Hoval Indoor Climate Systems
TopVent®

Recirculation units and supply air units with efficient air distribution for heating and cooling with central heat and cold generation
TopVent® TH | TC | THC | MH | MC | MHC

Design Handbook

Hoval

Indoor climate systems

Efficient. Flexible. Reliable.

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 heat exchangers 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

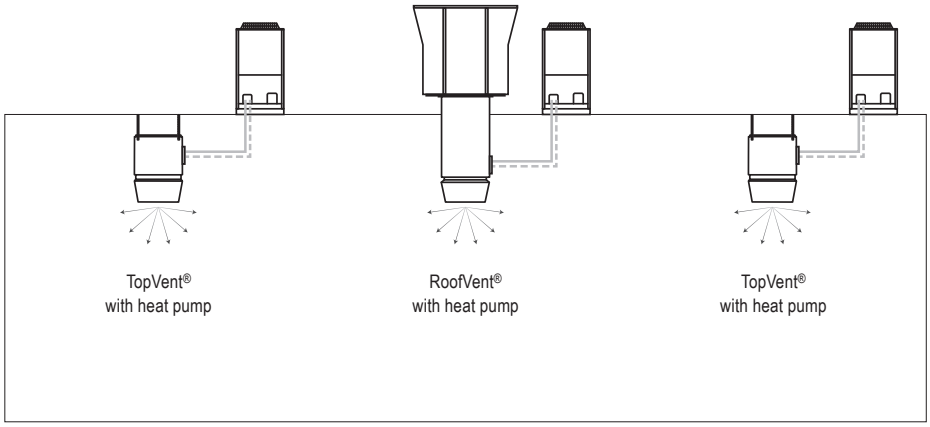
The number of supply and extract air handling units depends on how much fresh air is required in order to create a comfortable atmosphere for people in the building. Recirculation units cover additional heat or cool demand as required. A broad range of unit types and sizes with heating and cooling coils 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.

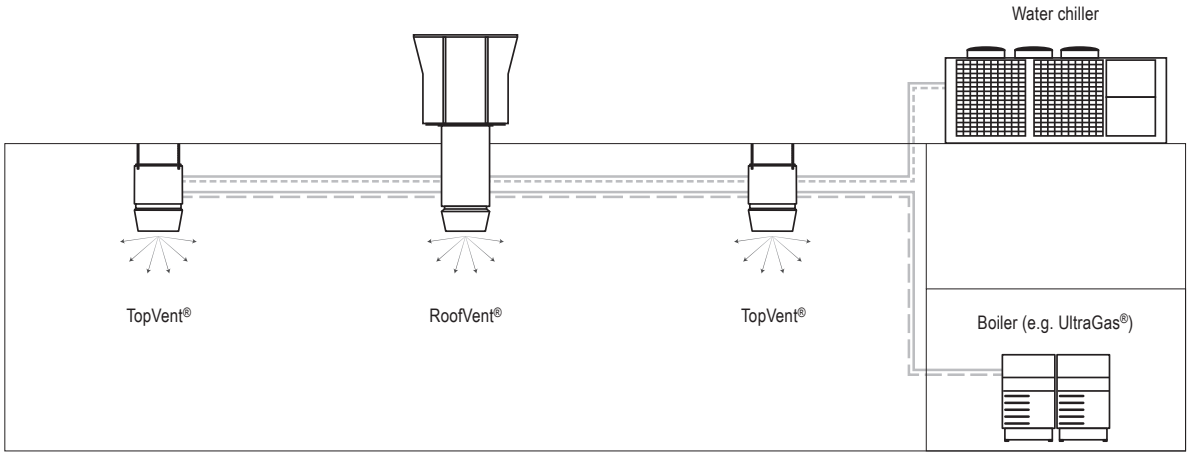
Control with specialist expertise
The TopTronic® C control system, which was specifically developed for Hoval indoor climate systems, regulates the separate units individually and controls them based on zones. This enables optimal adjustment to the local requirements of the different usage areas in the 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.

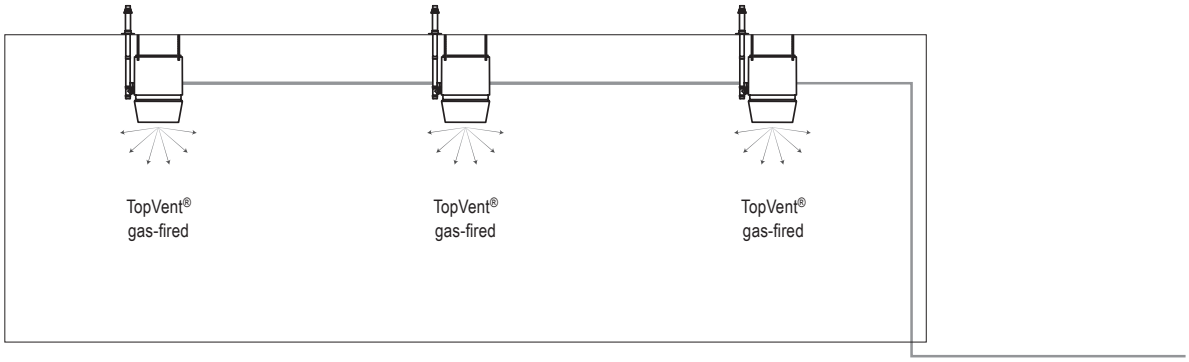
System with decentralised heat and cold generation with heat pump



System with central heat and cold generation



System with decentralised heat generation with gas-fired heat exchanger



TopVent® TH

Recirculation units for heating spaces up to 25 m in height with central heat supply

1 Use

1.1 Intended use

TopVent® TH units are recirculation units for heating spaces up to 25 m in height with central heat supply. They have the following functions:

- Heating (with connection to a hot water supply)
- Recirculation operation
- Air distribution with adjustable Air-Injector
- Air filtration (option)

The Hoval TopTronic® C integrated control system ensures energy-efficient, demand-based operation of Hoval indoor climate systems.

Intended use also includes compliance with the operating instructions. Any usage over and above this use is considered to be not as intended. The manufacturer can accept no liability for damage resulting from improper use.

1.2 User group

The units are only allowed to be installed, operated and maintained by authorised and instructed personnel who are well acquainted with the units and are informed about possible dangers.

The operating instructions are for operating engineers and technicians as well as specialists in building, heating and ventilation technology.

2 Construction and operation

2.1 Structure

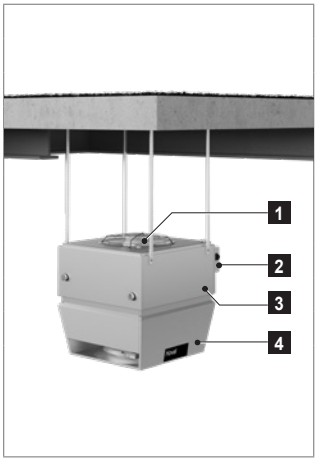
The TopVent® TH unit consists of the following components:

- Fan unit:
  Axial fan with energy-saving EC motor, maintenance-fee and infinitely variable
- Heating section:
  contains the heating coil for heating the supply air with hot water
- Air-Injector:
  Patented, automatically adjustable vortex air distributor for draught-free air distribution over a large area

As part of the TopTronic® C control system, the unit control box is an integral component. The following components are installed:

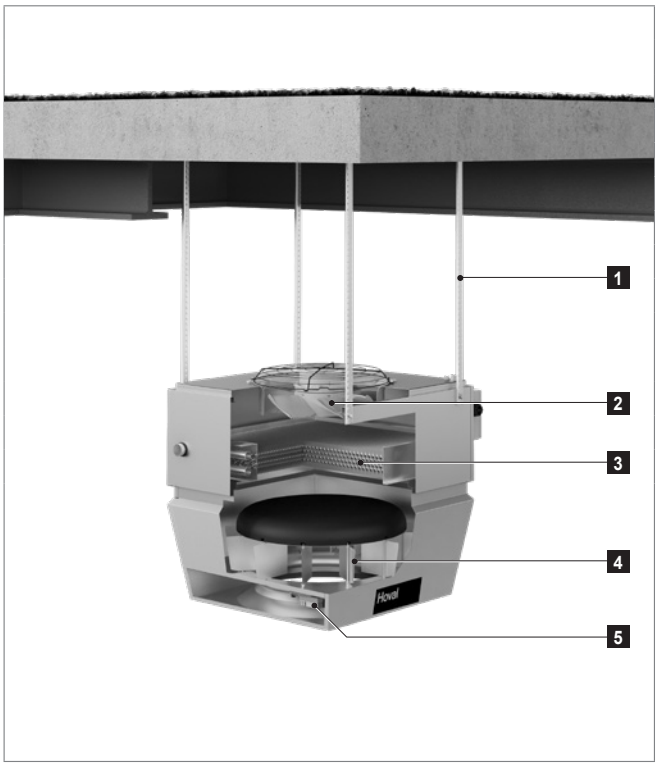
- Unit controller: this component controls the unit including the air distribution according to the specifications of the control zone. The unit controller is connected to the other components of the TopTronic® C control system via system bus.
- Main switch
- Circuit board with electrical components and external connections

All unit components are fully factory-wired.



1	Fan unit
2	Heating section
3	Unit control box
4	Air-Injector

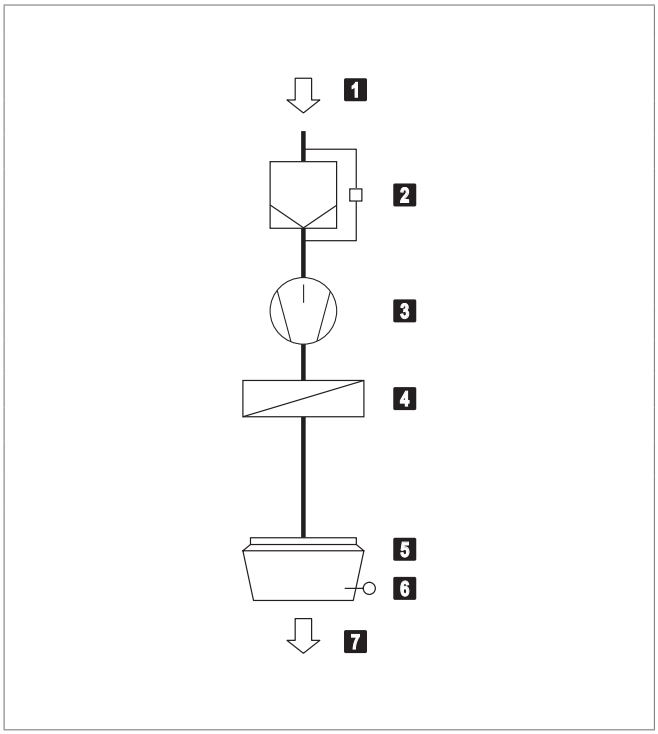
Fig. B1: TopVent® TH components



1	Suspension set
2	Fan
3	Heating coil
4	Air-Injector
5	Actuator Air-Injector

Fig. B2: TopVent® TH structure

2.2 Function diagram



1	Extract air
2	Air filter with differential pressure switch (option)
3	Fan
4	Heating coil
5	Air-Injector with actuator
6	Supply air temperature sensor
7	Supply air

Fig. B3: TopVent® TH function diagram

2.3 Operating modes

The TopVent® TH has the following operating modes:
- Recirculation
- Recirculation speed 1
- Standby

The TopTronic® C control system regulates these operating modes automatically for each control zone in accordance with the specifications in the calendar. The following points also apply:
- The operating mode of a control zone can be switched over manually.
- Each TopVent® TH unit can operate individually in a local operating mode: Off, Recirculation, Recirculation speed 1.

Code	Operating mode	Description
REC	**Recirculation** On/off-operation: if heating is required, the unit draws in room air, heats it and returns the warm air back into the room. The room temperature set value day is active.	Fan ..... speed 1 / 2 [1)] Heating ..... on [1)] Depending on heat demand
DES	■ Destratification: To avoid heat build-up under the ceiling, it may be appropriate to switch on the fan when there is no heat demand (either in permanent operation or in on/off operation depending on air temperature under the ceiling, as desired).	Fan ..... speed 2 Heating ..... off
REC1	**Recirculation speed 1** The same as REC, but the unit operates only at speed 1 (low air flow rate)	Fan ..... speed 1 [1)] Heating ..... on [1)] Depending on heat demand
DES	■ Destratification: The same as for REC, but the unit operates only at speed 1	Fan ..... speed 1 Heating ..... off
ST	**Standby** The unit is normally switched off. The following functions remain active:	
CPR	■ Cooling protection: If the room temperature drops below the set value for cooling protection, the unit heats up the room in recirculation operation.	Fan ..... speed 2 Heating ..... on
L_OFF	**Off** (local operating mode) The unit is switched off.	Fan ..... off Heating ..... off
–	**Forced heating** The unit draws in room air, warms it and blows it back into the room. Forced heating is activated by connecting the unit to a power supply (only if there is no bus connection to the zone controller). For example, it is suitable for heating the hall before taking the control system into operation or if the controller fails during the heating period.	Fan ..... speed 2 Heating ..... on

Table B4: TopVent® TH operating modes

3 Technical data

3.1 Unit type reference

TH - 6 A - ...

Unit type
TopVent® TH

Unit size
6 or 9

Heating section
A with coil type A
B with coil type B
C with coil type C

Further options

Table B5: Unit type reference TopVent® TH

3.2 Application limits

Extract air temperature	max.	°C	50
Supply air temperature	max.	°C	60
Temperature of the heating medium [1]	max.	°C	90
Pressure of the heating medium	max.	kPa	800

The units cannot be used in:
- Damp locations
- Places with a corrosive or aggressive environment
- Spaces with a large amount of dust
- Areas where there is danger of explosion

[1] Design for higher temperatures on request

Table B6: TopVent® TH application limits

3.3 Electrical connection

Unit type		TH-6	TH-9
Supply voltage	V AC	3 × 400	3 × 400
Permitted voltage tolerance	%	± 5	± 5
Frequency	Hz	50	50
Connected load	kW	1.5	2.1
Current consumption max.	A	2.9	4.0
Series fuse	A	13	13
Protection rating	-	IP 54	IP 54

Table B7: TopVent® TH electrical connections

3.4 Flow rate, product parameters

Unit type		TH-6			TH-9		
Coil type		A	B	C	A	B	C
Nominal air flow rate	m³/h			6000			9000
Floor area covered	m²			537			946
Static efficiency of the fans	%			48.5			43.0
Effective electric power input	kW	0.46	0.53	0.74	0.84	0.96	1.26

Table B8: TopVent® TH technical data

3.5 Heat output

Heating medium temperature			80/60 °C					60/40 °C				
Size	Type	t_{room}	Q	H_{max}	t_S	Δp_W	m_W	Q	H_{max}	t_S	Δp_W	m_W
		°C	kW	m	°C	kPa	l/h	kW	m	°C	kPa	l/h
TH-6	A	16	32.8	13.4	34.2	7	1410	18.8	16.8	27.3	2	807
		20	30.3	14.0	37.0	6	1301	16.2	17.9	30.0	2	697
	B	16	47.0	11.6	41.3	13	2020	26.9	14.6	31.3	4	1157
		20	43.4	12.0	43.5	11	1864	23.3	15.5	33.5	3	1001
	C	16	76.0	9.4	55.6	18	3267	45.0	11.8	40.3	6	1935
		20	70.3	9.8	56.8	16	3022	39.3	12.5	41.5	5	1690
TH-9	A	16	55.5	13.6	36.6	8	2386	31.7	17.0	28.5	3	1364
		20	51.2	14.1	38.9	7	2201	27.4	18.1	31.1	2	1179
	B	16	71.2	12.2	41.5	12	3060	40.6	15.4	31.4	4	1746
		20	65.7	12.7	43.7	10	2823	35.1	16.5	33.6	3	1509
	C	16	117.9	9.8	56.9	18	5066	69.9	12.3	41.1	6	3003
		20	109.1	10.2	58.0	15	4686	61.0	13.1	42.1	5	2622

Legend:
Type = Type of coil
t_{room} = Room air temperature
Q = Heat output
H_{max} = Maximum mounting height
t_S = Supply air temperature
Δp_W = Water pressure drop
m_W = Water quantity

Reference:
- At room air temperature 16°C: extract air temperature 18°C
- At room air temperature 20°C: extract air temperature 22°C

Table B9: TopVent® TH heat outputs

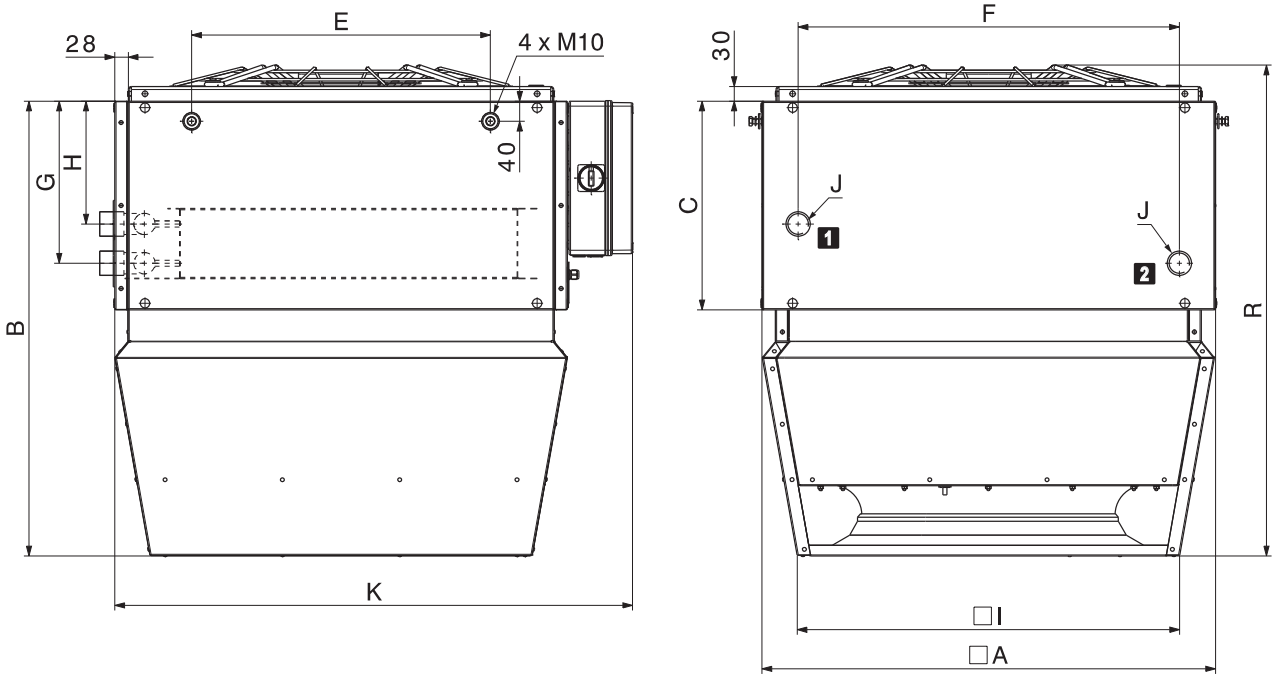
3.6 Sound data

Unit type			TH-6C	TH-9C
Sound pressure level (at a distance of 5 m) [1]		dB(A)	55	58
Total sound power level		dB(A)	77	80
Octave sound power level	63 Hz	dB	55	61
	125 Hz	dB	60	65
	250 Hz	dB	65	69
	500 Hz	dB	70	73
	1000 Hz	dB	74	75
	2000 Hz	dB	70	75
	4000 Hz	dB	64	70
	8000 Hz	dB	56	63

[1] with a hemispherical radiation pattern in a low-reflection room

Table B10: TopVent® TH sound power levels

3.7 Dimensions and weights



1 Return heating
2 Flow heating

Fig. B11: TopVent® TH dimensional drawing

Unit size		TH-6			TH-9		
Coil type		A	B	C	A	B	C
A	mm			900			1100
B	mm			905			1050
C	mm			415			480
E	mm			594			846
F	mm			758			882
G	mm			322			367
H	mm			244			289
I	mm			760			935
K	mm			1030			1230
R	mm			977			1152
J	"			Rp 1¼ (internal)			Rp 1½ (internal)
Water content of heating coil	l	4.6	4.6	7.9	7.4	7.4	12.4
Weight	kg	104	104	111	155	155	166

Table B12: TopVent® TH dimensions and weights

4 Specification texts

4.1 TopVent® TH

Recirculation unit for heating rooms up to 25 m in height with central heat supply; equipped with highly efficient air distributor; maximum floor area reached per unit 537 m² (size 6) and 946 m² respectively (size 9).

The unit consists of the following components:
- Fan unit
- Heating section
- Air-Injector or outlet nozzle
- Unit control box or terminal box
- Optional components

TopVent® TH units comply with all the requirements of the Ecodesign Directive 2009/125/EC relating to environmentally friendly design of energy-related products. They are systems of the 'fan coil unit' type.

Fan unit

Consisting of maintenance-free, direct-drive axial fan with high-efficiency EC motor and balanced rotating wheel with aerodynamically shaped blades and serrated trailing edge (integrated in the heating section).

Heating section

Housing made of aluzinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of ageing-resistant, silicone-free sealing materials.
The heating section contains:
- The highly efficient heating coil consisting of seamless copper pipes with pressed-on, optimised and profiled aluminium fins and manifolds made of copper; for connection to the hot water supply

Air-Injector

Housing made of aluzinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of ageing-resistant, silicone-free sealing materials, with:
- Vortex air distributor with concentric outlet nozzle, adjustable vanes and integrated absorber hood
- Actuator for infinitely variable adjustment of the air distribution from vertical to horizontal for draught-free air distribution in the hall under changing operating conditions
- Supply air temperature sensor

Outlet nozzle (variant)

Housing made of aluzinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of ageing-resistant, silicone-free sealing materials. Concentric outlet nozzle with a supply air sensor.

Unit control box

Control box fitted at the side of the housing for connection of the power supply and housing the control components that facilitate energy-optimised operation, controlled by the control system TopTronic® C. Plastic housing, protection rating IP 56. The following components are installed:
- Main switch
- Circuit board with all required electrical components, unit controller (clipped on) as well as connection terminals for the following external connections:
  - Heating valve
  - Heating pump
  - Return temperature sensor
  - Door contact

The circuit board is fitted with push-in terminals facilitating easy installation of the connection cables. All components in the unit control box as well as sensors and actuators in the unit are fully factory-wired.
Power supply and bus connection to be installed on site.

Terminal box (variant)

Terminal box fitted at the side of the housing for connection of the power supply and peripheral components of the unit. Plastic housing, protection rating IP 56. The following components are installed:
- Main switch
- Circuit board with all required electrical components as well as connection terminals for the following signals:
  - Input Enable fan
  - Input Control signal fan
  - Output Control signal next fan
  - Input Control signal actuator Air-Injector
  - Output Control signal next actuator Air-Injector
  - Output Feedback control signal Air-Injector
  - Output Error
- The following sensors and actuators in the unit are factory-wired:
  - Fan
  - Supply air temperature sensor
  - Actuator Air-Injector

Options for the unit

Suspension set:
for ceiling installation of the unit consisting of 4 pairs U-profiles made of aluzinc sheet steel, height-adjustable to 1300 mm. Paint according to unit.

Filter box:
Housing made of aluzinc sheet with 2 ISO coarse 60% bag filters (G4), with differential pressure switch for filter monitoring, factory-wired to the circuit board in the unit control box.

Flat filter box:
Housing made of aluzinc sheet with 4 pleated ISO coarse 60% cell filters (G4), with differential pressure switch for filter monitoring, factory-wired to the circuit board in the unit control box.

Standard paint finish:
External paint finish in Hoval red (RAL 3000)

Paint finish as desired:
Choice of external paint finish in RAL colour

Recirculation silencer:
as an attachment to the unit, made of aluzinc sheet metal, lined with sound insulation matting, insertion attenuation 3 dB(A)

Acoustic cowl:
consisting of an absorber hood of large volume, insertion attenuation 4 dB(A)

Hydraulic assembly diverting system:
Prefabricated assembly for hydraulic diverting system, consisting of mixing valve, regulating valve, ball valve, automatic air vent and screw connections for connection to the unit and to the distributor circuit; mixing valve with plug-in connection, sized for the coil in the unit and the Hoval TopTronic® C control system.

Mixing valve:
Mixing valve with modulating rotary actuator and plug-in connection, sized for the coil in the unit.

Pump control for mixing or injection system:
Electrical components for controlling a mixing or injection circuit in the load circuit, factory-installed in the unit control box.

Return temperature sensor:
Temperature sensor for monitoring the heating medium.

4.2 TopTronic® C – System control

Zone-based control system ex-works for operation of decentralised Hoval indoor climate systems with optimised use of energy, suitable for demand-driven control of overall systems comprising up to 64 control zones each with up to 15 supply and extract air handling units or supply air units and 10 recirculation units.

The control system is customised and preconfigured ex works. Zone allocation:
- Zone 1: __ x Unit type _____
- Zone 2: __ x Unit type _____
- Zone 3: __ x Unit type _____
- …

System structure:
- Unit controller: installed in the particular indoor climate unit
- Zone bus: as serial connection of all unit controllers in one control zone with the zone controller; with robust bus protocol via shielded and twisted-pair bus line (bus cables provided by the client)
- Zone control panel with:
  - System operator terminal
  - Fresh air temperature sensor
  - Zone controllers and room air temperature sensors
  - All components for the electrical power supply and protection
- System bus (Ethernet): for connecting all zone controllers to one another and to the system operator terminal (bus cables provided by the client)

Operation:
- TopTronic® C-ST as system operator terminal: touch panel for visualisation and control by web browser via HTML interface, including software for LAN access
- TopTronic® C-ZT as zone operator terminal: for simple on-site operation of a control zone (optional)
- Manual operating selector switch (optional)
- Manual operating selector button (optional)
- Operating of the units via building management system via standardised interfaces (optional):
  - BACnet
  - Modbus IP
  - Modbus RTU

Control functions:
- Control of the supply air temperature using room supply air cascade control via sequential control of the energy recovery and the coils (depending on the unit type)
- Demand-driven control of the room air quality by variation of the supply air and exhaust air volume flows with minimum and maximum limit (for supply and extract air handling units, optional)
- Control of the unit including the air distribution according to the specifications of the zone controller

Alarms, protection:
- Central alarm management with registration of all alarms (timestamp, priority, status) in an alarm list and alarm memory of the last 50 alarms; forwarding via e-mail can be set in the parameters.
- 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.
- Frost protection control of the units with constrained control of protection functions to prevent coil icing (for supply air units as well as supply and extract air handling units)
- A maintenance mode implemented in the control algorithm for testing all physical data points and alarms guarantees high reliability.

Options for the zone control panel:
- Design for heating (TH, TC, THC, MH, MC, MHC)
- Design for cooling (TC, THC, MC, MHC)
- Cooling lock switch (TC, THC, MC, MHC)
- Alarm lamp
- Socket
- Additional room air temperature sensors (max. 3)
- Combination sensor room air quality, temperature and humidity
- External sensor values
- External set values
- Load shedding input
- Operating selector switch on terminal
- Operating selector button on terminal
- Power supply for air handling unit
- Safety relay
- Control of distributor pump, incl. power supply

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

System control for operation of decentralised Hoval indoor climate systems with optimised use of energy, suitable for demand-driven control of TopVent® plants comprising 1 control zone with up to 6 supply air units and 10 recirculation units (power supply for the TopVent® units provided by the client).

System structure:
- Unit controller: installed in the particular indoor climate unit
- Zone bus: as serial connection of all unit controllers with the zone controller; with robust bus protocol via shielded and twisted-pair bus line (bus cables provided by the client)
- Zone control panel, designed as compact cabinet for wall installation, made of coated sheet steel (light grey RAL 7035), with:
  - Zone controller with operating panel, making it simple to operate and monitor the system
  - Fresh air temperature sensor
  - Room temperature sensor
- Circuit board with external connections for:
  - Collective alarm
  - Forced off (zone controller)
  - Forced off (supply air unit)
  - Heating demand
  - Setpoint heating demand
  - Fault heat supply
  - Cooling demand
  - Fault cold supply
  - External enabling heating/cooling
  - External setting heating/cooling
  - Changeover valves heating/cooling
  - Additional room air temperature sensors (max. 3)
  - External setpoint fresh air ratio
  - Operating selector switch on terminal (digital)
  - Operating selector button on terminal

Control functions:
- Control of the supply air temperature via sequential control of the coils
- Control of the unit including the air distribution according to the specifications of the zone controller

Alarms, protection:
- Central alarm management with registration of all alarms (timestamp, priority, status) in an alarm list and alarm memory of the last 50 alarms.
- 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.
- Frost protection control of the units with constrained control of protection functions to prevent coil icing (for supply air units)
- A maintenance mode implemented in the control algorithm for testing all physical data points and alarms guarantees high reliability.

Options for the zone control panel:
- Additional room air temperature sensors (max. 3)
- Operating of the units via building management system via standardised interfaces:
  - BACnet
  - Modbus IP
  - Modbus RTU

4.4 EasyTronic EC

Room temperature controller with timer for TopVent® recirculation unit heaters and air curtains (TH, TW, TV) with manual setting of the room temperature setpoint, setpoint decrease, fan speed and, where applicable, air distribution with the Air-Injector (TopVent® TH), in addition, unit operation subject to a door contact switch, protection rating IP 30.

Room temperature sensor ET-R
for connection to the EasyTronic EC in place of the room temperature sensor that is integrated in the room temperature controller, in a plastic housing for wall-mounted installation, protection rating IP 65.

TopVent® TC

Recirculation units for heating and cooling spaces up to 25 m in height with central heat and cold supply (2-pipe-system)

1 Use

1.1 Intended use

TopVent® TC units are recirculation units for heating and cooling spaces up to 25 m in height with central heat and cold supply. They have the following functions:

- Heating (with connection to a hot water supply)
- Cooling (with connection to a water chiller)
- Recirculation operation
- Air distribution with adjustable Air-Injector
- Air filtration (option)

The Hoval TopTronic® C integrated control system ensures energy-efficient, demand-based operation of Hoval indoor climate systems.

Intended use also includes compliance with the operating instructions. Any usage over and above this use is considered to be not as intended. The manufacturer can accept no liability for damage resulting from improper use.

1.2 User group

The units are only allowed to be installed, operated and maintained by authorised and instructed personnel who are well acquainted with the units and are informed about possible dangers.

The operating instructions are for operating engineers and technicians as well as specialists in building, heating and ventilation technology.

