

MODBUS-200 and Modbus-200-DIN

EH-200 controllers' Modbus interface

Interface installation and use

(Version 2.18, 14.02.2014)

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1 Installing the MODBUS-200 card into the EH-200 controller

Install the card with the controller switched off. Remove the plugs covering the screws on the cover of the controller. Detach the covers from the case, first the connection space cover and then the larger lower cover. Carefully turn the lower cover 90 degrees so that the PC board at the bottom of the case is visible. The display unit on the lower cover is connected to the bottom card by a flat cable. **Do not let the lower cover hang by the flat cable.**

There is a microcircuit on a socket on the other end of the PC board near the screw connectors. The circuit code, N20, (on the EH-200 controllers) is printed on the PC board next to the microcircuit. Carefully detach the microcircuit from the socket.

Install the two plastic stand-offs that come with the Modbus card into the holes in the bottom card. Align the Modbus card so that the double row pin connector goes to the empty socket of N20 and the plastic stand-offs on the bottom card fit into the holes in the Modbus card. Press the Modbus card carefully into place so that the pins go into the socket and the stand-offs will be locked.

In order to use the interface, the DIP switches on the Modbus card must be positioned correctly. The switches can be positioned during installation with the controller's covers open or later with the covers in place. If the DIP switches are positioned later, the display unit must be detached from the lower cover. The DIP switches are then visible through the display unit opening and their position can be changed.

2 Connecting the MODBUS-200-DIN unit into the EH-200-controller

Modbus-200-DIN strip connector	Meaning	EH-200 strip connector
⊥	24 VAC ground and signal ground	Strip connector 42
~	24 VAC	Strip connector 41
A	RS-232 RX	Strip connector A
C	RS-232 TX	Strip connector C

3 Positioning the MODBUS-200 card's and MODBUS-200-DIN unit's DIP switches

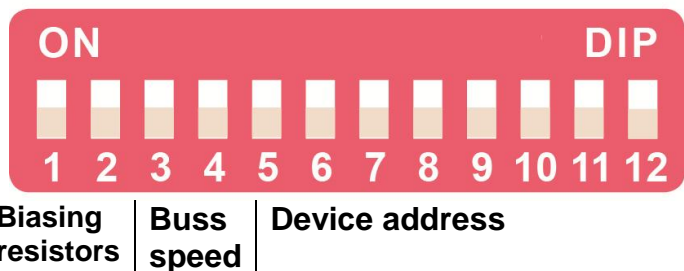
The address of the device (1-247) and the network speed (4800, 9600, 19200 tai 38400) in the Modbus network is defined, and biasing resistors are taken into use by using the DIP switches.

3.1 MODBUS-200 device address (DIP 5-12)

Each device in the Modbus network must have an individual device address. Addresses 1-247 can be used. The address is defined with the card's DIP switches 5-12. Switch 5 is the least significant bit on the address and switch 12 is the most significant bit.

P switch positions, 1 = ON
Address

DIP 5								DIP 12	
1	0	0	0	0	0	0	0	= 1	
0	1	0	0	0	0	0	0	= 2	
1	1	0	0	0	0	0	0	= 3	
0	0	1	0	0	0	0	0	= 4	
1	0	1	0	0	0	0	0	= 5	
0	1	1	0	0	0	0	0	= 6	
1	1	1	0	0	0	0	0	= 7	
.....									
1	1	1	0	1	1	1	1	= 247	

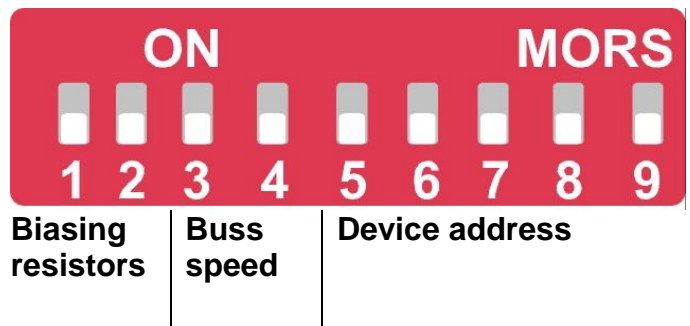


3.2 MODBUS-200-DIN, device address (5-9)

Each device in the Modbus network must have an individual device address. Addresses 1-31 can be used. The address is defined with the card's DIP switches 5-9. Switch 5 is the least significant bit on the address and switch 9 is the most significant bit.

DIP switch positions, 1 = ON Address

DIP 5					DIP 9	
1	0	0	0	0	= 1	
0	1	0	0	0	= 2	
1	1	0	0	0	= 3	
0	0	1	0	0	= 4	
1	0	1	0	0	= 5	
.....						
1	1	1	1	1	= 31	



3.3 Speed (DIP 3-4)

The speed must be the same for all the devices connected to the network. The speed is defined with the Modbus card's DIP switches 3-4 as follows:

DIP4	DIP3	Speed
0	0	4800
0	1	9600
1	0	19200
1	1	38400

3.4 Usage of biasing resistors (DIP 1-2)

The Modbus card uses a galvanically isolated RS-485 network as a physical interface. Only one device at a time can write in to the network, the other devices are listening. For this reason there are situations when no device writes in to the network but they all are listening. The biasing resistors ensure that the network remains stable in this situation. This is especially important if the network is long and if there is external interference.

