Hoval

Indoor Climate Systems

Hoval TopVent®

TP | MP

Design handbook

Recirculation and supply air units with efficient air distribution for heating and cooling with decentralised Belaria® VRF heat pump

Hoval | Responsibility for energy and environment

Hoval 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

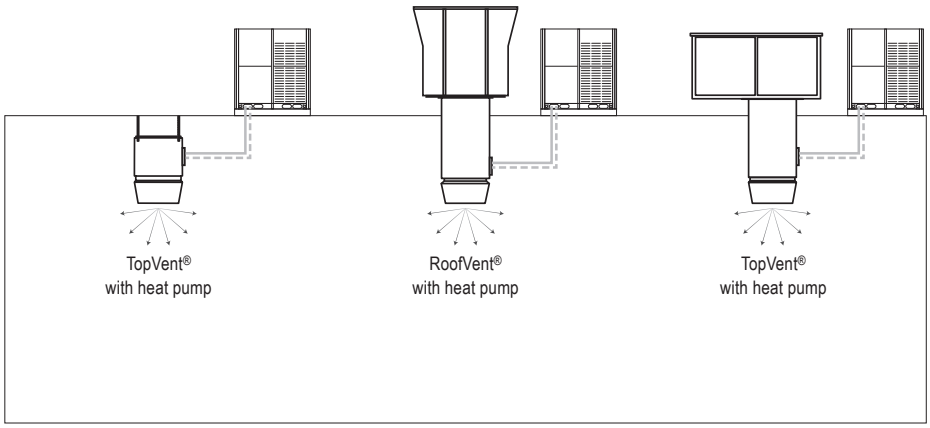
The number of supply and extract air handling units depends on how much fresh air is required in order to create a comfortable atmosphere for people in the building. Recirculation units cover additional heat or cool demand as required. A broad range of unit types and sizes with heating and cooling coils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

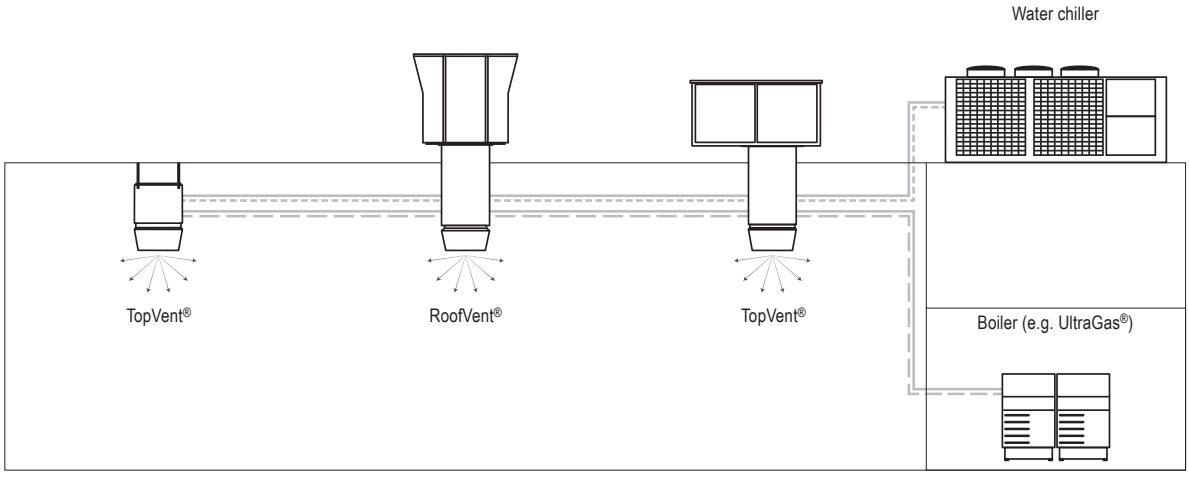
Control with specialist expertise
The TopTronic® C control system, which was specifically developed for Hoval indoor climate systems, regulates the separate units individually and controls them based on zones. This enables optimal adjustment to the local requirements of the different usage areas in the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

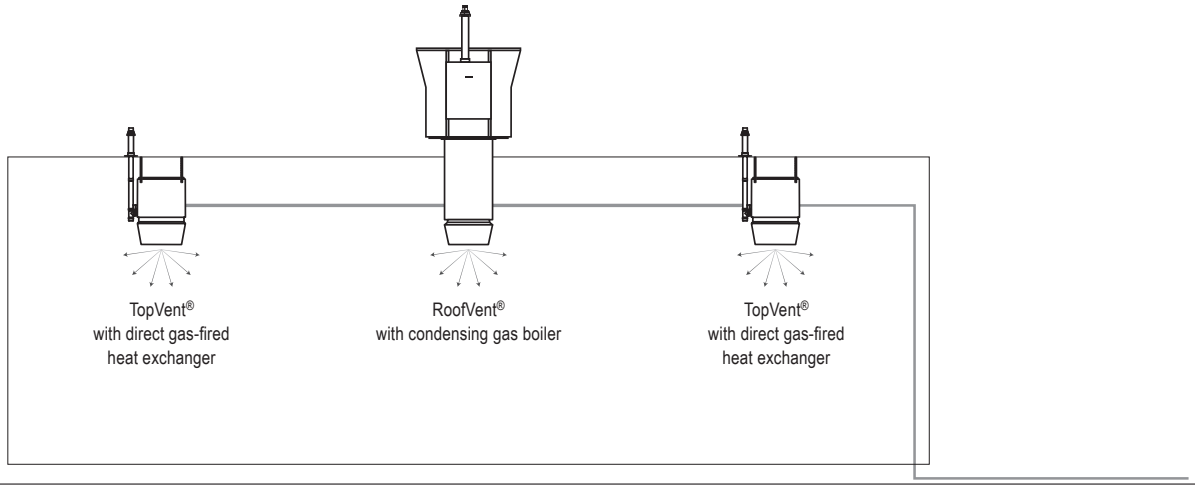
System with decentralised heat and cold generation with heat pump



System with central heat and cold generation



System with decentralised, gas-fired heat generation



TopVent® TP

Recirculation 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® TP 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 (option)

The TopVent® TP 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

TopVent® TP units consist of the following components:

Recirculation unit
- Filter box (option)
  For air filtration, a filter box is optionally available with pocket filters or a flat filter box with pleated cell filters ISO Coarse 60%.
- Heating/cooling section
  The heating cooling section contains the following components:
  – Radial fan with energy-saving EC motor
  – Heating/cooling coil for heating and cooling the supply air
  – Condensate separator
- 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.

As part of the TopTronic® C control system, the unit control box is an integral component.

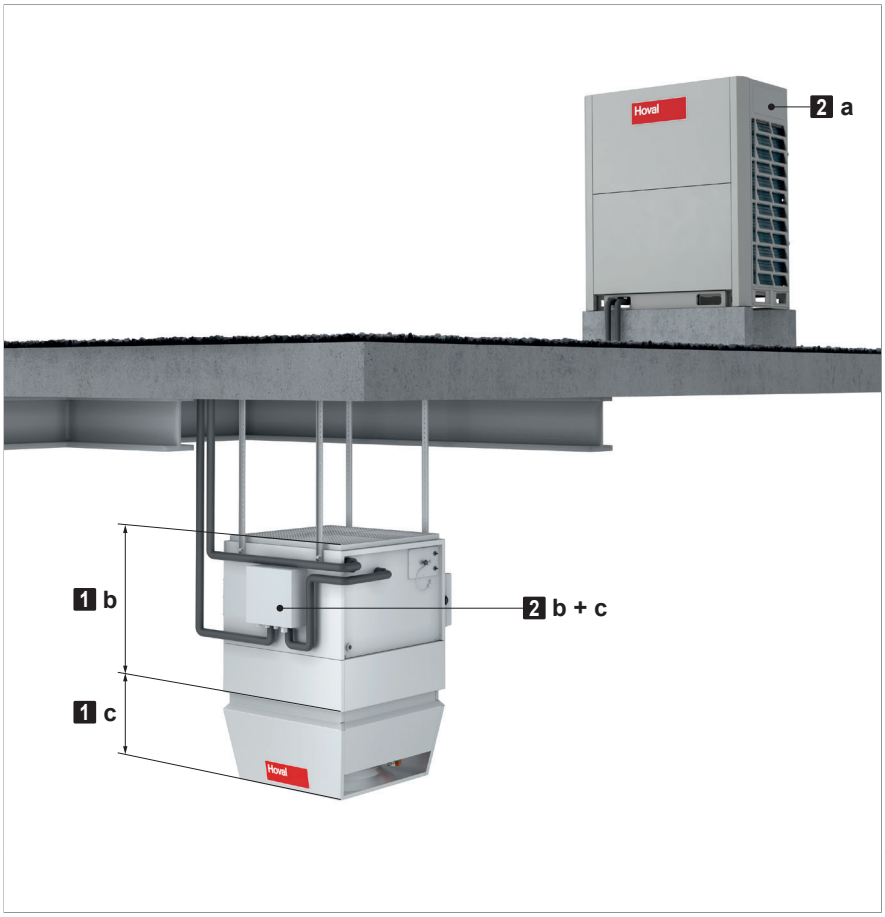
Heat pump system
The reversible air/air heat pump system in split design generates both heat and cold decentrally. It consists of the following components:
- Belaria® VRF heat pump with continuously modulating inverter technology for precise output control and high efficiency
- Conversion board for communication between heat pump, expansion valve and indoor climate unit (mounted in the combi box)
- Expansion valve (mounted in the combi box)

The combi box is mounted on the indoor climate unit.

TopVent® TP units are available in 2 unit sizes and a total of 3 output levels:

Unit size	Heat pump	Conversion board and expansion valve
TP-6	Belaria® VRF (33)	1 ×
	Belaria® VRF (40)	1 ×
TP-9	Belaria® VRF (67)	2 ×

Table B1: Availability

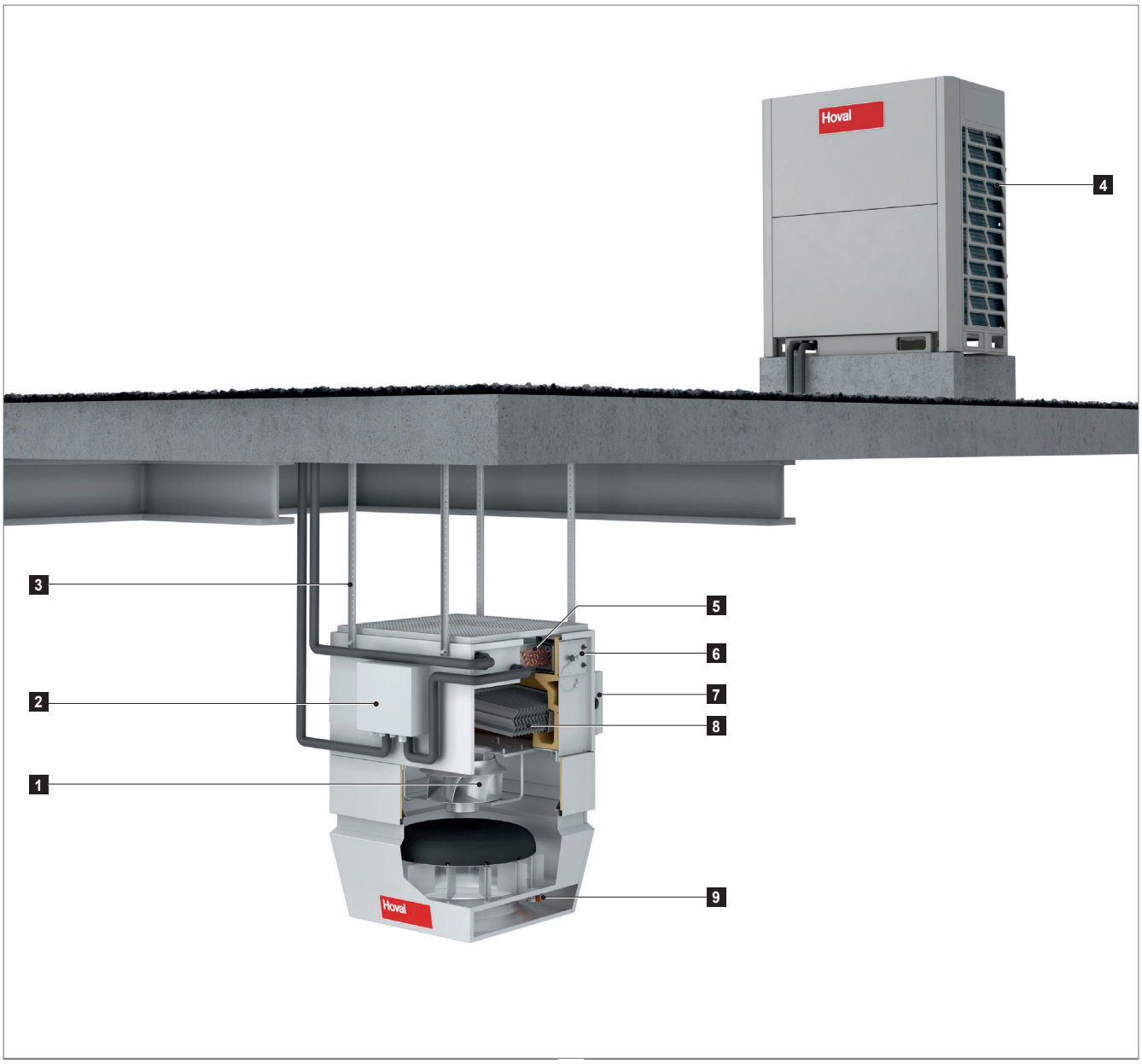


1 Recirculation unit
- **a** Filter box or flat filter box (not shown here)
- **b** Heating/cooling section
- **c** Air-Injector

2 Heat pump system
- **a** Heat pump Belaria® VRF
- **b** Conversion board (mounted in the combi box)
- **c** Expansion valve (mounted in the combi box)

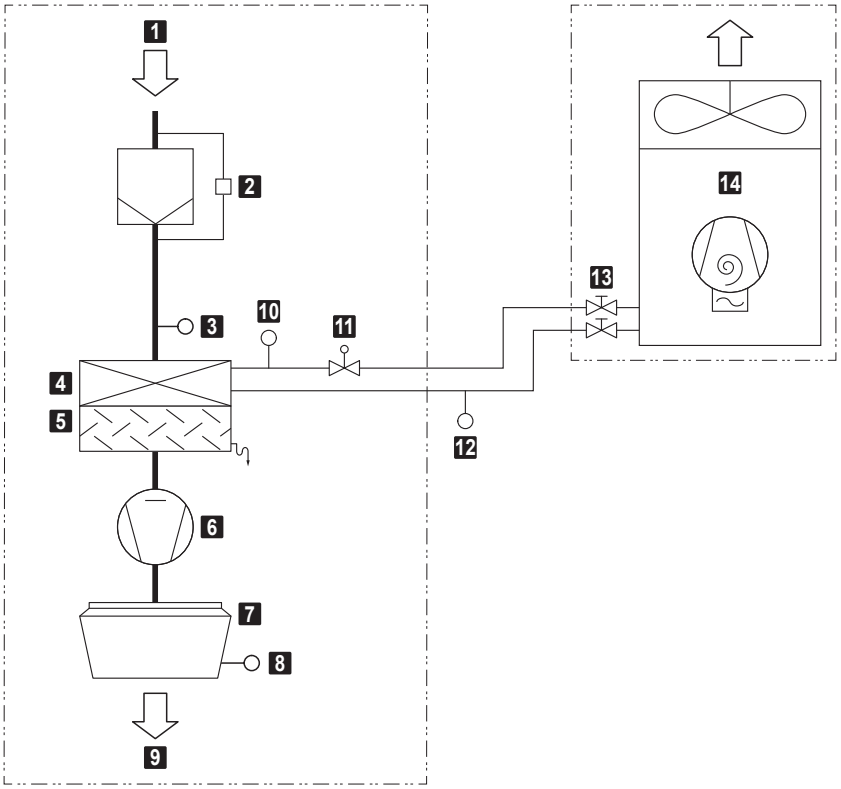
Fig. B1: Components TopVent® TP

2.1 Construction and operation TopVent® TP-6



1	Fan	6	Access panel, liquid temperature sensor
2	Combi box with conversion board and expansion valve	7	Unit control box
3	Suspension set	8	Condensate separator
4	Heat pump Belaria® VRF (33, 40)	9	Actuator Air-Injector
5	Heating/cooling coil		

