Automation System TROVIS 5400
Ventilation Controller
TROVIS 5477

Mounting and Operating Instructions

EB 5477 EN

Firmware version 2.0x

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TROVIS® Electronics from SAMSON

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Safety instructions

- Assembly, start-up and operation of this device may only be performed by trained and experienced personnel familiar with this product. Proper transportation and storage are assumed.
- The controller is intended for use in electrical power installations. For wiring and maintenance, you are required to observe the relevant safety regulations.

What's new compared to previous version (1.9)

Compared to the firmware version 1.9, the following changes have been made:

- A two-second delay before a sensor failure is detected and before a binary input state changes to suppress error messages caused by signal distortion.
- The system bus interface can be switched over from 8-bit addressing to 16-bit addressing (Fb44).
- When the modem is in operation, if you keep the enter key pressed when the time appears on the display, the current connection status "Free", "Call", "Conn" or "Ring" is shown.

Table of contents

1	**Operation**	**6**
1.1	Operating controls	6
1.1.1	Operating keys	6
1.1.2	Mode switches	7
1.2	Operating modes	8
1.3	Display	9
1.4	Data retrieval	10
1.5	Setting the time and date	10
1.6	Programming the time schedule	12
1.6.1	Entering public holidays	14
1.6.2	Entering vacations	15
2	**Start-up**	**17**
2.1	Setting the system code number and control method	17
2.2	Activating and deactivating functions	19
2.3	Changing parameters	20
2.4	Calibrating sensors	21
2.5	Entering the key number	22
2.6	Resetting default setting	22
3	**Manual operation**	**23**
4	**Systems**	**24**
4.1	System code number 9	36
5	**Control methods and system components**	**37**
5.1	Ventilation and temperature control in air-conditioning systems	37
5.1.1	Supply air temperature control	37
5.1.2	Exhaust air temperature control	37
5.1.3	Exhaust air temperature cascade control	38
5.1.4	Room temperature control	39
5.1.5	Room temperature cascade control	40
5.2	Humidity control in air-conditioning systems (Anl 6, 8 and 9)	41
5.2.1	Supply air humidity control	41
5.2.2	Exhaust air/room humidity control	42
5.2.3	Exhaust air or room humidity cascade control	*42*
5.3	Inputs	44
5.4	Outputs	44
5.4.1	Heating coil	44
5.4.2	Mixed air chamber	45
5.4.3	Heat recovery unit (HRU)	48

5.4.4 Cooling coil . . . 49
5.5 Humidifier . . . 50
5.6 Fans with variable speed . . . 51

6 Control functions . . . 53
6.1 Supply air temperature limit . . . 53
6.2 Supply air humidity limit . . . 53
6.3 Return air temperature limit . . . 54
6.4 Variable return air temperature maximum limit . . . 54
6.5 Sustained room temperature . . . 55
6.6 Night purge . . . 56
6.7 Summer compensation . . . 57
6.8 Fan operation dependent on room temperature/room humidity . . . 57
6.9 Air quality control via the mixed air chamber . . . 58
6.10 Outdoor temperature-compensated control . . . 59
6.10.1 Outdoor temperature-compensated supply air control . . . 59
6.10.2 Summer deactivation . . . 60
6.10.3 Summer time operation . . . 60
6.11 Control functions . . . 61
6.11.1 System start-up . . . 61
6.11.2 Circulating air mode after system start-up . . . 62
6.11.3 Enabling fan speed 1 . . . 62
6.11.4 Enabling fan speed 2 . . . 63
6.11.5 Fan operation feedback . . . 64
6.11.6 Enabling the cold storage . . . 64
6.11.7 Controlling the direct expansion evaporator . . . 65
6.11.8 Controlling the chiller . . . 65
6.11.9 Condensation detection . . . 66
6.11.10 Circulation pump control for the heating coil . . . 66
6.11.11 Circulation pump control for the HRU . . . 67
6.11.12 Electric air heater . . . 67

7 System-wide functions . . . 68
7.1 Switchover between summer time and winter time . . . 68
7.2 Frost protection . . . 68
7.2.1 System frost protection . . . 68
7.2.2 Frost protection HRU . . . 68
7.2.3 Stand-by monitoring . . . 69
7.2.4 Stand-by control . . . 69
7.3 Forced-operation of the pumps . . . 69
7.4 External correction of the temperature set point . . . 70

7.5 External setting of the outdoor air rate . . . 70
7.6 External correction of the humidity set point . . . 70
7.7 External setting of the air volume . . . 71
7.8 External demand for operation . . . 71
7.9 External demand for fan speed 2. . . . 72
7.10 External selection of the operating mode . . . 73
7.10.1 External selection of the operating mode using the four-staged switch . . . 73
7.10.2 External selection of the operating mode using Type 5257-6 Room Panel 73
7.11 Request for externally required signal . . . 75
7.12 Outdoor temperature output . . . 76
7.13 Locking settings . . . 76

8 Malfunctions . . . 77
8.1 Sensor failure . . . 77
8.1.1 Status register (FSR) . . . 77

9 Communication . . . 79
9.1 RS-232-C serial interface . . . 80
9.2 RS-485 interface . . . 81
9.3 Description of the communication parameters to be set . . . 82
9.4 Memory module. . . . 83

10 Installation . . . 84

11 Electrical connection. . . . 86

12 Appendix. . . . 89
12.1 Function block list CO . . . 89
12.2 List of parameters . . . 96
12.3 Display . . . 107
12.4 Technical data . . . 109
12.5 Resistance values. . . . 110
12.6 Customer data . . . 111

1 Operation

1.1 Operating controls

The TROVIS 5477 Ventilation Controller can be operated using the operating controls on the front panel.

The controller is ready for operation using its default temperature and time schedule settings. On start-up, after switching on the power supply, the correct **time and date** must be set in the controller (–> section 1.5).

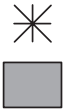
1.1.1 Operating keys

The operating keys are located on the front of the controller and protected by a transparent cover.

Changeover key
(press with pencil or similar pointed object)
Allows you to change between the operating level, parameter level and configuration level.

Reset key
(press with pencil or similar pointed object)
Allows you to reset all freely accessible parameters to default values (factory setting). This key's function is only active on the parameter level

Arrow keys
Allow you to retrieve and set parameters

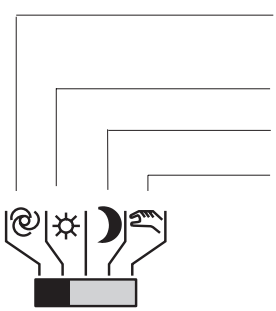


Enter key

Operating level:	allows you to read set points
Parameter level:	allows you to access and acknowledge parameters
Configuration level:	allows you to access and acknowledge function blocks

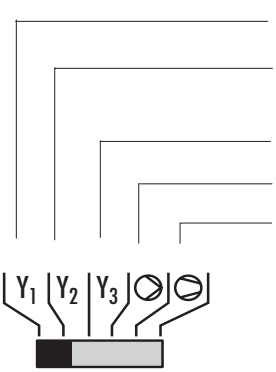
1.1.2 Mode switches

Operating mode switch

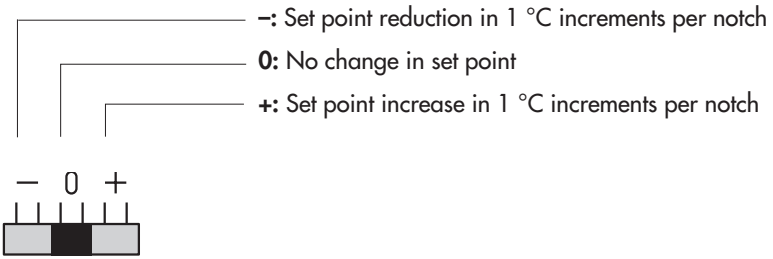


Selection switch for manual operation
The function of the selection switch depends on the position of the operating mode switch (see above).

Position at operating mode switch	**Function** at selection switch for manual operation
☜	Operation of selected output
⟲, ☼, ☽	Display of output states



Set point correction switch
Changes remain effective until the switch position is changed again



1.2 Operating modes

Day mode (rated operation) (☼)

The set points set for rated operation are constantly used by the controller irrelevant of the programmed time-of-use or summer mode.

Stand-by operation (☽)

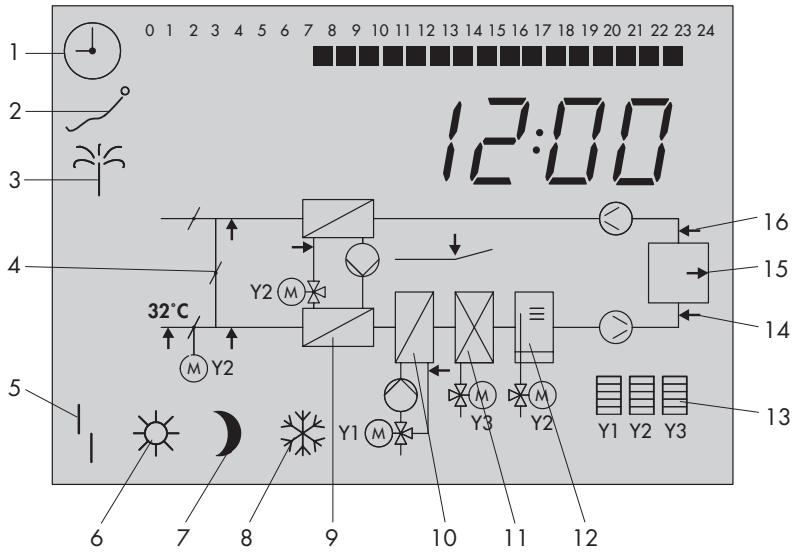
The ventilation is deactivated. The frost protection is active.

Manual operation (✋)

Manual operation of valves and pumps.

1.3 Display

During operation, the display indicates the current time as well as information about the operation of the controller. The times-of-use are represented by black squares below the row of numbers at the top of the display. Symbols indicate the operating status of the controller.



1 Time schedule
2 Public holidays
3 Vacation
4 Mixed air chamber
5 Malfunction
6 Rated operation
7 Reduced operation
8 Frost protection
9 Heat recovery unit
10 Heating coil
11 Cooling coil
12 Humidifier
13 Control outputs
14 Supply air temperature/humidity
15 Room temperature/humidity
16 Exhaust air temperature/humidity

Fig. 1 · Display while the controller is operating (example)

See section 1.4 for more information about how to read the current status of the controller in the operating level.

1.4 Data retrieval

You can view information in the operating level concerning various temperatures, control signals, times-of-use, public holidays, states of the binary inputs as well as the baud rate (–> Fig. 30). Which temperatures are shown depends on the system code number and the configuration.

You will find a list of the various displays in section .

How to proceed:

The controller shows the time.

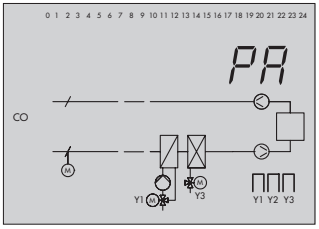
- Press the arrow key.
  Every time you press the key, another dat point appears on the display.
- If required, you can view other information concerning a data point.

1.5 Setting the time and date

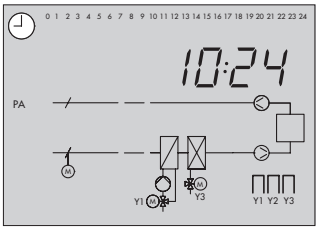
Set the current date and time directly after start-up and after a power failure, if necessary.

You must set the time and date in the parameter level.

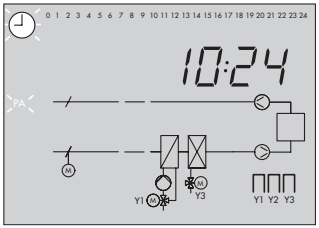
How to proceed:



- Switch to the configuration and parameter level.
  PA appears on the display.

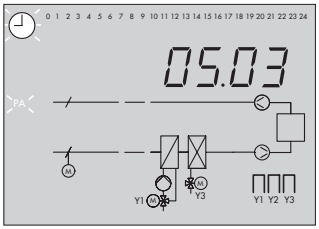


- Press the enter key.
  The time appears on the display.
  The ⏲ symbol starts to blink slowly.



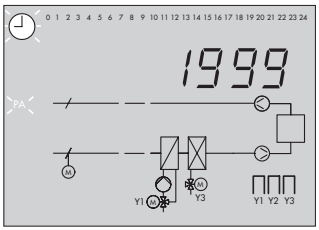
Press the enter key.
The ⏲ symbol and ***PA*** blink quickly.

Use the arrow key to set the correct time.



Press the enter key to acknowledge the time.
A date appears on the display

Use the arrow key to set the correct date.



Press the enter key to acknowledge the date.
The year appears on the display.

Use the arrow key to set the correct year.

Press the enter key to acknowledge the year.
The time appears on the display again.
The ⏲ symbol blinks slowly.

Press both arrow keys simultaneously.
PA appears on the display again.

Press the changeover key to return to the operating level.

Note:
The controller returns to the operating level two minute after the last key has been pressed.

1.6 Programming the time schedule

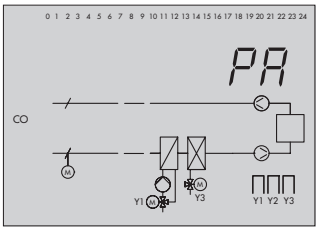
You can enter two time periods for every day of the week.
If you need just one continuous time-of-use period, set the same time for the start of the second time period and the end of the first time period.
You can set separate times-of-use for the system and, if required, for the fan speed 2.

Times-of-use	Display
System	***START, STOP*** and ⏲ blink
Fan speed 2	***START, STOP***, ⏲ and ◒ blink

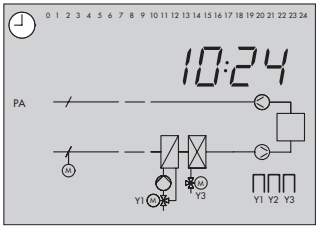
Parameters	WE*	Range of values
Period/day	1–7	1–7, 1, 2, 3, 4, 5, 6, 7 with 1–7 = every day, 1–5 = Monday to Friday, 6–7= Saturday and Sunday, 1 = Monday, 2 = Tuesday, ..., 7 = Sunday
Start first time-of-use	7:00	0:00 to 24:00 h; in steps of 30 minutes
Stop first time-of-use	12:00	0:00 to 24:00 h; in steps of 30 minutes
Start second time-of-use	12:00	0:00 to 24:00 h; in steps of 30 minutes
Stop second time-of-use	22:00	0:00 to 24:00 h; in steps of 30 minutes

* Default setting (WE) valid for system

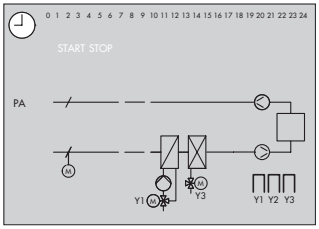
How to proceed:



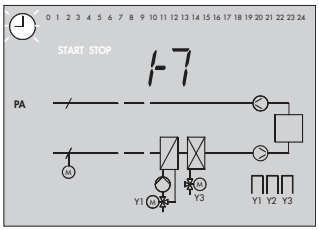
⇛ Switch to the configuration and parameter level.
PA appears on the display.



Press the enter key to enter the parameter level.
The time appears on the display.
⏲ blinks slowly.

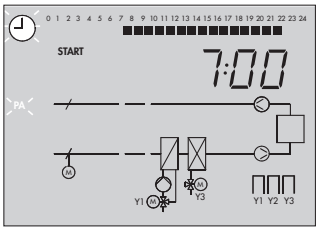


Press the arrow key until the same display as shown appears for changing the system times-of-use.
(***START, STOP*** and the ⏲ symbol start to blink, ⊖ additionally blinks with fan speed 2).



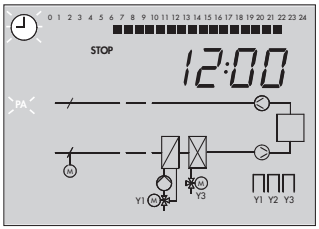
Press the enter key.
1–7 appears on the display.

Select the duration/day for the times-of-use.
1–7 = Monday to Sunday
1–5 = Monday to Friday
6–7 = Saturday and Sunday
1 = Monday, 2 = Tuesday, …, 7 = Sunday



Press enter key. The ⏲ symbol and ***PA*** start to blink quickly. ***START*** and a time appear on the display.

Set the start time (30-minute steps).



Press the enter key.
STOP and a time appear on the display.

Set the stop time (30-minute steps).

Press the arrow key
START and a time appear on the display.
The second time-of-use period can set in the same way as the first time-of-use period.

Repeat the steps in the gray box to enter times-of-use for other days not yet programmed.

⇩ Select ***End***.

✳ Exit the parameter level.

⇦ Return to the operating level.

Note! *The controller automatically returns to the operating level when keys are left unpressed for longer than two minutes.*

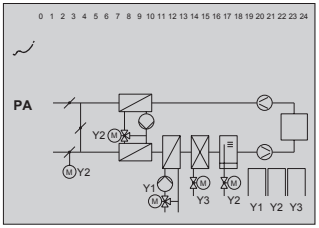
Note! *Use just the menu for the individual days to check the programmed time schedules. When time blocks are selected, the times-of-use for the days selected are reset to default settings!*

1.6.1 Entering public holidays

The controller uses the times-of-use programmed for Sundays on public holidays.
You can enter a maximum of 20 public holidays.

Parameter	WE	Range of values
Public holidays	01.01; 01.05; 25.12; 26.12	01.01 (1 Jan) to 31.12 (31 Dec)

How to proceed:



⇩ Switch to the configuration and parameter level.
PA appears on the display.

✳ Press the enter key.
The time appears on the display, 🕘 blinks slowly.

⇩ Select public holidays data point.
↗ appears on the display.

✳ Press the enter key to access data point.

⇩ Press the arrow key until – – – – appears, if necessary.

✳ Press the enter key.
The ↗ symbol blinks quickly.

⇩ Change the date of the public holiday.

✳ Confirm the date of the public holiday.

To enter other public holidays, press the arrow key until – – – – appears on the display again. Repeat the steps in the gray box.

- ⇩ Select ***End***.
- ✳ Exit the parameter level.
- ⇛ Return to the operating level.

Note! *Public holidays that are not assigned to a specific date should be deleted by the end of the year so that they are not carried on into the following year.*

Deleting a public holiday:

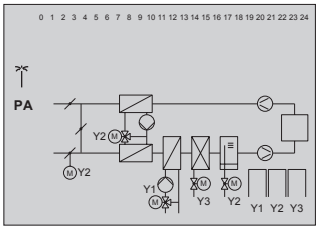
- ⇩ Use the arrow key to select the public holiday you want to delete.
- ✳ Press the enter key.
- ⇩ Press the arrow key until – – – – appears. – – – – is between 31.12 and 01.01.
- ✳ Press the enter key. The public holiday is deleted.

1.6.2 Entering vacations

During vacation periods, the controller constantly remains in stand-by mode.All safety functions are activated. A maximum of 10 vacation periods can be entered.

Parameter	WE	Range of values
Vacation period (START, STOP)	–	01.01 to 31.12

How to proceed:



- ⇩ Switch to the configuration and parameter level. ***PA*** appears on the display.
- ✳ Press the enter key. The time appears on the display, ⏲ blinks slowly.
- ⇩ Select vacation data point. ⛱ appears on the display.
- ✳ Press the enter key to access vacation data point. ***START*** appears on the display.
- ⇩ Press the arrow key until – – – – appears, if necessary.

- Press the enter key.
  The ⁀ symbol blinks quickly.
- Set when the vacation period should start.
- Press the enter key to confirm the start of the vacation period.
  STOP appears on the display.
- Set when the vacation period should end.
- Press the enter key to confirm the end of the vacation period.

To enter other vacations, press the arrow key until – – – – appears on the display again. Repeat the steps in the gray box.

- Select ***End***.
- Exit the parameter level.
- Return to the operating level.

Note!
Vacations that have been entered should be deleted by the end of the year so that they are not carried on into the following year.

Deleting a vacation period:

- Select the start of the vacation period to be deleted.
- Press the enter key.
- Press the arrow key until – – – – appears on the display.
  – – – – is between 31.12 and 01.01.
- Press the enter key.
  The vacation period has been deleted.

2 Start-up

2.1 Setting the system code number and control method

This ventilation controller allows ten different systems to be controlled. Each system is assigned a system code number. You can find a list of the different systems in section 4. In addition, the control method can be determined. The following control methods are available:

Control method	Display
Supply air control	
Exhaust air control	
Exhaust air cascade control	
Room control	
Room cascade control	

The control methods and functions of the controller are described in sections 5, 6 and 7.

Every change in system code number or control method causes the assignment of sensors to be reprogrammed: the sensor inputs required for the function blocks are activated and the sensor inputs not used are deactivated. These settings can be changed manually.

You must set the system code number in the configuration level (see Fig. 30).

How to proceed:

- Change to the configuration and parameter level.
  PA appears on the display.
- Select ***CO*** level.
- Press the enter key.
  The currently active system code number, e.g. Anl 1, blinks on the display.
- Press the enter key.
  Anl and ***CO*** blink quickly.

↑ Select the required system code number.

✳ Confirm the system you have selected.
Anl starts to blink slowly on the display.

↑ Press upward arrow key.
The components of the system and the arrows indicating the control method start to blink on the display.

✳ Press the enter key.
The components of the system and the control method arrows start to blink quickly on the display.

↑ Select the control method.

✳ Confirm the control method you have selected.

System code numbers 6, 8 and 9:

↓ Select the control method for the humidity control loop.
The humidity control loop is set in the same manner as the temperature control loop. On selecting options, humidifying and dehumidifying mode or just humidifying mode are differentiated between. In the humidifying mode, just the humidifier blinks.

↑ ↓ Press both arrow keys simultaneously. ***CO*** appears on the display again.

⇨ Press the changeover key to return to the operating level.

Note!
The controller automatically returns to the operating level when keys are left unpressed for longer than two minutes.

2.2 Activating and deactivating functions

The controller is configured by setting the function blocks (Fb). You can activate or deactivate function blocks in the configuration level ***CO***. On opening the configuration level, a black square located to the right of a function block number at the top of the display indicates whether function block is activated. The initial display shows the function blocks 1 to 24. Scroll to the function blocks 25 to 47 to display the setting of these function blocks. Proceed as described below to set the function block parameters.

How to proceed:

- Change to the configuration and parameter level. ***PA*** appears on the display.
- Select ***CO*** configuration level.
- Enter the configuration level. ***Anl*** appears on the display.
- Select the required function block.
- Confirm the function block you have selected. ***Fb_*** blinks. If a function is protected, ***0*** appears on the display. The code number must be entered (–> section 2.5) before a protected function block can be changed.
- Press the upward arrow key to activate the function block (Fb = ON). A black square to the right of the function block number at the top of the display indicates that the function block is activated.

  or alternatively:
- Press the downward arrow key to deactivate the function block (Fb = OFF).
- Press the enter key to acknowledge the setting. If the function block is left open, other parameters can be set. Proceed: The parameter appears: Carry out change and confirm it. Exit the function block.

Repeat the steps in the gray box to set other function blocks in the open configuration level.

- Press both arrow keys simultaneously to exit parameter level.
- Press the changeover key to return to the operating level.

Note! *The controller automatically returns to the operating level when keys are left unpressed for longer than two minutes.*

2.3 Changing parameters

Depending on the system code number set and the active functions, not all the parameters are accessible which are listed in the parameter lists in the appendix (–> section 12.2).

How to proceed:

- Change to the configuration and parameter level.
  PA appears on the display.
- Press the enter key.
  The time appears on the display.
- Select the parameter you want to set.
- Access the parameter.
- Change the parameter.
- Confirm the new parameter.

Repeat the steps in the gray box to set other parameters.

- Press both arrow keys simultaneously to exit the parameter level.
- Return to the operating level.

Note!
The controller automatically returns to the operating level when keys are left unpressed for longer than two minutes.

2.4 Calibrating sensors

The sensor calibration is performed in the configuration level.

- Fb17 = ON: Pt 100 and Pt 1000 sensors
- Fb17 = OFF: Pt 100 and PTC sensors

The values measured by all the connected sensors can be changed or reset. To proceed, set the sensor value displayed to the temperature measured directly at the measuring point (reference temperature).
Activate calibration with Fb1 to Fb7.
An incorrect calibration can be deleted by setting Fb1 to F7 = OFF.

How to proceed:

- Change to the configuration and parameter level.
- Select ***CO*** configuration level.
- Enter the configuration level. ***Anl*** appears on the display.
- Press the upward arrow key until Fb25 appears on the display.
  (This function block is merely selected to enter the code number. Another function block that is protected by the code number can be also used.)
- Press the enter key. ***0*** appears on the display.
  Enter and confirm the code number (–> section) .
- Close function block Fb 25.
- Select the function block of the sensor that is to be calibrated (Fb1 to Fb7):
  Fb1: Supply air sensor
  Fb2: Exhaust air sensor
  Fb3: Outdoor sensor
  Fb4: Return flow sensor, heating coil
  Fb5: Room sensor
  Fb6: Return flow sensor, HR (system 3 and 5)
  Fb7: Mixed air or extract air sensor (system 2 and 4)
- Press the enter key.
  A temperature appears on the display. ***Fb_*** starts to blink.
- Set the temperature measured at the actual point of measurement.
  The actual temperature at a thermometer direct at the point of measurement can be used as the reference temperature.

Confirm the new temperature.

End sensor calibration.

Other sensors can be calibrated in the same manner.

Press both arrow keys simultaneously to exit parameter level.

Return to the operating level.

