LUNA RC a

Instructions for Use

20220808

Symbol explanation

Symbols on the machine.

This product complies with applicable EU directives.

Symbols in this user manual

Warning/Caution!

Application area

LUNA RC is a controller that has been designed to regulate room temperature as well as VAV control applications.

The product may not be used for anything other than its intended use.

General

Read through the entire instructions for use before you install/use the product and save the instructions for future reference. It's not permissible to make changes or modifications to this product other than those specified in this document.

Protective equipment

Always use appropriate personal protective equipment for the work in question, in the form of gloves, respirators and protective glasses during handling, installation, cleaning and service/maintenance.

Electrical safety

Permitted voltage, see "Electrical data". It is not permissible to insert foreign objects into the product's contactor connections or the electronics's ventilation openings; risk for short circuiting.

24 V isolation transformer to be connected should comply with the provisions of IEC 61558-1.

Cable sizing must be carried out for cabling between the product and the power supply source.

Disconnect the power supply when working on products that are not required to run in production.

Always follow the local/national rules for who shall be permitted to carry out this type of electrical installation.

Handling

- The product must be handled with care.
- Installation
- Moist, cold and aggressive environments must be avoided.
- Avoid installing the product near a heat source.
- Assemble the product according to applicable industry regulations.
- Install the product for easy access during service/ maintenance.
- If the product is mounted above a fixed ceiling, the inspection hatch must be located so that the product is accessible for inspection.
- Check to make sure that the product doesn't have any visible defects.
- Check that the product is properly secured after it has been installed.
- Check that all cables are properly secured in place after installation.

The document was originally written in Swedish

Swegon

Contents

Installation

LUNA RC should ideally be mounted between 1.5 to 1.8 m above the floor on the surface of a wall using screws, see figure 1, or alternatively in a standardised adjusted installation box.

The installation position needs to be selected with care to eliminate fault factors that can affect the measurement.

For example, the controller should not be exposed to:

- direct sunlight
- distance from the user
- air flows from windows and doors
- air flows from ventilation nozzles
- air flows through the junction box
- draughts caused by an external wall

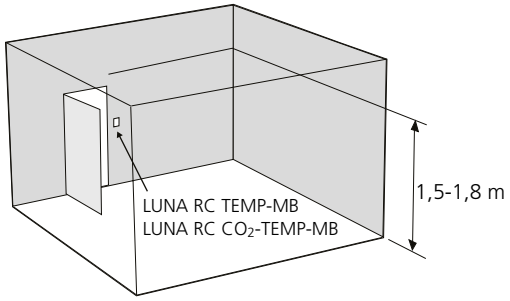


Figure 1. Recommended installation in room.

Dimensions

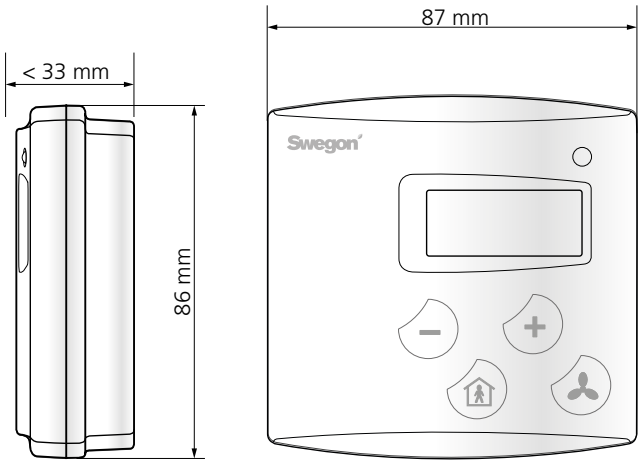


Figure 2. Dimensions, LUNA RC TEMP-MB and LUNA RC CO_2-TEMP-MB.

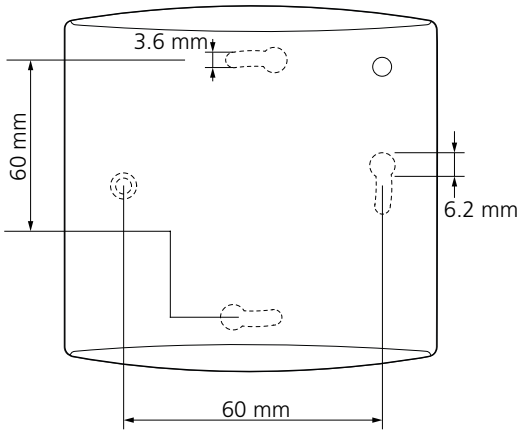
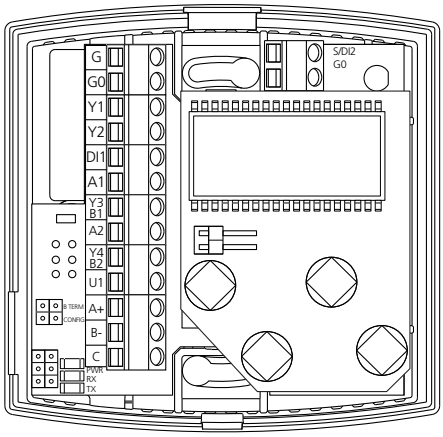


Figure 3. Dimensions, LUNA RC TEMP-MB and LUNA RC CO_2-TEMP-MB rear.

Connections

Connection and commissioning of the apparatus can only be carried out by qualified professionals. Connection must always be carried out with the power switched off.

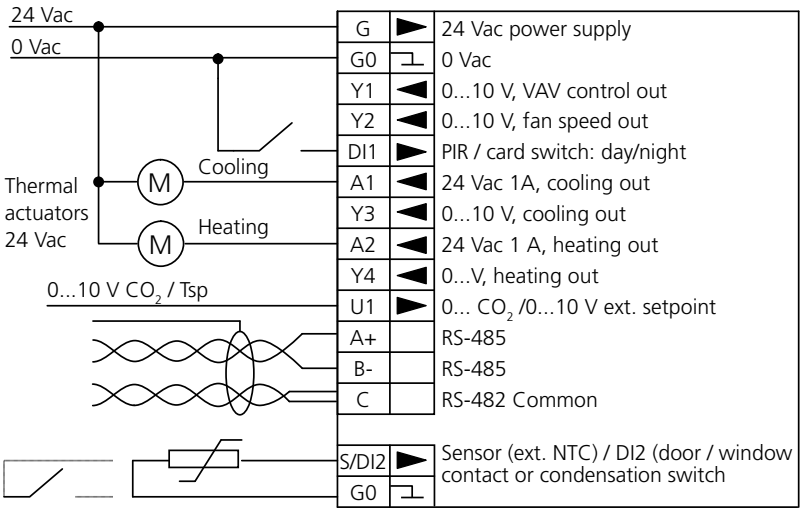
Note: The power supply voltage must be the same in the controller and in the connected 24 VAC actuators.



The maximum TRIAC output current is 1 A. For example, a maximum of three A 40405 thermal actuators can be connected to the same controller output. The power consumption will then not exceed 1 A.

The TRIAC outputs are protected with fuses that can only be replaced by the manufacturer.

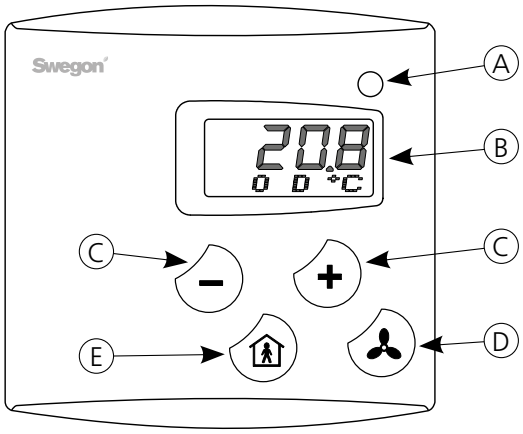
Note: It is also possible to use unused inputs and outputs to transfer other measurement and control information through Modbus.



Use after power failure

- The controller's settings remain the same during a power failure.
- Overdrives that have occurred through Modbus are deleted during the power failure. The parameters that are reset are marked in the Modbus register that begins on page 29.

User mode



A. Indicator lamp
- red=heating
- green=cooling

B. Display
- temperature or set point
- fan speed
- day mode (D) "D" is not visible when the CO_2 value or the set point is being displayed
- VAV boost status (VAV=boost enabled)

C. Change buttons for set point

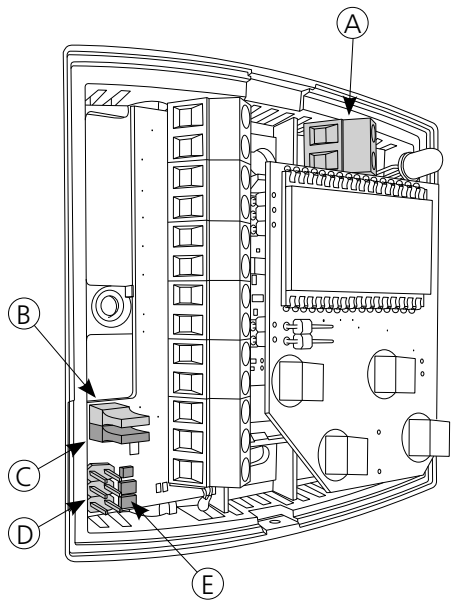
The set point is changed in larger steps when the buttons are pressed briefly multiple times in a row.

D. Control button for fan speed
- 0=STOP
- 1=Speed 1
- 2=Speed 2
- 3=Speed 3
- A=AUTO

E. Button for "Occupancy" (Man in house)

Commissioning

Note: Check all settings and parameters during commissioning. In this way, you can guarantee that the selected application will work correctly.



A. Terminals for external sensor or DI contact

B. Bus termination (120 Ω)
- closed=terminated
- open=not terminated

C. Selection button for configuration mode
- closed=configuration mode
- open=user mode (factory setting)

D. Terminal for the commissioning tool

E. Indicator lamps
- green PWR=supply voltage OK
- yellow TX=transmission from controller
- yellow RX=bus activity

Each controller must have a unique Modbus address (1...247). It is possible to regulate all controllers within the same segment by sending a joint command to the address zero (transmission). This function is used for testing during commissioning or for joint regulation of changes in day/ night mode.

