AIAS ROOM CONTROLLER

ORIGINAL INSTALLATION AND OPERATION INSTRUCTION

systemair

General description

AIAS-RC Room Controllers can handle everything from heating, cooling and ventilation to humidity, CO2 monitoring and control. They can be used either as stand-alone units or integrated into a system with communication. The controllers are connected to EXOline bus line such as Modbus, BACnet (only models with display) or Regin's own bus system EXOline, to communicate with AIAS COMBOX-system via RS485. They can also be configured for a specific application with Regin's software tool Regio tool© .

Applications

The AIAS-RC Room Controllers have an appealing design and functionality. They are suitable in buildings where you want optimal comfort and low energy consumption, for example offices, schools, shopping centres, airports, hotels and hospitals.

Mounting

The modular design with a separate bottom plate for wiring makes the AIAS-RC Room Controllers easy to install and commission. The controllers are mounted directly on the wall or on a wall box.

Communication

The controllers can be connected to AIAS-Combox via RS485 (EXOline) and configured for a particular application using the configuration tool Regiotool© , which can be downloaded free of charge from Regin's homepage www.regin.se. Seethe manual for Regio tool© for more information.

Control modes

The controller can be configured for different control modes/ control sequences:

- Heating
- Heating or cooling via the change-over function
- Heating/Heating
- Heating/Cooling
- Heating/ Cooling with VAV-control and forced supply air function
- Heating/Cooling with VAV-control
- Cooling
- Cooling/Cooling
- Heating/Cooling/VAV (only available in
- Heating/Heating or Cooling via change-over (only available in ...F-models)
- Heating/Cooling with VAV-control via change-over function in parallel to CO2 control

Following control features are available:

- Display
- Occupancy button
- CO2 input
- EC fan control (AO) follow cooling/heating
- Contol of a third sequence (damper)

Technical data

Supply voltage	18...30 V AC, 50...60 Hz
Internal consumption	2.5 VA
Ambient temperature	0...50°C
Ambient humidity	Max 90 % RH
Storage temperature	-20...+70°C
Terminal blocks	Lift type for cable cross-section 2.1 mm2
Protection class	IP20
Material casing	Polycarbonate, PC
Colour	
Cover	Polar white RAL9010
Bottom plate	Light gray
Weight	110 g
Dimensions	
Models without setpoint knob	95 x 95 x 28 mm
Models with setpoint knob	95 x 95 x 31 mm
Communication	
Type	RS485 (EXOline or Modbus with automatic detection or BACnet)
Communication speed	9600, 19200, 38400 bps (EXOline, Modbus and BACnet)
	or 76800 bps (BACnet only)
Functions as	
Modbus	RTU Slave
BACnet	MS/TP slave and master
Modbus	8 bits, 1 or 2 stop bits. Odd, even (FS) or no parity
Galvanically isolated port	No
Memory	
Non-volatile (EEPROM)	All settings and configurations are preserved
See also Chapter 15, Memory function on power failure.	
Built-in temperature sensor	
Type	NTC, linearised, 15 kOhm
Measuring range	0...50°C
Accuracy	+/-0.5°C at 15...30°C
Models with display	
Display type	LCD with background illumination
LVD, Low Voltage Directive	
This product conforms with the requirements of European LVD standard IEC 60 730-1.	
EMC emission and immunity standard	
This product conforms to the requirements of the EMC Directive 2004/108/EC through product standards EN 61000-6-1 and EN 61000-6-3.	
RoHS	
This product conforms to the Directive 2011/65/EU of the European Parliament and of the Council.	
Inputs (see Table 2 below for number and function for different models)	
AI1	PT1000-sensor, 0...50°C, accuracy +/- 0.1°C
UI	AI: PT1000-sensor, 0...100°C, accuracy +/- 0.2°C
	or AI2: 0...10 V
	or DI: see DI below
CI	Regin's condensation detector, KG-A
DI	Closing potential-free contact connected to +C in one end
Outputs (see Table 2 below for number and function for different models)	
DO	24 V AC, max 0.5 A
UO	DO:24 V AC, max 2.0 A or AO:0...10 V DC, max 5 mA
+C, power output for DI only	24 V DC, max 10mA, short circuit protected

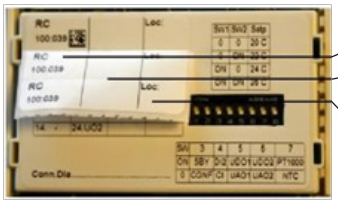
UO3*	UO1*	UO2*	AI1	AI2	DI1	DI2
Forced vent.	Heating actuator	Cooling actuator	Ext. room sensor	CO2	Occupancy sensor	CI Window contact
alt. EC fan	alt. Cooling actuator	alt. Heating actuator	alt. Change-over	alt. Flow	alt. Window contact	alt. Condensation detector
alt. follow Heat/ Cool in seq.				alt. 0...10 V	alt.Change-over	alt. Change-over

Accessories

External temperature sensors	TG-R5/PT1000,TG-UH/ PT1000,TG-A1/PT1000
Occupancy detector	IR24-P
Relay module for -F-models	RB3
Change-over	TG-A1/PT1000
Condensation detector	KG-A/1
CO2 transmitter	CO2RT

Using labels

On the back of the electronics cassette, there is a set of labels which makes it easier to install large numbers of controllers. By using the labels as carriers of information for the installation engineer, much time will be saved and you can keep wiring errors at a minimum.



- Model and address
- Field for new address or reference to connection diagram
- Field for room number

The three-piece label can be split and the parts can be fastened to the installation drawing and the bottom plate of the controller. The label carries information on the communication address etc., and has a note area where you can enter a reference number to the connection diagram.The address on the sticker has a different meaning depending on what communication protocol is used.

Example: If the address on Sticker is 191:183, for EXOline protocol it means PLA=191, ELA=183

Configuration

The controller is normally configured using Regio tool© . The passwords for the various access levels are 1111 (log in as administrator) and 3333 (log in as operator). For more information, see the manual for Regio tool© .The controller can also be configured on the display via the parameter menu. The computer running Regio tool© is connected to the cassette with a USB-to-RS485 converter. The adapter is connected to terminals 42(A) and 43(B). Use a 24 V AC trafo for supply voltage of the electronics cassette on terminals 10 and 11.If you want to configure the unit, it is normally better to do this before sending the cassette to the installation site. The bottom plates with location and wiring information can be sent separately to the installation site for electric installation.

Calibration

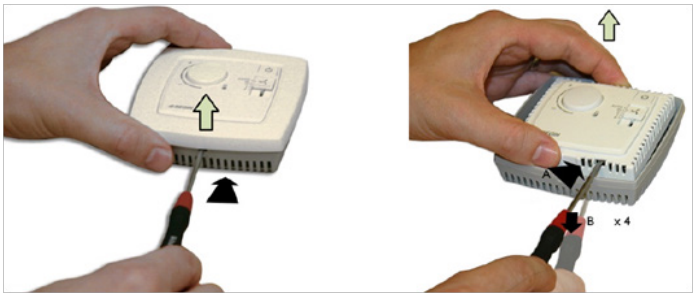
Calibration of a measured room temperature should be done under stable conditions.

Troubleshooting

The Manual/Auto function in Regio tool© makes it possible to test outputs. The output itself is not affected; only the software object that controls the output. This means that the built-in safety functions will not be disregarded.

Mounting

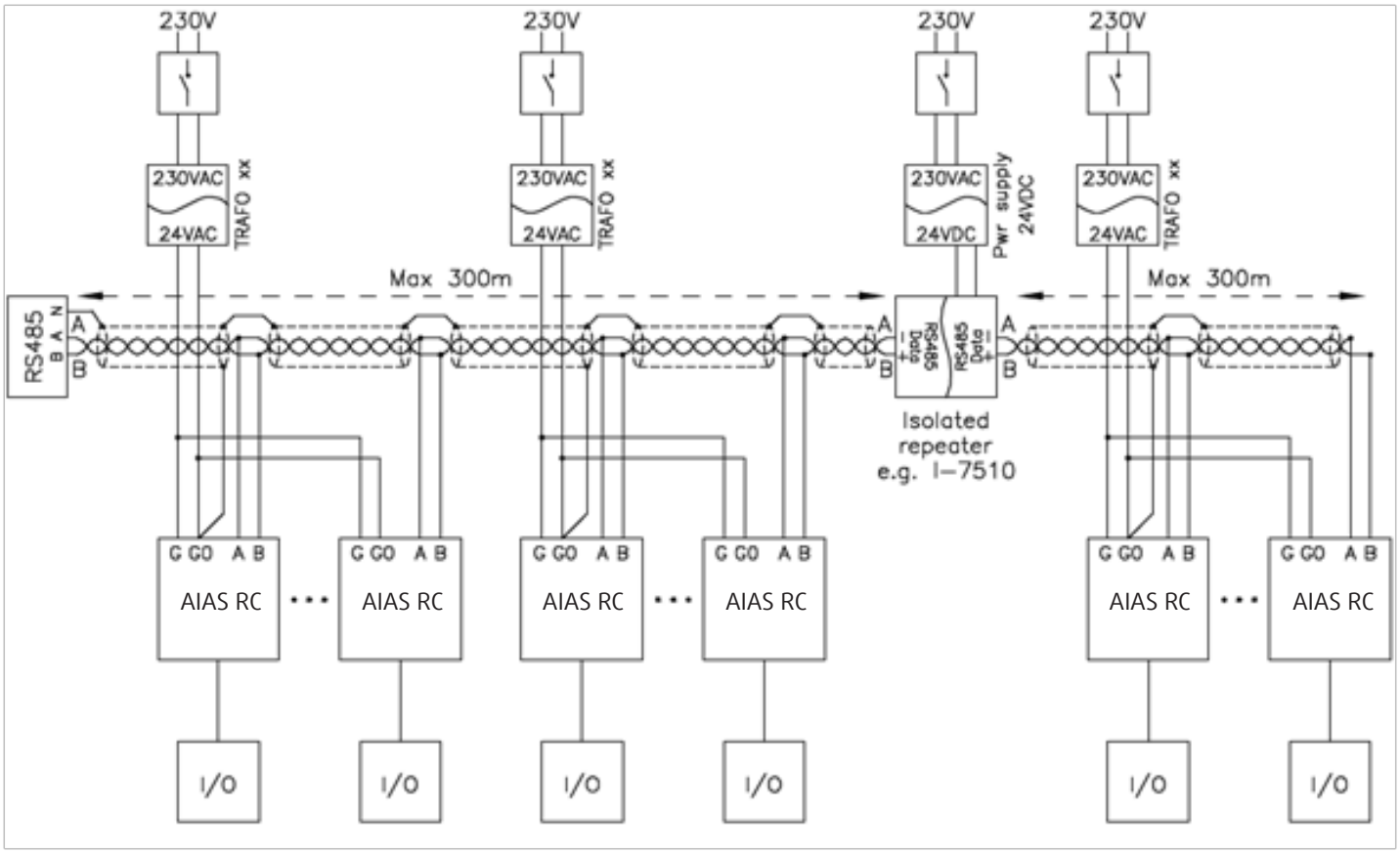
Place the controller in a location that has a temperature representative for the room. A suitable location is approx. 1.6 m above floor level in a place with unobstructed air circulation. Remove the frame by depressing the locking tab in the lower edge of the cover with a screwdriver. Next, gently pry the electronics cassette out by using the four rectangular screwdriver slots to lever against the edge of the bottom plate. Note: Take care not to damage the electronics when inserting the screwdriver into the slots!



The bottom plate with terminals has a number of fixing hole combinations. Select suitable holes and screw the bottom plate onto the wall or connection box, so that the arrows on the bottom plate point upwards. Do not tighten the screws too hard! With surface-mounted cabling, break out suitable holes from the marks in the plastic.

