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USER GUIDE

PDS 2

Produal

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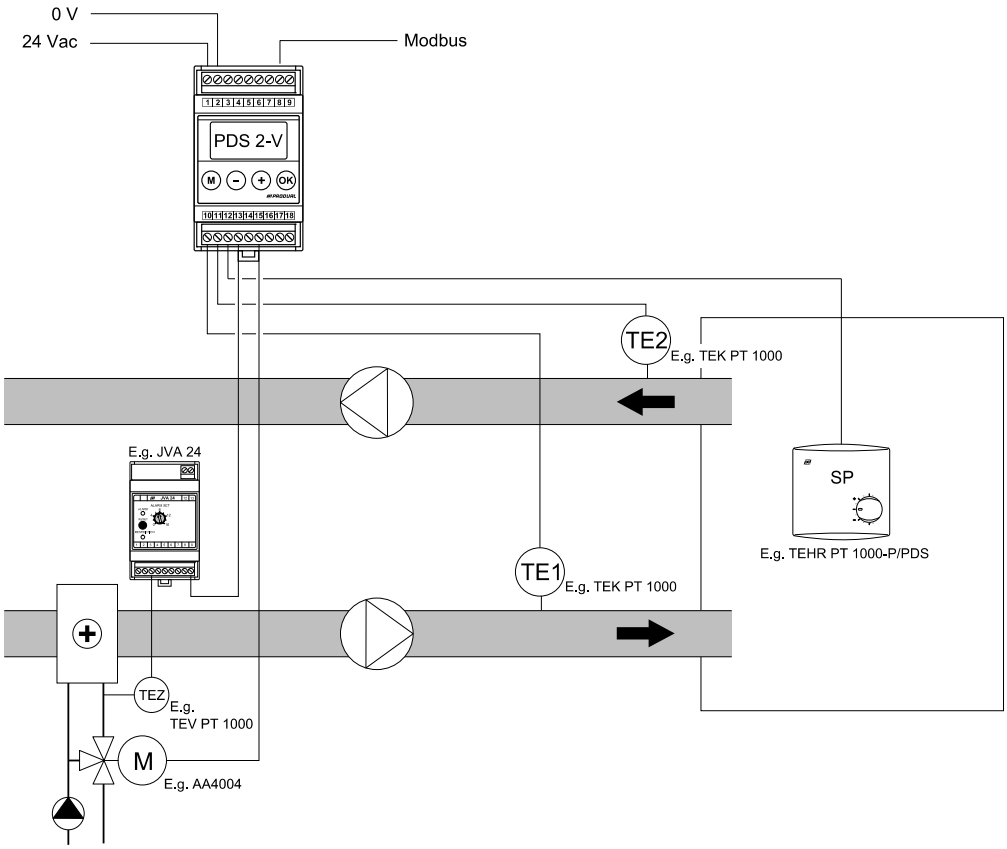
OPERATION

PDS 2 controller has two application profiles for different applications: PDS 2-V and PDS 2-H. PDS 2-V application profile is selected as a default.

PDS 2-V

PDS 2-V application profile is designed especially for air handling unit control and temperature control. The profile is applicable for constant value control and room/exhaust air temperature compensated control. In addition, the profile can also be used for domestic water temperature control.

Application example: Supply air temperature control

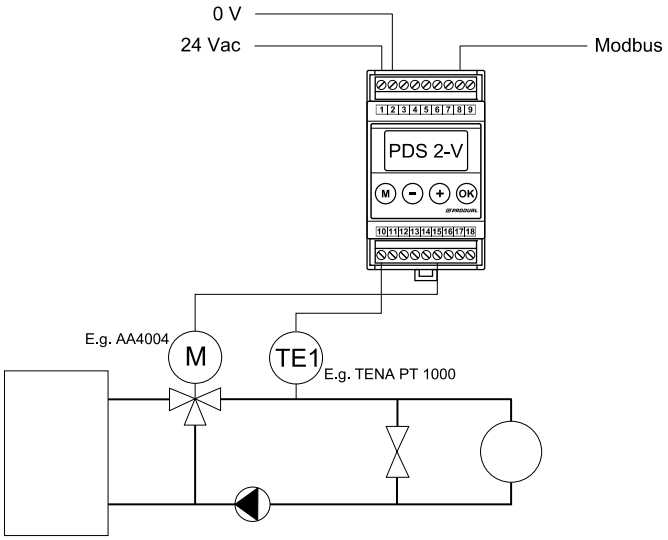


In the example diagram, PDS 2-V controls the supply air temperature (TE1) according to the set point (TE1SP) by controlling the heating radiator valve actuator (M). The set point is delivered to the controller via Modbus. The control also takes the exhaust air temperature (TE2) and room set point (SP) into consideration.

Instead of the duct sensor, TEHR PT 1000-P/PDS 2 device can also be used to detect the room temperature (TE2).

Information is subject to change without prior notice.

