Operating and installation instructions

REMKO MVV series

Outdoor units for cooling and heating

MVV 1200 DC, MVV 1600 DC, MVV 2000 DC

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Read the instructions prior to performing any task!

CE

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

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

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

Translation of the original

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1 Safety and usage instructions

1.1 General safety notes

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

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

1.2 Identification of notes

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

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

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

DANGER!

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

DANGER!

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

WARNING!

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

CAUTION!

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

NOTICE!

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

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

1.3 Personnel qualifications

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

1.4 Dangers of failure to observe the safety notes

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

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

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

1.5 Safety-conscious working

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

1.6 Safety notes for the operator

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

- The units and components may only be set up, installed and maintained by qualified personnel.
- Protective covers (grille) over moving parts must not be removed from units that are in operation.
- Do not operate units or components with obvious defects or signs of damage.
- Contact with certain unit parts or components may lead to burns or injury.
- The units and components must not be exposed to any mechanical load, extreme levels of humidity or extreme temperature.
- Spaces in which refrigerant can leak sufficient to load and vent. Otherwise there is danger of suffocation.
- All housing parts and device openings, e.g. air inlets and outlets, must be free from foreign objects, fluids or gases.
- The units must be inspected by a service technician at least once annually. Visual inspections and cleaning may be performed by the operator when the units are disconnected from the mains.

1.7 Safety notes for installation, maintenance and inspection

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

1.8 Unauthorised modification and changes

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

1.9 Intended use

Depending on the model, the units and the additional fittings with which they are equipped are only intended to be used as an air-conditioner for the purpose of cooling or heating the air in an enclosed space.

Any different or additional use is a non-intended use. The manufacturer/supplier assumes no liability for damages arising from a non-intended 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.

The threshold values specified in the technical data must not be exceeded.

1.10 Warranty

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

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

1.11 Transport and packaging

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

⚠ WARNING!

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

Why:

- Leave packaging material are not around.

- Packaging material may not be accessible to children!

1.12 Environmental protection and recycling

Disposal of packaging

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

Disposal of equipment and components

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

2 Technical data

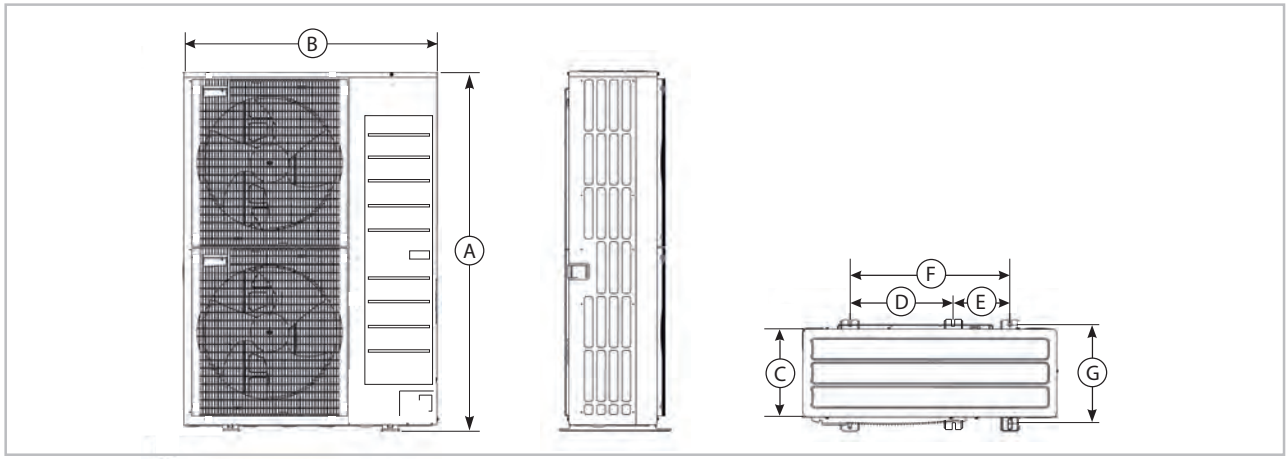
2.1 Unit data

Series		MVV 1200 DC	MVV 1600 DC	MVV 2000 DC
Operating mode		Inverter outdoor units for cooling and heating		
Number of outdoor units		1	1	1
Nominal cooling output [1]	kW	12.0[5] (5.76-12.43)	15.5[5] (7.75-16.33)	20.0[7] (9.23-21.53)
Nominal heat capacity [2]	kW	13.5[5] (6.60-15.53)	18.6[5] (8.30-20.13)	23.3[7] (10.52-25.43)
Operating range - outdoor unit - cooling	°C	-15 to +48		
Operating range - outdoor unit - heating	°C	-15 to +27		
Refrigerant		R410A [4]		
Energy efficiency ratio, cooling [1]		A[5]	A[5]	B[7]
Energy efficiency rating EER [1]		3.21[5]	3.29[5]	3.03[7]
Energy efficiency ratio, heating [2]		A[5]	A[5]	A[7]
Energy efficiency rating COP [2]		3.71[5]	3.75[5]	3.77[7]
Power consumption, annual, (500h) C/H		1870/1820	2355/2480	3295/3090
Operating pressure, max.	kPa	4200		
Air flow rate, max.	m³/h	6000		10800
Sound power level [3]	dB (A)	66/63	65/62	70/67
Sound pressure level, max. [3]	dB (A)	58/55	57/52	59/56
Power supply	V/Hz	400V / 3~ / N / Pe		
Enclosure class	IP	24		
Electrical rated power consumption, cooling [1]	kW	3.74	4.71	6.59
Electrical rated current consumpt., cooling [1]	A	5.51	6.94	13.80
Electrical rated power consumpt., heating [2]	kW	3.64	4.96	6.18
Electrical rated current consumpt., heating [2]	A	5.36	7.03	10.90
El. starting current, max.	A	10	12	15
El. power consumption, max.	kW	6.4	7.3	8.7
Compressor model		Rotary piston	Scroll	Scroll
Flow regulator		Electronic expansion valves		
Refrigerant, basic quantity	kg	3.30	3.90	4.80
Refrigerant, additional quantity	g/m	See operating manual *on page 27*		
Max. number of indoor units		7	8	10
Refrigerant connection, liquid pipe OU	Inches (mm)	3/8" (9.52)	3/8" (9.52)	3/8" (9.52)

Series		MVV 1200 DC	MVV 1600 DC	MVV 2000 DC
Refrigerant connection, suction pipe OU	Inches (mm)	5/8" (15.9)	3/4" (19.05)	3/4" (19.05)
Refrigerant piping, total length liquid pipe, max.	m	100		
Refrigerant piping, height difference bottom IU to top IU	m	8		
Refrigerant piping, height difference between OU top and IU	m	30		
Refrigerant piping, height difference between OU bottom and IU	m	20		
Refrigerant piping, length 1st distributor to IU max.	m	20		
Refrigerant piping, OU to furthest IU	m	60		
Dimensions - height/width/depth	mm	1295/900/315	1327/900/320	1560/1120/415
Weight	kg	95	102	137
Serial number		1226C8001	1227C8001	1239C8001
EDP no.		1623600	1623605	1623610

[1] Outside temperature TK 35°C / FK 24°C, max. air flow volume, 5m pipe length
[2] Outside temperature TK 7°C / FK 6°C, max. air flow volume, 5m pipe length [3] Distance 1m/5m free field
[4] Contains greenhouse gas per the Kyoto protocol, GWP 1975
[5] In combination with 1x indoor unit respectively from series MVW 281, MVW 361 and MVW 561
[6] In combination with 5x indoor units respectively from series MVW 221 and 1x MVW 451
[7] In combination with 5x indoor units respectively from series MVW 221 and 2x MVW 451

2.2 Unit dimensions MVV 1200-2000 DC



Measurements (mm)	A	B	C	D	E	F	G
MVV 1200 DC	1295	900	315	-	-	600	365
MVV 1600 DC	1327	900	320	-	-	600	365
MVV 2000 DC	1560	1120	415	665	205	870	495

2.3 Power data, cooling or heating mode

Power table MVV 1200 DC - cooling mode

		Luftansaugtemperatur Innengerät 16°C		Luftansaugtemperatur Innengerät 19°C		Luftansaugtemperatur Innengerät 22°C	
Anschlussleistung	Außentemperatur	Kälteleistung	Leistungsaufnahme	Kälteleistung	Leistungsaufnahme	Kälteleistung	Leistungsaufnahme
130%	10°C	12,56 kW	1,83 kW	15,13 kW	2,23 kW	15,69 kW	2,09 kW
	20°C	12,56 kW	2,11 kW	14,14 kW	2,45 kW	14,7 kW	2,48 kW
	25°C	12,56 kW	2,51 kW	13,63 kW	2,73 kW	14,23 kW	2,78 kW
	35°C	12,09 kW	3,26 kW	12,69 kW	3,32 kW	13,24 kW	3,37 kW
	44°C	11,46 kW	3,48 kW	12,05 kW	3,62 kW	12,27 kW	3,63 kW
120%	10°C	11,57 kW	1,67 kW	14,4 kW	2,15 kW	15,43 kW	2,15 kW
	20°C	11,57 kW	1,87 kW	13,93 kW	2,44 kW	14,44 kW	2,47 kW
	25°C	11,57 kW	2,23 kW	13,41 kW	2,72 kW	13,97 kW	2,75 kW
	35°C	11,57 kW	3,08 kW	12,43 kW	3,29 kW	12,99 kW	3,35 kW
	44°C	11,34 kW	3,53 kW	11,79 kW	3,57 kW	12,1 kW	3,61 kW
110%	10°C	10,63 kW	1,51 kW	13,2 kW	1,94 kW	15,13 kW	2,22 kW
	20°C	10,63 kW	1,66 kW	13,2 kW	2,27 kW	14,19 kW	2,45 kW
	25°C	10,63 kW	1,96 kW	13,2 kW	2,7 kW	13,67 kW	2,74 kW
	35°C	10,63 kW	2,71 kW	12,21 kW	3,27 kW	12,69 kW	3,32 kW
	44°C	10,63 kW	3,14 kW	11,58 kW	3,57 kW	11,98 kW	3,6 kW
100%	10°C	9,64 kW	1,36 kW	12 kW	1,74 kW	14,36 kW	2,14 kW
	20°C	9,64 kW	1,49 kW	12 kW	1,97 kW	13,89 kW	2,43 kW
	25°C	9,64 kW	1,72 kW	12 kW	2,34 kW	13,41 kW	2,72 kW
	35°C	9,64 kW	2,36 kW	12 kW	3,25 kW	12,43 kW	3,29 kW
	44°C	9,64 kW	2,93 kW	11,13 kW	3,58 kW	12,04 kW	3,66 kW
90%	10°C	8,7 kW	1,21 kW	10,8 kW	1,54 kW	12,9 kW	1,89 kW
	20°C	8,7 kW	1,33 kW	10,8 kW	1,69 kW	12,9 kW	2,19 kW
	25°C	8,7 kW	1,49 kW	10,8 kW	2,01 kW	12,9 kW	2,61 kW
	35°C	8,7 kW	2,04 kW	10,8 kW	2,78 kW	12,17 kW	3,27 kW
	44°C	8,7 kW	2,58 kW	10,8 kW	3,37 kW	11,61 kW	3,65 kW
80%	10°C	7,71 kW	1,06 kW	9,6 kW	1,35 kW	11,49 kW	1,65 kW
	20°C	7,71 kW	1,17 kW	9,6 kW	1,48 kW	11,49 kW	1,85 kW
	25°C	7,71 kW	1,27 kW	9,6 kW	1,7 kW	11,49 kW	2,19 kW
	35°C	7,71 kW	1,74 kW	9,6 kW	2,34 kW	11,49 kW	3,04 kW
	44°C	7,71 kW	2,01 kW	9,6 kW	2,79 kW	11,49 kW	3,59 kW
70%	10°C	6,77 kW	0,93 kW	8,4 kW	1,17 kW	10,03 kW	1,42 kW
	20°C	6,77 kW	1,01 kW	8,4 kW	1,27 kW	10,03 kW	1,56 kW
	25°C	6,77 kW	1,08 kW	8,4 kW	1,42 kW	10,03 kW	1,81 kW
	35°C	6,77 kW	1,46 kW	8,4 kW	1,94 kW	10,03 kW	2,5 kW
	44°C	6,77 kW	1,82 kW	8,4 kW	2,39 kW	10,03 kW	3,12 kW
60%	10°C	5,79 kW	0,8 kW	7,2 kW	0,99 kW	8,61 kW	1,2 kW
	20°C	5,79 kW	0,87 kW	7,2 kW	1,08 kW	8,61 kW	1,31 kW
	25°C	5,79 kW	0,9 kW	7,2 kW	1,16 kW	8,61 kW	1,47 kW
	35°C	5,79 kW	1,21 kW	7,2 kW	1,59 kW	8,61 kW	2,01 kW
	44°C	5,79 kW	1,52 kW	7,2 kW	1,94 kW	8,61 kW	2,54 kW
50%	10°C	4,84 kW	0,68 kW	6 kW	0,83 kW	7,16 kW	0,99 kW
	20°C	4,84 kW	0,73 kW	6 kW	0,89 kW	7,16 kW	1,07 kW
	25°C	4,84 kW	0,76 kW	6 kW	0,94 kW	7,16 kW	1,16 kW
	35°C	4,84 kW	0,99 kW	6 kW	1,26 kW	7,16 kW	1,58 kW
	44°C	4,84 kW	1,23 kW	6 kW	1,59 kW	7,16 kW	2,03 kW

Leistungsdaten unter Normnennbedingungen

Fig. 1: Power table MVV 1200 DC - cooling mode

Power table MVV 1200 DC - heating mode

		Luftansaugtemperatur Innengerät 16°C		Luftansaugtemperatur Innengerät 20°C		Luftansaugtemperatur Innengerät 24°C	
Anschlussleistung	Außentemperatur	Heizleistung	Leistungsaufnahme	Heizleistung	Leistungsaufnahme	Heizleistung	Leistungsaufnahme
130%	-20°C	8,55 kW	2,45 kW	8,47 kW	2,8 kW	8,42 kW	3,15 kW
	-10°C	10,23 kW	2,99 kW	10,14 kW	3,28 kW	10,1 kW	3,57 kW
	0°C	13,16 kW	3,6 kW	13,12 kW	3,82 kW	13,07 kW	4,04 kW
	7°C	15,67 kW	3,93 kW	15,63 kW	4,11 kW	14,96 kW	4,04 kW
	15°C	19,11 kW	4,24 kW	17,18 kW	3,73 kW	14,96 kW	3,16 kW
120%	-20°C	8,51 kW	2,69 kW	8,42 kW	3,01 kW	8,38 kW	3,33 kW
	-10°C	10,18 kW	3,19 kW	10,14 kW	3,45 kW	10,06 kW	3,72 kW
	0°C	13,12 kW	3,75 kW	13,07 kW	3,95 kW	13,03 kW	4,16 kW
	7°C	15,63 kW	4,05 kW	15,59 kW	4,22 kW	13,79 kW	3,66 kW
	15°C	17,89 kW	3,92 kW	15,84 kW	3,39 kW	13,79 kW	2,88 kW
110%	-20°C	8,46 kW	2,92 kW	8,38 kW	3,21 kW	8,34 kW	3,51 kW
	-10°C	10,14 kW	3,38 kW	10,1 kW	3,62 kW	10,06 kW	3,87 kW
	0°C	13,07 kW	3,89 kW	13,03 kW	4,08 kW	12,66 kW	4,1 kW
	7°C	15,59 kW	4,18 kW	14,54 kW	3,89 kW	12,66 kW	3,3 kW
	15°C	16,38 kW	3,33 kW	14,54 kW	3,06 kW	12,66 kW	2,61 kW
100%	-20°C	8,42 kW	3,15 kW	8,38 kW	3,42 kW	8,3 kW	3,69 kW
	-10°C	10,1 kW	3,57 kW	10,06 kW	3,79 kW	10,01 kW	4,02 kW
	0°C	13,03 kW	4,04 kW	12,99 kW	4,21 kW	11,52 kW	3,65 kW
	7°C	14,88 kW	4,02 kW	13,2 kW	3,47 kW	11,52 kW	2,95 kW
	15°C	14,88 kW	3,15 kW	13,2 kW	2,74 kW	11,52 kW	2,35 kW
90%	-20°C	8,37 kW	3,39 kW	8,32 kW	3,63 kW	8,28 kW	3,87 kW
	-10°C	10,04 kW	3,77 kW	10 kW	3,97 kW	9,96 kW	4,17 kW
	0°C	13,01 kW	4,2 kW	11,88 kW	3,79 kW	10,33 kW	3,21 kW
	7°C	13,39 kW	3,53 kW	11,88 kW	3,06 kW	10,33 kW	2,62 kW
	15°C	13,39 kW	2,79 kW	11,88 kW	2,44 kW	10,33 kW	2,1 kW
80%	-20°C	8,34 kW	3,62 kW	8,3 kW	3,83 kW	8,25 kW	4,05 kW
	-10°C	10,02 kW	3,96 kW	9,97 kW	4,14 kW	9,22 kW	3,83 kW
	0°C	11,9 kW	3,8 kW	10,56 kW	3,29 kW	9,22 kW	2,8 kW
	7°C	11,9 kW	3,07 kW	10,56 kW	2,68 kW	9,22 kW	2,3 kW
	15°C	11,9 kW	2,44 kW	10,56 kW	2,14 kW	9,22 kW	1,86 kW
70%	-20°C	8,28 kW	3,86 kW	8,24 kW	4,04 kW	8,03 kW	4,09 kW
	-10°C	9,95 kW	4,15 kW	9,24 kW	3,84 kW	8,03 kW	3,26 kW
	0°C	10,41 kW	3,24 kW	9,24 kW	2,82 kW	8,03 kW	2,42 kW
	7°C	10,41 kW	2,64 kW	9,24 kW	2,31 kW	8,03 kW	1,99 kW
	15°C	10,41 kW	2,11 kW	9,24 kW	1,86 kW	8,03 kW	1,62 kW
60%	-20°C	8,26 kW	4,09 kW	7,92 kW	4,01 kW	6,91 kW	3,39 kW
	-10°C	8,93 kW	3,69 kW	7,92 kW	3,19 kW	6,91 kW	2,73 kW
	0°C	8,93 kW	2,71 kW	7,92 kW	2,37 kW	6,91 kW	2,04 kW
	7°C	8,93 kW	2,23 kW	7,92 kW	1,96 kW	6,91 kW	1,7 kW
	15°C	8,93 kW	1,8 kW	7,92 kW	1,6 kW	6,91 kW	1,4 kW
50%	-20°C	7,44 kW	3,72 kW	6,6 kW	3,22 kW	5,72 kW	2,74 kW
	-10°C	7,44 kW	2,97 kW	6,6 kW	2,59 kW	5,72 kW	2,23 kW
	0°C	7,44 kW	2,22 kW	6,6 kW	1,95 kW	5,72 kW	1,69 kW
	7°C	7,44 kW	1,84 kW	6,6 kW	1,63 kW	5,72 kW	1,42 kW
	15°C	7,44 kW	1,5 kW	6,6 kW	1,34 kW	5,72 kW	1,18 kW

