Hoval

Indoor Climate Systems

Hoval TopVent®
CP | SP

Design handbook

Recirculation and supply air units configured as roof units with efficient air distribution for heating and cooling with decentralised heat pump

Hoval | Responsibility for energy and environment

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 appliances for decentralised heat and cold generation, or they heat and cool with a connection to a central energy supply.
Tailored control systems complete the system and ensure the effective combination and optimal use of all resources.

Diverse range of units ensures flexibility
Different types of ventilation units can be combined to create the perfect system for the project in question:
- RoofVent® supply and extract air handling units
- TopVent® supply air units
- TopVent® recirculation units

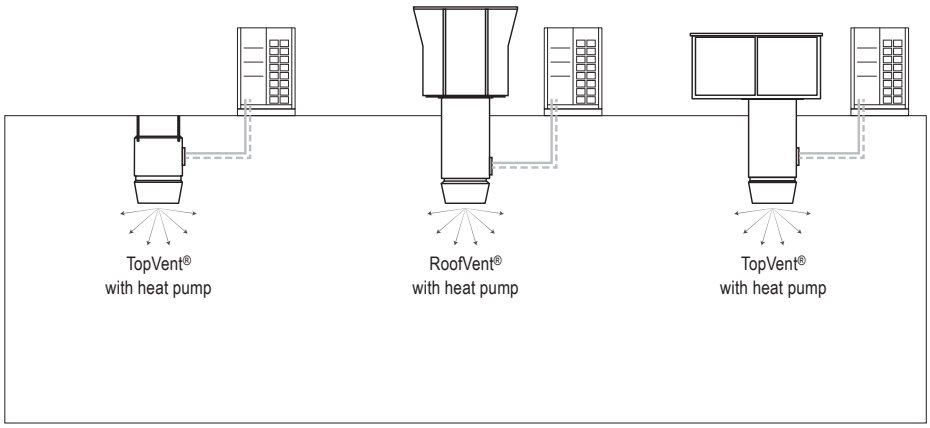
The number of supply and extract air handling units depends on how much fresh air is required in order to create a comfortable atmosphere for people in the building. Recirculation units cover additional heat or cool demand as required. A broad range of unit types and sizes with heating and cooling coils in various output levels means that the overall output of the system can be scaled to whatever level is required.
Specially designed unit versions are also available for halls with particularly humid or oily extract air.
Furthermore, there is a range of units available which have been expressly developed for very specific purposes. ProcessVent units, for example, are coupled with extract air purification systems in industrial halls and recover heat from process air.

Draught-free air distribution
A key feature of Hoval indoor climate units is the patented vortex air distributor, known as the Air-Injector. It is controlled automatically and changes the blowing angle of the air continuously between vertical and horizontal. The highly efficient air supply system has many advantages:
- It provides a high level of comfort during heating and cooling. No draughts develop in the hall.
- The efficient and even air distribution ensures that the indoor climate units cover a large area.
- The Air-Injector keeps the temperature stratification in the room low, thus minimising heat loss through the roof.

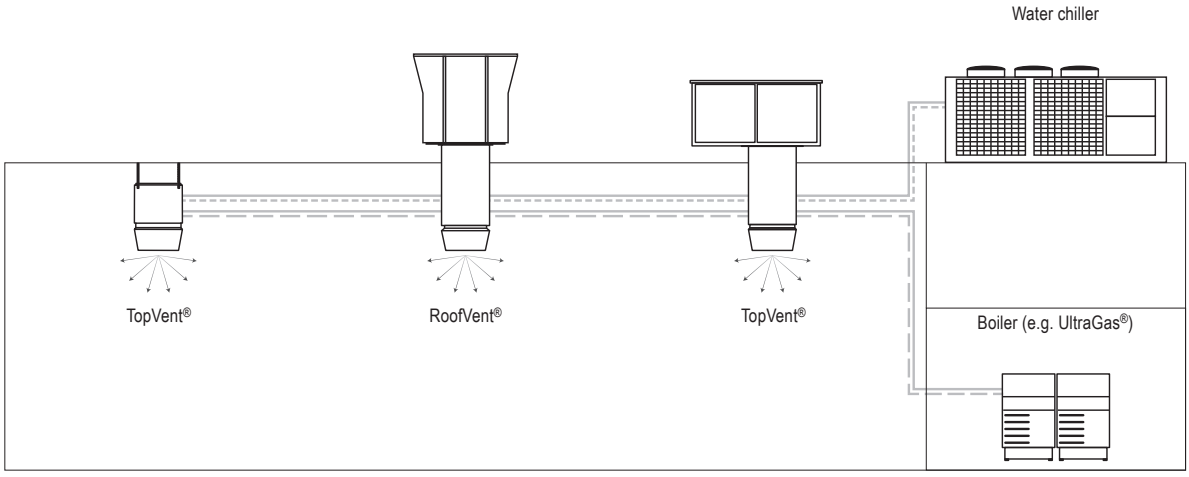
Control with specialist expertise
The TopTronic® C control system, which was specifically developed for Hoval indoor climate systems, regulates the separate units individually and controls them based on zones. This enables optimal adjustment to the local requirements of the different usage areas in the building. The patented control algorithm optimises energy use and ensures maximum comfort and hygiene levels. Clear interfaces make it easy to connect the system to the building management system.
Simpler control systems are also available for units that are only used for supply air or air recirculation.

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

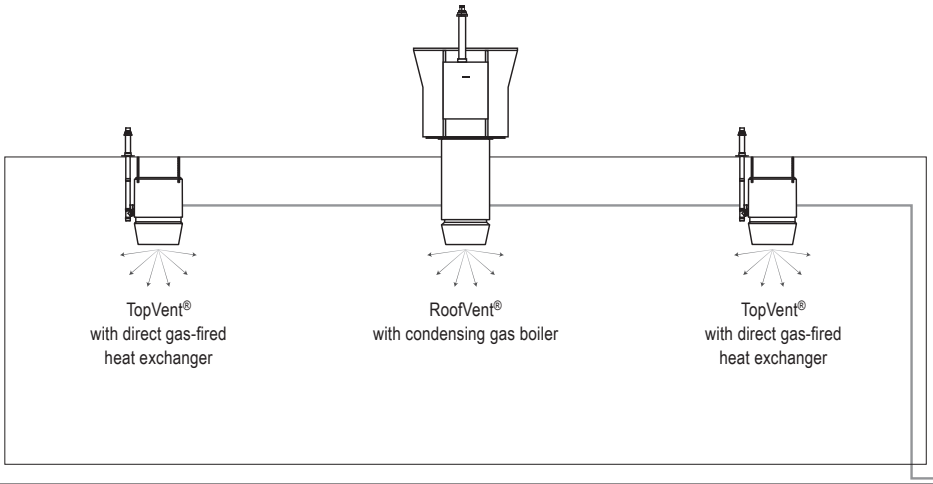
System with decentralised heat and cold generation with heat pump



System with central heat and cold generation



System with decentralised, gas-fired heat generation



TopVent® CP

Recirculation units configured as roof units with efficient air distribution for heating and cooling spaces up to 25 m in height with decentralised heat pump

1 Use

1.1 Intended use

TopVent® CP units are recirculation units intended for heating and cooling spaces up to 25 m in height with decentralised heat pump. They have the following functions:
- Heating and cooling with heat pump
- Recirculation operation
- Air distribution and destratification with adjustable Air-Injector
- Air filtration

The TopVent® CP unit complies with all the requirements of the Ecodesign Directive 2009/125/EC relating to environmentally friendly design of ventilation systems.
It is a system of the «fan coil unit» type, provided for in Commission Regulation (EU) 2016/2281.

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.

2 Construction and operation

2.1 Construction

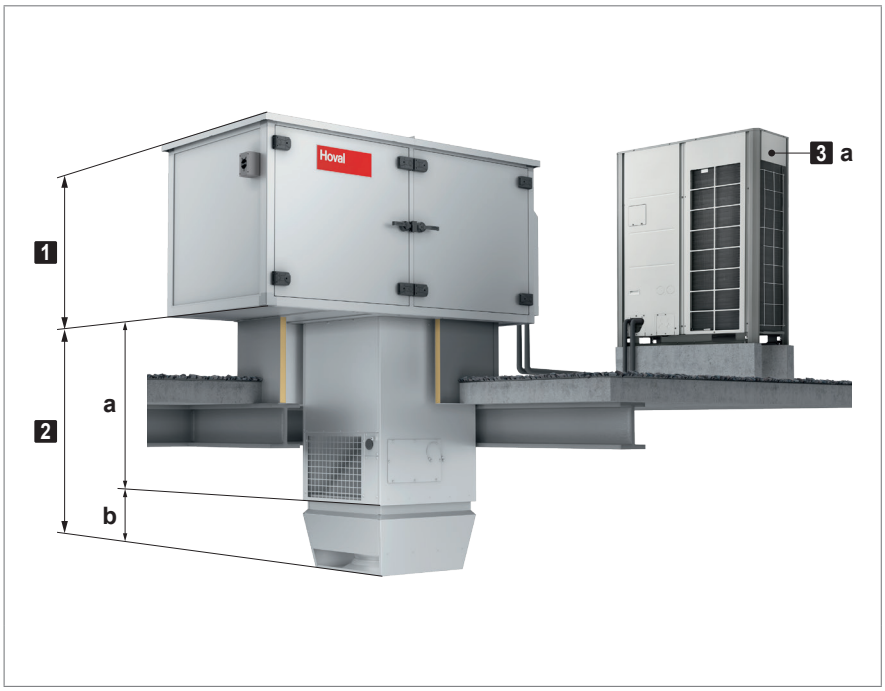
The TopVent® CP unit consists of the following components:

Roof unit
The self-supporting housing for mounting on the roof frame is of double-shell construction; this ensures good thermal insulation and high stability. The roof unit includes the following components:
- Fan
- Heating/cooling section
  - Heating/cooling coil for heating and cooling the supply air
  - Condensate separator
- Extract air filter
- Unit control box (part of the TopTronic® C control system)

All components are easily accessible for maintenance work through large access openings.

Below-roof unit
The below-roof unit comprises the following components:
- Connection module:
  The connection module serves as an air duct through the roof and for drawing in extract air from the hall through the extract air grille. To enable easy adaptation to local installation conditions, the connection module is available in 3 lengths.
- Air-Injector:
  The Air-Injector is a patented, infinitely variable vortex air distributor for the draught-free introduction of air into the hall under changing operating conditions.

Heat pump system
The reversible air/air heat pump system in split design generates both heat and cold decentrally. It consists of the following components:
- Heat pump with continuously modulating inverter technology for precise output control and high efficiency
- Communication kit for communication between heat pump, expansion valve and indoor climate unit (mounted in the roof unit)
- EEV kit with expansion valve (mounted in the roof unit)
- Branch joint kit (only for heat pump Q)

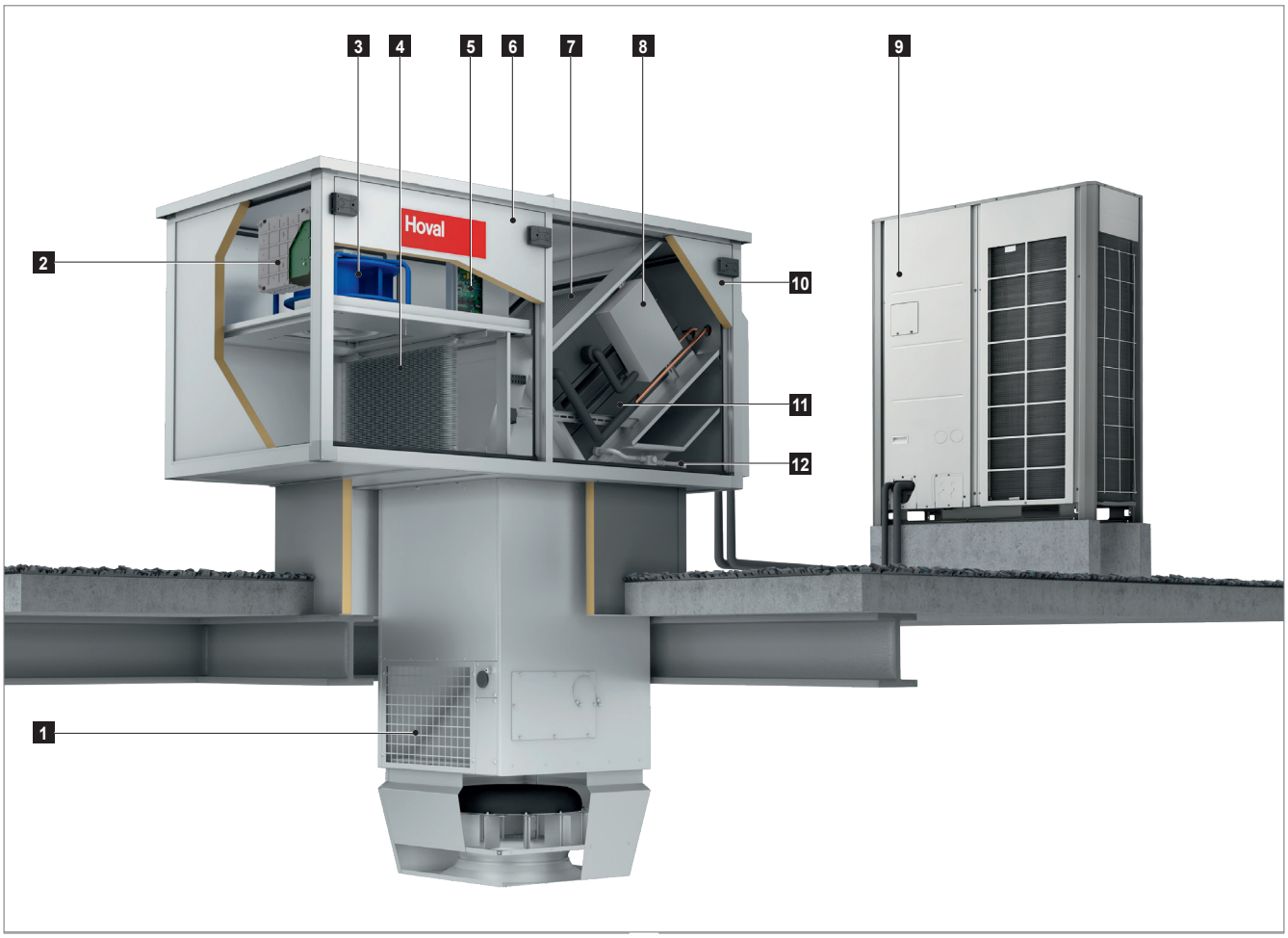


1 Roof unit

2 Below-roof unit
- **a** Connection module
- **b** Air-Injector

3 Heat pump system
- **a** Heat pump
- **b** Communication kit (mounted in the roof unit)
- **c** EEV kit (mounted in the roof unit)

Fig. B1: TopVent® CP components



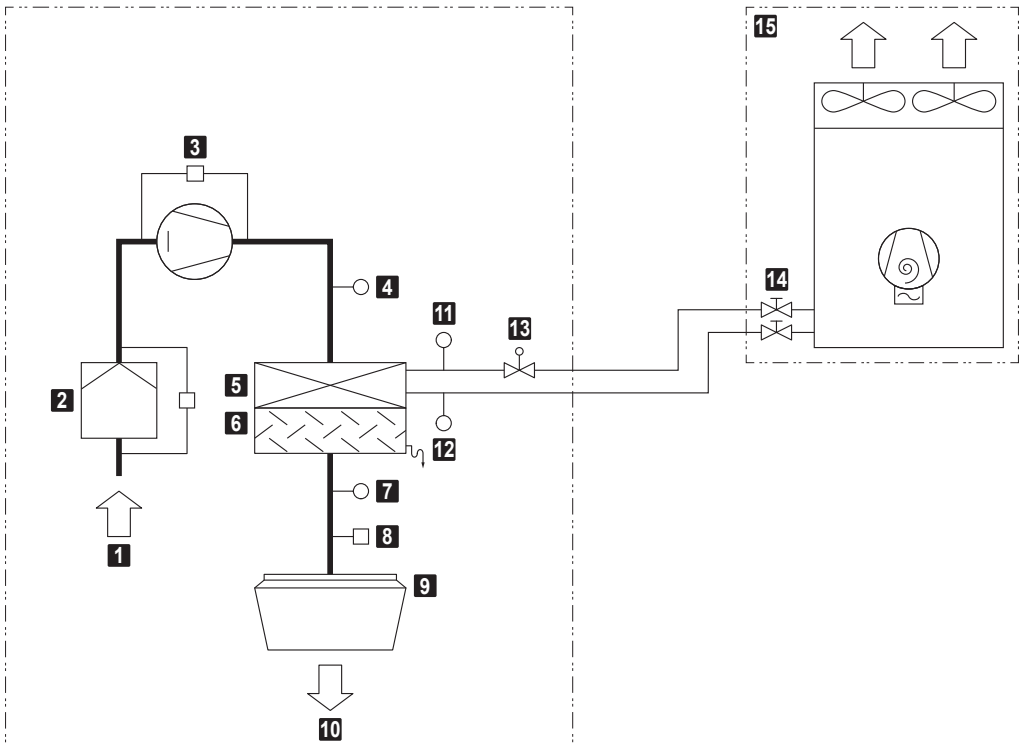
1	Extract air grille	7	Heating/cooling coil
2	Unit control box	8	EEV kit
3	Fan	9	Heat pump
4	Extract air filter	10	Refrigerant connection access door
5	Communication kit	11	Condensate separator
6	Fan access door	12	Condensate drain

Fig. B2: TopVent® CP construction

Notice
The picture only shows the schematic layout. For the position of the refrigerant connections in the roof unit, see Fig. E12 on page 68.

2.2 Function

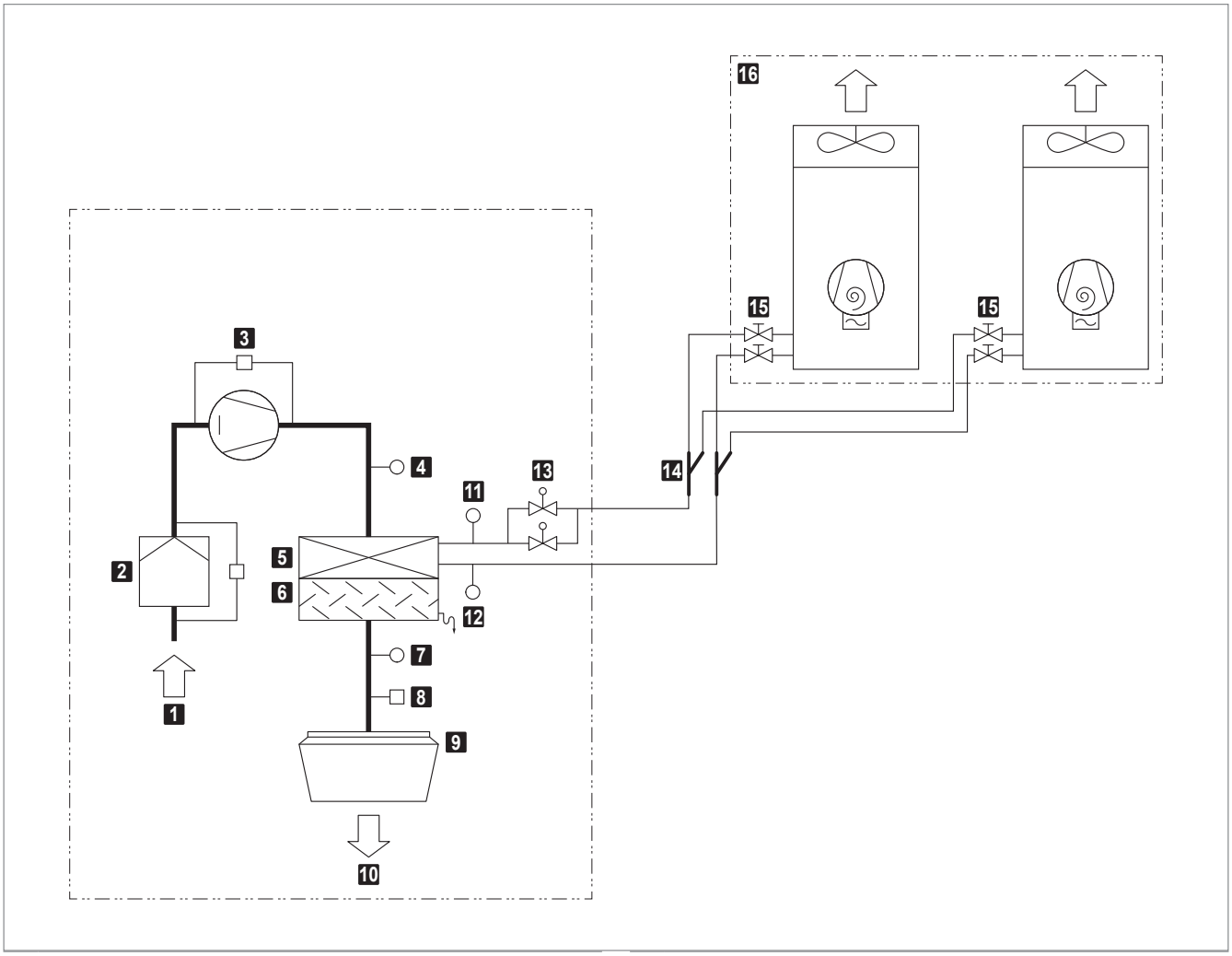
TopVent® CP-6-P | TopVent® CP-9-P



1	Extract air	9	Air-Injector
2	Extract air filter with differential pressure switch	10	Supply air
3	Fan with flow rate monitoring	11	Liquid temperature sensor (supplied loose)
4	Air inlet temperature sensor heating/cooling coil	12	Gas temperature sensor (supplied loose)
5	Heating/cooling coil	13	Expansion valve
6	Condensate separator	14	Shut-off valves
7	Supply air temperature sensor	15	Heat pump P
8	Actuator Air-Injector		

Table B1: TopVent® CP-6-P | TopVent® CP-9-P function diagram

TopVent® CP-9-Q



1	Extract air	9	Air-Injector
2	Extract air filter with differential pressure switch	10	Supply air
3	Fan with flow rate monitoring	11	Liquid temperature sensor (supplied loose)
4	Air inlet temperature sensor heating/cooling coil	12	Gas temperature sensor (supplied loose)
5	Heating/cooling coil	13	Expansion valves
6	Condensate separator	14	Branch joint kit Q (supplied loose)
7	Supply air temperature sensor	15	Shut-off valves
8	Actuator Air-Injector	16	Heat pump Q

Fig. B3: TopVent® CP-9-Q function diagram

2.3 Operating modes

TopVent® CP operates in the following 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® unit can operate individually in a local operating mode: Off, Recirculation, Recirculation speed 1

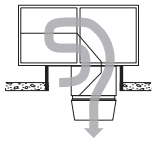
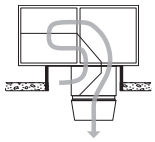
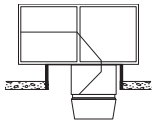
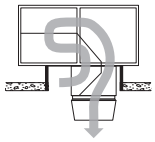
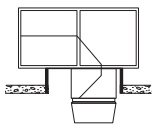
Code	Operating mode		Description
REC	**Recirculation** On/Off operation: during heat or cool demand, the unit draws in room air, heats or cools it and blows it back into the room. The room temperature set value day is active.		Fan ..... speed 1 / 2 [1)] Heating/cooling ..... on [1)] [1)] Depending on 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 the temperature stratification, 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 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 Heating/cooling ..... off
ST	**Standby** The unit is ready for operation; the following operating modes are activated if required:		
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 over-heating 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

Table B2: Operating modes TopVent® CP

3 Technical data

3.1 Type code

CP - 6 - P ...

