

Hoval Indoor Climate Systems RoofVent® RH | RC | RHC | R

Supply and extract air handling units with efficient air distribution for heating and cooling with central heat and cold generation

Design handbook



Hoval

	Hoval Indoor Climate Systems Efficient. Flexible. Reliable.	3	A
	RoofVent® RH Supply and extract air handling unit with efficient air distribution for heating spaces up to 25 m in height with central heat supply	7	B
	RoofVent® RC Supply and extract air handling unit with efficient air distribution for heating and cooling spaces up to 25 m in height with central heat and cold supply (2-pipe system)	25	C
	RoofVent® RHC Supply and extract air handling unit with efficient air distribution for heating and cooling spaces up to 25 m in height with central heat and cold supply (4-pipe system)	43	D
	RoofVent® R Supply and extract air handling unit with efficient air distribution for use in spaces up to 25 m in height	61	E
	Options	77	F
	Transport and installation	91	G
	System design	103	H
	System design Hoval TopTronic® C → see 'Control systems for Hoval Indoor Climate Systems' manual		I



Hoval Indoor Climate Systems

Efficient. Flexible. Reliable.

A



Efficient. Flexible. Reliable.

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

Diverse range of units ensures flexibility

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

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

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

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

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

Draught-free air distribution

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

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

Control with specialist expertise

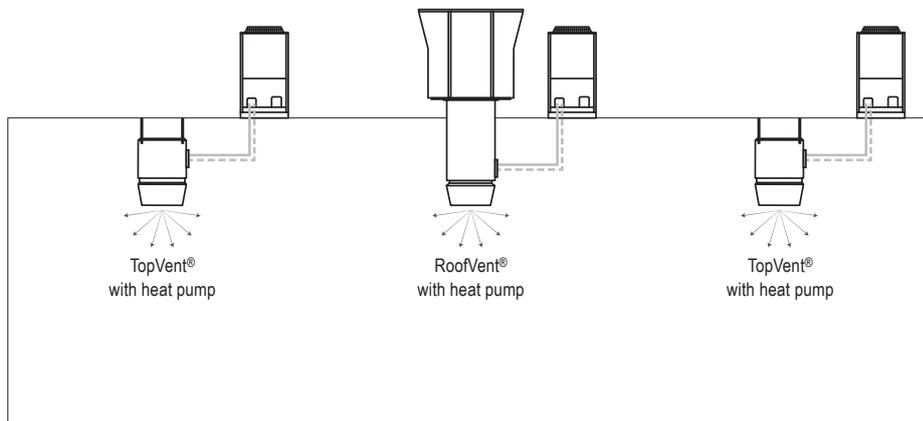
The TopTronic® C control system, which was specifically developed for Hoval indoor climate systems, regulates the separate units individually and controls them based on zones. This enables optimal adjustment to the local requirements of the different usage areas in the building. The patented control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

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

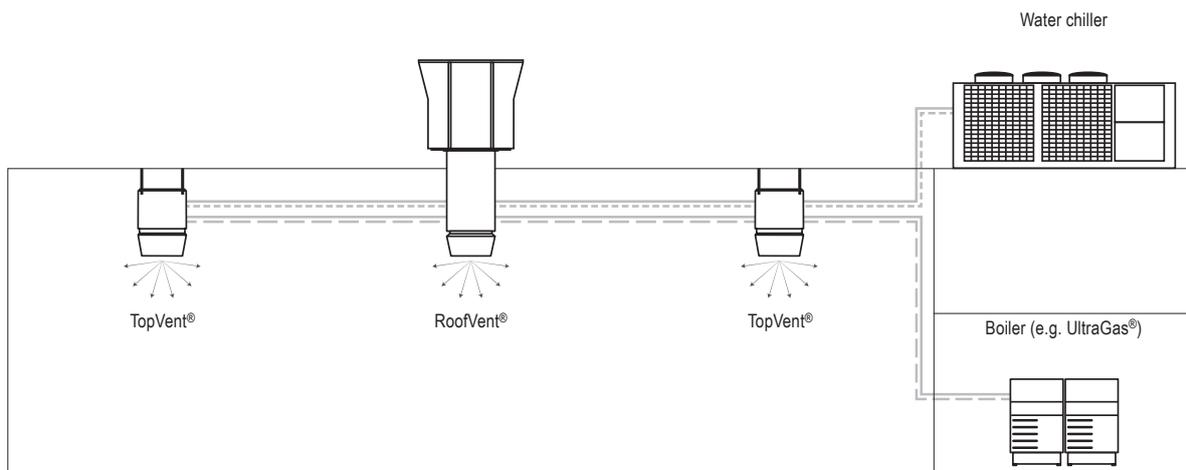
Competent and reliable

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

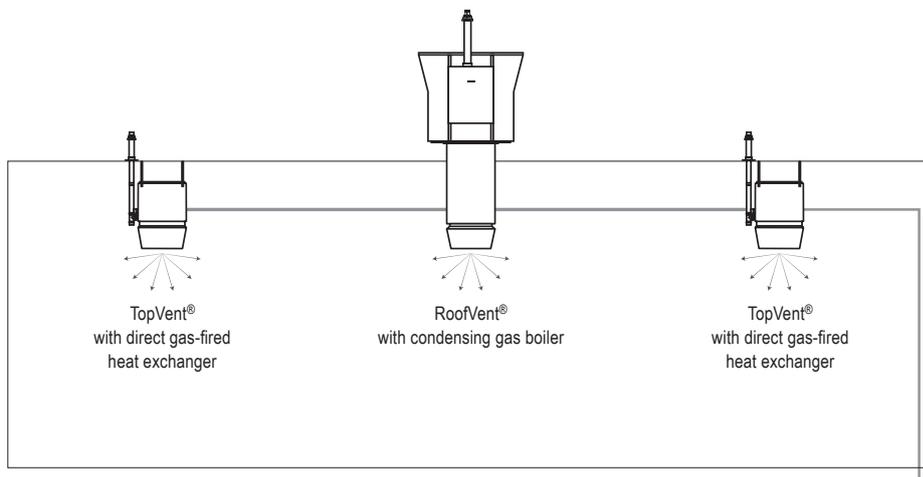
System with decentralised heat and cold generation with heat pump



System with central heat and cold generation



System with decentralised, gas-fired heat generation





RoofVent® RH

Supply and extract air handling unit with efficient air distribution for heating spaces up to 25 m in height with central heat supply

1 Use	8
2 Construction and operation	8
3 Technical data	14
4 Specification texts	20

B

1 Use

1.1 Intended use

RoofVent® RH units are supply and extract air handling units for heating spaces up to 25 m in height with central heat supply. They have the following functions:

- Fresh air supply
- Extract air removal
- Heating (with connection to a hot water supply)
- Energy recovery with highly efficient plate heat exchanger
- Filtering of the fresh air and the extract air
- Air distribution with adjustable Air-Injector

RoofVent® RH units comply with all the requirements of the Ecodesign Directive 2009/125/EC relating to environmentally friendly design of ventilation systems. They are systems of the 'non-residential ventilation unit' (NRVU) and 'bidirectional ventilation unit' (BVU) type.

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

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

1.2 User group

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

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

2 Construction and operation

2.1 Construction

The RoofVent® RH unit consists of the following components:

Roof unit with energy recovery

The self-supporting housing for mounting on the roof frame is of double-shell construction; this ensures good thermal insulation and high stability. The roof unit includes:

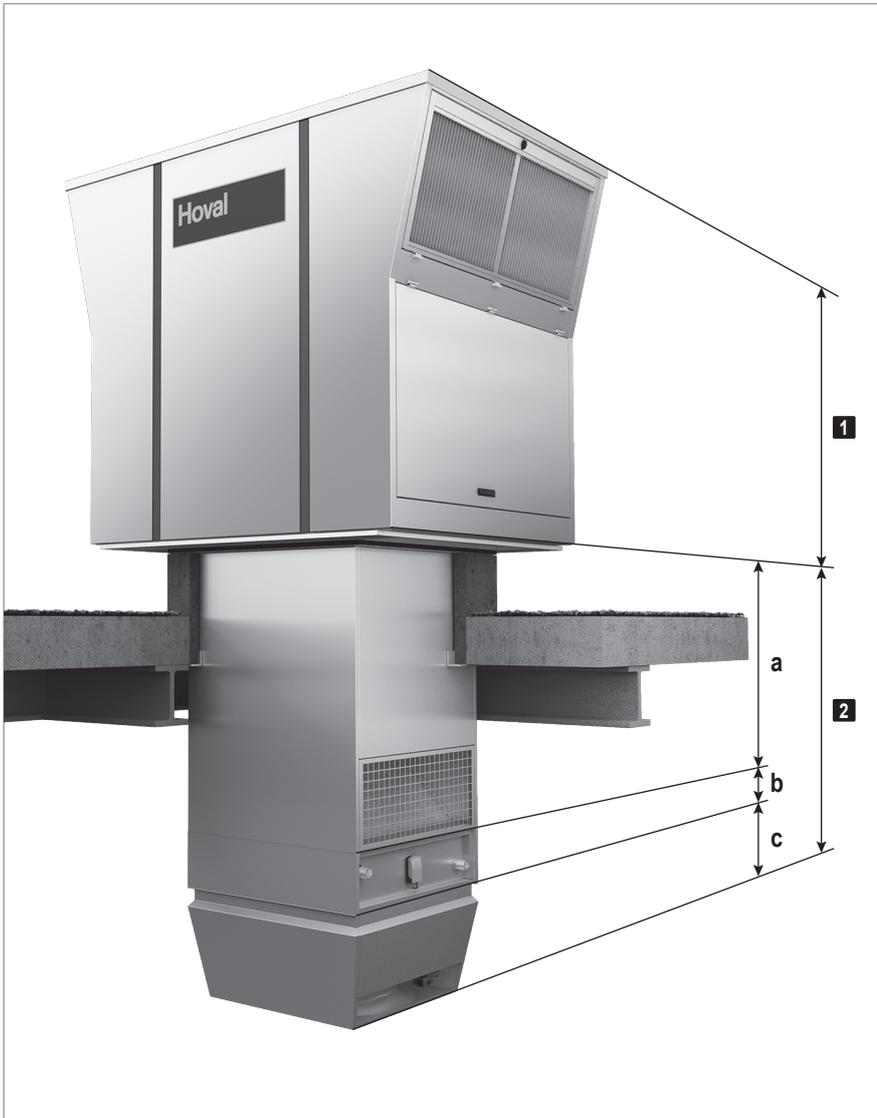
- the fans
- the air filters
- the plate heat exchanger with control dampers
- the control block

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

Below-roof unit

The below-roof unit is installed in the roof and projects into the hall. It consists of the following components:

- Connection module:
 - The connection module serves as an air duct through the roof and for drawing in extract air from the hall through the extract air grille. To enable easy adaptation to local installation conditions, the connection module is available in 4 lengths. It also contains the electrical connection box of the below-roof unit. This has a direct plug connection to the control block in the roof unit via the wiring harness.
- Heating section:
 - The heating section contains the hot water coil for heating the supply air.
- 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.



1 Roof unit with energy recovery

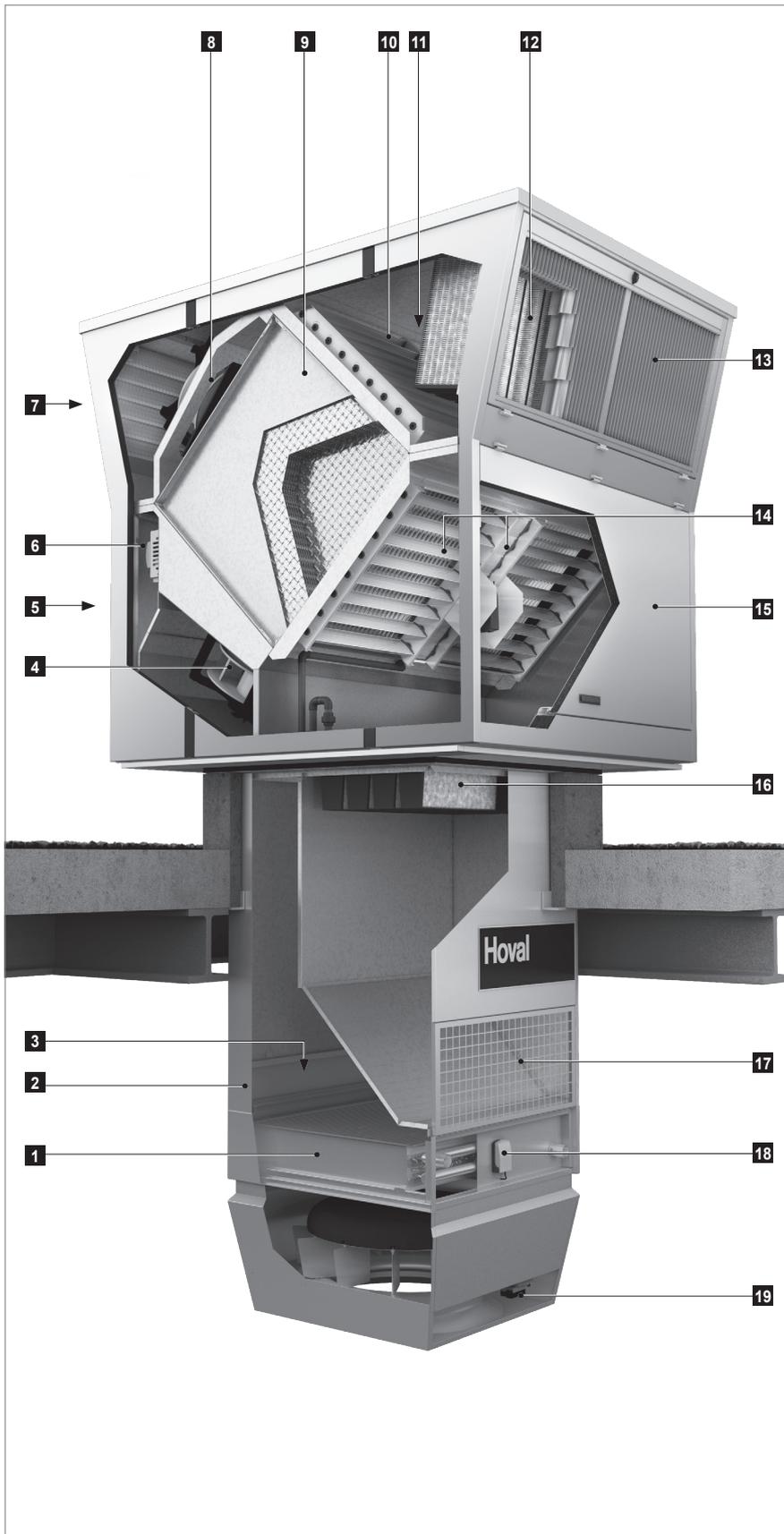
2 Below-roof unit

a Connection module

b Heating section

c Air-Injector

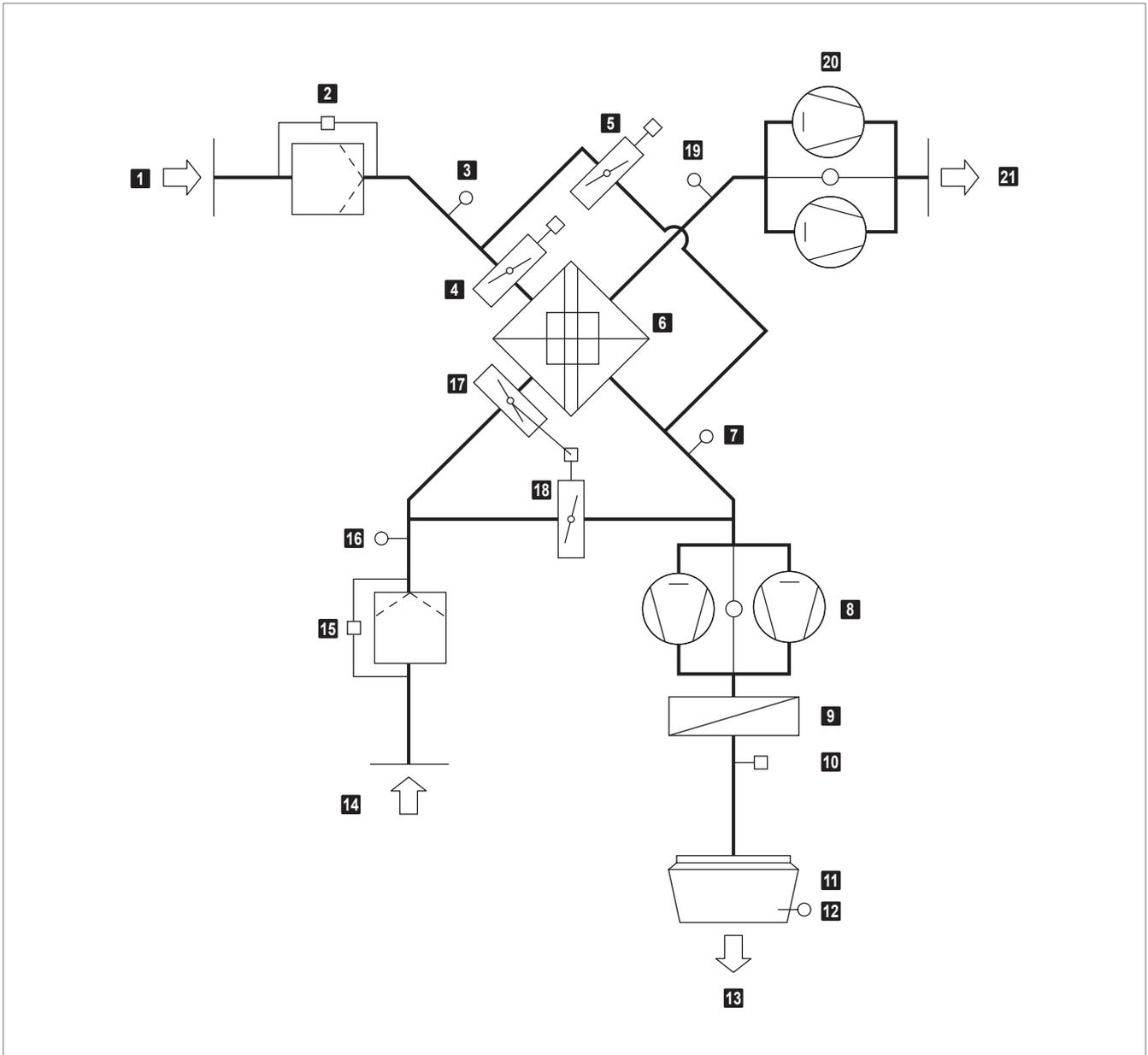
Fig. B1: RoofVent® RH components



- 1 Heating coil
- 2 Access panel, coil
- 3 Access panel, connection box
- 4 Supply air fans
- 5 Supply air access door
- 6 Control block
- 7 Exhaust air access door
- 8 Exhaust air fans
- 9 Plate heat exchanger with bypass (for performance control and as recirculation bypass)
- 10 Fresh air damper with actuator
- 11 Bypass damper with actuator
- 12 Fresh air filter
- 13 Fresh air access door
- 14 Extract air and recirculation dampers with actuator
- 15 Extract air access door
- 16 Extract air filter
- 17 Extract air grille
- 18 Frost controller
- 19 Actuator Air-Injector

Fig. B2: RoofVent® RH construction

2.2 Function diagram



- | | |
|---|--|
| 1 Fresh air | 12 Supply air temperature sensor |
| 2 Fresh air filter with differential pressure switch | 13 Supply air |
| 3 Temperature sensor air inlet ER (optional) | 14 Extract air |
| 4 Fresh air damper with actuator | 15 Extract air filter with differential pressure switch |
| 5 Bypass damper with actuator | 16 Extract air temperature sensor |
| 6 Plate heat exchanger | 17 Extract air damper with actuator |
| 7 Temperature sensor air outlet ER (optional) | 18 Recirculation damper (opposed to the extract air damper) |
| 8 Supply air fans with flow monitoring | 19 Exhaust air temperature sensor |
| 9 Heating coil | 20 Exhaust air fans with flow rate monitoring |
| 10 Frost controller | 21 Exhaust air |
| 11 Air-Injector with actuator | |

Fig. B3: RoofVent® RH function diagram

2.3 Operating modes

The RoofVent® RH has the following operating modes:

- Ventilation
- Ventilation (reduced)
- Air quality
- Recirculation
- Exhaust air
- Supply air
- 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 RoofVent® unit can operate individually in a local operating mode: Off, Recirculation, Supply air, Exhaust air, Ventilation.

Code	Operating mode	Description
VE	Ventilation The unit blows fresh air into the room and exhausts polluted room air. The room temperature set value day is active. Depending on the temperature conditions, the system continuously controls: <ul style="list-style-type: none"> ■ the energy recovery ■ the heating 	Supply air fan on *) Exhaust air fan on *) Energy recovery 0-100 % Extract air damper open Recirculation damper closed Heating 0-100 % *) Adjustable flow rate
VEL	Ventilation (reduced) As VE, but the unit only operates with the set minimum values for the supply and exhaust air volumes	Supply air fan MIN Exhaust air fan MIN Energy recovery 0-100 % Extract air damper open Recirculation damper closed Heating 0-100 %
AQ	Air quality This is the operating mode for demand-controlled ventilation of the room. The room temperature set value day is active. Depending on the temperature conditions, the system continuously controls: <ul style="list-style-type: none"> ■ the energy recovery ■ the heating Depending on the room air quality or room air humidity, the system operates in one of the following operating states:	
AQ_REC	■ Air quality Recirculation: When air quality is good and air humidity appropriate, the unit heats in recirculation operation.	Like REC
AQ_ECO	■ Air quality Mixed air: When ventilation requirements are medium, the unit heats in mixed air operation. The supply and exhaust air volume is based on the air quality.	Supply air fan MIN-MAX Exhaust air fan MIN-MAX Energy recovery 0-100 % Extract air damper 50 % Recirculation damper 50 % Heating 0-100 %
AQ_VE	■ Air quality Ventilation: When ventilation requirements are high or the room air humidity is too high, the unit heats in pure ventilation operation. The supply and exhaust air volume is based on the air quality.	Supply air fan MIN-MAX Exhaust air fan MIN-MAX Energy recovery 0-100 % Extract air damper open Recirculation damper closed Heating 0-100 %
REC	Recirculation On/Off recirculation operation with TempTronic algorithm: during heat demand, the unit draws in room air, heats it and blows it back into the room. The room temperature set value day is active. The flow rate is controlled in 2 stages.	Supply air fan 0 / 50 / 100 % *) Exhaust air fan off Energy recovery 0 % Extract air damper closed Recirculation damper open Heating on *)
DES	■ Destratification: To avoid heat build-up under the ceiling, it may be appropriate to switch on the fan when there is no heat demand (either in permanent operation or in on/off operation depending on the temperature stratification).	*) Depending on heat demand

Code	Operating mode	Description
EA	Exhaust air The unit extracts spent room air. There is no room temperature control. Unfiltered fresh air enters the room through open windows and doors or another system provides air supply.	Supply air fan off Exhaust air fan on *) Energy recovery 0 % Extract air damper open Recirculation damper closed Heating off *) Adjustable flow rate
SA	Supply air The unit blows fresh air into the room. The room temperature set value day is active. Depending on the temperature conditions, the system controls the heating. Spent room air passes through open windows and doors or another system provides extraction.	Supply air fan on *) Exhaust air fan off Energy recovery 0 % **) Extract air damper open Recirculation damper closed Heating 0-100 % *) Adjustable flow rate **) Fresh air and bypass dampers are open
ST	Standby The unit is normally switched off. The following functions remain active:	
CPR	■ Cooling protection: If the room temperature drops below the set value for cooling protection, the unit heats up the room in recirculation operation.	Supply air fan MAX Exhaust air fan off Energy recovery 0 % Extract air damper closed Recirculation damper open Heating on
NCS	■ Night cooling: If the room temperature exceeds the set value for night cooling and the current fresh air temperature permits it, the unit blows cool fresh air into the room and extracts warmer room air.	Supply air fan on *) Exhaust air fan on *) Energy recovery 0 % Extract air damper open Recirculation damper closed Heating off *) Adjustable flow rate
L_OFF	Off (local operating mode) The unit is switched off. Frost protection remains active.	Supply air fan off Exhaust air fan off Energy recovery 0 % Extract air damper closed Recirculation damper open Heating off
-	Forced heating The unit draws in room air, warms it and blows it back into the room. For example, forced heating is suitable for heating the hall before taking the control system into operation or if the controller fails during the heating period. Connecting a room thermostat makes it possible to specify a room temperature set value. Forced heating can be activated and set as required by the Hoval service technician.	Supply air fan MAX Exhaust air fan off Energy recovery 0 % Extract air damper closed Recirculation damper open Heating on

Table B1: RoofVent® RH operating modes

3 Technical data

3.1 Type code

	RH - 6 B - ...
Unit type	RoofVent® RH
Unit size	6 or 9
Heating section	B with coil type B C with coil type C D with coil type D
Further options	

Table B2: Type code

3.2 Application limits

Fresh air temperature	min.	°C	-30
Extract air temperature	max.	°C	50
Extract air relative humidity	max.	%	60
Moisture content of extract air	max.	g/kg	12.5
Supply air temperature	max.	°C	60
Temperature of the heating medium ¹⁾	max.	°C	90
Pressure of the heating medium	max.	kPa	800
Air flow rate	Size 6:	min.	m³/h 3100
	Size 9:	min.	m³/h 5000

¹⁾ Design for higher temperatures on request

Table B3: Application limits



Notice

Use units in corrosion-protected design for high extract air humidity if the humidity in the room increases by more than 2 g/kg.

3.3 Heat recovery system (HRS)

Unit type		RH-6	RH-9
Temperature efficiency, dry	%	77	78
Temperature efficiency, wet	%	89	90

Table B4: Thermal transfer level of the plate heat exchanger

3.4 Air filtration

Filter	Fresh air	Extract air
Class acc. to ISO 16890	ePM ₁ 55 %	ePM ₁₀ 65 %
Class acc. to EN 779	F7	M5
Factory setting of differential pressure switches	250 Pa	350 Pa

Table B5: Air filtration

3.5 Electrical connection

Unit type		RH-6	RH-9
Supply voltage	V AC	3 × 400	3 × 400
Permitted voltage tolerance	%	± 5	± 5
Frequency	Hz	50	50
Connected load	kW	4.6	8.6
Current consumption max.	A	7.8	14.4
Series fuse	A	13.0	20.0

Table B6: RoofVent® RH electrical connections

3.6 Air flow rate

Unit type		RH-6	RH-9
Nominal air flow rate	m³/h	5500	8000
Floor area covered	m²	480	797

Table B7: Air flow rate

3.7 Heat output

Fresh air temp.		-5 °C						-15 °C					
Size	Type	Q	Q _{TG}	H _{max}	t _s	Δp _w	m _w	Q	Q _{TG}	H _{max}	t _s	Δp _w	m _w
		kW	kW	m	°C	kPa	l/h	kW	kW	m	°C	kPa	l/h
RH-6	B	47.4	40.5	11.4	39.9	13	2038	49.1	38.5	11.7	38.8	14	2108
	C	76.2	69.3	9.0	55.4	15	3273	78.7	68.2	9.0	54.8	16	3383
RH-9	B	68.9	59.5	11.7	40.1	10	2962	71.2	56.8	12.0	39.1	10	3059
	C	113.1	103.7	9.1	56.5	14	4860	116.8	102.4	9.2	56.0	15	5017
	D	-	-	-	-	-	-	-	-	-	-	-	-
Legend:	Type = Type of coil Q = Coil heat output Q _{TG} = Output to cover fabric heat losses H _{max} = Maximum mounting height t _s = Supply air temperature Δp _w = Water pressure drop m _w = Water quantity												
Reference:	Heating medium: 80/60 °C Room air: 18 °C Extract air: 20 °C / 20 % rel. humidity												
- These operating conditions are not permissible, because the maximum supply air temperature of 60 °C is exceeded.													

