# Operating and installation manual

## REMKO WKF series

## Smart heat pumps
## Air/water system for heating and cooling

WKF 80, WKF 100, WKF 130, WKF 170
WKF-compact 80, WKF-compact 100, WKF-compact 130, WKF-compact 170
WKF 130 Duo, WKF 170 Duo

**Instructions for Technicians**

0277-2023-06 Edition 1, en_GB

Read the instructions prior to performing any task!

CE


**Read these operating instructions carefully before commissioning / using this device!**

**These instructions are an integral part of the system and must always be kept near or on the device.**

Subject to modifications; No liability accepted for errors or misprints!

**Translation of the original**

# Table of contents

# REMKO WKF series

# 1 Safety and usage instructions

## 1.1 General safety notes

Carefully read the operating manual before commissioning the units or their components for the first time. It provides useful tips and notes such as hazard warnings to prevent injury and material damage. Failure to follow the directions in this manual can endanger persons, the environment and the equipment itself or its components and will void any claims for liability.

Store this manual and the information required for the operation of this system (e.g. refrigerant datasheet) in the vicinity of the unit.

The refrigerant used in the system is flammable. If applicable, observe the local safety conditions.

**Warning of inflammable substances!**

**CAUTION!**

This device can be used by children above the age of 8, as well as by people with impaired physical, sensory or mental capabilities or a lack of experience and knowledge if they are supervised or have received instruction in the safe operation of the device, and if they understand the associated potential hazards. Children must never play with the device. Cleaning and user maintenance must not be carried out by unsupervised children.

- The electrical and device installation must be done only by a professional technician.
- During installation and first commissioning, the professional technician is responsible for adherence to applicable regulations.
- Operate the device only when fully installed and with all safety equipment.
- Protect the unit from dust and dirt during the building phase.

## 1.2 Identification of notes

This section provides an overview of all important safety aspects for proper protection of people and safe and fault-free operation.The instructions and safety notes contained within this manual must be observed in order to prevent accidents, personal injury and material damage.

Notes attached directly to the units must be observed in their entirety and be kept in a fully legible condition.

Safety notes in this manual are indicated by symbols. Safety notes are introduced with signal words which help to highlight the magnitude of the danger in question.

**DANGER!**

Contact with live parts poses an immediate danger of death due to electric shock. Damage to the insulation or individual components may pose a danger of death.

**DANGER!**

This combination of symbol and signal word warns of a situation in which there is immediate danger, which if not avoided may be fatal or cause serious injury.

**WARNING!**

This combination of symbol and signal word warns of a potentially hazardous situation, which if not avoided may be fatal or cause serious injury.

**CAUTION!**

This combination of symbol and signal word warns of a potentially hazardous situation, which if not avoided may cause injury or material and environmental damage.

**NOTICE!**

This combination of symbol and signal word warns of a potentially hazardous situation, which if not avoided may cause material and environmental damage.

*This symbol highlights useful tips and recommendations as well as information for efficient and fault-free operation.*

## 1.3 Personnel qualifications

Personnel responsible for commissioning, operation, maintenance, inspection and installation must be able to demonstrate that they hold a qualification which proves their ability to undertake the work.

## 1.4 Dangers of failure to observe the safety notes

Failure to observe the safety notes may pose a risk to people, the environment and the units. Failure to observe the safety notes may void any claims for damages.

In particular, failure to observe the safety notes may pose the following risks:

- The failure of important unit functions.
- The failure of prescribed methods of maintenance and repair.
- Danger to people on account of electrical and mechanical effects.

## 1.5 Safety-conscious working

The safety notes contained in this manual, the existing national regulations concerning accident prevention as well as any internal company working, operating and safety regulations must be observed.

## 1.6 Safety instructions for the operator

The operational safety of the units and components is only assured providing they are used as intended and in a fully assembled state.

- The units and components may only be set up, installed and maintained by qualified personnel.
- Protective covers (grilles) over moving parts must not be removed from units that are in operation.
- Do not operate units or components with obvious defects or signs of damage.
- Contact with equipment parts or components can lead to burns or injury.
- The units and components must not be exposed to any mechanical load, extreme levels of humidity or extreme temperatures.
- Rooms in which refrigerant may escape must be adequately aerated and ventilated. Otherwise there is danger of suffocation.
- All housing parts and unit openings, e.g. air inlets and outlets, must be free from foreign objects, fluids or gases.
- The units must be inspected by a service technician to ensure that they are safe to use and fully functional at least once yearly. Visual inspections and cleaning may be performed by the operator when the units are disconnected from the mains.

## 1.7 Safety notes for installation, maintenance and inspection

- Appropriate hazard prevention measures must be taken to prevent risks to people when performing installation, repair, maintenance or cleaning work on the units.
- The setup, connection and operation of the units and its components must be undertaken in accordance with the usage and operating conditions stipulated in this manual and comply with all applicable regional regulations.
- When setting up the indoor unit, pay attention to the minimum space volume.
- Regional regulations and laws as well as the Water Ecology Act (WHG) must be observed.
- The electrical power supply should be adapted to the requirements of the units.
- Units may only be mounted at the points provided for this purpose at the factory. The units may only be secured or mounted on stable structures, walls or floors.
- Mobile units must be set up securely on suitable surfaces and in an upright position. Stationary units must be permanently installed for operation.
- The units and components should not be operated in areas where there is an increased risk of damage. Observe the minimum clearances.
- The units and components must be kept at an adequate distance from flammable, explosive, combustible, abrasive and dirty areas or atmospheres.
- Safety devices may not be modified or bypassed.

## 1.8 Unauthorised modification and changes

Modifications or changes to units and components are not permitted and may cause malfunctions. Safety devices may not be modified or bypassed. Original replacement parts and accessories authorised by the manufactured ensure safety. The use of other parts may invalidate liability for resulting consequences.

## 1.9 Intended use

Depending on the model, the equipment and the additional fittings with which it is equipped is only intended to be used as an air-conditioner for the purpose of cooling or heating the air in an enclosed room.

Any different or additional use shall be classed as non-intended use. The manufacturer/supplier assumes no liability for damages arising from such use. The user bears the sole risk in such cases. Intended use also includes working in accordance with the operating and installation instructions and complying with the maintenance requirements.

Under no circumstances should the threshold values specified in the technical data be exceeded.

## 1.10 Warranty

For warranty claims to be considered, it is essential that the ordering party or its representative complete and return the "certificate of warranty" to REMKO GmbH & Co. KG at the time when the units are purchased and commissioned.

The warranty conditions are detailed in the "General business and delivery conditions". Furthermore, only the parties to a contract can conclude special agreements beyond these conditions. In this case, contact your contractual partner in the first instance.

## 1.11 Transport and packaging

The devices are supplied in a sturdy shipping container. Please check the equipment immediately upon delivery and note any damage or missing parts on the delivery and inform the shipper and your contractual partner. For later complaints can not be guaranteed.

**⚠ WARNING!**

**Plastic films and bags etc. are dangerous toys for children!**

Why:

- Leave packaging material are not around.

- Packaging material may not be accessible to children!

## 1.12 Environmental protection and recycling

**Disposal of packaging**

All products are packed for transport in environmentally friendly materials. Make a valuable contribution to reducing waste and sustaining raw materials. Only dispose of packaging at approved collection points.

**Disposal of equipment and components**

Only recyclable materials are used in the manufacture of the devices and components. Help protect the environment by ensuring that the devices or components (for example batteries) are not disposed in household waste, but only in accordance with local regulations and in an environmentally safe manner, e.g. using certified firms and recycling specialists or at collection points.

# 2 Technical data

## 2.1 Device data for WKF/WKF-compact 80-170

| Series | | WKF/WKF-compact 80 | WKF/WKF-compact 100 | WKF/WKF-compact 130 | WKF/WKF-compact 170 |
|---|---|---|---|---|---|
| Function | | Heating or Cooling | | | |
| System | | Split air/water | | | |
| Heat pump manager | | Smart-Control | | | |
| Drinking water tank enamelled WKF | | on site | | | |
| Drinking water tank enamelled WKF-compact | l | 300 | | | |
| Auxiliary heater/rated output | kW | optional/6 | | | optional/9 |
| Domestic hot-water heating (change-over valve) WKF | | optional | | | |
| Domestic hot-water heating (change-over valve) WKF-compact | | Series | | | |
| Connection oil/gas boiler | | optional | | | |
| Usable limits, heating | °C | -20 to +37 | | | |
| Inlet temperature, heating water, max. | °C | +60 | | | |
| Heating capacity (min./max.) | kW | 6.0 (0.9-7.5) | 8.0 (1.5-10.0) | 9.0 (2.0-12.5) | 11.0 (3.0-16.8) |
| Room heating energy efficiency Average 35/55 | % | 211/140 | 211/131 | 212/147 | 215/142 |
| Energy efficiency class Average | | A+++/A++ | A+++/A++ | A+++/A++ | A+++/A++ |
| Heating output / compressor frequency / COP for A12/W35 | kW/Hz/COP | 7.4 / 79 / 5.92 | 9.1 / 79 / 6.03 | 12.0 / 79 / 5.87 | 15.2 / 79 / 5.82 |
| Heating output / compressor frequency / COP [1)] for A7/W35 | kW/Hz/COP | 6.4 / 79 / 5.21 | 7.9 / 79 / 5.26 | 10.3 / 79 / 5.07 | 13.5 / 79 / 5.15 |
| Heating output / compressor frequency / COP [1)] for A2/W35 | kW/Hz/COP | 5.3 / 79 / 4.13 | 5.8 / 79 / 4.16 | 8.7 / 79 / 4.14 | 11.3 / 79 / 4.12 |
| Heating output / compressor frequency / COP [1)] for A-7/W35 | kW/Hz/COP | 4.2 / 79 / 3.50 | 5.2 / 79 / 3.56 | 6.9 / 79 / 3.47 | 8.8 / 79 / 3.45 |
| Heating output / compressor frequency / COP [1)] for A-15/W35 | kW/Hz/COP | 3.2 / 79 / 2.71 | 3.9 / 79 / 2.77 | 5.1 / 79 / 2.69 | 7.2 / 79 / 2.73 |
| Heating output / compressor frequency / COP [1)] for A7/W45 | kW/Hz/COP | 6.1 / 79 / 3.96 | 7.5 / 79 / 4.04 | 9.9 / 79 / 3.93 | 12.5 / 79 / 3.97 |
| Heating output / compressor frequency / COP [1)] for A7/W55 | kW/Hz/COP | 5.92/ 79 / 3.10 | 7.0 / 79 / 3.12 | 8.7 / 79 / 2.98 | 11.3 / 79 / 3.08 |

| Series | | WKF/WKF-compact 80 | WKF/WKF-compact 100 | WKF/WKF-compact 130 | WKF/WKF-compact 170 |
|---|---|---|---|---|---|
| Heating output / compressor frequency / COP [1] for A-7/W55 | kW/Hz/COP | 3.5 / 79 / 2.07 | 4.3 / 79 / 2.11 | 5.7 / 79 / 2.05 | 7.5 / 79 / 2.08 |
| Service limits, cooling | °C | +15 to +43 | | | |
| Min. inlet temperature for cooling | °C | 7 | | | |
| Cooling capacity min./max. | kW | 4.0 (0.8-6.5) | 6.0 (1.5-8.2) | 8.0 (2.1-10.5) | 12.0 (3.0-16.8) |
| Cooling capacity / compressor frequency / EER with A35/W7 | kW/Hz/EER | 4.5 / 2.7 | 7.2/2.8 | 6.5/2.7 | 12.4/3.17 |
| Cooling capacity / compressor frequency / EER with A35/W18 | kW/Hz/EER | 7.45 / 4.05 | 9.5/4.23 | 9.8/3.9 | 14.2/4.31 |
| Refrigerant/basic capacity AM | --/kg | R32 / 1.0 | R32 / 1.6 | R32 / 1.8 | R32 / 2.55 |
| Refrigerant / pre-charge quantity for more than 5 m length of ordinary pipe | g/m | 30/R32 | | | |
| Refrigerant connections | Inches (mm) | 1/4 / 1/2 | 3/8 / 5/8 | | 3/8 / 3/4 |
| Refrigerant piping length, max. | m | 20 | | | |
| Refrigerant piping height, max. | m | 10 | | | |
| Power supply | V/Ph/Hz | 230/1~/50 | | | 400/3~/50 |
| Max. current consumption | A | 13 | 14 | 16 | 15 |
| Rated current consumption for A7/W35 | A | 5.40 | 6.55 | 8.85 | 12.96 |
| Rated power consumption for A7/W35 | kW | 1.24 | 1.52 | 2.07 | 2.62 |
| Rated power consumption for A2/W35 | kW | 1.28 | 1.56 | 2.10 | 2.74 |
| Max. power consumption | kW | 3.0 | 3.7 | 4.1 | 6.2 |
| Power factor at A7/W35 (cosφ) | -- | 0.9 | | | |
| Customer's fuse protection, recommended (outdoor unit) | A slow-acting | 16 | 20 | | 3 x 16 |
| Medium flow rate water (according to EN 14511, at Δt 5 K) | $m^3/h$ | 1.1 | 1.4 | 1.8 | 2.3 |
| Pressure loss on condenser at rated medium flow rate | bar | 0.1 | 0.15 | 0.2 | 0.3 |
| Pressure loss, outdoor | kPa | 80 | | 70 | 60 |
| Max. airflow volume outdoor unit | $m^3/h$ | 2500 | 3150 | 3350 | 4480 |
| Max. operating pressure, water | bar | 3 | | | |
| Hydraulic connection inlet/return flow (flat-sealing) | Inches (mm) | 1 1/4 (31.8) | | | |
| Recom. pipe dimension copper piping | mm | 28 | | | 35 |
| Sound power level per DIN EN 12102:2008-09 and ISO 9614-2 | dB(A) | 54.4 | 56.7 | 58.3 | 60.6 |

# REMKO WKF series

| Series | | WKF/WKF-compact 80 | WKF/WKF-compact 100 | WKF/WKF-compact 130 | WKF/WKF-compact 170 |
|---|---|---|---|---|---|
| Sound pressure level, LpA (outdoor unit) [3] | dB(A) | 29.4 | 31.7 | 33.3 | 38.6 |
| Sound power level min./max. per DIN EN 12102:2008-09 and ISO 9614-2 | dB(A) | 51/56 | 54/59 | 55/61 | 57/63 |
| Sound pressure level LpA min./max. (outdoor unit) [3] | dB(A) | 29/34 | 32/37 | 33/39 | 35/41 |
| Tonality of each outdoor unit | dB(A) | - | - | - | - |
| Dimensions, indoor unit (height/width/depth) | mm | 500 x 800 x 500 | | | |
| Dimensions, outdoor unit (height/width/depth) | mm | 700x1010 x370 | 845x1165 x370 | | 1450x1085 x425 |
| Enclosure class outdoor unit | -- | IP X4 | | | |
| Weight indoor unit | kg | 50 | | | 55 |
| Weight outdoor unit | kg | 62 | 73 | 80 | 95 |

[1] COP = coefficient of performance in accordance with EN 14511, VDE tested

[2] Contains greenhouse gas according to Kyoto protocol, GWP 675

[3] Distance 5 m, VDE tested, A7/W55, with half-spherical propagation

## 2.2 Device data WKF 130/170 Duo

| Series | | WKF 130 Duo | WKF 170 Duo |
|---|---|---|---|
| Function | | Heating or Cooling | |
| System | | Split air/water | |
| Heat pump manager | | Smart-Control | |
| Drinking water tank enamelled | | - external | |
| Auxiliary heater/rated output | kW | optional/9 | |
| Domestic hot-water heating (changeover valve) | | - external | |
| Connection oil/gas boiler | | - external | |
| Number of indoor units / outdoor units | | 1/2 | |
| Usable limits, heating | °C | -20 to +37 | |
| Inlet temperature, heating water, max. | °C | +60 | |
| Heating capacity (min./max.) | kW | 14.0 (2.0-25.0) | 19.0 (3.0-33.6) |
| Room heating energy efficiency Average 35/55 | % | 212/147 | 215/142 |
| Energy efficiency class Average | | A+++/A++ | A+++/A++ |
| Heating output / compressor frequency / COP for A12/W35 | kW/Hz/COP | 24.0 / 79 / 5.87 | 30.4 / 79 / 5.82 |
| Heating output / compressor frequency / COP [1)] for A7/W35 | kW/Hz/COP | 20.6 / 79 / 5.07 | 27.0 / 79 / 5.15 |
| Heating output / compressor frequency / COP [1)] for A2/W35 | kW/Hz/COP | 17.4 / 79 / 4.14 | 22.6 / 79 / 4.12 |
| Heating output / compressor frequency / COP [1)] for A-7/W35 | kW/Hz/COP | 13.8 / 79 / 3.47 | 17.6 / 79 / 3.45 |
| Heating output / compressor frequency / COP [1)] for A-15/W35 | kW/Hz/COP | 10.2 / 79 / 2.69 | 14.4 / 79 / 2.73 |
| Heating output / compressor frequency / COP [1)] for A7/W45 | kW/Hz/COP | 19.8 / 79 / 3.93 | 25.0 / 79 / 3.97 |
| Heating output / compressor frequency / COP [1)] for A7/W55 | kW/Hz/COP | 18.4 / 79 / 3.04 | 22.6 / 79 / 3.08 |
| Heating output / compressor frequency / COP [1)] for A-7/W55 | kW/Hz/COP | 11.4 / 79 / 2.05 | 15.0 / 79 / 2.08 |
| Service limits, cooling | °C | +15 to +43 | |
| Min. inlet temperature for cooling | °C | 7 | |
| Cooling capacity min./max. | kW | 16.0 (2.1-21.0) | 30.0 (3.0-33.6) |
| Cooling capacity / compressor frequency / EER with A35/W7 | kW/Hz/EER | 13.0 / 2.7 | 24.8/3.17 |
| Cooling capacity / compressor frequency / EER with A35/W18 | kW/Hz/EER | 19.6 / 3.9 | 28.4/4.31 |
| Refrigerant/basic capacity AM | --/kg | R32 / 2 x 1.8 | R32 / 2 x 2.55 |
| Refrigerant / pre-charge quantity for more than 5 m length of ordinary pipe | g/m | 30/R32 | |

# REMKO WKF series

| Series | | WKF 130 Duo | WKF 170 Duo |
|---|---|---|---|
| Refrigerant connections | Inches (mm) | 2 x 3/8 / 5/8 | 2 x 3/8 / 3/4 |
| Refrigerant piping length, max. | m | 20 | |
| Refrigerant piping height, max. | m | 10 | |
| Power supply | V/Ph/Hz | 230/1~/50 | 400/3~/50 |
| Max. current consumpt. per phase per OM | A | 16 | 15 |
| Rated current consumpt. for A7/W35 per OU | A | 8.85 | 12.96 |
| Rated power consumpt. for A7/W35 per OU | kW | 2.07 | 2.62 |
| Rated power consumpt. for A2/W35 per OU | kW | 2.10 | 2.74 |
| Max. power consumption | kW | 4.1 | 6.2 |
| Power factor at A7/W35 (cosφ) | -- | 0.9 | |
| Customer's fuse protection, recommended (outdoor unit) | A slow-acting | 20 | 3 x 16 |
| Medium flow rate water (according to EN 14511, at Δt 5 K) | $m^3/h$ | 1.8 | 2.3 |
| Pressure loss on condenser at rated medium flow rate per indoor unit | bar | 0.2 | 0.3 |
| Pressure loss, outdoor | kPa | 70 | 60 |
| Max. airflow volume outdoor unit | $m^3/h$ | 3350 | 4480 |
| Max. operating pressure, water | bar | 3 | |
| Hydraulic connection inlet/return flow (flat-sealing) | Inches (mm) | 1 1/2 (32.7) external thread | |
| Recom. pipe dimension copper piping | mm | 42 | |
| Sound power level per OU per DIN EN 12102:2008-09 and ISO 9614-2 | dB(A) | 58.3 | 61.2 |
| Sound pressure level LpA (per outdoor unit) [3] | dB(A) | 33.3 | 39 |
| Sound power level per OU min./max. per DIN EN 12102:2008-09 and ISO 9614-2 | dB(A) | 55/61 | 57/63 |
| Sound pressure level LpA per outdoor unit min./max. [3] | dB(A) | 33/39 | 35/41 |
| Tonality of each outdoor unit | dB(A) | - | - |
| Indoor unit dimensions (H/W/D) | mm | 1000 x 800 x 500 | |
| Outdoor unit dimensions (H/W/D) | mm | 845 x 1165 x 370 | 1450 x 1085 x 425 |
| Enclosure class outdoor unit | -- | IP X4 | |
| Weight indoor unit | kg | 85 | 87 |
| Weight outdoor unit | kg | 80 | 95 |

[1] COP = coefficient of performance in accordance with EN 14511, VDE tested

[2] Contains greenhouse gas according to Kyoto protocol, GWP 675

[3] Distance 5 m, VDE tested, A7/W55, with full-spherical propagation

## 2.3 Product data

### Product data WKF/WKF-compact 80-170

**Average condition (moderate temperature periods)**

| Series | | WKF/WKF-compact 80 | WKF/WKF-compact 100 | WKF/WKF-compact 130 | WKF/WKF-compact 170 |
|---|---|---|---|---|---|
| Energy efficiency ratio, heating 35°C/55°C | | A+++/A++ | | | |
| Nominal heating power P rated | kW | 5/4 | 6/5 | 8/7 | 11/9 |
| Room heating energy efficiency ηs 35°C/ 55°C | % | 211/140 | 211/131 | 212/147 | 215/142 |
| Smart-Control's contribution to seasonal room heating energy efficiency | % | 4 | | | |
| Yearly energy consumpt. $Q_{HE}$ 35°C/55°C [1)] | | 1909/2809 | 2510/4011 | 3152/4725 | 4257/6845 |
| Sound power level $L_{WA}$ (outdoor unit) | dB(A) | 54 | 57 | 58 | 61 |
| Sound power level $L_{WA}$ (indoor unit) | dB(A) | - | - | - | - |

[1)] The specified value is based on results from standard testing.
The actual consumption depends on the use and location of the unit

### Product data WKF 130/170 Duo

**Average condition (moderate temperature periods)**

| Series | | WKF 130 Duo | WKF 170 Duo |
|---|---|---|---|
| Energy efficiency ratio, heating 35°C/55°C | | A+++/A++ | |
| Nominal heating power P rated | kW | 16/14 | 21/19 |
| Room heating energy efficiency ηs 35°C/55°C | % | 212/147 | 215/142 |
| Contribution to seasonal room heating energy efficiency of the REMKO Smart-Control | % | 4 | |
| Yearly energy consumption $Q_{HE}$ 35°C/ 55°C [1)] | | 6206/7786 | 8036/10640 |
| Sound power level $L_{WA}$ (outdoor unit) | dB(A) | 58 | 61 |
| Sound power level $L_{WA}$ (indoor unit) | dB(A) | - | - |

[1)] The specified value is based on results from standard testing.
The actual consumption depends on the use and location of the unit

## 2.4 Unit dimensions of outdoor units

**WKF 80**

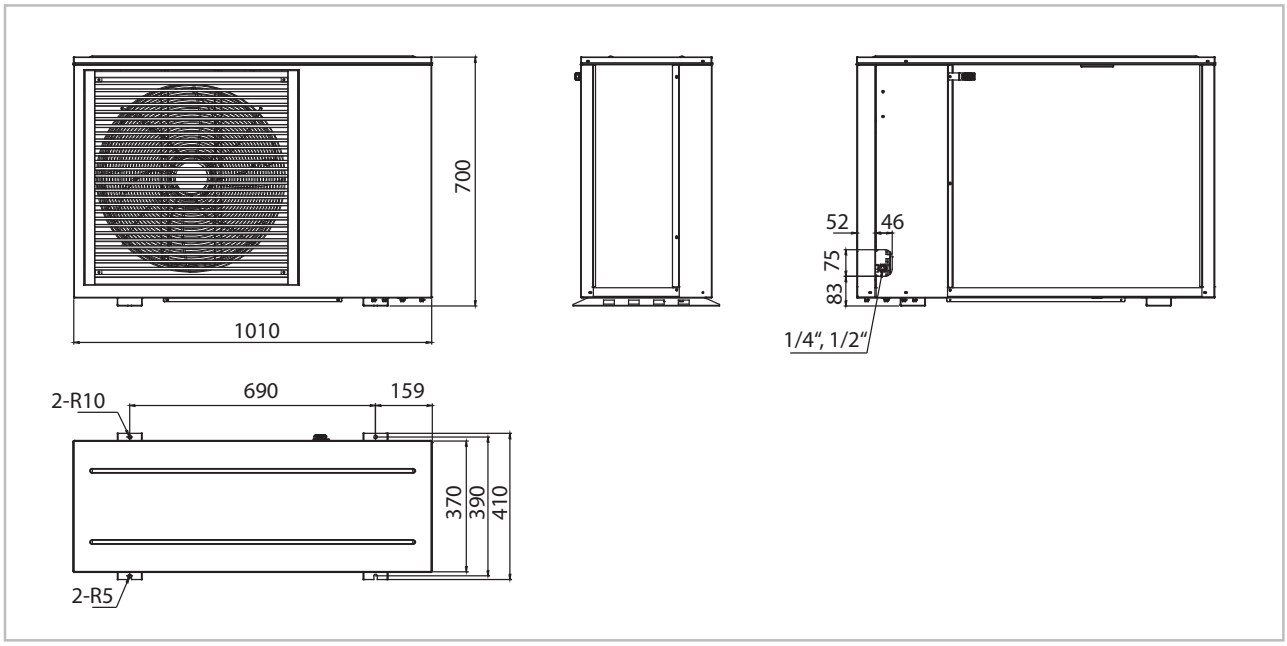


*Fig. 1: Dimensions of outdoor units WKF 80*

**WKF 100 / WKF 130**

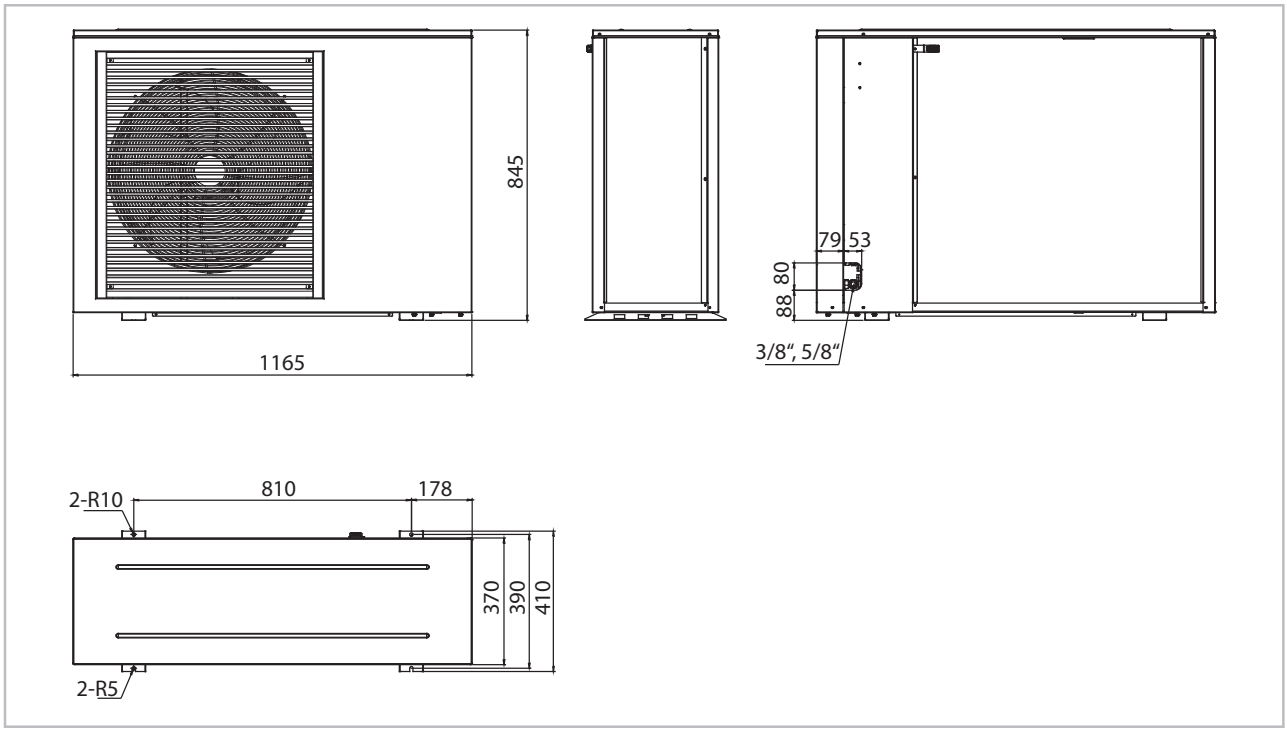


*Fig. 2: Dimensions of outdoor units WKF 100 / WKF 130*

**WKF 170**

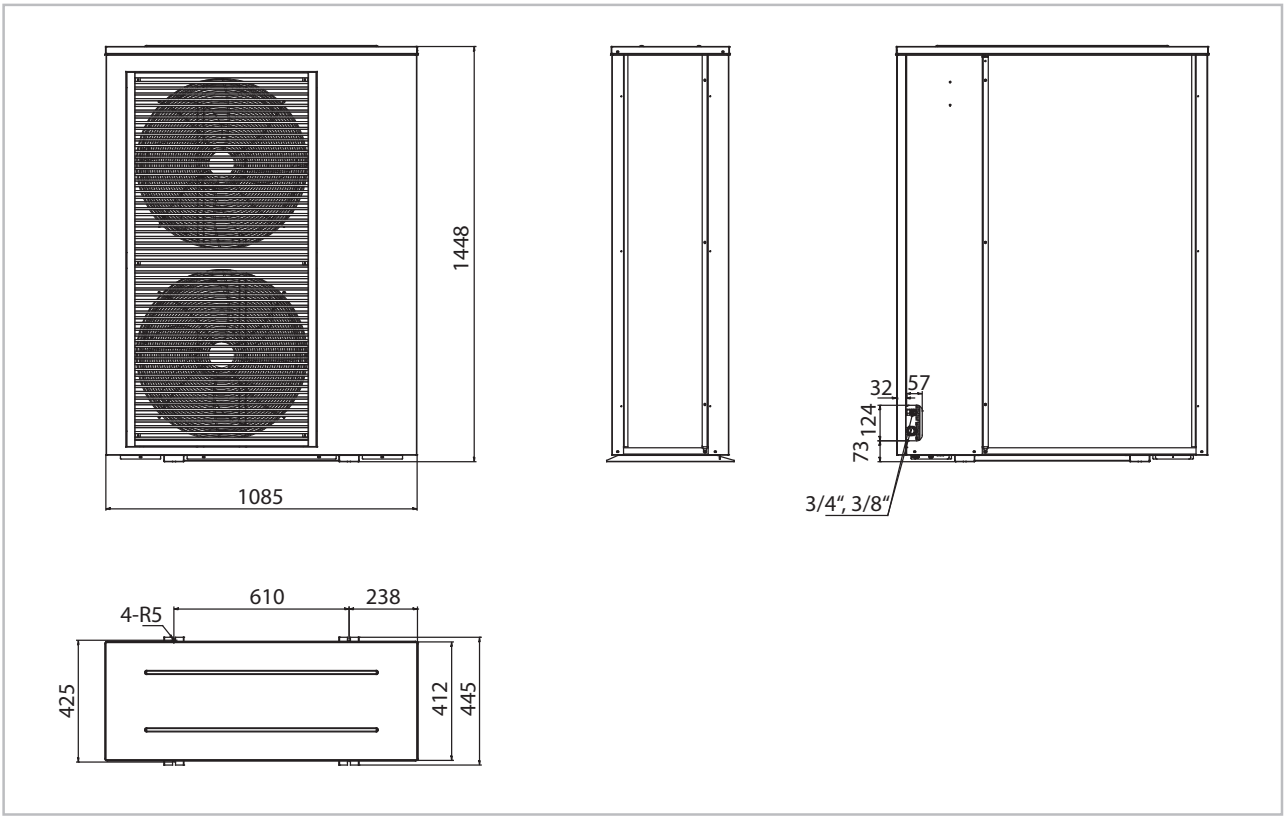


*Fig. 3: Dimensions of outdoor units WKF 170*

## 2.5 Unit dimensions of indoor units

**Unit dimensions of indoor units WKF 80-170**

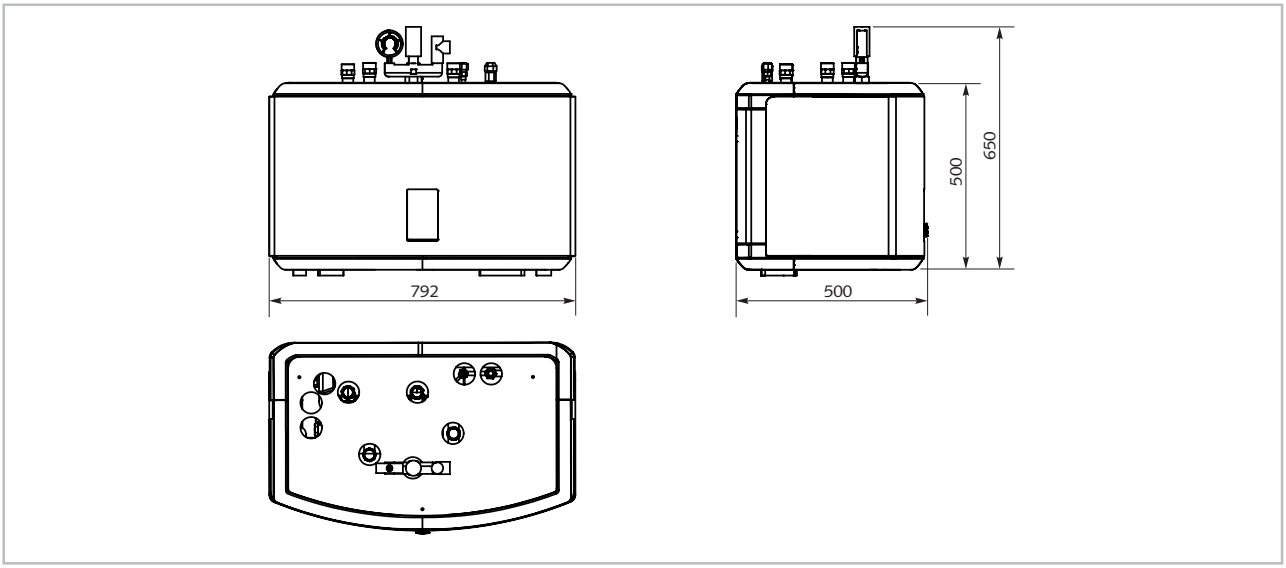


*Fig. 4: Dimensions indoor unit series WKF 80-170 (all dimensions in mm)*

**Pipe connection arrangement WKF 80-170**

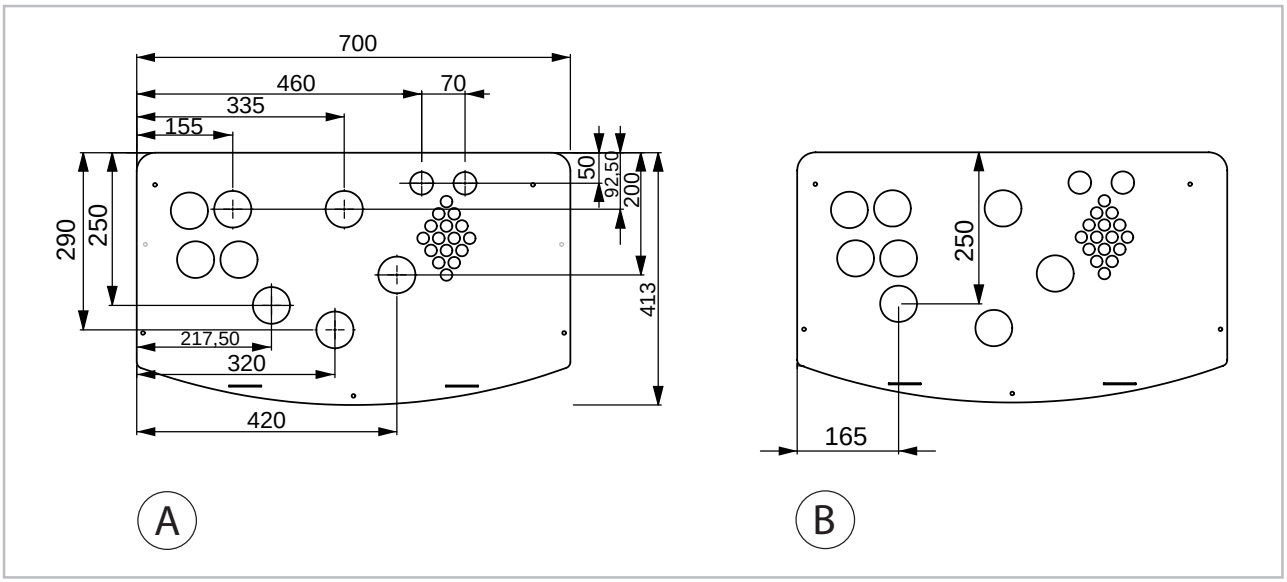


*Fig. 5: Pipe connection arrangement WKF 80-170 (All dimensions in mm)*

A: Bivalent version

B: Monovalent version

**Designations of the pipe connections WKF 80-170**

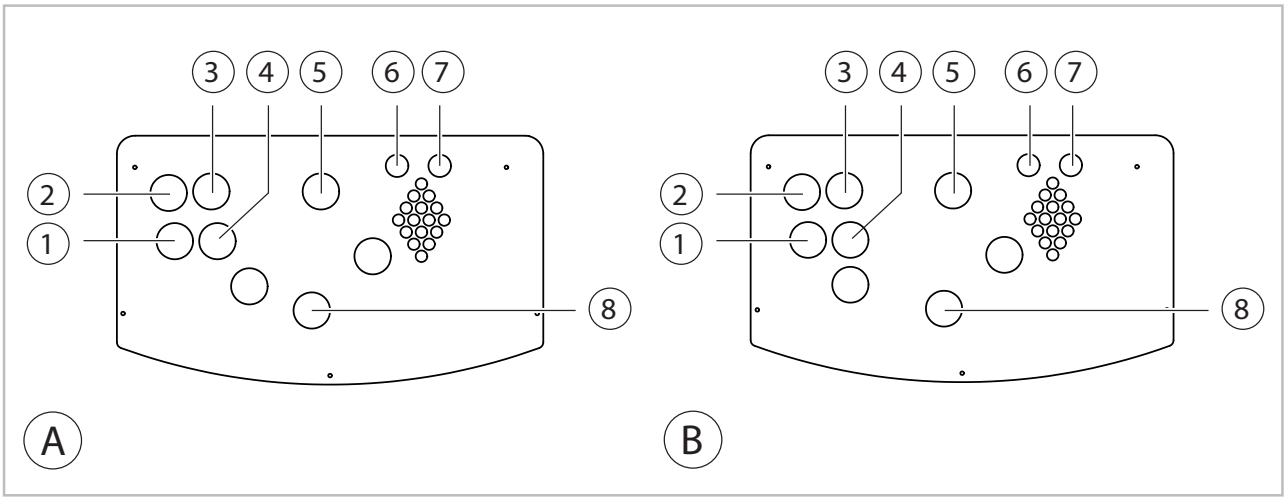


*Fig. 6: Designations of the pipe connections WKF 80-170*

A: Bivalent version
B: Monovalent version
1: Circulation 1" union nut (flat-sealing)
2: Cold water inlet 1" union nut (flat-sealing)
3: Heating inlet 1 1/4"
4: Hot water 1" union nut (flat-sealing)
5: Heating return flow 1 1/4"
6: Refrigerant liquid pipe
7: Refrigerant heat gas pipe
8: Safety assembly 1” OT

