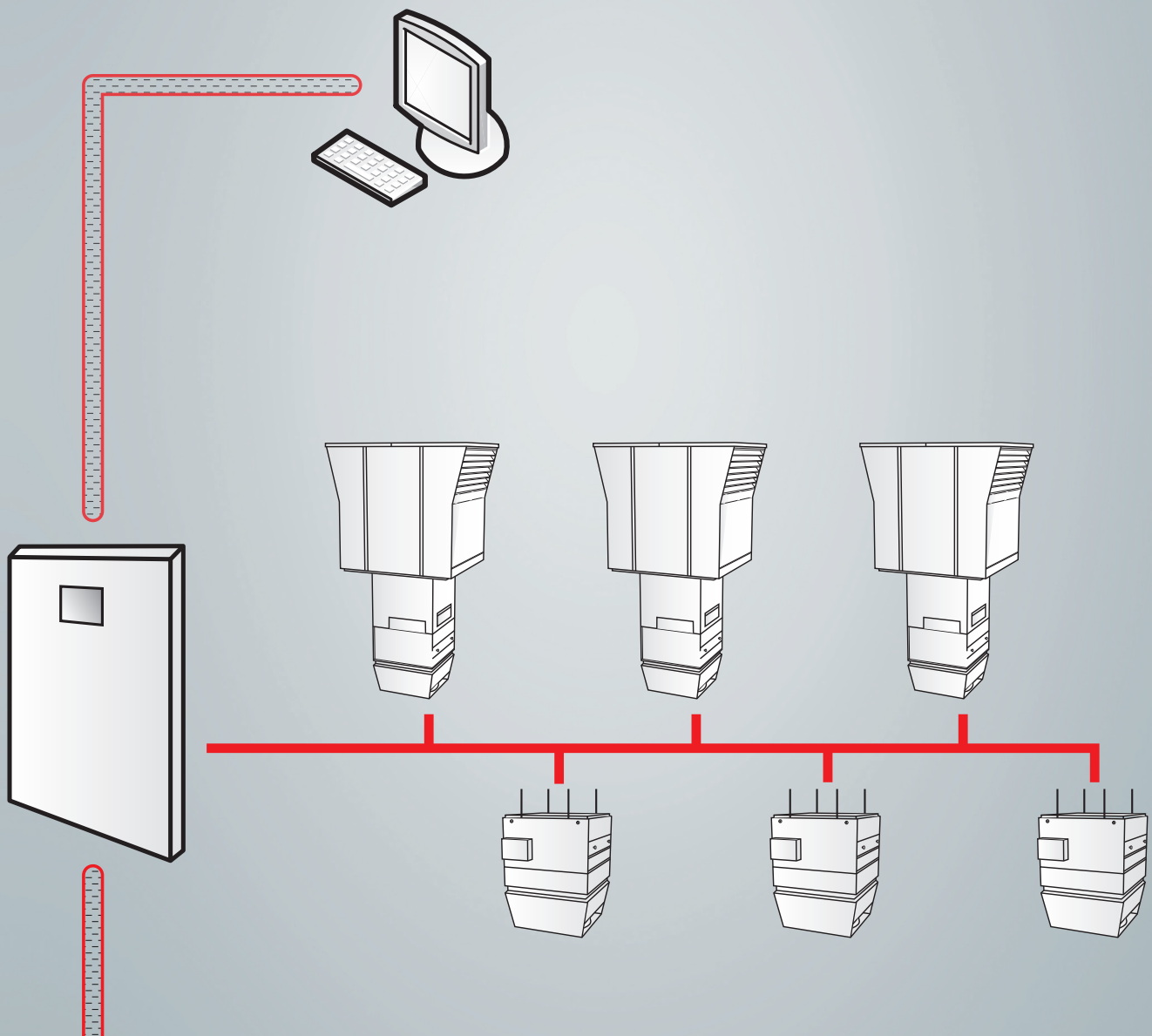








Control systems

Design handbook

Tailored control systems reliably ensure demand-based operation and maximum energy efficiency.



	<p>Hoval Indoor Climate Systems 3</p> <p>Efficient. Flexible. Reliable.</p>	<p>A</p>
	<p>TopTronic® C – System control 7</p> <p>Control system for decentralised indoor climate systems</p>	<p>B</p>
	<p>TopTronic® C – System control for TopVent® C-SYS 19</p> <p>Control system for decentralised indoor climate systems</p>	<p>C</p>
	<p>EasyTronic EC 27</p> <p>Room temperature controller with timer for TopVent® TH, TC, CH, CC, TV recirculation units and TopVent® TW air curtains</p>	<p>D</p>
	<p>EasyTronic TV 31</p> <p>Room temperature controller without timer for TopVent® TV recirculation units and TopVent® TW air curtains</p>	<p>E</p>
	<p>TempTronic MTC 33</p> <p>Programmable room temperature controller for TopVent® GV recirculation units</p>	<p>F</p>



Hoval Indoor Climate Systems

Efficient. Flexible. Reliable.

A



Efficient. Flexible. Reliable.

Hoval indoor climate systems are decentralised systems for heating, cooling and ventilating halls for industrial, commercial and leisure applications. The systems have a modular structure. One system comprises several ventilation units which are spread around the room. These units are equipped with reversible heat pumps and gas-fired appliances for decentralised heat and cold generation, or they heat and cool with a connection to a central energy supply. Tailored control systems complete the system and ensure the effective combination and optimal use of all resources.

Diverse range of units ensures flexibility

Different types of ventilation units can be combined to create the perfect system for the project in question:

- RoofVent® supply and extract air handling units
- TopVent® supply air units
- TopVent® recirculation units

The number of supply and extract air handling units depends on how much fresh air is required in order to create a comfortable atmosphere for people in the building. Recirculation units cover additional heat or cool demand as required. A broad range of unit types and sizes with heating and cooling coils in various output levels means that the overall output of the system can be scaled to whatever level is required.

Specially designed unit versions are also available for halls with particularly humid or oily extract air.

Furthermore, there is a range of units available which have been expressly developed for very specific purposes. ProcessVent units, for example, are coupled with extract air purification systems in industrial halls and recover heat from process air.

Draught-free air distribution

A key feature of Hoval indoor climate units is the patented vortex air distributor, known as the Air-Injector. It is controlled automatically and changes the blowing angle of the air continuously between vertical and horizontal. The highly efficient air supply system has many advantages:

- It provides a high level of comfort during heating and cooling. No draughts develop in the hall.
- The efficient and even air distribution ensures that the indoor climate units cover a large area.
- The Air-Injector keeps the temperature stratification in the room low, thus minimising heat loss through the roof.

Control with specialist expertise

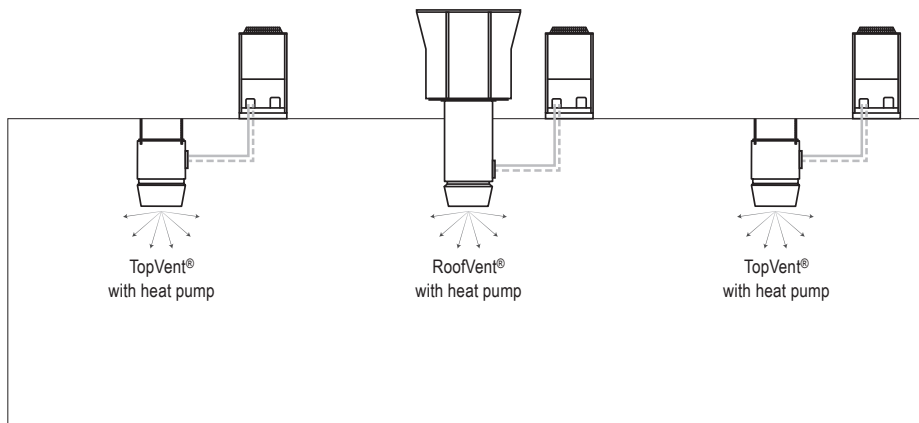
The TopTronic® C control system, which was specifically developed for Hoval indoor climate systems, regulates the separate units individually and controls them based on zones. This enables optimal adjustment to the local requirements of the different usage areas in the building. The patented control algorithm optimises energy use and ensures maximum comfort and hygiene levels. Clear interfaces make it easy to connect the system to the building management system.

Simpler control systems are also available for units that are only used for supply air or air recirculation.

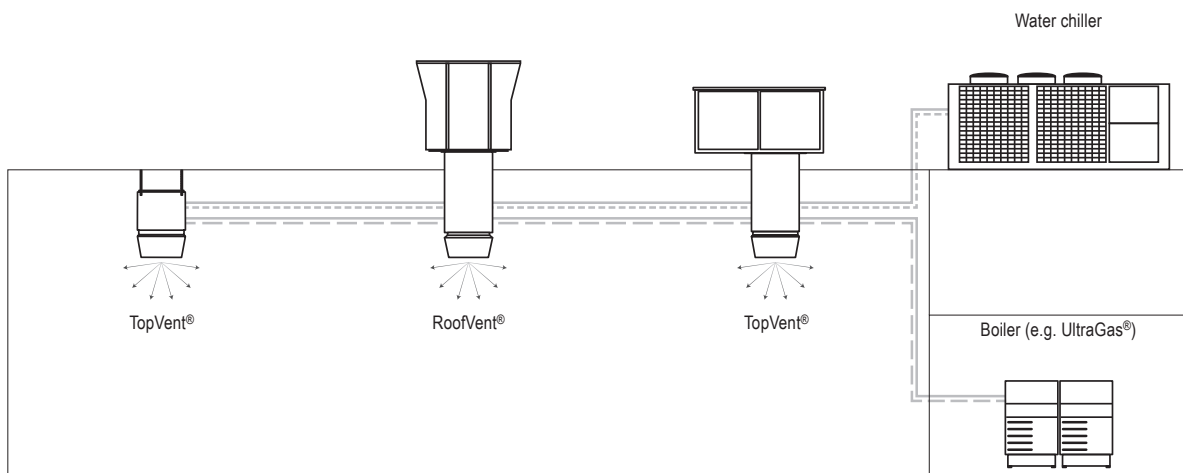
Competent and reliable

Hoval will support you and provide expert knowledge throughout all project phases. You can rely on comprehensive technical advice when it comes to planning Hoval indoor climate systems and on the skills of the Hoval technicians during the installation, commissioning and maintenance of the system.

