

# Service Manual

## Aqua thermal Series



**All DC Inverter**

# Part 1

## General Information

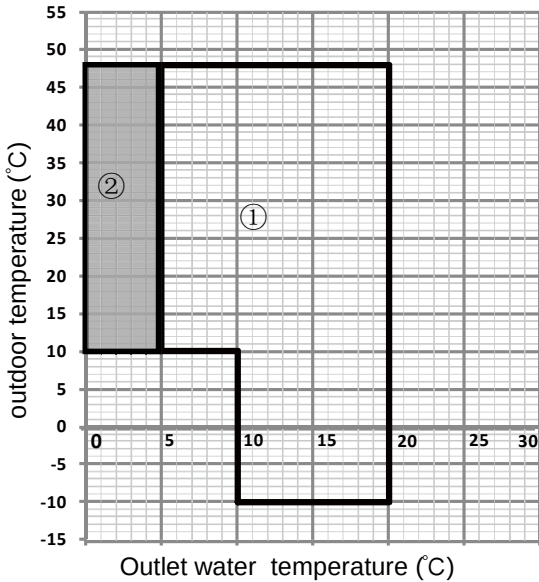
|   |                                              |   |
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| 1 | Unit Capacities and External Appearance..... | 4 |
| 2 | Water outlet temperature range.....          | 4 |

1 Unit Capacities and External Appearance

| Model        | MC-SU75-RN8L-B                                                                    | MC-SU90-RN8L-B                                                                    | MC-SU140-RN8L-B                                                                    | MC-SU180-RN8L-B                                                                     |
|--------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Power supply | 380-415V/3Ph/50Hz                                                                 | 380-415V/3Ph/50Hz                                                                 | 380-415V/3Ph/50Hz                                                                  | 380-415V/3Ph/50Hz                                                                   |
| Appearance   |  |  |  |  |

2 Water outlet temperature range

2.1 Cooling operating range



Notes:

- ①

Normal mode
- ②

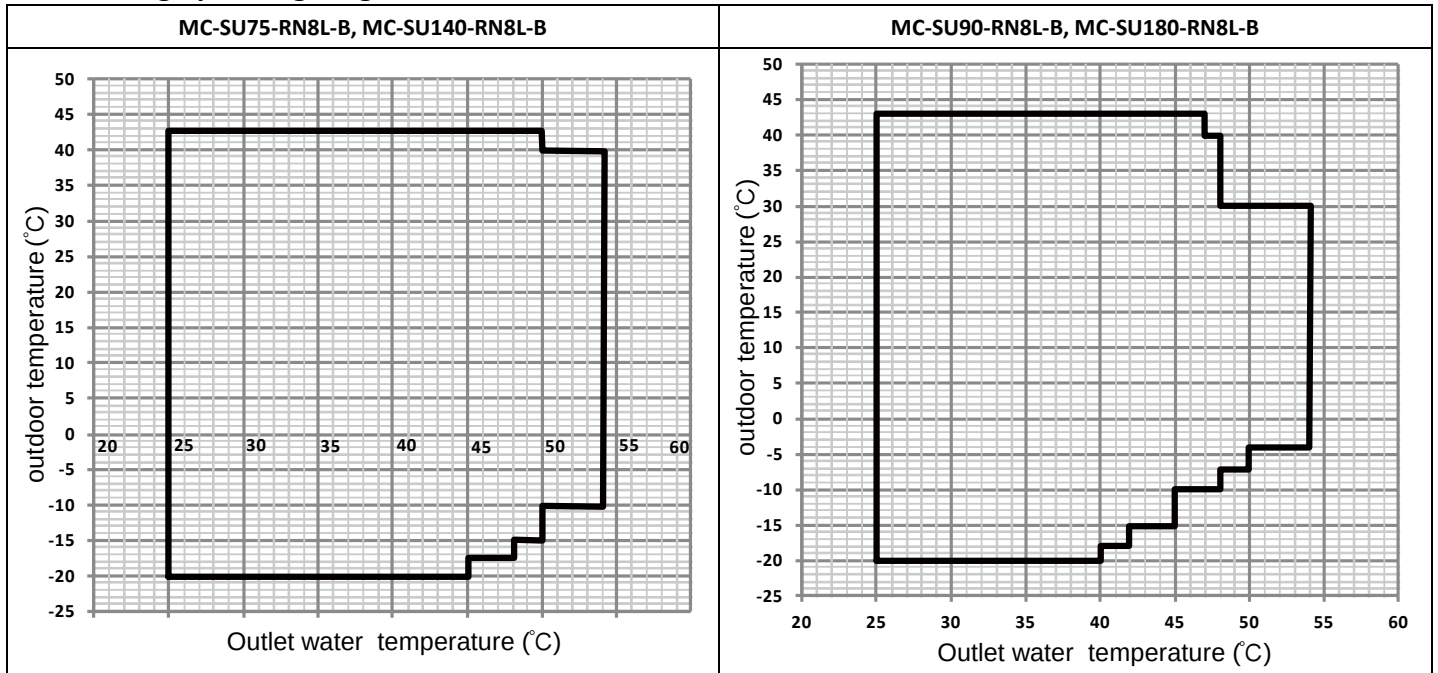
Low leaving water temperature mode

Low leaving water temperature mode can be set through wired controller, please refer to the Operation Manual for details. If low leaving water temperature function is effective, the operation range will extend to the red frame above. When the set temperature is less than 5℃, antifreeze liquid (concentration above 15%) should be added in the water system, otherwise the unit will be damaged.
- ③

T4: Ambient temperature

Two: Leaving water temperature

## 2.2 Heating operating range





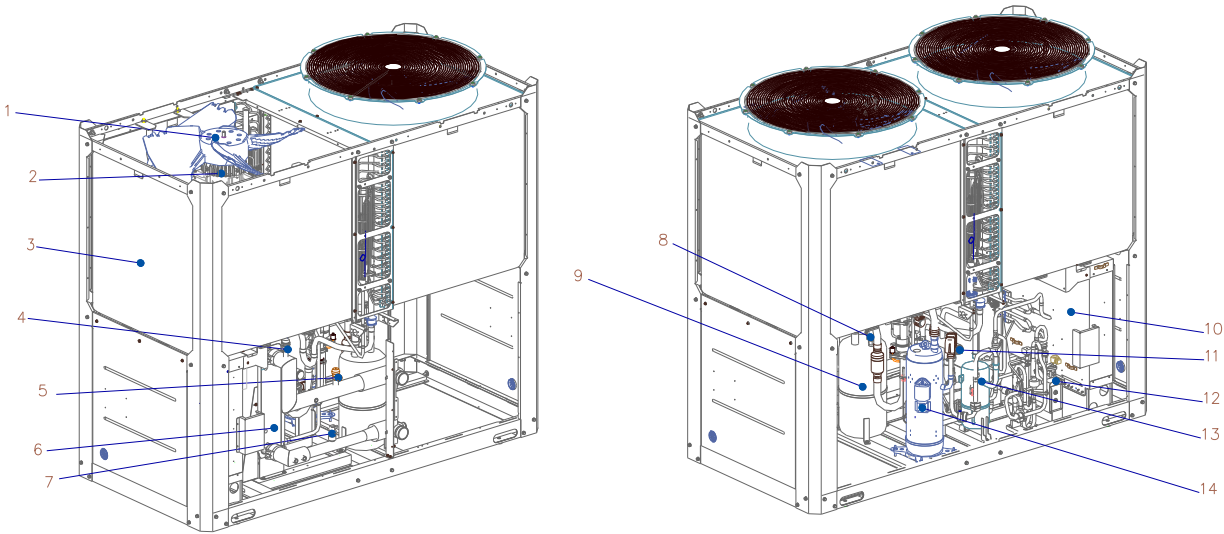


## Part 2

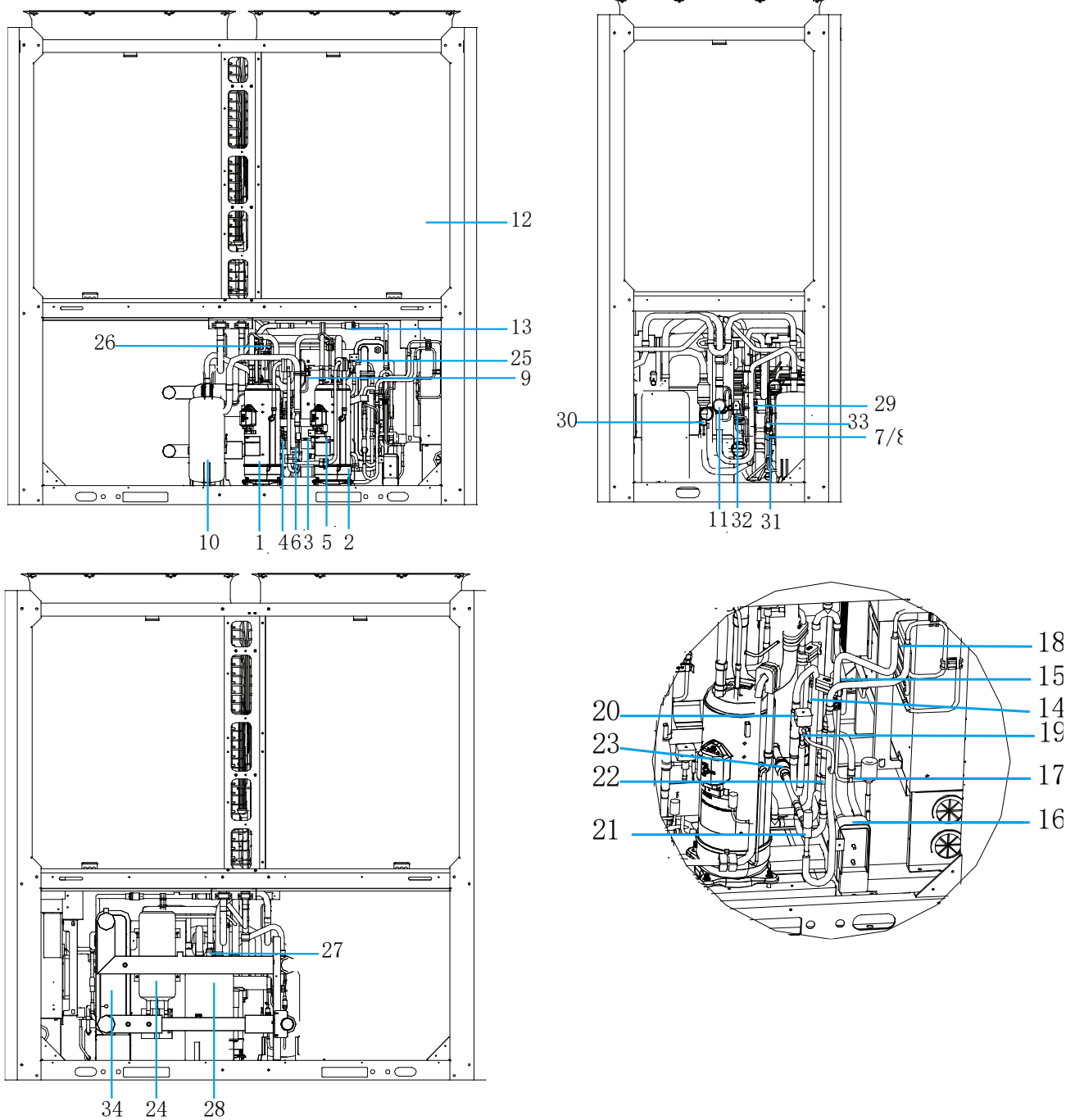
# Component Layout and Refrigerant Circuits

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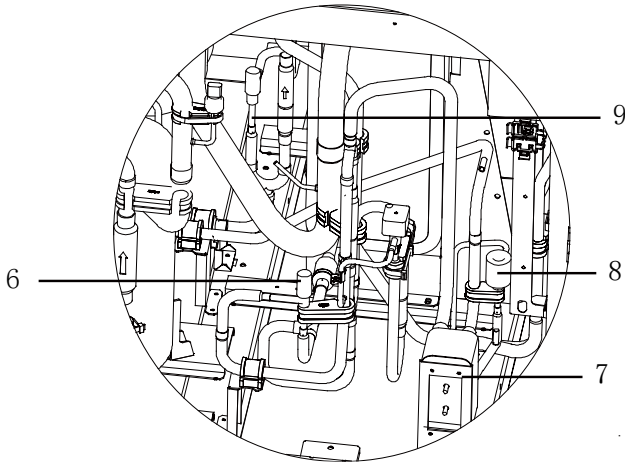
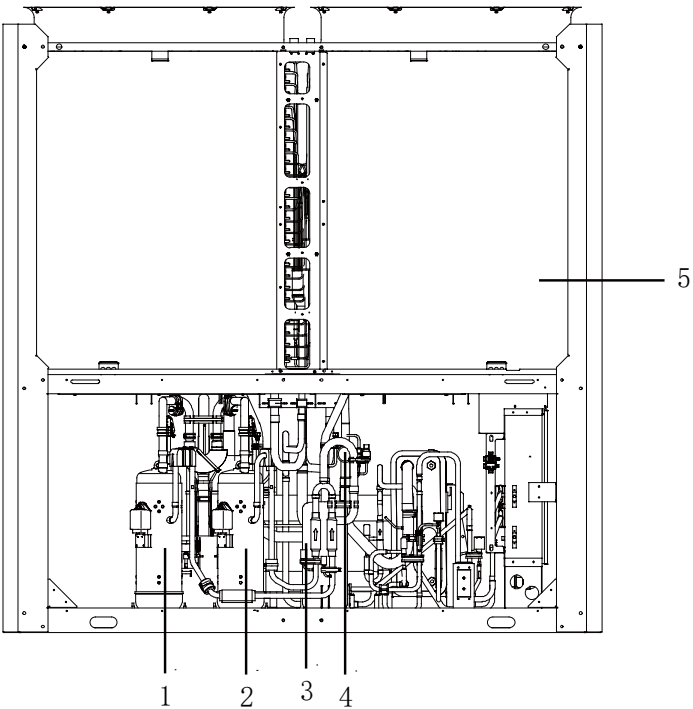
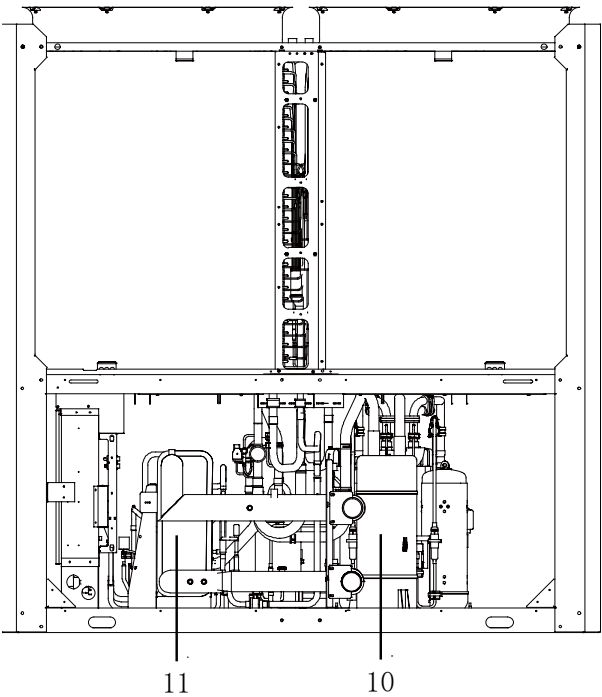
1 Layout of Functional Components



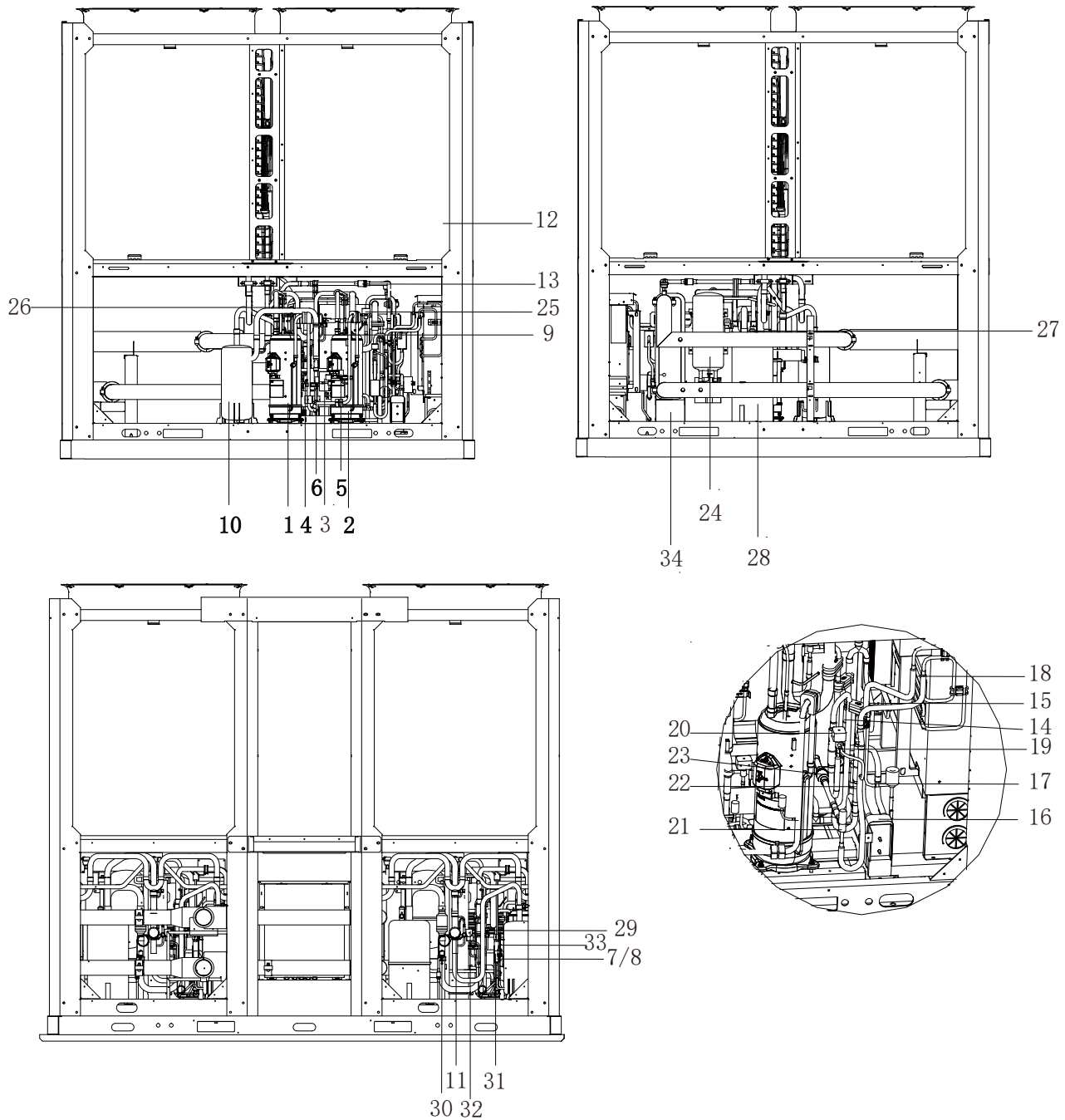
| Component list of MC-SU75-RN8L-B |                           |    |                                 |    |                               |
|----------------------------------|---------------------------|----|---------------------------------|----|-------------------------------|
| 1                                | Axial fan                 | 6  | Plate heating exchanger         | 11 | Four-way valve                |
| 2                                | Brushless DC Motor        | 7  | Flow switch                     | 12 | Plate heating exchanger       |
| 3                                | Condenser                 | 8  | Safety valve (Refrigerant side) | 13 | Oil separator                 |
| 4                                | Exhaust valve             | 9  | Gas-liquid separator            | 14 | DC inverter scroll compressor |
| 5                                | Safety valve (Water side) | 10 | Electric control box            |    |                               |



| Component list of MC-SU90-RN8L-B |                                  |       |                                 |       |                                  |
|----------------------------------|----------------------------------|-------|---------------------------------|-------|----------------------------------|
| 1                                | Compressor 1                     | 13    | Filter                          | 24    | Liquid storage tank              |
| 2                                | Compressor 2                     | 14    | One-way valve                   | 25    | Solenoid valve suit              |
| 3                                | Vapor injection solenoid valve 1 | 15    | Electronic expansion valve      | 26    | Pressure sensor                  |
| 4                                | Vapor injection solenoid valve 2 | 16    | Plate heating exchanger         | 27    | Safety valve                     |
| 5/6                              | High pressure switch             | 17    | Electronic expansion valve      | 28    | Gas-liquid separator             |
| 7/8                              | Filter                           | 18    | Heat sink assembly              | 29    | Meter connector                  |
| 9                                | Meter connector                  | 19    | Single pass solenoid valve suit | 30    | Low pressure switch              |
| 10                               | Oil separator                    | 20/22 | One way valve                   | 31/33 | Filter                           |
| 11                               | 4-way valve                      | 21    | Electronic expansion valve      | 32    | Solenoid valve suit(Oil balance) |
| 12                               | Condenser                        | 23    | Filter                          | 34    | Plate heat exchanger             |



| Component list of MC-SU140-RN8L-B |                          |   |                                  |    |                            |
|-----------------------------------|--------------------------|---|----------------------------------|----|----------------------------|
| 1                                 | DC inverter compressor 1 | 5 | Condenser                        | 9  | Electronic expansion valve |
| 2                                 | DC inverter compressor 2 | 6 | Electronic expansion valve       | 10 | Gas-liquid separator       |
| 3                                 | Oil seperator            | 7 | Brazing plates heating exchanger | 11 | Plate heat exchanger       |
| 4                                 | 4-way valve              | 8 | Electronic expansion valve       |    |                            |



Component list of MC-SU180-RN8L-B

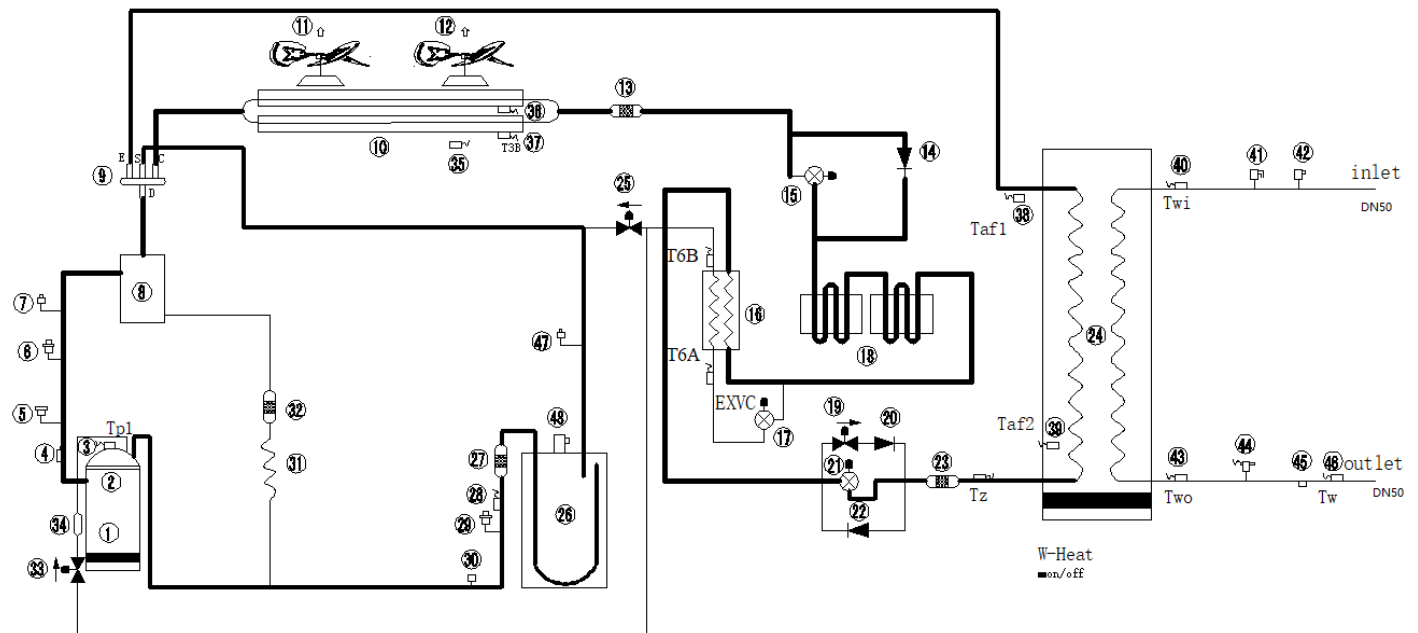
|    |                                           |    |                                  |    |                                 |
|----|-------------------------------------------|----|----------------------------------|----|---------------------------------|
| 1  | DC inverter compressor 1                  | 13 | Filter                           | 25 | Single pass solenoid valve suit |
| 2  | DC inverter compressor 2                  | 14 | One-way valve                    | 26 | Pressure sensor                 |
| 3  | Enhanced vapor injection solenoid valve 1 | 15 | Electronic expansion valve       | 27 | Safety valve                    |
| 4  | Enhanced vapor injection solenoid valve 2 | 16 | Brazing plates heating exchanger | 28 | Gas-liquid separator            |
| 5  | High pressure switch                      | 17 | Electronic expansion valve       | 29 | Meter connector                 |
| 6  | High pressure switch                      | 18 | Heat sink assembly               | 30 | Low pressure switch             |
| 7  | Filter                                    | 19 | Single pass solenoid valve suit  | 31 | Filter                          |
| 8  | Filter                                    | 20 | One way valve                    | 32 | Single pass solenoid valve suit |
| 9  | Meter connector                           | 21 | Electronic expansion valve       | 33 | Filter                          |
| 10 | 4-way valve                               | 22 | One way valve                    | 34 | Plate heat exchanger            |
| 11 | Oil seperator                             | 23 | Filter                           |    |                                 |
| 12 | Condenser                                 | 24 | Liquid storage tank              |    |                                 |

# Aqua thermal



## 2 Piping Diagrams

MC-SU75-RN8L-B



### Legend

|    |                                           |    |                                         |
|----|-------------------------------------------|----|-----------------------------------------|
| 1  | Crankcase heater                          | 25 | Solenoid valve                          |
| 2  | DC inverter compressor                    | 26 | Vapor-liquid separator                  |
| 3  | Discharge temperature sensor 1            | 27 | Filter                                  |
| 4  | Discharge temperature switch 1            | 28 | Suction temperature sensor              |
| 5  | High pressure switch                      | 29 | Low pressure sensor                     |
| 6  | High pressure sensor                      | 30 | Low pressure switch                     |
| 7  | Pin valve (Discharge side)                | 31 | Capillary                               |
| 8  | Oil separator                             | 32 | Filter                                  |
| 9  | 4-way-valve                               | 33 | Enhanced vapor injection solenoid valve |
| 10 | Condenser                                 | 34 | Muffler                                 |
| 11 | DC fan 1                                  | 35 | Ambient temperature sensor              |
| 12 | DC fan 2                                  | 36 | temperature sensor                      |
| 13 | Filter                                    | 37 | temperature sensor                      |
| 14 | One-way valve                             | 38 | Antifreeze temperature sensor 1         |
| 15 | Heating Electronic expansion valve        | 39 | Antifreeze temperature sensor 2         |
| 16 | Plate heat exchanger (Economizer)         | 40 | Entering water temperature sensor       |
| 17 | EVI Electronic expansion valve            | 41 | Safety valve                            |
| 18 | Coil for cooling electronic control board | 42 | Air purge valve                         |
| 19 | Liquid side bypass solenoid valve         | 43 | Leaving water temperature sensor        |
| 20 | One-way valve                             | 44 | Water flow switch                       |
| 21 | Cooling Electronic expansion valve        | 45 | Water drain                             |
| 22 | One-way valve                             | 46 | Total leaving water temperature sensor  |
| 23 | Filter                                    | 47 | Pin valve (Suction side)                |
| 24 | Plate heat exchanger                      | 48 | Safety valve                            |

**Key components:****1. Compressor:**

Maintains pressure differential between high and low pressure sides of the refrigerant system.

**2. Fan:**

Ventilates the air side heat exchanger.

**3. Air side heat exchanger:**

In the cooling mode, the heat of the refrigerant from the water side heat exchanger can be released into the air.

In the heating mode, the refrigerant can absorb the heat in the air and provide it to the water side heat exchanger.

**4. Water side heat exchanger:**

In cooling mode, the refrigerant can absorb heat from the water and reduce the temperature of the water.

In heating mode, the refrigerant can release heat into the water and increase the temperature of the water.

**5. Four-way valve:**

Controls refrigerant flow direction. Closed in cooling mode and open in heating mode. When closed, the air side heat exchanger functions as a condenser and water side heat exchanger functions as an evaporator; when open, the air side heat exchanger functions as an evaporator and water side heat exchanger function as a condenser.

**6. Vapor-liquid separator:**

Stores liquid refrigerant to protect the compressor from liquid hammering.

**7. Oil separator:**

Separates oil from gas refrigerant pumped out of the compressor and quickly returns it to the compressor. Separation efficiency is up to 99%.

**8. Plate heat exchanger (Economizer):**

In cooling mode, it can improve super-cooling degree and the super-cooled refrigerant can achieve better heat exchange in indoor side. In heating mode, the refrigerant comes from the plate heat exchanger going to the compressor can enhance the refrigerant enthalpy and improve the heating capacity in low ambient temperature. Refrigerant volume in plate heat exchanger is controlled according to temperature different between plate heat exchanger inlet and outlet.

**9. Electronic expansion valve:**

Controls refrigerant flow and reduces refrigerant pressure.

**10. Solenoid valve SV5 (defrost):**

Multiple functions for enhancing reliability.

**11. Solenoid valve SV6 (by pass):**

Increase refrigerant flow.

**12. Solenoid valve SV8A, SV8B (injection):**

Enhance enthalpy and capacity.

**13. High and low pressure switches:**

Regulate refrigerant system pressure. When the refrigerant system pressure rises above the upper limit or falls below the lower limit, the high or low pressure switches turn off, stopping the compressor.

**14. Discharge temperature switch:**

Protects the compressor from abnormally high temperatures and transient spikes in temperature.

**15. High pressure sensor:**

Measures compressor discharge side pressure of refrigerant.

**16. Low pressure sensor:**

Measures compressor suction side pressure of refrigerant.

**17. Air purge valve:**

Automatically removes air from the water circuit.

**18. Safety valve (water side):**

Prevents excessive water pressure by opening at 6bar and discharging water from the water circuit.

**19. Water flow switch:**

Detects water flow rate to protect the compressor and water pump in the event of insufficient water flow.



**20. Safety valve (refrigerant side):**

Prevents excessive refrigerant pressure by opening at 42bar and discharging refrigerant from the refrigerant system.

**21. Crankcase heater:**

Prevents refrigerant from mixing with compressor oil when the compressors are stopped.

**22. Water side heat exchanger electric heater:**

Protects the water side heat exchanger from ice formation.

**23. Water flow switch electric heater:**

Protects the water from ice formation.

**24. Pin valve (high and low pressure side):**

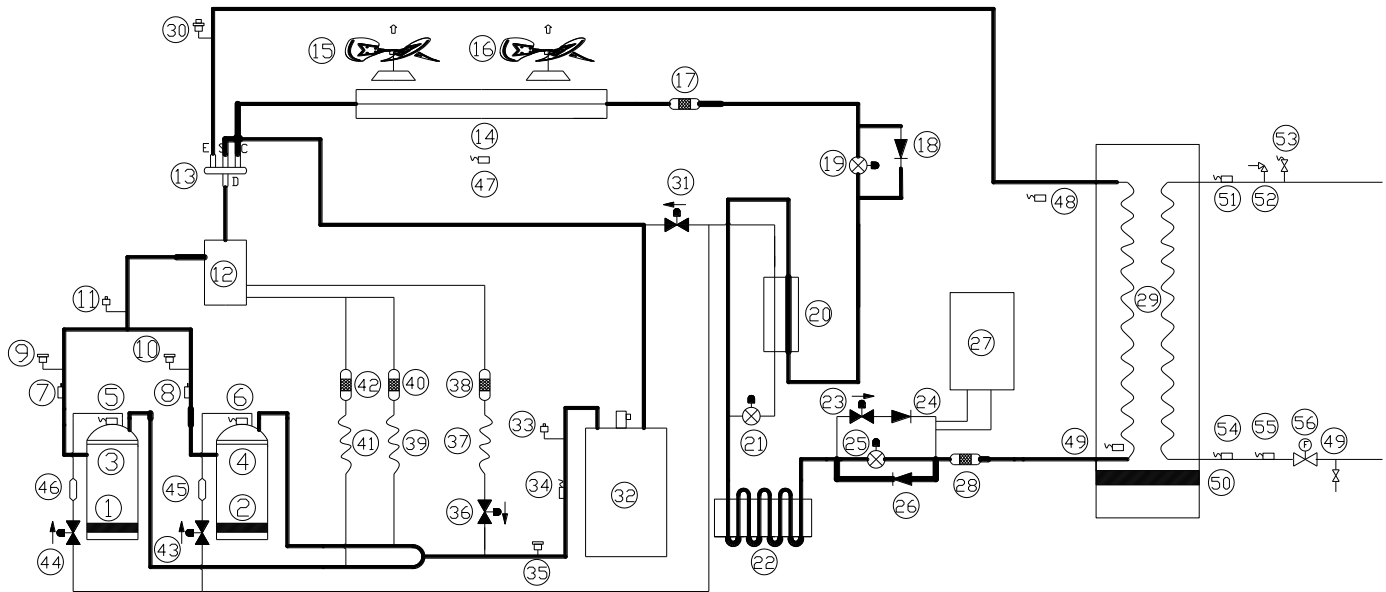
Charges or discharges refrigerant.

**25. Capillary:**

Normally return oil to the compressor.

**26. Wired Controller:**

Control and query the operation status of the unit.



Legend

|    |                                           |    |                                           |
|----|-------------------------------------------|----|-------------------------------------------|
| 1  | Crankcase heater 1                        | 30 | System pressure sensor                    |
| 2  | Crankcase heater 2                        | 31 | Solenoid valve                            |
| 3  | DC inverter compressor 1                  | 32 | Vapor-liquid separator                    |
| 4  | DC inverter compressor 2                  | 33 | Pin valve (Suction side)                  |
| 5  | Discharge temperature sensor 1            | 34 | Suction temperature sensor                |
| 6  | Discharge temperature sensor 2            | 35 | Low pressure switch                       |
| 7  | Discharge temperature switch 1            | 36 | Fast oil return solenoid valve            |
| 8  | Discharge temperature switch 2            | 37 | Capillary                                 |
| 9  | High pressure switch 1                    | 38 | Filter                                    |
| 10 | High pressure switch 2                    | 39 | Capillary                                 |
| 11 | Pin valve (Discharge side)                | 40 | Filter                                    |
| 12 | Oil separator                             | 41 | Capillary                                 |
| 13 | 4-way-valve                               | 42 | Filter                                    |
| 14 | Condenser                                 | 43 | Enhanced vapor injection solenoid valve 1 |
| 15 | DC fan 1                                  | 44 | Enhanced vapor injection solenoid valve 2 |
| 16 | DC fan 2                                  | 45 | Muffler 1                                 |
| 17 | Filter                                    | 46 | Muffler 2                                 |
| 18 | One-way valve                             | 47 | Ambient temperature sensor                |
| 19 | Heating Electronic expansion valve        | 48 | Antifreeze temperature sensor 1           |
| 20 | Plate heat exchanger (Economizer)         | 49 | Antifreeze temperature sensor 2           |
| 21 | EVI electronic expansion valve            | 50 | Water side heat exchanger electric heater |
| 22 | Coil for cooling electronic control board | 51 | Entering water temperature sensor         |
| 23 | Liquid side bypass solenoid valve         | 52 | Safety valve                              |
| 24 | One-way valve                             | 53 | Air purge valve                           |
| 25 | Cooling Electronic expansion valve        | 54 | Leaving water temperature sensor          |
| 26 | One-way valve                             | 55 | Total leaving water temperature sensor    |
| 27 | High pressure tank                        | 56 | Water flow switch                         |
| 28 | Filter                                    | 57 | Manual water drain valve                  |
| 29 | Plate heat exchanger                      |    |                                           |

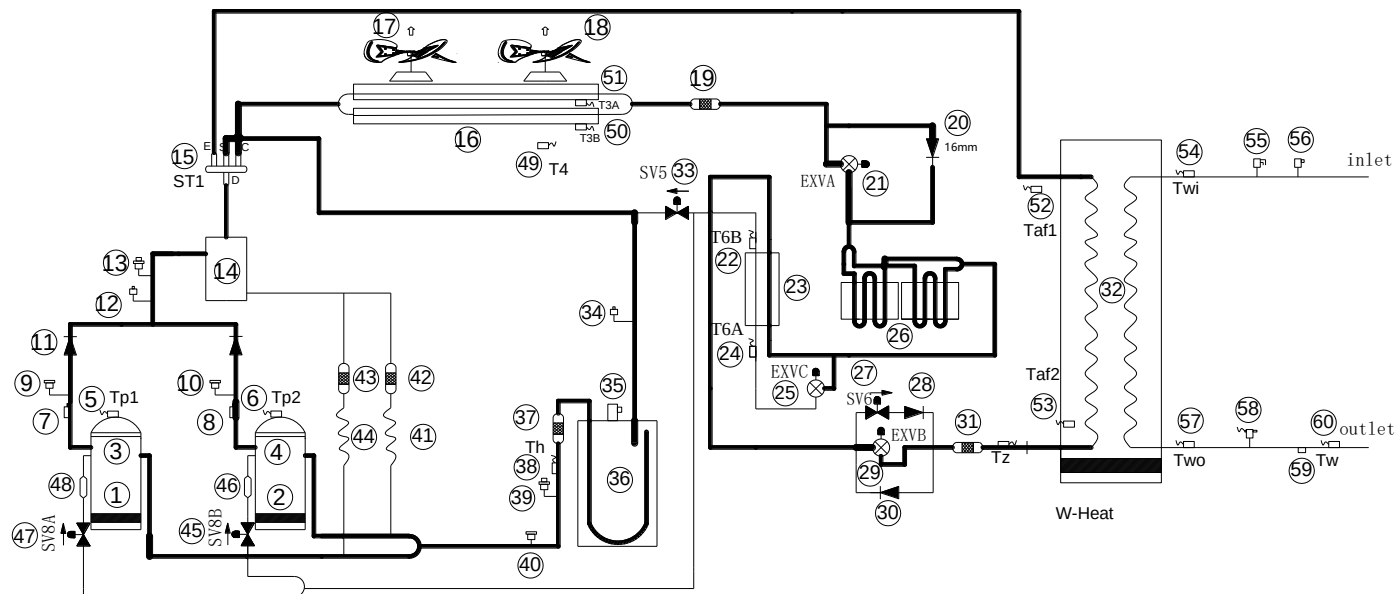
# Aqua thermal



## Key components:

1. **Compressor**  
Maintains pressure differential between high and low pressure sides of the refrigerant system.
2. **Fan:**  
Ventilates the air side heat exchanger.
3. **Oil separator:**  
Separates oil from gas refrigerant pumped out of the compressor and quickly returns it to the compressor. Separation efficiency is up to 99%.
4. **Vapor-liquid separator:**  
Stores liquid refrigerant to protect the compressor from liquid hammering.
5. **Electronic expansion valve:**  
Controls refrigerant flow and reduces refrigerant pressure.
6. **Four-way valve:**  
Controls refrigerant flow direction. Closed in cooling mode and open in heating mode. When closed, the air side heat exchanger functions as a condenser and water side heat exchanger functions as an evaporator; when open, the air side heat exchanger functions as an evaporator and water side heat exchanger function as a condenser.
7. **High and low pressure switches:**  
Regulate refrigerant system pressure. When the refrigerant system pressure rises above the upper limit or falls below the lower limit, the high or low pressure switches turn off, stopping the compressor.
8. **Discharge temperature switch:**  
Protects the compressor from abnormally high temperatures and transient spikes in temperature.
9. **Air purge valve:**  
Automatically removes air from the water circuit.
10. **Safety valve:**  
Prevents excessive water pressure by opening at 6bar and discharging water from the water circuit.
11. **Water flow switch:**  
Detects water flow rate to protect the compressor and water pump in the event of insufficient water flow.
12. **Pressure sensor:**  
Measures refrigerant system pressure.
13. **Crankcase heater:**  
Prevents refrigerant from mixing with compressor oil when the compressors are stopped.
14. **Water side heat exchanger electric heater:**  
Protects the water side heat exchanger from ice formation.
15. **Water flow switch electric heater:**  
Protects the water from ice formation.
16. **Plate heat exchanger(Economizer):**  
In cooling mode, it can improve super-cooling degree and the super-cooled refrigerant can achieve better heat exchange in indoor side. In heating mode, the refrigerant comes from the plate heat exchanger going to the compressor can enhance the refrigerant enthalpy and improve the heating capacity in low ambient temperature. Refrigerant volume in plate heat exchanger is controlled according to temperature different between plate heat exchanger inlet and outlet.
17. **Pin valve (high and low pressure side):**  
Charges or discharges refrigerant.
18. **Capillary:**  
Normally return oil to the compressor.
19. **Solenoid valve SV4(oil balance):**  
Quickly return oil to the compressor.
20. **Solenoid valve SV5(defrost):**  
Multiple functions for enhancing reliability.

