eTR 101 Modbus
Room Temperature Control Unit

Manual
Article numbers 30180 (white), 30181 (black)

1. Safety and use instructions

Installation, testing, operational start-up and troubleshooting should only be performed by an authorised electrician.

CAUTION!
Live voltage!

- Inspect the device for damage before installation. Only put undamaged devices into operation.
- Comply with the locally applicable directives, regulations and provisions for electrical installation.
- Immediately take the device or system out of service and secure it against unintentional switch-on if risk-free operation is no longer guaranteed.

Use the device exclusively for building automation and observe the operating instructions. Improper use, modifications to the device or failure to observe the operating instructions will invalidate any warranty or guarantee claims.
Operate the device only as a fixed-site installation, i.e. only in assembled condition and after conclusion of all installation and operational start-up tasks, and only in the surroundings designated for it.
Elsner Elektronik is not liable for any changes in norms and standards which may occur after publication of these operating instructions.

For information on installation, maintenance, disposal, scope of delivery and technical data, please refer to the installation instructions.

2. Description

The **Room Temperature Control Unit eTR 101 Modbus** measures the room temperature and displays the current value. The target temperature can be changed using the + and - touch buttons.

The **eTR 101 Modbus** is a Modbus slave with RS485 interface and RTU protocol. Modbus master, e.g. PC, SPS or MC, can read the measured values and other settings with "Function 04h (read input registers)" or with "Function 06H (write single register)" and "Function 10H (write multiple registers)" adjust, for example, the display of the setpoint or the basic setpoint shifts.

Functions:

- **Temperature** measurements.
- **Display** of the current temperature or the setpoint and the basic setpoint shifts
- **2 touch keys** (+/-) for changing the target temperature or the basic setpoint shifts

3. Views and device operation

3.1. Adjust room temperature

Depending on the setting from the modbus master, the **Room Temperature Control Unit eTR 101 Modbus** displays the current room temperature value or the setpoint or the shift compared to the basic setpoint. Using the master, the operating mode, the type and the brightness of the display, along with other values, can be set.

Possibility A: Display off

The LED display is off. Manual changing of the target temperature using the +/- keys is *not* possible.

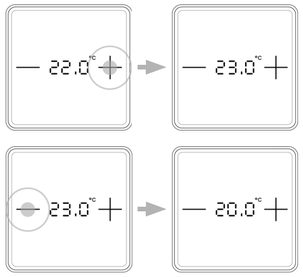
Possibility B: Current temperature displayed (room temperature)

The current room temperature is displayed. Manual changing of the target temperature using the +/- keys is *not* possible.

Possibility C: Display of the target temperature or basic target temperature

Depending on the setting, the current setpoint or the shift compared to the basic setpoint is displayed. The target temperature can be adjusted by pressing the +/- keys.

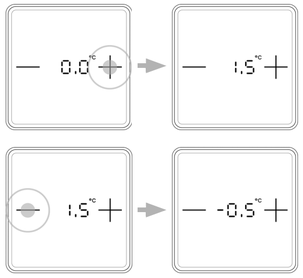
Setpoint display (absolute value):



Press +:
Increase room temperature
(Target temperature is increased)

Press -:
Lower room temperature
(Target temperature is lowered)

Display of the **basic setpoint shift** (change compared to the basic setpoint of the controls):

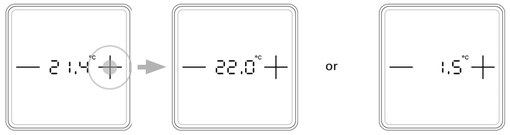


Press +:
Increase room temperature
(Basic setpoint shift, PLUS direction)

Press -:
Lower room temperature
(Basic setpoint shift, MINUS direction)

Possibility D: Display of the current temperature and the target temperature / basic setpoint shift

In normal mode, the current room temperature is displayed. Touching the keys changes the display to the target temperature or the basic setpoint shift, depending on the setting. Changes with + or - become visible. The display returns to room temperature if a touch key is not pressed for 5 seconds.



Gently press touch key **+ or -**: The current **target temperature** (or the basic setpoint shift) is displayed.

Press +: Increase room temperature
(Target temperature / basic setpoint shift is increased).

Press -: Lower room temperature
(Target temperature / basic setpoint shift is lowered).

General information:

The increments for the change and the possible setting range are specified using the modbus master.