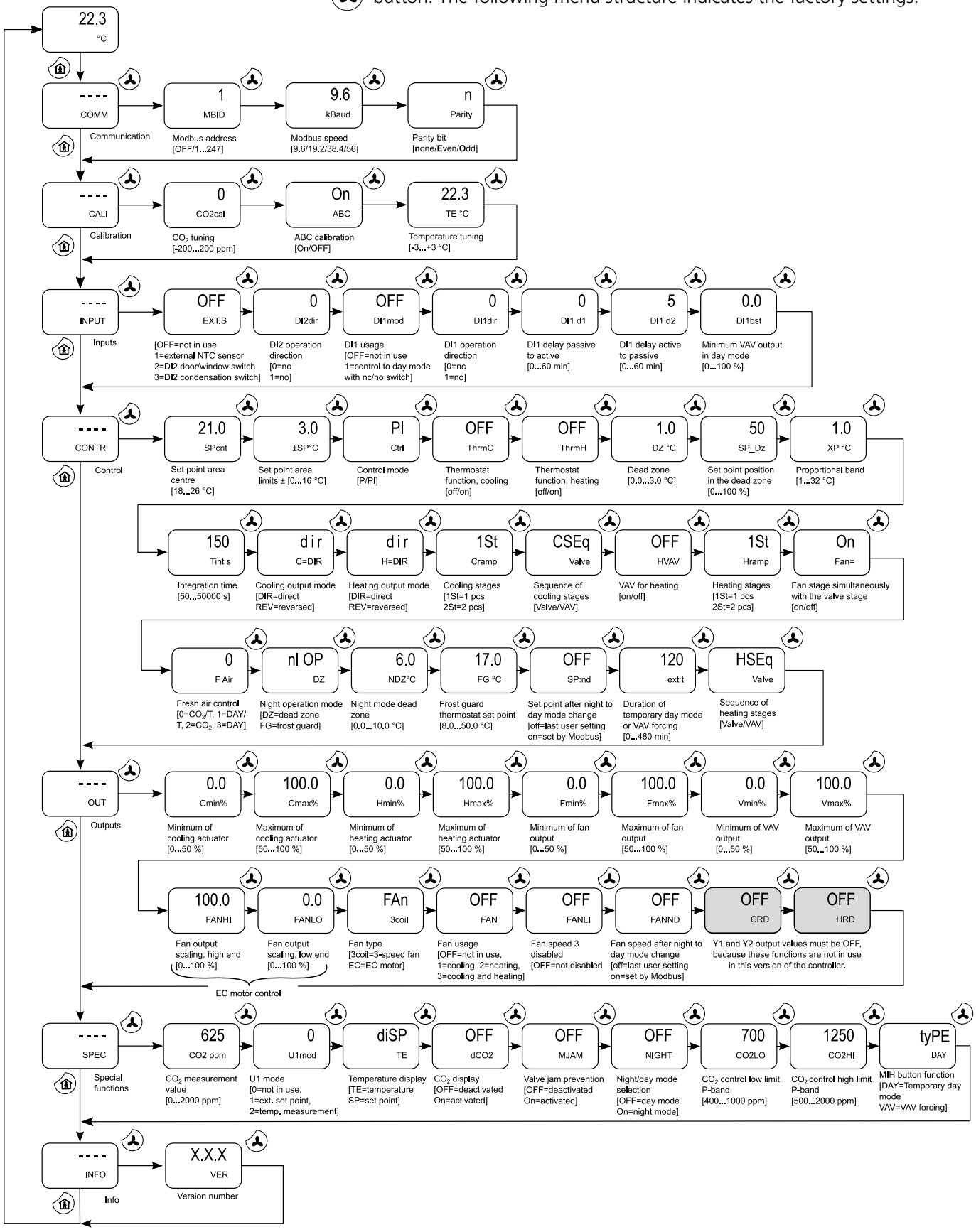
Controller settings can be adjusted using the controller buttons

Configuration with the aid of the menu:

1. Remove the lid
2. Set the selection button for configuration mode in the closed position
3. Make the settings that the process requires
4. Set the selection button for configuration mode in the open position. The controller reverts to user mode

Menu structure

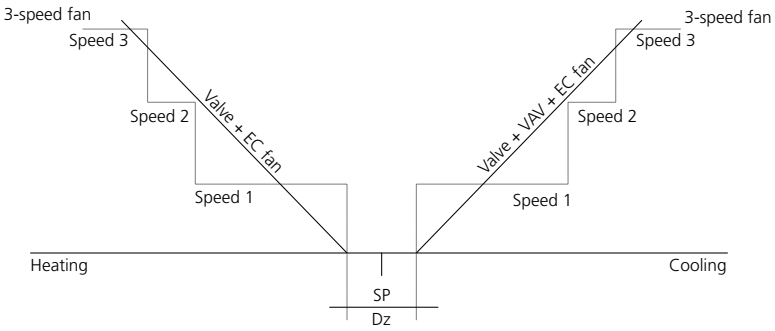
The menu is enabled by setting the selection button for configuration mode in the closed position. Proceed in the menu by pressing the ⌂ and ✣ buttons. Change the values using the + and − buttons. Accept the values with the ✣ button. The following menu structure indicates the factory settings.



Control methods

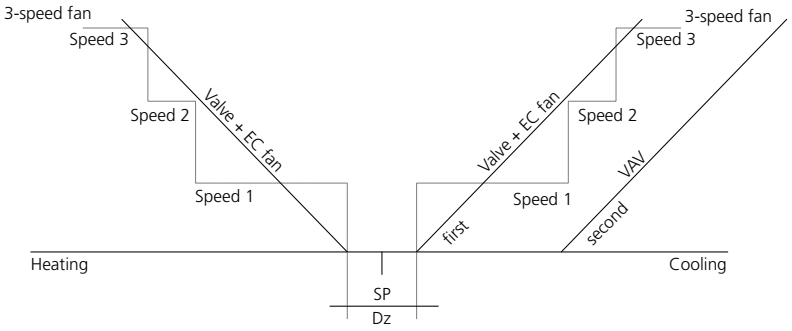
Heating and 1-step cooling

Parameter	Description	Select
Cramp	Cooling step	x 1
FAN	Using the fan	3



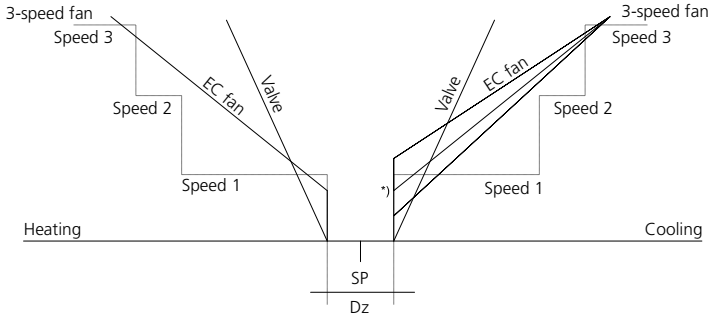
Heating and 2-step cooling

Parameter	Description	Select
Cramp	Cooling step	x 2
CSEq	Cooling step sequence	Valve
FAN	Using the fan	3



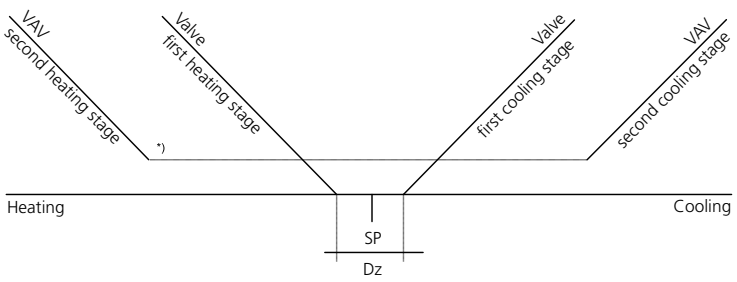
Heating and 1-step cooling, the valve is opened before the fan speed increases

Parameter	Description	Select
Cramp	Cooling step	x 1
Fan=	Fan step at the same time as valve step	OFF
FAN	Using the fan	3
FANLO	Scaling fan output, low capacity *)	e.g. 20%



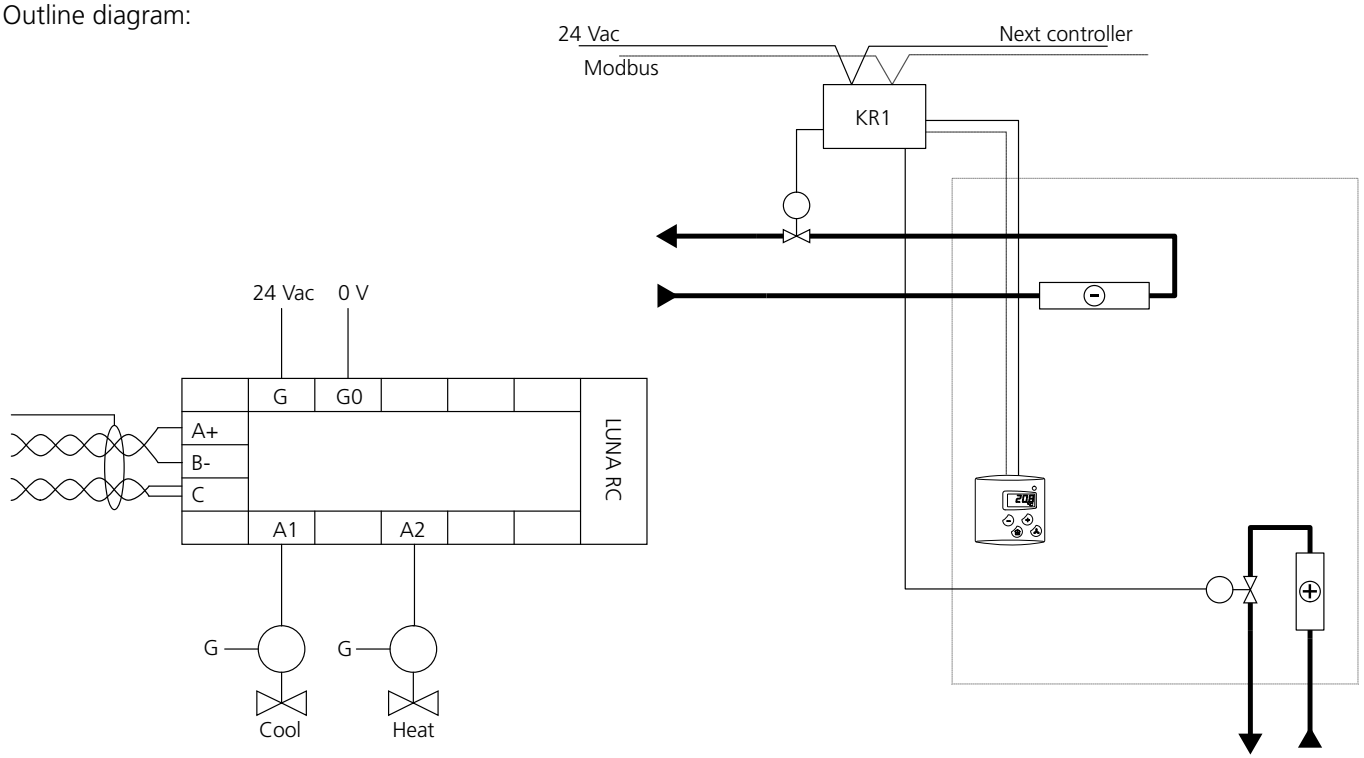
VAV heating and cooling

Parameter	Description	Select
HVAV	VAV heating	ON
Hramp	Heating step Note: If you have selected 2-step, the step sequence for heating is always: 1. Valve 2. VAV	x 2
Cramp	Cooling step	x 2
CSEq	Cooling step sequence	Valve
Vmin%	Minimum VAV output *)	e.g. 20%
FAN	Using the fan	OFF