21. **Solenoid valve SV6(by pass):**  
Increase refrigerant flow.
22. **Solenoid valve SV8A, SV8B(injection):**  
Enhance enthalpy and capacity.



Legend

|    |                                                         |    |                                           |
|----|---------------------------------------------------------|----|-------------------------------------------|
| 1  | Crankcase heater 1                                      | 31 | Filter                                    |
| 2  | Crankcase heater 2                                      | 32 | Plate heat exchanger                      |
| 3  | DC inverter compressor 1                                | 33 | Solenoid valve                            |
| 4  | DC inverter compressor 2                                | 34 | Pin valve (Suction side)                  |
| 5  | Discharge temperature sensor 1                          | 35 | Safety valve                              |
| 6  | Discharge temperature sensor 2                          | 36 | Vapor-liquid separator                    |
| 7  | Discharge temperature switch 1                          | 37 | Filter                                    |
| 8  | Discharge temperature switch 2                          | 38 | Suction temperature sensor                |
| 9  | High pressure switch 1                                  | 39 | Low pressure sensor                       |
| 10 | High pressure switch 2                                  | 40 | Low pressure switch                       |
| 11 | One-way valve                                           | 41 | Capillary                                 |
| 12 | Pin valve                                               | 42 | Filter                                    |
| 13 | High pressure sensor                                    | 43 | Capillary                                 |
| 14 | Oil separator                                           | 44 | Filter                                    |
| 15 | 4-way-valve                                             | 45 | Enhanced vapor injection solenoid valve 1 |
| 16 | Condenser                                               | 46 | Muffler 1                                 |
| 17 | DC fan 1                                                | 47 | Enhanced vapor injection solenoid valve 2 |
| 18 | DC fan 2                                                | 48 | Muffler 2                                 |
| 19 | Filter                                                  | 49 | Ambient temperature sensor                |
| 20 | One-way valve                                           | 50 | temperature sensor                        |
| 21 | Electronic expansion valve                              | 51 | temperature sensor                        |
| 22 | temperature sensor                                      | 52 | Antifreeze temperature sensor 1           |
| 23 | Plate heat exchanger (Economizer)                       | 53 | Antifreeze temperature sensor 2           |
| 24 | EVI plate heat exchanger refrigerant temperature sensor | 54 | Entering water temperature sensor         |
| 25 | Electronic expansion valve                              | 55 | Safety valve                              |
| 26 | Coil for cooling electronic control board               | 56 | Air purge valve                           |
| 27 | Liquid side bypass solenoid valve                       | 57 | Leaving water temperature sensor          |
| 28 | One-way valve                                           | 58 | Water flow switch                         |
| 29 | Electronic expansion valve                              | 59 | Water drain                               |
| 30 | One-way valve                                           | 60 | Total leaving water temperature sensor    |

**Key components:****1. Compressor**

Maintains pressure differential between high and low pressure sides of the refrigerant system.

**2. Fan:**

Ventilates the air side heat exchanger.

**3. Air side heat exchanger:**

In the cooling mode, the heat of the refrigerant from the water side heat exchanger can be released into the air.

In the heating mode, the refrigerant can absorb the heat in the air and provide it to the water side heat exchanger.

**4. Water side heat exchanger:**

In cooling mode, the refrigerant can absorb heat from the water and reduce the temperature of the water.

In heating mode, the refrigerant can release heat into the water and increase the temperature of the water.

**5. 4-way valve:**

Controls refrigerant flow direction. Closed in cooling mode and open in heating mode. When closed, the air side heat exchanger functions as a condenser and water side heat exchanger functions as an evaporator; when open, the air side heat exchanger functions as an evaporator and water side heat exchanger function as a condenser.

**6. Vapor-liquid separator:**

Stores liquid refrigerant to protect the compressor from liquid hammering.

**7. Oil separator:**

Separates oil from gas refrigerant pumped out of the compressor and quickly returns it to the compressor. Separation efficiency is up to 99%.

**8. Plate heat exchanger (Economizer):**

In cooling mode, it can improve super-cooling degree and the super-cooled refrigerant can achieve better heat exchange in indoor side. In heating mode, the refrigerant comes from the plate heat exchanger going to the compressor can enhance the refrigerant enthalpy and improve the heating capacity in low ambient temperature. Refrigerant volume in plate heat exchanger is controlled according to temperature different between plate heat exchanger inlet and outlet.

**9. Electronic expansion valve:**

Controls refrigerant flow and reduces refrigerant pressure.

**10. Solenoid valve SV5 (defrost):**

Multiple functions for enhancing reliability.

**11. Solenoid valve SV6 (by pass):**

Increase refrigerant flow.

**12. Solenoid valve SV8A, SV8B (injection):**

Enhance enthalpy and capacity.

**13. High and low pressure switches:**

Regulate refrigerant system pressure. When the refrigerant system pressure rises above the upper limit or falls below the lower limit, the high or low pressure switches turn off, stopping the compressor.

**14. Discharge temperature switch:**

Protects the compressor from abnormally high temperatures and transient spikes in temperature.

**15. High pressure sensor:**

Measures compressor discharge side pressure of refrigerant.

**16. Low pressure sensor:**

Measures compressor suction side pressure of refrigerant.

**17. Air purge valve:**

Automatically removes air from the water circuit.

**18. Safety valve (water side):**

Prevents excessive water pressure by opening at 6bar and discharging water from the water circuit.

**19. Water flow switch:**

Detects water flow rate to protect the compressor and water pump in the event of insufficient water flow.

**20. Safety valve (refrigerant side):**

Prevents excessive refrigerant pressure by opening at 42bar and discharging refrigerant from the refrigerant system.

**21. Crankcase heater:**

Prevents refrigerant from mixing with compressor oil when the compressors are stopped.

**22. Water side heat exchanger electric heater:**

Protects the water side heat exchanger from ice formation.

## Aqua thermal



**23. Water flow switch electric heater:**

Protects the water from ice formation.

**24. Pin valve (high and low pressure side):**

Charges or discharges refrigerant.

**25. Capillary:**

Normally return oil to the compressor.

**26. Wired Controller:**

Control and query the operation status of the unit.

**MC-SU180-RN8L-B**

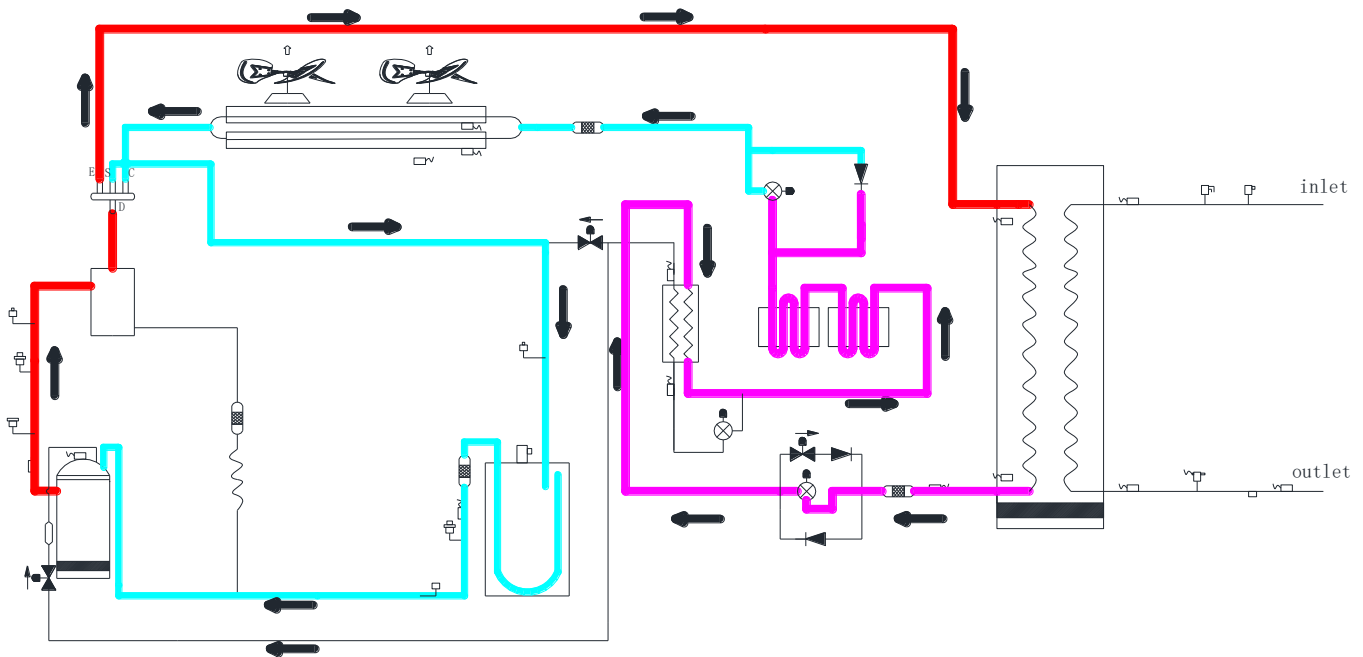
The piping diagrams is the same as MC-SU90-RN8L-B. MC-SU180-RN8L-B system consists of two independent MC-SU90-RN8L-B systems.

### 3 Refrigerant Flow Diagrams

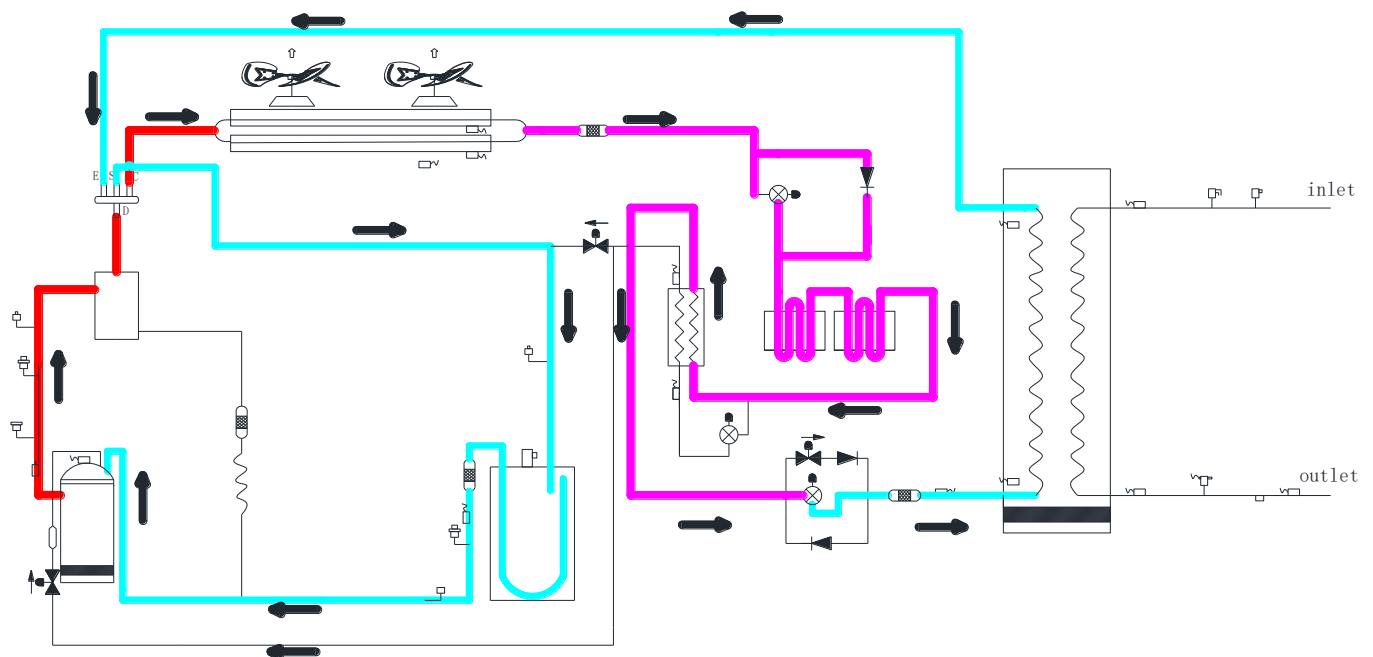
MC-SU75-RN8L-B

- High temperature, high press gas
- High temperature, high press liquid
- Low temperature, low press

#### Heating operation



#### Cooling and defrosting operation

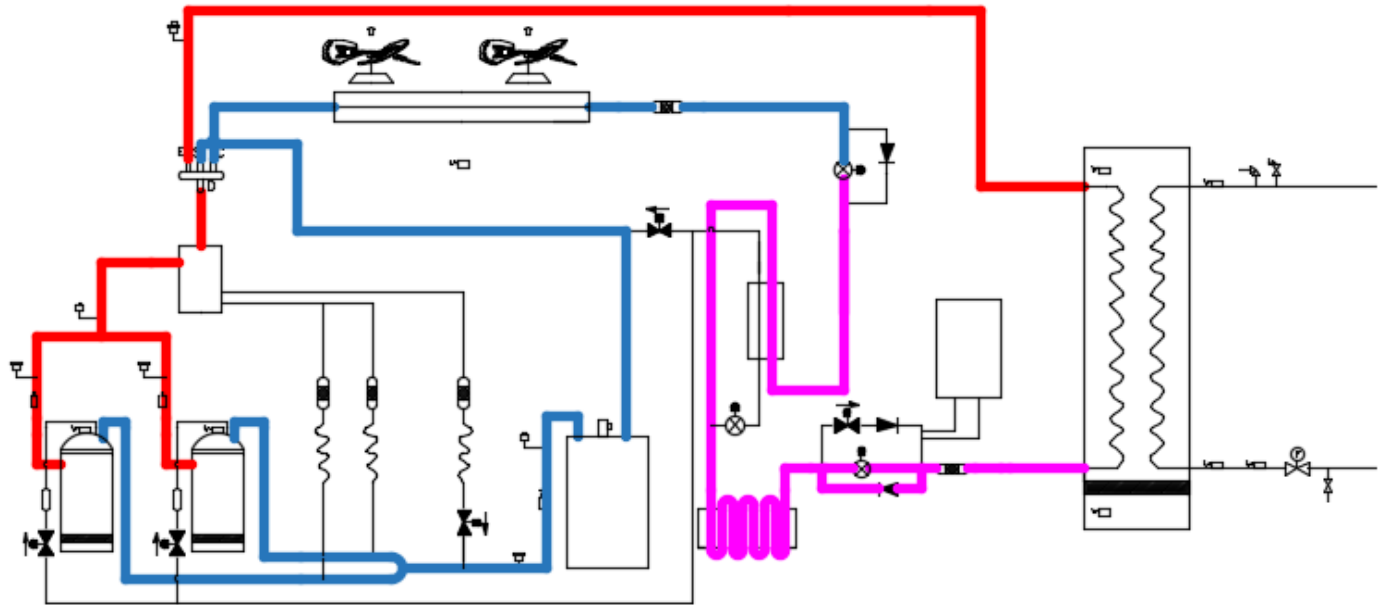




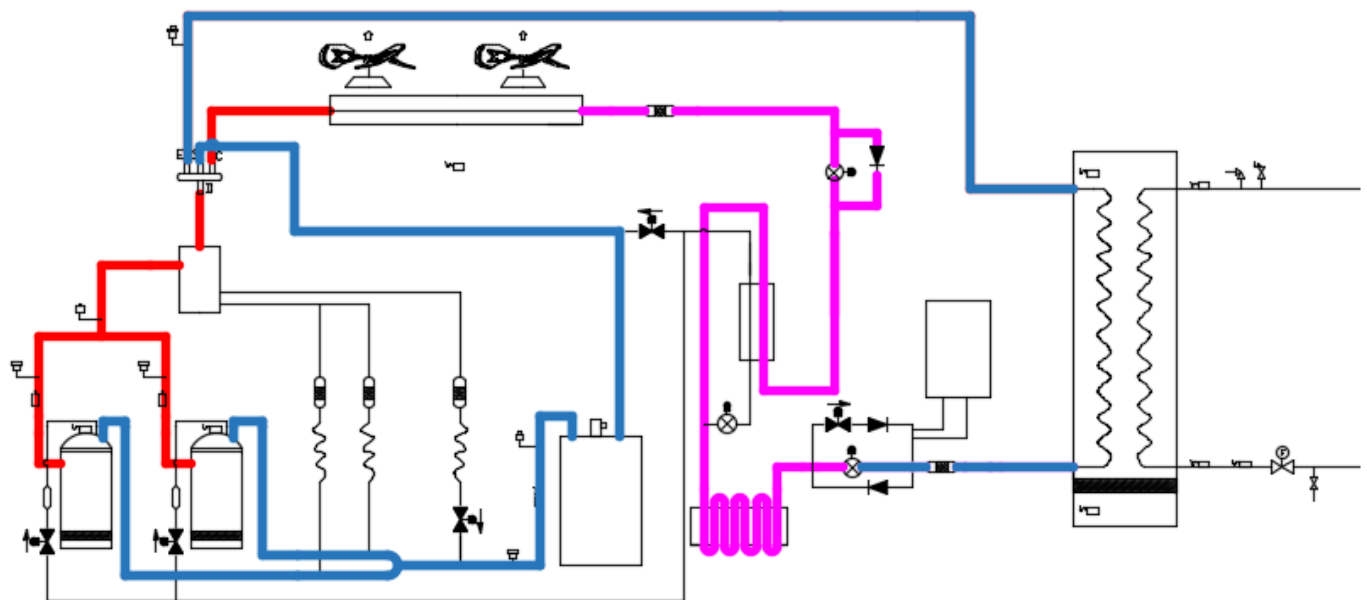
MC-SU90-RN8L-B

- High temperature, high press gas
- High temperature, high press liquid
- Low temperature, low press

## Heating operation



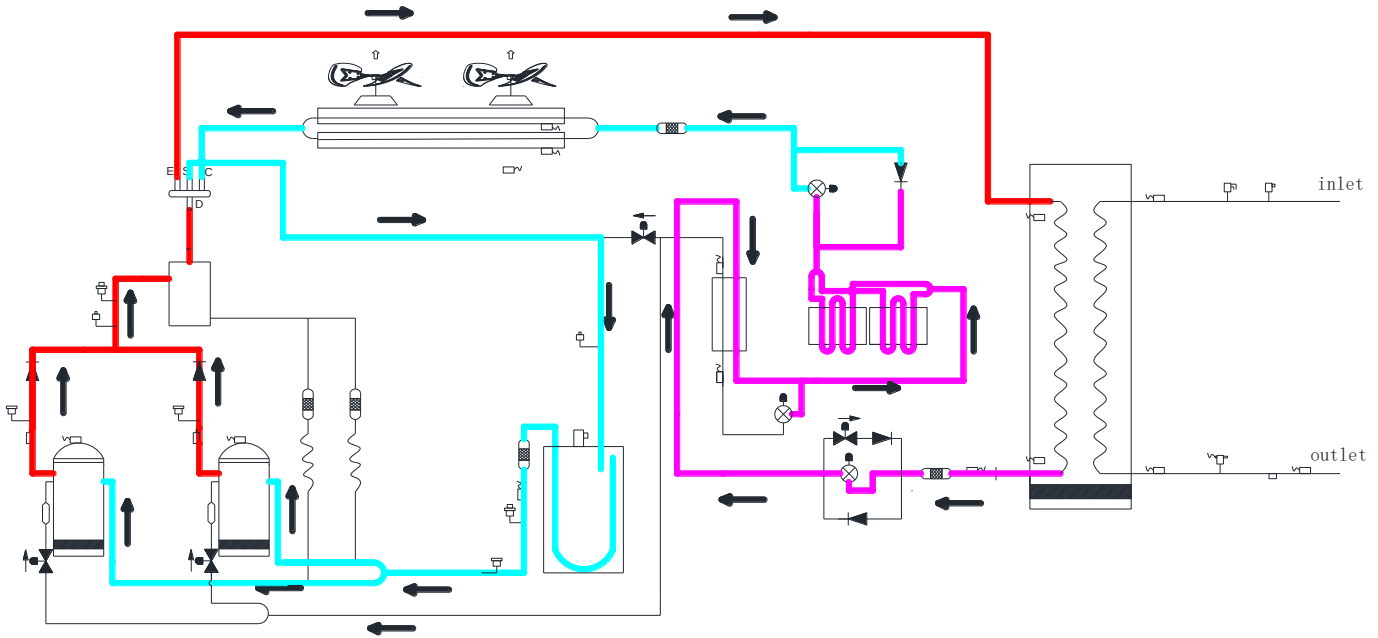
## Cooling and defrosting operation



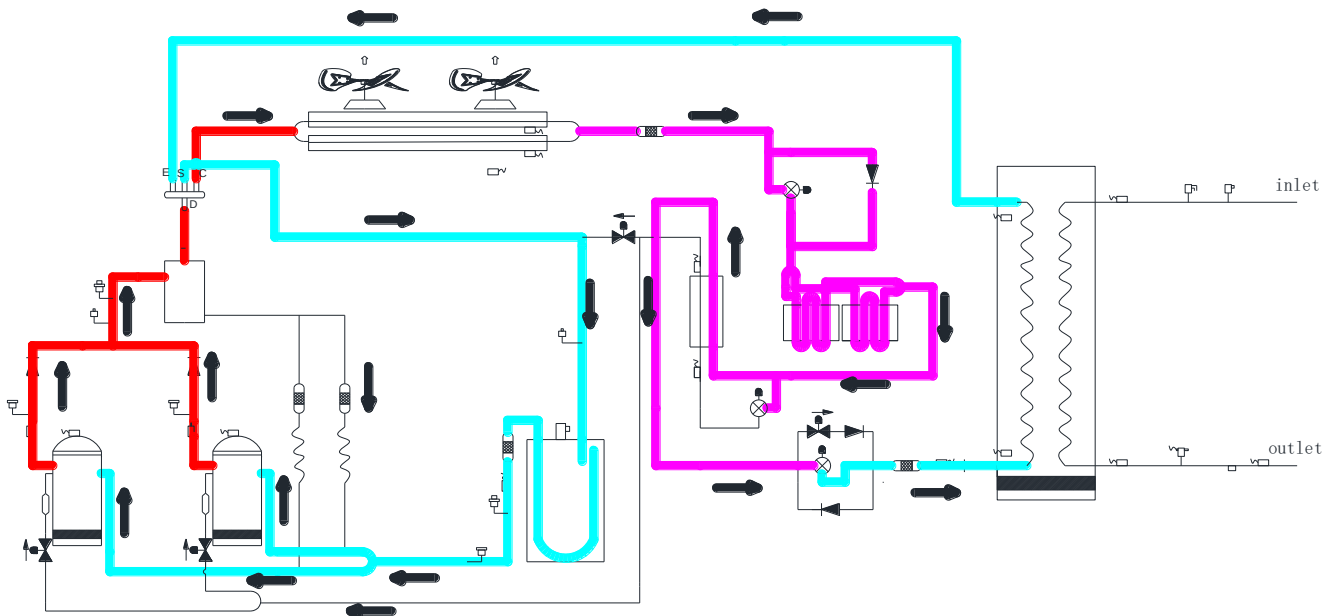
## MC-SU140-RN8L-B

- High temperature, high press gas
- High temperature, high press liquid
- Low temperature, low press

## Heating operation



## Cooling and defrosting operation



## MC-SU180-RN8L-B

The refrigerant flow diagrams is same as MC-SU90-RN8L-B. MC-SU180-RN8L-B system consists of two independent MC-SU90-RN8L-B systems.

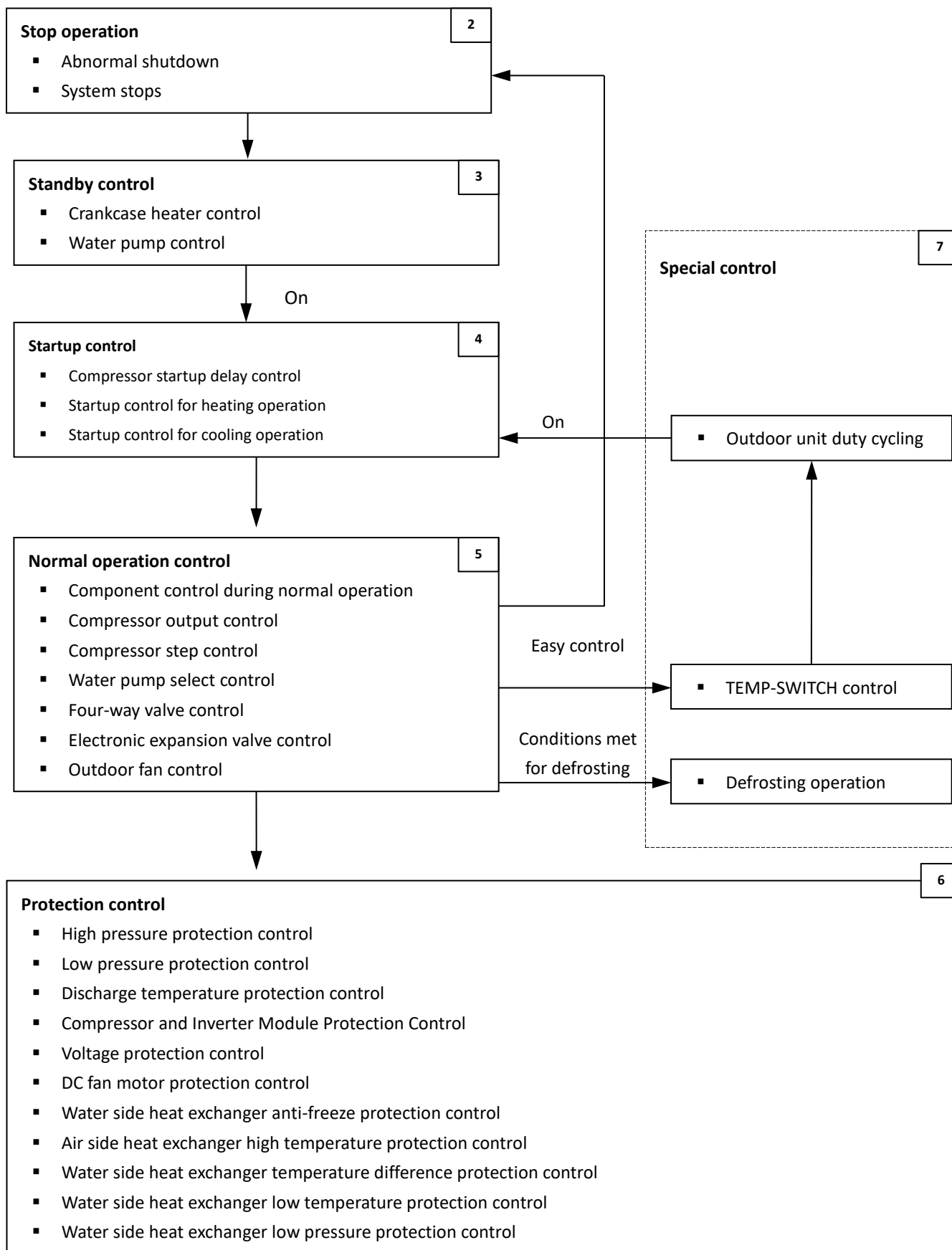


# Part 3

## Control

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## 1 General Control Scheme Flowchart



Note:

1. Numbers in the top right-hand corners of boxes indicate the relevant section of text on the following pages.

## 2 Stop Operation

The stop operation occurs for one of the following reasons:

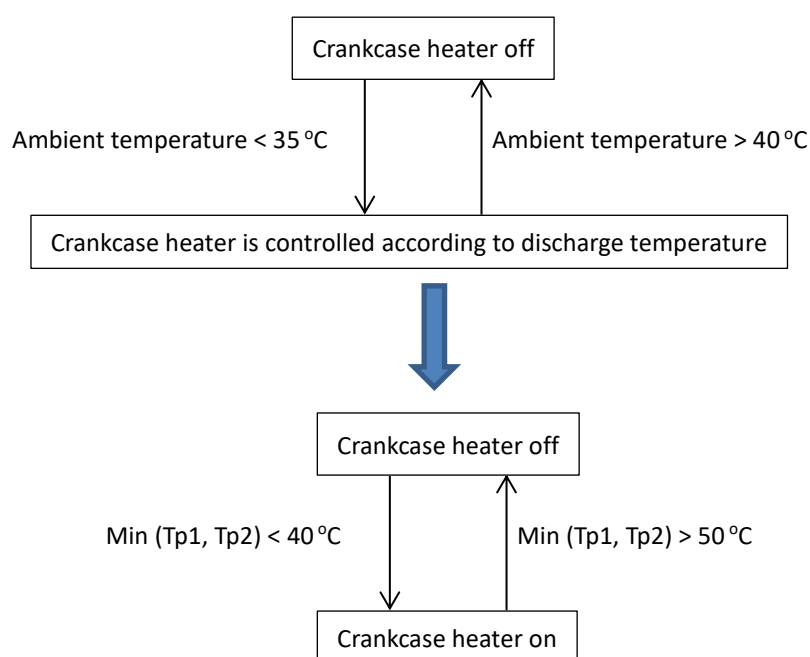
1. Abnormal shutdown: in order to protect the compressors, if an abnormal state occurs the system makes a stop with thermo off operation and an error code is displayed on the outdoor unit's PCB digital displays and on the user interface.
2. The system stops when the set temperature has been reached.

In order to prevent the compressor from starting and stopping frequently and to balance the pressure in the refrigeration system, forcibly stop the compressor for 7 minutes before starting. (Except for special controls such as defrosting).

## 3 Standby Control

### 3.1 Crankcase Heater Control

The crankcase heater is used to prevent refrigerant from mixing with compressor oil when the compressors are stopped. The crankcase heater is controlled according to the outdoor ambient temperature and discharge temperature. When the outdoor ambient temperature is above 40°C, the crankcase heater is off; when the outdoor ambient temperature is below 35°C, the crankcase heater is controlled according to discharge temperature.



Notes:

1. Tp1: discharge temperature sensor 1;
2. Tp2: discharge temperature sensor 2.

### 3.2 Water Pump Control

When the outdoor unit is in standby, the circulator pump run continuously.

## 4 Startup Control

### 4.1 Compressor Startup Delay Control

In initial startup control and restart control (except in defrosting operation), compressor startup is delayed such that a minimum 7 minutes has elapsed since the compressor stopped, in order to prevent frequency compressor on/off and to equalize the pressure within the refrigerant system.

### 4.2 Startup Control for Heating Operation

For MC-SU90-RN8L-B:

| Component                        | Wiring diagram label | 90kW | Control functions and states                                                                                                                                                                             |
|----------------------------------|----------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DC fan motor A                   | Fan A                | ●    | Startup after 4-way valve changes refrigerant flow direction. Controlled according to discharge pressure.                                                                                                |
| DC fan motor B                   | Fan B                | ●    |                                                                                                                                                                                                          |
| Electronic expansion valve A     | EXVA                 | ●    | Step from 0 to 480. Controlled according to discharge temperature superheat.                                                                                                                             |
| Electronic expansion valve B     | EXVB                 | ●    | Step 480                                                                                                                                                                                                 |
| Electronic expansion valve C     | EXVC                 | ●    | Step from 0 to 480. Controlled according to temperature difference between economizer plate heat exchanger inlet and outlet.                                                                             |
| Four-way valve                   | ST1                  | ●    | On                                                                                                                                                                                                       |
| Solenoid valve (oil balance)     | SV4                  | ●    | Closed for 200s, open for 600s, then closed.                                                                                                                                                             |
| Solenoid valve (defrost)         | SV5                  | ●    | Closed                                                                                                                                                                                                   |
| Solenoid valve (by pass)         | SV6                  | ●    | Closed                                                                                                                                                                                                   |
| Solenoid valve (injection)       | SV8A/B               | ●    | Open                                                                                                                                                                                                     |
| Water flow switch                | Water-SW             | ●    | After water pump (field supplied) is turned on for 2min, if water flow switch is open, water pump stops and water flow error code appears. The compressor can be started after the water flow is normal. |
| Electric auxiliary heater (pipe) | -                    | ●    | Controlled according to ambient temperature and total water outlet temperature.                                                                                                                          |
| Crankcase heater                 | CCH                  | ●    | Controlled according to ambient temperature and discharge temperature.                                                                                                                                   |

For MC-SU75-RN8L-B and MC-SU140-RN8L-B:

| Component                  | Wiring diagram label | 75kW | 140kW | Control functions and states                                                                                                                                                     |
|----------------------------|----------------------|------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Water pump                 | PUMP                 | ●    | ●     | Non-standard component: After the pump is turned on for 2 minutes, detect the water flow switch continuously. The compressor can be started only after the water flow is normal. |
| Inverter compressor 1      | BP1                  | ●    | ●     | Control the outlet water temperature. The operating increased and decreased frequency is 1Hz/s, and is executed according to the starting platform.                              |
| Inverter compressor 2      | BP2                  | ●    | ●     |                                                                                                                                                                                  |
| Inverter fan1              | FAN1                 | ●    | ●     | Startup after 4-way valve changes refrigerant flow direction. Controlled according to ambient temperature, discharge pressure and compressor frequency.                          |
| Inverter fan 2             | FAN2                 | ●    | ●     |                                                                                                                                                                                  |
| Electronic expansion valve | EXV-A                | ●    | ●     | Step from 0 to 480. Controlled according to discharge temperature superheat.                                                                                                     |
| Electronic expansion valve | EXV-B                | ●    | ●     | Step 480P                                                                                                                                                                        |
| Electronic expansion valve | EXV-C                | ●    | ●     | Enhanced vapor injection EXV, Step from 0 to 480. Controlled according to temperature difference between                                                                         |

|                                  |          |   |   |                                                                                                                                                                                                          |
|----------------------------------|----------|---|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                  |          |   |   | economizer plate heat exchanger inlet and outlet.                                                                                                                                                        |
| Four-way valve                   | ST1      | ● | ● | Open                                                                                                                                                                                                     |
| Solenoid valve (defrost)         | SV5      | ● | ● | Closed                                                                                                                                                                                                   |
| Solenoid valve (by pass)         | SV6      | ● | ● | Closed                                                                                                                                                                                                   |
| Solenoid valve (injection)       | SV8A/B   | ● | ● | Open                                                                                                                                                                                                     |
| Water flow switch                | Water-SW | ● | ● | After water pump (field supplied) is turned on for 2min, if water flow switch is open, water pump stops and water flow error code appears. The compressor can be started after the water flow is normal. |
| Electric auxiliary heater (pipe) | -        | ● | ● | Controlled according to ambient temperature and total water outlet temperature.                                                                                                                          |
| Crank case heater                | CCH      | ● | ● | Controlled according to ambient temperature and discharge temperature.                                                                                                                                   |

For MC-SU180-RN8L-B:

| Component                  | Wiring diagram label | 180kW | Control functions and states                                                                                                                                                                                 |
|----------------------------|----------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Inverter compressor        | BP1/2                | ●     | Compressor startup program selected according to ambient temperature.                                                                                                                                        |
| DC fan motor               | FAN                  | ●     | Fan run at maximum speed <sup>1</sup> .                                                                                                                                                                      |
| Electronic expansion valve | EXV                  | ●     | Position (steps) from 0 (fully closed) to 480 (fully open), controlled according to outdoor ambient temperature, discharge temperature, suction superheat, compressor speed and refrigerant system pressure. |
| Four-way valve             | ST1                  | ●     | On                                                                                                                                                                                                           |

Notes: 1. Refer to Table 3-4.1 in Part 3, 5.8 "Outdoor Fan Control".

