Operating and installation instructions

REMKO HTS series

ARTstyle heat pumps

HTS 80, HTS 90, HTS 110, HTS 130, HTS 200, HTS 260
HTS 200 Duo, HTS 260 Duo

Instructions for Technicians

0142-2022-05 Edition 4, 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 Special safety notes

Always pay attention to all of the following safety notes and stipulations.

- The device can only be installed as a complete unit together with all items of safety equipment.
- Personnel responsible for on-site construction, commissioning, operation, maintenance, inspection and installation must be able to demonstrate that they hold a qualification which proves their ability to undertake the work.
- Electrical installation and installation of the device must always be carried out by a trade specialist who is responsible for compliance with applicable specifications during the installation and initial commissioning.
- The hot water storage tank is at normal mains water pressure. If no diaphragm expansion valve is installed, the expansion water can drip out of the safety valve while it is heating up. After the heating process, if water still drips out of the safety valve, notify your trade technician.
- Protective covers (grills) over moving parts must not be removed from units that are in operation.
- Safety devices may not be modified or bypassed.
- Always pay attention to the notes defining the danger area that you will find in the 'Assembly' chapter.

⚠ DANGER!

Risk of suffocation

Rooms in which refrigerant may escape shall be adequately aerated and ventilated. Otherwise there is danger of suffocation.

⚠ CAUTION!

Risk of combustion and injury

Contact with equipment parts or components can lead to burns or injury.

⚠ CAUTION!

Maintain a safe distance from hazardous materials

The units and components must be kept at an adequate distance from flammable, explosive, combustible, abrasive and dirty areas or atmospheres.

⚠ CAUTION!

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

1.2 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.

1.3 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.

1.4 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.

1.5 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.

1.6 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.

1.7 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.

1.8 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.

1.9 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.

1.10 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.

1.11 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.

1.12 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!

1.13 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 Unit data HTS 80/90/110

Series		HTS 80	HTS 90	HTS 110
Function		Heating or Cooling		
System		Split air/water		
Compressor technology		Scroll	Power Plus inverter	Scroll
Heat pump manager		Smart Control		
Inlet temp. Heat. water, max. (up to -7°C)	°C	60	63	60
Min. inlet temperature for cooling	°C	7		
Number of outdoor units		1		
Electrical auxiliary heater/heating capac.	kW	9.0 / available as an accessory		
Drinking water heating (changeover valve)		optional outdoor		
Connection oil / gas boiler		optional outdoor		
Heating capacity min. / max.	kW	-	1.5 - 9.5	-
Heating capacity / revolutions rps / COP [1] at A12/W35	kW/Hz/COP	7,59/--/5,40	7,90/56/5,68	10,51/--/5,44
Heating capacity / revolutions rps / COP [1] at A7/W35	kW/Hz/COP	6,63/--/4,72	7,29/56/5,09	9,89/--/4,78
Heating capacity / revolutions rps / COP [1] at A2/W35	kW/Hz/COP	5,10/--/3,75	5,26/56/3,77	7,11/--/3,80
Heating capacity / revolutions rps / COP [1] at A-7/W35	kW/Hz/COP	4,46/--/3,23	4,84/56/3,17	6,38/--/3,25
Heating capacity / revolutions rps / COP [1] at A-15/W35	kW/Hz/COP	3,54/--/2,63	4,20/60/2,89	5,92/--/2,71
Heating capacity / revolutions rps / COP [1] at A-20/W35	kW/Hz/COP	3,20/--/2,17	3,56/60/2,42	5,21/--/2,19
Heating capacity / revolutions rps / COP [1] at A7/W45	kW/Hz/COP	6,26/--/3,68	7,01/56/3,92	9,71/--/3,72
Heating capacity / revolutions rps / COP [1] at A-7/W45	kW/Hz/COP	4,32/--/2,78	5,05/56/2,80	6,21/--/2,80
Heating capacity / revolutions rps / COP [1] at A7/W55	kW/Hz/COP	6,03/--/3,03	6,54/56/3,04	9,02/--/3,10
Heating capacity / revolutions rps / COP [1] at A-7/W55	kW/Hz/COP	4,10/--/2,15	5,28/60/2,46	6,41/--/2,17
Heating capacity / revolutions rps / COP [1] at A10/W35	kW/Hz/COP	7,42/--/5,20	7,9/56/5,39	10,00/--/5,30
Heating capacity / revolutions rps / COP [1] at A12/W45	kW/Hz/COP	7,14/--/4,20	-	10,10/--/4,30
Heating capacity / revolutions rps / COP [1] at A12/W55	kW/Hz/COP	6,81/--/3,38	-	9,90/--/3,40

REMKO HTS series

Series		HTS 80	HTS 90	HTS 110
Cooling capacity min. / max.	kW		1.2-8.0	
Cooling capacity / revolutions rps / EER 2) at A35/W7	kW/Hz/EER	4,50/--/2,35	5,45/58/2,35	6,08/--/2,36
Cooling capacity / revolutions rps / EER 2) at A35/W18	kW/Hz/EER	5,49/--/2,64	5,52/40/3,45	8,03/--/2,88
Cooling capacity / revolutions rps / EER 2) at A27/W18	kW/Hz/EER	5,83/--/3,21	5,41/40/3,52	8,59/--/3,48
Usable limits, heating	°C	-20 - +42		
Service limits, cooling	°C	+15 - +45		
Refriger./pre-charge quantity indoor mod.	--/kg	R410A2) /2.75	R410A2) /2.75	R410A2) /2.95
CO_2equivalent	t	5,7	5,7	6,1
Refrigerant / pre-charge quantity for more than 7 m length of ordinary pipe	g/m	30		
Refrigerant connect. on outdoor module	Inches (mm)	3/8" (9.52) / 5/8" (15.9)		
Refrigerant connections on indoor module	Inches (mm)	3/8" (9.52) / 5/8" (15.9)		
Refrig. piping total length (single leng.	m	30	50	30
Refrigerant piping height, max.	m	10	30	10
Compressor power supply IU	V/Ph/Hz	400V/3~/50Hz	230V/1~/50Hz	400V/3~/50Hz
Power supply to indoor unit control unit	V/Ph/Hz	230V/1~/50Hz		
Power supply to electrical heating coil	V/Ph/Hz	400V/3~/50Hz		
Max. current consumption	A	3,90	12,20	4,50
Rated current consumption for A7/W35	A	2,70	6,50	3,01
Rated power consumption for A7/W35	kW	1,44	1,43	2,06
Rated power consumption for A2/W35	kW	1,40	1,49	1,95
Max. power consumption	kW	2,20	2,52	2,80
Starting current	A	16	--	16
Power factor at A7/W35 (cosφ)	--	0,91	0,90	0,91
Customer's fuse protection recom-mended, indoor module	A slow-acting	3x16	16	3x20
Medium water flow rate (according to EN 14511, at Δt 5 K)	m^3/h	1,17	1,25	1,78
Pressure loss on condenser at medium flow rate	bar	0,13	0,17	0,15
Pressure loss, outdoor	kPa	40	80	40
Airflow volume outdoor module	m^3/h	2700		
Max. operating pressure, water	bar	3		
Hydr. conn. inlet/return flow, flat-sealing	Inches	1		

Series		HTS 80	HTS 90	HTS 110
Recomm. pipe dimension copper piping	mm	28		
Water volume, indoor module	l		4.2	
Refrigerant oil	Type	Synthetic Oil FV50S		
Rated power consumption of indoor unit pump, min./max.	W	7/136		
Rated power consumption of each outdoor unit fan	W	125		
Current cons. of IM pump min./max.	A	0.07/1.03		
Medium flow rate ind.unit pump min./max.	m³/h	0.9/2.0		
Motor protection, indoor unit pump	--	Resistant to blocking current		
Sound power level of indoor unit	dB(A)	43	47	44
Noise emission level LpA (ind. module) [3)]	dB(A)	19	25	21
Tonality per outdoor module	dB(A)	0		
Max. noise emission level of each outdoor module in acc. with DIN EN 12102:2008-09 and ISO 9614-2	dB(A)	56		
Noise emission level LpA (outd. mod.) [3)]	dB(A)	34		
Sound power level/Noise emission level, night operations / lowering mode for each outdoor module	dB(A)	-	42/21	-
Sound power level/Noise emission level, night operations / lower mode indoor module	dB(A)	-	44/22	-
Protection class outdoor module	--	IP 21		
Dimension of indoor unit				
Height	mm	1065		
Width	mm	650		
Depth	mm	650		
Dimension of outdoor module				
Diameter	mm	630		
Height	mm	1020		
Weight indoor module	kg	150	133	160
Weight of each outdoor module	kg	120		123

[1)] COP = coefficient of performance (heating coefficient) per EN 14511 (applies on a unit with clean heat transmission)

[2)] Contains greenhouse gas according to Kyoto protocol, GWP 2088

[3)] Distance 5m free field

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

2.2 Product data HTS 80/90/110

Average condition [1)]

Series		HTS 80	HTS 90	HTS 110
Energy efficiency ratio, heating 35°C/55°C		A++/A++	A++/A++	A++/A++
Nominal heating power P rated 35°C/55°	kW	4,0/5,0	7,0/7,0	7,0/8,0
Room heating energy efficiency ηs 35°C/55°C	%	151/132	160/131	161/128
Contribution to seasonal room heating energy efficiency of the REMKO Smart Control	%	4		
Yearly energy consumption Q_{HE} 35°C/ 55°C [4)]	kWh	2393/3192	3390/4461	3510/4794
Sound power level L_{WA} (outdoor unit)	dB(A)	56		
Sound power level L_{WA} (indoor unit)	dB(A)	42	49	44

Warmer condition [2)]

Series		HTS 80	HTS 90	HTS 110
Energy efficiency ratio, heating 35°C/55°C		A+++/A++	A+++/A++	A++/A++
Nominal heating power P rated 35°C/55°C	kW	4,0/4,0	6,0/5,0	6,0/6,0
Room heating energy efficiency ηs 35°C/55°C	%	190/159	182/145	202/148
Yearly energy consumption Q_{HE} 35°C/ 55°C [4)]		1233/1360	1728/1820	1601/2165

Colder condition [3)]

Series		HTS 80	HTS 90	HTS 110
Energy efficiency ratio, heating 35°C/55°C		A+/A+	A+/A+	A+/A+
Nominal heating power P rated 35°C/55°C	kW	4,0/7,0	8,0/8,0	8,0/10,0
Room heating energy efficiency ηs 35°C/55°C	%	136/110	146/121	147/107
Yearly energy consumption Q_{HE} 35°C/ 55°C [4)]		3165/6212	5365/6155	5497/9091

[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 Unit data HTS 130/200/260

Series		HTS 130	HTS 200	HTS 260
Function		Heating or Cooling		
System		Split air/water		
Compressor technology		Power Plus inverter		
Heat pump manager		Smart Control		
Inlet temp. Heat. water, max. (up to -7°C)	°C	63		
Min. inlet temperature for cooling	°C	7		
Number of outdoor units		1	2	
Electrical auxiliary heater / heating capacity	kW	9.0 / available as an accessory		
Drinking water heating (changeover valve)		optional outdoor		
Connection oil / gas boiler		optional outdoor		
Heating capacity min. / max.	kW	2.5 - 13.0	3.0 - 18.0	5.0 - 26.0
Heating capacity / revolutions rps / COP [1] at A12/W35	kW/Hz/COP	10.82/56/5.42	16.12/56/5.65	21.63/56/5.40
Heating capacity / revolutions rps / COP [1] at A7/W35	kW/Hz/COP	10.31/56/4.95	15.51/60/5.01	20.62/55/4.98
Heating capacity / revolutions rps / COP [1] at A2/W35	kW/Hz/COP	7.41/56/3.71	12.00/60/3.91	17.41/54/3.82
Heating capacity / revolutions rps / COP [1] at A-7/W35	kW/Hz/COP	6.76/56/3.27	9.64/60/3.43	13.55/54/3.24
Heating capacity / revolutions rps / COP [1] at A-15/W35	kW/Hz/COP	6.26/62/2.75	8.62/60/2.98	12.52/62/2.76
Heating capacity / revolutions rps / COP [1] at A-20/W35	kW/Hz/COP	5.44/62/2.16	7.94/60/2.41	10.83/62/2.19
Heating capacity / revolutions rps / COP [1] at A7/W45	kW/Hz/COP	9.75/56/3.77	14.20/60/3.89	19.87/54/3.79
Heating capacity / revolutions rps / COP [1] at A-7/W45	kW/Hz/COP	7.11/62/2.53	9.06/60/2.71	13.58/58/2.50
Heating capacity / revolutions rps / COP [1] at A7/W55	kW/Hz/COP	9.23/62/2.94	13.15/60/3.15	18.47/54/2.95
Heating capacity / revolutions rps / COP [1] at A-7/W55	kW/Hz/COP	6.47/56/2.09	8.51/62/2.25	11.64/54/2.01
Heating capacity / revolutions rps / COP [1] at A10/W35	kW/Hz/COP	11.0/56/5.25	15.9/55/5.31	21.8/55/5.28
Cooling capacity min. / max.	kW	2.3 - 11.0	3.4 - 14.8	4.4 - 19.0

REMKO HTS series

Series		HTS 130	HTS 200	HTS 260
Cooling capacity / revolutions rps / EER [2] at A35/W7	kW/Hz/EER	7.77/58/2.28	10.40/54/2.37	14.82/54/2.48
Cooling capacity / revolutions rps / EER [2] at A35/W18	kW/Hz/EER	7.85/40/3.37	12.4/40/3.51	16.10/40/3.66
Cooling capacity / revolutions rps / EER [2] at A27/W18	kW/Hz/EER	7.57/40/3.39	11.8/41/3.66	15.77/40/3.82
Usable limits, heating	°C	-20 - +45		
Service limits, cooling	°C	+15 - +45		
Refrigerant / pre-charge quantity indoor unit	-- / kg	R 410A[2] / 2.95	R 410A[2] / 5.40	
CO_2equivalent	t	6,1	11,2	
Refrigerant / pre-charge quantity for more than 7 m length of ordinary pipe	g / m	See ↬ *Chapter 9.2 'Commissioning the refrigeration system' on page 73*		
Refriger. connect. on outdoor module	Inches (mm)	3/8" (9.52) / 5/8" (15.9)		
Refrigerant connections on indoor module	Inches (mm)	3/8" (9.52) / 5/8" (15.9)	1/2" (12.70) / 3/4" (19.05)	
Refrigerant piping total length (single length)	m	50	25	
Refrigerant piping height, max.	m	30	15	
Power supply indoor module	V/Ph/Hz	400V/3~/50Hz		
Power supply to indoor unit control unit	V/Ph/Hz	230V/1~/50Hz		
Power supply to electrical heating coil	V/Ph/Hz	400V/3~/ 50Hz		
Max. current consumption	A	7.3	10.2	14.4
Rated current consumption for A7/W35	A	4.08	5.12	8.11
Rated power consumption for A7/W35	kW	2.08	3.10	4.15
Rated power consumption for A2/W35	kW	1.99	3.07	4.56
Max. power consumption	kW	4.21	6.39	8.45
Power factor at A7/W35 (cosφ)	--	0.8	0.8	0.8
Customer's fuse protection recommended, indoor module	A slow-acting	3 x 16	3 x 16	3 x 20
Medium water flow rate (according to EN 14511, at Δt 5 K)	m^3/h	1.79	2.6	3.5
Pressure loss on condenser at medium flow rate	bar	0.25	0.21	0.23
Pressure loss, outdoor	kPa	80		
Airflow volume outdoor module	m^3/h	2700	5000	5400
Max. operating pressure, water	bar	3		
Hydraulic connection inlet/return flow, flat-sealing	Inches	1	1 1/4" OT	

Series		HTS 130	HTS 200	HTS 260
Recommended pipe dimen. copper pip.	mm	28	35	42
Water volume, indoor module	l	4.8	5.3	5.3
Refrigerant oil	Type	Synthetic Oil FV50S		
Rated power consumption of indoor unit pump, min./max.	W	7 / 136		
Rated power consumption of each outdoor unit fan	W	125	115	125
Current consumption of indoor unit pump min./max.	A	0.07 / 1.03		
Medium flow rate indoor unit pump min./ max.	m³/h	0.9/2.0	0.9/2.8	0.9/3.5
Motor protection, indoor unit pump	--	Resistant to blocking current		
Sound power level of indoor unit	dB(A)	51	52	53
Tonality per outdoor module	dB(A)	0		
Max. noise emission level of each outdoor module in acc. with DIN EN 12102:2008-09 and ISO 9614-2	dB(A)	56	54	56
Sound power level/Noise emission level, night operations / lowering mode for each outdoor module	dB(A)	43/21	41/19	43/21
Sound power level/Noise emission level, night operations / lower mode indoor module	dB(A)	48/26	50/28	51/29
Noise emission level LpA (outdoor module) [3)]	dB(A)	34	32	35
Noise emission level LpA (indoor mod.) [3)]	dB(A)	29	28	29
Protection class outdoor module	--	IP21		
Dimension of indoor unit				
Height	mm	1065		
Width	mm	650		
Depth	mm	650		
Dimension of outdoor module				
Diameter	mm	630		
Height	mm	1020		
Weight indoor module	kg	156	172	178
Weight of each outdoor module	kg	123	120	

[1)] COP = coefficient of performance (heating coefficient) per EN 14511 (applies on a unit with clean heat transmission)

[2)] Contains greenhouse gas according to Kyoto protocol, GWP 2088 / [3)] Distance 5 m free field

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

2.4 Product data HTS 130/200/260

Average condition [1)]

Series		HTS 130	HTS 200	HTS 260
Energy efficiency ratio, heating 35°C/55°C		A++ / A+	A++ / A++	A++ / A+
Nominal heating power P rated	kW	8.0	11.0	15.0
Room heating energy efficiency ηs 35°C/55°C	%	158 / 122	165 / 131	164 / 122
Contribution to seasonal room heating energy efficiency of the REMKO Smart Control	%	4		
Yearly energy consumption Q_{HE} 35°C/ 55°C [4)]		3931 / 6165	5582 / 7653	7579 / 11934
Sound power level L_{WA} (outdoor unit)	dB(A)	56	54	56
Sound power level L_{WA} (indoor unit)	dB(A)	50	51	52

Warmer condition [2)]

Series		HTS 130	HTS 200	HTS 260
Energy efficiency ratio, heating 35°C/55°C		A+++ / A+++	A+++ / A++	
Nominal heating power P rated	kW	7.0	10.0	14.0
Room heating energy efficiency ηs 35°C/55°C	%	186 / 152	197 / 159	197 / 154
Yearly energy consumption Q_{HE} 35°C/ 55°C [4)]		1926 / 2365	2582 / 2821	3626 / 4432

Colder condition [3)]

Series		HTS 130	HTS 200	HTS 260
Energy efficiency ratio, heating 35°C/55°C		A+ / A+		
Nominal heating power P rated	kW	9.0	14.0	19.0
Room heating energy efficiency ηs 35°C/55°C	%	141 / 112	148 / 118	147 / 112
Yearly energy consumption Q_{HE} 35°C/ 55°C [4)]		6275 / 8514	9037 / 10864	12189 / 16552

[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.

2.5 Unit data HTS 200/260 Duo

Series		HTS 200 Duo	HTS 260 Duo
Function		Heating or cooling	
System		Split air/water	
Compressor technology		Power Plus inverter	
Heat pump manager		Smart Control	
Inlet temp. Heating water, max. (up to -7°C)	°C	63	
Min. inlet temperature for cooling	°C	7	
Number of indoor units / outdoor units		2/4	
Electrical auxiliary heater / heating capacity for each indoor unit	kW	9.0 / available as accessories	
Domestic hot-water heating (changeover valve)		optional outdoor	
Connection oil/gas boiler		optional outdoor	
Heating capacity min./max.	kW	3.0-36.0	5.0-52.0
Heating capacity / revolutions rps / COP [1] on A12/W35	kW/Hz/COP	32.24/56/5.65	43.26/56/5.40
Heating capacity / revolutions rps / COP [1] on A7/W35	kW/Hz/COP	31.02/56/5.01	41.24/55/4.98
Heating capacity / revolutions rps / COP [1] on A2/W35	kW/Hz/COP	24.0/60/3.91	34.84/54/3.82
Heating capacity / revolutions rps / COP [1] on A-7/W35	kW/Hz/COP	19.28/60/3.43	27.10/54/3.42
Heating capacity / revolutions rps / COP [1] on A-15/W35	kW/Hz/COP	17.24/60/2.41	25.04/62/2.76
Heating capacity / revolutions rps / COP [1] on A-20/W35	kW/Hz/COP	15.88/60/2.41	21.66/62/2.19
Heating capacity / revolutions rps / COP [1] on A7/W45	kW/Hz/COP	28.4/60/3.89	39.76/54/3.79
Heating capacity / revolutions rps / COP [1] on A-7/W45	kW/Hz/COP	18.12/60/2.71	27.16/58/2.50
Heating capacity / revolutions rps / COP [1] on A7/W55	kW/Hz/COP	26.3/60/3.15	36.94/54/2.95
Heating capacity / revolutions rps / COP [1] on A-7/W55	kW/Hz/COP	17.02/62/2.25	23.28/54/2.01
Heating capacity / revolutions rps / COP [1] on A10/W35	kW/Hz/COP	31.8/55/5.31	43.60/55/5.28
Cooling capacity min./max.	kW	3.4-29.6	4.4-38.0
Cooling capacity / revolutions rps / EER [2] on A35/W7	kW/Hz/EER	20.8/54/2.37	29.64/54/2.48
Cooling capacity / revolutions rps / EER [2] on A35/W18	kW/Hz/EER	24.8/40/3.51	31.54/40/3.66
Cooling capacity / revolutions rps / EER [2] on A27/W18	kW/Hz/EER	23.6/41/3.66	31.54/40/3.82

REMKO HTS series

Series		HTS 200 Duo	HTS 260 Duo
Usable limits, heating	°C	-20 - +45	
Service limits, cooling	°C	+15 - +45	
Refrigerant / pre-charge quantity for each indoor unit	--/kg	R 410A[2] / 5.40	
CO_2-equivalent for each indoor unit	t	11.2	
Refrigerant / pre-charge quantity for more than 7 m length of ordinary pipe for each indoor unit	g / m	See *Chapter 9.2 'Commissioning the refrigeration system' on page 73*	
Refrigerant connections on outdoor unit	Inches (mm)	3/8" (9.52) / 5/8" (15.9)	
Refrigerant connections on indoor unit	Inches (mm)	1/2" (12.70) / 3/4" (19.05)	
Refrigerant piping total length (single length)	m	25	
Refrigerant piping height, max.	m	15	
Power supply for each indoor unit	V/Ph/Hz	400V/3~/50Hz	
Control unit power supply for each indoor unit	V/Ph/Hz	230V/1~/50Hz	
Power supply, electrical heating coil for each indoor unit	V/Ph/Hz	400V/3~/50Hz	
Max. current consumpt. for each indoor unit	A	10.2	14.4
Rated current consumpt. on A7/W35 for each indoor unit	A	5.12	8.11
Rated power consumpt. on A7/W35 for each indoor unit	kW	3.10	4.15
Rated power consumpt. on A2/W35 for each indoor unit	kW	3.07	4.56
Max. power consumpt. for each indoor unit	kW	6.39	8.45
Power factor at A7/W35 (cosφ)	--	0.8	0.8
Fuse protection provided by the customer recommended, for each indoor unit	A slow-acting	3 x 16	3 x 20
Medium flow rate water (according to EN 14511, at Δt 5 K)	m^3/h	2 x 2.6	2 x 3.5
Pressure loss on condenser at rated medium flow rate	bar	0.21	0.23
Outdoor pressure loss for each indoor unit	kPa	80	
Airflow volume outdoor unit	m^3/h	4 x 2500	4 x 2700
Max. operating pressure, water	bar	3	
Hydraulic connection inlet/return flow, flat-sealing, for each indoor unit	Inches	1 1/4" OT	

Series		HTS 200 Duo	HTS 260 Duo
Recommended collector line pipe dimension for each indoor unit	Inch	2"	
Water volume, indoor unit	l	5.3	5.3
Refrigerant oil	Type	Synthetic Oil FV50S	
Rated power consumption of indoor unit pump, min./max.	W	7/136	
Rated power consumption of each outdoor unit fan	W	115	125
Current consumption of indoor unit pump min./max.	A	0.07/1.03	
Medium flow rate indoor unit pump min./max.	m³/h	0.9/2.8	0.9/3.5
Motor protection, indoor unit pump	--	Resistant to blocking current	
Sound power level for each indoor unit	dB(A)	52	53
Max. sound power level of each outdoor unit in acc. with DIN EN 12102:2008-09 and ISO 9614-2	dB(A)	54	56
Tonality of each outdoor unit	dB(A)	0	
Sound power level night operations / lowering mode for each outdoor unit	dB(A)	41	43
Sound power level night operations / lowering mode for each indoor unit	dB(A)	50	51
Sound pressure level LpA for each outdoor unit [3)]	dB(A)	32	35
Sound pressure level LpA for each indoor unit [3)]	dB(A)	28	29
Enclosure class outdoor unit	--	IP21	
Dimension of indoor unit			
Height	mm	1065	
Width	mm	650	
Depth	mm	650	
Dimension of outdoor unit			
Diameter	mm	630	
Height	mm	1020	
Weight of each indoor unit	kg	172	178
Weight of each outdoor unit	kg	120	

[1)] COP = coefficient of performance (heating coefficient) per EN 14511 (applies on a unit with clean heat transmission)

[2)] Contains greenhouse gas according to Kyoto protocol, GWP 2088

[3)] Distance 5m free field

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

2.6 Product data HTS 200/260 Duo

Average condition [1)]

Series		HTS 200 Duo	HTS 260 Duo
Energy efficiency ratio, heating 35°C/55°C		A++ / A++	A++ / A+
Nominal heating power P rated	kW	22.0	30.0
Room heating energy efficiency ηs 35°C/55°C	%	165/131	164/122
Contribution to seasonal room heating energy efficiency of the REMKO Smart Control	%	4	
Yearly energy consumption Q_{HE} 35°C/ 55°C [4)]		11164/15306	15158/23868
Sound power level L_{WA} (outdoor unit)	dB(A)	54	56
Sound power level L_{WA} (indoor unit)	dB(A)	51	52

Warmer condition [2)]

Series		HTS 200 Duo	HTS 260 Duo
Energy efficiency ratio, heating 35°C/55°C		A+++ / A++	
Nominal heating power P rated	kW	20.0	28.0
Room heating energy efficiency ηs 35°C/55°C	%	197/159	197/154
Yearly energy consumption Q_{HE} 35°C/ 55°C [4)]		5164/5642	7252/8864

Colder condition [3)]

Series		HTS 200 Duo	HTS 260 Duo
Energy efficiency ratio, heating 35°C/55°C		A+ / A+	
Nominal heating power P rated	kW	28.0	38.0
Room heating energy efficiency ηs 35°C/55°C	%	148/118	147/112
Yearly energy consumption Q_{HE} 35°C/ 55°C [4)]		18074/21728	24378/33104

[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 Device dimensions for outdoor unit

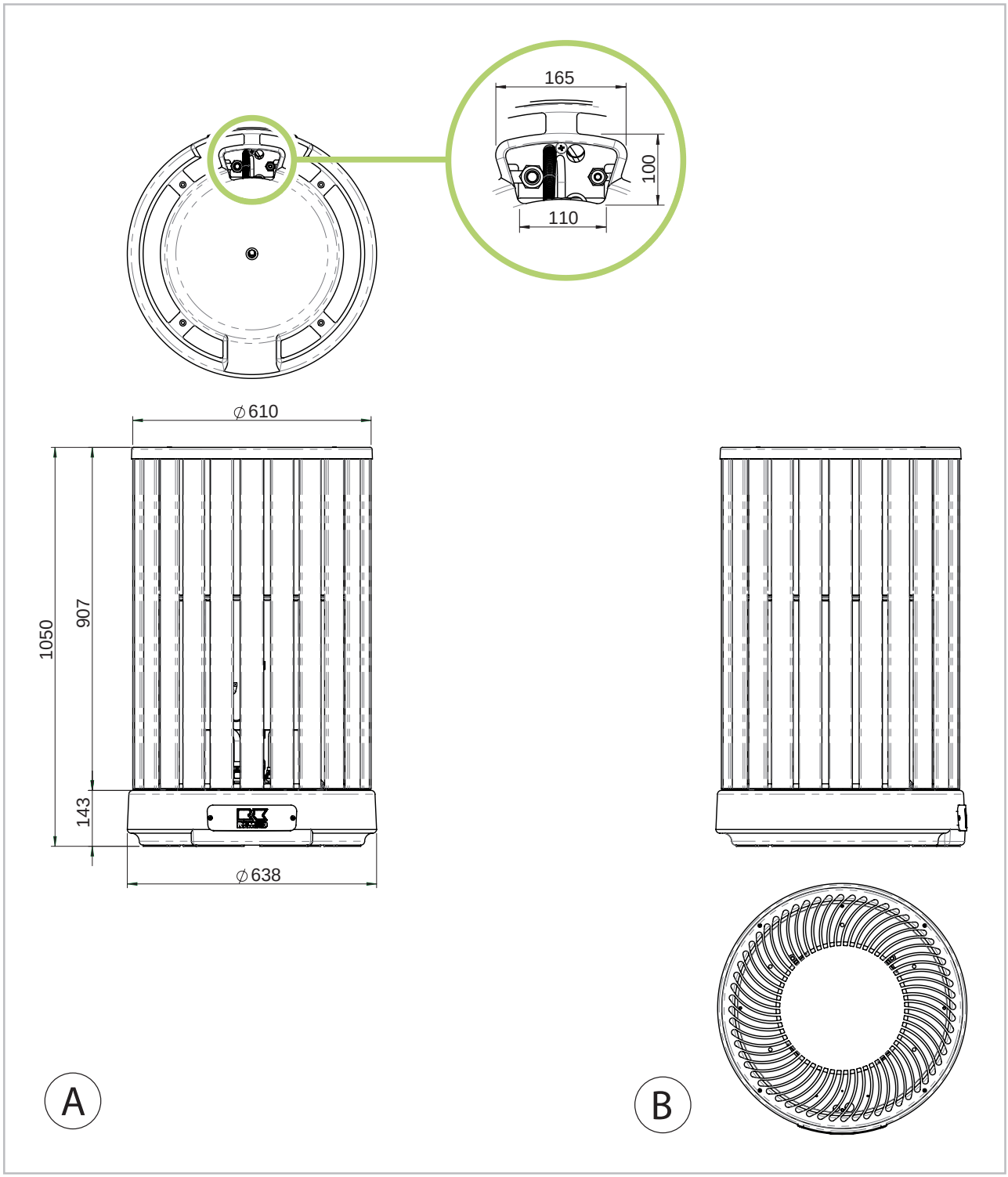


Fig. 1: Dimensions outdoor unit

A: View from above and from the front

B: View from below and from the back

Base dimensions

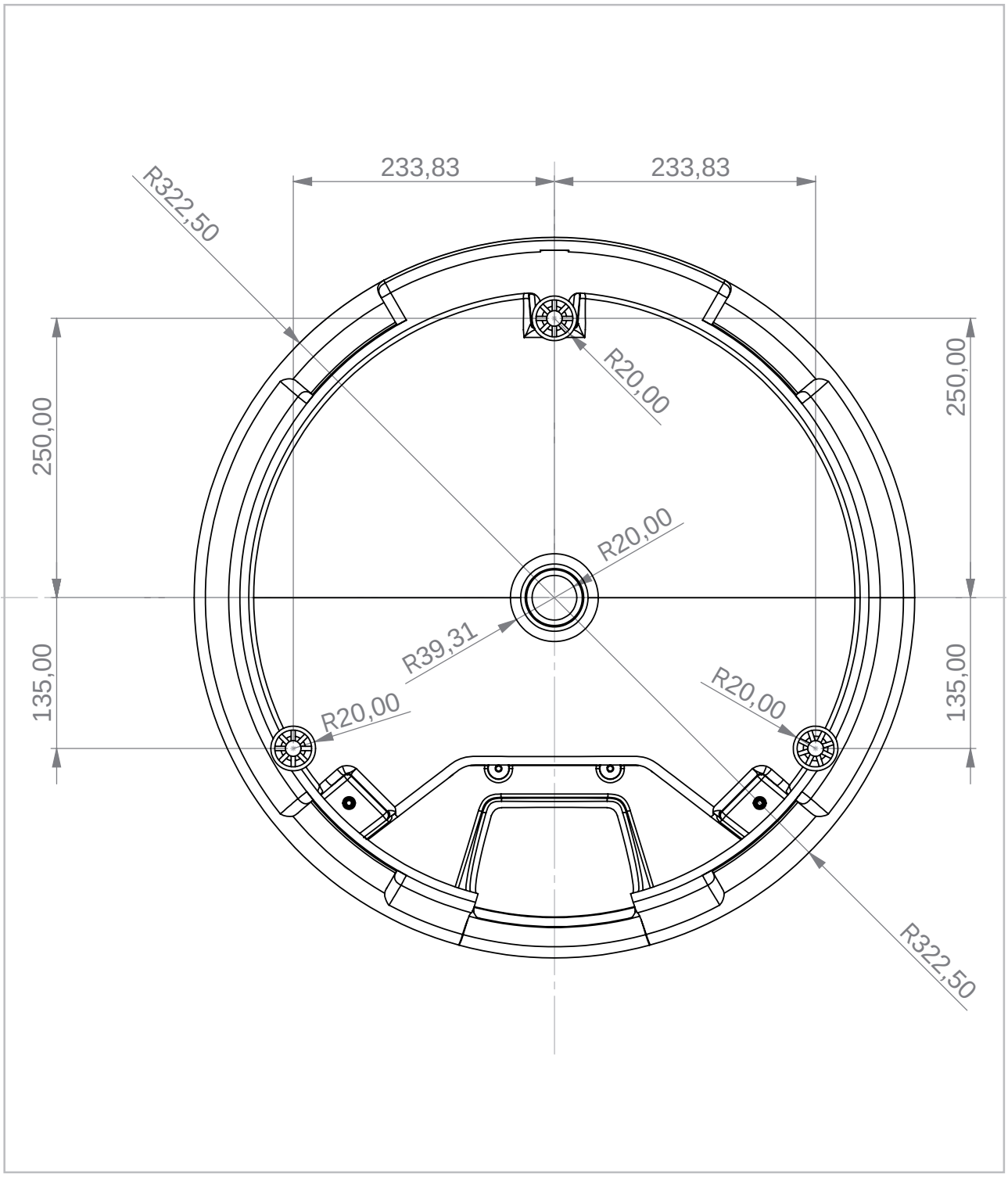


Fig. 2: Base dimensions (all measurements in mm)

