HLS 44-SE - room controller

User Guide

This user guide is for devices with the software version 2.1.3 or newer.

PRODUAL
measure - be sure.

Contents

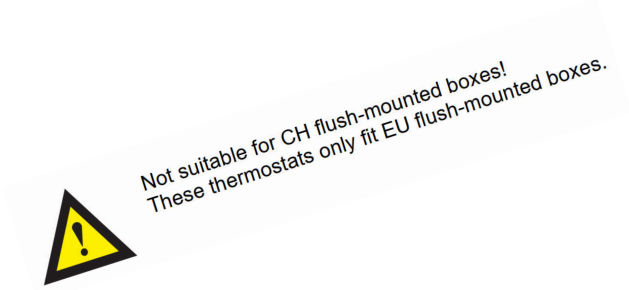
1 Commissioning

1.1 Mounting room controllers

The device can be installed in dry surroundings (IP20) by screws on the wall surface or on the standard flush mounting box. The recommended installation height is 150...180 cm.

The device position should be selected carefully. All the error factors that can affect to the measurements should be eliminated as well as possible. The following list defines the typical measurement error factors.

- direct sun light
- occupant proximity
- air flow coming from windows or doors
- air flow coming from ventilation nozzles
- air flow coming from the flush mounting box
- differential temperature caused by external wall

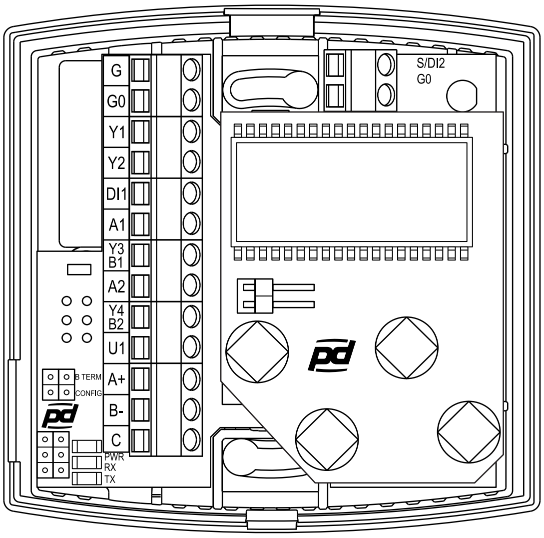


1.2 Wiring

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

Important: Always close the device cover before switching on the power.

NOTE **Note:** The supply voltage potential must be the same in the controller and in the connected 24 Vac actuators.



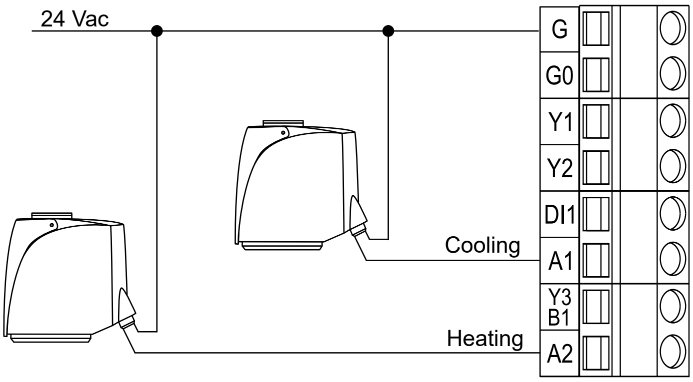
NOTE **Note:** Unused inputs and outputs can also be used for transferring other measuring and control information over the Modbus.

G	24 Vac/dc supply NOTE **Note:** Only the DC functions work when using DC supply voltage. To get full functionality, use AC supply.
G0	0 V
Y1	VAV control output, 0...10 Vdc, < 2 mA
Y2	Fan speed output, 0...10 Vdc, < 2 mA
DI1	Digital input, PIR / card switch for day/night mode change
A1	Cooling output, 24 Vac, < 1 A

Y3/B1	Cooling output or 6-way valve control output, 0...10 Vdc, < 2 mA
A2	Heating output, 24 Vac, < 1 A
Y4/B2	Heating output, 0...10 Vdc, < 2 mA
U1	CO_2 or external set point input, , 0...10 Vdc, < 2 mA
A+	Modbus RTU, RS-485. NOTE **Note:** The terminal *C* is galvanically isolated.
B-	
C	

S/DI2	External temperature sensor (NTC 10) input or digital input for door/window contact or condensation switch.
G0	0 V

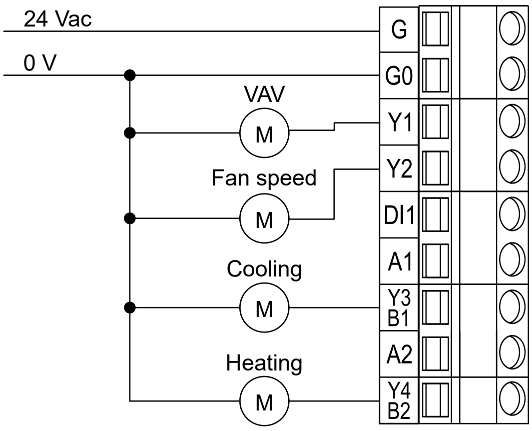
1.2.1 Thermal actuator wiring



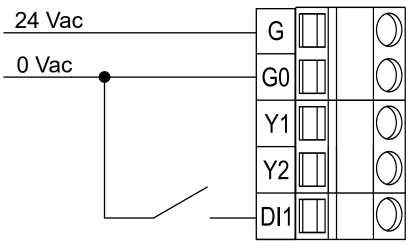
The maximum output current is 1 A. For example, up to three A 40405 thermal actuators can be connected to one output. Then the total current consumption doesn't exceed 1 A.

NOTE **Note:** The outputs are protected with fuses that can only be changed by the manufacturer.

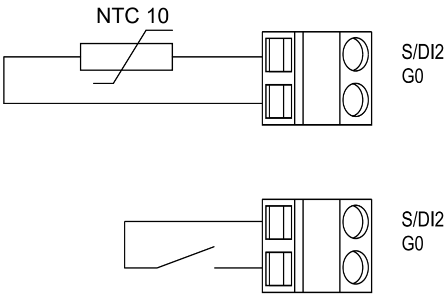
1.2.2 Voltage output wiring



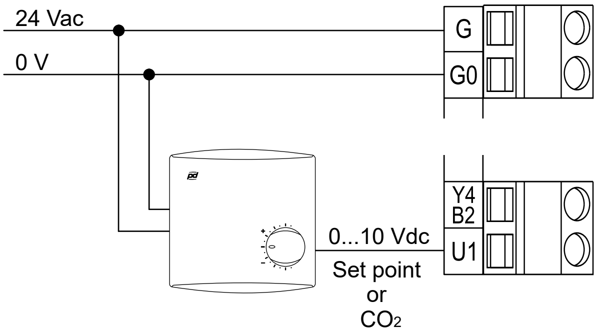
1.2.3 DI1 wiring



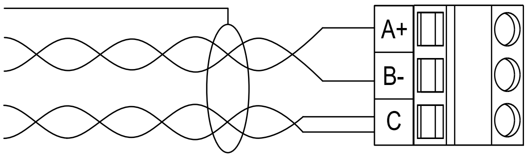
1.2.4 S/DI2 wiring



1.2.5 U1 input wiring



1.2.6 Modbus wiring



NOTE **Note:** The terminal *C* is galvanically isolated.

1.3 Configuring via Modbus

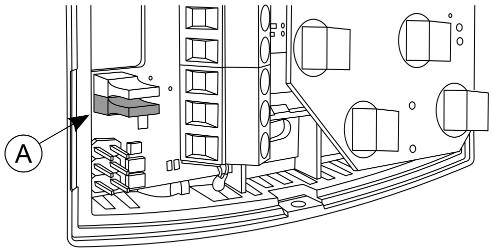
1. Write the settings to the device via Modbus.
2. Set Modbus register 40 value to 1.
   The configuration values are now stored to non-volatile memory.

   NOTE **Note:** Controller stores the configuration values hourly to non-volatile memory. This ensures that the most recent device settings remain after power failure.

1.4 Configuring through the device menu

NOTE **Note:** A commissioning tool (HLS 44-SE-SER) is also available. For configuration with the commissioning tool, see the commissioning tool instructions.

1. Remove the cover.
2. Set the configuration mode selector to closed position.



A. Configuration mode selector

3. Press the

4. Make the required settings.

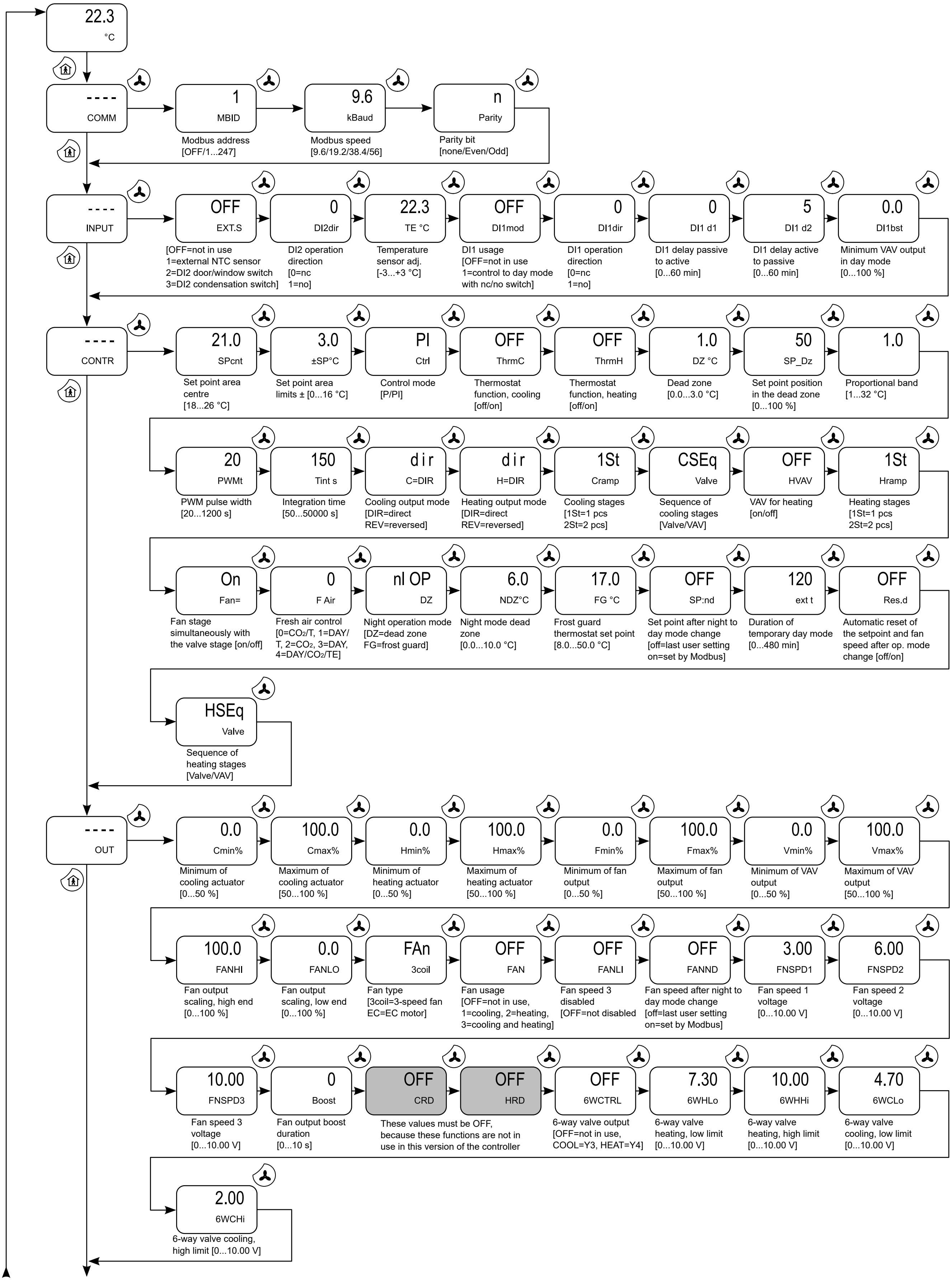
   You can proceed in the menu by touching the and buttons. The values can be changed with the and buttons. The value is accepted with the button.

