Operating and installation instructions

REMKO MVT series

Multisplit air-conditioning systems for cooling and heating
Outdoor units

MVT 603 DC, MVT 903 DC, MVT 1053 DC, MVT 1403 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 or their components for the first time. It provides useful tips and notes such as hazard warnings to prevent injury and material damage. Failure to follow the directions in this manual can endanger persons, the environment and the equipment itself or its components and will void any claims for liability.

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

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

Warning of inflammable substances!

1.2 Identification of notes

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

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

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

DANGER!

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

DANGER!

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

WARNING!

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

CAUTION!

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

NOTICE!

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

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

1.3 Personnel qualifications

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

1.4 Dangers of failure to observe the safety notes

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

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

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

1.5 Safety-conscious working

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

1.6 Safety instructions for the operator

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

- The units and components may only be set up, installed and maintained by qualified personnel.
- Protective covers (grills) over moving parts must not be removed from units that are in operation.
- Do not operate units or components with obvious defects or signs of damage.
- Contact with equipment parts or components can lead to burns or injury.
- The units and components must not be exposed to any mechanical load, extreme levels of humidity or extreme temperatures.
- Rooms in which refrigerant may escape shall be adequately aerated and ventilated. Otherwise, a risk of suffocation or fire exists.
- Do not leave children unsupervised when close to the system.
- Commissioning must be performed by authorised specialists exclusively. Deficient commissioning may lead to water leaks, electric shocks or fire. Commissioning must take place as described in the user manual.
- Only instruct authorised specialist personnel to perform maintenance or servicing.
- The system is filled with a flammable refrigerant. Never thaw any frozen unit components independently!
- Do not operate any further devices that produce high heat or naked flames in the same room.
- All housing parts and unit openings, e.g. air inlets and outlets, must be kept clear.
- The units must be inspected by a service technician to ensure that they are safe to use and fully functional at least once yearly. Visual inspections and cleaning may be performed by the operator when the units are disconnected from the mains.

1.7 Safety notes for installation, maintenance and inspection

- The refrigerant R32 used in the system is flammable. If applicable, observe the local safety conditions.
- Keep the cooling circuit clear of other gases and foreign substances. Only fill the cooling circuit with the refrigerant R32.
- Only use the accessories, components and appropriately marked parts provided. The use of non-standardised components may result in water leaks, electric shocks and fire.
- Only install and store the units in rooms larger than 4 m^2. With a failure to comply, leaks may result in the room filling with a flammable mixture!

  The minimum room size of 4 m^2 required for installation and storage pertains to the basic fill quantity of the unit. This varies according to the installation type and total fill quantity of the system. The calculation must take place in accordance with valid DIN standards. Make sure that the installation site is suitable for safe unit operation.
- Only mount the unit components on structurally suitable brickwork.
- The units must not be installed in rooms in which further devices that produce heat are operated (heaters, open hearths).
- Make sure the installation room is sufficiently ventilated.
- Interventions in the cooling circuit are only possible after completely draining the refrigerant. Never solder or grind unit components!
- Note that refrigerant may be odourless.
- Never operate the air conditioning unit in a humid room, such as a bathroom or laundry room. If the humidity is too high, this can cause short circuits on electrical parts.
- The product must be correctly earthed at all times, otherwise it may induce electric shocks.
- Attach the condensate drain as described in the operating manual. The inadequate drainage of condensate can lead to water damage in your apartment.
- All persons who intervene in the cooling circuit must hold a valid certificate from the chamber of industry and commerce, which confirms their ability to work with refrigerant.

- 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.
- Regional regulations and laws as well as the 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.
- 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 may not be modified or bypassed.
- The connection of the indoor unit must be established as a permanent connection; a detachable, reusable connection is not permissible.

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		MVT 603 DC	MVT 903 DC	MVT 1053 DC	MVT 1403 DC
Operating mode		Inverter multisplit outdoor units for cooling and heating			
Nominal cooling output [1]	kW	5,3 [d] (2.1-6.9)	7.9 [c] (2.9-8.5)	10.5 [b] (2.1-10.6)	12.4 [a] (2.1-14.20)
Energy efficiency ratio SEER		6,1 [d]	6.1 [c]	6.5 [b]	6.1 [a]
Power consumption, annual, Q_{CE} [3]	kWh	304 [d]	453 [c]	565 [b]	652 [a]
Energy efficiency ratio - cooling		A++ [d]	A++ [c]	A++ [b]	A++ [a]
Nominal heat capacity [2]	kW	4,3 [d] (2.3-7.2)	5.7 [c] (2.0-8.5)	8.9 [b] (2.3-11.1)	9.2 [a] (2.3-14.8)
Energy efficiency ratio SCOP [4]		4,0 [d]	4.0 [c]	4.0 [b]	3.8 [a]
Power consumption, annual, Q_{HE} [3] [4]	kWh	1537 [d]	1993 [c]	3226 [b]	3500 [a]
Energy efficiency ratio - heating		A+ [d]	A+ [c]	A+ [b]	A [a]
Power supply	V/ Ph/Hz	230/1~/50			
Electrical rated power consumption, cooling [1]	kW	1.63	2.45	3.50	4.26
Electrical rated power consumption, heating [2]	kW	1.50	2.10	3.00	3.10
Elec. power consumption, max.	kW	2,85 [d]	3,60 [c]	4,50 [b]	4,50 [a]
Electrical rated current consumption, cooling [1]	A	7.1	13.7	16.8	18.5
Electrical rated current consumption, heating [2]	A	6.6	12.5	15.0	13.5
Elec. current consumption, max.	A	13	17.5	21.5	22.0
Refrigerant connection, injection pipe	Inches (mm)	1/4 (6.35)			
Refrigerant connection, suction pipe	Inches (mm)	3.8 (9.52)		3 x 3/8 + 1 x 1/2 (9.52+12.70)	4 x 3/8 + 1 x 1/2 (9.52+12.70)
Operating pressure, max.	kPa	4300/1700			
Operating range, cooling	°C	-15 to +50			
Operating range, heating	°C	-15 to +24			
Air flow rate, max.	m^3/h	2200	2700	4000	3850
Enclosure class	IP	24			
Sound power level max.	dB (A)	65	67	70	70
Sound pressure level [5]	dB (A)	56	54	62	64

REMKO MVT series

Series		MVT 603 DC	MVT 903 DC	MVT 1053 DC	MVT 1403 DC
Refrigerant [6]		R32			
Refrigerant, basic quantity	kg	1.25	1.72	2.10	2.40
CO_2 equivalent	t	0.84	1.16	1.42	1.62
Refrigerant, additional quantity >5m	g/m	30			
Max. number of indoor units		2	3	4	5
Refrigerant piping, max. length per IU	m	25	30	35	35
Refrigerant piping, max. total length	m	40	60	80	80
Refrigerant piping, max. height, upper OU	m	10			
Refrigerant piping, max. height, bottom OU	m	15			
Dimensions Height	mm	554	673	810	
Width	mm	877	995	1044	
Depth	mm	346	380	465	
Weight	kg	35.5	51.1	68.8	73.3
EDP no.		1623350	1623355	1623360	1623365

[1] Air intake temperature TK 27 °C/FK 19 °C, outside temperature TK 35 °C, FK 24 °C, max. air flow volume, 5 m pipe length

[2] Air intake temperature TK 20 °C, outside temperature TK 7 °C, FK 6 °C, max. air flow volume, 5 m pipe length

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

[4] The specified value is based on the average heating period

[5] At a distance of 1 m in the open air: specified values are maximum values

[6] Contains greenhouse gas per the Kyoto protocol, GWP 675 (for further information, see "Adding refrigerant" chapter).

In conjunction with

[a] 5 x MXW 204

[b] 4 x MXW 204

[c] 3 x MXW 204

[d] 2 x MXW 204

2.2 Unit dimensions

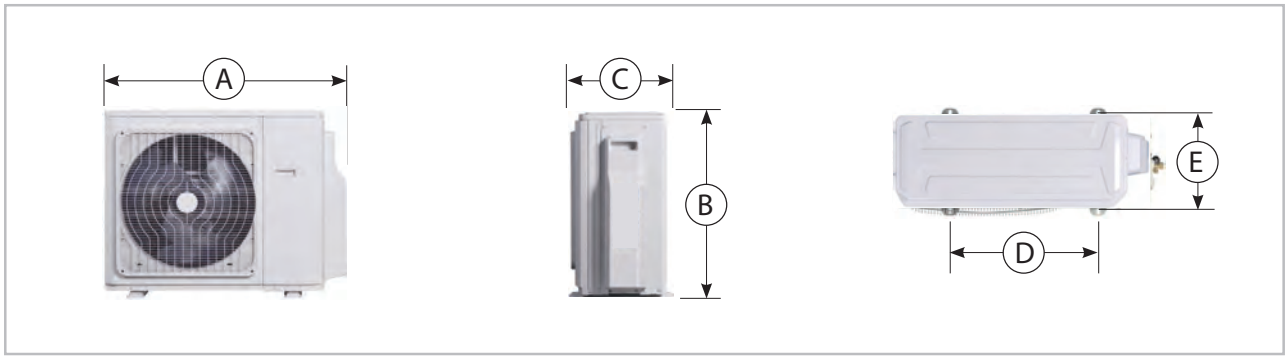


Fig. 1: Dimensions

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

	A	B	C	D	E
MVT 603 DC	877	554	346	511	317
MVT 903 DC	995	673	380	663	348
MVT 1053 DC	1044	810	465	673	403
MVT 1403 DC	1044	810	465	673	403

(All measurements in mm)

2.3 Performance data

Cooling capacity MVT 603 DC

Inside		Outside temperature (TK, °C)								
		20			25			30		
		Cooling capacity (A = Total, B = Sensitive, C = Power consumption)								
TK	FK	A	B	C	A	B	C	A	B	C
°C	°C	kW	kW	kW	kW	kW	kW	kW	kW	kW
20	14	8.11	6.32	1.86	7.76	6.20	2.03	7.41	6.07	2.20
22	16	8.53	6.53	1.88	8.16	6.41	2.05	7.80	6.28	2.22
25	18	8.98	6.74	1.90	8.59	6.62	2.07	8.21	6.48	2.24
27	19	9.16	6.78	1.91	8.77	6.66	2.08	8.37	6.53	2.25
30	22	9.81	7.11	1.93	9.38	6.99	2.10	8.96	6.85	2.28
32	24	10.17	7.27	1.94	9.73	7.15	2.11	9.30	7.02	2.29

Inside		Outside temperature (TK, °C)					
		35			40		
		Cooling capacity (A = Total, B = Sensitive, C = Power consumption)					
TK	FK	A	B	C	A	B	C
°C	°C	kW	kW	kW	kW	kW	kW
20	14	6.99	5.87	2.39	6.78	5.83	2.56
22	16	7.35	6.07	2.41	7.13	6.03	2.58
25	18	7.74	6.27	2.44	7.51	6.23	2.61
27	19	**7.90**	**6.32**	**2.45**	7.66	6.28	2.62
30	22	8.45	6.64	2.47	8.20	6.60	2.65
32	24	8.77	6.80	2.49	8.51	6.76	2.66

Heating capacity MVT 603 DC

Inside	Outside temperature (TK, °C)							
	-20		-15		-10		-7	
	Heating capacity (A = Total, B = Sensitive, C = Power consumption)							
TK	A	C	A	C	A	C	A	C
°C	kW	kW	kW	kW	kW	kW	kW	kW
15	4.65	2.73	5.44	2.83	6.24	2.93	6.71	2.99
18	5.58	2.77	5.36	2.87	6.15	2.97	6.62	3.03
20	4.51	2.82	5.28	2.92	6.06	3.02	6.52	3.08
22	4.42	2.84	5.18	2.95	5.93	3.05	6.39	3.11
24	4.37	2.87	5.12	2.98	5.87	3.08	6.32	3.14
25	4.33	2.89	5.07	2.99	5.81	3.09	6.26	3.16
27	4.28	2.91	5.02	3.02	5.75	3.12	6.19	3.19

Inside	Outside temperature (TK, °C)					
	2		7		10	
	Heating capacity (A = Total, B = Sensitive, C = Power consumption)					
TK	A	C	A	C	A	C
°C	kW	kW	kW	kW	kW	kW
15	7.09	2.69	8.45	2.13	8.02	1.92
18	6.99	2.73	8.32	2.17	7.91	1.95
20	6.89	2.77	**8.20**	**2.20**	7.79	1.98
22	6.75	2.80	8.04	2.22	7.63	2.00
24	6.68	2.83	7.95	2.24	7.56	2.02
25	6.61	2.84	7.87	2.26	7.48	2.03
27	6.54	2.87	7.79	2.28	7.40	2.05

REMKO MVT series

Cooling capacity MVT 903 DC

Inside		Outside temperature (TK, °C)								
		20			25			30		
		Cooling capacity (A = Total, B = Sensitive, C = Power consumption)								
TK	FK	A	B	C	A	B	C	A	B	C
°C	°C	kW	kW	kW	kW	kW	kW	kW	kW	kW
20	14	8.42	6.57	1.93	8.06	6.45	2.11	7.70	6.31	2.28
22	16	8.87	6.78	1.95	8.48	6.66	2.13	8.10	6.52	2.30
25	18	9.33	7.00	1.97	8.93	6.88	2.15	8.53	6.74	2.33
27	19	9.52	7.05	1.98	9.11	6.93	2.16	8.70	6.79	2.34
30	22	10.19	7.39	2.00	9.75	7.26	2.18	9.31	7.12	2.36
32	24	10.57	7.56	2.01	10.12	7.43	2.19	9.66	7.29	2.37

Inside		Outside temperature (TK, °C)					
		35			40		
		Cooling capacity (A = Total, B = Sensitive, C = Power consumption)					
TK	FK	A	B	C	A	B	C
°C	°C	kW	kW	kW	kW	kW	kW
20	14	7.26	6.10	2.48	7.04	6.06	2.65
22	16	7.64	6.31	2.50	7.41	6.27	2.68
25	18	8.05	6.52	2.53	7.80	6.48	2.70
27	19	**8.21**	**6.57**	**2.54**	7.96	6.53	2.72
30	22	7.78	6.90	2.57	8.52	6.86	2.74
32	24	9.11	7.06	2.58	8.84	7.03	2.76

Heating capacity MVT 903 DC

Inside	Outside temperature (TK, °C)							
	-20		-15		-10		-7	
	Heating capacity (A = Total, B = Sensitive, C = Power consumption)							
TK	A	C	A	C	A	C	A	C
°C	kW	kW	kW	kW	kW	kW	kW	kW
15	4.12	2.74	4.84	2.74	5.55	2.75	5.98	2.76
18	4.06	2.78	4.77	2.79	5.47	2.80	5.90	2.80
20	4.00	2.82	4.70	2.83	5.39	2.84	5.81	2.84
22	3.92	2.85	4.60	2.86	5.28	2.87	5.69	2.87
24	3.88	2.88	4.56	2.89	5.23	2.90	5.63	2.90
25	3.84	2.89	4.51	2.90	5.18	2.91	5.58	2.92
27	3.80	2.92	4.46	2.93	5.12	2.94	5.52	2.94