Biasing resistors must be taken into use in **two (and only two)** devices per network. The devices in question must be positioned at both ends of the network. Biasing resistors are taken into use using Modbus card's DIP switches 1-2 as follows:

DIP1	DIP2	
0	0	Biasing resistors are not in use
1	1	Biasing resistors are in use

4 RS-485 network cabling

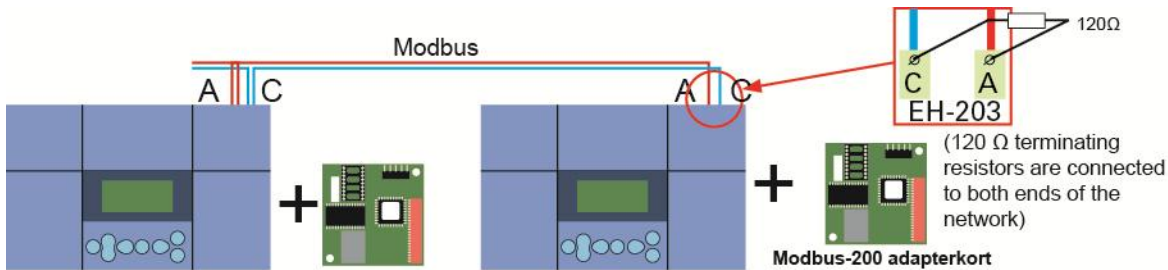
A twisted pair cable must be used for network cabling, e.g., Datajamak 2x(2+1)x0.24. The network must be like a chain, with the cable going from one device to the next and there must not be any stubs (max. length of stub 0.5m). The maximum length of the whole network is 1200m. **120 ohm terminating resistors are connected to both ends of the network.**

The network cable is connected to each EH-200 device in the network in the same way using screw connectors A and C. The meaning of the signals is as follows:

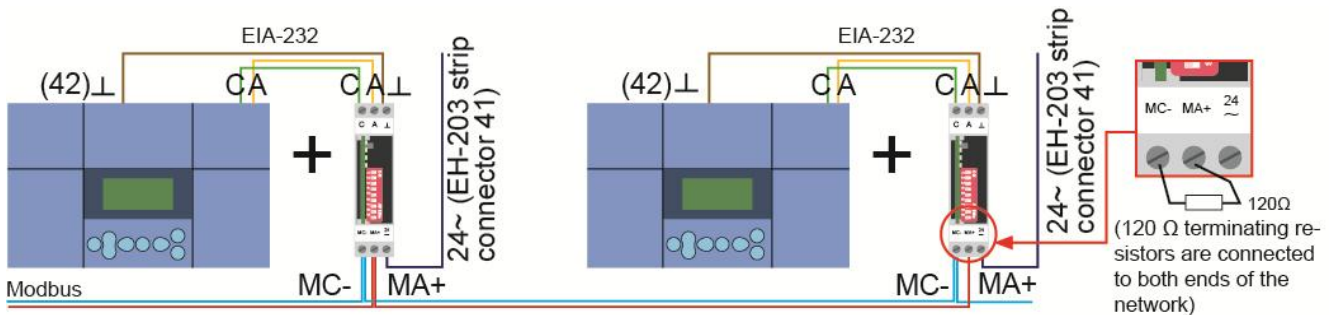
<u>Screw connector pin number</u>	<u>Meaning</u>	<u>Connect</u>
A	RS-485 Data +	Signal pair's other wire
C	RS-485 Data -	Signal pair's other wire

Terminating resistors are connected to both ends of the network between pins A and C. The twisted pair cable's protective shield can be connected if needed in to protective earth in order to eliminate interference. The connection is made **only from the other end of the protective shield**, e.g., always from the cable leaving the controller.

4.1 Modbus cabling to the MODBUS-200



4.2 Modbus cabling to the MODBUS-200-DIN



5 Arrangement of EH-200 controllers Modbus registers

EH-200 controllers data is arranged in the Modbus registers so that information of the same context is in consecutive registers. This makes it easier to read data from the Modbus network. The information is arranged as follows:

<u>Context</u>	<u>Modbus registers</u>
Time	0 – 3
Time programs for control circuits	4 – 59
Time programs for relays	60 - 115
Settings	
- control circuits	128 – 185, 320-324, 325-329
- configuration of measurements	186 – 196
- configuration of digital inputs	197
- in general	198 – 211, 280-285
Control circuit operating mode and manual control	212 – 213
Time control mode of relays	214 – 215

Supply water info	216 – 230
Measurements	
- analog	231 – 246, 290-292, 308-311
- counters	247 – 252
- digital inputs	253
Alarms	272, 254 – 255
Writing a value for network measurements	256 – 264
Control of text field transfer, resetting category bits	265
Controller text field transfer	266 – 271
Special registers	400, 500-516, 4000 – 4271, 6000 – 6543

Individual register addresses and corresponding controller information are in appendix 1.

6 Usage of registers

During start-up, Modbus card will update registers data from the controller and will not respond to any query. Start-up takes about 13 seconds.

EH-200 controllers have as a standard a local user interface from which settings can also be adjusted. For this reason, there is a risk that the data in monitoring program (PC) is not up-to-date with the actual controller data.

To prevent this from occurring, registers that contain the controllers setting type variables are divided into categories N1-N7. If a setting is changed locally, this information goes to register 253, bits 9-15. By monitoring bits 9-15 in register 253, the monitoring program knows if local change occurs and can update the settings. The register's categories are listed in appendix 1. After updating, the monitor can reset register 253's bits 9-15 by writing the value 0xFE in register 265. When the settings are changed locally and data is transferred between controller and Modbus registers, during that time register 400 value is 0x00FF. When data in Modbus registers is ready, value in register 400 is 0x0000. Monitoring program should not read the data if register 400 value is 0x00FF, but it should wait until value changes to 0x0000.

When the controllers time programs are manipulated from a local user interface (changed or just checked) and after that when the user exits, the controller rearranges the time programs. For this reason the time programs states may no longer be in the same Modbus registers that they originally were in. Nevertheless the controller always sets category bit N1 (control circuit time programs) or N2 (relay time programs), so the monitor program must always read the

time programs again when this bit has been set. Empty spaces cannot be left in the time program registers, but they must be filled in order.

Alarms are coded as bit data in registers 254 and 255. Bit data is saved during power failures so it is always up-to-date. The Modbus card must automatically acknowledge alarms to the controller when it updates registers 254 and 255. For this reason the controllers local alarm does not sound. Active /non-active alarms can always be read from these registers.

The Modbus-200 adapter card checks the 3-point characteristic heating curves of control circuits H1 and H2 (from version 2.12 on) to see if they are correct and if necessary changes point values so the curve remains in accepted limits. There is no check for the 5-point curves; the controller accepts all values. Modbus-200 adapter cards for versions 2.11 and older do not check 3-point curves; the check must be performed with an application having a modbus connection.