**Unit dimensions of indoor units WKF-compact 80-170**

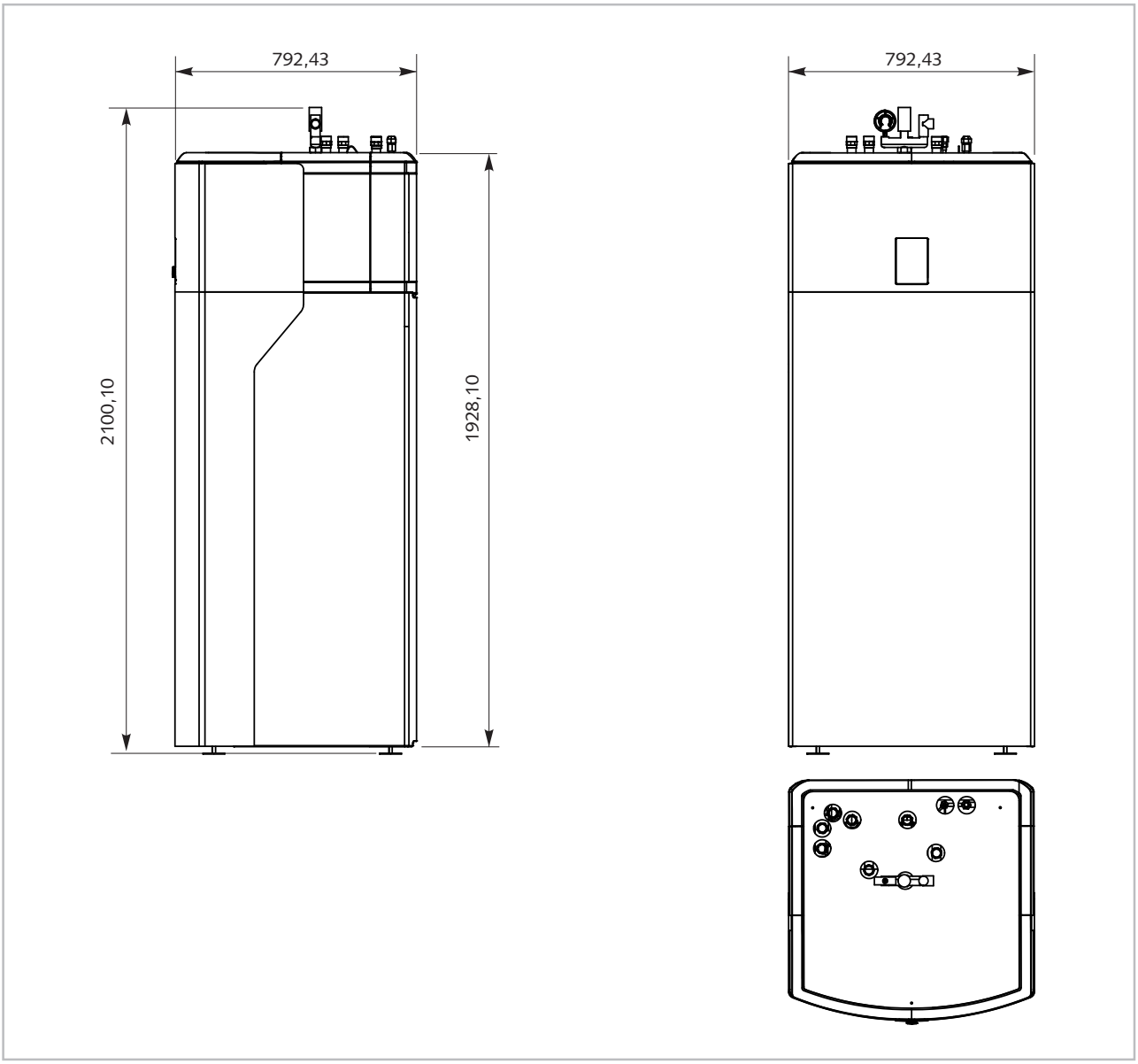


*Fig. 7: Indoor unit WKF-compact 80-170 dimensions (all dimensions in mm)*

**Pipe connection arrangement WKF-compact 80-170**

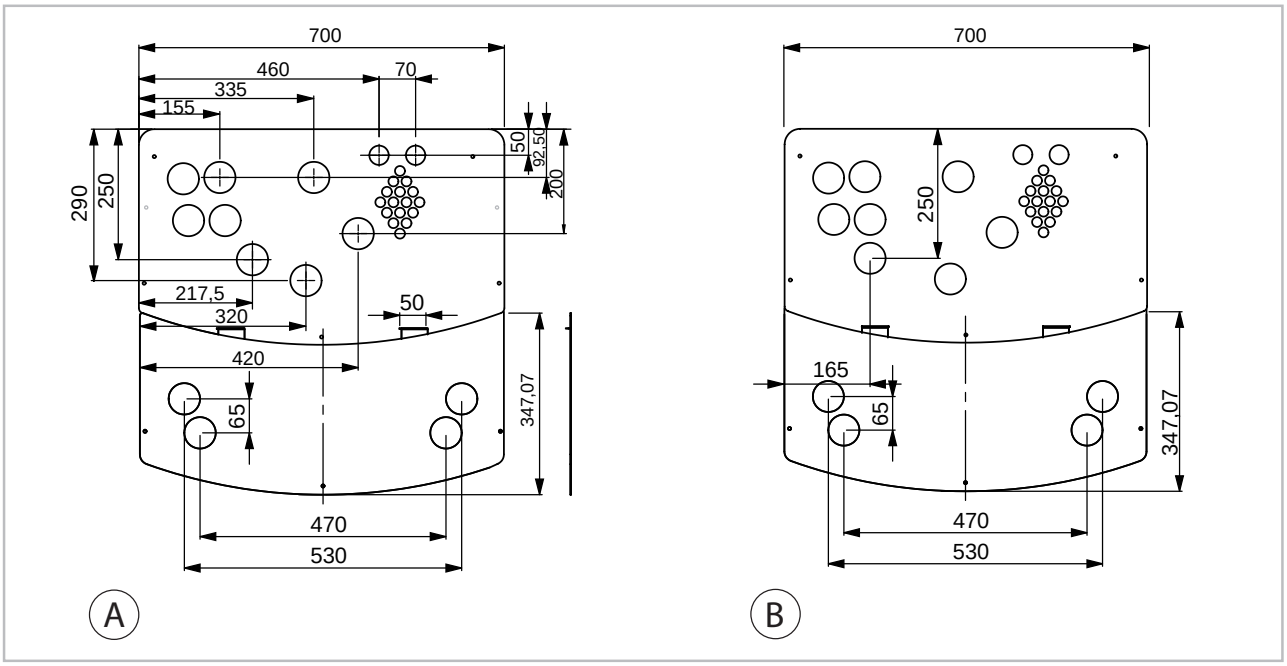


*Fig. 8: Pipe connection arrangement WKF-compact 80-170 (All dimensions in mm)*

A: Bivalent version

B: Monovalent version

**Designations of the pipe connections WKF-compact 80-170**

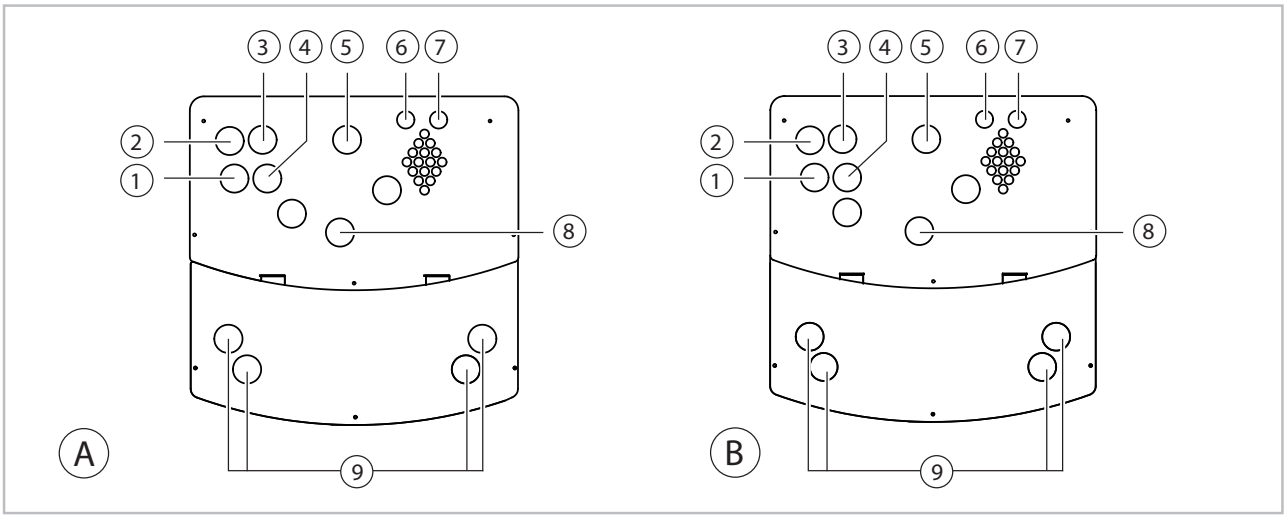


*Fig. 9: Designations of the pipe connections WKF-compact 80-170*

A: Bivalent version
B: Monovalent version
1: Circulation 1" union nut (flat-sealing)
2: Cold water inlet 1" union nut (flat-sealing)
3: Heating inlet 1 1/4"
4: Hot water 1" union nut (flat-sealing)
5: Heating return flow 1 1/4"
6: Refrigerant liquid pipe
7: Refrigerant heat gas pipe
8: Safety assembly 1” OT
9: Solar connections 3/4”

**Unit dimensions of indoor units WKF 130-170 Duo**

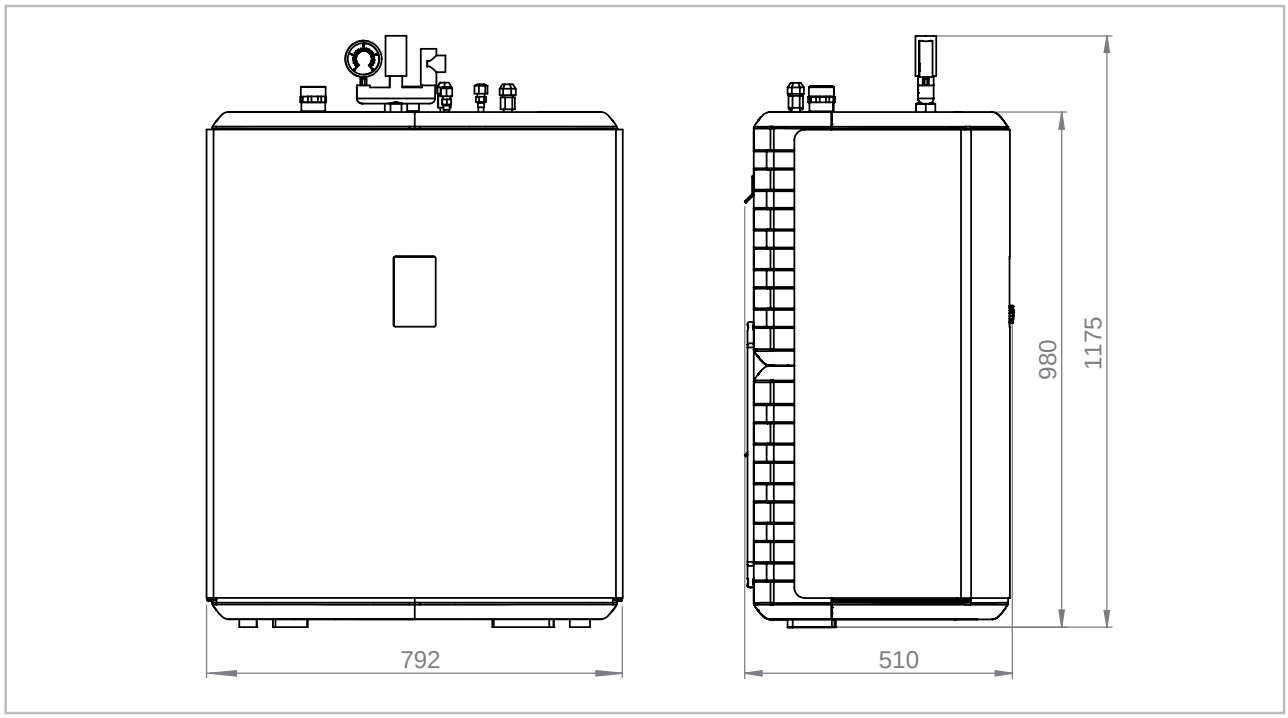


*Fig. 10: Dimensions indoor unit series WKF 130-170 Duo (all dimensions in mm)*

**Pipe connection arrangement and designations of the pipe connections WKF 130-170 Duo**

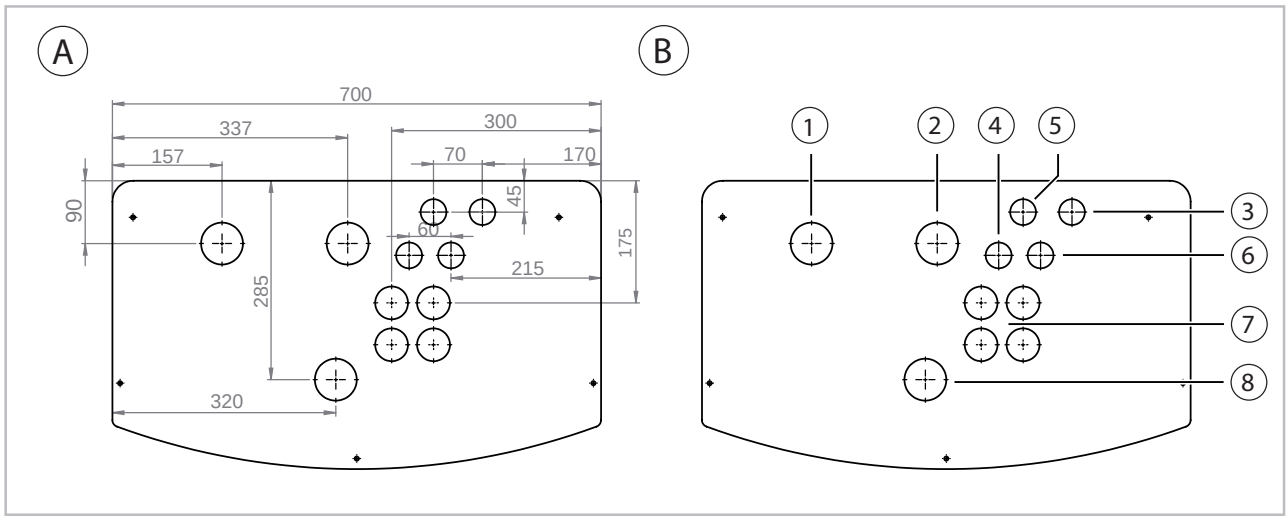


*Fig. 11: Pipe connection arrangement and designations of pipe connections WKF 130-170 Duo (All dimensions in mm)*

A: Pipe connection arrangement
B: Designations of the pipe connections
1: Inlet heat pump 1 1/2"
2: Return flow heat pump 1 1/2"
3: Refrigerant heat gas pipe outdoor unit A
4: Refrigerant liquid pipe outdoor unit B
5: Refrigerant liquid pipe outdoor unit A
6: Refrigerant heat gas pipe outdoor unit B
7: Cable inlet
8: Safety assembly

## 2.6 Heat pump usable limits in monovalent operation

**WKF 80-170, WKF-compact 80-170, WKF 130-170 Duo**

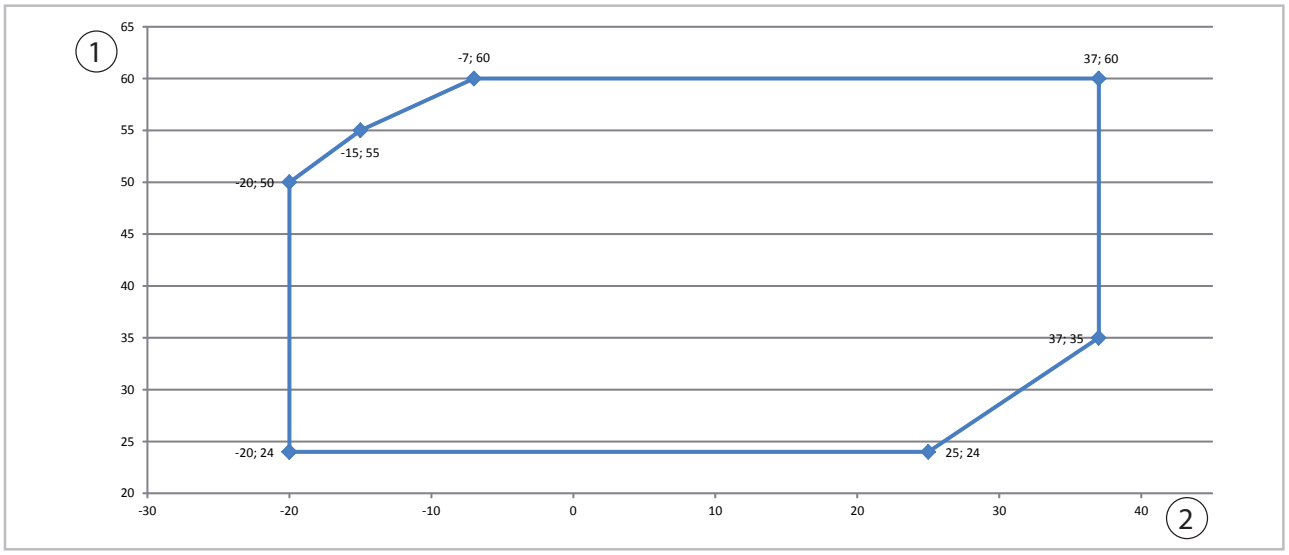


*Fig. 12: Usage limits*

1: Heating water inlet temperature [°C]
2: Outside air temperature [°C]

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Outside temperature [°C] | -20 | -20 | -15 | -7 | 37 | 37 | 25 | -20 |
| Inlet temperature [°C] | 24 | 50 | 55 | 60 | 60 | 35 | 24 | 24 |

## 2.7 Pump-characteristic curves, indoor module charging pump

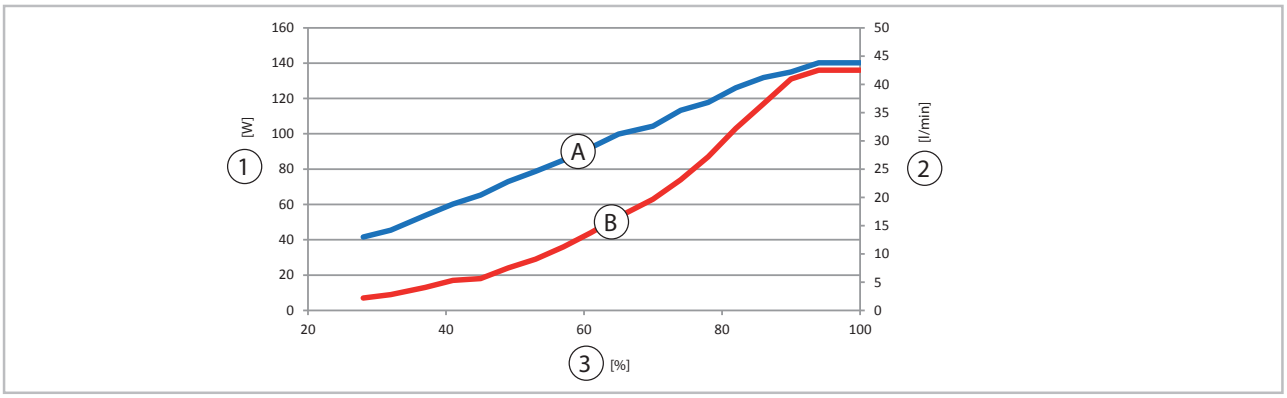


*Fig. 13: Circulation pump Grundfoss UPML 25-105 180 PWM - power range*

1: Power consumption [W]
2: Volume flow [l/mim]
3: Activation [%]

A: Characteristic curve volume flow [l/mim]
B: Characteristic curve power consumption [W]

External control via analogical-in PWM-signal. Tolerances of each curve according to EN 1151-1:2006

| Level | Output [W] | Current [A] | Motor protection |
|---|---|---|---|
| min. | 7 | 0,07 | Rotor current-proof |
| max. | 136 | 1,03 | Rotor current-proof |

## 2.8 Total sound-power level outdoor units

**Outdoor unit WKF/WKF-compact 80**

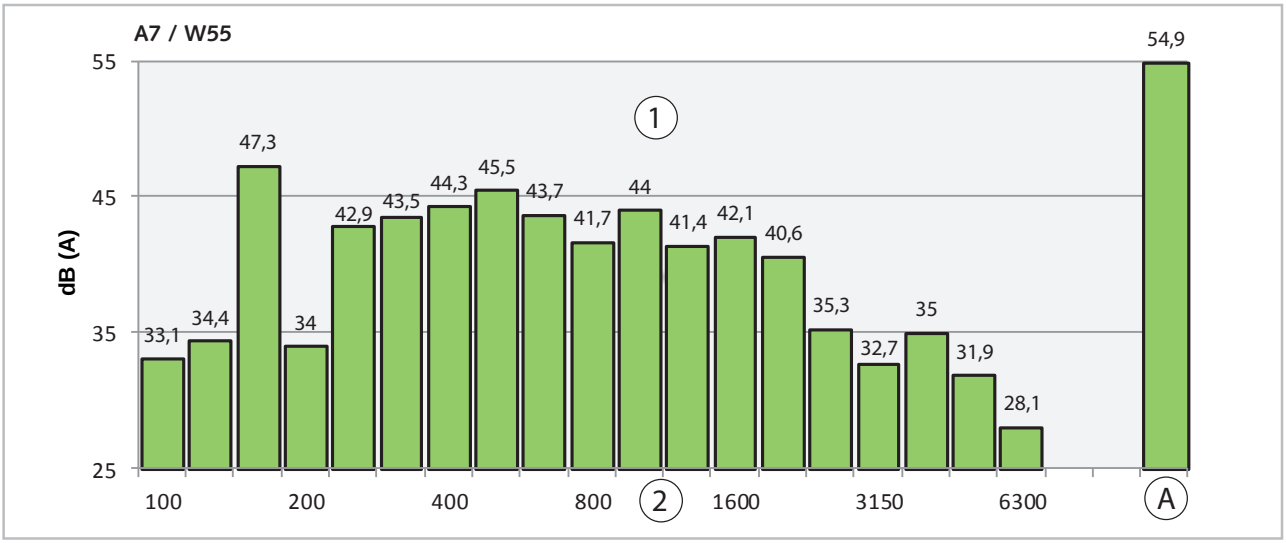


*Fig. 14: Overall sound-power level $L_P$ of a REMKO outdoor module type: WKF/WKF-compact 80*

A: A total [dB(A)]
1: Sound power $L_{wA}$re 1pW [dB(A)]
2: Frequency [Hz]

| Middle frequency [Hz] | 100 | 125 | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 |
|---|---|---|---|---|---|---|---|---|---|---|
| LWo [dB(A)] | 33.1 | 34.4 | 47.3 | 34 | 42.9 | 43.5 | 44.3 | 45.5 | 43.7 | 41.7 |

| Middle frequency [Hz] | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | A |
|---|---|---|---|---|---|---|---|---|---|---|
| LWo [dB(A)] | 44 | 41.4 | 42.1 | 40.6 | 35.3 | 32.7 | 35 | 31.9 | 28.1 | 54.9 |

The sound power conforms to accuracy class 2. The standard deviation of the aforementioned A-valued sound power levels amounts to 1.5 dB.

LWo: Sound power level radiated by the outdoor unit

# REMKO WKF series

**Outdoor unit WKF/WKF-compact 100**

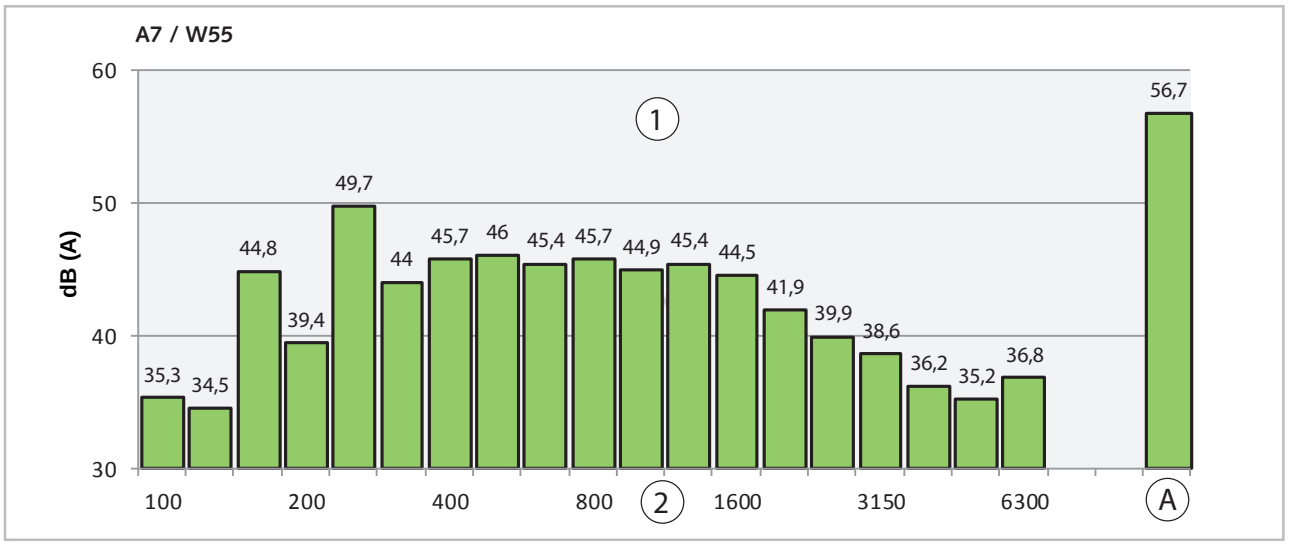


*Fig. 15: Overall sound-power level $L_P$ of a REMKO outdoor module type: WKF/WKF-compact 100*

A: A total [dB(A)]
1: Sound power $L_{wA}$re 1pW [dB(A)]
2: Frequency [Hz]

| Middle frequency [Hz] | 100 | 125 | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 |
|---|---|---|---|---|---|---|---|---|---|---|
| LWo [dB(A)] | 35.3 | 34.5 | 44.8 | 39.4 | 49.7 | 44 | 45.7 | 46 | 45.4 | 45.7 |

| Middle frequency [Hz] | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | A |
|---|---|---|---|---|---|---|---|---|---|---|
| LWo [dB(A)] | 44.9 | 45.4 | 44.5 | 41.9 | 39.9 | 38.6 | 36.2 | 35.2 | 36.8 | 56.7 |

The sound power conforms to accuracy class 2. The standard deviation of the aforementioned A-valued sound power levels amounts to 1.5 dB.

LWo: Sound power level radiated by the outdoor unit

**Outdoor unit WKF/WKF-compact 130**

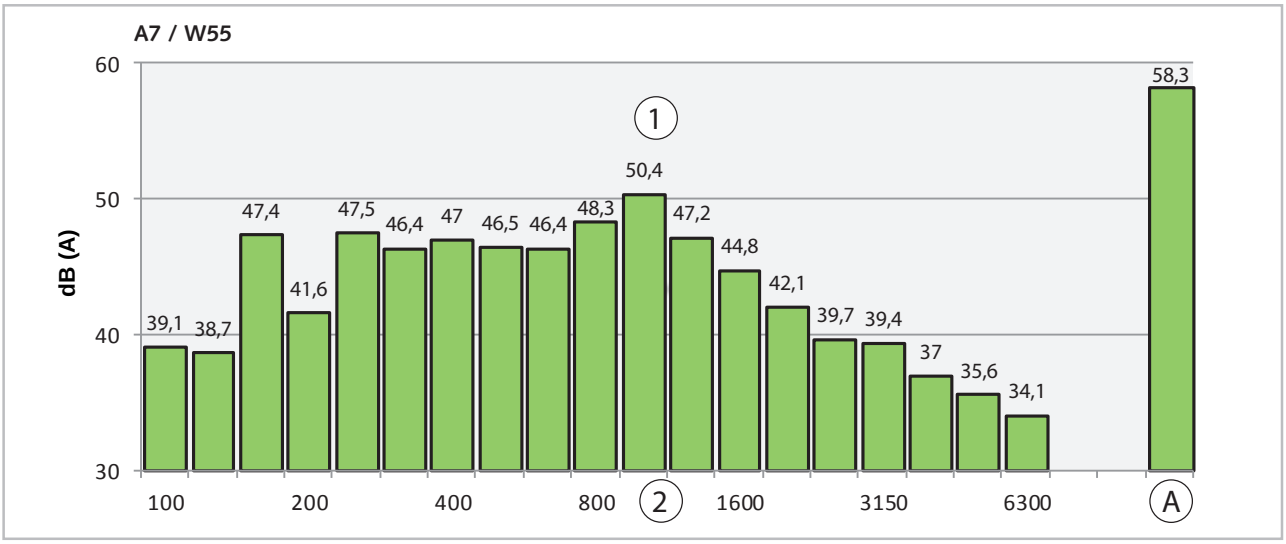


*Fig. 16: Overall sound-power level $L_P$ of a REMKO outdoor module type: WKF/WKF-compact 130*

A: A total [dB(A)]
1: Sound power $L_{wA}$re 1pW [dB(A)]
2: Frequency [Hz]

| Middle frequency [Hz] | 100 | 125 | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 |
|---|---|---|---|---|---|---|---|---|---|---|
| LWo [dB(A)] | 39.1 | 38.7 | 47.4 | 41.6 | 47.5 | 46.5 | 47 | 46.5 | 46.4 | 48.3 |

| Middle frequency [Hz] | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | A |
|---|---|---|---|---|---|---|---|---|---|---|
| LWo [dB(A)] | 50.4 | 47.2 | 44.8 | 42.1 | 39.7 | 39.4 | 37 | 35.6 | 34.1 | 58.3 |

The sound power conforms to accuracy class 2. The standard deviation of the aforementioned A-valued sound power levels amounts to 1.5 dB.

LWo: Sound power level radiated by the outdoor unit

# REMKO WKF series

**Outdoor unit WKF/WKF-compact 170**

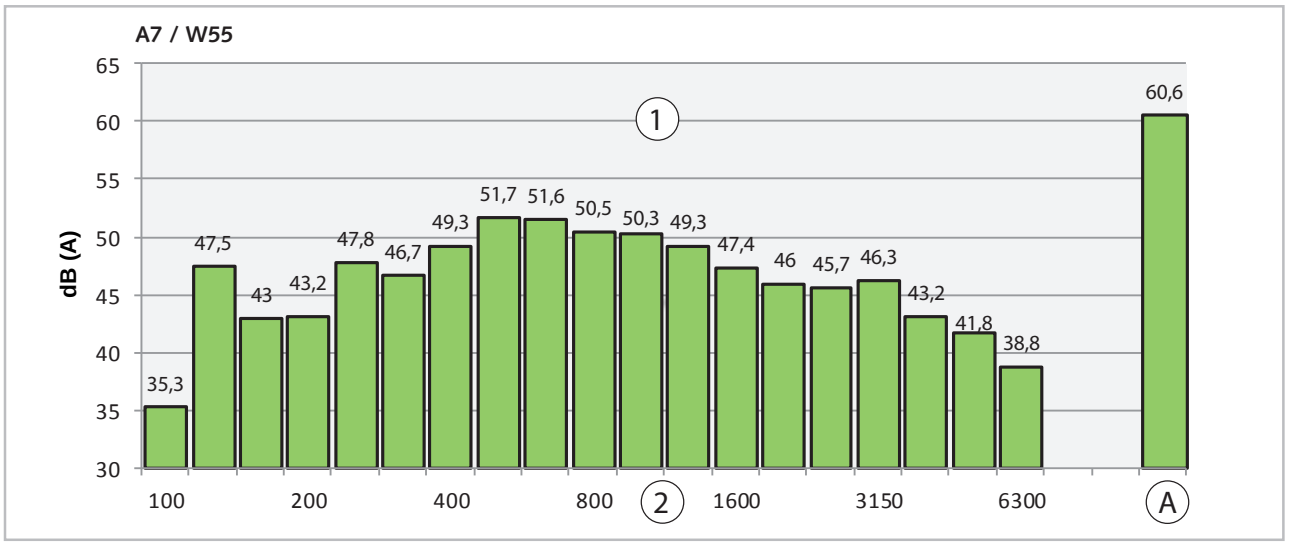


*Fig. 17: Overall sound-power level $L_P$ of a REMKO outdoor module type: WKF/WKF-compact 170*

A: A total [dB(A)]
1: Sound power $L_{wA}$re 1pW [dB(A)]
2: Frequency [Hz]

| Middle frequency [Hz] | 100 | 125 | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 |
|---|---|---|---|---|---|---|---|---|---|---|
| LWo [dB(A)] | 40.8 | 39.9 | 50.6 | 48.5 | 52 | 49.3 | 51.8 | 51.3 | 50.2 | 48.8 |

| Middle frequency [Hz] | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | A |
|---|---|---|---|---|---|---|---|---|---|---|
| LWo [dB(A)] | 52.6 | 48.5 | 44.8 | 43.6 | 40.9 | 39.4 | 38.9 | 37.8 | 36.5 | 60.6 |

The sound power conforms to accuracy class 2. The standard deviation of the aforementioned A-valued sound power levels amounts to 1.5 dB.

LWo: Sound power level radiated by the outdoor unit

**Outdoor unit WKF 130 Duo**

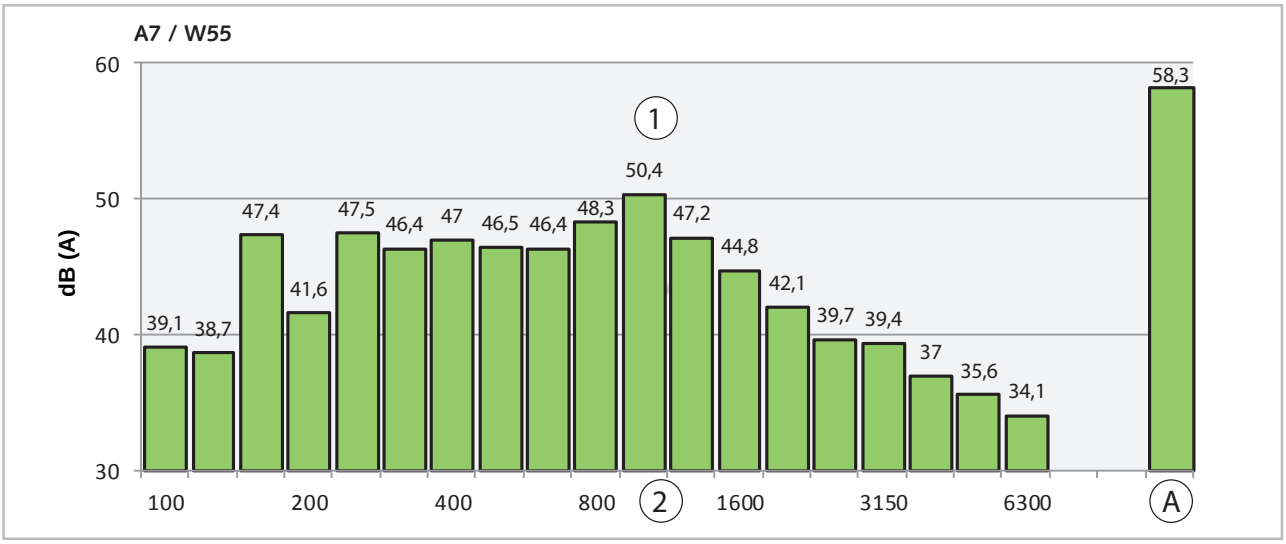


*Fig. 18: Overall sound-power level $L_P$ of a REMKO outdoor module type: WKF 130 Duo*

A: A total [dB(A)]
1: Sound power $L_{wA}$re 1pW [dB(A)]
2: Frequency [Hz]

| Middle frequency [Hz] | 100 | 125 | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 |
|---|---|---|---|---|---|---|---|---|---|---|
| LWo [dB(A)] | 39.1 | 38.7 | 47.4 | 41.6 | 47.5 | 46.5 | 47 | 46.5 | 46.4 | 48.3 |

| Middle frequency [Hz] | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | A |
|---|---|---|---|---|---|---|---|---|---|---|
| LWo [dB(A)] | 50.4 | 47.2 | 44.8 | 42.1 | 39.7 | 39.4 | 37 | 35.6 | 34.1 | 58.3 |

The sound power conforms to accuracy class 2. The standard deviation of the aforementioned A-valued sound power levels amounts to 1.5 dB.

LWo: Sound power level radiated by the outdoor unit

**Outdoor unit WKF 170 Duo**

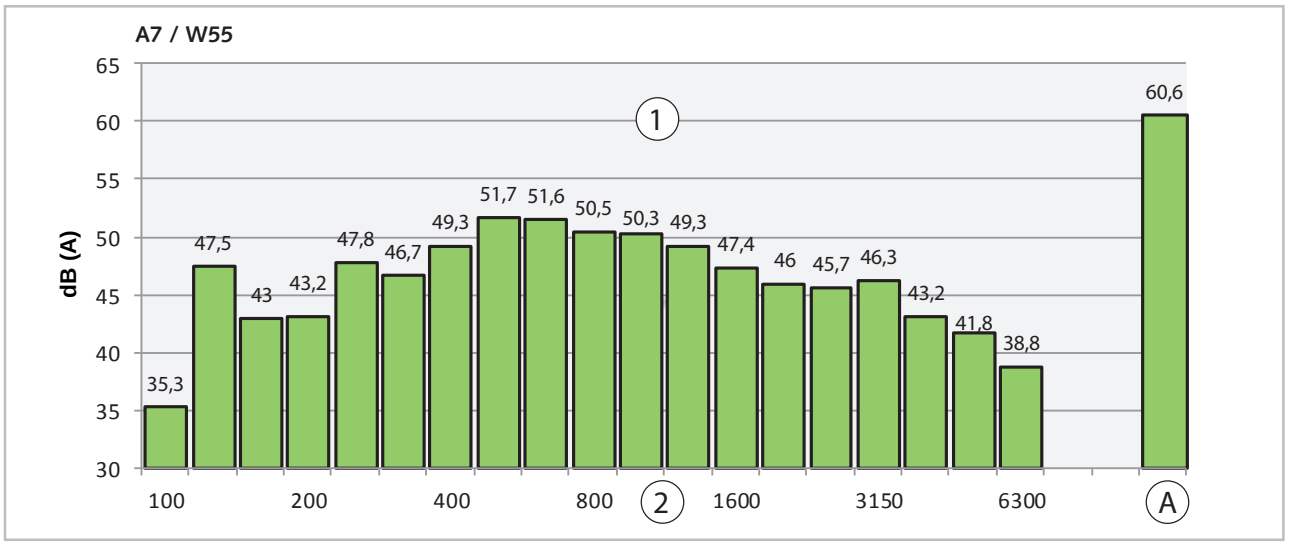


*Fig. 19: Overall sound-power level $L_P$ of a REMKO outdoor module type: WKF 170 Duo*

A: A total [dB(A)]
1: Sound power $L_{wA}$re 1pW [dB(A)]
2: Frequency [Hz]

| Middle frequency [Hz] | 100 | 125 | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 |
|---|---|---|---|---|---|---|---|---|---|---|
| LWo [dB(A)] | 40.8 | 39.9 | 50.6 | 48.5 | 52 | 49.3 | 51.8 | 51.3 | 50.2 | 48.8 |

| Middle frequency [Hz] | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | A |
|---|---|---|---|---|---|---|---|---|---|---|
| LWo [dB(A)] | 52.6 | 48.5 | 44.8 | 43.6 | 40.9 | 39.4 | 38.9 | 37.8 | 36.5 | 60.6 |

The sound power conforms to accuracy class 2. The standard deviation of the aforementioned A-valued sound power levels amounts to 1.5 dB.

LWo: Sound power level radiated by the outdoor unit

## 2.9 Reduction of sound power level

The sound power level can be considerably reduced by using the **REMKO ARTdesign sound insulation hoods**.

Further information regarding REMKO sound insulation hoods can be found in the separate operating instructions “REMKO sound insulation hoods for REMKO heat pumps - SWK 4-7”.