Inside	Outside temperature (TK, °C)					
	2		7		10	
	Heating capacity (A = Total, B = Sensitive, C = Power consumption)					
TK	A	C	A	C	A	C
°C	kW	kW	kW	kW	kW	kW
15	6.34	2.41	9.06	2.30	8.61	2.07
18	6.25	2.45	8.93	2.33	8.49	2.10
20	6.16	2.49	**8.80**	**2.37**	8.36	2.13
22	6.04	2.51	8.62	2.39	8.19	2.15
24	5.98	2.54	8.54	2.42	8.11	2.18
25	5.91	2.55	8.45	2.43	8.03	2.19
27	5.85	2.58	8.36	2.45	7.94	2.21

REMKO MVT series

Cooling capacity MVT 1053 DC

Inside		Outside temperature (TK, °C)								
		20			25			30		
		Cooling capacity (A = Total, B = Sensitive, C = Power consumption)								
TK	FK	A	B	C	A	B	C	A	B	C
°C	°C	kW	kW	kW	kW	kW	kW	kW	kW	kW
20	14	10.77	8.40	2.47	10.31	8.25	2.69	9.84	8.07	2.92
22	16	11.34	8.67	2.50	10.85	8.52	2.72	10.36	8.34	2.95
25	18	11.94	8.95	2.52	11.42	8.79	2.75	10.91	8.62	2.98
27	19	12.18	9.01	2.54	11.66	8.86	2.76	11.13	8.68	2.99
30	22	13.03	9.45	2.56	12.47	9.29	2.79	11.91	9.11	3.02
32	24	13.52	9.67	2.57	12.94	9.51	2.80	12.35	9.33	3.03

Inside		Outside temperature (TK, °C)					
		35			40		
		Cooling capacity (A = Total, B = Sensitive, C = Power consumption)					
TK	FK	A	B	C	A	B	C
°C	°C	kW	kW	kW	kW	kW	kW
20	14	9.29	7.80	3.17	9.01	7.75	3.39
22	16	9.78	8.06	3.20	9.48	8.01	3.43
25	18	10.29	8.33	3.23	9.98	8.28	3.46
27	19	**10.50**	**8.40**	**3.25**	10.19	8.35	3.48
30	22	11.24	8.83	3.28	10.90	8.77	3.51
32	24	11.66	9.03	3.30	11.31	8.99	3.53

Heating capacity MVT 1053 DC

Inside	Outside temperature (TK, °C)							
	-20		-15		-10		-7	
	Heating capacity (A = Total, B = Sensitive, C = Power consumption)							
TK	A	C	A	C	A	C	A	C
°C	kW	kW	kW	kW	kW	kW	kW	kW
15	4.92	3.92	6.06	3.97	6.99	3.92	7.55	3.89
18	4.84	3.98	5.97	4.03	6.89	3.98	7.44	3.95
20	4.77	4.04	5.88	4.10	6.78	4.04	7.33	4.01
22	4.68	4.08	5.77	4.14	6.65	4.08	7.18	4.05
24	4.63	4.12	5.71	4.18	6.58	4.12	7.11	4.09
25	4.58	4.14	5.65	4.20	6.51	4.14	7.03	4.11
27	4.53	4.18	5.59	4.24	6.45	4.18	6.96	4.15

Inside	Outside temperature (TK, °C)					
	2		7		10	
	Heating capacity (A = Total, B = Sensitive, C = Power consumption)					
TK	A	C	A	C	A	C
°C	kW	kW	kW	kW	kW	kW
15	8.75	3.60	11.43	2.90	10.86	2.61
18	8.62	3.65	11.27	2.95	10.70	2.65
20	8.49	3.71	**11.10**	**2.99**	10.55	2.69
22	8.32	3.74	10.88	3.02	10.33	2.72
24	8.24	3.78	10.77	3.05	10.23	2.74
25	8.15	3.80	10.66	3.06	10.12	2.76
27	8.07	3.84	10.55	3.09	10.02	2.79

REMKO MVT series

Cooling capacity MVT 1403 DC

Inside		Outside temperature (TK, °C)								
		20			25			30		
		Cooling capacity (A = Total, B = Sensitive, C = Power consumption)								
TK	FK	A	B	C	A	B	C	A	B	C
°C	°C	kW	kW	kW	kW	kW	kW	kW	kW	kW
20	14	12.62	9.84	2.89	12.08	9.66	3.15	11.53	9.46	3.41
22	16	13.28	10.16	2.92	12.71	9.98	3.18	12.14	9.77	3.44
25	18	13.98	10.49	2.95	13.38	10.30	3.21	12.78	10.09	3.48
27	19	14.27	10.56	2.96	13.65	10.38	3.23	13.04	10.17	3.50
30	22	15.27	11.07	2.99	14.61	10.88	3.26	13.95	10.67	3.53
32	24	15.84	11.32	3.01	15.15	11.14	3.28	14.47	10.93	3.55

Inside		Outside temperature (TK, °C)					
		35			40		
		Cooling capacity (A = Total, B = Sensitive, C = Power consumption)					
TK	FK	A	B	C	A	B	C
°C	°C	kW	kW	kW	kW	kW	kW
20	14	10.88	9.14	3.71	10.55	9.08	3.96
22	16	11.45	9.45	3.74	11.11	9.39	4.01
25	18	12.05	9.76	3.78	11.69	9.70	4.05
27	19	**12.30**	**9.84**	**3.80**	11.93	9.78	4.07
30	22	13.16	10.34	3.84	12.77	10.28	4.11
32	24	13.65	10.58	3.86	13.24	10.53	4.13

Heating capacity MVT 1403 DC

Inside	Outside temperature (TK, °C)							
	-20		-15		-10		-7	
	Heating capacity (A = Total, B = Sensitive, C = Power consumption)							
TK	A	C	A	C	A	C	A	C
°C	kW	kW	kW	kW	kW	kW	kW	kW
15	4.75	3.87	5.83	3.91	6.70	3.69	7.22	3.55
18	4.68	3.93	5.74	3.97	6.60	3.74	7.12	3.61
20	4.61	3.99	5.66	4.03	6.50	3.80	7.01	3.66
22	4.52	4.03	5.54	4.07	6.37	3.84	6.87	3.70
24	4.47	4.07	5.49	4.11	6.31	3.88	6.80	3.74
25	4.43	4.09	5.43	4.13	6.24	3.89	6.73	3.75
27	4.38	4.13	5.38	4.17	6.18	3.93	6.66	3.79

Inside	Outside temperature (TK, °C)					
	2		7		10	
	Heating capacity (A = Total, B = Sensitive, C = Power consumption)					
TK	A	C	A	C	A	C
°C	kW	kW	kW	kW	kW	kW
15	8.74	3.43	12.67	3.20	12.04	2.88
18	8.61	3.48	12.48	3.25	11.86	2.93
20	8.49	3.53	**12.30**	**3.30**	11.69	2.97
22	8.32	3.57	12.05	3.33	11.45	3.00
24	8.23	3.60	11.93	3.37	11.33	3.03
25	8.15	3.62	11.81	3.38	11.22	3.04
27	8.06	3.65	11.69	3.42	11.10	3.07

3 Design and function

3.1 Unit description

In cooling mode, the outdoor unit serves to output the heat extracted by the indoor unit 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 unit is designed to be mounted high up on the wall, in indoor areas. It is operated by an infrared remote control. The outdoor unit comprises a circuit containing a compressor, a liquefier with fin vaporisers, three electronic expansion valves and a condenser fan. The outdoor unit is combinable with REMKO indoor units from the MXW, MXD, MXT and ATY ranges in accordance with the cooling capacity (see "Combinations" chapter). The outdoor unit refrigerant circuit is controlled by the regulator in the indoor unit. In order to enable operation of the device at low outdoor temperatures, a thermal condenser pressure regulator serves as winter fan speed control to regulate the speed of the condenser fan.

Floor consoles, wall consoles and refrigerant pipes are available as accessories.

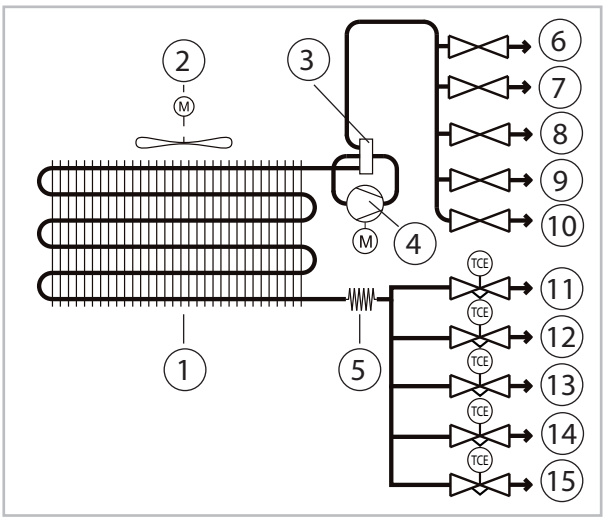


Fig. 2: Cooling cycle schematic

1: Condenser
2: Condenser fan
3: Reversing valve
4: Compressor
5: Capillary tube throttle element
6: Suction pipe connection valve A
7: Suction pipe connection valve B
8: Suction pipe connection valve C
9: Suction pipe connection valve D
10: Suction pipe connection valve E
11: Injection pipe A
12: Injection pipe B
13: Injection pipe C
14: Injection pipe D
15: Injection pipe E

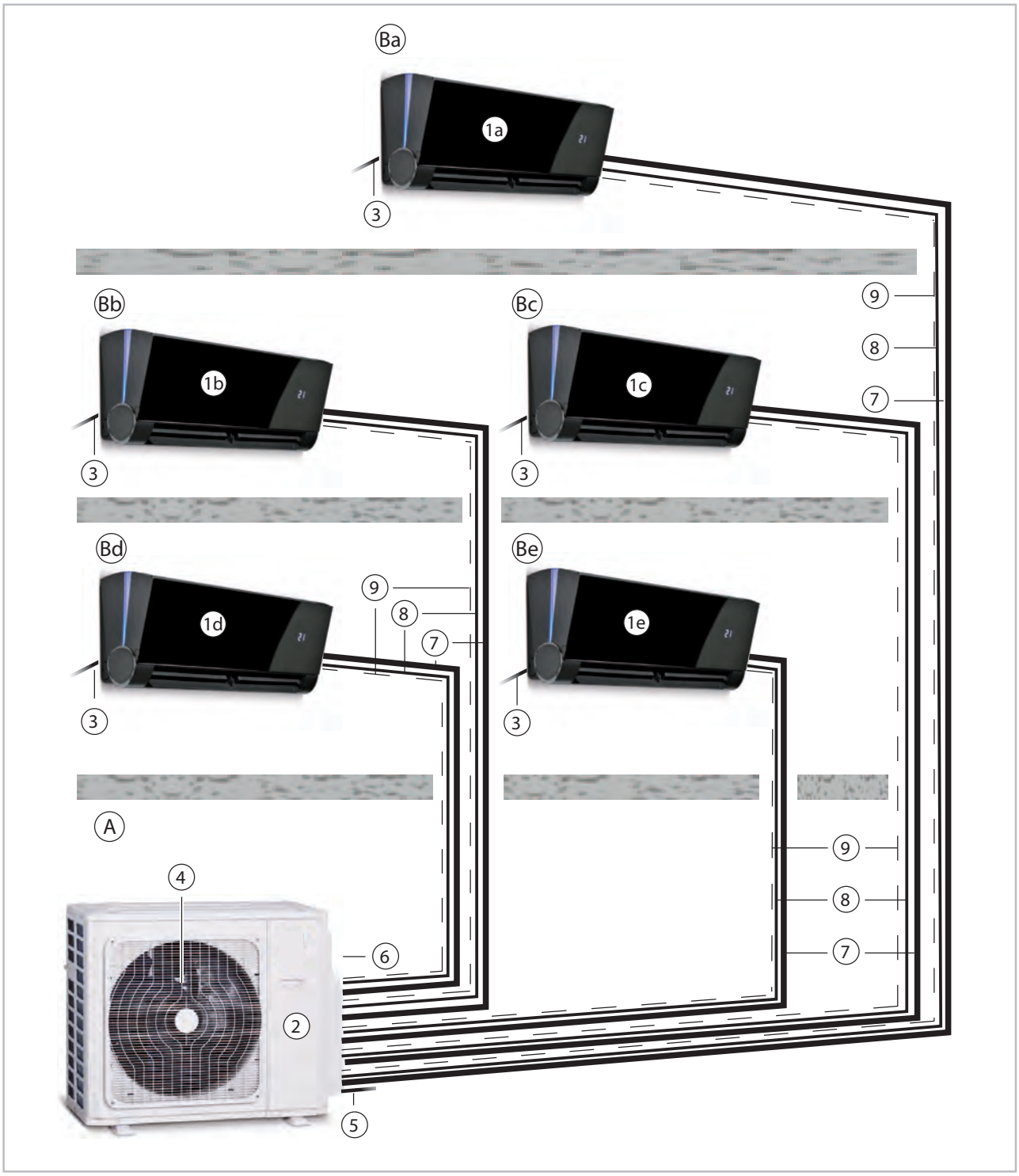


Fig. 3: System layout MVT 1403 DC

A: Outdoor area
Ba-e: Indoor area
1a-e: Indoor units
2: Outdoor unit
3: Condensate drainage line
4: Condenser fan
5: Power supply
6: Shut-off valves
7: Suction pipes
8: Injection pipes
9: Control lines

The connection between the indoor unit (indoor areas Ba, Bb, Bc, Bd, Be) and the outdoor unit (connection circuits A, B, C, D, E) of the outdoor unit is established using refrigerant piping and a control line.

3.2 Combinations

Indoor units

The following indoor units can be used together with the MVT 603-1403 DC outdoor units:

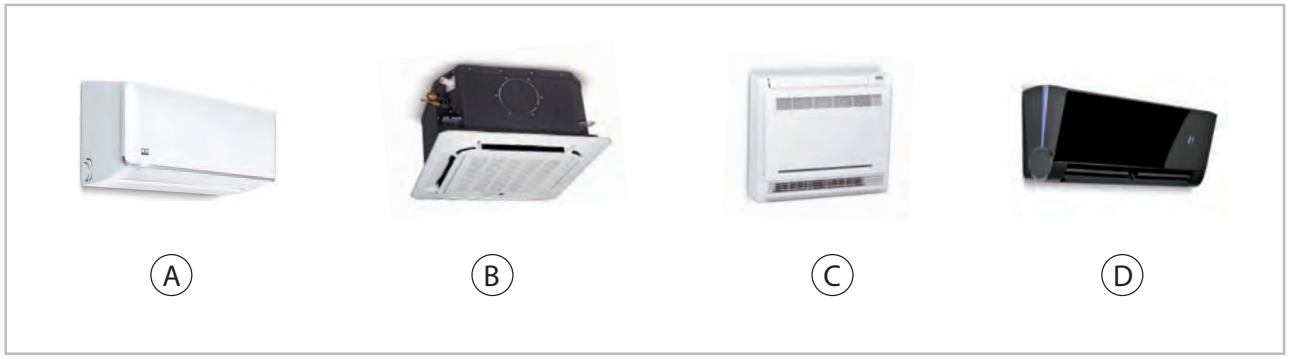


Fig. 4: Indoor units

A: MXW
B: MXD
C: MXT
D: ATY

The following combinations of outdoor units can be selected:

MVT 603 DC Combinations with 1 indoor unit

Combi-nation	Indoor units			
	2.0 kW	2.6 kW	3.5 kW	5.2 kW
1	●			
2		●		
3			●	
4				●

Combinations with 2 indoor units

Combi-nation	Indoor units			
	2.0 kW	2.6 kW	3.5 kW	5.2 kW
5	●●			
6		●●		
7	●	●		
8		●	●	
9	●		●	

MVT 903 DC Combinations with 1 indoor unit

Combi-nation	Indoor units			
	2.0 kW	2.6 kW	3.5 kW	5.2 kW
1	●			
2		●		
3			●	
4				●

Combinations with 2 indoor units

Combi-nation	Indoor units			
	2.0 kW	2.6 kW	3.5 kW	5.2 kW
5	●●			
6		●●		
7			●●	
8			●	●
9	●	●		
10		●	●	
11	●		●	
12		●		●
13	●			●

For more, see the next page.