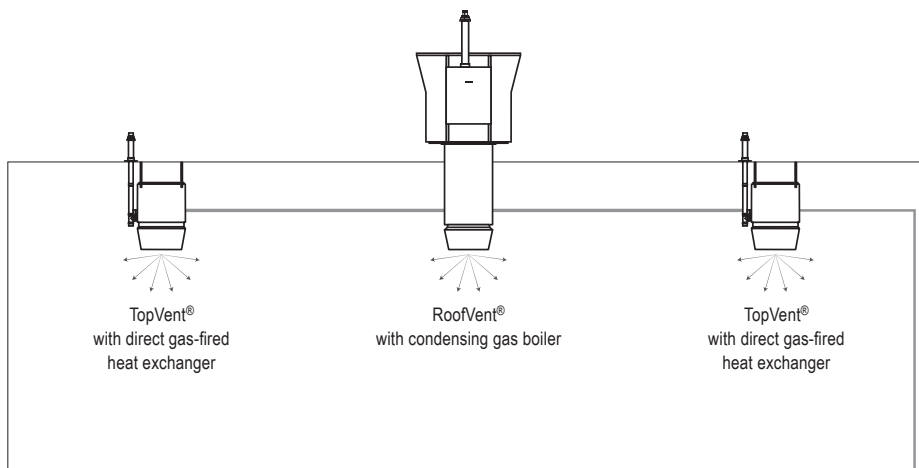
System with decentralised heat and cold generation with heat pump



System with central heat and cold generation



System with decentralised, gas-fired heat generation



Unit types and control systems

Heat and cold generation			TopTronic® System control	TopTronic® System control for TopVent®	EasyTronic EC	EasyTronic TV	TempTronic MTC	
Function	Unit type							
Decentralised with heat pump	Ventilation	RoofVent® RP	•					
	Recirculation	TopVent® TP	•					
Central	Ventilation	RoofVent® RH	•					
		RoofVent® RC	•					
		RoofVent® RHC	•					
		RoofVent® R	•					
		RoofVent® KH	•					
		RoofVent® KC	•					
		RoofVent® KHC	•					
	Supply air	TopVent® MH	•	•				
		TopVent® MC	•	•				
		TopVent® MHC	•	•				
		TopVent® SH	•	•				
		TopVent® SC	•	•				
		TopVent® SHC	•	•				
	Recirculation	TopVent® TH	•	•	•			
		TopVent® TC	•	•	•			
		TopVent® THC	•	•				
		TopVent® CH	•	•	•			
		TopVent® CC	•	•	•			
		TopVent® CHC	•	•				
		TopVent® TV			•	•		
	TopVent® TW			•	•			
Decentralised Gas-fired	Ventilation	RoofVent® RG	•					
		RoofVent® KG	•					
	Recirculation	TopVent® MG	•	•				
		TopVent® TG	•	•				
		TopVent® GV	•	•			•	



TopTronic® C – System control

Control system for decentralised indoor climate systems

1 System structure	8
2 Operating options	9
3 Zone control panel	12
4 Alarms and monitoring	18

1 System structure

The Hoval TopTronic® C control system works fully automatically to ensure the energy-efficient, demand-based operation of decentralised indoor climate systems.

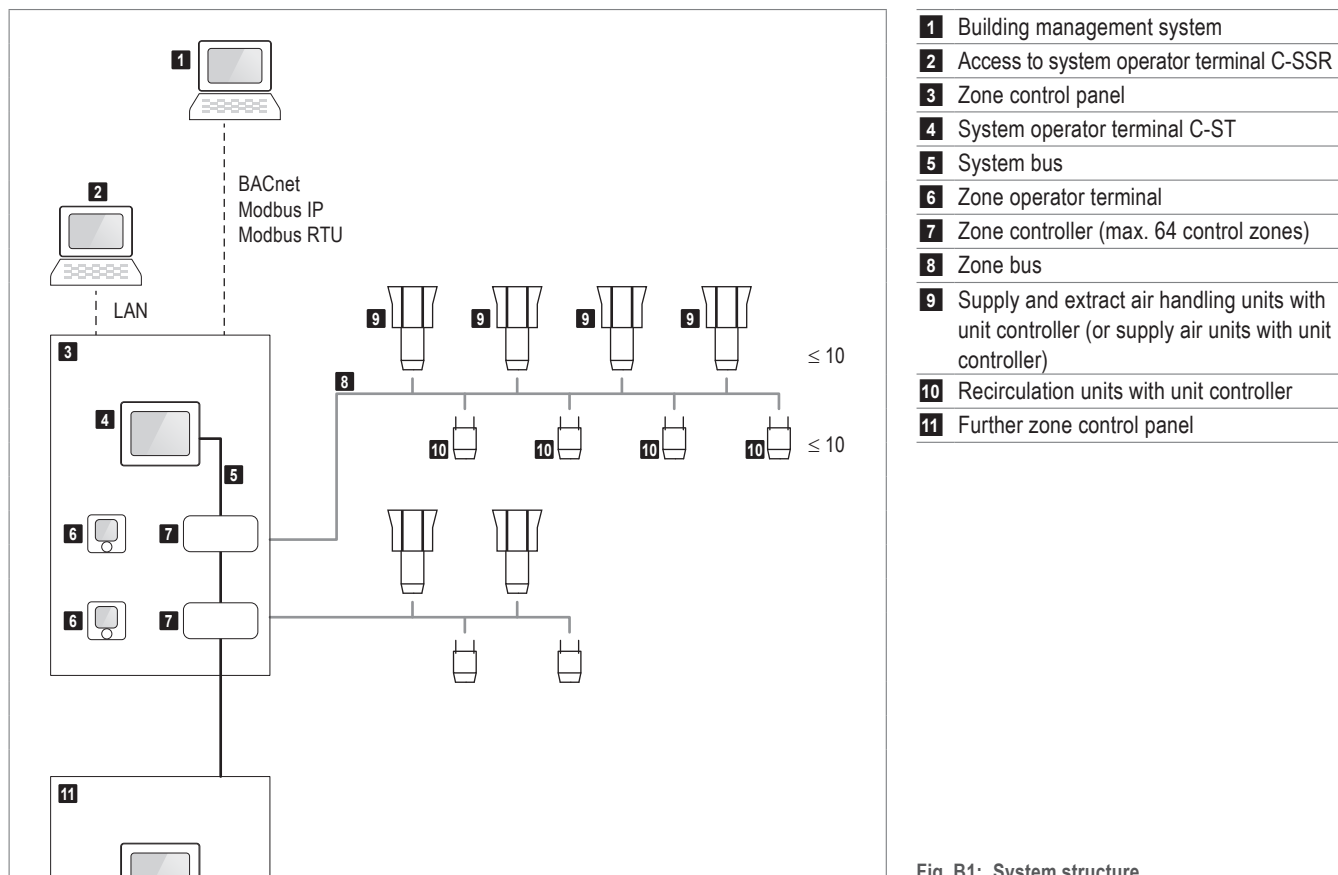


Fig. B1: System structure

1.1 Basic principles

Indoor climate units that operate under the same conditions are grouped into control zones. The criteria concerning how the zones are created can be, for example, operating times, room temperature set values and so on. The individual units are individually regulated and controlled zone-by-zone:

- A unit controller is integrated in each indoor climate unit and controls it according to the local conditions.
- There is one zone controller for each control zone in the zone control panel. It switches the operating modes according to the calendar, sends the outdoor and room temperatures to the individual units, manages set values and functions as an interface to external systems.

A system comprises up to 64 control zones with the following types of indoor climate units:

- Supply and extract air handling units (VENU)
- Supply air units (REMU)
- Recirculation units (RECU)

The following variants of control zones are available:

Type of units	Max. number
Supply and extract air handling units	10
Supply air units	10
Recirculation units	10
Supply and extract air handling units + Recirculation units	10 + 10
Supply air units + Recirculation units	10 + 10

Table B1: Variants of control zones



Notice

If different unit types are installed in a control zone, the recirculation units are connected automatically if there is a high heat or cool demand.

1.2 System bus

The system bus connects all zone controllers to one another and to the system operator terminal.

1.3 Zone bus

The zone bus functions as serial connection and connects all unit controllers in one control zone with the corresponding zone controller. It is laid as a line bus with a maximum length of 500 m. Repeaters and a power supply are required for longer lengths.

2 Operating options

2.1 System operator terminal

The system operator terminal is a touch panel with a colour display, making it simple and clear to operate the system. It gives trained users access to all information and settings that are necessary for normal operation:

- Display and setting of operating modes
- Display of temperatures and setting of the room temperature set values
- Display and programming of the weekly and annual calendar
- Display and handling of alarms and maintaining an alarm log
- Display and setting of control parameters
- Differentiated password protection

The C-SSR software package allows LAN access to the system operator terminal. Thus the system can be operated easily using a PC.

The system operator terminal is installed in the door of the zone control panel, or supplied loose. At least 1 system operator terminal is required for each system. A maximum of 4 system operator terminals can be used per system or 1 per zone control panel.



Fig. B2: System operator terminal C-ST

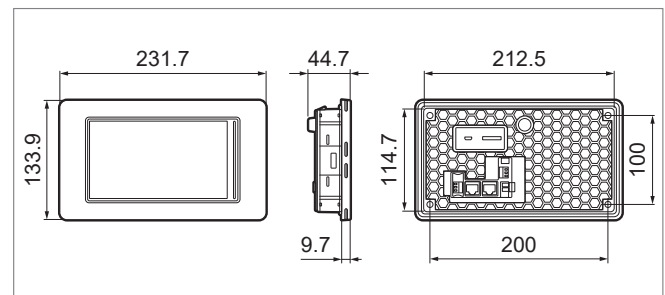


Fig. B3: Dimensional drawing and borehole diagram for the system operator terminal (dimensions in mm)

2.2 Zone operator terminal

The zone operator terminal is used for simple on-site operation of a control zone. It offers the following functions:

- Display of the current room temperature actual value
- Increase or decrease the set value by up to 5 °C
- Manual changeover of the operating mode
- Display of the collective fault signal

The zone operator terminal is installed in the door of the zone control panel, or supplied loose for surface or flush mounting in any location.