Unit type
TopVent® CP

Unit size
6 or 9

Heating/cooling section
P with coil type P for heat pump P
Q with coil type Q for heat pump Q

Further options

Table B3: Type code

3.2 Application limits

Heating mode				
Fresh air temperature (WB)		min. max.	°C °C	−25 18
Air inlet temperature to the heating/cooling coil (DB)		min. max.	°C °C	5 24
Cooling mode				
Fresh air temperature (DB)		min. max.	°C °C	−10 48
Air inlet temperature to the heating/cooling coil (WB)		min. max.	°C °C	14 26
Extract air temperature		max.	°C	50
Moisture content of extract air		max.	g/kg	15
Supply air temperature		max.	°C	45
Room temperature setpoint		min. max.	°C °C	12 26
Air flow rate	Size 6: Size 9:	min. min.	m³/h m³/h	3100 5000
Condensate quantity	Size 6: Size 9:	max. max.	kg/h kg/h	90 150
The units cannot be used in: ■ Damp locations ■ Rooms with mineral oil vapours in the air ■ Rooms with a high salt content in the air ■ Rooms with acidic or alkaline vapours in the air				

Table B4: Application limits

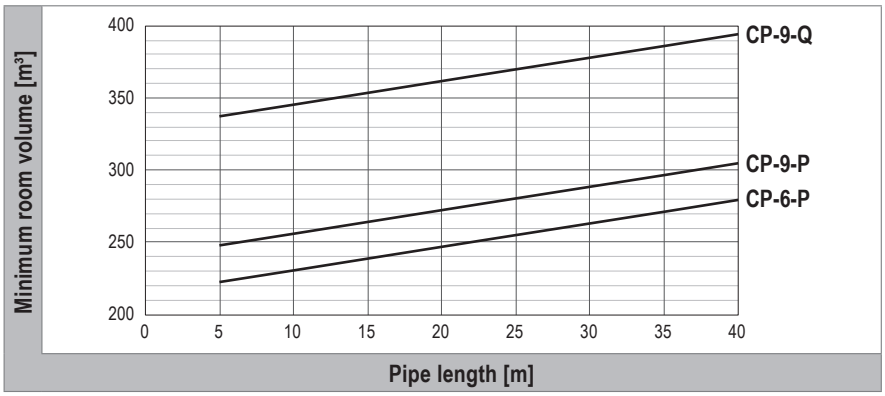


Fig. B4: Minimum room volume depending on the total refrigerant charge in accordance with EN 378

According to EN 378 (Refrigerating systems and heat pumps - Safety and environmental requirements), no additional safety measures for risk reduction are required for Hoval indoor climate units with heat pumps under the following conditions:

- The conditions according to EN 378 Annex C 3.1 are fulfilled.
- The room volume corresponds to the minimum values shown in Fig. B4 meaning that the permissible QLMV value is not exceeded.

3.3 Electrical connection

TopVent® CP

Unit type		CP-6	CP-9
Supply voltage	V AC	3 × 400	3 × 400
Permitted voltage tolerance	%	± 5	± 5
Frequency	Hz	50	50
Connected load	kW	2.1	3.2
Current consumption max.	A	3.4	5.1
Series fuse	A	13.0	13.0
Protection rating	–	IP 54	IP 54

Table B5: Electrical connection TopVent® CP

Heat pump

Heat pump		P	Q
Supply voltage	V AC	3 × 400	3 × 400
Permitted voltage tolerance	%	± 2	± 2
Frequency	Hz	50	50
Connected load	kW	16.8	2 × 15.9
Current consumption max.	A	26.9	2 × 25.5
Series fuse	A	32.0	2 × 32.0
Inrush current	A	5.9	2 × 5.9

Table B6: Heat pump electrical connections

3.4 Air flow rate

Unit type		CP-6	CP-9
Nominal air flow rate	m³/h	6000	9000
Floor area covered ■ for applications with higher comfort requirements (e.g. production halls, assembly halls, sports halls)	m²	537	946
■ for applications with low comfort requirements (e.g. warehouses, logistics centres)	m²	953	1674

Table B7: Air flow rate

3.5 Air filtration

Filter	Extract air
Class acc. to ISO 16890	ePM_1 55 %
Class acc. to EN 779	F7
Factory setting of differential pressure switches	300 Pa

Table B8: Air filtration

3.6 Technical data of the heat pump

Heat pump			P	Q
Heating	Rated heat output [1]	kW	39.2	67.2
	Power consumption	kW	8.43	15.54
	COP	–	4.65	4.32
	$\eta_{s,h}$	–	204	197
	SCOP	–	5.17	4.99
Cooling	Rated cooling capacity [2]	kW	39.2	67.2
	Power consumption	kW	11.88	23.30
	EER	–	3.30	2.88
	$\eta_{s,c}$	–	339	315
	SEER	–	8.55	7.94
Refrigerant		–	R32	R32
Refrigerant fill volume		kg	11.4	2 × 8.5

1) With fresh air temperature 7 °C / extract air temperature 20 °C
2) With fresh air temperature 35 °C / extract air temperature 27 °C / 45 % rel. humidity

Table B9: Heat pump technical data

3.7 Heat output

t_F	t_{room}	Type	Q	H_{max}	t_S	P_{HP}
°C	°C	CP-	kW	m	°C	kW
-5	16	6-P	46.9	11.6	41.2	12.4
		9-P	46.9	14.5	33.5	12.4
		9-Q	80.4	11.6	44.5	23.4
	20	6-P	41.3	12.3	42.4	11.0
		9-P	41.3	15.4	35.6	11.0
		9-Q	70.8	12.3	45.4	20.5
-15	16	6-P	41.6	12.2	38.6	14.8
		9-P	41.6	15.3	31.7	14.8
		9-Q	71.2	12.2	41.5	28.9
	20	6-P	41.3	12.3	42.4	13.7
		9-P	41.3	15.4	35.6	13.7
		9-Q	70.6	12.3	45.3	26.5

Legend:
t_F = Fresh air temperature
t_{room} = Room air temperature
Q = Heat output
H_{max} = Maximum mounting height
t_S = Supply air temperature
P_{HP} = Power consumption of the heat pump

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

Table B10: Heat output TopVent® CP

3.8 Cooling capacity

t_F	t_{room}	RH_{room}	Type	Q_{sen}	Q_{tot}	t_S	m_C	P_{HP}
°C	°C	%	CP-	kW	kW	°C	kg/h	kW
28	22	50	6-P	23.9	29.2	12.2	7.8	6.6
			9-P	23.3	29.2	16.3	8.7	6.6
			9-Q	40.0	50.1	10.8	14.9	12.1
		70	6-P	21.0	33.8	13.6	18.7	9.5
			9-P	23.2	38.3	16.4	22.2	9.5
			9-Q	37.1	61.2	11.8	35.5	16.7
32	26	50	6-P	29.2	41.4	13.5	17.9	11.6
			9-P	29.1	41.4	18.4	18.0	11.6
			9-Q	49.5	70.3	11.7	30.6	22.7
		70	6-P	23.2	44.8	16.5	31.7	12.5
			9-P	23.2	44.8	20.3	31.8	12.5
			9-Q	39.7	76.8	14.9	54.4	25.0

Legend:
t_F = Fresh air temperature
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
m_C = Condensate quantity
P_{HP} = Power consumption of the heat pump

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

Table B11: Cooling capacity TopVent® CP

3.9 Sound level

TopVent® CP

Unit type			CP-6		CP-9	
			Indoors	Outdoors	Indoors	Outdoors
Sound pressure level (at a distance of 5 m) [1]		dB(A)	55	42	59	46
Total sound power level		dB(A)	77	64	81	68
Octave sound power level	63 Hz	dB	45	40	47	42
	125 Hz	dB	61	55	65	59
	250 Hz	dB	67	57	70	60
	500 Hz	dB	71	60	73	62
	1000 Hz	dB	74	57	78	61
	2000 Hz	dB	70	56	76	62
	4000 Hz	dB	66	47	71	52
	8000 Hz	dB	65	39	66	40

1) with a hemispherical radiation pattern in a low-reflection room

Table B12: Sound level TopVent® CP

Heat pump

Heat pump			P		Q	
			Heating	Cooling	Heating	Cooling
Sound pressure level (at a distance of 5 m)		dB(A)	59.0	59.0	63.0	61.0
Total sound power level [1]		dB(A)	81.0	81.0	85.0	83.0
Octave sound pressure level [2]	63 Hz	dB	62.5	63.6	68.7	67.4
	125 Hz	dB	58.5	58.6	62.4	59.9
	250 Hz	dB	60.1	57.7	62.2	60.8
	500 Hz	dB	58.6	58.4	60.8	59.7
	1000 Hz	dB	54.3	52.2	57.6	56.4
	2000 Hz	dB	51.6	49.8	54.5	53.6
	4000 Hz	dB	53.0	52.8	49.9	50.4
	8000 Hz	dB	46.7	45.9	49.2	48.2

1) The values given are maximum values; the noise level is fluctuating due to scroll technology.
2) Measured at a distance of 1 m in front of the unit and 1 m above the floor in a semi-anechoic chamber.

Table B13: Heat pump sound level

For particularly quiet unit operation (e.g. during the night), the heat pump can be operated in silent mode. It then runs at a reduced speed of the compressor and/or fan, which also leads to a reduced capacity output depending on the setting parameters.

Silent mode	Noise reduction	Capacity level	
		Heat pump P	Heat pump Q
Level 1	− 3 dB	100 %	100 %
Level 2	− 6 dB	95 %	80 %
Level 3	− 9 dB	75 %	55 %

Table B14: Noise reduction and capacity output in silent mode

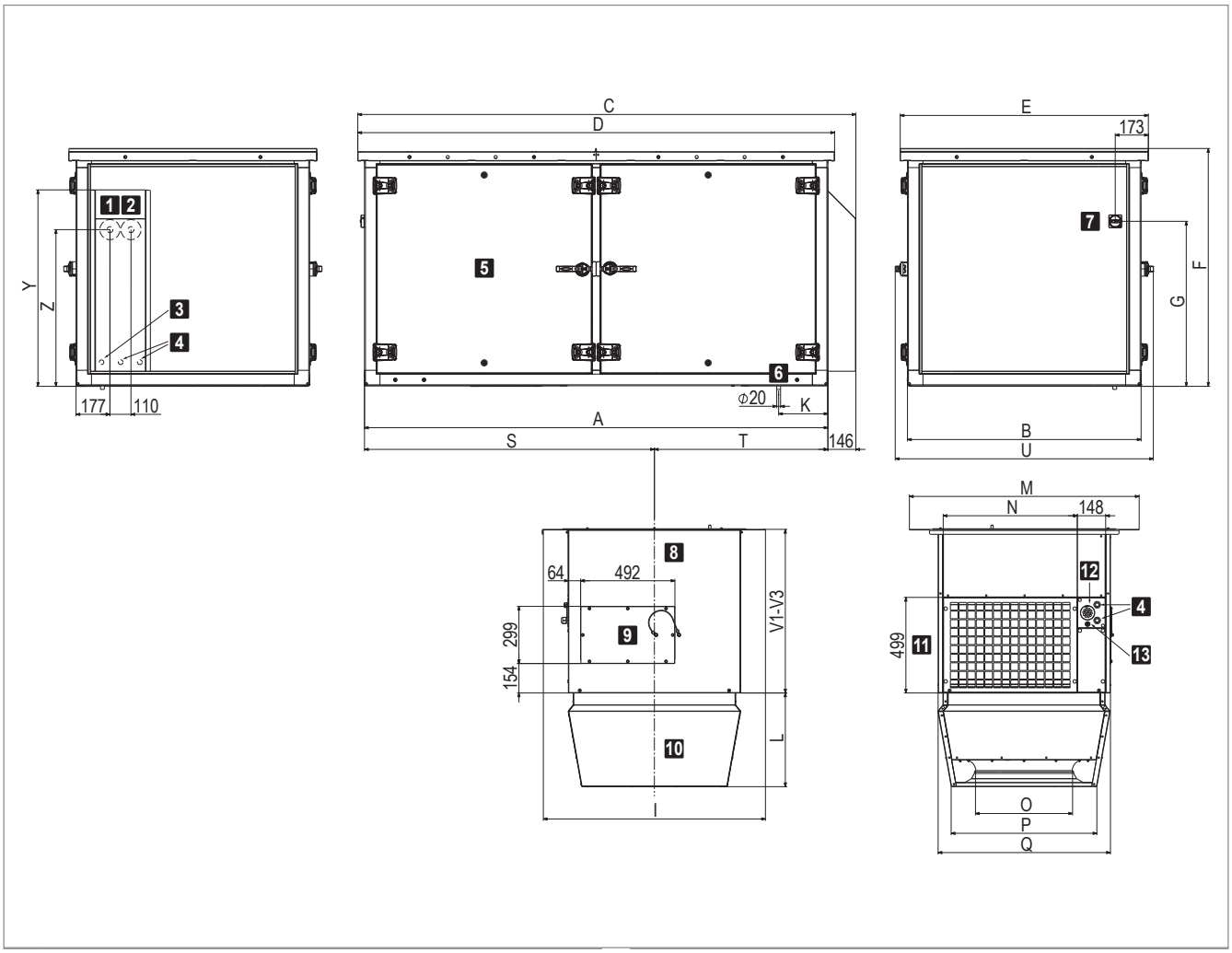
3.10 Product information according to ErP

Model	TopVent® CP			Unit
	6-P	9-P	9-Q	
Cooling capacity (sensible) ($P_{rated,c}$)	29.4	28.2	48.4	kW
Cooling capacity (latent) ($P_{rated,c}$)	9.8	11.0	18.8	kW
Heating capacity ($P_{rated,h}$)	44.1	44.1	75.6	kW
Total electric power input (P_{elec})	1.14	2.29	2.29	kW
Sound power level (L_{WA})	77	81	81	dB
Contact	Hoval Aktiengesellschaft Austrasse 70, 9490 Vaduz, Liechtenstein www.hoval.com			

Table B15: Product information according to Commission Regulation (EU) 2016/2281, Table 13

3.11 Dimensions and weights

TopVent® CP



1	Feedthrough for gas line (Ø 23…75 mm)	7	Isolation switch
2	Feedthrough for liquid line (Ø 23…75 mm)	8	Connection module
3	Cable feedthrough for signal cables heat pump	9	Installation lid
4	Cable feedthrough for power supply heat pump (2 × for heat pump Q)	10	Air-Injector
		11	Extract air grille
5	Roof unit	12	Cable feedthrough for signal cables
6	Condensate drain	13	Cable feedthrough for power supply TopVent®

Table B16: TopVent® CP dimensional drawing

Unit type		CP-6	CP-9
A	mm	2420	2725
B	mm	1220	1420
C	mm	2601	2906
D	mm	2490	2795
E	mm	1290	1490
F	mm	1239	1439
G	mm	862	926
I	mm	1160	1360
K	mm	257	292
L	mm	490	570
M	mm	1200	1400
N	mm	701	901
Ø O	mm	500	630
P	mm	767	937
Q	mm	900	1100
S	mm	1514	1684
T	mm	906	1041
U	mm	1348	1548
V1	mm	850	850
V2	mm	1300	1300
V3	mm	1750	1750
Y	mm	1025	1125
Z	mm	818	935

Table B17: TopVent® CP dimensions

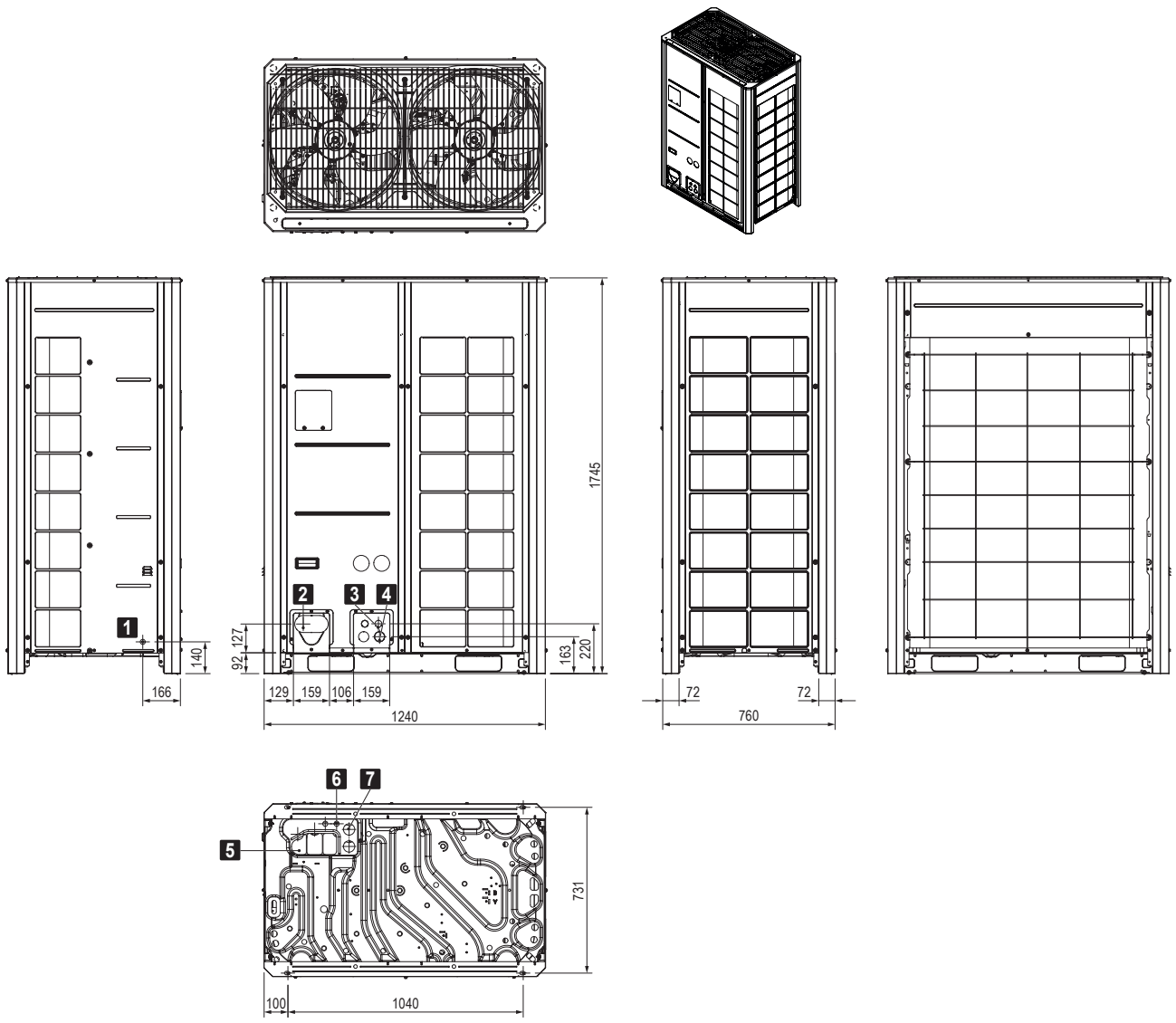
Unit type		CP-6	CP-9
Gas line connection	mm	Ø 22	Ø 28
Liquid line connection	mm	Ø 12	Ø 12

Table B18: Refrigerant pipe connections in the roof unit

Unit type		CP-6	CP-9
Total	**kg**	**672**	**869**
Roof unit	kg	530	687
Below-roof unit	kg	142	182
Air-Injector	kg	40	57
Connection module V1	kg	102	125
Additional weight V2	kg	+ 42	+ 50
Additional weight V3	kg	+ 85	+ 101

Table B19: TopVent® CP weights

Heat pump P



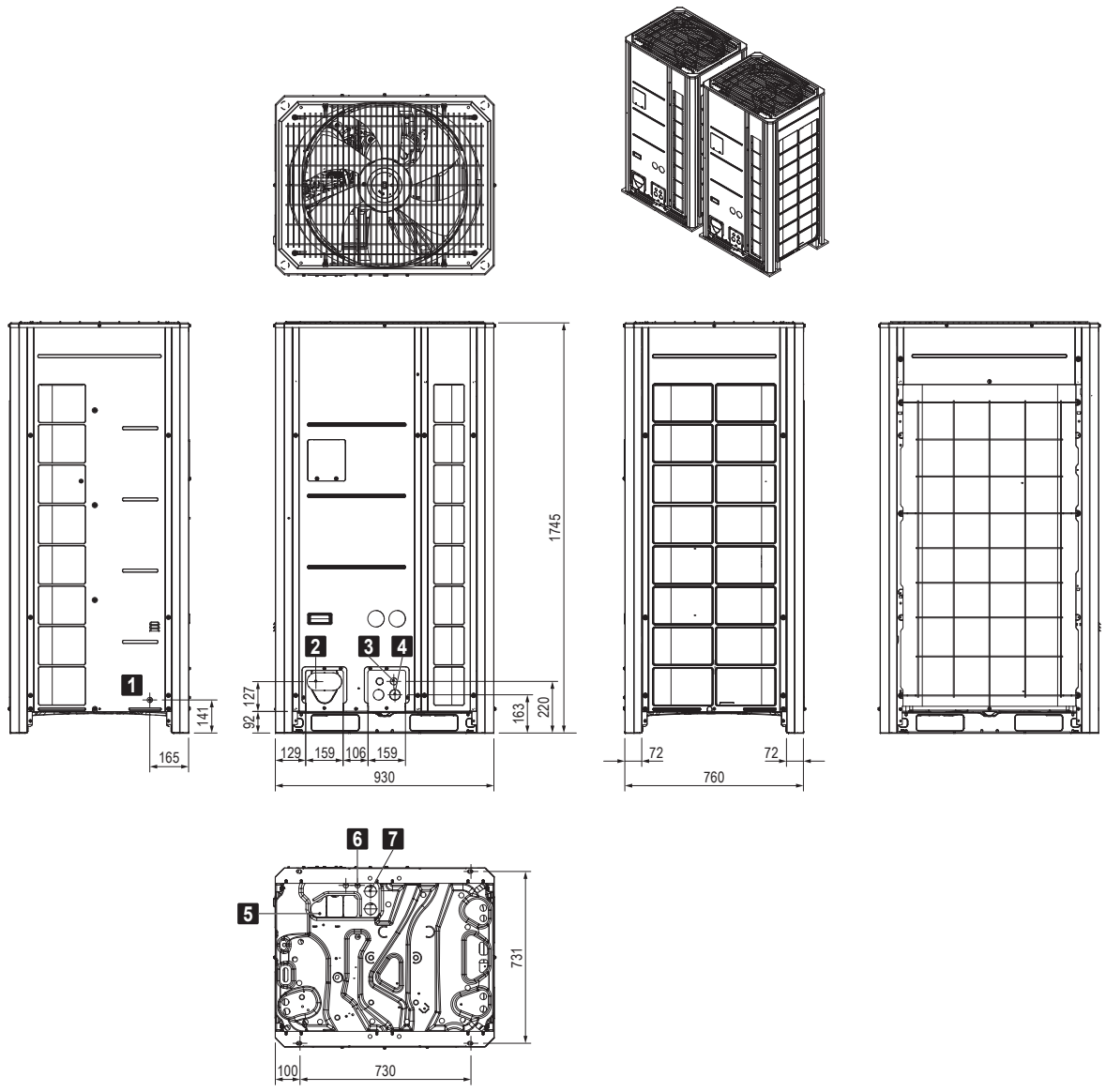
1	Opening for leak-tightness test	
2	Opening for refrigerant pipes (front)	
	■ Liquid line connection	Ø 12.7 mm
	■ Gas line connection	Ø 22.2 mm
3	Opening for signal lines (front)	
4	Opening for mains cable (front)	
5	Opening for refrigerant pipes (bottom)	
6	Opening for signal lines (bottom)	
7	Opening for mains cable (bottom)	

Heat pump		P
Weight	kg	255

Fig. B5: Heat pump P dimensions and weights

B

Heat pump Q



1	Opening for leak-tightness test	
2	Opening for refrigerant pipes (front)	
	■ Liquid line connection	Ø 12.7 mm
	■ Gas line connection	Ø 22.2 mm
3	Opening for signal lines (front)	
4	Opening for mains cable (front)	
5	Opening for refrigerant pipes (bottom)	
6	Opening for signal lines (bottom)	
7	Opening for mains cable (bottom)	

Heat pump		Q
Weight	kg	2 × 215

Fig. B6: Heat pump Q dimensions and weights

4 Specification texts

4.1 TopVent® CP

Recirculation unit with reversible heat pump system for heating and cooling spaces up to 25 m in height; configured as roof unit; equipped with highly efficient air distributor.