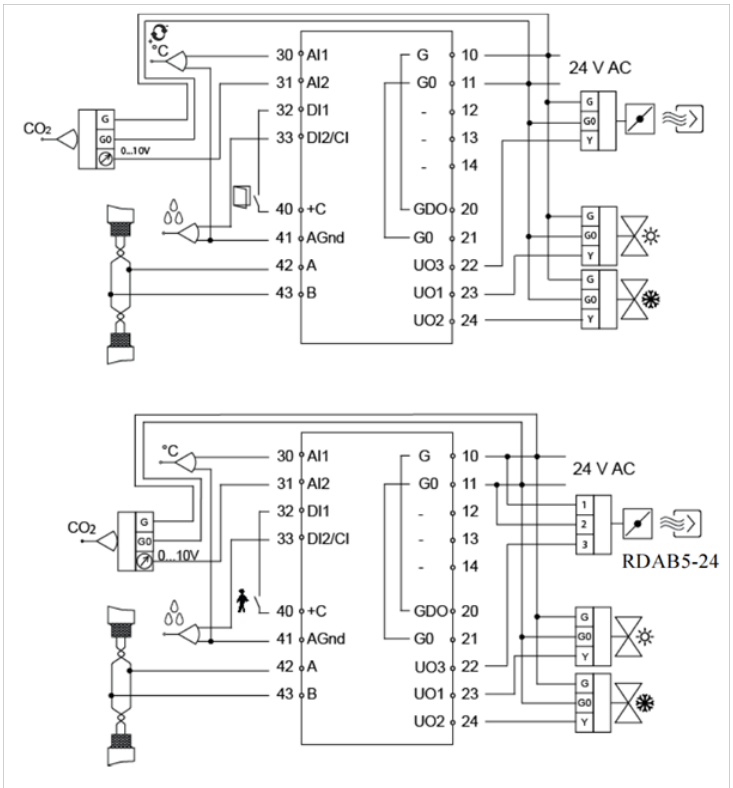
Wiring

All units that share the same transformer and communication loop must use the same transformer-pole for G (terminal 10) and G0 (terminal 11). On the communication loop the A-terminal (terminal 42) should only be connected to another A-terminal and the B-terminal (terminal 43) to another B-terminal. Otherwise, the communication will not work. The communication cable must be a screened twisted pair cable. The shield must be connected to G0 on one (and only one) Midi controller in each separate power supply loop with 24 V AC. If the length of the loop exceeds 300 m, a repeater is required. The figure below shows the location of the terminals.



Measurement and testing during installation

In order to make measurements and test the inputs/outputs of a room controller during installation, Regin's RC-TEST service adapter may be used. Simply align the pins at the bottom of the RC-TEST with the terminals contained in the controller's socket and then plug the electronics cassette into the terminals at the top of the device. Testing takes place via a standard multimeter.



Terminal	Designation	Operation
10	G	Supply voltage 24 V AC
11	G0	Supply voltage 0 V
12-14		No function.
20	GDO	24 V AC out common for DO. Internally connected to terminal 10, G.
21	G0	0 V common for UO. Internally connected to terminal 11, G0.
22	UO3	Output for VAV or EC-fan. For forced ventilation. 24 V AC output, max. 2.0 A. 24 V actuator is connected between terminal 22 and terminal 20, GDO.
		Alternatively For 0...10 V DC damper control/EC-fan. The damper actuator/EC-fan 0...10 V control signal terminal is connected to terminal 22 and its supply terminals to terminals 10 and 11. Make sure that the reference pole G0 is connected to the correct terminal on the actuator.
23	UO1	Control output heating (FS), cooling or heating or cooling via change-over. For a 0...10 V DC valve actuator, max 5 mA (FS). The valve actuator's 0...10 V control signal terminal is connected to terminal 23 and its supply terminals to terminals 10 and 11. Make sure that the reference pole G0 is connected to the correct terminal on the actuator.
		alternatively For a 24 V AC thermal actuator, max 2.0 A. The thermal actuator is connected between terminals 23 and 20, GDO.
		alternatively For a 24V AC actuator with spring return, max. 2.0 A. The actuator is connected between terminals 23 and 20. This can be configured either through the display or through Regio tool©. The output signal for UO1 can be set to NC (normally closed) or NO (normally open).
24	UO2	Control output heating or cooling (FS). For a 0...10 V DC valve actuator, max 5 mA (FS). The valve actuator's 0...10 V control signal terminal is connected to terminal 24 and its supply terminals to terminals 10 and 11. Make sure that the reference pole G0 is connected to the correct terminal on the actuator.
		alternatively For a 24 V AC thermal actuator, max 2.0 A. The thermal actuator is connected between terminals 24 and 20, GDO.
		alternatively For a 24V AC actuator with spring return, max. 2.0 A. The actuator is connected between terminals 24 and 20. This can be configured either through the display or through Regio tool©.
30	AI1	For an external room sensor, PT1000. Measuring range 0...50°C. The sensor is connected between terminals 30 and 41, AGnd.
31	AI2	For a 0...10 V CO2 sensor
		alternatively Flow input
		alternatively 0...10 V input
32	DI1	Occupancy detector. A potential-free contact is connected between terminals 32 and 40, +C. Closed contact corresponds to occupancy.
		alternatively Window contact (DI). A potential-free contact is connected between terminals 33 and 40, +C. Closed contact indicates closed window.
		alternatively Change-over.
33	DI2/CI	Regin's condensation detector, KG-A/1 (FS). The sensor is connected between terminals 33 and 41, AGnd.
		alternatively Window contact (DI). A potential-free contact is connected between terminals 33 and 40, +C. Closed contact indicates closed window. alternatively Change-over.
40	+C	24 V DC out common for DI and UI (with digital function)
41	AGnd	Analogue ground, reference for AI and UI (with analogue function)
42	A	RS485-communication A
43	B	RS485-communication B

Different control modes

The controllers can be configured for different control modes/control sequences. Depending on which control mode is active, one, both or all three of the universal outputs, U01, U02 and U03, are used. See table below for a summary.

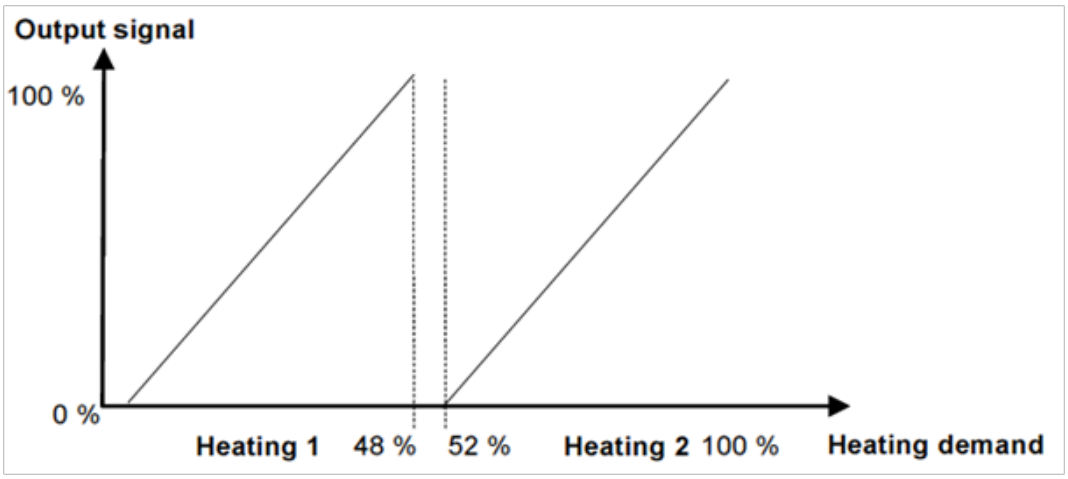
Control mode	U01*	U02*	U03**
Heating	Heating	-	VAV damper/EC fan
Heating/Heating (split output signal)	Heating	Heating	VAV damper/EC fan
Heating or cooling via change-over	Heating or cooling	-	VAV damper/EC fan
Heating/Cooling	Heating	Cooling	VAV damper/EC fan
Heating/Cooling with VAV-control and forced supply air function	Heating	Cooling	VAV damper/EC fan
Heating/Cooling with VAV-control	Heating	Cooling	VAV damper/EC fan
Cooling	Cooling	-	VAV damper/EC fan
Cooling/Cooling (split output signal)	Cooling	Cooling	VAV damper/EC fan
Heating/Cooling/VAV			
(only available in -C3- models, except C3DF0C)	Heating	Cooling	VAV damper/EC fan
Heating/Heating or Cooling via change-over (only available in fan models)	Heating	Cooling	VAV damper/EC fan

Heating

In control mode Heating, the unit is always a heating controller and controls according to the heating setpoint plus/minus the setpoint adjustment. The setpoint can be adjusted in the display or via the setpoint knob.

Heating/Heating

In control mode Heating/Heating, the controller is always a heating controller and controls according to the basic heating setpoint plus the setpoint adjustment. The control signal is divided between the two outputs with a deadband in between. The first output (U01) works between 0...48 % of the control signal. When the control signal reaches 52 %, U02 starts to operate and will be 10 V when the control signal is 100 %. See the figure below:

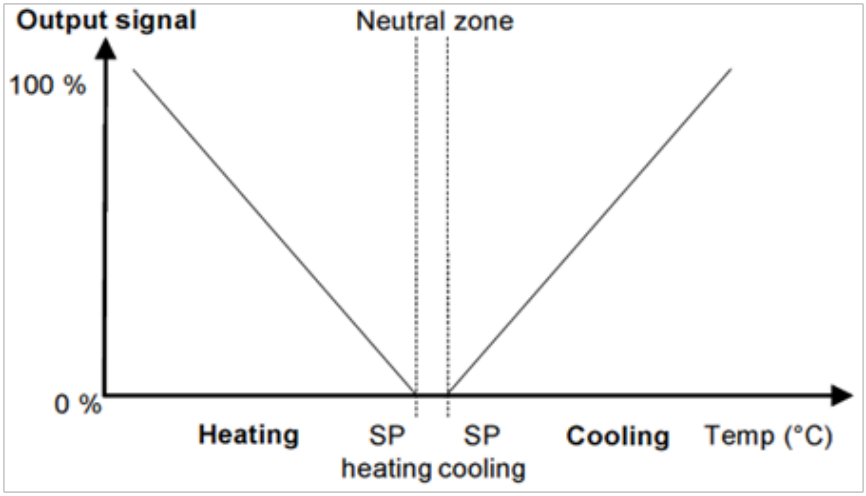


Heating or cooling via change-over

This control mode is used for installations with 2-pipe systems. It makes it possible to use the same pipe for both heating and cooling, depending on whether heating or cooling is required. Switching between heating and cooling mode can be performed either by using a digital or an analogue input. Only one output is used to control the actuator (U01). See more in the chapter Change-over function.

Heating/Cooling

In control mode Heating/Cooling, the controller functions as a heating controller when the room temperature is lower than the basic heating setpoint plus half the neutral zone. The neutral zone is the difference in temperature between the heating setpoint and the cooling setpoint. When the room temperature exceeds this limit, the controller becomes a cooling controller. There is a hysteresis of 0.1°C when the controller changes from heating to cooling controller and vice versa. When the controller is heating, it regulates according to the basic heating setpoint plus the setpoint adjustment, and when it is cooling according to the basic cooling setpoint plus the setpoint adjustment

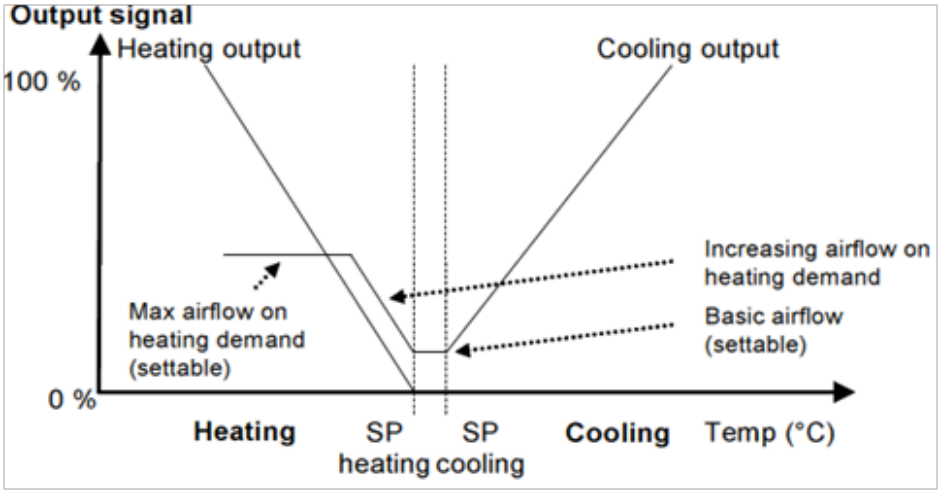


Heating/Cooling with VAV-control and forced supply air function

Like control mode Heating/Cooling but the cooling output is controlling a supply air damper (sub-tempered supply air). When the ventilation is forced, the cooling output is set to full cooling (full supply air volume), regardless of what the controller output signal is.