2 Construction and operation

2.1 Structure

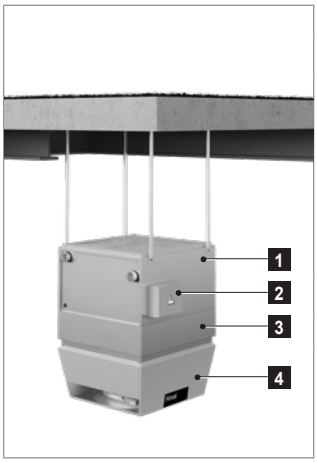
The TopVent® TC unit consists of the following components:

- Fan unit:
  Diagonal fan with energy-saving EC motor, maintenance-fee and infinitely variable
- Heating/cooling section:
  contains the heating/cooling coil for heating and cooling the supply air with hot water or cold water and the condensate separator for the condensate generated
- Air-Injector:
  Patented, automatically adjustable vortex air distributor for draught-free air distribution over a large area

As part of the TopTronic® C control system, the unit control box is an integral component. The following components are installed:

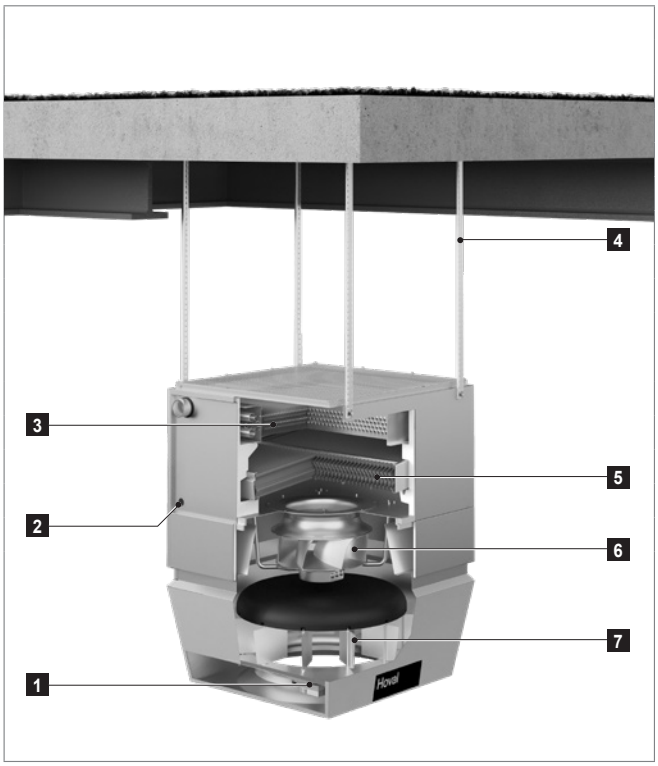
- Unit controller: this component controls the unit including the air distribution according to the specifications of the control zone. The unit controller is connected to the other components of the TopTronic® C control system via system bus.
- Main switch
- Circuit board with electrical components and external connections

All unit components are fully factory-wired.



1 Heating/cooling section
2 Unit control box
3 Fan unit
4 Air-Injector

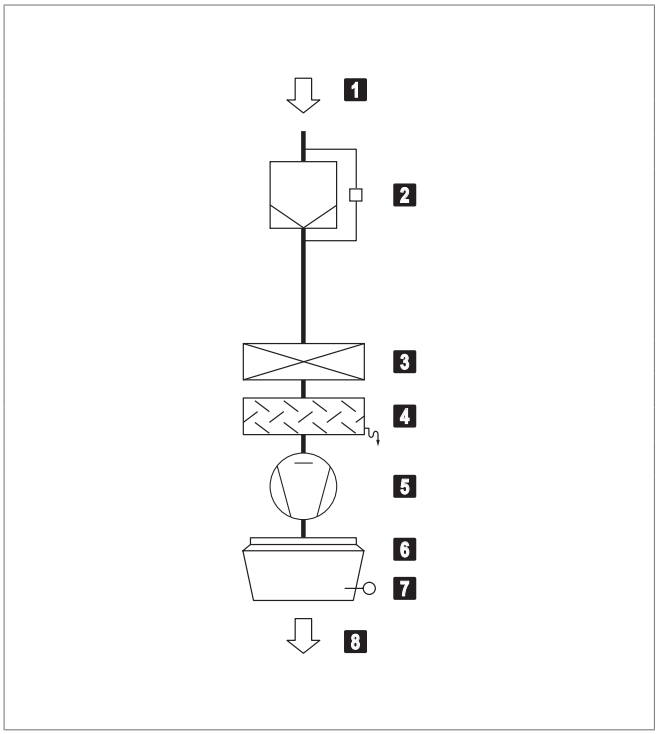
Fig. C1: TopVent® TC components



1	Actuator Air-Injector
2	Condensate connection
3	Heating/cooling coil
4	Suspension set
5	Condensate separator
6	Fan
7	Air-Injector

Fig. C2: TopVent® TC structure

2.2 Function diagram



1	Extract air
2	Air filter with differential pressure switch (option)
3	Heating/cooling coil
4	Condensate separator
5	Fan
6	Air-Injector with actuator
7	Supply air temperature sensor
8	Supply air

Fig. C3: TopVent® TC function diagram

2.3 Operating modes

The TopVent® TC has the following operating modes:
- Recirculation
- Recirculation speed 1
- Standby

The TopTronic® C control system regulates these operating modes automatically for each control zone in accordance with the specifications in the calendar. The following points also apply:
- The operating mode of a control zone can be switched over manually.
- Each TopVent® TC unit can operate individually in a local operating mode: Off, Recirculation, Recirculation speed 1.

Code	Operating mode	Description
REC	**Recirculation** On/Off operation: during heat or cool demand, the unit draws in room air, heats or cools it and blows it back into the room. The room temperature set value day is active.	Fan ..... speed 1 / 2 [1)] Heating/cooling ..... on [1)] Depending on heat or cool demand
DES	■ Destratification: To avoid heat build-up under the ceiling, it may be appropriate to switch on the fan when there is no heat or cool demand (either in permanent operation or in on/off operation depending on air temperature under the ceiling, as desired).	Fan ..... speed 2 Heating/cooling ..... off
REC1	**Recirculation speed 1** The same as REC, but the unit operates only at speed 1 (low air flow rate)	Fan ..... speed 1 [1)] Heating/cooling ..... on [1)] Depending on heat or cool demand
DES	■ Destratification: The same as for REC, but the unit operates only at speed 1	Fan ..... speed 1 Heating/cooling ..... off
ST	**Standby** The unit is normally switched off. The following functions remain active:	
CPR	■ Cooling protection: If the room temperature drops below the set value for cooling protection, the unit heats up the room in recirculation operation.	Fan ..... speed 2 Heating ..... on
OPR	■ Overheating protection: If the room temperature rises above the set value for overheating protection, the unit cools down the room in recirculation operation.	Fan ..... speed 2 Cooling..... on
L_OFF	**Off** (local operating mode) The unit is switched off.	Fan ..... off Heating/cooling ..... off
–	**Forced heating** The unit draws in room air, warms it and blows it back into the room. Forced heating is activated by connecting the unit to a power supply (only if there is no bus connection to the zone controller). For example, it is suitable for heating the hall before taking the control system into operation or if the controller fails during the heating period.	Fan ..... speed 2 Heating ..... on

Table C4: TopVent® TC operating modes

3 Technical data

3.1 Unit type reference

TC - 6 - C ...

Unit type
TopVent® TC

Unit size
6 or 9

Heating/cooling section
C with coil type C
D with coil type D

Further options

Table C5: Unit type reference TopVent® TC

3.2 Application limits

Extract air temperature		max.	°C	50
Supply air temperature		max.	°C	60
Temperature of the heating medium [1]		max.	°C	90
Pressure of the heating medium		max.	kPa	800
Air flow rate	Size 6:	min.	m³/h	3100
	Size 9:	min.	m³/h	5000
Condensate quantity	Size 6:	max.	kg/h	90
	Size 9:	max.	kg/h	150

The units cannot be used in:
- Damp locations
- Places with a corrosive or aggressive environment
- Spaces with a large amount of dust
- Areas where there is danger of explosion

[1] Design for higher temperatures on request

Table C6: TopVent® TC application limits

3.3 Electrical connection

Unit type		TC-6	TC-9
Supply voltage	V AC	3 × 400	3 × 400
Permitted voltage tolerance	%	± 5	± 5
Frequency	Hz	50	50
Connected load	kW	3.6	3.6
Current consumption max.	A	5.9	5.9
Series fuse	A	13	13
Protection rating	-	IP 54	IP 54

Table C7: TopVent® TC electrical connections

3.4 Flow rate, product parameters

Unit type		TC-6	TC-9	
Coil type		C	C	D
Nominal air flow rate	m³/h	6000		9000
Floor area covered	m²	537		946
Static efficiency of the fans	%	63.6		63.3
Effective electric power input	kW	0.67	1.23	1.34

Table C8: TopVent® TC technical data

3.5 Heat output

Heating medium temperature			80/60 °C					60/40 °C				
Size	Type	t_{room}	Q	H_{max}	t_S	Δp_W	m_W	Q	H_{max}	t_S	Δp_W	m_W
		°C	kW	m	°C	kPa	l/h	kW	m	°C	kPa	l/h
TC-6	C	16	76.0	9.4	55.6	18	3267	45.0	11.8	40.3	6	1935
		20	70.3	9.8	56.8	16	3022	39.3	12.5	41.5	5	1690
TC-9	C	16	117.9	9.8	56.9	18	5066	69.9	12.3	41.1	6	3003
		20	109.1	10.2	58.0	15	4686	61.0	13.1	42.1	5	2622
	D	16	140.7	9.1	64.4	15	6045	85.4	11.3	46.2	5	3670
		20	130.4	9.5	65.0	13	5600	75.1	12.0	46.8	4	3225

Legend:
Type = Type of coil
t_{room} = Room air temperature
Q = Heat output
H_{max} = Maximum mounting height
t_S = Supply air temperature
Δp_W = Water pressure drop
m_W = Water quantity

Reference:
- At room air temperature 16°C: extract air temperature 18°C
- At room air temperature 20°C: extract air temperature 22°C

Table C9: TopVent® TC heat outputs

3.6 Cooling capacities

Cooling medium temperature				6/12 °C						8/14 °C					
Size	Type	t_{room}	RH_{room}	Q_{sen}	Q_{tot}	t_S	Δp_W	m_W	m_C	Q_{sen}	Q_{tot}	t_S	Δp_W	m_W	m_C
		°C	%	kW	kW	°C	kPa	l/h	kg/h	kW	kW	°C	kPa	l/h	kg/h
TC-6	C	22	50	20.4	20.4	13.9	15	2925	0.0	18.0	18.0	15.1	12	2573	0.0
			70	18.5	27.7	14.9	28	3960	13.5	16.0	21.4	16.1	17	3064	7.9
		26	50	25.2	31.1	15.5	36	4448	8.6	22.7	24.8	16.7	23	3552	3.0
			70	23.2	43.7	16.5	71	6263	30.2	20.8	37.5	17.7	52	5367	24.6
TC-9	C	22	50	31.4	31.4	13.6	15	4496	0.0	27.6	27.6	14.9	12	3947	0.0
			70	28.4	44.7	14.6	31	6401	23.9	24.6	28.2	15.9	12	4031	5.2
		26	50	38.8	49.9	15.2	38	7149	16.3	35.0	35.0	16.4	19	5013	0.0
			70	35.9	69.8	16.2	75	9989	49.8	32.0	53.2	17.4	44	7619	31.1
	D	22	50	37.1	37.1	11.8	13	5307	0.0	32.2	32.2	13.4	10	4613	0.0
			70	34.6	56.7	12.6	30	8118	32.5	29.7	45.1	14.2	19	6459	22.6
		26	50	46.4	62.4	12.7	36	8941	23.5	41.6	50.9	14.3	24	7282	13.6
			70	43.9	87.4	13.5	70	12513	63.9	39.1	75.8	15.1	53	10854	54.0

Legend:
Type = Type of coil
t_{room} = Room air temperature
RH_{room} = Relative humidity of the room air
Q_{sen} = Sensible cooling capacity
Q_{tot} = Total cooling capacity
t_S = Supply air temperature
Δp_W = Water pressure drop
m_W = Water quantity
m_C = Condensate quantity

Reference:
- At room air temperature 22°C: extract air temperature 24°C
- At room air temperature 26°C: extract air temperature 28°C

Table C10: TopVent® TC cooling capacities

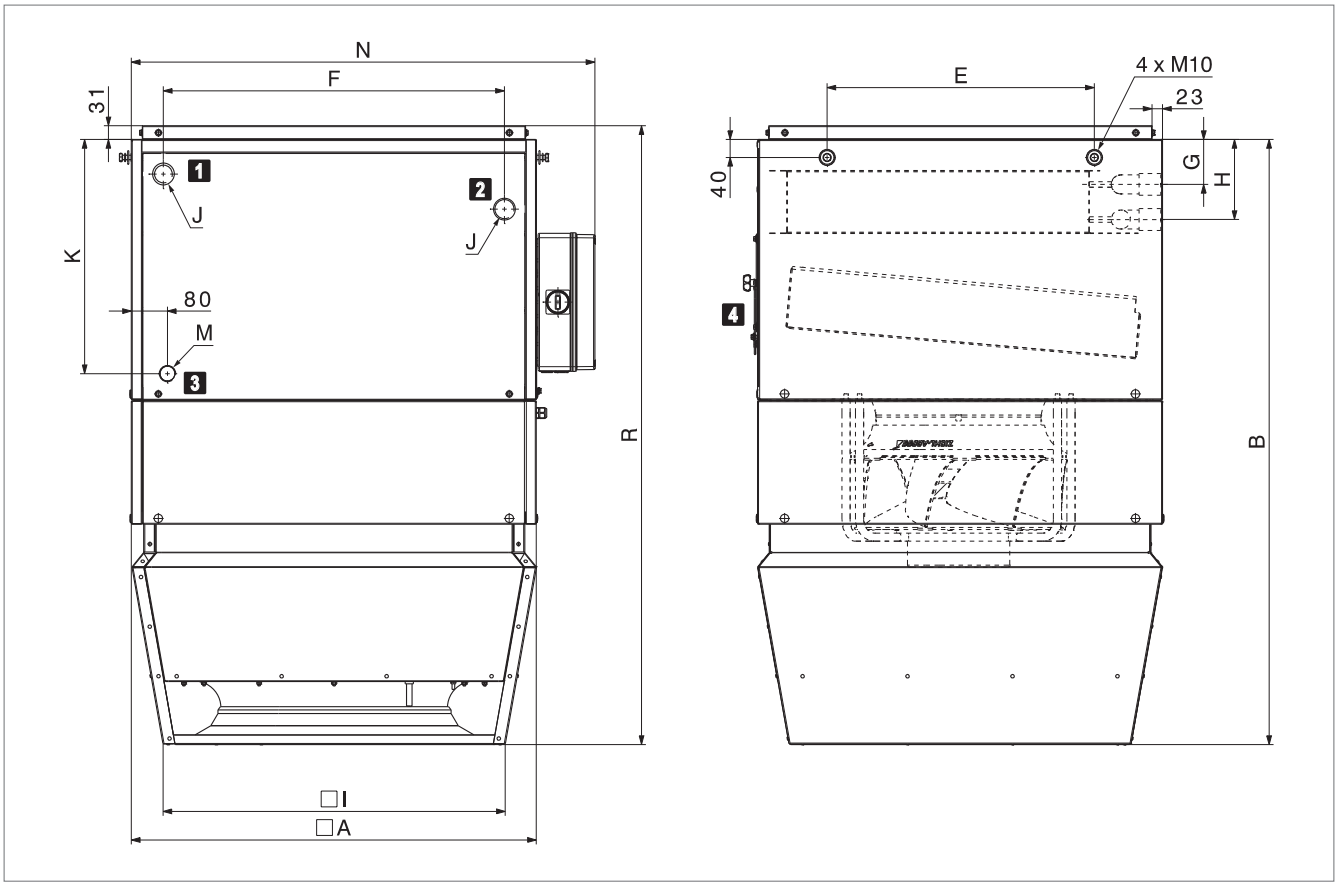
3.7 Sound data

Unit type			TC-6-C	TC-9-C
Sound pressure level (at a distance of 5 m) [1]		dB(A)	51	59
Total sound power level		dB(A)	73	81
Octave sound power level	63 Hz	dB	41	49
	125 Hz	dB	59	67
	250 Hz	dB	62	70
	500 Hz	dB	65	73
	1000 Hz	dB	67	75
	2000 Hz	dB	67	75
	4000 Hz	dB	66	74
	8000 Hz	dB	61	68

[1] with a hemispherical radiation pattern in a low-reflection room

Table C11: TopVent® TC sound power levels

3.8 Dimensions and weights



1 Return heating/cooling	3 Condensate connection
2 Flow heating/cooling	4 Access panel

Fig. C12: TopVent® TC dimensional drawing

Unit size		TC-6	TC-9	TC-9
Coil type		C	C	D
A	mm	900	1100	1100
B	mm	1344	1430	1430
E	mm	594	846	846
F	mm	758	882	882
G	mm	77	93	85
H	mm	155	171	180
I	mm	760	935	935
K	mm	521	558	558
N	mm	1030	1230	1230
R	mm	1375	1463	1463
J	"	Rp 1¼ (internal)	Rp 1½ (internal)	Rp 2 (internal)
M	"	G 1 (external)	G 1 (external)	G 1 (external)
Water content of heating/cooling coil	l	7.9	12.4	19.2
Weight	kg	216	265	276

Table C13: TopVent® TC dimensions and weights

4 Specification texts

4.1 TopVent® TC

Recirculation unit for heating and cooling rooms up to 25 m in height with central heat and cold supply (2-pipe system); equipped with highly efficient air distributor; maximum floor area reached per unit 537 m² (size 6) and 946 m² respectively (size 9).

The unit consists of the following components:
- Fan unit
- Heating/cooling section
- Air-Injector
- Unit control box or terminal box
- Optional components

TopVent® TC units comply with all the requirements of the Ecodesign Directive 2009/125/EC relating to environmentally friendly design of energy-related products. They are systems of the 'fan coil unit' type.

Fan unit

Consisting of radial fan with high-efficiency EC motor, backwards-curved, three-dimensional contoured blades and free-running rotor made of a high-performance composite material, aerodynamically optimised inflow nozzle, low-noise, with integrated overload protection (integrated in the heating/cooling section).

Heating/cooling section

Housing made of aluzinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of ageing-resistant, silicone-free sealing materials, internally insulated with close-pored polyurethane.
The heating/cooling section contains:
- The highly efficient heating/cooling coil consisting of seamless copper pipes with pressed-on, optimised and profiled aluminium fins and manifolds made of copper; for connection to the hot water and cold water supply
- The pull-out condensate separator with collecting channel, made of high-quality corrosion-resistant material, with a downslope in all directions for rapid draining
- The condensate trap for connecting to a condensate drain (supplied).

Air-Injector

Housing made of aluzinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of ageing-resistant, silicone-free sealing materials, internally insulated with close-pored polyurethane, with:
- Vortex air distributor with concentric outlet nozzle, adjustable vanes and integrated absorber hood
- Actuator for infinitely variable adjustment of the air distribution from vertical to horizontal for draught-free air distribution in the hall under changing operating conditions
- Supply air temperature sensor

Unit control box

Control box fitted at the side of the housing for connection of the power supply and housing the control components that facilitate energy-optimised operation, controlled by the control system TopTronic® C. Plastic housing, protection rating IP 56. The following components are installed:
- Main switch
- Circuit board with all required electrical components, unit controller (clipped on) as well as connection terminals for the following external connections:
  - Heating/cooling valve
  - Heating/cooling pump
  - Return temperature sensor
  - Condensate pump
  - Door contact

The circuit board is fitted with push-in terminals facilitating easy installation of the connection cables. All components in the unit control box as well as sensors and actuators in the unit are fully factory-wired.
Power supply and bus connection to be installed on site.

Terminal box (variant)

Terminal box fitted at the side of the housing for connection of the power supply and peripheral components of the unit. Plastic housing, protection rating IP 56. The following components are installed:
- Main switch
- Circuit board with all required electrical components as well as connection terminals for the following signals:
  - Input Enable fan
  - Input Control signal fan
  - Output Control signal next fan
  - Input Control signal actuator Air-Injector
  - Output Control signal next actuator Air-Injector
  - Output Feedback control signal Air-Injector
  - Output Error
- The following sensors and actuators in the unit are factory-wired:
  - Fan
  - Supply air temperature sensor
  - Actuator Air-Injector

Options for the unit

Suspension set:
for ceiling installation of the unit consisting of 4 pairs U-profiles made of aluzinc sheet steel, height-adjustable to 1300 mm. Paint according to unit.

Filter box:
Housing made of aluzinc sheet with 2 ISO coarse 60% bag filters (G4), with differential pressure switch for filter monitoring, factory-wired to the circuit board in the unit control box.

Flat filter box:
Housing made of aluzinc sheet with 4 pleated ISO coarse 60% cell filters (G4), with differential pressure switch for filter monitoring, factory-wired to the circuit board in the unit control box.

Standard paint finish:
External paint finish in Hoval red (RAL 3000)

Paint finish as desired:
Choice of external paint finish in RAL colour

Recirculation silencer:
as an attachment to the unit, made of aluzinc sheet metal, lined with sound insulation matting, insertion attenuation 3 dB(A)

Hydraulic assembly diverting system:
Prefabricated assembly for hydraulic diverting system, consisting of mixing valve, regulating valve, ball valve, automatic air vent and screw connections for connection to the unit and to the distributor circuit; mixing valve with plug-in connection, sized for the coil in the unit and the Hoval TopTronic® C control system.

Mixing valve:
Mixing valve with modulating rotary actuator and plug-in connection, sized for the coil in the unit.

Condensate pump:
Consisting of a centrifugal pump and a drip tray, max. delivery rate of 150 l/h with a delivery head of 3 m. Condensate pump with connection cable enclosed.

Pump control for mixing or injection system:
Electrical components for controlling a mixing or injection circuit in the load circuit, factory-installed in the unit control box.

Return temperature sensor:
Temperature sensor for monitoring the heating medium.

4.2 TopTronic® C – System control

Zone-based control system ex-works for operation of decentralised Hoval indoor climate systems with optimised use of energy, suitable for demand-driven control of overall systems comprising up to 64 control zones each with up to 15 supply and extract air handling units or supply air units and 10 recirculation units.

The control system is customised and preconfigured ex works. Zone allocation:
- Zone 1: __ x Unit type _____
- Zone 2: __ x Unit type _____
- Zone 3: __ x Unit type _____
- …

System structure:
- Unit controller: installed in the particular indoor climate unit
- Zone bus: as serial connection of all unit controllers in one control zone with the zone controller; with robust bus protocol via shielded and twisted-pair bus line (bus cables provided by the client)
- Zone control panel with:
  - System operator terminal
  - Fresh air temperature sensor
  - Zone controllers and room air temperature sensors
  - All components for the electrical power supply and protection
- System bus (Ethernet): for connecting all zone controllers to one another and to the system operator terminal (bus cables provided by the client)

Operation:
- TopTronic® C-ST as system operator terminal: touch panel for visualisation and control by web browser via HTML interface, including software for LAN access
- TopTronic® C-ZT as zone operator terminal: for simple on-site operation of a control zone (optional)
- Manual operating selector switch (optional)
- Manual operating selector button (optional)
- Operating of the units via building management system via standardised interfaces (optional):
  - BACnet
  - Modbus IP
  - Modbus RTU

Control functions:
- Control of the supply air temperature using room supply air cascade control via sequential control of the energy recovery and the coils (depending on the unit type)
- Demand-driven control of the room air quality by variation of the supply air and exhaust air volume flows with minimum and maximum limit (for supply and extract air handling units, optional)
- Control of the unit including the air distribution according to the specifications of the zone controller

Alarms, protection:
- Central alarm management with registration of all alarms (timestamp, priority, status) in an alarm list and alarm memory of the last 50 alarms; forwarding via e-mail can be set in the parameters.
- 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.
- Frost protection control of the units with constrained control of protection functions to prevent coil icing (for supply air units as well as supply and extract air handling units)
- A maintenance mode implemented in the control algorithm for testing all physical data points and alarms guarantees high reliability.

Options for the zone control panel:
- Design for heating (TH, TC, THC, MH, MC, MHC)
- Design for cooling (TC, THC, MC, MHC)
- Cooling lock switch (TC, THC, MC, MHC)
- Alarm lamp
- Socket
- Additional room air temperature sensors (max. 3)
- Combination sensor room air quality, temperature and humidity
- External sensor values
- External set values
- Load shedding input
- Operating selector switch on terminal
- Operating selector button on terminal
- Power supply for air handling unit
- Safety relay
- Control of distributor pump, incl. power supply

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

System control for operation of decentralised Hoval indoor climate systems with optimised use of energy, suitable for demand-driven control of TopVent® plants comprising 1 control zone with up to 6 supply air units and 10 recirculation units (power supply for the TopVent® units provided by the client).

System structure:
- Unit controller: installed in the particular indoor climate unit
- Zone bus: as serial connection of all unit controllers with the zone controller; with robust bus protocol via shielded and twisted-pair bus line (bus cables provided by the client)
- Zone control panel, designed as compact cabinet for wall installation, made of coated sheet steel (light grey RAL 7035), with:
  - Zone controller with operating panel, making it simple to operate and monitor the system
  - Fresh air temperature sensor
  - Room temperature sensor
- Circuit board with external connections for:
  - Collective alarm
  - Forced off (zone controller)
  - Forced off (supply air unit)
  - Heating demand
  - Setpoint heating demand
  - Fault heat supply
  - Cooling demand
  - Fault cold supply
  - External enabling heating/cooling
  - External setting heating/cooling
  - Changeover valves heating/cooling
  - Additional room air temperature sensors (max. 3)
  - External setpoint fresh air ratio
  - Operating selector switch on terminal (digital)
  - Operating selector button on terminal

Control functions:
- Control of the supply air temperature via sequential control of the coils
- Control of the unit including the air distribution according to the specifications of the zone controller

Alarms, protection:
- Central alarm management with registration of all alarms (timestamp, priority, status) in an alarm list and alarm memory of the last 50 alarms.
- 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.
- Frost protection control of the units with constrained control of protection functions to prevent coil icing (for supply air units)
- A maintenance mode implemented in the control algorithm for testing all physical data points and alarms guarantees high reliability.

Options for the zone control panel:
- Additional room air temperature sensors (max. 3)
- Operating of the units via building management system via standardised interfaces:
  - BACnet
  - Modbus IP
  - Modbus RTU

TopVent® THC

Recirculation units for heating and cooling spaces up to 25 m in height with central heat and cold supply (4-pipe-system)

1 Use

1.1 Intended use

TopVent® THC units are recirculation units for heating and cooling spaces up to 25 m in height with central heat and cold supply. They have the following functions:

- Heating (with connection to a hot water supply)
- Cooling (with connection to a water chiller)
- Recirculation operation
- Air distribution with adjustable Air-Injector
- Air filtration (option)

The Hoval TopTronic® C integrated control system ensures energy-efficient, demand-based operation of Hoval indoor climate systems.

Intended use also includes compliance with the operating instructions. Any usage over and above this use is considered to be not as intended. The manufacturer can accept no liability for damage resulting from improper use.

1.2 User group

The units are only allowed to be installed, operated and maintained by authorised and instructed personnel who are well acquainted with the units and are informed about possible dangers.

The operating instructions are for operating engineers and technicians as well as specialists in building, heating and ventilation technology.

2 Construction and operation

2.1 Structure

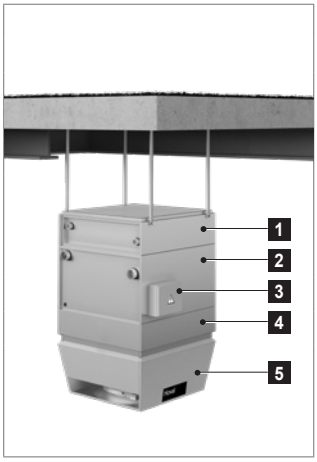
The TopVent® THC unit consists of the following components:

- Fan unit:
  Diagonal fan with energy-saving EC motor, maintenance-fee and infinitely variable
- Heating section:
  contains the heating coil for heating the supply air with hot water
- Cooling section:
  contains the cooling coil for cooling the supply air with cold water and the condensate separator for the condensate generated
- Air-Injector:
  Patented, automatically adjustable vortex air distributor for draught-free air distribution over a large area

As part of the TopTronic® C control system, the unit control box is an integral component. The following components are installed:

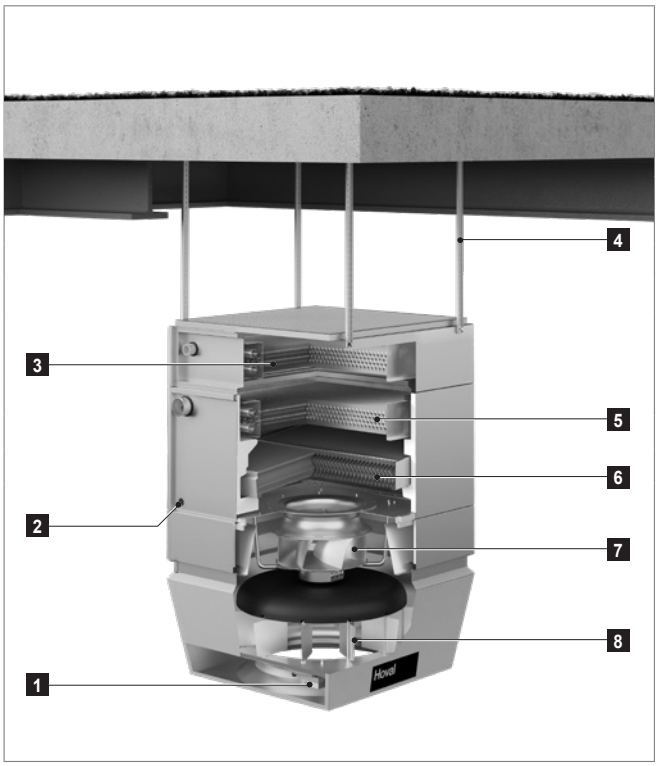
- Unit controller: this component controls the unit including the air distribution according to the specifications of the control zone. The unit controller is connected to the other components of the TopTronic® C control system via system bus.
- Main switch
- Circuit board with electrical components and external connections

All unit components are fully factory-wired.



