

# Hoval Indoor Climate Systems **RoofVent® KH | KC | KHC**

Supply and extract air handling units with efficient air distribution  
for heating and cooling with central heat and cold generation  
RoofVent® KH | KC | KHC

Design Handbook



# Hoval

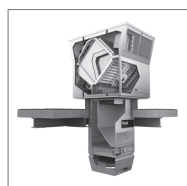




## Hoval Indoor Climate Systems

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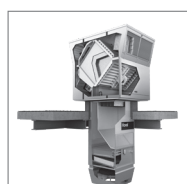
Efficient. Flexible. Reliable.



## RoofVent® KH

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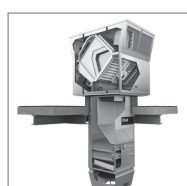
Supply and extract air handling unit with energy recovery for heating high spaces



## RoofVent® KC

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Supply and extract air handling unit with energy recovery for heating and cooling high spaces in the 2-pipe system



## RoofVent® KHC

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Supply and extract air handling unit with energy recovery for heating and cooling high spaces in the 4-pipe system



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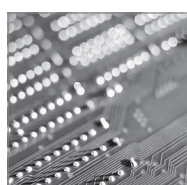
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## Control systems

Hoval TopTronic® C

→ see 'Control Systems for Hoval Indoor Climate Systems' manual





## Hoval Indoor Climate Systems

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

### Diverse range of units ensures flexibility

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

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

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

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

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

### Draught-free air distribution

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

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

### Control with specialist expertise

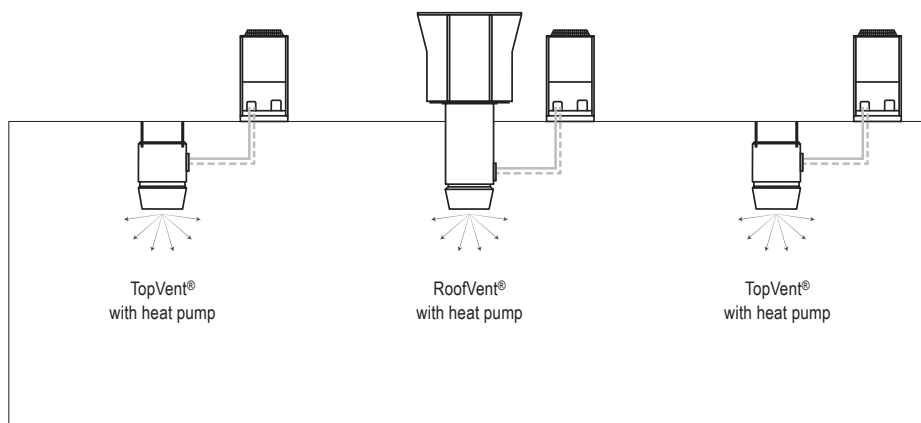
The TopTronic® C control system, which was specifically developed for Hoval indoor climate systems, regulates the separate units individually and controls them based on zones. This enables optimal adjustment to the local requirements of the different usage areas in the building. The patented control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

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

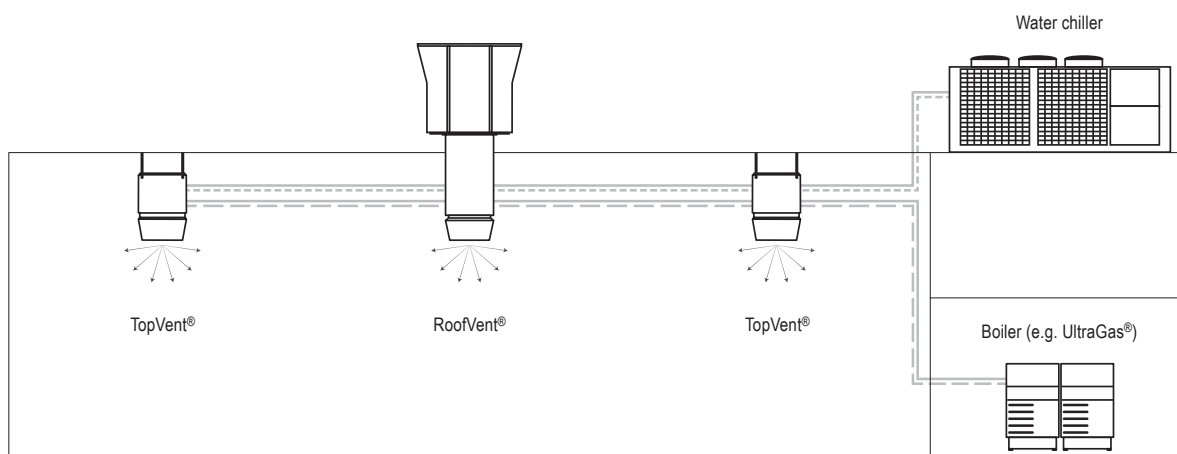
### Competent and reliable

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

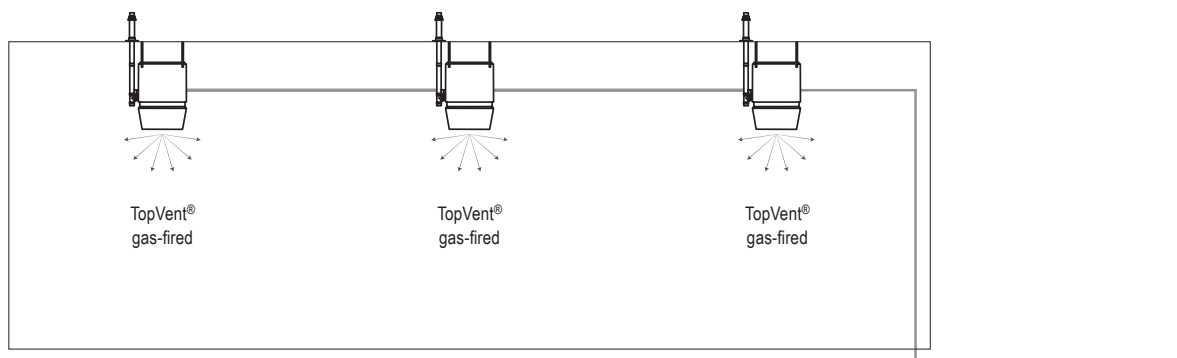
## System with decentralised heat and cold generation with heat pump



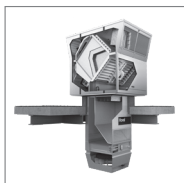
## System with central heat and cold generation



## System with decentralised heat generation with gas-fired heat exchanger





**RoofVent® KH**

Supply and extract air handling unit with energy recovery  
for heating high spaces

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## 1 Use

### 1.1 Intended use

RoofVent® KH units are supply and extract air handling units for use in tall, single-floor halls. 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® KH units are used in production halls, logistics centres, maintenance halls, shopping centres, sports halls, trade show halls, etc. A system usually consists of several RoofVent® units. These are installed distributed throughout the hall roof. The individual units are regulated individually and controlled based on zones. The system flexibly adjusts to local requirements.

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® KH unit consists of the following components:

#### Roof unit with energy recovery

Self-supporting casing for mounting on the roof frame; the double-shell design guarantees good thermal insulation and high stability.

#### Below-roof unit

The below-roof unit comprises the following components:

- Connection module:  
Available in 4 lengths per unit size for adapting the unit to local installation conditions
- Heating section:  
For heating the supply air
- Air-Injector:  
Patented, automatically adjustable vortex air distributor for draught-free air distribution over a large area

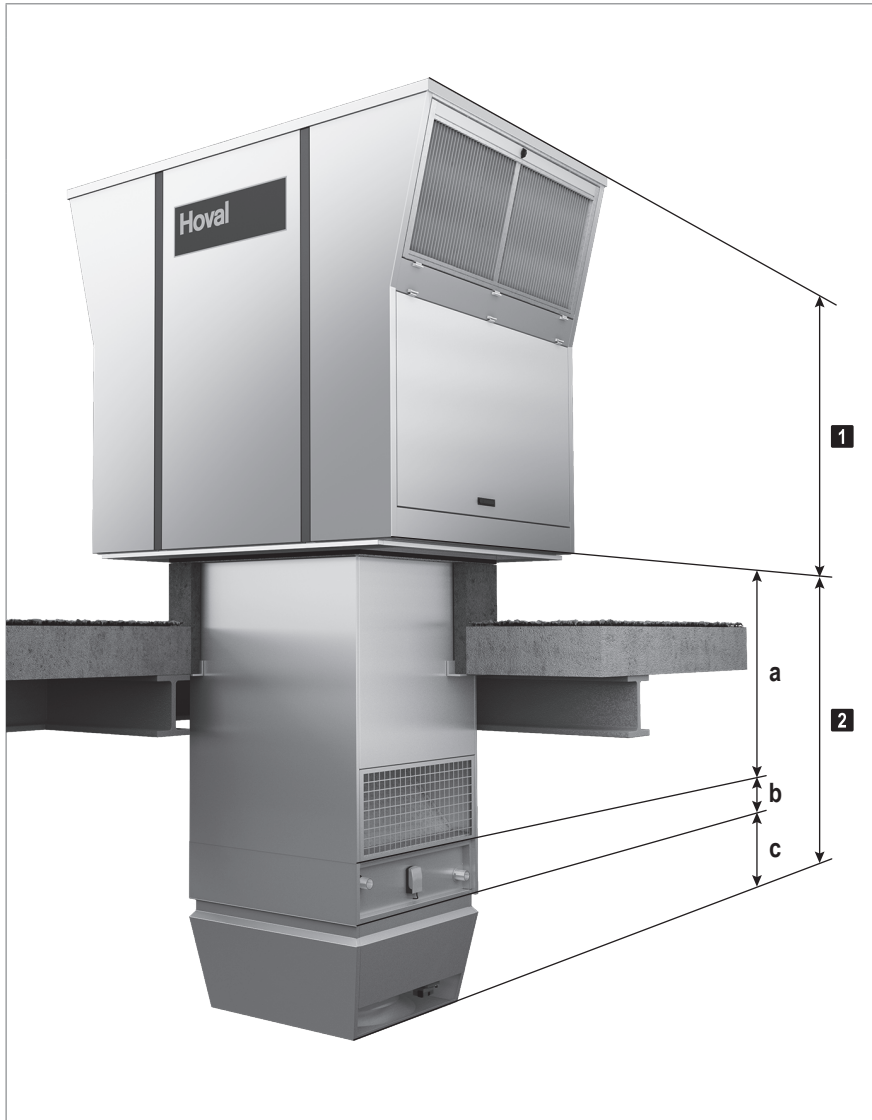
The components are bolted together and can be dismantled. The connections of the coil are located under the extract air grille as standard. The heating section can also be mounted on the connection module turned round.

Thanks to their high capability and efficient air distribution, RoofVent® units cover a large area. Therefore, compared to other systems, fewer units are needed to achieve the required conditions. Various units sizes and versions as well as a range of optional equipment offer great flexibility in adjustment to the specific project.

### 2.2 Air distribution with the Air-Injector

The patented air distributor – called the Air-Injector – is the core element. The air discharge angle is set by means of the infinitely variable guide vanes. It depends on the air flow rate, the mounting height and the temperature difference between the supply air and room air. The air is therefore blown into the room vertically downward, conically or horizontally. This ensures that:

- with each RoofVent® unit a large area of the hall can be reached,
- the occupied area is draught-free,
- the temperature stratification in the room is reduced, thus saving energy.



**1** Roof unit with energy recovery

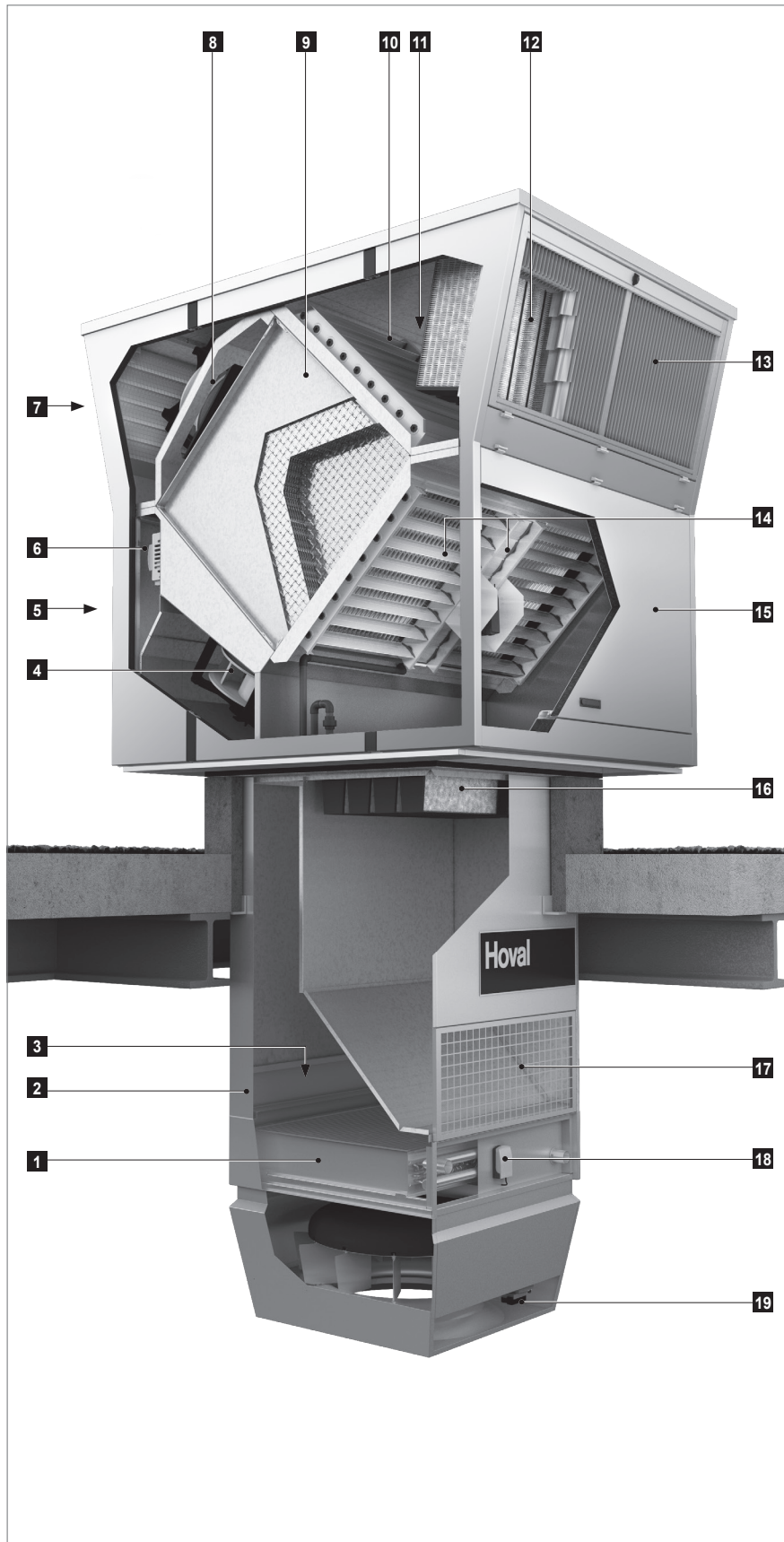
**2** Below-roof unit

**a** Connection module

**b** Heating section

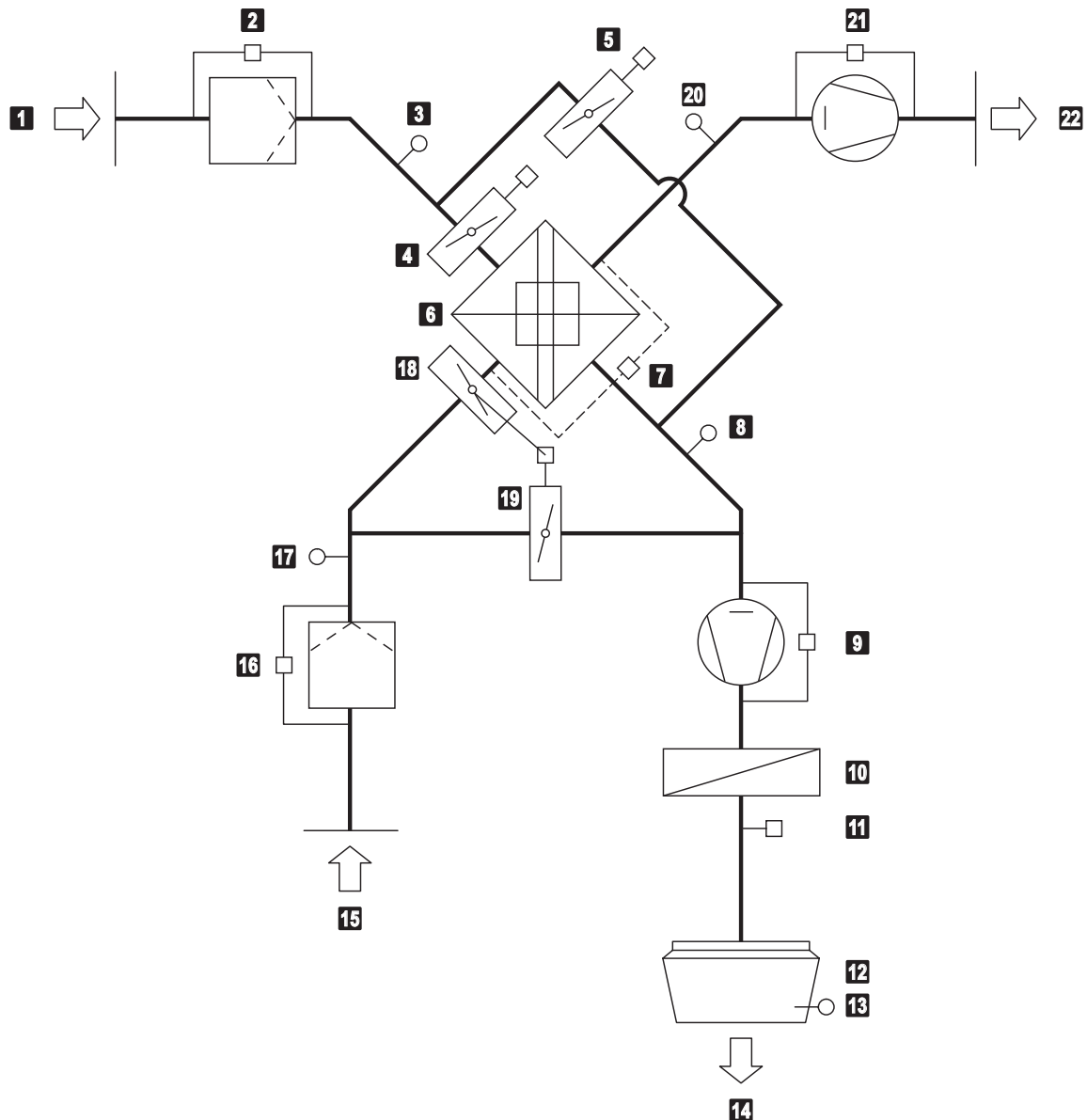
**c** Air-Injector

Fig. B1: Components of the RoofVent® KH



- |    |  |
|----|--|
| 1  | Heating coil   |
| 2  | Coil access panel  |
| 3  | Connection box access panel  |
| 4  | Supply air fan   |
| 5  | Supply air access door   |
| 6  | Control block  |
| 7  | Exhaust air access door  |
| 8  | Exhaust air fan  |
| 9  | Plate heat exchanger with bypass<br>(for performance control and as<br>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<br>actuator                                       |
| 15 | Extract air access door  |
| 16 | Extract air filter   |
| 17 | Extract air grille   |
| 18 | Frost controller   |
| 19 | Actuator of the Air-Injector   |

Fig. B2: Structure of the RoofVent® KH



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

Fig. B3: Function diagram for RoofVent® KH

## 2.3 Operating modes

The RoofVent® KH has the following operating modes:

- Ventilation
- Ventilation (reduced)
- Air quality
- Recirculation
- Exhaust air
- Supply air
- Standby
- Forced heating

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	<b>Ventilation</b> 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"> <li>■ the energy recovery</li> <li>■ the heating</li> </ul>	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	<b>Ventilation (reduced)</b> 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	<b>Air quality</b> 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"> <li>■ the energy recovery</li> <li>■ the heating</li> </ul> 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 is appropriate, the unit heats the room 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/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.	Supply air fan ..... MIN-MAX Exhaust air fan ..... MIN-MAX Energy recovery ..... 0-100 % Extract air damper ..... open Recirculation damper ..... closed Heating ..... 0-100 %

Code	Operating mode	Description
REC	<b>Recirculation</b> 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 / Speed 1 / Speed 2 *) Exhaust air fan ..... off Energy recovery ..... 0 % Extract air damper ..... closed Recirculation damper ..... open Heating ..... on *) *) Depending on heat demand
DES	<b>Destratification:</b> To avoid heat build-up under the ceiling, it may be appropriate to switch on the fan when there is no heat demand (either in permanent operation or in on/off operation depending on air temperature under the ceiling, as desired).	
EA	<b>Exhaust air</b> 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	<b>Supply air</b> 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	<b>Standby</b> 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	<b>Off (local operating mode)</b> 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
–	<b>Forced heating</b> The unit draws in room air, warms it and blows it back into the room. For example, it is suitable for heating the hall before taking the control system into operation or if the controller fails during the heating period. 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® KH operating modes

### 3 Technical data

#### 3.1 Type code

	<b>KH - 6 A - ...</b>
<b>Unit type</b>	RoofVent® KH
<b>Unit size</b>	6 or 9
<b>Heating section</b>	A with coil type A B with coil type B C with coil type C
<b>Further options</b>	

Table B2: Type code

#### 3.2 Application limits

Fresh air temperatures	min.	°C	-30
Extract air temperature	max.	°C	40
Extract air relative humidity	max.	%rh	50
Moisture content of extract air	max.	g/kg	12.5
Units in ColdClimate design:			
Fresh air temperature	min.	°C	-40
Extract air temperature	max.	°C	40
Extract air relative humidity	max.	%rh	40
Moisture content of extract air	max.	g/kg	4
Supply air temperature	max.	°C	60
Temperature of the heating medium <sup>1)</sup>	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

<sup>1)</sup> Design for higher temperatures on request

Table B3: Application limits



#### Notice

The increase of moisture content in the room is limited to a maximum of 2 g/kg.

