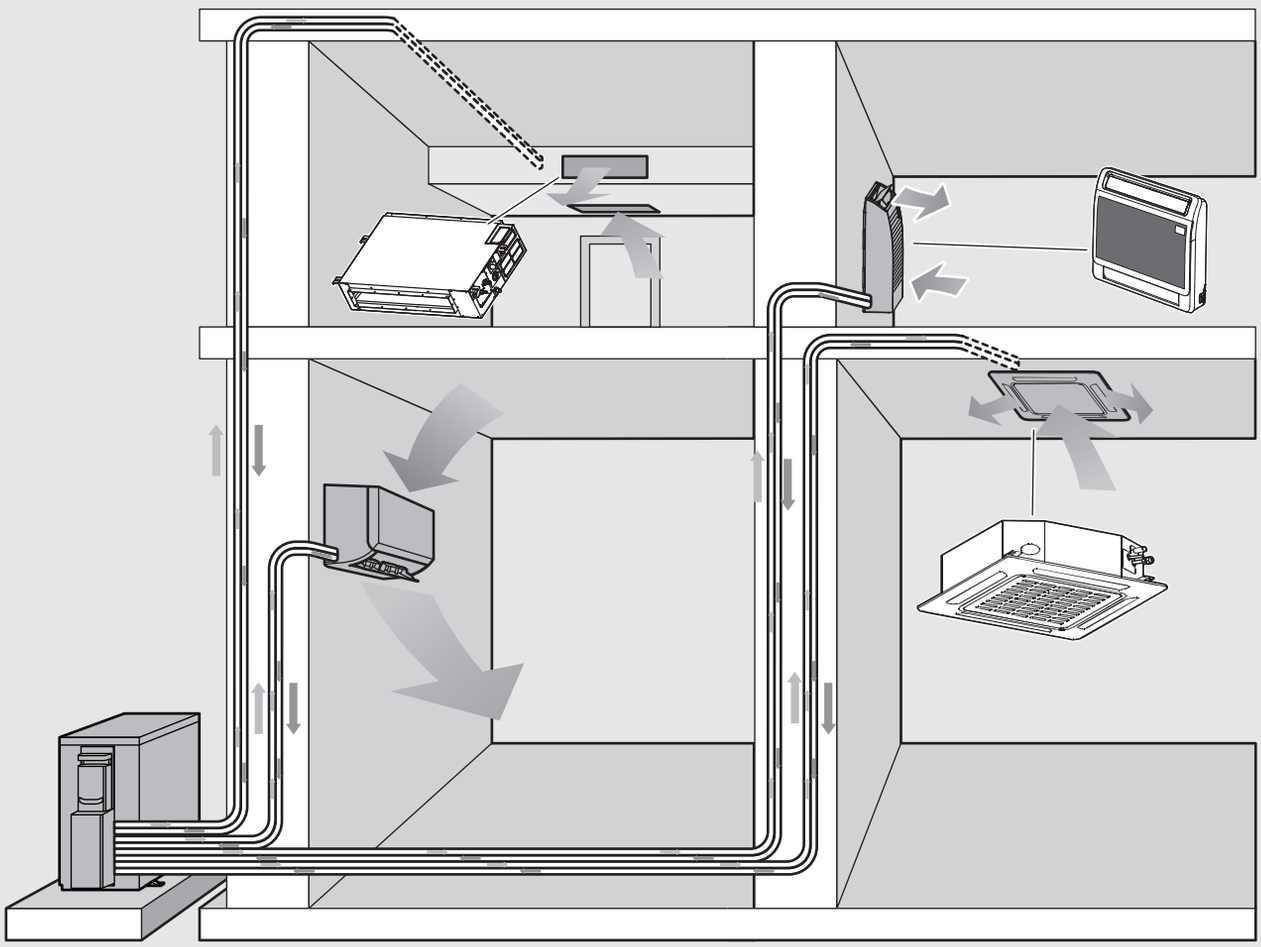
BOSCH

Service instructions

Multi-Split air conditioner
Climate 5000 M/7000 M



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1 Explanation of symbols and safety instructions

1.1 Explanation of symbols

Warnings

In warnings, signal words at the beginning of a warning are used to indicate the type and seriousness of the ensuing risk if measures for minimizing danger are not taken.

The following signal words are defined and can be used in this document:

DANGER

DANGER indicates that severe or life-threatening personal injury will occur.

WARNING

WARNING indicates that severe to life-threatening personal injury may occur.

CAUTION

CAUTION indicates that minor to medium personal injury may occur.

NOTICE

NOTICE indicates that material damage may occur.

Important information

The info symbol indicates important information where there is no risk to people or property.

1.2 General safety instructions

1.2.1 Overview

This service manual is intended for service engineers. All instructions must be observed. Failure to comply with instructions may result in material damage and personal injury, including danger to life

- Read the installation manuals (outdoor unit, indoor unit, etc) prior to maintenance.
- Observe the safety instructions and warnings.
- Follow national and regional regulations, technical regulations and guidelines.

⚠ Warning

- Do not touch the refrigerant piping, water piping or internal parts during operations or when the operation has just been completed. This is because the temperature may be too high or too low. Let them recover to the normal temperature first. Wear protective gloves if you must come in contact with these.
- Do not touch any refrigerant that has accidentally leaked.

⚠ Caution

- Please wear the appropriate personal protective tools during installation, maintenance or repair of the system (protective gloves, safety glasses, etc.).
- Do not touch the air inlet or aluminium fin of the unit.

⚠ Notice

- Improper installation or connection of equipment and accessories may cause electric shocks, short circuits, leaks, fires, or other damage to the equipment. Use only accessories, equipment and spare parts made or approved by the manufacturer.
- Do not place any object or equipment on top of the unit.
- Do not sit, climb, or stand on the unit.

1.2.2 Refrigerant

⚠ Warning

- Take appropriate precautions to prevent refrigerant leakage. If the refrigerant gas leaks, ventilate the area immediately. Possible risk: An excessively high concentration of refrigerant in an enclosed area can lead to anoxia (oxygen deficiency). The refrigerant gas may produce a toxic gas if it comes in contact with fire.
- Refrigerant must be recovered. Do not release it to the environment. Use the vacuum pump to draw the refrigerant out from the unit.

⚠ Notice

- Do not charge refrigerant before the wiring layout is completed.
- Only charge the refrigerant after the leak tests and vacuum drying have been completed.
- When charging the system with refrigerant, do not exceed the allowable charge.

1.2.3 Electricity

⚠ Notice

- All electrical works and repairs must be done by a certified installer or electrician.

⚠ Warning

- Make sure you switch off the power of the unit before you open the electric control box, and access any circuit wiring or components inside. At the same time, this prevents the unit from being accidentally powered up during installation or maintenance work.
- Once you open the cover of the electric control box, do not let any liquid spill into the box, and do not touch the components in the box with wet hands.
- Cut off power supply more then 5 minutes prior to access the electrical parts. Measure the voltage of the main circuit capacitor or electrical component terminals to make sure the voltage is less than 36 V before you touch any circuit component. Refer to the connections and wiring on the nameplate for the master circuit terminals and connections.
- Make sure the wiring ends are not subjected to any external force. Do not pull or squeeze the cables and wires. At the same time, make sure the wiring ends are not in contact with the piping or sharp edges of the sheet metal.
- Make sure all terminals of the components are firmly connected before you close the cover of the electric control box. Before you power on and start the unit, check that the cover of the electric control box is seated correctly and secured with screws.

2 General information

Always use appropriate tools only. In case of uncertainty, consult the manufacturer about the tools to use with flammable refrigerants.

DANGER

Fire hazard - Risk of injury or death

Using other parts than those specified by the manufacturer may result in the ignition of refrigerant from a leak.

- Always replace components with the parts specified by the manufacturer.

Preparing the work area

Prior to beginning any work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimised. For repairs to the refrigerating system, the following precautions are to be complied with prior to conducting work on the system.

- Undertake any works in a controlled area and a controlled procedure to minimise the risk of flammable gases or vapours being present while performing the task.
- Remove all possible ignition sources and put up a “No Smoking” sign.
- Do not use a halide torch or any other gas detection method with an open flame.
- Do not work in a confined space.
- Section off the work area.
- Ensure the work area is well ventilated before and while carrying out the work.
- Check area with a suitable refrigerant/leak detector before and while carrying out the work. If a leak detector needs recalibration, recalibrate in a refrigerant-free area.
- Keep a dry powder or CO_2-filled fire extinguisher at hand.
- Inform maintenance staff and other persons working in the area of the work being carried out.

Checking the refrigeration equipment

The following checks are to be applied to installations using flammable refrigerants:

- Ensure the charge size is in accordance with the room size in which the refrigerant containing parts are installed.
- Check that the ventilation machinery and outlets are operating adequately and are not obstructed.
- If an indirect refrigerating circuit is used, the secondary circuits must be checked for the presence of refrigerant, too.
- Ensure all marking to the equipment is visible and legible. Any unintelligible signage must be corrected.
- Ensure only refrigerant pipes and components constructed from materials inherently resistant to being corroded, or which are suitably protected, are exposed. All others must be installed in a position where they are unlikely to be exposed to any corrosive substances.

Checking electrical devices and cabling

Electrical components must be fit for the purpose and correspond to the correct specification. The manufacturer’s maintenance and service guidelines must be followed at all times. If in doubt consult the manufacturer’s technical department for assistance.

NOTICE

Temporary repairs to ensure continuing operation

If a fault exists that could compromise safety, usually, no electrical supply should be connected to the circuit until it is satisfactorily dealt with. However, if a fault cannot be corrected immediately, but it is necessary to continue operation, an adequate temporary solution must be sought.

- The owner of the equipment must be informed of this so that all parties are notified.

Repair and maintenance to electrical components should include initial safety checks and component inspection procedures.

- Initial safety checks include:
  - Capacitors must be discharged in a safe manner to avoid the possibility of sparking.
  - Live electrical components and wiring may not be exposed while charging, recovering or purging the system.
  - Ensure the device is continuously grounded.
- Check that cabling is not subject to wear and tear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects.
- Take into account the effects of aging or continual vibration from sources such as compressors or fans.

Repairs to sealed components

- Ensure all electrical supplies are disconnected from the equipment being worked on prior to any removal of sealed covers, etc.

CAUTION

Potentially hazardous situations

- If electrical supply is absolutely necessary during servicing, make sure to locate a permanently operating form of leak detection at the most critical point to warn of a potentially hazardous situation.

- Ensure particular attention is paid that
  - the casing is not altered to the point where the level of protection is compromised,
  - cables are undamaged,
  - there is not an excessive number of connections,
  - all terminals are made to original specification,
  - seals are undamaged and sealing materials have not degraded to the point of not preventing ingress of flammable atmospheres.
  - glands, etc are fitted correctly.
- Ensure the device is mounted securely.
- Ensure replacement parts are in accordance with the manufacturer’s specifications.

Repairs to intrinsically safe components

Intrinsically safe components do not have to be isolated prior to working on them. They are the only components which can be worked on while live in the presence of a flammable atmosphere.

- Ensure not to exceed the permissible voltage and current permitted for the equipment in use when applying permanent inductive or capacitance loads to the circuit.
- Ensure that the test apparatus is at the correct rating.

Leak detection methods

Leak detection fluids are suitable for use with most refrigerants.
However, the use of detergents containing chlorine should be avoided, as the chlorine may react with the refrigerant and corrode the copper pipe-work.
The use of silicon sealant may inhibit the effectiveness of some types of leak detection equipment.

The following leak detection methods are deemed acceptable for systems containing flammable refrigerants.

- Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant. For this reason, use electronic leak detectors to detect flammable refrigerants.
- Ensure to recalibrate an inadequate sensitivity in a refrigerant-free area.
- Leak detection equipment should be set at a percentage of the LFL of the refrigerant and be calibrated to the refrigerant employed.
- Ensure the appropriate percentage of gas (25 % maximum).
- If a leakage of refrigerant is found which requires brazing, all of the refrigerant must be either recovered from the system or isolated by shutting-off valves in a part of the system away from the leak.

Removal and evacuation

When breaking into the refrigerant circuit to make repairs - or for any other purpose - conventional procedures may be used.
Do not use compressed air or oxygen for purging refrigerant systems.

- Do not open the refrigerant system by brazing. Instead, adhere to the following procedure:
- Remove refrigerant.
- Flush the circuit with nitrogen.
- Evacuate.
- Flush again with nitrogen. This process may need to be repeated several times.
- Open the circuit by cutting or brazing.

Removal and evacuation for appliances containing flammable refrigerants

NOTICE

Flushing pipes containing flammable refrigerants

For appliances containing flammable refrigerants, the system should be flushed with oxygen-free nitrogen to render the unit safe.

- Always follow best practice.

- Flushing is achieved by vacuuming the system, then filling the system with oxygen-free nitrogen until the design pressure is reached.
- Vent the system to atmospheric pressure.
- Repeat the above process until there is no refrigerant is left in the system.
- Make sure to always flush the system before doing any brazing on the pipework.

Ensure that the outlet for the vacuum pump is away from any sources of ignition and that ventilation is available.

Charging procedures

Follow these requirements in addition to conventional charging procedures:

- Ensure that no contamination of different refrigerants occurs when using charging equipment.
- Keep hoses or lines as short as possible to minimise the amount of refrigerant contained in them.
- Keep refrigerant cylinders upright.
- Label the system when charging is complete (if not already labelled).
- Before recharging the system, pressure-test with oxygen-free nitrogen.
- Take extreme care not to overfill the refrigeration system.
- Leak-test the system on completing charging and prior to commissioning. A follow-up leak test is to be carried out before leaving the site.

Decommissioning

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its details.

It is recommended good practice that all refrigerants are recovered safely or safely vented.

- An oil and refrigerant sample should be taken prior to the task, in case analysis is required before reusing reclaimed refrigerant.
- Ensure that:
  - electrical power is available before starting the work,
  - the system is electrically isolated,
  - mechanical equipment for handling refrigerant recovery into cylinders is available (if required),
  - recovery equipment and cylinders conform to the appropriate standards,
  - all personal protective equipment is available and being used correctly,
  - the recovery process is supervised at all times by a competent person.
- Pump down refrigerant system, if possible.
- Make sure that cylinder is situated on the scales before recovery takes place.
- Start the recovery machine and operate in accordance with manufacturer's instructions.
- Do not overfill cylinders (no more than 70 % of the water capacity, converted to refrigerant density at temperature of recovery).
- Never exceed the maximum working pressure of the cylinder, not even temporarily.
- Ensure that the cylinders and the equipment are removed from the site promptly and that all isolation valves on the equipment are closed off when the process is finished.

Recovered refrigerants should only be charged into another refrigeration system after they have been cleaned and checked first.

Labelling

- Ensure equipment label states that it has been decommissioned and emptied of refrigerant and that the label is dated and signed.
- Ensure equipment is labelled to state it contains flammable refrigerant.

Recovery

When removing refrigerant from a system, either for service or decommissioning, it is recommended good practice that all refrigerants are removed safely.

- ▶ Ensure only appropriate refrigerant recovery cylinders are employed and that they are appropriately labelled for the refrigerant. Cylinders must come complete with pressure relief valve and all associated shut-off valves in good working order.
- ▶ Ensure sufficient amount of cylinders for holding the total system charge is available.
- ▶ Ensure empty recovery cylinders are evacuated and, if possible, cooled before recovery takes place.
- ▶ Ensure recovery equipment is in good working order and suitable for the recovery of flammable refrigerants.
- ▶ Ensure instructions concerning the equipment at hand are included with it.
- ▶ Ensure that a set of calibrated weighing scales in good working order is at hand.
- ▶ Ensure hoses are complete with leak-free disconnect couplings and are in good condition.
- ▶ Before use, check that recovery machine is in satisfactory working order, has been properly maintained, and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release. Consult the manufacturer if in doubt.
- ▶ Ensure the recovered refrigerant is returned to the refrigerant supplier in the correct recovery cylinder, with the relevant waste transfer note attached.
- ▶ Do not mix refrigerants in recovery units and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level so that no flammable refrigerant remains in the lubricant. Evacuation should be carried out prior to returning the compressor to the suppliers.
To accelerate this process, solely electric heating to the compressor body may be employed.

Transportation, marking and storage

- ▶ Ensure transport of equipment containing flammable refrigerants is in compliance with the transport regulations.
- ▶ Ensure the marking of the equipment using signs is in compliance with local regulations.
- ▶ Ensure the disposal of equipment containing flammable refrigerants is in compliance with national regulations.
- ▶ Ensure storage of equipment/appliances is in accordance with the manufacturer's instructions.

NOTICE

Storage of packed (unsold) equipment:

Storage package protection should be constructed in a way that mechanical damage to the equipment inside the package will not cause a leak of the refrigerant charge.

- ▶ Determine the maximum number of pieces of equipment permitted to be stored together according to local regulations

2.1 Product Information

2.1.1 Outdoor unit types

Model name	Dimensions (mm)	Compressor
CL5000M 41/2 E	805 × 330 × 554	KSN140D58UFZ
CL5000M 53/2 E	805 × 330 × 554	KSN140D58UFZ
CL5000M 62/3 E	890 × 342 × 673	KSN140D58UFZ
CL5000M 79/3 E	890 × 342 × 673	KTM240D57UMT
CL5000M 82/4 E	890 × 342 × 673	KTM240D57UMT
CL5000M 105/4 E	890 × 342 × 673	KTF310D43UMT
CL5000M 125/5 E	946 × 410 × 810	KTF310D43UMT

Table 1 Outdoor unit capacity range

2.1.2 Temperature sensors

Sensor	Designation
Room temperature sensor	T1
Indoor coil temperature sensor	T2
Outdoor coil temperature sensor	T3
Outdoor ambient temperature sensor	T4
Compressor discharge temperature sensor	TP (T5)

Table 2 Temperature sensors

3 Refrigerant

3.1 Recharge Refrigerant

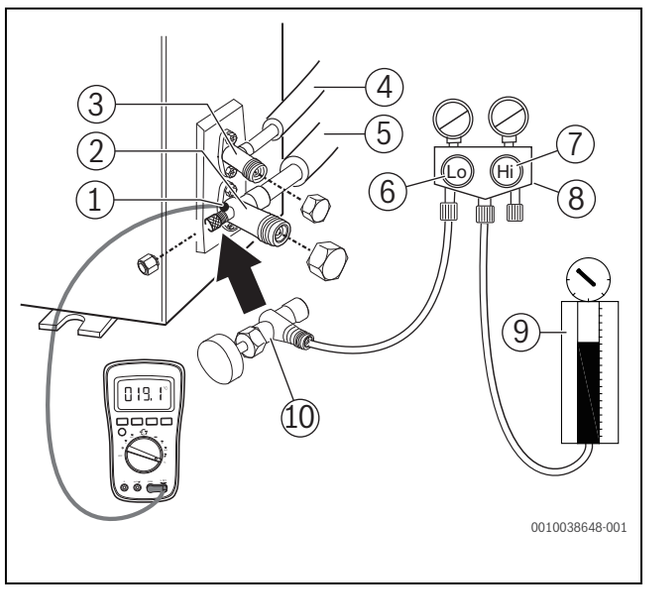


Fig. 1 Refrigerant recharge

[1] Temperature measuring point
[2] Gas valve
[3] Liquid valve
[4] Liquid pipe
[5] Gas pipe
[6] Low pressure control
[7] High pressure control
[8] Pressure gauge
[9] Refrigerant bottle
[10] Schrader valve opener

- ▶ Close the gas and the liquid valves.
- ▶ Connect the charge hose between pressure gauge and service port of the gas valve.
- ▶ Connect another charge hose between pressure gauge and valve on the refrigerant bottle.
- ▶ If necessary, invert the refrigerant bottle to ensure a complete liquid charge.
- ▶ Vacuum the set of gauges and charging hoses.
- ▶ Place the refrigerant bottle onto an electronic scale and record the starting weight.
- ▶ Fully open Schrader opening valve, gas valve and liquid valve.
- ▶ Operate the air conditioner in cooling mode to charge the system with liquid refrigerant.
- ▶ Slowly open the refrigerant bottle valve to charge the required amount of refrigerant.
- ▶ When the electronic scale displays the correct weight, close the refrigerant bottle valve and turn off the air conditioner.
- ▶ Unscrew and close the Schrader opening valve.
- ▶ Pump down and collect the refrigerant from the hoses into the system.
- ▶ Mount the caps of service port, gas and liquid valve.
- ▶ Use a torque wrench to tighten the caps to a torque of 18 Nm.
- ▶ Check for gas leakage.

3.2 Evacuate Refrigerant for Re-Installation

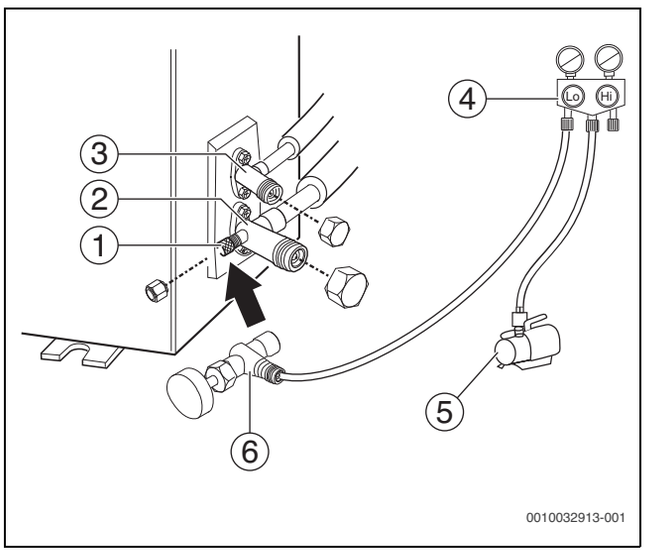


Fig. 2

[1] Schrader valve opener connection point (service port)
[2] Gas valve
[3] Liquid valve
[4] Pressure gauge
[5] Vacuum pump
[6] Schrader valve opener

3.2.1 Indoor Unit

Collecting the refrigerant in the outdoor unit

- ▶ Confirm that the liquid and gas valves are opened.
- ▶ Connect the charge hose between pressure gauge and service port of the gas valve.
- ▶ Connect another charge hose between pressure gauge and vacuum pump.
- ▶ Vacuum the set of gauges and charging hoses.
- ▶ Close the liquid valve.
- ▶ Operate the air conditioner in cooling mode. Cease operations when the gauge reaches 0.1 MPa. Close the gas valve so that the gauge rests between 0.3 MPa and 0.5 MPa.
- ▶ Disconnect the charge set and mount the caps of service port, liquid valve and gas valve.
- ▶ Use a torque wrench to tighten the caps to a torque of 18 Nm.
- ▶ Check for gas leakage.

Air purging with vacuum pump

- ▶ Tighten the flare nuts of the indoor and outdoor units, and confirm that liquid and gas valves are closed.
- ▶ Connect the charge hose between pressure gauge and service port of the gas valve.
- ▶ Connect another charge hose between pressure gauge and vacuum pump.
- ▶ Fully open the manifold valve.
- ▶ Using the vacuum pump, evacuate the system for at least 30 minutes.
- ▶ Check whether the compound meter indicates -0.1 MPa (approx. 500 microns).
  - – If the meter does not indicate above pressure after 30 minutes, continue evacuating for an additional 20 minutes.
  - – If the pressure does not achieve above pressure after 50 minutes, check for leakage.
  - – If the pressure successfully reaches above pressure, fully close the manifold valve, then cease vacuum pump operations.

- ▶ Wait for 5 minutes then check whether the gauge needle moves after turning off the vacuum pump. If the gauge needle moves backward, check wether there is gas leakage.
- ▶ Loosen the flare nut of the lower valve for 6 or 7 seconds and then tighten the flare nut again.
- ▶ Confirm the pressure display in the pressure indicator is slightly higher than the atmospheric pressure.
- ▶ Remove the charge hose from the gas valve.
- ▶ Fully open the liquid and gas valves and tighten their caps.

3.2.2 Outdoor Unit

Evacuation for the whole system

- ▶ Confirm that the liquid and gas valves are opened.
- ▶ Connect the vacuum pump to the gas valve's service port.
- ▶ Evacuate the system for approximately one hour. Confirm that the compound meter indicates -0.1 MPa (approx. 500 microns).
- ▶ Close the manifold valve on the charge set and turn off the vacuum pump.
- ▶ Wait for 5 minutes then check whether the gauge needle moves after turning off the vacuum pump.
- ▶ If the gauge needle moves backward, check whether there is gas leakage.
- ▶ Disconnect the charge hose from the vacuum pump.
- ▶ Mount the caps of service port, liquid valve and gas valve.
- ▶ Use a torque wrench to tighten the caps to a torque of 18 Nm.

Refrigerant charging

- ▶ Charge the refrigerant according to page 8.