Heating with heating elements and cooling with beams

Outline diagram:



Input	DI1	Ex1	S/DI2

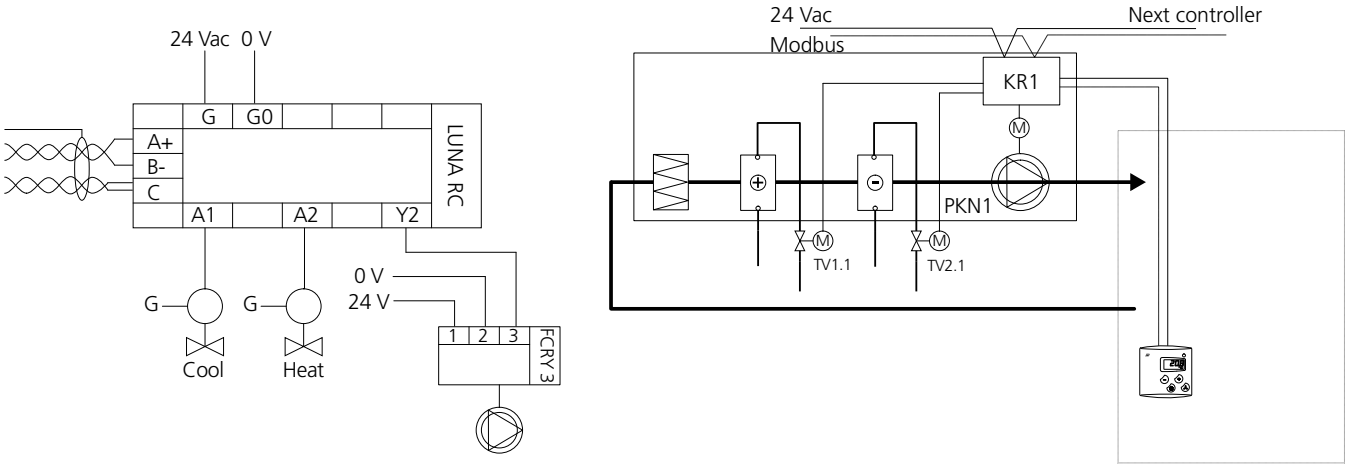
Output	Y1	Y2	A1	A2	Y3	Y4
Thermal actuator			x	x		

Mark the following parameters:

Parameter	Modbus register	Description	Factory setting	Min.	Max.	
Cramp	17	Cooling step	1St	1St	2St	1St=1 step, 2St=2 step
MJAM	22	Preventing valve blocking	OFF	ON	OFF	The valves can be blocked if they are in the same position for a long time. In such situations, you can enable the function that prevents valve blocking. When the MJAM parameter is in the ON position, the valves are opened and closed for 5 minutes, once a day.

Heating with heating elements and cooling with fan coils

Outline diagram:



Input	DI1	Ex1	S/DI2

Output	Y1	Y2	A1	A2	Y3	Y4
Thermal actuator			x	x		
FCRY 3-relay or EC-fan		x				

Mark the following parameters:

Parameter	Modbus register	Description	Factory setting	Min.	Max.	
EXT.S	40009	External temperature sensor/DI2 contact input	OFF	OFF	3	OFF=not used, 1=external NTC sensor, 2=DI2 contact for doors/windows (prevents both heating and cooling), 3=DI2 condensation switch (prevents cooling)
Cramp	17	Cooling step	1St	1St	2St	1St=1 step, 2St=2 step
CSEq	18	Cooling step sequence	Valve	Valve	VAV	Valve=valve first, VAV=VAV first
Fan=	19	Fan step at the same time as valve step	ON	OFF	ON	ON=the valve and fan steps operate simultaneously, OFF=valve step first, then fan step
Fmax%	40033	Maximum fan output	100.0	50.0	100.0	It is possible to limit the fan's maximum speed output (EC fan) if you want to avoid the fan making a lot of noise.
FANHI	40036	Scaling fan output, high capacity	100	0	100	The higher capacity for the EC fan's scaled control signal (0…10 V)
FANLO	40037	Scaling fan output, low capacity	0	0	100	The lower capacity for the EC fan's scaled control signal (0…10 V)
FAn	23	Fan type and size	3-coil	3-coil	EC	3-coil=fan with 3 speeds, EC=EC fan
FAN	40038	Using the fan	OFF	OFF	3	OFF=OFF, 1=cooling, 2=heating, 3=both cooling and heating
FANLI	24	The fan's speed 3 disabled	OFF	OFF	ON	When FANLI=ON, fan speed 3 is disabled in auto mode (e.g. due to noise). However, the user can connect speed 3 manually When FANLI=OFF, speed 3 is permitted in auto mode

Fan regulation (control)

- The fan can be regulated for 3 speeds or 0…10 V (EC motor). In manual mode, the EC motor operates so that the switch positions are 0=0%, 1=33%, 2=66% and 3=100% of the scaled control signal.
- With the relay module FCRY 3 connected to output Y2, you can regulate the speed of the fan coil or the 3-step fan. For example, when the parameter FAN is 2 and the parameter FAN=parameter is ON, the fan operates as follows:
  - o The temperature reaches set point (lower DZ), the valve is closed and the fan stops 5 minutes later.
  - o The temperature is below the lower DZ limit, the valve starts to open and the fan is controlled to speed 1 (Y2=3 V)
  - o The temperature is still falling, the valve is opened more than 70%. The fan is controlled to speed 2 (Y2=6 V)
  - o The temperature is still falling, the valve is opened more than 90%. The fan is controlled to speed 3 (Y2=10 V)

In a cooling situation where the parameter FAN is 1, the controller operates in accordance with the cooling demand (the temperature increases), see page 8

Open the valve before the fan speed is increased

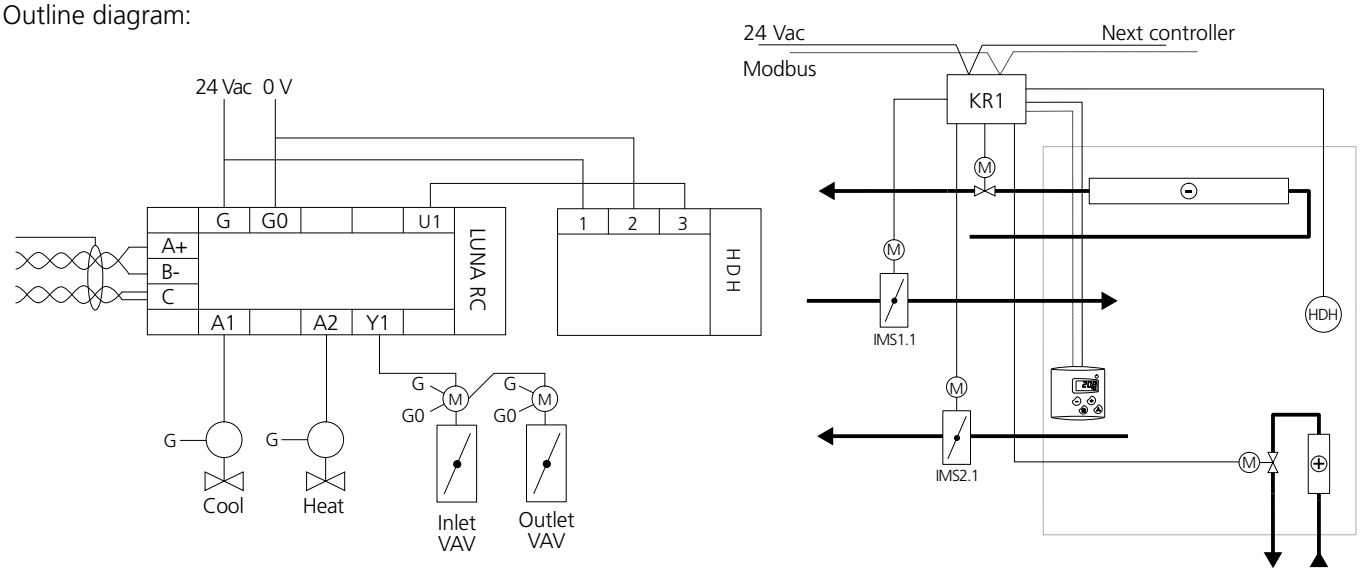
- When the parameter FAN=is ON, the EC fan that is connected to the output Y2 operates simultaneously with the heating and/or cooling valve. The fan starts when the valve starts to open and, when the valve is fully open, the fan operates at maximum speed. The fan speed is regulated linearly between the low and high limits.

  The fan operates for 5 minutes after the valve has been fully closed, and at the speed that has been determined by the parameter FANLO, see page 8.
- When the parameter FAN=is OFF, the 3-step fan operates at speed 1 and the valve is fully open. The fan is then controlled to speed 2 (66%) or 3 (100%) if required.

  Heating and 1-step cooling, the valve is opened before the fan speed increases, see page 8.

