

Temp-485 Box2

*Temperature sensor for indoor use
communicating over the RS-485 bus with a
simple communication protocol*



Device description

The **Temp-485 Box2** device is a temperature sensor which communicates over the RS-485 bus. The sensor is designed for indoors vertical wall mounting.

The measured temperature is transmitted over a simple text protocol in °C. Up to 26 sensors of this kind or 32 sensors at all can be connected on a 4-wire bus. Two wires are used for the RS-485 bus, the other two to power the sensor. The sensors can be powered from an external independent power source and can be connected only with the remaining wires of the RS-485 bus. The RS-485 bus line can be as long as 1200 m.

The sensor uses a semi-conductive element situated inside the metal rod to measure the temperature. The element measures with an accuracy of $\pm 0,5^{\circ}\text{C}$. The sensor is equipped with an indicator, which blinks to signalize the measurement of the temperature in progress.

To minimize the heat losses from the power supply and to have more possibilities of powering the sensor is equipped with a switching power supply, which makes possible to connect the sensor with a wide range of voltage supplies.

The sensor is equipped with a termination resistor for the RS-485 line, but the connection with it is controlled by the built-in DIP switch „**RS485 Terminator**“. It is necessary to turn switch 1 and 2 to ON only in the last sensor, where the RS-485 line ends.

Basic features

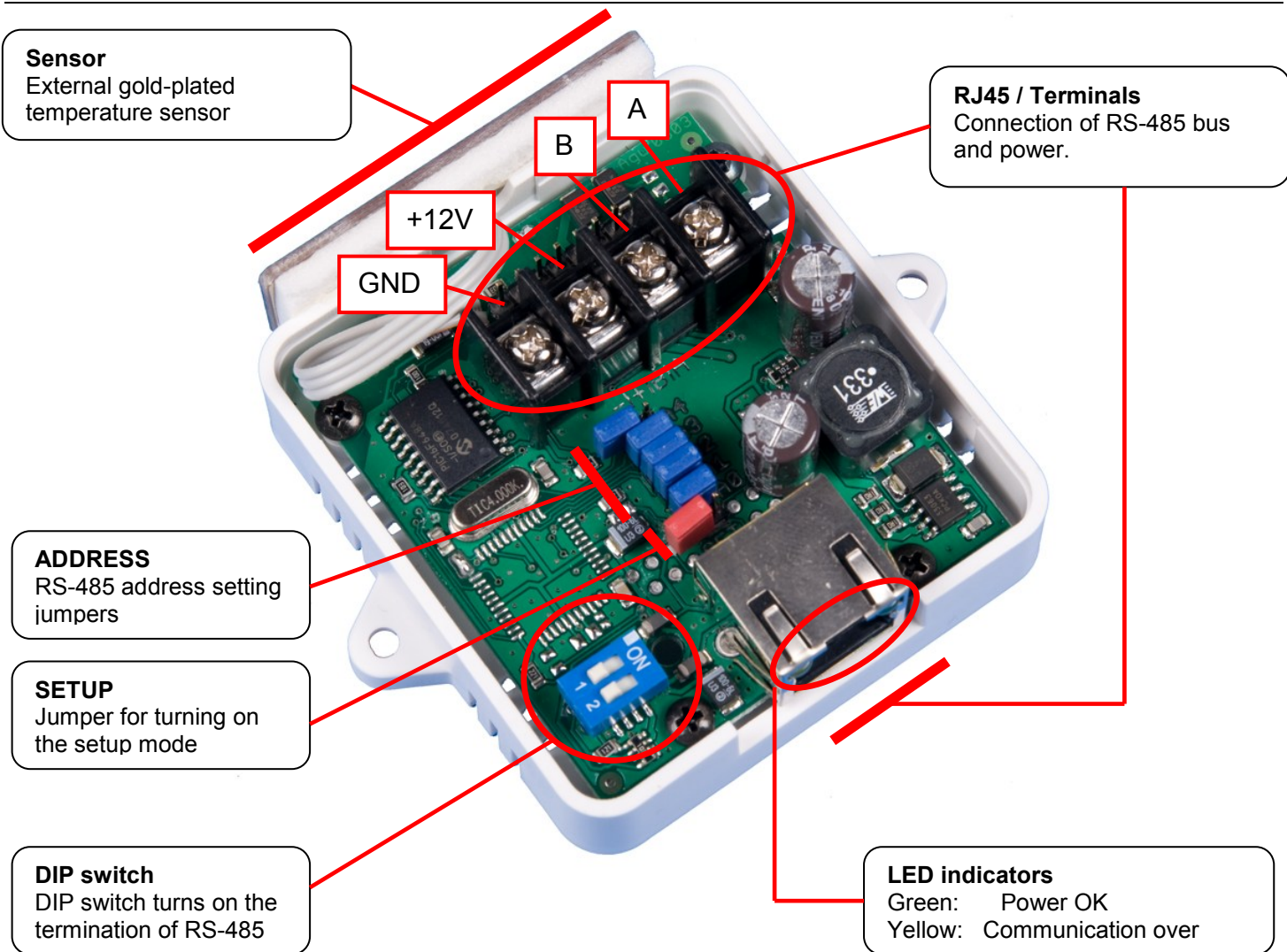
- Temperature range -10°C to $+70^{\circ}\text{C}$.
- Indication of communication and state of sensor with a LED indicator.
- RS-485 communication.
- Simple communication protocol.
- Minimal current consumption, power supply with unstable voltage.
- The sensor can send by itself the value of the temperature in a preset interval between 1 and 5000 seconds (one hour and 23 minutes).
- Communication over RS-485 compatible with the SNMP thermometer Poseidon