3.3 Pressure on service port for refrigerant R32

3.3.1 Cooling chart

Unit for pressure	DB/WB T_{IDU} [°C]	DB T_{ODU} [°C]									
		-17	-15	-9.44	7.22	23.89	29.44	35	40.56	46.11	48.89
		Pressure on service port									
bar	21.11/15	6.5	6.6	7.4	8.2	8.4	8.0	8.3	8.8	10.3	10.8
	23.89/17.22	6.8	6.9	8.1	8.8	8.8	8.5	8.9	9.3	10.9	11.4
	26.67/19.44	7.2	7.3	8.7	9.7	9.5	9.1	9.3	9.8	11.4	12.1
	32.22/22.78	7.9	8.0	9.8	10.7	10.5	9.7	10.2	10.8	12.6	13.3
MPa	21.11/15	0.65	0.66	0.74	0.82	0.84	0.80	0.83	0.88	1.03	1.08
	23.89/17.22	0.68	0.69	0.81	0.88	0.88	0.85	0.89	0.93	1.09	1.14
	26.67/19.44	0.72	0.73	0.87	0.97	0.95	0.91	0.93	0.98	1.14	1.21
	32.22/22.78	0.79	0.80	0.98	1.07	1.05	0.97	1.02	1.08	1.26	1.33

Table 3 Pressure on service port in cooling mode

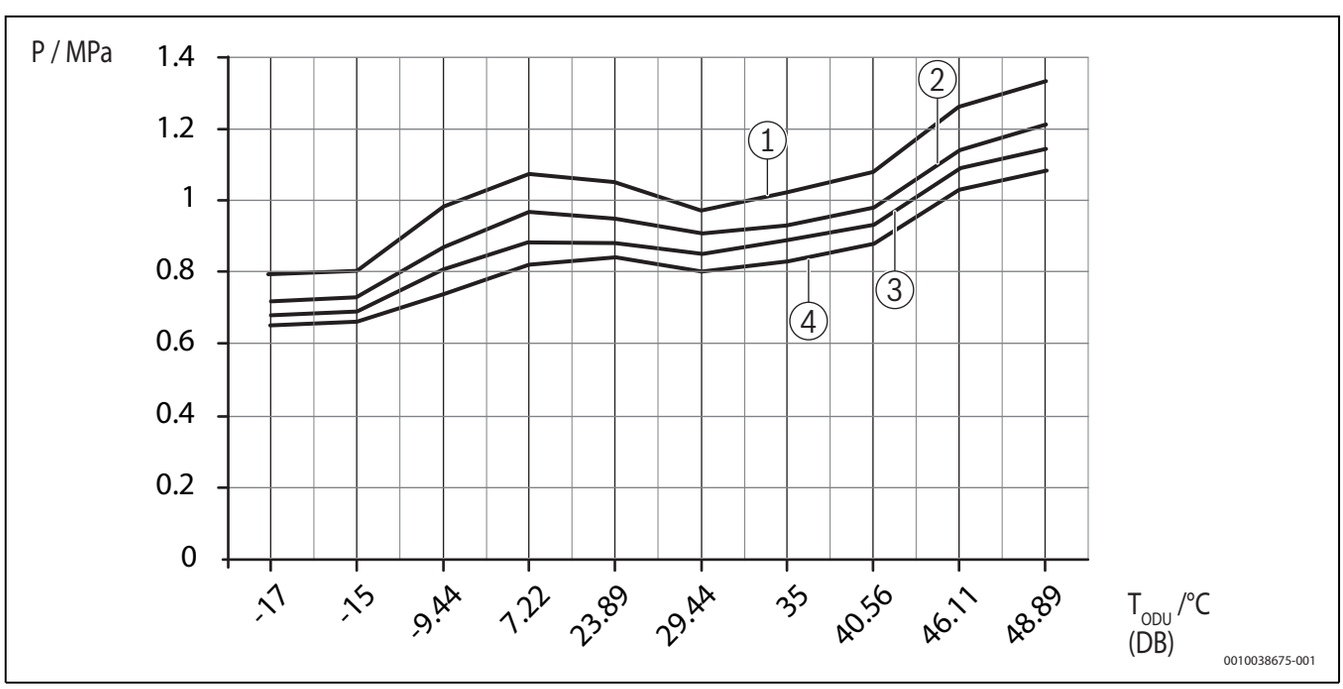


Fig. 3 Pressure on service port in cooling mode

DB/WB T_{IDU} [°C]:

[1] 32.22/22.78
[2] 26.67/19.44
[3] 23.89/17.22
[4] 21.11/15

DB Dry bulb temperature

P Pressure on service port
T_{IDU} Temperature at indoor unit
T_{ODU} Temperature at outdoor unit
WB Wet bulb temperature

3.3.2 Heating chart

Unit for pressure	DB T_{IDU} °C	DB/WB T_{ODU} °C						
		13.89/11.67	8.33/6.11	2.78/0.56	-2.78/-5	-8.33/-10.56	-17/-19	-27/-28
		Pressure on service port						
bar	12.78	30.9	29.1	25.8	23.3	21.2	18.9	16.8
	18.33	33.2	30.6	27.1	25.9	23.8	20.9	19.4
	23.89	34.5	32.1	28.4	26.8	25.4	21.9	20.4
MPa	12.78	3.09	2.91	2.58	2.33	2.12	1.89	1.68
	18.33	3.32	3.06	2.71	2.59	2.38	2.09	1.94
	23.89	3.45	3.21	2.84	2.68	2.54	2.19	2.04

Table 4 Pressure on service port in heating mode

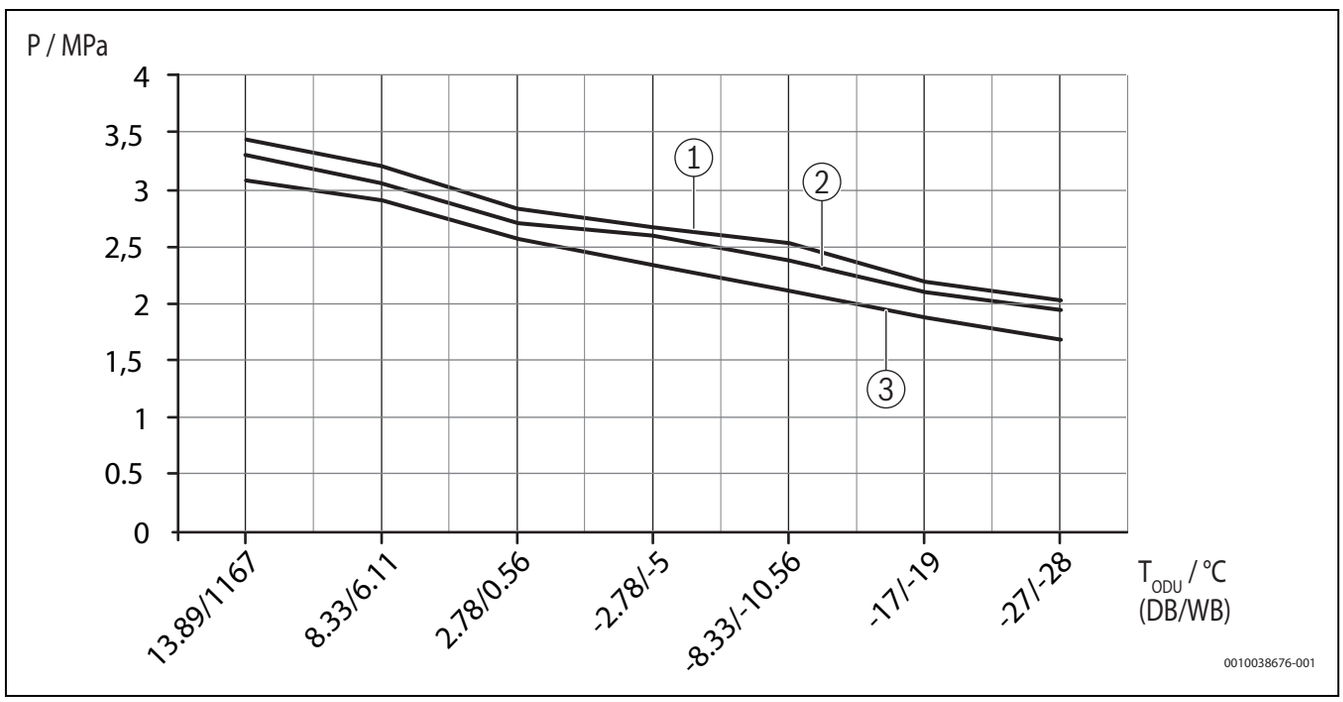


Fig. 4 Pressure on service port in heating mode

DB T_{IDU} [°C]:

[1] 23.89
[2] 18.33
[3] 12.78

DB Dry bulb temperature
P Pressure on service port
T_{IDU} Temperature at indoor unit
T_{ODU} Temperature at outdoor unit
WB Wet bulb temperature

3.3.3 System pressure table

Pressure		Temperature
kPa	bar	°C
100	1	-51.909
150	1.5	-43.635
200	2	-37.323
250	2.5	-32.15
300	3	-27.731
350	3.5	-23.85
400	4	-20.378
450	4.5	-17.225
500	5	-14.331
550	5.5	-11.65
600	6	-9.150
650	6.5	-6.805
700	7	-4.593
750	7.5	-2.498
800	8	-0.506
850	8.5	1.393
900	9	3.209
950	9.5	4.951
1000	10	6.624
1050	10.5	8.235
1100	11	9.790
1150	11.5	11.291
1200	12	12.745
1250	12.5	14.153
1300	13	15.52
1350	13.5	16.847
1400	14	18.138
1450	14.5	19.395
1500	15	20.619
1550	15.5	21.813
1600	16	22.978
1650	16.5	24.116
1700	17	25.229
1750	17.5	26.317
1800	18	27.382
1850	18.5	28.425
1900	19	29.447
1950	19.5	30.448
2000	20	31.431
2050	20.5	32.395
2100	21	33.341
2150	21.5	34.271
2200	22	35.184
2250	22.5	36.082
2300	23	36.965
2350	23.5	37.834
2400	24	38.688
2450	24.5	39.529
2500	25	40.358
2550	25.5	41.173
2600	26	41.977
2650	26.5	42.769
2700	27	43.55
2750	27.5	44.32
2800	28	45.079
2850	28.5	45.828
2900	29	46.567
2950	29.5	47.296
3000	30	48.015
3050	30.5	48.726
3100	31	49.428
3150	31.5	50.121
3200	32	50.806
3250	32.5	51.482
3300	33	52.15
3350	33.5	52.811
3400	34	53.464
3450	34.5	54.11
3500	35	54.748

Table 5 System pressure table

3.4 Refrigerant flow diagrams

Refrigeration circuit drawing of inverter 1 drive 2 type

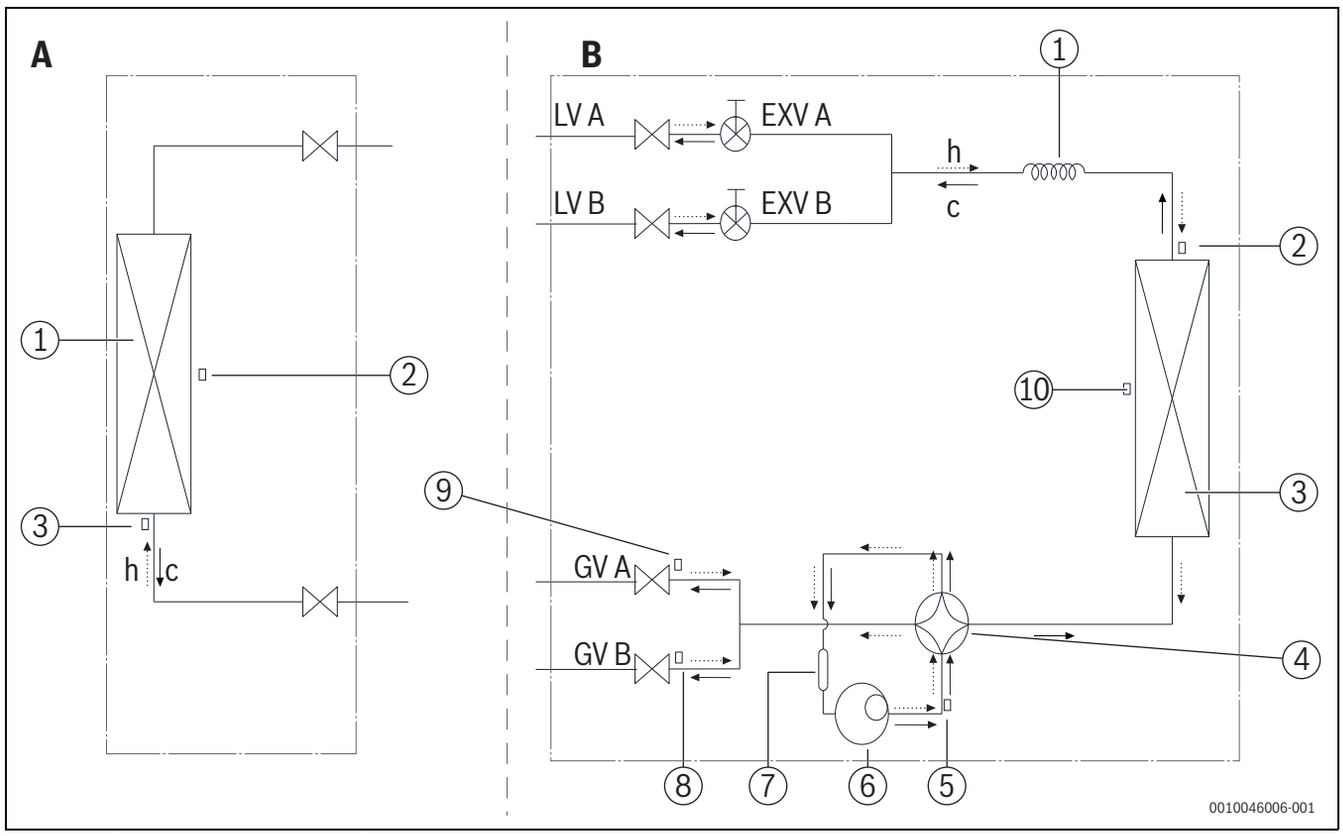


Fig. 5 Refrigeration circuit drawing of inverter 1 drive 2 type

A Indoor unit
B Outdoor unit
h heating
c cooling

A - Indoor unit:

[1] Heat exchanger (evaporator)
[2] T1 (room temperature sensor)
[3] T2 (evaporator temperature sensor middle)

B - Outdoor unit:

LV ... Liquid valve A/B
EXV ... Expansion valve A/B
GV .... Gas valve A/B

[1] Capillary
[2] T3 (condenser temperature sensor)
[3] Heat exchanger (condenser)
[4] 4-way valve
[5] TP (T5) (discharge temperature sensor)
[6] Compressor
[7] Muffler
[8] T2B-B (evaporator temperature sensor outlet)
[9] T2B-A (evaporator temperature sensor outlet)
[10] T4 (ambient temperature sensor)

Refrigeration circuit drawing of inverter 1 drive 3 type

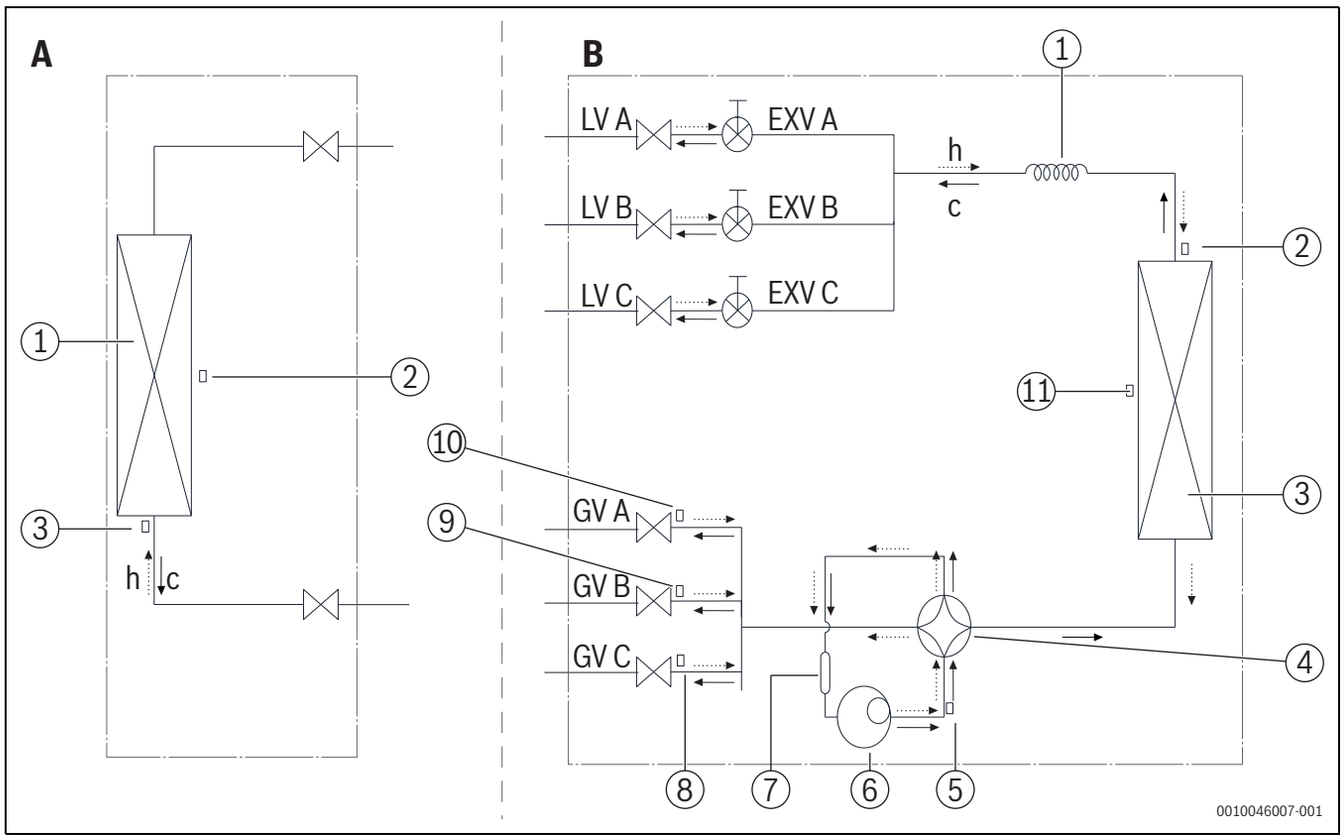


Fig. 6 Refrigeration circuit drawing of inverter 1 drive 3 type

A Indoor unit
B Outdoor unit
h heating
c cooling

A- Indoor unit:

[1] Heat exchanger (evaporator)
[2] T1 (room temperature sensor)
[3] T2 (evaporator temperature sensor middle)

B - Outdoor unit:

LV ... Liquid valve A/B/C
EXV ... Expansion valve A/B/C
GV .... Gas valve A/B/C

[1] Capillary
[2] T3 (condenser temperature sensor)
[3] Heat exchanger (condenser)
[4] 4-way valve
[5] TP (T5) (discharge temperature sensor)
[6] Compressor
[7] Muffler
[8] T2B-C (evaporator temperature sensor outlet)
[9] T2B-B (evaporator temperature sensor outlet)
[10] T2B-A (evaporator temperature sensor outlet)
[11] T4 (ambient temperature sensor)

Refrigeration circuit drawing of inverter 1 drive 4 type

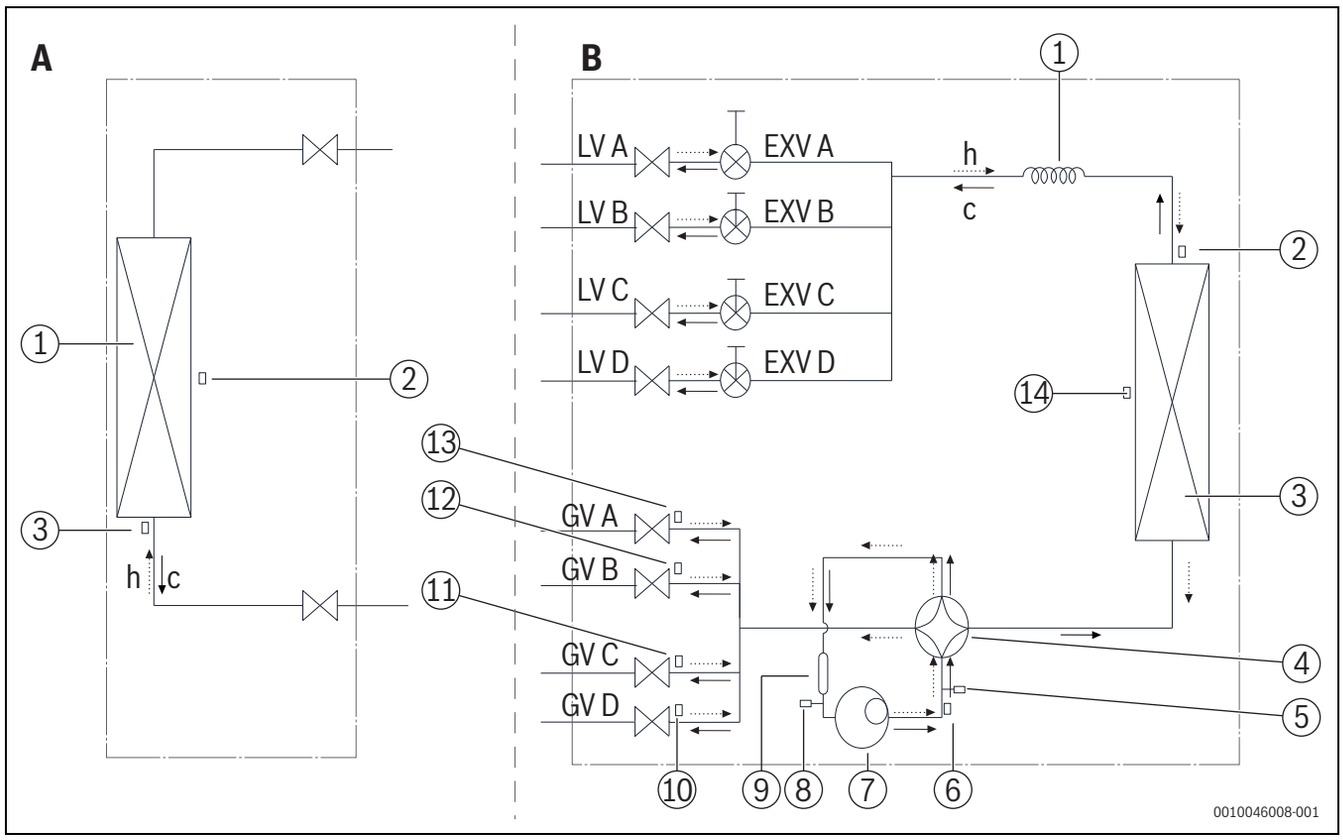


Fig. 7 Refrigeration circuit drawing of inverter 1 drive 4 type

A Indoor unit
B Outdoor unit
h heating
c cooling

A- Indoor unit:

[1] Heat exchanger (evaporator)
[2] T1 (room temperature sensor)
[3] T2 (evaporator temperature sensor middle)

B - Outdoor unit:

LV ... Liquid valve A/B/C/D
EXV ... Expansion valve A/B/C/D
GV .... Gas valve A/B/C/D

[1] Capillary
[2] T3 (condenser temperature sensor)
[3] Heat exchanger (condenser)
[4] 4-way valve
[5] High pressure switch
[6] TP (T5) (discharge temperature sensor)
[7] Compressor
[8] Low pressure switch
[9] Accumulator (Receiver)
[10] T2B-D (evaporator temperature sensor outlet)
[11] T2B-C (evaporator temperature sensor outlet)
[12] T2B-B (evaporator temperature sensor outlet)
[13] T2B-A (evaporator temperature sensor outlet)
[14] T4 (ambient temperature sensor)

Refrigeration circuit drawing of inverter 1 drive 5 type

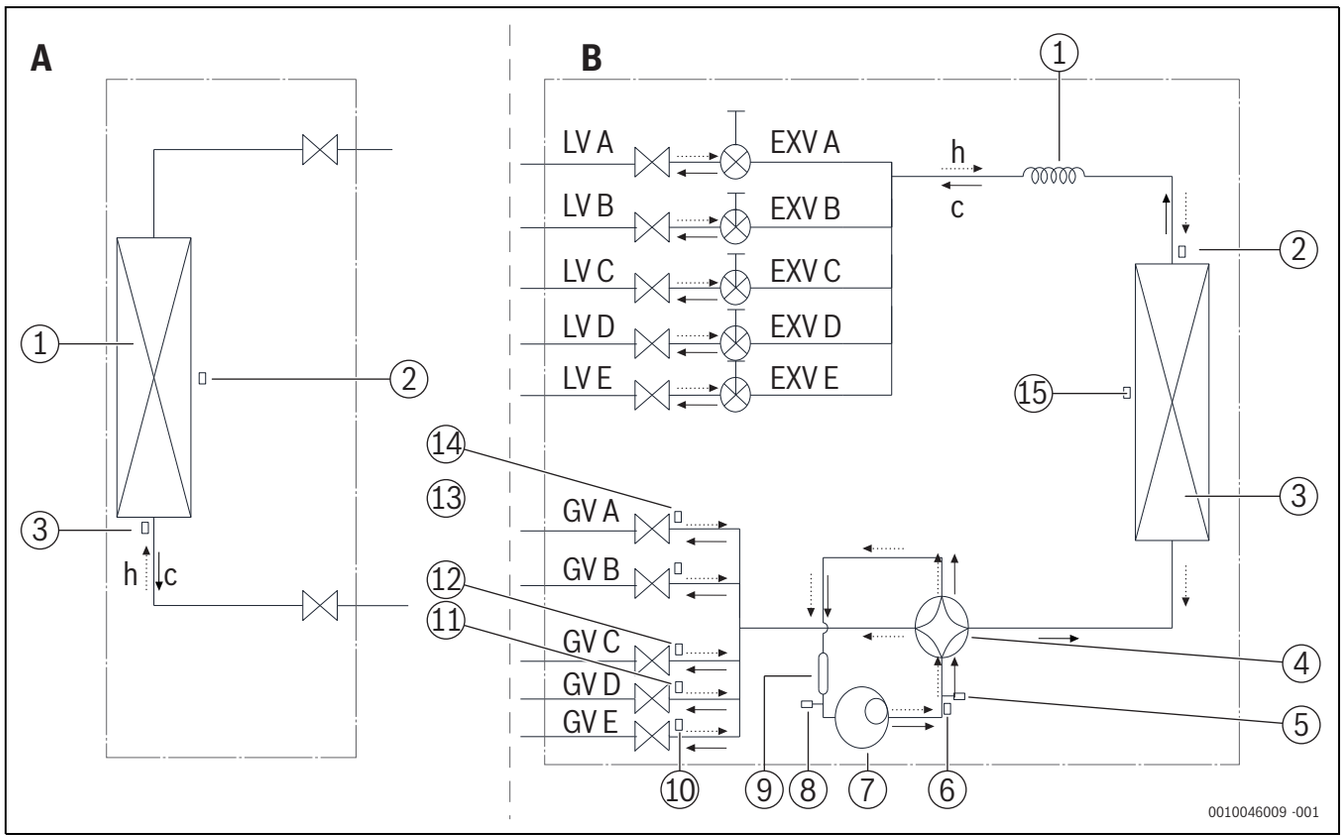


Fig. 8 Refrigeration circuit drawing of inverter 1 drive 5 type

A Indoor unit
B Outdoor unit
h heating
c cooling

A- Indoor unit:

[1] Heat exchanger (evaporator)
[2] T1 (room temperature sensor)
[3] T2 (evaporator temperature sensor middle)

B - Outdoor unit:

LV ... Liquid valve A/B/C/D/E
EXV ... Expansion valve A/B/C/D/E
GV .... Gas valve A/B/C/D/E
LV D Liquid valve D
LV E Liquid valve E

[1] Capillary
[2] T3 (condenser temperature sensor)
[3] Heat exchanger (condenser)
[4] 4-way valve
[5] High pressure switch
[6] TP (T5) (discharge temperature sensor)
[7] Compressor
[8] Low pressure switch
[9] Accumulator (Receiver)
[10] T2B-E (evaporator temperature sensor outlet)
[11] T2B-D (evaporator temperature sensor outlet)
[12] T2B-C (evaporator temperature sensor outlet)
[13] T2B-B (evaporator temperature sensor outlet)
[14] T2B-A (evaporator temperature sensor outlet)
[15] T4 (ambient temperature sensor)

4 Functions

4.1 Electronic control function

4.1.1 Abbreviation

Abbreviation	Element
T1	Indoor ambient temperature
T2	Coil temperature of indoor heat exchanger middle
T2B	Coil temperature of indoor heat exchanger outlet (This sensor is located in outdoor unit)
T3	Coil temperature of outdoor heat exchanger
T4	Outdoor ambient temperature
TP (T5)	Compressor discharge temperature
T_S	Set room temperature

Table 6 Element abbreviations

4.1.2 Electric control working environment

Input voltage	198V–264V
Input power frequency	50Hz
Indoor fan normal working amp.	≤ 1A
Outdoor fan normal working amp.	≤ 1.5A
Four-way valve normal working amp.	≤ 1A

Table 7 Voltage and current

4.2 Digital display function

- In standby , the LED displays "- -"
- In compressor operation, the LED displays the running frequency
- In defrosting mode, The LED displays "dF" or alternatively displays between running frequency and "dF" (each displays 0.5s)
- In compressor pre-heating, The LED displays "PH" or alternatively displays between running frequency and "PH" (each displays 0.5s)
- During the oil return process, The LED displays "RO" or alternatively displays between running frequency and "RO" (each displays 0.5s)
- In low ambient cooling mode, the LED displays "LC" or alternatively displays between running frequency and "LC" (each displays 0.5s)
- In forced cooling mode, the LED displays "FC" or alternatively displays between running frequency and "FC" (each displays 0.5s)
- When PFC module protection occurs three times within 15 minutes, the LED displays "E6" or alternative displays between running frequency and "E6" (each displays 0.5s)
- In protection or malfunction, the LED displays error code or protection code.

4.3 Point check function

A check switch is included on the outdoor PCB. Push SW1 to check the unit's status while running. The digital display shows the following codes each time the SW1 is pushed.

