Operating and installation instructions

REMKO WKF/WKF-compact series

Smart heat pumps
Air/water system for heating and cooling

WKF 70, WKF 70 compact, WKF 120, WKF 120 compact, WKF 120 Duo,
WKF 180, WKF 180 compact, WKF 180 Duo

Instructions for Technicians

0110-2020-01 Edition 5, 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

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1 Safety and usage instructions

1.1 General safety notes

Carefully read the operating manual before commissioning the units for the first time. It contains useful tips and notes such as hazard warnings to prevent personal injury and material damage. Failure to follow the directions in this manual not only presents a danger to people, the environment and the system itself, but will void any claims for liability.

Keep this operating manual and the refrigerant data sheet near to the units.

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 notes 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 (grille) 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 certain unit parts or components may lead to burns or injury.
- The units and components must not be exposed to any mechanical load, extreme levels of humidity or extreme temperature.
- Spaces in which refrigerant can leak sufficient to load and vent. Otherwise there is danger of suffocation.
- All housing parts and device 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 at least once annually. 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.
- Local regulations and laws such as Water Ecology Act must be observed.
- The 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 a heightened 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 must not be altered 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 Units data WKF / WKF-compact 70

Series		WKF 70	WKF-compact 70
Function		Heating or Cooling	
System		Split-Air/Water	
Heat pump manager		Smart-Control	
Domestic water storage tank, enamelled		optional	Ser. 300 l
Electric booster heating / rated output	kW	optional / 9,0	
Domestic hot-water heating (changeover valve)		optional	Series
Connecting oil-/ gas boiler		optional	
Heating capacity min / max	kW	1,2 - 6,0	
Heating capacity / compressor frequency / COP for A12/W35	kW/Hz/COP	6,00/56/5,10	
Heating capacity / compressor frequency / COP [1] for A7/W35	kW/Hz/COP	5,46/54/4,62	
Heating capacity / compressor frequency / COP [1] for A2/W35	kW/Hz/COP	4,61/65/3,50	
Heating capacity / compressor frequency / COP [1] for A-7/W35	kW/Hz/COP	4,50/81/2,80	
Heating capacity / compressor frequency / COP [1] for A-15/W35	kW/ Hz/COP	4,70/88/2,50	
Heating capacity / compressor frequency / COP [1] for A7/W45	kW/Hz/COP	5,00/56/3,60	
Heating capacity / compressor frequency / COP [1] for A-7/W45	kW/Hz/COP	4,40/81/2,60	
Heating capacity / compressor frequency / COP [1] for A7/W55	kW/Hz/COP	5,00/56/2,80	
Heating capacity / compressor frequency / COP [1] for A-7/W55	kW/Hz/COP	4,70/81/1,70	
Heating capacity / compressor frequency / COP [1] for A10/W35	kW/Hz/COP	5,80/54/4,92	
Cooling capacity min. / max.	kW	1,33- 5,30	
Cooling capacity / compressor frequency / EER for A35/W7	kW/Hz/EER	4,90/49/2,80	
Cooling capacity / compressor frequency / EER for A35/W18	kW/Hz/EER	6,70/49/3,60	
Cooling capacity / compressor frequency / EER for A27/W18	kW/Hz/EER	6,80/49/3,90	
Service limits, heating	°C	-20 - +35	
Service limits, cooling	°C	+10 - +46	
Supply-temperature, heating water	°C	55	
Min. Supply-temperature, cooling	°C	7	
Refr. / pre-charge quantity out. mod.	-- / kg	R 410A[2] / 1,20	
Refrigerant / additional quantity for up to 5 m length of ordinary pipe	g / m	50	
Refrigerant connection	Inches (mm)	3/8" (9,52) / 5/8" (15,9)	
Max. refrigerant pipe length	m	30	

Series		WKF 70	WKF-compact 70
Max. refrigerant pipe height	m	20	
Power supply	V / Hz	220-240 / 50	
Max. current consumption	A	15,0	
Rated current consumption for A7/W35	A	5,19	
Rated power consumption for A7/W35	kW	1,18	
Rated power consumption for A2/W35	kW	1,32	
Max. power consumption	kW	3,50	
Power factor A7/W35 (cosφ)	--	0,99	
Fuse protection on-site (o. mod.)	A / delax-action fuse	16	
Rated water flow (acc. to EN 14511, at Δt 5 K)	m³/h	0,95	
Pressure-loss at the condenser at nominal flow rate	bar	0,095	
Pressure-loss external	kPa	80	
Max. air-nominal flow rate outdoor module	m³/h	2650	
Max. operating pressure, water	bar	3	
Hydraulic connection, supply / return	Zoll (mm)	1" 1/4(31,8)	
Sound-power level in accordance with DIN EN 12102:2008-09 and ISO 9614-2	dB(A)	63,2	
Sound-pressure level, LpA (out. mod.) [3]	dB(A)	41,2	
Dimensions, indoor module (h/w/d)	mm	500/800/500	1928/800/790
Dimensions, outdoor module (h/w/d)	mm	638 / 880 / 310	
Enclosure class outdoor module	--	IP X4	
Weight indoor module	kg	50	248
Weight outdoor module	kg	47,5	

[1] COP = coefficient of performance or performance number according to EN 14511

[2] Contains greenhouse gas according to Kyoto protocol, GWP 1975

[3] Distance 5m, VDE tested, A7/W55/65Hz, at half spherical propagation

Data provided without guarantee! We reserve the right to modify the dimensions and constructional design as part of the ongoing technical-development process.

2.2 Product data WKF / WKF-compact 70

Average condition [1)]

Series		WKF 70	WKF-compact 70
Energy efficiency ratio, heating 35°C/55°C		A++ / A++	
Energy efficiency ratio, hot water XL		A	
Nominal heating power P rated	kW	5,0 / 6,0	
Room heating energy efficiency ηs 35°C/55°C	%	150 / 129	
Contribution to seasonal room heating energy efficiency of the REMKO Smart Control	%	4	
Yearly energy consumption Q_{HE} 35°C/55°C [4)]		2808 / 3705	
Hot water preparation energy efficiency ηwH	%	103	
Sound power level L_{WA} (outdoor module)	dB(A)	63,2	
Sound power level L_{WA} (indoor module)	dB(A)	-	

Warmer condition [2)]

Series		WKF 70	WKF-compact 70
Energy efficiency ratio, heating 35°C/55°C		A++ / A++	
Energy efficiency ratio, hot water XL		A	
Nominal heating power P rated	kW	5,0 / 6,0	
Room heating energy efficiency ηs 35°C/55°C	%	174 / 157	
Yearly energy consumption Q_{HE} 35°C/55°C [4)]		1389 / 1610	

Colder condition [3)]

Series		WKF 70	WKF-compact 70
Energy efficiency ratio, heating 35°C/55°C		A+ / A+	
Energy efficiency ratio, hot water XL		A	
Nominal heating power P rated	kW	6,0 / 8,0	
Room heating energy efficiency ηs 35°C/55°C	%	132 / 108	
Yearly energy consumption Q_{HE} 35°C/55°C [4)]		4525 / 6889	

[1)] Average condition = moderate temperature periods

[2)] Warmer condition = warm temperature periods

[3)] Colder condition = cold temperature periods

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

2.3 Units data WKF/WKF-compact 120/180

Series		WKF 120	WKF-compact 120	WKF 180	WKF-compact 180
Function		Heating or Cooling			
System		Split-Air/Water			
Heat pump manager		Smart-Control			
Enamelled DHW storage tank		on-site	ser. 300 l	optional	ser. 300 l
Electric booster heating / rated output	kW	optional / 9,0			
Domestic hot-water heating (changeover valve)		optional	series	optional	series
Connecting oil-/ gas boiler		optional			
Heating capacity min / max	kW	2,5 - 12,5		3,1 - 17,7	
Heating capacity / compressor frequency / COP for A12/W35	kW/Hz/COP	10,96/61/4,82		16,02 / 56 / 5,33	
Heating capacity / compressor frequency / COP [1)] for A7/W35	kW/Hz/COP	9,86/61/4,44		14,02 / 56 / 4,53	
Heating capacity / compressor frequency / COP [1)] for A2/W35	kW/Hz/COP	6,95/60/3,64		9,32 / 56 / 3,53	
Heating capacity / compressor frequency / COP [1)] for A-7/W35	kW/Hz/COP	6,14/61/2,89		8,20 / 56 / 2,87	
Heating capacity / compressor frequency / COP [1)] for A-15/W35	kW/ Hz/COP	4,82/61/2,39		6,36 / 56 / 2,40	
Heating capacity / compressor frequency / COP [1)] for A7/W45	kW/Hz/COP	10,15/58/3,67		12,27 / 58 / 3,46	
Heating capacity / compressor frequency / COP [1)] for A7/W55	kW/Hz/COP	8,99/61/2,78		12,85 / 56 / 2,92	
Heating capacity / compressor frequency / COP [1)] for A-7/W55	kW/Hz/COP	4,63/61/1,79		6,99 / 56 / 1,94	
Heating capacity / compressor frequency / COP [1)] for A10/W35	kW/Hz/COP	11,2/61/4,74		15,9/56/4,83	
Cooling capacity min. / max.	kW	3,3 - 9,1		2,8 - 15,0	
Cooling capacity / compressor frequency / EER for A35/W7	kW/Hz/EER	6,79/66/2,33		12,2 / 72 / 2,60	
Cooling capacity / compressor frequency / EER for A35/W18	kW/Hz/EER	5,3/38/3,66		12,7 / 38 / 3,81	
Cooling capacity / compressor frequency / EER for A27/W18	kW/Hz/EER	9,46/66/3,61		18,20 / 66 / 4,08	
Service limits, heating	°C	-20 - +45			
Service limits, cooling	°C	+15 - +45			
Supply-temperature, heating water	°C	55			
Min. Supply-temperature, cooling	°C	7			

REMKO WKF/WKF-compact series

Series		WKF 120	WKF-compact 120	WKF 180	WKF-compact 180
Refr. / pre-charge quantity out. mod.	-- / kg	R 410A[2] / 2,00		R 410A[2] / 2,85	
Refrigerant / pre-charge quantity for up to 10 m length of ordinary pipe	g / m	50			
Refrigerant connection	Inch (mm)	3/8" (9,52) / 5/8" (15,9)			
Max. refrigerant pipe length	m	50		75	
Max. refrigerant pipe height	m	30			
Power supply	V / Hz	220-240 / 50		380-415 / 3~ / 50	
Max. current consumption	A	16,8		7,2 per phase	
Rated current consumption for A7/W35	A	10,44		5,02 (per phase)	
Rated power consumption for A7/W35	kW	2,22		3,09	
Rated power consumption for A2/W35	kW	1,91		2,64	
Max. power consumption	kW	4,0		4,5	
Power factor A7/W35 (cosφ)	--	0,97		0,95	
Fuse protection on-site (o. mod.)	A delax-action fuse	20		3 x 16 A	
Rated water flow (acc. to EN 14511, at Δt 5 K)	m^3/h	1,70		2,4	
Pressure-loss at the condenser at nominal flow rate	bar	0,1			
Pressure-loss external	kPa	80			
Max. air-nominal flow rate outdoor mod.	m^3/h	4450		6200	
Max. operating pressure, water	bar	3			
Hydraulic connection, supply / return	Zoll (mm)	1 1/4" (31,8)			
Sound-power level in accordance with DIN EN 12102:2008-09 and ISO 9614-2	dB(A)	67,9		68,3	
Sound-pressure level, LpA (out. mod.) [3]	dB(A)	42,2		42,4	
Dimensions, indoor module (h/w/d)	mm	500/800/500	1928/800/790	500/800/500	1928/800/790
Dimensions, outdoor module (h/w/d)	mm	998 / 940 / 330		1420 / 940 / 330	
Enclosure class outdoor module	--	IP 24			
Weight indoor module	kg	50	250	55	252
Weight outdoor module	kg	74		100	

[1] COP = coefficient of performance or performance number according to EN 14511

[2] Contains greenhouse gas according to Kyoto protocol, GWP 1975

[3] Distance 5 m, VDE tested, A7/W55/58Hz, at full spherical propagation

Data provided without guarantee! We reserve the right to modify the dimensions and constructional design as part of the ongoing technical-development process.

2.4 Product data WKF/WKF-compact 120/180

Average condition [1)]

Series		WKF 120	WKF-compact 120	WKF 180	WKF-compact 180
Energy efficiency ratio, heating 35°C/55°C		A+ / A+		A+ / A+	
Energy efficiency ratio, hot water XL		A		A	
Nominal heating power P rated	kW	10,0		14,0	
Room heating energy efficiency ηs 35°C/55°C	%	147 / 118		146 / 122	
Contribution to seasonal room heating energy efficiency of the REMKO Smart Control	%	4		4	
Yearly energy consumption Q_{HE} 35°C/55°C [4)]		5514 / 6610		7860 / 9098	
Hot water preparation energy efficiency ηwH	%	102		107	
Sound power level L_{WA} (outdoor module)	dB(A)	67,9		68,3	
Sound power level L_{WA} (indoor module)	dB(A)	-		-	

Warmer condition [2)]

Series		WKF 120	WKF-compact 120	WKF 180	WKF-compact 180
Energy efficiency ratio, heating 35°C/55°C		A++ / A+		A+++ / A++	
Energy efficiency ratio, hot water XL		A		A	
Nominal heating power P rated	kW	9,0		12,0	
Room heating energy efficiency ηs 35°C/55°C	%	165 / 123		180 / 143	
Yearly energy consumption Q_{HE} 35°C/55°C [4)]		2968 / 3354		3803 / 5349	

Colder condition [3)]

Series		WKF 120	WKF-compact 120	WKF 180	WKF-compact 180
Energy efficiency ratio, heating 35°C/55°C		A+ / A+		A+ / A+	
Energy efficiency ratio, hot water XL		A		A	
Nominal heating power P rated	kW	12,0		18,0	
Room heating energy efficiency ηs 35°C/55°C	%	136 / 104		134 / 105	
Yearly energy consumption Q_{HE} 35°C/55°C [4)]		8481 / 12282		13300 / 17407	

[1)] Average condition = moderate temperature periods

[2)] Warmer condition = warm temperature periods

[3)] Colder condition = cold temperature periods

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

REMKO WKF/WKF-compact series

2.5 Unit data WKF 120/180 Duo

Series		WKF 120 Duo	WKF 180 Duo
Function		Heating or Cooling	
System		Split air/water	
Heat pump manager		Smart Control	
Enamelled drinking water storage tank		External	
Auxiliary heater / rated output	kW	Optional / 9 kW	
Domestic hot-water heating (changeover valve)		Optional, external	
Connection oil/gas-fired boiler		External	
Heating capacity min. / max.	kW	2.5-25.0	3.1-35.4
Heating capac. / compr. frequency / COP for A12/W35	kW/Hz/COP	21.92/61/4.82	32.4/56/5.33
Heating capac. / compr. frequency / COP [1] for A7/W35	kW/Hz/COP	19.72/61/4.44	28.04/56/4.53
Heating capac. / compr. frequency / COP [1] for A2/W35	kW/Hz/COP	13.90/60/3.64	18.64/56/3.53
Heating capac. / compr. frequency / COP [1] for A7/W35	kW/Hz/COP	12.28/61/2.89	16.40/56/2.87
Heating capac. / compr. frequency / COP [1] for A15/W35	kW/Hz/COP	9.64/61/2.39	12.72/56/2.40
Heating capac. / compr. frequency / COP [1] for A7/W45	kW/Hz/COP	20.30/58/3.67	24.54/56/3.46
Heating capac. / compr. frequency / COP [1] for A7/W55	kW/Hz/COP	17.98/61/2.78	25.70/56/2.92
Heating capac. / compr. frequency / COP [1] for A7/W55	kW/Hz/COP	9.26/61/1.79	13.98/56/1.94
Heating capac. / compr. frequency / COP [1] for A10/W35	kW/Hz/COP	22,4/61/4,74	31,8/56/4,83
Cooling capacity min. / max.	kW	3.30 -18.00	5.50 -32.00
Cooling capacity / compr. frequency / EER for A35/W7	kW/Hz/EER	13.58/66/2.33	24.40/72/2.60
Cooling capacity / compr. frequency / EER for A35/W18	kW/Hz/EER	10.60/38/3.66	25.4/38/3.81
Cooling capacity / compr. frequency / EER for A27/W18	kW/Hz/EER	18.92/66/3.61	36.40/66/4.01
Usable limits, heating	°C	-20 to +45	
Service limits, cooling	°C	+15 to +45	
Max. inlet temperature, heating water	°C	55	
Min inlet temperature, cooling	°C	7	
Refrigerant / basic capacity per outdoor unit	-- / kg	410A / 2.00	410 A / 2.80
Refrigerant / pre-charge quantity for up to 10 m length of ordinary pipe	g/m	50	
Refrigerant connections	Inches (mm)	3/8" (9.52) / 5/8" (15.9)	
Refrigerant piping length, max.	m	50	75
Refrigerant piping height, max.	m	30	
Power supply per outdoor unit	V / Hz	220-240/50	380-415/50
Max. current consumption per outdoor unit	A	16.8	7.20
Rated current consumption for A7/W35 (per phase) p/OU	A	10.44	5.02

Series		WKF 120 Duo	WKF 180 Duo
Rated power consumption for A7/W35 per outdoor unit	kW	2.22	3.09
Rated power consumption for A2/W35 per outdoor unit	kW	1,91	2,64
Max. power consumption per outdoor unit	kW	4.00	4.50
Power factor for A7/W35 (cosφ) per outdoor unit	--	0.97	0.95
Fuse protection provided by the customer (per outdoor unit)	A delax-action fuse	20	3 x 16 A
Nominal medium water flow rate (according to EN 14511, at Δt 5 K)	m^3/h	2 x 1.70	2 x 2.4, total 4.8
Pressure-loss at the condenser at nom. medium flow rate	bar	0.10	
Pressure loss, external	kPa	80	
Airflow volume per outdoor unit	m^3/h	3500	5400
Max. operating pressure, water	bar	3	
Hydraulic connection, inlet / return	Inches	1 1/2" AG	
Recommended pipe dimension, Cu pipe	mm	42	
Sound pressure level, LpA (outdoor unit) [3)]	dB(A)	42	42
Sound power level acc. to DIN EN 12102:2008-09 and ISO 9614-2 per outdoor unit	dB(A)	67.9	68.3
Dimensions, indoor unit (height/width/depth)	mm	1000x800x500	
Dimensions, outdoor unit (height/width/depth)	mm	998/940/330	1420/940/330
Protection class outdoor unit	--	IP 24	
Weight, indoor unit	kg	85	87
Weight per outdoor unit	kg	74	98

[1)] COP = coefficient of performance (heating capacity figure) in accordance with EN 14511, VDE tested

[2)] Contains greenhouse gas according to Kyoto protocol, GWP 1975

[3)] Distance 5 m, VDE tested, A7/W55/58Hz, with spherical diffusion

Information provided without guarantee! We reserve the right to make technical changes within the framework of technical advancement.

2.6 Product data WKF 120/180 Duo

Average condition [1)]

Series		WKF 120 Duo	WKF 180 Duo
Energy efficiency ratio, heating 35°C/55°C		A++ / A+	A++ / A++
Energy efficiency ratio, hot water XL		A	A
Nominal heating power P rated	kW	18,0	29,0
Room heating energy efficiency ηs 35°C/55°C	%	154 / 116	151 / 125
Contribution to seasonal room heating energy efficiency of the REMKO Smart Control	%	4	4
Yearly energy consumption Q_{HE} 35°C/55°C [4)]		9282 / 11218	15524 / 17 719
Hot water preparation energy efficiency ηwH	%	102	107
Sound power level L_{WA} (outdoor module)	dB(A)	67,9	67,9
Sound power level L_{WA} (indoor module)	dB(A)	-	-

Warmer condition [2)]

Series		WKF 120 Duo	WKF 180 Duo
Energy efficiency ratio, heating 35°C/55°C		A+++ / A++	A+++ / A+++
Energy efficiency ratio, hot water XL		A	A
Nominal heating power P rated	kW	17,0	25,0
Room heating energy efficiency ηs 35°C/55°C	%	184 / 134	194 / 152
Yearly energy consumption Q_{HE} 35°C/55°C [4)]		4897 / 4953	6981 / 7338

Colder condition [3)]

Series		WKF 120 Duo	WKF 180 Duo
Energy efficiency ratio, heating 35°C/55°C		A+ / A+	A+ / A+
Energy efficiency ratio, hot water XL		A	A
Nominal heating power P rated	kW	24,0	38,0
Room heating energy efficiency ηs 35°C/55°C	%	137 / 103	125 / 103
Yearly energy consumption Q_{HE} 35°C/55°C [4)]		16918 / 19617	29632 / 35842

[1)] Average condition = moderate temperature periods

[2)] Warmer condition = warm temperature periods

[3)] Colder condition = cold temperature periods

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

2.7 Unit dimensions outdoor module

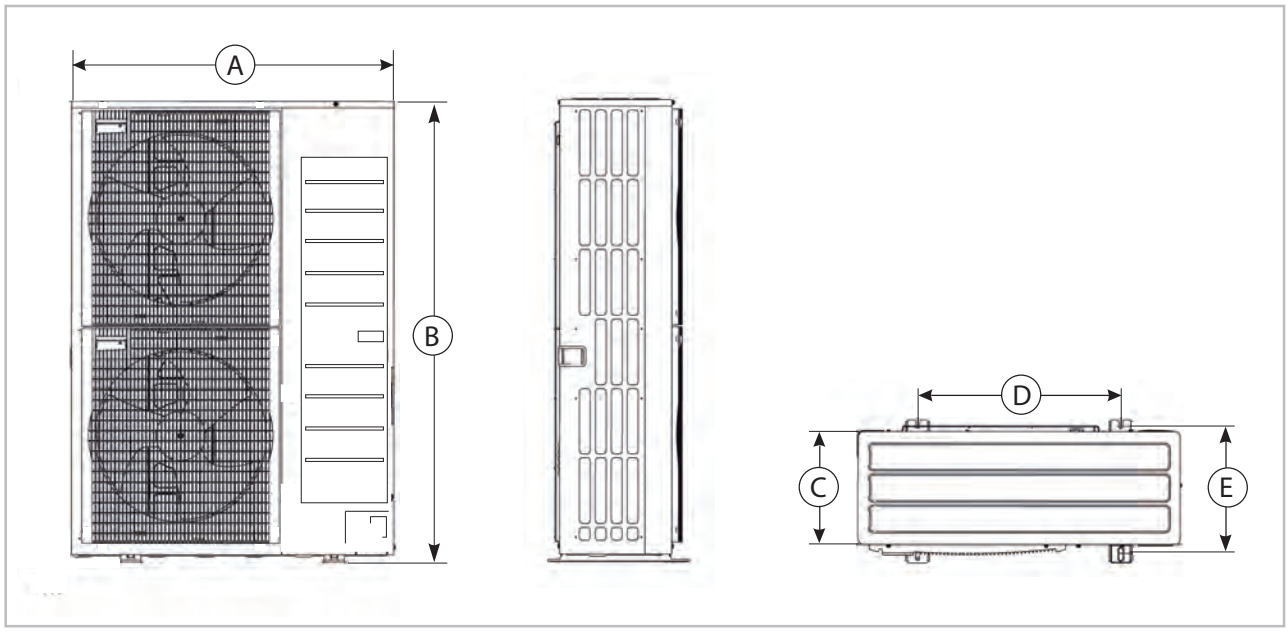

Fig. 1: Unit dimensions outdoor module WKF / WKF-compact70/120/180

Dimensions in mm	A	B	C	D	E
WKF/WKF-compact 70	880	638	364	660	340
WKF/WKF-compact 120	940	1010	330	620	360
WKF/WKF-compact 180	940	1430	330	620	350
WKF 120 Duo	940	1010	330	620	360
WKF 180 Duo	940	1430	330	620	350

2.8 Unit dimensions indoor modules

Unit dimensions indoor modules WKF 70/120/180

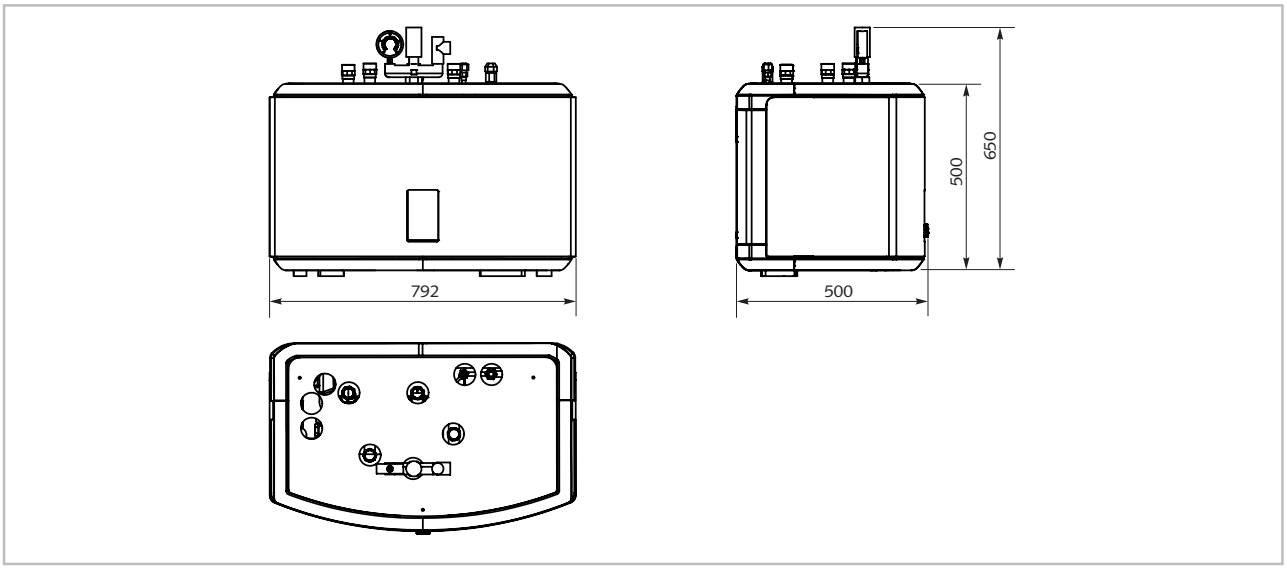

Fig. 2: Unit dimensions indoor modules series WKF 70/120/180 (all dimensions in mm)

Pipe-socket arrangement WKF 70/120/180

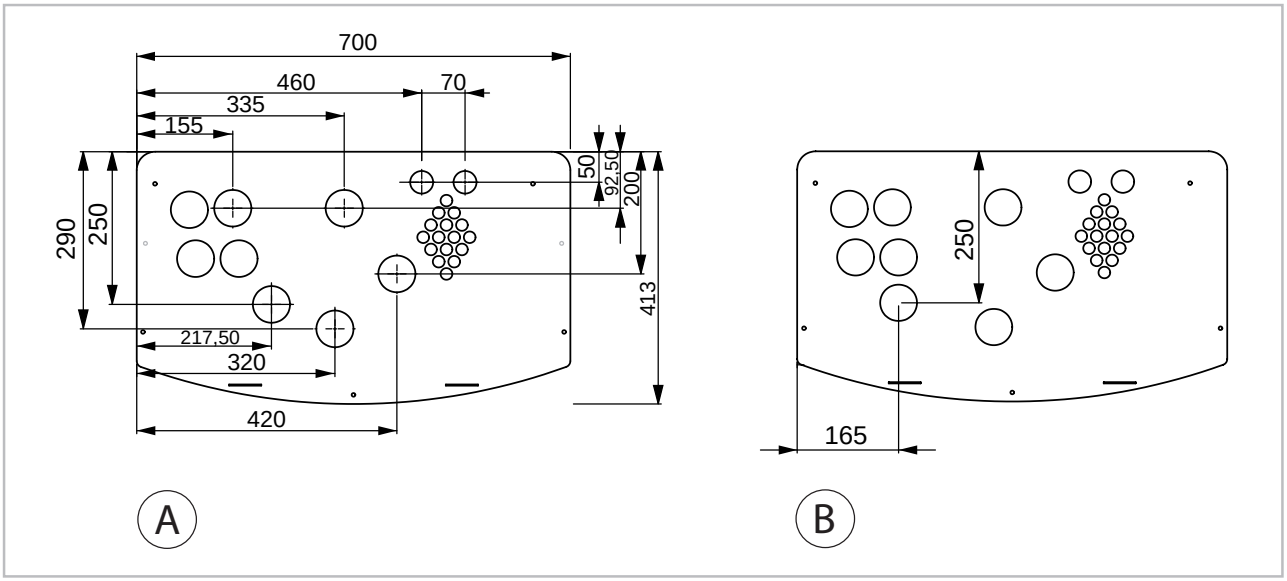

Fig. 3: Pipe-socket arrangement WKF 70/120/180 (all dimensions in mm)

A: Bivalent mode

B: Monovalent mode

Designations of the pipe connections WKF 70/120/180

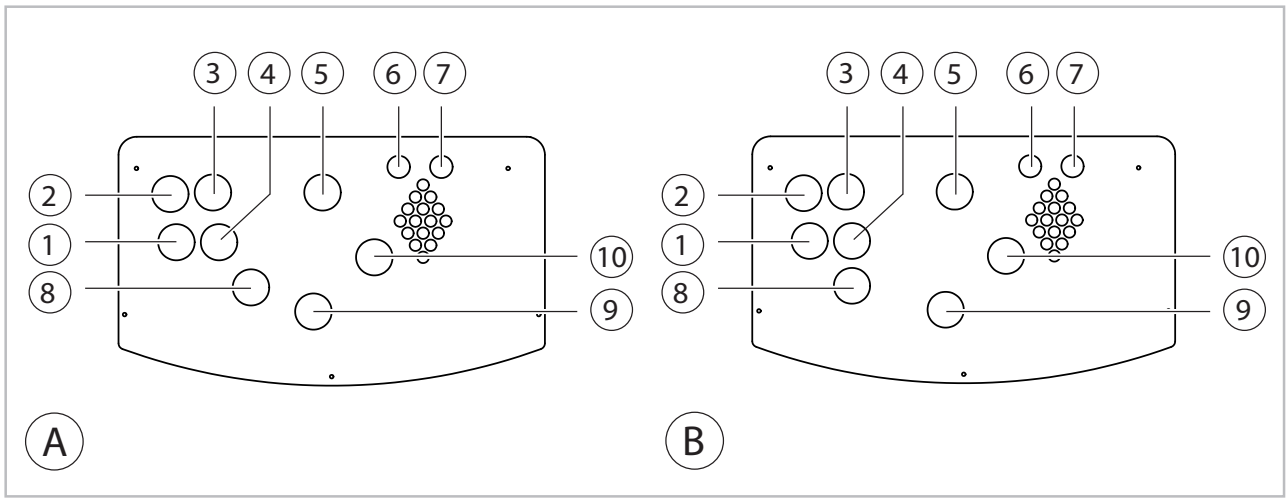

Fig. 4: Designations on the pipe connections WKF 70/120/180

A: Bivalent mode
B: Monovalent mode
1: Circulation 1"
2: Cold water inlet 1"
3: Inlet heater 1 1/4"
4: Warm water 1"
5: Return heater 1 1/4"
6: Refrigerant liquid pipe 3/8"
7: Refrigerant heat gas pipe 5/8"
8: 2nd heat generator return 1" (Outlet heat pump)
9: Safety assembly 1"
10: 2nd heat generator inletf 1" (Inlet heat pump)

Unit dimensions indoor modules WKF/WKF-compact 70/120/180

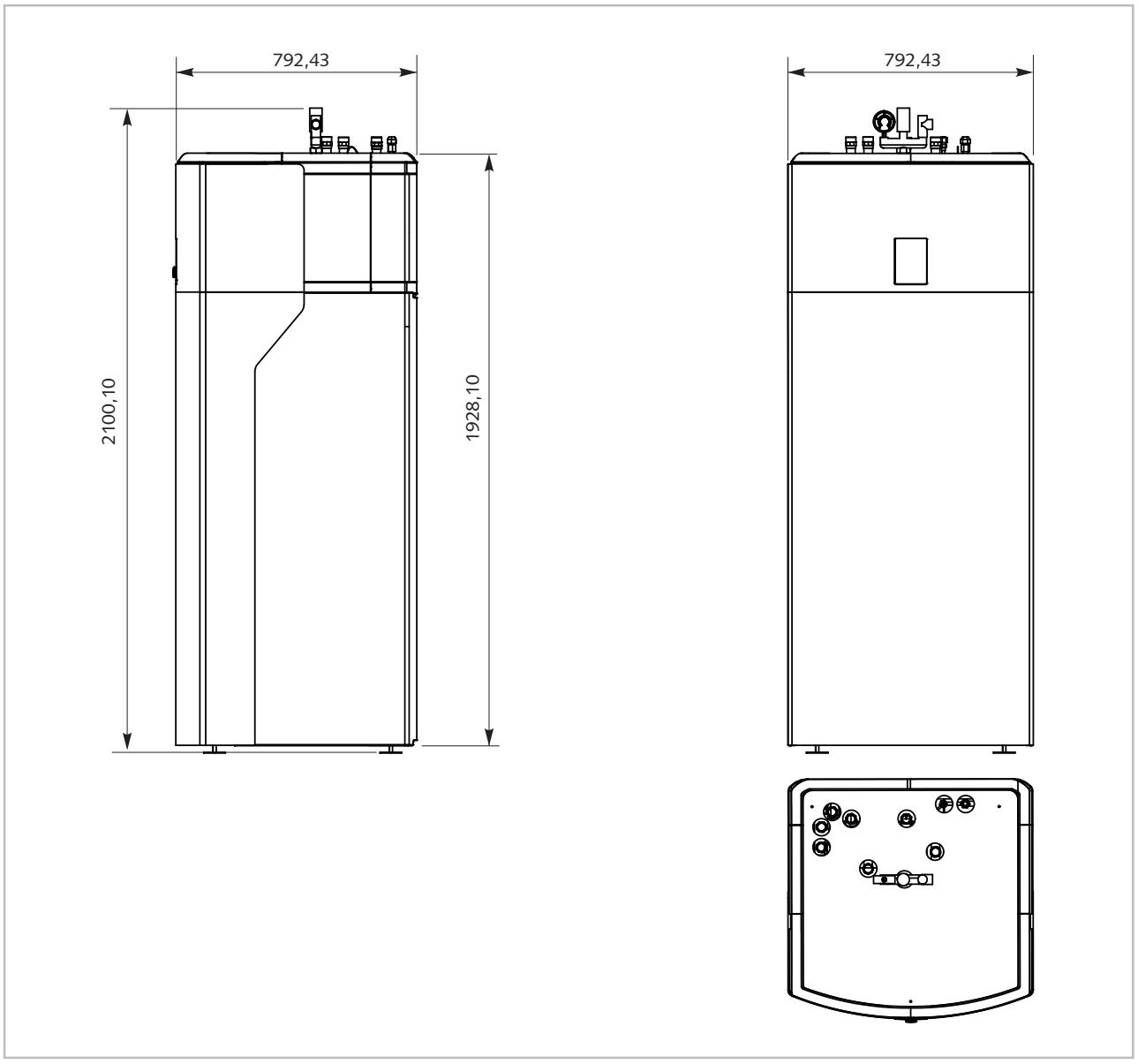

Fig. 5: Unit dimensions indoor modules WKF-compact 70/120/180 (all dimensions in mm)