Heating/Cooling with VAV-control

Heating and cooling are controlled in the same way as in the VAV-control above. The damper cannot be forced like above. There is also a function that opens the supply air damper on heating demand. This is normally always required if the heater is placed in the supply air duct, to carry the heat to the room. A maximum limit is set for the opening of the damper on heating demand. The factory setting is zero, which means that the function to open the damper on heating demand is not active. The basic flow can also be set separately.

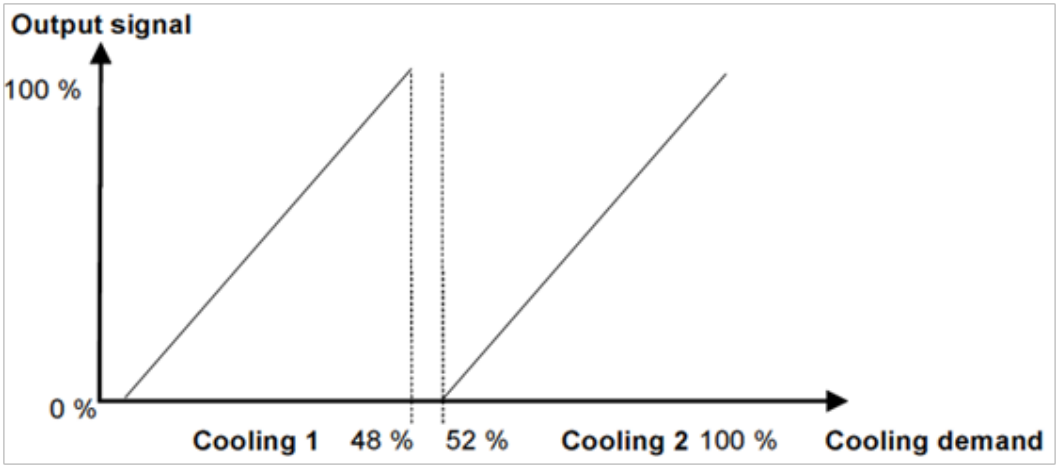


Cooling

In control mode Cooling, the unit is always a cooling controller and controls according to the basic cooling setpoint plus the setpoint adjustment.

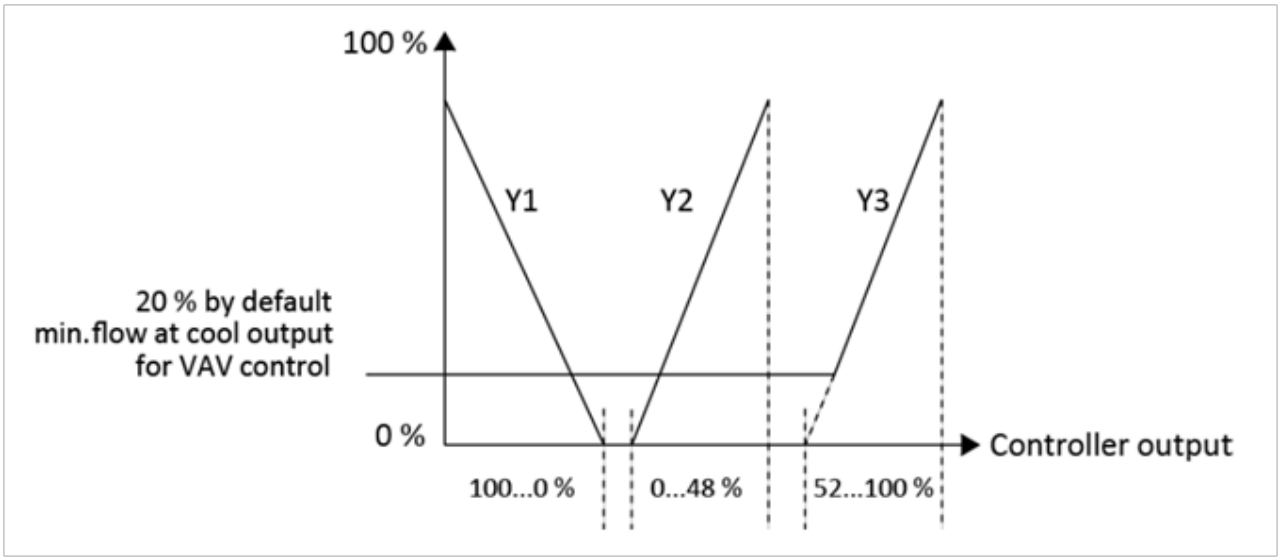
Cooling/Cooling

Split output signalIn control mode Cooling/Cooling, the controller always functions as a cooling controller and controls according to the basic cooling setpoint plus the setpoint adjustment. The control signal is divided between the two outputs with a deadband in between. The first output (UO1) works between 0...48 % of the control signal. When the control signal reaches 52 %, UO2 starts to operate and will be 10 V when the control signal is 100 %. See the figure below:

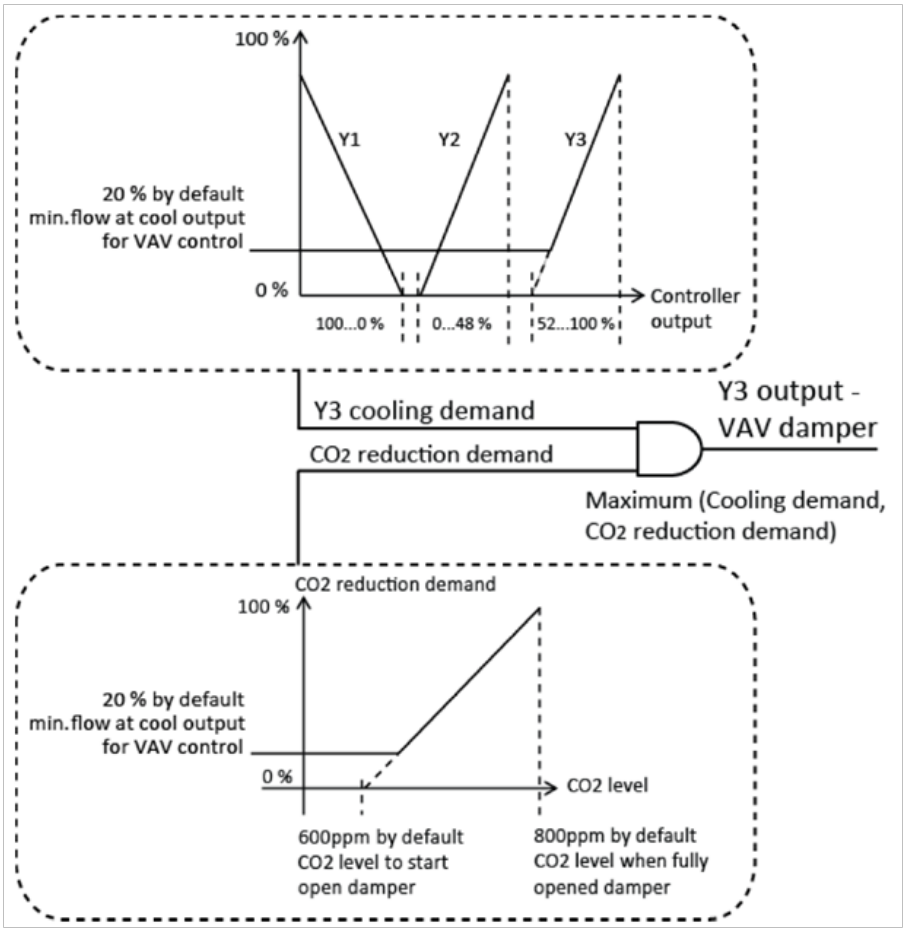


Heating/Cooling/VAV

This control mode offers the possibility to control three analogue outputs: heating, cooling and VAV. When the controller is in cooling mode, the control signal is split between cooling and VAV see figure below:



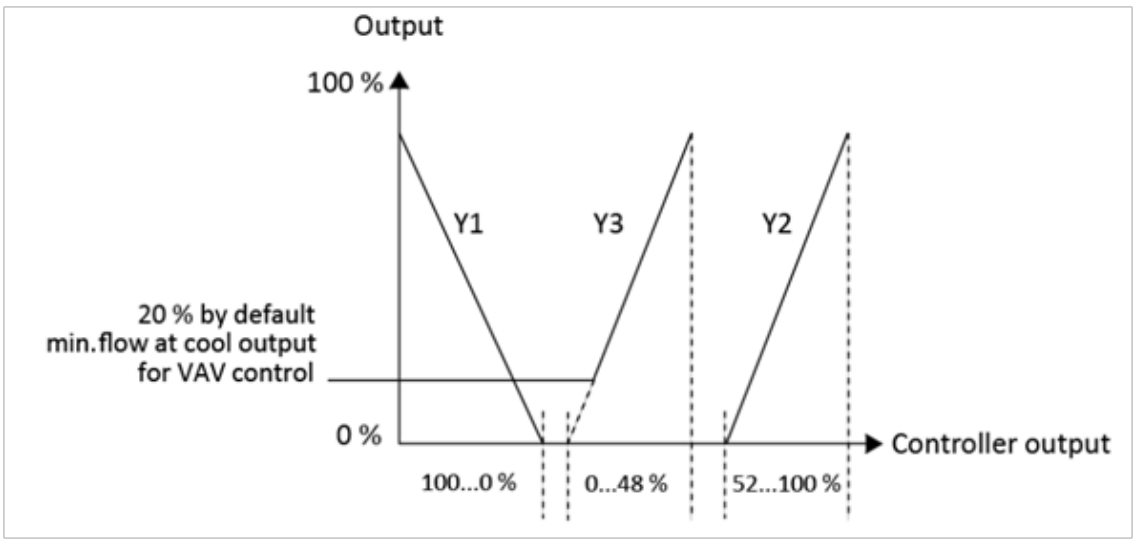
To avoid Y2 and Y3 opening and closing frequently during switch-over, a saddle point is implemented. Y2 will output 0...10 V (linear) when the controller output is 0...48 % and Y3 will output 0...10 V (linear) when the controller output is 52...100 %. In the saddle point, the outputs will always be 100 % for Y2 and 0 % for Y3.
As an addition to the function described above, it is possible to connect a CO2 sensor to controller. The output on Y3 will then be affected by either cooling demand or by the CO2 level rising too high. The output from the CO2 function is linear between two user-defined setpoints (see figure below).



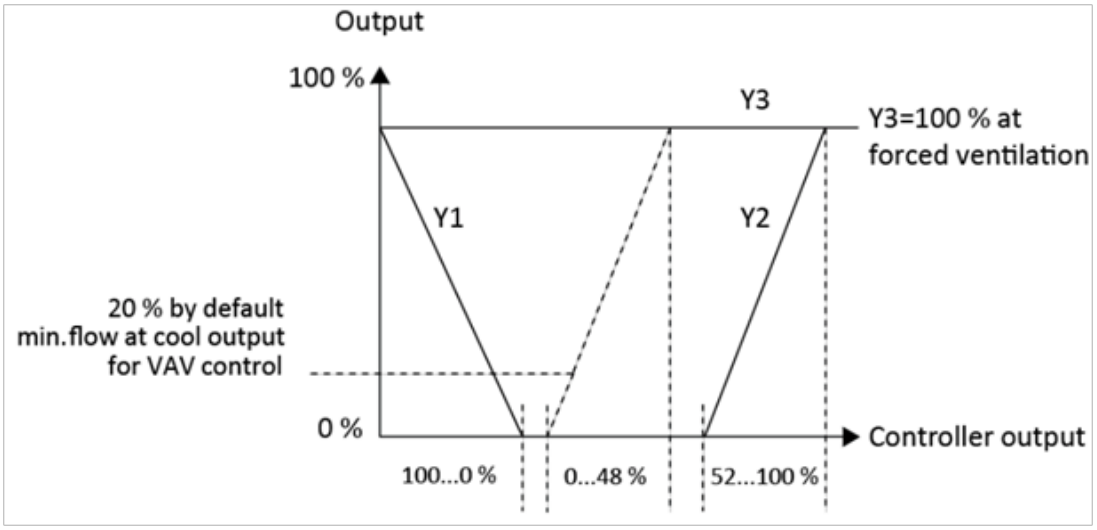
The variable for the min. limit of the VAV-damper is the same as for the VAV-damper in the VAV control applications on Y2. Default is 20 % min. limit.