**Outdoor unit WKF/WKF-compact 80 - Reduction of the sound power level using SWK 4**

| | Output restriction [%] | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ↓ All information in dB(A) ↓ | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 |
| Sound power level AM max. | 56 | 55.5 | 54.9 | 52.5 | 51 | 48.5 | 43 | 41 |
| Reducer sound hood | -6.5 | | | | | | | |
| Sound power level with SWK 4 sound hood | 49.5 | 49 | 48.4 | 46 | 44.5 | 42 | 36.5 | 34.5 |

**Outdoor unit WKF/WKF-compact 100 - Reduction of the sound power level using SWK 5**

| | Output restriction [%] | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ↓ All information in dB(A) ↓ | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 |
| Sound power level AM max. | 59 | 58 | 56.5 | 55 | 54 | 52 | 49 | 46 |
| Reducer sound hood | -7.0 | | | | | | | |
| Sound power level with SWK 5 sound hood | 52 | 51 | 49.7 | 48 | 47 | 45 | 42 | 39 |

**Outdoor unit WKF/WKF-compact 130 - Reduction of the sound power level using SWK 5**

| | Output restriction [%] | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ↓ All information in dB(A) ↓ | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 |
| Sound power level AM max. | 61 | 59 | 58.3 | 56 | 55 | 54 | 52 | 50 |
| Reducer sound hood | -6.0 | | | | | | | |
| Sound power level with SWK 5 sound hood | 55 | 53 | 52.3 | 50 | 49 | 48 | 46 | 44 |

**Outdoor unit WKF/WKF-compact 170 - Reduction of the sound power level using SWK 7**

| | Output restriction [%] | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ↓ All information in dB(A) ↓ | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 |
| Sound power level AM max. | 63 | 62 | 61.2 | 59 | 57 | 56 | 55 | 54 |
| Reducer sound hood | -5.0 | | | | | | | |
| Sound power level with SWK 7 sound hood | 58 | 57 | 56.2 | 44 | 52 | 51 | 50 | 49 |

During the final calculation of the sound pressure level using the BWP sound calculator, it must be ensured that the tonal accuracy entered there can also be deducted.

## 2.10 Characteristic curves

**Heating capacity WKF/WKF-compact 80 at inlet temperature of 35 °C**

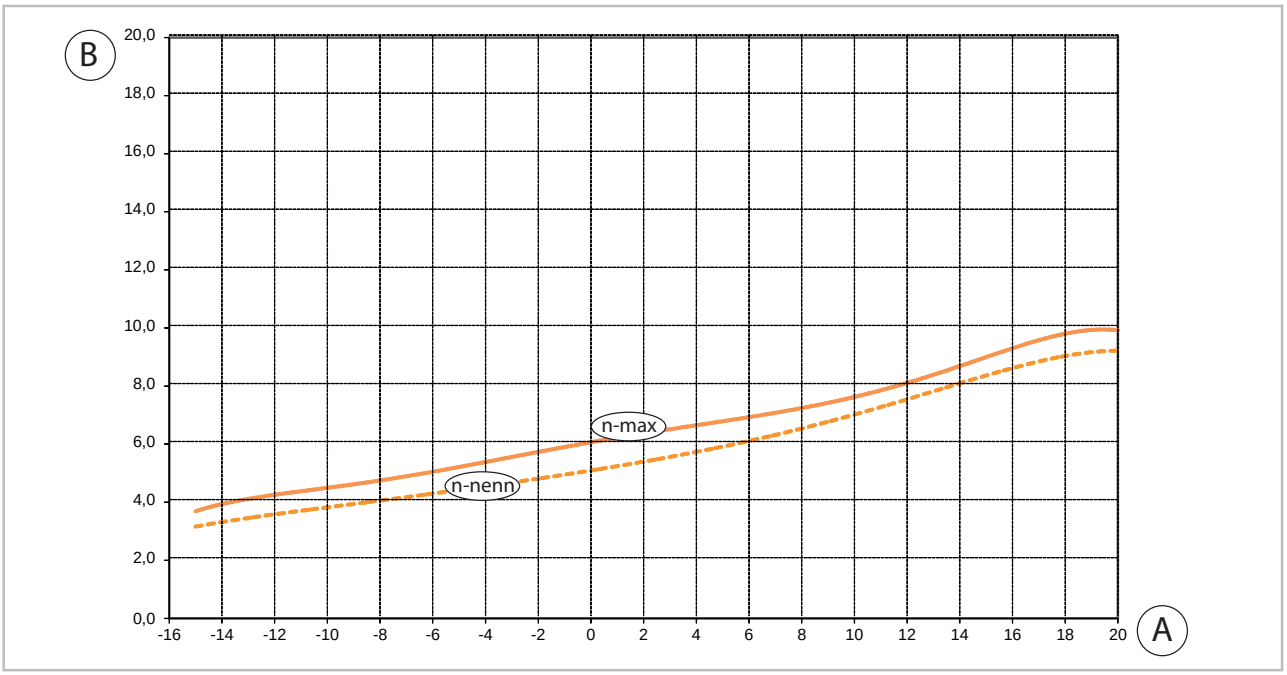


*Fig. 20: Heating capacity WKF/WKF-compact 80 at inlet temperature of 35 °C*

A: Outside temperature [°C] B: Heating capacity/total thermal load [kW]

**Heating capacity WKF/WKF-compact 80 at inlet temperature of 45 °C**

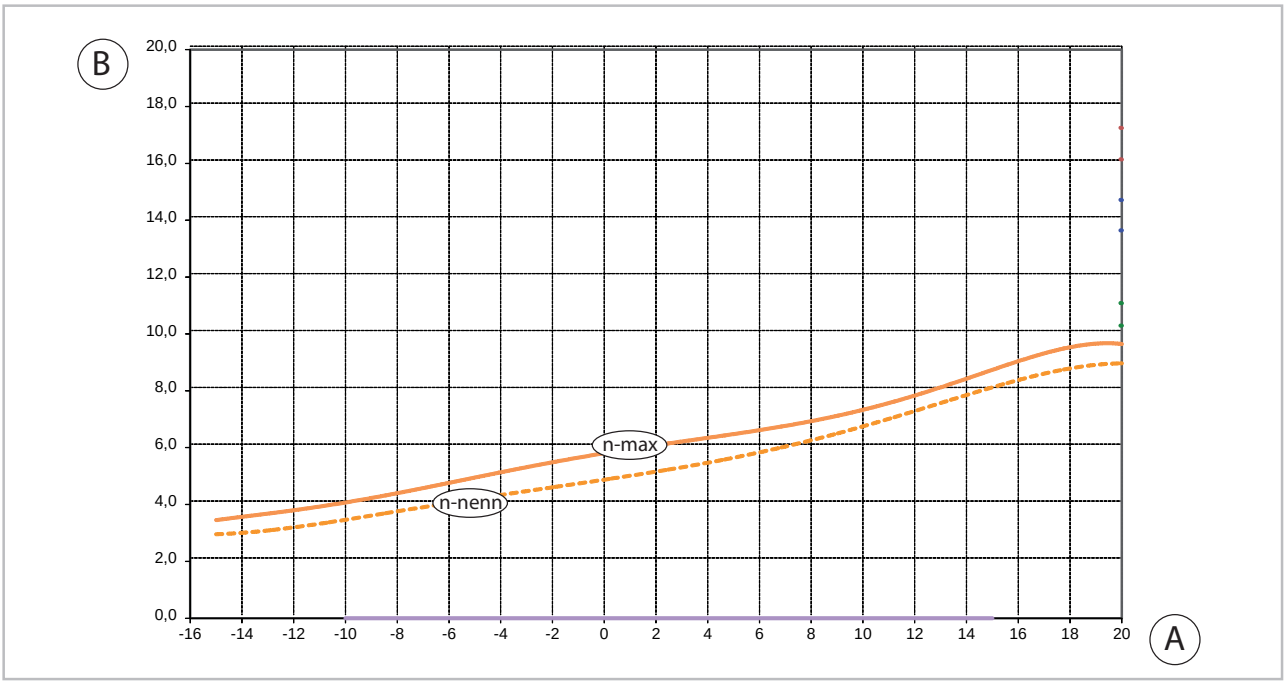


*Fig. 21: Heating capacity WKF/WKF-compact 80 at inlet temperature of 45 °C*

A: Outside temperature [°C] B: Heating capacity/total thermal load [kW]

**Heating capacity WKF/WKF-compact 80 at inlet temperature of 55 °C**

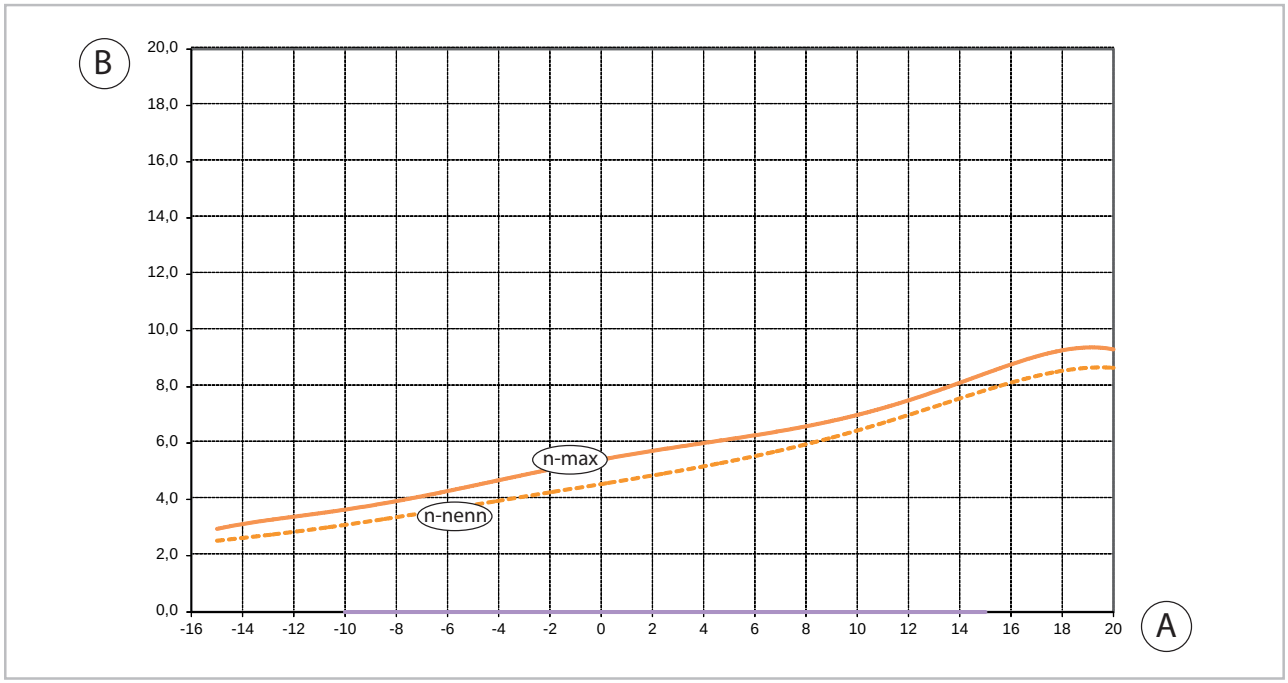


*Fig. 22: Heating capacity WKF/WKF-compact 80 at inlet temperature of 55 °C*

A: Outside temperature [°C] B: Heating capacity/total thermal load [kW]

**COP WKF/WKF-compact 80 at inlet temperature 35 °C, 45 °C and 55 °C**

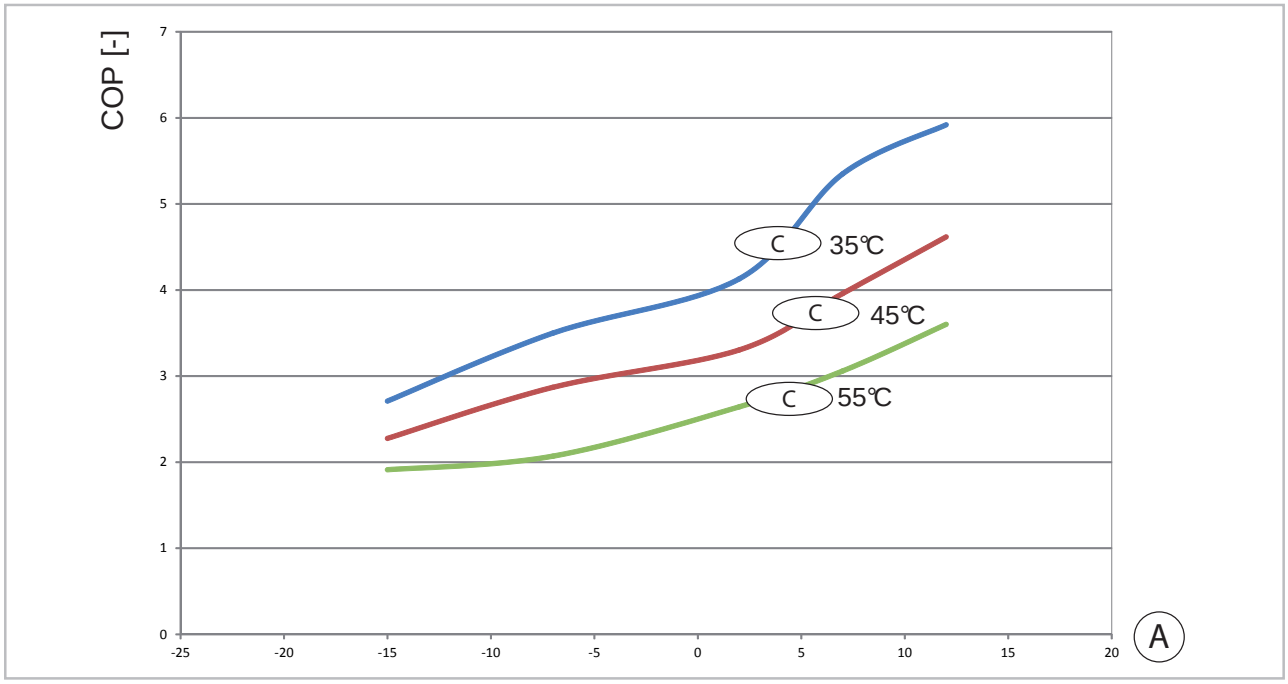


*Fig. 23: COP WKF/WKF-compact 80 at inlet temperature 35 °C, 45 °C and 55 °C*

A: Outside temperature [°C] C: Inlet temperature [°C]

**Heating capacity WKF/WKF-compact 100 at inlet temperature of 35 °C**

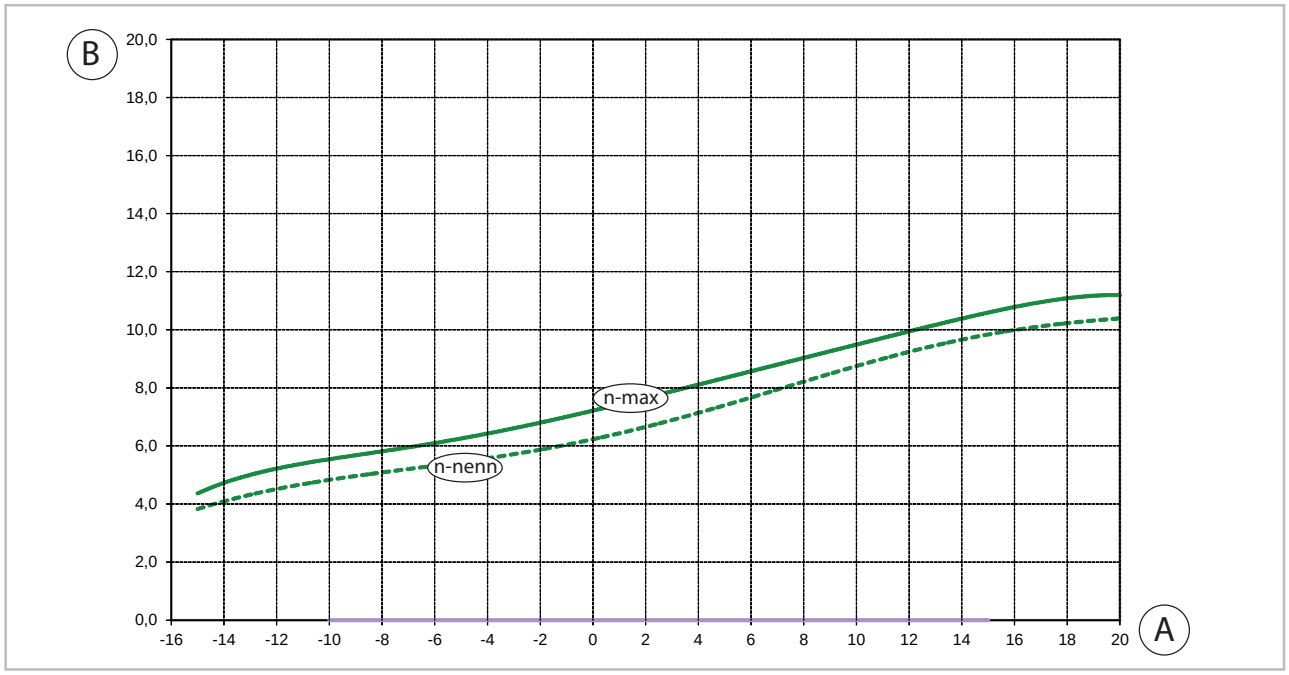


*Fig. 24: Heating capacity WKF/WKF-compact 100 at inlet temperature of 35 °C*

A: Outside temperature [°C] B: Heating capacity/total thermal load [kW]

**Heating capacity WKF/WKF-compact 100 at inlet temperature of 45 °C**

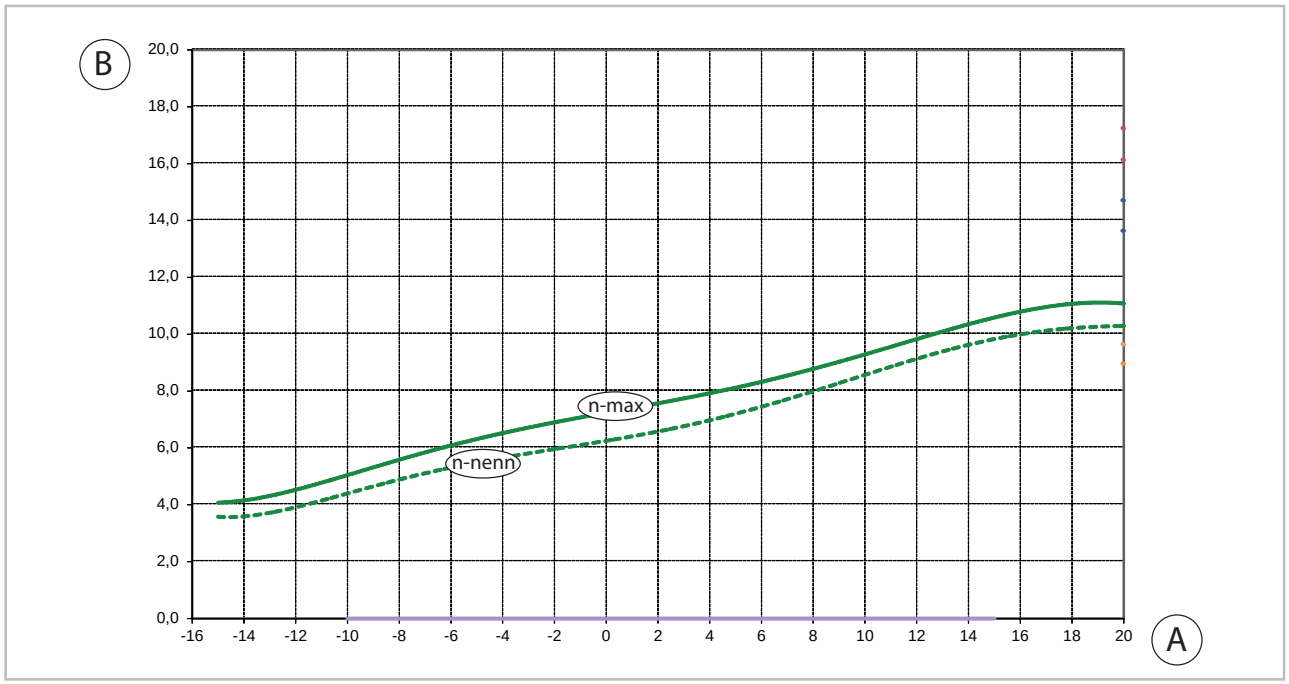


*Fig. 25: Heating capacity WKF/WKF-compact 100 at inlet temperature of 45 °C*

A: Outside temperature [°C] B: Heating capacity/total thermal load [kW]

**Heating capacity WKF/WKF-compact 100 at inlet temperature of 55 °C**

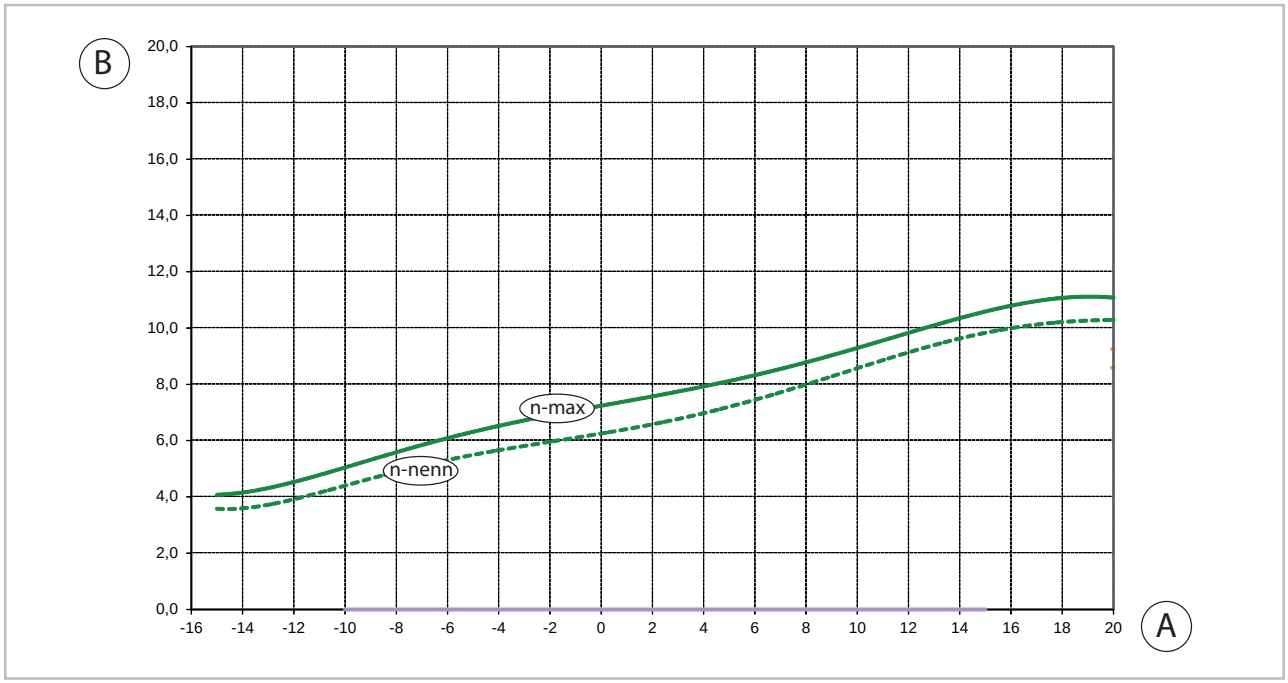


*Fig. 26: Heating capacity WKF/WKF-compact 100 at inlet temperature of 55 °C*

A: Outside temperature [°C] B: Heating capacity/total thermal load [kW]

**COP WKF/WKF-compact 100 at inlet temperature 35 °C, 45 °C and 55 °C**

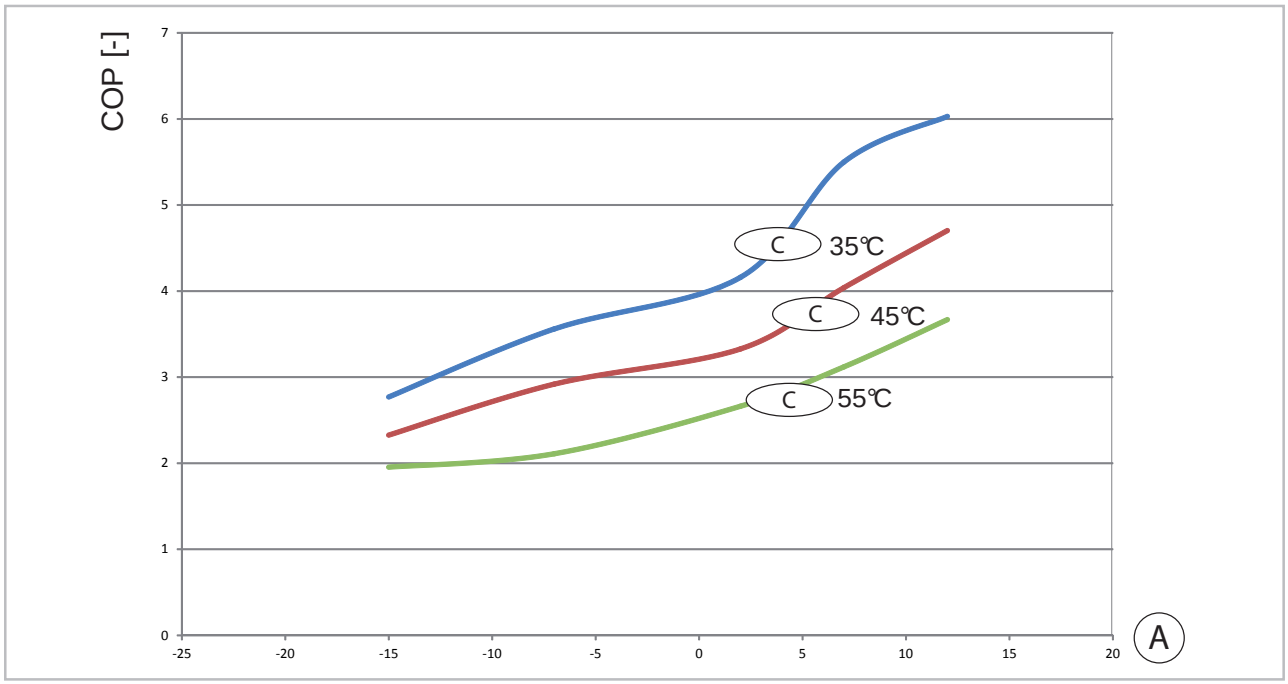


*Fig. 27: COP WKF/WKF-compact 100 at inlet temperature 35 °C, 45 °C and 55 °C*

A: Outside temperature [°C] C: Inlet temperature [°C]

**Heating capacity WKF/WKF-compact 130 at inlet temperature of 35 °C**

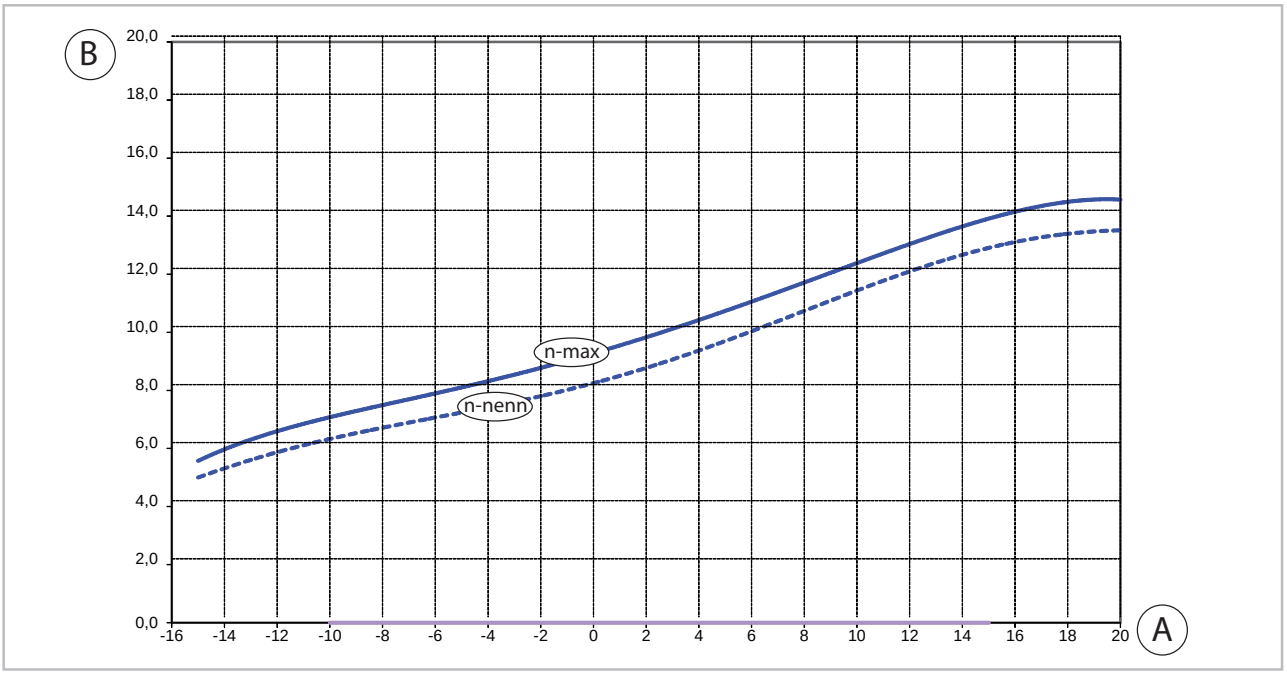


*Fig. 28: Heating capacity WKF/WKF-compact 130 at inlet temperature of 35 °C*

A: Outside temperature [°C] B: Heating capacity/total thermal load [kW]

**Heating capacity WKF/WKF-compact 130 at inlet temperature of 45 °C**

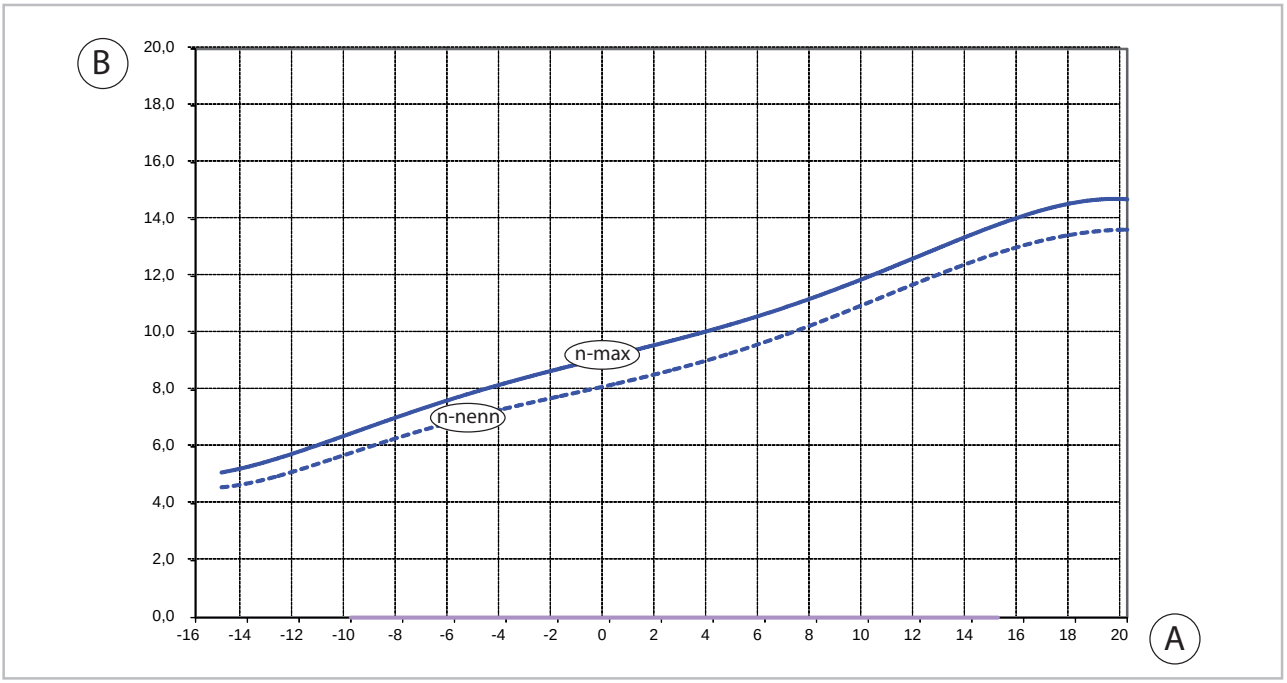


*Fig. 29: Heating capacity WKF/WKF-compact 130 at inlet temperature of 45 °C*

A: Outside temperature [°C] B: Heating capacity/total thermal load [kW]

**Heating capacity WKF/WKF-compact 130 at inlet temperature of 55 °C**

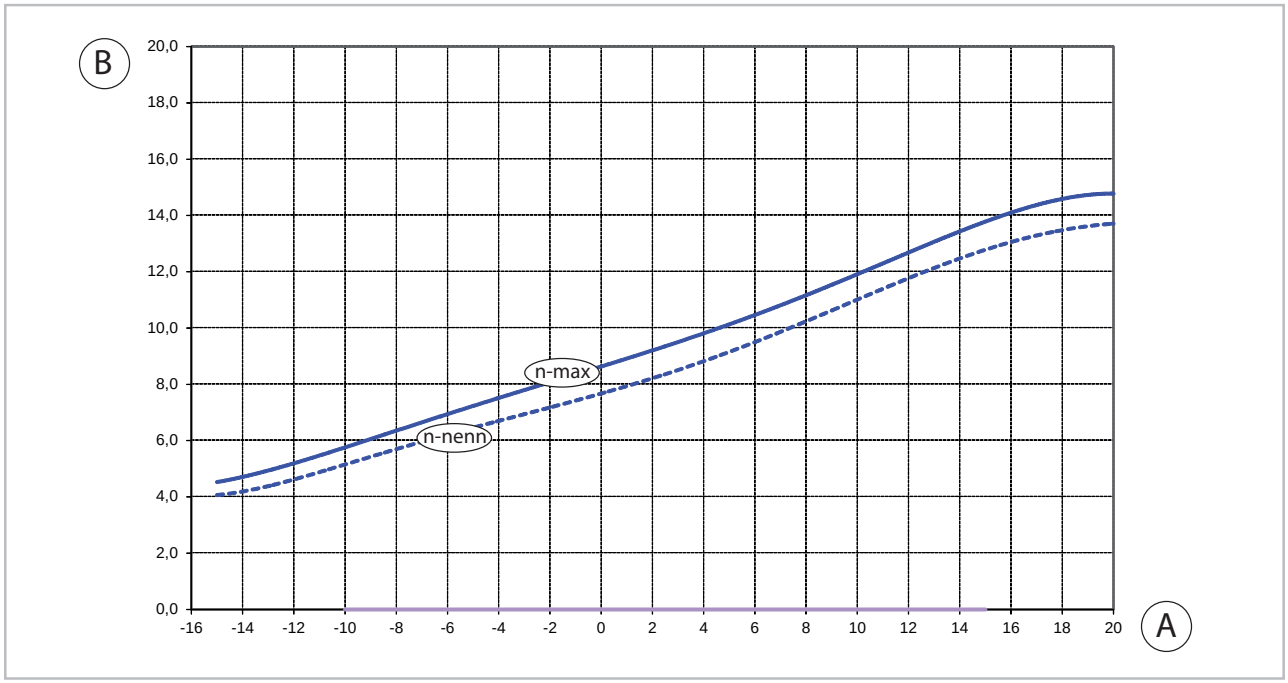


*Fig. 30: Heating capacity WKF/WKF-compact 130 at inlet temperature of 55 °C*

A: Outside temperature [°C] B: Heating capacity/total thermal load [kW]

**COP WKF/WKF-compact 130 at inlet temperature 35 °C, 45 °C and 55 °C**

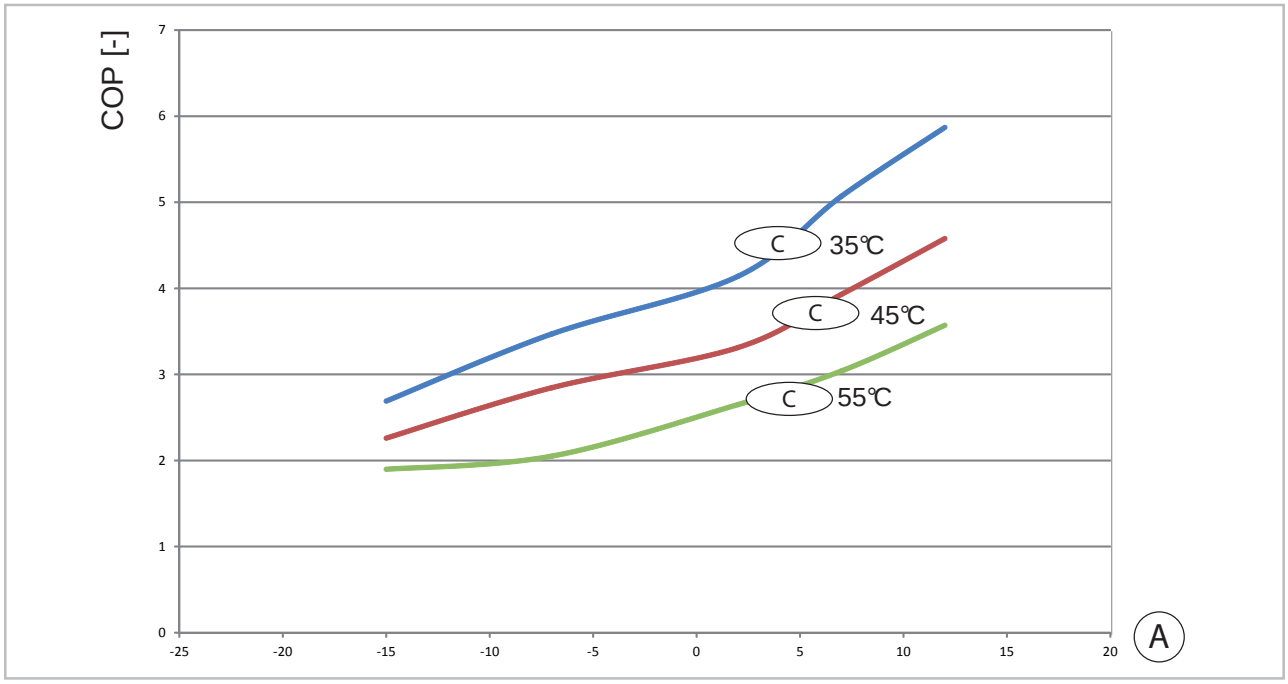


*Fig. 31: COP WKF/WKF-compact 130 at inlet temperature 35 °C, 45 °C and 55 °C*

A: Outside temperature [°C] C: Inlet temperature [°C]

**Heating capacity WKF/WKF-compact 170 at inlet temperature of 35 °C**

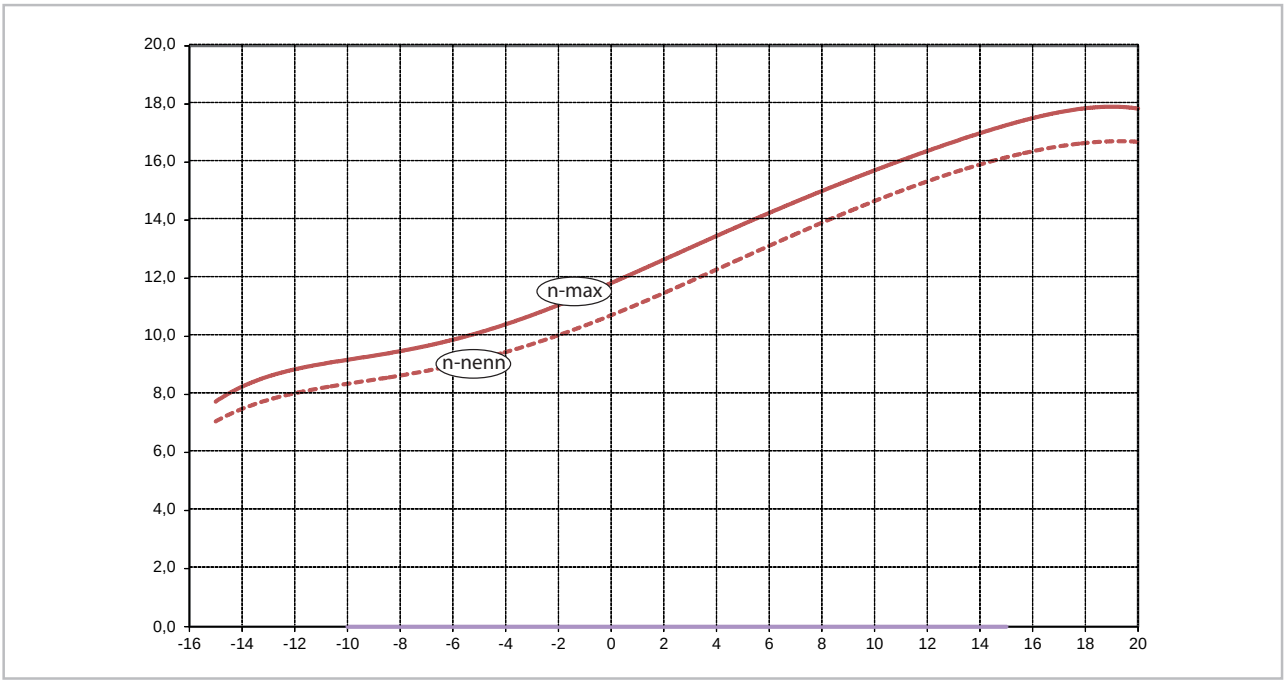


*Fig. 32: Heating capacity WKF/WKF-compact 170 at inlet temperature of 35 °C*

A: Outside temperature [°C] B: Heating capacity/total thermal load [kW]