Heating with heating elements, cooling with VAV and beams, ventilation on request (CO_2)

Outline diagram:



Input	DI1	Ex1	S/DI2
(PIR occupancy)			(x)

Output	Y1	Y2	A1	A2	Y3	Y4
Thermal actuator			x	x		
VAV	x					

Mark the following parameters:

Parameter	Modbus register	Description	Factory setting	Min.	Max.	
Cramp	17	Cooling step	1St	1St	2St	1St=1 step, 2St=2 step
CSEq	18	Cooling step sequence	Valve	Valve	VAV	Valve=valve first, VAV=VAV first
MJAM	22	Preventing valve blocking	OFF	ON	OFF	The valves can be blocked if they are in the same position for a long time. In such situations, you can enable the function that prevents valve blocking. When the MJAM parameter is in the ON position, the valves are opened and closed for 5 minutes, once a day
Vmin%	40034	Minimum VAV output	0.0	0.0	50.0	Minimum VAV output It is possible to set the minimum amount of fresh air in order to guarantee sufficient ventilation, for example to remove humidity in situations when the ventilated area is not in use

If you are using CO2 measurement or occupancy detection, mark the following parameters:

Parameter	Modbus register	Description	Factory setting	Min.	Max.	
CO2LO	40039	Lower P-band limit for CO2 regulation	700	400	1000	Lower P-band limit for CO2 regulation
CO2HI	40040	Higher P-band limit for CO2 regulation	1250	500	2000	Higher P-band limit for CO2 regulation
F Air	40018	Regulation, fresh air	0	0	3	0=CO2 / T, 1=DAY/T, 2=CO2 3=DAY
DI1bst	40026	Minimum VAV output in day mode	0%	0%	100%	Minimum VAV output when the controller is set to day mode
ABC	37	ABC calibration	ON	OFF	ON	

Improve the use of fresh air according to carbon dioxide level

With the controller, you can use ventilation that is regulated with the aid of CO_2 concentration (and temperature). Determine the regulation range by setting the lower limit (CO2LO; factory setting 700 ppm) and the higher limit (CO2HI; factory setting 1250 ppm).

Improvement in the use of fresh air based on CO_2 concentration requires that the parameter F Air is 0 or 2.

Note: When the parameter F Air is "0", the Y1 output is determined as the maximum value according to CO_2 content or temperature.

Improvement in the use of fresh air according to day mode

Alternatively, it is possible to improve the intake of fresh air according to the day mode. Improvement in the use of fresh air in day mode assumes the following:

- The parameter F Air is "1" or "3"
- Regulation of day mode: PIR, card switch, Modbus or the "Occupancy" button
- The parameter DI1bst (minimum VAV output when the controller is in day mode) has a value that is not zero (e.g. 80%)

Note: When the parameter F Air is "1", the Y1 output is determined as the maximum value according to the aforementioned regulations or temperatures.

Thermostat mode

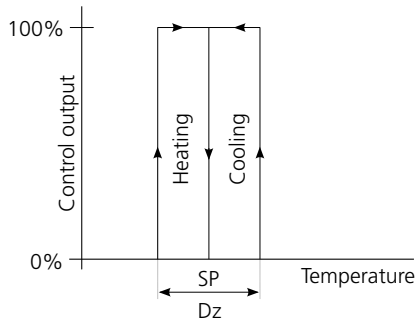
If you select thermostat mode, it is possible to regulate the actuators using regulation of the type of thermostat. The thermostat mode can be enabled for the cooling or heating side, or both.

- If thermostat mode is used on the heating side, the heating valve is opened fully when the temperature drops below the dead zone's lowest limit. The heating valve is closed when the temperature reaches the set point (SP).
- If thermostat mode is used on the cooling side, the cooling valve is opened fully when the temperature exceeds the dead zone's highest limit. The cooling valve is closed when the temperature reaches the set point (SP).

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

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

Actuator functions ON/OFF:



Input	DI1	Ex1	S/DI2

Output	Y1	Y2	A1	A2	Y3	Y4
Thermal actuator			x	x		
VAV	(X)					

Mark the following parameters:

Parameter	Modbus register	Description	Factory setting	Min.	Max.	
EXT.S	40009	External temperature sensor/DI2 contact input	OFF	OFF	3	OFF=not used, 1=external NTC sensor, 2=DI2 contact for doors/windows (prevents both heating and cooling), 3=DI2 condensation switch (prevents cooling)
SPcnt	40011	Middle of the user's set point range	21.0	18.0	26.0	Middle of the user's set point range
±SP °C	40012	Area limits for user set point	±3.0	±0	±16	The user can set the set point within these limits
DZ °C	40014	Dead zone	0.2	0.0	3.0	Used as hysteresis in thermostat mode
nl OP	20	Night operation mode	DZ	DZ	FG	DZ=dead zone, FG=frost protection mode
FAN	40038	Using the fan	OFF	OFF	3	OFF=OFF, 1=cooling, 2=heating, 3=both cooling and heating
Fmin%	40032	Minimum fan output	0.0	0.0	50.0	
Fmax%	40033	Maximum fan output	100.0	50.0	100.0	
Vmin%	40034	Minimum VAV output	0.0	0.0	50.0	
Vmax%	40035	Maximum VAV output	100.0	50.0	100.0	
ThrmC	29	Thermostat function, cooling	OFF	OFF	ON	OFF=P/PI controller, ON=thermostat mode
ThrmH	30	Thermostat function, heating	OFF	OFF	ON	OFF=P/PI controller, ON=thermostat mode

Regulating the electric heater

The controller can regulate an electric heater by using a PR 50/440 semi-conductor relay between the A2 output and the heater. The relay must have a PRMK auxiliary card.

IMPORTANT: The controller is not fitted with any overheating protection for the heater. The overheating protection must be included in the actual heater. It is possible to read off the overheating alarm using the DI input, but the signal does not disable the heater's regulation.

It is possible to connect the overheating alarm's signal to the DI1 or DI2 inputs. It is then possible to read off the signal using Modbus. The DI input must be set to position "not used" (DI1mod=0 or EXT.S=OFF).

Input	DI1	Ex1	S/DI2
Overheating alarm	(x)		(x)

Output	Y1	Y2	A1	A2	Y3	Y4
Thermal actuator			x			
24 VAC-regulated semi-conductor relay				x		

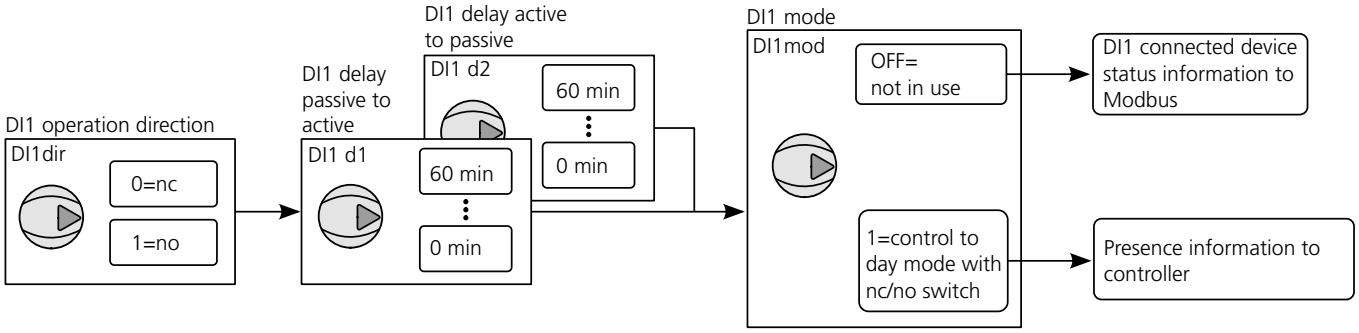
Mark the following parameters:

Parameter	Modbus register	Description	Factory setting	Min.	Max.	
EXT.S	40009	External temperature sensor/DI2 contact input	OFF	OFF	3	OFF=not used, 1=external NTC sensor, 2=DI2 contact for doors/windows (prevents both heating and cooling), 3=DI2 condensation switch (prevents cooling)
DI2dir	28	DI2 direction of operation (nc/no)	1	0	1	0=nc, 1=no
DI1mod	40021	DI1 mode	0	0	1	0=not used, 1=regulate to day mode with nc/no switch connected to DI1 input
DI1dir	40022	DI1 direction of operation (nc/no)	0	0	1	in night mode: 0=nc, 1=no

Use of the digital input DI1 and its functions

The DI1 input can be used to regulate the controller to day/night mode. This is achieved with the aid of a home/away switch, a card reader or a motion detector.

The DI1 input can be used to read off the status of other apparatus through Modbus, if the input is not required to regulate the room.



Parameter	Modbus register	Description	Factory setting	Min.	Max.	
DI1mod	40021	DI1 mode	0	0	1	0=not used, 1=regulate to day mode with nc/no switch connected to DI1 input
DI1dir	40022	DI1 direction of operation (nc/no)	0	0	1	1=night mode 0=nc, 1=no
DI1 d1	40023	DI1 delay passive to active	0	0	60	Delay in minutes when switching from night mode to day mode
DI1 d2	40024	DI1 delay active to passive	5	0	60	Delay in minutes when switching from day mode to night mode

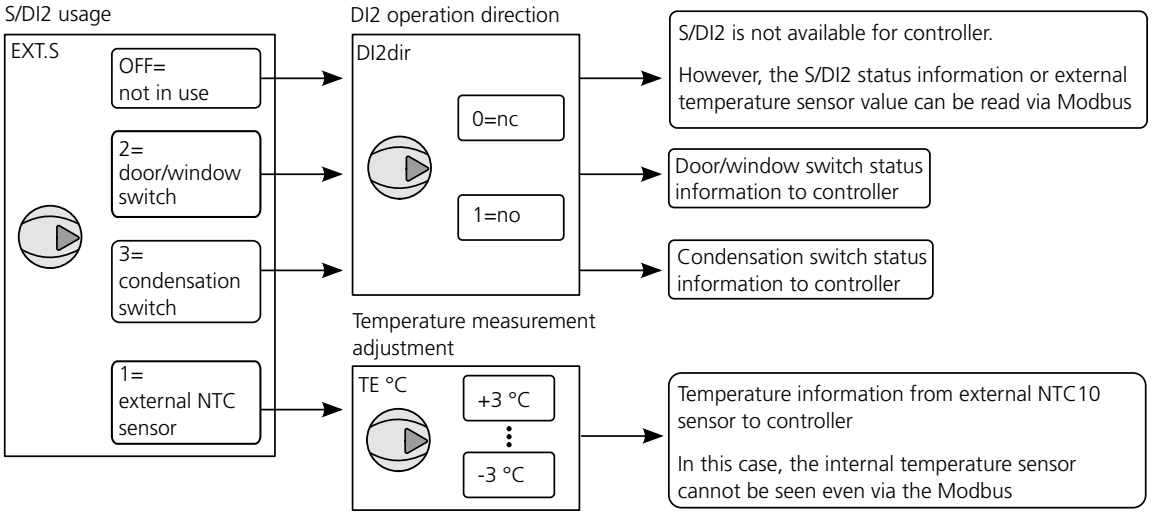
Use of the digital input DI2 and its functions

The DI2 input can be used to regulate the controller by using a door/window contact or dew point protection with relay output.