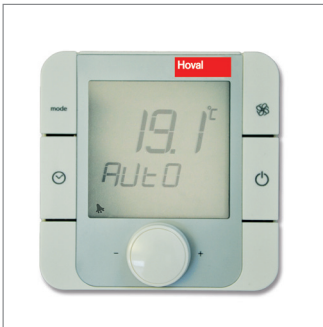


Fig. B4: Zone operator terminal

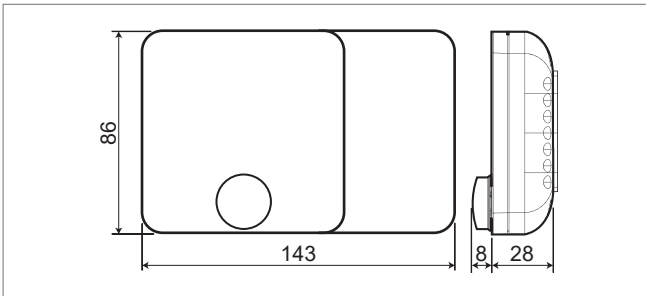


Fig. B5: Dimensional drawing for the zone operator terminal for surface mounting (dimensions in mm)

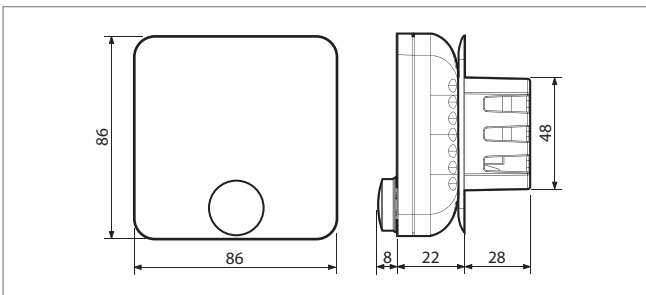


Fig. B6: Dimensional drawing for the zone operator terminal for flush mounting (dimensions in mm)

2.3 Operating selector switch

An operating selector switch makes it possible to specify an operating mode manually for a control zone. Automatic mode according to the calendar is overridden. The units work in the selected operating mode until the switch is moved back to 'Auto'.

The switches are installed in the door of the zone control panel. There is only 1 operating selector switch for each control zone. The operating modes available depend on the unit types present in the zone in question.



Notice

Operating selector switches installed in the panel door cannot be combined with operating selector switches connected to a terminal (see section 3.9).

2.4 Operating selector button

The operating selector button makes it possible to specify a particular operating mode temporarily for a control zone. After an adjustable time period, the units switch back to the operating mode that was being carried out previously.



Notice

The mode of function of the operating selector button can be set. The selected operating mode can also remain active until it is switched off again by pressing the button once more.

The buttons are configured as illuminated pushbuttons. They are installed in the door of the zone control panel. There are a maximum of 3 operating selector buttons for each control zone:

- Standby (ST)
- Ventilation (VE)
- Recirculation (REC)

There is also the option of connecting external operating selector buttons to a terminal (see section 3.9).

2.5 Integration into the building management system

The TopTronic® C can be easily integrated into the building management system via different bus interfaces. The following protocols are available:

- BACnet
- Modbus IP
- Modbus RTU

A full data point list is available on request. When planning observe the following:

BACnet

Each control zone represents 1 node requiring 1 BACnet licence (BACnet instance). The following must be provided on site:

- an IP address range in the local area network for all bus participants
- 1 IP connection per control panel

TopTronic® C uses the following BACnet object types:

BACnet object types
Analogue Value
Binary Value
Integer Value
Multi-state Value

Table B2: Used BACnet object types



Notice

Access to the TopTronic® controllers is only possible within the customer's network, i.e. from devices with the same network address. The firewall of the controllers blocks external access.

x x x . x x x . x x x . y y y

Network address Host address

Modbus IP

1 Modbus IP gateway RS485 is used for each control zone. The following must be provided on site:

- an IP address range in the local area network for all bus participants
- 1 IP connection per control zone

Modbus RTU

1 Modbus RTU gateway RS485 is used for each control zone. The following must be provided on site:

- 1 Modbus slave address per control zone

3 Zone control panel

The zone control panel is made of painted steel sheet (colour: light grey RAL 7035). It includes the following components:

- Operating elements in the panel door
- Power and control section
- 1 safety relay (external)
- 1 zone controller per control zone
- 1 fresh air temperature sensor
- 1 room temperature sensor per control zone

Size	Type	Dimensions (W x H x D)	Base height	Doors
3	SDZ3	600 × 760 × 210	–	1
5	SDZ5	800 × 1000 × 300	–	1
6	SDZ6	800 × 1200 × 300	–	1
7	SDZ7	800 × 1800 × 400	200	1
8	SDZ8	1000 × 1800 × 400	200	2
9	SDZ9	1200 × 1800 × 400	200	2

Table B3: Available sizes for zone control panels (dimensions in mm)

Short circuit resistance I_{CW}	10 kA _{eff}
Use	Indoors
Protection rating SDZ3, SDZ5, SDZ6	IP 66
Protection rating SDZ7, SDZ8, SDZ9	IP 55
Ambient temperature	5...40 °C

Table B4: Technical data for zone control panels

3.1 Design of control panels

Control panels for wall mounting

Control panels sizes 3 to 6 are configured as compact cabinets for wall installation. The cables are introduced from below through flange plates and membrane cable glands.

Control panels for individual setup

Control panels of sizes 7 to 9 are configured for individual setup in a self-supporting design. The cables are introduced through clamping profiles in the floor panel (cable introduction into the base is possible from the left or right side or from behind).

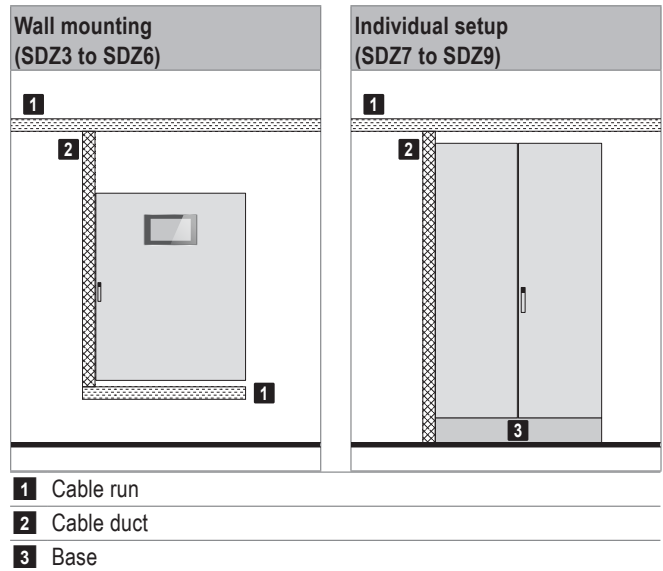


Fig. B7: Design of control panels

3.2 Mounting height

If the system operator terminal is installed in the door of the zone control panel the correct mounting height is essential for convenient operation.

- In control panels for individual setup the distance from the middle of the operator terminal to the floor is 1600 mm.
- Control panels for wall mounting must be mounted at the right height. The heights for the drill holes are given in the following table:

Type	SDZ3	SDZ5	SDZ6
A	600	800	800
B	760	1000	1200
C	1013	818	618
D	1733	1778	1778

Table B5: Distance of drill holes from the floor for convenient operation (dimensions in mm)

3.3 Temperature sensors

The following sensors are included in the zone control panel as standard equipment:

- 1 fresh air temperature sensor (per system)
- 1 room temperature sensor (per control zone)

Their measured values are used to control the operation of the plant depending on the temperature conditions. Additional temperature sensors as well as air quality and humidity sensors are optionally available. Their application allows the use of additional control functions:



Notice

- A maximum of 4 sensors can be connected per control zone:
- 4 temperature sensors or
 - 3 temperature sensors and 1 combination sensor

Averaging of the room temperature

Install additional sensors for a more accurate recording of the room temperature. The controller then works with the averaged temperature value.

Destratification mode

In some operating modes, the indoor climate units operate in on/off operation depending on the heat demand. To avoid heat build-up under the ceiling, it may be appropriate to switch on the fans when there is no heat demand (either in permanent operation or temperature-controlled). Install an additional temperature sensor as a stratification sensor under the hall ceiling to control the fan operation depending on the temperature stratification.

Demand-controlled ventilation

Install a combination sensor in the room to use demand-controlled ventilation. Depending on the measured room air quality, the fresh air volume introduced into the room is then optimised to achieve the setpoint value.

- with supply and extract air handling units in the 'Air quality' (AQ) operating mode
 - with supply air units in the 'Supply air speed 1' (SA1) and 'Supply air speed 2' (SA2) operating modes
- This enables the system to operate in a particularly energy-saving manner.

Dehumidification operation

Install a combination sensor both outdoors and indoors to use dehumidification operation. If the room air humidity is too high, ventilation units can be switched on in the 'Air Quality' (AQ) operating mode to dehumidify the room with fresh air.

Anti-icing plate heat exchanger

In applications with high room air humidity, install a combination sensor to protect the plate heat exchanger against icing up even at low outside temperatures.

Location of the sensors

- Install the fresh air sensor at least 3 m above the ground on a north-facing wall, so that it is protected from direct sunlight. Insulate the sensor from the building.
- Install the room air sensor at a representative position in the occupied area at a height of about 1.5 m. Its measured values must not be distorted by the presence of sources of heat or cold (machines, windows, etc.).

	Sensor type	Measuring values	Application	Protection rating
Fresh air	Temperature sensor	°C	■ Standard (1 × per system)	IP 65
	Combination sensor temperature and humidity	°C, %rh	■ Dehumidification operation ■ Units in ColdClimate design (up to -40 °C)	IP 65
Room air	Temperature sensor	°C	■ Standard (1 × per control zone) ■ Averaging of the room temperature average value ■ Stratification sensor	IP 20
	Combination sensor temperature, humidity, air quality	°C, %rh, CO ₂ + VOC	■ Demand-controlled ventilation ■ Dehumidification operation ■ Icing protection for plate heat exchanger ■ Wet rooms	IP 20 / IP 65

Table B6: Available temperature and combination sensors

3.4 External connections

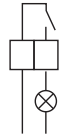
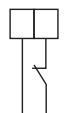
Collective alarm	
Volt-free signal for the external display of a collective alarm	 <p>24 VDC, max. 2 A 230 VAC, max. 3 A</p>
Forced off (zone controller)	
Input signal for emergency switch-off via software control (all units in a zone): <ul style="list-style-type: none"> ■ Fans off (without post operation) ■ Dampers closed (by spring return) Recommended for emergency shut-off of the units with high priority (e.g. in the event of a fire)	 <p>24 VAC, max. 1 A</p>

Table B7: External connections



Notice

Emergency switch-off with highest priority is effected via hardware control. For this, the input signal is directly wired to the individual unit (supply and extract air handling units, supply air units).

