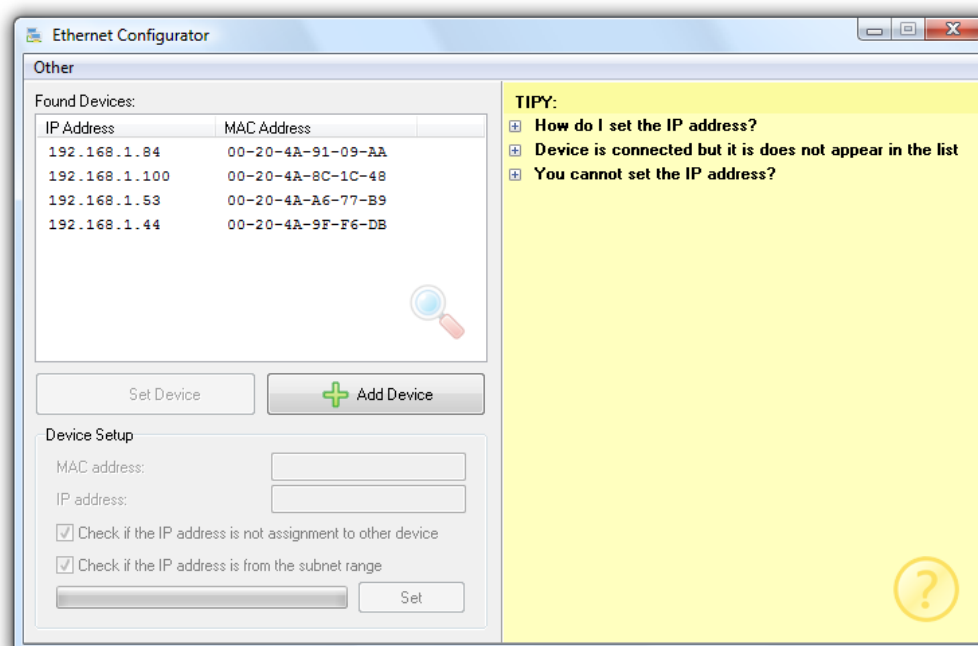


fig. 1 – Ethernet Configurator for setting the IP address

WiFi version: Connect your Papago to a windows PC using the supplied micro USB cable.² Run *Papago WiFi Configurator* software, you can download it on papouch.com. Set-up papago to your WiFi network parameters so you can access it from that network.

¹ The individual types of sensors are available from papouch.com.

² In Windows 7 or higher driver will be installed automatically.

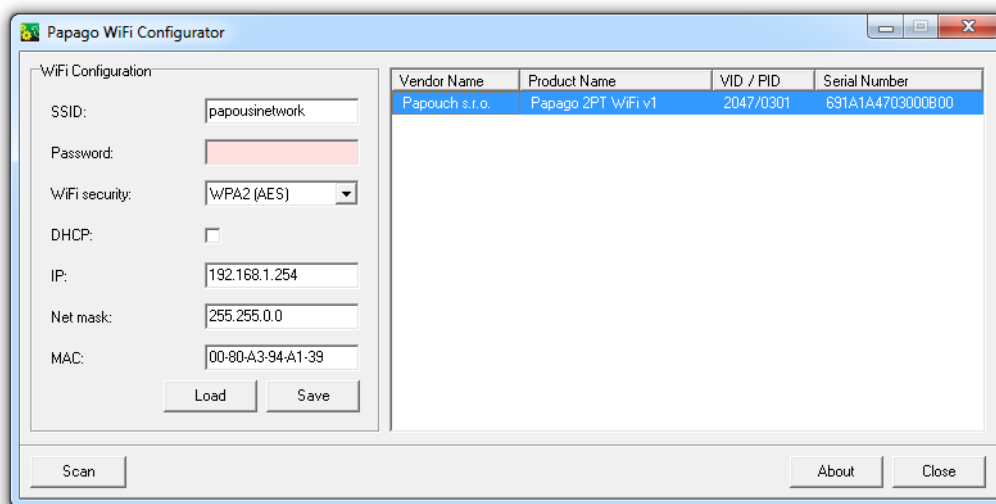


fig. 2 – WiFi configuration via USB

- 5) After setting the address, you can connect to a Web browser at the address specified as follows: *http://192.168.1.254/* (The example is given for the default IP address.)

CONFIGURATION

Configuration is done via a web interface. The basic network parameters can also be set via Telnet (see page 16). **The web interface** is accessible on the IP address of the device. (The default address is 192.168.1.254.)

After entering the IP address, the main page will appear showing the latest measured values.