Applications

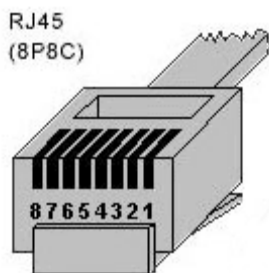
- Large temperature measuring systems.
- Industrial measurements and regulations.
- Temperature measurement of food, medical and similar storehouses.
- Temperature measurement of manufacturing and dwelling premises.

- When connected to a Poseidon device – temp. data transmission over Ethernet or Internet.
- When connected to a Poseidon device – possibility to log as far as 100 000 values in the internal Flash memory

Basic Features



1		Not used
2		Not used
3		485 B return
4		RS-485 Industrial bus
5		
6		485 A return
7		Ground
8		Power



Temperature range:..... -10°C...+70°C
Accuracy:..... +/- 0,5 °C
Resolution:..... 0,1 / 0,01°C (L / H mode)
Measuring element:..... DS18B20

Supply voltage:.....+8V...+30V DC, protection against polarity reversal
Power consumption:..... Usually 10 mA, max. 50 mA (according to the number of sensors)

RS-485 line termination resistor.....	Internal resistor 470Ω, connected by setting the jumper „ RS485 Terminator “
Wire connection.....	Terminal / RJ45

Range of sensor's comm.. addresses:.....“A” .. “Z”, “a” .. “z” and “0” .. “9”
 Modes to assign the address.....Using jumpers or in SETUP mode

- + Using jumpers.....The address “**A**” to “**Z**” is set by jumpers
- + In SETUP mode.....Address is set from terminal over the RS-485 line.
The jumpers have to be set to the “Adr by SETUP” value.

Mechanical parameters

Protection type.....IP 20
 External dimensions80 x 64 x 67 mm

Installation on the wall.....Mounting the sensor on the wall by two screws

Setting sensor address

The address of the sensor over RS-485 line must be unique and there are different ways to set it. The sensor needs to be restarted (by pulling the plug out) after any change in the jumper settings.