Table B8: RoofVent® RH heat output



Notice

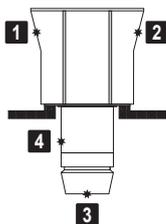
The output for coverage of the fabric heat losses (Q_{TG}) allows for the ventilation heat requirement (Q_V) and the energy recovery output (Q_{ER}) under the respective air conditions. The following applies:

$$Q + Q_{ER} = Q_V + Q_{TG}$$

3.8 Sound data

Position			1	2	3	4	
RH-6	Sound pressure level (at a distance of 5 m) ¹⁾	dB(A)	43	56	51	44	
	Total sound power level	dB(A)	65	78	73	66	
	Octave sound power level	63 Hz	dB	43	46	44	43
		125 Hz	dB	54	61	59	54
		250 Hz	dB	59	67	63	60
		500 Hz	dB	61	71	67	62
		1000 Hz	dB	56	74	69	57
		2000 Hz	dB	54	70	64	55
		4000 Hz	dB	51	66	60	51
		8000 Hz	dB	49	64	58	49
RH-9	Sound pressure level (at a distance of 5 m) ¹⁾	dB(A)	42	55	50	42	
	Total sound power level	dB(A)	63	77	72	64	
	Octave sound power level	63 Hz	dB	42	45	42	42
		125 Hz	dB	54	62	59	54
		250 Hz	dB	56	65	61	57
		500 Hz	dB	58	70	65	59
		1000 Hz	dB	55	73	68	56
		2000 Hz	dB	54	70	65	55
		4000 Hz	dB	48	64	58	48
		8000 Hz	dB	41	59	52	42

1) With hemispherical radiation in a low-reflection environment



- 1 Fresh air
- 2 Exhaust air
- 3 Supply air
- 4 Extract air

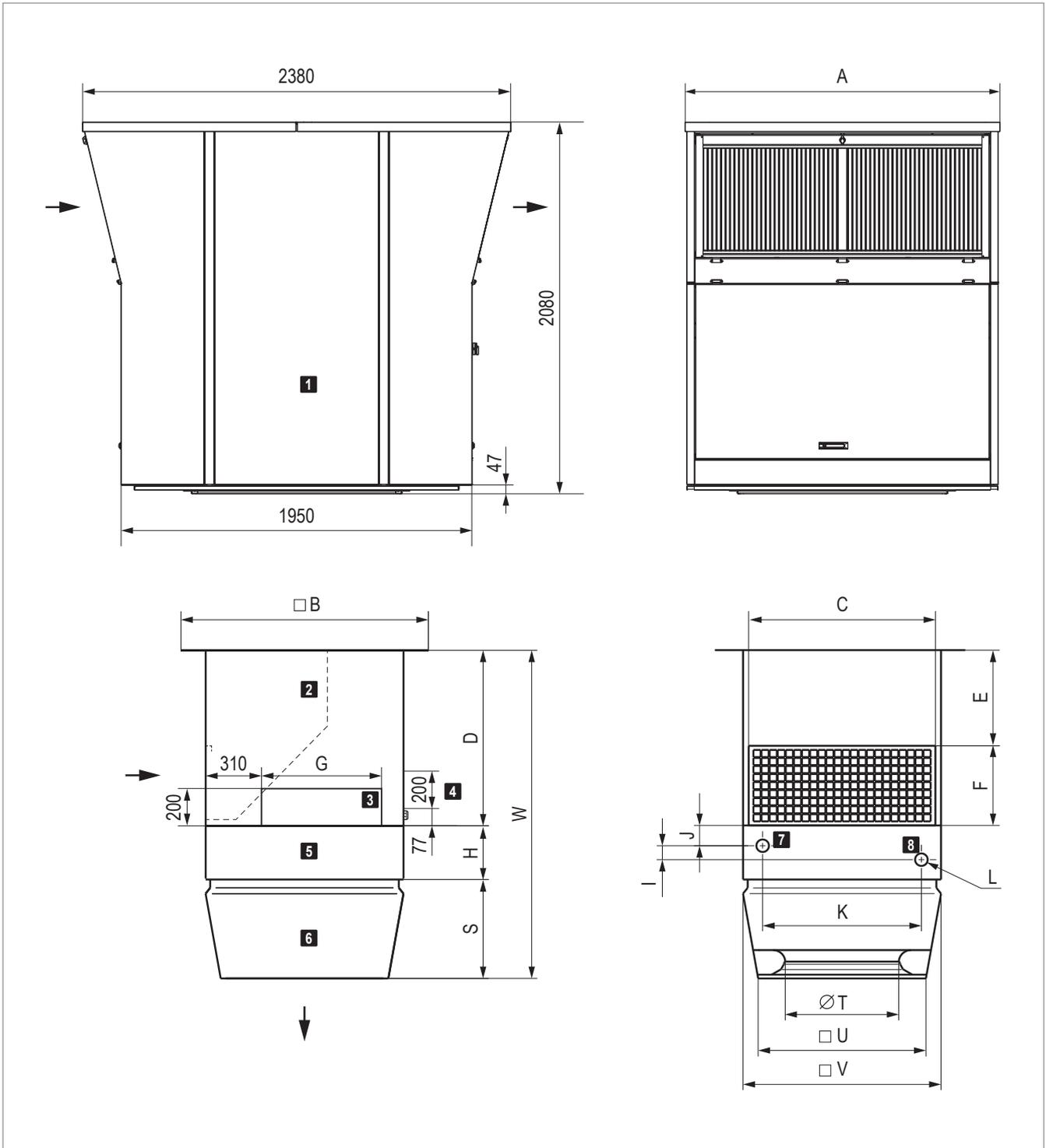
Table B9: RoofVent® RH sound data

3.9 Product information according to ErP

Trademark / Model		Hoval RoofVent® RH					Unit
		6B	6C	9B	9C	9D	
Type		NRVU, BVU					–
Drive		Variable speed drive					–
Heat recovery system		other					–
Thermal efficiency of heat recovery (η_{t_nrvu})		77	77	78	78	78	%
Nominal flow rate (q_{nom})		1.53	1.53	2.22	2.22	2.22	m³/s
Effective electric power input (P)		2.01	2.09	3.10	3.24	3.34	kW
Internal specific fan power (SFP _{int})		920	920	940	940	940	W/(m³/s)
Face velocity		2.69	2.69	2.98	2.98	2.98	m/s
Nominal external pressure ($\Delta p_{s, ext}$)	Supply air	220	180	300	260	230	Pa
	Extract air	190	190	300	300	300	
Internal pressure drop of ventilation components ($\Delta p_{s, int}$)	Fresh air/supply air	270	270	268	268	268	Pa
	Extract air/exhaust air	300	300	316	316	316	
Static efficiency of the fans (η_{fan}) in accordance with Regulation (EU) No 327/2011		62	62	63	63	63	%
Maximum leakage rate	External	0.45	0.45	0.25	0.25	0.25	%
	Internal	1.50	1.50	1.20	1.20	1.20	
Energy classification of the filters (class acc. to ISO 16890, final pressure difference)	Supply air ePM ₁ 55 %	250	250	250	250	250	Pa
	Extract air ePM ₁₀ 65 %	350	350	350	350	350	
Visual filter warning		Displayed on the operating unit					–
Casing sound power level (L _{WA})		73	73	72	72	72	dB(A)
Disassembly instructions		Devices that are no longer functional must be dismantled by a specialist company and disposed of at suitable collection points.					–
Contact details		Hoval Aktiengesellschaft Austrasse 70, 9490 Vaduz, Liechtenstein www.hoval.com					

Table B10: Product information according to Commission Regulation (EU) 1253/2014, Article 4(2)

3.10 Dimensions and weights



1 Roof unit with energy recovery

2 Connection module

3 Access panel, coil

4 Access panel, connection box

5 Heating section

6 Air-Injector

7 Return

8 Flow

Fig. B4: RoofVent® RH dimensional drawing (dimensions in mm)

Unit type		RH-6				RH-9			
A	mm	1400				1750			
B	mm	1040				1240			
C	mm	848				1048			
F	mm	410				450			
G	mm	470				670			
H	mm	270				300			
S	mm	490				570			
T	mm	500				630			
U	mm	767				937			
V	mm	900				1100			
Connection module		V0	V1	V2	V3	V0	V1	V2	V3
D	mm	940	1190	1440	1940	980	1230	1480	1980
E	mm	530	780	1030	1530	530	780	1030	1530
W	mm	1700	1950	2200	2700	1850	2100	2350	2850

Table B11: RoofVent® RH dimensions

Unit type		RH-6B	RH-6	RH-9B	RH-9C	RH-9D
I	mm	78	78	78	78	95
J	mm	101	101	111	111	102
K	mm	758	758	882	882	882
L (internal thread)	"	Rp 1¼	Rp 1¼	Rp 1½	Rp 1½	Rp 2
Water content of the coil	l	4.6	7.9	7.4	12.4	19.2

Table B12: Dimensions for hydraulic connection

Unit type		RH-6B	RH-6	RH-9B	RH-9C	RH-9D
Total	kg	842	849	1094	1104	1123
Roof unit	kg	700	700	900	900	900
Below-roof unit	kg	142	149	194	204	223
Air-Injector	kg	37	37	56	56	56
Heating section	kg	30	37	44	54	73
Connection module V0	kg	75		94		
Additional weight V1	kg	+ 11		+ 13		
Additional weight V2	kg	+ 22		+ 26		
Additional weight V3	kg	+ 44		+ 52		

Table B13: RoofVent® RH weights

4 Specification texts

4.1 RoofVent® RH

Supply and extract air handling unit for heating rooms up to 25 m in height with central heat supply; equipped with highly efficient air distributor; maximum floor area reached per unit 480 m² (size 6) and 797 m² respectively (size 9).

The unit consists of the following components:

- Roof unit with energy recovery
- Below-roof unit:
 - Connection module
 - Heating section
 - Air-Injector
- Control components
- Optional components

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

Roof unit with energy recovery

Self-supporting housing, made of aluminium (outside) and aluzinc sheet and aluminium (inside):

- Weatherproof, corrosion resistant, impact resistant, air-tight
- Low flammability, double-shelled, without heat bridges, with highly efficient insulation made of expanded polystyrene
- Hygienic and easy to maintain because of smooth interior surfaces and large access doors with ageing-resistant, silicone-free sealing materials

The roof unit with energy recovery includes:

Supply air and exhaust air fans:

Designed as maintenance-free, direct-drive radial fans with high-efficiency EC motor, backwards-curved, 3D contoured blades and a free-running rotating wheel made of a high-performance composite material; inflow nozzle with optimised flow; infinitely variable speed; with active pressure registration for constant volumetric flow control and/or demand-controlled volumetric flow adjustment; low-noise; with integrated overload protection.

Fresh air filter:

Designed as highly efficient compact filter elements, class ISO ePM₁ 55 % (F7), fully incinerable, easy to change, including differential pressure switch for filter monitoring.

Extract air filter:

Designed as highly efficient compact filter elements, class ISO ePM₁₀ 65 % (M5), fully incinerable, easy to change, including differential pressure switch for filter monitoring.

Plate heat exchanger:

Crossflow plate heat exchanger made of high-quality aluminium as a highly efficient, recuperative heat recovery system, certified by Eurovent, zero-maintenance, without moving parts, failsafe, hygienically harmless, no cross-contamination of impurities and odours. Equipped with bypass, recirculation bypass, condensate drain and condensation trap to the roof. The following dampers are arranged on the exchanger package:

- Fresh air and bypass dampers, each with their own actuator, for infinitely variable control of the heat recovery; with shut-off function by spring return.
- Extract air and recirculation dampers, interlinked in a counter-rotating arrangement with a common actuator, for controlling the recirculation and mixed air operation; with shut-off function by spring return.

All dampers correspond to seal integrity class 2 according to EN 1751.

Access openings:

- Fresh air access door: large access opening with integrated weather and bird protection, configured with quick locking system for easy access to the fresh air filter, the plate heat exchanger as well as the fresh air and bypass dampers.
- Exhaust air access door: large, lockable access opening with integrated weather and bird protection for easy access to the exhaust air filter.
- Extract air access door: large access opening, configured with quick locking system and telescopic support for easy access to the extract air filter, the plate heat exchanger, the condensation trap as well as the extract air and recirculation dampers.
- Supply air access door: large, lockable access opening, configured with telescopic support for easy access to the supply air fans, the control block and the condensate collecting channel.

Control block:

Compact design on an easily accessible mounting plate, comprising:

- Unit controller as part of the TopTronic® C control system:
 - Fully wired to the electrical components of the roof unit (fans, actuators, temperature sensors, filter monitoring, differential pressure sensor)
 - Pluggable wiring to the control box in the connection module
- High-voltage section:
 - Mains power terminals
 - Isolation switch
 - Button for stopping the fans during filter change

- Low-voltage section:
 - Transformer for actuators, sensors and the unit controller
 - Externally switchable forced heating
 - Externally switchable forced off
- Circuit board with further electronic components for unit control (differential pressure measurement, fuses for the transformer, fuses for low voltage, ...)

Connection module

Housing made of aluzinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of smooth interior surfaces and ageing-resistant, silicone-free sealing materials; configured with extract air grille and access panel for easy access to the coil for maintenance. The connection module contains:

- Laced wiring harness protected in a sheet metal duct, with direct plug connection to the control block in the roof unit
- Connection box made of galvanised sheet steel, configured with circuit board, screw-on cover and cable lead-ins with splash water protection and strain relief; for connection of:
 - Power supply
 - Zone bus
 - All sensors and actuators of the below-roof unit (ready-to-connect): frost controller, supply air temperature sensor, Air-Injector actuator
 - Peripheral components (e.g. mixing valves, pumps, ...)
 - Optional components as required

Connection module V1 / V2 / V3:

The connection module is extended for adapting to the local installation situation.

Heating section

Housing made of aluzinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of ageing-resistant, silicone-free sealing materials. The heating section contains:

- The highly efficient heating coil consisting of seamless copper pipes with pressed-on, optimised and profiled aluminium fins and manifolds made of copper; for connection to the hot water supply
- Frost controller

Air-Injector

1 Air-Injector:

Housing made of aluzinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of ageing-resistant, silicone-free sealing materials, with:

- Vortex air distributor with concentric outlet nozzle, adjustable vanes and integrated absorber hood
- Actuator for infinitely variable adjustment of the air distribution from vertical to horizontal
 - for draught-free air distribution in the hall under changing operating conditions
 - 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

2 Air-Injectors:

2x Air-Injectors, supplied loose; supply air duct for connecting the RoofVent® unit to the Air-Injectors on site.

Housing made of aluzinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of ageing-resistant, silicone-free sealing materials, with:

- Vortex air distributor with concentric outlet nozzle, adjustable vanes and integrated absorber hood
- Actuator for infinitely variable adjustment of the air distribution from vertical to horizontal
 - for draught-free air distribution in the hall under changing operating conditions
 - 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 sensor (supplied in the connection module)

Without Air-Injector:

Unit configured without vortex air distributor for connection to an on-site supply air duct and air distribution within the building, supply air temperature sensor supplied in the connection module.

Options for the unit

Oil-proof design:

- Oil-proof materials
- Special extract air filter for oil and dust separation in the connection module, class ISO ePM₁₀ 50% (M5)
- Plate heat exchanger additionally sealed; leak test according to works standard
- Condensate drain from the plate heat exchanger to the drip tray in the connection module
- Connection module in oil-tight design with integrated oil/condensate drip tray and drain connection

Corrosion-protected design for high extract air humidity:

- Powder-coated supply air and exhaust air fans, coat thickness > 80 µm; electronics potted on both sides
- Specially coated plate heat exchanger with condensate separator for high corrosion resistance; additionally sealed; leak test according to works standard
- Condensate drain from the plate heat exchanger to the drip tray in the connection module
- Additional insulation of various equipment components to avoid condensation
- Connection module with integrated condensate drip tray and drain connection
- Connecting elements (blind rivet nuts, screws, rivets) made of stainless steel 1.4301
- Casing of the roof unit powder-coated on the inside
- Parts prone to corrosion powder-coated, sheet metal parts of the dampers and all sheet metal parts of the below-roof unit powder-coated on both sides (pebble grey RAL 7032)
- Painted coil

Paint finish of below-roof unit:

Choice of external paint finish in RAL colour

Fresh air and exhaust air silencers:

Fresh air silencer configured as add-on part for the roof unit which can be folded downwards, housing made of aluminium with a bird screen and acoustic insulation lining, for reducing sound emissions on the fresh air side; exhaust air silencer configured as add-on part for the roof unit which can be folded downwards, housing made of aluminium with bird screen and easily accessible sound attenuation splitters, optimised flow, with abrasion-resistant and easily cleaned surfaces, non-flammable, hygienically clean with high-quality glass filament cover for reducing sound emissions on the exhaust air side.

Insertion loss fresh air / exhaust air ____ dB / ____ dB

Supply air and extract air silencer:

Supply air silencer configured as separated component in the below-roof unit, flow-optimised sound attenuation splitters, with abrasion-resistant and easily cleaned surfaces, non-flammable, hygienically clean with high-quality glass filament cover, extract air silencer configured as acoustic

insulation lining in the connection module, for reducing sound emission in the room.

Insertion loss supply air / extract air ____ dB / ____ dB

Hydraulic assembly diverting system:

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

Mixing valve:

Mixing valve with modulating rotary actuator, sized for the coil in the unit.

Socket:

230 V socket installed in the control block for simple supply of external, electrical units.

Energy monitoring:

Consisting of 2 additional temperature sensors for recording the air inlet and air outlet temperatures of the plate heat exchanger. Energy monitoring makes it possible to display the energy saved by heat and cool recovery.

Pump control for mixing or injection system:

Electrical components for controlling a mixing or injection circuit in the load circuit.

Return temperature sensor:

Temperature sensor for monitoring the heating medium. If necessary, it triggers frost pre-control at the heating valve to prevent the system possibly being shut down due to frost.

4.2 TopTronic® C control system

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

The control system is customised and preconfigured ex-works. Zone allocation:

Zone 1: ___ x Unit type _____

Zone 2: ___ x Unit type _____

Zone 3: ___ x Unit type _____

...

System structure:

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

Operation:

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

Control functions:

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

- Special destratification mode for rapid and large-area reduction of temperature stratification in the room by circulating the room air (RH, RC, RHC)

Alarms, protection:

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

Options for the zone control panel:

- Design for heating (RH, RC, RHC)
- Design for cooling (RC, RHC)
- Cooling lock switch (RC, RHC)
- Heating/cooling switch (RC, RHC)
- Alarm lamp
- Socket
- Additional room air temperature sensors (max. 3)
- Combination sensor room air quality, temperature and humidity
- External sensor values
- External set values
- Load shedding input
- Operating selector switch on terminal
- Operating selector button on terminal
- Power supply for air handling unit
- Safety relay
- Control of distributor pump(s), incl. power supply (RH, RC, RHC)



RoofVent® RC

Supply and extract air handling unit with efficient air distribution for heating and cooling spaces up to 25 m in height with central heat and cold supply (2-pipe system)

1 Use	26
2 Construction and operation	26
3 Technical data	32
4 Specification texts	38

C

1 Use

1.1 Intended use

RoofVent® RC units are supply and extract air handling units for heating and cooling spaces up to 25 m in height with central heat and cold supply (2-pipe system). They have the following functions:

- Fresh air supply
- Extract air removal
- Heating (with connection to a hot water supply)
- Cooling (with connection to a water chiller)
- Energy recovery with highly efficient plate heat exchanger
- Filtering of the fresh air and the extract air
- Air distribution with adjustable Air-Injector

RoofVent® RC units comply with all the requirements of the Ecodesign Directive 2009/125/EC relating to environmentally friendly design of ventilation systems. They are systems of the 'non-residential ventilation unit' (NRVU) and 'bidirectional ventilation unit' (BVU) type.

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

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

1.2 User group

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

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

2 Construction and operation

2.1 Construction

The RoofVent® RC unit consists of the following components:

Roof unit with energy recovery

The self-supporting housing for mounting on the roof frame is of double-shell construction; this ensures good thermal insulation and high stability. The roof unit includes:

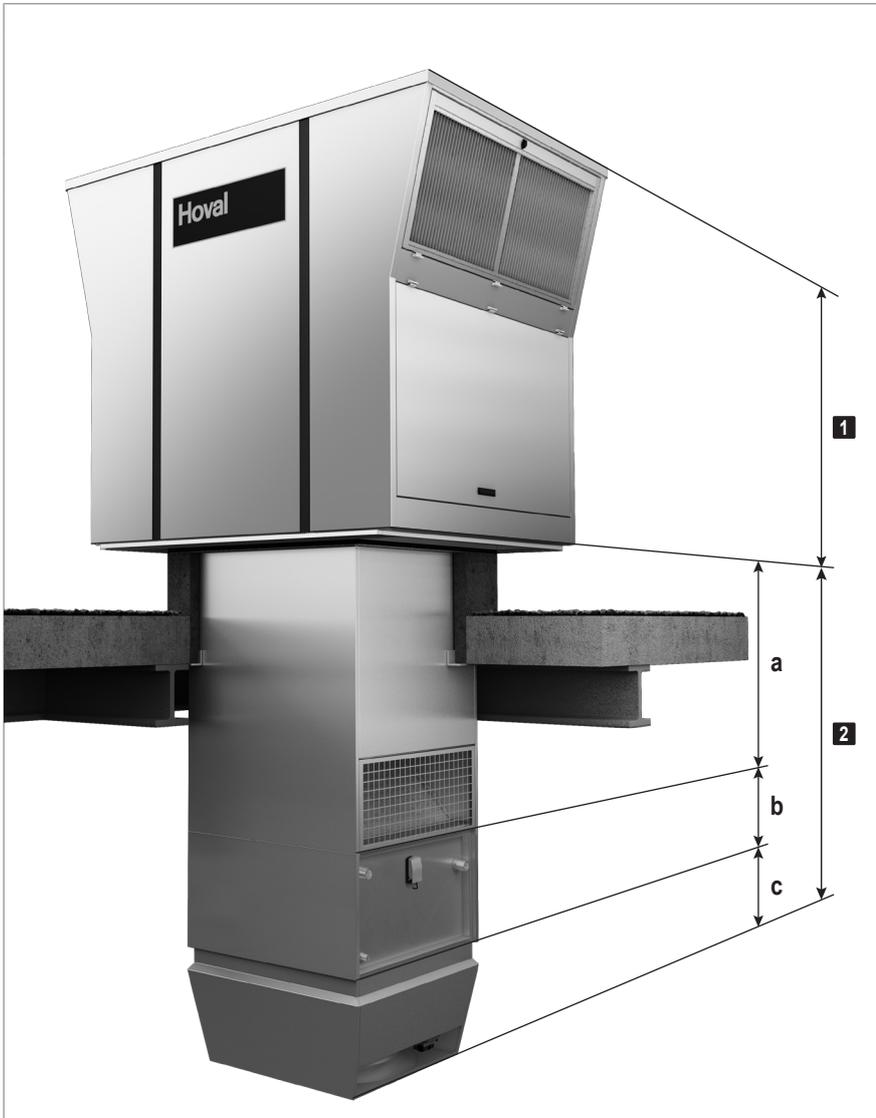
- the fans
- the air filters
- the plate heat exchanger with control dampers
- the control block

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

Below-roof unit

The below-roof unit is installed in the roof and projects into the hall. It consists of the following components:

- Connection module:
The connection module serves as an air duct through the roof and for drawing in extract air from the hall through the extract air grille. To enable easy adaptation to local installation conditions, the connection module is available in 4 lengths. It also contains the electrical connection box of the below-roof unit. This has a direct plug connection to the control block in the roof unit via the wiring harness.
- Heating/cooling section:
The heating/cooling section contains the coil for heating and cooling the supply air with hot water or cold water and the condensate separator with collecting channel and drain connection.
- 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.



1 Roof unit with energy recovery

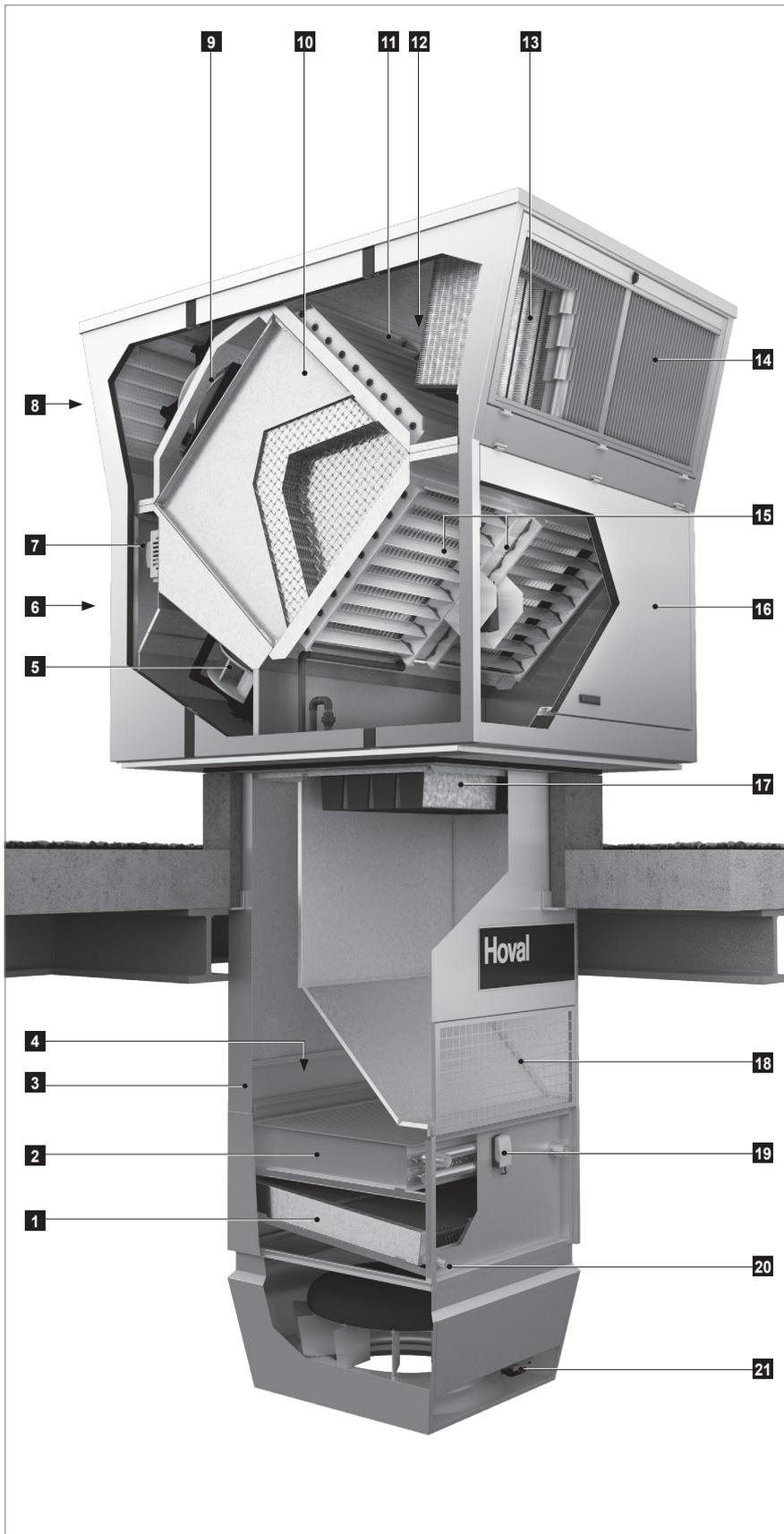
2 Below-roof unit

a Connection module

b Heating/cooling section

c Air-Injector

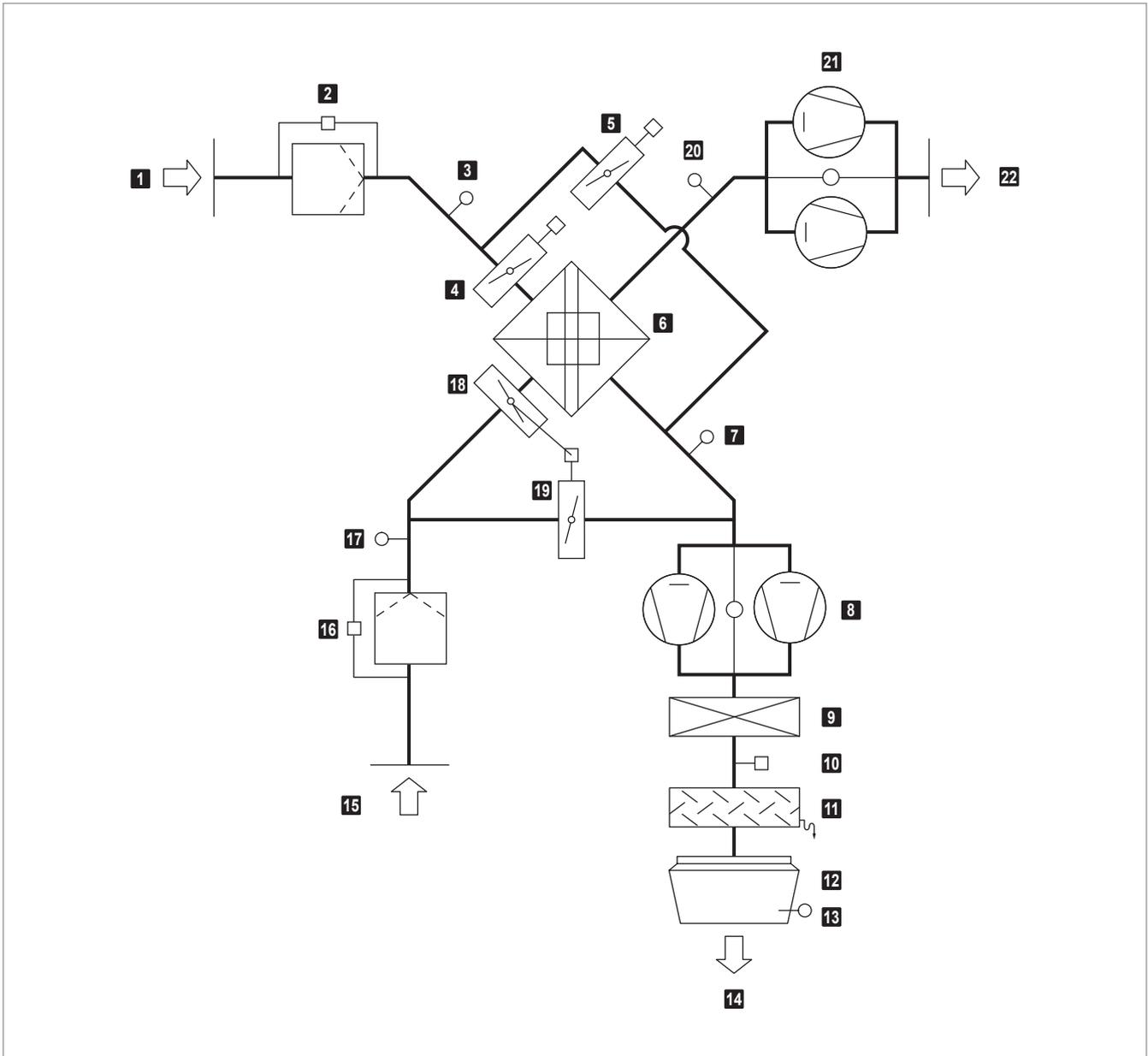
Fig. C1: RoofVent® RC components



- 1** Condensate separator
- 2** Heating/cooling coil
- 3** Access panel, coil
- 4** Access panel, connection box
- 5** Supply air fans
- 6** Supply air access door
- 7** Control block
- 8** Exhaust air access door
- 9** Exhaust air fans
- 10** Plate heat exchanger with bypass (for performance control and as recirculation bypass)
- 11** Fresh air damper with actuator
- 12** Bypass damper with actuator
- 13** Fresh air filter
- 14** Fresh air access door
- 15** Extract air and recirculation dampers with actuator
- 16** Extract air access door
- 17** Extract air filter
- 18** Extract air grille
- 19** Frost controller
- 20** Condensate connection
- 21** Actuator Air-Injector

Fig. C2: RoofVent® RC construction

2.2 Function diagram



- | | |
|---|--|
| 1 Fresh air | 12 Air-Injector with actuator |
| 2 Fresh air filter with differential pressure switch | 13 Supply air temperature sensor |
| 3 Temperature sensor air inlet ER (optional) | 14 Supply air |
| 4 Fresh air damper with actuator | 15 Extract air |
| 5 Bypass damper with actuator | 16 Extract air filter with differential pressure switch |
| 6 Plate heat exchanger | 17 Extract air temperature sensor |
| 7 Temperature sensor air outlet ER (optional) | 18 Extract air damper with actuator |
| 8 Supply air fans with flow monitoring | 19 Recirculation damper (opposed to the extract air damper) |
| 9 Heating/cooling coil | 20 Exhaust air temperature sensor |
| 10 Frost controller | 21 Exhaust air fans with flow rate monitoring |
| 11 Condensate separator | 22 Exhaust air |

Fig. C3: RoofVent® RC function diagram

2.3 Operating modes

The RoofVent® RC has the following operating modes:

- Ventilation
- Ventilation (reduced)
- Air quality
- Recirculation
- Exhaust air
- Supply air
- 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 RoofVent® unit can operate individually in a local operating mode: Off, Recirculation, Supply air, Exhaust air, Ventilation.

