
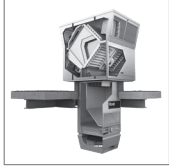






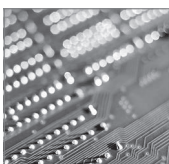


Hoval RoofVent® RH | RC | RHC | R

Design handbook

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



| | | | |
|---|--|-----|---|
|  | Hoval Indoor Climate Systems Efficient. Flexible. Reliable. | 3 | A |
|  | RoofVent® RH Supply and extract air handling unit with efficient air distribution for heating spaces up to 25 m in height with central heat supply | 7 | B |
|  | RoofVent® RC Supply and extract air handling unit with efficient air distribution for heating and cooling spaces up to 25 m in height with central heat and cold supply (2-pipe system) | 27 | C |
|  | RoofVent® RHC Supply and extract air handling unit with efficient air distribution for heating and cooling spaces up to 25 m in height with central heat and cold supply (4-pipe system) | 47 | D |
|  | RoofVent® R Supply and extract air handling unit with efficient air distribution for use in spaces up to 25 m in height | 67 | E |
|  | Options | 83 | F |
|  | Transport and installation | 97 | G |
|  | System design | 109 | H |
|  | Control systems Hoval TopTronic® C → see 'Control systems for Hoval Indoor Climate Systems' manual | | |



Hoval Indoor Climate Systems

Efficient. Flexible. Reliable.

A





Efficient. Flexible. Reliable.

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

Diverse range of units ensures flexibility

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

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

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

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

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

Draught-free air distribution

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

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

Control with specialist expertise

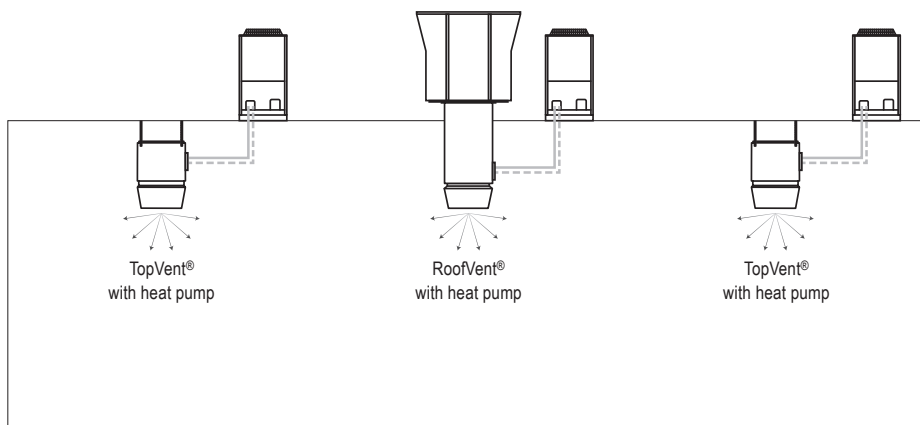
The TopTronic® C control system, which was specifically developed for Hoval indoor climate systems, regulates the separate units individually and controls them based on zones. This enables optimal adjustment to the local requirements of the different usage areas in the building. The patented control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

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

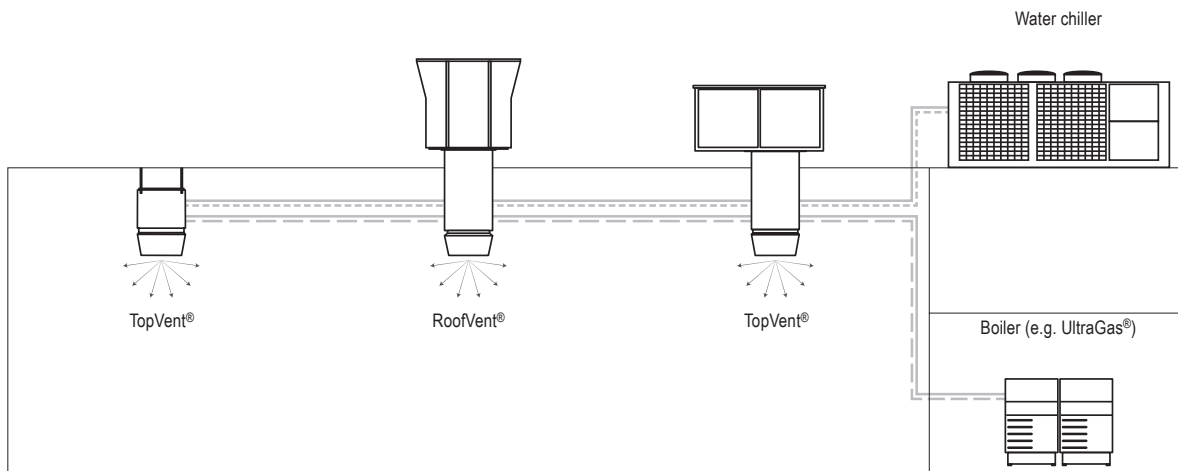
Competent and reliable

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

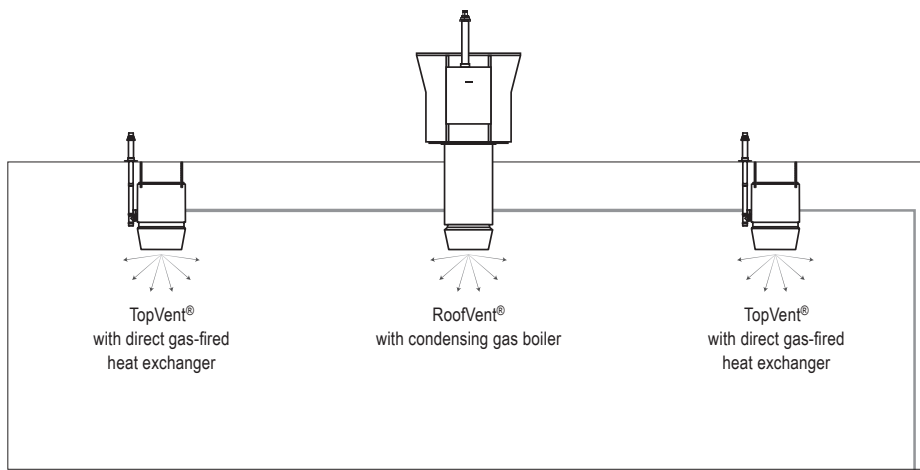
System with decentralised heat and cold generation with heat pump



System with central heat and cold generation



System with decentralised, gas-fired heat generation





RoofVent® RH

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

| | |
|--|----|
| 1 Use | 8 |
| 2 Construction and operation | 8 |
| 3 Technical data | 15 |
| 4 Specification texts | 21 |

B

1 Use

1.1 Intended use

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

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

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

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

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

1.2 User group

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

2 Construction and operation

2.1 Construction

The RoofVent® RH unit consists of the following components:

Roof unit with energy recovery

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

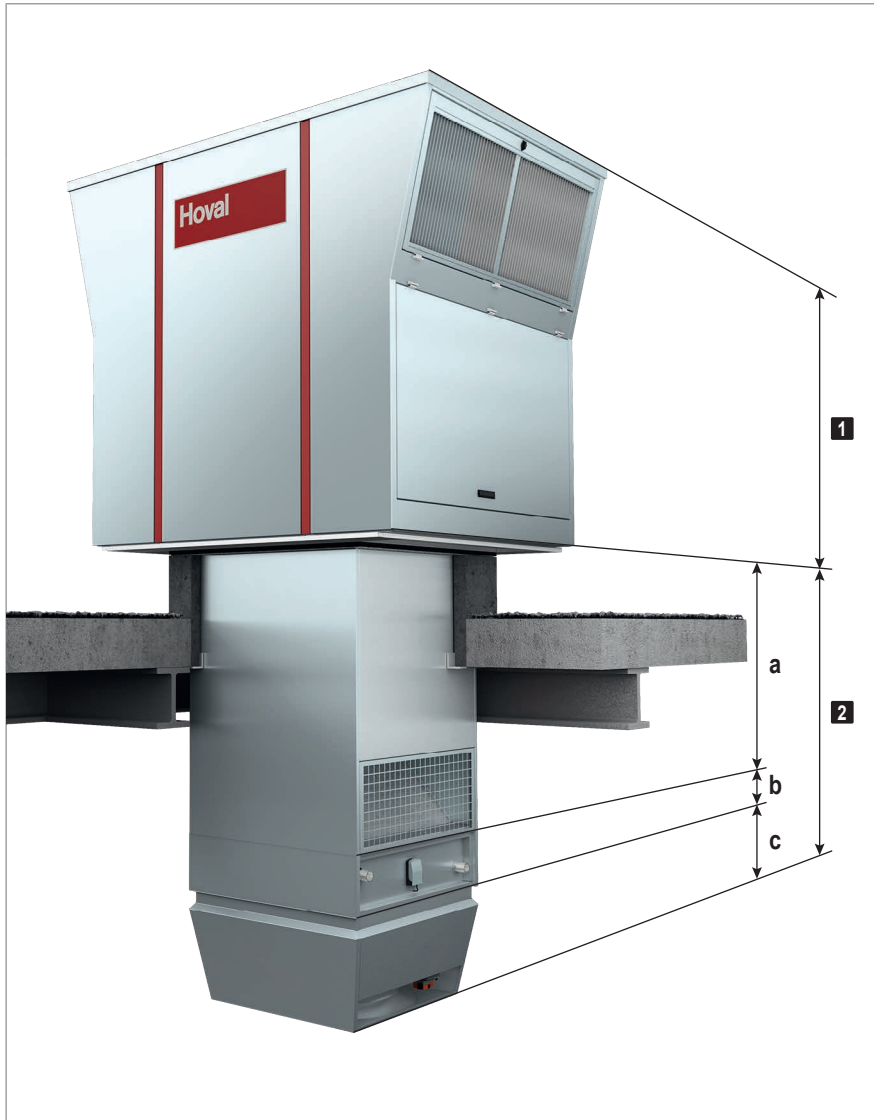
- the fans
- the air filters
- the plate heat exchanger with control dampers
- the control block

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

Below-roof unit

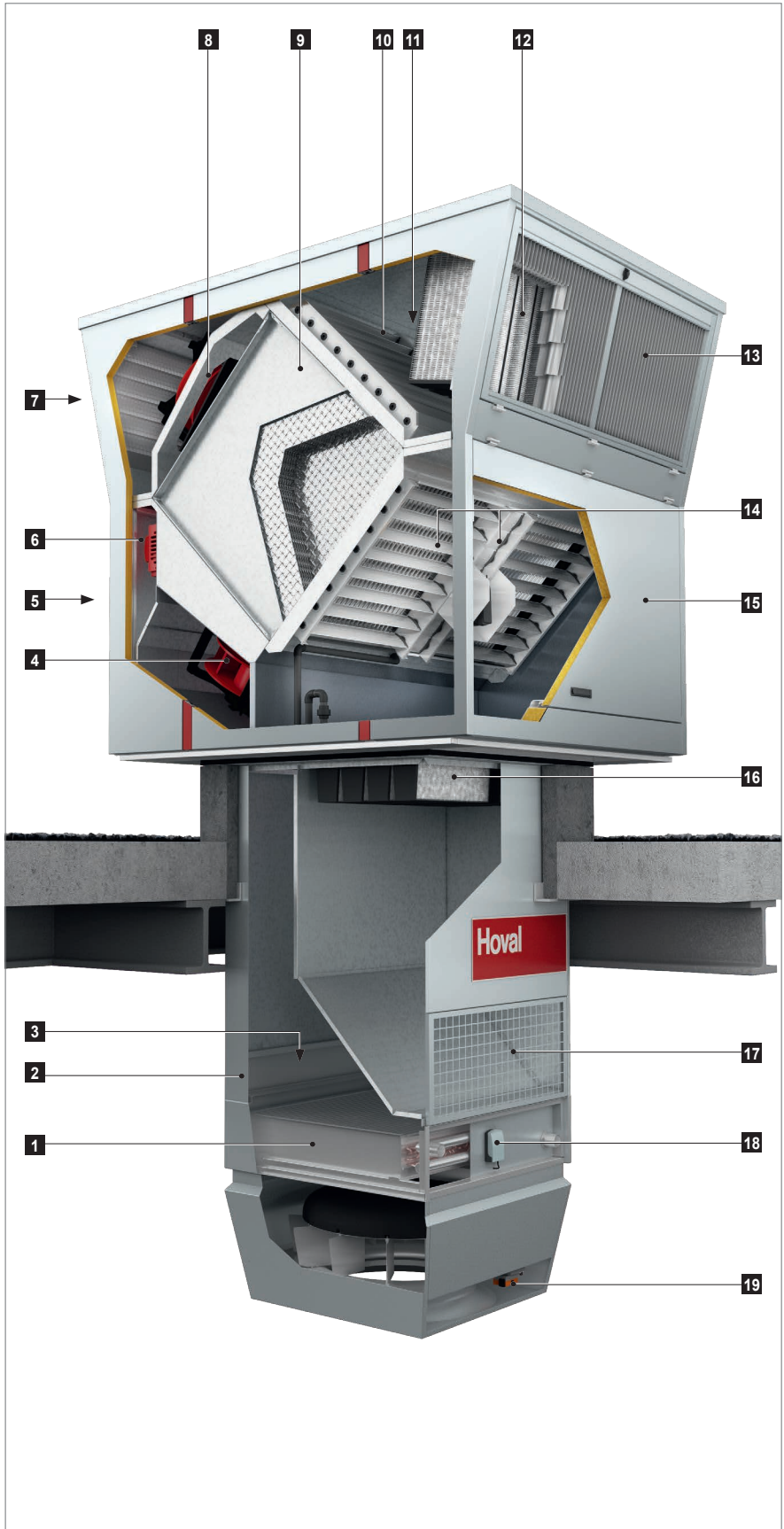
The below-roof unit is installed in the roof and projects into the hall. It consists of the following components:

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



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

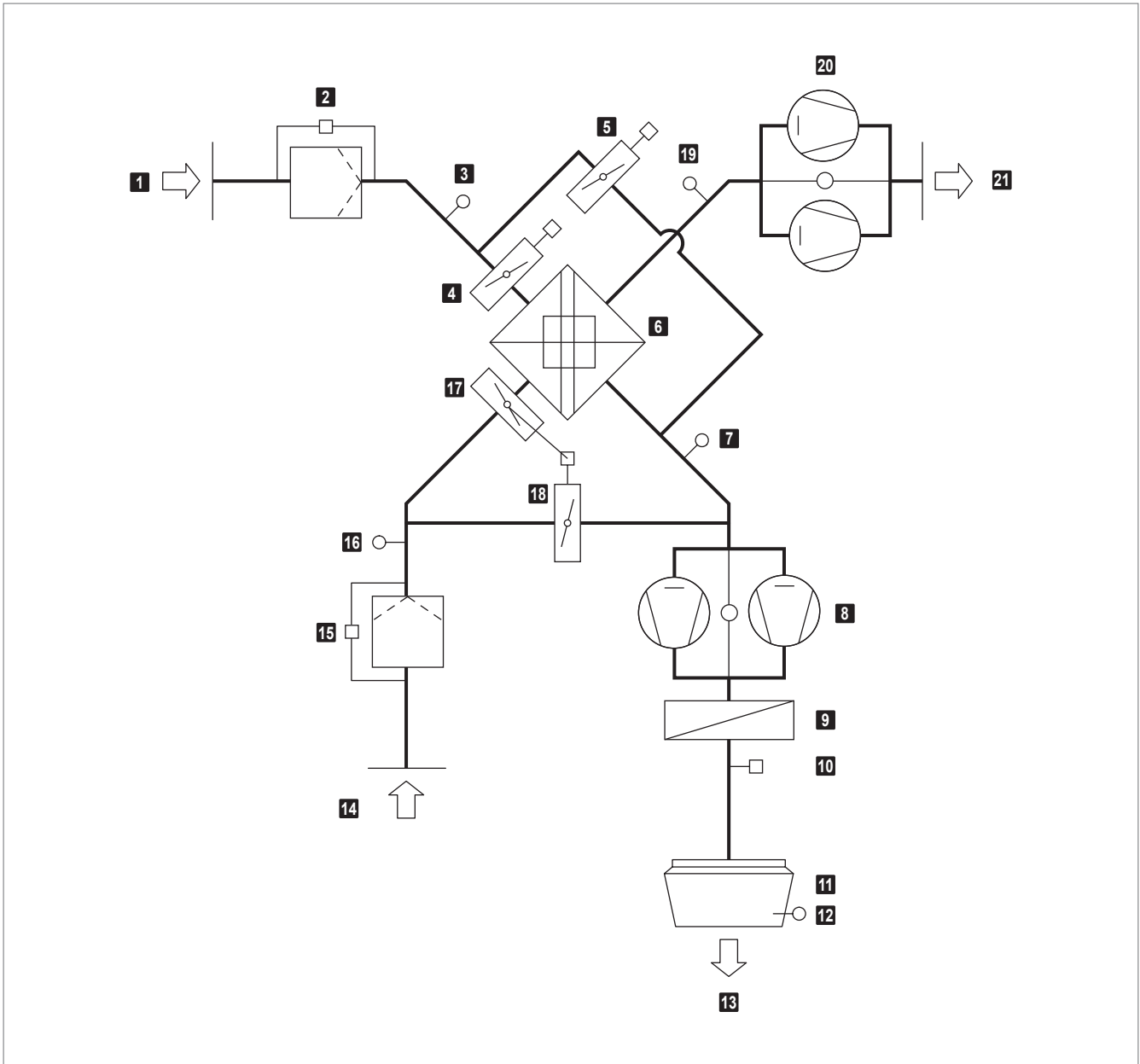
Fig. B1: RoofVent® RH components



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

Fig. B2: RoofVent® RH construction

2.2 Function diagram



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

Fig. B3: RoofVent® RH function diagram

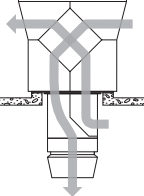
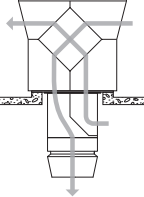
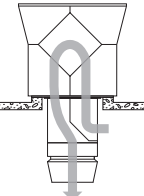
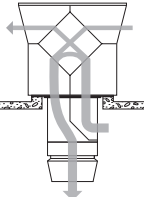
2.3 Operating modes

The RoofVent® RH has the following operating modes:

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

The TopTronic® C control system regulates these operating modes automatically for each control zone in accordance with the specifications in the calendar. The following points also apply:

- The operating mode of a control zone can be switched over manually.
- Each RoofVent® unit can operate individually in a local operating mode: Off, Recirculation, Supply air, Exhaust air, Ventilation.

| Code | Operating mode | | Description |
|--------|---|--|--|
| VE | <p>Ventilation</p> <p>The unit blows fresh air into the room and exhausts polluted room air. The room temperature set value day is active. Depending on the temperature conditions, the system continuously controls:</p> <ul style="list-style-type: none"> ■ the energy recovery ■ the heating |  | <p>Supply air fan on ¹⁾</p> <p>Exhaust air fan on ¹⁾</p> <p>Energy recovery 0-100 %</p> <p>Extract air damper open</p> <p>Recirculation damper closed</p> <p>Heating 0-100 %</p> <p>¹⁾ Adjustable flow rate</p> |
| VEL | <p>Ventilation (reduced)</p> <p>As VE, but the unit only operates with the set minimum values for the supply and exhaust air volumes</p> |  | <p>Supply air fan MIN</p> <p>Exhaust air fan MIN</p> <p>Energy recovery 0-100 %</p> <p>Extract air damper open</p> <p>Recirculation damper closed</p> <p>Heating 0-100 %</p> |
| AQ | <p>Air quality</p> <p>This is the operating mode for demand-controlled ventilation of the room. The room temperature set value day is active. Depending on the temperature conditions, the system continuously controls:</p> <ul style="list-style-type: none"> ■ the energy recovery ■ the heating <p>Depending on the room air quality or room air humidity, the system operates in one of the following operating states:</p> | | |
| AQ_REC | <ul style="list-style-type: none"> ■ Air quality Recirculation: When air quality is good and air humidity appropriate, the unit heats in recirculation operation. |  | Like REC |
| AQ_ECO | <ul style="list-style-type: none"> ■ Air quality Mixed air: When ventilation requirements are medium, the unit heats in mixed air operation. The supply and exhaust air volume is based on the air quality. |  | <p>Supply air fan MIN-MAX</p> <p>Exhaust air fan MIN-MAX</p> <p>Energy recovery 0-100 %</p> <p>Extract air damper 50 %</p> <p>Recirculation damper 50 %</p> <p>Heating 0-100 %</p> |

| Code | Operating mode | | Description |
|-------|---|--|---|
| AQ_VE | <ul style="list-style-type: none"> Air quality Ventilation: When ventilation requirements are high or the room air humidity is too high, the unit heats in pure ventilation operation. The supply and exhaust air volume is based on the air quality. | | Supply air fan MIN-MAX Exhaust air fan MIN-MAX Energy recovery 0-100 % Extract air damper open Recirculation damper closed Heating 0-100 % |
| REC | Recirculation On/Off recirculation operation with TempTronic algorithm: during heat demand, the unit draws in room air, heats it and blows it back into the room. The room temperature set value day is active. The flow rate is controlled in 2 stages. | | Supply air fan 0 / MIN / MAX ¹⁾ Exhaust air fan off Energy recovery 0 % Extract air damper closed Recirculation damper open Heating on ¹⁾ 1) Depending on heat demand |
| DES | <ul style="list-style-type: none"> Destratification: To avoid heat build-up under the ceiling, it may be appropriate to switch on the fan when there is no heat demand (either in permanent operation or in on/off operation depending on the temperature stratification, as desired). | | |
| EA | Exhaust air The unit extracts spent room air. There is no room temperature control. Unfiltered fresh air enters the room through open windows and doors or another system provides air supply. | | Supply air fan off Exhaust air fan on ¹⁾ Energy recovery 0 % Extract air damper open Recirculation damper closed Heating off 1) Adjustable flow rate |
| SA | Supply air The unit blows fresh air into the room. The room temperature set value day is active. Depending on the temperature conditions, the system controls the heating. Spent room air passes through open windows and doors or another system provides extraction. | | Supply air fan on ¹⁾ Exhaust air fan off Energy recovery 0 % ²⁾ Extract air damper open Recirculation damper closed Heating 0-100 % 1) Adjustable flow rate 2) Fresh air and bypass dampers are open |
| ST | Standby The unit is ready for operation. The following operating modes are activated if required: | | |
| CPR | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 ¹⁾ Exhaust air fan on ¹⁾ Energy recovery 0 % Extract air damper open Recirculation damper closed Heating off 1) Adjustable flow rate |

