



Papago METEO RS

Measurement of temperature, humidity, dew point, atmospheric pressure, CO₂ concentration, wind speed and direction, and rainfall

Complete user documentation



Version 1.09.0

September 10, 2026

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1 Documentation change history

Version	Description
1.09.0	Documentation updated for firmware 1.09. Davis 6466M rain gauge added.
1.05.0	Documentation updated for firmware 1.05. New version of the CO ₂ sensor.

2 Getting to know Papago

PAPAGO is a family of devices with a uniform appearance and common communication options. Each device combines a communication interface with measuring sensors or other inputs.

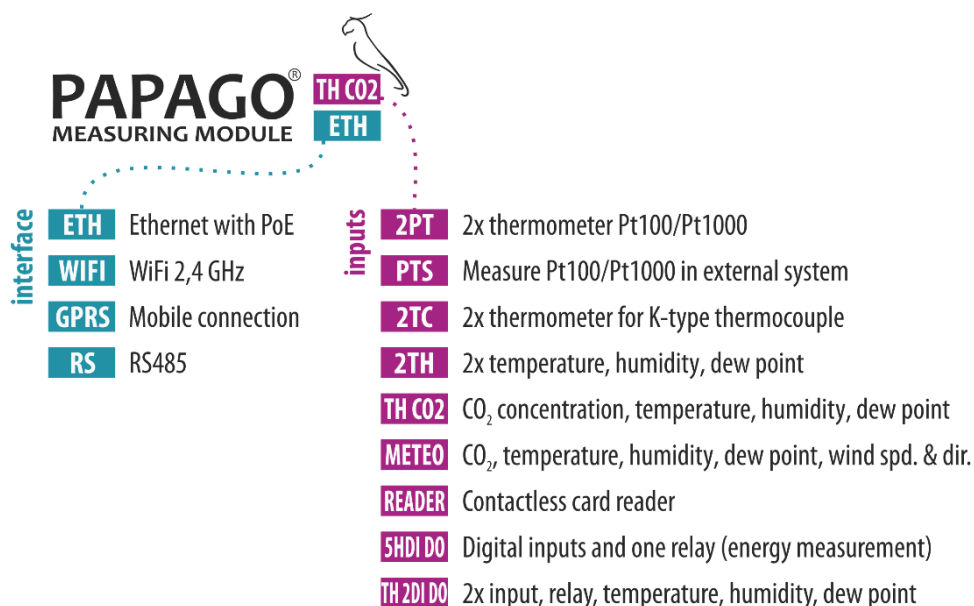


Fig. 1 – PAPAGO device family and combinations of interfaces and inputs

2.1 Applications

- Monitoring of meteorological values and processing
- Measurement of CO₂ levels, wind speed and direction in industry
- Expansion of PLCs – adding meteorological values
- Measurement for the HACCP system
- Detection of wind speed for automatic retraction of various sun blinds

2.2 Features

PAPAGO METEO RS measures CO₂ level, temperature, humidity, dew point, atmospheric pressure, wind speed and direction, and rainfall.

One of the following sensors can be connected to given input (One sensor per input):

Sensor	Measuring range	Inputs
TH sensor	temperature –40 to 125 °C; humidity 0 to 100 %	input: A, B
THP sensor	temp. –40 to 125 °C; hum. 0 to 100 %; pressure 50 to 110 kPa	input: A, B
T sensor	temperature –55 to 125 °C	input: A, B
CO ₂ sensor	CO ₂ level	input: A, B
Rain gauge	rainfall	input: A, B
Wind sensor	wind speed and direction	input: C

- RS485 interface with Modbus RTU protocol.
- Wide power voltage input 11 to 58 V DC.

- Current consumption typ. 26 mA @ 24 V.
- Measurement using:
 - (a) an external thermometer,
 - (b) a combined temperature and humidity sensor,
 - (c) a combined pressure, temperature and humidity sensor,
 - (d) a CO₂ concentration sensor,
 - (e) a wind speed and direction sensor,
 - (f) a rain gauge.

Sensors are sold separately.

- Robust sleek metal chassis that can be DIN rail mounted. Connections are inscribed on the chassis for easy wiring. LED indicators show all important states of the device.

3 Connections

1. Connect power source to + and – terminals. Papago supports 11 to 58 V DC. Power input is reverse voltage protected.
2. Connect sensors to connectors A, B and C. Connector C is designated for Wind sensor. A and B connectors are interchangeable.



Fig. 2 – front panel with sensor connectors

1. Connect Papago to RS485 master using twisted pair cable. RxTx+ connect to RxTx+ (also can be RT+ or A) on the other device. Likewise – connect RxTx- to the equivalent RxTx- (can be RT- or B).



Fig. 3 – panel with RS485, power and configuration USB connectors

Recommendations for connecting the RS485 line

- It is recommended to use a standard TP cable for computer networks (UTP, FTP or STP) and to use one twisted pair from this cable as the conducting wires for RS485.
- All devices on the line must be connected "one after the other" and not in a "star" (see right). The maximum length of the line is 1.2 km.

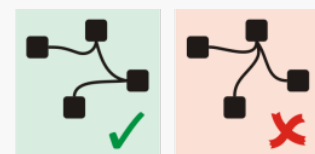


Fig. 4 – correct line and incorrect star RS485 topology

- Cable shielding is to be connected on one side only.
- End of the line must be terminated using the TERM switch

- Use the TERM switch to connect RS485 termination when the line is in a high-interference environment, for example when it runs alongside power cables. At most two devices on one line may have termination enabled, one at each end. Most installations do not require termination.
- Use the BIAS switches to connect resistors that define the idle state of the line. Enable these resistors at only one point on the entire RS485 line.
- The communication-line GND may be used to connect the cable shield. Shielding is not normally required, but is recommended in high-interference environments, for example when the line runs alongside power cables. Connect the shield to only one device on the communication line. Otherwise, independent grounds would be connected and form a ground loop that could damage devices on the line.