Code	Operating mode	Description
VE	Ventilation The unit blows fresh air into the room and exhausts polluted room air. The room temperature set value day is active. Depending on the temperature conditions, the system continuously controls: <ul style="list-style-type: none"> ■ the energy recovery ■ the heating/cooling 	Supply air fan on *) Exhaust air fan on *) Energy recovery 0-100 % Extract air damper open Recirculation damper closed Heating/cooling 0-100 % *) Adjustable flow rate
VEL	Ventilation (reduced) As VE, but the unit only operates with the set minimum values for the supply and exhaust air volumes	Supply air fan MIN Exhaust air fan MIN Energy recovery 0-100 % Extract air damper open Recirculation damper closed Heating/cooling 0-100 %
AQ	Air quality This is the operating mode for demand-controlled ventilation of the room. The room temperature set value day is active. Depending on the temperature conditions, the system continuously controls: <ul style="list-style-type: none"> ■ the energy recovery ■ the heating/cooling Depending on the room air quality or room air humidity, the system operates in one of the following operating states:	
AQ_REC	■ Air quality Recirculation: When air quality is good and air humidity appropriate, the unit heats or cools in recirculation operation.	Like REC
AQ_ECO	■ Air quality Mixed air: When ventilation requirements are medium, the unit heats or cools in mixed air operation. The supply and exhaust air volume is based on the air quality.	Supply air fan MIN-MAX Exhaust air fan MIN-MAX Energy recovery 0-100 % Extract air damper 50 % Recirculation damper 50 % Heating/cooling 0-100 %
AQ_VE	■ Air quality Ventilation: When ventilation requirements are high or the room air humidity is too high, the unit heats or cools in pure ventilation operation. The supply and exhaust air volume is based on the air quality.	Supply air fan MIN-MAX Exhaust air fan MIN-MAX Energy recovery 0-100 % Extract air damper open Recirculation damper closed Heating/cooling 0-100 %
REC	Recirculation On/Off recirculation operation with TempTronic algorithm: 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. The flow rate is controlled in 2 stages.	Supply air fan 0 / 50 / 100 % *) Exhaust air fan off Energy recovery 0 % Extract air damper closed Recirculation damper open Heating/cooling on *)
DES	■ Destratification: To avoid heat build-up under the ceiling, it may be appropriate to switch on the fan when there is no heat demand (either in permanent operation or in on/off operation depending on the temperature stratification).	*) Depending on heat or cool demand

Code	Operating mode	Description
EA	Exhaust air The unit extracts spent room air. There is no room temperature control. Unfiltered fresh air enters the room through open windows and doors or another system provides air supply.	Supply air fan off Exhaust air fan on *) Energy recovery 0 % Extract air damper open Recirculation damper closed Heating/cooling off *) Adjustable flow rate
SA	Supply air The unit blows fresh air into the room. The room temperature set value day is active. Depending on the temperature conditions, the system controls the heating/cooling. Spent room air passes through open windows and doors or another system provides extraction.	Supply air fan on *) Exhaust air fan off Energy recovery 0 % **) Extract air damper open Recirculation damper closed Heating/cooling 0-100 % *) Adjustable flow rate **) Fresh air and bypass dampers are open
ST	Standby The unit is normally switched off. The following functions remain active:	
CPR	■ Cooling protection: If the room temperature drops below the set value for cooling protection, the unit heats up the room in recirculation operation.	Supply air fan MAX Exhaust air fan off Energy recovery 0 % Extract air damper closed
OPR	■ Overheating protection: If the room temperature rises above the set value for overheating protection, the unit cools down the room in recirculation operation. If the temperatures also permit fresh air cooling, the units automatically switches to night cooling (NCS) to save energy.	Recirculation damper open Heating/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.	Supply air fan on *) Exhaust air fan on *) Energy recovery 0 % Extract air damper open Recirculation damper closed Heating/cooling off *) Adjustable flow rate
L_OFF	Off (local operating mode) The unit is switched off. Frost protection remains active.	Supply air fan off Exhaust air fan off Energy recovery 0 % Extract air damper closed Recirculation damper open Heating/cooling off
-	Forced heating The unit draws in room air, warms it and blows it back into the room. For example, forced heating is suitable for heating the hall before taking the control system into operation or if the controller fails during the heating period. Connecting a room thermostat makes it possible to specify a room temperature set value. Forced heating can be activated and set as required by the Hoval service technician.	Supply air fan MAX Exhaust air fan off Energy recovery 0 % Extract air damper closed Recirculation damper open Heating/cooling on

Table C1: RoofVent® RC operating modes

3 Technical data

3.1 Type code

	RC - 6 - C ...
Unit type	RoofVent® RC
Unit size	6 or 9
Heating/cooling section	C with coil type C D with coil type D
Further options	

Table C2: Type code

3.2 Application limits

Fresh air temperature	min.	°C	-30
Extract air temperature	max.	°C	50
Extract air relative humidity	max.	%	60
Moisture content of extract air	max.	g/kg	12.5
Supply air temperature	max.	°C	60
Temperature of the heating medium ¹⁾	max.	°C	90
Pressure of the heating medium	max.	kPa	800
Air flow rate	Size 6:	min.	m³/h 3100
	Size 9:	min.	m³/h 5000
Condensate quantity	Size 6:	max.	kg/h 90
	Size 9:	max.	kg/h 150

¹⁾ Design for higher temperatures on request

Table C3: Application limits



Notice

Use units in the corrosion-protected design for high extract air humidity if the humidity in the room increases by more than 2 g/kg.

3.3 Heat recovery system (HRS)

Unit type		RC-6	RC-9
Temperature efficiency, dry	%	77	78
Temperature efficiency, wet	%	89	90

Table C4: Thermal transfer level of the plate heat exchanger

3.4 Air filtration

Filter	Fresh air	Extract air
Class acc. to ISO 16890	ePM ₁ 55 %	ePM ₁₀ 65 %
Class acc. to EN 779	F7	M5
Factory setting of differential pressure switches	250 Pa	350 Pa

Table C5: Air filtration

3.5 Electrical connection

Unit type		RC-6	RC-9
Supply voltage	V AC	3 × 400	3 × 400
Permitted voltage tolerance	%	± 5	± 5
Frequency	Hz	50	50
Connected load	kW	4.6	8.6
Current consumption max.	A	7.8	14.4
Series fuse	A	13.0	20.0

Table C6: RoofVent® RC electrical connections

3.6 Air flow rate

Unit type		RC-6	RC-9
Nominal air flow rate	m³/h	5500	8000
Floor area covered	m²	480	797

Table C7: Air flow rate

3.7 Heat output

Fresh air temp.		-5 °C						-15 °C					
Size	Type	Q	Q _{TG}	H _{max}	t _s	Δp _w	m _w	Q	Q _{TG}	H _{max}	t _s	Δp _w	m _w
		kW	kW	m	°C	kPa	l/h	kW	kW	m	°C	kPa	l/h
RC-6	C	76.2	69.3	9.0	55.4	15	3273	78.7	68.2	9.0	54.8	16	3383
RC-9	C	113.1	103.7	9.1	56.5	14	4860	116.8	102.4	9.2	56.0	15	5017
	D	-	-	-	-	-	-	-	-	-	-	-	-
Legend:	Type = Type of coil Q = Coil heat output Q _{TG} = Output to cover fabric heat losses H _{max} = Maximum mounting height						t _s = Supply air temperature Δp _w = Water pressure drop m _w = Water quantity						
Reference:	Heating medium: 80/60 °C Room air: 18 °C Extract air: 20 °C / 20 % rel. humidity												
- These operating conditions are not permissible, because the maximum supply air temperature of 60 °C is exceeded.													

Table C8: RoofVent® RC heat output



Notice

The output for coverage of the fabric heat losses (Q_{TG}) allows for the ventilation heat requirement (Q_V) and the energy recovery output (Q_{ER}) under the respective air conditions. The following applies:

$$Q + Q_{ER} = Q_V + Q_{TG}$$

3.8 Cooling capacities

Size	Type	Q _{sen}	Q _{tot}	Q _{TG}	t _s	Δp _w	m _w	m _c	Q _{sen}	Q _{tot}	Q _{TG}	t _s	Δp _w	m _w	m _c
		kW	kW	kW	°C	kPa	l/h	kg/h	kW	kW	kW	°C	kPa	l/h	kg/h
Fresh air conditions		28 °C / 40 %							28 °C / 60 %						
RC-6	C	20.0	20.0	14.6	14.1	13	2862	0.0	17.6	36.8	12.2	15.4	44	5263	28.2
RC-9	C	29.0	29.0	21.3	14.1	12	4158	0.0	25.7	52.0	17.9	15.3	39	7440	38.6
	D	35.6	39.1	27.8	11.7	14	5599	5.2	32.9	70.4	25.1	12.7	45	10079	55.1
Fresh air conditions		32 °C / 40 %							32 °C / 60 %						
RC-6	C	24.5	34.5	19.1	15.7	39	4943	14.7	22.1	51.6	16.7	17.0	87	7382	43.3
RC-9	C	36.0	49.6	28.2	15.5	36	7105	20.0	32.7	74.6	24.9	16.8	81	10682	61.6
	D	44.2	66.6	36.4	12.5	40	9542	33.0	41.5	97.8	33.8	13.5	86	13999	82.6
Legend:	Type = Type of coil Q _{sen} = Sensible cooling capacity Q _{tot} = Total cooling capacity Q _{TG} = Output for coverage of transmission sensible gains (→ sensible cooling load)						t _s = Supply air temperature Δp _w = Water pressure drop m _w = Water quantity m _c = Condensate quantity								
Reference:	Cooling medium: 6/12 °C At fresh air temperature 28 °C: Room air: 22 °C Extract air: 24 °C / 50 % rel. humidity At fresh air temperature 32 °C: Room air: 26 °C Extract air: 28 °C / 50 % rel. humidity														

Table C9: RoofVent® RC cooling capacity



Notice

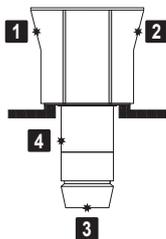
The output for coverage of transmission sensible gains (Q_{TG}) allows for the ventilation cooling requirement (Q_V) and the output of the energy recovery (Q_{ER}) under the respective air conditions. The following applies:

$$Q_{sen} + Q_{ER} = Q_V + Q_{TG}$$

3.9 Sound data

Position			1	2	3	4	
RC-6	Sound pressure level (at a distance of 5 m) ¹⁾	dB(A)	44	56	52	44	
	Total sound power level	dB(A)	66	78	74	66	
	Octave sound power level	63 Hz	dB	44	46	44	44
		125 Hz	dB	54	61	59	54
		250 Hz	dB	60	67	64	60
		500 Hz	dB	62	72	68	62
		1000 Hz	dB	57	74	70	57
		2000 Hz	dB	55	71	66	55
		4000 Hz	dB	51	66	60	51
	8000 Hz	dB	49	64	58	49	
RC-9	Sound pressure level (at a distance of 5 m) ¹⁾	dB(A)	43	55	51	42	
	Total sound power level	dB(A)	65	77	73	64	
	Octave sound power level	63 Hz	dB	43	45	44	42
		125 Hz	dB	54	62	60	54
		250 Hz	dB	57	65	63	57
		500 Hz	dB	60	70	67	59
		1000 Hz	dB	57	73	70	56
		2000 Hz	dB	46	70	66	55
		4000 Hz	dB	49	64	59	48
	8000 Hz	dB	43	59	54	42	

1) With hemispherical radiation in a low-reflection environment



- 1 Fresh air
- 2 Exhaust air
- 3 Supply air
- 4 Extract air

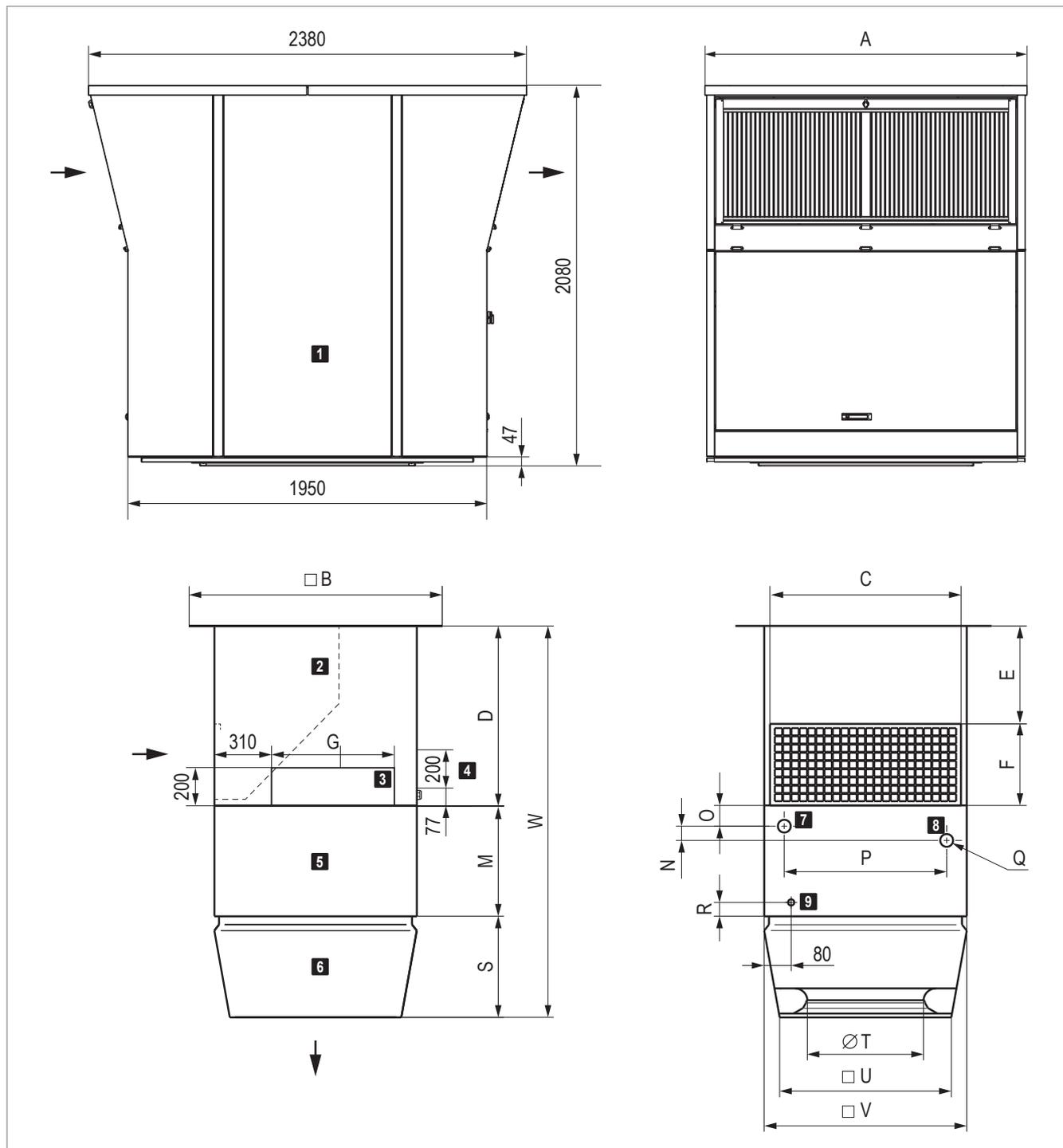
Table C10: RoofVent® RC sound data

3.10 Product information according to ErP

Trademark / Model		Hoval RoofVent® RC			Unit
		6C	9C	9D	
Type		NRVU, BVU			–
Drive		Variable speed drive			–
Heat recovery system		other			–
Thermal efficiency of heat recovery (η_{t_nrvu})		77	78	78	%
Nominal flow rate (q_{nom})		1.53	2.22	2.22	m³/s
Effective electric power input (P)		2.18	3.38	3.49	kW
Internal specific fan power (SFP _{int})		920	940	940	W/(m³/s)
Face velocity		2.69	2.98	2.98	m/s
Nominal external pressure ($\Delta p_{s, ext}$)	Supply air	110	220	190	Pa
	Extract air	190	300	300	
Internal pressure drop of ventilation components ($\Delta p_{s, int}$)	Fresh air/supply air	270	268	268	Pa
	Extract air/exhaust air	300	316	316	
Static efficiency of the fans (η_{fan}) in accordance with Regulation (EU) No 327/2011		62	63	63	%
Maximum leakage rate	External	0.45	0.25	0.25	%
	Internal	1.50	1.20	1.20	
Energy classification of the filters (class acc. to ISO 16890, final pressure difference)	Supply air ePM ₁ 55 %	250	250	250	–
	Extract air ePM ₁₀ 65 %	350	350	350	
Visual filter warning		Displayed on the operating unit			–
Casing sound power level (L _{WA})		74	73	73	dB(A)
Disassembly instructions		Devices that are no longer functional must be dismantled by a specialist company and disposed of at suitable collection points.			–
Contact		Hoval Aktiengesellschaft Austrasse 70, 9490 Vaduz, Liechtenstein www.hoval.com			

Table C11: Product information according to Commission Regulation (EU) 1253/2014, Article 4(2)

3.11 Dimensions and weights



- | | |
|---|--|
| <ul style="list-style-type: none"> 1 Roof unit with energy recovery 2 Connection module 3 Access panel, coil 4 Access panel, connection box 5 Heating/cooling section | <ul style="list-style-type: none"> 6 Air-Injector 7 Return 8 Flow 9 Condensate connection G1" (external) |
|---|--|

Fig. C4: RoofVent® RC dimensional drawing (dimensions in mm)

Unit type		RC-6				RC-9			
A	mm	1400				1750			
B	mm	1040				1240			
C	mm	848				1048			
F	mm	410				450			
G	mm	470				670			
M	mm	620				610			
S	mm	490				570			
T	mm	500				630			
U	mm	767				937			
V	mm	900				1100			
Connection module		V0	V1	V2	V3	V0	V1	V2	V3
D	mm	940	1190	1440	1940	980	1230	1480	1980
E	mm	530	780	1030	1530	530	780	1030	1530
W	mm	2050	2300	2550	3050	2160	2410	2660	3160

Table C12: RoofVent® RC dimensions

Unit type		RC-6-C	RC-9-C	RC-9-D
N	mm	78	78	95
O	mm	123	92	83
P	mm	758	882	882
Q (internal thread)	"	Rp 1¼	Rp 1½	Rp 2
R	mm	54	53	53
Water content of the coil	l	7.9	12.4	19.2

Table C13: Dimensions for hydraulic connection

Unit type		RC-6-C	RC-9-C	RC-9-D
Total	kg	882	1152	1171
Roof unit	kg	700	900	900
Below-roof unit	kg	182	252	271
Air-Injector	kg	37	56	56
Heating/cooling section	kg	70	102	121
Connection module V0	kg	75	94	
Additional weight V1	kg	+ 11	+ 13	
Additional weight V2	kg	+ 22	+ 26	
Additional weight V3	kg	+ 44	+ 52	

Table C14: RoofVent® RC weights

4 Specification texts

4.1 RoofVent® RC

Supply and extract air handling unit for heating and cooling rooms up to 25 m in height with central heat and cold supply (2-pipe system); equipped with highly efficient air distributor; maximum floor area reached per unit 480 m² (size 6) and 797 m² respectively (size 9).

The unit consists of the following components:

- Roof unit with energy recovery
- Below-roof unit:
 - Connection module
 - Heating/cooling section
 - Air-Injector
- Control components
- Optional components

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

Roof unit with energy recovery

Self-supporting housing, made of aluminium (outside) and aluzinc sheet and aluminium (inside):

- Weatherproof, corrosion resistant, impact resistant, air-tight
- Low flammability, double-shelled, without heat bridges, with highly efficient insulation made of expanded polystyrene
- Hygienic and easy to maintain because of smooth interior surfaces and large access doors with ageing-resistant, silicone-free sealing materials

The roof unit with energy recovery includes:

Supply air and exhaust air fans:

Designed as maintenance-free, direct-drive radial fans with high-efficiency EC motor, backwards-curved, 3D contoured blades and a free-running rotating wheel made of a high-performance composite material; inflow nozzle with optimised flow; infinitely variable speed; with active pressure registration for constant volumetric flow control and/or demand-controlled volumetric flow adjustment; low-noise; with integrated overload protection.

Fresh air filter:

Designed as highly efficient compact filter elements, class ISO ePM₁ 55 % (F7), fully incinerable, easy to change, including differential pressure switch for filter monitoring.

Extract air filter:

Designed as highly efficient compact filter elements, class ISO ePM₁₀ 65 % (M5), fully incinerable, easy to change, including differential pressure switch for filter monitoring.

Plate heat exchanger:

Crossflow plate heat exchanger made of high-quality aluminium as a highly efficient, recuperative heat recovery system, certified by Eurovent, zero-maintenance, without moving parts, failsafe, hygienically harmless, no cross-contamination of impurities and odours. Equipped with bypass, recirculation bypass, condensate drain and condensation trap to the roof. The following dampers are arranged on the exchanger package:

- Fresh air and bypass dampers, each with their own actuator, for infinitely variable control of the heat recovery; with shut-off function by spring return.
- Extract air and recirculation dampers, interlinked in a counter-rotating arrangement with a common actuator, for controlling the recirculation and mixed air operation; with shut-off function by spring return.

All dampers correspond to seal integrity class 2 according to EN 1751.

Access openings:

- Fresh air access door: large access opening with integrated weather and bird protection, configured with quick locking system for easy access to the fresh air filter, the plate heat exchanger as well as the fresh air and bypass dampers.
- Exhaust air access door: large, lockable access opening with integrated weather and bird protection for easy access to the exhaust air filter.
- Extract air access door: large access opening, configured with quick locking system and telescopic support for easy access to the extract air filter, the plate heat exchanger, the condensation trap as well as the extract air and recirculation dampers.
- Supply air access door: large, lockable access opening, configured with telescopic support for easy access to the supply air fans, the control block and the condensate collecting channel.

Control block:

Compact design on an easily accessible mounting plate, comprising:

- Unit controller as part of the TopTronic® C control system:
 - Fully wired to the electrical components of the roof unit (fans, actuators, temperature sensors, filter monitoring, differential pressure sensor)
 - Pluggable wiring to the control box in the connection module
- High-voltage section:
 - Mains power terminals
 - Isolation switch
 - Button for stopping the fans during filter change

- Low-voltage section:
 - Transformer for actuators, sensors and the unit controller
 - Externally switchable forced heating
 - Externally switchable forced off
- Circuit board with further electronic components for unit control (differential pressure measurement, fuses for the transformer, fuses for low voltage, ...)

Connection module

Housing made of aluzinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of smooth interior surfaces and ageing-resistant, silicone-free sealing materials; configured with extract air grille and access panel for easy access to the coil for maintenance. The connection module contains:

- Laced wiring harness protected in a sheet metal duct, with direct plug connection to the control block in the roof unit
- Connection box made of galvanised sheet steel, configured with circuit board, screw-on cover and cable lead-ins with splash water protection and strain relief; for connection of:
 - Power supply
 - Zone bus
 - All sensors and actuators of the below-roof unit (ready-to-connect): frost controller, supply air temperature sensor, Air-Injector actuator
 - Peripheral components (e.g. mixing valves, pumps, ...)
 - Optional components as required

Connection module V1 / V2 / V3:

The connection module is extended for adapting to the local installation situation.

Heating/cooling section

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

- The highly efficient heating/cooling coil consisting of seamless copper pipes with pressed-on, optimised and profiled aluminium fins and manifolds made of copper; for connection to the hot water and cold water supply
- Frost controller
- 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

1 Air-Injector:

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

- Vortex air distributor with concentric outlet nozzle, adjustable vanes and integrated absorber hood
- Actuator for infinitely variable adjustment of the air distribution from vertical to horizontal
 - for draught-free air distribution in the hall under changing operating conditions
 - 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

2 Air-Injectors:

2x Air-Injectors, supplied loose; supply air duct for connecting the RoofVent® unit to the Air-Injectors on site.

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

- Vortex air distributor with concentric outlet nozzle, adjustable vanes and integrated absorber hood
- Actuator for infinitely variable adjustment of the air distribution from vertical to horizontal
 - for draught-free air distribution in the hall under changing operating conditions
 - 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 sensor (supplied in the connection module)

Without Air-Injector:

Unit configured without vortex air distributor for connection to an on-site supply air duct and air distribution within the building, supply air temperature sensor supplied in the connection module.

Options for the unit

Oil-proof design:

- Oil-proof materials
- Special extract air filter for oil and dust separation in the connection module, class ISO ePM₁₀ 50% (M5)
- Plate heat exchanger additionally sealed; leak test according to works standard
- Condensate drain from the plate heat exchanger to the drip tray in the connection module
- Connection module in oil-tight design with integrated oil/condensate drip tray and drain connection

Corrosion-protected design for high extract air humidity:

- Powder-coated supply air and exhaust air fans, coat thickness > 80 µm; electronics potted on both sides
- Specially coated plate heat exchanger with condensate separator for high corrosion resistance; additionally sealed; leak test according to works standard
- Condensate drain from the plate heat exchanger to the drip tray in the connection module
- Additional insulation of various equipment components to avoid condensation
- Connection module with integrated condensate drip tray and drain connection
- Connecting elements (blind rivet nuts, screws, rivets) made of stainless steel 1.4301
- Casing of the roof unit powder-coated on the inside
- Parts prone to corrosion powder-coated, sheet metal parts of the dampers and all sheet metal parts of the below-roof unit powder-coated on both sides (pebble grey RAL 7032)
- Painted coil

Paint finish of below-roof unit:

Choice of external paint finish in RAL colour

Fresh air and exhaust air silencers:

Fresh air silencer configured as add-on part for the roof unit which can be folded downwards, housing made of aluminium with a bird screen and acoustic insulation lining, for reducing sound emissions on the fresh air side; exhaust air silencer configured as add-on part for the roof unit which can be folded downwards, housing made of aluminium with bird screen and easily accessible sound attenuation splitters, optimised flow, with abrasion-resistant and easily cleaned surfaces, non-flammable, hygienically clean with high-quality glass filament cover for reducing sound emissions on the exhaust air side.

Insertion loss fresh air / exhaust air ____ dB / ____ dB

Supply air and extract air silencer:

Supply air silencer configured as separated component in the below-roof unit, flow-optimised sound attenuation splitters, with abrasion-resistant and easily cleaned surfaces, non-flammable, hygienically clean with high-quality glass filament cover, extract air silencer configured as acoustic

insulation lining in the connection module, for reducing sound emission in the room.

Insertion loss supply air / extract air ____ dB / ____ dB

Hydraulic assembly diverting system:

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

Mixing valve:

Mixing valve with modulating rotary actuator, sized for the coil in the unit.

Condensate pump:

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

Socket:

230 V socket installed in the control block for simple supply of external, electrical units.

Energy monitoring:

Consisting of 2 additional temperature sensors for recording the air inlet and air outlet temperatures of the plate heat exchanger. Energy monitoring makes it possible to display the energy saved by heat and cool recovery.

Pump control for mixing or injection system:

Electrical components for controlling a mixing or injection circuit in the load circuit.

Return temperature sensor:

Temperature sensor for monitoring the heating medium. If necessary, it triggers frost pre-control at the heating valve to prevent the system possibly being shut down due to frost.

4.2 TopTronic® C control system

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

The control system is customised and preconfigured ex-works. Zone allocation:

Zone 1: ___ x Unit type _____

Zone 2: ___ x Unit type _____

Zone 3: ___ x Unit type _____

...

System structure:

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

Operation:

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

Control functions:

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

- Special destratification mode for rapid and large-area reduction of temperature stratification in the room by circulating the room air (RH, RC, RHC)

Alarms, protection:

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

Options for the zone control panel:

- Design for heating (RH, RC, RHC)
- Design for cooling (RC, RHC)
- Cooling lock switch (RC, RHC)
- Heating/cooling switch (RC, RHC)
- Alarm lamp
- Socket
- Additional room air temperature sensors (max. 3)
- Combination sensor room air quality, temperature and humidity
- External sensor values
- External set values
- Load shedding input
- Operating selector switch on terminal
- Operating selector button on terminal
- Power supply for air handling unit
- Safety relay
- Control of distributor pump(s), incl. power supply (RH, RC, RHC)



RoofVent® RHC

Supply and extract air handling unit with efficient air distribution for heating and cooling spaces up to 25 m in height with central heat and cold supply (4-pipe system)

1 Use	44
2 Construction and operation	44
3 Technical data	50
4 Specification texts	56

D

1 Use

1.1 Intended use

RoofVent® RHC units are supply and extract air handling units for heating and cooling spaces up to 25 m in height with central heat and cold supply (4-pipe system). They have the following functions:

- Fresh air supply
- Extract air removal
- Heating (with connection to a hot water supply)
- Cooling (with connection to a water chiller)
- Energy recovery with highly efficient plate heat exchanger
- Filtering of the fresh air and the extract air
- Air distribution with adjustable Air-Injector

RoofVent® RHC units comply with all the requirements of the Ecodesign Directive 2009/125/EC relating to environmentally friendly design of ventilation systems. They are systems of the 'non-residential ventilation unit' (NRVU) and 'bidirectional ventilation unit' (BVU) type.