1 Heating section
2 Cooling section
3 Unit control box
4 Fan unit
5 Air-Injector

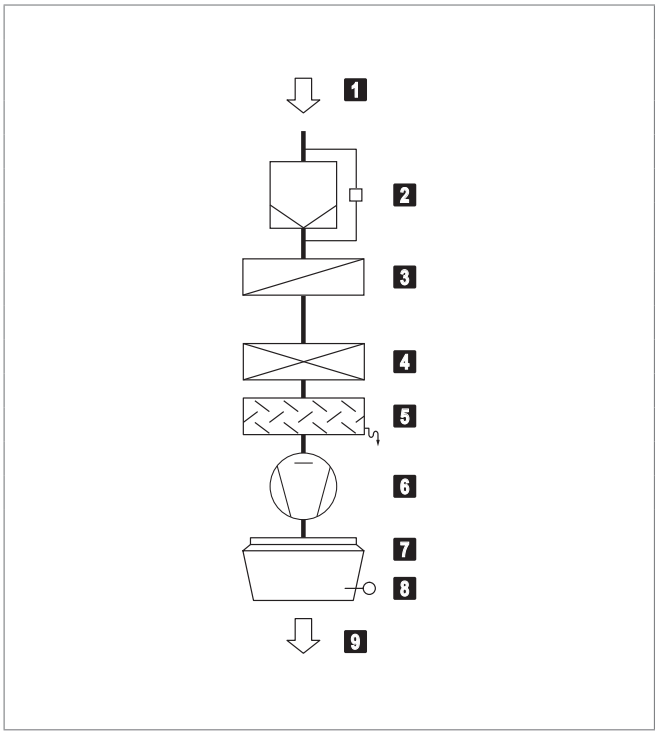
Fig. D1: TopVent® THC components



1	Actuator Air-Injector
2	Condensate connection
3	Heating coil
4	Suspension set
5	Cooling coil
6	Condensate separator
7	Fan
8	Air-Injector

Fig. D2: TopVent® THC structure

2.2 Function diagram



1	Extract air
2	Air filter with differential pressure switch (option)
3	Heating coil
4	Cooling coil
5	Condensate separator
6	Fan
7	Air-Injector with actuator
8	Supply air temperature sensor
9	Supply air

Fig. D3: TopVent® THC function diagram

2.3 Operating modes

The TopVent® THC has the following operating modes:
- Recirculation
- Recirculation speed 1
- Standby

The TopTronic® C control system regulates these operating modes automatically for each control zone in accordance with the specifications in the calendar. The following points also apply:
- The operating mode of a control zone can be switched over manually.
- Each TopVent® THC unit can operate individually in a local operating mode: Off, Recirculation, Recirculation speed 1.

Code	Operating mode	Description
REC	**Recirculation** On/Off operation: during heat or cool demand, the unit draws in room air, heats or cools it and blows it back into the room. The room temperature set value day is active.	Fan ..... speed 1 / 2 [1)] Heating/cooling ..... on [1)] Depending on heat or cool demand
DES	■ Destratification: To avoid heat build-up under the ceiling, it may be appropriate to switch on the fan when there is no heat or cool demand (either in permanent operation or in on/off operation depending on air temperature under the ceiling, as desired).	Fan ..... speed 2 Heating/cooling ..... off
REC1	**Recirculation speed 1** The same as REC, but the unit operates only at speed 1 (low air flow rate)	Fan ..... speed 1 [1)] Heating/cooling ..... on [1)] Depending on heat or cool demand
DES	■ Destratification: The same as for REC, but the unit operates only at speed 1	Fan ..... speed 1 Heating/cooling ..... off
ST	**Standby** The unit is normally switched off. The following functions remain active:	
CPR	■ Cooling protection: If the room temperature drops below the set value for cooling protection, the unit heats up the room in recirculation operation.	Fan ..... speed 2 Heating ..... on
OPR	■ Overheating protection: If the room temperature rises above the set value for overheating protection, the unit cools down the room in recirculation operation.	Fan ..... speed 2 Cooling..... on
L_OFF	**Off** (local operating mode) The unit is switched off.	Fan ..... off Heating/cooling ..... off
–	**Forced heating** The unit draws in room air, warms it and blows it back into the room. Forced heating is activated by connecting the unit to a power supply (only if there is no bus connection to the zone controller). For example, it is suitable for heating the hall before taking the control system into operation or if the controller fails during the heating period.	Fan ..... speed 2 Heating ..... on

Table D4: TopVent® THC operating modes

3 Technical data

3.1 Unit type reference

THC - 6 A C ...

Unit type
TopVent® THC

Unit size
6 or 9

Heating section
A with coil type A
B with coil type B
C with coil type C

Cooling section
C with coil type C
D with coil type D

Further options

Table D5: Unit type reference TopVent® THC

3.2 Application limits

Extract air temperature		max.	°C	50
Supply air temperature		max.	°C	60
Temperature of the heating medium [1]		max.	°C	90
Pressure of the heating medium		max.	kPa	800
Air flow rate	Size 6:	min.	m³/h	3100
	Size 9:	min.	m³/h	5000
Condensate quantity	Size 6:	max.	kg/h	90
	Size 9:	max.	kg/h	150
The units cannot be used in: ■ Damp locations ■ Places with a corrosive or aggressive environment ■ Spaces with a large amount of dust ■ Areas where there is danger of explosion				
[1] Design for higher temperatures on request				

Table D6: TopVent® THC application limits

3.3 Electrical connection

Unit type		THC-6	THC-9
Supply voltage	V AC	3 × 400	3 × 400
Permitted voltage tolerance	%	± 5	± 5
Frequency	Hz	50	50
Connected load	kW	3.6	3.6
Current consumption max.	A	5.9	5.9
Series fuse	A	13	13
Protection rating	-	IP 54	IP 54

Table D7: TopVent® THC electrical connections

3.4 Flow rate, product parameters

Unit type		THC-6			THC-9					
Coil type		AC	BC	CC	AC	BC	CC	AD	BD	CD
Nominal air flow rate	m³/h			6000						9000
Floor area covered	m²			537						946
Static efficiency of the fans	%			63.6						63.6
Effective electric power input	kW	0.72	0.76	0.87	1.37	1.49	1.42	1.54	1.56	1.68

Table D8: TopVent® THC technical data

3.5 Heat output

Heating medium temperature			80/60 °C					60/40 °C				
Size	Type	t_{room}	Q	H_{max}	t_S	Δp_W	m_W	Q	H_{max}	t_S	Δp_W	m_W
		°C	kW	m	°C	kPa	l/h	kW	m	°C	kPa	l/h
THC-6	A	16	32.8	13.4	34.2	7	1410	18.8	16.8	27.3	2	807
		20	30.3	14.0	37.0	6	1301	16.2	17.9	30.0	2	697
	B	16	47.0	11.6	41.3	13	2020	26.9	14.6	31.3	4	1157
		20	43.4	12.0	43.5	11	1864	23.3	15.5	33.5	3	1001
	C	16	76.0	9.4	55.6	18	3267	45.0	11.8	40.3	6	1935
		20	70.3	9.8	56.8	16	3022	39.3	12.5	41.5	5	1690
THC-9	A	16	55.5	13.6	36.3	8	2386	31.7	17.0	28.5	3	1364
		20	51.2	14.1	38.9	7	2201	27.4	18.1	31.1	2	1179
	B	16	71.2	12.2	41.5	12	3060	40.6	15.4	31.4	4	1746
		20	65.7	12.7	43.7	10	2823	35.1	16.5	33.6	3	1509
	C	16	117.9	9.8	56.9	18	5066	69.9	12.3	41.1	6	3003
		20	109.1	10.2	58.0	15	4686	61.0	13.1	42.1	5	2622

Legend:	Type = Type of coil	t_S = Supply air temperature
	t_{room} = Room air temperature	Δp_W = Water pressure drop
	Q = Heat output	m_W = Water quantity
	H_{max} = Maximum mounting height	
Reference:	■ At room air temperature 16°C: extract air temperature 18°C	
	■ At room air temperature 20°C: extract air temperature 22°C	

Table D9: TopVent® THC heat outputs

3.6 Cooling capacities

Cooling medium temperature				6/12 °C						8/14 °C					
Size	Type	t_{room}	RH_{room}	Q_{sen}	Q_{tot}	t_S	Δp_W	m_W	m_C	Q_{sen}	Q_{tot}	t_S	Δp_W	m_W	m_C
		°C	%	kW	kW	°C	kPa	l/h	kg/h	kW	kW	°C	kPa	l/h	kg/h
THC-6	C	22	50	20.4	20.4	13.9	15	2925	0.0	20.4	20.4	13.9	15	2925	0.0
			70	18.5	27.7	14.9	28	3960	13.5	16.0	21.4	16.1	17	3064	7.9
		26	50	25.2	31.1	15.5	36	4448	8.6	22.7	24.8	16.7	23	3552	3.0
			70	23.2	43.7	16.5	71	6263	30.2	20.8	37.5	17.7	52	5367	24.6
THC-9	C	22	50	31.4	31.4	13.6	15	4496	0.0	31.4	31.4	13.6	15	4496	0.0
			70	28.4	44.7	14.6	31	6401	23.9	24.6	28.2	15.9	12	4031	5.2
		26	50	38.8	49.9	15.2	38	7149	16.3	35.0	35.0	16.4	19	5013	0.0
			70	35.9	69.8	16.2	75	9989	49.8	32.0	53.2	17.4	44	7619	31.1
	D	22	50	37.1	37.1	11.8	13	5307	0.0	37.1	37.1	11.8	13	5307	0.0
			70	34.6	56.7	12.6	30	8118	32.5	29.7	45.1	14.2	19	6459	22.6
		26	50	46.4	62.4	12.7	36	8941	23.5	41.6	50.9	14.3	24	7282	13.6
			70	43.9	87.4	13.5	70	12513	63.9	39.1	75.8	15.1	53	10854	54.0

Legend:	Type = Type of coil	t_S = Supply air temperature	
	t_{room} = Room air temperature	Δp_W = Water pressure drop	
	RH_{room} = Relative humidity of the room air	m_W = Water quantity	
	Q_{sen} = Sensible cooling capacity	m_C = Condensate quantity	
	Q_{tot} = Total cooling capacity		
Reference:	■ At room air temperature 22°C: extract air temperature 24°C		
	■ At room air temperature 26°C: extract air temperature 28°C		

Table D10: TopVent® THC cooling capacities

3.7 Sound data

Unit type			THC-6CC	THC-9CC
Sound pressure level (at a distance of 5 m) [1]		dB(A)	54	60
Total sound power level		dB(A)	76	82
Octave sound power level	63 Hz	dB	41	47
	125 Hz	dB	59	66
	250 Hz	dB	62	69
	500 Hz	dB	68	74
	1000 Hz	dB	71	77
	2000 Hz	dB	71	76
	4000 Hz	dB	67	74
	8000 Hz	dB	58	67

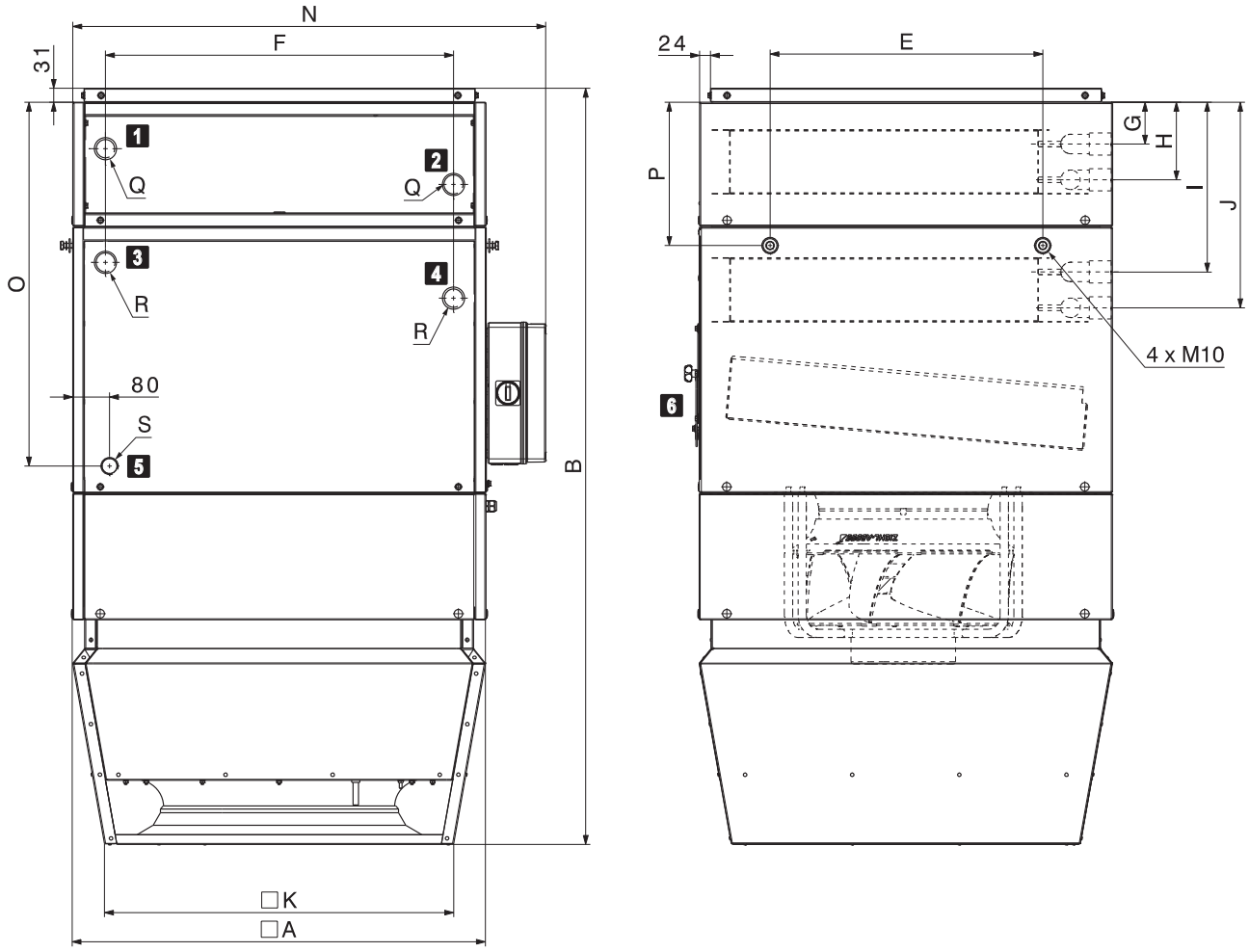
[1] with a hemispherical radiation pattern in a low-reflection room

Table D11: TopVent® THC sound power levels

3.8 Dimensions and weights

Unit size		THC-6			THC-9			THC-9		
Coil type		AC	BC	CC	AC	BC	CC	AD	BD	CD
A	mm	900			1100			1100		
B	mm	1647			1765			1765		
E	mm	594			846			846		
F	mm	758			882			882		
G	mm	101			111			111		
H	mm	179			189			189		
I	mm	349			395			386		
J	mm	427			473			481		
K	mm	760			935			935		
N	mm	1030			1230			1230		
O	mm	792			860			860		
P	mm	312			342			342		
Q	"	Rp 1¼ (internal)			Rp 1½ (internal)			Rp 1½ (internal)		
R	"	Rp 1¼ (internal)			Rp 1½ (internal)			Rp 2 (internal)		
S	"	G 1 (external)			G 1 (external)			G 1 (external)		
Water content of heating coil	l	4.6	4.6	7.9	7.4	7.4	12.4	7.4	7.4	12.4
Water content of cooling coil	l	7.9	7.9	7.9	12.4	12.4	12.4	19.2	19.2	19.2
Weight	kg	248	248	255	318	318	329	329	329	340

Table D12: TopVent® THC dimensions and weights



1 Return heating	3 Return cooling	5 Condensate connection
2 Flow heating	4 Flow cooling	6 Access panel

Fig. D13: TopVent® THC dimensional drawing

4 Specification texts

4.1 TopVent® THC

Recirculation unit for heating and cooling rooms up to 25 m in height with central heat and cold supply (4-pipe system); equipped with highly efficient air distributor; maximum floor area reached per unit 537 m² (size 6) and 946 m² respectively (size 9).

The unit consists of the following components:
- Fan unit
- Heating section
- Cooling section
- Air-Injector
- Unit control box
- Optional components

TopVent® THC units comply with all the requirements of the Ecodesign Directive 2009/125/EC relating to environmentally friendly design of energy-related products. They are systems of the 'fan coil unit' type.

Fan unit

Consisting of radial fan with high-efficiency EC motor, backwards-curved, three-dimensional contoured blades and free-running rotor made of a high-performance composite material, aerodynamically optimised inflow nozzle, low-noise, with integrated overload protection (integrated in the cooling section).

Heating section

Housing made of aluzinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of ageing-resistant, silicone-free sealing materials.
The heating section contains:
- The highly efficient heating coil consisting of seamless copper pipes with pressed-on, optimised and profiled aluminium fins and manifolds made of copper; for connection to the hot water supply

Cooling section

Housing made of aluzinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of ageing-resistant, silicone-free sealing materials, internally insulated with close-pored polyurethane.
The cooling section contains:
- The highly efficient cooling coil consisting of seamless copper pipes with pressed-on, optimised and profiled aluminium fins and manifolds made of copper; for connection to the hot water and cold water supply
- The pull-out condensate separator with collecting channel, made of high-quality corrosion-resistant material, with a downslope in all directions for rapid draining
- The condensate trap for connecting to a condensate drain (supplied).

Air-Injector

Housing made of aluzinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of ageing-resistant, silicone-free sealing materials, internally insulated with close-pored polyurethane, with:
- Vortex air distributor with concentric outlet nozzle, adjustable vanes and integrated absorber hood
- Actuator for infinitely variable adjustment of the air distribution from vertical to horizontal for draught-free air distribution in the hall under changing operating conditions
- Supply air temperature sensor

Unit control box

Control box fitted at the side of the housing for connection of the power supply and housing the control components that facilitate energy-optimised operation, controlled by the control system TopTronic® C. Plastic housing, protection rating IP 56. The following components are installed:
- Main switch
- Circuit board with all required electrical components, unit controller (clipped on) as well as connection terminals for the following external connections:
  - Heating/cooling valve
  - Heating/cooling pump
  - Return temperature sensor
  - Condensate pump

The circuit board is fitted with push-in terminals facilitating easy installation of the connection cables. All components in the unit control box as well as sensors and actuators in the unit are fully factory-wired.
Power supply and bus connection to be installed on site.

Options for the unit

Suspension set:
for ceiling installation of the unit consisting of 4 pairs U-profiles made of aluzinc sheet steel, height-adjustable to 1300 mm. Paint according to unit.

Filter box:
Housing made of aluzinc sheet with 2 ISO coarse 60% bag filters (G4), with differential pressure switch for filter monitoring, factory-wired to the circuit board in the unit control box.

Flat filter box:
Housing made of aluzinc sheet with 4 pleated ISO coarse 60% cell filters (G4), with differential pressure switch for filter monitoring, factory-wired to the circuit board in the unit control box.

Standard paint finish:
External paint finish in Hoval red (RAL 3000)

Paint finish as desired:
Choice of external paint finish in RAL colour

Recirculation silencer:
as an attachment to the unit, made of aluzinc sheet metal, lined with sound insulation matting, insertion attenuation 3 dB(A)

Hydraulic assembly diverting system:
Prefabricated assembly for hydraulic diverting system, consisting of mixing valve, regulating valve, ball valve, automatic air vent and screw connections for connection to the unit and to the distributor circuit; mixing valve with plug-in connection, sized for the coil in the unit and the Hoval TopTronic® C control system.

Mixing valve:
Mixing valve with modulating rotary actuator and plug-in connection, sized for the coil in the unit.

Condensate pump:
Consisting of a centrifugal pump and a drip tray, max. delivery rate of 150 l/h with a delivery head of 3 m. Condensate pump with connection cable enclosed.

Pump control for mixing or injection system:
Electrical components for controlling a mixing or injection circuit in the load circuit, factory-installed in the unit control box.

Return temperature sensor:
Temperature sensor for monitoring the heating medium.

4.2 TopTronic® C – System control

Zone-based control system ex-works for operation of decentralised Hoval indoor climate systems with optimised use of energy, suitable for demand-driven control of overall systems comprising up to 64 control zones each with up to 15 supply and extract air handling units or supply air units and 10 recirculation units.

The control system is customised and preconfigured ex works. Zone allocation:
- Zone 1: __ x Unit type _____
- Zone 2: __ x Unit type _____
- Zone 3: __ x Unit type _____
- …

System structure:
- Unit controller: installed in the particular indoor climate unit
- Zone bus: as serial connection of all unit controllers in one control zone with the zone controller; with robust bus protocol via shielded and twisted-pair bus line (bus cables provided by the client)
- Zone control panel with:
  - System operator terminal
  - Fresh air temperature sensor
  - Zone controllers and room air temperature sensors
  - All components for the electrical power supply and protection
- System bus (Ethernet): for connecting all zone controllers to one another and to the system operator terminal (bus cables provided by the client)

Operation:
- TopTronic® C-ST as system operator terminal: touch panel for visualisation and control by web browser via HTML interface, including software for LAN access
- TopTronic® C-ZT as zone operator terminal: for simple on-site operation of a control zone (optional)
- Manual operating selector switch (optional)
- Manual operating selector button (optional)
- Operating of the units via building management system via standardised interfaces (optional):
  - BACnet
  - Modbus IP
  - Modbus RTU

Control functions:
- Control of the supply air temperature using room supply air cascade control via sequential control of the energy recovery and the coils (depending on the unit type)
- Demand-driven control of the room air quality by variation of the supply air and exhaust air volume flows with minimum and maximum limit (for supply and extract air handling units, optional)
- Control of the unit including the air distribution according to the specifications of the zone controller

Alarms, protection:
- Central alarm management with registration of all alarms (timestamp, priority, status) in an alarm list and alarm memory of the last 50 alarms; forwarding via e-mail can be set in the parameters.
- 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.
- Frost protection control of the units with constrained control of protection functions to prevent coil icing (for supply air units as well as supply and extract air handling units)
- A maintenance mode implemented in the control algorithm for testing all physical data points and alarms guarantees high reliability.

Options for the zone control panel:
- Design for heating (TH, TC, THC, MH, MC, MHC)
- Design for cooling (TC, THC, MC, MHC)
- Cooling lock switch (TC, THC, MC, MHC)
- Alarm lamp
- Socket
- Additional room air temperature sensors (max. 3)
- Combination sensor room air quality, temperature and humidity
- External sensor values
- External set values
- Load shedding input
- Operating selector switch on terminal
- Operating selector button on terminal
- Power supply for air handling unit
- Safety relay
- Control of distributor pump, incl. power supply

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

System control for operation of decentralised Hoval indoor climate systems with optimised use of energy, suitable for demand-driven control of TopVent® plants comprising 1 control zone with up to 6 supply air units and 10 recirculation units (power supply for the TopVent® units provided by the client).

System structure:
- Unit controller: installed in the particular indoor climate unit
- Zone bus: as serial connection of all unit controllers with the zone controller; with robust bus protocol via shielded and twisted-pair bus line (bus cables provided by the client)
- Zone control panel, designed as compact cabinet for wall installation, made of coated sheet steel (light grey RAL 7035), with:
  - Zone controller with operating panel, making it simple to operate and monitor the system
  - Fresh air temperature sensor
  - Room temperature sensor
- Circuit board with external connections for:
  - Collective alarm
  - Forced off (zone controller)
  - Forced off (supply air unit)
  - Heating demand
  - Setpoint heating demand
  - Fault heat supply
  - Cooling demand
  - Fault cold supply
  - External enabling heating/cooling
  - External setting heating/cooling
  - Changeover valves heating/cooling
  - Additional room air temperature sensors (max. 3)
  - External setpoint fresh air ratio
  - Operating selector switch on terminal (digital)
  - Operating selector button on terminal

Control functions:
- Control of the supply air temperature via sequential control of the coils
- Control of the unit including the air distribution according to the specifications of the zone controller

Alarms, protection:
- Central alarm management with registration of all alarms (timestamp, priority, status) in an alarm list and alarm memory of the last 50 alarms.
- 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.
- Frost protection control of the units with constrained control of protection functions to prevent coil icing (for supply air units)
- A maintenance mode implemented in the control algorithm for testing all physical data points and alarms guarantees high reliability.

Options for the zone control panel:
- Additional room air temperature sensors (max. 3)
- Operating of the units via building management system via standardised interfaces:
  - BACnet
  - Modbus IP
  - Modbus RTU

TopVent® MH

Supply air units for ventilating and heating spaces up to 25 m in height with central heat supply

1 Use

1.1 Intended use

TopVent® MH units are supply air units for ventilating and heating spaces up to 25 m in height with central heat supply. They have the following functions:

- Heating (with connection to a hot water supply)
- Fresh air supply
- Mixed air operation
- Recirculation operation
- Air distribution with adjustable Air-Injector
- Air filtration

The Hoval TopTronic® C integrated control system ensures energy-efficient, demand-based operation of Hoval indoor climate systems.

Intended use also includes compliance with the operating instructions. Any usage over and above this use is considered to be not as intended. The manufacturer can accept no liability for damage resulting from improper use.

1.2 User group

The units are only allowed to be installed, operated and maintained by authorised and instructed personnel who are well acquainted with the units and are informed about possible dangers.

The operating instructions are for operating engineers and technicians as well as specialists in building, heating and ventilation technology.

2 Construction and operation

2.1 Structure

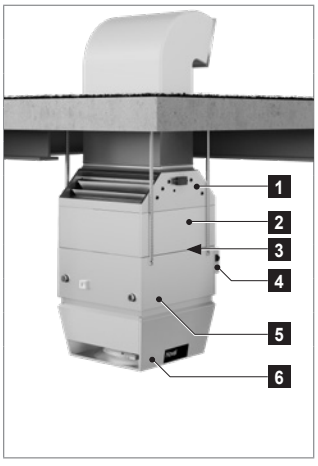
The TopVent® MH unit consists of the following components:

- Fan unit:
  Diagonal fan with energy-saving EC motor, maintenance-fee and infinitely variable
- Heating section:
  contains the heating coil for heating the supply air with hot water
- Air-Injector:
  Patented, automatically adjustable vortex air distributor for draught-free air distribution over a large area
- Filter box:
  contains 2 ISO Coarse 60 % bag filters (G4), easily accessible behind the sliding door
- Mixed air box:
  contains fresh air damper and recirculation damper linked to move in opposite directions and actuator with spring return

As part of the TopTronic® C control system, the unit control box is an integral component. The following components are installed:

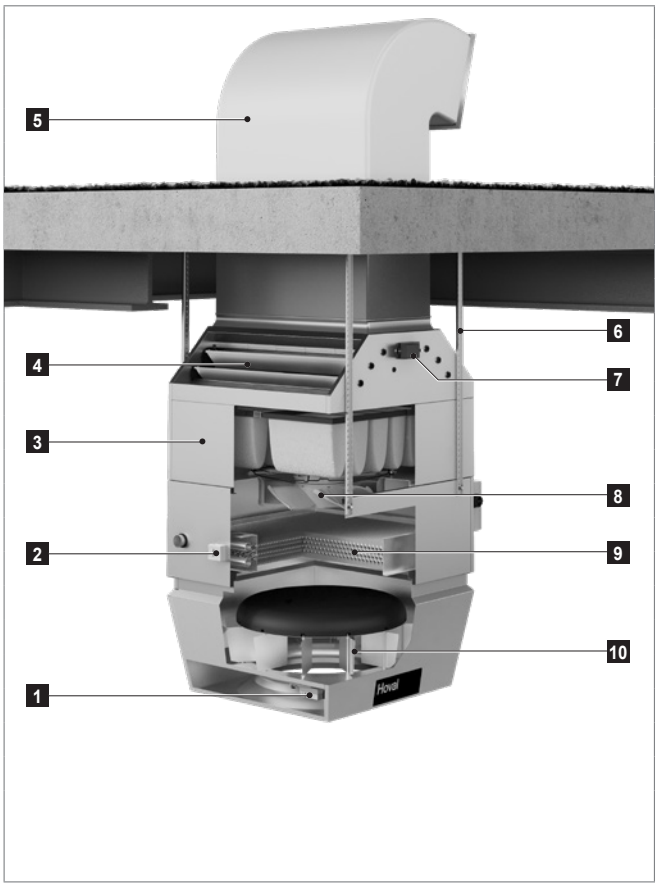
- Unit controller: this component controls the unit including the air distribution according to the specifications of the control zone. The unit controller is connected to the other components of the TopTronic® C control system via system bus.
- Main switch
- Circuit board with electrical components and external connections

All unit components are fully factory-wired.



1	Mixed air box
2	Filter box
3	Fan unit
4	Unit control box
5	Heating section
6	Air-Injector

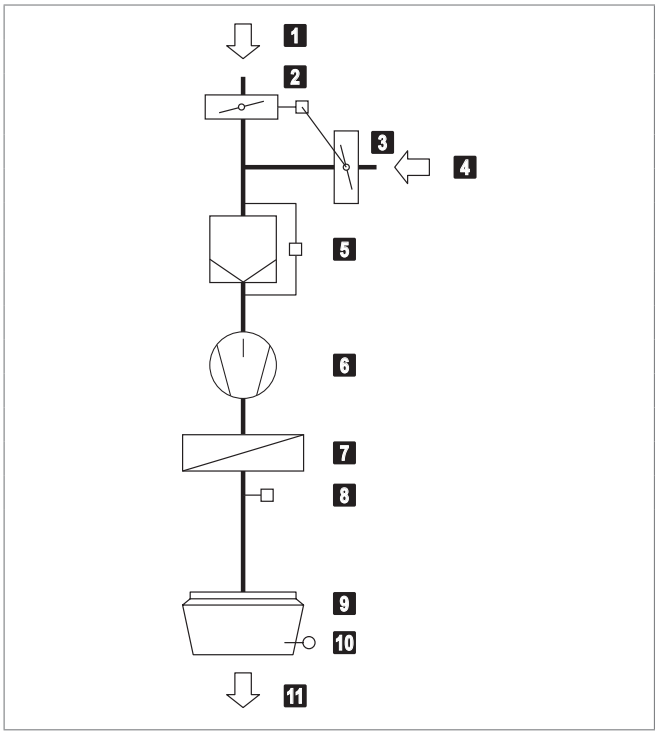
Fig. E1: TopVent® MH components



1	Actuator Air-Injector
2	Frost controller
3	Filter box
4	Mixed air box
5	Fresh air duct (field-supplied)
6	Suspension set
7	Fresh air damper actuator
8	Fan
9	Heating coil
10	Air-Injector

Fig. E2: TopVent® MH structure

2.2 Function diagram



1	Fresh air
2	Fresh air damper with actuator
3	Recirculation damper (opposed to the fresh air damper)
4	Extract air
5	Air filter with differential pressure switch
6	Fan
7	Heating coil
8	Frost controller
9	Air-Injector with actuator
10	Supply air temperature sensor
11	Supply air

Fig. E3: TopVent® MH function diagram

2.3 Operating modes

The TopVent® MH operates in the following modes:
- Supply air speed 2
- Supply air speed 1
- Recirculation
- Recirculation speed 1
- Standby

The TopTronic® C control system regulates these operating modes automatically for each control zone in accordance with the specifications in the calendar. The following points also apply:
- The operating mode of a control zone can be switched over manually.
- Each TopVent® MH unit can operate individually in a local operating mode: Off, Supply air speed 2, Supply air speed 1, Recirculation, Recirculation speed 1.