The unit consists of the following components:
- Roof unit (with access to all components relevant for maintenance)
- Below-roof unit:
  - Connection module
  - Air-Injector
- Optional components

The heat pump system consists of the following components:
- Heat pump
- Communication kit
- EEV kit
- Branch joint kit (only for heat pump Q)

The TopVent® CP unit complies with all the requirements of the Ecodesign Directive 2009/125/EC relating to environmentally friendly design of ventilation systems.
It is a system of the «fan coil unit» type, provided for in Commission Regulation (EU) 2016/2281.

Roof unit

Self-supporting casing, construction made of thermally decoupled aluminium profile frame system with nylon connecting elements and panels made of coated zinc sheet (anthracite grey, similar to RAL 7016), additional rain canopy made of aluminium:
- Weatherproof, corrosion resistant, impact resistant, air-tight
- Low flammability, double-shelled, without heat bridges, with highly efficient insulation made of expanded polystyrene
- Hygienic and easy to maintain because of smooth interior surfaces and large access doors with ageing-resistant, silicone-free sealing materials

The roof unit includes:

Fan
Configured as maintenance-free, directly driven radial fan with high-efficiency EC motor, backwards-curved, 3D contoured blades and free-running rotor made of a high-performance composite material, aerodynamically optimised inflow nozzle, low-noise, with integrated overload protection.

Heating/cooling section
The heating/cooling section contains:
- The highly efficient heating/cooling coil consisting of seamless copper pipes with pressed-on, optimised and profiled aluminium fins, manifold made of copper and injection distributor
- 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 drain on the roof via siphon

Extract air filter
Pleated cell filter of filter class ePM_1 55% according to ISO 16890, consisting of micro glass with synthetic lamination as handle protection, pleat pack completely encapsulated to prevent leakage, frame made of recycled plastic, fully incinerable, including differential pressure switch for filter monitoring.

Unit control box
Control box for connection of the power supply and housing the control components that facilitate energy-optimised operation, controlled by the control system TopTronic® C. Plastic casing, protection rating IP 56. The following components are installed:
- Circuit board with all required electrical components, unit controller (clipped on)

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, actuators in the unit and the isolation switch attached to the outside of the unit are fully factory-wired.
Power supply, bus connection, connection to Air-Injector actuator to be installed on site.

Access openings
Defined side walls of the roof unit configured as inspection doors for easy access to all components relevant for maintenance. The hinges allow opening with an opening angle of 90° or complete removal of the inspection doors.

Heat pump connection
Side wall of the roof unit designed with:
- Pipe feedthroughs for the refrigerant pipes, equipped with grommets for airtight sealing
- Cable feedthrough for signal cable and power supply
- Protection hood for the connections, supplied loose with the appropriate connecting screws.

On-site: Installation and insulation of the pipelines in the roof unit, heat pump signal cable, mounting of the protection hood to the roof unit

Below-roof unit

Connection module V1
Housing made of magnesium zinc sheet, air-tight, flame retardant, with highly efficient insulation made of expanded polystyrene, hygienic and easy to maintain because of smooth interior surfaces and ageing-resistant, silicone-free sealing materials; configured with:
- Extract air grille
- Cable feedthroughs for the electric supply

Connection module V2 / V3 (variant)
The connection module is extended for adapting to the local installation situation.

Design with Air-Injector
Housing made of magnesium zinc sheet, air-tight, hygienic and easy to maintain because of ageing-resistant, silicone-free sealing materials, internally insulated with closed-cell polyethylene foam, 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
  - for the rapid and large-area reduction of temperature stratification in the room through induction of secondary air and strong mixing of the room air with supply air

Actuator installed in the connection module for easy access from the roof.

Design without Air-Injector (variant)
Unit configured without vortex air distributor for connection to an on-site supply air duct and air distribution within the building.

Air distribution box (variant)
Housing made of magnesium zinc sheet, air-tight, hygienic and easy to maintain because of ageing-resistant, silicone-free sealing materials, insulated on the inside with closed-cell polyethylene foam; configured with 2 collars as connecting piece to the on-site air distribution system.

Options for the unit

Paint finish of below-roof unit
Exterior painting of the below-roof unit in choice of RAL colour.

Supply air silencer
Designed as a sound-absorbing mat made of melamine foam; hygienically perfect with carbon fibre coating; mounted in the roof unit; insertion loss 3 dB.

Roof frame
Consisting of 4 load-bearing side walls made of galvanised sheet steel with fastening rails for the roof foil, supplied loose with the matching connecting screws.
Assembly, insulation, integration in the roof structure on site.

Heat pump system

Highly efficient air-to-air heat pump system in split design with continuously modulating inverter technology for precise capacity control, reversible for heating and cooling the supply air, consisting of the following components:

Heat pump P
- Compact unit for outdoor installation
- Galvanised sheet steel casing, painted in RAL 7038 (agate grey) / RAL 7037 (dusty grey)
- Variable-speed inverter scroll compressor
- 2 speed-controlled fans
- Coated Al/Cu finned-tube evaporator or condenser
- Electronic expansion valve (for heating mode)
- 4-way valve
- Refrigerant shut-off valves
- Refrigerant R32
- Terminal box

Heat pump Q
- Cascade consisting of 2 compact devices for outdoor installation
- Galvanised sheet steel casing, painted in RAL 7038 (agate grey) / RAL 7037 (dusty grey)
- 1 variable-speed inverter scroll compressor per single unit
- 1 speed-controlled fan per single device per single unit
- Coated Al/Cu finned-tube evaporator or condenser
- Electronic expansion valve (for heating mode)
- 4-way valve
- Refrigerant shut-off valves
- Refrigerant R32
- Terminal box

Communication kit PQ
Printed circuit board assembly for communication between heat pump, expansion valve and indoor climate unit and for recording the temperatures at the heating/cooling coil. Mounted and fully wired in the roof unit of the indoor climate unit.

EEV kit P
Galvanised sheet steel casing, with 1 electronic expansion valve for cooling mode, thermally insulated and protected against mechanical damage. Mounted in the roof unit of the indoor climate unit.

EEV kit Q
Galvanised sheet steel casing, with 2 electronic expansion valves for cooling mode, thermally insulated and protected against mechanical damage. Mounted in the roof unit of the indoor climate unit.

Branch joint kit Q
For connecting the refrigerant lines of the single units in heat pump Q, consisting of 2 copper Y branch joints.

4.2 TopTronic® C – System control

Zone-based control system for the energy-optimised operation of decentralised Hoval indoor climate systems. Maximum system size per system bus: 64 control zones with up to 10 supply and extract air handling units or supply air units and 10 recirculation units each.

Zone allocation
Configured in advance for the customer at the factory:

	Room designation	Unit type
Zone 1:	_____	_____
Zone 2:	_____	_____
…		

System structure
- Zone control panel made of coated sheet steel (light grey RAL 7035), … x … x … mm, with:
  - System operator terminal
  - Fresh air temperature sensor
  - 1 zone controller and 1 room temperature sensor per zone (expandable to up to 4 room temperature sensors per zone)
  - Safety relay
  - Electrical cabinet internally pre-wired, all components routed to terminals
- Zone bus: as serial bus for communication with all controllers in one control zone, with robust bus protocol via shielded, twisted bus cable (provided by the client)
- Unit controller: installed in the particular indoor climate unit, works autonomously according to the specifications of the zone controller
- Heating/cooling demand per zone with feedback monitoring

Functions, standard
- Zone-based autonomous room control. Temperature and ventilation control separately adjustable for each zone
- Room temperature control via room-supply air cascade by means of energy-optimised double sequence control with priority circuit for energy recovery (supply and extract air handling units)
- Intelligent automatic heating to reach the desired room temperature at the switching time
- 5 adjustable room temperature set values per zone:
  - Cooling protection (lower setpoint in standby)
  - Overheating protection (upper setpoint in standby)
  - Room set value winter
  - Room set value summer
  - Night cooling set value (free cooling) (supply and extract air handling units, supply air units)
- Destratification mode for even temperature distribution

- Main operating modes of supply and extract air handling units:
  VE .... Ventilation, infinitely variably adjustment
  AQ.... Air quality, automatic control with Hoval combination sensor (option), optional reference variable:
  – CO_2 or VOC
  – Air humidity (optimised dehumidification mode)
  REC . Recirculation, infinitely variably adjustment
  DES.. Destratification
  EA .... Exhaust air, infinitely variably adjustment
  SA .... Supply air, infinitely variably adjustment
  ST .... Standby

- Main operating modes of supply air units:
  REC . Recirculation, infinitely variably adjustment
  DES.. Destratification
  SA .... Supply air, infinitely variably adjustment
  With Hoval combination sensor (option) also demand-driven control of the fresh air ratio, optional reference variable CO_2 or VOC
  ST .... Standby

- Main operating modes of recirculation units:
  REC . Recirculation, infinitely variably adjustment
  DES.. Destratification
  ST .... Standby

- Forced heating (construction site heating) can be activated on each device before completion of the overall system (activation by Hoval service technician)
- Control of draught-free air distribution with the Hoval Air-Injector: the discharge direction is adjusted infinitely variably and automatically according to the respective operating condition and the existing temperatures (heating/cooling).

Operation

- TopTronic® C-ST system operator terminal: touch panel for visualisation and control of all Hoval indoor climate units registered on the bus

Options for operation

- Activation of the system operator terminal for VNC access, for visualisation on customer's PC
- TopTronic® C-ZT as zone operator terminal: for simple on-site operation of a control zone
- Manual operating selector switches
- Manual operating selector buttons
- Operating of the units via building management system via standardised interfaces:
  – BACnet
  – Modbus IP
  – Modbus RTU

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.
- A maintenance mode implemented in the control algorithm for testing all physical data points and alarms guarantees high reliability.
- Pre-programmed data points retrievable via logger function for 1 year

Options for the zone control panel

- Alarm lamp
- Socket

Per zone:

- The change-over between heating and cooling can be either automatic or manual
  – Cooling lock switch for automatic changeover
  – Heating/cooling switch for manual changeover
- Additional room temperature sensors (max. 3)
- Combination sensor room air quality, temperature and humidity
- Combination sensor fresh air temperature and humidity
- Transfer of actual values and setpoints from external systems (0…10 V; 4 - 20 mA)
- Load shedding input
- Signal for external extract air fan
- Operating selector switches on terminal
- Operating selector button on terminal
- Control of distributor pump, incl. power supply
- Control box TW Pro

Power distribution:

- Circuit breakers and output terminals for Hoval indoor climate units
- Safety relay (4-pin)

4.3 TopTronic® C – Single zone control panel

Control system for the energy-optimised operation of decentralised Hoval indoor climate systems. Maximum system size: 1 control zone with up to 10 supply and extract air handling units or supply air units and 10 recirculation units.

System structure

- Zone control panel, designed as compact cabinet for wall installation, made of coated sheet steel (light grey RAL 7035), 380 × 300 × 210 mm, with:
  - System operator terminal
  - Fresh air temperature sensor
  - Zone controller
  - 1 Room temperature sensor (expandable to up to 4 room temperature sensors)
  - Safety relay
  - Electrical cabinet internally pre-wired, all components routed to terminals
- Zone bus: as serial bus for communication with all controllers in the control zone, with robust bus protocol via shielded, twisted bus cable (provided by the client)
- Unit controller: installed in the particular indoor climate unit, works autonomously according to the specifications of the zone controller
- Circuit board with external connections for:
  - Power supply
  - Zone bus
  - Room temperature sensors (max. 4)
  - Fresh air temperature sensor
  - Combination sensor room air quality, temperature and humidity
  - Collective alarm
  - Forced off
  - Heating demand
  - Setpoint heating demand
  - Fault heat supply
  - Cooling demand
  - Fault cold supply
  - External enabling heating/cooling (for automatic changeover)
  - External setting heating/cooling (for manual changeover)
  - Changeover valves heating/cooling
  - External setpoint fresh air ratio
  - Operating selector switch on terminal (digital)
  - Operating selector button on terminal

Functions, standard

- Room temperature control via sequential control of the coils
- Room temperature control via room-supply air cascade by means of energy-optimised double sequence control with priority circuit for energy recovery (supply and extract air handling units)
- Intelligent automatic heating to reach the desired room temperature at the switching time
- 5 adjustable room temperature set values per zone:
  - Cooling protection (lower setpoint in standby)
  - Overheating protection (upper setpoint in standby)
  - Room set value winter
  - Room set value summer
  - Night cooling set value (free cooling) (supply air units)
- Destratification mode for even temperature distribution

- Main operating modes of supply and extract air handling units:
  VE .... Ventilation, infinitely variably adjustment
  AQ.... Air quality, automatic control with Hoval combination sensor (option), optional reference variable CO_2 or VOC
  REC . Recirculation, infinitely variably adjustment
  DES.. Destratification
  EA .... Exhaust air, infinitely variably adjustment
  SA .... Supply air, infinitely variably adjustment
  ST .... Standby

- Main operating modes of supply air units:
  REC . Recirculation, infinitely variably adjustment
  DES.. Destratification
  SA .... Supply air, infinitely variably adjustment
  With Hoval combination sensor (option) also demand-driven control of the fresh air ratio, optional reference variable CO_2 or VOC
  ST .... Standby

- Main operating modes of recirculation units:
  REC . Recirculation, infinitely variably adjustment
  DES.. Destratification
  ST .... Standby

- Forced heating (construction site heating) can be activated on each device before completion of the overall system (activation by Hoval service technician)
- Control of draught-free air distribution with the Hoval Air-Injector: the discharge direction is adjusted infinitely variably and automatically according to the respective operating condition and the existing temperatures (heating/cooling).

Operation

- TopTronic® C-ST system operator terminal: touch panel for visualisation and control of all Hoval indoor climate units registered on the bus

Options for operation

- Activation of the system operator terminal for VNC access, for visualisation on customer's PC
- Operating of the units via building management system via standardised interfaces:
  - BACnet
  - Modbus IP
  - Modbus RTU

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.
- A maintenance mode implemented in the control algorithm for testing all physical data points and alarms guarantees high reliability.
- Pre-programmed data points retrievable via logger function for 1 year

Options for the zone control panel
- Additional room temperature sensors (max. 3)
- Combination sensor room air quality, temperature and humidity
- Signal for external extract air fan
- Control box TW Pro

4.4 HovalSupervisor cloud TopTronic® C

(Terms of use according to www.hoval.com/hsc are accepted when ordered.)

HovalSupervisor cloud TopTronic® C
Remote access, visualisation, historization, trends, evaluations and alarming for Hoval indoor climate systems with TopTronic® C control
- Project-specific system engineering
- Visualisation of the system statuses, error messages, actual and nominal values of the entire plant system
- Graphical display of the entire plant control system, in order to complete an analysis of sequences and subsequently to be able to perform an optimisation
- Integrated continuous line recorder for a period of 3 years
- Integrated alarm management
- Multi-user system: simultaneous access, 2 users included per plant
- Max. 300 data points historicized
- Max. 10 control zones

Consisting of:
- Project-specific engineering of the visualisation as described above
- Industrial router for connecting the TopTronic® C control system
  - Metal casing installed in the zone control panel
  - Without SIM card, free choice of phone network
  - Router configuration possible via web server
  - Network connections:
    2 x 10/100Mbit Ethernet
    2 x SIM card slot
  - SMA connections:
    1 x WLAN
    2 x mobile data via integrated antenna
  - Power supply for industrial router installed in zone control panel

HovalSupervisor cloud TopTronic® C subscription
Subscription for use of the HovalSupervisor cloud for visualisation of a TopTronic® C system
- 1 year term (subscription billed once a year)
- Use of the HovalSupervisor cloud and storage of the data in the cloud
- Paid support during business hours (only for the software, not for the system)
- The respective valid conditions of use and the service level agreement (SLA) apply, which can be retrieved online.

Options for HovalSupervisor cloud

- Antenna to improve mobile data reception in conjunction with the HovalSupervisor cloud TopTronic® C
  - Antenna with mounting bracket for on-site installation outside the TopTronic® C zone control panel
  - 2G/3G/4G-LTE/5G-ready
  - SMA port available on the antenna
- Antenna extension cable for connecting the antenna in conjunction with the HovalSupervisor cloud
  - SMA port
  - Double shielded
  - Length: 5 m

TopVent® SP

Supply air units configured as roof units with efficient air distribution for ventilating, heating and cooling spaces up to 25 m in height with decentralised heat pump

1 Use

1.1 Intended use

TopVent® SP units are supply air units intended for ventilation, heating and cooling spaces up to 25 m in height with decentralised heat pump. They have the following functions:
- Heating and cooling with heat pump
- Fresh air supply
- Mixed air operation
- Recirculation operation
- Air distribution and destratification with adjustable Air-Injector
- Air filtration

The TopVent® SP unit complies with all the requirements of the Ecodesign Directive 2009/125/EC relating to environmentally friendly design of ventilation systems. It is a system of the «non-residential ventilation unit» (NRVU) and «unidirectional ventilation unit» (UVU) type, provided for in Commission Regulation (EU) 1253/2014.

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.

2 Construction and operation

2.1 Construction

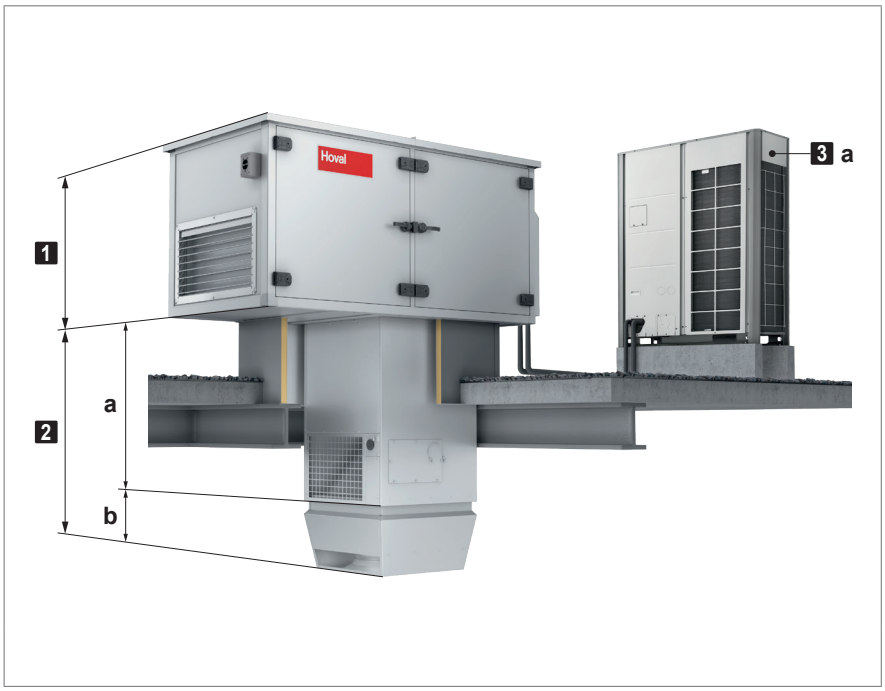
The TopVent® SP unit consists of the following components:

Roof unit
The self-supporting housing for mounting on the roof frame is of double-shell construction; this ensures good thermal insulation and high stability. The roof unit includes the following components:
- Fan
- Heating/cooling section
  - Heating/cooling coil for heating and cooling the supply air
  - Condensate separator
- Fresh air and extract air filters
- Control dampers
- Unit control box (part of the TopTronic® C control system)

All components are easily accessible for maintenance work through large access openings. A protection hood protects the fresh air inlet from strong winds and snowfall (supplied loose for assembly on site).

Below-roof unit
The below-roof unit comprises the following components:
- Connection module:
  The connection module serves as an air duct through the roof and for drawing in extract air from the hall through the extract air grille. To enable easy adaptation to local installation conditions, the connection module is available in 3 lengths.
- Air-Injector:
  The Air-Injector is a patented, infinitely variable vortex air distributor for the draught-free introduction of air into the hall under changing operating conditions.