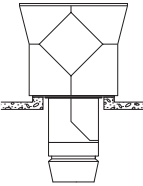
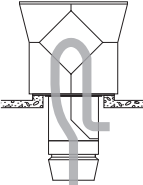
| Code | Operating mode | | Description |
|-------|--|--|---|
| L_OFF | <p>Off (local operating mode) The unit is switched off. Frost protection remains active.</p> |  | <p>Supply air fan off Exhaust air fan off Energy recovery 0 % Extract air damper closed Recirculation damper open Heating off</p> |
| - | <p>Forced heating The unit draws in room air, warms it and blows it back into the room. For example, forced heating is suitable for heating the hall before taking the control system into operation or if the controller fails during the heating period. Connecting a room thermostat makes it possible to specify a room temperature set value. Forced heating can be activated and set as required by the Hoval service technician.</p> |  | <p>Supply air fan MAX Exhaust air fan off Energy recovery 0 % Extract air damper closed Recirculation damper open Heating on</p> |

Table B1: RoofVent® RH operating modes

3 Technical data

3.1 Type code

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

Table B2: Type code

3.2 Application limits

| | | | |
|---|---------|------|-----------|
| Fresh air temperature | min. | °C | -30 |
| Extract air temperature | max. | °C | 50 |
| Moisture content of extract air | max. | g/kg | 15 |
| Supply air temperature | max. | °C | 60 |
| Temperature of the heating medium ¹⁾ | max. | °C | 90 |
| Pressure of the heating medium | max. | kPa | 800 |
| Air flow rate | Size 6: | min. | m³/h 3100 |
| | Size 9: | min. | m³/h 5000 |

¹⁾ Design for higher temperatures on request

Table B3: Application limits



Notice

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

3.3 Heat recovery system (HRS)

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

Table B4: Thermal transfer level of the plate heat exchanger

3.4 Air filtration

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

Table B5: Air filtration

3.5 Electrical connection

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

Table B6: RoofVent® RH electrical connections

3.6 Air flow rate

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

Table B7: Air flow rate

3.7 Heat output

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

Table B8: RoofVent® RH heat output



Notice

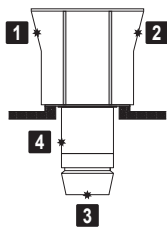
The output for coverage of the fabric heat losses (Q_{TG}) allows for the ventilation heat requirement (Q_V) and the energy recovery output (Q_{ER}) under the respective air conditions. The following applies:

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

3.8 Sound level

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

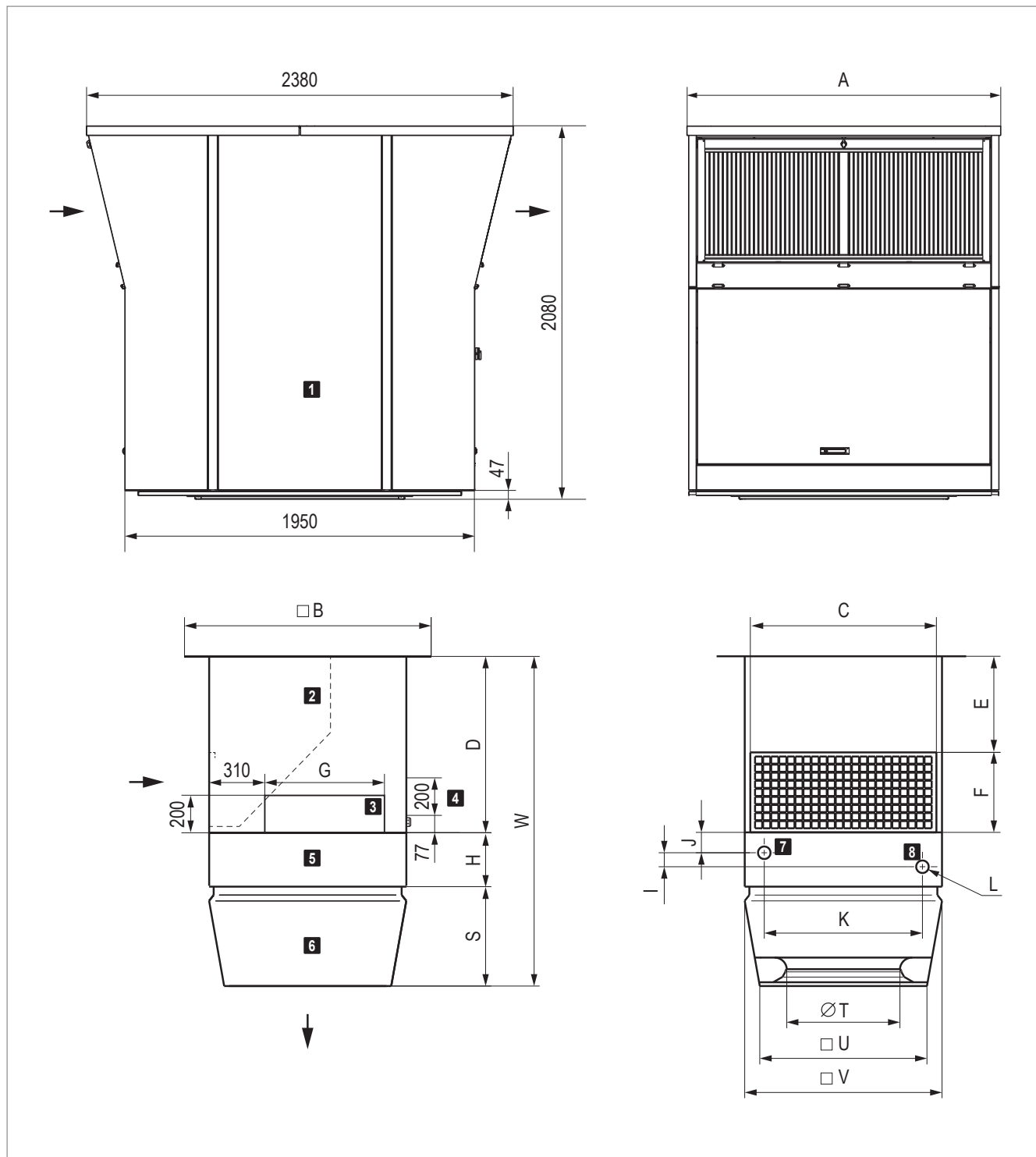
¹⁾ With hemispherical radiation in a low-reflection environment



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

Table B9: RoofVent® RH sound level

3.9 Dimensions and weights



- | | |
|---|--------------------------|
| 1 Roof unit with energy recovery | 5 Heating section |
| 2 Connection module | 6 Air-Injector |
| 3 Access panel, coil | 7 Return |
| 4 Access panel, connection box | 8 Flow |

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

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

Table B10: RoofVent® RH dimensions

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

Table B11: Dimensions for hydraulic connection

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

Table B12: RoofVent® RH weights

3.10 Product information according to ErP

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

Table B13: Product information according to Commission Regulation (EU) 1253/2014, Article 4(2)

4 Specification texts

4.1 RoofVent® RH

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

The unit consists of the following components:

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

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

Roof unit with energy recovery

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

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

The roof unit with energy recovery includes:

Supply air and exhaust air fans

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

Fresh air filter

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

Extract air filter

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

Plate heat exchanger

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

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

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

Access openings

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

Control block

Compact design on an easily accessible mounting plate, comprising:

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

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

Connection module

Housing made of magnesium-zinc 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 magnesium zinc 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-Injectors

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

- Vortex air distributor with concentric outlet nozzle, adjustable vanes and integrated absorber hood
- Actuator for infinitely variable adjustment of the air distribution from vertical to horizontal
 - for draught-free air distribution in the hall under changing operating conditions
 - for the rapid and large-area reduction of temperature stratification in the room through induction of secondary air and strong mixing of the room air with supply air
- Supply air temperature sensor

2 Air-Injectors

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

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

- Vortex air distributor with concentric outlet nozzle, adjustable vanes and integrated absorber hood
- Actuator for infinitely variable adjustment of the air distribution from vertical to horizontal
 - for draught-free air distribution in the hall under changing operating conditions
 - for the rapid and large-area reduction of temperature stratification in the room through induction of secondary air and strong mixing of the room air with supply air
- Supply air sensor (supplied in the connection module)

Without Air-Injector

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

Options for the unit

Oil-proof design

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

Corrosion-protected design for high extract air humidity

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

Paint finish of below-roof unit

Choice of external paint finish in RAL colour

Fresh air and exhaust air silencers

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

Supply air and extract air 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

Hydraulic assembly diverting system

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

Mixing valve

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

Socket

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

Energy monitoring

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

Pump control for mixing or injection system

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

Return temperature sensor

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

4.2 TopTronic® C – System control

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

Zone allocation

Configured in advance for the customer at the factory:

| | Room designation | Unit type |
|---------|------------------|-----------|
| Zone 1: | _____ | _____ |
| Zone 2: | _____ | _____ |
| ... | | |

System structure

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

Functions, standard

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

- Main operating modes of supply and extract air handling units:

VE Ventilation, infinitely variably adjustment
 AQ.... Air quality, automatic control with Hoval combination sensor (option), optional reference variable:

- CO₂ or VOC
- Air humidity (optimised dehumidification mode)

 REC . Recirculation, infinitely variably adjustment
 DES.. Destratification
 EA Exhaust air, infinitely variably adjustment
 SA Supply air, infinitely variably adjustment
 ST Standby

- Main operating modes of supply air units:

REC . Recirculation, infinitely variably adjustment
 DES.. Destratification
 SA Supply air, infinitely variably adjustment
 With Hoval combination sensor (option) also demand-driven control of the fresh air ratio, optional reference variable CO₂ or VOC
 ST Standby

- Main operating modes of recirculated air units:

REC . Recirculation, infinitely variably adjustment
 DES.. Destratification
 ST Standby

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

Operation

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

Options for operation

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

Alarms, protection

- Central alarm management with registration of all alarms (timestamp, priority, status) in an alarm list and alarm memory of the last 50 alarms; forwarding via e-mail can be set in the parameters.
- If there is a failure of communication, bus stations, sensor systems or supply media, each part of the system transitions to a protection mode which safeguards operation.
- A maintenance mode implemented in the control algorithm for testing all physical data points and alarms guarantees high reliability.
- Pre-programmed data points retrievable via logger function for 1 year

Options for the zone control panel

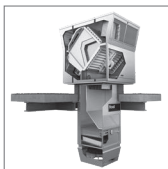
- Alarm lamp
- Socket

Per zone:

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

Power distribution:

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



RoofVent® RC

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

| | |
|--|----|
| 1 Use | 28 |
| 2 Construction and operation | 28 |
| 3 Technical data | 35 |
| 4 Specification texts | 41 |

1 Use

1.1 Intended use

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

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

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

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

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

1.2 User group

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

2 Construction and operation

2.1 Construction

The RoofVent® RC unit consists of the following components:

Roof unit with energy recovery

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

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

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

Below-roof unit

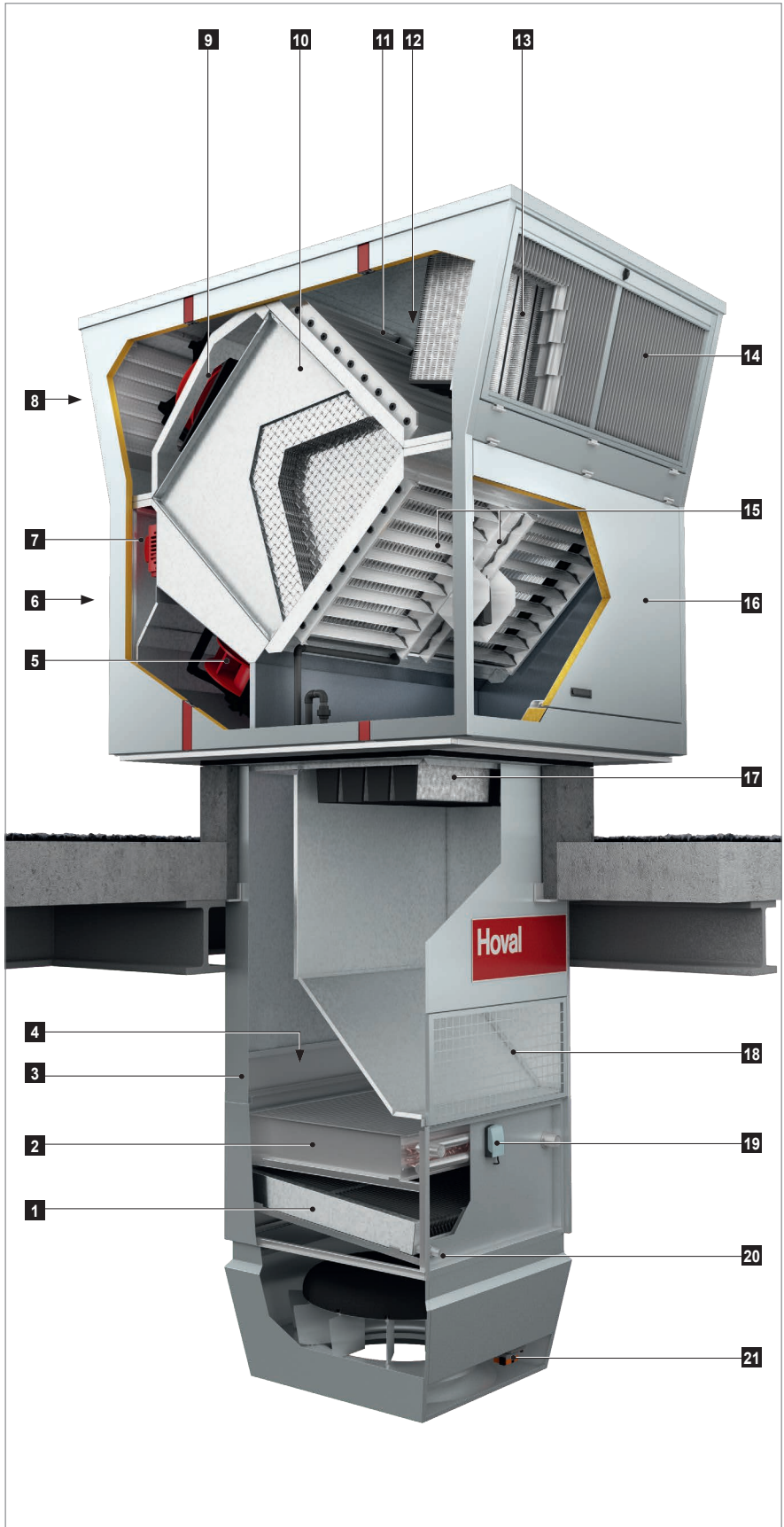
The below-roof unit is installed in the roof and projects into the hall. It consists of the following components:

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



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

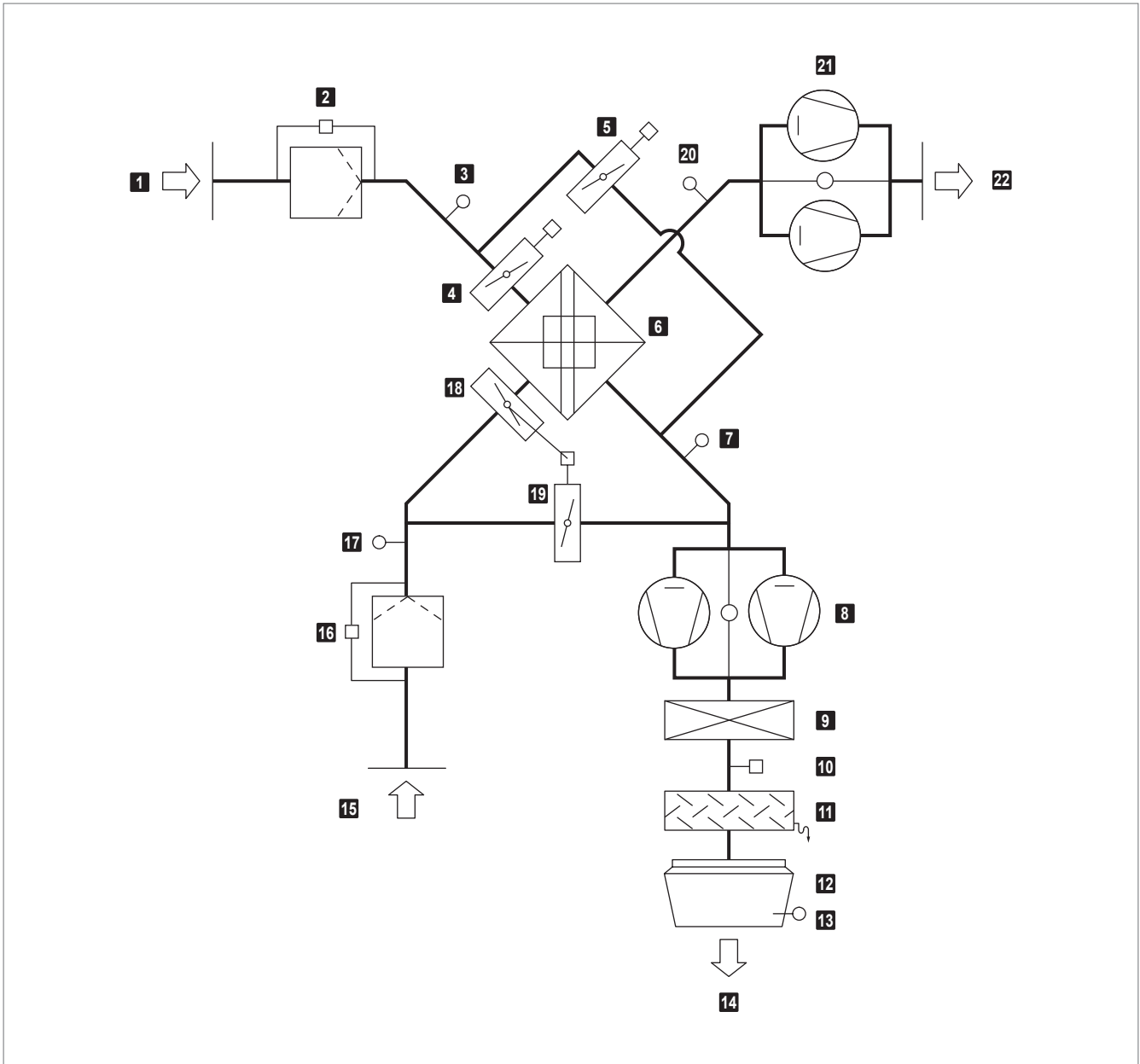
Fig. C1: RoofVent® RC components



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

Fig. C2: RoofVent® RC construction

2.2 Function diagram



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

Fig. C3: RoofVent® RC function diagram

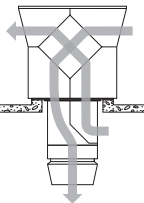
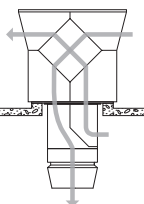
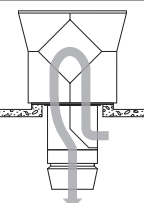
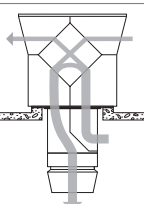
2.3 Operating modes

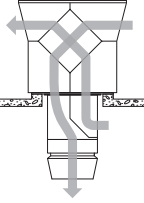
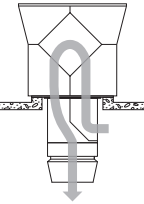
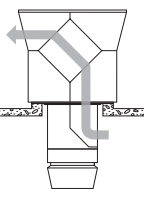
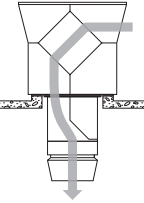
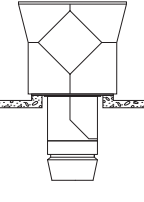
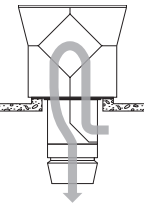
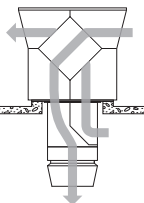
The RoofVent® RC has the following operating modes:

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

The TopTronic® C control system regulates these operating modes automatically for each control zone in accordance with the specifications in the calendar. The following points also apply:

- The operating mode of a control zone can be switched over manually.
- Each RoofVent® unit can operate individually in a local operating mode: Off, Recirculation, Supply air, Exhaust air, Ventilation.

| Code | Operating mode | | Description |
|--------|---|--|--|
| VE | <p>Ventilation</p> <p>The unit blows fresh air into the room and exhausts polluted room air. The room temperature set value day is active. Depending on the temperature conditions, the system continuously controls:</p> <ul style="list-style-type: none"> ■ the energy recovery ■ the heating/cooling |  | <p>Supply air fan on ¹⁾</p> <p>Exhaust air fan on ¹⁾</p> <p>Energy recovery 0-100 %</p> <p>Extract air damper open</p> <p>Recirculation damper closed</p> <p>Heating/cooling 0-100 %</p> <p>¹⁾ Adjustable flow rate</p> |
| VEL | <p>Ventilation (reduced)</p> <p>As VE, but the unit only operates with the set minimum values for the supply and exhaust air volumes</p> |  | <p>Supply air fan MIN</p> <p>Exhaust air fan MIN</p> <p>Energy recovery 0-100 %</p> <p>Extract air damper open</p> <p>Recirculation damper closed</p> <p>Heating/cooling 0-100 %</p> |
| AQ | <p>Air quality</p> <p>This is the operating mode for demand-controlled ventilation of the room. The room temperature set value day is active. Depending on the temperature conditions, the system continuously controls:</p> <ul style="list-style-type: none"> ■ the energy recovery ■ the heating/cooling <p>Depending on the room air quality or room air humidity, the system operates in one of the following operating states:</p> | | |
| AQ_REC | <ul style="list-style-type: none"> ■ Air quality Recirculation: When air quality is good and air humidity appropriate, the unit heats or cools in recirculation operation. |  | Like REC |
| AQ_ECO | <ul style="list-style-type: none"> ■ Air quality Mixed air: When ventilation requirements are medium, the unit heats or cools in mixed air operation. The supply and exhaust air volume is based on the air quality. |  | <p>Supply air fan MIN-MAX</p> <p>Exhaust air fan MIN-MAX</p> <p>Energy recovery 0-100 %</p> <p>Extract air damper 50 %</p> <p>Recirculation damper 50 %</p> <p>Heating/cooling 0-100 %</p> |

| Code | Operating mode | | Description |
|-------|--|--|---|
| AQ_VE | <ul style="list-style-type: none"> Air quality Ventilation: When ventilation requirements are high or the room air humidity is too high, the unit heats or cools in pure ventilation operation. The supply and exhaust air volume is based on the air quality. |  | Supply air fan MIN-MAX Exhaust air fan MIN-MAX Energy recovery 0-100 % Extract air damper open Recirculation damper closed Heating/cooling 0-100 % |
| REC | Recirculation On/Off recirculation operation with TempTronic algorithm: During heat or cool demand, the unit draws in room air, heats or cools it and blows it back into the room. The room temperature set value day is active. The flow rate is controlled in 2 stages. |  | Supply air fan 0 / MIN / MAX ¹⁾ Exhaust air fan off Energy recovery 0 % Extract air damper closed Recirculation damper open Heating/cooling on ¹⁾ 1) Depending on heat or cool demand |
| DES | <ul style="list-style-type: none"> Destratification: To avoid heat build-up under the ceiling, it may be appropriate to switch on the fan when there is no heat demand (either in permanent operation or in on/off operation depending on the temperature stratification, as desired). | | |
| EA | Exhaust air The unit extracts spent room air. There is no room temperature control. Unfiltered fresh air enters the room through open windows and doors or another system provides air supply. |  | Supply air fan off Exhaust air fan on ¹⁾ Energy recovery 0 % Extract air damper open Recirculation damper closed Heating/cooling off 1) Adjustable flow rate |
| SA | Supply air The unit blows fresh air into the room. The room temperature set value day is active. Depending on the temperature conditions, the system controls the heating/cooling. Spent room air passes through open windows and doors or another system provides extraction. |  | Supply air fan on ¹⁾ Exhaust air fan off Energy recovery 0 % ²⁾ Extract air damper open Recirculation damper closed Heating/cooling 0-100 % 1) Adjustable flow rate 2) Fresh air and bypass dampers are open |
| ST | Standby The unit is ready for operation. The following operating modes are activated if required: |  | |
| CPR | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 unit automatically switches to night cooling (NCS) to save energy. | | |
| NCS | <ul style="list-style-type: none"> 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 ¹⁾ Exhaust air fan on ¹⁾ Energy recovery 0 % Extract air damper open Recirculation damper closed Heating/cooling off 1) Adjustable flow rate |