### 4.3 Startup Control for Cooling Operation

For MC-SU90-RN8L-B:

| Component                        | Wiring diagram label | 90kW | Control functions and states                                                                                                                                                                             |
|----------------------------------|----------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DC fan motor A                   | Fan A                | ●    | According to ambient temperature, compressor frequency and air side heat exchanger refrigerant total outlet temperature.                                                                                 |
| DC fan motor B                   | Fan B                | ●    |                                                                                                                                                                                                          |
| Electronic expansion valve A     | EXVA                 | ●    | Step 480                                                                                                                                                                                                 |
| Electronic expansion valve B     | EXVB                 | ●    | Step from 0 to 480. Controlled according to suction temperature superheat.                                                                                                                               |
| Electronic expansion valve C     | EXVC                 | ●    | Step from 0 to 480. Controlled according to temperature difference between economizer plate heat exchanger inlet and outlet.                                                                             |
| Four-way valve                   | ST1                  | ●    | Closed                                                                                                                                                                                                   |
| Solenoid valve (oil balance)     | SV4                  | ●    | Closed for 200s, open for 600s, then closed.                                                                                                                                                             |
| Solenoid valve (defrost)         | SV5                  | ●    | Closed                                                                                                                                                                                                   |
| Solenoid valve (by pass)         | SV6                  | ●    | Open for 600s then closed.                                                                                                                                                                               |
| Solenoid valve (injection)       | SV8A/B               | ●    | Open                                                                                                                                                                                                     |
| Water side heat exchanger heater | -                    | ●    | According to water side heat exchanger anti-freezing temperature.                                                                                                                                        |
| Water flow switch                | Water-SW             | ●    | After water pump (field supplied) is turned on for 2min, if water flow switch is open, water pump stops and water flow error code appears. The compressor can be started after the water flow is normal. |
| Water flow switch heater         |                      | ●    | Controlled according to ambient temperature, water inlet temperature and water outlet temperature.                                                                                                       |
| Crank case heater                | CCH                  |      | Controlled according to ambient temperature and discharge temperature.                                                                                                                                   |



## Aqua thermal



For MC-SU75-RN8L-B and MC-SU140-RN8L-B:

| Component                  | Wiring diagram label | 75kW | 140kW | Control functions and states                                                                                                                                                                             |
|----------------------------|----------------------|------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Water pump                 | PUMP                 | ●    | ●     | Non-standard component: After the pump is turned on for 2 minutes, detect the water flow switch continuously. The compressor can be started only after the water flow is normal.                         |
| Inverter compressor 1      | BP1                  | ●    | ●     | Control the outlet water temperature. The operating increased and decreased frequency is 1Hz/s, and is executed according to the starting platform.                                                      |
| Inverter compressor 2      | BP2                  | ●    | ●     |                                                                                                                                                                                                          |
| Inverter fan1              | FAN1                 | ●    | ●     | Control According to the exhaust pressure of the outdoor unit, the initial target windshield is operated for the first 60s, and then correct every 20-60s.                                               |
| Inverter fan 2             | FAN2                 | ●    | ●     |                                                                                                                                                                                                          |
| Electronic expansion valve | EXV-A                | ●    | ●     | Step from 0 to 480. Controlled according to discharge temperature superheat.                                                                                                                             |
| Electronic expansion valve | EXV-B                | ●    | ●     | Step 480P                                                                                                                                                                                                |
| Electronic expansion valve | EXV-C                | ●    | ●     | Step from 0 to 480. Controlled according to temperature difference between economizer plate heat exchanger inlet and outlet.                                                                             |
| Four-way valve             | ST1                  | ●    | ●     | Open                                                                                                                                                                                                     |
| Solenoid valve (defrost)   | SV5                  | ●    | ●     | Closed                                                                                                                                                                                                   |
| Solenoid valve (by pass)   | SV6                  | ●    | ●     | Open for 600s, then closed.                                                                                                                                                                              |
| Solenoid valve (injection) | SV8A/B               | ●    | ●     | Open                                                                                                                                                                                                     |
| Water flow switch          | Water-SW             | ●    | ●     | After water pump (field supplied) is turned on for 2min, if water flow switch is open, water pump stops and water flow error code appears. The compressor can be started after the water flow is normal. |
| Water flow switch heater   |                      | ●    | ●     | Controlled according to ambient temperature, water inlet temperature and water outlet temperature.                                                                                                       |
| Crank case heater          | CCH                  |      | ●     | Controlled according to ambient temperature and discharge temperature.                                                                                                                                   |

For MC-SU180-RN8L-B:

| Component                  | Wiring diagram label | 180kW | Control functions and states                                                                                                                                                                                 |
|----------------------------|----------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Inverter compressor        | BP1/2                | ●     | Compressor startup program selected according to ambient temperature <sup>1</sup> .                                                                                                                          |
| DC fan motor               | FAN                  | ●     | Fan run at maximum speed <sup>2</sup> .                                                                                                                                                                      |
| Electronic expansion valve | EXV                  | ●     | Position (steps) from 0 (fully closed) to 480 (fully open), controlled according to outdoor ambient temperature, discharge temperature, suction superheat, compressor speed and refrigerant system pressure. |
| Four-way valve             | ST1                  | ●     | Off                                                                                                                                                                                                          |

## 5 Normal Operation Control

### 5.1 Component Control during heating mode

For MC-SU90-RN8L-B:

| Component                        | Wiring diagram label | 90kW | Control functions and states                                                                                                                                                                             |
|----------------------------------|----------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Inverter compressor A            | BP1                  | ●    | Controlled according to load requirement.                                                                                                                                                                |
| Inverter compressor B            | BP2                  | ●    |                                                                                                                                                                                                          |
| DC fan motor A                   | Fan A                | ●    | Startup after 4-way valve changes refrigerant flow direction.<br>Controlled according to discharge pressure.                                                                                             |
| DC fan motor B                   | Fan B                | ●    |                                                                                                                                                                                                          |
| Electronic expansion valve A     | EXVA                 | ●    | Step from 0 to 480. Controlled according to discharge temperature superheat.                                                                                                                             |
| Electronic expansion valve B     | EXVB                 | ●    | Step 480                                                                                                                                                                                                 |
| Electronic expansion valve C     | EXVC                 | ●    | Step from 0 to 480. Controlled according to temperature difference between economizer plate heat exchanger inlet and outlet.                                                                             |
| Four-way valve                   | ST1                  | ●    | On                                                                                                                                                                                                       |
| Solenoid valve (oil balance)     | SV4                  | ●    | Open for 3min after every 17min.                                                                                                                                                                         |
| Solenoid valve (defrost)         | SV5                  | ●    | Closed                                                                                                                                                                                                   |
| Solenoid valve (by pass)         | SV6                  | ●    | Closed                                                                                                                                                                                                   |
| Solenoid valve (injection)       | SV8A/B               | ●    | Open                                                                                                                                                                                                     |
| Water flow switch                | Water-SW             | ●    | After water pump (field supplied) is turned on for 2min, if water flow switch is open, water pump stops and water flow error code appears. The compressor can be started after the water flow is normal. |
| Electric auxiliary heater (pipe) | -                    | ●    | Controlled according to ambient temperature and total water outlet temperature.                                                                                                                          |
| Crank case heater                | c                    | ●    | Controlled according to ambient temperature and discharge temperature.                                                                                                                                   |

For MC-SU75-RN8L-B and MC-SU140-RN8L-B:

| Component                  | Wiring diagram label | 75kW | 140kW | Control functions and states                                                                                                                               |
|----------------------------|----------------------|------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Water pump                 | PUMP                 | ●    | ●     | Open                                                                                                                                                       |
| Inverter compressor 1      | BP1                  | ●    | ●     | Control the outlet water temperature. The operating increased and decreased frequency is 1Hz/s.                                                            |
| Inverter compressor 2      | BP2                  | ●    | ●     |                                                                                                                                                            |
| Inverter fan1              | FAN1                 | ●    | ●     | Startup after 4-way valve changes refrigerant flow direction. Controlled according to ambient temperature, discharge pressure and compressor frequency.    |
| Inverter fan 2             | FAN2                 | ●    | ●     |                                                                                                                                                            |
| Electronic expansion valve | EXV-A                | ●    | ●     | Step from 0 to 480. Controlled according to discharge temperature superheat.                                                                               |
| Electronic expansion valve | EXV-B                | ●    | ●     | Step 480.                                                                                                                                                  |
| Electronic expansion valve | EXV-C                | ●    | ●     | Enhanced vapor injection EXV, Step from 0 to 480. Controlled according to temperature difference between economizer plate heat exchanger inlet and outlet. |
| Four-way valve             | ST1                  | ●    | ●     | Open                                                                                                                                                       |
| Solenoid valve (defrost)   | SV5                  | ●    | ●     | Open during defrost and close at other times.                                                                                                              |
| Solenoid valve (by pass)   | SV6                  | ●    | ●     | Closed                                                                                                                                                     |
| Solenoid valve (injection) | SV8A/B               | ●    | ●     | Open                                                                                                                                                       |

For MC-SU180-RN8L-B:

| Component                  | Wiring diagram label | 180kW | Control functions and states                                                                                                                                                                                 |
|----------------------------|----------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Inverter compressor        | BP1/2                | ●     | Controlled according to load requirement from hydronic system.                                                                                                                                               |
| DC fan motor               | FAN                  | ●     | Controlled according to outdoor heat exchanger pipe temperature.                                                                                                                                             |
| Electronic expansion valve | EXV                  | ●     | Position (steps) from 0 (fully closed) to 480 (fully open), controlled according to outdoor ambient temperature, discharge temperature, suction superheat, compressor speed and refrigerant system pressure. |
| Four-way valve             | ST1                  | ●     | On                                                                                                                                                                                                           |

## 5.2 Component control during cooling mode

For MC-SU90-RN8L-B:

| Component                        | Wiring diagram label | 90kW | Control functions and states                                                                                                                                                                             |
|----------------------------------|----------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Inverter compressor A            | BP1                  | ●    | Controlled according to load requirement.                                                                                                                                                                |
| Inverter compressor B            | BP2                  | ●    |                                                                                                                                                                                                          |
| DC fan motor A                   | Fan A                | ●    | Controlled according to ambient temperature and discharge pressure and air side heat exchanger refrigerant temperature.                                                                                  |
| DC fan motor B                   | Fan B                | ●    |                                                                                                                                                                                                          |
| Electronic expansion valve A     | EXVA                 | ●    | Step 480                                                                                                                                                                                                 |
| Electronic expansion valve B     | EXVB                 | ●    | Step from 0 to 480. Controlled according to suction temperature superheat.                                                                                                                               |
| Electronic expansion valve C     | EXVC                 | ●    | Step from 0 to 480. Controlled according to temperature difference between economizer plate heat exchanger inlet and outlet.                                                                             |
| Four-way valve                   | ST1                  | ●    | Closed                                                                                                                                                                                                   |
| Solenoid valve (oil balance)     | SV4                  | ●    | Open for 3min after every 17min.                                                                                                                                                                         |
| Solenoid valve (defrost)         | SV5                  | ●    | Closed                                                                                                                                                                                                   |
| Solenoid valve (by pass)         | SV6                  | ●    | Closed                                                                                                                                                                                                   |
| Solenoid valve (injection)       | SV8A/B               | ●    | Open                                                                                                                                                                                                     |
| Water side heat exchanger heater | -                    | ●    | According to water side heat exchanger anti-freezing temperature.                                                                                                                                        |
| Water flow switch                | Water-SW             | ●    | After water pump (field supplied) is turned on for 2min, if water flow switch is open, water pump stops and water flow error code appears. The compressor can be started after the water flow is normal. |
| Water flow switch heater         | -                    | ●    | Controlled according to ambient temperature, water inlet temperature and water outlet temperature.                                                                                                       |
| Crank case heater                | CCH                  | ●    | Controlled according to ambient temperature and discharge temperature.                                                                                                                                   |

For MC-SU75-RN8L-B and MC-SU140-RN8L-B:

| Component                  | Wiring diagram label | 75kW | 140kW | Control functions and states                                                                                   |
|----------------------------|----------------------|------|-------|----------------------------------------------------------------------------------------------------------------|
| Inverter compressor 1      | BP1                  | ●    | ●     | Control the outlet water temperature. The operating increased and decreased frequency is 1Hz/s.                |
| Inverter compressor 2      | BP2                  | ●    | ●     |                                                                                                                |
| Inverter fan1              | FAN1                 | ●    | ●     | Control according to the exhaust pressure of the outdoor unit. Correct every 20-60s, and adjust in 0-32 gears. |
| Inverter fan 2             | FAN2                 | ●    | ●     |                                                                                                                |
| Electronic expansion valve | EXV-A                | ●    | ●     | Step 480.                                                                                                      |

|                                  |          |   |   |                                                                                                                                                                                                          |
|----------------------------------|----------|---|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Electronic expansion valve       | EXV-B    | ● | ● | Step from 0 to 480. Controlled according to discharge temperature superheat.                                                                                                                             |
| Electronic expansion valve       | EXV-C    | ● | ● | Enhanced vapor injection EXV, Step from 0 to 480. Controlled according to temperature difference between economizer plate heat exchanger inlet and outlet.                                               |
| Four-way valve                   | ST1      | ● | ● | Closed                                                                                                                                                                                                   |
| Solenoid valve (defrost)         | SV5      | ● | ● | Closed                                                                                                                                                                                                   |
| Solenoid valve (by pass)         | SV6      | ● | ● | Closed                                                                                                                                                                                                   |
| Solenoid valve (injection)       | SV8A/B   | ● | ● | Open                                                                                                                                                                                                     |
| Water side heat exchanger heater | -        | ● | ● | According to water side heat exchanger anti-freezing temperature                                                                                                                                         |
| Water flow switch                | Water-SW | ● | ● | After water pump (field supplied) is turned on for 2min, if water flow switch is open, water pump stops and water flow error code appears. The compressor can be started after the water flow is normal. |
| Water flow switch heater         | -        | ● | ● | Controlled according to ambient temperature, water inlet temperature and water outlet temperature                                                                                                        |
| Crank case heater                | CCH      | ● | ● | Controlled according to ambient temperature and discharge temperature                                                                                                                                    |

For MC-SU180-RN8L-B:

| Component                  | Wiring diagram label | 180kW | Control functions and states                                                                                                                                                                                 |
|----------------------------|----------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Inverter compressor        | BP1/2                | ●     | Controlled according to load requirement from hydronic system.                                                                                                                                               |
| DC fan motor               | FAN                  | ●     | Controlled according to outdoor heat exchanger pipe temperature.                                                                                                                                             |
| Electronic expansion valve | EXV                  | ●     | Position (steps) from 0 (fully closed) to 480 (fully open), controlled according to outdoor ambient temperature, discharge temperature, suction superheat, compressor speed and refrigerant system pressure. |
| Four-way valve             | ST1                  | ●     | Off                                                                                                                                                                                                          |

### 5.3 Compressor Output Control

The compressor rotation speed is controlled according to the load requirement. Before compressor startup, the outdoor unit determines the compressor target speed according to outdoor ambient temperature, discharge temperature and then runs the appropriate compressor startup program. Once the startup program is complete, the compressor runs at the target rotation speed.

The compressor speed is controlled according to two parts in normal operation:

In cooling mode: In a single system, the compressor speed is controlled according to the water outlet temperature and water outlet setting temperature. In a combination system, the compressor of master unit is controlled according total water outlet temperature and water outlet setting temperature, the compressor of the slave unit is controlled according to water inlet and water outlet temperature. Both in a single system and combination system, the compressor speed is limited by the inverter module temperature (calculated value), ambient temperature, discharge temperature, discharge pressure and air side heat exchanger refrigerant total outlet temperature.

## Aqua thermal



### 5.4 Compressor Step Control

The running speed of six-pole compressors in rotations per second (rps) is one third of the frequency (in Hz) of the electrical input to the compressor motor. The frequency of the electrical input to the compressor motors can be altered at a rate of 1Hz in two seconds.

### 5.5 Four-way Valve Control

The four-way valve is used to change the direction of refrigerant flow through the water side heat exchanger in order to switch between cooling and heating operations. During heating operation, the four-way valve is on; during cooling and defrosting operation, the four-way valve is off.

### 5.6 Electronic Expansion Valve Control

- **Power-on self-test:**  
When the power is first turned on, the EXV is closed for 700 steps, proofreading the 0-step position, and re-opening at a maximum of 480.
- **Startup:**  
Adjust from 480 to the initial position, (the initial opening is determined by the ambient temperature), maintain for a period of time. EXV is controlled according to suction superheat, exhaust, and compressor speed.
- **When the outdoor unit is in standby:**  
The EXV is at position 480 (steps).
- **When the outdoor unit stops:**  
After the compressor shuts down for 1 minute, the EXV is fully closed first, and then opened to the initial position.

### 5.7 Outdoor Fan Control

For MC-SU75-RN8L-B:

| Fan speed index | Fan speed (rpm) |       |
|-----------------|-----------------|-------|
|                 | FAN A           | FAN B |
| 0               | 0               | 0     |
| 1               | 150             | 0     |
| 2               | 190             | 0     |
| 3               | 230             | 0     |
| 4               | 270             | 0     |
| 5               | 330             | 0     |
| 6               | 150             | 150   |
| 7               | 170             | 170   |
| 8               | 190             | 190   |
| 9               | 210             | 210   |
| 10              | 230             | 230   |
| 11              | 250             | 250   |
| 12              | 270             | 270   |
| 13              | 290             | 290   |
| 14              | 310             | 310   |
| 15              | 330             | 330   |
| 16              | 350             | 350   |
| 17              | 370             | 370   |
| 18              | 400             | 400   |
| 19              | 430             | 430   |
| 20              | 450             | 450   |
| 21              | 470             | 470   |
| 22              | 510             | 510   |
| 23              | 550             | 550   |

|    |     |     |
|----|-----|-----|
| 24 | 580 | 580 |
| 25 | 610 | 610 |
| 26 | 640 | 640 |
| 27 | 680 | 680 |
| 28 | 710 | 710 |
| 29 | 750 | 750 |
| 30 | 780 | 780 |
| 31 | 800 | 800 |
| 32 | 830 | 830 |

For MC-SU90-RN8L-B and MC-SU180-RN8L-B:

| Fan speed index | Fan speed (rpm) |       |
|-----------------|-----------------|-------|
|                 | FAN A           | FAN B |
| 0               | 0               | 0     |
| 1               | 150             | 0     |
| 2               | 190             | 0     |
| 3               | 230             | 0     |
| 4               | 270             | 0     |
| 5               | 330             | 0     |
| 6               | 150             | 150   |
| 7               | 170             | 150   |
| 8               | 170             | 150   |
| 9               | 190             | 170   |
| 10              | 210             | 190   |
| 11              | 230             | 210   |
| 12              | 250             | 230   |
| 13              | 270             | 250   |
| 14              | 290             | 270   |
| 15              | 310             | 290   |
| 16              | 330             | 310   |
| 17              | 350             | 330   |
| 18              | 370             | 350   |
| 19              | 400             | 370   |
| 20              | 430             | 400   |
| 21              | 450             | 430   |
| 22              | 480             | 460   |
| 23              | 500             | 480   |
| 24              | 520             | 500   |
| 25              | 540             | 520   |
| 26              | 560             | 540   |
| 27              | 560             | 540   |
| 28              | 580             | 560   |
| 29              | 580             | 560   |
| 30              | 600             | 580   |
| 31              | 600             | 580   |
| 32              | 620             | 600   |

## Aqua thermal



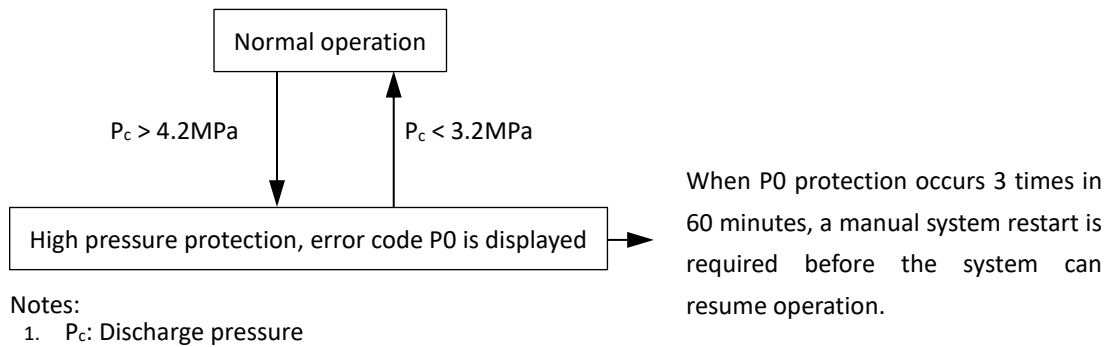
For MC-SU140-RN8L-B:

| Fan speed index | Fan speed (rpm) |       |
|-----------------|-----------------|-------|
|                 | FAN A           | FAN B |
| 0               | 0               | 0     |
| 1               | 150             | 0     |
| 2               | 190             | 0     |
| 3               | 230             | 0     |
| 4               | 270             | 0     |
| 5               | 330             | 0     |
| 6               | 150             | 150   |
| 7               | 170             | 170   |
| 8               | 170             | 170   |
| 9               | 190             | 190   |
| 10              | 210             | 210   |
| 11              | 230             | 230   |
| 12              | 250             | 250   |
| 13              | 270             | 270   |
| 14              | 290             | 290   |
| 15              | 310             | 310   |
| 16              | 330             | 330   |
| 17              | 350             | 350   |
| 18              | 370             | 370   |
| 19              | 400             | 400   |
| 20              | 430             | 430   |
| 21              | 470             | 470   |
| 22              | 510             | 510   |
| 23              | 550             | 550   |
| 24              | 600             | 600   |
| 25              | 650             | 650   |
| 26              | 680             | 680   |
| 27              | 700             | 700   |
| 28              | 720             | 720   |
| 29              | 750             | 750   |
| 30              | 780             | 780   |
| 31              | 800             | 800   |
| 32              | 830             | 830   |

## 6 Protection Control

### 6.1 High Pressure Protection Control

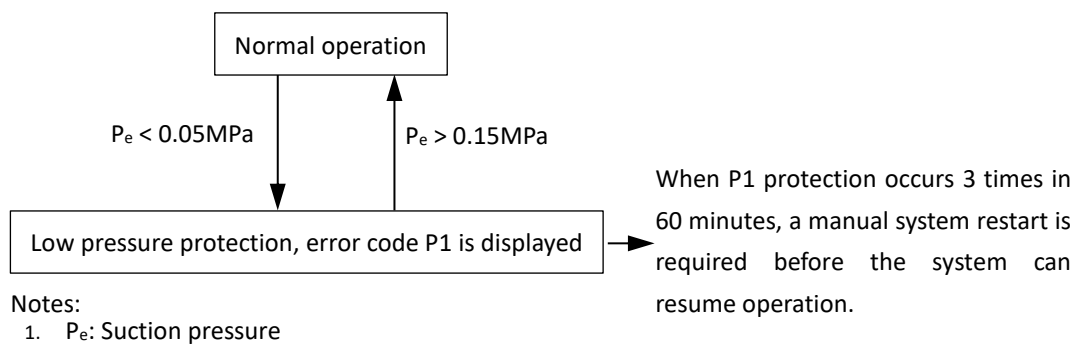
This control protects the refrigerant system from abnormally high pressure and protects the compressor from transient spikes in pressure.



When the discharge pressure rises above 4.2MPa the system displays P0 protection and the faulty unit stops running. When the discharge pressure drops below 3.2MPa, the compressor enters re-start control.

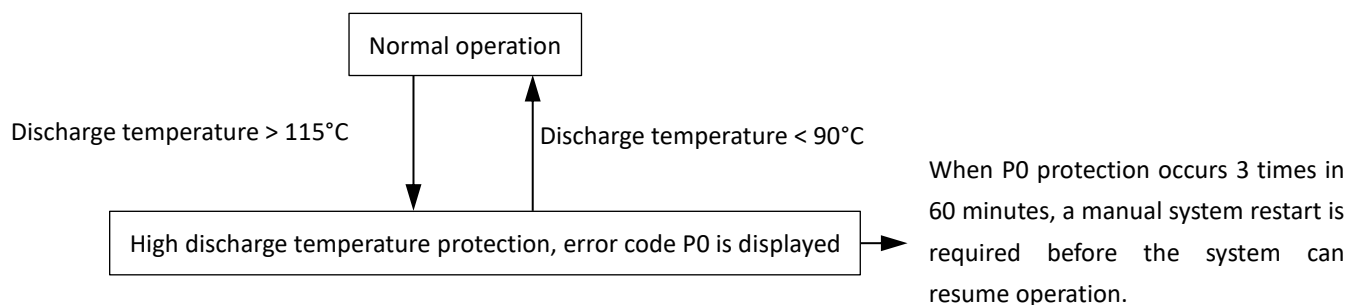
### 6.2 Low Pressure Protection Control

This control protects the refrigerant system from abnormally low pressure and protects the compressor from transient drops in pressure.



### 6.3 Discharge Temperature Protection Control

This control protects the compressor from abnormally high temperatures and transient spikes in temperature.



When the discharge temperature rises above 115°C the system displays P0 protection and the faulty unit stops running. When the discharge temperature drops below 90°C, the compressor enters re-start control.



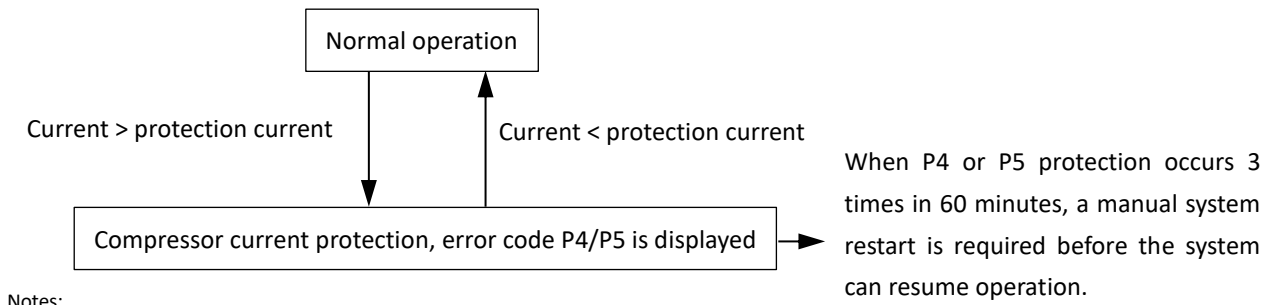
## Aqua thermal



### 6.4 Compressor and Inverter Module Protection Control

For MC-SU75-RN8L-B and MC-SU140-RN8L-B:

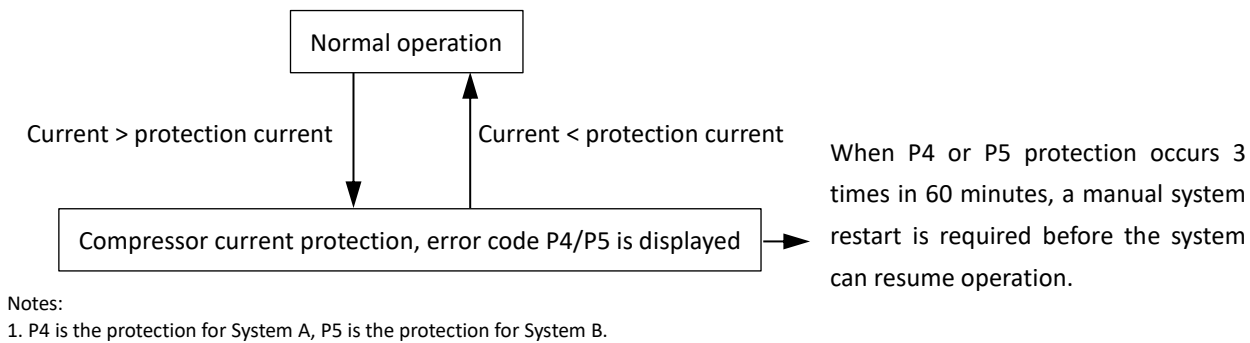
The inverter module board protection current of a single compressor: AC is 53A, bus DC current is 232A.



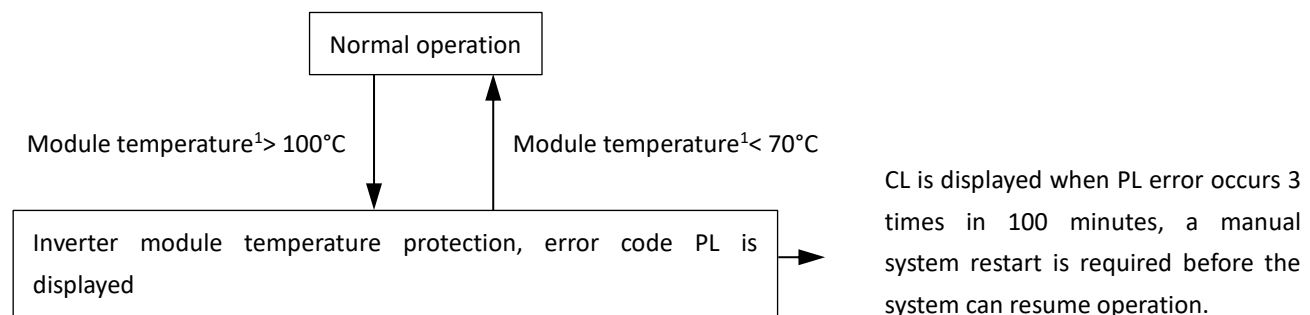
For MC-SU90-RN8L-B and MC-SU180-RN8L-B:

The inverter module board protection current of a single compressor: AC is 60A, bus DC current is 140A.

This control protects the compressors from abnormally high currents and protects the inverter modules from abnormally high temperatures. It is performed for each compressor and inverter module.



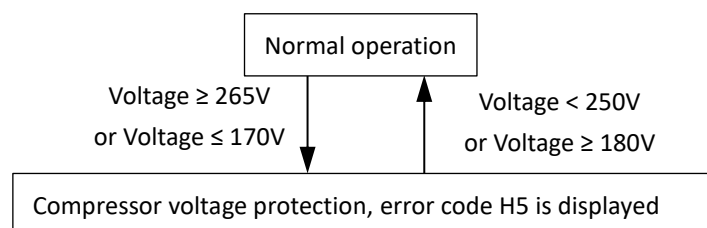
When the compressor current rises above protection current, the system displays P4 or P5 protection and the faulty unit stops running. When the compressor current drops below protection current, the compressor enters re-start control.



When the module temperature rises above 100°C, the system displays PL protection and all the units stop running. When the module temperature drops below 70°C, the compressor enters re-start control.

## 6.5 Voltage Protection Control

This control protects the units from abnormally high or abnormally low voltages.



When the phase voltage of AC power supply is at or above 265V for more than 30 seconds, the system displays H5 protection and the faulty unit stops running. When the phase voltage drops below 250V for more than 30 seconds, the unit restart once the compressor re-start delay has elapsed. When the phase voltage is below 170V for more than 30 seconds, the system displays H5 protection and all the units stop running. When the AC voltage rises to at or above 180V for more than 30 seconds, the refrigerant system restarts once the compressor re-start delay has elapsed.

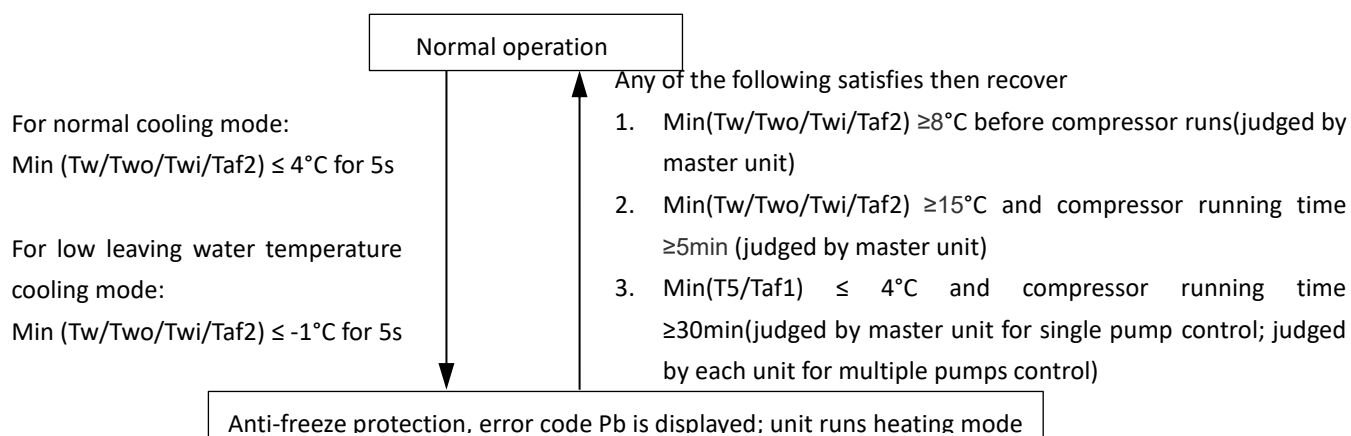
## 6.6 DC Fan Motor Protection Control

This control protects the DC fan motors from abnormal power supply. DC fan motor protection occurs when the fan module does not receive any feedback from the fan motor.

When DC fan motor protection control occurs the system displays the PU error code and the faulty unit stops running. When PU protection occurs 10 times in 120 minutes, the FF error is displayed. When an FF error occurs, a manual system restart is required before the system can resume operation.

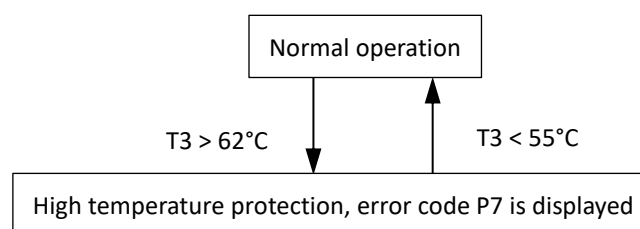
## 6.7 Water Side Heat Exchanger Anti-freeze Protection Control

When water side heat exchanger anti-freeze protection occurs the system displays error code Pb and the unit enters anti-freezing mode.



## 6.8 Air Side Heat Exchanger High Temperature Protection Control

This control protects the air side heat exchanger from high temperature.

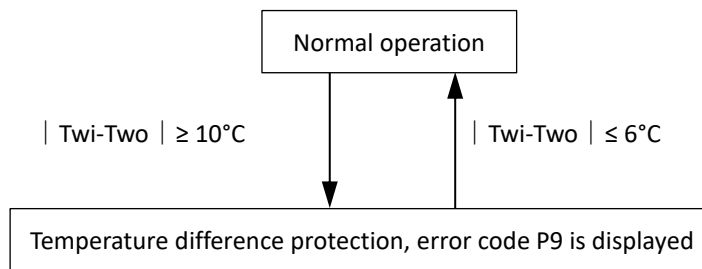


Note:

1. T3: Air side heat exchanger refrigerant outlet temperature

When the air side heat exchanger refrigerant outlet temperature (T3) rises above 62°C, the system displays P7 protection and the faulty unit stops running. When the air side heat exchanger refrigerant outlet temperature (T3) drops below 55°C, the compressor enters re-start control.

## 6.9 Water Side Heat Exchanger Temperature Difference Protection Control



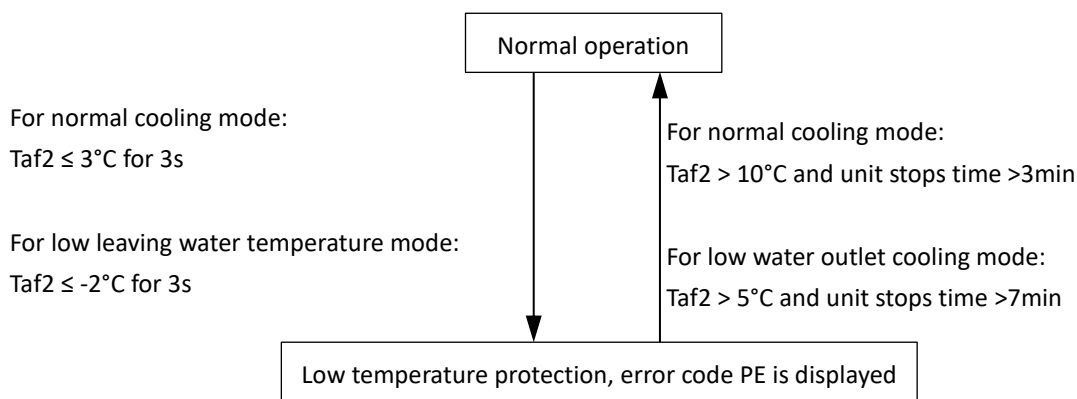
Notes:

1. Twi: Water side heat exchanger inlet temperature;
2. Two: Water side heat exchanger outlet temperature.

When the temperature difference rises at or above 10°C, the system displays P9 protection and the faulty unit stops running. When the temperature difference drops below 6°C, the compressor enters re-start control.

## 6.10 Water Side Heat Exchanger Low Temperature Protection Control

This control protects the water side heat exchanger from ice formation.



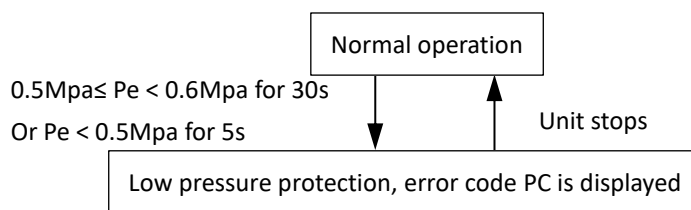
Notes:

1. Taf2: Water side heat exchanger anti-freezing temperature 2

## 6.11 Water Side Heat Exchanger Low Pressure Protection Control

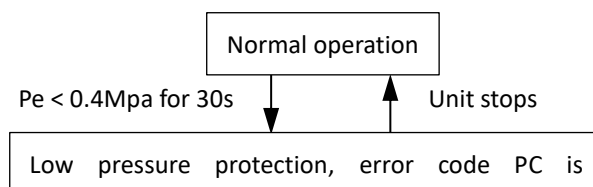
This control protects the water side heat exchanger from ice formation.

- Normal cooling mode



In normal cooling mode, when 0.5Mpa ≤ Pe < 0.6Mpa for 30s or Pe < 0.5Mpa for 5s, the system displays PC protection and the faulty unit stops running. When the unit stop, the compressor enters re-start control.

- Low leaving water temperature mode



In low water temperature cooling mode, when the suction pressure drops below 0.4Mpa for 30s, the system displays PC protection and the faulty unit stops running. When the unit stop, the compressor enters re-start control.

## 7 Special Control

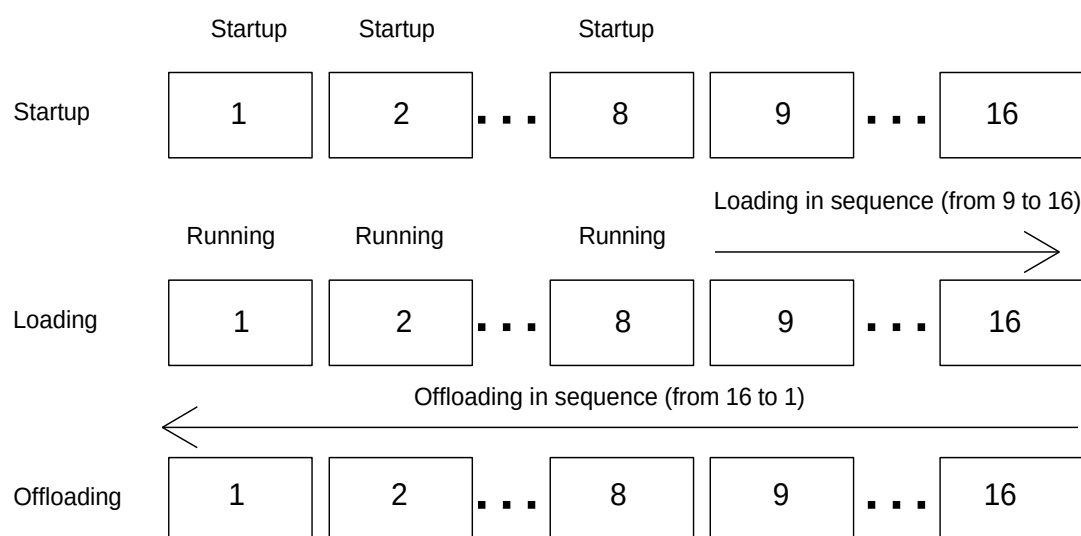
### 7.1 Outdoor Unit Duty Cycling

In systems with multiple outdoor units, outdoor unit duty cycling is used to balance the compressor running time. Outdoor unit duty cycling occurs whenever all the outdoor units stop running (either because the leaving water set temperature has been reached or because a master unit error has occurred):

Take 16 units in parallel as an example:

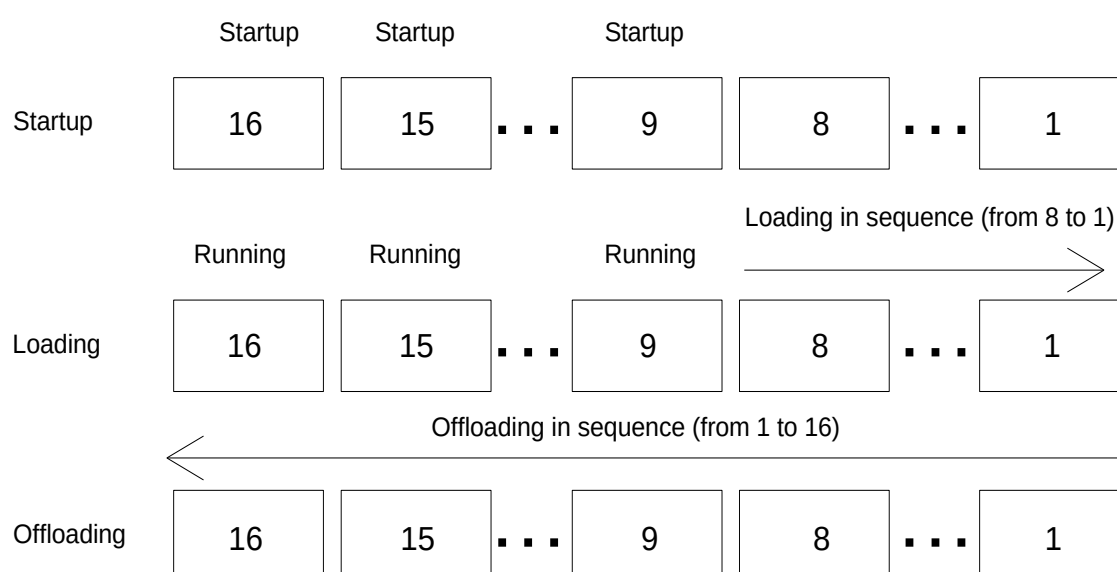
- First cycle:

When the outdoor units are powered on for the first time, if there is a load requirement, 50% of the units turn on starting with the 0# master unit to higher address slave units. As the leaving water temperature approaches its set temperature, units shut down in succession, starting with the unit with the highest address.



- Second cycle:

The next time a load requirement exists (or following a master unit error), the units turn on starting with the highest address unit to lower address units. As the leaving water temperature approaches its set temperature, units shut down in succession, starting with the unit with the lowest address.



- Subsequent cycles will repeat the actions of the first and second cycles

Notes:

- The address settings on the outdoor unit main PCBs for master unit and slave unit do not change.

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### 7.2 Defrosting Operation

In order to recover heating capacity, the defrosting operation is conducted when the outdoor unit air side heat exchanger is performing as a condenser. The defrosting operation is controlled according to outdoor ambient temperature, air side heat exchanger refrigerant temperature, water inlet temperature, compressor running time and defrosting time.

| Component                  | Wiring diagram label | 4-10kW | Control functions and states                |
|----------------------------|----------------------|--------|---------------------------------------------|
| Inverter compressor        | COMP                 | ●      | Runs at defrosting operation rotation speed |
| DC fan motor               | FAN                  | ●      | Off                                         |
| Electronic expansion valve | EXV                  | ●      | Fully open                                  |
| Four-way valve             | 4-WAY                | ●      | Off                                         |

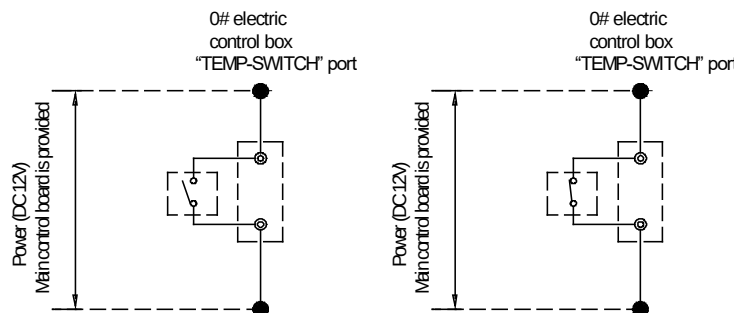
### 7.3 TEMP-SWITCH control

The function of "TEMP-SWITCH" must be set by wired controller for two target water temperature. For cooling and heating mode, different water temperatures can be switched just by one-touch. The operation method is as follows:

- Setting: "USER MENU"——"DOUBLE SETPOINT"

| DOUBLE SETPOINT |           |
|-----------------|-----------|
| DOUBLE SETPOINT | ◀DISABLE▶ |
| SETPOINT COOL_1 | ◀ 16 ▶ °C |
| SETPOINT COOL_2 | ◀ 20 ▶ °C |
| SETPOINT HEAT_1 | ◀ 16 ▶ °C |
| SETPOINT HEAT_2 | ◀ 25 ▶ °C |
| OK              |           |

- Wire connection: Shorting the terminal block CN110 at slave board (Refer to the Part 4, 3.1 Single unit) for MC-SU75-RN8L-B and MC-SU140-RN8L-B. Connect a switch between 20 and 25 terminals of block XT2 (Refer to the Part 4, 3.1 Single unit) for MC-SU90-RN8L-B and MC-SU180-RN8L-B. If the switch is off, unit operates at first target water temperature. If the switch is on unit operates at second target water temperature.