2.5 Entering the key number

Several functions are protected against unintentional and unauthorized access. These functions can only be altered when the code number is known. The code number is written on page 116. Tear out this page or blank out the code number to prevent its unauthorized use.

How to proceed:

0 appears on the display.

Press the arrow key until the correct code number appears on the display.

Confirm the code number.
When the correct code number is confirmed, the function block that should be changed starts to blink quickly on the display.

The code number remains active for approx. three minutes.

2.6 Resetting default setting

Parameters from the parameter level can be reset to their default values (factory settings).

How to proceed:

Press the reset key with a pencil, etc.
All the parameters are reset to the factory setting (WE).

3 Manual operation

In manual operation mode, all outputs are set, see wiring plan (-> section 11).

How to proceed:

1. Set the operating mode switch to ✋.
2. Slide the selector switch to the output you want to change:
   Y1 to 3: control signal output 1 to 3
   ○ : pump(s) output
   ⊖ : fan(s) output
   In systems with several pumps, select the pumps using the ✳ key.
   The associated symbol blinks in the system diagram.
   When the pumps are deactivated, just the pump circuit blinks on the display.
   – – – – appears on the display when the output is not relevant for the system code number selected.
3. Change the output:
   Increase the control signal: activate pumps, fan ↑
   Reduce the control signal: deactivate pumps, fan ↓.
   For two-speed fans, you can select ***ON1***, ***ON2*** or ***OFF***.
   The value does not need to be confirmed. It is kept even if you slide the selector switch to another setting.
4. Slide the operating mode switch from ✋ to exit the manual operating mode.

Note!
In manual operation mode, the user can set the outputs anyway as required. On selecting the manual operation mode, all limit temperatures and logical links ceased to be in force. The user has absolute control and takes on responsibility for interaction between all the outputs and the resulting consequences. A frost protection thermostat (Fb15 = ON) connected to the controllers keeps functioning even in manual operation mode.

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4 Systems

The ventilation controller can be used to control ten different types of systems which are assigned system code numbers in the controller.

System code number	System description	System type
0	Heating coil	Ventilation
1	Heating coil Cooling coil*	Ventilation
2	Heating coil Mixed air chamber	Ventilation
3	Heating coil Heat recovery unit	Ventilation
4	Heating coil Cooling coil* Mixed air chamber	Ventilation
5	Heating coil Cooling coil* Heat recovery unit	Ventilation
6	Heating coil Cooling coil Humidifier	Air-conditioning
7	Cooling coil*	Ventilation
8	Heating coil Cooling coil Mixed air chamber Humidifier	Air-conditioning
9	Heating coil Cooling coil Heat recovery unit Humidifier	Air-conditioning

* Also chilled ceiling or direct expansion evaporator (single-speed)

System code number 0

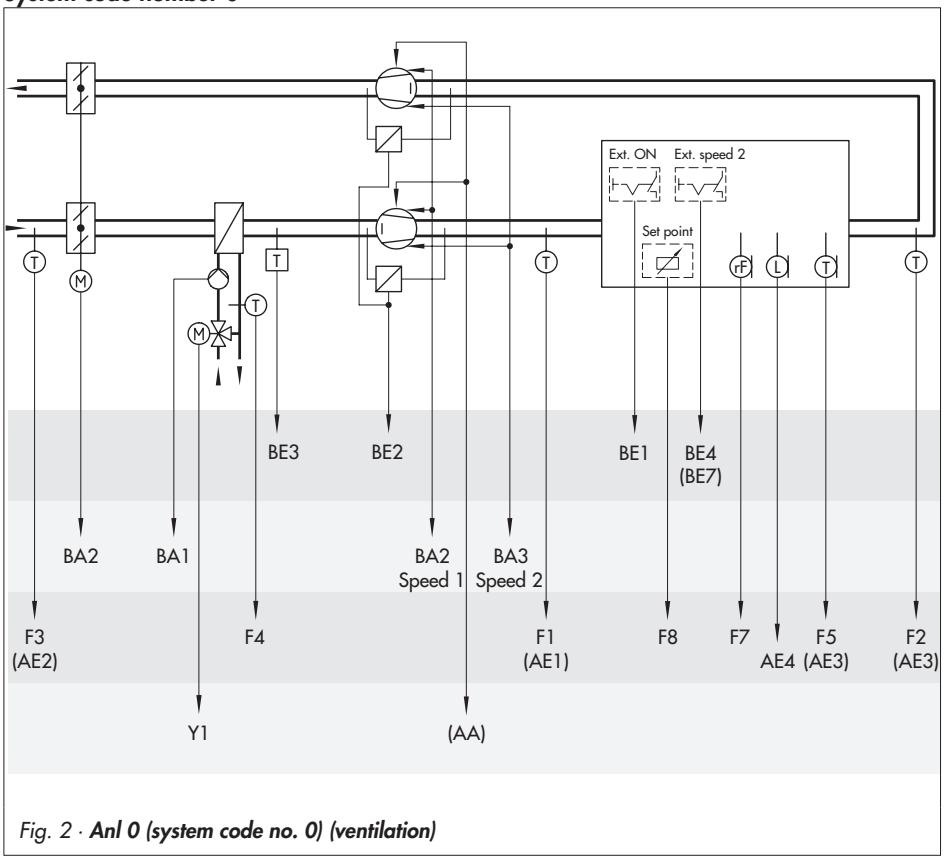


*Fig. 2 · **Anl 0 (system code no. 0) (ventilation)***

Control of the heating coil

- Outdoor temperature-compensated supply air control (–> section 6.10.1)
- Fan operation, 2-speed or 0 to 10 V (–> section 6.8 and 6.11.4)

System code number 1

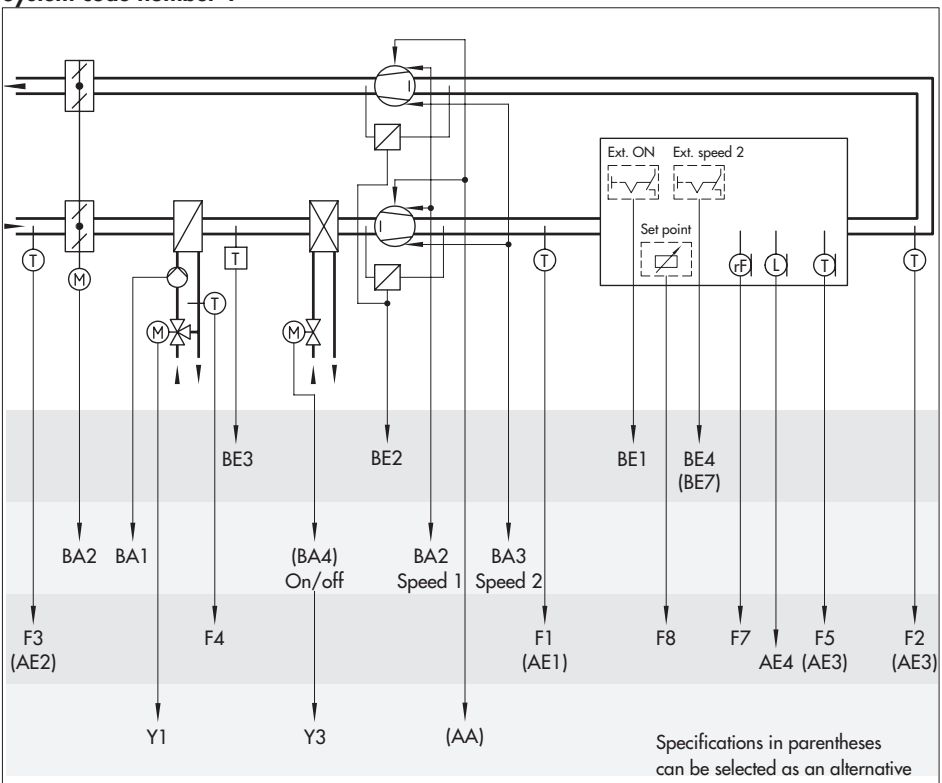


*Fig. 3 · **Anl 1 (system code no. 1) (ventilation)***

Control of the heating and cooling coils

- Summer compensation (–> section 6.7)
- Sequence operation of heating/cooling or overlapping operation (–> section 6.11.8)
- Fan operation, 2-speed or 0 to 10 V (–> section 6.8 and 6.11.4)

System code number 2

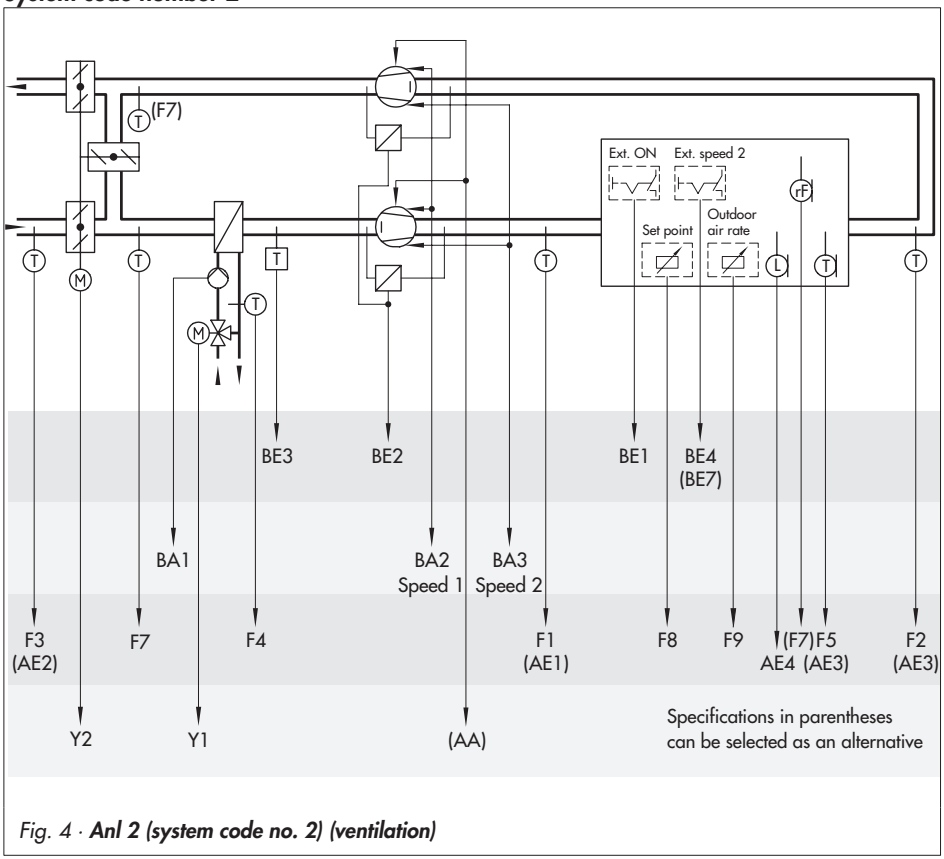


*Fig. 4 · **Anl 2 (system code no. 2) (ventilation)***

Control of mixed air chamber and heating coil

- Summer time operation (–> section 6.10.3)
- Sequence operation of heating/dampers or mixed air temperature control (–> section 5.4.2)
- Automatic reversal of operating action for mixed air chamber (–> section 5.4.2)
- Fan operation, 2-speed or 0 to 10 V (–> section 6.8 and 6.11.4)

System code number 3

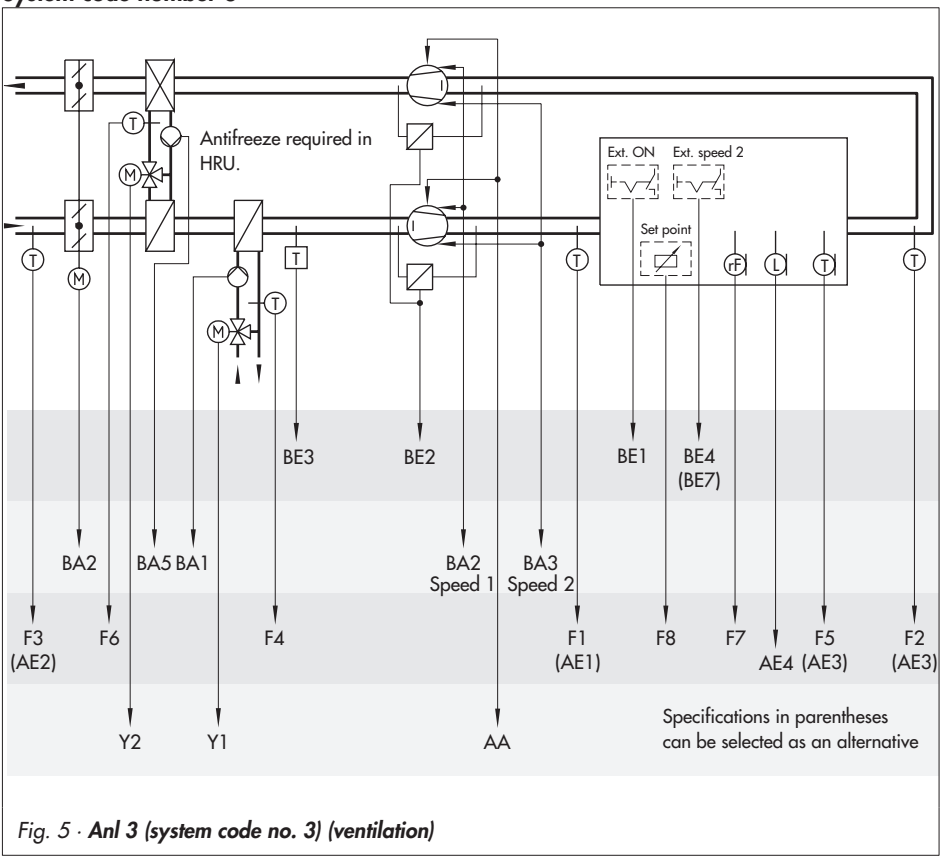


*Fig. 5 · **Anl 3 (system code no. 3) (ventilation)***

Control of heat recovery unit (HRU) and heating coil

- Frost protection for HRU (–> section 7.2.2)
- Automatic reversal of operating action for HRU configurable (–> section 5.4.2)
- Fan operation, 2-speed or 0 to 10 V (–> section 6.8 and 6.11.4)

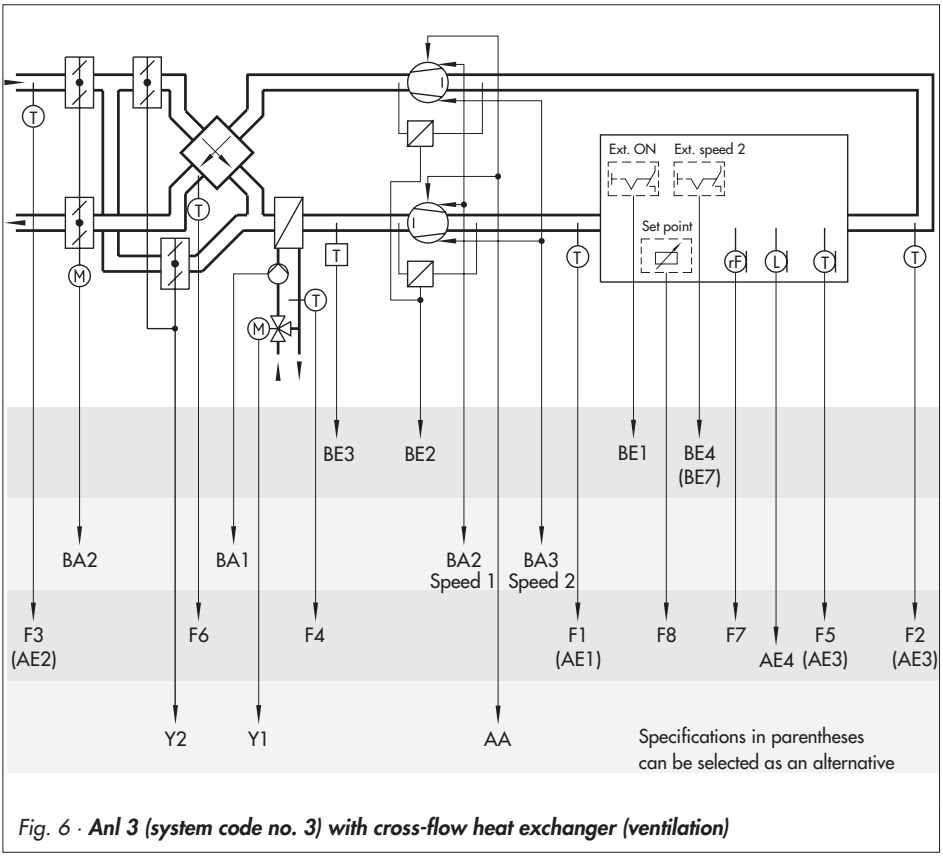


*Fig. 6 · **Anl 3 (system code no. 3) with cross-flow heat exchanger (ventilation)***

Control of heat recovery unit (HRU) and heating coil

- Heat recovery unit designed as a cross-flow heat exchanger
- Frost protection for HRU (–> section 7.2.2)
- Automatic reversal of operating action for HRU configurable (–> section 5.4.2)
- Fan operation, 2-speed or 0 to 10 V (–> section 6.8 and 6.11.4)

System code number 4

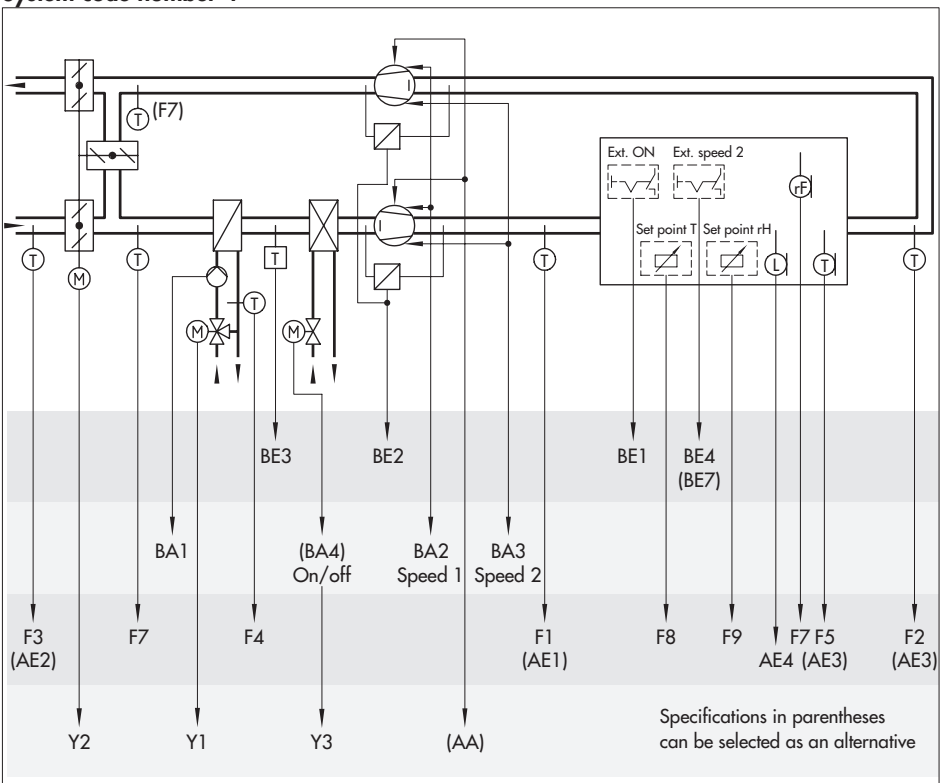


*Fig. 7 · **Anl 4 (system code no. 4) (ventilation)***

Control of mixed air chamber, heating and cooling coils

- Summer compensation (–> section 6.7)
- Summer time operation (–> section 6.10.3)
- Sequential operation of heating/dampers/cooling or sequence of heating/cooling and mixed air temperature control
- Automatic reversal of operating action for mixed air chamber (–> section 5.4.2)
- Fan operation, 2-speed or 0 to 10 V (–> section 6.8 and 6.11.4)

System code number 5

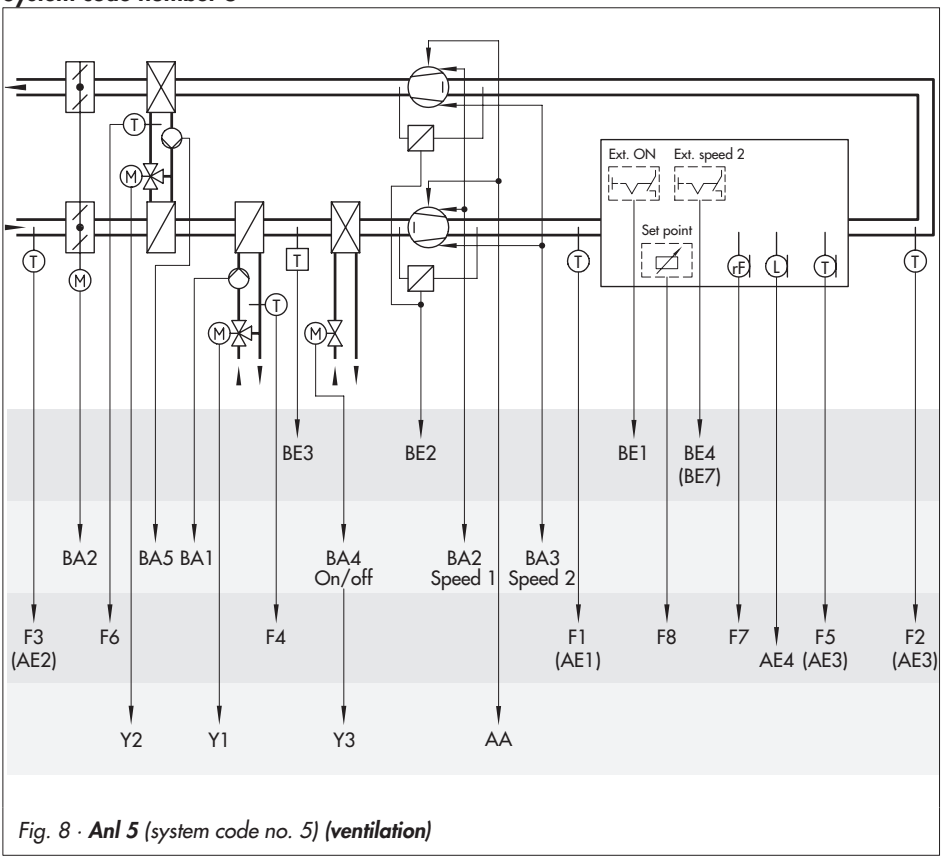


*Fig. 8 · **Anl 5** (system code no. 5) **(ventilation)***

Control of heat recovery unit (HRU) as well as heating and cooling coils

- Summer compensation (–> section 6.7)
- Frost protection for HRU (–> section 7.2.2)
- Automatic reversal of operating action for HRU configurable (–> section 5.4.2)
- Fan operation, 2-speed or 0 to 10 V (–> section 6.8 and 6.11.4)

System code number 6

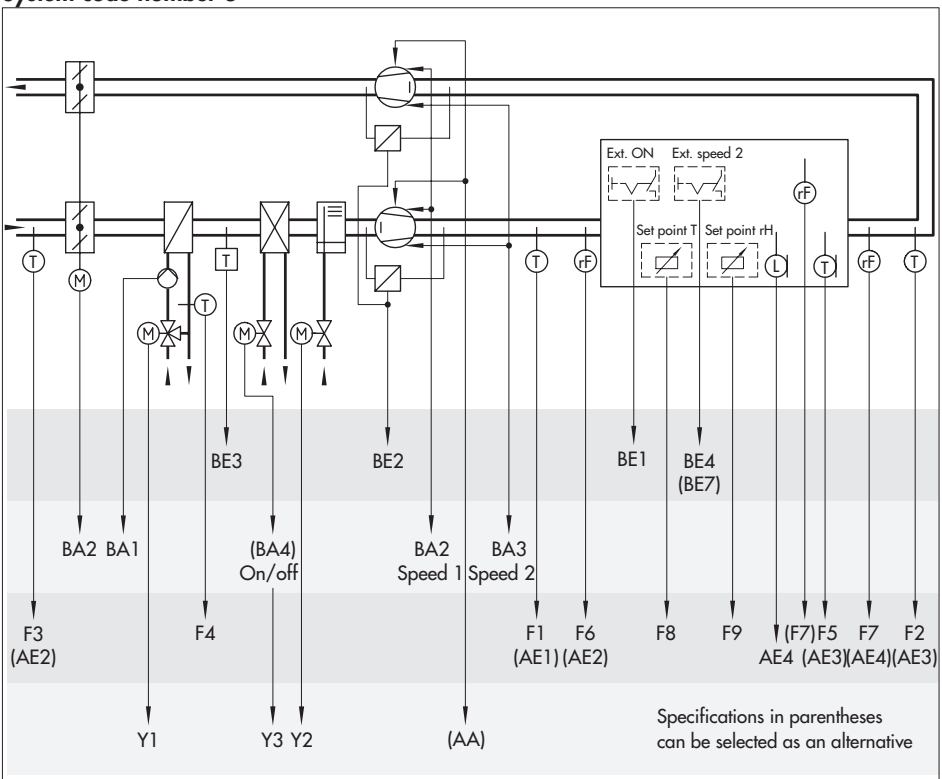


*Fig. 9 · **Anl 6 (system code no. 6) (air-conditioning, only humidification)***

Control of heating coil, cooling coil and humidification (only humidification)

- Two control loops: Temperature and humidity control
- Only humidification configurable (–> section 5.2)
- Summer compensation (–> section 6.7)
- Fan operation, 2-speed or 0 to 10 V (–> section 6.8 and 6.11.4)