Rules for the characteristic heating curve settings are following:

- There is 3 fixed outdoor temperature points in the curve, -20, 0 and +20. If you draw a direct line from -20 to +20 point, the value in 0 point can be maximum 7 degrees over the line and 2 degrees under the line. On other words, maximum convex is 7 and maximum concave is 2, compared to linear (straight) line.
- In addition, -20 point can not be lower than 0 point and 0 point can not be lower than +20 point.
- Examples to this: 40-40-40 is OK, but 40-39-40 or 40-41-40 is wrong. 40-50-50 is OK

When relays have timer functions (timed on or off), the timer value is not updated in the Modbus register (= register value does not decrease) even though the time runs out. The monitor program can, for example, poll the relay output mode (from register 253) to see when the timer time has run out.

7 Special registers

7.1 Window registers

There is a possibility in EH-200 controllers Modbus interface to read and write the whole register space in 16 register packets. With this feature, only 17 registers are needed from Modbus master to cover the whole register space of EH-200 device. This feature could be useful, for example, when connecting EH-200 controllers to certain BMS systems.

This feature is available by using registers 500 – 516. The address of first register under investigation is written to register 500. Then this register and next 15 registers following that address can be read or write from registers 501 – 516.

Example:

Let's read registers 128 – 143 using window registers:

1. Write the address 128 to register 500.
2. Read the values of registers 128 – 143 from registers 501 – 516.

7.2 Mirror registers

In some of the EH-200 controllers settings registers, two different controller settings are located in to the same single Modbus register, one in it's upper (MSB) and other in it's lower (LSB) byte. If the other setting (in MSB for example) is going to be changed remotely, care must be taken to ensure that the other setting in the same register (LSB in this example) remains unchanged. This solution might cause problems with certain BMS systems.

So called mirror registers can be used to overcome above mentioned problem. All Modbus operations can be done with mirror registers. Mirror registers addresses and content in EH-200 controllers are the following:

- 2000 – 2271: Most Significant Bytes (MSB's) of registers 0 – 271
- 4000 – 4271: Least Significant Bytes (LSB's) of registers 0 – 271
- 6000 – 6543: registers 0 – 271 MSB's and LSB's divided as follows:
6000 = register 0 MSB, 6001 = register 0 LSB, 6002 = register 1 MSB, 6003 = register 1 LSB 6542 = register 271 MSB, 6543 = register 271 LSB

Example: register 130 MSB = H1 Amount of drop
register 130 LSB = H1 Supply water maximum

We can read and write only "H1 Amount of drop" by using register 2130
We can read and write only "H1 Supply water maximum" by using register 4130
or
We can read and write only "H1 Amount of drop" by using register 6260
We can read and write only "H1 Supply water maximum" by using register 6261

Appendix 1: EH-200 Modbus register's individual addresses

Categories:

P1 = data is updated from the controller to the Modbus card approx. every 5s

P2 = data is updated from the controller to the Modbus card approx. every 30s

P3 = data is updated from the controller to the Modbus card approx. every 60s

N1 – N7 = data is updated from the controller to the Modbus card whenever it is changed locally from the controller's user interface.

Modbus register address	Task	Limits	Controller version info	Category / supported Modbus FC
TIME				P3 / 03 (r), 06 (w), 16 (w)
0, 0x0	Year	1995...2094		
1 MSB	Month	1...12		
1 LSB	Day	1...31		
2 MSB	Hour	0...23		
2 LSB	Minute	0...59		
3 MSB	Second	0...59		
3 LSB	Weekday, input, 0 = Sunday	0...6		N5 / 03 (r), 06 (w), 16 (w)
TIME PROGRAMS : H1,H2 and HW control circuits				N1 / 03 (r), 06 (w), 16 (w)
4	First switching moment (from the beginning of a 24 hour period-in minutes)	0...1440 [min]		
5 LSB	Control circuit and function connected to first switching moment Bytes 0...3: 0000 = H1 0001 = H2 0010 = HW byte 4 = 1: drop on (H1, H2) increase on (HW) byte 5 = 1: drop off (H1, H2) increase off (HW)	0x10...0x22		
5 MSB	Weekdays connected to first switching moment LSB = Monday... MSB = 0.	0...0x7F		
6	Second switching moment time	0...1440 [min]		
7 LSB	Control circuit connected to second switching moment	0x10...0x22		
7 MSB	Weekdays connected to second switching moment	0...0x7F		
8	Third switching moment time	0...1440 [min]		
9 LSB	Control circuit and function connected to third switching moment	0x10...0x22		
9 MSB	Weekdays connected to third switching moment	0...0x7F		
...				
58	Last switching moment time	0...1440 [min]		
59 LSB	Control circuit and function connected to last switching moment.	0x10...0x22		
59 MSB	Weekdays connected to last switching moment	0...0x7F		

Modbus register address	Task	Limits	Controller version info	Category / supported Modbus FC
TIME PROGRAMS: Relays R1 and R2			Not EH-203G and 202G	N2 / 03 (r), 06 (w), 16 (w)
60	First switching moment (from the beginning of a 24 hour period-in minutes)	0...1440 [min]		
61 LSB	Relay and function connected to first switching moment Byte 0...3: 0011 = R1 0100 = R2 byte 4 = 1: relay on byte 5 = 1: relay off	0x13...0x24		
61 MSB	Weekdays connected to first switching moment LSB = Monday... MSB = 0.	0...0x7F		
62	Second switching moment time	0...1440 [min]		
63 LSB	Relay and function connected to second switching moment	0x13...0x24		
63 MSB	Weekdays connected to second switching moment	0...0x7F		
64	Third switching time	0...1440 [min]		
64 LSB	Relay and function connected to third switching time	0x13...0x24		
64 MSB	Weekdays connected to third switching time	0...0x7F		
...				
114	Last switching moment time	0...1440 [min]		
115 LSB	Relay and function connected to last switching moment	0x13...0x24		
115 MSB	Weekdays connected to last switching moment	0...0x7F		
SETTINGS FOR CONTROL CIRCUITS			Addresses 128–156 not in use EH-201V	N3 / 03 (r), 06 (w), 16 (w)
128 LSB	H1 Curve setting -20	5...120 [°C]		
128 MSB	H1 Curve setting 0	5...120 [°C]		
129 LSB	H1 Curve setting +20	5...120 [°C]		
H1 5-point curve setting			EH-203 rev. 2.10 ->	N3 / 03 (r), 06 (w), 16 (w)
320 LSB	1 = basic curve (3-point) 0 = expanded curve (5-point)			
320 MSB	Supply water setting at an outdoor temperat. of -20 degrees (point 1).	5...120 [°C]		
321 LSB	Supply water setting at a point 2	5...120 [°C]		
321 MSB	Supply water setting at a point 3	5...120 [°C]		
322 LSB	Supply water setting at a point 4	5...120 [°C]		
322 MSB	Supply water setting at an outdoor temp. of +20 degrees (point 5)	5...120 [°C]		
323 LSB	Point 2 outdoor temperature (see register 321 LSB)	-20...+20 [°C]		
323 MSB	Point 3 outdoor temperature (see register 321 MSB)	-20...+20 [°C]		