Warning: The serial-line GND is galvanically isolated from the other parts of the device. Unless there is a specific reason, do not connect the two grounds. Connecting them defeats the galvanic isolation and exposes PAPAGO to ground loops between the power supply and the control system.

4. Unless you have PAPAGO set up beforehand, continue to the next chapter.

4 Configuration

Configuration is performed through the mini USB connector using Papago Meteo RS configurator for Windows. The software is available on the Papago product page at papouch.com. PAPAGO requires external power during USB configuration.

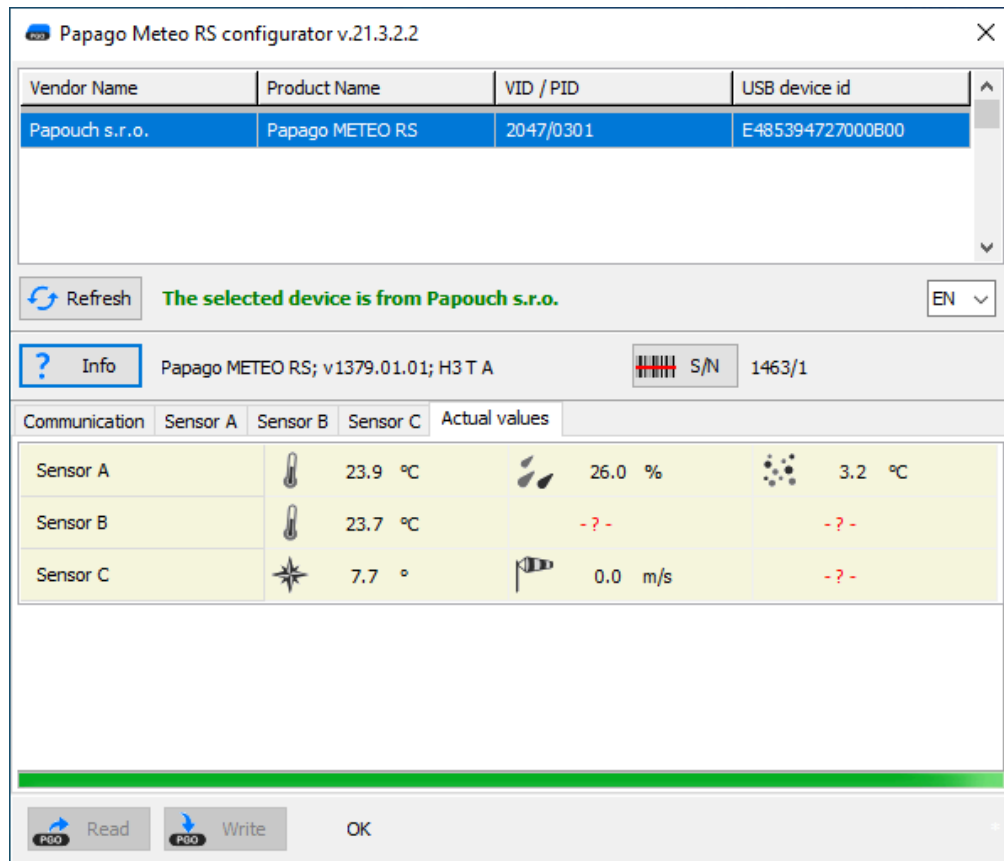


Fig. 5 – Papago METEO RS configuration application

4.1 Communication tab

Communication tab contains basic line communication parameters.

The screenshot shows the 'Papago Meteo RS configurator v.21.3.2.2' window. At the top, a table lists device information:

Vendor Name	Product Name	VID / PID	USB device id
Papouch s.r.o.	Papago METEO RS	2047/0301	E485394727000B00

Below the table, a 'Refresh' button and a status message 'The selected device is from Papouch s.r.o.' are visible. A language dropdown is set to 'EN'. The 'Info' tab is active, displaying 'Papago METEO RS; v1379.01.01; H3 T A' and a barcode with 'S/N 1463/1'. The 'Communication' tab is selected, showing settings for Sensor A, Sensor B, Sensor C, and Actual values. The settings are as follows:

Parameter	Value	Range / Options
Address	49	1 - 250
Baudrate	9600	▼
Communication word	8 data bits, none, 1 stop bit	▼
Protocol	Modbus RTU	▼
Spinel timeout	100	1 - 255 (10ms - 2,55s)
Modbus RTU termination	10	4 - 100 byte

At the bottom, there are 'Read' and 'Write' buttons (each with a 'PGO' icon) and an 'OK' button.

Fig. 6 – communication line parameter settings

4.2 Sensor tabs

Both A and B sensors have their respective tabs with identical settings.