Jumper SETUP	A0 to A4	Terminal RS-485 Setup menu	Address set. over RS-485	RS-485 sensor address
0	„A“ to „Z“	Not possible	Not possible	„A“ to „Z“ except „T“ acc. to settings A0 to A4
0	„ <u>Adr by SETUP</u> “	Not possible	Not possible	Internal address is used in the „0 ... 9“, „a ... z“ or „A ... Z“ range except „T“ The address preset in „Terminal RS-485 Setup menu“ or by issuing a command over RS-485.
1	„A“ to „Z“	Not possible	Not possible	„A“ to „Z“ except „T“ acc. to settings A0 to A4
1	„ <u>Adr by SETUP</u> “	Within 30 sec. after switching-on the power	Possible	Internal address is used in the „0 ... 9“, „a ... z“ or „A ... Z“ range except „T“ The address can be set: <ul style="list-style-type: none"> In this configuration the „Terminal RS-485 Setup menu“ can be activated by sending 30x the „u“ char. over the RS-485 line within 30 seconds after switching-on the power. Anytime over the RS-485 by issuing a command in the format: „T#<new address>“. <p>Note: To use this command only one sensor accepting this command must be connected at the line.</p>

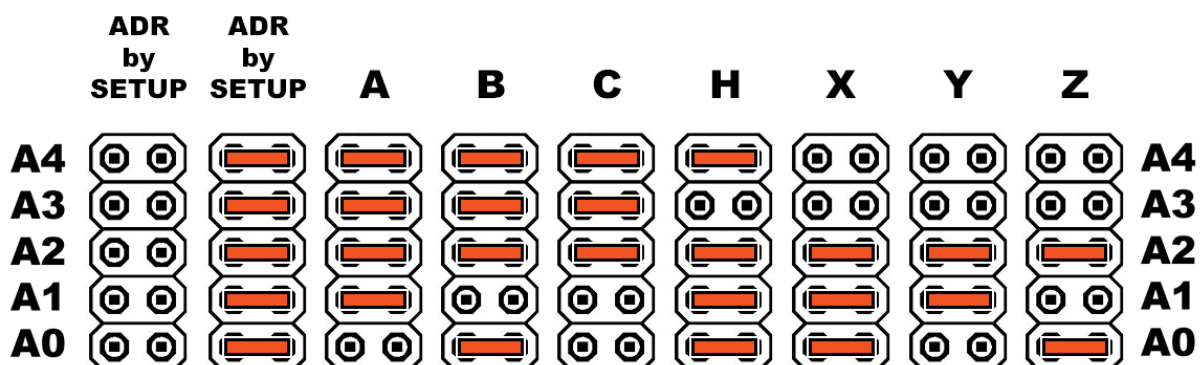
A4	A3	A2	A1	A0	Address
X	X	X	X	X	Adr by SETUP
X	X	X	X	O	A
X	X	X	O	X	B
X	X	X	O	O	C
X	X	O	X	X	D
X	X	O	X	O	E
X	X	O	O	X	F
X	X	O	O	O	G
X	O	X	X	X	H
X	O	X	X	O	I
X	O	X	O	X	J

A4	A3	A2	A1	A0	Address
X	O	X	O	O	K
X	O	O	X	X	L
X	O	O	X	O	M
X	O	O	O	X	N
X	O	O	O	O	O
O	X	X	X	X	P
O	X	X	X	O	Q
O	X	X	O	X	R
O	X	X	O	O	S
O	X	O	X	X	restricted
O	X	O	X	O	U

A4	A3	A2	A1	A0	Address
O	X	O	O	X	V
O	X	O	O	O	W
O	O	X	X	X	X
O	O	X	X	O	Y
O	O	X	O	X	Z
O	O	X	O	O	Adr by SETUP
O	O	O	X	X	Adr by SETUP
O	O	O	X	O	Adr by SETUP
O	O	O	O	X	Adr by SETUP
O	O	O	O	O	Adr by SETUP