   See the chapter Menu structure on page 7 for more details.

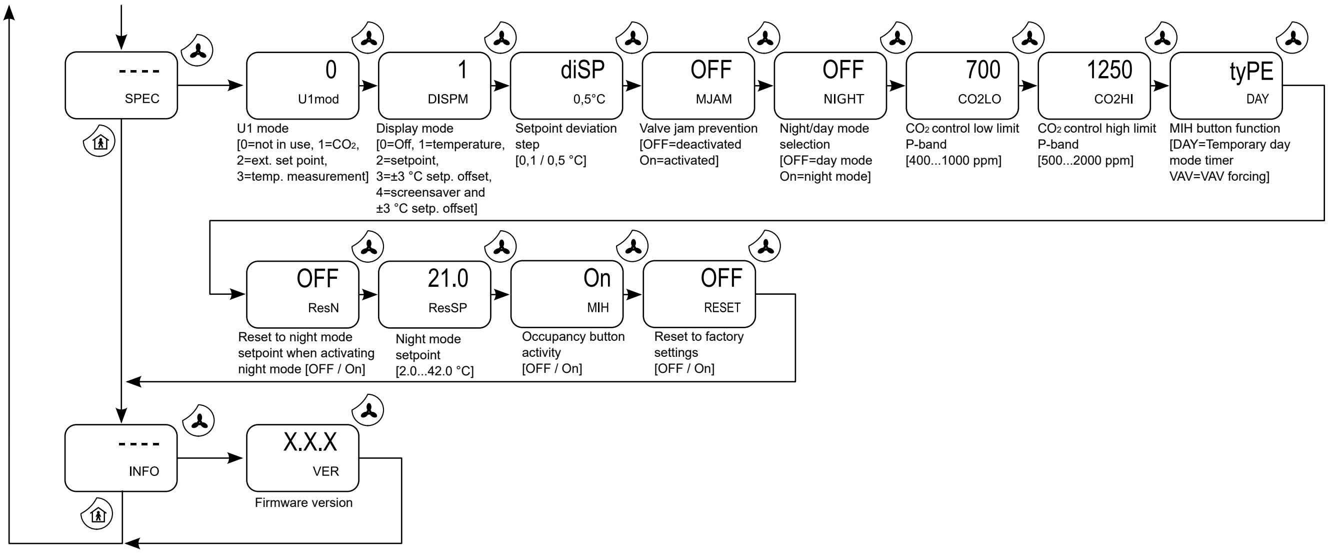
5. Set the configuration mode selector to open position.

1.5 Menu structure

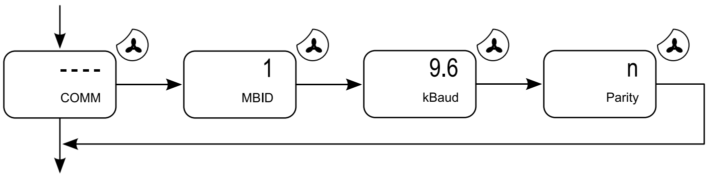
The following menu structure contains the factory settings.



The diagram continues on the next page.

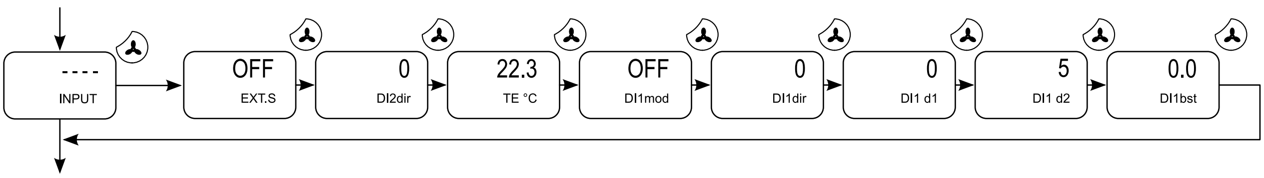


1.5.1 Communication menu



Parameter	Available values	Description
MBID	*OFF / 1...247*	Modbus address.
kBaud	*9.6 / 19.2 / 34.8 / 56*	Modbus speed (kbit/s).
Parity	*n / E / O*	Parity bit. *n* None *E* Even *O* Odd

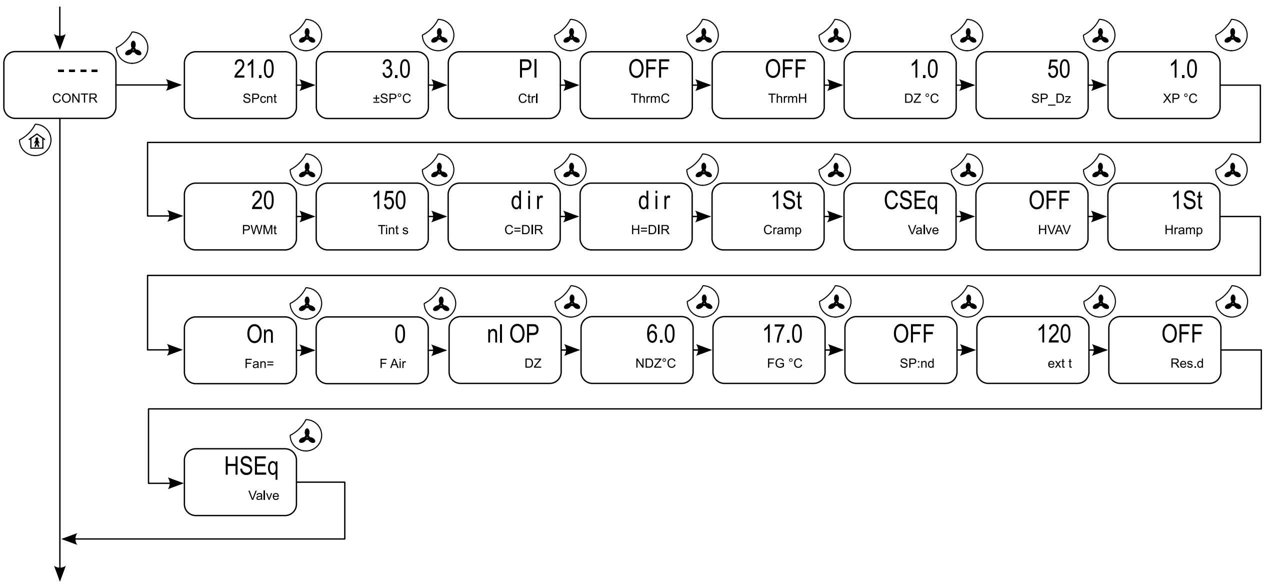
1.5.2 Input menu



Parameter	Available values	Description
EXT.S	*OFF / 1...3*	S/DI2 connector usage. *OFF* Not in use *1* External NTC sensor *2* Door/window switch *3* Condensation switch

Parameter	Available values	Description
DI2dir	*0 / 1*	DI2 operation direction. *0* Normally closed (NC) *1* Normally open (NO)
TE °C	*-3.0...3.0 °C*	Temperature sensor adjustment. **Important:** Eliminate all error factors that can affect to the temperature measurement before changing the parameter. The parameter cannot be reset to the factory value.
DI1mod	*OFF / 1*	DI1 usage. *OFF* Not in use *1* Control to day mode with NO/NC switch
DI1dir	*0 / 1*	DI1 operation direction. *0* Normally closed (NC) *1* Normally open (NO)
DI1 d1	*0...60 min*	DI1 delay from passive to active.
DI1 d2	*0...60 min*	DI1 delay from active to passive.
DI1bst	*0.0...100.0 %*	Minimum VAV output in day mode.

1.5.3 Control menu

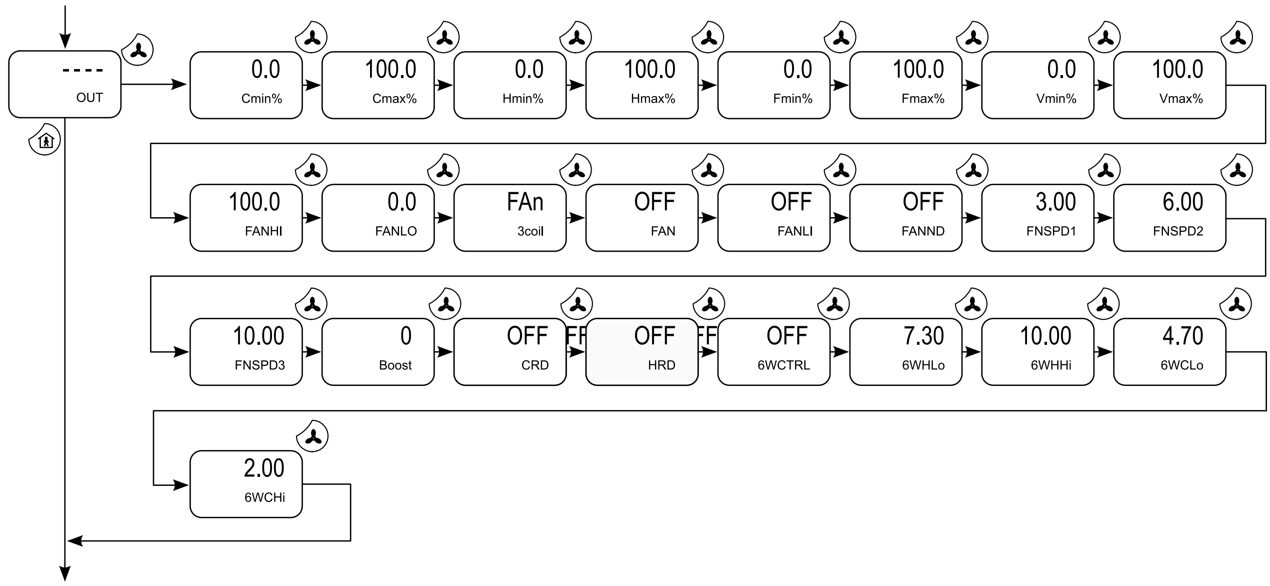


Parameter	Available values	Description
SPcnt	*18.0...26.0 °C*	User setpoint range centre.
±SP°C	*±0.0...16.0 °C*	User setpoint range.
Ctrl	*P / PI*	Control method.
ThrmC	*OFF / On*	Thermostat function, cooling. *OFF* Thermostat function not in use. *On* Thermostat function is in use in cooling.

Parameter	Available values	Description
ThrmH	*OFF / On*	Thermostat function, heating. *OFF* Thermostat function not in use. *On* Thermostat function is in use in heating.
DZ °C	*0.0...3.0 °C*	Dead zone.
SP_Dz	*0...100 %*	Set point position in the dead zone.
XP °C	*1.0...32.0 °C*	Proportional band.
PWMt	*20...1200 s*	Pulse width.
Tint s	*50...50000 s*	Integration time.
C=DIR	*dir / rev*	Cooling output direction. *dir* Direct *rev* Reversed
H=DIR	*dir / rev*	Heating output direction. *dir* Direct *rev* Reversed
Cramp	*1St / 2St*	Number of cooling stages.
QSEq	*Valve / VAV*	Cooling stage sequence. *Valve* Valve outputs (A1, Y3) first *VAV* VAV and fan outputs (Y1, Y2) first
HVAV	*OFF / On*	VAV heating.
Hramp	*1St / 2St*	Number of heating stages.
Fan=	*OFF / On*	Fan output (Y2) simultaneously with valve stages (A1, A2, Y3, Y4).
F Air	*0 / 1 / 2 / 3 / 4*	Fresh air control source. *0* CO_2 or temperature *1* Day mode or temperature *2* CO_2 *3* Day mode *4* Day mode, CO_2 or temperature
nl OP	*DZ / FG*	Night operation mode. *DZ* Control uses night operation mode dead zone. *FG* Frost guard mode.
NDZ °C	*0.0...10.0 °C*	Night mode dead zone.
FG °C	*8.0...50.0 °C*	Frost guard mode set point.
SP:nd	*OFF / On*	Effective set point after the change from night mode to day mode. *OFF* Last user setting. *On* Set by Modbus.