Reversed sequence

In some applications, e.g. free cooling, it may be desirable to reverse the sequence of Y2 and Y3 (i.e., to open Y3 before Y2). This function is a configuration of the control mode Heating/Cooling/VAV. When the function is active, the sequence of Y2 and Y3 will be reversed, i.e. Y3 will open 0...100 % when controller output is in the range of 0...48 % and Y2 will open 0...100 % when the controller output is 52...100 %. See the figure below:



At forced ventilation, Y3 will open fully as before, and Y2 will control depending on temperature. However, Y2 will not give any output unless the controller output is above 52 %.



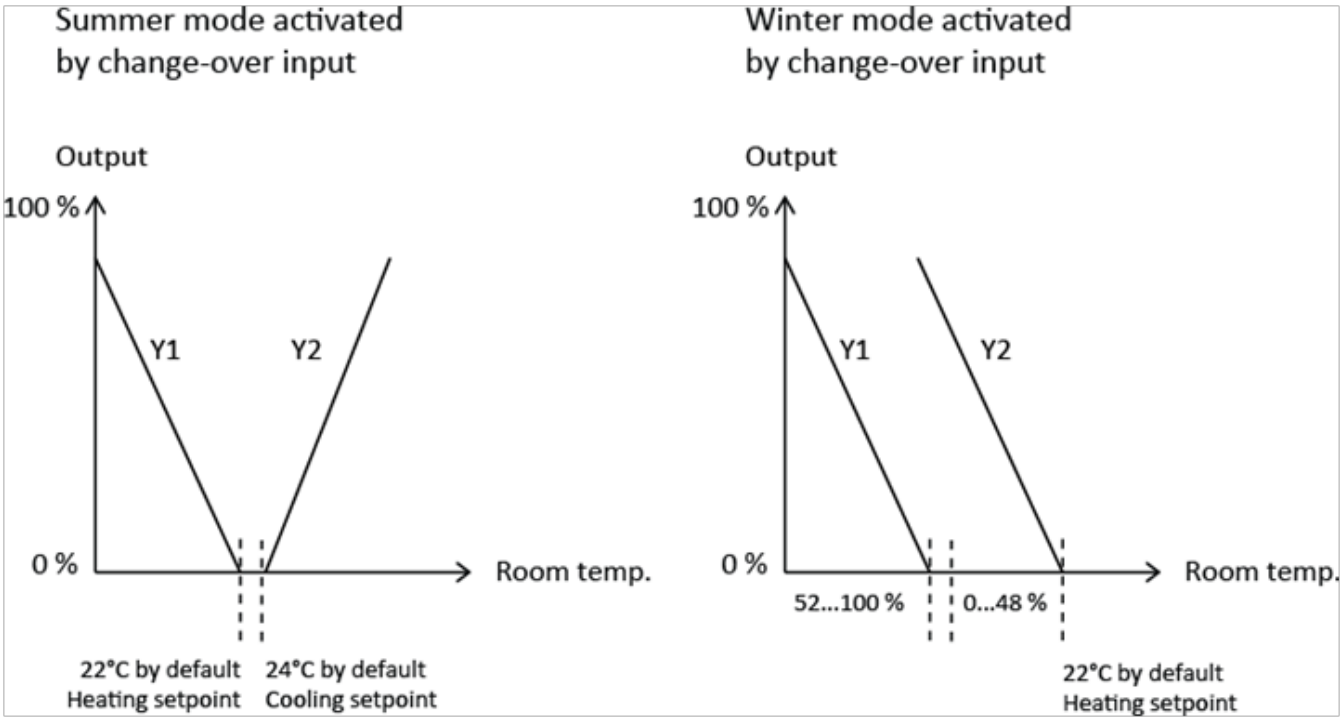
Heating/heating or cooling via change-over

For models offering fan functionality, a function for control of a heating battery on U01 in sequence with change-over on U02 is available. When this has been performed, the start sequence of U01/U02 is changed along with the limits for fan start.

The change-over function will be used to switch between summer and winter mode. U02 will be used as a cooling actuator in summer mode and as a heating actuator in winter mode.

In summer mode, RC will function as a regular heating/cooling controller.

In winter mode, RC will function as a heating/heating controller. U02 will initiate first and U01 second. The electrical heating battery connected to U01 will start only if the ordinary heat battery on U02 cannot meet the heating demand. When a heating demand exists, the output of U02 is 0...100 % linear to the heating demand 0...48 % and U01 0...100 % to the heating demand 52...100 %. When the heating demand is 48...52 % U02 will always output 100 % and U01 0 %.



As the electrical heater is connected to U01, and since an electrical heater may become very hot, a fan stop delay has been implemented into the system. The fan stop delay will only be activated in heating mode, and then only if the fan has been running prior to the stop. When the heat output has been set to 0 %, the fan will continue to run for an additional 120 s, at the same speed it had prior to stopping.
It is very important to note that Regio does not have any built-in function for monitoring when the fan is running or if the heat battery is overheating. This function must instead be provided by a supervisory system.

CO2 sensor and VAV control

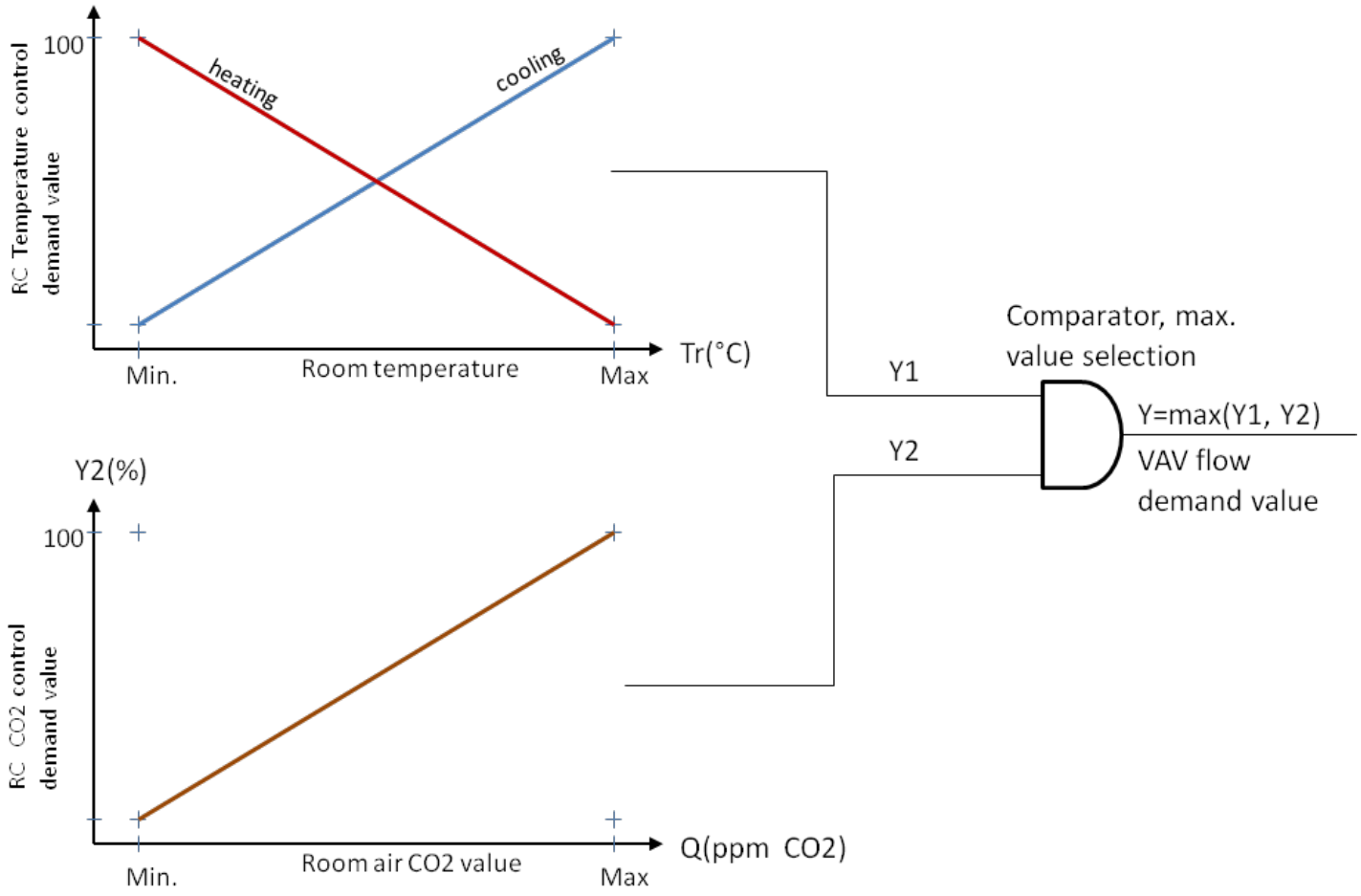
RC can be set to all of the above control modes. When RC are set to VAV control, the control mode is combined with a CO2 control function.

In control mode Heating/Cooling with VAV-control, the CO2 concentration in the room will make the VAV damper, cooling output UO2, open. The function is linear and the damper works between the configured min. flow (FS=20 %) and 100 %, depending on the CO2 concentration in the room. If the CO2 concentration drops below the configured min. limit, the damper will stay on the minimum allowed air flow. When the CO2 concentration rises, the damper will open linearly until reaching the configured CO2 max. value, at which point it will be 100 % open.

Full range change-over determined heating/cooling control by VAV combined with CO2 control.

This mode allows to control the room temperature by VAV either in heating or in cooling mode, depending on the change-over status. Control value Y1 is active for this function. As described above, the CO2 control over Control value Y2 operates in paralel. The Higher of the control values is forwarded to the alalog output for air flow control by VAV.