Pipe-socket arrangement WKF-compact 70/120/180

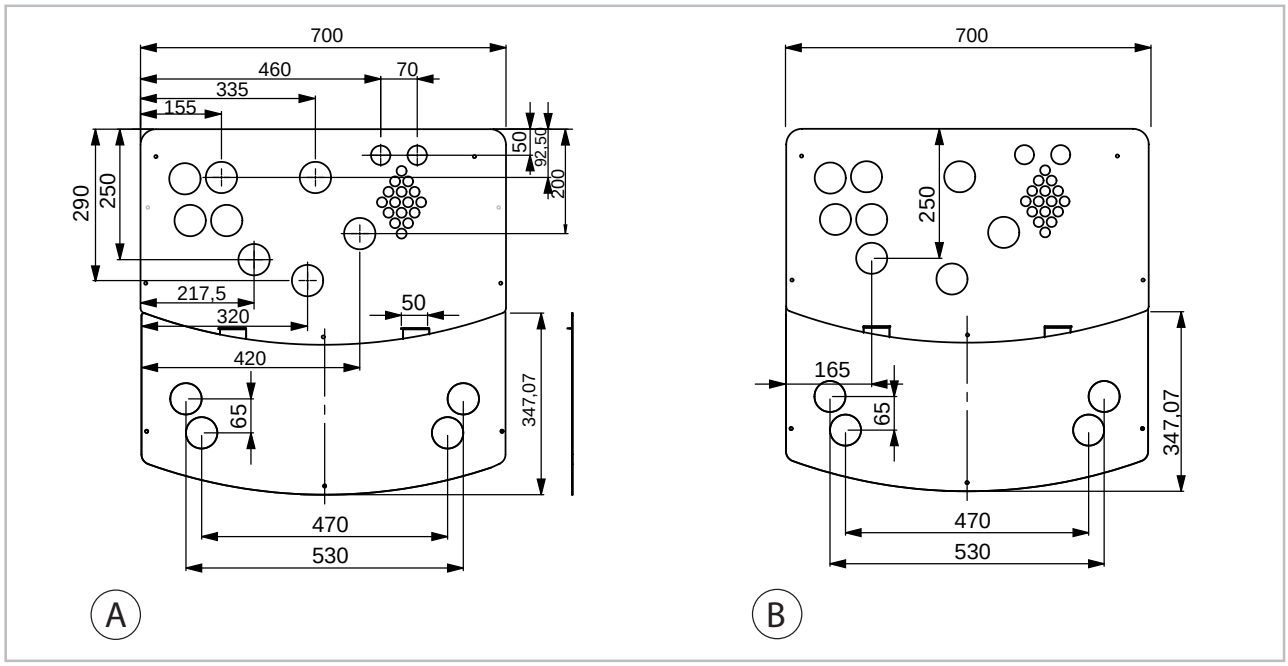

Fig. 6: Pipe-socket arrangement WKF-compact 70/120/180 (all dimensions in mm)

A: Bivalent mode

B: Monovalent mode

Designations of the pipe connections WKF-compact 70/120/180

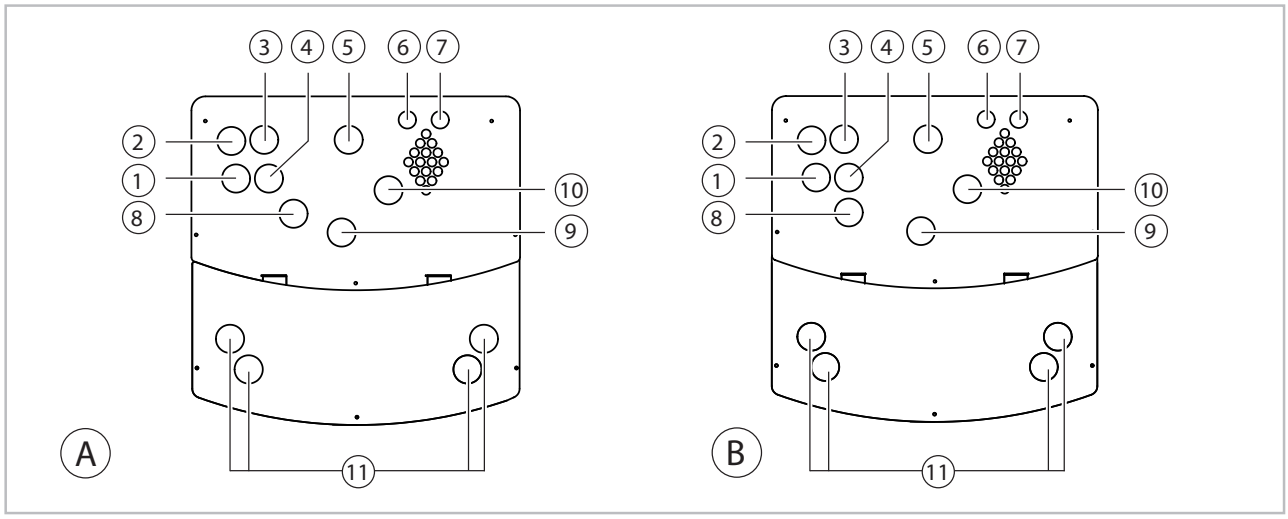

Fig. 7: Designations of the pipe connections WKF-compact 70/120/180

A: Bivalent mode
B: Monovalent mode
1: Circulation 1"
2: Cold water inlet 1"
3: Inlet heater 1 1/4"
4: Warm water 1"
5: Return heater 1 1/4"
6: Refrigerant liquid pipe 3/8"
7: Refrigerant heat gas pipe 5/8"
8: 2nd heat generator return 1" (Outlet heat pump)
9: Safety assembly 1"
10: 2nd heat generator inlet 1" (Inlet heat pump)
11: Connections solar 3/4"

Unit dimensions indoor modules WKF 120/180 Duo

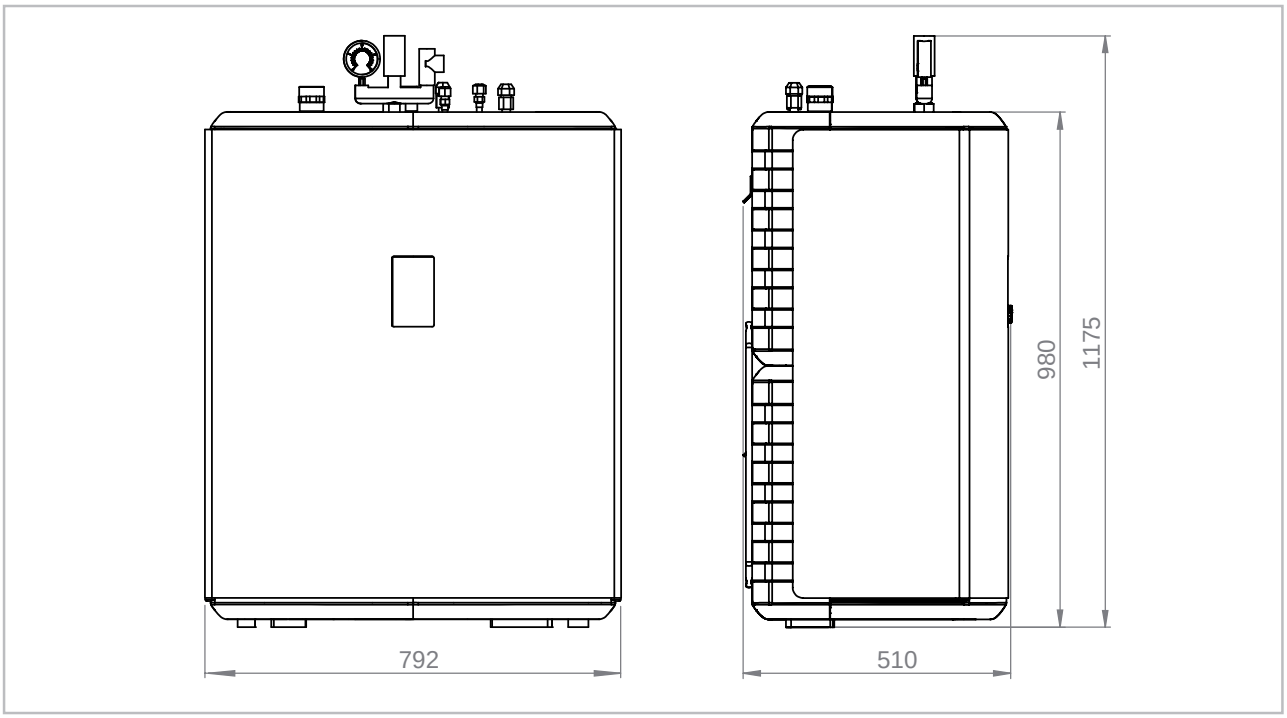

Fig. 8: Unit dimensions indoor modules WKF 120/180 Duo (all dimensions in mm)

Arrangement of the pipe sockets and designations on the pipe connections WKF 120/180 Duo

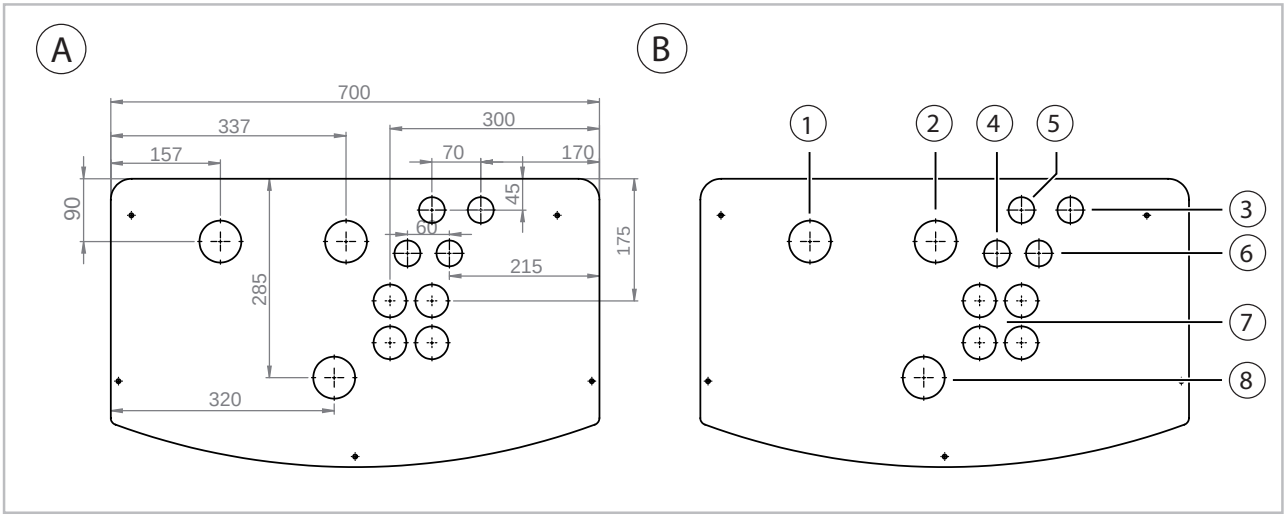

Fig. 9: Arrangement of the pipe sockets and designations on the pipe connections WKF 120/180 Duo (all dimensions in mm)

A: Pipe connection arrangement / B: Designations of the pipe connections
1: Heat pump outlet, 1 1/2"
2: Heat pump return, 1 1/2"
3: Refrigerant heat gas pipe, Outdoor unit A 5/8"
4: Refrigerant liquid pipe, Outdoor unit B 3/8"
5: Refrigerant liquid pipe, Outdoor unit A 3/8"
6: Refrigerant heat gas pipe, Outdoor unit B 5/8"
7: Cable feedthrough
8: Safety assembly

2.9 Heat pump service limits in monovalent mode

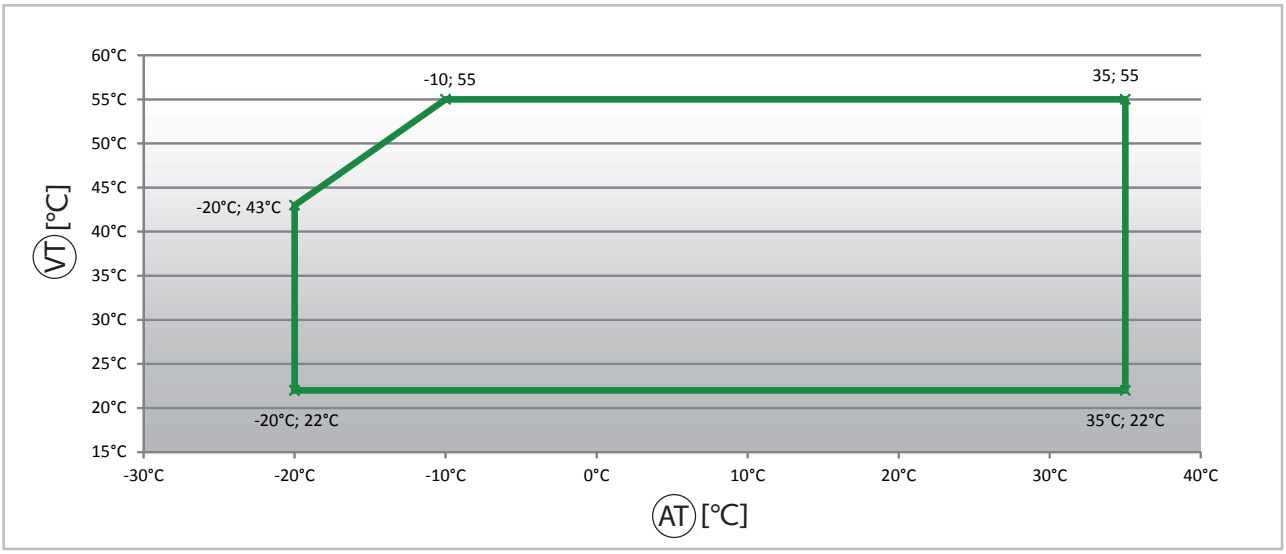

Fig. 10: Service limits and test points WKF/WKF-compact 70

AT: Outside temperature / VT: Inlet temperature

Outdoor temperature [°C]	-20	-20	-10	20	35	35
Inlet temperature [°C]	22	43	55	55	55	22

NOTE:

The left temperature value in the diagram refers to the supply-temperature heating water and the lower refers the outdoor air temperature.

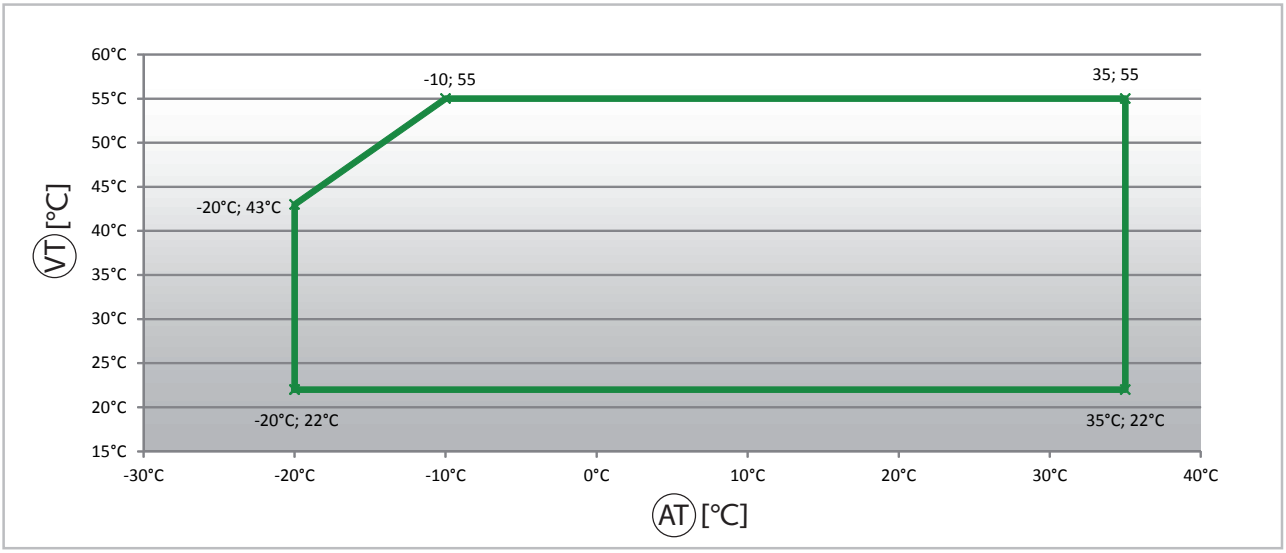

Fig. 11: Service limits and test points WKF/WKF-compact 120

AT: Outside temperature / VT: Inlet temperature

Outdoor temperature [°C]	-20	-20	-10	20	35	35
Inlet temperature [°C]	22	43	55	55	55	22

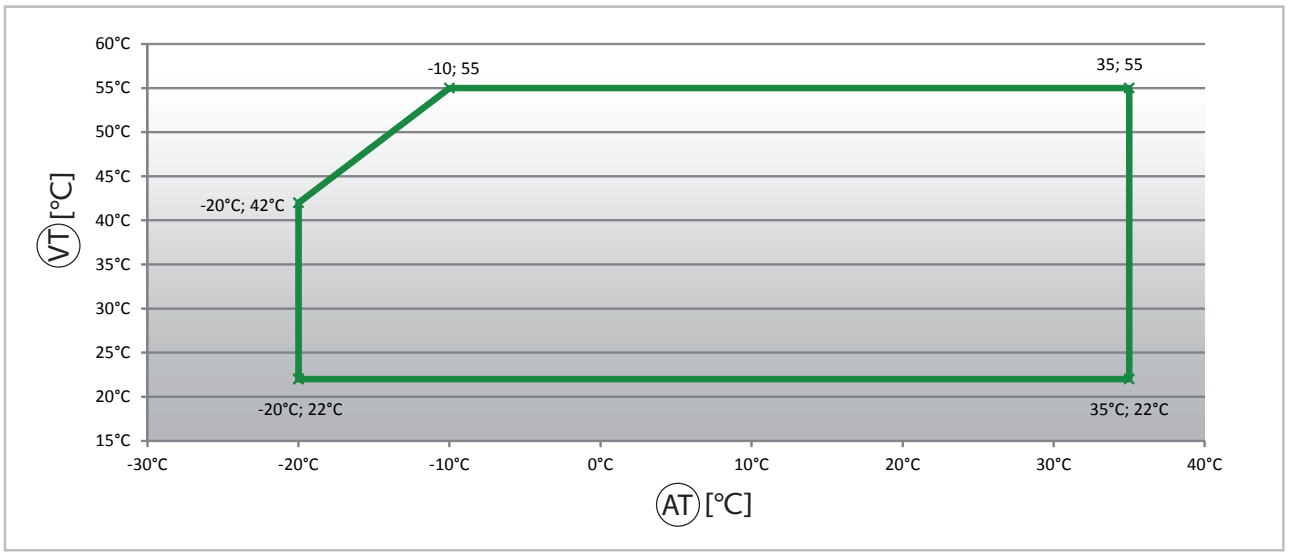

Fig. 12: Service limits and test points WKF/WKF-compact 180

AT: Outside temperature / VT: Inlet temperature

Outdoor temperature [°C]	-20	-20	-10	20	35	35
Inlet temperature [°C]	22	42	55	55	55	22

NOTE:

The left temperature value in the diagram refers to the supply-temperature heating water and the lower refers the outdoor air temperature.

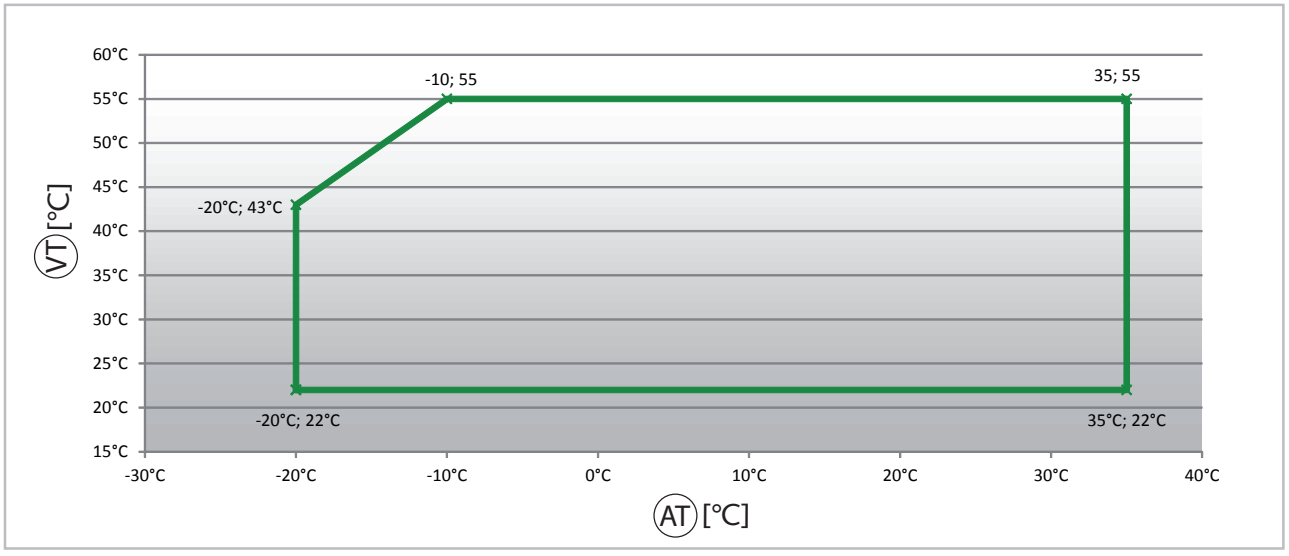

Fig. 13: Service limits and test points WKF 120 Duo

AT: Outside temperature / VT: Inlet temperature

Outdoor temperature [°C]	-20	-20	-10	20	35	35
Inlet temperature [°C]	22	43	55	55	55	22

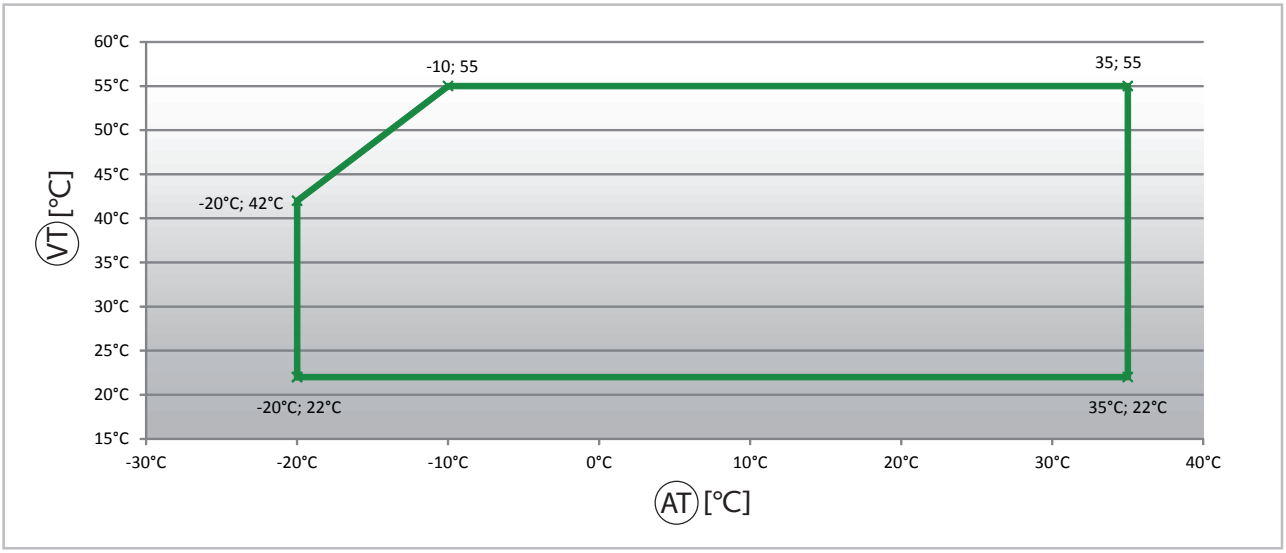

Fig. 14: Service limits and test points WKF 180 Duo

AT: Outside temperature / VT: Inlet temperature

Outdoor temperature [°C]	-20	-20	-10	20	35	35
Inlet temperature [°C]	22	42	55	55	55	22

2.10 Pump-characteristic curves, indoor module charging pump

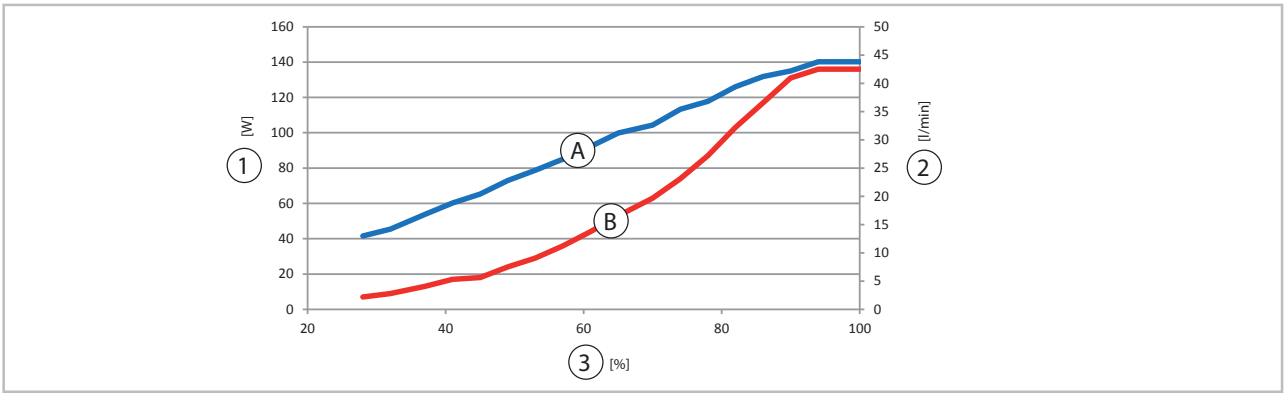

Fig. 15: Circulation pump Grundfoss UPML 25-105 180 PWM - power range

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

2.11 Overall sound pressure levels for outdoor modules

Outdoor module WKF/WKF-compact 70

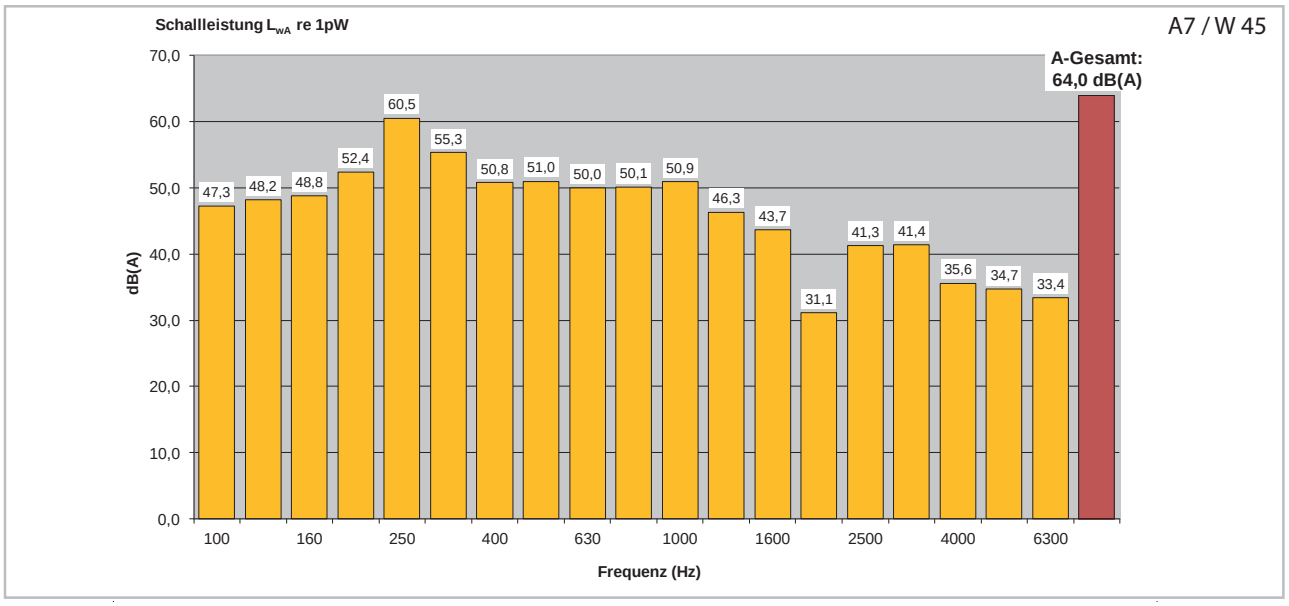

Fig. 16: Overall sound pressure level L_P of REMKO outdoor module series: WKF/WKF-compact 70

Middle frequency [Hz]	25	31,50	40	50	63	80	100	125	160
LI [dBA]	(25,6)	(38,3)	(30,8)	(37,7)	(35,1)	(31,3)	38,2	39,1	39,7
LWo [dBA]	(34,7)	(47,4)	(39,9)	(46,9)	(44,3)	(40,4)	47,3	48,2	48,8
FPI [dB]	-(14,7)	-(8,2)	-(8,8)	-(5,2)	-(3,5)	1(1,3)	0,6	2,0	4,7

Middle frequency [Hz]	200	250	315	400	500	630	800	1000	1250
LI [dBA]	43,3	54,3	46,1	41,6	41,9	40,8	41,0	41,8	37,2
LWo [dBA]	52,4	60,5	55,3	50,8	51,0	50,0	50,1	50,9	46,3
FPI [dB]	6,3	4,0	7,4	10,0	10,9	12,8	12,0	11,1	13,0

Middle frequency [Hz]	1600	2000	2500	3150	4000	5000	6300	8000	10000
LI [dBA]	34,6	21,9	32,1	32,3	26,5	25,6	24,3	(21,3)	(24,1)
LWo [dBA]	43,7	31,1	41,3	41,4	35,6	34,7	33,4	(30,4)	(33,2)
FPI [dB]	14,7	27,2	13,9	11,7	13,0	10,6	9,2	(7,7)	(4,5)

Determination of sound power conforms to accuracy class 2, the standard deviation of the o. a. A-valued sound-power levels amounts to 1.5 dB.

LWo: Sound power level radiated by the outdoor unit

FPI: Correction value with regard to the environment

LI: Sound intensity

Outdoor module WKF/WKF-compact 120

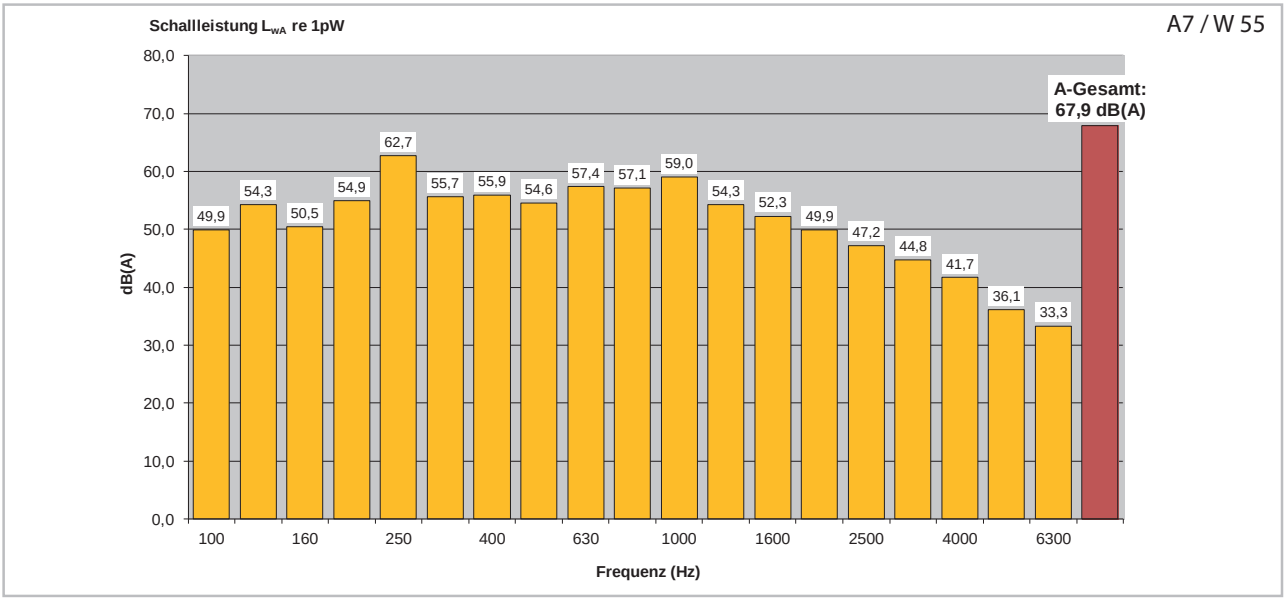

Fig. 17: Overall sound pressure level L_P of REMKO outdoor module series: WKF/WKF-compact 120

Middle frequency [Hz]	25	31,50	40	50	63	80	100	125	160
LI [dBA]	(27,6)	(40,9)	(38,3)	(31,4)	(45,3)	(33,5)	40,0	44,4	40,6
LWo [dBA]	(37,5)	(50,8)	(48,2)	(41,3)	(55,2)	(43,4)	49,9	54,3	50,5
FPI [dB]	-(14,3)	-(8,3)	-(8,5)	-(6,6)	-(3,6)	-(2,0)	-0,2	0,7	2,6

Middle frequency [Hz]	200	250	315	400	500	630	800	1000	1250
LI [dBA]	45,0	52,8	45,8	46,0	44,7	47,5	47,2	49,1	44,4
LWo [dBA]	54,9	62,7	55,7	55,9	54,6	57,4	57,1	59,0	54,3
FPI [dB]	4,3	4,3	5,6	6,7	7,1	7,1	11,2	6,0	6,0

Middle frequency [Hz]	1600	2000	2500	3150	4000	5000	6300	8000	10000
LI [dBA]	42,4	40,0	37,3	34,9	31,8	26,2	23,4	(21,6)	(16,2)
LWo [dBA]	52,3	49,9	47,2	44,8	41,7	36,1	33,3	(31,5)	(26,1)
FPI [dB]	5,7	5,5	5,5	5,4	5,1	6,0	6,3	(5,5)	(5,3)

Determination of sound power conforms to accuracy class 2, the standard deviation of the o. a. A-valued sound-power levels amounts to 1.5 dB.

LWo: Sound power level radiated by the outdoor unit

FPI: Correction value with regard to the environment

LI: Sound intensity

REMKO WKF/WKF-compact series

Outdoor module WKF/WKF-compact 180

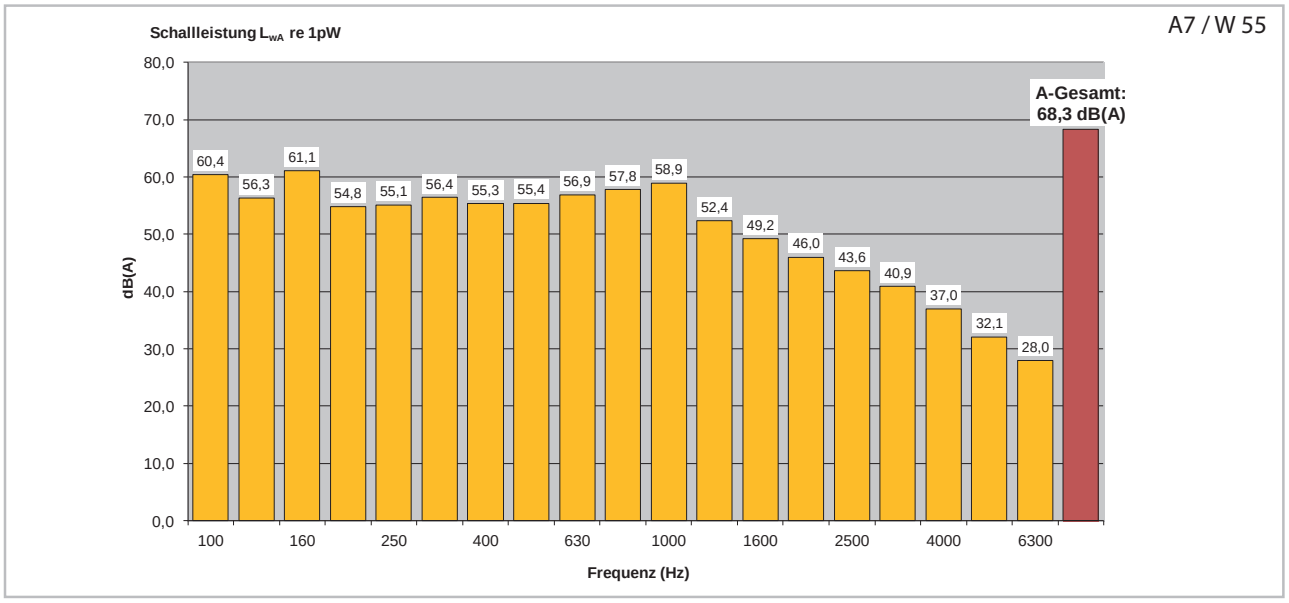

Fig. 18: Overall sound pressure level L_P of REMKO outdoor module series: WKF/WKF-compact 180

Middle frequency [Hz]	25	31,50	40	50	63	80	100	125	160
LI [dBA]	(31,4)	(41,6)	(32,8)	(40,8)	(37,3)	(37,4)	49,8	45,8	50,5
LWo [dBA]	(41,9)	(52,1)	(43,4)	(51,3)	(47,9)	(47,9)	60,4	56,3	61,1
FPI [dB]	-(11,6)	-(9,2)	-(7,7)	-(5,4)	-(3,2)	-(2,0)	0,0	1,1	2,1

Middle frequency [Hz]	200	250	315	400	500	630	800	1000	1250
LI [dBA]	44,3	44,6	45,8	44,8	44,9	46,4	47,2	48,4	41,9
LWo [dBA]	54,8	55,1	56,4	55,3	55,4	56,9	57,8	58,9	52,4
FPI [dB]	6,1	6,4	8,7	9,4	9,6	9,2	11,6	8,4	10,0

Middle frequency [Hz]	1600	2000	2500	3150	4000	5000	6300	8000	10000
LI [dBA]	38,7	35,5	33,1	30,4	26,5	21,6	17,5	(18,1)	(8,8)
LWo [dBA]	49,2	46,0	43,6	40,9	37,0	32,1	28,0	(28,6)	(19,3)
FPI [dB]	11,4	13,9	13,2	13,0	13,5	14,7	15,2	(11,1)	(14,8)

Determination of sound power conforms to accuracy class 2, the standard deviation of the o. a. A-valued sound-power levels amounts to 1.5 dB.