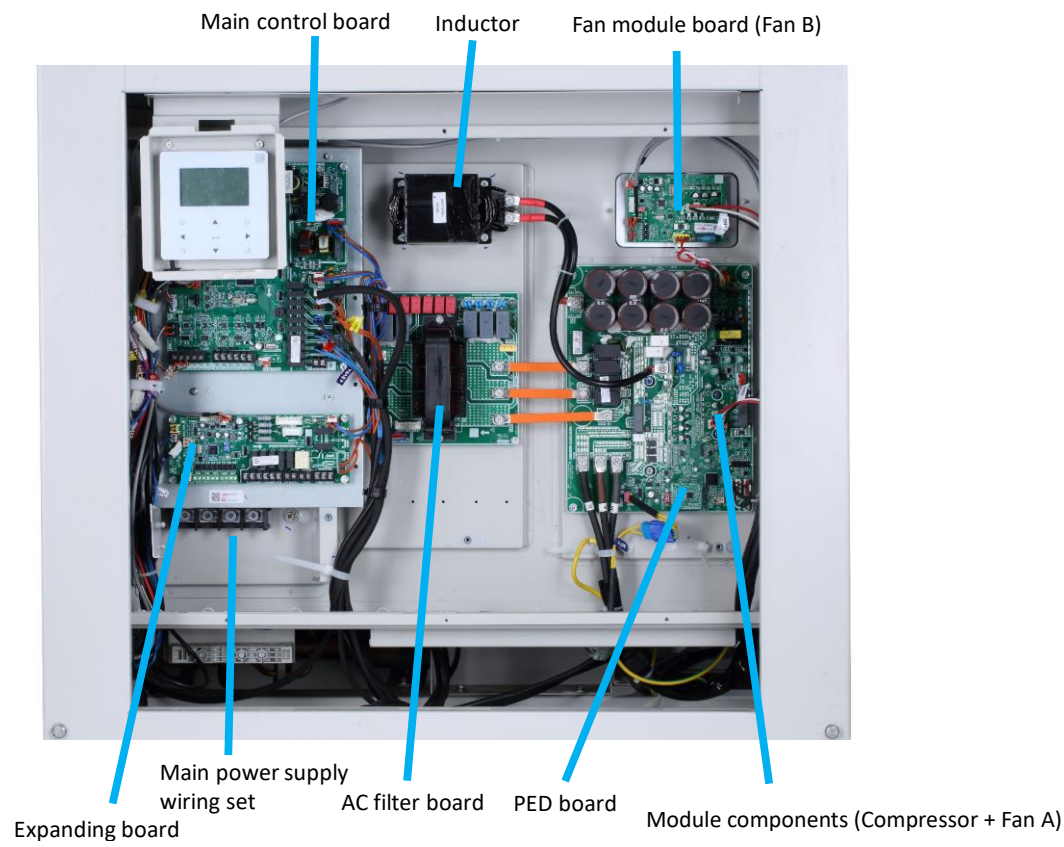
# Part 4

## Diagnosis and Troubleshooting

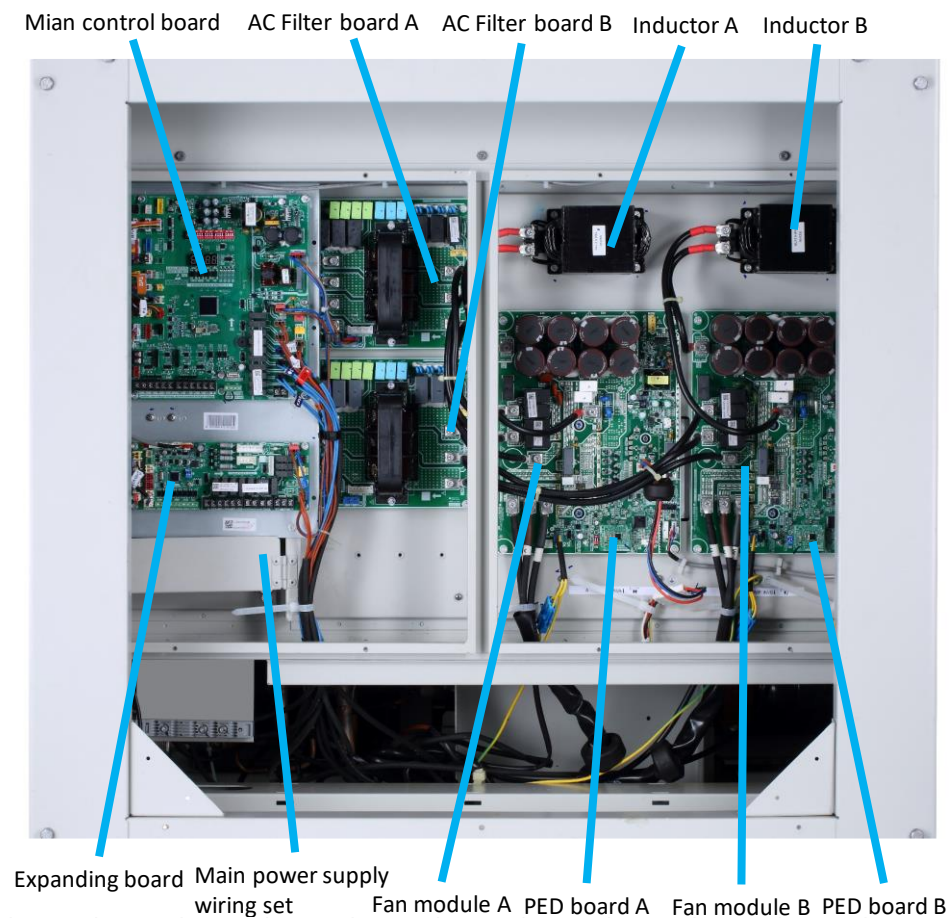
|                                    |     |
|------------------------------------|-----|
| 1 Electric Control Box Layout..... | 44  |
| 2 PCB Introduction .....           | 46  |
| 3 Wiring diagram .....             | 61  |
| 4 Error Code Table.....            | 68  |
| 5 Troubleshooting .....            | 70  |
| 6 Drive Module Failure.....        | 141 |
| 7 Appendix.....                    | 154 |

1 Electric Control Box Layout

For MC-SU75-RN8L-B



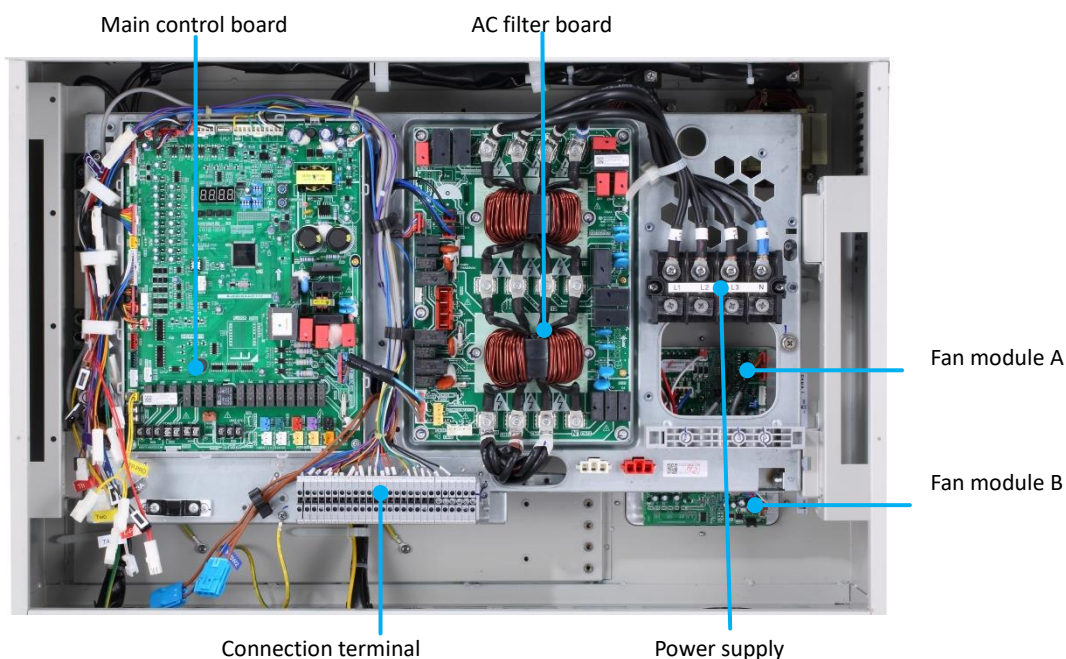
For MC-SU140-RN8L-B



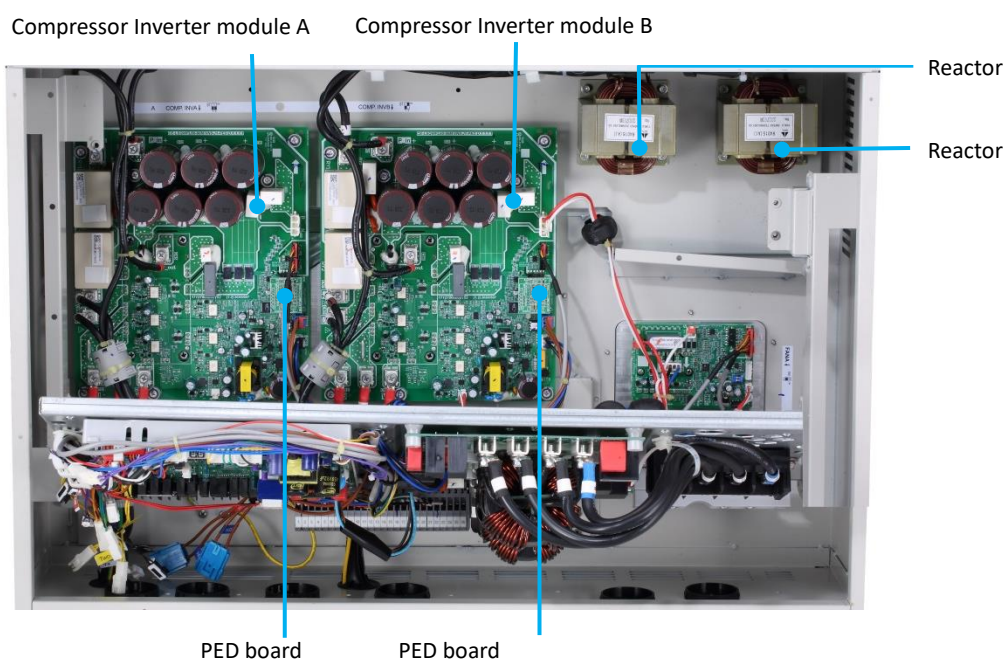


For MC-SU90-RN8L-B and MC-SU180-RN8L-B

- Electric control box side view-upper layer



- Electric control box side view-bottom layer



- Midea electric control side view

For MC-SU180-RN8L-B only





## 2 PCB Introduction

### 2.1 Types

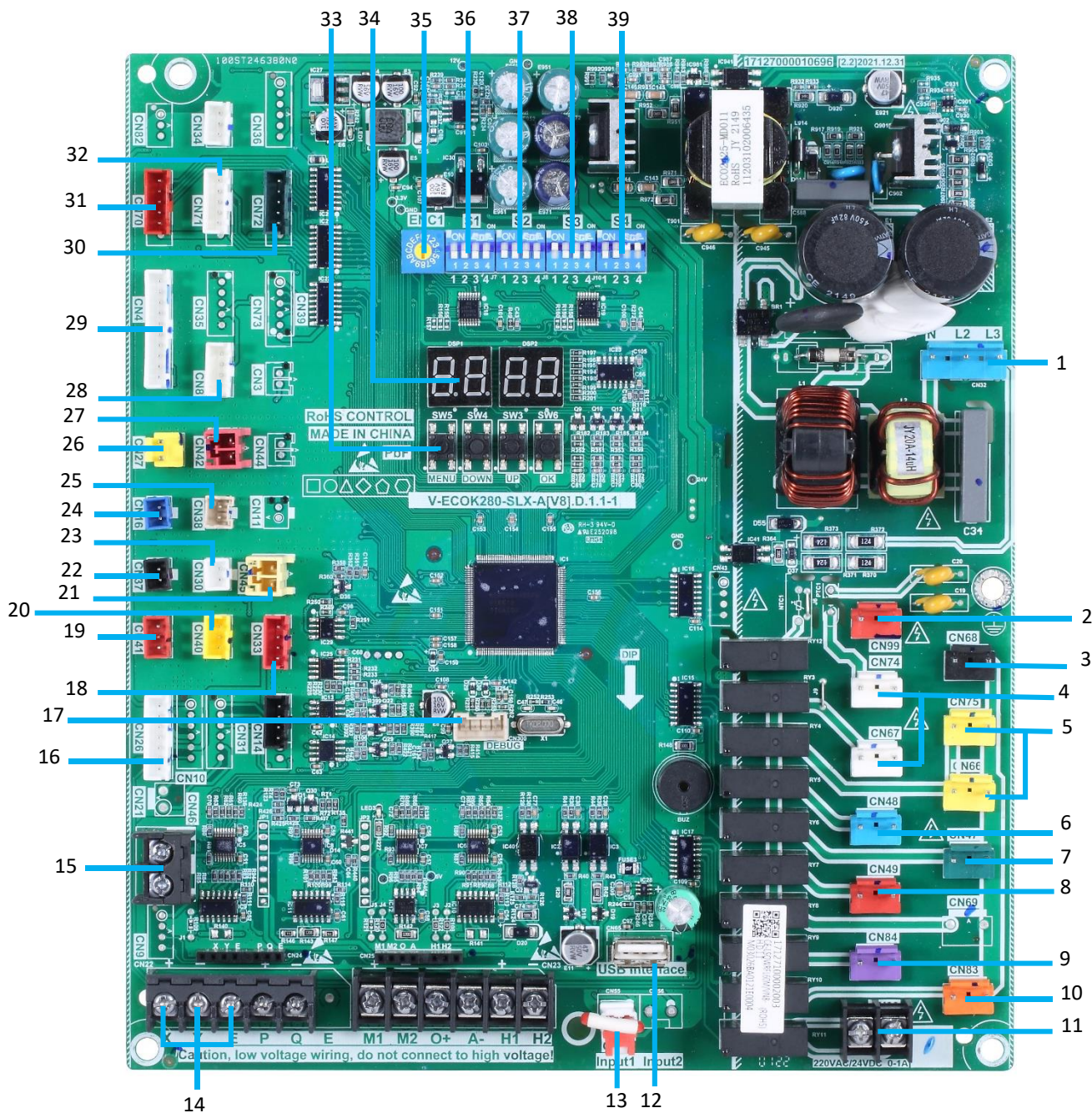
Aqua thermal 75kW, 90kW and 140kW unit have one main control board, two compressor inverter module board, two DC fan inverter module board and one filter board.

Aqua thermal 180kW unit have two main control board, four compressor inverter module board, four DC fan inverter module board and two filter board.

### 2.2 Main PCB

#### 2.2.1 Main PCB component

For MC-SU75-RN8L-B and MC-SU140-RN8L-B



| Label | Code      | Port  | Explanation                                        | Voltage  |
|-------|-----------|-------|----------------------------------------------------|----------|
| 1     | CN32      | POWER | Power supply port                                  | 220-240V |
| 2     | CN99      |       | Expanding board power connector                    | 220-240V |
| 3     | CN68      | PUMP  | Pump contactor control port (connected in factory) | 220-240V |
| 4     | CN74/CN67 | CCH   | compressor heating belt                            | 220-240V |

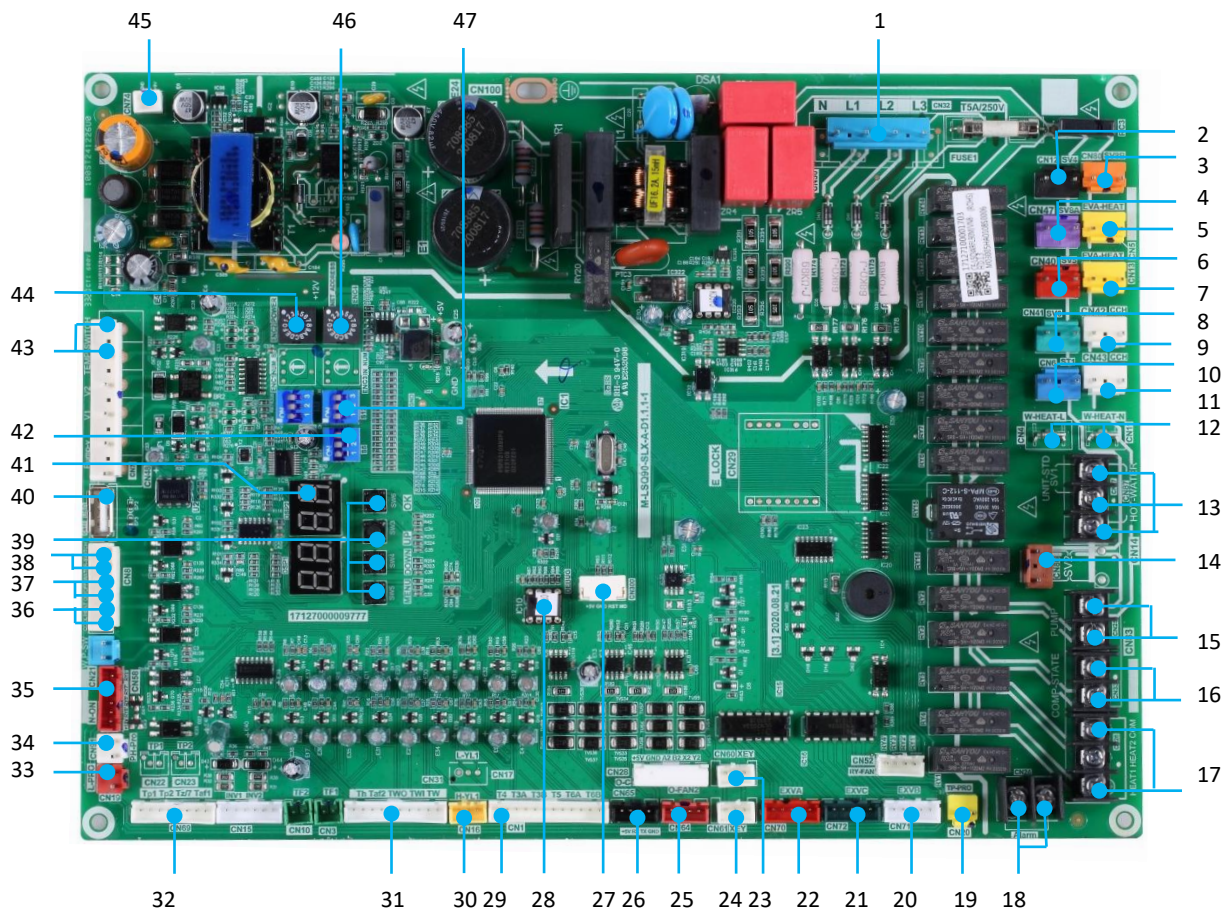
|    |           |          |                                                                                                              |            |
|----|-----------|----------|--------------------------------------------------------------------------------------------------------------|------------|
| 5  | CN75/CN66 | EVA-HEAT | Plate heat exchanger electric heating belt                                                                   | 220-240V   |
| 6  | CN48      | ST1      | Four-way valve                                                                                               | 220-240V   |
| 7  | CN47      | SV6      | One-way solenoid valve                                                                                       | 220-240V   |
| 8  | CN49      | SV5      | One-way solenoid valve                                                                                       | 220-240V   |
| 9  | CN84      | SV8A     | One-way solenoid valve                                                                                       | 220-240V   |
| 10 | CN83      | SV8B     | One-way solenoid valve                                                                                       | 220-240V   |
| 11 | CN93      | ALARM    | Fault alarm port                                                                                             | /          |
| 12 | CN65      | USB      | USB program burning port                                                                                     | DC5V       |
| 13 | CN28      | PH-PRO   | Three-phase protector signal detection port                                                                  | DC12V      |
| 14 | CN22      | XYE      | External unit parallel connection communication port & external unit and wired controller communication port | DC5V       |
| 15 | CN46      |          | Wired controller power supply port                                                                           | DC12V      |
| 16 | CN26      | O-Motor  | Module board PTC relay control port/Module board communication port                                          | DC12V/DC5V |
| 17 | CN300     | DEBUG    | Main control program burn port(WizPro200RS programmer)                                                       | DC3.3V     |
| 18 | CN33      | MS       | Expanding board communication port                                                                           | DC12V/DC5V |
| 19 | CN41      |          | Low pressure sensor                                                                                          | DC3.3V     |
| 20 | CN40      |          | High pressure sensor                                                                                         | DC3.3V     |
| 21 | CN45      | Taf2     | Water side antifreeze temperature sensor                                                                     | DC3.3V     |
| 22 | CN37      | T3A      | Pipe temperature sensor of the condenser                                                                     | DC3.3V     |
| 23 | CN30      | T4       | Outdoor ambient temperature sensor                                                                           | DC3.3V     |
| 24 | CN16      | T3B      | Pipe temperature sensor of the condenser                                                                     | DC3.3V     |
| 25 | CN38      | TP2      | DC inverter compressor B discharge temperature sensor                                                        | DC3.3V     |
| 26 | CN27      | TP-PRO   | Discharge temperature controller                                                                             | DC3.3V     |
| 27 | CN42      | L-PRO    | Low pressure switch                                                                                          | DC3.3V     |
| 28 | CN8       | T6A      | Refrigerant inlet temperature of EVI plate heat exchanger                                                    | DC3.3V     |
|    |           | T6B      | Refrigerant outlet temperature of EVI plate heat exchanger                                                   | DC3.3V     |
| 29 | CN4       | Two      | Unit water inlet temperature sensor                                                                          | DC3.3V     |
|    |           | Th       | System suction temperature sensor                                                                            | DC3.3V     |
|    |           | Two      | Unit water outlet temperature sensor                                                                         | DC3.3V     |
|    |           | Tz/7     | Coil final outlet temperature sensor                                                                         | DC3.3V     |
|    |           | Tp1      | DC inverter compressor A discharge temperature sensor                                                        | DC3.3V     |
| 30 | CN72      | EXVC     | Electronic expansion valve A                                                                                 | DC12V      |
| 31 | CN70      | EXVA     | Electronic expansion valve B                                                                                 | DC12V      |
| 32 | CN71      | EXVB     | Electronic expansion valve C                                                                                 | DC12V      |
| 33 | SW3       | UP       | Up button                                                                                                    | DC3.3V     |
|    | SW4       | DOWM     | Down button                                                                                                  | DC3.3V     |
|    | SW5       | MENU     | Menu button                                                                                                  | DC3.3V     |
|    | SW6       | OK       | Confirm button                                                                                               | DC3.3V     |
| 34 | DSP1/DSP2 |          | Digital tube                                                                                                 | DC3.3V     |
| 35 | ENC1      |          | ADDRESS DIP switch                                                                                           | DC3.3V     |
| 36 | S1        | S1-1     | 0: normal control mode; 1: remote control mode                                                               | DC3.3V     |
|    |           | S1-3     | 0: Single water pump control mode;<br>1: Multiple water pumps control mode                                   | DC3.3V     |



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|    |    |              |                                                |        |
|----|----|--------------|------------------------------------------------|--------|
| 37 | S2 | /            | Reserve                                        | DC3.3V |
| 38 | S3 | S3-1         | 1 (Default)                                    | DC3.3V |
| 39 | S4 | Ability dial | MC-SU75-RN8L-B: 0011;<br>MC-SU140-RN8L-B: 0111 | DC3.3V |

For MC-SU90-RN8L-B and MC-SU180-RN8L-B



| Label | Code     | Port                                            | Voltage |
|-------|----------|-------------------------------------------------|---------|
| 1     | CN30     | Power supply port/ sequence detection port      | 400VAC  |
| 2     | CN12     | Quick oil return solenoid valve                 | 230VAC  |
| 3     | CN80     | Injection solenoid valve of compressor system B | 230VAC  |
| 4     | CN47     | Injection solenoid valve of compressor system A | 230VAC  |
| 5     | CN5      | Water side heat exchanger heater                | 230VAC  |
| 6     | CN40     | Multi-function solenoid valve                   | 230VAC  |
| 7     | CN13     | Electric of water side heat exchanger heater    | 230VAC  |
| 8     | CN41     | Liquid bypass solenoid valve                    | 230VAC  |
| 9     | CN42     | Crankcase heater                                | 230VAC  |
| 10    | CN6      | Four-way valve                                  | 230VAC  |
| 11    | CN43     | Crankcase heater                                | 230VAC  |
| 12    | CN4/CN11 | Electric heater of water flow switch            | 230VAC  |
| 13    | CN87     | Three-way valve(For domestic hot water)         | 230VAC  |
| 14    | CN86     | Spray cooling valve                             | 230VAC  |
| 15    | CN25     | Pump relay                                      | 230VAC  |
| 16    | CN33     | COMP-STATE                                      | 230VAC  |
| 17    | CN26     | Pipeline auxiliary Heater                       | 230VAC  |
| 18    | CN24     | Alarm signal output                             | 230VAC  |

|    |           |                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |
|----|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 19 | CN20      | Discharge temperature switch                                                                                                                                                                                                                                                                                                                                                                                                      | DC12V |
| 20 | CN71      | System electronic expansion valve(For cooling)                                                                                                                                                                                                                                                                                                                                                                                    | DC12V |
| 21 | CN72      | Electronic expansion valve(For EVI)                                                                                                                                                                                                                                                                                                                                                                                               | DC12V |
| 22 | CN70      | System electronic expansion valve1                                                                                                                                                                                                                                                                                                                                                                                                | DC12V |
| 23 | CN60      | Outdoor units communication or HMI communication port                                                                                                                                                                                                                                                                                                                                                                             | DC5V  |
| 24 | CN61      | Outdoor units communication or HMI communication port                                                                                                                                                                                                                                                                                                                                                                             | DC5V  |
| 25 | CN64      | Fan inverter module communication port                                                                                                                                                                                                                                                                                                                                                                                            | DC5V  |
| 26 | CN65      | Compressor inverter module communication port                                                                                                                                                                                                                                                                                                                                                                                     | DC5V  |
| 27 | CN300     | Program burn import (WizPro200RS programming device)                                                                                                                                                                                                                                                                                                                                                                              | DC5V  |
| 28 | IC10      | EEPROM chip                                                                                                                                                                                                                                                                                                                                                                                                                       | DC5V  |
| 29 | CN1       | Temperature sensors input port.<br>T4: Outdoor ambient temperature sensor<br>T3A/T3B: Pipe temperature sensor of the condenser<br>T6A: Refrigerant inlet temperature of EVI plate heat exchanger<br>T6B: Refrigerant inlet temperature of EVI plate heat exchanger                                                                                                                                                                | DC5V  |
| 30 | CN16      | System pressure sensor                                                                                                                                                                                                                                                                                                                                                                                                            | DC5V  |
| 31 | CN31      | Temperature sensors input port<br>Th: System suction temperature sensor<br>Taf2: Water side antifreeze temperature sensor<br>Two: Unit water outlet temperature sensor<br>Twi: Unit water inlet temperature sensor<br>Tw: Total water outlet temperature sensor when several units are connected in parallel                                                                                                                      | DC5V  |
| 32 | CN69      | Temperature sensors input port<br>Tp1 :DC inverter compressor 1 discharge temperature sensor<br>Tp2:DC inverter compressor 2 discharge temperature sensor<br>Tz: Coil final outlet temperature sensor                                                                                                                                                                                                                             | DC5V  |
| 33 | CN19      | Low voltage protection switch                                                                                                                                                                                                                                                                                                                                                                                                     | DC5V  |
| 34 | CN91      | Three-phase protector output switch                                                                                                                                                                                                                                                                                                                                                                                               | DC5V  |
| 35 | CN58      | Compressor driver ON/OFF port                                                                                                                                                                                                                                                                                                                                                                                                     | DC12V |
| 36 | CN8       | Remote function of cool/heat port                                                                                                                                                                                                                                                                                                                                                                                                 | DC12V |
| 37 | CN8       | Remote function of on/off port                                                                                                                                                                                                                                                                                                                                                                                                    | DC12V |
| 38 | CN8       | Water flow switch port                                                                                                                                                                                                                                                                                                                                                                                                            | DC12V |
| 39 | SW3-SW6   | SW3: Up button<br>a) Select different menus when enter menu selection.<br>b) For spot inspection in conditions.<br>SW4: Down button<br>a) Select different menus when enter menu selection.<br>b) For spot inspection in conditions.<br>SW5: Menu button<br>Press to enter menu selection, short press to return to the previous menu.<br>SW6: OK button<br>Enter the submenu or confirm the function selected by short pressing. | DC5V  |
| 40 | USB       | Program burn import (USB)                                                                                                                                                                                                                                                                                                                                                                                                         | DC5V  |
| 41 | DSP1/DSP2 | Digital tube<br>1) In case of stand-by, the address of the module is displayed;<br>2) In case of normal operation, 10. is displayed (10 is followed by dot).<br>3) In case of fault or protection, fault code or protection code is displayed.                                                                                                                                                                                    | DC5V  |
| 42 | S5        | S5: Dip switch                                                                                                                                                                                                                                                                                                                                                                                                                    | DC5V  |

## Aqua thermal



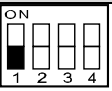
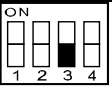
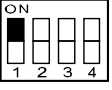
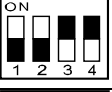
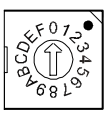
|    |      |                                                                                                                                                                                                |       |
|----|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
|    |      | S5-3: Normal control, valid for S5-3 OFF (factory default)<br>Remote control, valid for S5-3 ON.                                                                                               |       |
| 43 | CN7  | Target water temperature switching port                                                                                                                                                        | DC12V |
| 44 | ENC2 | Power DIP switch for capacity selection.<br>(MC-SU90-RN8L-B defaults 2; MC-SU180-RN8L-B defaults 6 )                                                                                           | DC5V  |
| 45 | CN74 | Power supply port of the HMI                                                                                                                                                                   | DC9V  |
| 46 | ENC4 | NET_ADDRESS DIP switch (0~15)                                                                                                                                                                  | DC5V  |
| 47 | S12  | S12: Dip switch<br>S12-1: Valid for S12-1 ON (factory default)<br>S12-2: Single water pump control, valid for S12-2 OFF (factory default)<br>Multiple water pumps control, valid for S12-2 ON. | DC5V  |

### 2.2.2 Main PCB field setting

Multiple pumps control: output pump signal on all units.

Single pump control: only the master unit output pump signal, no pump signal output on the slave units.

For MC-SU75-RN8L-B and MC-SU140-RN8L-B

| Switch                                                                              |      | Description                                                                                                                             | ON                           | OFF                       | Default factory setting  |
|-------------------------------------------------------------------------------------|------|-----------------------------------------------------------------------------------------------------------------------------------------|------------------------------|---------------------------|--------------------------|
|    | S1-1 | Control mode                                                                                                                            | Remote control               | Normal control            | OFF                      |
|    | S1-3 | Water pump                                                                                                                              | Multiple water pumps control | Single water pump control | OFF                      |
|  | S3-1 | -                                                                                                                                       | -                            | -                         | ON                       |
|  | S4   | DIP switch for capacity selection                                                                                                       | -                            | -                         | MC-SU75-RN8L-B:<br>0011  |
|  |      | DIP switch for capacity selection                                                                                                       | -                            | -                         | MC-SU140-RN8L-B:<br>0111 |
|  | ENC1 | 0-F valid for unit address setting on the DIP switches<br>0 indicates the master unit and 1-F the auxiliary units (parallel connection) | -                            | -                         | 0                        |

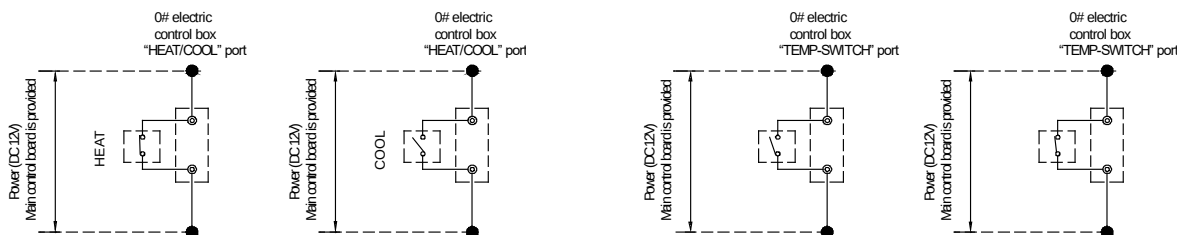
Note:

#### 1. Wiring of "HEAT/COOL" weak electric port

The remote function of "HEAT/COOL" must be set by DIP switch. The remote function "HEAT/COOL" is effective when S1-1or S5-3 is chosen ON, at the same time, the wire controller is out of control.

Corresponding parallel connect the "HEAT/COOL" port of the main unit's electric control box, then, connect the "ON/OFF" signal (provide by user) to the "HEAT/COOL" port of main unit as follows.

Wiring method: Shorting the terminal block CN138 at slave board inside the electric control box to enable the remote function of "HEAT/COOL".



#### 2. Wiring of "TEMP-SWITCH" weak electric port

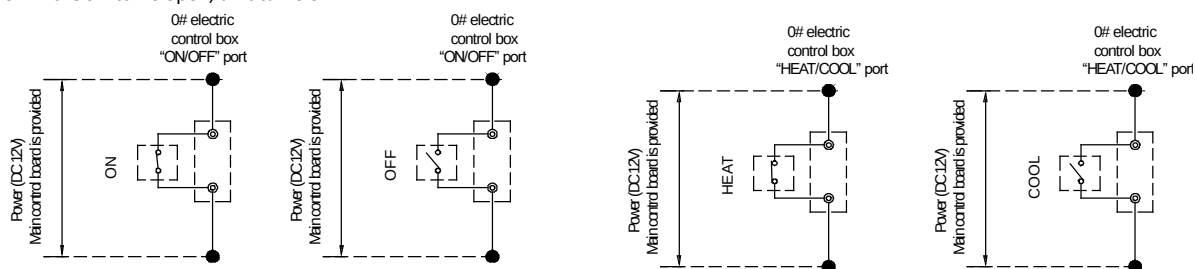
The function of "TEMP-SWITCH" must be set by wired controller for two setting water temperature. For cooling and heating mode.

Wiring method: Shorting the terminal block CN110 at slave board inside the electric control box to choose the target water temperature.

For MC-SU90-RN8L-B and MC-SU180-RN8L-B

| Switch          |       | Description                                                 | ON                     | OFF                 | Default factory setting                       |
|-----------------|-------|-------------------------------------------------------------|------------------------|---------------------|-----------------------------------------------|
| <b>S5</b><br>   | S5-3  | Control mode                                                | Remote control         | Normal control      | OFF                                           |
| <b>S12</b><br>  | S12-1 | Default setting                                             | Default setting        | -                   | ON                                            |
|                 | S12-2 | Water pump                                                  | Multiple pumps control | Single pump control | OFF                                           |
| <b>ENC2</b><br> | ENC2  | DIP switch for capacity selection                           | -                      | -                   | MC-SU90-RN8L-B : 2<br>MC-SU180-RN8L-B: 6      |
| <b>ENC4</b><br> | ENC4  | Address setting<br>0: master unit<br>1,2,3...F: slave units | -                      | -                   | MC-SU90-RN8L-B: 0<br>MC-SU180-RN8L-B: 0 and 1 |

**Note:**  
When using remote control function, first is to dial the S5-3 switch to ON. The operation method is as below:  
1. Remote ON/OFF:  
Connect a switch between 15 and 24 terminals of block XT2 (Refer to the Part 4, 3.1 Single unit) which can be turned on/off at any time. If the switch is closed, unit turns on. If the switch is open, unit turns off.

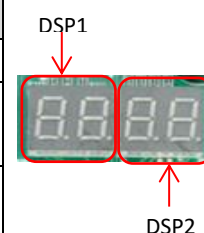


2. Remote cool/heat:  
Connect a switch between 14 and 23 terminals of block XT2 (Refer to the Part 4, 3.1 Single unit) which can change operation mode at any time. If the switch is closed, unit runs in heating mode. If the switch is open, unit runs in cooling mode.

## 2.2.3 Digital display output

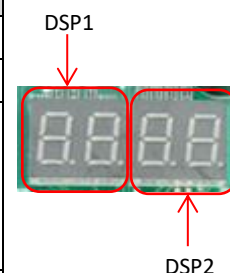
For MC-SU75-RN8L-B, MC-SU90-RN8L-B and MC-SU140-RN8L-B:

| Outdoor unit state  | Parameters displayed on DSP1                          | Parameters displayed on DSP2                          |
|---------------------|-------------------------------------------------------|-------------------------------------------------------|
| Standby             | 0                                                     | 1                                                     |
| Normal operation    | Running speed of compressor A in rotations per second | Running speed of compressor B in rotations per second |
| Error or protection | -- or placeholder                                     | Error or protection code                              |



For MC-SU180-RN8L-B:

| Outdoor unit state  | Master parameters displayed                           |                                                       | Slave parameters displayed                            |                                                       |
|---------------------|-------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------|
|                     | DSP1                                                  | DSP2                                                  | DSP1                                                  | DSP2                                                  |
| Standby             | Address                                               | Online number                                         | Address                                               | No display                                            |
| Normal operation    | Running speed of compressor A in rotations per second | Running speed of compressor B in rotations per second | Running speed of compressor A in rotations per second | Running speed of compressor B in rotations per second |
| Error or protection | -- or placeholder                                     |                                                       | Error or protection code                              |                                                       |



## Aqua thermal



### 2.2.4 Spot Check Description

The spot check sequence is shown as follows:

| Serial number |       | Contents of spot check                                                                                                                                                                                                                                                                |
|---------------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0             |       | Standby: host address (left 88) + number of online units (right 88),<br>Power-on: display frequency<br>Defrosting: dFdF                                                                                                                                                               |
| 1             | 0.xx  | Host address                                                                                                                                                                                                                                                                          |
| 2             | 1.xx  | Number of external units (e.g. 75/140kW respectively display 75/140.)                                                                                                                                                                                                                 |
| 3             | 2.xx  | Number of online units (Host valid)                                                                                                                                                                                                                                                   |
| 4             | 3.xx  | T4 capacity correction (reserved display "1")                                                                                                                                                                                                                                         |
| 5             | 4.xx  | Operation mode (8 shutdown, 1 cooling, 2 heating, 4 hot water)                                                                                                                                                                                                                        |
| 6             | 5.xx  | Fan gear (0 - 35)                                                                                                                                                                                                                                                                     |
| 7             | 6.xx  | Fan gear (reserved display "0")                                                                                                                                                                                                                                                       |
| 8             | 7.xx  | T3 (min)                                                                                                                                                                                                                                                                              |
| 9             | 8.xx  | T4                                                                                                                                                                                                                                                                                    |
| 10            | 9.xx  | Outlet water temperature of T5 water tank                                                                                                                                                                                                                                             |
| 11            | 10.xx | Taf1                                                                                                                                                                                                                                                                                  |
| 12            | 11.xx | Taf2                                                                                                                                                                                                                                                                                  |
| 13            | 12.xx | Tw total outlet water temperature of the unit                                                                                                                                                                                                                                         |
| 14            | 13.xx | Tw inlet water temperature of the unit                                                                                                                                                                                                                                                |
| 15            | 14.xx | Two outlet water temperature of the unit                                                                                                                                                                                                                                              |
| 16            | 15.xx | Tz Temperature of refrigerant liquid pipe at plate changing side                                                                                                                                                                                                                      |
| 17            | 16.xx | THeatR heat recovery sensor temperature (reserved display "---")                                                                                                                                                                                                                      |
| 18            | 17.xx | Discharge temperature 1                                                                                                                                                                                                                                                               |
| 19            | 18.xx | Discharge temperature 2                                                                                                                                                                                                                                                               |
| 20            | 19.xx | Radiation fin temperature 1                                                                                                                                                                                                                                                           |
| 21            | 20.xx | Radiation fin temperature 2                                                                                                                                                                                                                                                           |
| 22            | 21.xx | Discharge superheat temperature Tdsh                                                                                                                                                                                                                                                  |
| 23            | 22.xx | Compressor A current                                                                                                                                                                                                                                                                  |
| 24            | 23.xx | Compressor B current                                                                                                                                                                                                                                                                  |
| 25            | 24.xx | --                                                                                                                                                                                                                                                                                    |
| 26            | 25.xx | Electronic expansion valve A open degree (percent, maximum 100%)                                                                                                                                                                                                                      |
| 27            | 26.xx | Electronic expansion valve B open degree (percent, maximum 100%)                                                                                                                                                                                                                      |
| 28            | 27.xx | Electronic expansion valve C open degree (percent, maximum 100%)                                                                                                                                                                                                                      |
| 29            | 28.xx | High pressure (heating mode)                                                                                                                                                                                                                                                          |
| 30            | L.xx  | Low pressure (with decimal display-display during cooling or standby)                                                                                                                                                                                                                 |
| 31            | 30.xx | Refrigeration suction superheat temperature Tssh                                                                                                                                                                                                                                      |
| 32            | 31.xx | Th suction temperature                                                                                                                                                                                                                                                                |
| 33            | 32.xx | First nixie tube on the right: silent mode selection (0: night silent mode; 1: silent mode; 2: super silent mode; 3: no silent mode (default))<br>The second nixie tube on the right: the value of silent mode time selection (0-3) depends on the parameters of the wired controller |
| 34            | 33.xx | Static pressure selection (0 static pressure is reserved by default)                                                                                                                                                                                                                  |
| 35            | 34.xx | DC voltage A (reserved)                                                                                                                                                                                                                                                               |
| 36            | 35.xx | DC voltage B (reserved)                                                                                                                                                                                                                                                               |
| 37            | 36.xx | Frequency limiting serial number (reserved) (0: infinite frequency; 1: T4 frequency limiting; 2:                                                                                                                                                                                      |

|    |       |                                                                                                                                                                                                                                                                |
|----|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    |       | Tp exhaust frequency limiting; 3: Tz total cooling output frequency limiting; 4: Tf module temperature frequency limiting; 5: Two water output frequency limiting 6: Pressure frequency limiting, 7: Current frequency limiting, 8: Voltage frequency limiting |
| 38 | 37.xx | Defrosting process status (the first digit: T4 selection scheme; the second digit: interval in the scheme; the third and fourth digits together represent defrosting timing time)                                                                              |
| 39 | 38.xx | Fault of Party E: 1 indicates fault, 0 indicates no fault (reserved 90kw is valid)                                                                                                                                                                             |
| 40 | 39.xx | Defrosting scheme                                                                                                                                                                                                                                              |
| 41 | 40.xx | Initial frequency                                                                                                                                                                                                                                              |
| 42 | 41.xx | Tc (saturation temperature corresponding to high pressure) spot check value + 30                                                                                                                                                                               |
| 43 | 42.xx | Te (saturation temperature corresponding to low pressure) spot check value + 30                                                                                                                                                                                |
| 44 | 43.xx | T6a                                                                                                                                                                                                                                                            |
| 45 | 44.xx | T6b                                                                                                                                                                                                                                                            |
| 46 | 45.xx | Version number of main control software                                                                                                                                                                                                                        |
| 47 | 46.xx | The last failure                                                                                                                                                                                                                                               |
| 48 | 47.xx | ----                                                                                                                                                                                                                                                           |

Note: Need to perform spot check operation on the online controller.

