

Modbus Specification for Temperature Sensors Tx-RS485-MB

Supported Bus Protocol

Baud rate	1200, 2400, 9600, 19200, 38400
Parity	No, even, odd
Stop Bit	1, 2 (only at no parity)
Factory Default	9600 baud, 8N1, address: 1

For setting the bus protocol parameter the sensor offers the function code 0x46 of the MODBUS protocol. Alternative you can use the software tool Si-MODBUS-Configurator (free download on our website) for setting the bus parameter and testing the communication.

Modbus Specification

References:

- MODBUS over Serial Line Specification and Implementation Guide V1.02
- MODBUS Application Protocol Specification V1.1b

Transmission mode: Modbus RTU

The Sensors will start Modbus operation 4 seconds after power up.

Supported function codes

- 0x04: Read Input Register

Register	Value	Gain	Offset	Phys. Range	Data Range	Data Type
7 ^{1) 3)}	Module Temperature in °C	0.1	0	-40...+90°C	-400...900	INT16
8 ^{2) 3)}	Ambient Temperature in °C	0.1	0	-40...+90°C	-400...900	INT16

- 1) Only supported by Tm-RS485-MB
- 2) Only supported by Ta-ext-RS485-MB
- 3) Only available from Firmware Version 1.53

Please note:

Unsupported registers indicated in table will return 0.

To keep compatibility to old firmware versions, additional registers are available:

Register	Value	Gain	Offset	Phys. Range	Data Range	Data Type
0	reserved	-	-	-	-	-
1 ¹⁾	Module Temperature in °C	0.1	-25	-25...+75°C	0...1000	UINT16
2 ²⁾	Ambient Temperature in °C	0.1	-25	-25...+75°C	0...1000	UINT16
3	reserved	-	-	-	-	-
4	reserved	-	-	-	-	-
5 ¹⁾⁴⁾	Module Temperature in °C	0.1	-100	-40...+90°C	600...1900	UINT16
6 ²⁾⁴⁾	Ambient Temperature in °C	0.1	-100	-40...+90°C ⁵⁾	600...1900 ⁵⁾	UINT16

1) Only supported by Tm-RS485-MB

2) Only supported by Ta-ext-RS485-MB

4) Only available from Firmware Version 1.52

5) -40...+85°C for Firmware Version 1.52 / -40...+90°C from Firmware Version 1.53

Please note:

Unsupported registers indicated in table will return 0.

For using the full temperature measurement range of -40...90°C use register 5 and 6 resp. 7 and 8.

→ 0x08: Diagnostics

- Sub function 0x00: Return Query Data
- Sub function 0x01: Restart Communication Option
- Sub function 0x04: Force Listen Only Mode
- Sub function 0x0A: Clear Counters
- Sub function 0x0B: Return Bus Message Count
- Sub function 0x0C: Return Bus Communication Error Count
- Sub function 0x0D: Return Slave Exception Error Count
- Sub function 0x0E: Return Slave Message Count
- Sub function 0x0F: Return Slave No Response Count
- Sub function 0x10: Return Slave NAK Count
- Sub function 0x11: Return Slave Busy Count
- Sub function 0x12: Return Bus Character Overrun Count

→ 0x46: Communication Parameter

Please note: These settings will take effect after restart of the sensor by power on reset or restart communication command (function 0x08, Sub function 01).

Sub function 04: Write Address

Request			
00	Address	1 Byte	1 to 247
01	Function Code	1 Byte	0x46
02	Sub Function Code	1 Byte	0x04
03	New Address	1 Byte	1 to 247
Response			
00	Address	1 Byte	1 to 247
01	Function Code	1 Byte	0x46
02	Sub Function Code	1 Byte	0x04
03	New Address	1 Byte	1 to 247

Sub function 05: Read Communication Parameter

Request			
00	Address	1 Byte	1 to 247
01	Function Code	1 Byte	0x46
02	Sub Function Code	1 Byte	0x05
Response			
00	Address	1 Byte	1 to 247
01	Function Code	1 Byte	0x46
02	Sub Function Code	1 Byte	0x05
03	Baud rate	1 Byte	0 to 4, see table below
04	Parity /Stop Bit	1 Byte	0 to 3, see table below

Sub function 06: Write Communication Parameter

Request			
00	Address	1 Byte	1 to 247
01	Function Code	1 Byte	0x46
02	Sub Function Code	1 Byte	0x06
Response			
00	Address	1 Byte	1 to 247
01	Function Code	1 Byte	0x46
02	Sub Function Code	1 Byte	0x06
03	Baud rate	1 Byte	0 to 4, see table below
04	Parity /Stop Bit	1 Byte	0 to 3, see table below

Communication Parameter Setting Sub Function 05 and 06

Baud Rate	Value
1200	0
2400	1
9600	2
19200	3
38400	4
Parity / Stop Bit	Value
8N1 (10 Bit)	0
8N2 (11 Bit)	1
8E1 (11 Bit)	2
8O1 (11 Bit)	3

Sub function 07: Hardware and Firmware Version

Request			
00	Address	1 Byte	1 to 247
01	Function Code	1 Byte	0x46
02	Sub Function Code	1 Byte	0x07
Response			
00	Address	1 Byte	1 to 247
01	Function Code	1 Byte	0x46
02	Sub Function Code	1 Byte	0x07
03	Hardware Version	2 Byte	0 to 65535
04	Firmware Version	2 Byte	0 to 65535

Sub function 08: Read Serial Number (from Firmware Version 1.54)

Request			
00	Address	1 Byte	1 to 247
01	Function Code	1 Byte	0x46
02	Sub Function Code	1 Byte	0x08
Response			
00	Address	1 Byte	1 to 247
01	Function Code	1 Byte	0x46
02	Sub Function Code	1 Byte	0x08
03	Serial Number	30 Byte	Char

The response for the Read Serial Number Function are 20 character with a structure as followed:

- All characters “-“ printed on the sensor lable are leaved out
- For serial numbers with less than 20 characters the output is filled with „blank“ (0x20)

Example:

Serial number printed on the sensor label:

251-20311234

Output of Read Serial Number Function:

25120311234 _ _ _ _ _

Output of Read Serial Number Function in hex:

3235 3132 3033 3131 3233 3420 2020 2020 2020 2020

Identifying the sensor type by the serial number:

Serial number, beginning with	Sensor Type	Active Register
151	Ta-ext-RS485-MB	8
351	Ta-ext-RS485-MB	8
251	Tm-RS485-MB	7
451	Tm-RS485-MB	7

Exception codes:

- 01: Illegal Function
- 02: Illegal Data Access
- 03: Illegal Data Value
- 04: Slave Device Failure