If door/window contacts are used, the controller prevents heating and cooling from taking place when the relevant doors or windows are open. In this way, you avoid wasting energy and having condensation on the chilled beams.

If you use a condensing switch, cooling is prevented when the contact is enabled.

The DI2 input can be used to read off the status of other apparatus through Modbus, if the input is not required to regulate the room.



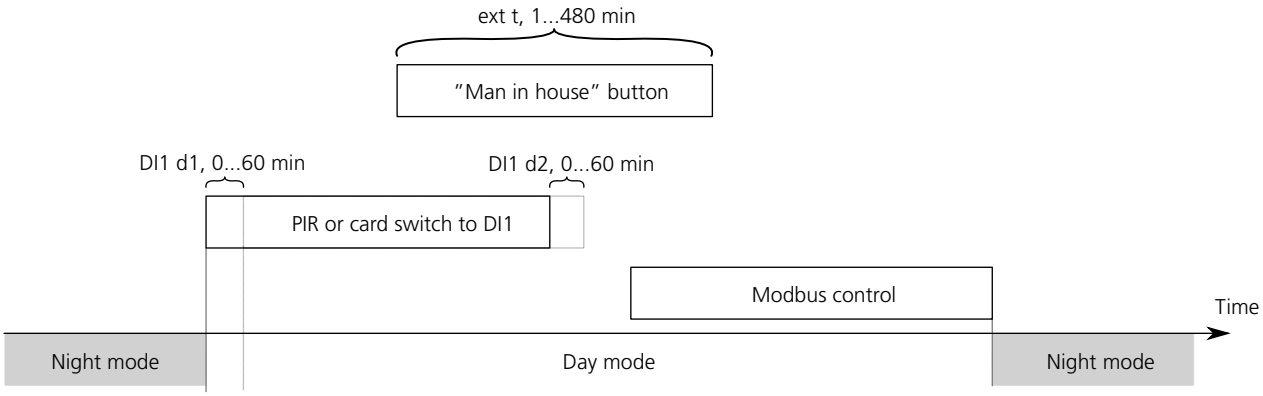
Mark the following parameters:

Parameter	Modbus register	Description	Factory setting	Min.	Max.	Parameter
EXT.S	40009	External temperature sensor/ DI2 contact input	OFF	OFF	3	OFF=not used, 1=external NTC sensor, 2=DI2 contact for doors/windows (prevents both heating and cooling), 3=DI2 condensation switch (prevents cooling)
DI2dir	28	DI2 direction of operation (nc/no)	1	0	1	0=nc, 1=no
TE °C	40010	Adjusting temperature sensors	0.0	-3.0	+3.0	It is possible to adjust the temperature measurement, if necessary Note: Eliminate all fault factors that can affect the temperature measurement before changing this parameter. It is not possible to reset the parameter to the factory setting.

Regulating day and night mode

- The parameter NIGHT is "OFF": The controller is and remains in day mode.
- The parameter NIGHT is "ON": The controller switches to day mode when the first regulation requires day mode. The controller switches to night mode when the last regulation requires night mode.

Example:



This takes place when the controller switches to day mode:

1. The use of fresh air is improved (the parameter DI1bst determines the amount of the improvement, 0…100%). It is possible to prevent the improvement in the use of fresh air by setting the parameter value for DI1bst to 0%.
2. The temperature set point that has been determined by the parameter SP:nd starts to be used.
3. The day mode's dead zone starts to be used and the controller switches from possible frost protection mode to regulation mode.

Mark the following parameters:

Parameter	Modbus register	Description	Factory setting	Min.	Max.	
EXT.S	40009	External temperature sensor/DI2 contact input	OFF	OFF	3	OFF=not used, 1=external NTC sensor, 2=DI2 contact for doors/windows (prevents both heating and cooling), 3=DI2 condensation switch (prevents cooling)
DI2dir	28	DI2 direction of operation (nc/no)	1	0	1	0=nc, 1=no
DI1mod	40021	DI1 mode	0	0	1	0=not used, 1=regulate to day mode with nc/no switch connected to DI1 input
DI1dir	40022	DI1 direction of operation (nc/no)	0	0	1	In night mode: 0=nc, 1=no
DI1 d1	40023	DI1 delay passive to active	0	0	60	Delay in minutes when switching from night mode to day mode
DI1 d2	40024	DI1 delay active to passive	5	0	60	Delay in minutes when switching from day mode to night mode
ext t	40025	Temporary day mode, length in minutes	120	1	480	
DI1bst	40026	Minimum VAV output in day mode	0%	0%	100%	Minimum VAV output when the controller is set to day mode
SP:nd	21	Effective set point after change from night mode to day mode	OFF	OFF	ON	OFF=Latest value set by user ON=The value from Modbus
NIGHT	14	Selection of night/day mode	OFF	OFF	ON	OFF=the controller is and remains in day mode, ON=the controller is in night mode unless it has been specially regulated to day mode

Temporary day mode

The button can be used to regulate temporary day mode. This means that the controller is normally in night operating mode and uses a wider dead zone to reduce energy consumption. When the button is pressed, the temporary day mode is enabled, including with a timer or with the ON/OFF function.

The ON/OFF function means that when the day mode is enabled with the button, the mode remains active until the button is pressed again. In timer mode, the timer value is set to the ext t parameter. When the timer reaches 0, the controller returns to night mode.

Set the following parameters if you want to enable temporary day mode:

Parameter	Modbus register	Description	Factory setting	Min.	Max.	Parameter
NIGHT	14	Selection of night/day mode	OFF	OFF	ON	Set the parameter to ON to enable temporary day mode
ext t	40025	Temporary day mode, length in minutes	120	0	480	Set the length to 0 min to enable the ON/OFF function
type	39	Function for the occupancy button	0	0	1	Set the parameter value to *DAY* (0)

VAV Boosting

The button can be used to boost the VAV output. When the function is enabled and you press the button, the VAV output is set to the parameter Vmax% for the time that has been set with the parameter ext t. If the timer value is 0, the boost function is active until you press the button again.

To enable the VAV boost function, set the following parameters:

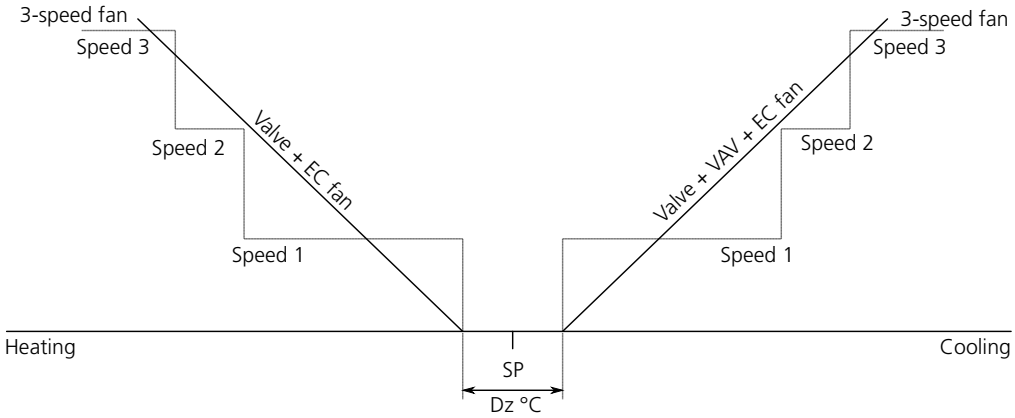
Parameter	Modbus register	Description	Factory setting	Min.	Max.	Parameter
NIGHT	14	Selection of night/day mode	OFF	OFF	ON	Set the parameter to OFF
ext t	40025	Time for VAV boosting	120	0	480	Set the length to 0 min to enable the ON/OFF function
F Air	40018	Source of fresh air regulation	0	0	3	0=CO2/T, 1=DAY/T, 2=CO2 3=DAY
type	39	Function for the occupancy button	0	0	1	Set the parameter value to VAV (1)
Vmax%	40035	The VAV output's maximum value	100.0	50.0	100.0	

Use the extended dead zone in night mode

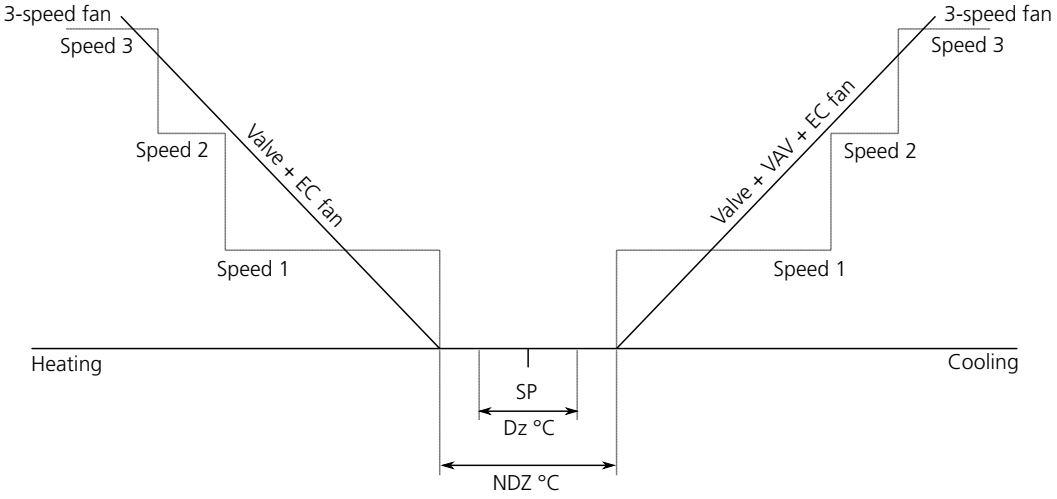
With the extended dead zone, you can save energy by permitting a lower temperature and ventilation. It is also possible to set the night dead zone to a lower value than for the day dead zone.

When the parameter nl OP is "DZ", the controller operates in exactly the same way as in day mode, except that it uses the night dead zone. The night dead zone is determined with the parameter NDZ °C.