3.5 Design for heating

For systems with indoor climate units connected to a hot water supply for heating the components required to control the heating circuit are installed in the zone control panel:

- Heating demand
- Setpoint heating demand
- Fault heat supply

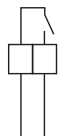
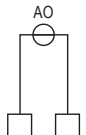
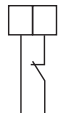
Heating demand	
Volt-free signal that reports the heating requirement to the heat production on site	 <p>max. 250 VAC, 8 A</p>
Setpoint heating demand	
Analogue signal that reports the setpoint for the flow temperature to the heat production on site	 <p>2-10 VDC... 0-100 °C</p>
Fault heat supply	
Alarm input signal that informs the system that the heat supply is not working: 0 = Fault 1 = Normal operation	 <p>24 VAC, max. 1 A</p>

Table B8: Signals for controlling the heating mode

3.6 Design for cooling

For systems with indoor climate units connected to a water chiller for cooling the components required to control the cooling circuit are installed in the zone control panel:

- Cooling demand
- Fault cold supply
- Heating/cooling changeover

There are various possibilities for changeover between heating and cooling:

Automatic changeover (External enabling)

- The system switches between heating and cooling automatically, depending on the temperature conditions.
- The system controls and monitors the changeover valves heating/cooling (in 2-pipe systems).
- External enabling: Via an on-site signal either only heating operation or heating and cooling operation can be enabled. This way it is possible to block the cooling function temporarily e.g. in the transition period.
- Option: For external enabling a switch can be installed in the door of the zone control panel (cooling lock switch C-KS).

Manual changeover (External setting)

- The system switches between heating and cooling according to the external setting.
- The system controls and monitors the changeover valves heating/cooling.
- Alternatively, the changeover valves heating/cooling may be set manually. In this case, however, the correct valve position cannot be monitored by the system.
- Option: For external setting a switch can be installed in the door of the zone control panel (heating/cooling switch C-SHK).

Hydraulics	Heating/cooling changeover	Changeover valves
4-pipe	Automatic (External enabling)	–
2-pipe	Automatic (External enabling)	Controlled and monitored
	Manual (External setting)	Controlled and monitored
		Manual, not monitored

Table B9: Possibilities for change-over between heating and cooling

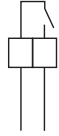
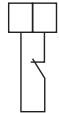


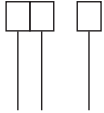
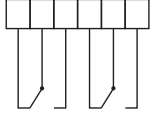
Cooling demand	
Volt-free output signal that reports the cooling requirement to the cold production on site	 max. 250 VAC, 8 A
Fault cold supply	
Alarm input signal that informs the system that the cold supply is not working 0 = Fault 1 = Normal operation	 24 VAC, max. 1 A
External enabling heating/cooling	
Input signal that reports on-site enabling of heating/cooling operation to the system: 0 = Heating 1 = Heating/Cooling	 24 VAC, max. 1 A
External setting heating/cooling	
Input signal that reports manual switch-over to the system: 0 = Heating 1 = Cooling	 24 VAC, max. 1 A
Changeover valves heating/cooling (1 x flow / 1 x return)	
Supply/control voltage: 0 V = Heating 24 V = Cooling	 24 VAC 0/24 VAC
Position response via limit switches	 24 VAC, max. 1 A

Table B10: Signals for controlling the cooling mode

3.7 Design for heat pump

For systems with indoor climate units which heat and cool with heat pumps, the components required for external enabling of heating/cooling are installed in the zone control panel:

- Heating/cooling changeover

There are various possibilities for changeover between heating and cooling:

Automatic changeover (External enabling)

- The system switches between heating and cooling automatically, depending on the temperature conditions.
- External enabling: Via an on-site signal either only heating operation or heating and cooling operation can be enabled. This way it is possible to block the cooling function temporarily e.g. in the transition period.
- Option: For external enabling a switch can be installed in the door of the zone control panel (cooling lock switch C-KS).

Manual changeover (External setting)

- The system switches between heating and cooling according to the external setting.
- Option: For external setting a switch can be installed in the door of the zone control panel (heating/cooling switch C-SHK).



External enabling heating/cooling	
Input signal that reports on-site enabling of heating/cooling operation to the system: 0 = Heating 1 = Heating/Cooling	 24 VAC, max. 1 A
External setting heating/cooling	
Input signal that reports manual switch-over to the system: 0 = Heating 1 = Cooling	 24 VAC, max. 1 A

Table B11: Signals for controlling the cooling mode

3.8 Design for gas-fired units

For systems with gas-fired indoor climate units no optional components are required in the zone control panel. The unit controllers communicate directly with the respective burner control.

3.9 Options for the zone control panel

Alarm lamp

A lamp for displaying alarms is installed in the door of the zone control panel. The lamp flashes when new alarms have occurred, and it lights up if already acknowledged alarms are still present.

There is only 1 collective alarm lamp for each zone control panel. It shows the alarms of the whole system.

Socket

A 1-phase socket with a 2-pin circuit breaker is installed in the zone control panel. This socket serves for connecting maintenance tools. Its circuit is not cut out by the safety relay.

Additional room temperature sensors

For the use of additional control functions (see section 3.3)

Combination sensor room air quality, temperature and humidity

For the use of additional control functions (see section 3.3)

- Type QF20: Protection rating IP 20
- Type QF65: Protection rating IP 65

Combination sensor fresh air temperature and humidity

For the use of additional control functions (see section 3.3).

External sensor values

It is possible to connect external sensors to the zone controller via additional inputs (input signal: 0...10 VDC or 4...20 mA):

- Room temperature (0...50 °C)
- Room air quality (0...2000 ppm)
- Room air humidity (0...100% rh)
- Fresh air temperature (-40...60 °C)
- Fresh air humidity (0...100 % rh)

External set values

It is possible to connect set value specifications from an external system to the zone controller via additional inputs (input signal: 2...10 VDC or 4...20 mA):

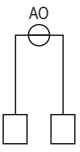
- Room temperature (5...40 °C)
- Room air quality (0...2000 ppm)
- Room air humidity (0...100% rh)
- Air flow rate (supply air/exhaust air) (1...100%)
 - 1% ... Set minimum air flow rate
 - 100% ... Nominal air flow rate
- Fresh air ratio for supply air units (0...100%)

Load shedding input

The zone controller includes a digital input for load shedding by an external system.

Signal for external extract air fan

In systems with TopVent® SH, SC or SHC supply air units the zone controller can provide a signal for controlling an external extract air fan.

Signal for external extract air fan	
Analogue output signal for controlling an extract air fan depending on the amount of fresh air currently introduced into the room	 <p>2-10 VDC... 0-90000 m³/h</p>

Operating selector switch on terminal (analogue)

An operating mode can be specified for a control zone from an external system using an analogue operating mode signal connected to a terminal. Automatic mode according to the calendar is overridden.

The operating modes are switched using different voltage levels. If there is no voltage applied, an alarm is triggered and the units switch to standby (ST).

Voltage	Supply and extract air handling units	Supply air units	Recirculation units
1.2 VDC	ST	ST	ST
2.4 VDC	REC	REC	REC
3.7 VDC	SA	REC1	REC1
5.0 VDC	EA	SA1	-
6.2 VDC	VE	SA2	-
7.5 VDC	VEL	-	-
8.8 VDC	AQ	-	-
10.0 VDC	AUTO	AUTO	AUTO

Table B12: Voltage levels for external switching of operating modes

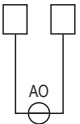
Operating selector switch on terminal (analogue)	 <p>24 VAC, max. 1 A</p>
--	---

Table B13: Connection of the external operating selector switch

Operating selector switch on terminal (digital)

An operating mode can be specified for a control zone from an external system using digital operating mode signals connected to a terminal. Automatic mode according to the calendar is overridden.

The operating modes are switched using digital inputs. If there is no signal applied, an alarm is triggered and the units switch to standby (ST).

Input	Supply and extract air handling units	Supply air units	Recirculation units
1	ST	ST	ST
2	REC	REC	REC
3	SA	REC1	REC1
4	EA	SA1	-
5	VE	SA2	-
6	VEL	-	-
7	AQ	-	-
8	AUTO	AUTO	AUTO

Table B14: Digital inputs for external switching of the operating modes

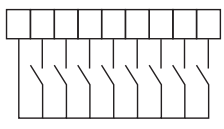
Operating selector switch on terminal (digital)	 <p>24 VAC, max. 1 A</p>
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Table B15: Connection of the external operating selector switch

Operating selector button on terminal

The operating selector button connected to a terminal makes it possible to specify a particular operating mode for a control zone (ST, VE or REC).

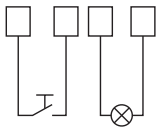
Operating selector button on terminal	 <p>24 VAC, max. 1 A</p>
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Table B16: Connection of the external operating selector button

Power supply and safety relay

The power supply for indoor climate units is integrated in the zone control panel. The following components are installed in the panel:

- the necessary circuit breakers and output terminals for each unit
- the safety relay (external)

The size of the safety relay depends on the rated current.

Rated current ¹⁾	Type	Design
< 1 A ²⁾	NT-2	2-pin
1 – 32 A	NT-4/32	4-pin
33 – 63 A	NT-4/63	4-pin
64 – 100 A	NT-4/100	4-pin
101 – 125 A	NT-4/125	4-pin
126 – 160 A	NT-4/160	4-pin
161 – 250 A	NT-4/250	4-pin
251 – 400 A	NT-4/400	4-pin

¹⁾ Rated current = Nominal current consumption of all indoor climate units
²⁾ Safety relay for zone controller (without power supply for indoor climate units)

Table B17: Sizes of the safety relay

Control of distributor pump(s), incl. power supply

The components required for controlling and supplying power to the distributor pump(s) are installed in the zone control panel. The pumps can either be controlled via a enable signal or switched directly.