2.8 Unit dimensions for indoor unit

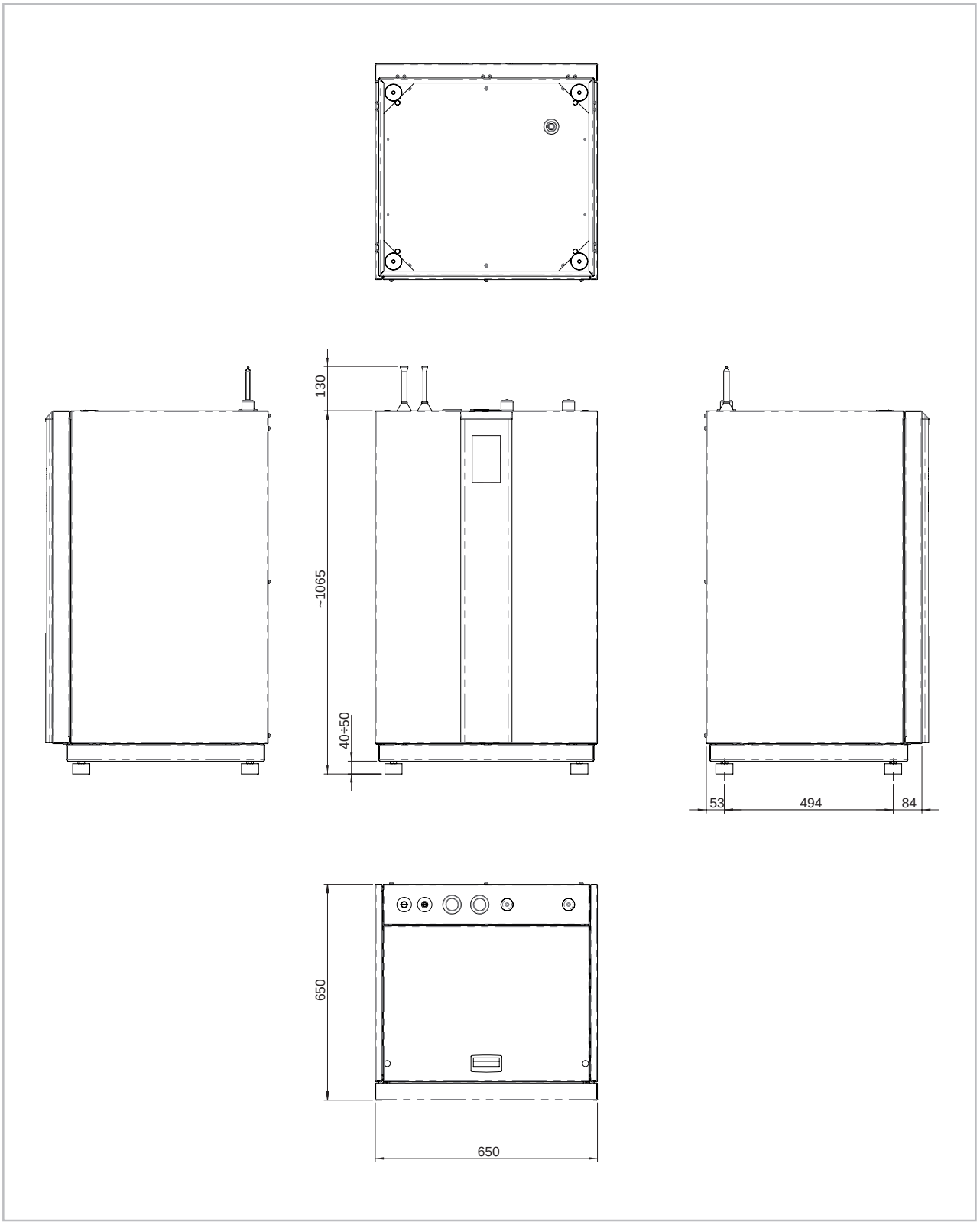


Fig. 3: Dimensions indoor unit

Designations of pipe connections on the indoor unit

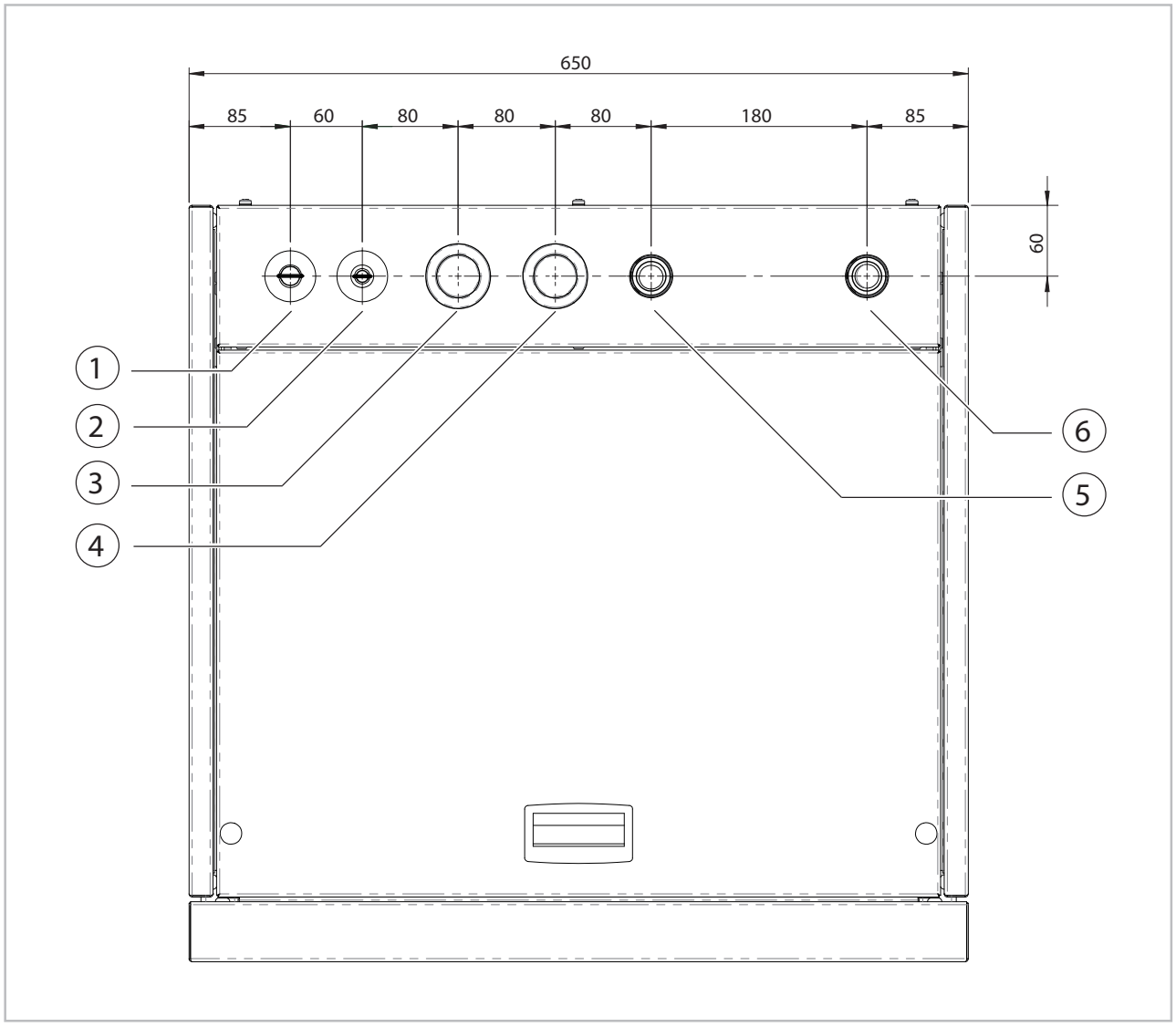


Fig. 4: Designations of pipe connections, plan view

1: Refrigerant connection, suction pipe
2: Refrigerant connection, injection pipe
3: Power supply = ø 36 mm
4: Probe and signal inlet = ø 36 mm
5: Heating water, inlet
6: Heating water, return flow

Dimensioning of piping (all details in inches)

	HTS 80/90/110/130	HTS 200/260
Refrigerant connections, suction pipe	5/8"	3/4"
T-piece for refrigerant distribution to suction pipe	-	5/8"
Refrigerant connections, injection pipe	3/8"	1/2"
T-piece for refrigerant distribution to injection pipe.	-	3/8"
Heating water, inlet (surface sealing)	1" OT	1 1/4" OT
Heating water, return flow (surface sealing)	1" OT	1 1/4" OT

2.9 Diagram, cooling cycle

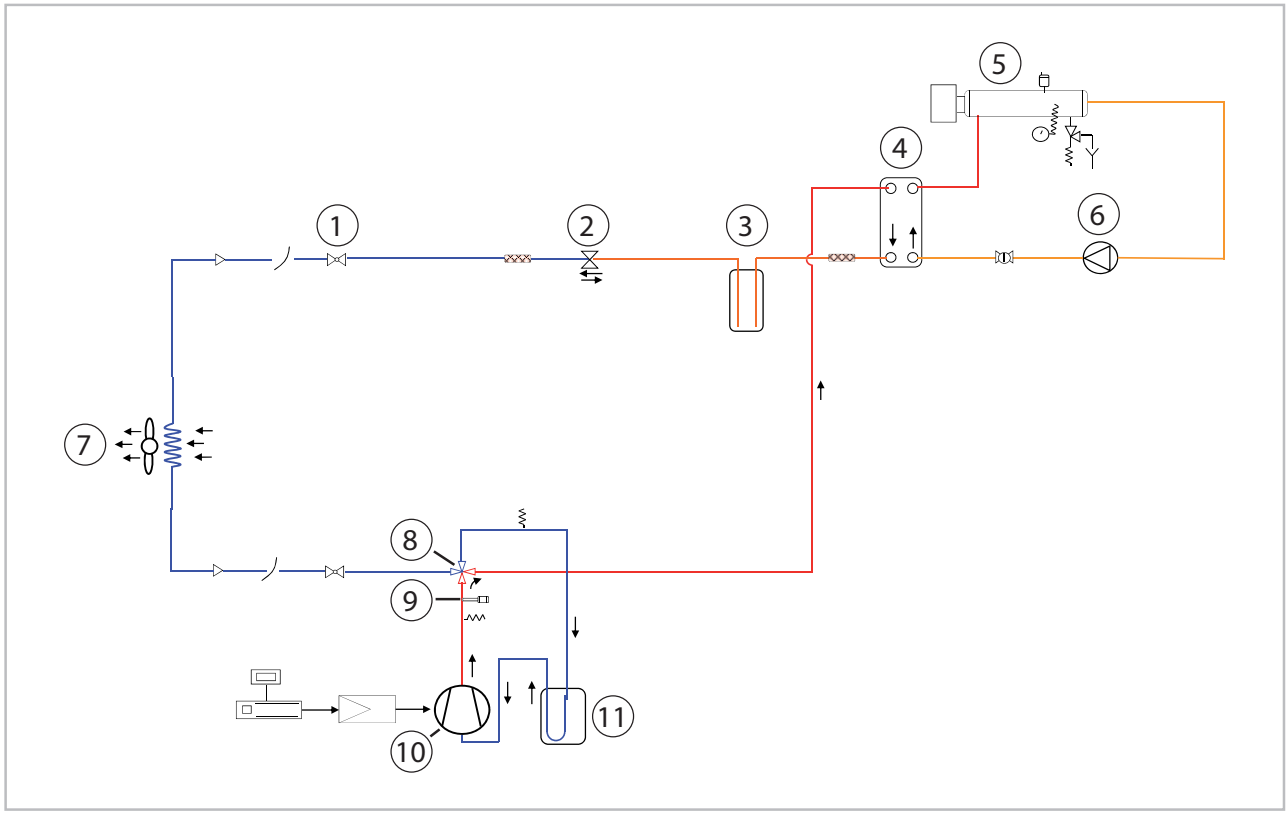


Fig. 5: Diagram, cooling cycle

1: Stop cock
2: Electronic expansion valve
3: Refrigerant collector
4: Plate heat exchanger
5: Electrical heating coil
6: Heating circulating pump
7: Evaporator with fan
8: 4-way switching valve
9: High pressure switch
10: Compressor
11: Liquid separator

2.10 Heat pump service limits in monovalent mode

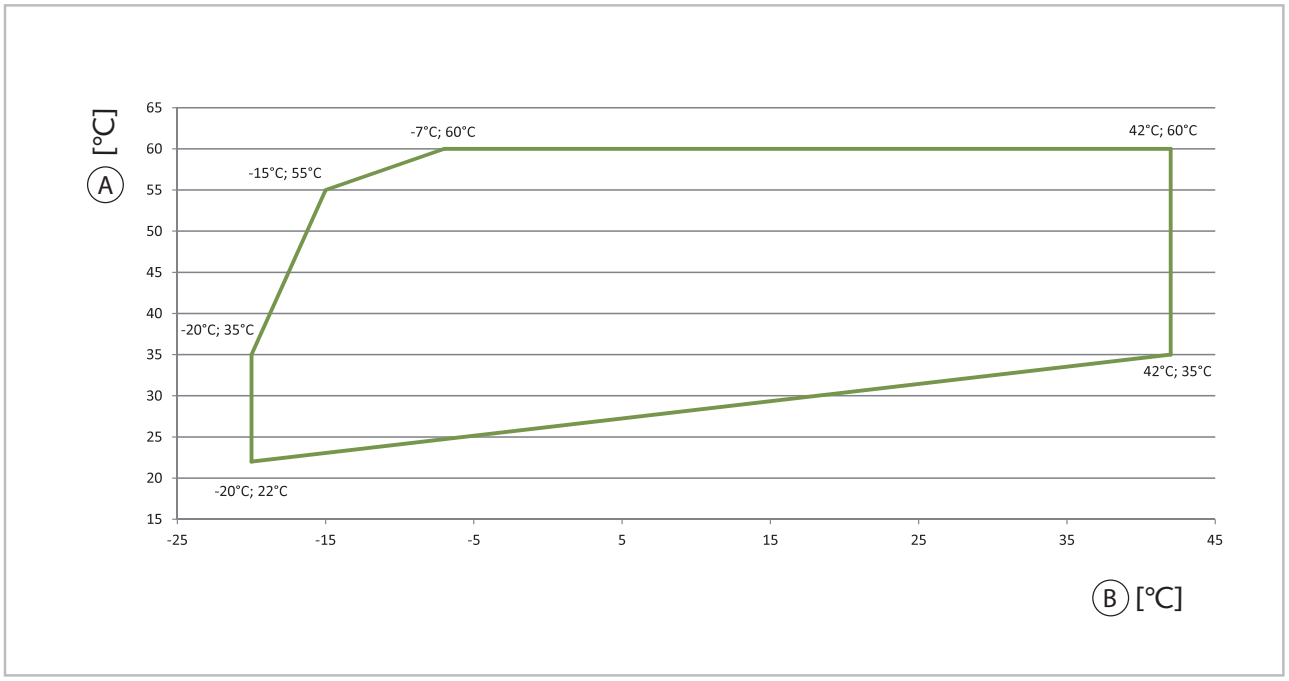


Fig. 6: Service limits and measuring points HTS 80/110

A: Water temperature

B: Air temperature

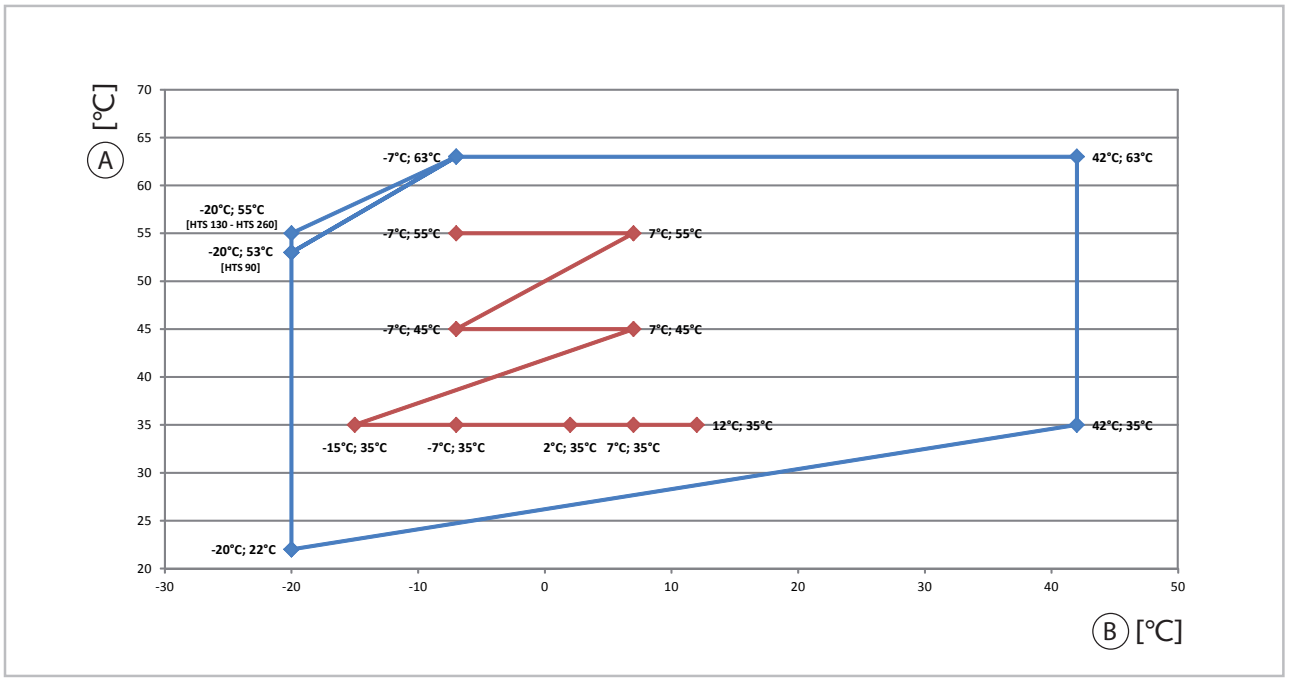


Fig. 7: Service limits and measuring points HTS 90/130/200/260

A: Water temperature
B: Air temperature

: Service limits
: Measuring point

2.11 Pump-characteristic curves, indoor module circulation pump

HTS 80/110

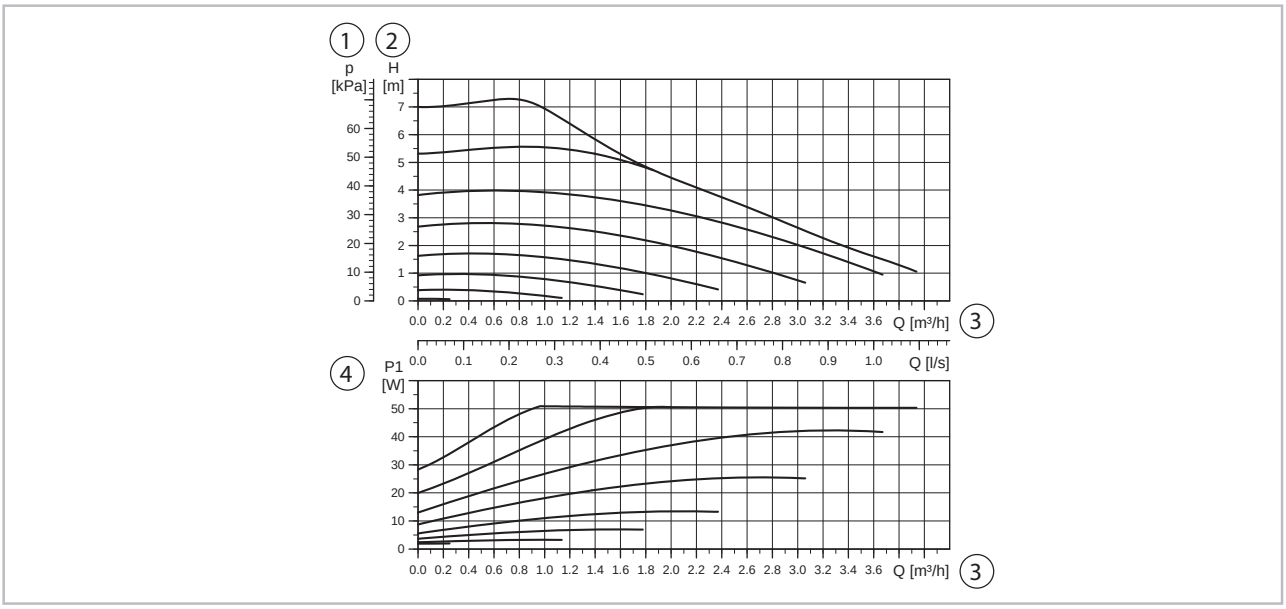


Fig. 8: Circulating pump Grundfoss UPM 3 25-70 130 - performance range

1: Pressure [kPa]
2: Heigh [m]
3: Medium flow rate [m^3/h]
4: Speed

External control via analogue-In PWM signal

The tolerances of each curve are in acc. with EN 1151-1:2006

Level	Output [W]	Current [A]	Motor protection
min.	2	0,04	Rotor current-proof
max.	52	0,52	Rotor current-proof

REMKO HTS series

HTS 90/130/200/260

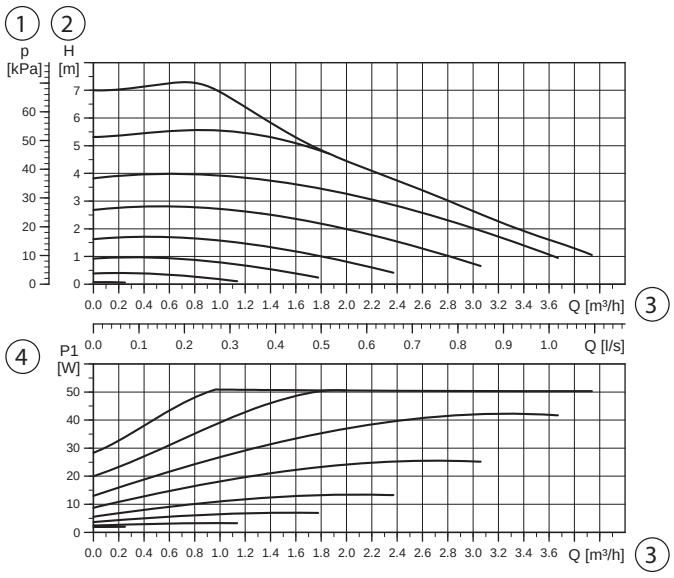


Fig. 9: Circulating pump Grundfoss UPML 25-105 180 PWM - performance range

1: Pressure [kPa]
2: Heigh [m]
3: Medium flow rate [m^3/h]
4: Speed

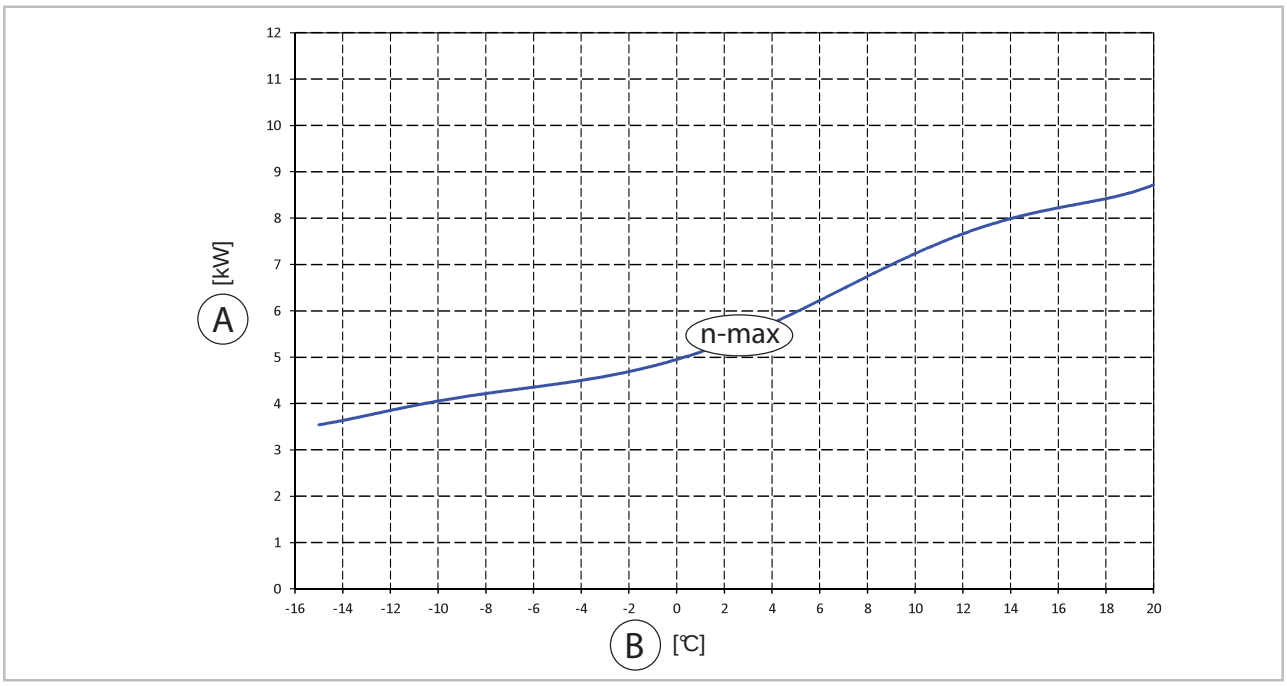
External control via analogue-In PWM signal

The tolerances of each curve are in acc. with EN 1151-1:2006

Level	Output [W]	Current [A]	Motor protection
min.	3	0,04	Rotor current-proof
max.	140	1,1	Rotor current-proof

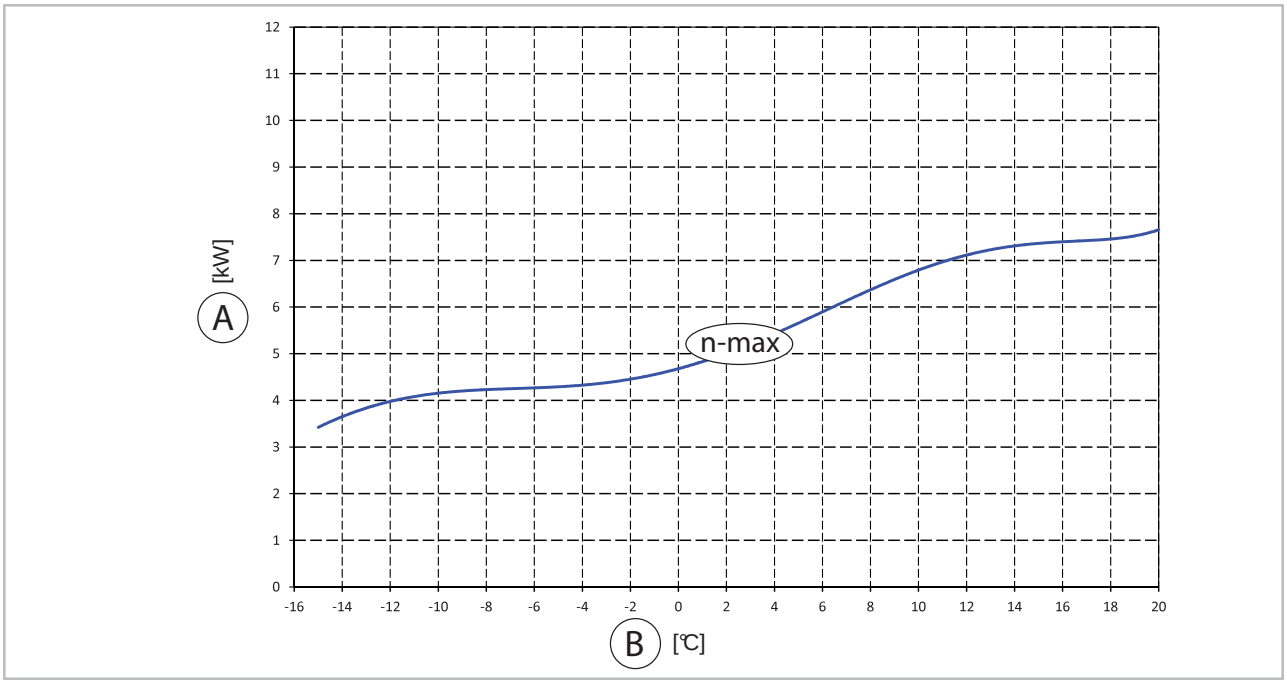
2.12 Characteristic curves

Heating capacity HTS 80 at inlet temperature of 35°C



A: Heating capacity / B: Outside temperature n-max: max. frequency

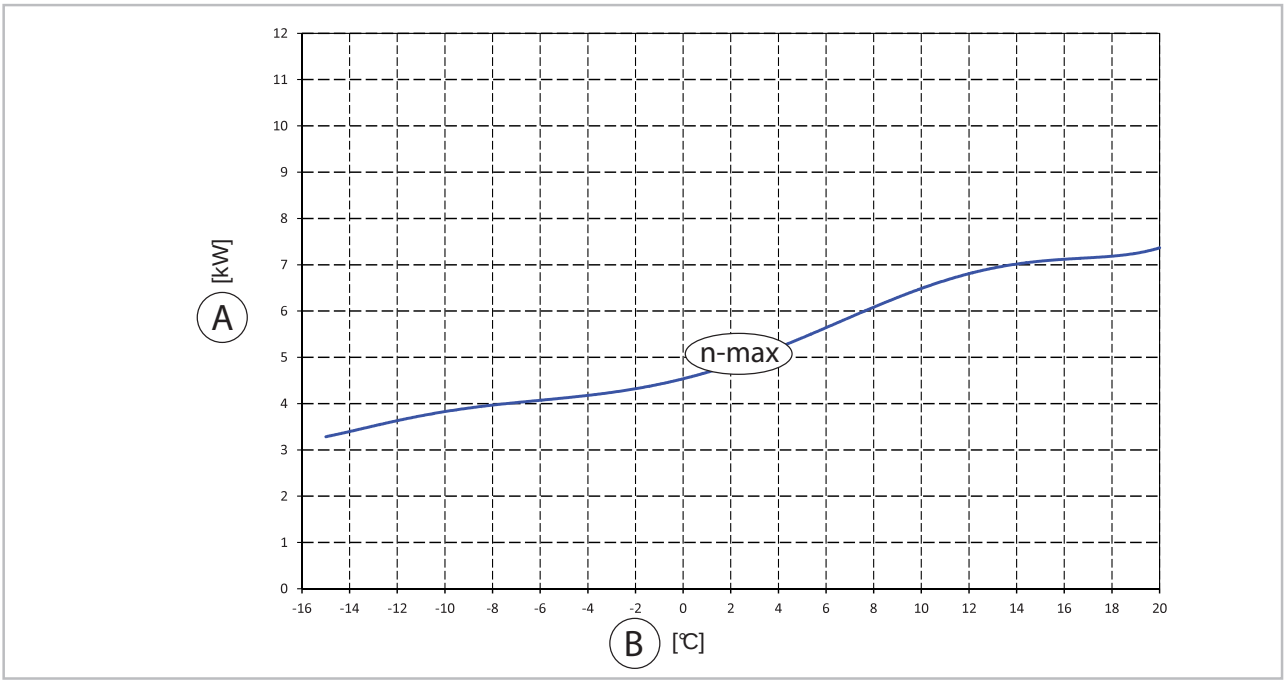
Heating capacity HTS 80 at inlet temperature of 45 °C



A: Heating capacity / B: Outside temperature n-max: max. frequency

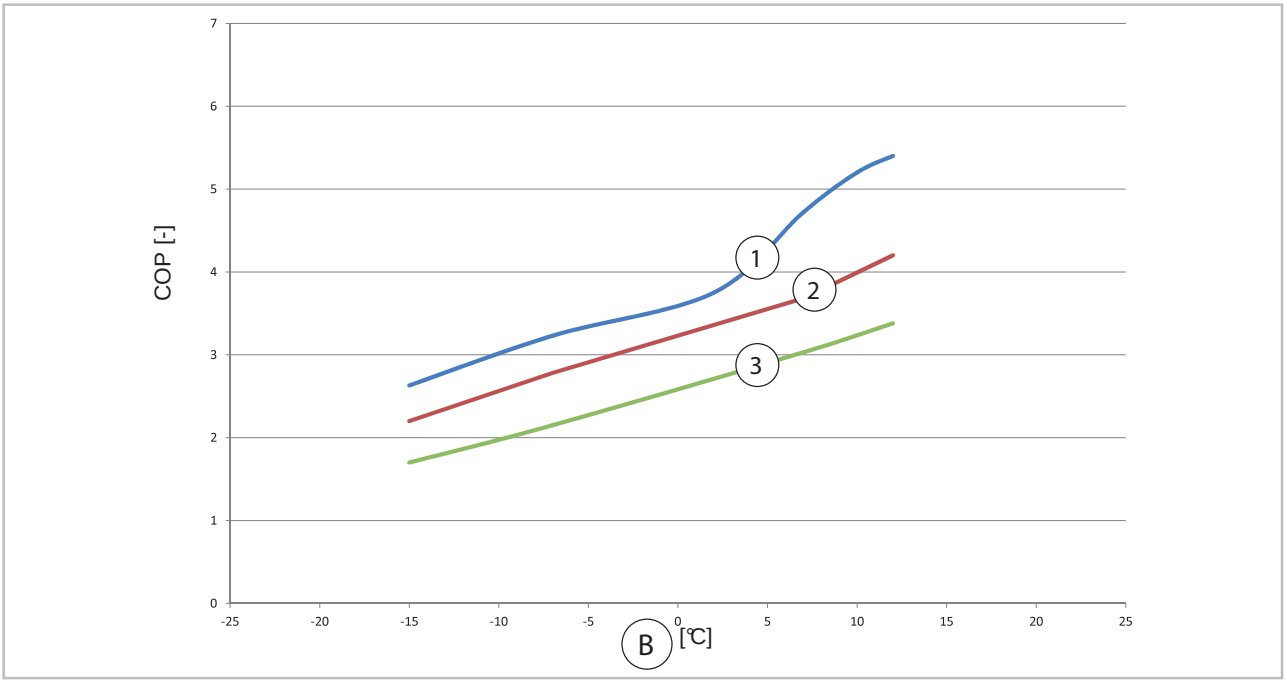
REMKO HTS series

Heating capacity HTS 80 at inlet temperature of 55 °C



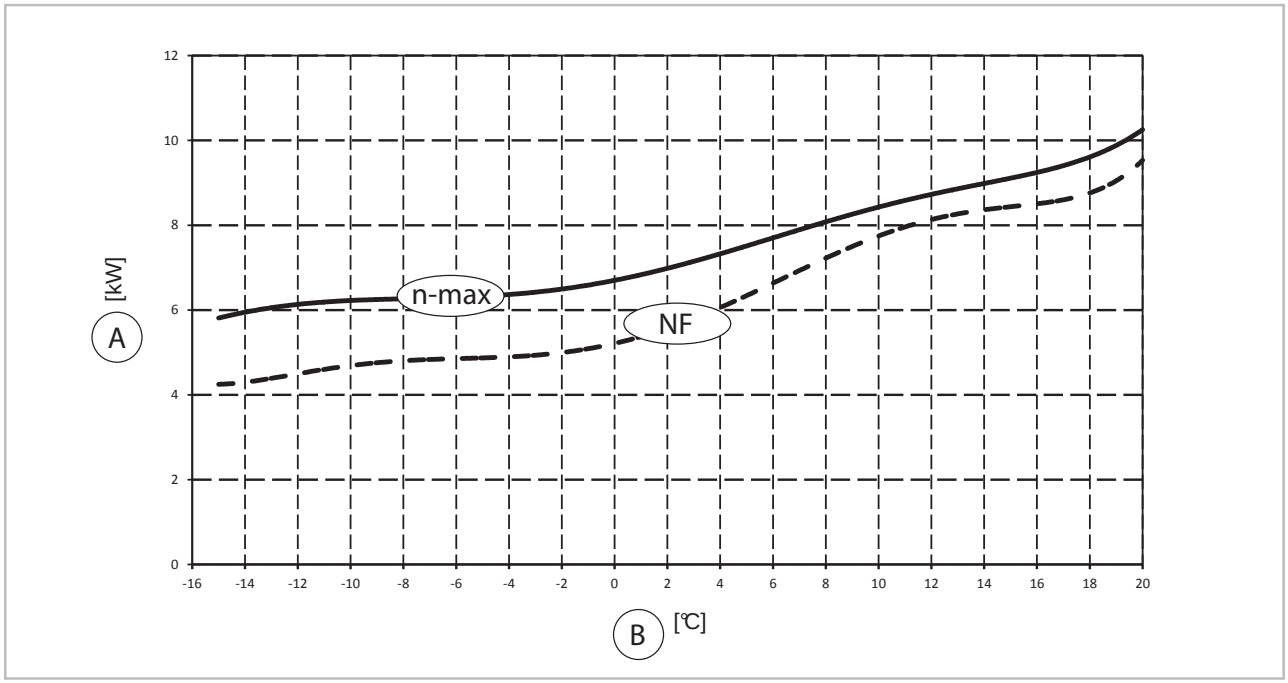
A: Heating capacity / B: Outside temperature n-max: max. frequency