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

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

1.2 User group

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

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

2 Construction and operation

2.1 Construction®

The RoofVent® RHC unit consists of the following components:

Roof unit with energy recovery

The self-supporting housing for mounting on the roof frame is of double-shell construction; this ensures good thermal insulation and high stability. The roof unit includes:

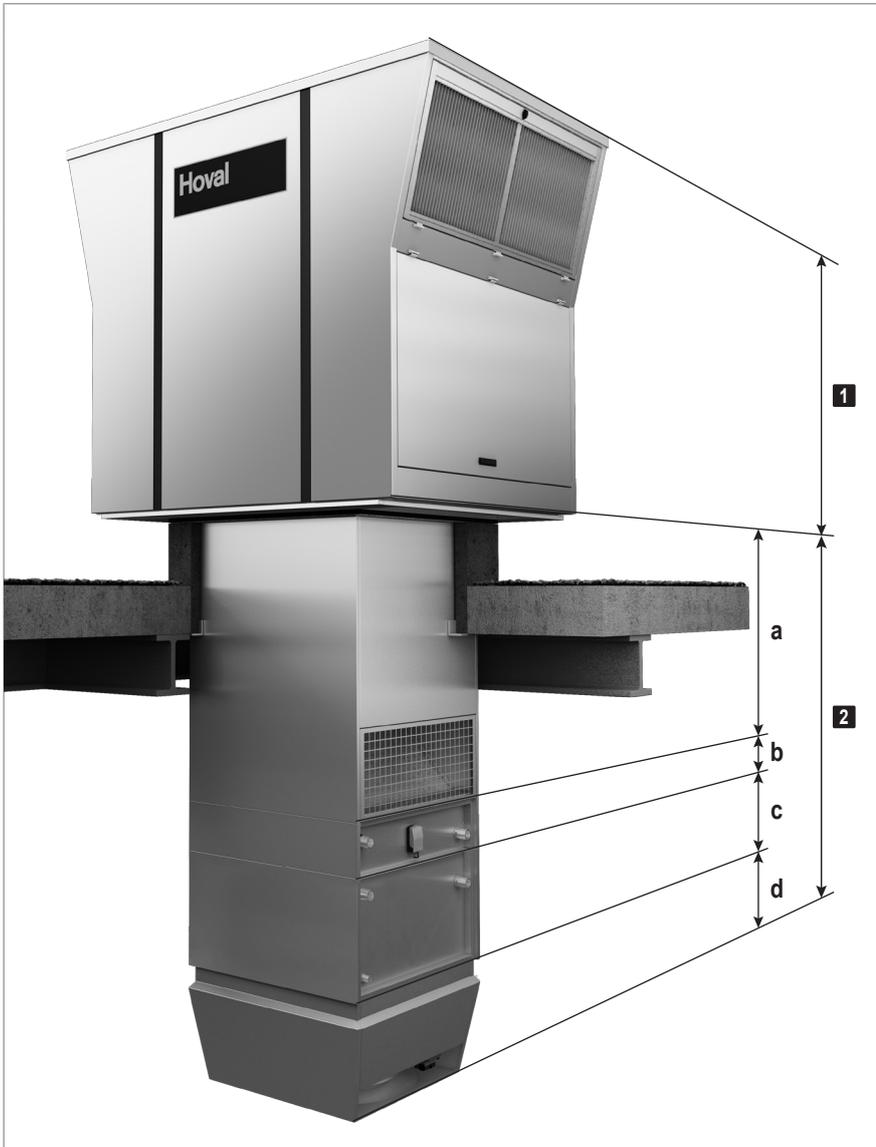
- the fans
- the air filters
- the plate heat exchanger with control dampers
- the control block

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

Below-roof unit

The below-roof unit is installed in the roof and projects into the hall. It consists of the following components:

- Connection module:
 - The connection module serves as an air duct through the roof and for drawing in extract air from the hall through the extract air grille. To enable easy adaptation to local installation conditions, the connection module is available in 4 lengths. It also contains the electrical connection box of the below-roof unit. This has a direct plug connection to the control block in the roof unit via the wiring harness.
- Heating section:
 - The heating section contains the hot water coil for heating the supply air.
- Cooling section:
 - The cooling section contains the cold water coil for cooling the supply air and the condensate separator with collecting channel and drain connection.
- 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.



1 Roof unit with energy recovery

2 Below-roof unit

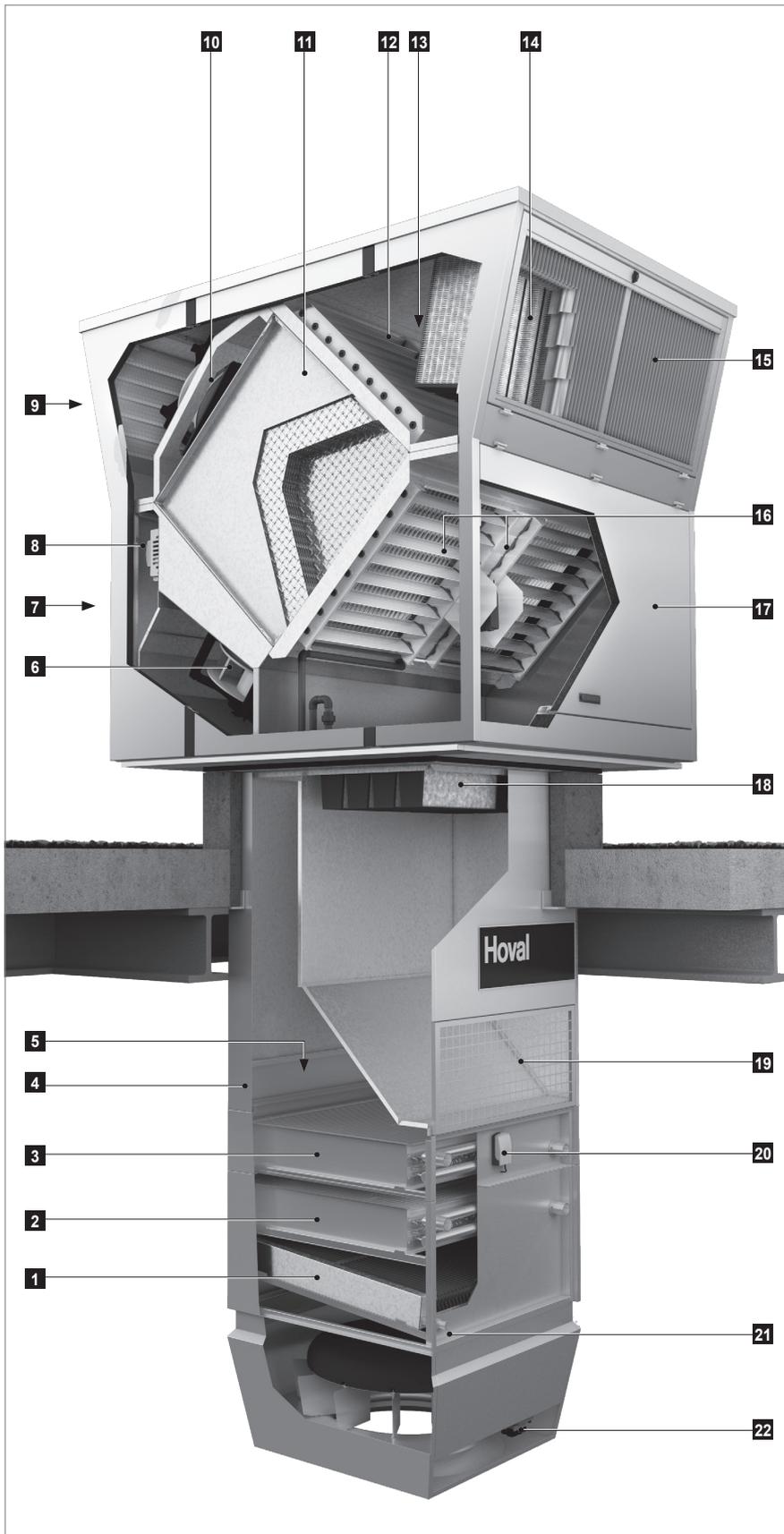
a Connection module

b Heating section

c Cooling section

d Air-Injector

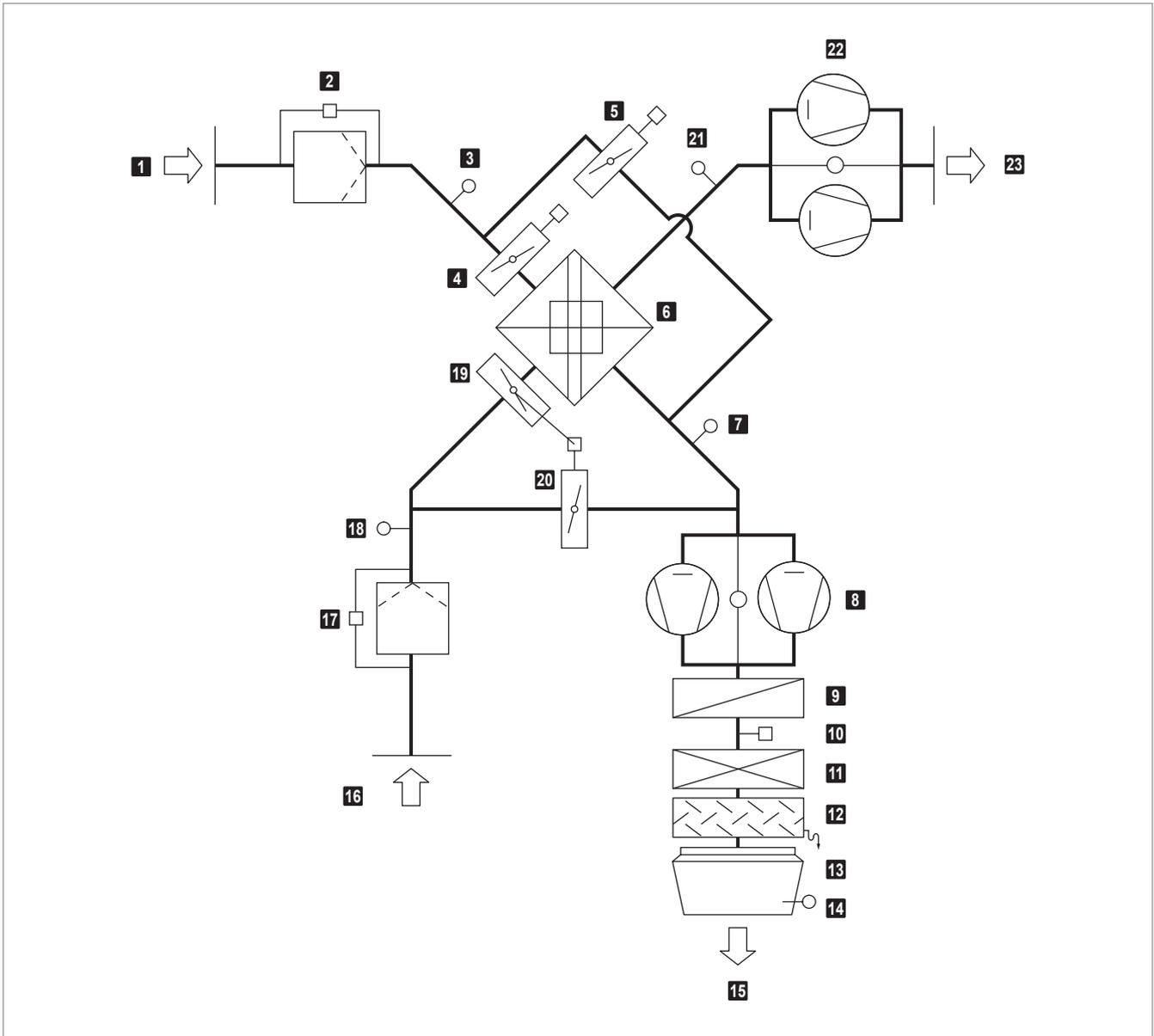
Fig. D1: RoofVent® RHC components



- 1** Condensate separator
- 2** Cooling coil
- 3** Heating coil
- 4** Access panel, coil
- 5** Access panel, connection box
- 6** Supply air fans
- 7** Supply air access door
- 8** Control block
- 9** Exhaust air access door
- 10** Exhaust air fans
- 11** Plate heat exchanger with bypass (for performance control and as recirculation bypass)
- 12** Fresh air damper with actuator
- 13** Bypass damper with actuator
- 14** Fresh air filter
- 15** Fresh air access door
- 16** Extract air and recirculation dampers with actuator
- 17** Extract air access door
- 18** Extract air filter
- 19** Extract air grille
- 20** Frost controller
- 21** Condensate connection
- 22** Actuator Air-Injector

Fig. D2: RoofVent® RHC construction

2.2 Function diagram



- | | |
|---|--|
| 1 Fresh air | 13 Air-Injector with actuator |
| 2 Fresh air filter with differential pressure switch | 14 Supply air temperature sensor |
| 3 Temperature sensor air inlet ER (optional) | 15 Supply air |
| 4 Fresh air damper with actuator | 16 Extract air |
| 5 Bypass damper with actuator | 17 Extract air filter with differential pressure switch |
| 6 Plate heat exchanger | 18 Extract air temperature sensor |
| 7 Temperature sensor air outlet ER (optional) | 19 Extract air damper with actuator |
| 8 Supply air fans with flow monitoring | 20 Recirculation damper (opposed to the extract air damper) |
| 9 Heating coil | 21 Exhaust air temperature sensor |
| 10 Frost controller | 22 Exhaust air fans with flow rate monitoring |
| 11 Cooling coil | 23 Exhaust air |
| 12 Condensate separator | |

Fig. D3: RoofVent® RHC function diagram

2.3 Operating modes

The RoofVent® RHC has the following operating modes:

- Ventilation
- Ventilation (reduced)
- Air quality
- Recirculation
- Exhaust air
- Supply air
- 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 RoofVent® unit can operate individually in a local operating mode: Off, Recirculation, Supply air, Exhaust air, Ventilation.

Code	Operating mode	Description
VE	Ventilation The unit blows fresh air into the room and exhausts polluted room air. The room temperature set value day is active. Depending on the temperature conditions, the system continuously controls: <ul style="list-style-type: none"> ■ the energy recovery ■ the heating/cooling 	Supply air fan on *) Exhaust air fan on *) Energy recovery 0-100 % Extract air damper open Recirculation damper closed Heating/cooling 0-100 % *) Adjustable flow rate
VEL	Ventilation (reduced) As VE, but the unit only operates with the set minimum values for the supply and exhaust air volumes	Supply air fan MIN Exhaust air fan MIN Energy recovery 0-100 % Extract air damper open Recirculation damper closed Heating/cooling 0-100 %
AQ	Air quality This is the operating mode for demand-controlled ventilation of the room. The room temperature set value day is active. Depending on the temperature conditions, the system continuously controls: <ul style="list-style-type: none"> ■ the energy recovery ■ the heating/cooling Depending on the room air quality or room air humidity, the system operates in one of the following operating states:	
AQ_REC	■ Air quality Recirculation: When air quality is good and air humidity appropriate, the unit heats or cools in recirculation operation.	Like REC
AQ_ECO	■ Air quality Mixed air: When ventilation requirements are medium, the unit heats or cools in mixed air operation. The supply and exhaust air volume is based on the air quality.	Supply air fan MIN-MAX Exhaust air fan MIN-MAX Energy recovery 0-100 % Extract air damper 50 % Recirculation damper 50 % Heating/cooling 0-100 %
AQ_VE	■ Air quality Ventilation: When ventilation requirements are high or the room air humidity is too high, the unit heats or cools in pure ventilation operation. The supply and exhaust air volume is based on the air quality.	Supply air fan MIN-MAX Exhaust air fan MIN-MAX Energy recovery 0-100 % Extract air damper open Recirculation damper closed Heating/cooling 0-100 %
REC	Recirculation On/Off recirculation operation with TempTronic algorithm: 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. The flow rate is controlled in 2 stages.	Supply air fan 0 / 50 / 100 % *) Exhaust air fan off Energy recovery 0 % Extract air damper closed Recirculation damper open Heating/cooling on *)
DES	■ Destratification: To avoid heat build-up under the ceiling, it may be appropriate to switch on the fan when there is no heat demand (either in permanent operation or in on/off operation depending on the temperature stratification).	*) Depending on heat or cool demand

Code	Operating mode	Description
EA	Exhaust air The unit extracts spent room air. There is no room temperature control. Unfiltered fresh air enters the room through open windows and doors or another system provides air supply.	Supply air fan off Exhaust air fan on *) Energy recovery 0 % Extract air damper open Recirculation damper closed Heating/cooling off *) Adjustable flow rate
SA	Supply air The unit blows fresh air into the room. The room temperature set value day is active. Depending on the temperature conditions, the system controls the heating/cooling. Spent room air passes through open windows and doors or another system provides extraction.	Supply air fan on *) Exhaust air fan off Energy recovery 0 % **) Extract air damper open Recirculation damper closed Heating/cooling 0-100 % *) Adjustable flow rate **) Fresh air and bypass dampers are open
ST	Standby The unit is normally switched off. The following functions remain active:	
CPR	■ Cooling protection: If the room temperature drops below the set value for cooling protection, the unit heats up the room in recirculation operation.	Supply air fan MAX Exhaust air fan off Energy recovery 0 % Extract air damper closed
OPR	■ Overheating protection: If the room temperature rises above the set value for overheating protection, the unit cools down the room in recirculation operation. If the temperatures also permit fresh air cooling, the units automatically switches to night cooling (NCS) to save energy.	Recirculation damper open Heating/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.	Supply air fan on *) Exhaust air fan on *) Energy recovery 0 % Extract air damper open Recirculation damper closed Heating/cooling off *) Adjustable flow rate
L_OFF	Off (local operating mode) The unit is switched off. Frost protection remains active.	Supply air fan off Exhaust air fan off Energy recovery 0 % Extract air damper closed Recirculation damper open Heating/cooling off
-	Forced heating The unit draws in room air, warms it and blows it back into the room. For example, forced heating is suitable for heating the hall before taking the control system into operation or if the controller fails during the heating period. Connecting a room thermostat makes it possible to specify a room temperature set value. Forced heating can be activated and set as required by the Hoval service technician.	Supply air fan MAX Exhaust air fan off Energy recovery 0 % Extract air damper closed Recirculation damper open Heating/cooling on

Table D1: RoofVent® RHC operating modes

3 Technical data

3.1 Type code

RHC - 6 B C ...	
Unit type	RoofVent® RHC
Unit size	6 or 9
Heating section	B with coil type B C with coil type C D with coil type D
Cooling section	C with coil type C D with coil type D
Further options	

Table D2: Type code

3.2 Application limits

Fresh air temperature	min.	°C	-30
Extract air temperature	max.	°C	50
Extract air relative humidity	max.	%	60
Moisture content of extract air	max.	g/kg	12.5
Supply air temperature	max.	°C	60
Temperature of the heating medium ¹⁾	max.	°C	90
Pressure of the heating medium	max.	kPa	800
Air flow rate	Size 6:	min.	m³/h 3100
	Size 9:	min.	m³/h 5000
Condensate quantity	Size 6:	max.	kg/h 90
	Size 9:	max.	kg/h 150

¹⁾ Design for higher temperatures on request

Table D3: Application limits



Notice

Use units in the corrosion-protected design for high extract air humidity if the humidity in the room increases by more than 2 g/kg.

3.3 Heat recovery system (HRS)

Unit type		RHC-6	RHC-9
Temperature efficiency, dry	%	77	78
Temperature efficiency, wet	%	89	90

Table D4: Thermal transfer level of the plate heat exchanger

3.4 Air filtration

Filter	Fresh air	Extract air
Class acc. to ISO 16890	ePM ₁ 55 %	ePM ₁₀ 65 %
Class acc. to EN 779	F7	M5
Factory setting of differential pressure switches	250 Pa	350 Pa

Table D5: Air filtration

3.5 Electrical connection

Unit type		RHC-6	RHC-9
Supply voltage	V AC	3 × 400	3 × 400
Permitted voltage tolerance	%	± 5	± 5
Frequency	Hz	50	50
Connected load	kW	4.6	8.6
Current consumption max.	A	7.8	14.4
Series fuse	A	13.0	20.0

Table D6: RoofVent® RHC electrical connections

3.6 Air flow rate

Unit type		RHC-6	RHC-9
Nominal air flow rate	m³/h	5500	8000
Floor area covered	m²	480	797

Table D7: Air flow rate

3.7 Heat output

Fresh air temp.		-5 °C						-15 °C					
Size	Type	Q	Q _{TG}	H _{max}	t _s	Δp _w	m _w	Q	Q _{TG}	H _{max}	t _s	Δp _w	m _w
		kW	kW	m	°C	kPa	l/h	kW	kW	m	°C	kPa	l/h
RHC-6	B	47.4	40.5	11.4	39.9	13	2038	49.1	38.5	11.7	38.8	14	2108
	C	76.2	69.3	9.0	55.4	15	3273	78.7	68.2	9.0	54.8	16	3383
RHC-9	B	68.9	59.5	11.7	40.1	10	2962	71.2	56.8	12.0	39.1	10	3059
	C	113.1	103.7	9.1	56.5	14	4860	116.8	102.4	9.2	56.0	15	5017
	D	-	-	-	-	-	-	-	-	-	-	-	-

Legend: Type = Type of coil
 Q = Coil heat output
 Q_{TG} = Output to cover fabric heat losses
 H_{max} = Maximum mounting height
 t_s = Supply air temperature
 Δp_w = Water pressure drop
 m_w = Water quantity

Reference: Heating medium: 80/60 °C
 Room air: 18 °C
 Extract air: 20 °C / 20 % rel. humidity

- These operating conditions are not permissible, because the maximum supply air temperature of 60 °C is exceeded.

Table D8: RoofVent® RHC heat output



Notice

The output for coverage of the fabric heat losses (Q_{TG}) allows for the ventilation heat requirement (Q_V) and the energy recovery output (Q_{ER}) under the respective air conditions. The following applies:

$$Q + Q_{ER} = Q_V + Q_{TG}$$

3.8 Cooling capacities

Size	Type	Q _{sen}	Q _{tot}	Q _{TG}	t _s	Δp _w	m _w	m _c	Q _{sen}	Q _{tot}	Q _{TG}	t _s	Δp _w	m _w	m _c
		kW	kW	kW	°C	kPa	l/h	kg/h	kW	kW	kW	°C	kPa	l/h	kg/h
Fresh air conditions		28 °C / 40 %							28 °C / 60 %						
RHC-6	C	20.0	20.0	14.6	14.1	13	2862	0.0	17.6	36.8	12.2	15.4	44	5263	28.2
RHC-9	C	29.0	29.0	21.3	14.1	12	4158	0.0	25.7	52.0	17.9	15.3	39	7440	38.6
	D	35.6	39.1	27.8	11.7	14	5599	5.2	32.9	70.4	25.1	12.7	45	10079	55.1
Fresh air conditions		32 °C / 40 %							32 °C / 60 %						
RHC-6	C	24.5	34.5	19.1	15.7	39	4943	14.7	22.1	51.6	16.7	17.0	87	7382	43.3
RHC-9	C	36.0	49.6	28.2	15.5	36	7105	20.0	32.7	74.6	24.9	16.8	81	10682	61.6
	D	44.2	66.6	36.4	12.5	40	9542	33.0	41.5	97.8	33.8	13.5	86	13999	82.6

Legend: Type = Type of coil
 Q_{sen} = Sensible cooling capacity
 Q_{tot} = Total cooling capacity
 Q_{TG} = Output for coverage of transmission sensible gains (→ sensible cooling load)
 t_s = Supply air temperature
 Δp_w = Water pressure drop
 m_w = Water quantity
 m_c = Condensate quantity

Reference: Cooling medium: 6/12 °C
At fresh air temperature 28 °C:
 Room air: 22 °C
 Extract air: 24 °C / 50 % rel. humidity
At fresh air temperature 32 °C:
 Room air: 26 °C
 Extract air: 28 °C / 50 % rel. humidity

Table D9: RoofVent® RHC cooling capacity



Notice

The output for coverage of transmission sensible gains (Q_{TG}) allows for the ventilation cooling requirement (Q_V) and the output of the energy recovery (Q_{ER}) under the respective air conditions. The following applies:

$$Q_{sen} + Q_{ER} = Q_V + Q_{TG}$$

3.9 Sound data

Position			1	2	3	4	
RHC-6	Sound pressure level (at a distance of 5 m) ¹⁾	dB(A)	44	56	51	44	
	Total sound power level	dB(A)	66	78	73	66	
	Octave sound power level	63 Hz	dB	44	46	43	43
		125 Hz	dB	54	61	56	54
		250 Hz	dB	60	67	63	60
		500 Hz	dB	62	71	67	62
		1000 Hz	dB	58	74	69	57
		2000 Hz	dB	55	70	64	55
		4000 Hz	dB	51	66	59	51
		8000 Hz	dB	50	64	56	49
RHC-9	Sound pressure level (at a distance of 5 m) ¹⁾	dB(A)	44	55	51	42	
	Total sound power level	dB(A)	66	77	73	64	
	Octave sound power level	63 Hz	dB	45	45	45	42
		125 Hz	dB	57	62	60	54
		250 Hz	dB	60	65	64	57
		500 Hz	dB	62	70	68	59
		1000 Hz	dB	59	73	70	56
		2000 Hz	dB	58	70	66	55
		4000 Hz	dB	51	64	59	48
		8000 Hz	dB	45	59	54	42

1) With hemispherical radiation in a low-reflection environment



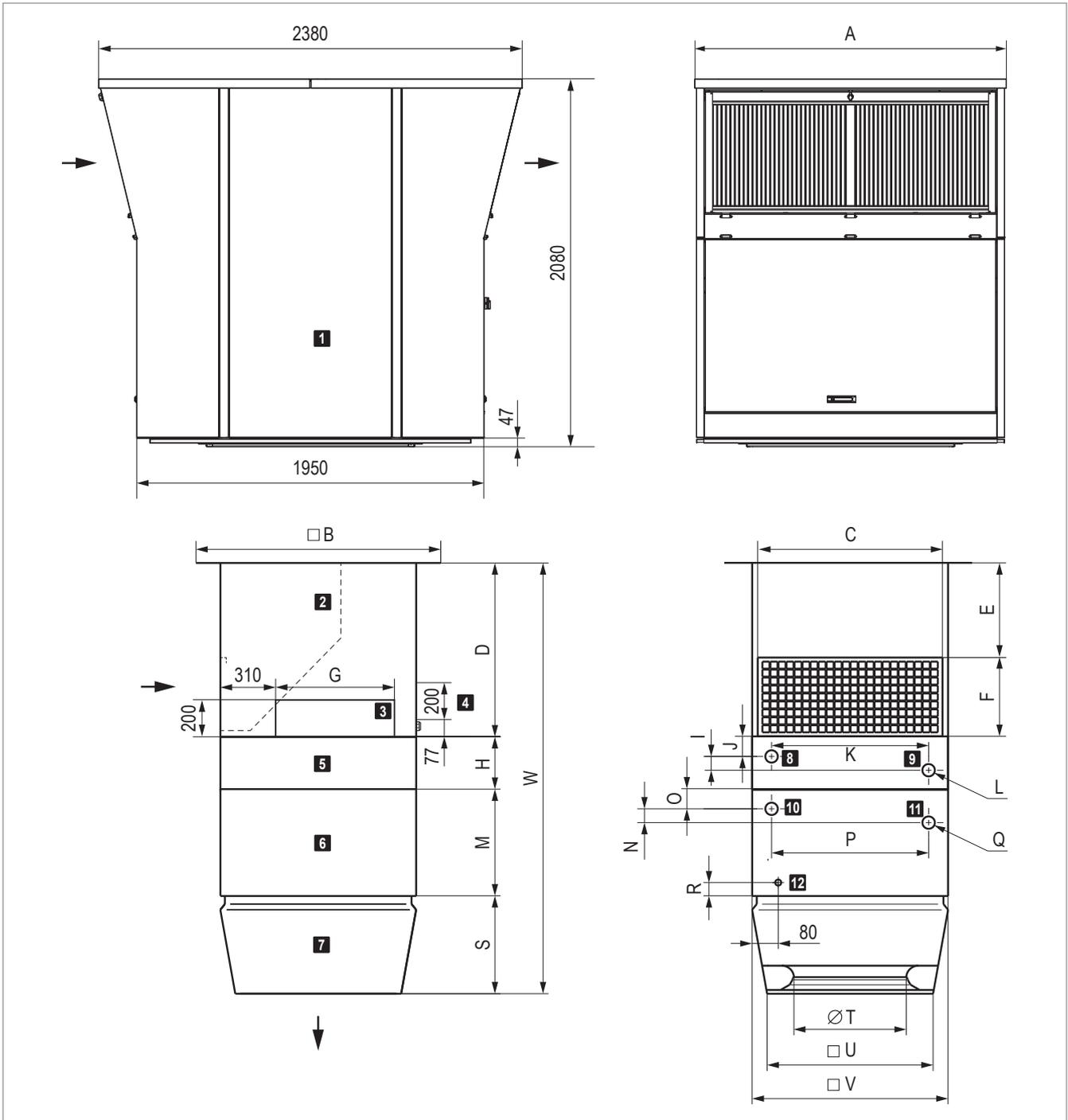
Table D10: RoofVent® RHC sound data

3.10 Product information according to ErP

Trademark / Model		Hoval RoofVent® RHC								Unit
		6BC	6CC	9BC	9BD	9CC	9CD	9DC	9DD	
Type		NRVU, BVU								–
Drive		Variable speed drive								–
Heat recovery system		other								–
Thermal efficiency of heat recovery ($\eta_{t, nrvu}$)		77	77	78	78	78	78	78	78	%
Nominal flow rate (q_{nom})		1.53	1.53	2.22	2.22	2.22	2.22	2.22	2.22	m³/s
Effective electric power input (P)		2.27	2.33	2.90	3.60	3.63	3.74	3.74	3.98	kW
Internal specific fan power (SFP _{int})		920	920	940	940	940	940	940	940	W/(m³/s)
Face velocity		2.69	2.69	2.98	2.98	2.98	2.98	2.98	2.98	m/s
Nominal external pressure ($\Delta p_{s, ext}$)	Supply air	80	50	170	140	130	100	100	40	Pa
	Extract air	190	190	300	300	300	300	300	300	
Internal pressure drop of ventilation components ($\Delta p_{s, int}$)	Fresh air/supply air	270	270	268	268	268	268	268	268	Pa
	Extract air/exhaust air	300	300	316	316	316	316	316	316	
Static efficiency of the fans (η_{fan}) in accordance with Regulation (EU) No 327/2011		62	62	63	63	63	63	63	63	%
Maximum leakage rate	External	0.45	0.45	0.25	0.25	0.25	0.25	0.25	0.25	%
	Internal	1.50	1.50	1.20	1.20	1.20	1.20	1.20	1.20	
Energy classification of the filters (class acc. to ISO 16890, final pressure difference)	Supply air ePM ₁ 55 %	250	250	250	250	250	250	250	250	–
	Extract air ePM ₁₀ 65 %	350	350	350	350	350	350	350	350	
Visual filter warning		Displayed on the operating unit								–
Casing sound power level (L _{WA})		73	73	73	73	73	73	73	73	dB(A)
Disassembly instructions		Devices that are no longer functional must be dismantled by a specialist company and disposed of at suitable collection points.								–
Contact		Hoval Aktiengesellschaft Austrasse 70, 9490 Vaduz, Liechtenstein www.hoval.com								

Table D11: Product information according to Commission Regulation (EU) 1253/2014, Article 4(2)

3.11 Dimensions and weights



- | | |
|---|---|
| <ul style="list-style-type: none"> 1 Roof unit with energy recovery 2 Connection module 3 Access panel, coil 4 Access panel, connection box 5 Heating section 6 Cooling section | <ul style="list-style-type: none"> 7 Air-Injector 8 Heating circuit return 9 Heating circuit flow 10 Cooling circuit return 11 Cooling circuit flow 12 Condensate connection G1" (external) |
|---|---|

Fig. D4: RoofVent® RHC dimensional drawing (dimensions in mm)

Unit type		RHC-6				RHC-9			
A	mm	1400				1750			
B	mm	1040				1240			
C	mm	848				1048			
F	mm	410				450			
G	mm	470				670			
H	mm	270				300			
M	mm	620				610			
S	mm	490				570			
T	mm	500				630			
U	mm	767				937			
V	mm	900				1100			
Connection module		V0	V1	V2	V3	V0	V1	V2	V3
D	mm	940	1190	1440	1940	980	1230	1480	1980
E	mm	530	780	1030	1530	530	780	1030	1530
W	mm	2320	2570	2820	3320	2460	2710	2960	3460

Table D12: RoofVent® RHC dimensions

Unit type		RHC-6		RHC-9		
Type of heating coil		B	C	B	C	D
I	mm	78	78	78	78	95
J	mm	101	101	111	111	102
K	mm	758	758	882	882	882
L (internal thread)	"	Rp 1¼	Rp 1¼	Rp 1½	Rp 1½	Rp 2
Water content of the coil	l	4.6	7.9	7.4	12.4	19.2

Table D13: Dimensions for hydraulic connection of the heating section

Unit type		RHC-6		RHC-9
Type of cooling coil		C	C	D
N	mm	78	78	95
O	mm	123	92	83
P	mm	758	882	882
Q (internal thread)	"	Rp 1¼	Rp 1½	Rp 2
R	mm	54	53	53
Water content of the coil	l	7.9	12.4	19.2

Table D14: Dimensions for hydraulic connection of the cooling section

Unit type	RHC	6BC	6CC	9BC	9BD	9CC	9CD	9DC	9DD
Total	kg	912	919	1196	1215	1206	1225	1225	1244
Roof unit	kg	700	700	900	900	900	900	900	900
Below-roof unit	kg	212	219	296	315	306	325	325	344
Air-Injector	kg	37	37	56	56	56	56	56	56
Heating section	kg	30	37	44	44	54	54	73	73
Cooling section	kg	70	70	102	121	102	121	102	121
Connection module V0	kg	75		94					
Additional weight V1	kg	+ 11		+ 13					
Additional weight V2	kg	+ 22		+ 26					
Additional weight V3	kg	+ 44		+ 52					

Table D15: RoofVent® RHC weights

4 Specification texts

4.1 RoofVent® RHC

Supply and extract air handling unit for heating and cooling rooms up to 25 m in height with central heat and cold supply (4-pipe system); equipped with highly efficient air distributor; maximum floor area reached per unit 480 m² (size 6) and 797 m² respectively (size 9).