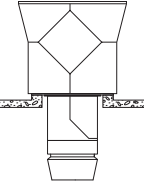
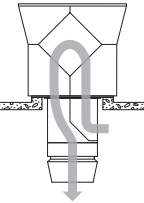
| Code | Operating mode | | Description |
|-------|--|--|---|
| L_OFF | <p>Off (local operating mode) The unit is switched off. Frost protection remains active.</p> |  | <p>Supply air fan off Exhaust air fan off Energy recovery 0 % Extract air damper closed Recirculation damper open Heating/cooling off</p> |
| - | <p>Forced heating The unit draws in room air, warms it and blows it back into the room. For example, forced heating is suitable for heating the hall before taking the control system into operation or if the controller fails during the heating period. Connecting a room thermostat makes it possible to specify a room temperature set value. Forced heating can be activated and set as required by the Hoval service technician.</p> |  | <p>Supply air fan MAX Exhaust air fan off Energy recovery 0 % Extract air damper closed Recirculation damper open Heating/cooling on</p> |

Table C1: RoofVent® RC operating modes

3 Technical data

3.1 Type code

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

Table C2: Type code

3.2 Application limits

| | | | |
|---|---------|------|-----------|
| Fresh air temperature | min. | °C | -30 |
| Extract air temperature | max. | °C | 50 |
| Moisture content of extract air | max. | g/kg | 15 |
| Supply air temperature | max. | °C | 60 |
| Temperature of the heating medium ¹⁾ | max. | °C | 90 |
| Pressure of the heating medium | max. | kPa | 800 |
| Air flow rate | Size 6: | min. | m³/h 3100 |
| | Size 9: | min. | m³/h 5000 |
| Condensate quantity | Size 6: | max. | kg/h 90 |
| | Size 9: | max. | kg/h 150 |

¹⁾ Design for higher temperatures on request

Table C3: Application limits



Notice

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

3.3 Heat recovery system (HRS)

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

Table C4: Thermal transfer level of the plate heat exchanger

3.4 Air filtration

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

Table C5: Air filtration

3.5 Electrical connection

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

Table C6: RoofVent® RC electrical connections

3.6 Air flow rate

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

Table C7: Air flow rate

3.7 Heat output

| Fresh air temp. | | -5 °C | | | | | | -15 °C | | | | | |
|-----------------|------|-------|-----------------|------------------|----------------|-----------------|----------------|--------|-----------------|------------------|----------------|-----------------|----------------|
| Size | Type | Q | Q _{TG} | H _{max} | t _s | Δp _w | m _w | Q | Q _{TG} | H _{max} | t _s | Δp _w | m _w |
| | | kW | kW | m | °C | kPa | l/h | kW | kW | m | °C | kPa | l/h |
| RC-6 | C | 76.2 | 69.3 | 9.0 | 55.4 | 15 | 3273 | 78.7 | 68.2 | 9.0 | 54.8 | 16 | 3383 |
| RC-9 | C | 113.1 | 103.7 | 9.1 | 56.5 | 14 | 4860 | 116.8 | 102.4 | 9.2 | 56.0 | 15 | 5017 |
| | D | - | - | - | - | - | - | - | - | - | - | - | - |

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

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

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

Table C8: RoofVent® RC heat output



Notice

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

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

3.8 Cooling capacity

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

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

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

Table C9: RoofVent® RC cooling capacity



Notice

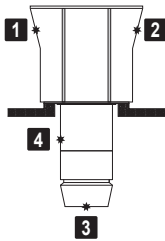
The output for coverage of transmission sensible gains (Q_{TG}) allows for the ventilation cooling requirement (Q_V) and the output of the energy recovery (Q_{ER}) under the respective air conditions. The following applies:

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

3.9 Sound level

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

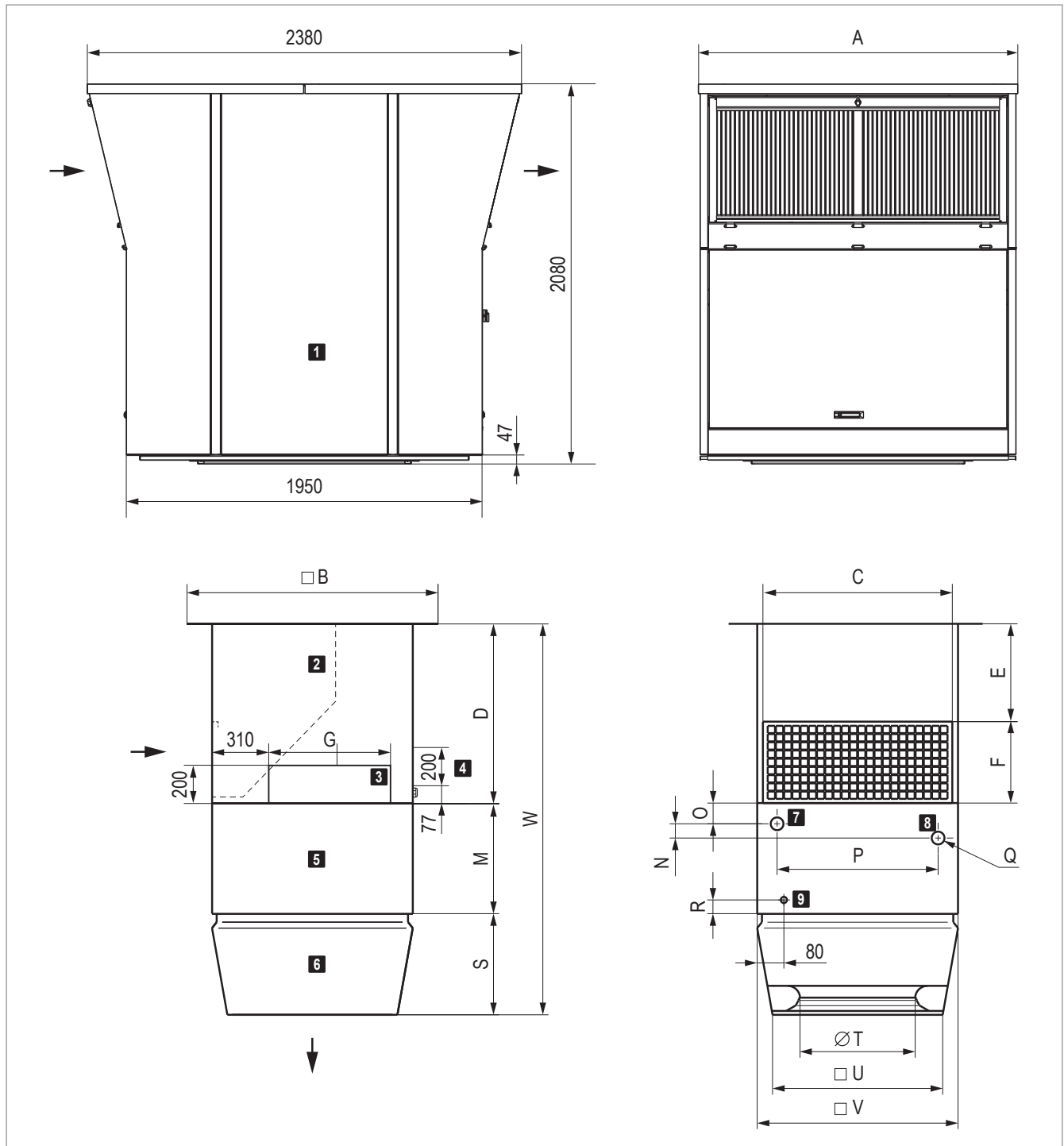
¹⁾ With hemispherical radiation in a low-reflection environment



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

Table C10: RoofVent® RC sound level

3.10 Dimensions and weights



- 1** Roof unit with energy recovery
- 2** Connection module
- 3** Access panel, coil
- 4** Access panel, connection box
- 5** Heating/cooling section

- 6** Air-Injector
- 7** Return
- 8** Flow
- 9** Condensate connection G1" (external)

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

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

Table C11: RoofVent® RC dimensions

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

Table C12: Dimensions for hydraulic connection

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

Table C13: RoofVent® RC weights

3.11 Product information according to ErP

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

Table C14: Product information according to Commission Regulation (EU) 1253/2014, Article 4(2)

4 Specification texts

4.1 RoofVent® RC

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

The unit consists of the following components:

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

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

Roof unit with energy recovery

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

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

The roof unit with energy recovery includes:

Supply air and exhaust air fans

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

Fresh air filter

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

Extract air filter

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

Plate heat exchanger

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

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

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

Access openings

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

Control block

Compact design on an easily accessible mounting plate, comprising:

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

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

Connection module

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

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

Connection module V1 / V2 / V3:

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

Heating/cooling section

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

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

Air-Injector

1 Air-Injectors

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

- Vortex air distributor with concentric outlet nozzle, adjustable vanes and integrated absorber hood
- Actuator for infinitely variable adjustment of the air distribution from vertical to horizontal
 - for draught-free air distribution in the hall under changing operating conditions
 - for the rapid and large-area reduction of temperature stratification in the room through induction of secondary air and strong mixing of the room air with supply air
- Supply air temperature sensor

2 Air-Injectors

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

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

- Vortex air distributor with concentric outlet nozzle, adjustable vanes and integrated absorber hood
- Actuator for infinitely variable adjustment of the air distribution from vertical to horizontal
 - for draught-free air distribution in the hall under changing operating conditions
 - for the rapid and large-area reduction of temperature stratification in the room through induction of secondary air and strong mixing of the room air with supply air
- Supply air sensor (supplied in the connection module)

Without Air-Injector

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

Options for the unit

Oil-proof design

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

Corrosion-protected design for high extract air humidity

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

Paint finish of below-roof unit

Choice of external paint finish in RAL colour

Fresh air and exhaust air silencers

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

Supply air and extract air 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

Hydraulic assembly diverting system

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

Mixing valve

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

Condensate pump

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

Socket

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

Energy monitoring

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

Pump control for mixing or injection system

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

Return temperature sensor

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

4.2 TopTronic® C – System control

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

Zone allocation

Configured in advance for the customer at the factory:

| | Room designation | Unit type |
|---------|------------------|-----------|
| Zone 1: | _____ | _____ |
| Zone 2: | _____ | _____ |
| ... | | |

System structure

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

Functions, standard

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

- Main operating modes of supply and extract air handling units:

VE Ventilation, infinitely variably adjustment
 AQ.... Air quality, automatic control with Hoval combination sensor (option), optional reference variable:

- CO₂ or VOC
- Air humidity (optimised dehumidification mode)

 REC . Recirculation, infinitely variably adjustment
 DES.. Destratification
 EA Exhaust air, infinitely variably adjustment
 SA Supply air, infinitely variably adjustment
 ST Standby

- Main operating modes of supply air units:

REC . Recirculation, infinitely variably adjustment
 DES.. Destratification
 SA Supply air, infinitely variably adjustment
 With Hoval combination sensor (option) also demand-driven control of the fresh air ratio, optional reference variable CO₂ or VOC
 ST Standby

- Main operating modes of recirculated air units:

REC . Recirculation, infinitely variably adjustment
 DES.. Destratification
 ST Standby

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

Operation

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

Options for operation

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

Alarms, protection

- Central alarm management with registration of all alarms (timestamp, priority, status) in an alarm list and alarm memory of the last 50 alarms; forwarding via e-mail can be set in the parameters.
- If there is a failure of communication, bus stations, sensor systems or supply media, each part of the system transitions to a protection mode which safeguards operation.
- A maintenance mode implemented in the control algorithm for testing all physical data points and alarms guarantees high reliability.
- Pre-programmed data points retrievable via logger function for 1 year

Options for the zone control panel

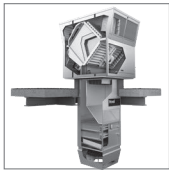
- Alarm lamp
- Socket

Per zone:

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

Power distribution:

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



RoofVent® RHC

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

| | |
|--|----|
| 1 Use | 48 |
| 2 Construction and operation | 48 |
| 3 Technical data | 55 |
| 4 Specification texts | 61 |



1 Use

1.1 Intended use

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

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

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

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

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

1.2 User group

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

2 Construction and operation

2.1 Construction

The RoofVent® RHC unit consists of the following components:

Roof unit with energy recovery

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

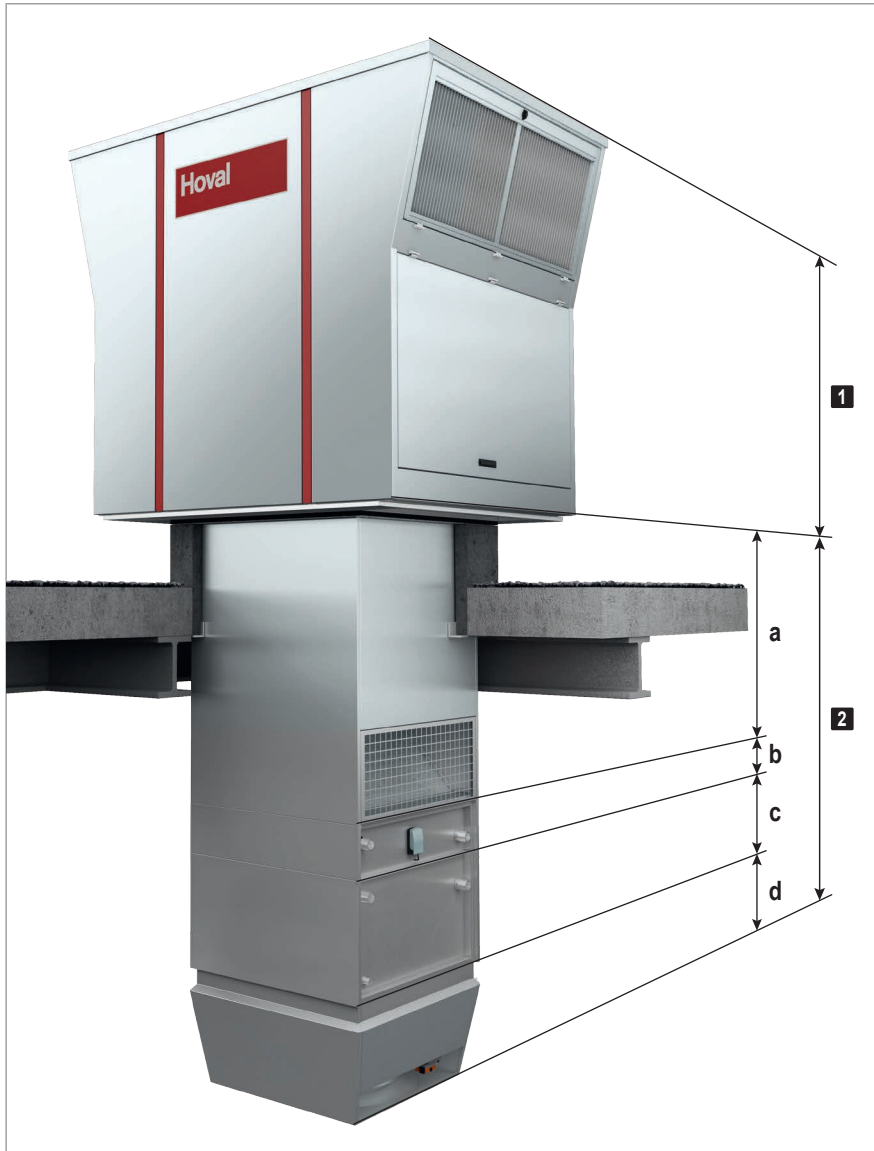
- the fans
- the air filters
- the plate heat exchanger with control dampers
- the control block

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

Below-roof unit

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

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



1 Roof unit with energy recovery

2 Below-roof unit

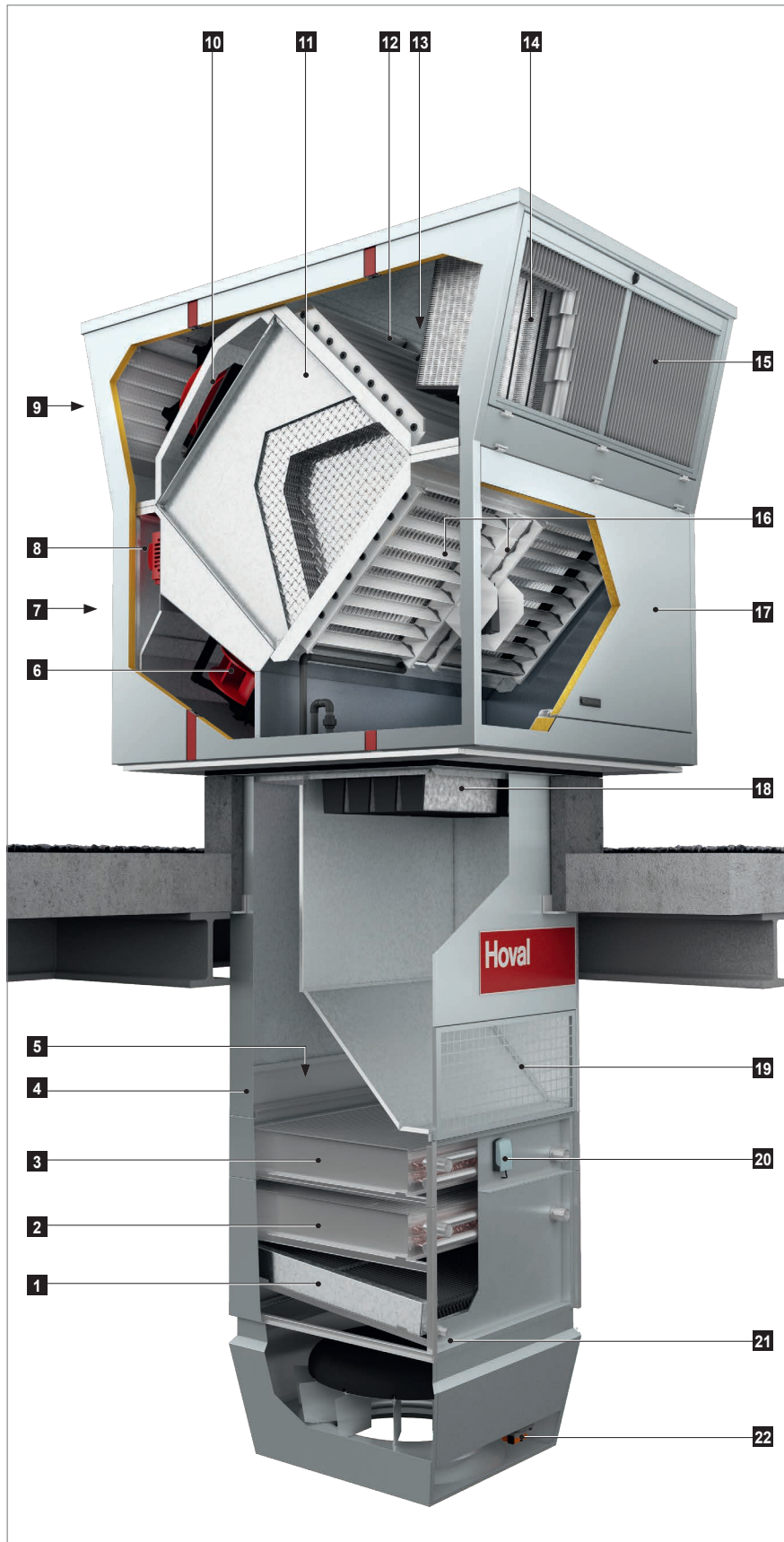
a Connection module

b Heating section

c Cooling section

d Air-Injector

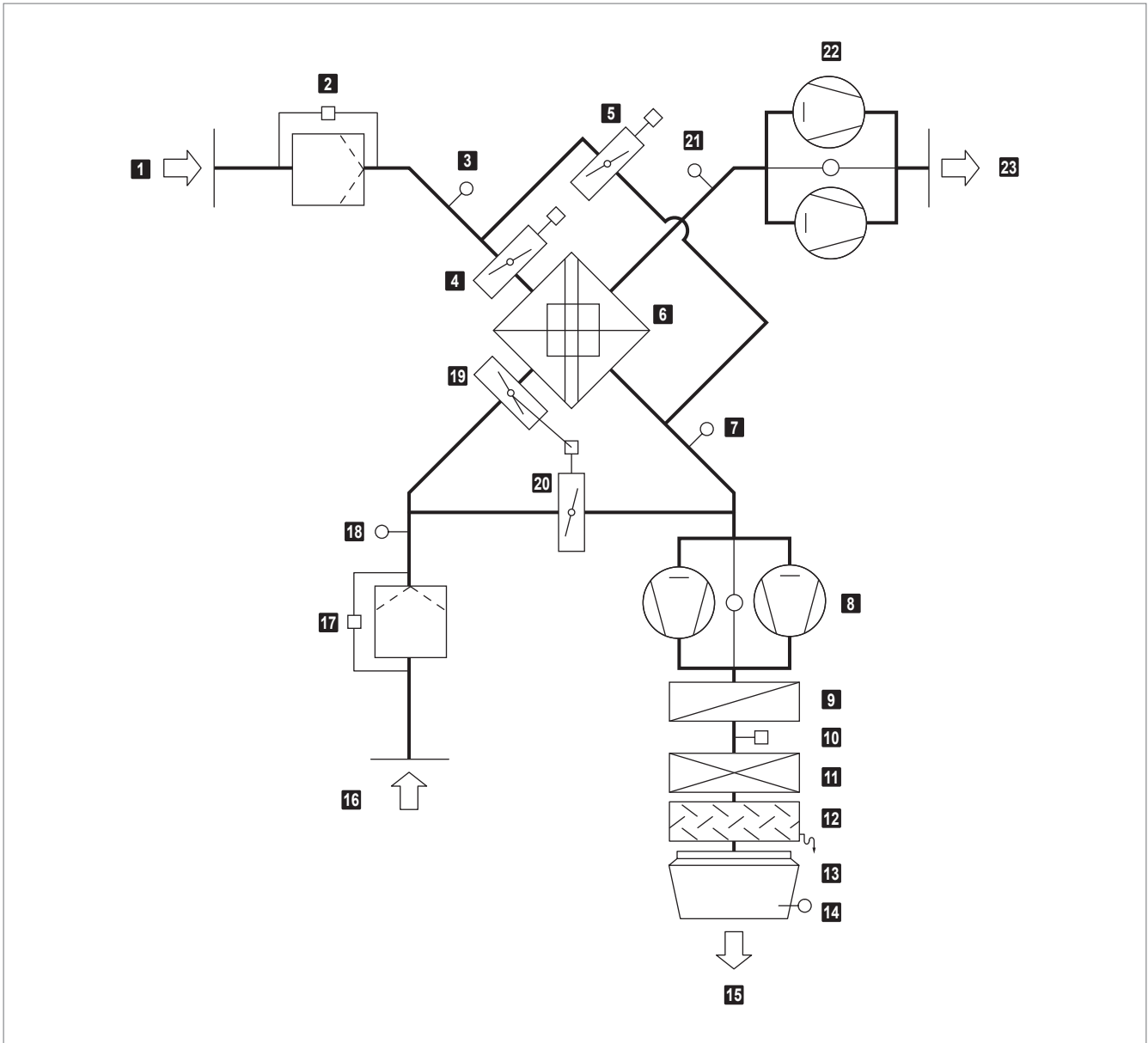
Fig. D1: RoofVent® RHC components



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

Fig. D2: RoofVent® RHC construction

2.2 Function diagram



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

Fig. D3: RoofVent® RHC function diagram

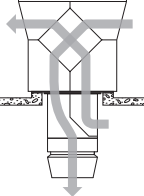
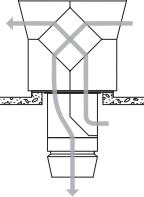
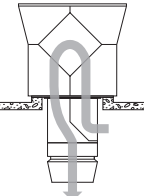
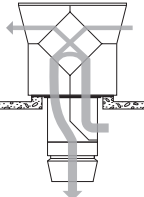
2.3 Operating modes