Type	Pump		Capacity
1PSW	Heat supply	1-phase	max. 2 kW
1PSK	Heat/cold supply (2-pipe system)	1-phase	max. 2 kW
1PSB	Heat supply and cold supply (4-pipe system)	1-phase	max. 2 kW
3PSW	Heat supply	3-phase	max. 4 kW
3PSK	Heat/cold supply (2-pipe system)	3-phase	max. 4 kW
3PSB	Heat supply and cold supply (4-pipe system)	3-phase	max. 4 kW

Table B18: Technical data for the pump control

4 Alarms and monitoring

The TopTronic® C control system monitors itself. Central alarm management records each alarm situation in the alarm list with a timestamp, priority and status. The alarms are displayed on the operator terminals and via the collective trouble indicator. Forwarding via e-mail is also possible. If there is a failure of communication, bus stations, sensor systems or supply media, each part of the system transitions to a protection mode which safeguards operation.



TopTronic® C – System control for TopVent® C-SYS

Control system for decentralised indoor climate systems

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2 Operating options	21
3 Zone control panel	22
4 Alarms and monitoring	25

1 System structure

The system control for TopVent® (C-SYS) is a TopTronic® C package solution for controlling plants comprising 1 control zone with up to 6 supply air units and 10 recirculation units.

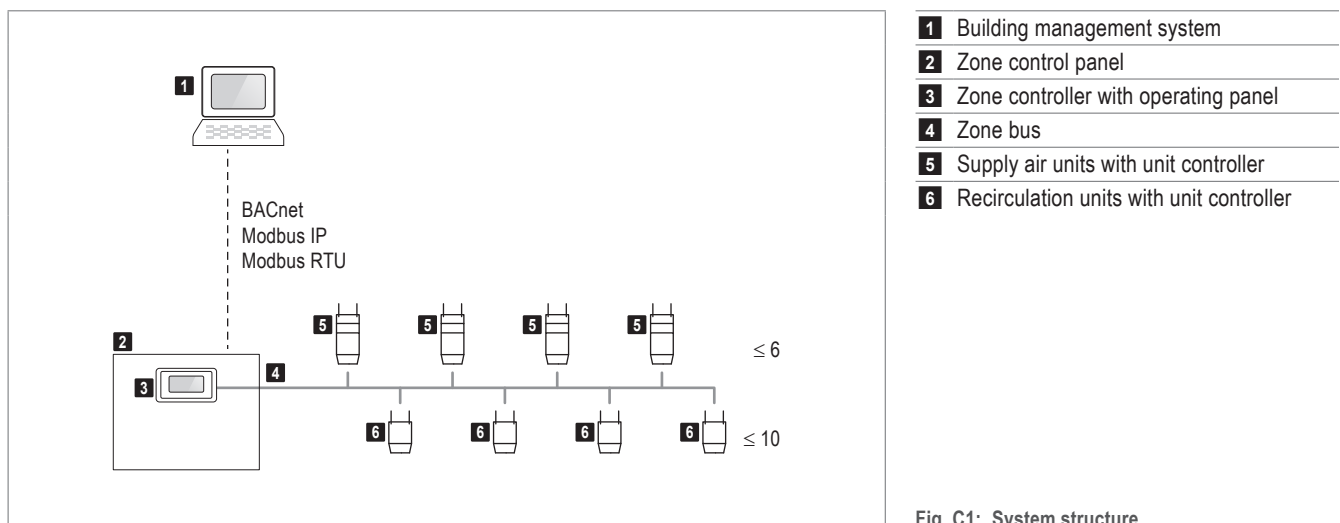


Fig. C1: System structure

1.1 Basic principles

The individual units are regulated individually and controlled based on zones:

- A unit controller is integrated in each indoor climate unit and controls it according to the local conditions.
- The zone controller switches the operating modes according to the calendar, sends the outdoor and room temperatures to the individual units, manages set values and functions as an interface to external systems.

A system comprises 1 control zone with the following types of indoor climate units:

- Supply air units (REMU)
- Recirculation units (RECU)

The following variants of control zones are available:

Type of units	Max. number
Supply air units	6
Recirculation units	10
Supply air units + Recirculation units	6 + 10

Table C1: Variants of control zones

1.2 Zone bus

The zone bus functions as serial connection of all unit controllers with the corresponding zone controller. It is laid as a line bus with a maximum length of 500 m. Repeaters and a power supply are required for longer lengths.



Notice

If different unit types are installed in a control zone, the recirculation units are connected automatically if there is a high heat or cool demand.

2 Operating options

2.1 Zone controller with operating panel

The zone controller with operating panel allows simple operation and monitoring of the system. It gives trained users access to all information and settings that are necessary for normal operation:

- Display and setting of operating modes
- Display of temperatures and setting of the room temperature set values
- Display and programming of the weekly calendar
- Display and handling of alarms and maintaining an alarm log
- Password protection

The zone controller with operating panel is installed in the door of the zone control panel.

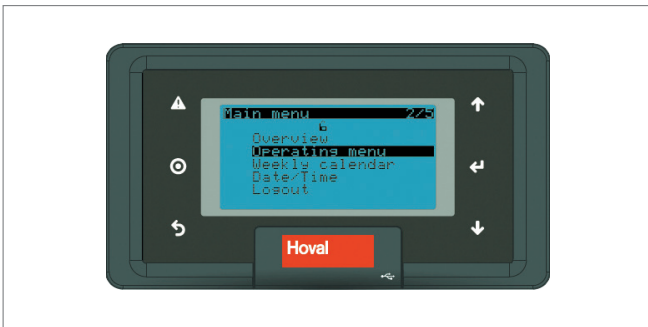


Fig. C2: Zone controller with operating panel

2.2 Integration into the building management system

The TopTronic® C can be easily integrated into the building management system via different bus interfaces. The following protocols are available:

- BACnet
- Modbus IP
- Modbus RTU

A full data point list is available on request. When planning observe the following:

BACnet

Each control zone represents 1 node requiring 1 BACnet licence (BACnet instance). The following must be provided on site:

- an IP address range in the local area network for all bus participants
- 1 IP connection per control panel

TopTronic® C uses the following BACnet object types:

BACnet object types
Analogue Value
Binary Value
Integer Value
Multi-state Value

Table C2: Used BACnet object types

i Notice

Access to the TopTronic® controllers is only possible within the customer's network, i.e. from devices with the same network address. The firewall of the controllers blocks external access.

$x x x . x x x . x x x . y y y$

Network address Host address

Modbus IP

1 Modbus IP gateway RS485 is used for each control zone. The following must be provided on site:

- an IP address range in the local area network for all bus participants
- 1 IP connection per control zone

Modbus RTU

1 Modbus RTU gateway RS485 is used for each control zone. The following must be provided on site:

- 1 Modbus slave address per control zone

3 Zone control panel

The zone control panel is made of coated steel sheet. It includes the following components:

- 1 zone controller with operating panel
- 1 safety relay (external)
- Power and control section
- 1 fresh air temperature sensor
- 1 room temperature sensor

Technical data	
Dimensions (W x H x D)	380 x 300 x 210 mm
Design	as compact cabinet for wall installation (cable introduction from below)
Material	Coated sheet steel (light grey RAL 7035)
Use	Indoors
Protection class	IP 66
Ambient temperature	5...40 °C
Power supply ¹⁾	230 VAC
Short circuit resistance I _{CW}	10 kA _{eff}
¹⁾ Power supply for the TopVent® units provided by the client	

Table C3: Technical data for the zone control panel

3.1 Mounting height

The zone control panel must be installed at the correct height to ensure convenient operation:

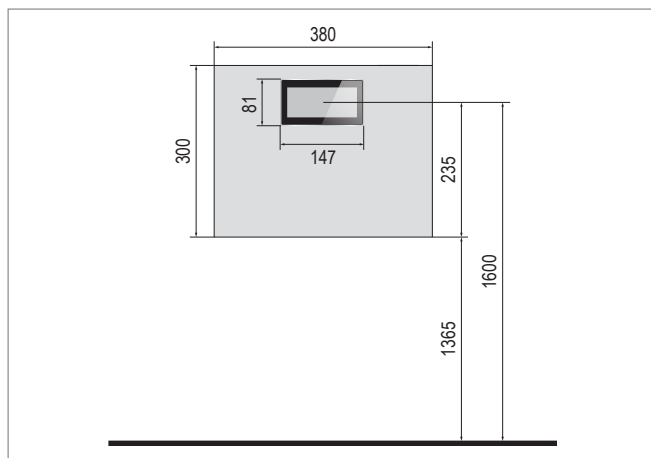


Fig. C3: Mounting height for convenient operation (dimensions in mm)

3.2 Temperature sensors

The following sensors are included in the zone control panel as standard equipment:

- 1 fresh air temperature sensor
- 1 room temperature sensor

Their measured values are used to control the operation of the plant depending on the temperature conditions. Additional temperature sensors are optionally available. Their application allows the use of additional control functions:

Notice
A maximum of 4 sensors can be connected.

Averaging of the room temperature

Install additional sensors for a more accurate recording of the room temperature. The controller then works with the averaged temperature value.

Destratification mode

In some operating modes, the indoor climate units operate in on/off operation depending on the heat demand. To avoid heat build-up under the ceiling, it may be appropriate to switch on the fans when there is no heat demand (either in permanent operation or temperature-controlled). Install an additional temperature sensor as a stratification sensor under the hall ceiling to control the fan operation depending on the temperature stratification.

Demand-controlled ventilation

Install a combination sensor in the room to use demand-controlled ventilation. Depending on the measured room air quality, the fresh air volume introduced into the room is then optimised in the 'Supply air speed 1' (SA1) and 'Supply air speed 2' (SA2) operating modes to achieve the setpoint value. This enables the system to operate in a particularly energy-saving manner.

Location of the sensors

- Install the fresh air sensor at least 3 m above the ground on a north-facing wall, so that it is protected from direct sunlight. Insulate the sensor from the building.
- Install the room air sensor at a representative position in the occupied area at a height of about 1.5 m. Its measured values must not be distorted by the presence of sources of heat or cold (machines, windows, etc.).

3.3 Options for the zone control panel

Additional room temperature sensors

For the use of additional control functions (see section 3.2)

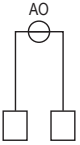
Combination sensor room air quality, temperature and humidity

For the use of additional control functions (see section 3.2)

- Type QF20: Protection rating IP 20
- Type QF65: Protection rating IP 65

Signal for external extract air fan

In systems with TopVent® SH, SC or SHC supply air units the zone controller can provide a signal for controlling an external extract air fan.