Application example: Domestic water temperature control (constant value control)



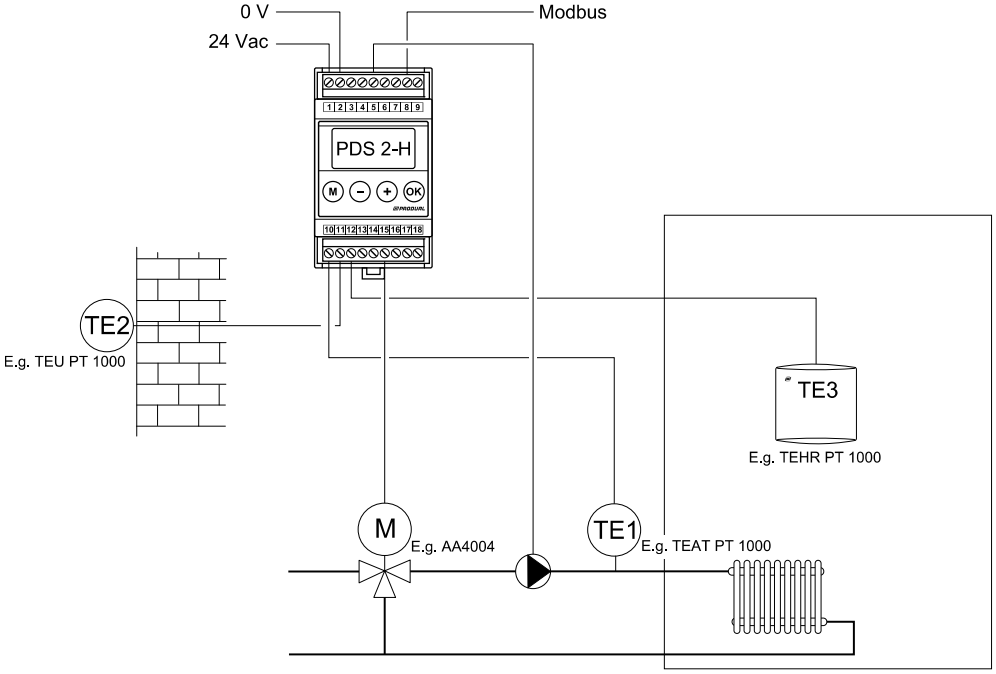
In the example diagram, PDS 2-V controls the domestic water temperature (TE1) according to the set point (TE1SP) by controlling the mixing valve actuator (M). The set point is delivered to the controller via Modbus.

NOTE: The controller temperature measurement TE2 and the set point input TE3 must be deactivated in this application.

PDS 2-H

PDS 2-H application profile is designed especially for outdoor temperature based heating water circuit temperature control. The control accuracy can also be improved with room temperature compensation.

Application example: Room temperature control



In the example diagram, PDS 2-H controls the heating radiator supply water temperature (TE1) according to the outdoor temperature (TE2) by controlling the valve actuator (M). In addition to outdoor temperature, the control also takes room temperature set point (ROOM C) and room temperature (TE3) into consideration.

Information is subject to change without prior notice.

Selecting the application profile

The application profile can be selected when the supply voltage is connected to the device. See the wiring instructions from pages 4 (PDS 2-V) and 9 (PDS 2-H). PDS 2-V application profile is selected as a default.

1. Press the ”+” and ”-” buttons simultaneously for five seconds.

   The device version shows on the display for five seconds.

2. Press the OK button when ”APPL” is shown on the display.

   ”APPL” text starts to flash.

   NOTE: The device returns to user mode if the buttons are not pushed during 10 seconds.

3. Select the wanted application by pushing the "+" and "-" buttons.
4. Push the OK button.

   The confirmation question appears on the display.

5. Press the OK button to accept the application selection.

   NOTE: You can return to previous display without accepting the selection by pressing the M button.

USING THE PDS 2-V APPLICATION PROFILE

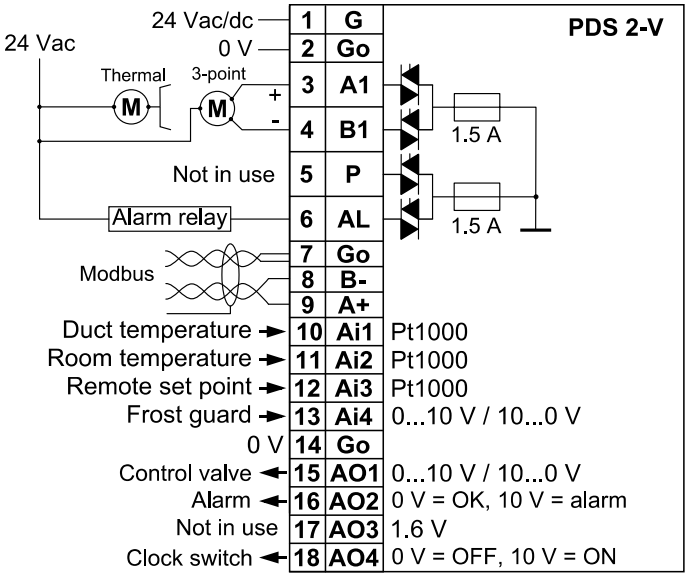
Commissioning



Device wiring and commissioning can only be carried out by qualified professionals. Always make the wirings while the power is switched off.