COP HTS 80 at inlet temperature 35 °C, 45 °C and 55 °C



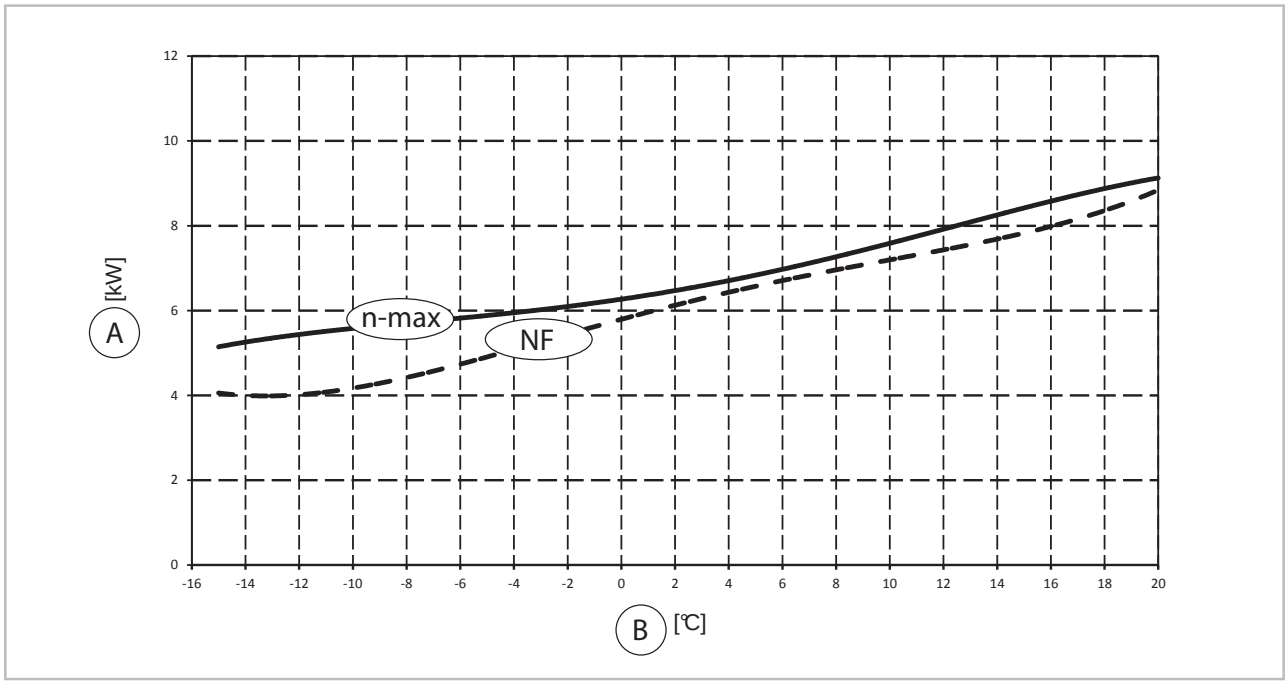
B: Outside temperature
1: Inlet temperature 35 °C
2: Inlet temperature 45 °C
3: Inlet temperature 55 °C

Heating capacity HTS 90 at inlet temperature of 35°C



A: Heating capacity / B: Outside temperature NF: Nominal frequency / n-max: max. frequency

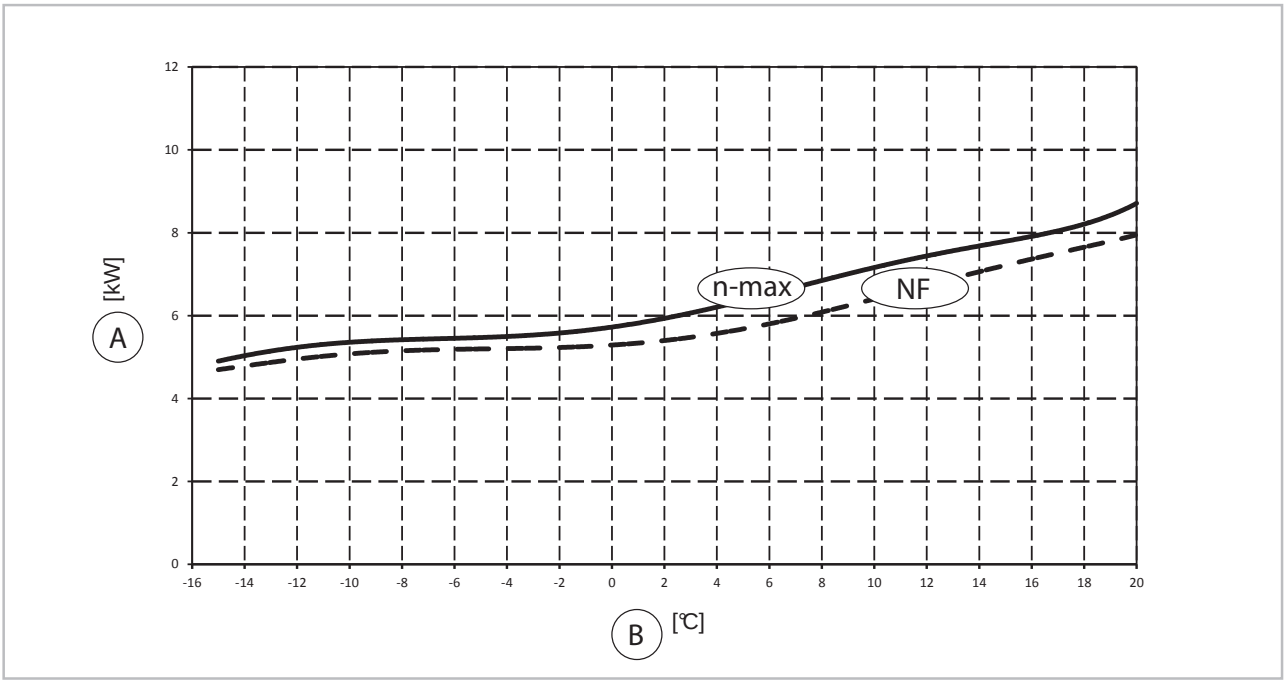
Heating capacity HTS 90 at inlet temperature of 45 °C



A: Heating capacity / B: Outside temperature NF: Nominal frequency / n-max: max. frequency

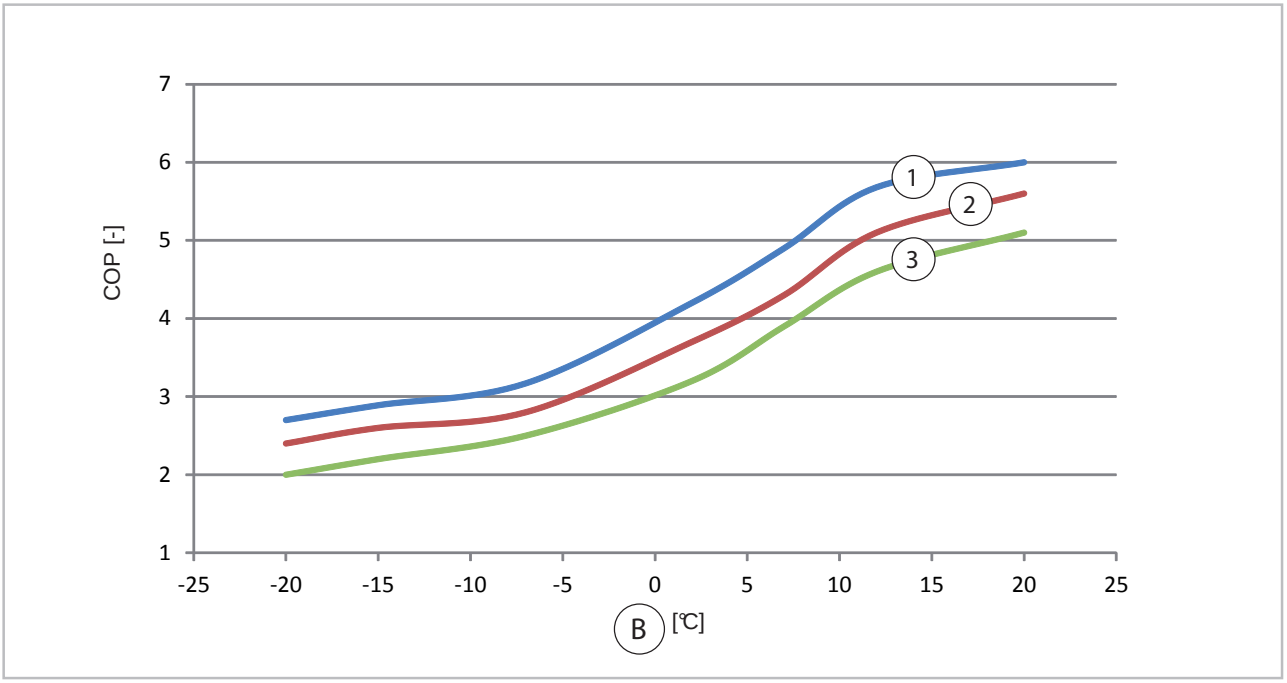
REMKO HTS series

Heating capacity HTS 90 at inlet temperature of 55 °C



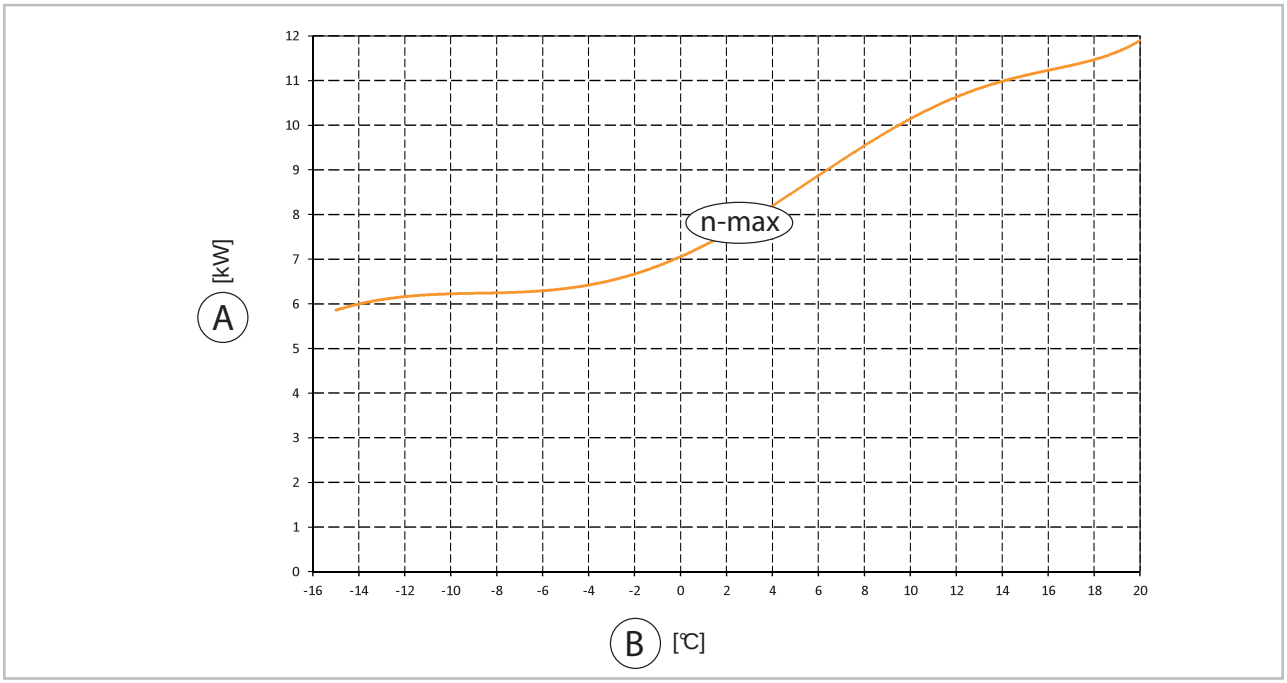
A: Heating capacity / B: Outside temperature NF: Nominal frequency / n-max: max. frequency

COP HTS 90 at inlet temperature 35 °C, 45 °C and 55 °C



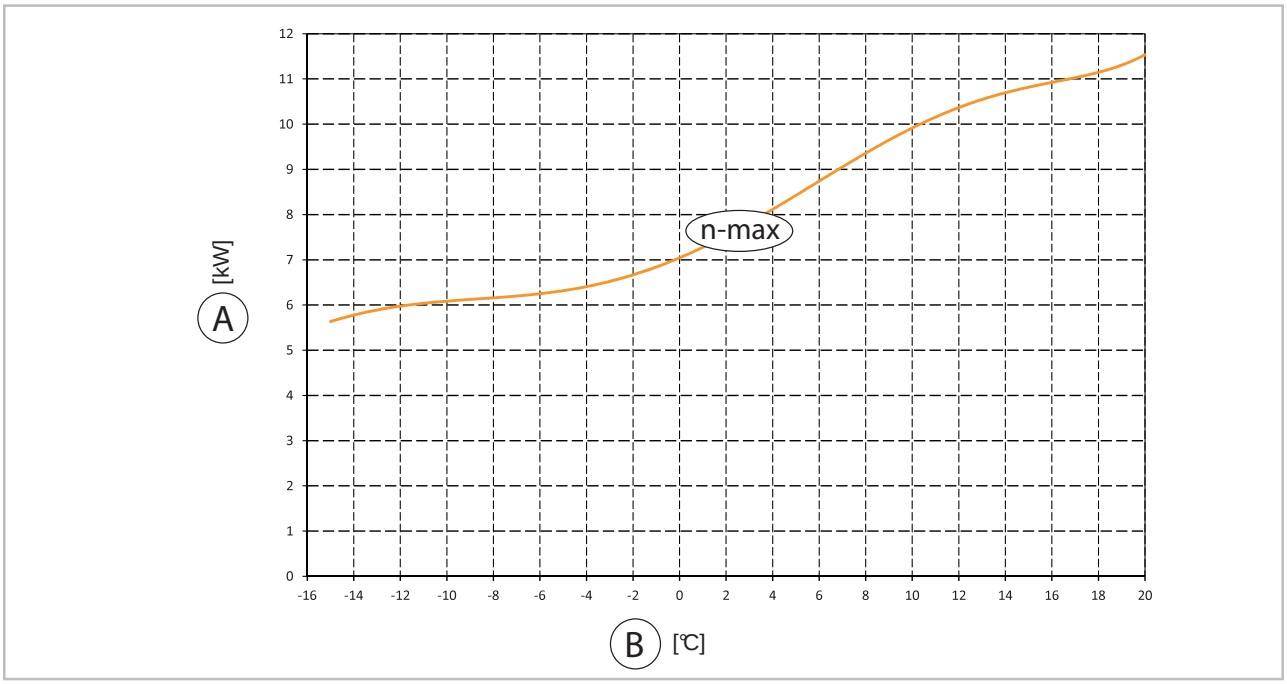
B: Outside temperature
1: Inlet temperature 35 °C
2: Inlet temperature 45 °C
3: Inlet temperature 55 °C

Heating capacity HTS 110 at inlet temperature of 35°C



A: Heating capacity / B: Outside temperature n-max: max. frequency

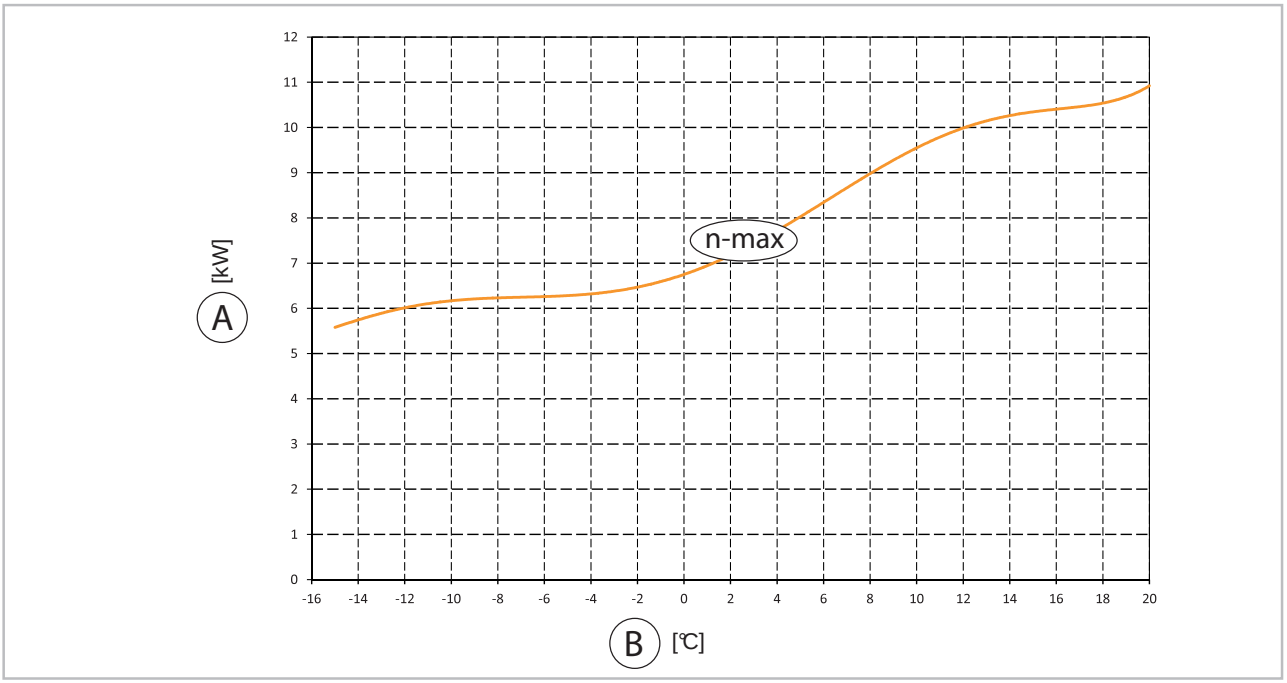
Heating capacity HTS 110 at inlet temperature of 45 °C



A: Heating capacity / B: Outside temperature n-max: max. frequency

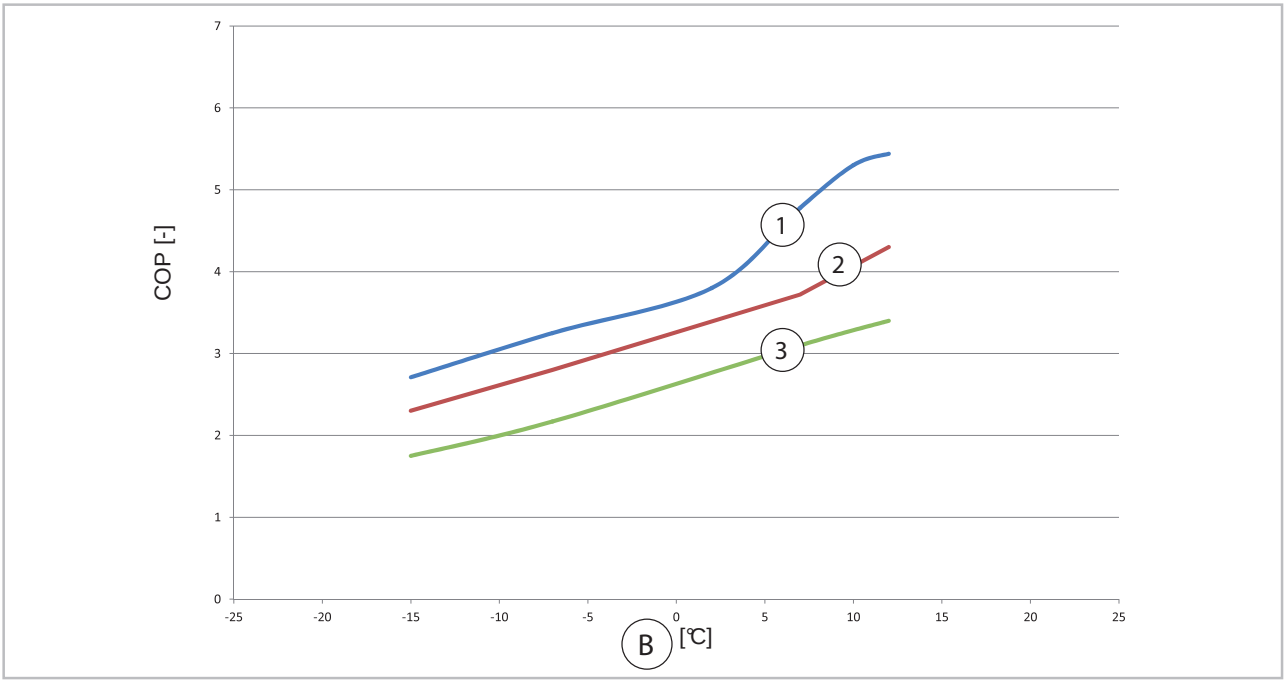
REMKO HTS series

Heating capacity HTS 110 at inlet temperature of 55 °C



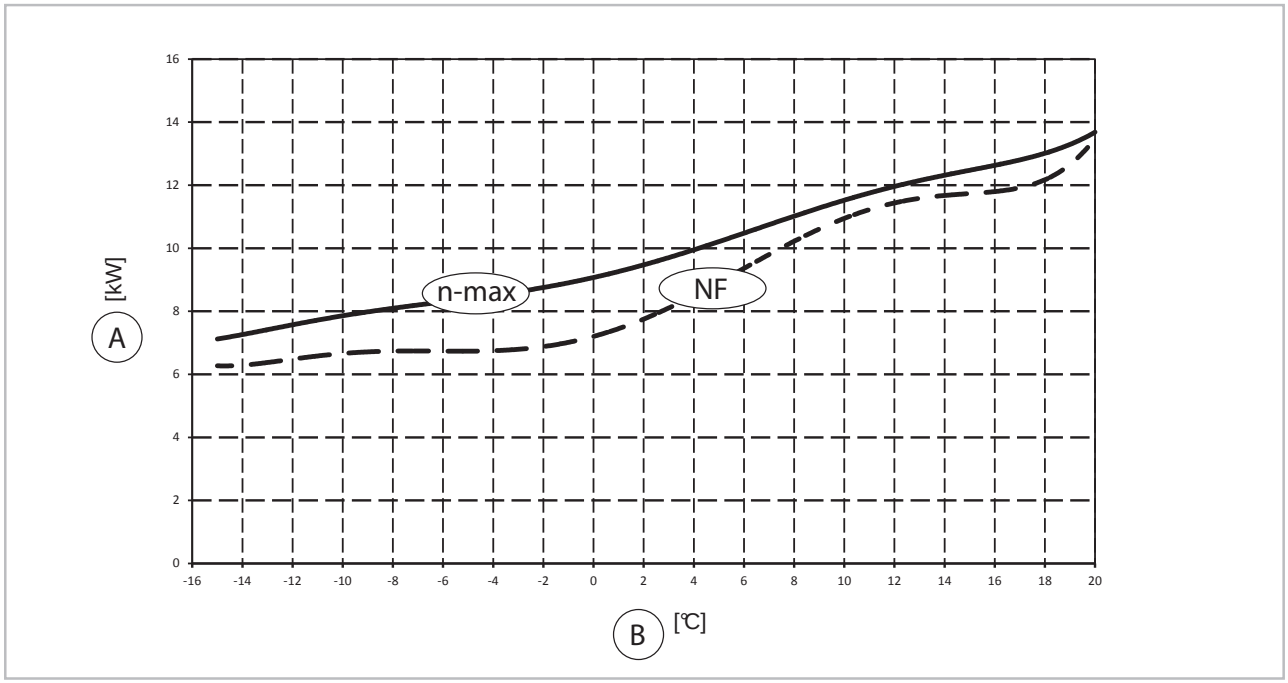
A: Heating capacity / B: Outside temperature n-max: max. frequency

COP HTS 110 at inlet temperature 35 °C, 45 °C and 55 °C



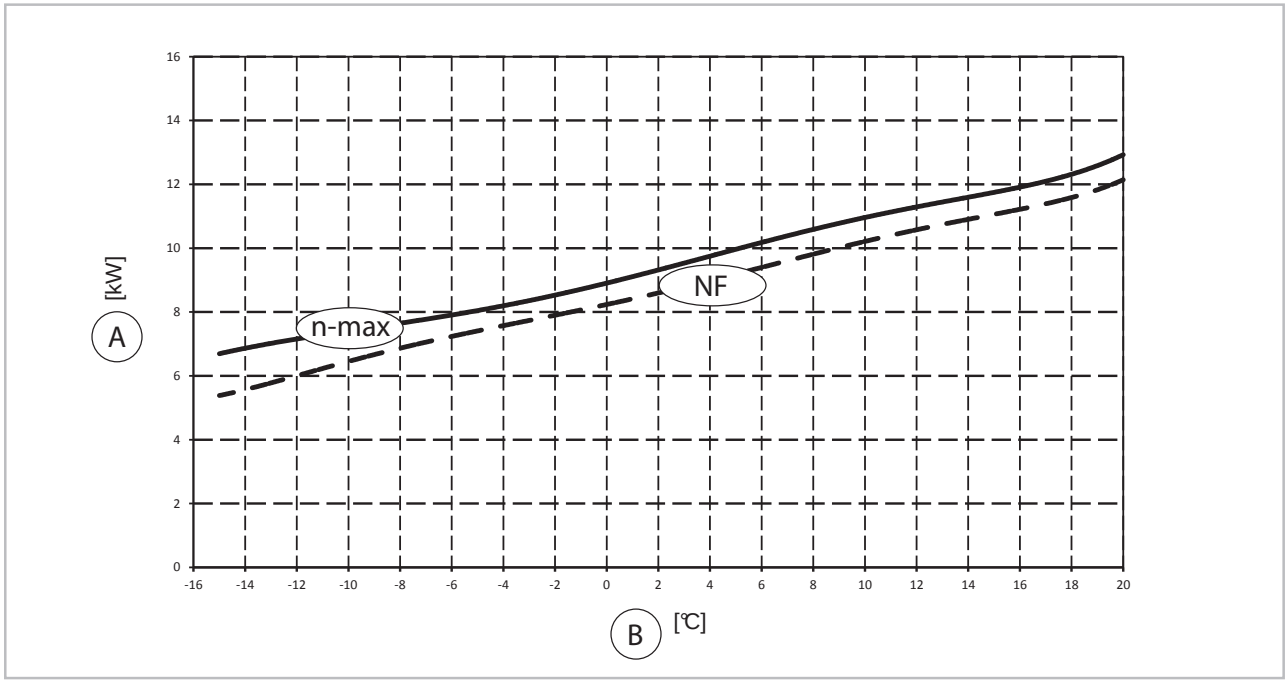
B: Outside temperature
1: Inlet temperature 35 °C
2: Inlet temperature 45 °C
3: Inlet temperature 55 °C

Heating capacity HTS 130 at inlet temperature of 35°C



A: Heating capacity / B: Outside temperature NF: Nominal frequency / n-max: max. frequency

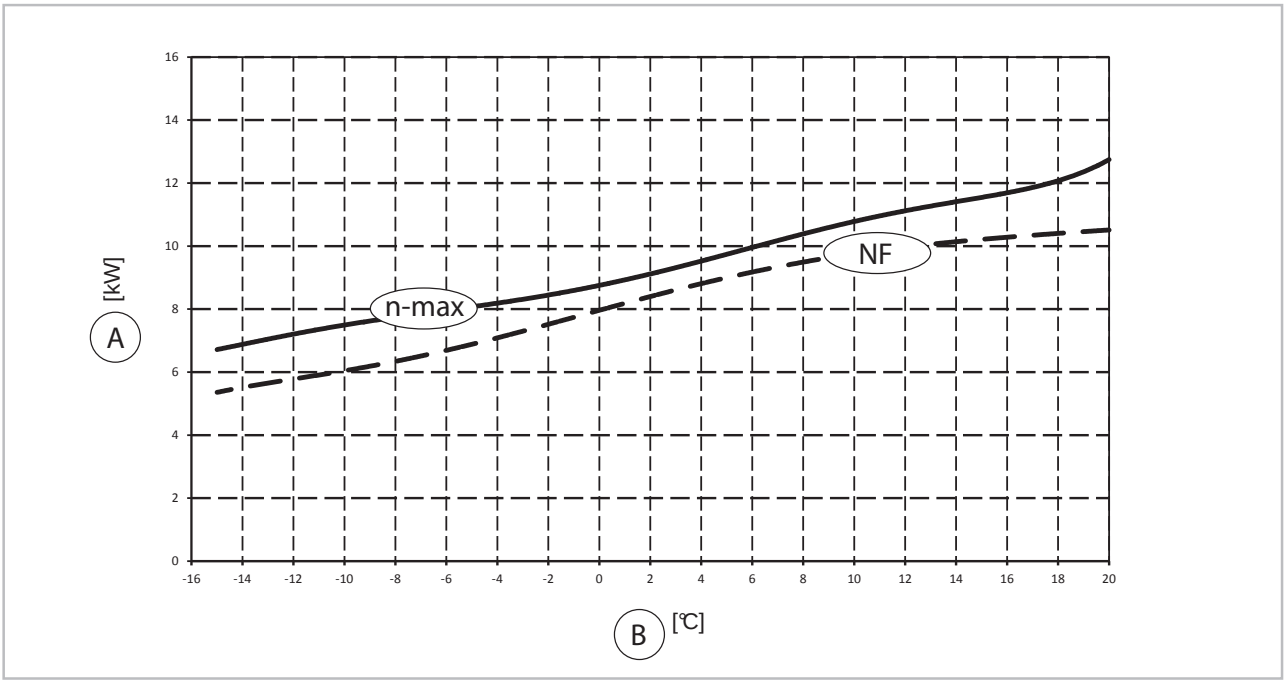
Heating capacity HTS 130 at inlet temperature of 45 °C



A: Heating capacity / B: Outside temperature NF: Nominal frequency / n-max: max. frequency

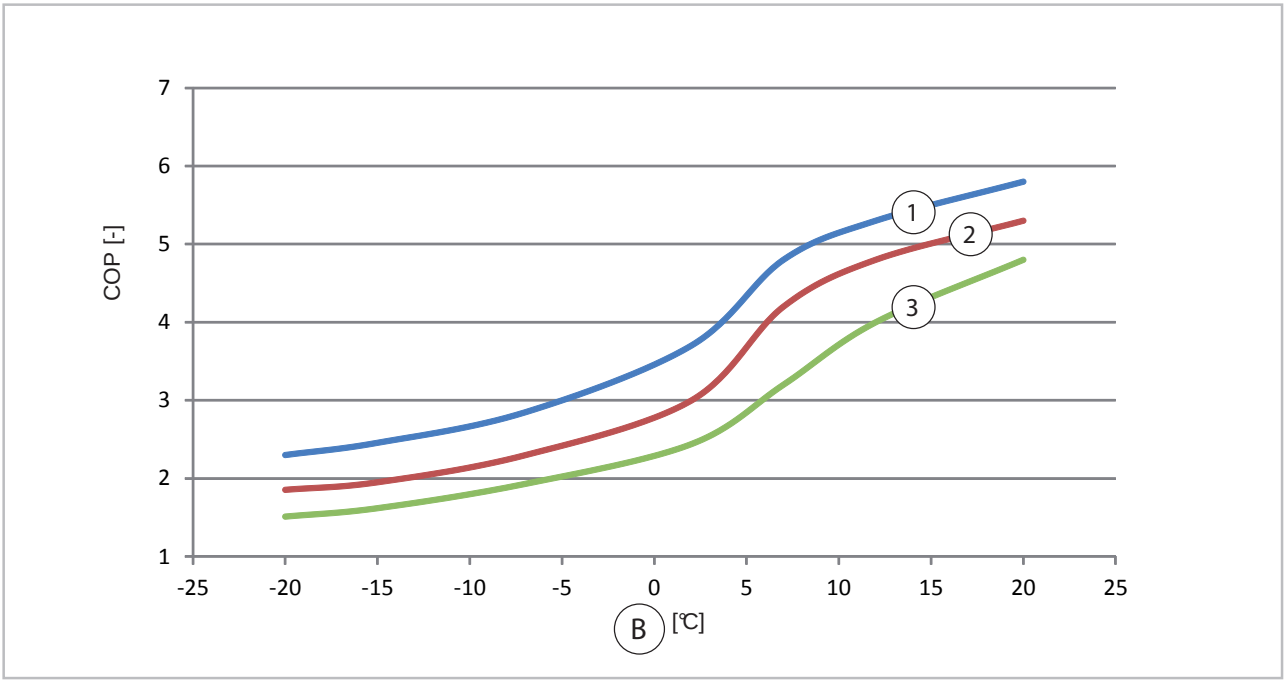
REMKO HTS series

Heating capacity HTS 130 at inlet temperature of 55 °C



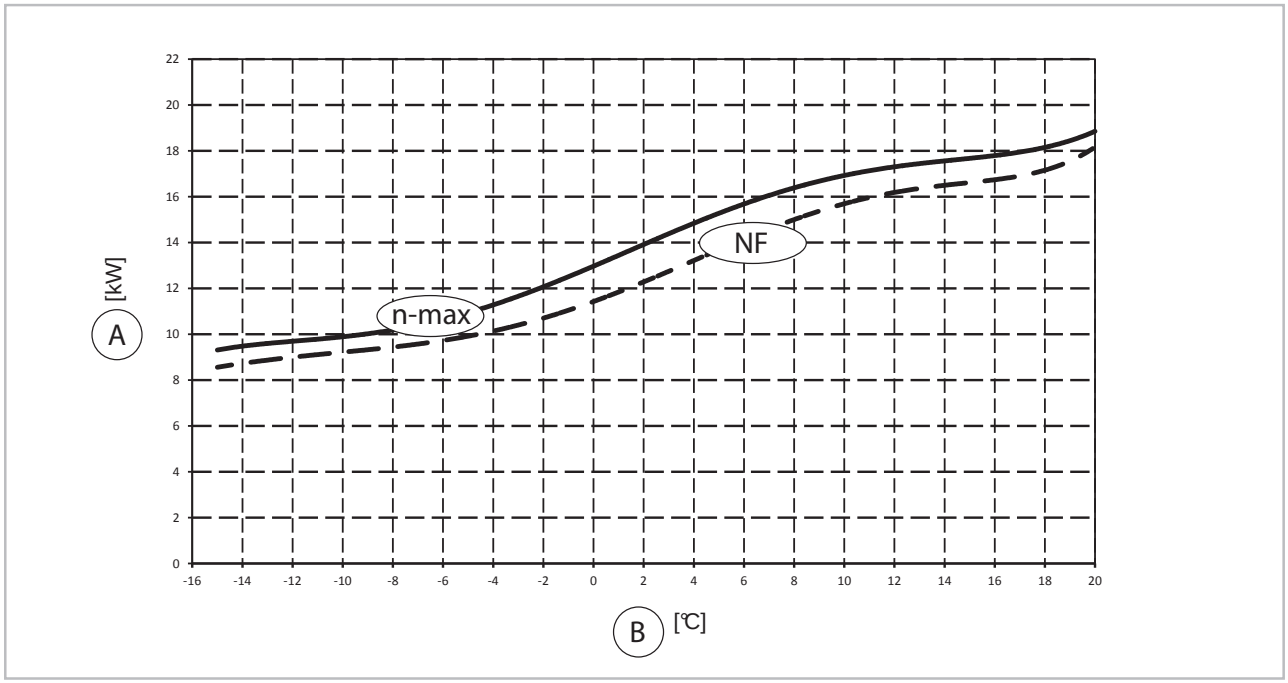
A: Heating capacity / B: Outside temperature NF: Nominal frequency / n-max: max. frequency