Signal for external extract air fan	
Analogue output signal for controlling an extract air fan depending on the amount of fresh air currently introduced into the room	
	2-10 VDC... 0-90000 m³/h

3.4 Heating/cooling changeover

There are various possibilities for changeover between heating and cooling:

Automatic changeover (External enabling)

- The system switches between heating and cooling automatically, depending on the temperature conditions.
- The system controls and monitors the changeover valves heating/cooling (in 2-pipe systems).
- External enabling: Via an on-site signal either only heating operation or heating and cooling operation can be enabled. This way it is possible to block the cooling function temporarily e.g. in the transition period.

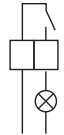
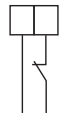
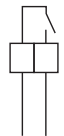
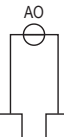
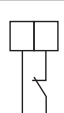
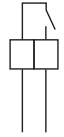
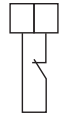
Manual changeover (External setting)

- The system switches between heating and cooling according to the external setting.
- The system controls and monitors the changeover valves heating/cooling.
- Alternatively, the changeover valves heating/cooling may be set manually. In this case, however, the correct valve position cannot be monitored by the system.

Hydraulics	Heating/cooling changeover	Changeover valves
4-pipe	Automatic (External enabling)	-
2-pipe	Automatic (External enabling)	Controlled and monitored
	Manual (External setting)	Controlled and monitored Manual, not monitored

Table C4: Possibilities for change-over between heating and cooling

3.5 External connections

Collective alarm	
Volt-free signal for the external display of a collective alarm	 max. 250 VAC, 8 A
Forced off (zone controller)	
Input signal for emergency switch-off via software control (all units in a zone): ■ Fans off (without post operation) ■ Dampers closed (by spring return) Recommended for emergency shut-off of the units with high priority (e.g. in the event of a fire)	 24 VAC, max. 1 A
Heating demand	
Volt-free signal that reports the heating requirement to the heat production on site	 max. 250 VAC, 8 A
Setpoint heating demand	
Analogue signal that reports the setpoint for the flow temperature to the heat production on site	 2-10 VDC... 0-100 °C
Fault heat supply	
Alarm input signal that informs the system that the heat supply is not working: 0 = Fault 1 = Normal operation	 24 VAC, max. 1 A
Cooling demand	
Volt-free output signal that reports the cooling requirement to the cold production on site	 max. 250 VAC, 8 A
Fault cold supply	
Alarm input signal that informs the system that the cold supply is not working 0 = Fault 1 = Normal operation	 24 VAC, max. 1 A


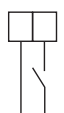
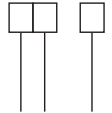
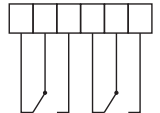
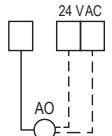
External enabling heating/cooling	
Input signal that reports on-site enabling of heating/cooling operation to the system: 0 = Heating 1 = Heating/Cooling	 24 VAC, max. 1 A
External setting heating/cooling	
Input signal that reports manual switch-over to the system: 0 = Heating 1 = Cooling	 24 VAC, max. 1 A
Changeover valves heating/cooling (1 x flow / 1 x return)	
Supply/control voltage: 0 V = Heating 24 V = Cooling	 24 VAC 0/24 VAC
Position response via limit switches	 24 VAC 0/24 VAC
External setpoint fresh air ratio	
It is possible to connect the setpoint value specification from an external system to the zone controller.	 2-10 VDC... 0-100 %

Table C5: External connections

i Notice
Emergency switch-off with highest priority is effected via hardware control. For this, the input signal is directly wired to the individual unit (supply air units).

4 Alarms and monitoring

Operating selector switch on terminal (digital)

An operating mode can be specified for the control zone from an external system using digital operating mode signals connected to a terminal. Automatic mode according to the calendar is overridden.

The operating modes are switched using digital inputs. If there is no signal applied, an alarm is triggered and the units switch to standby (ST).

Input	Supply air units	Recirculation units
1	ST	ST
2	REC	REC
3	REC1	REC1
4	SA1	–
5	SA2	–
6	AUTO	AUTO

Table C6: Digital inputs for external switching of the operating modes

The TopTronic® C control system monitors itself. Central alarm management records each alarm situation in the alarm list with a timestamp, priority and status. The alarms are displayed on the operator terminals and via the collective trouble indicator.

If there is a failure of communication, bus stations, sensor systems or supply media, each part of the system transitions to a protection mode which safeguards operation.

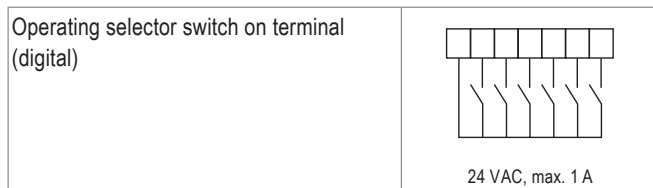


Table C7: Connection of the external operating selector switch

Operating selector button on terminal

The operating selector button connected to a terminal makes it possible to specify a particular operating mode for the control zone (ST or REC).

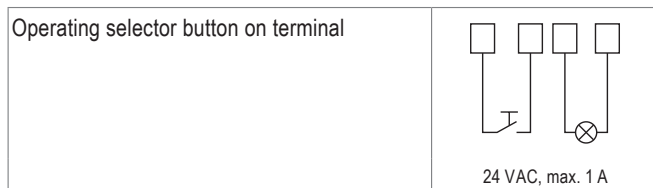


Table C8: Connection of the external operating selector button



EasyTronic EC

Room temperature controller with timer for TopVent® TH, TC, CH, CC, TV recirculation units and TopVent® TW air curtains

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2 External connections 28

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4 System structure 29



1 Use and function

The EasyTronic EC is a room temperature controller with timer for TopVent® TH, TC, CH, CC, TV recirculation units and TopVent® TW air curtains. A maximum of 10 TopVent® units can be connected to 1 controller.



Fig. D1: EasyTronic EC room temperature controller

Function

The EasyTronic EC is connected to the units via a system bus and fulfils the following functions:

- Recording the room temperature with the integrated temperature sensor
- Connection option for external room temperature sensor
- Room temperature control in on/off mode
- Lowering of the room temperature setpoint value via week programme
- Unit control depending on a door contact switch
- Manual adjustment of the fan speed
- Manual adjustment of air distribution with the Hoval Air-Injector from vertical to horizontal (for TopVent® TH, TC, CH, CC)
- Signal for switching a pump or a valve
- Fan off delay in cooling mode (for TopVent® TC, CC)
- External heating/cooling changeover (for TopVent® TC, CC)
- Alarm display
- Connection to the building management system via Modbus RTU

Location

Install the EasyTronic EC with the integrated temperature sensor or the external temperature sensor at a height of about 1.5 m at a representative location in the occupied area. The measured values must not be distorted by the presence of sources of heat or cold (machines, windows, sunlight, etc.).

2 External connections

External room temperature sensor	
Room temperature sensor ET-R (option)	
Door contact	
The connected units are switched on via door contact if the door is open.	 max. 24 VAC / 1 A
Pump/valve	
<ul style="list-style-type: none"> ■ TopVent® TH, TC, CH, CC: connection of pump and valve via a field-supplied relay ■ TopVent® TV, TW: Digital output 	 max. 230 VAC / 3 A
Heating/cooling changeover (TopVent® TC, CC)	
Changeover between heating and cooling mode is done via an external signal:	 max. 24 VAC / 1 A
<ul style="list-style-type: none"> ■ Contact open = Heating ■ Contact closed = Cooling 	
Modbus	
<ul style="list-style-type: none"> ■ Use a bus cable with a shielded, twisted wire pair. ■ Max. length: 300 m 	

Table D1: EasyTronic EC external connections

3 Technical data

EasyTronic EC	
Power supply	110...230 VAC, ±10%, 50/60 Hz
Power consumption	max. 1.3 W
Temperature range	0...50 °C
Dimensions (W x H x D)	128 x 80 x 56 mm
Protection rating	IP 30, class 2
Installation	In a flush-mounted box (spacing between mounting holes 83.5 mm) or on the supplied base

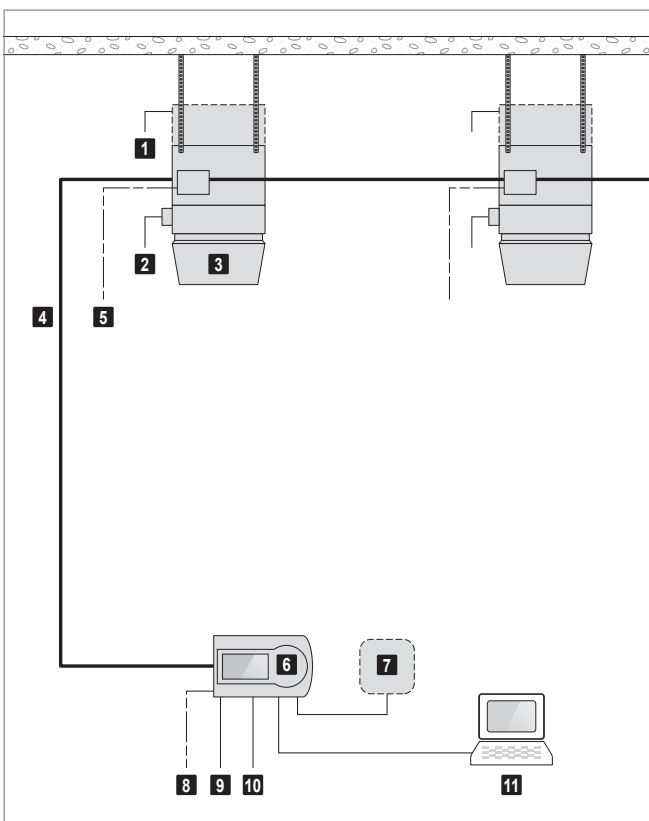
Table D2: EasyTronic EC technical data

Room temperature sensor ET-R	
Temperature range	-30...+70 °C
Dimensions (W x H x D)	93 × 70 × 46 mm
Protection rating	IP 65
Installation	In plastic casing for wall mounting

