

MODBUS-RTU FUNCTIONS:

0x03: Read Holding Registers

0x04: Read Input Registers

0x06: Write Single Register

0x10: Write Multiple registers

MEMORY MAP:

1. HOLDING REGISTERS

Holding Registers

Number	Address (HEX)		Type	Name	§
	High Byte	Low Byte			
40001	00	00	uint	BOILER SET TEMPERATURE	1.1
40002	00	01	uint	BOILER SET POWER	1.2
40003	00	02	uint	TIME/DATE: seconds	1.3
40004	00	03	uint	TIME/DATE: minutes	1.3
40005	00	04	uint	TIME/DATE: hours	1.3
40006	00	05	uint	TIME/DATE: weekdays	1.3
40007	00	06	uint	TIME/DATE: days	1.3
40008	00	07	uint	TIME/DATE: months	1.3
40009	00	08	uint	TIME/DATE: years	1.3

2. INPUT REGISTERS

Input Registers

Number	Reg. Address (HEX)		Type	Name	§
	High Byte	Low Byte			
30001	00	00	sint	CURRENT TEMPERATURE	2.1
30002	00	01	sint	OUTDOOR TEMPERATURE	2.2
30003	00	02	uint	INSTANT POWER	2.3
30004	00	03	uint	NOMINAL POWER	2.4
30005	00	04	uint	PRESSURE IN THE BOILER VESSEL x 10	2.5
30006	00	05	sint	WARNING/ERROR STATUS	2.6
30007	00	06	uint	REGULATION STEP (SINGLE OUTPUT POWER)	2.7
30008	00	07	uint	BOILER OPERATION MODE	2.8
30009	00	08	uint	O.T.C. BOILER OPERATION MODE	2.9
30010	00	09	uint	STATUS OF INPUT SIGNALS	2.10
30011	00	0A	uint	STATUS OF CONFIG SIGNALS	2.11
30012	00	0B	uint	STATUS OF OUTPUT SIGNALS	2.12
30013	00	0C	uint	BOILER SET TEMPERATURE	2.13
30014	00	0D	uint	BOILER SET POWER	2.14
30015	00	0E	uint	BOILER MODULATION	2.15
30016	00	0F	uint	OUTPUT WORK TIME	2.16
30017	00	10	uint	MAX. SET TEMPERATURE	2.17
30018	00	11	uint	MAX. SET PRESSURE x 10	2.18
30019	00	12	uint	PRESSURE SENSOR TYPE	2.19
30020	00	13	uint	EXTENDED PUMP OPERATION	2.20
30021	00	14	uint	FLOW DETECTION TIME	2.21

1.1/2.13 BOILER SET TEMPERATURE

Unsigned 16-bit integer (uint).

Boiler set temperature. It can have a value from 10 to MAX.TEMP degrees Celsius depending on the configuration of the boiler parameters. MAX.TEMP can have one of a set of values: 50/60/70/80/90 °C.

The boiler will respond with an error message with error code 0x01 (ILLEGAL FUNCTION) if it is in one of the following operating modes:

- MANUALLY/PROFILE mode (“IP” on display)
- O.T.C. mode (“IO” on display)

In CASCADE/EMERGENCY OPERATION mode (“CE” on display) the boiler does not respond to messages from modbus.

The boiler will respond with an error message with error code 0x01 (ILLEGAL FUNCTION) if the setting is in progress from the keyboard.

The boiler will respond with an error message with error code 0x03 (ILLEGAL DATA VALUE) if the new value is outside the allowed value range.

Example1, read set temperature, write new value using functions 0x06 and 0x10:

Read set temperature:

01 03 00 00 00 01 84 0A

01 03 02 00 28 B8 5A (Read value = 40°C)

Write new value (45°C) using function 0x06:

01 06 00 00 00 2D 49 D7

01 06 00 00 00 2D 49 D7

Read new value:

01 03 00 00 00 01 84 0A

01 03 02 00 2D 78 59 (Read value = 45°C)

Write new value (55°C) using function 0x10:

01 10 00 00 00 01 02 00 37 E7 86

01 10 00 00 00 01 01 C9

Read new value:

01 03 00 00 00 01 84 0A

01 03 02 00 37 F9 92 (Read value = 55°C)

Example2, response in case of writing a new value outside the allowed range:

Read maximum allowed set temperature (see 2.17):

01 04 00 10 00 01 30 0F

01 04 02 00 50 B9 0C (Read value = 80°C)

Attempt to write a new value of 85°C

01 06 00 00 00 55 49 F5

01 86 03 02 61 (Response with error code 0x03: ILLEGAL DATA VALUE)

Example3, if an attempt is made to set a new value when keyboard setup is in progress:

With function 0x06:

01 06 00 00 00 37 C8 1C

01 86 01 83 A0 (Response with error code 0x01: ILLEGAL FUNCTION)

With function 0x10:

01 10 00 00 00 01 02 00 37 E7 86

01 90 01 8D C0 (Response with error code 0x01: ILLEGAL FUNCTION)

Example4, read set temperature with function 0x04 (see 2.13)

Read set temperature:

01 04 00 0C 00 01 F1 C9

01 04 02 00 37 F8 E6 (Read value = 55°C)

1.2/2.14 SET POWER

Unsigned 16-bit integer (uint).