Parameter	Available values	Description
ext t	*0...480 min*	Temporary day mode or VAV forcing duration. *0* On/Off function. *1...480 min* Timer function.
Res.d	*OFF / On*	Set point and fan speed reset after operation mode change.
HSEq	*Valve / VAV*	Heating stage sequence. *Valve* Valve outputs (A2, Y4) first *VAV* VAV and fan outputs (Y1, Y2) first

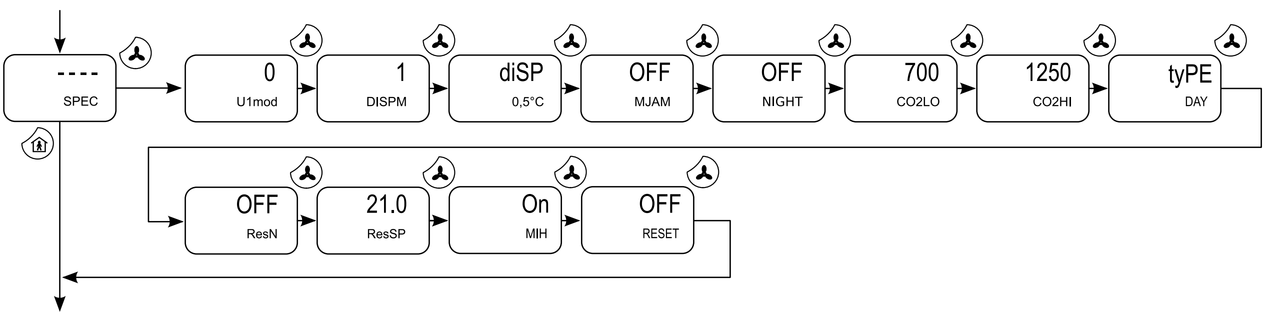
1.5.4 Output menu



Parameter	Available values	Description
Cmin%	*0.0...50.0 %*	Minimum of cooling actuator.
Cmax%	*50.0...100.0 %*	Maximum of cooling actuator.
Hmin%	*0.0...50.0 %*	Minimum of heating actuator.
Hmax%	*50.0...100.0 %*	Maximum of heating actuator.
Fmin%	*0.0...50.0 %*	Minimum of fan output.
Fmax%	*50.0...100.0 %*	Maximum of fan output.
Vmin%	*0.0...50.0 %*	Minimum of VAV output.
Vmax%	*50.0...100.0 %*	Maximum of VAV output.
FANHI	*0.0...100.0 %*	Fan output scaling, high end.
FANLO	*0.0...100.0 %*	Fan output scaling, low end.
FAn	*3coil / EC*	Fan type. *3coil* 3-speed fan *EC* EC fan

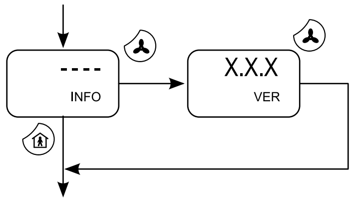
Parameter	Available values	Description
FAN	*OFF / 1 / 2 / 3*	Fan function. *OFF* Not in use *1* Cooling *2* Heating *3* Cooling and heating
FANLI	*OFF / On*	Fan speed 3 usage in auto mode. *OFF* Fan speed 3 enabled *On* Fan speed 3 disabled
FANND	*OFF / On*	Fan speed after operation mode change. *OFF* Last user setting. *On* Set by Modbus.
FnSp1	*0.00...10.00 V*	Fan speed 1 voltage.
FnSp2	*0.00...10.00 V*	Fan speed 2 voltage.
FnSp3	*0.00...10.00 V*	Fan speed 3 voltage.
BOOST	*0...10 s*	Fan output boost duration.
CRD	*OFF / On*	Use Y1 output for cooling. The value must be *OFF*. The function is not used in this version of the controller.
HRD	*OFF / On*	Use Y2 output for heating. The value must be *OFF*. The function is not used in this version of the controller.
6WCTRL	*OFF / COOL Y3 / HEAT Y4*	6-way valve output terminal. *OFF* 6-way valve control disabled *COOL Y3* Terminal Y3 *HEAT Y4* Terminal Y4
6WHLo	*0.00...10.00 V*	6-way valve control, lowest heating.
6WHHi	*0.00...10.00 V*	6-way valve control, highest heating.
6WCLo	*0.00...10.00 V*	6-way valve control, lowest cooling.
6WCHi	*0.00...10.00 V*	6-way valve control, highest cooling.

1.5.5 Special functions menu



Parameter	Available values	Description
U1mod	*0 / 1 / 2 / 3*	U1 function. *0* Not in use *1* CO_2 *2* External set point *3* Temperature measurement
DISPM	*0 / 1 / 2 / 3 / 4*	Display mode. *0* Display off *1* Measured temperature *2* Temperature set point *3* Deviation from temperature set point. *4* Screen saver and deviation from setpoint
dISP	*0.1 / 0.5 °C*	Set point changing step.
MJAM	*OFF / On*	Valve jam prevention function status. *OFF* Disabled *On* Enabled
NIGHT	*OFF / On*	Night/day mode selection. *OFF* Day mode *On* Night mode
CO2LO	*400...1000 ppm*	CO_2 low limit.
CO2HI	*500...2000 ppm*	CO_2 high limit.
tyPE	*DAY / VAV*	 button function. *DAY* Button press activates the temporary day mode. Set the day mode duration with *ext t* parameter. *VAV* Button press activates the VAV forcing mode. Set the forcing mode duration with *ext t* parameter.
ResN	*OFF / On*	Reset to night mode setpoint when activating night mode.
ResSP	*2.0...42.0 °C*	Night mode setpoint.
MIH	*OFF / On*	 button activity. *OFF* Button deactivated. *On* Button active.
RESET	*OFF / On*	Reset to factory settings.

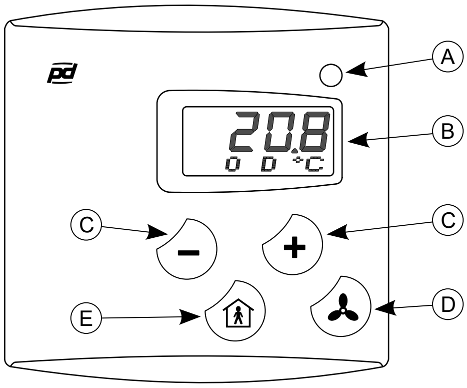
1.5.6 Info menu



Parameter	Available values	Description
VER	*X.X.X*	Software version.

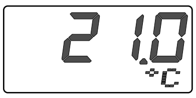
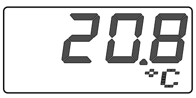
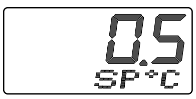
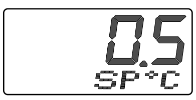
2 Functional description

2.1 User interface

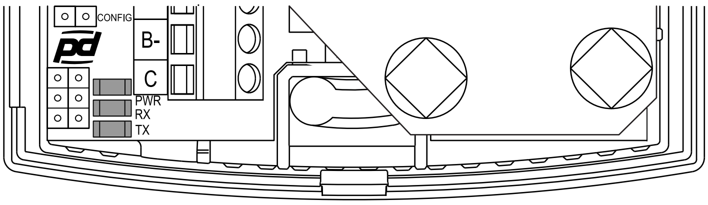
	A	Indicator light • red = heating • green = cooling
	B	Display • temperature, set point, or deviation from set point • fan speed (0, 1 , 2, 3, A) • day mode (D), night mode (N) • VAV forcing status (*VAV* = forcing is active)
	C	Set point change buttons The set point changes in larger steps when the buttons are quickly pressed several times in a row.
	D	Fan speed button
	E	Occupancy button (man in house)

2.1.1 Display modes

There are five display modes available in the controller. The display mode is selected with the *DISPM* parameter.

Parameter value		Description
0		The display and the indicator light are off.
1	 	The display shows the measured temperature value. When pressing the setpoint changing buttons, the setpoint is displayed. The indicator light indicates the heating and cooling.
2	 	The display shows the setpoint. The indicator light indicates the heating and cooling.
3	 	The display shows the measured temperature value. When pressing the setpoint changing buttons, the deviation from the setpoint is displayed. The indicator light indicates the heating and cooling.
4	 	The display shows the deviation from the setpoint when the buttons are pressed. The indicator light indicates the heating and cooling. The display and the indicator light turn off 10 seconds after the last press.

2.1.2 Indicator lights inside the device



PWR	The light is on when the supply voltage is connected.
RX	The light indicates that the controller sends data to bus.
TX	The light indicates the traffic in the bus.

2.2 Operation modes

Room controller has two operation modes that can have their own control settings. The operation modes are called day and night modes.

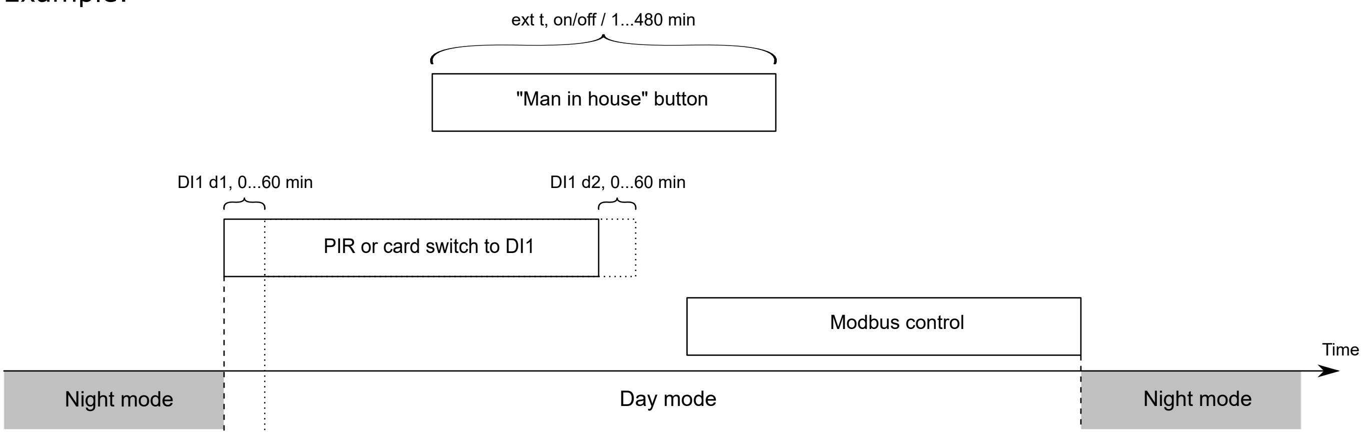
The operation modes can be controlled by the following functions:

- Using controller's input information
- Using the occupancy button
- Via Modbus communication

2.2.1 Control to day and night operating modes

- *NIGHT* parameter is *OFF*: The controller is in fixed day mode.
- *NIGHT* parameter is *On*: The controller moves to day mode when the first control requests the day mode. The controller moves to the night mode when the last control requests the night mode.