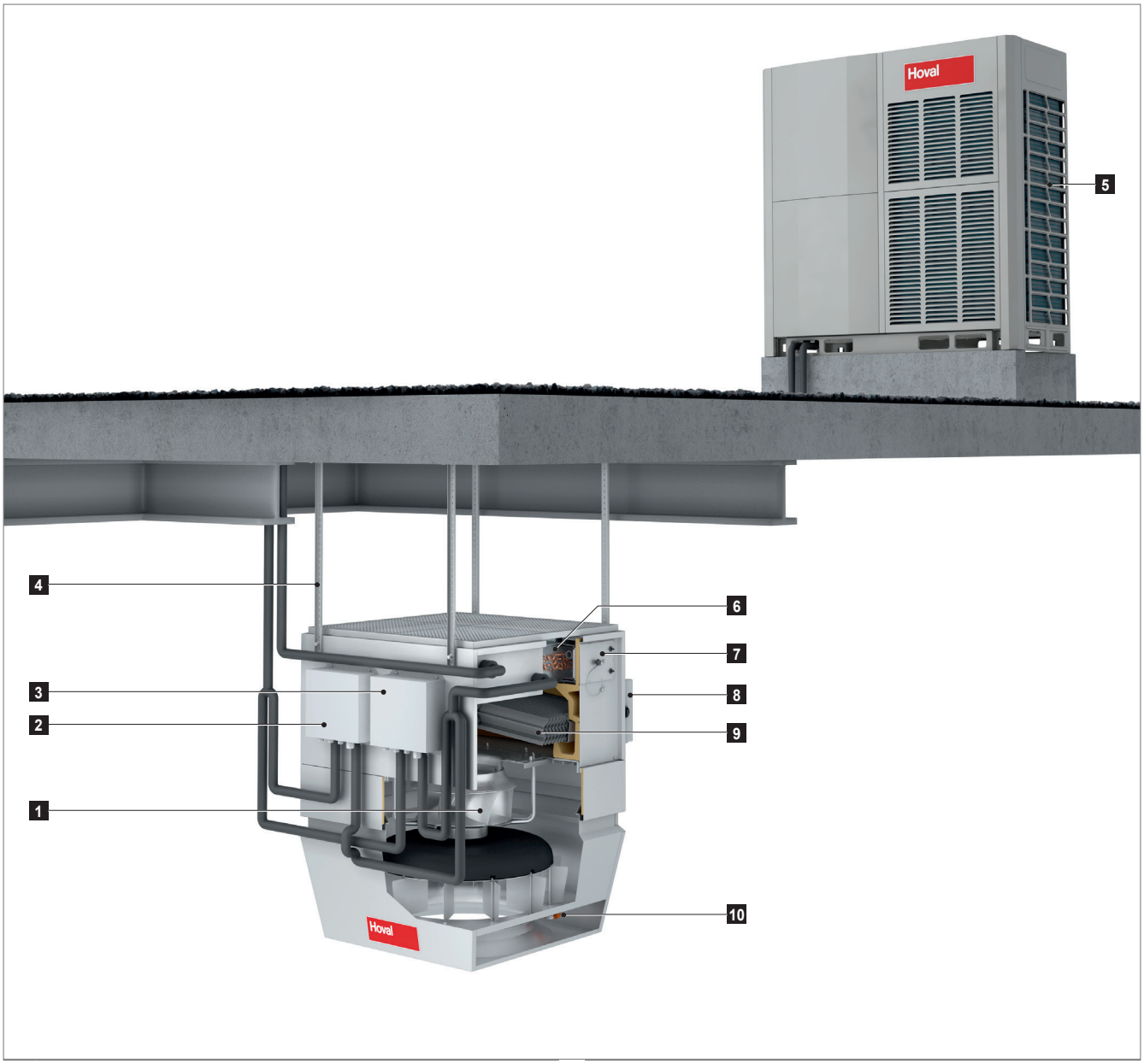
Fig. B2: Construction TopVent® TP-6



1	Extract air	8	Supply air temperature sensor
2	Air filter with differential pressure switch (optional)	9	Supply air
3	Air inlet temperature sensor heating/cooling coil	10	Liquid temperature sensor
4	Heating/cooling coil	11	Expansion valve
5	Condensate separator	12	Gas temperature sensor (supplied loose)
6	Fan	13	Shut-off valves
7	Air-Injector with actuator	14	Heat pump Belaria® VRF (33, 40)

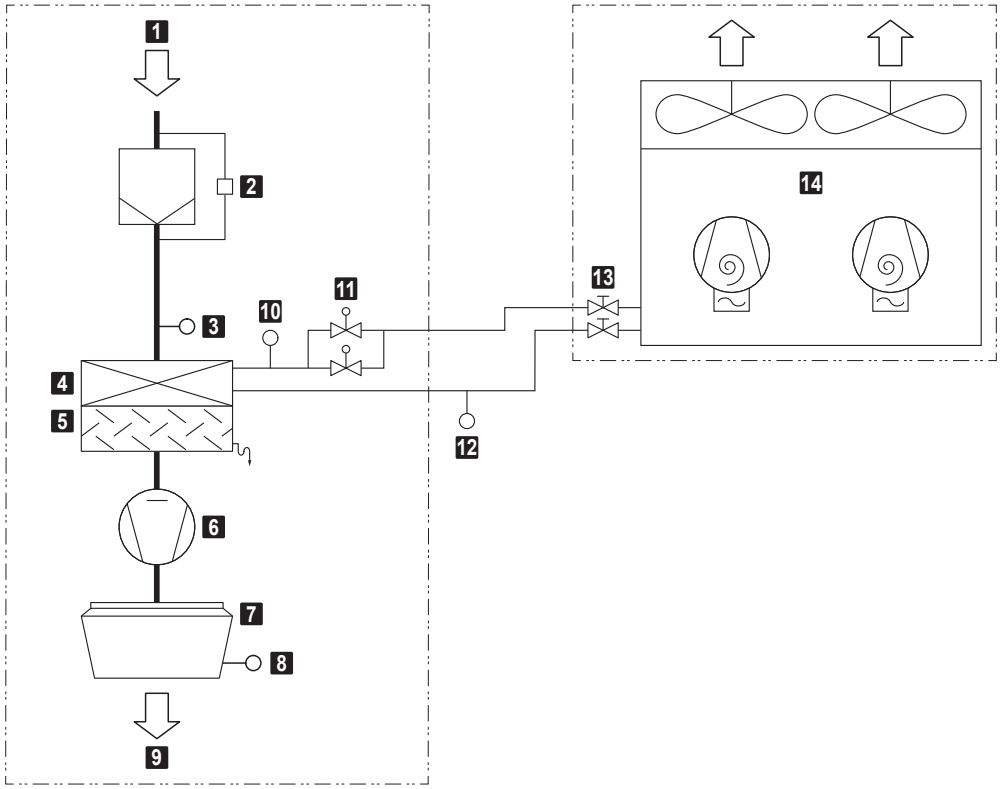
Table B2: Function diagram TopVent® TP-6

2.2 Construction and operation TopVent® TP-9



1	Fan	6	Heating/cooling coil
2	Combi box VRF 02 with conversion board and expansion valve	7	Access panel, liquid temperature sensor
3	Combi box VRF 03 with conversion board and expansion valve	8	Unit control box
4	Suspension set	9	Condensate separator
5	Heat pump Belaria® VRF (67)	10	Actuator Air-Injector

Fig. B3: Construction TopVent® TP-9



1	Extract air	8	Supply air temperature sensor
2	Air filter with differential pressure switch (optional)	9	Supply air
3	Air inlet temperature sensor heating/cooling coil	10	Liquid temperature sensor
4	Heating/cooling coil	11	Expansion valves
5	Condensate separator	12	Gas temperature sensor (supplied loose)
6	Fan	13	Shut-off valves
7	Air-Injector with actuator	14	Heat pump Belaria® VRF (67)

Table B3: Function diagram TopVent® TP-9

2.3 Operating modes

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

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

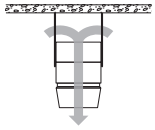
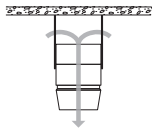
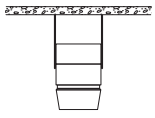
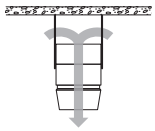
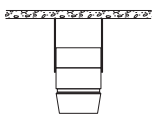
Code	Operating mode		Description
REC	**Recirculation** On/Off operation: during heat or cool demand, the unit draws in room air, heats or cools it and blows it back into the room. The room temperature set value day is active.		Fan ..... speed 1 / 2 [1] Heating/cooling ..... on [1] [1] Depending on heat 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 B4: TopVent® TP operating modes

3 Technical data

3.1 Type code

TP - 6 - J ...

Unit type
TopVent® TP

Unit size
6 or 9

Heating/cooling section
J with coil type J for Belaria® VRF (33)
L with coil type L for Belaria® VRF (40)
N with coil type N for Belaria® VRF (67)

Further options

Table B5: Type code

3.2 Application limits

Heating mode				
Fresh air temperature		min. max.	°C °C	-25 24
Air inlet temperature to the heating/cooling coil		min. max.	°C °C	5 30
Cooling mode				
Fresh air temperature		min. max.	°C °C	-15 48
Air inlet temperature to the heating/cooling coil		min. max.	°C °C	17 32
Extract air temperature		max.	°C	50
Moisture content of extract air [1)]		max.	g/kg	15
Supply air temperature		max.	°C	45
Room temperature setpoint		min.	°C	15
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				
[1)] Units for applications where the humidity in the room increases by more than 2 g/kg are available on request.				

Table B6: Application limits

3.3 Electrical connection

TopVent® TP

Unit type		TP-6	TP-9
Supply voltage	V AC	3 × 400	3 × 400
Permitted voltage tolerance	%	± 5	± 5
Frequency	Hz	50	50
Connected load	kW	1.7	3.4
Current consumption max.	A	3.0	5.9
Series fuse	A	13.0	13.0
Protection rating	–	IP 54	IP 54

Table B7: TopVent® TP electrical connections

Heat pump Belaria® VRF

Heat pump Belaria®		VRF (33)	VRF (40)	VRF (67)
Supply voltage	V AC	3 × 400	3 × 400	3 × 400
Permitted voltage tolerance	%	± 2	± 2	± 2
Frequency	Hz	50	50	50
Connected load	kW	16.5	20.6	34.0
Current consumption max.	A	26.4	33.1	54.5
Series fuse	A	32.0	40.0	63.0
Inrush current	A	–	–	–

Table B8: Electrical connection Belaria® VRF

3.4 Air flow rate

Unit type		TP-6	TP-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 B9: Air flow rate

3.5 Technical data of the Belaria® VRF heat pump

Heat pump Belaria®			VRF (33)	VRF (40)	VRF (67)
Heating	Rated heat output 1)	kW	33.5	40.0	67.0
	Power consumption	kW	7.60	8.51	15.33
	COP	–	4.40	4.70	4.37
	$\eta_{s,h}$	–	173	169	151
	SCOP	–	4.41	4.31	3.86
Cooling	Rated cooling capacity 2)	kW	33.5	40.0	67.0
	Power consumption	kW	8.90	9.88	18.10
	EER	–	3.75	4.05	3.70
	$\eta_{s,c}$	–	285	246	277
	SEER	–	7.20	6.22	7.00
Refrigerant		–	R410A	R410A	R410A
Refrigerant fill volume		kg	11	13	22

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 B10: Technical data Belaria® VRF

3.6 Sound level

TopVent® TP			TP-6	TP-9
Sound pressure level (at a distance of 5 m) 1)		dB(A)	59	61
Total sound power level		dB(A)	81	83
Octave sound power level	63 Hz	dB	42	48
	125 Hz	dB	56	67
	250 Hz	dB	65	70
	500 Hz	dB	70	74
	1000 Hz	dB	76	78
	2000 Hz	dB	76	76
	4000 Hz	dB	74	74
	8000 Hz	dB	68	68

1) With hemispherical radiation in a low-reflection environment

Table B11: TopVent® TP sound level

Heat pump Belaria®			VRF (33)	VRF (40)	VRF (67)
Sound pressure level (at a distance of 5 m)		dB(A)	59.0	63.0	67.0
Total sound power level 1)		dB(A)	81.0	85.0	89.0
Octave sound pressure level 2)	63 Hz	dB	62.6	63.5	66.5
	125 Hz	dB	60.6	61.2	65.0
	250 Hz	dB	61.0	60.8	65.0
	500 Hz	dB	58.3	57.5	63.0
	1000 Hz	dB	55.5	56.9	57.0
	2000 Hz	dB	46.8	47.5	52.0
	4000 Hz	dB	43.9	45.1	51.0
	8000 Hz	dB	43.5	44.1	50.2

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 1.3 m above the floor in a semi-anechoic chamber.

Table B12: Sound level Belaria® VRF

3.7 Heat output

t_F	t_{room}	Type	Q	H_{max}	t_S	P_{HP}
°C	°C	TP-	kW	m	°C	kW
-5	16	6-J	32.5	13.5	34.1	9.2
		6-L	38.9	12.5	37.2	10.3
		9-N	65.1	12.7	39.5	18.6
	20	6-J	31.0	13.8	37.3	9.0
		6-L	37.0	12.9	40.3	10.0
		9-N	61.9	13.0	42.4	18.1
-15	16	6-J	28.6	14.2	32.2	9.2
		6-L	34.2	13.2	34.9	10.3
		9-N	57.2	13.4	36.9	18.5
	20	6-J	28.5	14.3	36.1	9.4
		6-L	34.0	13.3	38.8	10.5
		9-N	57.0	13.5	40.8	18.9

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

Table B13: TopVent® TP heat output

3.8 Cooling capacity

t_F	t_{room}	RH_{room}	Type	Q_{sen}	Q_{tot}	t_S	m_C	P_{HP}
°C	°C	%	TP-	kW	kW	°C	kg/h	kW
28	22	50	6-J	20.6	26.4	13.8	8.6	4.9
			6-L	24.6	31.5	11.8	10.2	5.7
			9-N	41.2	52.4	10.4	16.4	10.3
		70	6-J	19.2	32.7	14.5	19.8	6.8
			6-L	21.8	37.0	13.2	22.4	7.3
			9-N	36.4	61.6	12.0	37.1	13.3
32	26	50	6-J	23.3	34.0	16.5	15.8	8.1
			6-L	27.7	40.6	14.3	18.9	9.2
			9-N	47.1	68.0	12.5	30.7	16.9
		70	6-J	17.6	34.9	19.3	25.5	8.2
			6-L	20.9	41.7	17.6	30.5	9.3
			9-N	35.5	69.9	16.3	50.5	17.0

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 B14: TopVent® TP cooling capacity

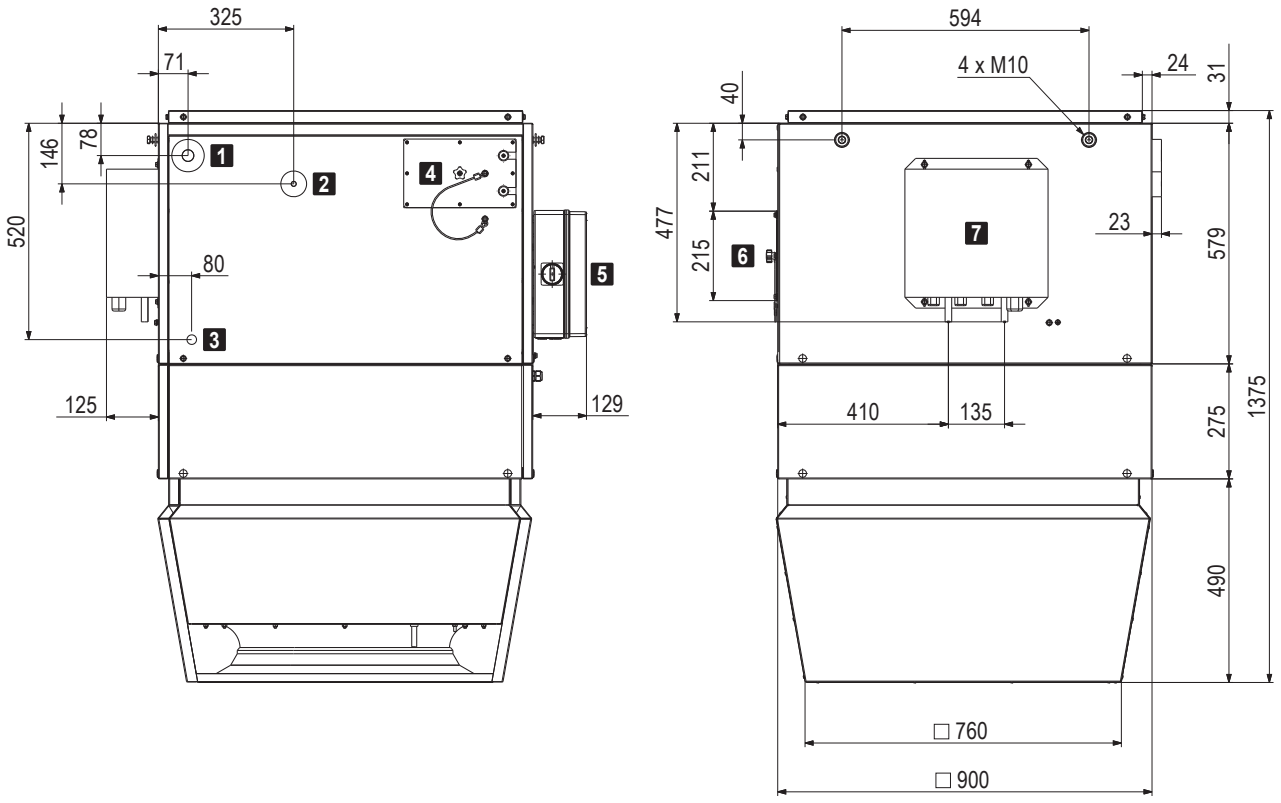
3.9 Product information according to ErP