LWo: Sound power level radiated by the outdoor unit

FPI: Correction value with regard to the environment

LI: Sound intensity

Outdoor module WKF 120 Duo

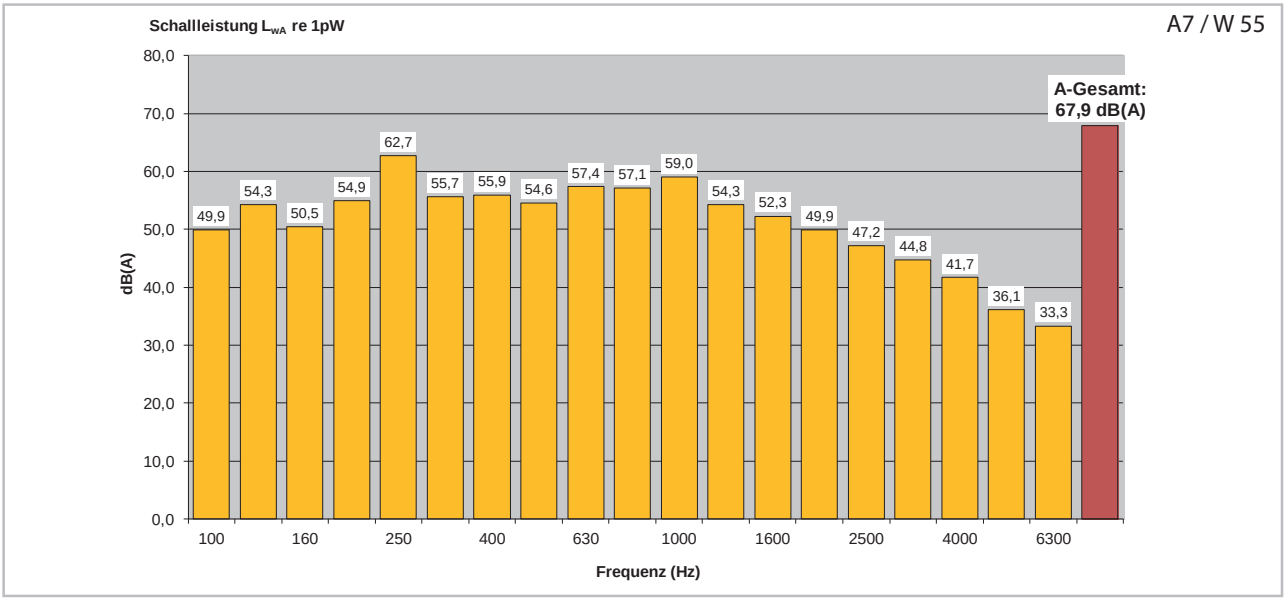

Fig. 19: Overall sound pressure level L_P of REMKO outdoor module series: WKF 120 Duo

Middle frequency [Hz]	25	31,50	40	50	63	80	100	125	160
LI [dBA]	(27,6)	(40,9)	(38,3)	(31,4)	(45,3)	(33,5)	40,0	44,4	40,6
LWo [dBA]	(37,5)	(50,8)	(48,2)	(41,3)	(55,2)	(43,4)	49,9	54,3	50,5
FPI [dB]	-(14,3)	-(8,3)	-(8,5)	-(6,6)	-(3,6)	-(2,0)	-0,2	0,7	2,6

Middle frequency [Hz]	200	250	315	400	500	630	800	1000	1250
LI [dBA]	45,0	52,8	45,8	46,0	44,7	47,5	47,2	49,1	44,4
LWo [dBA]	54,9	62,7	55,7	55,9	54,6	57,4	57,1	59,0	54,3
FPI [dB]	4,3	4,3	5,6	6,7	7,1	7,1	11,2	6,0	6,0

Middle frequency [Hz]	1600	2000	2500	3150	4000	5000	6300	8000	10000
LI [dBA]	42,4	40,0	37,3	34,9	31,8	26,2	23,4	(21,6)	(16,2)
LWo [dBA]	52,3	49,9	47,2	44,8	41,7	36,1	33,3	(31,5)	(26,1)
FPI [dB]	5,7	5,5	5,5	5,4	5,1	6,0	6,3	(5,5)	(5,3)

Determination of sound power conforms to accuracy class 2, the standard deviation of the o. a. A-valued sound-power levels amounts to 1.5 dB.

LWo: Sound power level radiated by the outdoor unit

FPI: Correction value with regard to the environment

LI: Sound intensity

REMKO WKF/WKF-compact series

Outdoor module WKF 180 Duo

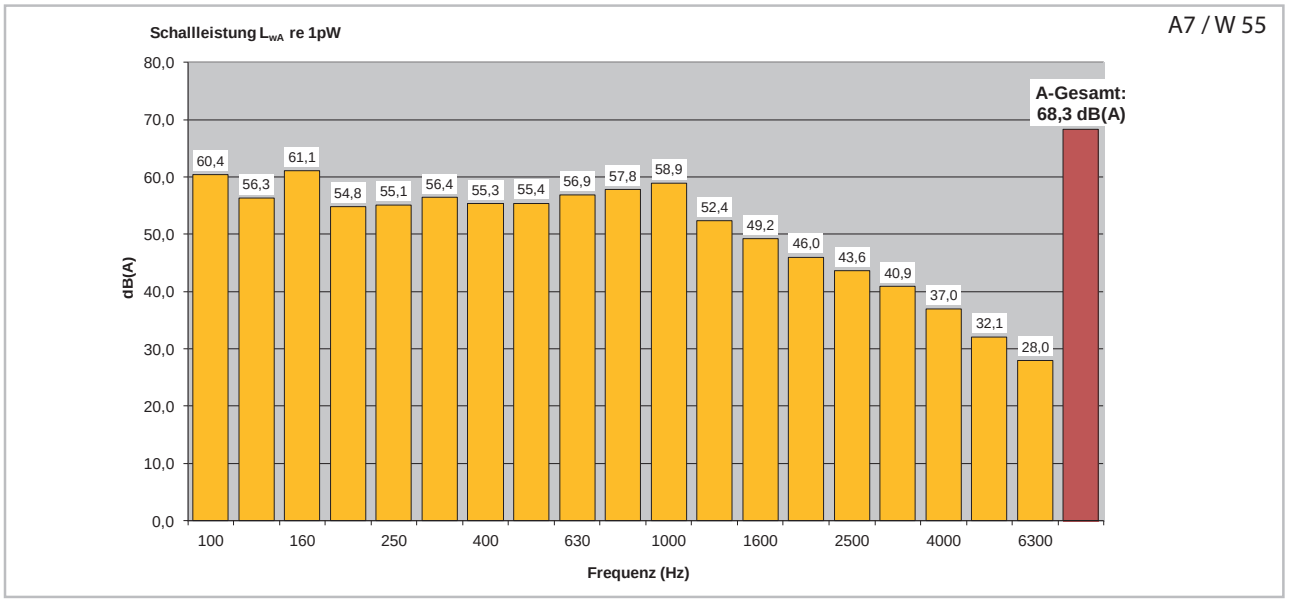

Fig. 20: Overall sound pressure level L_P of REMKO outdoor module series: WKF 180 Duo

Middle frequency [Hz]	25	31,50	40	50	63	80	100	125	160
LI [dBA]	(31,4)	(41,6)	(32,8)	(40,8)	(37,3)	(37,4)	49,8	45,8	50,5
LWo [dBA]	(41,9)	(52,1)	(43,4)	(51,3)	(47,9)	(47,9)	60,4	56,3	61,1
FPI [dB]	-(11,6)	-(9,2)	-(7,7)	-(5,4)	-(3,2)	-(2,0)	0,0	1,1	2,1

Middle frequency [Hz]	200	250	315	400	500	630	800	1000	1250
LI [dBA]	44,3	44,6	45,8	44,8	44,9	46,4	47,2	48,4	41,9
LWo [dBA]	54,8	55,1	56,4	55,3	55,4	56,9	57,8	58,9	52,4
FPI [dB]	6,1	6,4	8,7	9,4	9,6	9,2	11,6	8,4	10,0

Middle frequency [Hz]	1600	2000	2500	3150	4000	5000	6300	8000	10000
LI [dBA]	38,7	35,5	33,1	30,4	26,5	21,6	17,5	(18,1)	(8,8)
LWo [dBA]	49,2	46,0	43,6	40,9	37,0	32,1	28,0	(28,6)	(19,3)
FPI [dB]	11,4	13,9	13,2	13,0	13,5	14,7	15,2	(11,1)	(14,8)

Determination of sound power conforms to accuracy class 2, the standard deviation of the o. a. A-valued sound-power levels amounts to 1.5 dB.

LWo: Sound power level radiated by the outdoor unit

FPI: Correction value with regard to the environment

LI: Sound intensity

2.12 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 70 - Reduction of the sound power level using SWK 4

	Output restriction [%]							
↓ All information in dB(A) ↓	100	90	80	70	60	50	40	30
Max. outdoor unit sound power level	66	64.72	63.44	62.16	60.2	58.92	57.64	56.36
Reducer sound hood	-6.5	-6.5	-6.5	-6.5	-6.5	-6.5	-6.5	-6.5
Sound power level with SWK 4 sound hood	59.5	58.22	56.94	55.66	53.7	52.42	51.14	49.86

Outdoor unit WKF/WKF-compact 120 - Reduction of the sound power level using SWK 5

	Output restriction [%]							
↓ All information in dB(A) ↓	100	90	80	70	60	50	40	30
Max. outdoor unit sound power level	69.0	67.73	66.45	65.17	63.9	62.63	61.35	60.07
Reducer sound hood	-7.7	-7.7	-7.7	-7.7	-7.7	-7.7	-7.7	-7.7
Sound power level with SWK 5 sound hood	61.3	60.03	58.75	57.47	56.2	54.93	53.65	52.37

Outdoor unit WKF/WKF-compact 180 - Reduction of the sound power level using SWK 7

	Output restriction [%]							
↓ All information in dB(A) ↓	100	90	80	70	60	50	40	30
Max. outdoor unit sound power level	69.8	68.52	67.24	65.96	64.3	63.02	61.74	60.46
Reducer sound hood	-5.5	-5.5	-5.5	-5.5	-5.5	-5.5	-5.5	-5.5
Sound power level with SWK 7 sound hood	64.3	63.02	61.74	60.46	58.8	57.52	56.24	54.96

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. The deduction is then increased by a further 3 dB(A) (e.g. WKF 70 -5.5+(-3)= -8.5 dB(A)).