Leistungsdaten unter Normnennbedingungen

Fig. 2: Power table MVV 1200 DC - heating mode

REMKO MVV series

Power table MVV 1600 DC - cooling mode

		Luftansaugtemperatur Innengerät 16°C		Luftansaugtemperatur Innengerät 19°C		Luftansaugtemperatur Innengerät 22°C	
Anschlussleistung	Außentemperatur	Kälteleistung	Leistungsaufnahme	Kälteleistung	Leistungsaufnahme	Kälteleistung	Leistungsaufnahme
130%	10°C	16,22 kW	2,55 kW	19,54 kW	3,09 kW	20,26 kW	2,91 kW
	20°C	16,22 kW	2,93 kW	18,27 kW	3,41 kW	18,99 kW	3,45 kW
	25°C	16,22 kW	3,48 kW	17,6 kW	3,8 kW	18,38 kW	3,86 kW
	35°C	15,61 kW	4,53 kW	16,39 kW	4,61 kW	17,1 kW	4,69 kW
	44°C	14,8 kW	4,84 kW	15,56 kW	5,03 kW	15,84 kW	5,05 kW
120%	10°C	14,95 kW	2,32 kW	18,6 kW	2,98 kW	19,93 kW	2,99 kW
	20°C	14,95 kW	2,61 kW	17,99 kW	3,39 kW	18,66 kW	3,43 kW
	25°C	14,95 kW	3,09 kW	17,33 kW	3,78 kW	18,05 kW	3,83 kW
	35°C	14,95 kW	4,29 kW	16,05 kW	4,58 kW	16,77 kW	4,65 kW
	44°C	14,65 kW	4,92 kW	15,23 kW	4,97 kW	15,63 kW	5,03 kW
110%	10°C	13,73 kW	2,1 kW	17,05 kW	2,7 kW	19,54 kW	3,08 kW
	20°C	13,73 kW	2,31 kW	17,05 kW	3,16 kW	18,32 kW	3,41 kW
	25°C	13,73 kW	2,73 kW	17,05 kW	3,76 kW	17,66 kW	3,81 kW
	35°C	13,73 kW	3,77 kW	15,78 kW	4,55 kW	16,39 kW	4,62 kW
	44°C	13,73 kW	4,37 kW	14,96 kW	4,96 kW	15,47 kW	5,01 kW
100%	10°C	12,46 kW	1,89 kW	15,5 kW	2,42 kW	18,54 kW	2,97 kW
	20°C	12,46 kW	2,08 kW	15,5 kW	2,74 kW	17,94 kW	3,38 kW
	25°C	12,46 kW	2,39 kW	15,5 kW	3,26 kW	17,33 kW	3,78 kW
	35°C	12,46 kW	3,28 kW	15,5 kW	4,52 kW	16,05 kW	4,58 kW
	44°C	12,46 kW	4,08 kW	14,38 kW	4,97 kW	15,56 kW	5,08 kW
90%	10°C	11,24 kW	1,68 kW	13,95 kW	2,14 kW	16,66 kW	2,63 kW
	20°C	11,24 kW	1,85 kW	13,95 kW	2,36 kW	16,66 kW	3,05 kW
	25°C	11,24 kW	2,07 kW	13,95 kW	2,8 kW	16,66 kW	3,63 kW
	35°C	11,24 kW	2,83 kW	13,95 kW	3,86 kW	15,72 kW	4,54 kW
	44°C	11,24 kW	3,59 kW	13,95 kW	4,69 kW	15 kW	5,08 kW
80%	10°C	9,96 kW	1,48 kW	12,4 kW	1,88 kW	14,84 kW	2,3 kW
	20°C	9,96 kW	1,62 kW	12,4 kW	2,06 kW	14,84 kW	2,57 kW
	25°C	9,96 kW	1,77 kW	12,4 kW	2,37 kW	14,84 kW	3,05 kW
	35°C	9,96 kW	2,42 kW	12,4 kW	3,25 kW	14,84 kW	4,22 kW
	44°C	9,96 kW	2,8 kW	12,4 kW	3,88 kW	14,84 kW	4,99 kW
70%	10°C	8,75 kW	1,29 kW	10,85 kW	1,62 kW	12,95 kW	1,97 kW
	20°C	8,75 kW	1,41 kW	10,85 kW	1,77 kW	12,95 kW	2,17 kW
	25°C	8,75 kW	1,5 kW	10,85 kW	1,98 kW	12,95 kW	2,52 kW
	35°C	8,75 kW	2,03 kW	10,85 kW	2,7 kW	12,95 kW	3,47 kW
	44°C	8,75 kW	2,53 kW	10,85 kW	3,32 kW	12,95 kW	4,33 kW
60%	10°C	7,47 kW	1,11 kW	9,3 kW	1,38 kW	11,13 kW	1,66 kW
	20°C	7,47 kW	1,21 kW	9,3 kW	1,5 kW	11,13 kW	1,82 kW
	25°C	7,47 kW	1,25 kW	3,9 kW	1,62 kW	11,13 kW	2,04 kW
	35°C	7,47 kW	1,69 kW	9,3 kW	2,2 kW	11,13 kW	2,8 kW
	44°C	7,47 kW	2,11 kW	9,3 kW	2,7 kW	11,13 kW	3,53 kW
50%	10°C	6,26 kW	0,94 kW	7,75 kW	1,15 kW	9,24 kW	1,37 kW
	20°C	6,26 kW	1,01 kW	7,75 kW	1,24 kW	9,24 kW	1,49 kW
	25°C	6,26 kW	1,05 kW	7,75 kW	1,3 kW	9,24 kW	1,61 kW
	35°C	6,26 kW	1,37 kW	7,75 kW	1,75 kW	9,24 kW	2,19 kW
	44°C	6,26 kW	1,7 kW	7,75 kW	2,21 kW	9,24 kW	2,82 kW

Leistungsdaten unter Normnennbedingungen

Fig. 3: Power table MVV 1600 DC - cooling mode

Power table MVV 1600 DC - heating mode

		Luftansaugtemperatur Innengerät 16°C		Luftansaugtemperatur Innengerät 20°C		Luftansaugtemperatur Innengerät 24°C	
Anschlussleistung	Außentemperatur	Heizleistung	Leistungsaufnahme	Heizleistung	Leistungsaufnahme	Heizleistung	Leistungsaufnahme
130%	-20°C	11,01 kW	3,37 kW	10,9 kW	3,85 kW	10,85 kW	4,32 kW
	-10°C	13,17 kW	4,11 kW	13,06 kW	4,51 kW	13,01 kW	4,91 kW
	0°C	16,95 kW	4,94 kW	16,89 kW	5,25 kW	16,84 kW	5,55 kW
	7°C	20,18 kW	5,4 kW	20,13 kW	5,66 kW	19,27 kW	5,55 kW
	15°C	24,61 kW	5,83 kW	22,13 kW	5,13 kW	19,27 kW	4,35 kW
120%	-20°C	10,96 kW	3,69 kW	10,85 kW	4,13 kW	10,79 kW	4,57 kW
	-10°C	13,11 kW	4,38 kW	13,06 kW	4,75 kW	12,95 kW	5,11 kW
	0°C	16,89 kW	5,15 kW	16,84 kW	5,43 kW	16,78 kW	5,71 kW
	7°C	20,13 kW	5,57 kW	20,08 kW	5,8 kW	17,76 kW	5,04 kW
	15°C	23,04 kW	5,39 kW	20,4 kW	4,66 kW	17,76 kW	3,96 kW
110%	-20°C	10,9 kW	4,01 kW	10,79 kW	4,42 kW	10,74 kW	4,82 kW
	-10°C	13,06 kW	4,65 kW	13,01 kW	4,98 kW	12,95 kW	5,32 kW
	0°C	16,84 kW	5,35 kW	16,79 kW	5,61 kW	16,3 kW	5,63 kW
	7°C	20,08 kW	5,74 kW	18,73 kW	5,35 kW	16,3 kW	4,53 kW
	15°C	21,1 kW	4,57 kW	18,73 kW	4,21 kW	16,3 kW	3,59 kW
100%	-20°C	10,85 kW	4,34 kW	10,79 kW	4,7 kW	10,69 kW	5,07 kW
	-10°C	13,01 kW	4,91 kW	12,95 kW	5,22 kW	12,9 kW	5,52 kW
	0°C	16,78 kW	5,56 kW	16,73 kW	5,79 kW	14,84 kW	5,01 kW
	7°C	19,16 kW	5,53 kW	17 kW	4,77 kW	14,84 kW	4,06 kW
	15°C	19,16 kW	4,33 kW	17 kW	3,77 kW	14,84 kW	3,23 kW
90%	-20°C	10,77 kW	4,66 kW	10,72 kW	4,99 kW	10,67 kW	5,32 kW
	-10°C	12,93 kW	5,18 kW	12,87 kW	5,45 kW	12,82 kW	5,73 kW
	0°C	16,76 kW	5,77 kW	15,3 kW	5,21 kW	13,31 kW	4,42 kW
	7°C	17,24 kW	4,86 kW	15,3 kW	4,21 kW	13,31 kW	3,6 kW
	15°C	17,24 kW	3,83 kW	15,3 kW	3,35 kW	13,31 kW	2,89 kW
80%	-20°C	10,74 kW	4,98 kW	10,69 kW	5,27 kW	10,63 kW	5,56 kW
	-10°C	12,9 kW	5,45 kW	12,84 kW	5,69 kW	11,87 kW	5,26 kW
	0°C	15,33 kW	5,23 kW	13,6 kW	4,52 kW	11,87 kW	3,85 kW
	7°C	15,33 kW	4,22 kW	13,6 kW	3,68 kW	11,87 kW	3,16 kW
	15°C	15,33 kW	3,36 kW	13,6 kW	2,95 kW	11,87 kW	2,55 kW
70%	-20°C	10,66 kW	5,3 kW	10,61 kW	5,56 kW	10,34 kW	5,62 kW
	-10°C	12,82 kW	5,71 kW	11,9 kW	5,28 kW	10,34 kW	4,48 kW
	0°C	13,41 kW	4,45 kW	11,9 kW	3,87 kW	10,34 kW	3,32 kW
	7°C	13,41 kW	3,63 kW	11,9 kW	3,17 kW	10,34 kW	2,74 kW
	15°C	13,41 kW	2,91 kW	11,9 kW	2,56 kW	10,34 kW	2,23 kW
60%	-20°C	10,63 kW	5,62 kW	10,2 kW	5,51 kW	8,9 kW	4,66 kW
	-10°C	11,5 kW	5,07 kW	10,2 kW	4,39 kW	8,9 kW	3,75 kW
	0°C	11,5 kW	3,73 kW	10,2 kW	3,26 kW	8,9 kW	2,81 kW
	7°C	11,5 kW	3,06 kW	10,2 kW	2,69 kW	8,9 kW	2,34 kW
	15°C	11,5 kW	2,48 kW	10,2 kW	2,19 kW	8,9 kW	1,92 kW
50%	-20°C	9,58 kW	5,12 kW	8,5 kW	4,42 kW	7,37 kW	3,77 kW
	-10°C	9,58 kW	4,09 kW	8,5 kW	3,56 kW	7,37 kW	3,06 kW
	0°C	9,58 kW	3,05 kW	8,5 kW	2,68 kW	7,37 kW	2,33 kW
	7°C	9,58 kW	2,53 kW	8,5 kW	2,24 kW	7,37 kW	1,96 kW
	15°C	9,58 kW	2,06 kW	8,5 kW	1,84 kW	7,37 kW	1,62 kW

Leistungsdaten unter Normnennbedingungen

Fig. 4: Power table MVV 1600 DC - heating mode

REMKO MVV series

Power table MVV 2000 DC - cooling mode

		Luftansaugtemperatur Innengerät 16°C		Luftansaugtemperatur Innengerät 19°C		Luftansaugtemperatur Innengerät 22°C	
Anschlussleistung	Außentemperatur	Kälteleistung	Leistungsaufnahme	Kälteleistung	Leistungsaufnahme	Kälteleistung	Leistungsaufnahme
130%	10°C	20,93 kW	3,74 kW	25,21 kW	4,54 kW	26,14 kW	4,26 kW
	20°C	20,93 kW	4,3 kW	23,57 kW	4,99 kW	24,5 kW	5,07 kW
	25°C	20,93 kW	5,11 kW	22,71 kW	5,58 kW	23,71 kW	5,67 kW
	35°C	20,14 kW	6,65 kW	21,14 kW	6,76 kW	22,07 kW	6,88 kW
	44°C	19,1 kW	7,1 kW	20,08 kW	7,38 kW	20,44 kW	7,41 kW
120%	10°C	19,28 kW	3,4 kW	24 kW	4,38 kW	25,71 kW	4,39 kW
	20°C	19,28 kW	3,82 kW	23,21 kW	4,97 kW	24,07 kW	5,03 kW
	25°C	19,28 kW	4,54 kW	22,36 kW	5,54 kW	23,28 kW	5,62 kW
	35°C	19,28 kW	6,29 kW	20,71 kW	6,72 kW	21,64 kW	6,83 kW
	44°C	19,28 kW	7,21 kW	19,66 kW	7,29 kW	20,17 kW	7,37 kW
110%	10°C	17,72 kW	3,08 kW	22 kW	3,96 kW	25,22 kW	4,52 kW
	20°C	17,72 kW	3,4 kW	22 kW	4,63 kW	23,64 kW	4,99 kW
	25°C	17,72 kW	4 kW	22 kW	5,51 kW	22,79 kW	5,59 kW
	35°C	17,72 kW	5,53 kW	20,36 kW	6,68 kW	21,14 kW	6,77 kW
	44°C	17,72 kW	6,41 kW	19,31 kW	7,28 kW	19,97 kW	7,34 kW
100%	10°C	16,07 kW	2,77 kW	20 kW	3,55 kW	23,93 kW	4,36 kW
	20°C	16,07 kW	3,05 kW	20 kW	4,02 kW	23,14 kW	4,96 kW
	25°C	16,07 kW	3,5 kW	20 kW	4,78 kW	22,36 kW	5,54 kW
	35°C	16,07 kW	4,82 kW	20 kW	6,63 kW	20,71 kW	6,72 kW
	44°C	16,07 kW	5,98 kW	18,56 kW	7,29 kW	20,07 kW	7,46 kW
90%	10°C	14,5 kW	2,47 kW	18 kW	3,15 kW	21,5 kW	3,86 kW
	20°C	14,5 kW	2,71 kW	18 kW	3,46 kW	21,5 kW	4,48 kW
	25°C	14,5 kW	3,04 kW	18 kW	4,1 kW	21,5 kW	5,33 kW
	35°C	14,5 kW	4,15 kW	18 kW	5,66 kW	20,29 kW	6,67 kW
	44°C	14,5 kW	5,27 kW	18 kW	6,88 kW	19,35 kW	7,45 kW
80%	10°C	12,86 kW	2,17 kW	16 kW	2,75 kW	19,14 kW	3,37 kW
	20°C	12,86 kW	2,38 kW	16 kW	3,02 kW	19,14 kW	3,77 kW
	25°C	12,86 kW	2,6 kW	16 kW	3,48 kW	19,14 kW	4,48 kW
	35°C	12,86 kW	3,55 kW	16 kW	4,77 kW	19,14 kW	6,19 kW
	44°C	12,86 kW	4,11 kW	16 kW	5,69 kW	19,14 kW	7,32 kW
70%	10°C	11,29 kW	1,89 kW	14 kW	2,38 kW	16,71 kW	2,9 kW
	20°C	11,29 kW	2,06 kW	14 kW	2,6 kW	16,71 kW	3,18 kW
	25°C	11,29 kW	2,21 kW	14 kW	2,9 kW	16,71 kW	3,7 kW
	35°C	11,29 kW	2,98 kW	14 kW	3,97 kW	16,71 kW	5,09 kW
	44°C	11,29 kW	3,71 kW	14 kW	4,87 kW	16,71 kW	6,36 kW
60%	10°C	9,64 kW	1,63 kW	12 kW	2,02 kW	14,36 kW	2,44 kW
	20°C	9,64 kW	1,77 kW	12 kW	2,21 kW	14,36 kW	2,67 kW
	25°C	9,64 kW	1,84 kW	12 kW	2,38 kW	14,36 kW	2,99 kW
	35°C	9,64 kW	2,47 kW	12 kW	3,23 kW	14,36 kW	4,1 kW
	44°C	9,64 kW	3,09 kW	12 kW	3,96 kW	14,36 kW	5,18 kW
50%	10°C	8,07 kW	1,38 kW	10 kW	1,69 kW	11,93 kW	2,01 kW
	20°C	8,07 kW	1,48 kW	10 kW	1,82 kW	11,93 kW	2,19 kW
	25°C	8,07 kW	1,55 kW	10 kW	1,91 kW	11,93 kW	2,37 kW
	35°C	8,07 kW	2,01 kW	10 kW	2,57 kW	11,93 kW	3,22 kW
	44°C	8,07 kW	2,5 kW	10 kW	3,25 kW	11,93 kW	4,13 kW

Leistungsdaten unter Normnennbedingungen

Fig. 5: Power table MVV 2000 DC - cooling mode

Power table MVV 2000 DC - heating mode

		Luftansaugtemperatur Innengerät 16°C		Luftansaugtemperatur Innengerät 20°C		Luftansaugtemperatur Innengerät 24°C	
Anschlussleistung	Außentemperatur	Heizleistung	Leistungsaufnahme	Heizleistung	Leistungsaufnahme	Heizleistung	Leistungsaufnahme
130%	-19,8°C	14,25 kW	4,2 kW	14,11 kW	4,8 kW	14,04 kW	5,39 kW
	-9,8°C	17,04 kW	5,13 kW	16,9 kW	5,63 kW	16,83 kW	6,12 kW
	0°C	21,93 kW	6,17 kW	21,86 kW	6,54 kW	21,79 kW	6,92 kW
	7°C	26,12 kW	6,74 kW	26,05 kW	7,05 kW	24,93 kW	6,92 kW
	15°C	31,85 kW	7,27 kW	28,63 kW	6,4 kW	24,93 kW	5,42 kW
120%	-19,8°C	14,18 kW	4,61 kW	14,04 kW	5,15 kW	13,97 kW	5,7 kW
	-9,8°C	16,97 kW	5,46 kW	16,9 kW	5,92 kW	16,76 kW	6,38 kW
	0°C	21,86 kW	6,42 kW	24,79 kW	6,77 kW	21,72 kW	7,12 kW
	7°C	26,05 kW	6,95 kW	25,98 kW	7,24 kW	22,98 kW	6,28 kW
	15°C	29,82 kW	6,72 kW	26,4 kW	5,81 kW	22,98 kW	4,95 kW
110%	-19,8°C	14,11 kW	5,01 kW	13,97 kW	5,51 kW	13,9 kW	6,01 kW
	-9,8°C	16,9 kW	5,8 kW	16,83 kW	6,21 kW	16,76 kW	6,63 kW
	0°C	21,79 kW	6,68 kW	21,72 kW	7 kW	21,09 kW	7,02 kW
	7°C	25,98 kW	7,16 kW	24,24 kW	6,68 kW	21,09 kW	5,66 kW
	15°C	27,31 kW	5,7 kW	24,24 kW	5,25 kW	21,09 kW	4,48 kW
100%	-19,8°C	14,04 kW	5,41 kW	13,97 kW	5,86 kW	13,83 kW	6,32 kW
	-9,8°C	16,83 kW	6,13 kW	16,76 kW	6,51 kW	16,69 kW	6,88 kW
	0°C	21,72 kW	6,93 kW	21,65 kW	7,23 kW	19,21 kW	6,25 kW
	7°C	24,79 kW	6,89 kW	22 kW	5,95 kW	19,21 kW	5,06 kW
	15°C	24,79 kW	5,4 kW	22 kW	4,7 kW	19,21 kW	4,03 kW
90%	-19,8°C	13,94 kW	5,81 kW	13,87 kW	6,22 kW	13,8 kW	6,63 kW
	-9,8°C	16,73 kW	6,46 kW	16,66 kW	6,8 kW	16,59 kW	7,15 kW
	0°C	21,68 kW	7,19 kW	19,8 kW	6,5 kW	17,22 kW	5,51 kW
	7°C	22,31 kW	6,06 kW	19,8 kW	5,25 kW	17,22 kW	4,49 kW
	15°C	22,31 kW	4,78 kW	19,8 kW	4,18 kW	17,22 kW	3,6 kW
80%	-19,8°C	13,9 kW	6,21 kW	13,83 kW	6,58 kW	13,76 kW	6,94 kW
	-9,8°C	16,69 kW	6,79 kW	16,62 kW	7,1 kW	15,36 kW	6,56 kW
	0°C	19,84 kW	6,52 kW	17,6 kW	5,64 kW	15,36 kW	4,81 kW
	7°C	19,84 kW	5,27 kW	17,6 kW	4,59 kW	15,36 kW	3,94 kW
	15°C	19,84 kW	4,19 kW	17,6 kW	3,68 kW	15,36 kW	3,18 kW
70%	-19,8°C	13,8 kW	6,61 kW	13,73 kW	6,93 kW	13,38 kW	7,02 kW
	-9,8°C	16,58 kW	7,12 kW	15,4 kW	6,59 kW	13,38 kW	5,59 kW
	0°C	17,35 kW	5,56 kW	15,4 kW	4,83 kW	13,38 kW	4,14 kW
	7°C	17,35 kW	4,53 kW	15,4 kW	3,96 kW	13,38 kW	3,42 kW
	15°C	17,35 kW	3,62 kW	15,4 kW	3,19 kW	13,38 kW	2,78 kW
60%	-19,8°C	13,76 kW	7,02 kW	13,2 kW	6,88 kW	11,52 kW	5,82 kW
	-9,8°C	14,88 kW	6,33 kW	13,2 kW	5,48 kW	11,52 kW	4,67 kW
	0°C	14,88 kW	4,65 kW	13,2 kW	4,06 kW	11,52 kW	3,5 kW
	7°C	14,88 kW	3,82 kW	13,2 kW	3,35 kW	11,52 kW	2,91 kW
	15°C	14,88 kW	3,09 kW	13,2 kW	2,74 kW	11,52 kW	2,4 kW
50%	-19,8°C	12,39 kW	6,38 kW	11 kW	5,52 kW	9,54 kW	4,71 kW
	-9,8°C	12,39 kW	5,1 kW	11 kW	4,44 kW	9,54 kW	3,82 kW
	0°C	12,39 kW	3,8 kW	11 kW	3,35 kW	9,54 kW	2,91 kW
	7°C	12,39 kW	3,15 kW	11 kW	2,79 kW	9,54 kW	2,44 kW
	15°C	12,39 kW	2,57 kW	11 kW	2,29 kW	9,54 kW	2,02 kW

Leistungsdaten unter Normnennbedingungen

Fig. 6: Power table MVV 2000 DC - heating mode

3 Design and function

3.1 Unit description

In cooling mode, the MVV outdoor unit (OU) serves to output the heat extracted by the indoor unit (IU) from the room being cooled. In heating mode, the heat taken up by the outdoor unit can be discharged by the indoor unit into the room to be heated. In both operating modes, the output produced by the compressor precisely matches requirements, and thereby regulates the nominal temperature with minimal temperature deviations. This "inverter technology" results in energy savings over conventional split systems and also reduces noise emissions to a particularly low level. The outdoor unit can be installed in an outdoor area or, providing that certain requirements are met, an indoor area. The indoor units are designed to be mounted high up on the wall, in an indoor area (MVW) or for installation in suspended ceilings (MVD) and are equipped with an electronic flow regulator. The outdoor unit can be combined with REMKO indoor units from the series MVW and MVD that provide sufficient cooling capacity (see ↳ *Chapter 2.1 'Unit data' on page 8*). No more than 130% of the nominal cooling output of the indoor unit output may be installed. Operation takes place as standard via an infra-red remote control. The outdoor unit consists of a cycle with a compressor, fin condenser, electronic expansion valve and a condenser fan. The outdoor unit cooling cycle is controlled by the controller of the indoor unit. In order to enable operation of the unit at low outside temperatures, a thermal condenser pressure regulator serves as winter fan speed control to regulate the speed of the condenser fan.