Model	TopVent® TP			Unit
	6-J	6-L	9-N	
Cooling capacity (sensible) ($P_{rated,c}$)	21.8	27.9	48.1	kW
Cooling capacity (latent) ($P_{rated,c}$)	9.7	9.7	14.9	kW
Heating capacity ($P_{rated,h}$)	33.5	40.4	67.4	kW
Total electric power input (P_{elec})	1.12	1.12	1.90	kW
Sound power level (L_{WA})	81.0	81.0	83.0	dB
Contact details	Hoval Aktiengesellschaft Austrasse 70, 9490 Vaduz, Liechtenstein www.hoval.com			

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

3.10 Dimensions and weights

TopVent ® TP-6

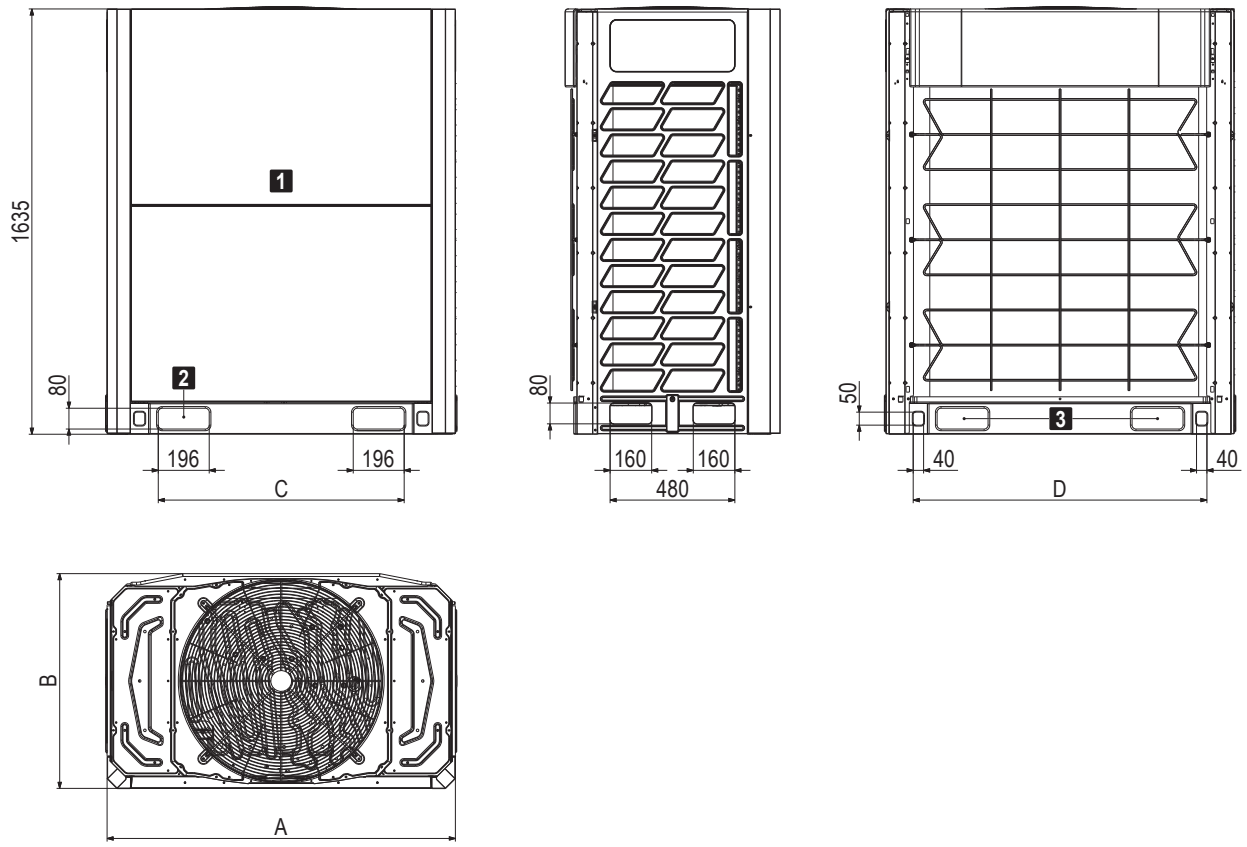


1	Gas line connection (∅ 28 mm)
2	Liquid line connection (∅ 12 mm)
3	Condensate connection (G1" external)
4	Access panel, liquid temperature sensor
5	Unit control box
6	Access panel, condensate separator
7	Combi box
	TP-6-J: VRF 02 (connection ∅ 12.7 mm)
	TP-6-L: VRF 03 (connection ∅ 15.9 mm)

Unit type		TP-6-J	TP-6-L
Weight	kg	223	223

Fig. B4: Dimensions and weights TopVent® TP-6

Belaria® VRF (33, 40)

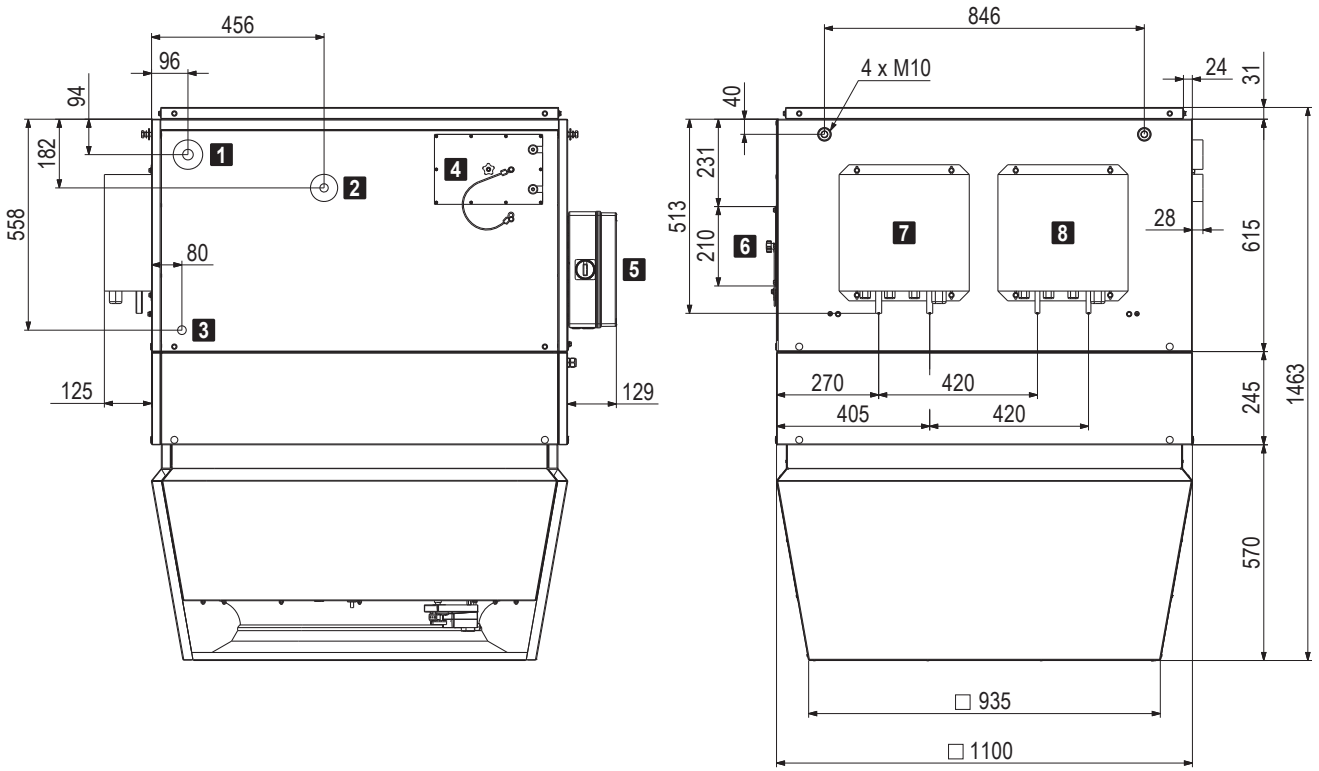


1	Access door		
2	Connection of refrigerant pipes and cabling		
	VRF(33):	Liquid line connection	∅ 15.9 mm
		Gas line connection	∅ 28.6 mm
	VRF(40):	Liquid line connection	∅ 15.9 mm
		Gas line connection	∅ 31.8 mm
3	Openings for forklift		

Heat pump Belaria®		VRF (33)	VRF (40)
A	mm	990	1340
B	mm	790	825
C	mm	596	946
D	mm	780	1130
Weight	kg	227	277

Fig. B5: Dimensions and weights Belaria® VRF (33, 40)

TopVent ® TP-9

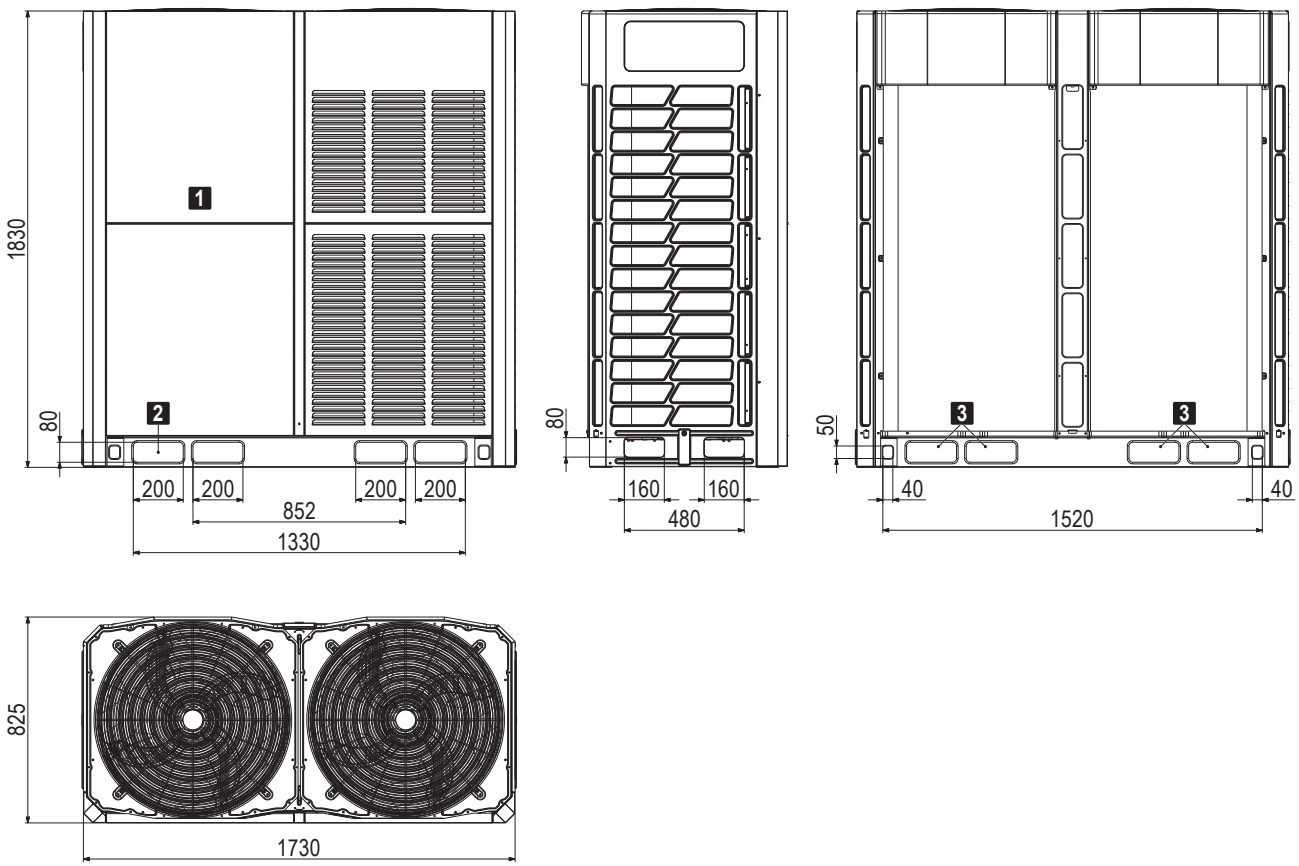


1	Gas line connection (∅ 28 mm)
2	Liquid line connection (∅ 22 mm)
3	Condensate connection (G1" external)
4	Access panel, liquid temperature sensor
5	Unit control box
6	Access panel, condensate separator
7	Combi box VRF 02 (connection ∅ 12.7 mm) – client
8	Combi box VRF 03 (connection ∅ 15.9 mm) – server

Unit type		TP-9-N
Weight	kg	316

Fig. B6: Dimensions and weights TopVent® TP-9

Belaria® VRF (67)



1	Access door	
2	Connection of refrigerant pipes and cabling	
	VRF(67): Liquid line connection	∅ 19.1 mm
	Gas line connection	∅ 31.8 mm
3	Openings for forklift	

Heat pump Belaria®		VRF (67)
Weight	kg	430

Fig. B7: Dimensions and weights Belaria® VRF (67)

4 Specification texts

4.1 TopVent® TP

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

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

The heat pump system consists of the following components:
- Heat pump Belaria® VRF (33, 40, 67)
- Conversion board
- Expansion valve

The TopVent® TP 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.

Heating/cooling section

Housing made of magnesium zinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of smooth internal surfaces and ageing-resistant, silicone-free sealing materials, internally insulated with close-pored polyurethane. The heating/cooling section contains
- The highly efficient heating/cooling coil consisting of seamless copper pipes with pressed-on, optimised and profiled aluminium fins, 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 trap for connecting to a condensate drain (supplied)
- The 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

Air-Injector

Casing made of magnesium zinc sheet, air-tight, flame retardant, 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
- Supply air temperature sensor

Unit control box

Control box fitted at the side of the casing 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:
- Isolation switch
- 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 and actuators in the unit are fully factory-wired.
Power supply and bus connection to be installed on site.

Options for the unit

Suspension set
For ceiling installation of the unit consisting of 4 pairs U-profiles made of magnesium zinc sheet, height-adjustable to 1300 mm.

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

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

Standard paint finish
Exterior painting in Hoval red (RAL 3000), including optional components and suspension set.

Paint finish as desired
Exterior painting of the unit in choice of RAL colour, including optional components and suspension set.

Recirculation silencer
As an attachment to the unit, made of magnesium zinc sheet, lined with sound insulation matting, insertion attenuation 3 dB.

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

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 Belaria® VRF (33, 40, 67)
- Compact unit for outdoor installation
- Painted casing RAL 7044 (silk grey) made from galvanised sheet steel
- Variable-speed inverter scroll compressor
  – 1 × for Belaria® VRF (33, 40)
  – 2 × for Belaria® VRF (67)
- Speed-controlled fan
  – 1 × for Belaria® VRF (33, 40)
  – 2 × for Belaria® VRF (67)
- Coated Al/Cu finned-tube evaporator or condenser
- Electronic expansion valve (for heating mode)
- 4-way valve for defrosting
- Refrigerant shut-off valves
- Refrigerant R410A
- Terminal box

Conversion board
Printed circuit board assembly for communication between heat pump, expansion valve and indoor climate unit and for recording the temperatures of the refrigerant upstream, in and downstream of the heating/cooling coil. Mounted and fully wired in the combi box.
– 1 × for Belaria® VRF (33, 40)
– 2 × for Belaria® VRF (67)

Expansion valve
Electronic expansion valve for cooling mode, mounted in the combi box, thermally insulated and protected against mechanical damage.
– 1 × for Belaria® VRF (33, 40)
– 2 × for Belaria® VRF (67)

Options for the heat pump

Rear protection hood
Hood made of magnesium zinc sheet, powder-coated (RAL 7044 silk grey), for protection against wind and snow. On-site: Mounting to the heat pump.

Side protection hood
Hood made of magnesium zinc sheet, powder-coated (RAL 7044 silk grey), for protection against wind and snow. On-site: Mounting to the heat pump.

Front protection hood
Hood made of magnesium zinc sheet, powder-coated (RAL 7044 silk grey), for protection against wind and snow. On-site: Mounting to the heat pump.

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 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
- 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 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

TopVent® MP

Supply air 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® MP 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® MP 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

TopVent® MP units consist of the following components:

Supply air unit
- Mixed air box with fresh air and recirculation dampers linked to move in opposite directions, equipped with actuator with spring return
- Filter box
  For air filtration, 2 pocket filters ISO Coarse 60% are installed.
- Heating/cooling section
  The heating cooling section contains the following components:
  – Heating/cooling coil for heating and cooling the supply air
  – Condensate separator
- Fan unit
  – Radial fan with energy-saving EC motor
- 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.

As part of the TopTronic® C control system, the unit control box is an integral component.