MVT 903 DC (Continued)
Combinations with 3 indoor units

Combi-nation	Indoor units			
	2.0 kW	2.6 kW	3.5 kW	5.2 kW
14	●●●			
15		●●●		
16	●●	●		
17	●●		●	
18	●●			●
19	●	●●		
20	●	●	●	
21	●	●		●
22	●		●●	
23	●		●	●
24		●●	●	
25		●	●●	

MVT 1053 DC Combinations with 1 indoor unit

Combi-nation	Indoor units			
	2.0 kW	2.6 kW	3.5 kW	5.2 kW
1	●			
2		●		
3			●	
4				●

Combinations with 2 indoor units

Combi-nation	Indoor units			
	2.0 kW	2.6 kW	3.5 kW	5.2 kW
5	●●			
6		●●		
7			●●	
8				●●
9			●	●
10	●	●		
11		●	●	
12	●		●	
13		●		●
14	●			●

Combinations with 3 indoor units

Combi-nation	Indoor units			
	2.0 kW	2.6 kW	3.5 kW	5.2 kW
15	●●●			
16		●●●		
17			●●●	
18	●●	●		
19	●●		●	
20	●●			●
21	●	●●		
22	●	●	●	
23	●	●		●
24	●		●●	
25	●		●	●
26	●			●●
27		●●	●	
28		●●		●
29		●	●●	
30		●	●	●
31		●		●●
32			●●	●

For more, see the next page.

REMKO MVT series

MVT 1053 DC (Continued)
Combinations with 4 indoor units

Combi-nation	Indoor units			
	2.0 kW	2.6 kW	3.5 kW	5.2 kW
33	●●●●			
34		●●●●		
35	●●●	●		
36	●●●		●	
37	●●●			●
38	●●	●●		
39	●●	●	●	
40	●●	●		●
41	●●		●●	
42	●●		●	●
43	●	●●●		
44	●	●●	●	
45	●	●●		●
46	●	●	●●	
47	●	●	●	●
48	●		●●●	
49	●		●●	●
50		●●●	●	
51		●●●		●
52		●●	●●	
53		●●	●	●
54		●	●●●	

MVT 1403 DC Combinations with 1 indoor unit

Combi-nation	Indoor units			
	2.0 kW	2.6 kW	3.5 kW	5.2 kW
1	●			
2		●		
3			●	
4				●

Combinations with 2 indoor units

Combi-nation	Indoor units			
	2.0 kW	2.6 kW	3.5 kW	5.2 kW
5	●●			
6		●●		
7			●	●
8	●	●		
9		●	●	
10	●		●	
11		●		●
12				●●
13	●			●
14		●●		

Combinations with 3 indoor units

Combi-nation	Indoor units			
	2.0 kW	2.6 kW	3.5 kW	5.2 kW
15	●●●			
16	●	●●		
17	●		●	●
18		●●		●
19		●		●●
20	●●	●		
21	●	●	●	
22			●●●	
23	●●		●	
24	●	●		●
25	●			●●
26		●	●●	
27			●●	●
28	●●			●
29		●●●		
30		●	●	●
31	●		●●	
32		●●	●	
33			●	●●

For more, see the next page.

MVT 1403 DC (Continued)
Combinations with 4 indoor units

Combi-nation	Indoor units			
	2.0 kW	2.6 kW	3.5 kW	5.2 kW
34	●●●●			
35	●●	●●		
36	●●		●	●
37	●	●●		●
38	●	●		●●
39		●●●	●	
40	●●●	●		
41	●●	●	●	
42	●		●●●	
43		●●●		●
44		●	●●●	
45	●●●		●	
46	●●	●		●
47	●●			●●
48	●	●	●●	
49	●		●●	●
50		●	●●	●
51	●●●			●
52	●	●●●		
53	●	●	●	●
54		●●	●●	
55			●●●●	
56	●●		●●	
57	●	●●	●	
58		●●●●		
59		●●	●	●
60			●●●	●

Combinations with 5 indoor units

Combi-nation	Indoor units			
	2.0 kW	2.6 kW	3.5 kW	5.2 kW
61	●●●●●			
62	●●●	●●		
63	●●●			●●
64	●●	●	●	●
65	●	●●●		●
66		●●●●●		
67		●●	●●●	
68	●●●●	●		
69	●●●	●	●	
70	●●	●●●		
71	●●		●●●	
72	●	●●	●●	
73		●●●●	●	
74		●	●●●●	
75	●●●●		●	
76	●●●	●		●
77	●●	●●	●	
78	●●		●●	●
79	●	●●	●	●
80		●●●●		●
81		●	●●●	●
82	●●●●			●
83	●●	●●		●
84	●	●●●●		
85	●	●	●●●	
86		●●●	●●	
87			●●●●●	
88	●●●		●	●
89	●	●●●	●	
90	●	●	●●	●
91		●●	●	●

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

Label the refrigerant piping (injection and suction pipes) as well as the associated electrical control lines of each interior unit with a letter. Only connect the lines to their associated connections.

- 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 (injection and suction pipe), valves and connections must be insulated against vapour density. 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 section "Minimum clearances").
- 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.
- Make special preparations regarding the oil return if the outdoor unit is located above the indoor unit (see the "Oil return measures" section).
- Add refrigerant if the basic length of the refrigerant piping exceeds 5 metres. For the quantity of additional refrigerant, refer to the "Adding refrigerant" chapter.

- Only use the union nuts supplied with the refrigerant piping. These should only be removed shortly before connecting the refrigerant piping.
- Carry out 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!

Always pay attention to the affiliation of the electrical lines and refrigerant piping! The connections of the individual circuits must not be mixed up. Mixing up the assignment of control lines and refrigerant piping can have fatal consequences (compressor damage)!

Commissioning of the individual circuits must be carried out successively.

! 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 70 mm diameter and 10 mm incline per indoor unit 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 (provided by the customer). Do not use cement or lime containing substances!

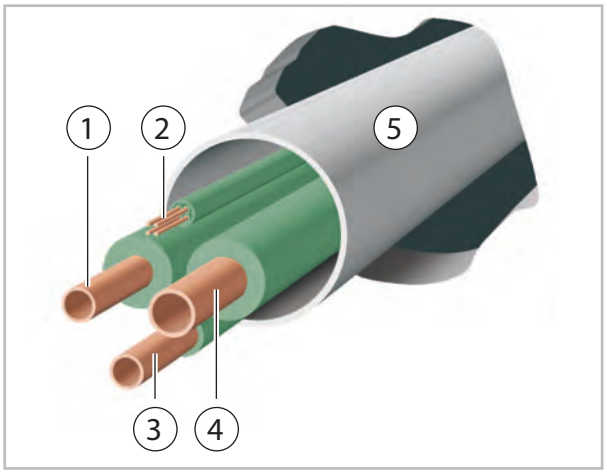


Fig. 5: Wall opening

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

5.3 Selecting the installation location

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

The unit should be at least 10 cm off the ground when mounted on the roof or ground. A floor bracket is available as an 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). This could be a small roof. However, the discharging warm air flow must not be affected by the measures.

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. Additional stabilisation is recommended. This can be realised with wire ropes or other constructions.

Fig. 6: Wind protection/1: Snow

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.

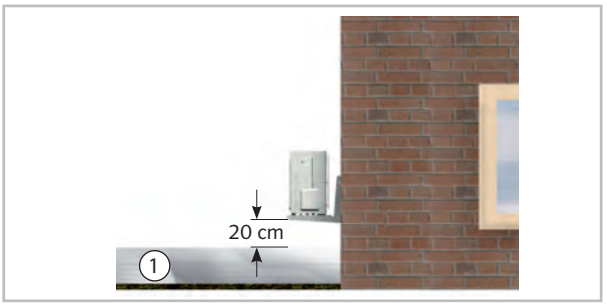


Fig. 7: Minimum clearance to snow

1: Snow

Installation inside buildings

- Ensure that heat can dissipate adequately when placing the outdoor unit in cellars, lofts, adjoining rooms or halls (Fig. 8).
- Install an additional fan with a rated flow similar to that of the outdoor unit being installed in the room and that can compensate any additional pressure loss in ventilation ducts (Fig. 8).
- Comply with any regulations and conditions affecting the statics of the building. If necessary, fit acoustic installation.
- Observe the valid provisions of DIN EN 60335 with regard to the installation of A2L filled outdoor units inside the building.

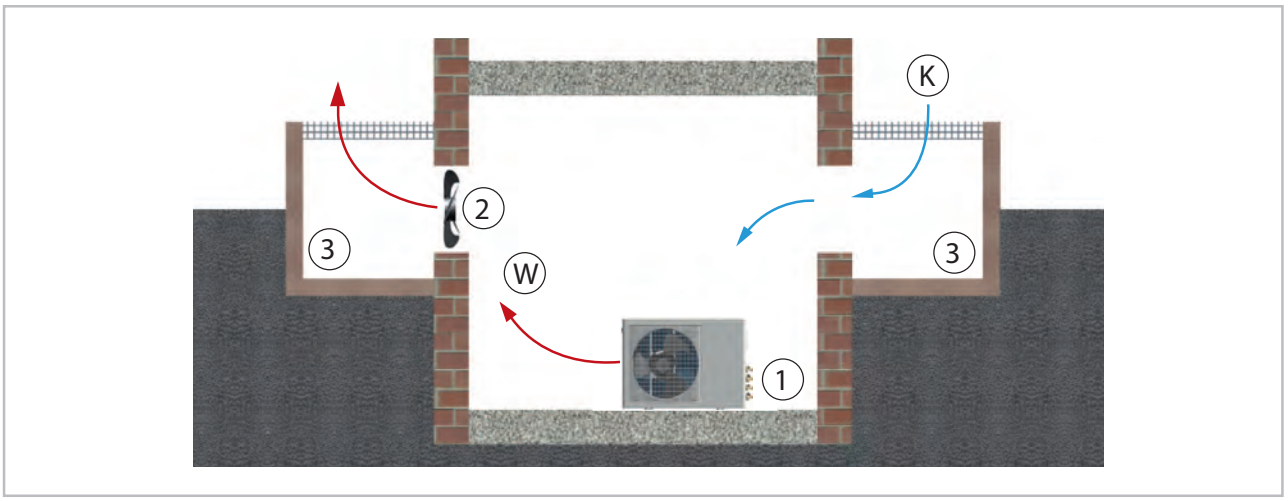


Fig. 8: Installation inside buildings

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

5.4 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.

5.5 Minimum clearances

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

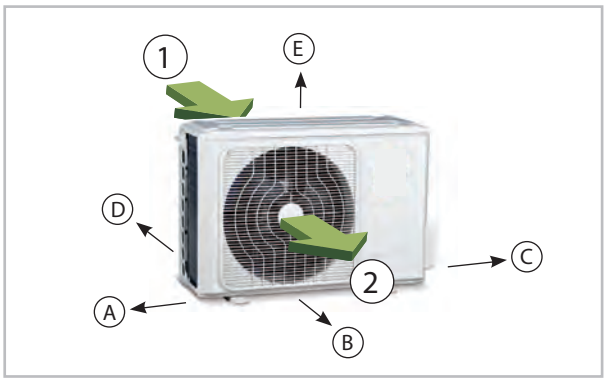


Fig. 9: Minimum clearances for outdoor unit

1: Air inlet
2: Air outlet

	MVT 603-1403 DC
A	100
B	1200
C	600
D	150
E	600

All measurements in mm

5.6 Oil return measures

If the outdoor unit is installed at a higher level than the indoor unit, suitable oil return measures must be taken. Usually, an oil pump bend is installed for every 7 metres of height difference.

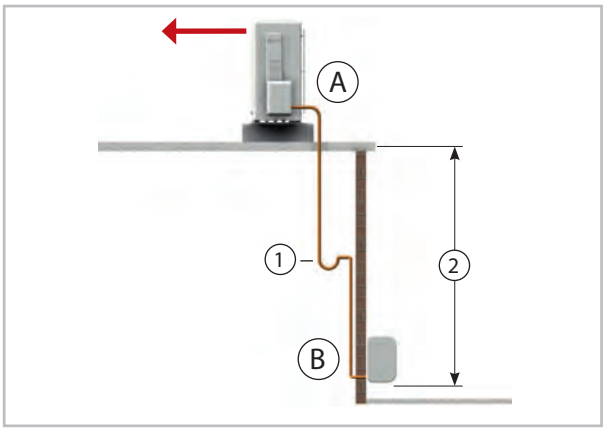


Fig. 10: Oil return measures

A: Outdoor unit
B: Indoor unit
1: One oil pump bend in suction pipe to outdoor unit every 7 metres of height difference, radius: 50 mm
2: Max. 10 m

6 Installation

6.1 Connection of refrigerant piping

The refrigerant piping is connected on the back 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.

Only use the union nuts supplied for connecting the indoor units, as these are non-detachable.

! NOTICE!

Installation should only be performed by authorised specialists.

! NOTICE!

The unit is factory filled with dry nitrogen for leak testing purposes. The pressurised nitrogen is released when the union nuts are undone.

! 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 that the fastenings are adequate and if necessary, take appropriate oil return measures!
6. The minimum length of the refrigerant piping must be 3 metres.
7. Remove the factory-fitted protective caps and union nuts on the connections. These should be used later in the installation process.
8. Before flanging the refrigerant piping, ensure that the union nut is fitted on the pipe.
9. Prepare the laid refrigerant piping as shown below (Fig. 11 and Fig. 12).
10. Verify that the shape of the flange is correct (Fig. 13).
11. Then use only the supplied non-detachable union nuts inside the building or connect the indoor units firmly (solder or press).
12. First connect and hand-tighten the refrigerant piping to ensure it is correctly seated.
13. Then tighten the fittings with 2 appropriately-sized open-ended spanners. Use one spanner to counter the force when tightening the fitting (Fig. 14).
14. Use insulation hoses which are designed for this temperature range and are diffusion proof.
15. 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.
16. Apply appropriate heat insulation to the installed refrigerant piping, including connector.
17. Take the same action at the shut-off valves for all subsequent refrigerant piping.