Refrigerant piping and distributors are used to establish the connection between the indoor unit and the outdoor unit.

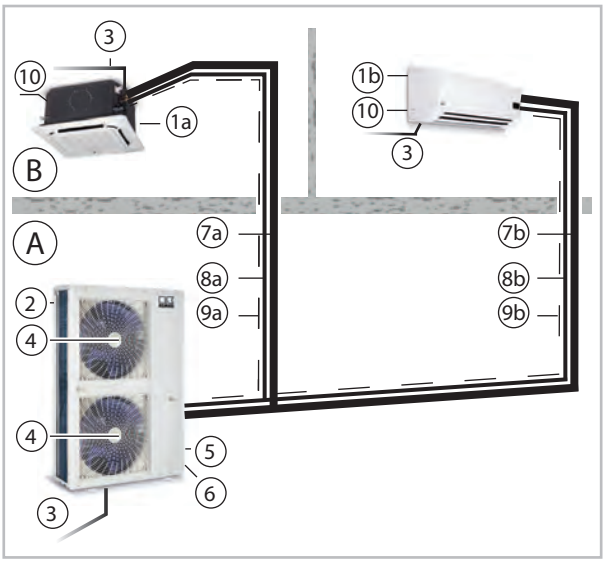


Fig. 7: System layout

A: Outdoor area
B: Indoor area
1 a,b: Indoor units
2: Outdoor unit
3: Condensate drainage line
4: Condenser fan
5: Outdoor unit power supply
6: Shut-off valve
7 a,b: Suction pipes
8 a,b: Liquid pipes
9 a,b: Control lines
10: Power supply to indoor units

System layout

The indoor units of unit series MVW / MVD must always be connected to a Y-distributor or a 4-fold distributor.

A maximum of 4Y distributors may be used per outdoor unit and liquid or suction pipe.

With the installation of more than **one** indoor unit per level, a 4-fold distributor must be used in order to distribute the refrigerant.

Exception: Installation of 2 indoor units at the end of the main line.

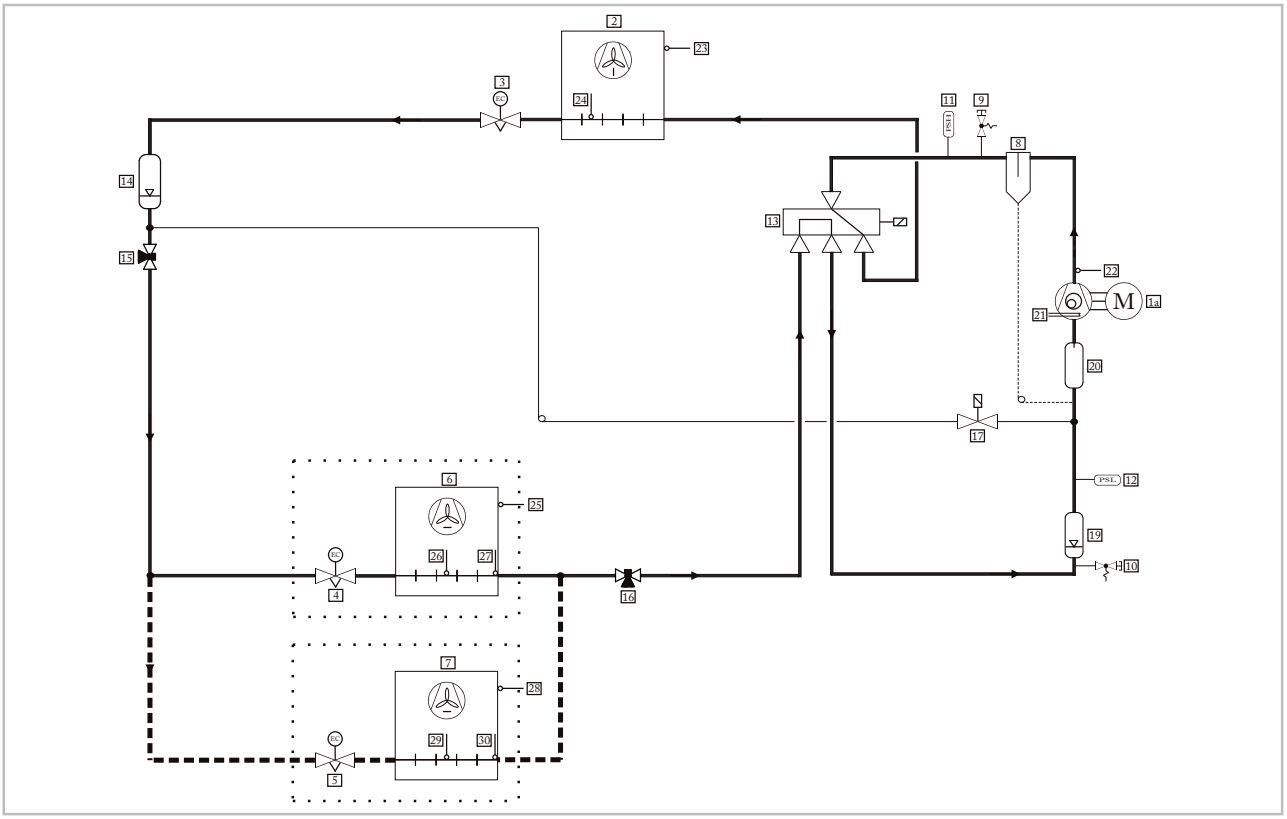


Fig. 8: Cooling cycle schematic MVV 1200 DC (see next page for legend)

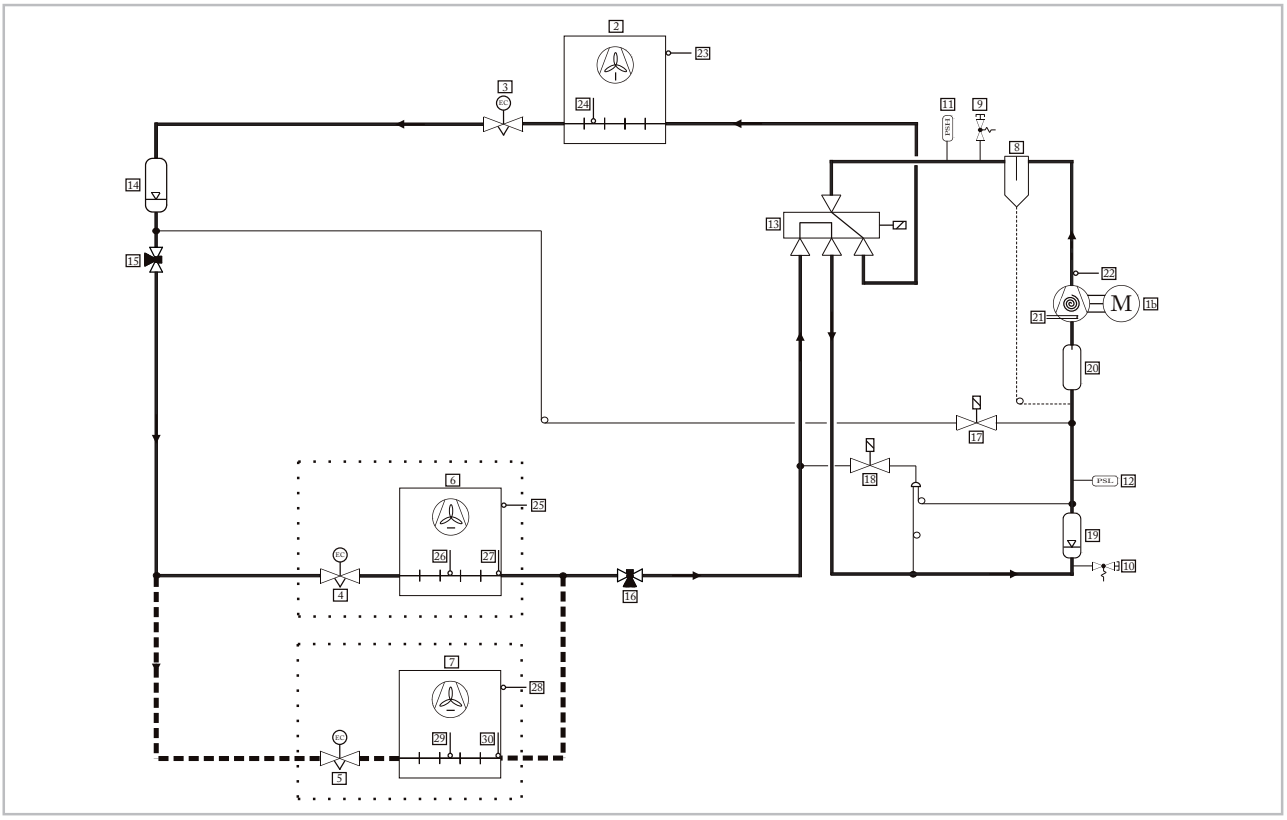


Fig. 9: Cooling cycle schematic MVV 1600 DC (see next page for legend)

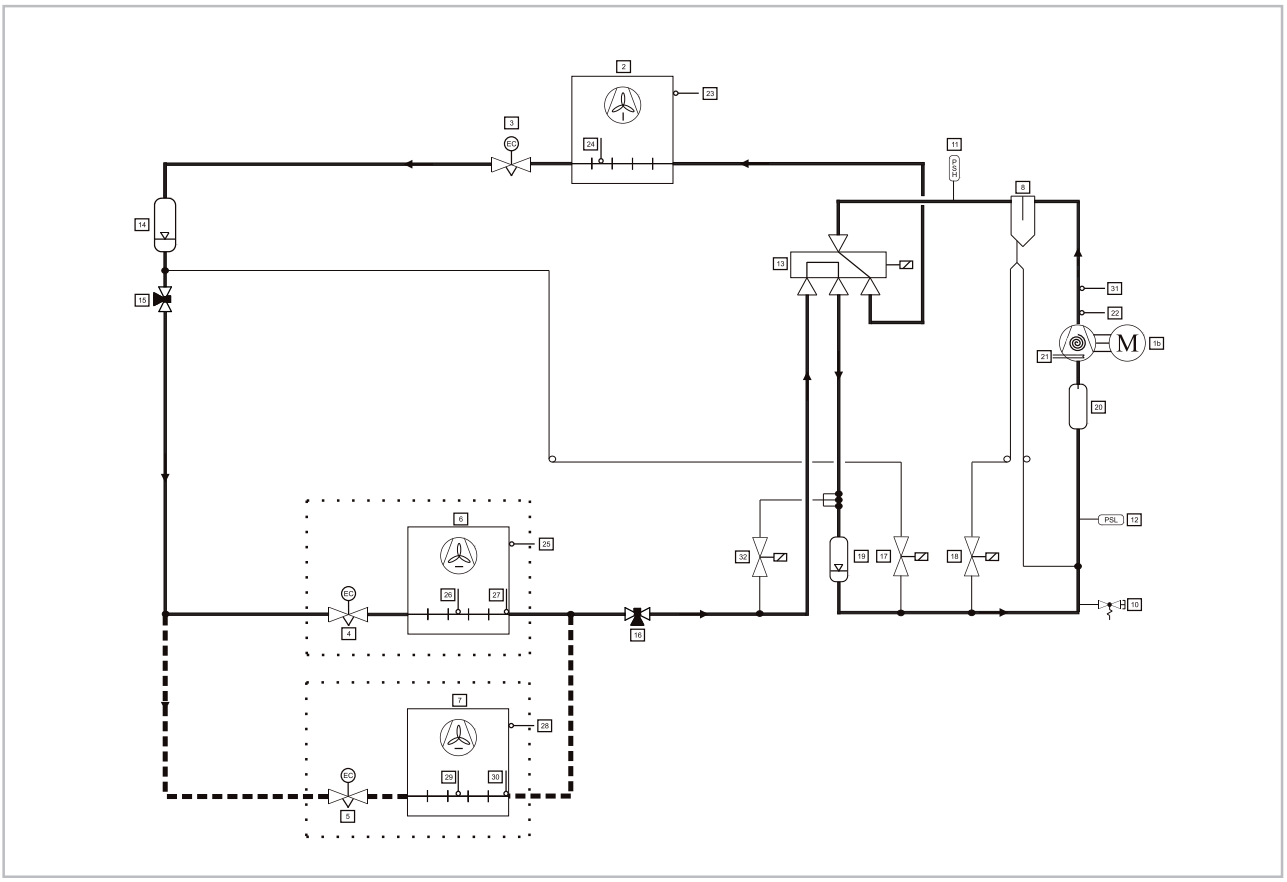


Fig. 10: Cooling cycle schematic MVV 2000 DC

1a: Rotary piston condenser
1b: Scroll condenser
2: Condenser, outdoor unit
3: Elec. expansion valve, heating
4: Elec. expansion valve, indoor unit 1
5: Elec. expansion valve, indoor unit 2
6: Evaporator indoor unit 1
7: Evaporator indoor unit 2
8: Oil separator
9: High pressure service valve
10: Low pressure service valve
11: High pressure monitor
12: Low pressure monitor
13: 4-way valve SV4 cooling/heating
14: Refrigerant collector
15: Shut-off valve FL
16: Shut-off valve SL
17: Re-injection valve SV6/SV2 (heating mode, t_a<3°C and f>52Hz)
18: Heat gas bypass valve SV5/SV4 (t_5>105°C)
19: ND collector
20: Liquid separator
21: Crankcase heating
22: Probe, heat gas T5 outdoor unit
23: Probe, ambient air T4 outdoor unit
24: Probe, condenser register T3 outdoor unit
25: Probe, ambient air T1 indoor unit 1
26: Probe, evaporator register centre T2(A) indoor unit 1
27: Probe, evaporator register outlet T2B indoor unit 1
28: Probe, ambient air T1 indoor unit 2
29: Probe, evaporator register centre T2(A) indoor unit 2
30: Probe, evaporator register outlet T2B indoor unit 2
31: Probe, heat gas PSH
32: Solenoid valve CN27

3.2 Combinations

The indoor units from the series MVD and MVW can be used together with the MVV series outdoor units.

Selection of the indoor units to be connected takes place solely according to the maximum refrigerating capacity of all indoor units to be connected. Max. 130%.

The power factor takes into account the fact that all indoor units are never required to deliver 100% capacity at the same time.

The design of the system and the inclusion of the power factor must always take place with consideration to the local conditions!

Outdoor unit Type	Power	Power factor	Maximum refrigerating capacity of the indoor units to be connected
MVV 1200 DC	12.0 kW	130 %	15.6 kW
MVV 1600 DC	15.5 kW	130 %	20.2 kW
MVV 2000 DC	20.0 kW	130 %	26.0 kW
MVV 1200 DC Duo	2x12.0 KW	130 %	2 x 15.6 kW
MVV 1600 DC Duo	2x15.5 kW	130 %	2 x 20.2 kW
MVV 2000 DC Duo	2x20.0 kW	130 %	2 x 26.0 kW

In the following you will find example installations for the MVV series with the indoor units from the MVD series and MVW

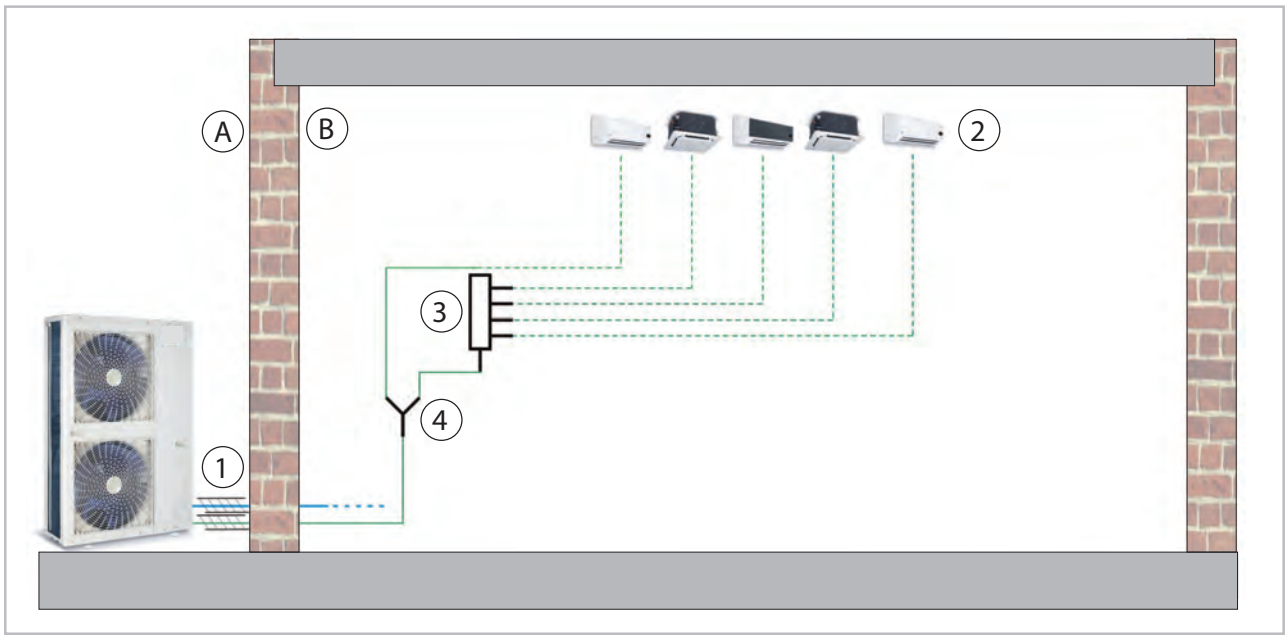


Fig. 11: connection possibilities on one level

A: Outdoor area
B: Indoor area
1: Outdoor unit
2: Indoor units of the series MVD or MVW
3: Distributor
4: Y-distributor

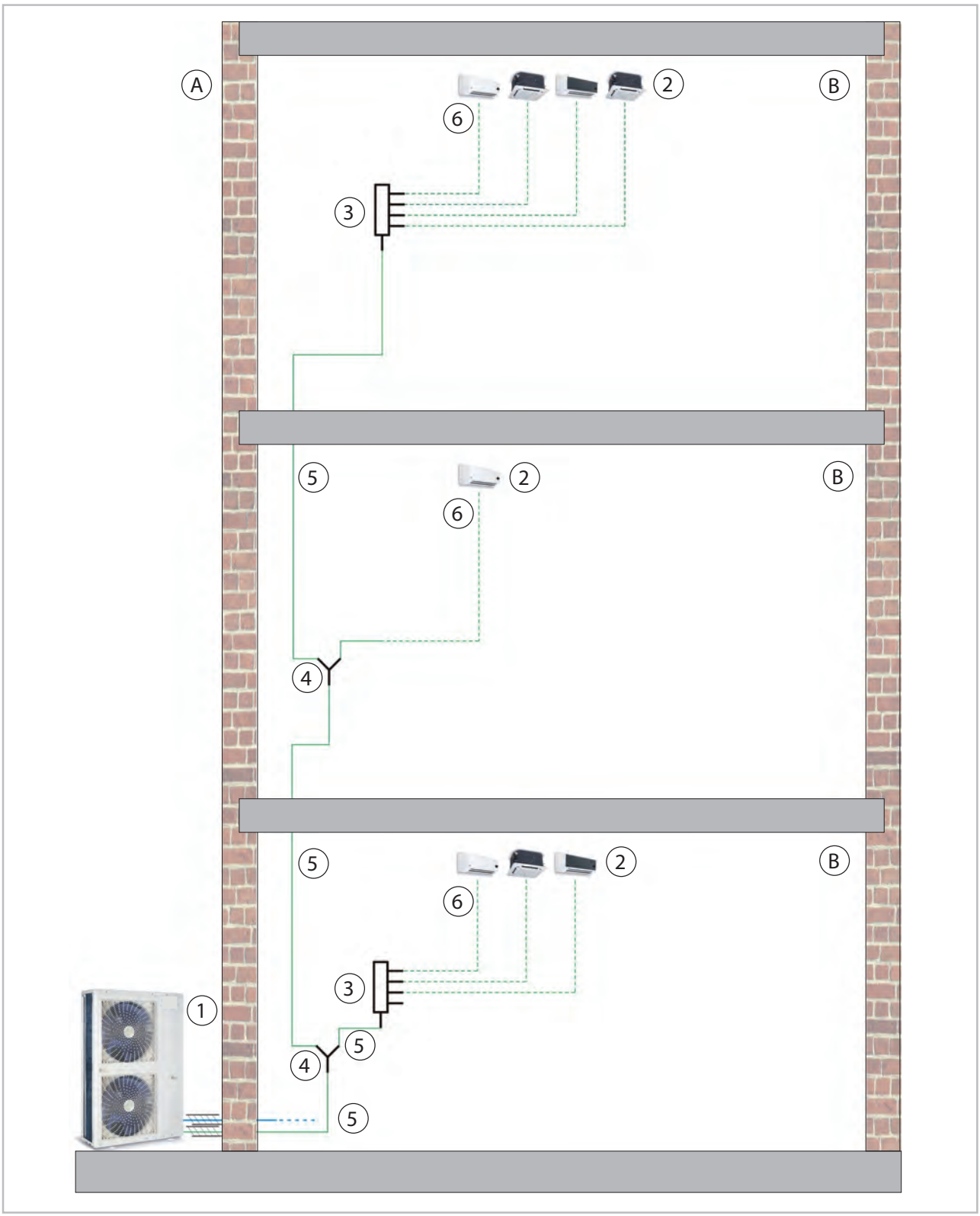


Fig. 12: Connection possibilities on multiple levels

A: Outdoor area
B: Indoor area
1: Outdoor unit
2: Indoor units of the series MVD or MVW
3: Distributor
4: Y-distributor
5: Main line
6: Ancillary line

4 Operation

The compressor in the outdoor unit is operated by means of regulating the control board in the outdoor unit. The chapter on "Regulation" in the manual for the outdoor unit must therefore be observed.