2.13 Characteristic curves

Heating capacity WKF/WKF-compact 70 at an inlet temperature 35 °C

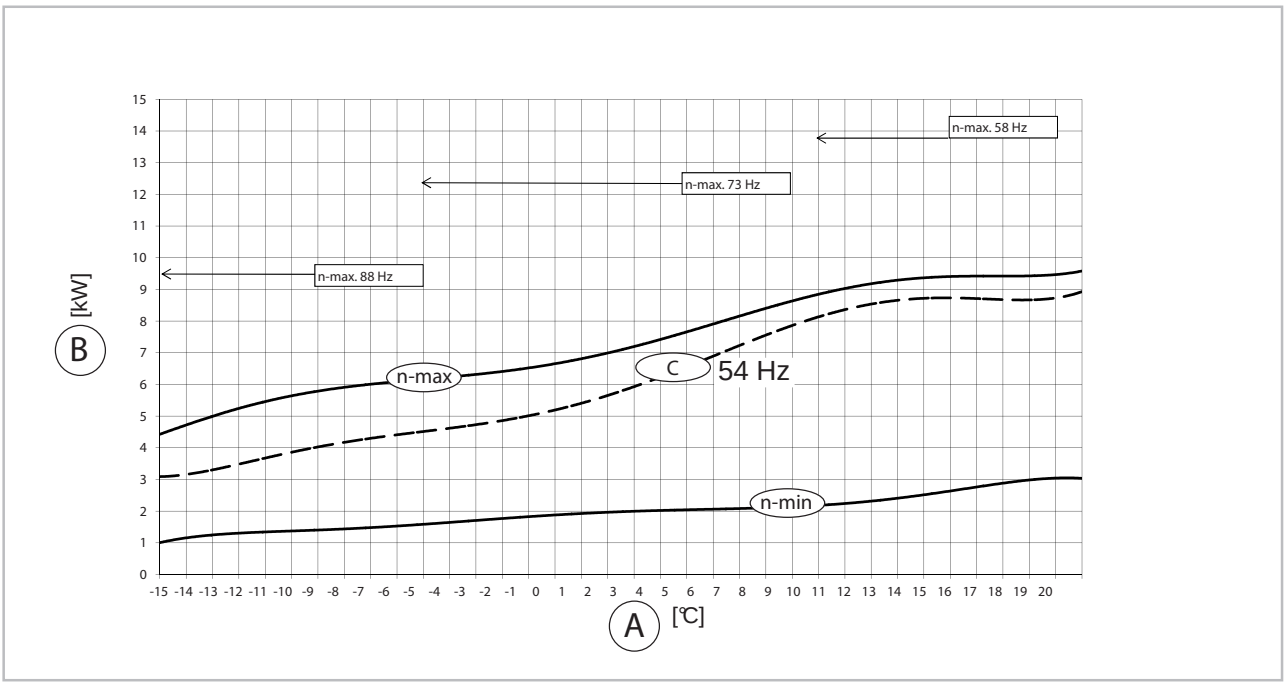

Fig. 21: Heating capacity WKF/WKF-compact 70 at an inlet temperature 35 °C

A: Outdoor temperature
B: Heating capacity
C: Rated frequency

Heating capacity WKF/WKF-compact 70 at an inlet temperature 45 °C

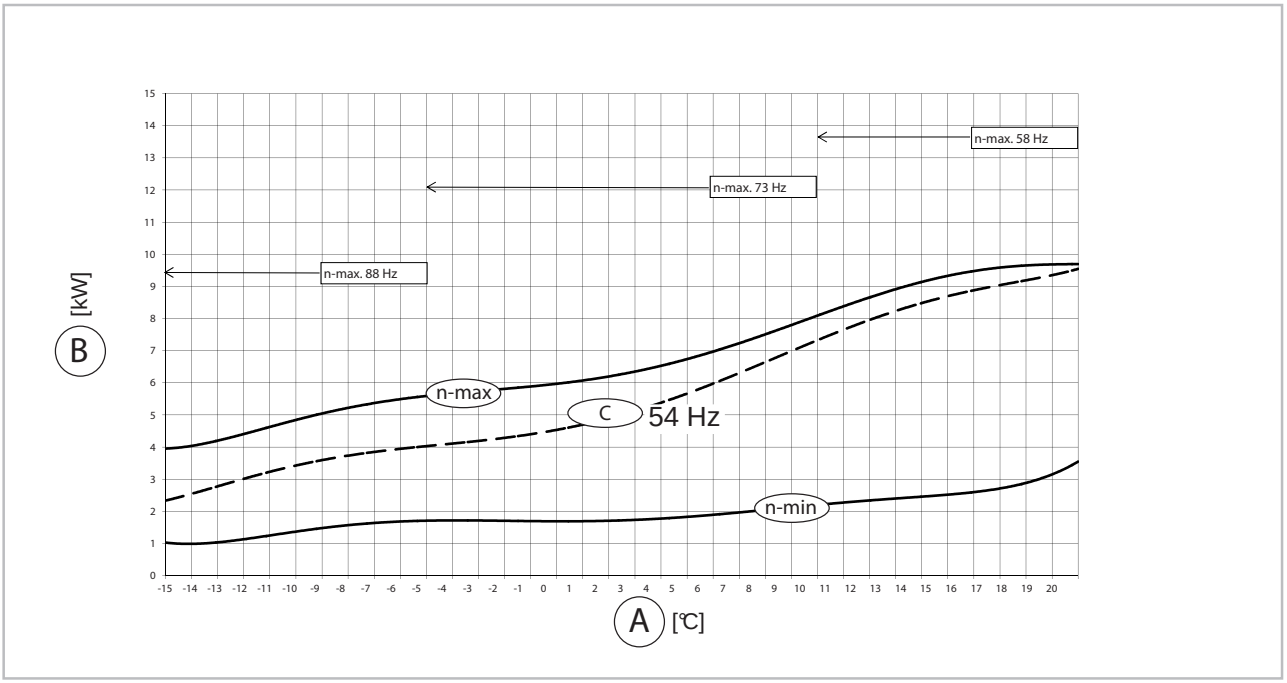

Fig. 22: Heating capacity WKF/WKF-compact 70 at an inlet temperature 45 °C

A: Outdoor temperature
B: Heating capacity
C: Rated frequency

Heating capacity WKF/WKF-compact 70 at an inlet temperature 55 °C

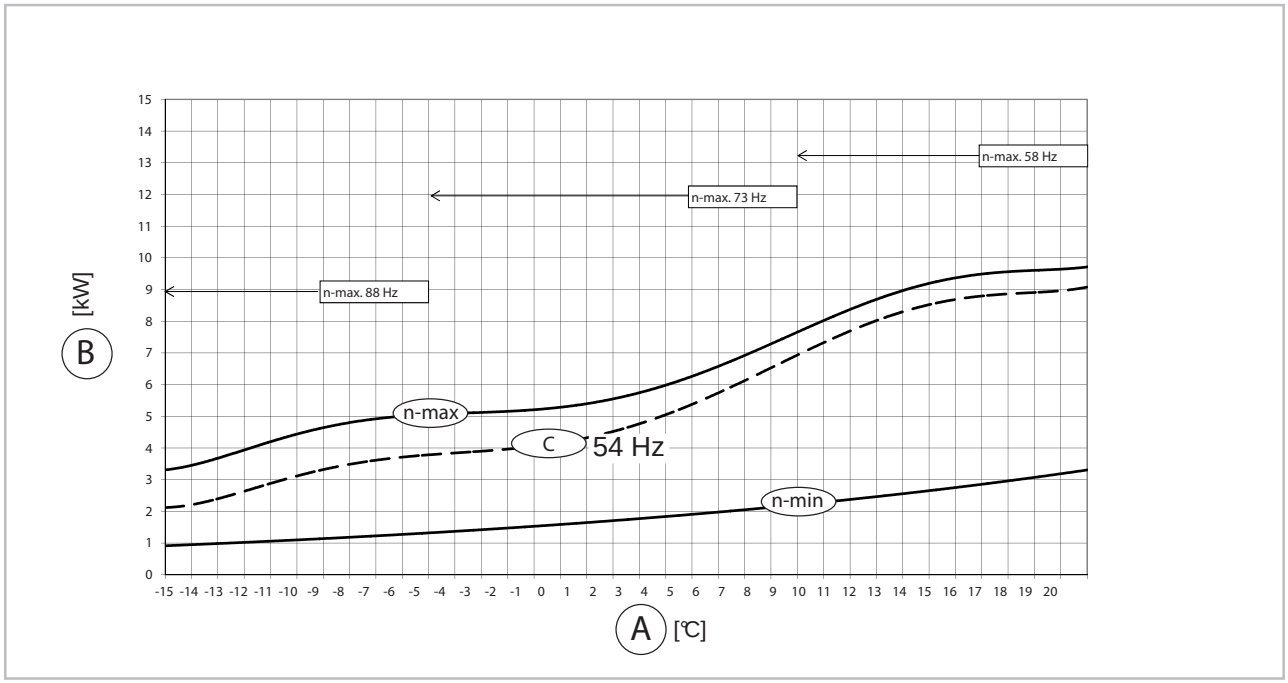

Fig. 23: Heating capacity WKF/WKF-compact 70 at an inlet temperature 55 °C

A: Outdoor temperature
B: Heating capacity
C: Rated frequency

COP WKF/WKF-compact 70 at an inlet temperature 35 °C, 45 °C and 55 °C

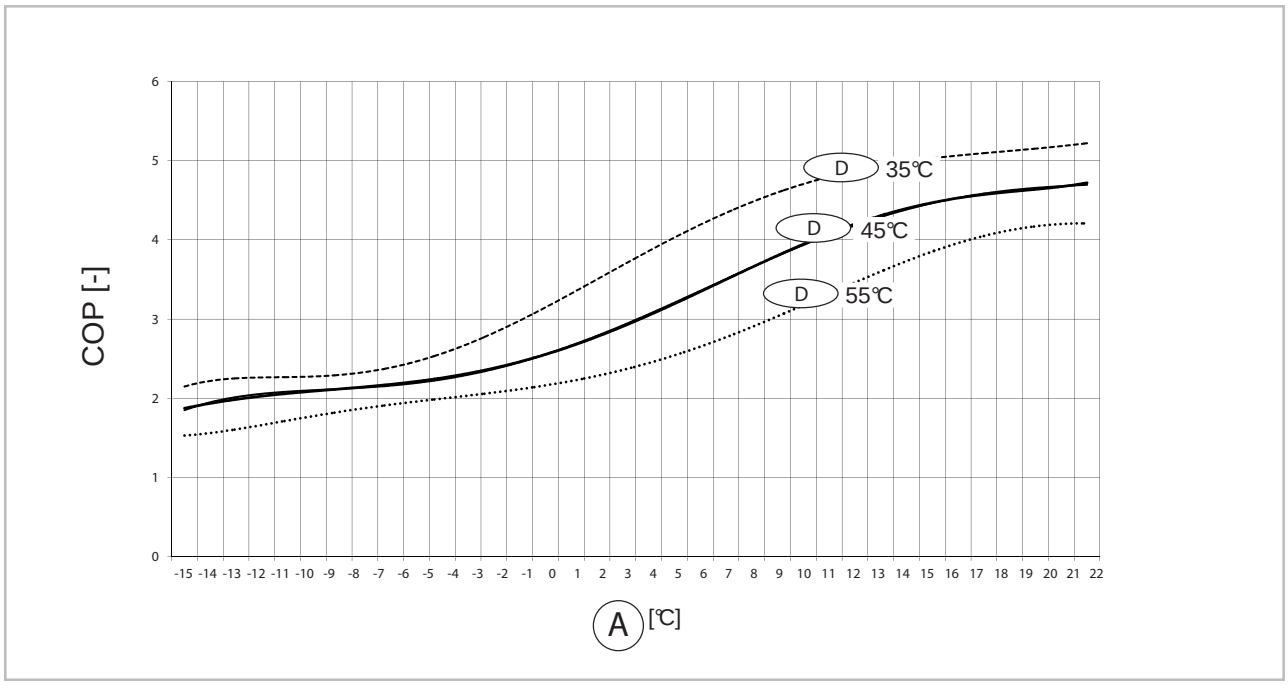

Fig. 24: COP WKF/WKF-compact 70 at an inlet temperature 35 °C, 45 °C and 55 °C

A: Outdoor temperature
D: Inlet temperature

Heating capacity WKF/WKF-compact 120 at an inlet temperature 35 °C

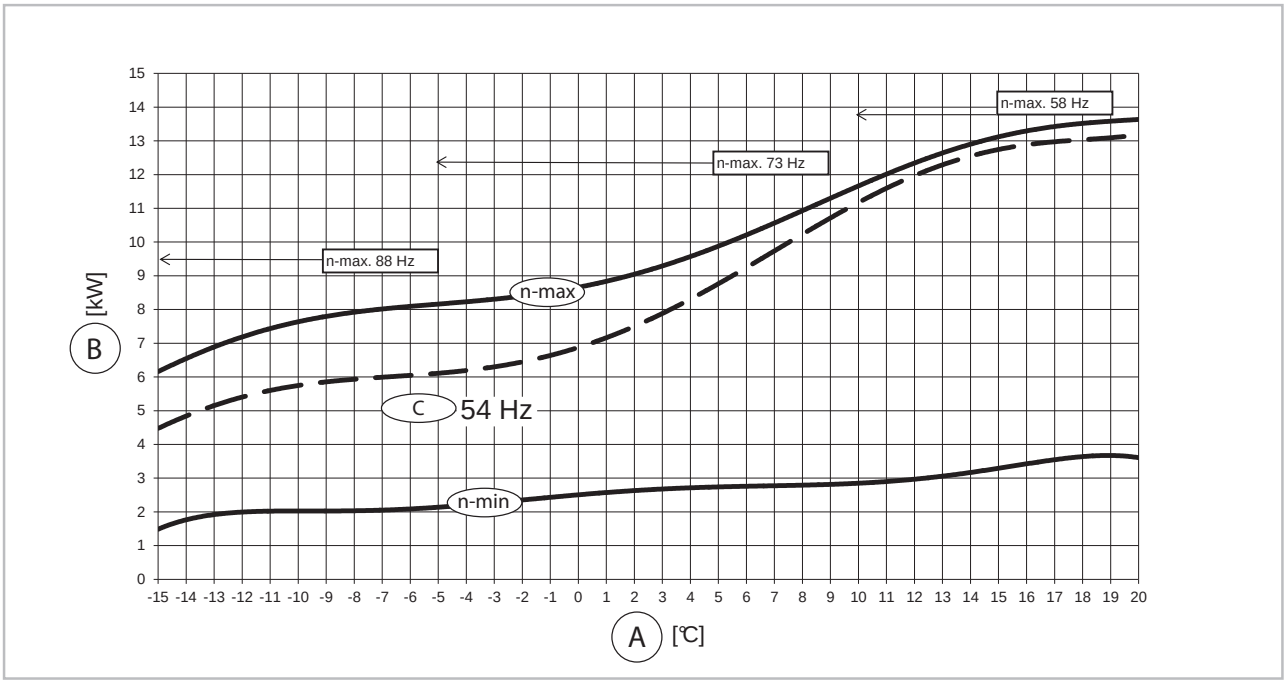

Fig. 25: Heating capacity WKF/WKF-compact 120 at an inlet temperature 35 °C

A: Outdoor temperature
B: Heating capacity
C: Rated frequency

Heating capacity WKF/WKF-compact 120 at an inlet temperature 45 °C

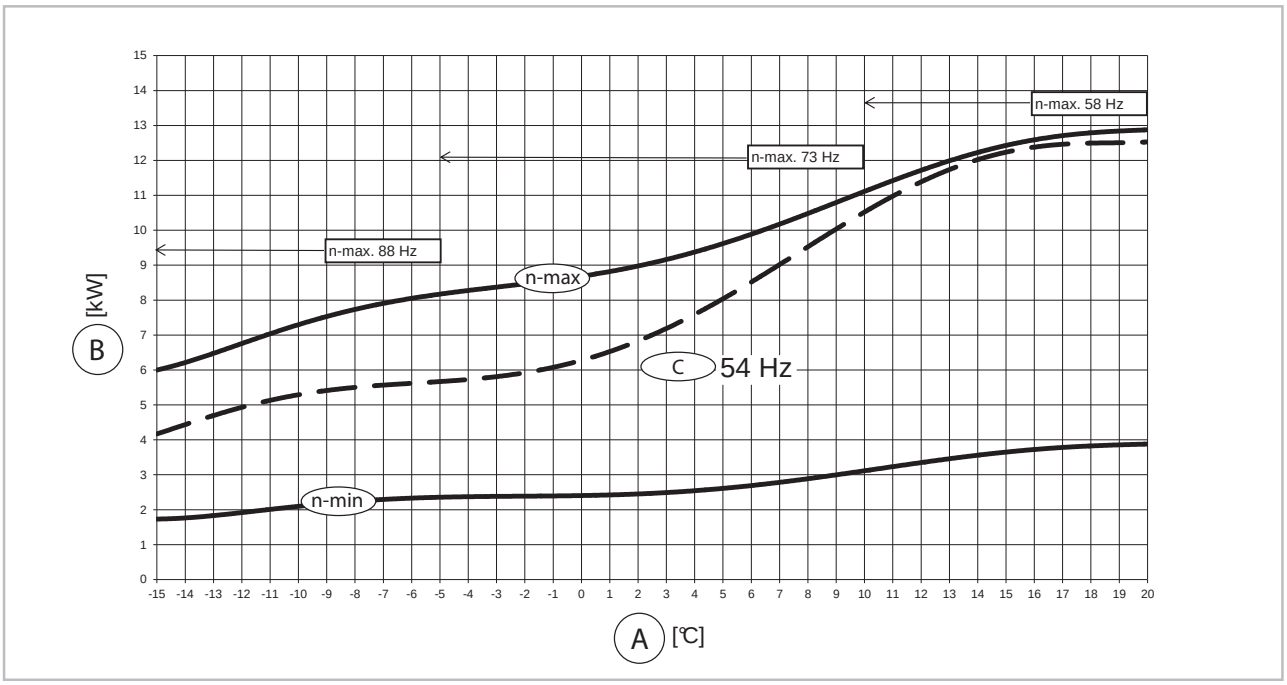

Fig. 26: Heating capacity WKF/WKF-compact 120 at an inlet temperature 45 °C

A: Outdoor temperature
B: Heating capacity
C: Rated frequency

Heating capacity WKF/WKF-compact 120 at an inlet temperature 55 °C

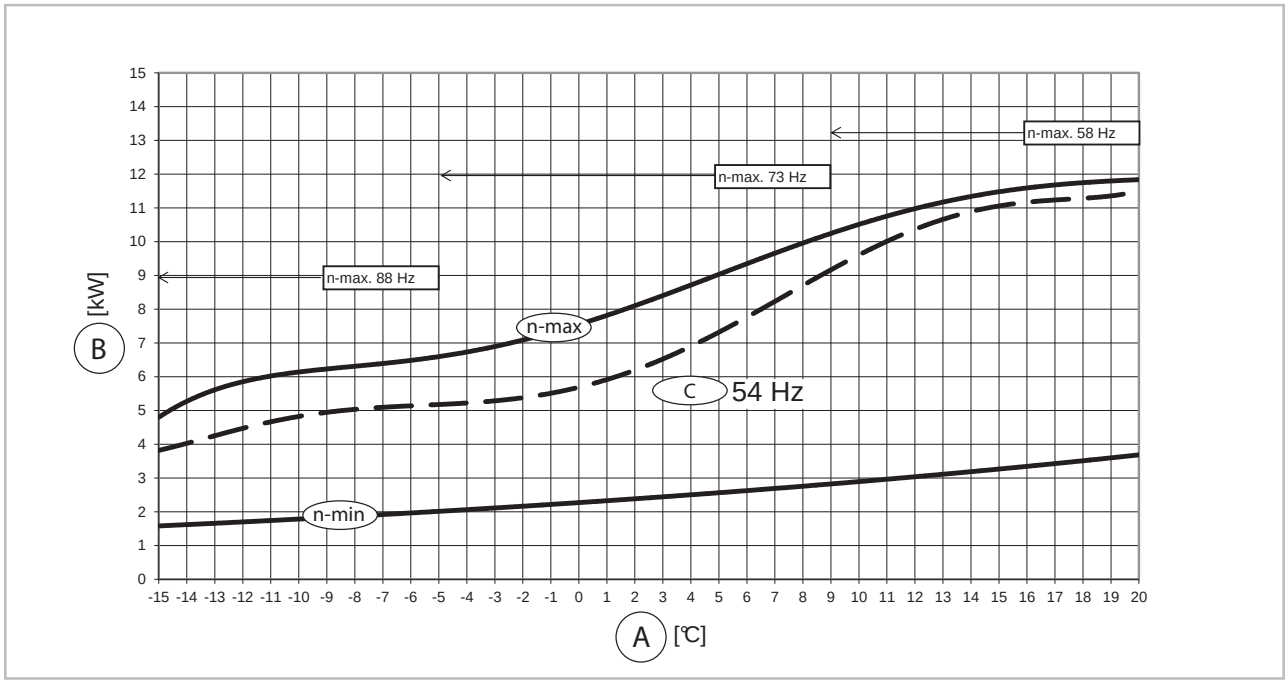

Fig. 27: Heating capacity WKF/WKF-compact 120 at an inlet temperature 55 °C

A: Outdoor temperature
B: Heating capacity
C: Rated frequency

COP WKF/WKF-compact 120 at an inlet temperature 35 °C, 45 °C and 55 °C

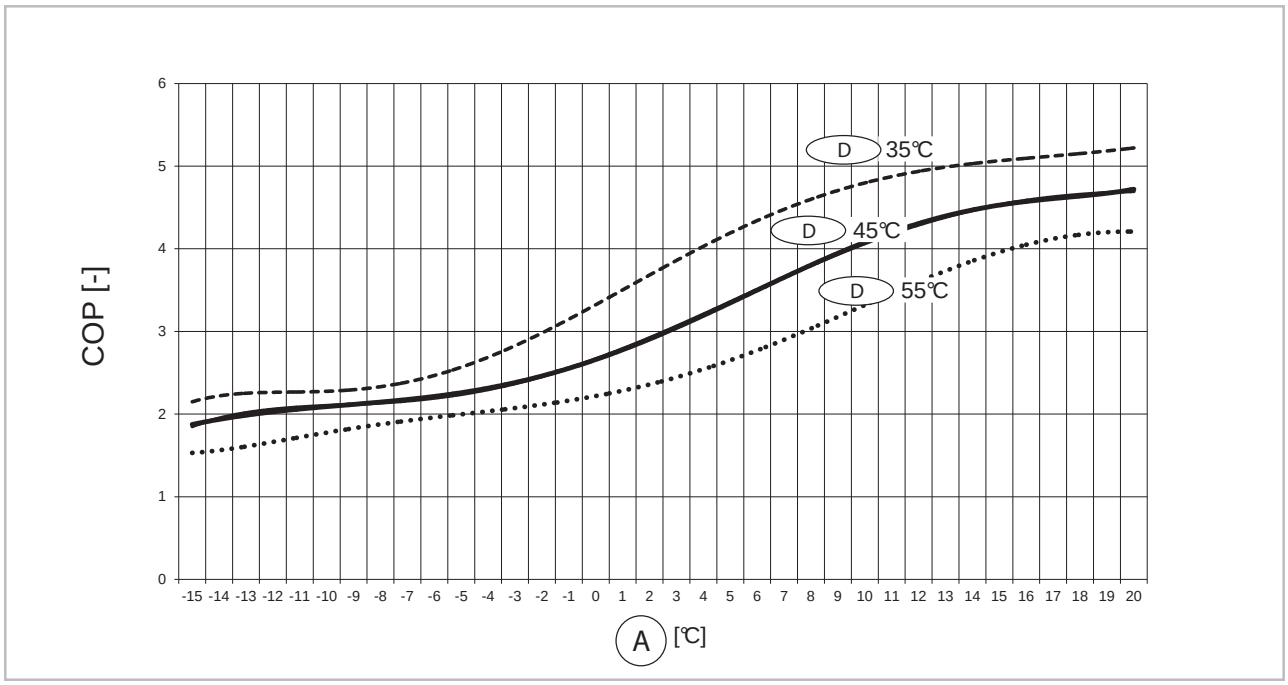

Fig. 28: COP WKF/WKF-compact 120 at an inlet temperature 35 °C, 45 °C and 55 °C

A: Outdoor temperature
D: Inlet temperature

Heating capacity WKF/WKF-compact 180 at an inlet temperature 35 °C

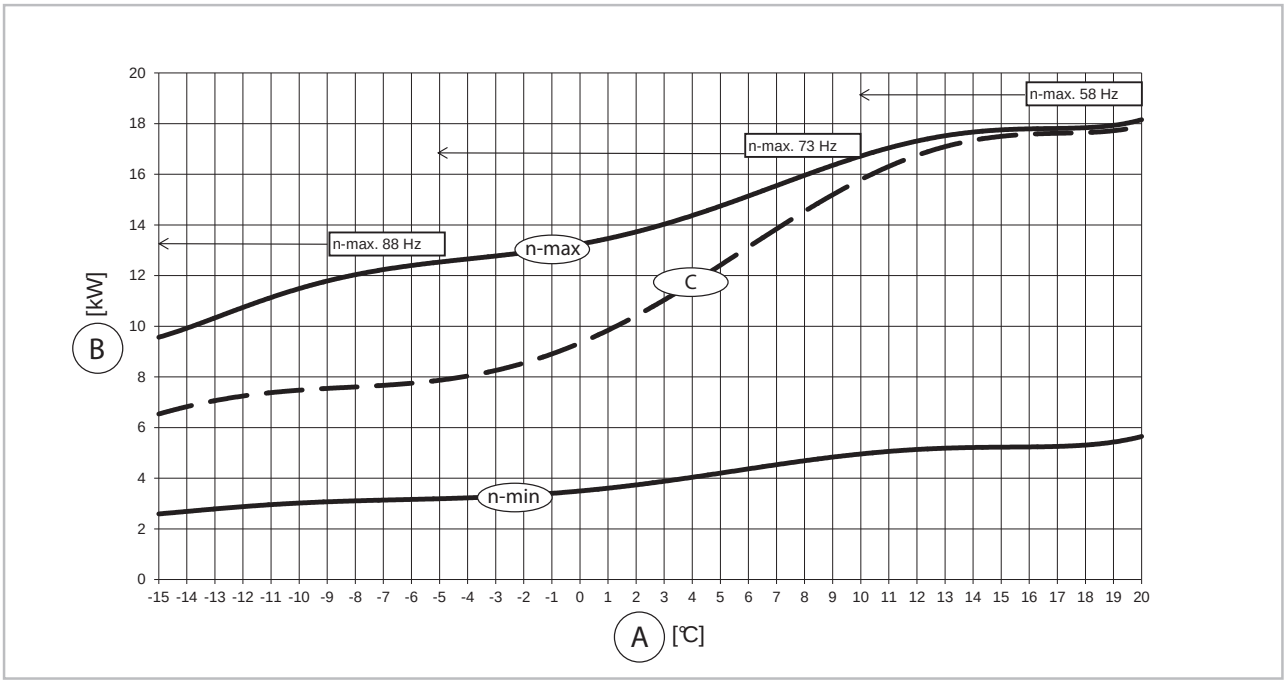

Fig. 29: Heating capacity WKF/WKF-compact 180 at an inlet temperature 35 °C

A: Outdoor temperature
B: Heating capacity
C: Rated frequency

Heating capacity WKF/WKF-compact 180 at an inlet temperature 45 °C

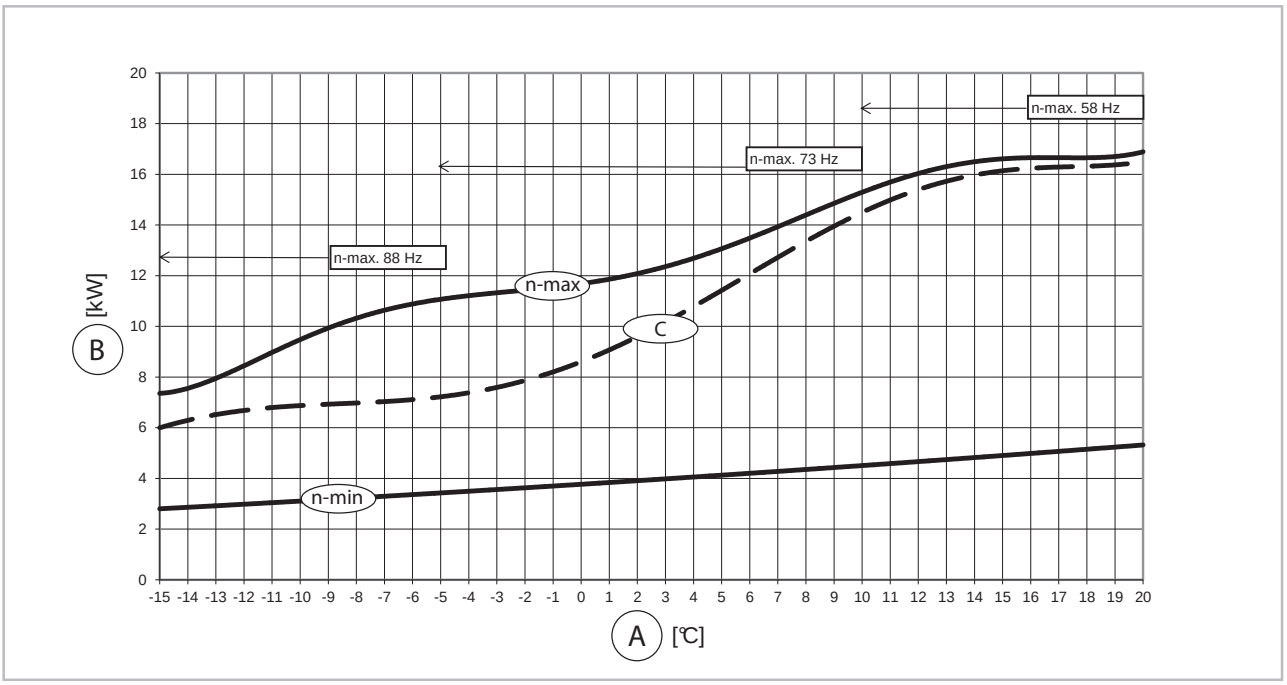

Fig. 30: Heating capacity WKF/WKF-compact 180 at an inlet temperature 45 °C

A: Outdoor temperature
B: Heating capacity
C: Rated frequency

Heating capacity WKF/WKF-compact 180 at an inlet temperature 55 °C

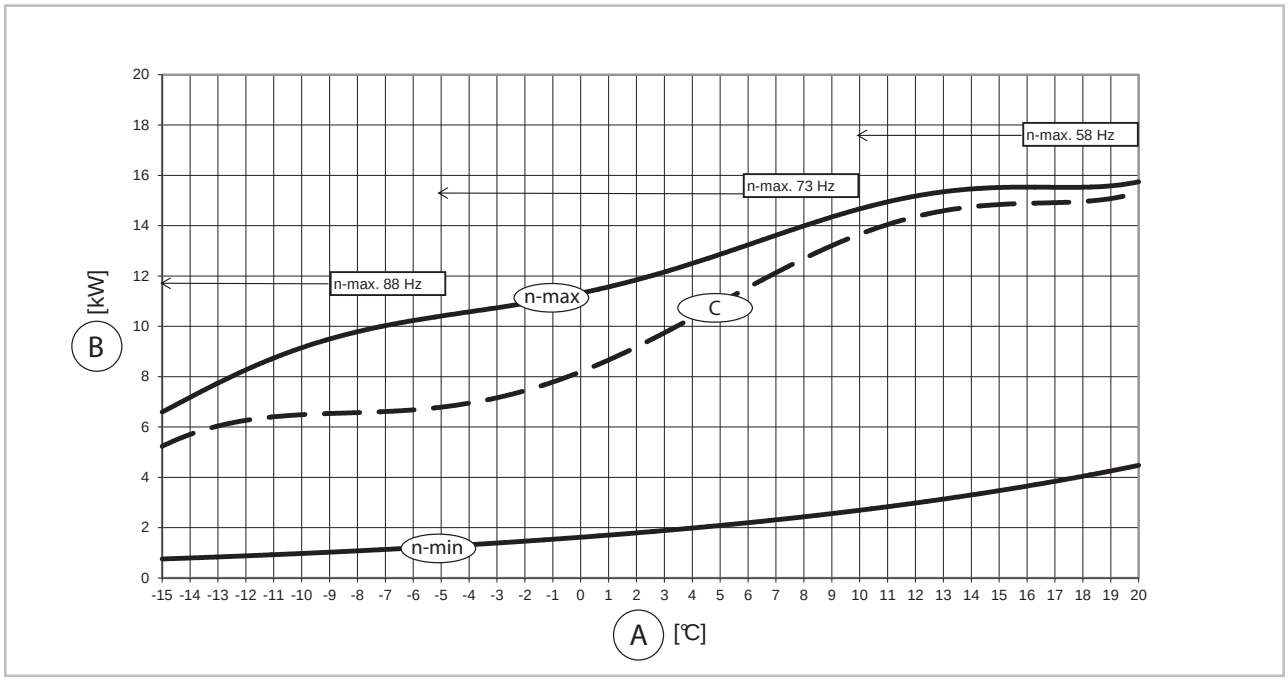

Fig. 31: Heating capacity WKF/WKF-compact 180 at an inlet temperature 55 °C

A: Outdoor temperature
B: Heating capacity
C: Rated frequency

COP WKF/WKF-compact 180 at an inlet temperature 35 °C, 45 °C and 55 °C

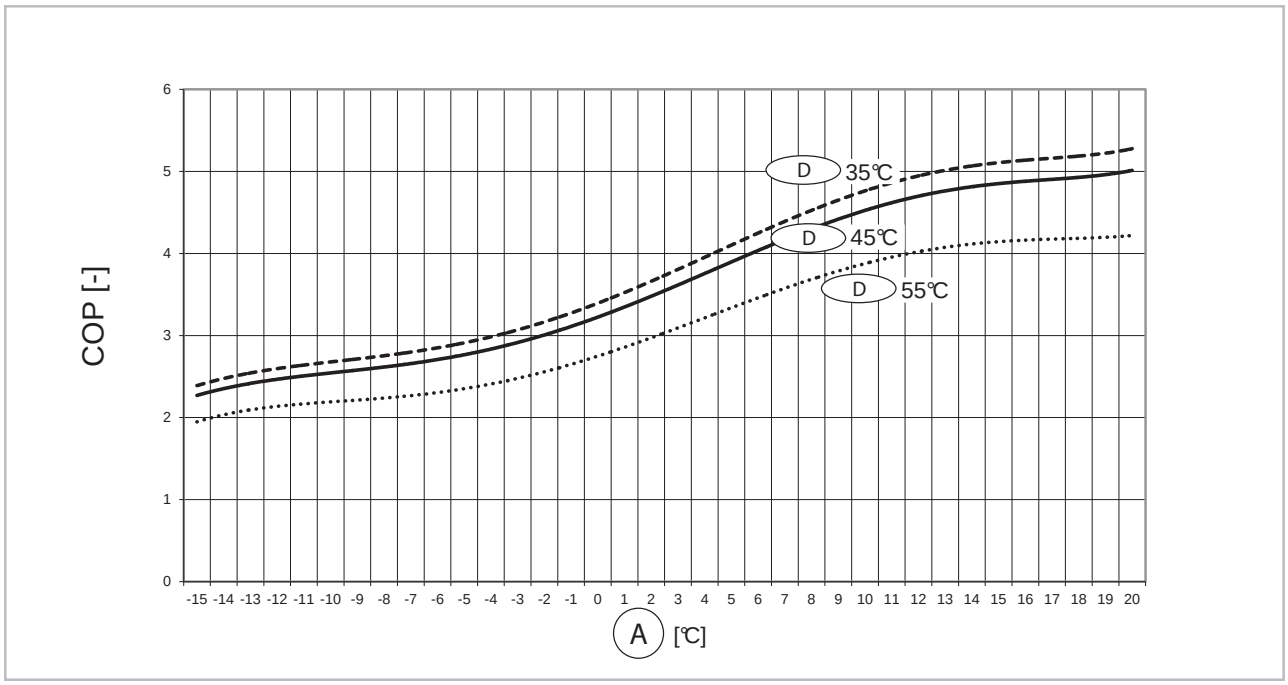

Fig. 32: COP WKF/WKF-compact 180 at an inlet temperature 35 °C, 45 °C and 55 °C

A: Outdoor temperature
D: Inlet temperature

Heating capacity WKF 120 Duo at an inlet temperature 35 °C

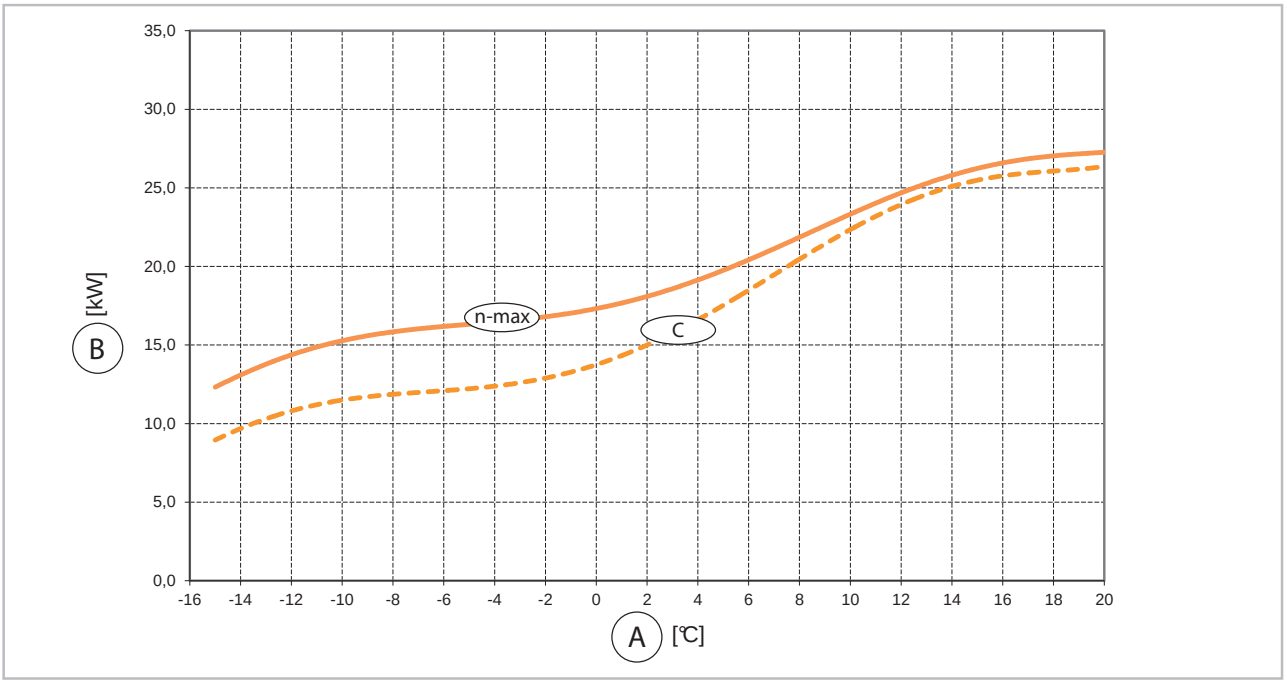

Fig. 33: Heating capacity WKF 120 Duo at an inlet temperature 35 °C

A: Outdoor temperature
B: Heating capacity
C: Rated frequency

Heating capacity WKF 120 Duo at an inlet temperature 45 °C

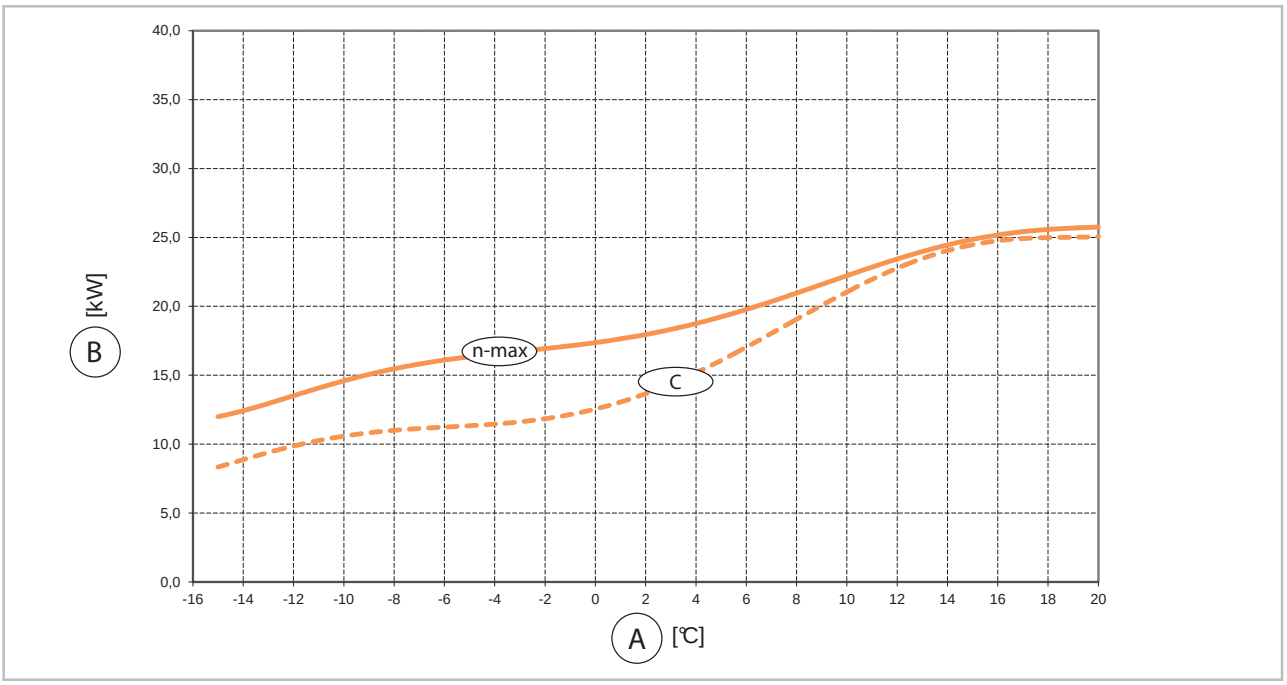

Fig. 34: Heating capacity WKF 120 Duo at an inlet temperature 45 °C

A: Outdoor temperature
B: Heating capacity
C: Rated frequency

Heating capacity WKF 120 Duo at an inlet temperature 55 °C

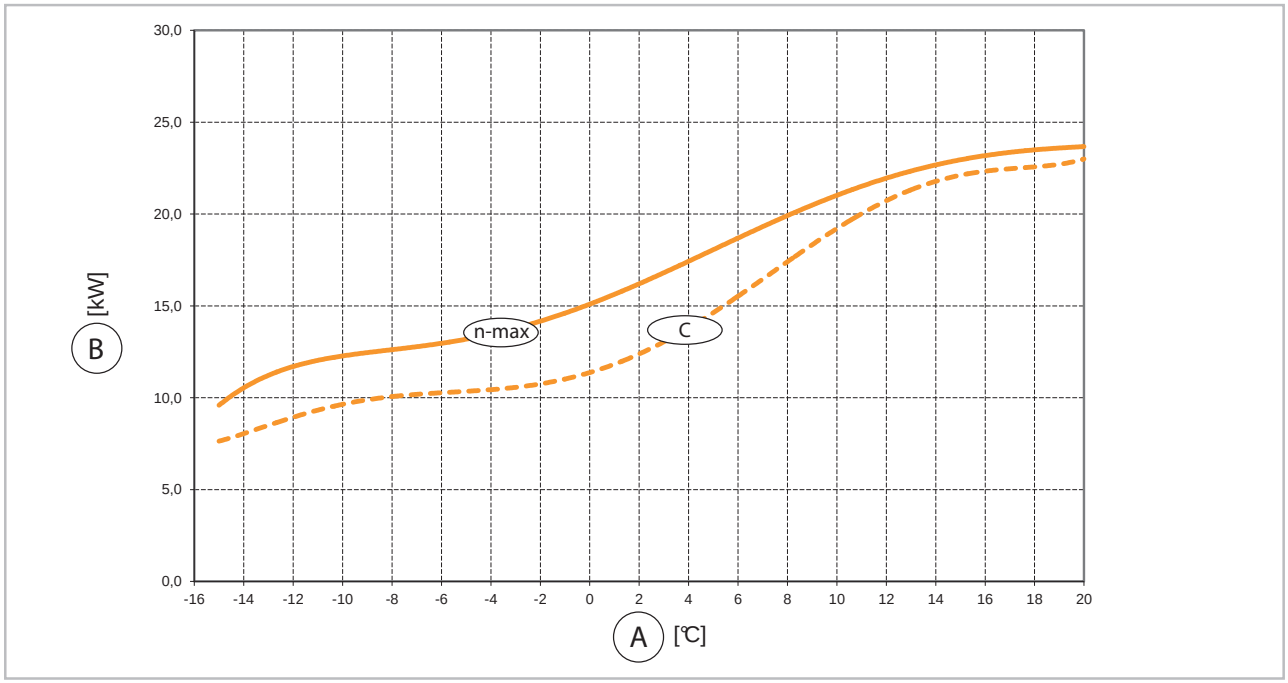

Fig. 35: Heating capacity WKF 120 Duo at an inlet temperature 55 °C

A: Outdoor temperature
B: Heating capacity
C: Rated frequency / n-max = max. frequency

COP WKF 120 Duo at an inlet temperature 35 °C, 45 °C and 55 °C

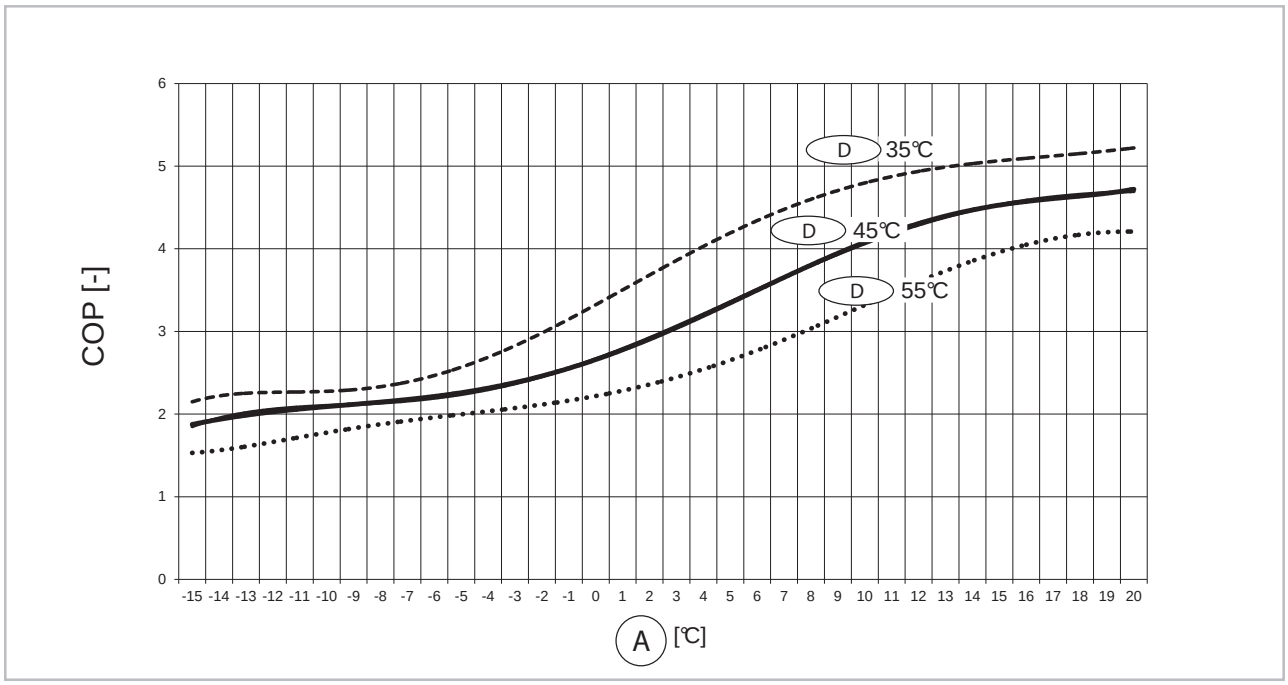

Fig. 36: COP WKF 120 Duo at an inlet temperature 35 °C, 45 °C and 55 °C

A: Outdoor temperature
D: Inlet temperature

Heating capacity WKF 180 Duo at an inlet temperature 35 °C

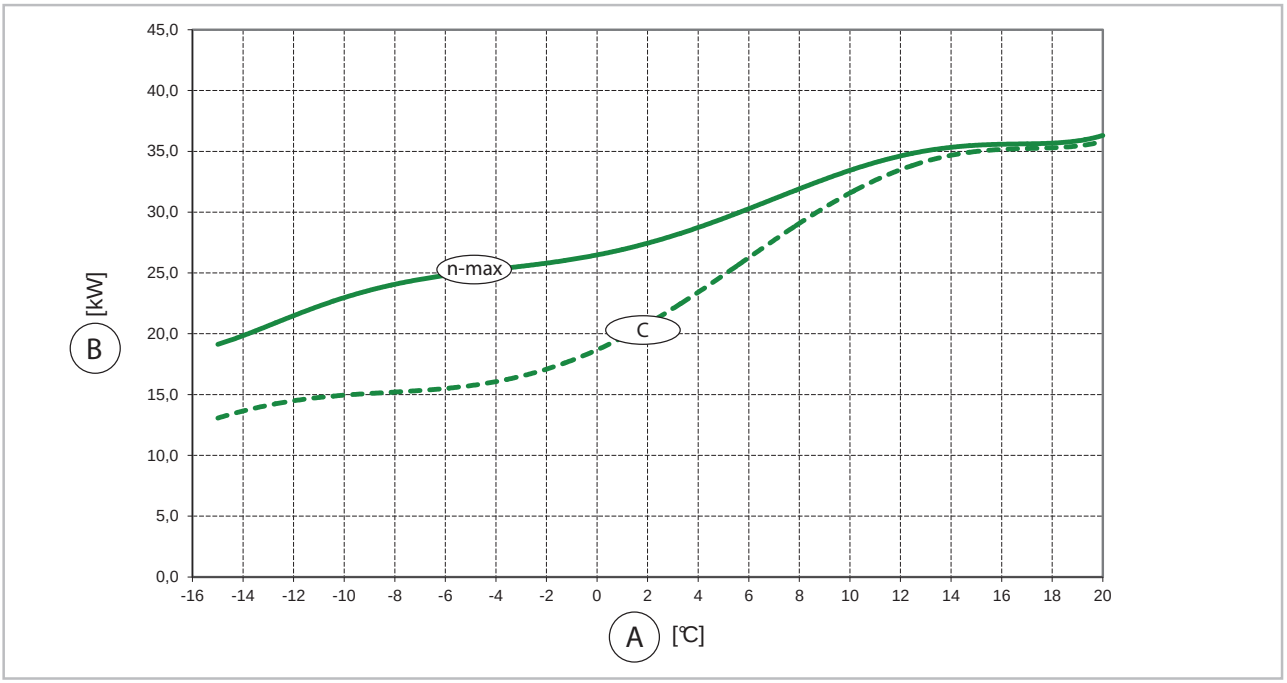

Fig. 37: Heating capacity WKF 180 Duo at an inlet temperature 35 °C

A: Outdoor temperature
B: Heating capacity
C: Rated frequency / n-max = max. frequency

Heating capacity WKF 180 Duo at an inlet temperature 45 °C

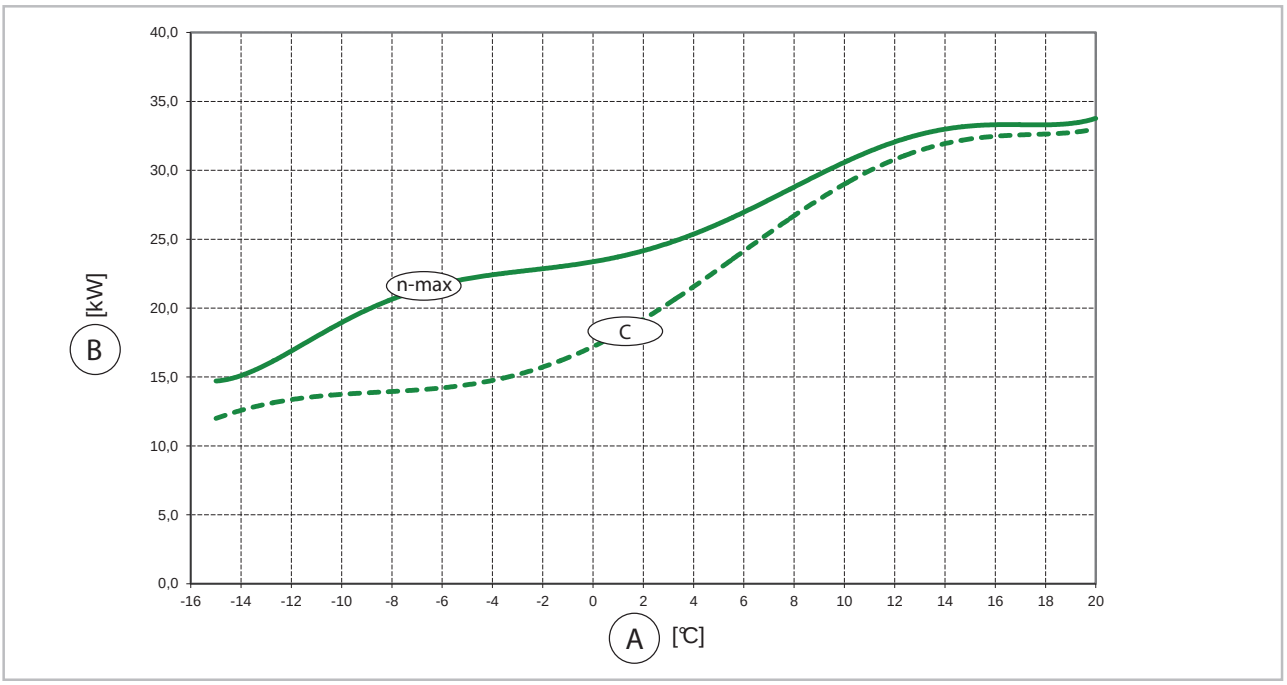

Fig. 38: Heating capacity WKF 180 Duo at an inlet temperature 45 °C

A: Outdoor temperature
B: Heating capacity
C: Rated frequency / n-max = max. frequency

Heating capacity WKF 180 Duo at an inlet temperature 55 °C

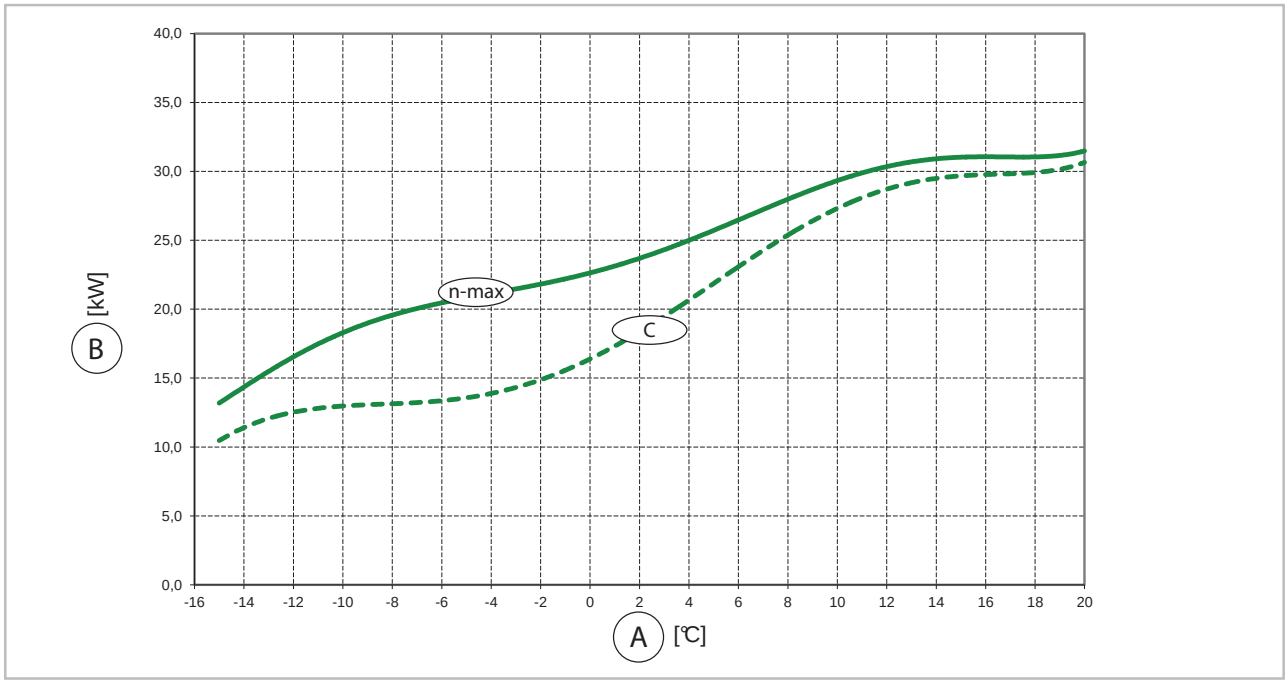

Fig. 39: Heating capacity WKF 180 Duo at an inlet temperature 55 °C

A: Außentemperatur
B: Heizleistung
C: Nennfrequenz / n-max: max. Frequenz

COP WKF 180 Duo at an inlet temperature 35 °C, 45 °C and 55 °C

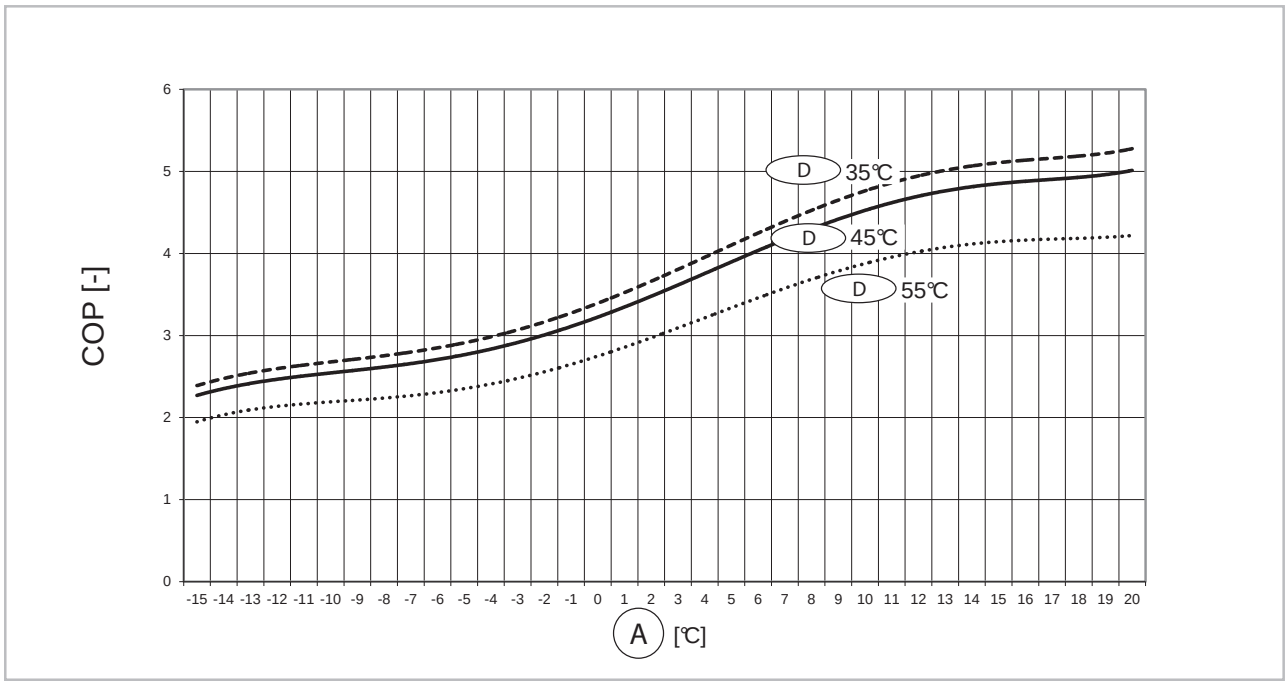

Fig. 40: COP WKF 180 Duo at an inlet temperature 35 °C, 45 °C and 55 °C

A: Outdoor temperature
D: Inlet temperature

Loss in heating and cooling output

Depending on the length of the refrigerant piping and the difference in elevation between the indoor and outdoor units, there may be a loss in heating or cooling output. These can be calculated using the following diagrams.