This mode is activated by setting parameter 11 (Control mode) to value 10 (see page 29)

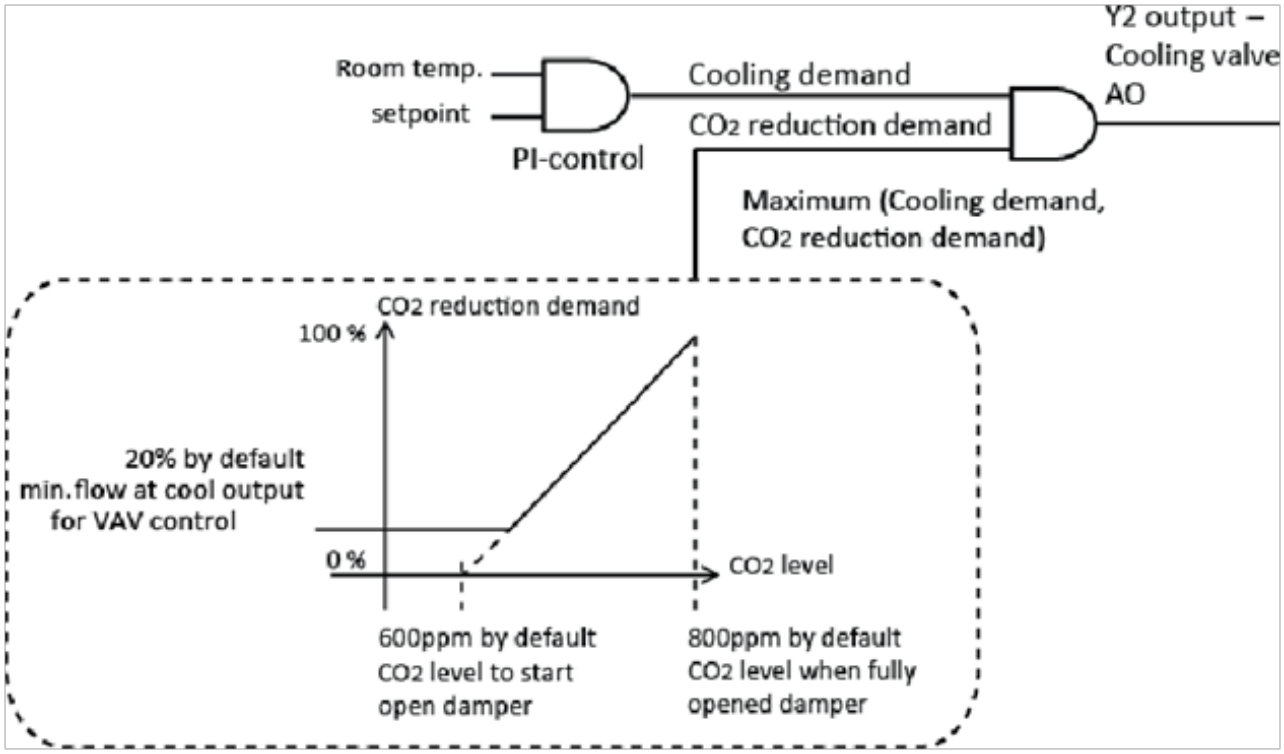


Minimum limit on analogue 0...10 V actuators

The minimum limitation on the analogue output is only active in Bypass, Occupied and Standby. If the operating mode is Unoccupied or Off, the damper will be closed (0 V on the analogue output). See table below:

Operating mode	Min. limit	VAV output (Y2)
Bypass	20 %	2 V
Occupied	20 %	2 V
Standby	20 %	2 V
Unoccupied	20 %	0 V
Off	20 %	0 V

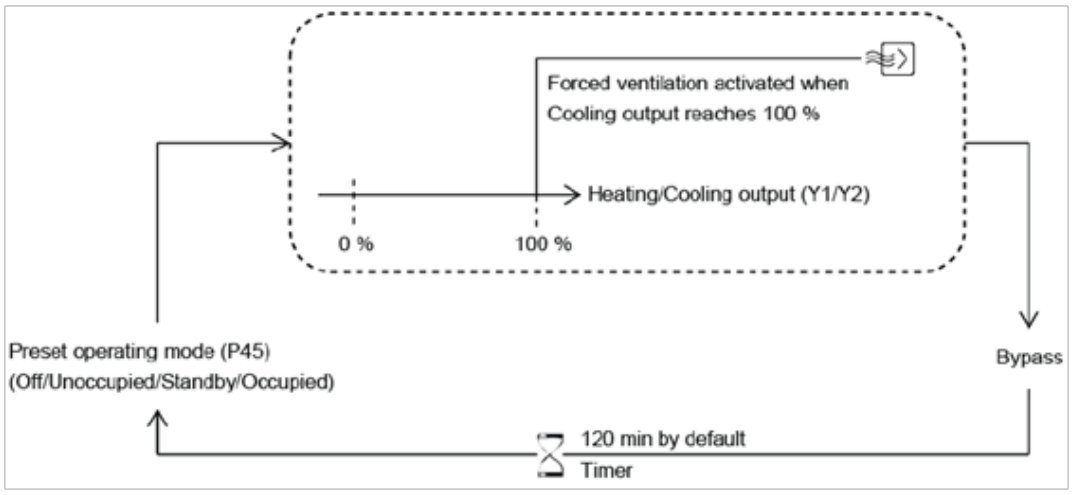
Many damper actuators have a working range of 2...10 V. This means that to set a minimum limitation of 20 %, the min. limitation in the RC will have to be set to 36 % .



Forced ventilation depending on the heating/cooling output

At 100 % heating or cooling output, forced ventilation can be activated. The function is intended to be used when the heater or cooler is located in the ventilation duct and the system is struggling to reach the setpoint. When the cooling or heating output reaches 100 %, the controller will switch to control mode Bypass.
The controller will remain in forced ventilation throughout the set Bypass time (FS=2h). Three different alternatives can be selected for setting the function forced ventilation:

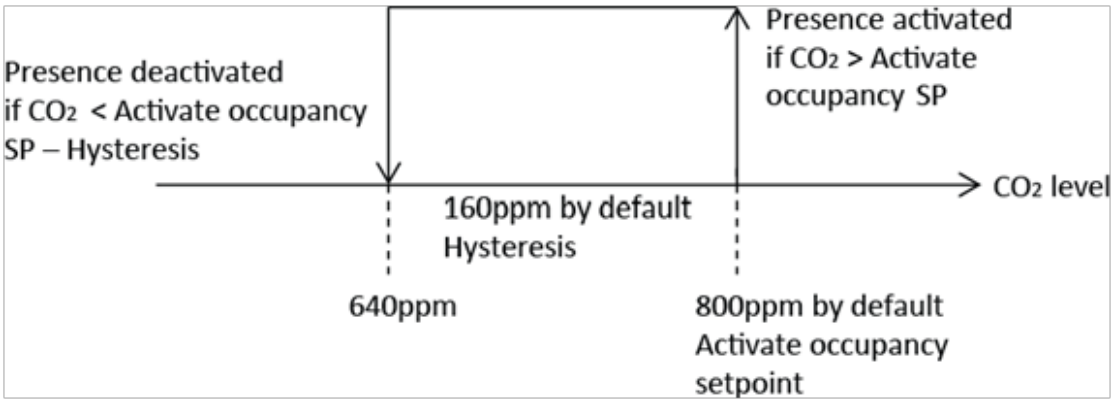
- Not active (FS)
- Forced ventilation at 100% heating or cooling output
- Forced ventilation at 100% cooling output



Presence detection depending on the CO2 concentration

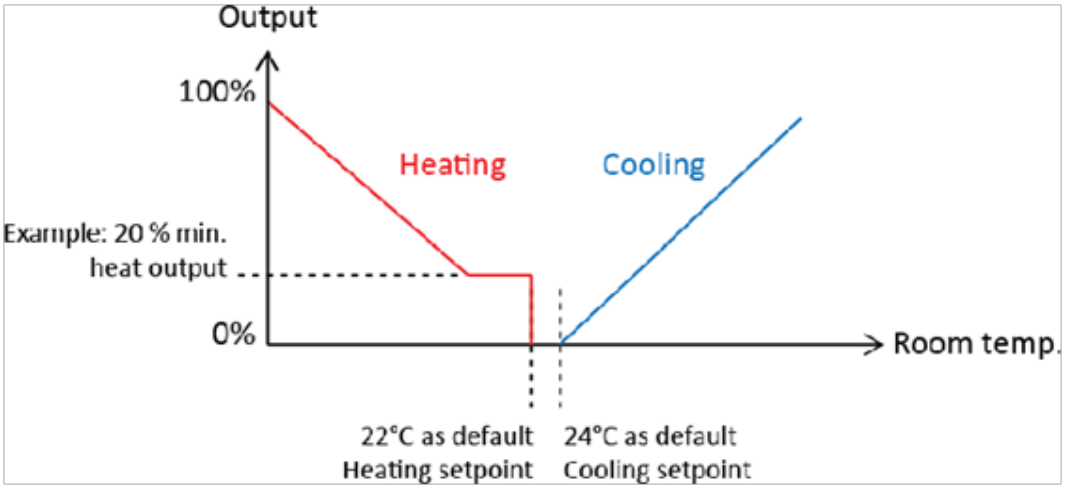
This function is not active when the controller is configured for Heating/Cooling with VAV¬control.

When the CO2 concentration exceeds the set value for activation of presence, UO3 will switch to forced ventilation if the presence operating mode is set to Bypass. It will stay there until the concentration drops below the set value (FS=800ppm) minus the hysteresis (FS=160ppm). When the concentration drops below this value, the controller will remain in presence mode for the duration of the configured occupancy off-delay (FS=10min).



Minimum limit for the heating output

In some applications, it is desirable to set a minimum limit for the heating output in order to prevent, for instance, downdraughts under windows. In general, this function works in a way similar to the minimum limit for the cooling output. However, there is a difference between the minimum limit for the heating and cooling output as the minimum limit for the latter still remains active after the controller enters heating mode. In addition, the minimum limitation for the heating output functions in all control modes.



Features for RC

0...10 V input

The 0...10 V input used as a CO2 input for RC supports a general 0...10 V signal. This input is not connected to any function but only acts as a read-out for the signal. To configure this option, parameter 81 is set to option 7, “0...10 V”.

Flow input

AI2 may be configured as a flow calculation input. A flow corresponding to 0 V and one corresponding to 10 V is set, and the flow is then calculated linearly between these two end points. To configure the flow calculation, Parameter 81 has the additional option 8, “Flow calculation”.

The calculated flow value may be shown in the display by setting parameter 42 to option 9.

OPERATING MODES

Different operating modes

The controllers have the following operating modes:

- 0 = Off
- 1 = Unoccupied
- 2 = Stand-by
- 3 = Occupied (FS)
- 4 = Bypass

Off

Operating mode Off means that the controller is not heating or cooling, and the fans are stopped. However, the temperature must not drop below the set minimum temperature (FS=8°C). If it does, the controller will start heating, and (if a fan is used) start the fan whether it has been manually stopped or not.

For controllers with display the background lighting is not lit, and only OFF is shown in the display.

Unoccupied

Operating mode Unoccupied means that the room where the controller is placed is not used for an extended period of time, for example during holidays or long weekends. Both heating and cooling are disconnected and the fans are stopped within a temperature interval with configurable min/max temperatures (FS min=15°C, max=30°C).

The background lighting is not lit, but the current room temperature (or setpoint depending on the configuration) is shown in the display. OFF is also shown in the display.

Stand-by

Operating mode Stand-by means that the room is in an energy save mode and is not used at the moment. This can be during nights, weekends, evenings etc. The controller is prepared to change operating mode to Occupied (comfort) if someone enters the room (presence). The room temperature is controlled around the applicable heating and cooling setpoints, with an extended temperature interval (FS=+/-3°C). For example, if the heating setpoint=22°C and the cooling setpoint=24°C, the controller will allow the temperature in the room to be between 19°C and 27°C. The setpoints can also be adjusted +/- 3°C via the setpoint buttons.

The background lighting is lit (dimmed). STANDBY and the current room temperature (or setpoint depending on the configuration) are shown in the display.

Occupied

Operating mode Occupied means that the room is in use and is therefore in a comfort mode. The controller regulates the room temperature around a heating setpoint and a cooling setpoint (FS heating setpoint=22°C, cooling setpoint=24°C). The setpoints can also be adjusted +/- 3°C locally via the setpoint buttons or via a central command.