Code	Operating mode	Description
SA2	**Supply air speed 2** The unit blows fresh air into the room. The fresh air ratio is adjustable. The heating is regulated according to the heat demand. The room temperature set value day is active. The unit operates at speed 2 (high air flow rate).	Fan ..... speed 2 Fresh air damper..... 10 % open [1] Heating ..... on [2] [1] Percentage is adjustable [2] Depending on heat demand
SA1	**Supply air speed 1** The same as SA2, but the unit operates only at speed 1 (low air flow rate)	Fan ..... speed 1 Fresh air damper..... 10 % open [1] Heating ..... on [2] [1] Percentage is adjustable [2] Depending on heat demand
REC	**Recirculation** On/off-operation: if heating is required, the unit draws in room air, heats it and returns the warm air back into the room. The room temperature set value day is active.	Fan ..... speed 1 / 2 [1] Fresh air damper..... closed Heating ..... on [1] [1] Depending on heat demand
DES	■ Destratification: To avoid heat build-up under the ceiling, it may be appropriate to switch on the fan when there is no heat demand (either in permanent operation or in on/off operation depending on air temperature under the ceiling, as desired).	Fan ..... speed 2 Fresh air damper..... closed Heating ..... off
REC1	**Recirculation speed 1** The same as REC, but the unit operates only at speed 1 (low air flow rate)	Fan ..... speed 1 Fresh air damper..... closed Heating ..... on [1] [1] Depending on heat demand
DES	■ Destratification: The same as for REC, but the unit operates only at speed 1	Fan ..... speed 1 Fresh air damper..... closed Heating ..... off
ST	**Standby** The unit is normally switched off. The following functions remain active:	
CPR	■ Cooling protection: If the room temperature drops below the set value for cooling protection, the unit heats up the room in recirculation operation.	Fan ..... speed 2 Fresh air damper..... closed Heating ..... on
NCS	■ Night cooling: If the room temperature exceeds the set value for night cooling and the current fresh air temperature permits it, the unit blows cool fresh air into the room and extracts warmer room air.	Fan ..... speed 2 Fresh air damper..... open Heating ..... off

Code	Operating mode	Description
L_OFF	**Off** (local operating mode) The unit is switched off. Frost protection for the unit remains active.	Fan ..... off Fresh air damper..... closed Heating ..... off
–	**Forced heating** The unit draws in room air, warms it and blows it back into the room. Forced heating can be activated and set as required by the Hoval service technician. For example, it is suitable for heating the hall before taking the control system into operation or if the controller fails during the heating period.	Fan ..... speed 2 [1)] Fresh air damper..... closed [1)] Heating ..... on [1)] [1)] Adjustable by the Hoval service technician

Table E4: TopVent® MH operating modes

3 Technical data

3.1 Unit type reference

MH - 6 A - ...

Unit type
TopVent® MH

Unit size
6 or 9

Heating section
A with coil type A
B with coil type B
C with coil type C

Further options

Table E5: Unit type reference TopVent® MH

3.2 Application limits

Extract air temperature	max.	°C	50
Supply air temperature	max.	°C	60
Temperature of the heating medium [1]	max.	°C	90
Pressure of the heating medium	max.	kPa	800
The units cannot be used in: ■ Damp locations ■ Places with a corrosive or aggressive environment ■ Spaces with a large amount of dust ■ Areas where there is danger of explosion			
[1] Design for higher temperatures on request			

Table E6: TopVent® MH application limits

3.3 Electrical connection

Unit type		MH-6	MH-9
Supply voltage	V AC	3 × 400	3 × 400
Permitted voltage tolerance	%	± 5	± 5
Frequency	Hz	50	50
Connected load	kW	1.5	2.1
Current consumption max.	A	2.9	4.0
Series fuse	A	13	13
Protection rating	-	IP 54	IP 54

Table E7: TopVent® MH electrical connection

3.4 Flow rate, product parameters

Unit type		MH-6			MH-9		
Coil type		A	B	C	A	B	C
Nominal air flow rate	m³/h			6000			9000
Floor area covered	m²			537			946
Static efficiency of the fans	%			48.5			43.0
Effective electric power input	kW	0.90	1.05	1.29	1.37	1.49	1.91

Table E8: TopVent® MH technical data

3.5 Heat output

Heating medium temperature			80/60 °C					60/40 °C				
Size	Type	t_F	Q	H_{max}	t_S	Δp_W	m_W	Q	H_{max}	t_S	Δp_W	m_W
		°C	kW	m	°C	kPa	l/h	kW	m	°C	kPa	l/h
MH-6	A	- 5	33.1	14.4	33.9	7	1424	19.1	18.8	27.0	2	820
		-15	33.8	14.7	33.2	8	1451	19.7	19.5	26.3	3	848
	B	- 5	47.5	12.1	41.0	13	2040	27.4	15.7	31.1	4	1177
		-15	48.4	12.2	40.5	14	2079	28.3	16.1	30.5	5	1216
	C	- 5	76.8	9.7	55.5	18	3297	45.7	12.3	40.1	7	1965
		-15	78.2	9.7	55.2	19	3358	47.2	12.4	39.9	7	2026
MH-9	A	- 5	56.1	14.4	36.0	8	2409	32.3	18.8	28.2	3	1387
		-15	57.1	14.6	35.4	8	2455	33.4	19.4	27.5	3	1433
	B	- 5	71.9	12.8	41.2	12	3090	41.3	16.7	31.1	4	1775
		-15	73.3	12.9	40.7	13	3149	42.7	17.0	30.6	4	1834
	C	- 5	119.0	10.1	56.8	18	5113	71.0	12.9	40.9	7	3050
		-15	121.2	10.1	56.5	19	5208	73.2	12.9	40.7	7	3145

Legend:
Type = Type of coil
t_F = Fresh air temperature
Q = Heat output
H_{max} = Maximum mounting height
t_S = Supply air temperature
Δp_W = Water pressure drop
m_W = Water quantity

Reference:
- Room air 18 °C, extract air 20 °C / 20 % rel. humidity
- Fresh air ratio 10 %

Table E9: TopVent® MH heat outputs

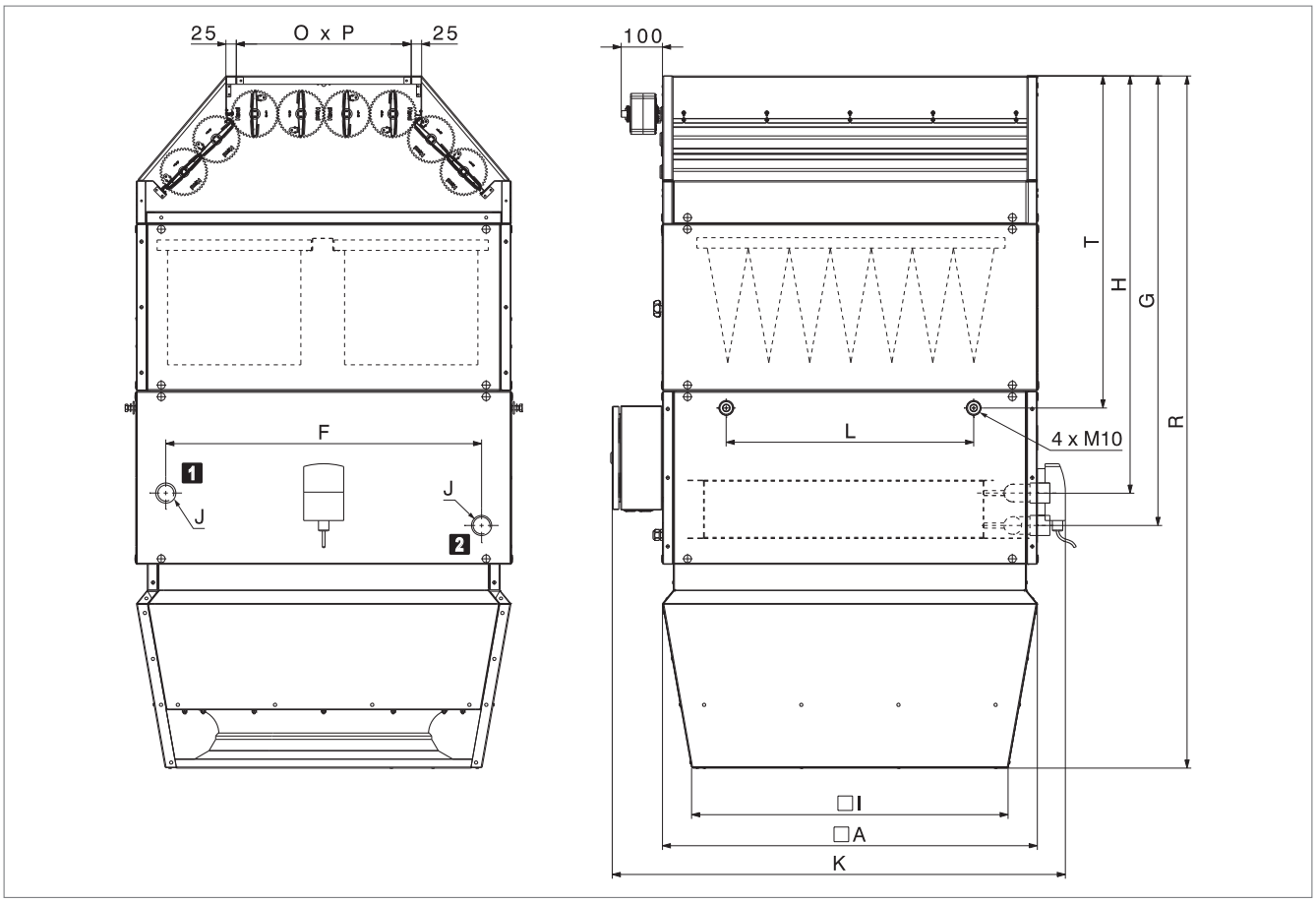
3.6 Sound data

Unit type			MH-6C	MH-9C
Sound pressure level (at a distance of 5 m) [1]		dB(A)	58	60
Total sound power level		dB(A)	80	82
Octave sound power level	63 Hz	dB	57	62
	125 Hz	dB	61	66
	250 Hz	dB	67	71
	500 Hz	dB	72	74
	1000 Hz	dB	76	77
	2000 Hz	dB	73	76
	4000 Hz	dB	67	71
	8000 Hz	dB	59	64

[1] with a hemispherical radiation pattern in a low-reflection room

Table E10: TopVent® MH sound power levels

3.7 Dimensions and weights



1 Return heating
2 Flow heating

Fig. E11: TopVent® MH dimensional drawing

Unit size		MH-6			MH-9		
Coil type		A	B	C	A	B	C
A	mm			900			1100
F	mm			758			882
G	mm			1077			1127
H	mm			999			1049
I	mm			760			935
K	mm			1089			1289
L	mm			594			846
O × P	mm			420 × 850			500 × 1050
R	mm			1660			1810
T	mm			795			800
J	"			Rp 1¼ (internal)			Rp 1½ (internal)
Water content of heating coil	l	4.6	4.6	7.9	7.4	7.4	12.4
Weight	kg	165	165	172	217	217	228

Table E12: TopVent® MH dimensions and weights

4 Specification texts

4.1 TopVent® MH

Supply air unit for heating rooms up to 25 m in height with central heat supply; equipped with highly efficient air distributor; maximum floor area reached per unit 537 m² (size 6) and 946 m² respectively (size 9).

The unit consists of the following components:
- Fan unit
- Heating section
- Air-Injector
- Filter box
- Mixed air box
- Unit control box
- Optional components

TopVent® TH units comply with all the requirements of the Ecodesign Directive 2009/125/EC relating to environmentally friendly design of energy-related products. They are systems of the 'fan coil unit' type.

Fan unit

Consisting of maintenance-free, direct-drive axial fan with high-efficiency EC motor and balanced rotating wheel with aerodynamically shaped blades and serrated trailing edge (integrated in the heating section).

Heating section

Housing made of aluzinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of ageing-resistant, silicone-free sealing materials.
The heating section contains:
- The highly efficient heating coil consisting of seamless copper pipes with pressed-on, optimised and profiled aluminium fins and manifolds made of copper; for connection to the hot water supply

Air-Injector

Housing made of aluzinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of ageing-resistant, silicone-free sealing materials, with:
- Vortex air distributor with concentric outlet nozzle, adjustable vanes and integrated absorber hood
- Actuator for infinitely variable adjustment of the air distribution from vertical to horizontal for draught-free air distribution in the hall under changing operating conditions
- Supply air temperature sensor

Filter box

Housing made of aluzinc sheet with 2 ISO coarse 60% bag filters (G4), with differential pressure switch for filter monitoring, factory-wired to the circuit board in the unit control box.

Mixed air box

Housing made of aluzinc sheet with fresh air damper and recirculation damper linked to move in opposite directions; includes actuator with spring return, factory-wired to the circuit board in the unit control box.

Unit control box

Control box fitted at the side of the housing for connection of the power supply and housing the control components that facilitate energy-optimised operation, controlled by the control system TopTronic® C. Housing made of coated sheet steel (light grey RAL 7035), protection rating IP 54. The following components are installed:
- Main switch
- Circuit board with all required electrical components, unit controller (clipped on) as well as connection terminals for the following external connections:
  - Heating valve
  - Heating pump
  - Return temperature sensor
  - Forced off

The circuit board is fitted with push-in terminals facilitating easy installation of the connection cables. All components in the unit control box as well as sensors and actuators in the unit are fully factory-wired.
Power supply and bus connection to be installed on site.

Options for the unit

Suspension set:
for ceiling installation of the unit consisting of 4 pairs U-profiles made of aluzinc sheet steel, height-adjustable to 1300 mm. Paint according to unit.

Standard paint finish:
External paint finish in Hoval red (RAL 3000)

Paint finish as desired:
Choice of external paint finish in RAL colour

Acoustic cowl:
consisting of an absorber hood of large volume, insertion attenuation 4 dB(A)

Hydraulic assembly diverting system:
Prefabricated assembly for hydraulic diverting system, consisting of mixing valve, regulating valve, ball valve, automatic air vent and screw connections for connection to the unit and to the distributor circuit; mixing valve with plug-in connection, sized for the coil in the unit and the Hoval TopTronic® C control system.

Mixing valve:
Mixing valve with modulating rotary actuator and plug-in connection, sized for the coil in the unit.

Pump control for mixing or injection system:
Electrical components for controlling a mixing or injection circuit in the load circuit, factory-installed in the unit control box.

Return temperature sensor:
Temperature sensor for monitoring the heating medium.

4.2 TopTronic® C – System control

Zone-based control system ex-works for operation of decentralised Hoval indoor climate systems with optimised use of energy, suitable for demand-driven control of overall systems comprising up to 64 control zones each with up to 15 supply and extract air handling units or supply air units and 10 recirculation units.

The control system is customised and preconfigured ex works. Zone allocation:
- Zone 1: __ x Unit type _____
- Zone 2: __ x Unit type _____
- Zone 3: __ x Unit type _____
- …

System structure:
- Unit controller: installed in the particular indoor climate unit
- Zone bus: as serial connection of all unit controllers in one control zone with the zone controller; with robust bus protocol via shielded and twisted-pair bus line (bus cables provided by the client)
- Zone control panel with:
  – System operator terminal
  – Fresh air temperature sensor
  – Zone controllers and room air temperature sensors
  – All components for the electrical power supply and protection
- System bus (Ethernet): for connecting all zone controllers to one another and to the system operator terminal (bus cables provided by the client)

Operation:
- TopTronic® C-ST as system operator terminal: touch panel for visualisation and control by web browser via HTML interface, including software for LAN access
- TopTronic® C-ZT as zone operator terminal: for simple on-site operation of a control zone (optional)
- Manual operating selector switch (optional)
- Manual operating selector button (optional)
- Operating of the units via building management system via standardised interfaces (optional):
  – BACnet
  – Modbus IP
  – Modbus RTU

Control functions:
- Control of the supply air temperature using room supply air cascade control via sequential control of the energy recovery and the coils (depending on the unit type)
- Demand-driven control of the room air quality by variation of the supply air and exhaust air volume flows with minimum and maximum limit (for supply and extract air handling units, optional)
- Control of the unit including the air distribution according to the specifications of the zone controller

Alarms, protection:
- Central alarm management with registration of all alarms (timestamp, priority, status) in an alarm list and alarm memory of the last 50 alarms; forwarding via e-mail can be set in the parameters.
- 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.
- Frost protection control of the units with constrained control of protection functions to prevent coil icing (for supply air units as well as supply and extract air handling units)
- A maintenance mode implemented in the control algorithm for testing all physical data points and alarms guarantees high reliability.

Options for the zone control panel:
- Design for heating (TH, TC, THC, MH, MC, MHC)
- Design for cooling (TC, THC, MC, MHC)
- Cooling lock switch (TC, THC, MC, MHC)
- Alarm lamp
- Socket
- Additional room air temperature sensors (max. 3)
- Combination sensor room air quality, temperature and humidity
- External sensor values
- External set values
- Load shedding input
- Operating selector switch on terminal
- Operating selector button on terminal
- Power supply for air handling unit
- Safety relay
- Control of distributor pump, incl. power supply

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

System control for operation of decentralised Hoval indoor climate systems with optimised use of energy, suitable for demand-driven control of TopVent® plants comprising 1 control zone with up to 6 supply air units and 10 recirculation units (power supply for the TopVent® units provided by the client).

System structure:
- Unit controller: installed in the particular indoor climate unit
- Zone bus: as serial connection of all unit controllers with the zone controller; with robust bus protocol via shielded and twisted-pair bus line (bus cables provided by the client)
- Zone control panel, designed as compact cabinet for wall installation, made of coated sheet steel (light grey RAL 7035), with:
  - Zone controller with operating panel, making it simple to operate and monitor the system
  - Fresh air temperature sensor
  - Room temperature sensor
- Circuit board with external connections for:
  - Collective alarm
  - Forced off (zone controller)
  - Forced off (supply air unit)
  - Heating demand
  - Setpoint heating demand
  - Fault heat supply
  - Cooling demand
  - Fault cold supply
  - External enabling heating/cooling
  - External setting heating/cooling
  - Changeover valves heating/cooling
  - Additional room air temperature sensors (max. 3)
  - External setpoint fresh air ratio
  - Operating selector switch on terminal (digital)
  - Operating selector button on terminal

Control functions:
- Control of the supply air temperature via sequential control of the coils
- Control of the unit including the air distribution according to the specifications of the zone controller

Alarms, protection:
- Central alarm management with registration of all alarms (timestamp, priority, status) in an alarm list and alarm memory of the last 50 alarms.
- 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.
- Frost protection control of the units with constrained control of protection functions to prevent coil icing (for supply air units)
- A maintenance mode implemented in the control algorithm for testing all physical data points and alarms guarantees high reliability.

Options for the zone control panel:
- Additional room air temperature sensors (max. 3)
- Operating of the units via building management system via standardised interfaces:
  - BACnet
  - Modbus IP
  - Modbus RTU

E

TopVent® MC

Supply air units for ventilating, heating and cooling spaces up to 25 m in height with central heat and cold supply (2-pipe-system)

F

1 Use

1.1 Intended use

TopVent® MC units are supply air units for ventilating, heating and cooling spaces up to 25 m in height with central heat and cold supply. They have the following functions:

- Heating (with connection to a hot water supply)
- Cooling (with connection to a water chiller)
- Fresh air supply
- Mixed air operation
- Recirculation operation
- Air distribution with adjustable Air-Injector
- Air filtration

The Hoval TopTronic® C integrated control system ensures energy-efficient, demand-based operation of Hoval indoor climate systems.

Intended use also includes compliance with the operating instructions. Any usage over and above this use is considered to be not as intended. The manufacturer can accept no liability for damage resulting from improper use.

1.2 User group

The units are only allowed to be installed, operated and maintained by authorised and instructed personnel who are well acquainted with the units and are informed about possible dangers.

The operating instructions are for operating engineers and technicians as well as specialists in building, heating and ventilation technology.

2 Construction and operation

2.1 Structure

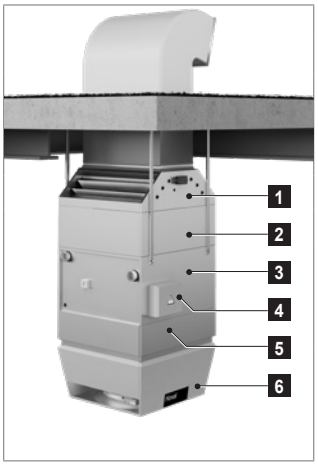
The TopVent® MC unit consists of the following components:

- Fan unit:
  Diagonal fan with energy-saving EC motor, maintenance-fee and infinitely variable
- Heating/cooling section:
  contains the heating/cooling coil for heating and cooling the supply air with hot water or cold water and the condensate separator for the condensate generated
- Air-Injector:
  Patented, automatically adjustable vortex air distributor for draught-free air distribution over a large area
- Filter box:
  contains 2 ISO Coarse 60 % bag filters (G4), easily accessible behind the sliding door
- Mixed air box:
  contains fresh air damper and recirculation damper linked to move in opposite directions and actuator with spring return

As part of the TopTronic® C control system, the unit control box is an integral component. The following components are installed:

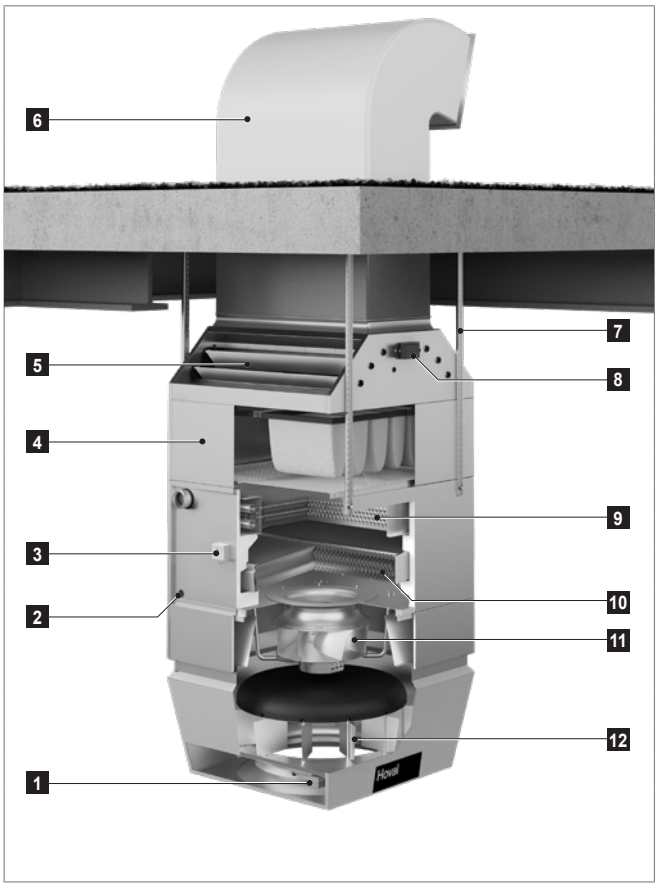
- Unit controller: this component controls the unit including the air distribution according to the specifications of the control zone. The unit controller is connected to the other components of the TopTronic® C control system via system bus.
- Main switch
- Circuit board with electrical components and external connections

All unit components are fully factory-wired.



1	Mixed air box
2	Filter box
3	Heating/cooling section
4	Unit control box
5	Fan unit
6	Air-Injector

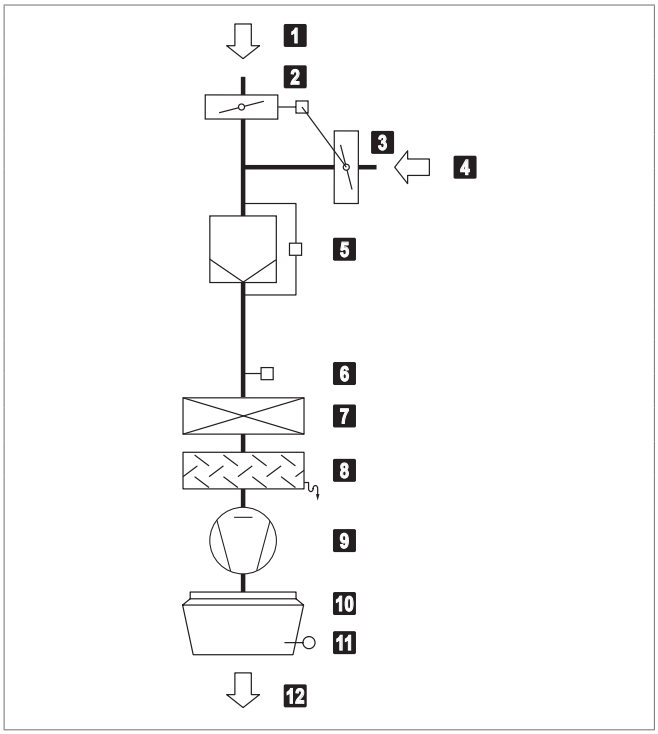
Fig. F1: TopVent® MC components



1	Actuator Air-Injector
2	Condensate connection
3	Frost controller
4	Filter box
5	Mixed air box
6	Fresh air duct (field-supplied)
7	Suspension set
8	Fresh air damper actuator
9	Heating/cooling coil
10	Condensate separator
11	Fan
12	Air-Injector

Fig. F2: TopVent® MC structure

2.2 Function diagram



1	Fresh air
2	Fresh air damper with actuator
3	Recirculation damper (opposed to the fresh air damper)
4	Extract air
5	Air filter with differential pressure switch
6	Frost controller
7	Heating/cooling coil
8	Condensate separator
9	Fan
10	Air-Injector with actuator
11	Supply air temperature sensor
12	Supply air

Fig. F3: TopVent® MC function diagram

2.3 Operating modes

The TopVent® MC has the following operating modes:
- Supply air speed 2
- Supply air speed 1
- Standby
- Recirculation
- Recirculation speed 1

The TopTronic® C control system regulates these operating modes automatically for each control zone in accordance with the specifications in the calendar. The following points also apply:
- The operating mode of a control zone can be switched over manually.
- Each TopVent® MC unit can operate individually in a local operating mode: Off, Supply air speed 2, Supply air speed 1, Recirculation, Recirculation speed 1.

Code	Operating mode	Description
SA2	**Supply air speed 2** The unit blows fresh air into the room. The fresh air ratio is adjustable. Heating/cooling is controlled according to the heat/cool demand. The room temperature set value day is active. The unit operates at speed 2 (high air flow rate).	Fan ..... speed 2 Fresh air damper..... 10 % open [1] Heating/cooling ..... on [2] [1] Percentage is adjustable [2] Depending on heat or cool demand
SA1	**Supply air speed 1** The same as SA2, but the unit operates only at speed 1 (low air flow rate)	Fan ..... speed 1 Fresh air damper..... 10 % open [1] Heating/cooling ..... on [2] [1] Percentage is adjustable [2] Depending on heat or cool demand
REC	**Recirculation** On/off-operation: If heating or cooling is required, the unit draws in room air, heats or cools it and returns it back into the room. The room temperature set value day is active.	Fan ..... speed 1 / 2 [1] Fresh air damper..... closed Heating/cooling ..... on [1] [1] Depending on heat or cool demand
DES	■ Destratification: To avoid heat build-up under the ceiling, it may be appropriate to switch on the fan when there is no heat or cool demand (either in permanent operation or in on/off operation depending on air temperature under the ceiling, as desired).	Fan ..... speed 2 Fresh air damper..... closed Heating/cooling ..... off
REC1	**Recirculation speed 1** The same as REC, but the unit operates only at speed 1 (low air flow rate)	Fan ..... speed 1 Fresh air damper..... closed Heating/cooling ..... on [1] [1] Depending on heat or cool demand
DES	■ Destratification: The same as for REC, but the unit operates only at speed 1	Fan ..... speed 1 Fresh air damper..... closed Heating/cooling ..... off
ST	**Standby** The unit is normally switched off. The following functions remain active:	
CPR	■ Cooling protection: If the room temperature drops below the set value for cooling protection, the unit heats up the room in recirculation operation.	Fan ..... speed 2 Fresh air damper..... closed Heating ..... on
OPR	■ Overheating protection: If the room temperature rises above the set value for overheating protection, the unit cools down the room in recirculation operation.	Fan ..... speed 2 Fresh air damper..... closed Cooling..... on
NCS	■ Night cooling: If the room temperature exceeds the set value for night cooling and the current fresh air temperature permits it, the unit blows cool fresh air into the room and extracts warmer room air.	Fan ..... speed 2 Fresh air damper..... open Heating/cooling ..... off

Code	Operating mode	Description
L_OFF	**Off** (local operating mode) The unit is switched off. Frost protection for the unit remains active.	Fan ..... off Fresh air damper..... closed Heating/cooling ..... off
–	**Forced heating** The unit draws in room air, warms it and blows it back into the room. Forced heating can be activated and set as required by the Hoval service technician. For example, it is suitable for heating the hall before taking the control system into operation or if the controller fails during the heating period.	Fan ..... speed 2 [1)] Fresh air damper..... closed [1)] Heating ..... on [1)] [1)] Adjustable by the Hoval service technician

Table F4: TopVent® MC operating modes

3 Technical data

3.1 Unit type reference

MC - 6 - C ...