4. Bus communication

4.1. Bus load

The RS485 transceiver used has 1/8 of a standard RS485 bus load (1/8 unit load) and can manage at least a 2.4 V at 54 Ohm bus load. It can, thus, operate a bus with 32 nodes at standard bus load. If nodes with a lower load than the standard bus load are connected to an RS485 bus, the bus can be operated with more nodes. If, for example, only nodes with 1/8 bus load are connected, up to 32 x 8 = 256 nodes can be connected to the bus.

4.2. Bus communication settings

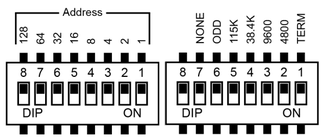


Fig. 1:
Dip switch detailed view

If all the dip switches are in the OFF position (factory settings), the following parameters are set:
Address:1
Baud rate: 19200
Parity: Even
Scheduling: Off

Setting the slave address:

The slave address is set on the 8-bit dip switch "Address". If all switches are OFF, address 1 is selected. Address 0 is reserved for broadcast information, addresses above 247 are invalid.

The address coding is binary. For example, the switches 1, 2, 3, 4 and 6 must be ON for address 47.

Interface parameters:

The interface parameters are set using the right 8-bit dip switch. If the switches 2-5 (from the right) are OFF, the set transmission rate is 19,200 baud. If one of these switches is set to ON, the corresponding baud rate applies.

Parity: One the two switches "ODD" and "NONE" are OFF, there is EVEN parity. Only "ODD" or "NONE" switches the corresponding parity check.

Switch "TERM": Bus scheduling 124 Ohm

5. Transmission protocol

Before the first measurement, and if there is a defective sensor, register 0 (temp. sensor measurement value) is "-32768".

Apart from register 0, 1, 4 and 5, the values communicated by the master are stored per register in the slave.

Register	Parameter	Data type	Data value	Range	Start value	Function
0	Actual temperature	Signed 16bit	0 to +550	0 to +55°C		Output
1	Sensor Fault 1 = On, 0 = Off	Unsigned 16bit	0 to 1	0 to 1		Output
2	Actual temperature offset	Signed 16bit	-50 to +50	-5 to +5K		Input/Output
3	LED brightness %	Unsigned 16bit	0 to 100	0 to 100%	0	Input/Output
4	LED On Off 1 = On, 0 = Off	Unsigned 16bit	0 to 1	0 to 1	80	Input/Output
5	LED Auto Off Activation	Unsigned 16bit	0 to 1	0 to 1	1	Input/Output
6	LED Auto Off Time	Unsigned 16bit	1 to 255	1 to 255	1	Input/Output
7	LED display Temp 1 = On, 0 = Off	Unsigned 16bit	0 to 1	0 to 1	10	Input/Output
8	Substations Type operation 0 = not used, 1 = basic setpoint shift (a), 2 = setpoint (b)	Unsigned 16bit	0 to 2	0 to 2	0	Input/Output
9a	Basic setpoint shift Max	Unsigned 16bit	0 to +50	0 to +5K	1	Input/Output
10a	Basic setpoint shift Min	Unsigned 16bit	0 to +50	0 to +5K	1	Input/Output
11a	Basic setpoint shift	Signed 16bit	0 to +50	Min to Max	0	Input/Output
12a	Basic setpoint shift step	Unsigned 16bit	1 to +20	0.1 to +2K	3	Input/Output
9b	Target value max	Unsigned 16bit	30 to 400	3 to 40°C	3	Input/Output
10b	Target value min	Unsigned 16bit	30 to 400	3 to 40°C	0.5	Input/Output
11b	Target value	Unsigned 16bit	30 to 400	Min to Max	21	Input/Output
12b	Target value step	Unsigned 16bit	1 to +20	0.1 to +2K	21	Input/Output

5.1. Function 04H read input registers

5.1.1. Query string from master

Byte no.	Variable		Explanation
0	Slave address	xx	
1	Command	04H	Read input registers
2	Start address high byte	xx	Register start address
3	Start address low byte	xx	
4	Word count high byte	xx	Number of registers to be read
5	Word count low byte	xx	
6	CRC low byte	xx	
7	CRC high byte	xx	

Sample query string for reading all data for slave address 1:
01H, 04H, 00H, 0BH, 00H, 01H, 40H, 08H

5.1.2. Output string from master

Before the first measurement, and if there is a defective sensor, register 0 (temp. sensor measurement value) is "-32768".