#### 3.3 Heat recovery system (HRS)

Unit type		KH-6	KH-9
Temperature efficiency, dry	%	57	57
Temperature efficiency, wet	%	61	64

Table B4: Thermal transfer level of the plate heat exchanger

#### 3.4 Air filtration

Filter	Fresh air	Extract air
Class acc. to ISO 16890	ISO coarse 50%	ISO coarse 50%
Class acc. to EN 779	G4	G4
Factory setting of differential pressure switches	250 Pa	300 Pa

Table B5: Air filtration

#### 3.5 Electrical connection

Unit type		KH-6	KH-9
Supply voltage	V AC	3 × 400	3 × 400
Permitted voltage tolerance	%	± 5	± 5
Frequency	Hz	50	50
Connected load	kW	6.88	10.68
Current consumption max.	A	11.67	17.67
Series fuse	A	13	20

Table B6: Electrical connection

## 3.6 Flow rate, product parameters

Unit type		KH-6			KH-9		
Nominal air flow rate	m³/h	7500			11000		
	m³/s	2.08			3.06		
Floor area covered	m²	727			1283		
Static efficiency of the fans	%	73.4			68.7		
Coil type		A	B	C	A	B	C
Nominal external pressure							
	Supply air	Pa	290	260	190	170	150
	Extract air	Pa	170	170	170	70	70
Effective electric power input	kW	3.84	3.91	4.08	7.02	7.09	7.33

Table B7: Technical data

## 3.7 Heat output

Fresh air temp.		-5 °C						-15 °C					
Size	Type	Q	Q <sub>TG</sub>	H <sub>max</sub>	t <sub>s</sub>	Δp <sub>W</sub>	m <sub>W</sub>	Q	Q <sub>TG</sub>	H <sub>max</sub>	t <sub>s</sub>	Δp <sub>W</sub>	m <sub>W</sub>
		kW	kW	m	°C	kPa	l/h	kW	kW	m	°C	kPa	l/h
KH-6	A	43.2	21.1	24.0	26.4	10	1857	46.0	13.7	25.0	23.4	12	1974
	B	63.2	41.1	17.5	34.3	21	2716	67.2	34.9	18.9	31.8	23	2885
	C	103.8	81.7	12.7	50.4	25	4459	110.2	78.0	13.0	48.9	28	4736
KH-9	A	77.8	45.4	20.8	30.3	12	3341	87.2	39.9	22.1	28.8	15	3748
	B	96.2	63.8	17.7	35.2	18	4132	102.3	54.9	19.0	32.8	20	4393
	C	161.1	128.7	12.8	52.7	26	6919	171.1	123.8	13.0	51.4	30	7531
Legend:	Type = Type of coil Q = Coil heat output Q <sub>TG</sub> = Output to cover fabric heat losses H <sub>max</sub> = Maximum mounting height t <sub>s</sub> = Supply air temperature Δp <sub>W</sub> = Water pressure drop m <sub>W</sub> = 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: Heat output

**Notice**

The output for coverage of the fabric heat losses (Q<sub>TG</sub>) allows for the ventilation heat requirement (Q<sub>V</sub>) and the energy recovery output (Q<sub>ER</sub>) under the respective air conditions.

The following applies:

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

### 3.8 Dimensions and weights

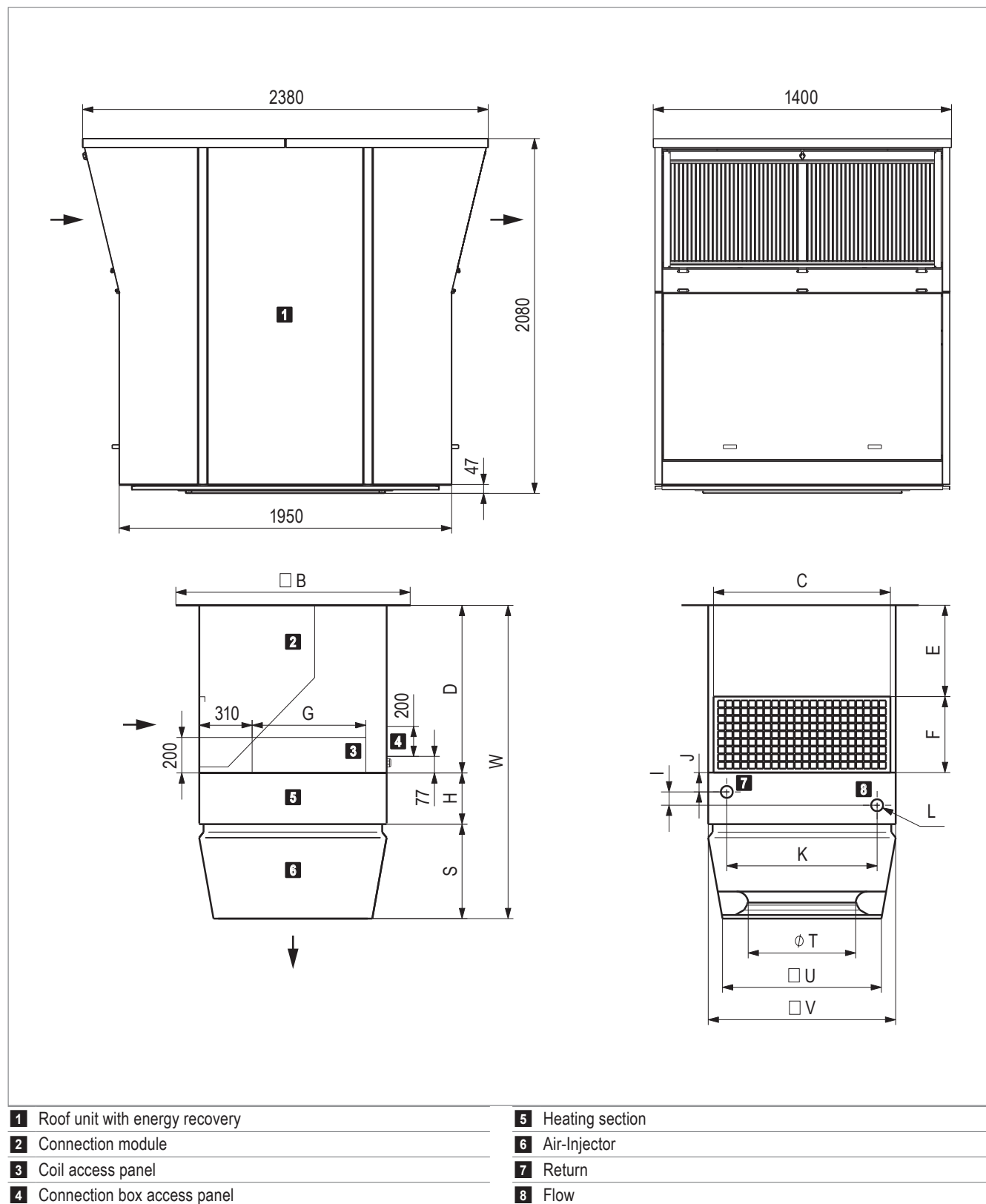


Fig. B4: Dimensional drawing (dimensions in mm)

Unit type		KH-6				KH-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 B9: Unit dimensions

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

Fig. B5: Dimensions for hydraulic connection of the heating section

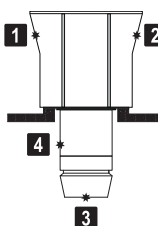
Unit type		KH-6A	KH-6B	KH-6C	KH-9A	KH-9B	KH-9C
Total	kg	709	709	716	895	895	905
Roof unit	kg	567	567	567	701	701	701
Below-roof unit	kg	142	142	149	194	194	204
Air-Injector	kg	37	37	37	56	56	56
Heating section	kg	30	30	37	44	44	54
Connection module V0	kg	75			94		
Additional weight V1	kg	+ 11			+ 13		
Additional weight V2	kg	+ 22			+ 26		
Additional weight V3	kg	+ 44			+ 52		

Table B10: Weights of the RoofVent® KH

### 3.9 Sound data

Item			1	2	3	4	
KH-6	Sound pressure level (at a distance of 5 m) <sup>1)</sup>		dB(A)	54	67	62	54
	Total sound power level		dB(A)	76	89	84	76
	Octave sound power level	63 Hz	dB	46	50	48	46
		125 Hz	dB	53	60	58	53
		250 Hz	dB	71	78	76	71
		500 Hz	dB	70	80	76	70
		1000 Hz	dB	66	85	81	67
		2000 Hz	dB	65	82	76	66
		4000 Hz	dB	60	76	70	60
8000 Hz	dB	69	81	76	68		
KH-9	Sound pressure level (at a distance of 5 m) <sup>1)</sup>		dB(A)	59	73	69	59
	Total sound power level		dB(A)	81	95	91	81
	Octave sound power level	63 Hz	dB	53	57	55	53
		125 Hz	dB	60	68	66	60
		250 Hz	dB	76	85	82	77
		500 Hz	dB	76	88	84	76
		1000 Hz	dB	74	91	87	74
		2000 Hz	dB	71	90	85	71
		4000 Hz	dB	64	83	77	64
8000 Hz	dB	65	81	76	65		

1) with hemispherical radiation in a low-reflection environment



1

Fresh air

2

Exhaust air

3

Supply air

4

Extract air

Table B11: Sound data

## 4 Specification texts

### RoofVent® KH

Supply and extract air handling unit with energy recovery for heating high spaces. 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

#### 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 bag filter elements, class ISO coarse 50 % (G4), fully incinerable, easy to change, including differential pressure switch for filter monitoring.

#### Extract air filter:

Designed as highly efficient bag filter elements, class ISO coarse 50 % (G4), fully incinerable, easy to change, including differential pressure switch for filter monitoring.

#### Plate heat exchanger:

Cross-flow 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 fan, 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
- 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
- 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

### ColdClimate design:

Units in ColdClimate design are suitable for temperatures down to -40 °C. The following features ensure trouble-free operation of the system:

- Actuators and gear wheels of the fresh air and bypass dampers are provided with a heating facility.
- To protect the plate heat exchanger against freezing, a special de-icing switch overrides the automatic unit control when necessary.
- The water temperature on the coil is also monitored by the frost controller.
- The return temperature of the heating medium is monitored by the return temperature sensor.
- Condensate from the plate heat exchanger is led to a condensate drain connection in the below-roof unit.

### 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 silencers:

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

**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.

TopTronic® C control systems

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

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

Zone 1: \_\_\_ x Unit type \_\_\_\_\_

Zone 2: \_\_\_ x Unit type \_\_\_\_\_

Zone 3: \_\_\_ x Unit type \_\_\_\_\_

...

**System structure:**

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

**Operation:**

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

**Control functions:**

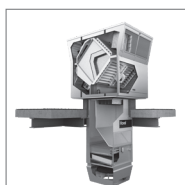
- Control of the supply air temperature using room supply air cascade control via sequential control of the energy recovery and the coils (depending on the unit type)
- Demand-driven control of the room air quality by variation of the supply air and exhaust air volume flows with minimum and maximum limit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

**Alarms, protection:**

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

**Options for the zone control panel:**

- Design for heating (KH, KC, KHC)
- Design for cooling (KC, KHC)
- Cooling lock switch (KC, KHC)
- Heating/cooling switch (KC, KHC)
- Alarm lamp
- Socket
- Additional room air temperature sensors (max. 3)
- Combination sensor room air quality, temperature and humidity (protection rating IP20 or IP65)
- Combination sensor fresh air temperature and humidity (protection rating IP65)
- 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 (KH, KC, KHC)

**RoofVent® KC**

Supply and extract air handling unit with energy recovery  
for heating and cooling high spaces in the 2-pipe system

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## 1 Use

### 1.1 Intended use

RoofVent® KC units are supply and extract air handling units for use in tall, single-floor halls. 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® KC units are used in production halls, logistics centres, maintenance halls, shopping centres, sports halls, trade show halls, etc. A system usually consists of several RoofVent® units. These are installed distributed throughout the hall roof. The individual units are regulated individually and controlled based on zones. The system flexibly adjusts to local requirements.

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® KC unit consists of the following components:

#### Roof unit with energy recovery

Self-supporting casing for mounting on the roof frame; the double-shell design guarantees good thermal insulation and high stability.

#### Below-roof unit

The below-roof unit comprises the following components:

- Connection module:  
Available in 4 lengths per unit size for adapting the unit to local installation conditions
- Heating/cooling section:  
For heating and cooling the supply air in the 2-pipe system
- Air-Injector:  
Patented, automatically adjustable vortex air distributor for draught-free air distribution over a large area

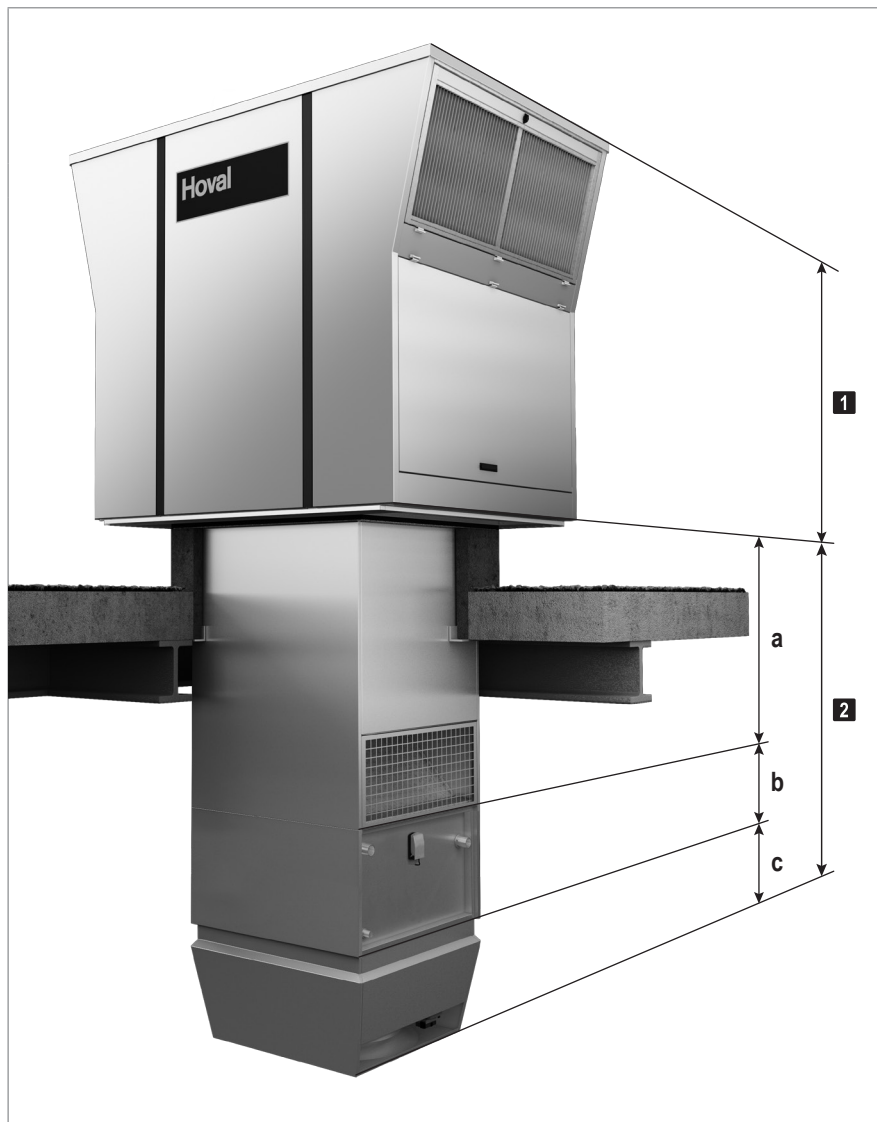
The components are bolted together and can be dismantled. The connections of the coil are located under the extract air grille as standard. The heating/cooling section can also be mounted on the connection module turned round.

Thanks to their high capability and efficient air distribution, RoofVent® units cover a large area. Therefore, compared to other systems, fewer units are needed to achieve the required conditions. Various units sizes and versions as well as a range of optional equipment offer great flexibility in adjustment to the specific project.

### 2.2 Air distribution with the Air-Injector

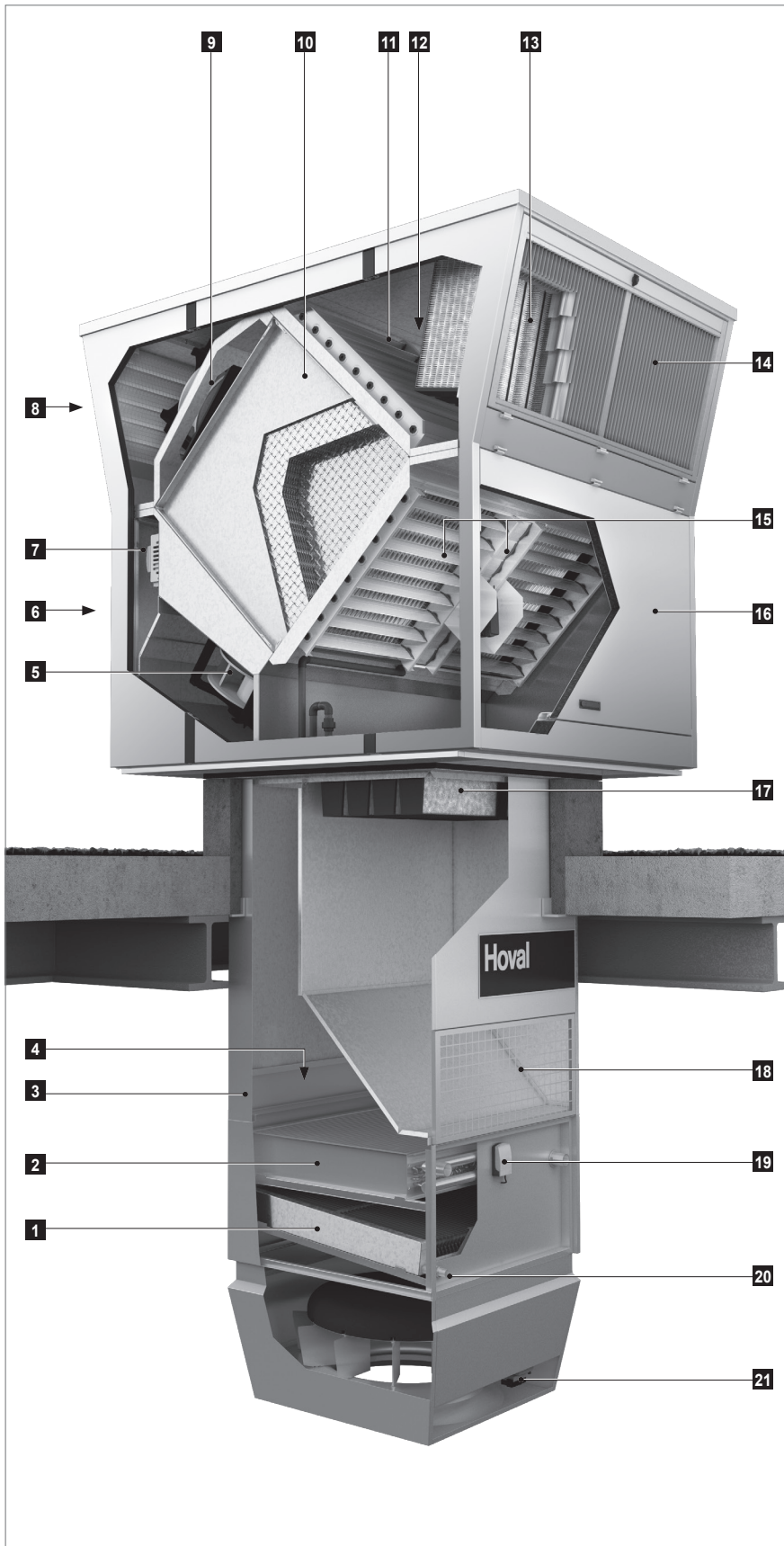
The patented air distributor – called the Air-Injector – is the core element. The air discharge angle is set by means of the infinitely variable guide vanes. It depends on the air flow rate, the mounting height and the temperature difference between the supply air and room air. The air is therefore blown into the room vertically downward, conically or horizontally. This ensures that:

- with each RoofVent® unit a large area of the hall can be reached,
- the occupied area is draught-free,
- the temperature stratification in the room is reduced, thus saving energy.