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Modbus register address	Task	Limits	Controller version info	Category / supported Modbus FC
... continue SETTINGS FOR CONTROL CIRCUITS			Addresses 128 – 156, not in use EH-201V	N3 / 03 (r), 06 (w), 16 (w)
324 LSB	Point 4 outdoor temperature (see register 322 LSB)	-20...+20 [°C]		
324 MSB	Curve's parallel shift			
129 MSB	H1 Supply water minimum	5...95 [°C]		
130 LSB	H1 Supply water maximum	5...125 [°C]		
130 MSB	H1 Amount of drop	0...35 [°C]		
131 LSB	H1 Amount of pre-increase	0...15 [°C]		
131 MSB	H1 Room compensation ratio	0...7 [°C]		
132 LSB	H1 Supply wat. freeze protect limit 0	5...20 [°C]		
132 MSB	H1 Supply water freeze protect limit-20	10...50 [°C]		
133 LSB	H1 Return water lower limit 0	5...20 [°C]		
133 MSB	H1 Return water lower limit -20	10...50 [°C]		
134 LSB	H1 Return water maximum	25...95 [°C]		
134 MSB	H1 Quantity of drop according to the exhaust fan	0...-10 [°C]		
135 LSB	H1 Autumn drying temperature level	0...15 [°C]		
135 MSB	H1 Wind/ E compensation lower limit	0...100 [%]	E-comp: EH-203 v.2.17->	
136 LSB	H1 Wind/E compensation upper limit	0...100 [%]	E-comp: EH-203 v.2.17->	
136 MSB	H1 Sun compensation lower limit	0...100 [%]	Removed EH-203 v.2.17->	
137 LSB	H1 Sun compensation upper limit	0...100 [%]	Removed EH-203 v.2.17->	
137 MSB	H1 Outdoor temperature delay time	0...10 [h]		
138 LSB	H1 Room temperature delay time	0...2.0 [h] (0.5 h step)		
138 MSB	H1 Actuator selection: 0 = 3-point control 1 = 0-10 V 2 = 2-10 V 3 = 230 V actuator	0...3		
139 LSB	H1 Control allowed = 0 / prohibited = 1 after pump stop limit	0...1		
139 MSB	H1 Pre-increase time	0...5 [h]		
140 LSB	H1 Wind/E compensation ratio	-7...7 [°C]	E-comp: EH-203 v.2.17->	
140 MSB	H1 Sun compensation ratio	0...7 [°C]	Removed EH-203 v.2.17->	
141 LSB	H1 Supply water alarm limit	1...75 [°C]		
141 MSB	Not in use			
142	Not in use			
143	H1 room temperature setting	5.0...45.0 [°C]		
144	H1 P-area	10...300 [°C]		
145	H1 I-area	5...300 [s]		
146	H1 D-area	0...10.0 [s]		
147	H1 actuator drive time	5...300 [s]		
148	H2 room temperature setting	5.0...45.0 [°C]	Not EH-201L	
149	H2 P-area	10...300 [°C]	Not EH-201L	

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Modbus register address	Task	Limits	Controller version info	Category / supported Modbus FC
... continue SETTINGS FOR CONTROL CIRCUITS			Addresses 128 – 156 not in use EH-201V	N3 / 03 (r), 06 (w), 16 (w)
150	H2 I-time	5...300 [s]	Not EH-201L	
151	H2 D-time	0...10.0 [s]	Not EH-201L	
152	H2 actuator drive time	5...300 [s]	Not EH-201L	
153	Not in use			
154	Not in use			
155	Exhaust gas maximum limit	150...300 [°C]	EH-203 v1.22-v.2.10	
156	Exhaust gas minimum limit	10...150 [°C]	EH-203 v1.22-v.2.10	
Contents of addresses 157-171 in EH-203			EH-203	
157 LSB	H2 Curve setting -20	5...120 [°C]		
157 MSB	H2 Curve setting 0	5...120 [°C]		
158 LSB	H2 Curve setting +20	5...120 [°C]		
H2, 5-point curve setting			EH-203 rev. 2.10 ->	N3 / 03 (r), 06 (w), 16 (w)
325 LSB	1 = basic curve (3-point) 0 = expanded curve (5-point)			
325 MSB	Supply water setting at an outdoor temperature of -20 degrees (point 1).	5...120 [°C]		
326 LSB	Supply water setting at a point 2	5...120 [°C]		
326 MSB	Supply water setting at a point 3	5...120 [°C]		
327 LSB	Supply water setting at a point 4	5...120 [°C]		
327 MSB	Supply water setting at an outdoor temperature of +20 degrees (point 5)	5...120 [°C]		
328 LSB	Point 2 outdoor temperature (see register 326 LSB)	-20...+20 [°C]		
328 MSB	Point 3 outdoor temperature (see register 326 MSB)	-20...+20 [°C]		
329 LSB	Point 4 outdoor temperature (see register 327 LSB)	-20...+20 [°C]		
329 MSB	Curve's parallel shift			
Settings for H2 control circuit continue....				
158 MSB	H2 Supply water minimum	5...95 [°C]		
159 LSB	H2 Supply water maximum	5...125 [°C]		
159 MSB	H2 Amount of drop	0...35 [°C]		
160 LSB	H2 Amount of pre-increase	0...15 [°C]		
160 MSB	H2 Supply water freeze protect limit 0	5...20 [°C]		
161 LSB	H2 Supply water freeze protect limit -20	10...50 [°C]		
161 MSB	H2 Autumn drying temperature level	0...15 [°C]		
162 LSB	H2 Room compensation ratio	0...7 [°C]		
162 MSB	H2 Wind/E compensation lower limit	0...100 [%]	E comp. EH-203 v. 2.17	

