

# MODBUS Specification for Temperature Sensors Tx-RS485-MB Series From Firmware Version 1.51



## 1. 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.

## 2. 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
0007 <sup>1) 3)</sup>	Module Temperature in °C	0.1	0	-40...+90°C	-400...900	INT16
0008 <sup>2) 3)</sup>	Ambient Temperature in °C	0.1	0	-40...+90°C	-400...900	INT16

<sup>1)</sup> Only supported by Tm-RS485-MB

<sup>2)</sup> Only supported by Ta-ext-RS485-MB

<sup>3)</sup> Only available from Firmware Version 1.53

Please note:

Unsupported registers indicated in table will return 0.

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

Register	Value	Gain	Offset	Phys. Range	Data Range	Data Type
0000	<i>reserved</i>	./.	./.	./.	0	UINT16
0001 <sup>1)</sup>	Module Temperature in °C	0.1	-25	-25...+75°C	0...1000	UINT16
0002 <sup>2)</sup>	Ambient Temperature in °C	0.1	-25	-25...+75°C	0...1000	UINT16
0003	<i>reserved</i>	./.	./.	./.	0	UINT16
0004	<i>reserved</i>	./.	./.	./.	0	UINT16
0005 <sup>1) 4)</sup>	Module Temperature in °C	0.1	-100	-40...+90°C	600...1900	UINT16
0006 <sup>2) 4)</sup>	Ambient Temperature in °C	0.1	-100	-40...+90°C <sup>3)</sup>	600...1900 <sup>5)</sup>	UINT16

<sup>1)</sup> Only supported by Tm-RS485-MB

<sup>2)</sup> Only supported by Ta-ext-RS485-MB

<sup>4)</sup> Only available from Firmware Version 1.52

<sup>5)</sup> -40...+85°C for Firmware Version V1.52 / -40...+90°C from Firmware Version V1.53

Please note:

Unsupported registers indicated in table will return 0.

For using the full temperature measurement range of -40...90°C use register 0005 and 0006 resp. 0007 and 0008.

- 0x08: Diagnostics

- Sub function 0x00: Return Query Data
- Sub function 0x01: Restart Communications 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 Module Address

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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	0x05
03	Baud Rate	1 Byte	0 to 4, see table below
04	Parity / Stop Bit	1 Byte	0 to 3, see table below

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 3, see table below
04	Parity / Stop Bit	1 Byte	0 to 3, see table below

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- 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

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- 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	20 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 lable:  
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	0008
351	Ta-ext-RS485-MB	0008
251	Tm-RS485-MB	0007
451	Tm-RS485-MB	0007

### Exception Codes:

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