Set power of the boiler. The minimum can be 0 and the maximum can be equal to the nominal power of the boiler.

In CE mode (CASCADE/EMERGENCY OPERATION) this value can only be set from the keyboard - the boiler does not respond to messages from modbus.

The boiler will respond with an error message with error code 0x01 (ILLEGAL FUNCTION) if the setting is in progress from the keyboard.

The boiler will respond with an error message with error code 0x03 (ILLEGAL DATA VALUE) if the new value is outside the allowed value range.

Example1, read set power, write new value using functions 0x06 and 0x10:

Read set power:

01 03 00 01 00 01 D5 CA

01 03 02 00 64 B9 AF (Read value = 100kW)

Write new value (80kW) using function 0x06:

01 06 00 01 00 50 D8 36

01 06 00 01 00 50 D8 36

Read new value:

01 03 00 01 00 01 D5 CA

01 03 02 00 50 B8 78 (Read value = 80kW)

Write new value (120kW) using function 0x10:

01 10 00 01 00 01 02 00 78 A7 A3

01 10 00 01 00 01 50 09

Read new value:

01 03 00 01 00 01 D5 CA

01 03 02 00 78 B8 66 (Read value = 120kW)

Example2, response in case of writing a new value outside the allowed range:

Read nominal power (see 2.4):

01 04 00 03 00 01 C1 CA

01 04 02 00 A0 B9 48 (Read value = 160kW)

Attempt to write a new value of 180kW:

01 06 00 03 00 B4 79 BD

01 86 03 02 61 (Response with error code 0x03: ILLEGAL DATA VALUE)

Example3, read set power with function 0x04 (see 2.14)

Read set power:

01 04 00 0D 00 01 A0 09

01 04 02 00 78 B9 12 (Read value = 120kW)

1.3 TIME/DATE

Registers 40003 - 40009 contain time in the following format:

seconds, minutes, hours, weekdays, days, months, years

All registers are unsigned 16-bit integers (uint).

Registers can only be read by a function 0x03 and they can be written with functions 0x06 and 0x10. When using function 0x10 changes will only be accepted if all registers containing time and date are specified - seven of them, so no register can be omitted. Of course, it is necessary that each register be within the allowed limits for a specific value.

Example1, read time/date, write new value using functions 0x06 and 0x10:

Read time/date registers:

01 03 00 02 00 07 A5 C8

01 03 0E 00 1B 00 21 00 0A 00 01 00 0E 00 08 00 17 A2 5F

Time/date read: 10:33:27, monady, 14-08-2023

Write new time/date (10:35:00, monday, 14-08-2023):

01 10 00 02 00 07 0E 00 00 00 23 00 0A 00 01 00 0E 00 08 00 17 C6 3E

01 10 00 02 00 07 20 0B

Read time/date registers:

01 03 00 02 00 07 A5 C8

01 03 0E 00 01 00 23 00 0A 00 01 00 0E 00 08 00 17 8F 7D

Time/date read: 10:35:01, monady, 14-08-2023

Example2, write of individual time/date register:

Read time/date registers:

01 03 00 02 00 07 A5 C8

01 03 0E 00 12 00 34 00 0A 00 01 00 0F 00 08 00 17 C7 5A

Time/date read: 10:52:18, monady, 15-08-2023

Writing a new value for days (14):

01 06 00 06 00 0E E8 0F

01 06 00 06 00 0E E8 0F

Read time/date registers:

01 03 00 02 00 07 A5 C8

01 03 0E 00 31 00 34 00 0A 00 01 00 0E 00 08 00 17 80 39

Time/date read: 10:52:49, monady, 14-08-2023

2.1 CURRENT TEMPERATURE

Signed 16-bit integer (sint).

Current boiler temperature in degrees Celsius.

2.2 OUTDOOR TEMPERATURE

Signed 16-bit integer (sint).

Current outside temperature in degrees Celsius.

This value is valid only in o.t.c. (Outdoor Temperature Compensation) boiler operation mode.