Heat pump system
The reversible air/air heat pump system in split design generates both heat and cold decentrally. It consists of the following components:
- Heat pump with continuously modulating inverter technology for precise output control and high efficiency
- Communication kit for communication between heat pump, expansion valve and indoor climate unit (mounted in the roof unit)
- EEV kit with expansion valve (mounted in the roof unit)
- Branch joint kit (only for heat pump Q)

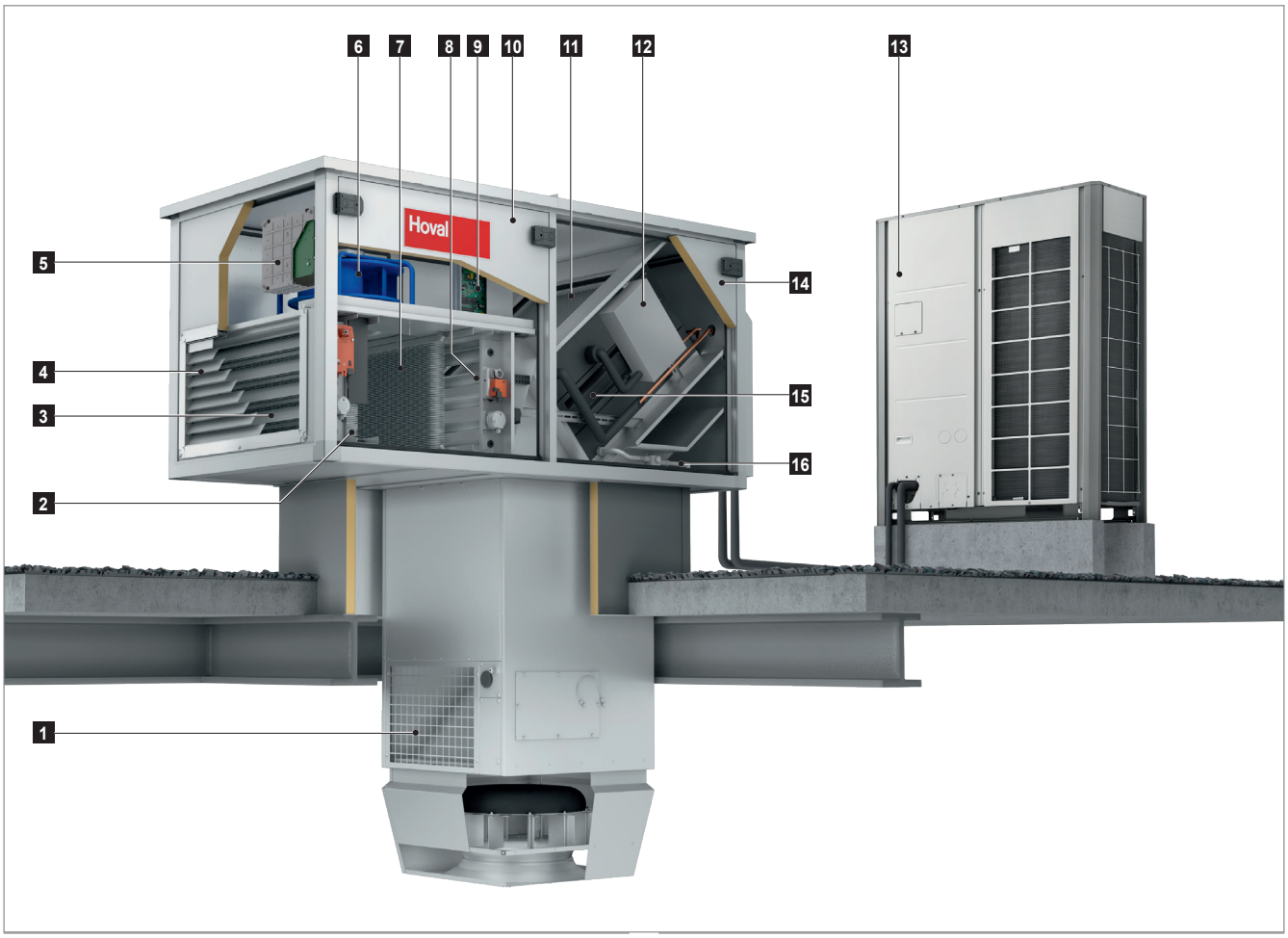


1 Roof unit

2 Below-roof unit
- **a** Connection module
- **b** Air-Injector

3 Heat pump system
- **a** Heat pump
- **b** Communication kit (mounted in the roof unit)
- **c** EEV kit (mounted in the roof unit)

Fig. C1: TopVent® SP components



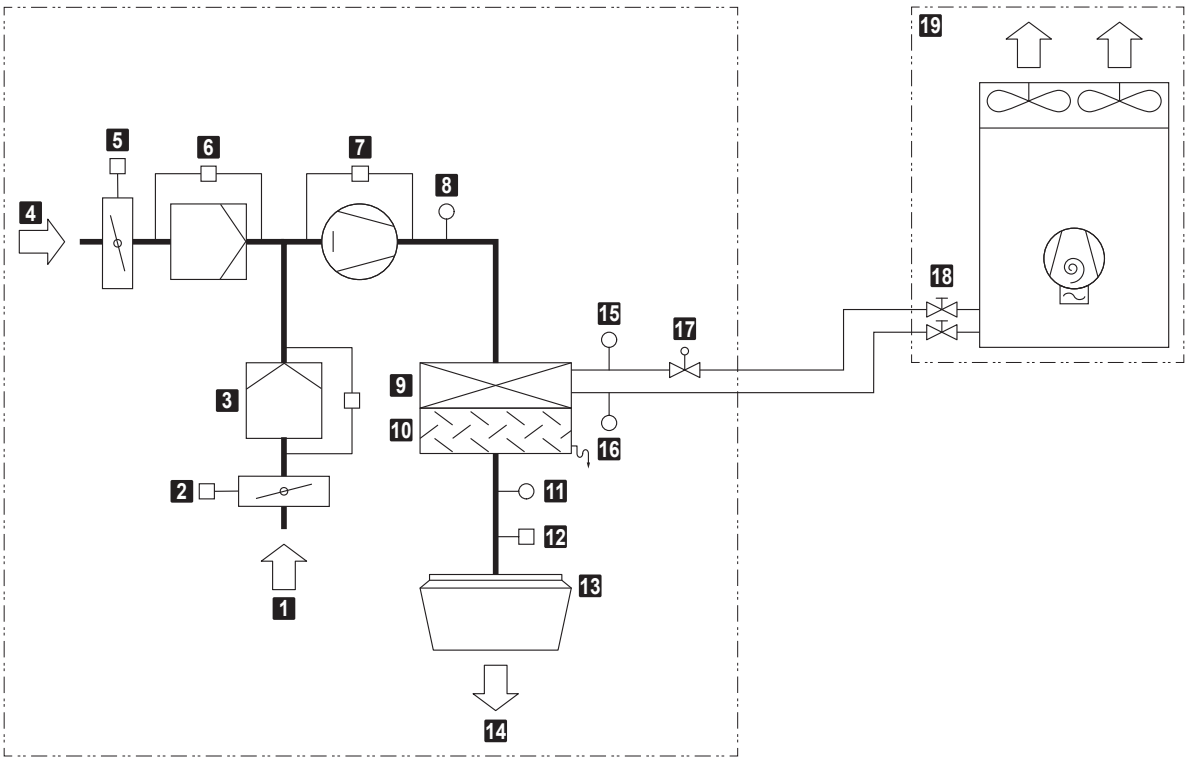
1	Extract air grille	9	Communication kit
2	Fresh air filter	10	Fan access door
3	Fresh air damper	11	Heating/cooling coil
4	Weather protection	12	EEV kit
5	Unit control box	13	Heat pump
6	Fan	14	Refrigerant connection access door
7	Extract air filter	15	Condensate separator
8	Recirculation damper	16	Condensate drain

Fig. C2: TopVent® SP construction

Notice
The picture only shows the schematic layout. For the position of the refrigerant connections in the roof unit, see Fig. E12 on page 68.

2.2 Function

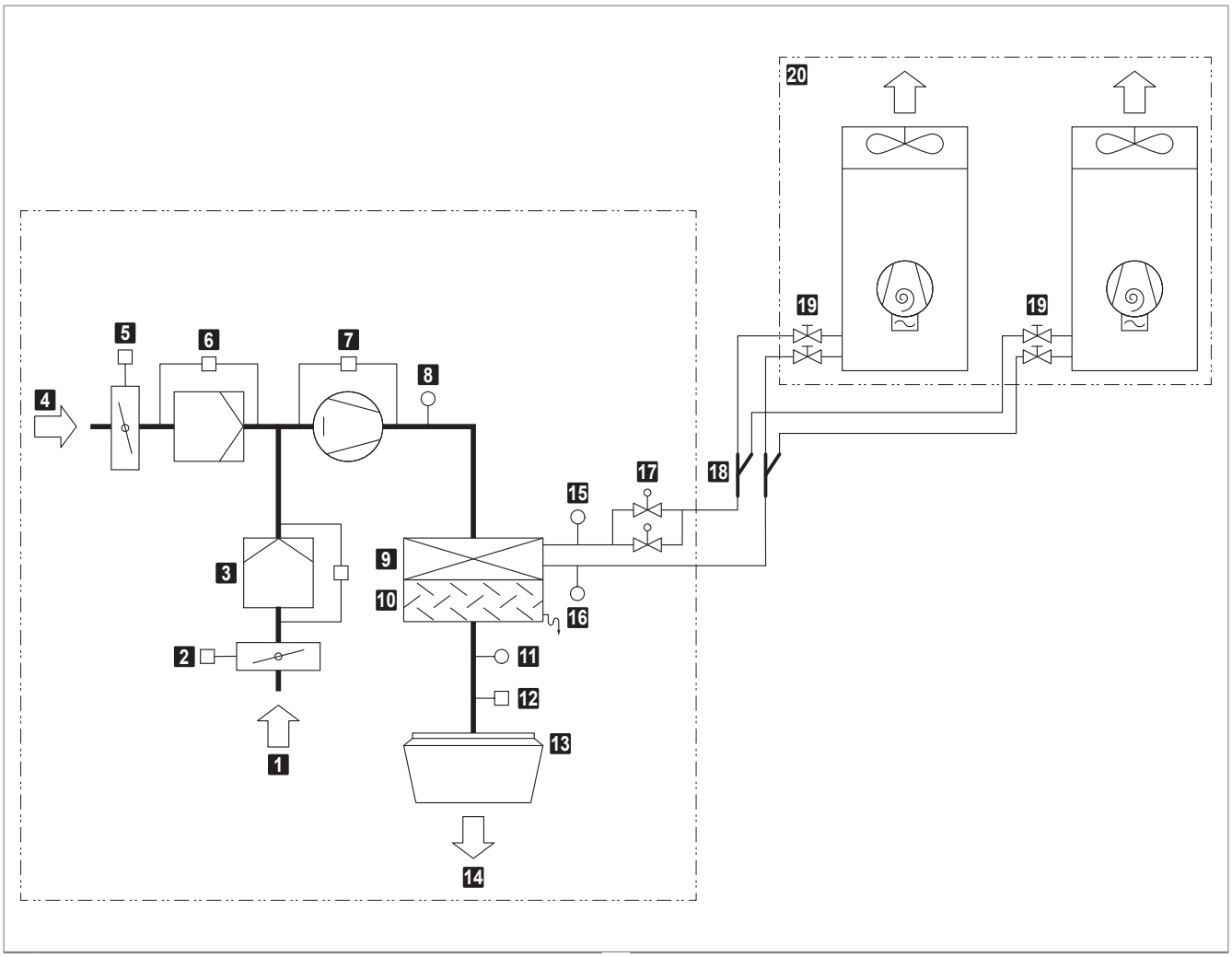
TopVent® SP-6-P | TopVent® SP-9-P



1	Extract air	11	Supply air temperature sensor
2	Recirculation damper with actuator	12	Actuator Air-Injector
3	Extract air filter with differential pressure switch	13	Air-Injector
4	Fresh air	14	Supply air
5	Fresh air damper with actuator	15	Liquid temperature sensor (supplied loose)
6	Fresh air filter with differential pressure switch	16	Gas temperature sensor (supplied loose)
7	Fan with flow rate monitoring	17	Expansion valve
8	Mixed air temperature sensor	18	Shut-off valves
9	Heating/cooling coil	19	Heat pump P
10	Condensate separator		

Table C1: TopVent® SP-6-P | TopVent® SP-9-P function diagram

TopVent® SP-9-Q



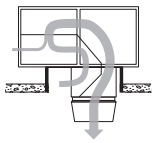
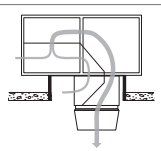
1	Extract air	11	Supply air temperature sensor
2	Recirculation damper with actuator	12	Actuator Air-Injector
3	Extract air filter with differential pressure switch	13	Air-Injector
4	Fresh air	14	Supply air
5	Fresh air damper with actuator	15	Liquid temperature sensor (supplied loose)
6	Fresh air filter with differential pressure switch	16	Gas temperature sensor (supplied loose)
7	Fan with flow rate monitoring	17	Expansion valves
8	Mixed air temperature sensor	18	Branch joint kit Q (supplied loose)
9	Heating/cooling coil	19	Shut-off valves
10	Condensate separator	20	Heat pump Q

Table C2: TopVent® SP-9-Q function diagram

2.3 Operating modes

TopVent® SP 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® 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 fan runs at speed 2 (high air flow rate). The room temperature set value day is active. The unit blows fresh air into the room. The control of the fresh air ratio can be selected:		
	Fixed fresh air ratio: The unit operates continuously with the set fresh air ratio. The system controls the heating/cooling according to the heating/cooling demand.		Fan ..... speed 2 Fresh air damper..... 10 % open [1] Heating/cooling ..... 0-100 % [2] [1] Percentage is adjustable [2] Depending on heat or cool demand
	Variable fresh air ratio: ■ The system regulates the fresh air ratio depending on the temperature. The set fresh air ratio serves as a minimum value. If the temperature conditions permit, more fresh air is brought into the room and used for free heating or free cooling. Only when this potential is fully utilised is the heating/cooling switched on via the coil if required. ■ If a combination sensor for room air is installed (option), the system additionally controls the fresh air ratio depending on the air quality: – If there is no heat demand, the fresh air damper is opened 100% if the indoor air quality is too poor. – When the setpoint value for the CO_2 or VOC content of the room air is reached, the fresh air damper closes again to the set minimum value. **Notice** In order to save heating energy, the unit only operates with the set minimum fresh air rate when heat is required.		Fan ..... speed 2 Fresh air damper..... MIN-100 % open [1] Heating/cooling ..... 0-100 % [2] [1] A minimum value can be set [2] Depending on heat or cool demand
SA1	**Supply air speed 1** The same as SA2, but the fan operates at speed 1 (low air flow rate)		Fan ..... speed 1 Fresh air damper..... MIN-100 % open [1] Heating/cooling ..... 0-100 % [1] Fixed or variable (see above)

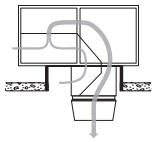
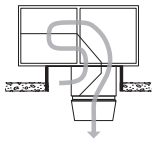
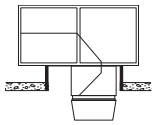
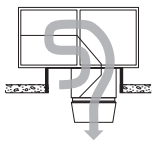
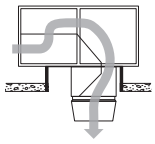
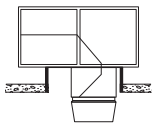
Code	Operating mode		Description
REC	**Recirculation** On/Off operation: during heat or cool demand, the unit draws in room air, heats or cools it and blows it back into the room. The room temperature set value day is active.		Fan ..... speed 1 / 2 [1] Fresh air damper..... closed Heating/cooling ..... 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 the temperature stratification, 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 ready for operation; the following operating modes are activated if required:		
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 over-heating 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
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

Table C3: Operating modes TopVent® SP

3 Technical data

3.1 Type code

SP - 6 - P ...

Unit type
TopVent® SP

Unit size
6 or 9

Heating/cooling section
P with coil type P for heat pump P
Q with coil type Q for heat pump Q

Further options

Table C4: Type code

3.2 Application limits

Heating mode				
Fresh air temperature (WB)		min.	°C	−25
		max.	°C	18
Air inlet temperature to the heating/cooling coil (DB)		min.	°C	5
		max.	°C	24
Cooling mode				
Fresh air temperature (DB)		min.	°C	−10
		max.	°C	48
Air inlet temperature to the heating/cooling coil (WB)		min.	°C	14
		max.	°C	26
Extract air temperature		max.	°C	50
Moisture content of extract air		max.	g/kg	15
Supply air temperature		max.	°C	45
Room temperature setpoint		min.	°C	12
		max.	°C	26
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 ■ Rooms with mineral oil vapours in the air ■ Rooms with a high salt content in the air ■ Rooms with acidic or alkaline vapours in the air				

Table C5: Application limits

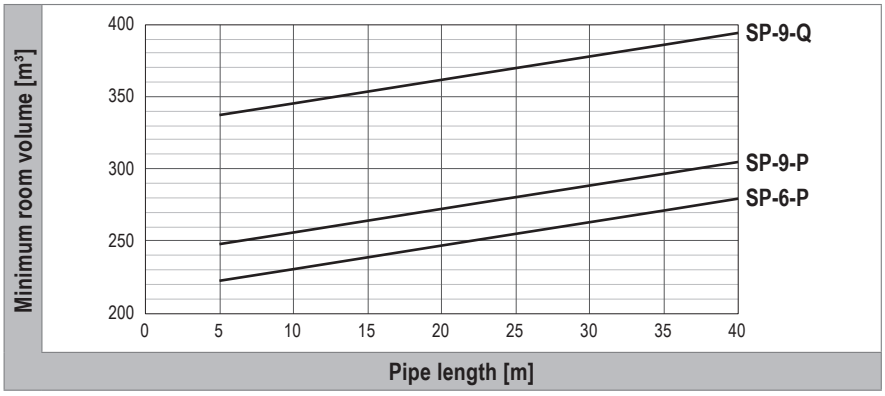


Fig. C3: Minimum room volume depending on the total refrigerant charge in accordance with EN 378

According to EN 378 (Refrigerating systems and heat pumps - Safety and environmental requirements), no additional safety measures for risk reduction are required for Hoval indoor climate units with heat pumps under the following conditions:

- The conditions according to EN 378 Annex C 3.1 are fulfilled.
- The room volume corresponds to the minimum values shown in Fig. C3 meaning that the permissible QLMV value is not exceeded.

3.3 Electrical connection

TopVent® SP

Unit type		SP-6	SP-9
Supply voltage	V AC	3 × 400	3 × 400
Permitted voltage tolerance	%	± 5	± 5
Frequency	Hz	50	50
Connected load	kW	2.1	3.2
Current consumption max.	A	3.6	5.3
Series fuse	A	13.0	13.0
Protection rating	–	IP 54	IP 54

Table C6: Electrical connection TopVent® SP

Heat pump

Heat pump		P	Q
Supply voltage	V AC	3 × 400	3 × 400
Permitted voltage tolerance	%	± 2	± 2
Frequency	Hz	50	50
Connected load	kW	16.8	2 × 15.9
Current consumption max.	A	26.9	2 × 25.5
Series fuse	A	32.0	2 × 32.0
Inrush current	A	5.9	2 × 5.9

Table C7: Heat pump electrical connections

3.4 Air flow rate

Unit type		SP-6	SP-9
Nominal air flow rate	m³/h	6000	9000
Floor area covered	m²	537	946

Table C8: Air flow rate

3.5 Air filtration

Filter	Fresh air / Extract air
Class acc. to ISO 16890	ePM_1 55 %
Class acc. to EN 779	F7
Factory setting of differential pressure switches	300 Pa

Table C9: Air filtration

3.6 Technical data of the heat pump

Heat pump			P	Q
Heating	Rated heat output [1]	kW	39.2	67.2
	Power consumption	kW	8.43	15.54
	COP	–	4.65	4.32
	$\eta_{s,h}$	–	204	197
	SCOP	–	5.17	4.99
Cooling	Rated cooling capacity [2]	kW	39.2	67.2
	Power consumption	kW	11.88	23.30
	EER	–	3.30	2.88
	$\eta_{s,c}$	–	339	315
	SEER	–	8.55	7.94
Refrigerant		–	R32	R32
Refrigerant fill volume		kg	11.4	2 × 8.5

1) With fresh air temperature 7 °C / extract air temperature 20 °C
2) With fresh air temperature 35 °C / extract air temperature 27 °C / 45 % rel. humidity

Table C10: Heat pump technical data

3.7 Heat output

t_F	t_{room}	Type	Q	H_{max}	t_S	P_{HP}
°C	°C	SP-	kW	m	°C	kW
-5	16	6-P	49.6	11.8	40.3	13.5
		9-P	49.6	15.1	32.1	13.5
		9-Q	85.2	11.7	43.8	25.6
	20	6-P	45.5	12.4	41.8	12.2
		9-P	45.5	16.1	34.3	12.2
		9-Q	78.0	12.4	45.0	22.9
-15	16	6-P	42.0	13.0	35.5	15.1
		9-P	42.0	15.1	28.6	15.1
		9-Q	71.8	13.0	38.4	29.3
	20	6-P	41.6	13.3	38.9	14.8
		9-P	41.6	17.4	32.0	14.8
		9-Q	71.2	13.2	41.8	28.9

Legend:
- t_F = Fresh air temperature
- t_{room} = Room air temperature
- Q = Heat output
- H_{max} = Maximum mounting height
- t_S = Supply air temperature
- P_{HP} = Power consumption of the heat pump

Reference:
- At room air temperature 16 °C: extract air temperature 18 °C
- At room air temperature 20 °C: extract air temperature 22 °C
- Fresh air ratio 10 %

Table C11: Heat output TopVent® SP

3.8 Cooling capacity

t_F	t_{room}	RH_{room}	Type	Q_{sen}	Q_{tot}	t_S	m_C	P_{HP}
°C	°C	%	SP-	kW	kW	°C	kg/h	kW
28	22	50	6-P	23.9	29.2	12.6	7.8	6.6
			9-P	23.4	29.2	16.7	8.5	6.6
			9-Q	40.2	50.1	11.1	14.6	12.1
		70	6-P	21.8	34.9	13.6	19.2	8.6
			9-P	23.3	38.3	16.7	21.9	9.5
			9-Q	38.2	62.7	11.8	35.9	17.1
32	26	50	6-P	29.3	41.4	13.9	17.7	11.6
			9-P	29.3	41.4	18.7	17.7	11.6
			9-Q	50.3	71.0	11.8	30.5	23.0
		70	6-P	23.4	44.8	16.8	31.5	12.5
			9-P	23.4	44.8	20.7	31.4	12.5
			9-Q	40.1	76.8	15.2	53.9	25.0

Legend:
- t_F = Fresh air temperature
- 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
- m_C = Condensate quantity
- P_{HP} = Power consumption of the heat pump

Reference:
- At room air temperature 22 °C: extract air temperature 24 °C
- At room air temperature 26 °C: extract air temperature 28 °C
- Fresh air ratio 10 %

Table C12: Cooling capacity TopVent® SP

3.9 Sound level

Unit type			SP-6		SP-9	
			Indoors	Outdoors	Indoors	Outdoors
Sound pressure level (at a distance of 5 m) [1]		dB(A)	55	47	59	50
Total sound power level		dB(A)	77	69	81	72
Octave sound power level	63 Hz	dB	45	44	47	45
	125 Hz	dB	61	55	65	58
	250 Hz	dB	67	63	70	64
	500 Hz	dB	71	65	73	66
	1000 Hz	dB	74	60	78	65
	2000 Hz	dB	70	59	76	65
	4000 Hz	dB	66	56	71	61
	8000 Hz	dB	65	57	66	57

1) with a hemispherical radiation pattern in a low-reflection room

Table C13: Sound level TopVent® SP

Heat pump

Heat pump			P		Q	
			Heating	Cooling	Heating	Cooling
Sound pressure level (at a distance of 5 m)		dB(A)	59.0	59.0	63.0	61.0
Total sound power level [1]		dB(A)	81.0	81.0	85.0	83.0
Octave sound pressure level [2]	63 Hz	dB	62.5	63.6	68.7	67.4
	125 Hz	dB	58.5	58.6	62.4	59.9
	250 Hz	dB	60.1	57.7	62.2	60.8
	500 Hz	dB	58.6	58.4	60.8	59.7
	1000 Hz	dB	54.3	52.2	57.6	56.4
	2000 Hz	dB	51.6	49.8	54.5	53.6
	4000 Hz	dB	53.0	52.8	49.9	50.4
	8000 Hz	dB	46.7	45.9	49.2	48.2

1) The values given are maximum values; the noise level is fluctuating due to scroll technology.
2) Measured at a distance of 1 m in front of the unit and 1 m above the floor in a semi-anechoic chamber.