Byte no.	Register Address	Variable		Explanation
0		Slave address	xx	
1		Command	04H	Read input register
2		Number of bytes	xx	
3	0	Actual temperature high byte	xx	value = measurement value
4		Actual temperature low byte	xx	
5	1	Sensor Fault high byte	xx	1 = Fault 0 = No fault
6		Sensor Fault low byte	xx	
7		CRC low byte	xx	
8		CRC high byte	xx	

Byte no.	Register Address	Variable		Explanation
7	2	Actual temperature offset high byte	xx	with algebraic sign, value/10 = Temperature offset xx.x K
8		Actual temperature offset low byte	xx	
9	3	LED brightness % high byte	xx	Value = LED display brightness xxx%
10		LED brightness % low byte	xx	
11	4	LED On Off high byte	xx	1 = LED display on 0 = LED display off
12		LED On Off low byte	xx	
13	5	LED Auto Off Activation high byte	xx	1 = Auto Off active 0 = Auto Off inactive
14		LED Auto Off Activation low byte	xx	
15	6	LED Auto Off Time high byte	xx	Value = LEDs switch off in xxxs
16		LED Auto Off Time low byte	xx	
17	7	LED display high byte	xx	1 = Current temperature display On 0 = Current temperature display Off
18		LED display low byte	xx	
19	8	Substations Type high byte	xx	0 = not used 1 = basic setpoint shift 2 = setpoint
20		Substations Type low byte	xx	
21	9a	Basic setpoint shift Max high byte	xx	Value/10 = basic setpoint shift, maximum x.x K
22		Basic setpoint shift Max low byte	xx	
23	10a	Basic setpoint shift Min high byte	xx	Value/10 = basic setpoint shift, minimum -x.x K
24		Basic setpoint shift Min low byte	xx	
25	11a	Basic setpoint shift high byte	xx	with algebraic sign, value/10 = Basic setpoint shift x.x K
26		Basic setpoint shift low byte	xx	
27	12a	Basic setpoint shift step high byte	xx	Value/10 = basic setpoint shift, increment x.x K
28		Basic setpoint shift step low byte	xx	
29	9b	Target value max high byte	xx	Value/10 = target temperature maximum xx.x°C
30		Target value max low byte	xx	
31	10b	Target value min high byte	xx	Value/10 = target temperature minimum xx.x°C
32		Target value min low byte	xx	
33	11b	Target value high byte	xx	Value/10 = target temperature xx.x°C
34		Target value low byte	xx	
35	12b	Target value step high byte	xx	Value/10 = target temperature increment x.x K
36		Target value step low byte	xx	
37		CRC low byte	xx	
38		CRC high byte	xx	

5.2. Function 06H write single register

5.2.1. Query string from master

Byte no.	Variable		Explanation
0	Slave address	xx	
1	Command	06H	Write single register
2	Address high byte	xx	Register address
3	Address low byte	xx	
4	Value high byte	xx	Value of the register to be written
5	Value low byte	xx	
6	CRC low byte	xx	
7	CRC high byte	xx	

Sample string for writing a target temperature of 21.5°C for slave address 1:
01H, 06H, 00H, 0BH, 00H, D7H, B8H, 56H

5.2.2. Output string from master

Byte no.	Variable		Explanation
0	Slave address	xx	
1	Command	06H	Write single register
2	Address high byte	xx	Register address
3	Address low byte	xx	
4	Value high byte	xx	Written value
5	Value low byte	xx	
6	CRC low byte	xx	
7	CRC high byte	xx	

5.3. Function 10H write multiple registers

5.3.1. Query string from master

Byte no.	Variable		Explanation
0	Slave address	xx	
1	Command	10H	Write multiple registers

Byte no.	Variable		Explanation
2	Start address high byte	xx	Register start address
3	Start address low byte	xx	
4	Word count high byte	xx	Number of registers to be written
5	Word count low byte	xx	
6	Number of bytes	xx	
7	Value high byte	xx	Value of the register to be written
8	Value low byte	xx	
...			
	CRC low byte	xx	
	CRC high byte	xx	

Sample string for writing the register 9, 10, 11 and 12 with the values:

Basic setpoint shift, maximum: +3.0K
Basic setpoint shift, minimum: -3.0K
Basic setpoint shift: 0K
Basic setpoint shift Increment: 0.5K

String: 01H, 10H, 00H, 09H, 00H, 04H, 08H, 00H, 1EH, 00H, 1EH, 00H, 00H, 00H, 05H, 3CH, 66H

5.3.2. Output string from master

Byte no.	Variable		Explanation
0	Slave address	xx	
1	Command	10H	Write multiple registers
2	Address high byte	xx	Register address
3	Address low byte	xx	
4	Word count high byte	xx	Number of written registers
5	Word count low byte	xx	
6	CRC low byte	xx	
7	CRC high byte	xx	