Unit type
TopVent® MC

Unit size
6 or 9

Heating/cooling section
C with coil type C
D with coil type D

Further options

Table F5: TopVent® MH unit type reference

3.2 Application limits

Extract air temperature		max.	°C	50
Supply air temperature		max.	°C	60
Temperature of the heating medium [1]		max.	°C	90
Pressure of the heating medium		max.	kPa	800
Air flow rate	Size 6:	min.	m³/h	3100
	Size 9:	min.	m³/h	5000
Condensate quantity	Size 6:	max.	kg/h	90
	Size 9:	max.	kg/h	150

The units cannot be used in:
- Damp locations
- Places with a corrosive or aggressive environment
- Spaces with a large amount of dust
- Areas where there is danger of explosion

[1] Design for higher temperatures on request

Table F6: TopVent® MC application limits

3.3 Electrical connection

Unit type		MC-6	MC-9
Supply voltage	V AC	3 × 400	3 × 400
Permitted voltage tolerance	%	± 5	± 5
Frequency	Hz	50	50
Connected load	kW	3.6	3.6
Current consumption max.	A	5.9	5.9
Series fuse	A	13	13
Protection rating	-	IP 54	IP 54

Table F7: TopVent® MC electrical connection

3.4 Flow rate, product parameters

Unit type		MC-6	MC-9	
Coil type		C	C	D
Nominal air flow rate	m³/h	6000		9000
Floor area covered	m²	537		946
Static efficiency of the fans	%	63.6		63.6
Effective electric power input	kW	0.85	1.44	1.56

Table F8: TopVent® MC technical data

3.5 Heat output

Heating medium temperature			80/60 °C					60/40 °C				
Size	Type	t_F	Q	H_{max}	t_S	Δp_W	m_W	Q	H_{max}	t_S	Δp_W	m_W
		°C	kW	m	°C	kPa	l/h	kW	m	°C	kPa	l/h
MC-6	C	- 5	76.8	9.7	55.5	18	3297	45.7	12.3	40.1	7	1965
		-15	78.2	9.7	55.2	19	3358	47.2	12.4	39.9	7	2026
MC-9	C	- 5	119.0	10.1	56.8	18	5113	71.0	12.9	40.9	7	3050
		-15	121.2	10.1	56.5	19	5208	73.2	12.9	40.7	7	3145
	D	- 5	142.0	9.3	64.4	15	6101	86.7	11.7	46.1	6	3725
		-15	144.6	9.4	64.2	15	6212	89.3	11.7	46.0	6	3837

Legend:
Type = Type of coil
t_F = Fresh air temperature
Q = Heat output
H_{max} = Maximum mounting height
t_S = Supply air temperature
Δp_W = Water pressure drop
m_W = Water quantity

Reference:
- Room air 18 °C, extract air 20 °C / 20 % rel. humidity
- Fresh air ratio 10 %

Table F9: TopVent® MC heat outputs

3.6 Cooling capacities

Cooling medium temperature				6/12 °C						8/14 °C					
Size	Type	t_F	RH_F	Q_{sen}	Q_{tot}	t_S	Δp_W	m_W	m_C	Q_{sen}	Q_{tot}	t_S	Δp_W	m_W	m_C
		°C	%	kW	kW	°C	kPa	l/h	kg/h	kW	kW	°C	kPa	l/h	kg/h
MC-6	C	28	40	21.0	21.0	14.0	16	3000	0.0	18.5	18.5	15.2	13	2649	0.0
			60	20.7	20.7	14.2	16	2961	0.0	18.2	18.2	15.4	12	2609	0.0
		32	40	25.7	32.3	15.7	39	4630	9.7	23.3	26.1	16.9	25	3734	4.1
			60	25.4	34.1	15.8	43	4884	12.7	23.0	27.8	17.0	29	3988	7.1
MC-9	C	28	40	32.2	32.2	13.8	16	4614	0.0	28.4	28.4	15.0	12	4064	0.0
			60	31.8	31.8	13.9	16	4554	0.0	28.0	28.0	15.2	12	4004	0.0
		32	40	39.7	51.9	15.3	41	7432	18.0	35.8	35.8	16.6	20	5131	0.0
			60	39.3	54.7	15.4	46	7829	22.7	35.4	38.1	16.7	22	5459	4.0
	D	28	40	38.1	38.1	11.8	13	5451	0.0	33.2	33.2	13.4	10	4756	0.0
			60	37.7	37.8	12.0	13	5409	0.1	32.9	32.9	13.6	10	4706	0.0
		32	40	47.4	64.8	12.7	39	9285	25.6	42.6	53.3	14.3	26	7626	15.7
			60	47.1	68.3	12.9	43	9785	31.2	42.2	56.7	14.5	30	8126	21.3

Legend:
Type = Type of coil
t_F = Fresh air temperature
RH_F = Relative humidity of the fresh air
Q_{sen} = Sensible cooling capacity
Q_{tot} = Total cooling capacity
t_S = Supply air temperature
Δp_W = Water pressure drop
m_W = Water quantity
m_C = Condensate quantity

Reference:
- At fresh air temperature 28°C: room air 22°C / 50% RH, extract air 24°C
- At fresh air temperature 32°C: room air 26°C / 50% RH, extract air 28°C

Fresh air ratio 10%

Table F10: TopVent® MC cooling capacities

F

3.7 Sound data

Unit type			MC-6-C	MC-9-C
Sound pressure level (at a distance of 5 m) [1]		dB(A)	52	59
Total sound power level		dB(A)	74	81
Octave sound power level	63 Hz	dB	42	49
	125 Hz	dB	60	67
	250 Hz	dB	63	70
	500 Hz	dB	66	73
	1000 Hz	dB	68	75
	2000 Hz	dB	68	75
	4000 Hz	dB	67	74
	8000 Hz	dB	62	68

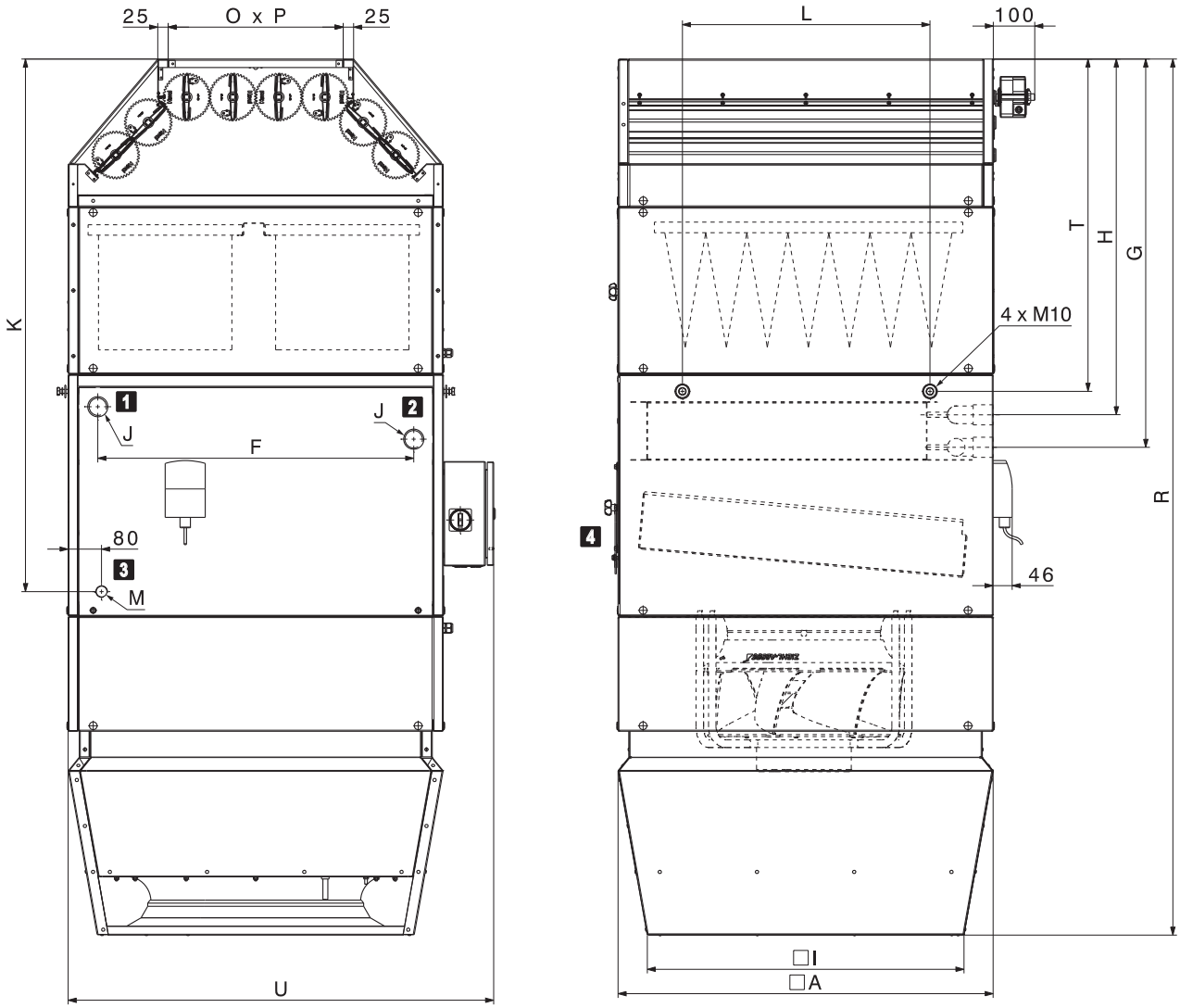
[1] with a hemispherical radiation pattern in a low-reflection room

Table F11: TopVent® MC sound power levels

3.8 Dimensions and weights

Unit size		MC-6	MC-9	MC-9
Coil type		C	C	D
A	mm	900	1100	1100
F	mm	758	882	882
G	mm	910	931	940
H	mm	832	853	845
I	mm	760	935	935
K	mm	1276	1318	1318
L	mm	594	846	846
O × P	mm	420 × 850	500 × 1050	500 × 1050
R	mm	2100	2190	2190
T	mm	795	900	900
U	mm	1020	1220	1220
J	"	Rp 1¼ (internal)	Rp 1½ (internal)	Rp 2 (internal)
M	"	G 1 (external)	G 1 (external)	G 1 (external)
Water content of heating/cooling coil	l	7.9	12.4	19.2
Weight	kg	266	323	334

Table F12: TopVent® MC dimensions and weights



1 Return heating/cooling	3 Condensate connection
2 Flow heating/cooling	4 Access panel

Fig. F13: TopVent® MC dimensional drawing

4 Specification texts

4.1 TopVent® MC

Supply air unit for heating and cooling rooms up to 25 m in height with central heat and cold supply (2-pipe system); equipped with highly efficient air distributor; maximum floor area reached per unit 537 m² (size 6) and 946 m² respectively (size 9).

The unit consists of the following components:
- Fan unit
- Heating/cooling section
- Air-Injector
- Filter box
- Mixed air box
- Unit control box
- Optional components

TopVent® MC units comply with all the requirements of the Ecodesign Directive 2009/125/EC relating to environmentally friendly design of energy-related products. They are systems of the 'fan coil unit' type.

Fan unit

Consisting of radial fan with high-efficiency EC motor, backwards-curved, three-dimensional contoured blades and free-running rotor made of a high-performance composite material, aerodynamically optimised inflow nozzle, low-noise, with integrated overload protection (integrated in the heating/cooling section).

Heating/cooling section

Housing made of aluzinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of ageing-resistant, silicone-free sealing materials, internally insulated with close-pored polyurethane.
The heating/cooling section contains:
- The highly efficient heating/cooling coil consisting of seamless copper pipes with pressed-on, optimised and profiled aluminium fins and manifolds made of copper; for connection to the hot water and cold water supply
- The pull-out condensate separator with collecting channel, made of high-quality corrosion-resistant material, with a downslope in all directions for rapid draining
- The condensate trap for connecting to a condensate drain (supplied).

Air-Injector

Housing made of aluzinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of ageing-resistant, silicone-free sealing materials, internally insulated with close-pored polyurethane, with:
- Vortex air distributor with concentric outlet nozzle, adjustable vanes and integrated absorber hood
- Actuator for infinitely variable adjustment of the air distribution from vertical to horizontal for draught-free air distribution in the hall under changing operating conditions
- Supply air temperature sensor

Filter box

Housing made of aluzinc sheet, internally insulated with EPDM, with 2 ISO coarse 60% bag filters (G4), with differential pressure switch for filter monitoring, factory-wired to the circuit board in the unit control box.

Mixed air box

Housing made of aluzinc sheet, internally insulated with EPDM, with fresh air damper and recirculation damper linked to move in opposite directions; includes actuator with spring return, factory-wired to the circuit board in the unit control box.

Unit control box

Control box fitted at the side of the housing for connection of the power supply and housing the control components that facilitate energy-optimised operation, controlled by the control system TopTronic® C. Housing made of coated sheet steel (light grey RAL 7035), protection rating IP 54. The following components are installed:
- Main switch
- Circuit board with all required electrical components, unit controller (clipped on) as well as connection terminals for the following external connections:
  - Heating/cooling valve
  - Heating/cooling pump
  - Return temperature sensor
  - Condensate pump
  - Forced off

The circuit board is fitted with push-in terminals facilitating easy installation of the connection cables. All components in the unit control box as well as sensors and actuators in the unit are fully factory-wired.
Power supply and bus connection to be installed on site.

Options for the unit

Suspension set:
for ceiling installation of the unit consisting of 4 pairs U-profiles made of aluzinc sheet steel, height-adjustable to 1300 mm. Paint according to unit.

Standard paint finish:
External paint finish in Hoval red (RAL 3000)

Paint finish as desired:
Choice of external paint finish in RAL colour

Hydraulic assembly diverting system:
Prefabricated assembly for hydraulic diverting system, consisting of mixing valve, regulating valve, ball valve, automatic air vent and screw connections for connection to the unit and to the distributor circuit; mixing valve with plug-in connection, sized for the coil in the unit and the Hoval TopTronic® C control system.

Mixing valve:
Mixing valve with modulating rotary actuator and plug-in connection, sized for the coil in the unit.

Condensate pump:
Consisting of a centrifugal pump and a drip tray, max. delivery rate of 150 l/h with a delivery head of 3 m. Condensate pump with connection cable enclosed.

Pump control for mixing or injection system:
Electrical components for controlling a mixing or injection circuit in the load circuit, factory-installed in the unit control box.

Return temperature sensor:
Temperature sensor for monitoring the heating medium.

4.2 TopTronic® C – System control

Zone-based control system ex-works for operation of decentralised Hoval indoor climate systems with optimised use of energy, suitable for demand-driven control of overall systems comprising up to 64 control zones each with up to 15 supply and extract air handling units or supply air units and 10 recirculation units.

The control system is customised and preconfigured ex works. Zone allocation:
- Zone 1: __ x Unit type _____
- Zone 2: __ x Unit type _____
- Zone 3: __ x Unit type _____
- …

System structure:
- Unit controller: installed in the particular indoor climate unit
- Zone bus: as serial connection of all unit controllers in one control zone with the zone controller; with robust bus protocol via shielded and twisted-pair bus line (bus cables provided by the client)
- Zone control panel with:
  – System operator terminal
  – Fresh air temperature sensor
  – Zone controllers and room air temperature sensors
  – All components for the electrical power supply and protection
- System bus (Ethernet): for connecting all zone controllers to one another and to the system operator terminal (bus cables provided by the client)

Operation:
- TopTronic® C-ST as system operator terminal: touch panel for visualisation and control by web browser via HTML interface, including software for LAN access
- TopTronic® C-ZT as zone operator terminal: for simple on-site operation of a control zone (optional)
- Manual operating selector switch (optional)
- Manual operating selector button (optional)
- Operating of the units via building management system via standardised interfaces (optional):
  – BACnet
  – Modbus IP
  – Modbus RTU

Control functions:
- Control of the supply air temperature using room supply air cascade control via sequential control of the energy recovery and the coils (depending on the unit type)
- Demand-driven control of the room air quality by variation of the supply air and exhaust air volume flows with minimum and maximum limit (for supply and extract air handling units, optional)
- Control of the unit including the air distribution according to the specifications of the zone controller

Alarms, protection:
- Central alarm management with registration of all alarms (timestamp, priority, status) in an alarm list and alarm memory of the last 50 alarms; forwarding via e-mail can be set in the parameters.
- 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.
- Frost protection control of the units with constrained control of protection functions to prevent coil icing (for supply air units as well as supply and extract air handling units)
- A maintenance mode implemented in the control algorithm for testing all physical data points and alarms guarantees high reliability.

Options for the zone control panel:
- Design for heating (TH, TC, THC, MH, MC, MHC)
- Design for cooling (TC, THC, MC, MHC)
- Cooling lock switch (TC, THC, MC, MHC)
- Alarm lamp
- Socket
- Additional room air temperature sensors (max. 3)
- Combination sensor room air quality, temperature and humidity
- External sensor values
- External set values
- Load shedding input
- Operating selector switch on terminal
- Operating selector button on terminal
- Power supply for air handling unit
- Safety relay
- Control of distributor pump, incl. power supply

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

System control for operation of decentralised Hoval indoor climate systems with optimised use of energy, suitable for demand-driven control of TopVent® plants comprising 1 control zone with up to 6 supply air units and 10 recirculation units (power supply for the TopVent® units provided by the client).

System structure:
- Unit controller: installed in the particular indoor climate unit
- Zone bus: as serial connection of all unit controllers with the zone controller; with robust bus protocol via shielded and twisted-pair bus line (bus cables provided by the client)
- Zone control panel, designed as compact cabinet for wall installation, made of coated sheet steel (light grey RAL 7035), with:
  - Zone controller with operating panel, making it simple to operate and monitor the system
  - Fresh air temperature sensor
  - Room temperature sensor
- Circuit board with external connections for:
  - Collective alarm
  - Forced off (zone controller)
  - Forced off (supply air unit)
  - Heating demand
  - Setpoint heating demand
  - Fault heat supply
  - Cooling demand
  - Fault cold supply
  - External enabling heating/cooling
  - External setting heating/cooling
  - Changeover valves heating/cooling
  - Additional room air temperature sensors (max. 3)
  - External setpoint fresh air ratio
  - Operating selector switch on terminal (digital)
  - Operating selector button on terminal

Control functions:
- Control of the supply air temperature via sequential control of the coils
- Control of the unit including the air distribution according to the specifications of the zone controller

Alarms, protection:
- Central alarm management with registration of all alarms (timestamp, priority, status) in an alarm list and alarm memory of the last 50 alarms.
- 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.
- Frost protection control of the units with constrained control of protection functions to prevent coil icing (for supply air units)
- A maintenance mode implemented in the control algorithm for testing all physical data points and alarms guarantees high reliability.

Options for the zone control panel:
- Additional room air temperature sensors (max. 3)
- Operating of the units via building management system via standardised interfaces:
  - BACnet
  - Modbus IP
  - Modbus RTU

TopVent® MHC

Supply air units for ventilating, heating and cooling spaces up to 25 m in height with central heat and cold supply (4-pipe-system)

1 Use

1.1 Intended use

TopVent® MHC units are supply air units for ventilating, heating and cooling spaces up to 25 m in height with central heat and cold supply. They have the following functions:

- Heating (with connection to a hot water supply)
- Cooling (with connection to a water chiller)
- Fresh air supply
- Mixed air operation
- Recirculation operation
- Air distribution with adjustable Air-Injector
- Air filtration

The Hoval TopTronic® C integrated control system ensures energy-efficient, demand-based operation of Hoval indoor climate systems.

Intended use also includes compliance with the operating instructions. Any usage over and above this use is considered to be not as intended. The manufacturer can accept no liability for damage resulting from improper use.

1.2 User group

The units are only allowed to be installed, operated and maintained by authorised and instructed personnel who are well acquainted with the units and are informed about possible dangers.

The operating instructions are for operating engineers and technicians as well as specialists in building, heating and ventilation technology.

2 Construction and operation

2.1 Structure

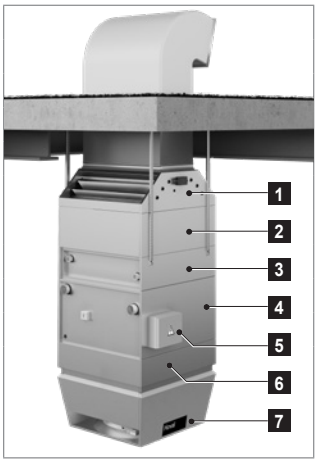
The TopVent® MHC unit consists of the following components:

- Fan unit:
  Diagonal fan with energy-saving EC motor, maintenance-fee and infinitely variable
- Heating section:
  contains the heating coil for heating the supply air with hot water
- Cooling section:
  contains the cooling coil for cooling the supply air with cold water and the condensate separator for the condensate generated
- Air-Injector:
  Patented, automatically adjustable vortex air distributor for draught-free air distribution over a large area
- Filter box:
  contains 2 ISO Coarse 60 % bag filters (G4), easily accessible behind the sliding door
- Mixed air box:
  contains fresh air damper and recirculation damper linked to move in opposite directions and actuator with spring return

As part of the TopTronic® C control system, the unit control box is an integral component. The following components are installed:

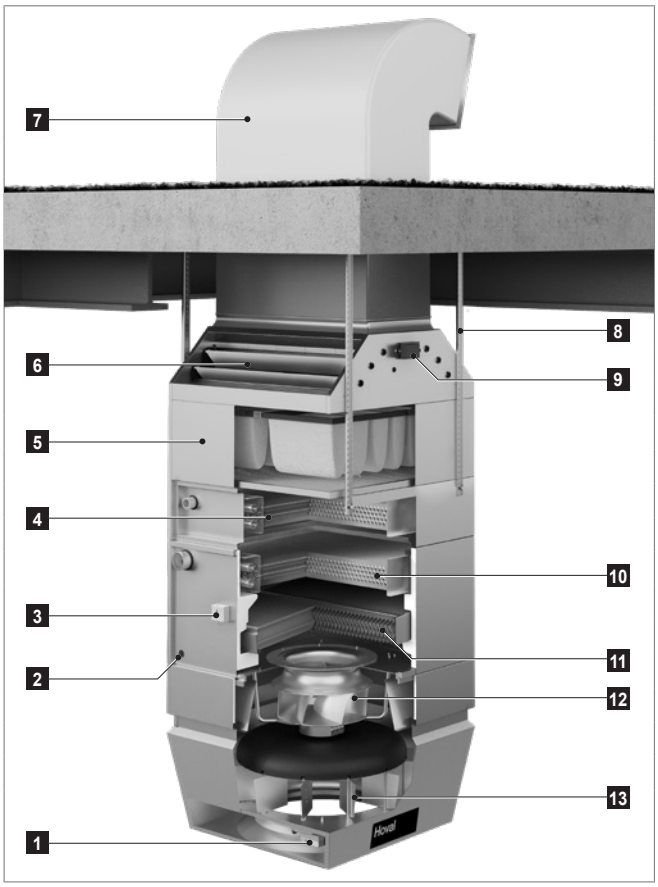
- Unit controller: this component controls the unit including the air distribution according to the specifications of the control zone. The unit controller is connected to the other components of the TopTronic® C control system via system bus.
- Main switch
- Circuit board with electrical components and external connections

All unit components are fully factory-wired.



1	Mixed air box
2	Filter box
3	Heating section
4	Cooling section
5	Unit control box
6	Fan unit
7	Air-Injector

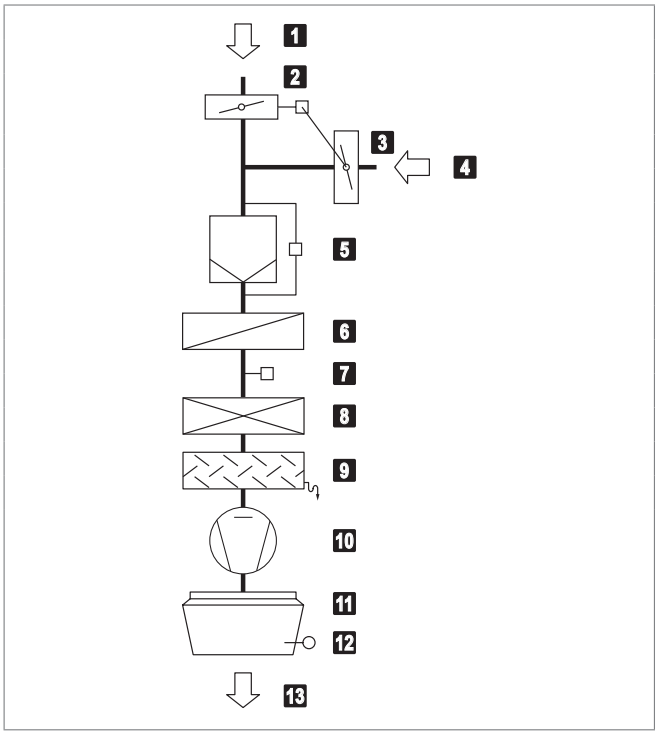
Fig. G1: TopVent® MHC components



1	Actuator Air-Injector
2	Condensate connection
3	Frost controller
4	Heating coil
5	Filter box
6	Mixed air box
7	Fresh air duct (field-supplied)
8	Suspension set
9	Fresh air damper actuator
10	Cooling coil
11	Condensate separator
12	Fan
13	Air-Injector

Fig. G2: TopVent® MHC structure

2.2 Function diagram



1	Fresh air
2	Fresh air damper with actuator
3	Recirculation damper (opposed to the fresh air damper)
4	Extract air
5	Air filter with differential pressure switch
6	Heating coil
7	Frost controller
8	Cooling coil
9	Condensate separator
10	Fan
11	Air-Injector with actuator
12	Supply air temperature sensor
13	Supply air

Fig. G3: TopVent® MHC function diagram

2.3 Operating modes

The TopVent® MHC has the following operating modes:
- Supply air speed 2
- Supply air speed 1
- Standby
- Recirculation
- Recirculation speed 1

The TopTronic® C control system regulates these operating modes automatically for each control zone in accordance with the specifications in the calendar. The following points also apply:
- The operating mode of a control zone can be switched over manually.
- Each TopVent® MHC unit can operate individually in a local operating mode: Off, Supply air speed 2, Supply air speed 1, Recirculation, Recirculation speed 1.

Code	Operating mode	Description
SA2	**Supply air speed 2** The unit blows fresh air into the room. The fresh air ratio is adjustable. Heating/cooling is controlled according to the heat/cool demand. The room temperature set value day is active. The unit operates at speed 2 (high air flow rate).	Fan ..... speed 2 Fresh air damper..... 10 % open [1] Heating/cooling ..... on [2] [1] Percentage is adjustable [2] Depending on heat or cool demand
SA1	**Supply air speed 1** The same as SA2, but the unit operates only at speed 1 (low air flow rate)	Fan ..... speed 1 Fresh air damper..... 10 % open [1] Heating/cooling ..... on [2] [1] Percentage is adjustable [2] Depending on heat or cool demand
REC	**Recirculation** On/off-operation: If heating or cooling is required, the unit draws in room air, heats or cools it and returns it back into the room. The room temperature set value day is active.	Fan ..... speed 1 / 2 [1] Fresh air damper..... closed Heating/cooling ..... on [1] [1] Depending on heat or cool demand
DES	■ Destratification: To avoid heat build-up under the ceiling, it may be appropriate to switch on the fan when there is no heat or cool demand (either in permanent operation or in on/off operation depending on air temperature under the ceiling, as desired).	Fan ..... speed 2 Fresh air damper..... closed Heating/cooling ..... off
REC1	**Recirculation speed 1** The same as REC, but the unit operates only at speed 1 (low air flow rate)	Fan ..... speed 1 Fresh air damper..... closed Heating/cooling ..... on [1] [1] Depending on heat or cool demand
DES	■ Destratification: The same as for REC, but the unit operates only at speed 1	Fan ..... speed 1 Fresh air damper..... closed Heating/cooling ..... off
ST	**Standby** The unit is normally switched off. The following functions remain active:	
CPR	■ Cooling protection: If the room temperature drops below the set value for cooling protection, the unit heats up the room in recirculation operation.	Fan ..... speed 2 Fresh air damper..... closed Heating ..... on
OPR	■ Overheating protection: If the room temperature rises above the set value for overheating protection, the unit cools down the room in recirculation operation.	Fan ..... speed 2 Fresh air damper..... closed Cooling..... on
NCS	■ Night cooling: If the room temperature exceeds the set value for night cooling and the current fresh air temperature permits it, the unit blows cool fresh air into the room and extracts warmer room air.	Fan ..... speed 2 Fresh air damper..... open Heating/cooling ..... off

Code	Operating mode	Description
L_OFF	**Off** (local operating mode) The unit is switched off. Frost protection for the unit remains active.	Fan ..... off Fresh air damper..... closed Heating/cooling ..... off
–	**Forced heating** The unit draws in room air, warms it and blows it back into the room. Forced heating can be activated and set as required by the Hoval service technician. For example, it is suitable for heating the hall before taking the control system into operation or if the controller fails during the heating period.	Fan ..... speed 2 [1)] Fresh air damper..... closed [1)] Heating ..... on [1)] [1)] Adjustable by the Hoval service technician

Table G4: TopVent® MHC operating modes

3 Technical data

3.1 Unit type reference

MHC - 6 A C ...