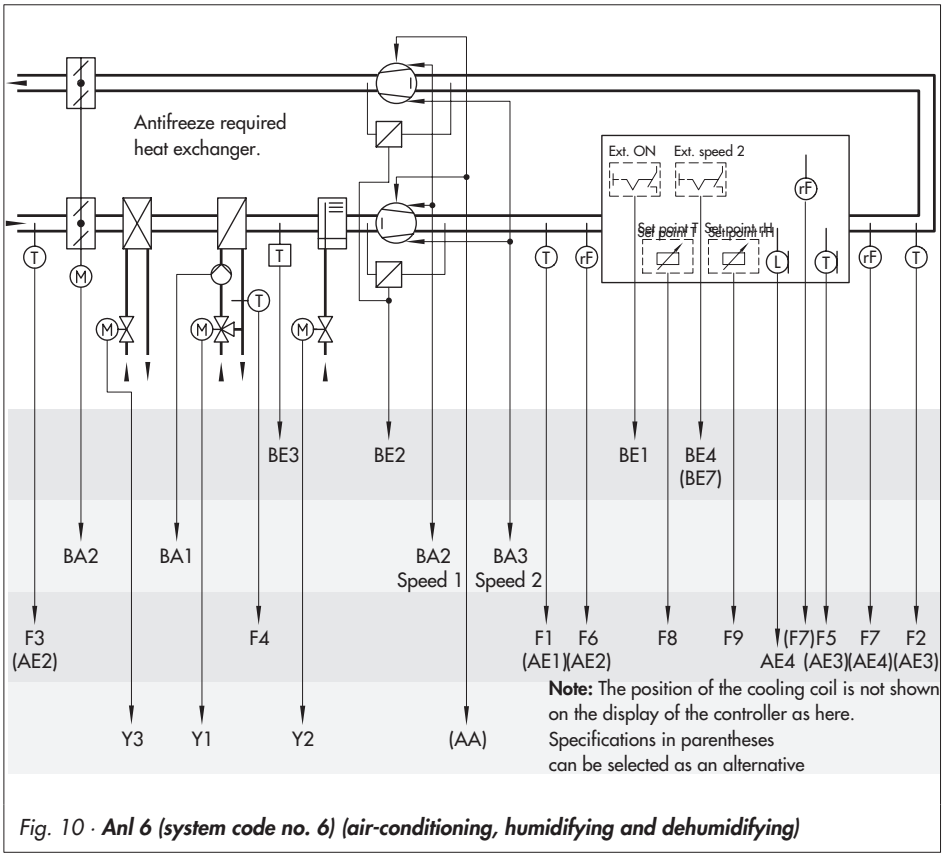


*Fig. 10 · **Anl 6 (system code no. 6) (air-conditioning, humidifying and dehumidifying)***

Control of cooling and heating coils and humidification (humidifying and dehumidifying)

- Two control loops: Temperature and humidity control
- Humidification or humidifying and dehumidifying operation configurable (–> section 5.2)
- Summer compensation (–> section 6.7)
- Fan operation, 2-speed or 0 to 10 V (–> section 6.7 and 6.11.4)

System code number 7

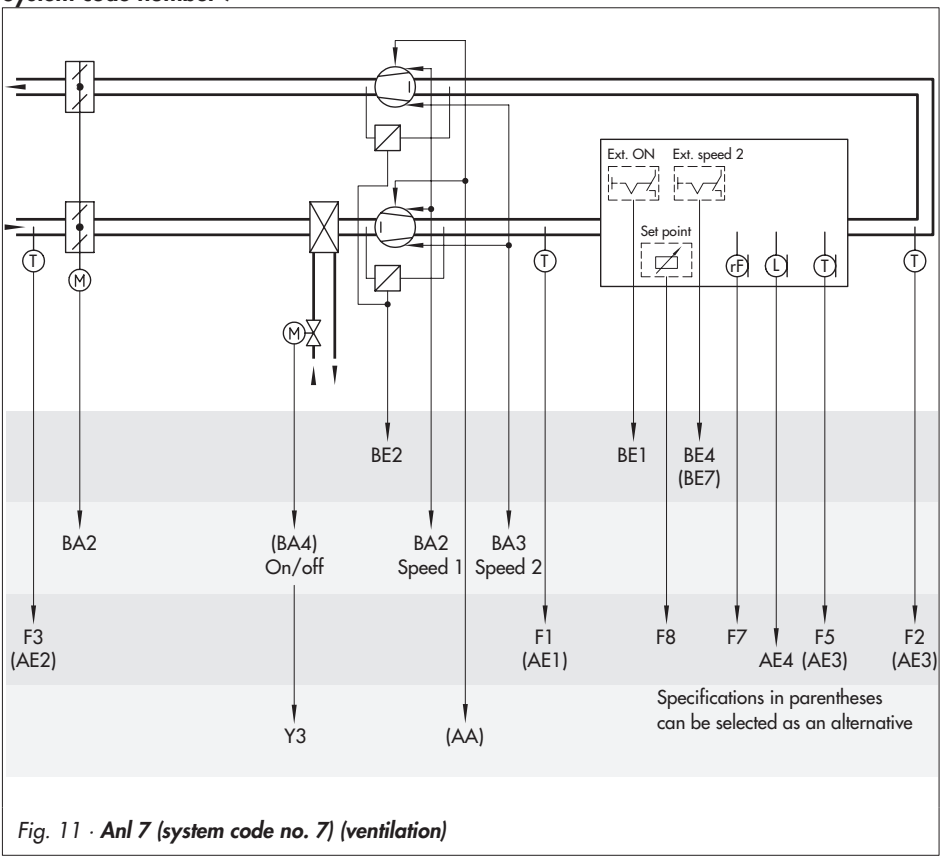


*Fig. 11 · **Anl 7 (system code no. 7) (ventilation)***

Cooling coil control

- Summer compensation (–> section 6.7)
- Fan operation, 2-speed or 0 to 10 V (–> section 6.8 and 6.11.4)

System code number 8

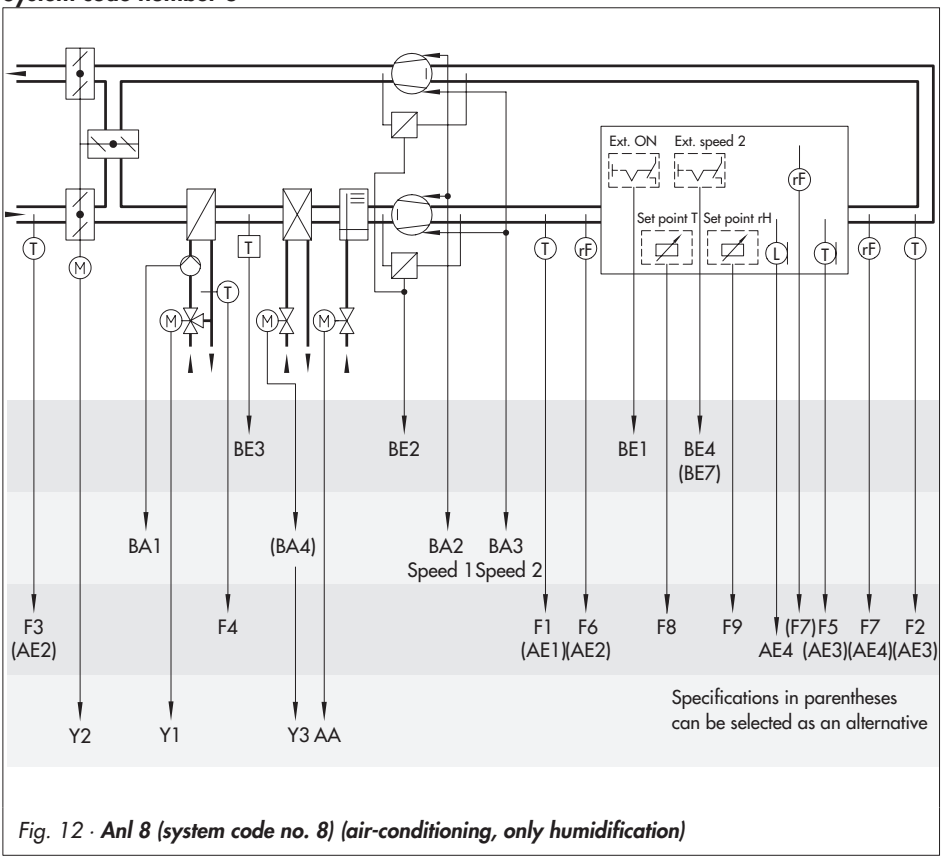


Fig. 12 · ***Anl 8 (system code no. 8) (air-conditioning, only humidification)***

Control of mixed air chamber, heating coil, cooling coil and humidification

- Two control loops: Temperature and humidity control
- Humidification or humidifying and dehumidifying operation configurable (–> section 5.2)
- Summer compensation (–> section 6.7)
- Summer time operation (–> section 6.10.3)
- Automatic reversal of operating action for mixed air chamber (–> section 5.4.2)
- Fan operation, 2-speed (–> section 6.8 and 6.11.4)

4.1 System code number 9

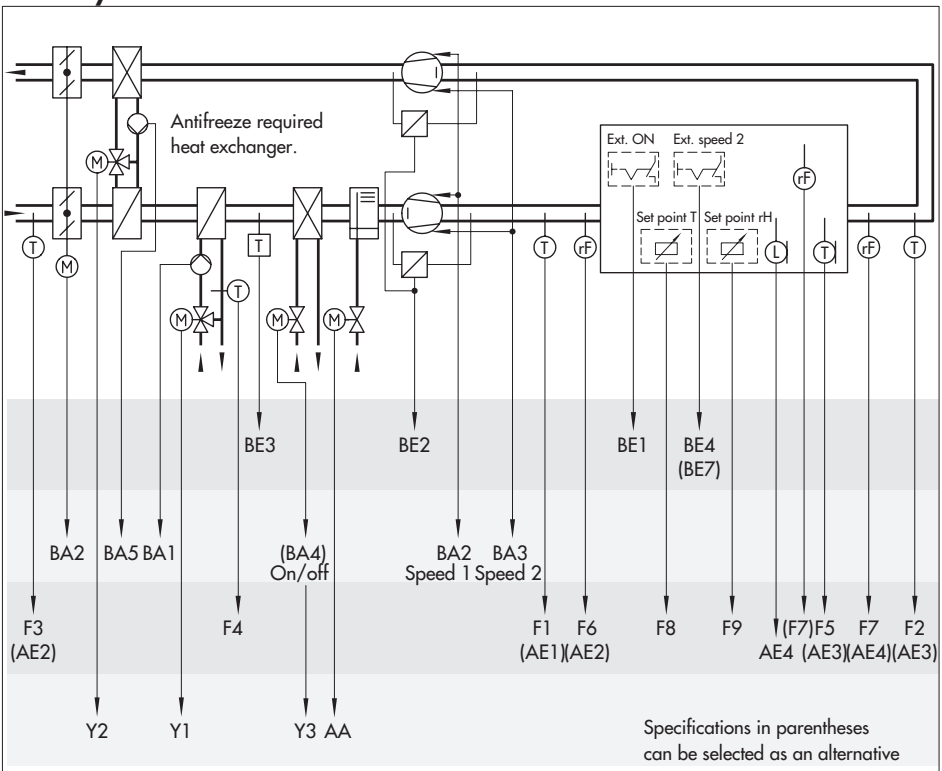


*Fig. 13 · **Anl 9 (system code no. 9) (air-conditioning, only humidification)***

Control of heat recovery unit (HRU), heating coil, cooling coil and humidification

- Two control loops: Temperature and humidity control
- Humidification or humidifying and dehumidifying operation (–> section 5.2)
- Summer compensation (–> section 6.7)
- Automatic reversal of operating action for HRU configurable (–> section 5.4.2)
- Fan operation, 2-speed (–> section 6.8 and 6.11.4)

5 Control methods and system components

5.1 Ventilation and temperature control in air-conditioning systems

In temperature control, various control methods are differentiated between: Supply air temperature control, exhaust air temperature control, exhaust air cascade control, room and room cascade control.

5.1.1 Supply air temperature control

The sensor input F1 is the control variable input by default. Alternatively, the supply air temperature can also be guided over the analog input AE1 to the controller.
The supply air temperature is controlled by a PID algorithm with an adjustable *Supply air temperature set point*. Depending on the system code number, the temperature control loop has between 1 and 3 sequence outputs that are adapted to the dynamics of the corresponding system components by means of the K_P, T_N and T_V control parameters. Functions such as return air temperature limit, summer compensation, manual set point correction or condensation detection can shift the set point. The supply air can be controlled dependent on the outdoor temperature.

Functions	WE	Configuration
Control method		Supply air control (–> page 17)
Sensor F1, supply air temperature ***or*** Assignment of inputs AE1 to AE4	OFF	Fb1 = ON or Fb18 = ON, ***option***: AE1F1
Parameters	WE	Range of values
Supply air temperature set point	22 °C	0 to 50 °C
K_P	0.5	0.1 to 99.9
T_N	60 sec	1 to 999 sec
T_V	– – –	– – – to 999 sec

5.1.2 Exhaust air temperature control

The sensor input F2 is the control variable input by default. Alternatively, the exhaust air temperature can also be guided over the analog input AE3 to the controller.
The exhaust air temperature is controlled by a PID algorithm with an adjustable *Exhaust air temperature set point*. Depending on the system code number, the temperature control loop has between 1 and 3 sequence outputs that are adapted to the dynamics of the corresponding system components by means of the K_P, T_N and T_V control parameters.

Functions such as return air temperature limit, summer compensation, manual set point correction or condensation detection can shift the set point.

Functions	WE	Configuration
Control method		Exhaust air control (–> page 17)
Sensor F2, exhaust air temperature ***or*** assignment of inputs AE1 to AE4	OFF	Fb2 = ON or Fb18 = ON, ***option:*** AE3F2
Parameters	WE	Range of values
Exhaust air temperature set point	22 °C	0 to 40 °C
K_P	0.5	0.1 to 99.9
T_N	60 sec	1 to 999 sec
T_V	– – –	– – – to 999 sec

5.1.3 Exhaust air temperature cascade control

The sensor input F2 is the control variable input for the exhaust air temperature and the sensor input F1 is the control variable input for the supply air temperature by default. Alternatively, the exhaust air temperature can also be guided over the analog input AE3 and the supply air temperature over the analog input AE1 to the controller.
The exhaust air temperature control loop is implemented as a P control loop with adjustable *Exhaust air temperature set point* and K_P *Temperature of the master loop*. The supply air temperature is controlled by a PID control algorithm with adjustable *Temperature set point of slave loop*. Depending on the system code number, the supply air temperature control loop has between 1 and 3 sequence outputs that are adapted to the dynamics of the corresponding system components by means of the K_P, T_N and T_V control parameters. The parameters - *Supply air temperature minimum limit* and *Supply air temperature maximum limit* - restrict the set point shift which arises when the exhaust air temperature control loop takes influence on the supply air temperature control loop:
Each deviation in exhaust air temperature by the amount x causes a shift of the supply air temperature set point by the amount x multiplied by the parameter K_P *Temperature of the master loop*.

- x = Exhaust air temperature set point – Exhaust air temperature actual value
- Temperature set point of slave $loop_{calculated}$ =
  Temperature set point of slave loop + x · K_P *Temperature master loop*
  Note!
  If the calculated set point is not within the limit, the minimum or maximum limit applies as the new set point.

Shifts in the set point which are caused by manual set point correction, return air temperature limit, summer compensation or by condensation detection, have unrestricted effects on the exhaust air temperature set point.

Functions	WE	Configuration
Control method		Exhaust air cascade control (–> page 17)
Sensor F1, supply air temperature ***or*** assignment of inputs AE1 to AE4	OFF	Fb1 = ON or Fb18 = ON, ***option***: AE1F1
Sensor F2, exhaust air temperature ***or*** assignment of inputs AE1 to AE4	OFF	Fb2 = ON or Fb18 = ON, ***option:*** AE3F2

Parameters	WE	Range of values
Exhaust air temperature set point	22 °C	0 to 40 °C
Temperature set point of the slave loop	22 °C	0 to 50 °C
K_P Temperature master loop	1	0.1 to 99.9
Supply air temperature minimum limit	18 °C	0 °C up to Supply air temp. maximum limit
Supply air temperature maximum limit	26 °C	Supply air temp. minimum limit up to 50 °C
K_P	0.5	0.1 to 99.9
T_N	60 sec	1 to 999 sec
T_V	– – –	– – – to 999 sec

5.1.4 Room temperature control

The sensor input F5 is the control variable input by default. Alternatively, the room temperature can also be guided over the analog input AE3 to the controller.
The room temperature is controlled by a PID algorithm with an adjustable *Room temperature set point*. Depending on the system code number, the temperature control loop has between 1 and 3 sequence outputs that are adapted to the dynamics of the corresponding system components by means of the K_P, T_N and T_V control parameters. Functions such as return air temperature limit, summer compensation, manual set point correction or condensation detection can shift the set point.

Functions	WE	Configuration
Control method		Room control (–> page 17)
Sensor F5, room temperature ***or*** assignment of inputs AE1 to AE4	OFF	Fb5 = ON or Fb18 = ON, option AE3F5

Parameters	WE	Range of values
Room temperature set point	22 °C	0 to 40 °C
K_P	0.5	0.1 to 99.9
T_N	60 sec	1 to 999 sec
T_V	– – –	– – – to 999 sec

5.1.5 Room temperature cascade control

- The sensor input F5 is the control variable input for the room temperature and the sensor input F1 is the control variable input for the supply air temperature by default. Alternatively, the room temperature can also be guided over the analog input AE3 and the supply air temperature over the analog input AE1 to the controller.
  The room temperature control loop is implemented as a P control loop with adjustable *Room temperature set point* and K_P *Temperature master loop*. The supply air temperature is controlled by a PID control algorithm with adjustable *Temperature set point of the slave loop*. Depending on the system code number, the temperature control loop has between 1 and 3 sequence outputs that are adapted to the dynamics of the corresponding system components by means of the K_P, T_N and T_V control parameters. The parameters - *Supply air temperature minimum limit* and *Supply air temperature maximum limit* - restrict the set point shift which arises when the room temperature control loop takes influence on the supply air temperature control loop: each deviation in room temperature by the amount x causes a shift of the supply air temperature set point by the amount x multiplied by the parameter K_P *Temperature master loop*.
- x = *Room temperature set point* – Room temperature actual value
- Supply air temperature set point $_{\text{calculated}}$ =
  Supply air temperature set point + x · K_P *Temperature master loop*
  Note!
  If the calculated set point is not within the limit, the minimum or maximum limit applies as the new set point.

Shifts in the set point which are caused by manual set point correction, return air temperature limit, summer compensation or by condensation detection, have unrestricted effects on the room temperature set point.

Functions	WE	Configuration
Control method		Room cascade control (–> page 17)
Sensor F1, supply air temperature ***or*** assignment of inputs AE1 to AE4	OFF	Fb1 = ON or Fb18 = ON, ***option:*** AE1F1
Sensor F5, room temperature ***or*** assignment of inputs AE1 to AE4	OFF	Fb5 = ON or Fb18 = ON, ***option:*** AE3F5

Parameters	WE	Range of values
Room temperature set point	22 °C	0 to 40 °C
Temperature set point of the slave loop	22 °C	0 to 50 °C
K_P Temperature master loop	1.0	0.1 to 99.9
Supply air temperature minimum limit	18 °C	0 °C up to supply air temp. maximum limit
Supply air temperature maximum limit	26 °C	Supply air temp. minimum limit up to 50 °C
K_P	0.5	0.1 to 99.9
T_N	60 sec	1 to 999 sec
T_V	– – –	– – – to 999 sec

5.2 Humidity control in air-conditioning systems (Anl 6, 8 and 9)

In humidity control, various control methods are differentiated between: Supply air, exhaust air/room temperature control, exhaust air cascade control and room cascade control.

5.2.1 Supply air humidity control

The sensor input F6 is the control variable input by default. Alternatively, the analog input AE2 can be used.
The supply air humidity is controlled by a PID control algorithm with an adjustable *Supply air humidity set point*. The humidity control loop can be used for just humidifying or for humidifying and dehumidifying depending on the control method. In humidifying and dehumidifying mode, the cooling coil is controlled in sequence to the humidifier.
The requirements of the humidity control loop for dehumidifying and the temperature control loop for cooling are converted internally into a common control signal Y3 for the cooling coil. Each output can be adapted to the dynamics of the corresponding system components by means of the K_P, T_N and T_V control parameters that are adjustable.
A manual set point correction has an unrestricted effect on the control by the shifting the set point.

Functions	WE	Configuration
Control method		Supply air control (–> page 17)
Sensor F6, supply air humidity ***or*** assignment of inputs AE1 to AE4	OFF	Fb6 = ON or Fb18 = ON, ***option:*** AE2F6

Parameters	WE	Range of values
Supply air humidity set point	50 %rH	0 to 100 %rH
K_P	0.5	0.1 to 99.9
T_N	60 sec	1 to 999 sec
T_V	– – –	– – – to 999 sec

5.2.2 Exhaust air/room humidity control

The sensor input F7 is the control variable input by default. Alternatively, the analog input AE4 can be used.
The exhaust air or room humidity control is implemented as a PID control algorithm with adjustable *Exhaust air humidity set point* or *Room humidity set point*. The humidity control loop can be used just for humidifying or for humidifying and dehumidifying depending on the control method. In humidifying and dehumidifying mode, the cooling coil is controlled in sequence to the humidifier.
The requirements of the humidity control loop for dehumidifying and the temperature control loop for cooling are converted internally into a common control signal Y3 for the cooling coil. Each output can be adapted to the dynamics of the corresponding system components by means of the K_P, T_N and T_V control parameters that are adjustable. A manual set point correction has an unrestricted effect on the control by the shifting the set point.

Functions	WE	Configuration
Control method		Exhaust air/room control (–> page 17)
Sensor F7, exhaust air/room control ***or*** assignmet of inputs AE1 to AE4	OFF	Fb7 = ON or Fb18 = ON, ***option:*** AE4F7

Parameters	WE	Range of values
Exhaust air humidity set point ***or*** room humidity set point	50 %rH 50 %rH	0 to 100 %rH 0 to 100 %rH
K_P	0.5	0.1 to 99.9
T_N	60 sec	1 to 999 sec
T_V	– – –	– – – to 999 sec

5.2.3 Exhaust air or room humidity cascade control

The sensor input F7 is the control variable input for exhaust air or room humidity and the sensor input F6 is the control variable input for supply air humidity by default. Alternatively, the analog input AE4 can be used for exhaust air or room humidity or the analog input AE2 for the supply air humidity.

The master loop has a P control response with adjustable *Exhaust air humidity set point* or *Room humidity set point* and *Kp Humidity master loop*. The supply air control is implemented by a PID control algorithm with adjustable *Humidity set point of the slave loop*. The humidity control loop can be used either just for humidifying or for humidifying and dehumidifying by involving the cooling coil in sequence to the humidifier. The requirements of the humidity control loop for dehumidifying and the temperature control loop for cooling are converted internally into one common control signal Y3 for the cooling unit. Each output can be adapted to the dynamics of the corresponding system components by means of the K_P, T_N and T_V control parameters that are adjustable. The set point of the supply air humidity control loop is shifted depending on the system deviation in the exhaust air or room humidity control loop:
Each deviation in humidity by the amount x shifts the supply air humidity set point by the amount x multiplied by the parameter *K_P Humidity master loop* within the range *Supply air humidity minimum limit* and *Supply air humidity maximum limit*.

- x = Exhaust air humidity set point – Exhaust air humidity actual value
- Humidity set point of the slave loop $_{calculated}$ =
  Humidity set point of the master loop + x · K_P Temperature of the master loop
  Note!
  If the calculated set point is not within the limit, the minimum or maximum limit applies as the new set point.

Functions	WE	Configuration
Control method		Exhaust air/room cascade control (–> page 17)
Sensor F6, supply air humidity ***or*** assignment of inputs AE1 to AE4	OFF	Fb6 = ON oder Fb18 = ON, ***option:*** AE2F6
Sensor F7, exhaust air or room humidiy ***or*** assignment of inputs AE1 to AE4	OFF	Fb7 = ON oder Fb18 = ON, ***option:*** AE4F7

Parameters	WE	Range of values
Exhaust air humidity set point *or* room humidity set point	50 %rH 50 %rH	0 to 100 %rH 0 to 100 %r
Humidity set point of the slave loop	50 %rH	0 to 100 %rH
K_P Humidity master loop	1.0	0.1 to 99.9
Supply air humidity minimum limit	40 %rH	0 %rF up to supply air humidity maximum limit
Supply air humidity maximum limit	60 %rH	Supply air humidity min. limit up to 100 %rH
K_P	0.5	0.1 to 99.9
T_N	60 sec	1 to 999 sec
T_V	– – –	– – – to 999 sec

5.3 Inputs

The assignment of the inputs depends on the system code number and the control method (–> section 4). Sensors that are required for the selected control methods are always activated. You must determined separately all the other sensors as well as the functions of the binary inputs by configuring them (–>section 2). Alternatively, you can also assign up to four analog inputs (0 to 10 V) to some of the resistance sensors. The analog inputs are suitable for active temperature, humidity and air quality sensors.

Functions	WE	Configuration	
Assignment of inputs AE1 to AE4	OFF	Fb18 = ON	
		AE_--: Not asssigned	AE1F1: Supply air temp. F1
		AE3F2: Exhaust air temp. F2	AE2F3: Outdoor temperature F3
		AE3F5: Room temperature F5	AE2F6: Supply air humidity F6
		AE4F7: Exh. air/room humidity	AE4L: Air quality L
		MIN: Lower measuring range value	
		MAX: Upper measuring range value	

5.4 Outputs

5.4.1 Heating coil

The heating coil is controlled from the control output Y1. The heating coil control is implemented by a PID control algorithm with the adjustable parameters K_P, T_N and T_V. The operating action of the control output Y1 can be reversed. The default setting of the operating action: heating capacity 0 to 100 % = 0 to 10 V.
An electric air heater can be controlled via the binary output BA5 subject to Y1 (–> section 6.11.12).