Wiring

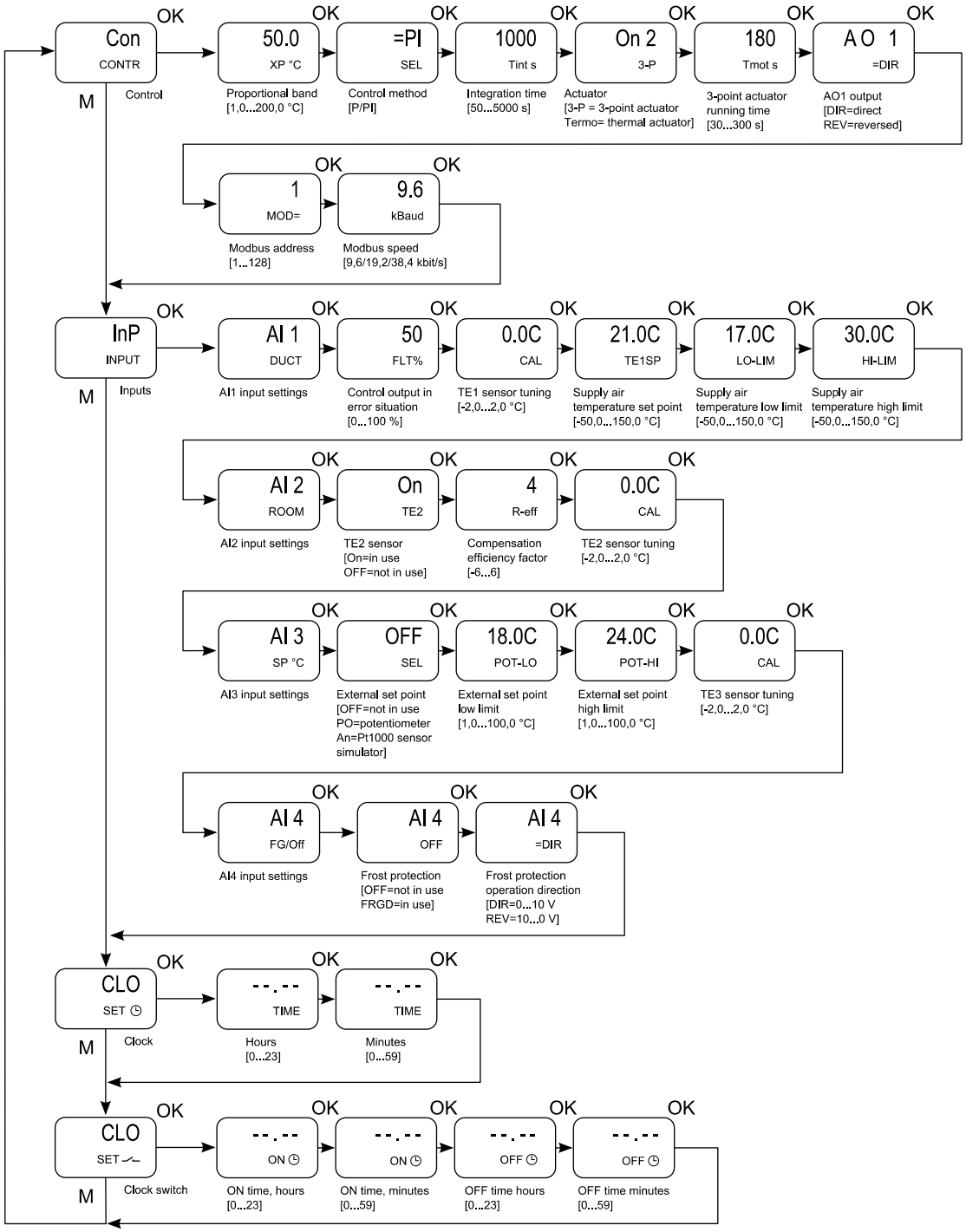
NOTE: To control thermal actuators and 3-point actuators AC supply voltage is required.



Information is subject to change without prior notice.

Menu

The device menu can be activated by pushing the buttons in the following sequence: “+”, “OK”, “OK”, “M”. You can exit the menu by pushing the “M” button for 5 seconds or by waiting for a minute.



Room / exhaust air temperature compensation

The room / exhaust air compensation is carried out by using the compensation efficiency factor (R-eff). The effective set point (effSP) is calculated as follows:

effSP = (SP-TE2) x R-eff + TE1SP, where

SP	room set point
TE2	room / exhaust air temperature
R-eff	compensation efficiency factor
TE1SP	supply air set point

Information is subject to change without prior notice.

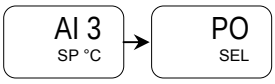
External set point

The external set point can be brought to the controller by connecting a potentiometer (control range 1…1,5 kΩ, e.g. TEHR PT 1000-P/PDS 2) or Pt1000 sensor simulator to the AI 3 input.

Setting the potentiometer set point range

After connecting the potentiometer, the potentiometer set point range can be set through the menu (the menu can be activated with the following button sequence: +, OK, OK, M).

1. Activate the potentiometer from AI 3 input settings.



   PO = potentiometer

2. Push the OK button.
3. Select the set point range low limit with + and - buttons.



4. Turn the potentiometer to the minimum position.

   The display starts to flash.

5. When the flashing stops, push the OK button to save the setting.
6. Select the set point range high limit with + and - buttons.



   NOTE: The potentiometer minimum and maximum value difference must be at least 2 ºC.

7. Turn the potentiometer to the maximum position.

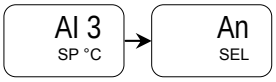
   The display starts to flash.

8. When the flashing stops, push the OK button to save the setting.

NOTE: You can leave the menu by pushing the M button for five seconds or by waiting for a minute.

Pt1000 sensor simulator

To use a Pt1000 sensor simulator, select An for AI 3 input type.



Frost protection

The controller's AI 4 input can be set to work as a frost protection input. By using this input, the controller can be controlled by a frost protection thermostat (JVS 24), for example.

The frost protection is carried out by adding the AI 4 input signal to the control valve output. In this way the heating energy increases which prevents the radiator freezing. The frost protection input direction (0…10 V / 10…0 V) can be set through the menu.

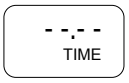
Information is subject to change without prior notice.

Clock switch

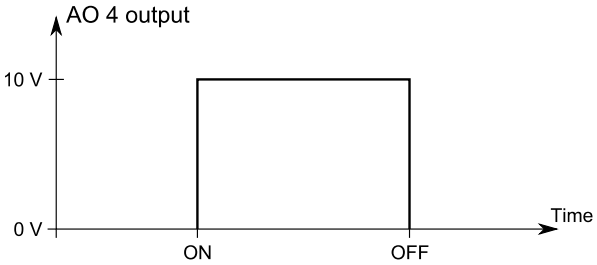
To use the clock switch you must set the time.