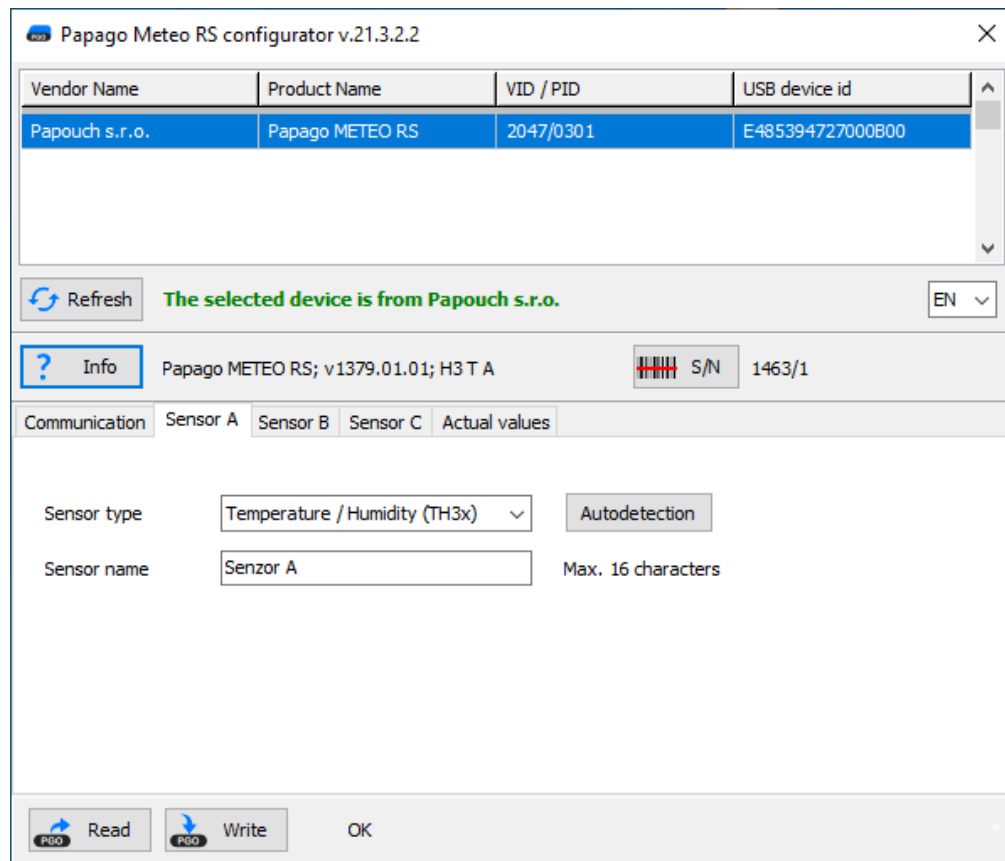


Fig. 7 – sensor A settings

Push the Autodetection button and sensor will be recognized automatically.

Only a wind speed and direction sensor can be connected as sensor C. Its tab is shown below:

Papago Meteo RS configurator v.21.3.2.2

Vendor Name	Product Name	VID / PID	USB device id
Papouch s.r.o.	Papago METEO RS	2047/0301	E485394727000B00

 Refresh **The selected device is from Papouch s.r.o.** EN ▾

? Info Papago METEO RS; v1379.01.01; H3 T A  S/N 1463/1

Communication Sensor A Sensor B Sensor C Actual values

Sensor type

Sensor name Max. 16 characters

North calibration 0.0° - 360.0°

 Read  Write OK

Fig. 8 – sensor C settings

5 Modbus RTU

5.1 Address

Tip: The address can be set easily with the configuration software over USB. The following information describes address configuration using Modbus RTU:

- **0x31** : Default address of the device (decimal 49). The address can be changed in register 1 (see below).
- **0x00** : Universal Modbus RTU address (decimal 0). If a device receives an instruction with this address, the instruction is carried out, but no response is sent.
- **0xF8** : Universal device address (decimal 248). If a device receives an instruction with this address, the instruction is carried out and the device responds. This can only be used when a single device is connected.

How to change address using a serial number?

You can set up multiple devices with the same default address on a single RS485 line using the following set of instructions:

1. Write down the given device serial number. It is written on a label in format 1463/0069 The number before the slash is a product number, the number after the slash is the serial number of the given unit.
2. Write the following holding registers using function code **0x10** and universal address **0xF8** :
 1. Product type (addr. 10) – write product type from label.
 2. Serial number (addr. 11) – write serial number from label.
 3. Address (addr. 12) – write new address you want to set.
3. From now on the device communicates on its new address.

5.2 Function code list

The internal memory of the device is accessible – based on the registry type – using these instructions:

Parameter	Value
0x03	read holding registers
0x04	read input registers
0x06	set one holding register
0x10	write to multiple holding registers
0x11	identification

5.3 Device identification

Read identification string of the device (Report slave ID).

Function codes:

0x11 – Report slave ID

Parameters:

Byte count	1 Byte	Based on the string
ID	1 Byte	ID is identical to device address
RI	1 Byte	Run Indicator – this is always 0xFF (ON)
Data	N Byte	The string should have this form: Papago METEO RS; v1379.01.09; H3 T A

5.4 Sensor and quantity codes

The following values are used in Modbus and Spinel as the connected sensor code:

- 0 – not specified or unused,
- 2 – temperature sensor (DS),
- 3 – temperature and humidity sensor (TH3x),
- 4 – temperature sensor (TMP),
- 5 – CO₂ concentration sensor (T6713),
- 6 – anemometer (Davis 6410),
- 7 – atmospheric pressure sensor,
- 8 – O₃ concentration sensor,
- 9 – rain gauge (Davis 6466M).

The following numeric quantity codes are used in Modbus and Spinel:

- 0 – unused,
- 1 – temperature,
- 2 – humidity,
- 3 – dew point,
- 4 – CO₂ concentration,
- 5 – atmospheric pressure,
- 6 – wind direction,
- 7 – wind speed,
- 8 – rainfall.

5.5 Holding Register

Address	Access	Function	Name
0 ¹	write	0x06	Allow configuration Writing 0x00FF to this memory location must precede all instructions that write to holding registers at addresses 0 to 5. This protects against accidental configuration changes. <i>Note: Allow configuration cannot be written with function code 0x10 together with other parameters.</i>
1	read, write	0x03, 0x06, 0x10	Address (ID)² Unique Modbus device address in the range 1 to 247. Default address: 0x0031 (49). See changing the address using the serial number .

¹ Registers can be numbered from zero or one depending on vendor. First register actually has an address 0.

² Writing to this memory space must be preceded by writing 0x00FF to address 0 position Allow configuration. This is to protect against accidental changes in configuration. Allow configuration must not be written using function code 0x10 (write to multiple registers).