Heating capacity losses for WKF/WKF-compact 70

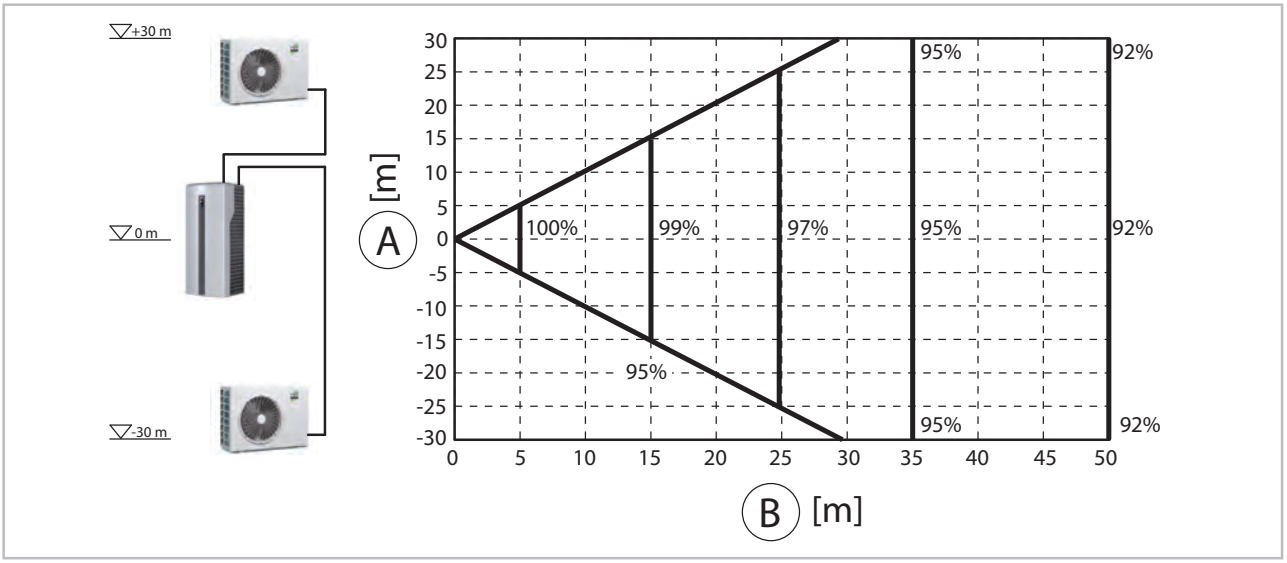

Fig. 41: Heating capacity losses for WKF/WKF-compact 70

A: Difference in elevation B: Length of refrigerant piping

Cooling capacity losses for WKF/WKF-compact 70

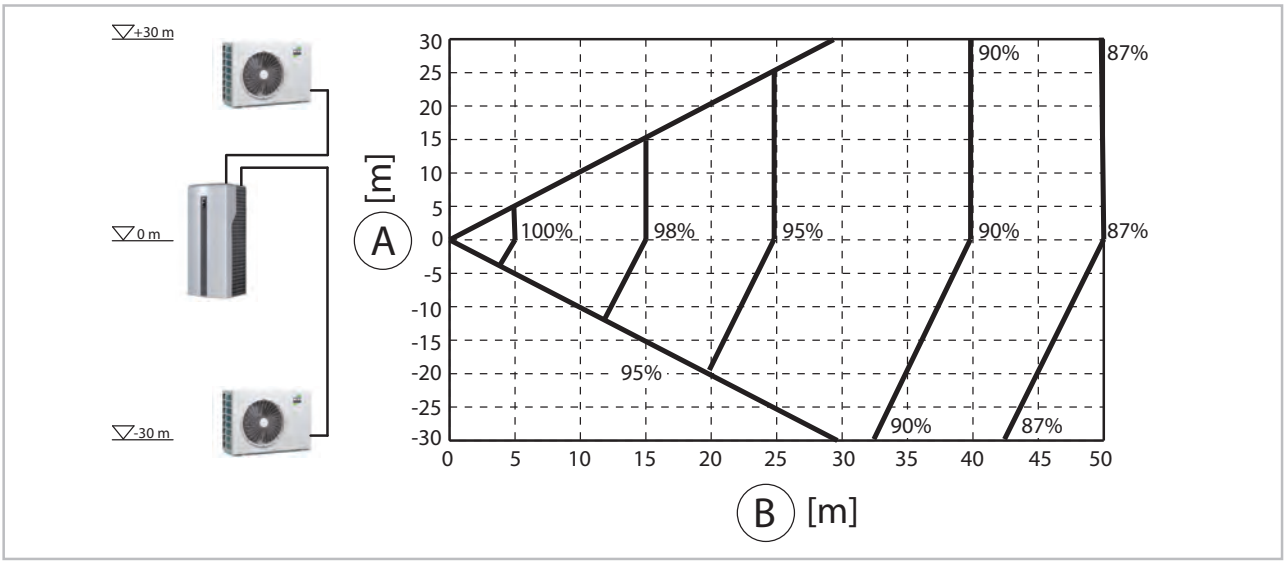

Fig. 42: Cooling capacity losses for WKF/WKF-compact 70

A: Difference in elevation B: Length of refrigerant piping

Heating capacity losses for WKF/WKF-compact 120

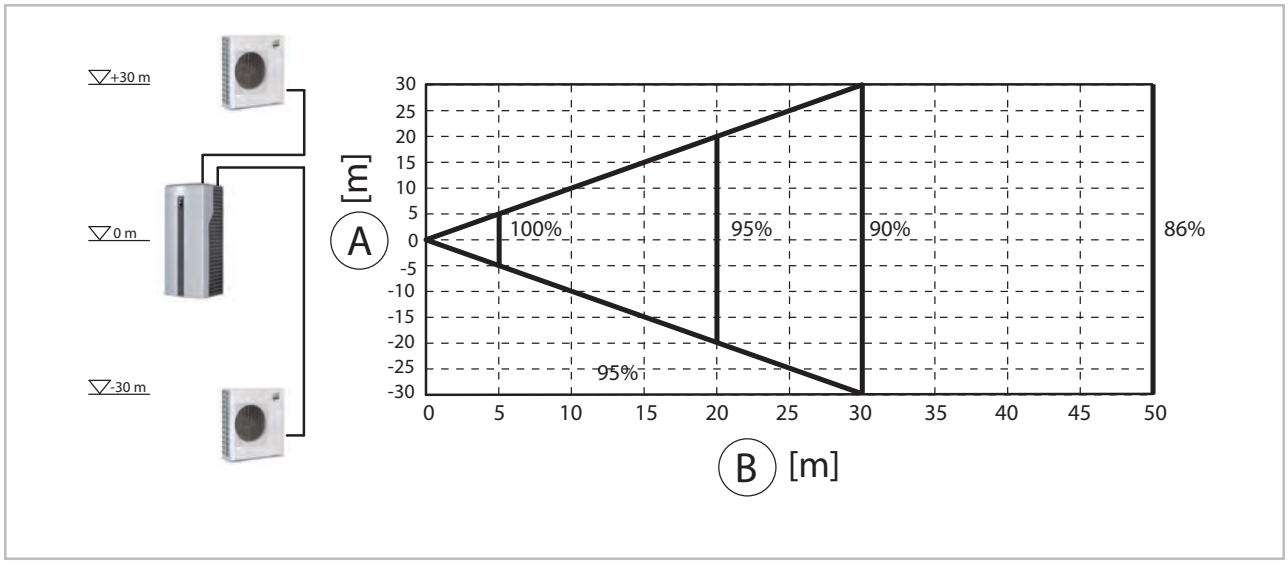

Fig. 43: Heating capacity losses for WKF/WKF-compact 120

A: Difference in elevation B: Length of refrigerant piping

Cooling capacity losses for WKF/WKF-compact 120

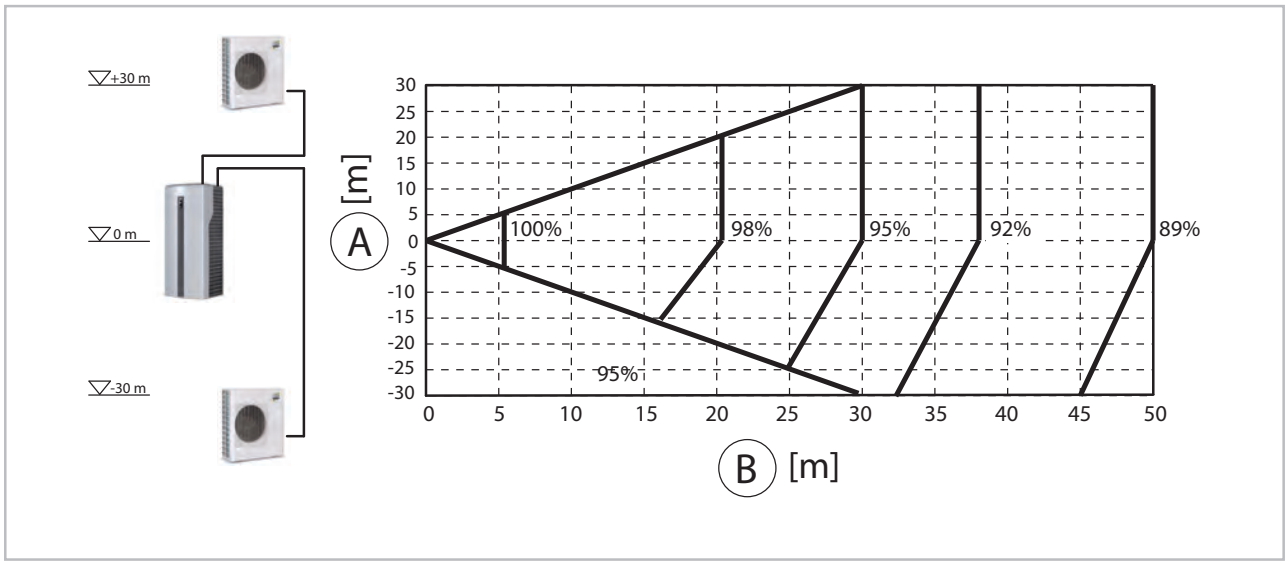

Fig. 44: Cooling capacity losses for WKF/WKF-compact 120

A: Difference in elevation B: Length of refrigerant piping

Heating capacity losses for WKF/WKF-compact 180

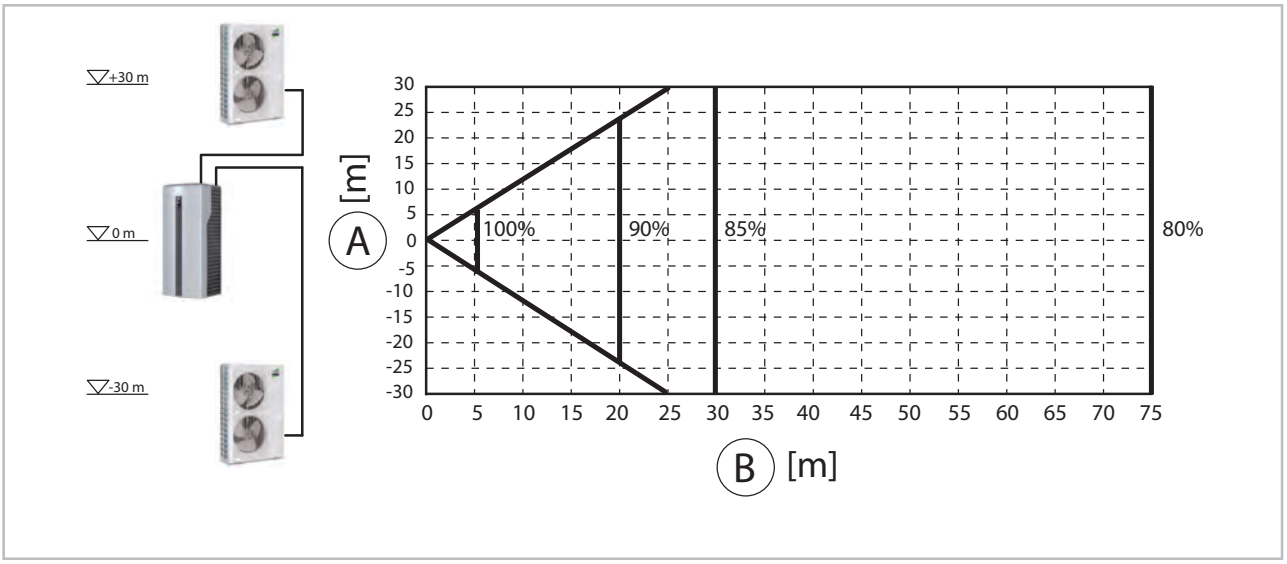

Fig. 45: Heating capacity losses for WKF/WKF-compact 180

A: Difference in elevation B: Length of refrigerant piping

Cooling capacity losses for WKF/WKF-compact 180

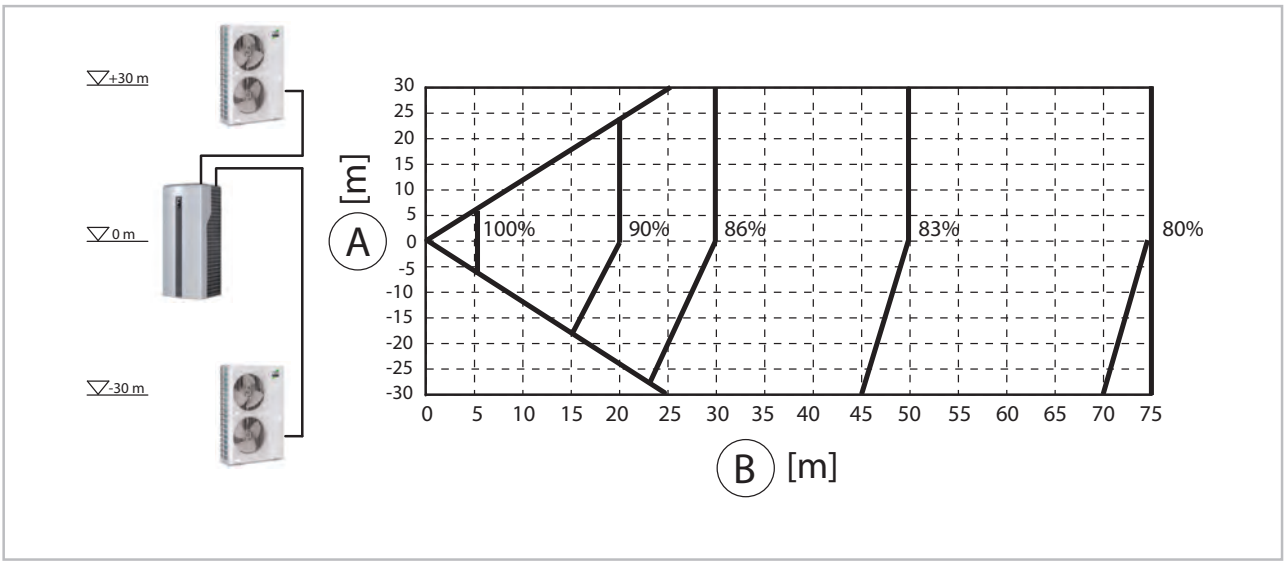

Fig. 46: Cooling capacity losses for WKF/WKF-compact 180

A: Difference in elevation B: Length of refrigerant piping

Heating capacity losses for WKF 120 Duo

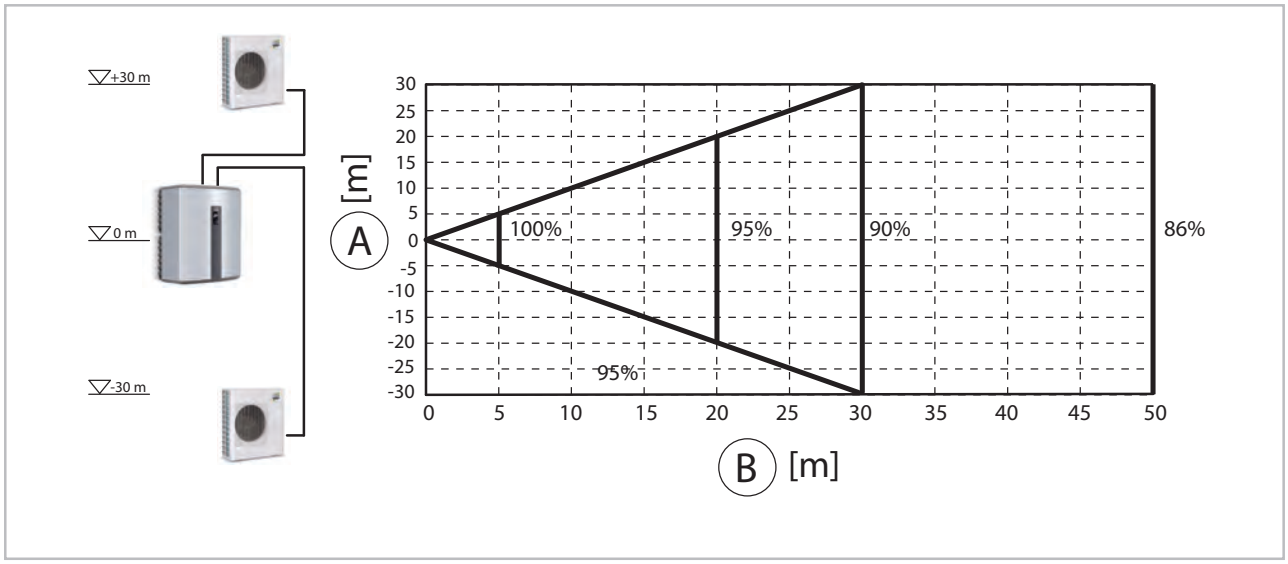

Fig. 47: Heating capacity losses for WKF 120 Duo

A: Difference in elevation B: Length of refrigerant piping

Cooling capacity losses for WKF 120 Duo

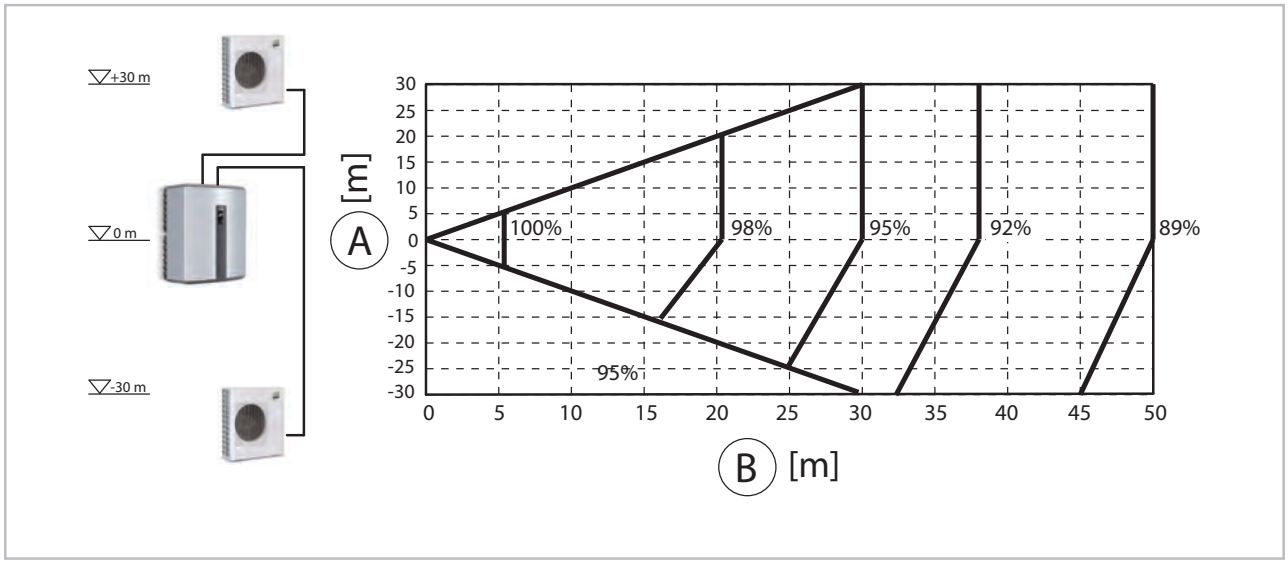

Fig. 48: Cooling capacity losses for WKF 120 Duo

A: Difference in elevation B: Length of refrigerant piping

Heating capacity losses for WKF 180 Duo

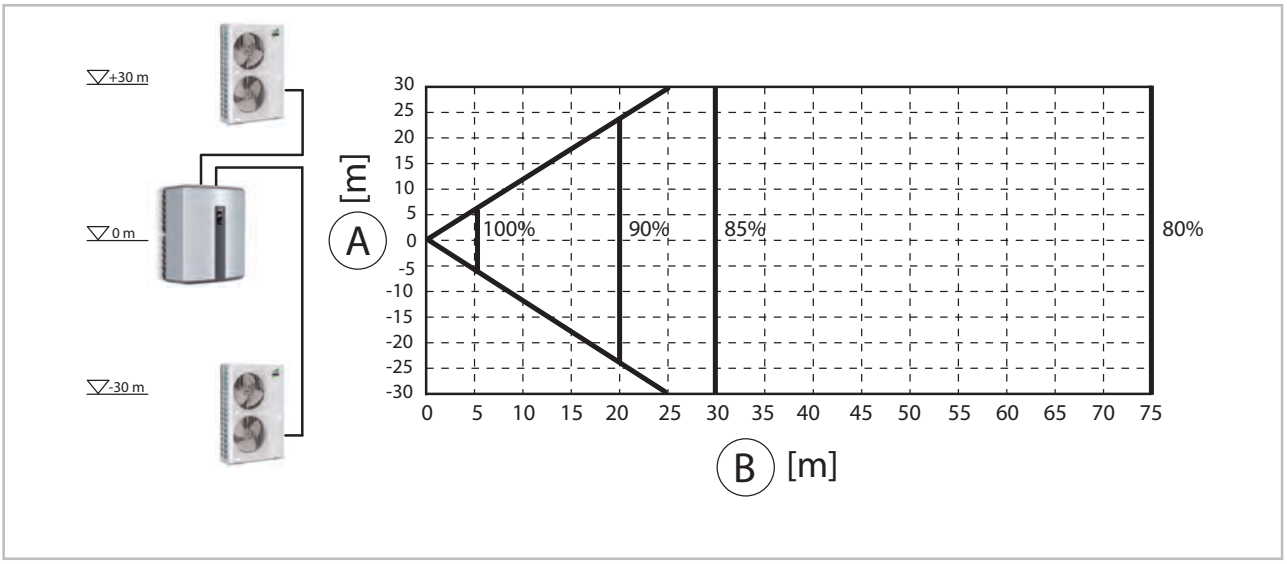

Fig. 49: Heating capacity losses for WKF 180 Duo

A: Difference in elevation B: Length of refrigerant piping

Cooling capacity losses for WKF 180 Duo

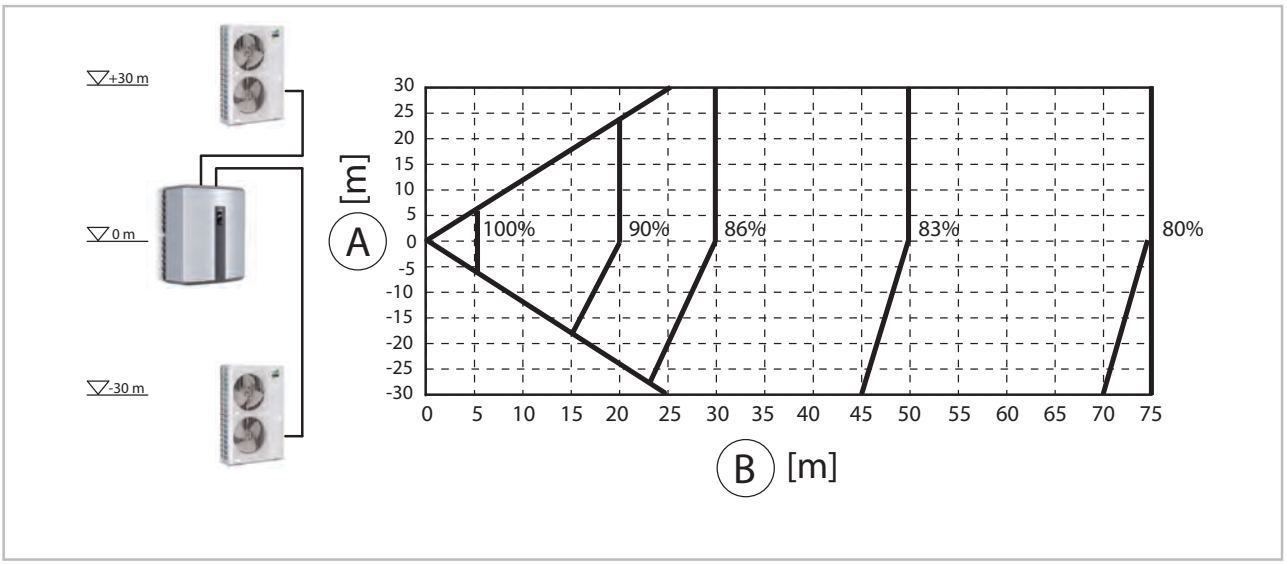

Fig. 50: Cooling capacity losses for WKF 180 Duo

A: Difference in elevation B: Length of refrigerant piping

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.

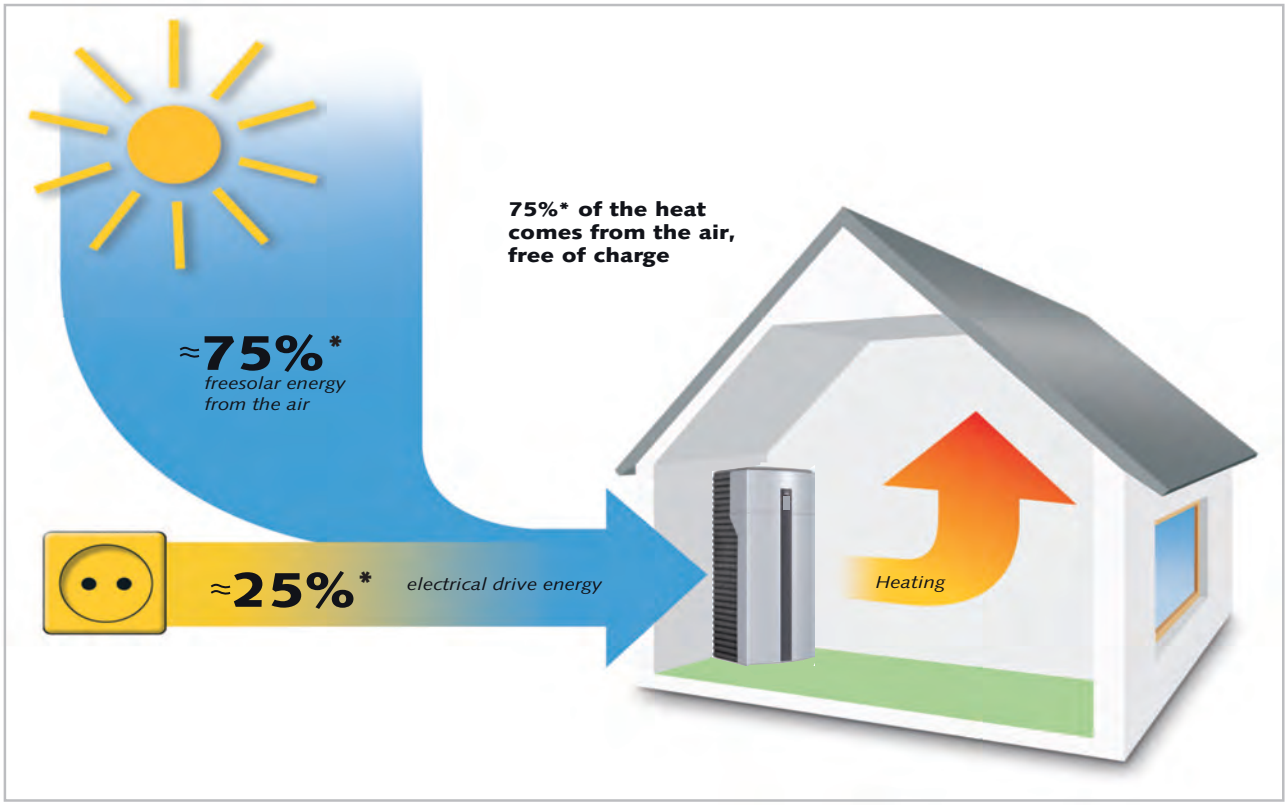

Fig. 51: Free heat

* 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.

REMKO WKF/WKF-compact series

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.

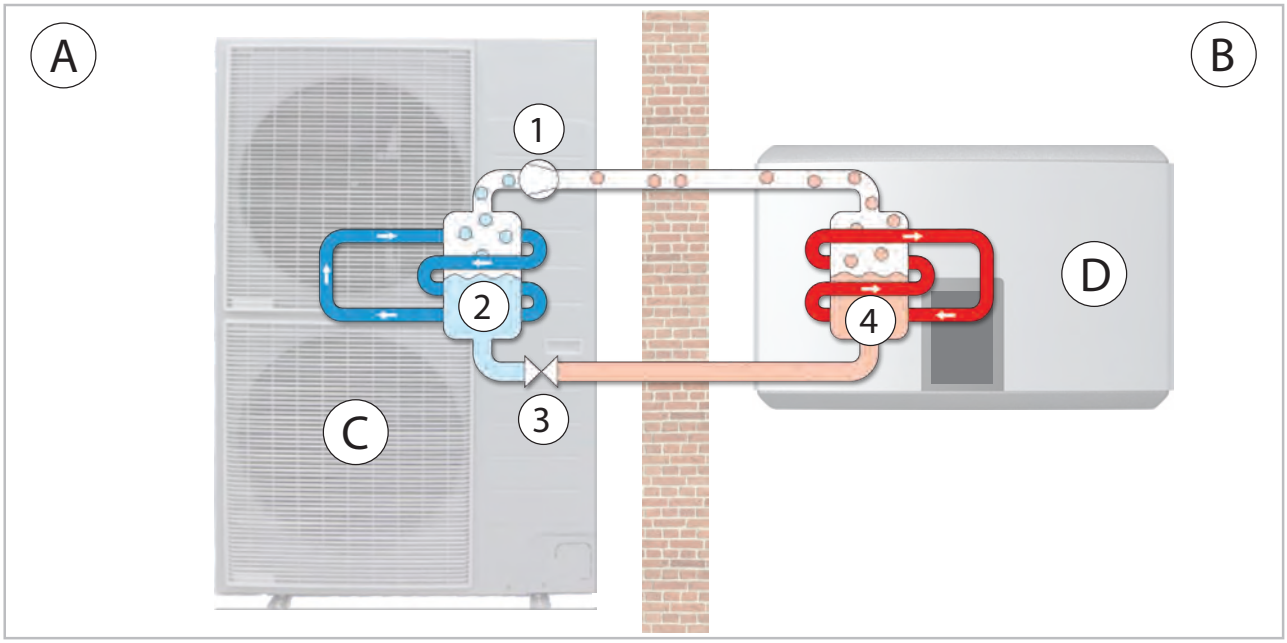

Fig. 52: Functional diagram heating inverter heat pump

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

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

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.)

REMKO WKF/WKF-compact series

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

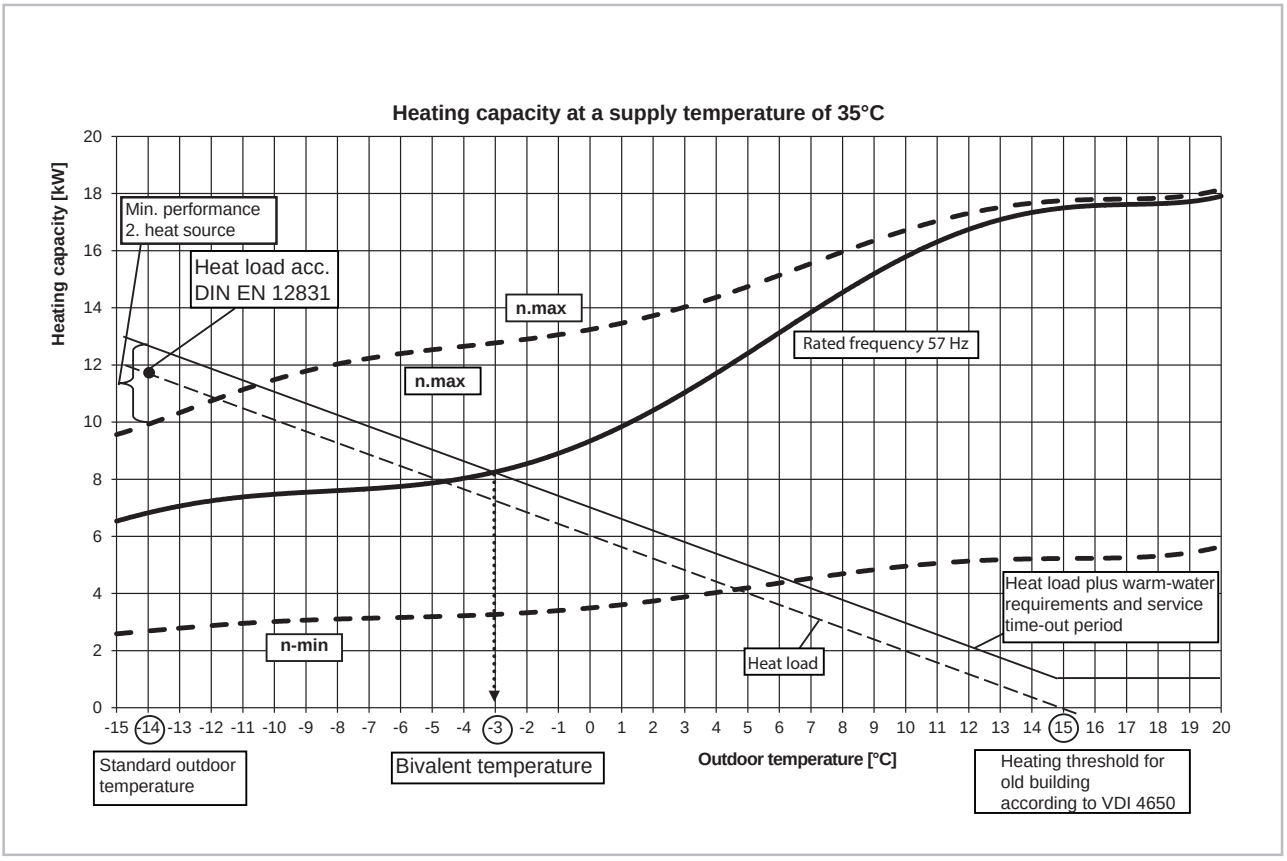

Fig. 53: Heating capacity diagramm of the heat pump WKF/WKF-compact 170

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.

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.

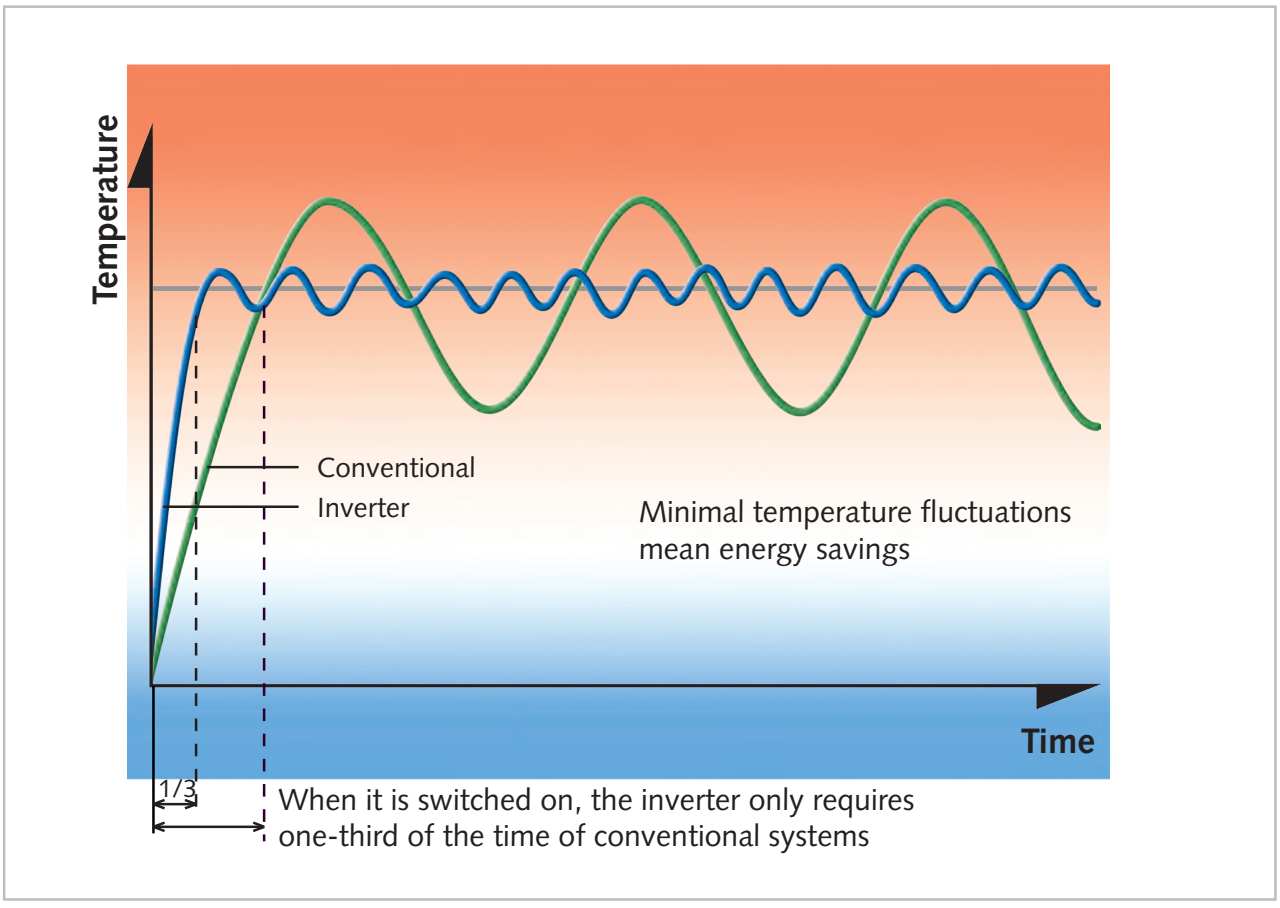

Fig. 54: Modern inverter technology

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.