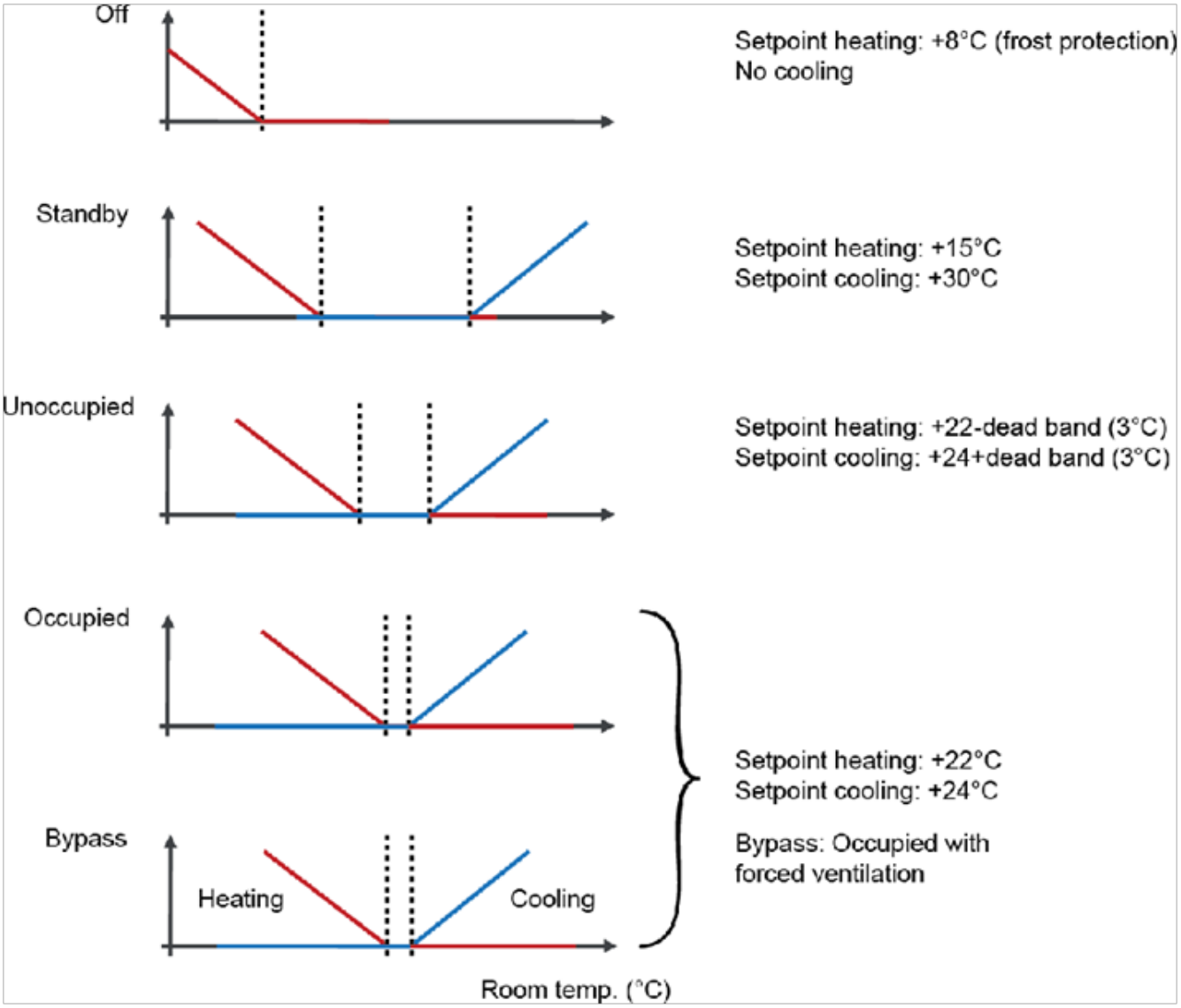
The background lighting is lit (dimmed), and the occupancy indication is shown (see the chapter Display handling). The current room temperature (or setpoint depending on the configuration) is also shown in the display.

Bypass

Operating mode Bypass means that the controller controls the room temperature in the same way as in operating mode Occupied. The output for forced ventilation is also active. After a configurable time (FS=2 hours) in Bypass, the controller automatically returns to the preset operating mode. Bypass is normally activated when the Occupancy button is pressed, via an occupancy detector, a central command or the CO2 level. The operating mode is useful for example in conference rooms, where many people are present at the same time for a certain period of time.

The background lighting is lit (dimmed). The occupancy indication and the symbol for forced ventilation are shown (see the chapter Display handling). The current room temperature (or setpoint depending on the configuration) is shown in the display.

Depending on the settings and input values, the controller will be set to different control modes using different setpoint values:



Activation of the different operating modes

The preset operating mode is configured to Occupied by default. This is configured in the parameter menu in the display, parameter 45
The operating mode is changed at the following events:

- When the Occupancy button is pressed (if the controller has an Occupancy button).
- Activation/deactivation of an occupancy detector on the digital input.
- Activation/deactivation of presence by CO2 level (for model with CO2 detection)
- Via central control, for example central time control, central booking system etc.

Occupancy button

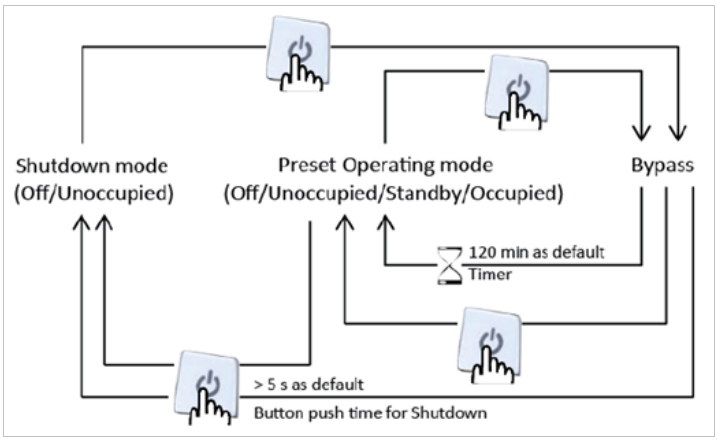
The occupancy button push time for Shutdown is 5 s as a default. It is configurable via Regio tool©.
When the Occupancy button is held depressed for more than 5 seconds, the controller will change its operating mode to Shutdown (Off/Unoccupied), regardless of the present operating mode. Via the display or Regio tool©, it is possible to configure which operating mode (Off or Unoccupied) should be activated upon Shutdown (FS=Unoccupied).

Shutdown

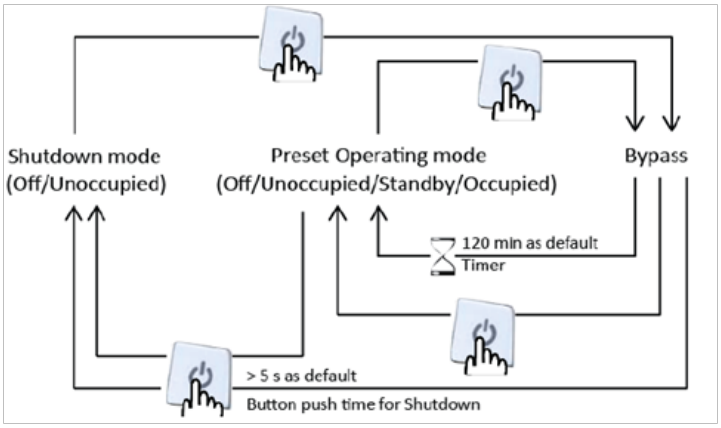
If the Occupancy button is pressed for less than 5 seconds when the controller is in its preset operating mode or in Shutdown, the controller will change to Bypass. If the button is then depressed for less than 5 seconds, the controller will return to the preset operating mode.

After a configurable period of time in Bypass (FS=2 hours), the controller will return to the preset operating mode.

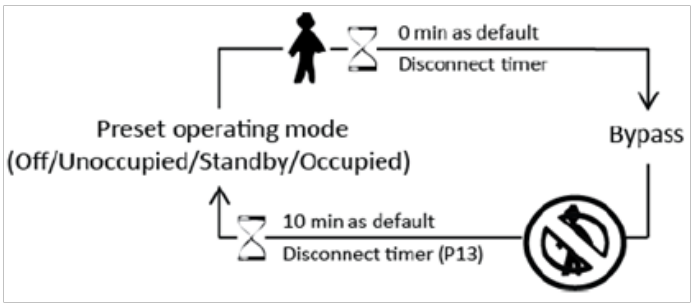
Because of the default 0 s setting, switching operating modes by depressing the Occupancy button functions differently: If the Occupancy button is pressed when the controller is in the preset operating mode or in Bypass mode, the controller will change to Shutdown. If the Occupancy button is pressed in Shutdown mode, the controller will switch to Bypass. After a configurable period of time in Bypass (FS=2 hours), the controller will return to the preset operating mode.



Because of the default 0 s setting, switching operating modes by depressing the Occupancy button functions differently: If the Occupancy button is pressed when the controller is in the preset operating mode or in Bypass mode, the controller will change to Shutdown. If the Occupancy button is pressed in Shutdown mode, the controller will switch to Bypass. After a configurable period of time in Bypass (FS=2 hours), the controller will return to the preset operating mode.



Occupancy detector



For local control of the operating mode between the preset operating mode and Bypass, an occupancy detector is connected. When occupancy is indicated, the controller changes operating mode to Bypass. If you want to be able to enter the room temporarily without activating Presence (to, for example, pick something up) it is possible to configure a power-up delay. This means that Presence is not activated until the power-up delay has expired. The Presence delay can be set to a value between 0 and 60 minutes (FS=0 min).
In Bypass on presence, there is a switch-off timer, which means that if there is no occupancy indication during this time (FS=10 mi), the controller will return to the preset operating mode.

Central control

Central control of the operating mode is also possible. By changing the variable RegioRemoteState, you can control the operating mode centrally according to the following table (there is a variable list for central control in Part IV of this manual):

RegioRemoteState	Description
0	Central operating mode Off
1	Central operating mode Unoccupied
2	Central operating mode Standby
3	Central operating mode Occupied
4	(Not used)
5 (FS)	No central control

The occupancy button

When using central control (i. e. RegioRemoteState <> 5) and you press the Occupancy button, the controller will change to Bypass and stay in this mode for as long time as you have configured. If you press the Occupancy button again when the controller is in Bypass, the controller will change to Stand-by, regardless of what has been set in the central control (RegioRemoteState).

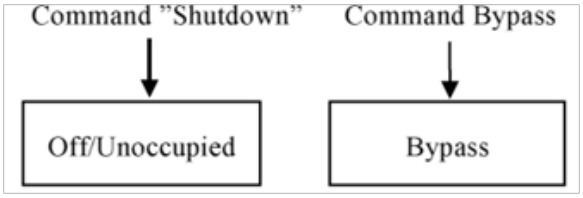
When the controller is in Bypass and the Bypass time has run out, the controller will change to the operating mode given by ***RegioRemoteState***. If ***RegioRemoteState*** equals 5 it will change to the preset operating mode. If the controller is in Stand-by and the central control is changed, the controller will change to this new operating mode.

Occupancy detector

When central control is used and the occupancy detector is activated, the controller will go to Bypass for a configurable time, and thereafter return to the central operating mode.

Central command

Via central commands from a comprehensive system, for example EXO4, you can handle the controller in the same way as you handle it locally via the Occupancy button, i. e. you can change its operating mode to Off/Unoccupied (Shutdown) or Bypass.



Central commands should be regarded as events and can be changed locally via the Occupancy button.

Setpoint calculation

Basic setpoint

There are two basic setpoints, one basic heating setpoint (FS=22°C) and one basic cooling setpoint (FS=24°C). Units without display have DIP switches to change the setpoints. The basic cooling setpoint is automatically changed at the same time. Therefore, the difference between the basic heating setpoint and the basic cooling setpoint is always the same.

The basic setpoint is set in the display.

You can also configure the setpoints via a central system or Regio tool©.

Setpoint offset

The setpoint value can be adjusted up and down from the basic setpoint value, via the setpoint knob or the display. How much the value can be adjusted can be configured in Regio tool© or in the parameter menu in the display (FS=+/-3°C).

Use the INCREASE button to increase the current setpoint in steps of 0.5°C to the max. limit, and the DECREASE button to decrease the current setpoint in steps of 0.5°C to the min. limit.

Calculation of the active setpoint

What setpoint value the controller should control according to depends on the operating mode, the control mode and the current setpoint offset.

Off

In operating mode Off or on open window the controller is a heating controller, and controls according to the frost protection setpoint (FS=8°C), regardless of the setpoint adjustment.

Unoccupied

In operating mode Unoccupied, it controls according to the heating setpoint (FS=15°C) if a control mode with heating has been set and the room temperature is lower than this setpoint. If the room temperature is higher than the cooling setpoint (FS=30°C) and a control mode with cooling has been set, the unit is a cooling controller and controls according to the cooling setpoint. The active setpoint changes in the middle of the neutral zone with a hysteresis of 0.1°C. A setpoint adjustment is not active in this operating mode.