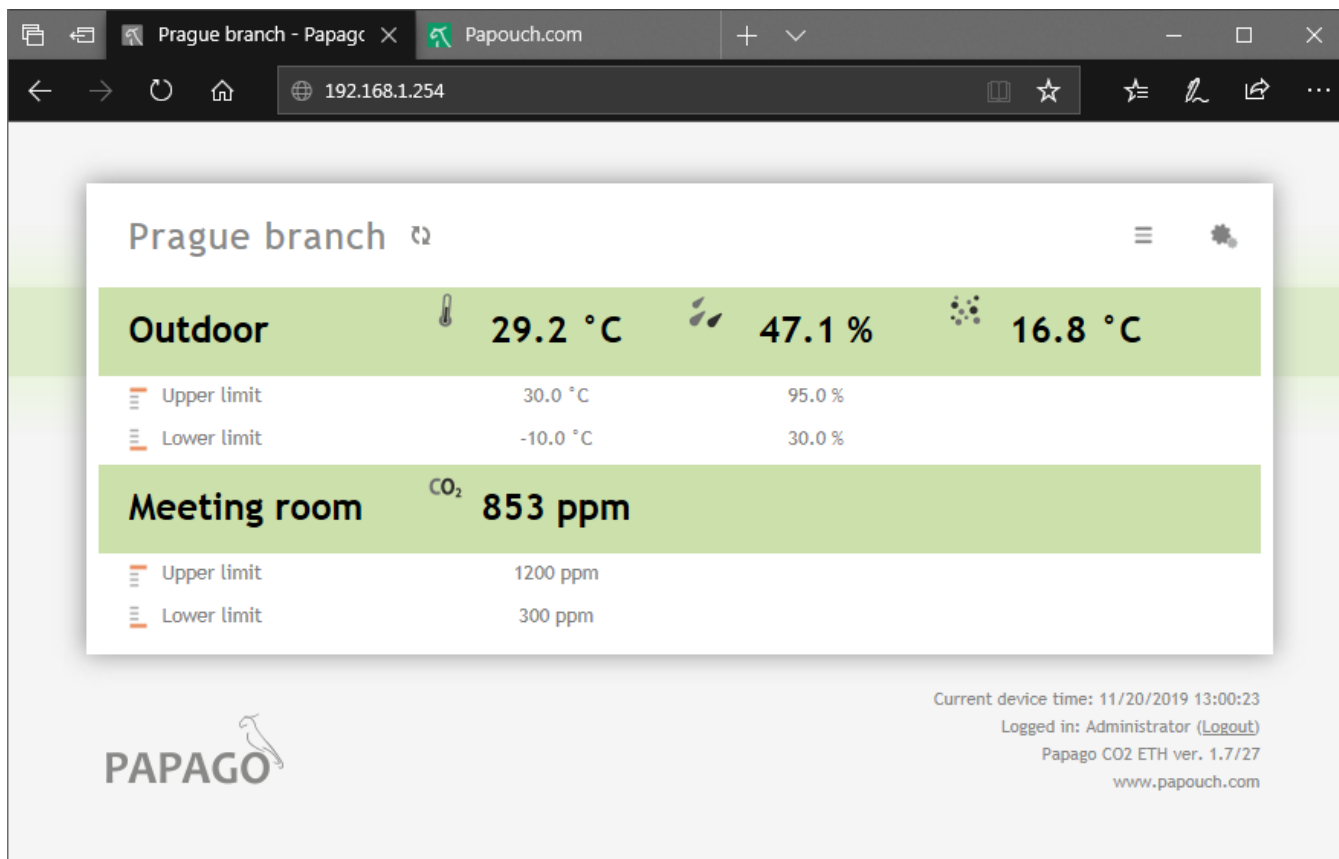


fig. 3 – Example from Papago TH CO2 WEB interface with one temperature-humidity combined sensor and one CO₂ concentration sensor connected opened in Microsoft Edge browser

The **web interface is secured** with a username and password. You can choose a separate password for the user (who can only display the values on the main page) and for the administrator (who can also change settings).

The web interface is optimized for the following browsers (or later version): Mozilla Firefox 29, Internet Explorer 10, Google Chrome 6, Opera 10.62, Safari 1. The Web interface can also be displayed on mobile phones using OS Android 4.2, iOS 7 and Windows Phone 8.1.

The configuration is displayed when you click the icon of gears in the upper right corner. The configuration is divided into sections according to the types of settings and is available in English and Czech.

PAPAGO
from papouch.com

Homepage
Network
Security
E-mail
SNMP
HTTP GET
Sensor A
Sensor B
Sensor C
Other

Settings [Save] [Default] [Reload]

Type: Papago TH CO2 ETH
Firmware version: 1.7/27
Serial number: 1256/0792
MAC: 00-80-A3-97-EB-59
Core version: Papago TH CO2 ETH; v1256.01.10; C D
Browser: Firefox 70

Technical support: papouch.com
Phone number: +420 267 314 268

Network

DHCP ☐

Device's IP address: 192.168.23.1
Netmask: 255.255.0.0
Gateway IP address: 192.168.1.201
DNS server's IP address: 0.0.0.0
WEB port: 80

Miscellaneous

ModBus Port: 502
Data port (Spinel): 10001

Security

User password: Not set
Confirm user password:
Administrator's password: Not set
Confirm administrator's password:
Current Administrator's password:

fig. 4 - Configuraton of Papago

Network

This section contains the configuration of network parameters.

Network

DHCP	<input checked="" type="checkbox"/>
Device's IP address	<input type="text" value="192.168.1.45"/>
Netmask	<input type="text" value="255.255.255.0"/>
Gateway IP address	<input type="text" value="0.0.0.0"/>
DNS server's IP address	<input type="text" value="0.0.0.0"/>
WEB port	<input type="text" value="88"/>

Miscellaneous

ModBus Port	<input type="text" value="512"/>
Data port (Spinel)	<input type="text" value="10001"/>

fig. 5 - network configuration

If the box for assigning addresses via DHCP is ticked, the fields for *Device's IP address*, *Netmask*, *Gateway IP address* and *DNS server's IP address* are reset and upon reloading the settings they are filled again with data obtained from the DHCP server.

If you have a **version with WiFi interface** in the section *Network* is also following parameters:

WiFi

SSID	<input type="text" value="papousinetwork"/>
Authentication method	<input type="text" value="WPA2 (AES)"/>
Pre-shared Key	<input type="text" value="Keep original password"/>
Re-enter key	<input type="text"/>

fig. 6 - WiFi network parameters

These options are available as an *Authentication method*: *Open*, *WEP (open)*, *WEP (shared)*, *WPA (TKIP)*, *WPA (AES)*, *WPA2 (TKIP)*, *WPA2 (AES)*, *WPA2 (Mixed)*.

Security

The section for setting the password of the user (can only access the main page) and the administrator (has access to both the main page and the settings).

Security

User password	<input type="text" value="Not set"/>
Confirm user password	<input type="text"/>
Administrator's password	<input type="text" value="Keep original password"/>
Confirm administrator's password	<input type="text"/>
Current Administrator's password	<input type="text"/>

fig. 7 - access security settings

After saving, the passwords are no longer displayed for security reasons. The fields for entering the password show *Not set*, if the password has not been entered, or *Keep original password*, if the password has been entered but is not to be displayed.

E-mail

The device can send e-mails if one of the thresholds set for any of the measuring channels has been exceeded.

E-mail

Send e-mail when the threshold is exceeded	<input checked="" type="checkbox"/>
SMTP server's name	<input type="text" value="smtp.depo.cz"/>
SMTP port	<input type="text" value="587"/>
Host name	<input type="text"/>
Sender's e-mail address	<input type="text" value="xport@depo.cz"/>
Recipient's e-mail address	<input type="text" value="pepa@depo.cz"/>

SMTP authorization

SMTP server requires verification	<input checked="" type="checkbox"/>
Verification name	<input type="text" value="auth@depo.cz"/>
Verification password	<input type="text" value="Keep original password"/>
Re-enter the password	<input type="text"/>

fig. 8 - settings for sending e-mails

When the limits are exceeded, the device sends an e-mail – format can be seen below:

Example - when limits are exceeded:

Temperature Sensor A is in range. Value is 27.7 °C.

Humidity Sensor A is in range. Value is 27.4 %.

Dewpoint Sensor A is in range. Value is 7.2 °C.

Temperature Sensor B exceeded upper limit 27.0 °C. Value is 27.5 °C.

Example – upon returning in the range:

Temperature Sensor A is in range. Value is 24.3 °C.

Humidity Sensor A is in range. Value is 25.1 %.

Dewpoint Sensor A is in range. Value is 3.1 °C.

Temperature Sensor B is in range. Value is 24.3 °C.