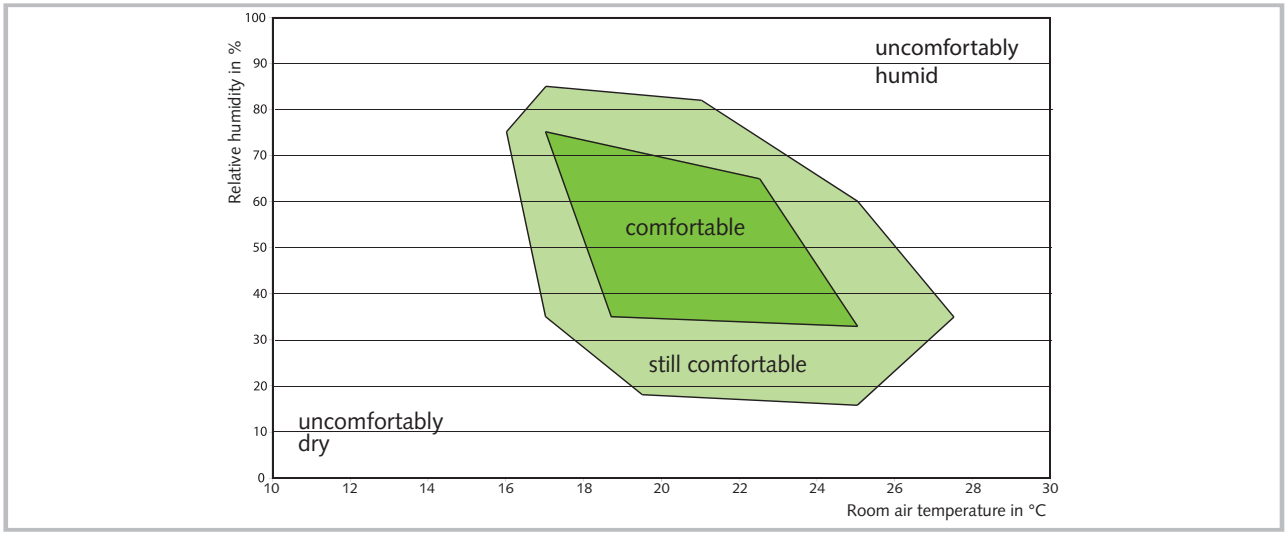

Fig. 55: Comfort zone

3.2 WKF series

We offer two different indoor-unit designs. The wall-mounted WKF series is equipped with a circulation pump and a safety module on the water side. Furthermore, an electrical auxillary heater can be incorporated as an option. It may be dispensed with an external buffer tank when the heat pump acting as the sole heat source. Should a second heat source may be used, a buffer tank is needed. The WKF series was constructed for the addition of several heat sources (bivalent installations or systems with solar-heating equipment).

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, that sufficient defrosting energy is available.

3.3 WKF-compact series

In addition, the indoor module of the WKF-compact series is fitted with an enamelled 300 L domestic water storage. An auxiliary electric heater 9 kW is available optionally. 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 by REMKO Smart-Serv or bivalent operation by REMKO Smart-BVT is also to realize. All connections are to be installed on top of the device.

4 Installation

4.1 System layout WKF/WKF-compact 70

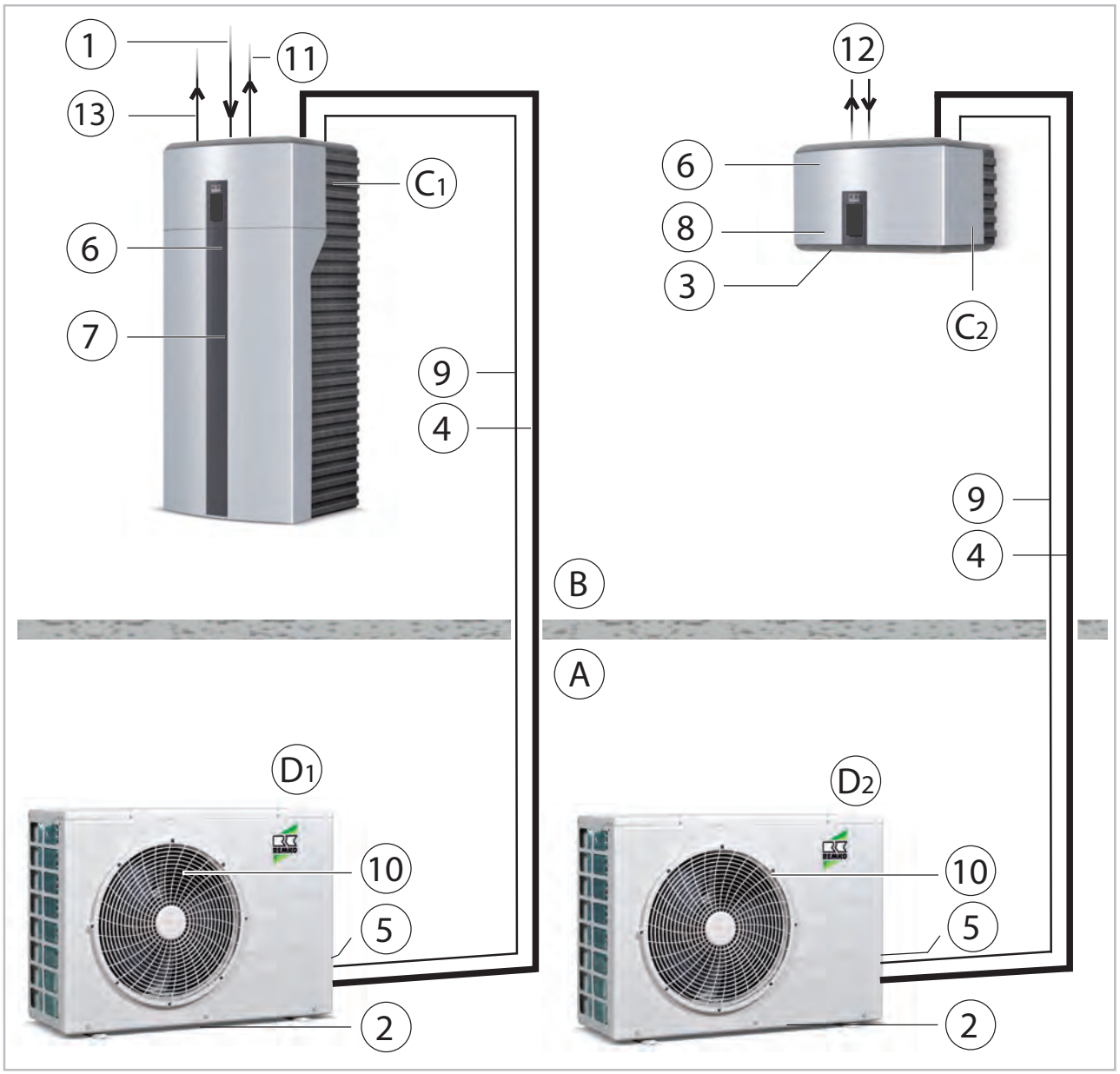

Fig. 56: System layout WKF/WKF-compact 70

A: Outdoor area
B: Indoor area
C1, C2: Indoor module WKF-compact 70, WKF 70
D1, D2: Outdoor module WKF-compact 70, WKF 70
1: Common return pipe (DN 25)
2: Condensate drain outdoor module (must be designed to be frost proof!)
3: Condensate drain indoor module
4: Refrigerant lines $^{3}/_{8}$" and $^{5}/_{8}$"
5: Mains supply outdoor module = 230V/1~/ 50Hz 16 A (e.g. 3x1,5 mm^2)
6: Mains supply indoor module = 230V/1~/ 50Hz 10A (e.g. 3x1,5 mm^2)
7: Mains cable electric auxiliary heater (e.g. 5x2,5 mm^2)
8: Mains cable electric auxiliary heater (optional), (e.g. 5x2,5 mm^2)
9: Control cable sheathed (e.g. 2x1mm^2)
10: Fan
11: Inlet for heating (DN 32)
12: Hot-water inlet and return pipes (DN 32)
13: Inlet pipe for hot-water storage (DN 32)

4.2 System layout WKF/WKF-compact 120

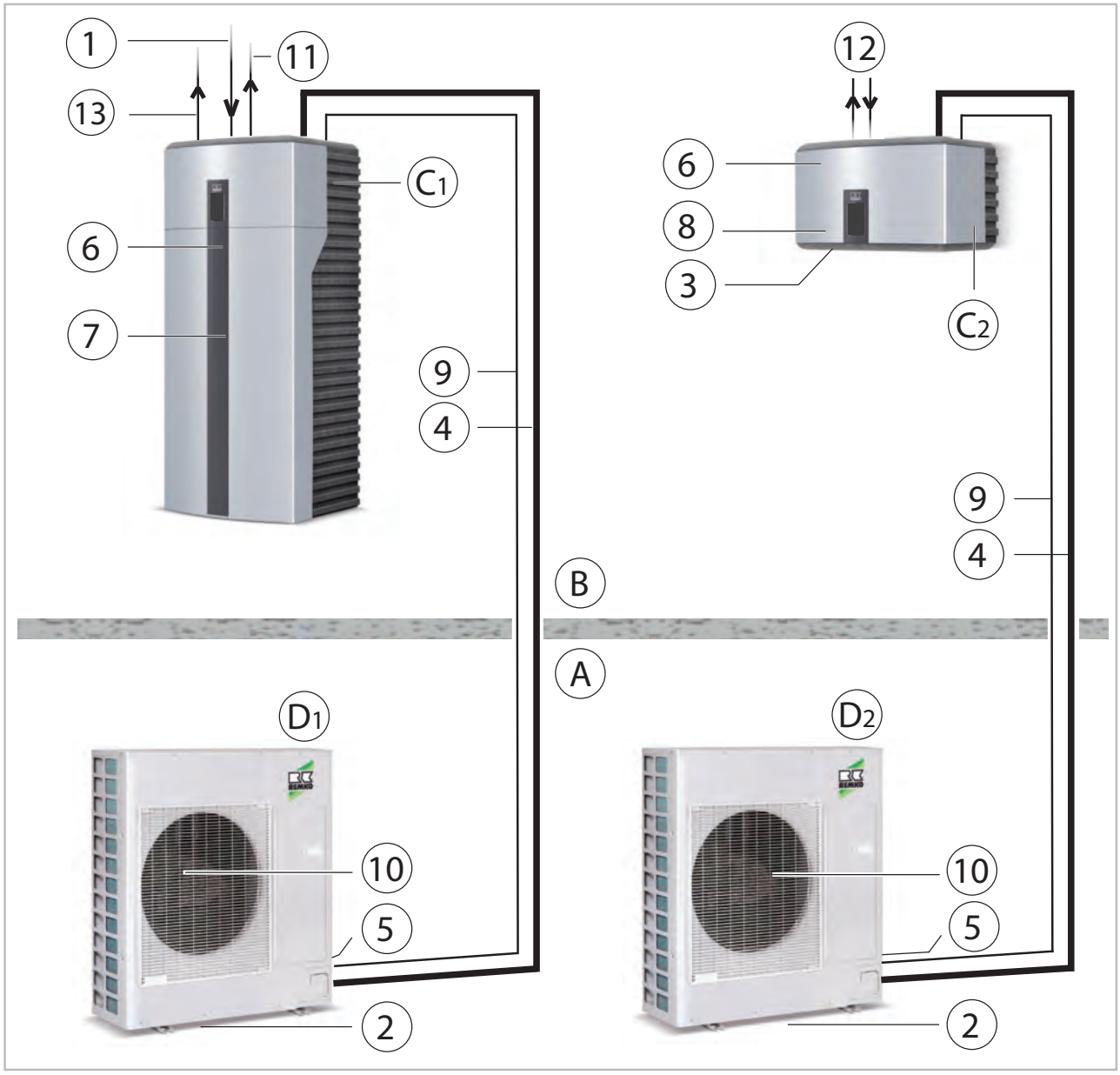

Fig. 57: System layout WKF/WKF-compact 120

A: Outdoor area
B: Indoor area
C1, C2: Indoor module WKF-compact 120, WKF 120
D1, D2: Outdoor module WKF-compact 120, WKF 120
1: Common return pipe (DN 25)
2: Condensate drain outdoor module (must be designed to be frost proof!)
3: Condensate drain indoor module
4: Refrigerant lines $^{3}/_{8}$" and $^{5}/_{8}$"
5: Mains supply outdoor module = 230V/3~/ 50Hz 20 A (e.g. 3x2,5 mm^2)
6: Mains supply indoor module = 230V/1~/ 50Hz 16A (e.g. 3x1,5 mm^2)
7: Mains cable electric auxiliary heater (e.g. 5x2,5 mm^2)
8: Mains cable electric auxiliary heater (optional), (e.g. 5x2,5 mm^2)
9: Control cable sheathed (e.g. 2x1mm^2)
10: Fan
11: Inlet for heating (DN 32)
12: Hot-water inlet and return pipes (DN 32)
13: Inlet pipe for hot-water tank (DN 32)

4.3 System layout WKF/WKF-compact 180

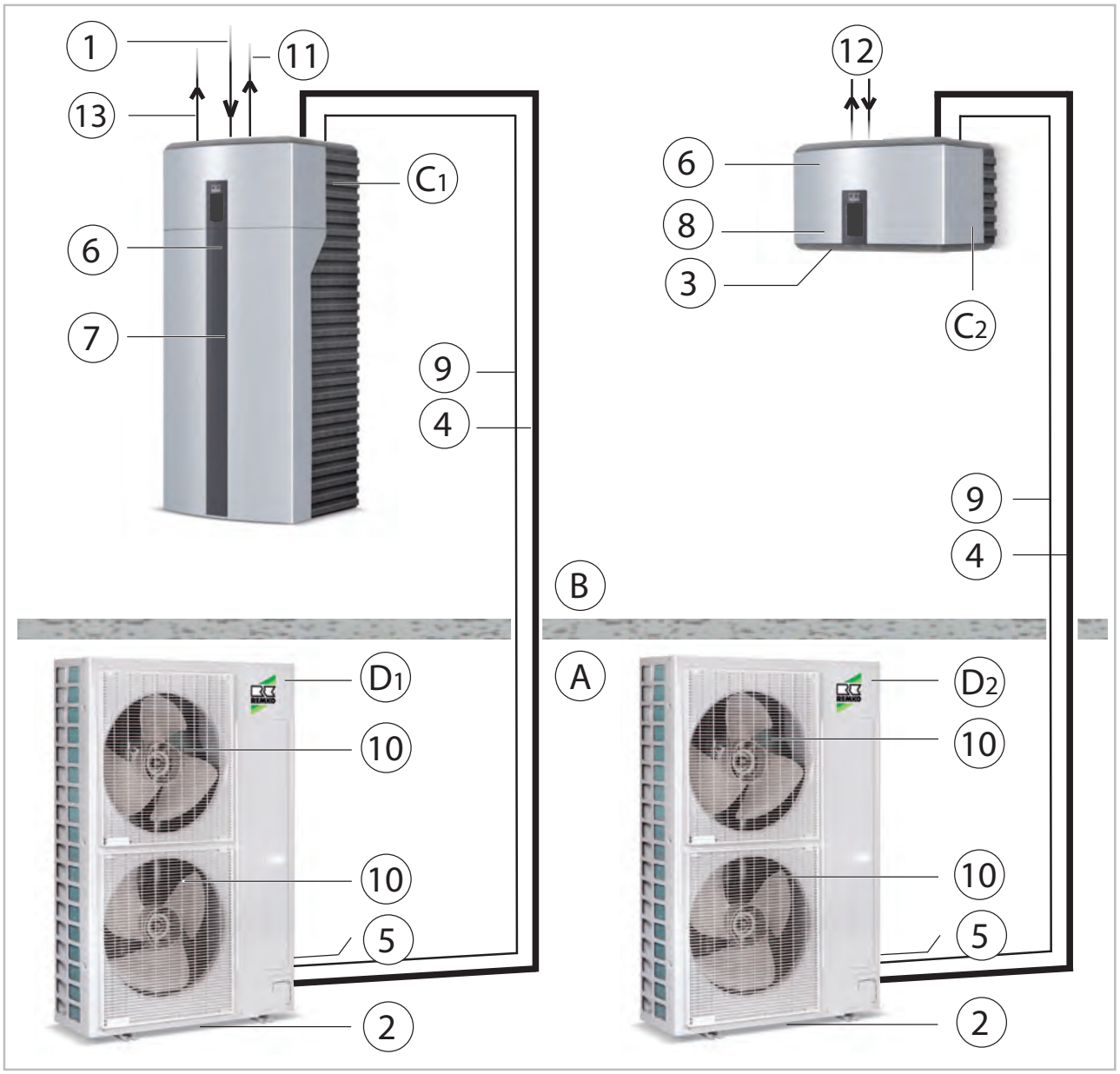

Fig. 58: System layout WKF/WKF-compact 180

A: Outdoor area
B: Indoor area
C1, C2: Indoor module WKF-compact 180, WKF 180
D1, D2: Outdoor module WKF-compact 180, WKF 180
1: Common return pipe (DN 25)
2: Condensate drain outdoor module (must be designed to be frost proof!)
3: Condensate drain indoor module
4: Refrigerant lines $^{3}/_{8}$" and $^{5}/_{8}$"
5: Mains supply outdoor module = 400V/3~/ 50Hz 3x16 A (e.g. 5x1,5 mm^2)
6: Mains supply indoor module = 230V/1~/ 50Hz 16A (e.g. 3x1,5 mm^2)
7: Mains cable electric auxiliary heater (e.g. 5x2,5 mm^2)
8: Mains cable electric auxiliary heater (optional), (e.g. 5x2,5 mm^2)
9: Control cable sheathed (e.g. 2x1mm^2)
10: Fan
11: Inlet for heating (DN 32)
12: Hot-water inlet and return pipes (DN 32)
13: Inlet pipe for hot-water tank (DN 32)

4.4 System layout WKF 120 Duo

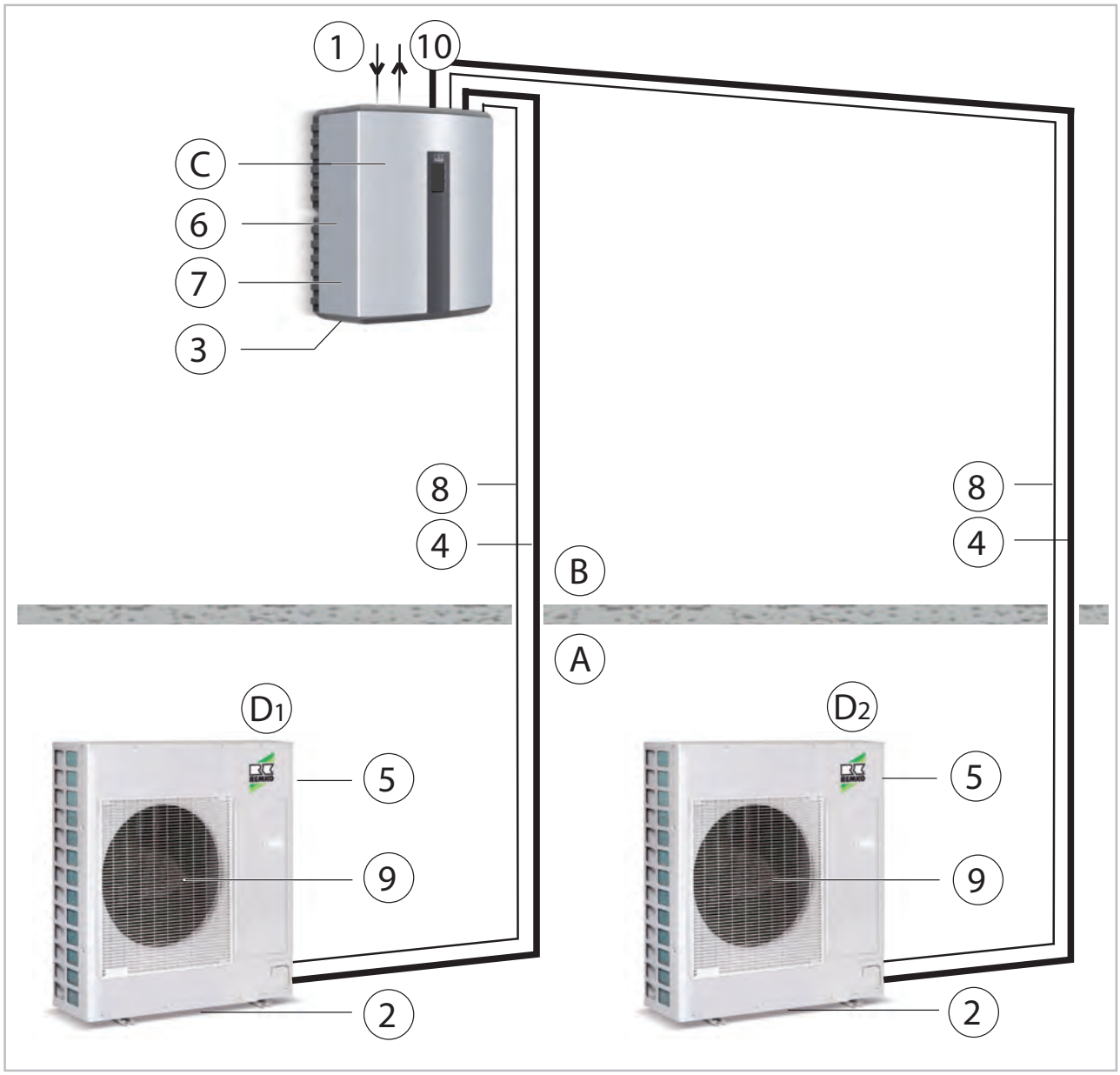

Fig. 59: System layout WKF 120 Duo

A: Outdoor area
B: Indoor area
C: Indoor module WKF 120 Duo
D1, D2: Outdoor module WKF 120 Duo
1: Common return pipe
2: Condensate drain, outdoor module (must be designed to be frost proof!)
3: Condensate drain, indoor module
4: Refrigerant piping $^{3}/_{8}$" and $^{5}/_{8}$"
5: Power supply, outdoor module = 230V/1~/ 50Hz 20A (e.g. 3x2.5 mm²)
6: Power supply, indoor module = 230V/1~/ 50Hz 16A (e.g. 3x1.5 mm²)
7: Power supply for auxiliary heater (optional), (e.g. 5x2.5 mm²)
8: Control line sheathed (e.g. 2x1 mm²)
9: Fan
10: Inlet for heating

4.5 System layout WKF 180 Duo

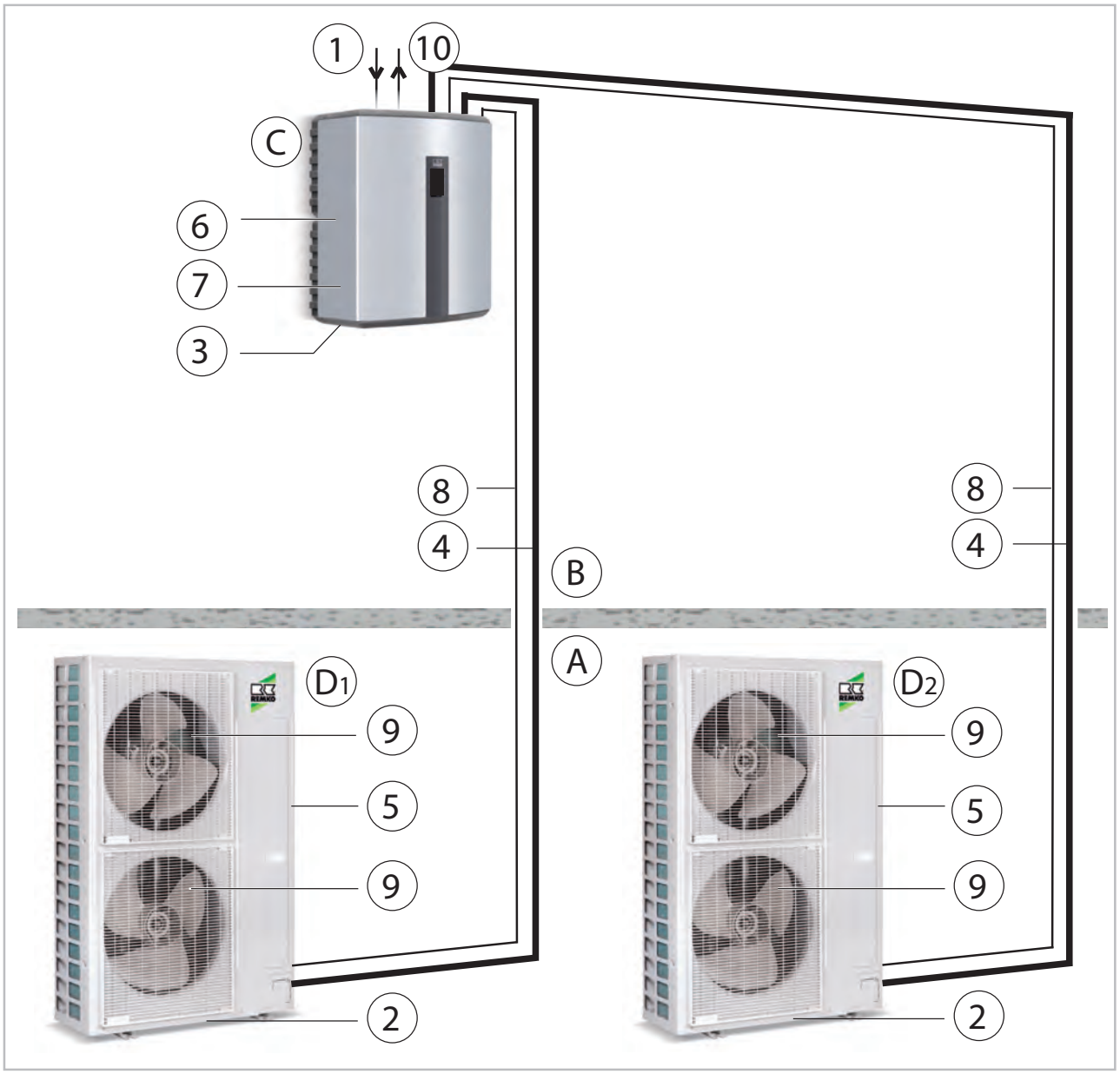

Fig. 60: System layout WKF 180 Duo

A: Outdoor area
B: Indoor area
C: Indoor module WKF 180 Duo
D1, D2: Outdoor module WKF 180 Duo
1: Common return pipe
2: Condensate drain, outdoor module (must be designed to be frost proof!)
3: Condensate drain, indoor module
4: Refrigerant piping $^{3}/_{8}$" and $^{5}/_{8}$"
5: Power supply, outdoor module = 400V/3~/ 50Hz 3x16A (e.g. 5x1.5 mm^2)
6: Power supply, indoor module = 230V/1~/ 50Hz 16A (e.g. 3x1.5 mm^2)
7: Power supply for auxiliary heater (e.g. 5x2.5 mm^2)
8: Control line sheathed (e.g. 2x1 mm^2)
9: Fan
10: Inlet for heating

The indoor and outdoor units must be connected to refrigerant piping with dimensions (external diameter) $^{3}/_{8}$" (=9.52 mm) and $^{5}/_{8}$" (=15.88 mm). At least a two-wire control line must be routed between the modules. Both the indoor and outdoor units require a separate power supply.

⚠ WARNING!

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

4.6 General installation instructions

- These instructions are to be observed when installing the entire system.
- The device should be delivered as near as possible to the site of installation in its original packaging in order to avoid transport damage.
- The device is to be checked for visible signs of transport damage. Possible defects must be reported immediately to contract partners and the forwarding agent.
- Suitable sites for installation are to be selected with regard to machinery noise and the set-up process.
- The shut-off valves for the refrigerant lines may only be opened immediately before commissioning of the system.
- The outdoor units are pre-filled with refrigerant up to a distance of 10 meters from the interior component. If the basic length of the refrigerant line exceeds 10 metres, add refrigerant.
- Establish all electrical connections in accordance with the relevant DIN and VDE standards.
- The electrical power cables must be fastened to the electrical terminals in the proper manner. Otherwise there is a risk of fire.
- See that neither refrigerant or pipes that carry water pass through living- or sleeping areas.

⚠ DANGER!

The installation of refrigerant equipment may be undertaken only by trained specialist personnel!

! 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).

⚠ DANGER!

All electrical installation work must be done by an electrician.

! 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).

⚠ DANGER!

All electrical installation work must be done by an electrician.

Wall breakthroughs

- A wall opening of at least 70 mm diameter and 10 mm slope 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 breakthrough under observation of fire protection regulations (responsibility of customer).

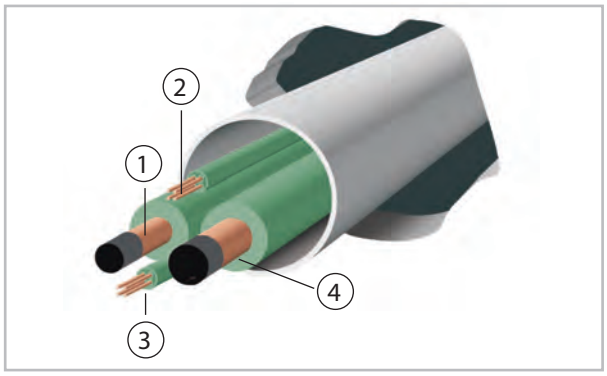

Fig. 61: Wall breakthroughs

1: Liquid line
2: Control cable
3: Supply
4: Hot gas line

4.7 Installation, mounting indoor module

Indoor module WKF series

- The wall bracket is to be attached to the wall with the fasteners supplied and the indoor module hooked onto it.
- The wall must possess sufficient load-bearing capacity for the weight of the indoor module.
- Ensure that the wall bracket is installed level.
- The indoor module can be aligned precisely by means of the adjustment screws on the back of the housing.
- The indoor module 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 device for installing the safety assembly.

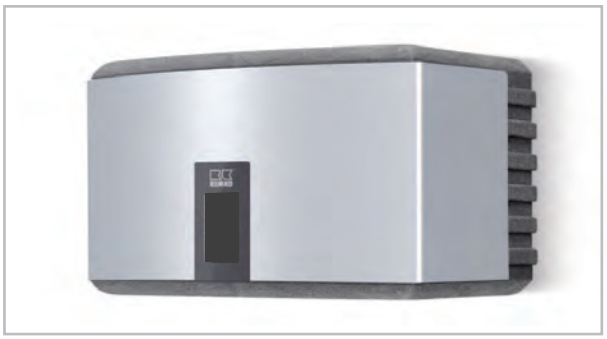

Fig. 62: Wall mounting WKF

Indoor module WKF-compact series

- The indoor module must be installed on a firm, level surface.
- The surface must possess sufficient load-bearing capacity for the weight of the indoor module.
- The height-adjustable feet can be used to level the indoor module precisely .
- The indoor module 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 device for installing the pipes and the safety assembly.

Fig. 63: Floor mounting WKF-compact

⚠ WARNING!

Only fasteners suitable for the given application may be used.

Minimum distances for the indoor modules

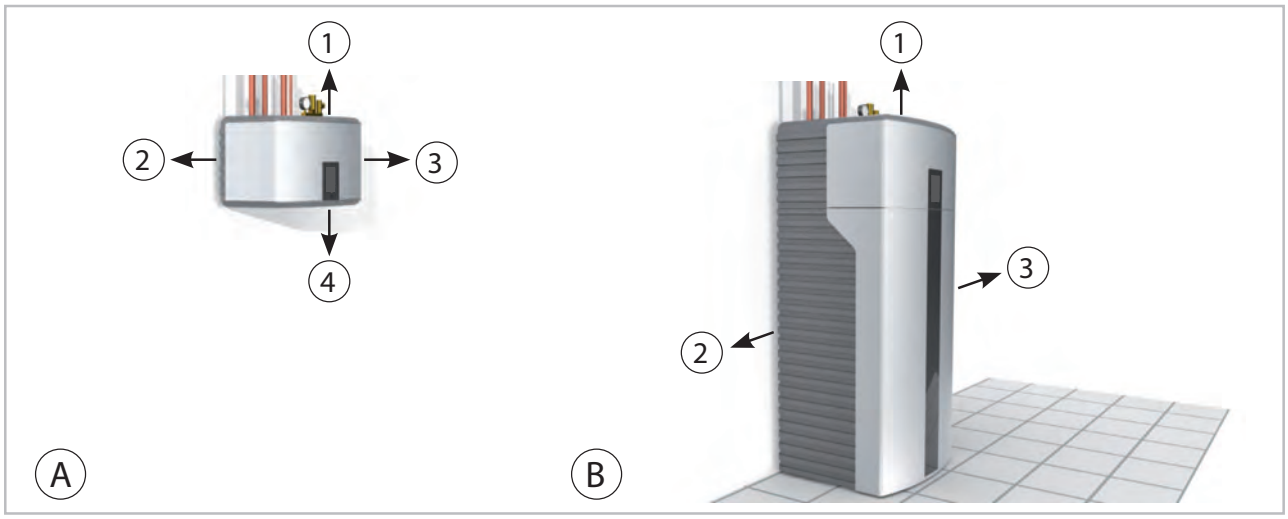

Fig. 64: Minimum distances for the indoor modules

A: WKF B: WKF-compact

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

4.8 Installation, mounting outdoor module

Outdoor module installation location

- The device may be attached only to a load-bearing structure or wall. Ensure that the outdoor module 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 intake and exhaust. The exhaust air must not be intake in again. Observe the performance of external modules. Additionally, there must be adequate space available for installation, maintenance and repair.
- If the outdoor module is erected in an area of strong winds, then the device must be protected against them and it is recommended an additional stabilization. This can, for example, be realized with ropes or other structures (Fig. 65). The snow line is to be observed during installation (Fig. 66).
- The outdoor module must always be installed on vibration dampers. Vibration dampers prevent the transmission of vibrations through the floor or walls.
- A heated, condensate tra 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 lateral 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. 66).
- The installation site of the outdoor module should be agreed together with the operator primarily so that operating noise is minimised and not in terms of “short routes”. Thanks to the split-design technology there are a great deal of different installation options with almost identical efficiency available.

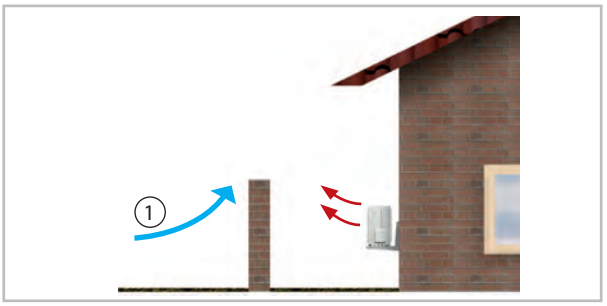

Fig. 65: Protection from wind

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.