Note: O (open) = jumper disconnected, X (close) = jumper connected

Temp-485 RS-485 address settings



LED signaling

The sensor device is equipped with a LED, which indicates the operating state:

Supply voltage switched on:

Jumper SETUP set (LED blinks shortly 2x)
 Jumper SETUP reset (LED blinks shortly 4x)

Reading the temperature from the device..... (LED blinks for 0.5 sec on each reading)
 „RS-485 Setup“ mode activated (LED lights incessantly)

RS-485 Setup mode

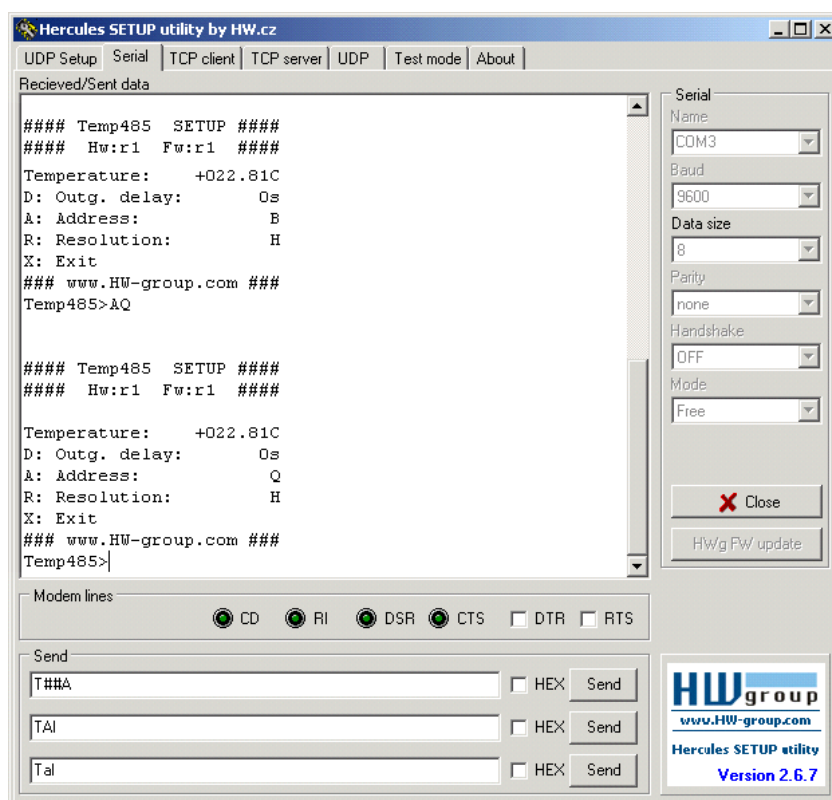
For more complex settings the sensor uses the terminal Setup mode via serial terminal over the RS-485 line. For common usage you do not need to use the SETUP mode. The jumpers A0 – A4 will be enough to set the addresses of the sensors.

Activation of the Setup mode

- Set the jumpers A0 to A4 to the „Adr by SETUP“ position (for ex. all or none occupied).
- Set the jumper „SETUP“ only in the sensor, which you want to configure
- The „Adr by SETUP“ position is set only in one sensor communicating over RS-485
- Connect through the terminal at the serial port (9600 8N1)
- Switch on the sensor's power supply (the LED blinks 8x red)
- During the first 30 sec. after the device is on type at least 30 times the character “u” (lower case u). (The LED lights red).
- At the terminal the SETUP mode will appear, as you can see from the figure.

In case you cannot activate, check if:

- You have powered the sensors (Is the LED lit?)
- You have set the jumpers to the combination „Adr by SETUP“ (After switching on the power the LED blinks 8x)
- The jumper is set to „SETUP“ and the settings of the terminal are 9600 8N1.
- The RS-232 / RS-485 converter is working properly? Does it support switching of directions?
- Did you really type circa 30 times the character “u” (lower case u)?
- You did not spend more than 30 seconds after the device was switched in to get at the SETUP mode.