Address	Access	Function	Name
2	read, write	0x03 , 0x06 , 0x10	Communication speed ² Speeds and their corresponding codes: • 0x0003 = 1 200 Bd • 0x0004 = 2 400 Bd • 0x0005 = 4 800 Bd • 0x0006 = 9 600 Bd (<i>default</i>) • 0x0007 = 19 200 Bd • 0x0008 = 38 400 Bd • 0x0009 = 57 600 Bd • 0x000A = 115 200 Bd
3	read, write	0x03 , 0x06 , 0x10	Data word ² The data word is always eight-bit.
4	read, write	0x03 , 0x06 , 0x10	End packet delay ² Delay between bytes considered to indicate the end of a packet, entered as a number of bytes. Range: 4 to 100. Default: 10.
5	read, write	0x03 , 0x06 , 0x10	Communication protocol ² After sending the response, the device switches to the selected protocol and then communicates using that protocol only. • 0x0001 = Spinel • 0x0002 = Modbus RTU (<i>default</i>)
10	read, write	0x03 , 0x10 ³	Product type This is always 1463 as the product type.
11	read, write	0x03 , 0x10 ³	Serial number Unique serial number.
12	read, write	0x03 , 0x10 ³	Address See changing the address using the serial number .
13	read, write	0x03 , 0x10	Hardware and firmware version The upper byte is the hardware version; the lower byte is the firmware version.
20	read, write	0x03 , 0x10	Set sensor A type The sensor type is one of these codes: • 0 = not set • 2 = Temperature (DS) • 3 = Temperature-humidity (TH3x) • 4 = Temperature (TMP) • 5 = CO₂ concentration (T6713) • 7 = Atmospheric pressure • 8 = O₃ concentration • 9 = Rain gauge (Davis 6466M)

³ Registers 10 to 12 have to be written together. Writing will not change values in registers Product type and serial number. Writing these values is only for setting address using the serial number (see [changing the address by serial number](#)).

Address	Access	Function	Name
30	read, write	0x03 , 0x10	Set sensor B type The sensor type is one of these codes: • 0 = not set • 2 = Temperature (DS) • 3 = Temperature-humidity (TH3x) • 4 = Temperature (TMP) • 5 = CO₂ concentration (T6713) • 7 = Atmospheric pressure • 8 = O₃ concentration • 9 = Rain gauge (Davis 6466M)
40	read, write	0x03 , 0x10	Set sensor C type The sensor type is one of these codes: • 0 = not set • 6 = Davis (wind speed and direction)
49	read, write	0x03 , 0x10	North direction calibration If 0 is set, the mark on the wind sensor must point directly north. Writing a value from 1 to 359 corrects the direction in one-degree increments. (For example, if mounting the sensor with its mark pointing north is not possible.)
50	read, write	0x03 , 0x06 , 0x10	Reset sensor A total and NTP time Writing 0x55AA resets the total rainfall statistics and stores the current NTP time for sensor A. The register always returns 0x0000 when read.
51	read, write	0x03 , 0x06 , 0x10	Reset sensor B total and NTP time Writing 0x55AA resets the total rainfall statistics and stores the current NTP time for sensor B. The register always returns 0x0000 when read.

5.6 Input Register

Current values from all sensors are available in Input registers. All values have their assigned registers. Values are updated only in registers of values that the connected sensor can actually measure.

For values stored in a pair of registers, the first register listed contains the upper two bytes and the second register contains the lower two bytes.

Address	Access	Function	Name
Sensor A – head			
0 ⁴	read	0x04	Sensor type Sensor type is one of these codes: • 0 = not set • 2 = Temperature (DS) • 3 = Temperature - humidity (TH3x) • 4 = Temperature (TMP) • 5 = CO₂ concentration (T6713) • 7 = Atmospheric pressure • 8 = O₃ concentration • 9 = Rain gauge (Davis 6466M)
1	read	0x04	Status Contains sensor status. It can have these values: • 0 = sensor is connected • 1 = sensor is disconnected
Sensor A – temperatures			
20	read	0x04	Value status Contains value status. It can have these values: • 0 = measured value is within range • 4 = measured value is invalid
21	read	0x04	Value in degrees Celsius as a signed integer ×10 (see calculation note)⁵
22, 23	read	0x04	Value in degrees Celsius as a float
24	read	0x04	Value in Fahrenheits as a signed integer ×10
25, 26	read	0x04	Value in Fahrenheits as a float
27	read	0x04	Value in Kelvins as a signed integer ×10
28, 29	Read	0x04	Value in Kelvins as a float
Sensor A – humidity			
40	read	0x04	Value status Contains value status. It can have these values: • 0 = measured value is within range • 4 = measured value is invalid
41	read	0x04	Value in percent as a signed integer ×10
42, 43	read	0x04	Value in percent in float format
Sensor A – dew point			
60	read	0x04	Value status Contains value status. It can have these values: • 0 = measured value is within range • 4 = measured value is invalid
61	read	0x04	Value in degrees Celsius as a signed integer ×10 (see calculation note)⁵
62, 63	read	0x04	Value in degrees Celsius as a float

⁴ Some systems can use register numbering from 1.

⁵ Calculation: *resulting value* = *register value* / 10. For example, 123 represents 12.3.