Example:



When the controller moves to the day mode, following happens:

1. The fresh air supply is improved (*DI1bst* parameter defines the improvement amount, 0…100 %). Fresh air usage improvement can be prevented by setting the *DI1bst* parameter value to 0 %.
2. The temperature setpoint defined by the *SP:nd* parameter becomes effective.
3. The day mode dead zone becomes effective and the controller moves from possible frost guard mode to controlling mode.

Note the following parameters:

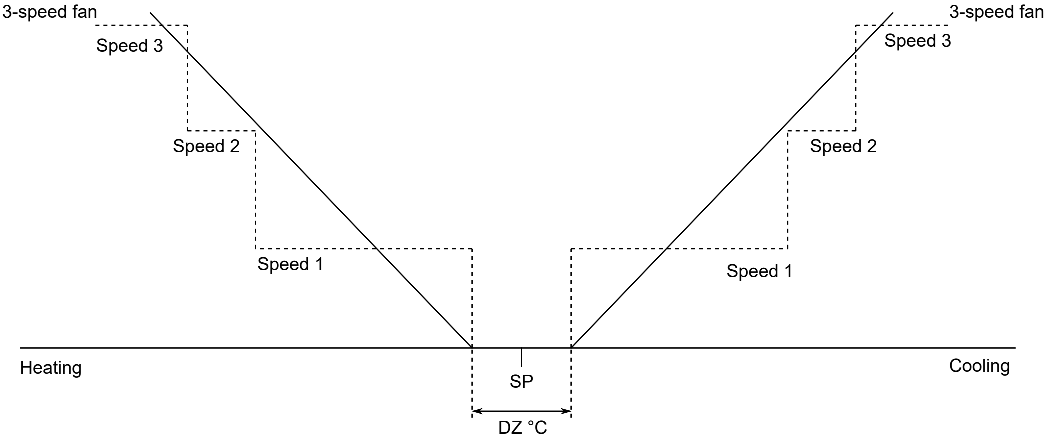
Parameter	Modbus register	Default	Range	Description
EXT.S	*40009*	*OFF*	*OFF / 1...3*	S/DI2 connector usage. *OFF* Not in use *1* External NTC sensor *2* Door/window switch *3* Condensation switch
DI2dir	*28*	*0*	*0 / 1*	DI2 operation direction. *0* Normally closed (NC) *1* Normally open (NO)
DI1mod	*40021*	*OFF*	*OFF / 1*	DI1 usage. *OFF* Not in use *1* Control to day mode with NO/NC switch
DI1dir	*40022*	*0*	*0 / 1*	DI1 operation direction. *0* Normally closed (NC) *1* Normally open (NO)
DI1 d1	*40021*	*0*	*0...60 min*	DI1 delay from passive to active.
DI1 d2	*40022*	*5*	*0...60 min*	DI1 delay from active to passive.
DI1bst	*40026*	*0.0 %*	*0.0...100.0 %*	Minimum VAV output in day mode.
SP:nd	*21*	*OFF*	*OFF / On*	Effective set point after the change from night mode to day mode. *OFF* Last user setting. *On* Set by Modbus.
ext t	*40025*	*120*	*0...480 min*	Temporary day mode duration.
NIGHT	*14*	*OFF*	*OFF / On*	Night/day mode selection. *OFF* Day mode *On* Night mode

2.2.2 Expanded dead zone in night mode

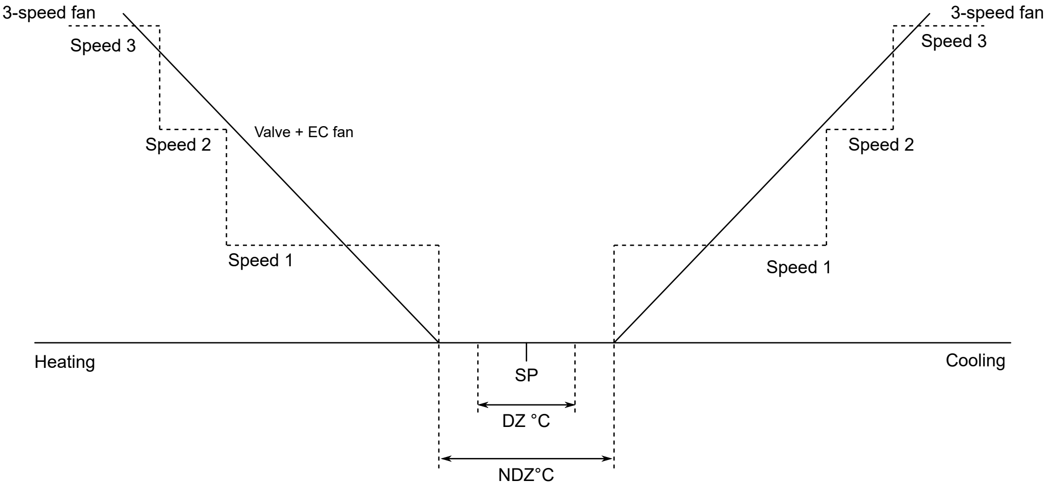
With the expanded dead zone you can save energy by allowing lower temperature and ventilation. It is also possible to set the night dead zone to a smaller value than the day dead zone.

When the *nl OP* parameter is *DZ*, the controller works just like in the day mode but uses the night dead zone. The night dead zone is defined with the *NDZ°C* parameter.

Day mode:



Night mode:



Note the following parameters:

Parameter	Modbus register	Default	Range	Description
EXT.S	*40009*	*OFF*	*OFF / 1...3*	S/DI2 connector usage. *OFF* Not in use *1* External NTC sensor *2* Door/window switch *3* Condensation switch
nl OP	*20*	*DZ*	*DZ / FG*	Night operation mode. *DZ* Control uses night operation mode dead zone. *FG* Frost guard mode.
NDZ °C	*40019*	*6.0 °C*	*0.0...10.0 °C*	Night mode dead zone.

2.2.3 Temporary day mode

button can be used to control temporary day mode. This means that the controller is normally in night operation mode and uses a wider dead zone to reduce energy consumption. When the button is pressed, the temporary day mode is activated, either with a timer or with on/off function.

On/off function means that when the day mode is activated with the button, the mode stays active until the button is pressed again.

In the timer mode, the timer value is set to *ext t* parameter. When the timer reaches 0, the controller returns to night mode.

To enable temporary day mode, set the following parameters:

Parameter	Modbus register	Default	Range	Description
NIGHT	*14*	*OFF*	*OFF / On*	Night/day mode selection. Set the parameter to *On* to enable temporary day mode.
ext t	*40025*	*120*	*0...480 min*	Temporary day mode duration. Set the duration to 0 min to enable on/off function.
tyPE	*36*	*DAY*	*DAY / VAV*	Man in house button function. Set the parameter value to *DAY*.

2.2.4 VAV forcing

button can be used to force the VAV output. When the function is active and the button is pressed, the VAV output is set to parameter *Vmax%* value for the time that is set with the parameter *ext t*. If the timer value is *0*, the forcing function is active until the button is pressed again.

To enable VAV forcing function, set the following parameters:

Parameter	Modbus register	Default	Range	Description
ext t	*40025*	*120*	*0...480 min*	VAV forcing duration. Set the duration to 0 min to enable on/off function.
F Air	*40018*	*0*	*0 / 1 / 2 / 3 / 4*	Fresh air control source. Define if CO_2 and temperature should also be a controlling factor for the VAV output. *0* CO_2 or temperature *1* Day mode or temperature *2* CO_2 *3* Day mode *4* Day mode, CO_2 or temperature
tyPE	*36*	*DAY*	*DAY / VAV*	Man in house button function. Set the parameter value to *VAV*.
U1mod	*40027*	*0*	*0 / 1 / 2 / 3*	U1 function. U1 must be activated if *F air* is *0*, *2* or *4* (external CO_2 is used also to control the VAV output). If external CO_2 is not used, *U1mod* can be set to *0*. *0* Not in use *1* CO_2 *2* External set point *3* Temperature measurement
Vmax%	*40035*	*100.0*	*50...100.0 %*	Maximum of VAV output.

2.3 Heating and cooling stages

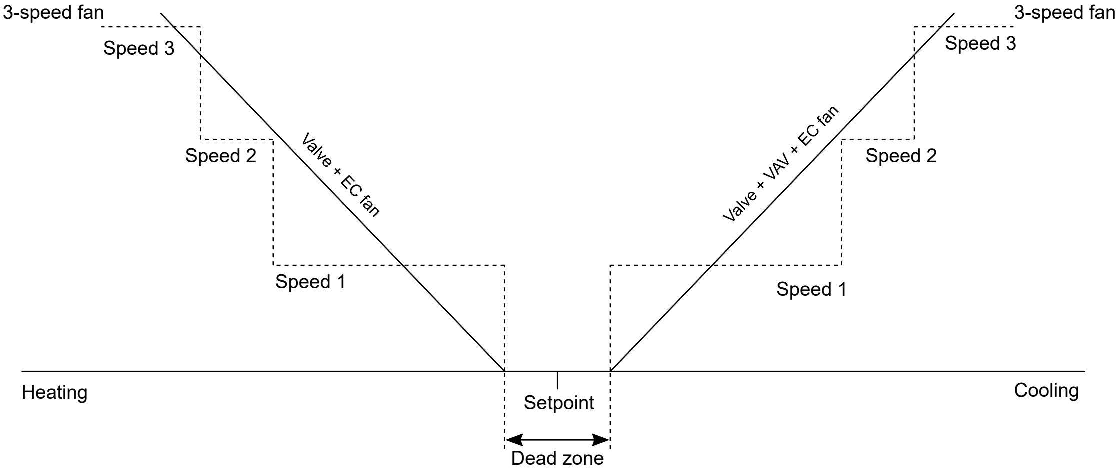
The controller can have one or two heating and cooling stages. VAV can also be selected to be a heating stage.

Note the following parameters:

Parame-ter	Modbus register	Default	Range	Description
Cramp	*17*	*1St*	*1St / 2St*	Number of cooling stages.
QSEq	*18*	*Valve*	*Valve / VAV*	Cooling stage sequence. *Valve* Valve outputs (A1, Y3) first *VAV* VAV and fan outputs (Y1, Y2) first
HVAV	*35*	*OFF*	*OFF / On*	VAV heating.
Hramp	*33*	*1St*	*1St / 2St*	Number of heating stages.
HSEq	*35*	*Valve*	*Valve / VAV*	Heating stage sequence. *Valve* Valve outputs (A4, Y4) first *VAV* VAV and fan outputs (Y1, Y2) first
Fan=	*19*	*OFF*	*OFF / On*	Fan output (Y2) simultaneously with valve stages (A1, A2, Y3, Y4).