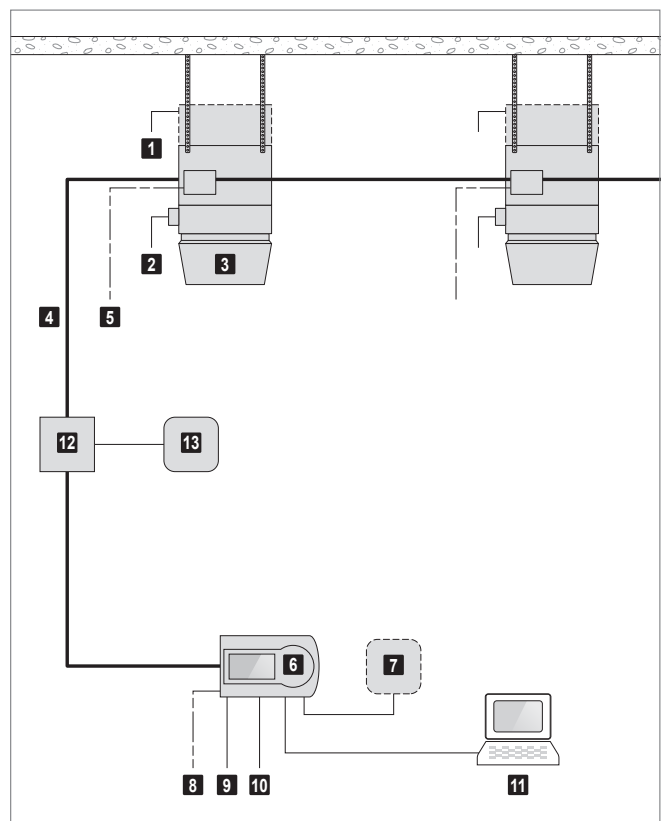
Table D3: Room temperature sensor ET-R technical data

4 System structure

4.1 EasyTronic EC with TopVent® TH, TC, CH, CC



- 1** Differential pressure switch air filter
- 2** Condensate pump
- 3** TopVent® TH, TC, CH, CC (max. 10)
- 4** System bus
- 5** Power supply for TopVent® TH, TC, CH, CC
- 6** EasyTronic EC
- 7** External room temperature sensor
- 8** Power supply for EasyTronic EC
- 9** Door contact
- 10** Heating/cooling changeover (TopVent® TC, CC)
- 11** BMS connection via Modbus

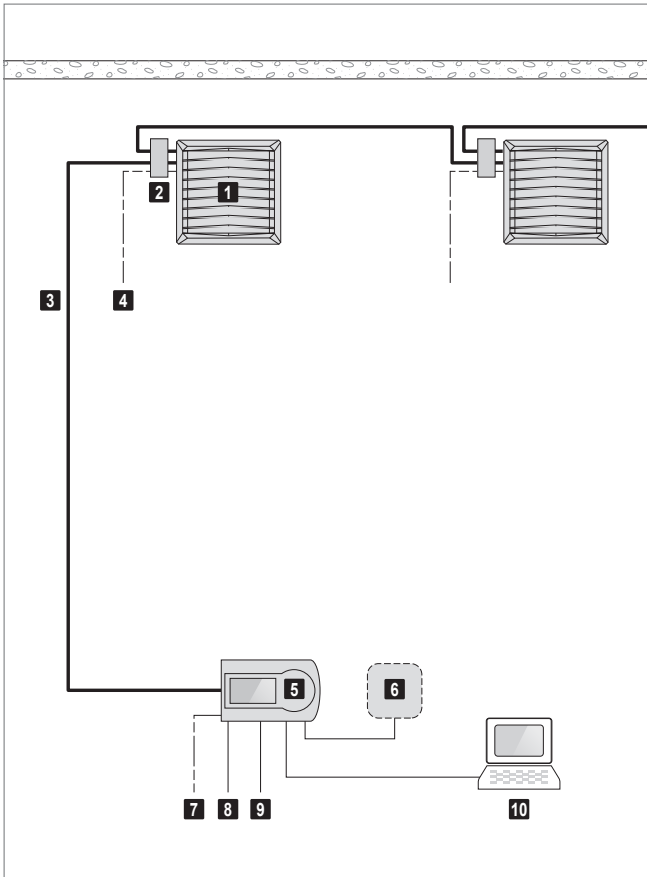


- 1** Differential pressure switch air filter
- 2** Condensate pump
- 3** TopVent® TH, TC, CH, CC (max. 10)
- 4** System bus
- 5** Power supply for TopVent® TH, TC, CH, CC
- 6** EasyTronic EC
- 7** External room temperature sensor
- 8** Power supply for EasyTronic EC
- 9** Door contact
- 10** Heating/cooling changeover (TopVent® TC, CC)
- 11** BMS connection via Modbus
- 12** Relay (field-supplied)
- 13** Pump/valve

Fig. D2: EasyTronic EC connection diagram without pump/valve control

Fig. D3: EasyTronic EC connection diagram with pump/valve control

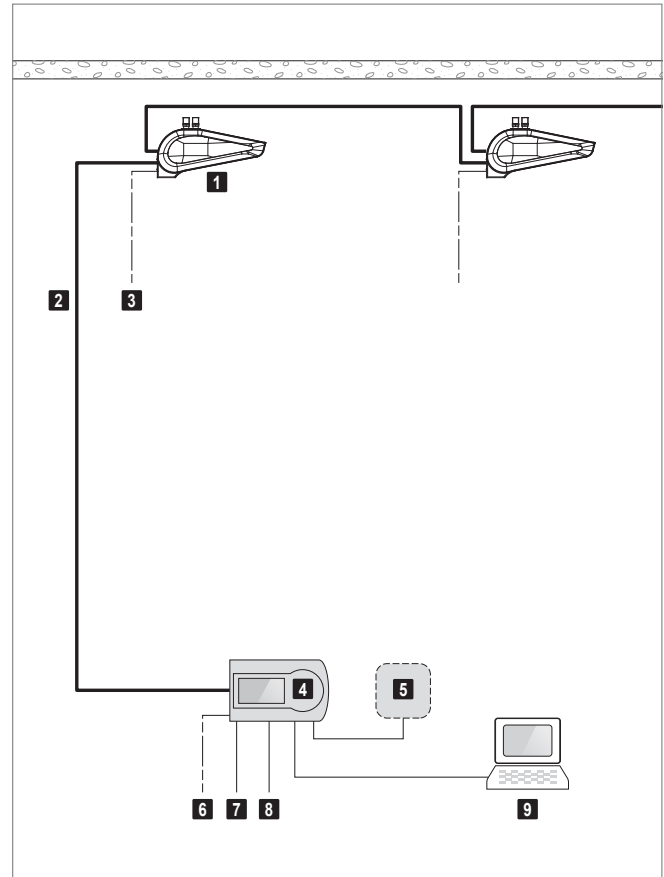
4.2 EasyTronic EC with TopVent® TV



- 1** TopVent® TV (max. 10)
- 2** Connection box (by the installer)
- 3** System bus
- 4** Power supply for TopVent® TV
- 5** EasyTronic EC
- 6** External room temperature sensor
- 7** Power supply for EasyTronic EC
- 8** Door contact
- 9** Pump/valve
- 10** BMS connection via Modbus

Fig. D4: EasyTronic EC connection diagram

4.3 EasyTronic EC with TopVent® TW



- 1** TopVent® TW (max. 10)
- 2** System bus
- 3** Power supply for TopVent® TW
- 4** EasyTronic EC
- 5** External room temperature sensor
- 6** Power supply for EasyTronic EC
- 7** Door contact
- 8** Pump/valve
- 9** BMS connection via Modbus

Fig. D5: EasyTronic EC connection diagram



EasyTronic TV

Room temperature controller without timer for TopVent® TV recirculation units and TopVent® TW air curtains

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3 System structure 32

1 Use and function

The EasyTronic TV is a room temperature controller without timer for TopVent® TV recirculation units and TopVent® TW air curtains. A maximum of 8 TopVent® units can be connected to 1 controller.



Fig. E1: EasyTronic TV room temperature controller

Function

- Recording the room temperature with the integrated temperature sensor
- Room temperature control in on/off mode: If the room temperature falls below the setpoint value, the connected TopVent® units switch on. Upon reaching the setpoint value, the units switch off again.
- Adjusting the fan speed: The required speed can be infinitely adjusted.

Location

- Install the EasyTronic TV with the integrated temperature sensor at a height of about 1.5 m at a representative location in the occupied area. The measured values must not be distorted by the presence of sources of heat or cold (machines, windows, sunlight, etc.).

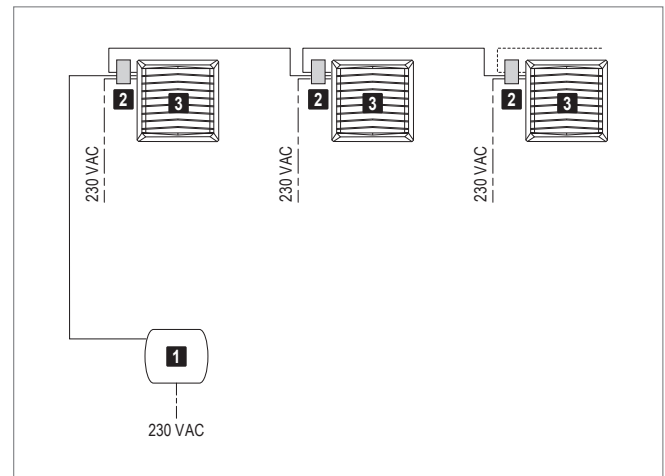
2 Technical data

EasyTronic TV	
Power supply	230 VAC, ±10%, 50 Hz
Working temperature	0...60 °C
Temperature control range	5...30 °C
Dimensions (W x H x D)	99 × 96 × 43 mm
Casing material	ABS
Protection rating	IP 30
Installation	Wall mounting (surface mounting)

Table E1: Technical data EasyTronic TV

3 System structure

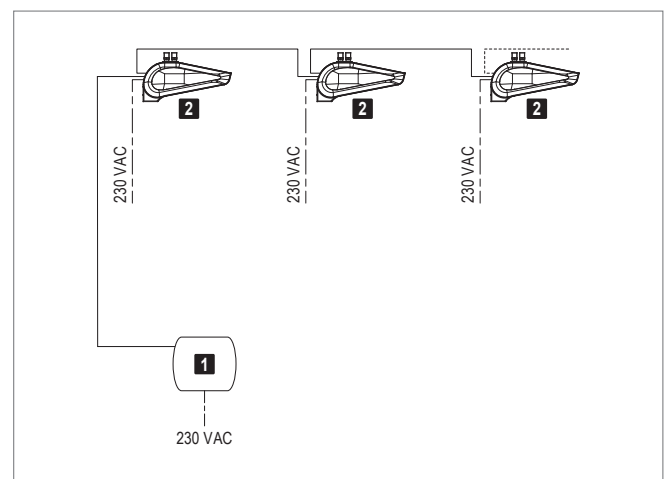
3.1 EasyTronic TV with TopVent® TV



- 1 EasyTronic TV
- 2 Connection box (by the installer)
- 3 TopVent® TV (max. 8)

Fig. E2: Connection diagram

3.2 EasyTronic TV with TopVent® TW



- 1 EasyTronic TV
- 2 TopVent® TW (max. 8)

Fig. E3: Connection diagram



TempTronic MTC

Programmable room temperature controller
for TopVent® GV recirculation units

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2 External connections	34
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4 System structure	35

1 Use and function

The TempTronic MTC is a programmable room temperature controller with menu operation for TopVent® GV recirculation units. A maximum of 8 units can be connected to 1 controller.