Stand-by

In operating mode Stand-by the controller controls according to the basic heating setpoint or the basic cooling setpoint plus/minus a settable neutral zone (FS=3°C). The setpoint can also be adjusted via the setpoint knob or display. This means that the factory setting for the heating setpoint is 19°C +/- 3°C (local adjustment) and the cooling setpoint is 27°C +/- 3°C (local adjustment). On heating demand the unit will control according to the heating setpoint, and on cooling demand it will control according to the cooling setpoint. The setpoint change takes place halfway between the setpoints with a hysteresis of 0.1°C.

Occupied/Bypass

In operating modes Occupied and Bypass the unit controls according to the basic heating setpoint or the basic cooling setpoint. The setpoint can also be adjusted via the setpoint knob or display. The setpoint change takes place halfway between the setpoints with a hysteresis of 0.1°C.

Setpoint display at setpoint adjustment

Parameter 74 is used to set what is shown in the display when the setpoint is adjusted.

0 = The added adjustment is shown in the display. Example: +1.5°C. The adjustment is added to both the heating and cooling setpoints.

1 = The sum of the control setpoint and the adjustment is shown in the display. Example: The control setpoint is 22°C and the added adjustment is +1.5°C. This means that the value 23.5°C will be shown in the display. ”HEAT” or ”COOL” will flash depending on which of the setpoint values is the control setpoint when you enter the setpoint menu, i.e. depending on which setpoint you are changing. The adjustment is added to both the heating and cooling setpoints.

2 = The sum of the heating setpoint and the adjustment is shown in the display. The adjustment is added to both the heating and cooling setpoints.

3 = The sum of the cooling setpoint and the adjustment is shown in the display. The adjustment is added to both the heating and cooling setpoints.

Actuators

Regio can be used with four types of actuators:

- Analogue 0...10 V actuators
- Thermal actuators
- 3-point actuators (Increase/Decrease actuators)
- On/Off spring return actuators

On units without display, it is possible to select if thermal or analogue actuators will be used via the DIP switches. For other actuators and Regio models, the actuator type is set via Regio tool© or, for controllers with a display, in the parameter menu.

Analogue actuators

The following output signals can be set for analogue actuators:

- 0...10 V (FS)
- 2...10 V
- 10...2 V
- 10...0 V

Thermal actuators

When thermal actuator control has been selected, it is controlled digitally with time proportional pulses via output U01 and U02. By pulsing, the opening degree of the actuator (and its valve) is varied. The period time (in seconds) is the sum of the on and off output times on the output. The period time is FS=60s. The controller varies the on and off output times proportionally depending on the output signal demand to the actuator.

3-point actuators

For 3-point actuators (increase/decrease actuators, -T-models), two digital outputs are used for controlling one actuator, one output to open the actuator and one to close it. You can configure the run time (in seconds) for the different actuators (FS=120 s). The program calculates the position of the actuator (0...100 %) and sends an increase or decrease signal when the controller output signal deviates more than the set neutral zone (FS=2 %) from the calculated position.

On/Off spring return actuators

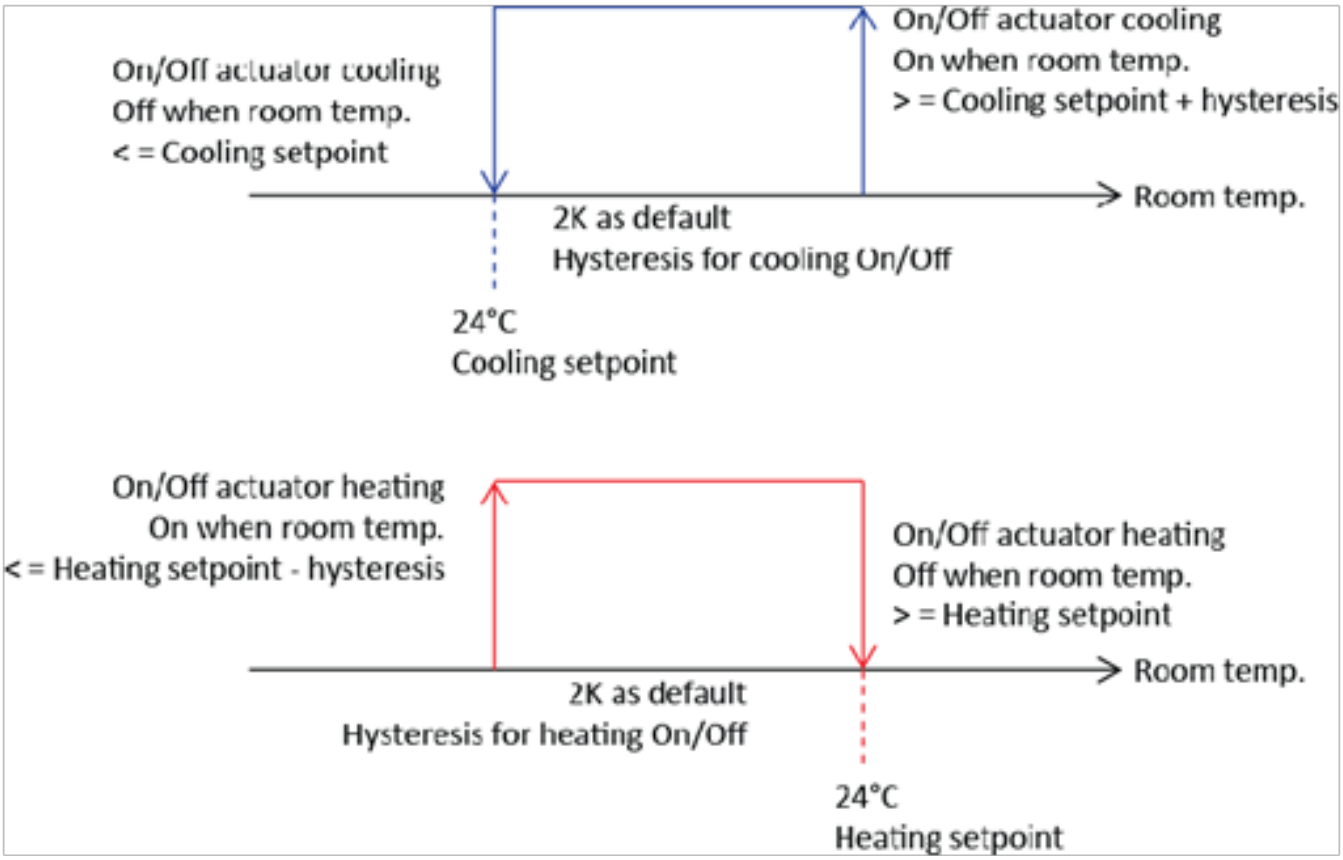
When On/Off spring return actuator has been selected, the functionality is similar to a thermostat function. This will be relevant only in control modes Heating, Heating/Cooling via change-over, Heating/Cooling and Cooling. Selecting this function will not be possible if any other control mode has been selected.

A hysteresis is used when the outputs are On or Off.

In heating mode, the temperature will be permitted to fall below the setpoint, minus the hysteresis, before the actuator opens. The actuator will then remain open until the temperature rises above the setpoint.

Actuator exercise

All actuators are exercised. The exercise takes place at set intervals in hours (FS=23 hours interval). An opening signal is sent to the actuator for as long as the configured run time. Then a closing signal corresponding to the length of the run time is sent and the exercise is finished.
On units with a display, the exercise can be inactivated by setting parameters 36 and 37 to zero (0).



SPECIAL FUNCTIONS

Change-over function

Change-over is a function for installations with 2-pipe systems or for pure VAV temperature control. It makes it possible to use the same pipe for both heating and cooling, depending on requirements during for example the summer (cooling output) and the winter (heating output).

Control modes

To activate the change-over function, control modes „Heating or Cooling via change-over", „Heating/Heating or Cooling via change over" or "Heating/cooling by VAV switched by change-over" needs to be configured.

The controller has an input for change-over. The input can be either of the type analogue PT1000- sensor or a closing contact connected to a digital input (FS=PT1000-input).

Change-over digital

When using a digital signal input (potential-free contact), closing the contact will activate the change-over function and set the heating output, U01 alt. D02/D03, to cooling. On open contact, the change-over function will set the heating output to heating.

Change-over analogue

In this mode, the change-over function will measure the difference between the room and media temperature. As long as the heat valve is more than 20 % open, or every time a valve exercise is performed, the difference between the media and room temperature will be calculated. If the temperature difference is lower than the configured value (differs for Heating and Cooling mode), the control mode will change. The factory settings for the difference between Heating and Cooling change-over are:

- Change from Heating to Cooling = 4K
- Change from Cooling to Heating = 3K

This setting may be changed using parameters number 9 and 10.

Forced ventilation

The controller has functionality for forced ventilation. A digital output for controlling a forcing damper to increase the airflow to the room. This output is always activated in operating mode Bypass.

When control mode "Heating/Cooling with VAV-control and forced supply air function" is active, the cooling output is used to control the forcing damper. When forced ventilation is active, the cooling output is set to full cooling, regardless of what the controller output signal is.

It can be selected whether the forced ventilation output should be a 0...10 V analogue output or a 24 V digital output (parameter 22).

Condensation detector

Special input CI

There is a special input (CI) on the controller. This input is intended for Regin's condensation detector, KG-A/1, and functions internally as a digital input, i. e. condensation or no condensation. When the condensation detector is activated, the cooling control is blocked and the controller is set in neutral position. When condensation ceases, the controller will start controlling from the neutral position.

Window contact

When window contact has been configured, the controller is set to normal mode on closed window. On open window, the controller is set to off mode, the heating and cooling outputs are set to 0 V and the frost protection function is activated.

Frost protection

The controller has built-in frost protection, which is activated when the controller is not in use. The frost protection prevents the temperature from dropping below 8°C. Return to normal fan speed and control occurs automatically when the room temperature exceeds 8°C.

High/low room temperature alarm

High/low temperature alarm is a function to indicate if the room temperature is too high or too low.

The high room temperature alarm will trigger when the room temperature exceeds the configured high temp limit (FS=40°C).

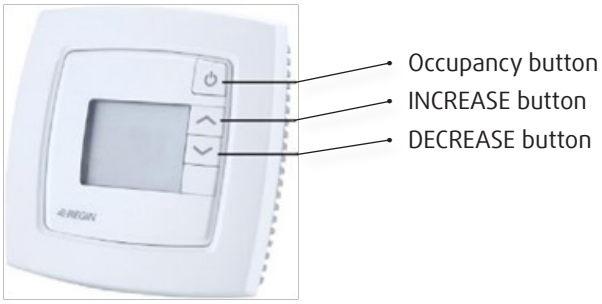
The low room temperature alarm will trigger when the room temperature falls below the configured low temp limit (FS=15°C).

The alarms are implemented as points that trigger when the temperature either exceeds or falls below the limits, and return as soon as the temperature returns. There is no advanced alarm handling, incorporating blocking or acknowledging or so forth. There is only an indication for faulty temperatures. All other alarm and alarm handling functions must be handled by a supervisory system.