The unit consists of the following components:

- Roof unit with energy recovery
- Below-roof unit:
 - Connection module
 - Heating section
 - Cooling section
 - Air-Injector
- Control components
- Optional components

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

Roof unit with energy recovery

Self-supporting housing, made of aluminium (outside) and aluzinc sheet and aluminium (inside):

- Weatherproof, corrosion resistant, impact resistant, air-tight
- Low flammability, double-shelled, without heat bridges, with highly efficient insulation made of expanded polystyrene
- Hygienic and easy to maintain because of smooth interior surfaces and large access doors with ageing-resistant, silicone-free sealing materials

The roof unit with energy recovery includes:

Supply air and exhaust air fans:

Designed as maintenance-free, direct-drive radial fans with high-efficiency EC motor, backwards-curved, 3D contoured blades and a free-running rotating wheel made of a high-performance composite material; inflow nozzle with optimised flow; infinitely variable speed; with active pressure registration for constant volumetric flow control and/or demand-controlled volumetric flow adjustment; low-noise; with integrated overload protection.

Fresh air filter:

Designed as highly efficient compact filter elements, class ISO ePM₁ 55 % (F7), fully incinerable, easy to change, including differential pressure switch for filter monitoring.

Extract air filter:

Designed as highly efficient compact filter elements, class ISO ePM10 65 % (M5), fully incinerable, easy to change, including differential pressure switch for filter monitoring.

Plate heat exchanger:

Crossflow plate heat exchanger made of high-quality aluminium as a highly efficient, recuperative heat recovery system, certified by Eurovent, zero-maintenance, without moving parts, failsafe, hygienically harmless, no cross-contamination of impurities and odours. Equipped with bypass, recirculation bypass, condensate drain and condensation trap to the roof. The following dampers are arranged on the exchanger package:

- Fresh air and bypass dampers, each with their own actuator, for infinitely variable control of the heat recovery; with shut-off function by spring return.
- Extract air and recirculation dampers, interlinked in a counter-rotating arrangement with a common actuator, for controlling the recirculation and mixed air operation; with shut-off function by spring return.

All dampers correspond to seal integrity class 2 according to EN 1751.

Access openings:

- Fresh air access door: large access opening with integrated weather and bird protection, configured with quick locking system for easy access to the fresh air filter, the plate heat exchanger as well as the fresh air and bypass dampers.
- Exhaust air access door: large, lockable access opening with integrated weather and bird protection for easy access to the exhaust air filter.
- Extract air access door: large access opening, configured with quick locking system and telescopic support for easy access to the extract air filter, the plate heat exchanger, the condensation trap as well as the extract air and recirculation dampers.
- Supply air access door: large, lockable access opening, configured with telescopic support for easy access to the supply air fans, the control block and the condensate collecting channel.

Control block:

Compact design on an easily accessible mounting plate, comprising:

- Unit controller as part of the TopTronic® C control system:
 - Fully wired to the electrical components of the roof unit (fans, actuators, temperature sensors, filter monitoring, differential pressure sensor)
 - Pluggable wiring to the control box in the connection module

- High-voltage section:
 - Mains power terminals
 - Isolation switch
 - Button for stopping the fans during filter change
- Low-voltage section:
 - Transformer for actuators, sensors and the unit controller
 - Externally switchable forced heating
 - Externally switchable forced off
- Circuit board with further electronic components for unit control (differential pressure measurement, fuses for the transformer, fuses for low voltage, ...)

Connection module

Housing made of aluzinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of smooth interior surfaces and ageing-resistant, silicone-free sealing materials; configured with extract air grille and access panel for easy access to the coil for maintenance. The connection module contains:

- Laced wiring harness protected in a sheet metal duct, with direct plug connection to the control block in the roof unit
- Connection box made of galvanised sheet steel, configured with circuit board, screw-on cover and cable lead-ins with splash water protection and strain relief; for connection of:
 - Power supply
 - Zone bus
 - All sensors and actuators of the below-roof unit (ready-to-connect): frost controller, supply air temperature sensor, Air-Injector actuator
 - Peripheral components (e.g. mixing valves, pumps, ...)
 - Optional components as required

Connection module V1 / V2 / V3:

The connection module is extended for adapting to the local installation situation.

Heating section

Housing made of aluzinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of ageing-resistant, silicone-free sealing materials. The heating section contains:

- The highly efficient heating coil consisting of seamless copper pipes with pressed-on, optimised and profiled aluminium fins and manifolds made of copper; for connection to the hot water supply
- Frost controller

Cooling section

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

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

Air-Injector

1 Air-Injector:

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

- Vortex air distributor with concentric outlet nozzle, adjustable vanes and integrated absorber hood
- Actuator for infinitely variable adjustment of the air distribution from vertical to horizontal
 - for draught-free air distribution in the hall under changing operating conditions
 - 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

2 Air-Injectors:

2x Air-Injectors, supplied loose; supply air duct for connecting the RoofVent® unit to the Air-Injectors on site.

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

- Vortex air distributor with concentric outlet nozzle, adjustable vanes and integrated absorber hood
- Actuator for infinitely variable adjustment of the air distribution from vertical to horizontal
 - for draught-free air distribution in the hall under changing operating conditions
 - 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 sensor (supplied in the connection module)

Without Air-Injector:

Unit configured without vortex air distributor for connection to an on-site supply air duct and air distribution within the building, supply air temperature sensor supplied in the connection module.

Options for the unit

Oil-proof design:

- Oil-proof materials
- Special extract air filter for oil and dust separation in the connection module, class ISO ePM₁₀ 50% (M5)
- Plate heat exchanger additionally sealed; leak test according to works standard
- Condensate drain from the plate heat exchanger to the drip tray in the connection module
- Connection module in oil-tight design with integrated oil/condensate drip tray and drain connection

Corrosion-protected design for high extract air humidity:

- Powder-coated supply air and exhaust air fans, coat thickness > 80 µm; electronics potted on both sides
- Specially coated plate heat exchanger with condensate separator for high corrosion resistance; additionally sealed; leak test according to works standard
- Condensate drain from the plate heat exchanger to the drip tray in the connection module
- Additional insulation of various equipment components to avoid condensation
- Connection module with integrated condensate drip tray and drain connection
- Connecting elements (blind rivet nuts, screws, rivets) made of stainless steel 1.4301
- Casing of the roof unit powder-coated on the inside
- Parts prone to corrosion powder-coated, sheet metal parts of the dampers and all sheet metal parts of the below-roof unit powder-coated on both sides (pebble grey RAL 7032)
- Painted coil

Paint finish of below-roof unit:

Choice of external paint finish in RAL colour

Fresh air and exhaust air silencers:

Fresh air silencer configured as add-on part for the roof unit which can be folded downwards, housing made of aluminium with a bird screen and acoustic insulation lining, for reducing sound emissions on the fresh air side; exhaust air silencer configured as add-on part for the roof unit which can be folded downwards, housing made of aluminium with bird screen and easily accessible sound attenuation splitters, optimised flow, with abrasion-resistant and easily cleaned surfaces, non-flammable, hygienically clean with high-quality glass filament cover for reducing sound emissions on the exhaust air side.

Insertion loss fresh air / exhaust air ____ dB / ____ dB

Supply air and extract air silencer:

Supply air silencer configured as separated component in the below-roof unit, flow-optimised sound attenuation splitters, with abrasion-resistant and easily cleaned surfaces, non-flammable, hygienically clean with high-quality glass filament cover, extract air silencer configured as acoustic

insulation lining in the connection module, for reducing sound emission in the room.

Insertion loss supply air / extract air ____ dB / ____ dB

Hydraulic assembly diverting system:

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

Mixing valve:

Mixing valve with modulating rotary actuator, sized for the coil in the unit.

Condensate pump:

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

Socket:

230 V socket installed in the control block for simple supply of external, electrical units.

Energy monitoring:

Consisting of 2 additional temperature sensors for recording the air inlet and air outlet temperatures of the plate heat exchanger. Energy monitoring makes it possible to display the energy saved by heat and cool recovery.

Pump control for mixing or injection system:

Electrical components for controlling a mixing or injection circuit in the load circuit.

Return temperature sensor:

Temperature sensor for monitoring the heating medium. If necessary, it triggers frost pre-control at the heating valve to prevent the system possibly being shut down due to frost.

4.2 TopTronic® C control system

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

The control system is customised and preconfigured ex-works. Zone allocation:

Zone 1: ___ x Unit type _____

Zone 2: ___ x Unit type _____

Zone 3: ___ x Unit type _____

...

System structure:

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

Operation:

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

Control functions:

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

- Special destratification mode for rapid and large-area reduction of temperature stratification in the room by circulating the room air (RH, RC, RHC)

Alarms, protection:

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

Options for the zone control panel:

- Design for heating (RH, RC, RHC)
- Design for cooling (RC, RHC)
- Cooling lock switch (RC, RHC)
- Heating/cooling switch (RC, RHC)
- Alarm lamp
- Socket
- Additional room air temperature sensors (max. 3)
- Combination sensor room air quality, temperature and humidity
- External sensor values
- External set values
- Load shedding input
- Operating selector switch on terminal
- Operating selector button on terminal
- Power supply for air handling unit
- Safety relay
- Control of distributor pump(s), incl. power supply (RH, RC, RHC)



RoofVent® R

Supply and extract air handling unit with efficient air distribution for use in spaces up to 25 m in height

1 Use	62
2 Construction and operation	62
3 Technical data	68
4 Specification texts	73



1 Use

1.1 Intended use

RoofVent® R units are supply and extract air handling units for use in spaces up to 25 m in height. They have the following functions:

- Fresh air supply
- Extract air removal
- Energy recovery with highly efficient plate heat exchanger
- Filtering of the fresh air and the extract air
- Air distribution with adjustable Air-Injector

RoofVent® R units comply with all the requirements of the Ecodesign Directive 2009/125/EC relating to environmentally friendly design of ventilation systems. They are systems of the 'non-residential ventilation unit' (NRVU) and 'bidirectional ventilation unit' (BVU) type.

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

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

1.2 User group

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

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

2 Construction and operation

2.1 Construction

The RoofVent® R unit consists of the following components:

Roof unit with energy recovery

The self-supporting housing for mounting on the roof frame is of double-shell construction; this ensures good thermal insulation and high stability. The roof unit includes:

- the fans
- the air filters
- the plate heat exchanger with control dampers
- the control block

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

Below-roof unit

The below-roof unit is installed in the roof and projects into the hall. It consists of the following components:

- Connection module:
The connection module serves as an air duct through the roof and for drawing in extract air from the hall through the extract air grille. To enable easy adaptation to local installation conditions, the connection module is available in 4 lengths. It also contains the electrical connection box of the below-roof unit. This has a direct plug connection to the control block in the roof unit via the wiring harness.
- 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.



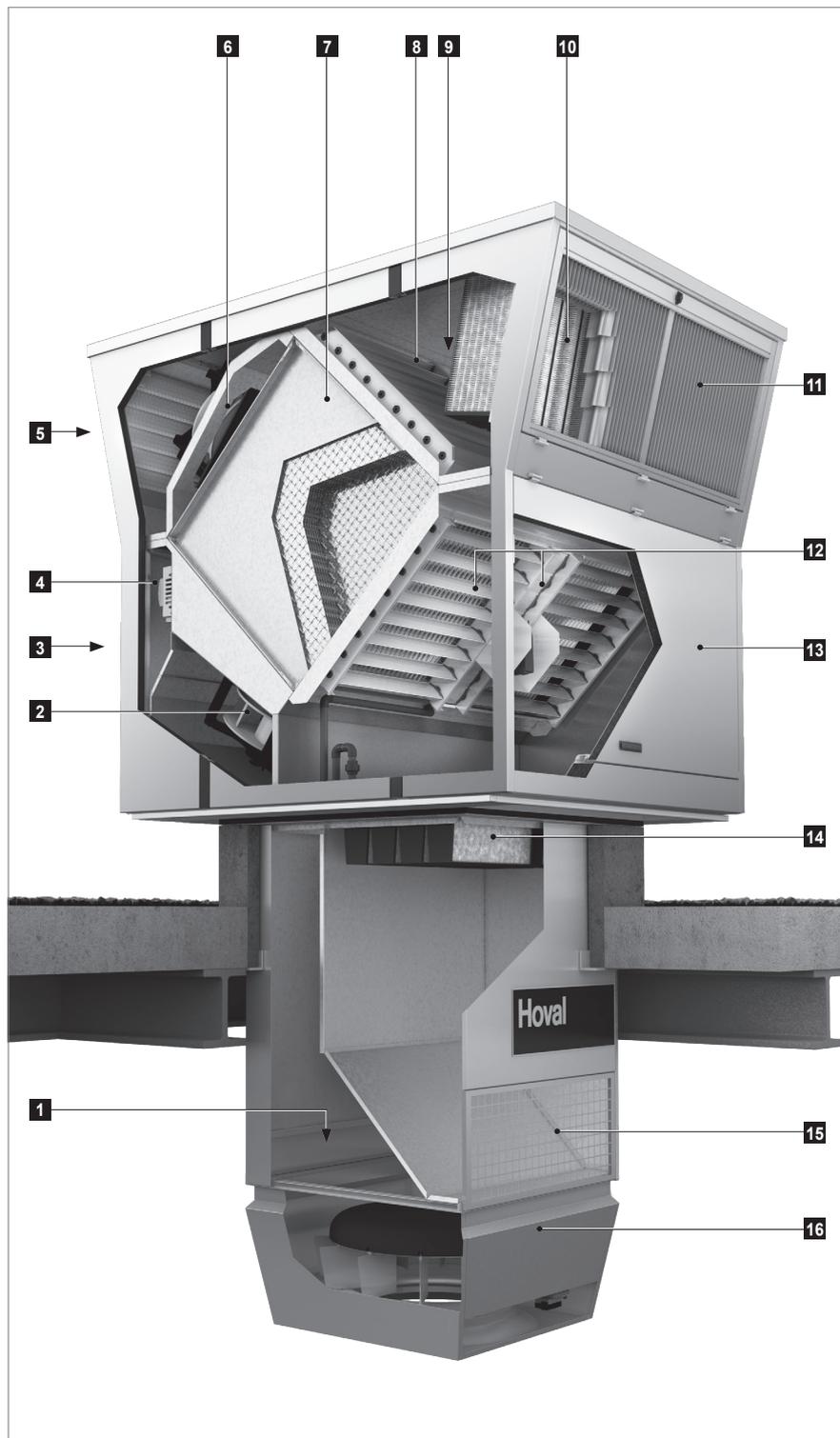
1 Roof unit with energy recovery

2 Below-roof unit

a Connection module

b Air-Injector

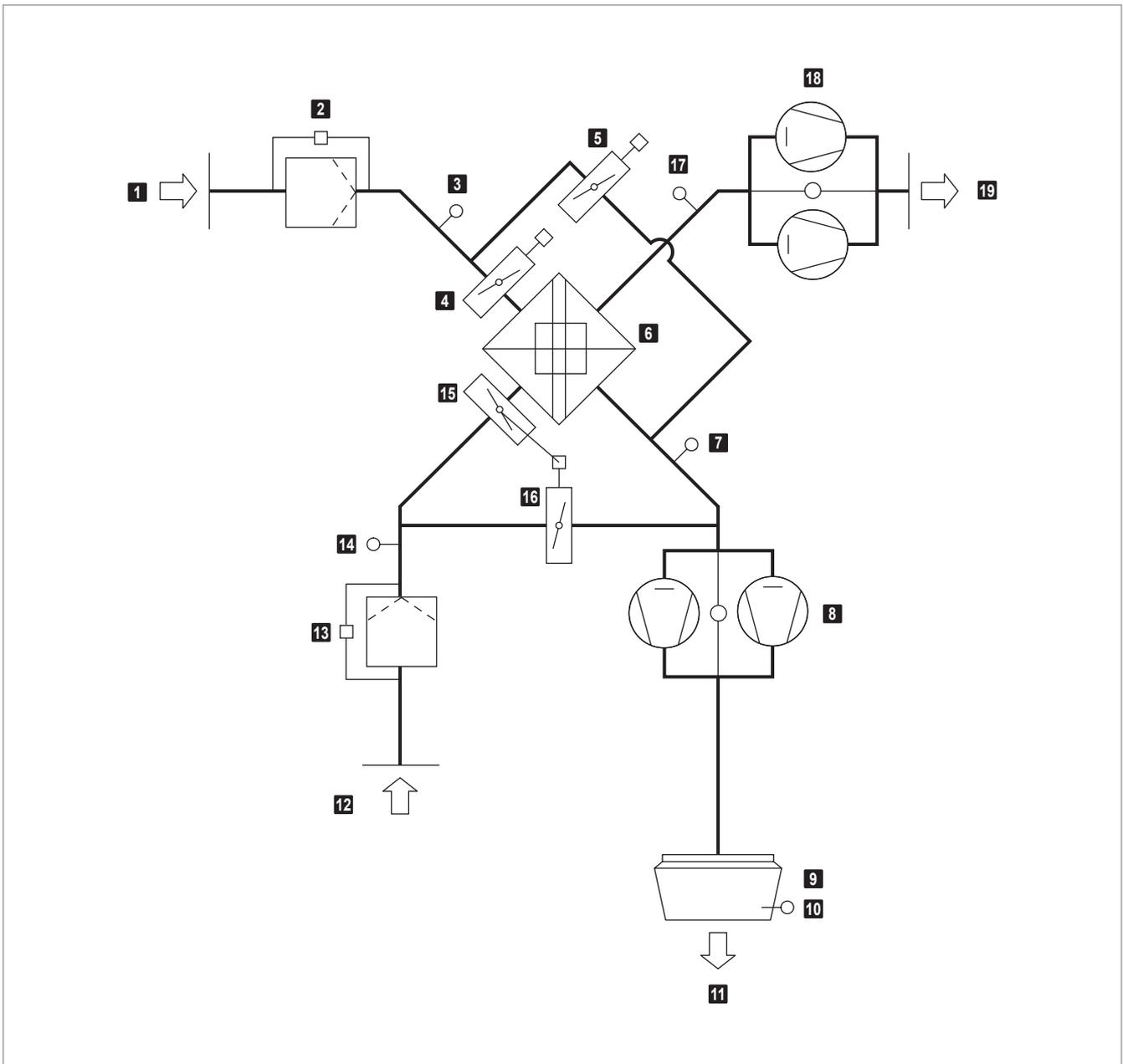
Fig. E1: RoofVent® R components



- 1 Access panel, connection box
- 2 Supply air fans
- 3 Supply air access door
- 4 Control block
- 5 Exhaust air access door
- 6 Exhaust air fans
- 7 Plate heat exchanger with bypass (for performance control and as recirculation bypass)
- 8 Fresh air damper with actuator
- 9 Bypass damper with actuator
- 10 Fresh air filter
- 11 Fresh air access door
- 12 Extract air and recirculation dampers with actuator
- 13 Extract air access door
- 14 Extract air filter
- 15 Extract air grille
- 16 Actuator Air-Injector

Fig. E2: RoofVent® R construction

2.2 Function diagram



- | | |
|---|--|
| <ul style="list-style-type: none"> 1 Fresh air 2 Fresh air filter with differential pressure switch 3 Temperature sensor air inlet ER (optional) 4 Fresh air damper with actuator 5 Bypass damper with actuator 6 Plate heat exchanger 7 Temperature sensor air outlet ER (optional) 8 Supply air fans with flow monitoring 9 Air-Injector with actuator 10 Supply air temperature sensor | <ul style="list-style-type: none"> 11 Supply air 12 Extract air 13 Extract air filter with differential pressure switch 14 Extract air temperature sensor 15 Extract air damper with actuator 16 Recirculation damper (opposed to the extract air damper) 17 Exhaust air temperature sensor 18 Exhaust air fans with flow rate monitoring 19 Exhaust air |
|---|--|

Fig. E3: RoofVent® R function diagram

2.3 Operating modes

The RoofVent® R has the following operating modes:

- Ventilation
- Ventilation (reduced)
- Air quality
- Exhaust air
- Supply air
- 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 RoofVent® unit can operate individually in a local operating mode: Off, Supply air, Exhaust air, Ventilation.

Code	Operating mode	Description
VE	<p>Ventilation</p> <p>The unit blows fresh air into the room and exhausts polluted room air. The room temperature set value day is active. Depending on the temperature conditions, the system continuously controls:</p> <ul style="list-style-type: none"> ■ the energy recovery 	<p>Supply air fan on *)</p> <p>Exhaust air fan on *)</p> <p>Energy recovery 0-100 %</p> <p>Extract air damper open</p> <p>Recirculation damper closed</p> <p>*) Adjustable flow rate</p>
VEL	<p>Ventilation (reduced)</p> <p>As VE, but the unit only operates with the set minimum values for the supply and exhaust air volumes</p>	<p>Supply air fan MIN</p> <p>Exhaust air fan MIN</p> <p>Energy recovery 0-100 %</p> <p>Extract air damper open</p> <p>Recirculation damper closed</p>
AQ	<p>Air quality</p> <p>This is the operating mode for demand-controlled ventilation of the room. The room temperature set value day is active. Depending on the temperature conditions, the system continuously controls:</p> <ul style="list-style-type: none"> ■ the energy recovery <p>Depending on the room air quality or room air humidity, the system operates in one of the following operating states:</p>	
AQ_ECO	<ul style="list-style-type: none"> ■ Air quality Mixed air: When ventilation requirements are medium, the unit works in mixed air operation. The supply and exhaust air volume is based on the air quality. 	<p>Supply air fan MIN-MAX</p> <p>Exhaust air fan MIN-MAX</p> <p>Energy recovery 0-100 %</p> <p>Extract air damper 50 %</p> <p>Recirculation damper 50 %</p>
AQ_VE	<ul style="list-style-type: none"> ■ Air quality Ventilation: When ventilation requirements are high or the room air humidity is too high, the unit works in pure ventilation operation. The supply and exhaust air volume is based on the air quality. 	<p>Supply air fan MIN-MAX</p> <p>Exhaust air fan MIN-MAX</p> <p>Energy recovery 0-100 %</p> <p>Extract air damper open</p> <p>Recirculation damper closed</p>
EA	<p>Exhaust air</p> <p>The unit extracts spent room air. There is no room temperature control. Unfiltered fresh air enters the room through open windows and doors or another system provides air supply.</p>	<p>Supply air fan off</p> <p>Exhaust air fan on *)</p> <p>Energy recovery 0 %</p> <p>Extract air damper open</p> <p>Recirculation damper closed</p> <p>*) Adjustable flow rate</p>

Code	Operating mode	Description
SA	Supply air The unit blows fresh air into the room. Spent room air passes through open windows and doors or another system provides extraction.	Supply air fan on *) Exhaust air fan off Energy recovery 0 % **) Extract air damper open Recirculation damper closed *) Adjustable flow rate **) Fresh air and bypass dampers are open
ST	Standby The unit is normally switched off. The following functions remain active:	
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.	Supply air fan on *) Exhaust air fan on *) Energy recovery 0 % Extract air damper open Recirculation damper closed *) Adjustable flow rate
L_OFF	Off (local operating mode) The unit is switched off. Frost protection remains active.	Supply air fan off Exhaust air fan off Energy recovery 0 % Extract air damper closed Recirculation damper open

Table E1: RoofVent® R operating modes

3 Technical data

3.1 Type code

	R - 6 - - ...
Unit type	RoofVent® R
Unit size	6 or 9
Further options	

Table E2: Type code

3.2 Application limits

Fresh air temperature	min.	°C	-30
Extract air temperature	max.	°C	50
Extract air relative humidity	max.	%	60
Moisture content of extract air	max.	g/kg	12.5
Supply air temperature	max.	°C	60
Air flow rate	Size 6:	min.	m³/h 3100
	Size 9:	min.	m³/h 5000

¹⁾ Design for higher temperatures on request

Table E3: Application limits



Notice

Use units in the corrosion-protected design for high extract air humidity if the humidity in the room increases by more than 2 g/kg.