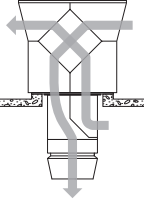
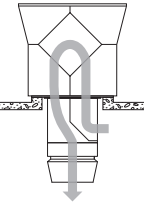
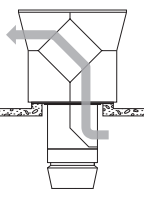
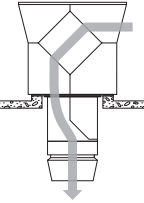
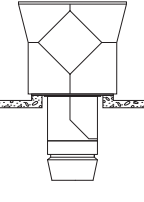
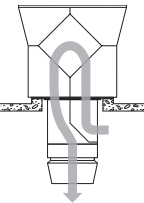
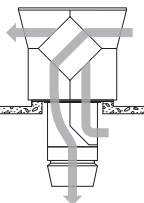
The RoofVent® RHC has the following operating modes:

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

The TopTronic® C control system regulates these operating modes automatically for each control zone in accordance with the specifications in the calendar. The following points also apply:

- The operating mode of a control zone can be switched over manually.
- Each RoofVent® unit can operate individually in a local operating mode: Off, Recirculation, Supply air, Exhaust air, Ventilation.

| Code | Operating mode | | Description |
|--------|---|--|--|
| VE | <p>Ventilation</p> <p>The unit blows fresh air into the room and exhausts polluted room air. The room temperature set value day is active. Depending on the temperature conditions, the system continuously controls:</p> <ul style="list-style-type: none"> ■ the energy recovery ■ the heating/cooling |  | <p>Supply air fan on ¹⁾</p> <p>Exhaust air fan on ¹⁾</p> <p>Energy recovery 0-100 %</p> <p>Extract air damper open</p> <p>Recirculation damper closed</p> <p>Heating/cooling 0-100 %</p> <p>¹⁾ Adjustable flow rate</p> |
| VEL | <p>Ventilation (reduced)</p> <p>As VE, but the unit only operates with the set minimum values for the supply and exhaust air volumes</p> |  | <p>Supply air fan MIN</p> <p>Exhaust air fan MIN</p> <p>Energy recovery 0-100 %</p> <p>Extract air damper open</p> <p>Recirculation damper closed</p> <p>Heating/cooling 0-100 %</p> |
| AQ | <p>Air quality</p> <p>This is the operating mode for demand-controlled ventilation of the room. The room temperature set value day is active. Depending on the temperature conditions, the system continuously controls:</p> <ul style="list-style-type: none"> ■ the energy recovery ■ the heating/cooling <p>Depending on the room air quality or room air humidity, the system operates in one of the following operating states:</p> | | |
| AQ_REC | <ul style="list-style-type: none"> ■ Air quality Recirculation: When air quality is good and air humidity appropriate, the unit heats or cools in recirculation operation. |  | Like REC |
| AQ_ECO | <ul style="list-style-type: none"> ■ Air quality Mixed air: When ventilation requirements are medium, the unit heats or cools in mixed air operation. The supply and exhaust air volume is based on the air quality. |  | <p>Supply air fan MIN-MAX</p> <p>Exhaust air fan MIN-MAX</p> <p>Energy recovery 0-100 %</p> <p>Extract air damper 50 %</p> <p>Recirculation damper 50 %</p> <p>Heating/cooling 0-100 %</p> |

| Code | Operating mode | | Description |
|-------|--|--|---|
| AQ_VE | <ul style="list-style-type: none"> Air quality Ventilation: When ventilation requirements are high or the room air humidity is too high, the unit heats or cools in pure ventilation operation. The supply and exhaust air volume is based on the air quality. |  | Supply air fan MIN-MAX Exhaust air fan MIN-MAX Energy recovery 0-100 % Extract air damper open Recirculation damper closed Heating/cooling 0-100 % |
| REC | Recirculation On/Off recirculation operation with TempTronic algorithm: During heat or cool demand, the unit draws in room air, heats or cools it and blows it back into the room. The room temperature set value day is active. The flow rate is controlled in 2 stages. |  | Supply air fan 0 / MIN / MAX ¹⁾ Exhaust air fan off Energy recovery 0 % Extract air damper closed Recirculation damper open Heating/cooling on ¹⁾ 1) Depending on heat or cool demand |
| DES | <ul style="list-style-type: none"> Destratification: To avoid heat build-up under the ceiling, it may be appropriate to switch on the fan when there is no heat demand (either in permanent operation or in on/off operation depending on the temperature stratification, as desired). | | |
| EA | Exhaust air The unit extracts spent room air. There is no room temperature control. Unfiltered fresh air enters the room through open windows and doors or another system provides air supply. |  | Supply air fan off Exhaust air fan on ¹⁾ Energy recovery 0 % Extract air damper open Recirculation damper closed Heating/cooling off 1) Adjustable flow rate |
| SA | Supply air The unit blows fresh air into the room. The room temperature set value day is active. Depending on the temperature conditions, the system controls the heating/cooling. Spent room air passes through open windows and doors or another system provides extraction. |  | Supply air fan on ¹⁾ Exhaust air fan off Energy recovery 0 % ²⁾ Extract air damper open Recirculation damper closed Heating/cooling 0-100 % 1) Adjustable flow rate 2) Fresh air and bypass dampers are open |
| ST | Standby The unit is ready for operation. The following operating modes are activated if required: |  | |
| CPR | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 unit automatically switches to night cooling (NCS) to save energy. | | |
| NCS | <ul style="list-style-type: none"> 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 ¹⁾ Exhaust air fan on ¹⁾ Energy recovery 0 % Extract air damper open Recirculation damper closed Heating/cooling off 1) Adjustable flow rate |

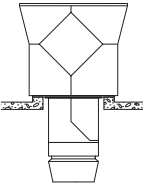
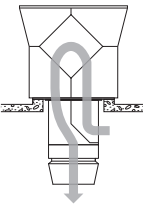
| Code | Operating mode | | Description |
|-------|--|--|---|
| L_OFF | Off (local operating mode) The unit is switched off. Frost protection remains active. |  | Supply air fan off Exhaust air fan off Energy recovery 0 % Extract air damper closed Recirculation damper open Heating/cooling off |
| - | Forced heating The unit draws in room air, warms it and blows it back into the room. For example, forced heating is suitable for heating the hall before taking the control system into operation or if the controller fails during the heating period. Connecting a room thermostat makes it possible to specify a room temperature set value. Forced heating can be activated and set as required by the Hoval service technician. |  | Supply air fan MAX Exhaust air fan off Energy recovery 0 % Extract air damper closed Recirculation damper open Heating/cooling on |

Table D1: RoofVent® RHC operating modes

3 Technical data

3.1 Type code

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

Table D2: Type code

3.2 Application limits

| | | | |
|---|---------|------|-----------|
| Fresh air temperature | min. | °C | -30 |
| Extract air temperature | max. | °C | 50 |
| Moisture content of extract air | max. | g/kg | 15 |
| Supply air temperature | max. | °C | 60 |
| Temperature of the heating medium ¹⁾ | max. | °C | 90 |
| Pressure of the heating medium | max. | kPa | 800 |
| Air flow rate | Size 6: | min. | m³/h 3100 |
| | Size 9: | min. | m³/h 5000 |
| Condensate quantity | Size 6: | max. | kg/h 90 |
| | Size 9: | max. | kg/h 150 |

¹⁾ Design for higher temperatures on request

Table D3: Application limits



Notice

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

3.3 Heat recovery system (HRS)

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

Table D4: Thermal transfer level of the plate heat exchanger

3.4 Air filtration

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

Table D5: Air filtration

3.5 Electrical connection

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

Table D6: RoofVent® RHC electrical connections

3.6 Air flow rate

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

Table D7: Air flow rate

3.7 Heat output

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

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

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

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

Table D8: RoofVent® RHC heat output



Notice

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

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

3.8 Cooling capacity

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

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

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

Table D9: RoofVent® RHC cooling capacity



Notice

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

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

3.9 Sound level

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

¹⁾ With hemispherical radiation in a low-reflection environment

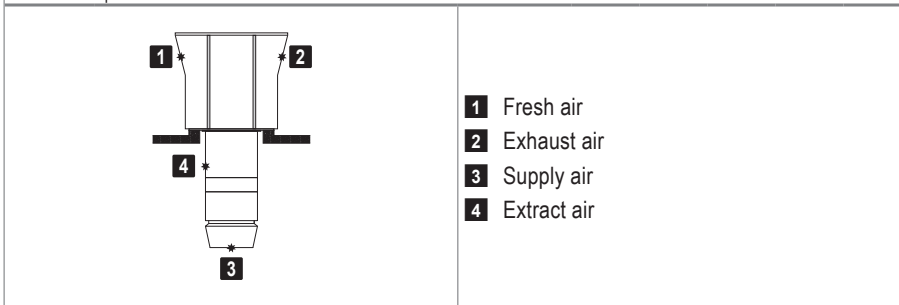
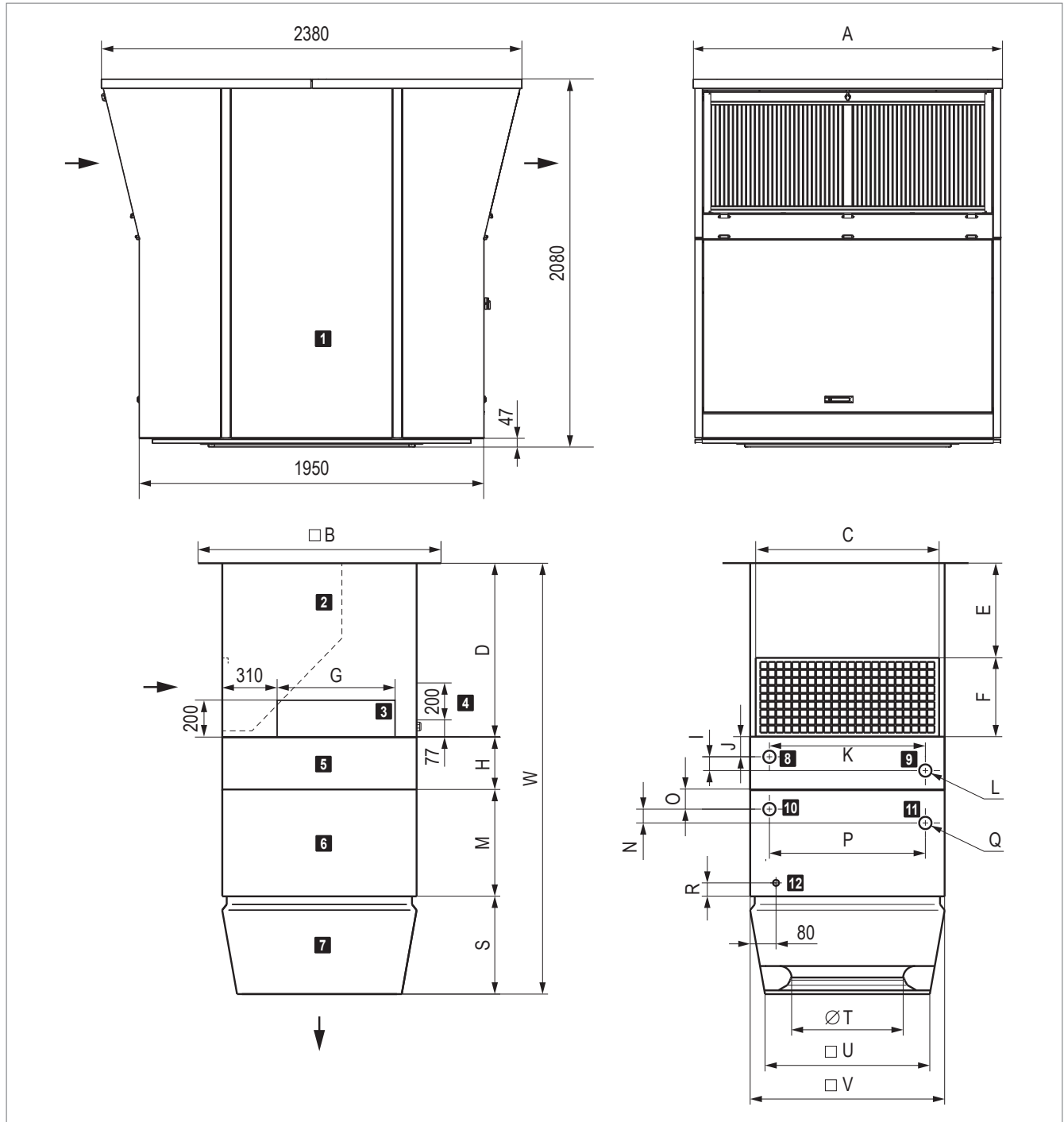


Table D10: RoofVent® RHC sound level

3.10 Dimensions and weights



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

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

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

Table D11: RoofVent® RHC dimensions

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

Table D12: Dimensions for hydraulic connection of the heating section

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

Table D13: Dimensions for hydraulic connection of the cooling section

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

Table D14: RoofVent® RHC weights

3.11 Product information according to ErP

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

Table D15: Product information according to Commission Regulation (EU) 1253/2014, Article 4(2)

4 Specification texts

4.1 RoofVent® RHC

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

The unit consists of the following components:

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

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

Roof unit with energy recovery

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

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

The roof unit with energy recovery includes:

Supply air and exhaust air fans

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

Fresh air filter

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

Extract air filter

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

Plate heat exchanger

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

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

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

Access openings

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

Control block

Compact design on an easily accessible mounting plate, comprising:

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

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

Connection module

Housing made of magnesium-zinc 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 magnesium zinc 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 magnesium zinc 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-Injectors

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

- Vortex air distributor with concentric outlet nozzle, adjustable vanes and integrated absorber hood
- Actuator for infinitely variable adjustment of the air distribution from vertical to horizontal
 - for draught-free air distribution in the hall under changing operating conditions
 - for the rapid and large-area reduction of temperature stratification in the room through induction of secondary air and strong mixing of the room air with supply air
- Supply air temperature sensor

2 Air-Injectors

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

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

- Vortex air distributor with concentric outlet nozzle, adjustable vanes and integrated absorber hood
- Actuator for infinitely variable adjustment of the air distribution from vertical to horizontal
 - for draught-free air distribution in the hall under changing operating conditions
 - for the rapid and large-area reduction of temperature stratification in the room through induction of secondary air and strong mixing of the room air with supply air
- Supply air sensor (supplied in the connection module)

Without Air-Injector

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

Options for the unit**Oil-proof design**

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

Corrosion-protected design for high extract air humidity

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

Paint finish of below-roof unit

Choice of external paint finish in RAL colour

Fresh air and exhaust air silencers

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

Supply air and extract air 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

Hydraulic assembly diverting system

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

Mixing valve

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

Condensate pump

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

Socket

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

Energy monitoring

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

Pump control for mixing or injection system

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

Return temperature sensor

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

4.2 TopTronic® C – System control

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

Zone allocation

Configured in advance for the customer at the factory:

| | Room designation | Unit type |
|---------|------------------|-----------|
| Zone 1: | _____ | _____ |
| Zone 2: | _____ | _____ |
| ... | | |

System structure

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

Functions, standard

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

- Main operating modes of supply and extract air handling units:

VE Ventilation, infinitely variably adjustment
 AQ.... Air quality, automatic control with Hoval combination sensor (option), optional reference variable:

- CO₂ or VOC
- Air humidity (optimised dehumidification mode)

 REC . Recirculation, infinitely variably adjustment
 DES.. Destratification
 EA Exhaust air, infinitely variably adjustment
 SA Supply air, infinitely variably adjustment
 ST Standby

- Main operating modes of supply air units:

REC . Recirculation, infinitely variably adjustment
 DES.. Destratification
 SA Supply air, infinitely variably adjustment
 With Hoval combination sensor (option) also demand-driven control of the fresh air ratio, optional reference variable CO₂ or VOC
 ST Standby

- Main operating modes of recirculated air units:

REC . Recirculation, infinitely variably adjustment
 DES.. Destratification
 ST Standby

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

Operation

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

Options for operation

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

Alarms, protection

- Central alarm management with registration of all alarms (timestamp, priority, status) in an alarm list and alarm memory of the last 50 alarms; forwarding via e-mail can be set in the parameters.
- If there is a failure of communication, bus stations, sensor systems or supply media, each part of the system transitions to a protection mode which safeguards operation.
- A maintenance mode implemented in the control algorithm for testing all physical data points and alarms guarantees high reliability.
- Pre-programmed data points retrievable via logger function for 1 year

Options for the zone control panel

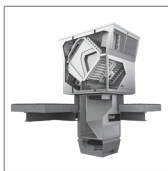
- Alarm lamp
- Socket

Per zone:

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

Power distribution:

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



RoofVent® R

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

| | |
|--|----|
| 1 Use | 68 |
| 2 Construction and operation | 68 |
| 3 Technical data | 74 |
| 4 Specification texts | 79 |

1 Use

1.1 Intended use

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

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

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

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

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

1.2 User group

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

2 Construction and operation

2.1 Construction

The RoofVent® R unit consists of the following components:

Roof unit with energy recovery

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

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

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

Below-roof unit

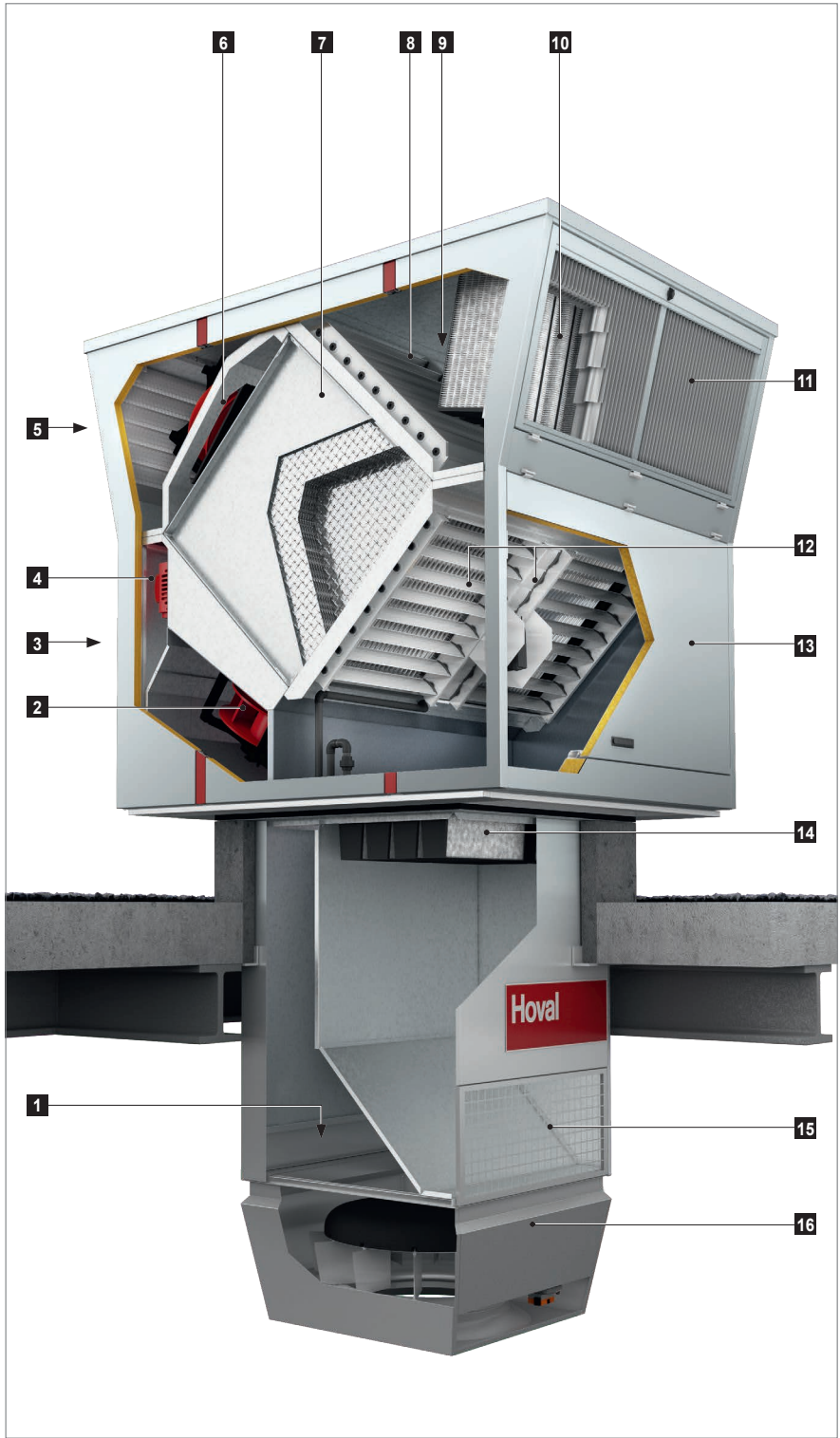
The below-roof unit is installed in the roof and projects into the hall. It consists of the following components:

- Connection module:
 - The connection module serves as an air duct through the roof and for drawing in extract air from the hall through the extract air grille. To enable easy adaptation to local installation conditions, the connection module is available in 4 lengths. It also contains the electrical connection box of the below-roof unit. This has a direct plug connection to the control block in the roof unit via the wiring harness.
- Air-Injector:
 - The Air-Injector is a patented, infinitely variable vortex air distributor for the draught-free introduction of air into the hall under changing operating conditions.