Commands and function of RS-485 Setup

At the right it can be seen a text from the terminal screen, when the sensor is in the Setup mode. By typing the first character of the line you can call the function which sets the respective parameter, the parameters are described as follows.

D: Outgoing Delay

The sensor sends the measure temperature regularly (interval in seconds has to be preset). This mode is useful, if you want to record the value in a buffer (PortStore) for example.

A: Address

The allowed range for the address is A...Z, 0...9, a...z. This value will be taken into account, only if the jumpers (A0 through A4) are set to the position that allows defining the address of the device. Otherwise the sensor will use (and display at the SETUP screen mode) the value of the address that is set by the jumpers.

R: Resolution

To preserve backward compatibility it is possible to set the format of the temperature to one decimal digit by choosing "L" (*for example* *A+025.5C<CR>), or by choosing "H" to two decimal digits (*for example* *A+025.52C<CR>).

```
#### Temp485  SETUP ####
####  Hw:r1   Fw:r1  ####

Temperature:      +030.3C
D: Outg. delay:   0s
A: Address:      Q
R: Resolution:   H
X: Exit
### www.HW-group.com ###

Temp485>
```

Communication protocol

The sensors operate in a question-answer mode. The maximum response time is 50 ms.

Communication bus.....	RS-485
Range of addresses.....	“A” ... “Z” (except „T“) and “a” ...“z” (25 + 26 addresses)
Communication.....	ASCII, described below
Response time.....	max. 50 ms for a command
Speed.....	9600 baud
Data bits.....	8
Parity	none
Stop bits.....	1

Temperature reading

Function	Command syntax	Example
Temperature request	T<address>I	TAI
Answer from sensor (all OK)	*<address><temp><CR>	*A+025.51C
Answer from sensor (error)	*<address>Err<CR>	*AErr

<address> is a character from „A“... „Z“ with exception of „T“

<CR> is the 0xD or 13 decimal - end of line

<temp> has the format *A+025.5C or *A+025.55C

Device identification

Function	Command syntax	Example
Device type request	T<address>?	TA?
Answer from sensor (all OK)	*<address><Identificat><cr>	*ATemp485.A

<Identificat> string „Temp485.A” number after the dot is the FW revision

Setting sensor's address

This function will work, only if the jumpers (A0 through A4) are set to the position „Adr by SETUP“ and „SETUP“ = 1 (jumper set). For other settings of jumpers the sensor will ignore the command.

POZOR: In the RS-485 line only one sensor must be set like this, otherwise a collision will occur and the address setting can not be guaranteed.

Function	Command syntax	Example
Temperature request	T#<new address>	T#A
Answer from sensor (all OK)	*<new address>OK<CR>	*AOK
Temperature request (error)	*<old address>Err<CR>	*BErr

<address> is a character from „A“... „Z“ with exception of „T“

<cr> is the 0xD or 13 decimal - end of line

Reading the only sensor on the line

The character „\$“ is used here as a general address = all the sensors in the line RS-485 will answer. In this way you can find the address of the sensor in case there is just one on the line.