CL5000M 62/3 E,CL5000M 79/3 E

Nr.	Display	Remark
0	Normal display	Running frequency/state or malfunction code will be shown
1	Quantity of connected indoor units	Actual data: Number of indoor unit shown on display no. • Display 1: 1 • Display 2: 2 • ...
2	Outdoor unit running mode code	• Off: 0 • Fan only: 1 • Cooling: 2 • Heating: 3 • Forced cooling: 4 • Forced defrost: A
3	Indoor unit A capacity	The capacity unit is horse power. If the indoor unit is not connected, the digital display shows the following: "—" (9 kBtu/h:1 HP, 12 kBtu/h:1.2 HP, 18 kBtu/h:1.5 HP, 24 kBtu/h: 2.0 HP)
4	Indoor unit B capacity	
5	Indoor unit C capacity	
6	Indoor unit D capacity	
7	Indoor unit E capacity	
8	Indoor unit A capacity demand code	Norm code*HP (9 kBtu/h:1 HP, 12 kBtu/h:1.2 HP, 18 kBtu/h:1.5 HP, 24 kBtu/h: 2.0 HP)
9	Indoor unit B capacity demand code	
10	Indoor unit C capacity demand code	
	Indoor unit D capacity demand code	
12	Indoor unit E capacity demand code	
13	Outdoor unit amendatory capacity demand code	
14	The frequency corresponding to the total indoor units' amendatory capacity demand	
15	The frequency after the frequency limit	
16	The frequency sending to compressor control chip	
17	Indoor unit A evaporator outlet temperature (T2BA)	If the temperature is lower than -9 °C, the digital display shows "-9." If the temperature is higher than 70 °C, the digital display shows "70." If the indoor unit is not connected, the digital display shows: "—"
18	Indoor unit B evaporator outlet temperature (T2BB)	
19	Indoor unit C evaporator outlet temperature (T2BC)	
20	Indoor unit D evaporator outlet temperature (T2BD)	
21	Indoor unit E evaporator outlet temperature (T2BE)	
22	Indoor unit A room temperature (T1A)	If the temperature is lower than 0 °C, the digital display shows "0." If the temperature is higher than 50 °C, the digital display shows "50." If the indoor unit is not connected, the digital display shows: "—"
23	Indoor unit B room temperature (T1B)	
24	Indoor unit C room temperature (T1C)	
24	Indoor unit D room temperature (T1D)	
26	Indoor unit E room temperature (T1E)	

Nr.	Display	Remark
27	Indoor unit A evaporator temperature (T2A)	If the temperature is lower than -9 ℃, the digital display shows “-9.” If the temperature is higher than 70 ℃, the digital display shows “70.” If the indoor unit is not connected, the digital display shows: “—”
28	Indoor unit B evaporator temperature (T2B)	
29	Indoor unit C evaporator temperature (T2C)	
30	Indoor unit D evaporator temperature (T2D)	
31	Indoor unit E evaporator temperature (T2E)	
32	Condenser pipe temperature (T3)	
33	Outdoor ambient temperature (T4)	
34	Compressor discharge temperature (TP (T5))	The display value is between 30–129 ℃. If the temperature is lower than 30 ℃, the digital display shows “30.” If the temperature is higher than 99 ℃, the digital display shows single and double digits. For example, if the digital display shows “0.5", the compressor discharge temperature is 105 ℃.
35	AD value of current	The display value is a hex number.[1)] For example, the digital display tube shows “CD”, it means AD value is 205.
36	AD value of AC voltage	
37	AD value of DC voltage	
38	EXV open angle for A indoor unit	Actual data/4. If the value is higher than 99, the digital display shows single and double digits. For example, if the digital display shows “2.0", the EXV open angle is120 × 4=480p.
39	EXV open angle for B indoor unit	
40	EXV open angle for C indoor unit	
41	EXV open angle for D indoor unit	
42	EXV open angle for E indoor unit	
43	MVI valve open angle	
44	EVI valve open angle	
45	Frequency limit symbol	• Bit7: Reserve • Bit6: Frequency limit caused by voltage • Bit5: Frequency limit caused by current • Bit4: Reserve • Bit3: Frequency limit caused by IPM. • Bit2: Frequency limit caused by TP (T5) • Bit1: Frequency limit caused by T3 • Bit0: Frequency limit caused by T2[2)]
46	T2B fault	• 00: No fault • 01: T2B-A fault • 02: T2B-B fault • 03: T2B-C fault • 04: T2B-D fault • 05:T2B-E fault • 06: T2B-F fault (The display priority is A-B-C-D-E-F)
47	Average value of T2	(Sum T2 value of all indoor units)/(number of connected indoor units) (The heating is the average value of T2, and the cooling is the average value of T2B)
48	Outdoor unit fan motor state	• Off: 0 • Super ultra high speed: 1 • Super high speed: 2 • High speed:3, • Med speed: 4 • Low speed: 5 • Breeze: 6 • Super breeze: 7
49	Reason of stop	

1) For hex numbers see chart p. 66

2) The display value is a hexidecimal number. For example, the digital display show 2A, then Bit5=1, Bit3=1 and Bit1=1. This means that a frequency limit may be caused by current, IPM or T3.

Table 8

CL5000M 105/4 E

Nr.	Display	Remark
0	Normal display	Running frequency/state or malfunction code will be shown
1	Quantity of connected indoor units	Actual data: Number of indoor unit shown on display no. • Display 1: 1 • Display 2: 2 • ...
2	Outdoor unit running mode code	• Off: 0 • Fan only: 1 • Cooling: 2 • Heating: 3 • Forced cooling: 4 • Forced defrost: A • DHW: C • Heating and DHW: d
3	Indoor unit A capacity	The capacity unit is horse power. If the indoor unit is not connected, the digital display shows the following: "—" (9 kBtu/h:1 HP, 12 kBtu/h:1.2 HP, 18 kBtu/h:1.5 HP, 24 kBtu/h: 2.0 HP)
4	Indoor unit B capacity	
5	Indoor unit C capacity	
6	Indoor unit D capacity	
7	Indoor unit E capacity	
8	Indoor unit A capacity demand code	Norm code*HP (9 kBtu/h:1 HP, 12 kBtu/h:1.2 HP, 18 kBtu/h:1.5 HP, 24 kBtu/h: 2.0 HP)
9	Indoor unit B capacity demand code	
10	Indoor unit C capacity demand code	
	Indoor unit D capacity demand code	
12	Indoor unit E capacity demand code	
13	Outdoor unit amendatory capacity demand code	
14	The frequency corresponding to the total indoor units' amendatory capacity demand	
15	The frequency after the frequency limit	
16	The frequency sending to compressor control chip	
17	Indoor unit A evaporator outlet temperature (T2BA)	If the temperature is lower than -9 ℃, the digital display shows "-9." If the temperature is higher than 70 ℃, the digital display shows "70." If the indoor unit is not connected, the digital display shows: "—"
18	Indoor unit B evaporator outlet temperature (T2BB)	
19	Indoor unit C evaporator outlet temperature (T2BC)	
20	Indoor unit D evaporator outlet temperature (T2BD)	
21	Indoor unit E evaporator outlet temperature (T2BE)	
22	Indoor unit A room temperature (T1A)	If the temperature is lower than 0 ℃, the digital display shows "0." If the temperature is higher than 50 ℃, the digital display shows "50." If the indoor unit is not connected, the digital display shows: "—"
23	Indoor unit B room temperature (T1B)	
24	Indoor unit C room temperature (T1C)	
24	Indoor unit D room temperature (T1D)	
26	Indoor unit E room temperature (T1E)	
27	Indoor unit A evaporator temperature (T2A)	If the temperature is lower than -9 ℃, the digital display shows "-9." If the temperature is higher than 70 ℃, the digital display shows "70." If the indoor unit is not connected, the digital display shows: "—"
28	Indoor unit B evaporator temperature (T2B)	
29	Indoor unit C evaporator temperature (T2C)	
30	Indoor unit D evaporator temperature (T2D)	
31	Indoor unit E evaporator temperature (T2E)	
32	Condenser pipe temperature (T3)	
33	Outdoor ambient temperature (T4)	
34	Compressor discharge temperature (TP (T5))	The display value is between 30–129 ℃. If the temperature is lower than 30 ℃, the digital display shows "30." If the temperature is higher than 99 ℃, the digital display shows single and double digits. For example, if the digital display shows "0.5", the compressor discharge temperature is 105 ℃.
35	AD value of current	The display value is a hex number.[1)] For example, the digital display tube shows "CD", it means AD value is 205.
36	AD value of voltage	

Nr.	Display	Remark
37	EXV open angle for A indoor unit	Actual data/4. If the value is higher than 99, the digital display shows single and double digits. For example, if the digital display shows “2.0", the EXV open angle is120 × 4=480p.
38	EXV open angle for B indoor unit	
39	EXV open angle for C indoor unit	
40	EXV open angle for D indoor unit	
41	EXV open angle for E indoor unit	
42	Frequency limit symbol	• Bit7: Frequency limit caused by IGBT radiator • Bit6: Frequency limit caused by PFC • Bit5: Frequency limit caused by T4 • Bit4: Frequency limit caused by T2 • Bit3: Frequency limit caused by T3 • Bit2: Frequency limit caused by TP (T5) • Bit1: Frequency limit caused by current • Bit0: Frequency limit caused by voltage
43	Average value of T2	(Sum T2 value of all indoor units)/(number of connected indoor units)
44	Outdoor unit fan motor state	• Off: 0 • Super high speed: 1 • High speed: 2 • Med speed:3, • Low speed: 4 • Breeze: 5 • Super breeze: 6
45	The last error or protection code	00 means no malfunction and protection
46	F indoor unit capacity	
47	F indoor unit capacity demand code	
48	F indoor unit evaporator outlet temperature(T2BF)	If the temperature is lower than -9 ℃, the digital display shows “-9.” If the temperature is higher than 70 ℃, the digital display shows “70.” If the indoor unit is not connected, the digital display shows: “—”
49	F indoor unit room temperature (T1F)	
50	F indoor unit room temperature (T2F)	
51	EXV open angle for F indoor unit	
52	Type of machine A	• 0: Air conditioner • 1: ATW
53	Water inlet temperature of heat exchanger (TW_in)	If the temperature is lower than -9 ℃, the digital display shows “-9.” If the temperature is higher than 70 ℃, the digital display shows “70.” If the indoor unit is not connected, the digital display shows: “—”
54	Water outlet temperature of heat exchanger (TW_out)	
55	Water outlet temperature (TW1)	
56	Gas pipe temperature(TR_out)	
57	Liquid pipe temperature(TR_in)	
58	Water temperature of the water tank(Tk)	
59	Backwater temperature of the waterTank(TWH)	
60	Total outlet temperature of hydraulic modulesystem (after expansion tank)(TW1B)	

Nr.	Display	Remark
61	Indoor unit status	• Bit7: Reserve • Bit6: Reserve • Bit5: Reserve • Bit4: Reserve • Bit3: Reserve • Bit2: Protection from falling off of water inlet and outlet temperature sensor • Bit1: Anti-freeze protection • Bit0: Water pump [2] – 0: Off – 1: On
62	Running mode of ATW	• 1: Machine A is an ATW, displaying the running mode sent by machine A • 2: Machine A is not ATW, and it displays “--”
63	Setting temperature after correct (TD)	
64	Setting temperature by controller (TS)	
65	Setting temperature after water tank (TksD)	Machine A is not ATW, and it displays “--”
66	Setting temperature (Tks)	

1) For hex numbers see chart p. 66

2) The display value is a decimal number. For example, the digital display shows 07, then Bit2=1, Bit1=1 and Bit0=1.

Table 9

CL5000M 41/2 E, CL5000M 53/2 E, CL5000M 82/4 E and CL5000M 125/5 E

Nr.	Display	Remark
0	Normal display	Running frequency/state or malfunction code will be shown
1	Quantity of connected indoor units	Actual data: Number of indoor unit shown on display no. • Display 1: 1 • Display 2: 2 • ...
2	Outdoor unit running mode code	• Off: 0 • Fan only: 1 • Cooling: 2 • Heating: 3 • Forced cooling: 4 • Forced defrost: A • DHW: C • Heating and DHW: d
3	Indoor unit A capacity	The capacity unit is horse power. If the indoor unit is not connected, the digital display shows the following: "—" (9 kBtu/h:1 HP, 12 kBtu/h:1.2 HP, 18 kBtu/h:1.5 HP, 24 kBtu/h: 2.0 HP)
4	Indoor unit B capacity	
5	Indoor unit C capacity	
6	Indoor unit D capacity	
7	Indoor unit E capacity	
8	Indoor unit A capacity demand code	Norm code*HP (9 kBtu/h:1 HP, 12 kBtu/h:1.2 HP, 18 kBtu/h:1.5 HP, 24 kBtu/h: 2.0 HP)
9	Indoor unit B capacity demand code	
10	Indoor unit C capacity demand code	
	Indoor unit D capacity demand code	
12	Indoor unit E capacity demand code	
13	Outdoor unit amendatory capacity demand code	
14	The frequency corresponding to the total indoor units' amendatory capacity demand	
15	The frequency after the frequency limit	
16	The frequency sending to compressor control chip	
17	Indoor unit A evaporator outlet temperature (T2BA)	If the temperature is lower than -9 ℃, the digital display shows "-9." If the temperature is higher than 70 ℃, the digital display shows "70." If the indoor unit is not connected, the digital display shows: "—"
18	Indoor unit B evaporator outlet temperature (T2BB)	
19	Indoor unit C evaporator outlet temperature (T2BC)	
20	Indoor unit D evaporator outlet temperature (T2BD)	
21	Indoor unit E evaporator outlet temperature (T2BE)	
22	Indoor unit A room temperature (T1A)	If the temperature is lower than 0 ℃, the digital display shows "0." If the temperature is higher than 50 ℃, the digital display shows "50." If the indoor unit is not connected, the digital display shows: "—"
23	Indoor unit B room temperature (T1B)	
24	Indoor unit C room temperature (T1C)	
24	Indoor unit D room temperature (T1D)	
26	Indoor unit E room temperature (T1E)	
27	Indoor unit A evaporator temperature (T2A)	If the temperature is lower than -9 ℃, the digital display shows "-9." If the temperature is higher than 70 ℃, the digital display shows "70." If the indoor unit is not connected, the digital display shows: "—"
28	Indoor unit B evaporator temperature (T2B)	
29	Indoor unit C evaporator temperature (T2C)	
30	Indoor unit D evaporator temperature (T2D)	
31	Indoor unit E evaporator temperature (T2E)	
32	Condenser pipe temperature (T3)	
33	Outdoor ambient temperature (T4)	
34	Compressor discharge temperature (TP (T5))	The display value is between 30–129 ℃. If the temperature is lower than 30 ℃, the digital display shows "30." If the temperature is higher than 99 ℃, the digital display shows single and double digits. For example, if the digital display shows "0.5", the compressor discharge temperature is 105 ℃.
35	AD value of current	The display value is a hex number.[1)] For example, the digital display tube shows "CD", it means AD value is 205.
36	AD value of AC voltage	
37	AD value of DC voltage	

Nr.	Display	Remark
38	EXV open angle for A indoor unit	Actual data/4. If the value is higher than 99, the digital display shows single and double digits. For example, if the digital display shows “2.0", the EXV open angle is120 × 4=480p.
39	EXV open angle for B indoor unit	
40	EXV open angle for C indoor unit	
41	EXV open angle for D indoor unit	
42	Frequency limit symbol	• Bit7: Frequency limit caused by IGBT radiator • Bit6: Frequency limit caused by PFC • Bit5: Frequency limit caused by T4 • Bit4: Frequency limit caused by T2 • Bit3: Frequency limit caused by T3 • Bit2: Frequency limit caused by TP (T5) • Bit1: Frequency limit caused by current • Bit0: Frequency limit caused by voltage[2)]
43	Average value of T2	(Sum T2 value of all indoor units)/(number of indoor units in good connection)
44	Outdoor unit fan motor state	• Off: 0 • Super high speed: 1 • High speed: 2 • Med speed: 3 • Low speed: 4 • Breeze: 5 • Super breeze: 6
45	The last error or protection code	00 means no malfunction and protection
46	F indoor unit capacity	
47	F indoor unit capacity demand code	
48	F indoor unit evaporator outlet temperature(T2BF)	If the temperature is lower than -9 ℃, the digital display shows “-9.” If the temperature is higher than 70 ℃, the digital display shows “70.” If the indoor unit is not connected, the digital display shows: “—””
49	F indoor unit room temperature (T1F)	
50	F indoor unit evaporator temperature (T2F)	
51	EXV open angle for F indoor unit	
52	Reason for shutdown	

1) For hex numbers see chart p. 66

2) The display value is a hexidecimal number. For example, the digital display show 2A, then Bit5=1, Bit3=1, and Bit1=1. This means that a frequency limit may be caused by T4, T3, or the current..

Table 10

4.4 Protection

4.4.1 Compressor three-minute delay at restart

Compressor functions are delayed for up to 10 seconds upon first starting the unit and for up to 3 minutes upon subsequent restarts.

4.4.2 Discharge Temperature Protection Control

This control protects the compressors from abnormally high temperatures and transient spikes in temperature. It is performed for each compressor.

4.4.3 Low voltage control

If the low voltage protection occurs and not resumes within 3 minutes, it will keep the protection always after restart the machine.

4.4.4 Compressor current limit protection

Temperature interval of current limit is same as range of T4 limited frequency.

Cooling mode:

Cooling Zone	CL5000M 41/2 E	CL5000M 53/2 E	CL5000M 62/3 E	CL5000M 79/3 E	CL5000M 82/4 E	CL5000M 105/4 E	CL5000M 125/5 E
CoolZone5	7	7	8	8	11	14	14
CoolZone4	7	7	11	11	12	15	15
CoolZone3	8	8	13	13	13	16.5	16.5
CoolZone2	10	10	15.5	15.5	16.5	21.5	21.5
CoolZone1	10	10	15	15	16.5	21.5	21.5

Table 11 Cooling in ℃

Heating mode:

Heating Zone	CL5000M 41/2 E	CL5000M 53/2 E	CL5000M 62/3 E	CL5000M 79/3 E	CL5000M 82/4 E	CL5000M 105/4 E	CL5000M 125/5 E
HeatZone4	7	7	11	12	12	18	18
HeatZone3	8	8	12	14	14	19	19
HeatZone2	10	9	13	16	16	20	20
HeatZone1	10	10	13	16	16	21.5	21.5

Table 12 Heating in ℃

4.4.5 Indoor/outdoor units communication protection

If the indoor units cannot receive the feedback signal from the outdoor units for 2 minutes, or If the outdoor units cannot receive the feedback signal from any of the indoor units for 3 minutes, the unit ceases operation and displays the failure.

4.4.6 High condenser coil temperature protection

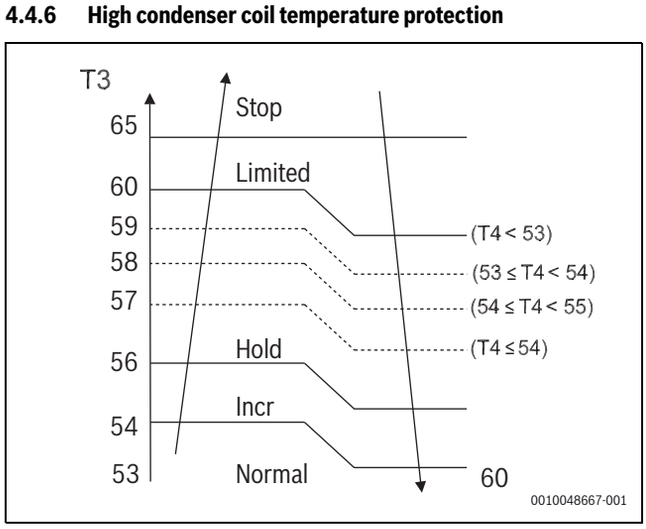


Fig. 9 High condenser coil temperature protection

4.4.7 Outdoor unit anti-freezing protection

When T2≤ 4 ℃ for 250 seconds or T2≤ 0 ℃, the indoor unit capacity demand will be zero and resume to normal when T2≥ 8 ℃ and the time of protection is ≥ 3 minutes.

4.4.8 Oil Return protection

- If the compressor frequency keeps lower than setting frequency for setting time, the unit rises the frequency to setting frequency for setting time and then resume to former frequency.
- The EXV will keep 300p while the indoor units will keep the current running mode.

If the outdoor ambient is higher than setting frequency during the oil return, the unit quit oil return.

4.4.9 Low outdoor ambient temperature protection

- When compressor is off and T4 is below -35 ℃ for 10s, the unit will stop and display “LP” or “PC 0L”.
- When compressor is on and T4 is below -40 ℃ for 10s, the unit will stop and display “LP” or “PC 0L”.
- When T4 is above -32 ℃ for 10s, the unit will exit protection.

5 Check Procedures

5.1 Before checking

CAUTION

Risk of injury from electric shock!

Electricity remains in capacitors even when the power supply is off.

- ▶ Ensure the capacitors are fully discharged before troubleshooting
- ▶ Be sure to turn off all power supplies or disconnect all wires to avoid electric shock.

CAUTION

Danger of burns!

During operation the compressor becomes hot.

- ▶ Operate after compressor and coil have returned to normal temperature in order to avoid injury.

5.2 Temperature Sensor Check

- ▶ Measure the resistance value of the sensor using a multi-meter.

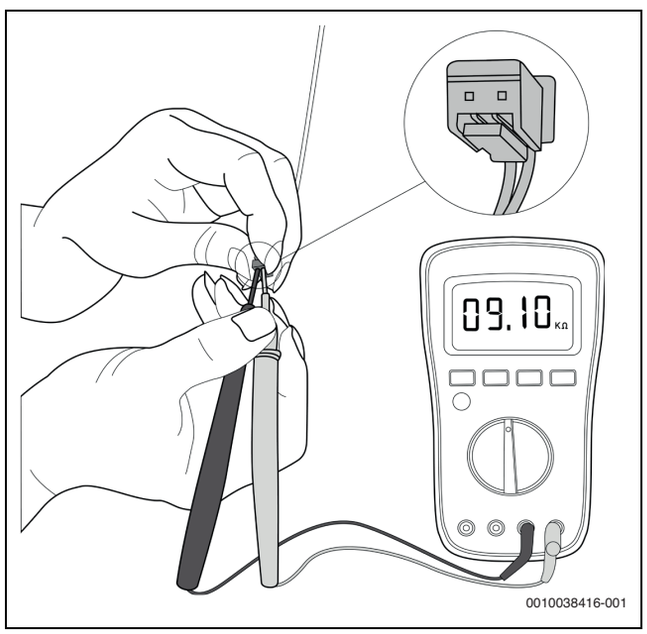


Fig. 10 Temperature Sensor Check

- ▶ Check corresponding temperature sensor resistance value table (→ chapter 9.2, p. 64.

The picture and the value are only for reference, actual condition and specific value may vary.

5.3 Compressor Check

- ▶ Measure the resistance value of each winding using a multi-meter.

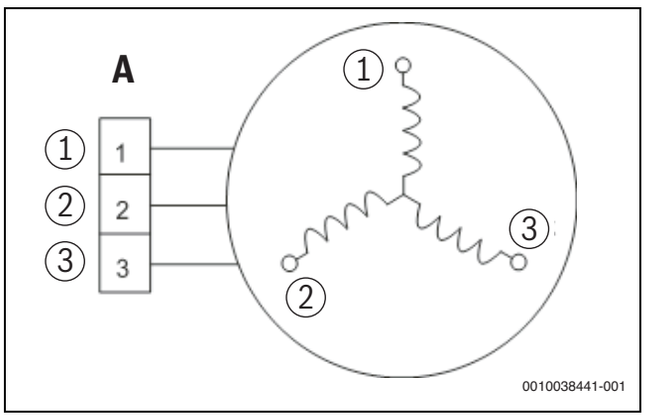


Fig. 11 Compressor check

[1] Blue
[2] Red
[3] Black

- ▶ Check the resistance value of each winding in the following table.

Compressor type	Blue-Red	Blue-Black	Red-Black
KSN140D58UFZ	1.86 Ω/20 °C		
KTM240D57UMT	0.62 Ω/20 °C		
KTF310D43UMT	0.65 Ω/20 °C		

Table 13 Resistance value of each winding

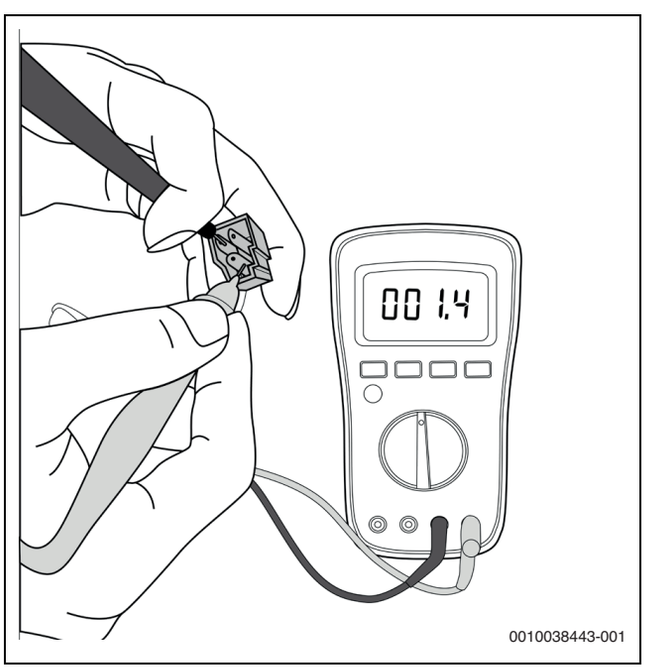


Fig. 12 Compressor Check

The picture and the value are only for reference, actual condition and specific value may vary.

5.4 IPM Continuity Check

- Turn off outdoor unit and disconnect power supply.
- Discharge electrolytic capacitors and ensure all energy-storage unit has been discharged.
- Disassemble outdoor PCB or disassemble IPM board.
- Measure the resistance value between P and U(V, W, N); U(V, W) and N.

Digital tester		Resistance value
(+)Red	(-)Black	
P	N	∞ (Several MΩ)
	U	
	V	
	W	
U	N	∞ (Several MΩ)
V		
W		
–		

Table 14

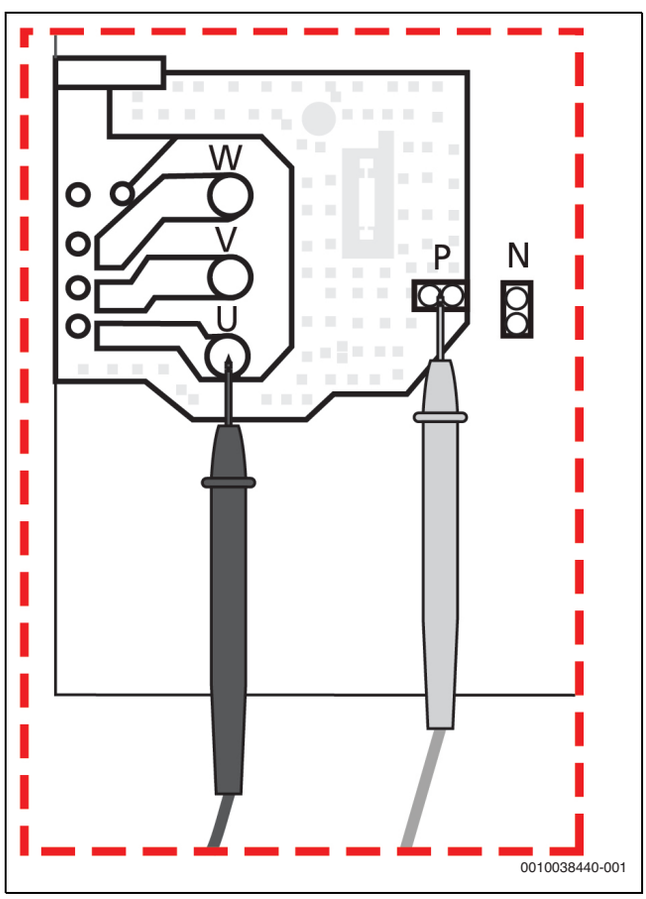


Fig. 13 IPM Continuity Check

The picture and the value are only for reference, actual condition and specific value may vary.