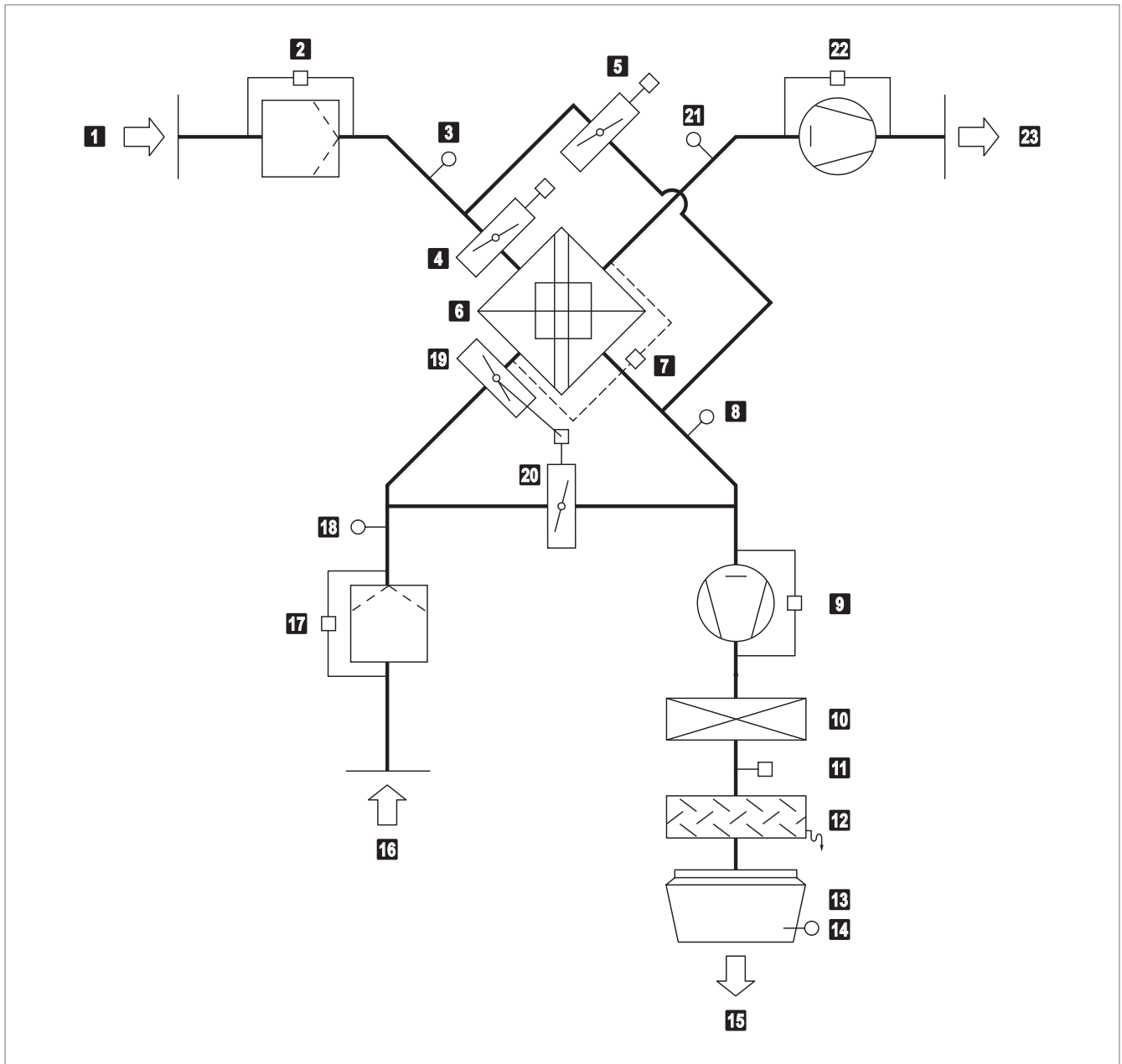
- 1** Roof unit with energy recovery
- 2** Below-roof unit
  - a** Connection module
  - b** Heating/cooling section
  - c** Air-Injector

Fig. C1: Components of the RoofVent® KC



- 1 Condensate separator
- 2 Heating/cooling coil
- 3 Coil access panel
- 4 Connection box access panel
- 5 Supply air fan
- 6 Supply air access door
- 7 Control block
- 8 Exhaust air access door
- 9 Exhaust air fan
- 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 of the Air-Injector

Fig. C2: Structure of the RoofVent® KC



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

Fig. C3: Function diagram for RoofVent® KC

## 2.3 Operating modes

The RoofVent® KC has the following operating modes:

- Ventilation
- Ventilation (reduced)
- Air quality
- Recirculation
- Exhaust air
- Supply air
- Standby
- Forced heating

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	<b>Ventilation</b> 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"> <li>■ the energy recovery</li> <li>■ the heating/cooling</li> </ul>	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	<b>Ventilation (reduced)</b> 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	<b>Air quality</b> 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"> <li>■ the energy recovery</li> <li>■ the heating/cooling</li> </ul> Depending on the room air quality or room air humidity, the system operates in one of the following operating states:	
AQ_REC	<ul style="list-style-type: none"> <li>■ Air quality Recirculation: When air quality is good and air humidity is appropriate, the unit heats or cools the room in recirculation operation.</li> </ul>	Like REC
AQ_ECO	<ul style="list-style-type: none"> <li>■ Air quality Mixed air: When ventilation requirements are medium, the unit heats or cools in mixed air operation. The supply/exhaust air volume is based on the air quality.</li> </ul>	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	<ul style="list-style-type: none"> <li>■ 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.</li> </ul>	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 %

Code	Operating mode	Description
REC	<b>Recirculation</b> 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 / Speed 1 / Speed 2 *) Exhaust air fan ..... off Energy recovery ..... 0 % Extract air damper ..... closed Recirculation damper ..... open Heating/cooling ..... on *) *) Depending on heat or cool demand
DES	<b>Destratification:</b> To avoid heat build-up under the ceiling, it may be appropriate to switch on the fan when there is no heat or cool demand (either in permanent operation or in on/off operation depending on air temperature under the ceiling, as desired).	
EA	<b>Exhaust air</b> 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	<b>Supply air</b> 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	<b>Standby</b> 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/cooling ..... on
OPR	■ Overheating protection: If the room temperature rises above the set value for overheating protection, the unit cools down the room in recirculation operation. If the temperatures also permit fresh air cooling, the units automatically switches to night cooling (NCS) to save energy.	
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	<b>Off (local operating mode)</b> 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
–	<b>Forced heating</b> The unit draws in room air, warms it and blows it back into the room. For example, it is suitable for heating the hall before taking the control system into operation or if the controller fails during the heating period. 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® KC operating modes

### 3 Technical data

#### 3.1 Type code

Unit type	KC - 9 - C ...
RoofVent® KC	
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 temperatures	min.	°C	-30
Extract air temperature	max.	°C	40
Extract air relative humidity	max.	%rh	50
Moisture content of extract air	max.	g/kg	12.5
Units in ColdClimate design:			
Fresh air temperature	min.	°C	-40
Extract air temperature	max.	°C	40
Extract air relative humidity	max.	%rh	40
Moisture content of extract air	max.	g/kg	4
Supply air temperature	max.	°C	60
Temperature of the heating medium <sup>1)</sup>	max.	°C	90
Pressure of the heating/cooling 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

<sup>1)</sup> Design for higher temperatures on request

Table C3: Application limits



#### Notice

The increase of moisture content in the room is limited to a maximum of 2 g/kg.

#### 3.3 Heat recovery system (HRS)

Unit type		KC-6	KC-9
Temperature efficiency, dry	%	57	57
Temperature efficiency, wet	%	61	64

Table C4: Thermal transfer level of the plate heat exchanger

#### 3.4 Air filtration

Filter	Fresh air	Extract air
Class acc. to ISO 16890	ISO coarse 50%	ISO coarse 50%
Class acc. to EN 779	G4	G4
Factory setting of differential pressure switches	250 Pa	300 Pa

Table C5: Air filtration

#### 3.5 Electrical connection

Unit type		KC-6	KC-9
Supply voltage	V AC	3 × 400	3 × 400
Permitted voltage tolerance	%	± 5	± 5
Frequency	Hz	50	50
Connected load	kW	6.98	10.78
Current consumption max.	A	11.67	17.67
Series fuse	A	13	20

Table C6: Electrical connection

#### 3.6 Flow rate, product parameters

Unit type		KC-6	KC-9	
Nominal air flow rate	m³/h	7000	10500	
	m³/s	1.94	2.92	
Floor area covered	m²	661	1194	
Static efficiency of the fans	%	73.4	68.7	
<b>Coil type</b>		<b>C</b>	<b>C</b>	<b>D</b>
Nominal external pressure				
Supply air	Pa	340	180	130
Extract air	Pa	390	250	250
Effective electric power input	kW	3.47	6.71	6.88

Table C7: Technical data

## 3.7 Heat output

Fresh air temp.		-5 °C						-15 °C					
Size	Type	Q	Q <sub>TG</sub>	H <sub>max</sub>	t <sub>s</sub>	Δp <sub>W</sub>	m <sub>W</sub>	Q	Q <sub>TG</sub>	H <sub>max</sub>	t <sub>s</sub>	Δp <sub>W</sub>	m <sub>W</sub>
		kW	kW	m	°C	kPa	l/h	kW	kW	m	°C	kPa	l/h
KC-6	C	99.3	78.7	11.8	51.4	23	4266	105.4	75.3	12.0	50.0	26	4530
KC-9	C	157.1	126.2	12.1	53.7	26	6750	166.9	121.7	12.3	52.4	29	7171
	D	–	–	–	–	–	–	–	–	–	–	–	–

Legend: Type = Type of coil  
 Q = Coil heat output  
 Q<sub>TG</sub> = Output to cover fabric heat losses  
 H<sub>max</sub> = Maximum mounting height  
 t<sub>s</sub> = Supply air temperature  
 Δp<sub>W</sub> = Water pressure drop  
 m<sub>W</sub> = 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: Heat output

**Notice**

The output for coverage of the fabric heat losses (Q<sub>TG</sub>) allows for the ventilation heat requirement (Q<sub>V</sub>) and the energy recovery output (Q<sub>ER</sub>) under the respective air conditions.

The following applies:

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

## 3.8 Cooling capacities

Size	Type	Q <sub>sen</sub>	Q <sub>tot</sub>	Q <sub>TG</sub>	t <sub>s</sub>	Δp <sub>W</sub>	m <sub>W</sub>	m <sub>C</sub>	Q <sub>sen</sub>	Q <sub>tot</sub>	Q <sub>TG</sub>	t <sub>s</sub>	Δp <sub>W</sub>	m <sub>W</sub>	m <sub>C</sub>
		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 %						
KC-6	C	24.0	26.2	15.2	15.5	22	3750	3.2	21.4	40.6	12.6	16.6	52	5809	28.2
KC-9	C	37.8	41.3	24.7	15.0	24	5919	5.1	33.8	62.8	20.6	16.2	55	8998	42.7
	D	45.5	52.7	32.3	12.9	23	7554	10.7	41.7	81.1	28.6	13.9	54	11618	57.9
Fresh air conditions		32 °C / 40 %							32 °C / 60 %						
KC-6	C	29.2	42.1	20.4	17.3	56	6022	18.9	26.6	56.4	17.9	18.4	101	8073	43.7
KC-9	C	46.0	66.3	32.8	16.7	61	9493	29.8	42.0	87.7	28.8	17.8	107	12560	67.2
	D	56.2	84.3	43.1	13.8	58	12065	41.2	52.5	112.5	39.3	14.9	104	16113	88.3
Legend:	Type = Type of coil Q <sub>sen</sub> = Sensible cooling capacity Q <sub>tot</sub> = Total cooling capacity Q <sub>TG</sub> = Output for coverage of transmission sensible gains (→ sensible cooling load) t <sub>s</sub> = Supply air temperature Δp <sub>W</sub> = Water pressure drop m <sub>W</sub> = Water quantity m <sub>C</sub> = 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: Cooling capacity

**Notice**

The output for coverage of the fabric heat losses (Q<sub>TG</sub>) allows for the ventilation heat requirement (Q<sub>V</sub>) and the energy recovery output (Q<sub>ER</sub>) under the respective air conditions.

The following applies:

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

### 3.9 Dimensions and weights

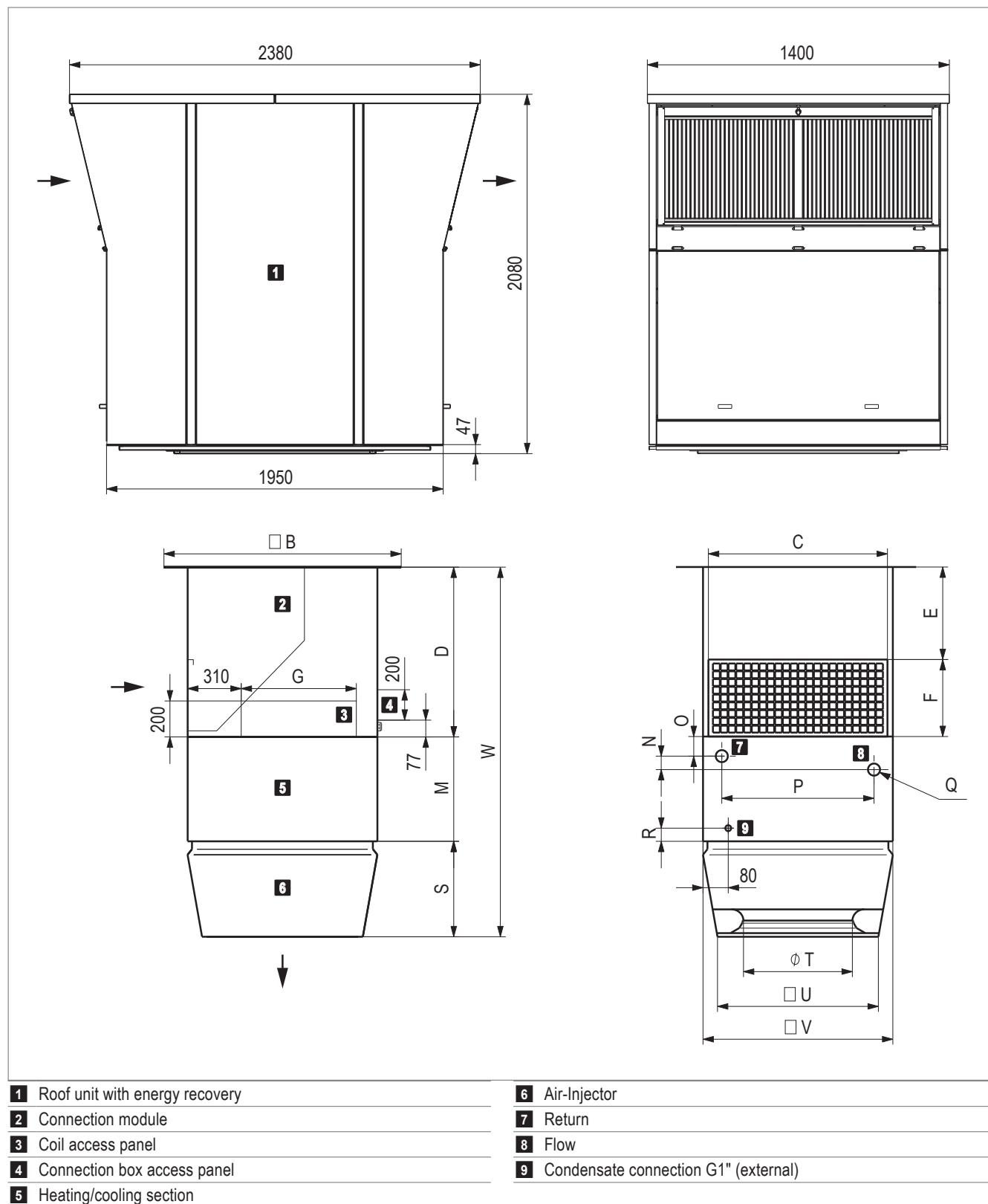


Fig. C4: Dimensional drawing (dimensions in mm)

Unit type		KC-6				KC-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 C10: Unit dimensions

Unit type		KC-6-C	KC-9-C	KC-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

Fig. C5: Dimensions for hydraulic connection of the cooling section

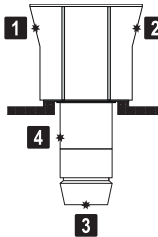
Unit type		KC-6-C	KC-9-C	KC-9-D
Total	kg	749	953	972
Roof unit	kg	567	701	701
Below-roof unit	kg	182	252	271
Air-Injector	kg	37	56	56
Heating/cooling section	kg	70	102	121
Connection module V0	kg	75	94	
Additional weight V1	kg	+ 11	+ 11	
Additional weight V2	kg	+ 22	+ 22	
Additional weight V3	kg	+ 44	+ 44	

Table C11: Weights of the RoofVent® KC

### 3.10 Sound data

Operating mode			VE				
Item			1	2	3	4	
KC-6	Sound pressure level (at a distance of 5 m) <sup>1)</sup>		dB(A)	52	65	60	52
	Total sound power level		dB(A)	74	87	82	74
	Octave sound power level	63 Hz	dB	45	48	46	45
		125 Hz	dB	53	59	57	53
		250 Hz	dB	69	76	73	69
		500 Hz	dB	69	79	75	69
		1000 Hz	dB	65	83	79	65
		2000 Hz	dB	64	80	75	64
		4000 Hz	dB	59	75	69	59
		8000 Hz	dB	65	78	72	65
KC-9	Sound pressure level (at a distance of 5 m) <sup>1)</sup>		dB(A)	58	72	68	58
	Total sound power level		dB(A)	80	94	90	80
	Octave sound power level	63 Hz	dB	52	56	54	52
		125 Hz	dB	59	67	65	60
		250 Hz	dB	75	83	81	75
		500 Hz	dB	76	87	83	76
		1000 Hz	dB	73	90	86	73
		2000 Hz	dB	70	89	84	69
		4000 Hz	dB	63	82	76	63
		8000 Hz	dB	66	81	75	66

1) with hemispherical radiation in a low-reflection environment



1

Fresh air

2

Exhaust air

3

Supply air

4

Extract air

Table C12: Sound data

## 4 Specification texts

### RoofVent® KC

Supply and extract air handling unit with energy recovery for heating and cooling high spaces in the 2-pipe system. 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

#### 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 bag filter elements, class ISO coarse 50 % (G4), fully incinerable, easy to change, including differential pressure switch for filter monitoring.