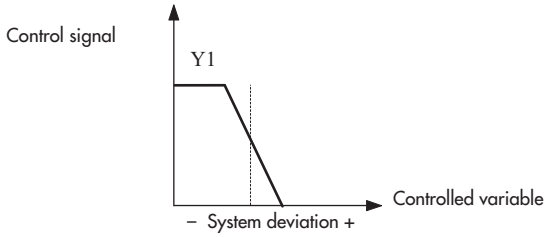


Fig. 14 · Output signal in Anl. 0

Functions	WE	Configuration
Operating action Y1	OFF	Fb21
Parameters	**WE**	**Range of values**
K_P Heating coil	0.5	0.1 to 99.9
T_N Heating coil	60 sec	1 to 999 sec
T_V Heating coil	– – –	– – – to 999 sec

5.4.2 Mixed air chamber

Mixed air chamber in sequential operation

The mixed air chamber is controlled from the Y2 output which can be adapted to the dynamics of the mixed air chamber by means of the parameters *K_P Mixed air chamber*, *T_N Mixed air chamber* and *T_V Mixed air chamber*. The parameter *Minimum outdoor air rate* guarantees an minimum proportion of outdoor air. The operating action of the control output Y2 can be reversed. The default setting is an outdoor air rate of 0 to 100 % which corresponds to a control signal of 0 to 10 V. By activating Fb22, the operating action is reversed: the outdoor air rate 0 to 100 % then corresponds to 10 to 0 V. On feedforwarding the outdoor temperature, the **summer time operation** function is taken into account (–> section 6.10.3). By additionally feedforwarding the exhaust air temperature, the **automatic reversal of the operating action** takes effect.

If the operating action of the control output Y2 is automatically reversed due to changing temperatures, while the control is in the sequence range Y1 or Y3, the mixed air chamber is then reversed with a constant changing rate of 15 % per minute. If there is a considerable difference in temperature between exhaust air and extract air due to the heat given off by the fan, the extract air temperature can also be selected as the measured variable in place of the exhaust air temperature.

Note:
The proportion of outdoor air can be suppressed during the warm-up phase with Fb43 = ON.

Functions	WE	Configuration
Sensor F7, mixed air or extract air temperature		Fb7 = ON, ***option:*** SEQ (with extract air sensor) Fb7 = OFF, ***option:*** SEQ (without extract air sensor)
Operating action Y2	OFF	Fb22
Circ. air mode after system start-up	OFF	Fb43 (not with supply air control)

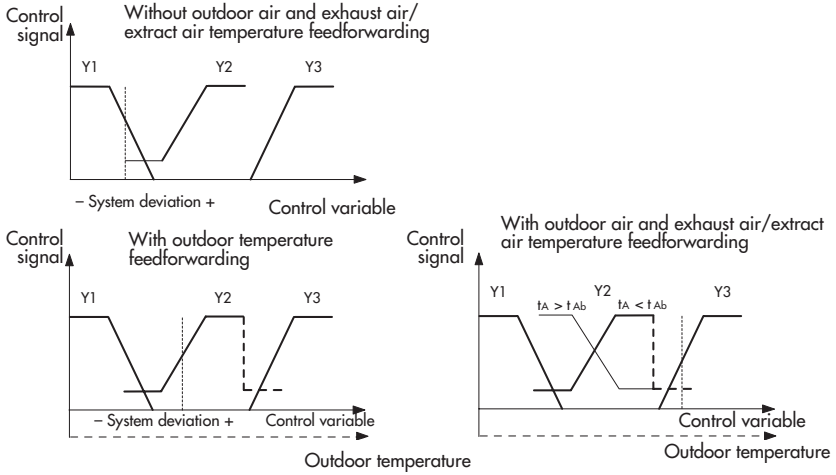


Fig. 15 · Various output signals, e.g. in system code number 4

Parameters	WE	Range of values
K_P Mixed air chamber	0.5	0.1 to 99.9
T_N Mixed air chamber	60 sec	1 to 999 sec
T_V Mixed air chamber	– – –	– – – to 999 sec
Minimum outdoor air rate	20 %	0 to 100 %

Independent mixed air temperature control

The independent mixed air temperature control is implemented by a PID control algorithm with adjustable *Mixed air temperature set point*. The output Y2 is adapted to the dynamics of the mixed air chamber with the parameters *K_P Mixed air chamber*, *T_N Mixed air chamber* and *T_V Mixed air chamber*. The parameter *Minimum outdoor air rate* guarantees a minimum proportion of outdoor air.
The operating action of the control output Y2 can be reversed. The default setting is an outdoor air rate of 0 to 100 % which correspond to a control signal of 0 to 10 V. By activating the function block Fb22, the operating action is reversed: an outdoor air rate 0 to 100 % corresponds to 10 to 0 V. On feedforwarding the outdoor temperature, the **summer time operation** function is taken into account (–> section 6.10.3). By additionally feedforwarding the exhaust temperature, the **automatic reversal of the operating action** takes effect.

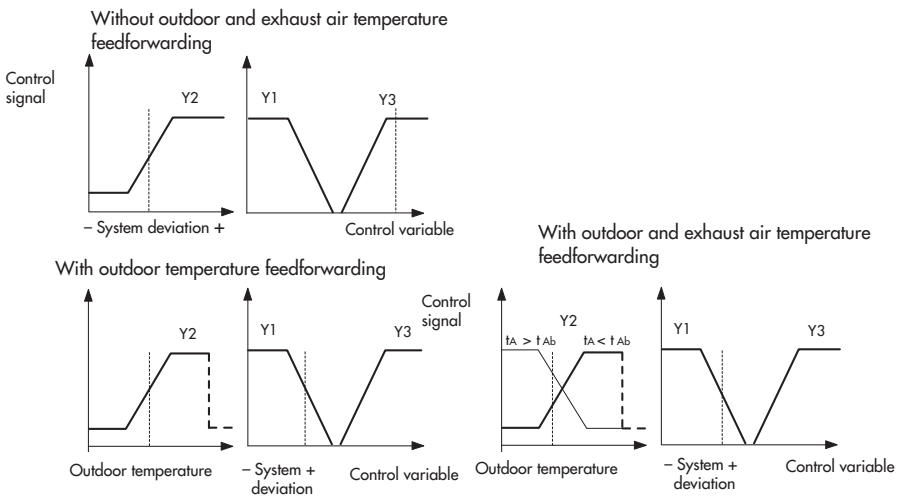


Fig. 16 · Various output signals, e.g. in system code number 4

Note!
The proportion of outdoor air can be suppressed during the warm-up phase with Fb43 = ON.

Functions	WE	Configuration
Sensor F7, mixed air or extract air temperature		Fb7 = ON, ***option:*** mixed air sensor
Operating action Y2	OFF	Fb22
Circulating air mode after system start-up	OFF	Fb43 (not with supply air control)
Parameters	WE	Range of values
K_P Mixed air chamber	0.5	0.1 to 99.9
T_N Mixed air chamber	60 sec	1 to 999 sec
T_V Mixed air chamber	– – –	– – – to 999 sec
Minimum outdoor air rate	20 %	0 to 100 %
Mixed air temperature set point	18 °C	10 to 30 °C

Outdoor temperature-controlled mixed air chamber

For the outdoor temperature-controlled mixed air chamber, two outdoor temperature basic values are determined with the parameters *Minimum outdoor air rate when the outdoor temperature is smaller* and *100 % outdoor when the outdoor temperature is greater* which result in a characteristic curve for controlling the mixed air chamber. The parameter *Minimum outdoor air rate* guarantees the required minimum proportion of the outdoor air.
The **summer time operation** (–> section 6.10.3) is always available with this operation mode.

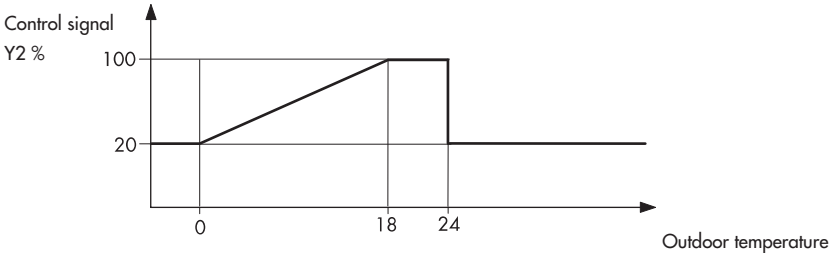


Fig. 17 · Outdoor temperature-controlled mixed air chamber

Note:
The proportion of outdoor air can be suppressed during the warm-up phase with Fb43 = ON.

Functions	WE	Configuration
Sensor F7, mixed air or extract air temperature		Fb7 = OFF, ***option:*** AT
Operating action Y2	OFF	Fb22
Circulating air mode after system start-up	OFF	Fb43 (not with supply air control)
Parameters	WE	Range of values
Min. outdoor air rate when the outdoor temperature is smaller	0 °C	–10 to 50 °C
100 % outdoor air when the outdoor temp. is greater	18 °C	–10 to 50 °C
Minimum outdoor air rate	20 %	0 to 100 %

5.4.3 Heat recovery unit (HRU)

The heat recovery unit is controlled from the control output Y2. It is implemented by a PID control algorithm with the parameters K_P *HRU*, T_N *HRU* and T_V *HRU*.

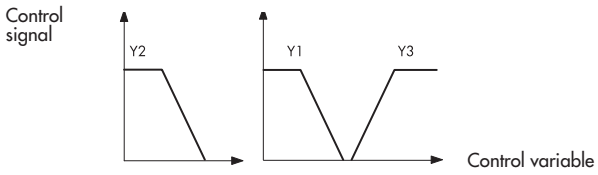


Fig. 18 · Output signals, e.g. in system code number 6 (humidifier only)

The operating action of the control output Y2 can be reversed.
The default setting is a heat recovery capacity of 0 to 100 % which corresponds to a control signal from 0 to 10 V. By activating the function block Fb22, the operating action is reversed: HRU capacity 0 to 100 % then corresponds to 10 to 0 V.
If the measured outdoor temperature and exhaust air temperature are available, the **automatic reversal of the operating action** for the heat recovery unit can be activated with Fb41 = ON.

Functions	WE	Configuration
Operating action Y2	OFF	Fb22
Automatic reversal of the operating action	OFF	Fb41
Parameters	WE	Range of values
K_P HRU	0.5	0.1 to 99.9
T_N HRU	60 sec	1 to 999 sec
T_V HRU	– – –	– – – to 999 sec

5.4.4 Cooling coil

The cooling coil is controlled from the control output Y3. It is implemented by a PID control algorithm with the parameters K_P *Cooling coil*, T_N *Cooling coil* and T_V *Cooling coil*. In the system code numbers 6, 8 and 9, the demands made by the humidity control loop for humidifying or the temperature control loop for cooling are converted internally into one common control signal Y3 for the cooling coil. The operating action of the control output Y3 can be reversed. The default setting is a cooling capacity of 0 to 100 % which corresponds to a control signal from 0 to 10 V.

By activating the function block Fb23, the operating action is reversed: the cooling capacity 0 to 100 % then corresponds to 10 to 0 V.

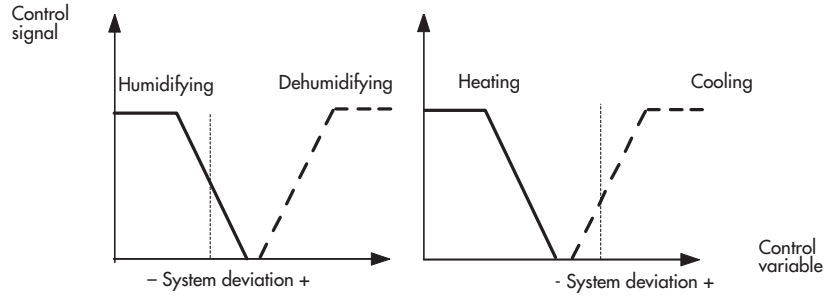


Fig. 19 · Output signals, e.g. in system code number 6 (humidifying and dehumidifying)

Cooling can also be controlled using an on/off signal which is issued at the binary output BA4 (–> section 6.11.7). Control of a chiller is likewise possible (–> section 6.11.8).

Functions	WE	Configuration
Operating actionY3	OFF	Fb23
Parameters	WE	Range of values
K_P Cooling coil	0.5	0.1 to 99.9
T_N Cooling coil	60 sec	1 to 999 sec
T_V Cooling coil	– – –	– – – to 999 sec

5.5 Humidifier

The humidifier is controlled in system code number 6 from the control output Y2 and in system code numbers 8 and 9 from the analog output AA. The allocation of the control output Y2 to the humidifier shown in the controller display does not apply to system code numbers 8 and 9!

The humidifier control is implemented by a PID control algorithm with the parameters *K_P Humidifier*, *T_N Humidifier* and *T_V Humidifier*.

The operating action of the control output Y2 can be reversed. The default setting is a humidifier capacity of 0 to 100 % which corresponds to a control signal of 0 to 10 V. By activating the function block Fb22, the operating action is reversed: a humidifier capacity 0 to 100 % then corresponds to 10 to 0 V.
The operating action at the analog output AA cannot be reversed.

Function	WE	Configuration
Operating action Y2	OFF	Fb22

Parameters	WE	Range of values
K_P Humidifier	0.5	0.1 to 99.9
T_N Humidifier	60 sec	1 to 999 sec
T_V Humidifier	– – –	– – – to 999 sec

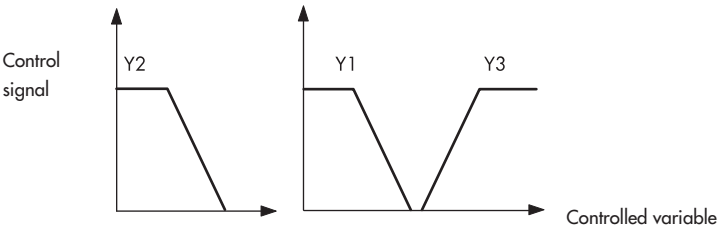


Fig. 20 · Output signals, e.g. in system code number 6 (humidifier only)

5.6 Fans with variable speed

The analog output AA can be used to control the speed of the fans and the air volume based on the air quality. If the air quality falls below the parameter *Air quality set point*, the air volume is increased based on the *Minimum air volume flow*.
When an exhaust air cascade control or a room temperature cascade control is used, the controller can be programmed so that the air volume is increased when the supply air temperature limit is reached to eliminate the system deviation as quickly as possible. This function has priority over the air quality control. After the system deviation has been balanced out, the air quality control is enabled again. The function is activated when the *Factor of change* K_P is selected greater than 0.

Example:
The supply air temperature has reached its minimum permissible value at 50 % air volume (y_{AA} = 50 %).

- *Exhaust air temperature set point* = 22 °C
- *Exhaust air temperature* = 24 °C
- *Factor of change* K_P = 5
- $Y_{AA_{neu}} = Y + XD \cdot K_P$

$$= 50\% + \left(24°C - 22°C\right) \div 40°C \cdot 100\% \cdot 5$$
$$= 75\%$$

(XD is the percentage error in relation to the measuring range. Its maximum limit is 10 %).

The system runs at an air volume of 75 % to reduce the excess temperature more quickly.

The air quality control is implemented by a PI control algorithm with the parameters *K_P Air quality control* and *T_N Air quality control*.
The operating action of the air quality input can be reversed. The default setting is an air quality of 0 to 100 % which corresponds to an input signal of 0 to 10 V. L 0 means an insufficient air quality.
By activating the function block Fb24, the operating action is reversed: air quality 0 to 100 % then corresponds to 10 to 0 V. As a result, L 0 means a very good air quality.

Functions	WE	Configuration
Assignment of inputs AE1 to AE4	OFF	Fb18 = ON, ***option:*** AE4L
Request for externally required signal	OFF	Fb20 = OFF
Variable air volume control over AA	OFF	Fb39 = ON
	25 %	MIN AA (minimum air volume) / 0 to 100 %
	0.0	K_P (Factor of change) / 0.0 to 10.0*
Operating action L	OFF	Fb24
	* Factor of change with cascade control only	

Parameters	WE	Range of values
Air quality set point	50	0 to 100
K_P Air quality control	0.5	0.1 to 99.9
T_N Air quality control	60 sec	1 to 999 sec

6 Control functions

6.1 Supply air temperature limit

The intention of the supply air temperature limit is to reduce the draft when supply air that is fairly cold is blown in. The temperature range within which the supply air temperature may vary is determined by the parameters *Supply air temperature minimum limit* and *Supply air temperature maximum limit*. If the supply air temperature is the control variable, i.e. for supply air temperature control or exhaust air or room temperature cascade control, the controller only permits set point shifts within this range.
If F1 or AE1 is just used as a limit input, i.e. for exhaust air or room temperature control, this deviation is included in the control when the supply air temperature exceeds or fall below the limit values, to counter any further drifting of the supply air temperature.

Functions	WE	Configuration
Sensor F1, supply air temperature ***or*** assignment of inputs AE1 to AE4	OFF	Fb1 = ON Fb18 = ON, ***option:*** AE1F1
Parameters	WE	Range of values
Supply air temperature minimum limit	18 °C	0 °C up to supply air temp. maximum limit
Supply air temperature maximum limit	26 °C	Supply air temp. minimum limit up to 50 °C

6.2 Supply air humidity limit

For exhaust air or room humidity control, the parameters *Supply air humidity minimum limit* and *Supply air humidity maximum limit* restrict the humidity range within which the supply air humidity may vary. If it leaves this range, the deviation is included in the system deviation to prevent any further drifting of the supply air humidity.
The main purpose of the supply air humidity maximum limit is to prevent condensation forming in the supply air duct.

Functions	WE	Configuration
Sensor F6, supply air humidity ***or*** assignment of outputs AE1 to AE4	OFF	Fb6 = ON Fb18 = ON, ***option:*** AE2F6
Parameters	WE	Range of values
Supply air humidity minimum limit	40 %rH	0 %rH up to supply air humidity max. limit
Supply air humidity maximum limit	60 %rH	Supply air humidity max. limit up to 100 %rH

6.3 Return air temperature limit

The temperature range within which the return air temperature may vary is determined by the parameters *Return air temperature minimum limit* and *Return air temperature maximum limit*. If the return air temperature moves towards these limits, the set point is corrected (for the cascade control, the set point of the exhaust air or room temperature). In the range *Return air temperature minimum limit*, the set point is directly raised by the amount x multiplied by the *Return air temperature limit factor* for every amount x that the return air temperature falls below. In the range *Return air temperature maximum limit*, the set point is directly lowered by the amount x multiplied by the *Return air temperature limit factor* for every amount x that the return air temperature exceeds.

Return air temperature falls below limit:

- x = *Return air temperature minimum limit – Actual return air temperature*
- Supply air temperature set point $_{calculated}$ =
  Supply air temperature set point + x · *Return air temperature limit factor*

Return air temperature exceeds limit:

- x = *Actual return air temperature – Return air temperature maximum limit*
- Supply air temperature set point $_{calculated}$ =
  Supply air temperature set point – x · *Return air temperature limit factor*

The supply air temperature limit function has priority.

Functions	WE	Configuration
Sensor F4, Return air temperature, heating coil		Fb4 = ON
Parameters	WE	Range of values
Return air temperature minimum limit	20 °C	0 °C up to return air temperature maximum limit
Return air temperature maximum limit	70 °C	Return air temperature minimum limit up to 100 °C
Return air temperature limit factor	1	0 to 10

6.4 Variable return air temperature maximum limit

If an outdoor temperature sensor exists, it is possible to vary return air temperature limit. The following parameters apply for the upper variable limit of the return air temperature: *Return air temperature maximum limit coordinate 1, Outdoor temperature coordinate 1, Return air temperature maximum limit coordinate 2, Outdoor temperature coordinate 2.*
The gray shaded area in Fig. indicates the permissible return air temperatures.

If the *Return air temperature maximum limit* is exceeded by the amount x, the set point (for cascade control, the set point of the exhaust air or room temperature) is reduced by the amount x multiplied with the *Return air temperature limit factor*.

- *x = Actual return air temperature – Return air temperature maximum limit*
  Note! The permissible return air temperature maximum limit depends on the outdoor temperature (see Fig.)
- Supply air temperature set point $_{calculated}$ =
  Supply air temperature set point – x · *Return air temperature limit factor*

The supply air temperature limit has priority.

Parameters	WE	Range of values
Return air temperature minimum limit	20 °C	0°C up to return air flow temp. maximum limit
Return air flow temperature maximum limit, coordinates 1 and 2	70 °C	Return air temperature minimum limit up to 100 °C
Return air temperature limit factor	1	0 to 10
Outdoor temperature coordinate 1	5 °C	–50 to 20 °C
Outdoor temperature coordinate 2	20 °C	–50 to 20 °C

6.5 Sustained room temperature

If a room temperature sensor is connected, the *Sustained room temperature* is monitored when the system is in the reduced operation mode. If the room temperature falls below this limit value, at first the system start-up function is initiated. Then the supply air temperature is controlled constantly to the set point *Supply air temperature maximum limit* (minus 1 °C). If the room temperature has reached the *Sustained room temperature* (plus 2 °C), the sustained room temperature function and usually the operation of the entire system is ended.

Functions	WE	Configuration
Sensor F5, room temperature		Fb5 = ON
Parameters	WE	Range of values
Room sustained temperature	15 °C	0 to 20 °C
Supply air temperature minimum limit	26 °C	Supply air temperature minimum limit up to 50 °C

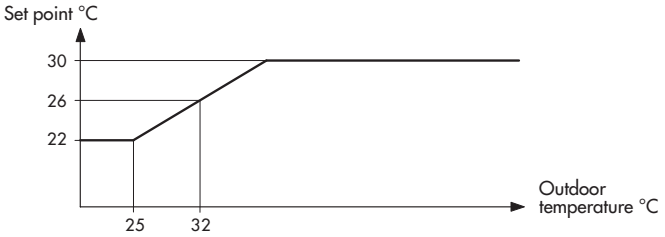


Fig. 21 · Summer compensation

6.6 Night purge

During the times-of-non-use, the night air can be used to cool the rooms under certain conditions: the fan operation (speed 1) is enabled and, if necessary, the mixed air chamber is reversed to 100 % outdoor air rate. The night purge is only enabled when the **summer deactivation** function (–> section 6.10.2) is active and, in addition, the following conditions are met:

- Room temperature is greater than the room temperature limit *Enable night purge (START)* and
- Temperature difference between room temperature and the outdoor temperature is greater than the value set under *Temperature difference to outdoor temperature*

The night purge can be set to start at 0:00 hrs at the earliest, 4:00 hrs at the latest – depending on the programmed system times-of-use. The controller must be programmed to start the night purge at the latest possible point in time. It is limited to two hours at the maximum. If the room temperature falls below the room temperature limit value determined under *Finish night purge (STOP),* the night purge is ended early.

Functions	WE	Configuration
Night purge	OFF	Fb10 = ON
	24 °C	START / STOP up to 50 °C
	18 °C	STOP / 10 °C up to START
	5 °C	Temperature difference to outdoor temp. / 0 to 50 °C

6.7 Summer compensation

The function is basically available for all systems with a cooling coil (Anl 1, Anl 4 to Anl 9): This summer compensation function lets the temperature set points for supply air, exhaust air and room be shifted in a linear manner by means of two coordinates. For this purpose, the following parameters must be defined:

- *Summer compensation when the outdoor temperature is greater*: from this outdoor temperature onwards, the temperature set point is raised
- *Set point at an outdoor temperature of 32 °C* determines the gradient of the characteristic curve.

Example:
In an air-conditioning system, the supply air temperature set point should be raised when the outdoor temperature is greater than 25 °C. At 32 °C, the supply air temperature set point should be 26 °C.

- *Supply air temperature set point = 22 °C*
- *Summer compensation when the outdoor temperature is greater = 25 °C*
- *Set point at an outdoor temperature of 32 °C* = 26 °C

Parameters	WE	Range of values
Summer compensation when the outdoor temperature is greater	26 °C	–50 to °C
Set point at an outdoor temperature of 32 °C	26 °C	0 to 40 °C

6.8 Fan operation dependent on room temperature/room humidity

You can select this function with room temperature control, room temperature cascade control, room humidity control, room humidity cascade control or with room humidity measurement (Fb7 = ON or Fb18 = ON (AE4F7)) or with a two-speed fan operation or with variable air volume control.
The fan speed 2 is activated, parallel to the associated times-of-use, depending on the room temperature and/or room humidity or the fan speed increases depending on the room temperature and/or room humidity. In systems that have a mixed air chamber, the outdoor air rate is additionally increased if the set point of the room humidity is exceeded.