5.5 4-way valve check

Power on, use a digital tester to measure the voltage.
When the unit operates in cooling, it is 0V. When the unit operates in heating, it is about 230V/AC.
If the value of the voltage is not in the range, the PCB must have problems and need to be replaced.

- Turn off the power, use a digital tester to measure the resistance. The value should be 1.8–2.5 K Ω.

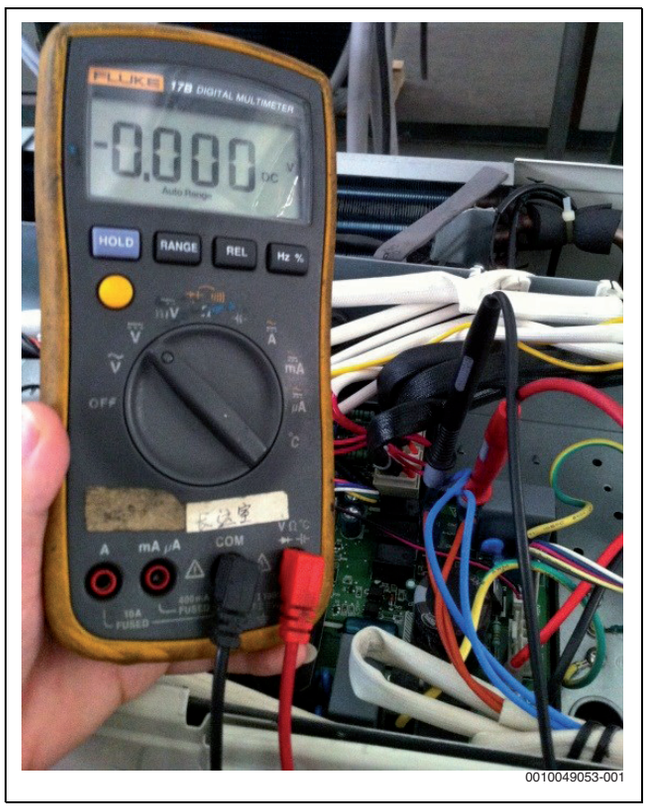


Fig. 14 4-way valve check

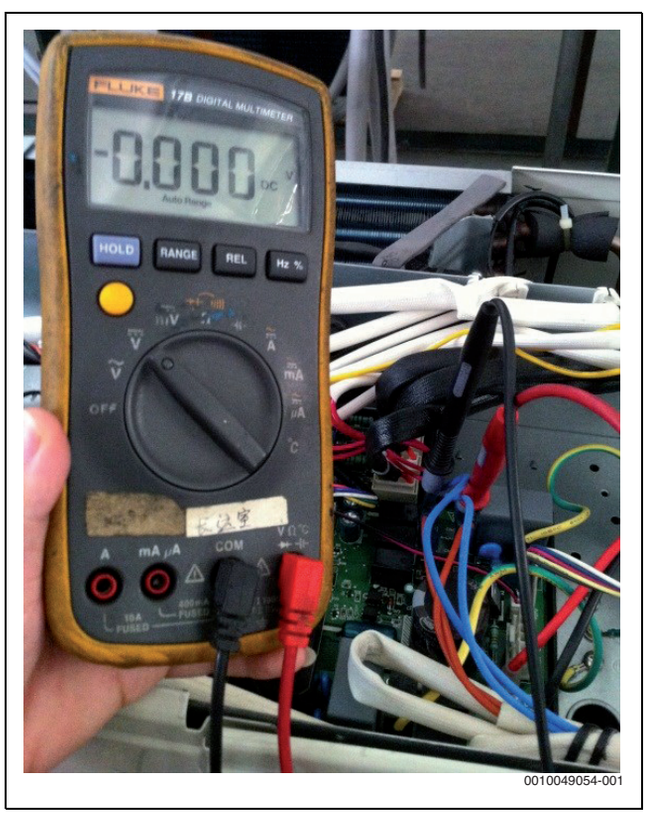


Fig. 15 4-way valve check

Fig. 16 4-way valve check

5.6 EXV Check

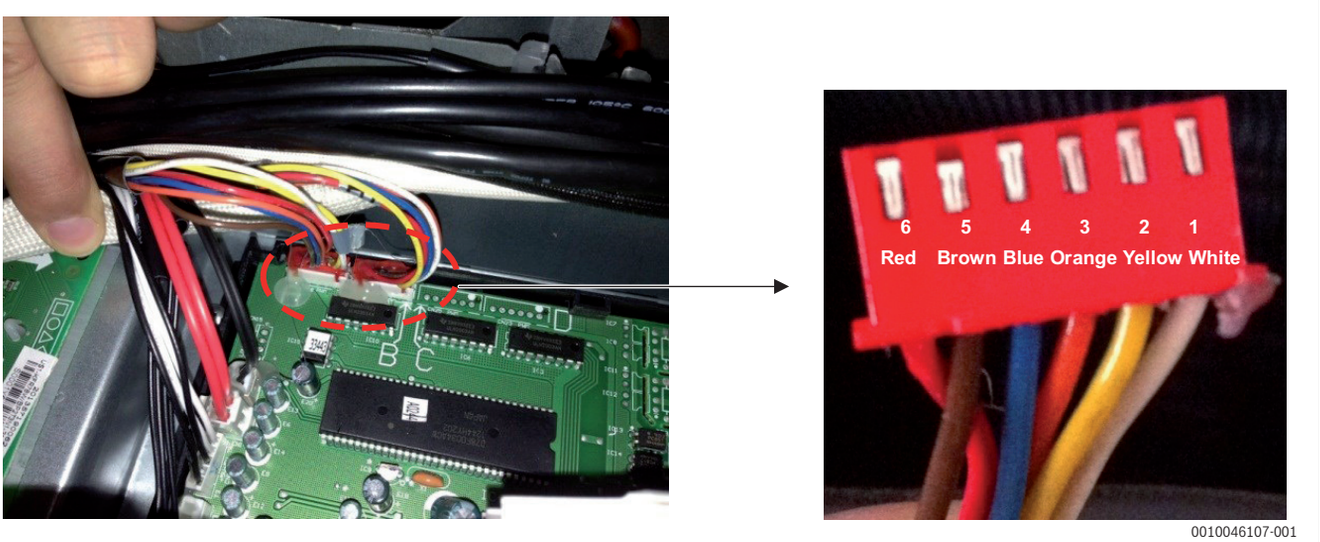


Fig. 17 EXV check

Lead wire - colour	normal value
red/blue	About 50 Ω
red/yellow	
brown/orange	

Table 15

6 Diagnosis and troubleshooting

WARNING

- All electrical work must be carried out by competent and suitably qualified, certified and accredited professionals and in accordance with all applicable legislation (all national, local and other laws, standards, codes, rules, regulations and other legislation that apply in a given situation).
- Power-off all units before connecting or disconnecting any connections or wiring. Otherwise electric shock may occur, leading to damage to components, physical injury or death.

NOTICE

Risk of static discharge.

Static charges can destroy sensitive electronics parts.

- Wear antistatic gloves.

Test the voltage between P and N on the back of main PCB with multimeter. If the voltage is lower than 36 V, the capacitors are fully discharged.

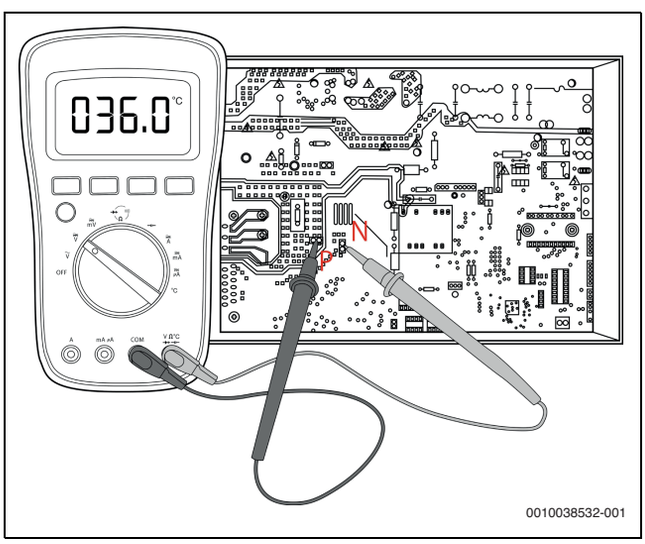


Fig. 18 Voltage between P and N

6.1 Indoor units mode conflict (only multi-split)

When using multi-split air conditioners, all operation modes are possible, but with the following peculiarities:

If you operate more than one indoor unit, indoor units may go into standby due to an operation mode conflict. An operation mode conflict occurs when at least one indoor unit is in heating mode and at the same time at least one indoor unit is in another operation mode (e.g. cooling mode). Heating mode always has priority. All indoor units that are not in heating mode will go into standby because of the operation mode conflict.

Indoor units with operation mode conflict show "– –" in the display or the operation light flashes and the timer light is on. For more information, see the technical documentation of the indoor units.

Avoiding the operation mode conflict:

- All indoor units are in heating mode or cooling/fan only mode.

6.2 Troubleshooting by Error Code - Indoor Unit

6.2.1 Error Codes for Indoor Units RAC5000/RAC8000/RAC8500

Error code	Error description
E0	Indoor EEPROM malfunction
E1	Communication malfunction between indoor and outdoor units
E3	Indoor fan speed has been out of control
E4	Open or short circuit of T1 temperature sensor
E5	Open or short circuit of T2 temperature sensor
EC	Refrigerant leakage detection
EE	Water level alarm
F0	Overcurrent protection (For some units)
F1	Open or short circuit of T4 temperature sensor
F2	Open or short circuit of T3 temperature sensor
F3	Open or short circuit of TP (T5) temperature sensor
F4	Outdoor EEPROM malfunction (For some units)
F5	Outdoor fan speed is out of control
F6	Open or short circuit of T2B temperature sensor
FA	Communication malfunction between two indoor units
P0	IPM module malfunction
P1	High or low voltage protection
P3	Too low ambient temperature protection
P4	Inverter compressor drive protection
P6	Low pressure protection of compressor

Table 16 Error codes for Indoor Units RAC5000/RAC8000/RAC8500

6.2.2 Error Codes for Indoor Units CL2000 UW... E/CL3000iU W ... E /CL5000iU W ... E/CL6000iU W ... E/CL5000iU CN...

Error code	Error description
EH 00/EH 0A	Indoor unit EEPROM parameter error
EL 01	Indoor/outdoor unit communication error
EH 02	Zero-crossing signal detection error (only for AC fan motor)
EH 03	The indoor fan speed is operating outside of the normal range
EC 51	Outdoor unit EEPROM parameter error
EC52	Condenser coil temperature sensor T3 is in open circuit or has short circuited
EC 53	Outdoor room temperature sensor T4 is in open circuit or has short circuited
EC 54	Compressor discharge temperature sensor TP (T5) is in open circuit or has short circuited
EC 56	Evaporator coil outlet temperature sensor T2B is in open circuit or has short circuited
EH 60	Indoor room temperature sensor T1 is in open circuit or has short circuited
EH 31	Upper indoor fan speed is operating outside of the normal range (only console type)
EH 32	Lower indoor fan speed is operating outside of the normal range (only console type)
EH 61	Evaporator coil middle temperature sensor T2 is in open circuit or has short circuited
EC 07	The outdoor fan speed is operating outside of the normal range
EH 0b	Indoor PCB/Display board communication error
EL 0C	Refrigerant leakage detection
PC 00	IPM malfunction or IGBT over-strong current protection
PC 01	Over voltage or over low voltage protection
PC 02	Top temperature protection of compressor or High temperature protection of IPM module or High pressure protection
PC 04	Inverter compressor drive error
PC 08	Current overload protection
PC 03	High pressure protection or low pressure prot ection
PC 0L	Low ambient temperature protection

Table 17 Error codes for indoor units CL2000 UW... E/CL3000iU W ... E /CL5000iU W ... E/CL6000iU W ... E/CL5000iU CN...

6.2.3 Error Codes for Indoor Units CL5000iU D...

Error code	Error description
EH 00/EH 0A	Indoor unit EEPROM fault
EL 01	Communication fault between outdoor and indoor unit
EH 03	Indoor unit fan outside the normal range (with some units)
EH 60	Temperature sensor T1 (room temperature sensor) switched off or short-circuited
EH 61	Temperature sensor T2 (pipe temperature sensor) switched off or short-circuited
EL 0C	Refrigerant leakage detector (with some units)
EH 0b	Communication fault of the indoor unit main board
EH 0E	Malfunction of the water level alarm
EC 53	Temperature sensor T4 (outside temperature) switched off or short-circuited
EC 52	Temperature sensor T3 (pipe temperature sensor) switched off or short-circuited
EC 54	Temperature sensor TP (compressor discharge temperature protection) switched off or short-circuited
EC 56	Temperature sensor T2B (pipe temperature) switched off or short-circuited
EC 51	Outdoor unit EEPROM fault
EC 07	Outdoor unit fan outside the normal range (with some units)
PC 00	IPM malfunction or IGBT overvoltage protector
PC 01	Overvoltage or low-voltage protection
PC 02	Maximum temperature protection of compressor or high temperature protection of IPM module
PC 03	High or low-pressure protection (with some units)
PC 04	Compressor control system failure of inverter
EC 0d	Malfunction of outdoor unit

Table 18 Fault codes of indoor unit CL5000iU D...

6.2.4 Error Codes for Indoor Units CL5000iL 4C...

Error description	Timer lamp
EH 00/EH 0A	Indoor unit EEPROM parameter error
EL 01	Indoor / outdoor unit communication error
EH bA	Communication error between indoor unit and indoor external fan module
EH 30	Parameters error of indoor external fan
EH 35	Phase failure of indoor external fan
EH 36	Indoor external fan current sampling bias fault
EH 37	Indoor external fan zero speed failure
EH 38	Indoor external fan stall failure
EH 39	Out of step failure of indoor external fan
EH 3A	Low voltage protection of indoor external fan DC bus
EH 3b	Indoor external fan DC bus voltage is too high fault
EH 3E	Indoor external fan over current fault
EH 3F	Indoor external fan module protection/hardware over current protection
EH 03	The indoor fan speed is operating outside of the normal range
EC 51	Outdoor unit EEPROM parameter error
EC 52	Condenser coil temperature sensor T3 is in open circuit or has short circuited
EC 53	Outdoor room temperature sensor T4 is in open circuit or has short circuited
EC 54	Compressor discharge temperature sensor TP is in open circuit or has short circuited
EC 55	IGBT temperature sensor TH is in open circuit or has short circuited
EC 0d	Outdoor unit malfunction
Eh 60	Indoor room temperature sensor T1 is in open circuit or has short circuited
EH 61	Evaporator coil temperature sensor T2 is in open circuit or has short circuited
EC 71	Outdoor external fan over current fault
EC 75	Outdoor external fan module protection/hardware over current protection
EC 72	Outdoor external fan phase failure
EC 74	Outdoor external fan current sampling bias fault
EC 73	Zero speed failure of outdoor unit DC fan
EC 07	The outdoor fan speed is operating outside of the normal range
EL 0C	Refrigerant leak detected
EH 0b	Communication error between indoor two chips

Error description	Timer lamp
EH 0E	Water-level alarm malfunction
PC 00	IPM malfunction or IGBT over-strong current protection
PC 10	Over low voltage protection
PC 11	Over voltage protection
PC 12	DC voltage protection
PC 02	Top temperature protection of compressor or High temperature protection of IPM module
PC 40	Communication error between outdoor main chip and compressor driven chip
PC 41	Current Input detection protection
PC 42	Compressor start error
PC 43	Lack of phase (3 phase) protection
PC 44	Outdoor unit zero speed protection
PC 45	341PWM error
PC 46	Compressor speed malfunction
PC 49	Compressor over current protection
PC 06	Compressor discharge temperature protection
PC 08	Outdoor current protection
PH 09	Anti-cold air in heating mode
PC 0F	PFC module malfunction
PC 30	System overpressure protection
PC 31	System pressure is too low protection
PC 03	Pressure protection
PC 0L	Outdoor low ambient temperature protection
PH 90	Evaporator coil temperature over high protection
PH 91	Evaporator coil temperature over low Protection
PC 0A	Condenser high temperature protection
PH 0C	Indoor unit humidity sensor failure
LH 00	Frequency limit caused by T2
LH 30	Indoor external fan current limit
LH 31	Indoor external fan voltage limit
LC 01	Frequency limit caused by T3
LC 02	Frequency limit caused by TP
LC 05	Frequency limit caused by voltage
LC 03	Frequency limit caused by current
LC 06	Frequency limit caused by PFC
LC 30	Frequency limit caused by high pressure
LC 31	Frequency limit caused by low pressure
LH 07	Frequency limit caused by remote controller
–	Indoor units mode conflict (match with multi outdoor unit)

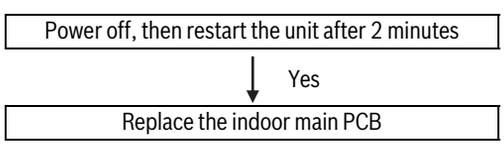
Table 19 Error codes for indoor units CL5000iL 4C...

6.2.5 Error Codes for Indoor Units CL5000iU 4CC...

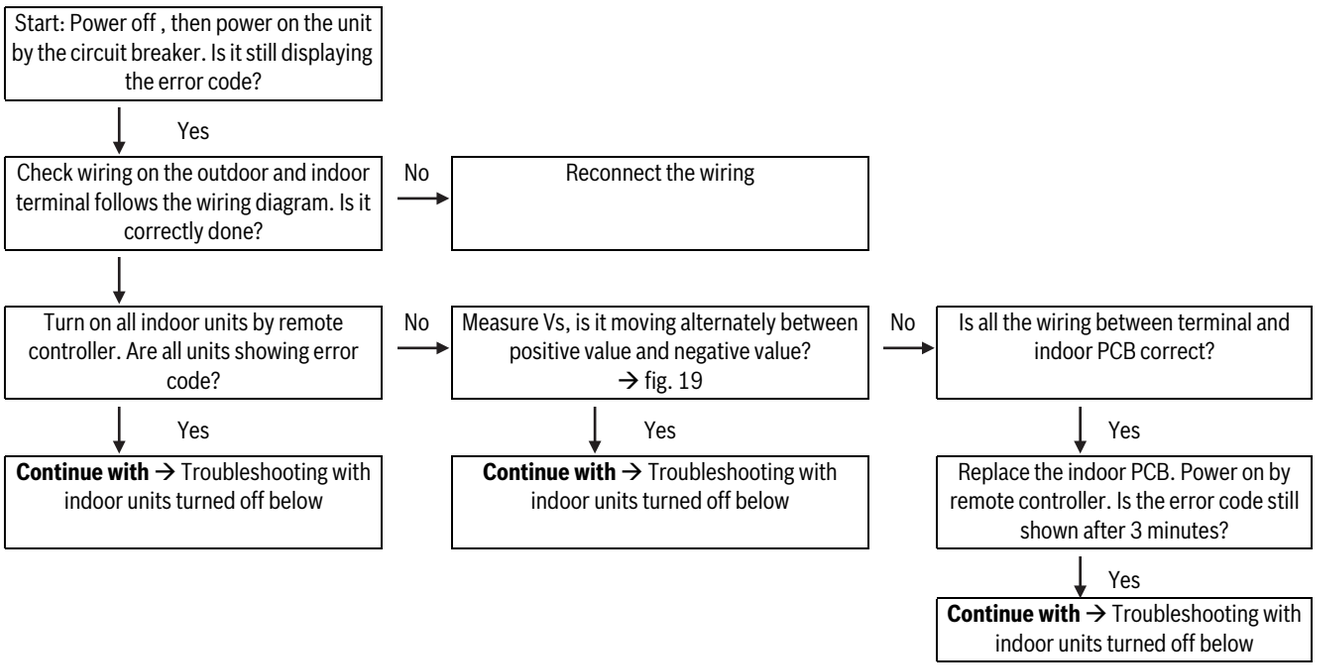
Error description	Timer lamp	Operation lamp (flashing times)
Indoor unit EEPROM parameter error	off	1
Indoor/outdoor unit communication error	off	2
Zero-crossing signal detection error (only for AC fan motor)	off	3
The indoor fan speed is operating outside of the normal range	off	4
Outdoor unit EEPROM parameter error	off	5
Condenser coil temperature sensor T3 is in open circuit or has short circuited	off	5
Outdoor room temperature sensor T4 is in open circuit or has short circuited	off	5
Compressor discharge temperature sensor TP (T5) is in open circuit or has short circuited	off	5
Evaporator coil outlet temperature sensor T2B is in open circuit or has short circuited	off	5
Indoor room temperature sensor T1 is in open circuit or has short circuited	off	6
The outdoor fan speed is operating outside of the normal range	off	12
Indoor PCB/Display board communication error	off	9
Refrigerant leakage detection	off	8
IPM malfunction or IGBT over-strong current protection	flashing	7
Over voltage or over low voltage protection	flashing	2
Top temperature protection of compressor or High temperature protection of IPM module or High pressure protection	flashing	3
Inverter compressor drive error	flashing	5
Current overload protection	flashing	1
High pressure protection or low pressure prot ection	flashing	7

Table 20 Error codes for indoor units CL5000iU 4CC...

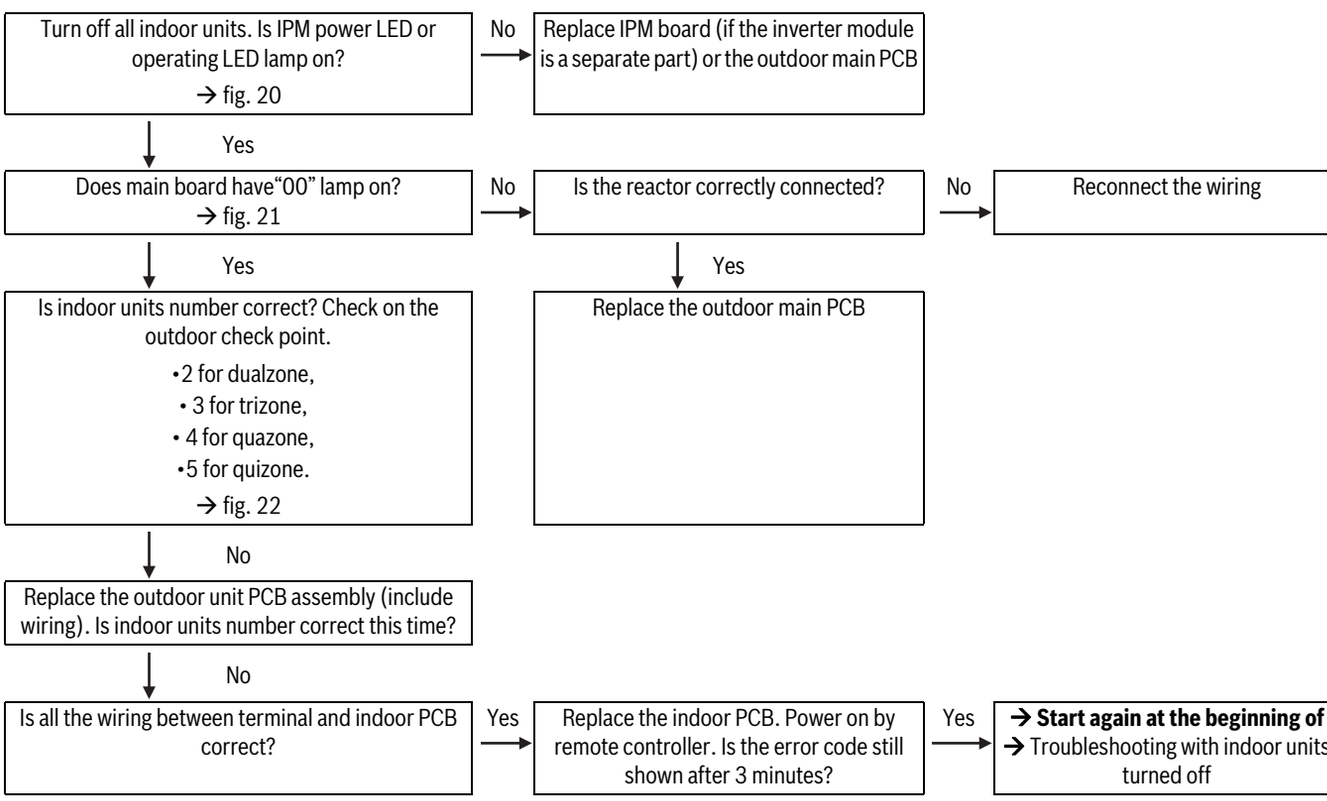
6.2.6 E0/EH 00/EH 0A: Indoor unit main control board EEPROM malfunction



6.2.7 E1/ E2/ EL 01: Indoor/outdoor unit communication error



Troubleshooting with indoor units turned off



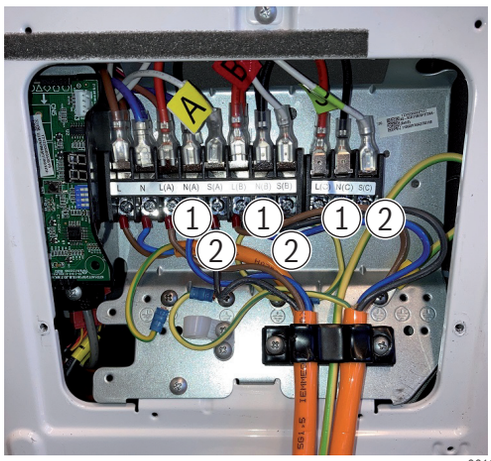


Fig. 19 Check voltage S–N

[1] N
[2] S

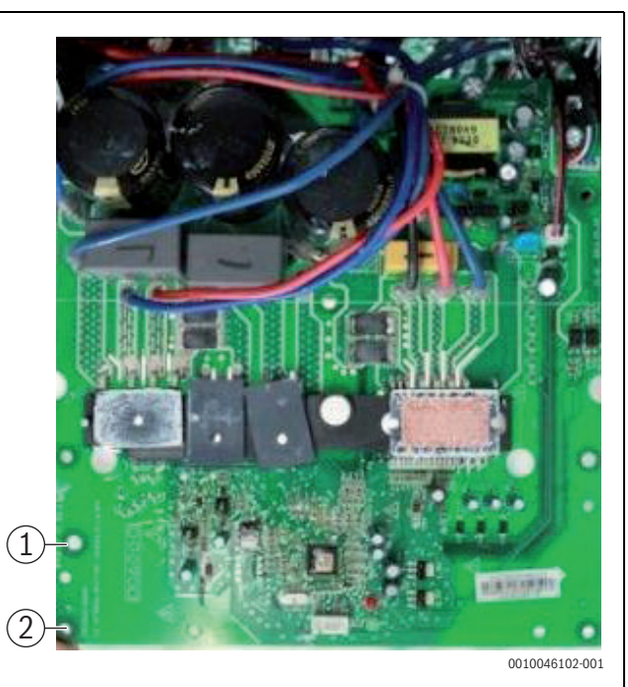


Fig. 20 IPM

[1] Operating
[2] Self-check

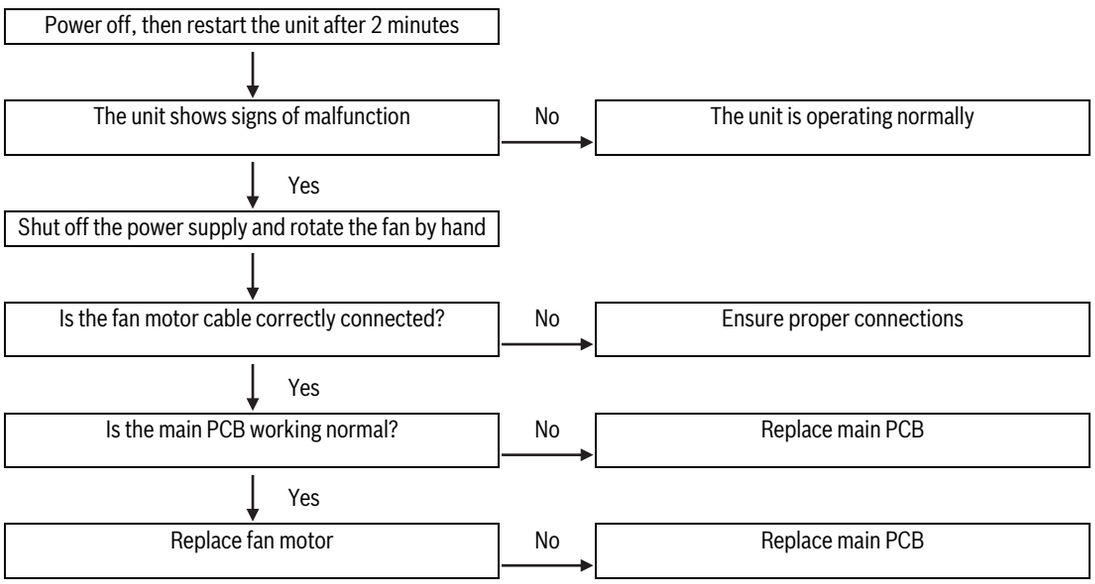
Fig. 21 IPM

[1] Power
[2] Self-check
[3] Operating

Fig. 22 Main board LED when power on and in standby

[1] Power on
[2] Standby

6.2.8 E3/EH 03: Indoor fan speed out of control



AC fan motor (control chip is in fan motor)

- Power on and set the unit running in fan mode at high fan speed. After running for 15 seconds, measure the voltage of pin 1 and pin 2. If the value of the voltage is less than 100V(208–240V power supply) or 50V (115V power supply), the PCB must have problems and need to be replaced.