Fig. F1: Room temperature controller TempTronic MTC

Function

The TempTronic MTC is connected to the units via a system bus and fulfils the following functions:

- Regulation of the room temperature with setting option for 3 temperature setpoints
- Clock programme with 10 programmable time blocks
- Summer ventilation (in 3 speeds)
- Destratification mode
- Recording the room temperature with the integrated temperature sensor
- Connection option for external room temperature sensor (instead of the integrated sensor or for averaging)
- Alarm display and reset
- External switching
- Keyboard locking
- Password protection

Communication is via a 2-wire low-voltage bus system. The TempTronic MTC cannot be used for 24 V, 230 V or other signals.

Location

Install the room temperature controller with the integrated temperature sensor at a height of about 1.5 m at a representative location in the occupied area. Its measured values must not be distorted by the presence of sources of heat or cold (machines, windows, sunlight, etc.).

2 External connections

TempTronic MTC

External switching					
Switching via a relay to be installed on site					
3 variants can be selected for the operating principle:					
<table border="1"> <tr> <td>Contact open</td> <td>= Clock programme</td> </tr> <tr> <td>Contact closed</td> <td>= Off</td> </tr> </table>		Contact open	= Clock programme	Contact closed	= Off
Contact open		= Clock programme			
Contact closed	= Off				
<table border="1"> <tr> <td>Contact open</td> <td>= Clock programme</td> </tr> <tr> <td>Contact closed</td> <td>= On</td> </tr> </table>	Contact open	= Clock programme	Contact closed	= On	
Contact open	= Clock programme				
Contact closed	= On				
<table border="1"> <tr> <td>Contact open</td> <td>= Setpoint night</td> </tr> <tr> <td>Contact closed</td> <td>= Setpoint day</td> </tr> </table>	Contact open	= Setpoint night	Contact closed	= Setpoint day	
Contact open	= Setpoint night				
Contact closed	= Setpoint day				

Table F1: TempTronic MTC external connections

Option module

By means of an optional module, the following additional functions can be controlled:

Collective alarm	
External display of a collective alarm Alarm = Out 230 VAC	
Operating signal	
External operating signal display	
Alarm reset	
External signal for alarm reset	
Fan	
External control of the fan: 0-2 V = Fan OFF 2-10 V = Fan MIN - MAX	

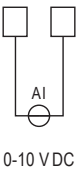



Burner	
External control of the burner: 0-2 V = Burner OFF 2-10 V = Burner MIN - MAX	
0-10 VDC	
Maximum output	
External signal for maximum fan and heating power	
24 VAC, max. 1 A	
Minimum output	
External signal for minimum fan and heating power	
24 VAC, max. 1 A	
Summer ventilation	
External signal for summer ventilation with maximum fan power	
24 VAC, max. 1 A	

Table F2: Option module OMC external connections

3 Technical data

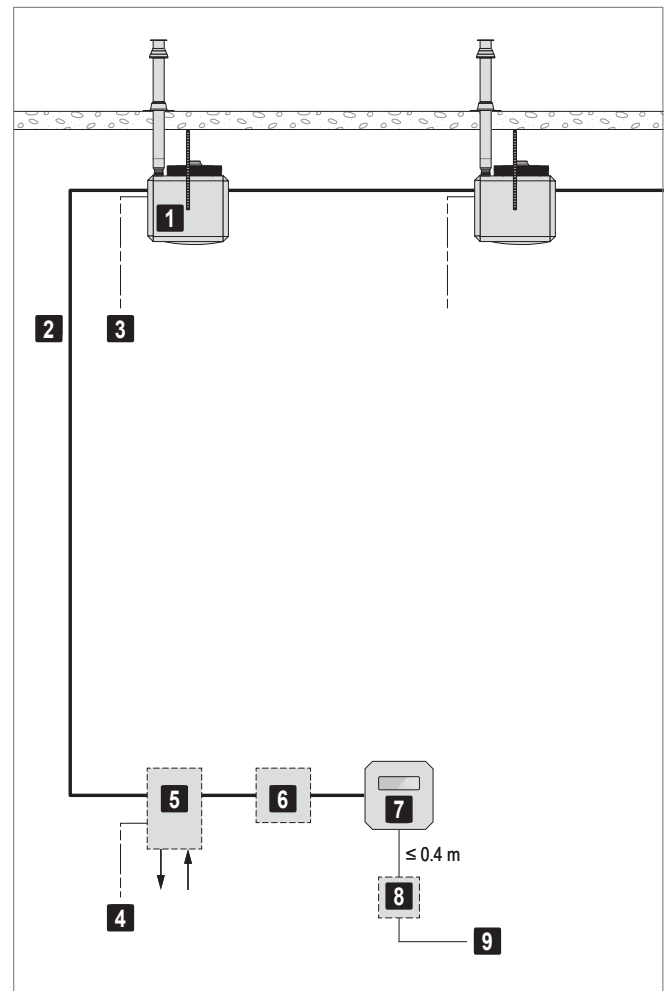
Technical data	
Feed voltage	Low voltage via system bus
Dimensions (W x H x D)	125 x 125 x 30 mm
Temperature range	0...50 °C
Controller	PI
Protection rating	IP 30
Installation	On a wall box or directly on the wall

Table F3: TempTronic MTC technical data

Room temperature sensor MTC-RF	
Temperature range	0...50 °C
Dimensions (W x H x D)	90 x 50 x 35 mm
Protection rating	IP 64
Installation	In plastic casing for wall mounting

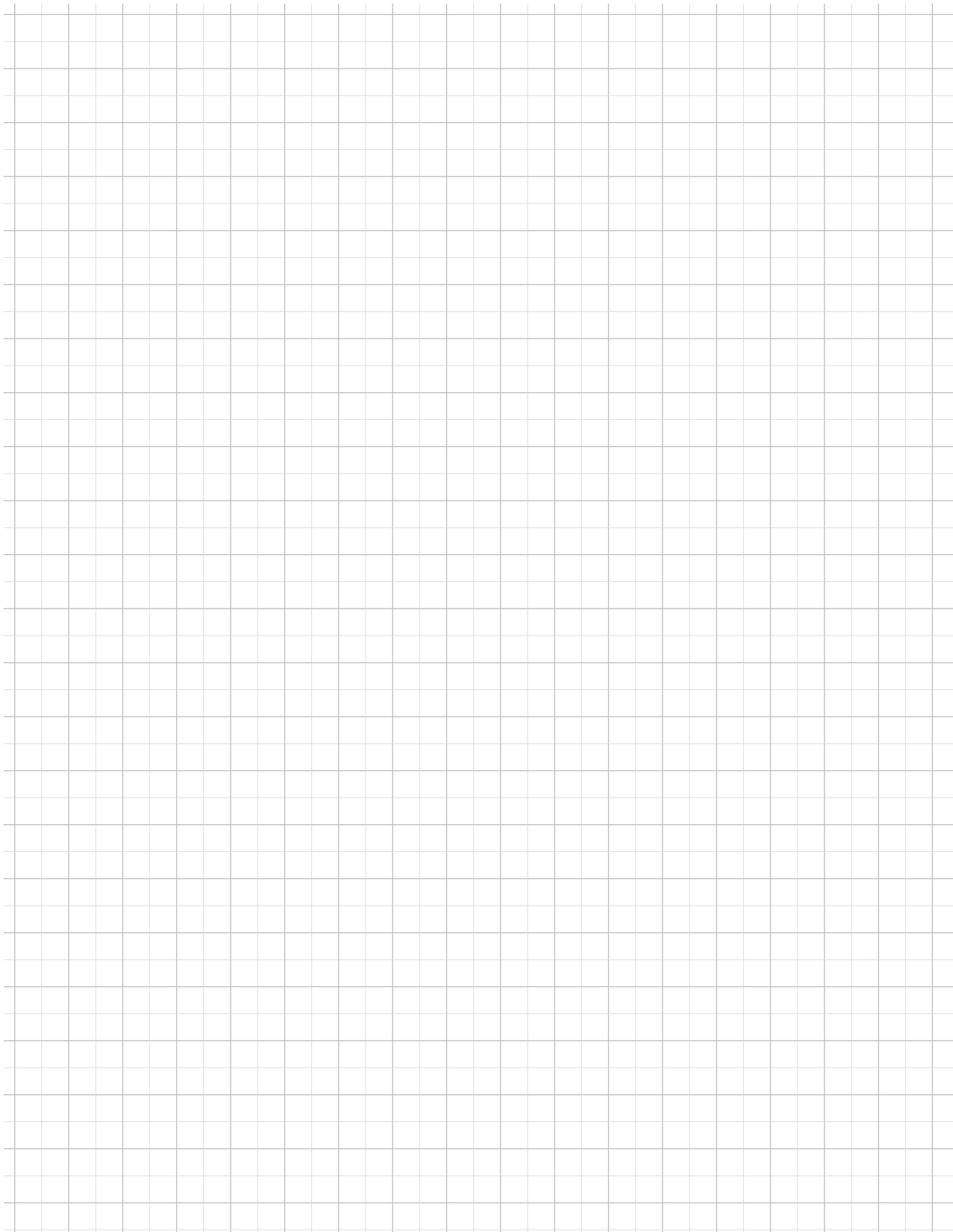
Table F4: Room temperature sensor MTC-RF technical data

4 System structure



- 1 TopVent® GV (max. 8)
- 2 System bus
- 3 Power supply for TopVent® GV
- 4 Power supply for option module
- 5 Option module
- 6 External room temperature sensor
- 7 TempTronic MTC
- 8 Relay (field-supplied)
- 9 External switching

Fig. F2: TempTronic MTC connection diagram



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