Address	Access	Function	Name
64	read	0x04	Value in Fahrenheits as a signed integer ×10
65, 66	read	0x04	Value in Fahrenheits as a float
67	read	0x04	Value in Kelvins as a signed integer ×10
68, 69	Read	0x04	Value in Kelvins as a float
Sensor A – CO₂ concentration			
80	read	0x04	Value status Contains value status. It can have these values: • 0 = measured value is within range • 4 = measured value is invalid
81	read	0x04	Value in percent as a signed integer ×10
82, 83	read	0x04	Value in percent in float format
Sensor A – atmospheric pressure			
100	read	0x04	Value status Contains value status. It can have these values: • 0 = measured value is within range • 4 = measured value is invalid
101	read	0x04	Value in hPa as a signed integer ×10
102, 103	read	0x04	Value in hPa in float format
104	read	0x04	Value in bar as a signed integer ×10
105, 106	read	0x04	Value in bar in float format
Sensor A – rainfall			
180	read	0x04	Value status Contains value status. It can have these values: • 0 = measured value is within range • 4 = measured value is invalid
181	read	0x04	Rainfall in mm over 15 minutes as an unsigned integer ×10
182, 183	read	0x04	Rainfall in mm over 15 minutes in float format
184	read	0x04	Rainfall in mm over one hour as an unsigned integer ×10
185, 186	read	0x04	Rainfall in mm over one hour in float format
187	read	0x04	Rainfall in mm over one day as an unsigned integer ×10
188, 189	read	0x04	Rainfall in mm over one day in float format
190, 191	read	0x04	NTP time stored when the total rainfall value was last reset
192, 193	read	0x04	Total rainfall in mm as an unsigned long ×10⁶
194, 195	read	0x04	Total rainfall in mm in float format⁶

⁶ The total rainfall value for sensor A and its NTP time can be reset by writing 0x55AA to holding register 50.

Address	Access	Function	Name
Sensor B – head			
500	read	0x04	Sensor type Sensor type is one of these codes: • 0 = not set • 2 = Temperature (DS) • 3 = Temperature - humidity (TH3x) • 4 = Temperature (TMP) • 5 = CO₂ concentration (T6713) • 7 = Atmospheric pressure • 8 = O₃ concentration • 9 = Rain gauge (Davis 6466M)
501	read	0x04	Status Contains sensor status. It can have these values: • 0 = sensor is connected • 1 = sensor is disconnected
Sensor B – temperature			
520	read	0x04	Value status Contains value status. It can have these values: • 0 = measured value is within range • 4 = measured value is invalid
521	read	0x04	Value in degrees Celsius as a signed integer ×10 (see calculation note)⁵
522, 523	read	0x04	Value in degrees Celsius as a float
524	read	0x04	Value in Fahrenheits as a signed integer ×10
525, 526	read	0x04	Value in Fahrenheits as a float
527	read	0x04	Value in Kelvins as a signed integer ×10
528, 529	Read	0x04	Value in Kelvins as a float
Sensor B – humidity			
540	read	0x04	Value status Contains value status. It can have these values: • 0 = measured value is within range • 4 = measured value is invalid
541	read	0x04	Value in percent as a signed integer ×10
542, 543	read	0x04	Value in percent in float format
Sensor B – dew point			
560	read	0x04	Value status Contains value status. It can have these values: • 0 = measured value is within range • 4 = measured value is invalid
561	read	0x04	Value in degrees Celsius as a signed integer ×10 (see calculation note)⁵
562, 563	read	0x04	Value in degrees Celsius as a float
564	read	0x04	Value in Fahrenheits as a signed integer ×10

Address	Access	Function	Name
565, 566	read	0x04	Value in Fahrenheits as a float
567	read	0x04	Value in Kelvins as a signed integer × 10
568, 569	Read	0x04	Value in Kelvins as a float
Sensor B – CO₂ concentration			
580	read	0x04	Value status Contains value status. It can have these values: • 0 = measured value is within range • 4 = measured value is invalid
581	read	0x04	Value in percent as a signed integer × 10
582, 583	read	0x04	Value in percent in float format
Sensor B – atmospheric pressure			
600	read	0x04	Value status Contains value status. It can have these values: • 0 = measured value is within range • 4 = measured value is invalid
601	read	0x04	Value in hPa as a signed integer × 10
602, 603	read	0x04	Value in hPa in float format
604	read	0x04	Value in bar as a signed integer × 10
605, 606	read	0x04	Value in bar in float format
Sensor B – rainfall			
680	read	0x04	Value status Contains value status. It can have these values: • 0 = measured value is within range • 4 = measured value is invalid
681	read	0x04	Rainfall in mm over 15 minutes as an unsigned integer × 10
682, 683	read	0x04	Rainfall in mm over 15 minutes in float format
684	read	0x04	Rainfall in mm over one hour as an unsigned integer × 10
685, 686	read	0x04	Rainfall in mm over one hour in float format
687	read	0x04	Rainfall in mm over one day as an unsigned integer × 10
688, 689	read	0x04	Rainfall in mm over one day in float format
690, 691	read	0x04	NTP time stored when the total rainfall value was last reset
692, 693	read	0x04	Total rainfall in mm as an unsigned long × 10⁷
694, 695	read	0x04	Total rainfall in mm in float format⁷
Sensor C – head			
1000	Read	0x04	Sensor type Sensor type is one of these codes: • 0 = not set • 6 = Davis (wind speed and direction)

⁷ The total rainfall value for sensor B and its NTP time can be reset by writing 0x55AA to holding register 51.