**Heating capacity WKF/WKF-compact 170 at inlet temperature of 45 °C**

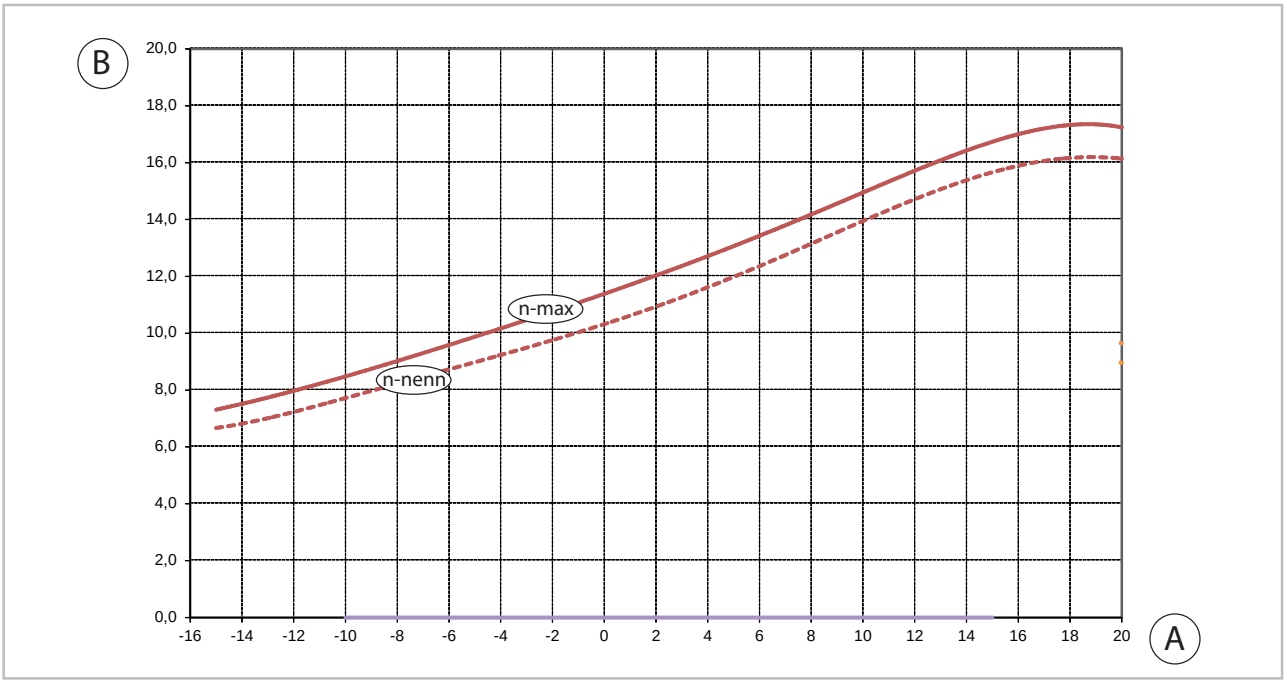


*Fig. 33: Heating capacity WKF/WKF-compact 170 at inlet temperature of 45 °C*

A: Outside temperature [°C] B: Heating capacity/total thermal load [kW]

**Heating capacity WKF/WKF-compact 170 at inlet temperature of 55 °C**

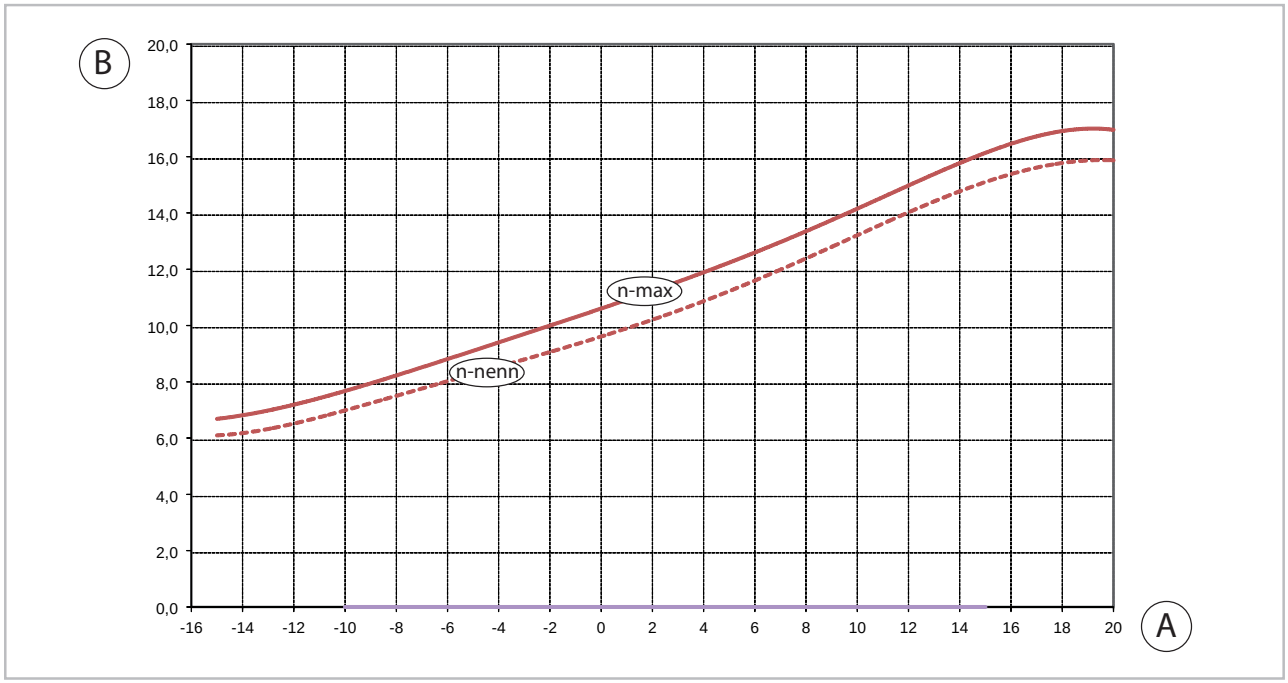


*Fig. 34: Heating capacity WKF/WKF-compact 170 at inlet temperature of 55 °C*

A: Outside temperature [°C] B: Heating capacity/total thermal load [kW]

**COP WKF/WKF-compact 170 at inlet temperature 35 °C, 45 °C and 55 °C**

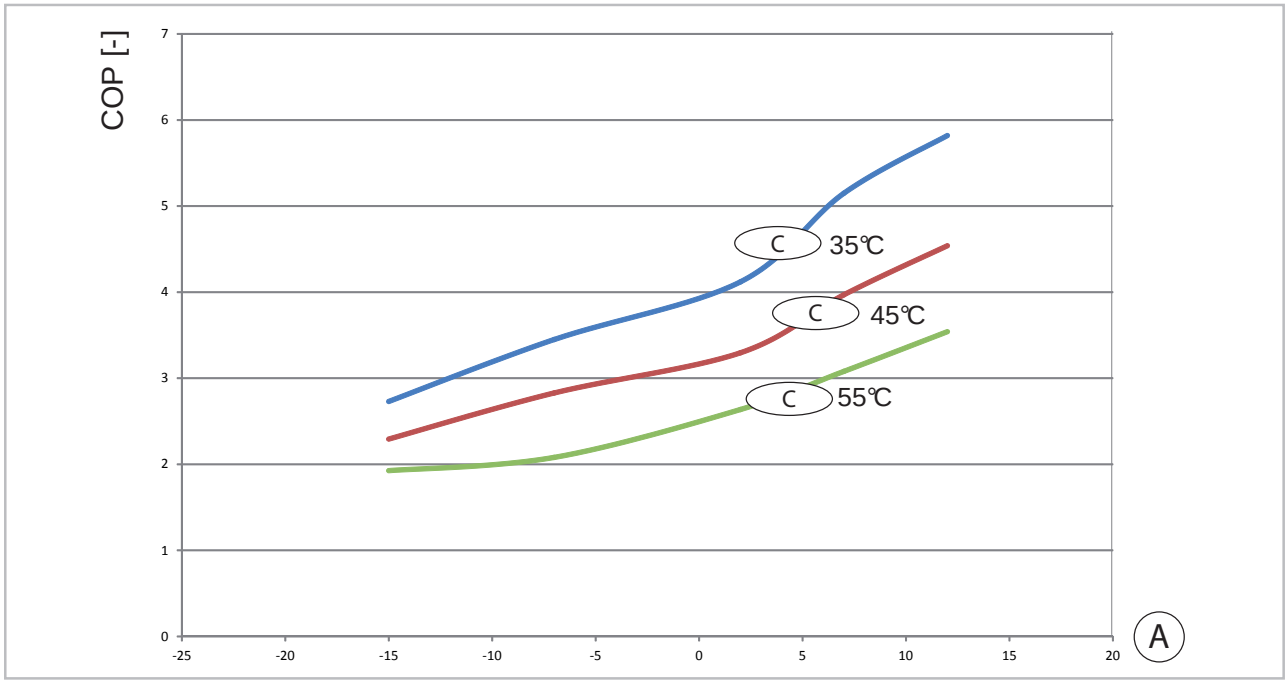


*Fig. 35: COP WKF/WKF-compact 170 at inlet temperature 35 °C, 45 °C and 55 °C*

A: Outside temperature [°C] C: Inlet temperature [°C]

**Heating capacity WKF 130 Duo at inlet temperature of 35 °C**

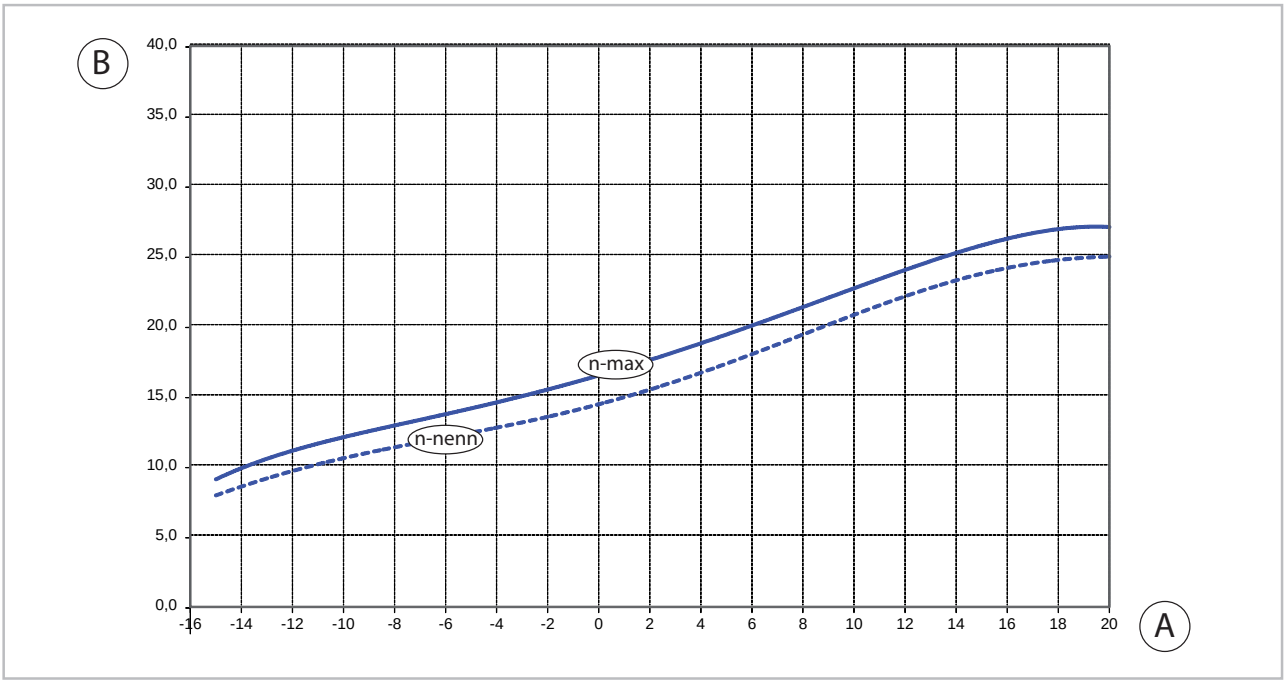


*Fig. 36: Heating capacity WKF 130 Duo at inlet temperature of 35 °C*

A: Outside temperature [°C] B: Heating capacity/total thermal load [kW]

**Heating capacity WKF 130 Duo at inlet temperature of 45 °C**

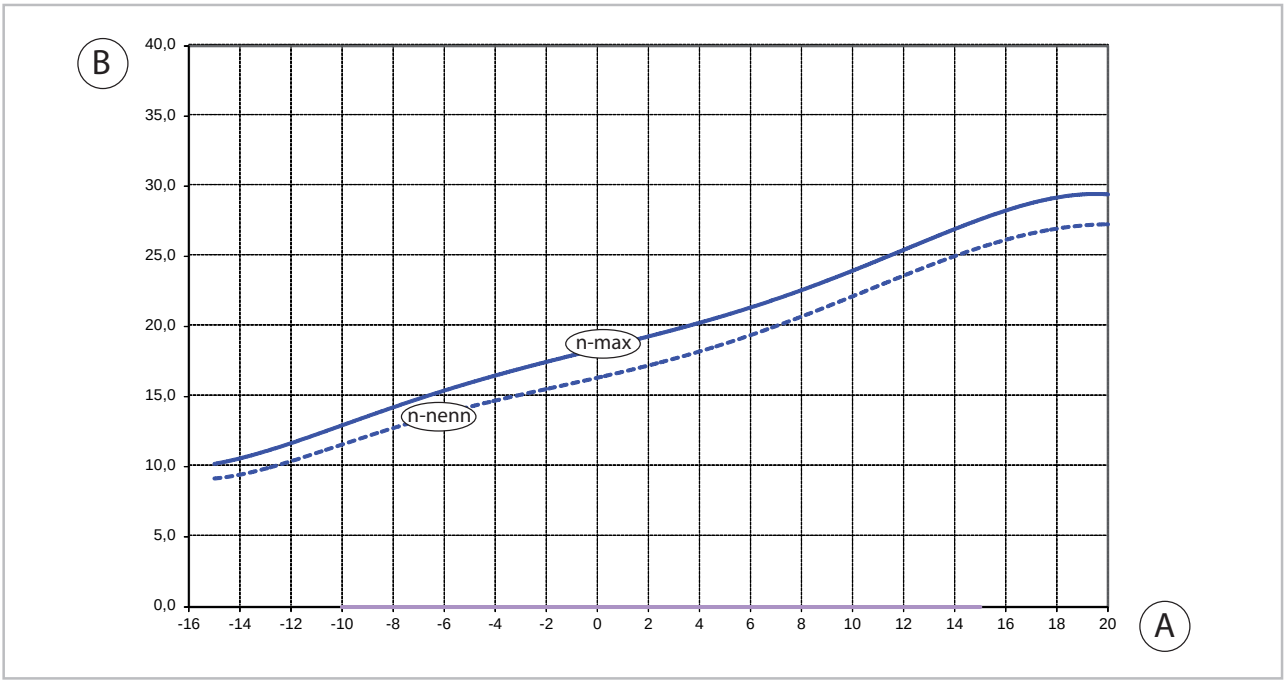


*Fig. 37: Heating capacity WKF 130 Duo at inlet temperature of 45 °C*

A: Outside temperature [°C] B: Heating capacity/total thermal load [kW]

**Heating capacity WKF 130 Duo at inlet temperature of 55 °C**

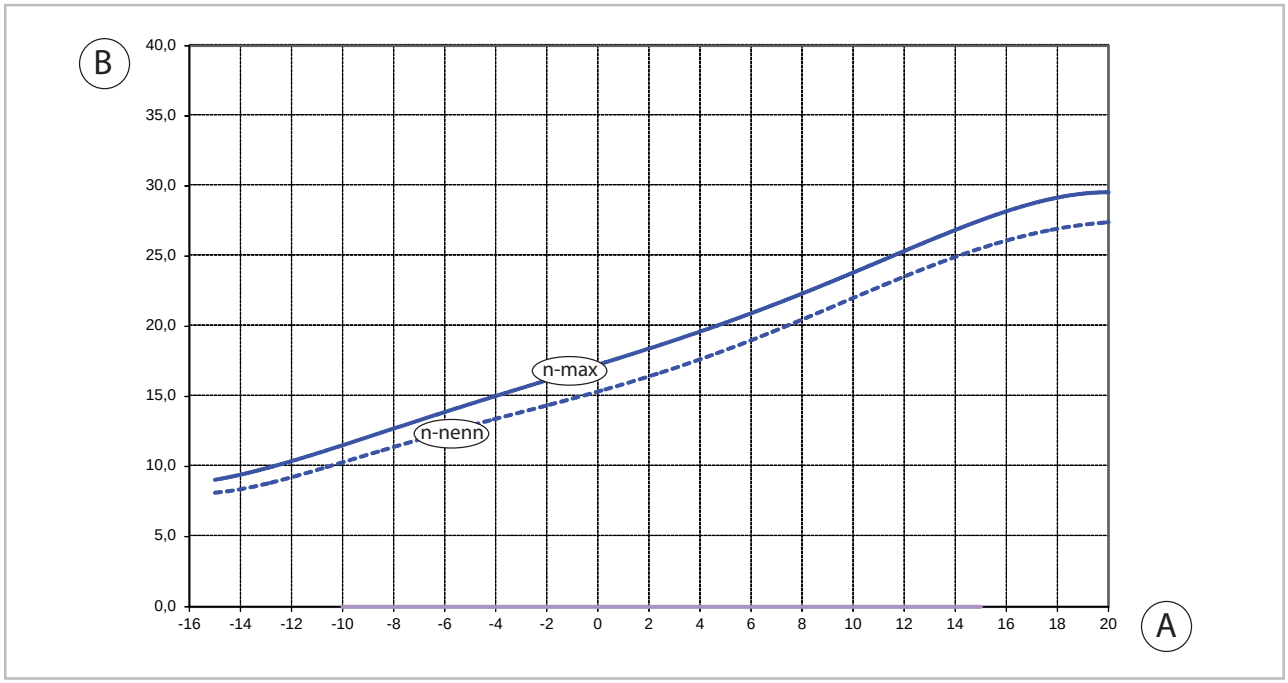


*Fig. 38: Heating capacity WKF 130 Duo at inlet temperature of 55 °C*

A: Outside temperature [°C] B: Heating capacity/total thermal load [kW]

**COP WKF 130 Duo at inlet temperature 35 °C, 45 °C and 55 °C**

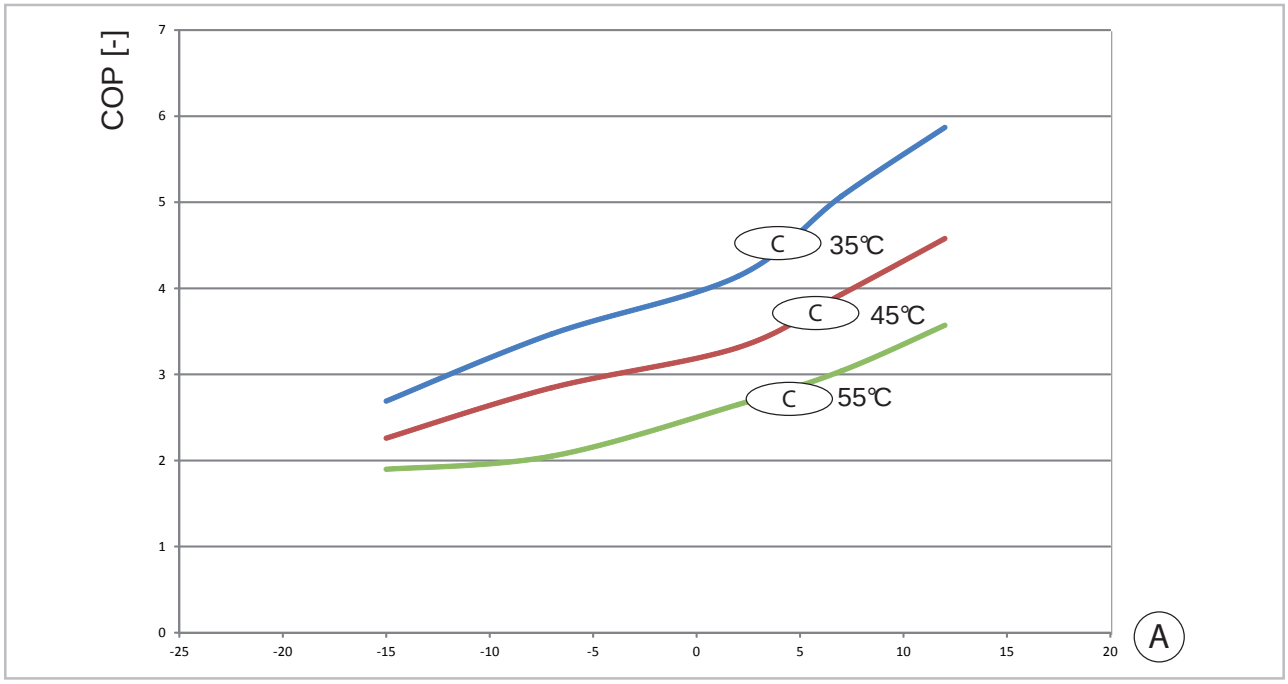


*Fig. 39: COP WKF 130 Duo at inlet temperature 35 °C, 45 °C and 55 °C*

A: Outside temperature [°C] C: Inlet temperature [°C]

**Heating capacity WKF 170 Duo at inlet temperature of 35 °C**

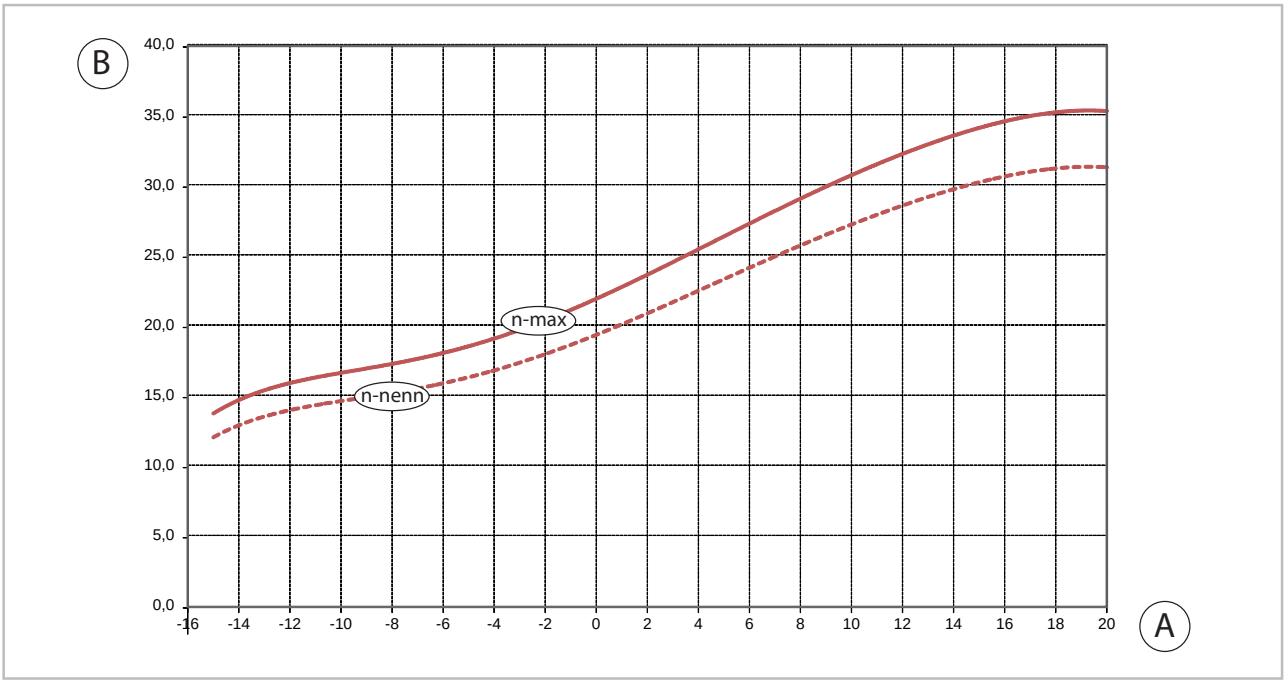


*Fig. 40: Heating capacity WKF 170 Duo at inlet temperature of 35 °C*

A: Outside temperature [°C] B: Heating capacity/total thermal load [kW]

**Heating capacity WKF 170 Duo at inlet temperature of 45 °C**

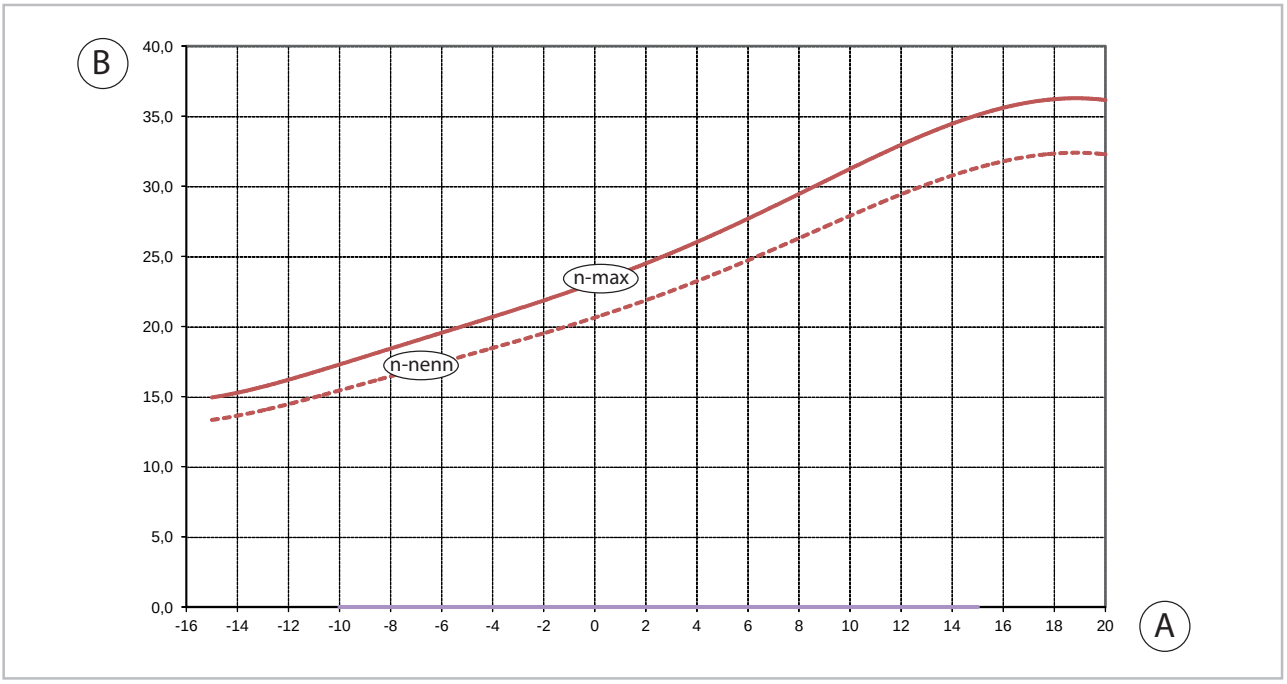


*Fig. 41: Heating capacity WKF 170 Duo at inlet temperature of 45 °C*

A: Outside temperature [°C] B: Heating capacity/total thermal load [kW]

**Heating capacity WKF 170 Duo at inlet temperature of 55 °C**

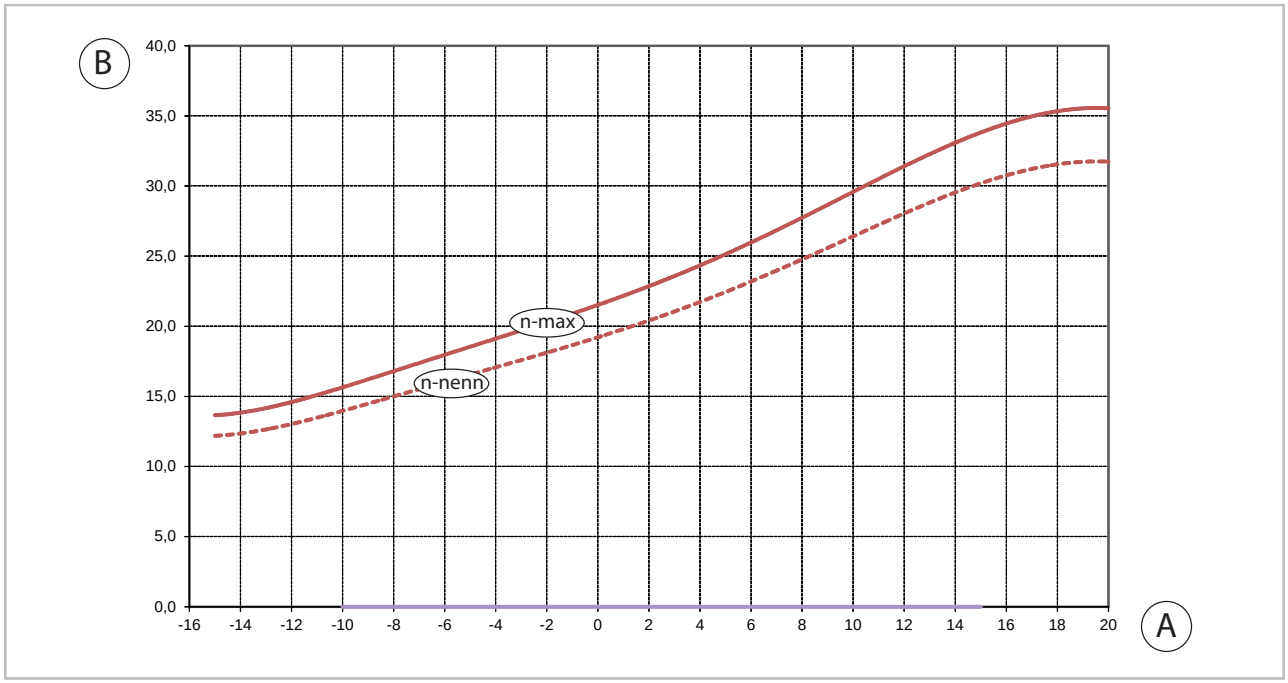


*Fig. 42: Heating capacity WKF 170 Duo at inlet temperature of 55 °C*

A: Outside temperature [°C] B: Heating capacity/total thermal load [kW]

**COP WKF 170 Duo at inlet temperature 35 °C, 45 °C and 55 °C**

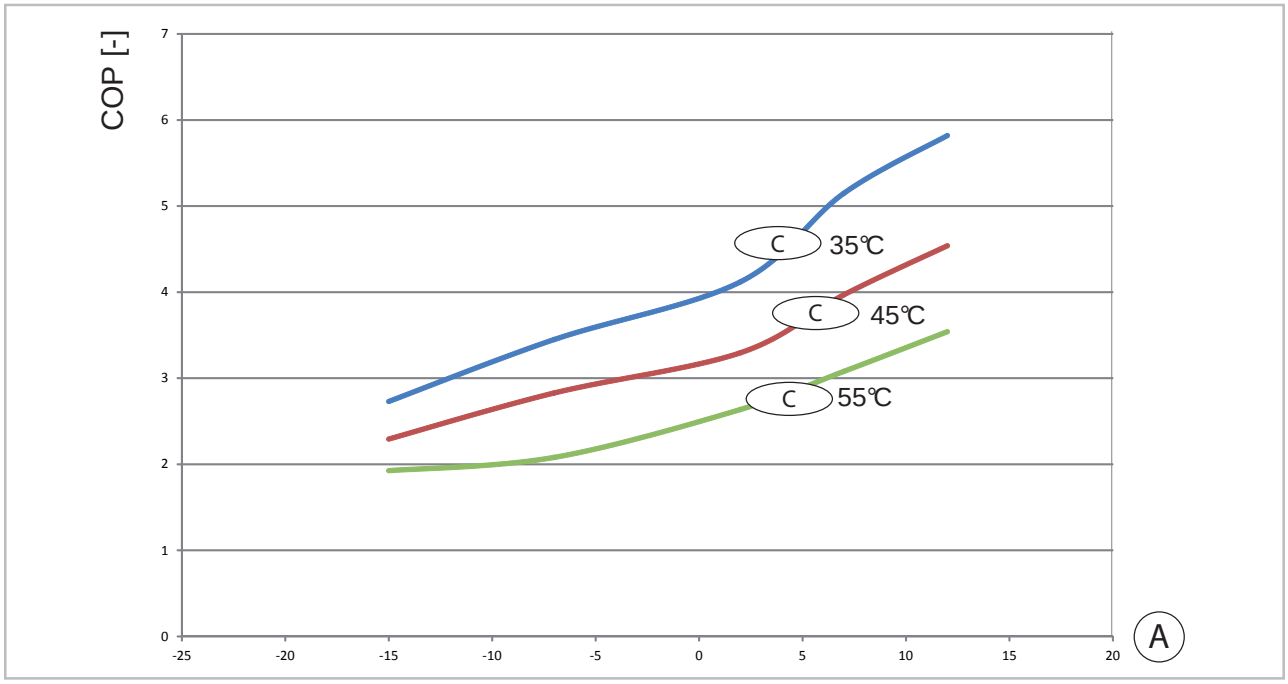


*Fig. 43: COP WKF 170 Duo at inlet temperature 35 °C, 45 °C and 55 °C*

A: Outside temperature [°C] C: Inlet temperature [°C]

# 3 Design and function

## 3.1 The heat pump in general

**Arguments for REMKO**

- Low heating costs in comparison to oil and gas.
- Heat pumps represent a contribution to environmental protection.
- Lower $CO_2$ emissions in comparison to oil and gas heating.
- All models are able to cool as well as heat.
- Low noise-level of the outdoor unit.
- Flexible installation due to split system design.
- Negligible maintenance costs.

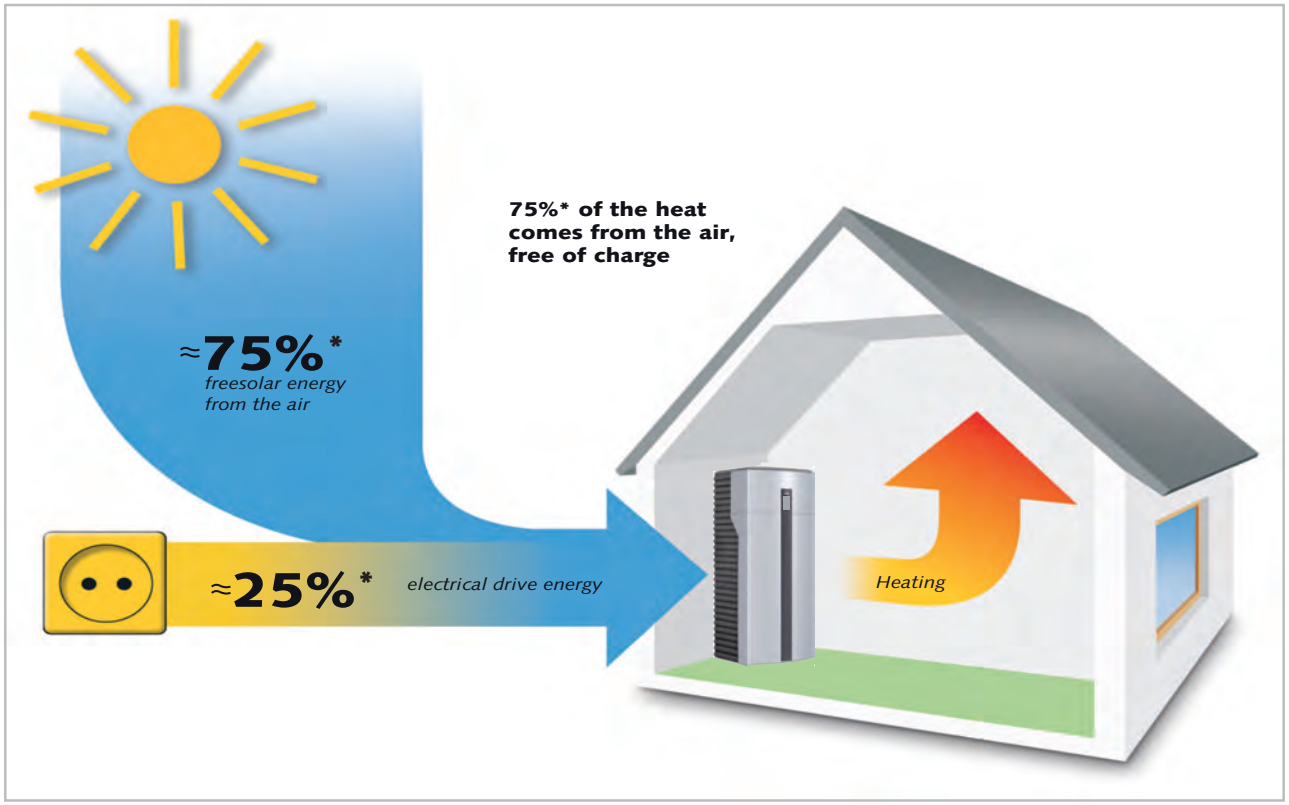


*Fig. 44: Free heat*

* The relationship can vary depending on outdoor temperature and operating conditions.

**Economical and environmentally-conscious heating**

The burning of fossil-based energy sources in order to generate power creates severe consequences for the environment. A high percentage of fossil fuels is also problematic due to the limited resources of oil and gas and the price increases resulting from this. For this reason, many people today are thinking both economically and environmentally-consciously in terms of heating. The application of heat pump technology enables both of these concepts to be combined. It makes use of the energy which is permanently available in the air, water and soil and converts it into usable heating energy by means of inputting electrical energy. Yet in order to generate heat equivalent to 4kWh, only 1kWh of electricity is required. The rest is made available free-of-charge by the environment.

### Heat source

There are essentially three heat sources that heat pumps can derive energy from. air, soil and groundwater. Air heat pumps have the advantage that air as a source heat is available everywhere in **unlimited** quantities that can be used **free of charge**. A disadvantage is that the outside air is at its coldest when the heat requirement is greatest.

Brine heat pumps extract energy from the soil. This is undertaken in serpentine pipe networks which are laid approx. 1m deep or placed by means of drilling. The disadvantage is the **large space requirements** for the serpentine pipe networks or the **high cost of drilling**. A long-term cooling of the soil is also a possibility.

Water heat pumps require **two wells** in order to obtain heat from the groundwater, one supply well and one dry well. The development of this source is not possible everywhere, it is expensive and requires planning permission.

### Function of the heat pump

A heat pump is a device which makes use of a working medium to absorb ambient heat under low temperatures and transports this heat to a place where it can be of use for heating purposes. Heat pumps work according to the same principles as a refrigerator. The difference is that heat, the by-product of the refrigerator, is the goal of the heat pump.

The main components of the cooling circuit consist of an evaporator, a compressor, a condenser and an expansion valve. In a finned evaporator, the refrigerant evaporates both because of lower pressure and because of lower heat-source temperatures through absorption of energy from the environment. In the compressor, the refrigerant is brought to a higher pressure and temperature by the application of electrical energy. Next, the hot refrigerant gas reaches the condenser, a plate heat-exchanger. Here the hot gas condenses, transferring heat to the heating system. The liquefied refrigerant then expands and cools in a flow regulator, the expansion valve. Then the refrigerant flows into the evaporator once more and the cycle is complete.