Help save on energy consumption in stand-by mode! If the device, system or component is not in use, we recommend disconnecting the power supply. Components with a safety function is excluded from our recommendation!

5 Installation instructions for qualified personnel

5.1 Important notes prior to installation

- Observe the operating manuals for the indoor unit and the outdoor unit when installing the entire system.
- Transport the unit in its original packaging as close as possible to the installation location. You avoid transport damage by doing so.
- Check the contents of the packaging for completeness and check the unit for visible transport damage. Report any damage immediately to your contractual partner and the shipping company.
- Lift the unit on the corners and not on the refrigerant or condensate drainage connections.
- The refrigerant piping (liquid and suction pipe), valves and connections must be insulated to make them vapour diffusion proof. If necessary also insulate the condensate drainage line.
- Select an installation location which allows air to freely flow through the air inlet and outlet (see *Chapter 5.5 'Minimum clearances' on page 24*).
- Do not install the unit in the immediate vicinity of devices which generate intensive thermal radiation. Installation in the vicinity of thermal radiation reduces the unit output.
- Only open the shut-off valves on the refrigerant piping after installation is complete.
- Seal off open refrigerant piping with suitable caps or adhesive strips to prevent the infiltration of moisture and never kink or compress the refrigerant piping.
- Avoid unnecessary bends. This minimises the pressure loss in the refrigerant piping and ensures that the compressor oil can flow back without obstruction.
- Only use the union nuts supplied with the refrigerant piping. These should only be removed shortly before connecting the refrigerant piping.
- Install all electrical wiring in accordance with applicable DIN and VDE standards.
- Ensure the electrical cables are properly connected to the terminals. Otherwise there is a risk of fire.

NOTICE!

Select the installation site such that persons in the vicinity are not disturbed by the operating noise generated (see TA noise).

NOTICE!

Different refrigerant pipes are required depending on the cooling capacity of the outdoor unit and the indoor unit.

5.2 Wall openings

- A wall opening of at least 70mm diameter and 10mm incline from the inside to the outside must be created.
- To prevent damage to the lines, 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 (responsibility of customer). Do not use cement or lime containing substances!

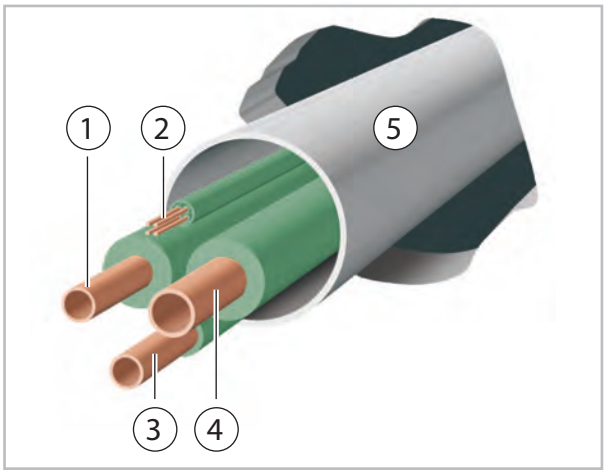


Fig. 13: Wall opening

1: Liquid line
2: Control line
3: Condensate drainage line
4: Suction pipe
5: PVC pipe

5.3 Installation materials

The outdoor unit is attached by 4 screws and a wall bracket to the wall or fixed by a floor bracket to the ground.

⚠ WARNING!

Only fasteners suitable for the given application may be used.

5.4 Selection of installation location

Indoor units

The indoor units from the MVW series are designed for horizontal wall installation above doors. However, they can also be used in the upper wall area (min. 1.75 m above the floor).

The indoor units from the MVD series are specifically designed for horizontal mounting in suspended ceilings with Euroraster dimensions. However, they can also be installed in suspended ceilings with different dimensions. Take into account the installation height of the equipment.

Outdoor unit

The outdoor unit is designed for horizontal installation on a base in outdoor areas. The installation site must be level, flat and firm. The unit should also be secured to prevent it from tipping over. The outdoor unit can be set up outside as well as inside a building. For external installation, please observe the following notes to protect the unit from the influence of the weather.

Rain

For floor or roof set-up, the unit should be installed with at least 10cm ground clearance. A floor bracket is available as an optional accessory.

Sun

The condenser on the outdoor unit emits heat. Exposure to sunlight further increases the temperature of the fins and reduces the heat released by the finned heat exchanger. The outdoor unit should be installed on to the north side of the building whenever possible. If necessary, take measures to provide sufficient shade (responsibility of customer). One possible solution is to build a small roofed area over the unit. These measures should not affect the flow of warm outlet air.

Noise

! NOTICE!

Select the installation site such that persons in the vicinity are not disturbed by the operating noise generated (see TA noise).

Wind

If the unit is being installed in windy areas, ensure that the warm outlet air is discharged in the prevailing wind direction. If this is not the possible, it may be necessary to install a windbreak (to be provided by the customer). Ensure that the windbreak does not adversely affect the air intake to the unit.

Fig. 14: Windbreak

1: Wind

Snow

The unit should be wall-mounted in areas of heavy snowfall. Installation should be at least 20 cm above the expected level of snow to prevent snow from entering the outdoor unit. An optional wall bracket is available as an accessory.

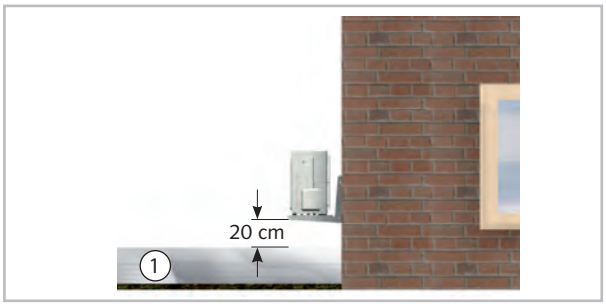


Fig. 15: Minimum clearance to snow

1: Snow

Installation inside buildings

- Ensure that heat can dissipate adequately when placing the outdoor unit in cellars, lofts, adjoining rooms or halls (Fig. 16).
- Install an additional fan with a rated flow comparative to that of the outdoor unit being installed in the room and which can compensate any additional pressure loss in ventilation ducts (Fig. 16).
- Comply with any regulations and conditions affecting the statics of the building. If necessary, fit acoustic installation.

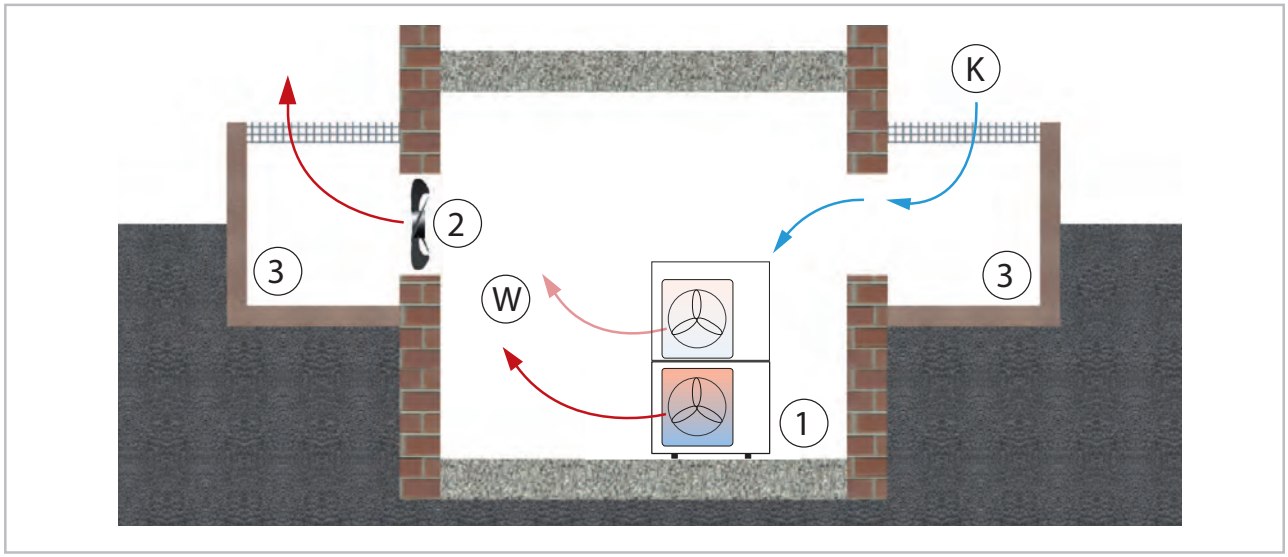


Fig. 16: Installation inside buildings

K: Cold fresh air
W: Warm air
1: Outdoor unit
2: Additional fan
3: Air shaft

5.5 Minimum clearances

Observe the minimum clearances to allow access for maintenance and repair work and facilitate optimum air distribution.

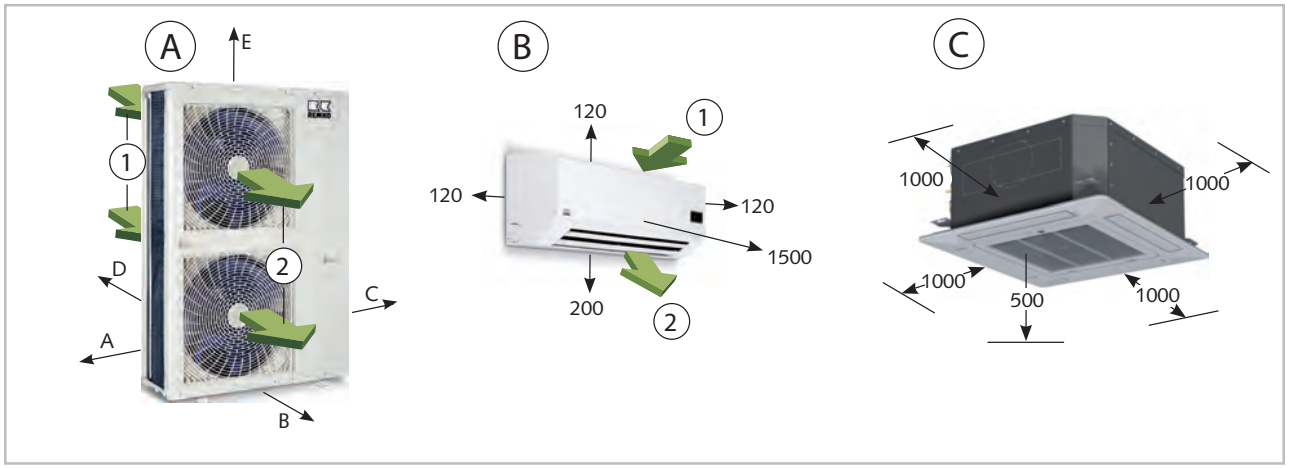


Fig. 17: Minimum clearances, outdoor units and indoor units (all measurements in mm)

A: Outdoor unit MVV
B: Indoor unit MVW
C: Indoor unit MVD

1: Air inlet
2: Air outlet

Minimum clearances for outdoor unit

	MVV 1200-2000 DC
A	300
W	2000
C	600
D	300
E	1000

6 Installation

6.1 Connection of refrigerant piping

The refrigerant piping connection is established by the customer on the front side of the units.

It may be necessary to fit a reducer or flared adapter to the indoor unit. These fittings are included with the indoor unit as an accessory kit. Once installed, the connections should be insulated to make them vapour diffusion proof.

! NOTICE!

Installation should only be performed by authorised specialists.

! 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!

The following instructions describe the installation of the cooling cycle and the assembly of the indoor unit and the outdoor unit.

1. The required pipe diameters are given in the table "Technical data".
2. Install the indoor unit and connect the refrigerant piping as described in the operating manual for the indoor unit.
3. Use the wall or floor brackets to fit the outdoor unit against structural parts approved to support the static load (refer to the installation instructions for the brackets).
4. Ensure that structure-borne sound is not transferred to parts of the building. Use vibration dampers to reduce the effects of structure-borne sound!
5. Lay the refrigerant piping from the indoor unit to the outdoor unit. Ensure adequate fastening.
6. Remove the factory-fitted protective caps and union nuts on the connections. These should be used later in the installation process.
7. Before flanging the refrigerant piping, ensure that the union nut is fitted on the pipe.
8. Prepare the laid refrigerant piping as shown below (Fig. 18 and Fig. 19).
9. Verify that the shape of the flange is correct (Fig. 20).
10. First connect and hand-tighten the refrigerant piping to ensure it is correctly seated.
11. Then finally tighten the fittings with 2 appropriately-sized torque wrenches. Use one spanner to counter the force when tightening the fitting (Fig. 21).
12. Use insulation hoses which are designed for this temperature range and are diffusion proof.
13. Observe the permitted bending radius for the refrigerant piping during installation. Never bend a pipe twice in the same place. Brittleness and cracking can result.
14. Apply appropriate heat insulation to the installed refrigerant piping, including connector.
15. Take the same action at the shut-off valves for all subsequent refrigerant piping.

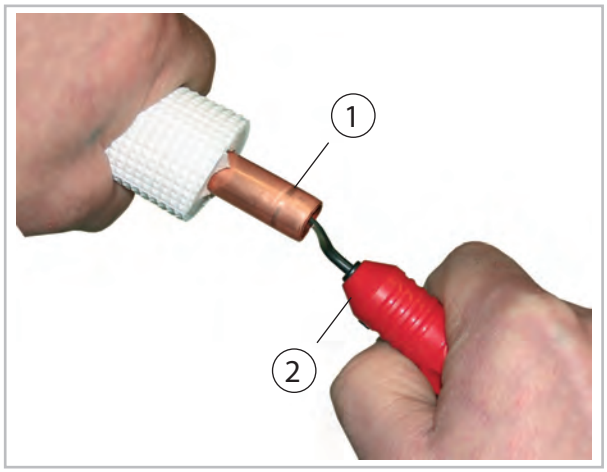


Fig. 18: Deburring the refrigerant piping

1: Refrigerant piping
2: Deburrer

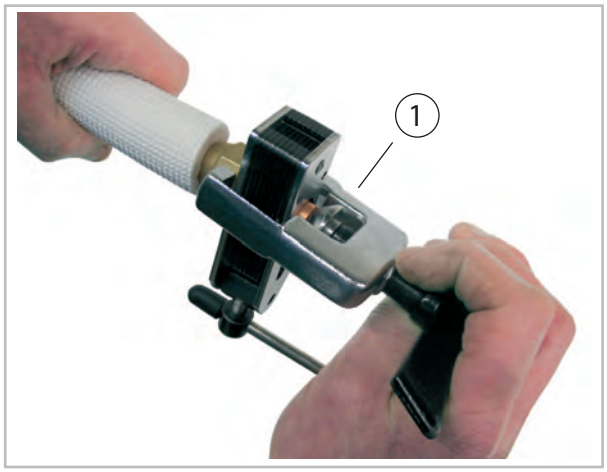


Fig. 19: Flanging the refrigerant piping

1: Flanging tool

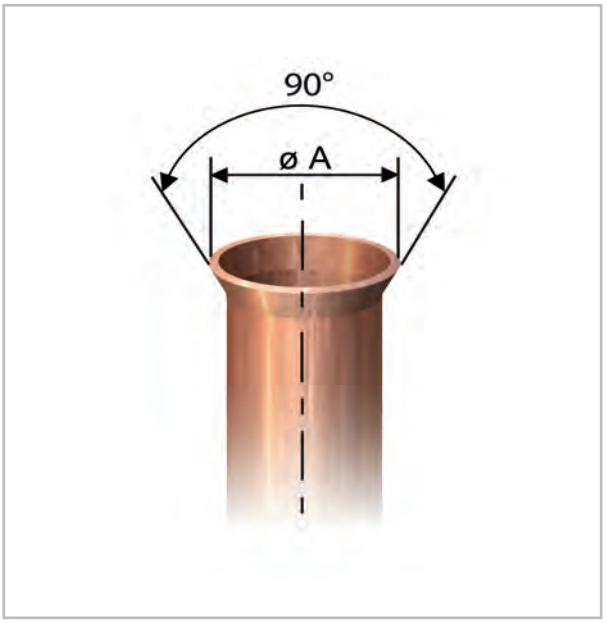


Fig. 20: Correct flange shape

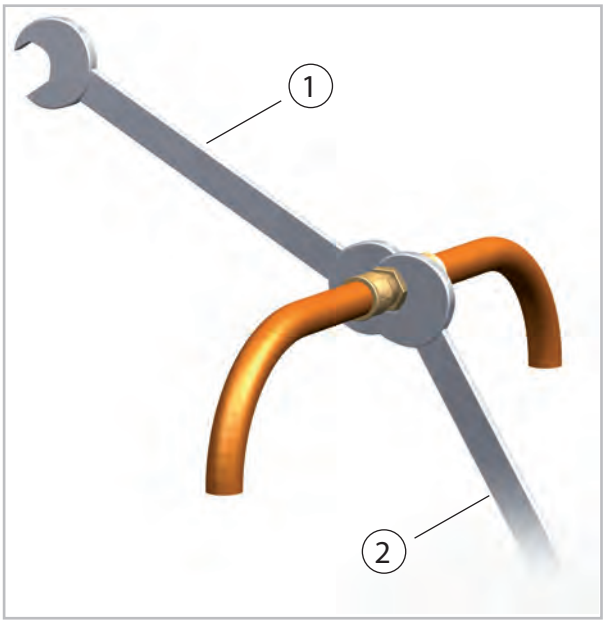


Fig. 21: Tightening the fitting

1: Tighten with the first open-ended spanner
2: Counter with the second open-ended spanner

Pipe dimension in inches	Tightening torque in Nm
1/4"	15-20
3/8"	33-40
1/2"	50-60
5/8"	65-75
3/4"	95-105

6.2 Leak testing

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

red = small valve = high pressure

blue = large valve = suction pressure

Once the connection has been made successfully, the leak test is carried out with dry nitrogen.

Leak testing involves spraying a leak detection spray onto the connections. If bubbles are visible, the connections have not been made properly. In that case, tighten the connection or, if necessary, create a new flange.

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

! NOTICE!

A vacuum of at least 20 mbar must be produced!

The time required to generate the vacuum is dependent on the final pressure pipe volume of the indoor units and the length of the refrigerant piping. However, the process will take 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.

6.3 Additional notes on connecting the refrigerant piping

When combining the outdoor unit with the different indoor units, the refrigerant piping connection may differ. Install the corresponding expansion fittings (sleeves) on the distributors. Depending on the number of distributors and total length of the liquid line, add refrigerant when commissioning the system for the first time (see *Chapter 6.4 'Adding refrigerant' on page 27*).

6.4 Adding refrigerant

The unit contains a basic quantity of refrigerant. Furthermore, an additional amount of refrigerant must be added, in accordance with the following table:

Component	Fill factor
Length of the liquid pipe 1/4"	0.023 kg/m
Length of the liquid pipe 3/8"	0.060 kg/m
Number of distribution units (4-fold)	0.1 kg/unit
Number of Y-pieces	0.1 kg/unit

⚠ CAUTION!

Wear protective clothing when handling refrigerant.

⚠ DANGER!

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

! NOTICE!

Check the overheating to determine the refrigerant fill quantity.

! NOTICE!

The escape of refrigerant contributes to climatic change. In the event of escape, refrigerant with a low greenhouse potential has a lesser impact on global warming than those with a high greenhouse potential. This device contains refrigerant with a greenhouse potential of 1975. That means the escape of 1 kg of this refrigerant has an effect on global warming that is 1975 times greater than 1 kg CO^2, based on 100 years. Do not conduct any work on the refrigerant circuit or dismantle the device - always enlist the help of qualified experts.

Calculation of the supplementary refrigerant to be added

The refrigerant quantity to be added is dependent on the dimensioning and length of **all liquid pipes**, as well as the number of Y-pieces and distribution units used. In the following you will find an example and a blank drawing for calculating the refrigerant quantity to be added.