Functions	WE	Configuration
Two-speed fans over BA2/BA3	OFF	Fb11 = ON (for two-speed fans) BA2 = BA3 = ON (–> page 63) BA2 = OFF, BA3 = ON (–> page 63)
	0 sec	Delay time / 0 to 60 sec

Variable air volume control over AA	OFF	Fb39 = ON (for variable air volume control)
	25 %	MIN AA (minimum air volume) / 0 to 100 %
	0.0	K_P (Factor of change) / 0.0 to 10.0*
Fan operation dependent on room temperature or room humidity	OFF	Fb42 = ON MIN: Reaction when limit is not reached MAX: Reaction when limit is exceeded
	5 °C	Difference room temperature set point/ 1 to 10 °C
	5 %rH	Difference room humidity set point/ 1 to 10 %rH
	* Factor of change with cascade control only	

6.9 Air quality control via the mixed air chamber

The air quality control via the mixed air chamber function is available in the systems with code numbers Anl 2, Anl 4 and Anl 8. The control signal Y2 is formed from two control signals that exist internally and originate from the temperature control loop and the air quality control loop. If the measured air quality falls below the value *Air quality set point*, the outdoor air rate determined until then just by the temperature control loop is increased dependent on the control parameters *K_P Air quality control* and *T_N Air quality control*. Under optimal conditions, i.e. the *Air quality set point* is exceeded, the outdoor air rate can be gradually reduced by the PI control algorithm until it reaches *Minimum outdoor air rate*, provided the temperature control loop does not demand the opposite.

Functions	WE	Configuration
Assignment of inputs AE1 to AE4, 0 to 10 V	OFF	FB18 = ON, ***option:*** AE4L

Parameters	WE	Range of values
Air quality set point	50	1 to 100
K_P Air quality control	0.5	0.1 to 99.9
T_N Air quality control	60 sec	1 to 999 sec
Minimum outdoor air rate	20 %	0 to 100 %

6.10 Outdoor temperature-compensated control

6.10.1 Outdoor temperature-compensated supply air control

The function is basically available in systems with cooling coil and, additionally, in system Anl 0. The function of **summer compensation** (–> section 6.7) can also be used for an outdoor temperature-compensated supply air control. The *Summer compensation when the outdoor temperature is greater* parameter determines from which outdoor temperature onwards the *Supply air temperature set point* should be reduced. The *Set point at an outside temperature of 32 °C* parameter determines also the gradient of the characteristic curve.

Example:
A heating coil is to heat the supply air to 35 °C when the outdoor temperature is –15 °C . The foot of perpendicular is to be at 15 °C outdoor temperature / 20 °C supply air temperature.

- *Supply air temperature set point* = a = 35 °C
- *Summer compensation when the outdoor temperature is greater* = b = – 15 °C
- *Set point at an outdoor temperature of 32 °C* = c
- *Supply air temperature minimum limit* = d = 20 °C
- Foot of perpendicular outdoor temperature = e = 15 °C

The calculation of the temperature required for the parameter *Set point at an outdoor temperature of 32 °C* results in:

$$c = a - (32\ °C - b) \cdot (a - d) / (e - b) = 11.5\ °C$$

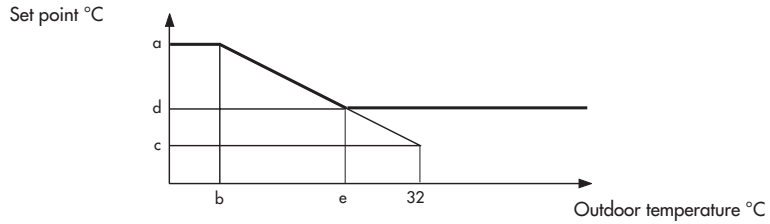


Fig. 22 · Outdoor temperature-compensated supply air control

Parameters	WE	Range of values
Summer compensation when the outdoor temp. is greater	26 °C	–50 to 40 °C
Set point at an outdoor temperature of 32 °C	26 °C	0 to 40 °C
Supply air temperature set point	22 °C	0 to 50 °C

6.10.2 Summer deactivation

In summer, the heating coil is switched off when the daily mean outdoor temperature (measured every hour between 6:00 and 22:00 hrs) is above the *Outdoor mean temperature* within a defined time period. If the summer deactivation is active, the heating coil is switched off at 22:00 hrs for the next 24 hours, i.e. control signal Y1 = 0 % and pump output BA1 = OFF. If the outdoor temperature falls below the set limit value, the heating coil control is enabled from 22:00 hrs for the next 24 hours, providing this is required from the times-of-use or the operating mode switch.

Parameters	WE	Range of values
Date when summer deactivation is enabled	01.06	01.01 to 31.12
Date when summer deactivation is disabled	30.09	01.01 to 31.12
Outdoor mean temperature	18 °C	0 to 30 °C

The *Outdoor mean temperature* can be read in the operating level in the outdoor temperature current reading by holding the enter key pressed down. The bar graph under the row of numbers 1 to 24 indicates the number of already measured outdoor temperatures used to calculate the mean temperature. The number in front of the mean temperature indicates whether the Summer decativation is enabled (1) or disenabled (0).

6.10.3 Summer time operation

The **summer time operation** function runs in all systems that have a mixed air chamber and outdoor temperature feedforward (Anl 2, Anl 4, Anl 8). When the outdoor temperatures exceed the limit value *Summer time operation when the outdoor temperature is greater*, the system is operated with a minimum outdoor air rate to avoid operation with 100 % outdoor air. Summer operation can also be used in systems with cooling coil in which it is better to prevent operation with just outdoor air at high outdoor temperatures for reasons of energy efficiency.

Parameter	WE	Range of values
Summer time operation when the outdoor temperature is greater:	22 °C	0 to 40 °C

6.11 Control functions

6.11.1 System start-up

Usually, all ventilation systems go over to standard operation first after a start-up phase when a request for operation exists from deactivated state or from manual operation. The duration of the start-up is determined by the parameter *Pump advance running time for start-up*. Two options exist to suppress the start-up partially or totally:

1. Pump advance running time for start-up = 0

2. When the outdoor temperature is fedforward, the outdoor temperature must be smaller than the parameter *Start-up mode when the outdoor temperature is smaller*

If the ventilation system goes into operation according to the programmed times-of-use, then the start-up function already starts to run before the time-of-use commences by the time period set in *Pump advance running time for start-up*. The fans are enabled exactly when the time-of-use starts.

If, however, the ventilation system is required to run by an external request for operation or by the operating mode selector switch, the fans are first enabled after a time delay set in *Pump advance running time for start-up*.

By enabling the heating coil circulation pump, the control signal Y1 for the heating coil is enabled at the same time:

- Without the temperature sensor F4 in the heating coil return flow, the control output Y1 runs either 100 % control signal or is set to the fixed value under *Control signal limit for Y1*. The *Control signal limit for Y1* only has any effect when the start-up function is active.
- With the temperature sensor F4 the value set under *Return air temperature maximum limit or Return air temperature maximum limit coordinate 1* is the set point for the warm-up of the heating coil during the start-up phase. Y1 varies corresponding to the system deviation. The system start-up function is cancelled when the fixed heating coil return air temperature is reached when the operation of the system has been demanded by the operating mode selector switch or over the binary input.

All other control outputs – also the control output Y2 of an independent mixed air temperature control – usually do not run a control signal during the system start-up. The control output Y2 is enabled when the fans are enabled. Before the control output Y3 (cooling coil) can be enabled, the *Pump advance running time for start-up* must be run through a second time. In the supply air control loop, the *Supply air temperature maximum limit* is set at first as the set point. Within five minutes, this value is led linearly to the current supply air set point.

Note:
An active system start-up is indicated in the operating level by the ☼ blinking symbol. During this operating phase, you cannot view the master or slave loop set points: in the operating level – – – – appears on the display at the corresponding places!

Parameters	WE	Range of values
Pump advance running time for start-up	300 sec	0 to 900 sec
Start-up mode the outdoor temperature is smaller	5 °C	0 to 10 °C
Control signal limit for Y1	100 %	0 to 100 %
Return air temperature minimum limit	70 °C	Return air temperature maximum limit up to 100 °C
Supply air temperature minimum limit	26 °C	Supply air temperature maximum limit up to 50 °C

6.11.2 Circulating air mode after system start-up

After the system start-up has finished, first the circulating air mode is run until the room or exhaust air temperature set point (±0.5 °C) has been reached. This function can be selected in systems with a mixed air chamber (Anl 2, Anl 4, Anl 8), with room or exhaust air temperature control and in systems that have room cascade control or exhaust air cascade control.

Function	WE	Configuration
Circulating air mode after system start-up	OFF	Fb43 = ON

6.11.3 Enabling fan speed 1

Usually, the fan speed 1 is enabled over the binary output BA2 at the programmed start of the time-of-use (times-of-use of the system). The system start-up has already been completed, if necessary, at the time period set under *Pump advance running time for start-up* before the time-of-use starts. When a request for an externally required signal is issued, the fan speed 1 is possibly enabled with a delay due to the system start-up.
If the outdoor air/extract air damper is additionally to be controlled over BA2, it will be necessary to determine in function block Fb11 that BA2 also remains activated when fan speed 2 is in operation.
In case of the malfunctions “system frost protection” or “missing fan feedback”, the fans are deactivated immediately.

Parameter	WE	Range of values
Pump advance running time for start-up	300 sec	0 to 900 sec

6.11.4 Enabling fan speed 2

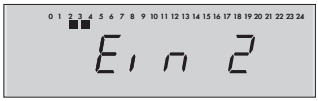
The fan speed 2 is controlled via the binary output BA3. It is enabled either:

- by *Times-of-use for fan speed 2*,
- by an external demand for fan speed 2,
- dependent on the air quality,
- for room temperature control or room temperature cascade control dependent on the room temperature and/or when Fb7 is activated dependent on the room humidity.

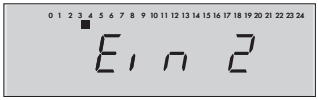
After fan speed 2 has been demanded when the system is in stand-by, first fan speed 1 is enabled; speed 2 is only enabled after the *Delay time* has elapsed. When the speed 2 is switched back to speed 1, the fans are switched off; speed 1 is only enabled after the *Delay time* has elapsed.
The *Delay time* is still taken into account even if the fans are activated in manual operation mode.

Functions	WE	Configuration
Two-speed fans over BA2/BA3	OFF	Fb11 = ON
		BA2 = BA3 = ON
		BA2 = OFF, BA3 = ON
	0 sec	Delay time / 0 to 60 sec

The following applies:



(1) BA2 = BA3 = ON



(2) BA2 = OFF, BA3 = ON

Note!
If the outdoor air/extract air damper should additionally be controlled over BA2, it will be necessary to determine that BA2 also remains activated when fan speed 2 is in operation.

Activating the fan speed dependent on the air quality

If the air quality falls below the *Air quality set point*, the operation of fan speed 2 is demanded. The fans are switched back to fan speed 1 when the air quality has risen to a value greater than *Air quality set point + Differential gap of speed 2 –> 1*, provided that the time schedule for "Fan speed 2" or the external demand for fan speed 2 do not require the opposite.

Functions	WE	Configuration
Assignment of inputs AE1 to AE4	OFF	Fb18 = ON, ***option:*** AE4L
Parameters	**WE**	**Range of values**
Air quality set point	50	0 to 100
Differential gap of speed 2 -> 1	5	5 to 30

6.11.5 Fan operation feedback

The operation feedback of the fans can be evaluated with the binary input BE2. If the floating BE2 input makes contact – after the fans are enabled and the delay time has elapsed – the ventilation system is deactivated. ***STOP*** blinks on the display. First when the next time-of-use starts, a new attempt to start is made automatically.

Functions	WE	Configuration
Fan operation feedback to BE2	OFF	Fb14 = ON
	180 sec	START (delay time) / 0 to 180 sec

Note!
To start the deactivated system manually, switch the operating mode switch briefly from automatic operation to reduced operation and back again to trigger an external demand for operation or press an external key intended for this purpose (confirm the fault by closing BE2) for at least one second.

6.11.6 Enabling the cold storage

In all systems with cooling coil, the binary output BA4 can be used to enable the charging of a cold storage. If the outdoor temperature measured over an hour exceeds the value *Enabling the cold storage at outdoor temperature* (*START*), BA4 is switched on. If the value falls below the limit for an hour, BA4 is switched off.

Functions	WE	Configuration
Cold storage	OFF	Fb12 = OFF
	18 °C	START (enabling the cold storage) / 0 to 30 °C

6.11.7 Controlling the direct expansion evaporator

In all systems with cooling coil, the binary output BA4 can be activated dependent on the control signal Y3. The control signal Y3 is available parallelly with this function.

Function	WE	Configuration
BA4 dependent on Y3	OFF	Fb12 = ON, ***option:*** SEQ
	30 %	START (activating value) / STOP up to 100 %
	10 %	STOP (deactivating value) / 0 % up to START

6.11.8 Controlling the chiller

In all systems with cooling coil (not Anl 7), a chiller can be run to overlap, i.e. parallelly to the other system elements operating in sequence. As soon as a low temperature is requested, the chiller is activated at least for the period determined under *Minimum activated time (START MIN*). The other system elements can be requested parallelly to the chiller. An excess amount of cold air is at first compensated with HRU and heating coil. If the heating coil control signal Y1 exceeds the value *STOP* (deactivation of cooling at Y1 >), the chiller is switched off at least for the time period determined under *STOP MIN* (minimum deactivated time). When the outdoor temperature is fedforward, the chiller basically is only enabled when the outdoor temperature is 3 °C higher than the current set point – with a cascade control, 3 °C higher than the current supply air set point. A chiller that is running is deactivated when Y1 > 0 % observing the *Minimum activation time (START MIN),* if the outdoor temperature is smaller than the set point; with outdoor temperatures higher than the set point depending on the parameter *Deactivate cooling (STOP).* The control signal Y3 is not available.

Function	WE	Configuration
Controlling the chiller	OFF	Fb12 = ON, ***option:*** PAr
	600 sec	START MIN (min. activation time)/ 0, 60 to 3600 sec
	600 sec	STOP MIN (min. deactivated time)/ 0, 60 to 3600 sec
	50 %	STOP (Deactivation of cooling at Y1 >) / 0 to 100 %

6.11.9 Condensation detection

In all systems with cooling coil with a dehumidifying function, a condensation monitor can be activated for chilled ceilings. As soon as condensation is detected in standard operation, the set point of the control is raised by 3 °C. If the condensation monitor indicates normal state again, the set point correction is reset.

Function	WE	Configuration
Condensation detection	OFF	Fb40 = ON, ***option:*** BE4, BE7 STEIG: Reaction to make contact FALL: Reaction to break contact

Note!
After selecting Fb40 = ON, only one input appears on the display, the binary input BE4 or BE7 is already being used somewhere else.

6.11.10 Circulation pump control for the heating coil

The circulation pump of the heating coil is controlled by the binary output BA1. If the system goes into operation due to the time schedule of the ventilation with the system start-up function, the circulating pump is switched on before the time-of-use starts at the time set under *Pump advance running time for start-up.*
Without the system start-up, the circulation pump is activated at the earliest when the time-of-use begins. In systems with an outdoor temperature sensor, the circulation pump's operation depends on the parameter *Start-up when the outdoor temperature is lower*: If the outdoor temperature is above this limit value and the control signal Y1 is 0 % for approximately three minutes, the circulation pump is switched off. First when Y1 > 0 %, it is activated again.
At the start of a time-of non-use (system deactivation) the circulation pump of the heating coil is switched off after three minutes lag time, provided there is no demand for operation from the functions, stand-by monitoring or stand-by control. During the summer deactivation, the circulation pump of the heating coil is basically switched off. It is activated daily for approximately one minute to prevent it from becoming jammed up.

Parameters	WE	Range of values
Start-up when the outdoor temperature is lower	5 °C	0 to 10 °C
Pump advance running time for start-up	300 sec	0, 60 to 900 sec

6.11.11 Circulation pump control for the HRU

In systems with connected heat recovery unit (Anl 3, Anl 5 and Anl 9) the binary output BA5 controls the HRU pump. This pump is only activated when the control signal is Y2 > 0 %. If Y2 is 0 % for longer than three minutes when the system is in operation, the circulation pump is deactivated. First when Y2 > 0 % it is activated again. If the time-of-use ends, the HRU pump is deactivated after three minutes.
The HRU pump is activated at least once for approximately one minute every 24 hours to prevent it from becoming jammed up.

6.11.12 Electric air heater

The binary output BA5 can also be used to control an electric air heater in on/off operation instead of the HRU pump. BA5 is then controlled depending on the control signal Y1.
The control signal Y1 is available parallelly!

Function	WE	Configuration
BA5 dependent on Y1	OFF	FB38 = ON
	30 %	START (activating value) / STOP up to 100 %
	10 %	STOP (deactivating value) / 0 % up to START
	10 sec	Lag time of the fans / 0 to 60 sec

7 System-wide functions

7.1 Switchover between summer time and winter time

The controller switches automatically between summer time and winter time. The summer time is set to begin on the last Sunday in March at 2:00 a.m. and winter time to begin on the last Sunday in October at 3:00 a.m.

Function	WE	Configuration
Switchover between summer time and winter time	OFF	Fb16 = ON

7.2 Frost protection

7.2.1 System frost protection

This function is used to protect the heating coil from being damaged by frost. Depending on the binary input BE3, the system runs or frost protection function is run. If BE3 input makes contact, the frost protection function starts: the fans are deactivated and the circulation pump of the heating coil is activated; a 100 % signal is issued at the control output of the heating coil Y1.
When the frost protection function is active, ***STOP*** and the symbol blink on the display.
The frost protection function is also active in manual operation mode.

Function	WE	Configuration
System frost protection with BE3	OFF	Fb15 = ON

7.2.2 Frost protection HRU

The function "Frost protection HRU" makes sure when the system is running that the heat recovery unit does not freeze on the outside. If the HRU return air temperature falls below or alternatively the extract air temperature measured directly at the heat recovery unit falls below the parameter *Heat recovery minimum temperature*, the frost protection function is started: the heat recovery unit is released from the sequential operation. The programmed limit value is used as the set point for an independent temperature control of this unit to make sure that further cooling off does not occur. The frost protection HRU remains active until the control signal Y2 for heat recovery has risen to a value of 95 %; directly after that, the sequential operation is reactivated. When the frost protection mode for HRU is active, the symbol blinks on the display.

Function	WE	Configuration
Sensor F6, return flow temperature HRU		Fb6 = ON
Parameter	WE	Range of values
Heat recovery minimum temperature	3 °C	1 to 10 °C

7.2.3 Stand-by monitoring

The outdoor temperature (F3/AE2) is required for this function. The circulation pump of the heating coil is activated outside of the times-of-use whenever the outdoor temperature falls below the value *Pump ON when the outdoor temperature is smaller*. If the stand-by monitoring is active, the ❄ symbol appears on the display of the controller in the operating level.

Function	WE	Configuration
Sensor F3, outdoor temperature ***or*** assignments of inputs AE1 to AE4	OFF	Fb3 = ON Fb18 = ON, ***option:*** AE2F3
Parameter	WE	Range of values
Pump ON when the outdoor temperature is smaller	0 °C	–50 to 10 °C

7.2.4 Stand-by control

If the outdoor temperature sensor (F3/AE2) and a return air temperature sensor (F4) exist, the value *Return air temperature minimum limit* in the heating coil is controlled for the frost protection in addition to the stand-by monitoring function during times-of-non-use. An active stand-by control is indicated in the operating level of the controller by the symbol appearing on the display.

Functions	WE	Configuration
Sensor F3, outdoor temperature ***or*** assignments of inputs AE1 to AE4	OFF	Fb3 = ON Fb18 = ON, ***option:*** AE2F3
Sensor F4, return flow temperature of heating coil		Fb4 =ON

7.3 Forced-operation of the pumps

If the connected pumps have not run during the past 24 hours, a force-operation of the pumps is started to prevent them from jamming.

7.4 External correction of the temperature set point

The set point can be changed at the set point correction switch or by a potentiometer connected to input F8. The potentiometer F8 and the set point correction switch both have an effect on the temperature set points.
The set point is changed at the correction switch in ±1 °C steps from one to the next switch position.
A correction is possible in the range from −5 °C (potentiometer setting 1000 Ω) to +5 °C (potentiometer setting 2000 Ω) provided the supply air temperature limitation in a supply air temperature control permits it.

Function	WE	Configuration
F8, temperature set point potentiometer	OFF	Fb8 = ON

7.5 External setting of the outdoor air rate

The outdoor air rate can be determined at the input F9 with a potentiometer. The outdoor air rate is then determined between the value *Minimum outdoor air rate (*potentiometer setting 1000 Ω) and 100 % (potentiometer setting 2000 Ω).

Function	WE	Configuration
F9, outdoor air rate potentiometer	OFF	Fb9 = ON
Parameter	WE	Range of values
Minimum outdoor air rate	20 %	0 to 100 %

7.6 External correction of the humidity set point

In all air-conditioning systems, the humidity set point can be determined at the input F9 with a potentiometer. The humidity set point is then determined between −20 % rH (potentiometer setting 1000 Ω) and + 20 % rH (potentiometer setting 2000 Ω), provided the supply air limit and supply air humidity control allow it.

Function	WE	Configuration
F9, humidity set point potentiometer	OFF	Fb9 = ON

7.7 External setting of the air volume

If the function blocks Fb39 and Fb13 are activated, i.e. **variable air volume control** and **external demand for operation** are configured, a potentiometer at input F12 can be used to trigger an external demand for operation and the air volume can be set. The air volume can be predetermined between the value *Minimum air volume* (MIN AA) and 100 %. The input F12 is evaluated as follows:

- Resistance 1000 to 2000 Ω:
  System operation required. Minimum air volume determined by the potentiometer (potentiometer setting 2000 Ω equals 100 %).
- Resistance ∞ (= BE1 open):
  System operation according to the times-of-use. Minimum air volume determined by the controller setting.

Functions	WE	Configuration
External demand of operation with BE1 and BE4	OFF	Fb13 = ON
Request for externally required signal	OFF	Fb20 = OFF
Variable air volume control over AA	OFF	Fb39 = ON
	25 % 0.0	MIN AA (min. air volume) / 0 to 100 % K_P (Factor of change)/ 0.0 to 10.0*
	* Factor of change for cascade contro only	

7.8 External demand for operation

The operation of the ventilation can be controlled with the binary inputs BE1 and BE4.

If the operating mode switch is set to automatic operation ( ), the binary inputs BE1 and BE4 have the following effect:

- BE1 and BE4 = OFF: Operation of the system corresponding to the times-of-use
- BE1 = ON, BE4 = OFF: Operation of the system, even outside of the times-of-use
- BE1 = OFF, BE4 = ON: System out of operation, even within the times-of-use

If the operating mode switch is set to reduced operation ( ), only BE1 is relevant for the external demand for operation:

- BE1 = OFF: System out of operation
- BE1 = ON: Operation of the system corresponding to the times-of-use

The system starts to run, if necessary, taking into account the system start-up function.

Function	WE	Configuration
External demand for operation with BE1 + BE4	OFF	Fb13 = ON

7.9 External demand for fan speed 2

The fan speed 2 can be demanded via the binary inputs BE4 or BE7.
The following applies:

(1) Fan speed 2 can only be switched on if the system is already in operation

(2) BE4/BE7 = ON starts the system operation with fan speed 2

Functions	WE	Configuration
2-speed fans over BA2/BA3	OFF	Fb11 = ON
		BA2 = BA3 = ON (–> page 63) BA2 = AUS, BA3 = ON (–> page 63)
	0 sec	Delay time / 0 to 60 sec
External demand for fan speed 2	OFF	Fb19 = ON
		BE4 (1), (2): Speed 2 demanded over BE4 BE7 (1), (2): Speed 2 demanded over BE7

Note:
*If the functions **External demand for operation** (Fb13 = ON) and **External demand for fan speed 2 with BE4** (Fb19 = ON, BE4) are configured, the input BE4 loses the function described in section 7.8 (system OFF) as a result.*

7.10 External selection of the operating mode

7.10.1 External selection of the operating mode using the four-staged switch

The operating mode of the ventilation can be determined by an external switch (–> Fig. 24) with four switch positions (OFF, Automatic operation, Fan speed 1 = ON, Fan speed 2 = ON). For this, the operating mode switch must be set to automatic operation ( ).

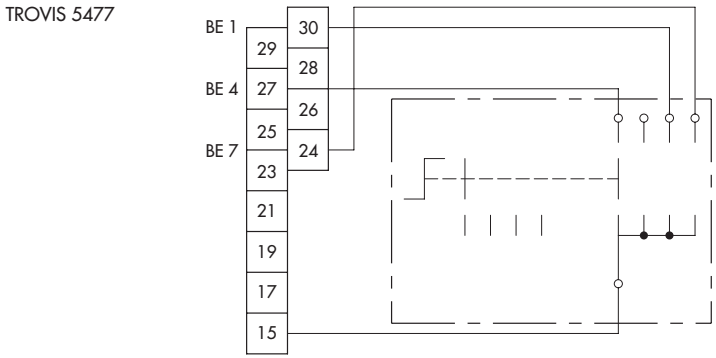


Fig. 23 · Example for the selection of the operating mode with an external switch

Functions	WE	Configuration
2-speed fans over BA2/BA3	OFF	Fb11 = ON
		BA2 = BA3 = ON (–> page 63)
		BA2 = OFF, BA3 = ON (–> page 63)
	0 sec	Delay time / 0 to 60 sec
External demand for operation with BE1 + BE4	OFF	Fb13 = ON
External demand for fan speed 2	OFF	Fb19 = ON, ***option:*** BE7*

* BE7 recognizable from the square at the bottom right of 7

7.10.2 External selection of the operating mode using Type 5257-6 Room Panel

The ventilation operating mode can be determined using the Type 5257-6 Room Panel for wall mounting (Fig. 24).