- 1** Roof unit with energy recovery
- 2** Below-roof unit
 - a** Connection module
 - b** Air-Injector

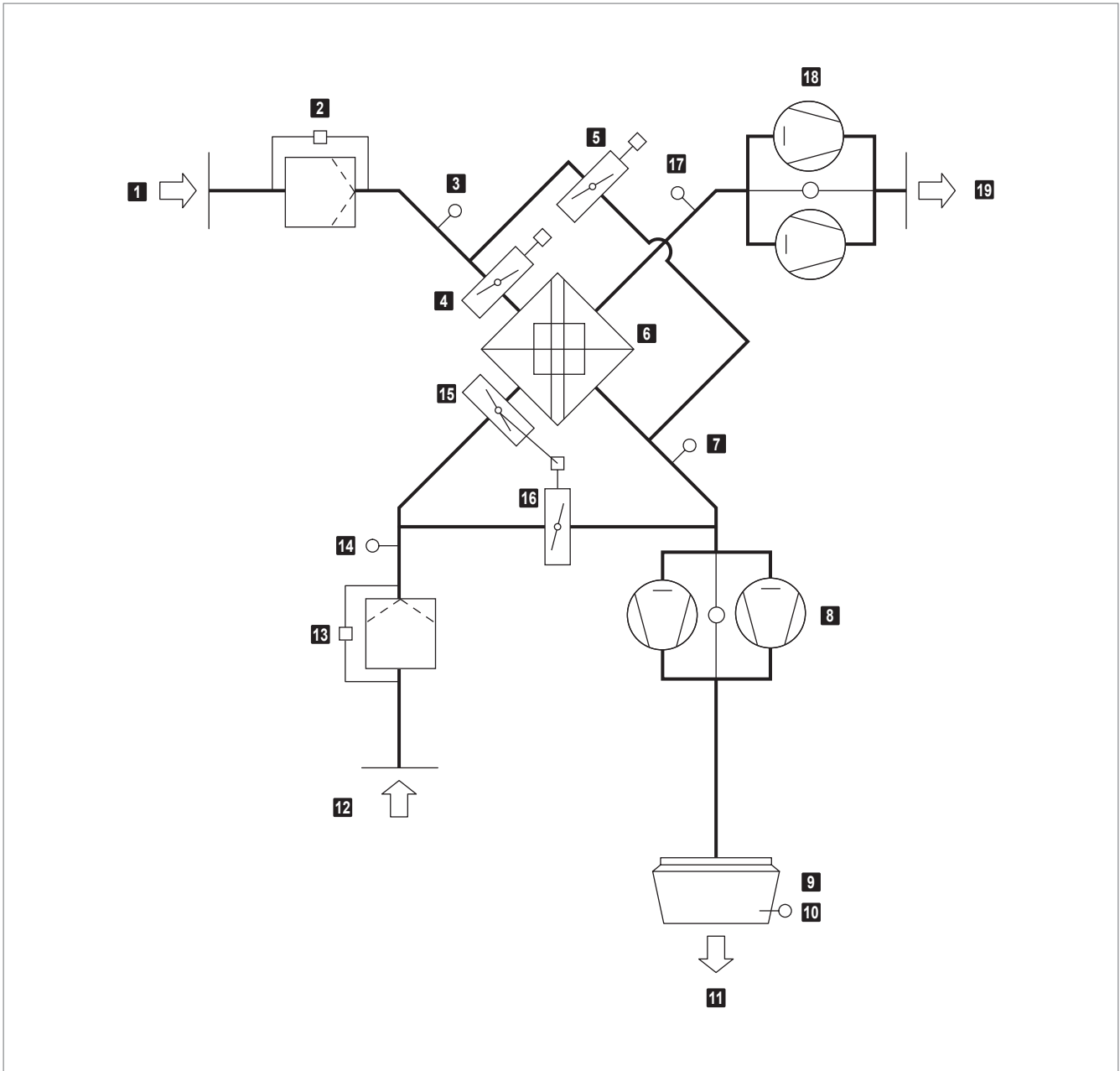
Fig. E1: RoofVent® R components



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

Fig. E2: RoofVent® R construction

2.2 Function diagram



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

Fig. E3: RoofVent® R function diagram

2.3 Operating modes

The RoofVent® RHC has the following operating modes:

- Ventilation
- Ventilation (reduced)
- Air quality
- Exhaust air
- Supply air
- Standby

The TopTronic® C control system regulates these operating modes automatically for each control zone in accordance with the specifications in the calendar. The following points also apply:

- The operating mode of a control zone can be switched over manually.
- Each RoofVent® unit can operate individually in a local operating mode: Off, Supply air, Exhaust air, Ventilation.

| Code | Operating mode | | Description |
|--------|--|--|---|
| VE | <p>Ventilation</p> <p>The unit blows fresh air into the room and exhausts polluted room air. The room temperature set value day is active. Depending on the temperature conditions, the system continuously controls:</p> <ul style="list-style-type: none"> ■ the energy recovery | | <p>Supply air fan on ¹⁾</p> <p>Exhaust air fan on ¹⁾</p> <p>Energy recovery 0-100 %</p> <p>Extract air damper open</p> <p>Recirculation damper closed</p> <p>¹⁾ Adjustable flow rate</p> |
| VEL | <p>Ventilation (reduced)</p> <p>As VE, but the unit only operates with the set minimum values for the supply and exhaust air volumes</p> | | <p>Supply air fan MIN</p> <p>Exhaust air fan MIN</p> <p>Energy recovery 0-100 %</p> <p>Extract air damper open</p> <p>Recirculation damper closed</p> |
| AQ | <p>Air quality</p> <p>This is the operating mode for demand-controlled ventilation of the room. The room temperature set value day is active. Depending on the temperature conditions, the system continuously controls:</p> <ul style="list-style-type: none"> ■ the energy recovery <p>Depending on the room air quality or room air humidity, the system operates in one of the following operating states:</p> | | |
| AQ_ECO | <ul style="list-style-type: none"> ■ Air quality Mixed air: When ventilation requirements are medium, the unit works in mixed air operation. The supply and exhaust air volume is based on the air quality. | | <p>Supply air fan MIN-MAX</p> <p>Exhaust air fan MIN-MAX</p> <p>Energy recovery 0-100 %</p> <p>Extract air damper 50 %</p> <p>Recirculation damper 50 %</p> |
| AQ_VE | <ul style="list-style-type: none"> ■ Air quality Ventilation: When ventilation requirements are high or the room air humidity is too high, the unit works in pure ventilation operation. The supply and exhaust air volume is based on the air quality. | | <p>Supply air fan MIN-MAX</p> <p>Exhaust air fan MIN-MAX</p> <p>Energy recovery 0-100 %</p> <p>Extract air damper open</p> <p>Recirculation damper closed</p> |

| Code | Operating mode | | Description |
|-------|--|--|---|
| EA | <p>Exhaust air</p> <p>The unit extracts spent room air. There is no room temperature control. Unfiltered fresh air enters the room through open windows and doors or another system provides air supply.</p> | | <p>Supply air fan off</p> <p>Exhaust air fan on ¹⁾</p> <p>Energy recovery 0 %</p> <p>Extract air damper open</p> <p>Recirculation damper closed</p> <p>¹⁾ Adjustable flow rate</p> |
| SA | <p>Supply air</p> <p>The unit blows fresh air into the room. Spent room air passes through open windows and doors or another system provides extraction.</p> | | <p>Supply air fan on ¹⁾</p> <p>Exhaust air fan off</p> <p>Energy recovery 0 % ²⁾</p> <p>Extract air damper open</p> <p>Recirculation damper closed</p> <p>¹⁾ Adjustable flow rate</p> <p>²⁾ Fresh air and bypass dampers are open</p> |
| ST | <p>Standby</p> <p>The unit is ready for operation. The following operating modes are activated if required:</p> | | |
| NCS | <p>■ Night cooling:</p> <p>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.</p> | | <p>Supply air fan on ¹⁾</p> <p>Exhaust air fan on ¹⁾</p> <p>Energy recovery 0 %</p> <p>Extract air damper open</p> <p>Recirculation damper closed</p> <p>¹⁾ Adjustable flow rate</p> |
| L_OFF | <p>Off (local operating mode)</p> <p>The unit is switched off. Frost protection remains active.</p> | | <p>Supply air fan off</p> <p>Exhaust air fan off</p> <p>Energy recovery 0 %</p> <p>Extract air damper closed</p> <p>Recirculation damper open</p> |

Table E1: RoofVent® R operating modes

3 Technical data

3.1 Type code

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

Table E2: Type code

3.2 Application limits

| | | | |
|---------------------------------|---------|------|-----------|
| Fresh air temperature | min. | °C | -30 |
| Extract air temperature | max. | °C | 50 |
| Moisture content of extract air | max. | g/kg | 15 |
| Supply air temperature | max. | °C | 60 |
| Air flow rate | Size 6: | min. | m³/h 3100 |
| | Size 9: | min. | m³/h 5000 |

¹⁾ Design for higher temperatures on request

Table E3: Application limits



Notice

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

3.3 Heat recovery system (HRS)

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

Table E4: Thermal transfer level of the plate heat exchanger

3.4 Air filtration

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

Table E5: Air filtration

3.5 Electrical connection

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

Table E6: RoofVent® R electrical connections

3.6 Air flow rate

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

Table E7: Air flow rate

3.7 Heat output

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

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

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

Table E8: RoofVent® R heat output

3.8 Sound level

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

¹⁾ With hemispherical radiation in a low-reflection environment



Table E9: RoofVent® R sound level

3.9 Dimensions and weights

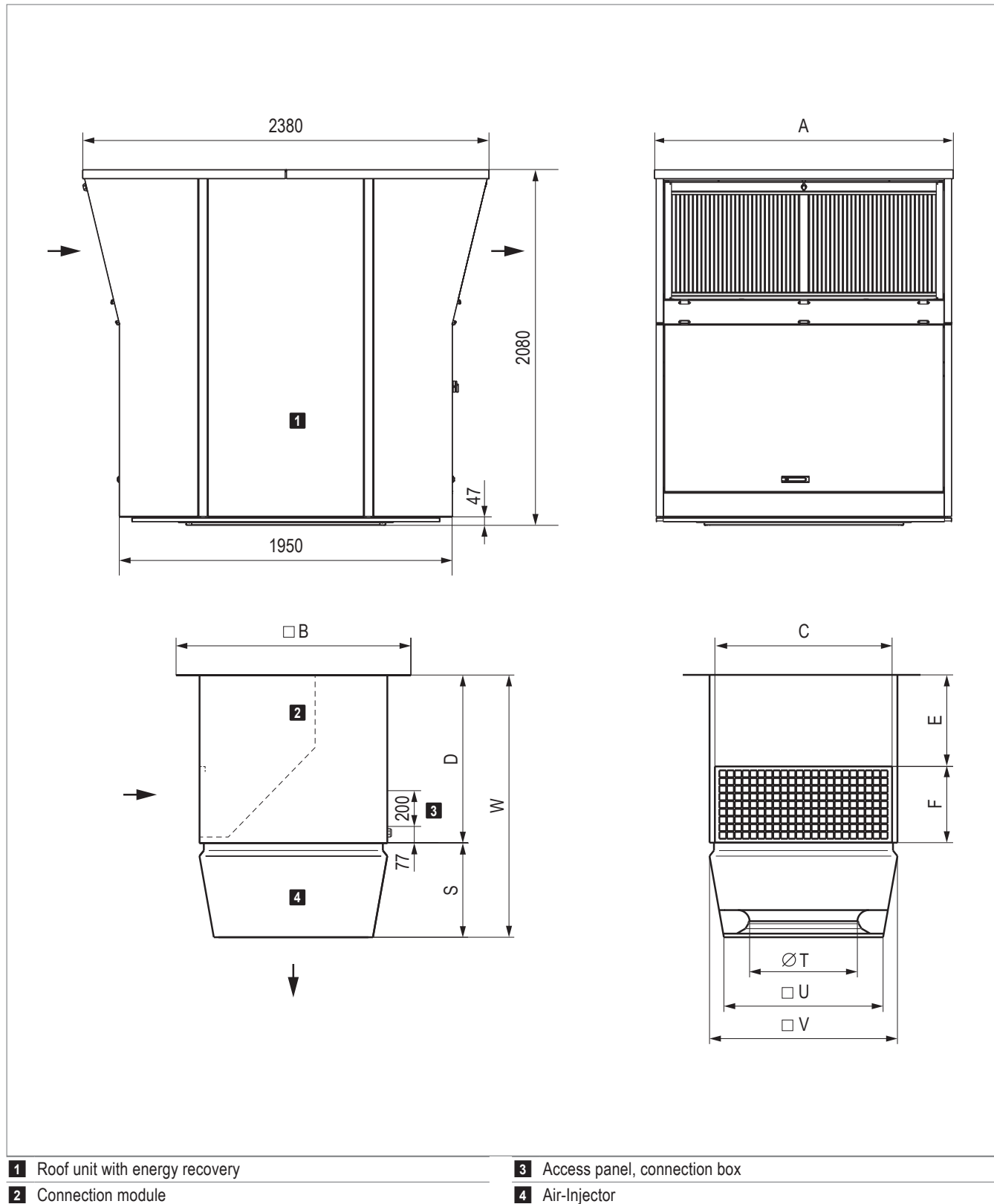


Fig. E4: RoofVent® R dimensional drawing (dimensions in mm)

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

Table E10: RoofVent® R dimensions

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

Table E11: RoofVent® R weights

3.10 Product information according to ErP

| Trademark / Model | | Hoval RoofVent® R | | Unit |
|--|------------------------------------|---|------|----------|
| | | 6 | 9 | |
| Type | | NRVU, BVU | | – |
| Drive | | Variable speed drive | | – |
| Heat recovery system | | other | | – |
| Thermal efficiency of heat recovery (η_{t_nrvu}) | | 77 | 78 | % |
| Nominal flow rate (q_{nom}) | | 1.53 | 2.22 | m³/s |
| Effective electric power input (P) | | 1.93 | 2.99 | kW |
| Internal specific fan power (SFP _{int}) | | 920 | 940 | W/(m³/s) |
| Face velocity | | 2.69 | 2.98 | m/s |
| Nominal external pressure ($\Delta p_{s, ext}$) | Supply air | 260 | 330 | Pa |
| | Extract air | 190 | 300 | |
| Internal pressure drop of ventilation components ($\Delta p_{s, int}$) | Fresh air/supply air | 270 | 268 | Pa |
| | Extract air/exhaust air | 300 | 316 | |
| Static efficiency of the fans (η_{fan}) in accordance with Regulation (EU) No 327/2011 | | 62 | 63 | % |
| Maximum leakage rate | External | 0.45 | 0.25 | % |
| | Internal | 1.50 | 1.20 | |
| Energy classification of the filters (class acc. to ISO 16890, final pressure difference) | Supply air ePM ₁ 55 % | 250 | 250 | Pa |
| | Extract air ePM ₁₀ 65 % | 350 | 350 | |
| Visual filter warning | | Displayed on the operating unit | | – |
| Casing sound power level (L _{WA}) | | 73 | 72 | dB(A) |
| Disassembly instructions | | Devices that are no longer functional must be dismantled by a specialist company and disposed of at suitable collection points. | | – |
| Contact details | | Hoval Aktiengesellschaft Austrasse 70, 9490 Vaduz, Liechtenstein www.hoval.com | | |

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

4 Specification texts

4.1 RoofVent® RHC

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

The unit consists of the following components:

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

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

Roof unit with energy recovery

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

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

The roof unit with energy recovery includes:

Supply air and exhaust air fans

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

Fresh air filter

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

Extract air filter

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

Plate heat exchanger

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

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

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

Access openings

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

Control block

Compact design on an easily accessible mounting plate, comprising:

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

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

Connection module

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

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

Connection module V1 / V2 / V3:

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

Air-Injector

1 Air-Injectors

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

- Vortex air distributor with concentric outlet nozzle, adjustable vanes and integrated absorber hood
- Actuator for infinitely variable adjustment of the air distribution from vertical to horizontal
 - for draught-free air distribution in the hall under changing operating conditions
 - for the rapid and large-area reduction of temperature stratification in the room through induction of secondary air and strong mixing of the room air with supply air
- Supply air temperature sensor

2 Air-Injectors

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

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

- Vortex air distributor with concentric outlet nozzle, adjustable vanes and integrated absorber hood
- Actuator for infinitely variable adjustment of the air distribution from vertical to horizontal
 - for draught-free air distribution in the hall under changing operating conditions
 - for the rapid and large-area reduction of temperature stratification in the room through induction of secondary air and strong mixing of the room air with supply air
- Supply air sensor (supplied in the connection module)

Without Air-Injector

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

Options for the unit

Oil-proof design

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

Corrosion-protected design for high extract air humidity

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

Paint finish of below-roof unit

Choice of external paint finish in RAL colour

Fresh air and exhaust air silencers

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

Supply air and extract air 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

Socket

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

Energy monitoring

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

4.2 TopTronic® C – System control

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

Zone allocation

Configured in advance for the customer at the factory:

| | Room designation | Unit type |
|---------|------------------|-----------|
| Zone 1: | _____ | _____ |
| Zone 2: | _____ | _____ |
| ... | | |

System structure

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

Functions, standard

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

- Main operating modes of supply and extract air handling units:

VE Ventilation, infinitely variably adjustment

AQ.... Air quality, automatic control with Hoval combination sensor (option), optional reference variable:
– CO₂ or VOC
– Air humidity (optimised dehumidification mode)

REC . Recirculation, infinitely variably adjustment

DES.. Destratification

EA Exhaust air, infinitely variably adjustment

SA Supply air, infinitely variably adjustment

ST Standby

- Main operating modes of supply air units:

REC . Recirculation, infinitely variably adjustment

DES.. Destratification

SA Supply air, infinitely variably adjustment

With Hoval combination sensor (option) also demand-driven control of the fresh air ratio, optional reference variable CO₂ or VOC

ST Standby

- Main operating modes of recirculated air units:

REC . Recirculation, infinitely variably adjustment

DES.. Destratification

ST Standby

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

Operation

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

Options for operation

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

Alarms, protection

- Central alarm management with registration of all alarms (timestamp, priority, status) in an alarm list and alarm memory of the last 50 alarms; forwarding via e-mail can be set in the parameters.
- If there is a failure of communication, bus stations, sensor systems or supply media, each part of the system transitions to a protection mode which safeguards operation.
- A maintenance mode implemented in the control algorithm for testing all physical data points and alarms guarantees high reliability.
- Pre-programmed data points retrievable via logger function for 1 year

Options for the zone control panel

- Alarm lamp
- Socket

Per zone:

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

Power distribution:

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

1 Type code 84

2 Oil-proof design 86

3 Corrosion-protected design for high extract air humidity 86

4 Connection module. 87

5 Design with 2 Air-Injectors 87

6 Design without Air-Injector 87

7 Paint finish of below-roof unit 87

8 Fresh air and exhaust air silencers 88

9 Supply air and extract air silencers 89

10 Hydraulic assembly diverting system. 90

11 Mixing valve 92

12 Condensate pump 92

13 Socket 93

14 Energy monitoring. 93

15 Return temperature sensor 93

16 Pump control 93



Options

F

1 Type code

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

Unit type

RoofVent® RH | RC | RHC | R

Unit size

6 or 9

Heating section

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

Heating/cooling section

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

Heat recovery

RX Temperature efficiency ErP 2018

Design

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

Connection module

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

Air outlet

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

Paint finish

- without
- LU Paint finish of below-roof unit

Silencers outside

- without
- AF Fresh air and exhaust air silencer

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

Silencers inside

- without
- SI Supply air and extract air silencer

Hydraulics

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

Condensate pump

- without
- KP Condensate pump

Socket

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

Control system

- TC TopTronic® C

Energy monitoring

- without
- EM Energy monitoring

Pump control

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

Return temperature sensor

- without
- RF Return temperature sensor

Table F1: Type code

2 Oil-proof design

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

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

Please note the following:

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



Notice

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

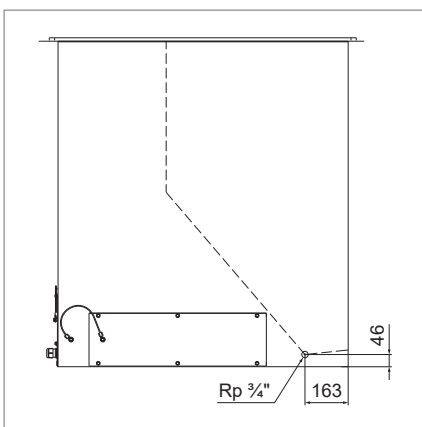


Fig. F1: Dimensional drawing for oil/condensate drain (in mm) for oil-proof design and corrosion-protected design for high extract air humidity

3 Corrosion-protected design for high extract air humidity

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

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

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

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

Please note the following:

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



Attention

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

4 Connection module

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

5 Design with 2 Air-Injectors

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

Please note the following:

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

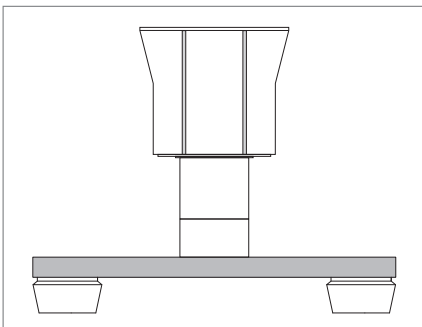


Fig. F2: RoofVent® unit with supply air duct and 2 Air-Injectors

A technical drawing of a supply air duct connection. It shows a cross-section of the duct with a connection point. Dimensions are given in millimeters: 20, 25, and 28. There are also labels X and V indicating different lengths or positions.

| Size | | 6 | 9 |
|------|----|-----|------|
| X | mm | 850 | 1050 |
| V | mm | 900 | 1100 |

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

6 Design without Air-Injector

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

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

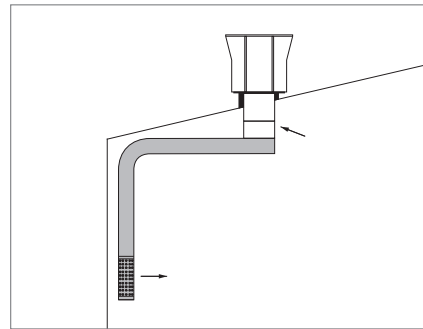


Fig. F3: Connection to an air distribution system supplied by the client (for dimensions see Table F2)

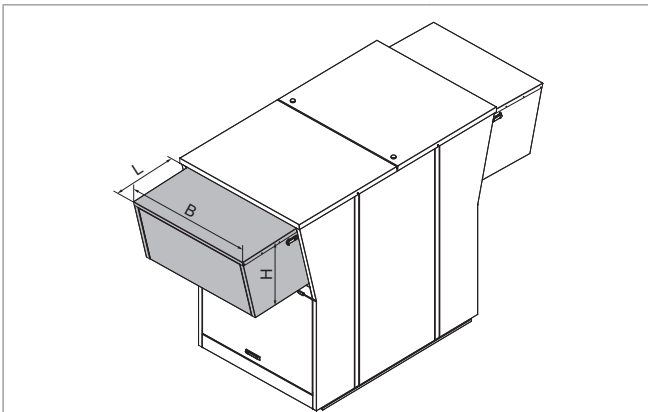
7 Paint finish of below-roof unit

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

8 Fresh air and exhaust air silencers

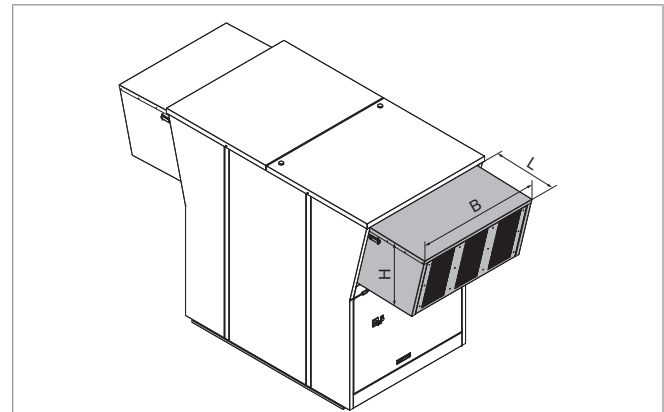
The fresh air silencer reduces noise emissions from RoofVent® units on the fresh air side. It consists of an aluminium casing with a bird screen and acoustic insulation lining and is configured as an add-on part for the roof unit which can be folded downwards.