COP HTS 130 at inlet temperature 35 °C, 45 °C and 55 °C



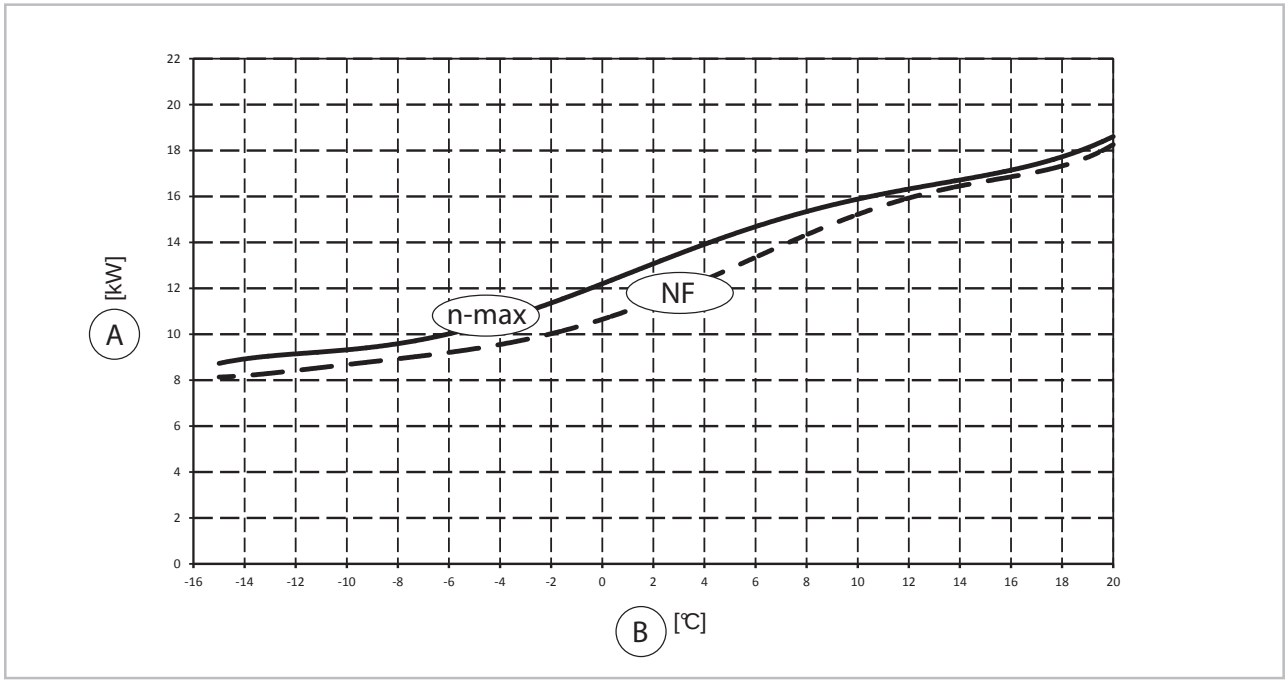
B: Outside temperature
1: Inlet temperature 35 °C
2: Inlet temperature 45 °C
3: Inlet temperature 55 °C

Heating capacity HTS 200 at inlet temperature of 35°C



A: Heating capacity / B: Outside temperature NF: Nominal frequency / n-max: max. frequency

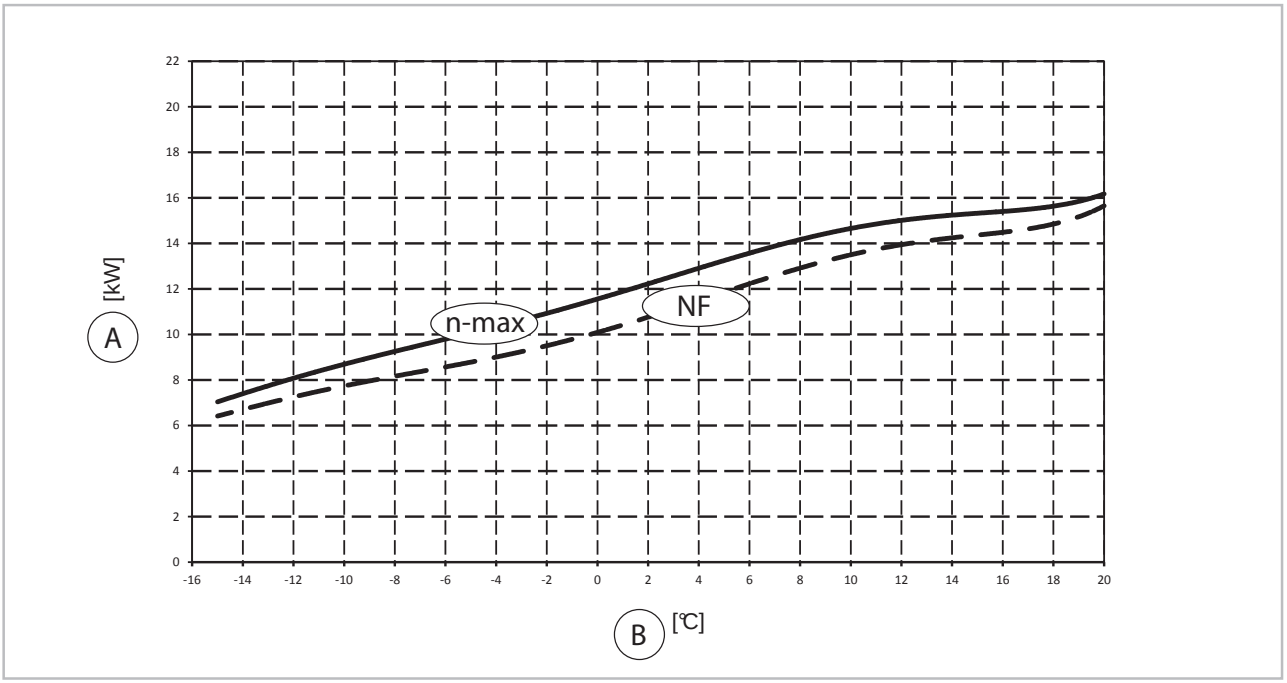
Heating capacity HTS 200 at inlet temperature of 45 °C



A: Heating capacity / B: Outside temperature NF: Nominal frequency / n-max: max. frequency

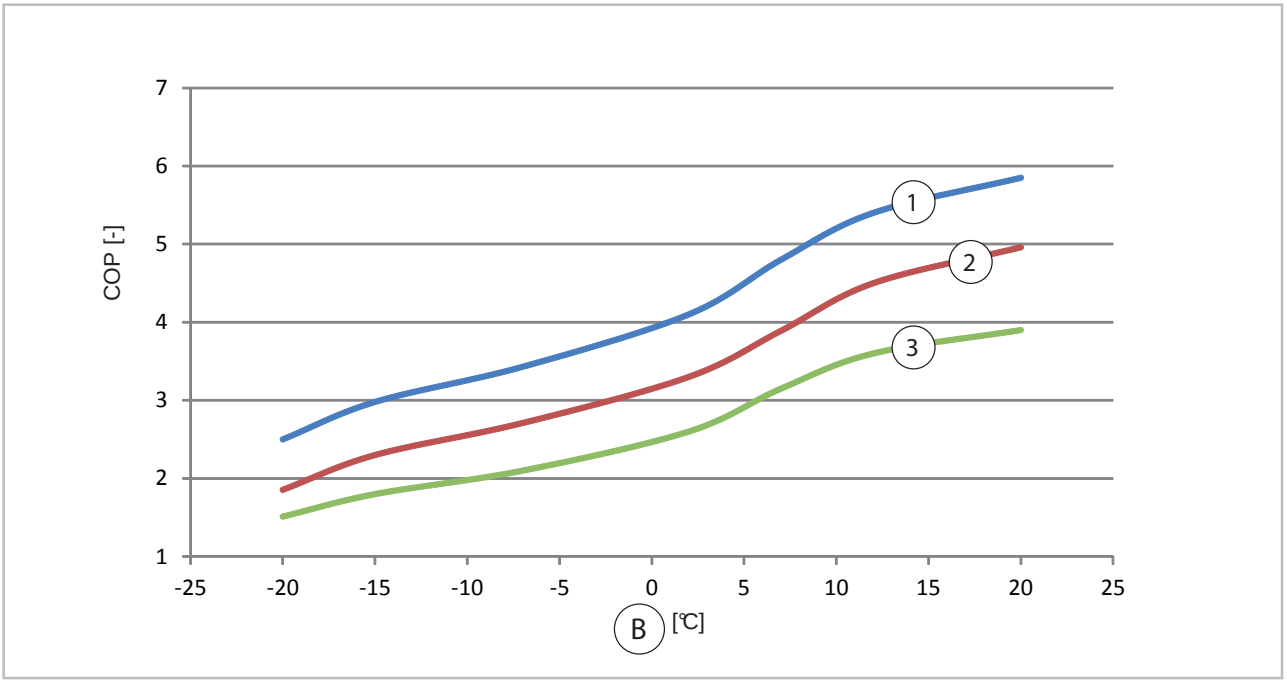
REMKO HTS series

Heating capacity HTS 200 at inlet temperature of 55 °C



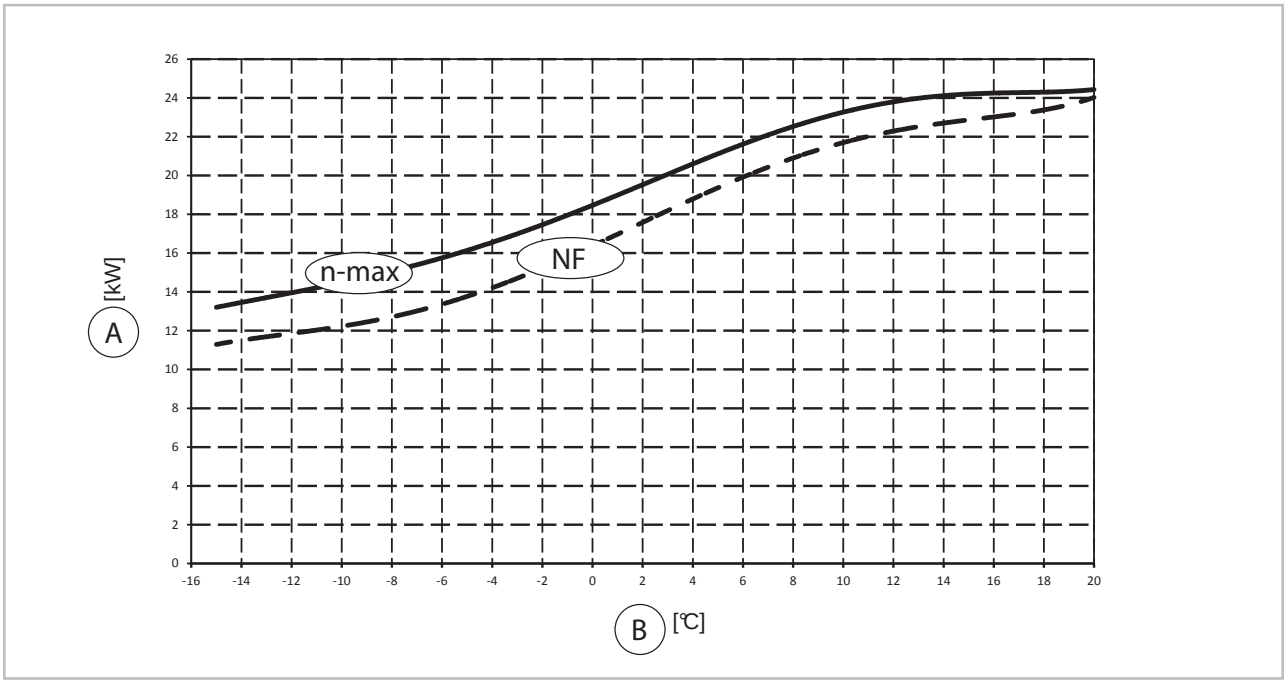
A: Heating capacity / B: Outside temperature NF: Nominal frequency / n-max: max. frequency

COP HTS 200 at inlet temperature 35 °C, 45 °C and 55 °C



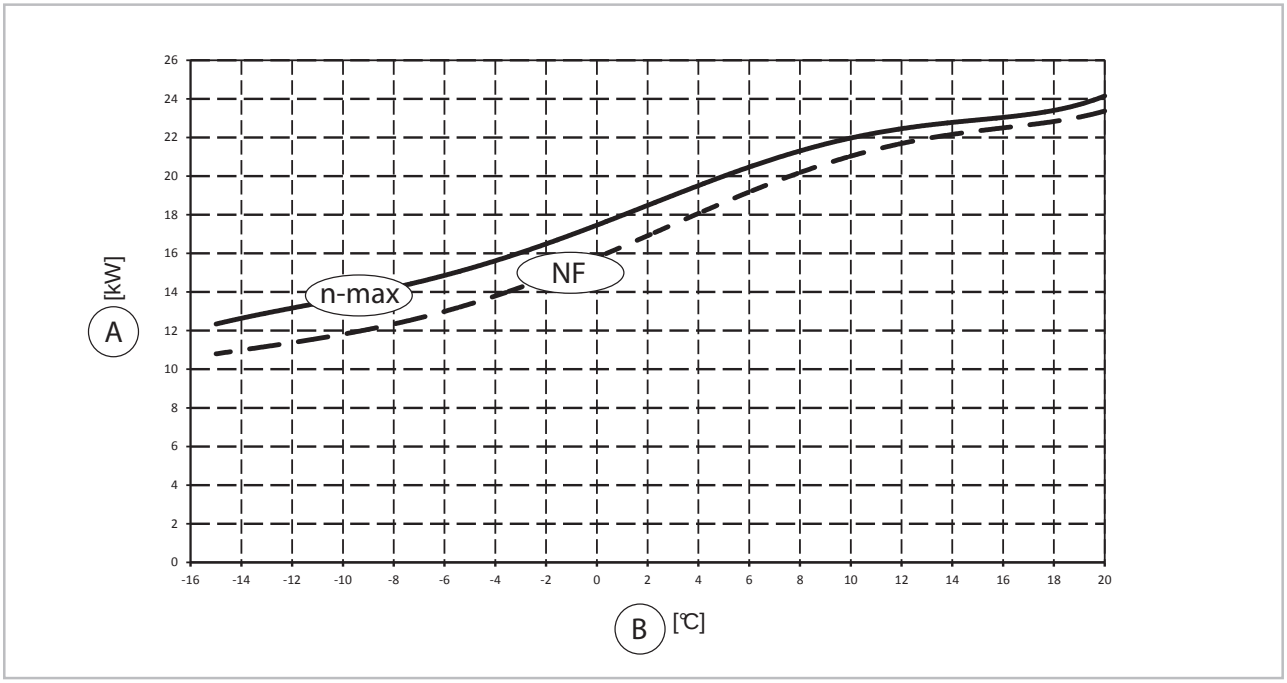
B: Outside temperature
1: Inlet temperature 35 °C
2: Inlet temperature 45 °C
3: Inlet temperature 55 °C

Heating capacity HTS 260 at inlet temperature of 35°C



A: Heating capacity / B: Outside temperature NF: Nominal frequency / n-max: max. frequency

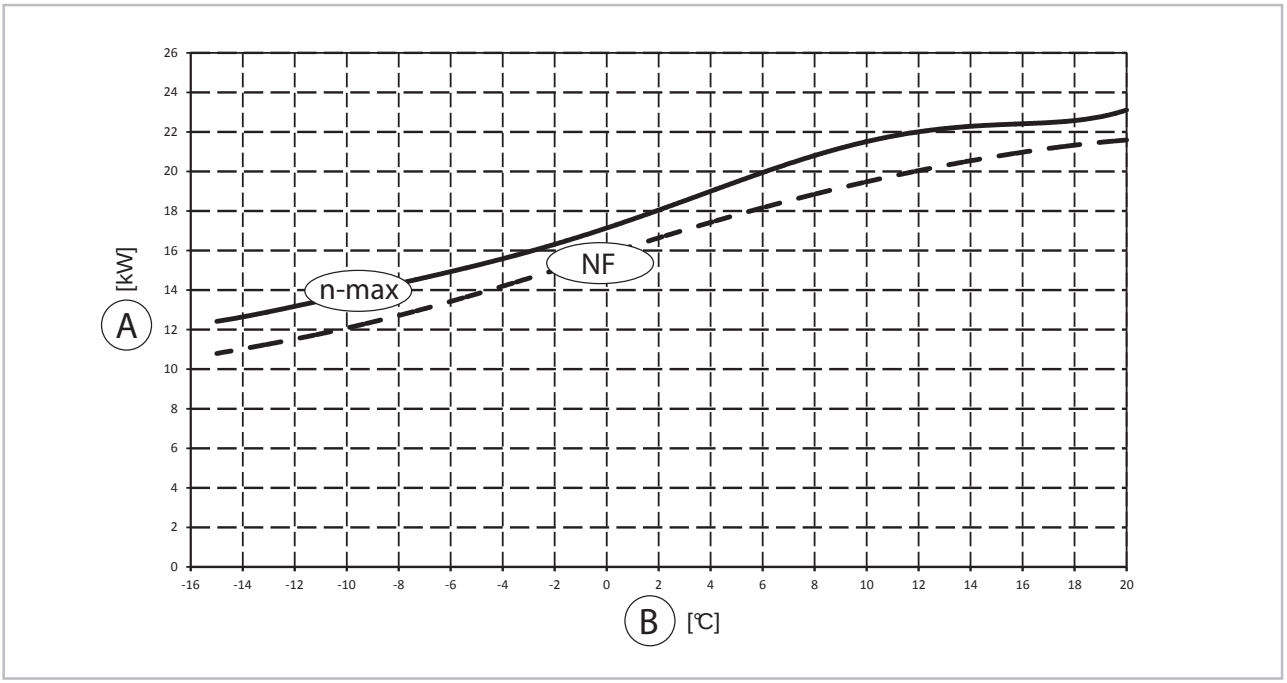
Heating capacity HTS 260 at inlet temperature of 45 °C



A: Heating capacity / B: Outside temperature NF: Nominal frequency / n-max: max. frequency

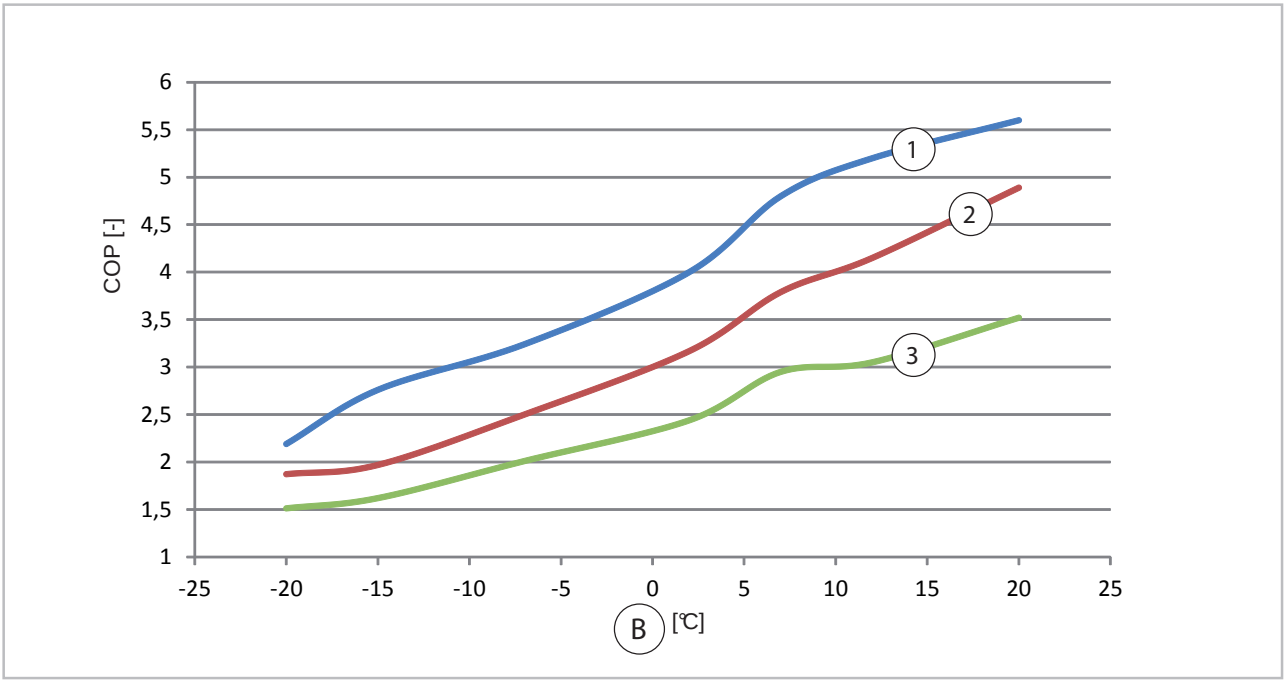
REMKO HTS series

Heating capacity HTS 260 at inlet temperature of 55 °C



A: Heating capacity / B: Outside temperature NF: Nominal frequency / n-max: max. frequency

COP HTS 260 at inlet temperature 35 °C, 45 °C and 55 °C



B: Outside temperature
1: Inlet temperature 35 °C
2: Inlet temperature 45 °C
3: Inlet temperature 55 °C

3 Design and function

3.1 The heat pump in general

Arguments for REMKO inverter heat pumps

- Lower heating costs in comparison to oil and gas.
- Heat pumps make 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 units.
- Flexible installation due to split system design.
- Negligible maintenance costs.

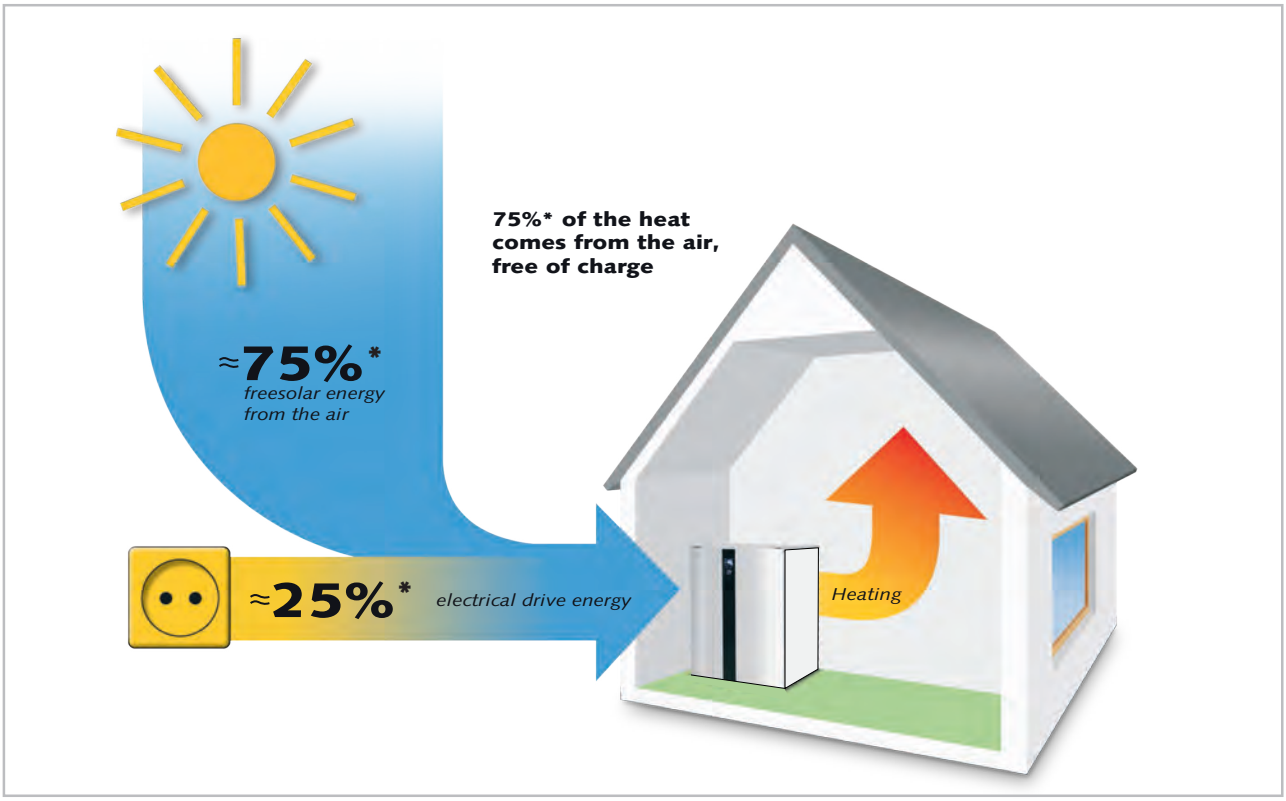


Fig. 10: Free heat

* The relationship can vary depending on outside 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 4 kWh, only about 1 kWh of electricity is required. The rest is made available free-of-charge by the environment.

Heat source

There are essentially three heat sources from which heat pumps can derive energy: 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 achieved through 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**. Long-term cooling of the soil is also a possibility.

REMKO HTS series

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 unit 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 heat 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.

Smart Control is used for regulation, and ensures self-sufficient operation in addition to all safety functions. The heating/cooling circuit in the indoor unit with series HTS consists of a circulation pump, plate heat exchangers, dirt traps, compressor, electrical expansion valve, safety valve, pressure gauge, filling and draining valves, an automatic bleeding valve and flow switch. The outdoor unit contains the evaporator and a speed-controlled and highly efficient fan. The HTS 80/90/110/130 series has one outdoor unit, while series HTS 200 and series HTS 260 each have 2 outdoor units.

A 3-way changeover valve, overflow protection valve and other probes are available as accessories.

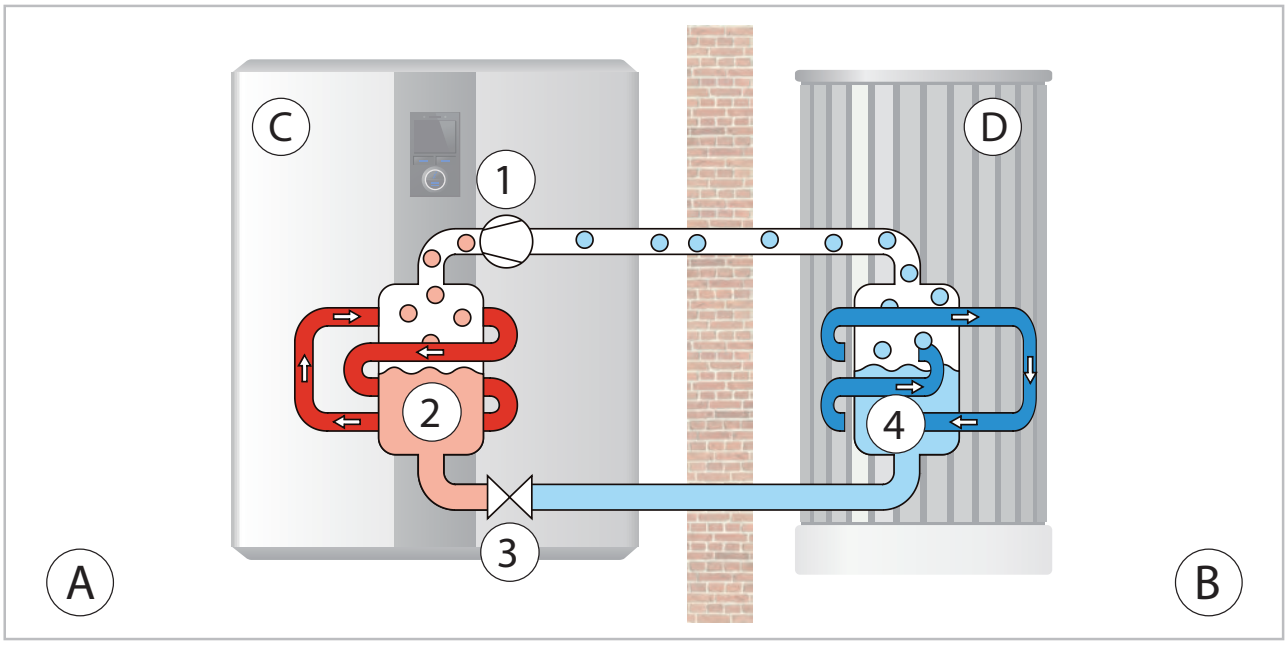


Fig. 11: Function diagram for heating the inverter heat pump

A: Indoor area
B: Outdoor area
C: Heat pump indoor unit
D: Heat pump outdoor unit

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

Heat pump operating mode

Heat pumps can work in various operating modes.

Monovalent

The heat pump the only heat generator for the 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.

Monoenergetic

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

Bivalent alternative

The heat pump provides the entire heating energy down to a predetermined outside temperature. If the outside temperature drops below this value, a second heat generator switches on to support the heat pump, which shuts down at this point. There is a distinction to be made here between **alternative operation** with oil or gas heating and **regenerative operations** with solar energy or wood-fired heating. This operating 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. This table *on page 44* provides an approximate specific heating load for a few types of building. 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 and blocking times comprise the total heating capacity 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 well as about the different thermal transmission coefficients (known as the K value). Also required are the room temperature and the standard outside temperature, that is, the lowest outside temperature on average that will occur during the year. The equation for determining the thermal transmission requirement is $Q=A \times U \times (t_R-t_A)$ and must be calculated for all enclosed room floor areas.

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 addition for the preparation of domestic water per person amounts in acc. with VDI 2067: 0.2 kW.

Design example

By way of a design example, a residential home with a living area of 150 m² and a heating requirement of approx. 80 W/m² was selected. 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 heating capacity of 12.5 kW. Depending on the power company, an additional charge must then be made in order to factor in any service time-out periods that may apply. The rating and determination of the heat pump's balance-point temperature derives graphically from the heat pump's inlet temperature specific heat-output diagram (in this example 35 °C for underfloor heating). 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 outside-temperature-dependent heating requirement, (Fig. 12) simplified here as a linear relationship between heat-load and the start of the heating season, is recorded in the graph of heat-load curves. The intersection of the straight lines with the rated heat-load curve is plotted on the X axis, where the balance-point temperature is read (in this example approx. -3°C). The minimum performance of the 2nd heat source is the difference between heat load and the heat pump's maximum heating capacity on these days (in this example, the required power required to cover peak load requirements is approx. 3 kW).

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Building type	Specific heating capacity in W/m²
Passive energy house	10
Low-energy house built in 2002	40
According 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

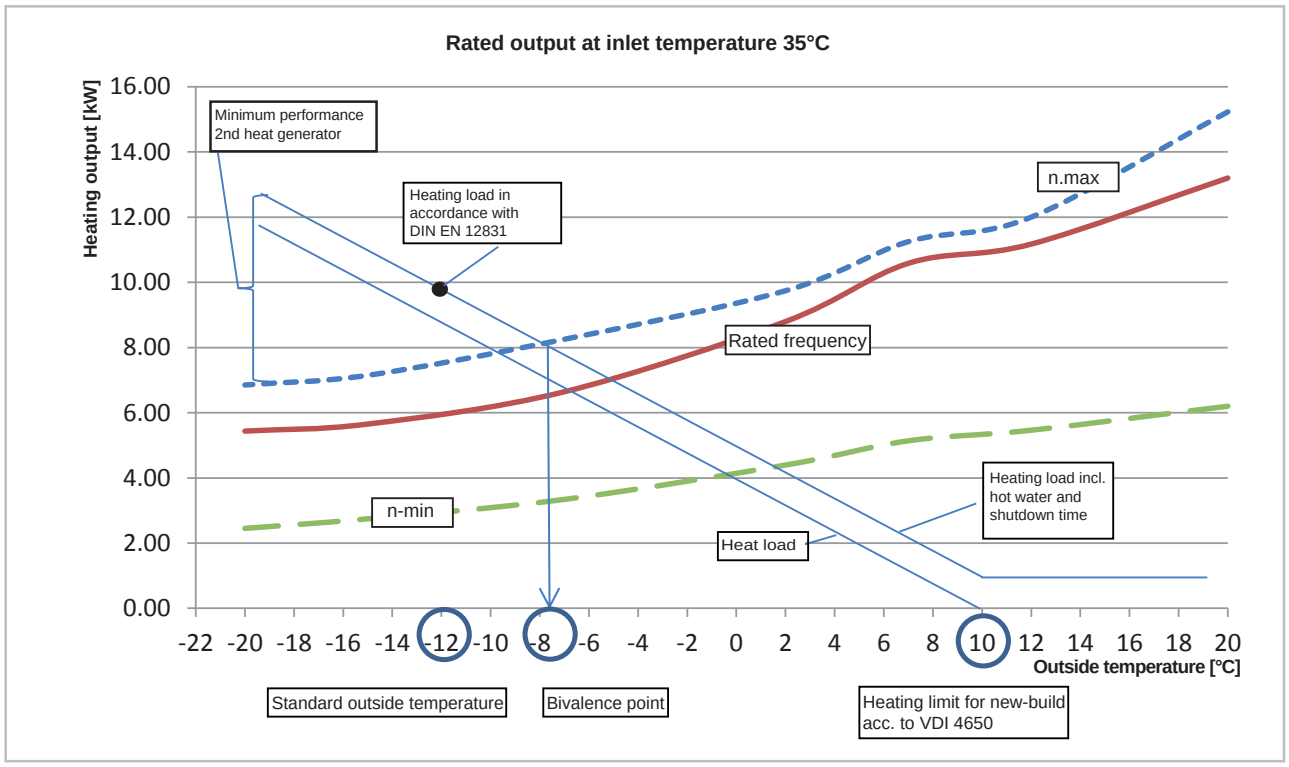


Fig. 12: Heating performance diagram of the heat pump HTS 130

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 anywhere. Air is available everywhere in unlimited quantities. For example, no wells are required.
- No excavation is required. No large areas are required for soil collectors.
- Favourable. Expensive drilling is not required.
- Good price-performance ratio and easy to install.
- Particularly suitable for low-energy houses with low inlet temperatures.
- Ideal for bivalent operation, in order to save energy.
- Great operational readiness achieved with inverter technology.

Split AC unit

The REMKO HTS heat pump is what is known as a split device. 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 consists only of the plate condenser, the fan and the fan motor. This means that the outdoor unit is considerably smaller. The indoor unit contains the condenser of the refrigerant circuit, an electronic expansion valve, filter dryer, refrigerant chamber and connections for the heating network.