Day mode:



Night mode:

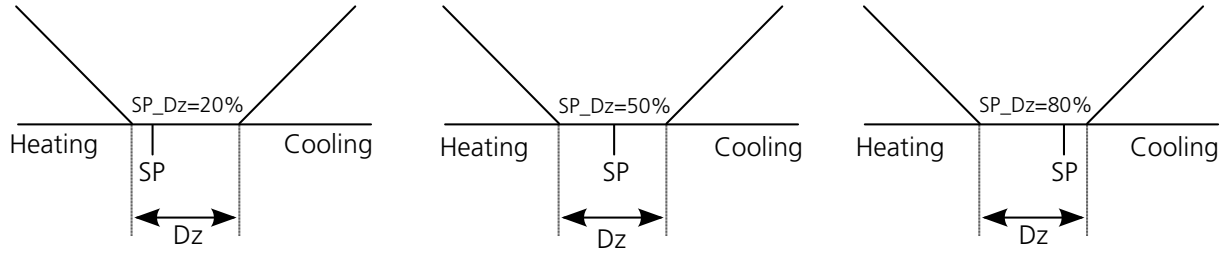


Mark the following parameters:

Parameter	Modbus register	Description	Factory setting	Min.	Max.	Parameter
EXT.S	40009	External temperature sensor/ DI2 contact input	OFF	OFF	3	OFF=not used, 1=external NTC sensor, 2=DI2 contact for doors/windows (prevents both heating and cooling), 3=DI2 condensation switch (prevents cooling)
nl OP	20	Night operating mode	DZ	DZ	FG	DZ=dead zone, FG=frost protection mode
NDZ °C	40019	Night mode's dead zone	6.0	0.0	10.0	NDZ °C

Asymmetric dead zone

The middle of the dead zone in relation to the temperature's set point can be adjusted with the parameter SP_Dz (0…100%) according to the figure below.

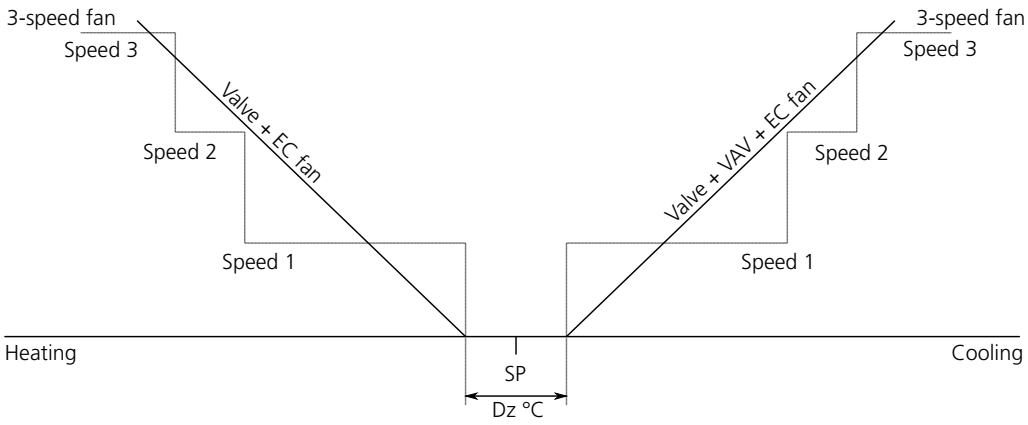


Frost protection function in night mode

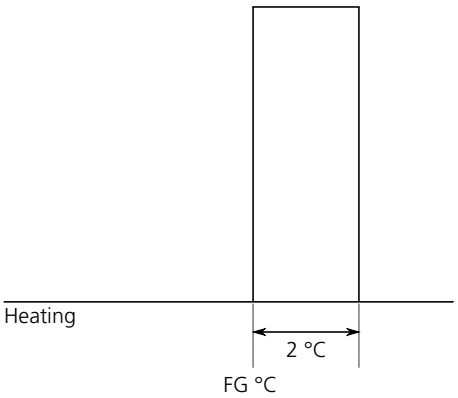
When the temperature is below the set point for frost protection (the parameter FG °C), the heating valve is opened and the fan starts (the parameter FAN must be "2" or "3") with speed 1. The EC motor's control signal is 33%.

When the temperature exceeds the set point by 2°C (the parameter FG °C), the heating valve is closed and the fan stops. The process is repeated until the controller switches to day mode.

Day:



Night:



Mark the following parameters:

Parameter	Modbus register	Description	Factory setting	Min.	Max.	Parameter
EXT.S	40009	External temperature sensor/DI2 contact input	OFF	OFF	3	OFF=not used, 1=external NTC sensor, 2=DI2 contact for doors/windows (prevents both heating and cooling), 3=DI2 condensation switch (prevents cooling)
nl OP	20	Night operating mode	DZ	DZ	FG	DZ=dead zone, FG=frost protection mode
FG °C	40020	Set point for frost protection thermostat	17.0	8.0	50.0	FG °C

Set point for temperature

The temperature's set point can be one of the following:

1. Set with controller buttons (the parameters SPcnt and ±SP °C)
2. Set with external 0...10 V signal (the parameter U1mod must be "2"). The external 0...10 V signal area's set point is the same as the set point rage that has been determined in the menu (the parameters SPcnt and ±SP °C)
3. Set through Modbus
4. The set point for frost protection (the parameter FG °C) in night mode, if the frost protection mode has been selected for night mode (the parameter nl OP is "FG")

The change from night mode to day mode also affects the temperature's set point. With the parameter SP:nd, the set point can be selected so that it is the latest value that the user has provided or that can be read off through Modbus. The value that the user has provided can be the 0...10 V signal that has been connected to the U1 input or the value that has been set with the controller buttons.

The controller uses the latest value as the set point (set by the user or through Modbus). It is possible to display the actual set point by pressing the - or + button The set point is shown continuously on the display if the parameter value for dISP is SP.

Parameter	Modbus register	Description	Factory setting	Min.	Max.	Parameter
SPcnt	40011	Middle of the user's set point range	21.0	18.0	26.0	Middle of the user's set point range
+SP °C	40012	Area limits for user set point	±3.0	±0	±16	The user can set the set point within these limits
SP_Dz	40015	Set point position in dead zone	50	0	100	
FG °C	40020	Set point for frost protection thermostat	17.0	8.0	50.0	FG °C
SP:nd	21	Effective set point after change from night mode to day mode	OFF	OFF	ON	OFF=Most recent user-set value ON=The value from Modbus
U1mod	40027	U1 mode	0	0	3	0=not used, 1=external set point, 2=temp. measurement with 0…10 V transmitter (Note: The external sensor is not available if the 0...10 V transmitter is selected)
dISP	27	The value on the display	TE	TE	SP	TE=temperature, SP=set point

When the middle of the set point range (parameter SPcnt) is changed with Modbus, the user's set point deviation remains unchanged.

Example:

1. The parameter value SPcnt is 21°C and the user has changed the set point to 23°C (the deviation is +2°C).
2. The parameter value SPcnt is changed to 22°C through Modbus (register 40011).

→ The controller uses 24°C as the actual set point (22°C + 2°C=24°C).

Example of use

You want the set point to revert to a constant value (e.g. 21°C) when the controller switches from night mode to day mode (for example in a hotel).

Set the parameters according to the following table.

Parameter	Modbus register	Description	Value
SP:nd	21	Effective set point after change from night mode to day mode	ON
	40002	Set point according to Modbus	210

You want the set point to revert to a set point set by the user when the controller switches from night mode to day mode (for example in an office).

Set the parameters according to the following table.

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

You want the set point to remain at the value specified through Modbus (e.g. 21°C)

Set the parameters according to the following table.

Parameter	Modbus register	Description	Value
SPcnt	40011	Middle of the user's set point range	21.0
±SP °C	40012	Area limits for user set point	0

Note: It is also possible to write the set point to Modbus register 40002. However, the value for register 40011 is shown on the display when you press the - and + buttons.

Fan speed

The fan speed (output Y2) is regulated as follows (the most recently changed value remains in force):

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

The parameter FANND determines this from the aforementioned set values that remain in force after the controller has switched from night mode to day mode.

Mark the following parameters:

Parameter	Modbus register	Description	Factory setting	Min.	Max.	Parameter
FANLI	24	The fan's speed 3 disabled	ON	OFF	ON	When FANLI=ON, fan speed 3 is disabled in auto mode (e.g. due to noise). However, the user can connect speed 3 manually. When FANLI=OFF, speed 3 is permitted in auto mode.
FANND	25	Effective fan speed after change of night mode to day mode	OFF	OFF	ON	OFF=Latest value set by user ON=The value from Modbus
	40001	Fan speed set through Modbus	0	0	4	0=OFF, 1=speed 1, 2=speed 2, 3=speed 3, 4=automatic

It is also possible to regulate the fan speed by exceeding the output over Modbus, see page 25, Output overdrives.

Sensor selection

The temperature information can be imported to the controller as follows:

1. Internal temperature measurement in the controller (the parameter EXT.S is "0", "2" or "3")
2. External temperature measurement with sensor NTC10 (the parameter EXT.S is "1")
3. External 0...10 V temperature measurement (the parameter U1mod is "3")

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

It is possible to read off the set point from the controller and then enter it in other controllers if several controllers are used in the same area.

Mark the following parameters:

Parameter	Modbus register	Description	Factory setting	Min.	Max.	Parameter
EXT.S	40009	External temperature sensor/DI2 contact input	OFF	OFF	3	OFF=not used, 1=external NTC sensor, 2=DI2 contact for doors/windows (prevents both heating and cooling), 3=DI2 condensation switch (prevents cooling)
TE °C	40010	Adjusting temperature sensors	0.0	-3.0	3.0	It is possible to adjust the temperature measurement, if necessary Note: Eliminate all fault factors that can affect the temperature measurement before changing this parameter. It is not possible to reset the parameter to the factory setting
U1mod	40027	U1 mode	0	0	3	0=not used, 1=external set point, 2=temp. measurement with 0…10 V transmitter (Note: The external sensor is not available if the 0...10 V transmitter is selected)

Output limits

It is possible to limit the various outputs' minimum and maximum values separately. The controller will not operate the outputs outside of these values. Setting a minimum limit for heating output, for example, is one way of preventing the discomfort caused by cold air flowing down from a window. It is only possible to exceed these limits if you regulate the outputs through Modbus (Modbus overdrive).