Modbus register address	Task	Limits	Controller version info	Category / supported Modbus FC
163 LSB	H2 Wind/E compensation upper limit	0...100 [%]	E comp. EH-203 v. 2.17	
163 MSB	H2 Sun compensation lower limit	0...100 [%]	Removed EH-203 v.2.17	
164 LSB	H2 Sun compensation upper limit	0...100 [%]	Removed EH-203 v.2.17	
164 MSB	H2 Outdoor temperature delay time	0...10 [h]		
165 LSB	H2 Room temperature delay time	0...2.0 [h] (0.5 h step)		
165 MSB	H2 Actuator selection: 0 = 3-point control 1 = 0-10 V 2 = 2-10 V 3 = 230 V actuator	0...3		
Contents of addresses 157-171 in EH-203			EH-203	
166 LSB	H2 Control allowed = 0 / prohibited = 1 after pump stop limit	0...1		
166 MSB	H2 Pre-increase time	0...5 [h]		
167 LSB	H2 Wind/ E compensation ratio	0...7 [°C]	E comp. v. 2.17->	
167 MSB	H2 Sun compensation ratio	0...7 [°C]	Removed v.2.17 ->	
168 LSB	H2 Supply water alarm limit	1...75 [°C]		
168 MSB	Not in use			
169 LSB	Not in use			
169 MSB	Burner start-up limit	5...95 [°C]	EH-203 v1.22 onward	
170 LSB	Burner hysteresis	1...10 [°C]	EH-203 v1.22 onward	
170 MSB	Electric heater start-up limit	5...95 [°C]	EH-203 v1.22 onward	
171 LSB	Electric heater hysteresis	1...10 [°C]	EH-203 v1.22 onward	
171 MSB	Exhaust gas temperature measurement alarm delay	0...6 [min]	EH-203 v1.22 onward	
Contents of addresses 157-171 in EH-201L.			EH-201L	
157 LSB	Full effect geothermal heating setting	5...55 [°C]		
157 MSB	Full effect geothermal heating hysteresis (measurement 10)	3...10 [°C]		
158 LSB	Limited effect geothermal heating setting	5...70 [°C]		
158 MSB	Limited effect geothermal heating hysteresis (measurement 10)	3...5 [°C]		
159 LSB	Limited effect geothermal heating hysteresis (measurement 9)	3...10 [°C]		
159 MSB	Min. temp. of limited effect geothermal heating accumulator's bottom part	30...55 [°C]		
169 MSB	Burner start-up limit	5...95 [°C]	EH-201L v1.30 onward	
170 LSB	Burner hysteresis	1...10 [°C]	EH-201L	

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170 MSB	Electric heater start-up limit	5...95 [°C]	v1.30 onward EH-201L v1.30 onward	
171 LSB	Electric heater hysteresis	1...10 [°C]	EH-201L v1.30 onward	
171 MSB	Exhaust gas temperature measurement alarm delay	0...6 [min]	EH-201L v1.30 onward	
Settings for HW circuit				
172	HW Temperature setting	5.0...95.0 [°C]	Not EH-201L	
173	HW Amount of increase	0...25 [°C]	Not EH-201L	

Modbus register address	Task	Limits	Controller version info	Category / supported Modbus FC
...continue				
Settings for HW circuit				
174	HW Alarm limit	65...120 [°C]	Not EH-201L	
175	HW Anticipate	50...250 [°C]	Not EH-201L	
176	HW P-area	10...300 [°C]	Not EH-201L	
177	HW I-time	5...300 [s]	Not EH-201L	
178	HW D-time	0...10.0 [s]	Not EH-201L	
179	HW Actuator selection: 0 = 3-point control 1 = 0-10 V 2 = 2-10 V 3 = 230 V actuator	0...3	Not EH-201L	
180	HW Actuator drive time	5...300 [s]	Not EH-201L	
181	HW quick run [%]	0...100 [%]	Not EH-201L	
182	HW Alarm delay time	0...12 [10s], (0...120 s)	Not EH-201L	
183	HW supply water alarm limit	1...75 [°C]	Not EH-201L	
184	Not in use			
185	Not in use			
CONFIGURATION OF MEASUREMENTS				N6 / 03 (r)
186 LSB	Empty			
186 MSB	Outdoor temperature: 0...10 = Local channel 11 = LON 12 = Not in use	0...12		
187 LSB	H1 Supply water	0...12, not 11		
187 MSB	H1 Room temperature	0...12		
188 LSB	H1 Return	0...12, not 11		
188 MSB	Domestic hot water	0...12, not 11		
189 LSB	Domestic hot water anticipate	0...12, not 11		
189 MSB	H2 Supply water	0...12, not 11		
190 LSB	H2 Room temperature	0...12		
190 MSB	EH-203: Measurement 6 (free text) EH-201/L: Measurement 3 (free text) EH-201/V: Measurement 4 (free text)	0...12, not 11		
191 LSB	Measurement 10 (free text)	0...12, not 11		
191 MSB	Wind/ E measurement	0...12	E comp.EH-203 v. 2.17	
192 LSB	Sun measurement/Pressure	0...12	EH-203 v. 2.0 ->	
192 MSB	Not in use			