Unit type
TopVent® MHC

Unit size
6 or 9

Heating section
A with coil type A
B with coil type B
C with coil type C

Cooling section
C with coil type C
D with coil type D

Further options

Table G5: TopVent® MHC unit type reference

3.2 Application limits

Extract air temperature		max.	°C	50
Supply air temperature		max.	°C	60
Temperature of the heating medium [1]		max.	°C	90
Pressure of the heating medium		max.	kPa	800
Air flow rate	Size 6:	min.	m³/h	3100
	Size 9:	min.	m³/h	5000
Condensate quantity	Size 6:	max.	kg/h	90
	Size 9:	max.	kg/h	150

The units cannot be used in:
- Damp locations
- Places with a corrosive or aggressive environment
- Spaces with a large amount of dust
- Areas where there is danger of explosion

[1] Design for higher temperatures on request

Table G6: TopVent® MHC application limits

3.3 Electrical connection

Unit type		MHC-6	MHC-9
Supply voltage	V AC	3 × 400	3 × 400
Permitted voltage tolerance	%	± 5	± 5
Frequency	Hz	50	50
Connected load	kW	3.6	3.6
Current consumption max.	A	5.9	5.9
Series fuse	A	13	13
Protection rating	-	IP 54	IP 54

Table G7: TopVent® MHC electrical connection

3.4 Flow rate, product parameters

Unit type		MHC-6			MHC-9					
Coil type		AC	BC	CC	AC	BC	CC	AD	BD	CD
Nominal air flow rate	m³/h			6000						9000
Floor area covered	m²			537						946
Static efficiency of the fans	%			63.6						63.6
Effective electric power input	kW	0.92	0.97	1.09	1.59	1.72	1.64	1.77	1.79	1.92

Table G8: TopVent® MHC technical data

3.5 Heat output

Heating medium temperature			80/60 °C					60/40 °C				
Size	Type	t_F	Q	H_{max}	t_S	Δp_W	m_W	Q	H_{max}	t_S	Δp_W	m_W
		°C	kW	m	°C	kPa	l/h	kW	m	°C	kPa	l/h
MHC-6	A	- 5	33.1	14.4	33.9	7	1424	19.1	18.8	27.0	2	820
		-15	33.8	14.7	33.2	8	1451	19.7	19.5	26.3	3	848
	B	- 5	47.5	12.1	41.0	13	2040	27.4	15.7	31.1	4	1177
		-15	48.4	12.2	40.5	14	2079	28.3	16.1	30.5	5	1216
	C	- 5	76.8	9.7	55.5	18	3297	45.7	12.3	40.1	7	1965
		-15	78.2	9.7	55.2	19	3358	47.2	12.4	39.9	7	2026
MHC-9	A	- 5	56.1	14.4	36.0	8	2409	32.3	18.8	28.2	3	1387
		-15	57.1	14.6	35.4	8	2455	33.4	19.4	27.5	3	1433
	B	- 5	71.9	12.8	41.2	12	3090	41.3	16.7	31.1	4	1775
		-15	73.3	12.9	40.7	13	3149	42.7	17.0	30.6	4	1834
	C	- 5	119.0	10.1	56.8	18	5113	71.0	12.9	40.9	7	3050
		-15	121.2	10.1	56.5	19	5208	73.2	12.9	40.7	7	3145

Legend:
- Type = Type of coil
- t_F = Fresh air temperature
- Q = Heat output
- H_{max} = Maximum mounting height
- t_S = Supply air temperature
- Δp_W = Water pressure drop
- m_W = Water quantity

Reference:
- Room air 18 °C, extract air 20 °C / 20 % rel. humidity
- Fresh air ratio 10 %

Table G9: TopVent® MHC heat outputs

3.6 Cooling capacities

Cooling medium temperature				6/12 °C						8/14 °C					
Size	Type	t_F	RH_F	Q_{sen}	Q_{tot}	t_S	Δp_W	m_W	m_C	Q_{sen}	Q_{tot}	t_S	Δp_W	m_W	m_C
		°C	%	kW	kW	°C	kPa	l/h	kg/h	kW	kW	°C	kPa	l/h	kg/h
MHC-6	C	28	40	21.0	21.0	14.0	16	3000	0.0	18.5	18.5	15.2	13	2649	0.0
			60	20.7	20.7	14.2	16	2961	0.0	18.2	18.2	15.4	12	2609	0.0
		32	40	25.7	32.3	15.7	39	4630	9.7	23.3	26.1	16.9	25	3734	4.1
			60	25.4	34.1	15.8	43	4884	12.7	23.0	27.8	17.0	29	3988	7.1
MHC-9	C	28	40	32.2	32.2	13.8	16	4614	0.0	28.4	28.4	15.0	12	4064	0.0
			60	31.8	31.8	13.9	16	4554	0.0	28.0	28.0	15.2	12	4004	0.0
		32	40	39.7	51.9	15.3	41	7432	18.0	35.8	35.8	16.6	20	5131	0.0
			60	39.3	54.7	15.4	46	7829	22.7	35.4	38.1	16.7	22	5459	4.0
	D	28	40	38.1	38.1	11.8	13	5451	0.0	33.2	33.2	13.4	10	4756	0.0
			60	37.7	37.8	12.0	13	5409	0.1	32.9	32.9	13.6	10	4706	0.0
		32	40	47.4	64.8	12.7	39	9285	25.6	42.6	53.3	14.3	26	7626	15.7
			60	47.1	68.3	12.9	43	9785	31.2	42.2	56.7	14.5	30	8126	21.3

Legend:
- Type = Type of coil
- t_F = Fresh air temperature
- RH_F = Relative humidity of the fresh air
- Q_{sen} = Sensible cooling capacity
- Q_{tot} = Total cooling capacity
- t_S = Supply air temperature
- Δp_W = Water pressure drop
- m_W = Water quantity
- m_C = Condensate quantity

Reference:
- At fresh air temperature 28°C: room air 22°C / 50% RH, extract air 24°C
- At fresh air temperature 32°C: room air 26°C / 50% RH, extract air 28°C

Fresh air ratio 10%

Table G10: TopVent® MHC cooling capacities

3.7 Sound data

Unit type			MHC-6CC	MHC-9CC
Sound pressure level (at a distance of 5 m) [1]		dB(A)	56	60
Total sound power level		dB(A)	77	82
Octave sound power level	63 Hz	dB	43	47
	125 Hz	dB	61	67
	250 Hz	dB	64	70
	500 Hz	dB	69	74
	1000 Hz	dB	73	78
	2000 Hz	dB	72	76
	4000 Hz	dB	69	74
	8000 Hz	dB	60	67

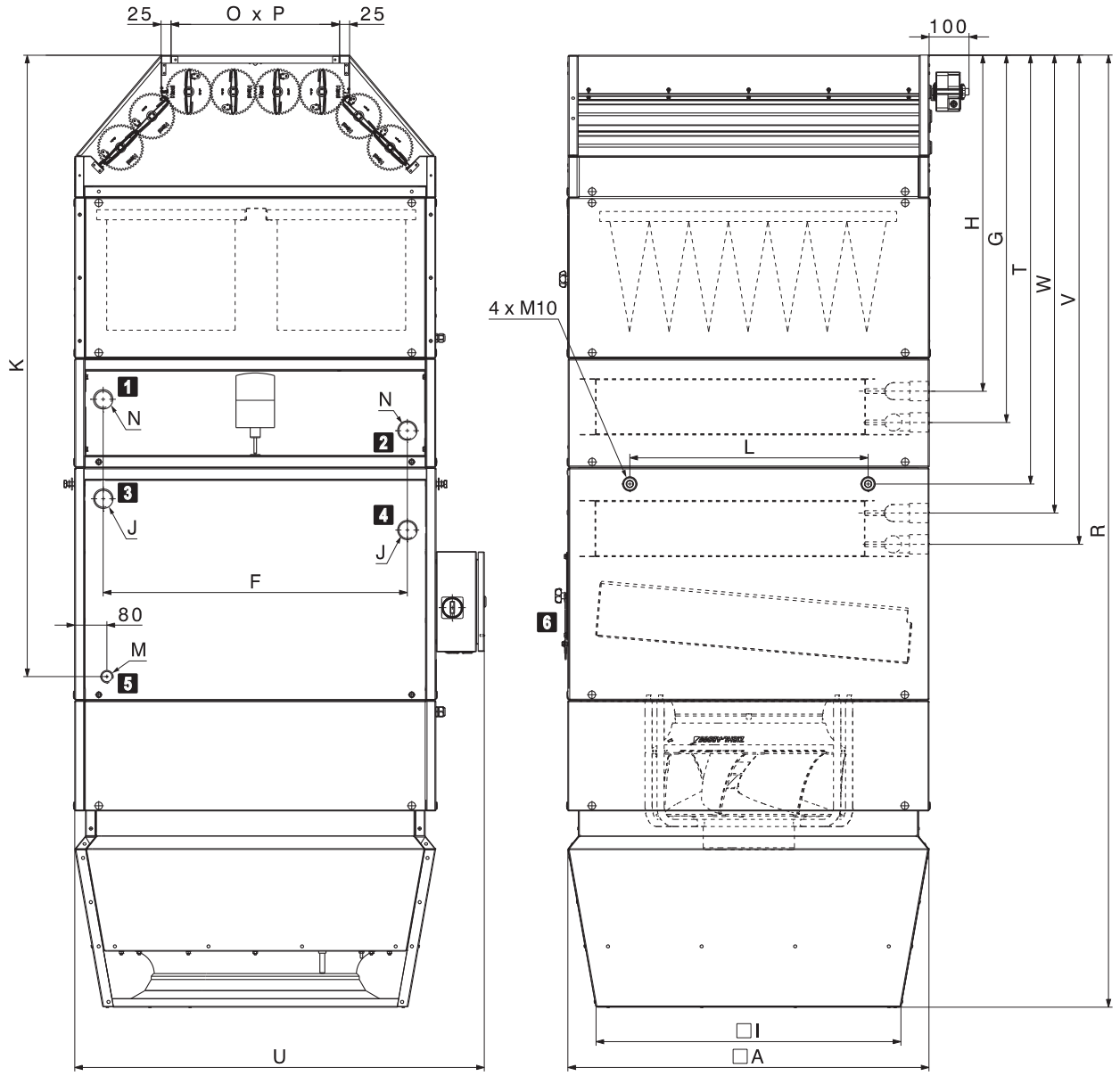
[1] with a hemispherical radiation pattern in a low-reflection room

Table G11: TopVent® MHC sound power levels

3.8 Dimensions and weights

Unit size		MHC-6			MHC-9			MHC-9		
Coil type		AC	BC	CC	AC	BC	CC	AD	BD	CD
A	mm	900			1100			1100		
F	mm	758			882			882		
G	mm	936			951			951		
H	mm	858			873			873		
I	mm	760			935			935		
K	mm	1550			1622			1622		
L	mm	594			846			846		
O × P	mm	420 × 850			500 × 1050			500 × 1050		
R	mm	2374			2496			2496		
T	mm	1069			1104			1104		
U	mm	1020			1220			1220		
V	mm	1184			1235			1244		
W	mm	1106			1157			1149		
N	"	Rp 1¼ (internal)			Rp 1½ (internal)			Rp 1½ (internal)		
J	"	Rp 1¼ (internal)			Rp 1½ (internal)			Rp 2 (internal)		
M	"	G 1 (external)			G 1 (external)			G 1 (external)		
Water content of heating coil	l	4.6	4.6	7.9	7.4	7.4	12.4	7.4	7.4	12.4
Water content of cooling coil	l	7.9	7.9	7.9	12.4	12.4	12.4	19.2	19.2	19.2
Weight	kg	295	299	305	377	377	388	388	388	399

Table G12: TopVent® MHC dimensions and weights



1 Return heating	3 Return cooling	5 Condensate connection
2 Flow heating	4 Flow cooling	6 Access panel

Fig. G13: TopVent® MHC dimensional drawing

4 Specification texts

4.1 TopVent® MHC

Supply air unit for heating and cooling rooms up to 25 m in height with central heat and cold supply (4-pipe system); equipped with highly efficient air distributor; maximum floor area reached per unit 537 m² (size 6) and 946 m² respectively (size 9).

The unit consists of the following components:
- Fan unit
- Heating section
- Cooling section
- Air-Injector
- Filter box
- Mixed air box
- Unit control box
- Optional components

TopVent® MHC units comply with all the requirements of the Ecodesign Directive 2009/125/EC relating to environmentally friendly design of energy-related products. They are systems of the 'fan coil unit' type.

Fan unit

Consisting of radial fan with high-efficiency EC motor, backwards-curved, three-dimensional contoured blades and free-running rotor made of a high-performance composite material, aerodynamically optimised inflow nozzle, low-noise, with integrated overload protection (integrated in the cooling section).

Heating section

Housing made of aluzinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of ageing-resistant, silicone-free sealing materials, internally insulated with EPDM:
The heating section contains:
- The highly efficient heating coil consisting of seamless copper pipes with pressed-on, optimised and profiled aluminium fins and manifolds made of copper; for connection to the hot water supply

Cooling section

Housing made of aluzinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of ageing-resistant, silicone-free sealing materials, internally insulated with close-pored polyurethane.

The cooling section contains:
- The highly efficient heating/cooling coil consisting of seamless copper pipes with pressed-on, optimised and profiled aluminium fins and manifolds made of copper; for connection to the hot water and cold water supply
- The pull-out condensate separator with collecting channel, made of high-quality corrosion-resistant material, with a downslope in all directions for rapid draining
- The condensate trap for connecting to a condensate drain (supplied).

Air-Injector

Housing made of aluzinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of ageing-resistant, silicone-free sealing materials, internally insulated with close-pored polyurethane, with:
- Vortex air distributor with concentric outlet nozzle, adjustable vanes and integrated absorber hood
- Actuator for infinitely variable adjustment of the air distribution from vertical to horizontal for draught-free air distribution in the hall under changing operating conditions
- Supply air temperature sensor

Filter box

Housing made of aluzinc sheet, internally insulated with EPDM, with 2 ISO coarse 60% bag filters (G4), with differential pressure switch for filter monitoring, factory-wired to the circuit board in the unit control box.

Mixed air box

Housing made of aluzinc sheet, internally insulated with EPDM, with fresh air damper and recirculation damper linked to move in opposite directions; includes actuator with spring return, factory-wired to the circuit board in the unit control box.

Unit control box

Control box fitted at the side of the housing for connection of the power supply and housing the control components that facilitate energy-optimised operation, controlled by the control system TopTronic® C. Housing made of coated sheet steel (light grey RAL 7035), protection rating IP 54. The following components are installed:
- Main switch
- Circuit board with all required electrical components, unit controller (clipped on) as well as connection terminals for the following external connections:
  – Heating/cooling valve
  – Heating/cooling pump

– Return temperature sensor
– Condensate pump
– Forced off

The circuit board is fitted with push-in terminals facilitating easy installation of the connection cables. All components in the unit control box as well as sensors and actuators in the unit are fully factory-wired.
Power supply and bus connection to be installed on site.

Options for the unit

Suspension set:
for ceiling installation of the unit consisting of 4 pairs U-profiles made of aluzinc sheet steel, height-adjustable to 1300 mm. Paint according to unit.

Standard paint finish:
External paint finish in Hoval red (RAL 3000)

Paint finish as desired:
Choice of external paint finish in RAL colour

Hydraulic assembly diverting system:
Prefabricated assembly for hydraulic diverting system, consisting of mixing valve, regulating valve, ball valve, automatic air vent and screw connections for connection to the unit and to the distributor circuit; mixing valve with plug-in connection, sized for the coil in the unit and the Hoval TopTronic® C control system.

Mixing valve:
Mixing valve with modulating rotary actuator and plug-in connection, sized for the coil in the unit.

Condensate pump:
Consisting of a centrifugal pump and a drip tray, max. delivery rate of 150 l/h with a delivery head of 3 m. Condensate pump with connection cable enclosed.

Pump control for mixing or injection system:
Electrical components for controlling a mixing or injection circuit in the load circuit, factory-installed in the unit control box.

Return temperature sensor:
Temperature sensor for monitoring the heating medium.

4.2 TopTronic® C – System control

Zone-based control system ex-works for operation of decentralised Hoval indoor climate systems with optimised use of energy, suitable for demand-driven control of overall systems comprising up to 64 control zones each with up to 15 supply and extract air handling units or supply air units and 10 recirculation units.

The control system is customised and preconfigured ex works. Zone allocation:
- Zone 1: __ x Unit type _____
- Zone 2: __ x Unit type _____
- Zone 3: __ x Unit type _____
- …

System structure:
- Unit controller: installed in the particular indoor climate unit
- Zone bus: as serial connection of all unit controllers in one control zone with the zone controller; with robust bus protocol via shielded and twisted-pair bus line (bus cables provided by the client)
- Zone control panel with:
  – System operator terminal
  – Fresh air temperature sensor
  – Zone controllers and room air temperature sensors
  – All components for the electrical power supply and protection
- System bus (Ethernet): for connecting all zone controllers to one another and to the system operator terminal (bus cables provided by the client)

Operation:
- TopTronic® C-ST as system operator terminal: touch panel for visualisation and control by web browser via HTML interface, including software for LAN access
- TopTronic® C-ZT as zone operator terminal: for simple on-site operation of a control zone (optional)
- Manual operating selector switch (optional)
- Manual operating selector button (optional)
- Operating of the units via building management system via standardised interfaces (optional):
  – BACnet
  – Modbus IP
  – Modbus RTU

Control functions:
- Control of the supply air temperature using room supply air cascade control via sequential control of the energy recovery and the coils (depending on the unit type)
- Demand-driven control of the room air quality by variation of the supply air and exhaust air volume flows with minimum and maximum limit (for supply and extract air handling units, optional)
- Control of the unit including the air distribution according to the specifications of the zone controller

Alarms, protection:
- Central alarm management with registration of all alarms (timestamp, priority, status) in an alarm list and alarm memory of the last 50 alarms; forwarding via e-mail can be set in the parameters.
- 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.
- Frost protection control of the units with constrained control of protection functions to prevent coil icing (for supply air units as well as supply and extract air handling units)
- A maintenance mode implemented in the control algorithm for testing all physical data points and alarms guarantees high reliability.

Options for the zone control panel:
- Design for heating (TH, TC, THC, MH, MC, MHC)
- Design for cooling (TC, THC, MC, MHC)
- Cooling lock switch (TC, THC, MC, MHC)
- Alarm lamp
- Socket
- Additional room air temperature sensors (max. 3)
- Combination sensor room air quality, temperature and humidity
- External sensor values
- External set values
- Load shedding input
- Operating selector switch on terminal
- Operating selector button on terminal
- Power supply for air handling unit
- Safety relay
- Control of distributor pump, incl. power supply

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

System control for operation of decentralised Hoval indoor climate systems with optimised use of energy, suitable for demand-driven control of TopVent® plants comprising 1 control zone with up to 6 supply air units and 10 recirculation units (power supply for the TopVent® units provided by the client).

System structure:
- Unit controller: installed in the particular indoor climate unit
- Zone bus: as serial connection of all unit controllers with the zone controller; with robust bus protocol via shielded and twisted-pair bus line (bus cables provided by the client)
- Zone control panel, designed as compact cabinet for wall installation, made of coated sheet steel (light grey RAL 7035), with:
  - Zone controller with operating panel, making it simple to operate and monitor the system
  - Fresh air temperature sensor
  - Room temperature sensor
- Circuit board with external connections for:
  - Collective alarm
  - Forced off (zone controller)
  - Forced off (supply air unit)
  - Heating demand
  - Setpoint heating demand
  - Fault heat supply
  - Cooling demand
  - Fault cold supply
  - External enabling heating/cooling
  - External setting heating/cooling
  - Changeover valves heating/cooling
  - Additional room air temperature sensors (max. 3)
  - External setpoint fresh air ratio
  - Operating selector switch on terminal (digital)
  - Operating selector button on terminal

Control functions:
- Control of the supply air temperature via sequential control of the coils
- Control of the unit including the air distribution according to the specifications of the zone controller

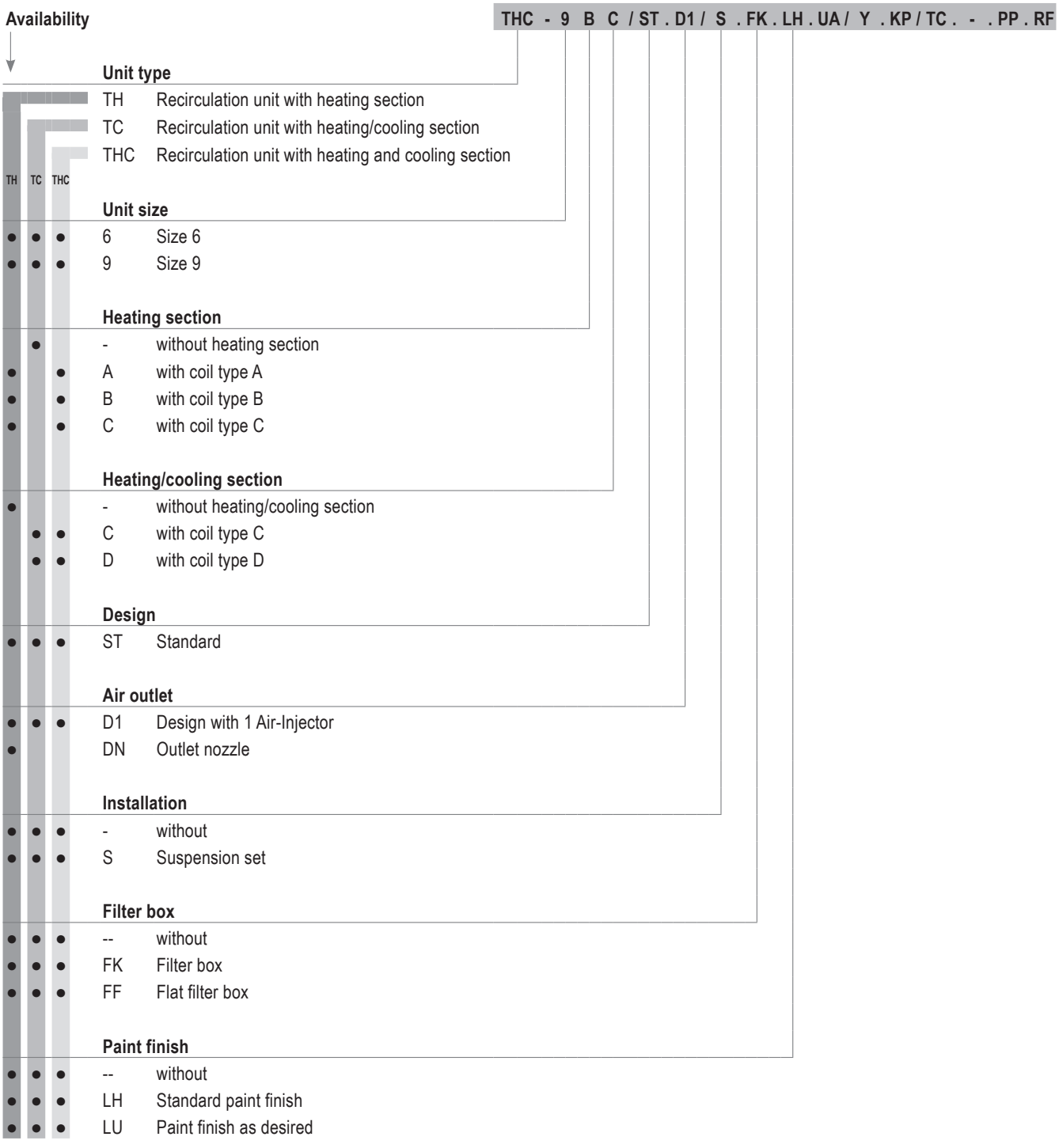
Alarms, protection:
- Central alarm management with registration of all alarms (timestamp, priority, status) in an alarm list and alarm memory of the last 50 alarms.
- If there is a failure of communication, bus stations, sensor systems or supply media, each part of the system transitions to a protection mode which safeguards operation.
- Frost protection control of the units with constrained control of protection functions to prevent coil icing (for supply air units)
- A maintenance mode implemented in the control algorithm for testing all physical data points and alarms guarantees high reliability.

Options for the zone control panel:
- Additional room air temperature sensors (max. 3)
- Operating of the units via building management system via standardised interfaces:
  - BACnet
  - Modbus IP
  - Modbus RTU

Options

1 Unit type reference

1.1 Type code for recirculation units



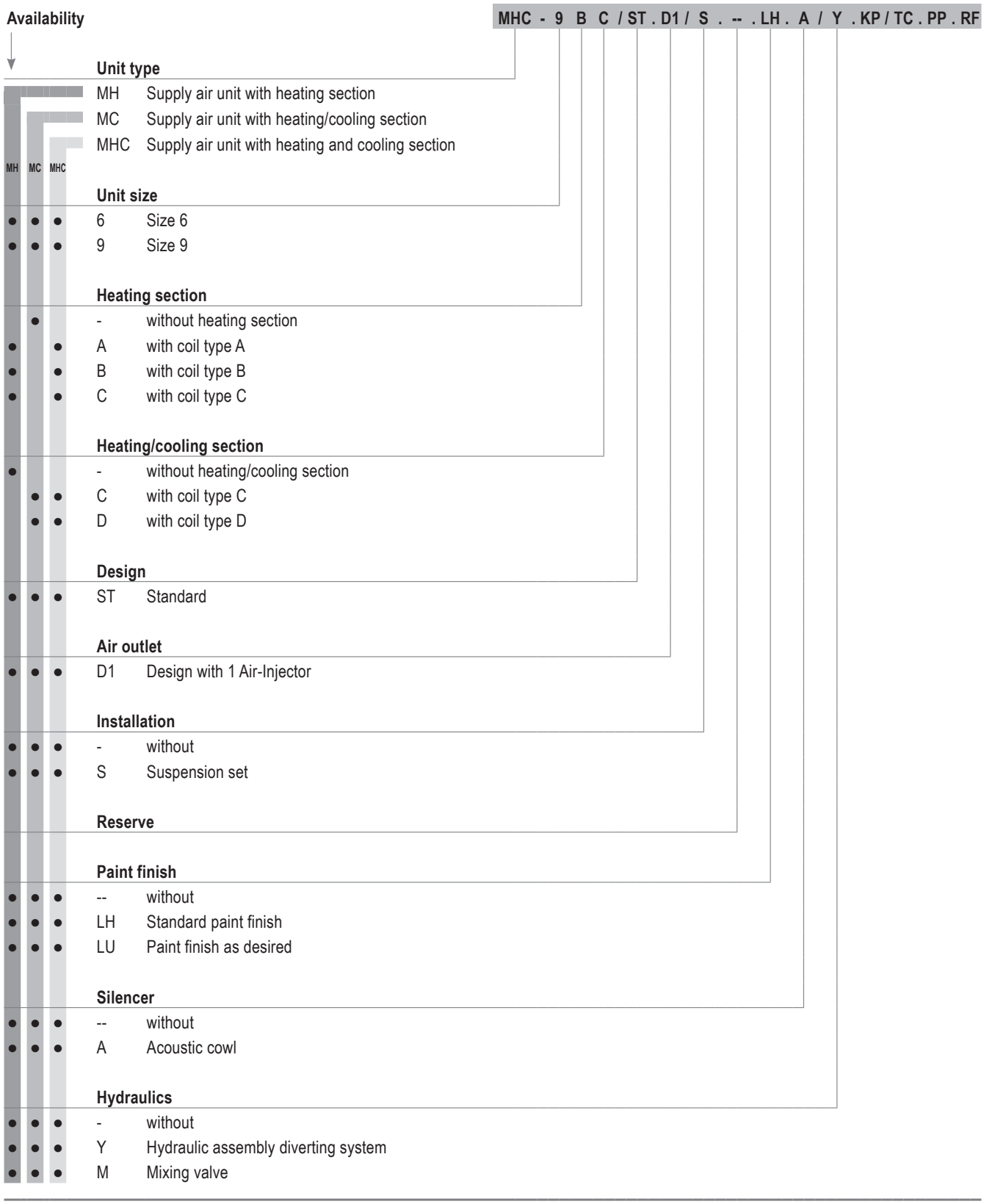
THC - 9 B C / ST . D1 / S . FK . LH . UA / Y . KP / TC . - . PP . RF

Availability

TH	TC	THC		
			Silencer	
●	●	●	--	without
●	●	●	U-	Recirculation silencer
●	●	●	-A	Acoustic cowl
●	●	●	UA	Recirculation silencer and acoustic cowl
			Hydraulics	
●	●	●	-	without
●	●	●	Y	Hydraulic assembly diverting system
●	●	●	M	Mixing valve
			Condensate pump	
●	●	●	--	without
	●	●	KP	Condensate pump
			Control system	
●	●	●	TC	TopTronic® C
●	●		KK	Terminal box design
			Reserve	
			Pump control	
●	●	●	--	without
●		●	PH	Heating pump
	●	●	PK	Heating or cooling pump
		●	PP	Heating pump and cooling pump
			Return temperature sensor	
●	●	●	--	without
●	●	●	RF	Return temperature sensor

Table H1: Type code and availability of recirculation units

1.2 Type code for supply air units



Availability

MHC - 9 B C / ST . D1 / S . -- . LH . A / Y . KP / TC . PP . RF

MH	MC	MHC		
			Condensate pump	
●	●	●	--	without
	●	●	KP	Condensate pump
			Control system	
●	●	●	TC	TopTronic® C
			Pump control	
●	●	●	--	without
●		●	PH	Heating pump
	●	●	PK	Heating or cooling pump
		●	PP	Heating pump and cooling pump
			Return temperature sensor	
●	●	●	--	without
●	●	●	RF	Return temperature sensor

Table H2: Type code and availability of supply air units

2 Outlet nozzle

For low-cost recirculation heating in spaces where comfort requirements are relatively low the TopVent® TH unit is available with a simple outlet nozzle. The air discharge angle cannot be adjusted. For example, the unit is well-suited for use in high-bay warehouses.
The outlet nozzle replaces the vortex air distributor Air-Injector. The external dimensions of the unit remain the same. The weight is reduced:

- Size 6 ..... -15 kg
- Size 9 ..... -21 kg

Fig. H3: TopVent® TH with outlet nozzle

3 Suspension set

A suspension set is available to make it easy to install the units on the ceiling. The set consists of 4 pairs of U-profiles made of Aluzinc sheet metal and is height-adjustable up to 1300 mm.

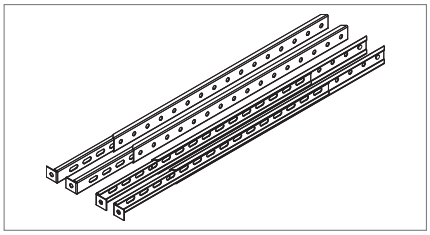


Fig. H4: Suspension set

4 Air filtration

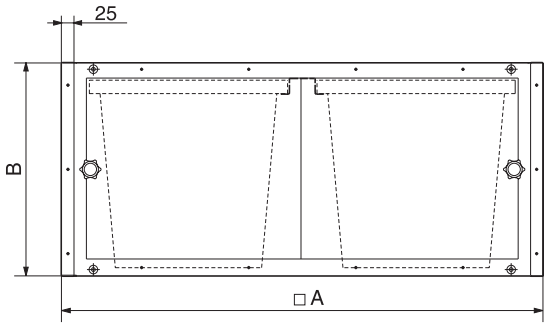
For hygiene reasons, Hoval recommends always fitting TopVent® units with a filter.

4.1 Filter box

A filter box with 2 bag filters can be installed for the purpose of filtering the recirculation air. The modular construction made of Aluzinc sheet metal with 2 sliding doors makes it easy to replace the filters.

Notice
In the planning phase make sure there is enough space in front of the sliding doors so that the filters can be replaced with ease.

A pressure difference control device is installed for automatic monitoring of the filter. It shows when the filters have to be cleaned or changed.

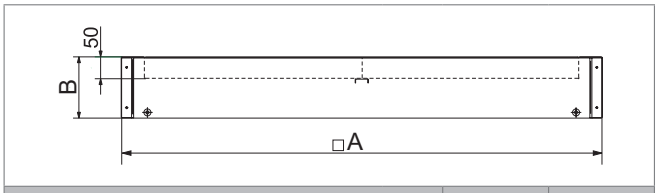


Size		6	9
A	mm	900	1100
B	mm	400	400
Filter class		ISO coarse 60 % (G4)	
Weight	kg	20	24
Factory setting of differential pressure switches	Pa	180	180

Table H5: Filter box technical data

4.2 Flat filter box

A flat filter box with 4 pleated cell filters can be installed for the purpose of filtering the recirculation air.
A pressure difference control device is installed for automatic monitoring of the filter. It shows when the filters have to be cleaned or changed.



Size		6	9
A	mm	900	1100
B	mm	140	165
Filter class		ISO coarse 60 % (G4)	
Weight	kg	10	12.5
Factory setting of differential pressure switches	Pa	50	50

Table H6: Flat filter box technical data

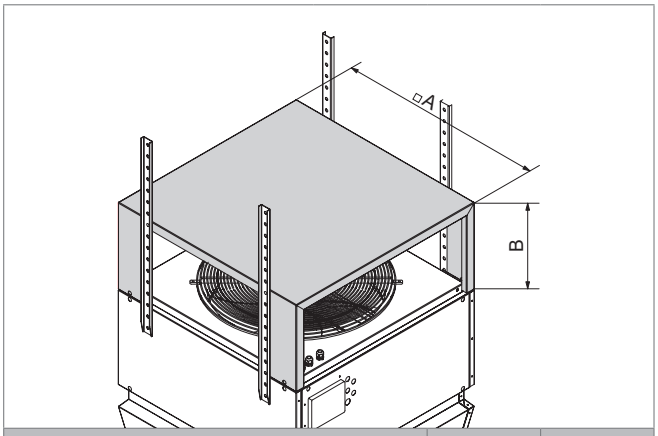
5 Paint finish

If the customer wishes, the units can be provided with an exterior paint finish. There are 2 possibilities:
- Standard paint finish in Hoval red (RAL 3000)
- Paint finish in desired RAL colour

6 Recirculation silencer

The use of a recirculation silencer for noise reduction is recommended mainly if the TopVent® units are installed under flat, hard ceilings (e.g. made of concrete or sheet steel). The recirculation silencer is mounted on the appliance and thus reduces the sound reflection from the ceiling.
Insertion attenuation is 3 dB (A) compared with the total sound power level of each TopVent® unit.
Mount the recirculation units as usual via the 4 fastening points in the heating or heating/cooling section (for example, using the optional suspension set).