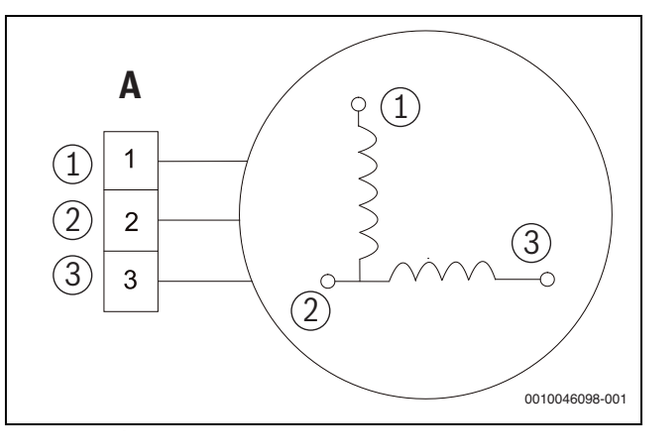


Fig. 23 AC fan motor

[1] Red
[2] Black
[3] White

DC fan motor (control chip is in fan motor)

- Power on and when the unit is in standby, measure the voltage of pin1-pin3, pin4-pin3 in fan motor connector.If the measured voltage does not fit the values in the table, the PCB has problems and needs to be replaced.

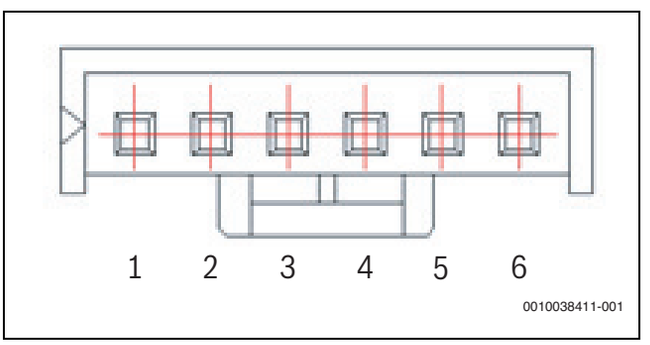


Fig. 24 Fan motor connector

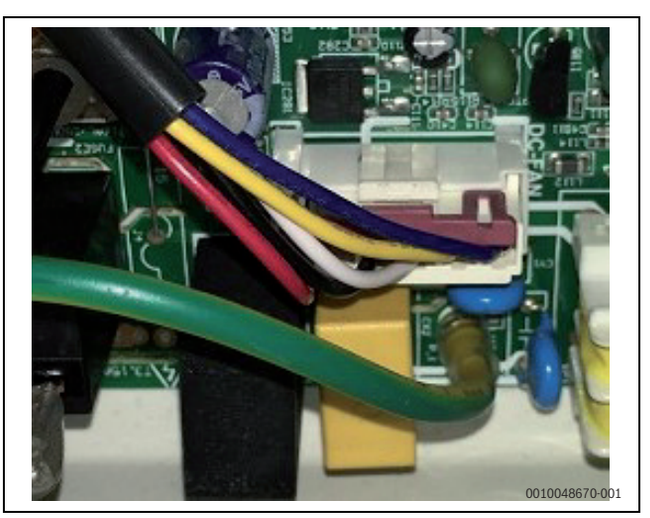


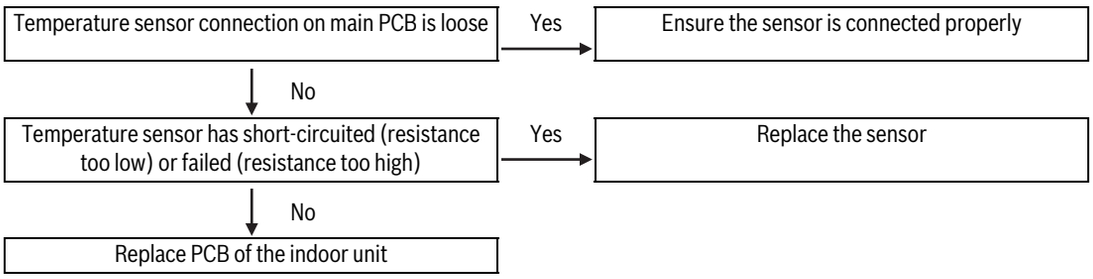
Fig. 25 Fan motor connector

No.	Color	Signal	Voltage[1)]
1	Red	Vs/Vm	280–380V
2	–	–	–
3	Black	GND	0V
4	White	Vcc	14–17.5V
5	Yellow	Vsp	0–5.6V
6	Blue	FG	14–17.5V

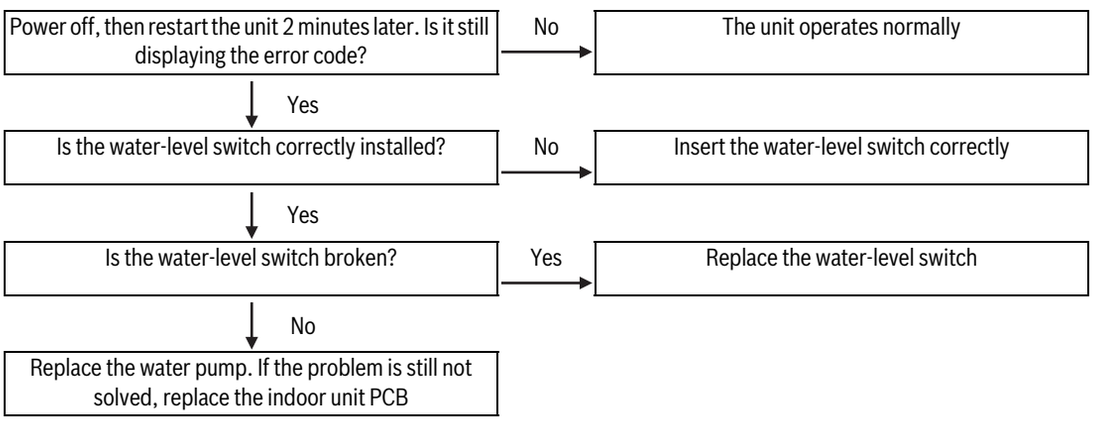
1) With mains voltage of 280–380V

Table 21 DC motor voltage input and output

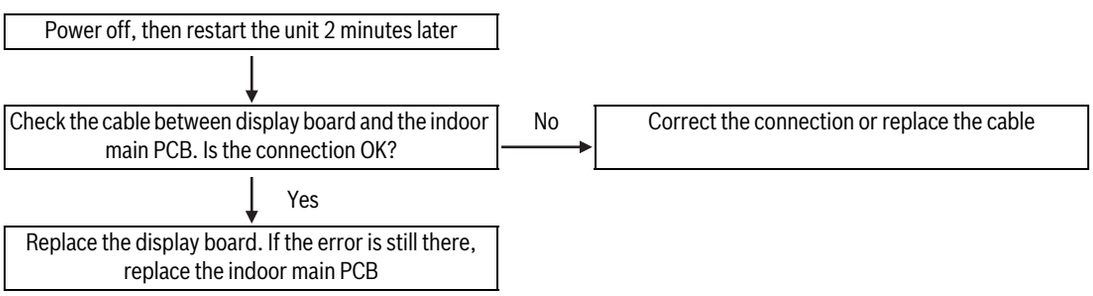
6.2.9 E4/E5/EH 60/EH 61: Open or short circuit of temperature sensor



6.2.10 EE: Water-level alarm malfunction (only indoor units with drain pump)



6.2.11 Eb/EH 0b: Communication error between the indoor PCB and display board



6.2.12 EH 60 / EH 61 / EC 52: Open or short circuit of temperature sensor

Digital output

- EH 60
- EH 61
- EC 52

Description

- If the sampling voltage is lower than 0.06 V or higher than 4.94 V, the LED displays the failure code.

Recommended parts to prepare

- Connection wires
- Sensors
- PCB

Additional information

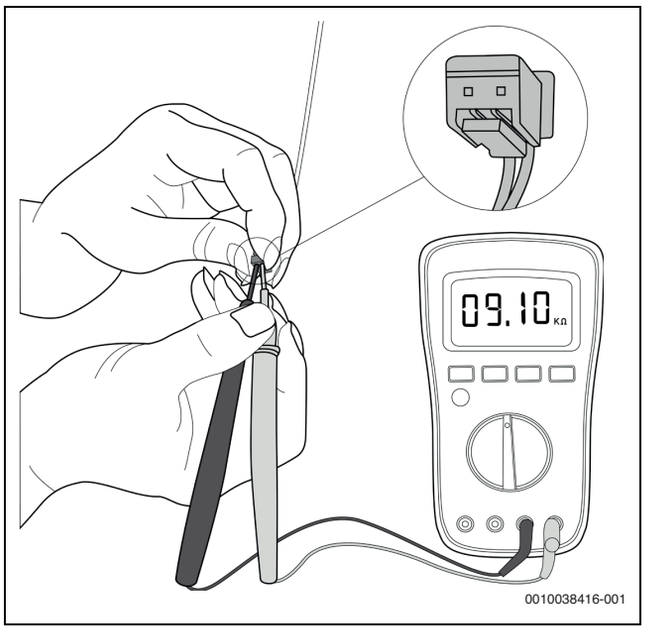
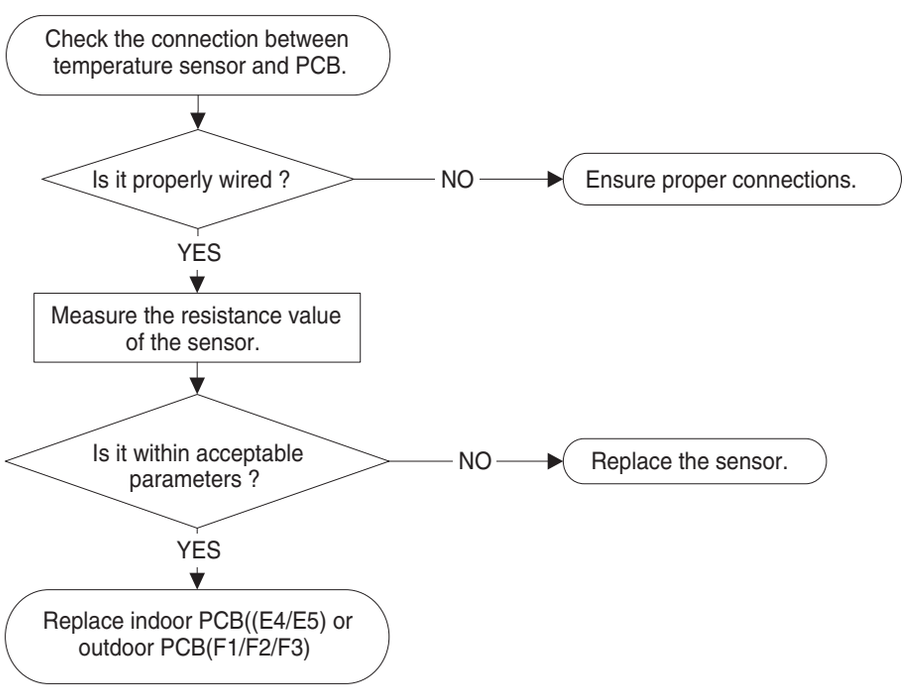


Fig. 26

Procedure

For certain models, outdoor PCB could not be removed separately. In this case, the outdoor electric control box should be replaced as a whole.



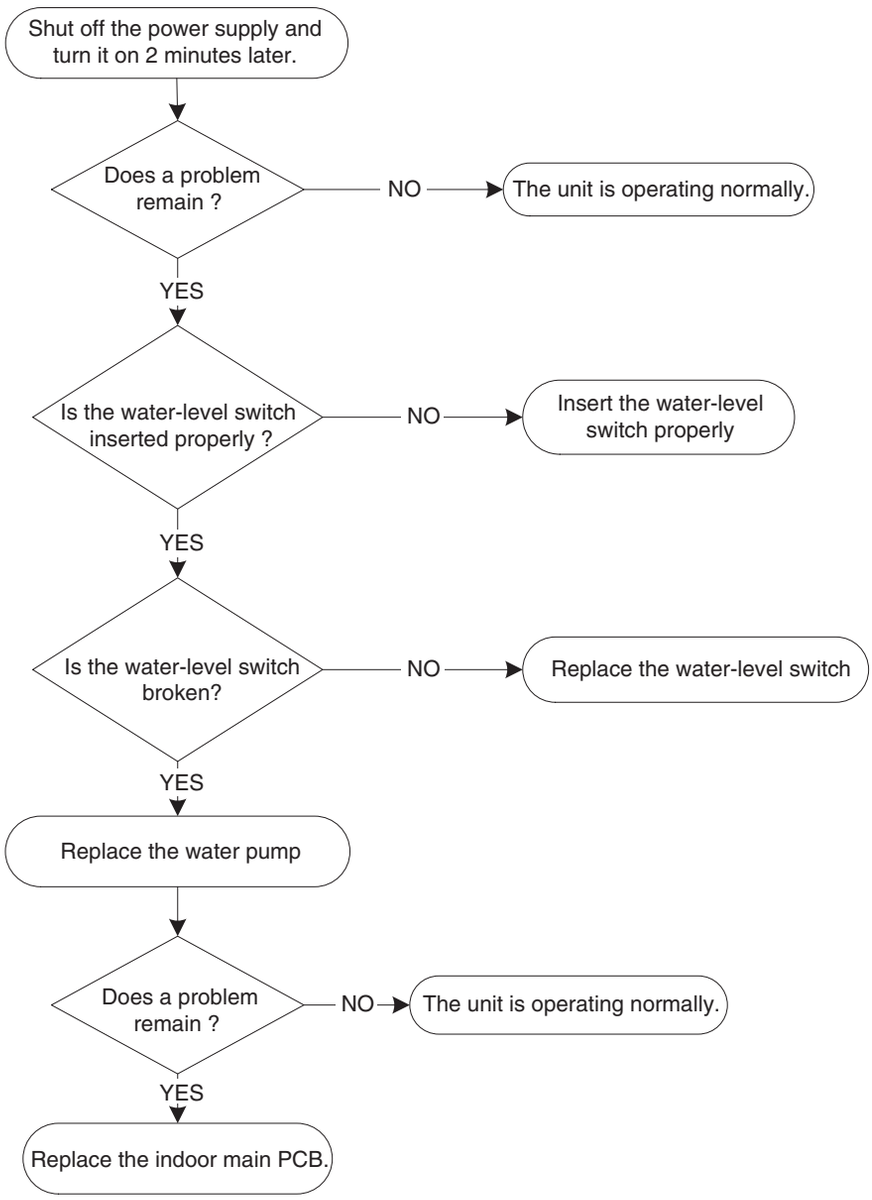
6.2.13 EH 0E: Water-Level Alarm Malfunction

Digital output
- EH 0E

Description
- If the sampling voltage is not 5V, the LED displays the failure code.

Recommended parts to prepare
- Connection wires
- Water-level switch
- Water pump
- Indoor PCB

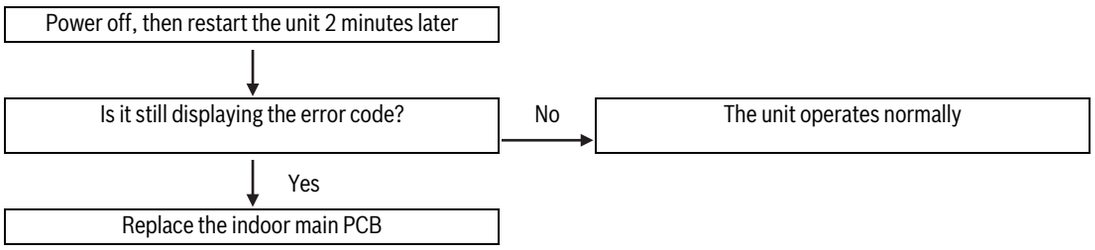
Procedure



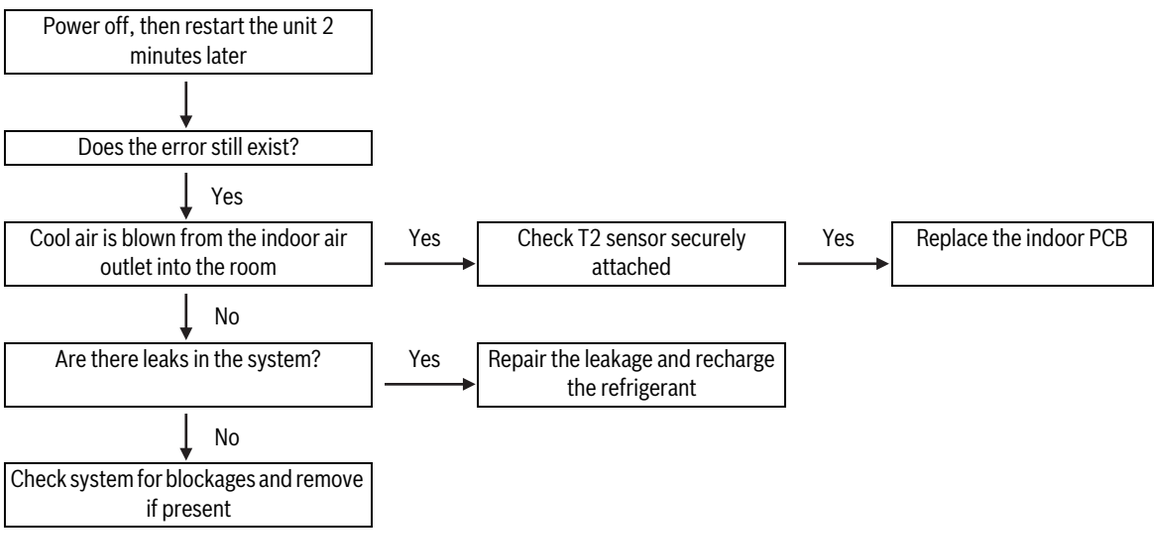
6.2.14 P4/PC04: Inverter compressor drive malfunction

The trouble shooting is same with IPM module protection.
Refer to → p. 46, P6/PC 00: IPM module protection.

6.2.15 FA/EH 0b: Communication malfunction between indoor unit chips



6.2.16 EC/ EL 0C: Refrigerant Leakage Detection



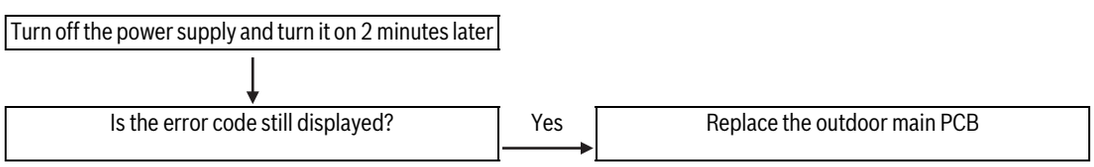
6.3 Troubleshooting by Error Code - Outdoor Unit

6.3.1 Error Codes Outdoor Units

Error code	Error description
EC 51	Outdoor EEPROM malfunction
EL 01	Indoor/outdoor unit communication error
PC 40	Communication malfunction between IPM board and outdoor main board
PC 08	Outdoor overcurrent protection
PC 10	Outdoor unit low AC voltage protection
PC 11	Outdoor unit main control board DC bus high voltage protection
PC 12	Outdoor unit main control board DC bus high voltage protection/341 MCE error
PC 00	IPM module protection
PC 0F	PCR module protection
EC 71	Over current failure of outdoor DC fan motor
EC 72	Lack phase failure of outdoor DC fan motor
EC 07	Outdoor fan speed has been out of control
PC 43	Outdoor compressor lack phase protection
PC 44	Outdoor unit zero speed protection
PC 45	Outdoor unit IR chip drive failure
PC 46	Compressor speed has been out of control
PC 49	Compressor overcurrent failure
PC 0A	High temperature protection of condenser
PC 06	Temperature protection of compressor discharge
PC 0L	Low ambient temperature protection
PC 02	Top temperature protection of compressor
EC 52	Condenser coil temperature sensor T3 is in open circuit or has short circuited
EC 53	Outdoor room temperature sensor T4 is in open circuit or has short circuited
EC 54	Compressor discharge temperature sensor TP (T5) is in open circuit or has short circuited
EC 56	Evaporator coil outlet temperature sensor T2B is in open circuit or has short circuited
EC 50	Open or short circuit of outdoor unit temperature sensor (T3, T4. TP (T5))

Table 22 Error codes

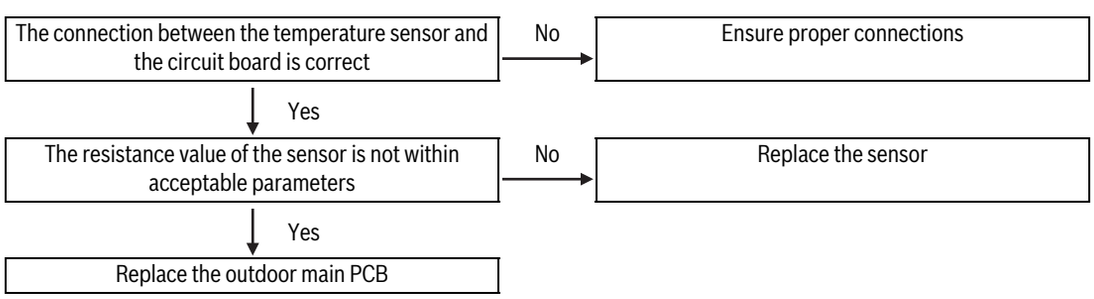
6.3.2 E0/EC 51: Outdoor unit EEPROM malfunction



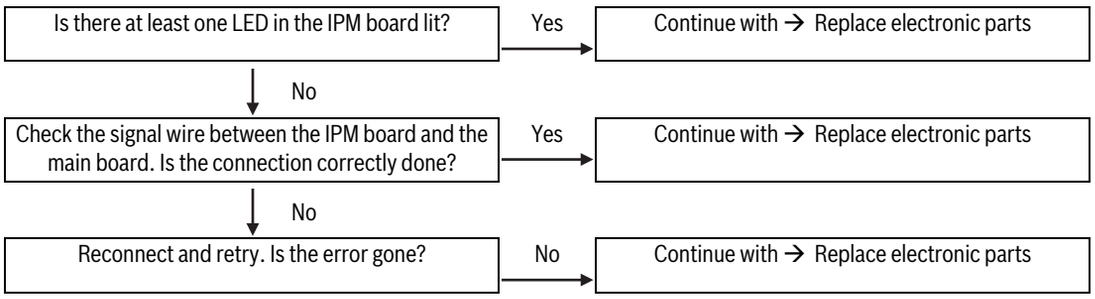
6.3.3 E4/EC 50, EC 52- 56: Temperature sensor short circuited

- E4/EC 50: Open circuit or short circuit of outdoor temperature sensor (T3, T4, TP (T5))
- EC 52: Condenser coil temperature sensor T3 is in open circuit or short-circuited
- EC 53: Outdoor room temperature sensor T4 is in open circuit or short-circuited
- EC 54: Compressor discharge temperature sensor TP (T5) is in open circuit or short-circuited
- EC 55: IGBT temperature sensor TH is in open circuit or short-circuited
- EC 56: Evaporator coil outlet temperature sensor T2B is in open circuit or short-circuited

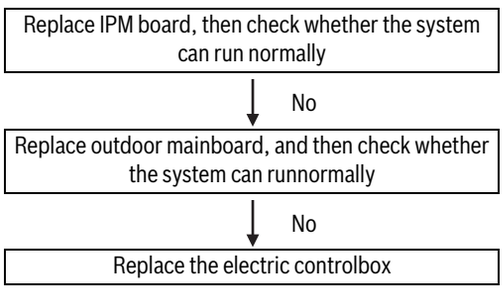
→ For resistance parameters, see p. 64 – 65.