SNMP

Here you can configure communication via SNMP used for data collection in large networks.

SNMP

Allow trap sending	<input checked="" type="checkbox"/>
SNMP manager's IP address	<input type="text" value="145.16.78.121"/>
Send SNMP trap when the threshold is exceeded	<input checked="" type="checkbox"/>
Periodical sending of measured-out values	<input type="text" value="5"/>
Read community name	<input type="text" value="public"/>
Write community name	<input type="text" value="private"/>

fig. 9 - settings for communication via SNMP

For description of SNMP objects see page 19.

HTTP GET

This section is used to set the sending of measured data to a remote server.

HTTP GET

Allow HTTP GET sending	<input checked="" type="checkbox"/>
Send HTTP GET upon change	<input checked="" type="checkbox"/>
Sending interval	<input type="text" value="5"/>
WEB server's address	<input type="text" value="example.com"/>
WEB Port	<input type="text" value="80"/>
Folder containing scripts	<input type="text" value="scripts/"/>
Script name	<input type="text" value="get.php"/>
GUID	<input type="text" value="BFLMPSVZ"/>
Encryption Key	<input type="text" value="Keep original password"/> <input type="button" value="X"/>
Retype Key	<input type="text"/>

fig. 10 - data sending via HTTP GET

If the sending interval is set to zero, the sending function is turned off. The interval can be set from 0 to 1440 minutes.

If a sensor is set as *Unconnected*, its parameters are not sent in GET.

If you enter an encryption key of 16 characters, the HTTP GET data is encrypted by 128-bit AES cipher (Rijndael), the CFB method.

GET Format

Example of periodic GET:

(GET comes from a PAPAGO unit that has one combined and one temperature sensor. & characters are deleted for better readability.)

```
script.php?mac=0080A397CF65 type=Papago TH CO2 ETH guid=PAP description=LOG
log_index=1 date_time=01/28/2015 9:35:00 T1V1_value=21.7 T1V1_units=°C
T1V1_status=0 H1V2_value=25.0 H1V2_units=% H1V2_status=0 D1V3_value=0.8
D1V3_units=°C D1V3_status=0 T2V1_value=23.4 T2V1_units=°C T2V1_status=0
```

Example of GET after pressing the button in the settings:

```
script.php?mac=0080A393A273&type=Papago%20PT%20ETH
&guid=PAPAGO-TEST-GUID&description=TEST
```

Example of encrypted GET after pressing the button in the settings:

```
script.php?encrypted_data=%DC%BD%5D%C1%DE%C4%0A%66%8B%69%0C%6D%8D
%70%B9%11%EA%8C%19%2A%93%F1%71%87%B7%47%94%77%C7%A2%71%D9%1
A%3D%BA%21%CF%0D%D5%42%1F%01%23%7B%AF%31%C9%6D%D6%EC%87%C4
%39%E4%76%84%29%A9%C1%31%74%05%31%3F%96%43%13%3C%73%08%D6%8F
%56%F5%6C%A2%77%53%C6%A7%10%8F%47%A5%A7%2D%04%9B%58%A0%94
```

The following parameters are sent in GET:

descriptionIndicates a standard GET with measurement (LOG), GET sent when exceeding a limit (WATCH) or a test GET sent when you press the button on the Web (TEST). GET with measurement and GET sent when exceeding a limit contain the same data

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

type.....Type designation of the device.

guid.....Unique user-specified text string.

log_indexThe serial number of the record in a circular buffer.³

date_timeDate and time of recording in the format mm/dd/yyyy hh:mm:ss.

encrypted_data This parameter contains the data of encrypted GET.

The following parameters may be given more than once if there are more measured values from one sensor. The first character may be either T (for temperature), H (for humidity) or D (dew point). Thus, Papago 2PT with two temperature sensors, provides these parameters:

T1V1⁴_valueThe first temperature as a decimal number.

T2V1_value.....The second temperature as a decimal number.

T1V1_units.....The unit of the first measured temperature.

T2V1_units.....The unit of the second measured temperature.

T1V1_status.....Status of the first value: the value is OK (0), upper limit exceeded (2), lower limit exceeded (3) invalid value (4).

T2V1_status.....Status of the second value: the value is OK (0), upper limit exceeded (2), lower limit exceeded (3) invalid value (4).

CH1_name.....Channel 1 name.

CH2_name.....Channel 2 name.

³ This number applies if the network connection to the device has been discontinued for some time. After restoring the network connection, all accumulated GETs are sent in the form of a circular buffer. The buffer has a capacity of 120 entries.

⁴ The number after the letter T indicates the serial number of the connector on the device. The number after the letter V indicates the serial number of the parameter from the connected sensor.

Sensor Section

Sensors A and B have their own individual sections with identical settings.

Sensor A

Connected sensor	<input type="button" value="Autodetect"/>	Temperature / Humidity ▼
Name	Outdoor	
Temperature measurement range	-40 °C to 123.8 °C	
<i>Limit watching</i>		
Watch temperature limits	<input checked="" type="checkbox"/>	
Out of limits watching	-10	100
Hysteresis	0	
Watch humidity limits	<input checked="" type="checkbox"/>	
Out of limits watching	20	80
Hysteresis	0	
Watch dew point limits	<input checked="" type="checkbox"/>	
Out of limits watching	0	10
Hysteresis	0	

fig. 11 - configuration of one of the sensors

By pressing the *Autodetect* button, all settings for Sensor A and/or B are done automatically according to the currently connected sensor(s), above all the right type of the sensor is entered in the field *Connected sensor*.

If the CO₂ sensor is connected, the available sensor settings change to the following:

Sensor B

Connected sensor	<input type="button" value="Autodetect"/>	CO2 concentration (T6713) ▼
Name	Meeting room	
<i>Limit watching</i>		
Watch CO2 limits	<input checked="" type="checkbox"/>	
CO2 limits	300	1200
Hysteresis	50	

fig. 12 – settings view when the CO₂ concentration sensor is connected

Other Settings

This section allows you to set the time, temperature unit, language of the website, etc...

Other settings

Name of the device	<input type="text" value="Prague Branch"/>
Language	<input type="text" value="English"/> ▼
Temperature units	<input type="text" value="Celsius [°C]"/> ▼

Date and time

Synchronize device's time with NTP server	<input checked="" type="checkbox"/>
NTP server's IP address	<input type="text" value="123.120.156.5"/>
Time zone	<input type="text" value="Prague - Czech Republic - CZ (GMT+01:00)"/> ▼
Auto daylight saving	<input checked="" type="checkbox"/>
Synchronize device's time with this PC's time	<input type="checkbox"/>

fig. 13 - other settings

The available languages are Czech or English; for temperature units you can choose between degrees Celsius, Fahrenheit or Kelvin.