Label the refrigerant piping (injection and suction pipes) as well as the associated electrical control lines of each interior unit with a letter. Only connect the lines to their associated connections.

NOTICE!

Always pay attention to the affiliation of the electrical lines and refrigerant piping! The connections of the individual circuits must not be mixed up. Mixing up the assignment of control lines and refrigerant piping can have fatal consequences (compressor damage)!

Commissioning of the individual circuits must be carried out successively.

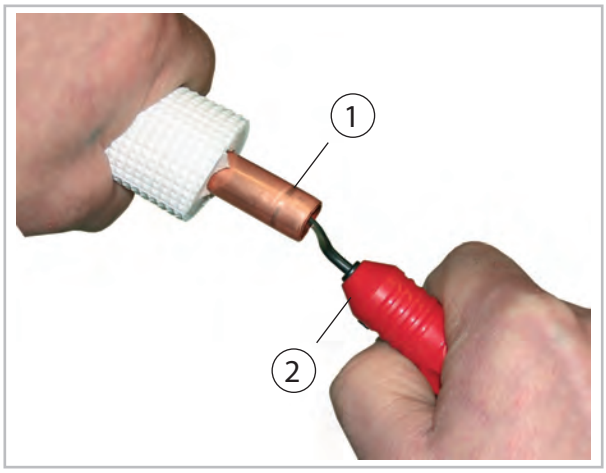


Fig. 11: Deburring the refrigerant piping

1: Refrigerant piping
2: Deburrer

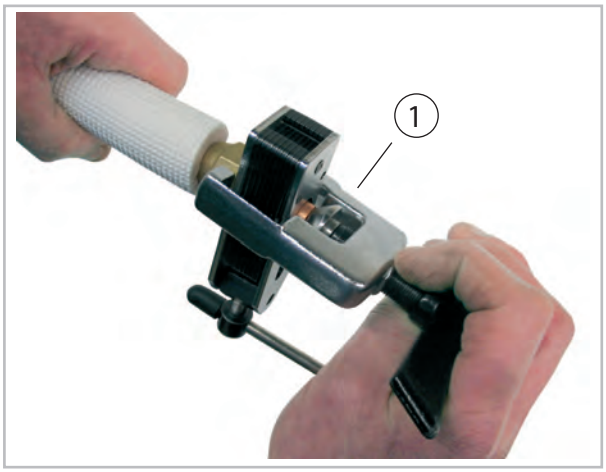


Fig. 12: Flanging the refrigerant piping

1: Flanging tool

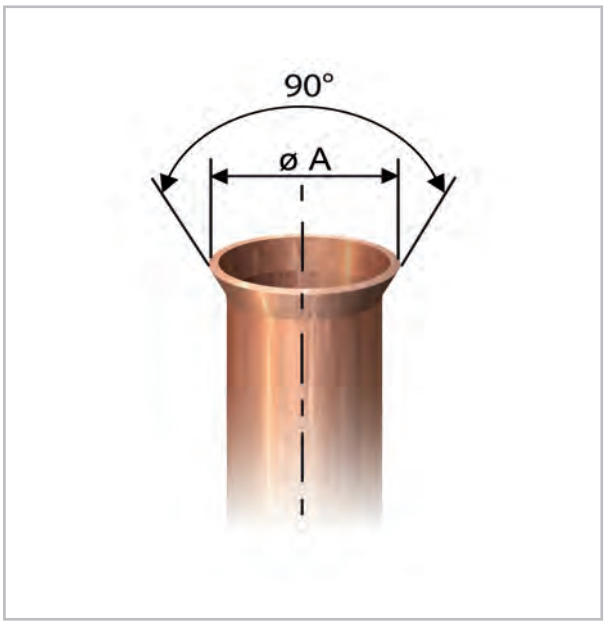


Fig. 13: Correct flange shape

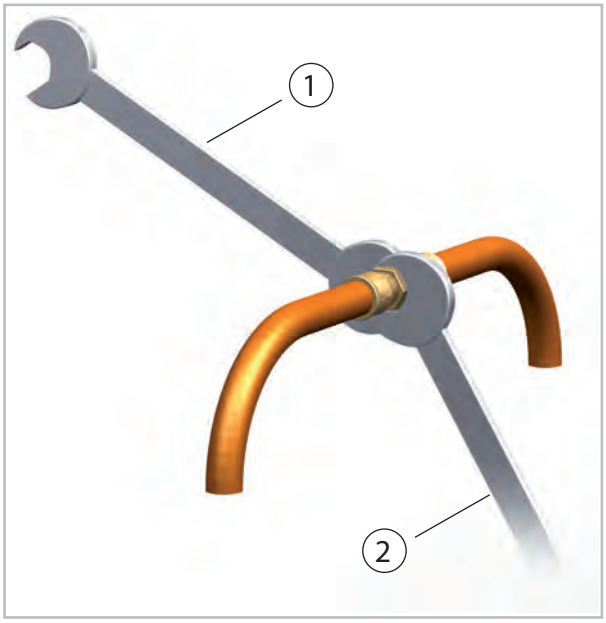


Fig. 14: Tightening the fitting

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 procedure for connecting the refrigerant piping sometimes differs. In this case, install the expansion fittings to the outdoor unit provided in the outdoor unit's scope of delivery.
- If the basic length of the connecting line exceeds 5 m, add refrigerant when commissioning the system for the first time (see chapter "Adding refrigerant").
- Units filled with flammable refrigerants must be firmly connected inside the building. Detachable connections are not permissible.

6.4 Adding refrigerant

The unit contains a basic quantity of refrigerant. In addition, an additional amount of refrigerant must be added for refrigerant piping lengths exceeding 5 metres per circuit. Refer to the following chart:

	Up to and incl. 5m	From 5 m
MVT	0 g/m	30 g/m

⚠ 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 unit contains refrigerant with a greenhouse potential of 675. That means the escape of 1 kg of this refrigerant has an effect on global warming that is 675 times greater than 1 kg CO_2, based on 100 years. Do not conduct any work on the refrigerant circuit or dismantle the unit - always enlist the help of qualified experts.

7 Condensate drainage connection and safe drainage

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 drain 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

Local regulations or environmental laws, for example the German Water Resource Act (WHG), can require suitable precautions to protect against uncontrolled drainage in case of leakage to provide for safe disposal of escaping air conditioning fluid 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 MVT devices, an electrical supply must be laid as a mains supply to the outdoor unit as well as a 4-core control line from the indoor unit to the outdoor unit.

We recommend that screened control lines are used with a minimum cross-section of 1.5 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.

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 (Fig. 15).
- Voltage is supplied to the indoor unit through the connecting line between the outdoor component and indoor unit.
- 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.
- Label the electrical control lines and the associated refrigerant pipes of each indoor unit with the same letter (A to D).
- Only connect the lines to their associated connections as labelled with the same letter. Mixing up the assignment of control lines and refrigeration pipes can lead to fatal consequences such as compressor damage!

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. Pay attention to the alignment of the circuits.
5. Fix the line in the strain relief and reassemble the unit.

Additional probe and control lines may be required on some indoor units.

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

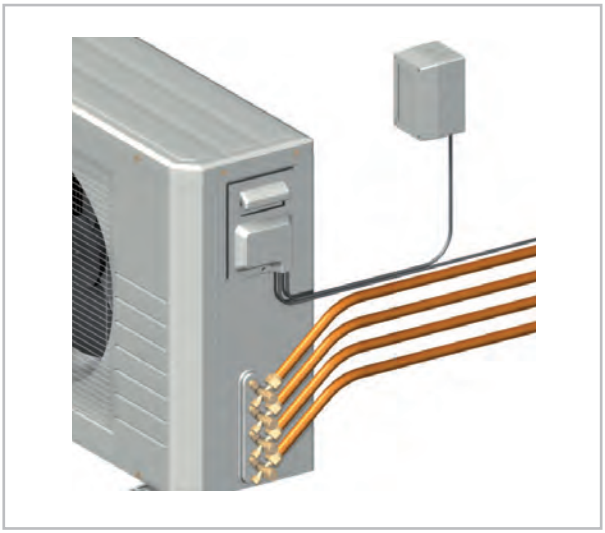


Fig. 15: Outdoor unit connection

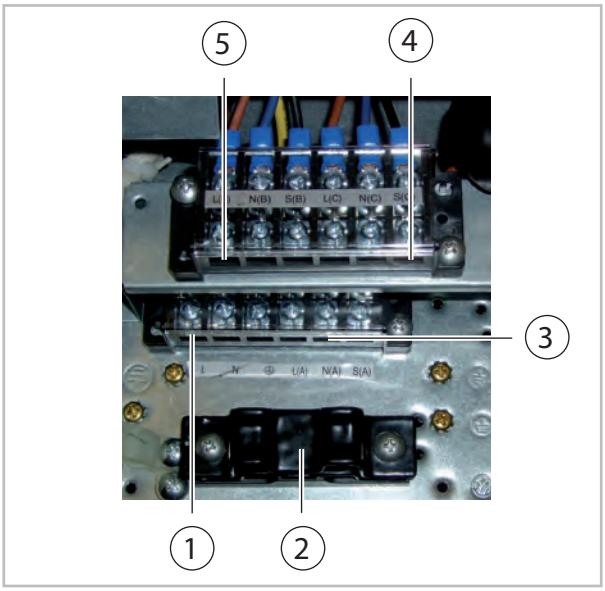


Fig. 16: Electrical wiring of the line shown on the following as an example MVT 903 DC

1: Mains cable
2: Strain relief
3: Control line for indoor unit A
4: Control line for indoor unit C
5: Control line for indoor unit B