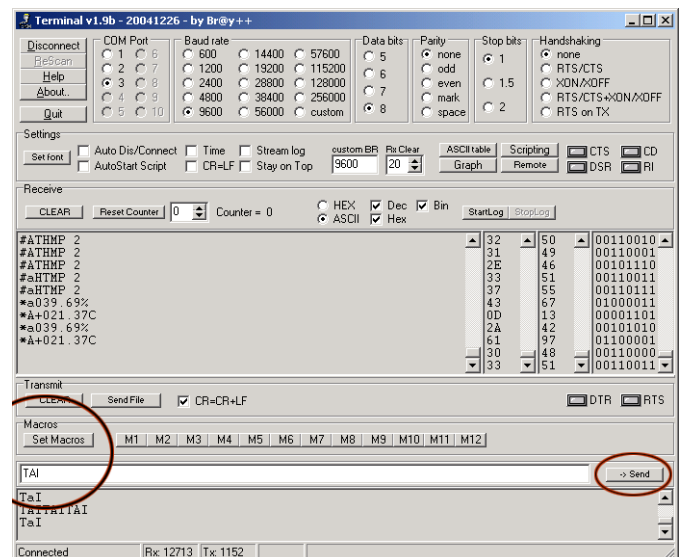
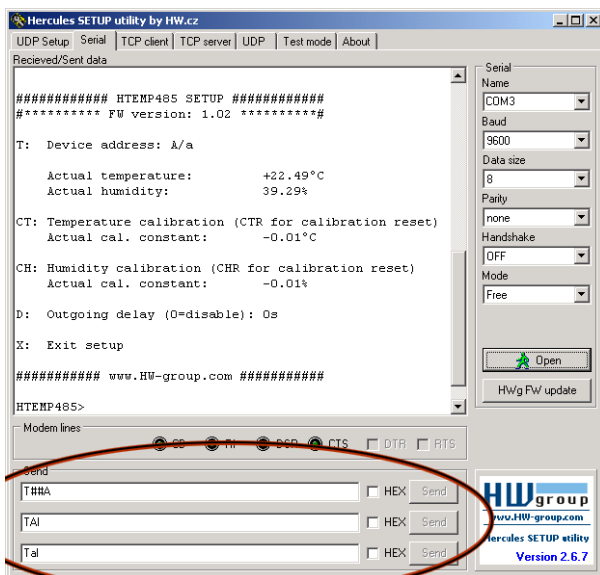
Function	Command syntax	Example
Temperature request	T\$I	T\$I
Answer from sensor	*<address><temp><CR>	*A+025.51C

<CR> is the 0xD or 13 decimal - end of line

<temp> has the format **A+025.5C or *A+025.55C*

Notes

- If the device does not answer in the terminal mode, the cause must be the typing delay between the characters. If you send the commands from the keyboard by typing them, because of the delay between characters being too long, the sensor will not admit the command. We recommend you to prepare the commands as „macro“ sequences and send them at once. The following figures show where you can find the macro in the recommended software Hercules and Terminal.
- If you set the address with the command „T#A“, that contains in it the character „#“, is necessary to write two times this character, because this character is used very often in macro to insert decimal values of characters. To set the address „A“ you have to type „T##A“.



Connection to the Poseidon device

- 1) Connect the Temp-485 sensor with TP cable.
- 2) If the sensor is the final device on the RS-485 bus, set both DIPs „**RS-485 Terminator**“, to **ON**.
- 3) Setup by jumpers the address of the sensor, with a value that is not used by any other sensor at the RS-485 line. Disconnect the jumper „**SETUP**“, located inside the sensor Temp-485.
- 4) Connect the terminal SETUP mode of the thermometer device Poseidon, which can be done in two ways:
 - **RS-232 Setup** (Poseidon DIP1=ON, Port2 connected to PC over RS-232, Poseidon needs to be turned off and on)
 - **TCP Setup at port 99** (If it is allowed and Poseidon DIP3=Off, it will be enough to Telnet at port 99)

In the Setup mode choose **(3)... RS-485(Temp-485)** and start-up the sensor auto-detection, which finds and displays the addresses of all sensors founded. The address will be displayed twice, in upper and lower case characters. If Poseidon displayed the address which you set then everything is fine.

- 5) Choosing **(x) eXit** you exit from the Setup mode and you should now be able to see the value of the sensor in the WWW page (type IP address of Poseidon in the browser's addr. field).

Tips and notes

- **Which cables to use?**

To connect the sensors, the most economical solution is the using a twisted pair (TP) cable, which is used for wiring computer networks. In practice just two pairs (out of four) are mostly used therefore one of the pairs can be used for data transmission over RS-485. For the supply we recommend to assign one pair for the positive and one pair for the negative pole.

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