Address	Access	Function	Name
1001	Read	0x04	Status Contains sensor status. It can have these values: • 0 = sensor is connected • 1 = sensor is disconnected
Sensor C – wind direction			
1140	read	0x04	Value status Contains value status. It can have these values: • 0 = measured value is within range • 4 = measured value is invalid
1141	read	0x04	Wind direction in degrees as a signed integer ×10
1142, 1143	read	0x04	Wind direction in degrees in float format
1144	read	0x04	Wind direction index Number 1 to 16 representing one of these states: N (1), NNE, NE, ENE, E, ESE, SE, SSE, S, SSW, SW, WSW, W, WNW, NW, NNW (16)
Sensor C – wind speed			
1160	read	0x04	Value status Contains value status. It can have these values: • 0 = measured value is within range • 4 = measured value is invalid
1161	read	0x04	Wind speed in meters per second as a signed integer ×10
1162, 1163	read	0x04	Wind speed in meters per second in float format
1164	read	0x04	Wind speed in kilometers as a signed integer ×10
1165, 1166	read	0x04	Wind speed in kilometers in float format

6 Spinel communication protocol

The device has Spinel protocol implemented in format 97 (binary). **Sensor and quantity codes** are shared by Modbus and 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 20 20 20 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 20 20 20 20 20 20 20 20 20 20 20 20 20 20 31 38 2E 39 02 01 01 82 00 20 20 20 20 20 20 20 20 20 20 20 20 20 20 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. 9 – example of communication with the device in Spinel Terminal

6.1 Format 97

Structure

Request:

PRE	FRM	NUM	NUM	ADR	SIG	INST	DATA	SUM	CR
-----	-----	-----	-----	-----	-----	------	------	-----	----

Response:

PRE	FRM	NUM	NUM	ADR	SIG	ACK	DATA	SUM	CR
-----	-----	-----	-----	-----	-----	-----	------	-----	----

Field	Meaning
PRE	Prefix, 0x2A (character *).
FRM	Format number 97 (0x61).
NUM	Number of instruction bytes from the following byte to the end of the frame.
ADR	Address of the module to which the request is sent or which sends the response.
SIG	Message signature – any number from 0x00 to 0xFF. The value from the request is returned in the response, making it easy to match the response to its request.
INST⁸	Instruction code.
ACK	Request acknowledgement indicating whether and how the request was executed. ACK values range from 0x00 to 0x0F.
DATA⁸	Data.
SUM	Check sum.
CR	Final mark (0x0D).

⁸ For easy orientation the instructions and data in the examples of following pages are highlighted this way.

Explanatory notes

Example

→ 2A 61 00 05 01 02 60 0C 0D

Byte(s)	Meaning
2A	Prefix
61	Format
00 05	Number of bytes after NUM through 0D, inclusive.
01	Device address
02	Message signature
60	Instruction code
0C	Check sum
0D	Final mark

Data Length (NUM)

Sixteen-bit value defining the number of bytes until the end of the instruction; number of all bytes found after NUM up to CR (including). It takes the values from 5 to 65535. If lower than 5, the instruction is considered faulty and it is answered (if intended for the relevant device) with ACK "Invalid Data" instruction.

Calculation:

Add the number of bytes following both NUM bytes through CR, inclusive. Treat the resulting count as a sixteen-bit number and split it into upper and lower bytes. The first NUM byte is the upper byte and the second is the lower byte. If the count is below 256, the first NUM byte is 0x00.

Address (ADR)

- Address 0xFF is reserved for **broadcast**. The device executes the request but sends no response.
- Address 0xFE is the **universal address**. The device executes the request and returns its actual configured address in the response. Use it only when a single device is connected to the line.

Request Acknowledgement (ACK)

ACK informs the superior device on the way of the received instruction processing. Acknowledgement codes:

Code	Meaning	Description
0x00	Everything OK	The instruction was properly received and completely executed.
0x01	Other error	Unspecified device error.
0x02	Invalid instruction code	The received instruction code is unknown.
0x03	Invalid data	Data has an invalid length or contains an invalid value.
0x04	Write not allowed / access refused	Conditions were not met; the write targets inaccessible memory; the function requires different settings; configuration was not immediately enabled; or the memory is password-protected.

Code	Meaning	Description
0x05	Device failure	A service-requiring fault, internal-memory or peripheral error, or another error affecting proper device operation.
0x06	No data available	—
0x0E	Automatically sent instruction	Continuous measurement and recurring transmission of measured values.

Check Sum (SUMA)

$$\text{SUM} = 0xFF - ((\text{PRE} + \text{FRM} + \text{NUM_HI} + \text{NUM_LO} + \text{ADR} + \text{SIG} + \text{INST/ACK} + \text{DATA}) \& 0xFF)$$

NUM enters the sum split into two bytes (upper and lower). The sum is masked to 8 bits ($\& 0xFF$) before subtraction, so the result is always in the range 0x00 to 0xFF.

No response is made to messages with a faulty check sum. (The system waits for CR reception even if an incorrect check sum is received.)

6.2 Instruction Overview

Instruction	Code	Category	Page
Read values from input register	41	Basic	22
Reading of name and version	F3	Miscellaneous	23
Reading of manufacturing data	FA	Miscellaneous	23

For clarity, only instructions (INST), acknowledgements (ACK) and data (DATA) are described in detail below. Address (ADR), signature (SIG) and check sum (SUMA) are described above.

6.3 Spinel instructions

Read values from input register

Instruction reads any part of input register (see [Input Register](#)). First register and number of registers has to be entered to be read. Any measured value or sensor type can be obtained.

Request: 0x41 address number-of-registers

Response: ACK 0x00 register (repeated for the requested number of registers)

Legend:

Field	Length [B]	Description
address	2	Address of the first input register to be read. Enter the address from the Address column in the Input Register table .
number-of-registers	2	Number of registers to be read. Enter a number from 1 to 127.
register	2	One 2-byte value from the input register; the field is repeated for the requested number of registers.

Example: read from register 20 (0x0014), 10 values (0x000A), meaning all information about temperature from sensor A

→ 2A 61 00 09 31 02 41 00 14 00 0A D9 0D

← 2A 61 00 19 31 02 00 00 80 00 FE 41 CB 33 33 03 09 42 9B 70 A4 0B A9 43 95 46 66 03 0D

Value 0x00FE represents 254, which means a temperature of 25.4 °C. The following bytes contain the same temperature in other formats.