Caution
Risk of injury from falling parts. The silencer cannot bear the weight of the appliance. Do not locate any suspension points on the silencer.



Size		6	9
A	mm	900	1100
B	mm	380	485
Weight	kg	15	20

Table H7: Dimensions and weights of the recirculation silencers

7 Acoustic cowl

The acoustic cowl reduces the noise level in the room; it is installed in the Air-Injector. This does not change the outside dimensions of the Air-Injector.
Insertion attenuation is 4 dB compared with the total sound power level of each TopVent® unit.

8 Hydraulic assembly diverting system

Assemblies for hydraulic diverting, which are optimally matched to the units, are available for easy installation of TopVent® units. Please note the following:

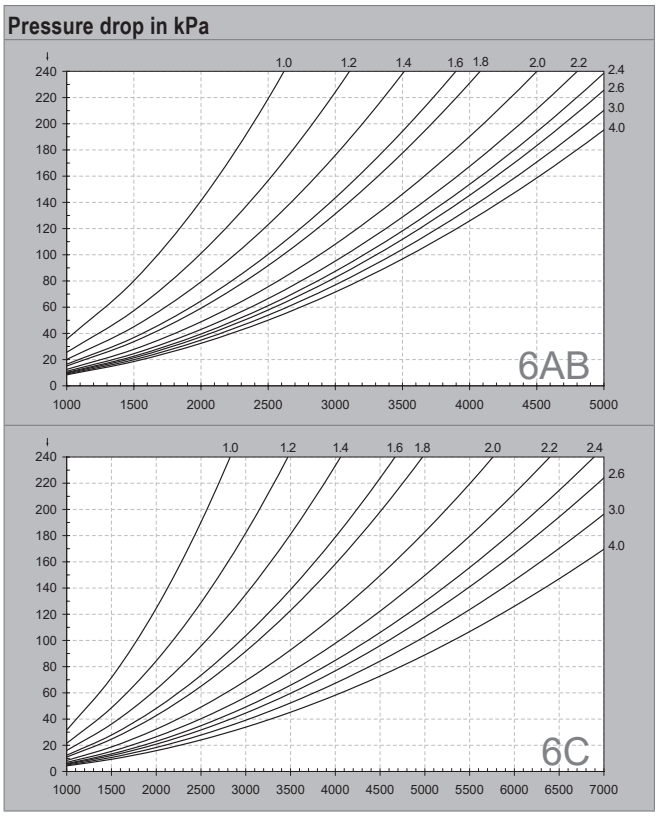
- Install the assembly horizontally.
- Mount the assembly so that its weight does not need to be absorbed by the coil.
- Insulate the assembly.

Default settings for the hydraulic alignment

Read off the default settings from Fig. H8. The curves 1.0 to 4.0 correspond to the revolutions of the valve spindles of the balancing valve; they are shown on the turning knob:

- 0.0 ... Valve closed
- 4.0 ... Valve fully open

The coil and the hydraulic assembly are already included in the specified pressure drops. Thus, only consider the pressure drops of the distributor circuit up to the screw connections.



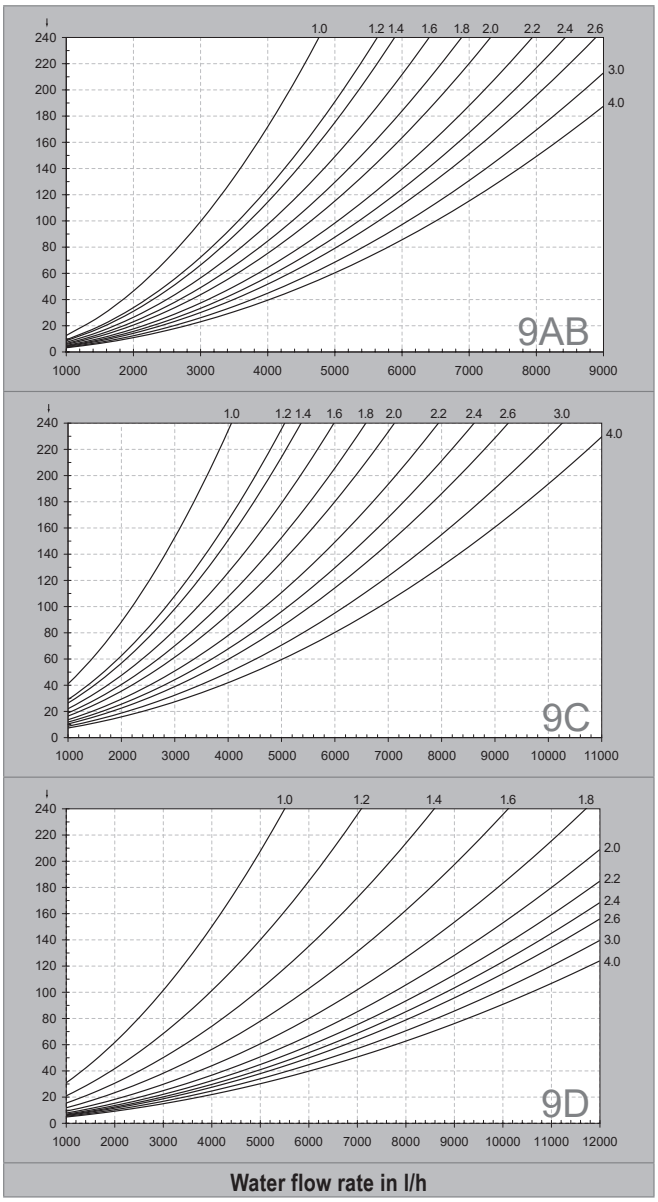
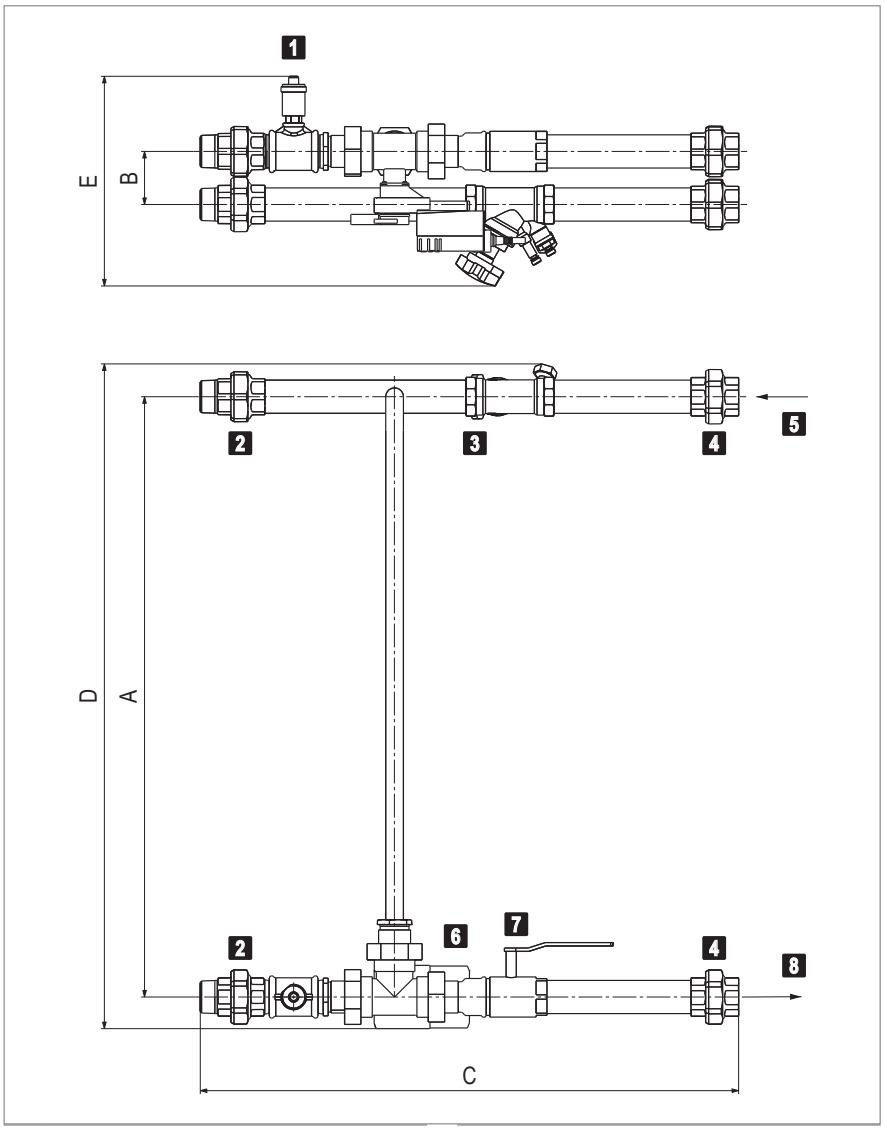


Fig. H8: Default settings for the balancing valves



1	Automatic air vent	5	Flow
2	Coil screw joint	6	Mixing valve
3	Control valve	7	Ball valve
4	Distributor circuit screw joint	8	Return

Fig. H9: Dimensional drawing for hydraulic assembly

Type	A	B	C	D	E	Mixing valve	Control valve	Screw joint
Y-6AB	758	78	726	853	300	NRQ24A-SR	STAD DN32	1¼ "
Y-6C	758	78	745	853	300	NRQ24A-SR	STAD DN32	1¼ "
Y-9AB	882	78	770	977	320	NRQ24A-SR	STAD DN40	1½ "
Y-9C	882	78	791	977	320	NRQ24A-SR	STAD DN40	1½ "
Y-9D	882	95	840	977	340	NRQ24A-SR	STAD DN50	2 "

Table H10: Dimensions (in mm) and valves of the hydraulic assembly

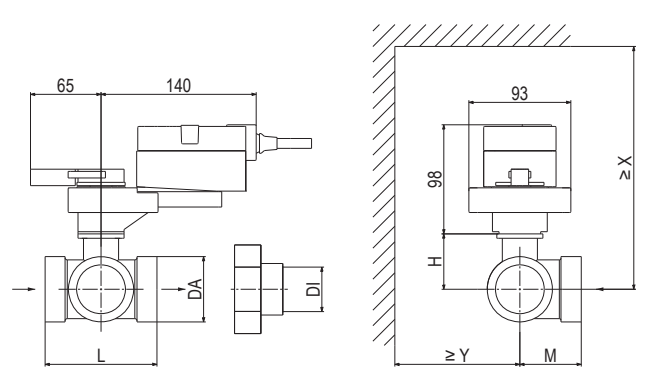
Electrical data of the mixing valves	
Nominal voltage	24 V AC/DC
Nominal voltage frequency	50/60 Hz
Power consumption for wire sizing	23 VA
Control signal Y	0…10 V DC
Operating range Y	2…10 V DC
Position response U	2…10 V DC
Actuator run time	9 s / 90°

Table H11: Electrical data of mixing valves

9 Mixing valve

Mixing valves, which are optimally matched to the units, are available for easy installation of TopVent® units. They have the following specifications:

- 3-way mixing valve with modulating rotary actuator (run time 9 s)
- Flow characteristic:
  - Equal percentage control path
  - Linear bypass
- Integrated position control and response



Type	DN	kvs	DA	DI	L	H	M	X	Y
		m³/h	"	"	mm	mm	mm	mm	mm
M-6AB	20	6.3	G 1¼	Rp ¾	86	46	42	220	90
M-6C	25	10	G 1½	Rp 1	85	46	45	220	90
M-9AB	25	10	G 1½	Rp 1	85	46	45	220	90
M-9C	32	10	G2	Rp 1¼	104	46	56	220	90
M-9D	40	16	G 2¼	Rp 1½	115	51	56	230	90

Table H12: Dimensions mixing valves

Type		Weight
M-6AB	kg	2.6
M-6C	kg	3.1
M-9AB	kg	3.1
M-9C	kg	4.0
M-9D	kg	4.7

Table H13: Weights mixing valves (in kg)

Electrical data of the mixing valves	
Nominal voltage	24 V AC/DC
Nominal voltage frequency	50/60 Hz
Power consumption for wire sizing	23 VA
Control signal Y	0…10 V DC
Operating range Y	2…10 V DC
Position response U	2…10 V DC
Actuator run time	9 s / 90°

Table H14: Electrical data of NRQ24A-SR mixing valves

10 Condensate pump

TopVent® cooling units must be connected to a condensate drainage system. For applications in which connection to the waste water system is too expensive or not possible for structural reasons, a condensate pump can be provided. This is installed directly under the condensate drain connection; the supplied container is prepared for installation on the Air-Injector. It pumps the condensate through a flexible hose to a delivery head of 3 m, thus enabling discharge of the condensate

- through waste water pipes directly below the ceiling,
- onto the roof.

Flow rate (at 3 m delivery head)	l/h	max. 150
Tank capacity	l	max. 1.9
Dimensions (L x W x H)	mm	288 x 127 x 178
Weight	kg	2.4

Table H15: Technical data condensate pump

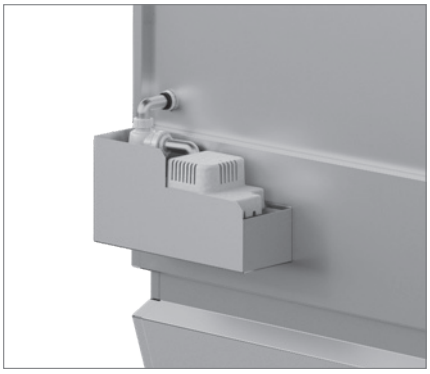


Fig. H16: Condensate pump

11 Return temperature sensor

The return temperature sensor monitors the return temperature of the heating medium.

12 Pump control for mixing or injection system

Instead of the diverting system, an injection or mixing circuit can also be installed in the load circuit.

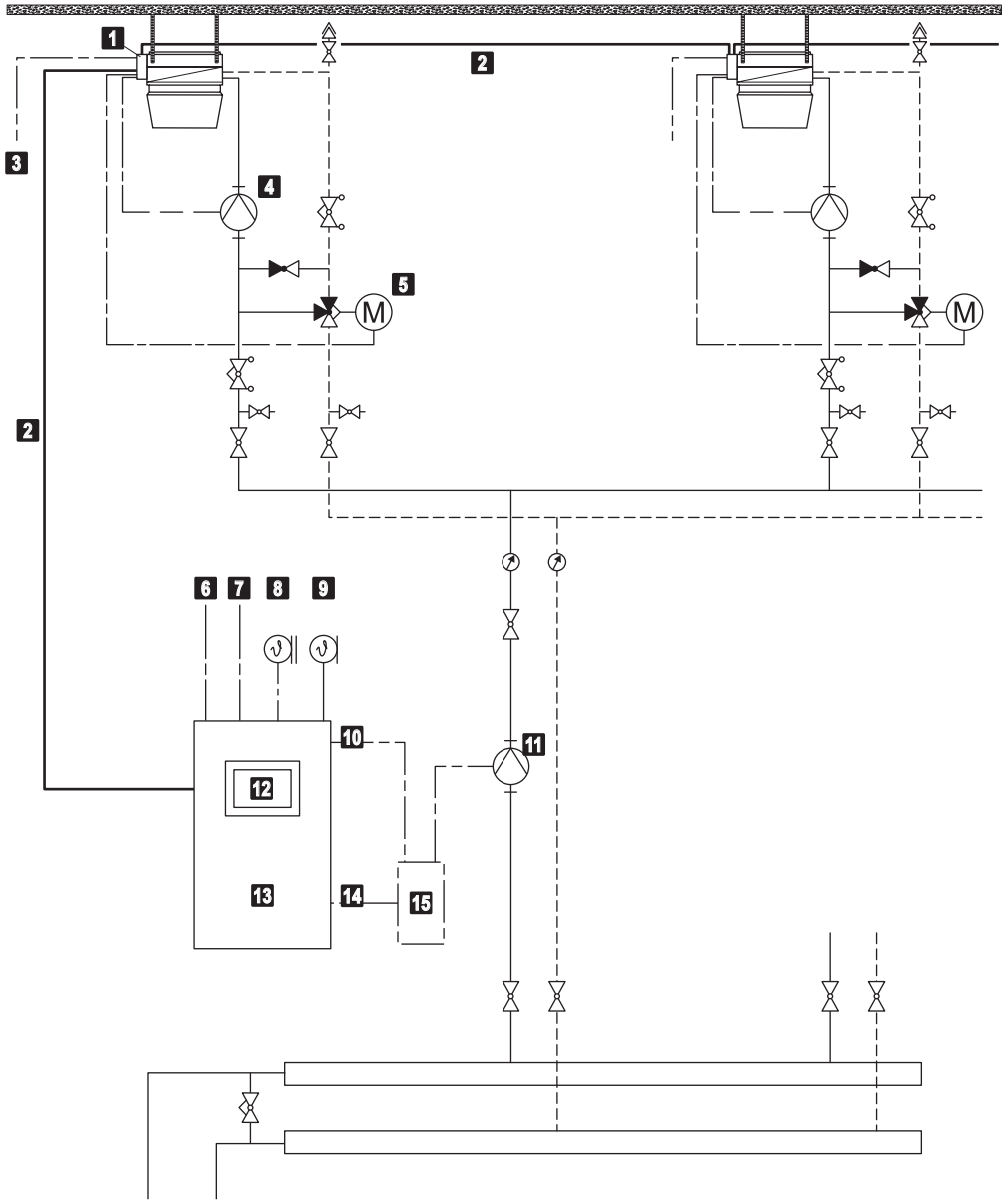
Please note the following:
- Not only the mixing valves but also the pumps in the load circuit are controlled directly by the control block.
- Terminals for wiring the mixing valves and the pumps in the load circuit are located in the connection box.
- Make sure that valves and pumps which meet the following requirements are provided on site.

12.1 Requirements for mixing valves

Use 3-way mixing valves with the following flow characteristics:
- Equal percentage control path
- Linear bypass
- The valve authority must be ≥ 0.5.
- The maximum run time of the valve actuator is 45 s.
- The valve actuator must be continuous, i.e. the stroke changes in proportion to the control voltage (DC 2…10 V).
- The valve actuator must be designed with a position response (0...10 VDC or 2…10 VDC).
- The maximum power consumption is 20 VA.
- Install the valve close to the unit (max. distance 2 m).

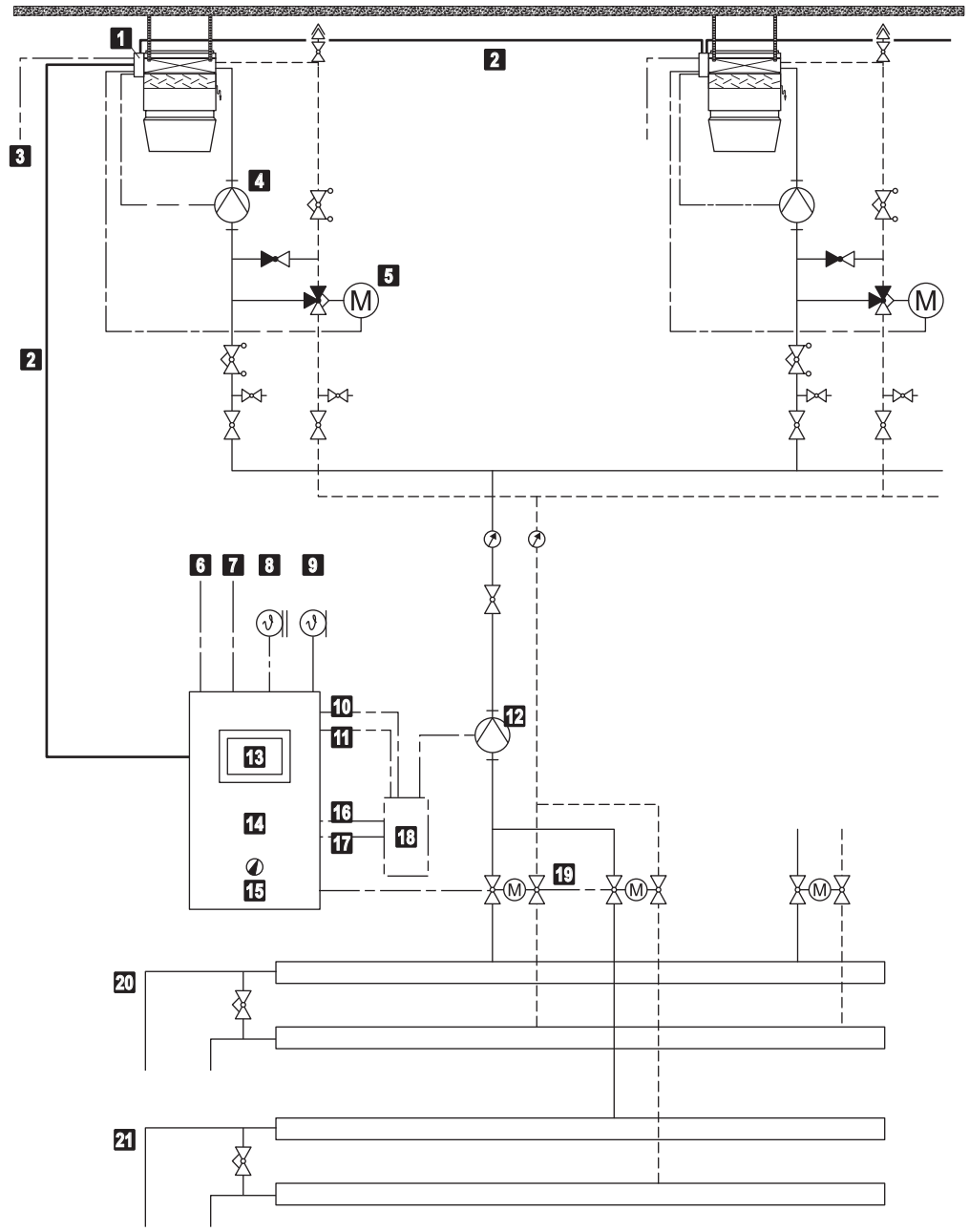
12.2 Requirements for pumps

- Voltage.....230 VAC
- Current.....up to 4.0 A



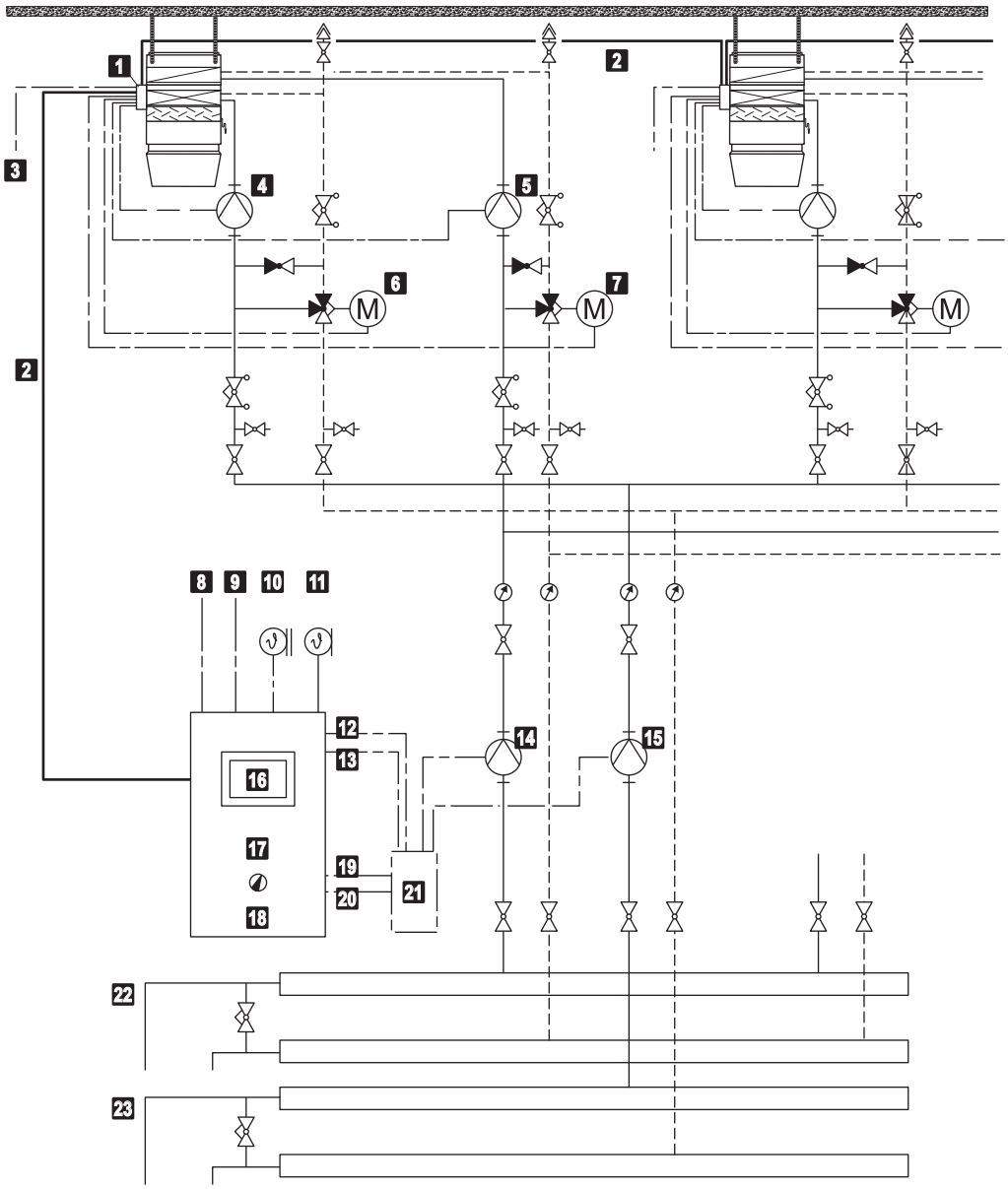
1	Unit control box	6	Power supply control panel	11	Distributor pump
2	Zone bus	7	Collective alarm	12	System operator terminal
3	Power supply for TopVent®	8	Fresh air temperature sensor	13	Zone control panel
4	Heating pump	9	Room temperature sensor	14	Heating demand
5	Mixing valve	10	Fault heat supply	15	Heating control panel

Fig. H17: Schematic diagram for injection system TopVent® TH / MH



1	Unit control box	8	Fresh air temperature sensor	15	Cooling lock switch
2	Zone bus	9	Room temperature sensor	16	Heating demand
3	Power supply for TopVent®	10	Fault heat supply	17	Cooling demand
4	Heating/cooling pump	11	Fault cold supply	18	Heating control panel
5	Mixing valve	12	Distributor pump	19	Changeover valves heating/cooling
6	Power supply control panel	13	System operator terminal	20	Heating circuit
7	Collective alarm	14	Zone control panel	21	Cooling circuit

Fig. H18: Schematic diagram for injection system TopVent® TC / MC



1	Unit control box	9	Collective alarm	17	Zone control panel
2	Zone bus	10	Fresh air temperature sensor	18	Cooling lock switch
3	Power supply for TopVent®	11	Room temperature sensor	19	Heating demand
4	Cooling pump	12	Fault heat supply	20	Cooling demand
5	Heating pump	13	Fault cold supply	21	Heating control panel
6	Mixing valve cooling	14	Distributor pump heating	22	Heating circuit
7	Mixing valve heating	15	Distributor pump cooling	23	Cooling circuit
8	Power supply control panel	16	System operator terminal		

Fig. H19: Schematic diagram for injection system TopVent® THC / MHC

Transport and installation

1 Installation

1.1 Preparation

The following guidelines are important when preparing for installation:

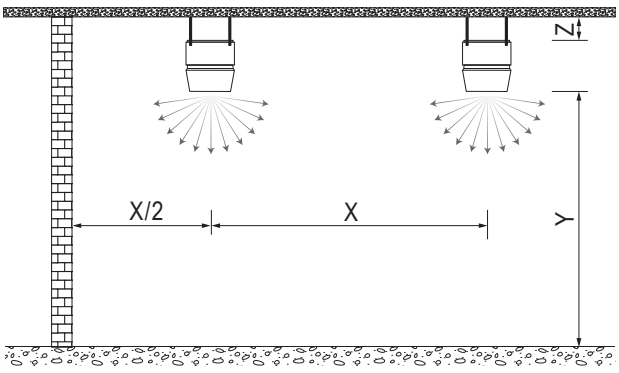
- The scope of delivery includes:
  - TopVent® unit, delivered on a pallet
  - Accessories (installation material, trap, temperature sensor)
  - Optional components

TopVent® unit

- Make sure that a lifting platform is available.
- Only secure the unit to ceilings with sufficient load-bearing capacity.
- For the purposes of installation the unit is provided with 4 M10 rivet nuts with hexagon bolts and washers.
  - Fasten the unit to the ceiling by means of the optional suspension set or by means of flat iron bars, perforated bars, angles, steel cables or similar.
  - Do not use eyebolts.

1.2 Positioning

- Comply with the minimum and maximum distances.
- All air inlet and air outlet openings must be freely accessible. The supply air jet must be free to spread out unhindered.
- The access panels in the unit must be freely accessible.
- Clearance of at least 0.9 m is required for maintenance work around the heating/cooling section.



Size			6	9
Unit clearance X	min.	m	12	14
	max.	m	23	31
Distance from ceiling Z	min.	m	0.3	0.4
Mounting height Y	min.	m	4	5
	max. [1)]	m	Approx. 9…25	

1) The maximum mounting height varies depending on the boundary conditions (for values, see table of heat outputs or calculation with the 'HK-Select' selection program)

Table I1: Minimum and maximum distances

1.3 Unit installation

Proceed as follows to position the unit:

- Transport the unit to the installation site and rotate it to the correct position.
- Fasten the unit to the designated suspension points.
- Connect supply air units to a fresh air duct via a canvas connection and connect both flanges with an earth wire.

2 Hydraulic installation

2.1 Heating/cooling coil

The TopTronic® C control system is designed for a distributor circuit with separate hydraulic connection of the units; i.e. a mixing valve is installed in front of each unit. The diverting system is used as standard.

Requirements for the boiler system and the distributor circuit

- Hydraulically coordinate the pipework for the individual units within a control zone to ensure even distribution.
- The heating medium must be available at the mixing valve without delay in the required amount and temperature.
- The condensate separator in cooling units only functions while the fan is running. No coolant must be allowed to circulate in the coil when the unit is switched off.
- Depending on local conditions, check whether compensators for linear expansion are required for the supply and return lines and/or articulated connections are required for the units.
- Do not fasten any loads to the coil, e.g. by means of the flow or return lines.
- Insulate the hydraulic lines.

The TopTronic® C control system switches on the heating/cooling pumps and the heating/cooling demand every day. This prevents the pumps from blocking in case of a long shutdown.