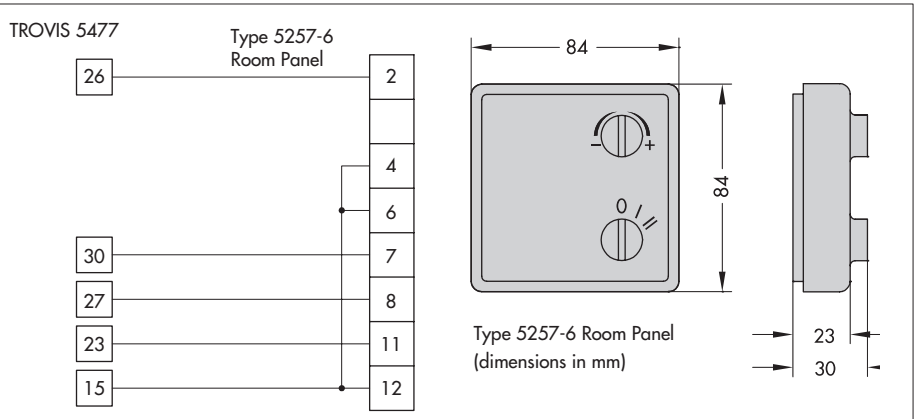


Fig. 24 · Connecting the Type 5257-6 Room Panel

It is possible to use the room panel to correct a temperature set point or to select an operating mode when it is wired as shown above.

Temperature set point correction by ±5 °C

Selecting the operating mode:

- 0 Operation of system according to the times-of-use or plant OFF outside of the times-of-use
- I Operation of system with fan speed 1 also outside of the times-of-use; fan speed 2 according to the times-of-use for fan speed 2
- II Operation of system with fan speed 2, also outside of the times-of-use for fan speed 2

The operating mode selection switch on the ventilation controller must be set to the automatic operation ( ).

Functions	WE	Configuration
2-speed fans over BA2/BA3	OFF	Fb11 = ON
		BA2 = BA3 = ON (–> page 63)
		BA2 = OFF, BA3 = ON (–> page 63)
	0 sec	Delay time / 0 to 60 sec
External demand for operation with BE1 + BE4	OFF	Fb13 = ON
External demand for fan speed 2	OFF	Fb19 = ON, ***option:*** BE4*

* BE4 recognizable from the squares at the bottom right of 1 and 7

7.11 Request for externally required signal

In complex systems, the controller can request the flow temperature required from a primary controller. The required flow temperature is requested at the analog output AA by using a 0 to 10 V signal. 0 to 10 V correspond to 0 to 120 °C.
If the heating coil control signal exceeds the limit value *Change when Y1 MAX* , the request for the externally required signal is increased gradually until the value *Flow requirement MAX* is reached. When the value falls below the limit value *Change when Y1 MIN* the request for the externally required signal is, in turn, gradually reduced until the set value is below *MIN AA*. When the system is inactive, the output for the request for the externally required signal is always at 0 V. A new operating phase is started with the same request for the externally required signal that it ended with; when operation starts with the start-up function, the temperature set under *MAX AA* is always requested.

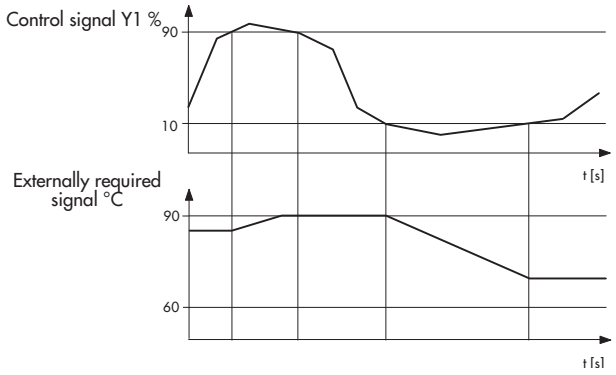


Fig. 25 · Request for the externally required signal

Function	WE	Configuration
Request for externally required signal	OFF	Fb20 = ON
	90 °C	MIN AA (flow requirement) / 0 to 120 °C
	90 °C	MAX AA (flow requirement) / 0 to 120 °C
	10 %	MIN (change when Y1) / 0 to 100 %
	90 %	MAX (change when Y1) / 0 to 100 %

7.12 Outdoor temperature output

If the analog output AA is not required for air volume control or the request for the externally required signal and Anl 8 or Anl 9 is not selected, the outdoor temperature is issued as a 0 to 10 V signal at the analog output AA. The outdoor temperature can be measured either with a temperature sensor at F3 or alternatively using an analog input. The measuring range is permanently allocated:
0 to 10 V = −40 to +50 °C.
The outdoor temperature can be passed on to other controllers using this function.

Functions	WE	Configuration
Request for externally required signal	OFF	Fb20 = OFF
Variable air volume control over AA	OFF	Fb39 = OFF

7.13 Locking settings

The controller is protected against unwanted configuration and parameterization. First when this function is inactivated, the settings in the controller can be changed. The settings for time and date, times-of-use (for vacations and public holidays as well), the set points for supply air, exhaust air and room temperatures as well as the set points of the slave loop are not affected by the locking function. The locking function is inactivated by switching it off.

Function	WE	Configuration
Locking settings	OFF	Fb37 = ON

8 Malfunctions

Interruptions or short circuits in the sensor wiring along with other malfunctions are indicated on the display with the blinking symbol ¦ . Additionally, they are indicated over the fault indication output BA6. In the operating level, – – – – appears on the display instead of a measured value when a sensor has failed.

Fault alarm output

The binary output BA6 is an open collector output. Er It is activated when the error status register is > 0. A maximum of 24 V DC may be applied to this output; the electric current should not exceed 10 mA when being switched.

8.1 Sensor failure

The controller reacts to a fault as described below:

- Supply air control:
  When the supply air sensor fails, all control outputs run a 0 % control signal and the binary outputs for pumps and fans maintain their operating states; when the frost protection is active, the fans are switched off.
- Exhaust air or room control (without supply air sensor):
  When the exhaust air or room sensor fail, all control outputs run a 0 % control signal and the binary outputs for pumps and fans maintain their operating status; when the frost protection is active, the fans are switched off.
- Exhaust air or room control/cascade control (with supply air sensor):
  Control to supply air maximum limit
- When other sensors fail, the system operation is fixed as if these sensors have not been configured.

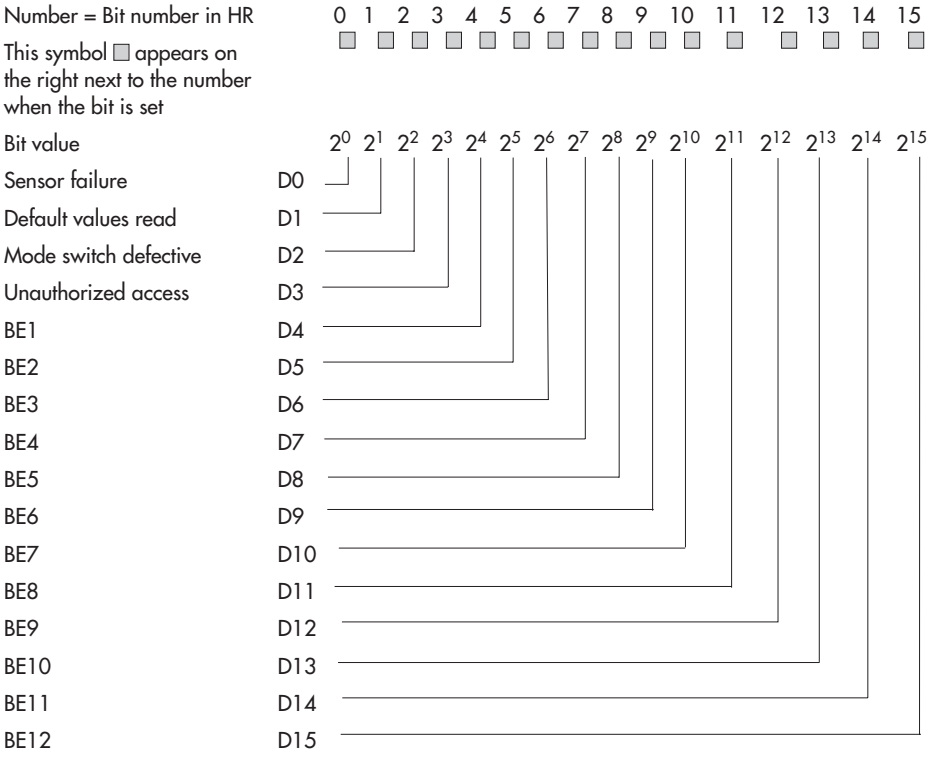
8.1.1 Status register (FSR)

If one of the function blocks Fb25 to Fb36 is activated, the messages of the corresponding binary inputs BE01 to BE12 are entered in the status register.

Function	WE	Configuration
BE01 to 12 to status register	OFF	Fb25 to Fb36 = ON STEIG: Message when the binary input makes contact FALL: Message when the binary input breaks contact

Note:
When Fb14 = ON (Fan operation feedback to BE2) and Fb26 = ON (BE in FSR), should a fault occur, then "Fan malfunction" is registered in the FSR and not just the switching state of BE2.

You can read the status register by keeping the enter key pressed down in the operating level when the baud rate appears in the display. The display can be interpreted as shown below:



The binary inputs are registered in the status register when the function block associated with it is activated in the configuration level.

9 Communication

The TROVIS 5477 Ventilation Controller can communicate with a building management system (GLT) over the serial system bus interface. A complete control system can be set up using an appropriate software for visualization and communication.

The following communication versions are possible:

Operation with a modem for a dial-up line to the system bus interface RS-232
Communication is automatically established only when faults in the plant occur. The controller works autonomously, yet it can be dialed over the modem for data retrieval at any time, and influenced, if necessary. The use of a modem connecting cable (1400-7139) is recommended.

Operation with a modem for a dedicated line to the system bus interface RS-232
Communication is established constantly over a dedicated line using two dedicated line modems. This version is used to bridge long distances or for the use of other signal level converters. The controller and modem can also be connected using a modem connecting cable (1400-7139).

Operation with a four-wire bus to the system bus interface RS-485
The signal level must be converted by a converter (SAMSON TROVIS 5484) for the connection between PC and bus line.

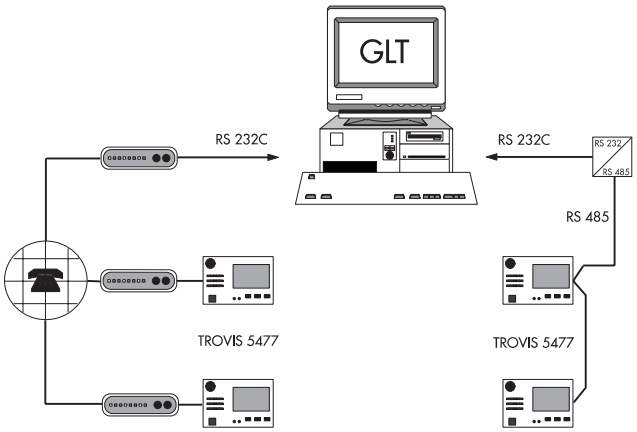


Fig. 26 · Network structure

The TROVIS 5477 Ventilation Controller is equipped with either a RS-232-C or a RS-485 interface depending on the order. It is not possible to change the interface later.

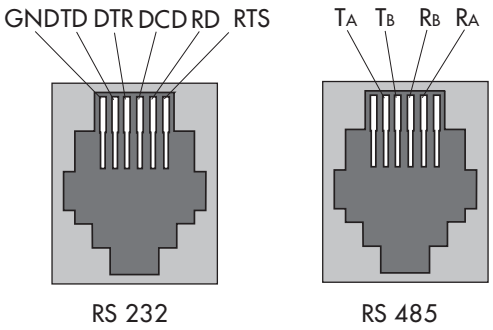


Fig. 27 · Pin assignment RS-232-C and RS-485

9.1 RS-232-C serial interface

The system bus connection is located on the back of the controller casing (RJ12 jack).
A controller can either be directly connected to a serial PC interface (point-to-point connection) or to dial-up modem. In the case, the controller is connected to the telecommunications network, a dial-up modem is required. The controller works autonomously and can trigger a call to the building control station in case of a fault.
When the modem function is active, a call to the control station is triggered as soon as the status of the status register (FSR) changes. After communication has been established with the control station and it has read the FSR, the function in the controller to trigger a call is reset.
In the case when the control station does not respond to the station address, connection is cancelled by the controller after the time *Modem-timeout to* has elapsed. If the connection to the control station is disrupted, the alternative number is dialed after the controller has attempted to redial the control station unsuccessfully by number of times set under *An*.
In special cases, the **Blocking modem dialing** function can be selected to prevent a call being made when a fault occurs. The building control station can also be informed when a previously reported fault no longer exists with the **Dialing also when fault no longer exists** function.

Functions	WE	Configuration
Modem operation	OFF	Fb44 = ON
		8 bit/16 bit addressing
	30 min	Cyclic initialization *In** / 0 to 255 min
	5 min	Modem dialing interval *PA** / 0 to 255 min
	5 min	Modem timeout *to** / 0 to 99 min
	PULS	Dialing procedure / PULS, ton
	–	Phone number *GLT**

Functions	WE	Configuration
Fault dialing	OFF	Fb45
Alternative phone number	OFF	Fb46 = ON
	5	Number of dial attempts GLT *An** / 0 to 99
	–	Alternative phone number*
Blocking modem dialing	OFF	Fb47
Parameters*	WE	Range of values
Station address	255	0 to 247 (8 bit), 0 to 999 (16 bit)
Baud rate *BAUD*	9600	150, 300, …, 4800, 9600

* -> Section 9.3 (Description of the communication parameters to be set)

9.2 RS-485 interface

The operation using a RS-485 serial interface requires a continuous bus connection (data cable) with four-wire connection. The bus line connects all the control devices through an open ring. The four-wire bus is connected to the control station at the end of bus line using a RS-485/RS-232 converter (e.g. TROVIS 5484).
The maximum cable length is 1,200 m. In this segment, up to 32 devices may be connected. If you wish to use more devices or bridge greater distances, make sure repeaters (e.g. TROVIS 5482) are installed to replicate the signal. On the whole, max. 246 participants can be connected in line.

⚠ ***Caution!***
For the installation, observe the standards and regulations for lightning and overvoltage protection.

Function	WE	Configuration
Modem operation	OFF	Fb44 = OFF 8 bit/16 bit addressing
Parameters*	WE	Range of values
Station address	255	0 to 247 (8 bit), 0 to 999 (16 bit)
Baud rate *BAUD*	9600	150, 300, …, 4800, 9600

* -> Section 9.3 (Description of the communication parameters to be set)

9.3 Description of the communication parameters to be set

Station number
The stations number is the controller's address. It can only be allocated once in a system (network).

Baud rate (*BAUD*)
Transmission rate.

Within a bus system, the transmission rate is the same as the transfer rate between the control station and the controller. The baud rate within the system must always be the same.

Pulse or multifrequency dialing PULS/ton (Fb44)
Determines the dialing procedure: Pulse dialing (Puls) or multifrequency dialing (ton).

Telephone number of the control station
The telephone number may have 23 characters at the maximum. "-" indicates the end of the string. Enter short pauses (e.g. between dialing code and the telephone number) using "P". Example: Telephone number 069-654321 --> Enter 0 6 9 P 6 5 4 3 2 1 -

Telephone number of the alternative recipient (*NR ALT*)
Enter the number in the same manner as the control station number.

Modem dialing interval (*PA*)
The time interval that must be kept between two calls.

Number of dialing attempts (*An*)
The number of attempts to dial the control station when the control station line is busy without resetting the function to trigger a call by the control system. After the specified number of redialing attempts have failed, the controller uses the alternative phone number. The function to trigger a call is reset by the control system by retrieving the status register (FSR).

Cyclic initialization (*In*)
This parameter defines the period of time for a cyclical issue of the initialization command "ATZ". The command is not issued during dial-up or when connected. The ATZ initialization causes the profile 0 to be copied to the active profile in the modem provided the modem parameters have been set and saved in profile 0 using a terminal program that came with the modem.

Note!
When using a dial-up modem, no data can be written to the controller at first after the connection has been established! To unlock, the key number needs to be sent to holding register 158.

9.4 Memory module

The use of a memory module (order no. 1400-7142) is particularly useful for transferring all the configuration data from one TROVIS 5477 Controller to other controllers.

The memory module has a sub-D 25-pin female connector on the front panel. After inserting the RJ12 jack of the memory module into the controller, ***77 SP*** appears on the display. If the memory module already contains data from another controller, ***SP 77*** appears on the display when the arrow keys are pressed.

- Press the enter key when ***77 SP*** appears on the display to upload controller settings onto the memory module.
- Press the enter key when ***SP 77*** appears on the display to download data on to the controller from the memory module.

The bars run across the top section of the display to indicate that data transmission from the memory module to the controller is in progress. When the bars stop running across the display, carefully remove the RJ12 jack.

10 Installation

The controller consists of the controller housing with the electronics and the rear panel of the controller with the terminals. It is suitable for panel, wall and top hat rail mounting (Fig. 29).

Panel mounting

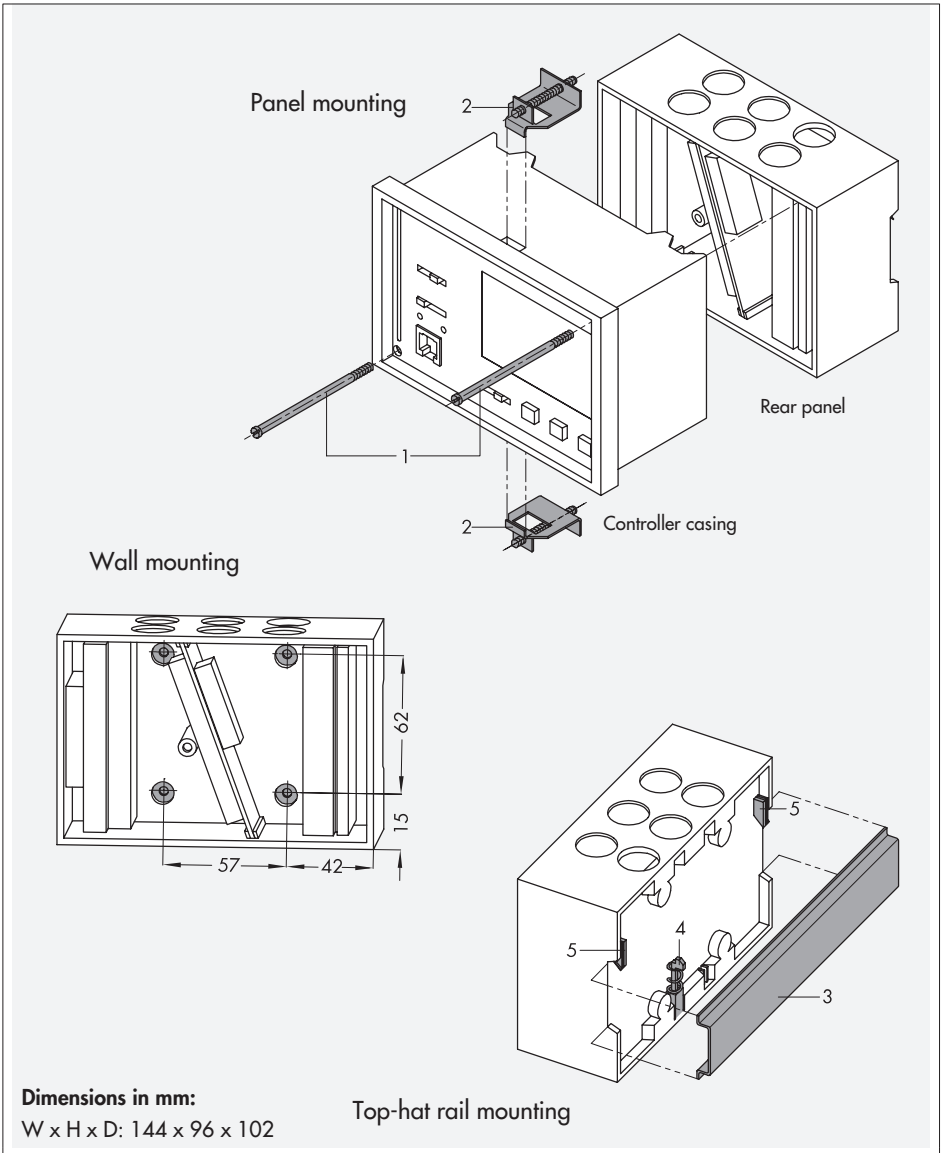
1. Remove both screws (1).
2. Pull apart the controller housing and the rear panel.
3. Make a cut-out of 138^{+1} x $92^{+0.8}$ mm (w x h) in the control panel.
4. Insert the controller housing through the panel cut-out.
5. Insert a mounting clamp (2) each at the top and the bottom. Screw the threaded rod towards the panel, so that the housing is clamped against the control panel.
6. Install the electrical connections at the rear of the housing as described in chapter .
7. Fit the controller housing.
8. Fasten both screws (1).

Wall mounting

1. Remove both screws (1).
2. Pull apart the controller housing and the rear panel.
3. If necessary, bore holes with the specified dimensions in the appropriate places. Fasten the rear of the housing with four screws.
4. Install the electrical connections at the back of the housing as described in chapter 11.
5. Fit the controller housing.
6. Fasten both screws (1).

Top hat rail mounting

1. Fit the spring-loaded hook (4) at the bottom of the top hat rail (3).
2. Slightly push the boiler controller upwards and pull the upper hooks (5) over the top hat rail.



Dimensions in mm:
W x H x D: 144 x 96 x 102

Fig. 28 · Mounting the controller

11 Electrical connection

⚠ ***Caution!***
For the wiring and connection of the controller, you are required to observe the regulations of the Association of German Electrical Engineers (VDE) and your local power supplier. For this reason, this type of work must be carried out by a specialist.

⚠ ***Caution!***
The controller inputs are not DC-isolated from the control outputs. If actuators and active sensors are used which are supplied from the same operating voltage source, either all the actuators or all the sensors must be DC-isolated. ***If these instructions are not followed, the controller may be destroyed.***

Notes concerning the electric wiring

- Use separate cables for the 230 V supply lines and the signal lines! To improve the noise immunity, keep a minimum distance of 10 cm between these cables. This distance also applies to the cables inside the control cabinet.
- Use separate cables for the digital signals (bus lines) and the analog signals (sensor cables, analog outputs).
- We recommend that shielded cables be used for analog signal lines in systems with a high level of electromagnetic noise. Ground the shield at the control cabinet inlet or outlet, using a large surface contact. Connect the central grounding point using a cable with ≥ 10 mm^2 on the shortest route to the PE grounding conductor.
- Equip the inductances in the control cabinet, e.g. contactor coils, with suitable interference suppressors (RC elements).
- Control cabinet elements with high field strengths, e.g. transformers or frequency converters, should be shielded by means of separators that have good chassis ground.

Surge protection measures

- If signal lines are routed outside of buildings or over long distances, you are required to provide appropriate surge protection measures. Theses are imperative when bus lines are used.
- The shield of signal lines that are routed outside buildings must have current carrying capacity and must be grounded on both sides.
- The surge diverters must be installed at the control cabinet inlet.

Connecting the controller

Connect the controller as shown in Fig. 30.

⚠ ***Note!***

It is important to observe the system code number and the configuration.

---

1. Open the casing.

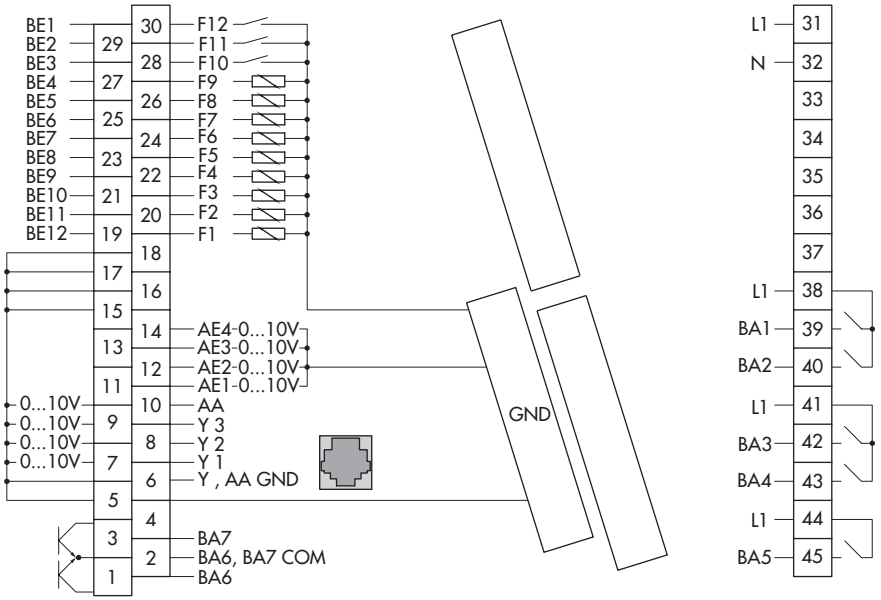
2. Make holes to feed through cables at the marked locations on the top, bottom or back of the rear casing. Insert the enclosed grommets.

Connecting sensors

Connect cables with a minimum cross-section of 2 x 0.5 mm^2 to the terminal strip of the casing rear panel.

Connecting actuators and pumps

Guide cables suitable for damp locations with a minimum cross-section of 1.5 mm^2 to the terminal strip of the controller according to the wiring plan.