NOTE: The time must be checked/set after power failure.

The time is set through the menu. The clock can be deactivated by setting the hours and minutes to ”- -”.



The clock switch output is AO 4. When the clock switch is active, the output is 10 V (see the following figure).



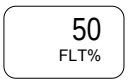
Alarms

Alarm output	Connector	Control signal	Status	Reason
Grounding	6	24 Vac Triac	Not connected = OK Connected = ALARM	Sensor fault
Voltage	16	0/10 V	0 V = OK 10 V = ALARM	Sensor fault

The alarms are also shown on the device display. For example, the room temperature sensor fault is shown on the display as follows:



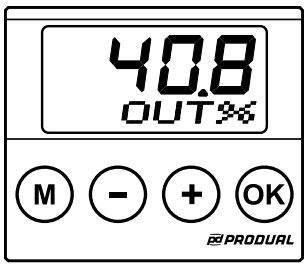
When an alarm activates, the control outputs (outputs A1, B1 and AO1) are driven to the value defined by the FLT% parameter.



User mode

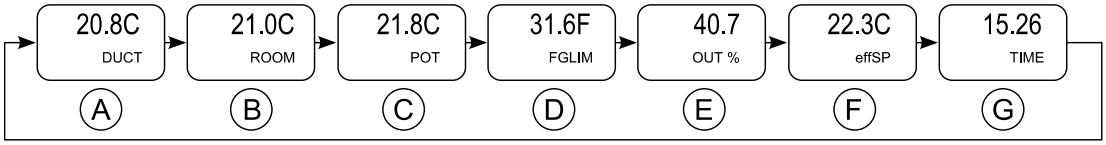
User interface

The device user interface consists of a display and four buttons.



Information is subject to change without prior notice.

The measuring values and controls which are relevant for the current control application scroll on the display. The views scroll in the following order.



A. Supply air temperature
B. Room / exhaust air temperature (visible only if the room / exhaust temperature sensor is in use)
C. Room temperature set point (visible only if the potentiometer or the sensor simulator is in use)
D. Frost protection effect (visible only if the frost protection thermostat signal affects the control)
E. Actuator control signal (0…100 %)
F. Effective set point
G. Time (visible only if the time is set)

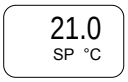
The wanted view can be locked to view continuously for a minute by pushing the OK button. The views can also be changed by pushing the OK button. The views return to scrolling mode after the buttons are not pushed during a minute.

Setting the room set point with controller buttons

NOTE: If the set point is set by a potentiometer, the effective set point can be checked by pushing the M button. However, the set point cannot be changed with the controller buttons.

NOTE: If the set point is set via Modbus (coil 5 = 1), the room set point change doesn't affect the control. The effective set point can be read via Modbus (register 30013).

1. Push the M button.

   The effective set point is shown on the display.

2. Push the - and + buttons to change the set point.
3. Wait for five seconds.

   The controller adopts the new set point and returns to normal operation.

Information is subject to change without prior notice.

USING THE PDS 2-H APPLICATION PROFILE

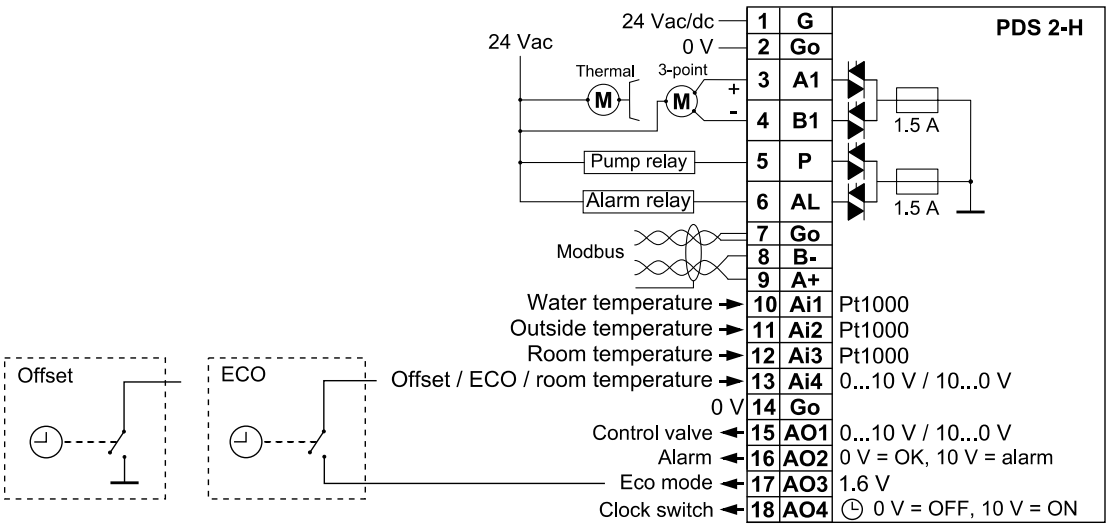
Commissioning

Caution

Device wiring and commissioning can only be carried out by qualified professionals. Always make the wirings while the power is switched off.