8.3 Electrical wiring diagram

MVT in combination with the indoor units ATY, MXD, MXT and MXW

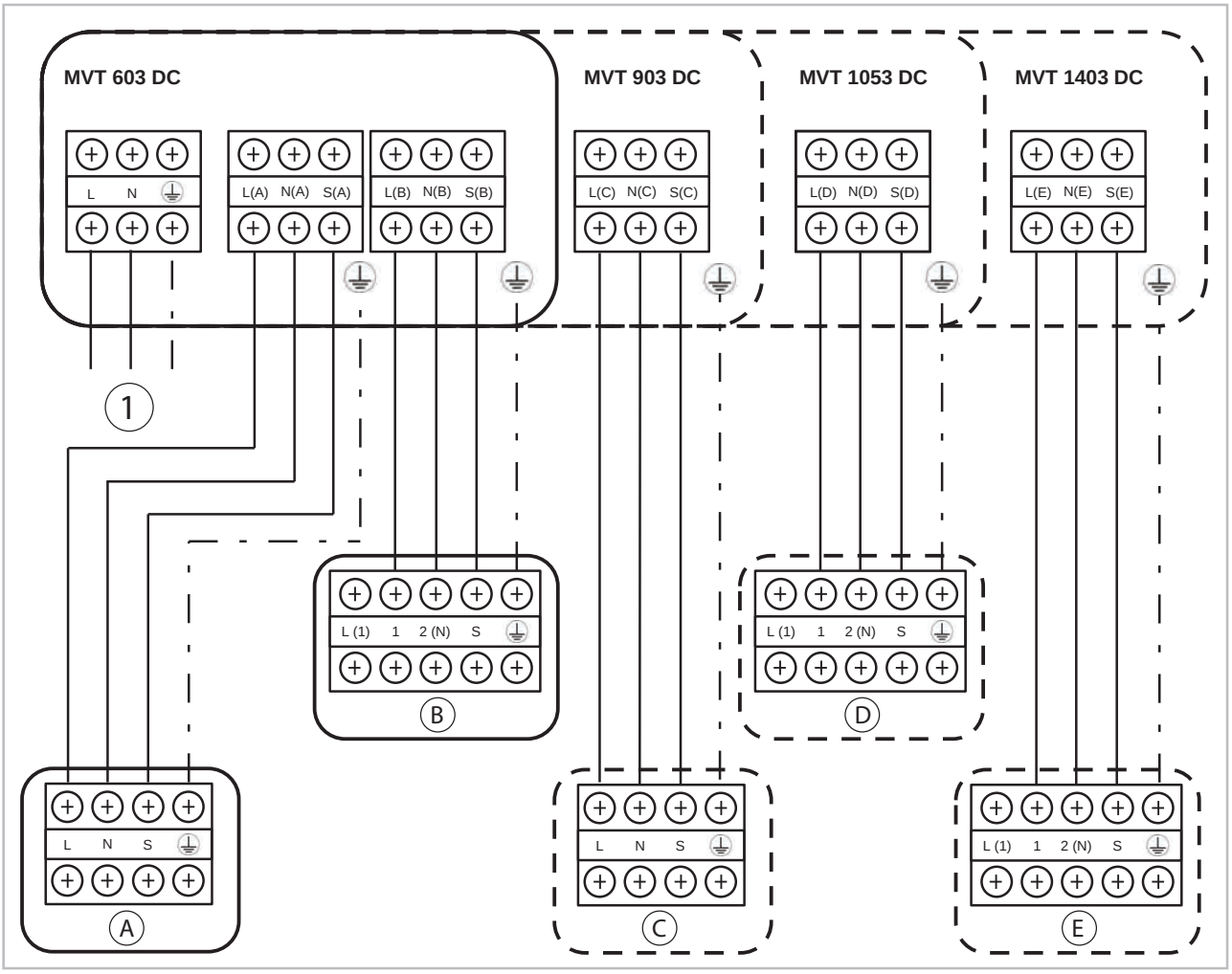


Fig. 17: Electrical wiring diagram

1: Mains cable
A: MXD IT
B: MXW IT
C: MXT IT
D: ATY IT
E: MXW IT

8.4 Electrical drawings

Circuit diagram MVT 603 DC

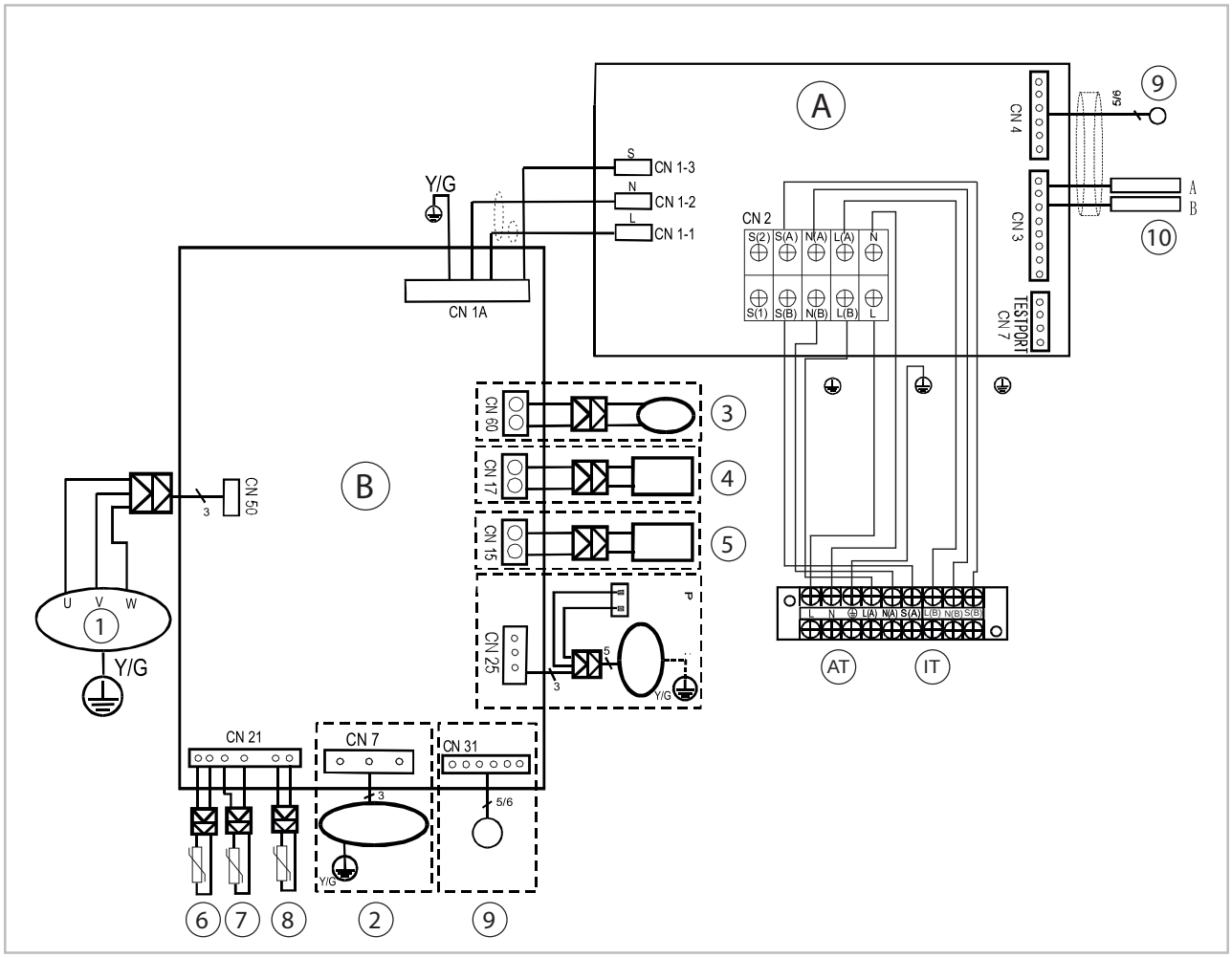


Fig. 18: Overview diagram MVT 603 DC

A: Control board
B: Inverter board
AT: Mains cable for outdoor unit 230 V / 1~ / 50 Hz
IT: Connection for indoor units 1-2
1: Compressor
2: Fan motor condenser
3: Four-way valve
4: Crankcase heating
5: Condensate tray heating
6: Temperature probe for heat gas line TP
7: Temperature probe for condenser outlet T3
8: Temperature probe for condenser inlet T4
9: Expansion valves
10: Suction pipe temperature probes

Circuit diagram MVT 903 DC

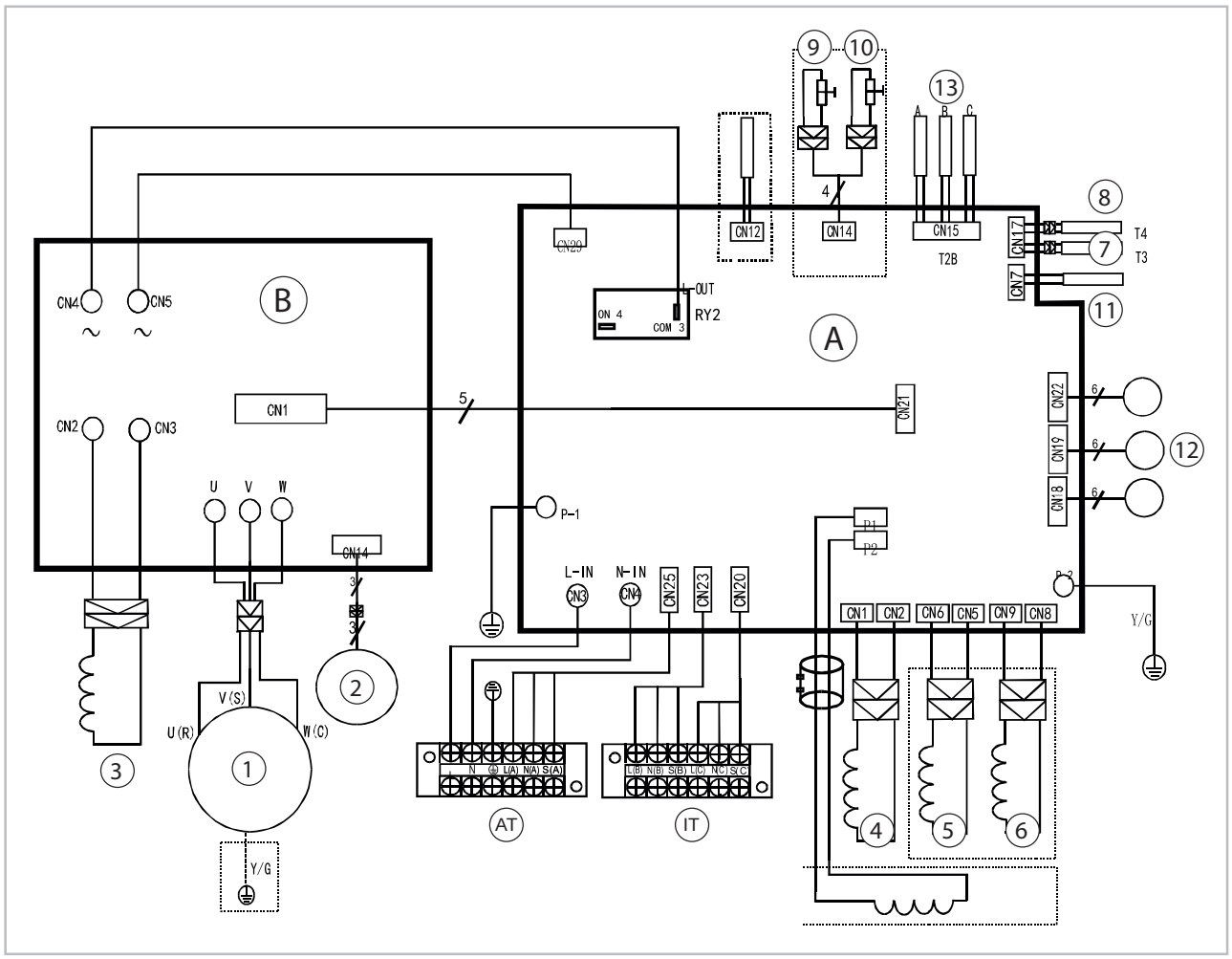


Fig. 19: Overview diagram MVT 903 DC

A: Control board
B: Inverter board
AT: Mains cable for outdoor unit 230 V / 1~ / 50 Hz
IT: Connection for indoor units 1-3
1: Compressor
2: Fan motor condenser
3: Transformer
4: Four-way valve
5: Crankcase heating
6: Condensate tray heating
7: Temperature probe for condenser outlet T3
8: Temperature probe for condenser inlet T4
9: Low-pressure probe
10: High-pressure probe
11: Temperature probe for heat gas line TP
12: Expansion valves
13: Suction pipe temperature probes

Circuit diagram MVT 1053 DC

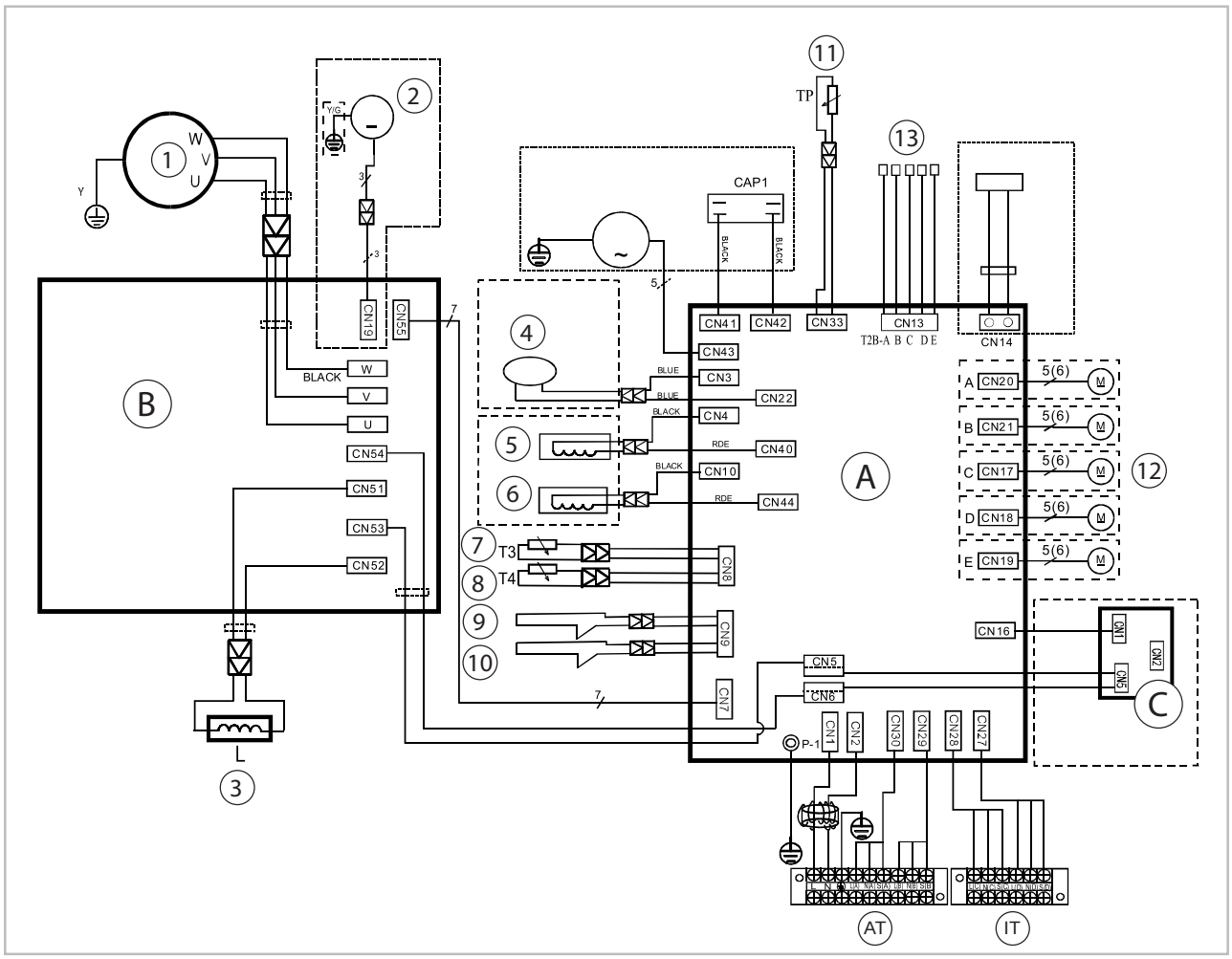


Fig. 20: Overview diagram MVT 1053 DC

A: Control board
B: Inverter board
C: Com circuit board
AT: Mains cable for outdoor unit 230 V / 1~ / 50 Hz
IT: Connection for indoor units 1-4
1: Compressor
2: Fan motor condenser
3: Transformer
4: Four-way valve
5: Crankcase heating
6: Condensate tray heating
7: Temperature probe for condenser outlet T3
8: Temperature probe for condenser inlet T4
9: High-pressure probe
10: Low-pressure probe
11: Temperature probe for heat gas line TP
12: Expansion valves
13: Suction pipe temperature probes

Circuit diagram MVT 1403 DC

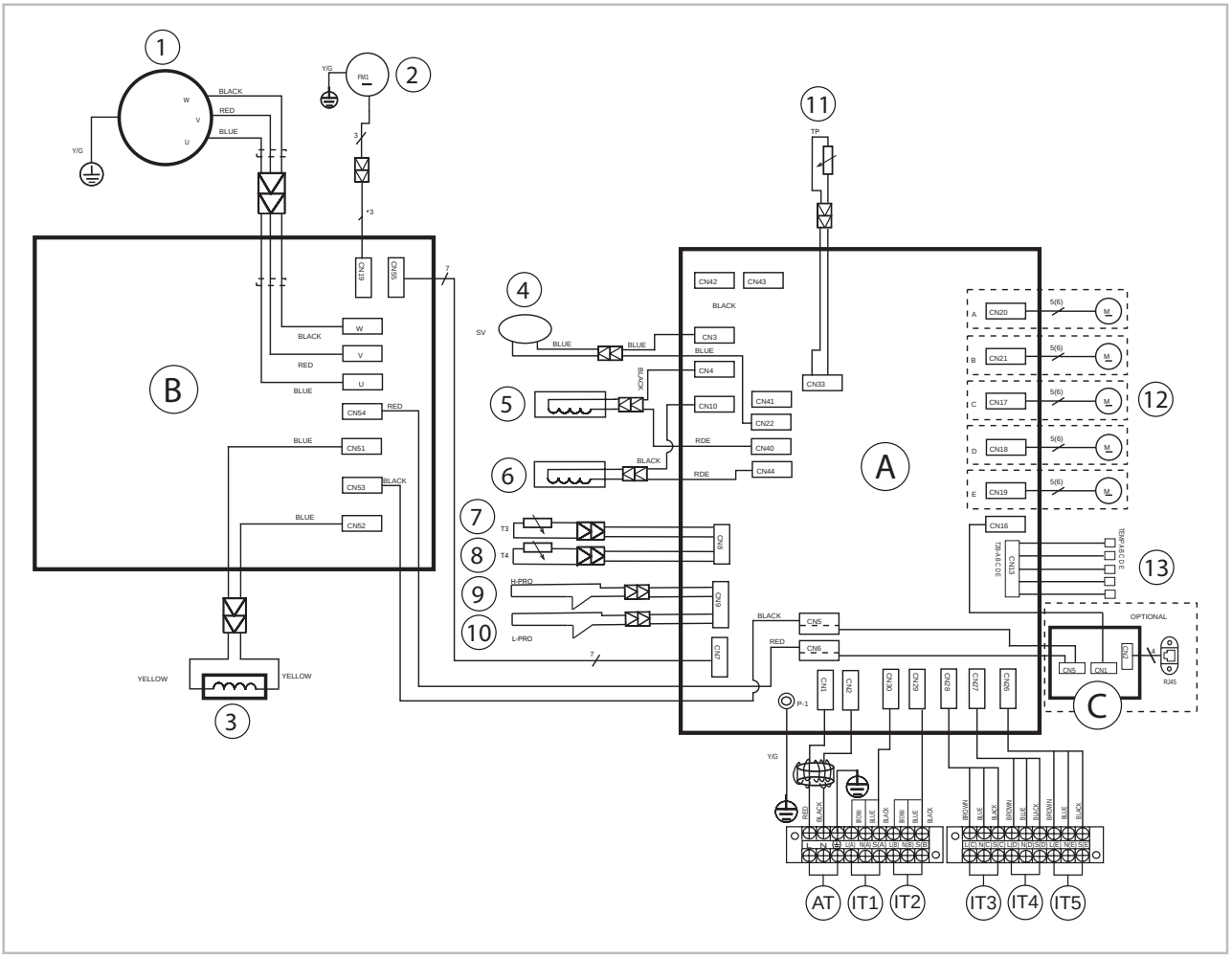


Fig. 21: Overview diagram MVT 1403 DC

A:	Control board
B:	Inverter board
C:	Com circuit board
AT:	Mains cable for outdoor unit 230 V / 1~ / 50 Hz
IT1-IT5:	Connection for indoor units 1-5
1:	Compressor
2:	Fan motor condenser
3:	Transformer
4:	Four-way valve
5:	Crankcase heating
6:	Condensate tray heating
7:	Temperature probe for condenser outlet T3
8:	Temperature probe for condenser inlet T4
9:	High-pressure probe
10:	Low-pressure probe
11:	Temperature probe for heat gas line TP
12:	Expansion valves
13:	Suction pipe temperature probes

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 affiliation of the electrical lines and refrigerant piping! The connections of the individual circuits must not be mixed up. Mixing up the assignment of control lines and refrigerant piping can have fatal consequences (compressor damage)!