6.3.4 E3/PC 40: Communication malfunction between IPM board and outdoor main board

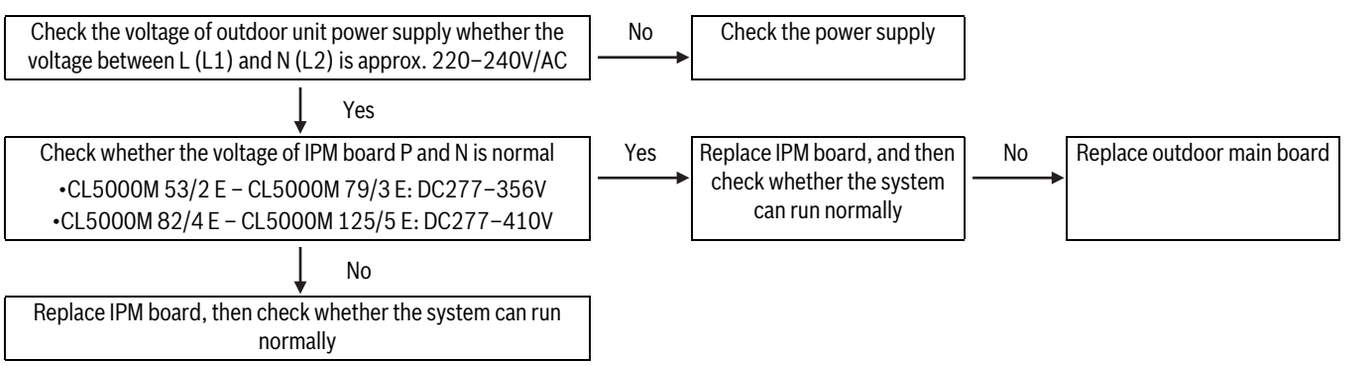


Replace electronic parts

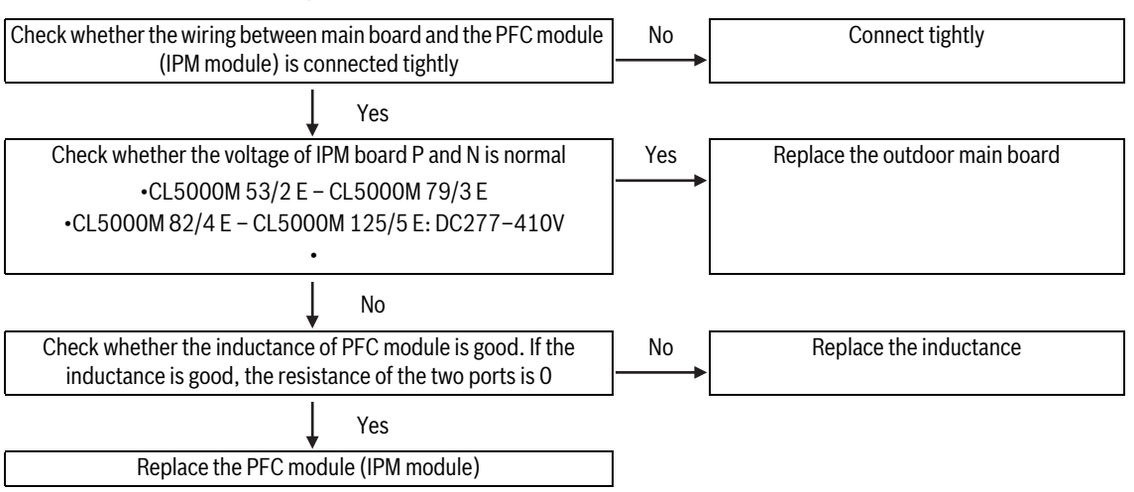


6.3.5 E5, PC10-12: Voltage protection

- E 5: Outdoor unit voltage protection
- PC10: Outdoor unit low AC voltage protection
- PC11: Outdoor unit main control board DC bus high voltage protection
- PC12: Outdoor unit main control board DC bus high voltage protection /341 MCE error

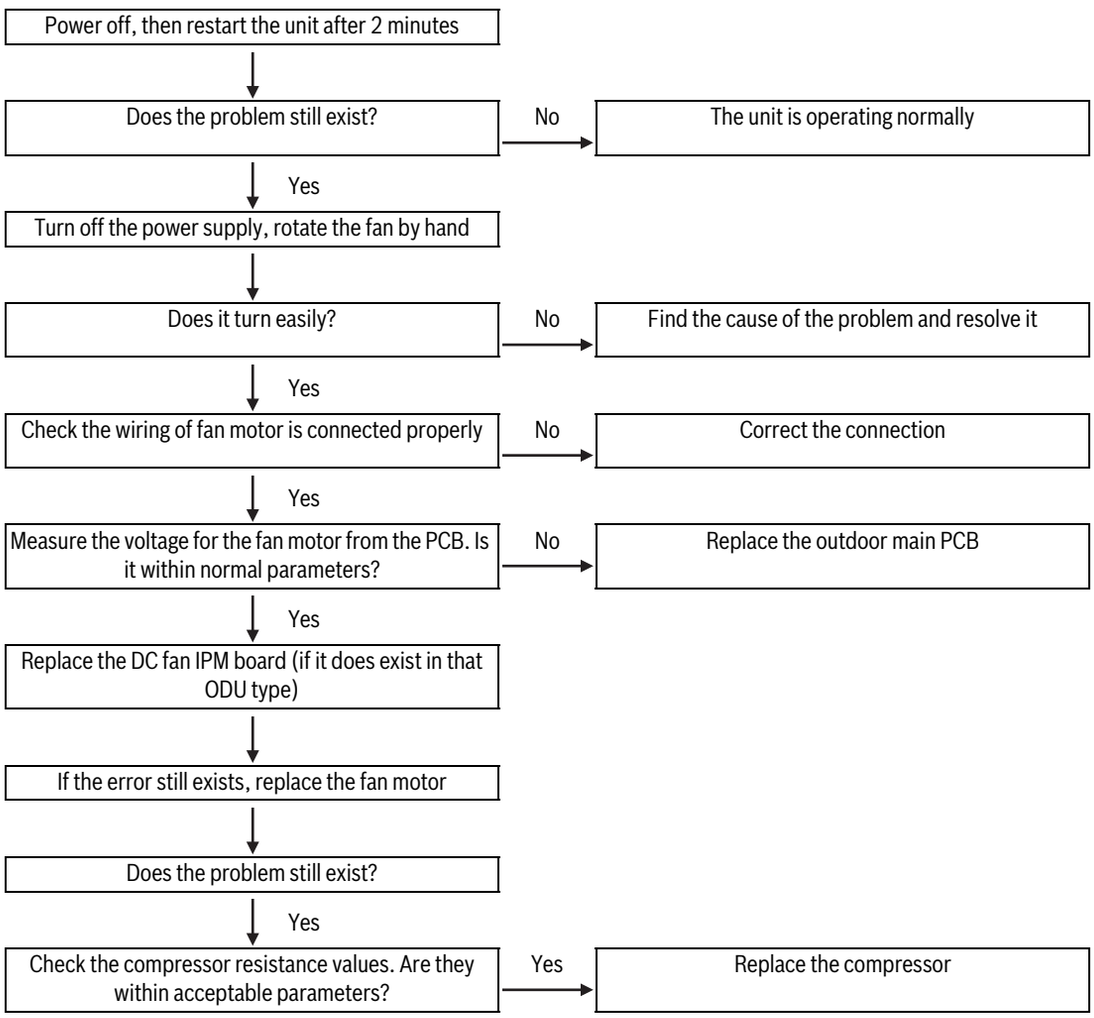


6.3.6 E6/PC 0F: PFC module protection



6.3.7 E8/EC 07, EC 71: Fan motor error

- E8/EC 07: Outdoor fan speed has been out of control or compressor speed has been out of control
- EC 71: Over current failure of outdoor DC fan motor



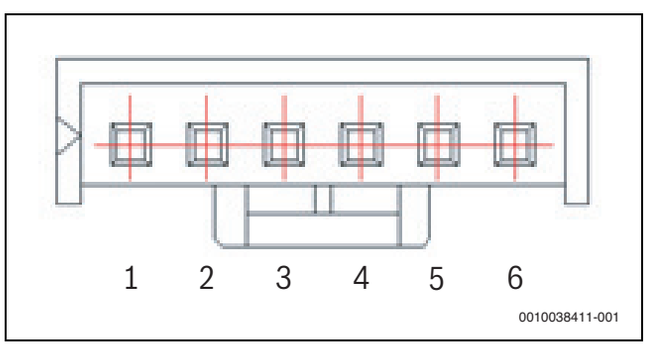


Fig. 27 DC fan motor

DC fan motor (control chip is in fan motor)

- ▶ Power on and when the unit is in standby, measure the voltage of pin1-pin3, pin4-pin3 in fan motor connector.If the measured voltage does not fit the values in the table, the PCB has problems and needs to be replaced.

No.	Color	Signal	Voltage[1)]
1	Red	Vs/Vm	140–380V
2	–	–	–
3	Black	GND	0V
4	White	Vcc	13.5–16.5V
5	Yellow	Vsp	0–6.5V
6	Blue	FG	15V

1) With mains voltage of 280-380V~

Table 23 DC motor voltage input and output

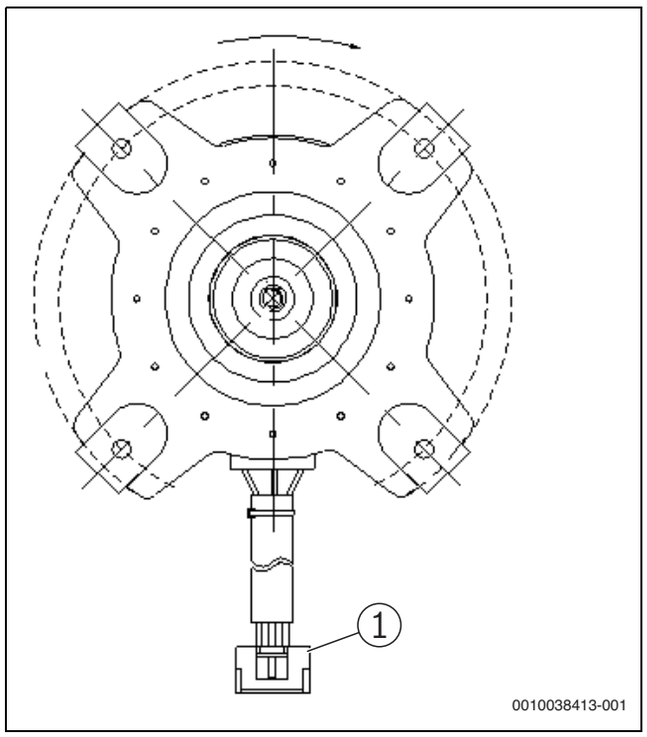
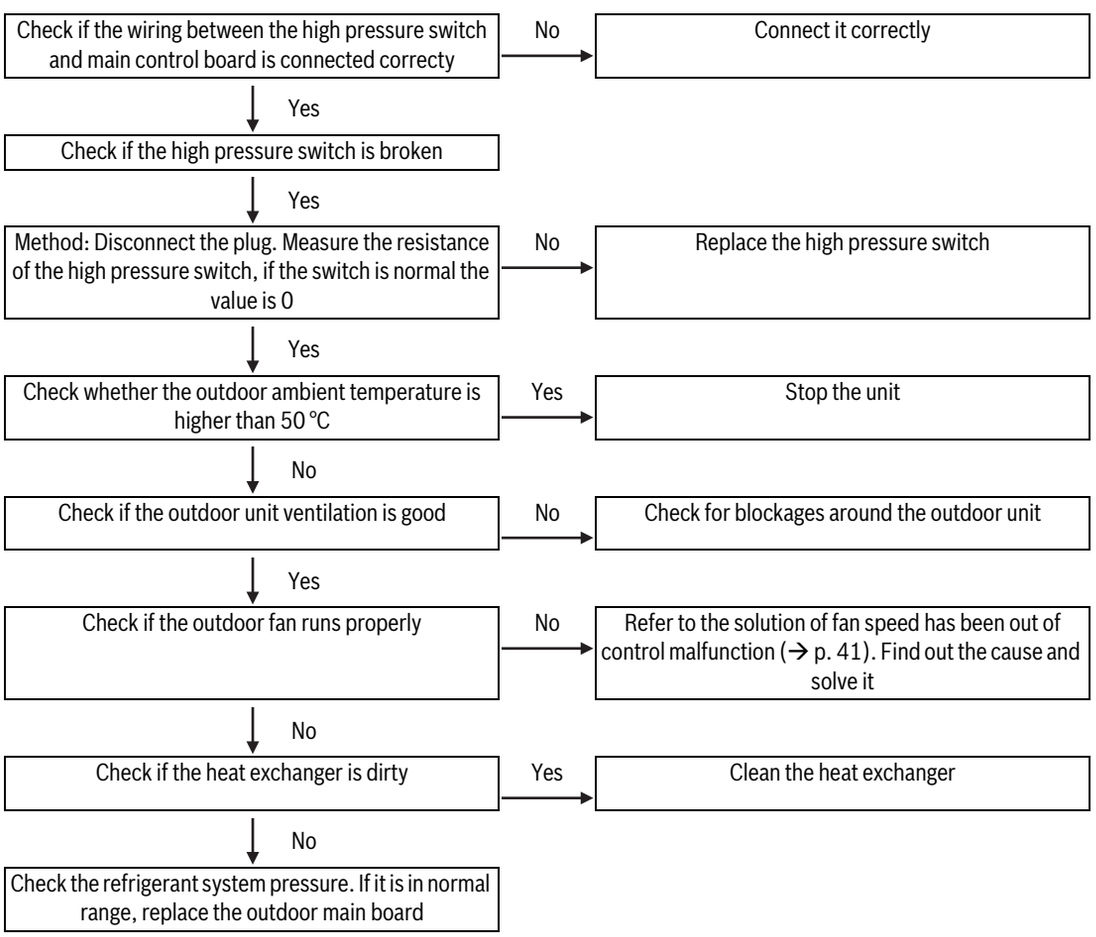


Fig. 28 Fan motor connector (control chip is in PCB)

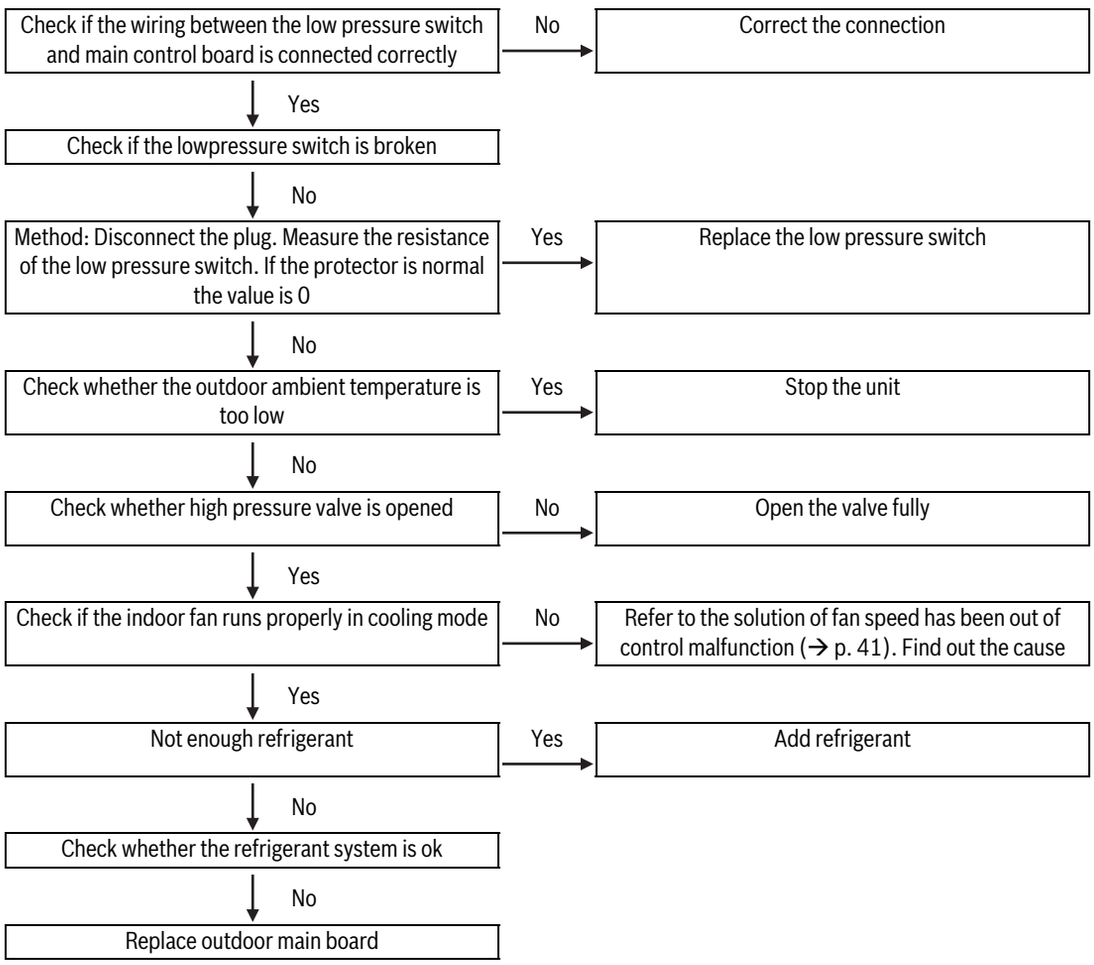
Indoor or outdoor DC Fan Motor (control chip is in PCB)

- Release the UVW connector. Measure the resistance of U-V, U-W, and V-W. If the resistances are not equal to each other, the fan motor may be experiencing problems and need to be replaced. Otherwise, the PCB must has problems and need to be replaced.

6.3.8 P1/PC 30: High pressure protection (CL5000M 105/4 E and CL5000M 125/5 E)

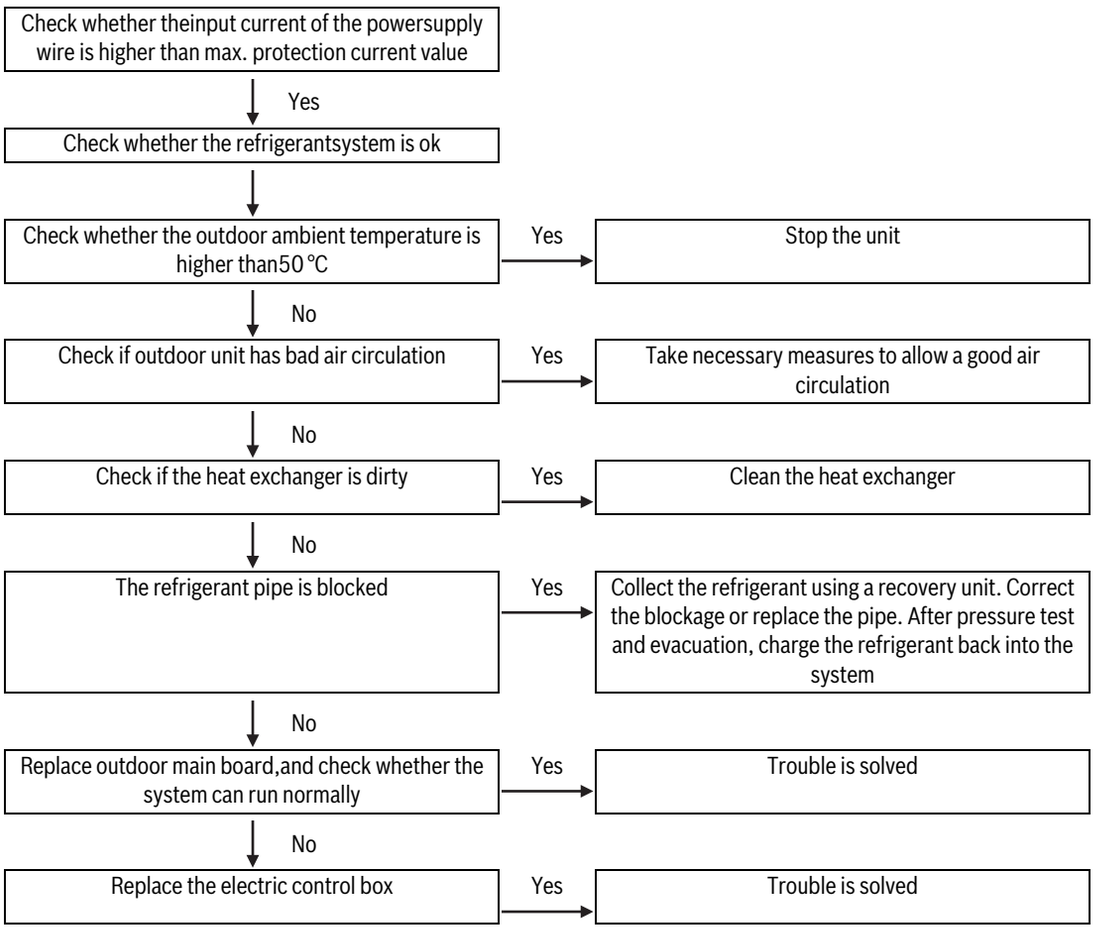


6.3.9 P2/PC 31: Low pressure protection (CL5000M 105/4 E and CL5000M 125/5 E)

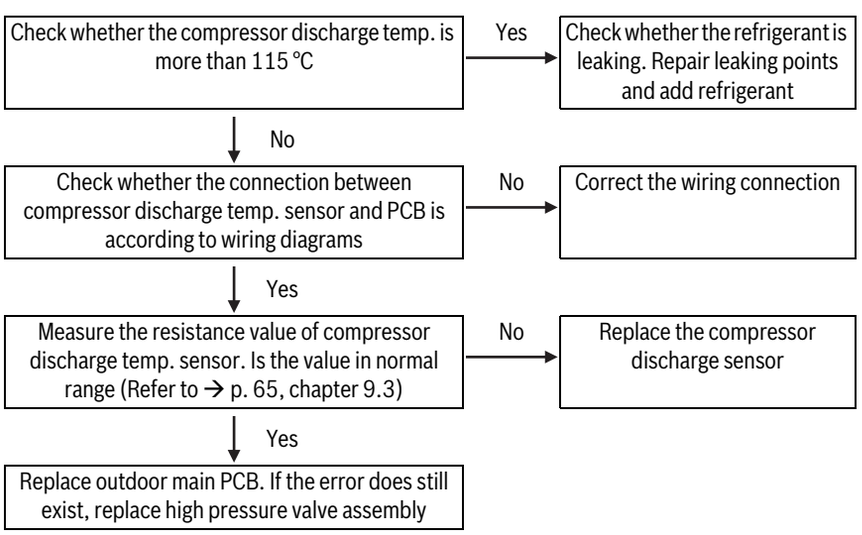


6.3.10 P3/PC 08, PC44, PC46, PC49: Compressor error

- P3/PC 08: Current protection of compressor
- PC44: Outdoor unit zero speed protection
- PC46: Compressor speed has been out of control
- PC49: Compressor overcurrent failure

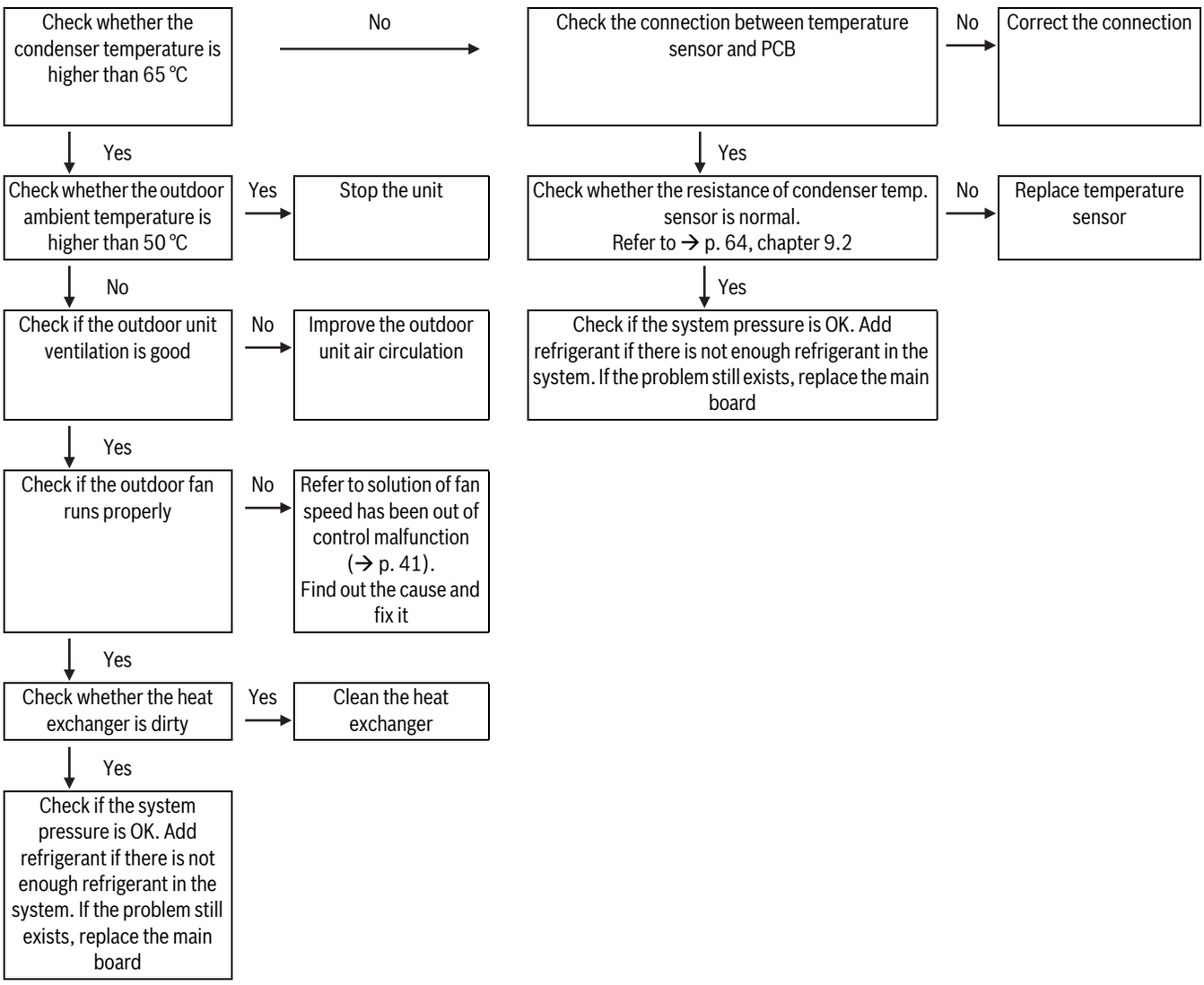


6.3.11 P4/PC 06: Temperature protection of compressor discharge



6.3.12 P5/PC 0A: High temperature protection of condenser

When outdoor pipe temperature is more than 65℃, the unit will stop. It will run again when outdoor pipe temperature less than 52 ℃.



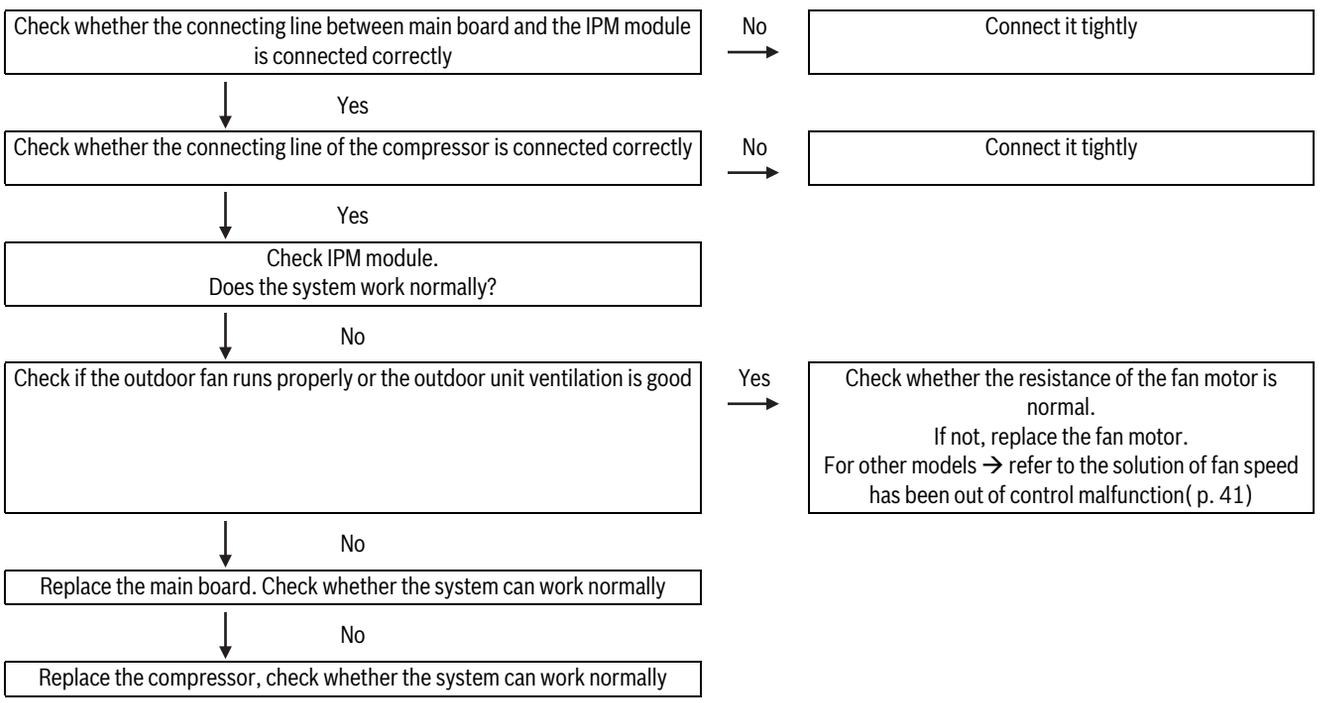
6.3.13 P6/PC 00: IPM module protection

▶ Check whether the voltage range of P-N on IPM module is normal.