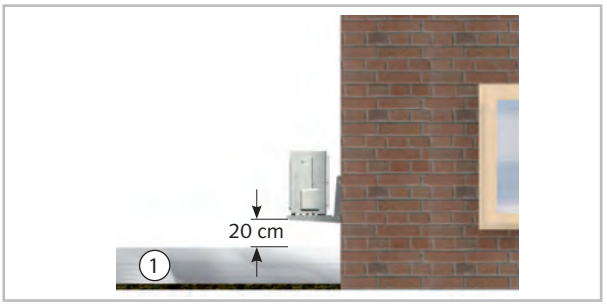

Fig. 66: Protection from snow

1: Snow

Point of emissions	Assessment level in accordance with TA noise	
	days in dB(A)	nights 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 des Gefahrenbereiches

⚠ 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 equipment 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 in mm for the outdoor modules

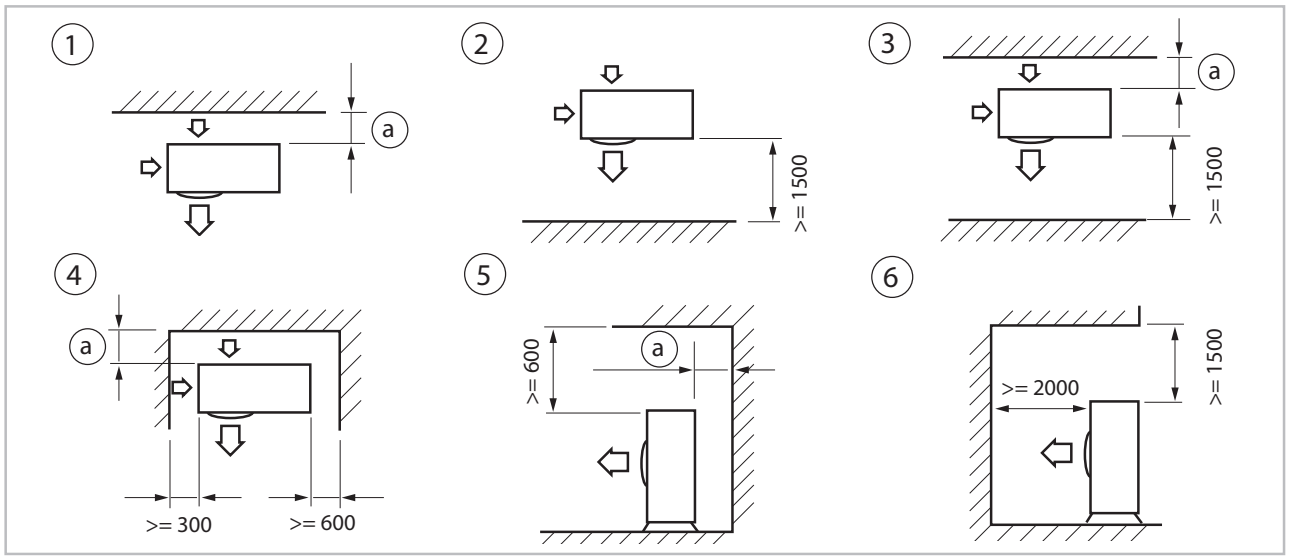

Fig. 67: Mindestabstände bei Aufstellung eines Außenmoduls in mm

1: Against a wall, free flow air forward, backward flow restriction
2: Against a wall, facing the wall air outlet, flow front restriction
3: Freely between two walls, facing the wall outlet, Sides: flow restrictions in front and rear
4: In a niche, free flow air to the front, rear and flow restriction on both sides.
5: Before a covered wall, free flow air to the front, rear and top of flow restrictions
6: Before a covered wall, air outlet towards wall, flow restrictions behind and above
a: WKF/WKF-compact 70 >= 150 mm
WKF/WKF-compact 120/180 >= 200 mm
WKF/120/180 Duo >= 200 mm

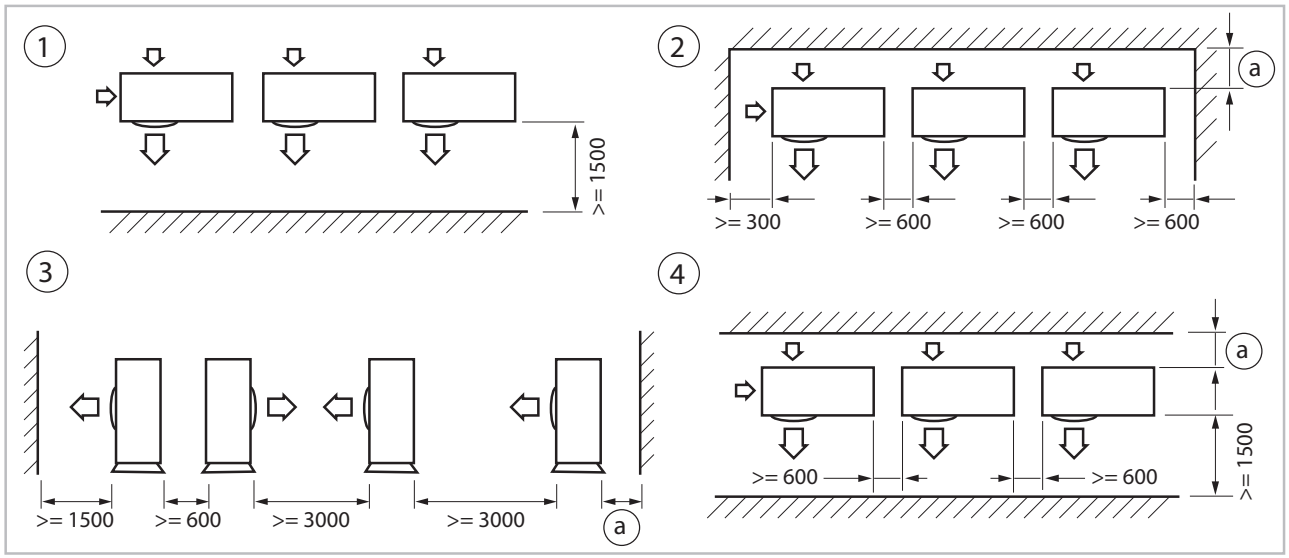

Fig. 68: Minimum distances for installation of several outdoor modules in mm

1: Against a wall, facing the wall air outlet, flow front restriction
2: In a niche, free flow air to the front, rear and flow restriction on both sides.
3: Between two walls, facing the wall outlet and other modules, Sides: flow restrictions in front and rear
4: Between two walls, air outlet towards wall, or the external modules-free: flow restriction in front, rear and internal modules on the sides.
a: WKF/WKF-compact 70 >= 150 mm
WKF/WKF-compact 120/180 >= 200 mm
WKF/120/180 Duo >= 200 mm

Condensate draining and ensured discharge

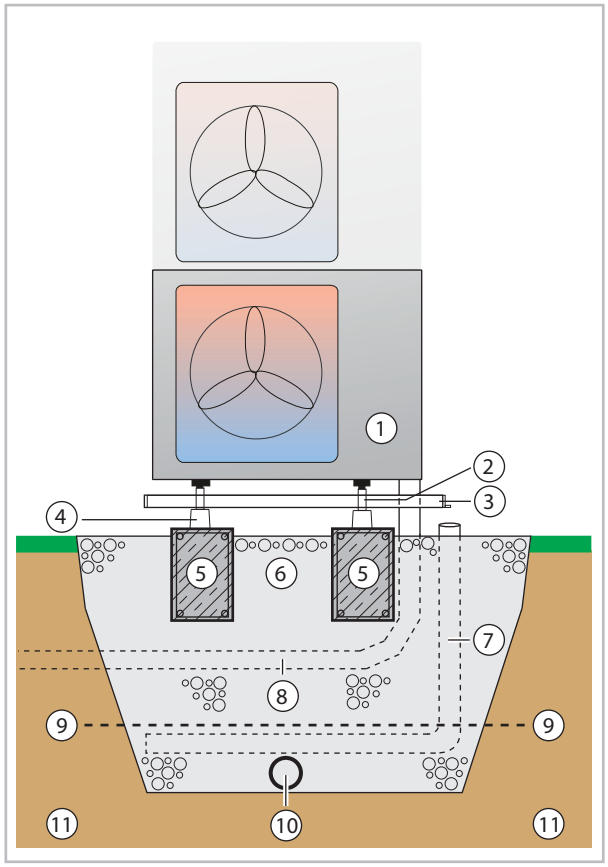

Fig. 69: Condensate-, melt-water drainage and transversely reinforced strip footing (sectional drawing)

1: Outdoor module
2: Leg
3: Condensation catch pan
4: Floor bracket
5: Transversely reinforced strip footing HxBxD = 300x200x800 mm
6: Gravel layer for seepage
7: Drainage canal
8: Protection tube for refrigerant pipes and electrical interconnection (temperature resistant up to at least 80 °C)
9: Depth of frost penetration
10: Drainage pipe
11: Soll

! NOTICE!

The refrigerant lines must enter the housing from the rear, side or front with the use of the REMKO OA2 oil separator.
WKF/WKF-compact 70/85/120/180

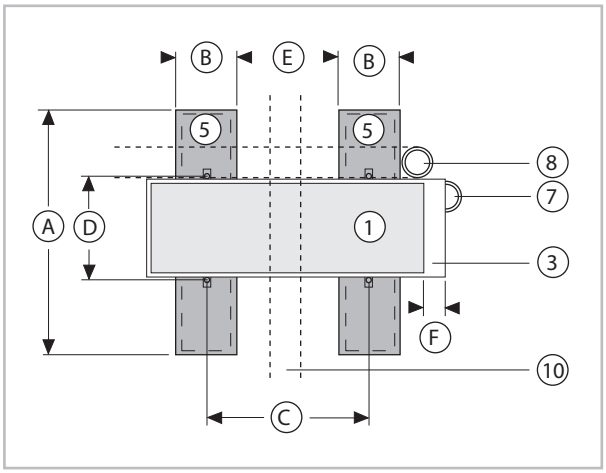

Fig. 70: Dimensioning of the transversely reinforced strip footing (Plan view)

Please see the terms 1,3,5,7,8 and 10 the legend on Fig. 69

Dimensioning of the strip footing (all values in mm)

Dim.	WKF 70 WKF-compact 70	WKF 120 WKF-compact 120 WKF 120 Duo WKF 180 WKF-compact 180 WKF 180 Duo
A	800	800
B	200	200
C	660	620
D	340	360 [1)] 350 [2)]
E	400	420
F	100	100

[1)] WKF 120 / WKF-compact 120 / WKF 120 Duo

[2)] WKF 180 / WKF-compact 180 / WKF 180 Duo

Condensate connection

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

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

- The condensate drain pipe to be installed on-site must be installed with a in cline of at least 2 % for good drainage. If necessary, fit vapour density insulation.
- When operating the system at outdoor temperatures below 4 °C, care must be taken that the condensate line is frost protected. The lower part of the housing and condensate pan are to be kept frost free in order to ensure permanent drainage of the condensate. If necessary, fit supplementary pipe heating.
- After completed installation, check that the condensate drainage is unobstructed and ensure that the line is leak tight.

Ensured discharge in the event of leakage

With the REMKO oil separator OA 2.2, the below listed requirements of local regulations and laws are met.

! NOTICE!

Local regulations or environmental laws, for example the German Water Resource Law (WHG), can require suitable precautions to protect against uncontrolled draining in case of leakage to provide for safe disposal of escaping refrigerator oil or hazardous media.

! 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.

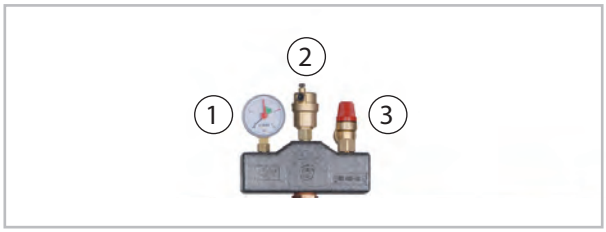

Fig. 71: Safety assembly

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/WKF-compact series

Hydraulic circuit diagram WKF

Functions: heating and hot water, operating mode: mono-energetic 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!

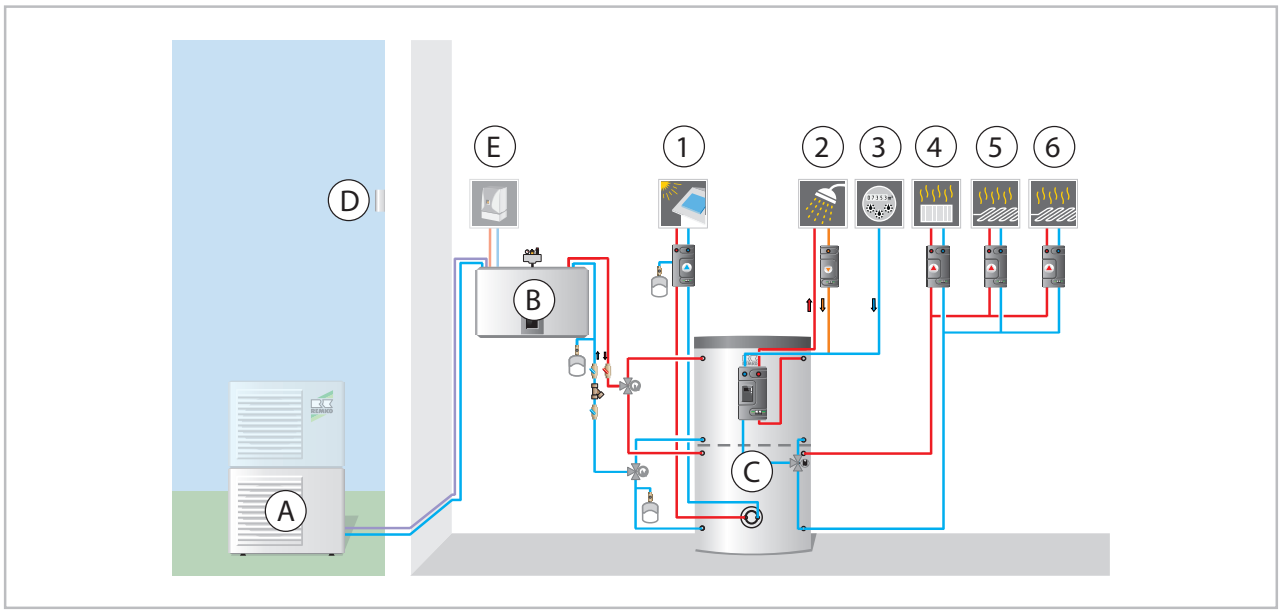

Fig. 72: Example hydraulic diagram WKF

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 circuit
5: Heating circuit 1 mixed
6: Heating circuit 2 mixed

The WKF compact heat pump models are ideal for use in new or in 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: mono-energetic.

**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!**

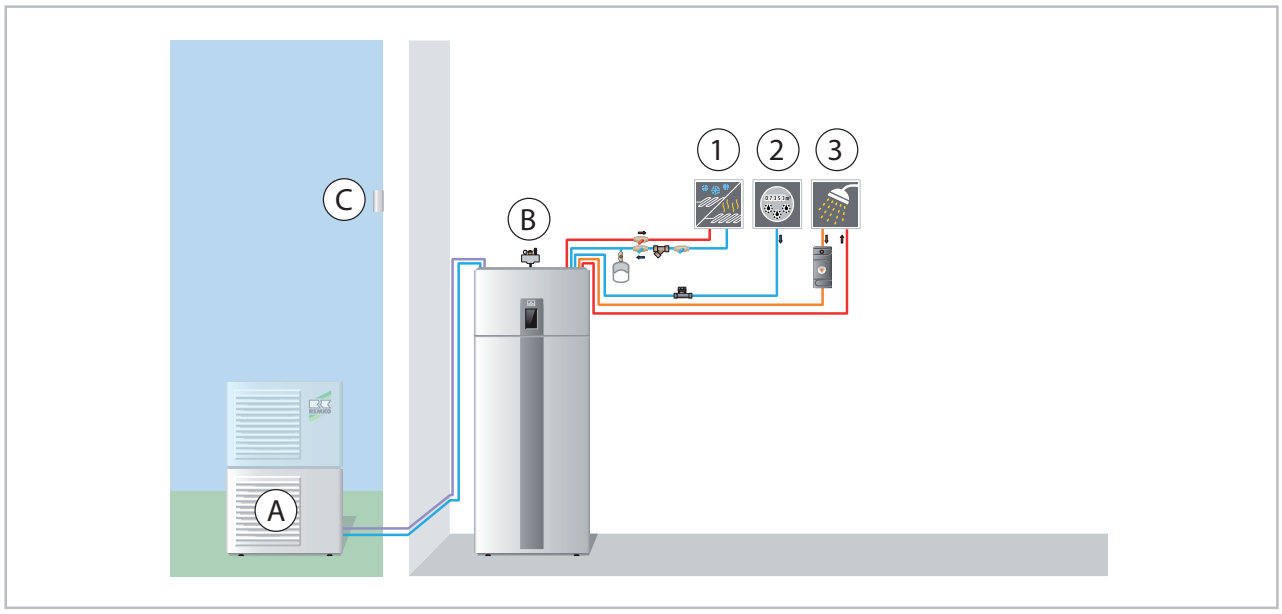

Fig. 73: Example hydraulic diagram WKF-compact

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 electr. booster heater (mono-energetic 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 3.5m², 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 Electrical heating coil

6.1 Function of an electrical heating coil

Layout of the electrical heating coil

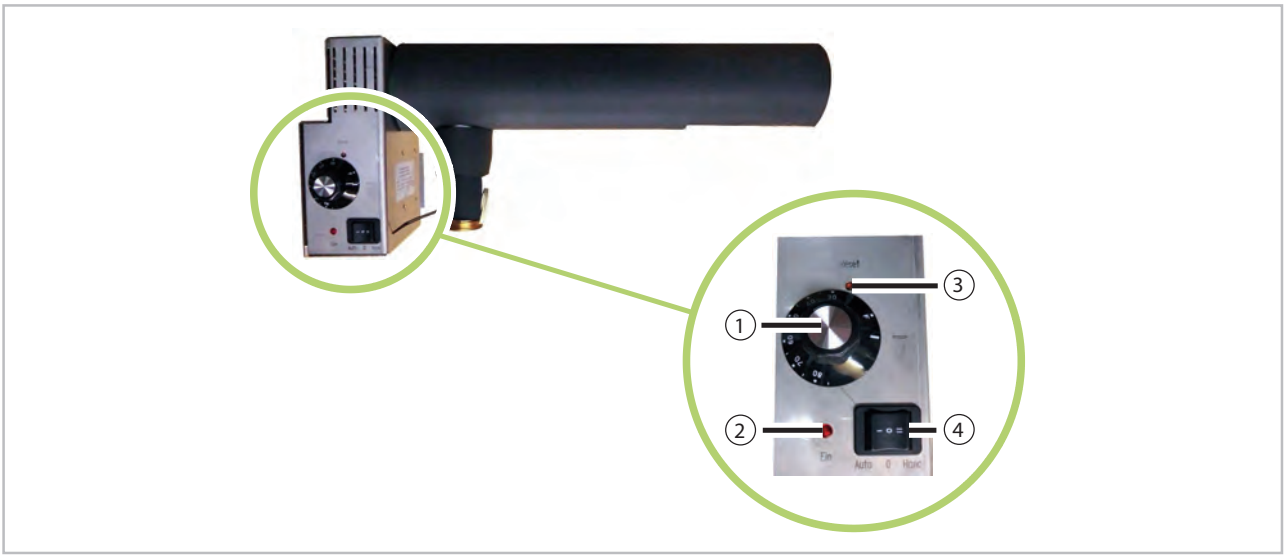

Fig. 74: Electrical heating coil, layout

1: Thermostat including safety temperature limiter (STB)
2: Operating LED (On/Off)
3: Reset STB
4: Function switch (0 = off, I = automatic, II = manual mode)

Function switch:

Automatic mode (I)

When the automatic mode is switched on, the heating coil, in accordance with the set bivalence point or the building heating load and selected inlet temperature, is engaged after a time lag and assists the heat pump in parallel operating mode.

Manual operation (II)

When manual operation is engaged, the heating coil is engaged directly, regardless of the parameters in the Smart-Control. This function can be used in the emergency heating mode, or for the pre-heating of non-installed or operationally capable outdoor modules. The temperature is then set using the thermostat on the housing.

! NOTICE!

Pumps and changeover valves must be activated separately in manual operation.
It is not permitted to operate the heating coil without the corresponding medium flow rate!

LED red (On):

This LED indicates if the heating coil is being activated or not.

Reset STB (Reset):

If the overheating of the heating coil has triggered the safety temperature limiter (STL), it can be reset after cooling down again by pressing this button. However, the reason for it being triggered must be analysed and remedied.

6.2 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. pH values and the salt content also play a major role. The challenge: A licenced 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 contractor/planner and
- subject to the installed materials: filling the heating system with demineralised softwater 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		
Overall 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	salline
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 value range is limited: the 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. This has reasons:

- The improper use of chemicals often leads to the failure of elastomer materials
- To blockages and deposits because of sludge formation
- To defective floating seals in pumps
- To the formation of biofilm which can cause microbial influenced corrosion or significantly impair heat 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. 75: Form for logging filling with completely deionised water

Media conveyed by the pumps

Grundfos pump

The pump is suitable for conveying the following media:

- Clean, thin, non-aggressive and non- explosive media without any solid or long-fibred components
- Cooling liquids that are free of mineral oil
- Soft water

The kinematic viscosity of water is ϑ = 1 mm2/s (1 cSt) at 20 °C. If the pump is used to convey liquids that have a different viscosity, the conveying capacity of the pump is reduced.

Example:

A water-glycol mixture with a 50 % glycol ratio has a viscosity of approx. 10 mm2/s (10 cSt) at 20 °C. This reduces the conveying capacity by approx. 15 %. Additives that could impair the functionality of the pump must not be added to the water. The viscosity of the conveyed medium must be taken into consideration when designing the pump.

Wilo pump

The pump can be used to convey water- glycol mixtures with a glycol ratio of up to 50 %. Example of a water-glycol mixture:

Maximum permissible viscosity: 10 to 50 cSt. This corresponds to a water-ethylene glycol mixture with a glycol ratio of approx. 50 % at -10 °C. The pump is controlled by a performance-limiting function that protects against overloading.

The conveyance of glycol mixtures has an impact on the MAX characteristic curve because the conveying performance is reduced in line with the glycol content and the temperature of the media. Temperatures above the nominal temperature specified for the medium in question should be avoided so that the effect of the glycol is not diminished.

As a general rule, operating times should be kept to a minimum if media temperatures are high. It is essential that the plant be cleaned and rinsed before adding the glycol mixture.

To prevent corrosion or precipitates, the glycol mixture must be checked regularly and replaced if necessary. If the glycol mixture needs to be thinned out, follow the instructions of the glycol manufacturer.

9 Refrigeration connection

9.1 Connection of refrigerant lines

- The outdoor- and the indoor units are connected with two (WKF Duo with four) copper pipes of refrigerator quality having the dimensions 3/8" (=9,52 mm) and 5/8" (=15,88 mm) (REMKO special accessory).
- Observe the permitted bending radius for the refrigerant pipes during installation in order to prevent kinks. Never bend a pipe twice in the same place in order to prevent embrittlement or crack formation.
- Assure suitable fastening and insulation when laying the refrigerant pipes.
- The copper pipes are to be flared to make the connections to the units. In doing so, check that the flare has the correct shape and suitable union nuts. (Fig. 76 to Fig. 78).

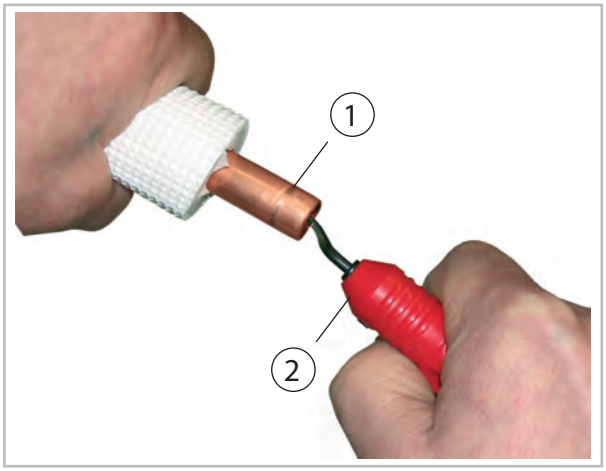

Fig. 76: Deburring the refrigerant line

1: Refrigerant line
2: Deburrer

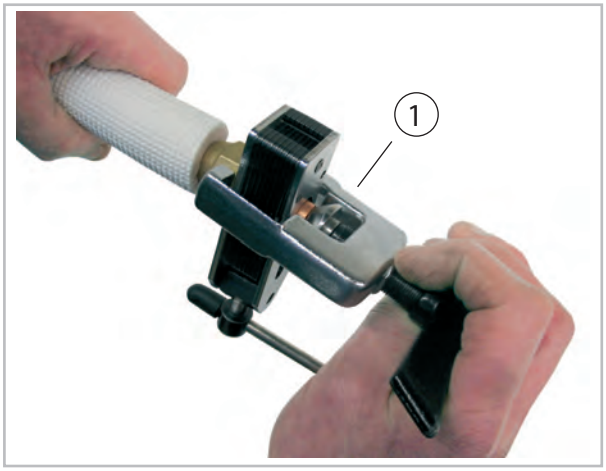

Fig. 77: Flanging the refrigerant line

1: Flanging tool

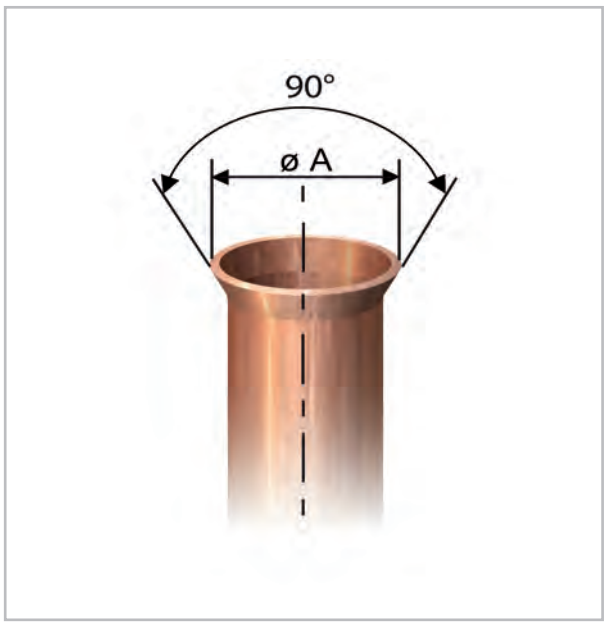

Fig. 78: Correct flange shape

Copper piping Outside diameterer	Flare dimensions ø A
3/8" =9,52 mm	12,4 - 12,8 mm
5/8" =15,88 mm	21,9 - 22,3 mm

Connection to the unit

- Remove the cover panel from the outdoor unit if necessary. It may be necessary to remove the pre-cut bushings.
- Take off the factory-fitted protective caps. You can use the union nuts for additional mounting. Make sure to slide the union nuts onto the pipe before it is flared.
- Make connections to the device by hand initially, in order to ensure a good fit. Later, tighten the joints with two open-end wrenches Use one wrench to resist the rotation of the other (Fig. 79).

! 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.

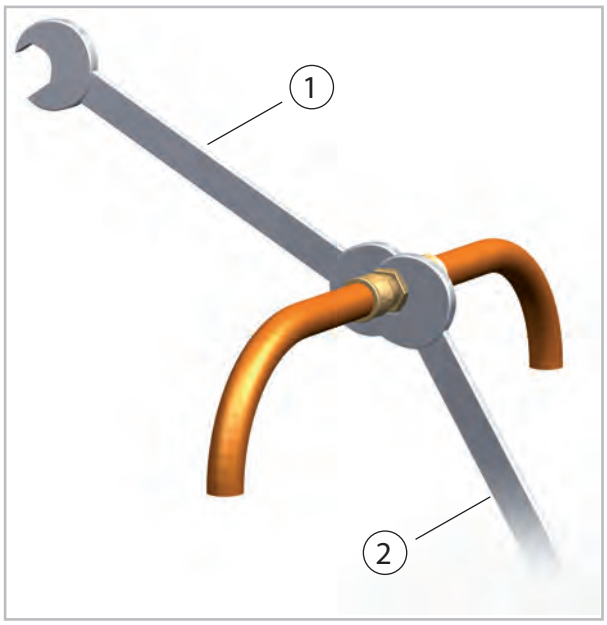

Fig. 79: Tighten fittings

1: Tighten 1st Spanner
2: Counter 2nd Spanner

Copper piping Outside diameter	Tightening torque
3/8" =9,52 mm	32 - 40 Nm
5/8" =15,88 mm	65 - 75 Nm

- The installed refrigerant pipes, including the flare connections, must be provided with suitable insulation.
- Special measures need not be taken for the return of the compressor oil.

! NOTICE!

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

Outdoor units may be delivered with nuts suitable for joining flanges.

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. The leak test 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 pipes 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 units and the length of the refrigerant pipes. 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 component 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 components have been connected and checked, the system can be commissioned. To ensure the proper functioning of the units, a functional check must be performed prior to handover to the operator in order to detect any operational irregularities. 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 pipes.
- Compressor and fan running smoothly.
- Discharge of warmer water in the indoor unit and discharge cold air in the outdoor unit in heating mode
- Function test of the indoor units 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 component 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 (to be provided by the customer).
5. Program the heat pump manager.
6. Switching on heating mode

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

7. Check the correct function and settings of all regulation, control and safety devices 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 heat pump manager to set the target temperature to the required value.
- Re-install all disassembled parts.
- Instruct the operator on how to use the units.

! 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 cycle!

⚠ 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 length of ordinary pipe (see table).
- If the length of any of the pipelines exceeds max. pipe length, then an additional filling for each metres of pipe length (basic length) is required (see next table).

Basic pipe length	Additional fill quantity
	WKF 70, WKF-compact 70
Zo max. 5 m	0 g/m
5 m to max. 30 m per circuit	50 g/m

Basic pipe length	Additional fill quantity	
	WKF 120 WKF-com-pact 120 WKF 120 Duo	WKF 180 WKF-com-pact 180 WKF 180 Duo
To max. 10 m	0 g/m	0 g/m
10 m to max. 50 m per circuit	50 g/m	---
10 m to max. 75 m per circuit	---	50 g/m

Examples

Basic pipe length	Additional fill quantity	
	WKF 70, WKF-com-pact 70	All other series
5 m	0 g	0 g
10 m	250 g	0 g
15 m	500 g	250 g
20 m	750 g	500 g
25 m	1000 g	750 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 device contains refrigerant with a greenhouse potential of 1975. That means the escape of 1 kg of this refrigerant has an effect on global warming that is 1975 times greater than 1 kg CO^2, based on 100 years. Do not conduct any work on the refrigerant circuit or dismantle the device - 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.
- A water / system temperature of min. 20 °C in the return flow must be ensured (e.g. by means of heating rod/emergency-heat operation).
- The entire heating system is rinsed, cleaned and deaerated (incl. hydraulic balancing).
- The refrigerant filling quantity must be expanded if necessary! At HTS 80-130 > 7m by 30 g/m, HTS 200-260 > 7m by 60 g/m (overall piping quantity both units.
- The refrigerant piping is laid without kinks in the protective tube. The protective tube is dry and is professionally fitted with waterproof sealing to prevent any water penetration (see *'Condensate draining and ensured discharge' on page 65*).
- **The heat pump is not released if an outside temperature under 10 °C is measured at the outside sensor 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

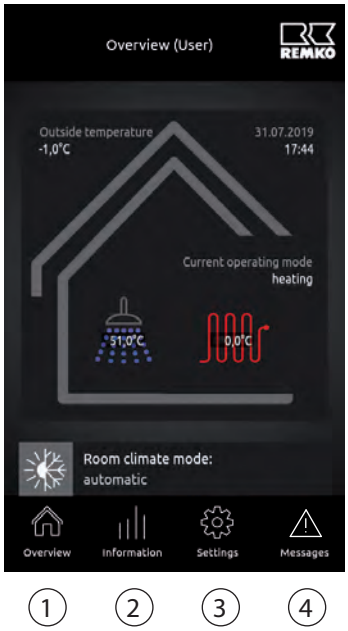

Fig. 80: Controls of the Smart-Control Touch

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 Incor-rect mode	The set-point temperature has to be higher than the heat-source tempera-ture, 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 recom-mend the operating mode "heat" in the cold heating season
	Temperature overlapping, e.g. external temperature greater than room temper-ature	Observe temperature ranges
Red indicator lamp	Failure outdoor module	Contact customer service

15.2 Error messages on the outdoor modules

Outdoor modules error display

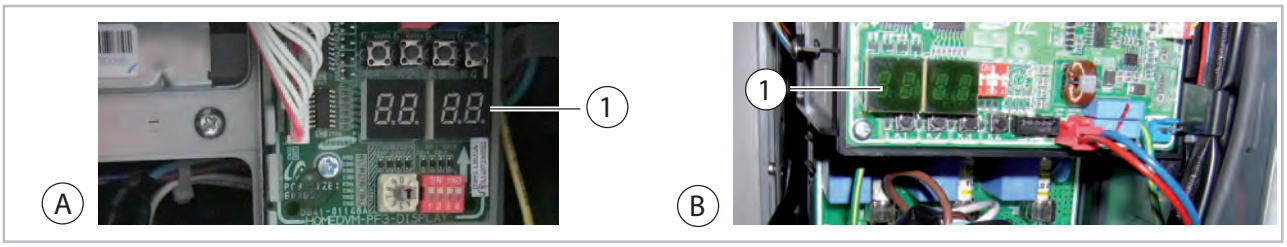

Fig. 81: Displays on outdoor modules

1: Display
A: WKF/WKF-compact 70
B: WKF/WKF-compact 120/180
WKF 120/180 Duo

Display	LED display			Replace	Plug	Pin	Meaning
	Red	Green	Yellow				
E101	-	-	-	IM	CN31		Communication error between indoor unit and outdoor unit or wrong platinum versions
E102	-	-	-	IM	CN31		Interruption in communication between indoor unit and outdoor unit
E162	-	-	-	IM			EEPROM error
E177	●	(+)	❍	OM			Outdoor unit has received an emergency stop signal
E201	●	✺	❍	OM	CN31		Communication error between indoor unit and outdoor unit or wrong platinum versions
E202	●	● or ❍	❍	OM	CN31		Interruption in communication between indoor unit and outdoor unit
E203	●	●	✺	OM	CN39		Communication error between main and inverter board
E221	●	✺	❍	OM	CN43	1,2	Error in outside temperature probe
E231	●	✺	❍	OM	CN43	3,4	Evaporator probe error
E237							
E251	●	✺	❍	OM	CN43	3,4	Hot gas temperature probe error
E320	●	✺	❍	OM	CN43	7,8	1st error, OLP probe (overload switch)
E403	●	✺	❍	OM			Ice protection compressor (in cooling mode only)
E404	●	✺	❍	OM			Compressor overload switch (normal operation)
E407	●	✺	❍	OM	CN34		Disruption by high pressure switch
E416	●	✺	❍	OM	CN43	5,6	Compressor overheating switch (normal operation)

Display	LED display			Replace	Plug	Pin	Meaning
	Red	Green	Yellow				
E419	●	✺	❍	OM	CN81		Malfunction of electronic expansion valve
E425	●	✺	❍	OM			Phase error malfunction. Minimum a phase conductor is missing (WKF 180 only) or wrong EEPROM on the motherboard (WKF 120 only)
E440	●	✺	❍	OM	CN43	1,2	Heating mode is not possible; outdoor temp. > 35°C
E441	●	✺	❍	OM	CN43	1,2	Cooling mode is not possible; outdoor temp. < +10°C
E443	●	✺	❍	OM	CN42		Gas leakage error (before operation). Low pressure at HP probe
E458	❍	❍	●	OM			Compressor start error. BLDC fan overcurrent or error
E461	❍	✺	❍	OM			Power consumption of the compressor is not plausible (too low)
E462	●	✺	❍	OM			Power consumption of the compressor is not plausible (too high)
E463	●	✺	❍	OM	CN43	7,8	Compressor overload switch (OLP) is triggered (Over 115°C)
E464	✺	❍	❍	OM			Inverter board current consumption IPM is too high or software version of the main board
E465	❍	●	✺	OM			Compressor current consumption too high
E466	✺	●	❍	OM			AC/DC power supply malfunction
E467	●	❍	●	OM			Phase error malfunction. A phase conductor is missing on the compressor
E468	●	✺	✺	OM			Motherboard/inverter board current consumption probe malfunction
E469	●	✺	❍	OM			Disturbance DC-voltage probe (inverter board)
E470	●	✺	❍	OM			EEPROM malfunction (read error)
E471	●	✺	❍	OM			EEPROM version of the motherboard does not match the inverter
E472				OM			Check AC input voltage
E473				OM			Compressor jammed
E474	✺	✺	❍	OM			IPM (IGBT module) malfunction
E475	❍	❍	●	OM			BLDC fan 2 malfunction
E484	●	✺	●	OM			PFC overload malfunction (inverter board)

REMKO WKF/WKF-compact series

Display	LED display			Replace	Plug	Pin	Meaning
	Red	Green	Yellow				
E485	●	✺	❍	OM			Total power consumpt.malfunction
E500	✺	✺	❍	OM			Inverter board overheating mal-function
E554	●	✺	❍	OM			Refrigerant quantity malfunction
E556	❍	❍	✺	OM			EEPROM version of the mother-board and Com-Kit version do not match
E901	●	✺	❍	IM	CN41	1,2	Return flow probe malfunction
E902	●	✺	❍	IM	CN41	5,6	Inlet probe malfunction
E904							
E906	●	✺	❍	IM	CN41	3,4	Liquid line probe malfunction
E912							
EA							