For control, a Smart-Control is included which ensures the independent operation of all safety devices. The water-circulation system of the Series WKF consists of a circulation pump, plate heat-exchangers, dirt traps, safety valve, a manometer, fill- and drain valves, an automatic air-bleeder and flow switch. The WKF-compact series has, in addition, a 3-way changeover valve and a domestic hot water storage.

Wall- and floor consoles, condensate pans, condensate tray with heating, a 3-way changeover valve, a overflow protection valve and other sensors are available as accessories.

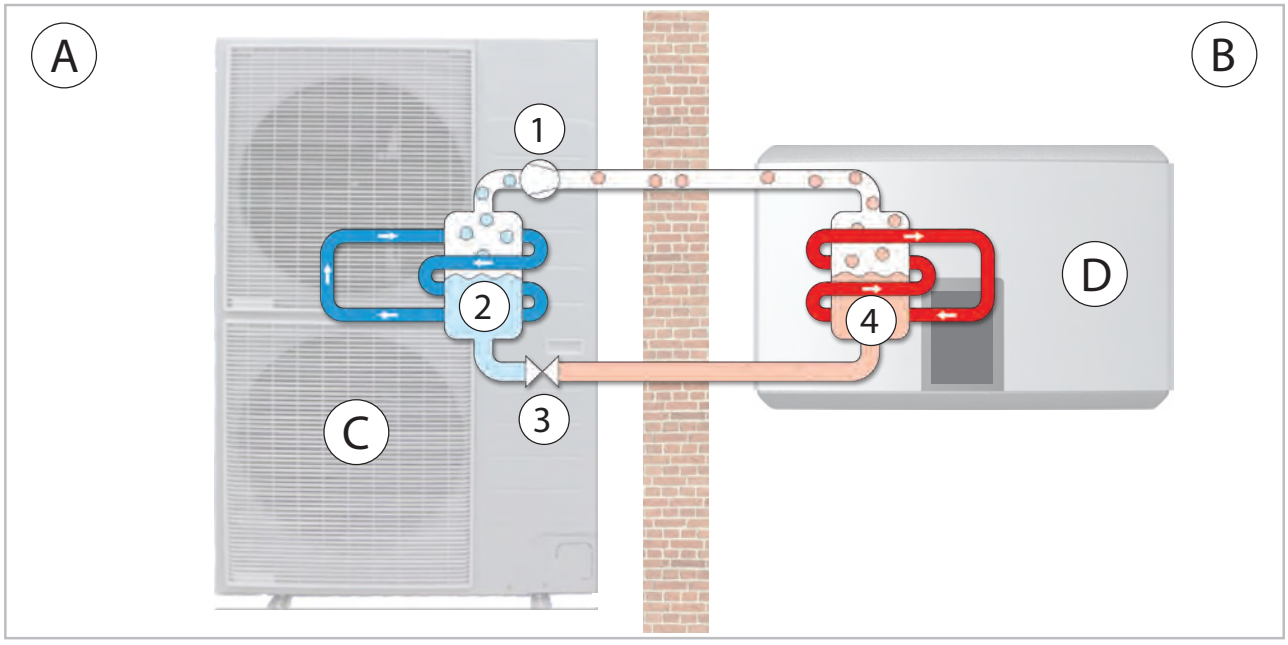


*Fig. 45: Functional diagram heating inverter heat pump*

A: Outdoor area
B: Indoor area
C: Heating pump outdoor module
D: Heating pump indoor module

1: Condensing
2: Evaporation
3: Decompression
4: Liquefying

# REMKO WKF series

**Heat pump modes**

Heat pumps can work in various operating modes.

**Monovalent**

The heat pump the only source of heat for a building all year round. This mode is particularly suitable for heating plants with low supply-water temperatures and is primarily used in combination with brine/water and water/water heat pumps.

**Single energy source**

The heat pump has an E-heater to handle peak loads. The heat pump covers the majority of the required heating power. Occasionally, when it is extremely cold outside, an electrical booster-heating system switches on as required in order to support the heat pump.

**Bivalent parallel**

The heat pump provides the entire heating energy down to a predetermined outdoor temperature. If the temperature drops below this value, a second heat source switches on to support the heat pump. There is a distinction to be made here between **alternative operation** with oil- or gas heat and **regenerative operations** with solar energy or wood-fired heating. This mode is possible for all heating systems.

**Layout**

A precise calculation of the building's heating load according to EN 12831 is required for the design and dimensioning of a heating system. However, approximate requirements can be determined based on the year of construction and the type of building. The table shows the approximate specific heating loads for a number of building types. The required heating system output can be calculated by multiplying the area to be heated with the given values

For a precise calculation, various factors must be considered. The transmission-heat requirement, the infiltration heat-loss and an allowance for water heating comprise the total heating output which the heating system must provide.

The total area of the floor surfaces, exterior wall windows, doors and roofing is required in order to determine the transmission heat requirement. In addition, information about the materials used in the building is required, as these lead to extremely varied thermal transmission coefficients (the so called K value). Also required are the room temperature and the standard outdoor temperature, that is, the lowest outdoor-temperature on average that will occur during the year. The equation for calculating the transmission-heat requirement is $Q=A \times U \times (t_R-t_A)$ and must be calculated separately for all room-enclosure surfaces.

The infiltration heat requirement takes into consideration how often the heated room air is exchanged for cold external air. The room volume (V), the air exchange frequency (n) and the specific heat capacity (c) of the air is also required in addition to the room temperature and average low temperature. The equation is: $Q=V \times n \times c (t_R-t_A)$. An approximate allowance for heating water - per person according to VDI 2067: 0.2 kW

**Example**

A residential home comprised of 150 m² living-space and a heat requirement of 80 W/m² has been selected for the example design. A total of five persons live in the house. The heat load amount to 11.5 kW. Adding a drinking water allowance of 0.2 kW results in a required heat capacity of 12.5 kW. Depending on the power company, an additional charge must then be made in order to factor in the service time-out period. The rating and determination of the heat pump's balance-point temperature derives graphically from the heat pump's temperature-specification heat-output diagram. (In the example, 35 °C for a floor heating-system). Next, the heat load for the standard outdoor temperature (the lowest temperature of the year locally) and the heat threshold are marked on the graph. The outdoor-temperature-dependent heating requirement, simplified here as a straight-line relationship between heat-load and the start of the heating season, is recorded in the graph of heat-load curves. The intersection of the two straight lines with the rated heat-load curve is plotted on the X axis, where the balance-point temperature is read. (in the example, ca.-3°C) The least load of the 2nd heat source is the difference between heat load and the heat pump's maximum heat output on these days. (In the example, the capacity necessary to cover peak loads is ca. 3 kW.)

| Building type | Specific heating output in W/m² |
|---|---|
| Passive energy house | 10 |
| Low-energy house built in 2002 | 40 |
| Accord. to energy conservation order regarding heat insulation 1995 | 60 |
| Modern building constructed around 1984 | 80 |
| Partially-renovated old building constructed pre-1977 | 100 |
| Non-renovated old building constructed pre-1977 | 200 |

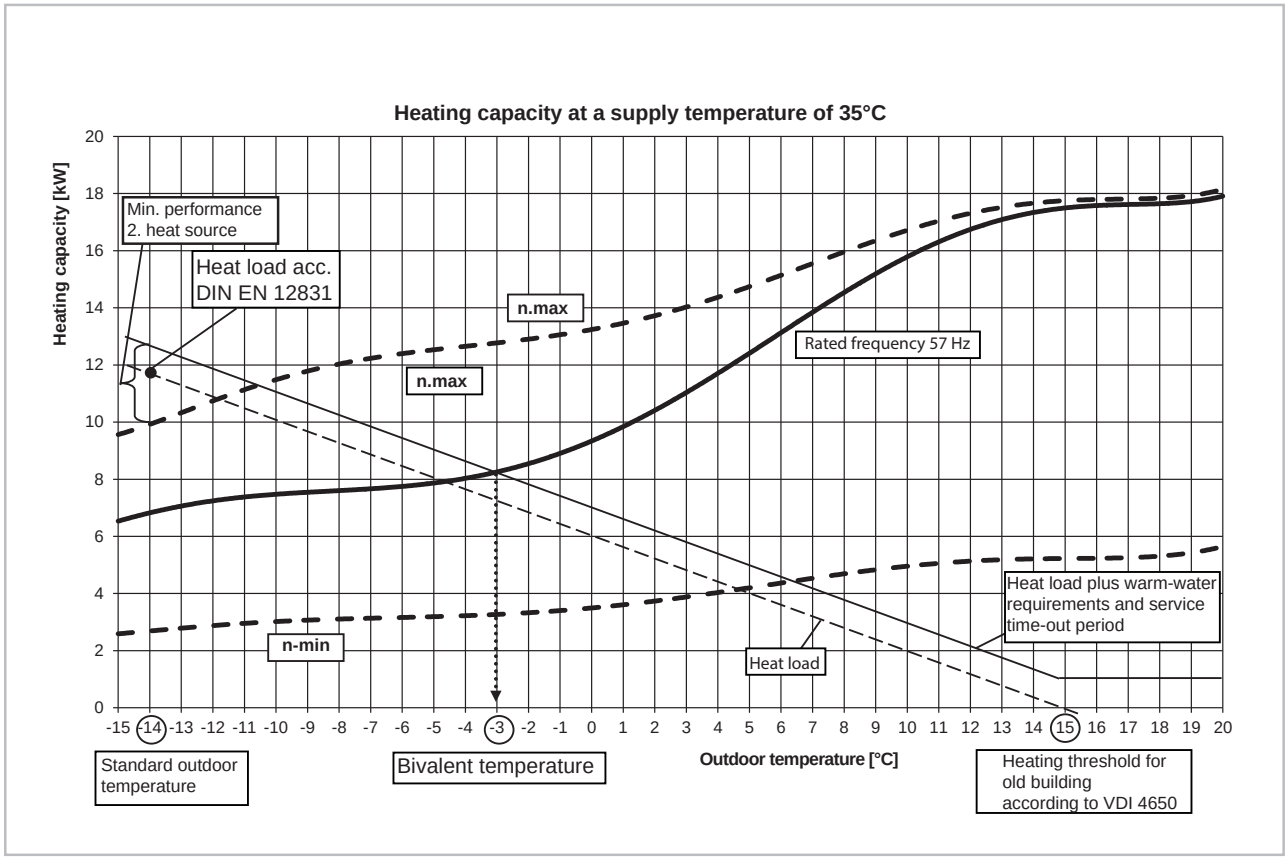


*Fig. 46: Heating capacity diagramm of the heat pump WKF/WKF-compact 170*

## Characteristics of REMKO inverter heat pumps

### Outdoor air as a heat source

An air/water heat pump absorbs energy from the outdoor air as its heat source and transmits this to the heating system. They have the following advantages over brine/water and water/water heat pump systems:

- Can be used everywhere Air is available everywhere in unlimited quantities. For example, no wells are required.
- No excavation required. No large areas are required for soil collectors.
- Economical. Expensive drilling is not required.
- Excellent value for money and simple installation.
- Particularly suitable for low-energy houses with low inlet temperatures.
- Ideal for bivalent operation, in order to save energy.

# REMKO WKF series

**Split AC unit**

The REMKO inverter heat pump is a so called split AC unit. This means that it consists of an outdoor unit and an indoor unit, both of which are connected via refrigerant-carrying copper pipes. Thus there are no water-carrying pipes laid from the indoors to outdoors which need to be made frost proof. The outdoor unit contains only the condenser, the evaporator and the expansion valve. This means that the outdoor unit is considerably smaller. The indoor module contains the system's condenser and the connections for the heating network.

**REMKO inverter technology**

The heat pump's condenser is equipped with a requirement-dependent speed control system. The power control on conventional heat pumps provides only two states, either ON (full output) or OFF (no output). The heat pump turns on below a specified temperature and turns off when this temperature is reached. This kind of heat regulation is very inefficient. Heat regulation in the Remko inverter heat pump is modulated to the actual need. The electronics system has an integrated frequency-converter which serves to modify the condenser speed and the speed of the blower as required. The condenser works at a higher speed when under full load than under partial load. The lower speeds ensure a longer operational lifetime for the components, improved coefficient of performance and lower noise. Lower speeds also result in lower energy consumption (electricity) and longer service life. I.e.: inverter heat-pumps will run practically throughout the heating season. In all, the highest efficiency possible.

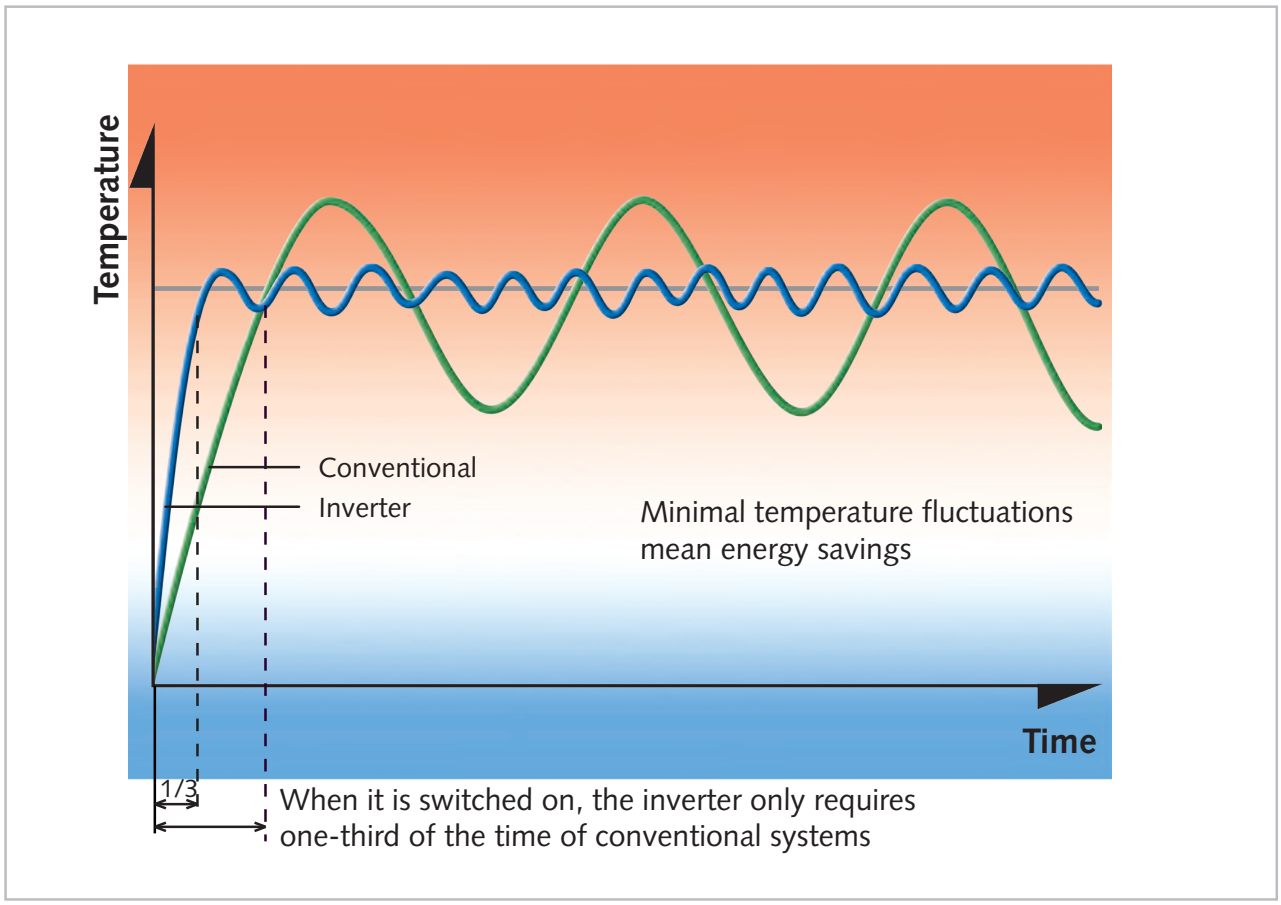


*Fig. 47: Modern inverter technology*

*Thanks to innovative inverter technology, this heat pump will almost always operate by adapting its heating capacity to the actual requirements of the heating season, and will in fact turn itself off when heat is no longer needed. The same applies in the opposite direction with cooling.*

### Defrost by circulation reversal

At temperatures below about +5°C, humidity freezes in the evaporator (outdoor module) and an ice layer can form which reduces heat transfer from the air to the refrigerant and to the air stream. This layer of ice must be removed. A four-way valve serves to reverse the refrigerant circuit, so that the hot gas from the compressor flows through the original evaporator and the ice that has formed there can melt. The defrost process is not initiated after a predetermined time; rather it is carried out as required in order to save energy.

### Cooling mode

Because of circuit reversal, cooling is also possible. In cooling mode, the components of the refrigeration circuit are used to produce cold water with which heat can be extracted from a building. This can be accomplished with dynamic cooling or passive cooling.

Under **dynamic cooling** the refrigerating capacity is actively transferred to the indoor air. This is undertaken by means of water-based REMKO fan convectors. In doing so, it is desirable that the inlet temperatures are under the dewpoint, in order to transfer a higher refrigerating capacity and to dehumidify the indoor air.

**Passive cooling** refers to the absorption of heat via cooled floors, walls or ceiling surfaces. In doing so, water-carrying pipes make the structural sections into thermically effective heat exchangers. In order to achieve this, the refrigerant temperature has to lie above the dew point, in order to avoid the formation of condensation. Dewpoint monitoring is required for this purpose.

We recommend dynamic cooling with fan convectors, in order to achieve increased thermal performance and in order to dehumidify the air on muggy summer days. The advantage here is that dewpoint monitoring is not required.

The comfort zone in the illustration below shows which values for temperature and humidity are considered comfortable for people. This range should ideally be met when heating or air-conditioning buildings.

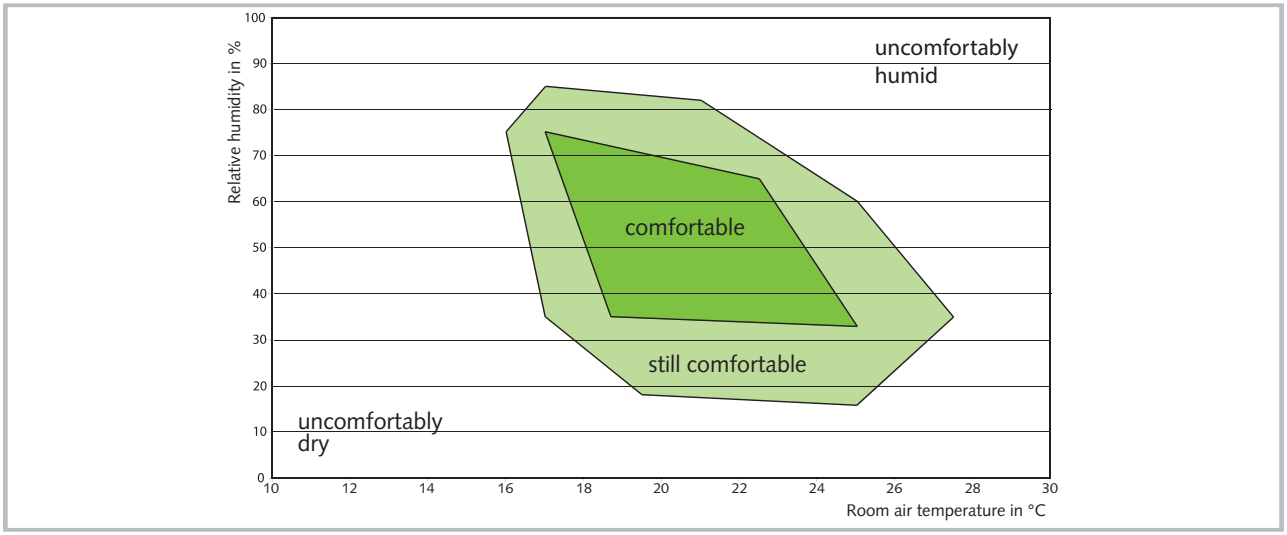


*Fig. 48: Comfort zone*

# REMKO WKF series

## 3.2 Series WKF

We offer two different indoor unit designs. The wall-mounted device of series WKF is equipped with a circulation pump and a safety assembly on the water side. Furthermore, an auxiliary heater can be incorporated as an option. An external buffer tank can be eliminated if the heat pump functions as the only heat generator. If a second heat generator is used, a buffer tank is necessary. Series WKF was designed for addition of several heat sources (bivalent installations or systems with solar-heating equipment).

For the WKF series, an external buffer tank is always required, its size depending on the type and the power of the second heat source. On the one hand, the buffer tank prevents short run-times for the heat pump and on the other hand, ensures that enough defrosting energy is available.

**! NOTICE!**

Before installation, consider the minimum space volume of the indoor unit's installation room. The room may have to be ventilated or joined to the next room. (see the chapter "Installation/set-up of indoor unit).

## 3.3 Series WKF-compact

In addition, the indoor unit of the WKF-compact series is equipped with a 300 l tap water reservoir. A 9 kW electric auxiliary heater is available as an option. As a result, the WKF-compact series is the ideal equipment when the heat pump is intended as the sole heat source (single energy-source operation).

Single energy-source operation through REMKO Smart-Serv or bivalent operation through REMKO Smart-BVT must also be realized. All connections are to be established on the top of the unit.

*REMKO GmbH & Co. KG herewith confirms that the supplied product corresponds to the UBA (German Environment Agency) positive list.*

# 4 Installation

## 4.1 System layout WKF/WKF-compact 80

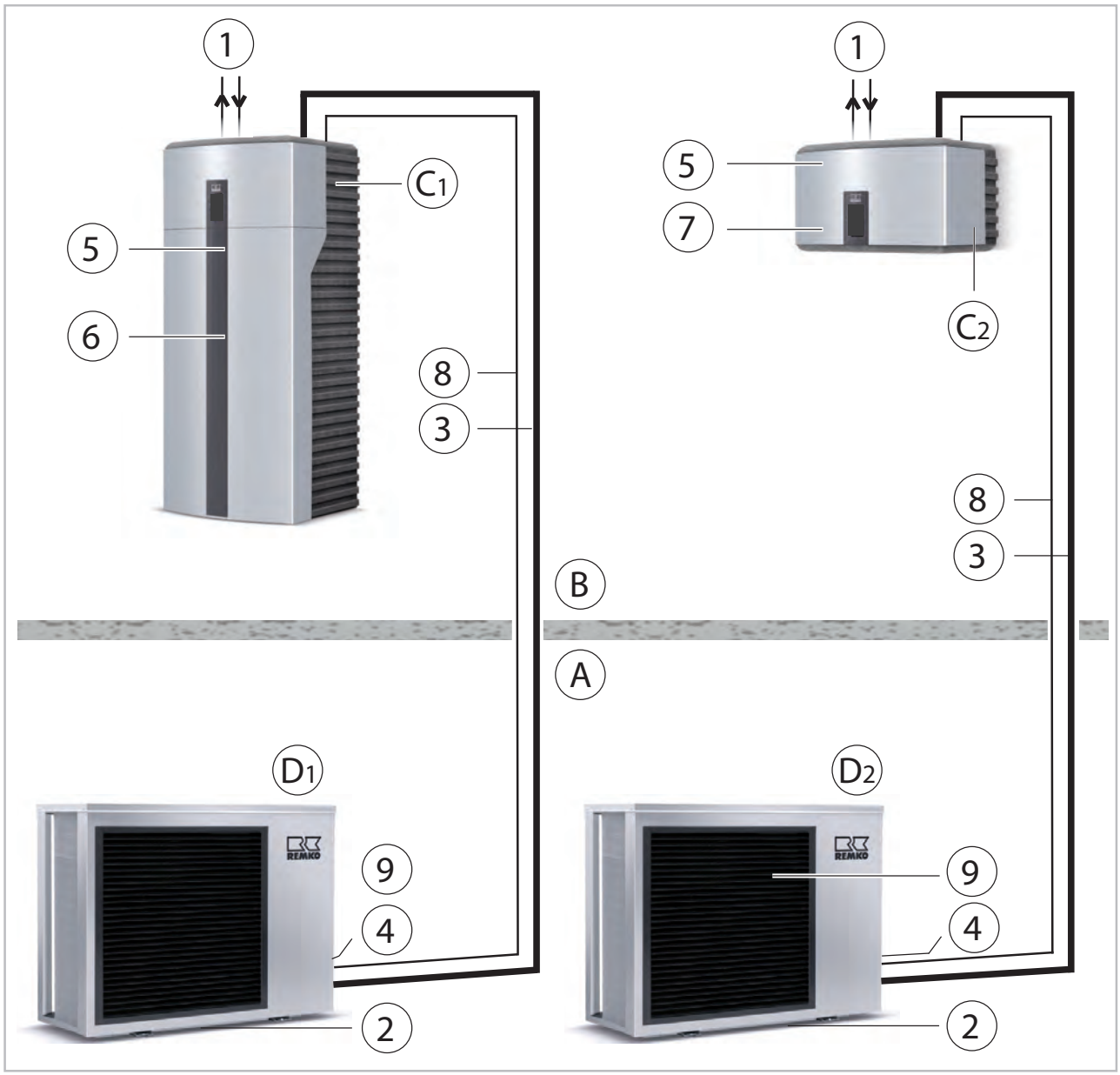


*Fig. 49: System layout*

A: Outdoor area
B: Indoor area
C1: Indoor unit WKF-compact 80
C2: Indoor unit WKF 80
D1: Outdoor unit WKF-compact 80
D2: Outdoor unit WKF 80
1: Hot-water supply and return pipes
2: Condensate drain, outdoor unit (must contain anti-freeze!)
3: Refrigerant lines $^1/_4$" and $^1/_2$"
4: Outdoor unit power supply = 230V/1~/50Hz 16A (e.g. 3x1.5 mm$^2$)
5: Indoor unit power supply = 230V/1~/50Hz 10A (e.g. 3x1.5 mm$^2$)
6: Power supply for electrical auxiliary heater 6 kW (e.g. 5x2.5 mm$^2$)
7: Power supply for electrical auxiliary heater 6 kW (optional) (e.g. 5x2.5 mm$^2$)
8: Control line shielded (e.g. 2x1 mm$^2$)
9: Fan
10: Inlet for heating (DN 32)

## 4.2 System layout WKF/WKF-compact 100/130

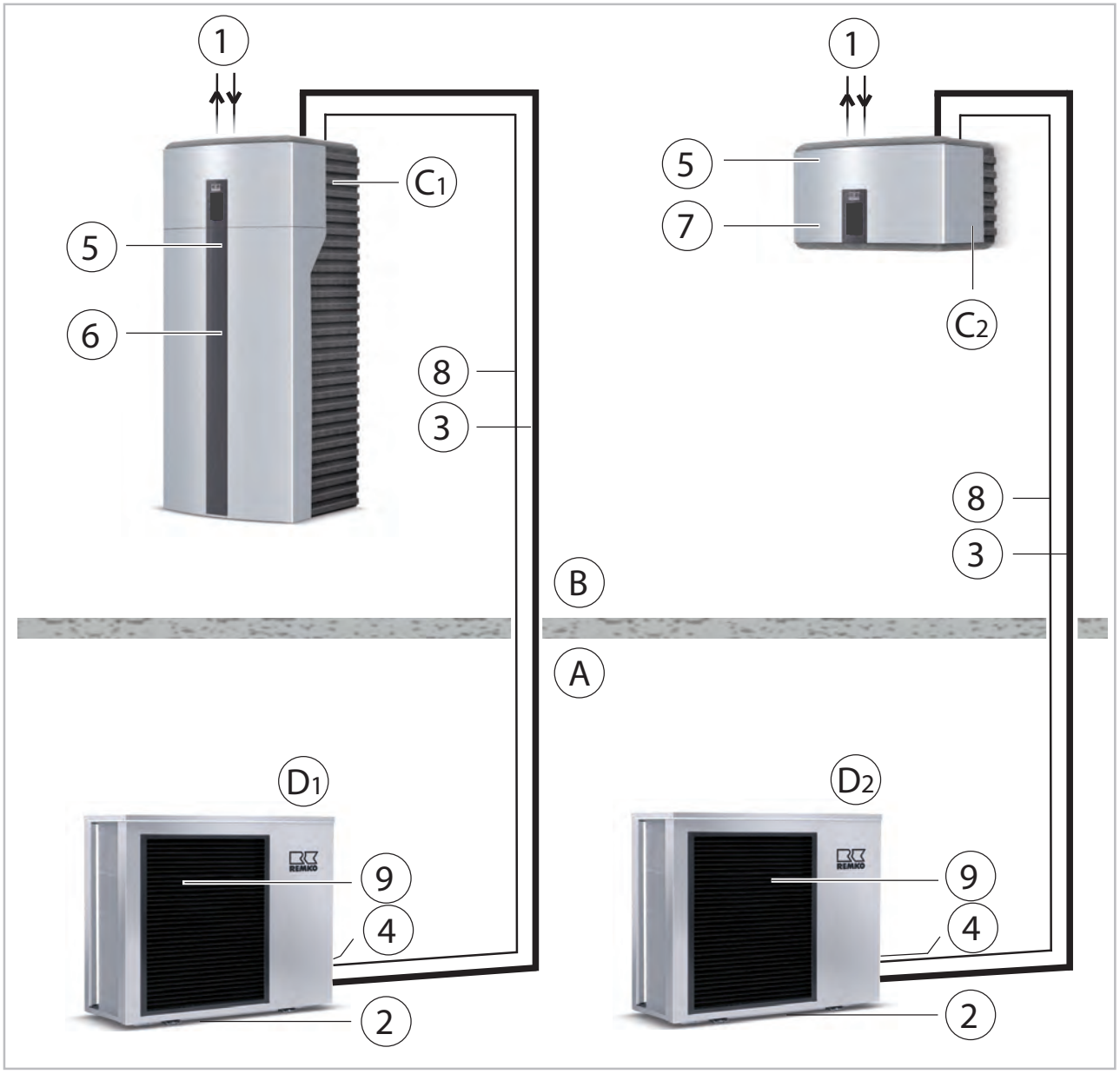


*Fig. 50: System layout*

A: Outdoor area
B: Indoor area
C1: Indoor unit WKF-compact 100/130
C2: Indoor unit WKF 100/130
D1: Outdoor unit WKF-compact 100/130
D2: Outdoor unit WKF 100/130
1: Hot-water supply and return pipes
2: Condensate drain, outdoor unit (must contain anti-freeze!)
3: Refrigerant lines $^{3}/_{8}$" and $^{5}/_{8}$"
4: Outdoor unit power supply = 230V/1~/50Hz 20A (e.g. 3x2.5 mm$^2$)
5: Indoor unit power supply = 230V/1~/50Hz 16A (e.g. 3x1.5 mm$^2$)
6: Power supply for electrical auxiliary heater 6 kW (e.g. 5x2.5 mm$^2$)
7: Power supply for electrical auxiliary heater 6 kW (optional) (e.g. 5x2.5 mm$^2$)
8: Control line shielded (e.g. 2x1 mm$^2$)
9: Fan
10: Inlet for heating (DN 32)

## 4.3 System layout WKF/WKF-compact 170

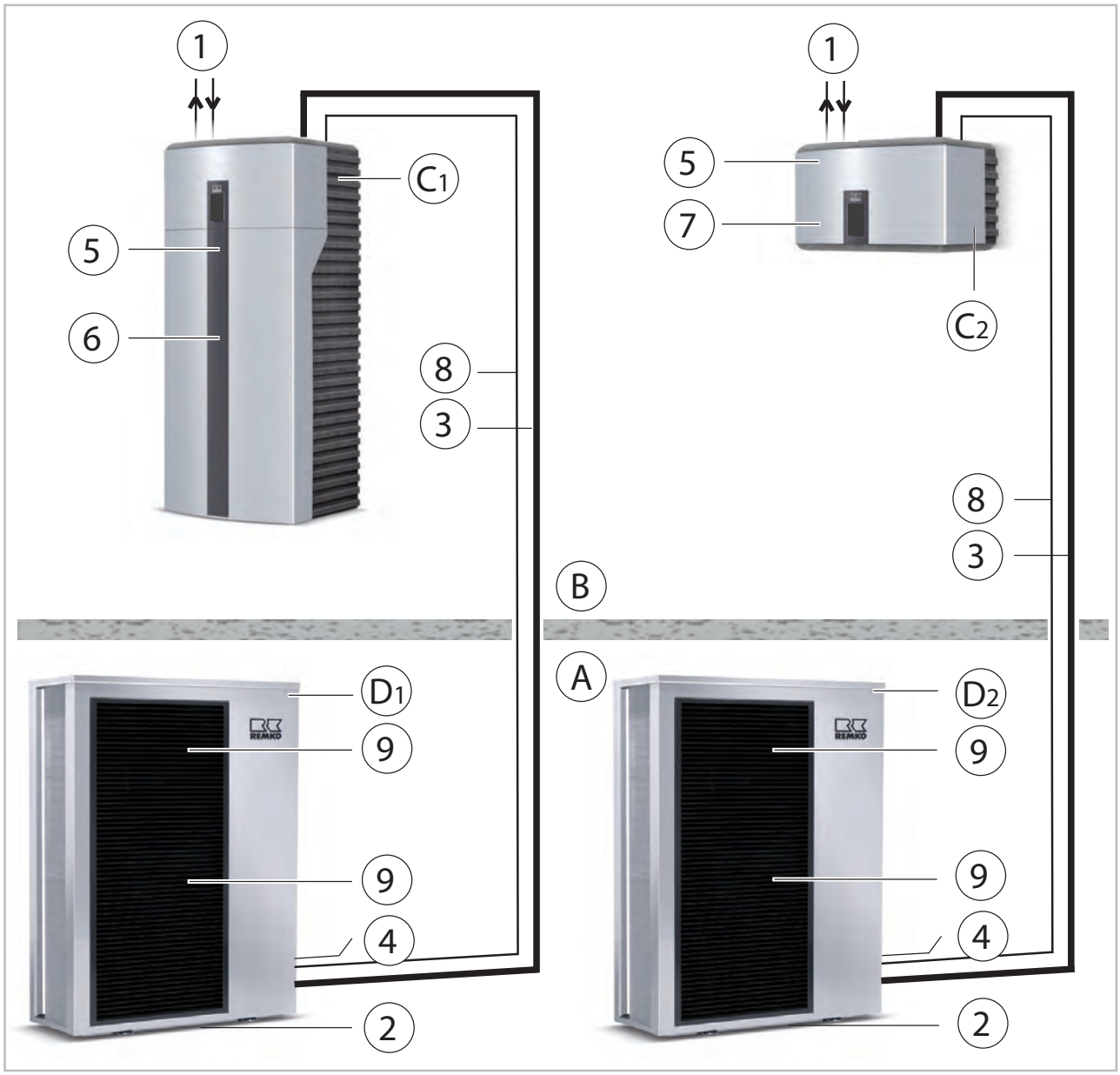


*Fig. 51: System layout*

A: Outdoor area
B: Indoor area
C1: Indoor unit WKF-compact 170
C2: Indoor unit WKF 170
D1: Outdoor unit WKF-compact 170
D2: Outdoor unit WKF 170
1: Hot-water supply and return pipes
2: Condensate drain, outdoor unit (must contain anti-freeze!)
3: Refrigerant lines $^{3}/_{8}$" and $^{3}/_{4}$"
4: Outdoor unit power supply = 400V/3~/50Hz 3x20A (e.g. 5x2.5 mm$^2$)
5: Indoor unit power supply = 230V/1~/50Hz 16A (e.g. 3x1.5 mm$^2$)
6: Power supply for electrical auxiliary heater 9 kW (e.g. 5x2.5 mm$^2$)
7: Power supply for electrical auxiliary heater 9 kW (optional) (e.g. 5x2.5 mm$^2$)
8: Control line shielded (e.g. 2x1 mm$^2$)
9: Fan
10: Inlet for heating (DN 32)

## 4.4 System layout WKF 130 Duo

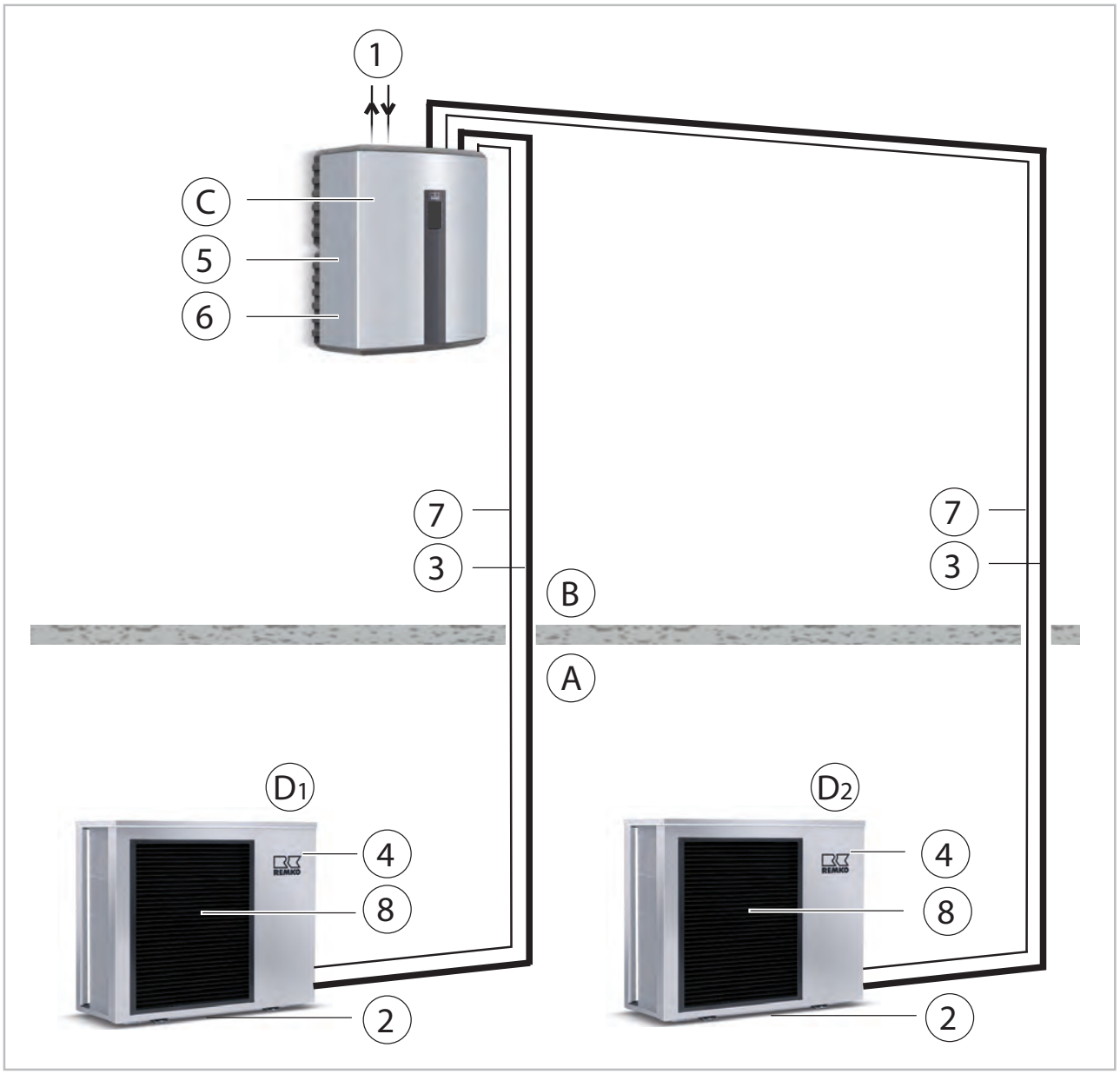


*Fig. 52: System layout*

A: Outdoor area
B: Indoor area
C: Indoor unit WKF 130 Duo
D1: Outdoor unit 1 WKF 130 Duo
D2: Outdoor unit 2 WKF 130 Duo
1: Inlet and return for heating
2: Condensate drain, outdoor unit (must contain anti-freeze!)
3: Refrigerant lines $^{3}/_{8}$" and $^{5}/_{8}$"
4: Outdoor unit power supply = 230V/1~/50Hz 20A (e.g. 3x2.5 mm$^2$)
5: Indoor unit power supply = 230V/1~/50Hz 16A (e.g. 3x1.5 mm$^2$)
6: Power supply for electrical auxiliary heater 9 kW (optional) (e.g. 5x2.5 mm$^2$)
7: Control line shielded (e.g. 2x1 mm$^2$)
8: Fan