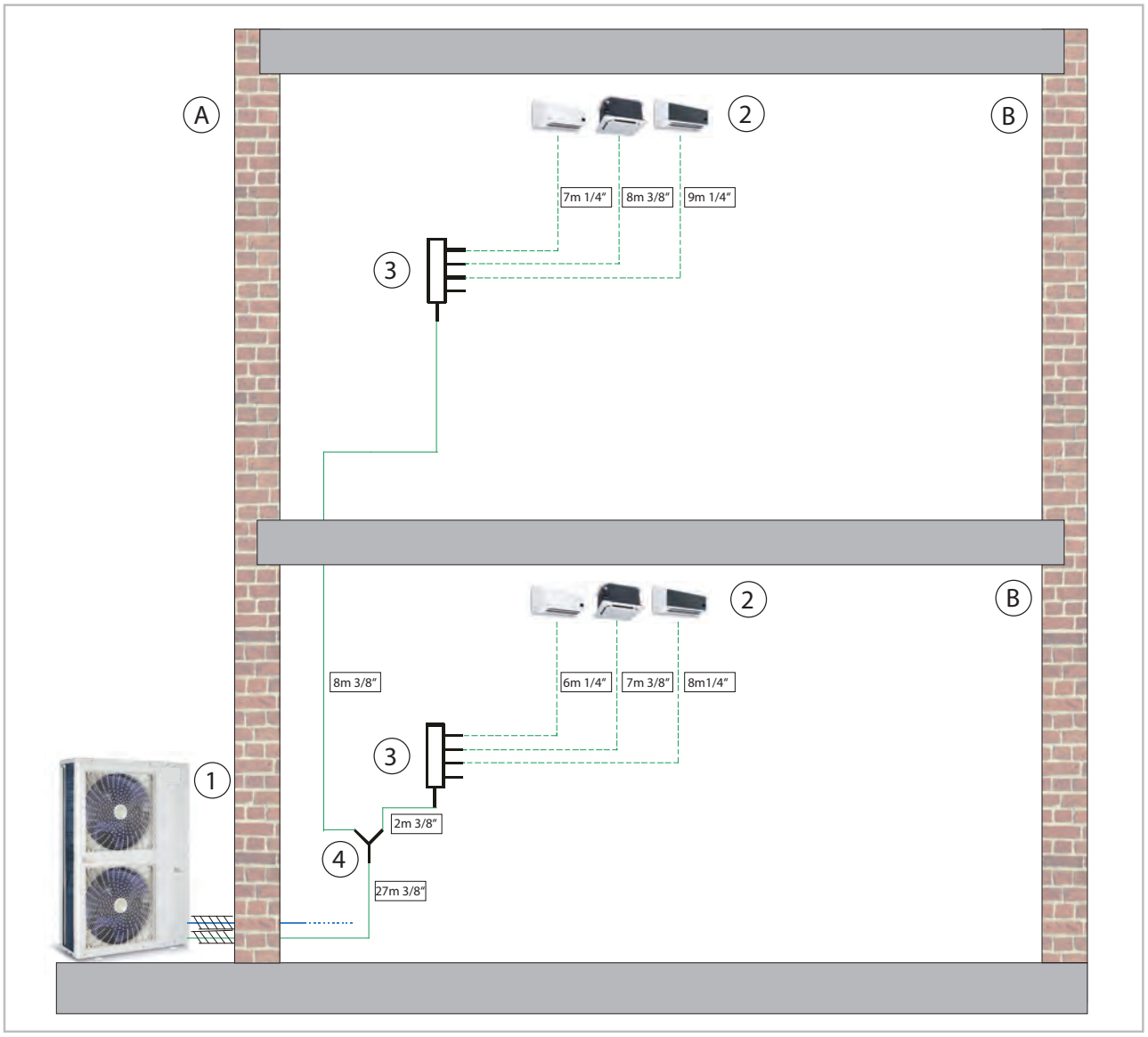


Fig. 22: Example combination for calculating the supplementary refrigerant to be added

A: Outdoor area
B: Indoor area
1: Outdoor unit
2: Indoor units of the series MVD or MVW
3: Distributor
4: Y-piece

Component	Number	Fill factor	Additional fill quantity
Length of the liquid pipe 1/4"	30 m	0.023 kg/m	0.69 kg
Length of the liquid pipe 3/8"	52 m	0.060 kg/m	3.12 kg
Number of distribution units in the liquid pipe	2	0.1 kg/unit	0.2 kg
Number of Y-pieces in the liquid pipe	1	0.1 kg/unit	0.1 kg
Sum			**4.11 kg**

The following sketch and the empty table are provided for calculating the refrigerant quantity to be added and must be completed by the installer.

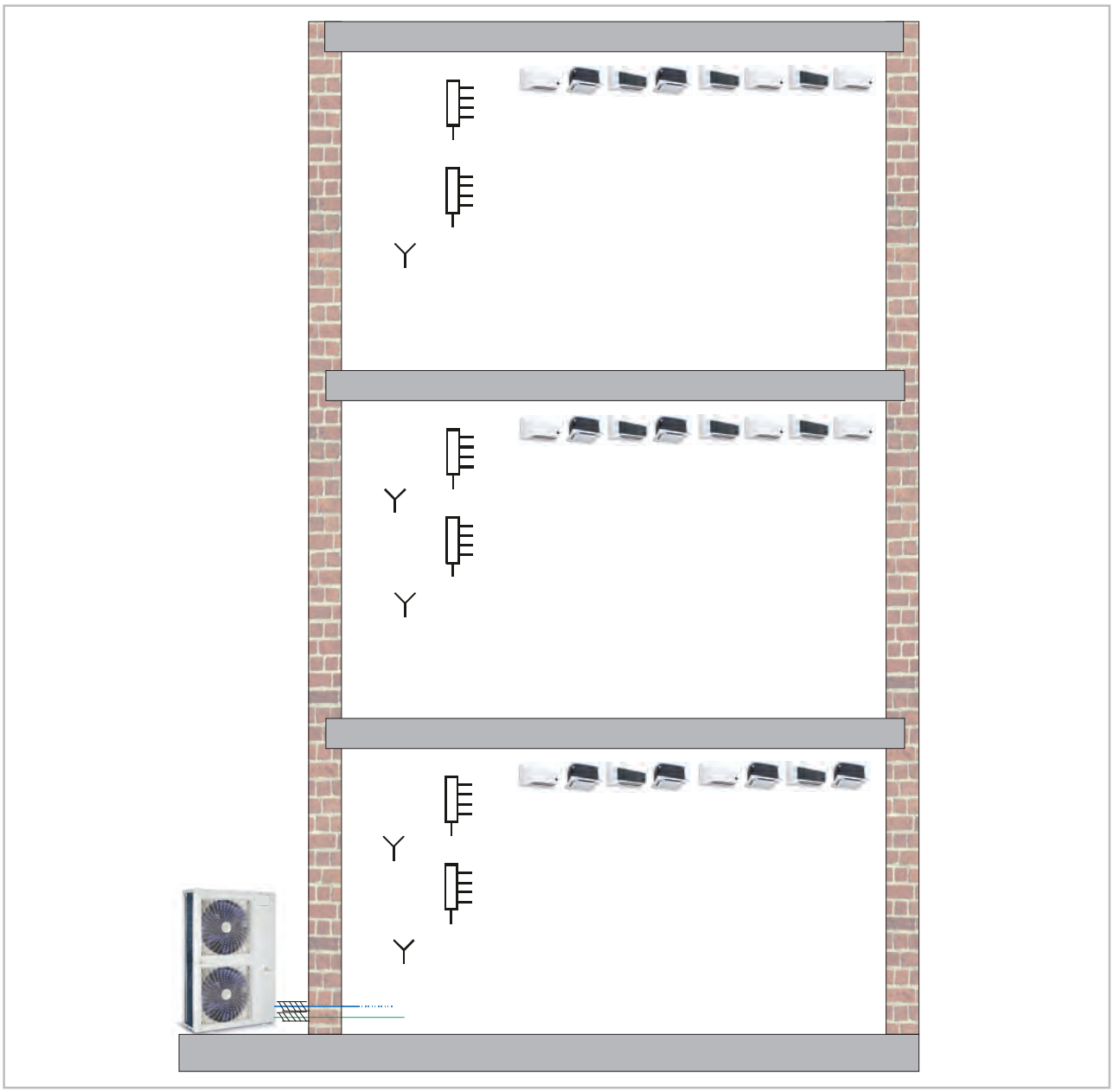


Fig. 23: Sketch for determining the refrigerant quantity to be added

Component	Number	Fill factor	Additional fill quantity
Length of the liquid pipe 1/4"	m	0.023 kg/m	kg
Length of the liquid pipe 3/8"	m	0.060 kg/m	kg
Number of distribution units in the liquid pipe		0.1 kg/unit	kg
Number of Y-pieces in the liquid pipe		0.1 kg/unit	kg
Sum			**kg**

! NOTICE!

When configuring and topping up the system with refrigerant, observe the practical limit value for refrigerants according to DIN EN 378-1! Practical limit value R410A: 0.44 kg/m^3 room volume of the smallest room. If this is exceeded, implement suitable measures for reducing the possible refrigerant concentration per DIN EN 378-1.

Example:

The calculation of the refrigerant quantity to be added provides the following:

Refrigerant quantity to be added: 4.11 kg

Basic fill quantity of the outdoor unit: 3.9 kg

Total fill quantity: 8.01 kg

Practical limit value R410A: 0.44 kg/m^3

8.01 kg / (0.44 kg/m^3) = 18.20 m^3

This equates to a min. room size of the smallest air conditioned room of approx. 2.7 x 2.7 x 2.5 m.

7 Condensate drainage connection and safe drainage

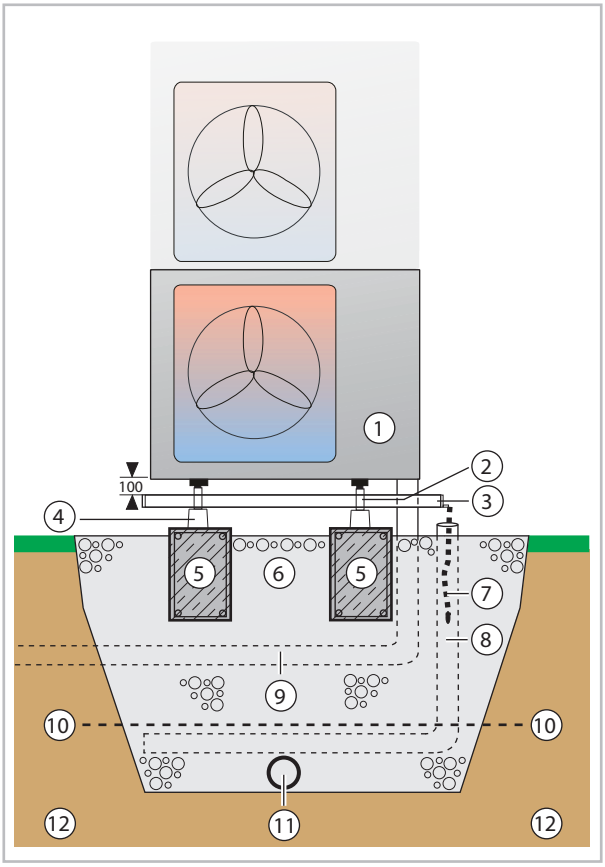


Fig. 24: Condensate drainage, seepage of condensate and strip foundation based on MVV 1200-1600 DC as an example (cross-section)

1: Outdoor unit
2: Leg
3: Condensate collection tray
4: Floor bracket
5: Reinforced strip foundation HxWxD = 300x200x800mm
6: Gravel layer for seepage
7: Condensate drainage heating
8: Drainage channel
9: Conduit for refrigerant piping and electrical connecting line (temperature-resistant up to at least 60°C)
10: Frost line
11: Drainage pipe
12: Soil

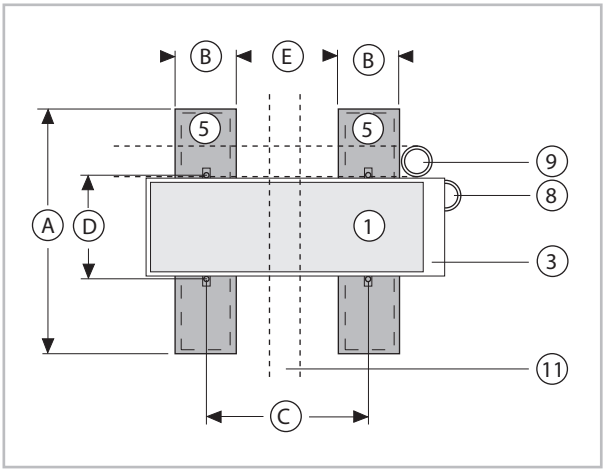


Fig. 25: Dimensions for the strip foundation MVV 1200-1600 DC (bird's eye view)

For the designations of 1,3,5,8,9 and 11, please refer to the legend for the Fig. 24

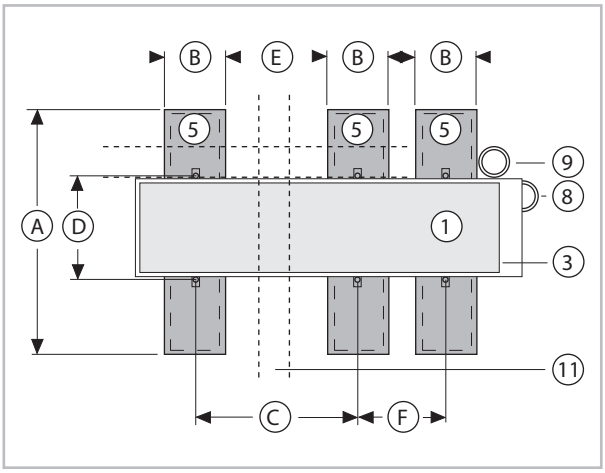


Fig. 26: Dimensions for the strip foundation MVV 2000 DC (bird's eye view)

For the designations of 1,3,5,8,9 and 11, please refer to the legend for the Fig. 24

Dimensioning of the strip foundation (all measurements in mm)

Dimension	MVV 1200-1600 DC	MVV 2000 DC
A	800	800
W	200	200
C	600	665
D	365	495
E	400	465
F	-	205

Condensate drainage connection

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

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

- The condensate drainage line should have an incline of min. 2%. This is the responsibility of the customer. If necessary, fit vapour-diffusion-proof insulation.
- When operating the unit at outdoor temperatures below 4 ℃, care must be taken that the condensate drainage line is anti-freeze protected. The lower part of the housing and condensate tray is also to be kept frost free in order to ensure permanent draining of the condensate. If necessary, fit a pipe heater.
- Following installation, check that the condensate run off is unobstructed and ensure that the line is durably leak tight.

Safe drainage in the event of leakages

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

! NOTICE!

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

! NOTICE!

If condensate is removed via a duct in accordance with DIN EN 1717, ensure that any microbiological contamination present on the wastewater side (bacteria, fungi, viruses) cannot enter the unit connected to it.

8 Electrical wiring

8.1 General connection and safety instructions

For the MVV 1200-2000 DC units, an electrical supply cable must be laid as a power supply to the outdoor unit and indoor units, as well as a 3-core control line from the indoor units to the outdoor unit.

We recommend that control lines are used with a minimum cross-section of 0.75 mm².

DANGER!

All electrical installation work is to be performed by specialist companies. Disconnect the power supply when connecting the electrical terminals.

NOTICE!

The electrical connection for the units must be made at a separate feedpoint with a residual current device in accordance with local regulations and should be laid out by an electrician.

We recommend using shielded wires for the control lines.

8.2 Outdoor unit connection

Before you start to connect, note the following instructions:

- Customers should install a terminal box in the vicinity of the outdoor unit. We recommend using a main/repair switch (Figure 9).
- The power supply to the indoor units takes place through a separate supply line to the indoor units.
- Details concerning the electrical protection of the system are provided in the technical data. Observe the required diameters!
- If the outdoor unit is installed on a roof, ensure it is protected against lightning strikes.

Proceed as follows to connect the line:

1. Remove the side panel at the connection.
2. Choose the cable cross-section in accordance with the relevant specifications.
3. Feed both cables through the edge protection rings on the fixed connection panel.
4. Connect the control line to the corresponding terminals.
5. Fix the line in the strain relief and reassemble the unit.

Check all plugged and clamped terminals to verify that they are seated correctly and make permanent contact. Tighten as required.

Fig. 27: Outdoor unit connection

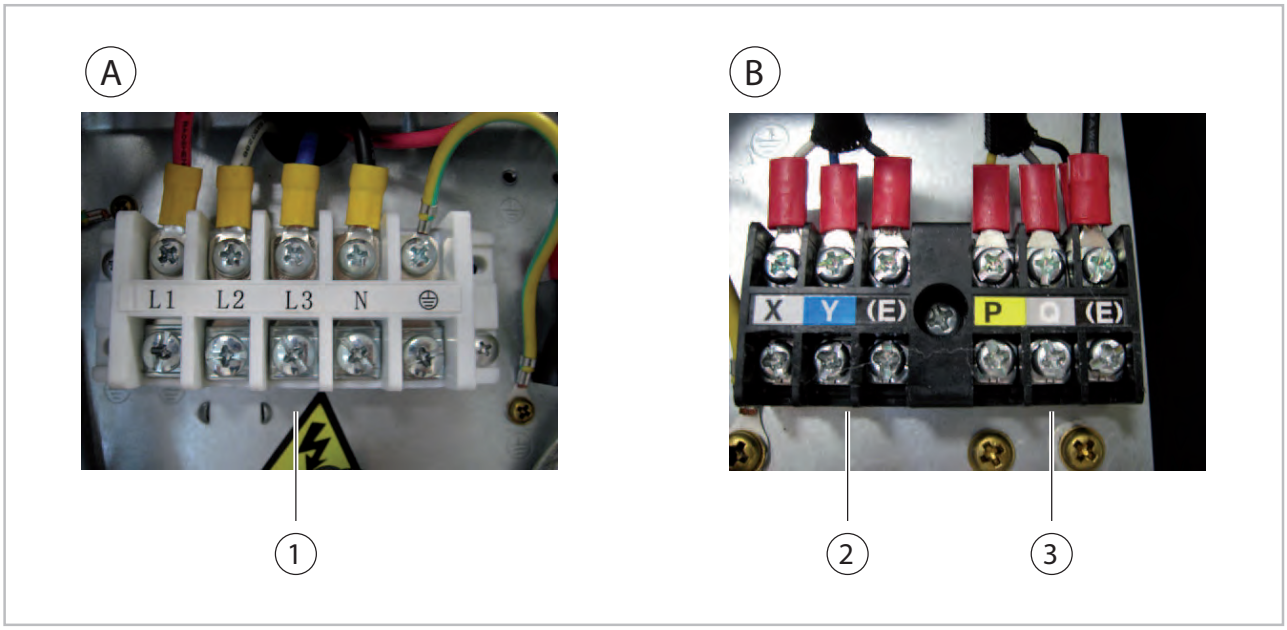


Fig. 28: Electrical wiring of the lines to the outdoor units MVV 1200-1600 DC

A: Terminal block supply line
B: Terminal block communication
1: Power supply
2: Not connected
3: Control line

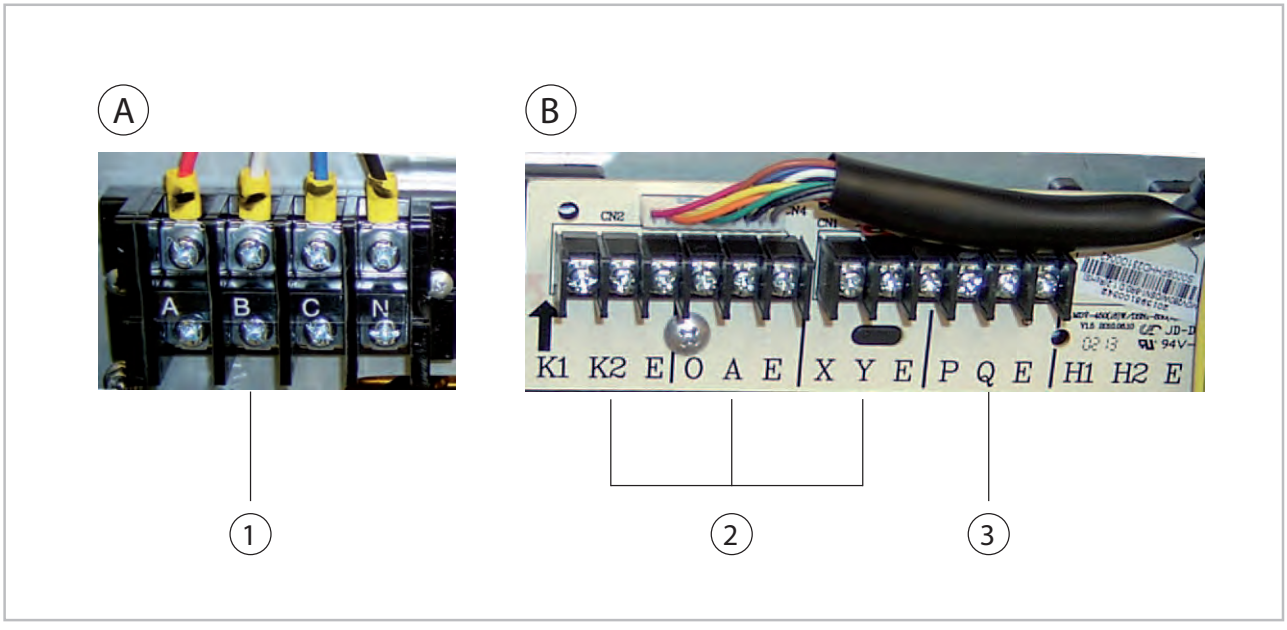


Fig. 29: Electrical wiring of the lines to the outdoor unit MVV 2000 DC

A: Terminal block supply line
B: Terminal block communication
1: Power supply
2: Not connected
3: Control line