2.3.1 Heating and cooling stage using examples

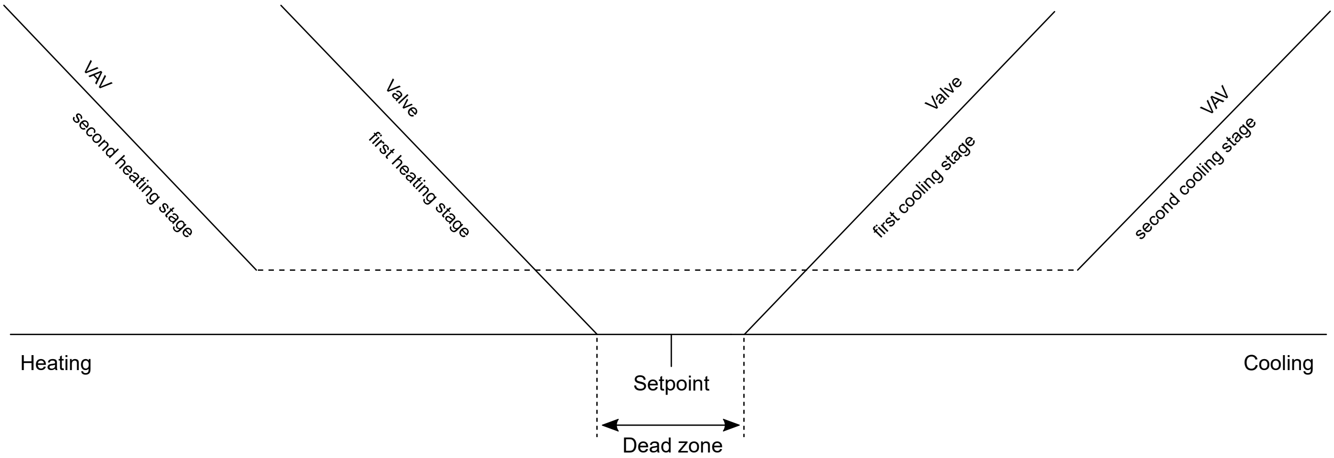
One stage heating and cooling.



Set the parameters according to the following table.

Parameter	Modbus register	Description	Value
Cramp	*17*	Number of cooling stages.	*1St*
HVAV	*35*	VAV heating.	*OFF*
Hramp	*33*	Number of heating stages.	*1St*

Two stage heating and two stage cooling, valve opens before the fan speed increases. VAV is used for heating and cooling. Minimum VAV output is 20 %.

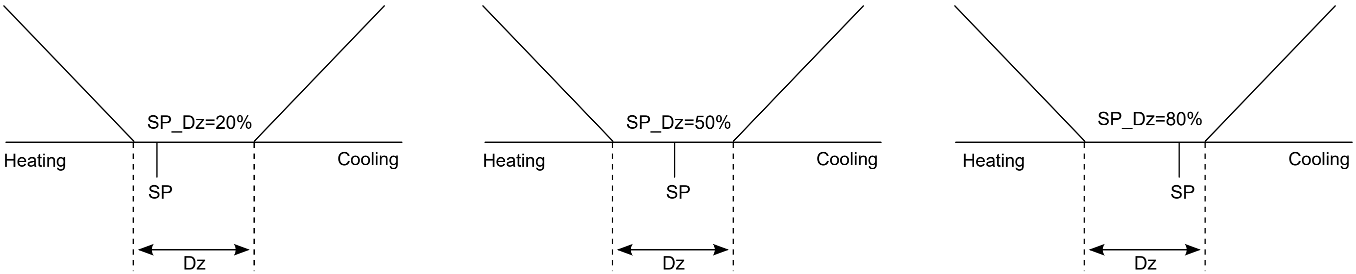


Set the parameters according to the following table.

Parameter	Modbus register	Description	Value
Cramp	*17*	Number of cooling stages.	*2St*
QSEq	*18*	Cooling stage sequence.	*Valve*
HVAV	*35*	VAV heating.	*On*
Hramp	*33*	Number of heating stages.	*2St*
HSEq	*35*	Heating stage sequence.	*Valve*
Fan=	*19*	Fan output (Y2) simultaneously with valve stages (A1, A2, Y3, Y4).	*OFF*
Vmin%	*40034*	Minimum of VAV output.	*20.0*

2.4 Asymmetric dead zone

The dead zone centre relation to the temperature setpoint can be adjusted with the *SP_Dz* parameter (0…100 %) according to the following figure.



2.5 Temperature sensor selection

The temperature information can be imported to the controller by using following methods:

1. Controller inner temperature measurement (*EXT.S* parameter is *0*, *2* or *3*)
2. External temperature measurement with NTC10 sensor (*EXT.S* parameter is *1*)
3. External 0...10 V temperature measurement (*U1mod* parameter is *3*)

NOTE **Note:** The external 0…10 V temperature transmitter range must be 0…+50 °C.

The set point can be read from one controller and then fed to other controllers in cases where multiple controllers are located in the same space.

Note the following parameters:

Parameter	Modbus register	Default	Range	Description
EXT.S	*40009*	*OFF*	*OFF / 1...3*	S/DI2 connector usage. *OFF* Not in use *1* External NTC sensor *2* Door/window switch *3* Condensation switch
TE °C	*40010*	*0.0*	*-3.0...3.0 °C*	Temperature sensor adjustment. **Important:** Eliminate all error factors that can affect to the temperature measurement before changing the parameter. The parameter cannot be reset to the factory value.
U1mod	*40027*	*0*	*0 / 1 / 2 / 3*	U1 function. *0* Not in use *1* CO_2 *2* External set point *3* Temperature measurement

2.6 Temperature setpoint

The temperature set point can be one of the following:

1. Set with the controller buttons (parameters *SPcnt* and ±*SP °C*).
2. Set by external 0...10 V signal (*U1mod* parameter must be *2*). The external set point 0...10 V signal range is the same as the set point area defined in the menu (parameters *SPcnt* and ±*SP °C*).
3. Set via the Modbus.
4. The frost guard set point (*FG °C* parameter) in the night mode, if the frost guard mode is selected to the night mode (*nl OP* parameter is *FG*).

The change from night mode to day mode affects also to the temperature set point. With the *Sp:nd* parameter you can select the set point either to be the latest user given value or to be read via Modbus. The user given value can be the 0...10 V signal connected to the U1 input or the value set by the controller buttons.

The controller uses the latest value as the set point (set by user or set via the Modbus). The effective set point can be displayed by pushing the - or + button. The set point shows continuously on the display, if the *dISP* parameter value is *SP*.

Note the following parameters:

Parameter	Modbus register	Default	Range	Description
SPcnt	*40011*	*21.0 °C*	*18.0...26.0 °C*	User setpoint range centre.
±SP °C	*40012*	*±3.0 °C*	*±0.0...16.0 °C*	User setpoint range.
SP_Dz	*40015*	*50 %*	*0...100 %*	Set point position in the dead zone.
FG °C	*40020*	*17 °C*	*8.0...50.0 °C*	Frost guard mode set point.

Parameter	Modbus register	Default	Range	Description
SP:nd	*21*	*OFF*	*OFF / On*	Effective set point after the change from night mode to day mode. *OFF* Last user setting. *On* Set by Modbus.
U1mod	*40027*	*0*	*0 / 1 / 2 / 3*	U1 function. *0* Not in use *1* CO_2 *2* External set point *3* Temperature measurement
DISPM	*40044*	*1*	*0 / 1 / 2 / 3*	Display mode. *0* Display off *1* Measured temperature *2* Temperature set point *3* Deviation from temperature set point.

When the set point area centre (parameter *SPcnt*) is changed via the Modbus, the user set point deviation is kept unchanged.

Example:

1. *SPcnt* parameter value is 21 °C and the user has changed the set point to 23 °C (deviation is +2 °C).
2. *SPcnt* parameter value is changed to 22 °C via the Modbus (register 40011).
3. The controller takes 24 °C as the effective set point (22 °C + 2 °C = 24 °C).

2.6.1 Temperature setpoint using examples

The set point is wanted to return to a constant value (21 °C for example), when the controller moves from night mode to day mode (hotels for example).

Set the parameters according to the following table.

Parameter	Modbus register	Description	Value
SP:nd	*21*	Effective set point after the change from night mode to day mode.	*On*
	40002	Set point by Modbus.	*210*

The set point is wanted to return to user set point value, when the controller moves from night mode to day mode (offices for example).

Set the parameters according to the following table.

Parameter	Modbus register	Description	Value
SP:nd	*21*	Effective set point after the change from night mode to day mode.	*OFF*

The set point is wanted to stay at the value given via Modbus (21 °C for example)

Set the parameters according to the following table.

Parameter	Modbus register	Description	Value
SPcnt	*40011*	User setpoint range centre.	*21.0*
±SP °C	*40012*	User setpoint range.	*0*

NOTE **Note:** The set point value can also be written to the Modbus register 40002. However, the register 40011 value is shown on the display when the - and + button are pushed.

2.7 Fan speed control

The fan speed (output Y2) can be controlled by following ways (the most recently changed value is effective):

1. The value set by user with the controller button (0 - 1 - 2 - 3 - A, A = automatic).
2. Set via the Modbus.

The parameter *FANND* defines which of the above values is set effective after night mode to day mode change.

Note the following parameters:

Parame-ter	Modbus register	Default	Range	Description
FANLI	*24*	*On*	*OFF / On*	Fan speed 3 usage in auto mode. *OFF* Fan speed 3 enabled *On* Fan speed 3 disabled
FANND	*25*	*OFF*	*OFF / On*	Fan speed after operation mode change. *OFF* Last user setting. *On* Set by Modbus.
	40001	*0*	*0 / 1 / 2 / 3 / 4*	Fan speed by Modbus. *0* Off *1* Speed 1 *2* Speed 2 *3* Speed 3 *4* Automatic

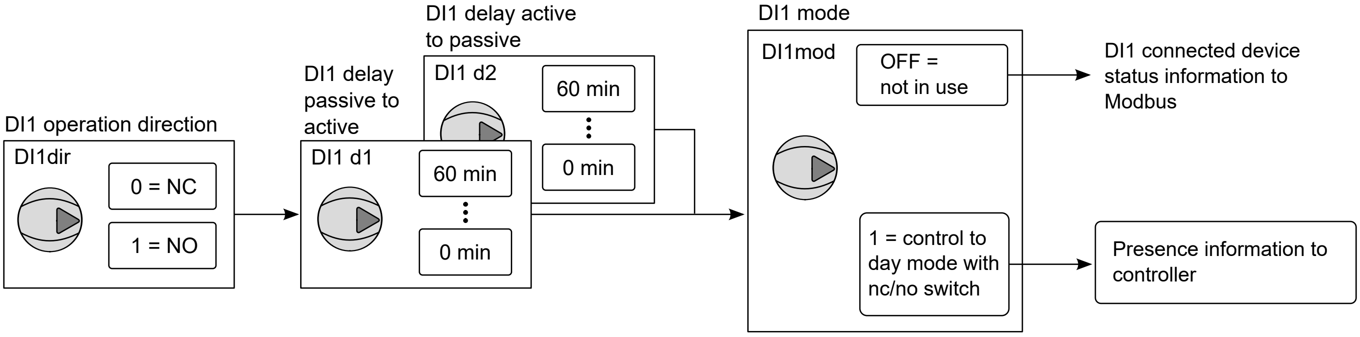
The fan speed can also be controlled by using Modbus output overrides.

2.8 Digital input functions

2.8.1 DI1 input functions

DI1 input can be used to control the controller to the day and night mode by using a home/away switch, card reader or motion detector.

The DI1 input can also be used to read other device statuses via the Modbus, if the input is not needed for the room control.



Note the following parameters:

Parameter	Modbus register	Default	Range	Description
DI1mod	*40021*	*OFF*	*OFF / 1*	DI1 usage. *OFF* Not in use *1* Control to day mode with NO/NC switch
DI1dir	*40022*	*0*	*0 / 1*	DI1 operation direction. *0* Normally closed (NC) *1* Normally open (NO)
DI1 d1	*40021*	*0*	*0...60 min*	DI1 delay from passive to active.
DI1 d2	*40022*	*5*	*0...60 min*	DI1 delay from active to passive.