Input	DI1	Ex1	S/DI2

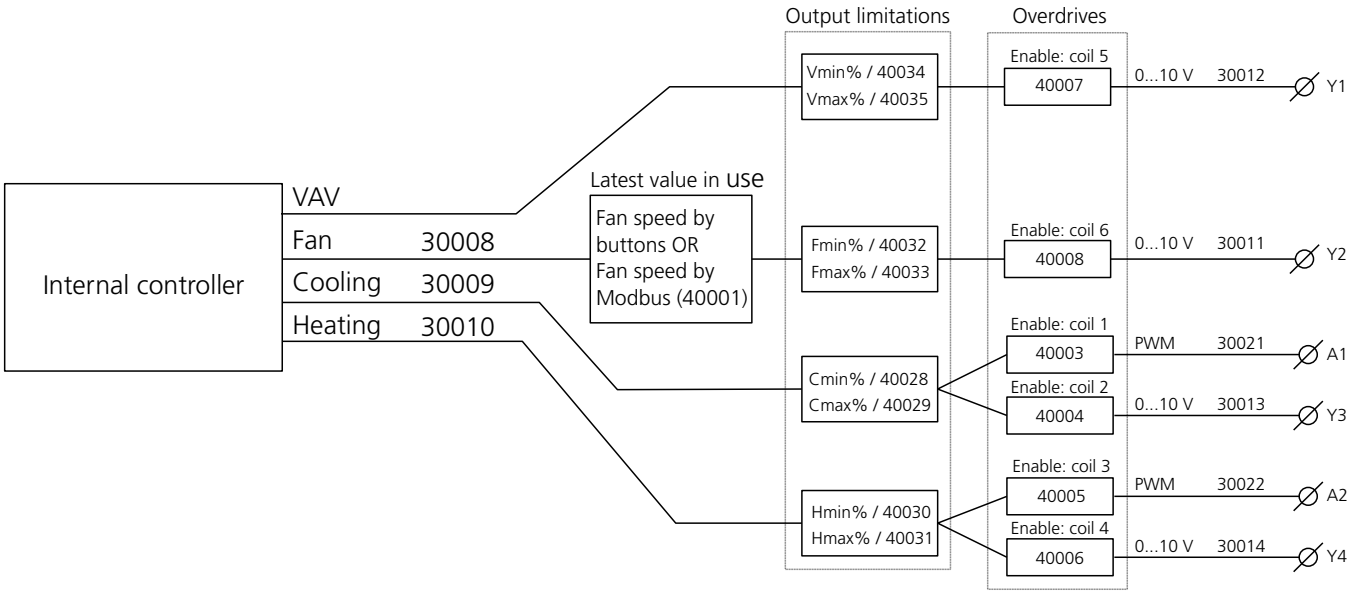
Output	Y1	Y2	A1	A2	Y3	Y4
	x	x	x	x	x	x

Mark the following parameters:

Parameter	Modbus register	Description	Factory setting	Min.	Max.	
Cmin%	40028	The cooling actuator's minimum value	0.0	0.0	50.0	
Cmax%	40029	The cooling actuator's maximum value	100.0	50.0	100.0	
Hmin%	40030	The heating actuator's minimum value	0.0	0.0	50.0	
Hmax%	40031	The heating actuator's maximum value	100.0	50.0	100.0	
Fmin%	40032	Minimum fan output	0.0	0.0	50.0	
Fmax%	40033	Maximum fan output	100.0	50.0	100.0	
Vmin%	40034	Minimum VAV output	0.0	0.0	50.0	
Vmax%	40035	Maximum VAV output	100.0	50.0	100.0	

Output overdrives

All outputs can be exceeded separately through Modbus.



Coils

Register	Parameter description	Data type	Value	Range	Standard
1	Cooling PWM overdrive enable (A1)	Bit	OFF=0, ON=1	OFF-ON	0
2	Cooling 0-10 V overdrive enable (Y3)	Bit	OFF=0, ON=1	OFF-ON	0
3	Heating PWM overdrive enable (A2)	Bit	OFF=0, ON=1	OFF-ON	0
4	Heating 0-10 V overdrive enable (Y3)	Bit	OFF=0, ON=1	OFF-ON	0
5	VAV overdrive enable (Y1)	Bit	OFF=0, ON=1	OFF-ON	0
6	FAN overdrive enable (Y1)	Bit	OFF=0, ON=1	OFF-ON	0

Input registers

Register	Parameter description	Data type	Value	Range	Standard
30008	Current cooling (controller)	Signed 16	0...1000	0…10.00 V	0
30009	Current heating (controller)	Signed 16	0...1000	0…10.00 V	0
30010	Current speed for FAN (controller)	Signed 16	0...4	OFF-ON	0
30011	Speed for FAN (connection Y2)	Signed 16	0...1000	0…10.00 V	0
30012	VAV regulation (connection Y1)	Signed 16	0...1000	0…10.00 V	0
30013	Cooling regulation (connection Y3)	Signed 16	0...1000	0…10.00 V	0
30014	Heating regulation (connection Y4)	Signed 16	0...1000	0…10.00 V	
30021	Cooling regulation (connection A1)	Signed 16	0...1000	0.00…10.00%	
30022	Heating regulation (connection A2)	Signed 16	0...1000	0.00…10.00%	

Holding registers

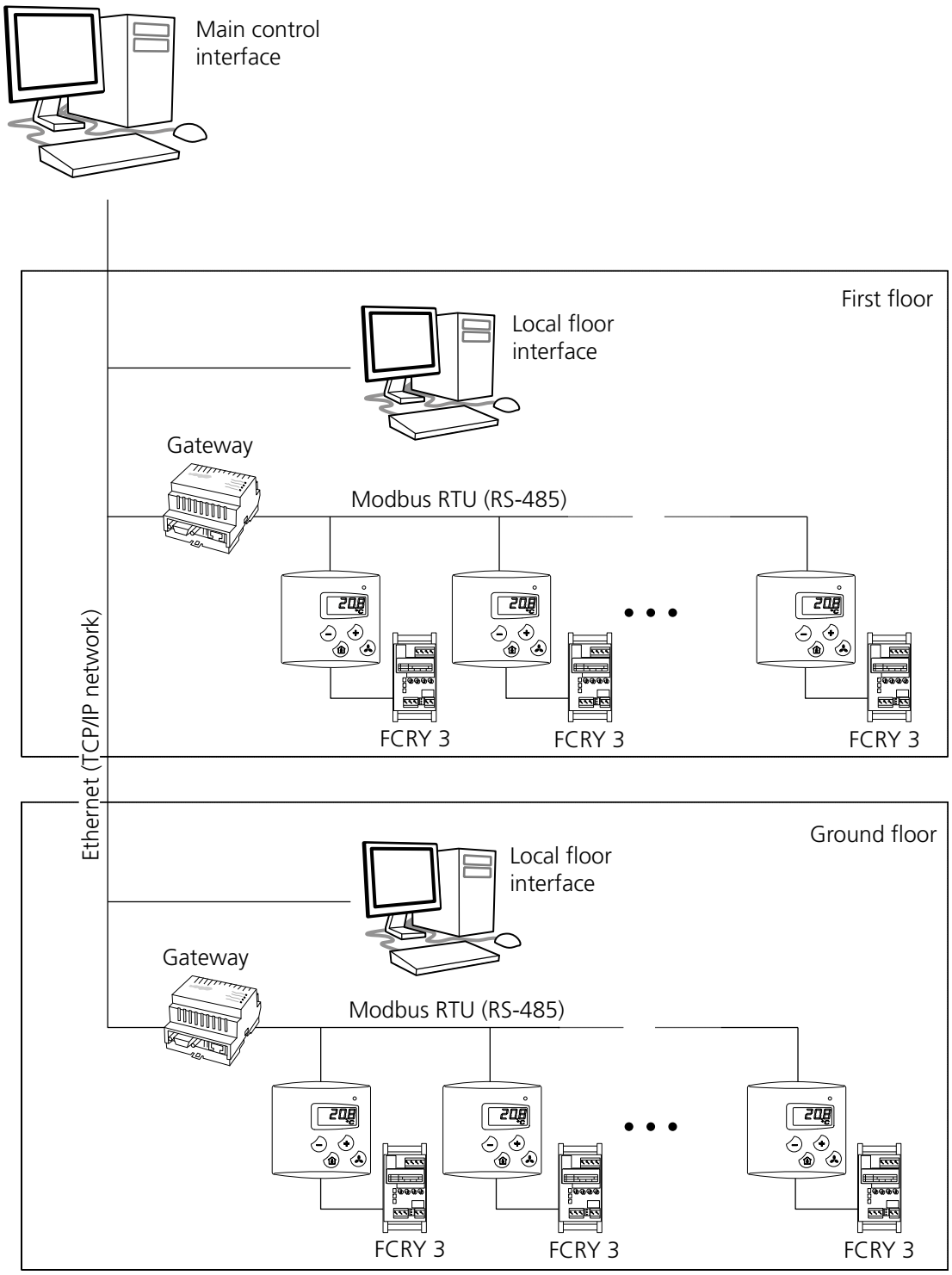
Register	Parameter description	Data type	Value	Range	Standard
40001	FAN speed by Modbus	Signed 16	0...4	0 - 1 - 2 - 3 - 4	0
40003	Overdrive cooling PWM by Modbus (A1)	Signed 16	0...1000	0…100.0%	0
40004	Overdrive cooling 0-10 V by Modbus (Y3)	Signed 16	0...1000	0...10.00 V	0
40005	Overdrive heating PWM by Modbus (A2)	Signed 16	0...1000	0…100.0%	0
40006	Overdrive heating 0-10 V by Modbus (Y4)	Signed 16	0...1000	0…10.00 V	0
40007	Overdrive VAV by Modbus (Y1)	Signed 16	0...1000	0…10.00 V	0
40008	Overdrive FAN by Modbus (Y2)	Signed 16	0...1000	0…10.00 V	0
40028	The cooling actuator's minimum value	Signed 16	0...500	0.0…50.0%	0
40029	The cooling actuator's maximum value	Signed 16	500...1000	50.0…100.0%	1000
40030	The heating actuator's minimum value	Signed 16	0...500	0.0 … 50.0%	0
40031	The heating actuator's maximum value	Signed 16	500-1000	50.0 … 100.0%	1000
40032	Minimum fan output	Signed 16	0...500	0.0 … 50.0%	0
40033	Maximum fan output	Signed 16	500-1000	50.0 … 100.0%	1000
40034	Minimum VAV output	Signed 16	0...500	0.0 … 50.0%	0
40035	Maximum VAV output	Signed 16	500-1000	50.0 … 100.0%	1000

Service alarm

If the temperature does not reach the dead zone within 120 hours, the Modbus register's SERVICE ALARM changes to "ON". The alarm is intended solely for information purposes and does not affect the controller's function. It is possible to reset the alarm through Modbus.

Network description

It is possible to connect up to 247 controllers through one and the same network segment. The following diagram shows a typical installation where the room controllers have been connected to a gateway server at floor level.