2.3 INSTANT POWER

Unsigned 16-bit integer (uint).

Current boiler power.

2.4 NOMINAL POWER

Unsigned 16-bit integer (uint).

Nominal power of the boiler.

2.5 PRESSURE IN THE BOILER VESSEL x 10

Unsigned 16-bit integer (uint).

Ten times the value of the current pressure in the boiler vessel.

For example, if the current pressure in the boiler vessel is 1.4 bar, this value will be 14. This means that this value should be divided by 10 to get the correct pressure value.

2.6 WARNING/ERROR STATUS

Signed 16-bit integer (sint).

This value represents the error or warning status that appears on the boiler display. Negative values represent warnings and positive values represent errors. Zero means no warnings or errors. For example, for warning A1 the value will be -1, for error E1 the value will be 1. Similarly for A4/E4 the values will be -4/4.

2.7 REGULATION STEP (SINGLE OUTPUT POWER)

Unsigned 16-bit integer (uint).

This value represents the power of the individual heater in the boiler. The nominal power of the boiler divided by this number gives the number of heaters in the boiler.

2.8 BOILER OPERATION MODE

Unsigned 16-bit integer (uint).

This value depends on the operating mode of the boiler and can be one of the following values:

- 0, for (IM) INDEPENDENT WORK/MANUAL mode
- 1, for (IP) INDEPENDENT WORK/DAILY PROFILE mode
- 2, for (IO) INDEPENDENT WORK/O.T.C. mode
- 3, for (CA) WORKING IN A CASCADE/AUTOMATIC mode
- 4, for (CE) WORKING IN A CASCADE/EMERGENCY mode

2.9 O.T.C. BOILER OPERATION MODE

Unsigned 16-bit integer (uint).

This value represents the mode of operation in O.T.C. mode and can be one of the following values:

- 0, for: guiding the temperature according to constant value
- 1, for: guiding the temperature according to the daily curve
- 2, for: guiding the temperature according to the night curve

2.10 STATUS OF INPUT SIGNALS

Unsigned 16-bit integer (uint).

This value represents the input statuses (Discrete Inputs). The lowest 3 bits (b2-b0) of this 16-bits value (b15-b0) represent:

- b2: overheating status
 - 1: overheating has occurred
 - 0: no overheating

- b1: flow detector status
 - 1: there is fluid flow through the boiler vessel
 - 0: no fluid flow through the boiler vessel
- b0: signal status for operation permission (thermostat)
 - 1: there is a work permit signal
 - 0: no work permit signal

2.11 STATUS OF CONFIG SIGNALS

Unsigned 16-bit integer (uint).

These value represent the options selected when configuring the boiler. Twelve lowest bits (b15.....b0) represent:

- b11: (Currently not in use.)
 - 1: allowed signal RE14
 - 0: signal RE14 is not allowed
- b10:
 - 1: allowed signal "boiler in operation" (RE13)
 - 0: the "boiler in operation" signal is not allowed (RE13)
- b9:
 - 1: allowed error signal (RE12)
 - 0: no error signal allowed (RE12)
- b8:
 - 1: allowed pump on/off signal (RE11)
 - 0: pump on/off signal is not allowed (RE11)
- b7: (Currently not in use.)
 - 1: rate of temperature change processing is allowed
 - 0: no rate of temperature change processing is allowed
- b6: (Currently not in use.)
 - 1: return temperature processing is allowed
 - 0: return temperature processing is not allowed
- b5: (Currently not in use.)
 - 1: the anti-freeze program is activated
 - 0: the anti-freeze program is not activated
- b4: (Currently not in use.)
 - 1: there is antifreeze in the system
 - 0: there is no antifreeze in the system
- b3: (Currently not in use.)
 - 1: allowed signal for detection of liquid level in the boiler vessel
 - 0: a signal for detecting the liquid level in the boiler vessel is not allowed
- b2:
 - 1: allowed boiler overheating signal
 - 0: boiler overheating signal is not allowed
- b1:
 - 1: allowed signal from the flow detector
 - 0: no signal from the flow detector is allowed
- b0:
 - 1: allowed external condition signal (thermostat)
 - 0: external condition signal (thermostat) is not allowed

2.12 STATUS OF OUTPUT SIGNALS

Unsigned 16-bit integer (uint).