Wiring

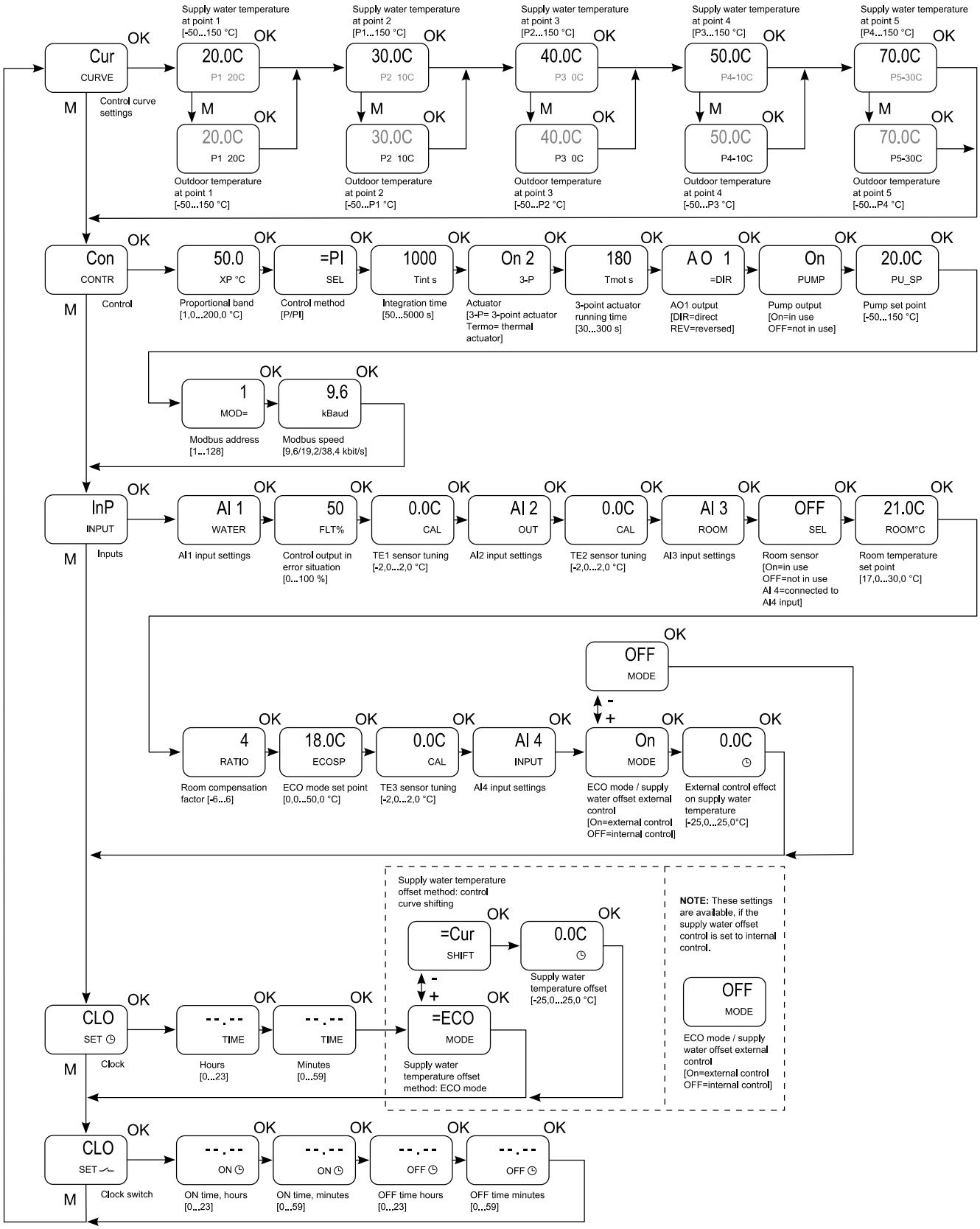
NOTE: To control thermal actuators and 3-point actuators AC supply voltage is required.



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Menu

The device menu can be activated by pushing the buttons in the following sequence: “+”, “OK”, “OK”, “M”. You can exit the menu by pushing the “M” button for 5 seconds or by waiting for a minute.

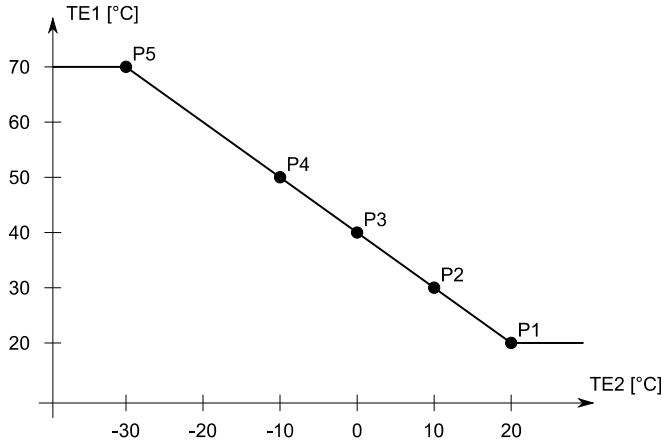


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Supply water temperature control

The controller controls the supply water temperature according to the five-point (P1…P5) curve that is based on the outdoor temperature. The outdoor temperature (TE2) and the corresponding supply water temperature (TE1) are set for every curve point during the commissioning. The curve points in the following figure are the factory defaults.

The curve points P1 and P5 are also the minimum and maximum limits for the water temperature.



Room temperature compensation

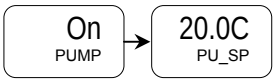
The room temperature compensation is carried out by using the compensation factor (RATIO). The effective set point (effSP) is calculated according to the following formula:

effSP = (ROOM C - TE3) x RATIO + TE1SP, where

ROOM C	room set point
TE3	room temperature
RATIO	compensation factor
TE1SP	supply water temperature set point (according to the curve)

Pump control

With the pump output (output P) you can control the circulation water pump, for example. The pump control can be activated through the menu.



When the outdoor temperature drops below the PU_SP parameter value, the pump is switched on. There is a 2 °C hysteresis in the switching.