Modbus register address	Task	Limits	Controller version info	Category / supported Modbus FC
193 LSB	Not in use			
193 MSB	Measurement 11 (free text)	0...12, not 11		
194 LSB	Measurement 9 (free text)	0...12, not 11		
194 MSB	KL energy measurement: 0...2 = Digital input 11 = LON 99 = Not in use	0...2, 11, 99		
195 LSB	Facility water consumption measurement: 0...2 = Digital input 11 = LON 99 = Not in use	0...2, 11, 99		
195 MSB	Exhaust gas temperature measurement	0...12, not 11	EH-203 v1.22 and EH-201L v1.20 onward	
196 LSB	Energy meter connected (0=no, 1=yes)	0...1	EH-203	
196 MSB				
CONFIGURATION OF DIGITAL INPUTS				N6 / 03 (r), 06 (w), 16 (w)
197	bit3...bit0 = Input1 bit7...bit4 = Input2 bit11...bit8 = Input3 bit12...bit15 not in use 0000 = Alarm transfer 0001 = EF:speed ½, 2/2 0010 = Home/Away switch (201/V: HW temperature increase) 0011 = Pump run information 0100 = District heating energy reading 0101 = District heating water reading 0110 = Facility water consumption reading			
GENERAL SETTINGS				N6 / 03 (r), 06 (w), 16 (w)
198	Amount of energy corresponding to the energy meter's 1-pulse	0...100 [kWh] 0...25.0 [kWh]	Before v1.30 Starting at v1.30	
199	Amount of water corresponding to the water meter's 1-pulse	0...100 [l]		
200	District heating maximum output limit [kW]	0...999 [kW]		
201	Pump stop limit [C]	5...50 [°C]		
202 LSB	Relay 1: 0 = Not in use 1 = Time control 2 = Not allowed 3 = Not allowed 4 = 3-point control 5 = Pump control (summer stop) 6 = Time/outdoor temperature		Burner control (8) EH203 v1.22 and EH-201L v1.30 onward Geothermal heating (9,10)	

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	control 7 = Temperature controlled 8 = Burner control 9 = Full effect geothermal heating 10 = Limited effect geothermal heating		EH-201L	
Modbus register address	Task	Limits	Controller version info	Category / supported Modbus FC
... continue GENERAL SETTINGS				N6 / 03 (r), 06 (w), 16 (w)
202 MSB	Relay 2 0 = Not in use 1 = Time control 2 = Not allowed 3 = Parallel pump 4 = 3-point control 5 = Not allowed 6 = Not allowed 7 = Not allowed 8 = Electric heater control 11 = Compressor control in geothermal heating		Electric resistance control (8) EH-203 v1.22 and EH-201L v1.30 onward Compr.control (11) EH-201L	
203	Time interval for saving trend measurements [s]	0...65565 [s]		
204	Measurement channels [1-11] saved in trends, LSbit = channel 1	0...0x07FF		
205 LSB	Measurement 11 difference alarm limit	1...75 [°C]		
205 MSB	Relay outdoor temperature control limit	-30...20 [°C]		
206	Amount of water corresponding to one pulse of domestic hot water	0...25 [l] version 1.30 - > 0...100 [l]		
207	Lon sun measurement maximum limit in tens of luxes	0...900 [10lux], (0...9000 lux)		
208	Lon sun measurement minimum limit in tens of luxes	0...900 [10lux], (0...9000 lux)		
209	Lon wind measurement maximum limit m/s	0...10.0 [m/s]		
210	Lon wind measurement minimum limit m/s	0...10.0 [m/s]		
211 LSB	Supply water alarm delay time	0...12 [10min]		
211 MSB	Control limit for temperat. controlled relay	0...100 [°C]		
EH-203 v2.0 new registers:				
280 MSB	Pump 1 mechanical control (0=auto,16=On,32=Off)	0,16,32	EH203 2.0 ->	N7 / 03 (r),06(w),16(w)
280 LSB	Pump 2 mechanical control (0=auto,16=On,32=Off)	0,16,32	EH203 2.0 ->	N7 / 03 (r),06(w),16(w)
281 LSB	Pressure measurement measurement area	0...16,0 bar	EH203 2.0 ->	N7 / 03 (r),06(w),16(w)
281 MSB	Threshold value of the pressure	0...10,0 bar	EH203 2.0 ->	N7 / 03

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	measurement's upper limit alarm			(r),06(w),16(w)
282 LSB	Threshold value of the pressure measurement's fill alarm	0...10,0 bar	EH203 2.0 ->	N7 / 03 (r),06(w),16(w)
282 MSB	Threshold value of the pressure measurement's leakage alarm	0...10,0 bar	EH203 2.0 ->	N7 / 03 (r),06(w),16(w)
Modbus register address	Task	Limits	Controller version info	Category / supported Modbus FC
... continue EH-203 v2.0 new registers:				N6 / 03 (r), 06 (w), 16 (w)
283 LSB	Length of the consumption alarm's control period	0...99 min	EH203 2.0 ->	N7 / 03 (r),06(w),16(w)
283 MSB	Pump 2 type (0=Backup pump, 1=DHW pump, 2=Alternate pump)	0...2	EH203 2.0 ->	N7 / 03 (r),06(w),16(w)
284 LSB	Pump 1 indication mode (0=overcurrent protection, 1=running mode)	0...1	EH203 2.0 ->	N7 / 03 (r),06(w),16(w)
284 MSB	Pump 2 indication mode (0=overcurrent protection, 1=running mode)		EH203 2.0 ->	N7 / 03 (r),06(w),16(w)
285 LSB	Reporting day for energy measurement data 0 = not in use	0...31	EH203 2.0 ->	N7 / 03 (r),06(w),16(w)
CONTROL CIRCUIT OPERATION MODE AND MANUAL CONTROL				
340	H1 circuit operation mode 0 = Automatic 1 = Continuous day 2 = Continuous night 3 = Stand-by 4 = Manual control, mechanical 5 = Manual control, electric	0...5	Modbus-200 2.12 ->	N5/ 03 (r), 06 (w), 16 (w)
341	H2 circuit operation mode 0 = Automatic 1 = Continuous day 2 = Continuous night 3 = Stand-by 4 = Manual control, mechanical 5 = Manual control, electric	0...5	Modbus-200 2.12 ->	N5/ 03 (r), 06 (w), 16 (w)
342	HW circuit operation mode 0 = Automatic 4 = Manual control, mechanical 5 = Manual control, electric	0, 4, 5	Modbus-200 2.12 ->	N5/ 03 (r), 06 (w), 16 (w)
212	bit3...bit0 = H1 bit7...bit4 = H2 bit11...bit8 = HW 0000 = Automatic 0001 = Continuous day (not HW) 0010 = Continuous night (not HW) 0011 = Stand-by (not HW) 0100 = Manual control, mechanical 0101 = Manual control, electric 0110 = No increases (HW) 0111 = Continuous increase (HW)			N5 / 03 (r), 06 (w), 16 (w)