Display handling

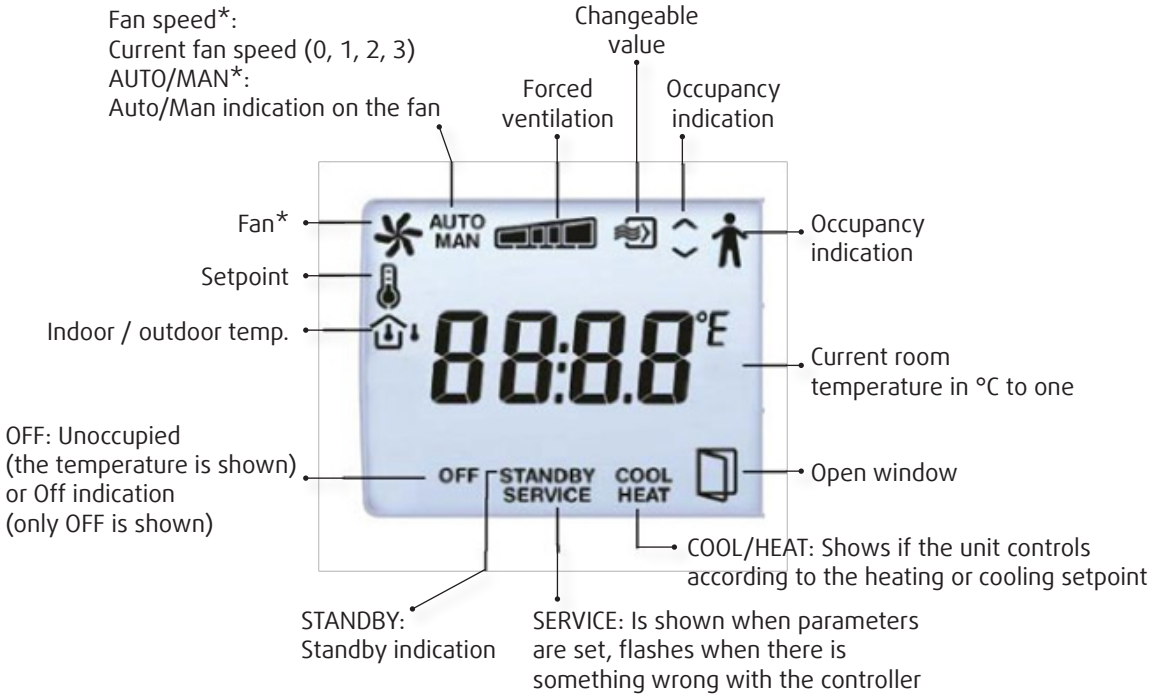
The controller has a display.

Also an Occupancy button is available, as well as an INCREASE button and a DECREASE button to increase and decrease the setpoint.



Display indications

The display has the following indications (indications marked with an asterisk (*) are NOT available):



Parameter menu

It is possible to set different parameter values in a parameter menu. The parameter menu is accessed by simultaneously holding the INCREASE and DECREASE buttons depressed for about 5 seconds and then pressing the INCREASE button twice. The Service indication will be displayed.

The display will initially show the parameter number "1". Use the INCREASE and DECREASE buttons to scroll between parameters.

Press the Occupancy button to select the desired parameter. The parameter number will be replaced by the parameter value. The value can be changed using the INCREASE and DECREASE buttons. If a button is held depressed the value will start scrolling, first slowly and then with increasing speed in 3 – 4 steps with 2 – 3 seconds between steps.

Acknowledge/Regret

To acknowledge and store a set parameter value, press the Occupancy button again, the display then returns to showing the parameter number. To retrieve the original value, i.e. the value before change, press the INCREASE and DECREASE buttons at the same time. The original value is shown on the display.

Return

After a certain time, about 1 minute, or when the INCREASE and DECREASE buttons are pressed at the same time while in the menu, the display returns to the normal view. Exit is shown on the display after the last parameter. The parameter menu is exited by pressing the Occupancy button while in Exit. Pressing on INCREASE goes to the first parameter and pressing on DECREASE goes to the last parameter.

Parameters

The following parameters can be changed in the parameter menu (FS = Factory setting):

Parameter number	Description	FS
1	Basic heating setpoint	22°C
2	Basic cooling setpoint	24°C
3	Neutral zone at standby, Heating setpoint = Basic sp. heating-3 by default Cooling setpoint = Basic sp.cooling+3 by default	3°C
4	Heating setpoint at Unoccupied	15°C
5	Cooling setpoint at Unoccupied	30°C
6	Frost protection setpoint	8°C
7	P-band for room controller	10°C
8	I-time for room controller	300 s
9	The difference between the temperature in the room and the media temperature for change-over to cooling	3K
10	The difference between the temperature in the room and the media temperature for change-over to heating	4K
11	Control mode: 0=Heating 1= Heating / Heating 2= Heating or Cooling via change-over 3= Heating / Cooling 4= Heating / Cooling with VAV-control and forced ventilation 5= Heating / Cooling with VAV-control 6= Cooling 7= Cooling / Cooling 8= Heating / Cooling/VAV (C3-models, except RC-C3DFOC) 9=Heating / Heating or Cooling via change-over (only available on models with fan control) 10=Heating / cooling by VAV switched by change-over (paralel CO2 control by VAV available)	10
12	Time in Bypass mode	120 min
13	Disconnect timer with Occupancy/Unoccupancy	10 min
14	Switch-on delay for Occupancy	0 min
15	State connected sensor on AI1: 0=Internal sensor 1=External room sensor 2=Change-over sensor	0
16	N/A	
17	State connected sensor on DI1: 1=Window contact 2= No function 3= Presence detector 4=Change-over sensor	1
18	State connected sensor on DI2: 1=Window contact 2=Condensation detection 3=No function 4=Change-over sensor	2
20	State connected function on UO1: 0=None 1=Thermal actuator heat 2= None 3=Heating actuator 0...10 V 4= None 5=On/off actuator heat 6= None	3

Parameter number	Description	FS
21	State connected function on UO2: 0= None 1= None 2=Thermal actuator cool 3= None 4=Cooling actuator 0...10 V 5= None 6=On/off actuator cool	4
22	State connected function on UO3: 0= None 1=Forced vent. digital 2=Analogue output (OEM) 3=None 4=Ordinary analogue output 5=None 6=Control of EC fan	1
24	Y3 output in manual mode (only if Y3 is configured as an analogue output)	0 %
28	State output signal range for Y3-actuators: 0=0...10 V 1=2...10 V 2=10...2 V 3=10...0 V	0
29	State output signal range for heating actuators: 0=0...10 V 1=2...10 V 2=10...2 V 3=10...0 V	0
30	State output signal range for cooling actuators: 0=0...10 V 1=2...10 V 2=10...2 V 3=10...0 V	0
31	Period time for heating actuators with thermal actuator	60 s
32	Period time for cooling actuators with thermal actuator	60 s
33	Run time for heating actuators with increase/decrease actuators	120 s
34	Run time for cooling actuators with increase/decrease actuators	120 s
35	Neutral zone for increase/decrease actuators	2%
36	Time in hours between exercise of heating actuators	23h
37	Time in hours between exercise of cooling actuators	23h
38	Hysteresis for on/off actuators and heating	2K
39	Hysteresis for on/off actuators and cooling	2K
40	Minimum limit for the heat output	20 %
41	The fan will never stop 0=OFF 1=ON	0
42	Select if setpoint or actual value is to be shown in the display. 0=Actual value 1=Heat setpoint 2=Cool setpoint 3=Average value of heating and cooling setpoint 4=Only setpoint offset 5= CO2 concentration in the room in ppm 6=Heating setpoint +setpoint offset 7=cooling setpoint+setpoint offset 8=Average of heating and cooling setpoint+setpoint offset 9=The calculated flow in the duct in l/s	0
43	Highest permitted setpoint adjustment upwards	3°C
44	Highest permitted setpoint adjustment downwards	3°C
45	Preset operating mode: 0=Off 1=Unoccupied 2=Stand-by 3=Occupied. Forced ventilation is not set in Occupied mode.	3
46	State operating mode by pressing the occupancy button for 5 s: 0=Off 1=Unoccupied.	1

Parameter number	Description	FS
47	Select operating mode for central control: 0=Off 1=Unoccupied 2=Stand-by 3=Occupied 5=No central control	5
48	Min flow at cool output when control mode Heating/Cooling with VAV- control is selected Min flow at Y3 output when control mode Heating/Cooling/VAV is selected	20%
49	Max flow on Y3 output when control mode Heating/Cooling/VAV is selected and in heating mode	0%
50	Configuration of fan control: 0=No control 1=Fan is controlled by heating demand 2=Fan is controlled by cooling demand 3=Fan is controlled by both heating and cooling demand	3
51	Start signal in % for fan speed 1 on heating or cooling control	5%
52	Start signal in % for fan speed 2	60%
53	Start signal in % for fan spped 3	100%
54	Hysteresis for start/stop of fans	5%
55	State number of speeds for the fan (1, 2 or 3)	3
56	Temperature compensation on AI1	0°C
57	Temperature compensation on UI1	0°C
58	Temperature compensation on internal room sensor	0°C
59	Filter factor for analogue temperature inputs	0,2
60	State NO/NC digital input 1: 0=NO (Normally open) 1=NC (Normally closed)	0
61	State NO/NC digital input 2: 0=NO (Normally open) 1=NC (Normally closed)	1
62	State NO/NC universal input 1: 0=NO (Normally open) 1=NC (Normally closed)	0
63	Manual/Auto Heating output: 0=Off 1=Manual 2=Auto	2
64	Manual/Auto cooling output: 0=Off 1=Manual	2
65	Manual/Auto Y3 forced ventilation output: 0=Off 1=Manual 2=Auto Manual mode means that Y3 puts out what is stated in parameter 24 if Y3 is configured as an analogue output.	2
66	Manual/Auto control of change over mode: 0=Heat control 1=Cool control	2
67	Heating output in manual mode	0 %
68	Cooling output in manual mode	0 %
69	Controller Modbus address	Factory set
70	Parity but Modbus communication: 0=No parity 1=Odd parity 2=Even parity	2
71	Modbus time out for character (t1.5), in ms. Should be 1,5 times a character, i.e. at least 2 ms.	3 ms

Parameter number	Description	FS
72	Answer delay in Modbus (t3.5), in ms. Should be 3,5 times a character, i.e. at least 5 ms.	5 ms
73	Selection of heating output function (NO/NC): 0=NC (Normally closed) 1=NO (Normally opened)	0
74	Setpoint display at setpoint adjustment.: 0=The offset is shown in the display 1=The active setpoint + offset is shown in the display. Heat or Cool is shown depending on whether heat or cool is active when entering the menu	0
75	Sequence order for Y2 and Y3: 0=Y2 activates before Y3 1=Y3 activates before Y2	0
76	Forced ventilation, control function: 0=Not active	0
77	Operating mode at presence detection (DI1): 3=Occupied	4
78	EXOline PLA-address	Factory set
79	EXOline ELA-address	
80	Selection of cooling output functions (NO/NC): 0=NC	0
81	State the connected sensor at AI2 0=None 1– 4=No function 5= CO2-sensor	5
82	Flow at 0 V input in AI2	0 l/s
83	Flow at 10 V input in AI2	100 l/s
84	Minimum runtime when calculating for change over	600s
86	Alarm limit for high room temperature	40°C
87	Alarm limit for low room temperature	15°C
97	Activate presence if CO2 level is higher	800ppm
98	Deactivate presence if the CO2 level is lower than the limit minus this hysteresis	160ppm
100	Filter factor for CO2-input	0.2
104	CO2-level at 0 V	0ppm
105	CO2-level at 10 V	2000ppm
112	Min limit for VAV-damper at CO2-control	600ppm
113	Max limit for VAV-damper at CO2-control	800ppm
114	This parameter defines the protocol to be used: 0=EXOline/Modbus	0
115	BACnet MS/TP MAC address: 0-127=master address 128-254=slave address	Factory set (00- 99)
116	Low 4 figures of the BACnet device ID. 0-9999	Factory set
117	High 3 figures of the device ID.	
118	BACnet MS/TP Max master.	127
119	COMbus speed: 0=9600 1=19200	0
120	COMbus reset. When activated (1) it resets the communication to default settings	0 (deactivated)
121	Min limit for EC fan (%)	10 %
122	Max limit for EC fan (%)	100 %
125	Model	Factory set (read only)
126	Version Major	
127	Version Minor	
128	Version Branch	
129	Revision	

MEMORY FUNCTION ON POWER FAILURE

On power failure, settings and configurations are preserved in the controller in a so-called non-volatile memory (EEPROM). All changes made to the settings and configuration is saved in the memory, which means that the latest values are always stored. Measured values, as well as other variables that change often, are not stored.

Values can be saved up to approximately 100 000 times in the non-volatile memory. Therefore, changed values should not systematically and very often be sent to the controller via network communication. Normal changes may still be sent via the network; for example if the operating mode is changed a few times per day.

Example

Activation of Bypass is not stored in the memory. Instead, the controller will return to the preset operating mode after power failure. However, the set operating mode will be saved if central control is being used (parameter 47).