● = On / ✺ = Flashing / ❍ = Off / IM = Indoor unit / OM = Outdoor unit

16 General view of unit and spare parts

16.1 Exploded view outdoor modules WKF/WKF-compact 70

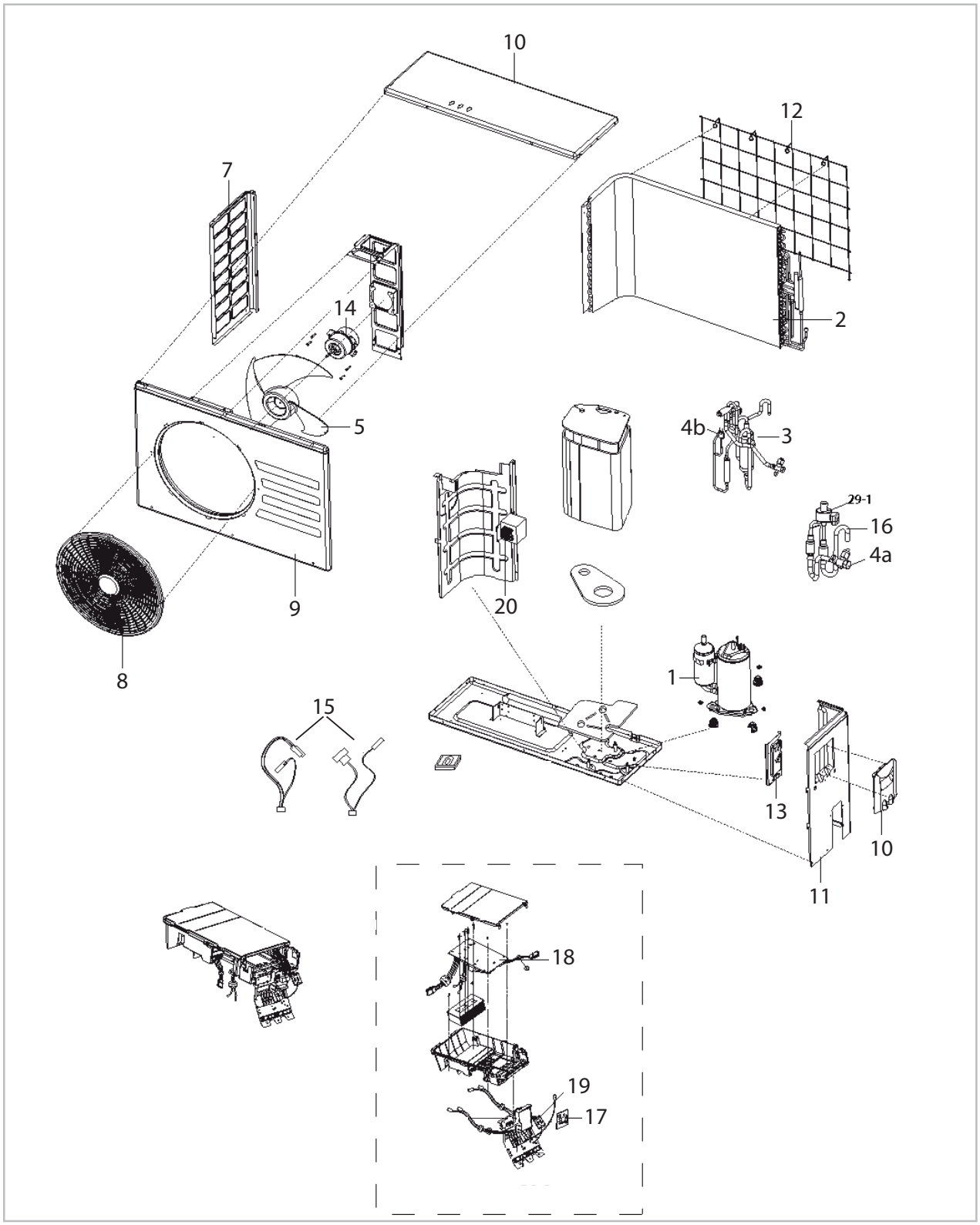

Fig. 82: Exploded view outdoor modules WKF/WKF-compact 70

16.2 Spare parts for outdoor unit WKF/WKF-compact 70

No.	Designation	WKF 70 / WKF-compact 70 WKF 70S-LINE / WKF-compact 70S-LINE
1	Compressor	On request by providing the serial number
2	Finned heat exchanger	
3	Four-way changeover valve	
4	Shut-off valves	
5	Fan blade	
6	Cover panel	
7	Side panel, left	
8	Fan protection grate	
9	Front panel	
10	Cover - display	
11	Side panel, right	
12	Grate, rear	
13	Valve mounting plate	
14	Fan motor	
15	Probe set evaporator/compressor heat gas/outside temperature	
16	Electronic expansion valve	
17	Motherboard with display	
18	Inverter board	
19	F1/F2 interference filter	
20	Inductor	
	Spare parts not illustrated	
	High pressure switch	On request by providing the serial number

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

16.3 Exploded view outdoor modules WKF/WKF-compact 120

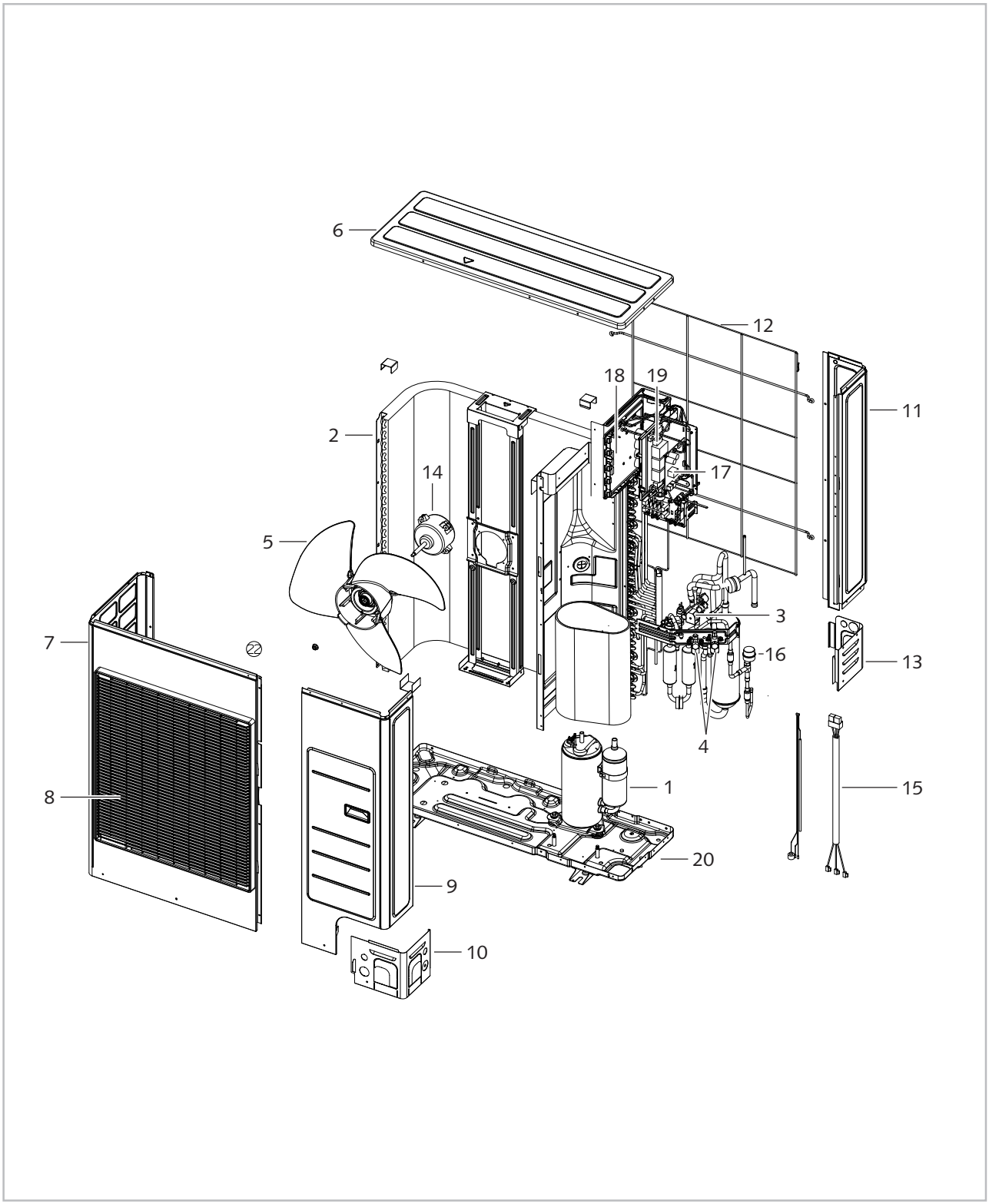

Fig. 83: Exploded view outdoor modules WKF/WKF-compact 120

We reserve the right to modify the dimensions and constructional design as part of the ongoing technicalde-velopment process.

16.4 Spare parts for outdoor unit WKF/WKF-compact 120

No.	Designation	WKF 120 / WKF-compact 120 WKF 120S-LINE / WKF-compact 120S-LINE
1	Compressor	On request by providing the serial number
2	Finned heat exchanger	
3	Four-way changeover valve	
4	Shut-off valves	
5	Fan blade	
6	Cover panel	
7	Side panel, left front	
8	Grate, front	
9	Side panel, right front	
10	Mounting corner, right front	
11	Side panel, right rear	
12	Grate, rear	
13	Mounting corner, right rear	
14	Fan motor	
15	Evaporator probe / compressor probe set	
15	Heat gas probe / outside temperature probe set	
16	Electronic expansion valve	
17	Motherboard with display	
18	Inverter board	
19	EMI board	
20	Device base/condensate tray	
	Spare parts not illustrated	
	Inductor	On request by providing the serial number
	High pressure switch	

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

16.5 Exploded view outdoor modules WKF/WKF-compact 180

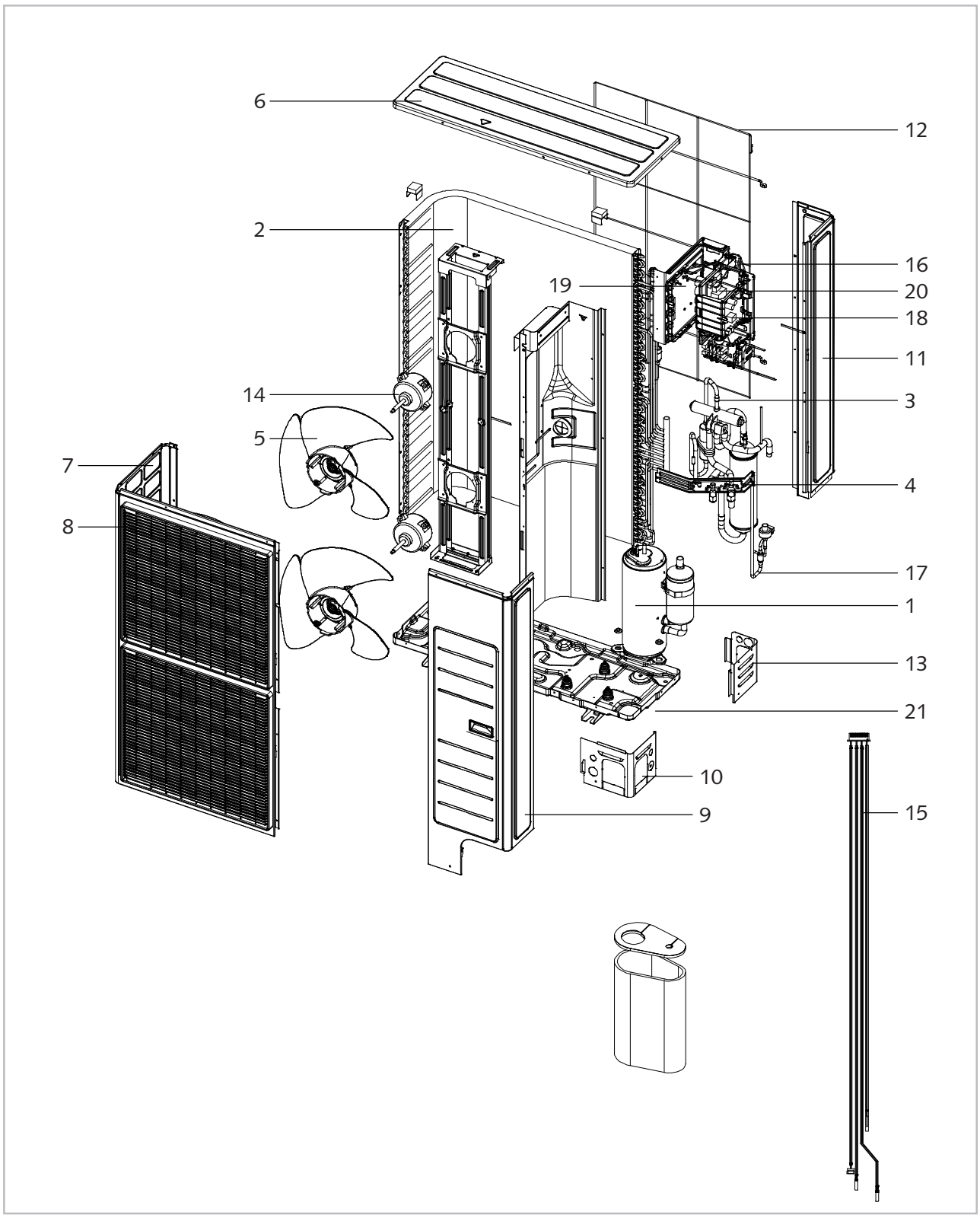

Fig. 84: Exploded view outdoor modules WKF/WKF-compact 180

We reserve the right to modify the dimensions and constructional design as part of the ongoing technicaldevelopment process.

16.6 Spare parts for outdoor unit WKF/WKF-compact 180

No.	Designation	WKF 180 / WKF-compact 180 WKF 180S-LINE / WKF-compact 180S-LINE
1	Compressor	On request by providing the serial number
2	Finned heat exchanger	
3	Four-way changeover valve	
4	Shut-off valves	
5	Fan blade	
6	Cover panel	
7	Side panel, left front	
8	Grate, front	
9	Side panel, right front	
10	Mounting corner, right front	
11	Side panel, right rear	
12	Grate, rear	
13	Mounting corner, right rear	
14	Fan motor	
15	Evaporator probe / compressor probe set	
15	Heat gas probe / outside temperature probe set	
16	Inductor	
17	Electronic expansion valve	
18	Motherboard with display	
19	Inverter board	
20	EMI board	
21	Device base/condensate tray	
	Spare parts not illustrated	
	High pressure switch	On request by providing the serial number

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

16.7 Exploded view outdoor module WKF 120 Duo

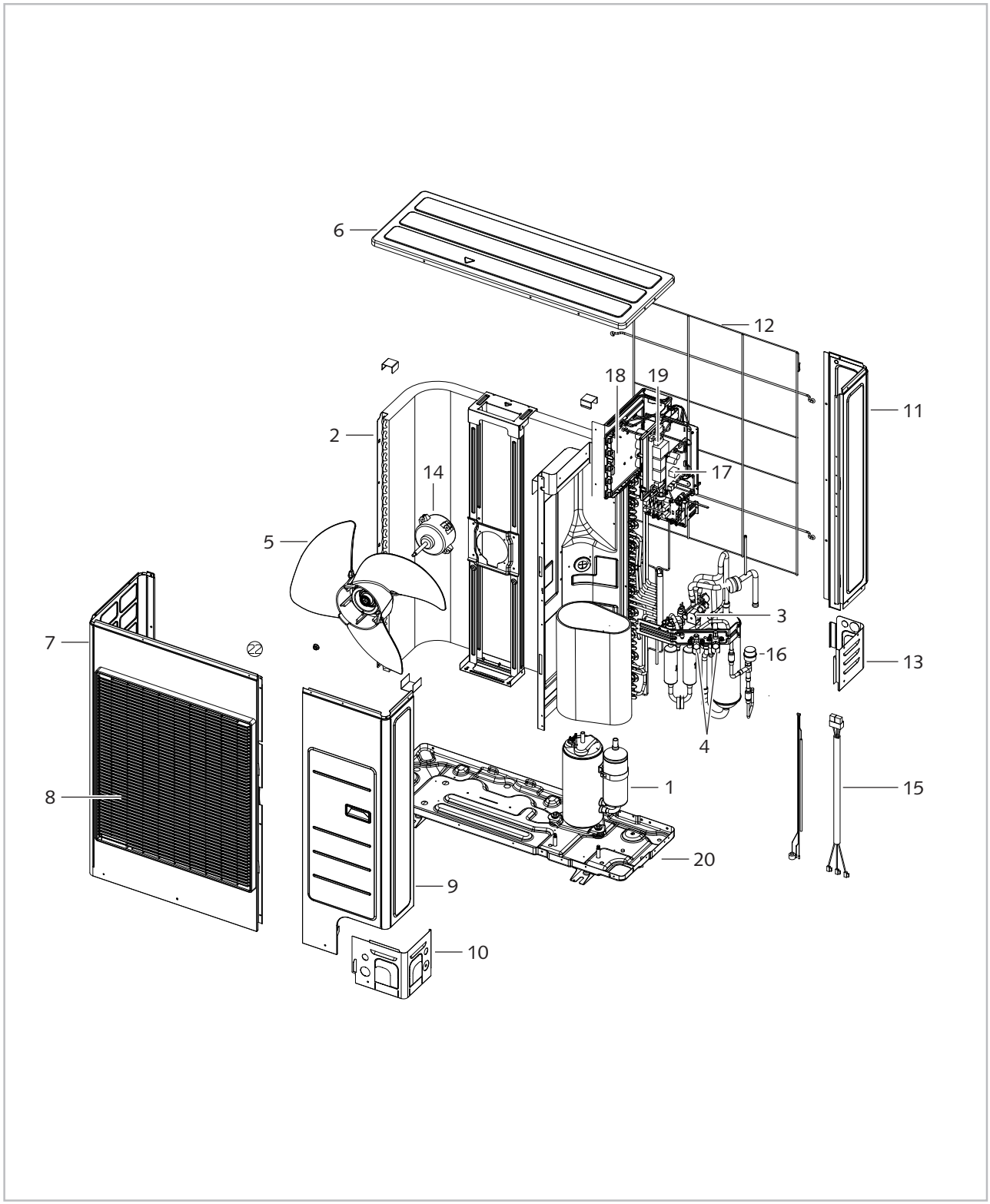

Fig. 85: Exploded view outdoor unit WKF 120 Duo

We reserve the right to modify the dimens. and design as part of the ongoing techn. development process

16.8 Spare parts for outdoor unit WKF 120 Duo

No.	Designation	WKF 120 Duo / WKF 120 Duo
1	Compressor	On request by providing the serial number
2	Finned heat exchanger	
3	Four-way changeover valve	
4	Shut-off valves	
5	Fan blade	
6	Cover panel	
7	Side panel, left front	
8	Grate, front	
9	Side panel, right front	
10	Mounting corner, right front	
11	Side panel, right rear	
12	Grate, rear	
13	Mounting corner, right rear	
14	Fan motor	
15	Evaporator probe / compressor probe set	
15	Heat gas probe / outside temperature probe set	
16	Electronic expansion valve	
17	Motherboard with display	
18	Inverter board	
19	EMI board	
20	Device base/condensate tray	
	Spare parts not illustrated	
	Inductor	On request by providing the serial number
	High pressure switch	

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

16.9 Exploded view outdoor unit WKF 180 Duo

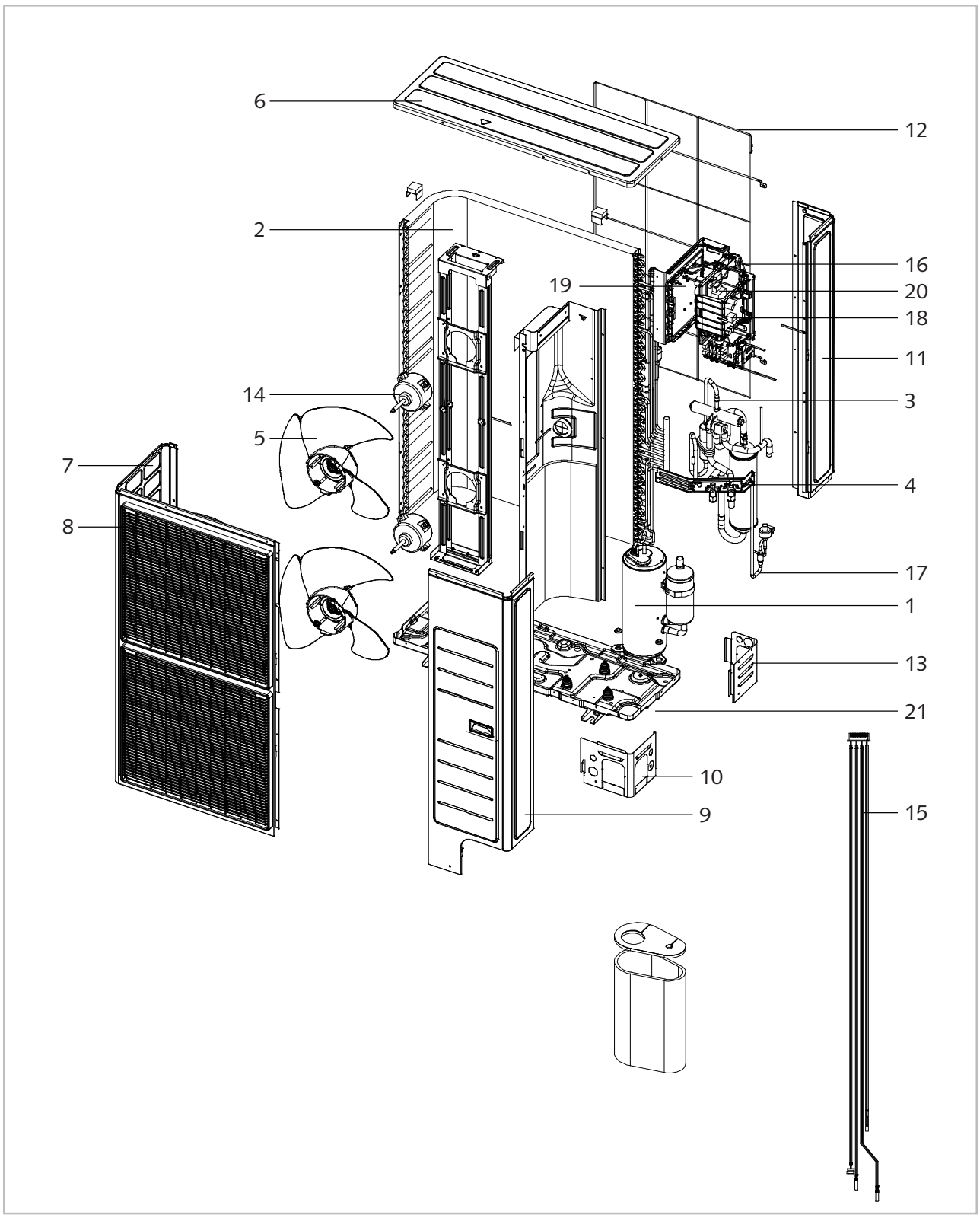

Fig. 86: Exploded view outdoor unit WKF 180 Duo

We reserve the right to modify the dimens. and design as part of the ongoing techn. development process

16.10 Spare parts for outdoor unit WKF 180 Duo

No.	Designation	WKF 180 Duo / WKF 180 Duo
1	Compressor	On request by providing the serial number
2	Finned heat exchanger	
3	Four-way changeover valve	
4	Shut-off valves	
5	Fan blade	
6	Cover panel	
7	Side panel, left front	
8	Grate, front	
9	Side panel, right front	
10	Mounting corner, right front	
11	Side panel, right rear	
12	Grate, rear	
13	Mounting corner, right rear	
14	Fan motor	
15	Evaporator probe / compressor probe set	
15	Heat gas probe / outside temperature probe set	
16	Inductor	
17	Electronic expansion valve	
18	Motherboard with display	
19	Inverter board	
20	EMI board	
21	Device base/condensate tray	
	Spare parts not illustrated	
	High pressure switch	On request by providing the serial number

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

16.11 Exploded view indoor module WKF 70/120/180

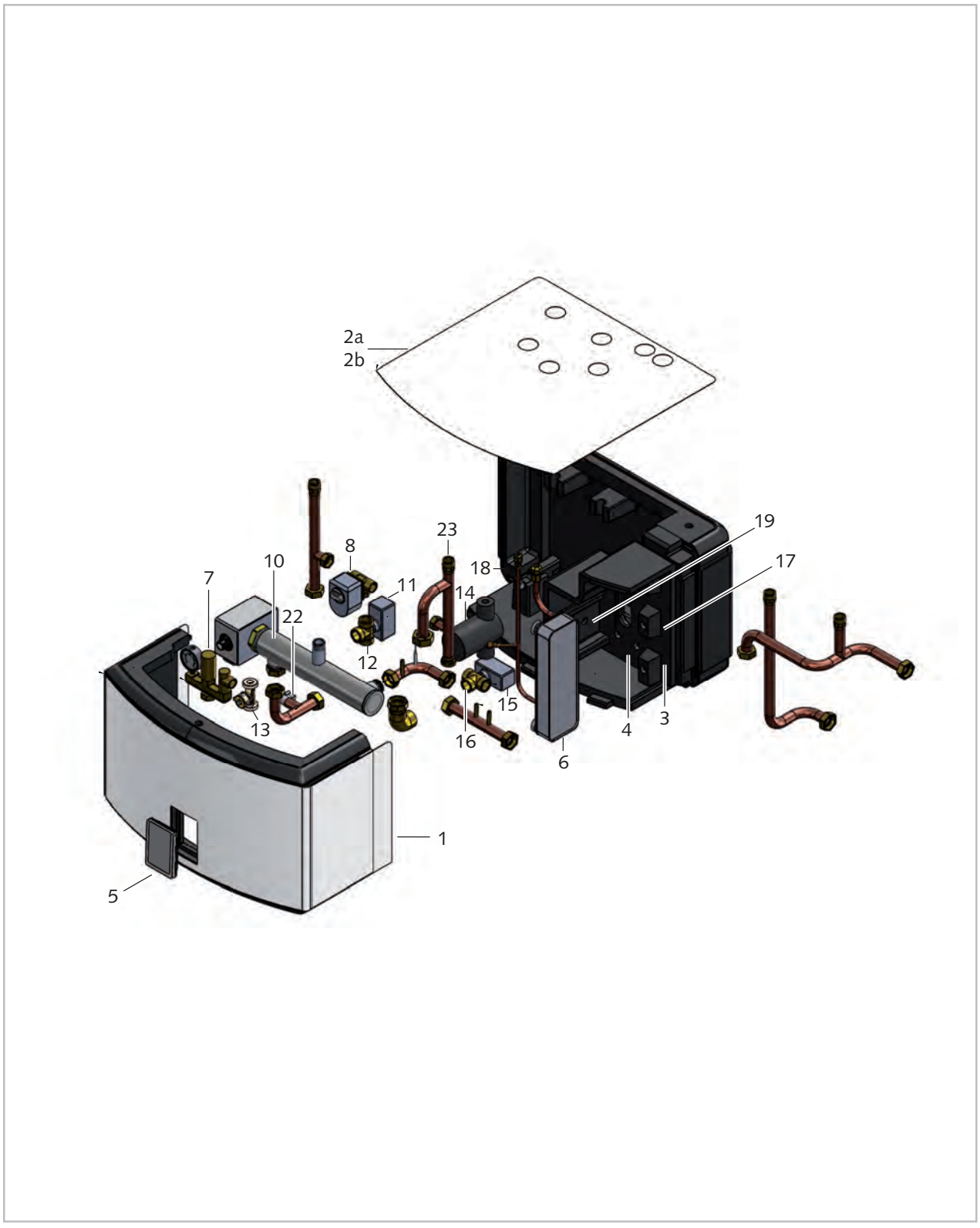

Fig. 87: Exploded view indoor module WKF 70/120/180

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

16.12 WKF 70/120/180 indoor unit spare parts

No.	Designation	WKF 70/120/180
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 9 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	
15	Servo-motor, 3-way valve bivalent mode	
16	Valve body, 3-way valve bivalent mode	
17	Terminal strips	
18	Pipe group support block	
19	Comkit control board	
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 70/120/180
Complete wiring harness, indoor unit	On request by providing the serial number
Comkit cable set	
SD card (current software without Smart-Count and without Smart-Web) *)	
Coding resistance	
Pt1000 1.5m length (S15)	
Transformer for Comkit board	
Assembly Booster heater 9 kW incl. flow rate meter	
Red indicator light for REMKO Smart Serv	
WKF controller retainer	

*) 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)!

16.13 Exploded view indoor modules WKF-compact 70/120/180

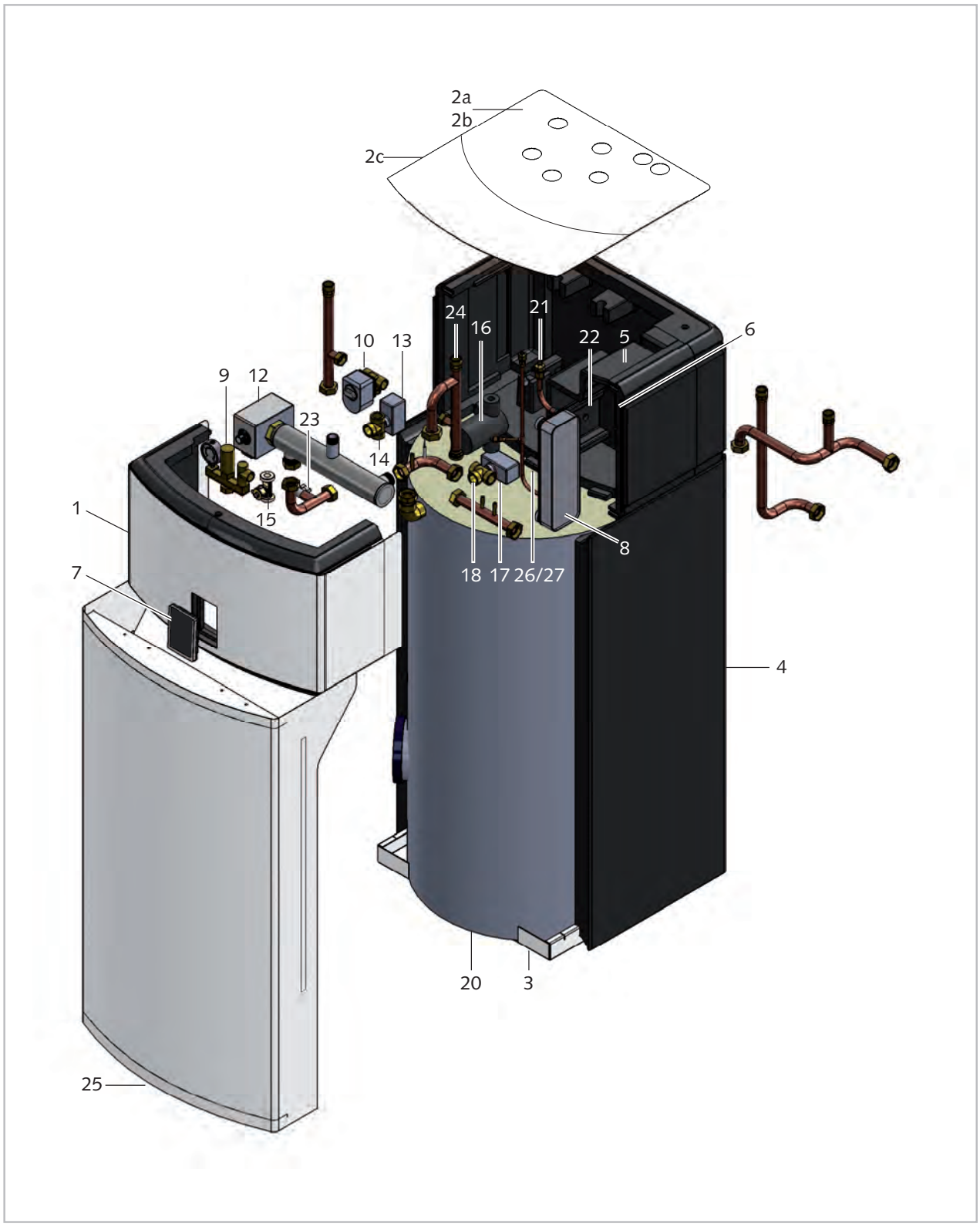

Fig. 88: Exploded view indoor modules WKF-compact 70/120/180

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

16.14 WKF compact 70/120/180 indoor unit spare parts

No.	Designation	WKF-compact 70/120/180
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 9 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	
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	
22	Comkit control board	
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/WKF-compact series

Spare parts not illustrated

Designation	WKF-compact 70/120/180
Complete wiring harness, indoor unit	On request by providing the serial number
Comkit cable set	
Protective anode/chain anode	
SD card I/O module (current software without Smart-Count and without Smart-Web) *)	
Coding resistance	
Pt1000 1.5m length (S15)	
Transformer for Comkit board	
Assembly Booster heater 9 kW incl. flow rate meter	
Red indicator light for REMKO Smart Serv	
WKF controller retainer	

*) 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/WKF-compact 70/120/180
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 thick-ness: 2 mm)	
Flat gasket (Outside: 30 mm x inside: 21 mm x thick-ness: 2 mm)	

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

16.15 Exploded view indoor modules WKF 120/180 Duo

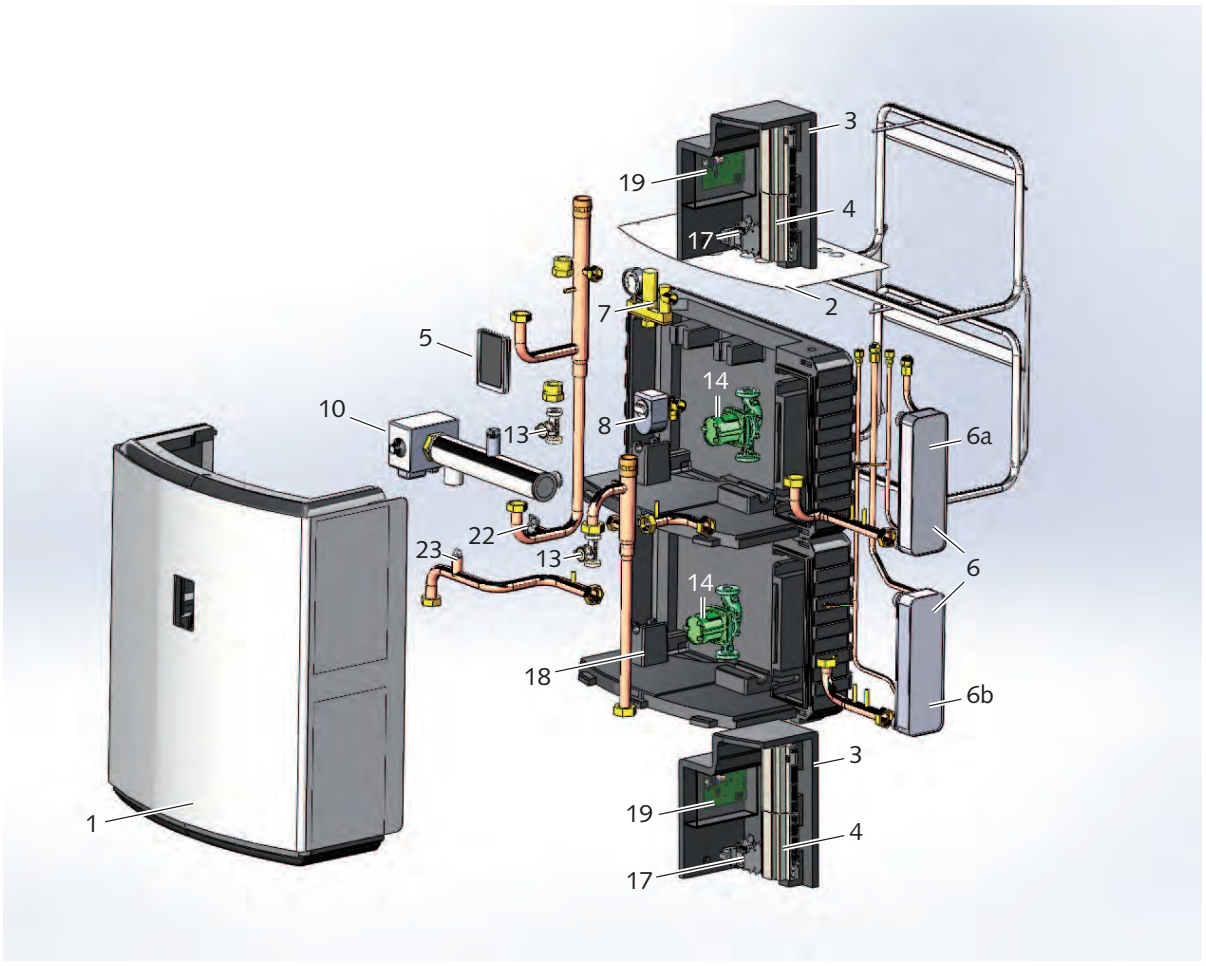

Fig. 89: Exploded view indoor modules WKF 120/180 Duo

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

16.16 Spare parts for indoor unit WKF 120/180 Duo

No.	Designation	WKF 120/180 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 9 kW	
13	Ultrasonic flow rate meter	
14	Primary pump, indoor unit	
17	Terminal strips	
18	Pipe group support block	
19	Comkit control board	
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)	
	Transformer	
	WKF controller retainer	

*) 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.

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