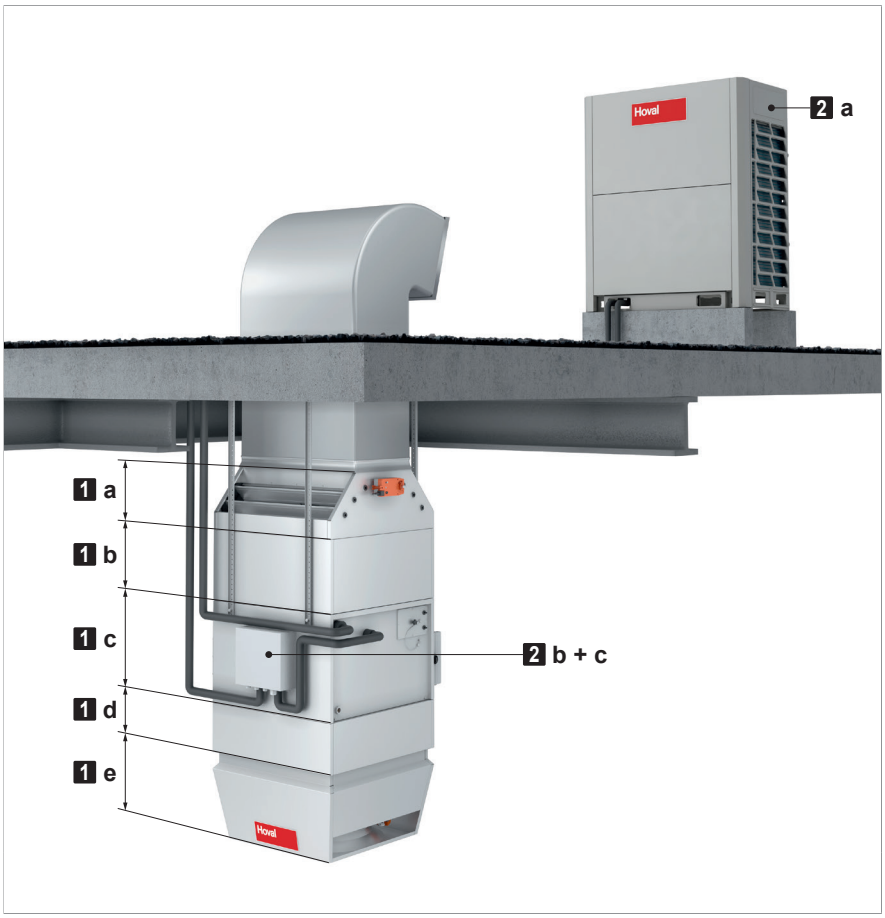
Heat pump system
The reversible air/air heat pump system in split design generates both heat and cold decentrally. It consists of the following components:
- Belaria® VRF heat pump with continuously modulating inverter technology for precise output control and high efficiency
- Conversion board for communication between heat pump, expansion valve and indoor climate unit (mounted in the combi box)
- Expansion valve (mounted in the combi box)

The combi box is mounted on the indoor climate unit.

TopVent® MP units are available in 2 unit sizes and a total of 3 output levels:

Unit size	Heat pump	Conversion board and expansion valve
MP-6	Belaria® VRF (33)	1 ×
	Belaria® VRF (40)	1 ×
MP-9	Belaria® VRF (67)	2 ×

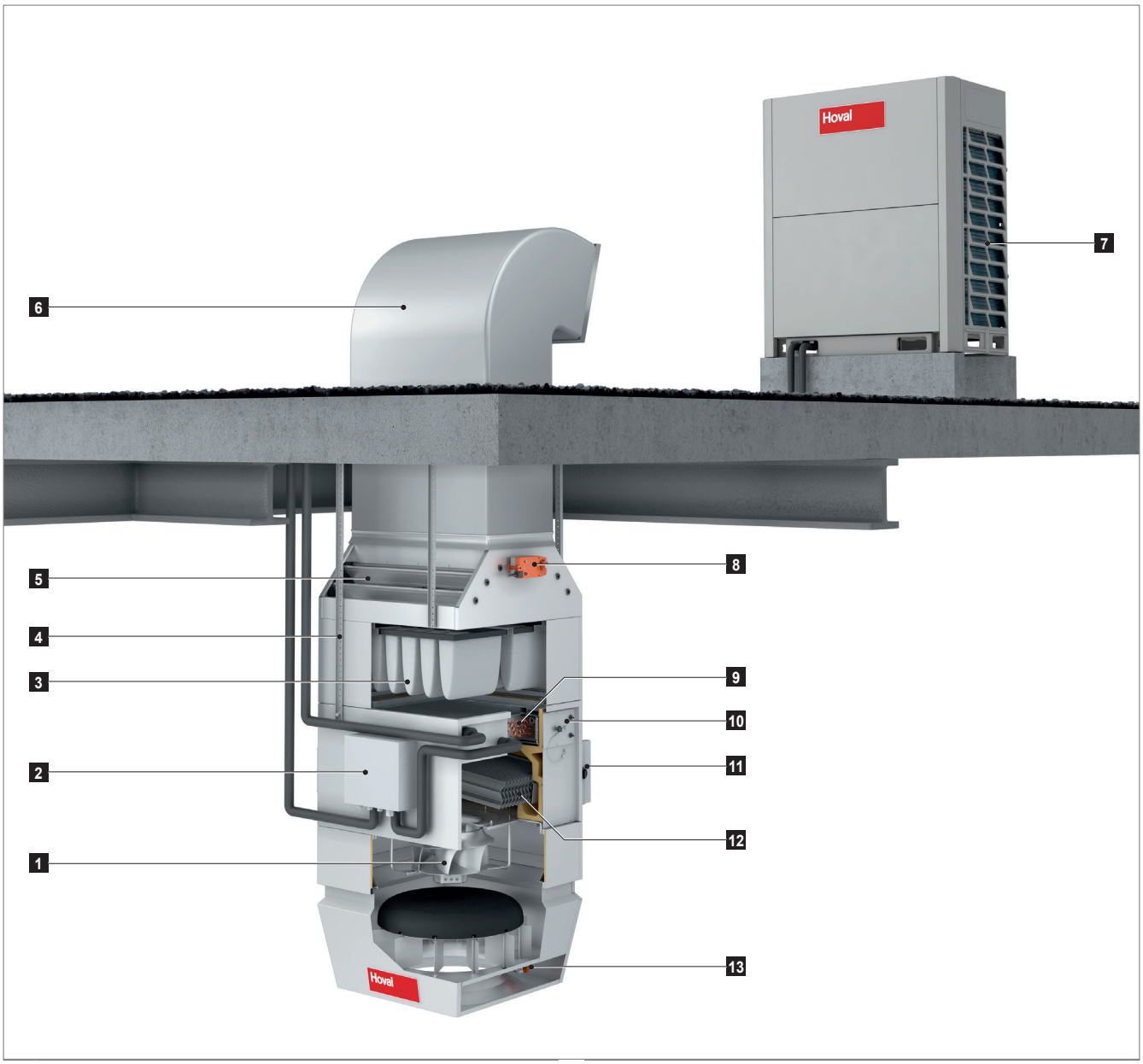
Table C1: Availability



- **1** Supply air unit
  - **a** Mixed air box
  - **b** Filter box
  - **c** Heating/cooling section
  - **d** Fan unit
  - **e** Air-Injector
- **2** Heat pump system
  - **a** Heat pump Belaria® VRF
  - **b** Conversion board (mounted in the combi box)
  - **c** Expansion valve (mounted in the combi box)

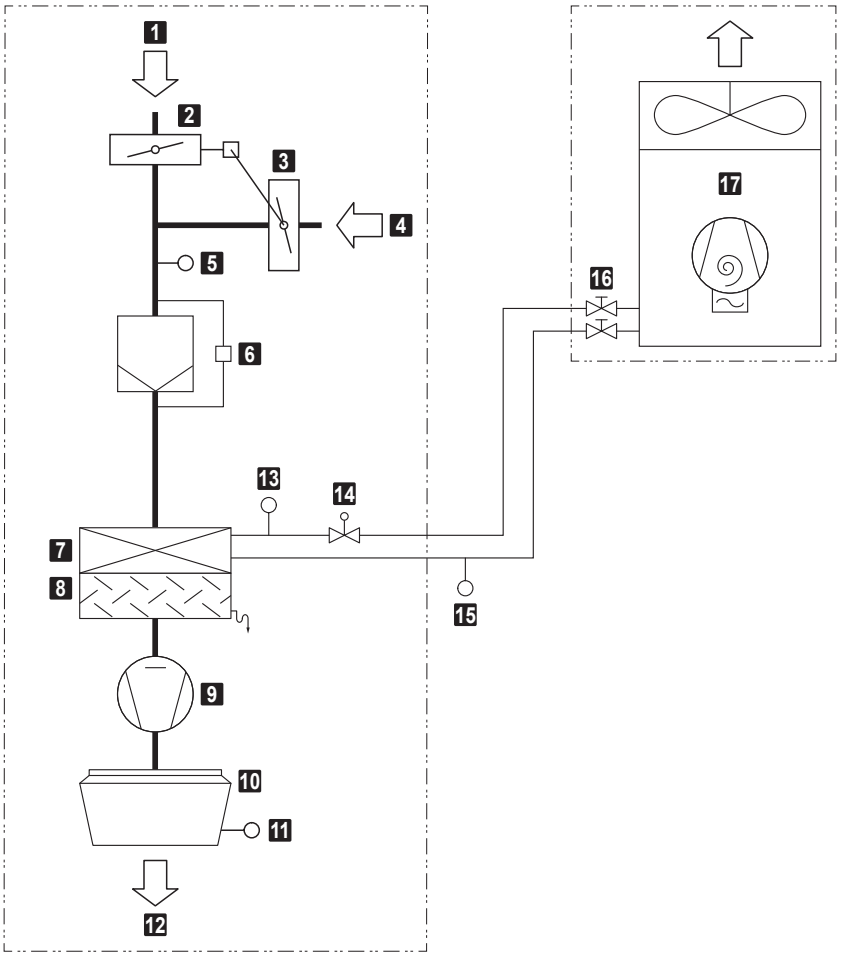
Fig. C1: Components TopVent® MP

2.1 Construction and operation TopVent® MP-6



1	Fan	8	Fresh air damper actuator
2	Combi box with conversion board and expansion valve	9	Heating/cooling coil
3	Air filter	10	Access panel, liquid temperature sensor
4	Suspension set	11	Unit control box
5	Recirculation damper	12	Condensate separator
6	Fresh air duct (field-supplied)	13	Actuator Air-Injector
7	Heat pump Belaria® VRF (33, 40)		

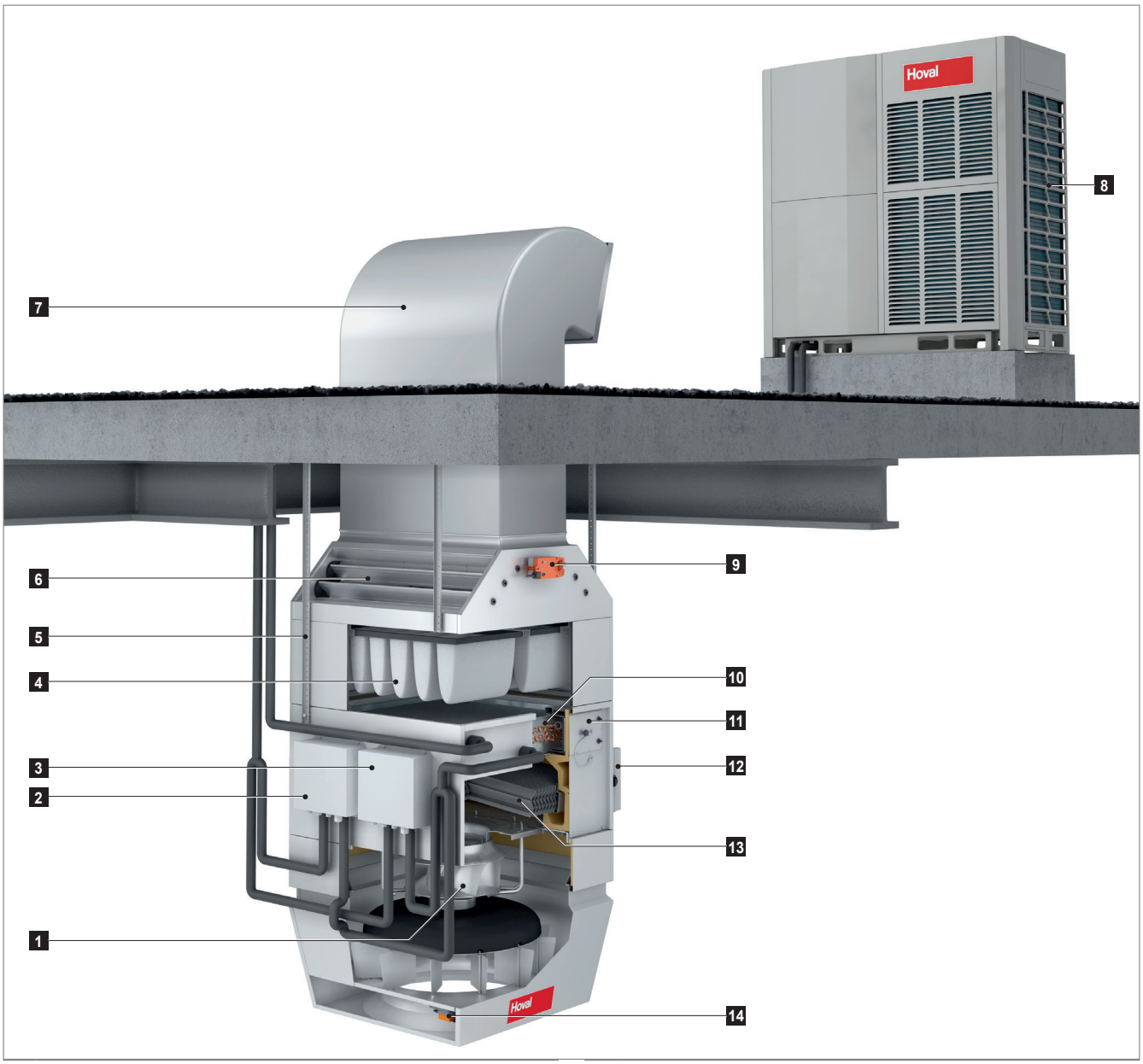
Fig. C2: Construction TopVent® MP-6



1	Fresh air	10	Air-Injector with actuator
2	Fresh air damper with actuator	11	Supply air temperature sensor
3	Recirculation damper (opposed to the fresh air damper)	12	Supply air
4	Extract air	13	Liquid temperature sensor
5	Mixed air temperature sensor	14	Expansion valve
6	Air filter with differential pressure switch	15	Gas temperature sensor (supplied loose)
7	Heating/cooling coil	16	Shut-off valves
8	Condensate separator	17	Heat pump Belaria® VRF (33, 40)
9	Fan		

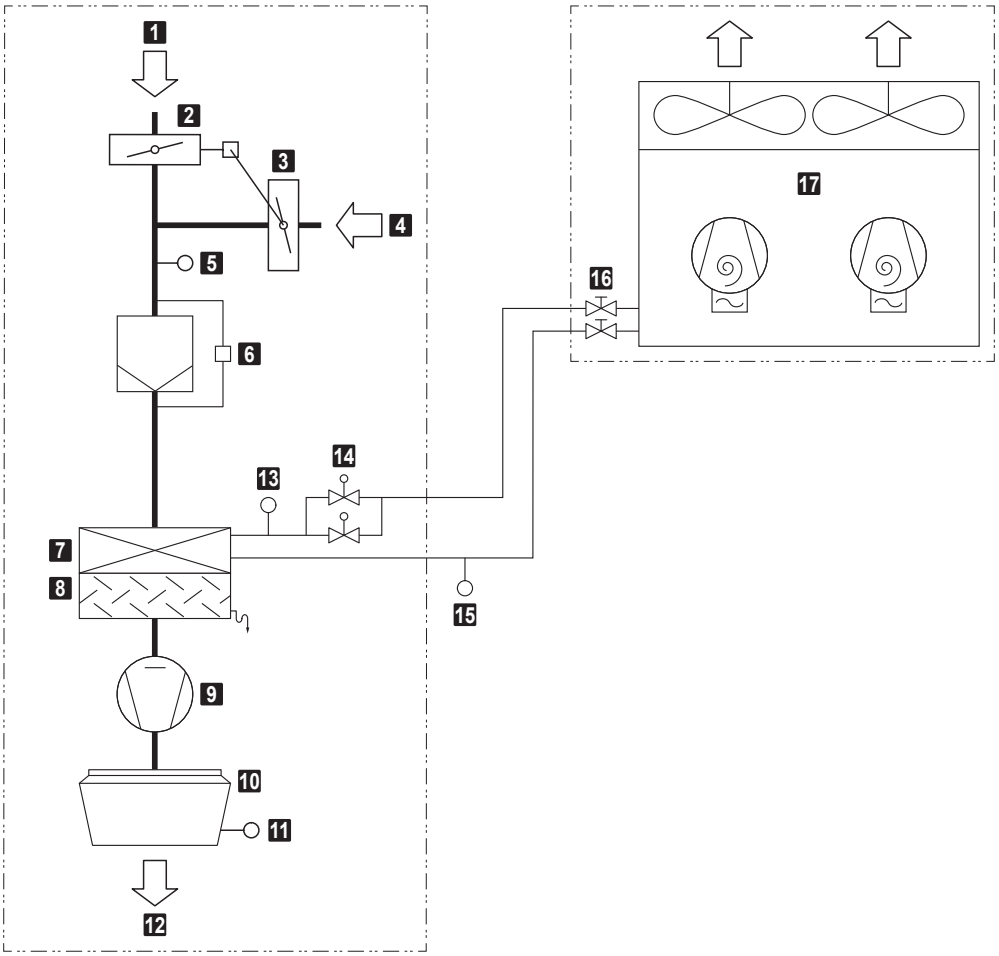
Table C2: Function diagram TopVent® MP-6