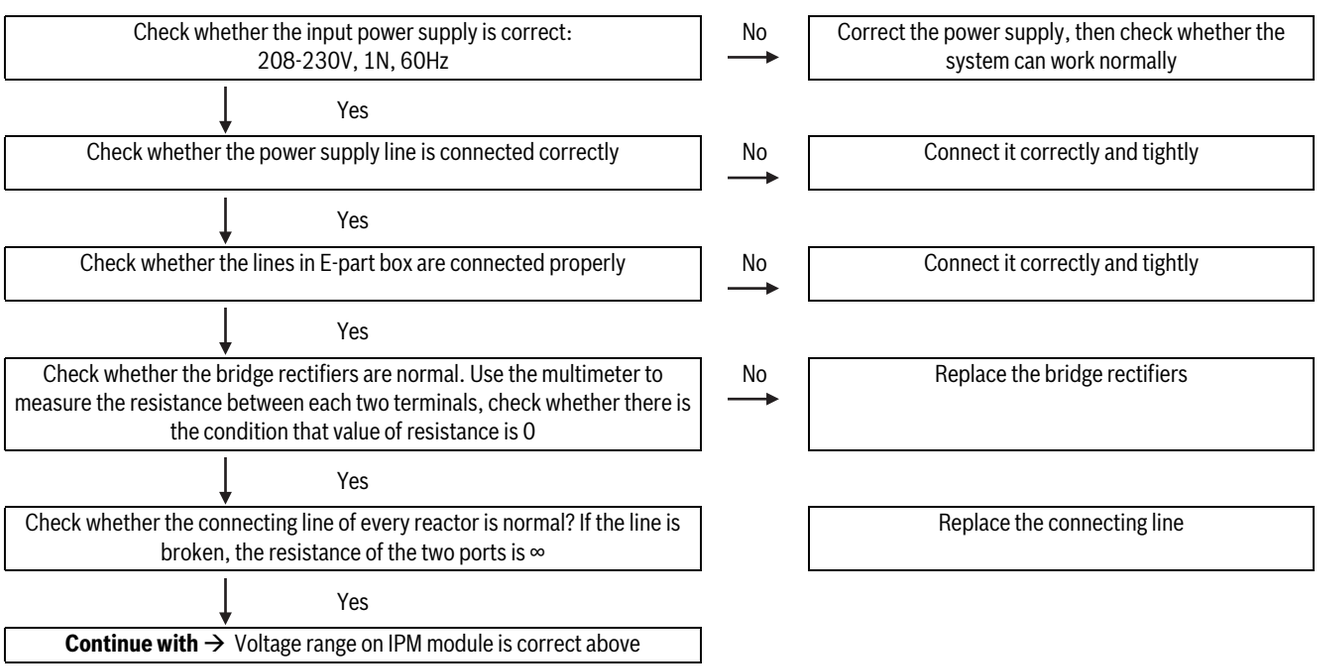
Correct voltage range of P-N on IPM module:

- CL5000M 53/2 E – CL5000M 79/3 E: DC277–356V
- CL5000M 82/4 E – CL5000M 125/5 E: DC277- 410V

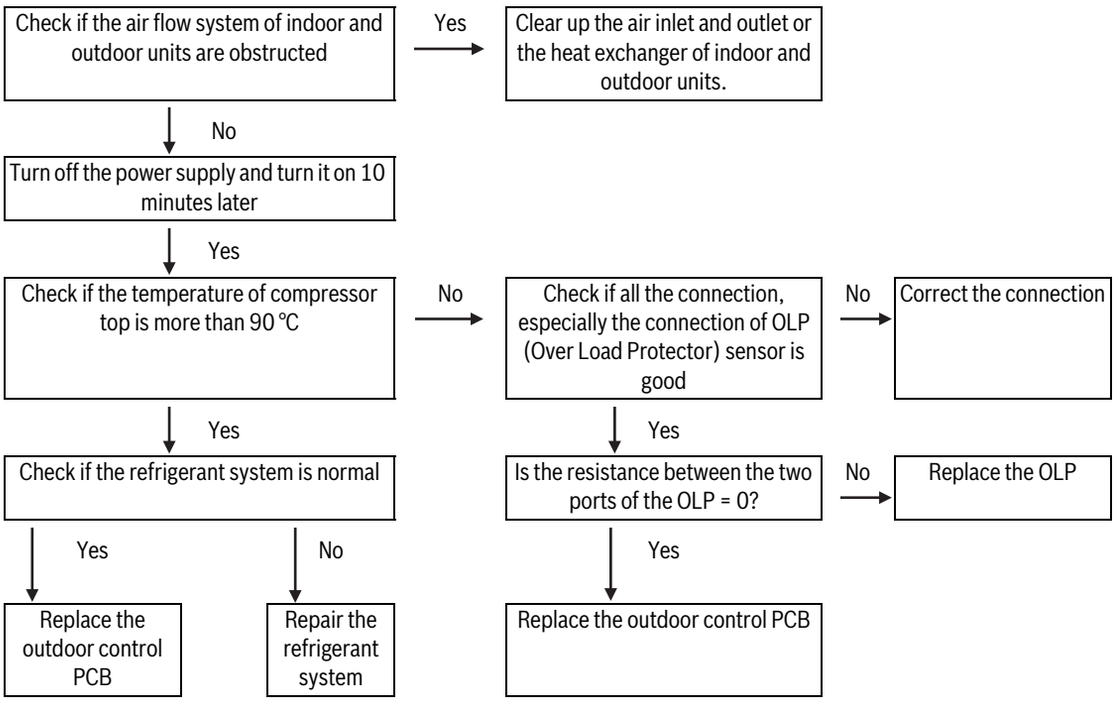
Voltage range on IPM module is correct



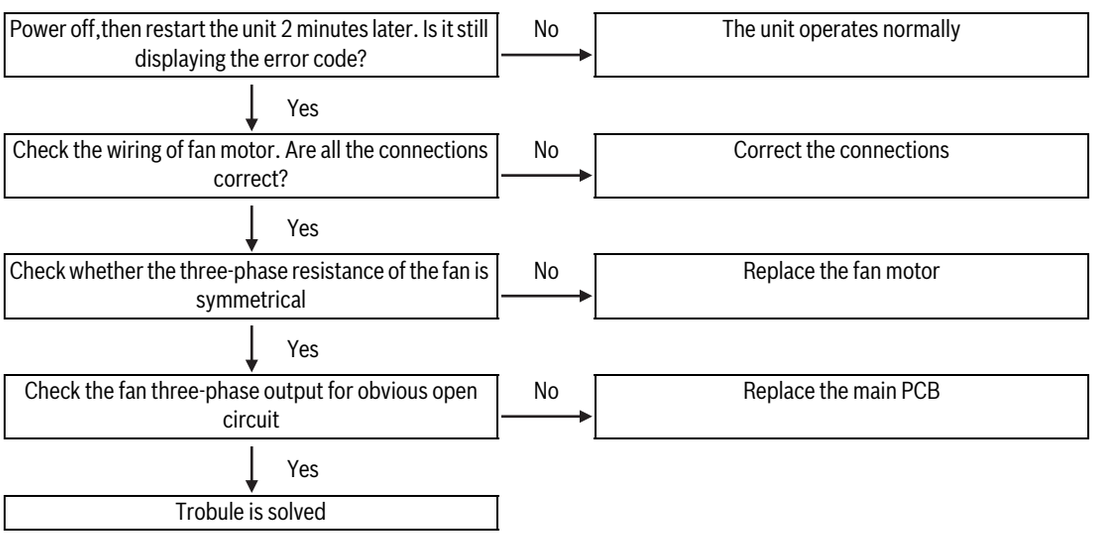
Voltage range on IPM module is not not correct



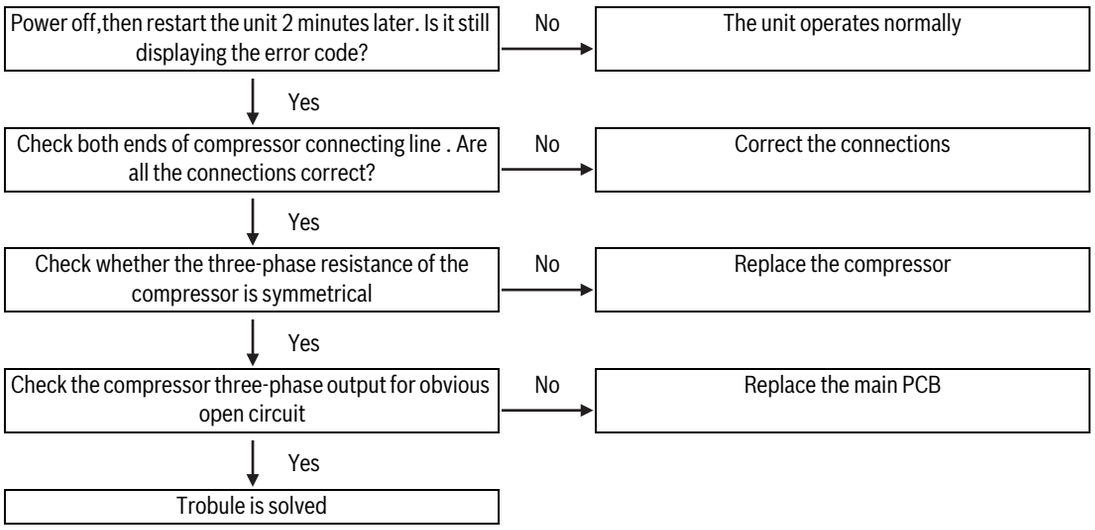
6.3.14 P0/PC 02:Top temperature protection of compressor



6.3.15 EC72: Lack phase failure of outdoor DC fan motor



6.3.16 PC43: Outdoor compressor lack phase protection



6.4 Parameter information inquiry

To access parameter information inquiry:

▶ Press and hold the ⏻ key and the key for 7 seconds.

Displayed code	Explanation
Error code	Refer to error code table on page 27
T1	T1 temperature
T2	T2 temperature
T3	T3 temperature
T4	T4 temperature
TP	TP (T5) temperature
FT	Targeted Frequency
fr	Actual frequency
dL	Compressor current (reserved)
Uo	Outdoor AC voltage
Sn	Indoor capacity test (reserved)
--	Reserved
Pr	Outdoor fan speed = value × 8
Lr	EXV opening angle = value × 8 (reserved)
Ir	Indoor fan speed = value × 8
HU	Indoor humidity (reserved)
TT	Adjusted setting temperature
--	Reserve
--	Reserve
--	Reserve
oT	New calculated frequency (reserved)

Table 24 Information Inquiry

6.5 Troubleshooting without error code

6.5.1 Special errors without error code

The cooling operation or heating operation does not operate

Usually caused by a faulty 4-way valve. Checking 4-way valve → p. 25, chapter 5.5

When cooling, heat exchanger of non-operating indoor unit frosts
When heating, non-operating indoor unit get warm

Usually caused by a faulty EXV valve or wire and piping connected in reverse. Checking EXV valve → p. 26, chapter 5.6

Automatic correction of wiring/piping error

▶ Press check switch on the outdoor unit PCB board for 5 seconds until LED displays “CE”, which mean this function is working,

▶ Approximately 5-10 minutes after the switch is pressed, “CE” disappears and the wiring/piping error will be corrected.

▶ Wiring and piping are now properly connected.

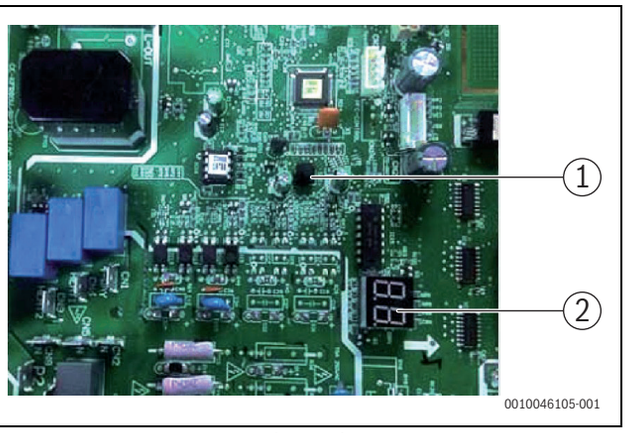


Fig. 29 Automatic correction of wiring/piping error

[1] Check switch
[2] LED display

6.5.2 Error Diagnosis and Troubleshooting Without Error Code

Remote Maintenance

When troubles occur, please check the following points with customers before field maintenance.

Problem	Type	Possible causes of trouble	Test method / remedy
Unit will not start	Electrical	Power failure	▶ Test voltage.
		The main power tripped	▶ Close the power switch.
		Loose connections	▶ Inspect connections - tighten.
		Faulty transformer	▶ Change the transformer.
The power switch is on but fan does not run	Electrical	Loose connections	▶ Inspect connections - tighten.
		Faulty transformer	▶ Change the transformer.
		The voltage is too high or too low	▶ Test voltage.
	Other	Interference from cell phone towers and remote boosters	▶ Reconnect the power or press ON/OFF button on remote control to restart operation.
The temperature on the display board cannot be set	Electrical	The remote control is powered off	▶ Replace the battery of the remote control.
		Broken remote control	▶ Replace the remote control.
Unit is on but the airflow is not cold (hot)	Electrical	Set temperature is too high/low	▶ Adjust the set temperature.
	Refrigerant	Ambient temperature is too high/low	▶ Turn on the unit later.
		Fan mode is active	▶ Change to cooling/heating mode.
Unit runs, but shortly stops	Electrical	The voltage is too high or too low	▶ Test voltage.
	Refrigerant	Set temperature is too high/low	▶ Adjust the set temperature.
		Ambient temperature is too high/low	▶ Turn on the unit later.
The unit starts up and stops frequently	Electrical	The voltage is too high or too low	▶ Test voltage.
	Refrigerant	Ambient temperature is too high/low	▶ Turn on the unit later.
		Frosting and defrosting frequently	▶ Turn on the unit later.
	Other	The air inlet or outlet of either unit is blocked	▶ Remove the obstacles.
Unit runs continuously but insufficient cooling (heating)	Refrigerant	Dirty air filter	▶ Clean or replace filter.
		Dirty condenser fins	▶ Clean condenser fins.
		Set temperature is too high/low	▶ Adjust the set temperature.
		Ambient temperature is too high/low.	▶ Turn on the unit later.
		Noise reduction function is activated (optional function)	▶ Turn off noise reduction function.
	Other	Heavy load condition	▶ Check heat load.
		Bad air proof	▶ Close all the windows and doors.
		The air inlet or outlet of either unit is blocked	▶ Remove the obstacles.
Unit is noisy	Other	Loosen hold down bolts and / or screws	▶ Tighten bolts or screws.
		Shipping plates remain attached	▶ Remove them.

Table 25 Remote maintenance

Field Maintenance

Problem	Type	Possible causes of trouble	Test method / remedy
Unit will not start	Electrical	Power failure	▶ Test voltage
		Blown fuse or varistor	▶ Inspect fuse type & size
		Loose connections	▶ Inspect connections - tighten
		Shorted or broken wires	▶ Test circuits with tester
		Safety device opens	▶ Test continuity of safety device
		Faulty transformer	▶ Check control circuit with tester
Compressor will not start but fan runs	Refrigerant	Compressor stuck	▶ Replace the compressor
	Electrical	Shorted or broken wires	▶ Test circuits with tester
		Faulty thermostat / room temperature sensor	▶ Test continuity of thermostat / sensor & wiring
		Shorted or open capacitor	▶ Check capacitor with tester
		Faulty magnetic contactor for compressor	▶ Test continuity of coil & contacts
		Shorted or grounded compressor	▶ Check resistance with multimeter
Compressor and condenser (outdoor) fan will not start	Electrical	Shorted or broken wires	▶ Test circuits with tester
		Faulty thermostat / room temperature sensor	▶ Test continuity of thermostat / sensor & wiring
		Faulty magnetic contactor for compressor	▶ Test continuity of coil & contacts
Evaporator (indoor) fan will not start	Electrical	Shorted or broken wires	▶ Test circuits with tester
		Shorted or open capacitor	▶ Check capacitor with tester
		Faulty magnetic contactor for fan	▶ Test continuity of coil & contacts
		Shorted or grounded fan motor	▶ Check resistance with multimeter
Condenser (Outdoor) fan will not start	Electrical	Shorted or broken wires	▶ Test circuits with tester
		Faulty thermostat / room temperature sensor	▶ Test continuity of thermostat / sensor & wiring
		Shorted or open capacitor	▶ Check capacitor with tester
		Faulty magnetic contactor for fan	▶ Test continuity of coil & contacts
		Shorted or grounded fan motor	▶ Check resistance with multimeter
Unit runs, but shortly stops	Refrigerant	Shortage of refrigerant	▶ Leak test
		Restricted liquid line	▶ Replace restricted part
		Overcharge of refrigerant	▶ Reduce charged refrigerant volume
		Dirty or partially blocked condenser	▶ Clean condenser or remove obstacle
		Capillary tube closed completely	▶ Replace capillary
	Electrical	Faulty magnetic contactor for compressor	▶ Test continuity of coil & contacts
		Low voltage	▶ Test voltage
Compressor short cycling due to overload	Refrigerant	Shortage of refrigerant	▶ Leak test
		Overcharge of refrigerant	▶ Reduce charged refrigerant volume
		Dirty or partially blocked condenser	▶ Clean condenser or remove obstacle
	Electrical	Faulty magnetic contactor for compressor	▶ Test continuity of coil & contacts
		Low voltage	▶ Test voltage
High discharge pressure	Refrigerant	Overcharge of refrigerant	▶ Change charged refrigerant volume
		Dirty or partially blocked condenser	▶ Clean condenser or remove obstacle
		Air or incompressible gas in refrigerant cycle	▶ Purge, evacuate and recharge
		Limitation of the condensation air flow	▶ Remove obstruction to air flow
		High temperature condensing medium	▶ Remove obstruction in air or water flow
		Insufficient condensing medium	▶ Remove obstruction in air or water flow
Low discharge pressure	Refrigerant	Shortage of refrigerant	▶ Leak test
		Inefficient compressor	▶ Test compressor efficiency
High suction pressure	Refrigerant	Overcharge of refrigerant	▶ Change charged refrigerant volume
		Inefficient compressor	▶ Test compressor efficiency
		Temperature sensor is not installed correctly	▶ Install the sensor properly
	Other	Heavy load condition	▶ Check heat load

Problem	Type	Possible causes of trouble	Test method / remedy
Low suction pressure	Refrigerant	Shortage of refrigerant	▶ Leak test
		Restricted liquid line	▶ Replace restricted part
		Dirty air filter	▶ Clean or replace
		Dirty evaporator coil	▶ Clean coil
		Insufficient air through evaporator coil	▶ Check fan
		Capillary tube closed completely	▶ Replace capillary
Unit runs continuously but insufficient cooling	Refrigerant	Shortage of refrigerant	▶ Leak test
		Restricted liquid line	▶ Replace restricted part
		Dirty air filter	▶ Clean or replace
		Dirty evaporator coil	▶ Clean coil
		Insufficient air through evaporator coil	▶ Check fan
		Dirty or partially blocked condenser	▶ Clean condenser or remove obstacle
		Air or incompressible gas in refrigerant cycle	▶ Purge, evacuate and recharge
		Short cycling of condensing air	▶ Remove obstruction to air flow
		Inefficient compressor	▶ Test compressor efficiency
	Other	Heavy load condition	▶ Check heat load
		Poor choices of capacity	▶ Choose AC of lager capacity or add the number of AC
Too cool	Electrical	Faulty thermostat / room temperature sensor	▶ Test continuity of thermostat / sensor & wiring
		Wrong setting place of temperature sensor	▶ Place the temperature sensor at the central of the air inlet grille
Compressor is noisy	Refrigerant	Overcharge of refrigerant	▶ Reduce charged refrigerant volume
		Broken compressor internal parts	▶ Replace compressor
	Other	Loosen hold down bolts and / or screws	▶ Tighten bolts or screws
		Shipping plates remain attached	▶ Remove them
		Contact of piping with other piping or external plate	▶ Rectify piping so as not to contact each other or with external plate
Horizontal louver can not revolve	Electrical	Loose connections	▶ Inspect connections - tighten
		Shorted or broken wires	▶ Test circuits with tester
		Faulty stepping motor	▶ Replace the stepping motor

Table 26 Field Maintenance

7 Environmental protection and disposal

Environmental protection is a fundamental corporate strategy of the Bosch Group.
The quality of our products, their economy and environmental safety are all of equal importance to us and all environmental protection legislation and regulations are strictly observed.
We use the best possible technology and materials for protecting the environment taking account of economic considerations.

Packaging

Where packaging is concerned, we participate in country-specific recycling processes that ensure optimum recycling.
All of our packaging materials are environmentally compatible and can be recycled.

Used appliances

Used appliances contain valuable materials that can be recycled.
The various assemblies can be easily dismantled. Synthetic materials are marked accordingly. Assemblies can therefore be sorted by composition and passed on for recycling or disposal.

Old electrical and electronic appliances

This symbol means that the product must not be disposed of with other waste, and instead must be taken to the waste collection points for treatment, collection, recycling and disposal.

The symbol is valid in countries where waste electrical and electronic equipment regulations apply, e.g. "(UK) Waste Electrical and Electronic Equipment Regulations 2013 (as amended)". These regulations define the framework for the return and recycling of old electronic appliances that apply in each country.

As electronic devices may contain hazardous substances, it needs to be recycled responsibly in order to minimize any potential harm to the environment and human health. Furthermore, recycling of electronic scrap helps preserve natural resources.

For additional information on the environmentally compatible disposal of old electrical and electronic appliances, please contact the relevant local authorities, your household waste disposal service or the retailer where you purchased the product.

You can find more information here:
www.weee.bosch-thermotechnology.com/

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9 Appendix

9.1 Electrical wiring

9.1.1 CL5000M 41/2 E, CL5000M 53/2 E

A dotted line means the item is optional.

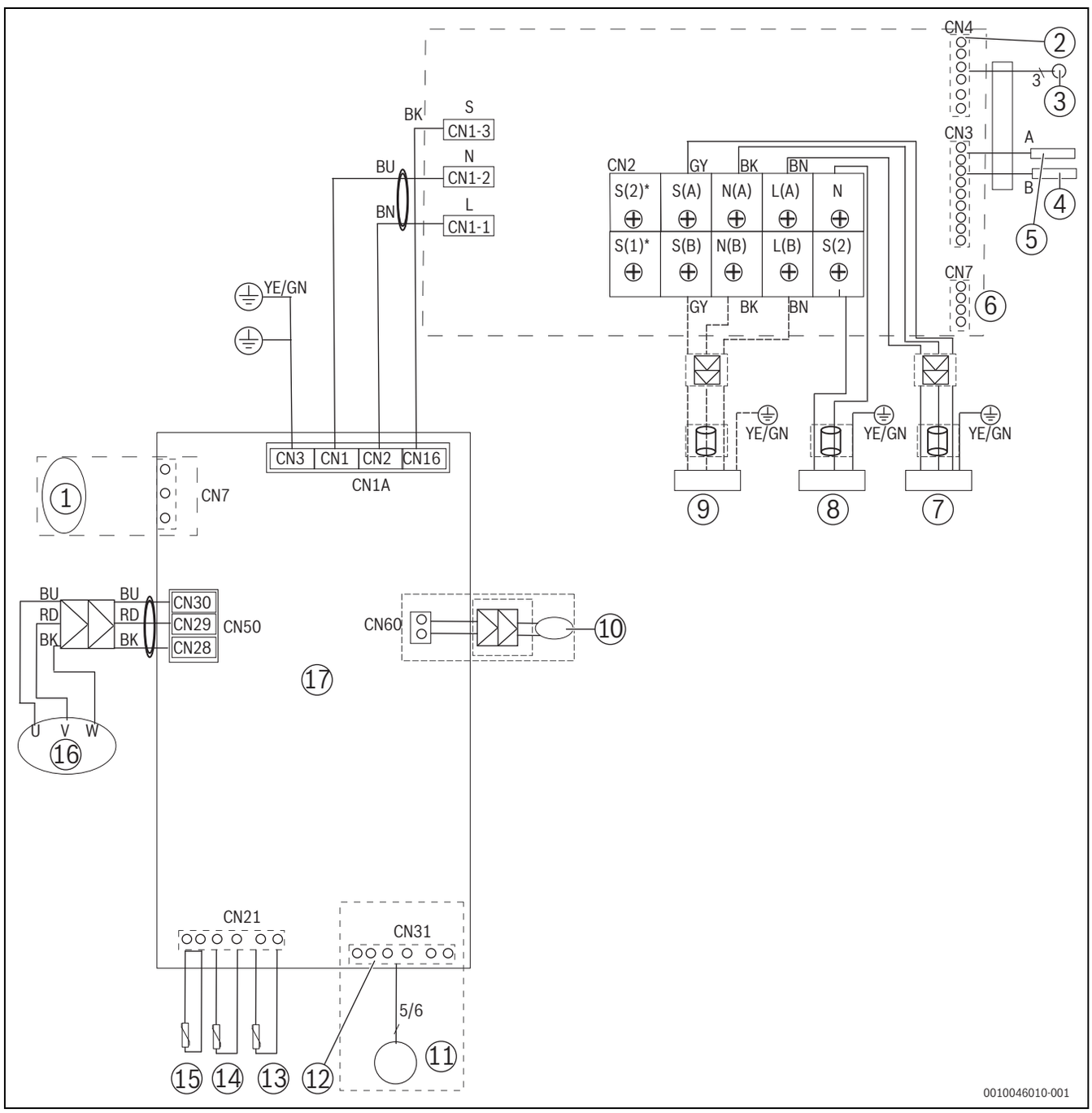

Fig. 30 Electrical wiring CL5000M 41/2 E, CL5000M 53/2 E

BK	Black wire
BN	Brown wire
BU	Blue wire
GY	Grey wire
RD	Red wire
YE/GN	Yellow-green wire
CN...	Port code
*	not used

[1] DC fan
[2] Valve A
[3] Electronic expansion valve
[4] Indoor pipeoutlet temperature B
[5] Indoor pipeoutlet temperature A
[6] Testport
[7] To A
[8] Power supply
[9] To B
[10] 4-way valve
[11] Electronic expansion valve
[12] Valve B
[13] Ambient temperature sensor
[14] Condenser temperature sensor
[15] Discharge temperature sensor
[16] Compressor
[17] Main board

9.1.2 CL5000M 62/3 E, CL5000M 79/3 E

A dotted line means the item is optional.