Commissioning of the individual circuits must be carried out successively.

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 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 unit 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, external, internal, discharge and evaporator temperatures and record the test data in the commissioning log.
11. Remove the pressure gauge.
12. Proceed as previously described for all other cooling cycles.

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.

Probe description

T1	Room temperature probe for indoor unit
T2	Evaporator centre temperature probe for indoor unit
T2B	Temperature probe for suction pipe (installed in the outdoor unit)
T3	Temperature probe for condenser outlet
T4	Temperature probe for condenser air inlet
T5	Temperature probe for heat gas line compressor
Ts	Setpoint

Outdoor unit display

The digital display is located on the outdoor unit's control board. This display can be used to show the current operating status.

- The display shows "- -" in standby
- The display shows the current operating frequency when the compressor is running
- When defrosting, the display shows "dF" or alternates between "dF" and the current compressor frequency (0.5s each)
- If the compressor is in the pre-heating function, the display shows "PH" or alternates between "PH" and the current compressor frequency (0.5s each)
- If the system's oil return function is running, the display shows "RO" or alternates between "RO" and the current compressor frequency (0.5s each)
- If winter fan speed control is active due to low outside temperatures, the display shows "LC" or alternates between the compressor frequency and "LC" (0.5s each)
- In “Force Cool Mode – Force Control”, the display shows "FC" or alternates between "FC" and the current compressor frequency (0.5s each)

- If the compressor moves to an incorrect frequency range within 15 minutes, a safety shutdown occurs and the unit shows "E6"
- If there is a malfunction, the malfunction is displayed coded. See the "Outdoor unit malfunction display" table

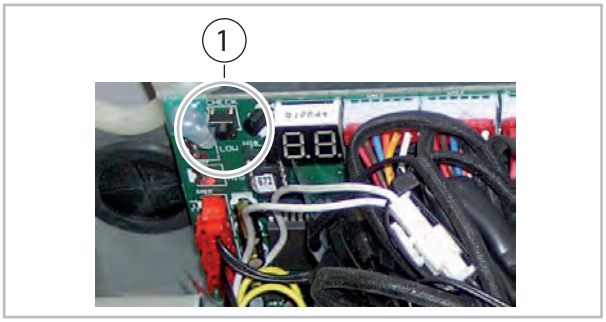


Fig. 22: Check key on the outdoor unit's board

1: Check key

Query operating statuses

The SW1 "Check" key is located on the control board in the outdoor unit. You can use this key to query different operating statuses. Pressing it multiple times takes you to the different parameter levels (see table below):

Item	Display	Description
0	Standard display	Current compr. freq. or malfunct. display
1	Number of indoor units detected	Current value
2	Operating mode (coded)	Standby:0, Recirculation mode:1, Cooling mode:2, Heating mode:3 Force mode for test purposes:4 Defrosting:5
3	Indoor unit A connected load	The load is displayed in HP. If no unit is connected or detected, the display shows the following: “——” (2.0 kW=0.8 HP, 2.6kW=1.0 HP, 3.5 kW=1.2 HP, 5kW=1.5 HP)
4	Indoor unit B connected load	
5	Indoor unit C connected load	
6	Indoor unit D connected load	
7	Indoor unit E connected load	
8	Indoor unit A power requirement	Current value*HP 2.0 kW=0.8 HP, 2.6kW=1.0 HP, 3.5 kW=1.2 HP, 5kW=1.5 HP)
9	Indoor unit B power requirement	
10	Indoor unit C power requirement	
11	Indoor unit D power requirement	
12	Indoor unit E power requirement	
13	Total power requirement of all indoor units	
14	Current frequency requirement depending on the total power requirement	
15	Frequency limit	
16	Frequency that is transferred to the compressor	

Continued

Item	Display	Description
17	Temp. of suction pipe for indoor unit A (T_{2B}A)	Current value. If the temperature is lower than -9°C, the display shows "-9". If the temperature is higher than 70°C, the display shows "70". If no indoor unit is connected, the display shows the following: "——"
18	Temp. of suction pipe for indoor unit B (T_{2B}B)	
19	Temp. of suction pipe for indoor unit C (T_{2B}C)	
20	Temp. of suction pipe for indoor unit D (T_{2B}D)	
21	Temp. of suction pipe for indoor unit E (T_{2B}E)	
22	Indoor unit A room temperature (T_1A)	Current value. If the temperature is lower than 0°C, the display shows "0". If the temperature is higher than 70°C, the display shows "70". If no indoor unit is connected, the display shows the following: "——"
23	Indoor unit B room temperature (T_1B)	
24	Indoor unit C room temperature (T_1C)	
25	Indoor unit D room temperature (T_1D)	
26	Indoor unit E room temperature (T_1E)	
27	Temp. of evaporator centre for ind. unit A (T_2A)	Current value. If the temperature is lower than -9°C, the display shows "-9". If the temperature is higher than 70°C, the display shows "70". If no indoor unit is connected, the display shows the following: "——"
28	Temp. of evaporator centre for ind. unit B (T_2B)	
29	Temp. of evaporator centre for ind. unit C (T_2C)	
30	Temp. of evaporator centre for ind. unit D (T_2D)	
31	Temp. of evaporator centre for ind. unit E (T_2E)	
32	Temperature of condenser outlet (T3)	
33	Temperature of condenser air inlet (T4)	
34	Hot gas temperature in compressor outlet (T5)	The value that is displayed is between 30-129 °C. If the temperature is lower than 30°C, the display shows "30". If the temperature is higher than 99°C, the display shows the value without the "1". For example, if the display shows "0.5", the measured temperature is 105°C.
35	Current consumption	The value that is displayed is a hexadecimal number. For example, if the display shows the value "Cd", the measured value is 205.
36	Current mains voltage	
37	Degree of opening of injection valve A	Current value X 4. If the value is greater than 99, the display shows the 2nd and 3rd place of the value. For example, if the display shows "2.0", the degree of opening is 120x4=480 steps.)
38	Degree of opening of injection valve B	
39	Degree of opening of injection valve C	
40	Degree of opening of injection valve D	
41	Degree of opening of injection valve E	
42	Frequency limit	Not used
43	Average value for probe T2	(T2 total for all indoor units)/(total of all connected indoor units)(in cooling mode:T2B, in heating mode: T2)
44	Current speed of condenser fan motor	OFF:0, High:1, Medium:2, Medium/high:3 Low/medium 4, Low/low:5
45	Previous error message	00 means no error messages have occurred

(3) Cooling capacity - Heating capacity OU / IU

Display	Cooling capacity (kW)	Heating capacity (kW)
1	2.0-2.5	2.0-2.5
2	2.0-2.5	2.0-2.5
3	3.0-3.8	3.0-3.8
4	4.5-5.0	4.5-5.0
5	5.0	5.5-6.1
6	5.5-6.1	6.1-7.0
7	6.1-7.0	6.1-7.0
8	7.0-7.5	7.0-7.5
9	7.5-8.0	7.5-8.0
10	>8.0	>8.0

(6) Hot gas temperature probe

Display	Temperature (°C)
10	35-40
11	40-45
12	45-50
13	50-55
14	55-60
15	60-65
16	65-70

(5) Air inlet temperature probe

Display	Temperature (°C)
15	-7.5
20	-5.0
25	-2.5
30	0
35	2.5
40	5.0
45	7.5
50	10.0
55	12.5
60	15.0
65	17.5
70	20.0
75	22.5
80	25.0
85	27.5
90	30.0
95	32.5
99	34.5

(7) Outdoor unit current consumption

Display	Current consump. (A)
44	6.0
46	6.2
54	7.4
55	7.6
58	7.8
62	8.0
66	8.6
67	8.8
68	9.0
70	9.2
72	9.5
76	10.0
78	10.2
80	10.4
82	10.6
84	11.0
88	11.6
92	12.0
94	12.2

11 Troubleshooting, fault analysis and customer service

11.1 Troubleshooting and customer service

The unit and components are manufactured using state-of-the-art production methods and tested several times to verify their correct function. However, if alarms 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 "Troubleshooting 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 correctly?	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. equipment 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 condensation 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.	Refrigerant piping swapped	Are the injection pipes and suction pipes of circuits A, B and C correspondingly connected?	Rectification by specialist firm
	Electrical control lines swapped	Are the control pipes and refrigerant pipes of circuits A, B and C correspondingly connected?	Rectification by specialist firm
	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 appropriate 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.

Operational malfunctions (continued)

Malfunction	Possible causes	Checks	Remedial measures
The compressor's suction pipe and / or liquid separator have iced up	Thermal load has increased	Is the outdoor unit in permanent operating mode?	Reduce the thermal load. If necessary, install an additional unit / insulate components that have iced up

Outdoor unit board malfunction display

Display	Error description
E0	EEPROM error, outdoor unit
E2	Communication error between indoor unit and outdoor unit
E3	Communication error between inverter board and control board
E4	Outdoor unit air inlet temperature probe faulty
E5	Over-voltage or under-voltage error
E8	Condenser fan speed control sensor not working
F1	Temperature of suction pipe for indoor unit A faulty
F2	Temperature of suction pipe for indoor unit B faulty
F3	Temperature of suction pipe for indoor unit C faulty
F4	Temperature of suction pipe for indoor unit D faulty
F5	Temperature of suction pipe for indoor unit E faulty
P1	High pressure fault
P2	Low pressure alarm
P3	Compressor current consumption too high
P4	Temperature probe for heat gas line faulty
P5	Excessive temperature in condenser
P6	Inverter board safety shut-down
LP	Ambient temperature too low

Note

After rectifying the fault, the malfunction code remains for 30 seconds (with the exception of E2 and E3).

11.2 Outdoor unit error analysis

Error E0: EEPROM error on outdoor unit

Switch off, wait 2 minutes and then switch on again. Is the error still present?
↓ YES
Replace the control board.

Error E3: Communication error between inverter board and control board

		The board shows E3 The control board cannot communicate with the inverter board		
↓	YES ←	Is an LED still illuminated on the inverter board?		
		↓ NO		
	YES ←	Check the electrical connection between the inverter board and the control board. Is this correctly implemented?		
		↓ NO		
		Correct the connection. Is the error still present?	NO →	The system is ready for operation again.
		↓ NO		
	→	Replace the inverter board. Is the problem rectified?	JOO →	
		↓ NO		
		Replace the control board. Is the problem rectified?	JOO →	
		↓ NO		
		Replace the entire electrical box	→	

Error E5: Overvoltage or undervoltage error

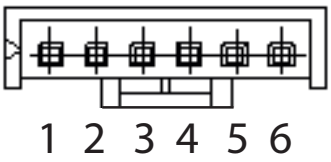
		Overvoltage/undervoltage protection has tripped.		
		Check the power supply voltage on the outdoor unit's L and N terminals. Is this between 220 and 240 V?	NO →	Correct the mains cable
		↓YES		
↓	YES ←	Is voltage present between terminals P and N on the inverter board? Is the measured value between 277-356 VDC (MVT 603 DC) or 277-410 VDC (larger versions)		
		↓NO		
		Replace the rectifier. Is the error rectified?	JOO →	Problem solved.
		↓NO		
	→	Replace the inverter board. Is the unit working normally?	JOO →	
		↓NO		
		Replace the control board.	→	

Error E8: Condenser fan speed control not working

		Switch off, wait 2 minutes and then switch on again. Is the error still present?	NO →	The unit operates normally.
		↓YES		
		Switch off; rotate the condenser fan manually. Does it move easily?	NO →	Determine the cause and rectify the error.
		↓YES		
		Check the electrical connecting lines to the motor. Are these correctly implemented?	NO →	Replace the connections.
		↓YES		
Replace the control board.	NO ←	Check the output voltage on the control board (see annex). Is voltage available to the output?		
		↓YES		
	NO ←	Replace the fan motor.		

Check the DC motor (the control unit is installed in the motor)

Measure the voltage between terminals 1-3 and 4-3 on the plug when the unit is in standby mode. Compare the measured voltage with the table below. If the values do not match, the control board must be replaced.



Terminal	Colour	Voltage
1	Red	140 V~380 V
2	---	---
3	Black	0 V
4	White	13.5-16.5 V
5	Yellow	0~6.5V
6	Blue	15V

Error P1: High pressure fault (for larger versions)

		High pressure fault P1 is present.		
		↓		
		Is the electrical connection between the high pressure probe and the control board established correctly?	NO →	
		↓ YES		
		Check whether the high pressure probe is faulty.		
		↓		
		Remove the high pressure probe's plug and measure the resistance. The value should be 0.	NO →	Replace the high pressure probe.
		↓ YES		
Switch the unit off.	YES ←	Is the outside temperature higher than 50°C?		
		↓ NO		
		Is enough air fed over the condenser?	NO →	Clean the condenser.
		↓ YES		
		Is the condenser fan motor running?	NO →	See troubleshooting for error E8
		↓ YES		
Adjust the refrigerant volume.	YES ←	Check the refrigerant volume. Is the system over-filled?		
		↓ NO		
		Replace the control board.		

Error P2: Low pressure alarm

		Low pressure probe has tripped. Error P2 is present.		
		↓		
		Is the electrical connection between the low pressure probe and the control board established correctly?	NO →	Correct the connection.
		↓ YES		
		Check whether the low pressure probe is faulty.		
		↓		
		Remove the low pressure probe's plug and measure the resistance. The value should be 0.	NO →	Replace the low pressure probe.
		↓ YES		
Switch the unit off.	YES ←	Is the ambient temperature lower than +5°C or -15 °C for units with a winter fan speed control?		
		↓ NO		
		Check that the valve is letting through on the high pressure side.	NO →	Open the valves.
		↓ YES		
		Check that the indoor unit's fan motor is running in cooling mode.	NO →	See troubleshooting in the indoor unit's operating instructions
		↓ YES		
		Replace the control board. Error rectified?		
		↓ NO		
		Check the refrigerant volume. Is refrigerant being lost?		
		↓ YES		
		Problem rectified.		