Table C14: Heat pump sound level

For particularly quiet unit operation (e.g. during the night), the heat pump can be operated in silent mode. It then runs at a reduced speed of the compressor and/or fan, which also leads to a reduced capacity output depending on the setting parameters.

Silent mode	Noise reduction	Capacity level	
		Heat pump P	Heat pump Q
Level 1	− 3 dB	100 %	100 %
Level 2	− 6 dB	95 %	80 %
Level 3	− 9 dB	75 %	55 %

Table C15: Noise reduction and capacity output in silent mode

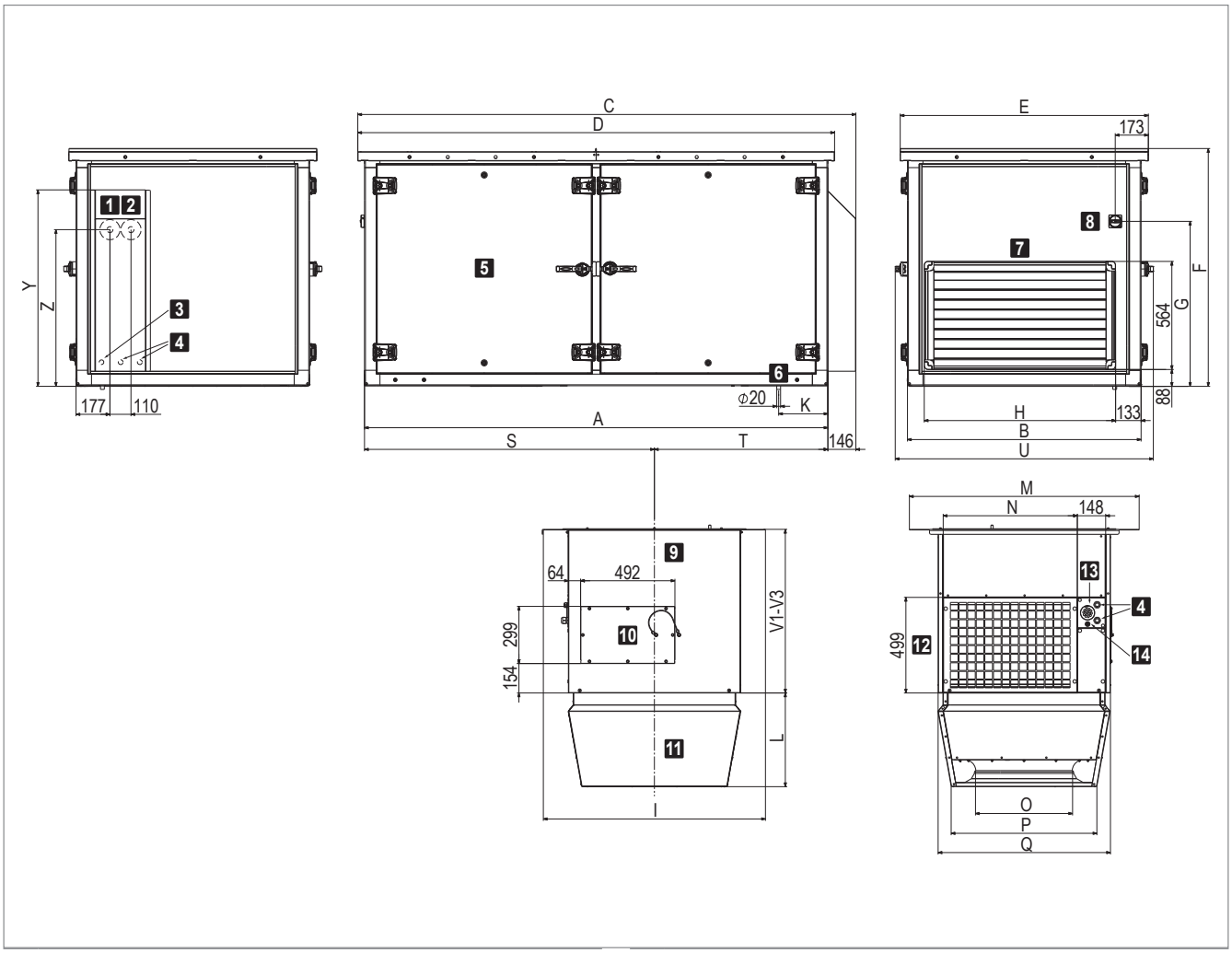
3.10 Product information according to ErP

Trademark / Model		Hoval TopVent® SP			Unit
		6-P	9-P	9-Q	
Type		NRVU, UVU			–
Drive		Variable speed drive			–
Heat recovery system		none			–
Thermal efficiency of heat recovery (η_{t_nrvu})		–			%
Nominal flow rate (q_{nom})		1.67	2.5	2.5	m³/s
Effective electric power input (P)		1.2	2.3	2.3	kW
Internal specific fan power (SFP_{int})		162	65	65	W/(m³/s)
Face velocity		3.106	3.273	3.273	m/s
Nominal external pressure ($\Delta p_{s, ext}$)	Supply air	0	0	0	Pa
	Extract air	–	–	–	
Internal pressure drop of ventilation components ($\Delta p_{s, int}$)	Fresh air/supply air	–	–	–	Pa
	Extract air/exhaust air	–	–	–	
Static efficiency of the fans (η_{fan}) in accordance with Regulation (EU) No 327/2011		69.0	63.6	63.6	%
Maximum leakage rate	External	≤ 1	≤ 1	≤ 1	%
	Internal	–	–	–	
Energy classification of the filters (class acc. to ISO 16890, final pressure difference)	Supply air ePM_1 55 %	D	D	D	–
	Extract air ePM_{10} 65 %	–	–	–	
Visual filter warning		Displayed on the operating unit			–
Casing sound power level (L_{WA})		77	81	81	dB(A)
Disassembly instructions		Devices that are no longer functional must be dismantled by a specialist company and disposed of at suitable collection points.			–
Contact		Hoval Aktiengesellschaft Austrasse 70, 9490 Vaduz, Liechtenstein www.hoval.com			

Table C16: Product information according to Commission Regulation (EU) 1253/2014, Article 4(2)

3.11 Dimensions and weights

TopVent® SP



1	Feedthrough for gas line (Ø 23…75 mm)	8	Isolation switch
2	Feedthrough for liquid line (Ø 23…75 mm)	9	Connection module
3	Cable feedthrough for signal cables heat pump	10	Installation lid
4	Cable feedthrough for power supply heat pump (2 × for heat pump Q)	11	Air-Injector
5	Roof unit	12	Extract air grille
6	Condensate drain	13	Cable feedthrough for signal cables
7	Weather protection	14	Cable feedthrough for power supply TopVent®

Table C17: TopVent® SP dimensional drawing

Unit type		SP-6	SP-9
A	mm	2420	2725
B	mm	1220	1420
C	mm	2601	2906
D	mm	2490	2795
E	mm	1290	1490
F	mm	1239	1439
G	mm	862	962
H	mm	999	1199
I	mm	1160	1360
K	mm	257	292
L	mm	490	570
M	mm	1200	1400
N	mm	701	901
O	mm	500	630
P	mm	767	937
Q	mm	900	1100
S	mm	1514	1684
T	mm	906	1041
U	mm	1348	1548
V1	mm	850	850
V2	mm	1300	1300
V3	mm	1750	1750
Y	mm	1025	1125
Z	mm	818	935

Table C18: TopVent® SP dimensions

Unit type		SP-6	SP-9
Gas line connection	mm	Ø 28	Ø 28
Liquid line connection	mm	Ø 12	Ø 22

Table C19: Refrigerant pipe connections in the roof unit

Unit type		SP-6	SP-9
Total	**kg**	**717**	**924**
Roof unit	kg	575	742
Below-roof unit	kg	142	182
Air-Injector	kg	40	57
Connection module V1	kg	102	125
Additional weight V2	kg	+ 42	+ 50
Additional weight V3	kg	+ 85	+ 101

Table C20: TopVent® SP weights

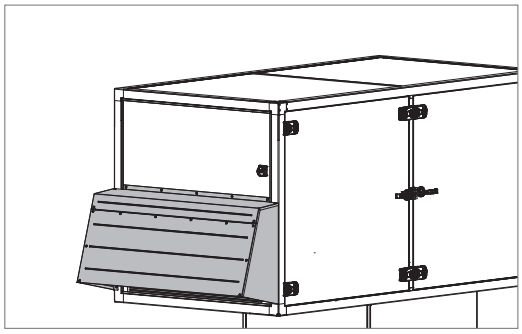
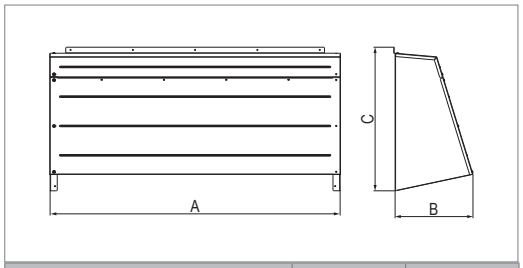


Fig. C4: Fresh air inlet with protection hood

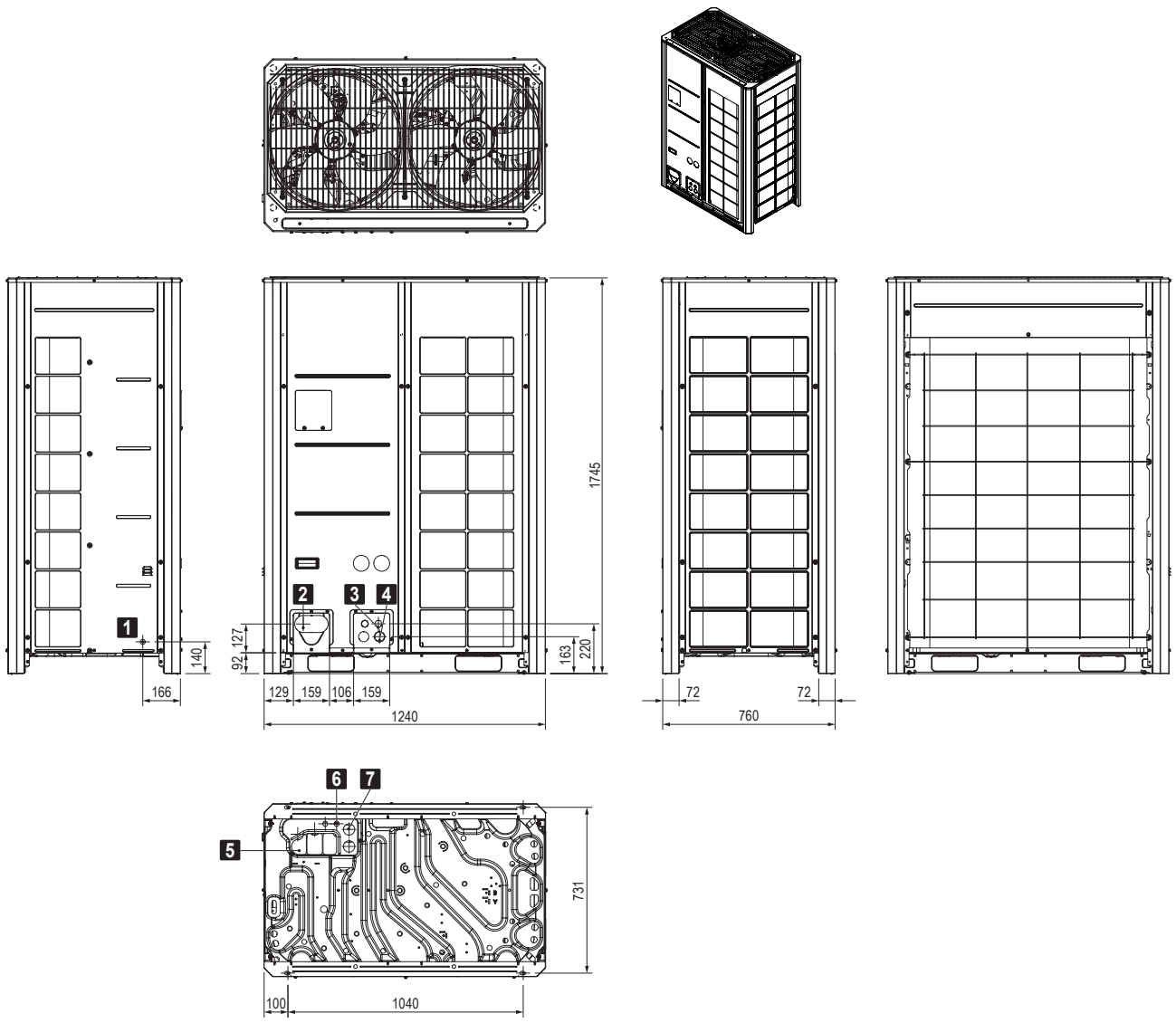


Size		6	9
A	mm	1220	1420
B	mm	377	381
C	mm	603	703
Weight	kg	11.2	13.6

Table C21: Protection hood dimensions and weights

C

Heat pump P

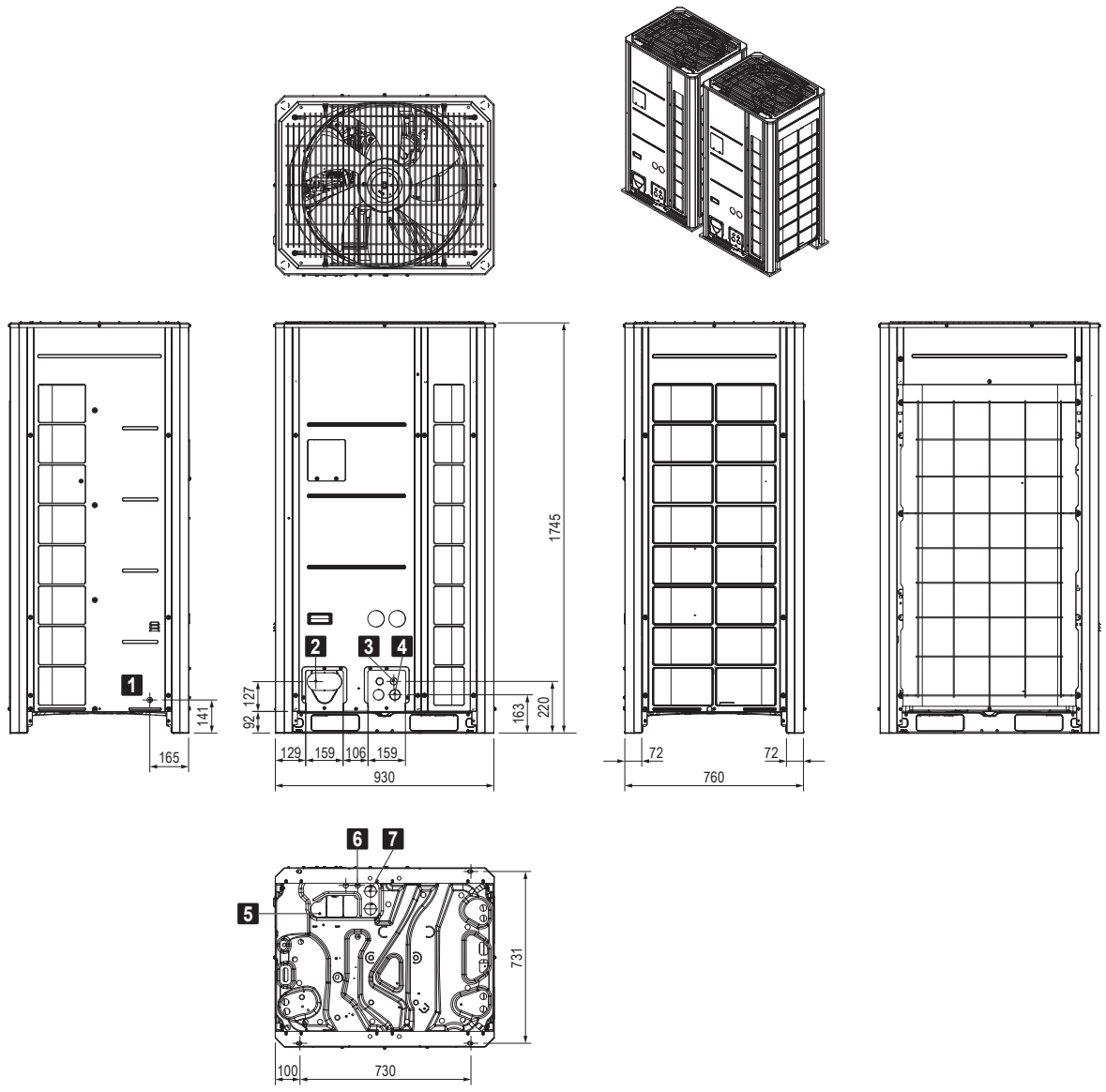


1	Opening for leak-tightness test	
2	Opening for refrigerant pipes (front)	
	■ Liquid line connection	Ø 12.7 mm
	■ Gas line connection	Ø 22.2 mm
3	Opening for signal lines (front)	
4	Opening for mains cable (front)	
5	Opening for refrigerant pipes (bottom)	
6	Opening for signal lines (bottom)	
7	Opening for mains cable (bottom)	

Heat pump		P
Weight	kg	255

Fig. C5: Heat pump P dimensions and weights

Heat pump Q



1	Opening for leak-tightness test	
2	Opening for refrigerant pipes (front)	
	■ Liquid line connection	Ø 12.7 mm
	■ Gas line connection	Ø 22.2 mm
3	Opening for signal lines (front)	
4	Opening for mains cable (front)	
5	Opening for refrigerant pipes (bottom)	
6	Opening for signal lines (bottom)	
7	Opening for mains cable (bottom)	

Heat pump		Q
Weight	kg	2 × 215

Fig. C6: Heat pump Q dimensions and weights

4 Specification texts

4.1 TopVent® SP

Supply air unit with reversible heat pump system for ventilating, heating and cooling spaces up to 25 m in height; configured as roof unit; equipped with highly efficient air distributor.

The unit consists of the following components:
- Roof unit (with access to all components relevant for maintenance)
- Below-roof unit:
  - Connection module
  - Air-Injector
- Optional components

The heat pump system consists of the following components:
- Heat pump
- Communication kit
- EEV kit
- Branch joint kit (only for heat pump Q)

The TopVent® SP unit complies with all the requirements of the Ecodesign Directive 2009/125/EC relating to environmentally friendly design of ventilation systems. It is a system of the «non-residential ventilation unit» (NRVU) and «unidirectional ventilation unit» (UVU) type, provided for in Commission Regulation (EU) 1253/2014.

Roof unit

Self-supporting casing, construction made of thermally decoupled aluminium profile frame system with nylon connecting elements and panels made of coated zinc sheet (anthracite grey, similar to RAL 7016), additional rain canopy made of aluminium:
- Weatherproof, corrosion resistant, impact resistant, air-tight
- Low flammability, double-shelled, without heat bridges, with highly efficient insulation made of expanded polystyrene
- Hygienic and easy to maintain because of smooth interior surfaces and large access doors with ageing-resistant, silicone-free sealing materials

The roof unit includes:

Fan
Configured as maintenance-free, directly driven radial fan with high-efficiency EC motor, backwards-curved, 3D contoured blades and free-running rotor made of a high-performance composite material, aerodynamically optimised inflow nozzle, low-noise, with integrated overload protection.

Heating/cooling section
The heating/cooling section contains:
- The highly efficient heating/cooling coil consisting of seamless copper pipes with pressed-on, optimised and profiled aluminium fins, manifold made of copper and injection distributor
- 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 drain on the roof via siphon

Fresh air filter
Pleated cell filter of filter class ePM_1 55% according to ISO 16890, consisting of micro glass with synthetic lamination as handle protection, pleat pack completely encapsulated to prevent leakage, frame made of recycled plastic, fully incinerable, including differential pressure switch for filter monitoring.

Extract air filter
Pleated cell filter of filter class ePM_1 55% according to ISO 16890, consisting of micro glass with synthetic lamination as handle protection, pleat pack completely encapsulated to prevent leakage, frame made of recycled plastic, fully incinerable, including differential pressure switch for filter monitoring.

Fresh air damper
Damper consisting of sheet steel blades with sealing lip and plastic gearwheels; tightness class 4 according to EN 1751; including actuator with shut-off function by spring return.

Recirculation damper
Damper consisting of sheet steel blades with plastic gearwheels; tightness class 2 according to EN 1751; including actuator.

Unit control box
Control box for connection of the power supply and housing the control components that facilitate energy-optimised operation, controlled by the control system TopTronic® C. Plastic casing, protection rating IP 56. The following components are installed:
- Circuit board with all required electrical components, unit controller (clipped on)

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, actuators in the unit and the isolation switch attached to the outside of the unit are fully factory-wired.
Power supply, bus connection, connection to Air-Injector actuator to be installed on site.

Access openings
Defined side walls of the roof unit configured as inspection doors for easy access to all components relevant for maintenance. The hinges allow opening with an opening angle of 90° or complete removal of the inspection doors.

Heat pump connection
Side wall of the roof unit designed with:
- Pipe feedthroughs for the refrigerant pipes, equipped with grommets for airtight sealing
- Cable feedthrough for signal cable and power supply
- Protection hood for the connections, supplied loose with the appropriate connecting screws.

On-site: Installation and insulation of the pipelines in the roof unit, heat pump signal cable, mounting of the protection hood to the roof unit

Below-roof unit

Connection module V1
Housing made of magnesium zinc sheet, air-tight, flame retardant, with highly efficient insulation made of expanded polystyrene, hygienic and easy to maintain because of smooth interior surfaces and ageing-resistant, silicone-free sealing materials; configured with:
- Extract air grille
- Cable feedthroughs for the electric supply

Connection module V2 / V3 (variant)
The connection module is extended for adapting to the local installation situation.

Design with Air-Injector
Housing made of magnesium zinc sheet, air-tight, hygienic and easy to maintain because of ageing-resistant, silicone-free sealing materials, internally insulated with closed-cell polyethylene foam, 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
  - for the rapid and large-area reduction of temperature stratification in the room through induction of secondary air and strong mixing of the room air with supply air

Actuator installed in the connection module for easy access from the roof.

Design without Air-Injector (variant)
Unit configured without vortex air distributor for connection to an on-site supply air duct and air distribution within the building.

Air distribution box (variant)
Housing made of magnesium zinc sheet, air-tight, hygienic and easy to maintain because of ageing-resistant, silicone-free sealing materials, insulated on the inside with closed-cell polyethylene foam; configured with 2 collars as connecting piece to the on-site air distribution system.

Options for the unit

Paint finish of below-roof unit
Exterior painting of the below-roof unit in choice of RAL colour.

Supply air silencer
Designed as a sound-absorbing mat made of melamine foam; hygienically perfect with carbon fibre coating; mounted in the roof unit; insertion loss 3 dB.

Roof frame
Consisting of 4 load-bearing side walls made of galvanised sheet steel with fastening rails for the roof foil, supplied loose with the matching connecting screws.
Assembly, insulation, integration in the roof structure on site.