#### Extract air filter:

Designed as highly efficient bag filter elements, class ISO coarse 50 % (G4), fully incinerable, easy to change, including differential pressure switch for filter monitoring.

#### Plate heat exchanger:

Cross-flow 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 fan, 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, ...)

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### Connection module

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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.

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### Heating/cooling section

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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

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#### 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 polyethylene, with:

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

#### 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 polyethylene, with:

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

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### Options for the unit

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#### ColdClimate design:

Units in ColdClimate design are suitable for temperatures down to -40 °C. The following features ensure trouble-free operation of the system:

- Actuators and gear wheels of the fresh air and bypass dampers are provided with a heating facility.
- To protect the plate heat exchanger against freezing, a special de-icing switch overrides the automatic unit control when necessary.
- The water temperature on the coil is also monitored by the frost controller.
- The return temperature of the heating medium is monitored by the return temperature sensor.
- Condensate from the plate heat exchanger is led to a condensate drain connection in the below-roof unit.

#### 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 silencers:

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

#### 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.

#### TopTronic® C control systems

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

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

Zone 1: \_\_\_\_ x Unit type \_\_\_\_\_

Zone 2: \_\_\_\_ x Unit type \_\_\_\_\_

Zone 3: \_\_\_\_ x Unit type \_\_\_\_\_

...

#### System structure:

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

#### Operation:

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

#### Control functions:

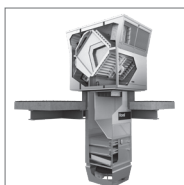
- Control of the supply air temperature using room supply air cascade control via sequential control of the energy recovery and the coils (depending on the unit type)
- Demand-driven control of the room air quality by variation of the supply air and exhaust air volume flows with minimum and maximum limit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

**Alarms, protection:**

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

**Options for the zone control panel:**

- Design for heating (KH, KC, KHC)
- Design for cooling (KC, KHC)
- Cooling lock switch (KC, KHC)
- Heating/cooling switch (KC, KHC)
- Alarm lamp
- Socket
- Additional room air temperature sensors (max. 3)
- Combination sensor room air quality, temperature and humidity (protection rating IP20 or IP65)
- Combination sensor fresh air temperature and humidity (protection rating IP65)
- 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 (KH, KC, KHC)

**RoofVent® KHC**

Supply and extract air handling unit with energy recovery for heating and cooling high spaces in the 4-pipe system

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2 Construction and operation .....	40
3 Technical data .....	46
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## 1 Use

### 1.1 Intended use

RoofVent® KHC units are supply and extract air handling units for use in tall, single-floor halls. 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® KHC units are used in production halls, logistics centres, maintenance halls, shopping centres, sports halls, trade show halls, etc. A system usually consists of several RoofVent® units. These are installed distributed throughout the hall roof. The individual units are regulated individually and controlled based on zones. The system flexibly adjusts to local requirements.

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® KHC unit consists of the following components:

#### Roof unit with energy recovery

Self-supporting casing for mounting on the roof frame; the double-shell design guarantees good thermal insulation and high stability.

#### Below-roof unit

The below-roof unit comprises the following components:

- Connection module:  
Available in 4 lengths per unit size for adapting the unit to local installation conditions
- Heating section:  
For heating the supply air
- Cooling section:  
For cooling the supply air
- Air-Injector:  
Patented, automatically adjustable vortex air distributor for draught-free air distribution over a large area

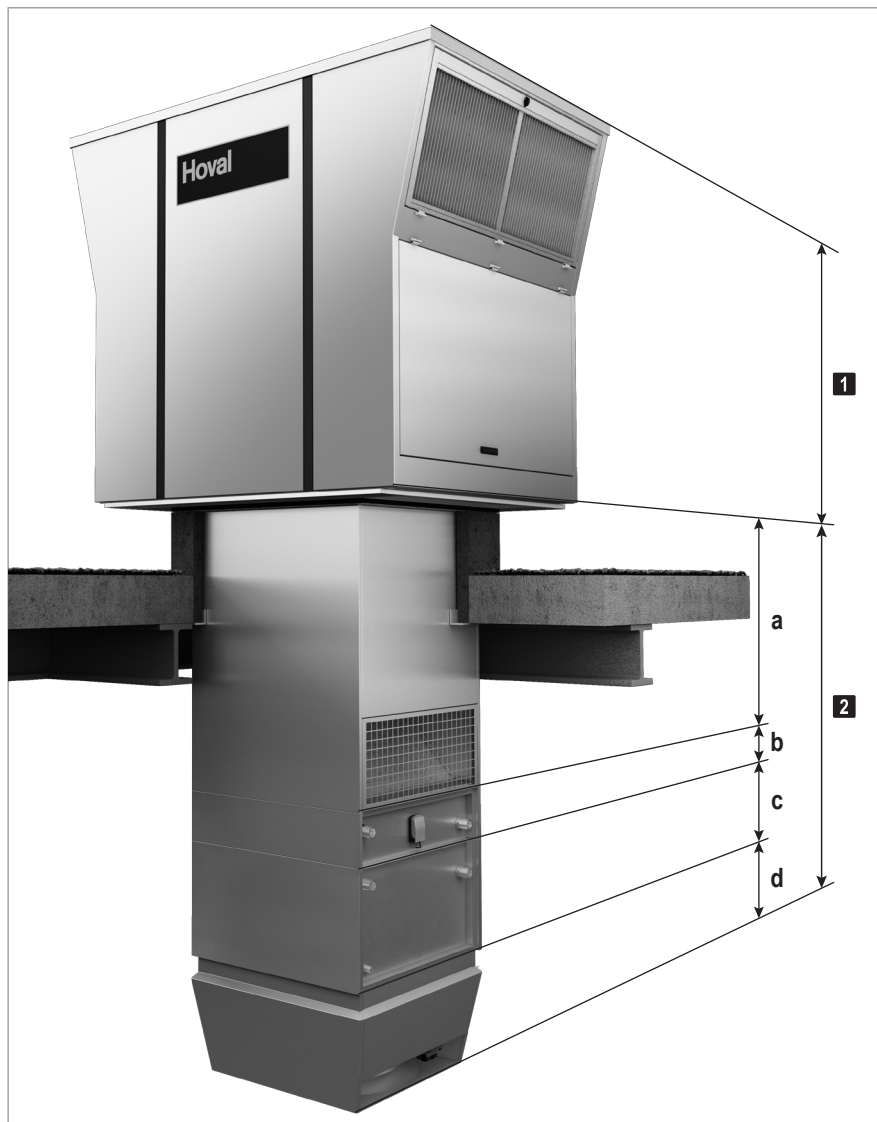
The components are bolted together and can be dismantled. The connections of the coil are located under the extract air grille as standard. The heating/cooling section can also be mounted on the connection module turned round.

Thanks to their high capability and efficient air distribution, RoofVent® units cover a large area. Therefore, compared to other systems, fewer units are needed to achieve the required conditions. Various units sizes and versions as well as a range of optional equipment offer great flexibility in adjustment to the specific project.

### 2.2 Air distribution with the Air-Injector

The patented air distributor – called the Air-Injector – is the core element. The air discharge angle is set by means of the infinitely variable guide vanes. It depends on the air flow rate, the mounting height and the temperature difference between the supply air and room air. The air is therefore blown into the room vertically downward, conically or horizontally. This ensures that:

- with each RoofVent® unit a large area of the hall can be reached,
- the occupied area is draught-free,
- the temperature stratification in the room is reduced, thus saving energy.



**1** Roof unit with energy recovery

**2** Below-roof unit

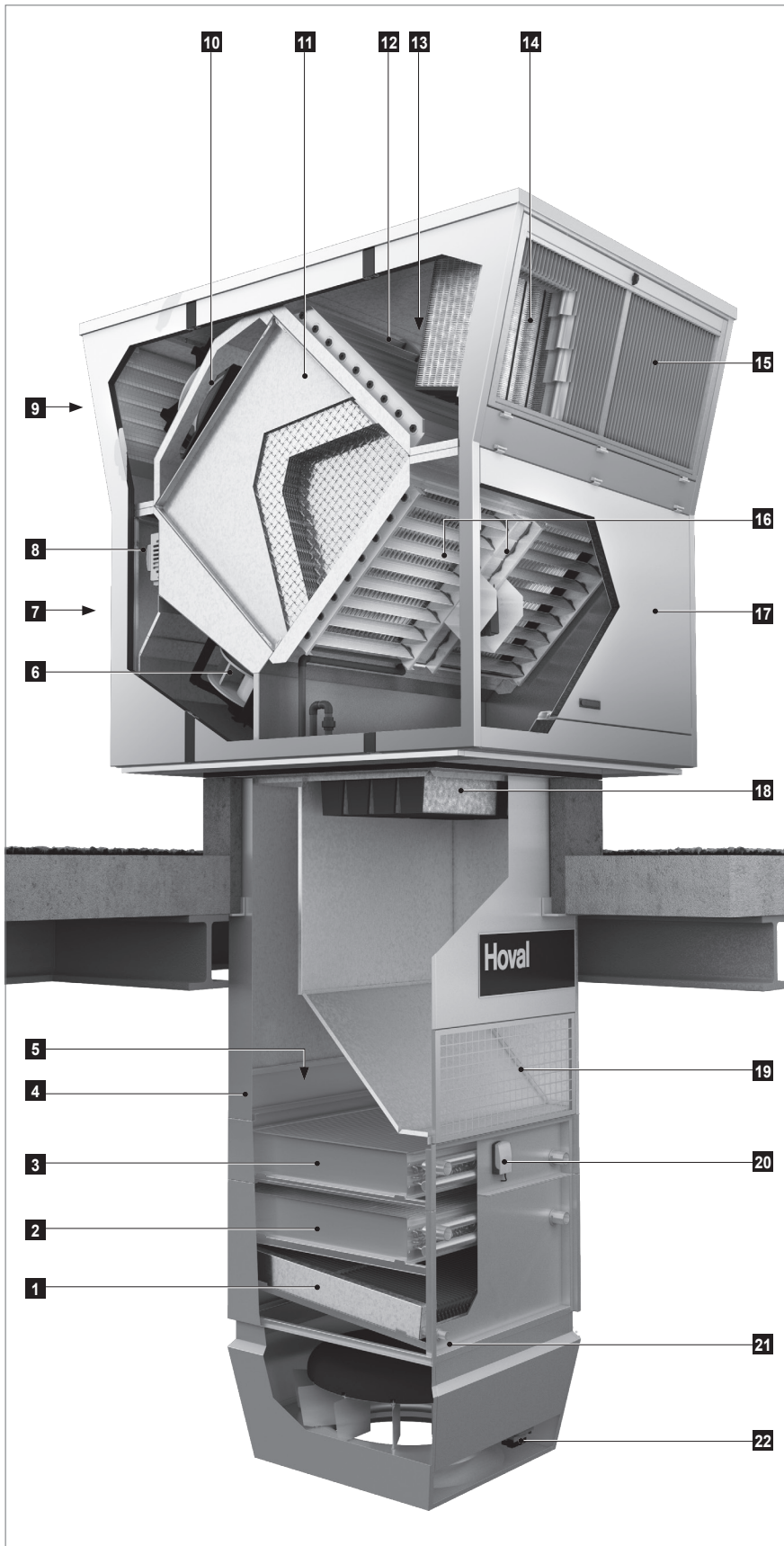
**a** Connection module

**b** Heating section

**c** Cooling section

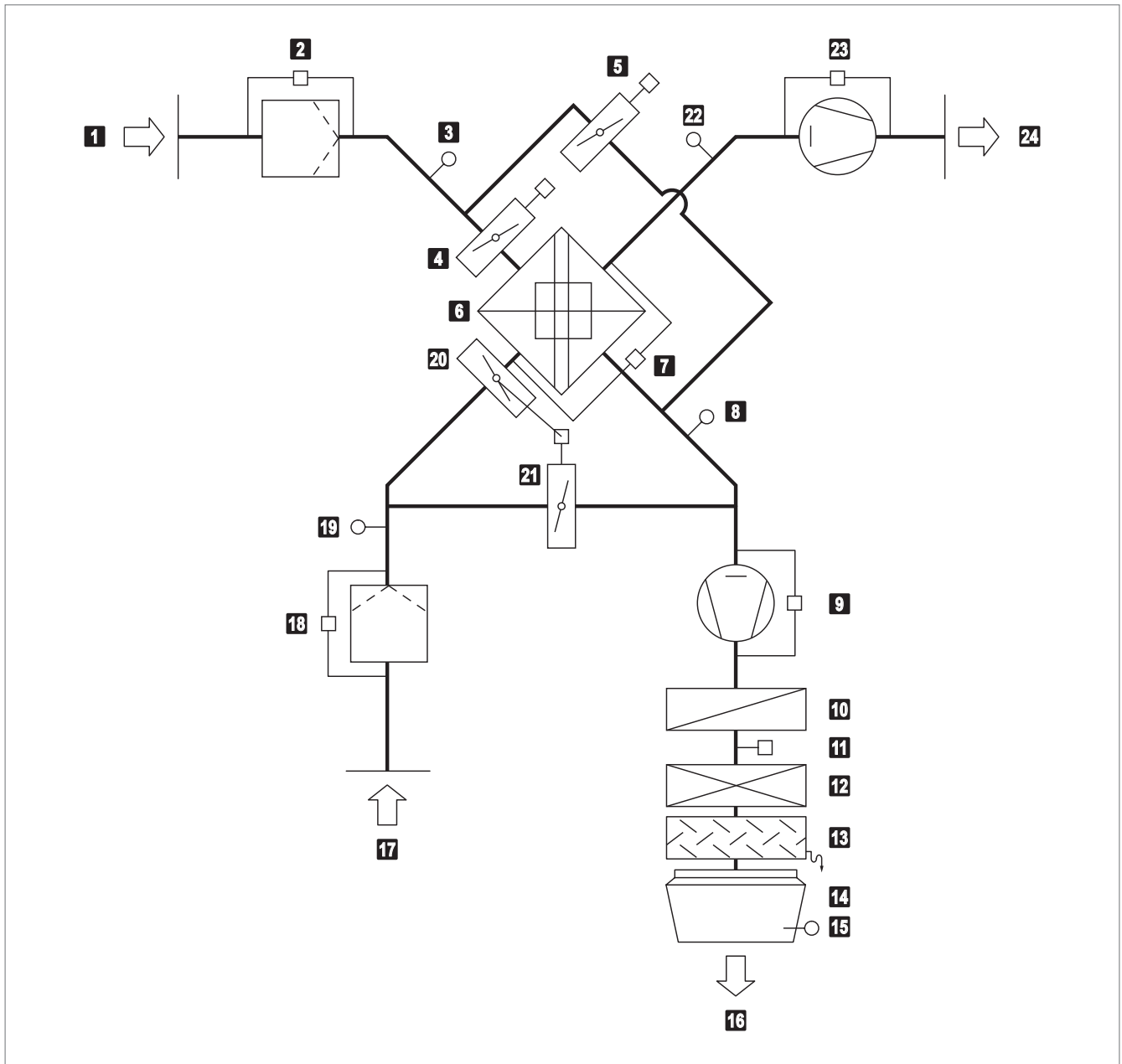
**d** Air-Injector

Fig. D1: Components of the RoofVent® KHC



- 1 Condensate separator
- 2 Cooling coil
- 3 Heating coil
- 4 Coil access panel
- 5 Connection box access panel
- 6 Supply air fan
- 7 Supply air access door
- 8 Control block
- 9 Exhaust air access door
- 10 Exhaust air fan
- 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 of the Air-Injector

Fig. D2: Structure of the RoofVent® KHC



<b>1</b> Fresh air	<b>13</b> Condensate separator
<b>2</b> Fresh air filter with differential pressure switch	<b>14</b> Air-Injector with actuator
<b>3</b> Temperature sensor air inlet ER (optional)	<b>15</b> Supply air sensor
<b>4</b> Fresh air damper with actuator	<b>16</b> Supply air
<b>5</b> Bypass damper with actuator	<b>17</b> Extract air
<b>6</b> Plate heat exchanger	<b>18</b> Extract air filter with differential pressure switch
<b>7</b> De-icing switch for plate heat exchanger (only in ColdClimate design)	<b>19</b> Extract air temperature sensor
<b>8</b> Temperature sensor air outlet ER (optional)	<b>20</b> Extract air damper with actuator
<b>9</b> Supply air fan with flow rate monitoring	<b>21</b> Recirculation damper (opposed to the extract air damper)
<b>10</b> Heating coil	<b>22</b> Exhaust air temperature sensor
<b>11</b> Frost controller	<b>23</b> Exhaust air fan with flow rate monitoring
<b>12</b> Cooling coil	<b>24</b> Exhaust air

Fig. D3: Function diagram for RoofVent® KHC

## 2.3 Operating modes

The RoofVent® KHC has the following operating modes:

- Ventilation
- Ventilation (reduced)
- Air quality
- Recirculation
- Exhaust air
- Supply air
- Standby
- Forced heating

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	<b>Ventilation</b> 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"> <li>■ the energy recovery</li> <li>■ the heating/cooling</li> </ul>	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	<b>Ventilation (reduced)</b> 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	<b>Air quality</b> 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"> <li>■ the energy recovery</li> <li>■ the heating/cooling</li> </ul> Depending on the room air quality or room air humidity, the system operates in one of the following operating states:	
AQ_REC	<ul style="list-style-type: none"> <li>■ Air quality Recirculation: When air quality is good and air humidity is appropriate, the unit heats or cools the room in recirculation operation.</li> </ul>	Like REC
AQ_ECO	<ul style="list-style-type: none"> <li>■ Air quality Mixed air: When ventilation requirements are medium, the unit heats or cools in mixed air operation. The supply/exhaust air volume is based on the air quality.</li> </ul>	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	<ul style="list-style-type: none"> <li>■ 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.</li> </ul>	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 %

Code	Operating mode	Description
REC	<b>Recirculation</b> 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 / Speed 1 / Speed 2 *) Exhaust air fan ..... off Energy recovery ..... 0 % Extract air damper ..... closed Recirculation damper ..... open Heating/cooling ..... on *) *) Depending on heat or cool demand
DES	<b>Destratification:</b> To avoid heat build-up under the ceiling, it may be appropriate to switch on the fan when there is no heat or cool demand (either in permanent operation or in on/off operation depending on air temperature under the ceiling, as desired).	
EA	<b>Exhaust air</b> 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	<b>Supply air</b> 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	<b>Standby</b> 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/cooling ..... on
OPR	■ Overheating protection: If the room temperature rises above the set value for overheating protection, the unit cools down the room in recirculation operation. If the temperatures also permit fresh air cooling, the units automatically switches to night cooling (NCS) to save energy.	
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	<b>Off (local operating mode)</b> 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
–	<b>Forced heating</b> The unit draws in room air, warms it and blows it back into the room. For example, it is suitable for heating the hall before taking the control system into operation or if the controller fails during the heating period. 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® KHC operating modes

### 3 Technical data

#### 3.1 Type code

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

Table D2: Type code

#### 3.2 Application limits

Fresh air temperatures	min.	°C	-30
Extract air temperature	max.	°C	40
Extract air relative humidity	max.	%rh	50
Moisture content of extract air	max.	g/kg	12.5
Units in ColdClimate design:			
Fresh air temperature	min.	°C	-40
Extract air temperature	max.	°C	40
Extract air relative humidity	max.	%rh	40
Moisture content of extract air	max.	g/kg	4
Supply air temperature	max.	°C	60
Temperature of the heating medium <sup>1)</sup>	max.	°C	90
Pressure of the heating/cooling 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

<sup>1)</sup> Design for higher temperatures on request

Table D3: Application limits



#### Notice

The increase of moisture content in the room is limited to a maximum of 2 g/kg.