Error P3: Compressor current consumption too high

		Safety shut-down due to increased current consumption on the compressor.	
		↓	
		Switch the unit off, switch it back on and measure the total current consumption. Is this within the specified range?	
		↓ YES	
		Check the cooling cycle. Is this OK?	
		↓ YES	
Switch the unit off.	YES ←	Is the outside temperature higher than 50°C?	
		↓ NO	
Clean the condenser.	YES ←	Is the condenser dirty?	
		↓ NO	
Problem solved.	YES ←	Replace the control board. Is the unit running normally?	
		↓ NO	
	YES ←	Replace the entire electrical box.	

Error P4: Temperature probe for heat gas line faulty

		Heat gas temperature on the compressor too high		
		↓		
Check the cooling cycle for leaks. Did you find a leak?	YES ←	Is the heat gas temperature higher than 115°C?		
		↓ NO		
	NO →	Check the electrical connection between the heat gas line temperature probe and the control board. Is this correctly implemented?	NO →	Establish the electrical connection correctly.
↓ YES		↓ YES		
Rectify the leak and re-start the system.		Measure the resistance of the heat gas line's temperature probe. Is this correct (see Annex)?	NO →	Replace the temperature probe.
		↓ YES		
		Replace the control board.		

Error P5: Excessive temperature on condenser

The unit stops if the refrigerant temperature on the condenser outlet exceeds 65 °C. It re-starts once the temperature is 52 °C.

Excessive temperature safety shut-down. The unit shows P5.	NO →	Check the electrical connection between the condenser outlet's temperature probe and the board. Is it OK?	NO →	Establish the connection correctly.	
↓YES			JOO →	Check the temperature probe's resistance (for resistances, see the table). Is it OK?	
				↓YES	↓NO
Is the refrigerant temperature on the condenser outlet higher than 65°C?					Replace the temperature probe.
↓YES					
Is the outside temperature higher than 50°C?	JOO →	Switch the unit off.			
↓NO				↓	
Is the condenser fan running properly?	NO →	See troubleshooting for malfunction E8			
↓YES					
Is the condenser dirty?	JOO →	Clean the condenser.			
↓NO					
Is the refrigerant volume correct?	←				
↓YES					
Replace the control board					

Error P6: Inverter board safety shut-down (part 1)

Inverter board safety shut-down			
↓			
Check the voltage between the inverter board's P and N terminals. Is this between 277-366 VDC (MVT 603 DC) or 277-410 VDC (larger versions)?	NO →		**See the second part of this table on the next page!**
↓YES			
Check the electrical connection between the control board and the inverter board. Is this OK?	NO →	Correct the connection. Error rectified?	
↓YES			
Is the compressor's electrical connection configured correctly?	← NO		
	NO →	Correct the connection. Error rectified?	
↓YES			
Replace the inverter board. Is the unit working normally?	← NO		
	JOO →		Problem rectified.
↓NO			
Is the condenser fan motor working properly?	NO →	See troubleshooting for malfunction E8	
↓YES			
Replace the control board. Is the unit working normally?	JOO →		
↓NO			
Replace the compressor. Is the unit working normally?	JOO →		

Error P6: Inverter board safety shut-down (part 2)

	Inverter board safety shut-down			
	↓			
JOO →	Check the voltage between the inverter board's P and N terminals. Is this between 277-366 VDC (MVT 603 DC) or 277-410 VDC (larger versions)?	JOO →		**See the first part of this table on the previous page!**
	↓ NO			
	Check the power supply to the mains cable. Is this between 208-230 V?	NO →	Correct the mains cable. Is the system running normally?	
	↓ YES			
	Are the power supply's cables fitted correctly? Is the neutral wire correct?	NO ←		
		NO →		Tighten the cable. Error rectified?
	↓ YES			
↑	Are all electrical connections in the electrical box connected correctly?	NO ←		
		NO →		Correct the electrical connection.
	↓ YES	↓ NO		
	Check that the rectifier is functioning. To do this, use a multimeter to measure between the two terminals. The resistance value should be 0.			
	↓ YES		↓ NO	
	Check the electrical connections for the rectifier. Are these correctly implemented?		Replace the rectifier.	
		NO →	Replace the electrical connections.	
	YES ←			

Check the individual components

Check the temperature probes

Disconnect the temperature probe from the control board and measure the resistance on the plug's contacts.

(See tables and *Chapter 11.3 'Resistances of the temperature probes' on page 60*)

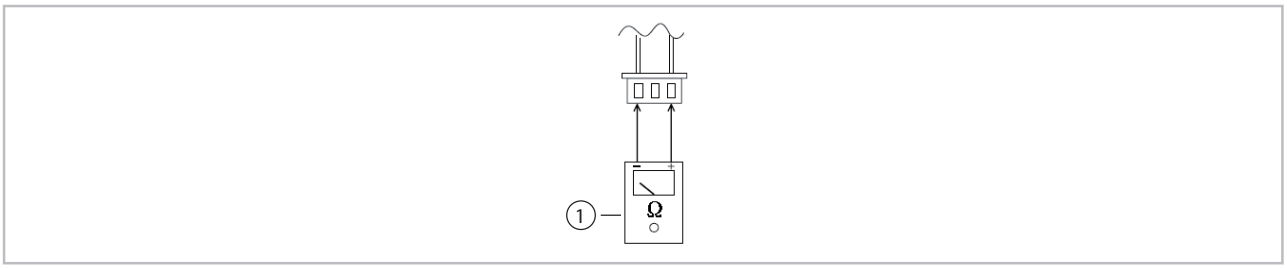


Fig. 23: Check temperature probes

1: Multimeter

Check compressor motor resistance values

Use a multimeter to check the resistance values.

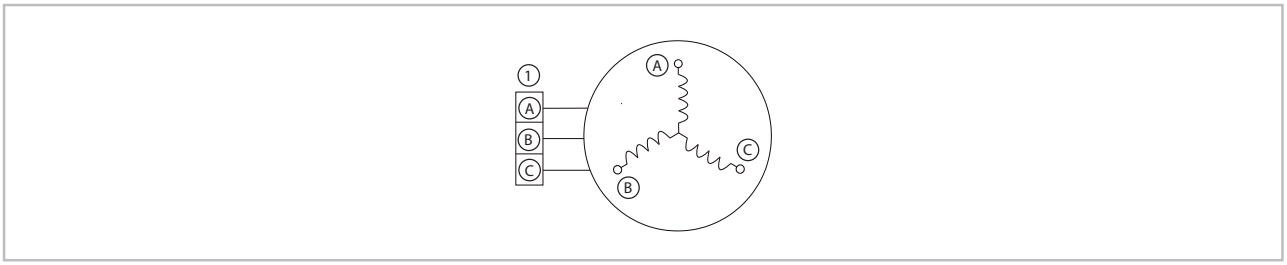


Fig. 24: Measurement of resistance values

1: Connection terminals
A: blue
B: red
C: black

Item	Resistance value			
	ASN108D22UEZ	ASM135D23UFZ	ATF235D22UMT	ATF310D43UMT
blue-red	1.57Ω (20 °C)	1.75Ω (20 °C)	0.75Ω (20 °C)	0.65Ω (20 °C)

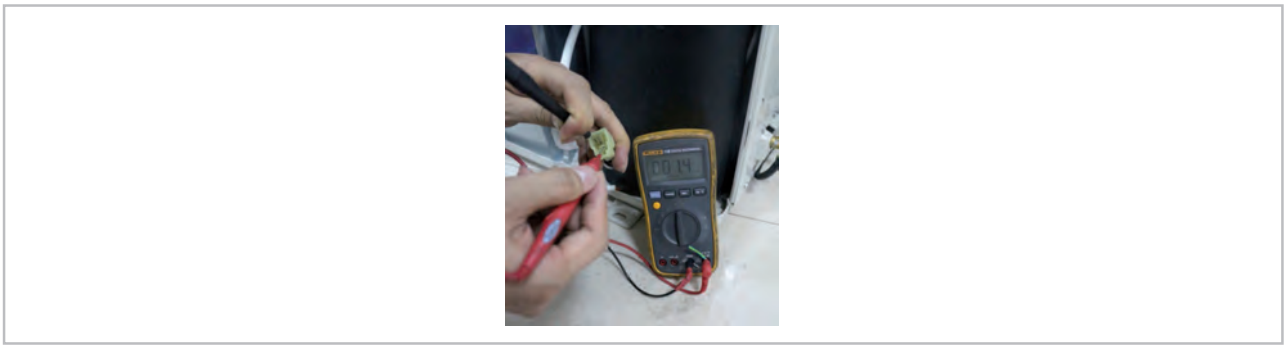


Fig. 25: Measure the resistance values using the multimeter

Check the IPM board

Switch the unit off and wait until the condensers are completely discharged. Disconnect the cables from the IPM board and measure the resistances between P and UVWN, UVW and N.

Voltmeter		Normal resistance	Voltmeter		Normal resistance
(+) Red	(-) Black	∞ Multiple MOhm	(+) Red	(-) Black	∞ Multiple MOhm
P	N		U	N	
	U		V		
	V		W		
	W		(+) Red		

Check the resistance values for the fan motor on the indoor unit

Use a multimeter to check the resistance values.

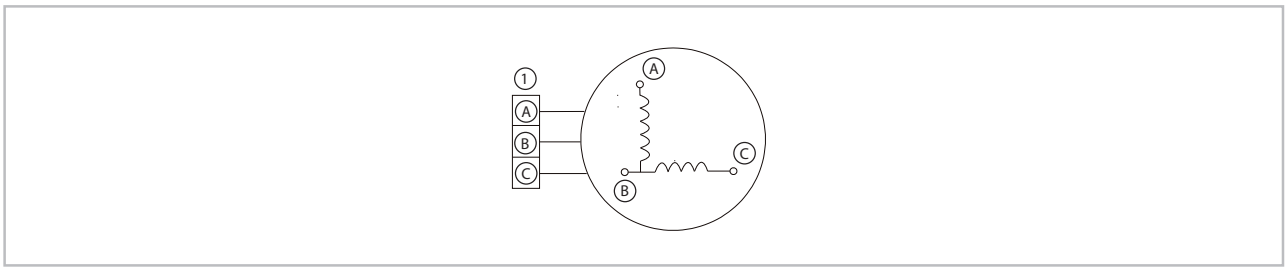


Fig. 26: Measurement of resistance values

1: Connection terminals
A: red
B: black
C: white

Item	Resistance value								
	YKSS-68-4-15-1 (Weilng)								
Black - red	285.8Ω ±8% (20 °C)								
Red - yellow	178.5Ω ±8% (20 °C)								
Yellow - blue	178.5Ω ±8% (20 °C)								

11.3 Resistances of the temperature probes

Probe T1, T2, T3 and T4

Temp. (°C)	Resistance (kΩ)	Temp. (°C)	Resistance (kΩ)
-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

Temp. (°C)	Resistance (kΩ)	Temp. (°C)	Resistance (kΩ)
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 (kΩ)	Temp. (°C)	Resistance (kΩ)
-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 (kΩ)	Temp. (°C)	Resistance (kΩ)
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

REMKO MVT series

Temp. (°C)	Resistance (kΩ)	Temp. (°C)	Resistance (kΩ)
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	Commissioning	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 above

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 and spare parts lists

14.1 Exploded view of the unit MVT 603 DC

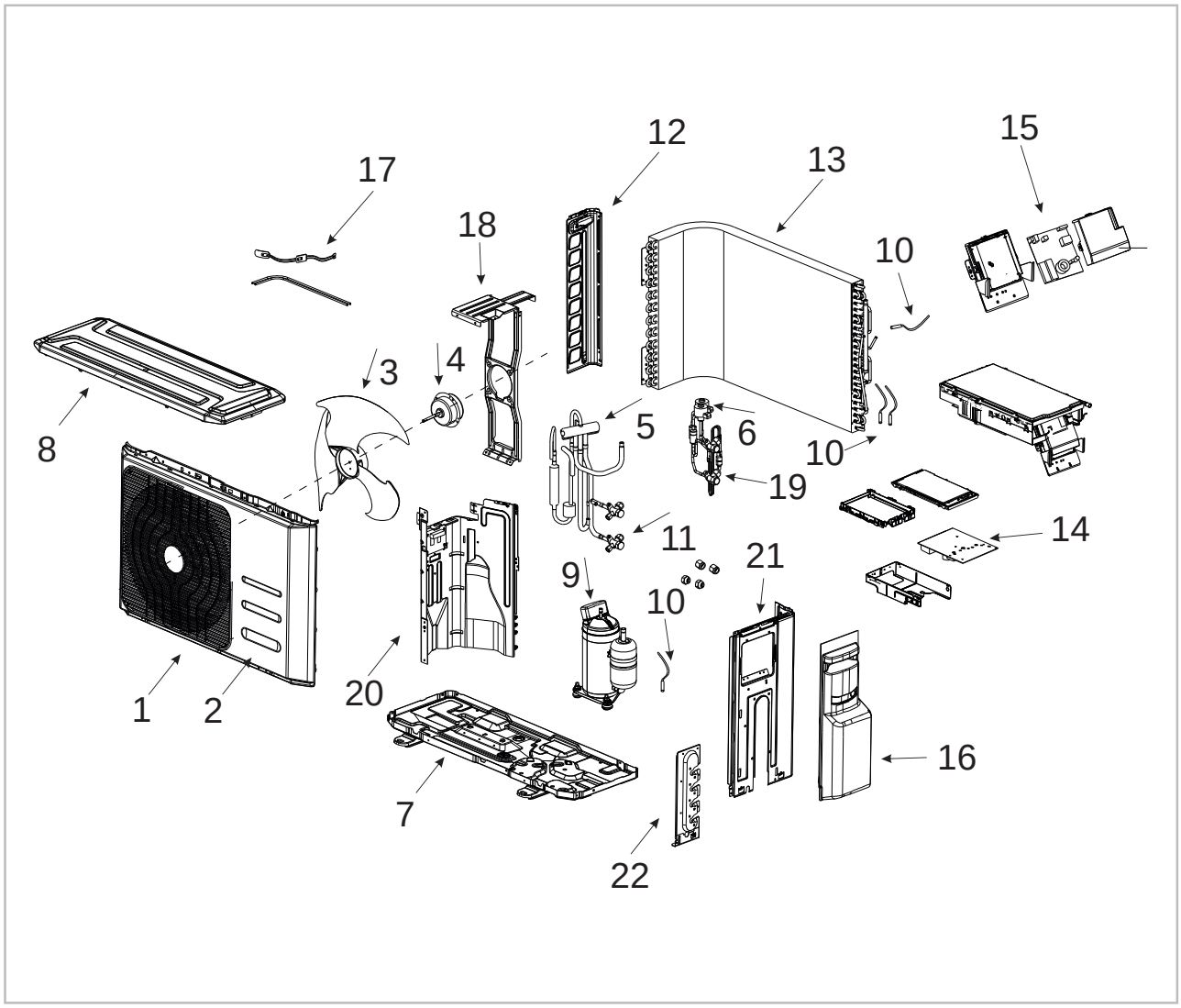


Fig. 27: Exploded view of the unit MVT 603 DC

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

14.2 Spare parts list MVT 603 DC

IMPORTANT!