Clock switch

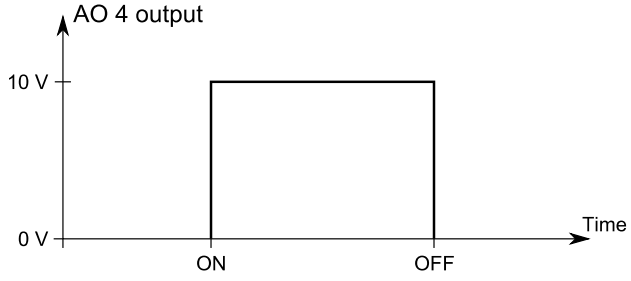
To use the clock switch you must set the time.

NOTE: The time must be checked/set after power failure.

The time is set through the menu. The clock can be deactivated by setting the hours and minutes to ”- -”.



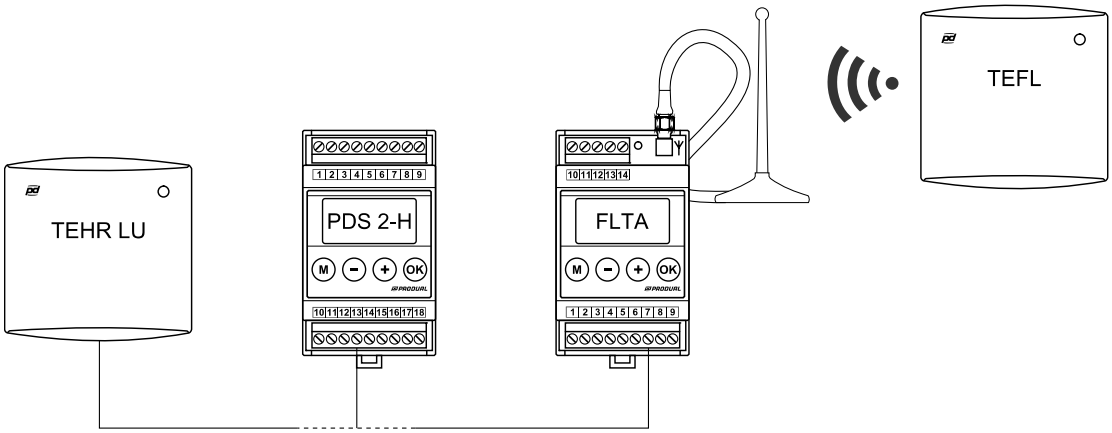
The clock switch output is AO 4. When the clock switch is active, the output is 10 V (see the following figure).



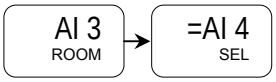
Information is subject to change without prior notice.

Using a transmitter as a room sensor

If needed, a wireless transmitter (e.g. TEFL) or 0…10 V room transmitter (e.g. TEHR LU) can be connected to the controller. The wireless base station FLTA is also needed for connecting the wireless transmitter.



The transmitter temperature signal is connected to the controller's AI 4 input. The transmitter signal must be formed so that 2…10 V corresponds to the 10…50 °C temperature (a signal below 2 V causes a sensor fault error). The transmitter can be activated through the menu.



NOTE: When the transmitter is in use, the ECO mode and supply water temperature offset can be used only via Modbus or by using the internal clock switch.

Setting an offset for supply water temperature

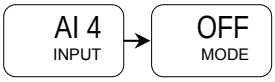
The supply water temperature can be adjusted by ±25 °C during night time, for example. The offset can be activated by using external input or with the controller's internal clock or via Modbus (registers 2 and 40006).

NOTE: When the supply water temperature offset is in use, the temperature transmitter cannot be used. The ECO mode can be used only via Modbus.

Setting an offset for supply water temperature by using the internal clock

The internal clock can be activated through the menu.

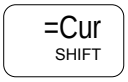
1. Set the AI 4 input to OFF.



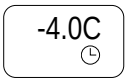
2. Set the time.



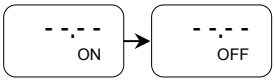
3. Select the =Cur SHIFT for supply water temperature adjustment method.



4. Select the offset.



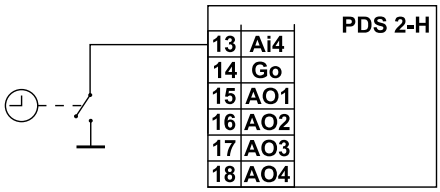
5. Set the clock switch ON and OFF times.



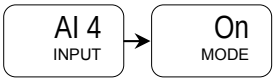
Information is subject to change without prior notice.

Setting an offset for supply water temperature by using an external input

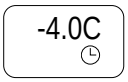
1. Connect the external switch to the AI 4 input.



2. Set the AI 4 input to On.



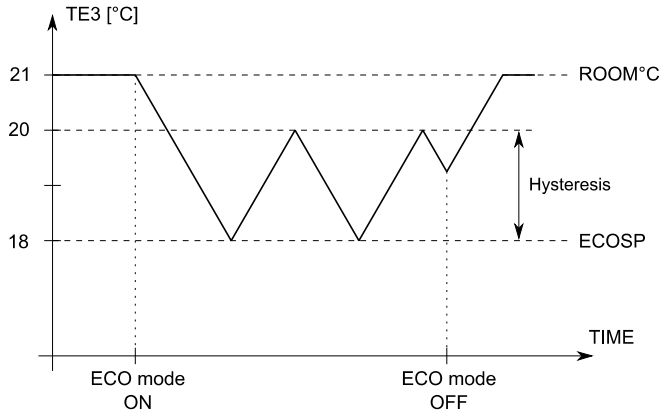
3. Select the offset.