#### 3.3 Heat recovery system (HRS)

Unit type		KHC-6	KHC-9
Temperature efficiency, dry	%	57	57
Temperature efficiency, wet	%	61	64

Table D4: Thermal transfer level of the plate heat exchanger

#### 3.4 Air filtration

Filter	Fresh air	Extract air
Class acc. to ISO 16890	ISO coarse 50%	ISO coarse 50%
Class acc. to EN 779	G4	G4
Factory setting of differential pressure switches	250 Pa	300 Pa

Table D5: Air filtration

#### 3.5 Electrical connection

Unit type		KHC-6	KHC-9
Supply voltage	V AC	3 × 400	3 × 400
Permitted voltage tolerance	%	± 5	± 5
Frequency	Hz	50	50
Connected load	kW	7.18	10.98
Current consumption max.	A	12.02	18.02
Series fuse	A	13	20

Table D6: Electrical connection

### 3.6 Flow rate, product parameters

Unit type		KHC-6			KHC-9					
Nominal air flow rate	m³/h	7000			10500					
	m³/s	1.94			2.92					
Floor area covered	m²	661			1194					
Static efficiency of the fans	%	73.4			68.7					
Coil type		AC	BC	CC	AC	AD	BC	BD	CC	CD
Nominal external pressure										
Supply air	Pa	310	280	230	140	90	120	70	60	10
Extract air	Pa	390	390	390	250	250	250	250	250	250
Effective electric power input	kW	3.54	3.61	3.72	6.84	7.02	6.91	7.09	7.12	7.30

Table D7: Technical data

### 3.7 Heat output

Fresh air temp.		-5 °C						-15 °C					
Size	Type	Q	Q <sub>TG</sub>	H <sub>max</sub>	t <sub>s</sub>	Δp <sub>W</sub>	m <sub>W</sub>	Q	Q <sub>TG</sub>	H <sub>max</sub>	t <sub>s</sub>	Δp <sub>W</sub>	m <sub>W</sub>
		kW	kW	m	°C	kPa	l/h	kW	kW	m	°C	kPa	l/h
KHC-6	A	42.0	21.4	21.6	27.1	10	1804	44.6	14.5	25.0	24.2	12	1918
	B	60.7	40.1	16.1	35.0	18	2609	64.5	34.4	17.3	32.6	21	2772
	C	99.3	78.7	11.8	51.4	23	4266	105.4	75.3	12.0	50.0	26	4530
KHC-9	A	72.8	41.8	20.3	29.8	11	3125	77.3	32.1	23.0	27.1	13	3321
	B	93.7	62.8	16.7	35.8	18	4027	99.6	54.4	17.9	33.4	20	4280
	C	157.1	126.2	12.1	53.7	26	6750	166.9	121.7	12.3	52.4	29	7171
Legend:	Type = Type of coil Q = Coil heat output Q <sub>TG</sub> = Output to cover fabric heat losses H <sub>max</sub> = Maximum mounting height t <sub>s</sub> = Supply air temperature Δp <sub>W</sub> = Water pressure drop m <sub>W</sub> = 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: Heat output



#### Notice

The output for coverage of the fabric heat losses (Q<sub>TG</sub>) allows for the ventilation heat requirement (Q<sub>V</sub>) and the energy recovery output (Q<sub>ER</sub>) under the respective air conditions.

The following applies:

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

### 3.8 Cooling capacities

Size	Type	$Q_{sen}$	$Q_{tot}$	$Q_{TG}$	$t_s$	$\Delta p_W$	$m_W$	$m_C$	$Q_{sen}$	$Q_{tot}$	$Q_{TG}$	$t_s$	$\Delta p_W$	$m_W$	$m_C$
		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 %						
KHC-6	C	24.0	26.2	15.2	15.5	22	3750	3.2	21.4	40.6	12.6	16.6	52	5809	28.2
KHC-9	C	37.8	41.3	24.7	15.0	24	5919	5.1	33.8	62.8	20.6	16.2	55	8998	42.7
	D	45.5	52.7	32.3	12.9	23	7554	10.7	41.7	81.1	28.6	13.9	54	11618	57.9
Fresh air conditions		32 °C / 40 %							32 °C / 60 %						
KHC-6	C	29.2	42.1	20.4	17.3	56	6022	18.9	26.6	56.4	17.9	18.4	101	8073	43.7
KHC-9	C	46.0	66.3	32.8	16.7	61	9493	29.8	42.0	87.7	28.8	17.8	107	12560	67.2
	D	56.2	84.3	43.1	13.8	58	12065	41.2	52.5	112.5	39.3	14.9	104	16113	88.3
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 $\Delta p_W$ = Water pressure drop $m_W$ = Water quantity $m_C$ = Condensate quantity														
Reference:	Cooling medium: 6/12 °C <b>At fresh air temperature 28 °C:</b> Room air: 22 °C Extract air: 24 °C / 50 % rel. humidity <b>At fresh air temperature 32 °C:</b> Room air: 26 °C Extract air: 28 °C / 50 % rel. humidity														

Table D9: Cooling capacity



#### 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.

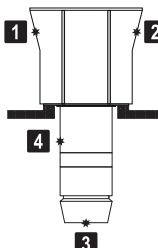
The following applies:

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

### 3.9 Sound data

Operating mode			VE				
Item			1	2	3	4	
KHC-6	Sound pressure level (at a distance of 5 m) <sup>1)</sup>	dB(A)	52	65	59	52	
	Total sound power level		dB(A)	74	87	81	74
	Octave sound power level	63 Hz	dB	44	48	44	45
		125 Hz	dB	52	59	55	53
		250 Hz	dB	70	76	72	69
		500 Hz	dB	69	79	74	69
		1000 Hz	dB	65	83	78	65
		2000 Hz	dB	64	80	73	64
		4000 Hz	dB	59	75	67	59
		8000 Hz	dB	65	78	70	65
KHC-9	Sound pressure level (at a distance of 5 m) <sup>1)</sup>	dB(A)	58	72	67	58	
	Total sound power level		dB(A)	80	94	89	80
	Octave sound power level	63 Hz	dB	52	56	52	52
		125 Hz	dB	59	67	63	60
		250 Hz	dB	75	83	79	75
		500 Hz	dB	76	87	82	76
		1000 Hz	dB	73	90	85	73
		2000 Hz	dB	70	89	82	69
		4000 Hz	dB	63	82	75	63
		8000 Hz	dB	64	81	73	66

1) with hemispherical radiation in a low-reflection environment



1

Fresh air

2

Exhaust air

3

Supply air

4

Extract air

Table D10: Sound data

### 3.10 Dimensions and weights

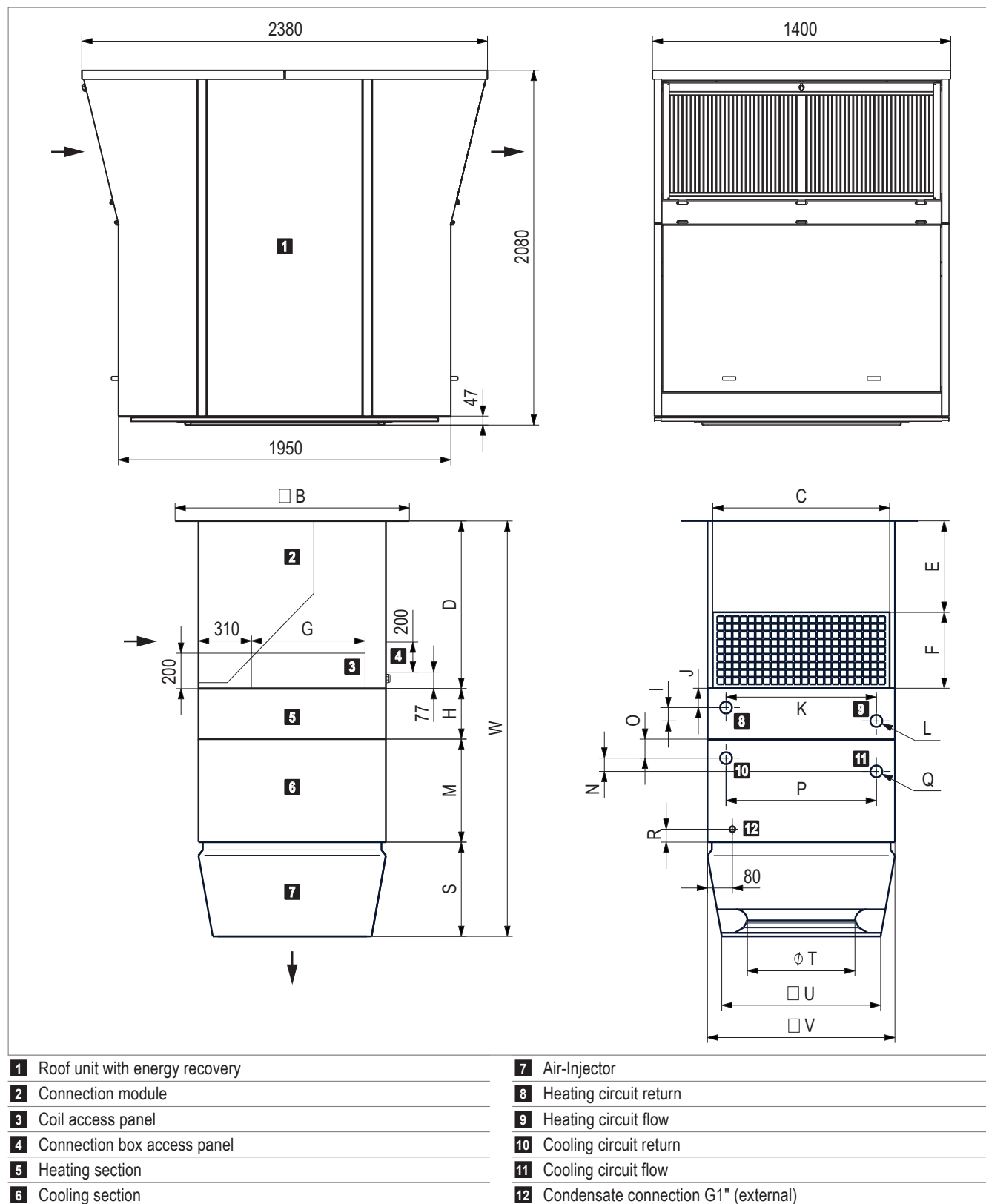


Fig. D4: Dimensional drawing (dimensions in mm)

Unit type		KHC-6				KHC-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 D11: Unit dimensions

Unit type		KHC-6			KHC-9		
Heating coil type		A	B	C	A	B	C
I	mm	78	78	78	78	78	78
J	mm	101	101	101	111	111	111
K	mm	758	758	758	882	882	882
L (internal thread)	"	Rp 1¼	Rp 1¼	Rp 1¼	Rp 1½	Rp 1½	Rp 1½
Water content of the coil	l	4.6	4.6	7.9	7.4	7.4	12.4

Fig. D5: Dimensions for hydraulic connection of the heating section

Unit type		KHC-6		KHC-9	
Cooling coil type		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	

Fig. D6: Dimensions for hydraulic connection of the cooling section

Unit type	KHC	6-AC	6-BC	6-CC	9-AC	9-AD	9-BC	9-BD	9-CC	9-CD
Total	kg	779	779	786	997	1016	997	1016	1007	1026
Roof unit	kg	567	567	567	701	701	701	701	701	701
Below-roof unit	kg	212	212	219	296	315	296	315	306	325
Air-Injector	kg	37	37	37	56	56	56	56	56	56
Heating section	kg	30	30	37	44	44	44	44	54	54
Cooling section	kg	70	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 D12: Weights of the RoofVent® KHC

## 4 Specification texts

### RoofVent® KHC

Supply and extract air handling unit with energy recovery for heating and cooling high spaces in the 4-pipe system. 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

---

#### 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 bag filter elements, class ISO coarse 50 % (G4), fully incinerable, easy to change, including differential pressure switch for filter monitoring.

#### Extract air filter:

Designed as highly efficient bag filter elements, class ISO coarse 50 % (G4), fully incinerable, easy to change, including differential pressure switch for filter monitoring.

#### Plate heat exchanger:

Cross-flow 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 fan, 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 polyethylene, with:

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

### 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 polyethylene, with:

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

### ColdClimate design:

Units in ColdClimate design are suitable for temperatures down to -40 °C. The following features ensure trouble-free operation of the system:

- Actuators and gear wheels of the fresh air and bypass dampers are provided with a heating facility.
- To protect the plate heat exchanger against freezing, a special de-icing switch overrides the automatic unit control when necessary.
- The water temperature on the coil is also monitored by the frost controller.
- The return temperature of the heating medium is monitored by the return temperature sensor.
- Condensate from the plate heat exchanger is led to a condensate drain connection in the below-roof unit.

### 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 silencers:**

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

**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.

**TopTronic® C control systems**

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

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

Zone 1: \_\_\_\_ x Unit type \_\_\_\_\_

Zone 2: \_\_\_\_ x Unit type \_\_\_\_\_

Zone 3: \_\_\_\_ x Unit type \_\_\_\_\_

...

**System structure:**

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

**Operation:**

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

**Control functions:**

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

**Alarms, protection:**

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

**Options for the zone control panel:**

- Design for heating (KH, KC, KHC)
- Design for cooling (KC, KHC)
- Cooling lock switch (KC, KHC)
- Heating/cooling switch (KC, KHC)
- Alarm lamp
- Socket
- Additional room air temperature sensors (max. 3)
- Combination sensor room air quality, temperature and humidity (protection rating IP20 or IP65)
- Combination sensor fresh air temperature and humidity (protection rating IP65)
- 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 (KH, KC, KHC)





## Options

1 Type code .....	58
2 ColdClimate design .....	60
3 Connection module .....	60
4 Design with 2 Air-Injectors .....	61
5 Design without Air-Injector .....	61
6 Paint finish of below-roof unit .....	61
7 Fresh air and exhaust air silencers .....	62
8 Supply air and extract air silencers .....	63
9 Mixing valve .....	63
10 Condensate pump .....	64
11 Socket .....	64
12 Energy monitoring .....	64
13 Return temperature sensor .....	64
14 Pump control for mixing or injection system .....	64

## 1 Type code

**KH - 9 B C - K1 / ST . -- / V0 . D1 . LU / AF . SI / M . KP . -- . SD / TC . EM . PH . RF**

### Unit type

- KH Unit with heating section
- KC Unit with heating/cooling section
- KHC Unit with heating and cooling section

### Unit size

- 6 Size 6
- 9 Size 9

### Heating section

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

### Heating/cooling section

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

### Heat recovery

- K1 Temperature efficiency 57 %

### Design

- ST Standard
- CC ColdClimate design

### Reserve

### 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

**KH - 9 B C - K1 / ST . -- / V0 . D1 . LU / AF . SI / M . KP . -- . SD / TC . EM . PH . RF**

#### Silencers outside

- without
- AF Fresh air and exhaust air silencer

#### Silencers inside

- without
- SI Supply air and extract air silencer

#### Hydraulics

- without
- M Mixing valve

#### Condensate pump

- without
- KP Condensate pump

#### Reserve

#### Socket

- without
- SD Socket in the unit

#### 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

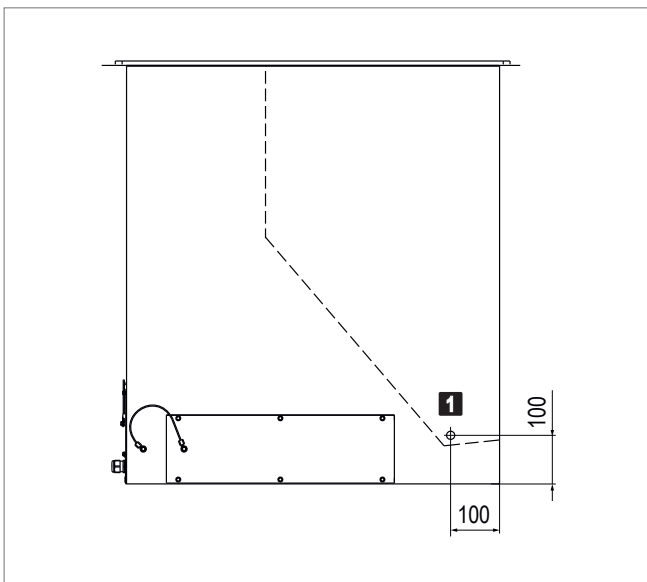
Table E1: Type code

## 2 ColdClimate design

RoofVent® units in ColdClimate design are suitable for use in regions where outside temperatures fall below  $-30\text{ }^{\circ}\text{C}$ . The minimum outside temperature allowed is  $-40\text{ }^{\circ}\text{C}$ . The following features ensure trouble-free operation of the system:

### Plate heat exchanger

- To protect the plate heat exchanger against freezing, a differential pressure sensor is installed for monitoring its pressure drop. When the pressure difference becomes too high due to ice formation a special de-icing switch overrides the automatic unit control:
  - The alarm 'De-icing energy recovery' is shown.
  - The unit runs in local 'Exhaust air' mode until the ice has defrosted and then switches back to automatic mode.
- Condensate from the plate heat exchanger is not drained onto the roof but through a hose inside the connection module.
  - Install an condensate drain with trap in accordance with the local provisions.



1 Condensate drain connection G  $\frac{3}{4}$ " (external thread)

Fig. E1: Dimensional drawing for condensate drain connection (in mm)

### Fresh air and bypass dampers

Actuators and gear wheels of the fresh air and bypass dampers are provided with a heating facility.

### Frost control

In addition to the air temperature, the water temperature in the heating/cooling coil is also monitored by the frost controller. For this, the capillary end of the frost controller is inserted in an immersion sleeve in the return manifold of the heating coil.

- If the water temperature falls below  $11\text{ }^{\circ}\text{C}$ , the mixing valve steadily opens.
- On reaching a water temperature of  $5\text{ }^{\circ}\text{C}$  or lower the mixing valve is fully open, the unit switches off and a frost alarm is activated.



### Notice

Always use a return temperature sensor for units in ColdClimate design. It triggers frost pre-control at the heating valve to prevent the system possibly being shut down due to frost.

### Requirements for on-site installations

#### Hydraulic circuit:

A mixing system must be installed in the load circuit. (For mixing valve and pump specifications please refer to section 14.)

#### Electrical installation:

At low outside temperatures, a cold start of the fans can cause damage to the unit. Therefore:

- A continuous power supply for the fans must be ensured so that they do not cool down too much.
- After a power failure, there is a waiting period of 20 minutes before the fans start up again.



### Notice

Always use a combination sensor QF65 for measuring the outdoor temperature. It is suitable for temperatures down to  $-40\text{ }^{\circ}\text{C}$ .



### Notice

Always use the option 'Socket in the unit' for units in ColdClimate design.

## 3 Connection module

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

## 4 Design with 2 Air-Injectors

A supply air duct can be connected to the RoofVent® unit for distributing the supply air over a very wide area. 2 Air-Injectors can be installed on this. The supply air duct and the cabling must be provided by the client.



### Notice

An actuator is installed in each of the 2 Air-Injectors. The supply air temperature sensor is enclosed in the connection module for on-site installation in the supply air duct.

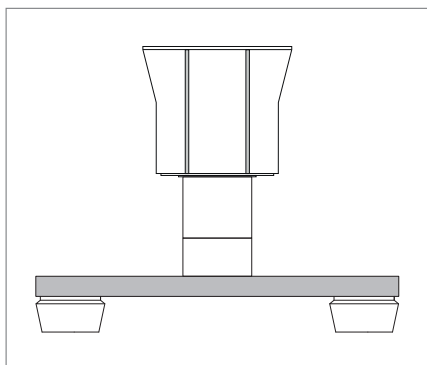


Fig. E2: RoofVent® unit with supply air duct and 2 Air-Injectors

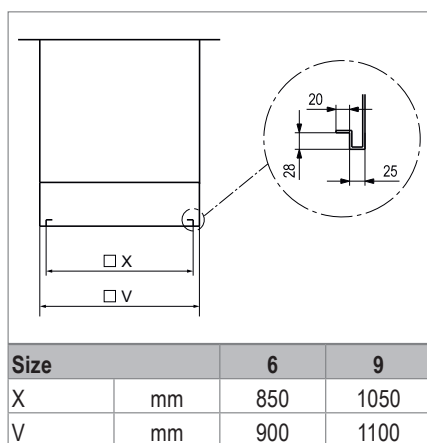


Fig. E3: Connection dimensions for supply air duct (in mm)

## 5 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.



### Notice

The supply air temperature sensor is enclosed in the connection module for on-site installation in the supply air duct.