2.2 Construction and operation TopVent® MP-9



1	Fan	8	Heat pump Belaria® VRF (67)
2	Combi box VRF 02 with conversion board and expansion valve	9	Fresh air damper actuator
3	Combi box VRF 03 with conversion board and expansion valve	10	Heating/cooling coil
4	Air filter	11	Access panel, liquid temperature sensor
5	Suspension set	12	Unit control box
6	Recirculation damper	13	Condensate separator
7	Fresh air duct (field-supplied)	14	Actuator Air-Injector

Fig. C3: Construction TopVent® MP-9



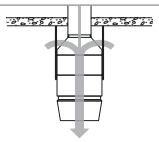
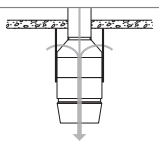
1	Fresh air	10	Air-Injector with actuator
2	Fresh air damper with actuator	11	Supply air temperature sensor
3	Recirculation damper (opposed to the fresh air damper)	12	Supply air
4	Extract air	13	Liquid temperature sensor
5	Mixed air temperature sensor	14	Expansion valves
6	Air filter with differential pressure switch	15	Gas temperature sensor (supplied loose)
7	Heating/cooling coil	16	Shut-off valves
8	Condensate separator	17	Heat pump Belaria® VRF (67)
9	Fan		

Table C3: Function diagram TopVent® MP-9

2.3 Operating modes

TopVent® MP 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® MP 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)

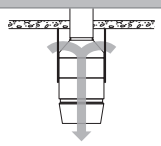
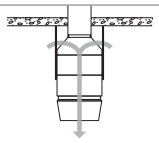
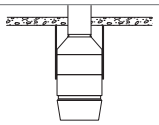
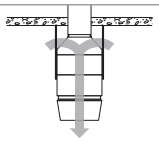
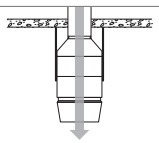
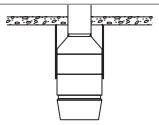
Code	Operating mode		Description
REC	**Recirculation** On/Off operation: during heat or cool demand, the unit draws in room air, heats or cools it and blows it back into the room. The room temperature set value day is active.		Fan ..... speed 1 / 2 [1] Fresh air damper..... closed Heating/cooling ..... 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 C4: Operating modes TopVent® MP

C

3 Technical data

3.1 Type code

MP - 6 - J ...

Unit type
TopVent® MP

Unit size
6 or 9

Heating/cooling section
J with coil type J for Belaria® VRF (33)
L with coil type L for Belaria® VRF (40)
N with coil type N for Belaria® VRF (67)

Further options

Table C5: Type code

3.2 Application limits

Heating mode				
Fresh air temperature		min. max.	°C °C	-25 24
Air inlet temperature to the heating/cooling coil		min. max.	°C °C	5 30
Cooling mode				
Fresh air temperature		min. max.	°C °C	-15 48
Air inlet temperature to the heating/cooling coil		min. max.	°C °C	17 32
Extract air temperature		max.	°C	50
Moisture content of extract air [1]		max.	g/kg	15
Supply air temperature		max.	°C	45
Room temperature setpoint		min.	°C	15
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				
[1] Units for applications where the humidity in the room increases by more than 2 g/kg are available on request.				

Table C6: Application limits

3.3 Electrical connection

TopVent® MP

Unit type		MP-6	MP-9
Supply voltage	V AC	3 × 400	3 × 400
Permitted voltage tolerance	%	± 5	± 5
Frequency	Hz	50	50
Connected load	kW	1.7	3.5
Current consumption max.	A	3.0	5.9
Series fuse	A	13.0	13.0
Protection rating	–	IP 54	IP 54

Table C7: Electrical connection TopVent® MP

Heat pump Belaria® VRF

Heat pump Belaria®		VRF (33)	VRF (40)	VRF (67)
Supply voltage	V AC	3 × 400	3 × 400	3 × 400
Permitted voltage tolerance	%	± 2	± 2	± 2
Frequency	Hz	50	50	50
Connected load	kW	16.5	20.6	34.0
Current consumption max.	A	26.4	33.1	54.5
Series fuse	A	32.0	40.0	63.0
Inrush current	A	–	–	–

Table C8: Electrical connection Belaria® VRF

3.4 Air flow rate

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

Table C9: Air flow rate

3.5 Air filtration

Filter	Fresh air / Extract air
Class acc. to ISO 16890	ISO coarse 60 %
Class acc. to EN 779	G4
Factory setting of differential pressure switches	180 Pa

Table C10: Air filtration

3.6 Technical data of the Belaria® VRF heat pump

Heat pump Belaria®			VRF (33)	VRF (40)	VRF (67)
Heating	Rated heat output 1)	kW	33.5	40.0	67.0
	Power consumption	kW	7.60	8.51	15.33
	COP	–	4.40	4.70	4.37
	$\eta_{s,h}$	–	173	169	151
	SCOP	–	4.41	4.31	3.86
Cooling	Rated cooling capacity 2)	kW	33.5	40.0	67.0
	Power consumption	kW	8.90	9.88	18.10
	EER	–	3.75	4.05	3.70
	$\eta_{s,c}$	–	285	246	277
	SEER	–	7.20	6.22	7.00
Refrigerant		–	R410A	R410A	R410A
Refrigerant fill volume		kg	11	13	22

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 C11: Technical data Belaria® VRF

3.7 Sound level

Unit type			MP-6		MP-9	
			indoors	outdoors	indoors	outdoors
Sound pressure level (at a distance of 5 m) 1)		dB(A)	58	51	62	55
Total sound power level		dB(A)	80	73	84	77
Octave sound power level	63 Hz	dB	46	44	49	46
	125 Hz	dB	64	59	68	63
	250 Hz	dB	66	62	71	67
	500 Hz	dB	71	65	75	69
	1000 Hz	dB	75	67	79	71
	2000 Hz	dB	74	68	77	71
	4000 Hz	dB	72	66	75	69
	8000 Hz	dB	62	57	68	64

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

Table C12: Sound level TopVent® MP

Heat pump Belaria®			VRF (33)	VRF (40)	VRF (67)
Sound pressure level (at a distance of 5 m)		dB(A)	59.0	63.0	67.0
Total sound power level 1)		dB(A)	81.0	85.0	89.0
Octave sound pressure level 2)	63 Hz	dB	62.6	63.5	66.5
	125 Hz	dB	60.6	61.2	65.0
	250 Hz	dB	61.0	60.8	65.0
	500 Hz	dB	58.3	57.5	63.0
	1000 Hz	dB	55.5	56.9	57.0
	2000 Hz	dB	46.8	47.5	52.0
	4000 Hz	dB	43.9	45.1	51.0
	8000 Hz	dB	43.5	44.1	50.2

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 1.3 m above the floor in a semi-anechoic chamber.

Table C13: Sound level Belaria® VRF

3.8 Heat output

t_F	t_{room}	Type	Q	H_{max}	t_S	P_{HP}
°C	°C	MP-	kW	m	°C	kW
-5	16	6-J	33.2	14.3	31.9	9.2
		6-L	39.0	13.2	35.0	10.3
		9-N	65.3	13.3	37.3	18.5
	20	6-J	32.5	14.6	35.4	9.3
		6-L	38.9	13.4	38.5	10.4
		9-N	65.1	13.5	40.8	18.7
-15	16	6-J	28.7	15.8	28.9	9.1
		6-L	34.3	14.4	31.7	10.2
		9-N	57.5	14.5	33.7	18.3
	20	6-J	28.6	16.1	32.5	9.2
		6-L	34.2	14.7	35.2	10.3
		9-N	57.2	14.7	37.2	18.5

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
- Fresh air ratio 10 %

Table C14: Heat output TopVent® MP

3.9 Cooling capacity

t_F	t_{room}	RH_{room}	Type	Q_{sen}	Q_{tot}	t_S	m_C	P_{HP}
°C	°C	%	MP-	kW	kW	°C	kg/h	kW
28	22	50	6-J	20.4	26.4	14.2	8.5	5.0
			6-L	24.7	31.5	12.2	10.1	5.7
			9-N	41.8	52.9	10.6	16.3	10.4
		70	6-J	19.4	32.7	14.8	19.6	6.8
			6-L	22.5	38.1	13.2	22.8	7.5
			9-N	37.6	63.1	12.0	37.5	13.6
32	26	50	6-J	23.4	34.0	16.8	15.6	8.1
			6-L	27.9	40.6	14.6	18.6	9.2
			9-N	47.4	68.0	12.8	30.3	16.9
		70	6-J	17.7	34.9	19.6	25.3	8.2
			6-L	21.1	41.7	17.9	30.2	9.3
			9-N	35.9	69.9	16.6	50.0	17.0

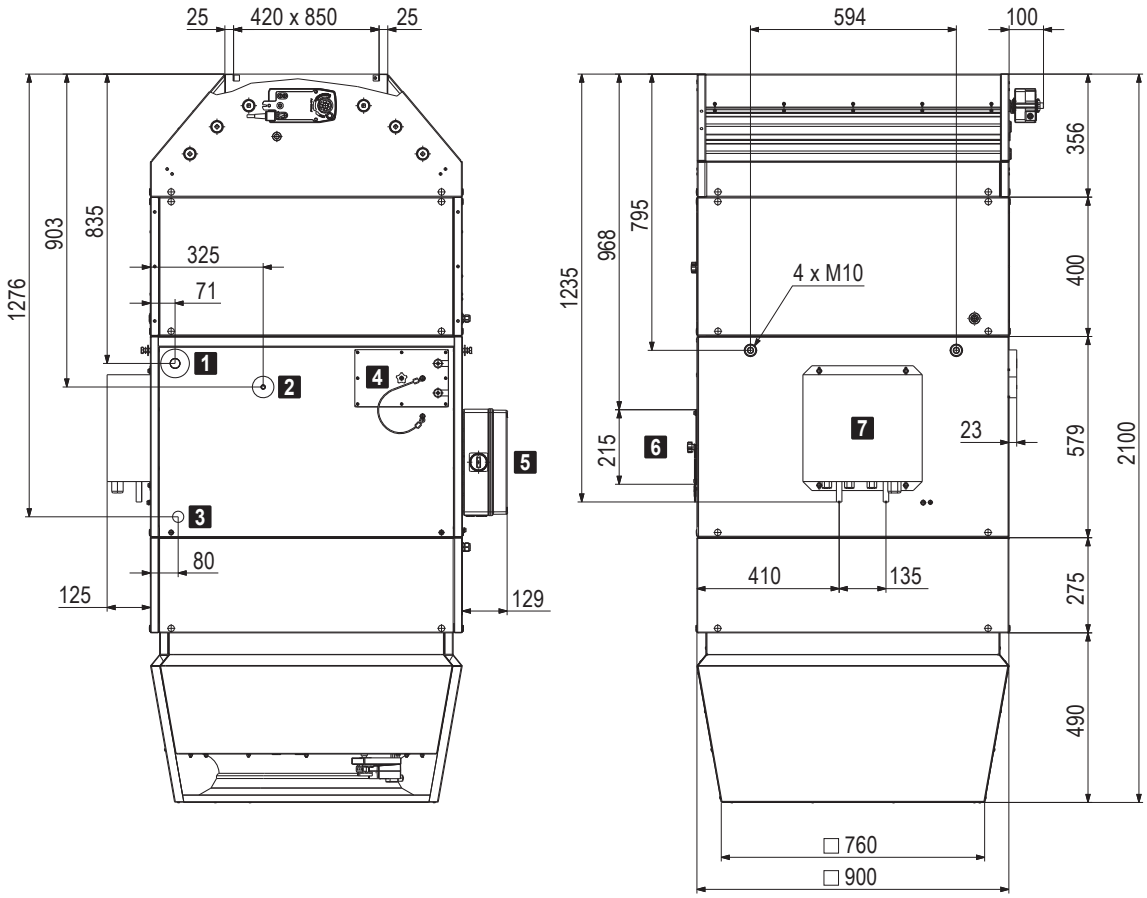
Legend:
t_F = Fresh air temperature
t_{room} = Room air temperature
RH_{room} = Relative humidity of the room air
Q_{sen} = Sensible cooling capacity
Q_{tot} = Total cooling capacity
t_S = Supply air temperature
m_C = Condensate quantity
P_{HP} = Power consumption of the heat pump

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 C15: Cooling capacity TopVent® MP

3.10 Dimensions and weights

TopVent® MP-6

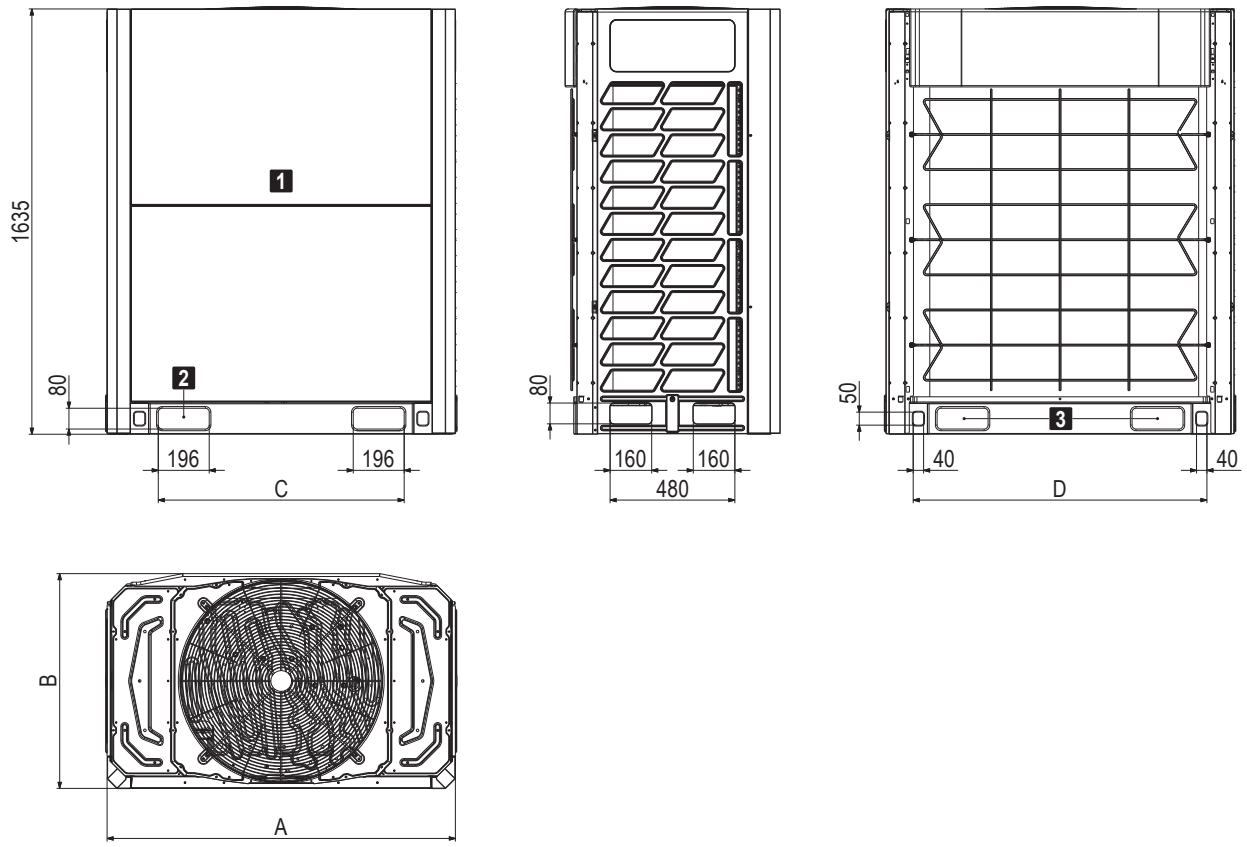


1	Gas line connection (∅ 28 mm)
2	Liquid line connection (∅ 12 mm)
3	Condensate connection (G1" external)
4	Access panel, liquid temperature sensor
5	Unit control box
6	Access panel, condensate separator
7	Combi box
	MP-6-J: VRF 02 (connection ∅ 12.7 mm)
	MP-6-L: VRF 03 (connection ∅ 15.9 mm)

Unit type		MP-6-J	MP-6-L
Weight	kg	282	282

Fig. C4: Dimensions and weights TopVent® MP-6

Belaria® VRF (33, 40)