Heat pump system

Highly efficient air-to-air heat pump system in split design with continuously modulating inverter technology for precise capacity control, reversible for heating and cooling the supply air, consisting of the following components:

Heat pump P
- Compact unit for outdoor installation
- Galvanised sheet steel casing, painted in RAL 7038 (agate grey) / RAL 7037 (dusty grey)
- Variable-speed inverter scroll compressor
- 2 speed-controlled fans
- Coated Al/Cu finned-tube evaporator or condenser
- Electronic expansion valve (for heating mode)
- 4-way valve
- Refrigerant shut-off valves
- Refrigerant R32
- Terminal box

Heat pump Q
- Cascade consisting of 2 compact devices for outdoor installation
- Galvanised sheet steel casing, painted in RAL 7038 (agate grey) / RAL 7037 (dusty grey)
- 1 variable-speed inverter scroll compressor per single unit
- 1 speed-controlled fan per single device per single unit
- Coated Al/Cu finned-tube evaporator or condenser
- Electronic expansion valve (for heating mode)
- 4-way valve
- Refrigerant shut-off valves

- Refrigerant R32
- Terminal box

Communication kit PQ
Printed circuit board assembly for communication between heat pump, expansion valve and indoor climate unit and for recording the temperatures at the heating/cooling coil. Mounted and fully wired in the roof unit of the indoor climate unit.

EEV kit P
Galvanised sheet steel casing, with 1 electronic expansion valve for cooling mode, thermally insulated and protected against mechanical damage. Mounted in the roof unit of the indoor climate unit.

EEV kit Q
Galvanised sheet steel casing, with 2 electronic expansion valves for cooling mode, thermally insulated and protected against mechanical damage. Mounted in the roof unit of the indoor climate unit.

Branch joint kit Q
For connecting the refrigerant lines of the single units in heat pump Q, consisting of 2 copper Y branch joints.

4.2 TopTronic® C – System control

Zone-based control system for the energy-optimised operation of decentralised Hoval indoor climate systems. Maximum system size per system bus: 64 control zones with up to 10 supply and extract air handling units or supply air units and 10 recirculation units each.

Zone allocation
Configured in advance for the customer at the factory:

	Room designation	Unit type
Zone 1:	_____	_____
Zone 2:	_____	_____
…		

System structure
- Zone control panel made of coated sheet steel (light grey RAL 7035), … x … x … mm, with:
  - System operator terminal
  - Fresh air temperature sensor
  - 1 zone controller and 1 room temperature sensor per zone (expandable to up to 4 room temperature sensors per zone)
  - Safety relay
  - Electrical cabinet internally pre-wired, all components routed to terminals
- Zone bus: as serial bus for communication with all controllers in one control zone, with robust bus protocol via shielded, twisted bus cable (provided by the client)
- Unit controller: installed in the particular indoor climate unit, works autonomously according to the specifications of the zone controller
- Heating/cooling demand per zone with feedback monitoring

Functions, standard
- Zone-based autonomous room control. Temperature and ventilation control separately adjustable for each zone
- Room temperature control via room-supply air cascade by means of energy-optimised double sequence control with priority circuit for energy recovery (supply and extract air handling units)
- Intelligent automatic heating to reach the desired room temperature at the switching time
- 5 adjustable room temperature set values per zone:
  - Cooling protection (lower setpoint in standby)
  - Overheating protection (upper setpoint in standby)
  - Room set value winter
  - Room set value summer
  - Night cooling set value (free cooling) (supply and extract air handling units, supply air units)
- Destratification mode for even temperature distribution

- Main operating modes of supply and extract air handling units:
  VE .... Ventilation, infinitely variably adjustment
  AQ.... Air quality, automatic control with Hoval combination sensor (option), optional reference variable:
  – CO_2 or VOC
  – Air humidity (optimised dehumidification mode)
  REC . Recirculation, infinitely variably adjustment
  DES.. Destratification
  EA .... Exhaust air, infinitely variably adjustment
  SA .... Supply air, infinitely variably adjustment
  ST .... Standby

- Main operating modes of supply air units:
  REC . Recirculation, infinitely variably adjustment
  DES.. Destratification
  SA .... Supply air, infinitely variably adjustment
  With Hoval combination sensor (option) also demand-driven control of the fresh air ratio, optional reference variable CO_2 or VOC
  ST .... Standby

- Main operating modes of recirculation units:
  REC . Recirculation, infinitely variably adjustment
  DES.. Destratification
  ST .... Standby

- Forced heating (construction site heating) can be activated on each device before completion of the overall system (activation by Hoval service technician)
- Control of draught-free air distribution with the Hoval Air-Injector: the discharge direction is adjusted infinitely variably and automatically according to the respective operating condition and the existing temperatures (heating/cooling).

Operation
- TopTronic® C-ST system operator terminal: touch panel for visualisation and control of all Hoval indoor climate units registered on the bus

Options for operation
- Activation of the system operator terminal for VNC access, for visualisation on customer's PC
- TopTronic® C-ZT as zone operator terminal: for simple on-site operation of a control zone
- Manual operating selector switches
- Manual operating selector buttons
- Operating of the units via building management system via standardised interfaces:
  – BACnet
  – Modbus IP
  – Modbus RTU

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.
- A maintenance mode implemented in the control algorithm for testing all physical data points and alarms guarantees high reliability.
- Pre-programmed data points retrievable via logger function for 1 year

Options for the zone control panel
- Alarm lamp
- Socket

Per zone:
- The change-over between heating and cooling can be either automatic or manual
  – Cooling lock switch for automatic changeover
  – Heating/cooling switch for manual changeover
- Additional room temperature sensors (max. 3)
- Combination sensor room air quality, temperature and humidity
- Combination sensor fresh air temperature and humidity
- Transfer of actual values and setpoints from external systems (0…10 V; 4 - 20 mA)
- Load shedding input
- Signal for external extract air fan
- Operating selector switches on terminal
- Operating selector button on terminal
- Control of distributor pump, incl. power supply
- Control box TW Pro

Power distribution:
- Circuit breakers and output terminals for Hoval indoor climate units
- Safety relay (4-pin)

4.3 TopTronic® C – Single zone control panel

Control system for the energy-optimised operation of decentralised Hoval indoor climate systems. Maximum system size: 1 control zone with up to 10 supply and extract air handling units or supply air units and 10 recirculation units.

System structure

- Zone control panel, designed as compact cabinet for wall installation, made of coated sheet steel (light grey RAL 7035), 380 × 300 × 210 mm, with:
  - System operator terminal
  - Fresh air temperature sensor
  - Zone controller
  - 1 Room temperature sensor (expandable to up to 4 room temperature sensors)
  - Safety relay
  - Electrical cabinet internally pre-wired, all components routed to terminals
- Zone bus: as serial bus for communication with all controllers in the control zone, with robust bus protocol via shielded, twisted bus cable (provided by the client)
- Unit controller: installed in the particular indoor climate unit, works autonomously according to the specifications of the zone controller
- Circuit board with external connections for:
  - Power supply
  - Zone bus
  - Room temperature sensors (max. 4)
  - Fresh air temperature sensor
  - Combination sensor room air quality, temperature and humidity
  - Collective alarm
  - Forced off
  - Heating demand
  - Setpoint heating demand
  - Fault heat supply
  - Cooling demand
  - Fault cold supply
  - External enabling heating/cooling (for automatic changeover)
  - External setting heating/cooling (for manual changeover)
  - Changeover valves heating/cooling
  - External setpoint fresh air ratio
  - Operating selector switch on terminal (digital)
  - Operating selector button on terminal

Functions, standard

- Room temperature control via sequential control of the coils
- Room temperature control via room-supply air cascade by means of energy-optimised double sequence control with priority circuit for energy recovery (supply and extract air handling units)
- Intelligent automatic heating to reach the desired room temperature at the switching time
- 5 adjustable room temperature set values per zone:
  - Cooling protection (lower setpoint in standby)
  - Overheating protection (upper setpoint in standby)
  - Room set value winter
  - Room set value summer
  - Night cooling set value (free cooling) (supply air units)
- Destratification mode for even temperature distribution

- Main operating modes of supply and extract air handling units:
  VE .... Ventilation, infinitely variably adjustment
  AQ.... Air quality, automatic control with Hoval combination sensor (option), optional reference variable CO_2 or VOC
  REC . Recirculation, infinitely variably adjustment
  DES.. Destratification
  EA .... Exhaust air, infinitely variably adjustment
  SA .... Supply air, infinitely variably adjustment
  ST .... Standby

- Main operating modes of supply air units:
  REC . Recirculation, infinitely variably adjustment
  DES.. Destratification
  SA .... Supply air, infinitely variably adjustment
  With Hoval combination sensor (option) also demand-driven control of the fresh air ratio, optional reference variable CO_2 or VOC
  ST .... Standby

- Main operating modes of recirculation units:
  REC . Recirculation, infinitely variably adjustment
  DES.. Destratification
  ST .... Standby

- Forced heating (construction site heating) can be activated on each device before completion of the overall system (activation by Hoval service technician)
- Control of draught-free air distribution with the Hoval Air-Injector: the discharge direction is adjusted infinitely variably and automatically according to the respective operating condition and the existing temperatures (heating/cooling).

Operation

- TopTronic® C-ST system operator terminal: touch panel for visualisation and control of all Hoval indoor climate units registered on the bus

Options for operation

- Activation of the system operator terminal for VNC access, for visualisation on customer's PC
- Operating of the units via building management system via standardised interfaces:
  - BACnet
  - Modbus IP
  - Modbus RTU

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.
- A maintenance mode implemented in the control algorithm for testing all physical data points and alarms guarantees high reliability.
- Pre-programmed data points retrievable via logger function for 1 year

Options for the zone control panel
- Additional room temperature sensors (max. 3)
- Combination sensor room air quality, temperature and humidity
- Signal for external extract air fan
- Control box TW Pro

4.4 HovalSupervisor cloud TopTronic® C

(Terms of use according to www.hoval.com/hsc are accepted when ordered.)

HovalSupervisor cloud TopTronic® C
Remote access, visualisation, historization, trends, evaluations and alarming for Hoval indoor climate systems with TopTronic® C control
- Project-specific system engineering
- Visualisation of the system statuses, error messages, actual and nominal values of the entire plant system
- Graphical display of the entire plant control system, in order to complete an analysis of sequences and subsequently to be able to perform an optimisation
- Integrated continuous line recorder for a period of 3 years
- Integrated alarm management
- Multi-user system: simultaneous access, 2 users included per plant
- Max. 300 data points historicized
- Max. 10 control zones

Consisting of:
- Project-specific engineering of the visualisation as described above
- Industrial router for connecting the TopTronic® C control system
  - Metal casing installed in the zone control panel
  - Without SIM card, free choice of phone network
  - Router configuration possible via web server
  - Network connections:
    2 x 10/100Mbit Ethernet
    2 x SIM card slot
  - SMA connections:
    1 x WLAN
    2 x mobile data via integrated antenna
  - Power supply for industrial router installed in zone control panel

HovalSupervisor cloud TopTronic® C subscription
Subscription for use of the HovalSupervisor cloud for visualisation of a TopTronic® C system
- 1 year term (subscription billed once a year)
- Use of the HovalSupervisor cloud and storage of the data in the cloud
- Paid support during business hours (only for the software, not for the system)
- The respective valid conditions of use and the service level agreement (SLA) apply, which can be retrieved online.

Options for HovalSupervisor cloud

- Antenna to improve mobile data reception in conjunction with the HovalSupervisor cloud TopTronic® C
  - Antenna with mounting bracket for on-site installation outside the TopTronic® C zone control panel
  - 2G/3G/4G-LTE/5G-ready
  - SMA port available on the antenna
- Antenna extension cable for connecting the antenna in conjunction with the HovalSupervisor cloud
  - SMA port
  - Double shielded
  - Length: 5 m

Options

1 Type code

CP - 6 - P / ST . V1 . D1 / -- . CL . Z / - . -- / TC . -- . --

Unit type

CP	TopVent® CP
SP	TopVent® SP

Unit size

6 or 9

Heating/cooling section

P	with coil type P for heat pump P
Q	with coil type Q for heat pump Q (only for size 9)

Design

ST	Standard

Connection module

V1	Standard
V2	Length + 450 mm
V3	Length + 900 mm

Air outlet

D1	Design with Air-Injector
D0	Design without Air-Injector
DB	Air distribution box

Surface

--	Standard
CL	Paint finish of below-roof unit (as desired)

Silencer

-	without
Z	Supply air silencer

Control system

TC	TopTronic® C

Table D1: Type code

2 Connection module

The connection module is available in 3 lengths for adapting the unit to local conditions.

The connection module V3 is equipped with 2 installation lids.

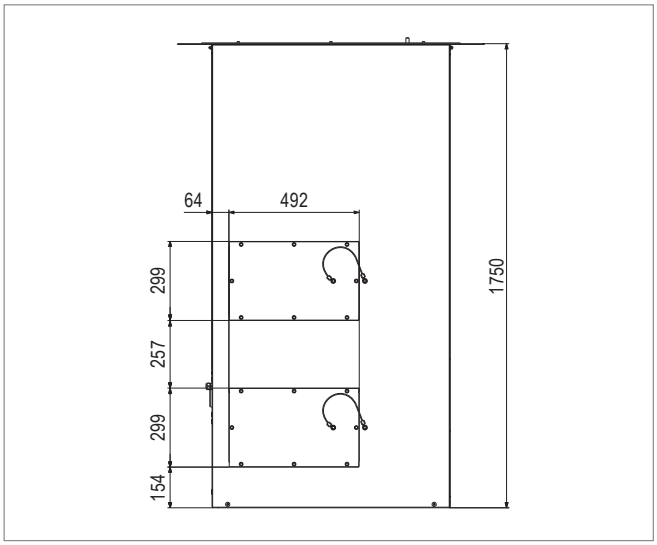
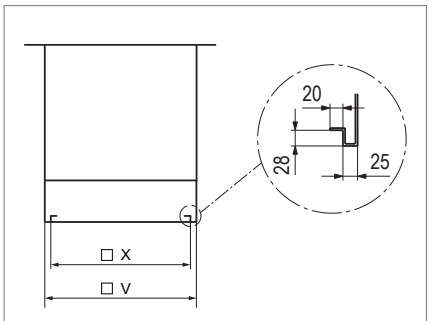


Fig. D1: Installation lids in connection module V3

3 Design without Air-Injector

TopVent® units in the design without Air-Injector are suitable for connecting to an air distribution system supplied by the client.



Size	6	9
X	850	1050
V	900	1100

Table D2: Supply air duct connection dimensions (in mm)

4 Air distribution box

For easy connection to ventilation ducts or fabric sleeves, TopVent® units are available with an air distribution box. This has a collar on 2 opposite sides as a connection piece to the on-site air distribution system.
The air distribution box replaces the Air-Injector.

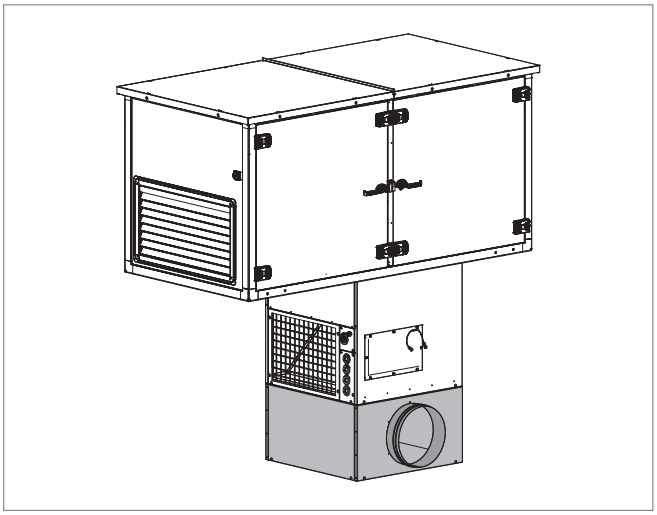
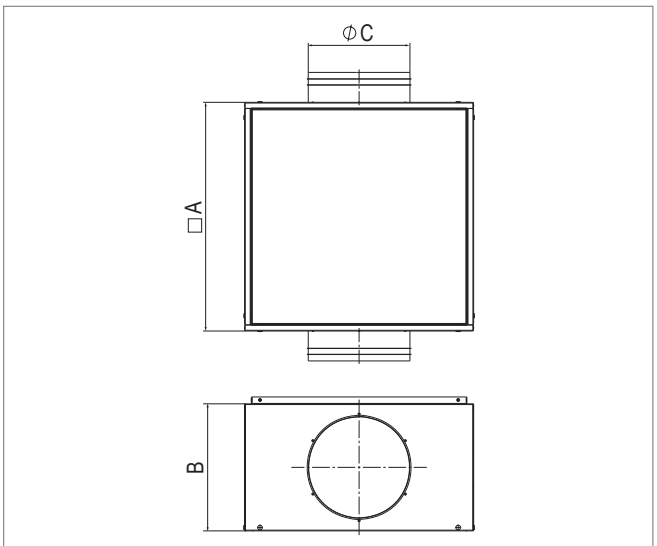


Fig. D2: TopVent® unit with air distribution box



Size		6	9
A	mm	900	1100
B	mm	500	500
C	mm	400	400
Weight	kg	32	40

Table D3: Air distribution box dimensions and weights

5 Paint finish of below-roof unit

On request, the below-roof unit can be provided with an exterior painting in choice of RAL colour.

6 Supply air silencer

The supply air silencer reduces noise emissions from TopVent® units. It consists of a sound-absorbing mat made of melamine foam and is mounted above the fan on the casing ceiling. Insertion attenuation is 3 dB compared with the total sound power level of each TopVent® unit. Weight: 20 kg.

7 Roof frame

For easy installation of the TopVent® units in the roof, suitable roof frames are available as accessories. The roof frames consist of 4 load-bearing side walls made of galvanised sheet steel with fastening rails for the roof foil. They are supplied loose with the appropriate connecting screws for assembly on site.

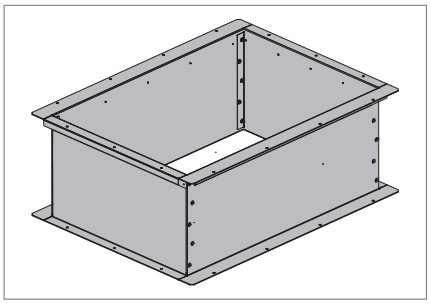


Fig. D3: Roof frame

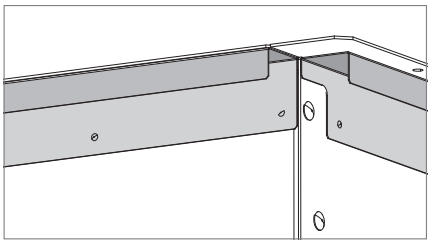
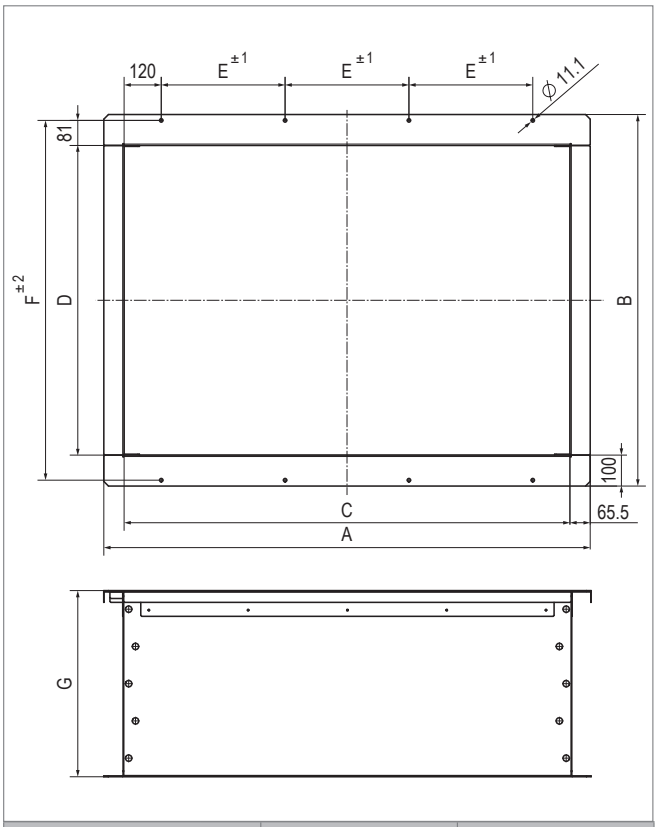


Fig. D4: Fastening rails for the roof foil



Size		6		9	
Type		RF-60-6	RF-80-6	RF-60-9	RF-80-9
A	mm	1571		1771	
B	mm	1200		1400	
C (inner dimension)	mm	1440		1640	
D (inner dimension)	mm	1000		1200	
E	mm	400		466.5	
F	mm	1162		1362	
G	mm	600	800	600	800
Weight	kg	101	125	116	144

Table D4: Roof frame dimensions and weights

Transport and installation

1 Installation

1.1 Preparation

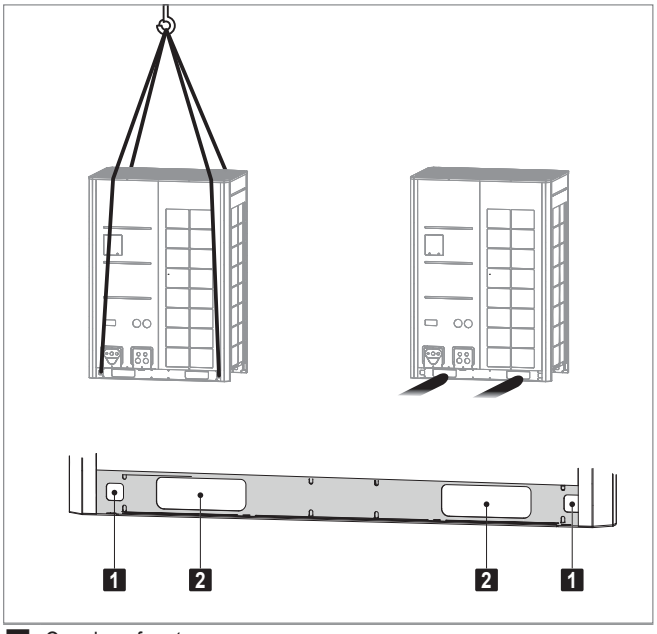
The scope of delivery includes:
- TopVent® unit including communication kit and EEV kit, delivered in 2 parts on pallets (roof unit, below-roof unit)
- Heat pump
- Accessories (lifting kit, transport eyes, installation material, temperature sensors)
- Optional components

The units are installed in or on the roof. A crane or helicopter is required.

TopVent® unit
- Transport eyes are supplied for lifting the below-roof unit.
  - Use lifting ropes at least 2 m in length to lift the below-roof unit.
- A lifting kit is supplied for lifting the roof unit.
  - Use lifting straps at least 3 m in length to lift the roof unit.
- Use the roof frames available as accessories for quick and easy installation of the TopVent® units in the roof.
- A sealing compound is required for sealing (e.g. Sikaflex® -221).

Notice
Provide suitable protective devices and make sure the units can be accessed easily. The roof of the TopVent® units cannot be walked on.