8.3 Electrical wiring diagram

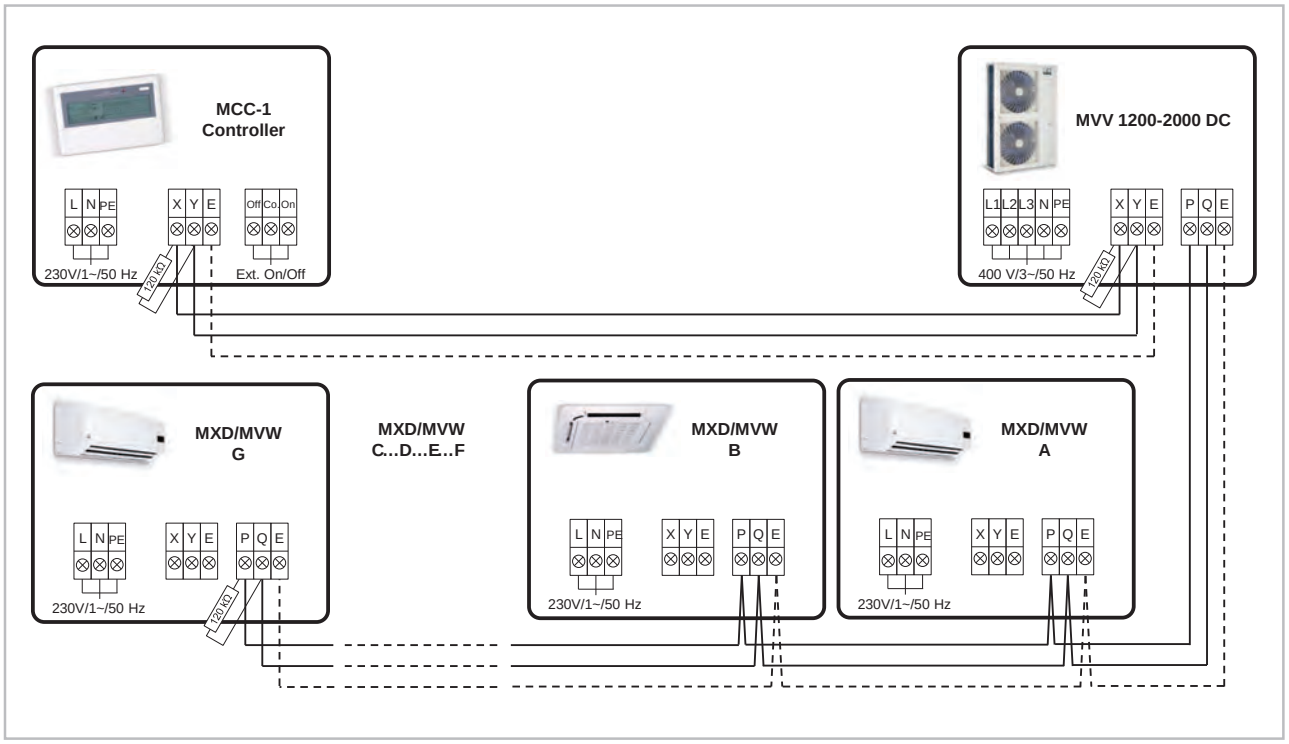


Fig. 30: Electrical wiring diagram

	Minimum cross section [1)]	Line configuration
Indoor unit supply	3 x 1.5 mm^2	
Outdoor unit supply	5 x 2.5 mm^2	
Communication line	3 x 0.75 mm^2	Shielded [2)]
Central remote control	3 x 0.75 mm^2	Shielded [2)]

[1)] All figures are “minimum cross sections”. The actual cross sections required must be determined by a specialist electrical company depending on the installation type. This is the responsibility of the customer.

[2)] The communication lines require continuous lubrication. Additional clamping points (such as branch boxes) must therefore not be used!

The control is always connected with the indoor units and outdoor unit in series. Furthermore, the last indoor unit in series must be equipped with a fixed resistor (see Fig. 30).

Ensure a correct rotating field!

8.4 Electrical drawings

MVV 1200 DC

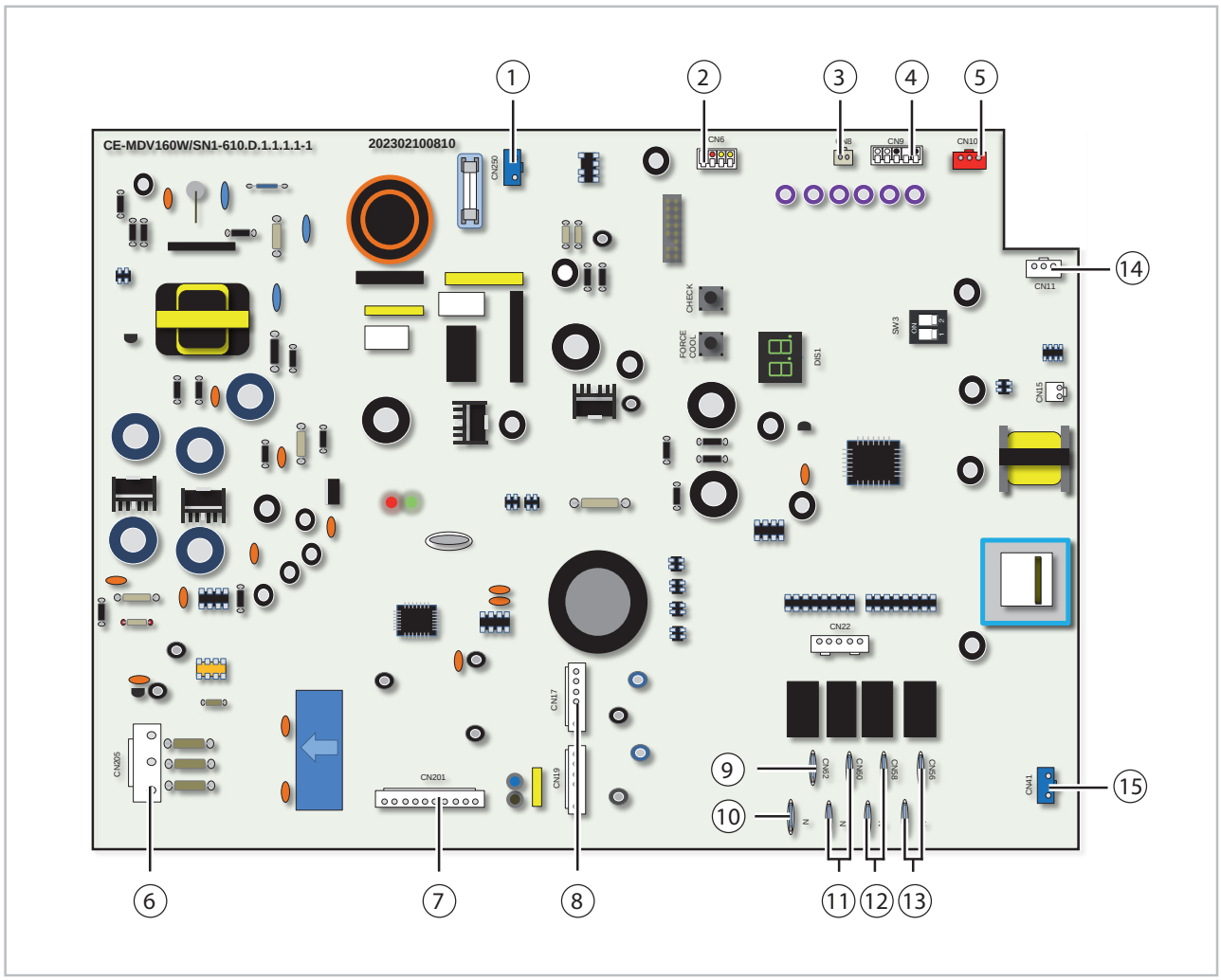


Fig. 31: Electrical drawings MVV 1200 DC - control board

1: Connection to the power pcb (contact: CN 19)
2: Low pressure switch, high pressure switch
3: Heat gas probe
4: Probe, condenser, register, probe, ambient air
5: Connection with the terminal block, control line
6: Connection to the inverter board (contact: CN 5)
7: Connection to the inverter board (contact: CN 1)
8: Fan motor, condenser
9: Connection to the contactor K1 (contact: A1)
10: Connection to the contactor K1 (contact: A2)
11: Crankcase heating
12: Reversing valve SV4, cooling/heating
13: Re-injection valve
14: Connection with the terminal block, Multi-Central-Controller (MCC1)
15: Connection to the power pcb (contact: CN 18)

Electrical drawings MVV 1200 DC

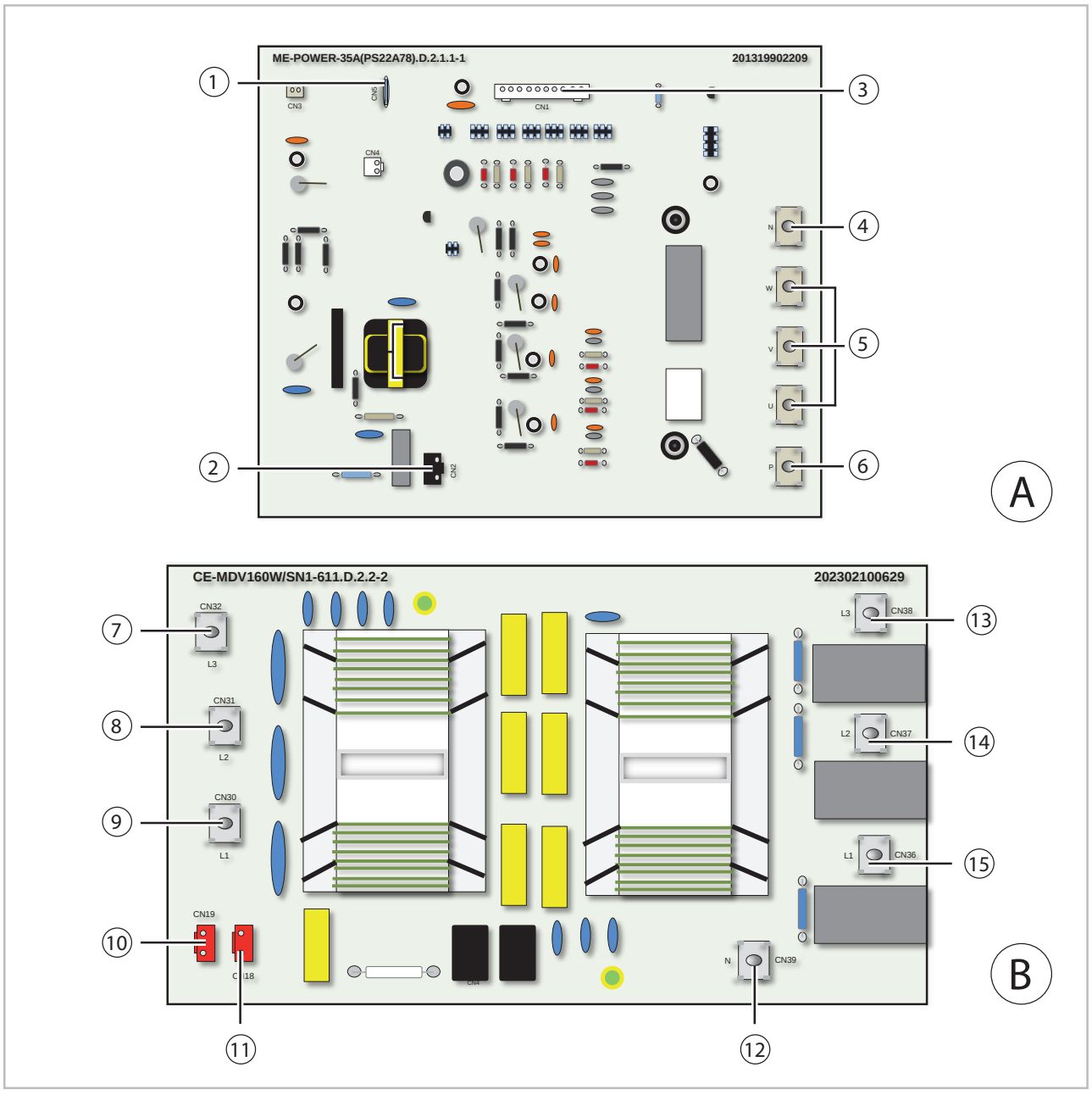


Fig. 32: Electrical drawings MVV 1200 DC - inverter and power pcb

A: Inverter board
B: Power pcb
1: Connection to the control board (contact: CN 205)
2: Connection to the power pcb (contact: CN 18)
3: Connection to the control board (contact: CN 201)
4: Connection to the C2 capacitor (contact: plus "+")
5: Compressor
6: Connection to the C2 capacitor (contact: minus "-")
7: Connection to the three-phase inverter (contact 1)
8: Connection to the three-phase inverter (contact 2)
9: Connection to the three-phase inverter (contact 3)
10: Connection to the control board (contact: CN 250)
11: Connection to the control board (contact: CN 41)
12: Connection with the terminal block, power supply (contact: N)
13: Connection with the terminal block, power supply (contact: L3)
14: Connection with the terminal block, power supply (contact: L2)
15: Connection with the terminal block, power supply (contact: L1)

MVV 1600 DC

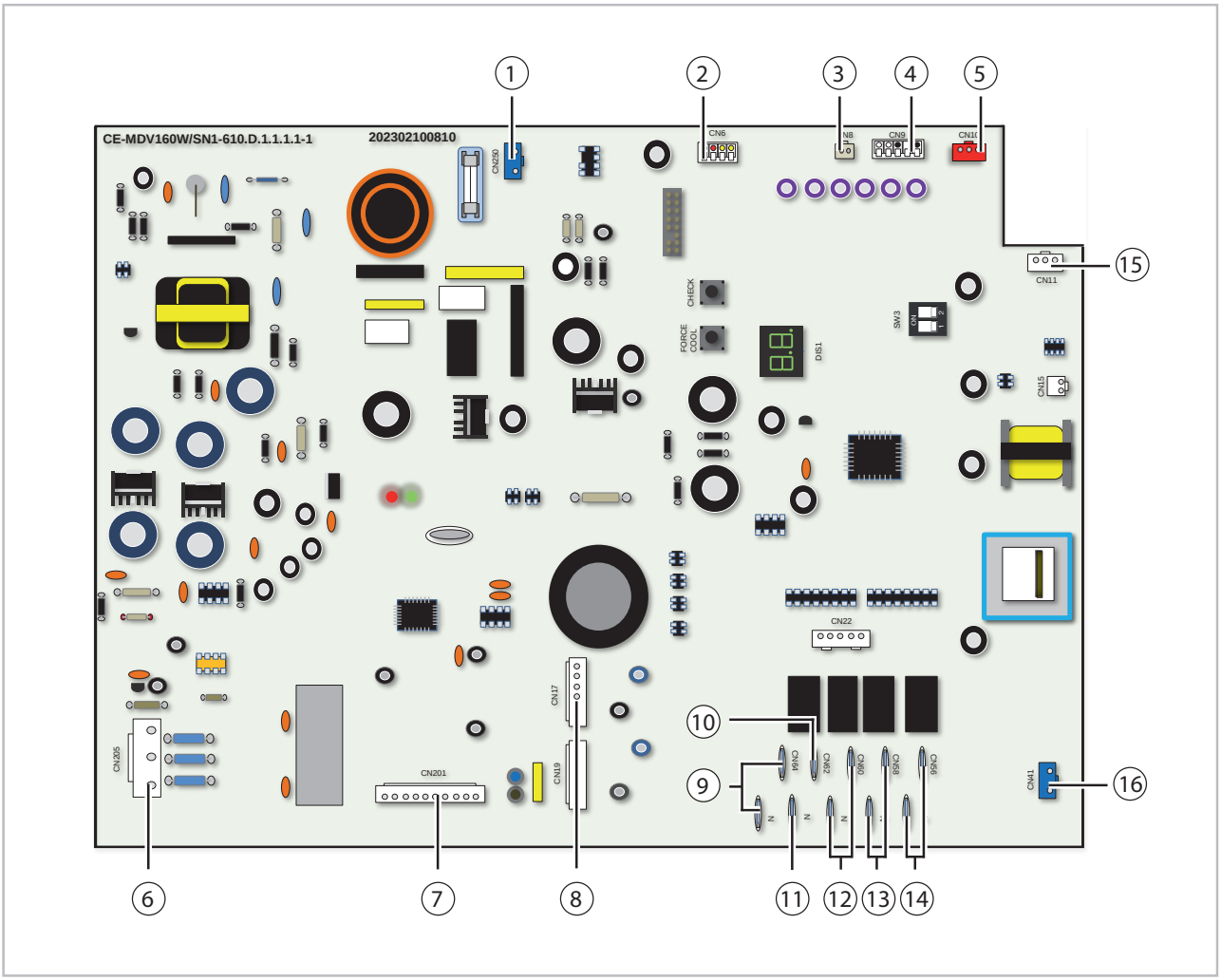


Fig. 33: Electrical drawings MVV 1600 DC - control board

1: Connection to the power pcb (contact: CN 19)
2: Low pressure switch, high pressure switch
3: Heat gas probe
4: Probe, condenser, register, probe, ambient air
5: Connection with the terminal block, control line
6: Connection to the inverter board (contact: CN 5)
7: Connection to the inverter board (contact: CN 1)
8: Fan motor, condenser
9: Re-injection valve
10: Connection to the contactor K1 (contact: A1)
11: Connection to the contactor K1 (contact: A2)
12: Crankcase heating
13: Reversing valve SV4, cooling/heating
14: Heat gas bypass valve
15: Connection with the terminal block, Multi-Central-Controller (MCC1)
16: Connection to the power pcb (contact: CN 18)

Electrical drawings MVV 1600 DC

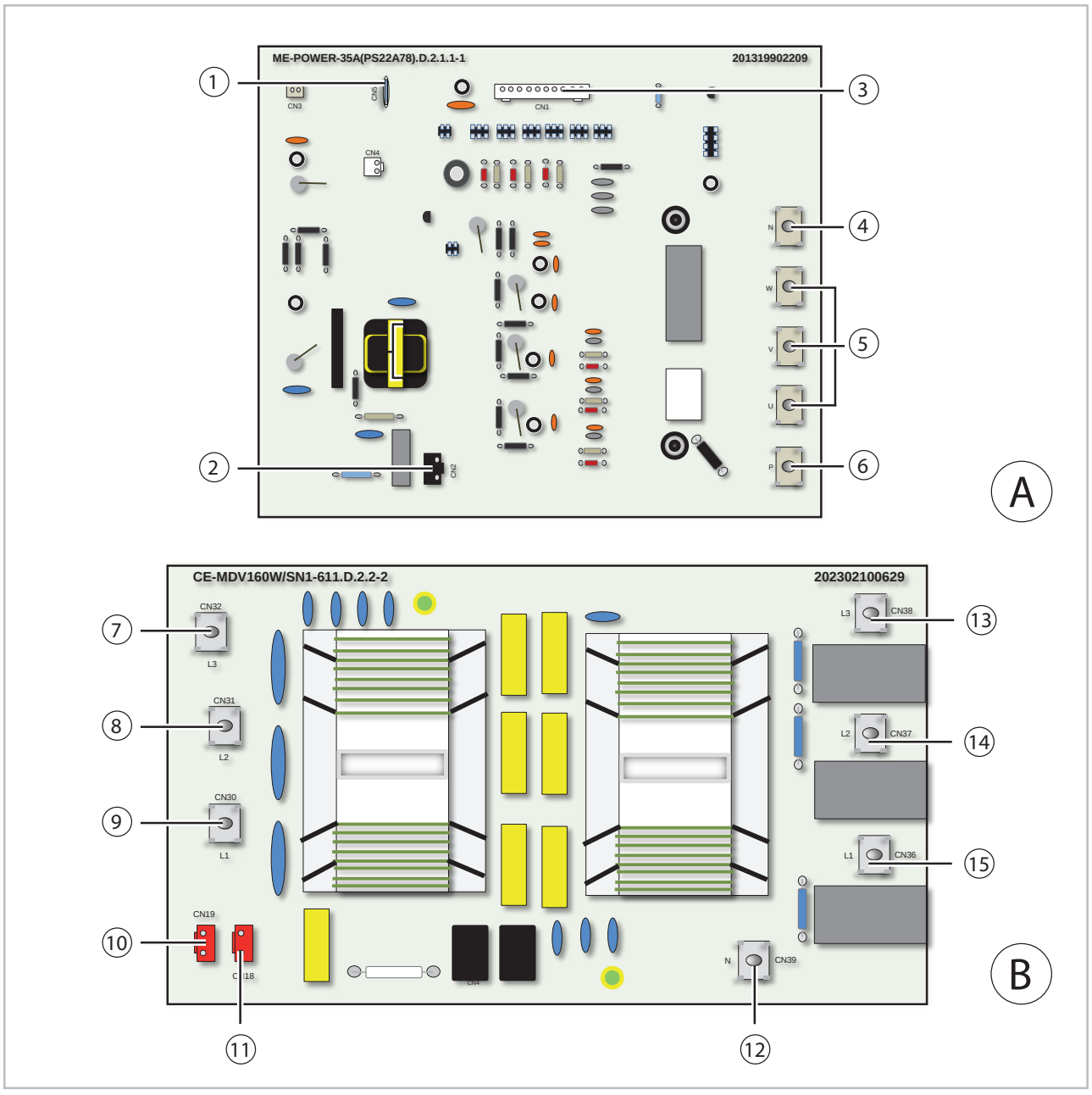


Fig. 34: Electrical drawings MVV 1600 DC - inverter and power pcb

A: Inverter board
B: Power pcb
1: Connection to the control board (contact: CN 205)
2: Connection to the power pcb (contact: CN 18)
3: Connection to the control board (contact: CN 201)
4: Connection to the C2 capacitor (contact: plus "+")
5: Compressor
6: Connection to the C2 capacitor (contact: minus "-")
7: Connection to the three-phase inverter (contact 1)
8: Connection to the three-phase inverter (contact 2)
9: Connection to the three-phase inverter (contact 3)
10: Connection to the control board (contact: CN 250)
11: Connection to the control board (contact: CN 41)
12: Connection with the terminal block, power supply (contact: N)
13: Connection with the terminal block, power supply (contact: L3)
14: Connection with the terminal block, power supply (contact: L2)
15: Connection with the terminal block, power supply (contact: L1)