REMKO heat pump technology

The REMKO HTS 80/110 heat pumps turn on when the temperature drops below a specified setpoint and turn off when this setpoint is reached. The hydraulic connection of the HTS 80/110 heat pumps is always implemented via a buffer tank.

The REMKO HTS 90/130/200/260 heat pumps modulate and are adapted to the actual demand via the inverter technology. For this reason, hydraulic incorporation via a buffer tank is not absolutely necessary. The electronics system has an integrated frequency-converter which serves to modify the compressor speed and the speed of the fan as required. The compressor works at a higher speed when under full load than under partial load. The lower speed ensures improved power figures and lower noise development. Lower speeds also result in lower energy consumption (electricity) and longer service life. I.e.: REMKO HTS 90/130/200/260 heat pumps will run practically throughout the heating season. In all, the highest efficiency possible.

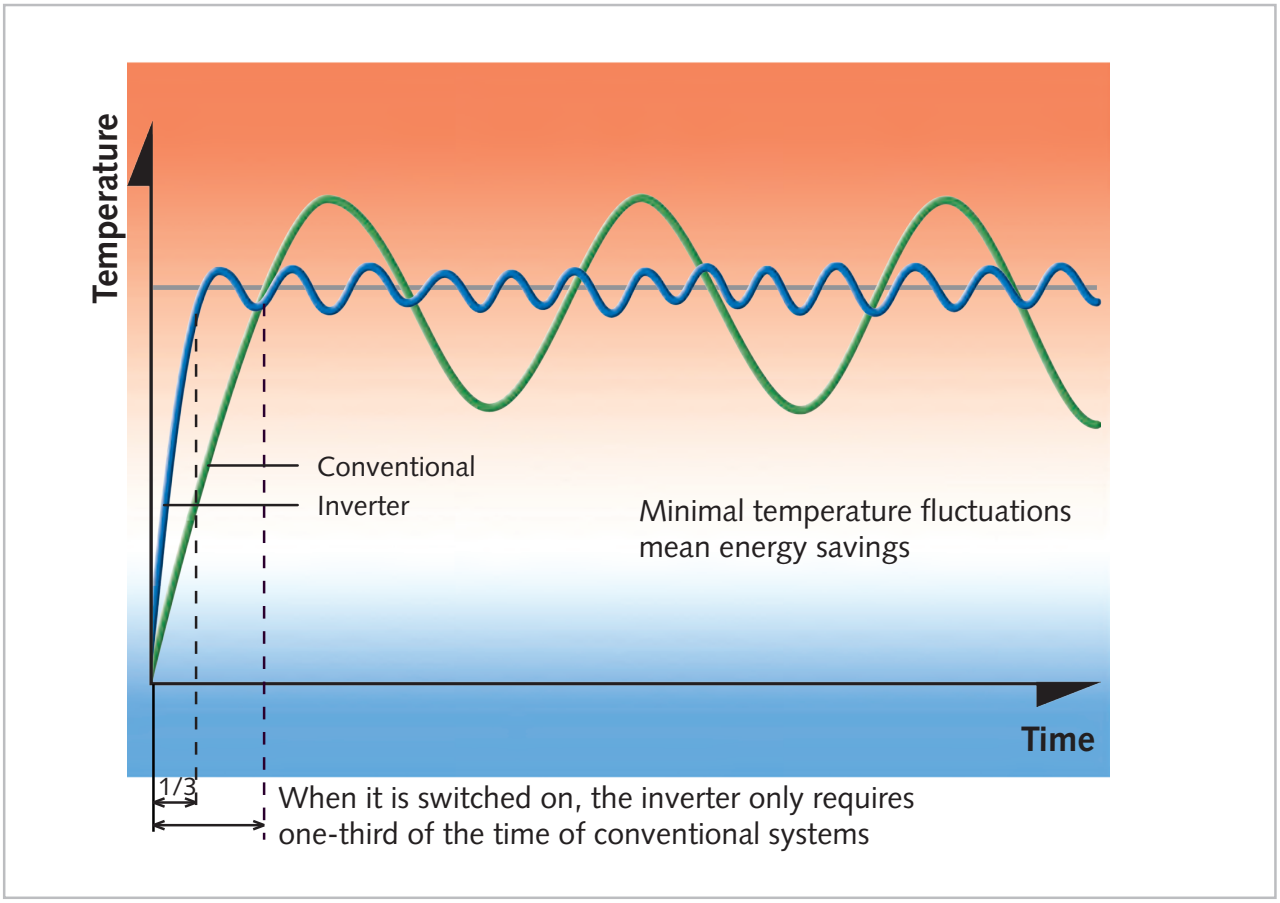


Fig. 13: Inverter and non-inverter systems

Power Plus inverter units: HTS 90/130/200/260 Conventional units: HTS 80/110

Defrost by circulation reversal

At temperatures below about +5°C, humidity freezes in the evaporator (outdoor unit) 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 heat 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.

With **dynamic cooling** the refrigerating capacity is actively transferred to the indoor air. This is achieved by means of water-based fan convectors. In doing so, it is desirable that the inlet temperatures are under the dew point, 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 thermally 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. Dew-point monitoring is required for this purpose.

We recommend dynamic cooling with fan convectors, in order to achieve increased cooling capacity and in order to dehumidify the air on muggy summer days. You will find corresponding devices in the KWD, KWK and WLT-S series on our website: “www.remko.de”. The advantage here is that dew point 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.

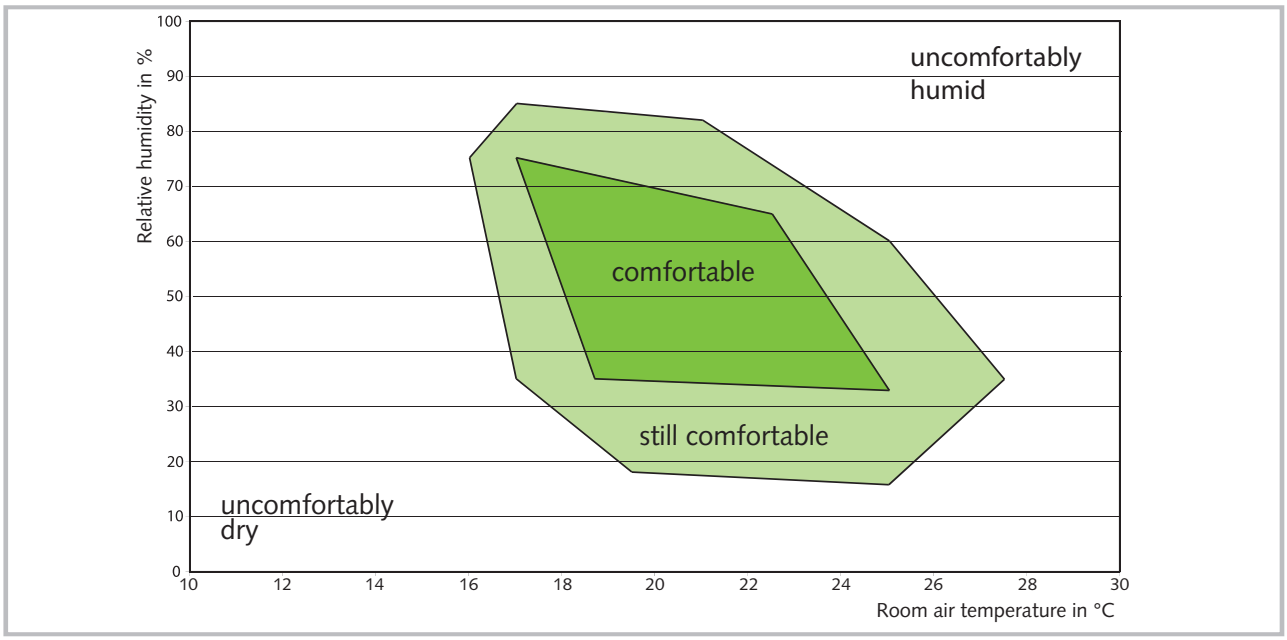


Fig. 14: Comfort zone

4 Installation

4.1 System layout

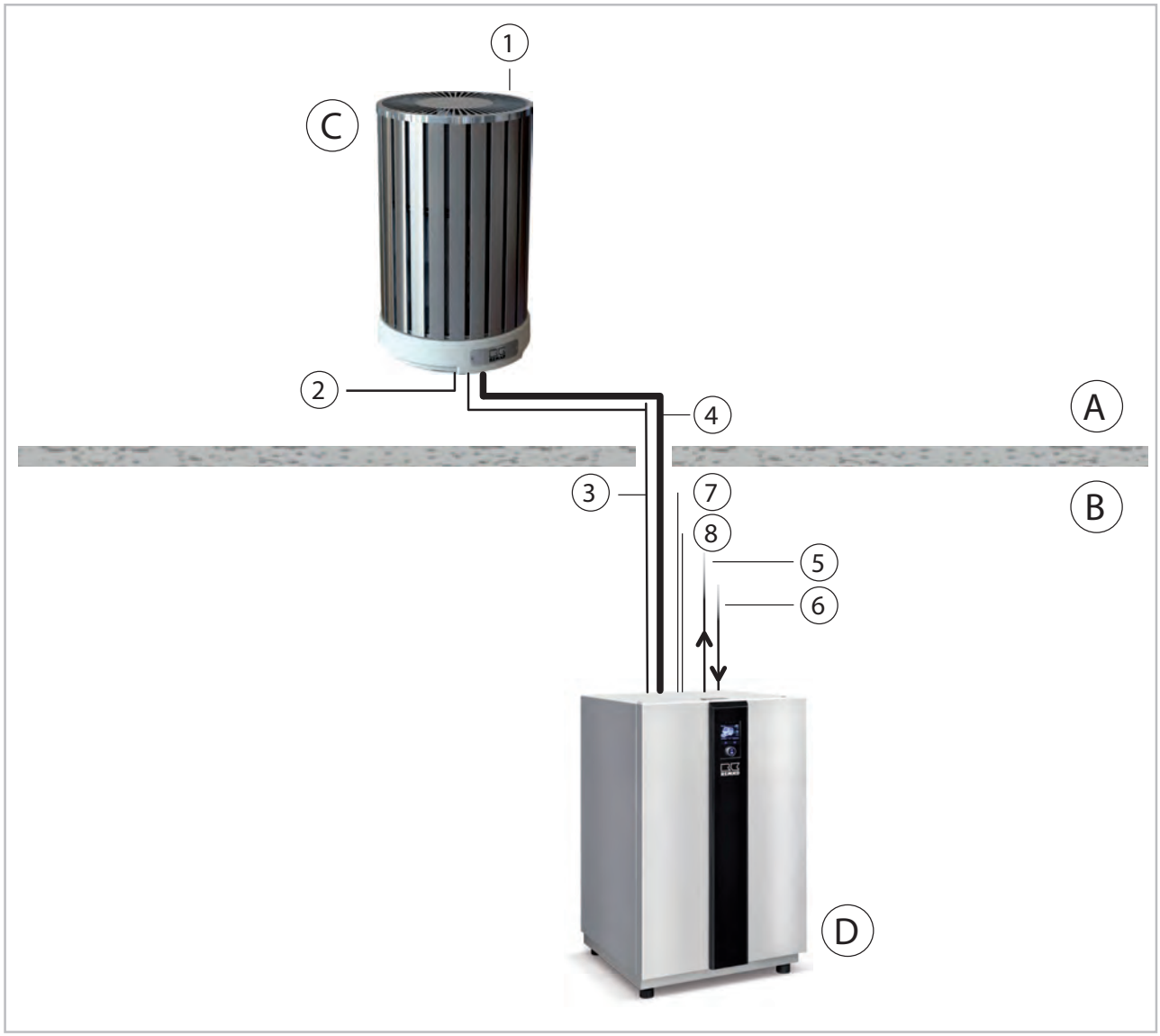


Fig. 15: System layout HTS 80/90/110/130

A: Outdoor area
B: Indoor area
C: Outdoor unit
D: Indoor unit
1: Fan / air outlet
2: Condensate drainage, outdoor unit
(must be designed to be frost proof!)
3: Lines between indoor and outdoor modules:
Control line outdoor module 0-10V (sheathed) / sensor cable (sheathed), e.g. 5 x 1,0 mm^2
Power supply coming from the outdoor unit / Condensate drainage heating 5x1.5 mm^2,
4: Refrigerant lines $^3/_8$" and $^5/_8$“
5: Inlet
6: Return flow
7: Power supply line to indoor module:
HTS 90=230V/1~/ 50Hz,16A
(e.g. 3x2.5 mm^2)
HTS 80/110/130=400V/3~/ 50Hz, 3x16A
(e.g. 5x2.5 mm^2)
Control voltage regulation =
230V/1~/50Hz, 16A (e.g. 3x1.5 mm^2)
8: Mains supply line, electrical auxiliary heater = 400V / 3~ / 50Hz, 16A (e.g. 5x2.5 mm^2)

REMKO HTS series

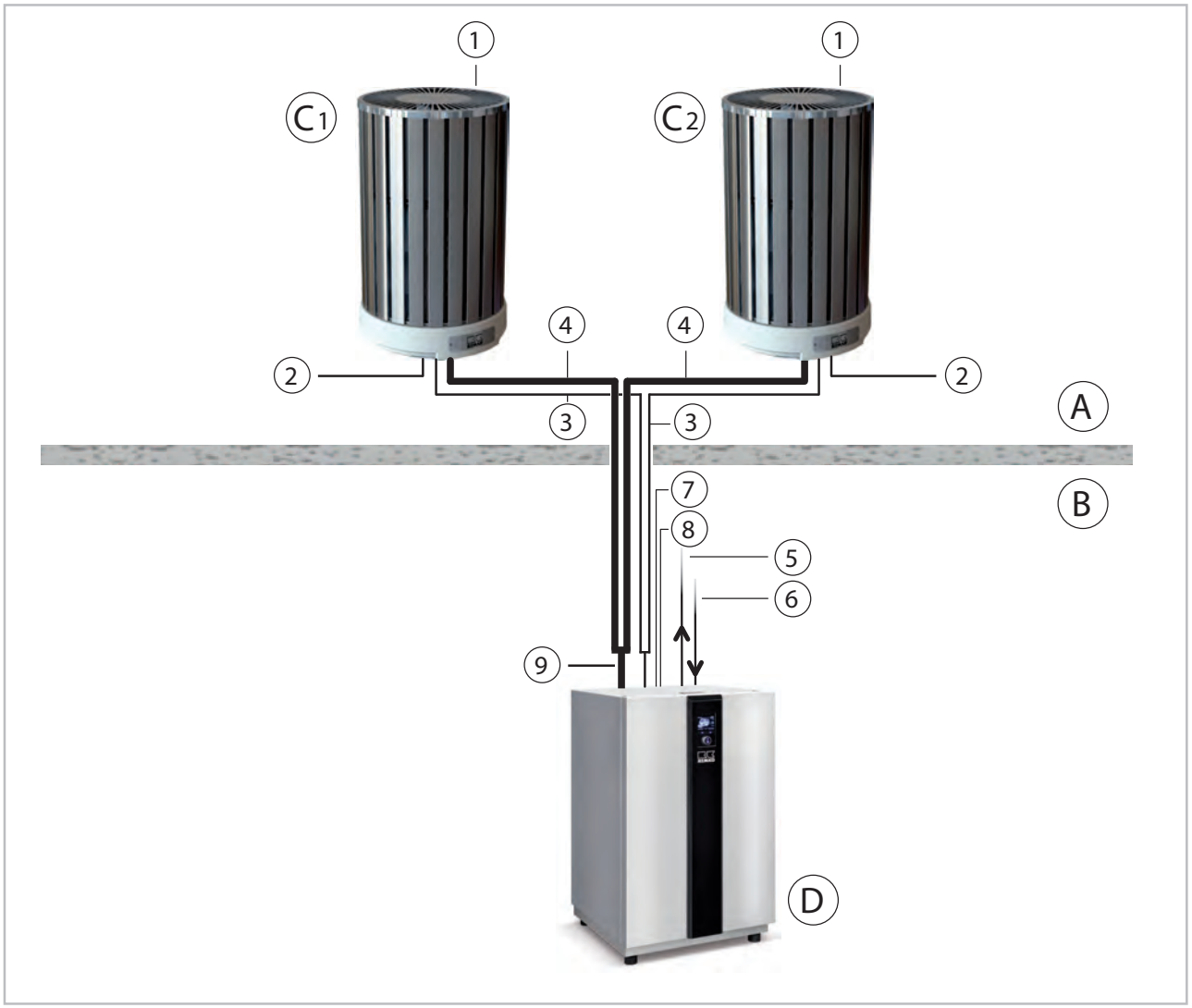


Fig. 16: System layout HTS 200/260

A: Outdoor area
B: Indoor area
C1: Outdoor unit 1
C2: Outdoor unit 2
D: Indoor unit
1: Fan
2: Condensate drain, external module (must contain anti-freeze!)
3: Lines between indoor and outdoor modules: Control line outdoor module (sheathed) / sensor cable (sheathed), e.g. 5 x 1,0 mm²
Power supply from the outdoor unit / condensate drainage heating 5 x 1.5 mm²
4: Refrigerant lines $^{3}/_{8}$" and $^{5}/_{8}$“
5: Inlet
6: Return flow
7: Power supply, indoor unit = 400V / 3~ / 50Hz,16A (e.g. 5 x 2.5 mm²)
Control voltage regulation = 230V / 1~ / 50Hz, 16A (e.g. 3 x 1.5 mm²)
8: Mains supply line, electrical auxiliary heater = 400V / 3~ / 50Hz, 16A (e.g. 5 x 2.5 mm²)
9: Refrigerant line 1/2" and 3/4"

The indoor and outdoor modules have to be connected with refrigerant lines of dimensions (outer diameter) $^{3}/_{8}$"(=9.52 mm) and $^{5}/_{8}$"(=15.88 mm).

⚠ WARNING!

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

4.2 General installation notes

- These instructions are to be observed when installing the heat pump.
- The unit should be delivered as near as possible to the site of installation in its original packaging in order to avoid transport damage.
- The unit is to be checked for visible signs of transport damage. Possible faults are to be reported immediately to the contractual partner and the haulage company.
- Suitable sites for installation are to be selected with regard to machinery noise and the set-up process.
- The stop valves for the refrigerant lines may only be opened immediately before commissioning of the system.
- The exterior components are pre-filled with refrigerant up to a distance of 7 metres from the interior component. Add refrigerant if the basic length of the refrigerant piping exceeds 7 metres.
- Establish all electrical wiring in accordance with the relevant DIN and VDE standards.
- The electrical power cables must always be fastened to the electrical terminals in the proper manner. Otherwise there is a risk of fire.
- See that neither refrigerant or pipes that carry water pass through living or sleeping areas.

⚠ DANGER!

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

! NOTICE!

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

⚠ DANGER!

All electrical installation work must be done by an electrician.

Wall opening

- The required wall cutout in the building must be measured in accordance with the protective pipe used so that the building wall can be properly sealed. The wall opening should created with a 10 mm incline from the inside to the outside.
- To prevent damage, the interior of the wall opening should be padded or, for example, lined with PVC pipe (see figure).
- After installation has been completed, use a suitable sealing compound to close off the wall opening, taking account of fire protection regulations (provided by the customer).

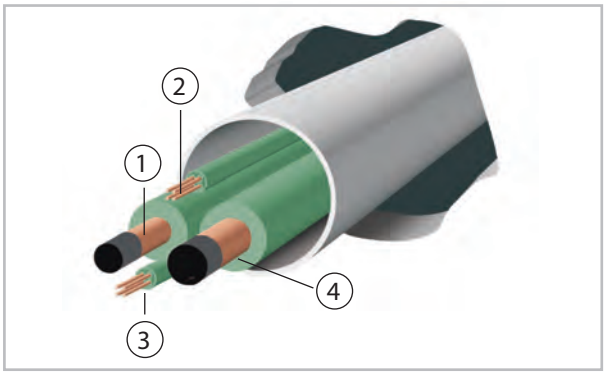


Fig. 17: Wall opening

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

In order to create a watertight pipe/cable duct cutout and prevent damage, we recommend use of a REMKO pipe gland.
This is suitable for the introduction of 1 to 5 cables/ pipes with external diameter 4-30 mm in core holes / casing tubes with internal diameter 100 mm.

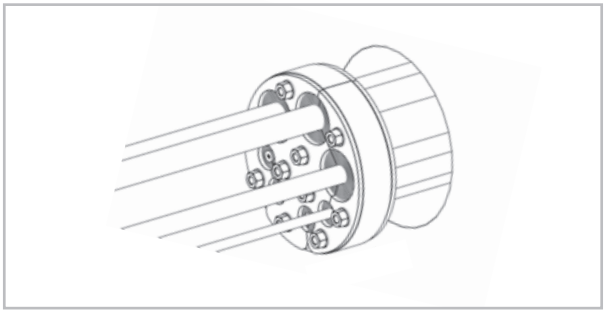


Fig. 18: REMKO pipe opening

4.3 Set-up, assembly indoor unit

- Depending on local conditions, the noise emission level of the indoor unit should be taken into account, and where necessary acoustic insulation measures should be adopted.
- Ensure that the wall bracket is installed level.
- The indoor unit can be aligned precisely by means of the adjustment screws on the back of the housing.
- The indoor unit is to be mounted in such a way that all of the sides have sufficient space for purposes of installation and maintenance. It is equally important that there is sufficient space above the device for installing the safety assembly, dirt traps etc.

Fig. 19: Set-up, indoor unit

Minimum spacing for indoor unit

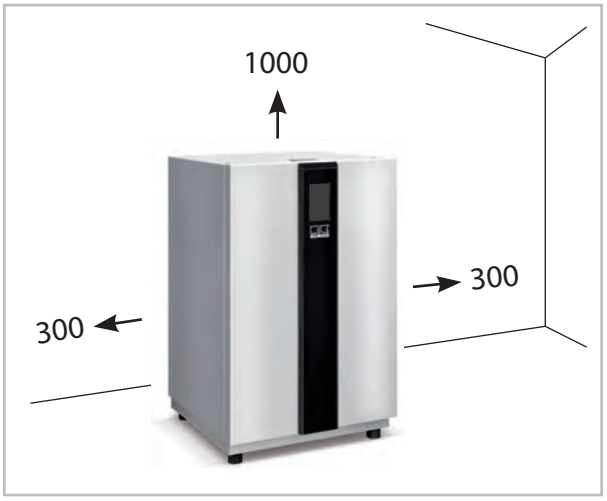


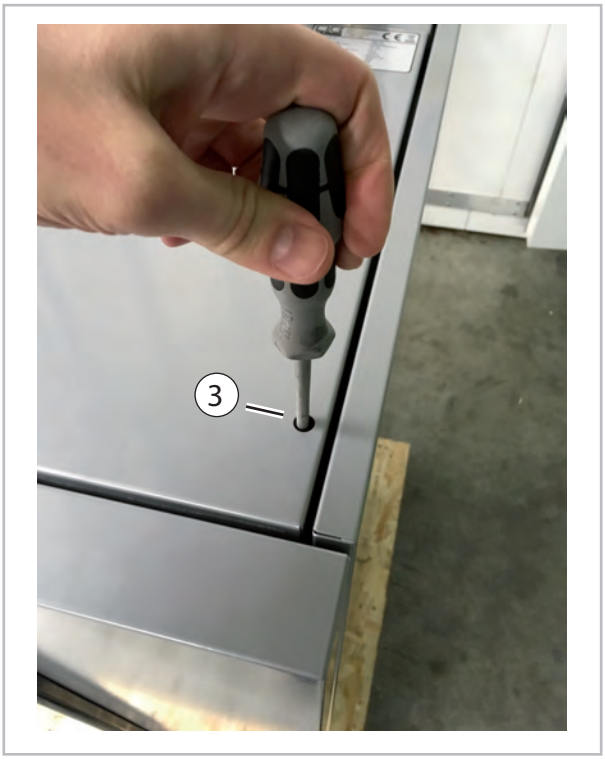
Fig. 20: Recommended minimum spacing for indoor unit (figures in mm)

4.4 Opening the unit

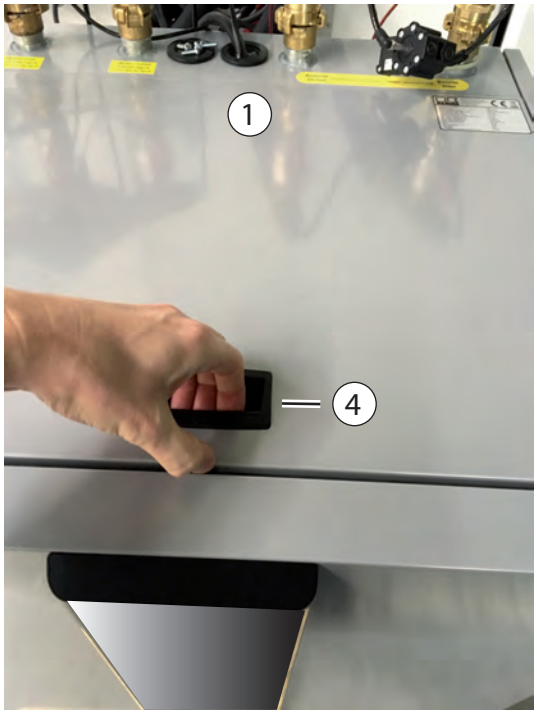
Open the unit as follows:

A. Open unit and junction box cover

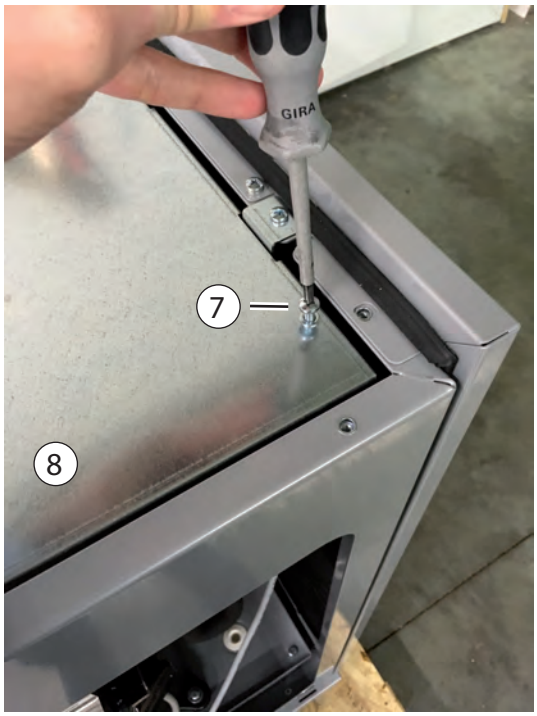
1. Remove the two covers [2] and loosen the two screws [3] left and right at the edge of the cover [1].



2. Remove the cover [1] of the heat pump by holding it by the grip [4] and pushing it out of the rear groove.



4. Then loosen the screws [7] of the junction box cover [8] and remove it.



B. Open front door

1. Loosen the three upper screws [6] behind the front door [5].

2. Then tilt the front door [5] forward and remove it carefully.

4.5 Layout, assembly of outdoor module

Outdoor module installation location

- The unit 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 inlet and outlet. Additionally, there must be adequate space available for installation, maintenance and repair.
- If the outdoor unit is erected in an area of strong winds, then the unit must be protected against them and additional stabilisation is recommended. This can be realised with wire ropes or other constructions. The snow line is to be observed during installation (Fig. 21).
- A heated, condensate catch-pan ensures that condensation from the pan can drain off. Ensure that the condensate is prevented from freezing so that it can drain off (gravel, drainage). The Water Ecology Act is to be observed (Fig. 25).
- During installation, add about 20 cm to the expected snow depth to guarantee unimpeded intake and exhaust of outdoor air year round (Fig. 21).
- The installation site of the outdoor module should be agreed together with the operator primarily so that 'non-concerning levels of operating noise' are achieved, rather than in respect of 'short distances'. This is because: Thanks for splitter technology, there is a vast amount of different installation options with almost identical efficiency available.
- Air suction takes place in the bottom area of the plate heat exchanger. Air outflow takes place upwards in a perpendicular direction (Fig. 22).

! 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.

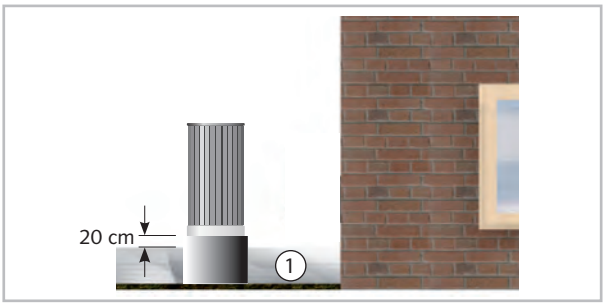


Fig. 21: Protection against snow

1: Snow

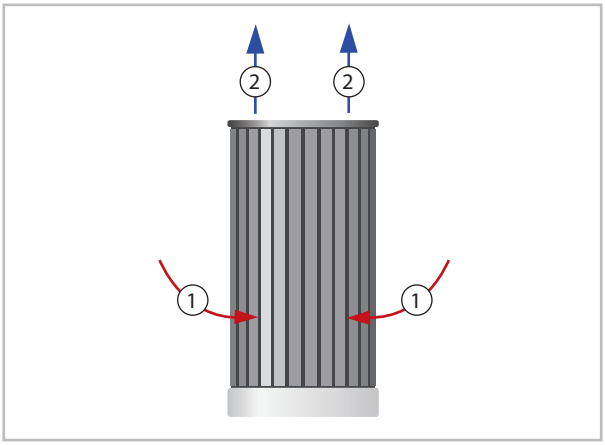


Fig. 22: Air intake and air outlet on outdoor module

1: Air intake
2: Air outlet

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

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

Definition of the Danger Area

⚠ WARNING!

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

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

Minimum distances of the outdoor modules

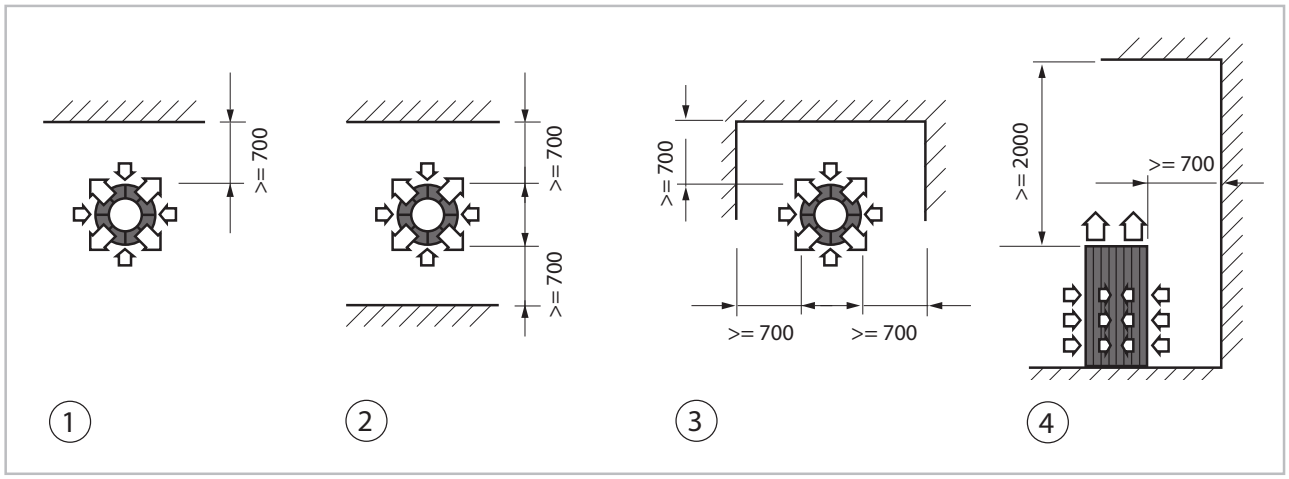


Fig. 23: Minimum distances during construction of an outdoor module in mm

1: Next to a wall, air outlet open to the front, flow restriction behind
2: Between two walls, air outlet free to the top, sides free, flow restriction behind
3: In a niche, air outlet open to the top, flow restriction behind and on both sides
4: Next to a covered wall, air outlet open to the front, flow restrictions behind and above

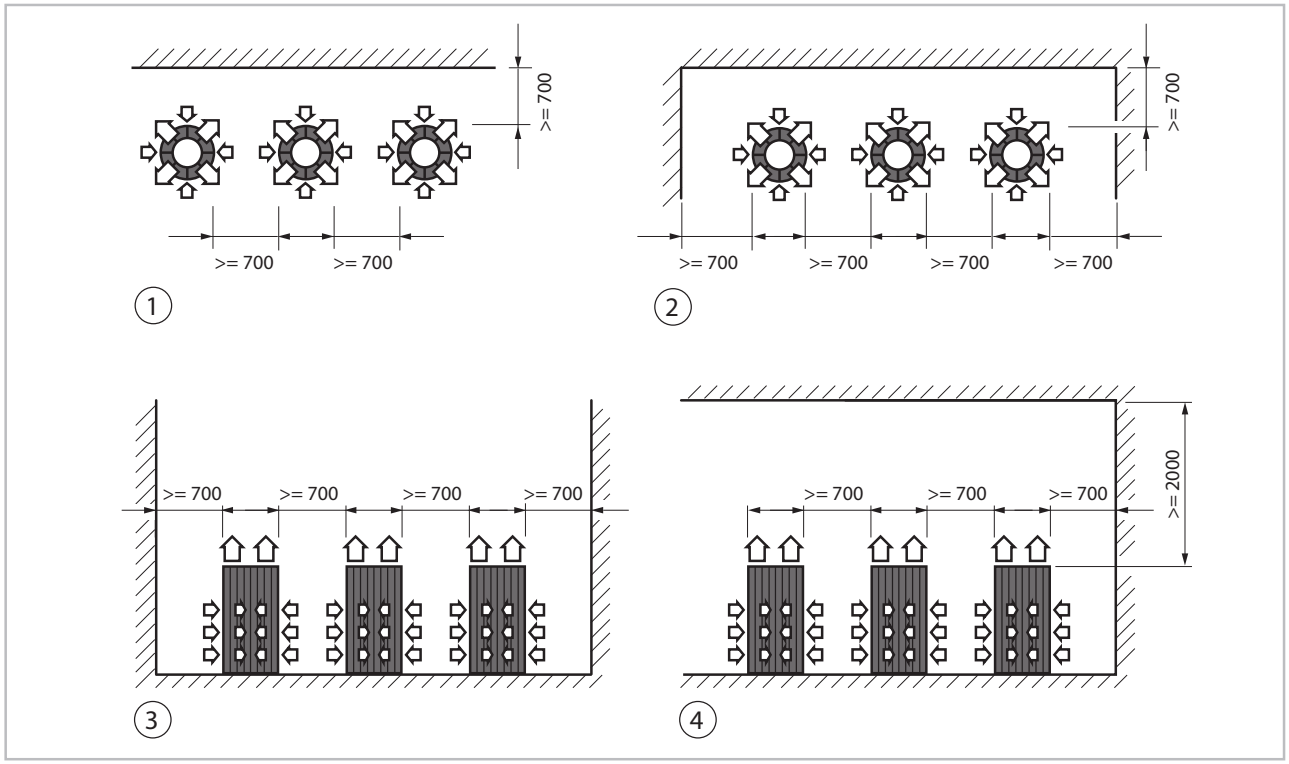


Fig. 24: Minimum distances during construction of an outdoor module in mm

1: Next to a wall, air outlet open to the front, flow restriction behind
2: In a niche, air outlet open to the top, flow restriction behind and on both sides
3: Between two walls, air outlet free to the top, flow restriction on both sides
4: In a niche, air outlet open to the top, flow restriction behind and to top

Condensate drainage connection and safe drainage

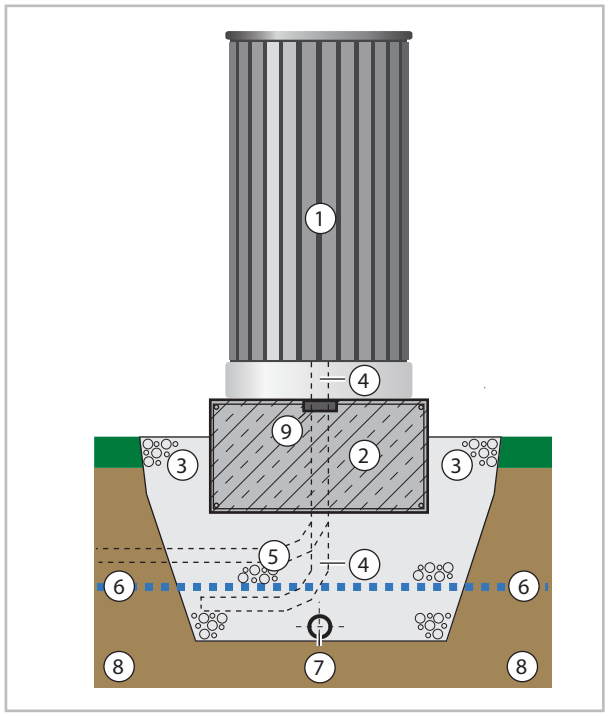


Fig. 25: Condensate drainage to foundation (sect.)