ECO mode

NOTE: The room temperature measurement is required when using the ECO mode.

In the ECO mode the controller works as a thermostat that uses the ECOSP parameter value as a set point. When the room temperature (TE3) drops below the set point, the controller opens the valve and starts the circulation water pump. The controller closes the valve and stops the pump when the room temperature rises 2 °C (hysteresis) over the set point.

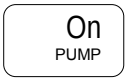


The ECO mode can be activated by using external input or with the controller's internal clock or via Modbus (register 3).

Activating the ECO mode by using the internal clock

NOTE: When the ECO is activated by using the internal clock, the supply water temperature offset can be used only via Modbus.

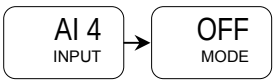
1. Activate the pump control.



2. Set the ECO mode set point.



3. Set the AI 4 input to OFF.



Information is subject to change without prior notice.

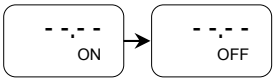
4. Set the time.



5. Select the =ECO mode for supply water temperature adjustment method.



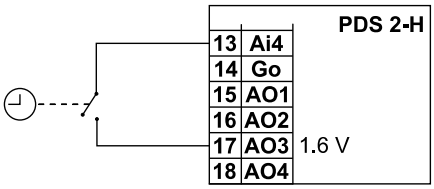
6. Set the clock switch ON and OFF times.



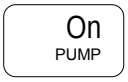
Enabling the ECO mode by using an external input

NOTE: When the ECO mode is activated by using the external input, the temperature transmitter cannot be used. The supply water temperature offset can be used only via Modbus.

1. Connect the external switch to the AI 4 input.



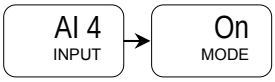
2. Activate the pump control.



3. Set the ECO mode set point.



4. Set the AI 4 input to On.



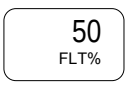
Alarms

Alarm output	Connector	Control signal	Status	Reason
Grounding	6	24 Vac Triac	Not connected = OK Connected = ALARM	Sensor fault
Voltage	16	0/10 V	0 V = OK 10 V = ALARM	Sensor fault

The alarms are also shown on the device display. For example, the room temperature sensor fault is shown on the display as follows:



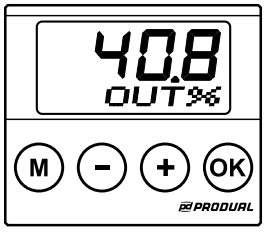
When an alarm activates, the control outputs (outputs A1, B1 and AO1) are driven to the value defined by the FLT% parameter.



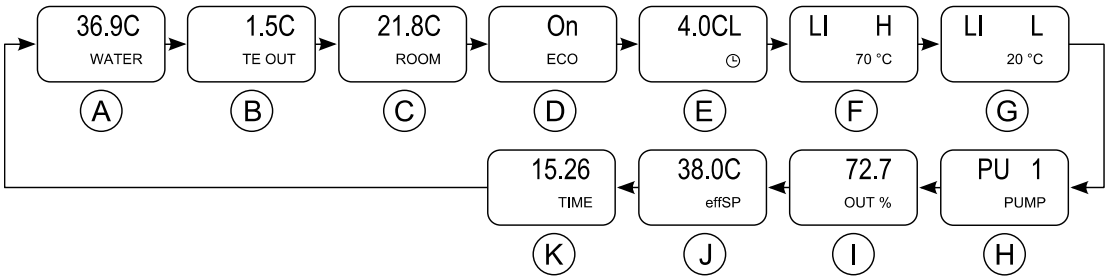
User mode

User interface

The device user interface consists of a display and four buttons.



The measuring values and controls which are relevant for the current control application scroll on the display. The views scroll in the following order.



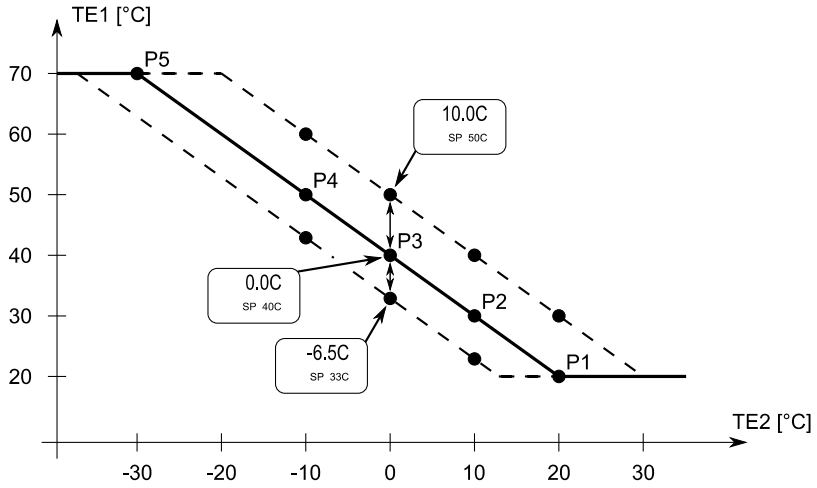
A. Supply water temperature
B. Outdoor temperature
C. Room temperature (visible only if the room temperature measurement is in use)
D. ECO mode active (visible only if the ECO mode is active)
E. Supply water temperature offset active (visible only if the offset is active)
F. Water temperature high limit reached (visible only when the effective supply water temperature is limited to maximum value)
G. Water temperature low limit reached (visible only when the effective supply water temperature is limited to minimum value)
H. Pump control status (visible only if the pump control is in use)
I. Actuator control signal (0…100 %)
J. Effective set point
K. Time (visible only if the time is set)

The wanted view can be locked to view continuously for a minute by pushing the OK button. The views can also be changed by pushing the OK button. The views return to scrolling mode after the buttons are not pushed during a minute.