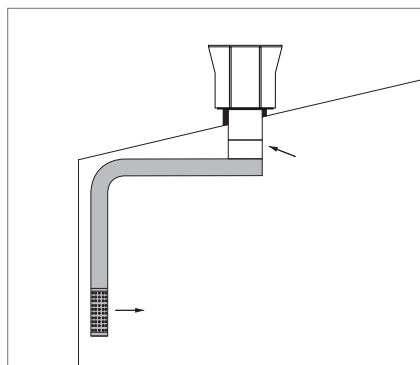


Fig. E4: Connection to an air distribution system supplied by the client

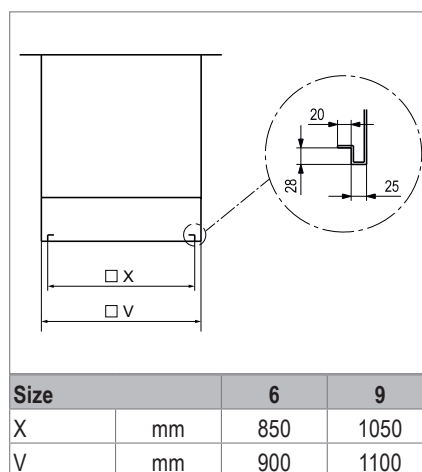


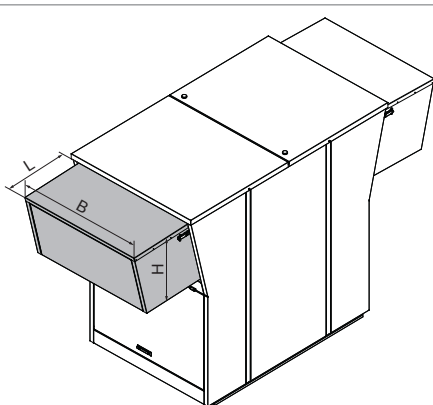
Fig. E5: Connection dimensions for supply air duct (in mm)

## 6 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.

## 7 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.



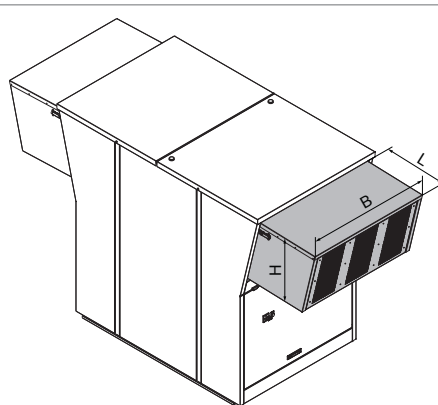
Size		6	9
L	mm	625	625
B	mm	1280	1630
H	mm	650	650
Weight	kg	30	42
Pressure drop	Pa	19	20

Table E2: Technical data of the 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
Sum	3	3

Table E3: Insertion attenuation of the 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	93	100

Table E4: Technical data of the 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
Sum	11	11

Table E5: Insertion attenuation of the 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 ColdClimate design.

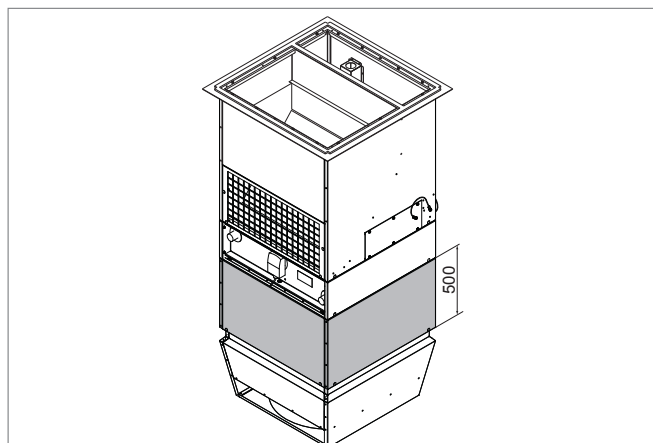
## 8 Supply air and extract air silencers

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.



### Notice

Due to space requirements of the extract air silencer an extended connection module is required (option V1, V2 or V3).



Size		6	9
Weight	kg	53	80
Supply air pressure drop	Pa	41	49
Extract air pressure drop	Pa	0	0

Table E6: Technical data of the 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
<b>Sum</b>	<b>15</b>	<b>15</b>	<b>2</b>	<b>2</b>

Table E7: Insertion attenuation of the supply and extract air silencers (values in dB, relating to the nominal air flow rate)



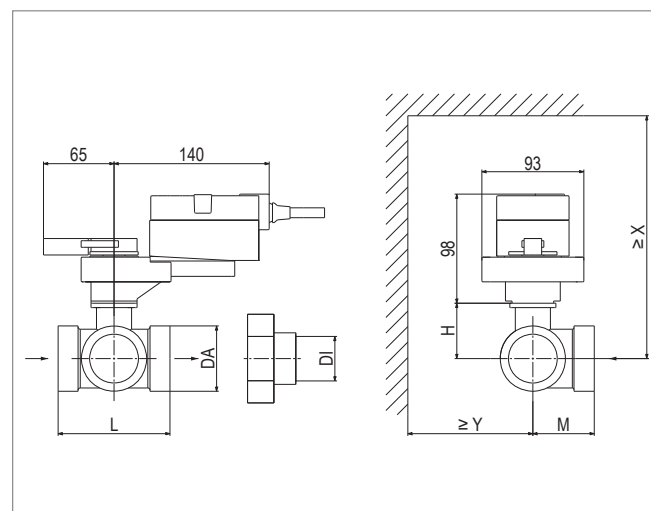
### Notice

Supply air and extract air silencers are not available for units in ColdClimate design.

## 9 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 m³/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	G 2	Rp 1¼	104	46	56	220	90
M-9D	40	16	G 2¼	Rp 1½	115	51	56	230	90

Table E8: Dimensions of mixing valves

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

Table E9: Weights of the mixing valves

## 10 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 E10: Technical data of the condensate pump

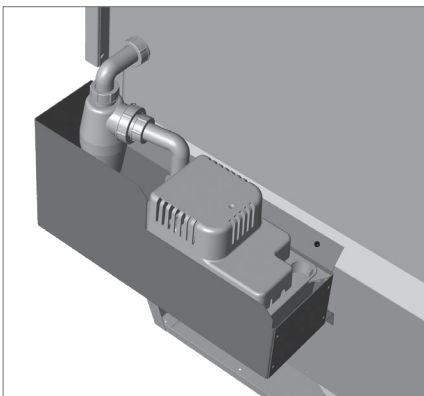


Fig. E6: Condensate pump

## 11 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.

## 12 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.

## 13 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.

## 14 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  $\geq 0.5$ .
- 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 for changeover valves

Use changeover valves conforming to the following specification:

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

### Requirements for pumps

Voltage \_\_\_\_\_ 230 V AC

Current \_\_\_\_\_ up to 4.0 A

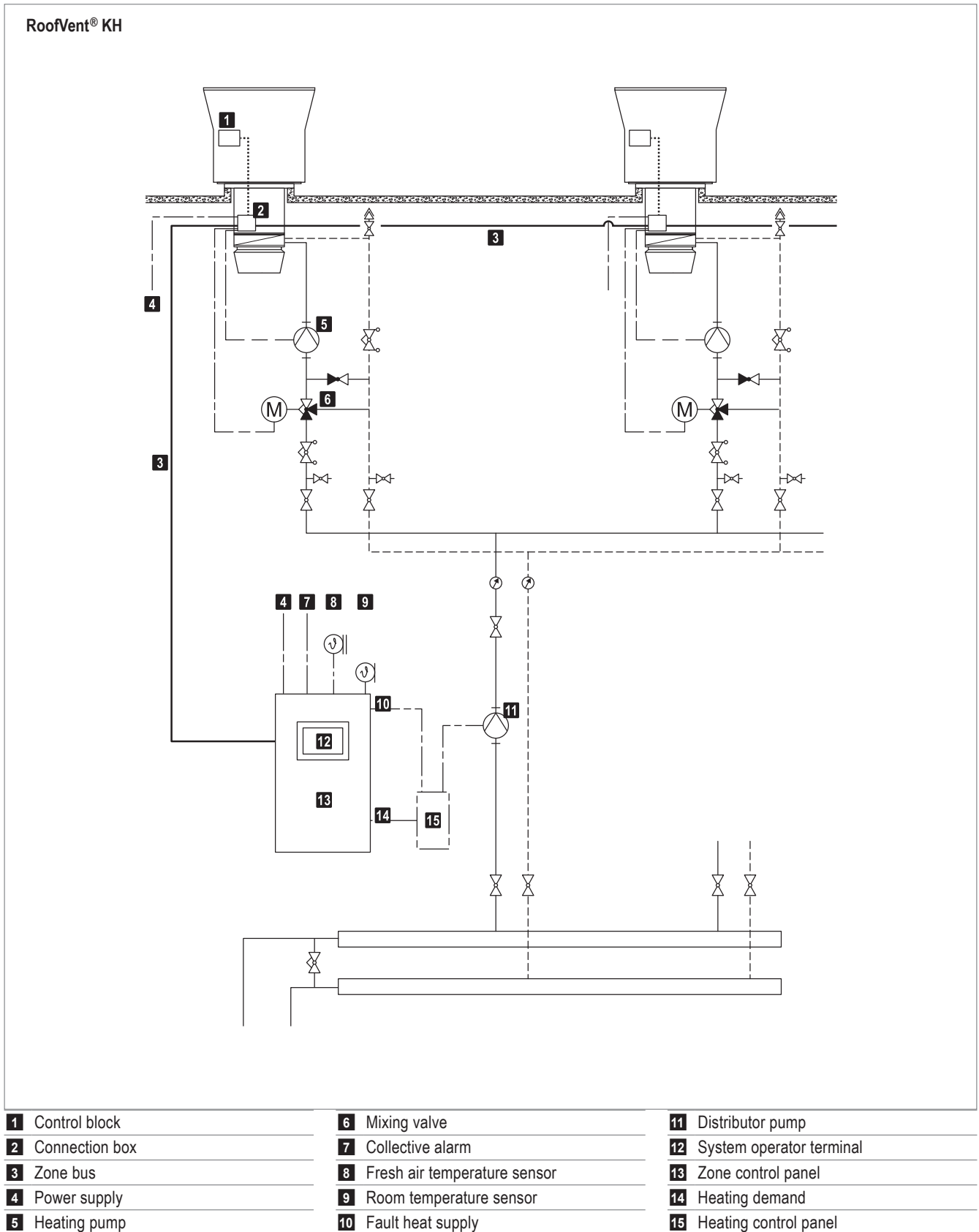


Fig. E7: Schematic diagram for mixing system RoofVent® KH

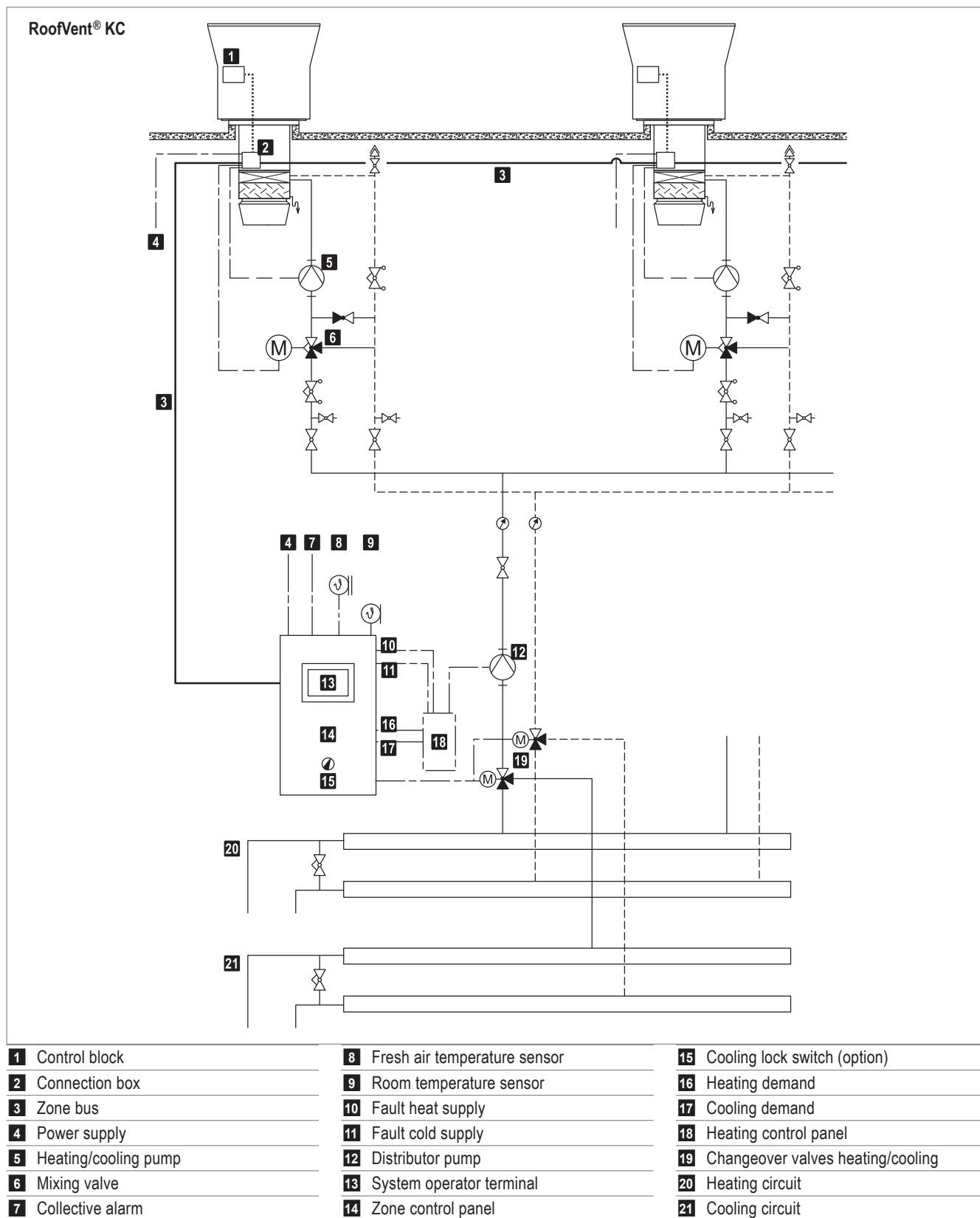
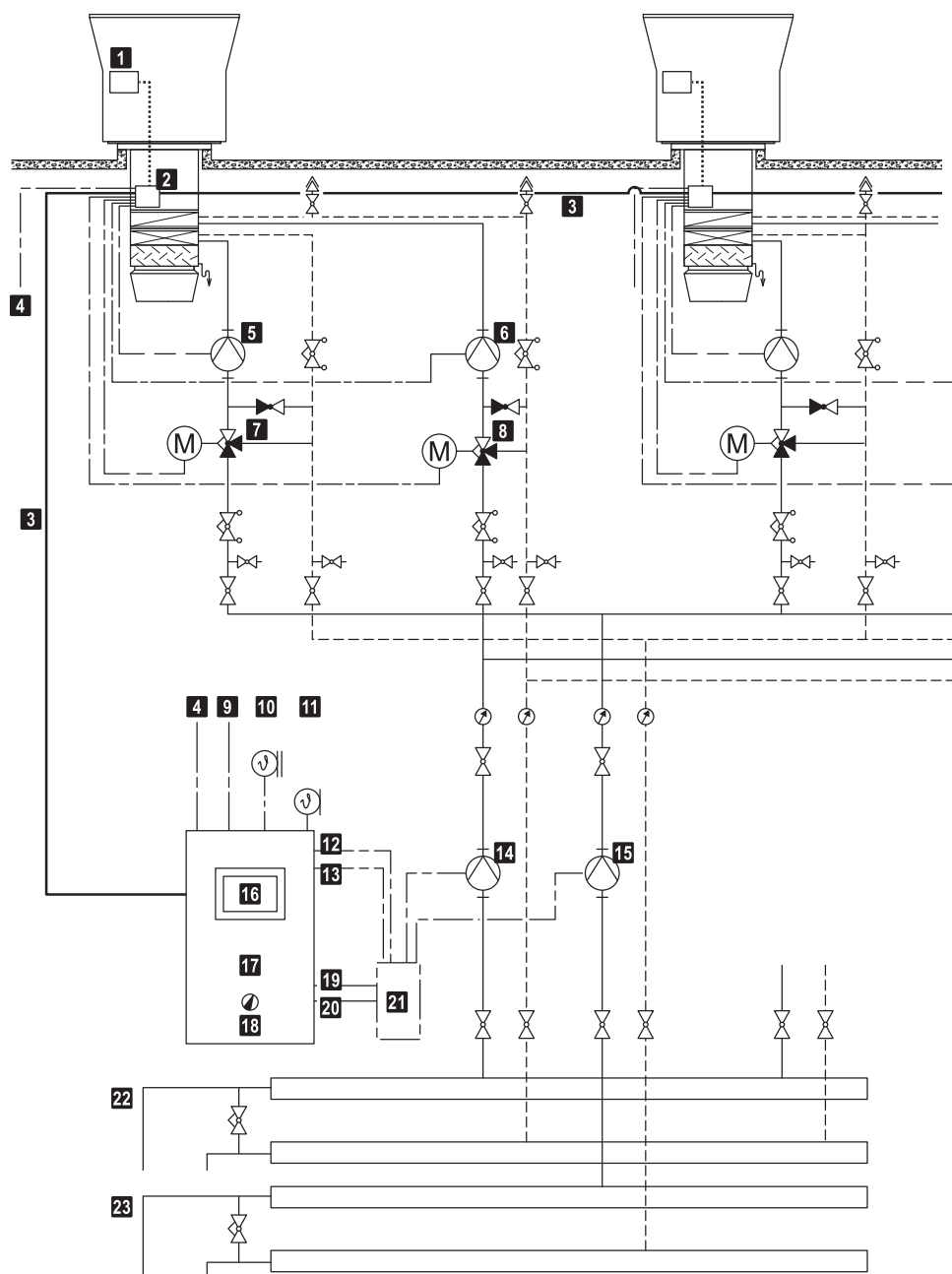


Fig. E8: Schematic diagram for mixing system RoofVent® KC

## RoofVent® KHC



- |                               |  |  |
|-------------------------------|--|--|
| <b>1</b> Control block        | <b>9</b> Collective alarm              | <b>17</b> Zone control panel           |
| <b>2</b> Connection box       | <b>10</b> Fresh air temperature sensor | <b>18</b> Cooling lock switch (option) |
| <b>3</b> Zone bus             | <b>11</b> Room temperature sensor      | <b>19</b> Heating demand               |
| <b>4</b> Power supply         | <b>12</b> Fault heat supply            | <b>20</b> Cooling demand               |
| <b>5</b> Cooling pump         | <b>13</b> Fault cold supply            | <b>21</b> Heating control panel        |
| <b>6</b> Heating pump         | <b>14</b> Distributor pump cooling     | <b>22</b> Heating circuit              |
| <b>7</b> Mixing valve cooling | <b>15</b> Distributor pump heating     | <b>23</b> Cooling circuit              |
| <b>8</b> Mixing valve heating | <b>16</b> System operator terminal     |  |

Fig. E9: Schematic diagram for mixing system RoofVent® KHC





## Transport and Installation

1 Installation .....	70
2 Hydraulic installation .....	74
3 Electrical installation .....	78

## 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 (installation material, filters)
  - 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 section 1.3.
- A sealing compound is required for sealing (e.g. PU foam).
- Define the desired orientation of the units (position of the refrigerant connections).



#### Note

The standard position of the refrigerant 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.

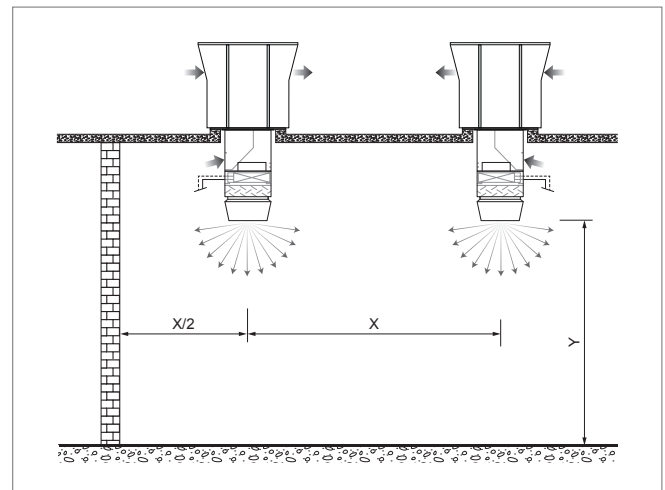


#### Notice

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.