## 4.5 System layout WKF 170 Duo

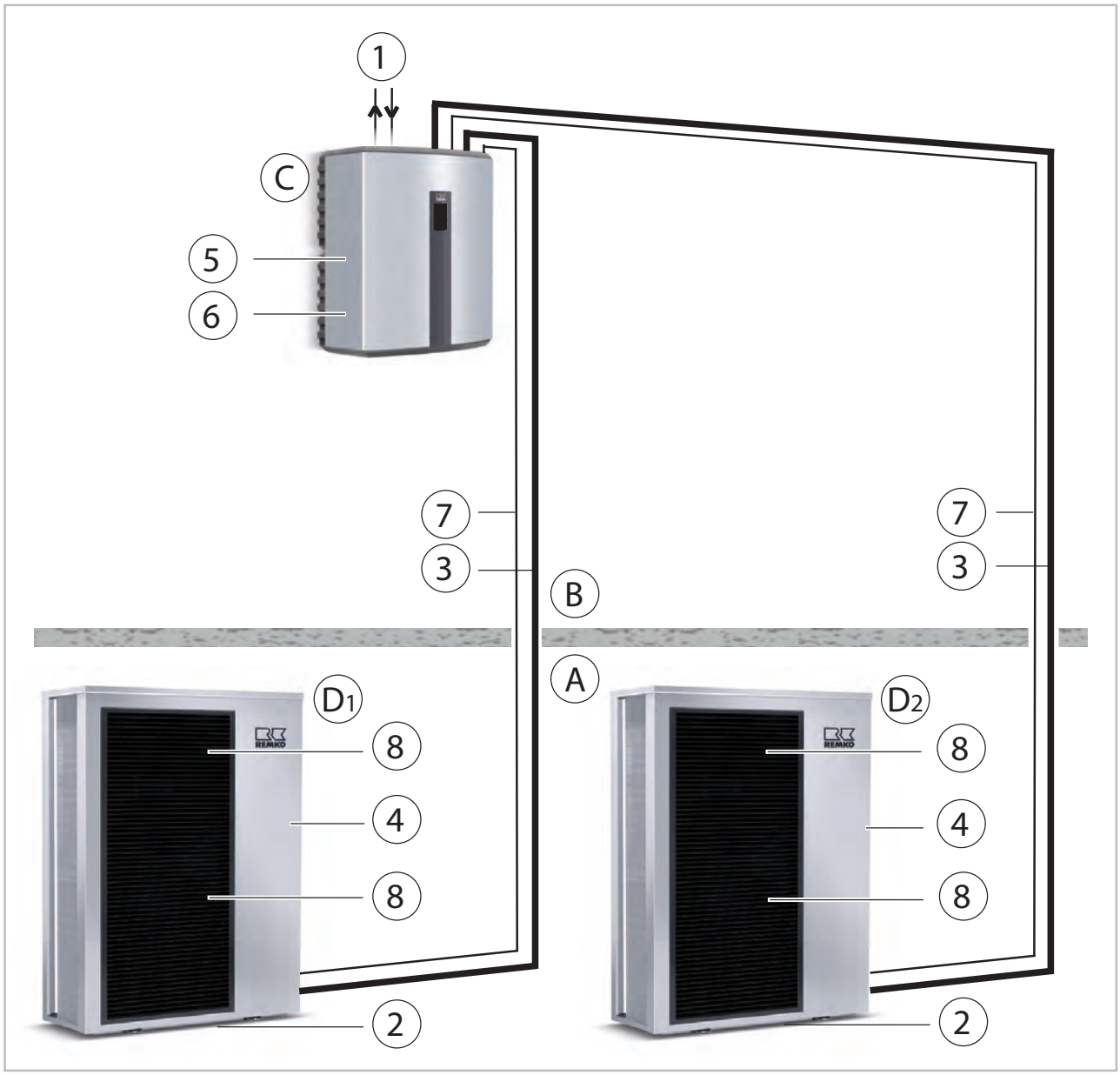


*Fig. 53: System layout*

A: Outdoor area
B: Indoor area
C: Indoor unit WKF 170 Duo
D1: Outdoor unit 1 WKF 170 Duo
D2: Outdoor unit 2 WKF 170 Duo
1: Inlet and return for heating
2: Condensate drain, outdoor unit (must contain anti-freeze!)
3: Refrigerant lines $^3/_8$" and $^3/_4$"
4: Outdoor unit power supply = 400V/3~/50Hz 3x16A (e.g. 5x1.5 mm$^2$)
5: Indoor unit power supply = 230V/1~/50Hz 16A (e.g. 3x1.5 mm$^2$)
6: Power supply for electrical auxiliary heater 9 kW (e.g. 5x2.5 mm$^2$)
7: Control line shielded (e.g. 2x1 mm$^2$)
8: Fan

## 4.6 General installation notes

- These instructions are to be observed when installing the heat pump.
- The unit should be delivered as near as possible to the site of installation in its original packaging in order to avoid transport damage.
- The unit is to be checked for visible signs of transport damage. Possible faults are to be reported immediately to the contractual partner and the haulage company.
- Suitable sites for installation are to be selected with regard to machinery noise and the set-up process.
- The stop valves for the refrigerant lines may only be opened immediately before commissioning of the system.
- The exterior components are pre-filled with refrigerant up to a distance of 5 metres from the interior component. Add refrigerant if the basic length of the refrigerant piping exceeds 5 metres.
- Establish all electrical wiring in accordance with the relevant DIN and VDE standards.
- The electrical power cables must always be fastened to the electrical terminals in the proper manner. Otherwise there is a risk of fire.
- At least a two-wire control line must be laid between the two modules. Both the indoor and outdoor units require a separate power supply.
- The indoor and outdoor modules are to be connected to the refrigerant lines provided, depending on the design and performance.
- See that neither refrigerant or pipes that carry water pass through living or sleeping areas.

**DANGER!**

All electrical installation work must be done by an electrician.

**WARNING!**

All electric lines are in accordance VDE regulations to dimension and to lay.

**DANGER!**

The connection of refrigerant pipes and the handling of refrigerant may be only be carried out by qualified personnel (competence category I).

**NOTICE!**

Open refrigerant pipes must be protected against the introduction of moisture by means of suitable caps or adhesive strips Refrigerant pipes may not be kinked or compressed. Refrigerant pipes may only be cut to length with a suitable pipe cutter (use no hacksaws or the like).

**Wall opening**

- A wall opening of at least 70 mm diameter and 10 mm incline from the inside to the outside must be created.
- To prevent damage, the interior of the wall opening should be padded or, for example, lined with PVC pipe (see figure).
- After installation has been completed, use a suitable sealing compound to close off the wall opening, taking account of fire protection regulations (provided by the customer).

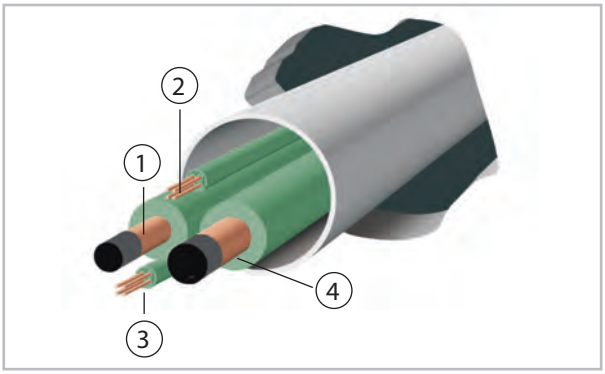


*Fig. 54: Wall opening*

1: Injection pipe / 2: Control line
3: Supply pipe / 4: Suction pipe

*In order to create a watertight pipe/cable duct cutout and prevent damage, we recommend use of a REMKO pipe gland.*

## 4.7 Set-up, assembly indoor unit

### Minimum volume of set-up space

When environmentally friendly refrigerants are used, the installation rooms may have to have a minimum size or volume, depending on the total fill quantity. If the total fill quantity is greater than 1.84 kg, consideration must be made according to DIN EN 60335 T2-T40. The following table shows the minimum surface space based on the refrigerant fill quantity.

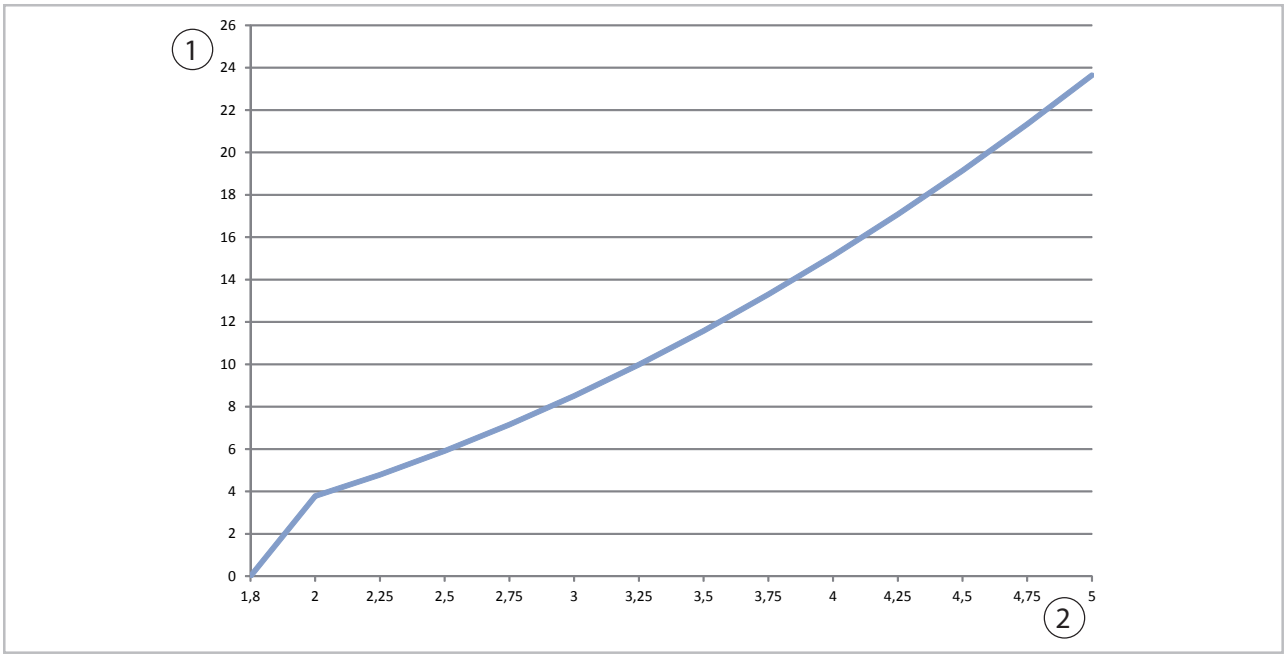


*Fig. 55: Minimum space for unventilated installation rooms based on fill quantity with an installation height of 1.6 m*

1: Area [$m^2$]

2: Refrigerant fill quantity [kg]

If the space requirements cannot be adhered to, the space must be joined to another one with air grilles or door slits. Moreover, mechanical ventilation can be installed for the installation room.

The necessary cross-sections of the connection openings can then be calculated according to DIN EN 60335 T2-T40.

Refrigerant fill quantity [kg] per basic pipe length [m] per circuit. Installation height of indoor unit 1.6 m

| [m] | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|
| WKF 80 | 1.00 [1)] | 1.03 [1)] | 1.06 [1)] | 1.09 [1)] | 1.12 [1)] | 1.15 [1)] | 1.18 [1)] | 1.21 [1)] |
| WKF 100 | 1.60 [1)] | 1.63 [1)] | 1.66 [1)] | 1.69 [1)] | 1.72 [1)] | 1.75 [1)] | 1.78 [1)] | 1.81 [1)] |
| WKF 130/Duo | 1.80 [2)] | 1.83 [2)] | 1.86 [2)] | 1.89 [2)] | 1.92 [2)] | 1.95 [2)] | 1.98 [2)] | 2.01 [2)] |
| WKF 170/Duo | 2.55 [2)] | 2.58 [2)] | 2.61 [2)] | 2.64 [2)] | 2.67 [2)] | 2.70 [2)] | 2.73 [2)] | 2.76 [2)] |

[1)] No specification for the installation room.

[2)] The minimum size of the installation room must be considered.

For more, see the next page

# REMKO WKF series

| [m] | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|
| WKF 80 | 1.24 [1] | 1.27 [1] | 1.30 [1] | 1.33 [1] | 1.36 [1] | 1.39 [1] | 1.42 [1] | 1.45 [1] |
| WKF 100 | 1.84 [1] | 1.87 [2] | 1.90 [2] | 1.93 [2] | 1.96 [2] | 1.99 [2] | 2.02 [2] | 2.05 [2] |
| WKF 130/Duo | 2.04 [2] | 2.07 [2] | 2.10 [2] | 2.13 [2] | 2.16 [2] | 2.19 [2] | 2.22 [2] | 2.25 [2] |
| WKF 170/Duo | 2.79 [2] | 2.82 [2] | 2.85 [2] | 2.88 [2] | 2.91 [2] | 2.94 [2] | 2.97 [2] | 3.00 [2] |

[1] No specification for the installation room.

[2] The minimum size of the installation room must be considered.

**Indoor unit, WKF series**

- The wall bracket is to be attached to the wall with suitable fastening material and the indoor unit hooked onto it.
- The wall must have adequate load-bearing capacity for the weight of the indoor unit.
- Ensure that the wall bracket is installed level.
- The indoor unit can be aligned precisely by means of the adjustment screws on the back of the housing.
- The indoor unit is to be mounted in such a way that all of the sides have sufficient space for purposes of installation and maintenance. It is equally important that there be enough space above the device for installing the safety assembly.

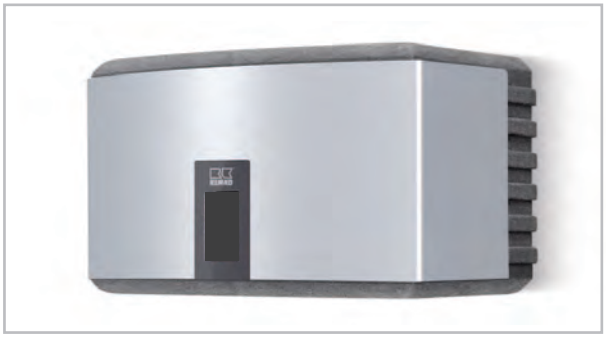

*Fig. 56: Wall attachment WKF*

**WARNING!**

Only fasteners suitable for the given application may be used.

**Indoor unit, WKF-compact series**

- The indoor unit must be installed on a firm, level surface.
- The surface must possess sufficient load-bearing capacity for the weight of the indoor unit.
- The height-adjustable feet can be used to level the indoor unit precisely.
- The indoor unit is to be mounted in such a way that all of the sides have sufficient space for purposes of installation and maintenance. It is equally important that there is sufficient space above the module for installing the pipes and the safety assembly.

*Fig. 57: Floor installation WKF-compact*

### Minimum spacing for indoor units

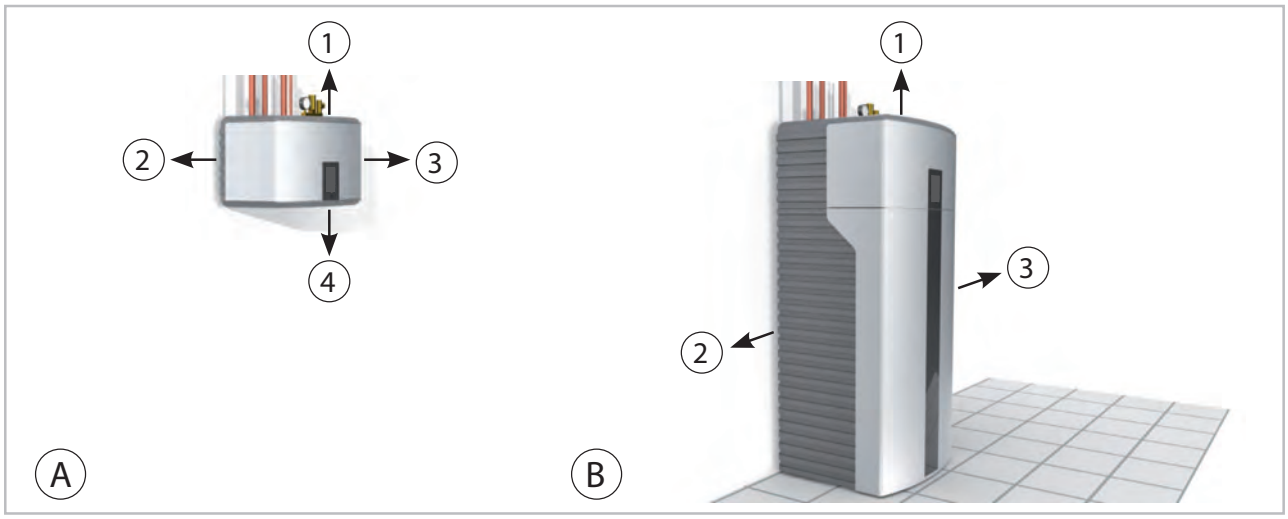


*Fig. 58: Minimum spacing for indoor units*

A: WKF

B: WKF-compact

| Dimensions in mm | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| WKF | 500 | 300 | 300 | 150 |
| WKF-compact | 500 | 300 | 300 | --- |

### Safety assembly – Description

In rare cases, refrigerant may flow into the heating water. To prevent uncontrolled flow out into the installation room, we recommend guiding escaping gases outdoors through a blow-off line by a safety valve. Applicable regulations must be observed. Below are some instructions on installing the blow-off line of the safety valve to the outdoors.

### Diaphragm safety valve

**! NOTICE!**

In order to avoid damage, the installation, commissioning and maintenance of the diaphragm safety valves must always be implemented as stipulated in the installation instructions.

The diaphragm safety valves were manufactured in accordance with the safety requirements of the pressure equipment directive 97/23/EC and are TÜV-certified (with enlarged outlet, type-tested per TRD 721 VdTÜV bulletin for safety valve SV100).

### Safety assembly

The manifold is made from solid cast brass CB753S. The small air bubbles in heating water are automatically routed to the fast-bleeder, thanks to the special design.

The lower connection, for the heat pump connection line, has a 1" internal thread.

A pre-formed polystyrene shell per DIN 4102-A1 provides insulation.

The complete safety assembly comprises:

1. A heating manometer 1/4", ø 63 mm, with green flag and red position indicator and metal housing. The automatic shut-off valve 3/8" x 1/4" enables trouble-free replacement without having to empty the system.
2. An automatic fast-bleeder with a shut-off valve, brass design, a float made from high quality plastic and functionally reliable valve. Connection = 3/8" with an O-ring seal.

3. A diaphragm safety valve 1/2" x 3/4", type-tested, in compact brass design and a trigger pressure of 3 bar for power ratings up to 50 kW or 45 000 kcal/h.

The safety assembly can only be used for closed heating systems per EN 12828 for power ratings up to 50 KW.

**Dimensions of the safety assembly**

**WARNING!**

Water temperatures or water mix temperatures over 50 °C can result in burns.

Ensure that these high temperatures do not present any hazard to personnel during the installation of the safety valve.

**CAUTION!**

Do not damage the connection threads during installation. This will prevent damage to property and injury to personnel.

**CAUTION!**

All connections must be leak-tight.

The fittings and equipment (manometer, quick-bleeder and safety valve) are sealed into the manifold and checked for functionality and leak-tightness. Install the safety valve per EN 12828, above the level and in the immediate vicinity of the heat generator.

Route the connecting line (min. 3/4" DN = 20 mm) with standard permissible materials keeping the route as short as possible. No shut-off valve may be installed.

Install the safety assembly such that the fittings are all vertical.

The diameter of the discharge line for the safety valve must comply with the diameter of the valve outlet.

The max. length must not exceed 2 m, more than 2 bends is not permitted. If these max. values are exceeded (2 bends and 2 m line), then the next largest dimension should be selected for the discharge line. Note that in this case, more than 3 bends and a 4 m line length is also not permitted.

**NOTICE!**

Carry out the installation such that the safety assembly is located above the level of the heat generator.

## Safety assembly – Installation schematic

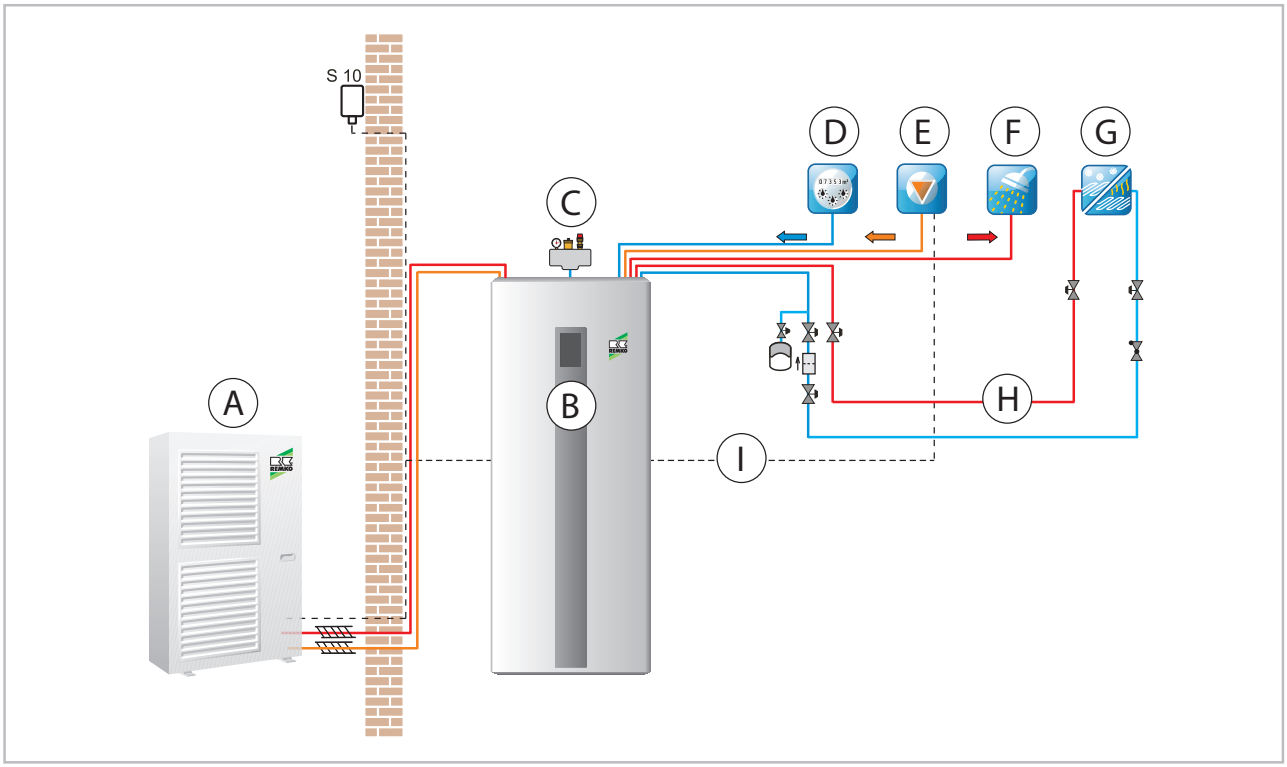


*Fig. 59: Safety assembly – Installation schematic*

A: Outdoor unit
B: Indoor unit
C: Safety assembly
D: Cold water
E: Circulation
F: Hot water
G: Floor heating cycle
H: Supply line
I: Return line

## 4.8 Layout, assembly of outdoor unit

**Outdoor unit installation location**

- The unit may be attached only to a load-bearing structure or wall. Ensure that the outdoor unit is installed only vertically. The installation site should be well ventilated.
- To minimise noise, install floor consoles with vibration dampers and a considerable distance from acoustically-reflective walls to minimise noise.
- The minimum clearances specified on the next page should be maintained when carrying out the installation. These minimum distances serve to ensure unrestricted air inlet and outlet. The air that has discharged may not be drawn in again. Take the performance data of the outdoor units into account. Additionally, there must be adequate space available for installation, maintenance and repair.
- If the outdoor unit is erected in an area of strong winds, then the unit must be protected against them and additional stabilisation is recommended. This can be realised for example with wire ropes or other constructions (Fig. 60). The snow line is to be observed during installation (Fig. 61).
- The outdoor unit must always be installed on vibration dampers. Vibration dampers prevent the transmission of vibrations through the floor or walls.
- A heated, condensate catch-pan ensures that condensation from the pan can drain off. Ensure that the condensate is prevented from freezing so that it can drain off (gravel, drainage). The Water Ecology Act is to be observed.
- If there is insufficient space under the device for the refrigerant lines, then the pre-cut recesses can be removed from the side enclosure-panel and the pipes guided through these openings.
- During installation, add about 20 cm to the expected snow depth to guarantee unimpeded intake and exhaust of outdoor air year round (Fig. 61).
- The installation site of the outdoor unit should be agreed together with the operator primarily so that 'non-concerning levels of operating noise' are achieved, rather than in respect of 'short distances'. This is because: Thanks for splitter technology, there is a vast amount of different installation options with almost identical efficiency available.


*Fig. 60: Protection against wind*

1: Wind

**NOTICE!**

The site for the outdoor unit must be selected so that machinery noise that occurs disturbs neither the residents nor the facility operator. Observe the TA-noise specifications as well as the table containing the drawings relating to sound pressure levels.

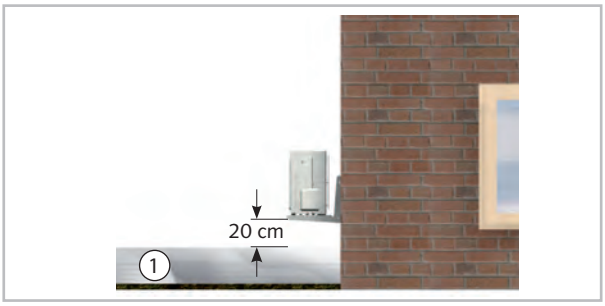


*Fig. 61: Protection against snow*

1: Snow

**WARNING!**

Refrigerant is heavier than air. If there are leaks, escaping refrigerant can get through open windows of the room under the installation location. If refrigerant escapes from the unit, the refrigerant sinks downward and displaces the air. There is danger of suffocation.

Set up the unit at an adequate distance from light shafts.

Make sure that the unit is not installed in front of or over incoming air, exhaust air or other ventilation installations.

For adhering to the unit's safety concept, safety distances from light shafts apply.

| Immission location | Assessment level in accordance with TA noise | |
|---|---|---|
| | Daytime in dB(A) | Night-time in dB(A) |
| Industrial areas | 70 | 70 |
| Commercial areas | 65 | 50 |
| Core areas, village areas and mixed zones | 60 | 45 |
| General residential areas and small housing estates | 55 | 40 |
| Exclusively residential areas | 50 | 35 |
| Spa areas, hospitals and mental institutions | 45 | 35 |

Isolated noise peaks of short duration may not exceed 30 dB(A) during the day and 20 dB(A) at night.

**Definition of the Danger Area**

**⚠ WARNING!**

Access to the unit is only permitted for authorised and trained persons. If unauthorised persons can approach the danger areas, these areas must be identified with corresponding signs, barriers, etc.

- The external danger area surrounds the unit up to a distance of 2 m, measured in all directions from the unit housing.
- The external danger area on-site can differ as a result of the setup. The specialist company performing the installation work bears the responsibility for this.
- The internal danger area is located inside the machine and can only be reached with the use of an appropriate tool. Access is prohibited for unauthorised persons!

**Minimum distances of the outdoor units**

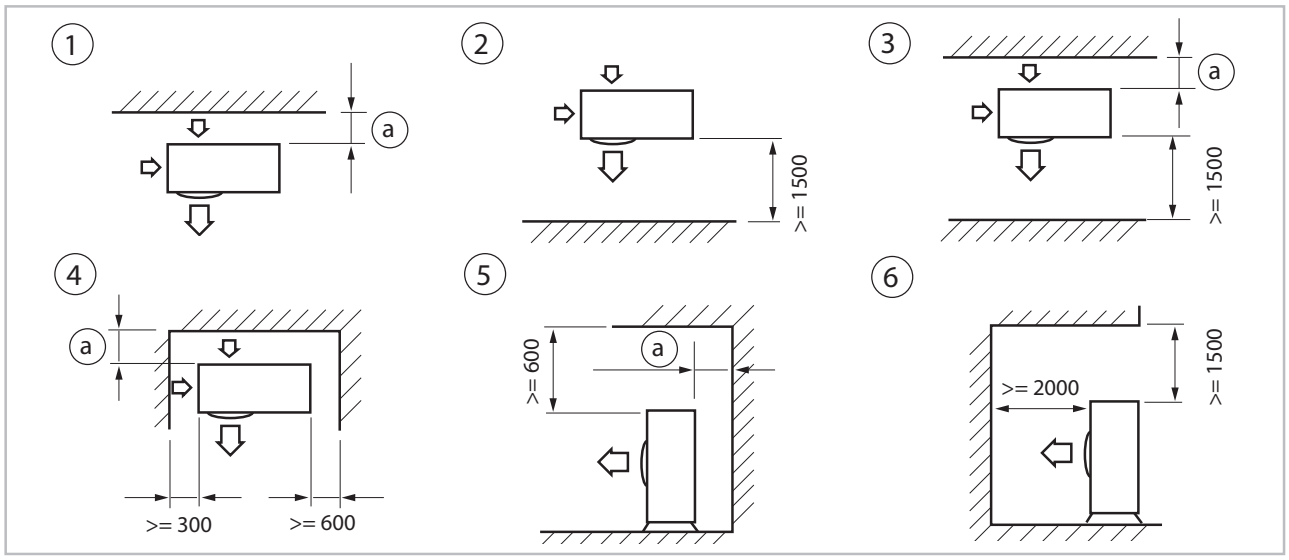


*Fig. 62: Minimum distances during construction of an outdoor units in mm*

1: Next to a wall, air outlet open to the front, flow restriction behind
2: Next to a wall, air outlet toward the wall, flow restriction to the front
3: Between two walls, air outlet toward the wall, open sides: flow restriction front and rear
4: In a niche, air outlet open to the front, flow restriction behind and on both sides
5: Next to a covered wall, air outlet open to the front, flow restrictions behind and above
6: Next to a covered wall, air outlet open in the direction of the wall, flow restrictions behind and above
a: WKF/WKF-compact 80 >= 150 mm
WKF/WKF-compact 130/170 >= 200 mm
WKF 130/170 Duo >= 200 mm

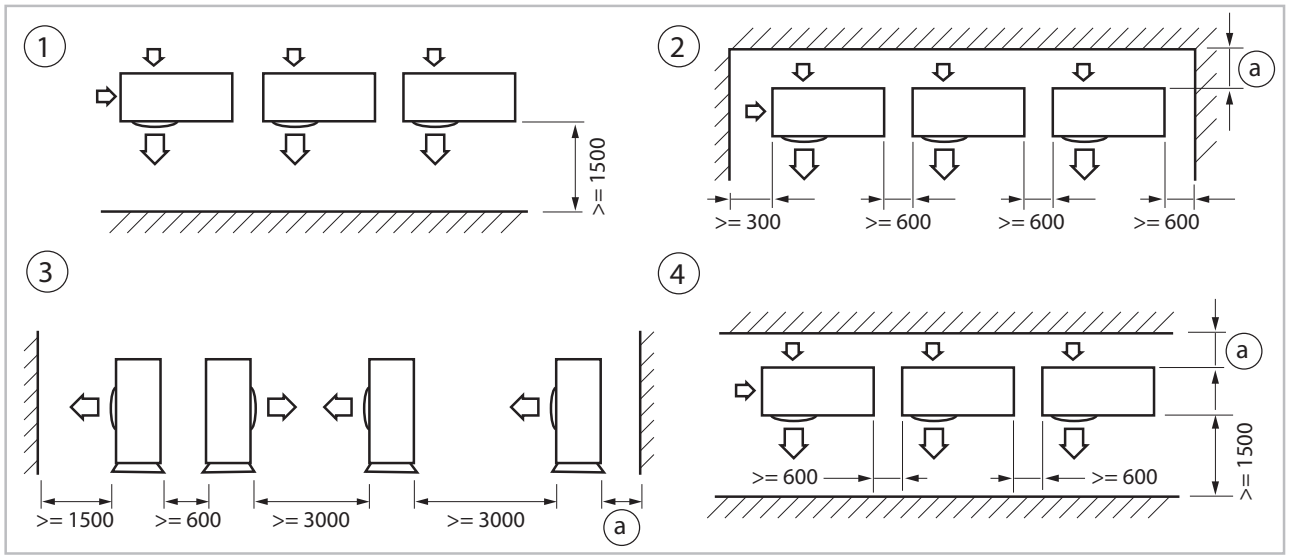


*Fig. 63: Minimum distances during construction of multiple outdoor units in mm*

1: Next to a wall, air outlet toward the wall, flow restriction to the front
2: In a niche, air outlet open to the front, flow restriction behind and on both sides
3: Between two walls, air outlet toward the wall and in the direction of other devices, open sides: flow restriction front and rear
4: Between two walls, air outlet toward the wall, sides of external devices open: flow restriction front, rear and for internal devices on the sides
a: WKF/WKF-compact 80 >= 150 mm
WKF/WKF-compact 130/170 >= 200 mm
WKF 130/170 Duo >= 200 mm

## Condensate drainage connection and safe drainage

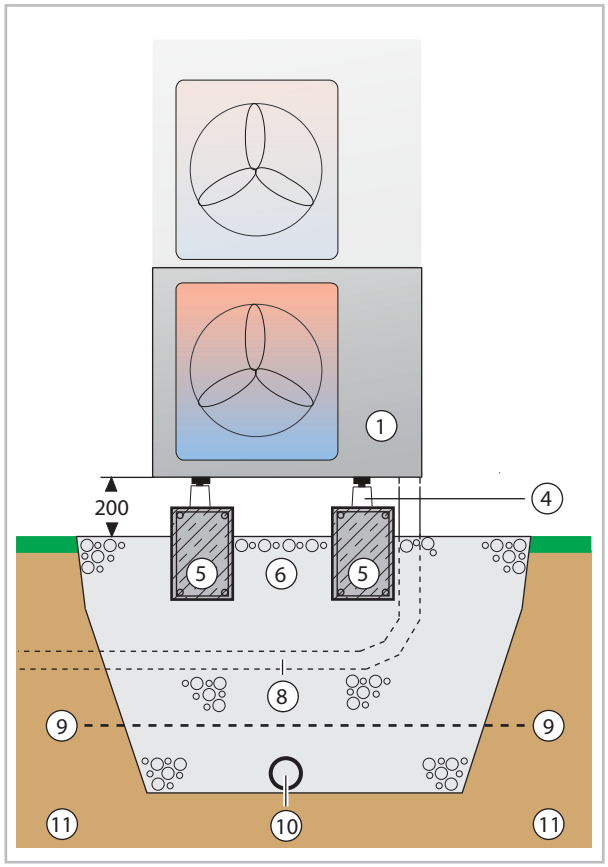


*Fig. 64: Condensate drainage, seepage of condensate and strip foundation (cross-section)*

1: Outdoor unit
4: Floor bracket
5: Reinforced strip foundation HxWxD = 300x200x800mm
6: Gravel layer for seepage
8: Conduit for refrigerant piping and electrical connecting line (temperature-resistant up to at least 80 °C)
9: Frost line
10: Drainage pipe
11: Soil

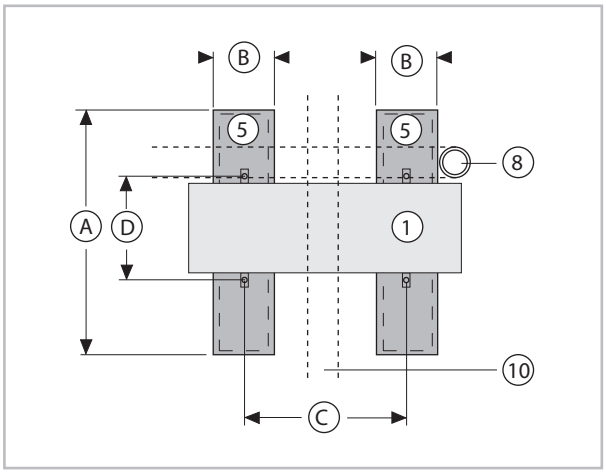


*Fig. 65: Dimensions for the strip foundation (bird's eye view)*

For the designations of 1,5,8 and 10, please refer to the legend for Fig. 64

**Dimensioning the strip foundation (all dimensions in mm)**

| Dimension | WKF 80<br>WKF-compact 80 | WKF 100,130,170<br>WKF-compact 100, 130,170<br>WKF 130, 170 Duo |
|---|---|---|
| A | 800 [3] | 800 [3] |
| B | 200 | 200 |
| C | 690 | 810 [1]<br>610 [2] |
| D | 390 | 390 [1]<br>425 [2] |

[1] WKF 100, 130 / WKF-compact 100, 130 / WKF 130 Duo

[2] WKF 170 / WKF-compact 170 / WKF 170 Duo

[3] Depending on the floor bracket used, dimension "A" must be adjusted.

### Condensate drainage connection

If the temperature falls below the dew point, condensation will form on the finned condenser during **heating mode.**

A condensate tray should be installed on the underside of the unit to drain any condensate.

- The condensate drainage line must be provided by the customer and have an incline of at least 2 %. If necessary, fit vapour-diffusion-proof insulation.
- When operating the unit at outside temperatures below 4 °C, ensure the condensate drainage line is laid to protect it against frost. The lower part of the housing and condensate tray is also to be kept frost free in order to ensure permanent draining of the condensate. If necessary, fit a pipe heater.
- Following installation, check that the condensate run off is unobstructed and ensure that the line is durably leak tight.

### Safe drainage in the event of leakages

The REMKO oil separator OA 2.2 fulfils the following list of requirements from regional regulations and laws.

**! NOTICE!**

With the connection of an external drain line to the oil separator, it must be kept frost-free.

# 5 Hydraulic connection

*A separate interpretation of nominal flow rate must be made for every system (see technical data).*

- We recommend installing a buffer tank as a hydraulic compensator for hydraulic isolation of the heating circuit. Hydraulic isolation is required when: - different inlet temperatures are to be realised, e.g. underfloor heating/radiators - the pressure drop of the heat distribution system is greater than 80 kPa - with the use of further heat generators, such as combustible burners for solid fuel, solar or bivalent systems.
- Perform a pipe-network calculation before installing the heat pump. After installing the heat pump, it is necessary to perform a hydraulic balancing of the heating circuit.
- Protect underfloor heating systems against excessively high inlet temperatures.
- Do not reduce pipe diameters for the inlet and return flow connections to the heat pump before connecting a buffer tank.
- Plan for air bleed valves and drain-off taps at appropriate places.
- Flush the system's entire pipe network before connecting the heat pump.
- One or, where necessary, several expansion vessels must be designed for the entire hydraulic system.
- The system pressure of the entire pipe network is to be matched to the hydraulic system and must be checked when the heat pump is turned off. Also update the static-pressure form supplied with the heat pump.
- As delivered, the safety assembly consists of a pressure gauge, a bleeder and a safety valve. It is to be mounted to the pipe connection provided on the indoor unit.
- System separation is required if no oxygen diffusion-tight pipe has been used, and in systems in which contaminants are already present.

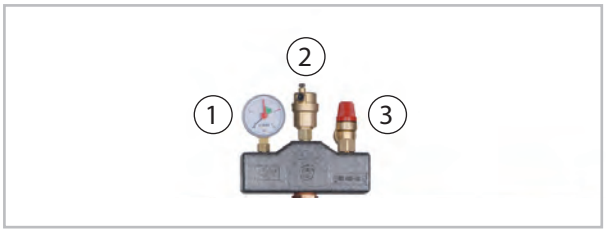


*Fig. 66: Safety assembly*

1: Pressure gauge
2: Automatic bleeding valve
3: Safety valve

- Install the dirt trap delivered with the unit outside the heat pump in the return flow. Ensure that the dirt trap remains accessible for inspection.
- Be sure to position one gate valve upstream and another downstream of the dirt trap. This ensures that the dirt trap can be checked at any time without loosing water.
- The dirt trap must be checked during every maintenance of the system.
- Additionally, a hand-operated bleeder is installed in the indoor unit on the heat pump for additional bleeding.
- All exposed metallic surfaces must be additionally insulated.
- Cooling mode via the heating circuit requires a complete vapour density insulation along the entire length of the pipework.
- All outgoing heating circuits, including the connections for water heating, are to be secured against the ingress of circulating water by means of check valves.
- Before being placed in service, the system must be thoroughly flushed. Conduct a seal test and perform a thorough bleeding of both the indoor unit and the entire system - repeatedly, if necessary, in acc. with DIN standards.