1: Outdoor unit / 2: Reinforced foundation: ø 700 mm, height 250 mm from ground level and frost free below ground level
3: Gravel layer / 4: Drainage pipe: ø 100 mm
5: Protective pipe for introduction of refrigerant and electrical connecting line: ø 100 mm Recommended max. radius 30°
6: Frost line / 7: Drainage pipe / 8: Soil
9: Sealing with REMKO pipe gland

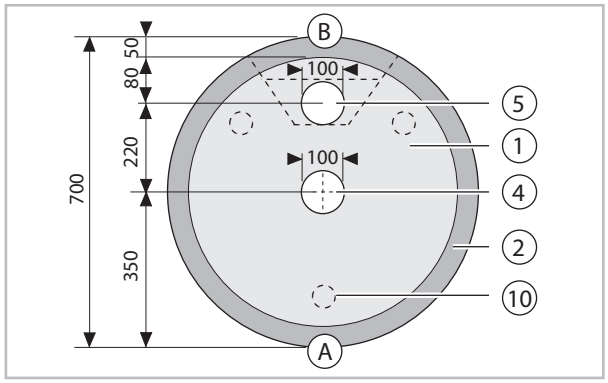


Fig. 26: Dimensions for the foundations (top view)

1: Outdoor unit: A = front / B = back
2: Reinforced foundation: ø 700 mm, height 250 mm from ground level and frost free below ground level
4: Condensate drainage protective pipe: ø 100 mm
5: Protective pipe for introduction of refrigerant and electrical connecting line: ø 100 mm
10: Stand foots

! NOTICE!

The HT pipe [5] must protrude by approx. 20 mm above the concrete foundation.

After routing and connecting the pipes, seal the conduit with the REMKO pipe opening!

OUR TIP

Instead of the foundation, you can also insert prefabricated concrete rings with external dimension ø 800 mm and internal dimension ø 600 mm, and then fill them with gravel.

A 1m long concrete pipe can also be used, which is approx. 800 mm in the ground. It can then be covered with a manhole cover without filling, where the connecting lines are implemented and the outdoor unit stands.

Condensate drainage connection

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

Make provision under the unit for a soakaway for any condensate that occurs, to enable it to be directed away.

- The drainage pipe should protrude approx. 150 mm out of the foundation so that the condensate connection of the outdoor module projects into the pipe.
- The condensate drainage line should have an incline of min. 2 %. This is to be provided by the customer. If necessary, fit vapour-diffusion-proof insulation.
- When operating the unit at outside temperatures below 4 °C, ensure the condensate drainage line is laid to protect it against frost. The lower part of the housing and condensate tray is also to be kept frost free in order to ensure permanent draining of the condensate. If necessary, fit a pipe heater.
- Following installation, check that the condensate run off is unobstructed and ensure that the line is durably leak tight.

! NOTICE!

Do not connect the condensate outlet at the sewage canal. This can lead to unpleasant odours or back-flow due to any possible negative pressure that can occur.

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 need to be achieved, e.g. underfloor heating/radiators
  - the pressure drop in the heating distribution system is greater than 80 kPa
  - the use of other heat generators, e.g. combustible burner for solid fuel, solar or bivalent (dual-fuel) 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.
- In cooling mode, the surface heating must be protected against falling below the dew point.
- 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.

! NOTICE!

For the device series HTS 80 and HTS 110 a buffer tank for hydraulic compensator must be provided!

Up-to-date circuit diagrams for hydraulic integration can be found on the internet at www.remko.de

- 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. When installing heat pumps HTS 80 or HTS 110, also adapt the static-pressure to the delivery height required (building height).
- As delivered, the safety assembly consists of a pressure gauge, a bleeder and a safety valve. A T-piece must be installed between the heat pump connection and the shut-off cock provided. The cap of the quick-bleed device in the safety assembly must be closed when the heat pump is operating!
  System separation is required if no oxygen diffusion-tight pipe has been used, and in systems in which contaminants are already present.
  The stop cocks supplied are to be positioned accordingly in the supply and return flow of the heating cycle (see Fig. 27).
- 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 and that it can be locked.
- 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.
- To prevent structure-borne transmission, we advise you to install additional compensators in the inlet line and return flow.

! NOTICE!

Before the first filling of the system, all removable heat pump screw connections and the components delivered by us must be checked to ensure that they are correctly sealed. Damage that results from non-compliance is not covered by the guarantee!

Hydraulic circuit diagram HTS 80/110

Functions: Heating and hot water, operating mode: monoenergetic.

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

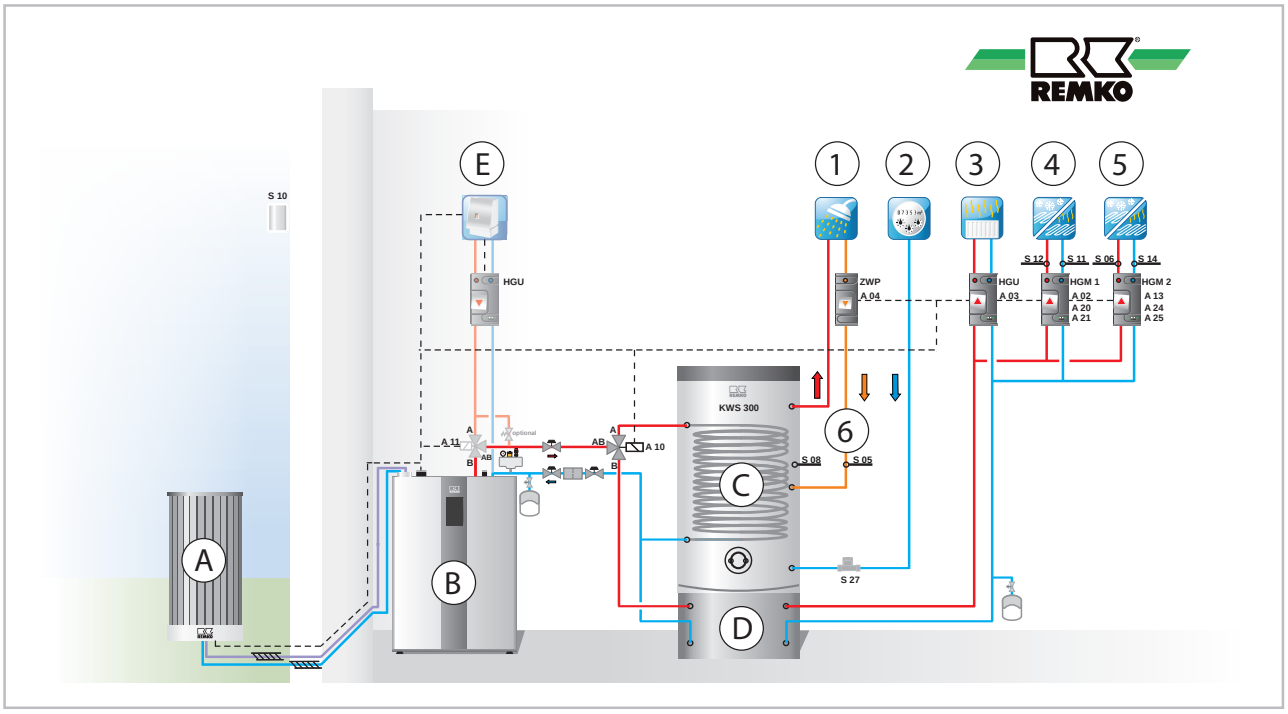


Fig. 27: Example hydraulic diagram HTS 80/110

A: Outdoor unit
B: Indoor unit
C: Hot water storage tank
D: Buffer tank
E: 2nd Heat generator
1: Hot water
2: Cold water
3: Unmixed heating cycle
4: Mixed heating cycle 1
5: Mixed heating cycle 2
6: Circulation

HTS compact heat pump models are ideal for use in new construction or in existing buildings, where the heat pump is the sole heat generator. In emergencies, a 2nd heat generator can be connected. This may be the REMKO Smart-Serv auxiliary heater or even a condensing boiler or regular boiler.

The highly efficient primary pump in the indoor unit is 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 KWS 300, is a combination storage tank for the preparation of domestic water and a buffer tank for the heating system. The additionally necessitated external 3-way changeover valve is switched over by the Smart Control to provide HW.

- The heating cycles connected must be hydraulically balanced.
- The pressure drop between indoor unit and storage tank must not exceed 40 kPa.
- A minimum water flow volume of 20 l/KW must be assured.
- The pipe cross sections of the lines from the heat pump to the storage tank may not be reduced.
- The min. water volume with active cooling must be observed.

Hydraulic circuit diagram HTS 80/110

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

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

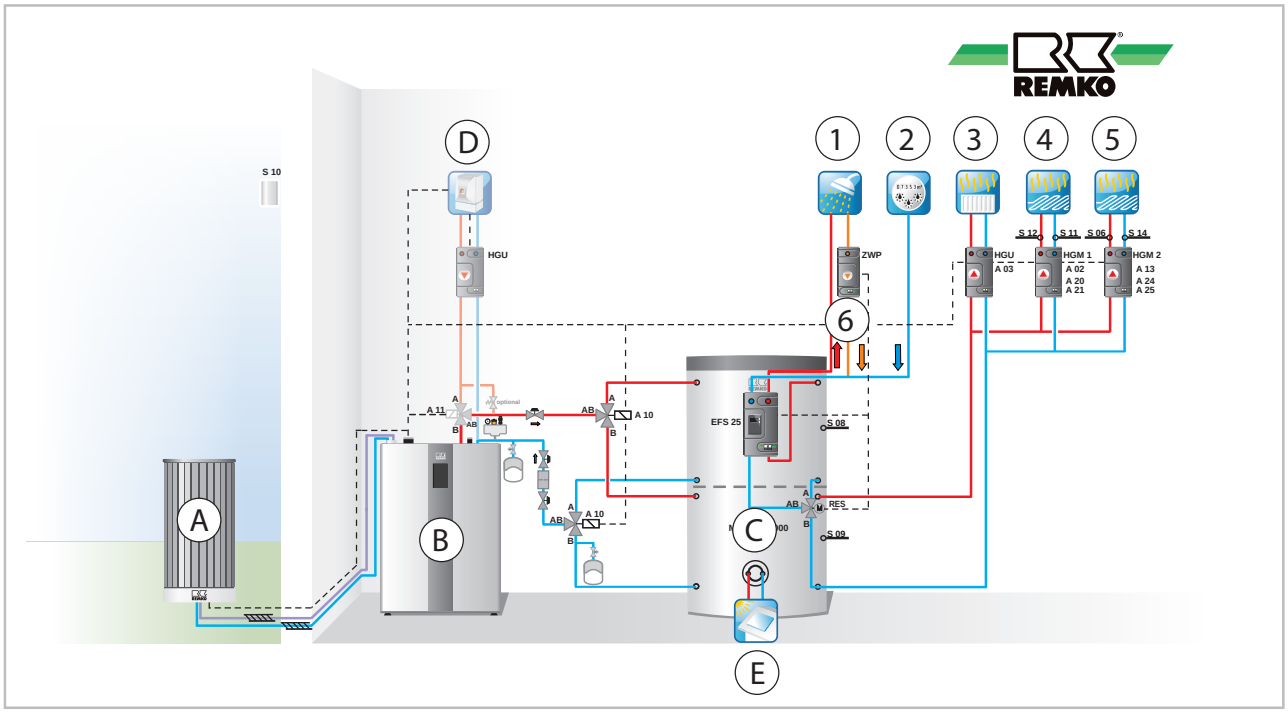


Fig. 28: Example hydraulic diagram HTS 80/110

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

HTS compact heat pump models are ideal for use in new construction 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.

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 necessitated external 3-way changeover valves are switched over by the Smart Control to provide HW. 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/KW 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 HTS 90/130

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

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

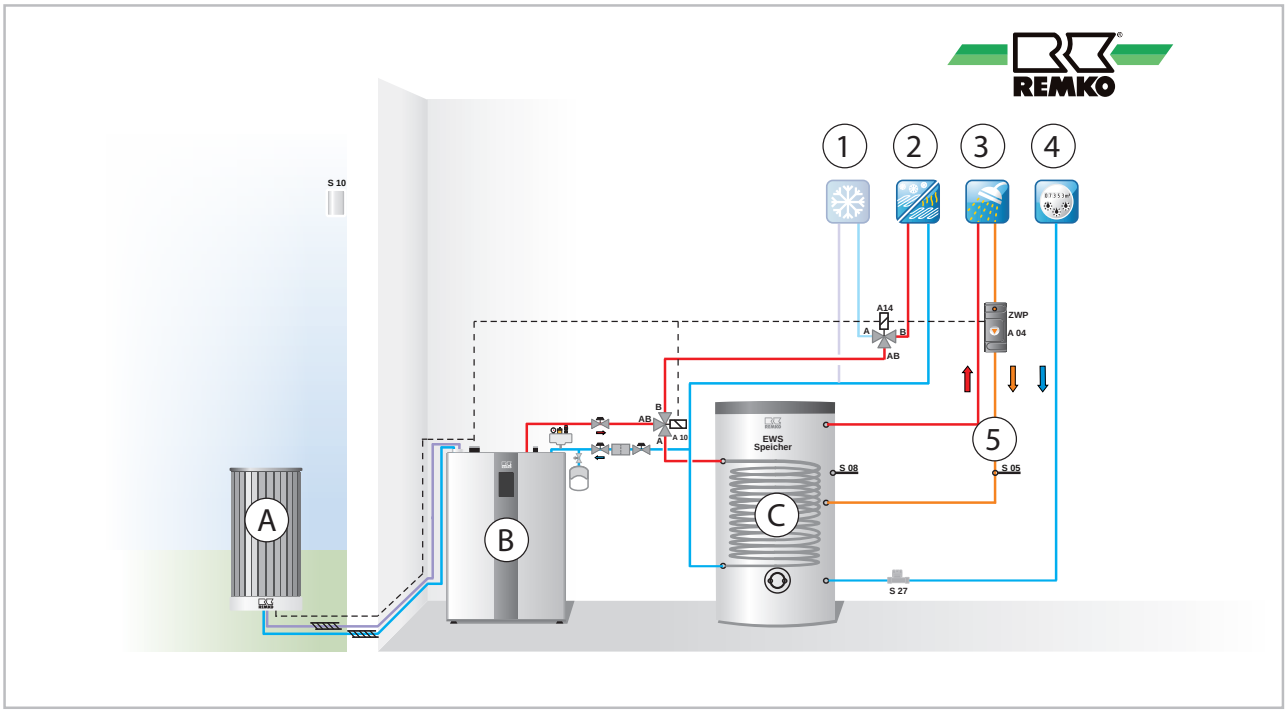


Fig. 29: Example hydraulic diagram HTS 90/130

A: Outdoor unit
B: Indoor unit
C: Domestic hot-water tank
1: Cooling cycle
2: Mixed heating cycle
3: Hot water
4: Cold water
5: Circulation

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

The highly efficient primary pump in the indoor unit can be used as a heating cycle pump and its speed is regulated. 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 a mixed heating circuit group, type HGM, are available.

The REMKO drinking water storage tank, type EWS 300 E is an enamelled drinking water storage tank with a HE surface area of 3.5m^2. The additionally necessitated external 3-way changeover valve is switched over by the Smart Control to provide HW.

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/KW 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 storage tank may not be reduced.
- The min. water volume with active cooling must be observed.

REMKO HTS series

Hydraulic circuit diagram HTS 90/130

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

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

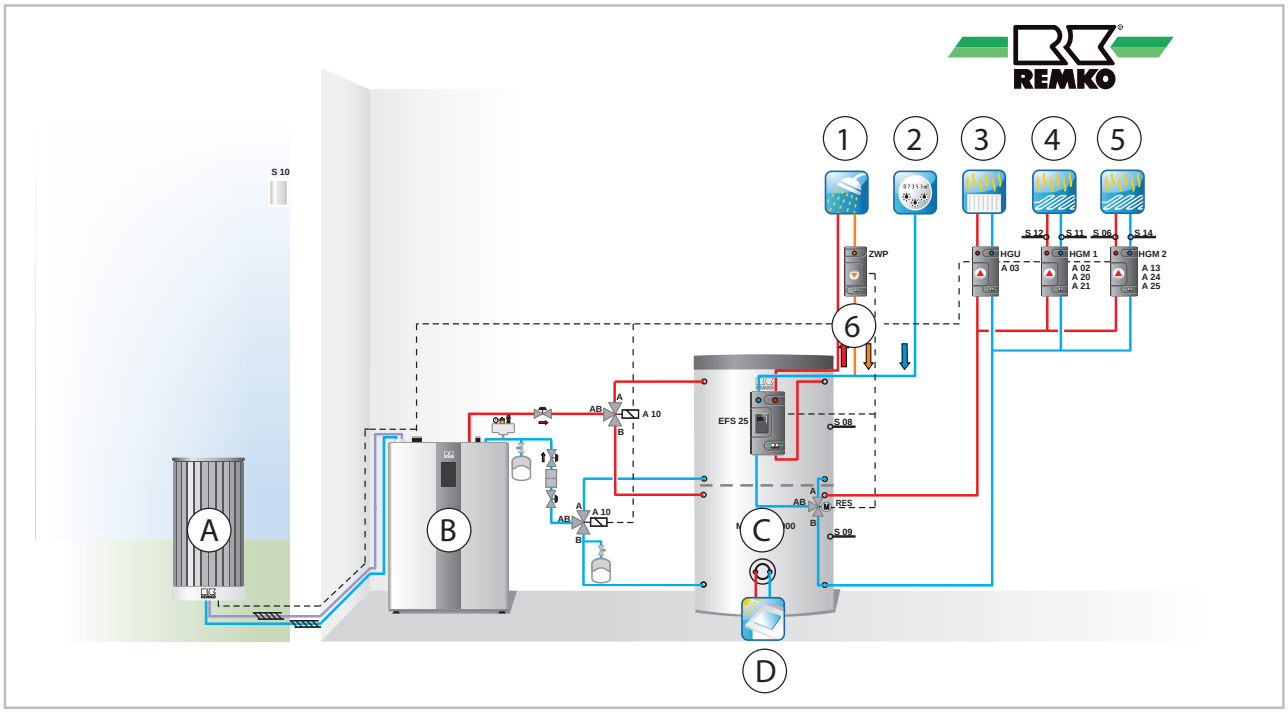


Fig. 30: Example hydraulic diagram HTS 90/130

A: Outdoor unit
B: Indoor unit
C: Buffer tank
D: Solar plant (optional)
1: Hot water
2: Cold water
3: Unmixed heating cycle
4: Mixed heating cycle 1
5: Mixed heating cycle 2
6: Circulation

HTS compact heat pump models are ideal for use in new construction 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.

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 necessitated external 3-way changeover valves are switched over by the Smart Control to provide HW. In a bivalent alternative application the boiler or condensing boiler is connected after the indoor unit. The external Smart BVT set is available for this as an accessory.

- The pressure drop of the heating system shall not exceed 80 kPa
- A minimum water flow volume of 20 l/KW 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 HTS 200/260

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

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

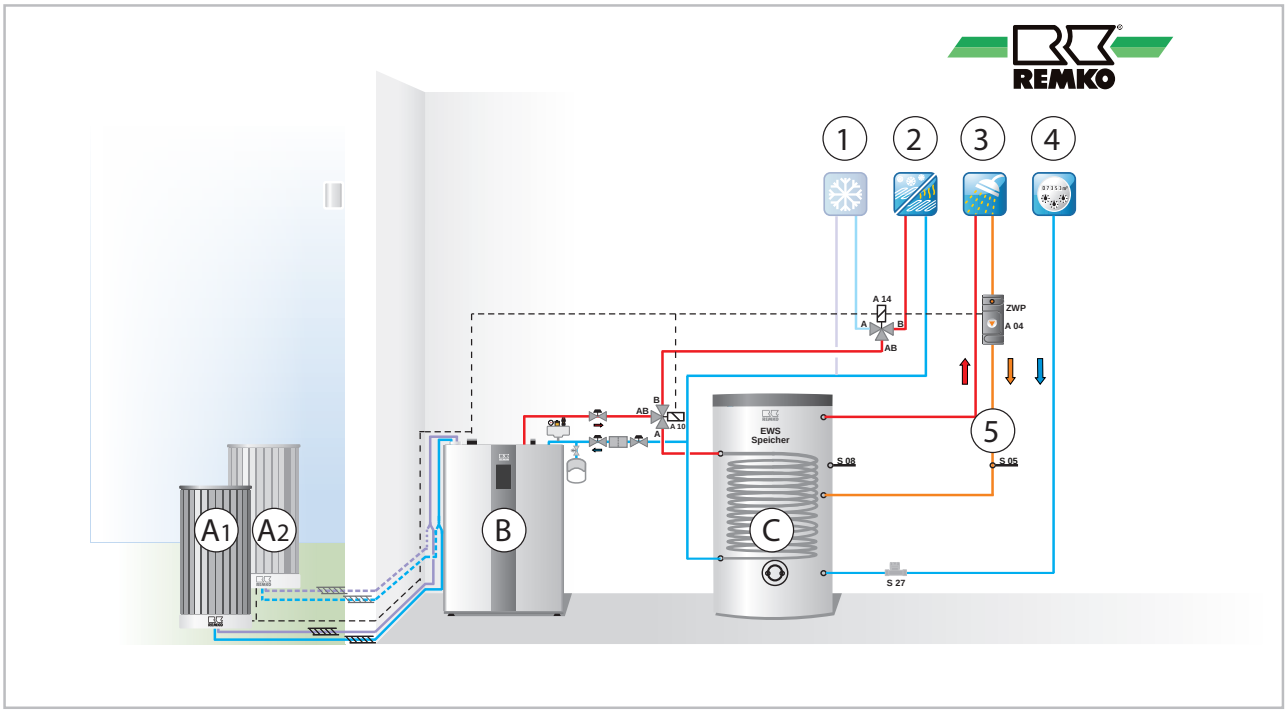


Fig. 31: Example hydraulic diagram HTS 200/260

A1: Outdoor unit 1
A2: Outdoor unit 2
B: Indoor unit
C: Domestic hot-water tank
1: Cooling cycle
2: Mixed heating cycle
3: Hot water
4: Cold water
5: Circulation

HTS compact heat pump models are ideal for use in new construction 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.

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 necessitated external 3-way changeover valve is switched over by the Smart Control to provide HW. 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 of the heating system shall not exceed 80 kPa.
- A minimum water flow volume of 20 l/KW 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 storage tank may not be reduced.

REMKO HTS series

Hydraulic circuit diagram HTS 200/260

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

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

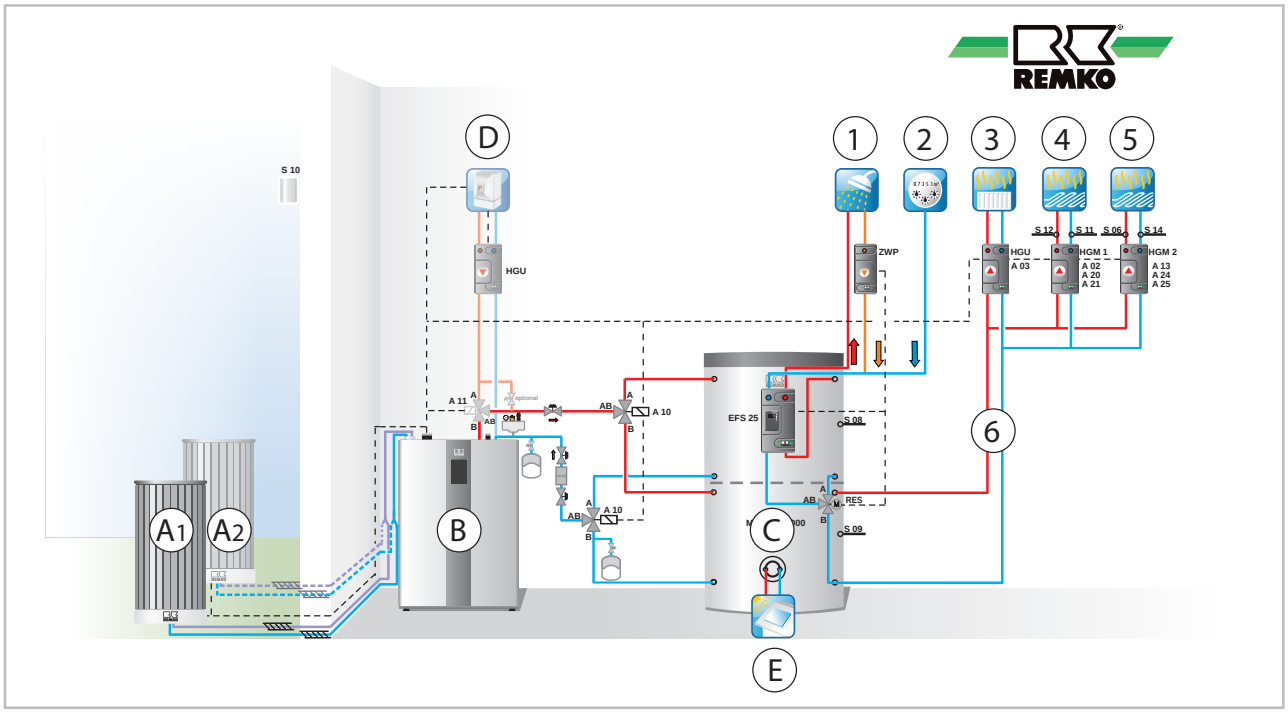


Fig. 32: Example hydraulic diagram HTS 200/260

A1: Outdoor unit 1
A2: Outdoor unit 2
B: Indoor unit
C: Buffer tank
D: 2. Heat generator
E: Solar plant (optional)

1: Hot water
2: Cold water
3: Unmixed heating cycle
4: Mixed heating cycle 1
5: Mixed heating cycle 2
6: Circulation

HTS compact heat pump models are ideal for use in new construction 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.

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 necessitated external 3-way changeover valves are switched over by the Smart Control to provide HW. 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 installation of a condensing boiler with internal heating cycle pump must be implemented via a hydraulic compensator.

- The pressure drop of the heating system shall not exceed 80 kPa.
- A minimum water flow volume of 20 l/KW 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 HTS 200/260 Duo

Functions: heating and hot water, operating mode: 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!

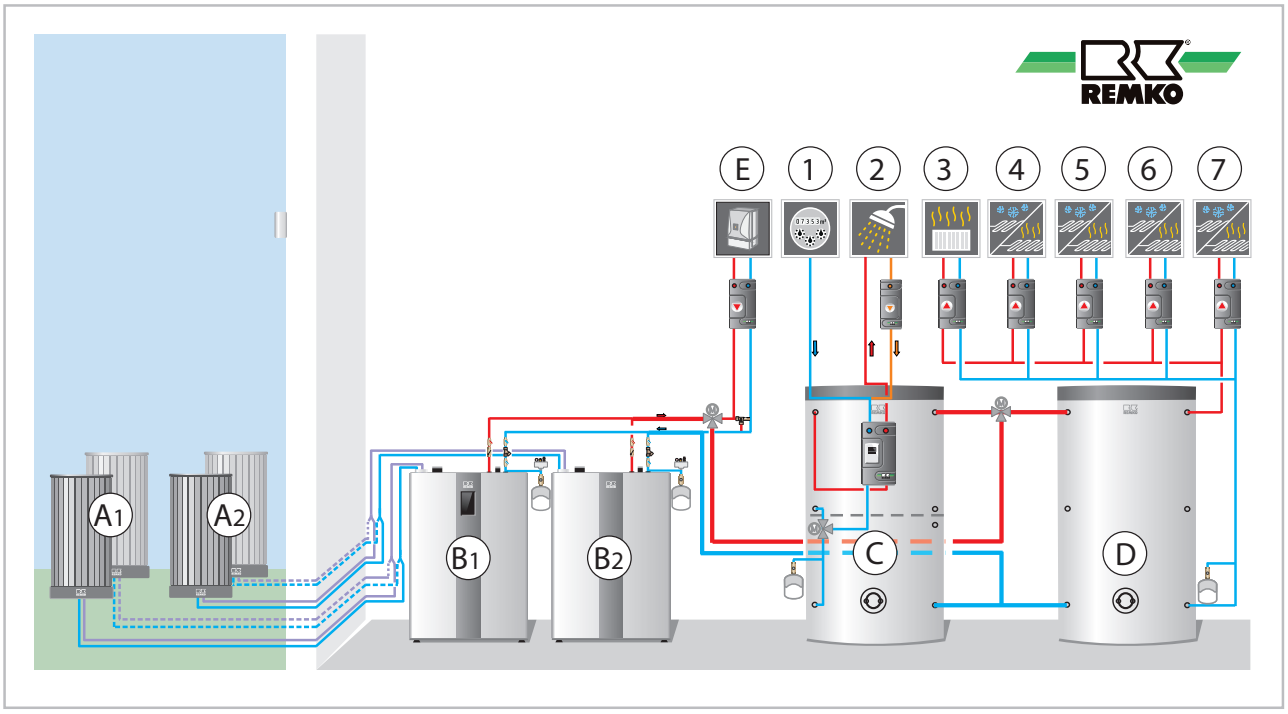


Fig. 33: Example hydraulic diagram HTS 200/260 Duo

A1: Outdoor unit 1 and 2
A2: Outdoor unit 3 and 4
B1: Indoor unit 1 (master)
B2: Indoor unit 2 (slave)
C: Buffer tank
D: Buffer tank heating cycle/cooling cycle
E: 2. Heat generator

1: Cold water
2: Hot water
3: Unmixed heating cycle
4: Mixed heating cycle 1
5: Mixed heating cycle 2
6: Mixed heating cycle 3
7: Mixed heating cycle 3

HTS compact heat pump models are ideal for use in new construction 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.

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 storage tank "C" 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 necessitated external 3-way changeover valves are switched over by the Smart-Control to provide HW. 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.

Storage tank “D” is a buffer tank for the hydraulic decoupling of the water pump side from the on site hydraulic system. The storage tank can be used for heating and passive cooling.

- A minimum water flow volume of 40 l/min must be ensured.
- A storage tank volume of at least 20 l/kW is recommended.
- The collector pipe must be as least DN 50 (e.g. copper piping) 54 mm.
- The pipe cross sections of the lines from the heat pump to the storage tank may not be reduced.

6 Function of an electrical heating coil

6.1 Function of an electrical heating coil

Layout of the electrical heating coil

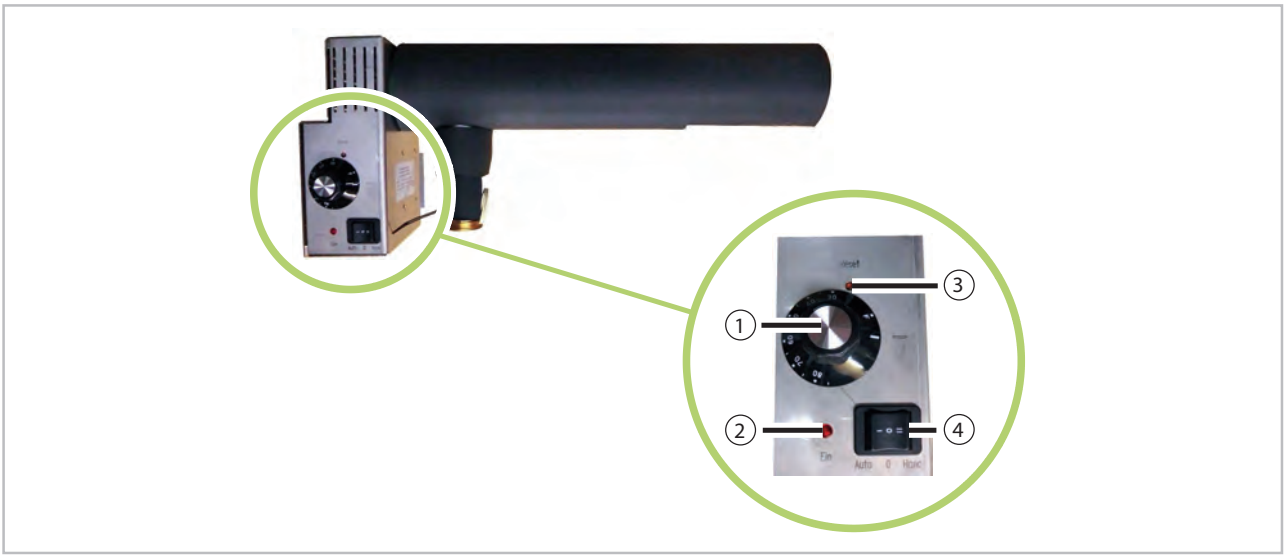


Fig. 34: Electrical heating coil, layout

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):

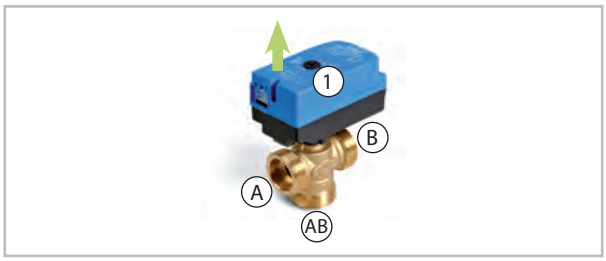
If the overheating of the heating coil has triggered the safety temperature limiter (STL), it can be reset after cooling down again by pressing this button. However, the reason for it being triggered must be analysed and remedied.

6.2 Emergency-heat operation

Should you experience faults with the Smart Control or the outdoor module during operation of your heat pump system, it is possible to activate a manual emergency-heat operation.