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: 0xF3

Response: ACK 0x00 string

Legend:

Field	Length [B]	Description
string	1	Name and version in the form Papago METEO RS; v1379.01.06; H3 T A. The string may also contain additional sections introduced by a semicolon, a space and a lowercase letter identifying the information that follows.

Example: request

→ 2A 61 00 05 31 02 F3 49 0D

Reading of manufacturing data

This instruction reads the manufacturing data of the device.

Request: 0xFA

Response: ACK 0x00 product_number serial_number other

Legend:

Field	Length [B]	Description
product_number	2	Product number. For a device number 0227.00.03/0001, this number is 227.
serial_number	2	Product serial number. For a device number 0227.00.03/0001, this number is 1.
other	4	Additional manufacturing information.

Example: request

→ 2A 61 00 05 FE 02 FA 75 0D

7 Indications

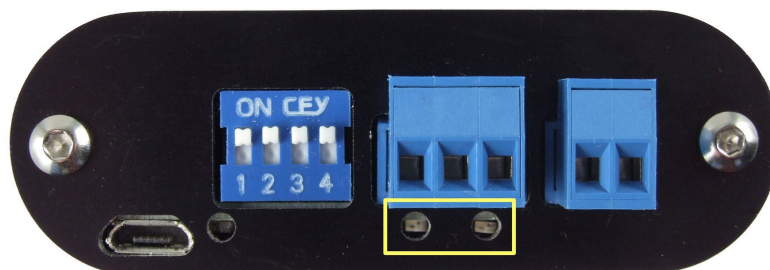


Fig. 10 – device front-panel indicators

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

Yellow (right): Flashes when communicating via RS485.

8 Technical parameters

8.1 Integrated temperature and humidity sensor TH3

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 percent RH.⁹

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

Humidity sensor

Parameter	Value
Humidity range	0 % to 100 % RH
Recommended measurement range	20 – 80 %
Resolution	1% RH
Humidity measurement accuracy	see the humidity measurement accuracy graph
Sensor element	polymer sensor
Sensor mechanical finish	inside hardened aluminum block

⁹ Key differences between the TH3 sensor and the older version marked TH2E:

Parameter	TH3 (new sensor)	TH2E (old sensor)
Measurement accuracy within 0–10 % RH	±2 %	±2 to ±4 %
Measurement accuracy within 90–100 % RH	±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

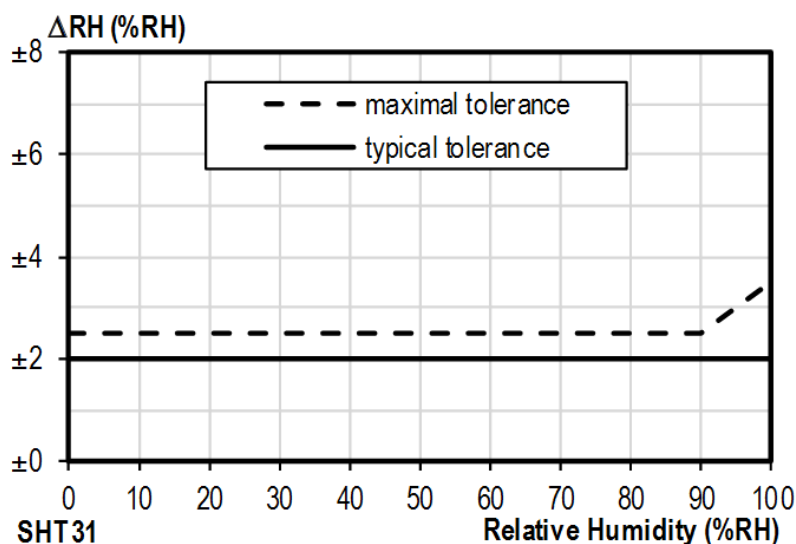


Fig. 11 – humidity measurement accuracy

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

Parameter	Value
Range	–40.0 °C to +125 °C
Resolution	0.1 °C
Sensor element	semiconductor
Sensor mechanical finish	inside hardened aluminum block

¹⁰ You can speed up this process as follows:

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

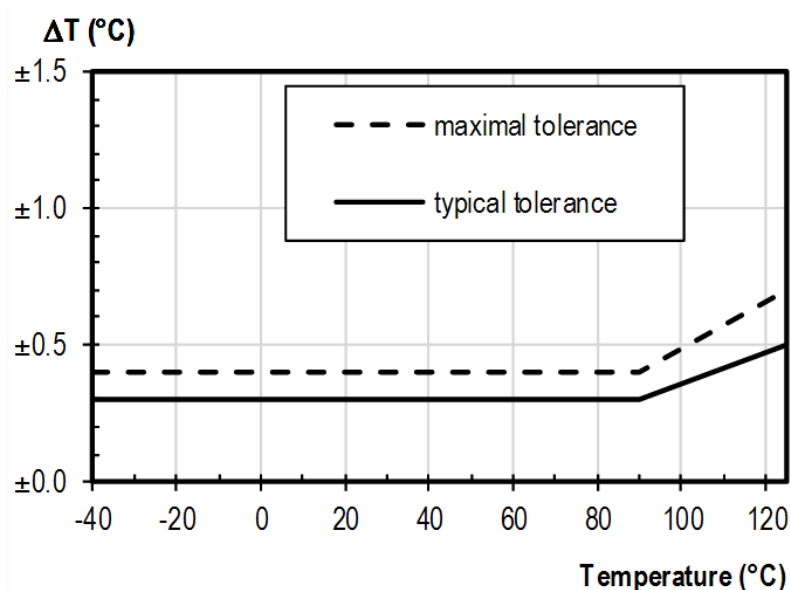


Fig. 12 – temperature measurement accuracy

8.2 Integrated pressure, temperature and humidity sensor

The design and measuring ranges of the sensor are identical to the TH3 sensor. In addition, the sensor measures atmospheric pressure with the following parameters:

Parameter	Value
Measured atmospheric pressure range	50 to 110 kPa
Accuracy	±0,4 kPa

8.3 Standalone temperature sensor

Parameter	Value
Sensor type	semiconductor
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 protection	IP68 (permanent immersion into 1m max.)