3.3 Heat recovery system (HRS)

Unit type		R-6	R-9
Temperature efficiency, dry	%	77	78
Temperature efficiency, wet	%	89	90

Table E4: Thermal transfer level of the plate heat exchanger

3.4 Air filtration

Filter	Fresh air	Extract air
Class acc. to ISO 16890	ePM ₁ 55 %	ePM ₁₀ 65 %
Class acc. to EN 779	F7	M5
Factory setting of differential pressure switches	250 Pa	350 Pa

Table E5: Air filtration

3.5 Electrical connection

Unit type		R-6	R-9
Supply voltage	V AC	3 × 400	3 × 400
Permitted voltage tolerance	%	± 5	± 5
Frequency	Hz	50	50
Connected load	kW	4.6	8.6
Current consumption max.	A	7.8	14.4
Series fuse	A	13.0	20.0

Table E6: RoofVent® R electrical connections

3.6 Air flow rate

Unit type		R-6	R-9
Nominal air flow rate	m³/h	5500	8000
Floor area covered	m²	480	797

Table E7: Air flow rate

3.7 Heat output

Size	-5 °C			-15 °C		
	Q _{ER} kW	Q _{TG} kW	t _S m	Q _{ER} kW	Q _{TG} kW	t _S °C
R-6	35.6	-6.9	14.3	50.6	-10.5	12.3
R-9	52.5	-9.4	14.5	74.5	-14.4	12.7

Legend:
 t_F = Fresh air temperature
 Q_{ER} = Heat output of the energy recovery
 Q_{TG} = Output to cover fabric heat losses
 t_S = Supply air temperature

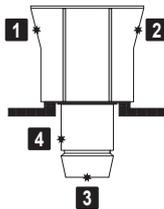
Reference:
 Room air: 18 °C
 Extract air: 20 °C / 20 % rel. humidity

Table E8: RoofVent® R heat output

3.8 Sound data

Position			1	2	3	4	
R-6	Sound pressure level (at a distance of 5 m) ¹⁾	dB(A)	43	55	52	43	
	Total sound power level	dB(A)	65	77	74	65	
	Octave sound power level	63 Hz	dB	43	46	45	43
		125 Hz	dB	54	60	59	54
		250 Hz	dB	58	66	64	58
		500 Hz	dB	61	71	69	61
		1000 Hz	dB	56	73	70	56
		2000 Hz	dB	54	69	65	54
		4000 Hz	dB	51	66	62	51
		8000 Hz	dB	49	63	59	49
R-9	Sound pressure level (at a distance of 5 m) ¹⁾	dB(A)	41	55	50	42	
	Total sound power level	dB(A)	63	77	72	64	
	Octave sound power level	63 Hz	dB	42	45	43	42
		125 Hz	dB	54	62	60	54
		250 Hz	dB	56	65	62	57
		500 Hz	dB	58	70	67	59
		1000 Hz	dB	54	73	68	56
		2000 Hz	dB	54	70	65	55
		4000 Hz	dB	48	64	59	48
		8000 Hz	dB	40	59	53	42

1) With hemispherical radiation in a low-reflection environment



- 1 Fresh air
- 2 Exhaust air
- 3 Supply air
- 4 Extract air

Table E9: RoofVent® R sound data

3.9 Dimensions and weights

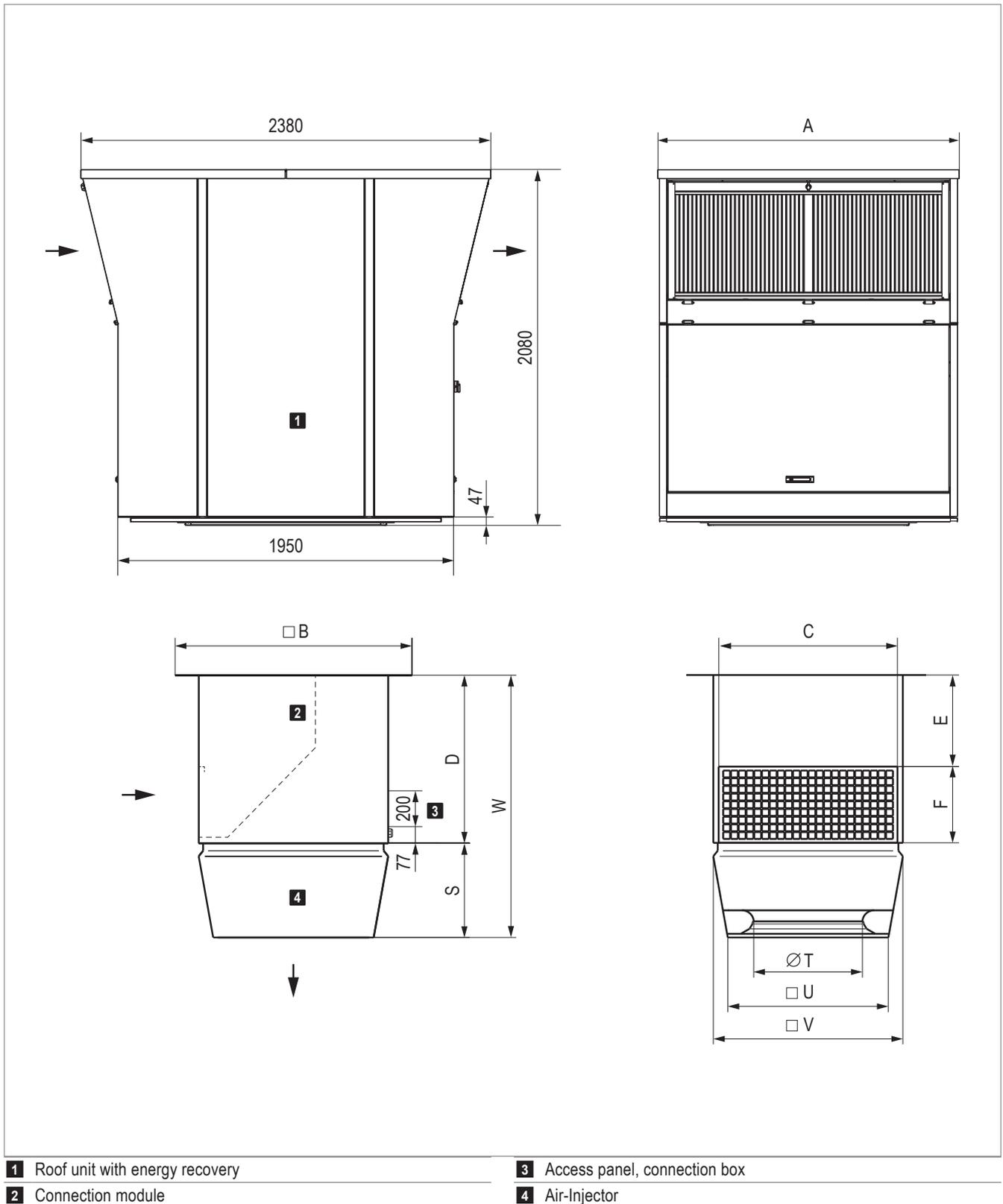


Fig. E4: RoofVent® R dimensional drawing (dimensions in mm)

Unit type		R-6				R-9			
A	mm	1400				1750			
B	mm	1040				1240			
C	mm	848				1048			
F	mm	410				450			
S	mm	490				570			
T	mm	500				630			
U	mm	767				937			
V	mm	900				1100			
Connection module		V0	V1	V2	V3	V0	V1	V2	V3
D	mm	940	1190	1440	1940	980	1230	1480	1980
E	mm	530	780	1030	1530	530	780	1030	1530
W	mm	1430	1680	1930	2430	1550	1800	2050	2550

Table E10: RoofVent® R dimensions

Unit type		R-6	R-9
Total	kg	812	1050
Roof unit	kg	700	900
Below-roof unit	kg	112	150
Air-Injector	kg	37	56
Connection module V0	kg	75	94
Additional weight V1	kg	+ 11	+ 13
Additional weight V2	kg	+ 22	+ 26
Additional weight V3	kg	+ 44	+ 52

Table E11: RoofVent® R weights

3.10 Product information according to ErP

Trademark / Model		Hoval RoofVent® R		Unit
		6	9	
Type		NRVU, BVU		–
Drive		Variable speed drive		–
Heat recovery system		other		–
Thermal efficiency of heat recovery (η_{t_nrvu})		77	78	%
Nominal flow rate (q_{nom})		1.53	2.22	m ³ /s
Effective electric power input (P)		1.93	2.99	kW
Internal specific fan power (SFP _{int})		920	940	W/(m ³ /s)
Face velocity		2.69	2.98	m/s
Nominal external pressure ($\Delta p_{s, ext}$)	Supply air	260	330	Pa
	Extract air	190	300	
Internal pressure drop of ventilation components ($\Delta p_{s, int}$)	Fresh air/supply air	270	268	Pa
	Extract air/exhaust air	300	316	
Static efficiency of the fans (η_{fan}) in accordance with Regulation (EU) No 327/2011		62	63	%
Maximum leakage rate	External	0.45	0.25	%
	Internal	1.50	1.20	
Energy classification of the filters (class acc. to ISO 16890, final pressure difference)	Supply air ePM ₁ 55 %	250	250	Pa
	Extract air ePM ₁₀ 65 %	350	350	
Visual filter warning		Displayed on the operating unit		–
Casing sound power level (L _{WA})		73	72	dB(A)
Disassembly instructions		Devices that are no longer functional must be dismantled by a specialist company and disposed of at suitable collection points.		–
Contact		Hoval Aktiengesellschaft Austrasse 70, 9490 Vaduz, Liechtenstein www.hoval.com		

Table E12: Product information according to Commission Regulation (EU) 1253/2014, Article 4(2)

4 Specification texts

4.1 RoofVent® R

Supply and extract air handling unit for use in rooms up to 25 m in height; equipped with highly efficient air distributor; maximum floor area reached per unit 480 m² (size 6) and 797 m² respectively (size 9).

The unit consists of the following components:

- Roof unit with energy recovery
- Below-roof unit:
 - Connection module
 - Air-Injector
- Control components
- Optional components

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

Roof unit with energy recovery

Self-supporting housing, made of aluminium (outside) and aluzinc sheet and aluminium (inside):

- Weatherproof, corrosion resistant, impact resistant, air-tight
- Low flammability, double-shelled, without heat bridges, with highly efficient insulation made of expanded polystyrene
- Hygienic and easy to maintain because of smooth interior surfaces and large access doors with ageing-resistant, silicone-free sealing materials

The roof unit with energy recovery includes:

Supply air and exhaust air fans:

Designed as maintenance-free, direct-drive radial fans with high-efficiency EC motor, backwards-curved, 3D contoured blades and a free-running rotating wheel made of a high-performance composite material; inflow nozzle with optimised flow; infinitely variable speed; with active pressure registration for constant volumetric flow control and/or demand-controlled volumetric flow adjustment; low-noise; with integrated overload protection.

Fresh air filter:

Designed as highly efficient compact filter elements, class ISO ePM₁ 55 % (F7), fully incinerable, easy to change, including differential pressure switch for filter monitoring.

Extract air filter:

Designed as highly efficient compact filter elements, class ISO ePM₁₀ 65 % (M5), fully incinerable, easy to change, including differential pressure switch for filter monitoring.

Plate heat exchanger:

Crossflow plate heat exchanger made of high-quality aluminium as a highly efficient, recuperative heat recovery system, certified by Eurovent, zero-maintenance, without moving parts, failsafe, hygienically harmless, no cross-contamination of impurities and odours. Equipped with bypass, recirculation bypass, condensate drain and condensation trap to the roof. The following dampers are arranged on the exchanger package:

- Fresh air and bypass dampers, each with their own actuator, for infinitely variable control of the heat recovery; with shut-off function by spring return.
- Extract air and recirculation dampers, interlinked in a counter-rotating arrangement with a common actuator, for controlling the recirculation and mixed air operation; with shut-off function by spring return.

All dampers correspond to seal integrity class 2 according to EN 1751.

Access openings:

- Fresh air access door: large access opening with integrated weather and bird protection, configured with quick locking system for easy access to the fresh air filter, the plate heat exchanger as well as the fresh air and bypass dampers.
- Exhaust air access door: large, lockable access opening with integrated weather and bird protection for easy access to the exhaust air filter.
- Extract air access door: large access opening, configured with quick locking system and telescopic support for easy access to the extract air filter, the plate heat exchanger, the condensation trap as well as the extract air and recirculation dampers.
- Supply air access door: large, lockable access opening, configured with telescopic support for easy access to the supply air fans, the control block and the condensate collecting channel.

Control block:

Compact design on an easily accessible mounting plate, comprising:

- Unit controller as part of the TopTronic® C control system:
 - Fully wired to the electrical components of the roof unit (fans, actuators, temperature sensors, filter monitoring, differential pressure sensor)
 - Pluggable wiring to the control box in the connection module
- High-voltage section:
 - Mains power terminals
 - Isolation switch
 - Button for stopping the fans during filter change

- Low-voltage section:
 - Transformer for actuators, sensors and the unit controller
 - Externally switchable forced off
- Circuit board with further electronic components for unit control (differential pressure measurement, fuses for the transformer, fuses for low voltage, ...)

Connection module

Housing made of aluzinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of smooth interior surfaces and ageing-resistant, silicone-free sealing materials; configured with extract air grille and access panel. The connection module contains:

- Laced wiring harness protected in a sheet metal duct, with direct plug connection to the control block in the roof unit
- Connection box made of galvanised sheet steel, configured with circuit board, screw-on cover and cable lead-ins with splash water protection and strain relief; for connection of:
 - Power supply
 - Zone bus
 - All sensors and actuators of the below-roof unit (ready-to-connect): supply air temperature sensor, Air-Injector actuator
 - Optional components as required

Connection module V1 / V2 / V3:

The connection module is extended for adapting to the local installation situation.

Air-Injector

1 Air-Injector:

Housing made of aluzinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of ageing-resistant, silicone-free sealing materials, with:

- Vortex air distributor with concentric outlet nozzle, adjustable vanes and integrated absorber hood
- Actuator for infinitely variable adjustment of the air distribution from vertical to horizontal
 - for draught-free air distribution in the hall under changing operating conditions
 - 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

2 Air-Injectors:

2x Air-Injectors, supplied loose; supply air duct for connecting the RoofVent® unit to the Air-Injectors on site.

Housing made of aluzinc sheet, air-tight, flame retardant, hygienic and easy to maintain because of ageing-resistant, silicone-free sealing materials, with:

- Vortex air distributor with concentric outlet nozzle, adjustable vanes and integrated absorber hood
- Actuator for infinitely variable adjustment of the air distribution from vertical to horizontal
 - for draught-free air distribution in the hall under changing operating conditions
 - 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 sensor (supplied in the connection module)

Without Air-Injector:

Unit configured without vortex air distributor for connection to an on-site supply air duct and air distribution within the building, supply air temperature sensor supplied in the connection module.

Options for the unit

Oil-proof design:

- Oil-proof materials
- Special extract air filter for oil and dust separation in the connection module, class ISO ePM₁₀ 50% (M5)
- Plate heat exchanger additionally sealed; leak test according to works standard
- Condensate drain from the plate heat exchanger to the drip tray in the connection module
- Connection module in oil-tight design with integrated oil/condensate drip tray and drain connection

Corrosion-protected design for high extract air humidity:

- Powder-coated supply air and exhaust air fans, coat thickness > 80 µm; electronics potted on both sides
- Specially coated plate heat exchanger with condensate separator for high corrosion resistance; additionally sealed; leak test according to works standard
- Condensate drain from the plate heat exchanger to the drip tray in the connection module
- Additional insulation of various equipment components to avoid condensation
- Connection module with integrated condensate drip tray and drain connection
- Connecting elements (blind rivet nuts, screws, rivets) made of stainless steel 1.4301
- Casing of the roof unit powder-coated on the inside
- Parts prone to corrosion powder-coated, sheet metal parts of the dampers and all sheet metal parts of the below-roof unit powder-coated on both sides (pebble grey RAL 7032)

Paint finish of below-roof unit:

Choice of external paint finish in RAL colour

Fresh air and exhaust air silencers:

Fresh air silencer configured as add-on part for the roof unit which can be folded downwards, housing made of aluminium with a bird screen and acoustic insulation lining, for reducing sound emissions on the fresh air side; exhaust air silencer configured as add-on part for the roof unit which can be folded downwards, housing made of aluminium with bird screen and easily accessible sound attenuation splitters, optimised flow, with abrasion-resistant and easily cleaned surfaces, non-flammable, hygienically clean with high-quality glass filament cover for reducing sound emissions on the exhaust air side.

Insertion loss fresh air / exhaust air ____ dB / ____ dB

Supply air and extract air silencer:

Supply air silencer configured as separated component in the below-roof unit, flow-optimised sound attenuation splitters, with abrasion-resistant and easily cleaned surfaces, non-flammable, hygienically clean with high-quality glass filament cover, extract air silencer configured as acoustic insulation lining in the connection module, for reducing sound emission in the room.

Insertion loss supply air / extract air ____ dB / ____ dB

Socket:

230 V socket installed in the control block for simple supply of external, electrical units.

Energy monitoring:

Consisting of 2 additional temperature sensors for recording the air inlet and air outlet temperatures of the plate heat exchanger. Energy monitoring makes it possible to display the energy saved by heat and cool recovery.

4.2 TopTronic® C control system

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

The control system is customised and preconfigured ex works. Zone allocation:

Zone 1: __ x Unit type _____

Zone 2: __ x Unit type _____

Zone 3: __ x Unit type _____

...

System structure:

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

Operation:

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

Control functions:

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

- Special destratification mode for rapid and large-area reduction of temperature stratification in the room by circulating the room air (RH, RC, RHC)

Alarms, protection:

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

Options for the zone control panel:

- Design for heating (RH, RC, RHC)
- Design for cooling (RC, RHC)
- Cooling lock switch (RC, RHC)
- Heating/cooling switch (RC, RHC)
- Alarm lamp
- Socket
- Additional room air temperature sensors (max. 3)
- Combination sensor room air quality, temperature and humidity
- External sensor values
- External set values
- Load shedding input
- Operating selector switch on terminal
- Operating selector button on terminal
- Power supply for air handling unit
- Safety relay
- Control of distributor pump(s), incl. power supply (RH, RC, RHC)



Options

1	Type code	78
2	Oil-proof design	80
3	Corrosion-protected design for high extract air humidity	80
4	Connection module	81
5	Design with 2 Air-Injectors	81
6	Design without Air-Injector	81
7	Paint finish of below-roof unit	81
8	Fresh air and exhaust air silencers	82
9	Supply air and extract air silencers	83
10	Hydraulic assembly diverting system	84
11	Mixing valve	86
12	Condensate pump	86
13	Socket	87
14	Energy monitoring	87
15	Return temperature sensor	87
16	Pump control for mixing or injection system	87

1 Type code

RHC - 9 B C - RX / ST . -- / V0 . D1 . LU / AF . SI / Y . KP . -- . SD / TC . EM . PH . RF

Unit type

RoofVent® RH | RC | RHC | R

Unit size

6 or 9

Heating section

- without heating section
- B with coil type B
- C with coil type C
- D with coil type D

Heating/cooling section

- without heating/cooling section
- C with coil type C
- D with coil type D

Heat recovery

RX Temperature efficiency ErP 2018

Design

- ST Standard
- OE Oil-proof design
- KA Corrosion-protected design for high extract air humidity

Connection module

- V0 Standard
- V1 Length + 250 mm
- V2 Length + 500 mm
- V3 Length + 1000 mm

Air outlet

- D1 Design with 1 Air-Injector
- D2 Design with 2 Air-Injectors
- D0 Design without Air-Injector

Paint finish

- without
- LU Paint finish of below-roof unit

Silencers outside

- without
- AF Fresh air and exhaust air silencer

RHC - 9 B C - RX / ST . -- / V0 . D1 . LU / AF . SI / Y . KP . -- . SD / TC . EM . PH . RF

Silencers inside

- without
- SI Supply air and extract air silencer

Hydraulics

- without
- Y Hydraulic assembly diverting system
- M Mixing valve

Condensate pump

- without
- KP Condensate pump

Socket

- without
- SD Socket in the unit
- CH Socket in the unit Switzerland

Control system

- TC TopTronic® C

Energy monitoring

- without
- EM Energy monitoring

Pump control

- without
- PH Heating pump
- PK Heating or cooling pump
- PP Heating pump and cooling pump

Return temperature sensor

- without
- RF Return temperature sensor

Table F1: Type code

2 Oil-proof design

RoofVent® units in oil-proof design are suitable for use in applications with oil-saturated extract air. The maximum oil load in the extract air is 10 mg/m³ air. The following features ensure trouble-free operation of the system:

- Oil-proof materials
- Special extract air filter for oil and dust separation class ISO ePM₁₀ 65 % (M5), factory setting of the differential pressure switch 320 Pa
- Plate heat exchanger additionally sealed
- Condensate drain from the plate heat exchanger to the drip tray in the connection module
- Connection module in oil-tight design with integrated oil/condensate drip tray and drain connection

Please note the following:

- Install an oil/condensate drain with trap in accordance with the local provisions to remove these types of emulsions.
- Do not damage or drill into the connection module, in order not to breach the sealing.
- Check the extract air filter at regular intervals.
- Due to the special extract air filter the unit has an additional pressure drop of 70 Pa.
- In the 'Air quality' operating mode the units always work in pure ventilation operation (AQ_VE).
- Do not operate the units in 'Recirculation' mode (REC) unless there is no oil pollution in the room.



Notice

RoofVent® units in oil-proof design are not available with a connection module in the length V0, but only in the lengths V1, V2 and V3.

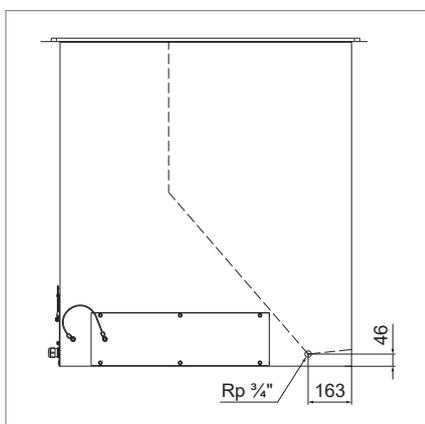


Fig. F1: Dimensional drawing for oil/condensate drain (in mm) for oil-proof design and corrosion-protected design for high extract air humidity

3 Corrosion-protected design for high extract air humidity

RoofVent® units in corrosion-protected design for high extract air humidity are suitable for use in applications with increased corrosion risk and high increase in humidity in the room (increase by more than 2 g/kg), such as:

- Car wash plants
- Applications in the paper industry
- Applications in the electronics industry
- Applications in the food industry

The following features ensure trouble-free operation of the system:

- Powder-coated supply air and exhaust air fans, coat thickness > 80 µm; electronics potted on both sides
- Specially coated plate heat exchanger with condensate separator for high corrosion resistance; additionally sealed; leak test according to works standard
- Condensate drain from the plate heat exchanger to the drip tray in the connection module
- Additional insulation of various equipment components to avoid condensation
- Connection module with integrated condensate drip tray and drain connection
- Connecting elements (blind rivet nuts, screws, rivets) made of stainless steel 1.4301
- Casing of the roof unit powder-coated on the inside
- Parts prone to corrosion powder-coated, sheet metal parts of the dampers and all sheet metal parts of the below-roof unit powder-coated on both sides (pebble grey RAL 7032)
- Painted coil

Please note the following:

- Install an condensate drain with trap in accordance with the local provisions to remove the condensate.
- Do not damage or drill into the connection module, in order not to breach the sealing.
- There is an increased risk of ice formation in the plate heat exchanger in applications with high extract air humidity. Consequently, it is important to activate icing protection when commissioning the plant. It is essential to have a humidity sensor for this.



Attention

Danger of damaging the units due to ice formation. Order a combination sensor room air quality, temperature and humidity (option). It is required for icing protection.

4 Connection module

The connection module is available in 4 lengths for adapting the RoofVent® unit to local conditions.

5 Design with 2 Air-Injectors

To distribute the supply air over a very wide area, a supply air duct provided by the client can be connected to the RoofVent® unit. 2 Air-Injectors can be installed on this. Please note the following:

- For both unit sizes 2 air distributors size 6 are supplied.
- Install the 2 air distributors on the supply air duct.
- Wire up the 2 actuators of the air distributors to the connection box.
- The supply air temperature sensor is enclosed. Install it in the supply air duct and wire it up to the connection box.

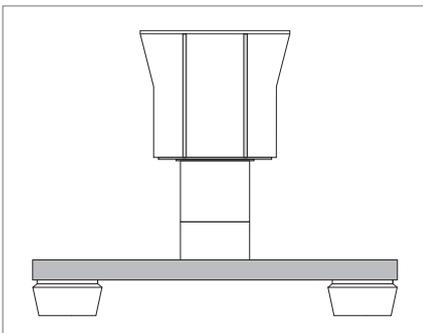
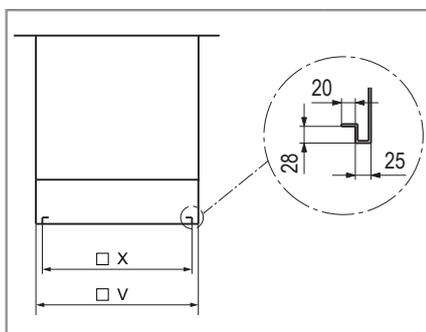


Fig. F2: RoofVent® unit with supply air duct and 2 Air-Injectors



Size		6	9
X	mm	850	1050
V	mm	900	1100

Table F2: Connection dimensions supply air duct (in mm)

6 Design without Air-Injector

RoofVent® units in the design without Air-Injector are suitable for connecting to an air distribution system supplied by the client. Please note the following:

- The supply air temperature sensor is enclosed. Install it in the supply air duct and wire it up to the connection box.

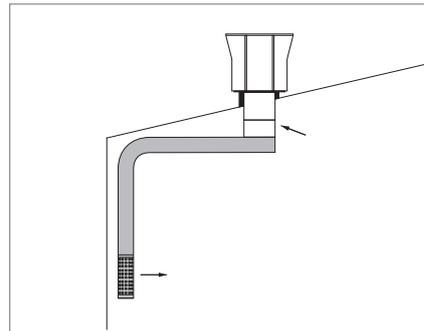


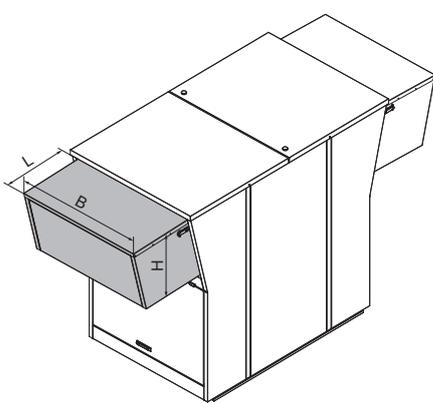
Fig. F3: Connection to an air distribution system supplied by the client (for dimensions see Table F2)

7 Paint finish of below-roof unit

The entire below-roof unit is painted in any colour. If the below-roof unit is equipped with a supply air silencer, this is also painted.

8 Fresh air and exhaust air silencers

The fresh air silencer reduces noise emissions from RoofVent® units on the fresh air side. It consists of an aluminium casing with a bird screen and acoustic insulation lining and is configured as an add-on part for the roof unit which can be folded downwards.



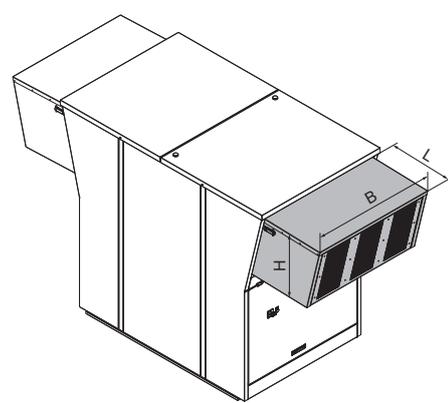
Size		6	9
L	mm	625	625
B	mm	1280	1630
H	mm	650	650
Weight	kg	30	42
Pressure drop	Pa	10	10

Table F3: Technical data fresh air silencer

Frequency	Size 6	Size 9
63 Hz	0	0
125 Hz	1	1
250 Hz	3	3
500 Hz	4	4
1000 Hz	4	4
2000 Hz	4	4
4000 Hz	3	3
8000 Hz	3	3
Total	3	3

Table F4: Insertion attenuation fresh air silencer (values in dB, relating to the nominal air flow rate)

The exhaust air silencer reduces noise emissions from RoofVent® units on the exhaust air side. It consists of an aluminium casing with a bird screen and sound attenuation splitters and is configured as an add-on part for the roof unit which can be folded downwards.



Size		6	9
L	mm	625	625
B	mm	1280	1630
H	mm	650	650
Weight	kg	52	68
Pressure drop	Pa	50	53

Table F5: Technical data exhaust air silencer

Frequency	Size 6	Size 9
63 Hz	2	2
125 Hz	3	3
250 Hz	9	9
500 Hz	11	11
1000 Hz	15	15
2000 Hz	14	14
4000 Hz	10	10
8000 Hz	8	8
Total	11	11

Table F6: Insertion attenuation exhaust air silencer (values in dB, relating to the nominal air flow rate)

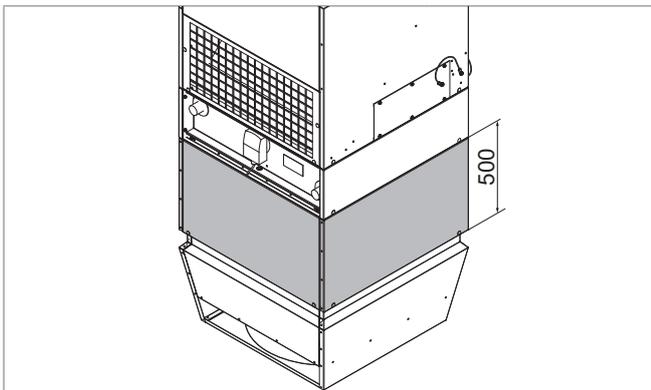


Notice

Fresh air and exhaust air silencers are not available for units in corrosion-protected design for high extract air humidity.

9 Supply air and extract air silencers

Supply air and extract air silencers reduce the noise from RoofVent® units within the room. The supply air silencer is designed as a separated component and is installed above the Air-Injector. The extract air silencer consists of acoustic insulation lining in the connection module.



Size		6	9
Weight	kg	53	80
Supply air pressure drop	Pa	22	26
Extract air pressure drop	Pa	0	0

Table F7: Technical data supply air and extract air silencers

Frequency	Supply air		Extract air	
	Size 6	Size 9	Size 6	Size 9
63 Hz	7	5	0	0
125 Hz	9	7	0	0
250 Hz	15	15	2	2
500 Hz	17	17	3	3
1000 Hz	19	20	3	3
2000 Hz	15	17	3	3
4000 Hz	13	12	2	2
8000 Hz	10	9	2	2
Total	15	15	2	2

Table F8: Insertion attenuation supply and extract air silencers (values in dB, relating to the nominal air flow rate)



Notice

Supply air and extract air silencers are not available for units in oil-proof design or in corrosion-protected design for high extract air humidity.