If the Smart Control regulation system fails, you can start emergency-heat operation as follows:

1. Open the front panel (door).
2. Set the black knob of the electrical terminal box (located on the left-hand side) for the auxiliary heater to "position 2".
3. Set the thermostat on the electrical terminal box of the auxiliary heater to the desired temperature, e.g. floor heating 35 °C, heating element 50 °C.
4. Remove the control line plug on the internal circulation pump. By pulling out the control line, the circulation pump runs at full load in manual mode.
5. If you are using external heating cycle groups (pumps), set these to manual operation.
6. If you are using external heating cycle groups (pumps), HGU or HGM from Remko, you must pull out the PWM control line plug on the pump housing for emergency operation.
7. Remove the motor of the 3-way changeover valve by pulling out the safety split pin between motor and valve body (see separate "3-way changeover valve" operating instructions).
8. Pull the motor [1] away from the valve body.



9. Turn the cylindrical ball valve in the direction of Outlet [B] using the round side (underfloor heating side or heating element).

To switch to providing hot water, proceed as follows:

1. Turn the cylindrical ball valve in the direction of Outlet [A] using the round side (drinking water storage tank).
2. Set the thermostat on the electrical terminal box of the booster heater to the desired temperature, e.g. 50°C.

The respective operating modes must be switched manually!

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

1. You can access the expert level by touching the REMKO logo in the upper right corner of the display.

   After activating the expert level by touching the corresponding REMKO logo, a password is required. To enter the password at this level, use the "+/-" and then proceed to the next item with "Next". Once you have finished entering the password (0321), confirm the input with "OK".
2. Deactivate the heat pump in the "Settings - Basic settings - System configuration" menu point of the expert level. After the heat pump has been switched off, the auxiliary heating will be released.
3. The electric heating element is then activated.
4. Check the set temperature on the thermostat of the electric heating element.
5. If necessary set it above the max. desired temperature (HW target temperature), e.g. if HW target temperature = 45 °C, then heating element = 50 °C.
6. The Smart Control takes full control of heat regulation and the activation of the heating element.

7 Cooling of the heat pump

Tempering/cooling via the floor heating

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

Comfortable cooling with the heat pump

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

Cooling via a separate cooling circuit

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

Cooling via a heating circle

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

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

Cooling via a parallel buffer tank as system boundary

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

! NOTICE!

Minimum water volume

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

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

8 Corrosion protection

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

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

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

Scope of application of VDI 2035:

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

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

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

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

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

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

Water treatment with chemicals

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

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

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

! NOTICE!

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

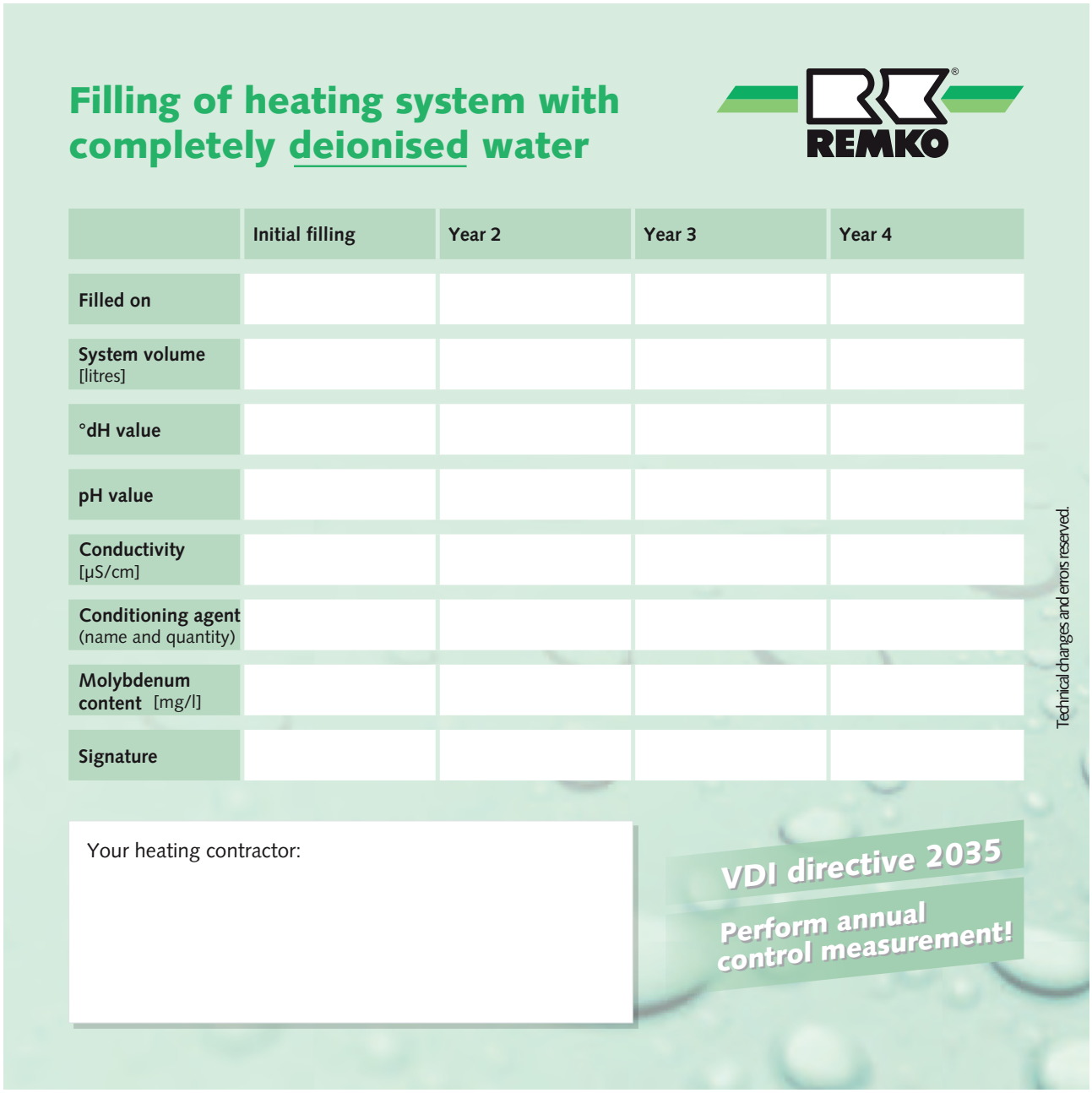


Fig. 35: Form for logging filling with completely deionised water

9 Refrigeration connection

9.1 Connection of refrigerant piping

- To install the refrigerant piping, you first need to remove the aluminium trim panels on the outdoor unit (see Fig. 36). Unfasten the four M6 screws from the lower area of the trim panel (1) and carefully remove the trim panel by lifting it upwards (2). Ensure that you do not damage the heat exchanger and the fan.
- The outdoor unit and the indoor unit are connected together by two copper lines (copper tubes in refrigerator quality) with dimensions of 3/8" = 9.52 mm and 5/8" = 15.88 mm (REMKO accessories).
- When bending the refrigerant piping, pay attention to the bending radii to prevent bending of the tubes. Never bend a pipe twice in the same place. Doing so can make it brittle or cause cracks.
- Assure suitable fastening and insulation when laying the refrigerant pipes.
- The copper pipes must be flared and cleaned using a plastic fabric to make the connections to the modules.
- The connections must be created using hard solder applied in an inert gas atmosphere (nitrogen).
- When connecting up two outdoor units, the refrigerant piping must be cut to the same length. Max. length difference of 2 m shall not be exceeded.

The bent hose set from REMKO can be used for the correct laying of the refrigerant piping. This prevents kinks in the refrigerant piping.

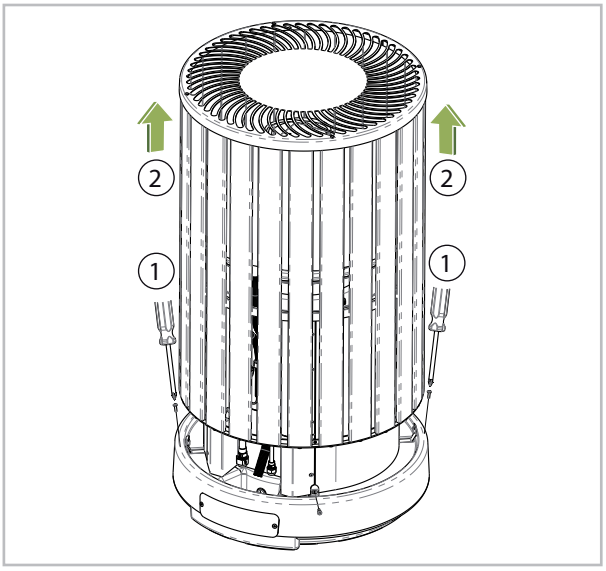


Fig. 36: Disassembly of the aluminium trim panel

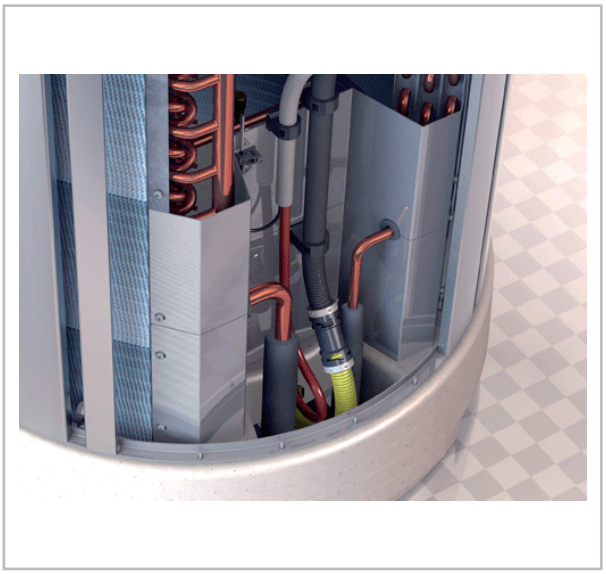


Fig. 37: Refrigerant connection on the outdoor unit

NOTICE!

Depending on the air humidity in the interior there is the possibility that the dew point is exceeded in the insulation.

– We recommend the pipes with an additional vapor diffusion densities to provide insulation.

Dimensioning of the refrigerant piping based on the example of the HTS 200 series

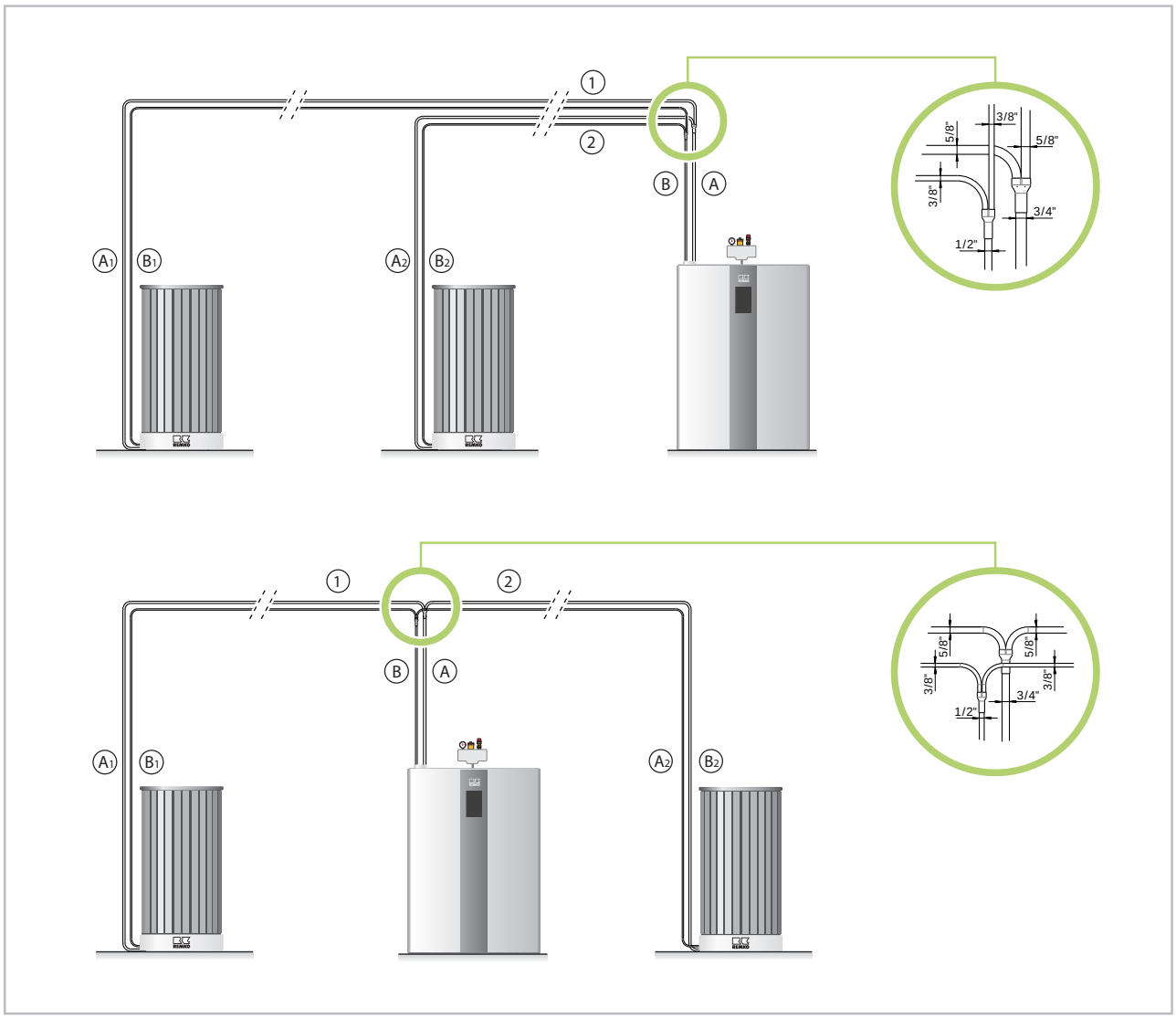


Fig. 38: Connection options

A:	Refrigerant suction pipe 3/4"	B1, B2:	Refrigerant injection pipe 3/8"
A1,A2:	Refrigerant suction pipe 5/8"	1:	Line 1
B:	Refrigerant injection pipe 1/2"	2:	Line 2 - (ΔP line 1 ≈ ΔP line 2)

NOTES

1. The refrigerant piping 1 and 2 must have the same line length and cross-section. The max. line length difference with units that have two outdoor units shall not exceed 2 m.

2. To assure optimum refrigerant distribution in the line system, the T-pieces must be installed as closed as possible to the indoor unit.

3. With horizontal assembly of the refrigerant distributor (Y-piece) ensure that the distributor is only ever installed in a horizontal position to assure uniform distribution of refrigerant and oil.

Maximum permissible refrigerant piping lengths with height differences between the outdoor and indoor units

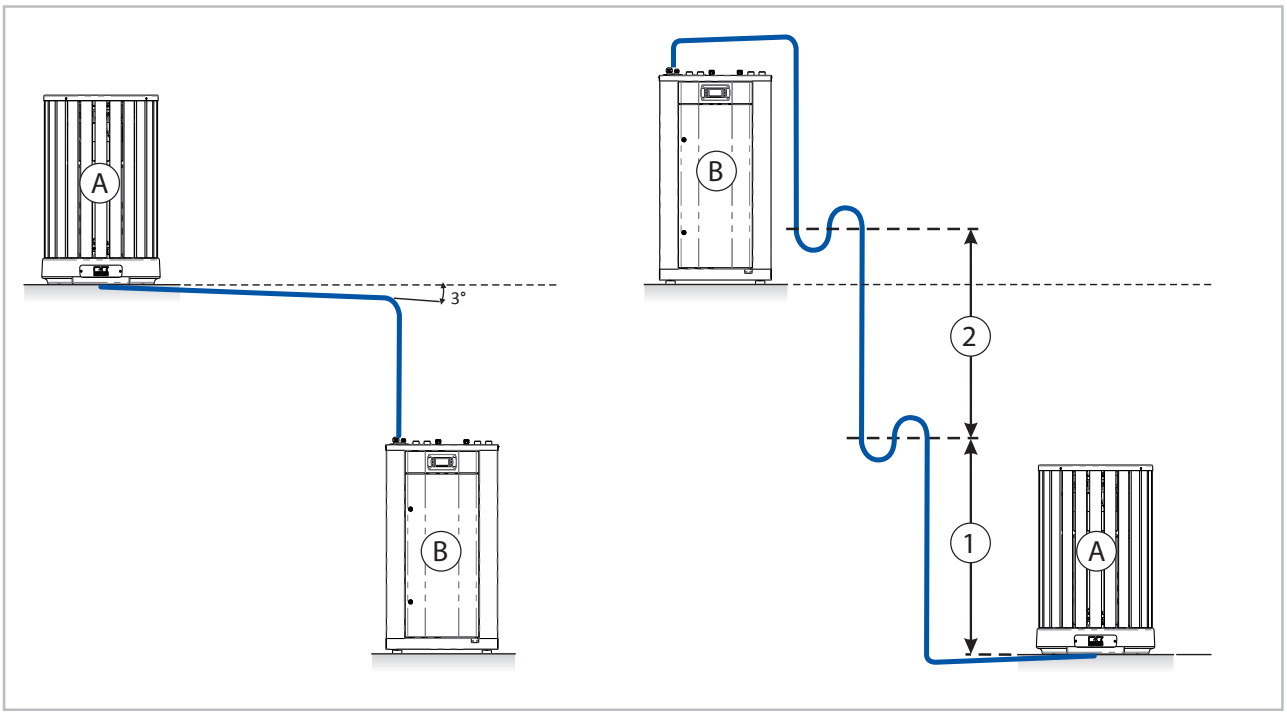


Fig. 39: Line lengths with height differences between the outdoor and indoor units

A: Outdoor unit
B: Indoor unit
1: If 5 metres of height difference must be overcome, a siphon must be installed
2: With height differences greater than 5 metres, a siphon must be installed at each 3 metre difference in height

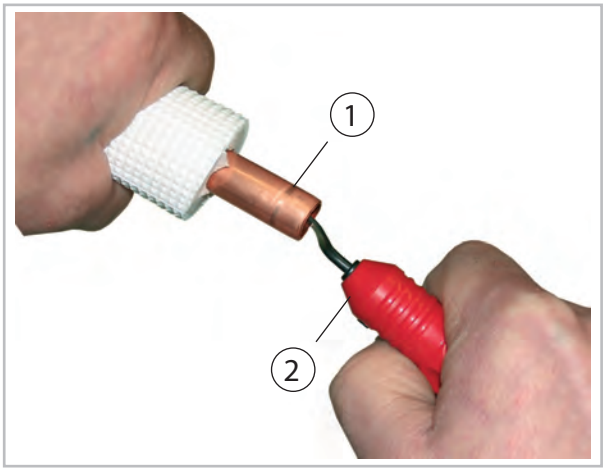


Fig. 40: Deburring the refrigerant piping

1: Refrigerant piping
2: Deburrer

! NOTICE!

Soldering is only permitted in an inert gas atmosphere!

Connection to the unit

- Take off the factory-fitted protective caps.
- The refrigerant piping must be connected to the unit connections. The connection is then soldered accordingly with the addition of dry nitrogen in compliance with the standard.
- The installed refrigerant piping must be provided with suitable insulation.
- Special measures need not be taken for the return of the compressor oil.

! NOTICE!

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

! NOTICE!

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

9.2 Commissioning the refrigeration system

Leak testing

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

blue = large valve = suction pressure

Once the connection has been made successfully, the leak test is carried out with dry nitrogen. Leak testing involves spraying a leak detection spray onto the connections. If bubbles are visible, the connections have not been made properly. Then produce a soldered connection.

Pumping down to vacuum

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

The connections can be found above the shut-off cocks on the indoor unit (see Fig. 41)

! NOTICE!

A vacuum of at least 10 mbar must be produced!

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

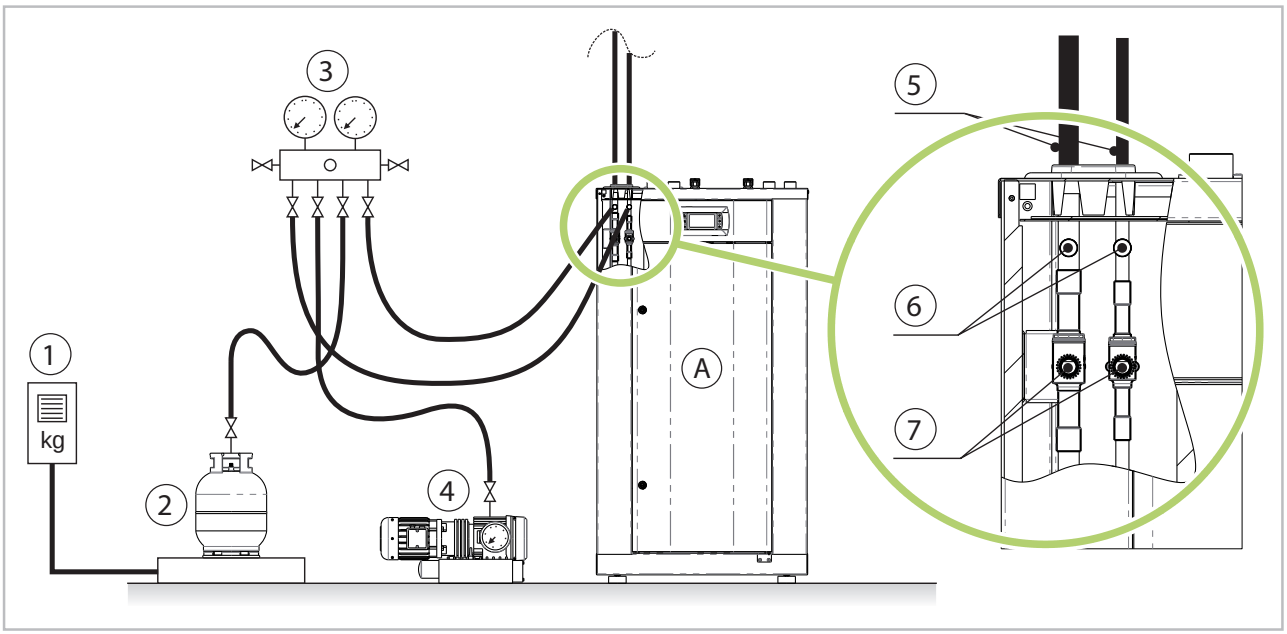


Fig. 41: Pumping down to vacuum

A: Indoor unit
1: Refrigerant charging scale
2: Refrigerant gas container
3: Pressure gauge kit
4: Vacuum pump
5: Refrigerant connections 5/8" - 3/8"
6: Connections
7: Valves

Commissioning

NOTICE!

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

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

Once all the components have been connected and tested, the system can be put into operation. A functional check should be performed to verify its correct function and identify any unusual operating behaviour prior to handing it over to the operator.

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 indoor unit until the pressure gauge indicates a pressure of approx. 2 bar.
3. Check all connections for leaks with leak detection spray and suitable leak detectors. If no leaks are found, open the shut-off valve by turning it 90 ° anticlockwise using the valve's cap until the first latch. The taper's rounded sides must be facing upwards and downwards. If leaks are found, draw off the refrigerant and rework the defective connection. It is imperative that the vacuum creation and drying steps are repeated!
4. Activate the main circuit breaker or fuse.
5. Program the Smart Control (refer to the controller manual for this).
6. Switch on heating mode

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

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

Functional checks and test run

Check the following points:

- Leak-tightness of the refrigerant piping.
- Compressor and fan running smoothly.
- Issue of warmer water in the indoor unit and issue of cold air to outdoor unit during heating operation.
- Function test of the indoor unit and all program sequences.
- Check of the actuators and probes connected for correct function and plausible sensor values via manual operation. (See "Smart Control" operating manual)
- 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.

Final tasks

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

! NOTICE!

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

Adding refrigerant

⚠ DANGER!

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

⚠ DANGER!

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

- The indoor unit is pre-filled with refrigerant sufficient for a length of ordinary pipe up to 7 metres per outdoor unit.
- If the single pipe length exceeds 7 metres, then an additional filling is required for each additional metre of pipe length to the outdoor unit (single length).

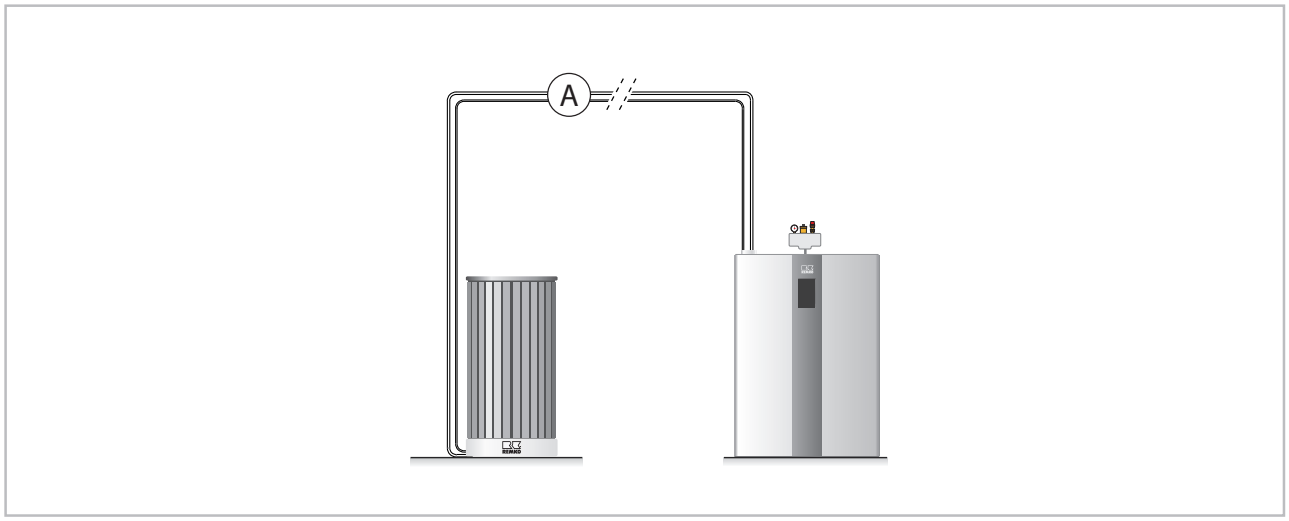
Total single pipe length per outdoor unit	Additional fill quantity
Up to and incl. 7 m	0 g/m
From 7 m total single pipe length	30 g/m

See next page for calculation examples.

REMKO HTS series

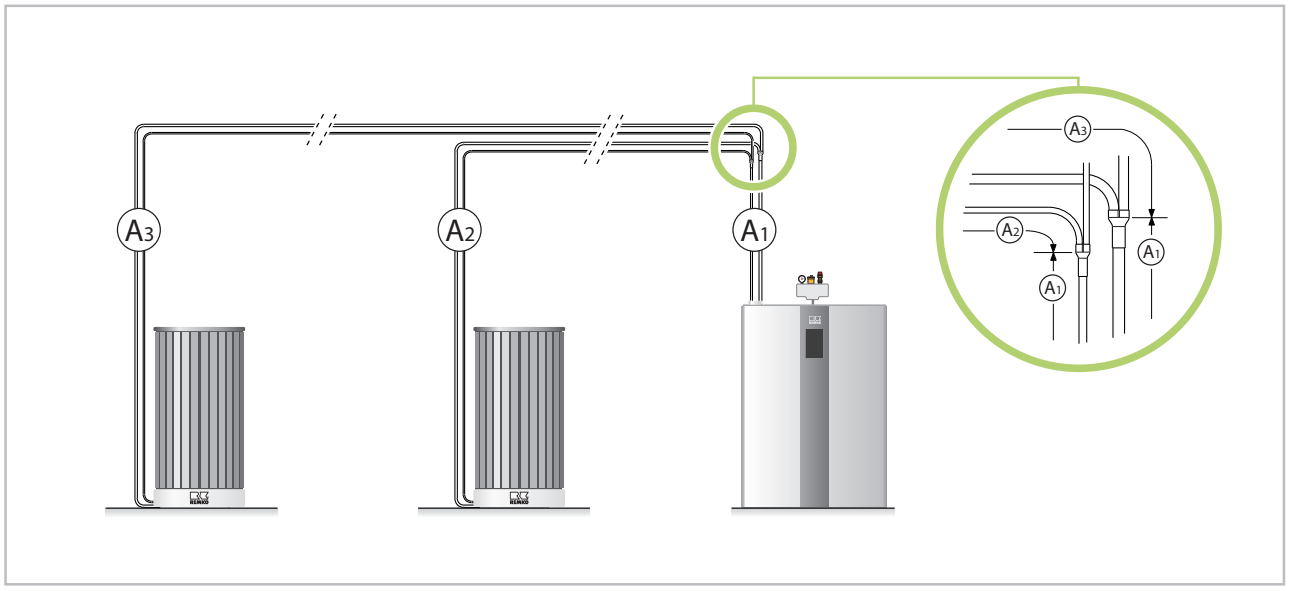
Calculation of the total length of the refrigerant piping HTS 80/90/110/130

Total length = A



Calculation of the total length of the refrigerant piping HTS 200/260

Total length = A1+A2+A3



Examples

Total single pipe length [m]		Additional fill quantity [g]	
Outdoor unit A	Outdoor unit B	HTS 80/90/110/130	HTS 200/260
7	-	0	-
7	7	-	0
15	-	240	-
15	14	-	450

Overview of the top-up quantities after measurement/calculation of the total piping length from the indoor unit to **each** outdoor unit (simple route, see drawings on the previous page for this).

Total line length	Top-up quantity HTS 80/110	Top-up quantity HTS 90/130	Top-up quantity HTS 200/260
1	-	-	-
2	-	-	-
3	-	-	-
4	-	-	-
5	-	-	-
6	-	-	-
7	-	-	-
8	30	30	-
9	60	60	-
10	90	90	-
11	120	120	-
12	150	150	-
13	180	180	-
14	210	210	-
15	240	240	30
16	270	270	60
17	300	300	90
18	330	330	120
19	360	360	150
20	390	390	180
21	420	420	210
22	450	450	240
23	480	480	270
24	510	510	300
25	540	540	330
26	570	570	360
27	600	600	390
28	630	630	420
29	660	660	450
30	690	690	480
31	-	720	510
32	-	750	540
33	-	780	570

Total line length	Top-up quantity HTS 80/110	Top-up quantity HTS 90/130	Top-up quantity HTS 200/260
34	-	810	600
35	-	840	630
36	-	870	660
37	-	900	690
38	-	930	720
39	-	960	750
40	-	990	780
41	-	1020	810
42	-	1050	840
43	-	1080	870
44	-	1110	900
45	-	1140	930
46	-	1170	960
47	-	1200	990
48	-	1230	1020
49	-	1260	1050
50	-	1290	1080

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 2088. That means the escape of 1 kg of this refrigerant has an effect on global warming that is 2088 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

10.1 Important notes

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

NOTICE!

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

11 Before commissioning

Observe the following points before commissioning:

- The heating system is filled with DI water in accordance with VDI 2035. We recommend the addition of REMKO full heating protection (see chapter "Corrosion 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).
- 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 refrigerant filling quantity must be expanded if necessary! At HTS 80-130 > 7 m by 30 g/m, HTS 200-260 > 7 m by 60 g/m (overall piping quantity both units, see ↳ *'Adding refrigerant' on page 75*).
- 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 Fig. 25).
- **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 information on commissioning

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

- 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. 42: Smart-Control Touch start screen

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 assure fault-free operation and long service life for the heat pump system.

Care

- The indoor and outdoor modules must be kept free of soiling, vegetation and other deposits.
- The unit is to be cleaned with a damp cloth. In doing so, ensure 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, at least once per year depending on the degree of soiling, 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 statutory seal test where applicable, it is necessary to arrange a yearly 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 shutdown

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

- The system is to be switched to "Stand-by" mode for heating during temporary shutdowns and for hot water it should be switched to "Off" mode.
- 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 shutdown phase is over.
- Instructions for changing the mode appear in the corresponding chapter of the heat-pump manager's 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 has been tested several times to ensure that it works properly. 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.

Malfunction	Possible causes	Remedial measures
The heat pump does not start or switches itself off	Power failure, under-voltage	Check the voltage and, if necessary, wait for it to come back on
	Defective mains fuse / main switch turned off	Exchange mains fuse, master switch on
	Damaged power supply	Repair by specialist firm
	Power company off-period Disable signal is shown in the display!	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
	Nominal temperature exceeded, incorrect operating mode	The set-point temperature has to be higher than the heat-source temperature, check mode
	Wiring error on the indoor or outdoor units	Disconnect the outdoor unit, then establish the correct terminal sequence using the connection plan. Re-establish voltage to the outdoor module. Also make sure that the protective earth is connected correctly
Heating cycle pump does not switch off	Incorrect pump switching action	Have pump switching of 'heating circuit' checked out at specialist level
Heating cycle pumps fail to switch on	Incorrect operating 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. In the cold heating period, we recommend the 'heating' operating mode
	Temperature overlapping, e.g. outside temperature greater than room temperature	Check temperature ranges. Sample test!