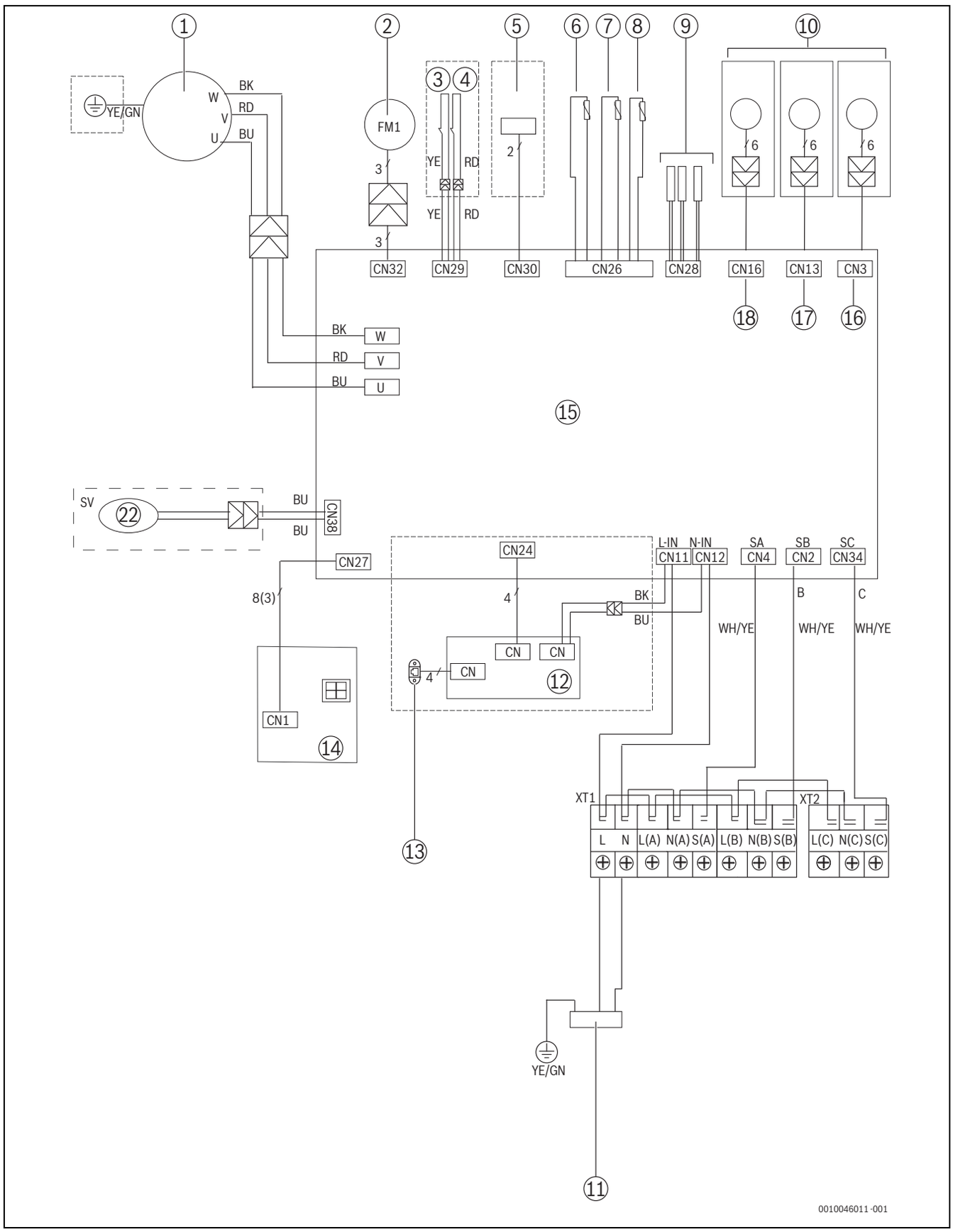

Fig. 31 Electrical wiring CL5000M 62/3 E, CL5000M 79/3 E

BK	Black wire
BN	Brown wire
BU	Blue wire
GY	Grey wire
RD	Red wire
WH/YE	White- yellow wire
YE/GN	Yellow-green wire
CN...	Port code
*	not used

[1] Compressor
[2] Outdoor DC Fan
[3] High pressure switch (optional)
[4] Low pressure switch (optional)
[5] Top temperature protection of compressor (optional)
[6] Coil temperature sensor
[7] Outdoor ambient temperature sensor
[8] Compressor discharge temperature sensor
[9] Indoor pipe out let temperature
[10] Electronic expansion valves
[11] Power supply
[12] DR board
[13] RJ45 (optional)
[14] Auxiliary board
[15] Main board
[16] Valve C
[17] Valve B
[18] Valve A
[19] 4-way valve

9.1.3 CL5000M 82/4 E

A dotted line means the item is optional.

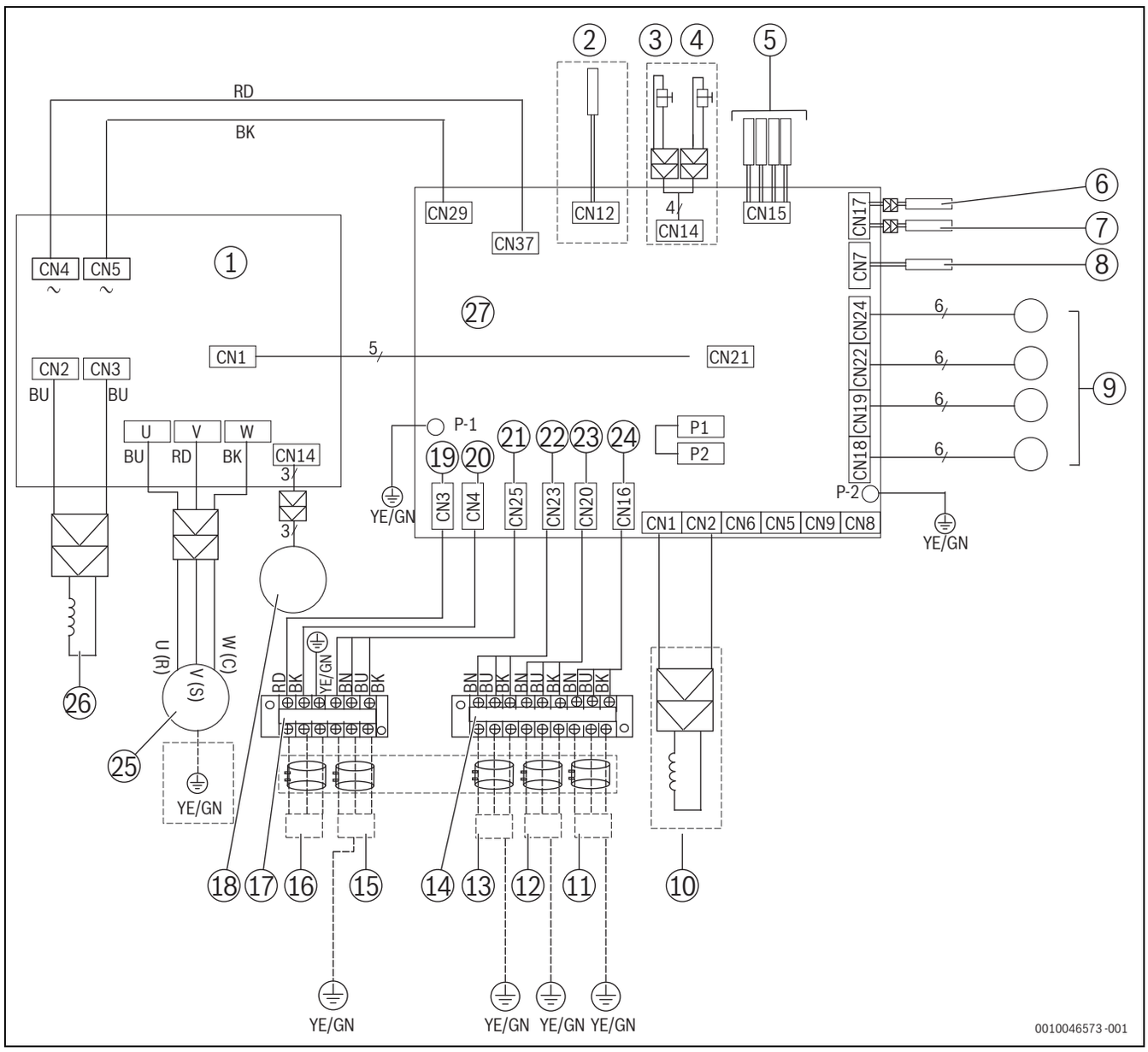

Fig. 32 Electrical wiring CL5000M 82/4 E

BK Black wire
BN Brown wire
BU Blue wire
RD Red wire
YE/GN Yellow-green wire
CN... Port code

[1] IPM board
[2] Top temperature protection of compressor (optional)
[3] Low pressure protection (optional)
[4] High pressure protection (optional)
[5] Indoor pipe outlet temperature sensor (T2B-A...D)
[6] Outdoor ambient temperature sensor (T4)
[7] Condenser temperature sensor (T3)
[8] Discharge sensor
[9] Electronic expansion valves D...A
[10] 4-way valve
[11] To D
[12] To C
[13] To B
[14] Pins (from left to right): L(B), N(B), S(B), L(C), N(C), S(C), L(D), N(D), S(D)
[15] To A
[16] Power supply
[17] Pins (from left to right): L, N, Earth, L(A), N(A), S(A)
[18] DC Fan
[19] L-in
[20] N-in
[21] S-A
[22] S-B
[23] S-C
[24] S-D
[25] Compressor
[26] Reactor
[27] Main board

9.1.4 CL5000M 105/4 E

A dotted line means the item is optional.

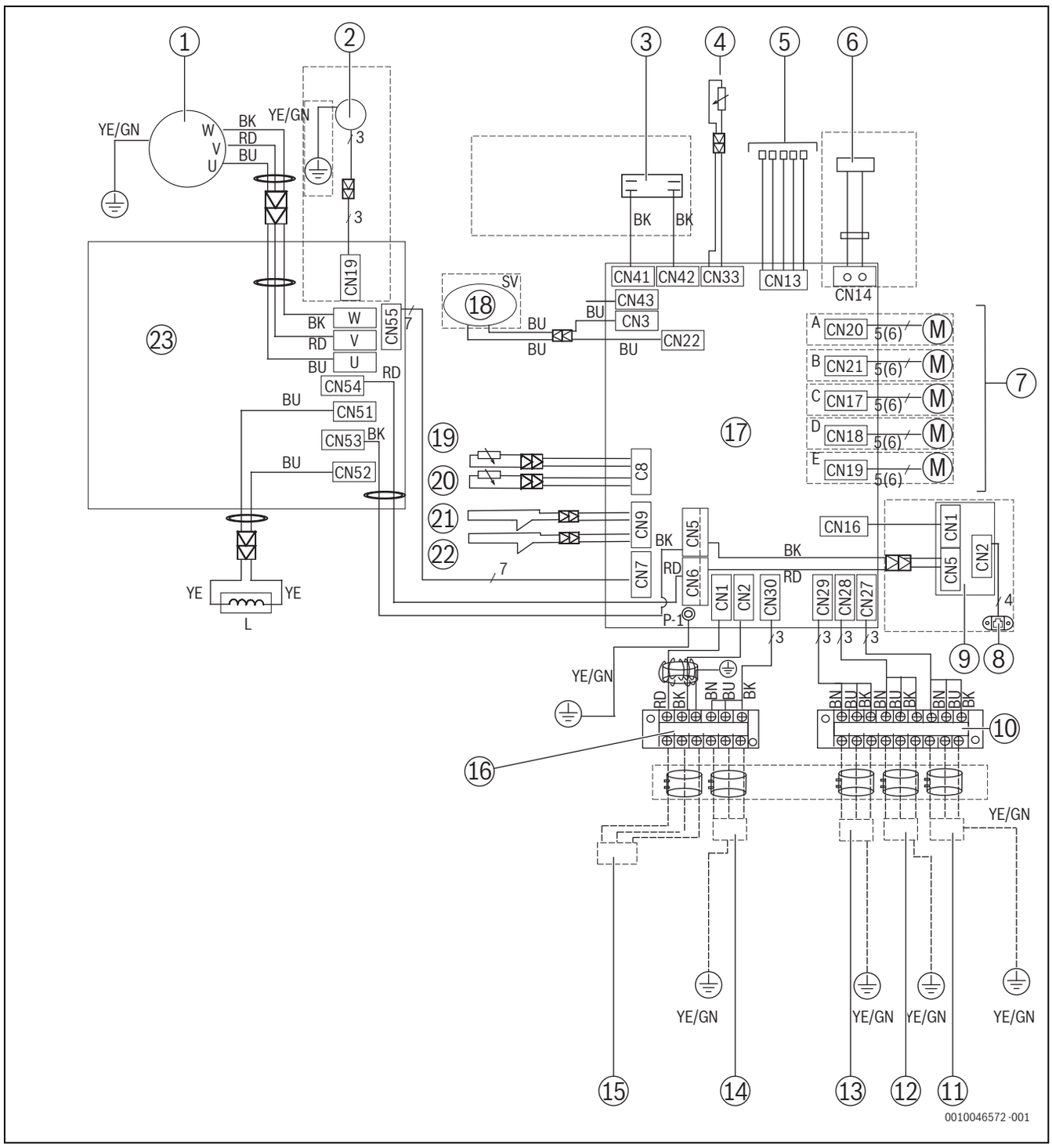

Fig. 33 Electrical wiring CL5000M 105/4 E

BK Black wire
BN Brown wire
BU Blue wire
RD Red wire
YE Yellow wire
YE/GN Yellow-green wire
CN... Port code

[1] Compressor
[2] Outdoor fan DC - only for units with DC motor (optional)
[3] Fan motor capacitor
[4] Exhaust temperature sensor (TP (T5))
[5] Indoor pipe outlet temperature (T2B-A...E)
[6] OLP temperature sensor or top temperature protection of compressor (optional)
[7] Electronic expansion valves 1-5
[8] RJ45 (optional)
[9] DR board (optional)
[10] Pins (from left to right): L(B), N(B), S(B), L(C), N(C), S(C), L(D), N(D), S(D)
[11] To D (optional)
[12] To C (optional)
[13] To B (optional)
[14] To A (optional)
[15] Power supply
[16] Pins (from left to right): L, N, Earth, L(A), N(A), S(A)
[17] Main board
[18] 4-way valve
[19] Condenser temperature sensor (T3)
[20] Outdoor ambient temperature sensor (T4)
[21] High pressure switch
[22] Low pressure switch
[23] Driver board

9.1.5 CL5000M 125/5 E

A dotted line means the item is optional.

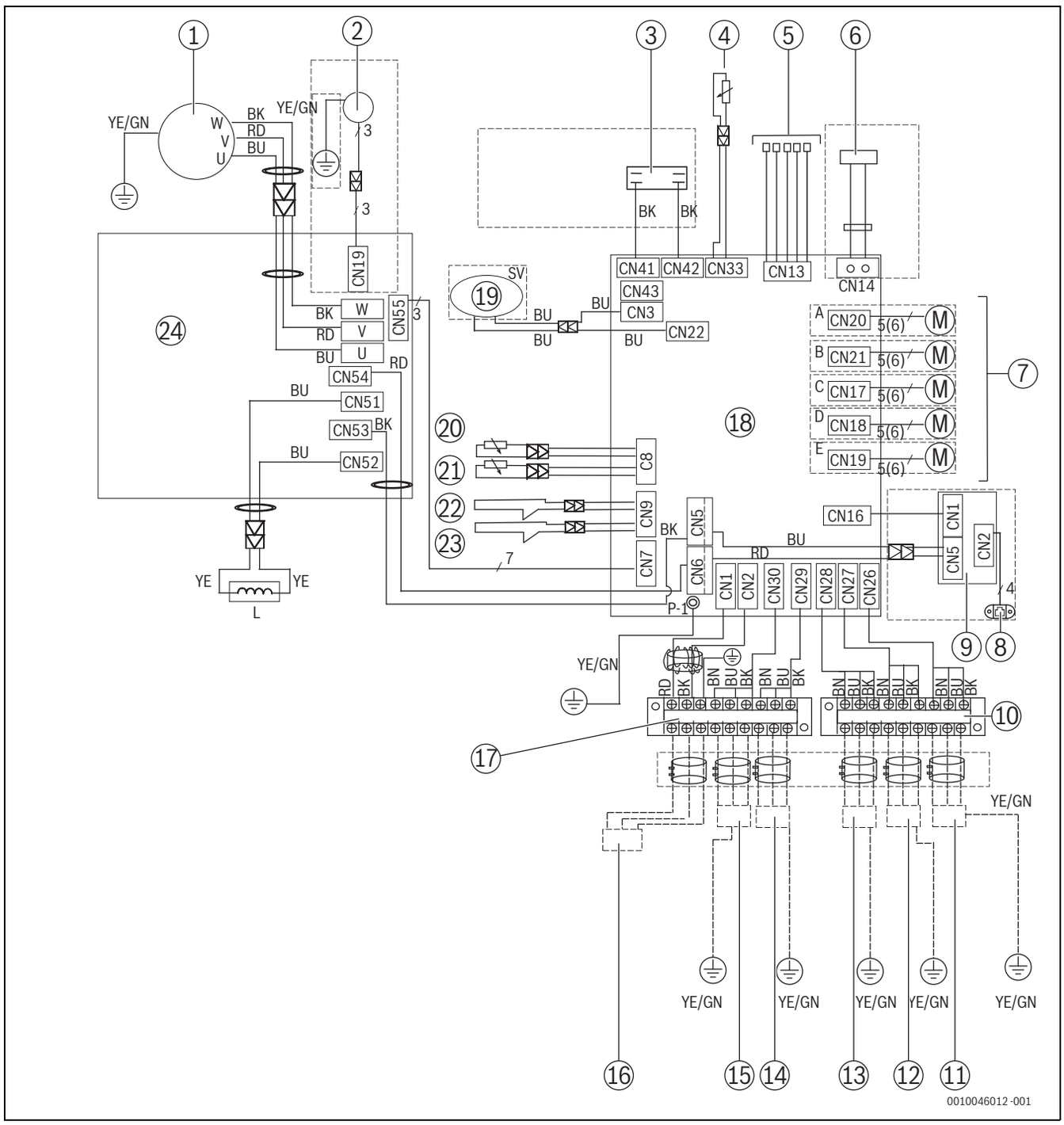

Fig. 34 Electrical wiring CL5000M 125/5 E

BK Black wire
BN Brown wire
BU Blue wire
RD Red wire
YE Yellow wire
YE/GN Yellow-green wire
CN... Port code

[1] Compressor
[2] Outdoor fan DC - only for units with DC motor (optional)
[3] Fan motor capacitor
[4] Exhaust temperature sensor (TP (T5))
[5] Indoor pipe outlet temperature A - E (T2B-A... E)
[6] OLP temperature sensor or top temperature protection of compressor (optional)
[7] Electronic expansion valves 1-5 (optional)
[8] RJ45 (optional)
[9] DR board (optional)
[10] Pins (from left to right): L(C), N(C), S(C), L(D), N(D), S(D), L(E), N(E), S(E)
[11] To E (optional)
[12] To D (optional)
[13] To C (optional)
[14] To B (optional)
[15] To A (optional)
[16] Power supply
[17] Pins (from left to right): L, N, Earth, L(A), N(A), S(A), L(B), N(B), S(B)
[18] Main board
[19] 4-way valve
[20] Condenser temperature sensor (T3)
[21] Outdoor ambient temperature sensor (T4)
[22] High pressure switch
[23] Low pressure switch
[24] Driver board

9.2 Temperature Sensor Resistance Value Table for T1,T2,T3 and T4

Temperature [°C]	Resistance [kΩ]
-20	115.3
-18	101.5
-16	89.59
-14	79.31
-12	70.17
-10	62.28
-8	56.37
-6	49.32
-4	44.00
-2	39.82
0	35.20
2	31.56
4	28.35
6	25.50
8	22.57
10	20.72
12	18.72
14	16.93
16	15.34
18	13.92
20	12.64
22	11.50
24	10.47
26	9.551
28	8.720
30	7.971
32	7.295
34	6.684
36	6.131
38	5.630
40	5.175
42	4.763
44	4.387
46	4.046
48	3.735
50	3.451
52	3.192
54	2.959
56	2.738
58	2.540
60	2.358
62	2.191
64	2.037
66	1.896
68	1.766
70	1.647
72	1.537
74	1.435
76	1.341
78	1.254
80	1.174
82	1.100
84	1.031
86	0.9668
88	0.9075
90	0.8525
92	0.8013
94	0.7537
96	0.7094
98	0.6682
100	0.6297
102	0.5959
104	0.5604
106	0.5291
108	0.4999
110	0.4726
112	0.4470
114	0.4230
116	0.4006
118	0.3796
120	0.3598
122	0.3413
124	0.3239
126	0.3075
128	0.2922
130	0.2777
132	0.2641
134	0.2513
136	0.2392
138	0.2278

Table 27

9.3 Temperature Sensor Resistance Value Table for TP (T5)

Temperature [°C]	Resistance [kΩ]
-20	542.7
-18	483.0
-16	430.5
-14	384.3
-12	343.6
-10	307.7
-8	275.9
-6	247.8
-4	222.8
-2	200.7
0	180.9
2	163.3
4	147.6
6	133.5
8	121.0
10	109.8
12	99.69
14	90.66
16	82.54
18	75.24
20	68.66
22	62.73
24	57.37
26	52.53
28	48.14
30	44.17
32	40.57
34	37.30
36	34.32
38	31.62
40	29.15
42	26.90
44	24.85
46	22.89
48	21.26
50	19.69
52	18.26
54	16.94
56	15.73
58	14.62
60	13.59
62	12.65
64	11.79
66	10.99
68	10.25
70	9.569
72	8.980
74	8.358
76	7.820
78	7.321
80	6.859
82	6.430
84	6.033
86	5.663
88	5.320
90	5
92	4.703
94	4.426
96	4.167
98	3.927
100	3.702
102	3.492
104	3.296
106	3.113
108	2.941
110	2.781
112	2.630
114	2.489
116	2.357
118	2.233
120	2.117
122	2.007
124	1.905
126	1.808
128	1.717
130	1.632

Table 28

9.4 Hex value parameters CL 5000 M/7000 M

Display code	Voltage [V]	Current [A]
1E	30	6.0
1F	31	6.1
20	32	6.2
21	33	6.3
22	34	6.4
22	35	6.5
24	36	6.6
25	37	6.7
26	38	6.9
27	39	7.0
28	40	7.1
29	41	7.2
2A	42	7.3
2B	43	7.5
2C	44	7.7
2D	45	7.9
2E	46	8.0
2F	47	8.2
30	48	8.3
31	49	8.4
32	50	8.5
33	51	8.7
34	52	8.8
35	53	9.0
36	54	9.2
37	55	9.3
38	56	9.4
39	57	9.5
3A	58	9.7
3B	59	9.8
3C	60	9.9
3D	61	10.0
3E	62	10.2
3F	63	10.3
40	64	10.4
41	65	10.5
42	66	10.7
43	67	10.8
44	68	11
45	69	11.1
46	70	11.3
47	71	11.4
48	72	11.5
49	73	11.7
4A	74	11.8
4B	75	11.9
4C	76	12.0
4D	77	12.2
4E	78	12.3
4F	79	12.4
50	80	12.5
51	81	12.7
52	82	12.8
53	83	12.9

Display code	Voltage [V]	Current [A]
54	84	13.0
55	85	13.2
56	86	13.3
57	87	13.5
58	88	13.7
59	89	13.8
5A	90	13.9
5B	91	14.0
5C	92	14.2
5D	93	14.3
5E	94	14.4
5F	95	14.5
60	96	14.7
61	97	14.9
62	98	15.0
63	99	15.2
64	100	15.3
65	101	15.4
66	102	15.5
67	103	15.7
68	104	15.8
69	105	15.9
6A	106	16.0
6B	107	16.2
6C	108	16.3
6D	109	16.4
6E	110	16.5
6F	111	16.7
70	112	16.8
71	113	16.9
72	114	17.0
73	115	17.1
74	115	17.2
75	117	17.4
76	118	17.5
77	119	17.7
78	120	17.8
79	121	17.9
7A	122	18.0
7B	123	18.2
7C	124	18.3
7D	125	18.4
7E	126	18.5
7F	127	18.7
80	128	18.8
81	129	19.0
82	130	19.2
83	131	19.3
84	132	19.4
85	133	19.5
86	134	19.7
87	135	19.8
88	136	19.9
89	137	20.0

Display code	Voltage [V]	Current [A]
8A	138	20.2
8B	139	20.3
8C	140	20.4
8D	141	20.5
8E	142	20.7
8F	142	20.8
90	144	20.9
91	145	21.0
92	146	21.2
93	147	21.3
94	148	21.4
95	149	21.5
96	150	21.7
97	151	21.8
98	152	21.9
99	153	22.0
9A	154	22.2
9B	155	22.3
9C	156	22.4
9D	157	22.5
9E	158	22.7
9F	159	22.9
A0	160	23.0
A1	161	23.2
A2	162	23.3
A3	163	23.4
A4	164	23.5
A5	165	23.7
A6	166	23.8
A7	167	23.9
A8	168	24.1
A9	169	24.3
AA	170	24.5
AB	171	24.7
AC	172	24.8
AD	173	25.0
AE	174	25.2
AF	175	25.4
B0	176	25.6
B1	177	25.8
B2	178	26.0
B3	179	26.2
B4	180	26.3
B5	181	26.4
B6	182	26.5
B7	183	26.7
B8	184	26.8
B9	185	26.9
BA	186	27.0
BB	187	27.2
BC	188	27.4
BD	189	27.5
BE	190	27.7
BF	191	27.8
C0	192	28.0
C1	193	28.2
C2	194	28.3
C3	195	28.4
C4	196	28.5
C5	197	28.7
C6	198	28.8
C7	199	28.9
C8	200	29.0
C9	201	29.2
CA	202	29.3
CB	203	29.4
CC	204	29.5
CD	205	29.7
CE	206	29.8
CF	207	29.9
D0	208	30.0
D1	209	30.2
D2	210	30.3
D3	211	30.4
D4	212	30.5
D5	213	30.7
D6	214	30.9
D7	215	31.0
D8	216	31.2
D9	217	31.3
DA	218	31.4
DB	219	31.5
DC	220	31.7
DD	221	31.8
DE	222	32.0

Table 29

9.5 Service Report

Request No.: Installation Date:		Date: Service Date:	
Customer Information			
Name		Telephone No.	
Home Address			
Email			
Product Information			
Indoor Unit Model		Outdoor Unit Model	
Serial No. of indoor unit		Serial No. of outdoor unit	
Working Mode	☐ Cooling ☐ Heating ☐ Fan only ☐ Dry		
Setting temperature	_____ ℃	Fan speed	☐ Turbo ☐ Auto ☐ High ☐ Medium ☐ Low
Temperature of air inlet	_____ ℃	Temperature of air outlet	_____ ℃
Installation / Condition Information			
Indoor temperature	_____ ℃	Indoor humidity	_____%RH
Outdoor temperature	_____ ℃	Outdoor humidity	_____%RH
Length of Connecting pipe		Pipe diameter	Gas pipe: Liquid pipe:
Length of Wiring		wire diameter	
System Running Pressure	_____MPa or _____Bar		
Room size (L*W*H)			
Photo of Installation of Indoor unit (Photo #1)		Photo of Installation of Outdoor unit (Photo #2)	
Failure Description			
Error Code of Indoor unit:		Code of Outdoor PCB:	
Unit does not start		Less cooling or heating	
Remote control does not work		Unit starts but stops shortly	
Indoor display shows nothing		High noise	
No cooling or heating at all		High vibration	

Parameter information inquiry			
Parameter	**Definition**	**Display value**	**Display value meaning**
T1	Room temperature		
T2	Indoor coil temperature		
T3	Outdoor coil temperature		
T4	Ambient temperature		
TP (T5)	Discharge temperature		
FT	Targeted Frequency		
Fr	Actual Frequency		
dl	Compressor current		
Uo	Outdoor AC voltage		
Sn	Indoor capacity test		
Pr	Outdoor fan speed		
Lr	EXV opening steps		
ir	Indoor fan speed		
HU	Indoor humidity		
TT	Adjusted setting temperature		
oT	New calculated frequency		
--	Reserved		

Approval from Manufacturer	
☐ Approved	
☐ More Proof needed	
☐ Rejected	

Bosch Thermotechnik GmbH
Sophienstrasse 30-32
35576 Wetzlar, Germany

www.bosch-industrial.com