Modbus

Bus properties

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

The apparatus supports the following Modbus registers and function codes. The parameter memory's service life allows at least 1 million write cycles.

The regulations that are marked with * are saved in the volatile memory. These regulations revert to the factory settings after a power failure.

The product supports the following function codes for Modbus

0x01	Read coils
0x02	Read discrete inputs
0x03	Read holding registers
0x04	Read input registers
0x05	Write single coil
0x06	Write single register
0x0F	Write multiple coils
0x10	Write multiple registers
0x17	Read/write multiple registers

Note: If you try to enter a parameter value that exceeds the range for the parameter values, the value will be replaced with the nearest acceptable value. For example, if you enter 270 in register 40011, the value will be replaced with 260.

Coils

Register	Parameter description	Data type	Values	Range	Default
1	*Cooling PWM overdrive enable (A1)	Bit	0-1	0=OFF, 1=ON	0
2	*Cooling 0…10 V overdrive enable (Y3)	Bit	0-1	0=OFF, 1=ON	0
3	*Heating PWM overdrive enable (A2)	Bit	0-1	0=OFF, 1=ON	0
4	*Heating 0…10 V overdrive enable (Y4)	Bit	0-1	0=OFF, 1=ON	0
5	*VAV overdrive enable (Y1)	Bit	0-1	0=OFF, 1=ON	0
6	*FAN overdrive enable (Y2)	Bit	0-1	0=OFF, 1=ON	0
7	Not in use	Bit	0-1	0=OFF, 1=ON	0
8	Not in use	Bit	0-1	0=OFF, 1=ON	0
9	Not in use	Bit	0-1	0=OFF, 1=ON	0
10	Not in use	Bit	0-1	0=OFF, 1=ON	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=DIR, 1=REV	0
16	Heating output mode	Bit	0-1	0=DIR, 1=REV	0
17	Cooling stages	Bit	0-1	0=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 protection	0
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	Display	Bit	0-1	0=temperature 1=set point	0
28	DI2 operation direction	Bit	0-1	0=nc, 1=no	1
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 output	Bit	0-1	0=VAV, 1=cooling	0
32	Y2 output	Bit	0-1	0=fan, 1=heating	0
33	Heating stages	Bit	0-1	0=stage, 1=2 stages	0
34	Not in use	Bit	0-1	0=OFF, 1=ON	0
35	Not in use	Bit	0-1	0=OFF, 1=ON	0
36	Sequence of heating stages	Bit	0-1	0=valve first, 1=VAV first	0
37	ABC calibration	Bit	0-1	0=OFF, 1=ON	1
38	CO2 measurement value display (toggling)	Bit	0-1	0=OFF, 1=ON	0
39	Man in house button function	Bit	0-1	0=Temporary day mode 1=VAV boosting	0

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 mode 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	CO2 overdrive	Bit	0-1	0=OFF, 1=ON
10007	VAV boosting state	Bit	0-1	0=OFF, 1=ON

Input registers

Register	Parameter description	Data type	Values	Range
30001	Discrete inputs (16 - 1)	Unsigned 16	16 bits	16 bits
30002	Coils (16 - 1)	Unsigned 16	16 bits	16 bits
30003	Coils (32 - 17)	Unsigned 16	16 bits	0=OFF, 1=ON
30004	Temperature	Signed 16	-600…600	-60.0…600°C
30005	External temperature	Signed 16	-600…600	-60.0…600°C
30006	CO2	Signed 16	0…2000	0…2000 ppm
30007	Effective set point	Signed 16	50…500	5.0…50.0°C
30008	Current cooling (controller)	Signed 16	0…1000	0…10.00 V
30009	Current heating (controller)	Signed 16	0…1000	0…10.00 V
30010	Current fan speed (controller)	Signed 16	0 - 1 - 2 - 3 - 4	0=OFF 1=speed 1 2=speed 2 3=speed 3 4=automatic
30011	Fan speed (connector Y2)	Signed 16	0…1000	0…10.00 V
30012	VAV control (connector Y1)	Signed 16	0…1000	0…10.00 V
30013	Cooling control (connector Y3)	Signed 16	0…1000	0…10.00 V
30014	Heating control (connector Y4)	Signed 16	0…1000	0…10.00 V
30015	U1 input value	Signed 16	0…1000	0…10.00 V
30016	External NTC sensor value (connector)	Signed 16	-600…600	-60.0…600°C
30017	VAV/Boosting control	Signed 16	0 - 1- 2	0=CO2 1=temperature 2=PIR
30018	Set point by user	Signed 16	±SP °C	±SP °C
30019	Fan control by user	Signed 16	0 - 1 - 2 - 3 - 4	0=OFF 1=speed 1 2=speed 2 3=speed 3 4=automatic
30020	User set point deviation	Signed 16	±SP	±SP
30021	Cooling control (connector A1)	Signed 16	0…1000	0.00…100.0%
30022	Heating control (connector A2)	Signed 16	0…1000	0.00…100.0%

Holding registers

Register	Parameter description	Data type	Values	Range	
40001	FAN Speed by Modbus	Signed 16	0 - 1 - 2 - 3 - 4	0=OFF 1=speed 1 2=speed 2 3=speed 3 4=automatic	4
40002	Set point by Modbus	Signed 16	80…500	8.0…50.0°C	210
40003	Overdrive Cooling PWM by Modbus (A1)	Signed 16	0…1000	0.00…100.0%	0
40004	Overdrive Cooling 0...10 V by Modbus (Y3)	Signed 16	0…1000	0…10.00 V	0
40005	Overdrive Heating PWM by Modbus (A2)	Signed 16	0…1000	0.00…100.0%	0
40006	Overdrive Heating 0...10 V by Modbus (Y4)	Signed 16	0…1000	0…10.00 V	0
40007	Overdrive VAV by Modbus (Y1)	Signed 16	0…1000	0…10.00 V	0
40008	Overdrive FAN by Modbus (Y2)	Signed 16	0…1000	0…10.00 V	0
40009	External temperature sensor / DI2 input	Signed 16	0 - 1 - 2 - 3	0=not in use 1=ext. temp. 2=door/window 3=condensation switch	0
40010	Temperature sensor adjustment	Signed 16	-30…30	-3.0…3.0°C	0
40011	Centre of user set point area	Signed 16	180…260	18.0…26.0°C	210
40012	User set point area limits	Signed 16	0…160	0.0…16.0°C	30
40013	Control mode	Signed 16	0 - 1	0=P, 1=PI	1
40014	Dead zone	Signed 16	0…30	0.0…3.0°C	10
40015	Set point position in dead zone	Signed 16	0…100	0…100%	50
40016	Proportional band	Signed 16	10…320	1.0…32.0°C	10
40017	Integral time	Signed 16	50…5000	50…5000 s	150
40018	Fresh air control	Signed 16	0 - 1 - 2 - 3	0=CO2/T 1=day mode/T 2=CO2 3=day mode	0
40019	Night mode dead zone	Signed 16	0…100	0.0…10.0°C	60
40020	Frost protection thermostat set point	Signed 16	80…500	8.0…50.0°C	170
40021	DI1 mode	Signed 16	0 - 1	0=not in use 1=day/night mode switch	0
40022	DI1 operation direction	Signed 16	0 - 1	0=nc, 1=no	0
40023	DI1 delay passive to active	Signed 16	0…60	0…60 min	0
40024	DI1 delay active to passive	Signed 16	0…60	0…60 min	5
40025	Duration of temporary day mode	Signed 16	1…480	1…480 min	120
40026	Minimum VAV output in day mode	Signed 16	0…1000	0.0…100.0%	0
40027	U1 mode	Signed 16	0 - 1 - 2	0=not used 1=T set point 2=T measurement	0
40028	Minimum of cooling actuator	Signed 16	0…500	0.0…50.0%	0
40029	Maximum of cooling actuator	Signed 16	500…1000	50.0…100.0%	1000

Holding registers

Register	Parameter description	Data type	Values	Range	
40030	Minimum of heating actuator	Signed 16	0…500	0.0…50.0%	0
40031	Maximum of heating actuator	Signed 16	500…1000	50.0…100.0%	1000
40032	Minimum of fan output	Signed 16	0…500	0.0…50.0%	0
40033	Maximum of fan output	Signed 16	500…1000	50.0…100.0%	1000
40034	Minimum VAV output	Signed 16	0…500	0.0…50.0%	0
40035	Maximum VAV output	Signed 16	500…1000	50.0…100.0%	1000
40036	Fan output scaling, high end	Signed 16	0…1000	0.00…100.0%	1000
40037	Fan output scaling, low end	Signed 16	0…1000	0.00…100.0%	0
40038	Fan usage	Signed 16	0 - 1 - 2 - 3	0=OFF 1=cooling 2=heating 3=heating and cooling	0
40039	Low limit P-band for CO2 control	Signed 16	400…1000	400…1000 ppm	700
40040	High limit P-band for CO2 control	Signed 16	500…2000	500…2000 ppm	1250
40041	CO2 sensor adjustment (offset)	Signed 16	-200…200	-200…200 ppm	0

Technical data

Designation:	LUNA RC TEMP-MB:	
	LUNA RC CO_2-TEMP-MB: Version with built-in CO_2 sensor	
Power supply:	24 VAC/DC** (20…28 V) < 1 VA	
Set point:	day mode	18…26°C, *21°C, ±3°C
	night mode	Frost protection 8…50°C, *17°C
Precision (measurement error):	±0.5°C	
Dead band:	Dz	in day mode 0.2…3°C, *0.2°C
		in night mode 0…10°C, *6.0°C
Proportional band:	Xp	1…32°C, *1°C
Integration time:	Tn	50…5000 s, *300 s
Output:	4 x 0…10 V, 2 mA	
	2 x TRIAC output 24 VAC 1A for thermal actuators	
Permitted room humidity:	0…85% RH (non-condensing)	
Conductive terminals:	1.5 mm^2	
IP class:	IP20	
Casing:	ABS plastic	
Dimensions:	(w x h x d) 87 x 86 x 33 mm	
	* Factory setting	
	** Note: When using supply voltage with direct current, only capacities 0…10 V work.	

Standards and directives

The following standards have been observed:

2014/30/EU	Electromagnetic compatibility (EMC).
2011/65/EU	The Restriction of Hazardous Substances Directive (RoHS2).
EN 61000-6-2:2006	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards - Immunity for industrial environments.
EN 61000-6-3:2007/A1:2011	Electromagnetic compatibility (EMC) – Part 6-3: Generic standards - Emission from equipment in homes, offices, shops and similar environments