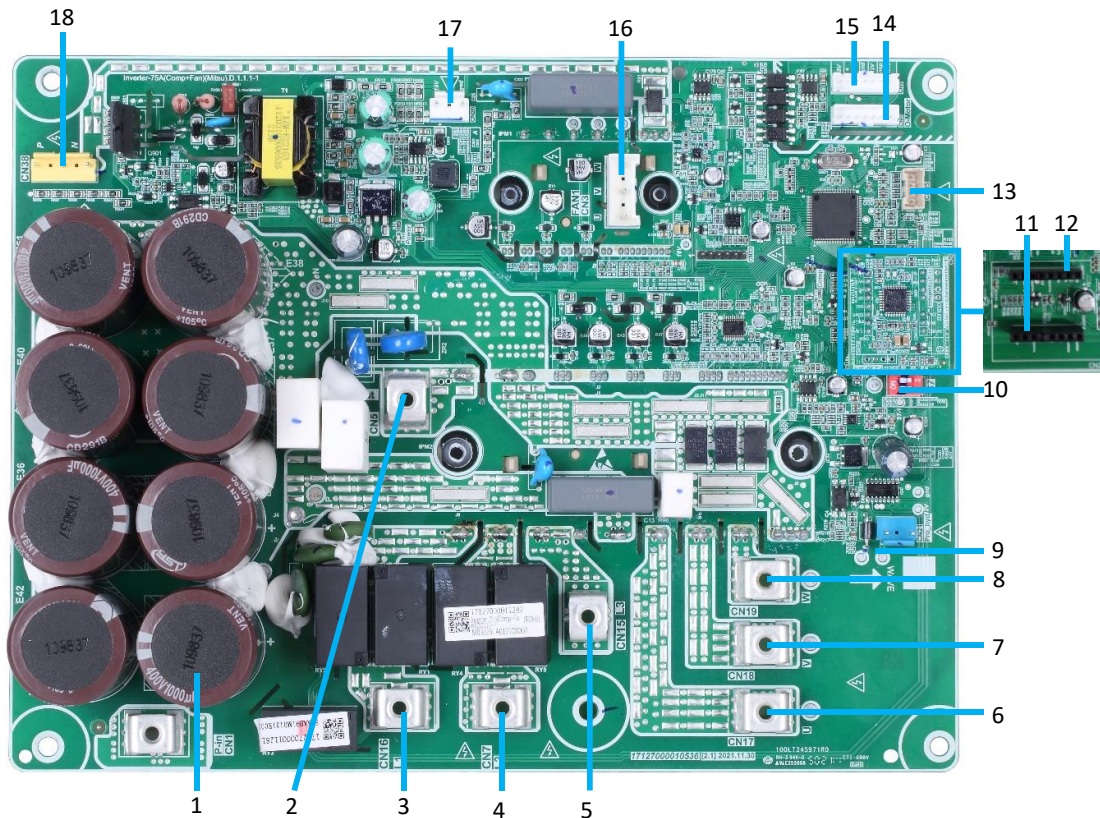


## Aqua thermal

### 2.3 Compressor Inverter Module Board

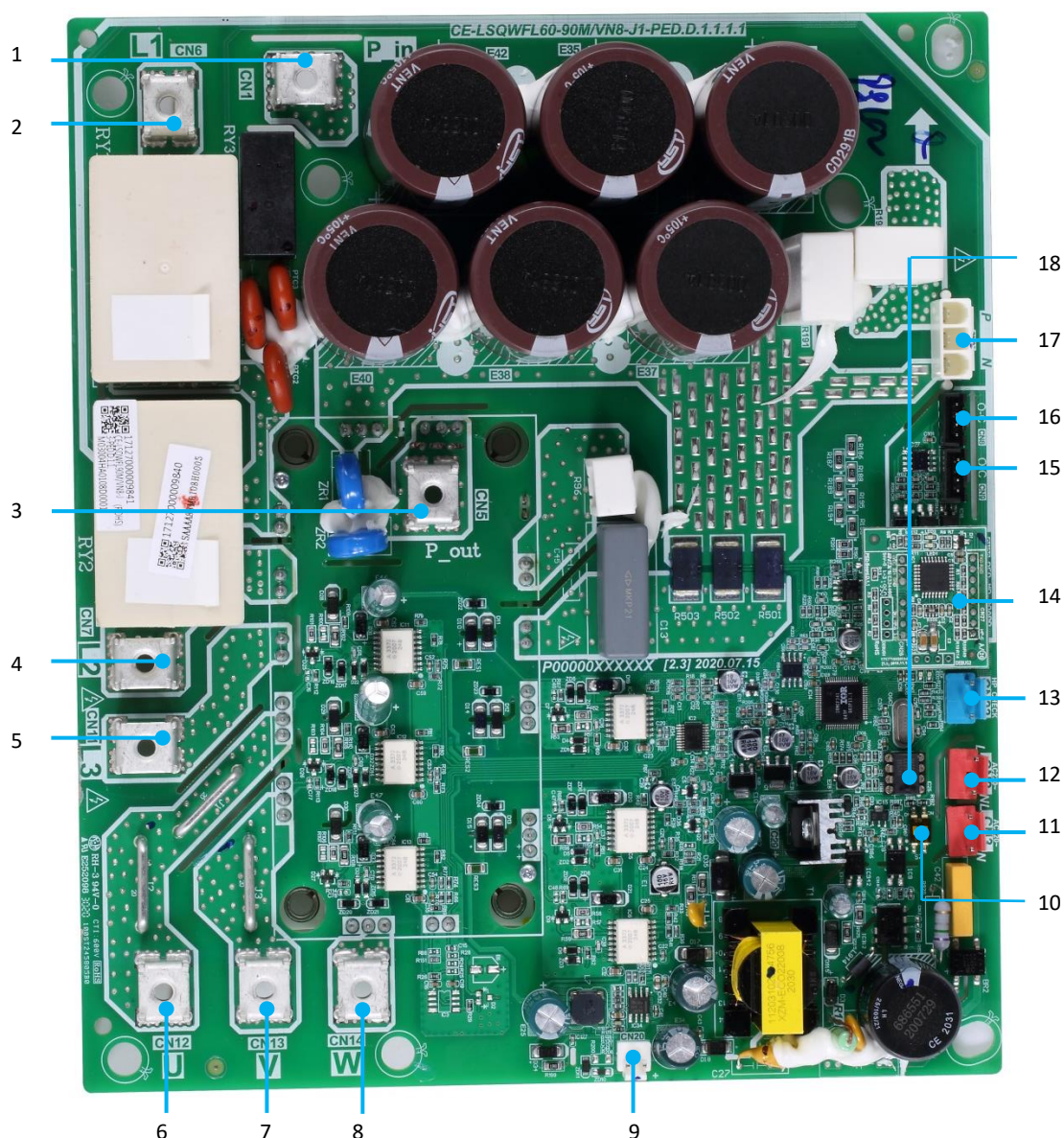
#### 2.3.1 Compressor Inverter Module PCB component

For MC-SU75-RN8L-B and MC-SU140-RN8L-B



| Label | Code   | Port    | Explanation                                                            | Voltage    |
|-------|--------|---------|------------------------------------------------------------------------|------------|
| 1     | CN1    | P-in    | Reactor output port                                                    |            |
| 2     | CN5    | P-out   | Reactor input port                                                     |            |
| 3     | CN16   | L1      | Power supply for module board                                          | 380-415V   |
| 4     | CN7    | L2      |                                                                        |            |
| 5     | CN15   | L3      |                                                                        |            |
| 6     | CN17   | U       | Compressor output                                                      |            |
| 7     | CN18   | V       |                                                                        |            |
| 8     | CN19   | W       |                                                                        |            |
| 9     | CN21   | H-SW    | High pressure switch                                                   |            |
| 10    | S7     |         | module address setting<br>system A: 00; system B: 01                   |            |
| 11    | CN27-1 |         | PED board connection port                                              | DC12V/DC5V |
| 12    | CN27-2 |         | PED board connection port                                              | DC12V/DC5V |
| 13    | CN25   | DEBUG   | Driver burn port (WizPro200RS programmer)                              | DC5V       |
| 14    | CN8    | O-Motor | Module Board PTC Relay Control Port/Module Board<br>Communication Port | DC12V/DC5V |
| 15    | CN9    | O-Motor | Module Board PTC Relay Control Port/Module Board<br>Communication Port | DC12V/DC5V |
| 16    | CN3    | UVW     | Fan output port                                                        |            |
| 17    | CN26   |         | Fan control power supply output port                                   | DC19V      |
| 18    | CN39   | P N     | Fan power supply output port                                           | DC565V     |

For MC-SU90-RN8L-B and MC-SU180-RN8L-B:



## Part 4 - Diagnosis and Troubleshooting

| Label | Code | Port                                 | Voltage                  |
|-------|------|--------------------------------------|--------------------------|
| 1     | CN1  | Reactor output port                  | DC565V                   |
| 2     | CN6  | Three-phase power supply in (L1)     | 400VAC                   |
| 3     | CN5  | Reactor input port                   | DC565V                   |
| 4     | CN7  | Three-phase power supply in (L2)     | 400VAC                   |
| 5     | CN11 | Three-phase power supply in (L3)     | 400VAC                   |
| 6     | CN12 | Compressor connection port U         | VUV=VUW=VVW<br>0-380V AC |
| 7     | CN13 | Compressor connection port V         |                          |
| 8     | CN14 | Compressor connection port W         |                          |
| 9     | CN20 | Power supply for fan module          | DC20V                    |
| 10    | S7   | Address DIP switch                   | DC5V                     |
| 11    | CN3  | Power supply for compressor board    | AC230                    |
| 12    | CN2  | Power supply for compressor board    |                          |
| 13    | CN23 | High pressure switch connection port | DC12V                    |
| 14    | CN22 | PED board                            | DC12V                    |
| 15    | CN9  | Compressor board communication port  | DC5V                     |

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|    |      |                                     |        |
|----|------|-------------------------------------|--------|
| 16 | CN8  | Compressor board communication port | DC5V   |
| 17 | CN38 | Power supply for fan module board   | DC565V |
| 18 | IC25 | EEPROM                              | DC5V   |

### 2.3.2 Compressor Inverter Module PCB field setting

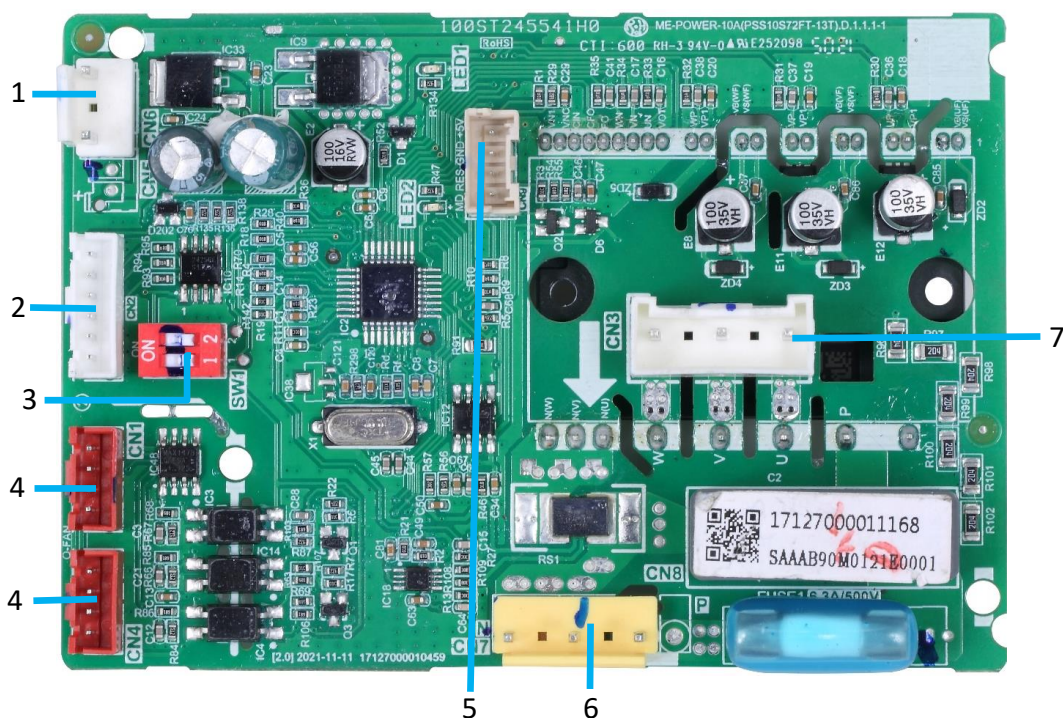
| Switch                                                                                         | Description                                  | S7-1 | S7-2 |
|------------------------------------------------------------------------------------------------|----------------------------------------------|------|------|
| <b>S7</b><br> | Compressor A inverter module address setting | OFF  | OFF  |
|                                                                                                | Compressor B inverter module address setting | OFF  | ON   |



## 2.4 Fan Module Board

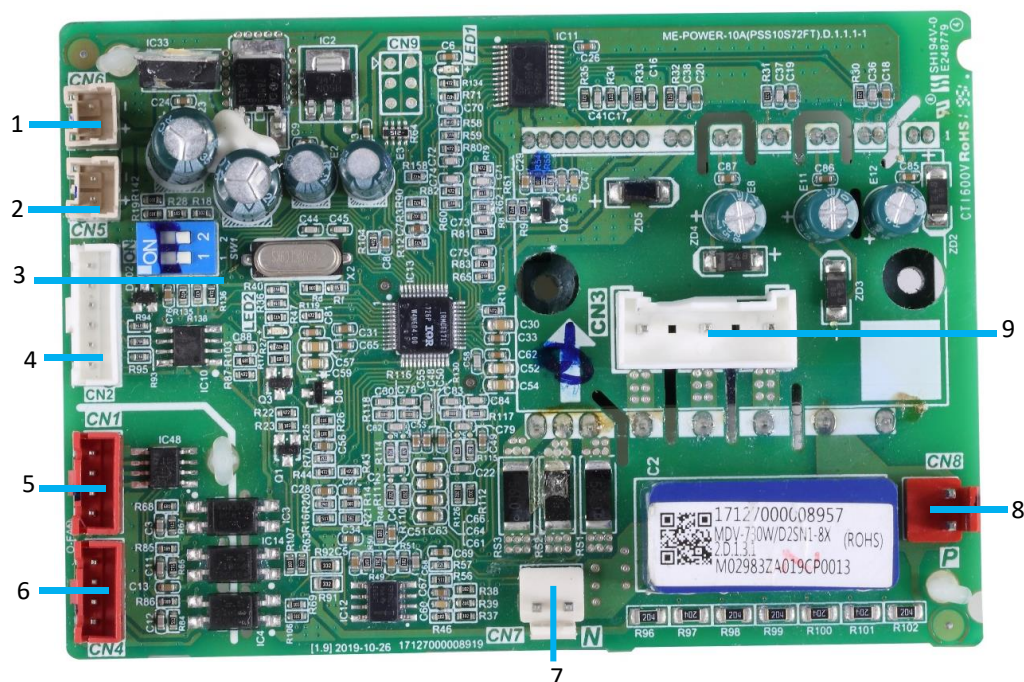
### 2.4.1 Fan Module Board component

For MC-SU75-RN8L-B and MC-SU140-RN8L-B



| Label | Code    | Port  | Explanation                                | Voltage |
|-------|---------|-------|--------------------------------------------|---------|
| 1     | CN6     |       | Fan module control power supply input port | DC19V   |
| 2     | CN12    |       | Reserve                                    |         |
| 3     | SW1     |       | Fan module address setting                 |         |
| 4     | CN1/CN4 |       | Fan module communication port              | DC5V    |
| 5     | CN9     | DEBUG | Program burn port (WizPro200RS programmer) | DC5V    |
| 6     | CN7     | P N   | Fan module power supply port               | DC565V  |
| 7     | CN3     | UVW   | Fan output port                            |         |

For MC-SU90-RN8L-B and MC-SU180-RN8L-B



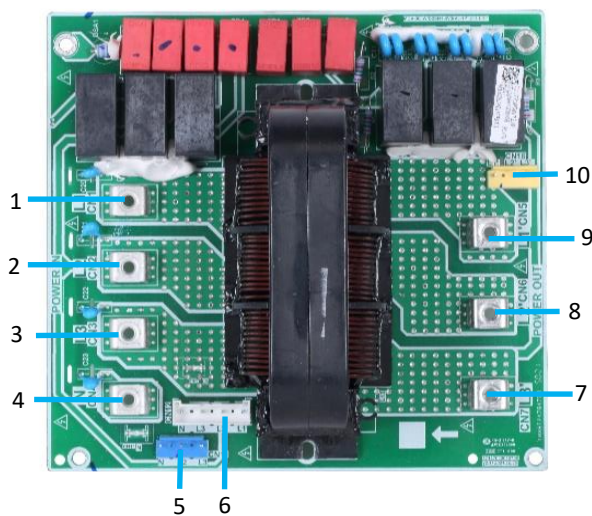
| Label | Code | Port                                | Voltage   |
|-------|------|-------------------------------------|-----------|
| 1     | CN6  | Power supply port                   | DC20V     |
| 2     | CN5  | Power supply port                   | DC20V     |
| 3     | SW1  | Address DIP switch                  | DC5V      |
| 4     | CN2  | Program input port                  | DC5V      |
| 5     | CN1  | Fan module board communication port | DC5V      |
| 6     | CN4  | Fan module board communication port | DC5V      |
| 7     | CN7  | DC bus voltage N                    | DC565V    |
| 8     | CN8  | DC bus voltage P                    | DC565V    |
| 9     | CN3  | Fan output port U/V/W               | AC 0~380V |

#### 2.4.2 Fan Module PCB field setting

| Switch                                                                                         | Description                           | S1-1 | S1-2 |
|------------------------------------------------------------------------------------------------|---------------------------------------|------|------|
| <b>S1</b><br> | Fan A inverter module address setting | OFF  | OFF  |
|                                                                                                | Fan B inverter module address setting | OFF  | ON   |

#### 2.5 AC Filter Board

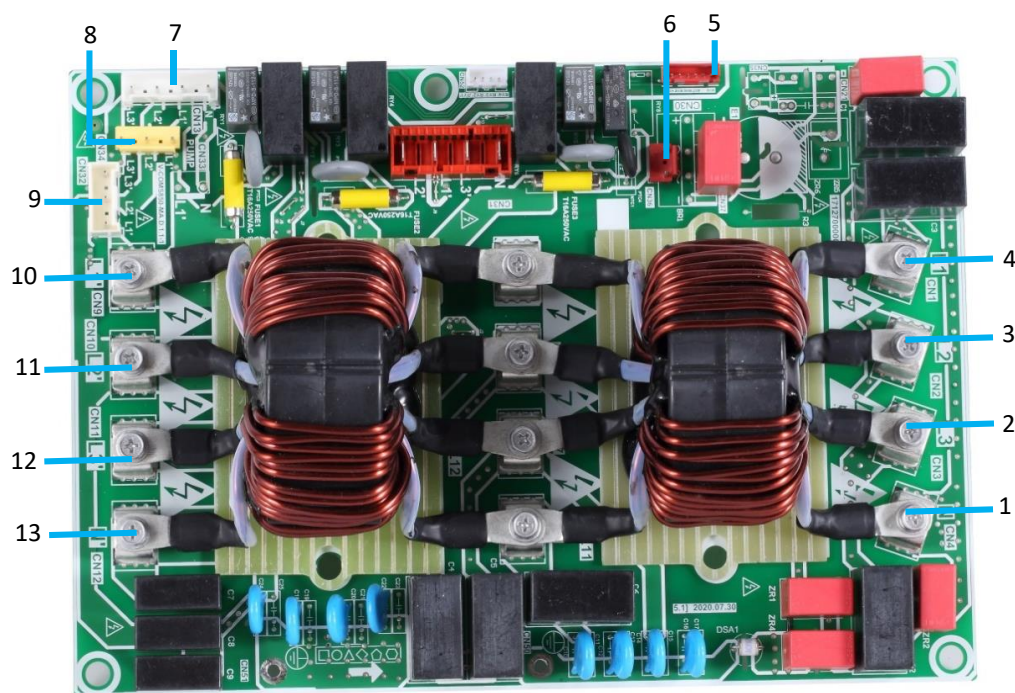
For MC-SU75-RN8L-B and MC-SU140-RN8L-B



| Label | Code | Port | Explanation                                        | Voltage  |
|-------|------|------|----------------------------------------------------|----------|
| 1     | CN1  | L1   | Input port L1                                      | 380-415V |
| 2     | CN2  | L2   | Input port L2                                      |          |
| 3     | CN3  | L3   | Input port L3                                      |          |
| 4     | CN4  | N    | Input port N                                       |          |
| 5     | CN11 |      | Power supply port for main PCB                     |          |
| 6     | CN12 |      | Port for three phase protector (reserve)           | 380-415V |
| 7     | CN7  | L3'  | Output port L3                                     | 380-415V |
| 8     | CN6  | L2'  | Output port L2                                     |          |
| 9     | CN5  | L1'  | Output port L1                                     |          |
| 10    | CN16 |      | Three phase water pump power supply port (reserve) | 380-415V |

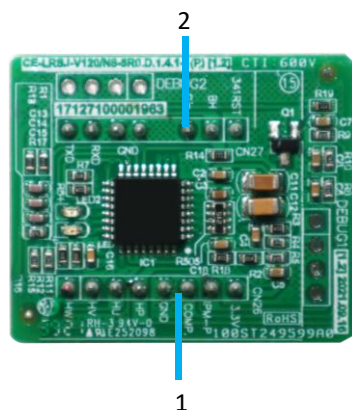


For MC-SU90-RN8L-B and MC-SU180-RN8L-B



| Label | Code | Port                                                               | Voltage |
|-------|------|--------------------------------------------------------------------|---------|
| 1     | CN4  | Input port N                                                       | 400VAC  |
| 2     | CN3  | Input port L3                                                      | 400VAC  |
| 3     | CN2  | Input port L2                                                      | 400VAC  |
| 4     | CN1  | Input port L1                                                      | 400VAC  |
| 5     | CN30 | Relay driver signal for compressor from main PCB                   | DC12V   |
| 6     | CN36 | Power supply for compressor inverter module                        | 230VAC  |
| 7     | CN13 | Power supply port for main PCB/Three phase sequence detection port | 230VAC  |
| 8     | CN34 | Power supply for three phase water pump                            | 400VAC  |
| 9     | CN32 | Port for three phase protector                                     | 400VAC  |
| 10    | CN9  | Output port L1'                                                    | 400VAC  |
| 11    | CN10 | Output port L2'                                                    | 400VAC  |
| 12    | CN11 | Output port L3'                                                    | 400VAC  |
| 13    | CN13 | Output port N                                                      | 400VAC  |
| 14    | CN51 | Ground screw hole                                                  | /       |
| 15    | CN50 | Ground screw hole                                                  | /       |

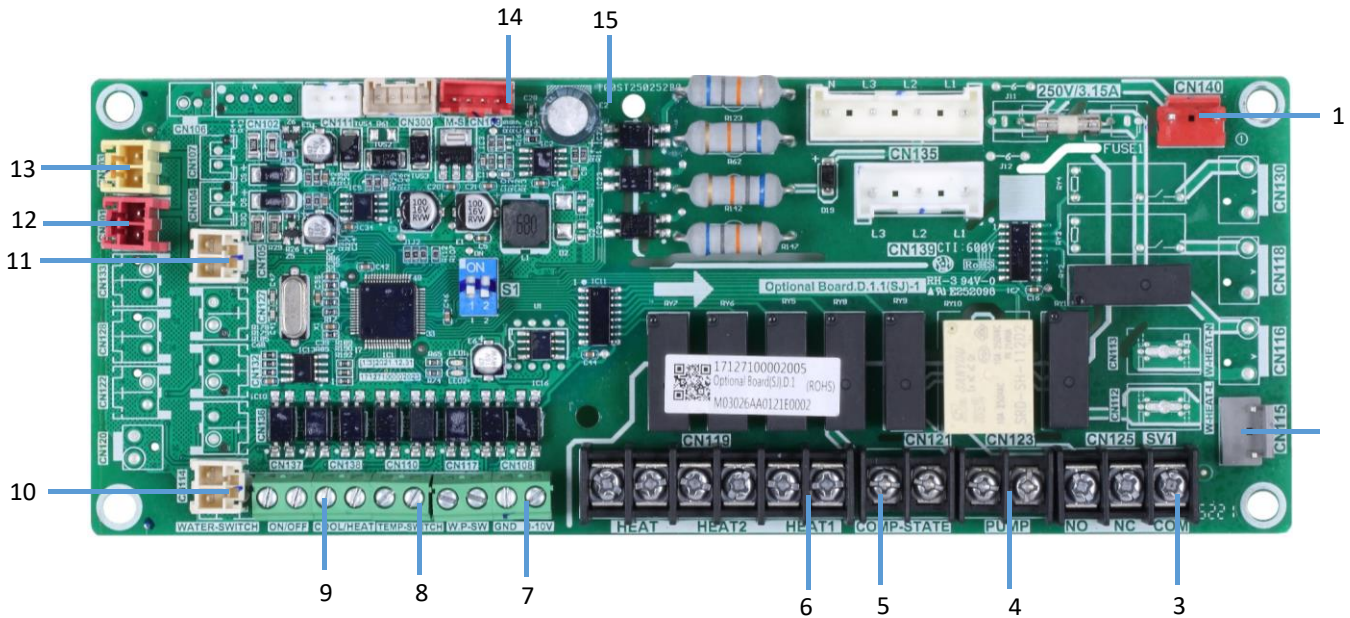
## 2.6 PED Board



| Label | Code | Port | Explanation                            | Voltage |
|-------|------|------|----------------------------------------|---------|
| 1     | CN26 | /    | For connecting compressor module board | /       |
| 2     | CN27 | /    | For connecting compressor module board | /       |

## 2.7 Slave PCB Board

For MC-SU75-RN8L-B and MC-SU140-RN8L-B only:

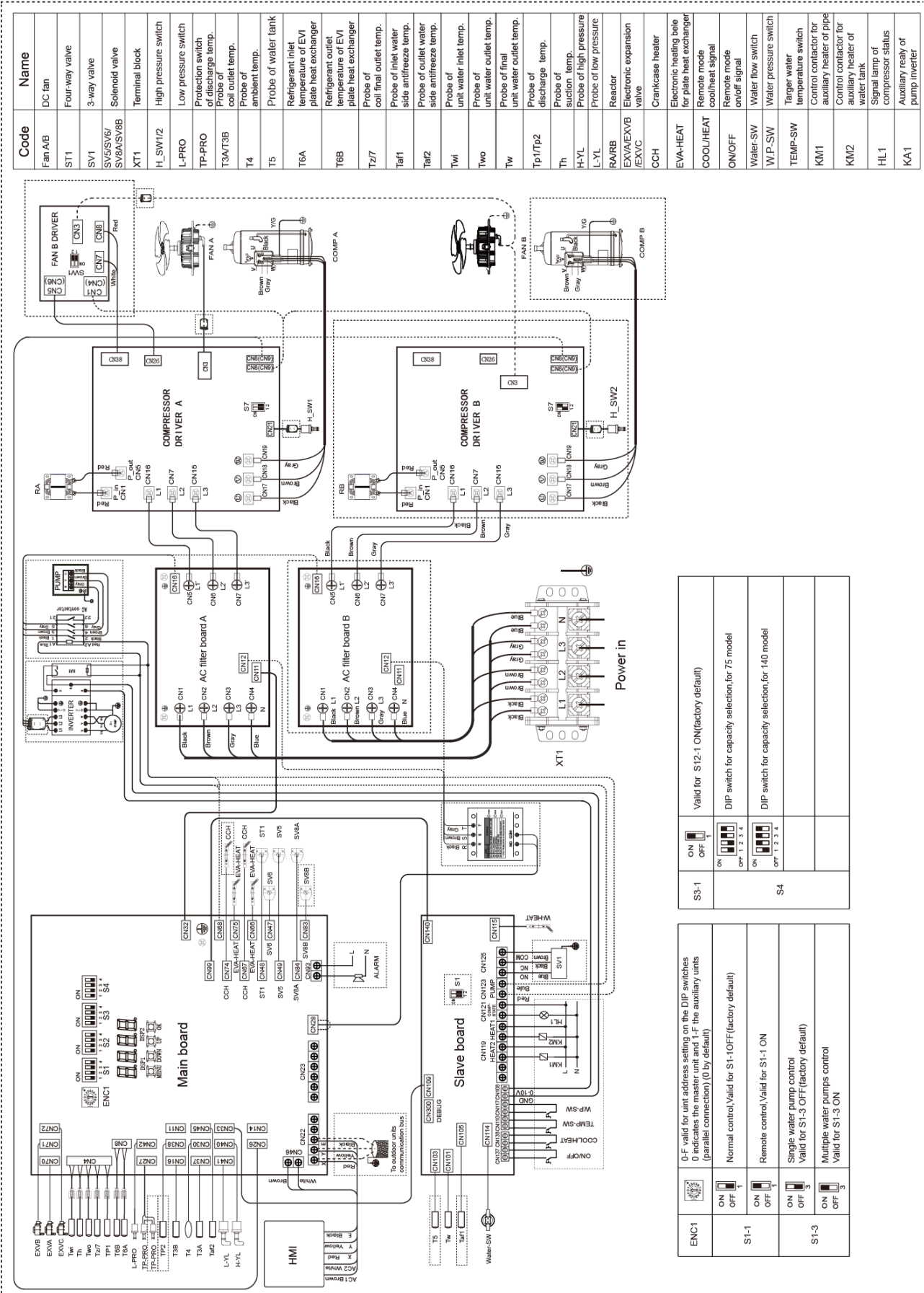


| Label | Code  | Port         | Explanation                                                                 | Voltage      |
|-------|-------|--------------|-----------------------------------------------------------------------------|--------------|
| 1     | CN140 | POWER        | Slave PCB board strong power supply                                         | 220-240V     |
| 2     | CN115 | W-HEAT       | Water pipe electric heating belt                                            | 220-240V     |
| 3     | CN125 | 3-way valve  | Three-way valve for making hot water (used for customized hot water models) | 220-240V     |
| 4     | CN123 | PUMP         | Port for water pump contactor control (for market installation)             | 220-240V     |
| 5     | CN121 | COMP-STATE   | Compressor Status Indication                                                | /            |
| 6     | CN119 | HEAT1        | Pipe auxiliary motor heating belt                                           | /            |
| 7     | CN108 | PUMP-V       | Frequency conversion pump 0-10V control signal                              | DC 0-10V     |
| 8     | CN110 | W.P-SW       | Water pressure difference switch                                            | DC12V        |
|       |       | TEMP-SW      | Target water temperature switch                                             | DC12V        |
| 9     | CN138 | COOL/HEAT    | Remote mode control                                                         | DC12V        |
|       |       | ON/OFF       | Remote switch control                                                       | DC12V        |
| 10    | CN114 | WATER-SWITCH | Water flow switch                                                           | DC12V        |
| 11    | CN105 | Taf1         | Water tank anti-freeze sensor                                               | DC3.3V       |
| 12    | CN101 | TW           | Total water sensor                                                          | DC3.3V       |
| 13    | CN103 | T5           | Water tank sensor                                                           | DC3.3V       |
| 14    | CN300 | DEBUG        | Main control program burn port (WizPro200RS programmer)                     | DC3.3V       |
| 15    | CN109 | MS           | Communication port of slave PCB board and main PCB board                    | DC12V/DC3.3V |

## 3 Wiring diagram

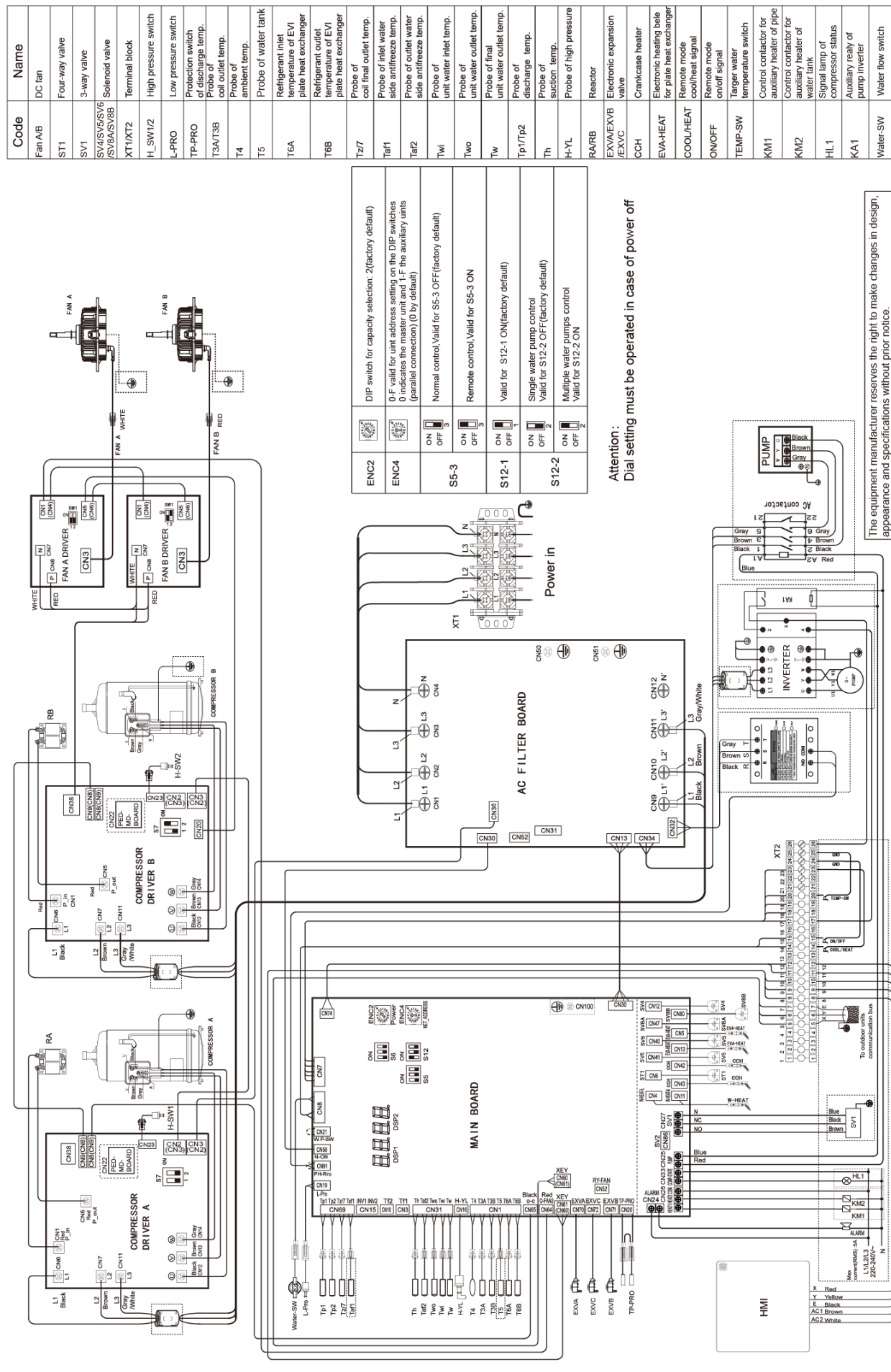
### 3.1 Single unit

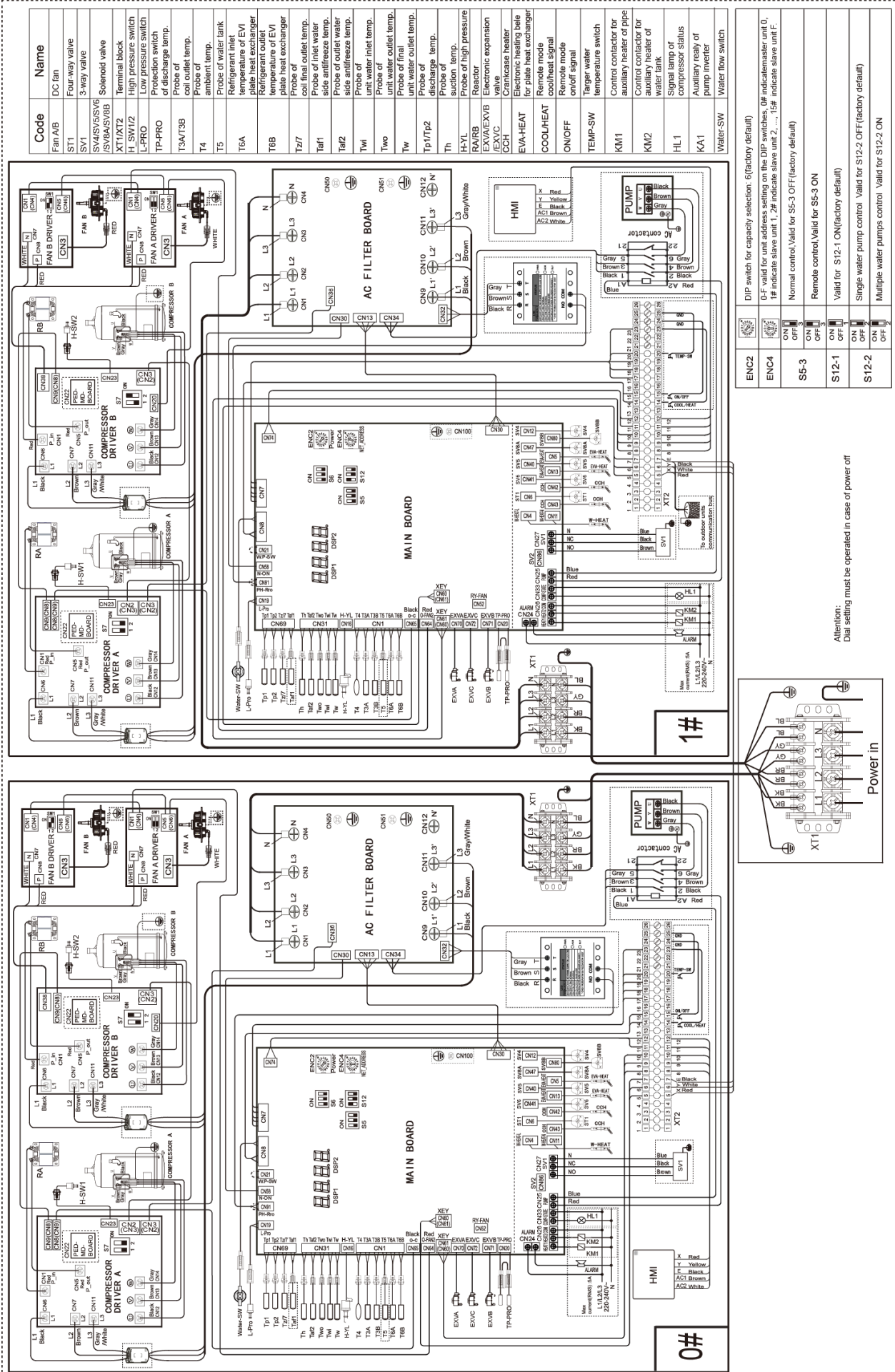
For MC-SU75-RN8L-B and MC-SU140-RN8L-B





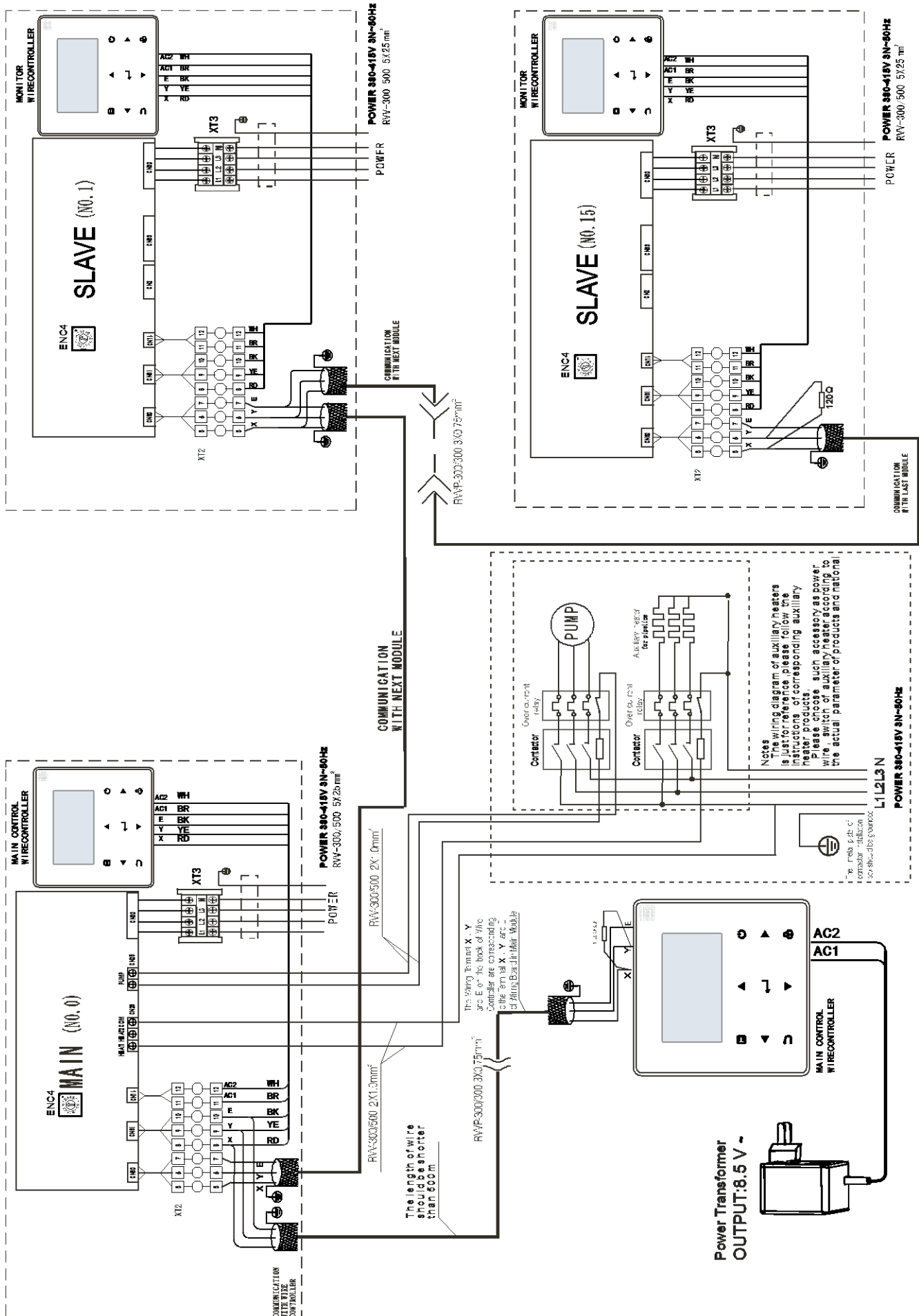
For MC-SU90-RN8L-B:





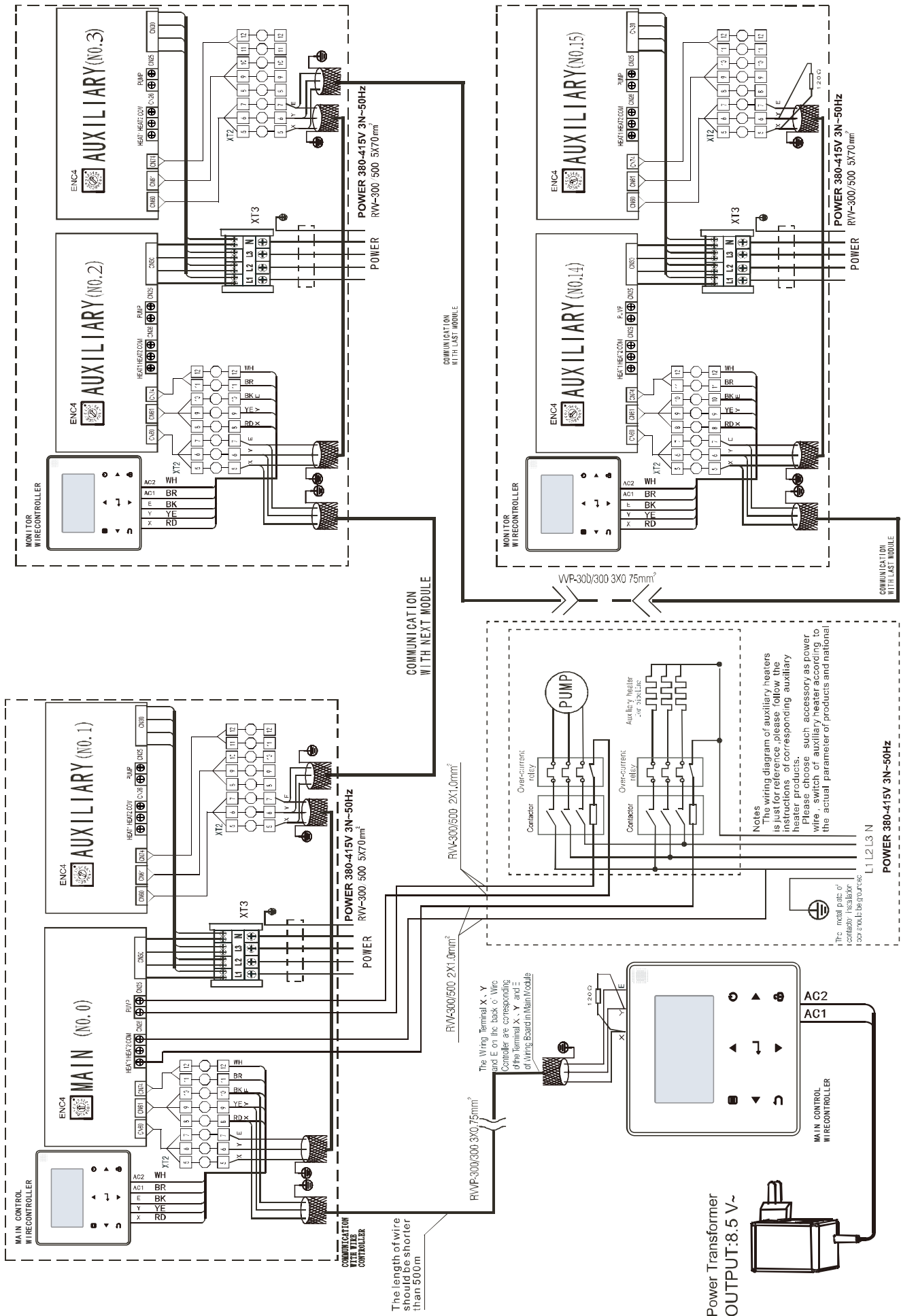
For MC-SU75-RN8L-B:

For MC-SU90-RN8L-B:





For MC-SU180-RN8L-B:





## 4 Error Code Table

| Code | Content                                                                            | Remarks                                  |
|------|------------------------------------------------------------------------------------|------------------------------------------|
| E0   | Main control EPROM error                                                           | Displayed on main PCB and user interface |
| E1   | Phase sequence failure of main control board check                                 | Displayed on main PCB and user interface |
| E2   | Main control and wired control transmission error                                  | Displayed on main PCB and user interface |
|      | Communication failure between master and slave                                     |                                          |
| E3   | Total water outlet temperature sensor error (valid for the main unit)              | Displayed on main PCB and user interface |
| E4   | Unit water outlet temperature sensor error                                         | Displayed on main PCB and user interface |
| E5   | 1E5 Condenser tube temperature sensor T3A error                                    | Displayed on main PCB and user interface |
|      | 2E5 Condenser tube temperature sensor T3B error                                    |                                          |
| E6   | Water tank temperature sensor T5 error                                             | Displayed on main PCB and user interface |
| E7   | Ambient temperature sensor error                                                   | Displayed on main PCB and user interface |
| E8   | Power supply phase sequence protector output error                                 | Displayed on main PCB and user interface |
| E9   | Water flow detection error                                                         | Displayed on main PCB and user interface |
| Eb   | 1Eb: Taf1 the pipe of <b>hot water side</b> antifreeze protection sensor error     | Displayed on main PCB and user interface |
|      | 2Eb: Taf2 cooling evaporator low-temperature antifreeze protection sensor error    | Displayed on main PCB and user interface |
| EC   | Slave unit module reduction                                                        | Displayed on main PCB and user interface |
| Ed   | System discharge temperature sensor error                                          | Displayed on main PCB and user interface |
| EE   | 1EE EVI plate heat exchanger refrigerant temperature T6A sensor error              | Displayed on main PCB and user interface |
|      | 2EE EVI plate heat exchanger refrigerant temperature T6B sensor error              | Displayed on main PCB and user interface |
| EF   | Unit water return temperature sensor error                                         | Displayed on main PCB and user interface |
| EH   | System self-check error alarm (for MC-SU90-RN8L-B and MC-SU180-RN8L-B)             | Displayed on main PCB and user interface |
| EP   | Discharge sensor error alarm                                                       | Displayed on main PCB and user interface |
| EU   | Tz sensor error                                                                    | Displayed on main PCB and user interface |
| P0   | P0 System high-pressure protection or discharge temperature protection             | Displayed on main PCB and user interface |
|      | 1P0 Compressor module 1 high pressure protection                                   | Displayed on main PCB and user interface |
|      | 2P0 Compressor module 2 high pressure protection                                   | Displayed on main PCB and user interface |
| P1   | System low pressure protection                                                     | Displayed on main PCB and user interface |
| P2   | Tz total cold outlet temperature too high (for MC-SU90-RN8L-B and MC-SU180-RN8L-B) | Displayed on main PCB and user interface |
| P3   | T4 ambient temperature too high in cooling mode                                    | Displayed on main PCB and user interface |
| P4   | 1P4 System A current protection                                                    | Displayed on main PCB and user interface |
|      | 2P4 System A DC bus current protection                                             | Displayed on main PCB and user interface |
| P5   | 1P5 System B current protection                                                    | Displayed on main PCB and user interface |
|      | 2P5 System B DC bus current protection                                             | Displayed on main PCB and user interface |
| P6   | Inverter module failure (for MC-SU90-RN8L-B and MC-SU180-RN8L-B)                   | Displayed on main PCB and user interface |
| P7   | High temperature protection of system condenser                                    | Displayed on main PCB and user interface |
| P9   | Water inlet and outlet temperature difference protection                           | Displayed on main PCB and user interface |
| PA   | Abnormal water inlet and outlet temperature difference protection                  | Displayed on main PCB and user interface |
| Pb   | Winter antifreeze protection                                                       | Displayed on main PCB and user interface |
| PC   | Cooling evaporator pressure too low                                                | Displayed on main PCB and user interface |
| PE   | Cooling evaporator low temperature antifreeze protection                           | Displayed on main PCB and user interface |
| PH   | Heating T4 too high temperature protection                                         | Displayed on main PCB and user interface |
| PL   | Tfin module too high temperature protection                                        | Displayed on main PCB and user interface |



Continued:

| Code | Content                                                                                                                         | Remarks                                  |
|------|---------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| PU   | 1PU DC fan A module protection                                                                                                  | Displayed on main PCB and user interface |
|      | 2PU DC fan B module protection                                                                                                  | Displayed on main PCB and user interface |
| H9   | 1H9 Compressor A inverter module is not matched                                                                                 | Displayed on main PCB and user interface |
|      | 2H9 Compressor A inverter module is not matched                                                                                 | Displayed on main PCB and user interface |
| HC   | High pressure sensor error                                                                                                      | Displayed on main PCB and user interface |
| HE   | 1HE No inset A valve error                                                                                                      | Displayed on main PCB and user interface |
|      | 2HE No inset B valve error                                                                                                      | Displayed on main PCB and user interface |
|      | 3HE No inset C valve error                                                                                                      | Displayed on main PCB and user interface |
| F0   | 1FO IPM module A transmission error                                                                                             | Displayed on main PCB and user interface |
|      | 2FO IPM module B transmission error                                                                                             | Displayed on main PCB and user interface |
| F2   | Superheat insufficient                                                                                                          | Displayed on main PCB and user interface |
| F4   | 1F4 module A L0 or L1 protection occurs for 3 times in 60 minutes                                                               | Displayed on main PCB and user interface |
|      | 2F4 module B L0 or L1 protection occurs for 3 times in 60 minutes                                                               | Displayed on main PCB and user interface |
| F6   | 1F6 A system buss voltage error (PTC)                                                                                           | Displayed on main PCB and user interface |
|      | 2F6 B system buss voltage error (PTC)                                                                                           | Displayed on main PCB and user interface |
| Fb   | Pressure sensor error                                                                                                           | Displayed on main PCB and user interface |
| Fd   | Suction temperature sensor error                                                                                                | Displayed on main PCB and user interface |
| FF   | 1FF DC fan A error                                                                                                              | Displayed on main PCB and user interface |
|      | 2FF DC fan B error                                                                                                              | Displayed on main PCB and user interface |
| FP   | DIP switch inconsistency of multiple water pumps                                                                                | Displayed on main PCB and user interface |
| C7   | If PL occurs 3 times, the system reports the C7 failure                                                                         | Displayed on main PCB and user interface |
| L0   | Compressor inverter module protection (x=1or2) (for MC-SU90-RN8L-B and MC-SU180-RN8L-B)                                         | Displayed on main PCB                    |
| L1   | Low-voltage protection (x=1or2) (for MC-SU90-RN8L-B and MC-SU180-RN8L-B)                                                        | Displayed on main PCB                    |
| L2   | High-voltage protection (x=1or2) (for MC-SU90-RN8L-B and MC-SU180-RN8L-B)                                                       | Displayed on main PCB                    |
| L4   | MCE error (x=1or2) (for MC-SU90-RN8L-B and MC-SU180-RN8L-B)                                                                     | Displayed on main PCB                    |
| L5   | Zero speed protection (x=1or2) (for MC-SU90-RN8L-B and MC-SU180-RN8L-B)                                                         | Displayed on main PCB                    |
| L7   | Phase sequence error (x=1or2) (for MC-SU90-RN8L-B and MC-SU180-RN8L-B)                                                          | Displayed on main PCB                    |
| L8   | Compressor frequency variation greater than 15Hz within one second protection (for MC-SU90-RN8L-B and MC-SU180-RN8L-B)          | Displayed on main PCB                    |
| L9   | Actual compressor frequency differs from target frequency by more than 15Hz protection (for MC-SU90-RN8L-B and MC-SU180-RN8L-B) | Displayed on main PCB                    |
| dF   | Defrosting prompt (for MC-SU90-RN8L-B and MC-SU180-RN8L-B)                                                                      | Displayed on main PCB and user interface |
| bH   | 1bH Module 1 relay blocking or 908 chip self-check failed                                                                       | Displayed on main PCB and user interface |
|      | 2bH Module 2 relay blocking or 908 chip self-check failed                                                                       | Displayed on main PCB and user interface |

## 5 Troubleshooting

### 5.1 Warning

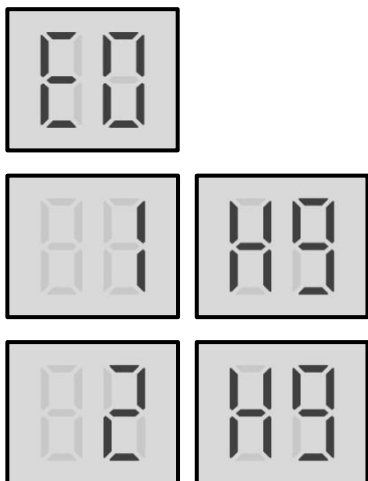
#### Warning



- 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 the outdoor units before connecting or disconnecting any connections or wiring, otherwise electric shock (which can cause physical injury or death) may occur or damage to components may occur.

## 5.2 E0/H9 Troubleshooting

### 5.2.1 Digital display output



### 5.2.2 Description

For MC-SU75-RN8L-B and MC-SU140-RN8L-B

- E0 indicates that the capability dialing code of the main PCB is inconsistent with the actual model.
- 1H9 indicates that the driving model of IPM inverter module (compressor A) does not match.
- 2H9 indicates that the driving model of IPM inverter module (compressor B) does not match.
- The faulty unit stops running.
- Error code is displayed on main PCB and user interface...d user interface.

For MC-SU90-RN8L-B and MC-SU180-RN8L-B

- E0 indicates main PCB EEPROM error.
- 1H9 indicates IPM inverter module (compressor A) EEPROM error.
- 2H9 indicates IPM inverter module (compressor B) EEPROM error.
- The faulty unit stops running.
- Error code is displayed on main PCB and user interface...d user interface.

### 5.2.3 Possible causes

For MC-SU75-RN8L-B and MC-SU140-RN8L-B

- The dialing code of main PCB capability is error.
- The address dialing code of the IPM inverter module PCB is error.
- Main PCB or IPM inverter module damaged.

For MC-SU90-RN8L-B and MC-SU180-RN8L-B

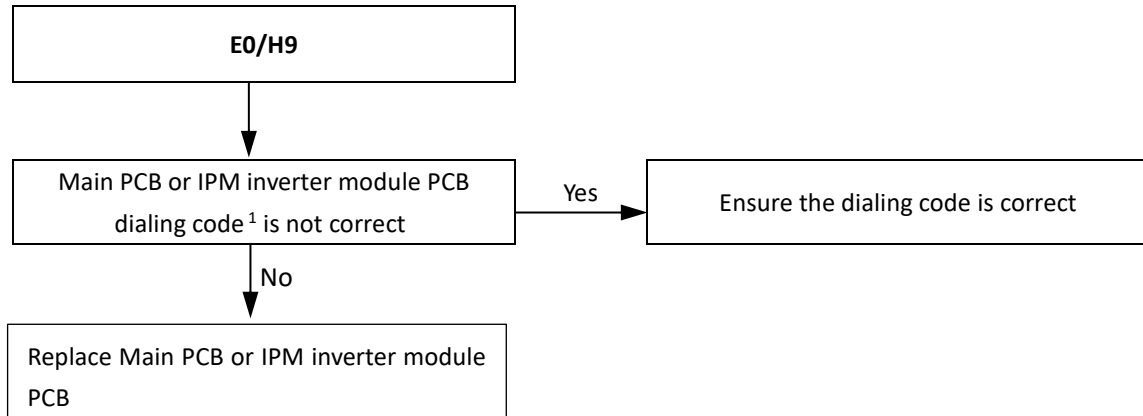
- Main PCB or IPM inverter module EEPROM is not connected properly.
- Main PCB or IPM inverter module damaged.
- EEPROM damaged.

## Aqua thermal



### 5.2.4 Procedure

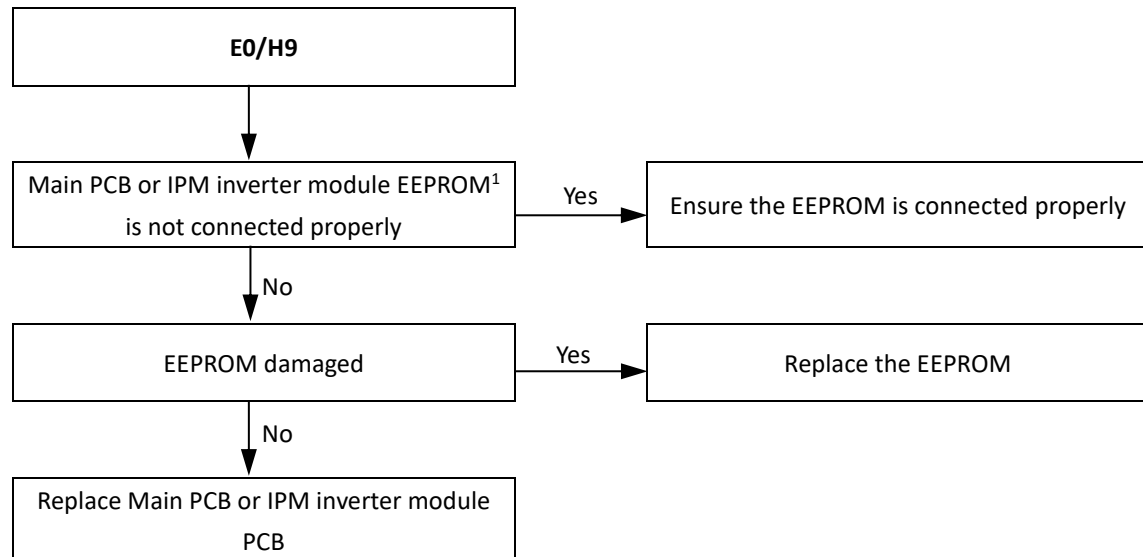
For MC-SU75-RN8L-B and MC-SU140-RN8L-B



Notes:

1. Main PCB capability dialing code is designated S4 on the main PCBs (labeled 39 in Part 4, 2.2.1 Main PCB component);
2. Compressor inverter module PCB address dialing code is designated S7 on compressor inverter module PCB.

For MC-SU90-RN8L-B and MC-SU180-RN8L-B



Notes:

1. Main PCB EEPROM is designated IC10 on the main PCBs (labeled 28 in Part 4, 2.2.1 Main PCB component);
2. Compressor inverter module PCB EEPROM is designated IC25 on compressor inverter module PCB (labeled 18 in Part 4, 2.3.1 Compressor Inverter Module PCB component).

## 5.3 E1 Troubleshooting

### 5.3.1 Digital display output



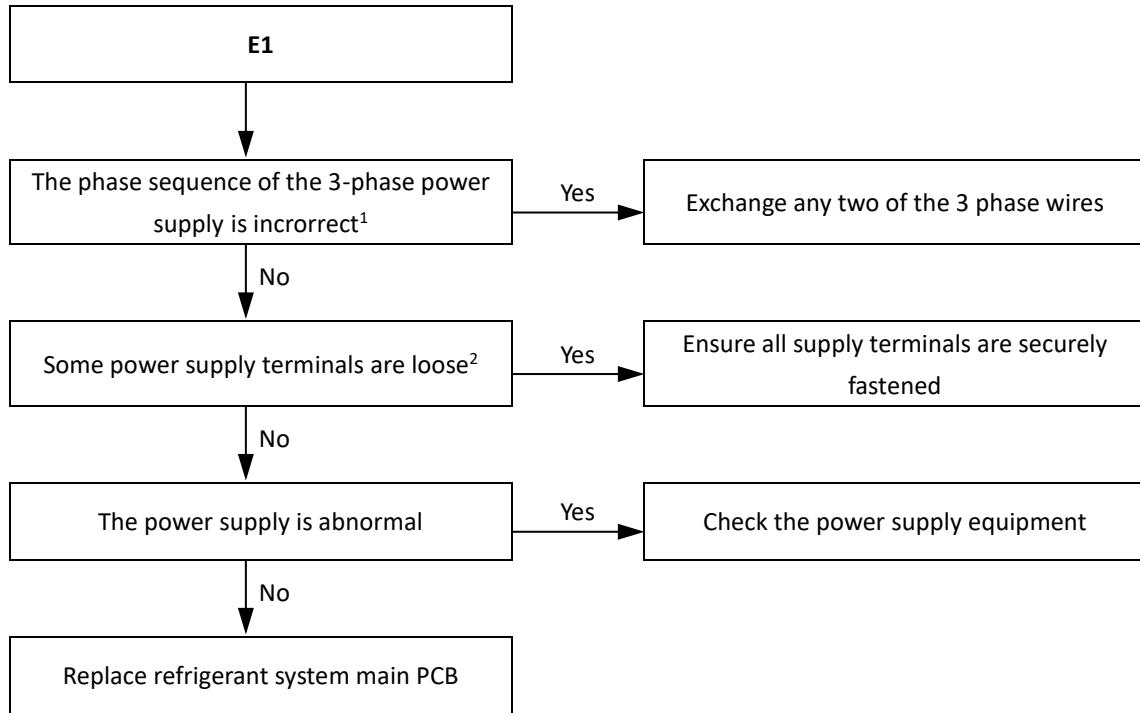
### 5.3.2 Description

- Phase sequence error.
- The faulty unit stops running.
- Error code is displayed on main PCB and user interface.

### 5.3.3 Possible causes

- Power supply phases not connected in correct sequence.
- Power supply terminals loose.
- Power supply abnormal.
- Main PCB damaged.

## 5.3.4 Procedure



## Notes:

1. The A, B, C terminals of 3-phase power supply should match compressor phase sequence requirements. If the phase sequence is inverted, the compressor will operate inversely. If the wiring connection of each outdoor unit is in A, B, C phase sequence, and multiple units are connected, the current difference between C phase and A, B phases will be very large as the power supply load of each outdoor unit will be on C phase. This can easily lead to tripped circuits and terminal wiring burnout. Therefore if multiple units are to be used, the phase sequence should be staggered, so that the current is distributed among the three phases equally.
2. Loose power supply terminals can cause the compressor to operate abnormally and compressor current to be very large.

## 5.4 E2 Troubleshooting

### 5.4.1 Digital display output



### 5.4.2 Description

- Communication error between outdoor unit and user interface.
- Communication failure between master and slave units
- When this error occurs in the main unit, all units stop running. When this error occurs in the slave unit, the slave unit stops running.
- Error code is displayed on main PCB and user interface.

### 5.4.3 Possible causes

- Communication wires between outdoor unit and user interface not connected properly.
- For MC-SU90-RN8L-B, Communication wiring P Q E terminals misconnected. For MC-SU75-RN8L-B, MC-SU140-RN8L-B MC-SU180-RN8L-B, Communication wiring X Y E terminals misconnected
- Wiring connection is loosen
- Interference from high voltage wires or other sources of electromagnetic radiation.
- Communication wire too long.
- Damaged main PCB, user interface or electric control box communication terminals block.

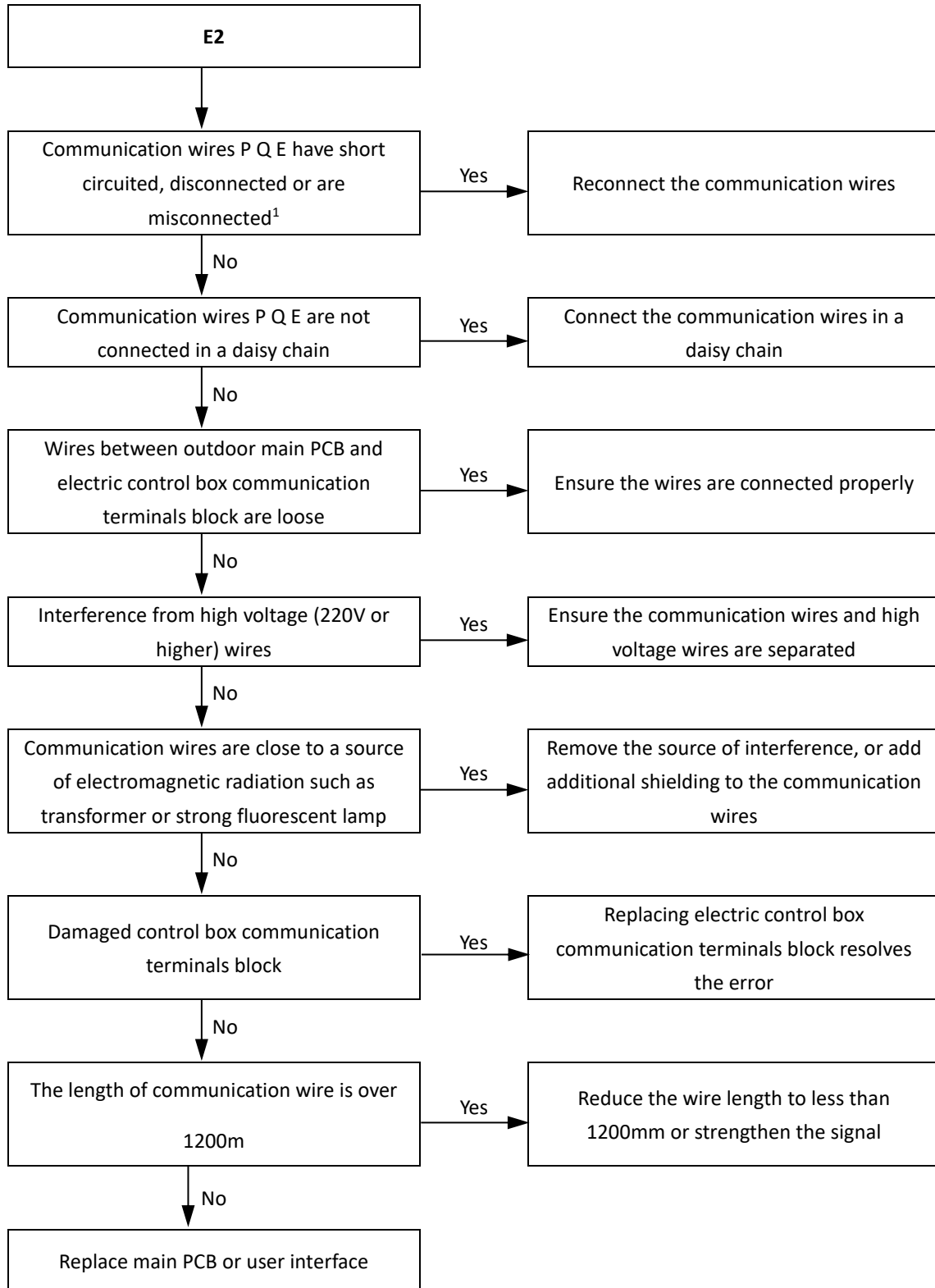


## Aqua thermal



### 5.4.4 Procedure

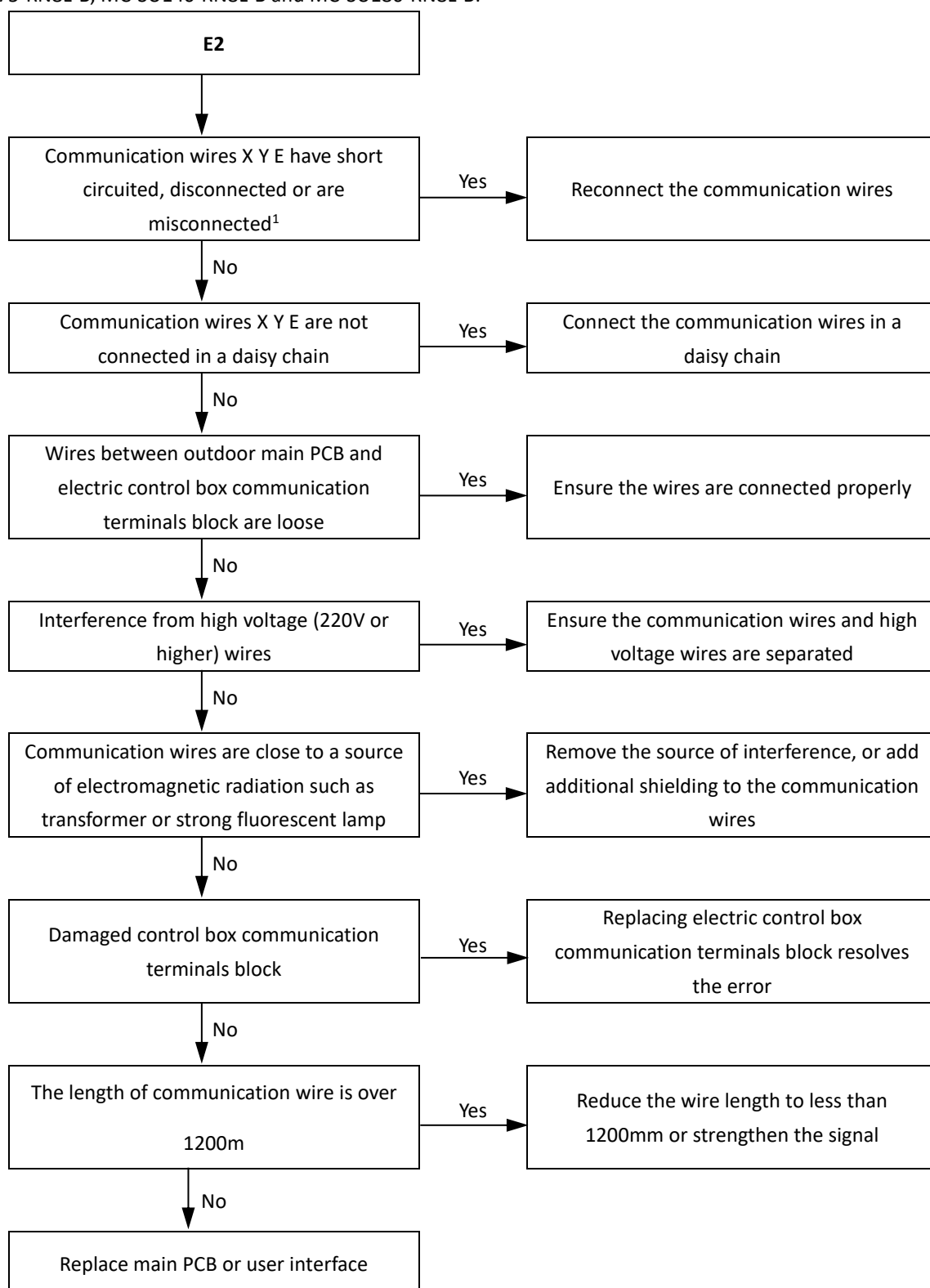
For MC-SU90-RN8L-B:



Notes:

1. Measure the resistance among P, Q and E. The normal resistance between P and Q is 120Ω, between P and E is infinite, between Q and E is infinite. Communication wiring has polarity. Ensure that the P wire is connected to P terminals and the Q wire is connected to Q terminals.

For MC-SU75-RN8L-B, MC-SU140-RN8L-B and MC-SU180-RN8L-B:



Notes:

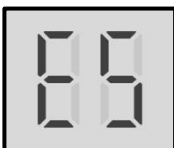
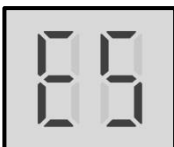
1. Measure the resistance among X, Y and E. The normal resistance between X and Y is 120Ω, between X and E is infinite, between Y and E is infinite. Communication wiring has polarity. Ensure that the P wire is connected to P terminals and the Q wire is connected to Q terminals.
2. Check whether the communication wires X, Y and E between units have disconnected or are misconnected.

## Aqua thermal



### 5.5 E3, E4, E5, E7, Eb, Ed, EE, EF, EP, EU, Fb, Fd Troubleshooting

#### 5.5.1 Digital display output





### 5.5.2 Description

For MC-SU75-RN8L-B and MC-SU140-RN8L-B

- E3 indicates total water outlet temperature sensor error (valid for the main unit)
- E4 unit water outlet temperature sensor error
- 1E5 indicates condenser tube temperature sensor T3A error
- 2E5 indicates condenser tube temperature sensor T3B error
- E6 Water tank temperature sensor T5 failure
- E7 indicates ambient temperature sensor error
- 1Eb indicates pipe of the tank antifreeze protection sensor Taf1 error
- 2Eb indicates cooling evaporator low-temperature antifreeze protection sensor Taf2 error
- Ed indicates discharge pipe temperature sensors Tp1 and Tp2 error at the same time
- 1EE indicates EVI plate heat exchanger refrigerant temperature sensor T6A error
- 2EE indicates EVI plate heat exchanger refrigerant temperature sensor T6B error
- EF indicates unit water return temperature sensor error
- EP indicates discharge temperature sensor failure error
- EU indicates water side heat exchanger refrigerant total outlet temperature sensor Tz error in heating mode.
- Fb indicates Low pressure sensor error.
- Fd indicates suction temperature sensor Th error.
- All stop running.
- Error code is displayed on main PCB and user interface.

For MC-SU90-RN8L-B and MC-SU180-RN8L-B

- E3 indicates total water outlet temperature sensor error (valid for the main unit)
- E4 unit water outlet temperature sensor error
- 1E5 indicates condenser tube temperature sensor T3A error
- 2E5 indicates condenser tube temperature sensor T3B error
- E7 indicates ambient temperature sensor error
- 1Eb indicates pipe of the tank antifreeze protection sensor Taf1 error

## Aqua thermal

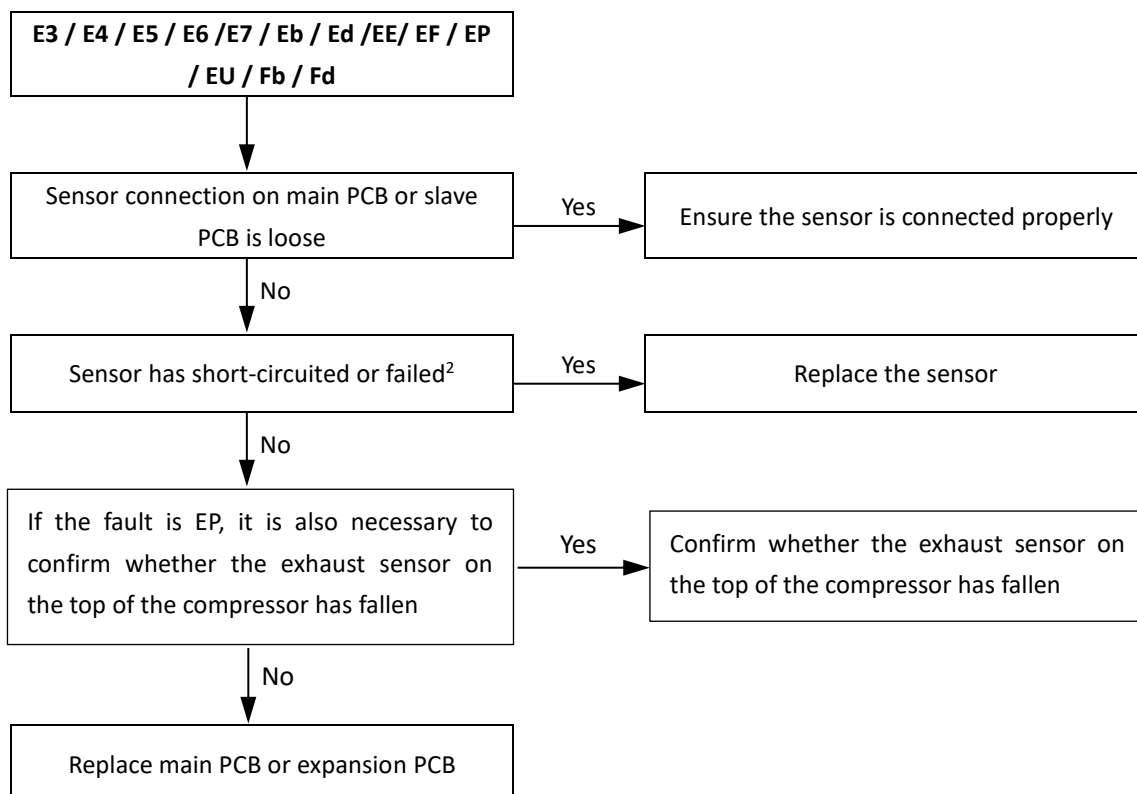
- 2Eb indicates cooling evaporator low-temperature antifreeze protection sensor Taf2 error
- Ed indicates discharge pipe temperature sensors Tp1 and Tp2A error at the same time
- 1EE indicates EVI plate heat exchanger refrigerant temperature sensor T6A error
- 2EE indicates EVI plate heat exchanger refrigerant temperature sensor T6B error
- EF indicates unit water return temperature sensor error
- EP indicates discharge temperature sensor failure error
- EU indicates air side heat exchanger refrigerant total outlet temperature sensor Tz error.
- Fb indicates pressure sensor error.
- Fd indicates suction temperature sensor Th error.
- All stop running.
- Error code is displayed on main PCB and user interface.

### 5.5.3 Possible causes

- Sensor not connected properly or has malfunctioned.
- Damaged main PCB.

### 5.5.4 Procedure

For MC-SU75-RN8L-B and MC-SU140-RN8L-B

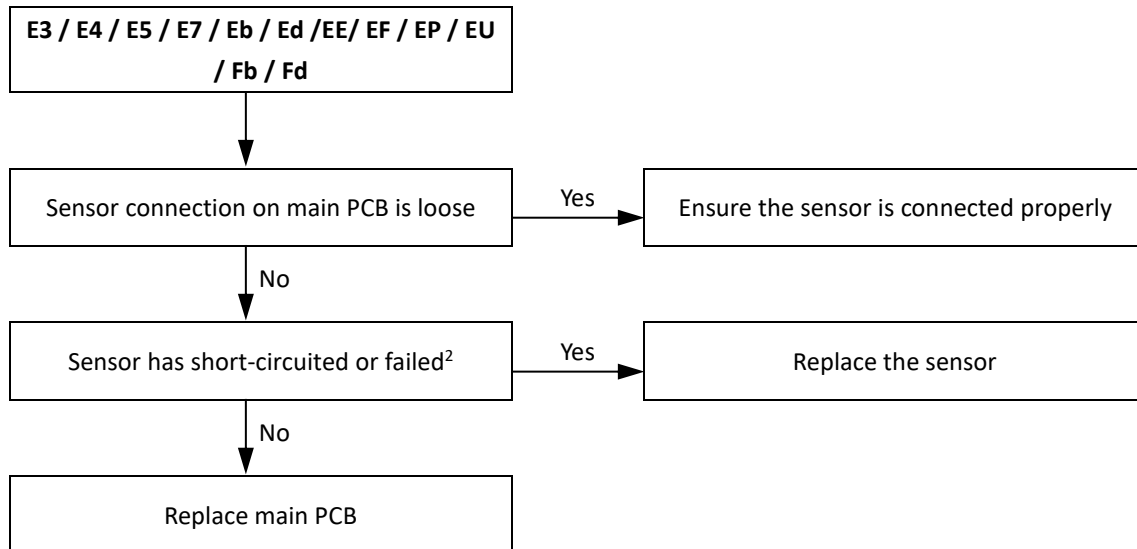


Notes:

1. Most sensors are connected to ports CN4 (E4), CN37 (1E5), CN16 (2E5), CN30 (E7), CN45 (2Eb), CN4 and CN38 (Ed), CN8 (EE), CN4 (EF), CN4 and CN38 (EP), CN4 (EU), CN41 (Fb), CN4 (Fd) on the main PCB (labeled 29, 22, 24, 23, 21, 25, 28, 19 in Part 4, 2.2.1 Main PCB component), A few sensors are connected to ports CN101 (E3), CN103 (E6), CN105 (1Eb) on the slave PCB (labeled 14,15,13 in Part 4, 2.7 Slave PCB component).

2. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Part 4, 6.1 "Temperature Sensor Resistance Characteristics".

For MC-SU90-RN8L-B and MC-SU180-RN8L-B



Notes:

1. All the sensors are connected to port CN1, CN16, CN31, CN3, CN10 and CN69 on the main PCB (labeled 29, 30, 31, 32 in Part 4, 2.2.1 Main PCB component).
2. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Part 4, 6.1 "Temperature Sensor Resistance Characteristics".

## Aqua thermal



### 5.6 E8 Troubleshooting

#### 5.6.1 Digital display output



#### 5.6.2 Description

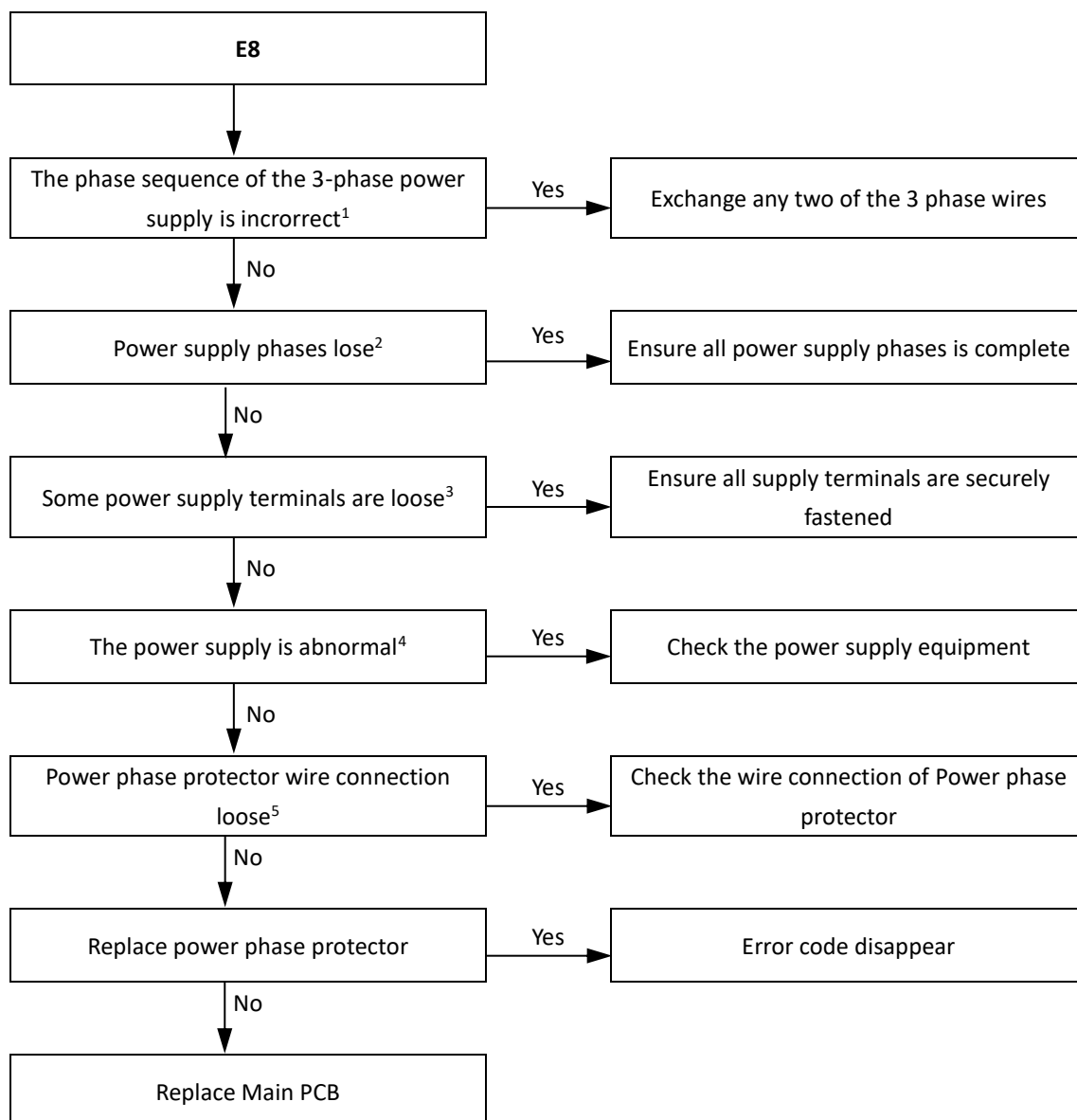
- Power supply phase sequence protector output error
- When this error occurs in the main unit, all units stop running. When this error occurs in the slave unit, the slave unit stops running.
- Error code is displayed on main PCB and user interface.

#### 5.6.3 Possible causes

- Power supply phases not connected in correct sequence or lose.
- Power supply terminals or Power phase protector wire connection loose.
- Power supply abnormal.
- Damaged main PCB.
- Damaged power phase protector.



## 5.6.4 Procedure



### Notes:

1. The red LED on the power phase protector will on.
2. The red LED on the power phase protector will flash with 1HZ.
3. The A, B, C terminals of 3-phase power supply should match compressor phase sequence requirements. If the phase sequence is inverted, the compressor will operate inversely. If the wiring connection of each outdoor unit is in A, B, C phase sequence, and multiple units are connected, the current difference between C phase and A, B phases will be very large as the power supply load of each outdoor unit will be on C phase. This can easily lead to tripped circuits and terminal wiring burnout. Therefore if multiple units are to be used, the phase sequence should be staggered, so that the current is distributed among the three phases equally.
4. The red LED on the power phase protector will flash with 3HZ. Loose power supply terminals can cause the compressor to operate abnormally and compressor current to be very large.
5. For MC-SU75-RN8L-B and MC-SU140-RN8L-B, wire connected to port CN28 on the main PCB. For MC-SU90-RN8L-B and MC-SU180-RN8L-B, wire connected to port CN91 on the main PCB. (labeled 34 in Part 4, 2.2.1 Main PCB component)

## Aqua thermal

### 5.7 E9 Troubleshooting

#### 5.7.1 Digital display output



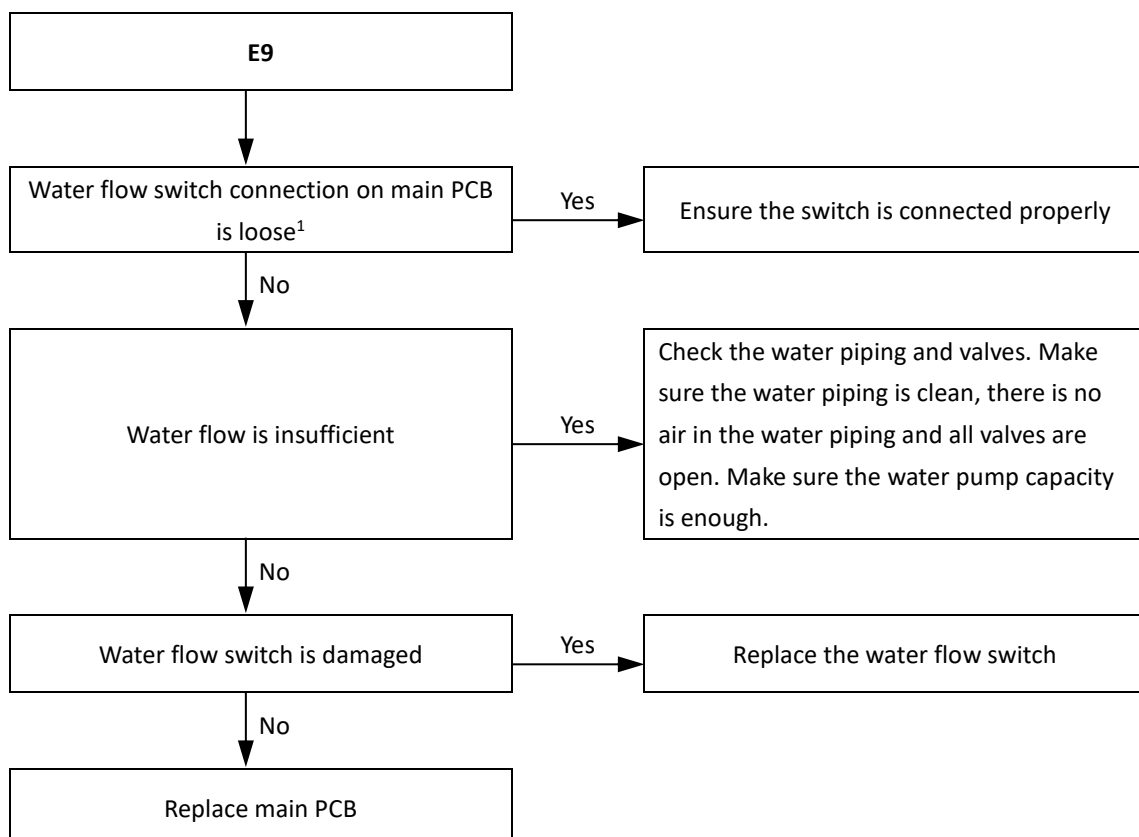
#### 5.7.2 Description

- Water flow failure.
- E9 indicates water flow switch error. When E9 error occurs 3 times in 60 minutes, manual system restart is required before the system can resume operation.
- The faulty unit stops running.
- Error code is displayed on main PCB and user interface.

#### 5.7.3 Possible causes

- The wire circuit is short connected or open.
- Water flow rate is too low.
- Water flow switch damaged.
- Damaged main PCB.

#### 5.7.4 Procedure



#### Notes:

- For MC-SU75-RN8L-B and MC-SU140-RN8L-B, Water flow switch connection is port CN114 on the slave PCB (labeled 12 in Part 4, 2.7 Slave PCB component).
- For MC-SU90-RN8L-B and MC-SU180-RN8L-B, Water flow switch connection is port CN8 on the main PCB (labeled 38 in Part 4, 2.2.1 Main PCB component).

## 5.8 EC Troubleshooting

### 5.8.1 Digital display output



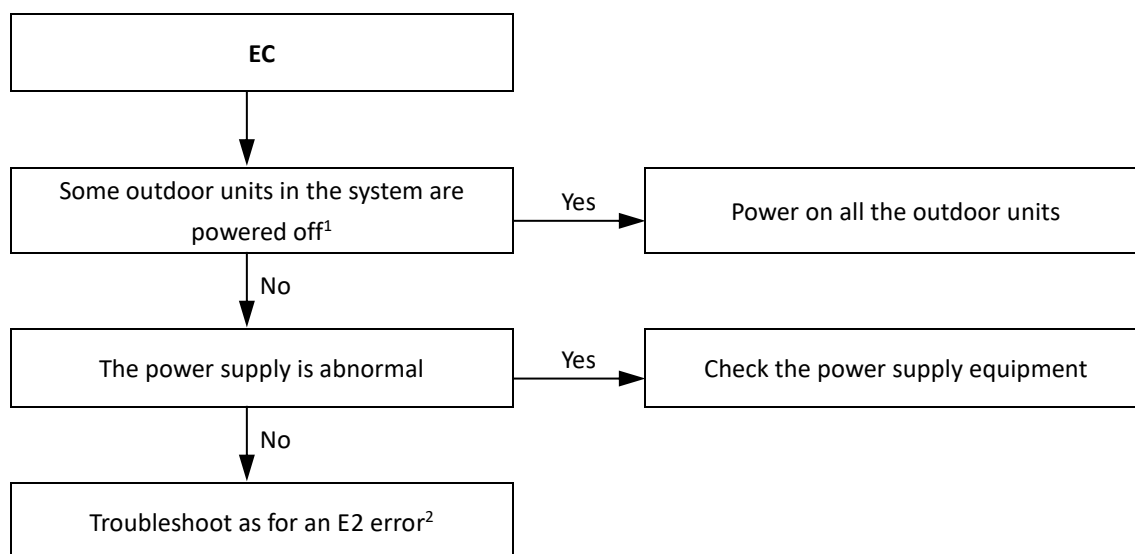
### 5.8.2 Description

- EC indicates that the number of slave units detected by master unit has decreased.
- The slave unit that has lost contact with the main unit stops running.
- Error code is only displayed on the user interface.

### 5.8.3 Possible causes

- Some outdoor units power off.
- Power supply abnormal.
- Incorrect outdoor unit address setting.
- Communication wires between outdoor units not connected properly.
- Wiring connection is loosen.
- Damaged main PCB or electric control box communication terminals block.

### 5.8.4 Procedure



#### Notes:

1. For MC-SU75-RN8L-B and MC-SU140-RN8L-B, check digital display on the main PCB. If digital display is on, the main PCB is powered on, if digital display is off, the main PCB is powered off. Please refer to labeled 11 in Part 4, 2.7 Slave PCB component.
2. For MC-SU90-RN8L-B and MC-SU180-RN8L-B, check digital display on the main PCB. If digital display is on, the main PCB is powered on, if digital display is off, the main PCB is powered off. Please refer to labeled 37 in Part 4, 2.2.1 Main PCB component.
3. See Part 4, 4.4 "E2 Troubleshooting".

## Aqua thermal

### 5.9 EH Troubleshooting (for MC-SU90-RN8L-B and MC-SU180-RN8L-B only)

#### 5.9.1 Digital display output

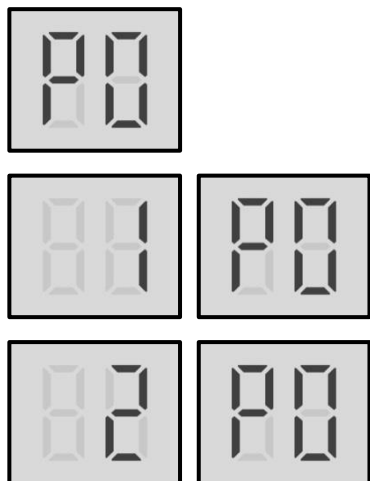


#### 5.9.2 Description

- EH indicates system self-check in the factory, it will not display in the normal operating.

## 5.10 P0 Troubleshooting

### 5.10.1 Digital display output



### 5.10.2 Description

- Discharge pipe high pressure or discharge temperature switch protection. When the discharge pressure rises above 4.2MPa or discharge temperature rises above 115°C, the system displays P0 protection and all units stop running. When the discharge pressure falls below 3.2MPa or discharge temperature fall below 90°C, P0 is removed and normal operation resumes. When P0 error occurs 3 times in 60 minutes, a manual system restart is required before the system can resume operation.
- Error code is displayed on main PCB and user interface.

### 5.10.3 Possible causes

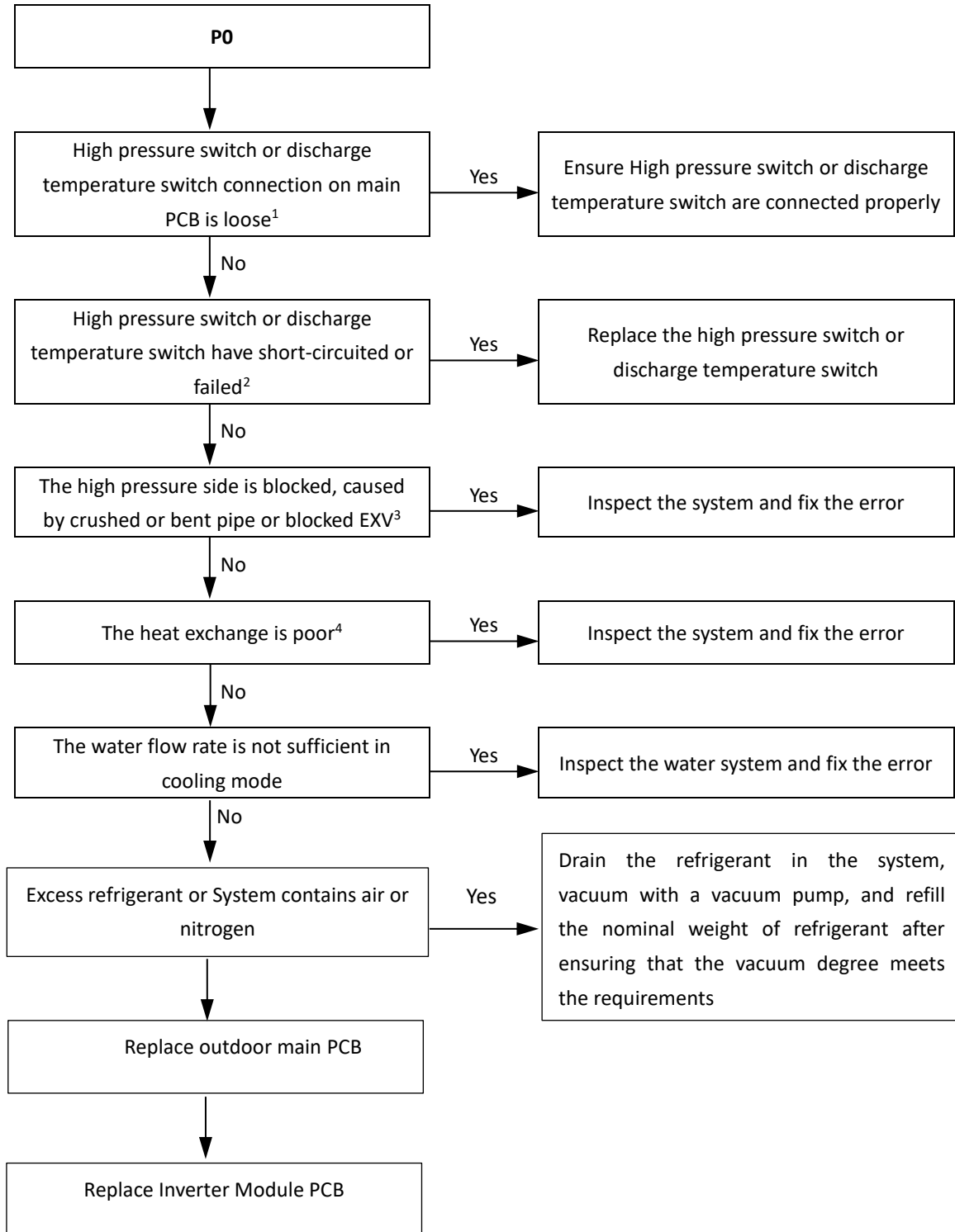
- High pressure switch or discharge temperature switch not connected properly or has malfunctioned.
- Excess refrigerant.
- System contains air or nitrogen.
- High pressure side blockage.
- Poor condenser heat exchange.
- Main PCB damaged.

## Aqua thermal



### 5.10.4 Procedure

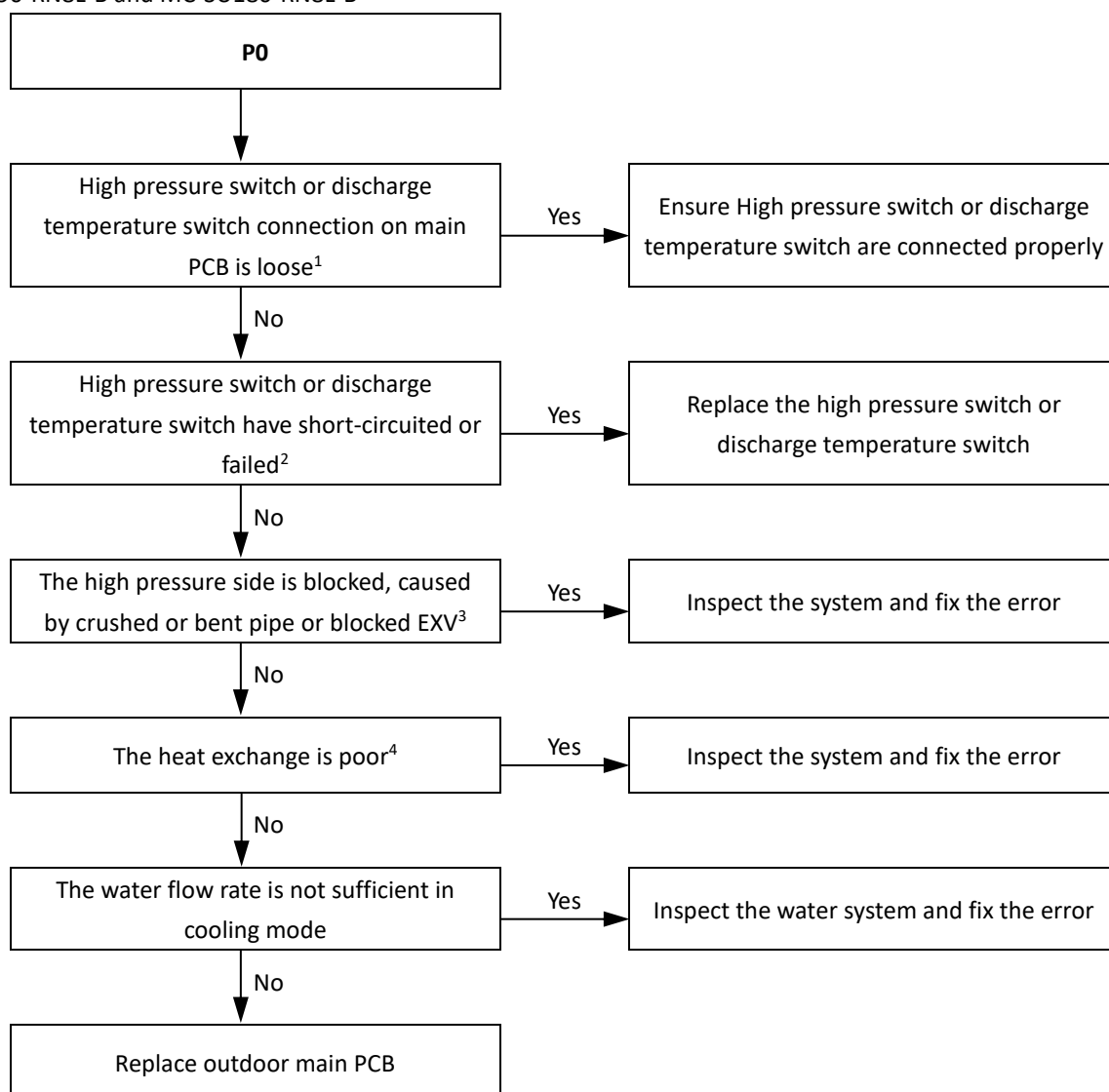
For MC-SU75-RN8L-B and MC-SU140-RN8L-B



#### Notes:

1. Discharge temperature switch connection is port CN27 on the main PCB(labeled 26 in Part 4, 2.2.1 Main PCB component) .High pressure switch connection is port CN21 on the IPM inverter module PCB;
2. Measure the resistance among the three terminals of the pressure sensor. If the resistance is of the order of mega Ohms or infinite, the pressure sensor has failed;
3. High pressure side blockage causes discharge temperature to be higher than normal, discharge pressure to be higher than normal and suction pressure to be lower than normal;
4. In heating mode check water side heat exchanger, water piping, circulator pumps and water flow switch for dirt/blockages. In cooling mode check air side heat exchanger, fan(s) and air outlets for dirt/blockages.

For MC-SU90-RN8L-B and MC-SU180-RN8L-B



**Notes:**

1. High pressure switch connection is port CN20 on the main PCB (labeled 19 in Part 4, 2.2.1 Main PCB component).
2. Measure the resistance among the three terminals of the pressure sensor. If the resistance is of the order of mega Ohms or infinite, the pressure sensor has failed.
3. High pressure side blockage causes discharge temperature to be higher than normal, discharge pressure to be higher than normal and suction pressure to be lower than normal.
4. In heating mode check water side heat exchanger, water piping, circulator pumps and water flow switch for dirt/blockages. In cooling mode check air side heat exchanger, fan(s) and air outlets for dirt/blockages.

## Aqua thermal



### 5.11 P1 Troubleshooting

#### 5.11.1 Digital display output



#### 5.11.2 Description

For MC-SU75-RN8L-B and MC-SU140-RN8L-B

- P1 indicates suction pipe low pressure protection. When the suction pressure falls below 0.05MPa, the system displays P1 protection and all units stop running. When the pressure rises above 0.15MPa, P1 is removed and normal operation resumes. When P1 error occurs 3 times in 60 minutes, a manual system restart is required before the system can resume operation.
- P1 another indicates in the standby state or shutdown state, after the compressor stops for 3min, it is determined that the refrigerant quantity of the refrigerant system of the unit is insufficient through the saturation temperature corresponding to the high-pressure pressure, the system displays P1 protection, the unit does not start and the protection is not locked; When the detection pressure returns to above the judgment value, the protection is released and the unit can resume startup.
- P1 the last one indicates during the operation of the compressor of the unit, if the exhaust superheat is too high and lasts for 30min, report P1 protection first, and then judge the low refrigerant. If the low refrigerant protection is not triggered, P1 protection is removed and the operation is restarted according to the demand.
- Error code is displayed on main PCB and user interface.

For MC-SU90-RN8L-B and MC-SU180-RN8L-B

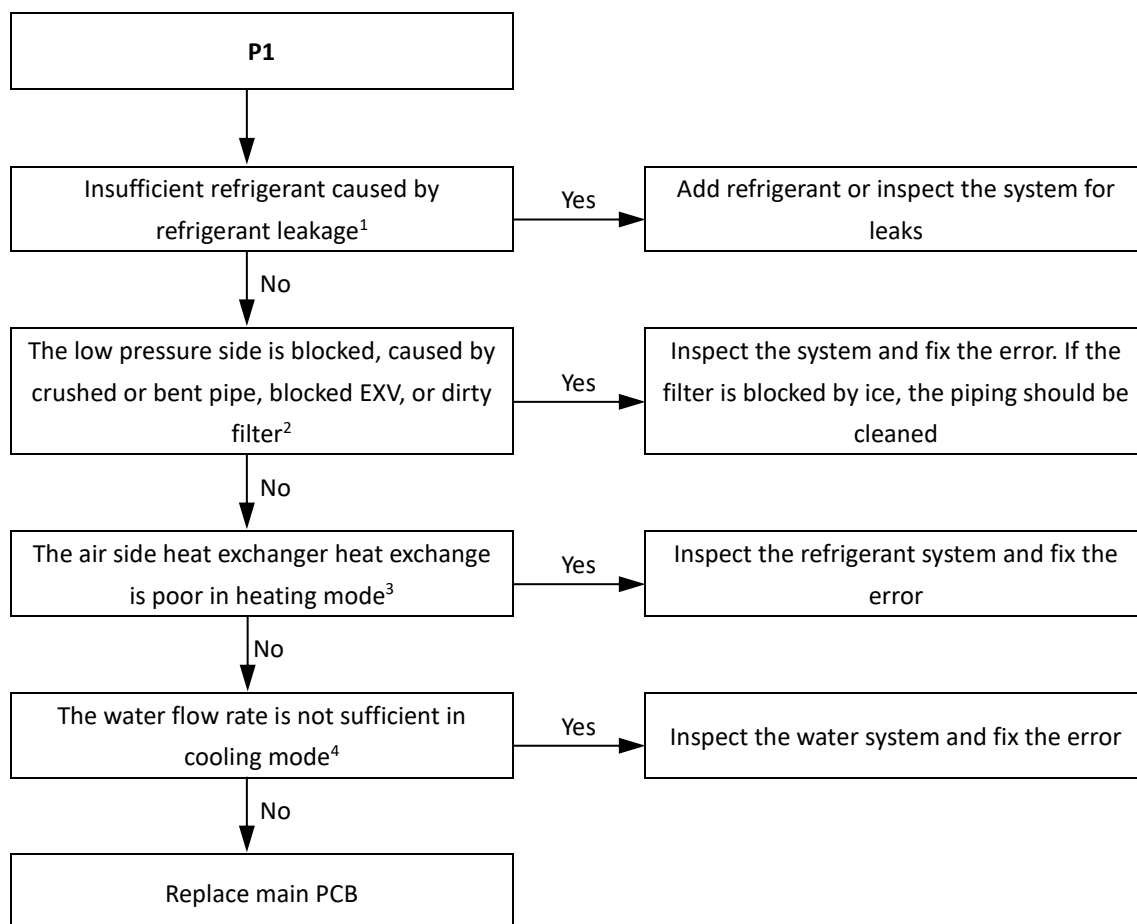
- P1 indicates suction pipe low pressure protection. When the suction pressure falls below 0.05MPa, the system displays P1 protection and all units stop running. When the pressure rises above 0.15MPa, P1 is removed and normal operation resumes. When P1 error occurs 3 times in 60 minutes, a manual system restart is required before the system can resume operation.
- Error code is displayed on main PCB and user interface.

#### 5.11.3 Possible causes

- Low pressure switch not connected properly or has malfunctioned.
- Insufficient refrigerant.
- Low pressure side blockage.
- Poor evaporator heat exchange in heating mode.
- Insufficient water flow in cooling mode.
- Main PCB damaged.



## 5.11.4 Procedure



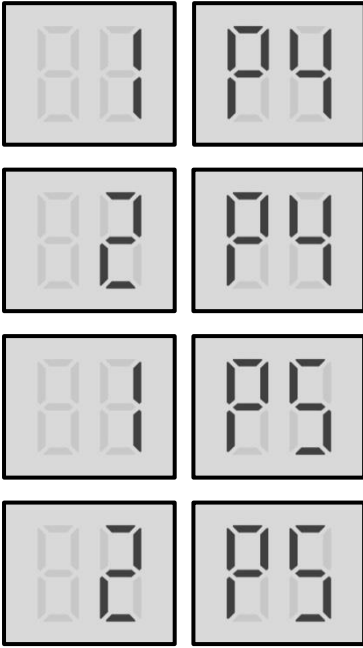
## Notes:

1. To check for insufficient refrigerant: An insufficiency of refrigerant causes compressor discharge temperature to be higher than normal, discharge and suction pressures to be lower than normal and compressor current to be lower than normal, and may cause frosting to occur on the suction pipe. These issues disappear once sufficient refrigerant has been charged into the system.
2. A low pressure side blockage causes compressor discharge temperature to be higher than normal, suction pressure to be lower than normal and compressor current to be lower than normal, and may cause frosting to occur on the suction pipe. For normal system parameters.
3. Check air side heat exchanger, fan(s) and air outlets for dirt/blockages.
4. Check water side heat exchanger, water piping, circulator pumps and water flow switch for dirt/blockages.

## Aqua thermal

### 5.12 P4, P5 Troubleshooting

#### 5.12.1 Digital display output



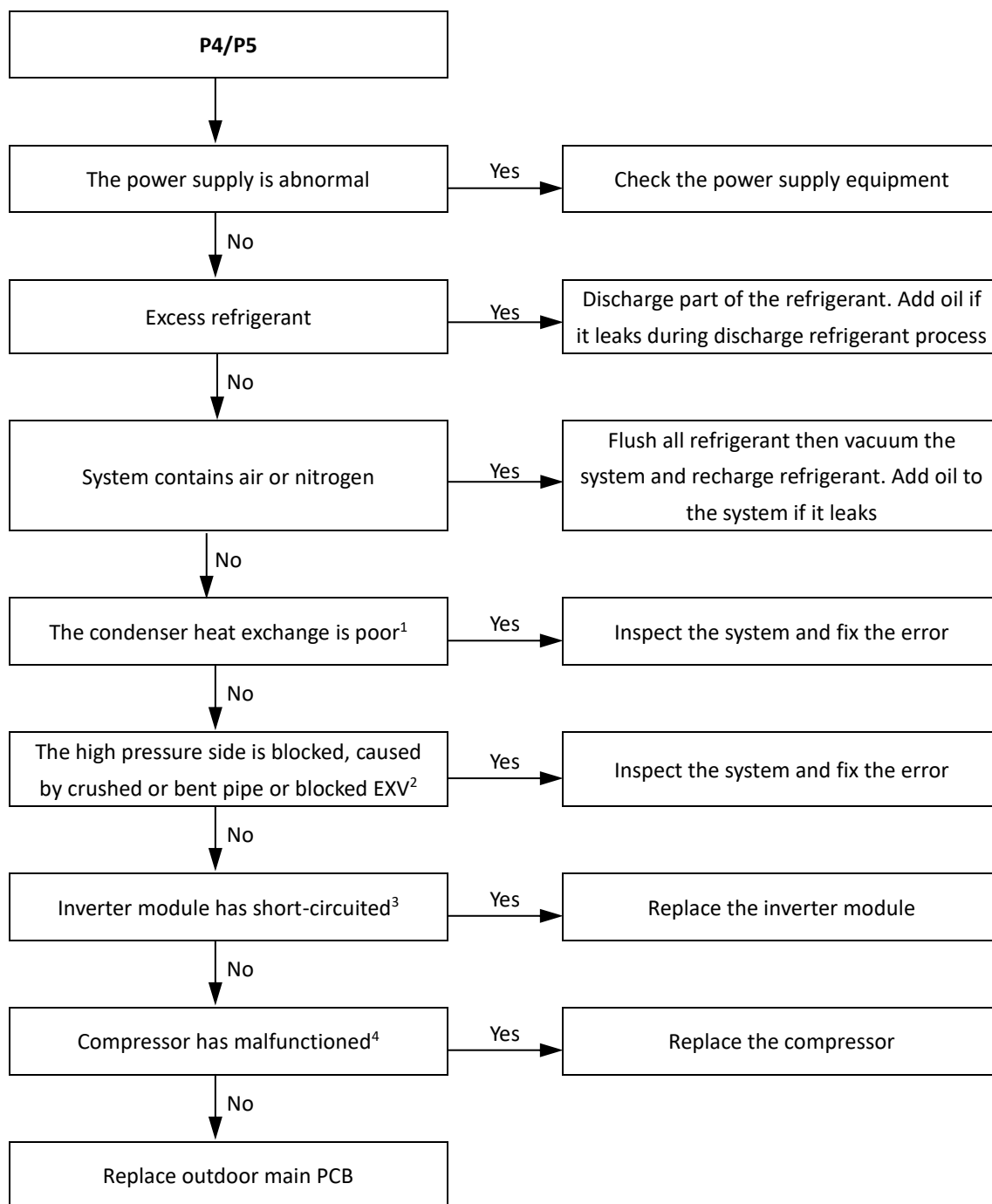
#### 5.12.2 Description

- 1 P4 indicates system A current protection
- 2 P4 indicates system A DC bus current protection
- 1 P5 indicates system B current protection
- 2 P5 indicates system B DC bus current protection
- When the compressor current rises above the protection value 53A/60A (53A for 75/140 model, 60A for 90/180 model), or DC bus current rises above the protection value 232A/140A (232A for 75/140 model, 140A for 90/180 model), the system displays P4 or P5 protection and the faulty unit stops running. When the current returns to the normal range, P4 or P5 is removed and normal operation resumes. When P4 or P5 error occurs 3 times in 60 minutes, a manual system restart is required before the system can resume operation.
- Error code is displayed on main PCB and user interface.

#### 5.12.3 Possible causes

- Power supply abnormal.
- Poor condenser heat exchange.
- High pressure side blockage.
- Excess refrigerant.
- System contains air or nitrogen.
- Inverter module damaged.
- Compressor damaged.
- Main PCB damaged.

## 5.12.4 Procedure



## Notes:

1. In heating mode check water side heat exchanger, water piping, circulator pumps and water flow switch for dirt/blockages. In cooling mode check air side heat exchanger, fan(s) and air outlets for dirt/blockages.
2. High pressure side blockage causes discharge temperature to be higher than normal, discharge pressure to be higher than normal and suction pressure to be lower than normal.
3. Set a multi-meter to buzzer mode and test any two terminals of P N and U V W of the inverter module. If the buzzer sounds, the inverter module has short-circuited.
4. The normal resistances of the inverter compressor is 0.124Ω(at 20°C ambient temperature) among U V W and infinite between each of U V W and ground. If any of the resistances differ from these specifications, the compressor has malfunctioned.

## Aqua thermal

### 5.13 P6 Troubleshooting (for MC-SU90-RN8L-B and MC-SU180-RN8L-B)

#### 5.13.1 Digital display output



#### 5.13.2 Description

- Indicates inverter module failure
- When a P6 error occurs, a manual system restart is required before the system can resume operation. The cause of a P6 error should be addressed promptly in order to avoid system damage.
- The faulty unit stops running.
- Error code is displayed on the main PCB and user interface.

#### 5.13.3 Possible causes

- Inverter module protection
- DC bus low or high voltage protection
- MCE error
- Zero speed protection
- Phase sequence error
- Excessive compressor frequency variation
- Actual compressor frequency differs from target frequency

#### 5.13.4 Specific error codes for XP6 inverter module protection

If P6 error code is displayed, please spot check the specific error code through the wired controller.

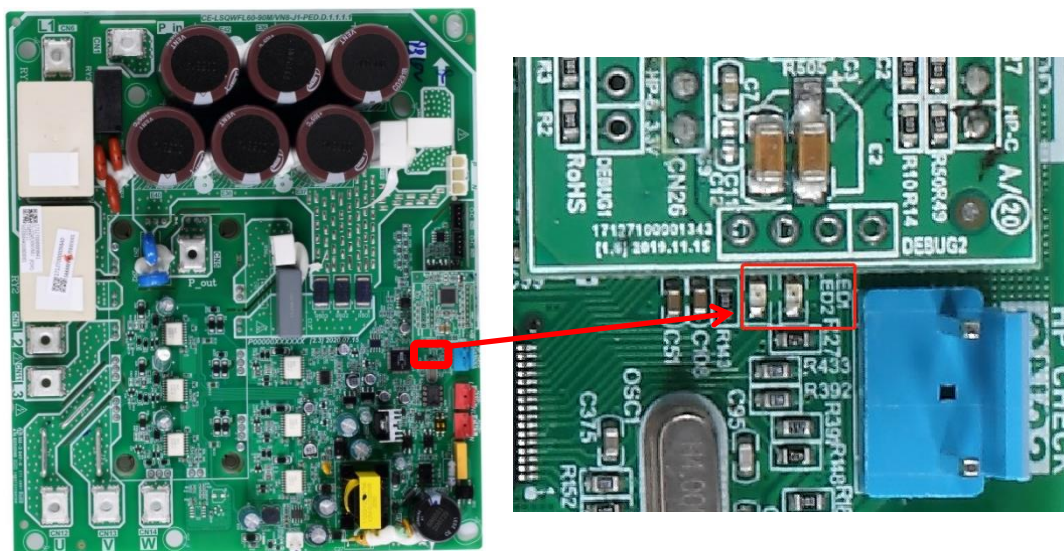
| Specific error code <sup>1</sup> | Content                                                                                |
|----------------------------------|----------------------------------------------------------------------------------------|
| xL0                              | Inverter module protection                                                             |
| xL1                              | DC bus low voltage protection                                                          |
| xL2                              | DC bus high voltage protection                                                         |
| xL4                              | MCE error                                                                              |
| xL5                              | Zero speed protection                                                                  |
| xL7                              | Phase sequence error                                                                   |
| xL8                              | Compressor frequency variation greater than 15Hz within one second protection          |
| xL9                              | Actual compressor frequency differs from target frequency by more than 15Hz protection |

Notes:

1. 'x' is a placeholder for the compressor system (compressor and related electrical components), with 1 representing compressor system A and 2 representing compressor system B.

The specific error codes xL0, xL1, xL2 and xL4 can also be obtained from the inverter module LED indicators. If an inverter module error has occurred, LED2 is continuously on and LED1 flashes.