Heat pump
- Lifting the heat pump with a crane:
  - Lift the unit at 4 suspension points.
  - Use 2 straps at least 8 m in length.
  - Pass the straps through the openings at the bottom of the unit.
  - Use cloths or boards to protect the points where the unit comes into contact with the straps.
- Lifting the heat pump with a forklift:
  - Transport to the installation site: Lift the unit under the pallet.
  - Unloading from the pallet: Guide the forklift tines into the large rectangular openings under the device.



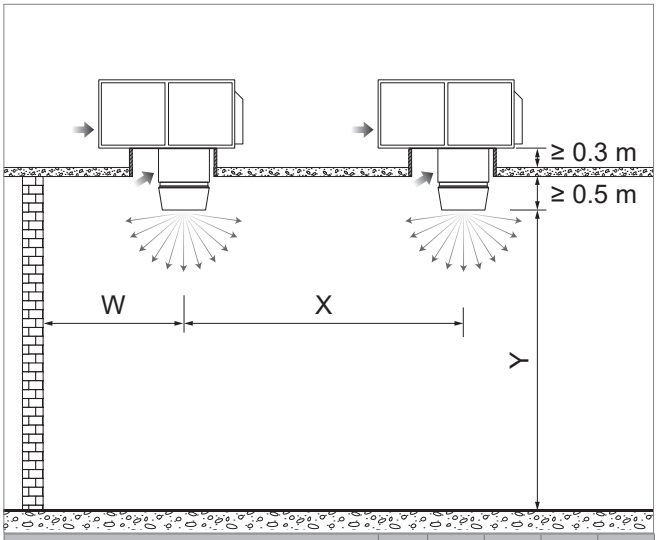
1 Openings for straps
2 Openings for forklift

Fig. E1: Lifting the heat pump

1.2 Positioning

TopVent® unit

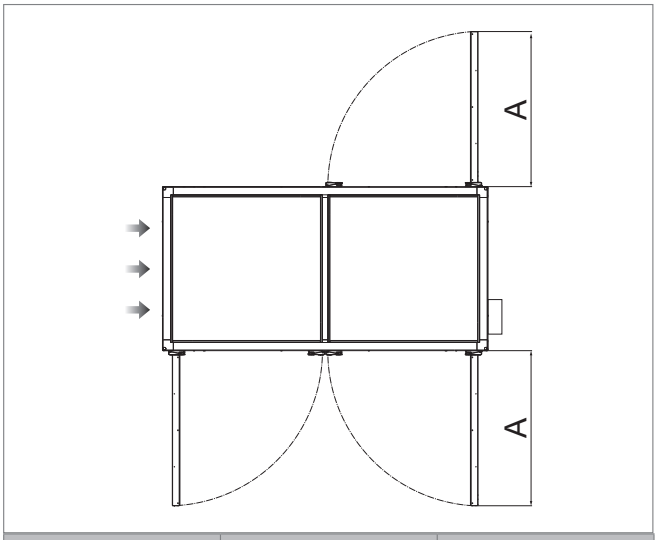
- Comply with the minimum and maximum distances.
- All air inlet and air outlet openings must be freely accessible. The supply air jet must be free to spread out unhindered.
- The access doors in the roof unit must be freely accessible and there must be sufficient space for maintenance work.
- Make sure that supply air units draw in fresh air through the fresh air damper:
  - Not impaired by exhaust air openings, flues or the like
  - Roof frame protruding at least 300 mm from the roof



Unit type			CP-6	CP-9	SP-6	SP-9
Mounting height Y	max. [1]	m	Approx. 9…25			
	min.	m	4	5	4	5
Applications with higher comfort requirements						
■ Distance from wall W	max.	m	12	15	12	15
	min.	m	6	7	6	7
■ Unit clearance X	max.	m	23	31	23	31
	min.	m	12	14	12	14
Applications with low comfort requirements						
■ Distance from wall W	max.	m	15	20	–	–
	min.	m	6	7	–	–
■ Unit clearance X	max.	m	30	41	–	–
	min.	m	12	14	–	–

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)

Fig. E2: Minimum and maximum distances



Size	6	9
A	1165	1315

Fig. E3: Space requirements for opening the access doors (dimensions in mm)

Heat pump

- Place the heat pump as close as possible to the indoor climate unit, in a well ventilated location.

> **Notice**
> Excessively long refrigerant lines reduce the efficiency of the system. Place the heat pump as close as possible to the indoor climate unit.

- Note the following when choosing a location:
  - Not near a heat source with high temperature
  - Not in locations where dust or dirt can affect the heat exchangers
  - Not in locations with mineral oil vapours in the air
  - Not in locations with acidic or alkaline vapours in the air
  - Not in locations with a high salt content in the air
- Heat pump Q: Place the two single units as close to each other as possible.
  - The maximum length of the refrigerant pipes between the two single units is 10 m.

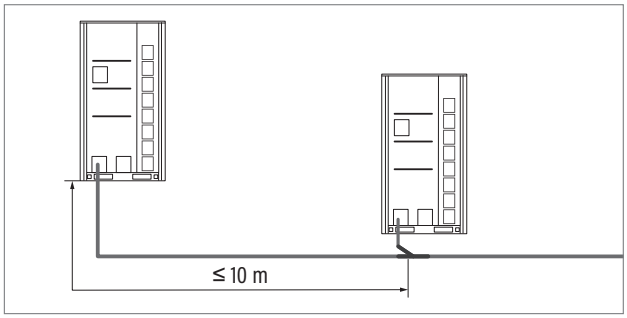


Fig. E4: Maximum length of the refrigerant pipes

- Observe the minimum distances for sufficient air flow through the heat pump.

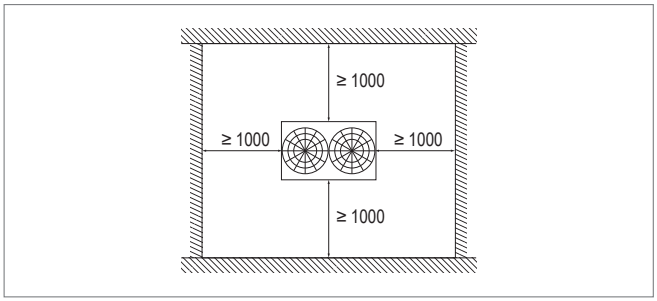


Fig. E5: Minimum distances for the heat pump P (dimensions in mm)

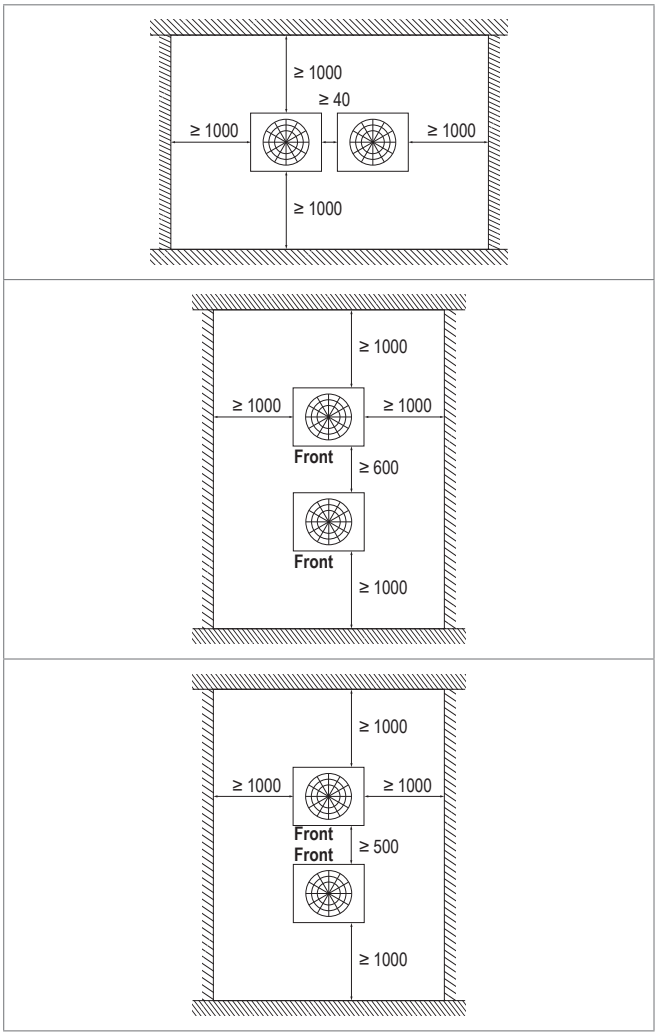


Fig. E6: Minimum distances for the heat pump Q (dimensions in mm)

- Place the heat pump on a solid base with sufficient load-bearing capacity to avoid vibrations and noise.
- Install the heat pump on a solid base or on support blocks made of concrete or steel:
  - The base must be at least 200 mm high to allow sufficient space for the installation of the refrigerant pipes.
  - The support blocks must be at least 100 mm wide and they must also support the unit in the centre.
  - The supporting surface must be flat and level (max. inclination ± 0.2 %). The support points must bear the weight evenly.
  - Water must be free to drain through the base plate of the heat pump.
- Align the heat pump in such a way that the front faces the prevailing wind direction.

- In areas with heavy snowfall:
  - Increase the base height to ensure that the unit operation is not affected by snow.
  - Remove the rear grille from the unit to prevent snow accumulation.

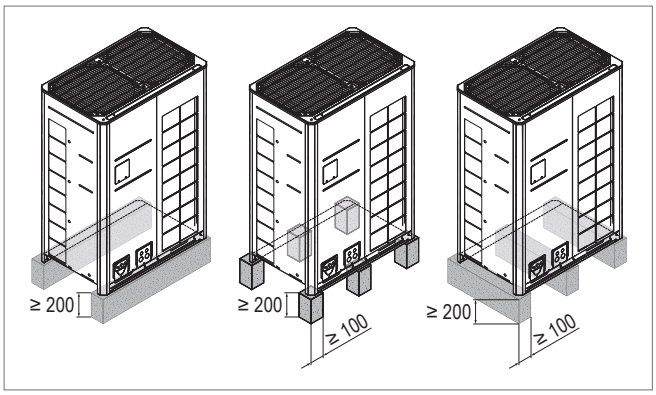
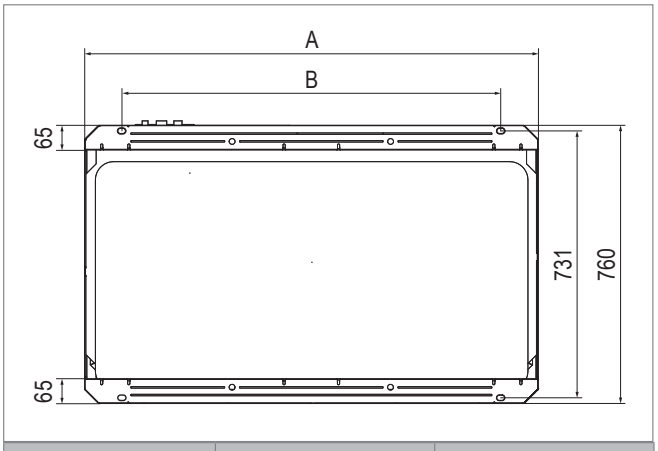
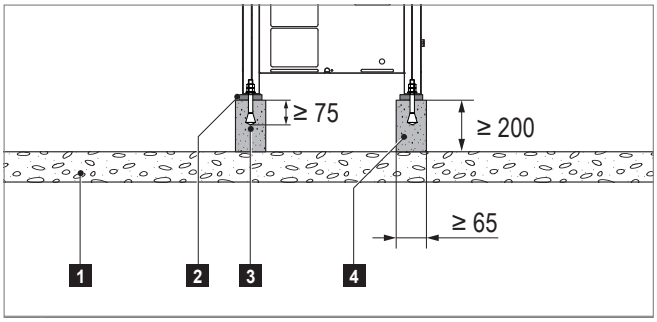


Fig. E7: Base for the heat pump



Heat pump	P	Q (2 single units)
A	1240	930
B	1040	730

Table E1: Position of the screw connections (dimensions in mm)



1	Firm ground
2	Vibration damper
3	Anchor bolt Ø 10 mm
4	Base made of concrete or steel

Fig. E8: Installing the heat pump

1.3 Roof frame

Roof frames are required for installing TopVent® units in the roof. Suitable roof frames are available as accessories (see part D «Options», section 7).

Please consider the following in the design process:

- The extract air grille must be freely accessible under the roof.
- Observe the minimum distances according to Fig. E2.
- The roof frame must protrude at least 300 mm from the roof, so that no water can penetrate during a rainstorm or snowfall and to ensure that the fresh air weather protection is sufficiently high above the roof.

> **Notice**
> Roof frames are available in 2 heights and connection modules in 3 lengths for adapting to the local installation situation.

- The condensate must be able to drain off freely.
- Ensure that the supporting surface for the unit is flat and level.
- Insulate the roof frame before installing the unit (thermal insulation, 60 mm thick).
- Embed the roof frame tightly into the roof structure with roof foil.
- The following applies to any roof frames constructed on site:
  - The supporting surface must correspond to the specifications in Table D4 on page 60.

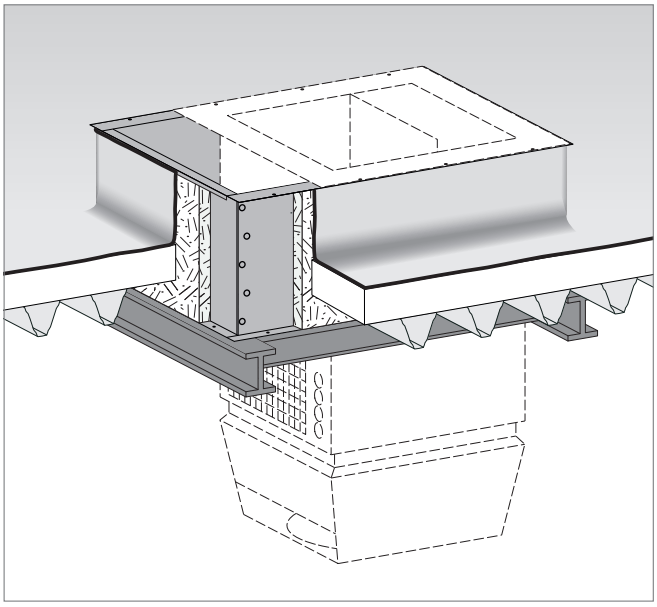


Fig. E9: Conceptual drawing of the roof frame

1.4 Unit installation

Proceed as follows to position the unit:

Below-roof unit

- Apply sealing compound to the roof frame.
- Fasten the adjustment screws in the roof frame.
- Screw in the transport eyes and attach the lifting gear.
- Transport the below-roof unit to the roof frame using a helicopter or crane.
- Turn the below-roof unit to the desired position.
- Hang the below-roof unit into the roof frame from above.

Roof unit

- Attach the lifting kit to the roof unit.
- Attach the lifting straps.
- Transport the roof unit to the roof, correctly position the roof unit over the below-roof unit and set it down.
- Screw the roof unit to the below-roof unit.
- Remove the lifting kit.

Heat pump

- Transport the heat pump to the installation site.
- Place the heat pump on the prepared frame.
- Mount the heat pump on the base using vibration dampers and 4 anchor bolts Ø 10 mm.

2 Refrigeration system installation

2.1 Refrigerant pipes

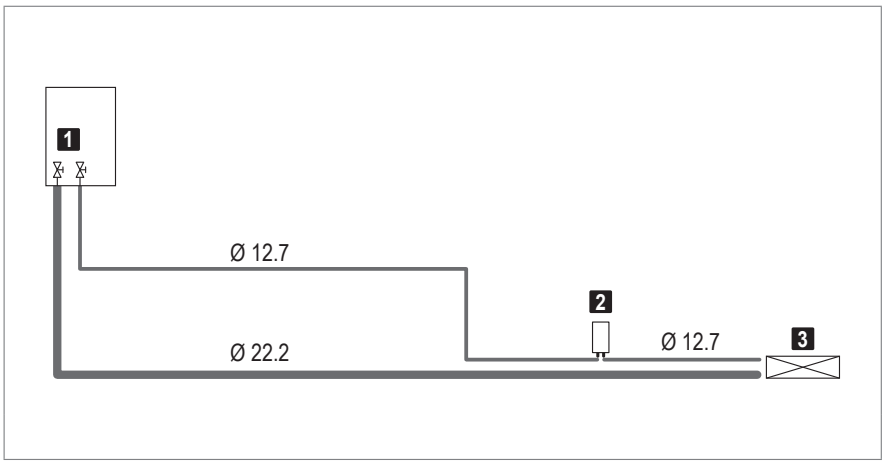
The refrigerant pipes must be installed by a qualified refrigeration technician in line with the local regulations.

To avoid damaging the unit:
- Do not use any flux.
- Ensure there is a nitrogen supply when soldering.
- Insulate the refrigerant pipes.
- Carry out a leak-tightness test and vacuum drying.

Notice
Excessively long refrigerant lines reduce the efficiency of the system. Place the heat pump as close as possible to the indoor climate unit.

- Install the refrigerant pipes as shown in Fig. E10 and Fig. E11 schematically according to the local conditions.
- The maximum length of the liquid line is 40 m.
- The maximum height difference between the heat pump and the indoor climate unit is ± 30 m.
- The maximum length between the two single units of heat pump Q is 10 m.

Refrigerant pipes for heat pump P



1 Connections on the heat pump
- Liquid line . . . . . Ø 12.7 mm
- Gas line . . . . . Ø 22.2 mm

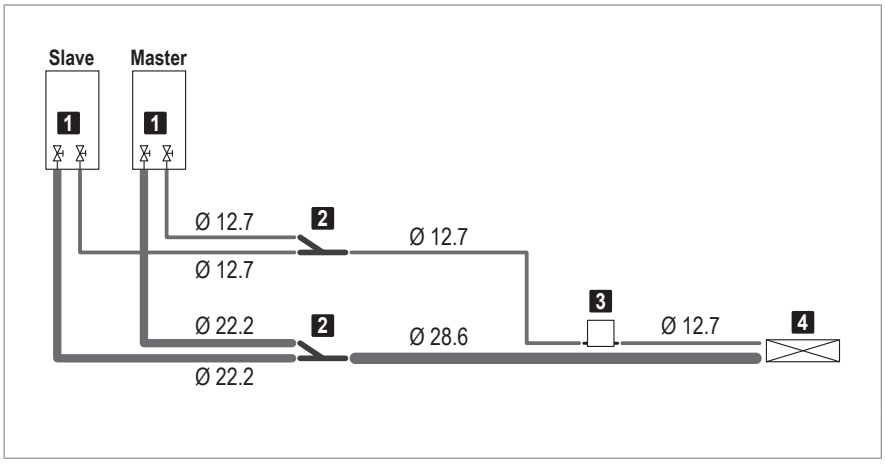
2 EEV kit P, mounted in the indoor climate unit, connection Ø 12.7 mm

3 Connections on heating/cooling coil:
Unit size 6:
- Liquid line . . . . . Ø 12 mm
- Gas line . . . . . Ø 22 mm

Unit size 9:
- Liquid line . . . . . Ø 12 mm
- Gas line . . . . . Ø 28 mm

Fig. E10: Refrigerant pipes for heat pump P (pipe diameters in mm)

Refrigerant pipes for heat pump Q



1 Connections on the heat pump
- Liquid line . . . . . Ø 12.7 mm
- Gas line . . . . . Ø 22.2 mm

2 Branch joint kit, supplied loose

3 EEV kit Q, mounted in the indoor climate unit, connection Ø 19.05 mm

4 Connections on heating/cooling coil:
- Liquid line . . . . . Ø 12 mm
- Gas line . . . . . Ø 28 mm

Fig. E11: Refrigerant pipes for heat pump Q (pipe diameters in mm)

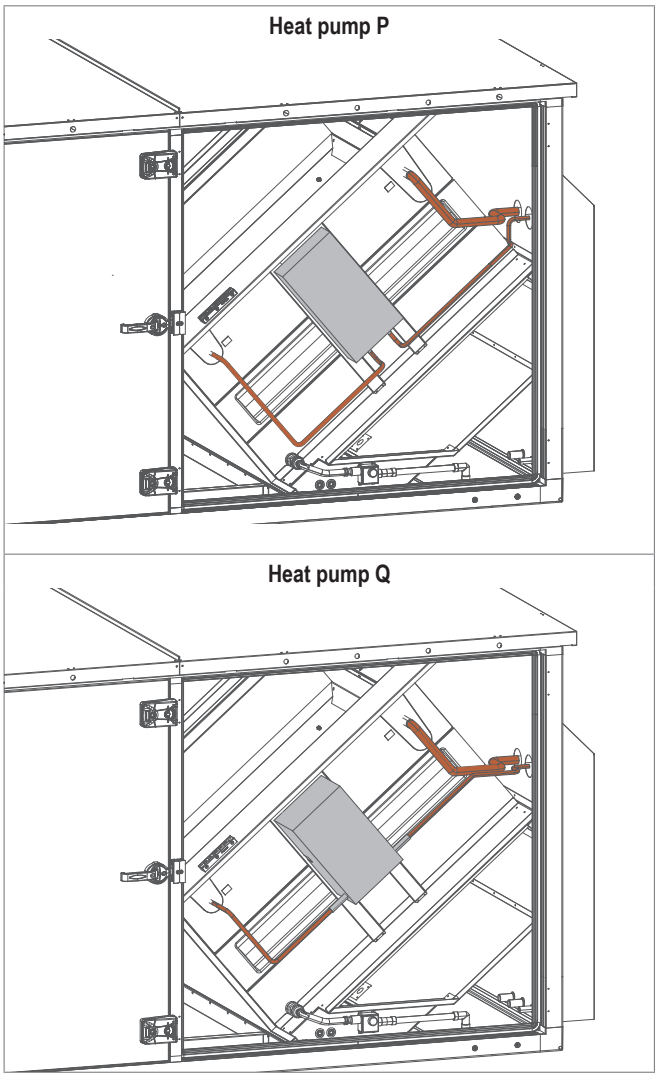


Fig. E12: Installation of refrigerant pipes in the roof unit

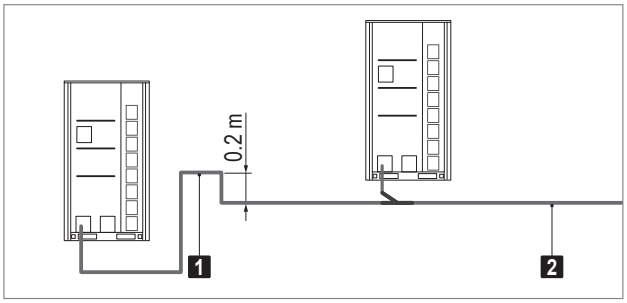
- The thickness of the insulation depends on the pipe diameter. Minimum thicknesses are given in Table E2. Thicker insulation is required in hot, humid environments.

Ø	Minimum thickness [1]	Material
12.7 mm	15 mm	Closed-cell foam, fire protection class B1, temperature-resistant up to 120 °C, outer insulation UV-resistant
22.2 mm	20 mm	
28.6 mm	20 mm	

[1] Increase the thickness of the insulation in hot, humid environments (> 80% relative humidity).

Table E2: Insulation of the refrigerant pipes

- If the heat pump is placed lower than the main pipe: Install an oil return trap in the gas line.



1 Oil return trap
2 Main pipe

Fig. E13: Oil return trap

- Install the liquid temperature sensor and the gas temperature sensor as close as possible to the heating/cooling coil.