10 Hydraulic assembly diverting system

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

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

Default settings for the hydraulic alignment

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

0.0 __ Valve closed

4.0 __ Valve fully open

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

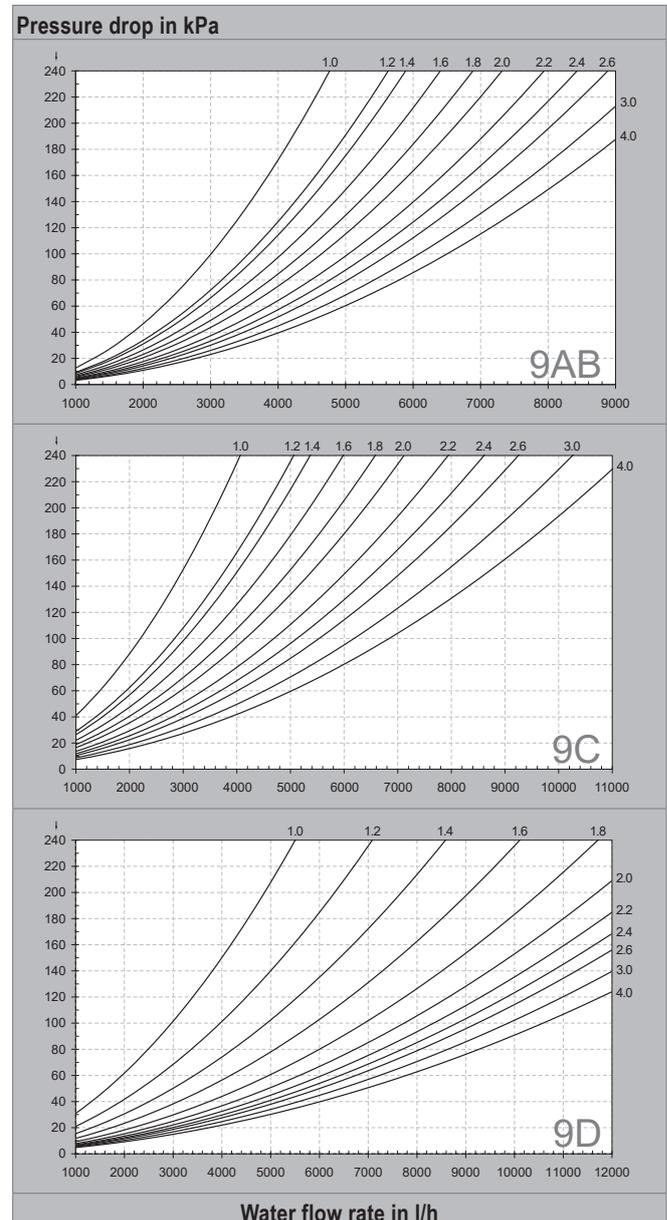
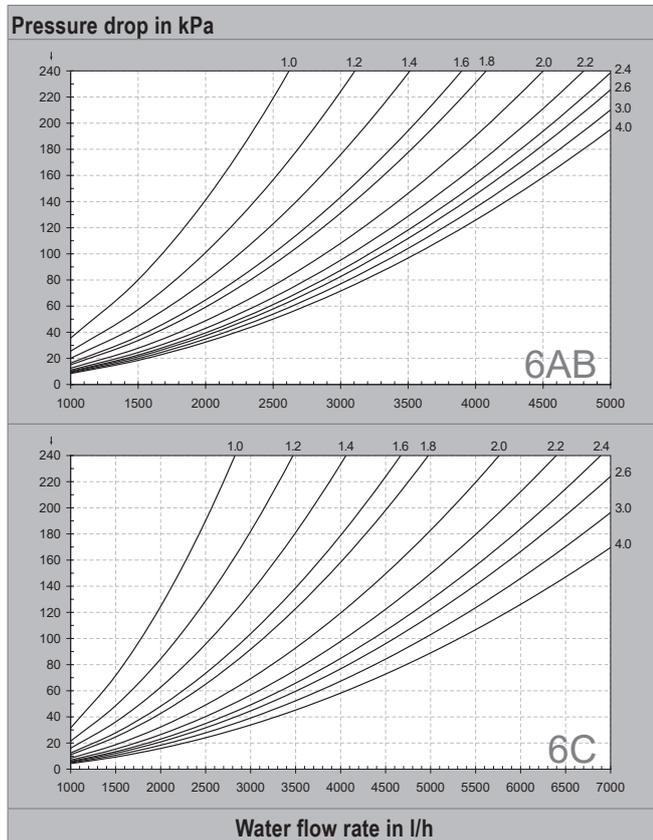
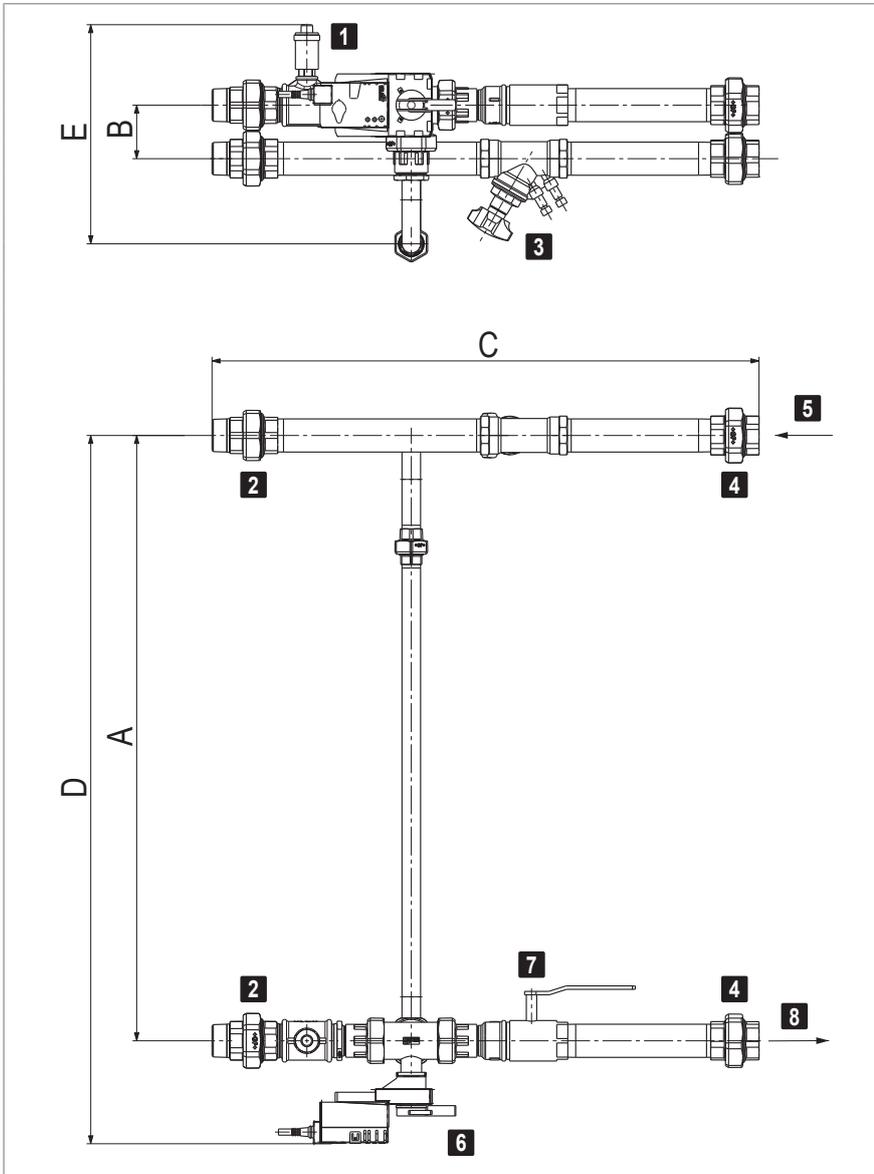


Fig. F4: Default settings for the balancing valves



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

Fig. F5: Dimensional drawing for hydraulic assembly

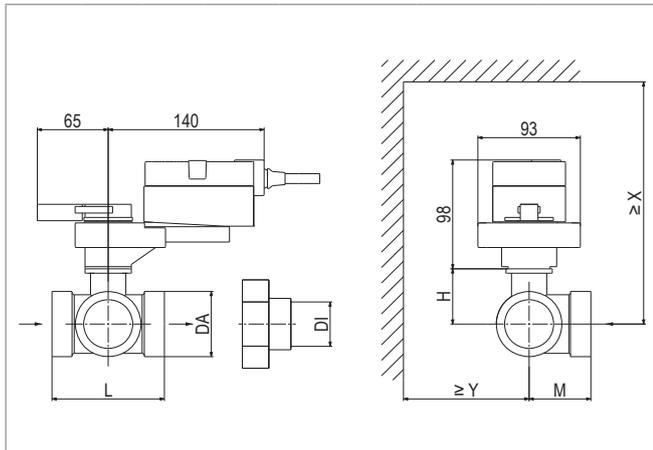
Type	A	B	C	D	E	Mixing valve	Control valve	Screw joint
Y-6AB	758	78	726	904	315	DN20 / kvs 6.3	STAD DN32	1¼ "
Y-6C	758	78	745	904	315	DN25 / kvs 10	STAD DN32	1¼ "
Y-9AB	882	78	770	1028	319	DN25 / kvs 10	STAD DN40	1½ "
Y-9C	882	78	791	1032	319	DN32 / kvs 10	STAD DN40	1½ "
Y-9D	882	95	840	1032	326	DN40 / kvs 16	STAD DN50	2 "

Table F9: Dimensions (in mm) and valves of the hydraulic assembly

11 Mixing valve

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

- 3-way mixing valve with modulating rotary actuator (run time 90 s)
- Flow characteristic:
 - Equal percentage control path
 - Linear bypass
- Integrated position control and response



Type	DN	kvs m ³ /h	DA "	DI "	L mm	H mm	M mm	X mm	Y mm
M-6AB	20	6.3	G 1¼	Rp ¾	86	46	42	220	90
M-6C	25	10	G 1½	Rp 1	85	46	45	220	90
M-9AB	25	10	G 1½	Rp 1	85	46	45	220	90
M-9C	32	10	G2	Rp 1¼	104	46	56	220	90
M-9D	40	16	G 2¼	Rp 1½	115	51	56	230	90

Table F10: Mixing valve dimensions

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

Table F11: Mixing valve weights (in kg)

12 Condensate pump

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

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

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

Table F12: Condensate pump technical data

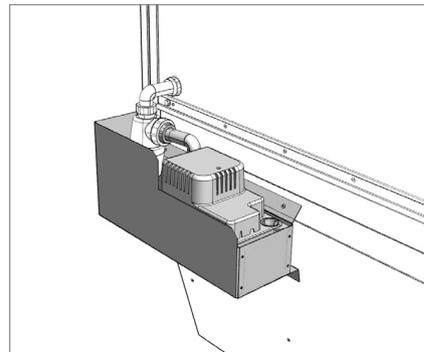


Fig. F6: Condensate pump

13 Socket

For maintenance work, a socket (1-phase, 230 V AC, 50 Hz) can be installed in the roof unit, next to the control block.

14 Energy monitoring

Energy monitoring makes it possible to display the energy saved by heat and cool recovery. For this purpose, 2 additional temperature sensors are installed in the RoofVent® units; they record the air inlet and air outlet temperatures of the plate heat exchanger.

15 Return temperature sensor

The return temperature sensor monitors the return temperature of the heating medium. If necessary, it triggers frost pre-control at the heating valve to prevent the system possibly being shut down due to frost.

16 Pump control for mixing or injection system

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

Please note the following:

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

Requirements for mixing valves

- Use 3-way mixing valves with the following flow characteristics:
 - Equal percentage control path
 - Linear bypass
- The valve authority must be ≥ 0.5 .
- The maximum run time of the valve actuator is 90 s.
- The valve actuator must be continuous, i.e. the stroke changes in proportion to the control voltage (0...10 VDC or 2...10 VDC).
- The valve actuator must be designed with a position response (0...10 VDC or 2...10 VDC).
- The maximum power consumption is 20 VA.
- Install the valve close to the unit (max. distance 2 m).

Requirements on changeover valves

Use changeover valves conforming to the following specification:

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

Requirements for pumps

- Voltage..... 230 V AC
- Current..... up to 4.0 A

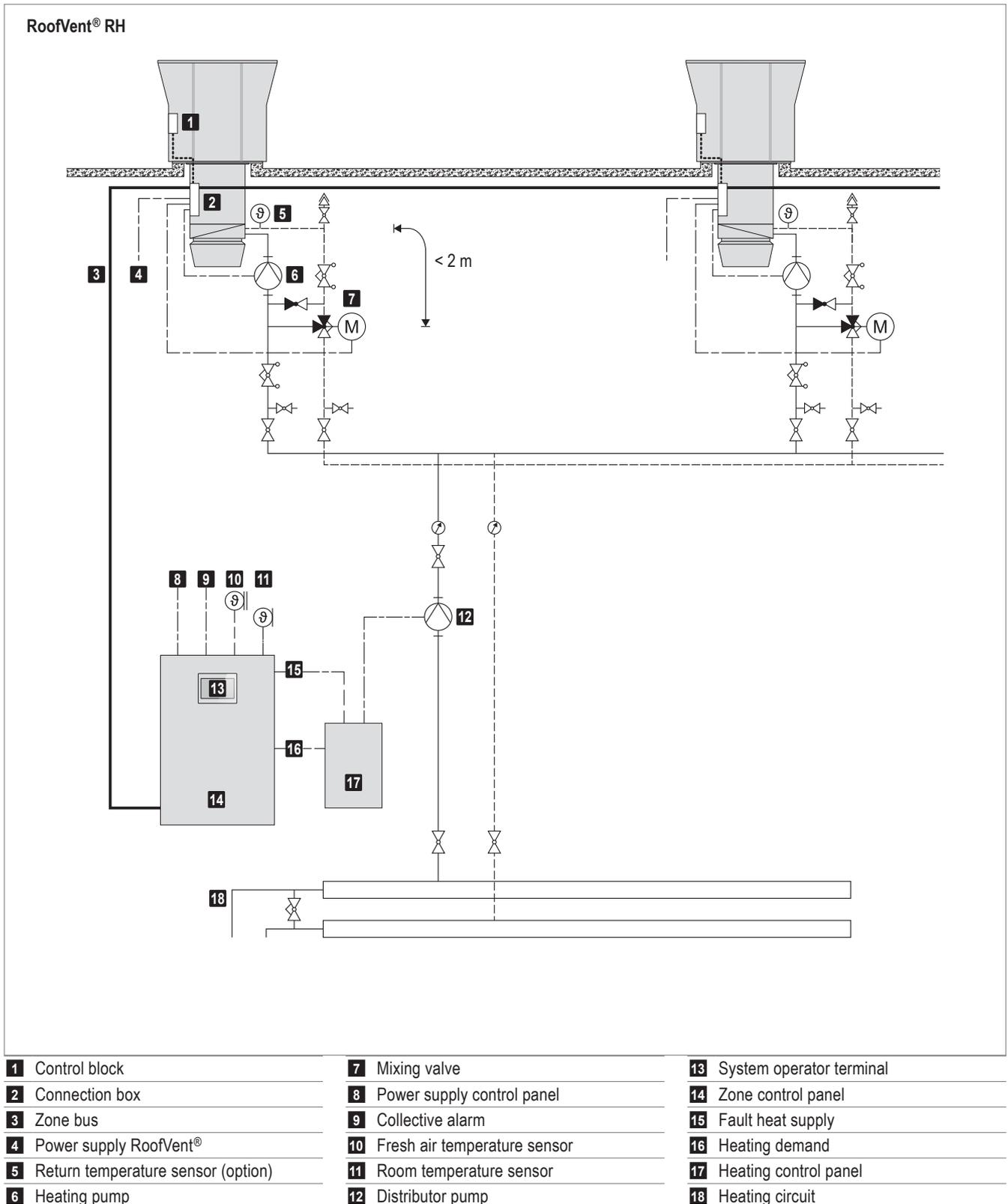


Fig. F7: Schematic diagram for injection system of RoofVent® RH

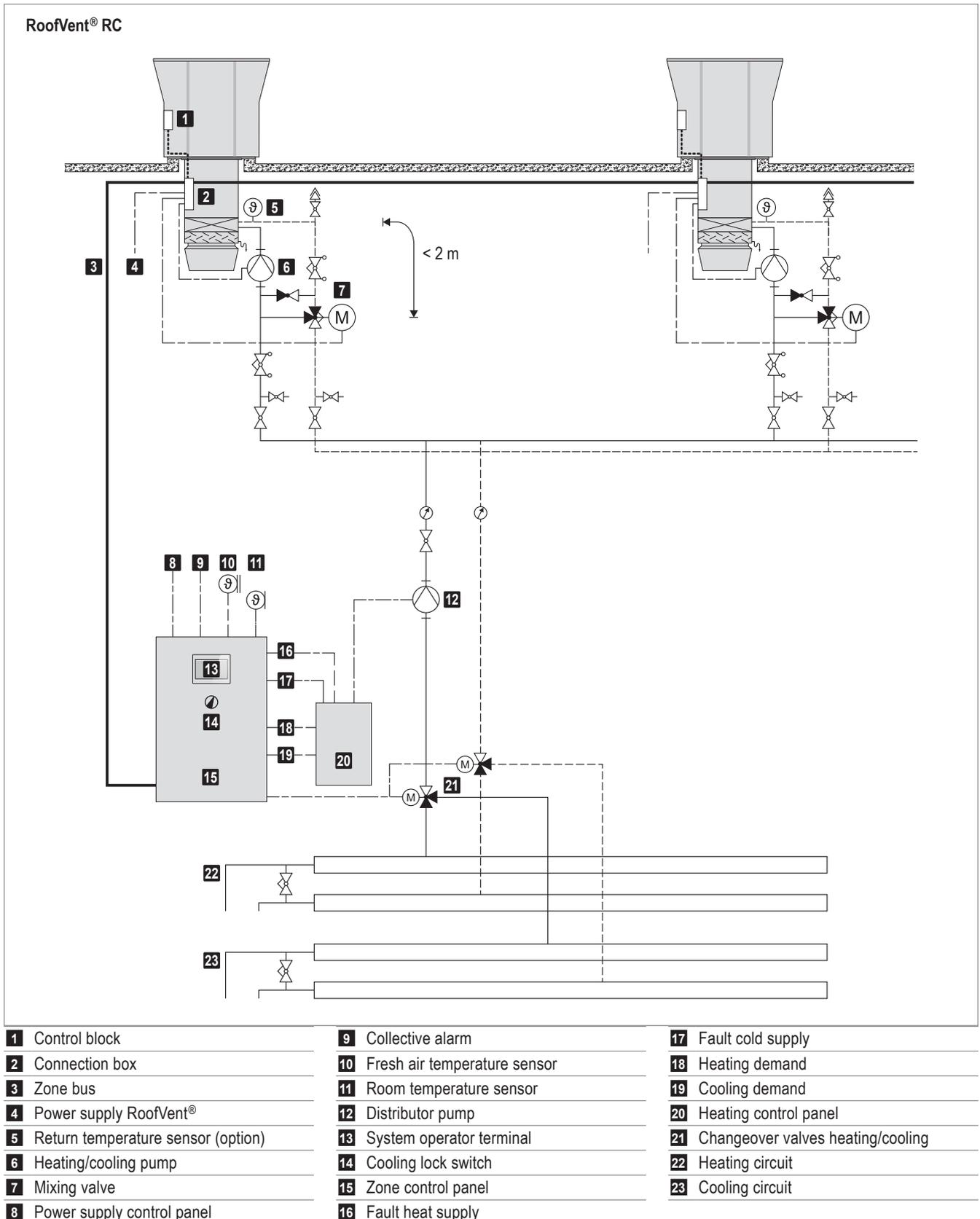


Fig. F8: Schematic diagram for injection system of RoofVent® RC

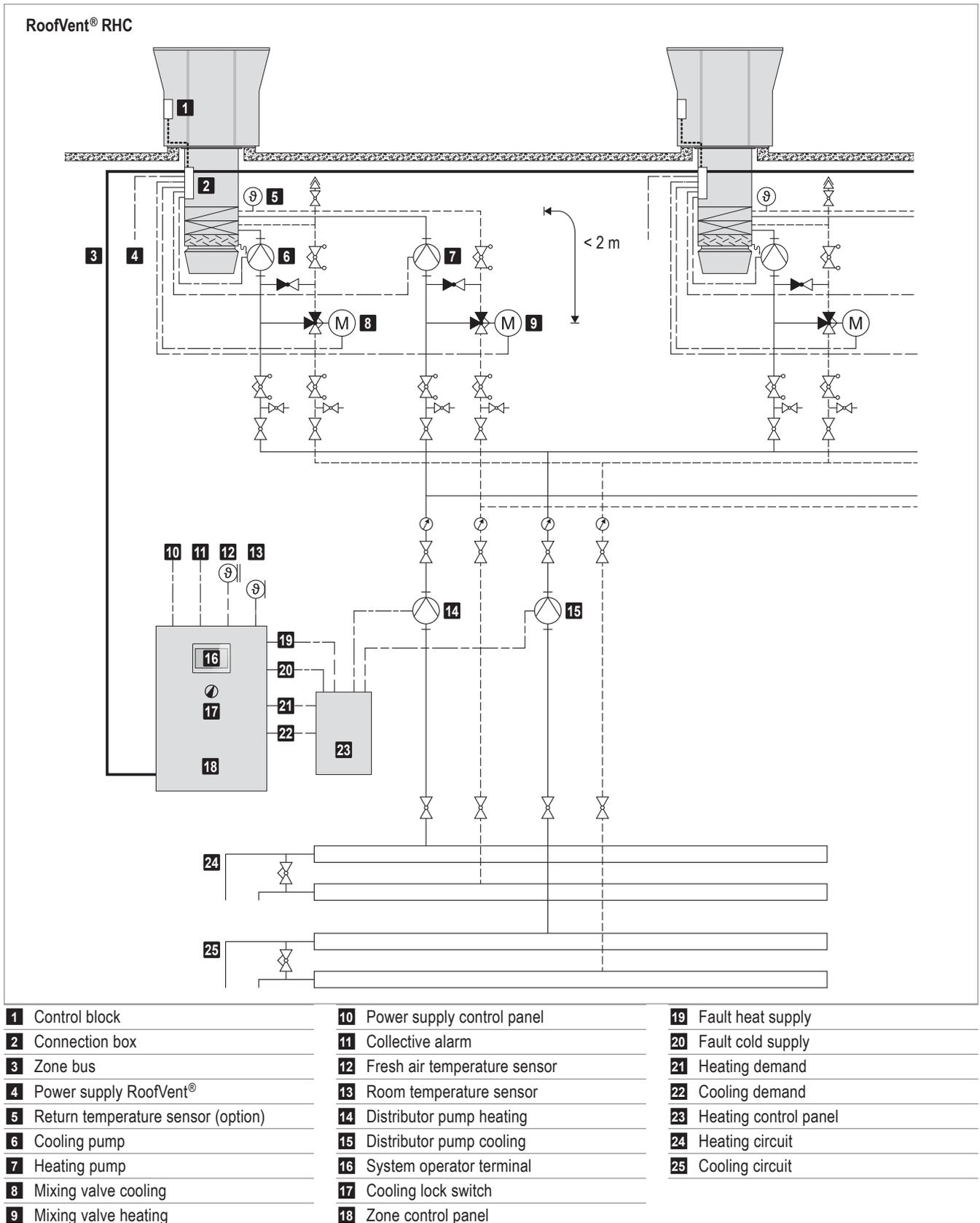


Fig. F9: Schematic diagram for injection system of RoofVent® RHC



Transport and installation

1 Installation	92
2 Hydraulic installation	96
3 Electrical installation	100

1 Installation

1.1 Preparation

The following guidelines are important when preparing for installation:

- The scope of delivery includes:
 - RoofVent® unit, delivered in 2 parts on pallets (roof unit, below-roof unit)
 - Accessories (transport eyes, installation material, extract air filter, trap, temperature sensors)
 - Optional components
- The units are installed in or on the roof. A crane or helicopter is required.
- Transport eyes are supplied for lifting the below-roof unit and the roof unit.
 - Use lifting ropes at least 2 m in length to lift the below-roof unit.
 - Use lifting ropes at least 3 m in length to lift the roof unit.
- Depending on the unit size, the below-roof unit can be delivered in 2 parts.
- Make sure that the roof frame corresponds to the specifications in chapter 1.3.
- A sealing compound is required for sealing (e.g. PU foam).
- Define the desired orientation of the units (position of the coil connections).



Notice

The standard position of the coil connections is underneath the extract air grille. Check the local installation conditions. If another orientation is required, the heating or cooling section can be mounted turned round on the connection module.

- Fresh air and exhaust air silencers are supplied separately. Install them on the unit before transporting it to the roof, and make sure they are locked.
- Follow the installation instructions included.

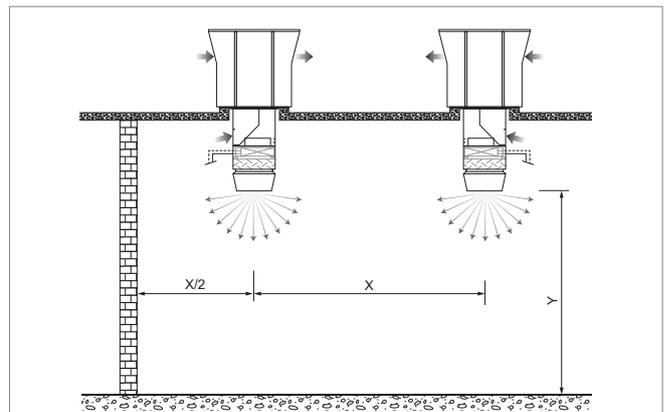


Notice

Provide suitable protective devices and make sure the units can be accessed easily. The maximum roof load of the RoofVent® units is 80 kg.

1.2 Positioning

- Comply with the minimum and maximum distances.
- Pay attention to the alignment of the units relative to each other. Units must not draw in exhaust air from other units as fresh air.
- All air inlet and air outlet openings must be freely accessible. The supply air jet must be free to spread out unhindered.
- The access doors in the roof unit and the access panels in the below-roof unit must be easily accessible.
- Clearance of at least 0.9 m is required for maintenance work around the heating/cooling section.



Size			6	9
Distance X	min.	m	11	13
	max.	m	22	28
Mounting height Y	min.	m	4	5
	max. ¹⁾	m	Approx. 9...25	

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

Table G1: Minimum and maximum distances

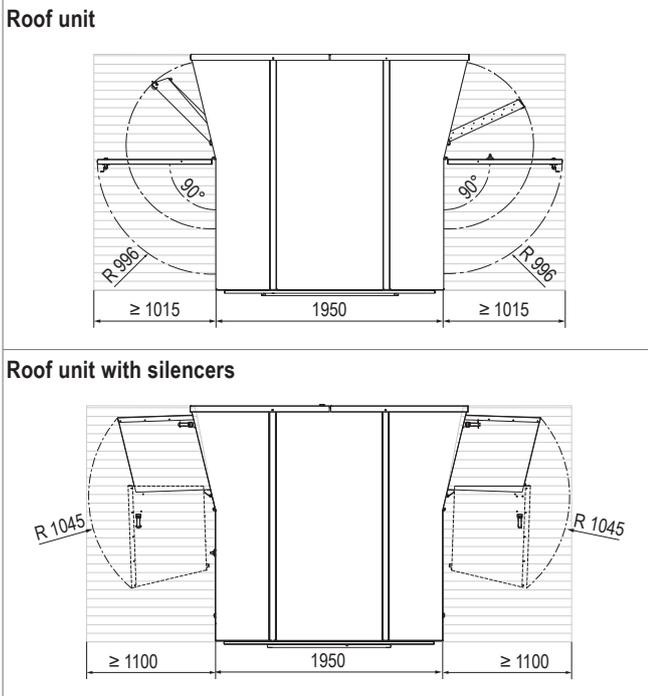
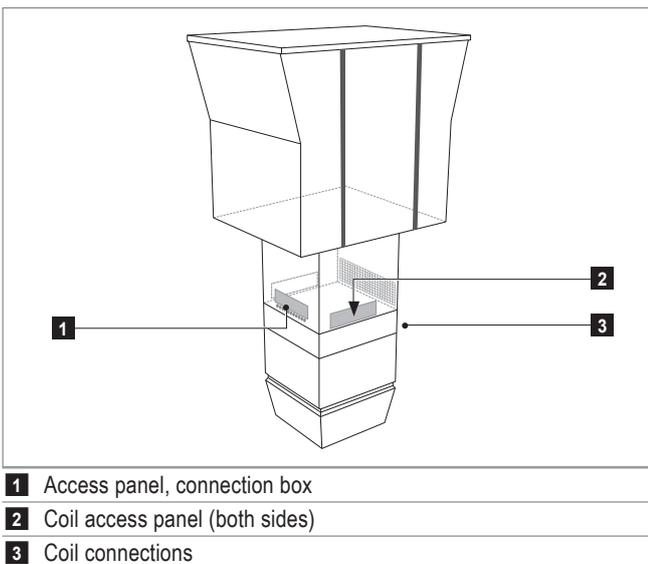


Fig. G1: Space requirements for maintenance on the roof (dimensions in mm)

i Notice
If side access is not possible, proportionally more space is required for opening the access doors.



- 1 Access panel, connection box
- 2 Coil access panel (both sides)
- 3 Coil connections

Fig. G2: Position of the access panels in the connection module

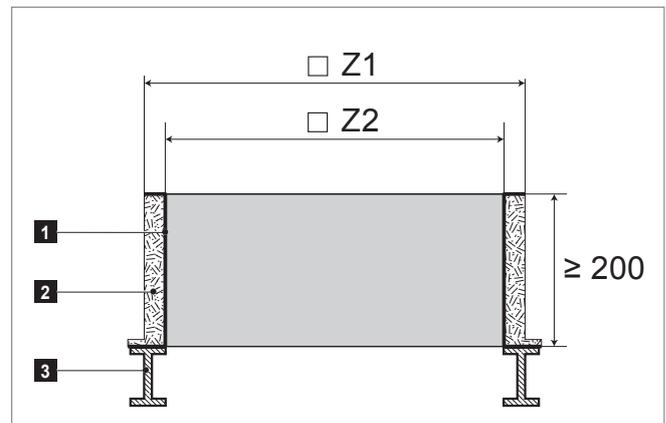
1.3 Roof frame

Roof frames are required for installing RoofVent® units in the roof. Please consider the following in the design process:

- The extract air grille and the access panels must be freely accessible under the roof.
- The roof frame must protrude at least 200 mm from the roof, so that no water can penetrate during a rainstorm or snowfall.

i Notice
The connection module is available in 4 lengths for adapting to the local installation situation.

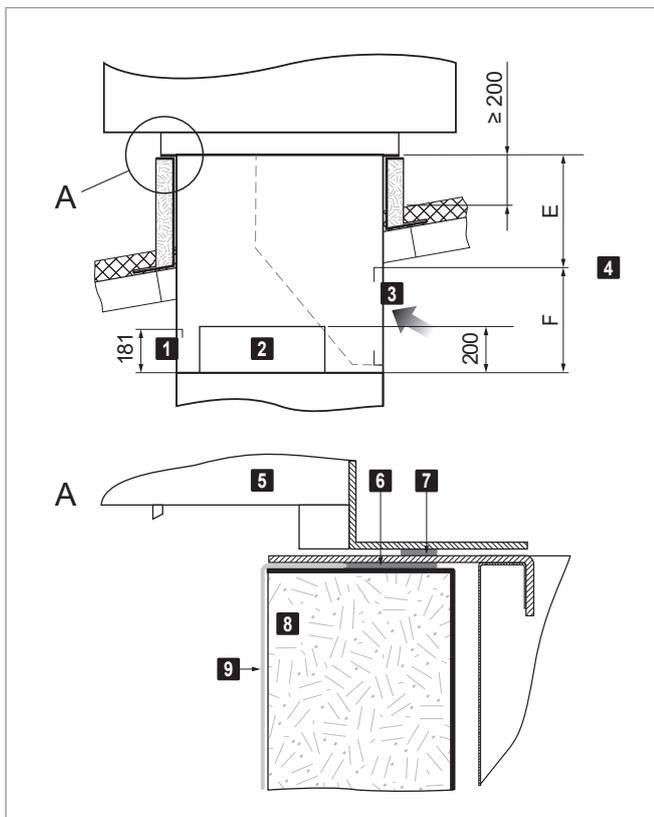
- The opening (dimension Z2) must be large enough to accommodate the below-roof unit.
- The condensate must be able to drain off freely.
- The roof frame must be flat and horizontal.
- Insulate the roof frame before installing the unit (e.g. 40 mm PU foam).
- Please observe the minimum distances when designing the roof frame (see chapter 1.2). Change the orientation of the coil connections, if necessary.