To ensure the correct delivery of spare parts, please always the device type with the corresponding serial number (see type plate)

No.	Designation
1	Condenser protection grille
2	Condenser front panel
3	Fan blade
4	Fan motor
5	4-way valve
6	Electronic injection valve
7	Floor panel
8	Cover panel
9	Compressor
10	Temperature probes, set
11	Shut-off valve, suction pipe
12	Side section, left
13	Condenser
14	Inverter board
15	Control board
16	Refrigerant connections cover
17	Crankcase heating
18	Fan motor mount
19	Shut-off valve, injection pipe
20	Partitioning panel
21	Side section, right
22	Service valve bracket

14.3 Exploded view of the unit MVT 903 DC

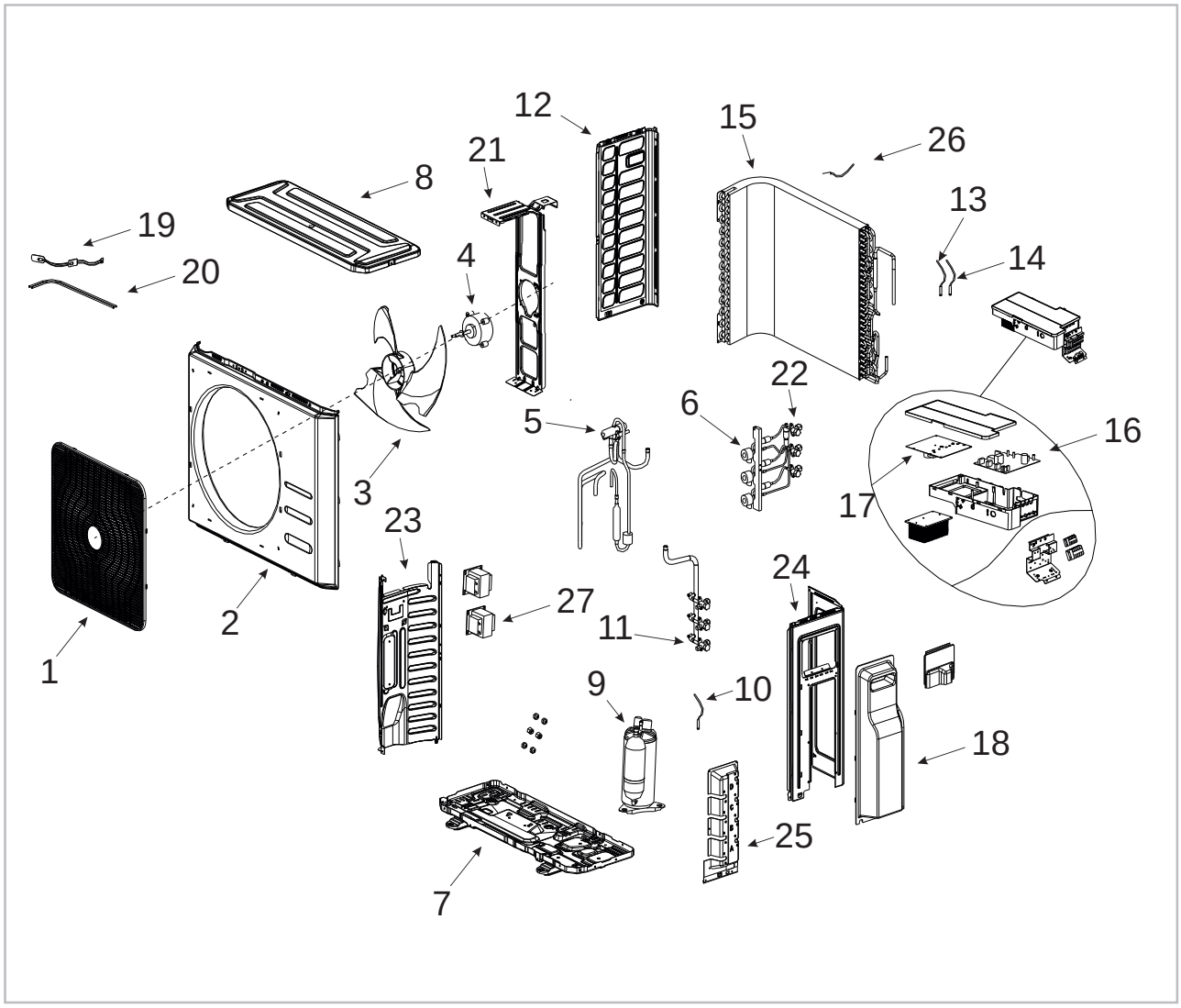


Fig. 28: Exploded view of the unit MVT 903 DC

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

14.4 Spare parts list MVT 903 DC

IMPORTANT!

To ensure the correct delivery of spare parts, please always the device type with the corresponding serial number (see type plate)

No.	Designation
1	Condenser protection grille
2	Condenser front panel
3	Fan blade
4	Fan motor
5	4-way valve
6	Electronic injection valve
7	Floor panel
8	Cover panel
9	Compressor
10	Heat gas probe
11	Shut-off valve, suction pipe
12	Side section, left
13	Temperature probe for condenser outlet
14	Temperature probe, suction pipe
15	Condenser
16	Inverter board
17	Control board
18	Refrigerant connections cover
19	Condensate tray heating
20	Crankcase heating
21	Fan motor mount
22	Shut-off valve, injection pipe
23	Partitioning panel
24	Side section, right
25	Service valve bracket
26	Temperature probe for condenser air inlet
27	Transformer

14.5 Exploded view of the unit MVT 1053 DC

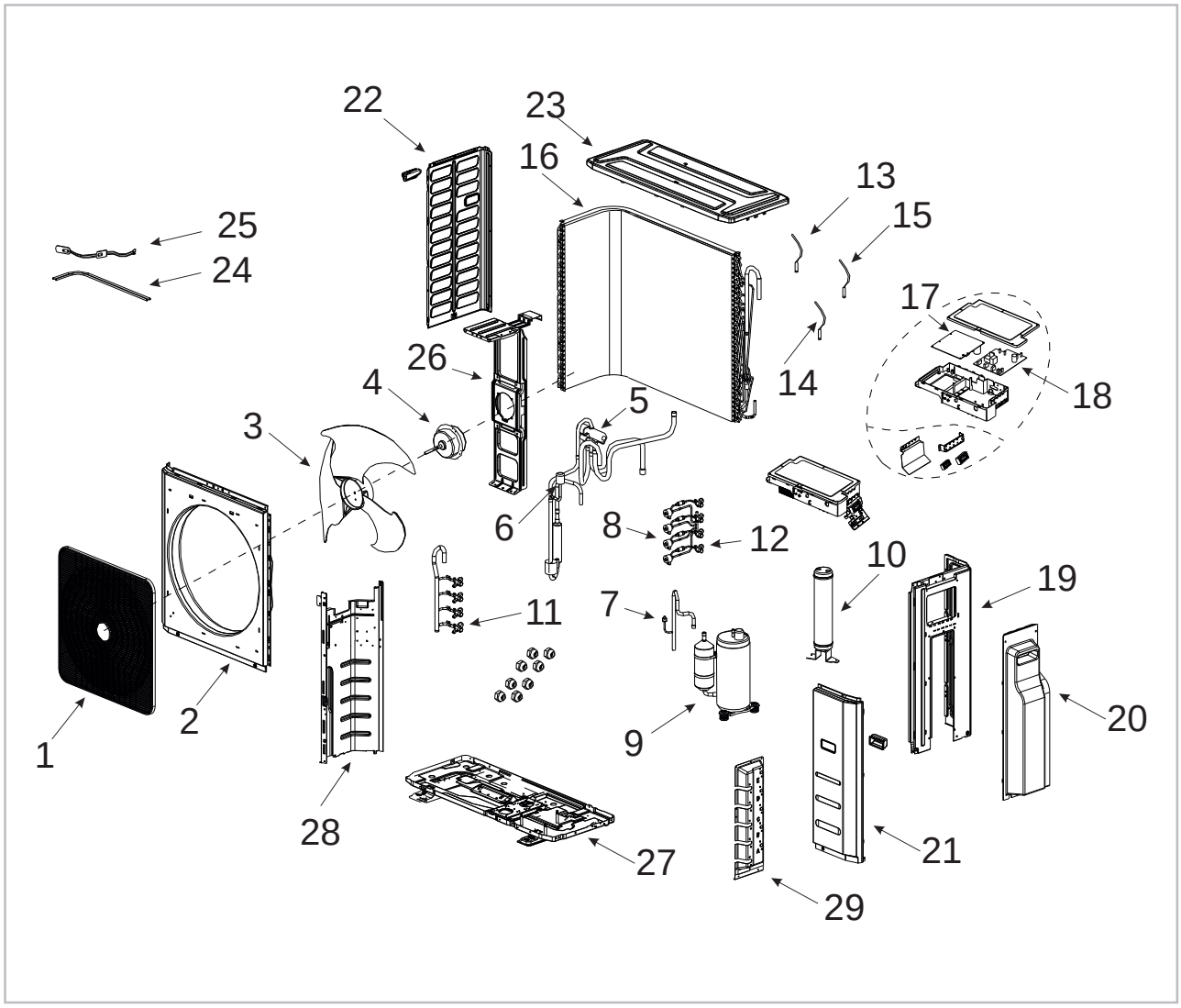


Fig. 29: Exploded view of the unit MVT 1053 DC

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

14.6 Spare parts list MVT 1053 DC

IMPORTANT!

To ensure the correct delivery of spare parts, please always the device type with the corresponding serial number (see type plate)

No.	Designation
1	Condenser protection grille
2	Condenser front panel
3	Fan blade
4	Fan motor
5	4-way valve
6	Low-pressure probe
7	High-pressure probe
8	Electronic injection valve
9	Compressor
10	Liquid separator
11	Shut-off valve suction pipe 3/8"
12	Shut-off valve, injection pipe
13	Temperature probe for condenser outlet
14	Air inlet temperature probe
15	Temperature probe for heat gas line
16	Condenser
17	Inverter board
18	Control board
19	Side section, right
20	Cover for refrigerant connections
21	Compressor room front panel
22	Side section, left
23	Cover panel
24	Crankcase heating
25	Condensate tray heating
26	Fan motor mount
27	Floor panel

For more, see the next page

No.	Designation
28	Partitioning panel
29	Service valve bracket
	Spare parts not illustrated
	Shut-off valve suction pipe 1/2"
	Temperature probe, suction pipe

14.7 Exploded view of the unit MVT 1403 DC

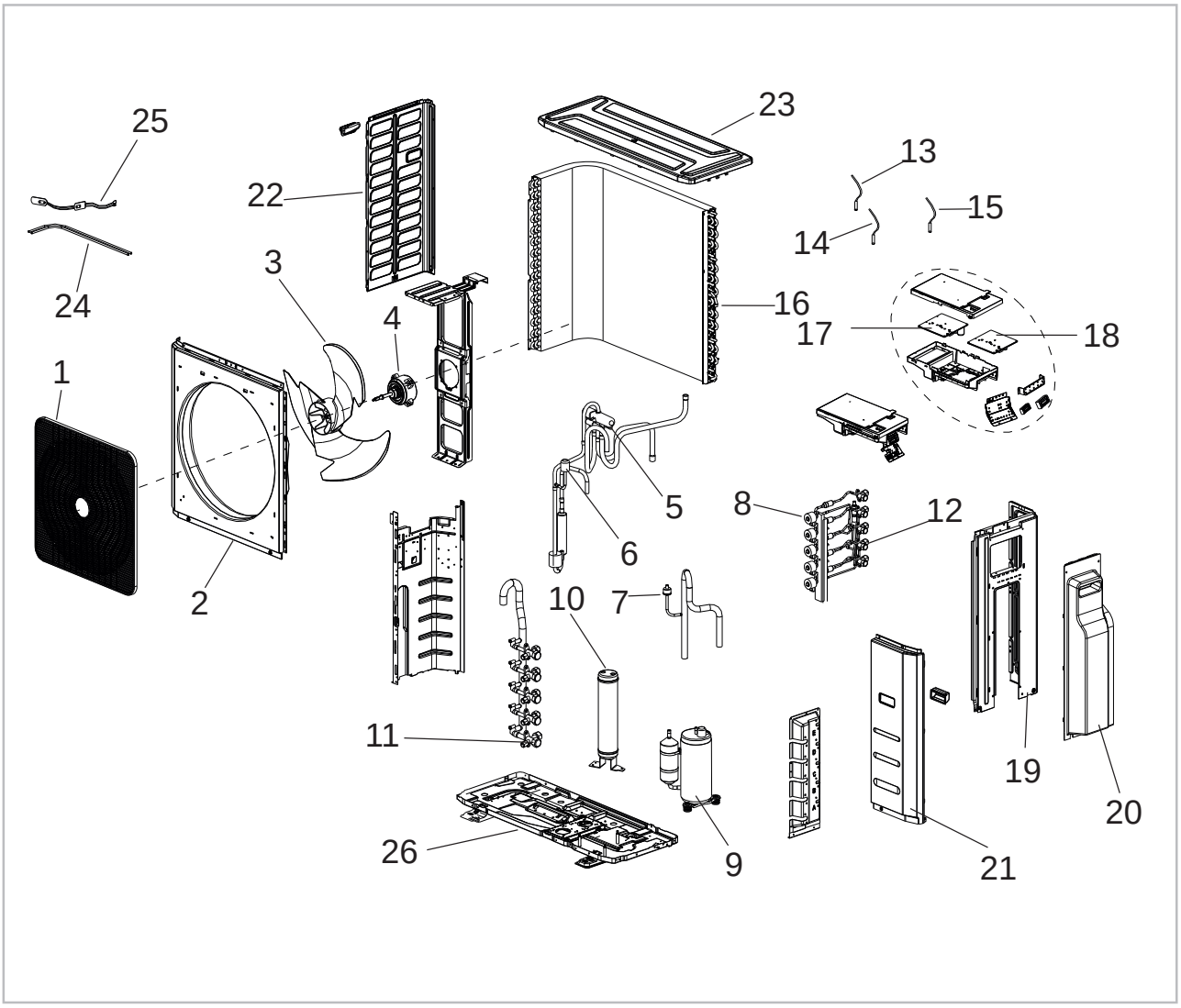


Fig. 30: Exploded view of the unit MVT 1403 DC

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

14.8 Spare parts list MVT 1403 DC

IMPORTANT!

To ensure the correct delivery of spare parts, please always the device type with the corresponding serial number (see type plate)

No.	Designation
1	Condenser protection grille
2	Condenser front panel
3	Fan blade
4	Fan motor
5	4-way valve
6	Low-pressure probe
7	High-pressure probe
8	Electronic injection valve
9	Compressor
10	Liquid separator
11	Shut-off valve suction pipe 3/8"
12	Shut-off valve, injection pipe
13	Temperature probe for condenser outlet
14	Air inlet temperature probe
15	Temperature probe for heat gas line
16	Condenser
17	Inverter board
18	Control board
19	Side section, right
20	Cover for refrigerant connections
21	Compressor room front panel
22	Side section, left
23	Cover panel
24	Condensate tray heating
25	Crankcase heating
26	Floor panel
	Spare parts not illustrated
	Injection valve suction pipe 1/2"

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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