CONFIGURATION VIA TELNET PROTOCOL**Connection****IP address is not known**

It is recommended that the IP address should be set using the Ethernet Configurator software (for more information see page 6).

- 1) Open the window of the cmd command. (In the Windows OS select Start/Run, enter `cmd` in the provided line and click Enter.)
- 2) Make the following entries into the ARP table:
 - a. Type `arp -d` and confirm by Enter. This will delete the current ARP table.
 - b. Use the following command to assign 192.168.1.254 to the module MAC address:
`arp -s [new_ip_address] [MAC_address_of_device]`
example: `arp -s 192.168.1.254 00-20-4a-80-65-6e`
- 3) Now open Telnet. (Type in `telnet` and click Enter.⁵)
- 4) Enter `open [new_ip_address] 1` and confirm.
- 5) After a while, the terminal will display an error message saying that connection failed. However, this step is necessary for the module to enter the IP address into its ARP table.
- 6) Connect to the IP address of the module. (Type in `open [IP address in dotted format] 9999` and click Enter.)
- 7) So far you have only entered the configuration mode of the module. The IP address has not yet been set. It must be set in the menu **Server Configuration > IP Address**. If you close the configuration mode without saving the settings and IP address configuration, the whole procedure must be repeated!
- 8) If the entered IP address is valid, the device displays an introductory text ending with:
Press Enter for Setup Mode
Press Enter within 3 seconds, otherwise the configuration mode will close.
- 9) The device will display a preview of its settings.
- 10) The preview ends with a paragraph called "Change setup:" which lists the groups of parameters that can be configured. Network parameters can be changed in the "Server" section where you can set a new network address and other parameters.

⁵ In OS Windows Vista or higher, the client for Telnet is not a standard part of the system. Install it using the following procedure:

- a) Open the "Control Panels/Programs and Features" menu.
- b) On the left, click "Enable or disable features of Windows system" (this option requires the administrator to log in).
- c) The "Features of Windows system" window displays. Here tick the "Telnet service Client" field and click Ok. The client for Telnet will be installed.

IP address is known

- 1) In OS Windows choose Start/Run, enter `telnet` in the provided line and press Enter.⁵
- 2) Connect to the IP address of the module. (Type in `open [IP address in dotted format] 9999` and press Enter.)
- 3) If the entered IP address is valid, the device displays an introductory text ending with:
Press Enter for Setup Mode
Press Enter within 3 seconds, otherwise the configuration mode will close.
- 4) The device will display a preview of its settings.
- 5) The preview ends with a paragraph called "Change setup:" which lists the groups of parameters that can be configured. Network parameters can be changed in the "Server" section.

Telnet main menu

Individual items can be chosen using the numbers written next to them. Choose the required number and press Enter.

The menu structure is as follows:

Change Setup:

0 Server

...

7 Defaults

8 Exit without save

9 Save and exit

Your choice ?

Server

Basic Ethernet settings.

This section contains the following parameters:

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*(IP address)*

IP address of the module. The digits must be entered one by one and separated by Enter.

Default value: 192.168.1.254

Set Gateway IP Address*(set the IP address of the gateway)***Gateway IP addr***(IP address of the gateway)*

In "Set Gateway IP Address" enter "Y" to change the IP address. The system then prompts you to change the Gateway IP address. The digits must be entered one by one and separated by Enter.

Netmask*(network mask)*

Here you specify the number of bits of the IP address that make up the network part.

The Netmask is set as a number of bits determining the range of available IP addresses of the local network. If, for example, value 2 is entered, the structure of the Netmask is 255.255.255.252. The entered value specifies the number of bits from the right. The maximum is 32.

Default value: 8

Example:

The mask 255.255.255.0 (binary form: 11111111 11111111 11111111 00000000) =. number 8.

The mask 255.255.255.252 (binary form: 11111111 11111111 11111111 11111100) = number 2.

Change telnet config password*(Set the password for Telnet)***Enter new Password***(Enter the password for Telnet)*

This parameter is used to set a new password which is required prior to any configuration via Telnet or via WEB interface (admin password).

For item "Change telnet config password", enter "Y" to change the password. The system then prompts you to change the password.

Factory Defaults

By pressing number 7 the device restores the default settings.

The default setting means that all parameters will return to their initial factory settings. The IP address remains unchanged; the web interface port is set to 80.

Exit without save

To close the configuration mode without saving the changed parameters.

Save and exit

This option saves the changes. If any parameter has been changed, the device is restarted. The restart takes several tens of seconds.

XML

It is possible to obtain the last measured values, limits (thresholds) and device name from the device in the form of a text file in the XML format. The file is available at [http://\[IP-adresa\]/fresh.xml](http://[IP-adresa]/fresh.xml) – i.e. for example at <http://192.168.1.254/fresh.xml> for the default settings.

```
<root xmlns="http://www.papouch.com/xml/papago/act">
  <sns id="1" name="Outdoor" type="1" status="0" unit="0" val="29.2"
    w-min="-10.0" w-max="30.0" type2="2" status2="0" unit2="0" val2="47.1"
    w-min2="30.0" w-max2="95.0" type3="3" status3="0" unit3="0" val3="16.8"
    w-min3="" w-max3=""/>
  <sns id="2" name="Meeting room" type="4" status="0" unit="0" val="853"
    w-min="300" w-max="1200"/>
  <status msp="1" level="2" location="Prague branch" time="11/20/2019 13:00:23"/>
</root>
```

The XML file contains a *sns* tag for each measured parameter as well as the *status* tag:

status

location

User-defined name of the device.

time

The current system time of the device in the format *mm/dd/yyyy hh:mm:ss*.

sns

For sensors that measure more than one value, this tag also contains the attributes of type, status, unit and val with indices 2, 3, etc., which contain other values (type2, status2, type3,...).

id

The serial number of the measured variable. (The first number is 1.)

name

The name of the sensor.

type, type2, type3

Number 1 (parameters of temperature), 2 (parameters of humidity) or 3 (dew point).

status, status2, status3

It describes the status of the measured value. Can show the following values:

- 0 the value is valid and shows the currently measured value
- 2 the measured value exceeds the user-set upper limit
- 3 the measured value exceeds the user-set lower limit
- 4 measurement error or sensor error (damaged sensor or cable)

unit, unit2, unit3

The number represents the code the chosen temperature unit. It can have the following values:

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

The currently measured value as a decimal number, with an accuracy of one- or two-tenths depending on the extent and type of the sensor. (For validity of the value see *status*.)

The lower (*w-min*) and upper (*w-max*) limit of the value set by the user. The value is shown as a decimal number with an accuracy of one-tenth.