Heat pump Q

- The heat pump Q consists of 2 single units. Use the branching kit supplied for branching the pipeline.
  - Install the 2 Y branch joints as close as possible to the master unit.
  - The minimum straight pipe length without diameter changes before and after the two Y branch joints is 0.5 m.
  - Install the 2 Y branch joints horizontally so that the two branch pipes are in one plane.

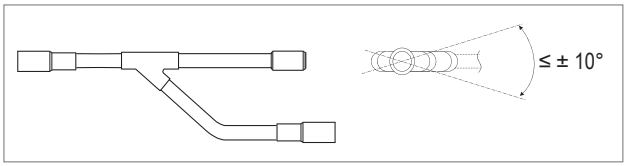
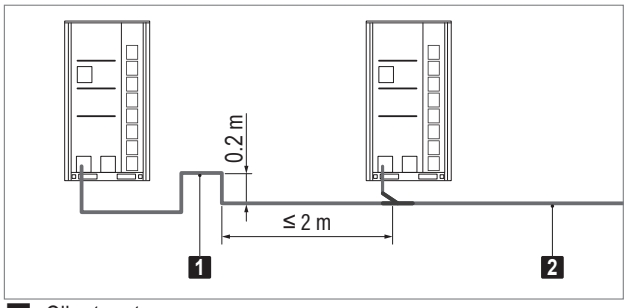


Fig. E14: Installation of the branch joint kit

- If the distance between the 2 single units is more than 2 m: Install an oil return trap in the gas line.



1 Oil return trap
2 Gas line to the indoor climate unit

Fig. E15: Oil return trap

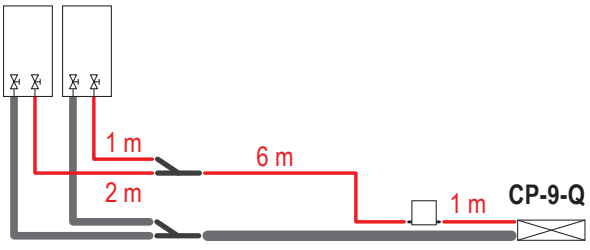
2.2 Calculation of the additional refrigerant fill

The heat pump is filled with R32 refrigerant at the factory. Depending on the length of the liquid line and depending on the size of the unit, refrigerant must also be topped up:

- 0.103 kg refrigerant per metre of liquid line length (from the heat pump to the heating/cooling coil)
- Heating/cooling coil top-up volume:

Unit size		6	9
Refrigerant	kg	2.1	3.7

Table E3: Top-up volume for the heating/cooling coil



(10 m × 0.103 kg/m) + 3.7 kg = **4.73 kg**

Fig. E16: Calculation example

3 Hydraulic installation

Heat pump

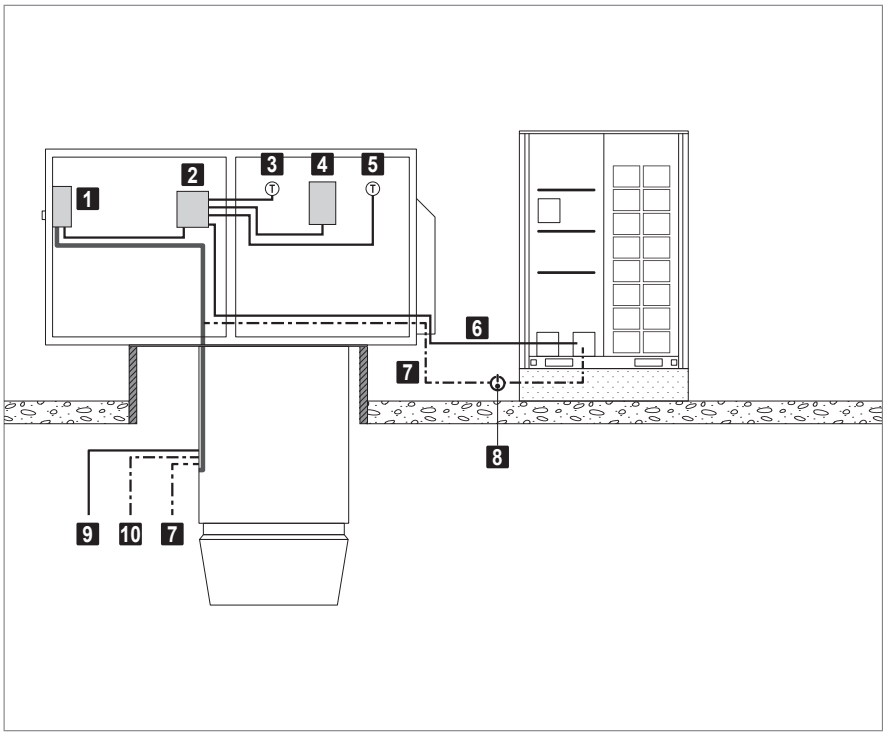
- Make sure that the heat pump is not damaged by pooling water or ice formation:
  - Make sure that water is free to drain through the bottom plate of the heat pump.

4 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.
- Carry out the electrical installation according to the wiring diagram:
  - Power supply for TopVent® CP, SP
  - Power supply for heat pump with main switch in view of the heat pump
  - Zone bus based on system layout
  - Signal lines
- Connect the electrical components of the heat pump system.

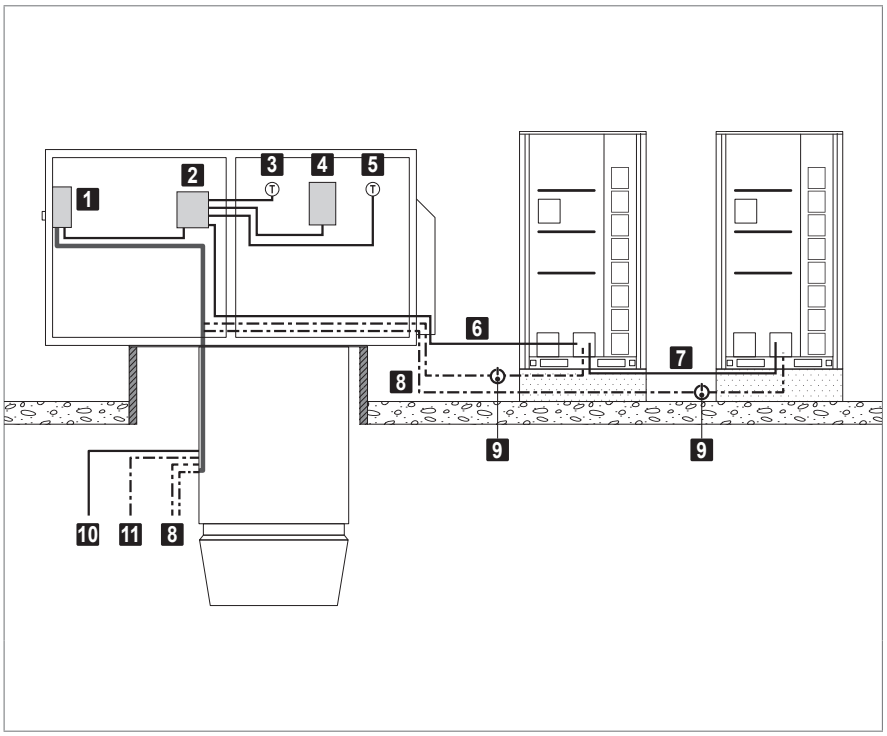
E

4.1 Electrical connection of the heat pump system



1	Unit control box
2	Communication kit PQ
3	Liquid temperature sensor (supplied loose)
4	EEV kit P
5	Gas temperature sensor (supplied loose)
6	Communication TopVent®
7	Power supply heat pump
8	Heat pump main switch (on-site)
9	Zone bus
10	Power supply TopVent®

Fig. E17: Electrical connection of the heat pump system for heat pump P



1	Unit control box
2	Communication kit PQ
3	Liquid temperature sensor (supplied loose)
4	EEV kit Q
5	Gas temperature sensor (supplied loose)
6	Communication TopVent®
7	Communication master–slave
8	Power supply heat pumps
9	Heat pump main switch (on-site)
10	Zone bus
11	Power supply TopVent®

Fig. E18: Electrical connection of the heat pump system for heat pump Q

4.2 Cable list for on-site connections – TopTronic® C System control

Component	Designation	Voltage	Cable		Comments	Start	Target
TopTronic® C System control Zone control panel	Power supply	3 × 400 VAC	NYM-J	5 × … mm²		On-site	Zone control panel
		1 × 230 VAC	NYM-J	3 × … mm²		On-site	Zone control panel
	Zone bus		J-Y(ST)Y	2 × 2 × 0.8 mm	max. 500 m	Zone control panel	Hoval units
	System bus		Ethernet	≥ CAT 5	For connecting several zone control panels | max. 100 m	Zone control panel	Further zone control panel
	Integration into the building management system		Ethernet	≥ CAT 5	BACnet, Modbus IP | max. 100 m	Zone control panel	On-site (BMS)
			J-Y(ST)Y	2 × 2 × 0.8 mm	Modbus RTU | max. 1200 m	Zone control panel	On-site (BMS)
	HovalSupervisor cloud (wired)		Ethernet	≥ CAT 5	max. 100 m	Zone control panel	On-site
	Room temperature sensor		J-Y(ST)Y	2 × 2 × 0.8 mm	max. 100 m	Zone control panel	Sensor
	Additional room temperature sensors		J-Y(ST)Y	2 × 2 × 0.8 mm	max. 100 m	Zone control panel	Sensors
	Combination sensor room air quality, temperature and humidity		J-Y(ST)Y	4 × 2 × 0.8 mm	max. 250 m	Zone control panel	Sensor
	Fresh air temperature sensor		J-Y(ST)Y	2 × 2 × 0.8 mm	max. 100 m	Zone control panel	Sensor
	Combination sensor fresh air temperature and humidity		J-Y(ST)Y	2 × 2 × 0.8 mm	max. 250 m	Zone control panel	Sensor
	Collective alarm	Volt-free max. 230 VAC max. 24 VDC	NYM-O	2 × 1.5 mm²	max. 3 A max. 2 A	Zone control panel	On-site
	Power supply for units	3 × 400 VAC	NYM-J	5 × 1.5 mm² (min.)	RoofVent® size 6 max. cable cross section 5 × 6 mm²	Zone control panel or on-site	Hoval units
		3 × 400 VAC	NYM-J	5 × 4.0 mm² (min.)	RoofVent® size 9 max. cable cross section 5 × 10 mm²		
		3 × 400 VAC	NYM-J	5 × 1.5 mm² (min.)	TopVent® max. cable cross section 5 × 6 mm²		
	Power supply for heat pump	3 × 400 VAC	NYM-J	5 × 6.0 mm² (min.)	Heat pump P (for 100 m length) max. cable cross section 5 × 16 mm²	Zone control panel or on-site	Heat pump
		3 × 400 VAC	NYM-J	5 × 4.0 mm² (min.)	Heat pump Q – Master (for 100 m length) max. cable cross section 5 × 16 mm²	ⓘ Max. outer diameter for cable routing through TopVent® roof unit: 20.5 mm	
		3 × 400 VAC	NYM-J	5 × 4.0 mm² (min.)	Heat pump Q – Slave (for 100 m length) max. cable cross section 5 × 16 mm²		
	System operator terminal (if external)	24 VDC	NYM-J	3 × 1.5 mm²	Power supply 0.42 A | max. 50 m max. cable cross section 3 × 4 mm²	Zone control panel	System operator terminal
			Ethernet	≥ CAT 5	Communication | max. 100 m	Zone control panel	System operator terminal
	Zone operator terminal (if external)	24 VAC	J-Y(ST)Y	4 × 2 × 0.8 mm	Power supply, 1 A fusing, max. 500 m	Zone control panel	Zone operator terminal
	External sensor values	0-10 VDC	J-Y(ST)Y	2 × 2 × 0.8 mm	max. 100 m	On-site	Zone control panel
	External set values	0-10 VDC	J-Y(ST)Y	2 × 2 × 0.8 mm	max. 100 m	On-site	Zone control panel
	Load shedding input [1)]	24 VAC	NYM-O	2 × 1.5 mm²	max. 1 A | max. 100 m	On-site	Zone control panel
	Operating selector switch on terminal (analogue)	0-10 VDC	J-Y(ST)Y	2 × 2 × 0.8 mm	max. 100 m	On-site (switch)	Zone control panel

Component	Designation	Voltage	Cable	Comments	Start	Target
	Operating selector switch on terminal (digital)	0-10 V DC	J-Y(ST)Y 6 × 2 × 0.8 mm	max. 100 m	On-site (switch)	Zone control panel
	Operating selector button on terminal	24 V AC	J-Y(ST)Y 6 × 2 × 0.8 mm	max. 100 m	On-site (button)	Zone control panel
	Forced off [1]	24 V AC	NYM-O 2 × 1.5 mm²	max. 1 A | max. 100 m	On-site	Zone control panel
	Heating/cooling changeover [1]	24 V AC	NYM-O 2 × 1.5 mm²	Signal external enabling/setting max. 1 A | max. 100 m	On-site	Zone control panel
	Signal for external extract air fan	2-10 V DC	J-Y(ST)Y 2 × 2 × 0.8 mm	for TopVent® SP | max. 100 m	Zone control panel	On-site
TopVent® unit	Power supply	3 × 400 V AC	NYM-J 5 × 1.5 mm² (min.)	max. cable cross section 5 × 6 mm²	Zone control panel or on-site	TopVent® unit
	Zone bus		J-Y(ST)Y 2 × 2 × 0.8 mm	max. 500 m	Zone control panel	TopVent® unit
	Forced off	24 V AC	NYM-O 2 × 1.5 mm²	for TopVent® SP max. 1 A | max. 100 m	On-site	TopVent® unit
Heat pump	Power supply	3 × 400 V AC	NYM-J 5 × 6.0 mm² (min.)	Heat pump P (for 100 m length) max. cable cross section 5 × 16 mm²	Zone control panel or on-site	Heat pump
		3 × 400 V AC	NYM-J 5 × 4.0 mm² (min.)	Heat pump Q – Master (for 100 m length) max. cable cross section 5 × 16 mm²		
		3 × 400 V AC	NYM-J 5 × 4.0 mm² (min.)	Heat pump Q – Slave (for 100 m length) max. cable cross section 5 × 16 mm²		
	Communication TopVent®		J-Y(ST)Y 2 × 2 × 0.8 mm		TopVent® unit	Heat pump
	Communication master–slave		J-Y(ST)Y 1 × 2 × 0.8 mm	for heat pump Q	Heat pump	Heat pump

1) Use a relay to connect the signal to several zone controllers in parallel.

Table E4: Cable list for on-site connections – TopTronic® C System control

4.3 Cable list for on-site connections – TopTronic® C Single zone control panel

Component	Designation	Voltage	Cable		Comments	Start	Target
TopTronic® C Single zone control panel	Power supply	1 × 230 VAC	NYM-J	3 × 1.5 mm²	max. cable cross section 3 × 6 mm²	On-site	Zone control panel
	Zone bus		J-Y(ST)Y	2 × 2 × 0.8 mm	max. 500 m	Zone control panel	Hoval units
	Integration into the building management system		Ethernet	≥ CAT 5	BACnet, Modbus IP | max. 100 m	Zone control panel	On-site (BMS)
			J-Y(ST)Y	2 × 2 × 0.8 mm	Modbus RTU | max. 1200 m	Zone control panel	On-site (BMS)
	HovalSupervisor cloud (wired)		Ethernet	≥ CAT 5	max. 100 m	Zone control panel	On-site
	Room temperature sensor		J-Y(ST)Y	2 × 2 × 0.8 mm	max. 100 m	Zone control panel	Sensor
	Additional room temperature sensors		J-Y(ST)Y	2 × 2 × 0.8 mm	max. 100 m	Zone control panel	Sensors
	Combination sensor room air quality, temperature and humidity		J-Y(ST)Y	4 × 2 × 0.8 mm	max. 250 m	Zone control panel	Sensor
	Fresh air temperature sensor		J-Y(ST)Y	2 × 2 × 0.8 mm	max. 100 m	Zone control panel	Sensor
	Collective alarm	Volt-free max. 230 VAC	NYM-O	2 × 1.5 mm²	max. 13 A	Zone control panel	On-site
	External setpoint fresh air ratio	2-10 V DC	J-Y(ST)Y	2 × 2 × 0.8 mm	max. 100 m	On-site	Zone control panel
	Operating selector switch on terminal (digital)	0-10 V DC	J-Y(ST)Y	6 × 2 × 0.8 mm	max. 100 m	On-site (switch)	Zone control panel
	Operating selector button on terminal	24 V DC	J-Y(ST)Y	6 × 2 × 0.8 mm	max. 0.5 A | max. 100 m	On-site (button)	Zone control panel
	Forced off	24 V DC	NYM-O	2 × 1.5 mm²	max. 0.5 A | max. 100 m	On-site	Zone control panel
	Heating/cooling changeover	24 V DC	NYM-O	2 × 1.5 mm²	Signal external enabling/setting max. 0.5 A | max. 100 m	On-site	Zone control panel
	Signal for external extract air fan	2-10 V DC	J-Y(ST)Y	2 × 2 × 0.8 mm	for TopVent® SP | max. 100 m	Zone control panel	On-site
TopVent® unit	Power supply	3 × 400 VAC	NYM-J	5 × 1.5 mm² (min.)	max. cable cross section 5 × 6 mm²	On-site	TopVent® unit
	Zone bus		J-Y(ST)Y	2 × 2 × 0.8 mm	max. 500 m	Zone control panel	TopVent® unit
	Forced off	24 VAC	NYM-O	2 × 1.5 mm²	for TopVent® SP max. 1 A | max. 100 m	On-site	TopVent® unit
Heat pump	Power supply	3 × 400 VAC	NYM-J	5 × 6.0 mm² (min.)	Heat pump P (for 100 m length) max. cable cross section 5 × 16 mm²	On-site	Heat pump
		3 × 400 VAC	NYM-J	5 × 4.0 mm² (min.)	Heat pump Q – Master (for 100 m length) max. cable cross section 5 × 16 mm²		
		3 × 400 VAC	NYM-J	5 × 4.0 mm² (min.)	Heat pump Q – Slave (for 100 m length) max. cable cross section 5 × 16 mm²		
	Communication TopVent®		J-Y(ST)Y	2 × 2 × 0.8 mm		TopVent® unit	Heat pump
	Communication master–slave		J-Y(ST)Y	1 × 2 × 0.8 mm	for heat pump Q	Heat pump	Heat pump

Table E5: Cable list for on-site connections – TopTronic® C Single zone control panel

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.

1.1 Applications with higher comfort requirements (e.g. production halls, assembly halls, sports halls)

Design data		**Example**
■ Geometry of the room ■ Internal heat gains ■ People in the room ■ Heating and cooling with decentralised heat pump ■ Improvement of air quality, fresh air supply for the people in the room (fresh air volume 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	350 kW −15 °C 18 °C 20 °C
Design conditions cooling:	■ Transmission sensible gains ■ Fresh air conditions ■ Room air conditions ■ Extract air temperature	140 kW 32 °C / 40 %rh 26 °C / 40 %rh 28 °C
Fresh air supply ■ Required fresh air volume 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® SP 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 Fig. E2 on page 63 and HK-Select).		<u>Supply air units:</u> Size 6 → OK Size 9 → OK <u>Recirculation units:</u> Size 6 → OK Size 9 → OK

Required performance for covering fabric heat losses

- 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 output 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	$Q_{H\_Supply\ air}$	$Q_{H\_Recirculation}$
SP-6-P	34.9	322 – 34.9 = 287.1
SP-9-P	31.6	322 – 31.6 = 290.4
SP-9-Q	61.2	322 – 61.2 = 260.8

(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.

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

  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	$Q_{C\_Supply\ air}$	$Q_{C\_Recirculation}$
SP-6-P	28.5	168 – 28.5 = 139.5
SP-9-P	27.9	168 – 27.9 = 140.1
SP-9-Q	49.2	168 – 49.2 = 118.8

(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 SP-6-P	CP-6-P	6	7	5	5	**7**
	CP-9-P	6	7	5	5	**7**
	CP-9-Q	4	5	3	5	**5**
1 unit SP-9-P	CP-6-P	6	8	5	5	**8**
	CP-9-P	6	8	5	3	**8**
	CP-9-Q	4	5	3	3	**5**
1 unit SP-9-Q	CP-6-P	5	7	5	5	**7**
	CP-9-P	5	7	5	3	**7**
	CP-9-Q	4	4	3	3	**4**

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

F

1.2 Applications with low comfort requirements (e.g. warehouses, logistics centres)

<table>
<tr><th>Design data</th><th>Example</th></tr>
<tr><td>■ Geometry of the room
■ Heating and cooling with decentralised heat pump</td><td>181 × 105 × 12 m</td></tr>
<tr><td>Design conditions heating:
■ Fabric heat losses
■ Fresh air temperature
■ Room temperature
■ Extract air temperature</td><td>892 kW
−15 °C
15 °C
18 °C</td></tr>
<tr><td>Design conditions cooling:
■ Transmission sensible gains
■ Fresh air conditions
■ Room air conditions
■ Extract air temperature</td><td>923 kW
32 °C / 40 %rh
26 °C / 40 %rh
28 °C</td></tr>
<tr><td>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 Fig. E2 on page 63 and HK-Select).</td><td><u>Recirculation units:</u>
Size 6 → OK
Size 9 → OK</td></tr>
<tr><td>Required number of recirculation units
■ Determine the required number of recirculation units based on the heat output.
n = Fabric heat losses : heat output per unit
■ Determine the required number of recirculation units based on the cooling capacity.
n = Transmission sensible gains : cooling capacity per unit
■ Choose the final solution from the remaining possibilities, depending on the geometry of the hall and the costs.</td><td>
<table>
<tr><th>Type</th><th>kW</th><th>Quantity</th></tr>
<tr><td>CP-6-P</td><td>892 : 41.6</td><td>22</td></tr>
<tr><td>CP-9-P</td><td>892 : 41.6</td><td>22</td></tr>
<tr><td>CP-9-Q</td><td>892 : 71.2</td><td>13</td></tr>
</table>
<table>
<tr><th>Type</th><th>kW</th><th>Quantity</th></tr>
<tr><td>CP-6-P</td><td>923 : 29.6</td><td>32</td></tr>
<tr><td>CP-9-P</td><td>923 : 29.6</td><td>32</td></tr>
<tr><td>CP-9-Q</td><td>923 : 50.8</td><td>19</td></tr>
</table>
</td></tr>
</table>

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® unit and the heat pump	Annually by Hoval customer service

Table F1: 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.

Hoval

Hoval is one of the leading international companies for heating and indoor climate solutions. Drawing on more than 75 years of experience and benefiting from a close-knit team culture, the Hoval Group delivers exciting solutions and develops technically superior products. This leadership role requires a sense of responsibility for energy and the environment, which is expressed in an intelligent combination of different heating technologies and customised indoor climate solutions.

Hoval also provides personal consultations and comprehensive customer service. With around 2500 employees in 15 companies around the world, Hoval sees itself not as a conglomerate, but as a large family that thinks and acts globally.
Hoval heating and indoor climate solutions are currently exported to more than 50 countries.

Responsibility for energy and environment

Your Hoval partner

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Edition 2025-04