AA Analog output
AE Analog input
BA Binary output
BE Binary input
F Sensor or potentiometer input
GND Ground
Y Control output

Fig. 29 · Electrical connections

12 Appendix

12.1 Function block list CO

Fb	Function	WE	Anl	Comment Function block parameter/Range of values (default)
1	Sensor F1, Supply air temperature		0 to 9	Fb1 = ON: Sensor active; always active with supply air/exhaust air cascade control and room cascade control; Fb1 = OFF: Sensor inactive; always inactive if Fb18 = ON with AE1F1
2	Sensor F2, Exhaust air temperature		0 to 9	Fb2 = ON: Sensor active; always active with exhaust air control/exhaust air cascade control Fb2 = OFF: Sensor inactive; always inactive if Fb18 = ON with AE3F2
3	Sensor F3, Outdoor temperature		0 to 9	Fb3 = ON: Sensor active Fb3 = OFF: Sensor inactive; always inactive if Fb18 = ON with AE_F3
4	Sensor F4, Return air temperature heating coil		0 to 6, 8, 9	Fb4 = ON: Sensor active Fb4 = OFF: Sensor inactive
5	Sensor F5, Room temperature		0 to 9	Fb5 = ON: Sensor active; always active with room control/cascade control Fb5 = OFF: Sensor inactive; always inactive if Fb18 = ON with AE3F5
6	Sensor F6, Return temperature HR		3, 5	Fb6 = ON: Sensor active Fb6 = OFF: Sensor inactive
	Sensor F6, Supply air humidity		6, 8, 9	Fb6 = ON: Sensor active; always active with supply air, exhaust air cascade control and room cascade control Fb6 = OFF: Sensor inactive; always inactive if Fb18 = ON with AE2F6
7	Sensor F7, mixed air or extract air temperature		2, 4	Fb7 = ON: **Select:** *Mixed air sensor:* Mixed air temperature control *SEQ:* Operation in sequence with extract air temperature Fb7 = OFF: **Select:** *SEQ:* Operation in sequence *AT:* Outdoor temperature-compensated mixed air chamber operation

Fb	Function	WE	Anl	Comment Function block parameter/Range of values (default)
7	Sensor F7, exhaust air or room humidity		0 to 9	Fb7 = ON: Sensor active; always active with exhaust air, exhaust air cascade, room or room cascade control Fb7 = OFF: Sensor inactive; always inactive if Fb18 = ON with AE4F7
8	F8, Potentiometer Temperature set point	OFF	0 to 9	Fb8 = ON: Set point adjustable by ±5 °C (with 1000 to 2000 Ω)
9	F9, Potentiometer Outdoor air rate	OFF	2, 4	Fb9 = ON: Proportion of outdoor air adjustable between *Minimum outdoor air rate* (PA) and 100 % (with 1000 to 2000 Ω)
	F9, Potentiometer Humidity set point	OFF	6, 8, 9	Fb9 = ON: Set point adjustable by ±20 % rH (with 1000 to 2000 Ω)
10	Night purge	OFF	0 to 9	Fb10 = ON: Only with outdoor and room temperature; **Function block parameters:** *START (Night purge enabled)/STOP up to 50 °C; (24 °C)* *STOP (Night purge ends)/10 to START (18 °C)* *Temperature difference to outdoor temperature:* 0 to 50 °C (5 °C)
11	2-speed fans over BA2/BA3	OFF	0 to 9	Fb11 = ON: **Select:** BA2 = BA3 = ON; BA2 = AUS, BA3 = ON **Function block parameters:** *Delay time*/0 to 60 sec (0 sec)
12	Cold storage	OFF		Fb12 = OFF: **Function block parameters:** *START* (Cold storage enabled at outdoor temperature)/0 to 30 °C (18 °C)

Fb	Function	WE	Anl	Comment Function block parameter/Range of values (default)
12	BA4 dependent on Y3 or controlling the chiller	OFF	1, 4 to 9 for 7 only SEQ	Fb12 = ON: **Select:** *SEQ* (operation in sequence) / *PAr* (operation in parallel) **Function block parameters with SEQ:** *START* (Activation value)/*STOP* up to 100 % (30 %) *STOP* (Deactivation value)/0 % up to *START* (10 %) **Function block parameters with PA:** *START MIN* (Minimum activation time)/0, 60 to 3600 sec; (600 sec) *STOP MIN* (Minimim deactivation time) /0, 60 to 3600 sec (600 sec) *STOP* (Deactivate cooling when Y1 >)/0 to 100 % (50 %)
13	External request for operation with BE1 and BE4	OFF	0 to 9	Fb13 = ON and operating mode switch at BE1 = ON, BE4 = OFF: System ON; with start-up mode, if needed BE1 = BE4 = OFF: Operation acc. to times-of-use BE4 = ON: System out of operation Fb13 = ON and ooperating mode switch at : BE1 = ON: Operation according to times-of-use BE1 = OFF: System out of operation
14	Fan operation feedback to BE2	OFF	0 to 9	Fb14 = ON:**Function block parameters:** *START* (Delay time)/0 to 180 sec (180 sec)
15	System frost protection with BE3	OFF	0 to 9	Fb 15 = ON: Standard operation or frost protection dependent on BE3: BE3 = OFF: Frost protection mode BE3 = ON: Standard operation
16	Automatic switchover between summer and winter	ON	0 to 9	Fb16 = OFF: Automatic switchover between summer time and winter time
17	Selecting sensor type	OFF	0 to 9	Fb17 = ON:Pt100 and Pt1000 sensors, mixed possible Fb17 = OFF: Pt100 and PTC sensors, mixed possible

Fb	Function	WE	Anl	Comment Function block parameter/Range of values (default)
18	Assigning the inputs AE1 to AE4; 0 to 10 V **Note:** Temperature measured variables can only be imposed on the analog inputs as an alternative if they are labeled in the system diagrams. Locking prevents an input being assigned twice.	OFF	0 to 9	Fb18 = ON:Determine measured variable and measuring range for AE1 to AE4 ; **Select measured variable**: – – (not assigned), *AE1F1*(supply air temperature F1), *AE3F2* (exhaust air temperature F2, or *AE2F3* (outdoor temperature F3), *AE3F5* (room temperature F5), *AE2F6* (supply air humidity F6), *AE4F7* (exhaust air or room humidity F7), or *AE4L* (air quality L) **Function block parameters:** MIN to MAX Temperatures for F1, F2, F3, F5: *MIN:* –40 to 0 °C (–40 °C) *MAX:* 0 to 70 °C (50 °C) Humidity for F6, F7*:* *MIN:* –10 to 10 % rH (0 % rH) *MAX:* 90 to 110 % rH (100 % rH) Air quality (0 to 10 V = 0 to 100 L): *MIN:* –10 to 10 L (0 L) *MAX:* 90 to 110 L (100 L)
19	External demand for fan speed 2	OFF	0 to 9	Fb19 = ON: Only with Fb11 = ON; **Select:** *BE4, BE7,* dependent on or independent from BE1
20	Request for externally required signal	OFF	0 to 9	Fb20 = ON:Externally required signal; **Function block parameters:** *MIN AA* (Flow requirement)/0 to 120 °C (90 °C) MAX AA (Flow requirement)/0 to 120 °C (90 °C) *MIN* (Change when Y1)/0 to 100 °C (10 °C) *MAX* (Change when Y1)/0 to 100 °C (90 °C) Fb20 = OFF: Outdoor temperature, when available, to AA: –40 to 50 °C = 0 to 10 V
21	Operating action of Y1	OFF	0 to 6, 8, 9	Fb21 = ON: 0 to 100 % = 10 to 0 V Fb21 = OFF: 0 to 100 % = 0 to 10 V
22	Operating action of Y2	OFF	2 to 9	Fb22 = ON: 0 to 100 % =10 to 0 V Fb22 = OFF: 0 to 100 % = 0 to 10 V
23	Operating action of Y3	OFF	1, 4 to 9	Fb23 = ON: 0 to 100 % = 10 to 0 V Fb23 = OFF: 0 to 100 % = 0 to 10 V

Fb	Function	WE	Anl	Comment Function block parameter/Range of values (default)
24	Operating action of L	OFF	0 to 9	Fb24 = ON: 0 to 100 L = 10 to 0 V Fb24 = OFF: 0 to 100 L = 0 to 10 V
25	BE01 in FSR	OFF	0 to 9	Fb25 = ON: **Select:** *StEIG* (entry in FSR for rising signal edge; make contact) *FALL* (entry in FSR for negative signal edge; break contact) ***Note:*** *Can only be changed with code number.*
26	BE02 in FSR	–> Fb 25		
27	BE03 in FSR	–> Fb 25		
28	BE04 in FSR	–> Fb 25		
29	BE05 in FSR	–> Fb 25		
30	BE06 in FSR	–> Fb 25		
31	BE07 in FSR	–> Fb 25		
32	BE08 in FSR	–> Fb 25		
33	BE09 in FSR	–> Fb 25		
34	BE10 in FSR	–> Fb 25		
35	BE11 in FSR	–> Fb 25		
36	BE12 in FSR	–> Fb25		
37	Locking settings	OFF	0 to 9	Fb37 = ON: CO level locked; PA level locked except for time, date, set points, times-of-use, public holidays and vacations ***Note:*** *Can only be changed with code number.*
38	BA5 dependent on Y1	OFF	0 to 9	Fb38 = ON: BA5 ON/OFF dependent on Y1; **Function block parameters:** *START* (Activation value)/STOP up to 100 % (30 %) *STOP* (Deactivation value)/0 up to START (10 %) Lag time of the fans/0 to 60 sec (10 sec)
39	Variable air volume via analog output AA	OFF	0 to 7	Fb39 = ON: Only with Fb20 = OFF; control of AA dependent on analog input for air quality **Function block parameters:** *MIN AA* (Minimum air volume)/0 to 100 % (25 %), K_p (Factor of change)/0.0 to 10.0 (0.0) * Only with cascade control

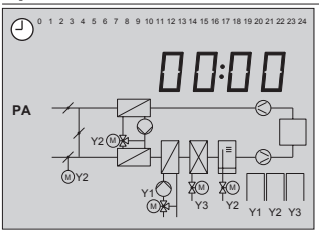
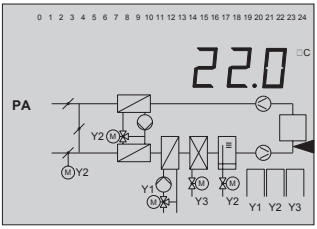
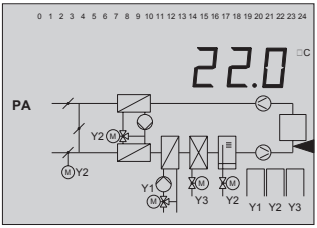
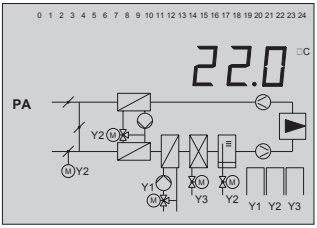
Fb	Function	WE	Anl	Comment Function block parameter/Range of values (default)
40	Condensation detection	OFF	1, 4, 5, 6*, 7, 8*, 9*	Fb40 = ON: **Select:** BE4, BE7 *StEIG* (entry in FSR for rising signal edge; make contact) FALL (entry in FSR for negative signal edge; break contact) ***Note:*** *Can only be changed with code number.*
41	Automatic reversal of the operating action	OFF	3, 5, 9	Fb41 = ON: Only with Fb2 = ON and Fb3 = ON **or** AE3F2 and AE2F3
42	Fan operation dependent on room temperature/room humidity	OFF	0 to 9	Fb42 = ON: Only with Fb11 = ON, with room control or room cascade control and/or with Fb7 (AE4F7); **Select** Reaction: *MIN* (When value falls below limit) MAX (When value exceeds limit) **Function block parameters:** *Difference in room temperature set point:* 1 to 10 °C (5 °C) **or** *Difference in room humidity set point:* 1 to 10 % rH (5 % rH)
43	Circulating air mode after system start-up	OFF	2, 4, 8	Fb43 = ON: Activated, not with supply air control
44	Modem operation	OFF	0 to 9	Fb44 = ON:Activated, **function block parameters:** 8 bit/16 bit addressing *In* (Cyclic initialization)/0 to 255 min (30 min) *PA* (Dialing interval when line is busy)/0 to 255 (5 min) *to (Time after missing Modbus query)*/0 to 99 min (5 min) *PULS/ton* (Dialing procedure) (PULS) Control station phone number: (0 to 9, P = Pause, - = End; maximum 23 characters) ***Note:*** *Can only be changed with the code number.*
45	Dialing when faults occur	OFF	0 to 9	Fb45 = ON: Dialing initiated for incoming and outgoing faults Fb45 = OFF: Dialing initiated for incoming faults ***Note:*** *Can only be changed with the code number.*

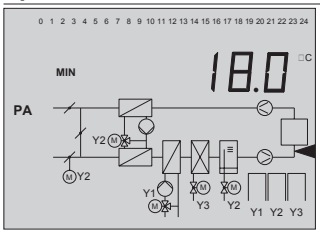
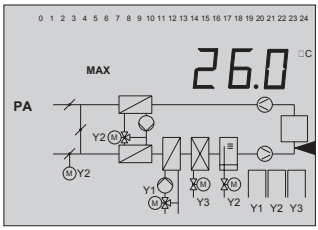
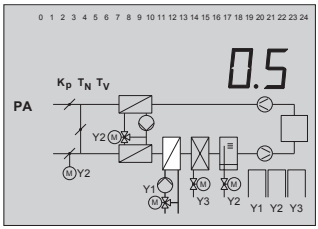
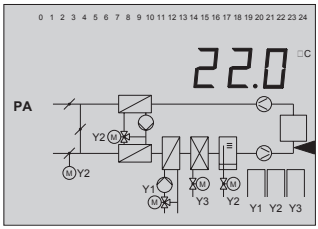
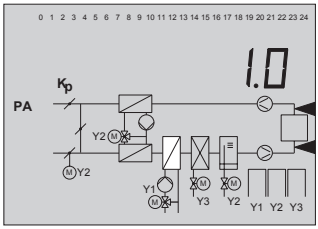
Fb	Function	WE	Anl	Comment Function block parameter/Range of values (default)
46	Alternative recipient	OFF	0 to 9	Fb46 = ON: Alternative number; **Function block parameters:** *An* (Number of dialing attempts to control station)/ 0 to 99 (5) *Alternative recipient's telephone number/0 to 9, P = Pause, - = End; maximum 23 characters)* ***Note:*** *Can only be changed with the code number.*
47	Prevent modem dialing	OFF	0 to 9	Fb47 = ON: Modem does not dial control station because of FSR change ***Note:*** *Can only be changed with the code number.*

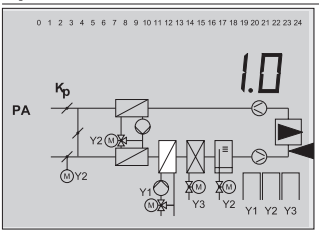
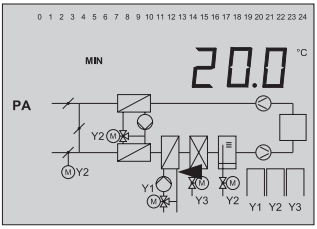
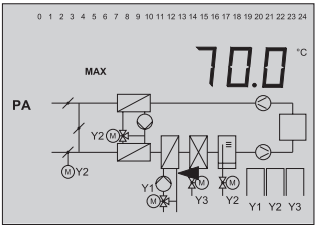
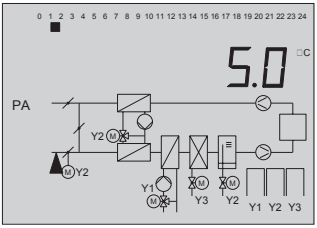
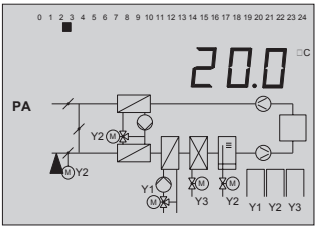
12.2 List of parameters

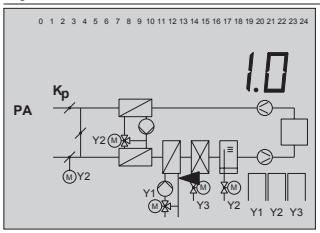
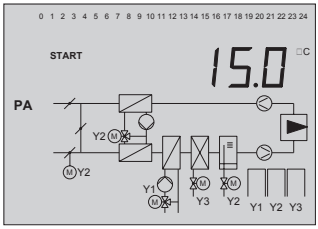
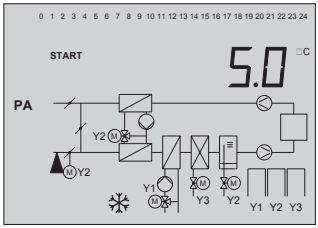
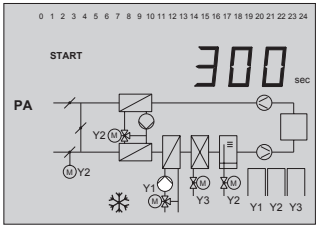
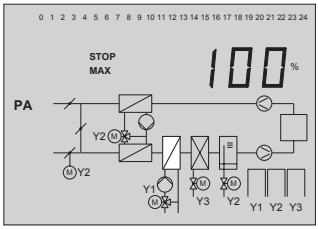
Parameters in *PA level*

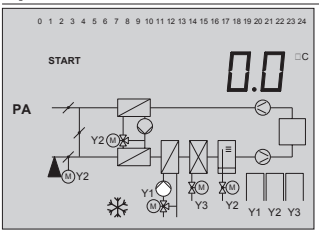
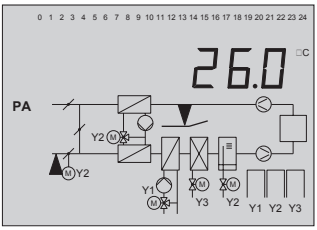
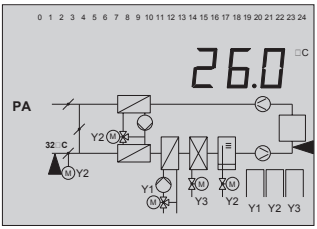
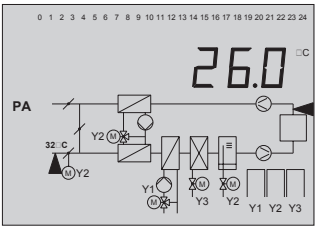
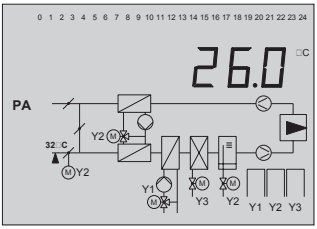
The parameters displayed below are just examples. The system shown does not appear in the controller.

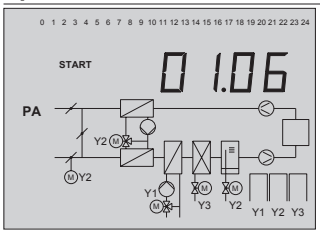
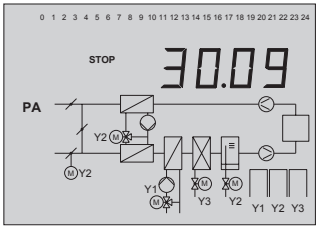
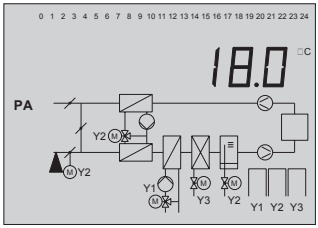
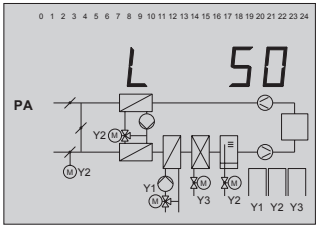
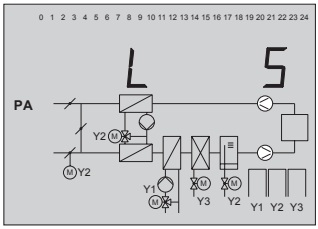
Symbol	Parameter description / Range of values (default setting)
	Time
	Supply air temperature set point (0 to 50 °C; WE = 22 °C)
	Exhaust air temperature set point (0 to 40 °C; WE = 22 °C)
	Room temperature set point (0 to 40 °C; WE = 22 °C)

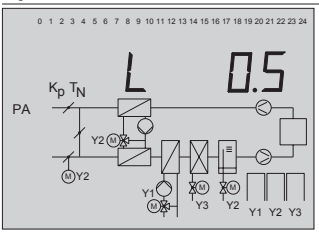
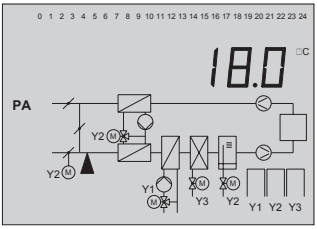
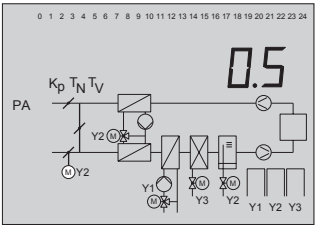
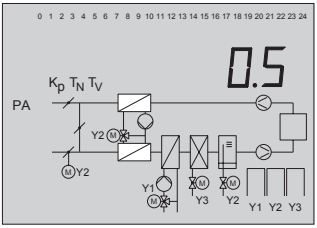
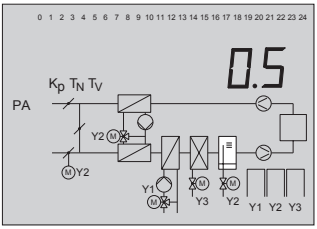
Symbol	Parameter description / Range of values (default setting)
	Supply air temperature minimum limit (0 °C to [Supply air temperature maximum limit]; WE = 18 °C)
	Supply air temperature maximum limit ([Supply air temperature minimum limit] to 50 °C; WE = 26 °C)
	K_P Heating coil (0.1 to 99.9; WE = 0,5) T_N Heating coil (1 to 999 sec; WE = 60 sec) T_V Heating coil (– – – to 999 sec; WE = – – –)
	Temperature set point of the slave loop (0 to 50 °C; WE = 22 °C)
	K_P Temperature master loop (0.1 to 99.9 sec; WE = 1.0)

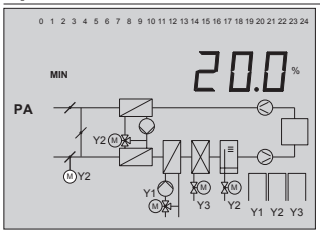
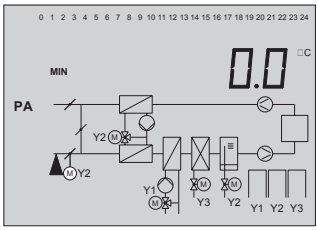
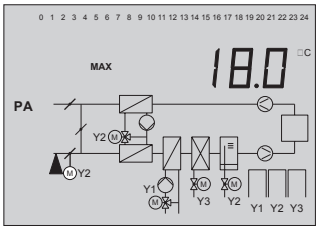
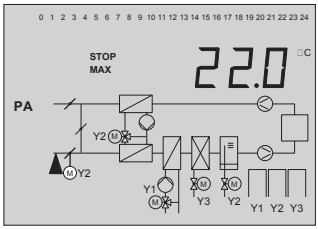
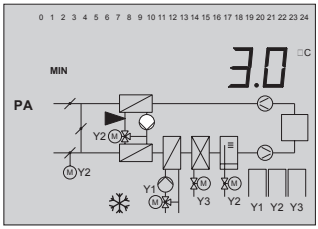
Symbol	Parameter description / Range of values (default setting)
	K_P Temperature master loop (0.1 to 99.9; WE = 1.0)
	Return air temperature minimum limit (0 °C to [Return air temperature maximum limit]; WE = 20 °C)
	Return air temperature maximum limit (coordinate 1, 2 recognizable from the square located to the right of 1, 2) ([Return air temperature minimum limit] to 100 °C; WE = 70 °C)
	Outdoor temperature, coordinate 1 (–50 to 20 °C; WE = 5 °C)
	Outdoor temperature, coordinate 2 (–50 to 20 °C; WE = 20 °C)

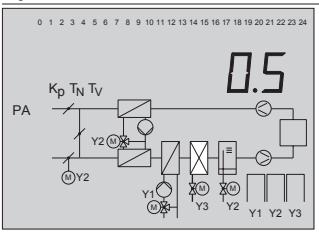
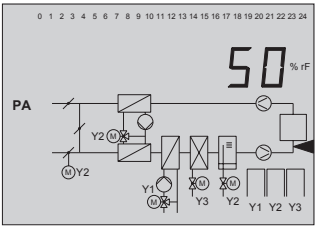
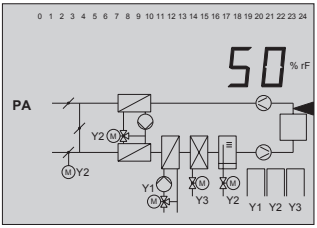
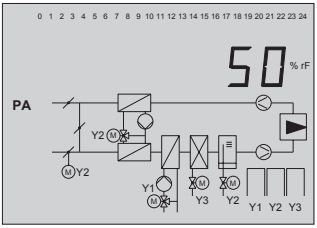
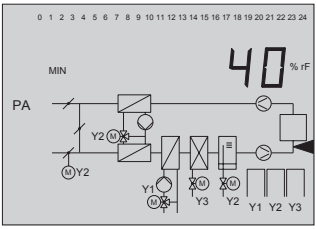
Symbol	Parameter description / Range of values (default setting)
	Return air temperature limit factor (0 to 10; WE = 1)
	Sustained room temperature (0 to 20 °C; WE = 15 °C)
	Start-up mode when the outdoor temperature is smaller (0 to 10 °C; WE = 5 °C)
	Pump advance running time for start-up (0, 60, 120 to 900 sec; WE = 300 sec)
	Control signal limit for Y1 (0 to 100 %; WE = 100 %)