15.2 Error messages on the Smart-Control

Operating messages, warnings and error display on the Smart-Control

Operating messages

ID	Description	Desig.	Details
ID6000	Storage tank 1: Max. temperature reached		The temperature on one of the probes in storage tank 1 is higher than the maximum permitted storage tank temperature
ID6001	HW request		There is an active requirement to charge the storage tank
ID6002	Heat pump compressor start		Heat pump compressor start
ID6003	Switching cycle disabled (I/O2)		The heat pump was disabled in order to reduce the compressor's switching cycles
ID6005	Internal pump lead time		The internal pump runs at reduced speed during the pump lead time
ID6006	Switching cycle disabled		The heat pump was disabled in order to reduce the compressor's switching cycles
ID6007	Min. holding time		The heat pump is disabled due to a minimum holding time
ID6008	Disable signal	S16	The heat pump is disabled due to a disable signal
ID6009	Disable signal (I/O 2)		The heat pump is disabled due to a disable signal
ID6010	Heat pump compressor start (I/O 2)		Heat pump compressor start
ID6012	Defrosting HP (I/O 2)		Defrost heat pump
ID6020	Pump internal after-run time		The internal pump runs at a reduced speed during the pump after-run time
ID6022	Min. holding time (I/O2)		The heat pump is disabled due to a minimum holding time
ID6103	Heat demand HP		Heat demand, heat pump
ID6104	Cooling demand HP		Cooling demand, heat pump
ID6105	Defrost heat pump		Defrost heat pump
ID6107	Standby mode enabled		Standby mode enabled
ID6108	Random delay after power failure		Random delay after power failure (up to 200 seconds after power returns) - the purpose of the random delay is to avoid a system overload due to many consumers being switched on at the same time
ID6109	Outdoor temp. Heat pump usable limit		Outdoor temp. Heat pump usable limit - the heat pump is disabled due to the usable limits being exceeded or not being reached
ID6111	Heat pump bivalence temperature		Heat pump bivalence temperature - the heat pump is disabled because the temperature has dropped below the bivalence temperature
ID6113	Solar heating		Solar heating - heat generators are disabled

ID	Description	Desig.	Details
ID6115	Low pressure difference		The pressure difference is too low to start the compressor
ID6116	Maximum defrosting period		Maximum defrosting period

Error

ID	Description	Desig.	Details
ID7050	Anti-freeze protection		The anti-freeze protection in the heat pump's heat exchanger was triggered due to an inlet temperature that is too low. After rectifying the cause of the error, reset the error in (Expert/Settings/Heat pump/Basic settings) and, if necessary, de-energise the outdoor unit.
ID7103	Incorrect phase sequence (rotating field)	µPC	Please check the phase sequence (the rotating field) of the power supply
ID7108	The anti-freeze protection		In the heat pump's heat exchanger was triggered due to a return temperature that is too low. After rectifying the cause of the error, reset the error in (Expert/Settings/Heat pump/Basic settings) and, if necessary, de-energise the outdoor unit.
ID7150	EEV motor fault	µPC	EEV motor fault. Please contact an authorised service technician
ID7200	Open contact - storage tank 1 bottom probe	S02	Open contact - storage tank 1 bottom probe
ID7201	Short circuit - storage tank 1 bottom probe	S02	Short circuit - storage tank 1 bottom probe
ID7202	Open contact - storage tank 1 middle probe	S09	Open contact - storage tank 1 middle probe
ID7203	Short circuit - storage tank 1 middle probe	S09	Short circuit - storage tank 1 middle probe
ID7204	Open contact - storage tank 1 top probe	S08	Open contact - storage tank 1 top probe
ID7205	Short circuit - storage tank 1 top probe	S08	Short circuit - storage tank 1 top probe
ID7206	Open contact - external probe	S10	Open contact - external probe
ID7207	Short circuit - external probe	S10	Short circuit - external probe
ID7208	Open contact - refrigerant probe	S07	Open contact - refrigerant probe
ID7209	Short circuit - refrigerant probe	S07	Short circuit - refrigerant probe
ID7210	Open contact - circulation temp. probe	S05	Open contact - drinking water circulation temperature probe

ID	Description	Desig.	Details
ID7211	Short circuit - circulation temp. probe	S05	Short circuit - drinking water circulation temperature probe
ID7212	Open contact - inlet temp. probe	S13	Open contact - inlet temp. probe
ID7213	Short circuit - inlet temp. probe	S13	Short circuit - inlet temp. probe
ID7214	Min. refrigerant temp.	S07	The minimum refrigerant temperature was not reached - anti-freeze protection in the heat exchanger
ID7215	Min. refrigerant temp. (I/O2)	S07.2	The minimum refrigerant temperature (I/O2) was not reached - anti-freeze protection in the heat exchanger
ID7218	Open contact - collector 1 probe	S01	Open contact - collector 1 probe
ID7219	Short circuit - collector 1 probe	S01	Short circuit - collector 1 probe
ID7228	Open contact - inlet temp. probe	S13.2	Open contact - inlet temp. probe
ID7229	Short circuit - inlet temp. probe	S13.2	Short circuit - inlet temp. probe
ID7231	Anti-freeze protection (I/O 2)		The anti-freeze protection in the heat pump's heat exchanger was triggered due to an inlet temperature of less than 5 °C. After eliminating the cause of the error, the controller must be restarted to reset the error
ID7236	Open contact - mix. heating cycle inlet temp. probe	S12	Open contact - mixed heating cycle inlet temperature probe
ID7237	Short circuit - mix. heating cycle inlet temp. probe	S12	Short circuit - mixed heating cycle inlet temperature probe
ID7238	Open contact - mix. heating cycle return temp. probe	S11	Open contact - mixed heating cycle return temperature probe
ID7239	Short circuit - mix. heating cycle return temp. probe	S11	Short circuit - mixed heating cycle return temperature probe
ID7240	Connection to the KNX interface	KNX	Connection to the KNX IP interface lost
ID7241	Negative temp. differential	µPC	The temperature difference when the heat generator is active is implausible
ID7245	Tunnel occupied	KNX	The tunnel with the physical address (PA of the SMT) set on the controller is already taken by another KNXnet/IP unit (e.g.: ETS PC) or is not available on the interface.
ID7246	Low pressure	µPC	The compressor is disabled due to a low pressure malfunction
ID7247	Device Offline	µPC	Device Offline - please check the data connection between the controller board and the inverter
ID7248	Interface is not supported	KNX	The KNXnet/IP tunnelling protocol is not supported by the detected KNX interface

ID	Description	Desig.	Details
ID7249	Incorrect interface detected	KNX	The physical address of the detected KNXnet/IP interface is not consistent with the parameter settings of the SMT controller
ID7250	Min. medium flow rate (I/O 2)		The medium flow rate fell below the heat pump's minimum medium flow rate due to defrosting or in cooling mode. After eliminating the cause of the error, the controller must be restarted to reset the error
ID7251	Min. volumetric flow rate		The medium flow rate fell below the heat pump's minimum medium flow rate due to defrosting or in cooling mode. After eliminating the cause of the error, the indoor and outdoor units must be restarted to reset the error
ID7252	Heat pump malfunction code	S20	Heat pump malfunction code
ID7253	Heat pump 2 malfunction code	S20.2	Heat pump 2 malfunction code
ID7254	General inverter fault	µPC	General inverter fault - please contact an authorised service technician
ID7255	EEPROM error	µPC	EEPROM error. Please contact an authorised service technician
ID7256	Envelope fault	µPC	Envelope fault - the compressor operates outside the programmed curve. Please contact an authorised service technician
ID7257	Fan overload	µPC	The compressor is disabled due to a fan overload
ID7258	Maximum hot gas temperature	µPC	Maximum hot gas temperature - the compressor is blocked by having reached the maximum hot gas temperature
ID7259	High pressure malfunction	µPC	High pressure malfunction. If this fault occurs frequently, please contact an authorised service technician
ID7260	High pressure malfunction transducer	µPC	The compressor is disabled due to a high pressure malfunction
ID7262	Outside temperature sensor error	µPC	Please check the outside temperature sensor on the inverter board and its connection
ID7264	Inlet temperature probe error	µPC	Please check the inlet temperature probe on the inverter board and its connection
ID7267	Outlet temperature probe error	µPC	Please check the outlet temperature probe on the inverter board and its connection
ID7269	Hot gas temperature probe error	µPC	Please check the hot gas temperature probe on the inverter board and its connection
ID7270	Suction gas temperature probe error	µPC	Please check the suction gas temperature probe on the inverter board and its connection.
ID7271	High pressure probe error	µPC	Please check the high pressure probe on the inverter board and its connection
ID7272	Low pressure probe error	µPC	Please check the low pressure probe on the inverter board and its connection
ID7273	WKF fault code E101		Communication error between com. kit and outdoor unit. F1/F2 twisted or cable break

ID	Description	Desig.	Details
ID7274	WKF fault code E177		Compressor stopped due to an emergency stop signal. After eliminating the cause of the error, the indoor and outdoor units must be restarted to reset the error
ID7275	WKF fault code E221		Short circuit or open contact - probe ambient air temperature motherboard outdoor unit CN43 Pin 1&2
ID7276	Restart required		Due to the changed system (setting / coding resistor), the controller has to be restarted - disconnect it from the power supply for around 10 seconds
ID7278	Low overheating		The compressor is disabled due to overheating being too low.
ID7283	Open contact - internal return temp. probe	S15	Open contact - internal return temperature probe
ID7284	Short circuit - internal return temperature probe	S15	Short circuit - internal return temperature probe
ID7285	Low suction gas temperature	µPC	The compressor is disabled due to the suction gas temperature being too low
ID7286	Coding error	Rc	A unique unit identifier could not be assigned using the coding resistor at the Rc terminal
ID7287	Low evaporation temperature	µPC	The compressor is disabled due to the evaporation temperature being too low
ID7288	High evaporation temperature	µPC	The compressor is disabled due to the evaporation temperature being too high
ID7289	High condensation temperature	µPC	The compressor is disabled due to the condensation temperature being too high
ID7290	WKF fault code E102		Communication error between com. kit and outdoor unit. F1/F2 twisted or cable break
ID7291	WKF fault code E201		Communication error between com. kit and outdoor unit - communication could not be established or incorrect board version
ID7292	WKF fault code E231		Short circuit or open contact - evaporator temperature probe motherboard outdoor unit CN43 Pin 3&4
ID7293	WKF fault code E251		Short circuit or open contact - hot gas temperature probe motherboard outdoor unit CN43 Pin 5&6
ID7294	WKF fault code E320		Short circuit or open contact - overload switch probe (OLP) motherboard outdoor unit CN43 Pin 7&8
ID7295	WKF fault code E416		Compressor stopped by overheating protection
ID7296	Open contact - 2nd mixed heating cycle return flow temp.	S14	Open contact - 2nd mixed heating cycle return flow temp.
ID7297	Short circuit - 2nd mixed heating cycle return flow temp.	S14	Short circuit - 2. acc. to return flow temp.
ID7298	Open contact - 3rd mixed heating cycle inlet temp.	S12.2	Open contact - 3. mixed heating cycle return flow temp.

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ID	Description	Desig.	Details
ID7299	Short circuit - 3rd mixed heating cycle inlet temp.	S12.2	Short circuit - 3. mixed heating cycle return flow temp.
ID7300	Open contact - 3rd mixed heating cycle return flow temp.	S11.2	Open contact - 3. mixed heating cycle return flow temp.
ID7301	Short circuit - 3rd mixed heating cycle return flow temp.	S11.2	Short circuit - 3. mixed heating cycle return flow temp.
ID7302	Open contact - 4th mixed heating cycle inlet temp.	S06.2	Open contact - 4. mixed heating cycle return flow temp.
ID7303	Short circuit - 4th mixed heating cycle inlet temp.	S06.2	Short circuit - 4. mixed heating cycle return flow temp.
ID7304	Open contact - 4th mixed heating cycle return flow temp.	S14.2	Open contact - 4. mixed heating cycle return flow temp.
ID7305	Short circuit - 4th mixed heating cycle to return flow temp.	S14.2	Short circuit - 4. mixed heating cycle return flow temp.
ID7306	Open contact - refrig-erant probe (I/O 2)	S07.2	Open contact - refrigerant probe (I/O 2)
ID7307	Short circuit - refrig-erant probe (I/O 2)	S07.2	Short circuit - refrigerant probe (I/O 2)
ID7308	WKF fault code E464		Overcurrent at the inverter module IPM (IGBT transistor module). Check software status for the motherboard
ID7309	WKF fault code E425		Phase fault malfunction. A phase conductor is missing at the frequency converter (can only occur with WKF 180 - otherwise, check motherboard version)
ID7310	WKF fault code E203		Communication error between motherboard (7-segment display) and inverter board
ID7311	WKF fault code E466		Under-voltage or over-voltage in the intermediate DC circuit of the inverter.
ID7312	WKF fault code E469		Voltage probe fault in the intermediate DC circuit of the inverter. Replace inverter board if necessary
ID7313	WKF fault code E458		Implausibly high current at the current probe or fault at the BLDC motor for fan 1.
ID7314	WKF fault code E475		Fault at the BLDC motor for fan 2
ID7315	WKF fault code E461		Implausibly low current at the current probe or fault on the inverter board at compressor start (can occur with compressor damage)
ID7316	WKF fault code E467		Missing phase conductor on the compressor
ID7317	WKF fault code E462		Overcurrent fault (primary side) - check power supply / fuse for the EMI board
ID7318	WKF fault code E463		Compressor overtemperature (OLP). Probe value greater than 115°C (below 12.7 kohm). Can be caused by a jammed expansion valve

ID	Description	Desig.	Details
ID7319	WKF fault code E554		Refrigerant quantity / refrigerant loss malfunction
ID7320	WKF fault code E556		Power ratings for the com. kit board (IM) and the motherboard (AM) differ - check board versions.
ID7328	Open contact - 2nd mixed heating cycle return flow temp.	S06	Open contact - 2. mixed heating cycle return flow temp.
ID7329	Short circuit - 2. mixed heating cycle return flow temp.	S06	Short circuit - 2. mixed heating cycle return flow temp.
ID7332	Anti-freeze protection	µPC	The anti-freeze protection in the heat pump's heat exchanger was triggered due to an inlet temperature that is too low. After eliminating the cause of the error, the controller must be restarted to reset the error
ID7333	Negative temp. differential		The temperature difference when the heat generator is active is implausible
ID7334	Comm. signal		Communication between operating unit SMT 1 and power unit SMT 1 I/O was interrupted.

Warnings

ID	Description	Desig.	Details
ID8100	The system temperature is too low		The system temperature is too low to start the heat pump
ID8102	Temperature discrepancy in solar cycle		The collector temperature is at least 60K higher than the storage tank temperature
ID8103	Overnight collector temperature		A collector temperature of at least 45°C (113 °F) occurred overnight
ID8105	Target flow rate		The flow rate has dropped below the target flow rate
ID8106	Low pressure		Low pressure. The compressor is disabled temporarily
ID8107	Compressor status		The active operating mode is safety mode because the compressor is active without demand
ID8108	Compressor start error	µPC	Compressor start error
ID8109	EVD EVO probe fault	µPC	EVD EVO probe fault
ID8110	Driver offline	µPC	Driver offline
ID8111	Device offline		Device offline - please check the data connection between the controller board and the inverter
ID8132	Anti-freeze protection active		The anti-freeze protection function is currently active - check the room climate mode set
ID8138	HW storage tank set temp.		The hot water storage tank set temperature was reduced due to low outside temperatures
ID8139	Lower application area (heating)		The temperature has currently dropped below the guaranteed application area of the external unit in heating mode

ID	Description	Desig.	Details
ID8140	Upper application area (heating)		The guaranteed application area of the external unit in heating mode is currently exceeded
ID8141	Lower application area (cooling)		The temperature has currently dropped below the guaranteed application area of the external unit in cooling mode
ID8142	Upper application area (cooling)		The guaranteed application area of the external unit in cooling mode is currently exceeded
ID8144	Target flow rate (I/O 2)		The flow rate has dropped below the target flow rate
ID8223	SD card error (host)		SD card error (host): The SD card is either not inserted correctly or an error has occurred
ID8224	SD card error		SD card error (CP): The SD card is not inserted or an error has occurred
ID8225	Dewpoint monitoring	CP	Dew point monitoring was activated but no control panel (with integrated humidity and temperature probe) was assigned to the cooling cycle to calculate the dew point
ID8226	Temp. dropped below min. inlet temp.		Temp. dropped below min. inlet temp. (or dew point) - cooling request is suppressed
ID8227	Hygiene function: Setpoint not reached		The hygiene function was cancelled due to the maximum runtime being reached before attaining the set temperature
ID8229	2. heat generator active		Due to the return temperature being too low during defrosting, the 2nd heat generator activated

15.3 Fault code on outdoor unit

To get to the status-LED, remove the cover plate from the terminal compartment.

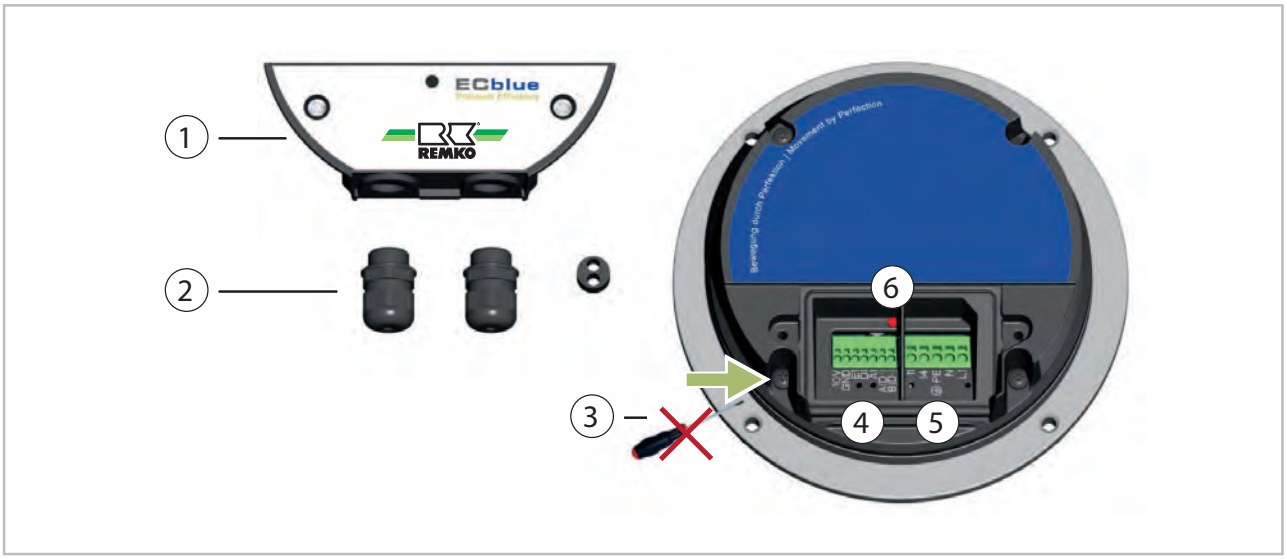

Fig. 43: Location of fault code

1: Cover plate for terminal compartment
2: Cable screws (2 x M16), sealing insert with two 5 mm holes for two pipes, to be used when required
3: Do not loosen safety screws on housing!
4: Connection, control
5: Connection, fault signal relay and power supply
6: Status LED

Status Out with flash code

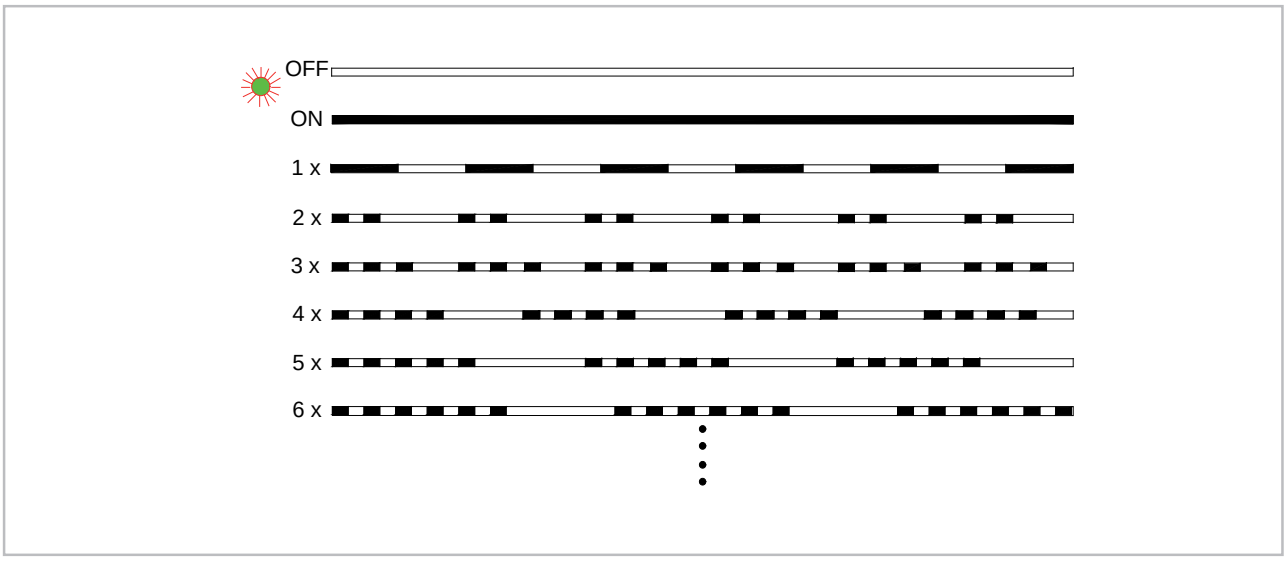

Fig. 44: Status LED in the cover of the terminal compartment

LED code	Relay K1 *)	Cause Explanation	Response of controller remedy
OFF	Deactivated, 11 - 14 interrupted	No mains voltage	Mains voltage available? Unit switches OFF and automatically switches back ON during voltage recovery.
ON	Tightened, 11 - 14 bridged	Normal operation without malfunction	
1 x	Tightened, 11 - 14 bridged	**Not enabled = OFF** Terminals “D1” - “10 V” (Digital In 1) not bridged or shut down via Bus.	Shut down ⇒ digital input or bus.
2 x	Tightened, 11 - 14 bridged	**Active temperature management** To protect the unit from damage due to high internal temperatures, it has active temperature management. If the temperature rises above the specified threshold, the modulation reduces linearly. To prevent the entire system from being shut down externally during a reduced operation because of an internal temperature that is too high (operation permissible for the controller), no alarm code follows via the relay.	As the temperature drops, the modulation increases again linearly. Check installation of unit and cooling of controller.
3 x	Deactivated, 11 - 14 interrupted	**Incorrect signal** from Hall-ICs, error in commutation. Faulty internal plug connection.	Controller shuts down motor. Automatic re-start, when error is no longer detected. Replace fan / motor.
5 x	Deactivated, 11 - 14 interrupted	**Motor jammed** If during an existing commutation there is no rotational speed for 8 seconds, measured > 0, the error “motor jammed” is triggered.	EC controller shuts down, a renewed attempt to start is made after approx. 2.5 seconds. Final shut down if fourth start-up attempt is unsuccessful. Reset then necessary by interrupting mains voltage. Check if motor is rotating freely.
6 x	Deactivated, 11 - 14 interrupted	**Earth fault or short circuit of motor winding.**	EC controller shuts down, a renewed attempt to start is made after approx. 60 seconds. Final shut down, if another error is detected within 60 seconds of a second start-up attempt. Reset then necessary by interrupting mains voltage.
7 x	Deactivated, 11 - 14 interrupted	**ZK under voltage** If the intermediate circuit voltage falls below the specified threshold, shut down follows.	If the intermediate circuit voltage increases again above the threshold within 75 seconds, an automatic start-up attempt follows. If the intermediate circuit voltage remains below the threshold for longer than 75 seconds, a shut down with an error message follows.

LED code	Relay K1 *)	Cause Explanation	Response of controller remedy
8 x	Deactivated, 11 - 14 interrupted	**ZK under voltage** If the intermediate circuit voltage increases above the specified threshold, shut down of the motor follows. Cause - too high input voltage or regenerative motor operation.	If the intermediate circuit voltage falls below the threshold within 75 seconds, an automatic start-up attempt follows. If the intermediate circuit voltage remains above the threshold for longer than 75 seconds, shut down with an error message follows.
9 x	Tightened, 11 - 14 bridged	**Cooling off period** Cooling off period for approx. 60 sec. Final shut down after 2 cooling off periods.	Cooling off period for approx. 60 seconds. Final shut down after 2 cooling off periods.
11x	Deactivated, 11 - 14 interrupted	**Motor start error** If a start command is pending (enable available and setpoint > 0) and the motor does not start rotating in the correct direction within 5 minutes, an error message follows.	If, following the error message, it is possible to start the motor in the set direction of rotation, the error message goes out. Following an interim voltage interruption, the countdown to shut down starts from scratch. Check if motor is rotating freely. Check if fan is driven backwards by air flow.
12 x	Deactivated, 11 - 14 interrupted	**Mains voltage too low** If the intermediate circuit voltage falls below the specified threshold, shut down follows.	If the mains voltage increases again above the threshold within 75 seconds, an automatic start-up attempt follows. If the mains voltage remains below the threshold for longer than 75 seconds, a shut down with an error message follows.
13 x	Deactivated, 11 - 14 interrupted	**Mains voltage too high** Cause, too high input voltage. If mains voltage increases above the specified threshold, shut down of the motor follows.	If the mains voltage falls below the threshold again within 75 seconds, an automatic start-up attempt follows. If the mains voltage remains below the threshold for longer than 75 seconds, a shut down follows.
14 x	Deactivated, 11 - 14 interrupted	**Peak current error** If the motor current increases (even briefly) above the specified threshold, shut down follows.	After a shut down, the controller waits for a period of 5 seconds and then attempts a further start-up. If a further 5 shut downs occur within 60 seconds, a final shut down with an error message follows. If 60 seconds have elapsed without a further shut down, the counter is reset.
17 x	Deactivated, 11 - 14 interrupted	**Temperature alarm** Exceeding max. permissible internal temperature.	Controller shuts down motor. Automatic re-start after cooling down. Check installation of unit and cooling of controller.

*) K1: factory-set programmed function: Alarm code not reversed

16 View of the unit and spare parts

16.1 Exploded view of outdoor unit HTS 80/90/110/130/200/260

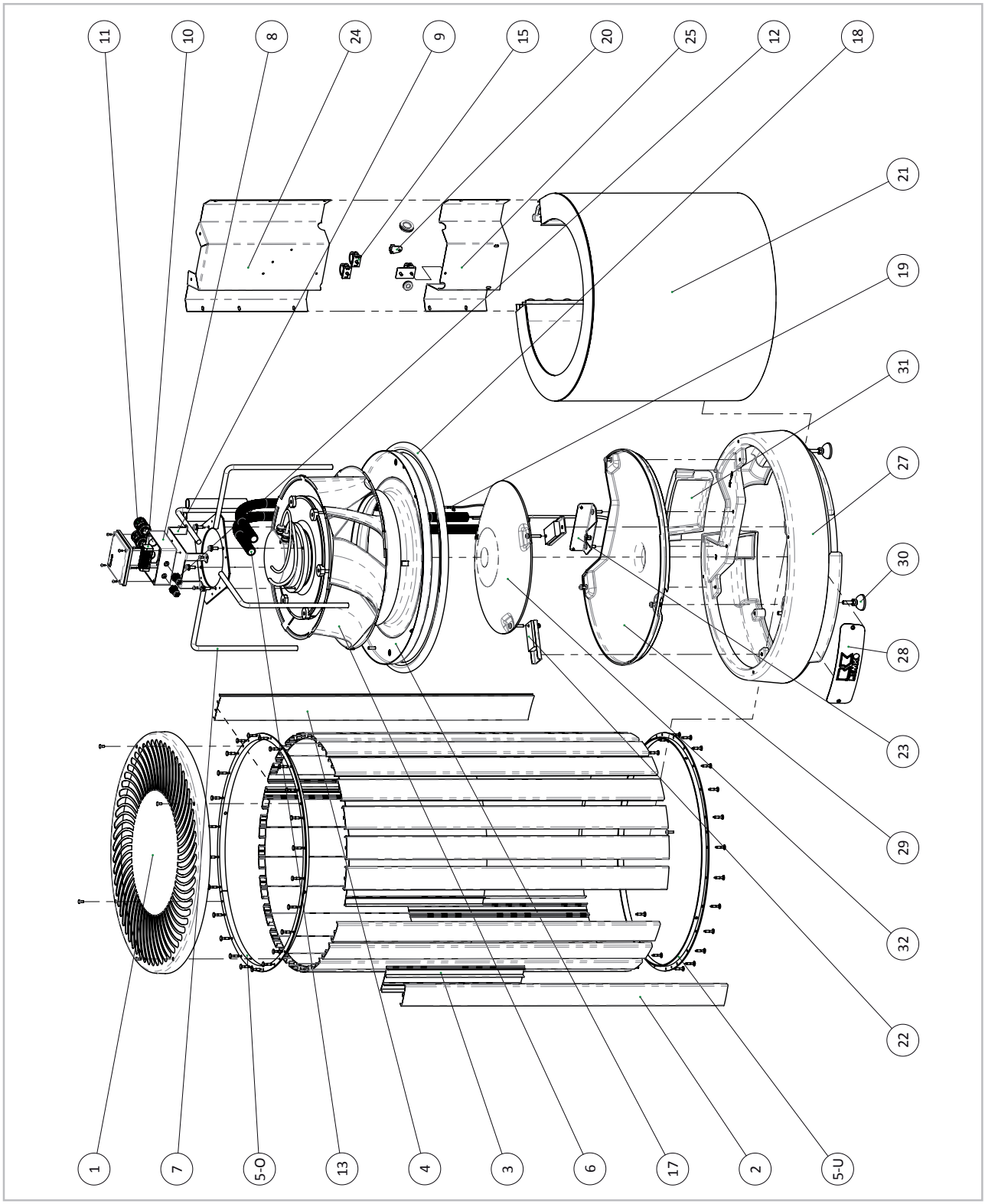

Fig. 45: Exploded view of outdoor module HTS 80/90/110/130/200/260

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

Spare parts list - Outdoor module HTS 80/90/110/130/200/260

No.	Designation	HTS 80/90/110/130/200/260
1	Air outlet grid	On request by providing the serial number
2	Aluminium air deflection blade (Alu/Camura)	
3	Locking profile on outdoor housing (short)	
4	Locking profile on outdoor housing (long)	
5-o	Circular profile (top)	
5-u	Circular profile (bottom)	
6	Complete fan with motor	
7	Fan frame	
7.a	Fan unit with frame, fan, air inlet nozzle and motor	
8	Electrical connection box	
9	Retaining bracket for the elect. connection box	
10	Connection terminals	
11	PG screw connections Ø17	
12	PG screw connections Ø17	
13	Cable hoses Ø17	
15	Pipe clip Ø17	
17	Air inlet nozzle	
18	Air inlet nozzle gasket	
19	External probe	
20	Probe bracket	
21	Plate evaporator	
22	Rubber support for finned heat exchanger	
23	Evaporator mounting bracket	
24	Top cover on evaporator	
25	Bottom cover on evaporator	
27	Cast iron base	
28	Stainless steel Remko logo	
29	Condense tray with electric heater	
30	Adjustable levelling feet	
31	Cast iron door for connections area	
32	Closing plastic disc	

To assure the correct delivery of spare parts, please always provide the unit type with its corresponding serial number (see name plate).

16.2 Exploded view of indoor unit HTS 80/90/110/130/200/260

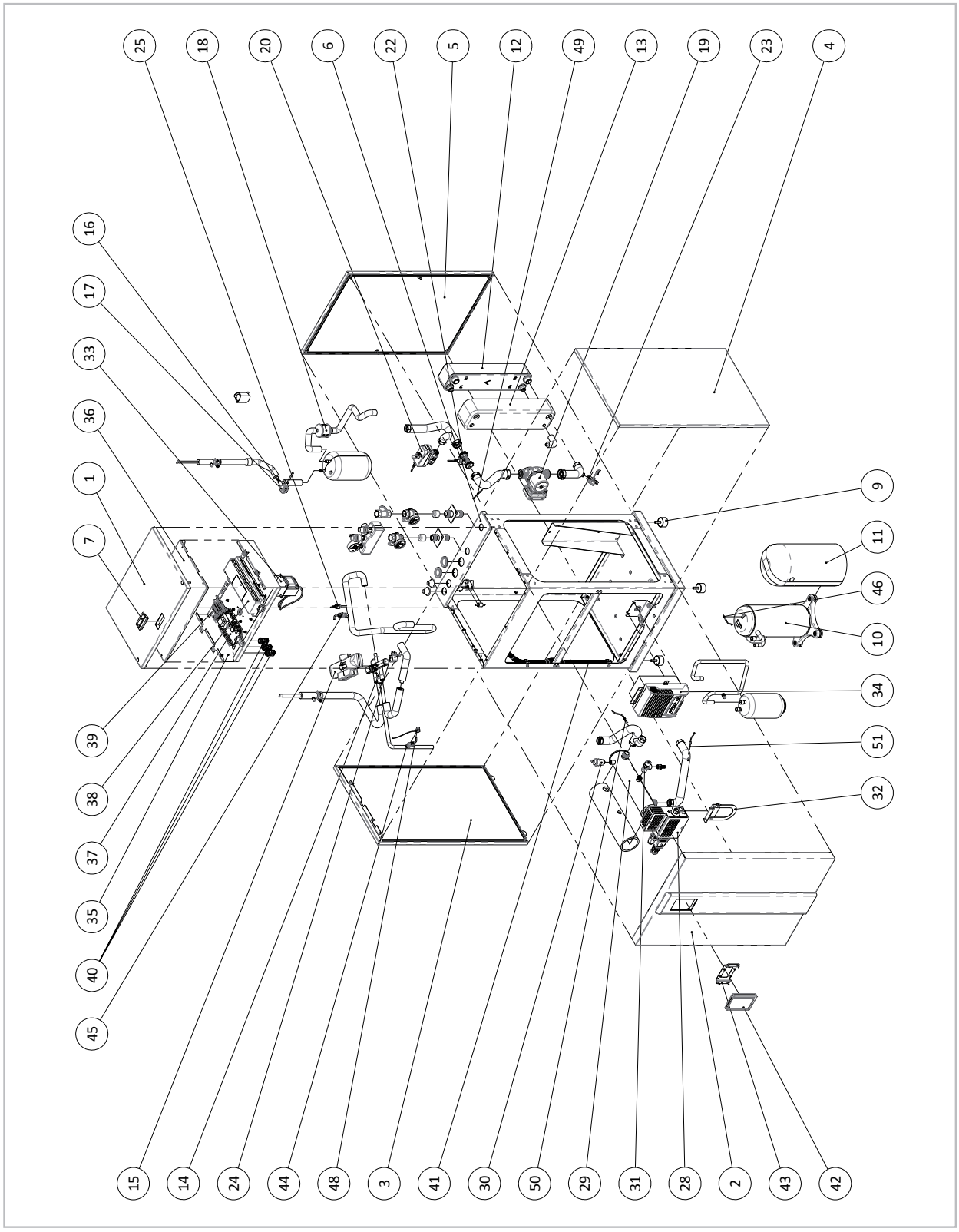

Fig. 46: Exploded view - Indoor unit HTS 80/90/110/130/200/260

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

Spare parts list - Indoor module HTS 80/90/110/130/200/260

No.	Designation	HTS 80/90/110/130/200/260
1	Cover	On request by providing the serial number
2	Front part	
3	Side section, left	
4	Side section, right	
5	Back wall	
6	Adapter plate, top	
7	Recessed grip	
9	Feet (height-adjustable)	
10	Compressor	
11	Compressor hood	
12	Plate heat exchanger	
13	Insulation shell, plate heat exchanger	
14	4-way valve	
15	Insulation shell, 4-way valve	
16	Electronic expansion valve	
17	Coil for expansion valve	
18	Refrigerant dryer	
19	Grundfoss circulation pump	
20	Bypass valve, complete	
22	Flow probe	
23	Ball valve for filling/drainage	
24	Coil 4-way changeover valve	
25	High pressure switch	
28	Heating element 9 kW	
29	Bottle electrical heating coil	
30	Automatic bleeding valve	
31	Safety valve, 6 bar	
32	Retaining bracket booster heating 9 kW	
33	DC inductor (not with HTS 90)	
35	Switch box	
36	Lid of switch box	
37	WP control board	
38	SMT I/O module	

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No.	Designation	HTS 80/90/110/130/200/260
39	Terminal strips	On request, please specify the serial number
40	Cable feedthrough tube	
41	Cable gland 17 mm	
42	Smart-Control Touch control V2	
42.a	Exchange control with rotary knob for Touch control V2	
43	Control panel bracket	
44	Pressure sensor suction side/low pressure	
45	Pressure sensor pressure-side/high pressure	
46	Heat gas probe	
48	Probe suction-side	
49	Water return/inlet probe (water side probe)	
50	Probe SMT PT1000	
51	Water supply/outlet probe (water side probe)	
	Spare parts not illustrated	
	SD card (current software without Smart Web, Smart Count)	On request, please specify the serial number
	Connection cable for pressure sensors	
	Coding resistance	
	Wave-trap (only with HTS 90)	
	Red indicator light for REMKO Smart Serv	
	Communication board to control board HTS	
	Coding resistor Slave only HTS 200/260 Duo	

To ensure the correct delivery of spare parts, please always provide the unit type with its corresponding serial number (see name plate).

Components of accessories set (without illustration)

Designation	HTS 80/90/110/130/200/260
Accessories set, complete	On request, please specify the serial number
Immersion probe	
Dirt trap	
Ball valve 1“, red	
Ball valve 1“, blue	
Safety assembly	
External probe	

To ensure the correct delivery of spare parts, please always provide the unit type with its corresponding serial number (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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REMKO HTS series

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REMKO GmbH & Co. KG
Klima- und Wärmetechnik

Im Seelenkamp 12
32791 Lage

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

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

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

Hotline International
+49 (0) 5232 606-130