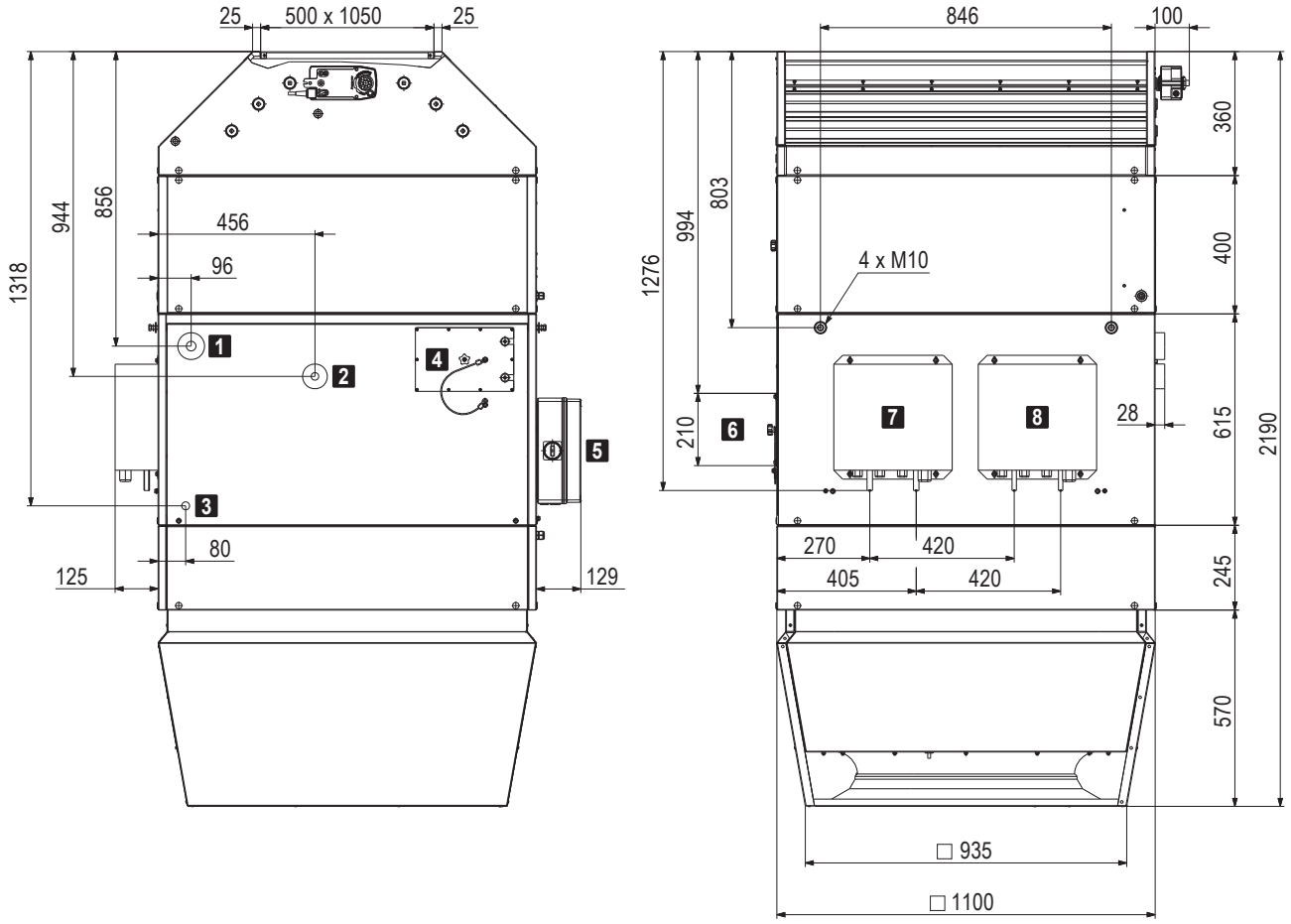


1	Access door		
2	Connection of refrigerant pipes and cabling		
	VRF(33):	Liquid line connection	∅ 15.9 mm
		Gas line connection	∅ 28.6 mm
	VRF(40):	Liquid line connection	∅ 15.9 mm
		Gas line connection	∅ 31.8 mm
3	Openings for forklift		

Heat pump Belaria®		VRF (33)	VRF (40)
A	mm	990	1340
B	mm	790	825
C	mm	596	946
D	mm	780	1130
Weight	kg	227	277

Fig. C5: Dimensions and weights Belaria® VRF (33, 40)

TopVent® MP-9

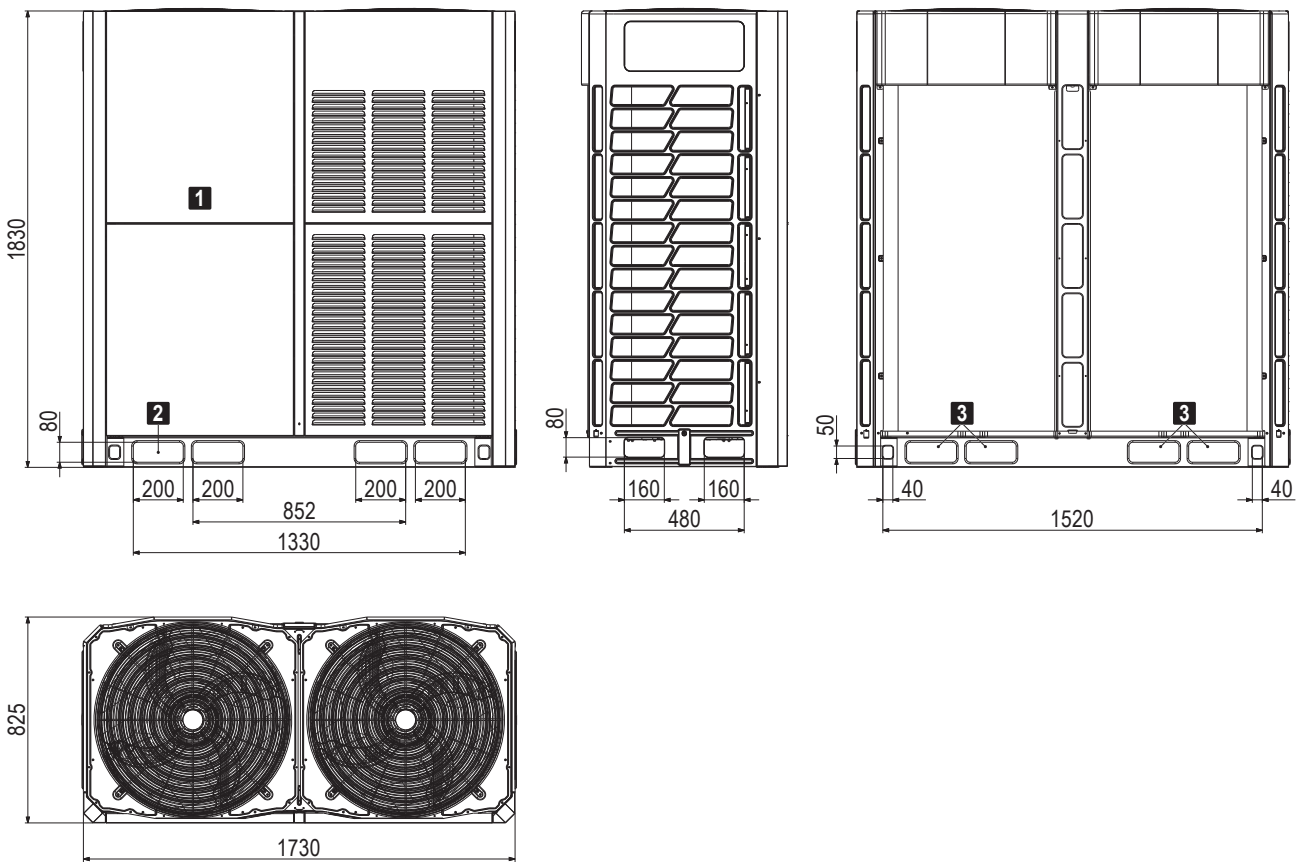


1	Gas line connection (∅ 28 mm)
2	Liquid line connection (∅ 22 mm)
3	Condensate connection (G1" external)
4	Access panel, liquid temperature sensor
5	Unit control box
6	Access panel, condensate separator
7	Combi box VRF 02 (connection ∅ 12.7 mm) – client
8	Combi box VRF 03 (connection ∅ 15.9 mm) – server

Unit type		MP-9-N
Weight	kg	380

Fig. C6: Dimensions and weights TopVent® MP-9

Belaria® VRF (67)



1	Access door	
2	Connection of refrigerant pipes and cabling	
	VRF(67): Liquid line connection	∅ 19.1 mm
	Gas line connection	∅ 31.8 mm
3	Openings for forklift	

Heat pump Belaria®		VRF (67)
Weight	kg	430

Fig. C7: Dimensions and weights Belaria® VRF (67)

3.11 Product information according to ErP

Model	TopVent® MP			Unit
	6-J	6-L	9-N	
Cooling capacity (sensible) ($P_{rated,c}$)	20.2	26.3	45.8	kW
Cooling capacity (latent) ($P_{rated,c}$)	11.3	11.3	17.2	kW
Heating capacity ($P_{rated,h}$)	36.0	43.3	72.0	kW
Total electric power input (P_{elec})	1.42	1.42	2.20	kW
Sound power level (L_{WA})	83.0	83.0	84.0	dB
Contact details	Hoval Aktiengesellschaft Austrasse 70, 9490 Vaduz, Liechtenstein www.hoval.com			

Table C16: Product information according to Commission Regulation (EU) 2016/2281, Table 13

4 Specification texts

4.1 TopVent® MP

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

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

The heat pump system consists of the following components:
- Heat pump Belaria® VRF (33, 40, 67)
- Conversion board
- Expansion valve

The TopVent® MP 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.

Fan unit

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

Heating/cooling section

Housing made of magnesium zinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of smooth internal surfaces and ageing-resistant, silicone-free sealing materials, internally insulated with close-pored polyurethane. The heating/cooling section contains
- The highly efficient heating/cooling coil consisting of seamless copper pipes with pressed-on, optimised and profiled aluminium fins, 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 trap for connecting to a condensate drain (supplied)

Air-Injector

Casing made of magnesium zinc sheet, air-tight, flame retardant, 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
- Supply air temperature sensor

Filter box

Casing made of magnesium zinc sheet, internally insulated with closed-cell polyethylene foam, with 2 ISO coarse 60% bag filters (G4), with differential pressure switch for filter monitoring, factory-wired to the circuit board in the unit control box.

Mixed air box

Casing made of magnesium zinc sheet, internally insulated with closed-cell polyethylene foam, with fresh air damper and recirculation damper linked to move in opposite directions; includes actuator with spring return, factory-wired to the circuit board in the unit control box.

Unit control box

Control box fitted at the side of the casing 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:
- Isolation switch
- 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 and actuators in the unit are fully factory-wired.
Power supply and bus connection to be installed on site.

Options for the unit

Suspension set
For ceiling installation of the unit consisting of 4 pairs

U-profiles made of magnesium zinc sheet, height-adjustable to 1300 mm.

Standard paint finish
Exterior painting in Hoval red (RAL 3000), including optional components and suspension set.

Paint finish as desired
Exterior painting of the unit in choice of RAL colour, including optional components and suspension set.

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

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 Belaria® VRF (33, 40, 67)
- Compact unit for outdoor installation
- Painted casing RAL 7044 (silk grey) made from galvanised sheet steel
- Variable-speed inverter scroll compressor
  - 1 × for Belaria® VRF (33, 40)
  - 2 × for Belaria® VRF (67)
- Speed-controlled fan
  - 1 × for Belaria® VRF (33, 40)
  - 2 × for Belaria® VRF (67)
- Coated Al/Cu finned-tube evaporator or condenser
- Electronic expansion valve (for heating mode)
- 4-way valve for defrosting
- Refrigerant shut-off valves
- Refrigerant R410A
- Terminal box

Conversion board
Printed circuit board assembly for communication between heat pump, expansion valve and indoor climate unit and for recording the temperatures of the refrigerant upstream, in and downstream of the heating/cooling coil. Mounted and fully wired in the combi box.
– 1 × for Belaria® VRF (33, 40)
– 2 × for Belaria® VRF (67)

Expansion valve
Electronic expansion valve for cooling mode, mounted in the combi box, thermally insulated and protected against mechanical damage.
– 1 × for Belaria® VRF (33, 40)
– 2 × for Belaria® VRF (67)

Options for the heat pump

Rear protection hood
Hood made of magnesium zinc sheet, powder-coated (RAL 7044 silk grey), for protection against wind and snow. On-site: Mounting to the heat pump.

Side protection hood
Hood made of magnesium zinc sheet, powder-coated (RAL 7044 silk grey), for protection against wind and snow. On-site: Mounting to the heat pump.

Front protection hood
Hood made of magnesium zinc sheet, powder-coated (RAL 7044 silk grey), for protection against wind and snow. On-site: Mounting to the heat pump.

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 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
- 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 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

Options

1 Type code

1.1 Type code for recirculation units

TP - 6 - J / ST . D1 / S . FK . LH . U- / - . KP / TC . - . -- . --

Unit type
TopVent® TP

Unit size
6 or 9

Heating/cooling section
J with coil type J for Belaria® VRF (33)
L with coil type L for Belaria® VRF (40)
N with coil type N for Belaria® VRF (67)

Design
ST Standard

Air outlet
D1 Design with Air-Injector

Installation
- without
S Suspension set

Filter box
-- without
FK Filter box
FF Flat filter box

Paint finish
-- without
LH Standard paint finish
LU Paint finish as desired

Silencer
-- without
U- Recirculation silencer

Condensate pump
-- without
KP Condensate pump

Control system
TC TopTronic® C

Table D1: Type code for recirculation units

1.2 Type code for supply air units

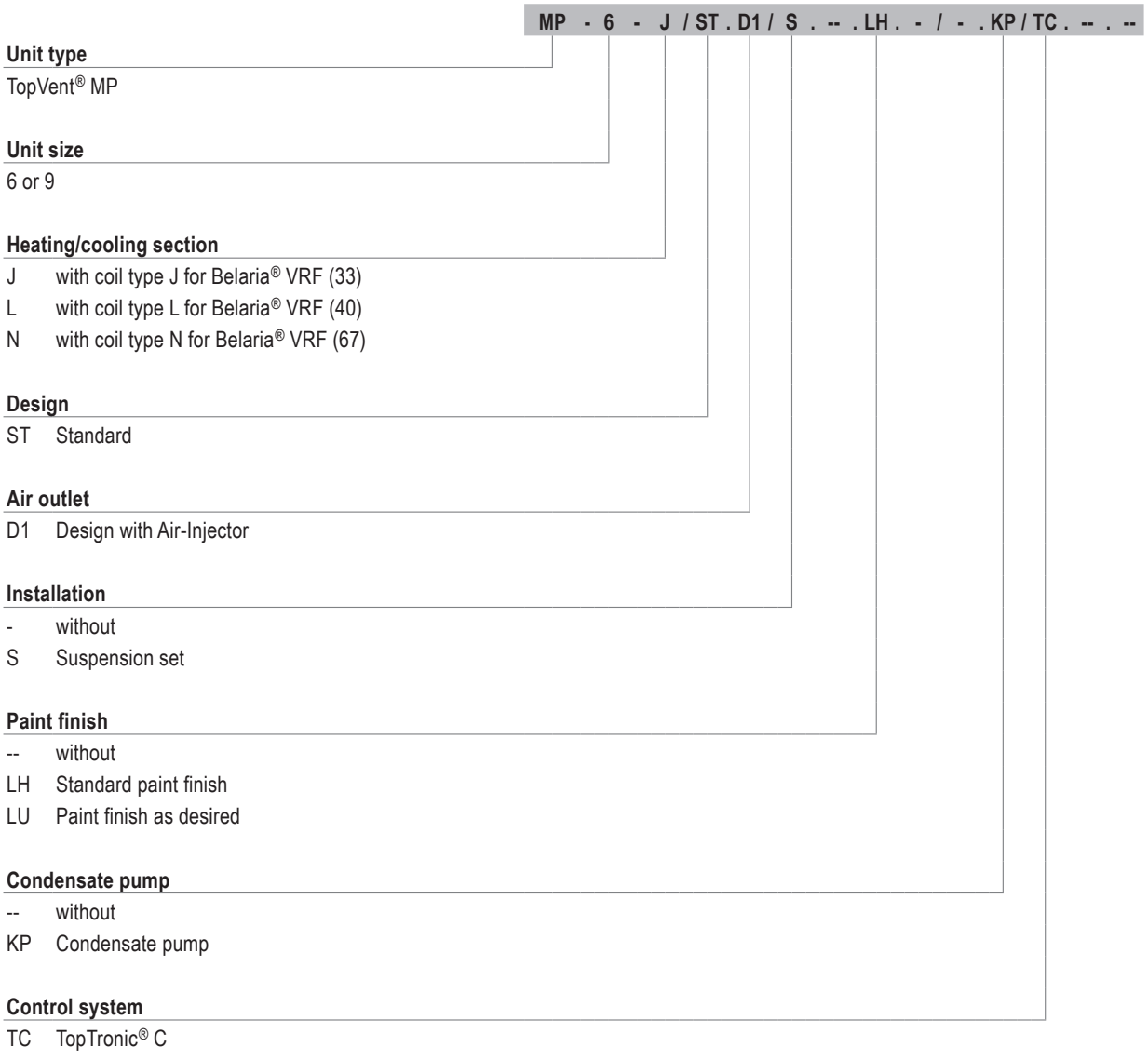


Table D2: Type code for supply air units

2 Suspension set

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

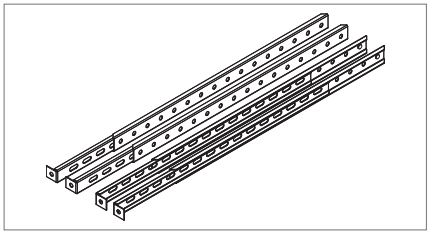
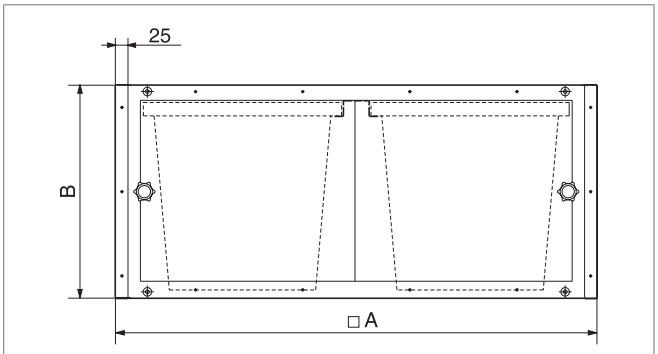


Fig. D1: Suspension set



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

Table D3: Filter box technical data

3 Air filtration

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

Notice
TopVent® MP units are equipped with the filter box with pocket filters as standard.