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 | 30 | 42 |
| Pressure drop | Pa | 10 | 10 |

Table F3: Technical data fresh air silencer



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

Table F5: Technical data exhaust air silencer

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

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

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

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

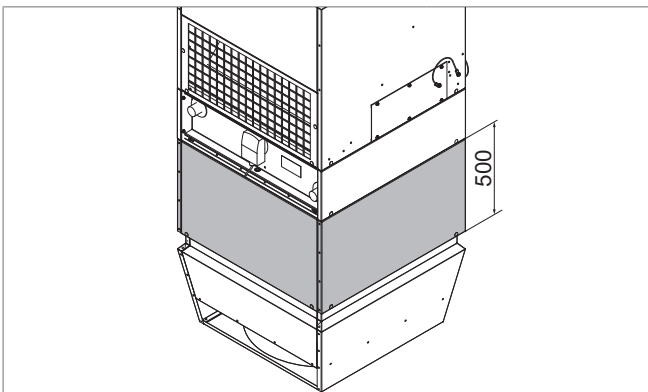


Notice

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

9 Supply air and extract air silencers

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



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

Table F7: Technical data supply air and extract air silencers

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

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



Notice

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

10 Hydraulic assembly diverting system

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

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

Default settings for the hydraulic alignment

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

0.0 . . . Valve closed

4.0 . . . Valve fully open

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

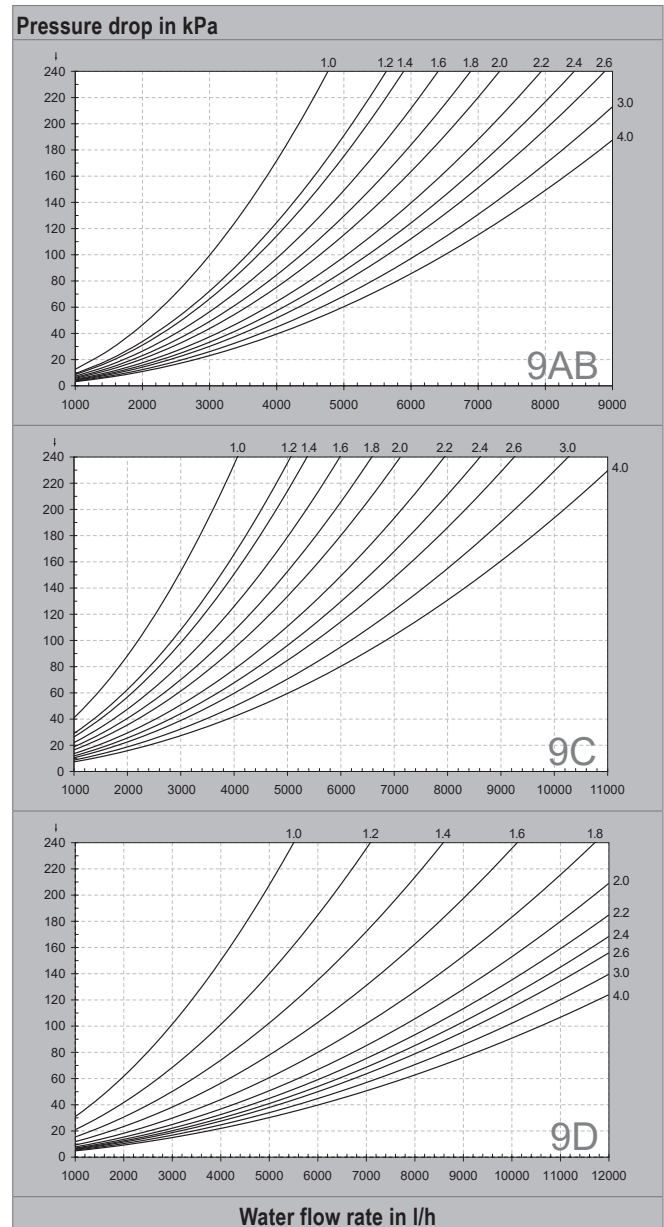
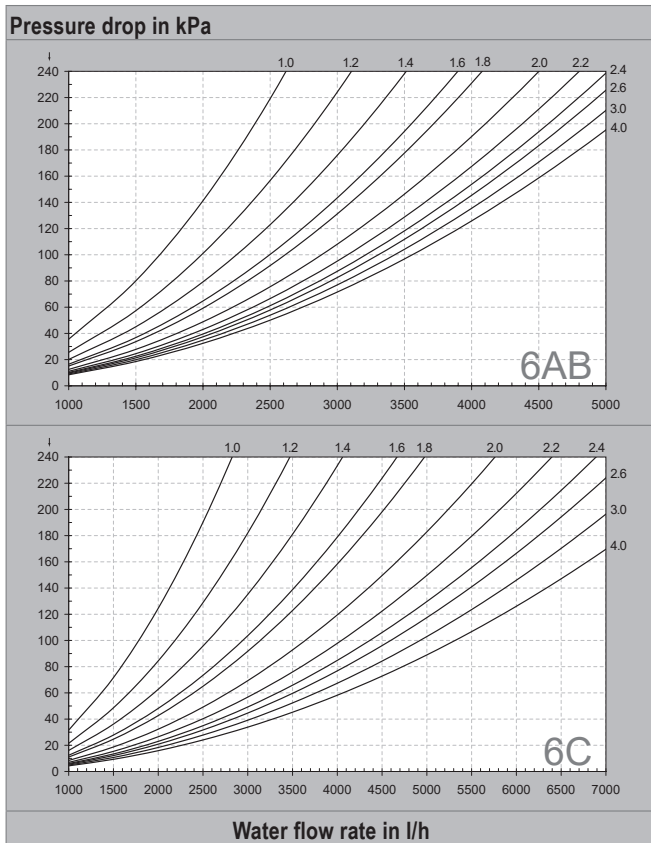
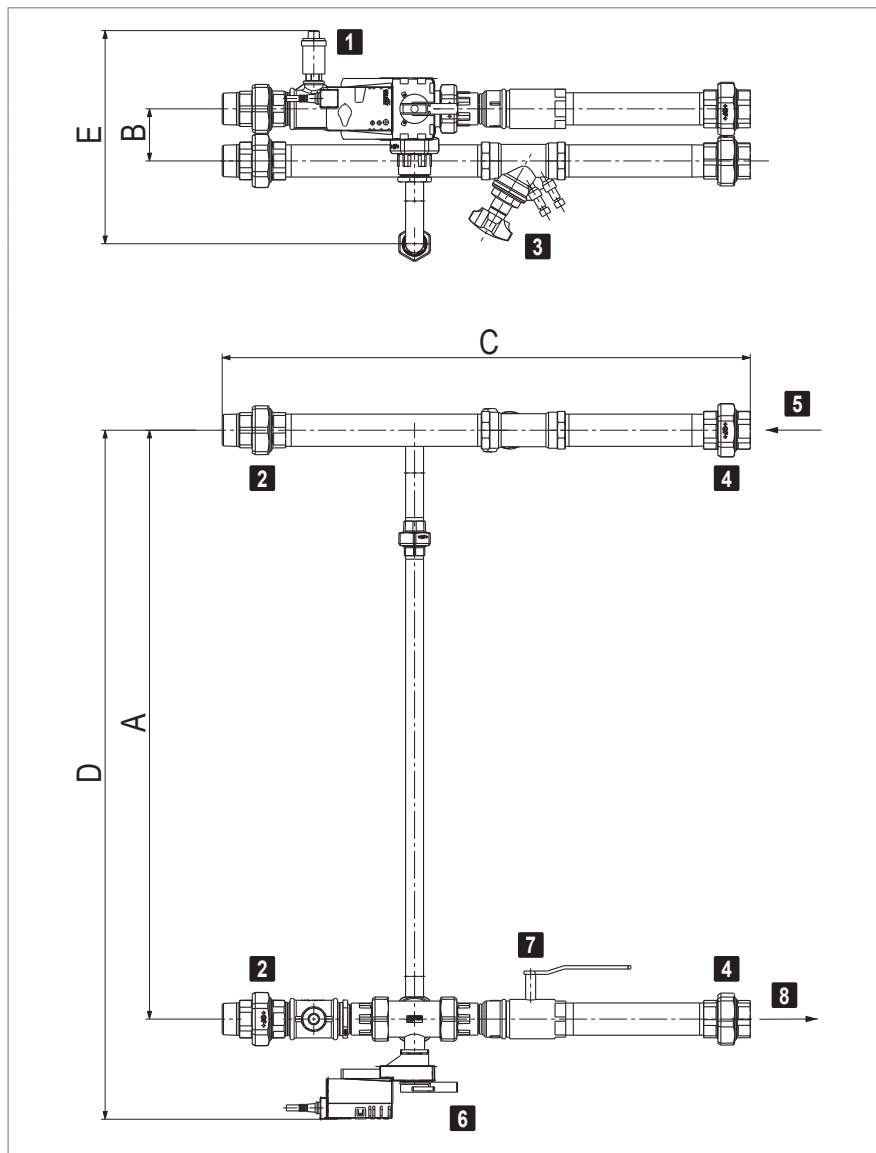


Fig. F4: Default settings for the balancing valves



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

Fig. F5: Hydraulic assembly dimensional drawing

| Type | A | B | C | D | E | Screw joint | Weight |
|-------|-----|----|-----|------|-----|-------------|--------|
| Y-6AB | 758 | 78 | 726 | 904 | 315 | 1¼ " | 11 |
| Y-6C | 758 | 78 | 745 | 904 | 315 | 1¼ " | 11 |
| Y-9AB | 882 | 78 | 770 | 1028 | 319 | 1½ " | 13 |
| Y-9C | 882 | 78 | 791 | 1032 | 319 | 1½ " | 14 |
| Y-9D | 882 | 95 | 840 | 1032 | 326 | 2 " | 19 |

Table F9: Hydraulic assembly dimensions and weights (in mm resp. kg)

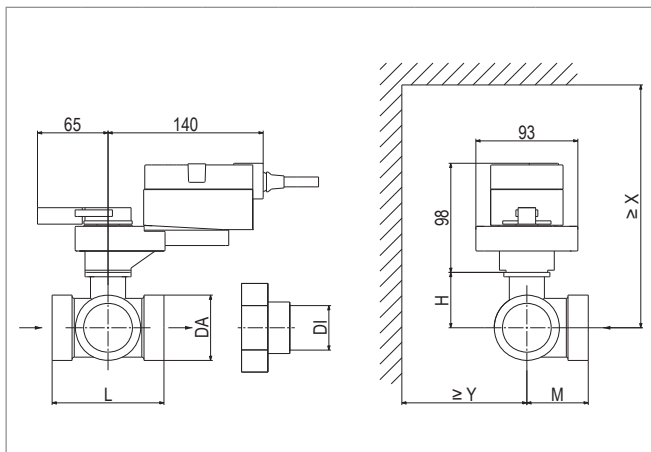
| Type | Mixing valve | Control valve |
|-------|----------------|---------------|
| Y-6AB | DN20 / kvs 6.3 | STAD DN32 |
| Y-6C | DN25 / kvs 10 | STAD DN32 |
| Y-9AB | DN25 / kvs 10 | STAD DN40 |
| Y-9C | DN32 / kvs 10 | STAD DN40 |
| Y-9D | DN40 / kvs 16 | STAD DN50 |

Table F10: Valves of the hydraulic assembly

11 Mixing valve

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

- 3-way mixing valve with modulating rotary actuator (run time 9 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-6C | 25 | 10 | G 1½ | Rp 1 | 85 | 46 | 45 | 220 | 90 |
| M-9AB | 25 | 10 | G 1½ | Rp 1 | 85 | 46 | 45 | 220 | 90 |
| M-9C | 32 | 10 | G2 | Rp 1¼ | 104 | 46 | 56 | 220 | 90 |
| M-9D | 40 | 16 | G 2¼ | Rp 1½ | 115 | 51 | 56 | 230 | 90 |

Table F11: Mixing valve dimensions

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

Table F12: Mixing valve weights (in kg)

12 Condensate pump

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

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

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

Table F13: Condensate pump technical data

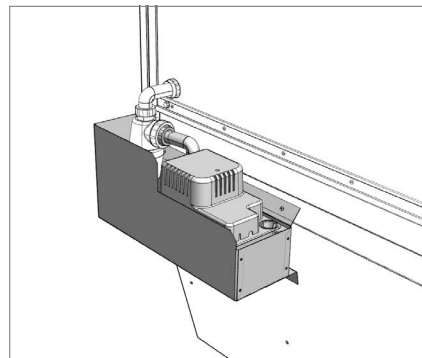


Fig. F6: Condensate pump

13 Socket

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

14 Energy monitoring

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

15 Return temperature sensor

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

16 Pump control

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

Please note the following:

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

Requirements for mixing valves

- Use 3-way mixing valves with the following flow characteristics:
 - Equal percentage control path
 - Linear bypass
- The valve authority must be ≥ 0.5 .
- The maximum run time of the valve actuator is 45 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 pumps

Voltage. 230 V AC

Current. up to 4.0 A

Requirements on changeover valves

Use changeover valves conforming to the following specification for heating and cooling in the 2-pipe system:

- 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

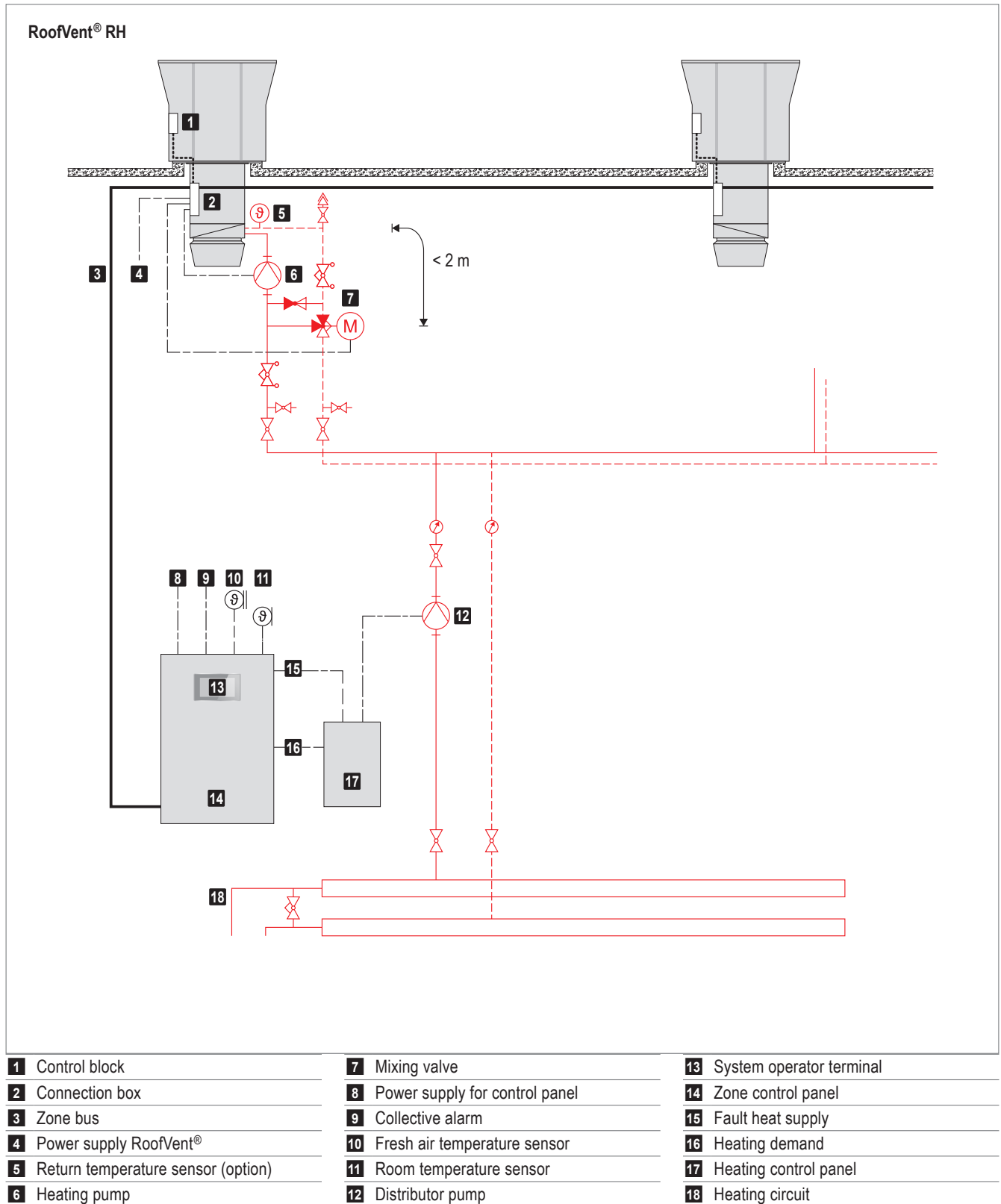


Fig. F7: Schematic diagram for injection circuit RoofVent® RH

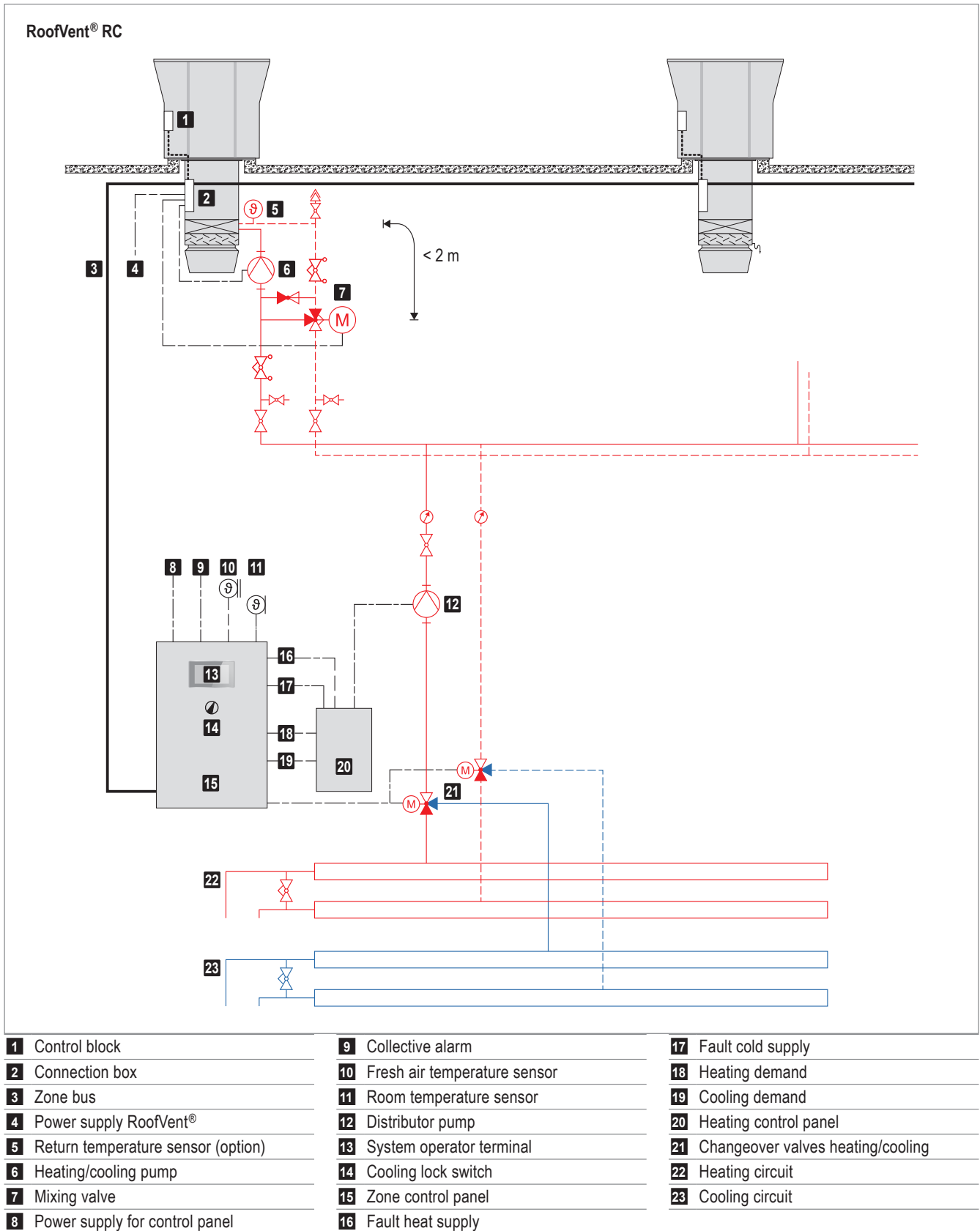
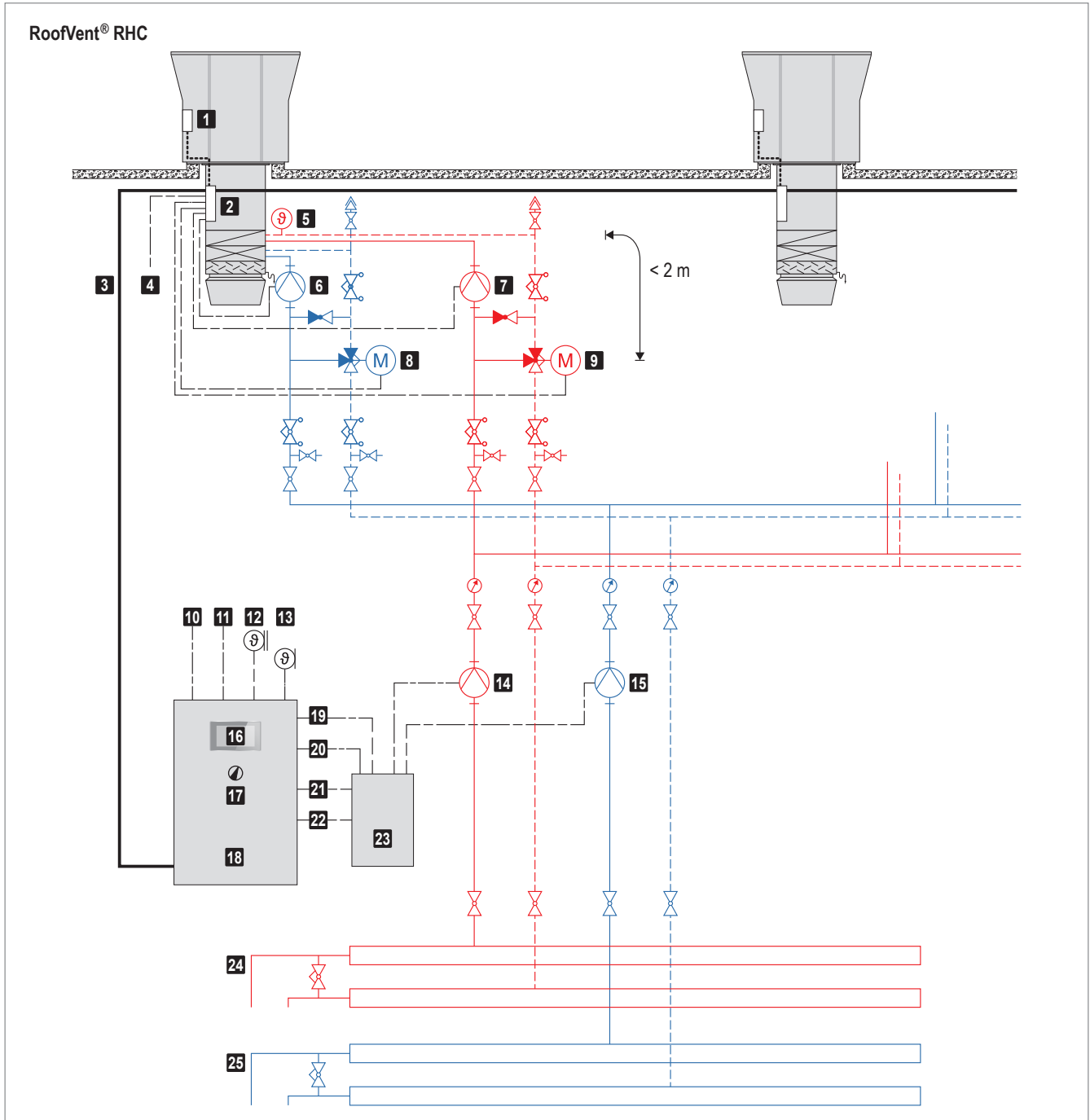


Fig. F8: Schematic diagram for injection circuit RoofVent® RC



- | | | |
|---|--|---------------------------------|
| 1 Control block | 10 Power supply for control panel | 19 Fault heat supply |
| 2 Connection box | 11 Collective alarm | 20 Fault cold supply |
| 3 Zone bus | 12 Fresh air temperature sensor | 21 Heating demand |
| 4 Power supply RoofVent® | 13 Room temperature sensor | 22 Cooling demand |
| 5 Return temperature sensor (option) | 14 Distributor pump heating | 23 Heating control panel |
| 6 Cooling pump | 15 Distributor pump cooling | 24 Heating circuit |
| 7 Heating pump | 16 System operator terminal | 25 Cooling circuit |
| 8 Mixing valve cooling | 17 Cooling lock switch | |
| 9 Mixing valve heating | 18 Zone control panel | |

Fig. F9: Schematic diagram for injection circuit RoofVent® RHC

1 Installation 98
2 Hydraulic installation 102
3 Electrical installation 106



Transport and installation



1 Installation

1.1 Preparation

The following guidelines are important when preparing for installation:

- The scope of delivery includes:
 - RoofVent® unit, delivered in 2 parts on pallets (roof unit, below-roof unit)
 - Accessories (transport eyes, installation material, extract air filter, trap, temperature sensors)
 - Optional components
- The units are delivered screwed onto the pallet. To loosen the screws, the inspection doors must be opened. When unloading the units, make sure that there is enough space to open the inspection doors.
- 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.
 - A ladder will be required to screw in the transport eyes.
 - Use lifting ropes at least 2 m in length to lift the below-roof unit.
 - Use lifting ropes at least 3 m in length to lift the roof unit.
- Depending on the unit size, the below-roof unit can be delivered in 2 parts.
- Make sure that the roof frame corresponds to the specifications in chapter 1.3.
- A sealing compound is required for sealing (e.g. Sikaflex 221).
- Define the desired orientation of the units (position of the coil connections).



Notice

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

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

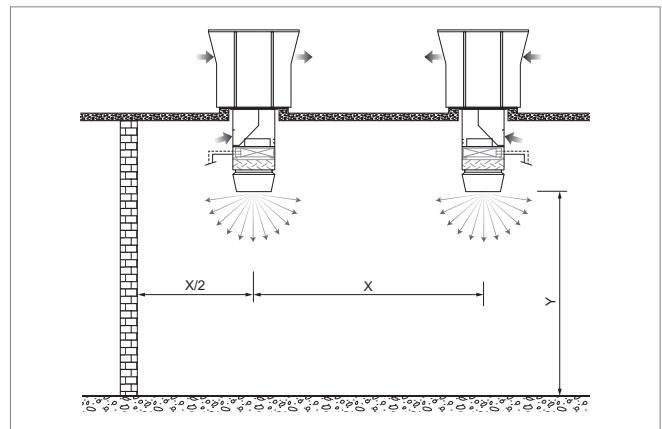


Notice

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

1.2 Positioning

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



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

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

Table G1: Minimum and maximum distances

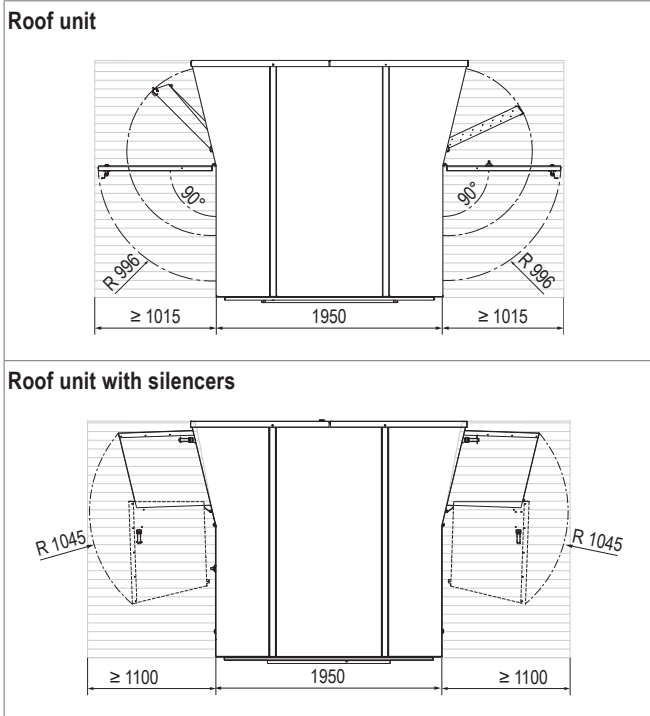
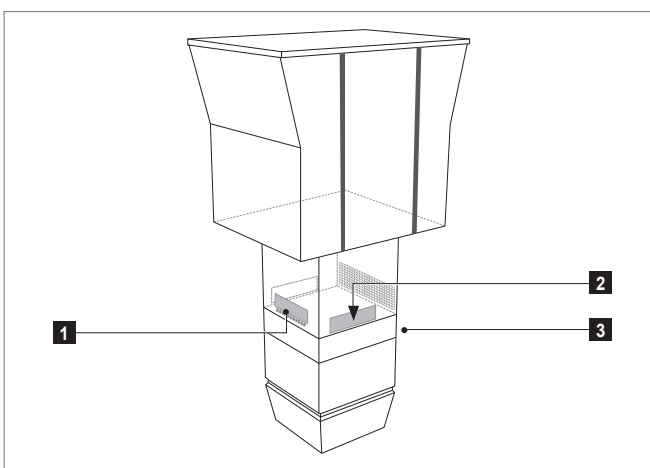


Fig. G1: Space requirements for maintenance on the roof (dimensions in mm)



Notice

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



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

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

1.3 Roof frame

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

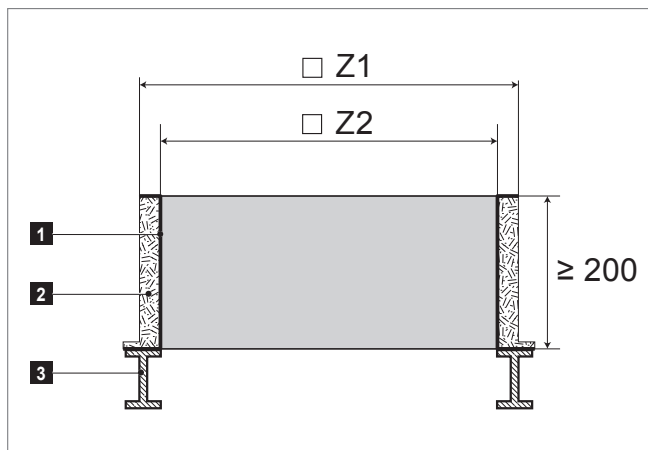
- The extract air grille and the access panels must be freely accessible under the roof.
- The roof frame must protrude at least 200 mm from the roof, so that no water can penetrate during a rainstorm or snowfall.



Notice

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

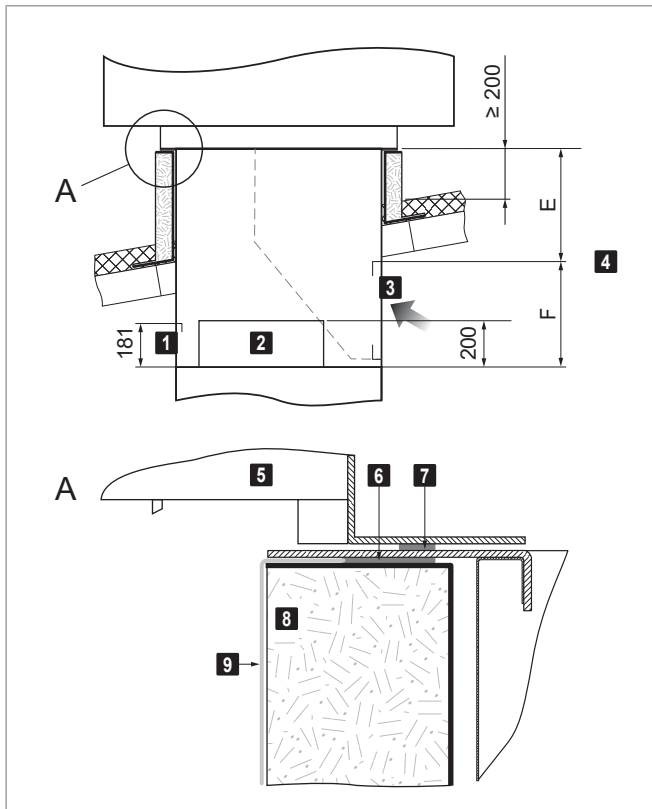
- The opening (dimension Z2) must be large enough to accommodate the below-roof unit.
- The condensate must be able to drain off freely.
- The roof frame must be flat and horizontal.
- Insulate the roof frame before installing the unit (e.g. 40 mm PU foam).
- Please observe the minimum distances when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



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

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

Table G2: Dimensions for roof frame



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

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

| Size | | 6 | 9 |
|------|----|-----|-----|
| Z3 | mm | 571 | 749 |

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

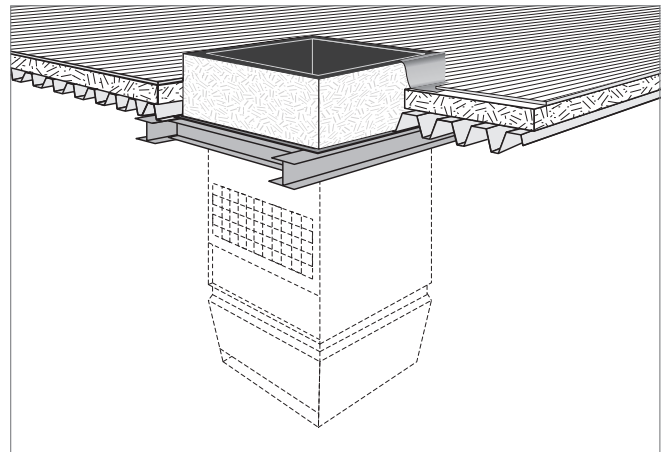


Fig. G4: Conceptual drawing of the roof frame

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

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



Notice

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

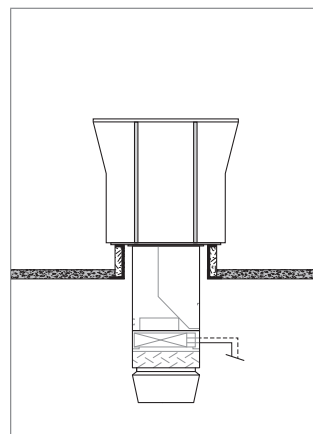


Fig. G5: Roof frame with straight side walls

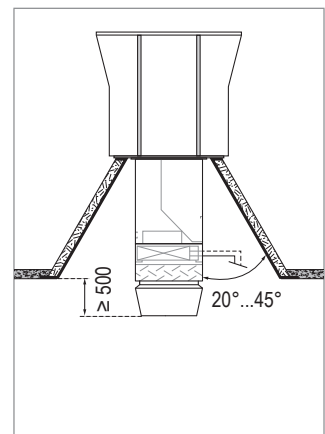


Fig. G6: Roof frame with conical side walls

1.4 Unit installation

Proceed as follows to position the unit:

Below-roof unit

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

Roof unit

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

1.5 Duct connection

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

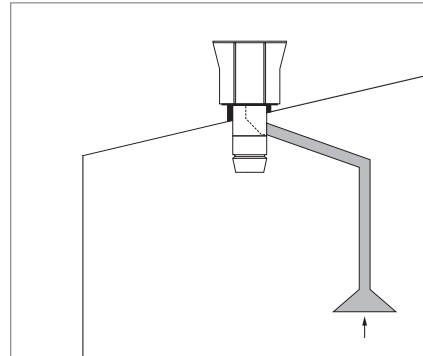
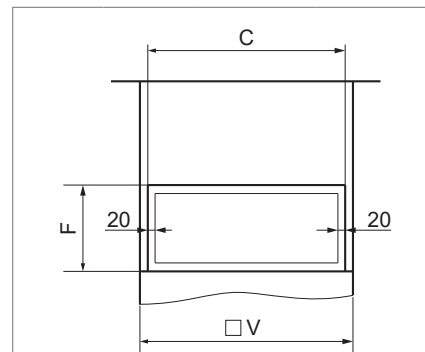


Fig. G7: Extract air duct



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

Table G4: Connection dimensions (in mm)



2 Hydraulic installation

2.1 Heating/cooling coil

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

Requirements on the boiler system and the distributor circuit

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

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

Requirements for mixing valves

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



Notice

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

Requirements on changeover valves

Use changeover valves conforming to the following specification for heating and cooling in the 2-pipe system:

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

2.2 Condensate connection

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

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



Notice

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

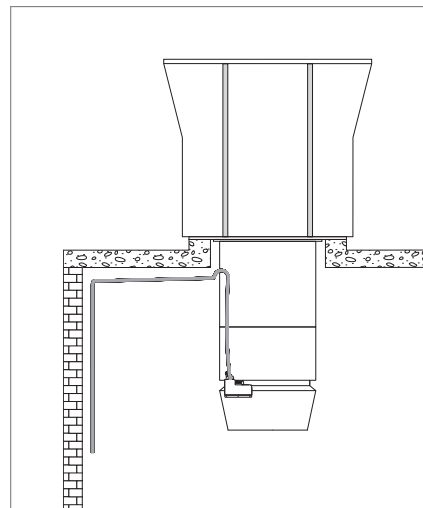


Fig. G8: Condensate drain

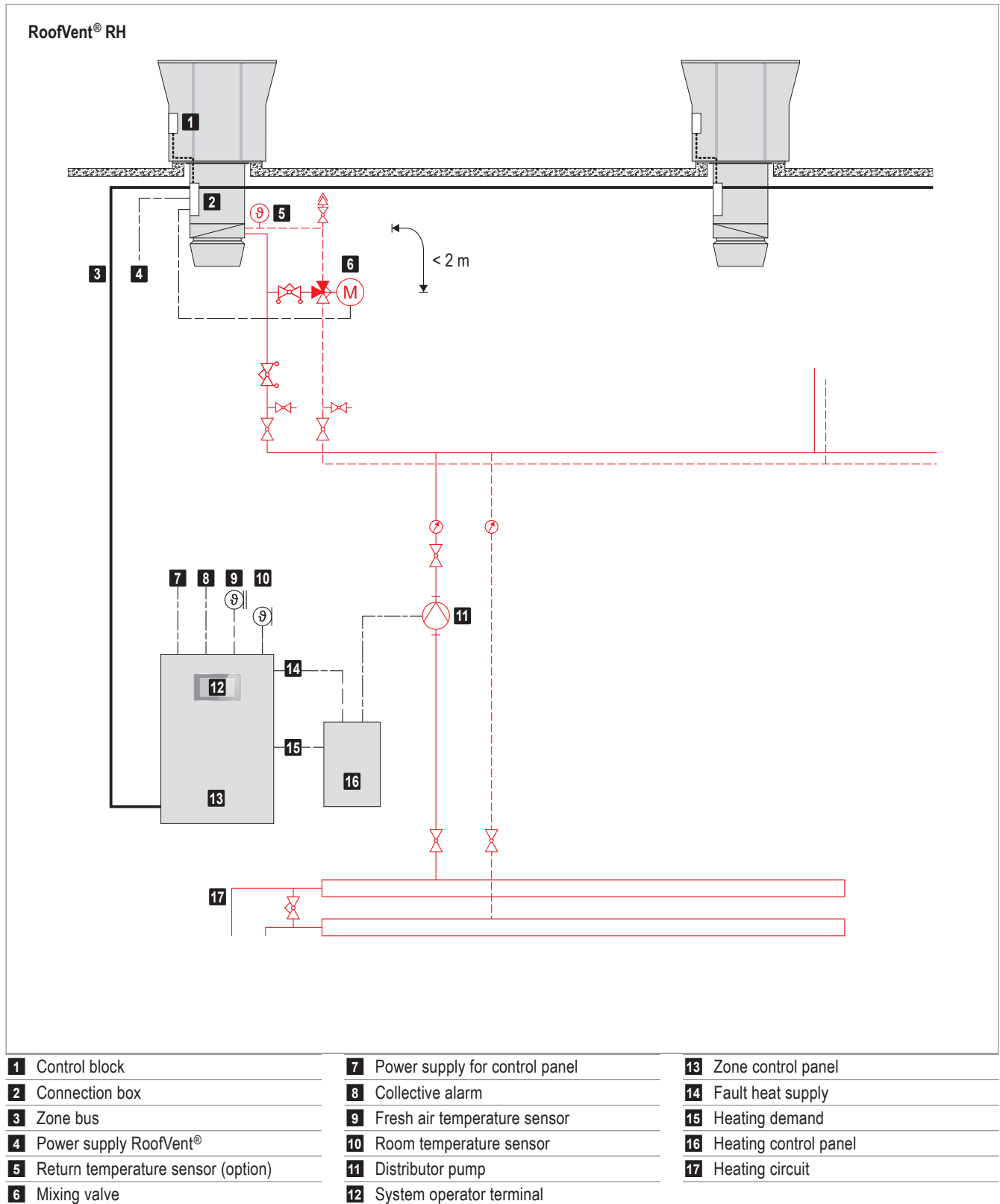


Table G5: Schematic diagram for hydraulic diverting circuit RoofVent® RH

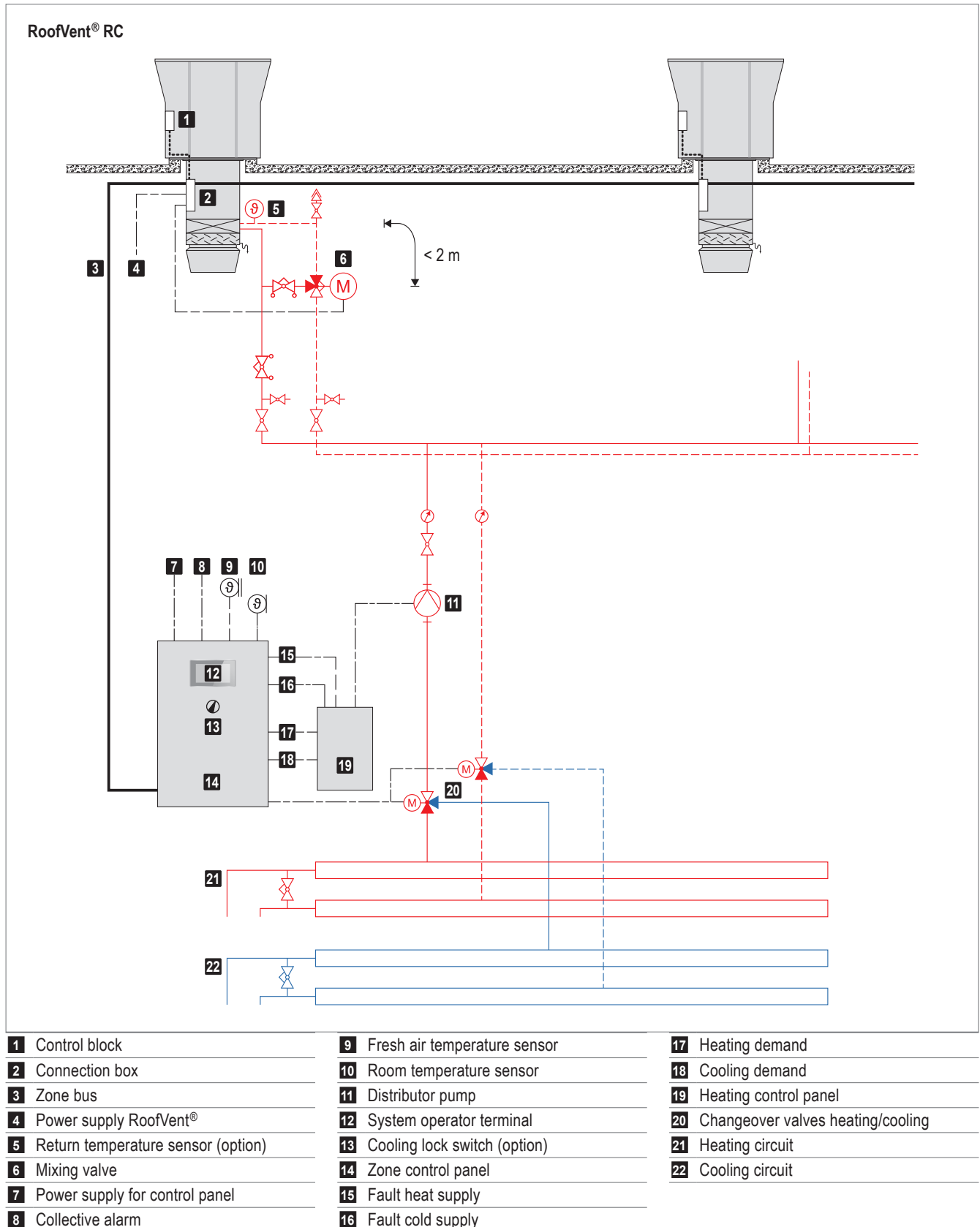


Table G6: Schematic diagram for hydraulic diverting circuit RoofVent® RC

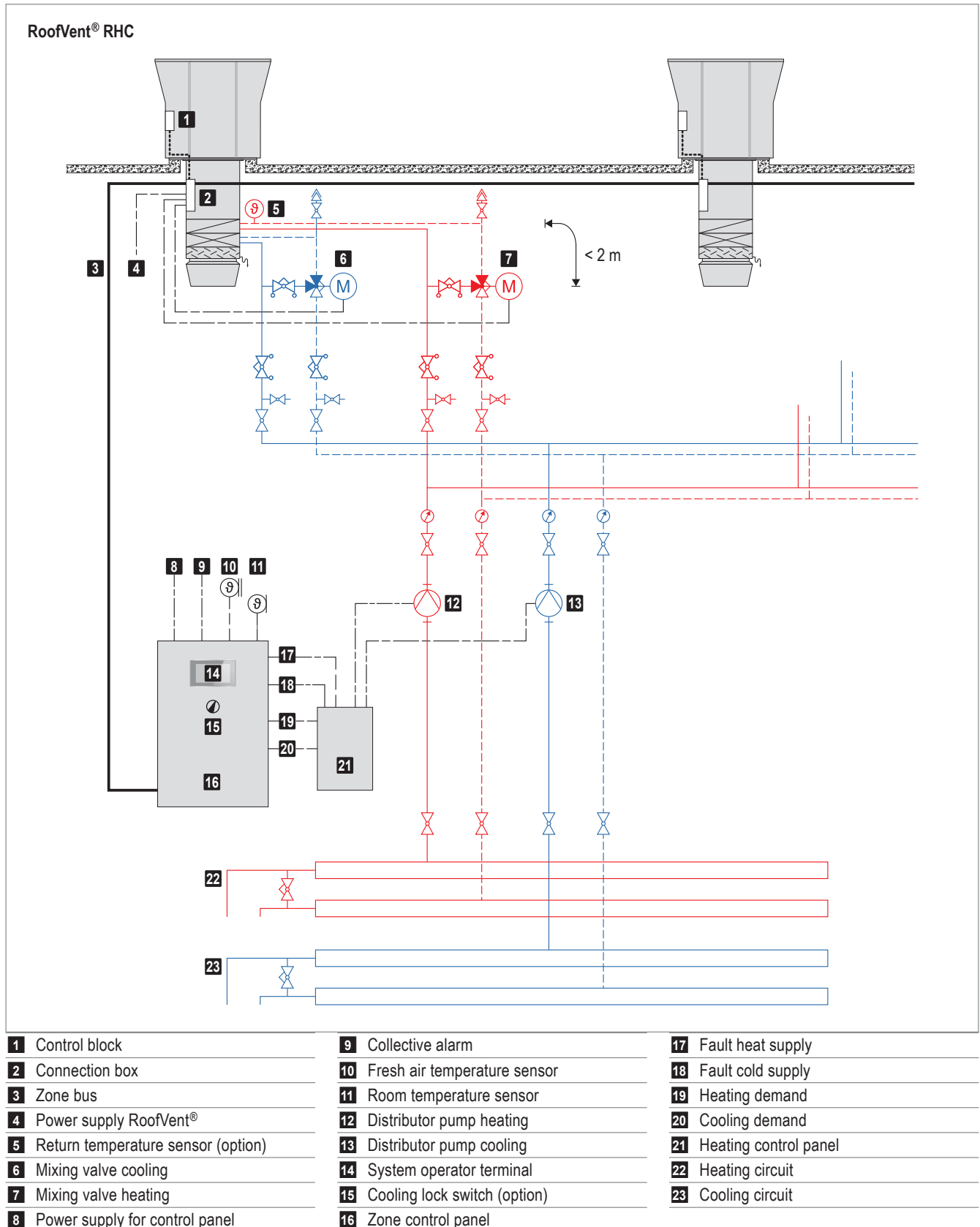
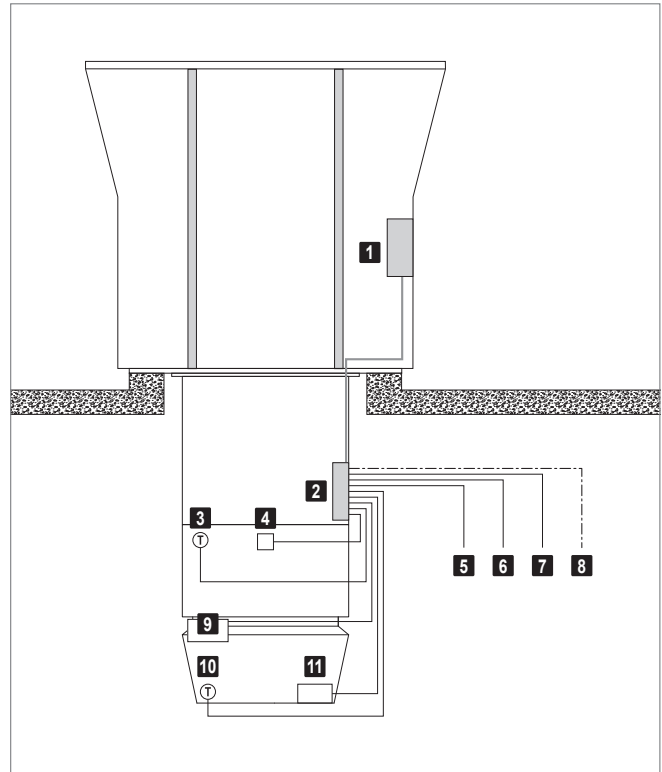


Table G7: Schematic diagram for hydraulic diverting circuit RoofVent® RHC

3 Electrical installation

- The electrical installation must only be carried out by a qualified electrician.
- Observe the relevant regulations (e.g. EN 60204-1).
- Choose the dimensions of the cable cross sections in line with the applicable regulations.
- Route signal and bus lines separately from mains cables.
- Make sure the lightning protection system for the units or for the entire building is planned and carried out by professionals.
- Provide overload protection equipment on site in the mains connection line of the zone control panel.
- Carry out the electrical installation according to the wiring diagram:
 - Power supply RoofVent®
 - Zone bus based on system layout
 - Signal lines
- Connect the connection box in the below-roof unit to the control block in the roof unit.
- Connect the electrical components of the below-roof unit to the connection box.



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

Fig. G9: On-site electrical connection

| Component | Designation | Voltage | Cable | Comments | Start | Target | |
|--|---|--|--------------------------------------|---|----------------------------------|----------------------------|--------------------|
| TopTronic® C System control | Power supply | 3 × 400 VAC | NYM-J 5 × ... mm ² | | On-site | Zone control panel | |
| | | 1 × 230 VAC | NYM-J 3 × ... mm ² | | On-site | Zone control panel | |
| Zone control panel | Zone bus | | J-Y(ST)Y 2 × 2 × 0.8 mm | max. 500 m length | Zone control panel | Hoval units | |
| | System bus | | Ethernet ≥ CAT 5 | For connecting several zone control panels | Zone control panel | Further zone control panel | |
| | Integration into the building management system | | Ethernet ≥ CAT 5 | | BACnet, Modbus IP | Zone control panel | On-site (BMS) |
| | | | J-Y(ST)Y 2 × 2 × 0.8 mm | | Modbus RTU | Zone control panel | On-site (BMS) |
| | Room temperature sensor | | J-Y(ST)Y 2 × 2 × 0.8 mm | max. 250 m | Zone control panel | Sensor | |
| | Additional room temperature sensors | | J-Y(ST)Y 2 × 2 × 0.8 mm | max. 250 m | Zone control panel | Sensor | |
| | Combination sensor room air quality, temperature and humidity | | J-Y(ST)Y 4 × 2 × 0.8 mm | max. 250 m | Zone control panel | Sensor | |
| | Fresh air temperature sensor | | J-Y(ST)Y 2 × 2 × 0.8 mm | max. 250 m | Zone control panel | Sensor | |
| | Combination sensor fresh air temperature and humidity | | J-Y(ST)Y 2 × 2 × 0.8 mm | max. 250 m | Zone control panel | Sensor | |
| | Heating demand | Volt-free max. 250 VAC max. 24 VDC | NYM-O 2 × 1.5 mm ² | max. 8 A | | Zone control panel | On-site |
| | Setpoint heating demand | 2-10 VDC | J-Y(ST)Y 2 × 2 × 0.8 mm | max. 250 m | | Zone control panel | On-site |
| | Cooling demand | Volt-free max. 250 VAC max. 24 VDC | NYM-O 2 × 1.5 mm ² | max. 8 A | | Zone control panel | On-site |
| | Fault heat supply | 24 VAC | NYM-O 2 × 1.5 mm ² | max. 1 A | | On-site | Zone control panel |
| | Fault cold supply | 24 VAC | NYM-O 2 × 1.5 mm ² | max. 1 A | | On-site | Zone control panel |
| | Collective alarm | Volt-free max. 230 VAC max. 24 VDC | NYM-O 2 × 1.5 mm ² | max. 3 A max. 2 A | | Zone control panel | On-site |
| | Distributor pump heat supply | | 3 × 400 VAC | NYM-J 4 × 1.5 mm ² (min.) | Power supply 3-phase, max. 6 A | Zone control panel | Pump |
| | | | 1 × 230 VAC | NYM-J 3 × 1.5 mm ² (min.) | Power supply 1-phase, max. 6 A | Zone control panel | Pump |
| | | | | NYM-O 4 × 1.5 mm ² | Control line | Zone control panel | Pump |
| | Distributor pump cold supply | | 3 × 400 VAC | NYM-J 4 × 1.5 mm ² (min.) | Power supply 3-phase, max. 6 A | Zone control panel | Pump |
| | | | 1 × 230 VAC | NYM-J 3 × 1.5 mm ² (min.) | Power supply 1-phase, max. 6 A | Zone control panel | Pump |
| | | | NYM-O 4 × 1.5 mm ² | Control line | Zone control panel | Pump | |
| Power supply for units | | 3 × 400 VAC | NYM-J 5 × 1.5 mm ² (min.) | RoofVent® size 6 | Zone control panel or on-site | Hoval units | |
| | | 3 × 400 VAC | NYM-J 5 × 4.0 mm ² (min.) | RoofVent® size 9 | | | |
| | | 3 × 400 VAC | NYM-J 5 × 1.5 mm ² (min.) | TopVent® | | | |
| System operator terminal (if external) | | 24 VDC | NYM-J 3 × 1.5 mm ² | Power supply 0.42 A | Zone control panel | System operator terminal | |
| | | | Ethernet ≥ CAT 5 | Communication | Zone control panel | System operator terminal | |
| Zone operator terminal (if external) | | 24 VAC | J-Y(ST)Y 4 × 2 × 0.8 mm | Power supply, 1 A fusing, max. 250 m length | Zone control panel | Zone operator terminal | |
| External sensor values | | 0-10 VDC | J-Y(ST)Y 2 × 2 × 0.8 mm | | On-site | Zone control panel | |

| Component | Designation | Voltage | Cable | Comments | Start | Target |
|----------------|--|-------------------------------|--------------------------------------|--|----------------------------------|--------------------|
| | External set values | 0-10 VDC | J-Y(ST)Y 2 × 2 × 0.8 mm | | On-site | Zone control panel |
| | Load shedding input | 24 VAC | NYM-O 2 × 1.5 mm ² | max. 1 A | On-site | Zone control panel |
| | Operating selector switch on terminal (analogue) | 0-10 VDC | J-Y(ST)Y 2 × 2 × 0.8 mm | | On-site (switch) | Zone control panel |
| | Operating selector switch on terminal (digital) | 0-10 VDC | J-Y(ST)Y 6 × 2 × 0.8 mm | | On-site (switch) | Zone control panel |
| | Operating selector button on terminal | 24 VAC | J-Y(ST)Y 6 × 2 × 0.8 mm | | On-site (button) | Zone control panel |
| | Forced off | 24 VAC | NYM-O 2 × 1.5 mm ² | max. 1 A | On-site | Zone control panel |
| | Heating/cooling changeover | 24 VAC | NYM-O 2 × 1.5 mm ² | Signal external enabling/setting max. 1 A | On-site | Zone control panel |
| | Changeover valve flow | 24 VAC | NYM-O 7 × 1.5 mm ² | see valve specification | Zone control panel | Valve |
| | Changeover valve return | 24 VAC | NYM-O 7 × 1.5 mm ² | see valve specification | Zone control panel | Valve |
| RoofVent® unit | Power supply | 3 × 400 VAC | NYM-J 5 × 1.5 mm ² (min.) | RoofVent® size 6 | Zone control panel or on-site | RoofVent® unit |
| | | 3 × 400 VAC | NYM-J 5 × 4.0 mm ² (min.) | RoofVent® size 9 | | |
| | Zone bus | | J-Y(ST)Y 2 × 2 × 0.8 mm | max. 500 m length | Zone control panel | RoofVent® unit |
| | Mixing valve heating | 24 VAC | NYM-O 4 × 1.0 mm ² | with Hydraulic assembly or Mixing valve option: cable connected to the mixing valve | TopVent® unit | Valve |
| | Mixing valve cooling | 24 VAC | NYM-O 4 × 1.0 mm ² | with Hydraulic assembly or Mixing valve option: cable connected to the mixing valve | TopVent® unit | Valve |
| | Heating pump | 230 VAC | NYM-J 3 × 1.5 mm ² | Power supply | TopVent® unit | Pump |
| | | 24 VAC | NYM-O 4 × 1.0 mm ² | Control line | TopVent® unit | Pump |
| | Cooling pump | 230 VAC | NYM-J 3 × 1.5 mm ² | Power supply | TopVent® unit | Pump |
| | | 24 VAC | NYM-O 4 × 1.0 mm ² | Control line | TopVent® unit | Pump |
| Forced off | 24 VAC | NYM-O 2 × 1.5 mm ² | max. 1 A | On-site | RoofVent® unit | |
| Forced heating | 24 VAC | NYM-J 2 × 1.5 mm ² | max. 1 A | On-site | RoofVent® unit | |

Fig. G10: Cable list for on-site connections

1 Design example. 110
2 Maintenance schedule 112
3 Checklist for project discussions 113



System design



H

1 Design example



Notice

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

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

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

2 Maintenance schedule

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

Table H1: Maintenance schedule

Project

Project No.

Date

Name

Function

Address

Tel.

Fax

E-mail

Information about the hall

Application

Type

Insulation

Length

Width

Height

Is the roof strong enough?

yes no

Are there window areas?

yes no

Percentage?

Is there a crane?

yes no

Height?

Is there enough space for installation and servicing?

yes no

Are there any voluminous installations or machines?

yes no

Are pollutants present?

yes no

Which?

– If yes, are they heavier than air?

yes no

Is oil contained in the extract air?

yes no

Is dust present?

yes no

Dust level?

Is there high humidity?

yes no

How much?

Is the air volume balanced?

yes no

Are local machine extractions required?

yes no

Are any conditions imposed by public authorities?

yes no

Which?

Are sound level requirements to be fulfilled?

yes no

Which?

Design data

| | | |
|-------------------------------------|----------------------|--------------------------------------|
| Fresh air flow rate? | <input type="text"/> | m ³ /h |
| Fresh air / hall area | <input type="text"/> | m ³ /h per m ² |
| Air change rate | <input type="text"/> | |
| Internal heat gains (machines, ...) | <input type="text"/> | kW |
| Heating and cooling | <input type="text"/> | |
| Hydraulic system | <input type="text"/> | |
| Unit size | <input type="text"/> | |
| Control zones | <input type="text"/> | |

Design conditions heating

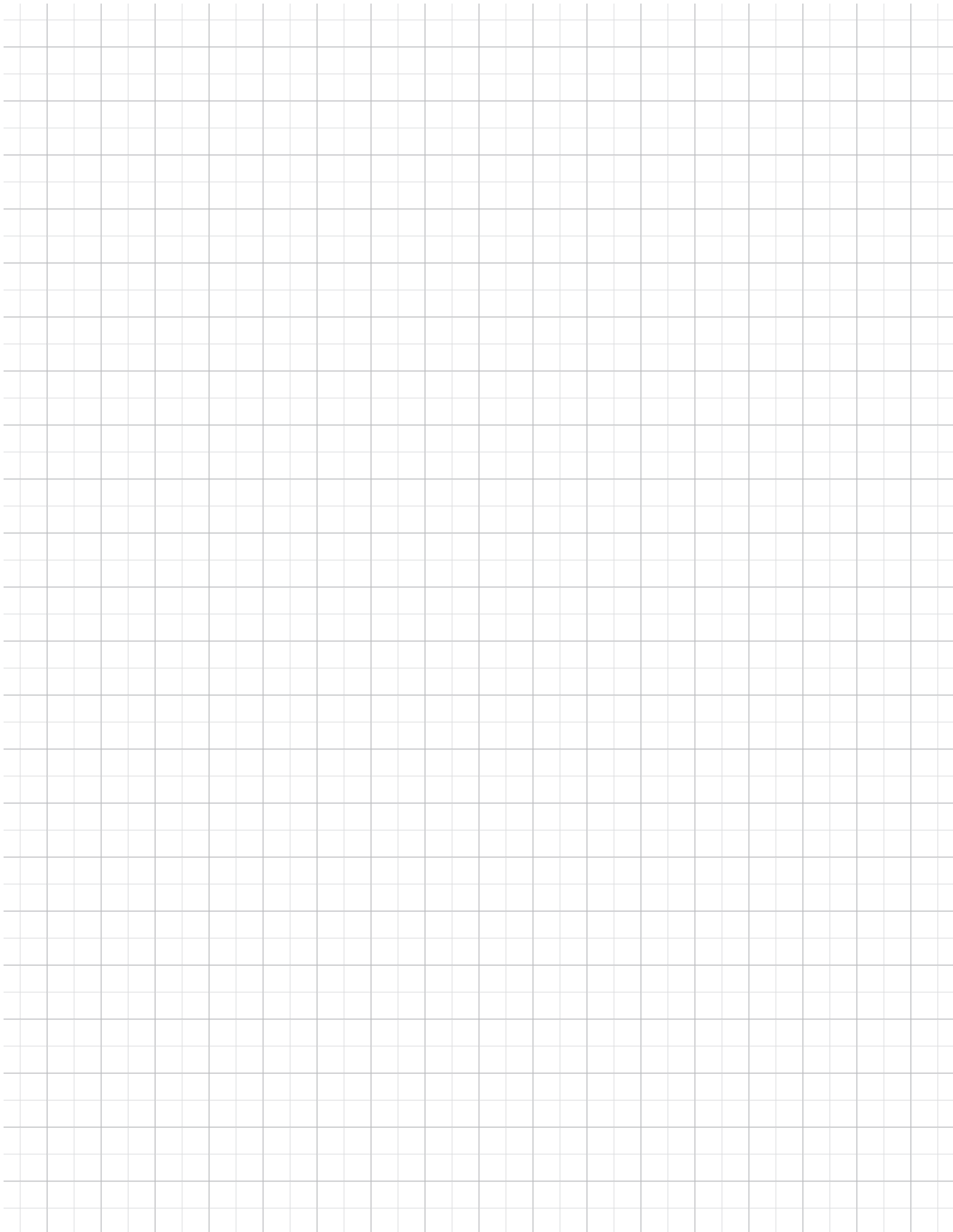
| | | | | |
|--|----------------------|----|----------------------|----|
| ■ Highest outside temperature and humidity | <input type="text"/> | °C | <input type="text"/> | % |
| ■ Room temperature | <input type="text"/> | °C | | |
| ■ Extract air temperature and humidity | <input type="text"/> | °C | <input type="text"/> | % |
| ■ Fabric heat losses | <input type="text"/> | kW | | |
| ■ Temperature of the heating medium | <input type="text"/> | / | <input type="text"/> | °C |

Design conditions cooling

| | | | | |
|--|----------------------|----|----------------------|----|
| ■ Highest outside temperature and humidity | <input type="text"/> | °C | <input type="text"/> | % |
| ■ Room temperature | <input type="text"/> | °C | | |
| ■ Extract air temperature and humidity | <input type="text"/> | °C | <input type="text"/> | % |
| ■ Transmission sensible gains | <input type="text"/> | kW | | |
| ■ Temperature of the cooling medium | <input type="text"/> | / | <input type="text"/> | °C |

Further information

H



Hoval quality.
You can count on us.

As a specialist in heating and climate technology, Hoval is your experienced partner for system solutions. For example, you can heat water with the sun's energy and your rooms with oil, gas, wood or a heat pump. Hoval ties together the various technologies and also integrates room ventilation into the system. So you can save energy while looking after the environment and your costs – and still enjoy the same level of comfort.

Hoval is one of the leading international companies for indoor climate solutions. More than 75 years of experience continuously motivate us to design innovative system solutions. We manufacture 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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Your Hoval partner