MVV 2000 DC

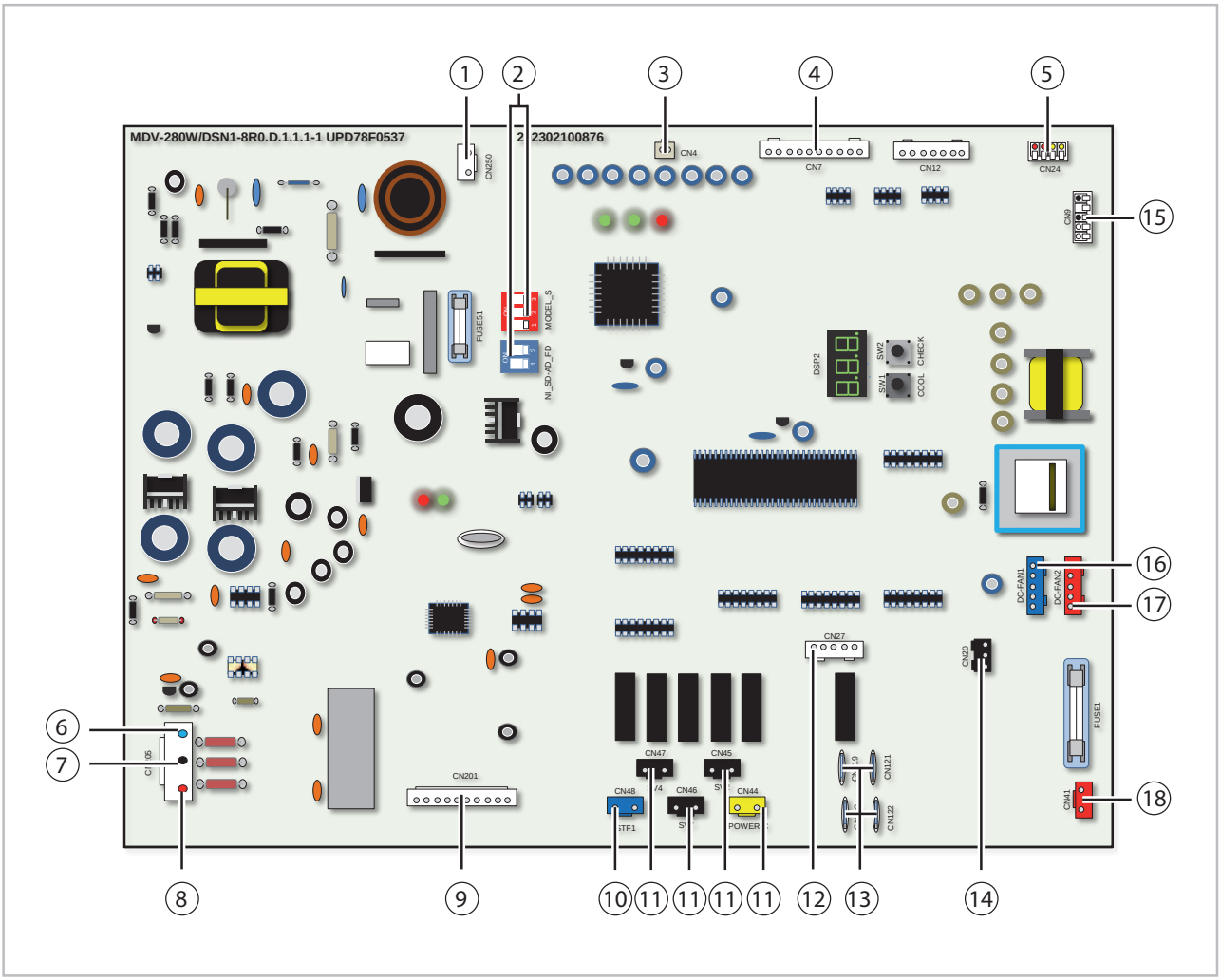


Fig. 35: Electrical drawings MVV 2000 DC - control board

1: Connection to the filter board (contact: CN 207)
2: DIP switch
3: Heat gas probe
4: Connection with the communication terminal block (contact CN 4)
5: Low pressure switch, high pressure switch
6: Connection to the IPM board (contact: CN 5)
7: Connection to the CAP3 capacitor (contact: minus "-")
8: Connection to the CAP2 capacitor (contact: plus "+")
9: Connection to the IPM board (contact: CN 1)
10: 4-way valve
11: Solenoid valve
12: Electronic expansion valve
13: Crankcase heating
14: Connection to the filter board (contact: CN 150)
15: Probe, condenser, register, probe, ambient air
16: Connection to the regulation board, fan motor (contact: CN 103)
17: Connection to the regulation board, fan motor (contact: CN 104)
18: Connection to the filter board (contact: CN 209)

Electrical drawings MVV 2000 DC

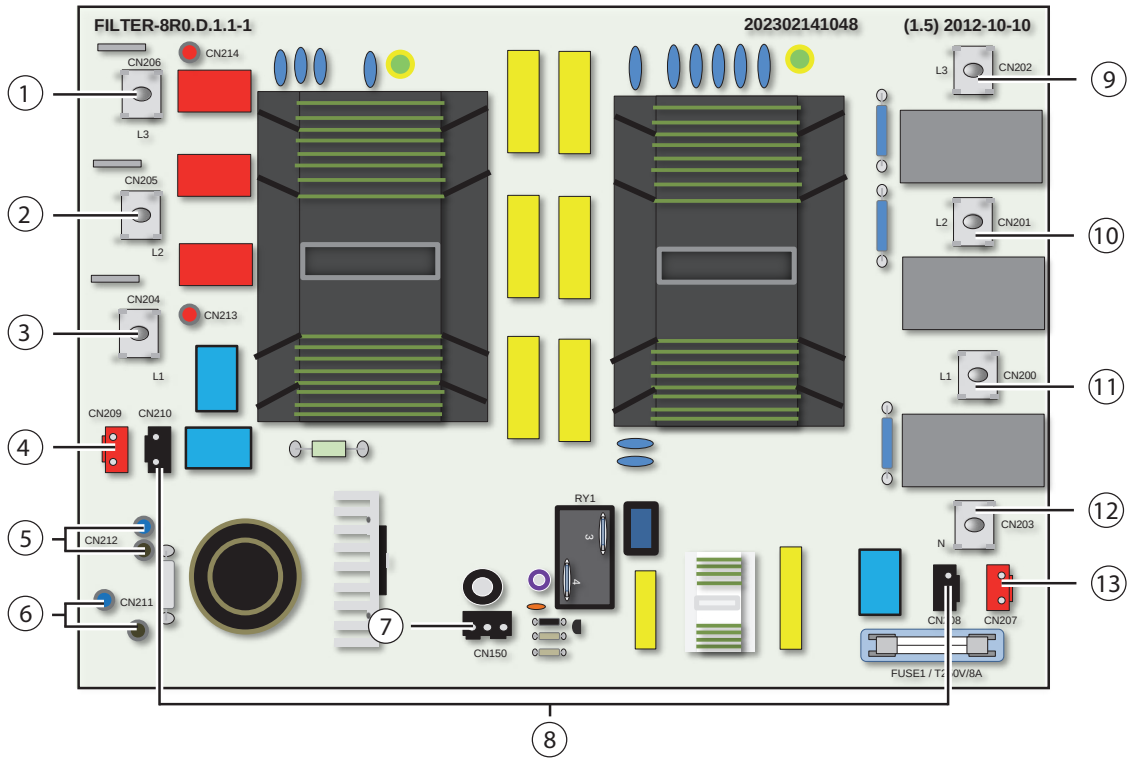


Fig. 36: Electrical drawings MVV 2000 DC power pcb

1: Connection with the three-phase inverter (contact: 1)
2: Connection with the three-phase inverter (contact: 2)
3: Connection with the three-phase inverter (contact: 3)
4: Connection to the control board (contact: CN 41)
5: Connection to the IPM board (contact: CN 2)
6: Connection to the distribution board (contact: CN 101)
7: Connection to the control board (contact: CN 150)
8: Connected with each other
9: Connection with the terminal block, power supply (contact: L3)
10: Connection with the terminal block, power supply (contact: L2)
11: Connection with the terminal block, power supply (contact: L1)
12: Connection with the terminal block, power supply (contact: N)
13: Connection to the control board (contact: CN 250)

Function of the DIP switches MVV 1200-1600 DC

DIP switch SW 3 / SW 7 *	
	ON: Automatic addressing
	OFF: Manual addressing
	ON: Cancellation of addressing
	OFF: Factory setting

After the addressing of all indoor devices has been carried out, the DIP switches relevant for the addressing must be set to automatic addressing / factory setting. This ensures that the devices are permanently recognized during operation by any connected controls (e.g. SC-1).

Function of the DIP switches MVV 2000 DC

Function S 5

DIP switch S 5 *	
	Priority heating
	Priority cooling
	Priority initial start
	Only heating mode
	Only cooling mode

Function S 6

DIP switch S 6 *	
	Automatic addressing (factory setting)
	Manual addressing
	Reset addressing

* The black mark represents the DIP switch.

9 Before commissioning

After leak testing has been successfully completed, connect the vacuum pump via the pressure gauge station to the valve connections on the outdoor unit (see chapter "Leak testing") and create a vacuum.

Perform the following checks prior to putting the unit into operation for the first time and after any work on the cooling cycle. Record the results in the commissioning report:

- Check all refrigerant piping and valves for leak-tightness using leak detection spray or soapy water.
- Check the refrigerant piping and insulation for damage.
- Check the electrical connection between the indoor unit and the outdoor unit for correct polarity.
- Check that all fastenings, mountings, etc. are firm and at the correct level.

10 Commissioning

! NOTICE!

Commissioning should only be performed by specially trained personnel and documented after the certificate has been issued. Observe the operating manuals for the indoor unit and outdoor unit when commissioning the entire system.

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

This check is dependent on the installed indoor units. The processes are specified in the operating manual for the indoor units being commissioned.

! NOTICE!

Always pay attention to the correct electrical connection of the control line and power supply to all units.

Functional checks and test run

Check the following points:

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

Function test of cooling operating mode

1. Remove the protective caps from the valves.
2. Start the commissioning procedure after evacuating the pipe system by briefly opening the shut-off valves on the outdoor unit until the pressure gauge indicates a pressure of approx. 2 bar.
3. Check all connections for leaks with leak detection spray and suitable leak detectors.
4. If no leaks are found, fully open the shut-off valves by turning them anti-clockwise using a spanner. If leaks were found, draw off the refrigerant and rework the defective connection. It is imperative that the vacuum creation and drying steps are repeated!
5. Activate the main circuit breaker or fuse.
6. Use the remote control to set the indoor unit's target temperature to a value that is lower than the existing room temperature.

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

7. Switch the indoor units to cooling mode.
8. Check all regulating, control and safety devices for function and correct adjustment during the test run.
9. Check the control of the indoor unit with the functions described in the operating instructions: timer, temperature adjustments and all mode settings.

> *Check the individual operating parameters with the help of the display on the outdoor unit as described in the "Functional checks and test run" section, and note the value in the commissioning log.*

10. Measure the overheating, outside, internal, outlet and evaporator temperatures and record the test data in the commissioning log.
11. Remove the pressure gauge.

Final tasks

- Use the remote control to set the target temperature to the required value.
- Re-install all disassembled 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.

Functional checks and test run

During operation of the system, the operating parameters can be called up on the display of the outdoor unit. The following parameters are displayed in turn and can be read off in the following tables. On the display on the outdoor unit board, you can call up the operating parameters of the system. In order to do so, press the check key SW2 located beneath the display on the OU circuit board (see Fig. 37).

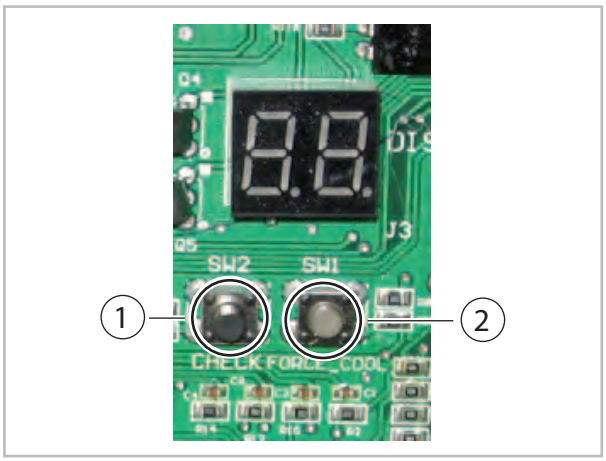


Fig. 37: Check key on the outdoor unit's board

1: Check key
2: Force Cool key

The following parameters are shown in the display during operation:

Operating status	Display
Standby	Number of indoor units
Compressor operation	Current frequency
Defrost mode on	“dF”
Oil warm-up function active	“1 1”
Error function	Error code

Force Cool key

This key enables a test run of the outdoor unit. If this key is pressed then the system runs for approx. 35 minutes with a compressor frequency of 43 Hz. During this status, no manual adjustment of the system can take place.

LED display

On the board of the outdoor unit are 2 LEDs, which display the current operating status of the system.

	LED 1 (red)	LED 2 (green)
Flashes		Stand-By mode
Illuminated	Malfunction	Operating status

	LED 1 (red)	LED 2 (green)
Off	Stand-By mode / operation	

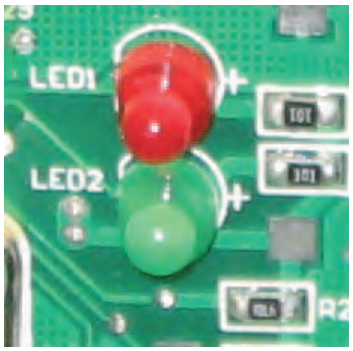


Fig. 38: LED display

Switch all indoor units on and select cooling mode and the highest fan stage. The following parameters are shown on the display:

Item	Display	Indicator value
0	Rated frequency of the compressor	Current value
1	Operating mode	0=Off 2=Cooling 3=Heating 4=Test
2	Condenser fan speed	Current value
3	Power of the connected indoor units	Current value
4	Power of the outdoor unit	Current value
5	Temperature probe, condenser, register	Current value
6	Temperature probe, ambient air	Current value
7	Temperature heat gas probe	Current value
8	Surface temperature of the cooling fins	Current value
9	Opening width of the electronic expansion valve in the outdoor unit	Current value
10	Outdoor unit current consumption	Current value
11	Outdoor unit voltage	Current value
12	Medium suction gas temperature	Current value
13	Number of indoor units	Current value
14	Number of indoor units running	Current value
15	Previous error message	Last error code, 00 = no error
16	--	Cancel

11 Troubleshooting and customer service

11.1 Troubleshooting

The unit and components are manufactured using state-of-the-art production methods and tested several times to verify their correct function. However, if malfunctions should occur, please check the functions as detailed in the list below. For systems with an indoor unit and outdoor unit, refer to the chapter "Trouble-shooting and customer service" in both operating manuals. Please inform your dealer if the unit is still not working correctly after all function checks have been performed!

Operational malfunctions

Malfunction	Possible causes	Checks	Remedial measures
The unit does not start or switches itself off	Power failure, under-voltage,	Does all other electrical equipment function cor-rectly?	Check the voltage and if necessary, wait for it to come back on
	Defective mains fuse / main switch turned off	Are all lighting circuits functioning correctly?	Replace mains fuse, switch main switch on
	Damaged power supply	Does all other elec. equip-ment function correctly?	Repair by specialist firm
	Wait time after switching on is too short	Does a restart occur after around 5 minutes?	Schedule longer wait times
	Operational temperature range too low/exceeded	Are the fans on the units still working?	Observe temperature ranges
	Over-voltage or under-voltage at times	Check by specialist firm	Switch the system off and back on
	Condensate pump's switch-off contact opened	Is the external condensate pump on the indoor unit showing "Malfunction"?	Clean the condensate pump's outlet. Have the pump replaced
The unit works at reduced or no cooling capacity.	Air inlet and / or air outlet opening blocked by debris.	Debris in air inlet and air outlet area?	Clean the fins. Reduce the air resistance.
	Thermal/wind load has increased.	Have structural / usage modifications been made?	Reduce the thermal/wind loads by taking appro-priate measures.
	No heat output possible.	Is the outdoor unit's fan working?	Check the fan / winter fan speed control.
	Leaking cooling cycle	Are there signs of severe frost on the large shut-off valve?	Repair by specialist firm.
The compressor's suction pipe and / or liquid separator have iced up	Thermal load has increased	Is the outdoor unit in per-manent operating mode?	Reduce the thermal load. If necessary, install an additional unit / insulate components that have iced up

Malfunction indicated by display MVV 1200-1600 DC

Display	Description	Cause	Details
E0	EEPROM error	EEPROM contact problem	on page 48
E2	Communication error between IU and OU	Power supply faulty, communication line faulty	
E3	Communication error of board in the OU	Board faulty, connection faulty	on page 49
E4	Probe outside temperature defective / interrupted, probe, condenser defective / interrupted	Probes faulty, connection faulty	on page 49
E5	Voltage monitoring has tripped	Power supply faulty, board faulty	on page 50
E6	Fan motor defective, connection interrupted	Board faulty	on page 50
E7	Excessive temperature heat exchanger outdoor unit in heating mode	Fan motor faulty, connection faulty	on page 51
E8	2x E6 malfunctions in 10 minutes	Fan motor faulty, connection faulty	on page 50
P0	Excessive temperature inverter module	Heat build-up in board space	on page 51
P1	High pressure fault	Connections faulty, fan motor faulty, register outdoor unit dirty, high pressure switch faulty	on page 52
P2	Low pressure alarm	Connections faulty, refrigerant piping faulty, register indoor unit dirty, low pressure switch faulty	on page 53
P3	Compressor overcurrent protection has tripped	Outside temperature too high, fan motor faulty, register outdoor unit dirty, refrigerant piping faulty	on page 54
P4	Excessive temperature compressor outlet	Connection faulty, refrigerant low,probe faulty	on page 55
P5	Excessive temperature in condenser	Register outdoor unit dirty, refrigerant piping faulty, probe faulty	on page 56
P6	Inverter module fault	Condenser faulty, inverter module faulty	on page 57
P7	Excessive temperature evaporator	Connection faulty, board indoor unit faulty, probe faulty	on page 58
P8	Fan protection against excessive speed	Strong wind at the outdoor unit	on page 58

Malfunction indicated by display MVV 2000 DC

Display	Description
H0	Error Ir341 and motherboard
H1	Communication error
H4	3x P6 within 30 minutes
H5	3x P2 within 30 minutes
H7	Number of indoor units has reduced
H8	Non functional
HF	"M-Home" error
E1	Non functional
E2	Communication error indoor unit and outdoor unit
E4	Probe T3 or T4 defective
E5	Overload protection
E6	Condenser fan fault
E7	Heat gas pipe probe defective
EA	Non functional
Eb	2x E6 within 10 minutes
P0	Compressor excessive temperature
P1	High pressure fault
P2	Low pressure alarm / direction of rotation of the mains supply faulty
P3	Outdoor unit current consumption fault
P4	Heat gas pipe excessive temperature
P5	Excessive temperature in condenser
P6	Inverter board fault
P8	Windbreak
PE	Temperature evaporator too high

11.2 Fault analysis

Error code E0: EEPROM error

Is the EEPROM correctly mounted on the circuit board?	NO →	Correctly mount the EEPROM on the circuit board
↓YES		
Replace indoor unit circuit board		