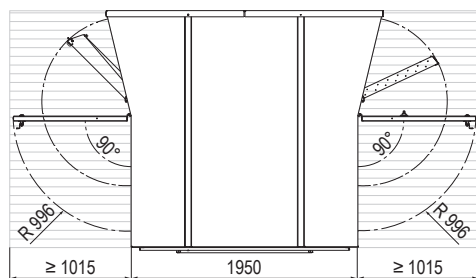


Unit type			KH-6	KH-9	KC-6 KHC-6	KC-9 KHC-9
Distance X	min.	m	14	18	12	17
	max.	m	27	36	25	35
Mounting height Y	min.	m	4	5	4	5
	max. <sup>1)</sup>	m	Approx. 9...25			

<sup>1)</sup> 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 F1: Minimum and maximum distances

## Roof unit



## Roof unit with silencers

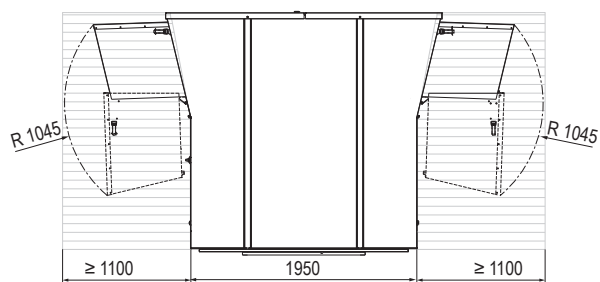


Fig. F1: Space requirements for maintenance on the roof (dimensions in mm)



### Notice

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

### 1.3 Roof frame

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

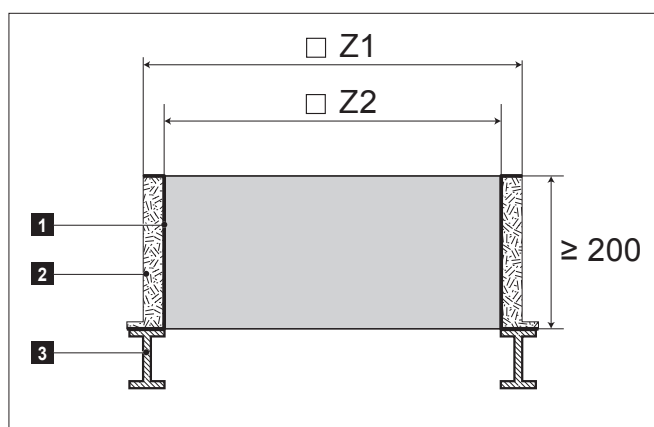
- The extract air grille and the access panels must be freely accessible under the roof.
- The roof frame must protrude at least 200 mm from the roof, so that no water can penetrate during a rainstorm or snowfall.



#### Notice

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

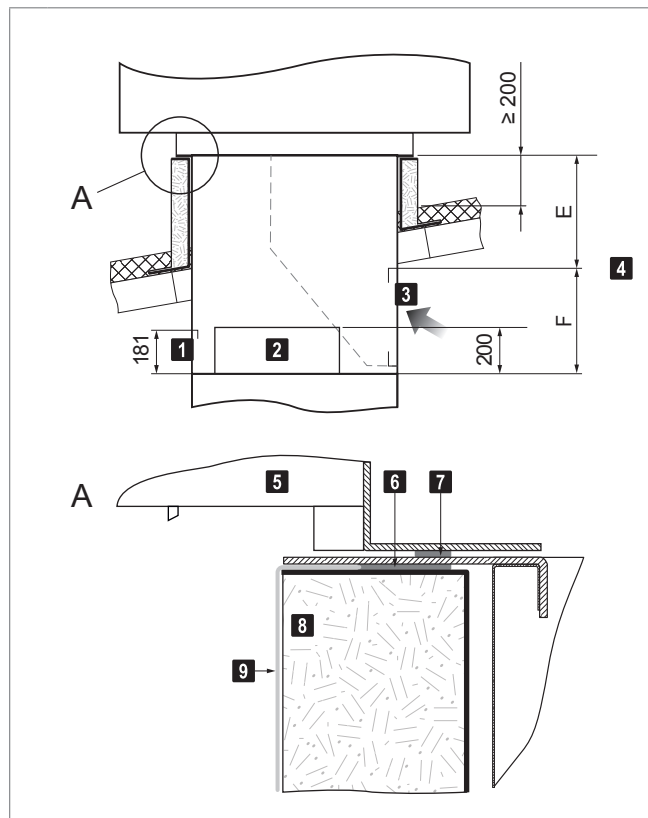
- The opening (dimension Z2) must be large enough to accommodate the below-roof unit.
- The condensate must be able to drain off freely.
- The roof frame must be flat and horizontal.
- Insulate the roof frame before installing the unit (e.g. 40 mm PU foam).
- Please observe the minimum distances when designing the roof frame. 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

Fig. F2: Dimensions for roof frame



- 1 Access panel, connection box
- 2 Access panel, coil (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. F3: Installation of RoofVent® units in the roof frame (dimensions in mm)

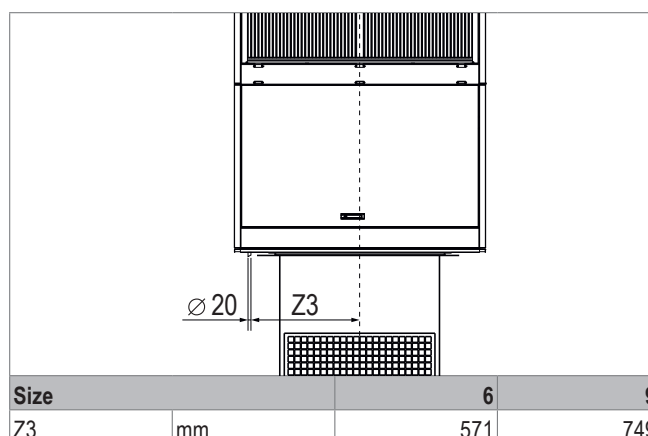


Table F2: Condensate drain of the plate heat exchanger (measured from unit centre)

Size		6	9
Z3	mm	571	749

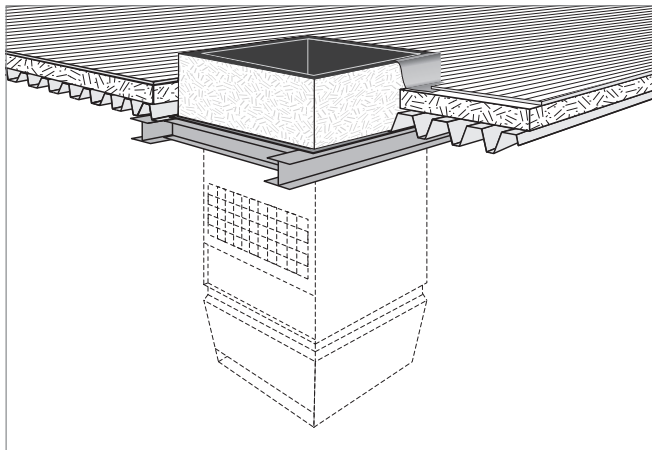


Fig. F4: Conceptual drawing of the roof frame

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)



### Note

Ensure there is sufficient clearance for maintenance work.

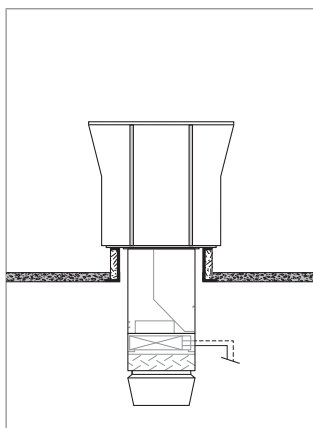


Fig. F5:  
Roof frame with straight side walls

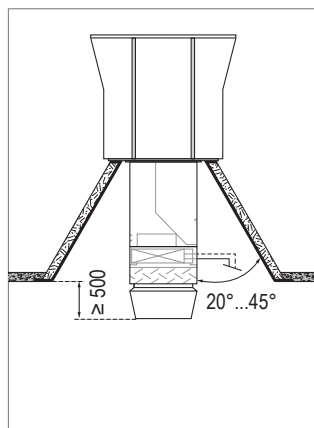


Fig. F6:  
Roof frame with conical side walls

## 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.

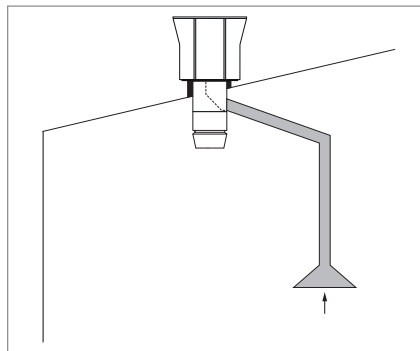
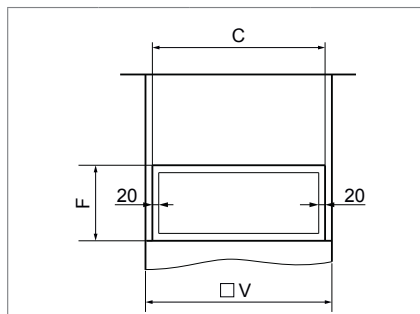


Fig. F7: Extract air duct



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

Table F3: 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 for the boiler system and the distributor circuit

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

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

#### Requirements for mixing valves

- Use 3-way mixing valves with the following flow characteristics:
  - Equal percentage control path
  - Linear bypass
- The valve authority must be  $\geq 0.5$ .
- 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 for changeover valves

Use changeover valves conforming to the following specification:

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

### 2.2 Condensate connection

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

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



#### Notice

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

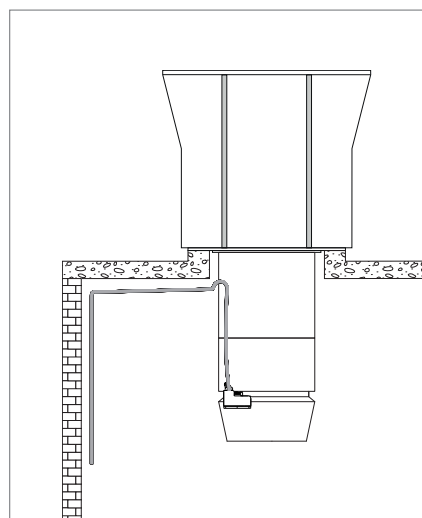
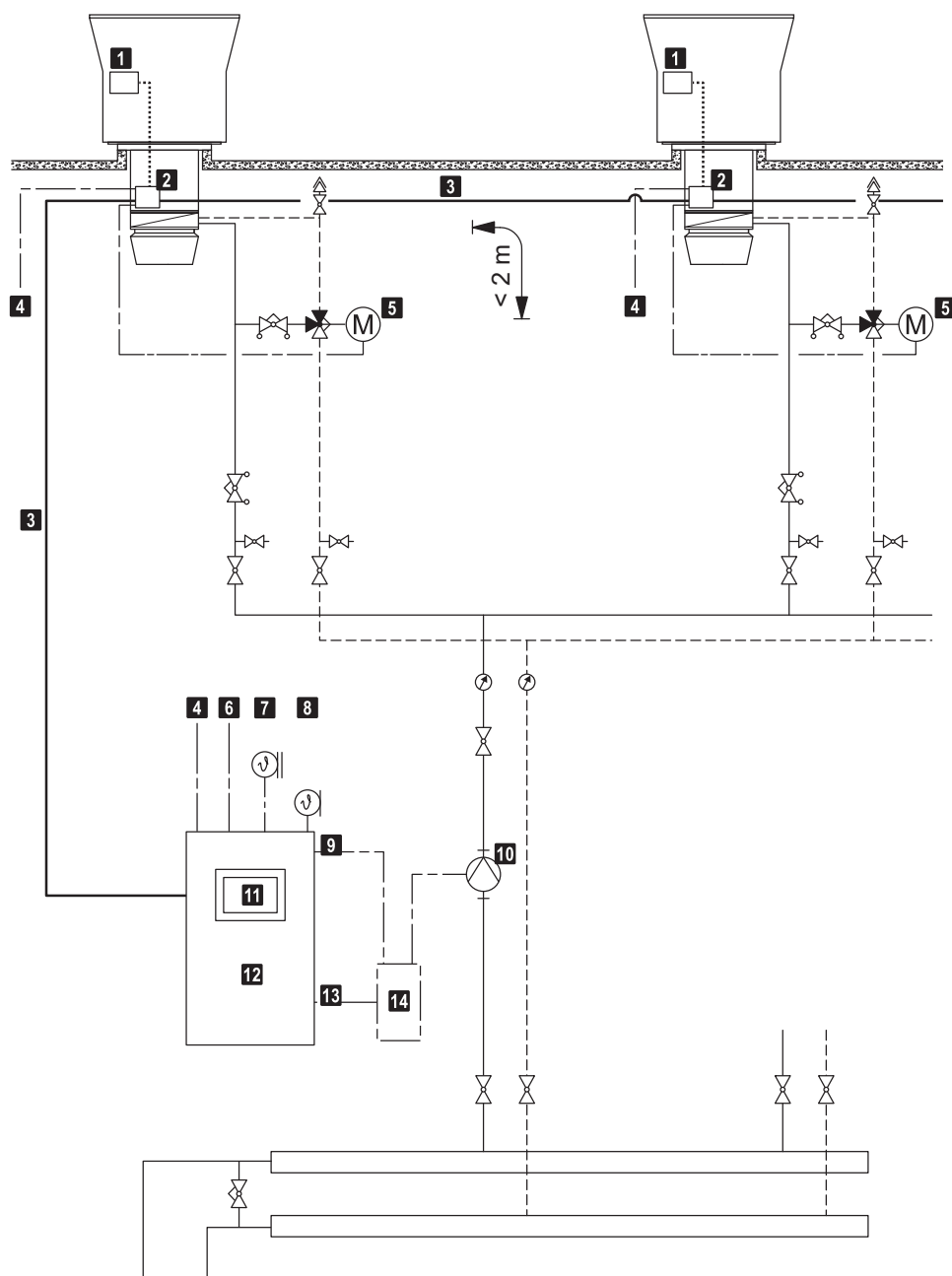


Fig. F8: Condensate line

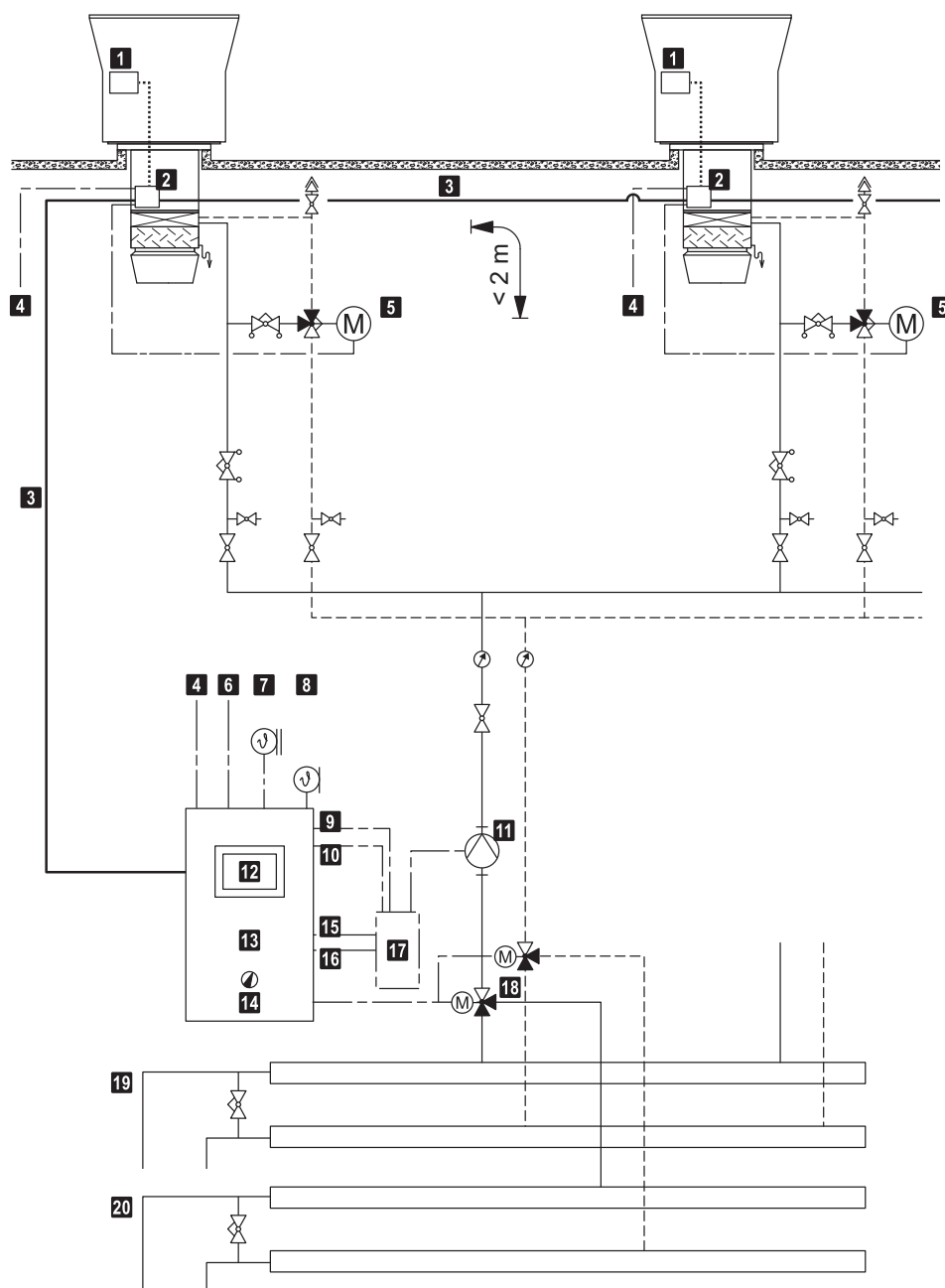
### RoofVent® KH



<b>1</b> Control block	<b>6</b> Collective alarm	<b>11</b> System operator terminal
<b>2</b> Connection box	<b>7</b> Fresh air temperature sensor	<b>12</b> Zone control panel
<b>3</b> Zone bus	<b>8</b> Room temperature sensor	<b>13</b> Heating demand
<b>4</b> Power supply	<b>9</b> Fault heat supply	<b>14</b> Heating control panel
<b>5</b> Mixing valve	<b>10</b> Distributor pump	

Fig. F9: Conceptual drawing for hydraulic diverting system RoofVent® KH

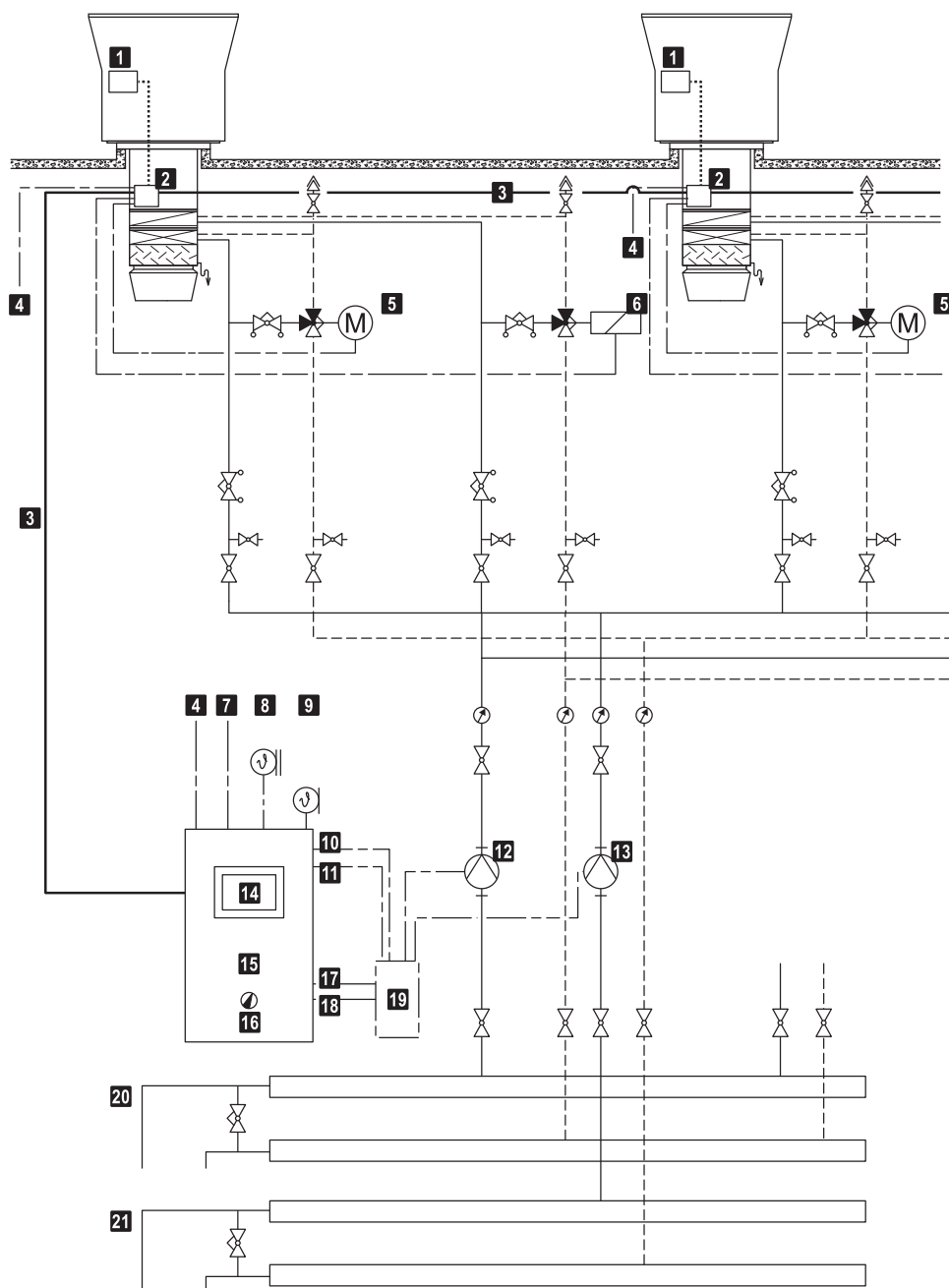
### RoofVent® KC



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

Fig. F10: Conceptual drawing for hydraulic diverting system RoofVent® KC

### RoofVent® KHC



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

Fig. F11: Conceptual drawing for hydraulic diverting system RoofVent® KHC

### 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.



#### Caution

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

- Carry out the electrical installation according to the wiring diagram:
  - Power supply for RoofVent®
  - Zone bus based on system layout
  - Signal lines
- Make the plug connection from the connection box in the below-roof unit to the control block in the roof unit.
- Make the plug connections from the actuator of the Air-Injector, frost controller and supply air sensor to the connection box.
- Wire up mixing valves to the connection box.
- For mixing or injection system: Wire the pump to the connection box.