8.4 Sensor cable

Parameter	Value
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.

8.5 CO₂ concentration sensor

Carbon dioxide concentration measurement

Parameter	Value
Range ¹¹	400 to 5,000 ppm (0 to 40,000 ppm for indication only)
Accuracy from 400 to 1,000 ppm ¹²	±(50 ppm + 2.5% of measured value) ¹³
Accuracy from 1,001 to 2,000 ppm ¹²	±(50 ppm + 3% of measured value) ¹³
Accuracy from 2,001 to 5,000 ppm ¹²	±(50 ppm + 5% of measured value) ¹³
Temperature stability	±(5 ppm + 0.5% of measured value)
Response time (τ63%)	60 s
Sensor type	optical (NDIR)

Temperature measurement

Parameter	Value
Range ¹¹	–10 to +60 °C
Resolution	0.1 °C
Accuracy ¹²	±0.8 °C within 10 to 30 °C
Response time (τ63%)	120 s

Humidity measurement

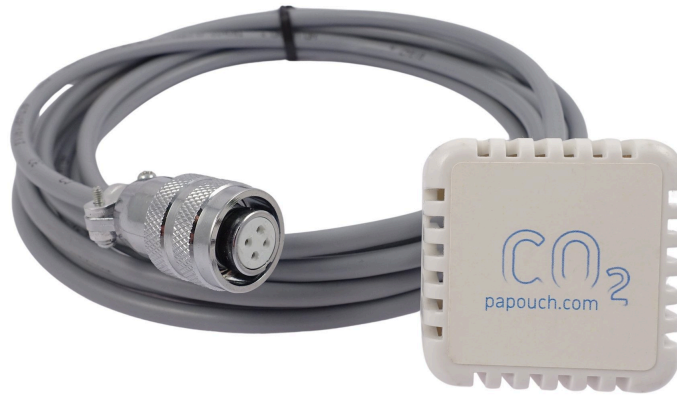
Parameter	Value
Range ¹¹	0 to 100 % RH
Resolution	0.1 % RH
Accuracy ¹²	±6% RH (within 20 to 65 % RH)
Response time (τ63%)	90 s

Parameter	Value
Dimensions	40 × 40 × 21 mm
Mount hole diameter	4 mm
Cable connection	terminal block
Degree of protection	IP 20
Cable length	3 m or custom length

¹¹ For complete technical parameters, see the “Sensirion SCD41” sensor documentation.

¹² In addition to the stated specification, measurement accuracy may be adversely affected by lighting, air circulation, and placement.

¹³ At 25 °C, 50 % RH, and 1013 mbar.

Fig. 13 – CO₂ concentration sensor designFig. 14 – bottom side of the CO₂ concentration sensor

8.6 Wind speed and direction sensor

Parameter	Value
Type	Davis 6410
Operating temperature	-40 to +65 °C
Wind direction resolution	16 steps (22.5°)
Direction accuracy	±3°
Wind speed range	0.5 to 89 m/s
Wind speed accuracy	±1 m/s or ±5 % (whichever is higher)
Lead cable length	12.2 m (extendable)



Fig. 15 – wind speed and direction sensor

8.7 Rain gauge

The Davis 6466M rain gauge is designed in accordance with World Meteorological Organization (WMO) recommendations and provides accurate, reliable rainfall measurement over the long term. Rainwater is collected by the inlet cone, passes through a protective debris screen and collects in the tipping spoon. Once the defined volume corresponding to one measuring increment, i.e. 0.2 mm of rainfall, has accumulated, the spoon tips and closes a switch contact, recording the rainfall increment. The water is then discharged through drain screens in the bottom. The aerodynamically optimized shape minimizes wind-induced losses. The UV-resistant plastic construction provides high mechanical durability and stable parameters during long-term outdoor operation.

Parameter	Value
Type	Davis 6466M
Rainfall measurement accuracy	rainfall rates up to 250 mm/h: $\pm 3\%$ of the total amount or $\pm$ one spoon tip (0.2 mm of rainfall), whichever is greater



Fig. 16 – Davis 6466M rain gauge

8.8 Other parameters

Port RS485

Parameter	Value
Connector	slip-on terminal
Overvoltage protection	transil 6.5 V on RS485 (against SGND)
Communication speed	110 Bd to 230.4 kBd (default: 9.6 kBd)
Data bits	8
Parity	no parity, even or odd
Stop bits	1 or 2
Communication protocols	Modbus RTU (default) and Spinel
Default address	49

USB interface

Parameter	Value
Specifications	USB 1.1 HID (2.0, 3.0 compatible)
Connector	micro USB B
Use	configuration

Device electronics

Parameter	Value
Power voltage	11 to 58 V DC (with reverse polarity protection)
Current consumption at 12 V	typ. 45 mA
Current consumption at 24 V	typ. 26 mA
Power supply connector	slip-on terminal
Operating temperature range	–20 to +70 °C
Electronics operating humidity	Maximum 90%, non-condensing
Dimensions (without connectors)	88 × 70 × 25 mm

Other parameters

Parameter	Value
Housing material	anodized aluminum
Degree of protection	IP 30
Weight	typ. 130 g

8.9 Available designs



Fig. 17 – device with DIN rail holder

Mountable on 35 mm DIN rail: optional accessory

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

Notes:

Notes:

Notes:



Papouch s.r.o.

Industrial data transfer, line and protocol converters, RS232, RS485, RS422, USB, Ethernet, LTE, WiFi, measurement modules, intelligent temperature sensors, I/O modules, custom development and manufacturing.

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