The SNMP protocol (version 1) contains objects with individual values. For a detailed description of the objects see below. The MIB table you can import into your SNMP manager can be downloaded from papouch.com.



Objects – variables

Type

Name: inChType

Object ID: 1.3.6.1.4.1.18248.31.1.2.1.1.1.1 to 6⁶

Description: The type of this value. It can have one of the following values:

- 0 → Not used.
- 1 → Temperature.
- 2 → Humidity.
- 3 → Dew point.
- 4 → CO₂ concentration.

Status

Name: inChStatus

Object ID: 1.3.6.1.4.1.18248.31.1.2.1.1.2.1 to 6⁶

Description: The status of this value. It describes the current status of the measured value. It can have one of the following values:

- 0 → The value is valid and within the limits.
- 1 → The value has not yet been measured.
- 2 → The value is valid and exceeds the upper limit.
- 3 → The value is valid and exceeds the lower limit.
- 4 → The value is invalid – measurement error.

Measured value

Name: inChValue

Object ID: 1.3.6.1.4.1.18248.31.1.2.1.1.3.1 to 6⁶

Description: The measured value as an integer. To obtain the real value, divide by ten.

Unit

Name: inChUnits

Object ID: 1.3.6.1.4.1.18248.31.1.2.1.1.4.1 to 6⁶

Description: Unit of the value. May contain one of the following values:

- 0 → degrees Celsius.
- 1 → degrees Fahrenheit.
- 2 → degrees Kelvin.
- 3 → percentage (humidity)

SNMP objects – general

The following two objects relate to the entire device.

Device name

Name: deviceName

⁶ The ID of the objects shows the values from sensors A and B arranged one after another. First A, then B. The values are arranged in the order of temperature, humidity, dew point, i.e. there are 2 or 6 objects.

Object ID: 1.3.6.1.4.1.18248.31.1.1.1.0

Description: User-defined device name.

Alarm text

Name: psAlarmString

Object ID: 1.3.6.1.4.1.18248.31.1.1.2.0

Description: Text of the alarm message sent when a threshold is exceeded.

Traps**Trap 1 – Value is outside the limits**

The trap contains the measured value and the limit that was exceeded.

The trap is only sent when one of the limits has been exceeded. The trap can only be delivered to a properly configured IP address of a PC with the SNMP manager.

Trap 2 – Current measured values

The trap contains all current values as well as the name of the device set by the user.

The trap is sent only if a non-zero frequency of sending has been set.

MODBUS TCP**Input Register**

Input Register contains the currently measured data from both sensors in several formats..

Address	Access	Function	Name
Sensor 1 – head			
0	read	0x04	Status Contains the status of the sensor. Possible values: 0 = this sensor is not used (set to Not Connected in the configuration) 1 = this sensor is used for measuring
1, 2	read	0x04	Date and time Date and time of the device in the format of NTP.
Sensor 1 – the first parameter (temperature)			
10	read	0x04	Status of the measured values Status of the measured values. Options: 0 = the measured value is within the measuring range 2 = exceeded upper limit of the measuring range (overflow) 3 = exceeded lower limit of the measuring range (underflow) 4 = the measured value is invalid
11	read	0x04	Value in the form of signed integer
12	read	0x04	Value in the float format The upper two bytes.
13	read	0x04	Value in the float format The lower two bytes.
14	read	0x04	Unit The unit in which information is stored in the previous registries. 0 = °C, or % for humidity 1 = °F 2 = K
Sensor 1 – the second parameter (humidity)			
20 to 24			
Sensor 1 – the third parameter (dew point)			
30 to 34			
Sensor 2			
from 100			

The device contains the standard Spinel protocol (format 97) for communication via the TCP data channel. [Spinel Terminal](#) has been designed for comfortable communication via Spinel.

index	time	data
0	14:05:59.010	2A 61 00 05 31 02 F3 49 0D
1	14:05:59.018	2A 61 00 25 31 02 00 50 61 70 61 67 6F 20 32 50 54 20 45 54 48 3B 20 76 31 30 31 30 2E 30 31 2E 30 31 3B 20 66 39 37 EB 0D
2	14:06:07.369	2A 61 00 06 31 02 58 01 E2 0D
3	14:06:07.378	2A 61 00 1A 31 02 00 01 01 01 80 00 00 FB 41 C9 7C 81 20 30 20 20 32 35 2E 31 1C 0D
4	14:06:21.483	2A 61 00 05 31 02 FA 42 0D
5	14:06:21.484	2A 61 00 07 31 02 06 03 F2 3F 0D
6	14:07:14.566	2A 61 00 57 31 04 0F 58 31 31 2F 32 35 2F 32 30 31 34 20 31 34 3A 30 37 3A 33 32 01 01 01 81 00 20 20 20 20 20 20 20 B0 43 00 BD 41 97 79 6B 20 20 20 20 20 20 31 38 2E 39 02 01 01 82 00 20 20 20 20 20 20 B0 43 0C 95 43 A1 0E 49 20 20 20 20 20 33 32 32 2E 31 63 0D
7	14:07:20.156	TCP/IP client socket - disconnecting
8	14:07:20.166	TCP/IP client socket - disconnect
9	14:19:35.451	device is gone - serial, parallel - COM8

fig. 15 - communication with the device using the Spinel Terminal program

Summary of implemented instructions:

This instruction reads the current measured values. The values are converted to the currently selected temperature unit. The measured values are returned as a sign integer, as a value in the float format and as an ASCII string.

Request:

Instruction code: 58H

Parameters: (sensor)

sensor	Sensor No.	length: 1 byte
The number of the sensor to be read. It is possible to choose 01H (sensor a) or 02H (sensor b).		