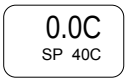
Information is subject to change without prior notice.

Setting an offset for supply water temperature

In the user mode, the supply water temperature can be adjusted by ±25 °C. The adjustment affects to the supply water temperature through a vertical shift of the temperature curve.

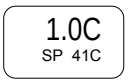


1. Push the M button.

   The current supply water offset value and the supply water effective set point are shown on the display.

2. Push the - and + buttons to change the offset value.

   NOTE: The offset value effect shows immediately on the effective set point.

3. Push the OK button.

   The controller adopts the new value and returns to normal operation.

MODBUS

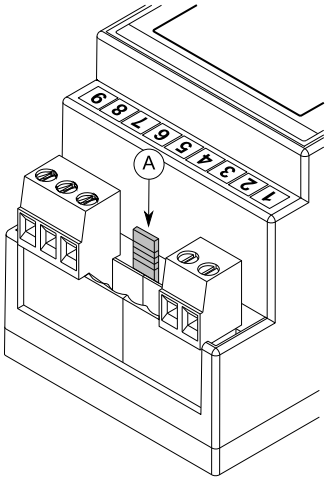
Bus properties

Protocol	RS-485 Modbus RTU
Bus speed	9600/19200/38400 bps
Data bits	8
Parity	none
Stop bits	1
Network size	up to 128 devices per segment.

Information is subject to change without prior notice.

Bus termination

The Modbus can be terminated by placing the termination jumper.



A. Termination jumper

Modbus function codes

The device supports the following Modbus function codes.

0x01	Read Coils
0x02	Read Discrete Inputs
0x03	Read Holding Registers
0x04	Read Input Registers
0x05	Write Single Coil
0x06	Write Single Register
0x10	Write Multiple Registers
0x16	Mask write Register

Modbus registers

NOTE: The registers marked with * are not in use in the PDS 2-V application profile.

NOTE: If you try to write a parameter value that is beyond the parameter value range, the value will be replaced by the nearest acceptable value.

Example:

1. The register value range is -500…500.
2. You try to write the value 600 to the register.

   -> the value 500 is written to the register.

Coils

Register	Parameter description	Data type	Values	Range	Default
2	*Modbus supply water temperature offset activation [1)]	Bit	0 - 1	0: Off, 1: On	0
3	*ECO mode by Modbus [1)]	Bit	0 - 1	0: Off, 1: On	0
4	Actuator output overdrive activation	Bit	0 - 1	0: Off, 1: On	0
5	Modbus supply water/air temperature set point activation	Bit	0 - 1	0: Off, 1: On	0
6	Alarm	Bit	0 - 1	0: Off, 1: On	0

[1)] The register is returned to factory default if the function is controlled by the controller (internal clock switch or external input).

Information is subject to change without prior notice.

Discrete inputs

Register	Parameter description	Data type	Values	Range
10002	*Supply water temperature offset asked by PDS 2 (clock switch)	Bit	0 - 1	0: Off, 1: On
10003	*ECO mode asked by PDS 2 (clock switch)	Bit	0 - 1	0: Off, 1: On
10004	*Supply water temperature offset active	Bit	0 - 1	0: Off, 1: On
10005	*ECO mode active	Bit	0 - 1	0: Off, 1: On
10006	*Pump status	Bit	0 - 1	0: Off, 1: On

Input registers

Register	Parameter description	Data type	Values	Range
30002	Discrete inputs 16 - 01	16 bit		
30003	Coils 16 - 01	16 bit		
30004	Actuator output overdrive	Signed 16	0…1000	0,0…100,0 %
30005	Modbus supply water/air temperature set point	Signed 16	-500…1500	-50,0…150,0 °C
30006	*Modbus supply water temperature offset	Signed 16	-250…250	-25,0…25,0 °C
30007	Clock switch ON time	Signed 16	0…1439, 65535	0…1439 min 65535 = time not set
30008	Clock switch OFF time	Signed 16	0…1439, 65535	0…1439 min 65535 = time not set
30009	Temperature TE1	Signed 16	-500…1500	-50,0…150,0 °C
30010	Temperature TE2	Signed 16	-500…1500	-50,0…150,0 °C
30011	Temperature TE3	Signed 16	-500…1500	-50,0…150,0 °C
30012	AI4 input voltage	Signed 16	0…100	0…10,0 V
30013	Effective set point	Signed 16	-500…1500	-50,0…150,0 °C
30014	Set point / external set point	Signed 16	-500…1500	-50,0…150,0 °C
30015	Output	Signed 16	0…1000	0,0…100,0 %

Holding registers

Register	Parameter description	Data type	Values	Range
40003	Coils 16 - 01	16 bit		
40004	Actuator output overdrive	Signed 16	0…1000	0,0…100,0 %
40005	Modbus supply water/air temperature set point	Signed 16	-500…1500	-50,0…150,0 °C
40006	*Modbus supply water temperature offset	Signed 16	-500…500	-50,0…50,0 °C
40007	Clock switch ON time	Signed 16	0…1439, 65535	0…1439 min 65535 = time not set
40008	Clock switch OFF time	Signed 16	0…1439, 65535	0…1439 min 65535 = time not set
41793	Clock switch ON time - OFF time (two reg. long)	Hexadecimal	0x000001… 0x59E059F, 0xFFFFFFFF	ON (0…1439 min) [00] OFF (0…1439 min) 0xFFFFFFFF = time not set

Information is subject to change without prior notice.