Requirements for mixing valves

- Use 3-way mixing valves with the following flow characteristics:
  - Equal percentage control path
  - Linear bypass
- The valve authority must be ≥ 0.5.
- The valve actuator must have a short run time (< 10 s).
- The valve actuator must be continuous, i.e. the stroke changes in proportion to the control voltage (DC 2…10 V).
- The valve actuator must be designed with a position response (0...10 VDC or 2…10 VDC).
- The maximum power consumption is 20 VA.
- Install the valve close to the unit (max. distance 2 m).

Notice
Use the 'Hydraulic assembly' or 'Mixing valve' options for quick and easy hydraulic installation.

Requirements for changeover valves

Use changeover valves conforming to the following specification:

- 3-way changeover valves
- Supply voltage 24 V AC
- 1-wire control (0/24 V AC)
- Position response via limit switches (0°/90°)
- Power consumption max. 44 VA

2.2 Condensate connection

Condensate arising in cooling units must be removed via a condensate-proof line.

- Install and insulate the supplied trap on the condensate connection of the unit.
- Dimension the slope and cross-section of the condensate line so that no condensate backflow takes place.
- Make sure that the condensate produced is drained in compliance with local regulations.
- Route the condensate line from the pump directly upwards.

Notice
Use the 'Condensate pump' option for quick and easy hydraulic installation.

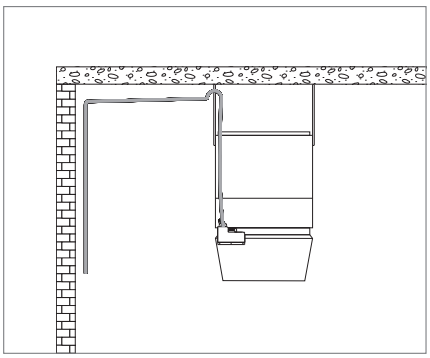
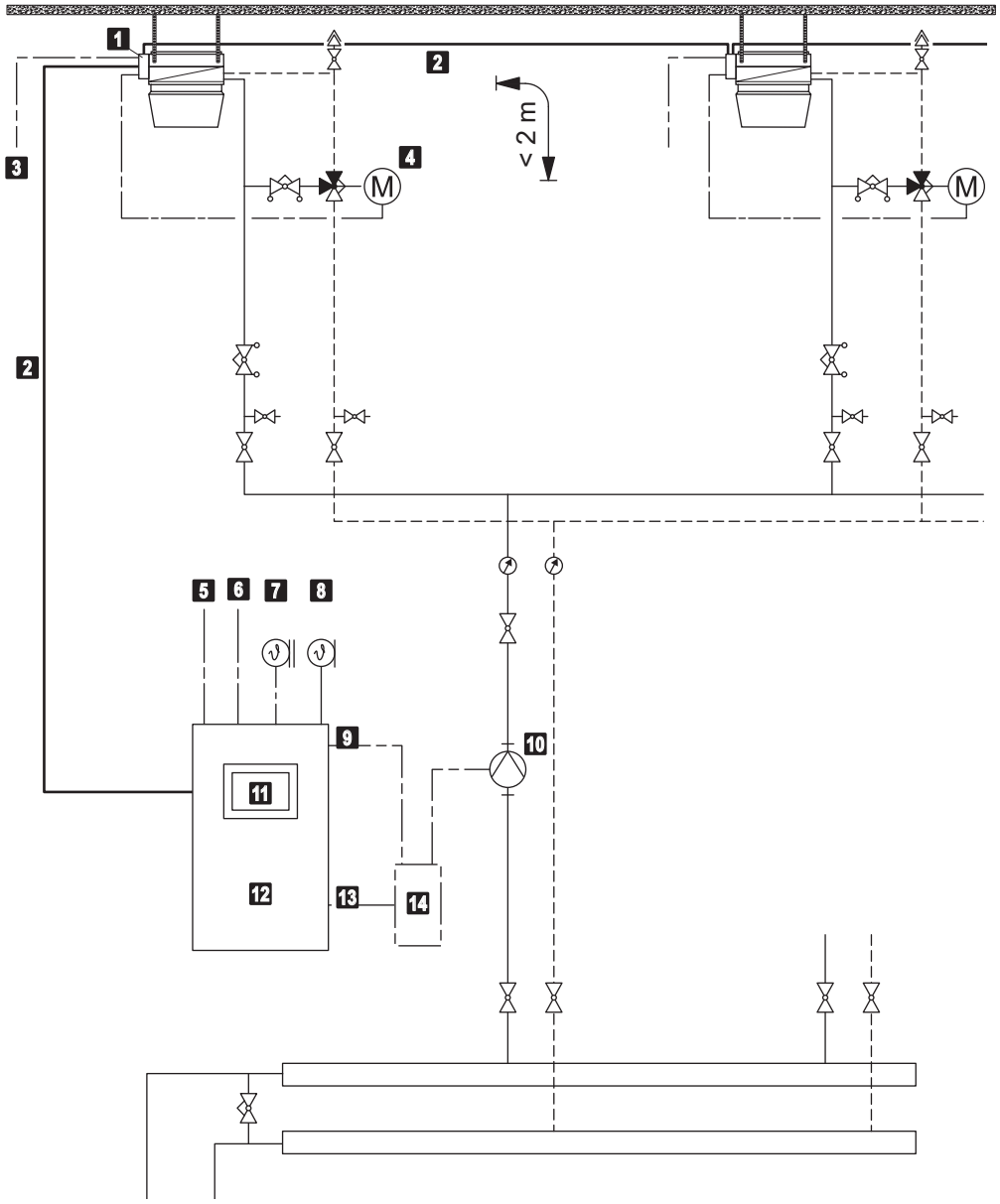
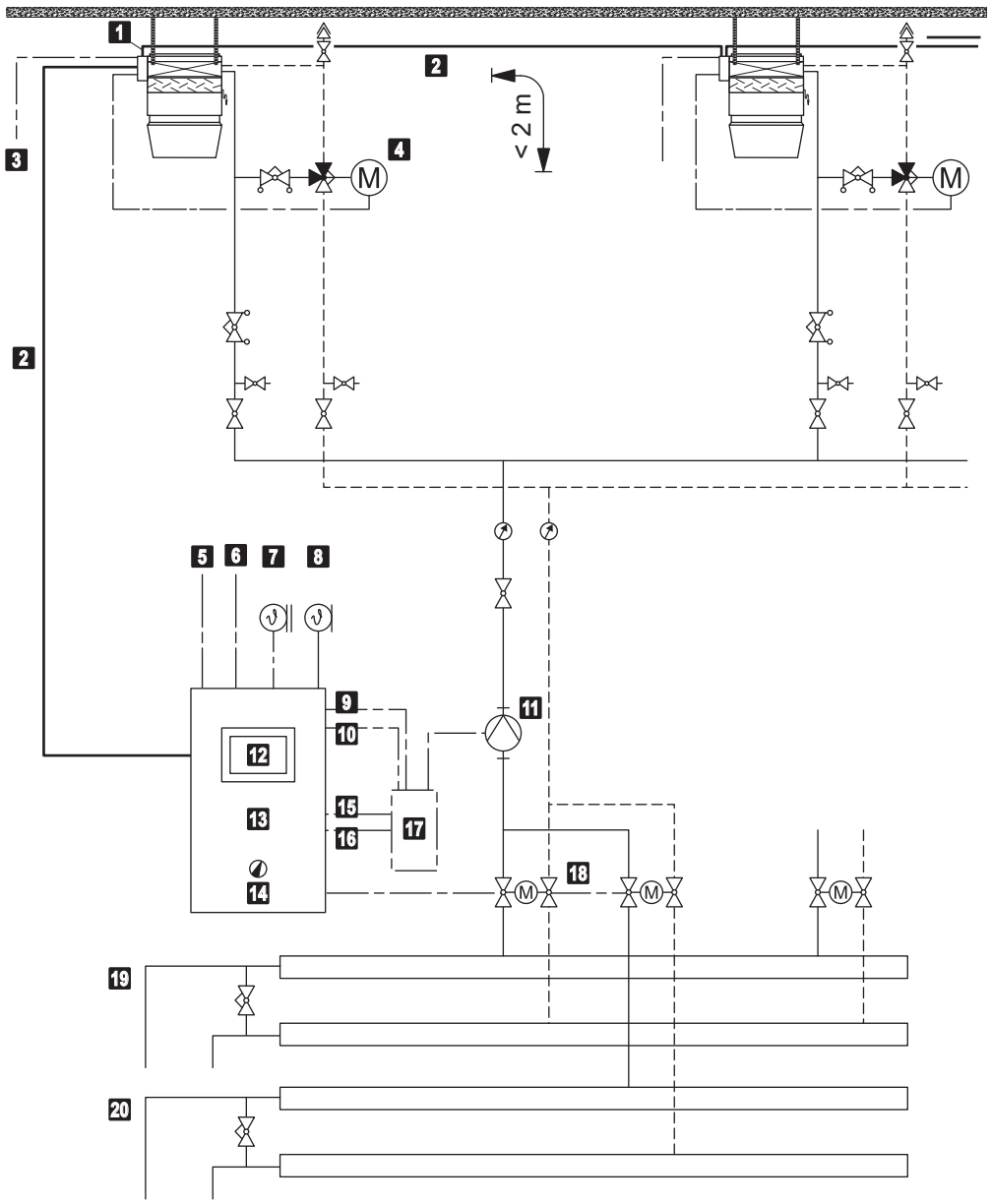


Fig. I2: Condensate line



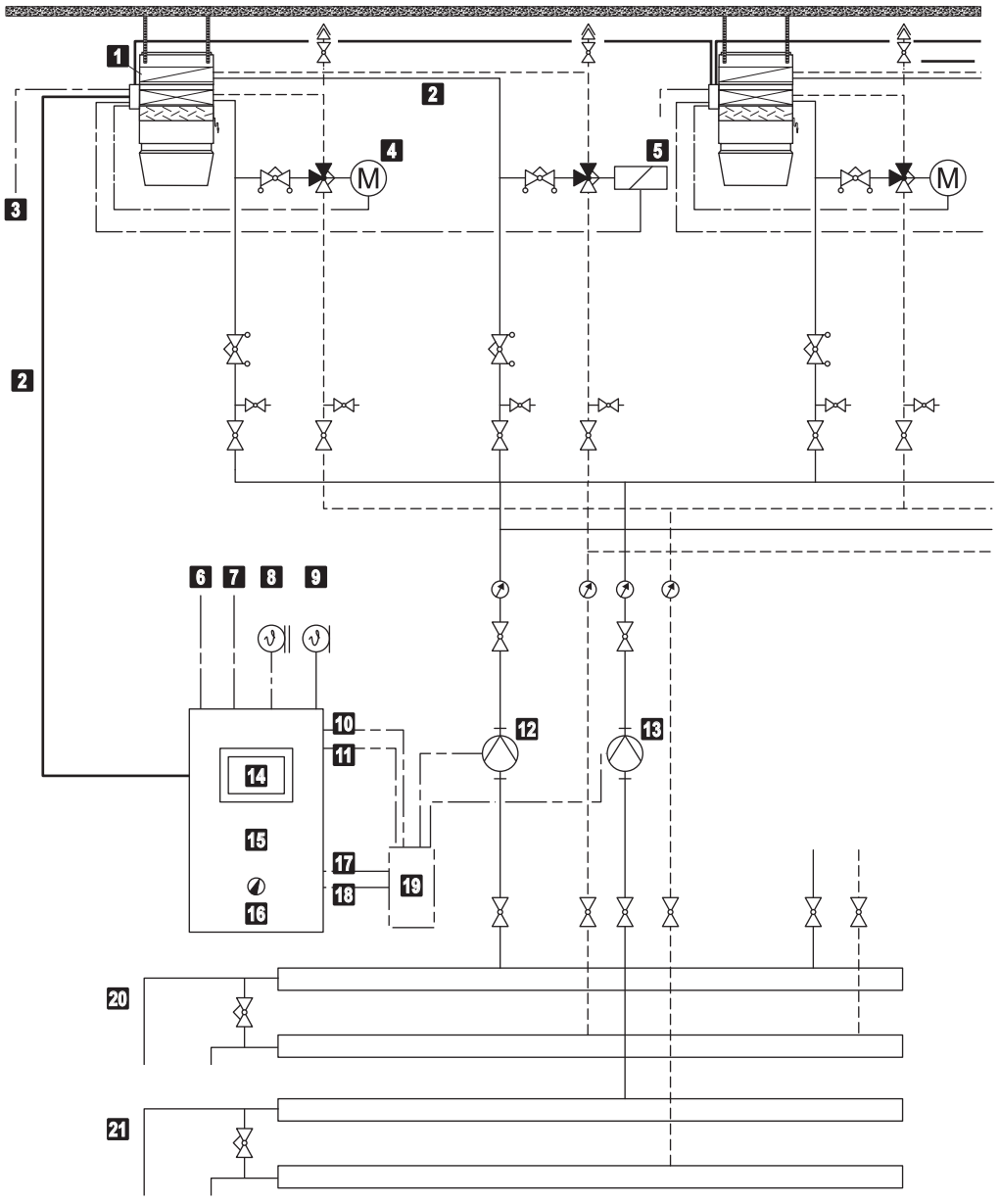
1	Unit control box	6	Collective alarm	11	System operator terminal
2	Zone bus	7	Fresh air temperature sensor	12	Zone control panel
3	Power supply for TopVent®	8	Room temperature sensor	13	Heating demand
4	Mixing valve	9	Fault heat supply	14	Heating control panel
5	Power supply control panel	10	Distributor pump		

Fig. I3: Conceptual drawing for hydraulic diverting system TopVent® TH / MH



1	Unit control box	8	Room temperature sensor	15	Heating demand
2	Zone bus	9	Fault heat supply	16	Cooling demand
3	Power supply for TopVent®	10	Fault cold supply	17	Heating control panel
4	Mixing valve	11	Distributor pump	18	Changeover valves heating/cooling
5	Power supply control panel	12	System operator terminal	19	Heating circuit
6	Collective alarm	13	Zone control panel	20	Cooling circuit
7	Fresh air temperature sensor	14	Cooling lock switch		

Fig. I4: Conceptual drawing for hydraulic diverting system TopVent® TC / MC



1	Unit control box	8	Fresh air temperature sensor	15	Zone control panel
2	Zone bus	9	Room temperature sensor	16	Cooling lock switch
3	Power supply for TopVent®	10	Fault heat supply	17	Heating demand
4	Mixing valve heating	11	Fault cold supply	18	Cooling demand
5	Mixing valve cooling	12	Distributor pump heating	19	Heating control panel
6	Power supply control panel	13	Distributor pump cooling	20	Heating circuit
7	Collective alarm	14	System operator terminal	21	Cooling circuit

Fig. I5: Conceptual drawing for hydraulic diverting system TopVent® THC / MHC

3 Electrical installation

- The electrical installation must only be carried out by a qualified electrician.
- Observe the relevant regulations (e.g. EN 60204-1).
- Choose the dimensions of the cable cross sections in line with the applicable regulations.
- Route signal and bus lines separately from mains cables.
- Make sure the lightning protection system for the units or for the entire building is planned and carried out by professionals.
- Provide overload protection equipment on site in the mains connection line of the zone control panel.

Attention
Use an all-pole sensitive residual current circuit breaker for a leakage current protective circuit.

- Carry out the electrical installation according to the wiring diagram:
  - Power supply for TopVent®
  - Zone bus based on system layout
  - Signal lines
- Connect optional components to the unit control box (condensate pump, return temperature sensor, mixing valve, pump).

Component	Designation	Voltage	Cable		Comments
TopTronic® C System control	Power supply	3 × 400 VAC	NYM-J	5 × … mm²	3-phase
		1 × 230 VAC	NYM-J	3 × … mm²	1-phase
	Zone bus		J-Y(St)Y	2 × 2 × 0.8 mm	max. 1000 m length
Zone control panel	System bus		Ethernet	≥ CAT 5	For connecting several zone control panels
	Integration into the building management system		Ethernet	≥ CAT 5	BACnet, Modbus IP
			J-Y(St)Y	2 × 2 × 0.8 mm	Modbus RTU
	Room temperature sensor		J-Y(St)Y	2 × 2 × 0.8 mm	max. 250 m
	Fresh air temperature sensor		J-Y(St)Y	2 × 2 × 0.8 mm	max. 250 m
	Additional room air temperature sensors		J-Y(St)Y	2 × 2 × 0.8 mm	max. 250 m
	Combination sensor room air quality, temperature and humidity		J-Y(St)Y	4 × 2 × 0.8 mm	max. 250 m
	Heating demand	Volt-free	NYM-O	2 × 1.5 mm²	max. 8 A
		max. 230 VAC			
		max. 24 VDC			
	Setpoint heating demand	0-10 VDC	J-Y(St)Y	2 × 2 × 0.8 mm	max. 250 m
	Cooling demand	Volt-free	NYM-O	2 × 1.5 mm²	max. 8 A
		max. 230 VAC			
		max. 24 VDC			
	Fault heat supply	24 VAC	NYM-O	2 × 1.5 mm²	max. 1 A
	Fault cold supply	24 VAC	NYM-O	2 × 1.5 mm²	max. 1 A
	Collective alarm	Volt-free	NYM-O	2 × 1.5 mm²	max. 8 A
		max. 230 VAC			
		max. 24 VDC			
	Distributor pump heat supply	3 × 400 VAC	NYM-J	4 × 1.5 mm² (min.)	Power supply 3-phase, max. 6 A
		1 × 230 VAC	NYM-J	3 × 1.5 mm² (min.)	Power supply 1-phase, max. 6 A
			NYM-O	4 × 1.5 mm²	Control line
	Distributor pump cold supply	3 × 400 VAC	NYM-J	4 × 1.5 mm² (min.)	Power supply 3-phase, max. 6 A
		1 × 230 VAC	NYM-J	3 × 1.5 mm² (min.)	Power supply 1-phase, max. 6 A
			NYM-O	4 × 1.5 mm²	Control line
	Power supply for units	3 × 400 VAC	NYM-J	5 × 1.5 mm² (min.)	RoofVent® units size 6
		3 × 400 VAC	NYM-J	5 × 4.0 mm² (min.)	RoofVent® units size 9
		3 × 400 VAC	NYM-J	5 × 1.5 mm² (min.)	TopVent® units
	System operator terminal (if external)	24 VAC	NYM-J	3 × 1.5 mm²	Power supply, 1 A fusing
			Ethernet	≥ CAT 5	Communication
	Zone operator terminal (if external)	24 VAC	J-Y(St)Y	4 × 2 × 0.8 mm	Power supply, 1 A fusing, max. 250 m length
	External sensor values	0-10 VDC	J-Y(St)Y	2 × 2 × 0.8 mm	
	External set values	0-10 VDC	J-Y(St)Y	2 × 2 × 0.8 mm	
	Load shedding input	24 VAC	NYM-O	2 × 1.5 mm²	max. 1 A
	Operating selector switch on terminal (analogue)	0-10 VDC	J-Y(St)Y	2 × 2 × 0.8 mm	max. 1 A
	Operating selector switch on terminal (digital)	0-10 VDC	J-Y(St)Y	5 × 2 × 0.8 mm	max. 1 A
	Operating selector button on terminal	24 VAC	J-Y(St)Y	5 × 2 × 0.8 mm	max. 1 A
	Forced off	24 VAC	NYM-O	2 × 1.5 mm²	max. 1 A
	External enabling/setting heating/cooling		NYM-O	2 × 1.5 mm²	max. 1 A
	Changeover valve flow	24 VAC	NYM-O	7 × 1.5 mm²	
	Changeover valve return	24 VAC	NYM-O	7 × 1.5 mm²	

Component	Designation	Voltage	Cable		Comments
TopTronic® C System control for TopVent® C-SYS Zone control panel	Power supply	1 × 230 VAC	NYM-J	3 × 1.5 mm²	1-phase
	Zone bus		J-Y(St)Y	2 × 2 × 0.8 mm	max. 1000 m length
	Integration into the building management system		Ethernet	≥ CAT 5	BACnet, Modbus IP
			J-Y(St)Y	2 × 2 × 0.8 mm	Modbus RTU
	Room temperature sensor		J-Y(St)Y	2 × 2 × 0.8 mm	max. 250 m
	Fresh air temperature sensor		J-Y(St)Y	2 × 2 × 0.8 mm	max. 250 m
	Additional room air temperature sensors		J-Y(St)Y	2 × 2 × 0.8 mm	max. 250 m
	Heating demand	Volt-free	NYM-O	2 × 1.5 mm²	max. 8 A
		max. 230 VAC			
		max. 24 VDC			
	Setpoint heating demand	0-10 VDC	J-Y(St)Y	2 × 2 × 0.8 mm	max. 250 m
	Cooling demand	Volt-free	NYM-O	2 × 1.5 mm²	max. 8 A
		max. 230 VAC			
		max. 24 VDC			
	Fault heat supply	24 VAC	NYM-O	2 × 1.5 mm²	max. 1 A
	Fault cold supply	24 VAC	NYM-O	2 × 1.5 mm²	max. 1 A
	Collective alarm	Volt-free	NYM-O	2 × 1.5 mm²	max. 8 A
		max. 230 VAC			
		max. 24 VDC			
	External setpoint fresh air ratio	0-10 VDC	J-Y(St)Y	2 × 2 × 0.8 mm	
	Operating selector switch on terminal (digital)	0-10 VDC	J-Y(St)Y	5 × 2 × 0.8 mm	max. 1 A
	Operating selector button on terminal	24 VAC	J-Y(St)Y	5 × 2 × 0.8 mm	max. 1 A
	Forced off	24 VAC	NYM-O	2 × 1.5 mm²	max. 1 A
	External enabling/setting heating/cooling		NYM-O	2 × 1.5 mm²	max. 1 A
	Changeover valve flow	24 VAC	NYM-O	7 × 1.5 mm²	
	Changeover valve return	24 VAC	NYM-O	7 × 1.5 mm²	
TopVent® Ventilation unit	Power supply	3 × 400 VAC	NYM-J	5 × 1.5 mm² (min.)	min. 7 m length
	Zone bus		J-Y(St)Y	2 × 2 × 0.8 mm	max. 1000 m length
	Mixing valve heating	24 VAC	NYM-O	4 × 1.0 mm²	with Hydraulic assembly or Mixing valve option: cable connected to the mixing valve
	Mixing valve cooling	24 VAC	NYM-O	4 × 1.0 mm²	with Hydraulic assembly or Mixing valve option: cable connected to the mixing valve
	Heating pump	230 VAC	NYM-J	3 × 1.5 mm²	Power supply
		24 VAC	NYM-O	4 × 1.0 mm²	Control line
	Cooling pump	230 VAC	NYM-J	3 × 1.5 mm²	Power supply
		24 VAC	NYM-O	4 × 1.0 mm²	Control line
	Forced off	24 VAC	NYM-O	2 × 1.5 mm²	max. 1 A (for MH, MC, MHC)
	Door contact	24 VAC	NYM-O	2 × 1.0 mm²	max. 1 A (for TH, TC)

Table I6: Cable list for on-site connections – TopTronic® C

Component	Designation	Voltage	Cable	Comments
EasyTronic EC	Power supply	1 × 230 V AC	NYM 2 × 1.5 mm² (min.)	
	External room temperature sensor		J-Y(St)Y 2 × 2 × 0.8 mm	shielded, max. 30 m length
Controller	TopVent® control signals		J-Y(St)Y 4 × 2 × 0.8 mm	Fan, air distribution
	Door contact	24 V DC	NYM 2 × 1.0 mm²	
	Pump / valve control	230 V AC 24 V DC	depending on the number of contacts	via field-supplied relay, max 2 A
TopVent®	Power supply	3 × 400 V AC	NYM-J 5 × 1.5 mm² (min.)	min. 7 m length
Terminal box design	TopVent® control signals		J-Y(St)Y 4 × 2 × 0.8 mm	Fan, air distribution

Table I7: Cable list for on-site connections – EasyTronic EC

Actuator Air-Injector	
Control voltage	0…10 V DC
Operating range	2…10 V DC
Position response	2…10 V DC
Fan	
Enable signal	digital
Control voltage	0…10 V DC

Table I8: Control signals for TopVent® in terminal box design

System design

1 Design example

Notice
Use the 'HK-Select' program to design Hoval Indoor Climate Systems.
You can download it free of charge on the Internet.

Design data		Example
■ Geometry of the room ■ Internal heat gains ■ People in the room ■ Heating and cooling with central energy supply (boiler and water chiller) ■ Improvement of air quality, fresh air supply for the people in the room (fresh air flow rate per person = 30 m³/h)		50 × 60 ×12 m 28 kW 20 people
Design conditions heating:	■ Fabric heat losses ■ Fresh air temperature ■ Room temperature ■ Extract air temperature ■ Temperature of the heating medium	350 kW - 15 °C 18 °C 20 °C 60 °C / 40 °C
Design conditions cooling:	■ Transmission sensible gains ■ Fresh air conditions ■ Room air conditions ■ Extract air temperature ■ Temperature of the cooling medium	140 kW 32 °C / 40 % RH 26 °C / 40 % RH 28 °C 6 °C / 12 °C
Fresh air supply ■ Required fresh air flow rate in total: ■ Fresh air ratio of supply air units: max. 10 % of the nominal air flow rate *The fresh air ratio can be adjusted from 0…100 %. Where EU Regulation 1253/2014 applies, it must be restricted to max. 10 % in the design conditions.* ■ Calculate the required number of supply air units from the nominal air flow rate.		20 × 30 = 600 m³/h Size 6: max. 600 m³/h fresh air Size 9: max. 900 m³/h fresh air → **1 TopVent® MC unit**
Mounting height ■ Calculate the actual mounting height (= distance between the floor and the bottom edge of the units). Y = Hall height – distance from ceiling – unit height ■ Compare the actual mounting height with the minimum and maximum mounting height (see Table I1 on page 92 and HK-Select).		Supply air units: Size 6 → OK Size 9 → OK Recirculation units: Size 6 → OK Size 9 → OK

Required performance for covering fabric heat losses/ transmission sensible gains

- Required heat output for coverage of fabric heat losses in total:

  Q_{H_req} = Fabric heat losses – internal heat loads

  350 – 28 = 322 kW

- Required cooling capacity for coverage of transmission sensible gains in total:

  Q_{C_req} = Transmission sensible gains + internal heat loads

  140 + 28 = 168 kW

Required heat output of recirculation units

- Determine the required heat output of the recirculation units based on the capacity of the supply air unit.

  $Q_{H\_Recirculation} = Q_{H\_req} - Q_{H\_Supply\ air}$

  For the supply air unit, take into account only the share of capacity that is used for coverage of fabric heat losses (separately shown in HK-Select).

Type	$Q_{H\_Supply\ air}$	$Q_{H\_Recirculation}$
MC-6/C	40.5	322 – 40.5 = 281.5
MC-9/C	63.2	322 – 63.2 = 258.8
MC-9/D	79.3	322 – 79.3 = 242.7

(values in kW)

Required cooling capacity of recirculation units

- Determine the required cooling capacity of the recirculation units based on the capacity of the supply air unit.

  $Q_{C\_Recirculatoin} = Q_{C\_req} - Q_{C\_Supply\ air}$

  For the supply air unit, take into account only the share of capacity that is used for coverage of transmission sensible gains (separately shown in HK-Select).

Type	$Q_{C\_Supply\ air}$	$Q_{C\_Recirculation}$
MC-6/C	25.4	168 – 25.4 = 142.6
MC-9/C	39.2	168 – 39.2 = 128.8
MC-9/D	46.7	168 – 46.7 = 121.3

(values in kW)

Minimum number of recirculation units

- Determine the minimum number of recirculation units depending on the available supply air units. Take into account the following criteria:
  - Floor area covered
  - Heat output
  - Cooling capacity
  - Unit clearances

Supply air unit	Recirculation units	Required number of recirculation units				Minimum number of recirculation units
Type	Type	Floor area covered	Heat output	Cooling capacity	Unit clearances	
1 unit MC-6/C	TC-6/C	5	7	6	5	**7**
	TC-9/C	3	5	4	5	**5**
	TC-9/D	3	4	3	5	**5**
1 unit MC-9/C	TC-6/C	4	7	5	5	**7**
	TC-9/C	3	4	4	3	**4**
	TC-9/D	3	4	3	3	**4**
1 unit MC-9/D	TC-6/C	4	6	5	5	**6**
	TC-9/C	3	4	≈ 3 *(-1 kW)*	3	**4**
	TC-9/D	3	≈ 3 *(-2 kW)*	3	3	**3**

- Choose the final solution from the remaining possibilities, depending on the geometry of the hall and the costs.

2 Maintenance schedule

Activity	Interval
Renew air filter	When the filter alarm is displayed, at least annually
Comprehensively checking function; cleaning and possibly repairing the TopVent® units	Annually by Hoval customer service

Table J1: Maintenance schedule

Project		Name	
Project No.		Function	
		Address	
		Tel.	
		Fax	
Date		E-mail	

Information about the hall

Application		Length	
Type		Width	
Insulation		Height	

Is the roof strong enough?	○ yes	○ no			
Are there window areas?	○ yes	○ no	Percentage?		
Is there a crane?	○ yes	○ no	Height?		
Is there enough space for installation and servicing?	○ yes	○ no			
Are there any voluminous installations or machines?	○ yes	○ no			
Are pollutants present?	○ yes	○ no	Which?		
– If yes, are they heavier than air?	○ yes	○ no			
Is oil contained in the extract air?	○ yes	○ no			
Is dust present?	○ yes	○ no	Dust level?		
Is there high humidity?	○ yes	○ no	How much?		
Are local machine extractions required?	○ yes	○ no			
Are any conditions imposed by public authorities?	○ yes	○ no	Which?		
Are sound level requirements to be fulfilled?	○ yes	○ no	Which?		

Design data

Internal heat gains (machines, ...)		kW
Heating and cooling		
Unit size		
Control zones		

Design conditions heating

■ Standard outside temperature		°C
■ Room temperature		°C
■ Extract air temperature		°C
■ Fabric heat losses		kW

Design conditions cooling

■ Standard outside temperature		°C	
■ Room temperature and humidity		°C	%
■ Extract air temperature		°C	
■ Transmission sensible gains		kW	

Further information

Hoval quality.
You can count on us.

As a specialist in heating and air-conditioning technology, Hoval is your experienced partner for system solutions. For example, you can heat water with the sun's energy and the rooms with oil, gas, wood or a heat pump. Hoval ties together the various technologies and also integrates room ventilation into this system. You can be sure to save both energy and costs while protecting the environment.

Hoval is one of the leading international companies for indoor climate solutions. More than 70 years of experience continuously motivates us to design innovative system solutions. We export complete systems for heating, cooling and ventilation to more than 50 countries.

We take our responsibility for the environment seriously. Energy efficiency is at the heart of the heating and ventilation systems we design and develop.

Responsibility for energy and environment

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