Response:

Acknowledgement code: ACK 00H

Parameters: {(sensor₁)(variable₁)(type₁)(status₁)(unit₁)(unita₁)(value₁)} {...}

sensor	Sensor No.	length: 1 byte
<p>This bytes indicates the sensor number and applies to all subsequent bytes until the next <i>chn</i> byte. This means that the following bytes belong to the channel with that number. It is numbered from 01H.</p>		

variable	Variable No.	length: 1 byte
The number of the variable from the given sensor. Numbered from 01H.		

type	Variable type	length: 1 byte
The type of the variable can have one of the following values: 00H..... not defined 01H..... temperature 02H..... humidity 03H..... dew point 04H..... CO ₂ concentration		
status	Status of the measured value	length: 1 byte

The status of the measured value for the channel with the number given in the previous <i>chn</i> .	
bit 0 (LSb)	0 = the lower limit of the monitored range was not exceeded 1 = the lower limit of the monitored range was exceeded
bit 1	0 = the upper limit of the monitored range was not exceeded 1 = the upper limit of the monitored range was exceeded
bit 2	0 = the lower limit of the measuring range was not exceeded 1 = the lower limit of the measuring range was exceeded
bit 3	0 = the upper limit of the measuring range was not exceeded 1 = the upper limit of the measuring range was exceeded
bit 7 (MSb)	0 = the measured value is invalid 1 = the measured value is valid

unit	Unit	length: 1 byte
Unit code: 0 for °C, 1 for °F or 2 Kelvin.		

unita	Unit in ASCII string	length: 10 bytes
Unit Code as a right-aligned ASCII string. For example °C, °F, etc.		

value	Measured value	length: 16 bytes
The measured value from the channel with the number given in the <i>chn</i> byte.		
The values are sent simultaneously in three different formats. The first is a 16bit sign value (integer in the form of MSB:LSB), followed by two values converted for the current range based on the current setup: in the 32 bit float format according to IEEE 754 ⁷ and in the ASCII format. The values are given in the aforementioned order.		
<i>Example:</i>		
The value of 9215.85 is expressed as follows:		
0AH, 58H, 46H, 0FH, FFH, 66H, 20H, 20H, 20H, 39H, 32H, 31H, 35H, 2EH, 38H, 35H		
INT part: 0AH, 58H (2648)		
IEEE 754 part: 46H, 0FH, FFH, 66H		
ASCII part: 20H, 20H, 20H, 39H, 32H, 31H, 35H, 2EH, 38H, 35H (9215.85)		

Examples:

Request – read channel 1:
2AH, 61H, 00H, 06H, 31H, 02H, 58H, 01H, E2H, 0DH
Response:
2AH, 61H, 00H, 1AH, 31H, 02H, 00H, 01H, 01H, 01H, 80H, 00H, 00H, EEH, 41H, BEH, D6H, C3H, 20H, 20H, 20H, 20H, 20H, 20H, 32H, 33H, 2EH, 38H, 93H, 0DH
The value measured on channel 1 was 21,74. Channel number: 01H Variable number: 01H Variable type: 01H Value status: 80H Unit: 00H INT part: 00H, EEH (5434) IEEE 754 part: 41H, BEH, D6H, C3H

⁷ The description of the IEEE 754 standard is available here: http://en.wikipedia.org/wiki/IEEE_754

ASCII part: 20H, 20H, 20H, 20H, 20H, 00H, 32H, 33H, 2EH, 38H (21.74)

Reading of name and version

Reads the name of the device, software version and the list of possible communication formats. Set by the manufacturer.

Request:

Instruction code: F3H

Response:

Acknowledgement code: ACK 00H

Parameters: (string)

string	Name and version	length: 1 byte
Papago 2PT ETH; v1010.01.01; f97		
In addition to the information described above, the string can also contain other information in sections introduced by a semicolon, space and a small letter to determine which information follows.		

Examples:

Request:
2AH, 61H, 00H, 05H, 31H, 02H, F3H, 49H, 0DH
Response:
2AH, 61H, 00H, 25H, 31H, 02H, 00H, 50H, 61H, 70H, 61H, 67H, 6FH, 20H, 32H, 50H, 54H, 20H, 45H, 54H, 48H, 3BH, 20H, 76H, 31H, 30H, 31H, 30H, 2EH, 30H, 31H, 2EH, 30H, 31H, 3BH, 20H, 66H, 39H, 37H, EBH, 0DH,

Reading of manufacturing data

This instruction reads the manufacturing data of the device.

Request:

Instruction code: FAH

Response:

Acknowledgement code: ACK 00H

Parameters: (product_number)(serial_number)(other)

product_number	length: 2 bytes
Product number. For a device number 0227.00.03/0001 this number is 227.	
serial_number	length: 2 bytes
Serial number. For a device number 0227.00.03/0001 this number is 1.	
other	length: 4 bytes
Other manufacturing information.	

Examples:

Request:
2AH, 61H, 00H, 05H, FEH, 02H, FAH, 75H, 0DH

Automatic message

This response is generated when the preset limits are exceeded or when the measured value exceeds the physical range of the sensor. The message may contain information about one or more channels.

Acknowledgement code: ACK 0FH

Parameters: [event][time] {[sensor][variable][type][status][unit][unitA][value]} {...}

event		length: 1 byte
Number of the event source		
This byte specifies the event source. It can be used to distinguish the automatic message sent when the limits or measuring range are exceeded from other automated messages from the device. The value of this byte is 30H.		
time		length: 19 bytes
time of the event		
Time of the event as a string in the format <i>mm/dd/yyyy hh:mm:ss</i>		
sensor		length: 1 byte
sensor number		
The serial number of the sensor the following bytes belong to. Numbering starts from 01H.		
variable		length: 1 byte
variable number		
The serial number of a variable from one sensor, used to distinguishing between different variables obtained from one sensor, if the sensor provides more than one. Numbering starts from 01H.		
type		length: 1 byte
variable type		
The type of the variable can have one of the following values:		
00H not defined		
01H temperature		
02H humidity		
03H dew point		
04H CO ₂ concentration		
status		length: 1 byte
Status of the measured value		
bits 0 to 3 (lower nibble)	0000 = the measured value is within the measuring range	
	0001 = the lower limit of the monitored range was exceeded	
	0010 = the upper limit of the monitored range was exceeded	
	0100 = the lower limit of the physical range of the A/D converter was exceeded	
bit 7 (MSb)	1000 = the upper limit of the physical range of the A/D converter was exceeded	
	0 = the measured value is invalid	
1 = the measured value is valid		
unit		length: 1 byte
unit ID		

The numerical designation of the unit:

00H..... °C

01H..... °F

02H..... K

unitA

unit as a string

length: 10 bytes

A right-aligned string designating the selected unit. For example "°C"

value

measured value

length: 16 bytes

The values are sent simultaneously in three different formats. The first is a 16bit sign value (integer in the form of MSB:LSB), followed by two values converted for the current range based on the current setup: in the 32 bit float format according to IEEE 754⁸ and in the ASCII format. The values are given in the aforementioned order.