This value represents the digital output statuses. Fourteen lowest bits (b15.....b0) represent:

- b13: (Currently not in use.)
 - 1: RE14 is ON
 - 0: RE14 is OFF
- b12:
 - 1: RE13, signal: "boiler in operation" is ON
 - 0: RE13, signal: "boiler in operation" is OFF
- b11:
 - 1: RE12, error signal is ON
 - 0: RE12, error signal is OFF
- b10:
 - 1: RE11, signal for controlling the pump is ON
 - 0: RE11, signal for controlling the pump is OFF
- b9:
 - 1: RE10, signal to turn on the heater number 10 is ON
 - 0: RE10, signal to turn on the heater number 10 is OFF
- b8:
 - 1: RE9, signal to turn on the heater number 9 is ON
 - 0: RE9, signal to turn on the heater number 9 is OFF
- b7:
 - 1: RE8, signal to turn on the heater number 8 is ON
 - 0: RE8, signal to turn on the heater number 8 is OFF
- b6:
 - 1: RE7, signal to turn on the heater number 7 is ON
 - 0: RE7, signal to turn on the heater number 7 is OFF
- b5:
 - 1: RE6, signal to turn on the heater number 6 is ON
 - 0: RE6, signal to turn on the heater number 6 is OFF
- b4:
 - 1: RE5, signal to turn on the heater number 5 is ON
 - 0: RE5, signal to turn on the heater number 5 is OFF
- b3:
 - 1: RE4, signal to turn on the heater number 4 is ON
 - 0: RE4, signal to turn on the heater number 4 is OFF
- b2:
 - 1: RE3, signal to turn on the heater number 3 is ON
 - 0: RE3, signal to turn on the heater number 3 is OFF
- b1:
 - 1: RE2, signal to turn on the heater number 2 is ON
 - 0: RE2, signal to turn on the heater number 2 is OFF
- b0:
 - 1: RE1, signal to turn on the heater number 1 is ON
 - 0: RE1, signal to turn on the heater number 1 is OFF

2.13 BOILER SET TEMPERATURE

Unsigned 16-bit integer (uint).

The temperature of the boiler can be adjusted in the range (10 - MAX.TEMP) °C depending on the configuration of the

boiler. A new temperature value can only be set in **(IM)** MANUALLY and **(CA)** WORKING IN A CASCADE/AUTOMATIC modes.

In **(IP)** MANUALLY-PROFILE operating mode this value is determined by the hourly value diagram and cannot be changed. If an attempt is made to set a new value, the response is a message with an appropriate error code.

In **(IO)** O.T.C. operating mode this value is calculated depending on the outside temperature and cannot be changed. If an attempt is made to set a new value, the response is a message with an appropriate error code.

In (CE) WORKING IN A CASCADE/EMERGENCY operating mode the new temperature value can only be set using the keyboard on the boiler because in this mode the boiler does not respond to modbus messages.

2.14 BOILER SET POWER

Unsigned 16-bit integer (uint).

The power can be adjusted in the range from zero to the nominal power with the appropriate regulation step (§ 2.7). In **(CE)** WORKING IN A CASCADE/EMERGENCY operating mode (cascade operation in case of communication failure) this value can only be set from the keyboard.

2.15 BOILER MODULATION

Unsigned 16-bit integer (uint).

This value describes the power reduction method when approaching the set temperature and can have one of the following values:

- 0: OFF, the boiler will not reduce the set power until the set temperature is reached
- 1: NORM, the boiler will turn off a small part of the power when approaching the set temperature
- 2: MAX, the boiler will turn off a slightly larger part of the power when approaching the set temperature

2.16 OUTPUT WORK TIME

Unsigned 16-bit integer (uint).

This represents the operating time of one of the heaters before it is automatically replaced by another - a free heater, if it is available at that moment. Allowed values are in the interval from 1 to 240 minutes.

2.17 MAX. SET TEMPERATURE

Unsigned 16-bit integer (uint).

This represents the maximum temperature that can be set for the boiler. It can have values: 50, 60, 70, 80 or 90 degrees Celsius.

2.18 MAX SET PRESSURE x 10

Unsigned 16-bit integer (uint).

This represents the maximum pressure value that can be measured by the built-in sensor. It can have values: 3 / 4 / 6 bar.

2.19 PRESSURE SENSOR TYPE

Unsigned 16-bit integer (uint).

This value represents the type of built-in pressure sensor and can have one of the following values:

- 0: MIKOTERM pressure sensor
- 1: WILO pressure sensor

2: DANFOSS pressure sensor

2.20 EXTENDED PUMP OPERATION

Unsigned 16-bit integer (uint).

This value represents the time of additional operation of the circulation pump after the last heater has been switched off. It can have values from 30 to 240 seconds.

2.21 FLOW DETECTION TIME

Unsigned 16-bit integer (uint).

This value represents the time it takes to accept a flow detector state change. It can have values from 2 to 10 seconds.