Component	Designation	Voltage	Cable	Comments
TopTronic® C System control  Zone control panel	Power supply	3 × 400 VAC	NYM-J 5 × ... mm <sup>2</sup>	3-phase
		1 × 230 VAC	NYM-J 3 × ... mm <sup>2</sup>	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 air 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 <sup>2</sup>	max. 3 A

Component	Designation	Voltage	Cable	Comments
	Power supply for units	3 × 400 VAC	NYM-J 5 × 1.5 mm <sup>2</sup> (min.)	RoofVent® units size 6
		3 × 400 VAC	NYM-J 5 × 4.0 mm <sup>2</sup> (min.)	RoofVent® units size 9
		3 × 400 VAC	NYM-J 5 × 1.5 mm <sup>2</sup> (min.)	TopVent® units
	Heating demand	Volt-free max. 250 VAC max. 24 VDC	NYM-O 2 × 1.5 mm <sup>2</sup>	max. 8 A
	Setpoint heating demand	2-10 VDC	J-Y(St)Y 2 × 2 × 0.8 mm	Max. 250 m
	Fault heat supply	24 VAC	NYM-O 2 × 1.5 mm <sup>2</sup>	max. 1 A
	Cooling demand	Volt-free max. 250 VAC max. 24 VDC	NYM-O 2 × 1.5 mm <sup>2</sup>	max. 8 A
	Fault cold supply	24 VAC	NYM-O 2 × 1.5 mm <sup>2</sup>	max. 1 A
	Distributor pump heat supply	3 × 400 VAC	NYM-J 4 × 1.5 mm <sup>2</sup> (min.)	Power supply 3-phase, max. 6 A
		1 × 230 VAC	NYM-J 3 × 1.5 mm <sup>2</sup> (min.)	Power supply 1-phase, max. 6 A
			NYM-O 4 × 1.5 mm <sup>2</sup>	Control line
	Distributor pump cold supply	3 × 400 VAC	NYM-J 4 × 1.5 mm <sup>2</sup> (min.)	Power supply 3-phase, max. 6 A
		1 × 230 VAC	NYM-J 3 × 1.5 mm <sup>2</sup> (min.)	Power supply 1-phase, max. 6 A
			NYM-O 4 × 1.5 mm <sup>2</sup>	Control line
	System operator terminal (if external)	24 VAC	NYM-J 3 × 1.5 mm <sup>2</sup>	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 <sup>2</sup>	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 <sup>2</sup>	max. 1 A
	External enabling/setting heating/cooling		NYM-O 2 × 1.5 mm <sup>2</sup>	max. 1 A
	Changeover valve flow	24 VAC	NYM-O 7 × 1.5 mm <sup>2</sup>	
	Changeover valve return	24 VAC	NYM-O 7 × 1.5 mm <sup>2</sup>	
RoofVent®  Ventilation unit	Power supply	3 × 400 VAC	NYM-J 5 × 1.5 mm <sup>2</sup> (min.)	RoofVent® units size 6
		3 × 400 VAC	NYM-J 5 × 4.0 mm <sup>2</sup> (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 <sup>2</sup>	max. 1 A
	Forced heating	24 VAC	NYM-J 2 × 1.5 mm <sup>2</sup>	max. 1 A
	Mixing valve heating	24 VAC	NYM-O 5 × 1.0 mm <sup>2</sup>	
	Mixing valve cooling	24 VAC	NYM-O 4 × 1.0 mm <sup>2</sup>	
	Heating pump	230 VAC	NYM-J 3 × 1.5 mm <sup>2</sup>	Power supply
		24 VAC	NYM-O 4 × 1.0 mm <sup>2</sup>	Control line
	Cooling pump	230 VAC	NYM-J 3 × 1.5 mm <sup>2</sup>	Power supply
		24 VAC	NYM-O 4 × 1.0 mm <sup>2</sup>	Control line

Table F4: Cable list for on-site connections





## System design

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3 Checklist for project discussions .....	85

# 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"> <li>Hall geometry (L × W × H)</li> <li>Required fresh air flow rate</li> <li>Internal heat gains (machines, lighting, etc.)</li> <li>Heating and cooling with central energy supply, in the 4-pipe system</li> <li>Optimisation of the ventilation quality (no limitation on the number of units)</li> </ul>		65 × 42 × 9 m 42000 m³/h 33 kW → Unit type KHC → Unit size 6
Design conditions heating:	<ul style="list-style-type: none"> <li>Fabric heat losses</li> <li>Fresh air temperature</li> <li>Room temperature</li> <li>Extract air temperature</li> <li>Temperature of the heating medium</li> </ul>	115 kW −12 °C 18 °C 20 °C / 40 %rh 60/40 °C
Design conditions cooling:	<ul style="list-style-type: none"> <li>Transmission sensible gains</li> <li>Fresh air conditions</li> <li>Room air conditions</li> <li>Extract air temperature</li> <li>Temperature of the cooling medium</li> </ul>	58 kW 32 °C / 50 %rh 26 °C 28 °C / 40 %rh 8/14 °C
<b>Number of units</b> <ul style="list-style-type: none"> <li>Calculate the required number of units:  <math display="block">n = \text{Fresh air flow rate} / \text{nominal air flow rate}</math> </li> </ul>		$n = 42000 / 7000 = 6$ → 6 units (size 6)
<b>Type of heating coil</b> <ul style="list-style-type: none"> <li>Calculate the required output for coverage of fabric heat losses per unit:  <math display="block">Q_{H\_req} = (\text{fabric heat losses} - \text{internal heat gains}) / n</math> </li> <li>Use the 'Hoval HK-Select' selection program to calculate the output for coverage of fabric heat losses under the given design conditions and select the suitable coil type.</li> </ul>		$(115 - 33) / 6 = 13.7 \text{ kW per unit}$ KHC-6A: 3.3 kW KHC-6B: 15.9 kW KHC-6C: 16.5 kW → Heating coil type B
<b>Type of cooling coil</b> <ul style="list-style-type: none"> <li>Calculate the required output for coverage of transmission sensible gains per unit:  <math display="block">Q_{C\_req} = (\text{transmission sensible gains} + \text{internal heat gains}) / n</math> </li> <li>Use the 'Hoval HK-Select' selection program to calculate the output for coverage of transmission sensible gains under the given design conditions and select the suitable coil type.</li> </ul>		$(58 + 33) / 6 = 15.2 \text{ kW per unit}$ KHC-6...C: 16.5 kW → Cooling coil type C

Checks	
<ul style="list-style-type: none"> <li>Effective air flow rate  <math>V_{\text{eff}} = \text{Nominal air flow rate} \times n</math> </li> </ul>	$7000 \times 6 = 42000 \text{ m}^3/\text{h}$ $42000 \text{ m}^3/\text{h} \geq 42000 \text{ m}^3/\text{h}$ → OK
<ul style="list-style-type: none"> <li>Effective heat output  <math>Q_{\text{H\_effective}} = \text{Output for coverage of fabric heat losses} \times n</math> </li> </ul>	$15.9 \times 6 = 95.4 \text{ kW}$ $95.4 \text{ kW} > (115 - 33) \text{ kW}$ → OK
<ul style="list-style-type: none"> <li>Mounting height  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.  <math>Y = \text{Hall height} - \text{length of below-roof unit}</math> </li> </ul>	$9000 - 2320 = 6680 \text{ mm}$ $Y_{\text{min}} = 4.0 \text{ m} < 6.68 \text{ m}$ → OK $Y_{\text{max}} = 24.9 \text{ m} > 6.68 \text{ m}$ → OK
<ul style="list-style-type: none"> <li>Effective cooling capacity  <math>Q_{\text{C\_effective}} = \text{Output for coverage of transmission sensible gains} \times n</math> </li> </ul>	$16.5 \times 6 = 99 \text{ kW}$ $99 \text{ kW} > (58 + 33) \text{ kW}$ → OK
<ul style="list-style-type: none"> <li>Floor area reached  Compare the floor area reached with the base area of the hall (L × W).  <math>A = \text{Floor area reached} \times n</math> </li> </ul>	$661 \times 6 = 3966 \text{ m}^2$ $65 \times 42 = 2730 \text{ m}^2$ $3966 \text{ m}^2 > 2730 \text{ m}^2$ → OK
<ul style="list-style-type: none"> <li>Minimum and maximum clearances  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. </li> </ul>	$n = 6 = 3 \times 2$ Unit clearance in length: $X = 65 / 3 = 21.7 \text{ m}$ $X_{\text{max}} = 25.0 \geq 21.7 \text{ m}$ $X_{\text{min}} = 12.0 \leq 21.7 \text{ m}$ → OK Unit clearance in width: $X = 42 / 2 = 21.0 \text{ m}$ $X_{\text{max}} = 25.0 \geq 21.0 \text{ m}$ $X_{\text{min}} = 12.0 \leq 21.0 \text{ m}$ → 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 RoofVent® unit	Annually by Hoval customer service

Table G1: Maintenance schedule

Project

Project No.

Name

Function

Address

Tel.

Fax

E-mail

Date

### Information about the hall

Application

Length

Type

Width

Insulation

Height

Is the roof strong enough?

☐ yes ☐ no

Are there window areas?

☐ yes ☐ no

Percentage?

Is there a crane?

☐ yes ☐ no

Height?

Is there enough space for installation and servicing?

☐ yes ☐ no

Are there any voluminous installations or machines?

☐ yes ☐ no

Are pollutants present?

☐ yes ☐ no

Which?

– If yes, are they heavier than air?

☐ yes ☐ no

Is oil contained in the extract air?

☐ yes ☐ no

Is dust present?

☐ yes ☐ no

Dust level?

Is there high humidity?

☐ yes ☐ no

How much?

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?  m<sup>3</sup>/h

Fresh air / hall area  m<sup>3</sup>/h per m<sup>2</sup>

Air change rate

Internal heat gains (machines, ...)  kW

Heating and cooling

Unit size

Control zones

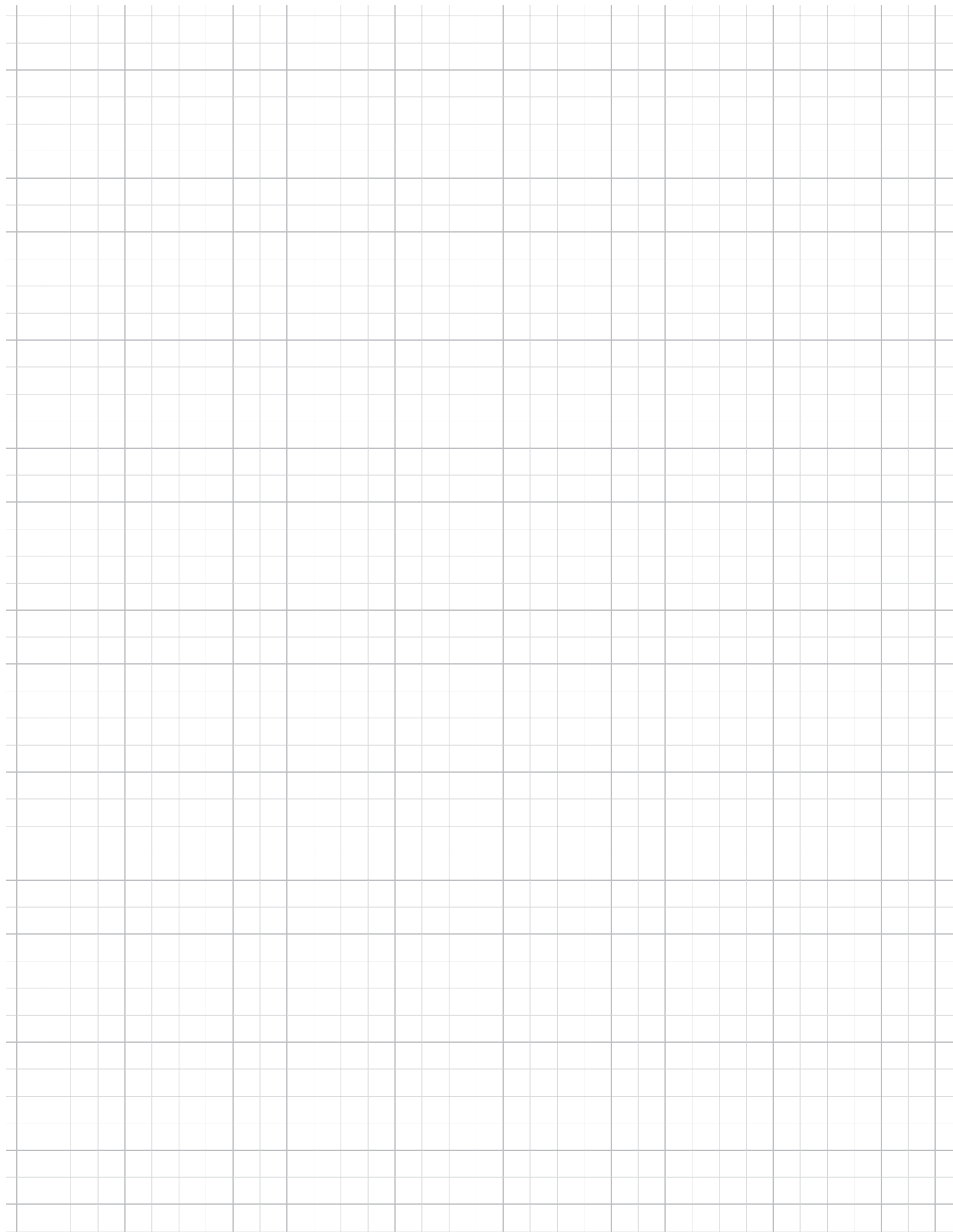
### Design conditions heating

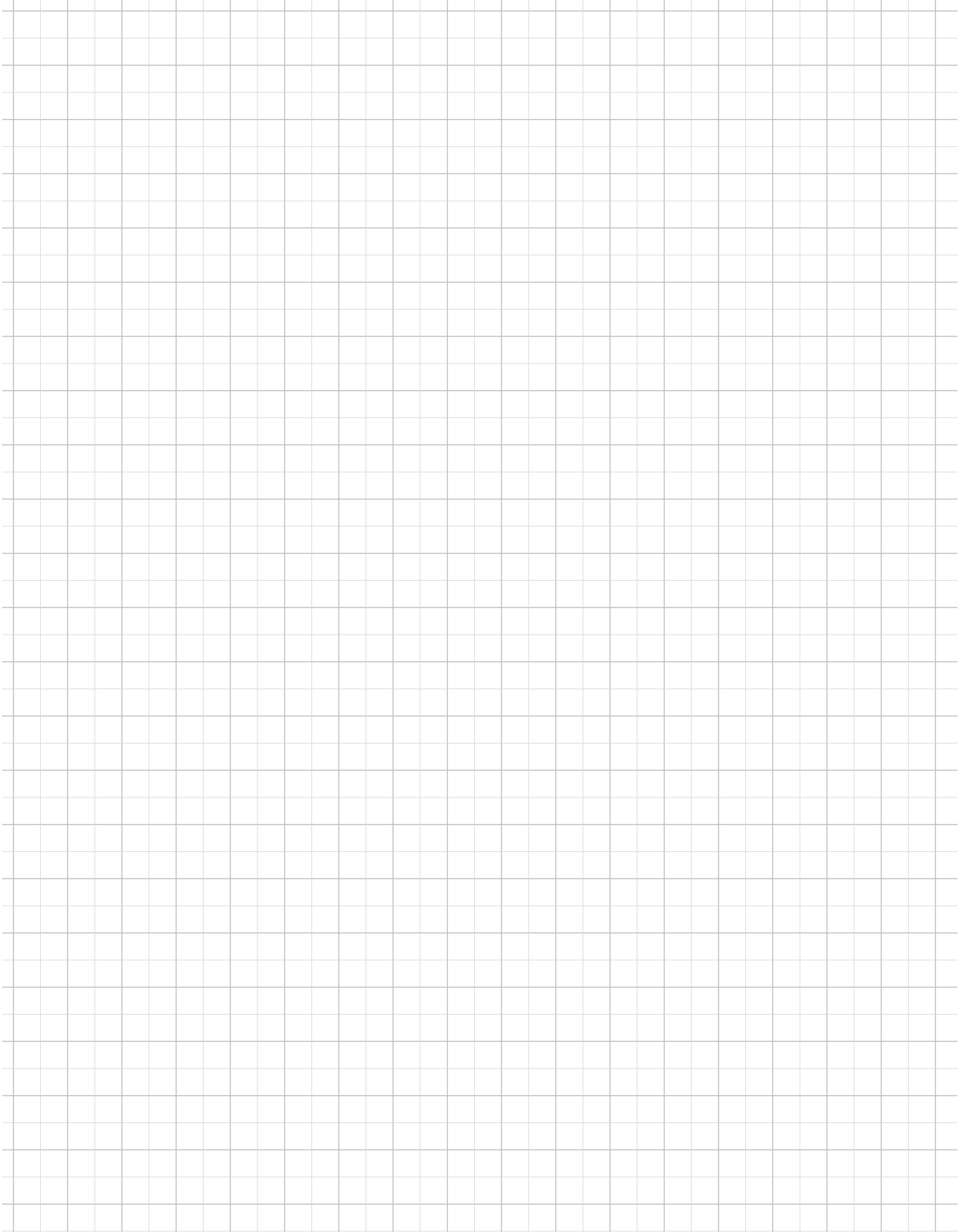
- Standard outside temperature and humidity  °C  %
- Room temperature  °C
- Extract air temperature and humidity  °C  %
- Fabric heat losses  kW

### Design conditions cooling

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

### Further information







# Hoval quality. You can count on us.

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

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

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

## Responsibility for energy and environment



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