Example:

The value of 9215.85 is expressed as follows:

0AH, 58H, 46H, 0FH, FFH, 66H, 20H, 20H, 20H, 39H, 32H, 31H, 35H, 2EH, 38H, 35H

INT part: 0AH, 58H (2648)

IEEE 754 part: 46H, 0FH, FFH, 66H

ASCII part: 20H, 20H, 20H, 39H, 32H, 31H, 35H, 2EH, 38H, 35H (9215.85)

Example:

Automatic response:

2AH, 61H, 00H, 57H, 31H, 04H, 0FH, 58H, 31H, 31H, 2FH, 32H, 35H, 2FH, 32H, 30H, 31H, 34H, 20H, 31H, 34H, 3AH, 30H, 37H, 3AH, 33H, 32H, 01H, 01H, 01H, 81H, 00H, 20H, 20H, 20H, 20H, 20H, 20H, 20H, B0H, 43H, 00H, BDH, 41H, 97H, 79H, 6BH, 20H, 20H, 20H, 20H, 20H, 20H, 20H, 31H, 38H, 2EH, 39H, 02H, 01H, 01H, 82H, 00H, 20H, 20H, 20H, 20H, 20H, 20H, 20H, 20H, B0H, 43H, 0CH, 95H, 43H, A1H, 0EH, 49H, 20H, 20H, 20H, 20H, 20H, 33H, 32H, 32H, 2EH, 31H, 63H, 0DH

Automatic information about exceeding the lower limit on channel 1 and the upper limit on channel 2. The meaning of the values sent for channel 1:

Instruction No.: 58H

ASCII time: 31H, 31H, 2FH, 32H, 35H, 2FH, 32H, 30H, 31H, 34H, 20H, 31H, 34H, 3AH, 30H, 37H, 3AH, 33H, 32H

Channel No.: 01H

Variable No.: 01H

Variable type: 01H

Value status: 81H

Units numerically: 00H

Units in ASCII: 20H, 20H, 20H, 20H, 20H, 20H, 20H, 20H, B0H, 43H

Current value:

In the form of INT: 00H, BDH

In the form of float: 41H, 97H, 79H, 6BH

In the form of ASCII: 20H, 20H, 20H, 20H, 20H, 20H, 31H, 3BH, 2EH, 39H

⁸ The description of the IEEE 754 standard is available here: http://en.wikipedia.org/wiki/IEEE_754

INDICATIONS

Two LEDs integrated in the Ethernet connector:

Yellow – LINK: is lit when the device is connected by cable to a switch or PC.

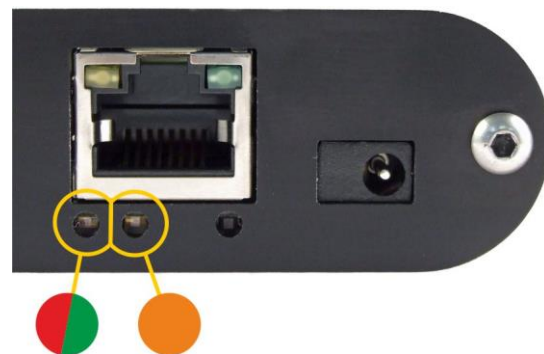
Green – ACT: indicates communication over the Ethernet.

Two LEDs to the left under the Ethernet connector:

Yellow (right): is lit when the connection is established via Spinel or Modbus.

Red-green (left):

- the green light is lit and the red light flashes when the device is working properly and is connected to at least one sensor
- the green and red LEDs are lit when the device works, but is not connected to any sensor
- the red LED is lit to indicate an error



Papago with WiFi connection:

Yellow-blue (right):

- Yellow lights up if Spinel or ModBus connection is established.
- Blue lights up when the Papago is connected to a WiFi network.

Red-Green (left):

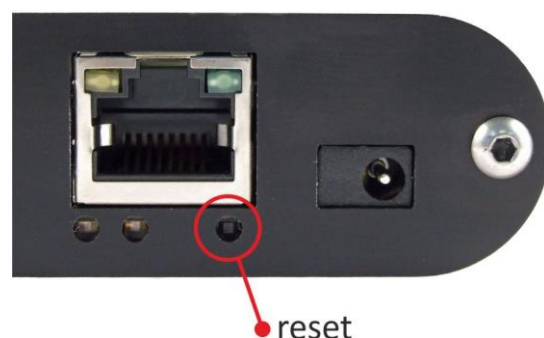
- Green lights up and red flashes if the device is OK and at least one sensor is connected.
- Green and Red light up when the device is OK but no sensor is connected.
- Red lights up in case of device fault



RESET

Follow the instructions below to restore the default configuration set by the manufacturer. Unlike when the reset is performed via the web interface or using the Telnet protocol (see page 18), the IP address is also reset to the default value of 192.168.1.254.

- 1) Disconnect the device from the power supply.
- 2) Press the button located in a small hole on the right side under the Ethernet connector.
- 3) Turn on the power and wait for about 10 seconds until the yellow light below the Ethernet connector flashes 4 times.
- 4) Release the button.



TECHNICAL PARAMETERS

Integrated temperature and humidity sensor⁹

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 vapours (cleaning with alcohol, petrol etc.). Especially organic solvents and compounds can negatively affect the sensor accuracy by as tens of percent RH.

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

Humidity sensor

Humidity range 0 % to 100 % RH
 Recommended measurement range 20 – 80 %
 Resolution 1% RH
 Humidity measurement accuracy see Fig. 16
 Sensor element polymer sensor
 Sensor mechanical finish inside hardened aluminum block

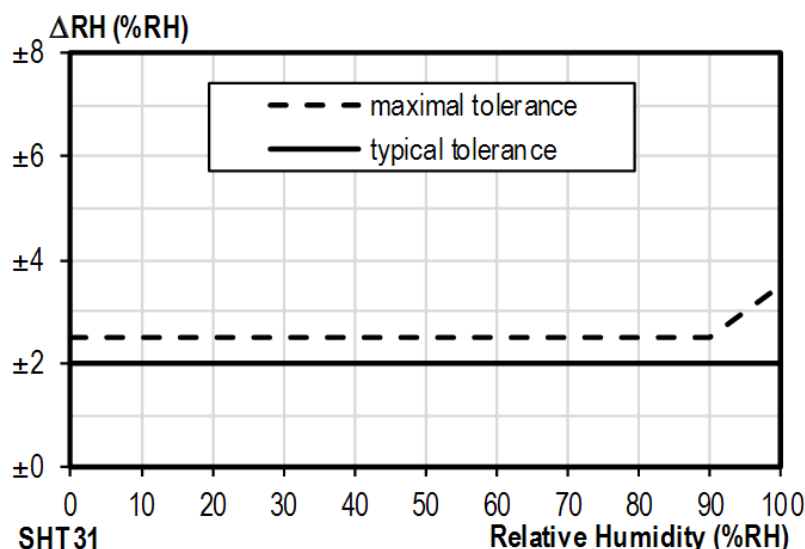


Fig. 16 – Accuracy of humidity measuring

⁹ Sensor marked TH3 is supported in firmware including and above version 1.12. If you have an older firmware, you will have to flash the firmware to be able to read from TH3 sensor. Here are the key differences between the old version (Marked as TH2E) and TH3 version:

	TH3 (new sensor)	TH2E (old sensor)
Measurement accuracy within 0 – 10 %	±2 %	±2 to ±4 %
Measurement accuracy within 90 – 100 %	±2 %	±2 to ±4 %
Recommended measurement range	20 – 80 % RH	
Temperature measurement range	-40.0 °C to +125.0 °C	-40.0 °C to +123.8 °C
Temperature measurement accuracy	±0.3 to ±0.5 °C	±0.4 to ±2.0 °C

Operating and Maximum Range of Values

- Sensor is stable in standard range of humidity values. 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.¹⁰
- 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

Range.....-40.0 °C to +125 °C
 Resolution.....0.1 °C
 Sensor elementsemiconductor
 Sensor mechanical finish.....inside hardened aluminum block

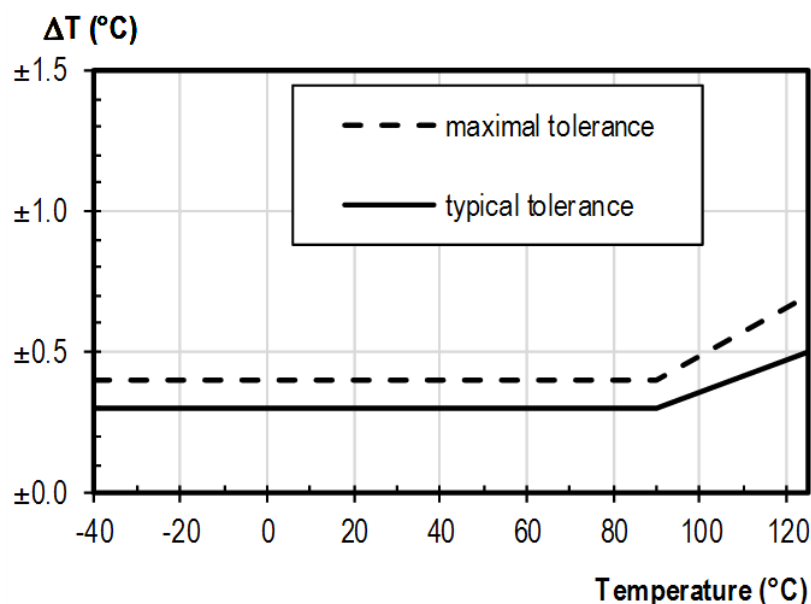


Fig. 17 – Accuracy of temperature measurement

Standalone temperature sensor

Sensor typesemiconductor
 Measuring temperature range-55 °C to +125 °C
 Accuracy.....±0.5 °C in the range of -10 °C to +85 °C
 Temperature drift±0.2 °C per 1000 hours at 125 °C
 Dimensions.....normalized diameter 6 mm, length 60 mm
 Housing material.....hardened alloy
 Degree of protectionIP68 (permanent immersion into 1m max.)

¹⁰ 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.)

Sensor cable

- Cable jacket silicone rubber, blue
 - Wire insulation FEP polymer
 - Length standard 3 m (optionally up to 20 meters)
 - Measuring temperature range -60 °C to +200 °C
 - Maximum allowable temperature +220 °C
 - Cable diameter 4.3 mm (±0.1 mm)
- The cable shows excellent resistance to moisture, chemicals and carbohydrates.

CO2 concentration sensor

- Measuring range 0 to 2000 ppm¹¹
- Accuracy within 400 - 2000 ppm ± 25 ppm, ± 3% measured value
- Temperature dependency 5 ppm per °C or 0.5 % of the value per °C (always the greater value)
- Concentration change settling time max. 3 min to 90 %
- Power on settling time max. 10 minut to 100 %
- Sensor operating temperatures -10 to +60 °C

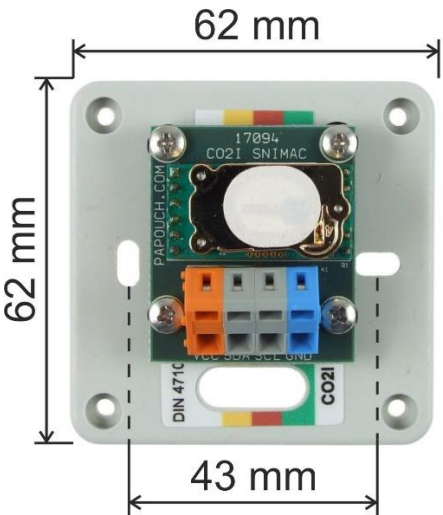


fig. 18 – sensor dimensions

- Dimensions see figure above, enclosure height 29 mm
- Mounting holes diameter 4 mm
- Wire connections Wago 236 terminal
- IP coverage IP 20
- Cable length 3 m, 10 m or custom length

¹¹ If the sensor is in an environment below 400 ppm for longer than 15 minutes, its accuracy can be affected.

Other parameters

Ethernet interface

ConnectionTBase 10/100 Ethernet
ConnectorRJ45
GET encryption.....128 bit AES; Rijndael; CFB method

WiFi interface

Type.....IEEE 802.11 b/g and IEEE 802.11n (single stream), IEEE 802.11 d/h/i/j/k/w/r
Operating frequency2,4 GHz
Antenna connectorSMA RP

Clock circuit and internal memory

Clock backup method (RTC)capacitor (not replaceable by the user)
RTC backup time after power outage5 days
(if the device was previously connected to a power source
for at least three hours without interruption)

Device electronics

PoE power supply.....according to IEEE 802.3af
Power supply from an external source11 to 58 V DC (with reverse polarity protection)
Current consumption from ext. source at 15 V ...typically 120 mA
Current consumption from ext. source at 24 V ...typically 72 mA
Current consumption from PoEtypically 32 mA
Consumptiontypically 1.8 W
Power supply connectorcoaxial 3.8 × 1.3 mm; + inside
Operating temperature range-20 to +70 °C
Dimensions (without connectors).....88 × 70 × 25 mm
Housing material.....anodized aluminium
Degree of protectionIP 30

Other parameters

Weighttypically 130 g

Default settings of the Ethernet

IP address192.168.1.254
Netmask255.255.255.0 (8 bits; mask C)
IP address of the gateway0.0.0.0

Available designs

Mountable on 35 mm DIN railoptional accessory



fig. 19 – Papago TH CO2 ETH with DIN rail holder

Do not hesitate to contact us if you have any other requirements concerning the design and functions of PAPAGO TH CO2.

Papouch s.r.o.

Data transmission in industry, line and protocol conversions, RS232/485/422/USB/Ethernet/GPRS/WiFi, measurement modules, intelligent temperature sensors, I/O modules, and custom-made electronic applications.

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