- 1 Weight-bearing inner wall of the roof frame
- 2 Insulation (e.g. 40 mm PU foam)
- 3 IPE beam

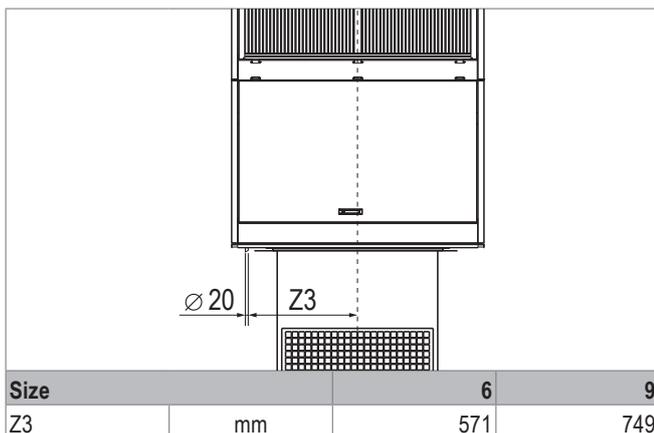
Size			6	9
Z1	max.	mm	1110	1460
Z2	min.	mm	962	1162
	max.	mm	970	1170

Table G2: Dimensions for roof frame



- 1 Access panel, connection box
- 2 Coil access panel (both sides)
- 3 Extract air grille
- 4 Dimensions E and F see 'Technical data' chapter
- 5 Roof unit
- 6 Sealing compound (on site)
- 7 Sealing strip (fitted at the factory)
- 8 Roof frame
- 9 Membrane

Fig. G3: Installation of RoofVent® units in the roof frame (dimensions in mm)



Size		6	9
Z3	mm	571	749

Table G3: Condensate drain of the plate heat exchanger (measured from unit centre)

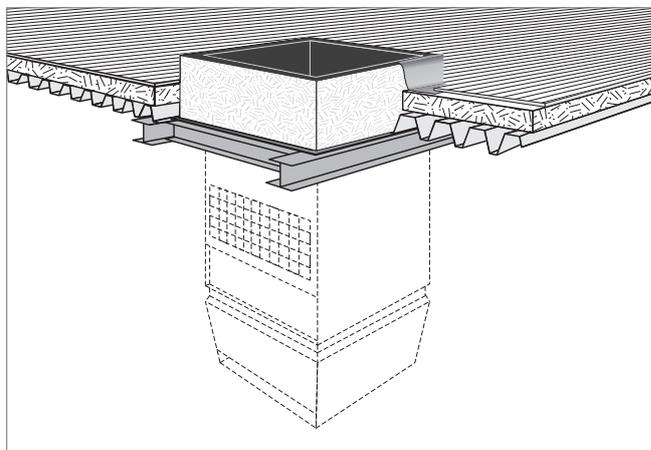


Fig. G4: Conceptual drawing of the roof frame

Depending on local conditions, 2 different types of roof frame can be used:

- Roof frame with straight side walls (where there is sufficient space)
- Roof frame with conical side walls (where a below-roof unit protruding into the room interferes with the crane-ways, for example)



Notice

Ensure there is sufficient clearance for maintenance work (see chapter 1.2).

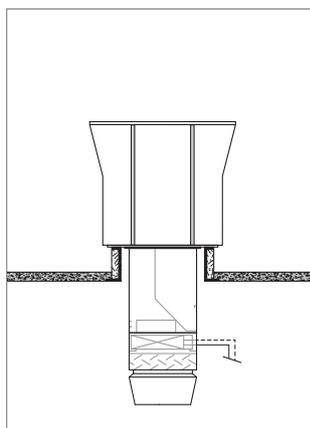


Fig. G5: Roof frame with straight side walls

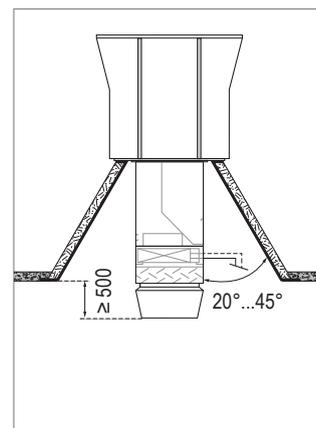


Fig. G6: Roof frame with conical side walls

1.4 Unit installation

Proceed as follows to position the unit:

Below-roof unit

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

Roof unit

- Remove the cover caps on the unit roof.
- Screw in the transport eyes and attach the lifting gear.
- Transport the roof unit to the roof, correctly position the roof unit over the below-roof unit and set it down.
- Screw the the roof unit and below-roof unit together.
- Remove the transport eyes and refit the cover caps.

1.5 Duct connection

If necessary, it is possible to connect an extract air duct to the below-roof unit instead of the extract air grille.

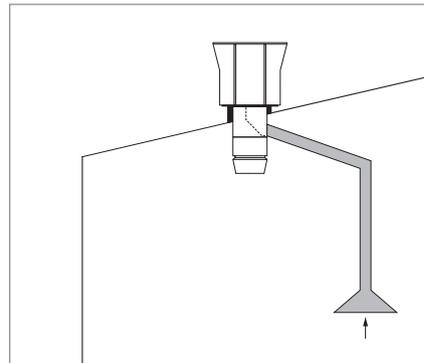
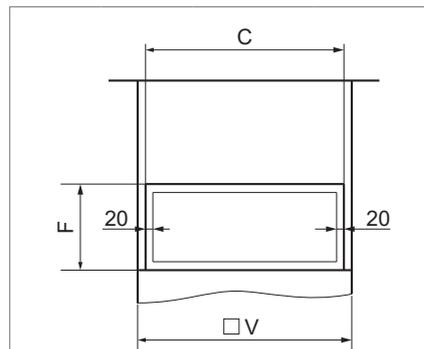


Fig. G7: Extract air duct



Size		6	9
C	mm	848	1048
F	mm	410	450
V	mm	900	1100

Table G4: Connection dimensions (in mm)

2 Hydraulic installation

2.1 Heating/cooling coil

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

Requirements on the boiler system and the distributor circuit

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

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

Requirements for mixing valves

- Use 3-way mixing valves with the following flow characteristics:
 - Equal percentage control path
 - Linear bypass
- The valve authority must be ≥ 0.5 .
- The maximum run time of the valve actuator is 90 s.
- The valve actuator must be continuous, i.e. the stroke changes in proportion to the control voltage (0...10 VDC or 2...10 VDC).
- The valve actuator must be designed with a position response (0...10 VDC or 2...10 VDC).
- The maximum power consumption is 20 VA.
- Install the valve close to the unit (max. distance 2 m).



Notice

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

Requirements on changeover valves

Use changeover valves conforming to the following specification:

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

2.2 Condensate connection

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

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



Notice

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

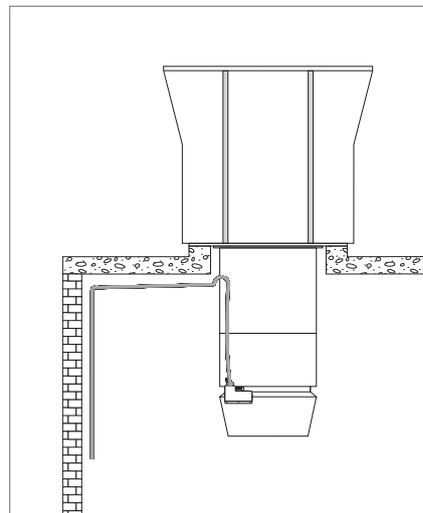


Fig. G8: Condensate drain

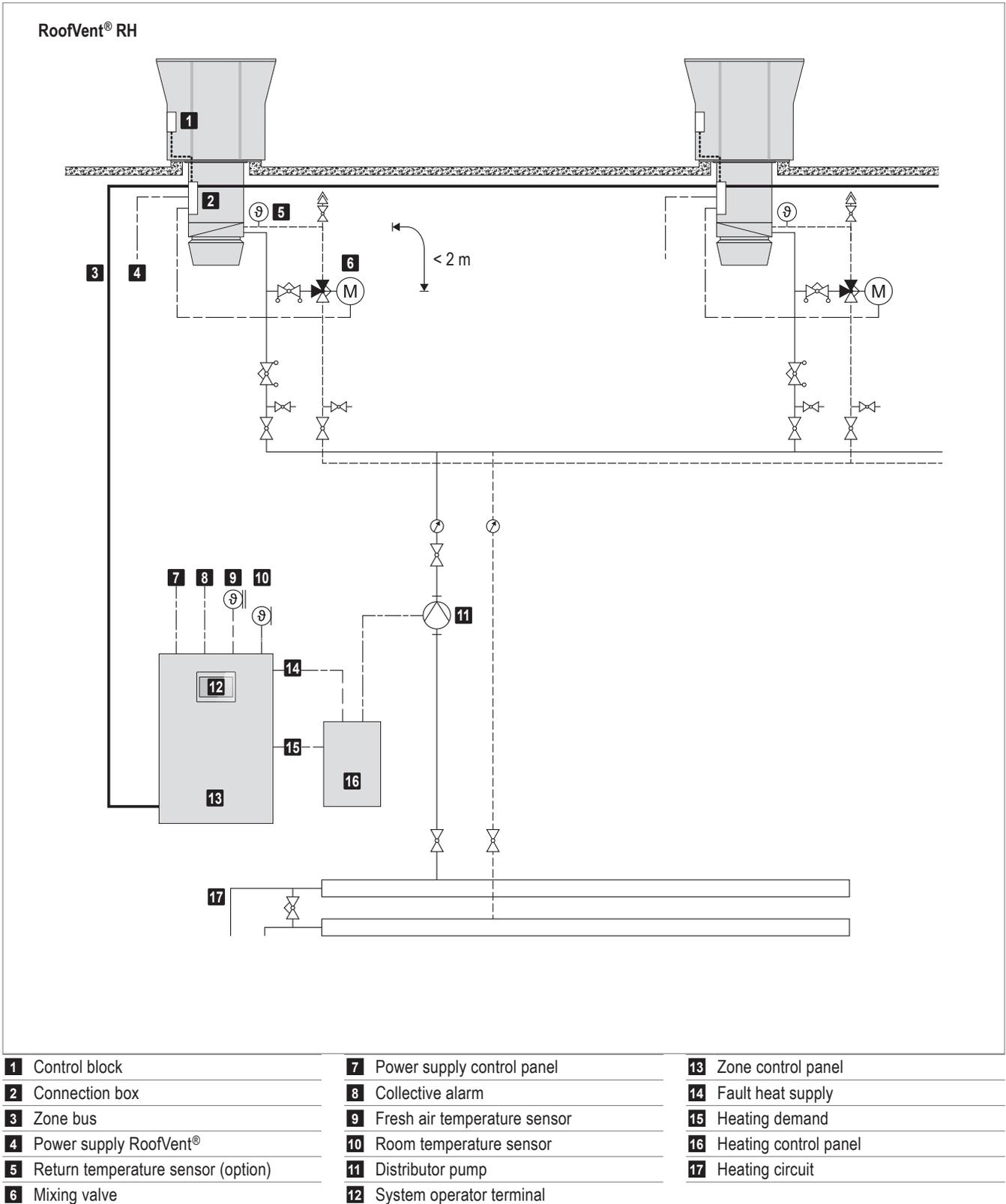
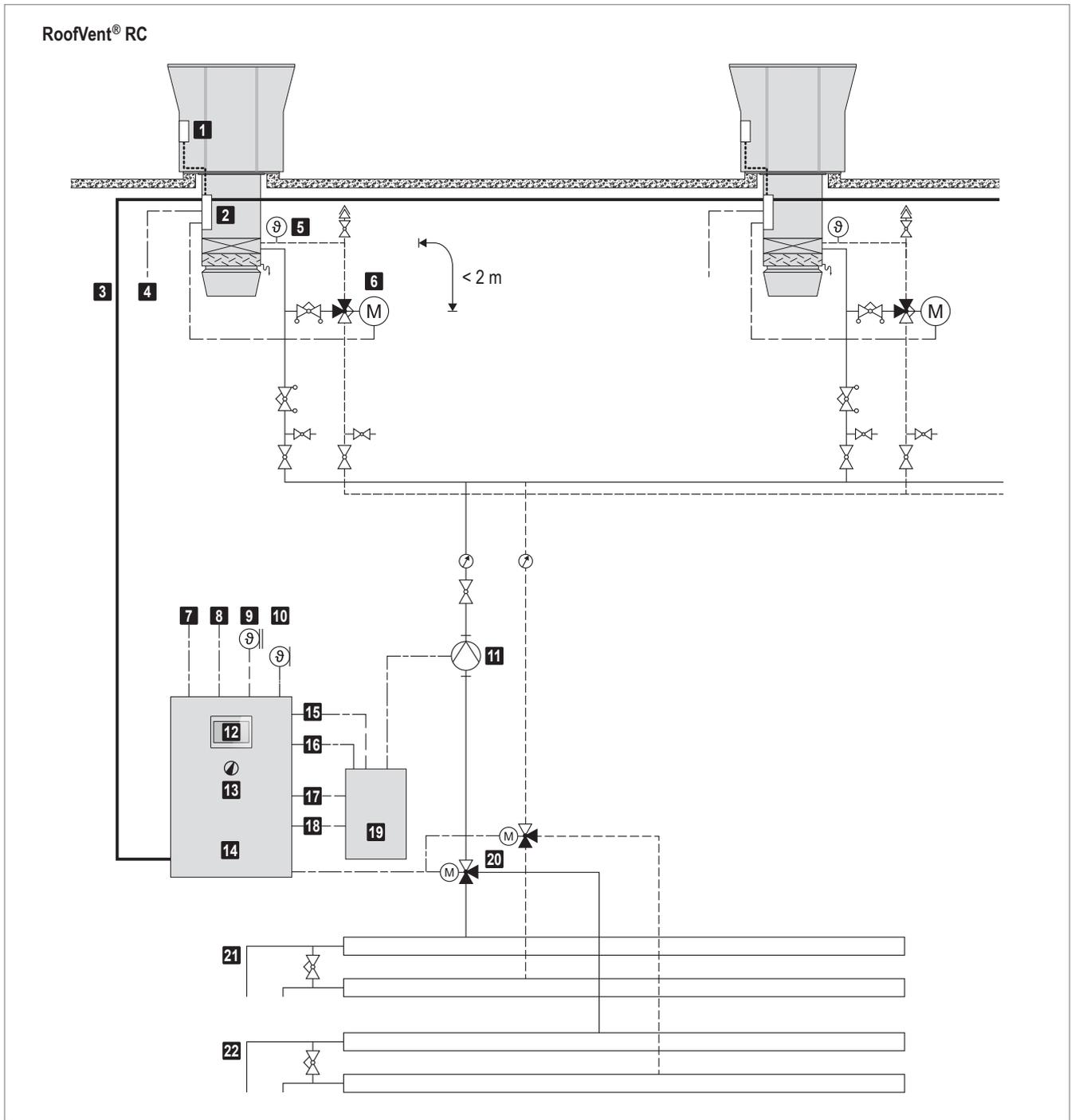


Table G5: Conceptual drawing for hydraulic diverting system RoofVent® RH



1 Control block	9 Fresh air temperature sensor	17 Heating demand
2 Connection box	10 Room temperature sensor	18 Cooling demand
3 Zone bus	11 Distributor pump	19 Heating control panel
4 Power supply RoofVent®	12 System operator terminal	20 Changeover valves heating/cooling
5 Return temperature sensor (option)	13 Cooling lock switch (option)	21 Heating circuit
6 Mixing valve	14 Zone control panel	22 Cooling circuit
7 Power supply control panel	15 Fault heat supply	
8 Collective alarm	16 Fault cold supply	

Table G6: Conceptual drawing for hydraulic diverting system RoofVent® RC

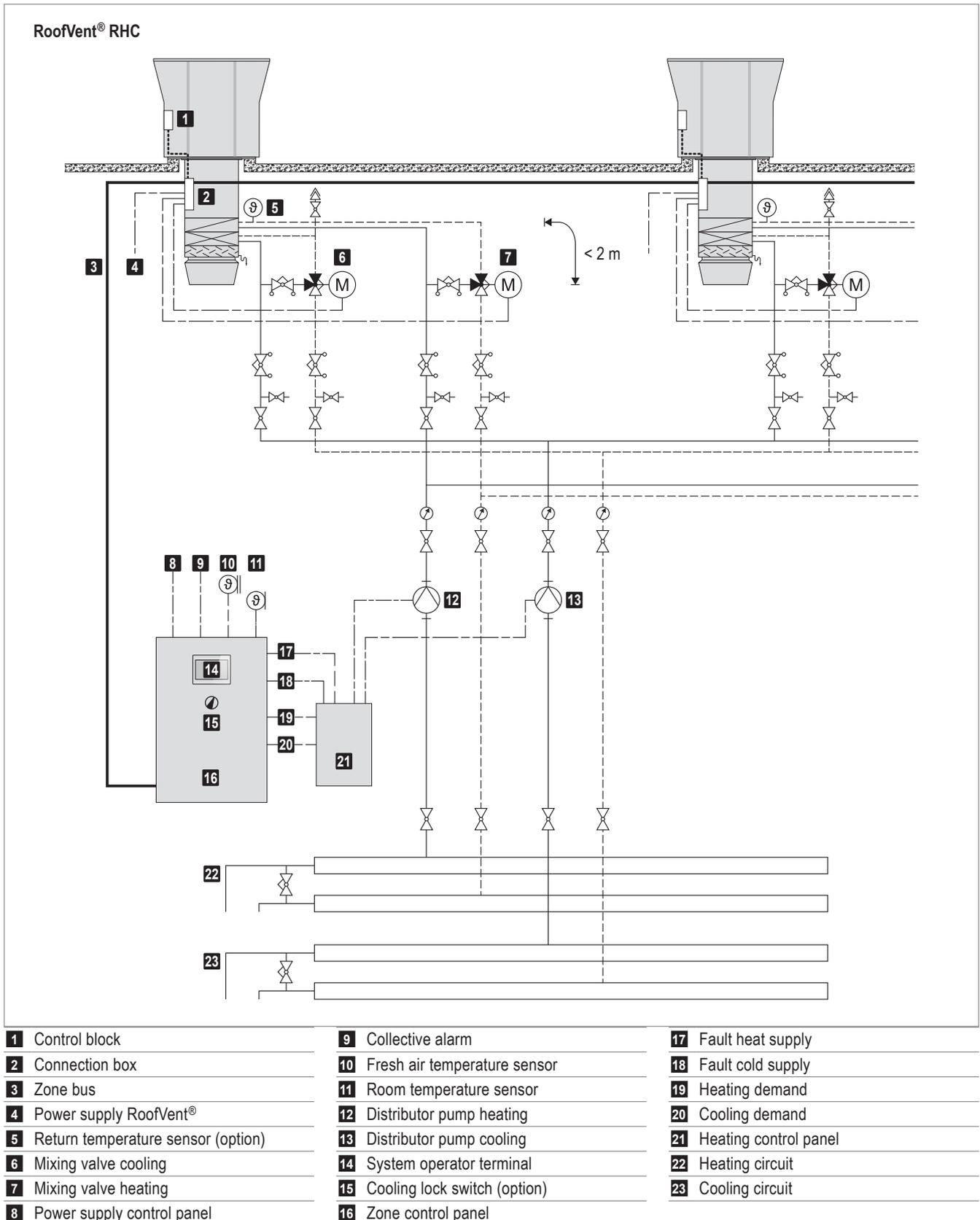


Table G7: Conceptual drawing for hydraulic diverting system RoofVent® RHC

3 Electrical installation

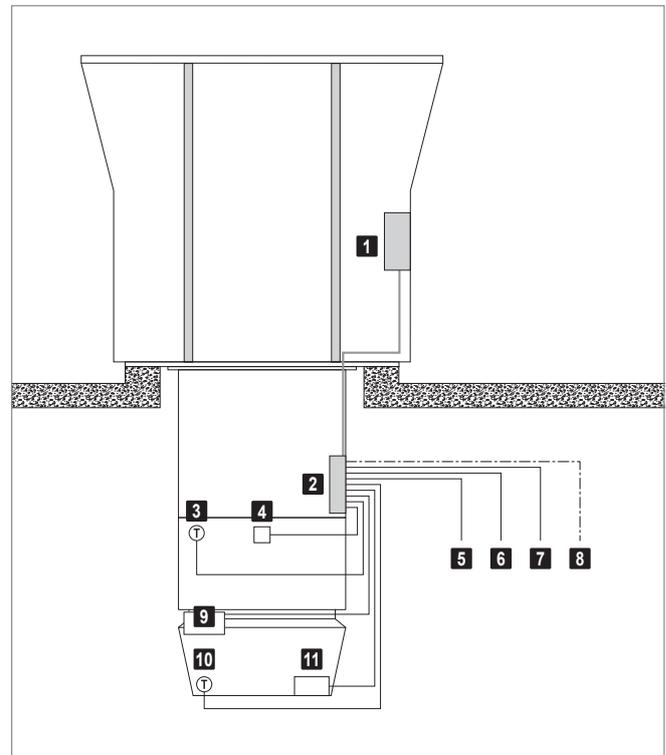
- The electrical installation must only be carried out by a qualified electrician.
- Observe the relevant regulations (e.g. EN 60204-1).
- Choose the dimensions of the cable cross sections in line with the applicable regulations.
- Route signal and bus lines separately from mains cables.
- Make sure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



Attention

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

- Carry out the electrical installation according to the wiring diagram:
 - Power supply RoofVent®
 - Zone bus based on system layout
 - Signal lines
- Connect the connection box in the below-roof unit to the control block in the roof unit.
- Connect the electrical components of the below-roof unit to the connection box.



- 1** Control block
- 2** Connection box
- 3** Return temperature sensor (option)
- 4** Frost controller
- 5** Mixing valve
- 6** Pump (option)
- 7** Zone bus
- 8** Power supply RoofVent®
- 9** Condensate pump (option)
- 10** Supply air temperature sensor
- 11** Actuator Air-Injector

Fig. G9: On-site electrical connection

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

Component	Designation	Voltage	Cable	Comments
RoofVent®	Power supply	3 × 400 VAC	NYM-J 5 × 1.5 mm ² (min.)	RoofVent® units size 6
		3 × 400 VAC	NYM-J 5 × 4.0 mm ² (min.)	RoofVent® units size 9
	Zone bus		J-Y(St)Y 2 × 2 × 0.8 mm	max. 1000 m length
	Forced off	24 VAC	NYM-O 2 × 1.5 mm ²	max. 1 A
	Forced heating	24 VAC	NYM-J 2 × 1.5 mm ²	max. 1 A
	Mixing valve heating	24 VAC	NYM-O 5 × 1.0 mm ²	
	Mixing valve cooling	24 VAC	NYM-O 4 × 1.0 mm ²	
	Heating pump	230 VAC	NYM-J 3 × 1.5 mm ²	Power supply
		24 VAC	NYM-O 4 × 1.0 mm ²	Control line
	Cooling pump	230 VAC	NYM-J 3 × 1.5 mm ²	Power supply
24 VAC		NYM-O 4 × 1.0 mm ²	Control line	

Table G8: Cable list for on-site connections



System design

1 Design example	104
2 Maintenance schedule	106
3 Checklist for project discussions	107

1 Design example



Notice

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

Design data	Example
<ul style="list-style-type: none"> Hall geometry (L × W × H) Required fresh air flow rate Internal heat gains (machines, lighting, etc.) Heating and cooling in the 4-pipe system Optimisation of the ventilation quality (no limitation on the number of units) 	<p>52 × 42 × 9 m 32000 m³/h 33 kW → Unit type RHC → Unit size 6</p>
<p>Design conditions heating:</p> <ul style="list-style-type: none"> Fresh air temperature Room temperature Extract air conditions Fabric heat losses Temperature of the heating medium 	<p>- 12 °C 18 °C 20 °C / 40 %rh 93 kW 60/40 °C</p>
<p>Design conditions cooling:</p> <ul style="list-style-type: none"> Fresh air temperature Room temperature Extract air temperature Transmission sensible gains Temperature of the cooling medium 	<p>32 °C / 50 %rh 26 °C 28 °C 57 kW 8/14 °C</p>
<p>Number of units</p> <ul style="list-style-type: none"> Calculate the required number of units: <p>$n = \text{Fresh air flow rate} / \text{nominal air flow rate}$</p>	<p>$n = 32000 / 5500 = 5.8$ → 6 units RHC-6</p>
<p>Type of heating coil</p> <ul style="list-style-type: none"> Calculate the required heat output for coverage of fabric heat losses per unit: <p>$Q_{H_req} = (\text{Fabric heat losses} - \text{internal heat loads}) / n$</p> <ul style="list-style-type: none"> Use the 'Hoval HK-Select' selection program to calculate the heat output for coverage of fabric heat losses under the given design conditions and select the suitable coil type. 	<p>$(93 - 33) / 6 = 10 \text{ kW per unit}$ RHC-6B: 21.7 kW RHC-6C: 40.6 kW → Heating coil type B</p>
<p>Type of cooling coil</p> <ul style="list-style-type: none"> Calculate the required cooling capacity for coverage of transmission sensible gains per unit: <p>$Q_{C_req} = (\text{transmission sensible gains} + \text{internal heat loads}) / n$</p> <ul style="list-style-type: none"> Use the 'Hoval HK-Select' selection program to calculate the cooling capacity for coverage of transmission sensible gains under the given design conditions and select the suitable coil type. 	<p>$(57 + 33) / 6 = 15 \text{ kW per unit}$ RHC-6..C: 15.6 kW → Cooling coil type C</p>

Checks	
<ul style="list-style-type: none"> Effective air flow rate <p>$V_{\text{eff}} = \text{Nominal air flow rate} \times n$</p>	$5500 \times 6 = 33000 \text{ m}^3/\text{h}$ $33000 \text{ m}^3/\text{h} > 32000 \text{ m}^3/\text{h}$ → OK
<ul style="list-style-type: none"> Effective heat output <p>$Q_{\text{H_effective}} = \text{Output for coverage of fabric heat losses} \times n$</p>	$21.7 \times 6 = 130.2 \text{ kW}$ $130.2 \text{ kW} > (93 - 33) \text{ kW}$ → OK
<ul style="list-style-type: none"> Mounting height <p>Calculate the actual mounting height (= distance between the floor and the bottom edge of the unit) and compare with the minimum and maximum mounting height.</p> <p>$Y = \text{Hall height} - \text{length of below-roof unit}$</p>	$9000 - 2320 = 6680 \text{ mm}$ $Y_{\text{min}} = 4.0 \text{ m} < 6.68 \text{ m}$ → OK $Y_{\text{max}} = 15.3 \text{ m} > 6.68 \text{ m}$ → OK
<ul style="list-style-type: none"> Effective cooling capacity <p>$Q_{\text{C_effective}} = \text{Output for coverage of transmission sensible gains} \times n$</p>	$15.6 \times 6 = 93.6 \text{ kW}$ $93.6 \text{ kW} > (57 + 33) \text{ kW}$ → OK
<ul style="list-style-type: none"> Floor area reached <p>Compare the floor area reached with the base area of the hall (L × W).</p> <p>$A = \text{Floor area reached} \times n$</p>	$480 \times 6 = 2880 \text{ m}^2$ $52 \times 42 = 2184 \text{ m}^2$ $2880 \text{ m}^2 > 2184 \text{ m}^2$ → OK
<ul style="list-style-type: none"> Minimum and maximum clearances <p>Determine the positioning of the units according to the number of units and the base area of the hall; check the minimum and maximum clearances.</p>	$n = 6 = 3 \times 2$ Unit clearance in length: $X = 52 / 3 = 17.3 \text{ m}$ $X_{\text{max}} = 21.0 \geq 17.3 \text{ m}$ $X_{\text{min}} = 11.0 \leq 17.3 \text{ m}$ → OK Unit clearance in width: $X = 42 / 2 = 21.0 \text{ m}$ $X_{\text{max}} = 21.0 \geq 21.0 \text{ m}$ $X_{\text{min}} = 11.0 \leq 21.0 \text{ m}$ → OK

2 Maintenance schedule

Activity	Interval
Changing the fresh air and extract air filter	When the filter alarm is displayed, at least annually
Comprehensively checking function; cleaning and possibly repairing the unit	Annually by Hoval customer service

Table H1: Maintenance schedule

Project

Project No.

Date

Name

Function

Address

Tel.

Fax

E-mail

Information about the hall

Application

Type

Insulation

Length

Width

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?

Is the air volume balanced?

yes no

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

- Fresh air flow rate? m³/h
- Fresh air / hall area m³/h per m²
- Air change rate
- Internal heat gains (machines, ...) kW
- Heating and cooling
- Hydraulic system
- Unit size
- Control zones

Design conditions heating

- Highest outside temperature and humidity °C %
- Room temperature °C
- Extract air temperature and humidity °C %
- Fabric heat losses kW
- Temperature of the heating medium / °C

Design conditions cooling

- Highest outside temperature and humidity °C %
- Room temperature °C
- Extract air temperature and humidity °C %
- Transmission sensible gains kW
- Temperature of the cooling medium / °C

Further information

Hoval quality. You can count on us.

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

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

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

Responsibility for energy and environment

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The Hoval logo is displayed in white, bold, sans-serif font on a red rectangular background. The background of the entire bottom section features a scenic landscape with snow-capped mountains, a lake, and a dramatic sky with a lightning bolt.