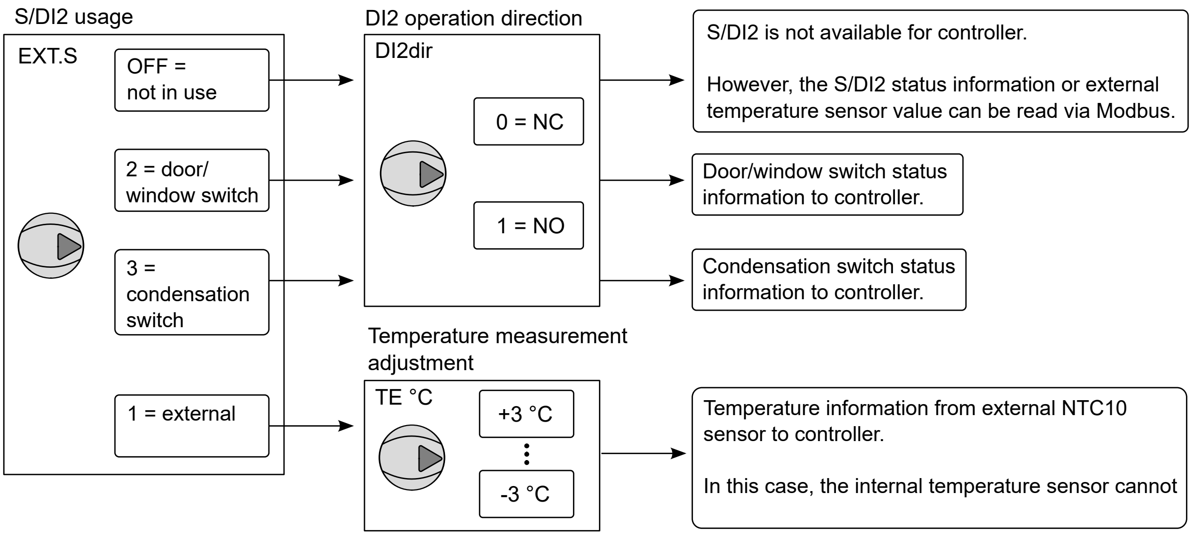
2.8.2 S/DI2 input functions

S/DI2 input can be used to control the controller by using a door/window contact or dew point guard with relay output.

In the door/window contact case the controller prevents cooling and heating when the door or window is open. This way the energy loss and cooling beam condensation problems can be avoided.

In the condensation switch case, the cooling is prevented when the contact activates.

The S/DI2 input can be used to read other device statuses via the Modbus if the input is not needed for the room control.



Note the following parameters:

Parame-ter	Modbus register	Default	Range	Description
EXT.S	*40009*	*OFF*	*OFF / 1...3*	S/DI2 connector usage. *OFF* Not in use *1* External NTC sensor *2* Door/window switch *3* Condensation switch
DI2dir	*28*	*0*	*0 / 1*	DI2 operation direction. *0* Normally closed (NC) *1* Normally open (NO)
TE °C	*40010*	*0.0*	*-3.0...3.0 °C*	Temperature sensor adjustment. **Important:** Eliminate all error factors that can affect to the temperature measurement before changing the parameter. The parameter cannot be reset to the factory value.

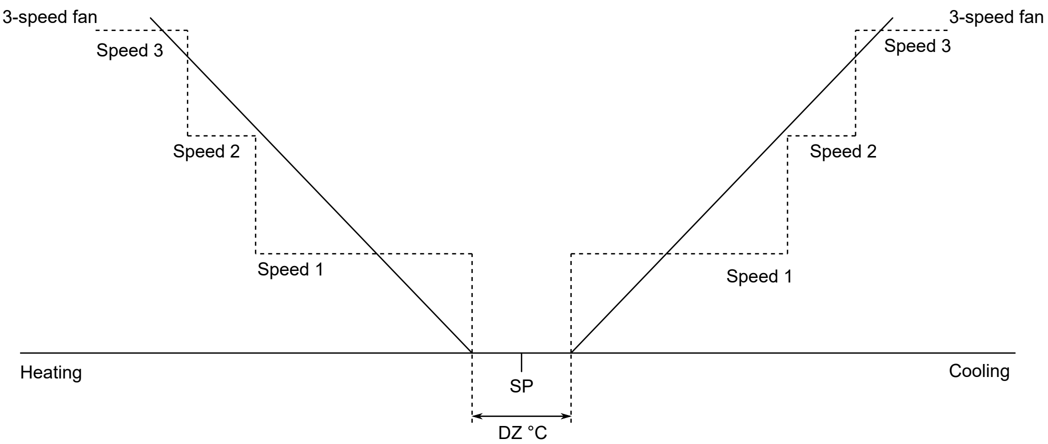
2.9 Frost guard mode

When the temperature drops below the frost guard set point (*FG °C* parameter), the heating valve opens and the fan starts (the *FAN* parameter must be ”2” or ”3”) at speed 1. The EC motor control signal is 33 %.

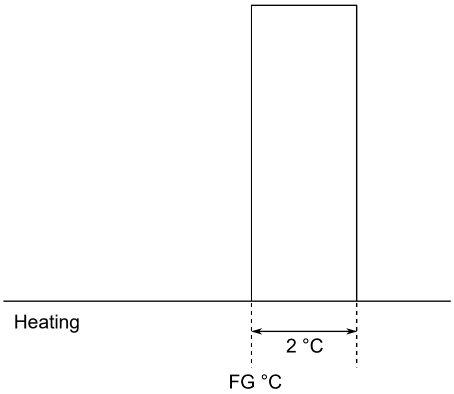
NOTE **Note:** The frost guard function is not available when the 6-way valve control is enabled (*WCTRL* parameter is *COOL* or *HEAT*).

When the temperature rises 2 °C over the set point (*FG °C* parameter), the heating valve closes and the fan stops. The procedure repeats until the controller moves to day mode.

Day mode:



Night mode:



Note the following parameters:

Parame-ter	Modbus register	Default	Range	Description
EXT.S	*40009*	*OFF*	*OFF / 1...3*	S/DI2 connector usage. *OFF* Not in use *1* External NTC sensor *2* Door/window switch *3* Condensation switch
nl OP	*20*	*DZ*	*DZ / FG*	Night operation mode. *DZ* Control uses night operation mode dead zone. *FG* Frost guard mode.
FG °C	*40020*	*17 °C*	*8.0...50.0 °C*	Frost guard mode set point.
WCTRL	*40047*	*OFF*	*OFF / On*	6-way valve control status. *OFF* 6-way valve control disabled *On* 6-way valve control enabled

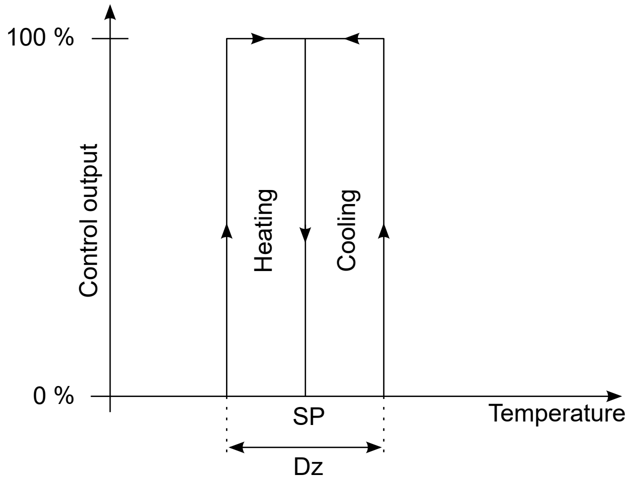
2.10 Thermostat function

By choosing the thermostat function, the actuators can be controlled by a thermostat type control. Thermostat function can be activated either for cooling or heating side or for both.

- When using the thermostat function in the heating side, the heating valve opens fully when the temperature falls below the dead zone (*DZ*) lower limit. The heating valve closes when the temperature reaches the setpoint (*SP*).
- When using the thermostat function in the cooling side, the cooling valve opens fully when the temperature rises over the dead zone higher limit. The cooling valve closes when the temperature reaches the setpoint.

In the night mode the controller works according to the chosen function, either in thermostat mode or in frost guard mode.

The thermostat mode affects to the outputs A1, A2, Y3 and Y4.



Note the following parameters:

Parameter	**Modbus register**	**Default**	**Range**	**Description**
EXT.S	*40009*	*OFF*	*OFF / 1...3*	S/DI2 connector usage. *OFF* Not in use *1* External NTC sensor *2* Door/window switch *3* Condensation switch
SPcnt	*40011*	*21.0 °C*	*18.0...26.0 °C*	User setpoint range centre.
±SP °C	*40012*	*±3.0 °C*	*±0.0...16.0 °C*	User setpoint range.
DZ °C	*40014*	*1.0 °C*	*0.0...3.0 °C*	Dead zone.
nl OP	*20*	*DZ*	*DZ / FG*	Night operation mode. *DZ* Control uses night operation mode dead zone. *FG* Frost guard mode.
FAN	*40038*	*OFF*	*OFF / 1 / 2 / 3*	Fan function. *OFF* Not in use *1* Cooling *2* Heating *3* Cooling and heating
Fmin%	*40032*	*0.0 %*	*0.0...50.0 %*	Minimum of fan output.
Fmax%	*40033*	*100.0 %*	*50.0...100.0 %*	Maximum of fan output.
Vmin%	*40034*	*0.0 %*	*0.0...50.0 %*	Minimum of VAV output.
Vmax%	*40035*	*100.0 %*	*50.0...100.0 %*	Maximum of VAV output.
ThrmC	*29*	*OFF*	*OFF / On*	Thermostat function, cooling. *OFF* Thermostat function not in use. *On* Thermostat function is in use in cooling.

Parameter	Modbus register	Default	Range	Description
ThrmH	*30*	*OFF*	*OFF / On*	Thermostat function, heating. *OFF* Thermostat function not in use. *On* Thermostat function is in use in heating.

2.11 Electric heater control

The controller can control an electric heater by using a solid state relay PR 50/440 between the A2 output and the heater. The relay must be equipped with a PRMK auxiliary card.

Important: The controller is not equipped with a heater overheating protector. The overheating protection must be included in the heater itself. The overheating alarm signal can be read by digital input, but the signal does not deactivate the heater control.

The overheating alarm signal can be connected to the DI1 or DI2 input, and the signal can then be read via the Modbus. The digital input must be set to ”not in use” position (*DI1mod = 0* or *EXT.S = OFF*).

Note the following parameters:

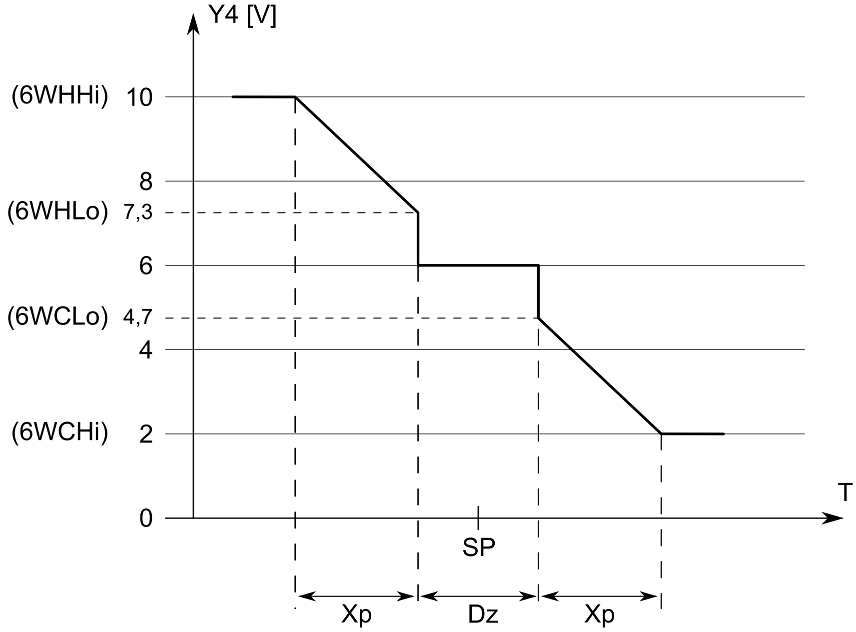
Parame-ter	Modbus register	Default	Range	Description
EXT.S	*40009*	*OFF*	*OFF / 1...3*	S/DI2 connector usage. *OFF* Not in use *1* External NTC sensor *2* Door/window switch *3* Condensation switch
DI2dir	*28*	*0*	*0 / 1*	DI2 operation direction. *0* Normally closed (NC) *1* Normally open (NO)
DI1mod	*40021*	*OFF*	*OFF / 1*	DI1 usage. *OFF* Not in use *1* Control to day mode with NO/NC switch
DI1dir	*40022*	*0*	*0 / 1*	DI1 operation direction. *0* Normally closed (NC) *1* Normally open (NO)

2.12 6-way valve control

The controller can control 6-way valves (e.g. Belimo EXT-K3B2 valves with LR24A-MP/LR24A-SR rotary actuator) by using the Y4 output (enable the control with the parameter *WCTRL* or the Modbus register 40041).