*Actual schemas for hydraulic integration can be found on the internet at www.remko.de*

# REMKO WKF series

**Hydraulic circuit diagram WKF**

Functions: heating and hot water, operating mode: monoenergetic or bivalent alternative.

**This hydraulic cycle diagram serves solely to assist in planning activities;**
**the customer-provided hydraulic system on site must be planned and installed by the installation contractor!**

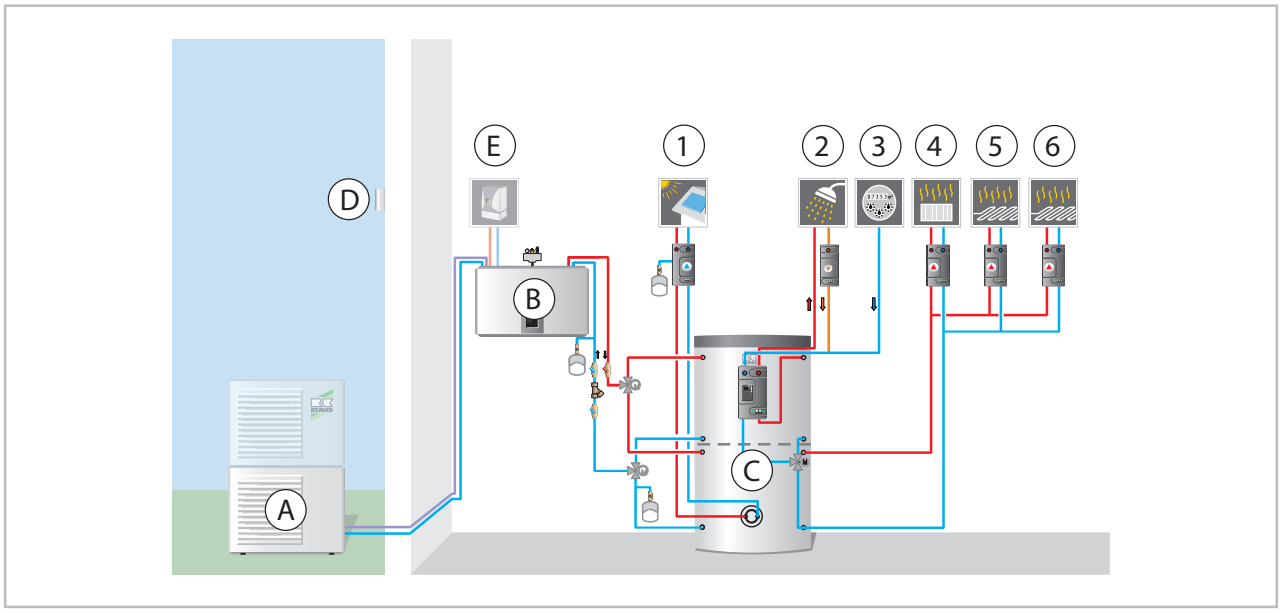


*Fig. 67: Example hydraulic diagram WKF*

A: Outdoor unit
B: Indoor unit WKF
C: MPS storage tank
D: External probe
E: 2. Heat generator
1: Solar plant (optional)
2: Hot water
3: Cold water
4: Unmixed heating cycle
5: Mixed heating cycle 1
6: Mixed heating cycle 2

The WKF compact heat pump models are ideal for use in new or existing buildings, where the heat pump is the sole heat generator. In emergencies, a 2nd heat generator can be connected (bivalent alternative design) via the Smart Control Touch.

The highly efficient primary pump in the indoor unit can be used as a circulation pump for storage tank in heat pump operation and is speed-regulated. Then a REMKO heating circuit group unmixed, type HGU, and a mixed heating circuit group, type HGM, are available.

The REMKO storage tank, type MPS 800 or 1000, is a combination storage tank for the preparation for domestic water via a fresh water station and a buffer tank for the heating system. The additionally required external three-way changeover valves are switched over by the Smart Control Touch to provide hot water. In a bivalent alternative application the boiler or condensing boiler can be connected after the indoor unit. The external Smart BVT set is available for this as an accessory.

- The pressure drop between indoor unit and storage tank must not exceed 40 kPa.
- A minimum water flow volume of 20 l/min must be assured
- The pipe cross sections of the lines from the heat pump to the storage tank may not be reduced.

**Hydraulic circuit diagram WKF-compact**

Functions: heating or cooling and hot water, operating mode: monoenergetic.

**This hydraulic cycle diagram serves solely to assist in planning activities;
the customer-provided hydraulic system on site must be planned and installed by the installation contractor!**

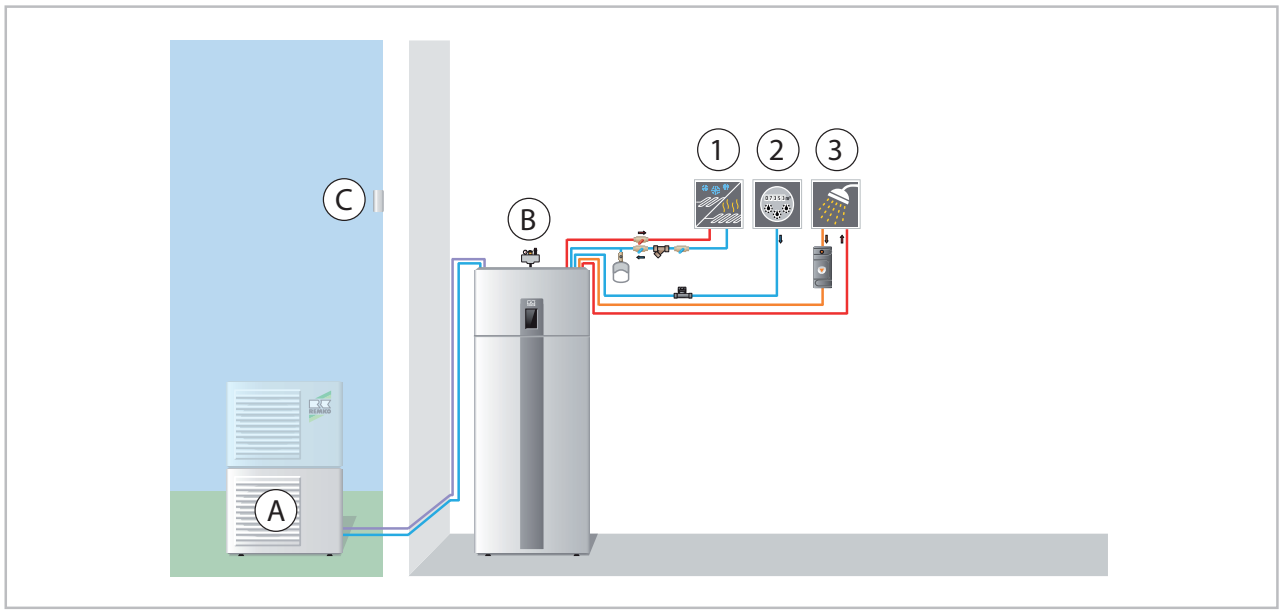


*Fig. 68: Example hydraulic diagram WKF-compact*

A: Outdoor unit
B: Indoor unit WKF-compact
C: External probe

1: Mixed heating circuit
2: Cold water
3: Hot water

WKF compact heat pump models are ideal for use in new construction, where the heat pump is the sole heat generator. In an emergency, an electric booster heater (monoenergetic variant) can be switched on by the Smart Control.

The REMKO drinking water storage tank, type WKT 300 is an enamelled drinking water storage tank with a heat exchanger surface area of 3.5 m², which is integrated into the bottom housing. The additionally necessitated three-way changeover valve is switched over by the Smart Control to provide hot water, and is also part of the indoor unit. In a bivalent alternative application, the boiler can be connected directly to the indoor unit (bivalent variant). In the bivalent variant, the changeover valve required for this is also part of indoor unit.

The highly efficient primary pump in the indoor unit can be used as a circulation pump heating circuit and its speed is regulated according to requirements. A pressure loss of max. 80 kPa is made available by the customer. If the pressure losses on site exceed this, a separate storage tank, e.g. REMKO KPS 300, must be used as a hydraulic compensator. Then a REMKO heating circuit group unmixed, type HGU, and two mixed heating circuit groups (on the WKF Duo four), type HGM, are available. Moreover, the hot water connections, cold water supply, and circulation are all connected to the indoor unit on the top.

So that the heat pump can efficiently and smoothly supply the heating water system directly (without buffer tank), the following basic prerequisites must be fulfilled:

- The heating system must be able to be operated with an inlet temperature (e.g. only floor heating).
- The pressure drop of the heating system shall not exceed 80 kPa
- A minimum water flow volume of 20 l/min must be assured. If this is not possible, then a valve must be installed at a suitable location (last heating circuit manifold).
- The pipe cross sections of the lines from the heat pump to the heating circuit manifolds shall not be reduced
- The min. water volume with active cooling must be observed.

# 6 Emergency-heat operation

If the compressor fails, you can start emergency-heat operation as follows:

1. Activation of emergency-heat operation is only possible in the expert level of the Smart-Control regulation. To do this, select the "Expert" level on the basic display.
2. After activating the expert level by touching the REMKO logo, a password is required (the password is: "0321").
3. After confirmation, +/- symbols are displayed at the bottom. The password can be set by touching the +/- symbols. After the entry, confirm with "OK".

   The REMKO default password for the expert level is "0321". If this password has not already been changed, the expert level is enabled after entering this password.

   After the expert level has been enabled, various parameter levels are visible.
4. Select the "Settings" level by touching the "Settings" icon.
5. After selecting the "Settings" level, select the "Basic settings" parameter.
6. The "System configuration" parameter appears in the "Basic settings" level. Select this icon by touching it.
7. After selecting the "System configuration" level, select the "Heat pump" parameter.
8. Then deactivate the heat pump in the “Heat pump” level by touching the “activated” icon and changing the operating mode setting from “activated” to “deactivated”.

   The heat pump is now deactivated.

With deactivation of the heat pump, the second heat generator, e.g. the REMKO Smart-Serv auxiliary heater or a condensing unit installed in the system is active.

**! NOTICE!**

If the heat pump is switched off, e.g. by triggering the fuse, the water must be drained manually to prevent freezing.

# 7 Cooling of the heat pump

### Tempering/cooling via the floor heating

The floor heating is predominantly known for emitting heat during the heating period. When in heating mode, the heat emission capacity of floor heating stands at around 50 W/m$^2$. If temperature control is to take place via the floor heating, this can be activated and controlled depending on the temperature difference and air humidity between the floor heating and the rooms to be cooled. The cooling capacity then stands at between 20-30 W/m$^2$. This value is usually sufficient for cooling the living area.

### Comfortable cooling with the heat pump

If the floor heating is to be used for cooling, it is necessary to observe the following points. Cooling should be activated promptly because this is a slow-acting system. Heating the building in advance should be prevented. The automatic function of REMKO Smart-Control regulation realises automatic switching from heating in the winter to cooling in the summer when the parameters are correspondingly set. Once the regulation has been changed to summer mode (hot water only), the outside temperature is monitored by the REMKO Smart-Control regulation. In order to ensure that the building does not heat when this is not desired, in “automatic” room climate mode the cooling function is enabled as necessary with the correspondingly activated parameters. The heat pump then operates from this time point in cooling mode to achieve heat dissipation. Hot water preparation always operates as a priority in cooling mode, as in heating mode.

### Cooling via a separate cooling circuit

If a separate cooling circuit should be used with the system in addition to the heating cycles, then a changeover valve (A14) must be installed in the inlet pipe, which is activated with 230 V. This is attached to the controller on A14. In cooling mode, the valve is switched to the cooling circuit AB/A. If no cooling mode is operated, the valve is de-energised at AB/B heating cycle.

### Cooling via a heating circle

Cooling via a surface system, for example via floor heating, is referred to as passive cooling. When cooling via a surface system, it is necessary to observe the inlet temperature in particular. The regulation of this cooling function is adjusted such that the floor heating is not cooled too greatly and undershoots the so-called dew point. If the dew point temperature is undershot, moisture forms on the water-bearing pipes or on the floor surface of the heating system, which must be avoided in all instances. Using REMKO Smart-Control regulation, cooling can be activated via a cooling curve of a connected heating/cooling circuit. This also requires a REMKO room temperature humidity probe. This probe is installed in a reference room, such as the living room for example. Using this probe the current air humidity and room temperature are determined and it is possible to react to changing air humidity or temperature fluctuations. Furthermore, a heating/cooling circuit mixing valve must also be installed. The water temperature in the heating/cooling system is always held above the dew point via the mixing valve function. Determination of the water temperature takes place via a supply and return probe, which is installed above the mixing valve and the heating cycle pumps, directly on the pipes. Using the supply and measured return temperature, REMKO Smart-Control regulation is able to regulate the water temperature with the aid of the heating cycle mixing valve such that the dew point is not undershot. This avoids moisture forming on the water-bearing pipes or floor and causing moisture damage as a result of the dew point being undershot. For comfortable cooling via the floor heating, we recommend installing a REMKO HGM pump assembly. In order to prevent moisture forming in the case of a technical defect or incorrect setting of the cooling function parameters, it is advisable to additionally install a dew point monitor.

To protect the complete system, it is always advisable to safeguard the floor heating with at least one external dew point monitor and one dew point probe. In general, one dew point probe should be installed per sub-distributor for the floor heating. The dew point probe reacts to any moisture and switches off the system (e.g. HGM heating cycle pump) if moisture arises. This ensures that the system is switched off if necessary in a serious situation, without it being possible for more major damage to occur.

**Cooling via a parallel buffer tank as system boundary**

If the system is to be operated with a parallel buffer tank, which acts as system boundary to the consumer circuit, then there is no need to mounted a remote control in the living room, if the regulation of the consuming cooling circuit is operated via an external controller.

**! NOTICE!**

**Minimum water volume**

If the system/water volume in the cooling circuit provided by the customer is less than 5L/kW cooling capacity, an additional buffer tank is recommended to increase the volume. This can be incorporated as a serial buffer in the return flow or as a hydraulic compensator. The KPS series buffer tank can be supplied by REMKO for this.

*The water temperature in the pipes is maintained above the nominal dewpoint temperature by the controller, in order to prevent the formation of condensation on the exposed pipes as well as those concealed under the plaster.*

# 8 Corrosion protection

Oxygen always plays a role if metal materials in a heating system corrode. The pH value and the salt content also play a major role. A licensed plumber who would like to be able to guarantee his customers a hot water heating system not at risk of corrosion from oxygen - without the use of chemicals - must pay attention to the following:

- Correct system design by the heating builder/ planner and
- depending on the materials installed: filling the heating system with demineralised soft water or fully deionised water, checking the pH value after 8 to 12 weeks.

VDI 2035 applies for the system types listed below. If the guide values for filling, replenishment and circulation water are exceeded, the water must be pre-conditioned.

Scope of application of VDI 2035:

- Domestic hot-water heating systems as per DIN 4753 (sheet 1 only)
- Water heating systems as per DIN EN 12828 inside the building up to an inlet temperature of 100 °C
- Systems that serve building complexes and with a replenishment water volume during their service life that is a maximum of twice the filling water volume.

See the following table for the requirements in accordance with VDI 2035 Part 1 with regard to total hardness.

| | Total hardness [°dH] subject to the specific system volume | | |
|---|---|---|---|
| **Total rated output in kW** | < 20 l/kW | ≥ 20 l/kW and <50 l/kW | ≥ 50 l/kW |
| **to 50 kW** | ≤ 16.8 °dH | ≤ 11.2 °dH | ≤ 0.11 °dH |

The following table provides the allowed oxygen content in connection with the salt content.

| Reference values for the hot water in accordance with VDI 2035 Part 2 | | | |
|---|---|---|---|
| | | low-salt | saline |
| **Electrical conductivity at 25 °C** | µS/cm | < 100 | 100-1500 |
| **Oxygen content** | mg/l | < 0.1 | < 0.02 |
| **pH value at 25 °C** | | 8.2 - 10.0 *) | |

*) For aluminium and aluminium alloys, the pH range is restricted: pH value at 25 °C is 8.2-8.5 (max. 9.0 for aluminium alloys)

### Water treatment with chemicals

Adding chemicals to treat water should only be done as an exception. VDI 2035 Part 2 requires explicitly under Point 8.4.1 that all water treatment be explained and documented in the system log book. There is a reason for this, because unprofessional use of chemicals leads:

- frequently to the failure of elastomer materials
- to blocking and sedimentation due to the sludge that forms
- to defective anti-friction seals on pumps
- to the formation of biofilms that cause microbially influenced corrosion and/or that can substantially impair thermal transfer.

*In low-salt water and the correct pH for a short time even to oxygen concentrations up 0.5 mg / l are tolerated.*

**NOTICE!**

Heat pump systems and components from REMKO must be filled and operated with deionised water (completely desalinated). We also recommend the use of the complete heating protection unit available from us. Full protection with glycol should be used in cooling systems. The system water should be tested each time the plant is serviced, but at least once a year. Damage that results from non-compliance is not covered by the guarantee. Below you will find a suitable form for documenting the filling of the system.

## Filling of heating system with completely deionised water

| | Initial filling | Year 2 | Year 3 | Year 4 |
|---|---|---|---|---|
| **Filled on** | | | | |
| **System volume** [litres] | | | | |
| **°dH value** | | | | |
| **pH value** | | | | |
| **Conductivity** [µS/cm] | | | | |
| **Conditioning agent** (name and quantity) | | | | |
| **Molybdenum content** [mg/l] | | | | |
| **Signature** | | | | |

Your heating contractor:

**VDI directive 2035**

**Perform annual control measurement!**



*Fig. 69: Form for logging filling with completely deionised water*

### Pump media

### Grundfos pump

The pump is suitable for circulation of the following media:

- Pure, low viscosity, non-aggressive and non-explosive media without solid or long-fibre components
- Mineral oil free coolants
- Softened water

The kinematic viscosity of water is $\vartheta$= 1 $mm^2/s$ (1 cSt) at 20 °C. If you use the pump to pump liquids with a different viscosity, the max. pump pressure will be reduced.

Example: A water-glycol mixture with 50% glycol content has a viscosity of approx. 10 $mm^2/s$ (10 cSt) at 20 °C. Then the pumping capacity is reduced by approx. 15 %.

No additives must be added to the water which could impair the function of the pump.

The viscosity of the pumped medium must be taken into account when designing the pump.

# 9 Refrigeration connection

## 9.1 Connection of refrigerant piping

- The outdoor unit and the indoor unit are connected together by two (or four on WKF Duo) copper lines (refrigerator-quality copper tubes) with the following dimensions:
  WKF 80: 1/4"-1/2"
  WKF 100/130: 3/8"-5/8"
  WKF 170: 3/8"-3/4"
  connected (REMKO accessories).
- When bending the refrigerant piping, pay attention to the bending radii to prevent bending of the tubes. Never bend a pipe twice in the same place. Doing so can make it brittle or cause cracks.
- Assure suitable fastening and insulation when laying the refrigerant pipes.
- The copper tubes are connected by hard soldering with an insoluble bond.
  The soldered joints must be made in a protective atmosphere to avoid the formation of scale inside.
  On the indoor unit, the copper tubes are soldered in a shielding gas atmosphere to create an insoluble bond.

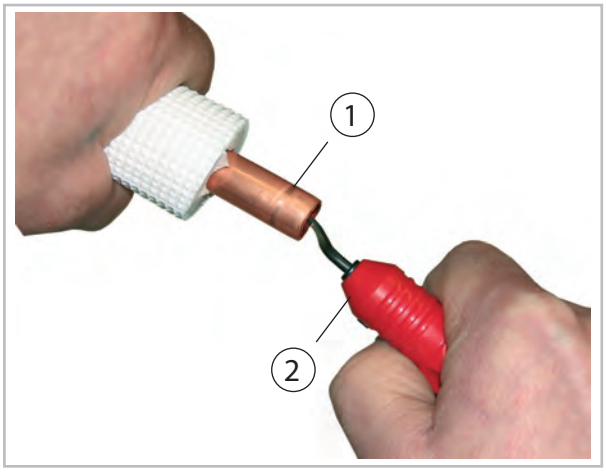


*Fig. 70: Deburring the refrigerant piping*

1: Refrigerant piping
2: Deburrer

### Connection to the unit

- The cover of the outdoor unit must be dismantled. It may be necessary to remove the pre-cut bushings.
- Take off the factory-fitted protective caps.
- The connection of the refrigerant pipes to the device connections are initially to be made by hand, in order to ensure a good fit.

- The refrigerant piping installed, including the soldered connections, must be provided with suitable insulating material as far as the shut-off valve.
- Special measures need not be taken for the return of the compressor oil.

**! NOTICE!**

Use only tools which are approved for use in an HVAC environment. (z. B.: bending pliers, pipe/tubing cutters, de-burrers and flaring tools). Do not cut refrigerant pipes with a saw.

**! NOTICE!**

All work must be carried out in a way that prevents dirt, particles, water etc. from entering, refrigerant lines!

**! NOTICE!**

The on-site power supply for each outdoor unit of the heat pump must be switched on **24 hours before** the technical assistance commissioning!

## 9.2 Commissioning the refrigeration system

### Leak testing

Once all the connections have been made, the pressure gauge station is attached to the Schrader valve as follows (if fitted):

blue = large valve = suction pressure

Once the connection has been made successfully, the leak test is carried out with dry nitrogen. Leak testing involves spraying a leak detection spray onto the connections. If bubbles are visible, the connections have not been made properly. In that case, tighten the connection or, if necessary, create a new flange.

### Pumping down to vacuum

After completing a successful leak test, the excess pressure in the refrigerant piping is removed and a vacuum pump with an absolute final partial pressure of min. 10 mbar is used to remove all of the air and empty the pipes. Any moisture present in the pipes will also be removed.

**! NOTICE!**

A vacuum of at least 10 mbar must be produced!

The time required to generate the vacuum is dependent on the final pressure pipe volume of the indoor unit and the length of the refrigerant piping. This always takes at least 60 minutes. Once any foreign gases and humidity have been completely extracted from the system, the valves on the pressure gauge station are closed and the valves on the outdoor unit are opened as described in the "Commissioning" section.

### Commissioning

**! NOTICE!**

Commissioning should only be performed and documented by specially trained personnel.

Observe the operating manual for the indoor units and outdoor components when commissioning the entire system.

Once all the components have been connected and tested, the system can be put into operation. A functional check should be performed to verify its correct function and identify any unusual operating behaviour prior to handing it over to the operator. This check is dependent on the installed indoor units. The processes are specified in the operating manual for the indoor units being commissioned.

### Functional checks and test run

Check the following points:

- Leak-tightness of the refrigerant piping.
- Compressor and fan running smoothly.
- Issue of warmer water in the indoor unit and issue of cold air to outdoor unit during heating operation.
- Function test of the indoor unit and all program sequences.
- Check of the surface temperature of the suction pipe and that the vaporiser is not overheating. To measure the temperature, hold the thermometer to the suction pipe and subtract the boiling point temperature reading on the pressure gauge from the measured temperature.
- Record the measured temperatures in the commissioning report.

### Function test of heating operating mode

1. Remove the protective caps from the valves.
2. Start the commissioning procedure by briefly opening the shut-off valves on the outdoor unit until the pressure gauge indicates a pressure of approx. 2 bar.
3. Check all connections for leaks with leak detection spray and suitable leak detectors. If no leaks are found, fully open the shut-off valves by turning them anti-clockwise using a spanner. If leaks are found, draw off the refrigerant and rework the defective connection. It is imperative that the vacuum creation and drying steps are repeated!
4. Activate the main circuit breaker or fuse.
5. Program the Smart-Control.
6. Switch on heating mode

*Due to the turn on delay, the compressor will start up a few minutes later.*

7. Check all regulating, control and safety devices for function and correct adjustment during the test run.
8. Measure all cooling data and record the measured values in the commissioning report.
9. Remove the pressure gauge.

### Final tasks

- Use the Smart-Control to set the target temperature to the required value.
- Mount all removed parts.
- Familiarise the operator with the system.

**! NOTICE!**

Check that the shut-off valves and valve caps are tight after carrying out any work on the cooling cycle. Use appropriate sealant products as necessary.

### Adding refrigerant

**⚠ DANGER!**

The connection of refrigerant pipes and the handling of refrigerant may be only be carried out by qualified personnel (competence category I).

**⚠ DANGER!**

Only refrigerant in a liquid state may be used to fill the cooling circuit.

**Attention: combustible refrigerant!**

**⚠ CAUTION!**

Danger of injury from refrigerant!

Refrigerant degreases the skin on contact and may cause cold burns.

Therefore:

- Wear chemical-resistant protective gloves when undertaking any work involving refrigerants.

-Safety glasses must be worn to protect the eyes.

**! NOTICE!**

Check the overheating to determine the refrigerant fill quantity.

- The outdoor unit is pre-filled with refrigerant sufficient for a max. pipe length (see following tables).
- If the length of any of the pipelines exceeds the max. pipe length, then an additional filling is required for each additional metre of pipe length (basic length) (see following tables).

| Basic pipe length | Additional fill quantity |
|---|---|
| | All series |
| Up to and incl. 5 m | 0 g/m |
| 5 m to max. 20 m per circuit | 30 g/m |

**Examples**

| Basic pipe length | Additional fill quantity |
|---|---|
| | All series |
| 5 m | 0 g |
| 10 m | 150 g |
| 15 m | 300 g |
| 20 m | 450 g |

**! NOTICE!**

The escape of refrigerant contributes to climatic change. In the event of escape, refrigerant with a low greenhouse potential has a lesser impact on global warming than those with a high greenhouse potential.
This unit contains refrigerant with a greenhouse potential of 675. That means the escape of 1 kg of this refrigerant has an effect on global warming that is 675 times greater than 1 kg $CO_2$, based on 100 years. Do not conduct any work on the refrigerant circuit or dismantle the unit - always enlist the help of qualified experts.

# 10 Electrical wiring

**Important Information**

*You can find information on the electrical connections of the indoor and outdoor unit, on the terminal assignment of the I/0 module, as well as on the circuit diagrams in the separate "Electrical wiring" operating instructions*

**! NOTICE!**

For an existing block the heat pump by the utility (utility switching) must be used the control contact S 16 of the Smart-Control.

# 11 Before commissioning

Observe the following points before commissioning:

- The heating system is filled with DI water in accordance with VDI 2035. We recommend the addition of REMKO full heating protection (see the chapter “Corrosion protection”).
- - A water or system temperature of min. 20 °C in the return flow must be ensured (e.g. with a heating element/emergency heating operation).
- The entire heating system is rinsed, cleaned and de-aerated (incl. hydraulic balancing).
- The refrigerant filling quantity must be expanded if necessary! ↳ *‘Examples’ on page 74*) mode.
- The refrigerant piping is laid without kinks in the protective tube. The protective tube is professionally fitted with waterproof sealing to prevent any water penetration (see the chapter “Commissioning refrigeration/Adding refrigerant”).
- **The heat pump is not released if an outside temperature under 10 °C is measured at the external probe and the water inlet temperature (return flow) is under 15 °C.**

**! NOTICE!**

No commissioning can take place if the above named points are not observed. Damage resulting from this is not covered by the guarantee!

# 12 Commissioning

**Touch display and notes about commissioning**

The Smart Control is used to operate and control the entire heating system. The Smart-Control is operated from the touch display.

- The unit is pre-installed at the factory. After a reset of the Smart-Control, the default parameters are loaded.
- An intensive visual inspection is to be carried out before the actual commissioning.
- Switch on the power supply.
- Then the preinstalled data is loaded and the parameters can be set with the help of the commissioning wizard or in the system configuration. You can find information on this in the separate operating instructions of the Smart-Control.

**! NOTICE!**

Before commissioning the entire system, including hot water tank, must be filled!

**Overview of the controls**


*Fig. 71: Controls of the Smart-Control Touch*

1: Overview (quick access)
2: Information (quick access)
3: Settings (quick access)
4: Messages (warnings, information notes and errors)

### Function display

The REMKO Smart Control Touch regulation is an operating module with touch display. Unit operation is intuitive and self-explanatory via the plain text display on the user interface of the controller. No buttons are required to adjust and change parameters. Instead, this takes place by touching the surface of the controller at the appropriate points. The installation of further functions such as KNX or Smart-Web is possible through the installation of further supplementary software available as an accessory.

# 13 Care and maintenance

Regular care and maintenance serves to ensure trouble-free operation and long service-life of the heat pump system.

### Care

- The indoor and outdoor units must be kept free of soiling, vegetation and other deposits.
- The device is to be cleaned with a damp cloth. In doing so, it is to be ensured that no caustic, abrasive or solvent-based cleaning products are used. Use of powerful water jets is to be avoided.
- Open the outdoor unit regularly and carry out maintenance. For this, the evaporator fins must be cleaned and impurities removed from the module if necessary. Special attention should be paid to the condensate drainage. Proper drainage of any condensate that accumulates must always be ensured.

**! NOTICE!**

It is not recommended to set up/mount the outdoor unit under trees or bushes!

### Maintenance

- To perform the possibly statutory seal test, it is necessary to arrange an annual maintenance contract with an appropriate specialist firm.

**! NOTICE!**

If the $CO_2$ equivalent is greater than specified below, the refrigeration circuit must be checked for leaks.

> 5 t ➜ 1 x a year

> 50 t ➜ 2 x a year

> 500 t ➜ 4 x a year

A heat pump should always be serviced annually. Therefore, we recommend arranging for a service contract that includes the seal inspection.

# 14 Temporary shut-down

The system may not be switched off at the mains power supply even if the heating system is not used for heating purposes over an extended period (e.g. holidays)!

- During the temporary shut-down the plant for heating must be put in a "Standby" mode and for hot water over to the "Off".
- Heating phases can be programmed for the duration of the period of absence.
- The previous operating mode has to be switched back on when the shut-down phase is over.
- Instructions for changing the mode appear in the corresponding chapter of the Smart-Control manual.

**! NOTICE!**

In "Standby" , the heat pump is in standby mode. Of the entire system, only the frost-protection function s activated.

# 15 Troubleshooting and customer service

## 15.1 General Troubleshooting

The unit has been manufactured using state-of-the-art production methods and tested several times to ensure its correct function. However, in the event that malfunctions should occur, the device should be checked against the following list. Please inform your dealer if the unit is still not working correctly after all of the functional checks have been performed.

| Fault | Possible causes | Remedial measures |
|---|---|---|
| The heat pump does not start or switches itself off | Power outage, under-voltage | Check the voltage and, if necessary, wait for it to come back on |
| | Defective mains fuse Master switch off | Exchange mains fuse, master switch on |
| | Damaged mains cable | Repair by specialist firm |
| | Power company off-period | Wait until the power-company off-period is over and the heat pump starts up as required |
| | Operational temperature limits too low or too high | Observe temperature ranges |
| | Set-point temperature exceeded Incorrect mode | The set-point temperature has to be higher than the heat-source temperature, check mode |
| | | Disconnect the outdoor module, then establish the correct clamp order using the connection plan Re-establish voltage to the outdoor module. Also make sure that the protective earth is connected correctly. |
| Heat circuit pump fails to switch off | Incorrect pump switching | Arrange to have pump switching checked in "heating circuit" expert level |
| Heat circuit pumps fail to switch on | Incorrect mode set | Check mode |
| | Control PCB fuse in indoor module switching cabinet faulty | Exchange the fuse on the left side of the control PCB |
| | Incorrect heating program set | Check heating program We recommend the operating mode "heat" in the cold heating season |
| | Temperature overlapping, e.g. external temperature greater than room temperature | Observe temperature ranges |
| Red indicator lamp | Failure outdoor module | Contact customer service |

## 15.2 Fault messages

**Fault display – Malfunction codes**

| Error | ID | Description | Details |
|---|---|---|---|
| E03 | ID7308 | Transistor module malfunction | The protection function of the inverter's transistor module (IPM/IGBT) has triggered. |
| E10 | ID7047 | Power supply malfunction | Malfunction from over- or undervoltage |
| E17 | ID7275 | Air inlet temperature probe fault | Short circuit or open contact – probe ambient air temperature, outdoor unit |
| E18 | ID7044 | Register temperature probe fault | Short circuit or open contact – probe register temperature, outdoor unit |
| E19 | ID7293 | Hot gas temperature probe fault | Short circuit or open contact – probe for heating gas temperature, motherboard |
| E20 | ID7043 | Suction gas temperature probe fault | Short circuit or open contact – probe for suction gas temperature, outdoor unit |
| E21 | ID7046 | Low-pressure probe error | Low-pressure probe fault – Please check the low pressure probe on the outdoor unit and its connection. |
| E22 | ID7045 | High-pressure probe error | High-pressure probe fault – Please check the high-pressure probe on the outdoor unit and its connection. |
| E25 | ID7313 | Fan 1 malfunction | Malfunction at fan 1 of outdoor unit |
| E26 | ID7314 | Fan 2 malfunction | Malfunction at fan 2 of outdoor unit |
| E27 | ID7037 | Low pressure | Low pressure malfunction |
| E28 | ID7038 | High pressure | High pressure malfunction |
| E33 | ID7290 | Indoor/outdoor unit communication | Communication between the indoor and outdoor unit is interrupted. Check the communication line and the power supply to the outdoor version's circuit board. |
| E34 | ID7310 | Communication motherboard/ inverter | Communication fault between motherboard and inverter board |
| E35 | ID7316 | Compressor current malfunction | Check for cable break or short circuit on the compressor line. |
| E36 | ID7041 | Compressor overload malfunction | The compressor's maximum current consumption was exceeded. |
| E37 | ID7042 | Inverter error | Inverter fault – Check the winding resistances and the connection lines of the compressor<br>**Winding resistances**:<br>WKF 80 about 1.91 ohms at 20 °C<br>WKF 100 about 0.72 ohms at 20 °C<br>WKF 130 about 0.95 ohms at 20 °C<br>WKF 170 about 0.88 ohms at 20 °C |

**Fault display – Malfunction codes (continued)**

| Error | ID | Description | Details |
|---|---|---|---|
| E38 | ID7311 | DC voltage fault | Fault in interim DC circuit of inverter |
| E39 | ID7039 | AC current fault | AC current consumption is not plausible |
| E40 | ID7040 | EEPROM error | The EEPROM settings for the motherboard (outdoor unit) are not plausible. |
| --- | ID7109 | Communication malfunction | Communication malfunction - 1st Heat pump |
| --- | ID7170 | Communication malfunction | Communication malfunction - 2nd Heat pump |
| --- | ID7252 | WP general alarm signal | Heat pump general alarm signal – 1. WP |
| --- | ID7253 | WP general alarm signal | Heat pump general alarm signal – 2. WP |

# 16 View of the unit and spare parts

## 16.1 Device representation outdoor unit WKF/ WKF-compact 80

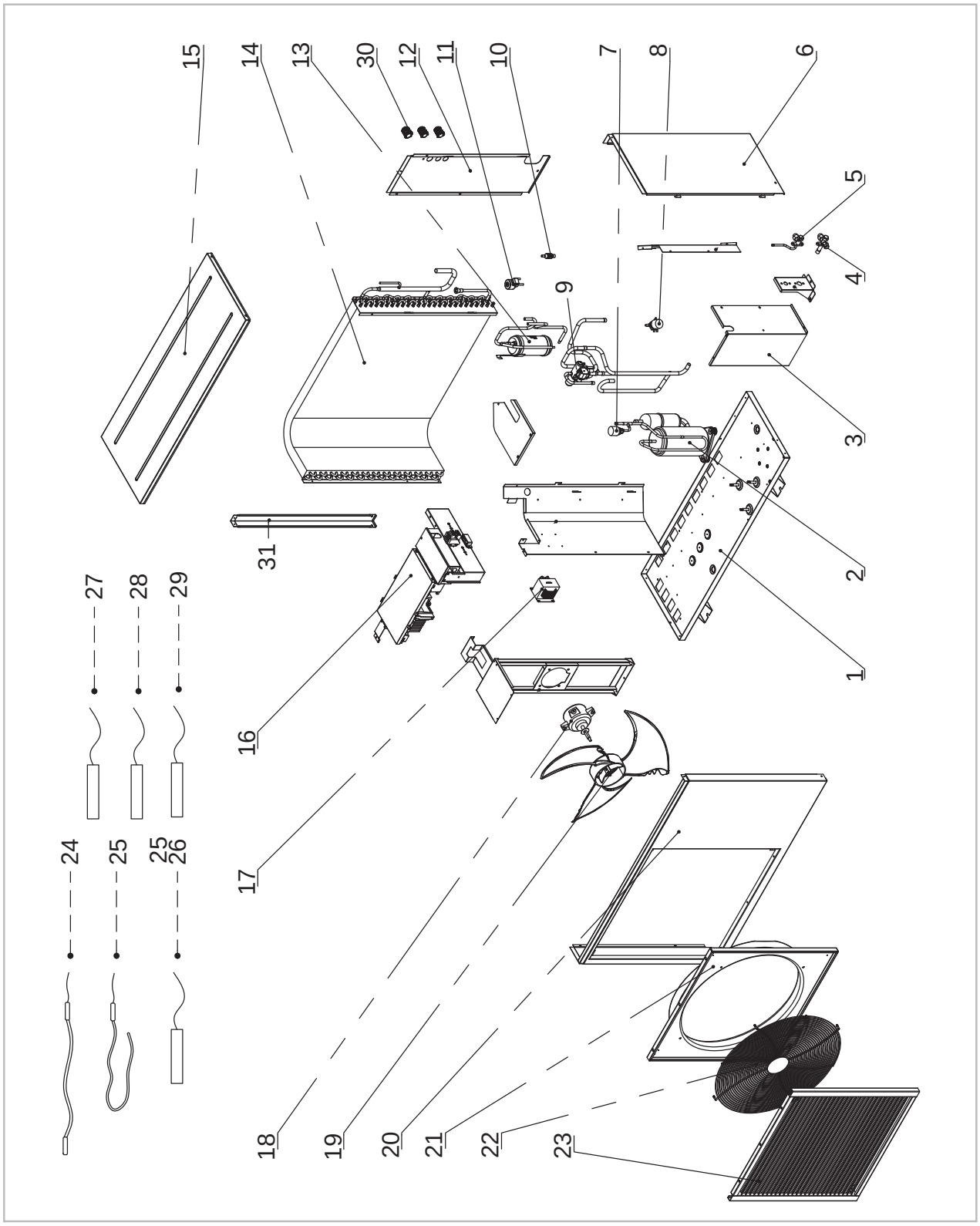


*Fig. 72: Exploded view*

## 16.2 Spare parts outdoor unit WKF/ WKF-compact 80

| No. | Designation |
|---|---|
| 1 | Device base/condensate tray |
| 2 | Compressor |
| 3 | Compressor noise protection housing |
| 4 | Shut-off valve $^1/_2$” |
| 5 | Shut-off valve $^1/_4$” |
| 6 | Side panel, right |
| 7 | Low pressure sensor |
| 8 | High pressure transducer |
| 9 | Four-way changeover valve |
| | Coil 4-way changeover valve |
| 10 | Filter |
| 11 | Electronic expansion valve |
| | Coil, electronic expansion valve |
| 12 | Side panel, rear |
| 13 | Fluid collector (0.7 l) |
| 14 | Lamella heat exchanger |
| 15 | Cover panel |
| 16 | Motherboard |
| 17 | Choke |
| 18 | Fan motor |
| 19 | Fan blade |
| 20 | Front panel (RAL 9006) |
| 21 | Fan safety panel (RAL 7021) |
| 22 | Fan safety grid (RAL 7021) |
| 23 | Air baffle (RAL 7021) |
| 24 | Crankcase heating compressor |
| 25 | Condensate heating – Assembly |
| 26 | TP evaporator probe |
| 27 | TS suction pipe probe |
| 28 | Sensor, TA air suction |
| 29 | Sensor, TD heat gas |
| 30 | Cable entry |
| 31 | Housing brace rear left |
| **Spare parts not illustrated** | |
| | Protection grid, side |
| | Protective grid, air suction side |

When ordering spare parts, please always state the unit number and unit type (see name plate)!