Modbus register address	Task	Limits	Controller version info	Category / supported Modbus FC
... continue CONTROL CIRCUIT OPERATION MODE AND MANUAL CONTROL				N6 / 03 (r), 06 (w), 16 (w)
213	LSByte: Control circuit: 0 = H1 1 = H2 2 = HW	0...2		Nothing / 03 (r), 06 (w), 16 (w)
	MSByte: Drive amount (position) DC (0-100 %) / Drive time 3-point-120...+120 s	0...100 [%] or -120...+120 [s]	Before version EH-203 v1.22	
	MSByte: Drive amount in percentage	-100...100 [%]	EH-203 v1.22, EH-201L v1.30 onward:	
TIME CONTROL MODE OF RELAYS				N6 / 03 (r), 06 (w), 16 (w)
214	Relay 1: bit0...bit11: Timer time bit12...bit15: Relay control function: 0 = Time control 1 = Continuous ON 2 = Continuous OFF 3 = Timer ON 4 = Timer OFF ATTENTION! The relay must be time controlled for this function to be possible	0...999 min 0...4	EH-203 v1.30 and EH-201L v1.30 onward	
215	Relay 2: bit0...bit11: Timer time bit12...bit15: Relay control function: 0 = Time control 1 = Continuous ON 2 = Continuous OFF 3 = Timer ON 4 = Timer OFF ATTENTION! The relay must be time controlled for this function to be possible	0...999 min 0...4	EH-203 v1.30 and EH-201L v1.30 onward	
SUPPLY WATER INFO				P3 / 03 (r), 04 (r)
216 LSB	H1 supply water corresponding with the curve	[°C]		
216 MSB	H1 room compensation effect	[°C]		
217 LSB	H1 wind/E compensation effect	[°C]	E-comp. EH-203 v.2.17->	
217 MSB	H1 sun/S compensation effect	[°C]	S-comp. EH-203 v.2.17->	
218 LSB	H1 reduced mode/temperature drop clock program effect	[°C]		
218 MSB	H1 pre-increase effect	[°C]		
219 LSB	H1 autumn drying effect	[°C]		
219 MSB	H1 outdoor temperature delay effect	[°C]		
220 LSB	EF ½ speed effect	[°C]		

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Modbus register address	Task	Limits	Controller version info	Category / supported Modbus FC
...continue SUPPLY WATER INFO			NOT EH-201V	P3 / 03 (r), 04 (r)
220 MSB	H1 max. limit effect	[°C]		
221 LSB	H1 min. limit effect	[°C]		
221 MSB	H1 return water limit effect	[°C]		
222 LSB	H1 DH output limit effect	[°C]		
222 MSB	Not in use			
223 LSB	H1 supply water setting	[°C]		
223 MSB	H2 supply water corresponding with the curve	[°C]	Not EH-201L	
224 LSB	H2 room compensation effect	[°C]	Not EH-201L	
224 MSB	H2 wind/ E compensation effect	[°C]	E comp. EH-203 v.2.17->	
225 LSB	H2 sun compensation effect (H2 s compensation effect)	[°C]	S-comp. only EH-203 v.2.17	
225 MSB	H2 reduced mode/temperature drop clock program effect	[°C]	Not EH-201L	
226 LSB	H2 pre-increase effect	[°C]	Not EH-201L	
226 MSB	H2 autumn drying effect	[°C]	Not EH-201L	
227 LSB	H2 outdoor temperature delay effect	[°C]	Not EH-201L	
227 MSB	H2 max. limit effect	[°C]	Not EH-201L	
228 LSB	H2 min. limit effect	[°C]	Not EH-201L	
228 MSB	Not in use			
229 LSB	H2 supply water setting	[°C]	Not EH-201L	
229 MSB	Not in use			
230 LSB	Not in use			
230 MSB	Not in use			
ANALOG MEASUREMENTS				
231	Outdoor temperature, output	-50.00...+50.00 [°C]		P3 / 03 (r), 04 (r)
232	H1 supply water	0...130.00 [°C]		P2 / 03 (r), 04 (r)
233	H1 room temperature, output	0...60.00 [°C]		P3 / 03 (r), 04 (r)
234	H1 return	0...130.00 [°C]		P3 / 03 (r), 04 (r)
235	Domestic hot water	0...130.00 [°C]		P1 / 03 (r), 04 (r)
236	Domestic hot water anticipate	0...60.00 [°C]		P1 / 03 (r), 04 (r)
237	H2 supply water	0...130.00 [°C]		P2 / 03 (r), 04 (r)
238	Measurement 6, output Measurement 3, output	0...60.00 [°C]	EH-203 EH-201L	P3 / 03 (r), 04 (r)
239	Measurement 9, output	0...130.00 [°C]		P3 / 03 (r), 04 (r)
240	Measurement 10, output	0...130.00 [°C]		P3 / 03 (r), 04 (r)

Modbus register address	Task	Limits	Controller version info	Category / supported Modbus FC
...continue ANALOG MEASUREMENTS				
241	Measurement 11, output	0...130.00 [°C]		P3 / 03 (r), 04 (r)
242	H1-valve position info	0...100 [%]		P2 / 03 (r), 04 (r)
243	H2- valve position info	0...100 [%]		P2 / 03 (r), 04 (r)
244	HW- valve position info	0...100 [%]		P1 / 03 (r), 04 (r)
245	Yesterday's average temperature			N5 / 03 (r), 04 (r)
246	Average temperature of the day before last			N5 / 03 (r), 04 (r)
EH203 v2.0 new registers:				
290	DH Supply	0...130 [°C]	EH203 2.0 ->	P3 / 03 (r)
291	DH Return	0...130 [°C]	EH203 2.0 ->	P3 / 03 (r)
292	Network pressure measurement	0...16 [bar]	EH203 2.0 ->	P3 / 03 (r)
308 – 309	DH Energy from the energy meter	0...999999 [kWh]	EH203 2.0 ->	P3 / 03 (r)
310 – 311	DH Water from the energy meter	0...999999.99 [m ³]	EH203 2.0 ->	P3 / 03 (r)
COUNTERS				
247 and 248	DH Energy measurement, output	0...99999.9 [MWh]		P3 / 03 (r), 04 (r)
249 and 250	DH Water measurement, output	0...9999999.9 [m ³]		
251 and 252	Facility water measurement, output	0...99999.9 [m ³]		
DIGITAL STATES				
253	bit0 = Digital input 1 state bit1 = Digital input 2 state bit2 = Digital input 3 state bit3 = Relay output 1 state (1 = relay activated) bit4 = Relay output 2 state (1 = relay activated) bit5 = Output inhibiting H1 (1 = on) bit6...bit8 Not in use bit9 = Category poll request N1 bit10 = Category poll request N2 bit11 = Category poll request N3 bit12 = Category poll request N4 bit13 = Category poll request N5 bit14 = Category poll request N6 bit15 = Category poll request N7			P1 / 03 (r), 04 (r)