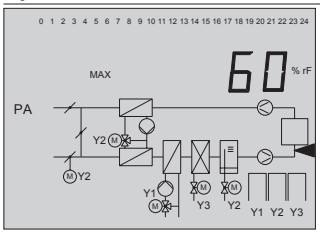
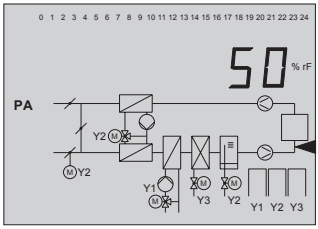
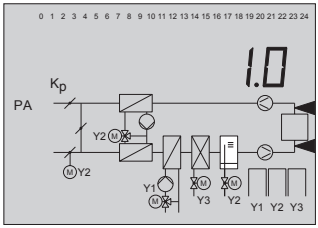
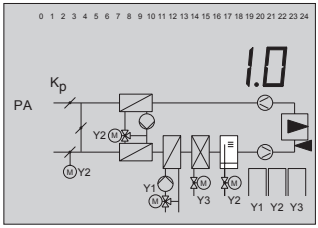
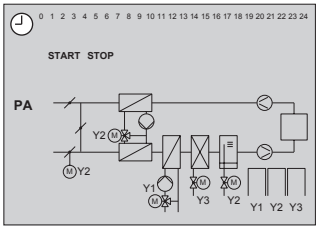
Symbol	Parameter description / Range of values (default setting)
	Pump ON when the outdoor temperature is smaller (–50 to 10 °C; WE = 0 °C)
	Summer compensation when outdoor temperature is greater (–50 to 40 °C; WE = 26 °C)
	Set point at an outdoor temperature of 32 °C; Supply air temperature (0 to 40 °C; WE = 26 °C)
	Set point at an outdoor temperature of 32 °C; Exhaust air temperature (0 to 40 °C; WE = 26 °C)
	Set point at an outdoor temperature of 32 °C; Room temperature (0 to 40 °C; WE = 26 °C)

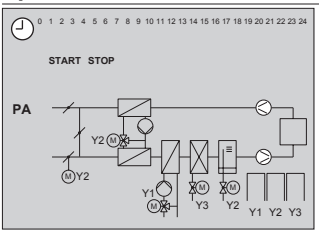
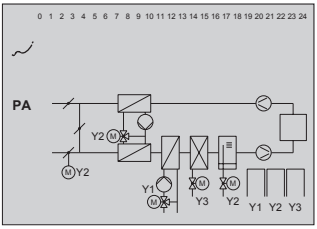
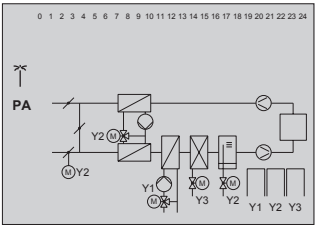
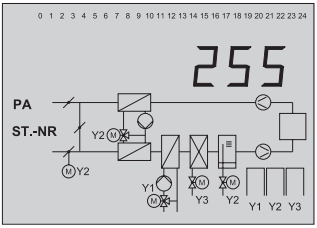
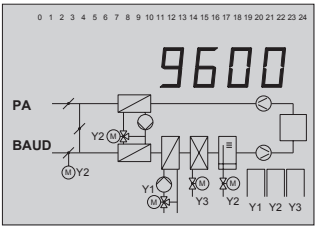
Symbol	Parameter description / Range of values (default setting)
	Date when summer deactivation is enabled (freely configurable; WE = 01.06)
	Date when summer deactivation is disabled (freely configurable; WE = 30.09)
	Outdoor mean temperature (0 to 30 °C; WE = 18 °C)
	Air quality set point (0 to 100; WE = 50)
	Differential gap of speed 2 –> 1 (5 to 30 ; WE = 5)

Symbol	Parameter description / Range of values (default setting)
	K_P Air quality control (0.1 to 99.9; WE = 0.5) T_N Air quality control (1 to 999 sec; WE = 60 sec)
	Mixed air temperature set point (10 to 30 °C; WE = 18 °C)
	K_P Mixed air chamber (0.1 to 99.9; WE = 0.5) T_N Mixed air chamber (1 to 999 sec; WE = 60 sec) T_V Mixed air chamber (– – – to 999 sec; WE = – – –)
	K_P Heat recovery (0.1 to 99.9; WE = 0.5) T_N Heat recovery (1 to 999 sec; WE = 60 sec) T_V Heat recovery (– – – to 999 sec; WE = – – –)
	K_P Humidifier (0.1 to 99.9; WE = 0.5) T_N Humidifier (1 to 999 sec; WE = 60 sec) T_V Humidifier (– – – to 999 sec; WE = – – –) **Note:** In Anl 8 and Anl 9, the humidifier is assigned to the analog output AA – not as appears on the display – to the control output Y2.

Symbol	Parameter description / Range of values (default setting)
	Minimum outdoor air rate (0 to 100 %; WE = 20 %)
	Minimum outdoor air rate when the outdoor temperature is smaller (–10 to 50 °C; WE = 0°C)
	100 % outdoor air rate when the outdoor temperature is greater (–10 to 50 °C; WE = 18 °C)
	Summer time operation when the outdoor temperature is greater (0 to 40 °C; WE = 22 °C)
	Heat recovery – Minimum temperature limit (1 to 10 °C; WE = 3 °C)

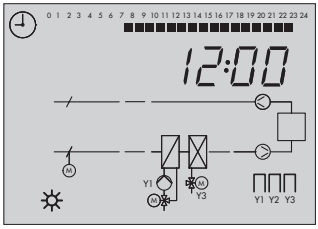
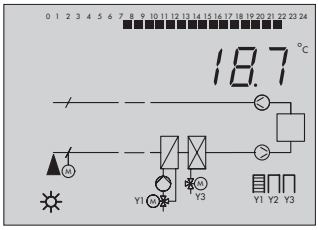
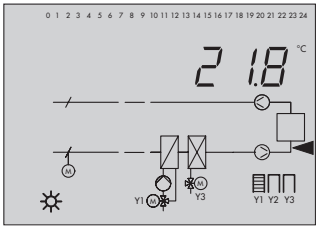
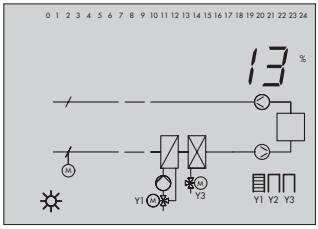
Symbol	Parameter description / Range of values (default setting)
	K_P Cooling coil (0.1 to 99.9; WE = 0.5) T_N Cooling coil (1 to 999 sec; WE = 60 sec) T_V Cooling coil (– – – to 999 sec; WE = – – –)
	Supply air humidity set point (0 to 100 % rH; WE = 50 % rH)
	Exhaust air humidity set point (0 to 100 % rH; WE = 50 % rH)
	Room humidity set point (0 to 100 % rH; WE = 50 % rH)
	Supply air humidity minimum limit (0 % rH to [Supply air humidity maximum limit]; WE = 40 % rH)

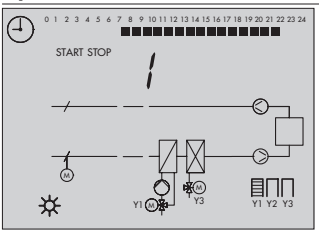
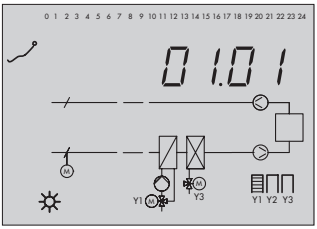
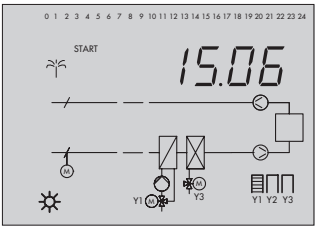
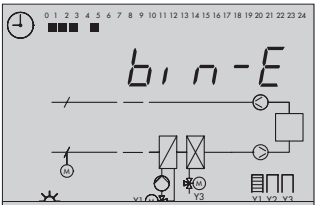
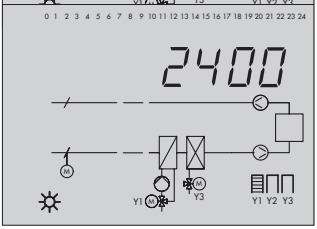
Symbol	Parameter description / Range of values (default setting)
	Supply air humidity maximum limit ([Supply air humidity minimum limit] to 100 % rH; WE = 60 % rH)
	Humidity set point of the slave loop (0 to 100 % rH; WE = 50 % rH)
	K_P Humidity master loop (0.1 to 99.9; WE = 1.0)
	K_P Humidity master loop (0.1 to 99.9; WE = 1.0)
	Times-of-use (freely configurable; WE = daily 7:00 to 22:00 hrs)

Symbol	Parameter description / Range of values (default setting)
	Times-of-use for fan speed 2 (freely configurable; WE = daily 7:00 to 22:00 hrs)
	Public holidays (freely configurable; WE = 01.01, 01.05, 25.12, 26.12) Max. 20 public holidays
	Vacations (freely configurable; WE = no vacation periods set) Max. 10 vacation periods
	Station number (1 to 247; WE = 255)
	Baud rate (150, 300, 600, 1200, 2400, 4800, 9600; WE = 9600)

12.3 Display

The data points listed below are typical displays that appear in conjunction with system code 1.

Symbol	Designation of the data point
	Time
	Outdoor temperature Press enter key: Summer deactivation active (1)/not active (0). Daily mean temperature Number of measured outdoor temperatures.
	Supply air temperature Press arrow key: Other sensor values appear. Press enter key: The set points are displayed.
	Control signal outputs, binary outputs By moving the mode selector switch to the manual mode position, all control signal outputs and binary outputs appear numerically. The switching conditions with two-speed fans are only recognizable in position. The same applies to variable air volume operation.

Symbol	Designation of the data point
	Times-of-use (Monday in this example) Press arrow key: The times-of-use for other week days are displayed.
	Public holidays (01.01 in this example) Press arrow key: All the other public holidays that have been entered appear on the display.
	Vacation (starting on 15.06 in this example) Press arrow key: All the other vacations that have been entered appear on the display.
	Binary inputs Press enter key: The binary outputs are displayed
	Baud rate Press enter key The fault status register register (FSR) appears.

12.4 Technical data

Inputs	10 configurable inputs for Pt100 and PTC sensors, Pt100 and Pt1000 sensors or binary messages including inputs for humidity measuring F6 and F7: 100 to 138.5 Ω, linear = 0 to 100 %rH or 1000 to 2000 Ω, linear = 0 to 100 %rH 2 inputs F8 and F9 only for potentiometer 1000 to 2000 Ω or binary messages 4 inputs for 0 to 10 V (Ri = 18 kΩ) for connecting active temperature, humidity and air quality sensors (adjustable temperature measuring ranges)
Outputs	
Analog outputs	4 continuous-action outputs 0 to 10 V; load > 5 kΩ
Binary outputs	5 for pumps, fans and chiller, floating Loading capacity: max. 230 V AC, 3 A cos y = 0.6; min. 230 V AC, 10 mA, 24 V AC, 50 mA 1 for fault indication, open collector, max. 24 V DC, 10 mA
Interfaces	RS 485 for connection to a four-wire bus or RS 232 for connection to a modem
Control parameters	K_P: 0.1 to 99; T_N: 1 to 999 s; T_V: 1 to 999 s
Operating voltage	230 V (+10 %, –15 %); power 3 VA
Ambient temperature	0 to 40 °C
Storage temperature	–20 to 60 °C
Degree of protection	IP 40 corresponding to IEC 529
Class of protection	I corresponding toVDE 0106
Degree of contamination	2 corresponding to VDE 0110
Overvoltage category	II corresponding to VDE 0110
Humidity rating	F corresponding to VDE 40040
Noise immunity	Corresponding to EN 61000-6-1
Noise emission	Corresponding to EN 61000-6-3
Weight	Approx. 0.6 kg

12.5 Resistance values

Resistance values with PTC measuring element

Sensor for outdoor, supply air, exhaust air and mixed air temperature: Type 5215 (duct sensor)

Sensor for outdoor temperature: Type 5227-2 (wall sensor), for heating coil return air temperature and HR circuit temperature: Type 5227-2 (immersion sensor) and Type 5267 (surface sensor)

Sensors for room temperature Type 5257-1, 5257-6 (room panel)

°C	–35	–30	–25	–20	–15	–10	–5	0	5	10
Ω	862.5	882.2	901.9	921.6	941.2	960.9	980.4	1000.0	1019.5	1039.0

°C	15	20	25	30	35	40	45	50	55	60
Ω	1058.5	1077.9	1097.3	1116.7	1136.1	1155.4	1174.7	1194.0	1213.2	1232.4

°C	65	70	75	80	85	90	95	100	105	110
Ω	1251.6	1270.7	1289.8	1308.9	1328.0	1347.0	1366.0	1385.0	1403.9	1422.9

°C	115	120	125	130	135	140	145	150
Ω	1441.7	1460.6	1479.4	1498.2	1517.0	1535.8	1554.5	1573.1

Temperature monitor thermostat for plant frost protection: Type 5312-2

Resistance values with Pt 1000 measuring element

Sensor for outdoor temperature: Type 5224, sensor for heating coil return air temperature and HR circuit temperature: Type 5264 (immersion sensor) and Type 5265 (surface sensor)

°C	–20	–10	0	10	20	25	30	40	50	60	70	80	90	100	110	120
Ω	694	757	825	896	971	1010	1050	1132	1219	1309	1402	1500	1601	1706	1815	1925

12.6 Customer data

Station	
Operator	
Responsible Samson office	
System code number	

Function block settings

Fb	ON/ OFF	Options selected, function block parameters
1		
2		
3		
4		
5		
6		
7		Mixed air temperature control Operation in sequence with extract air temperature; Operation in sequence with exhaust air temperature Outdoor temperature-compensated mixed air chamber operation
8		
9		
10		Enable night purge (START): [24] °C Finish night purge (STOP): [18] °C Temperature difference to outdoor temperature: [5] °C
11		Speed 2: BA2 = BA3 = ON or BA2 = OFF, BA3 = ON Delay time: [0] sec
12	OFF	Enable chiller at outdoor temperature (START): [18] °C
	ON	SEQ Activating value (START): [30] %; Deactivating value (STOP): [10] % PAr Minimum deactivation time (STOP MIN): [600] sec; Minimum activation time (START MIN): [600] sec; Cooling deactivated when Y1 > (STOP): [50] %
13		

Fb	ON/ OFF	Options selected, function block parameters
14		Delay time (START): [180] sec
15		
16		
17		
18	Assignment AE	AE1__ AE2__ AE3__ AE4__
		F1 Lower measuring range value MIN [–40] °C Upper measuring range value MAX [+50] °C
		F2 Lower measuring range value MIN [–40] °C Upper measuring range value MAX [+50] °C
		F3 Lower measuring range value MIN [–40] °C Upper measuring range value MAX [+50] °C
		F5 Lower measuring range value MIN [–40] °C Upper measuring range value MAX [+50] °C
		F6 Lower measuring range value MIN [0] % rH Upper measuring range value MAX [100] % rH
		F7 Lower measuring range value MIN [0] % rH Upper measuring range value MAX [100] % rH
		L Lower measuring range value MIN [0] Upper measuring range value MAX [100]
19		BE4 or BE7, dependent on or independent from BE1
20		Flow requirement (MIN AA): [90] °C, Flow requirement (MAX AA): [90] °C, Change when Y1 (MIN): [10] °C, Change when Y1 (MAX): [90] °C
21		
22		
23		
24		
25		StEIG/FALL
26		StEIG/FALL
27		StEIG/FALL
28		StEIG/FALL
29		StEIG/FALL

Fb	ON/ OFF	Options selected, function block parameters
30		StEIG/FALL
31		StEIG/FALL
32		StEIG/FALL
33		StEIG/FALL
34		StEIG/FALL
35		StEIG/FALL
36		StEIG/FALL
37		
38		Activation value (START): [30] %, Deactivation (STOP): [10] % Lag time of fans (STOP):[10) sec
39		Minimum air volume (MIN AA): [25] %; Factor of change (K_P): [0.0] (only for cascade control)
40		BE4/BE7, StEIG/FALL
41		
42		MIN/MAX Difference in room temperature set point: [5] °C Difference in room humidity set point: [5] % rH
43		
44		8 bit/16 bit addressing Cyclic initialization: In [30] min Modem dialing interval when line occupied: PA [5] min Time constant afer missing Modbus query: to [5] min Dialing procedure (pulse/multifrequency dialing) PULS/ton [PULS] Telephone number of control station GLT:
45		
46		Number of dialing attempts to control station GLT: An [5] Telephone number of alternative recipient:
47		

Parameter settings

Parameters		Range of values
Supply air temperature set point		0 to 50 °C
Exhaust air temperature set point		0 to 40 °C
Room temperature set point		0 to 40 °C
Supply air temperature minimum limit		0 to 50 °C
Supply air temperature maximum limit		0 to 50 °C
K_P Heating coil T_N Heating coil T_V Heating coil		0.1 to 99.9 1 to 999 sec - - - to 999 sec
Temperature set point of the slave loop		0 to 50 °C
K_P Temperature master loop		0.1 to 99.9
Return air temperature minimum limit		0 to 100 °C
Return air temperature maximum limit		0 to 100 °C
Return air temperature maximum limit Coordinate 1 Coordinate 2		 0 to 100 °C 0 to 100 °C
Outdoor temperature Coordinate 1 Coordinate 2		–50 to 20 °C –50 to 20 °C
Return air temperature limit factor		0 to 10
Sustained room temperature		0 to 20 °C
Start-up when the outdoor temperature is smaller		0 to 10 °C
Pump advance running time for start-up		0 to 900 sec
Control signal limit for Y1		0 to 100 %
Pump ON when the outdoor temperature is smaller		–50 to 10 °C
Summer compensation when the outdoor temperature is greater		–50 to 40 °C
Set point at an outdoor temperature of 32 °C Supply air temperature Exhaust air temperature Room temperature		 0 to 40 °C 0 to 40 °C 0 to 40 °C
Date when summer deactivation is enabled		01.01 to 31.12

Parameters		Range of values
Date when summer deactivation is disabled		01.01 to 31.12
Outdoor mean temperature		0 to 30 °C
Air quality set point		0 to 100 °C
Differential gap of speed 2 ->1		5 to 30
K_p Air quality control T_N Air quality control		0.1 to 99.9 1 to 999 sec
Mixed air temperature set point		10 to 30 °C
K_P Mixed air chamber T_N Mixed air chamber T_V Mixed air chamber		0.1 to 99.9 1 to 999 sec - - - to 999 sec
K_p Heat recovery T_N Heat recovery T_V Heat recovery		0.1 to 99.9 1 to 999 sec - - - to 999 sec
K_P Humidifier T_N Humidifier T_V Humidifier		0.1 to 99.9 1 to 999 sec - - - to 999 sec
Minimum outdoor air rate		0 to 100 %
Minimum outdoor air rate when the outdoor temperature is smaller		–10 to 50 °C
100 % outdoor air when the outdoor temperature is greater		–10 to 50 °C
Summer time operation when the outdoor temperature is greater		0 to 40 °C
Heat recovery - min. temperature limit		1 to 10 °C
K_P Cooling coil T_N Cooling coil T_V Cooling coil		0.1 to 99.9 1 to 999 sec - - - to 999 sec
Supply air humidity set point		0 to 100 %rH
Exhaust air humidity set point		0 to 100 %rH
Room humidity set point		0 to 100 %rH
Supply air humidity minimum limit		0 to 100 %rH
Supply air humidity maximum limit		0 to 100 %rH
Humidity set point of the slave loop		0 to 100 %rH
K_P Humidity master loop		0.1 to 99.9

Parameters					Range of values
Times-of-use	Start 1	Stop 1	Start 2	Stop 2	Blocks or individual days; two times-of-use 0:00 to 24:00
Monday					
Tuesday					
Wednesday					
Thursday					
Friday					
Saturday					
Sunday					
Times-of-use for fan speed 2	Start 1	Stop 1	Start 2	Stop 2	Blocks or individual days; two times-of-use 0:00 to 24:00
Monday					
Tuesday					
Wednesday					
Thursday					
Friday					
Saturday					
Sunday					
Public holidays					01.01 to 31.12
Start/end of vacation					01.01 to 31.12
Station number					8 bit/16 bit 1 to 247/999
Baud rate *BAUD*					150 to 9600

Code number: **1732**

Index

A

Analog output 18
  Display 7
  Humidifier 50
  Outdoor temperature 76
  Request for externally required signal . 75
Air quality 63
Analog input
  Exhaust air humidity 42
  Exhaust air temperature . . . . . 37 - 38
  Room humidity 42
  Room temperature 39
  Supply air temperature . . . . . 37 - 38, 40
Analog output 51
Automatic reversal of the operating direction HR 48

B

Baud rate 82
Betriebsebene 108
Binary inputs
  External demand for fan speed 2 72
  External demand for operation 71
Binary output
  Activated dependent on Y3 65
  Display outputs 7

C

Chilled buffer storage 64
Chiller 65
Control method . . . . . 37 - 41
Control signal limitation 61
Cooling coil 49

D

Date, setting 10
Dialing procedure 82
Display 9

E

Exhaust air humidity control 42
Exhaust air temperature cascade control . 38
External air volume setting 71
External demand for fan speed 2. 72
External demand for operation 71
External humidity set point correction. . . . 70
External outdoor air rate setting 70
External temperature set point correction . 70
Extract air damper 62

F

Fan operation
  Dependent on room temperature/room humidity. 57
Fan speed 2, enabling
  Dependent on the air quality 63
Frost protection
  Heat recovery. 68
  Heating coil 68
  Stand-by monitoring 69
  System 68

H

Heating coil 44
Humidifier 50

I

Installation
  Panel mounting. 84
  Wall mounting 84

L

Locking settings 76

M

Mixed air chamber
- Automatic reversal of the operating action 45
- Circulating air mode after system start-up 62
- Independent mixed air temperature control 46
- Outdoor temperature-controlled 48
- Sequential operation 45

Modem dialing interval 82

O

Operating action
- Control output Y1 67
- Control output Y2 45
- Outdoor air rate 45

Operating level 10
Outdoor air damper 62
Outdoor temperature output 76
Outdoor temperature sensor 61
Outdoor temperature-compensated supply air control 59

P

Parallel operation
- Chiller 65

Potentiometer
- Air volume setting 71
- Humidity set point correction 70
- Outdoor air rate setting 70
- Temperature set point correction 70

Public holidays 14
Pump output, display 7

R

Request for externally required signal . . . 75
Resistance values for temperature sensors 110
Return air flow temperature limitation . . . 54
Return air flow temperature sensor 61
Return air temperature sensor 69
Room temperature cascade control 40
Room temperature control 39
RS 232 C serial interface 80

S

Sensor failure . . . . . 77 - 78
Sensor version 110
Serial interface . . . . . 79 - 83
- Pin assignment . . . . . 79 - 83

Stand-by monitoring 69
Station number 82
Status register 77
Supply air humidity control 41
Supply air temperature control 37
Supply air temperature limit 53
Surge protection measures 86
Sustained room temperature 55
Switchover between summer time and winter time 68
System code number . . . . . 24 - 36
System start-up mode
- Dependent on outdoor temperature . . 61
- Return air temperature-controlled 61

T

Technical data 107
Telephone number
- Alternative recipient 82
- Control station 82

Time, setting 10

V

Vacations 15

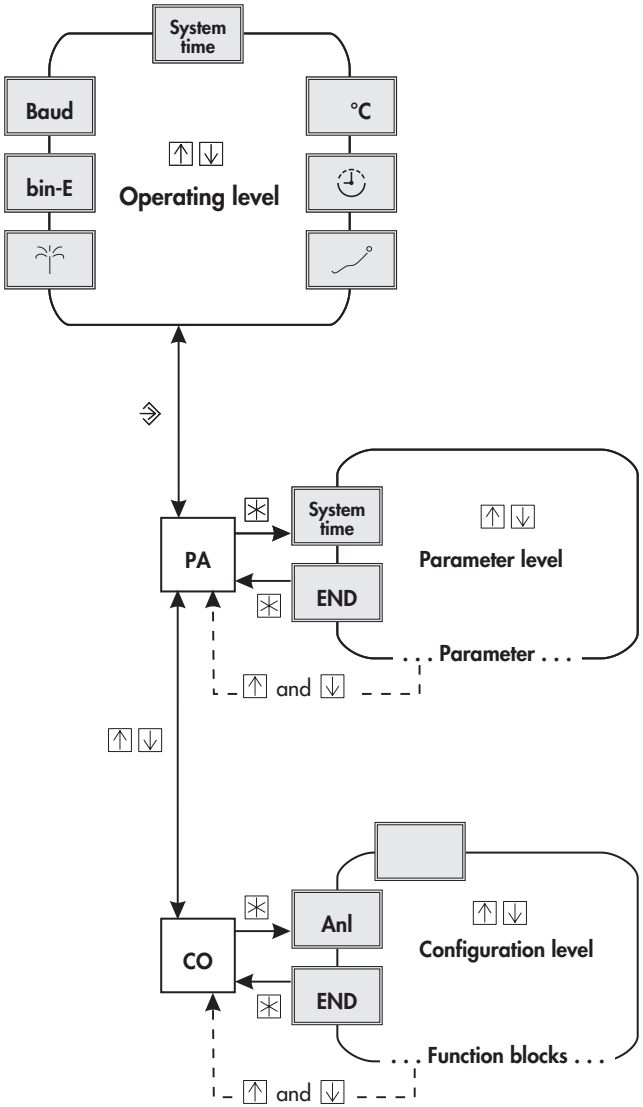


Fig. 30 · Structure of the levels

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