3.1 Filter box

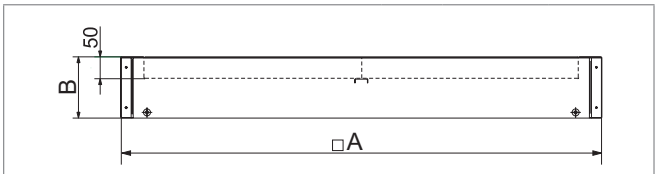
A filter box with 2 bag filters can be installed for the purpose of filtering the recirculation air. The modular construction made of magnesium zinc sheet with 2 sliding doors makes it easy to replace the filters.

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

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

3.2 Flat filter box

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



Size		6	9
A	mm	900	1100
B	mm	140	165
Filter class		ISO coarse 60 % (G4)	
Weight	kg	10	12.5
Factory setting of differential pressure switches	Pa	180	180

Table D4: Flat filter box technical data

4 Paint finish

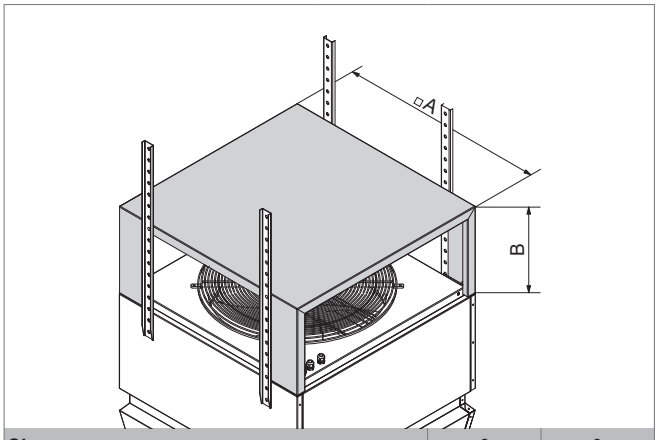
If the customer wishes, the units can be provided with an exterior paint finish. There are 2 possibilities:

- Standard paint finish in Hoval red (RAL 3000)
- Paint finish in desired RAL colour

5 Recirculation silencer

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

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



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

Table D5: Recirculation silencer dimensions and weights

6 Condensate pump

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

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

Flow rate (at 3 m delivery head)	l/h	max. 150
Tank capacity	l	max. 1.9
Dimensions (L x W x H)	mm	288 x 127 x 178
Weight	kg	2.4
Nominal voltage	V AC	230
Power consumption	kW	0.1
Current consumption	A	0.43

Table D6: Condensate pump technical data

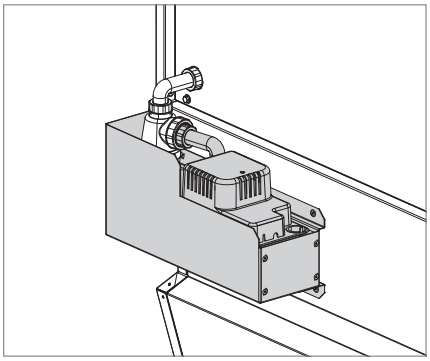
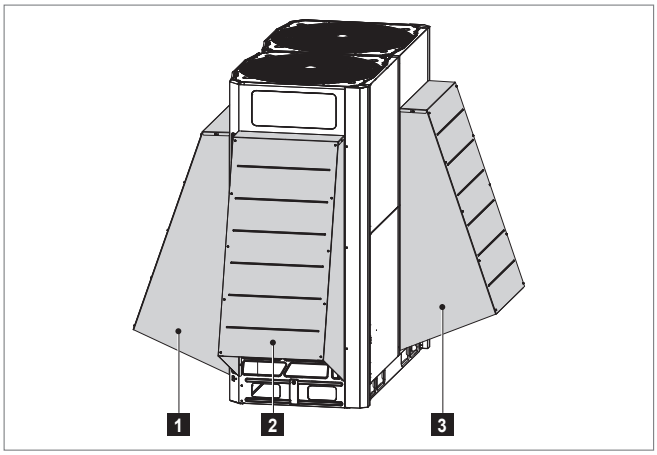


Fig. D2: Condensate pump

7 Options for the heat pump

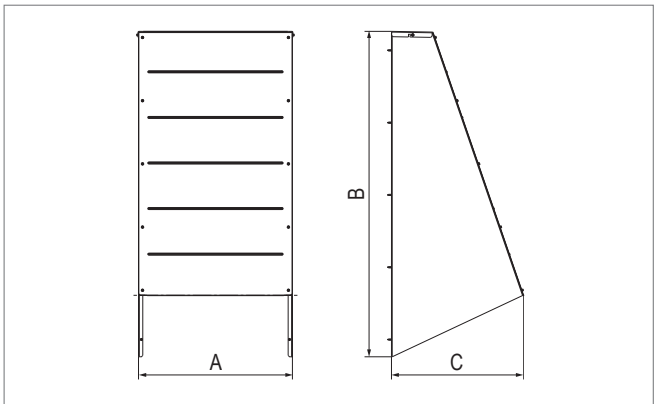
7.1 Protection hood

To protect the heat pump from strong winds and snowfall, protection hoods are available as accessories. They are supplied loose with the appropriate connecting screws for assembly on site.



1 Rear protection hood
2 Side protection hood
3 Front protection hood

Fig. D3: Belaria® VRF (67) heat pump with protection hoods



Belaria®	Protection hood		Qty.	A	B	C
VRF (33)	Side	PS-33	2	578	1222	497
	Rear	PR-33	1	842	1222	497
VRF (40)	Side	PS-40	2	578	1222	497
	Rear	PR-40	1	1192	1222	497
VRF (67)	Side	PS-67	2	600	1396	557
	Rear	PR-67	2	760	1378	550
	Front	PF-67	1	760	1378	550

Table D7: Quantity and dimensions of protections hoods (in mm)

Transport and installation

1 Installation

1.1 Preparation

The scope of delivery includes:
- TopVent® unit, including combi box with converter board and expansion valve supplied as complete unit on pallet
- Heat pump Belaria® VRF
- Accessories (installation material, trap, temperature sensors)
- Optional components

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

Heat pump Belaria® VRF
- Lifting the heat pump with a crane:
  – Use 2 straps at least 8 m in length.
- 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.

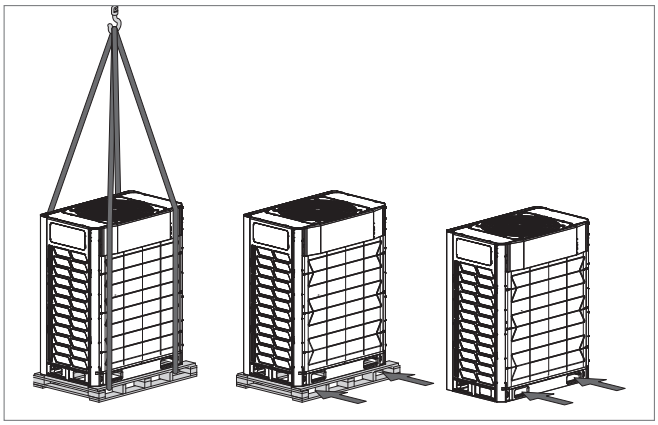
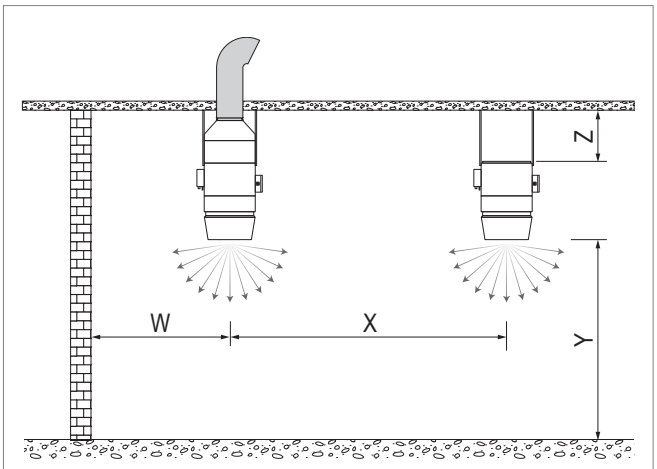


Fig. E1: Lifting the heat pump

1.2 Positioning

TopVent® unit
- Comply with the minimum and maximum distances.
- Only secure the unit to ceilings with sufficient load-bearing capacity.
- All air inlet and air outlet openings must be freely accessible. The supply air jet must be free to spread out unhindered.
- The access panels in the unit must be freely accessible.
- Clearance of at least 0.9 m is required for maintenance work around the heating/cooling section.
- Make sure that supply air units draw in fresh air via the fresh air duct:
  – Intake opening at approx. 1.5 m height above the roof
  – Not impaired by exhaust air openings, flues or the like



Unit type			TP-6	TP-9	MP-6	MP-9
Distance from ceiling Z	min.	m	0.3	0.4	0.3	0.4
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)

Table E1: Minimum and maximum distances

Heat pump Belaria® VRF

- 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
- Observe the minimum distances for sufficient air flow through the heat pump.
- 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 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 base must be flat and level. The support points must bear the weight evenly.
  - Water must be free to drain through the base plate of the heat pump.
- In areas with heavy snowfall:
  - Increase the base height to ensure that the unit operation is not affected by snow.
  - Protect the heat pump with protection hoods (option).

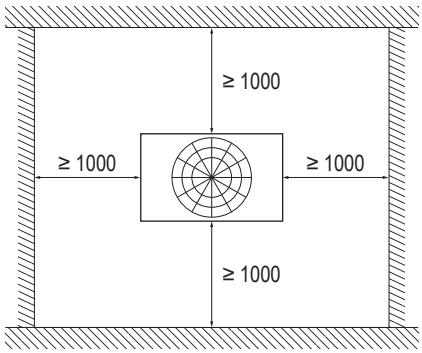
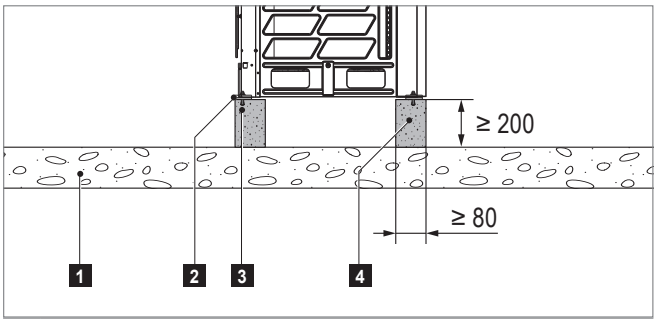
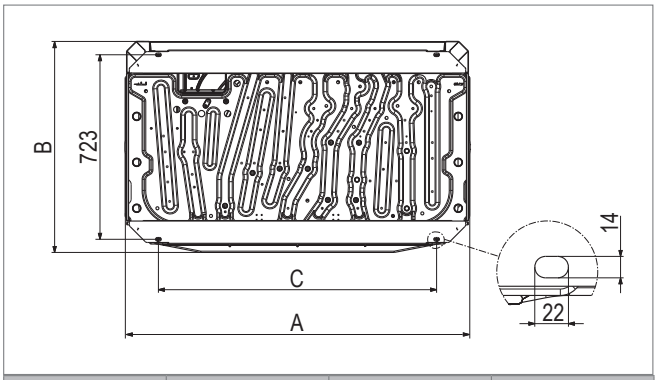


Fig. E2: Minimum distances for the heat pump (dimensions in mm)



1	Firm ground
2	Vibration damper
3	Expansion anchor ∅ 10 mm
4	Base made of concrete or steel

Fig. E3: Base for the heat pump



Dimension	VRF (33)	VRF (40)	VRF (67)
A	990	1340	1730
B	790	825	825
C	740	1090	1480

Table E2: Position of the screw connections (dimensions in mm)

1.3 Unit installation

Proceed as follows to position the unit:

TopVent® unit

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

Heat pump Belaria® VRF

- Transport the heat pump to the installation site.
- Place the unit on the prepared frame.
- Fasten the unit with 4 expansion anchors ∅ 10 mm.

E

2 Refrigeration system installation

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.

2.1 Refrigerant pipes

- Install the refrigerant pipes as shown in Fig. E6 to Fig. E8 schematically according to the local conditions. The maximum length for the flow and the return is 40 m each.

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

- The material to be used and the pipe thickness depend on the pipe diameter:

Pipe diameter	Material	Pipe thickness
∅ 12.7 mm	Hardened copper	0.8 mm
∅ 15.9 mm		1.0 mm
∅ 19.1 mm		1.0 mm
∅ 28.6 mm	Semi-hard copper	1.3 mm

Table E3: Configuration of refrigerant pipes

- The thickness of the insulation depends on the pipe diameter. Minimum thicknesses are given in Table E4. Thicker insulation is required in hot, humid environments.

Pipe diameter	Minimum thickness of the insulation [1]	Material
∅ 12.7 mm	15 mm	Closed-cell foam, fire protection class B1, temperature-resistant up to 120 °C, outer insulation UV-resistant
∅ 15.9 mm	20 mm	
∅ 19.1 mm	20 mm	
∅ 28.6 mm	20 mm	

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

Table E4: Insulation of the refrigerant pipes

- 2 expansion valves are required for the Belaria® VRF (67). Use the branching kit supplied for branching the pipeline.
  – Install the branching kit so that the two branch pipes are in one plane.

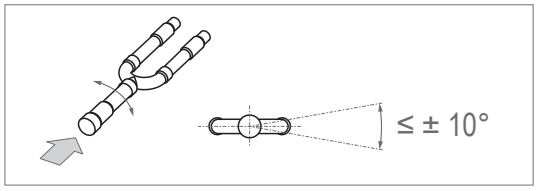


Fig. E4: Installation of the branching kit

- If the heat pump is placed more than 20 m higher than the heating/cooling coil: Install an oil return trap in the gas line every 10 m.