## 16.3 Device representation outdoor unit WKF/ WKF-compact 100

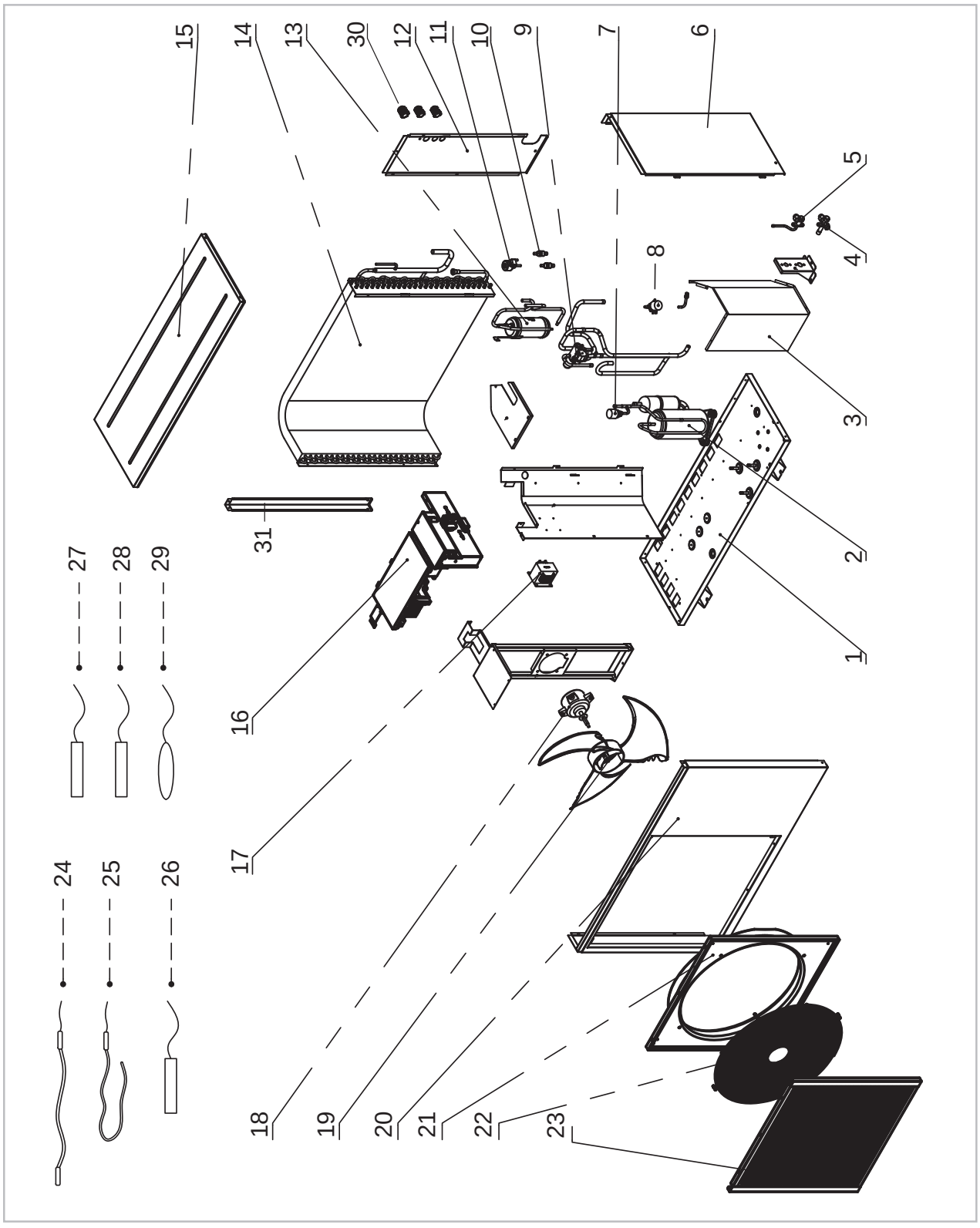


*Fig. 73: Exploded view*

## 16.4 Spare parts outdoor unit WKF/ WKF-compact 100

| No. | Designation |
|---|---|
| 1 | Device base/condensate tray |
| 2 | Compressor |
| 3 | Compressor noise protection housing |
| 4 | Shut-off valve $^{5}/_{8}$” |
| 5 | Shut-off valve $^{3}/_{8}$” |
| 6 | Side panel, right |
| 7 | Low pressure sensor |
| 8 | High pressure transducer |
| 9 | Four-way changeover valve |
| | Coil 4-way changeover valve |
| 10 | Filter |
| 11 | Electronic expansion valve |
| | Coil, electronic expansion valve |
| 12 | Side panel, rear |
| 13 | Fluid collector (0.7 l) |
| 14 | Lamella heat exchanger |
| 15 | Cover panel |
| 16 | Motherboard |
| 17 | Choke |
| 18 | Fan motor |
| 19 | Fan blade |
| 20 | Front panel (RAL 9006) |
| 21 | Fan safety panel (RAL 7021) |
| 22 | Fan safety grid (RAL 7021) |
| 23 | Air baffle (RAL 7021) |
| 24 | Crankcase heating compressor |
| 25 | Condensate heating – Assembly |
| 26 | TP evaporator probe |
| 27 | TS suction pipe probe |
| 28 | Sensor, TD heat gas |
| 29 | Sensor, TA air suction |
| 30 | Cable entry |
| 31 | Housing brace rear left |
| **Spare parts not illustrated** | |
| | Protection grid, side |
| | Protective grid, air suction side |

When ordering spare parts, please always state the unit number and unit type (see name plate)!

## 16.5 Device representation outdoor unit WKF/ WKF-compact 130

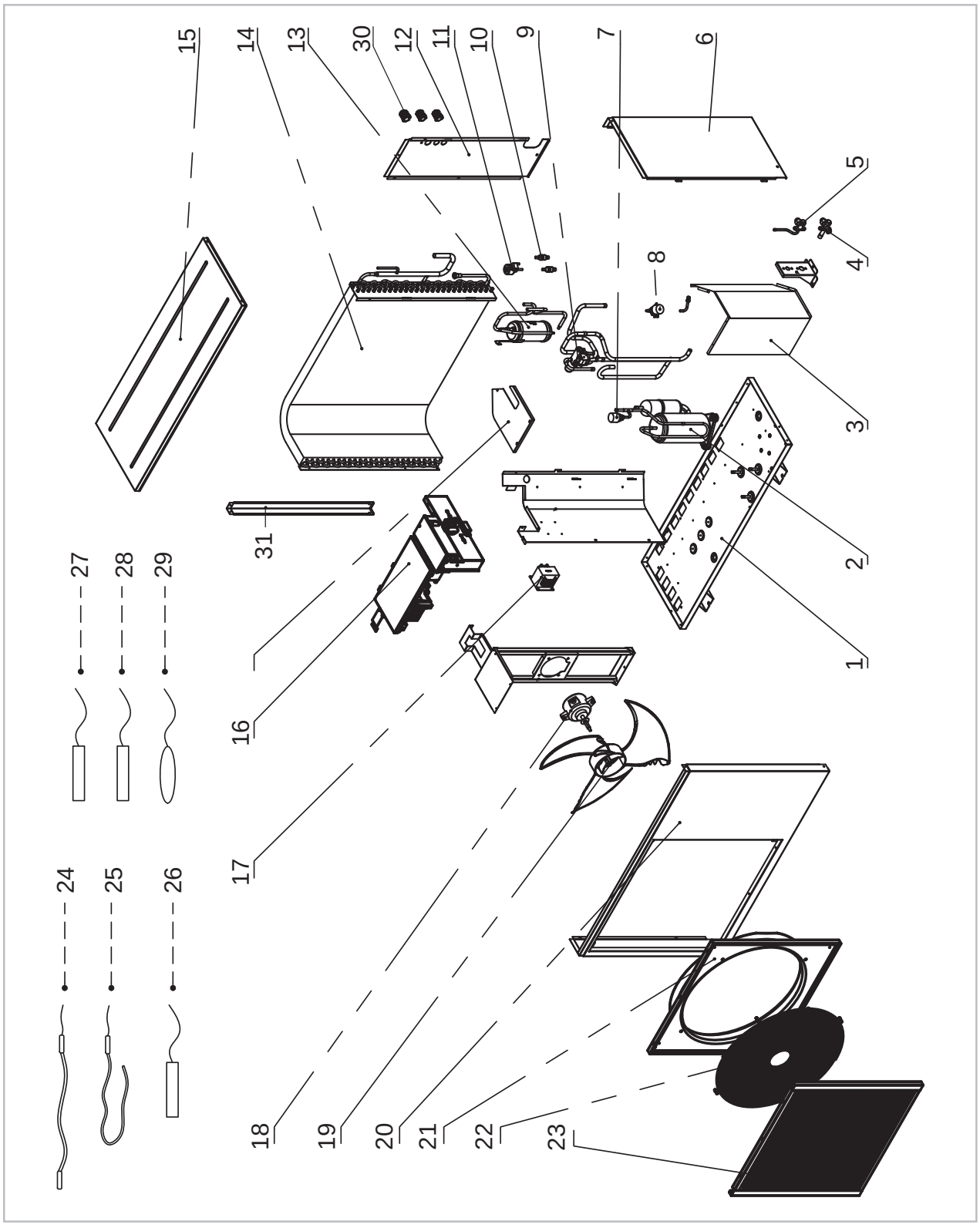


*Fig. 74: Exploded view*

## 16.6 Spare parts outdoor unit WKF/ WKF-compact 130

| No. | Designation |
|---|---|
| 1 | Device base/condensate tray |
| 2 | Compressor |
| 3 | Compressor noise protection housing |
| 4 | Shut-off valve $^{5}/_{8}$” |
| 5 | Shut-off valve $^{3}/_{8}$” |
| 6 | Side panel, right |
| 7 | Low pressure sensor |
| 8 | High pressure transducer |
| 9 | Four-way changeover valve |
| | Coil 4-way changeover valve |
| 10 | Filter |
| 11 | Electronic expansion valve |
| | Coil, electronic expansion valve |
| 12 | Side panel, rear |
| 13 | Fluid collector (0.7 l) |
| 14 | Lamella heat exchanger |
| 15 | Cover panel |
| 16 | Motherboard |
| 17 | Choke |
| 18 | Fan motor |
| 19 | Fan blade |
| 20 | Front panel (RAL 9006) |
| 21 | Fan safety panel (RAL 7021) |
| 22 | Fan safety grid (RAL 7021) |
| 23 | Air baffle (RAL 7021) |
| 24 | Crankcase heating compressor |
| 25 | Condensate heating – Assembly |
| 26 | TP evaporator probe |
| 27 | TS suction pipe probe |
| 28 | Sensor, TD heat gas |
| 29 | Sensor, TA air suction |
| 30 | Cable entry |
| 31 | Housing brace rear left |
| **Spare parts not illustrated** | |
| | Protection grid, side |
| | Protective grid, air suction side |

When ordering spare parts, please always state the unit number and unit type (see name plate)!

## 16.7 Device representation outdoor unit WKF/ WKF-compact 170

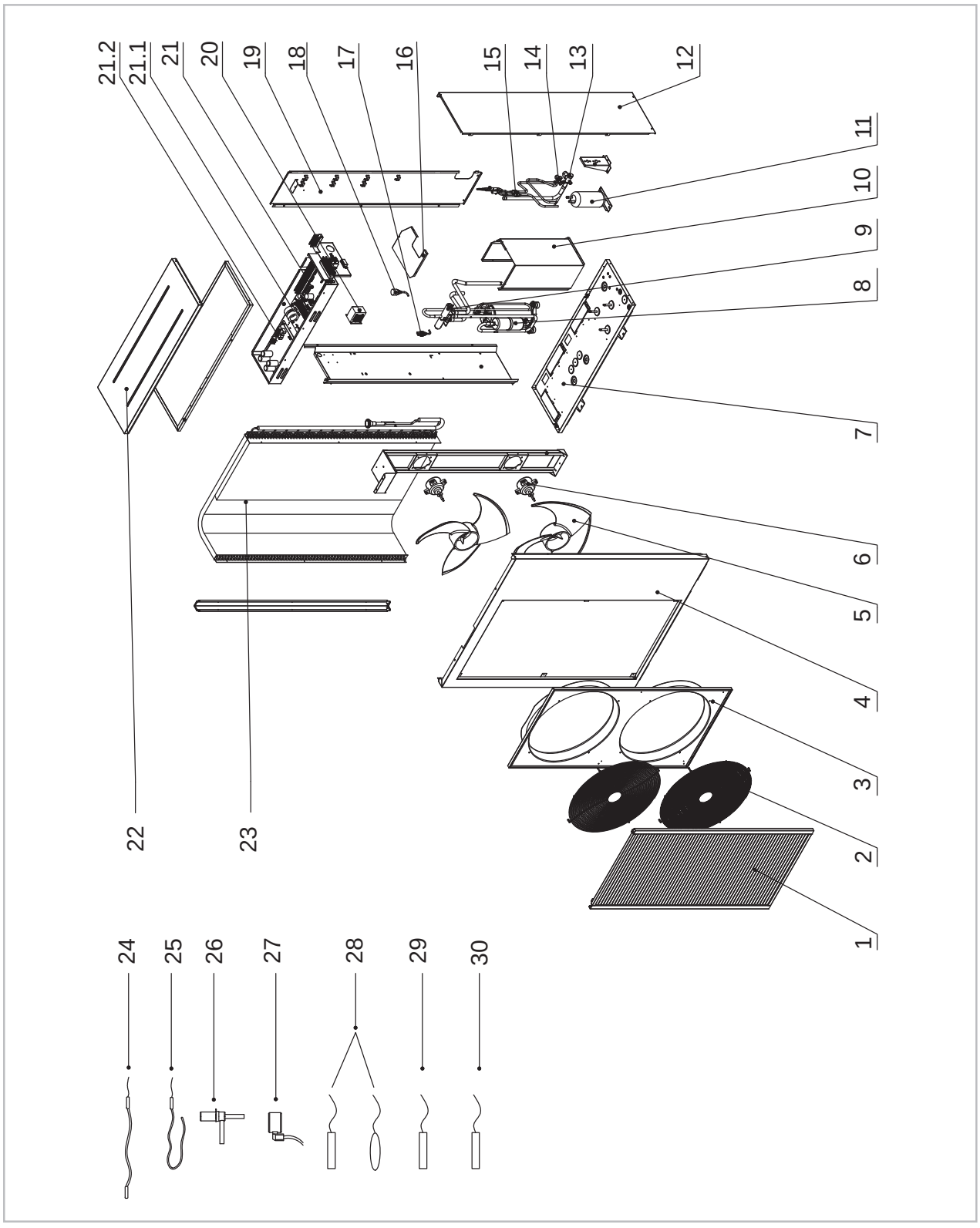


*Fig. 75: Exploded view*

## 16.8 Spare parts outdoor unit WKF/ WKF-compact 170

| Nr. | Bezeichnung |
|---|---|
| 1 | Air baffle (RAL 7021) |
| 2 | Fan safety grid (RAL 7021) |
| 3 | Fan safety panel (RAL 7021) |
| 4 | Front panel (RAL 9006) |
| 5 | Fan blade |
| 6 | Fan motor |
| 7 | Device base/condensate tray |
| 8 | Compressor |
| 9 | Four-way changeover valve |
| | Coil four-way changeover valve |
| 10 | Compressor noise protection housing side part |
| 11 | Fluid collector |
| 12 | Side panel, right |
| 13 | Shut-off valve $^{3}/_{4}$” |
| 14 | Shut-off valve $^{3}/_{8}$” |
| 15 | Filter |
| 16 | Compressor noise protection housing |
| 17 | High pressure transducer |
| 18 | Low pressure transducer |
| 19 | Rear side panel (pipe inlet) |
| 20 | Choke |
| 21 | Motherboard |
| 21.1 | Power/filter board |
| 21.2 | Inverter board |
| 22 | Cover panel |
| 23 | Lamella heat exchanger evaporator |
| 24 | Crankcase heating compressor |
| 25 | Condensate heating – Connection terminal assembly |
| 26 | Electronic expansion valve |
| 27 | Coil, electronic expansion valve |
| 28 | Probe set for evaporator/suction pipe |
| 29 | Sensor, TD heat gas |
| 30 | Sensor, TA air suction |
| **Spare parts not illustrated** | |
| | Inverter board |
| | Power-/Filter board |
| | Protection grid, side |
| | Protective grid, air suction side |

When ordering spare parts, please always state the unit number and unit type (see name plate)!

## 16.9 Device representation indoor unit WKF 80-170

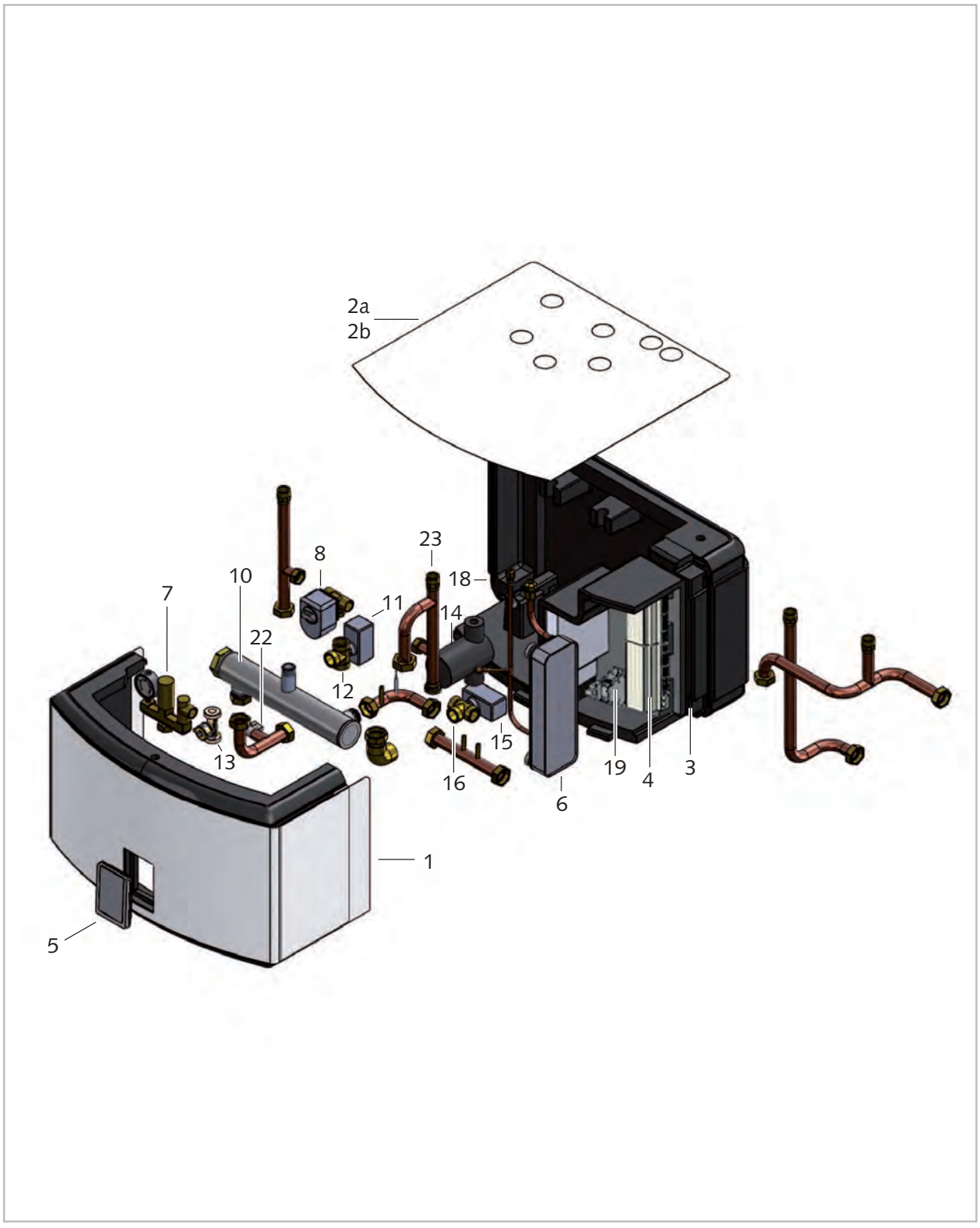


*Fig. 76: Exploded view*

We reserve the right to modify the dimensions and design as part of the ongoing technical development process.

## 16.10 Spare parts indoor unit WKF 80-170

| No. | Designation | WKF 80-170 |
|---|---|---|
| 1 | Front panel/hood | On request by providing the serial number |
| 2a | Monovalent/mono-energetic cover | |
| 2b | Bivalent alternative cover | |
| 3 | Switch box | |
| 4 | SMT I/O module | |
| 5 | Smart Control Touch operating panel | |
| 6 | Plate heat exchanger | |
| 7 | Safety assembly | |
| 8 | Bypass valve, complete | |
| 10 | Booster heater 6 kW, 400V/3~/50 Hz | |
| 11 | Servo-motor, 3-way valve | |
| 12 | Valve body, 3-way valve | |
| 13 | Ultrasonic flow rate meter | |
| 14 | Primary pump, indoor unit | |
| | Alternatively Wilo | |
| | Alternatively REMKO | |
| | Alternatively REMKO, power cable | |
| 15 | Servo-motor, 3-way valve bivalent mode | |
| 16 | Valve body, 3-way valve bivalent mode | |
| 18 | Pipe group support block | |
| 19 | Terminal | |
| 22 | Ball valve for filling/drainage | |
| 23 | Bleeder 1/4“ | |

When ordering spare parts, please always state the unit number and unit type (see name plate)!

**Spare parts not illustrated**

| Designation | WKF 80-170 |
|---|---|
| Complete wiring harness, indoor unit | On request by providing the serial number |
| Coding resistor | |
| Pt1000 3.5m length (S15) | |
| Assembly Booster heater 6 kW incl. flow rate meter | |
| STB Smart-Serv | |
| Smart-Serv relay | |

*) When exchanging the SC card, always change both cards and order 2 cards accordingly.

When ordering spare parts, please always state the unit number and unit type (see name plate)!

## 16.11 Device representation indoor unit WKF-compact 80-170

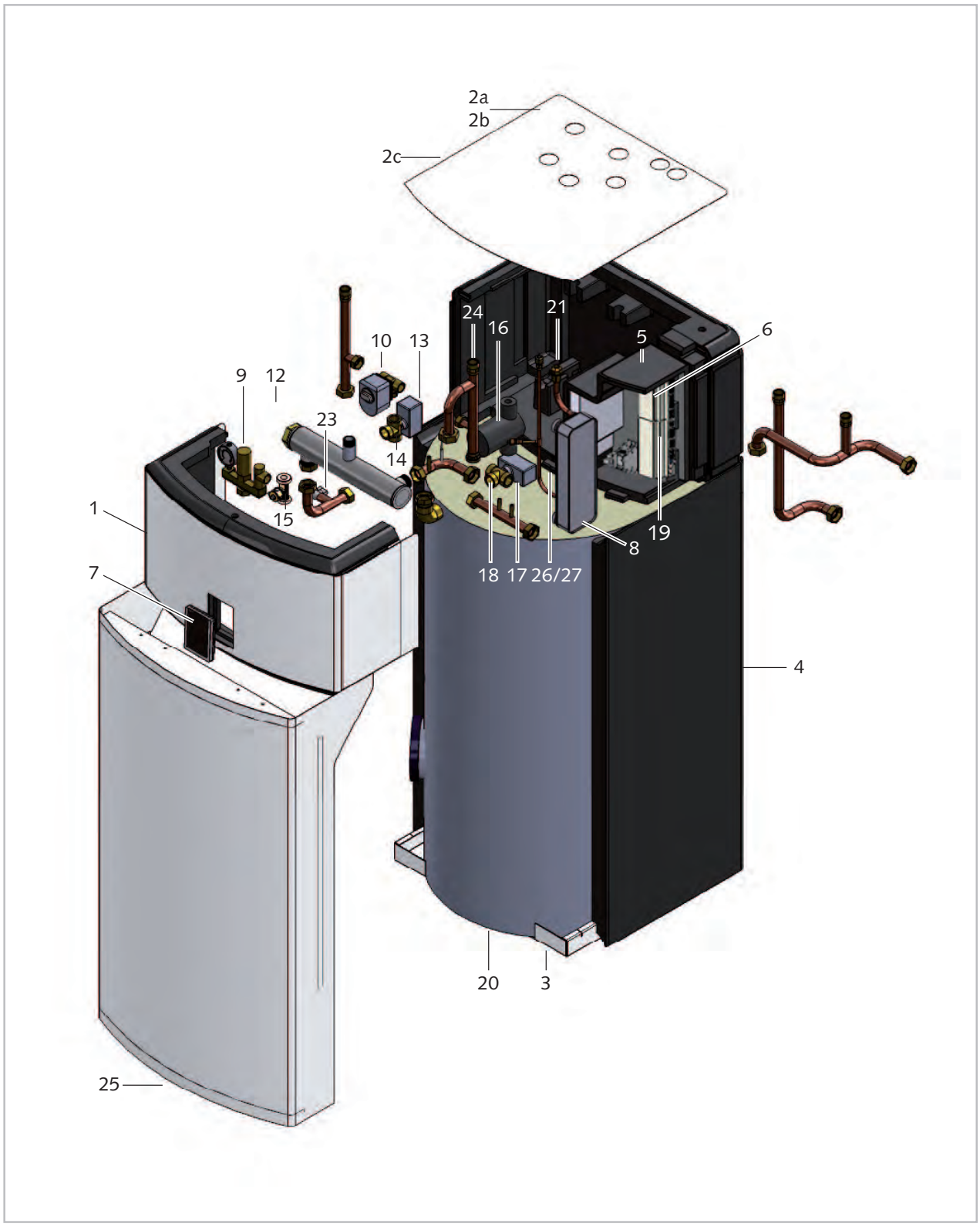


*Fig. 77: Exploded view*

We reserve the right to modify the dimensions and design as part of the ongoing technical development process.

## 16.12 Spare parts indoor unit WKF-compact 80-170

| No. | Designation | WKF compact 80-170 |
|---|---|---|
| 1 | Front panel/hood | On request by providing the serial number |
| 2a | Monovalent/mono-energetic cover | |
| 2b | Bivalent alternative cover | |
| 2c | Front cover | |
| 3 | Floor panel | |
| 4 | Side part storage tank | |
| 5 | Switch box | |
| 6 | SMT I/O module | |
| 7 | Smart Control Touch operating panel | |
| 8 | Plate heat exchanger | |
| 9 | Safety assembly | |
| 10 | Bypass valve, complete | |
| 12 | Booster heater 6 kW, 400V/3~/50 Hz | |
| 13 | Servo-motor, 3-way valve | |
| 14 | Valve body, 3-way valve | |
| 15 | Ultrasonic flow rate meter | |
| 16 | Primary pump, indoor unit | |
| | Alternatively Wilo | |
| | Alternatively REMKO | |
| | Alternatively REMKO, power cable | |
| 17 | Servo-motor, 3-way valve bivalent mode | |
| 18 | Valve body, 3-way valve bivalent mode | |
| 19 | Terminal strips | |
| 20 | WKF 300 drinking water storage tank | |
| 21 | Pipe group support block | |
| 23 | Ball valve for filling/drainage | |
| 24 | Bleeder 1/4“ | |
| 25 | Storage tank front panel | |
| 26 | Sacrificial anode/heating rod | |
| 27 | Sacrificial anode/chain | |

When ordering spare parts, please always state the unit number and unit type (see name plate)!

# REMKO WKF series

**Spare parts not illustrated**

| Designation | WKF compact 80-170 |
|---|---|
| Complete wiring harness, indoor unit | On request by providing the serial number |
| Coding resistor | |
| Pt1000 3.5 m length (S15) | |
| Assembly Booster heater 6 kW incl. flow rate meter | |
| STB Smart-Serv | |
| Smart-Serv relay | |

*) When exchanging the SC card, always change both cards and order 2 cards accordingly.

When ordering spare parts, please always state the unit number and unit type (see name plate)!

**Components of accessories set (without illustration)**

| Designation | WKF compact 80-170 |
|---|---|
| **Accessories set, complete** | On request by providing the serial number |
| Immersion probe | |
| Dirt trap | |
| Ball valve 1“, red | |
| Ball valve 1“, blue | |
| Safety assembly | |
| External probe | |
| Corrugated pipe 1 WT top connection (WP-VL) = 540 mm | |
| Corrugated pipe 2 WT bottom connection (WP-RL) = 1340 mm | |
| Corrugated pipe 3 WW top connection = 1250 mm | |
| Corrugated pipe 4 Circ. Middle connection = 1600 mm | |
| Corrugated pipe 5 KW top connection = 2400 mm | |
| Flat gasket (Outside: 39 mm x inside: 27 mm x thickness: 2 mm) | |
| Flat gasket (Outside: 30 mm x inside: 21 mm x thickness: 2 mm) | |

When ordering spare parts, please always state the unit number and unit type (see name plate)!

## 16.13 Device representation indoor unit WKF 130-170 Duo

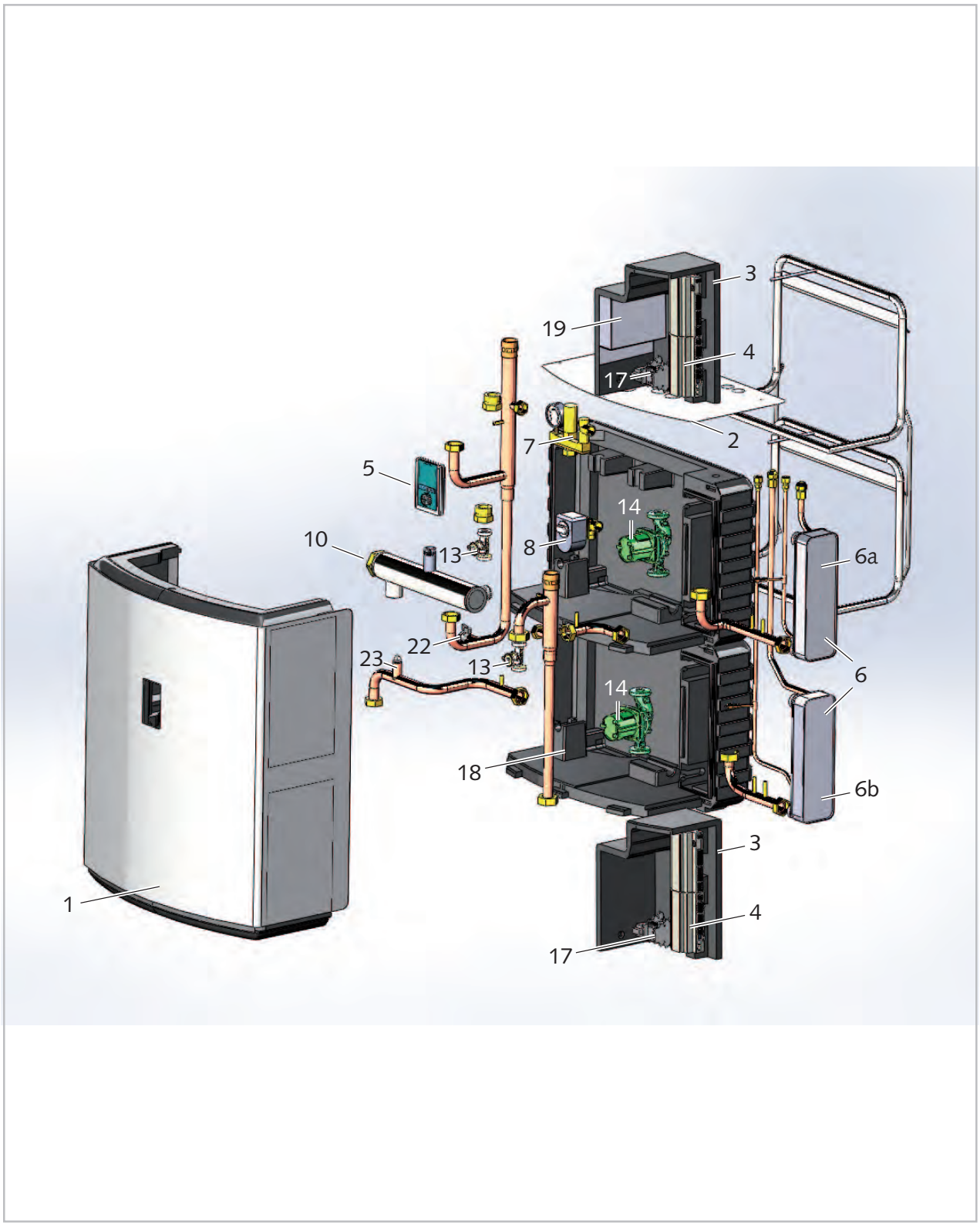


*Fig. 78: Exploded view*

We reserve the right to modify the dimensions and design as part of the ongoing technical development process.

## 16.14 Spare parts indoor unit WKF 130-170 Duo

| No. | Designation | Indoor unit WKF 130-170 Duo |
|---|---|---|
| 1 | Front panel/hood | On request by providing the serial number |
| 2 | Cover | |
| 3 | Switch box | |
| 4 | SMT I/O module | |
| 5 | Smart Control Touch operating panel | |
| 6 | Plate heat exchanger, raw | |
| 6a | Plate heat exchanger, soldered/insulated at top | |
| 6b | Plate heat exchanger, soldered/insulated at bottom | |
| 7 | Safety assembly | |
| 8 | Bypass valve, complete | |
| 10 | Booster heater 6 kW | |
| 13 | Ultrasonic flow rate meter | |
| 14 | Primary pump, indoor unit | |
| | Alternatively Wilo | |
| | Alternatively REMKO | |
| | Alternatively REMKO, power cable | |
| 17 | Terminal strips | |
| 18 | Pipe group support block | |
| 19 | Relay Smart-Serv | |
| 22 | Ball valve for filling/drainage | |
| 23 | Bleeder 1/4“ | |
| | **Spare parts not illustrated** | |
| | Complete wiring harness, indoor unit | On request by providing the serial number |
| | SD card I/O module (current software without Smart-Count and without Web-Count) *) | |
| | Master coding resistor (I/O module on top) | |
| | Slave coding resistor (I/O module on bottom) | |
| | STB Smart-Serv | |
| | Smart-Serv relay | |

*) When exchanging the SC card, always change three cards and order 3 cards accordingly.

When ordering spare parts, please always state the unit number and unit type (see name plate)!

# 17 General terms

**All-in-one unit**

Design in which all refrigeration components are installed in one housing. No refrigeration work has to be carried out.

**Annual power input factor**

The annual power input factor indicates the power input (e.g. electrical energy) required in order to achieve a certain benefit (e.g. heating energy). The annual power input factor includes the energy required for auxiliary drives.

**Bivalent mode**

The heat pump provides the entire heating energy down to a predetermined outdoor temperature (e.g. -3 °C). If the temperature drops below this value, the heat pump switches off and the secondary heating appliance takes over the heating, e.g. a heating boiler.

**Coefficient of performance**

The current ratio of thermal output produced by the heat pump to the consumed electrical power is referred to as the coefficient of performance, as measured under standardised boundary conditions according to EN 255 / EN 14511. A coefficient of performance of 4 means that a usable thermal output amounting to 4-times the electrical power consumption is available.

**Compressor (condenser)**

Unit designed for the mechanical conveyance and compression of gasses. Compression serves to significantly increase the pressure and temperature of the medium.

**Condenser**

Heat exchanger on a refrigerant plant which liquefies a working medium in order to transmit heat to its environment (e.g. the heating system).

**Defrost**

At outdoor temperatures below 5 °C it is possible that ice may form on the evaporators of air/water heat pumps. The removal of this ice is referred to as defrosting and is undertaken by supplying heat, either regularly or as requirements dictate. Air/water heat pumps with circuit reversal are distinguished by their requirements-based, quick and energy-efficient defrosting system.

**Energy supply company switching**

Certain energy supply companies offer special tariffs for the operation of heat pumps.

*When switching off the power supply companies only on the barrier is in contact only requirement of a heat source (heat pump) is blocked. Be switched off at monoenergetic operation, the power supply of the electric heating element with.*

**Evaporator**

Heat exchanger on a refrigerant plant which uses the evaporation of a working medium in order to extract heat from its environment at low temperatures (e.g. the outdoor air).

**Expansion valve**

Heat pump component for lowering the condensing pressure on the vapour tension. In addition, the expansion valve regulates the quantity of injected refrigerant in relation to the evaporator load.

**Heat carrier**

Liquid or gas medium (e.g. water, brine or air), in which heat is transported.

**Heat pump system**

A heat pump system consists of a heat pump and a heat source system. For brine and water/water heat pumps, the heat source system must be made available separately.

**Heat source**

Medium from which the heat pump derives heat, in other words, soil, air and water.

**Heating output**

Flow of heat emitted from the liquefier to the environment. The heating output is the sum of the electrical power consumed by the condenser and the heat flux obtained from the environment.

**Inverter**

Power regulator which serves to match the speed of the compressor motor and the speed of the evaporator fans to the heating requirement.

### Limit temperature / bivalence point

Outdoor temperature where the secondary heating appliance cuts in under bivalent operation.

### Monovalent mode

In this mode, the heat pump is the sole heating appliance in the building all year round. Monovalent mode is primarily used in combination with brine/water and water/water heat pumps.

### Noise

Noise is transmitted in media such as air or water. Essentially there are two types of noise, airborne sound and solid-borne sound. Airborne sound is transmitted entirely via the air. Solid-borne sound is transmitted in solid materials or liquids and is only partially radiated as airborne sound. The audible range of sound lies between 20 and 20,000 Hz.

### Refrigerant

The working medium used in a refrigerant plant, e.g. heat pump, is referred to as the refrigerant. The refrigerant is a liquid which is used for thermal transfer in a refrigeration plant and which is able to absorb heat by changing its state at low temperatures and low pressures. A further change of state at higher temperatures and higher pressure serves to dissipate this heat.

### Refrigerating capacity

Heat flux extracted from the environment by the evaporator (air, water or soil).

### Regulations and guidelines

The erection, installation and commissioning of heat pumps has to be undertaken by qualified specialist engineers. In doing so, various standards and directives are to be observed.

### Seal inspection

System operators are obliged to ensure the prevention of refrigerant leakage in accordance with the directive on substances that deplete the ozone layer (EC 2037/2000) and the Regulation on Certain Fluorinated Greenhouse Gases (EC 842/2006). In addition, a minimum of one annual service and inspection must be carried out, as well as a sealing test for refrigerating plants with a refrigerant filling weight over 3 kg.

### Seasonal performance factor

The seasonal performance factor relates to the ratio of heat content delivered by the heat pump system to the supplied electrical energy in one year. It may not be compared to the performance number. The seasonal performance factor expresses the reciprocal of the annual power input factor.

### Single energy-source mode

The heat pump covers a large proportion of the required thermal output. On a few days per year an electrical heating coil supplements the heat pump under extremely low outdoor temperatures. Dimensioning of the heat pump for air/water heat pumps is generally based on a limit temperature (also known as balance point) of approx. -5 °C.

### Sound pressure level

The sound pressure level is a comparable characteristic quantity for the radiated acoustic output of a machine, for example, a heat pump. The noise emission level at certain distances and acoustic environments can be measured. The standard is based on a sound pressure level given as a nominal noise level.

### Split AC unit

Design where one part of the device is positioned outdoors and the other inside the building. Both units are connected to each other by a refrigerant pipe.

### Storage tank

The installation of a hot-water storage tank is generally recommended in order to extend the running time of the heat pump under low heat requirements. A storage tank is required for air/water heat pumps in order to bridge off-periods.

# 18 Index

# **REMKO** QUALITY WITH SYSTEMS

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**REMKO GmbH & Co. KG**
**Klima- und Wärmetechnik**

Im Seelenkamp 12
32791 Lage

Telephone +49 (0) 5232 606-0
Telefax +49 (0) 5232 606-260

E-mail info@remko.de
URL www.remko.de

**Hotline within Germany**
+49 (0) 5232 606-0

**Hotline International**
+49 (0) 5232 606-130