Modbus register address	Task	Limits	Controller version info	Category / supported Modbus FC
ALARMS				
272	General alarm Bit 0 = A-general alarm Bit 1 = B-general alarm Function: If a classified alarm is active the bit mode is 1, otherwise it is 0. If a new alarm is received when the general alarm bit mode is already at 1, it returns to 0 for 20 seconds before it reverts back.			
254	0 = No alarms bit0 = Sensor fault at channel 1 (A) bit1 = Sensor fault at channel 2 (A) bit2 = Sensor fault at channel 3 (B) bit3 = Sensor fault at channel 4 (B) bit4 = Sensor fault at channel 5 (A) bit5 = Sensor fault at channel 6 (B) bit6 = Sensor fault at channel 7 (B) bit7 = Sensor fault at channel 8 (B) bit8 = Sensor fault at channel 9 (B) bit9 = Sensor fault at channel 10 (B) bit10 = Sensor fault at channel 11 (B) bit11 = Freeze protect alarm H1 (A) bit12 = Freeze protect alarm H2 (A) bit13 = Dom. hot water overheat (B) bit14 = Pump stopped (A) EH.203 v.2.0-> pump 1 alarm (A) bit15 = External alarm dig input 1 (A)			
255	bit0 = External alarm dig. input 2 (A) bit1 = External alarm dig. input 3 (A) bit2 = Freeze protect alarm H1 return water (A) bit3 = Fault in LON sensor (B) bit4 = H1 supply water alarm (B) bit5 = H2 supply water alarm (B) bit6 = HW supply water alarm (B) bit7 = Measurement 11 difference alarm (B) bit8 = Exhaust temperature maximum limit alarm (B) bit9 = Exhaust temperature minimum limit alarm (B) bit10 = Ground liquid temperature minimum limit alarm (B) bit11 = Pressure measurement, upper limit alarm (B) bit12 = Pressure measurement, fill alarm (A) bit13 = Pressure measurement, lower limit alarm (A) bit14 = Water consumption alarm (B) bit15 = pump 2 alarm (A)		bit8 and 9: EH-203 v1.22 and EH-201L v.1.30 onward bit10: EH-203 v. 1.22 onward bit11-15: EH-203 v. 2.0 onward	

Modbus register address	Task	Limits	Controller version info	Category / supported Modbus FC
WRITING A VALUE FOR NETWORK MEASUREMENTS				Nothing / 06 (w), 16 (w)
256	Outdoor temperature, input	-70.00...60.00 [°C]		
257	H1 room temperature, input	-10.00...60.00 [°C]		
258	H2 room temperature, input	-10.00...60.00 [°C]		
259	Wind measurement/S comp., input	0...50.0 [m/s]	S-komp. EH-203 v. 2.17->	
260	Sun measurement, input	0...30000 [lx]	removed EH-203 v.2.17->	
261 and 262	DH Energy measurement, input	0...999999.9 [MWh]		/ 16 (w)
263 and 264	Facility water measurement, input	0...999999.9 [m ³]		/ 16 (w)
CONTROL OF TEXT FIELD TRANSFER, RESETTING CATEGORY BITS				Nothing / 03 (r), 06 (w), 16 (w)
265	<p>Text field transfer:</p> <p>1 = Transfer digital input 1 text 2 = Transfer digital input 2 text 3 = Transfer digital input 3 text 4 = Transfer measurement 6 text 5 = Transfer measurement 9 text 6 = Transfer measurement 10 text 7 = Transfer measurement 11 text 8 = Transfer relay 1 text 9 = Transfer relay 2 text</p> <p>Category acknowledgement: 0xFE = Reset category bits 9-15 from register 253</p> <p>Alarm message acknowledgement: 0xFF = alarm message received</p>			

Modbus register address	Task	Limits	Controller version info	Category / supported Modbus FC
CONTROLLER TEXT FIELD TRANSFER				Nothing / 03 (r)
266 LSB	The text is read starting at 266 lower byte and going to the NULL-character, but up to 271 upper byte maximum.			
266 MSB				
267 LSB				
267 MSB				
268 LSB				
268 MSB				
269 LSB				
269 MSB				
270 LSB				
270 MSB				
271 LSB				
271 MSB				

BROADCAST-REGISTERS	The following modbus registers are the same for all of the Ouman devices so these registers must be used if the above mentioned measurements are sent as Broadcast-messages to Ouman devices.			
450	Outdoor temperature			/ 03 (r), 06(w),16(w)
SPECIAL REGISTERS				Nothing / 03 (r)
400	Value is 0x00FF if data in registers belonging to groups N1-N7 is updating between controller and Modbus registers. Value is 0x0000 if data is ready. Value is 0x00FF if updating incomplete			
500 – 516	Window registers, look chapter 6.1			
2000 - 2271	MSB mirror registers, look chapter 6.2			
4000 - 4271	LSB mirror registers, look chapter 6.2			
6000 - 6543	MSB and LSB mirror registers, look chapter 6.2			

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Modbus register address	Task	Limits	Controller version info	Category / supported Modbus FC
CONTROLLER TYPE INFORMATION				/ 43
Object Id:	Object value:			
Object Id 00	"OUMAN"			
Object Id 01	Device type (e.g. "201L")			
Object Id 02	Program version (e.g. "144" = 1.44)			

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