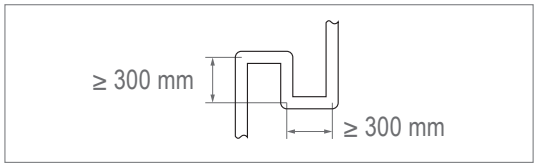


Fig. E5: Oil return trap

2.2 Calculation of the additional refrigerant fill

- The heat pump is filled with refrigerant at the factory:
  – Refrigerant R410A
- Depending on the unit size, the heat pump is only partially prefilled at the factory, and so refrigerant must be added on site:

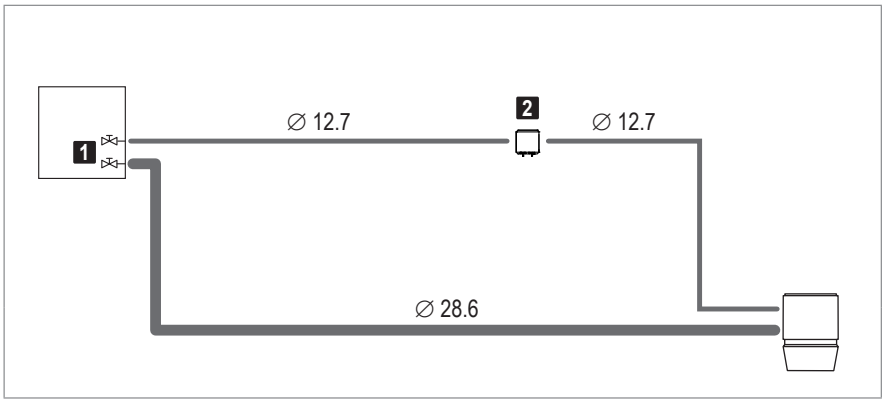
Belaria®		VRF (33)	VRF (40)	VRF (67)
Prefill volume	kg	11.0	11.8	11.8
Top-up volume	kg	–	1.2	10.2
Total fill volume	**kg**	**11.0**	**13.0**	**22.0**

Table E5: Refrigerant fill of the heat pump

- In addition, refrigerant must be topped up depending on the length and diameter of the liquid line (from the heat pump to the expansion valve).
  – ∅ 12.7 mm . . . 0.11 kg refrigerant per metre length
  – ∅ 19.1 mm . . . 0.26 kg refrigerant per metre length
- The entire top-up volume is calculated as follows:

	Top-up volume of heat pump		=	_____
+	____ m (∅ 12.7)	× 0.11	=	_____
+	____ m (∅ 19.1)	× 0.26	=	_____
	Total top-up volume		=	_____

Refrigerant pipes for Belaria® VRF (33)

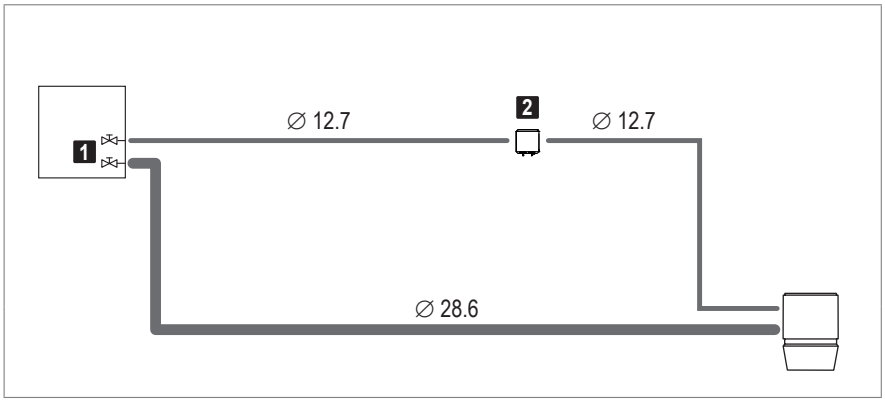


1 Connections on the heat pump
- Liquid line . . . . . ∅ 15.9 mm
- Gas line . . . . . ∅ 28.6 mm

2 Expansion valve in combi box VRF 02, mounted on the indoor climate unit

Fig. E6: Refrigerant pipes for Belaria® VRF (33) (pipe diameter in mm)

Refrigerant pipes for Belaria® VRF (40)

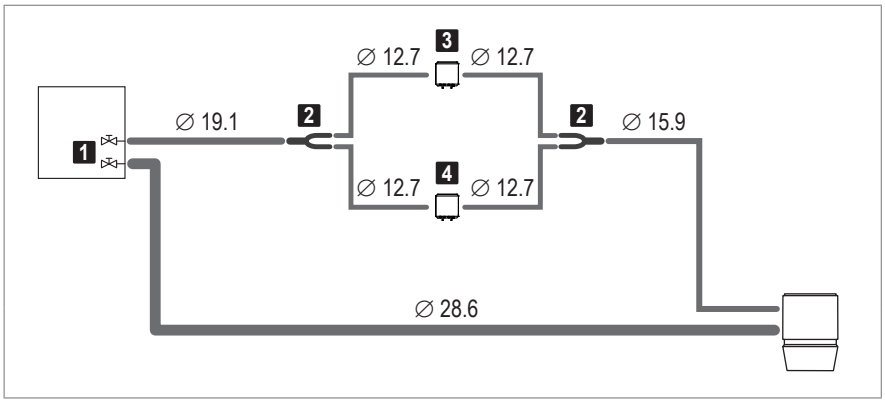


1 Connections on the heat pump
- Liquid line . . . . . ∅ 15.9 mm
- Gas line . . . . . ∅ 31.8 mm

2 Expansion valve in combi box VRF 03, mounted on the indoor climate unit

Fig. E7: Refrigerant pipes for Belaria® VRF (40) (pipe diameter in mm)

Refrigerant pipes for Belaria® VRF (67)



1 Connections on the heat pump
- Liquid line . . . . . ∅ 19.1 mm
- Gas line . . . . . ∅ 31.8 mm

2 Branching kit, supplied loose

3 Expansion valve in combi box VRF 02, mounted on the indoor climate unit

4 Expansion valve in combi box VRF 03, mounted on the indoor climate unit

Fig. E8: Refrigerant pipes for Belaria® VRF (67) (pipe diameter in mm)

3 Hydraulic installation

3.1 Condensate connection

TopVent® unit

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

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

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

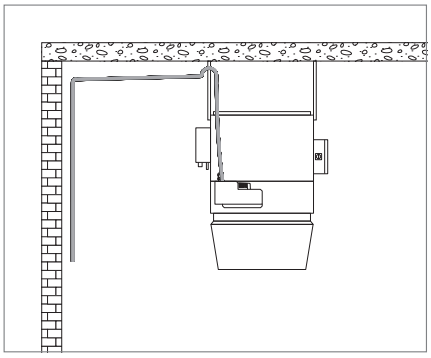


Fig. E9: Condensate line

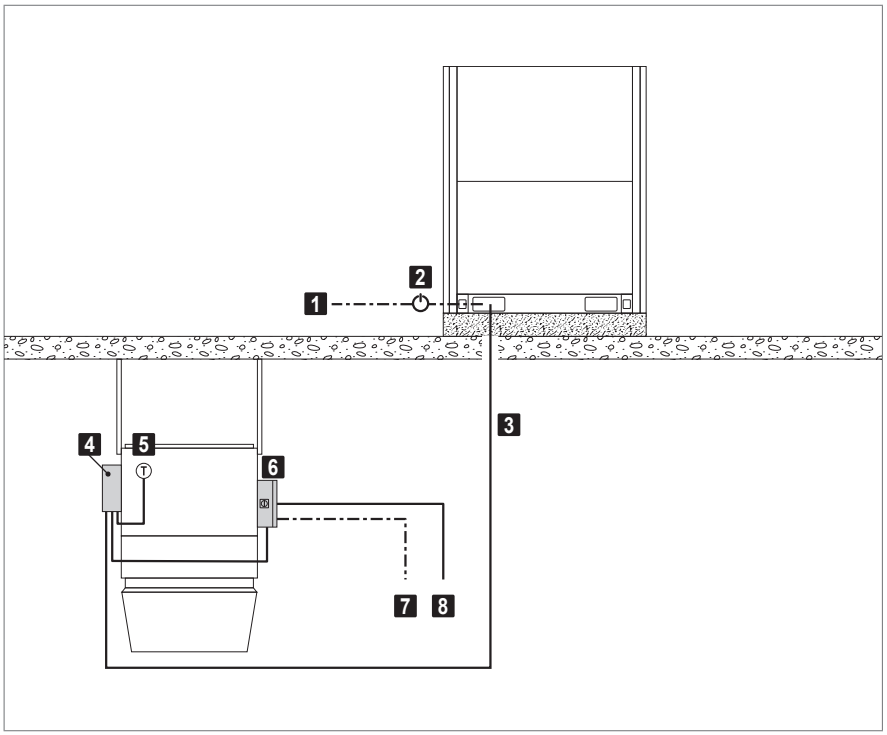
Heat pump

- 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® TP, MP
  - Power supply for Belaria® 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.
- Connect optional components to the unit control box (condensate pump).

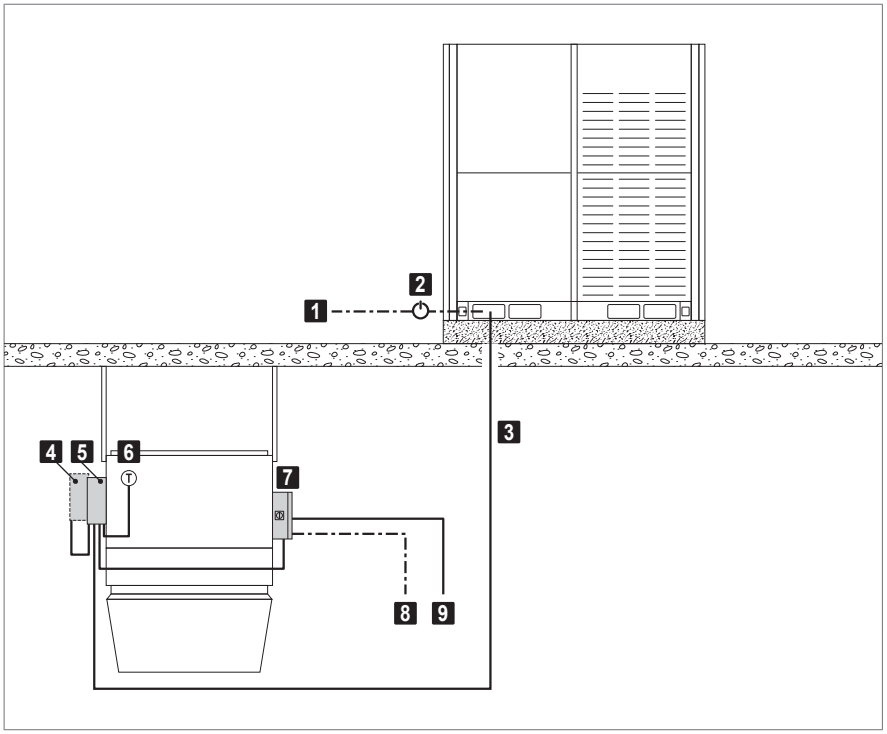
4.1 Electrical installation for TopVent® TP-6, MP-6



1	Power supply heat pump
2	Heat pump main switch (on-site)
3	Communication TopVent®
4	Combi box VRF (conversion board, expansion valve)
5	Gas temperature sensor (supplied loose)
6	Unit control box
7	Power supply for TopVent®
8	Zone bus

Fig. E10: Electrical connection of the heat pump system for TopVent® TP-6, MP-6

4.2 Electrical installation for TopVent® TP-9, MP-9



1	Power supply heat pump
2	Heat pump main switch (on-site)
3	Communication TopVent®
4	Combi box VRF 02 – client (conversion board, expansion valve)
5	Combi box VRF 03 – server (conversion board, expansion valve)
6	Gas temperature sensor (supplied loose)
7	Unit control box
8	Power supply for TopVent®
9	Zone bus

Fig. E11: Electrical connection of the heat pump system for TopVent® TP-9, MP-9

4.3 Cable list

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)
	Room temperature sensor		J-Y(ST)Y	2 × 2 × 0.8 mm	max. 100 m	Zone control panel	Sensors
	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	Sensors
	Fresh air temperature sensor		J-Y(ST)Y	2 × 2 × 0.8 mm	max. 100 m	Zone control panel	Sensors
	Combination sensor fresh air temperature and humidity		J-Y(ST)Y	2 × 2 × 0.8 mm	max. 250 m	Zone control panel	Sensors
	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 × 4.0 mm² (min.)	Belaria® VRF (33) (for 100 m length) max. cable cross section in panel 5 × 16 mm²	Zone control panel or on-site	Hoval heat pump
		3 × 400 VAC	NYM-J	5 × 6.0 mm² (min.)	Belaria® VRF (40) (for 100 m length) max. cable cross section in panel 5 × 25 mm²		
		3 × 400 VAC	NYM-J	5 × 10.0 mm² (min.)	Belaria® VRF (67) (for 100 m length) max. cable cross section in panel 5 × 50 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 length	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	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
	Operating selector switch on terminal (digital)	0-10 VDC	J-Y(ST)Y	6 × 2 × 0.8 mm	max. 100 m	On-site (switch)	Zone control panel

Component	Designation	Voltage	Cable		Comments	Start	Target
	Operating selector button on terminal	24 VAC	J-Y(ST)Y	6 × 2 × 0.8 mm	max. 100 m	On-site (button)	Zone control panel
	Forced off	24 VAC	NYM-O	2 × 1.5 mm²	max. 1 A | max. 100 m	On-site	Zone control panel
	Heating/cooling changeover	24 VAC	NYM-O	2 × 1.5 mm²	Signal external enabling/setting max. 1 A | max. 100 m	On-site	Zone control panel
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)
	Room temperature sensor		J-Y(ST)Y	2 × 2 × 0.8 mm	max. 100 m	Zone control panel	Sensors
	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	Sensors
	Fresh air temperature sensor		J-Y(ST)Y	2 × 2 × 0.8 mm	max. 100 m	Zone control panel	Sensors
	Collective alarm	Volt-free max. 250 VAC max. 24 VDC	NYM-O	2 × 1.5 mm²	max. 8 A max. 2 A	Zone control panel	On-site
	External setpoint fresh air ratio	0-10 VDC	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 VDC	J-Y(ST)Y	6 × 2 × 0.8 mm	max. 100 m	On-site (switch)	Zone control panel
	Operating selector button on terminal	24 VAC	J-Y(ST)Y	6 × 2 × 0.8 mm	max. 100 m	On-site (button)	Zone control panel
	Forced off	24 VAC	NYM-O	2 × 1.5 mm²	max. 1 A | max. 100 m	On-site	Zone control panel
	Heating/cooling changeover	24 VAC	NYM-O	2 × 1.5 mm²	Signal external enabling/setting max. 1 A | max. 100 m	On-site	Zone control panel
TopVent® unit	Power supply	3 × 400 VAC	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 VAC	NYM-O	2 × 1.5 mm²	max. 1 A for TopVent® MP | max. 100 m	On-site	TopVent® unit
Belaria® VRF heat pump	Power supply	3 × 400 VAC	NYM-J	5 × 4.0 mm² (min.)	Belaria® VRF (33) (for 100 m length) max. cable cross section in HP 5 × 25 mm²	Zone control panel or on-site	Hoval heat pump
		3 × 400 VAC	NYM-J	5 × 6.0 mm² (min.)	Belaria® VRF (40) (for 100 m length) max. cable cross section in HP 5 × 25 mm²		
		3 × 400 VAC	NYM-J	5 × 10.0 mm² (min.)	Belaria® VRF (67) (for 100 m length) max. cable cross section in HP 5 × 25 mm²		
	Communication TopVent®		J-Y(ST)Y	4 × 2 × 0.8 mm		TopVent® unit	Hoval heat pump

Table E6: Cable list for on-site connections

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 flow rate per person = 30 m³/h)		50 × 60 ×12 m 28 kW 20 people
Design conditions heating:	■ Fabric heat losses ■ Fresh air temperature ■ Room temperature ■ Extract air temperature	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 flow rate in total: ■ Fresh air ratio of supply air units: max. 10 % of the nominal air flow rate *The fresh air ratio can be adjusted from 0…100 %. Where EU Regulation 1253/2014 applies, it must be restricted to max. 10 % in the design conditions.* ■ Calculate the required number of supply air units from the nominal air flow rate.		20 × 30 = 600 m³/h Size 6: max. 600 m³/h fresh air Size 9: max. 900 m³/h fresh air → **1 TopVent® MP unit**
Mounting height ■ Calculate the actual mounting height (= distance between the floor and the bottom edge of the units). Y = Hall height – distance from ceiling – unit height ■ Compare the actual mounting height with the minimum and maximum mounting height (see Table E1 on page 58 and HK-Select).		Supply air units: Size 6 → OK Size 9 → OK Recirculation units: Size 6 → OK Size 9 → OK

Required performance for covering fabric heat losses

- 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	$Q_{H\_Supply\ air}$	$Q_{H\_Recirculation}$
MP-6-J	22.0	322 – 22.0 = 300.0
MP-6-L	27.6	322 – 27.6 = 294.4
MP-9-N	47.4	322 – 47.4 = 274.6

(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	$Q_{C\_Supply\ air}$	$Q_{C\_Recirculation}$
MP-6-J	23.7	168 – 23.7 = 144.3
MP-6-L	28.6	168 – 28.6 = 139.4
MP-9-N	48.8	168 – 48.8 = 119.2

(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 MP-6-J	TP-6-J	6	10	6	5	**10**
	TP-6-L	6	9	5	5	**9**
	TP-9-N	4	5	3	5	**5**
1 unit MP-6-L	TP-6-J	6	10	6	5	**10**
	TP-6-L	6	9	5	3	**9**
	TP-9-N	4	5	3	3	**5**
1 unit MP-9-N	TP-6-J	5	10	5	5	**10**
	TP-6-L	5	8	4	3	**8**
	TP-9-N	4	5	3	3	**5**

- 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 Table E1 on page 58 and HK-Select).</td><td>Recirculation units:
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>TP-6-J</td><td>892 : 28.6</td><td>32</td></tr>
<tr><td>TP-6-L</td><td>892 : 34.2</td><td>27</td></tr>
<tr><td>TP-9-N</td><td>892 : 57.2</td><td>16</td></tr>
</table>
<table>
<tr><th>Type</th><th>kW</th><th>Quantity</th></tr>
<tr><td>TP-6-J</td><td>923 : 24.8</td><td>38</td></tr>
<tr><td>TP-6-L</td><td>923 : 29.6</td><td>32</td></tr>
<tr><td>TP-9-N</td><td>923 : 50.4</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 Belaria® VRF 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

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Your Hoval partner

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