NOTE **Note:** The controller default values are for the Belimo LR24A-MP/LR24A-SR rotary actuator.

The 6-way valve output is controlled according to the following diagram.



Note the following parameters:

Parame-ter	Modbus register	Default	Range	Description
WCTRL	*40047*	*OFF*	*OFF / COOL Y3 / HEAT Y4*	6-way valve output terminal. *OFF* 6-way valve control disabled *COOL Y3* Terminal Y3 *HEAT Y4* Terminal Y4
6WHLo	*40048*	*7.30*	*0.0...10.00*	6-way valve heating, low limit.
6WHHi	*40049*	*10.00*	*0.0...10.00*	6-way valve heating, high limit.
6WCLo	*40050*	*4.70*	*0.0...10.00*	6-way valve cooling, low limit.
6WCHi	*40051*	*2.00*	*0.0...10.00*	6-way valve cooling, high limit.

2.13 Output limitations

It is possible to limit minimum and maximum values of each output separately. The controller does not drive the output outside the given limits. For example, setting the heating output minimum limit is one way to prevent discomfort of chilled air that flows down the window. The limits can be overridden only by controlling the outputs directly via Modbus.

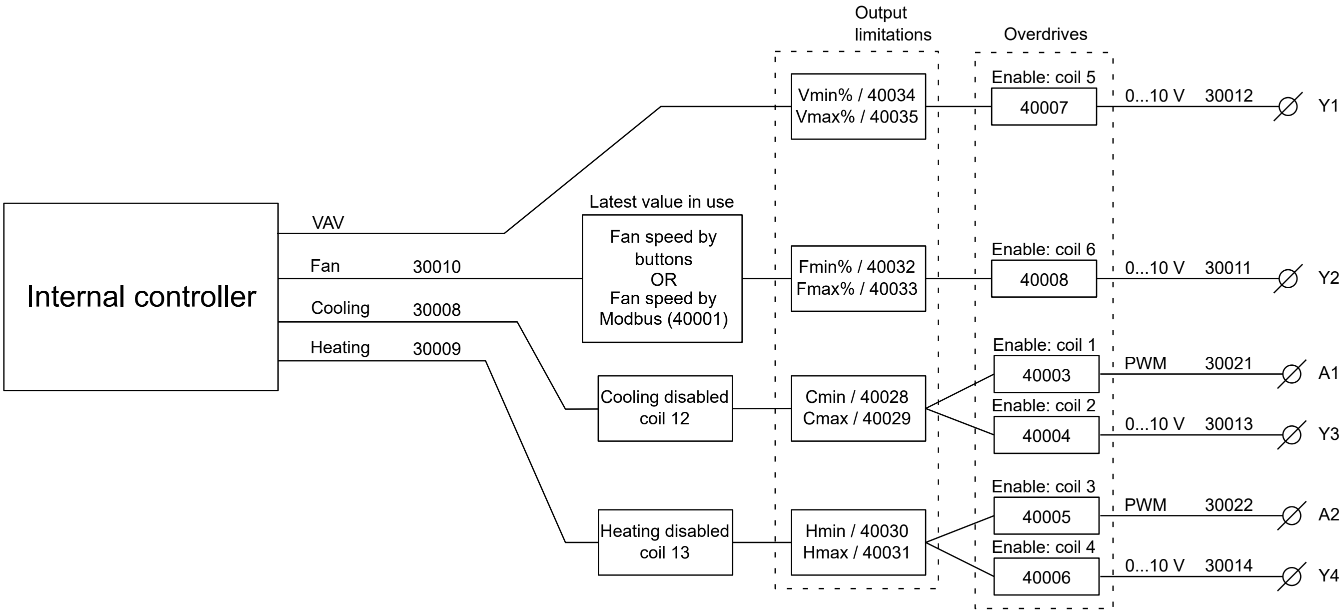
Note the following parameters:

Parameter	Modbus register	Default	Range	Description
Cmin%	*40028*	*0.0 %*	*0.0...50.0 %*	Minimum of cooling actuator.
Cmax%	*40029*	*100.0 %*	*50.0...100.0 %*	Maximum of cooling actuator.
Hmin%	*40030*	*0.0 %*	*0.0...50.0 %*	Minimum of heating actuator.
Hmax%	*40031*	*100.0 %*	*50.0...100.0 %*	Maximum of heating actuator.
Fmin%	*40032*	*0.0 %*	*0.0...50.0 %*	Minimum of fan output.
Fmax%	*40033*	*100.0 %*	*50.0...100.0 %*	Maximum of fan output.

Parameter	Modbus register	Default	Range	Description
Vmin%	*40034*	*0.0 %*	*0.0...50.0 %*	Minimum of VAV output.
Vmax%	*40035*	*100.0 %*	*50.0...100.0 %*	Maximum of VAV output.

2.14 Output overrides

All outputs can be overridden separately via Modbus.



Coils:

Regis-ter	Parameter description	Data type	Values	Range	Default
1	*Cooling PWM override enable (A1).	Bit	*0 - 1*	0. Off 1. On	*0*
2	*Cooling 0...10 V override enable (Y3).	Bit	*0 - 1*	0. Off 1. On	*0*
3	*Heating PWM override enable (A2).	Bit	*0 - 1*	0. Off 1. On	*0*
4	*Heating 0...10 V override enable (Y4).	Bit	*0 - 1*	0. Off 1. On	*0*
5	*VAV override enable (Y1).	Bit	*0 - 1*	0. Off 1. On	*0*
6	*Fan override enable (Y2).	Bit	*0 - 1*	0. Off 1. On	*0*

Input registers:

Register	Parameter description	Data type	Values	Range
30008	Current cooling (controller).	S16	*0...1000*	0...10,00 V
30009	Current heating (controller).	S16	*0...1000*	0...10,00 V

Register	Parameter description	Data type	Values	Range
30010	Current fan speed (controller).	S16	*0 - 1 - 2 - 3 - 4*	0. Off 1. Speed 1 2. Speed 2 3. Speed 3 4. Automatic
30011	Fan speed (connector Y2).	S16	*0...1000*	0...10,00 V
30012	VAV control (connector Y1).	S16	*0...1000*	0...10,00 V
30013	Cooling control (connector Y3).	S16	*0...1000*	0...10,00 V
30014	Heating control (connector Y4).	S16	*0...1000*	0...10,00 V
30021	Cooling control (connector A1).	S16	*0...1000*	0...100,0 %
30022	Heating control (connector A2).	S16	*0...1000*	0...100,0 %

Holding registers:

Regis-ter	Parameter description	Data type	Values	Range	Default
40001	Fan speed by Modbus.	S16	*0 - 1 - 2 - 3 - 4*	0. Off 1. Speed 1 2. Speed 2 3. Speed 3 4. Automatic	*4*
40003	Cooling override (PWM) by Modbus (A1).	S16	*0...1000*	0...100,0 %	*0*
40004	Cooling override (0...10 V) by Modbus (Y3).	S16	*0...1000*	0...10,00 V	*0*
40005	Heating override (PWM) by Modbus (A2).	S16	*0...1000*	0...100,0 %	*0*
40006	Heating override (0...10 V) by Modbus (Y3).	S16	*0...1000*	0...10,00 V	*0*
40007	VAV override by Modbus (Y1).	S16	*0...1000*	0...10,00 V	*0*
40008	Fan override by Modbus (Y2).	S16	*0...1000*	0...10,00 V	*0*
40028	Minimum of cooling actuator.	S16	*0...500*	0...50,0 %	*0*
40029	Maximum of cooling actuator.	S16	*500...1000*	50,0...100,0 %	*1000*
40030	Minimum of heating actuator.	S16	*0...500*	0...50,0 %	*0*
40031	Maximum of heating actuator.	S16	*500...1000*	50,0...100,0 %	*1000*
40032	Minimum of fan output.	S16	*0...500*	0...50,0 %	*0*
40033	Maximum of fan output.	S16	*500...1000*	50,0...100,0 %	*1000*
40034	Minimum of VAV output.	S16	*0...500*	0...50,0 %	*0*
40035	Maximum of VAV output.	S16	*500...1000*	50,0...100,0 %	*1000*

2.15 Service alarm

If the temperature does not reach the dead zone in 120 hours, the Modbus register 11 value changes to ”ON” position. The alarm is for information purposes only and does not affect to the controller functions. Reset the alarm by writing the value 0 to the register or by cycling the power off and on..

3 Modbus

3.1 Modbus properties

Protocol	RS-485 Modbus RTU
Bus speed	9600*/19200/38400/56000 bit/s
Data bits	8
Parity	none*/odd/even
Stop bits	1
Modbus ID	1*
Network size	up to 247 devices per segment
	* factory setting

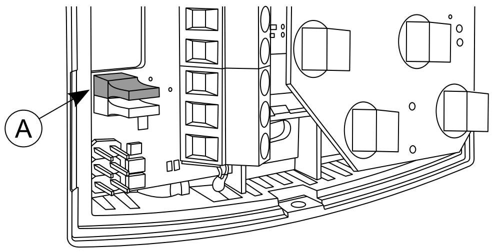
3.2 Modbus function codes

The device supports the following Modbus function codes.

Decimal	Hexa-decimal	Function
1	0x01	Read Coils
2	0x02	Read Discrete Inputs
3	0x03	Read Holding Registers
4	0x04	Read Input Registers
5	0x05	Write Single Coil
6	0x06	Write Single Register
15	0x0F	Write Multiple Coils
16	0x10	Write Multiple Registers
23	0x17	Read/Write Multiple Registers

3.3 Terminating Modbus

1. Open the cover.
2. Place the termination jumper.



A. Termination jumper

3.4 Modbus registers

3.4.1 Coils

The controls marked with * are stored in the volatile memory. These controls are returned to factory defaults after a power failure.