Error code E2: Communication error between indoor unit and outdoor unit

Switch off power to the system for 1 minute, re-establish power supply, start system		
↓YES		
Is the communication line correctly wired?	NO →	Correctly wire communication line
↓YES		
Has shielded cable been used?	NO →	Use shielded cable
↓YES		
Is a fixed resistor (120 Ohm) installed on the last indoor unit in the series?	NO →	Install fixed resistor (120 Ohm) on the last indoor unit in the series
↓YES		
Is the power supply to all units OK?	NO →	Ensure correct power supply
↓YES		
Check the circuit board on the indoor unit or outdoor unit and replace if necessary		

Error code E3: Communication error of board in the outdoor unit

Switch off power to the system for 1 minute, re-establish power supply, start system		
↓YES		
Are the LEDs on the control board flashing?	JOO →	Replace the control board
↓NO		
Is the connection between the control board and inverter board (CN1) established correctly?	NO →	Establish the connection correctly
↓YES		
Are 3.3. Volt present between the 3rd and 4th contact from the bottom (GND and +3.3V) of the plug CN201 on the control board?	NO →	Replace the control board
↓YES		
Is the connection between the inverter board and power pcb (CN12) established correctly?	NO →	Establish the connection correctly
↓YES		
Is the voltage between P and N on the power pcb 277 – 345 Volt?	JOO →	Replace the control board
↓NO		
Replace power pcb		

Error code E4: Error probe T3 register condenser / T4 air intake

Is the probe correctly mounted on the circuit board?	NO →	Correctly mount the probe on the circuit board
↓YES		
Is the probe visibly damaged?	JOO →	Replace probe
↓NO		
Are the probe resistance values OK? (See ↳ *Chapter 11.3 'Resistances of the temperature probes' on page 59*)	NO →	Replace probe
↓YES		
Replace indoor unit circuit board		

Error code E5: Voltage monitoring has tripped

Is the power supply to the outdoor unit 220 – 230 Volt?	NO →	Ensure the correct power supply
↓YES		
Replace power pcb. Is the fault still present?		
↓YES		
Replace the control board		

Error code E6: Fan motor fault

Is the fan motor correctly mounted on the board?	NO →	Correctly mount the fan motor on the board
↓YES		
Can the shaft of the fan motor be rotated easily?	NO →	Replace fan motor
↓YES		
Is the output voltage of the board between the black and white contacts of the fan motor 15 Volt when in standby operation?	NO →	Replace the control board
↓YES		
Is the output voltage of the board between the black and yellow contacts of the fan motor over 2.4 Volt?	NO →	Replace the control board
↓YES		
Replace fan motor		

Error code E7: Excessive temperature heat exchanger outdoor unit in heating mode

Is the outside temperature in heating mode higher than 24°C?	JOO →	System protection, heating not possible
↓NO		
Is the probe T3 correctly mounted on the board?	NO →	Correctly mount the probe on the circuit board
↓YES		
Is the probe visibly damaged?	JOO →	Replace probe
↓NO		
Are the probe resistance values OK? (See ↬ *Chapter 11.3 'Resistances of the temperature probes' on page 59*)	NO →	Replace probe
↓YES		
Replace the control board		

Error code P0: Excessive temperature inverter module

Is the inverter board heavily soiled?	JOO →	Switch off system and clean inverter board of coarse dirt
↓NO		
Switch off system, wait 5 minutes and switch system on again		

Error code P1: High pressure fault

Is the heat exchanger of the outdoor unit heavily soiled?	JOO →	Carefully clean the register
↓NO		
Are the fan motors working?	NO →	(See ↬ *on page 50*)
↓YES		
Is the ambient temperature of the outdoor unit above the usable limit?	NO →	Switch off unit and wait until the unit is back inside the usable limits
↓YES		
Is the plug of the pressure switch correctly mounted on the board?	NO →	Correctly mount the plug
↓YES		
Is the refrigerant piping kinked?	JOO →	Suction refrigerant back off, replace pipe, perform pressure test and evacuate, put back into operation
↓NO		
Is too much refrigerant in the cooling cycle?	JOO →	Suction off refrigerant and refill system
↓NO		
Switch off high pressure switch. Is the fault still present?		
↓YES		
Replace the control board, outdoor unit		

Error code P2: Low pressure alarm

Is the heat exchanger of the indoor unit heavily soiled?	JOO →	Carefully clean the register
↓NO		
Are the fan motors working?	NO →	(See ↗ *on page 50*)
↓YES		
Is the ambient temperature of the indoor unit above the usable limit?	NO →	Switch off unit and wait until the unit is back inside the usable limits
↓YES		
Is the plug of the pressure switch correctly mounted on the board?	NO →	Correctly mount the plug
↓YES		
Is the refrigerant piping kinked?	JOO →	Suction refrigerant back off, replace pipe, perform pressure test and evacuate, put back into operation
↓NO		
Is too little refrigerant in the cooling cycle?	JOO →	Fix leak, top up refrigerant
↓NO		
Replace low pressure switch. Is the fault still present?		
↓YES		
Replace the control board, outdoor unit		

Error code P3: Overcurrent protection, compressor

Is the total current consumption of the system greater than 30 ampere?	NO →	Replace the control board
↓YES		
Is the heat exchanger of the outdoor unit heavily soiled?	JOO →	Carefully clean the register
↓NO		
Are the fan motors working?	NO →	(See *on page 50*)
↓YES		
Is the ambient temperature of the outdoor unit above the usable limit?	NO →	Switch off unit and wait until the unit is back inside the usable limits
↓YES		
Is the refrigerant piping kinked?	JOO →	Suction refrigerant back off, replace pipe, perform pressure test and evacuate, put back into operation
↓NO		
Is too much refrigerant in the cooling cycle?	JOO →	Suction off refrigerant and refill system
↓NO		
Replace the control board, outdoor unit		

Error code P4: Excessive temperature compressor outlet

Is the compressor outlet temperature higher than 115°C?	NO →	Replace probe T5
↓YES		
Is too little refrigerant in the cooling cycle?	JOO →	Fix leak, top up refrigerant
↓NO		
Is the probe T5 correctly mounted on the board?	NO →	Correctly mount the probe on the circuit board
↓YES		
Is the probe visibly damaged?	JOO →	Replace probe
↓NO		
Are the probe resistance values OK? (See *Chapter 11.3 'Resistances of the temperature probes' on page 59*)	NO →	Replace probe
↓YES		
Replace the control board		

Error code P5: Excessive temperature in condenser

Is the condenser temperature higher than 65°C?	NO →	Replace probe T5
↓YES		
Is the probe T5 correctly mounted on the board?	NO →	Correctly mount the probe on the circuit board
↓YES		
Is the probe visibly damaged?	JOO →	Replace probe
↓NO		
Are the probe resistance values OK? (See *Chapter 11.3 'Resistances of the temperature probes' on page 59*)	NO →	Replace probe
↓YES		
Is the heat exchanger of the outdoor unit heavily soiled?	JOO →	Carefully clean the register
↓NO		
Is too little refrigerant in the cooling cycle?	JOO →	Fix leak, top up refrigerant
↓NO		
Is the refrigerant piping kinked?	JOO →	Suction refrigerant back off, replace pipe, perform pressure test and evacuate, put back into operation
↓NO		
Replace the control board		

Error code P6: Inverter module fault

Switch off power to the system for 1 minute, re-establish power supply, start system		
↓		
Measure resistances of the motor windings of the compressor U - V: 0.5 - 5.0 Ohm V - W: 0.5 - 5.0 Ohm W - U: 0.5 - 5.0 Ohm ?	NO →	Replace compressor
↓ YES		
Is the voltage between the capacitors of the compressor 540 – 600 Volt?	NO →	Replace defective capacitor
↓ YES		
Is the voltage between P and N on the inverter board approx. 570 Volt?	NO →	Replace the control board
↓ YES		
Replace inverter board		

Error code P7: Excessive temperature evaporator heating mode

Is the temperature at the evaporator of an indoor unit higher than 63°C for over 50 seconds?	NO →	Replace probe T2
↓YES		
Is the heat exchanger of the indoor unit heavily soiled?	JOO →	Carefully clean the register
↓NO		
Are the fan motors working?	NO →	(See *on page 50*)
↓YES		
Is the refrigerant piping kinked?	JOO →	Suction refrigerant back off, replace pipe, perform pressure test and evacuate, put back into operation
↓NO		
Is too much refrigerant in the cooling cycle?	JOO →	Suction off refrigerant and refill system
↓NO		
Wait until the temperature at probe T2 is below 50°C and the 3 minute compressor disabled time has elapsed		

Error code P8: Fan protection against excessive speed

The fan blade turns too quickly and generates high voltage on the board		
↓		↓
Weather-related increase in the fan speed		Installation of the outdoor unit favours high air flow rate
↓		↓
Implement wind protection measures		Implement wind protection measures and change the installation site if necessary

11.3 Resistances of the temperature probes

Probe T3, T4

Temp. (°C)	Resistance (Ohm)	Temp. (°C)	Resistance (Ohm)
-20	115.27	12	18.72
-19	108.15	13	17.80
-18	101.52	14	16.93
-17	96.34	15	16.12
-16	89.59	16	15.34
-15	84.22	17	14.62
-14	79.31	18	13.92
-13	74.54	19	13.26
-12	70.17	20	12.64
-11	66.09	21	12.06
-10	62.28	22	11.50
-9	58.71	23	10.97
-8	56.37	24	10.47
-7	52.24	25	10.00
-6	49.32	26	9.55
-5	46.57	27	9.12
-4	44.00	28	8.72
-3	41.59	29	8.34
-2	39.82	30	7.97
-1	37.20	31	7.62
0	35.20	32	7.29
1	33.33	33	6.98
2	31.56	34	6.68
3	29.91	35	6.40
4	28.35	36	6.13
5	26.88	37	5.87
6	25.50	38	5.63
7	24.19	39	5.40
8	22.57	40	5.18
9	21.81	41	4.96
10	20.72	42	4.76
11	19.69	43	4.57
44	4.39	79	1.21
45	4.21	80	1.17
46	4.05	81	1.14
47	3.89	82	1.10
48	3.73	83	1.06
49	3.59	84	1.03
50	3.45	85	1.00
51	3.32	86	0.97
52	3.19	87	0.94
53	3.07	88	0.91
54	2.96	89	0.88
55	2.84	90	0.85
56	2.74	91	0.83
57	2.64	92	0.80
58	2.54	93	0.78
59	2.45	94	0.75
60	2.36	95	0.73
61	2.27	96	0.71
62	2.19	97	0.69
63	2.11	98	0.67
64	2.04	99	0.65
65	1.97	100	0.63
66	1.90	101	0.61
67	1.83	102	0.59
68	1.77	103	0.58
69	1.71	104	0.56
70	1.65	105	0.54
71	1.59	106	0.53
72	1.54	107	0.51
73	1.48	108	0.50
74	1.43	109	0.48
75	1.39	110	0.47
76	1.34	111	0.46
77	1.29	112	0.45
78	1.25	113	0.43

REMKO MVV series

Temp. (°C)	Resistance (Ohm)	Temp. (°C)	Resistance (Ohm)
114	0.42	127	0.30
115	0.41	128	0.29
116	0.40	129	0.28
117	0.39	130	0.28
118	0.38	131	0.27
119	0.37	132	0.26
120	0.36	133	0.26
121	0.35	134	0.25
122	0.34	135	0.25
123	0.33	136	0.24
124	0.32	137	0.23
125	0.32	138	0.23
126	0.31	139	0.22

Probe T5

Temp. (°C)	Resistance (Ohm)	Temp. (°C)	Resistance (Ohm)
-20	542.7	-2	200.7
-19	511.9	-1	190.5
-18	483.0	0	180.9
-17	455.9	1	171.9
-16	430.5	2	163.3
-15	406.7	3	155.2
-14	384.3	4	147.6
-13	363.3	5	140.4
-12	343.6	6	133.5
-11	325.1	7	127.1
-10	307.7	8	121.0
-9	291.3	9	115.2
-8	275.9	10	109.8
-7	261.4	11	104.6
-6	247.8	12	99.69
-5	234.9	13	95.05
-4	222.8	14	90.66
-3	211.4	15	86.49

Temp. (°C)	Resistance (Ohm)	Temp. (°C)	Resistance (Ohm)
16	82.54	51	18.96
17	78.79	52	18.26
18	75.24	53	17.58
19	71.86	54	16.94
20	68.66	55	16.32
21	65.62	56	15.73
22	62.73	57	15.16
23	59.98	58	14.62
24	57.37	59	14.09
25	54.89	60	13.59
26	52.53	61	13.11
27	50.28	62	12.65
28	48.14	63	12.21
29	46.11	64	11.79
30	44.17	65	11.38
31	42.33	66	10.99
32	40.57	67	10.61
33	38.89	68	10.25
34	37.30	69	9.90
35	35.78	70	9.57
36	34.32	71	9.25
37	32.94	72	8.94
38	31.62	73	8.64
39	30.36	74	8.36
40	29.15	75	8.08
41	28.00	76	7.82
42	26.90	77	7.57
43	25.86	78	7.32
44	24.85	79	7.09
45	23.89	80	6.86
46	22.89	81	6.64
47	22.10	82	6.43
48	21.26	83	6.23
49	20.46	84	6.03
50	19.69	85	5.84

Temp. (°C)	Resistance (Ohm)	Temp. (°C)	Resistance (Ohm)
86	5.66	109	2.86
87	5.49	110	2.78
88	5.32	111	2.70
89	5.16	112	2.63
90	5.00	113	2.56
91	4.85	114	2.49
92	4.70	115	2.42
93	4.56	116	2.36
94	4.43	117	2.29
95	4.29	118	2.23
96	4.17	119	2.17
97	4.05	120	2.12
98	3.93	121	2.06
99	3.81	122	2.01
100	3.70	123	1.96
101	3.60	124	1.91
102	3.49	125	1.86
103	3.39	126	1.81
104	3.30	127	1.76
105	3.20	128	1.72
106	3.11	129	1.67
107	3.03	130	1.63
108	2.94		

12 Care and maintenance

Regular care and observation of some basic points will ensure trouble-free operation and a long service life.

DANGER!

Prior to performing any work, ensure the equipment is disconnected from the voltage supply and secured to prevent accidental switch-on!

Care

- Ensure the unit is protected against dirt, mould and other deposits.
- Only clean the unit using a damp cloth. Do not use a jet of water.
- Do not use any caustic, abrasive or solvent-based cleaning products
- When operating the fan, clean the fins of the unit prior to long shutdown periods.

Maintenance

- It is recommended that you take out a maintenance contract with an annual service from an appropriate specialist firm.

This enables you to ensure the operational reliability of the plant at all times!

NOTICE!

Statutory regulations require an annual leak test for the cooling cycle dependant on the refrigerant quantity. Inspection and documentation of the work performed is to be carried out by specialist technicians.

Type of task Checks/maintenance/inspection	Commis-sioning	Monthly	Half-yearly	Yearly
General	●			●
Check voltage and current	●			●
Check function of compressor/fans	●			●
Dirt on condenser	●	●		
Check the refrigerant volume	●		●	
Check condensate drainage	●		●	
Check insulation	●			●
Check moving parts	●			●
Sealing test for cooling cycle	●			●[1)]

[1)] see note *on page 61*

13 Shutdown

Temporary shutdown

1. Let the indoor unit run for 2 to 3 hours in recirculation mode, or in cooling mode at maximum temperature, to extract any residual humidity from the unit.
2. Shut down the system using the remote control.
3. Switch off the electrical power supply to the unit.
4. Cover the unit as far as possible with plastic foil in order to protect it from the influences of weather.

Permanent shutdown

Ensure that units and components are disposed of in accordance with local regulations, e.g. through authorised disposal and recycling specialists or at collection points.

REMKO GmbH & Co. KG or your contractual partner will be pleased to provide a list of certified firms in your area.

14 Exploded view of the unit and spare parts list

14.1 Exploded view of the unit

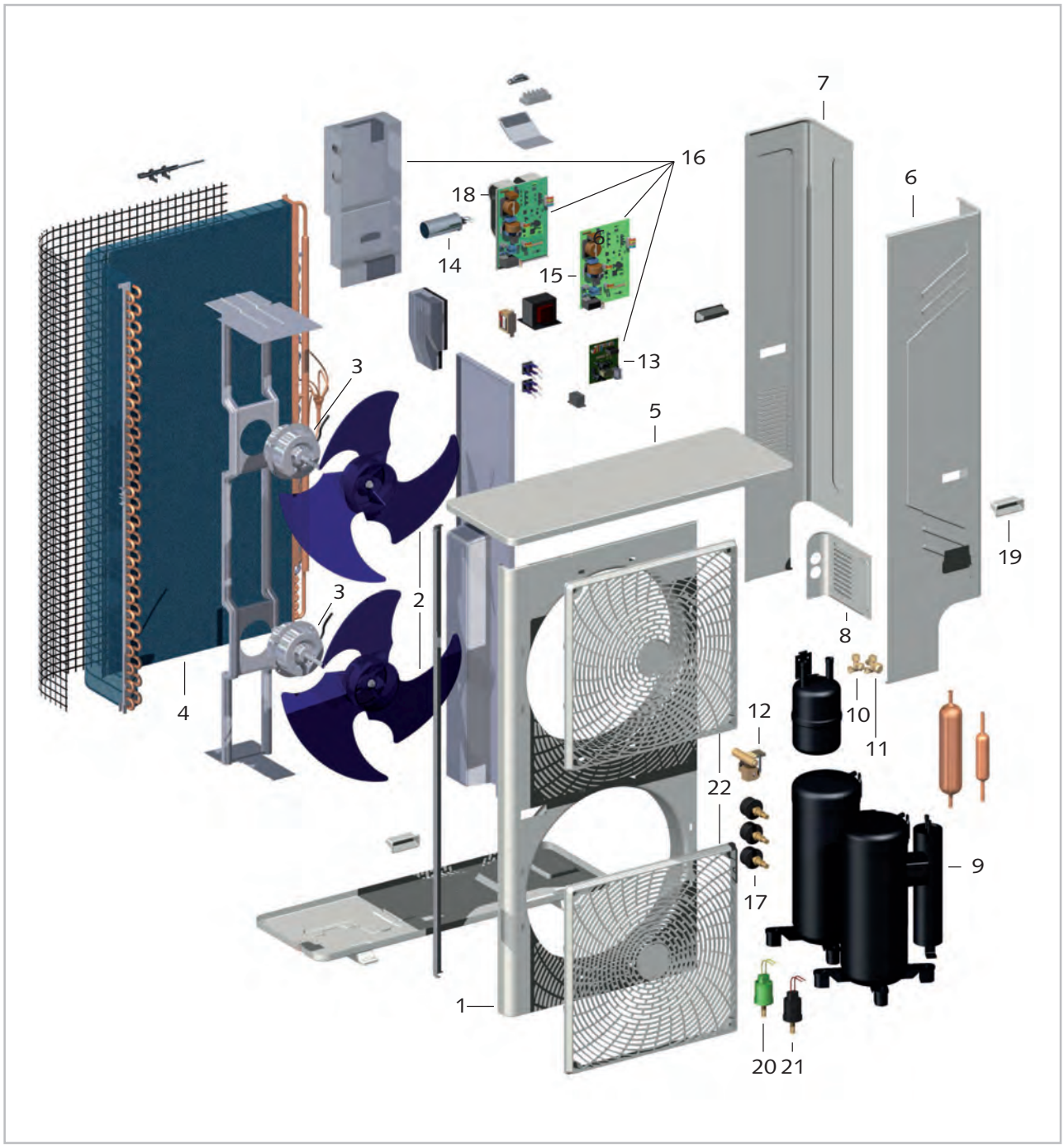


Fig. 39: Exploded view of the unit MVV 1200-2000 DC

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

14.2 Spare parts list

No.	Designation	MVV 1200 DC	MVV 1600 DC	MVV 2000 DC
1	Front panel	On request by providing the serial number		
2	Fan blade, condenser			
3	Fan motor, condenser			
4	Condenser			
5	Cover panel			
6	Side panel, right front			
7	Side panel, right rear			
8	Cover, right rear			
9	Compressor, cpl. incl. capacitor			
10	Shut-off valve, suction pipe			
11	Shut-off valve, liquid pipe			
12	Reversing valve			
13	Inverter board			
14	Capacitor, compressor			
15	Control board with display			
16	Electronics module, cpl.			
17	Electronic expansion valve			
18	Power pcb			
19	Recessed grip			
20	High pressure switch			
21	Low pressure switch			
22	Air outlet grid, condenser			

When ordering spare parts, please always state the serial no., unit number and unit type (see name plate)!

For spare parts that are not illustrated see next page.

Spare parts not illustrated

No.	Designation	MVV 1200 DC	MVV 1600 DC	MVV 2000 DC
	Cover, right front	On request by providing the serial number		
	Electrical crankcase heating			
	Temperature probe, ambient air			
	Temperature probe outlet, condenser			
	Temperature probe, heat gas			
	Solenoid valve SV2, SV4, SV7			
	Solenoid valve heat gas bypass SV5			
	Solenoid valve re-injection SV6			
	Solenoid valve coil for SV2, SV4, SV7			
	Solenoid valve coil for SV5, SV7			
	Phase sequence relay			

When ordering spare parts, please always state the serial no., unit number and unit type (see name plate)!

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REMKO QUALITY WITH SYSTEMS

Air-Conditioning | Heating | New Energies

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