Register	Parameter description	Data type	Values	Range	Default
1	*Cooling PWM override enable (A1).	Bit	*0 - 1*	0. Off 1. On	*0*
2	*Cooling 0...10 V override enable (Y3).	Bit	*0 - 1*	0. Off 1. On	*0*
3	*Heating PWM override enable (A2).	Bit	*0 - 1*	0. Off 1. On	*0*
4	*Heating 0...10 V override enable (Y4).	Bit	*0 - 1*	0. Off 1. On	*0*
5	*VAV override enable (Y1).	Bit	*0 - 1*	0. Off 1. On	*0*
6	*Fan override enable (Y2).	Bit	*0 - 1*	0. Off 1. On	*0*
7	Not in use.	Bit	-	-	*0*
8	Not in use.	Bit	-	-	*0*
9	Not in use.	Bit	-	-	*0*
10	Not in use.	Bit	-	-	*0*
11	*Service alarm reset.	Bit	*0 - 1*	0. Off 1. On	*0*
12	*Cooling disabled.	Bit	*0 - 1*	0. Off 1. On	*0*
13	*Heating disabled.	Bit	*0 - 1*	0. Off 1. On	*0*
14	Night mode.	Bit	*0 - 1*	0. Off 1. On	*0*
15	Cooling output mode.	Bit	*0 - 1*	0. Direct 1. Reversed	*0*
16	Heating output mode.	Bit	*0 - 1*	0. Direct 1. Reversed	*0*
17	Cooling stages.	Bit	*0 - 1*	0. 1 stage 1. 2 stages	*0*
18	Sequence of cooling stages.	Bit	*0 - 1*	0. Valve first 1. VAV first	*0*
19	Fan stage simultaneously with valve stage.	Bit	*0 - 1*	0. Off 1. On	*1*
20	Night operation mode.	Bit	*0 - 1*	0. Dead zone 1. Frost guard	*0*

Regis-ter	Parameter description	Data type	Values	Range	Default
21	Effective set point after night mode to day mode change.	Bit	*0 - 1*	0. User 1. Modbus	*0*
22	Valve jam prevention.	Bit	*0 - 1*	0. Off 1. On	*0*
23	Fan type.	Bit	*0 - 1*	0. 3-speed fan 1. EC fan	*0*
24	Fan speed 3 disabled.	Bit	*0 - 1*	0. Off 1. On	*0*
25	Effective fan speed after night mode to day mode change.	Bit	*0 - 1*	0. User 1. Modbus	*0*
26	VAV for heating.	Bit	*0 - 1*	0. Off 1. On	*0*
27	Set point changing step.	Bit	*0 - 1*	0. 0,1 °C 1. 0,5 °C	*1*
28	DI2 operation direction.	Bit	*0 - 1*	0. NC 1. NO	*0*
29	Thermostat function, cooling.	Bit	*0 - 1*	0. P/PI 1. Thermostat	*0*
30	Thermostat function, heating.	Bit	*0 - 1*	0. P/PI 1. Thermostat	*0*
31	Y1 usage.	Bit	*0 - 1*	0. VAV 1. Cooling	*0*
32	Y2 usage.	Bit	*0 - 1*	0. Fan 1. Heating	*0*
33	Heating stages.	Bit	*0 - 1*	0. 1 stage 1. 2 stages	*0*
34	Set point and fan speed reset after operation mode change.	Bit	*0 - 1*	0. Off 1. On	*0*
35	Sequence of heating stages.	Bit	*0 - 1*	0. Valve first 1. VAV first	*0*
36	Man in house button function.	Bit	*0 - 1*	0. Temporary day mode 1. VAV forcing	*0*
37	Reset to night mode setpoint when activating night mode.	Bit	*0 - 1*	0. Off 1. On	*0*
38	Reboot the device.	Bit	*0 - 1*	0. - 1. Reboot	*0*
39	button activity.	Bit	*0 - 1*	0. Button deactivated 1. Button active	*1*

Regis-ter	Parameter description	Data type	Values	Range	Default
40	Save current configuration to non-volatile memory. The register value changes to 0 automatically after saving.	Bit	*0 - 1*	0. - 1. Save settings	*0*

3.4.2 Discrete inputs

Register	Parameter description	Data type	Values	Range
10001	Occupied by PIR	Bit	*0 - 1*	0. Off 1. On
10002	Occupied by “man in a house”	Bit	*0 - 1*	0. Off 1. On
10003	Day extension	Bit	*0 - 1*	0. Off 1. On
10004	DI1 Input state	Bit	*0 - 1*	0. Off 1. On
10005	DI2 Input state	Bit	*0 - 1*	0. Off 1. On
10006	CO_2 overdrives	Bit	*0 - 1*	0. Off 1. On
10007	Not in use.	Bit	-	-
10008	Not in use.	Bit	-	-

3.4.3 Input registers

Register	Parameter description	Data type	Values	Range
30001	Discrete inputs 16...1.	U16	*bits 0...15*	Discrete inputs 16....1
30002	Coils 16...1.	U16	*bits 0...15*	Coils 16....1
30003	Coils 32...17.	U16	*bits 0...15*	Coils 32...17
30004	Temperature value.	S16	*-600...600*	-600...600 °C
30005	External temperature value.	S16	*-600...600*	-600...600 °C
30006	CO_2 value.	S16	*0...2000*	0...2000 ppm
30007	Effective setpoint.	S16	*50...500*	5,0...50,0 °C
30008	Current cooling (controller).	S16	*0...1000*	0...10,00 V
30009	Current heating (controller).	S16	*0...1000*	0...10,00 V
30010	Current fan speed (controller).	S16	*0 - 1 - 2 - 3 - 4*	0. Off 1. Speed 1 2. Speed 2 3. Speed 3 4. Automatic
30011	Fan speed (connector Y2).	S16	*0...1000*	0...10,00 V
30012	VAV control (connector Y1).	S16	*0...1000*	0...10,00 V
30013	Cooling control (connector Y3).	S16	*0...1000*	0...10,00 V
30014	Heating control (connector Y4).	S16	*0...1000*	0...10,00 V

Register	Parameter description	Data type	Values	Range
30015	U1 input value.	S16	*0...1000*	0...10,00 V
30016	External NTC value (connector).	S16	*-600...600*	-600...600 °C
30017	VAV / boosting control.	S16	*0 - 1 - 2*	0. CO_2 1. Temperature 2. PIR
30018	Setpoint by user.	S16	*20...420*	2,0...42,0 °C
30019	Fan control by user.	S16	*0 - 1 - 2 - 3 - 4*	0. Off 1. Speed 1 2. Speed 2 3. Speed 3 4. Automatic
30020	User setpoint deviation.	S16	*0...160*	0...16,0 °C
30021	Cooling control (connector A1).	S16	*0...1000*	0...100,0 %
30022	Heating control (connector A2).	S16	*0...1000*	0...100,0 %
30023	Current timer value of temporary day mode.	S16	*0...480*	0...480 min

3.4.4 Holding registers

The controls marked with * are stored in the volatile memory. These controls are returned to factory defaults after a power failure.

Regis-ter	Parameter description	Data type	Values	Range	Default
40001	Fan speed by Modbus.	S16	*0 - 1 - 2 - 3 - 4*	0. Off 1. Speed 1 2. Speed 2 3. Speed 3 4. Automatic	*4*
40002	Setpoint by Modbus.	S16	*80…500*	8,0...50,0 °C	*210*
40003	*Cooling override (PWM) by Modbus (A1).	S16	*0...1000*	0...100,0 %	*0*
40004	*Cooling override (0...10 V) by Modbus (Y3).	S16	*0...1000*	0...10,00 V	*0*
40005	*Heating override (PWM) by Modbus (A2).	S16	*0...1000*	0...100,0 %	*0*
40006	*Heating override (0...10 V) by Modbus (Y4).	S16	*0...1000*	0...10,00 V	*0*
40007	*VAV override by Modbus (Y1).	S16	*0...1000*	0...10,00 V	*0*
40008	*Fan override by Modbus (Y2).	S16	*0...1000*	0...10,00 V	*0*
40009	External temperature sensor / DI2 input.	S16	*0 - 1 - 2 - 3*	0. Not in use 1. External temperature sensor 2. Door/window switch 3. Condensation switch	*0*
40010	Temperature sensor adjustment.	S16	*-30…30*	-3,0...3,0 °C	*0*
40011	Centre of user setpoint area.	S16	*180...260*	18,0...26,0 °C	*210*

Regis-ter	Parameter description	Data type	Values	Range	Default
40012	User setpoint area limits .	S16	*0...160*	0...16,0 °C	*30*
40013	Control mode.	S16	*0 - 1*	0. P 1. PI	*1*
40014	Dead zone.	S16	*0...30*	0...3,0 °C	*10*
40015	Set point position in dead zone.	S16	*0...100*	0...100 %	*50*
40016	Proportional band (Xp).	S16	*10…320*	1,0…32,0 °C	*10*
40017	Integration time.	S16	*50…5000*	50…5000 s	*150*
40018	Fresh air control.	S16	*0 - 1 - 2 - 3*	0. CO_2 / Temp. 1. Day mode / Temp. 2. CO_2 3. Day mode	*0*
40019	Night mode dead zone.	S16	*0...100*	0...10,0 °C	*60*
40020	Frost guard function setpoint.	S16	*80…500*	8,0...50,0 °C	*170*
40021	DI1 mode.	S16	*0 - 1*	0. Not in use 1. Day/night mode switch	0
40022	DI1 operation direction.	S16	*0 - 1*	0. NC 1. NO	*0*
40023	DI1 delay passive to active.	S16	*0...60*	0...60 min	*0*
40024	DI1 delay active to passive.	S16	*0...60*	0...60 min	*5*
40025	Duration of temporary day mode.	S16	*0...480*	0...480 min	*120*
40026	Minimum VAV output in day mode or VAV forcing mode. The controlled mode is selected with the register 36.	S16	*0...1000*	0...100,0 %	*0*
40027	U1 mode.	S16	*0 - 1 - 2*	0. Not in use 1. Temperature set point 2. Temperature measurement	*0*
40028	Minimum of cooling actuator.	S16	*0...500*	0...50,0 %	*0*
40029	Maximum of cooling actuator.	S16	*500...1000*	50,0...100,0 %	*1000*
40030	Minimum of heating actuator.	S16	*0...500*	0...50,0 %	*0*
40031	Maximum of heating actuator.	S16	*500...1000*	50,0...100,0 %	*1000*
40032	Minimum of fan output.	S16	*0...500*	0...50,0 %	*0*
40033	Maximum of fan output.	S16	*500...1000*	50,0...100,0 %	*1000*
40034	Minimum of VAV output.	S16	*0...500*	0...50,0 %	*0*
40035	Maximum of VAV output.	S16	*500...1000*	50,0...100,0 %	*1000*
40036	Fan output scaling, high end.	S16	*0...1000*	0...100,0 %	*1000*
40037	Fan output scaling, low end.	S16	*0...1000*	0...100,0 %	*0*
40038	Fan usage.	S16	*0 - 1 - 2 - 3*	0. Off 1. Cooling 2. Heating 3. Heating and cooling	*0*

Regis-ter	Parameter description	Data type	Values	Range	Default
40039	Low limit proportional band for CO_2 control.	S16	*400...1000*	400...1000 ppm	*700*
40040	High limit proportional band for CO_2 control.	S16	*500...2000*	500...2000 ppm	*1250*
40041	Fan speed 1 voltage.	S16	*0...1000*	0...10,00 V	*300*
40042	Fan speed 2 voltage.	S16	*0...1000*	0...10,00 V	*600*
40043	Fan speed 3 voltage.	S16	*0...1000*	0...10,00 V	*1000*
40044	Display mode.	S16	*0 - 1 - 2 - 3 - 4*	0. Off 1. Temperature 2. Setpoint 3. Deviation from setpoint 4. Screen saver and deviation from setpoint	*1*
40045	PWM pulse width.	S16	*20...1200*	20...1200 s	*20*
40046	Fan output boost duration.	S16	*0...10*	0...10 s	*0*
40047	6-way valve output.	S16	*0 - 1 - 2*	0. Off 1. Cooling (Y3) 2. Heating (Y4)	*0*
40048	6-way valve heating, low limit.	S16	*0...1000*	0...10,00 V	*730*
40049	6-way valve heating, high limit.	S16	*0...1000*	0...10,00 V	*1000*
40050	6-way valve cooling, low limit.	S16	*0...1000*	0...10,00 V	*470*
40051	6-way valve cooling, high limit.	S16	*0...1000*	0...10,00 V	*200*
40052	Night mode setpoint.	S16	*20…420*	2,0...42,0 °C	*210*
40053	Firmware version.	S16	*0...1000*	0...1000	-