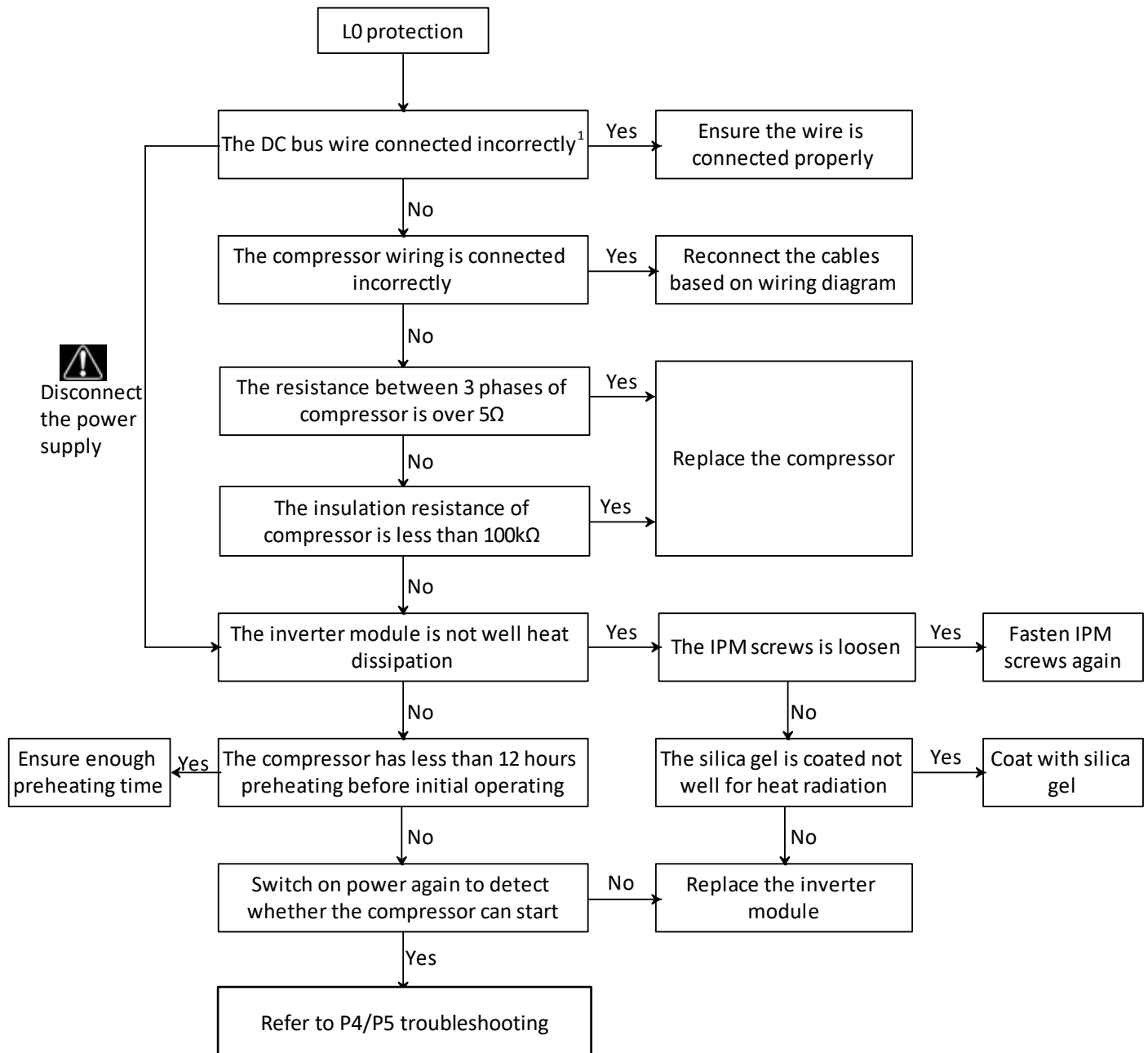
LED indicators LED1 and LED2 on inverter module



Errors indicated on LED1

| LED1 flashing pattern                                 | Corresponding error                  |
|-------------------------------------------------------|--------------------------------------|
| Flashes 8 times and stops for 1 second, then repeats  | xL0 - Inverter module protection     |
| Flashes 9 times and stops for 1 second, then repeats  | xL1 - DC bus low voltage protection  |
| Flashes 10 times and stops for 1 second, then repeats | xL2 - DC bus high voltage protection |
| Flashes 12 times and stops for 1 second, then repeats | xL4 - MCE error                      |

## 5.13.5 L0: Inverter module protection



Note:

1. Make sure wire connection of CN38 port of compressor inverter module board is firm. Plug or pull out the wire under live working is not allowed.

- How to determine whether the compressor module is damaged?

IPM internal rectifier circuit

IPMM internal inverter circuit

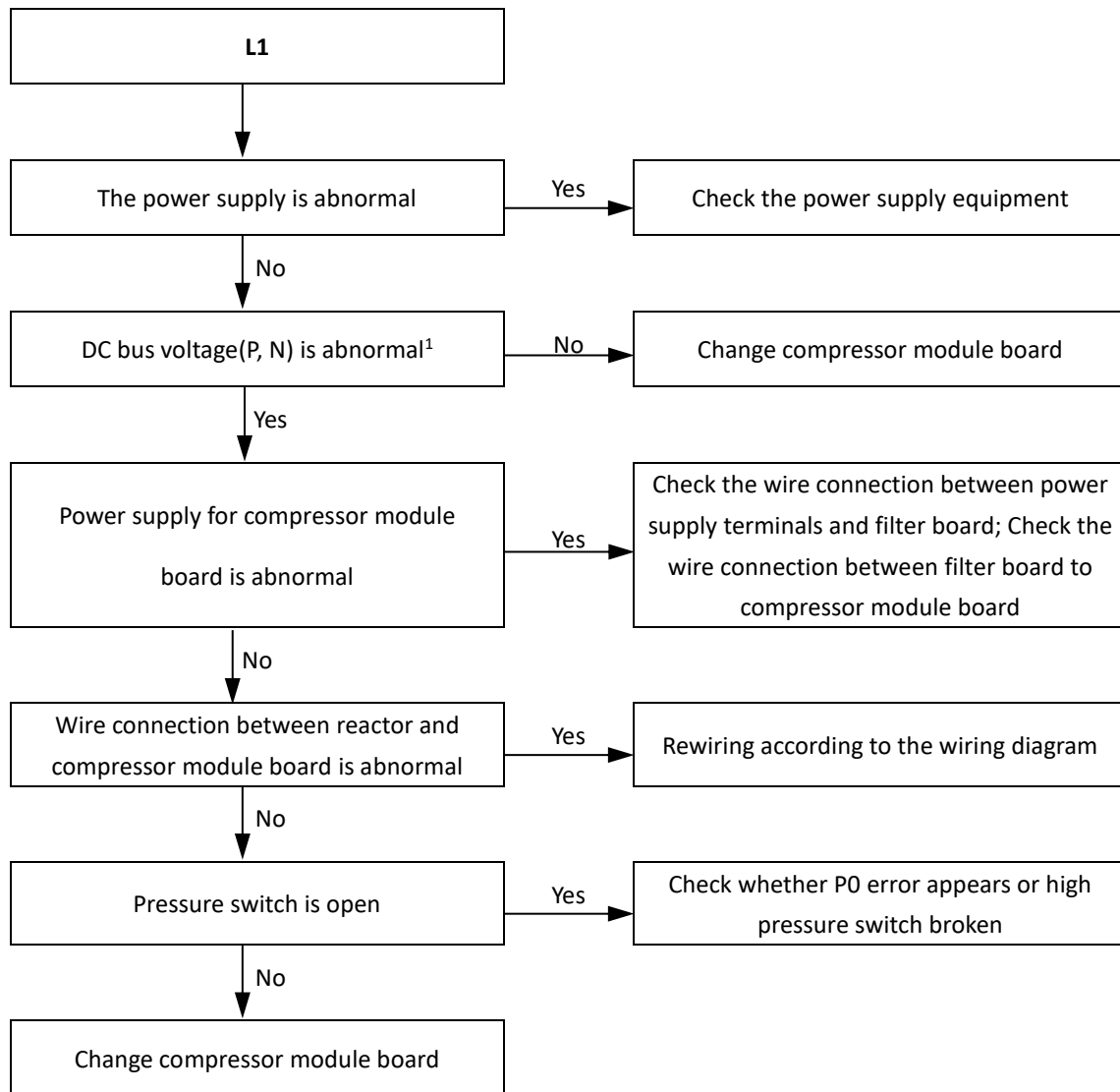
- Three phase rectifier measure

Set the multimeter to diode position. After unit power off for 10min, put the black pin on CN5(P\_OUT) and put the red pin on CN6(L1)、CN7(L2)、CN11(L3) respectively. If the voltage value is 0V, it means the three phase rectifier bridge reactor is damaged. Similarly, put the red pin on CN38 (N) and put the black pin on CN6 (L1), CN7 (L2) and CN11 (L3) respectively. If the voltage value is 0V, it means the three phase rectifier bridge reactor is damaged.

- Inverter circuit measure

Set the multimeter to diode position. After unit power off for 10min, put the black pin on CN1(P\_in) and put the red pin on CN12(U)、CN13(V)、CN14(W) respectively. If the voltage value is 0V, it means the IGBT or freewheel diode is damaged. Similarly, put the red pin on CN38 (N) and put the black pin on CN12 (U), CN13 (V) and CN14 (W) respectively. If the voltage value is 0V, it means the IGBT or freewheel diode is damaged.

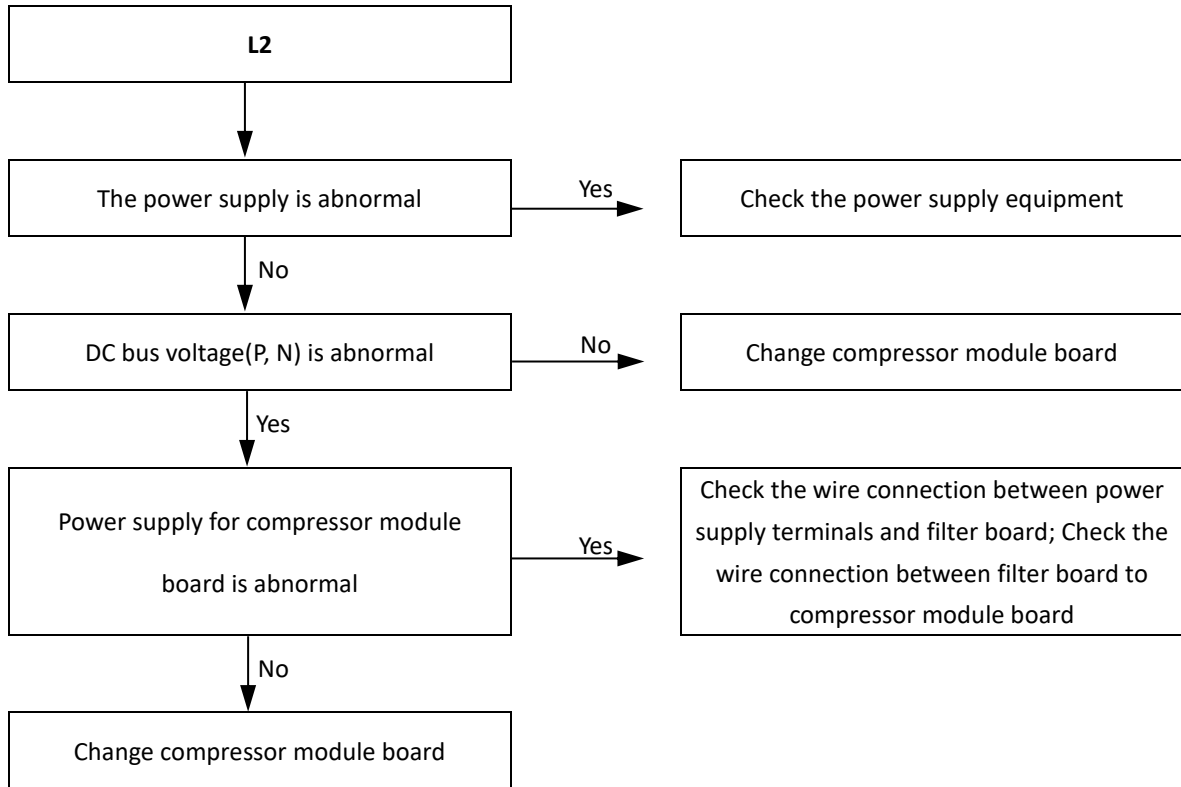
## 5.13.6 L1: Low-voltage protection



Note:

1. The normal DC voltage between terminals P and N of CN38 of compressor inverter module board should be 450-650V. When the voltage is lower than 350V.

## 5.13.7 L2: High-voltage protection

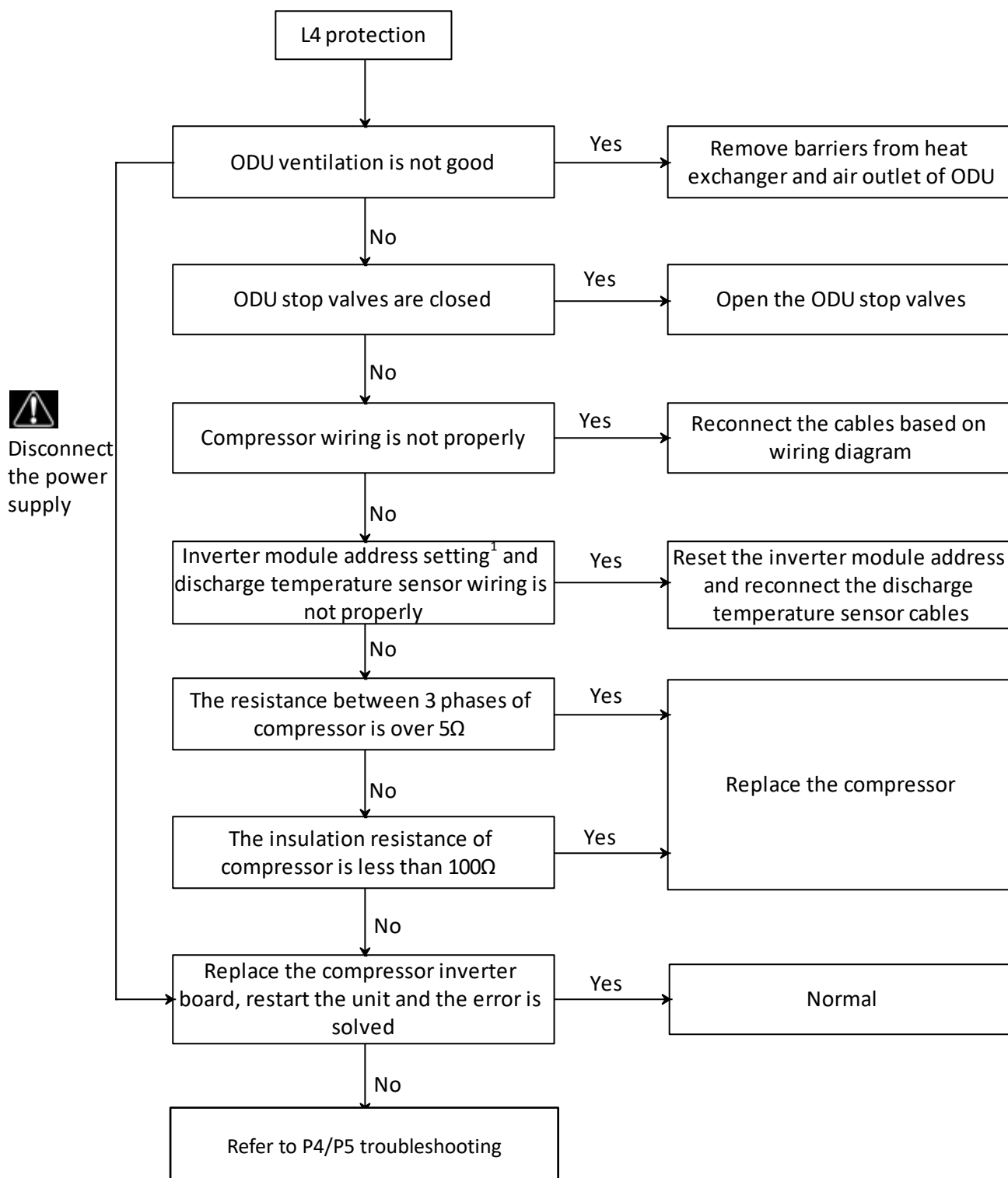


Note:

1. The normal DC voltage between terminals P and N on inverter module should be 450-650V. When the voltage is higher than 800V, L2 protection will be appeared.



## 5.13.8 L4: MCE error

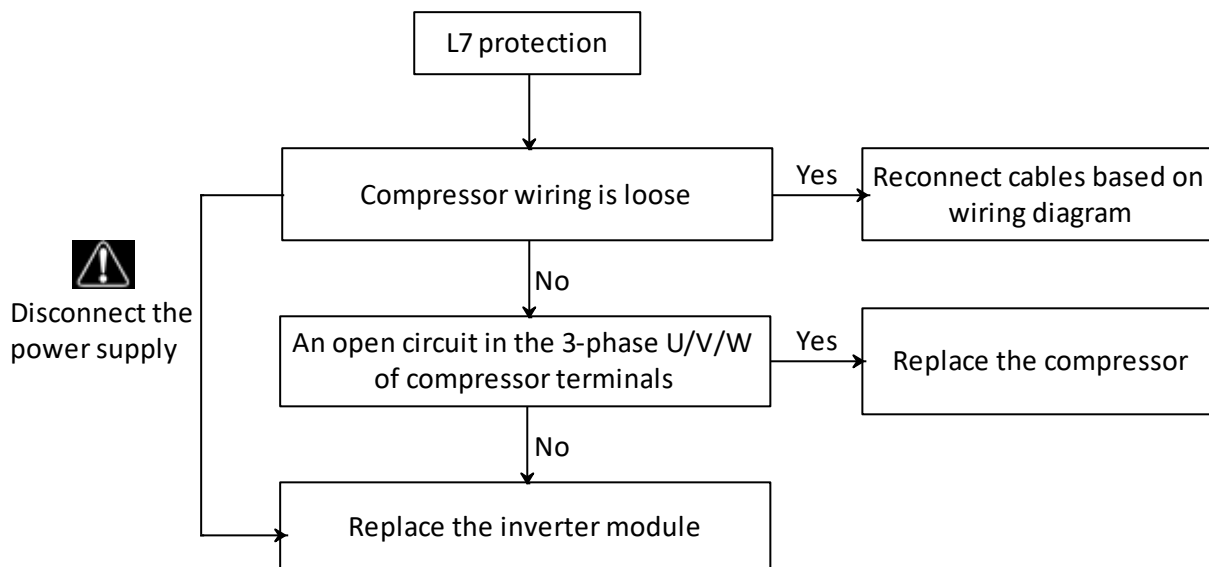


Notes:

1. Compressor inverter module address is set through dial switch S7 on the inverter module. The compressor inverter module A/B location refers to the wiring diagram

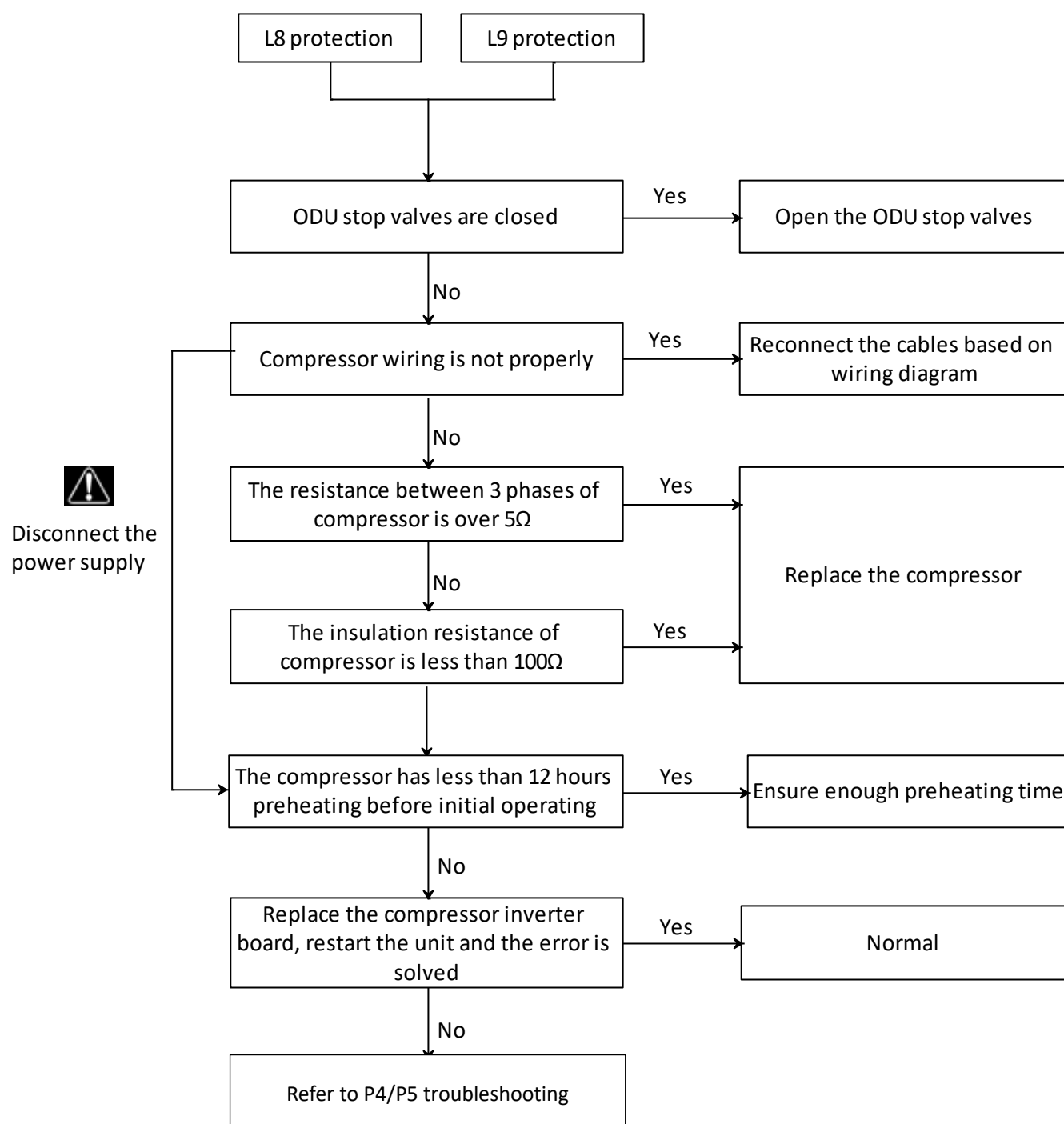
| Switch                                                                                           | Description                                  | S7-1 | S7-2 |
|--------------------------------------------------------------------------------------------------|----------------------------------------------|------|------|
| <b>S7</b><br> | Compressor A inverter module address setting | OFF  | OFF  |
|                                                                                                  | Compressor B inverter module address setting | OFF  | ON   |

## 5.13.9 L7: Phase sequence error



## 5.13.10 L8: Compressor frequency variation greater than 15Hz within one second protection

L9: Actual compressor frequency differs from target frequency by more than 15Hz protection



## Aqua thermal



### 5.13.11 Compressor replacement procedure

#### Step 1: Remove faulty compressor and remove oil

- Remove the faulty compressor from the outdoor unit.
- Before removing the oil, shake the compressor so as to not allow impurities to remain settled at the bottom.
- Drain the oil out of the compressor and retain it for inspection. Normally the oil can be drained out from the compressor discharge pipe.



#### Step 2: Inspect oil from faulty compressor

- The oil should be clear and transparent. Slightly yellow oil is not an indication of any problems. However, if the oil is dark, black or contains impurities, the system has problems and the oil needs to be changed. Refer to Figure 4-4.20 for further details regarding inspecting compressor oil. (If the compressor oil has been spoiled, the compressor will not be being lubricated effectively. The scroll plate, crankshaft and bearings will wear. Abrasion will lead to a larger load and higher current. More electric energy will get dissipated as heat and the temperature of the motor will become increasingly high. Finally, compressor damage or burnout will result.)

#### Step 3: Check oil in other compressors in the system

- If the oil drained from the faulty compressor is clean, go to Step 6.
- If the oil drained from the faulty compressor is only lightly spoiled, go to Step 4.
- If the oil drained from the faulty compressor is heavily spoiled, check the oil in the other compressors in the system. Drain the oil from any compressors where the oil has been spoiled. Go to Step 4.

#### Step 4: Replace oil separator(s) and accumulator(s)

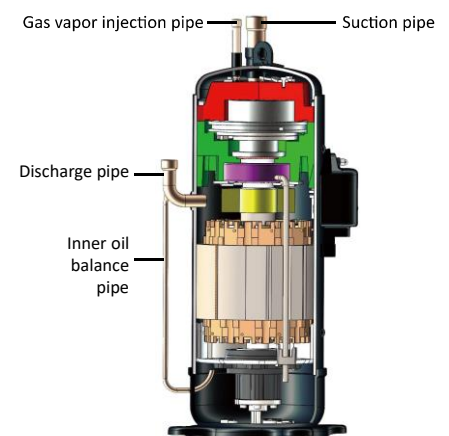
- If the oil from a compressor is spoiled (lightly or heavily), drain the oil from the oil separator and accumulator in that unit and then replace them.

#### Step 5: Check filters(s)

- If the oil from a compressor is spoiled (lightly or heavily), check the filter between the gas stop valve and the 4-way valve in that unit. If it is blocked, clean with nitrogen or replace.

#### Step 6: Replace the faulty compressor and re-fit the other compressors

- Replace the faulty compressor.
- If the oil had been spoiled and was drained from the non-faulty compressors in Step 3, use clean oil to clean them before re-fitting them into the units. To clean, add oil into the compressor through the discharge pipe using a funnel, shake the compressor, and then drain the oil. Repeat several times and then re-fit the compressors into the units. (The discharge pipe is connected to the oil pool of the compressor by the inner oil balance pipe.)



#### Step 7: Add compressor oil

- Please refer to the compressor specification for oil type. Different compressors require different types of oil. Using the wrong type of oil leads to various problems.
- The principle during changing compressor is to keep the system oil amount is the same as original state.

#### Step 8: Vacuum drying and refrigerant charging

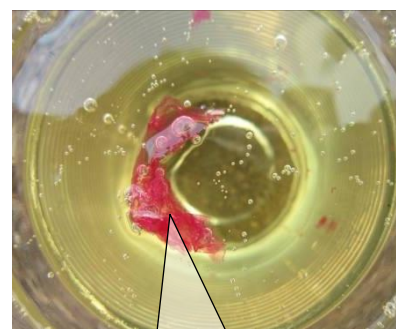
- Once all the compressors and other components have been fully connected, vacuum dry the system and recharge refrigerant.

# Inspecting compressor oil

This oil is black - it has been



This oil is a little yellow, but is clear and transparent and the condition is acceptable



This oil is still transparent but there are impurities which may clog the filter

Cloudy or gray oil indicates abnormal system



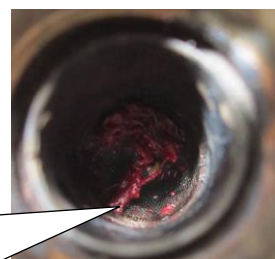
This oil contains particles of copper

## Effects of spoiled compressor oil



Worn crankshaft

Filter blocked by impurities, which leads to abnormal compressor suction



Worn scroll plate

Worn scroll plate



Normal compressor bearings

Seriously worn and damaged bearings



## Aqua thermal

### 5.14 dF Troubleshooting

#### 5.14.1 Digital display output



#### 5.14.2 Description

Normal defrost logic, resume after defrost, not fault.

### 5.15 P7 Troubleshooting

#### 5.15.1 Digital display output



#### 5.15.2 Description

For MC-SU75-RN8L-B and MC-SU140-RN8L-B

- High temperature protection of air side heat exchanger tube temperature sensor “T3a / T3b” in cooling mode. When the tube temperature of air side heat exchanger is higher than 62°C, the system displays P7 protection and all units stop running. When the tube temperature of air side heat exchanger returns drops below 55°C, P7 is removed and normal operation resumes.
- The faulty unit stops running.
- Error code is displayed on main PCB and user interface.

For MC-SU90-RN8L-B and MC-SU180-RN8L-B

- High temperature protection of air side heat exchanger refrigerant outlet temperature sensor or air side heat exchanger refrigerant total outlet temperature sensor in cooling mode. When the air side heat exchanger refrigerant outlet temperature is higher than 62°C, the system displays P7 protection and all units stop running. When the air side heat exchanger refrigerant outlet temperature returns drops below 55°C, P7 is removed and normal operation resumes.
- All units stop running.
- Error code is displayed on main PCB and user interface.

#### 5.15.3 Possible causes

For MC-SU75-RN8L-B and MC-SU140-RN8L-B

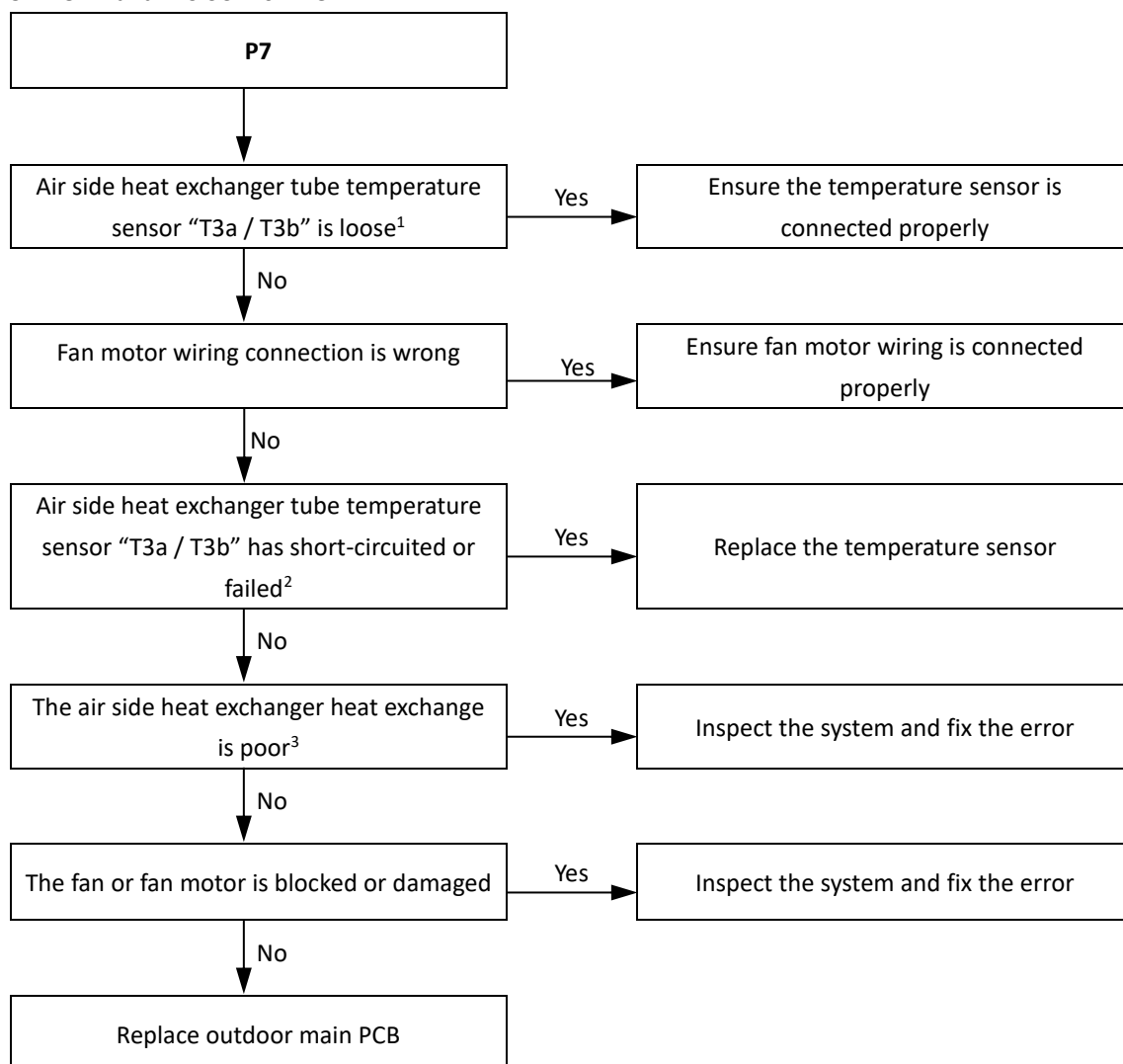
- Air side heat exchanger tube temperature sensor “T3a / T3b” not connected properly or has malfunctioned.
- Fan motor wiring connection is wrong.
- Poor condenser heat exchange.
- Fan motor damaged.
- Main PCB damaged.

For MC-SU90-RN8L-B and MC-SU180-RN8L-B

- Air side heat exchanger refrigerant outlet temperature sensor or air side heat exchanger refrigerant total outlet temperature sensor not connected properly or has malfunctioned.
- Fan motor wiring connection is wrong.
- Poor condenser heat exchange.
- Fan motor damaged.
- Main PCB damaged.

## 5.15.4 Procedure

For MC-SU75-RN8L-B and MC-SU140-RN8L-B



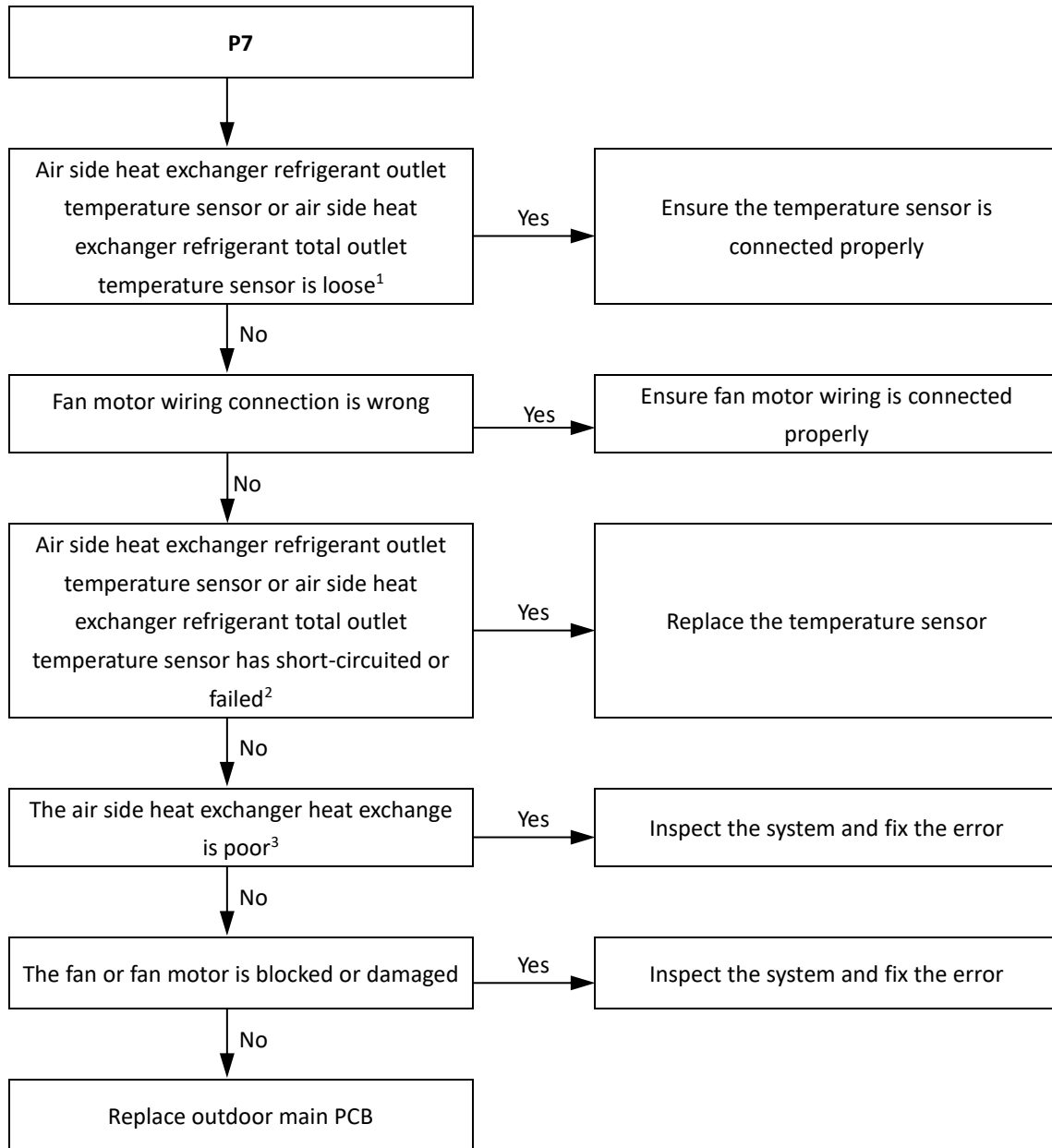
## Notes:

1. Air side heat exchanger tube temperature sensor "T3a / T3b" connection port is CN37/CN16 on the main PCB (labeled 22,24 in Part 4, 2.2.1 Main PCB component)
2. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Part 4, 6.1 "Temperature Sensor Resistance Characteristics".
3. Check air side heat exchanger, fan(s) and air outlets for dirt/blockages.

## Aqua thermal



For MC-SU90-RN8L-B and MC-SU180-RN8L-B



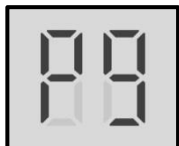
Notes:

4. Air side heat exchanger refrigerant outlet temperature sensor and air side heat exchanger refrigerant total outlet temperature sensor connection port is CN1 on the main PCB (labeled 29 in Part 4, 2.2.1 Main PCB component)
5. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Part 4, 6.1 "Temperature Sensor Resistance Characteristics".
6. Check air side heat exchanger, fan(s) and air outlets for dirt/blockages.



## 5.16 P9 Troubleshooting

### 5.16.1 Digital display output



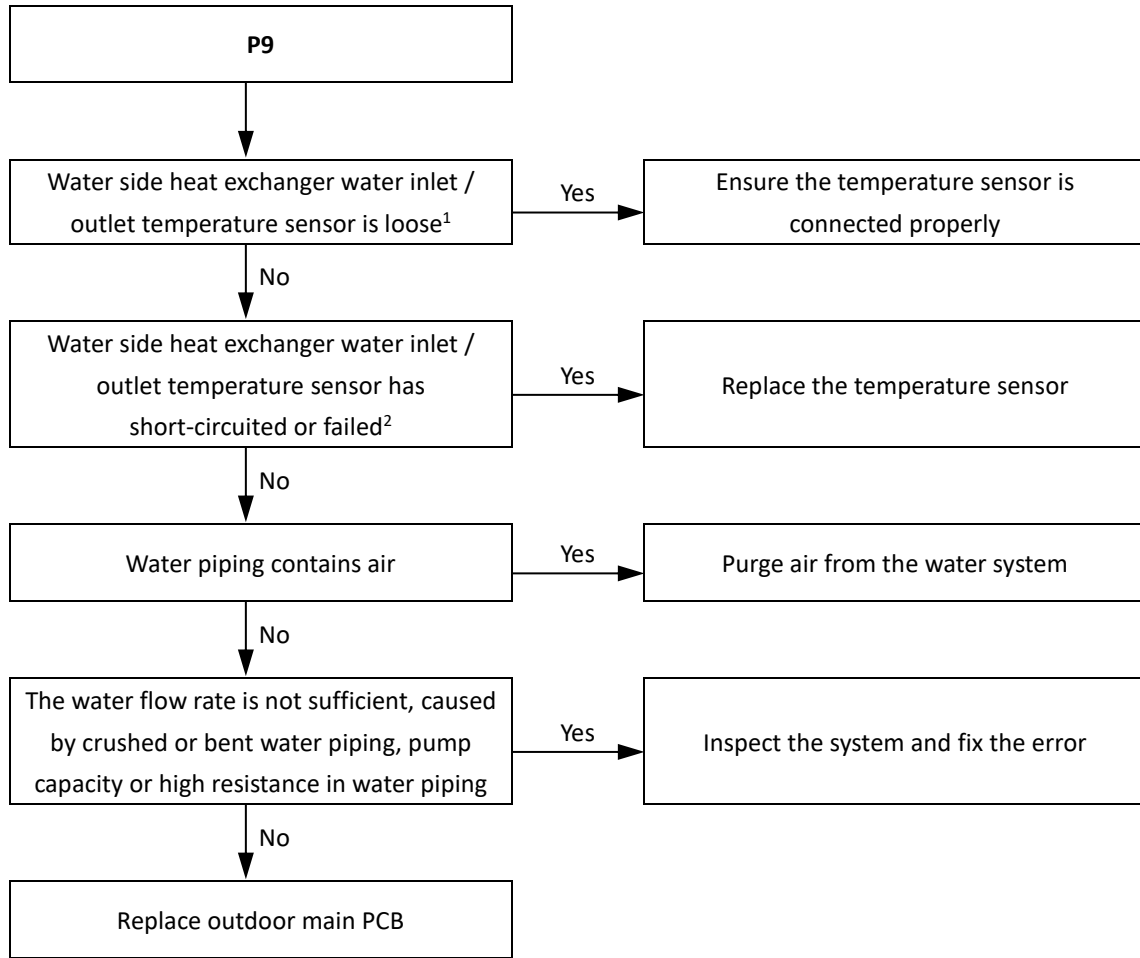
### 5.16.2 Description

- Water inlet and outlet temperature difference protection
- The faulty unit stops running.
- Error code is displayed on main PCB and user interface.

### 5.16.3 Possible causes

- Temperature sensor not connected properly or has malfunctioned.
- Water piping contains air.
- Insufficient water flow.
- Main PCB damaged.

## 5.16.4 Procedure

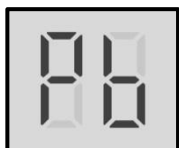


## Notes:

1. For MC-SU90-RN8L-B and MC-SU180-RN8L-B, water side heat exchanger water inlet temperature sensor and water side heat exchanger water outlet temperature sensor connections are port CN4 on the main PCB (labeled 29 in Part 4, 2.2.1 Main PCB component). For MC-SU90-RN8L-B and MC-SU180-RN8L-B, water side heat exchanger water inlet temperature sensor and water side heat exchanger water outlet temperature sensor connections are port CN31 on the main PCB (labeled 31 in Part 4, 2.2.1 Main PCB component);
2. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Part 4, 6.1 "Temperature Sensor Resistance Characteristics".

## 5.17 Pb Troubleshooting

### 5.17.1 Digital display output



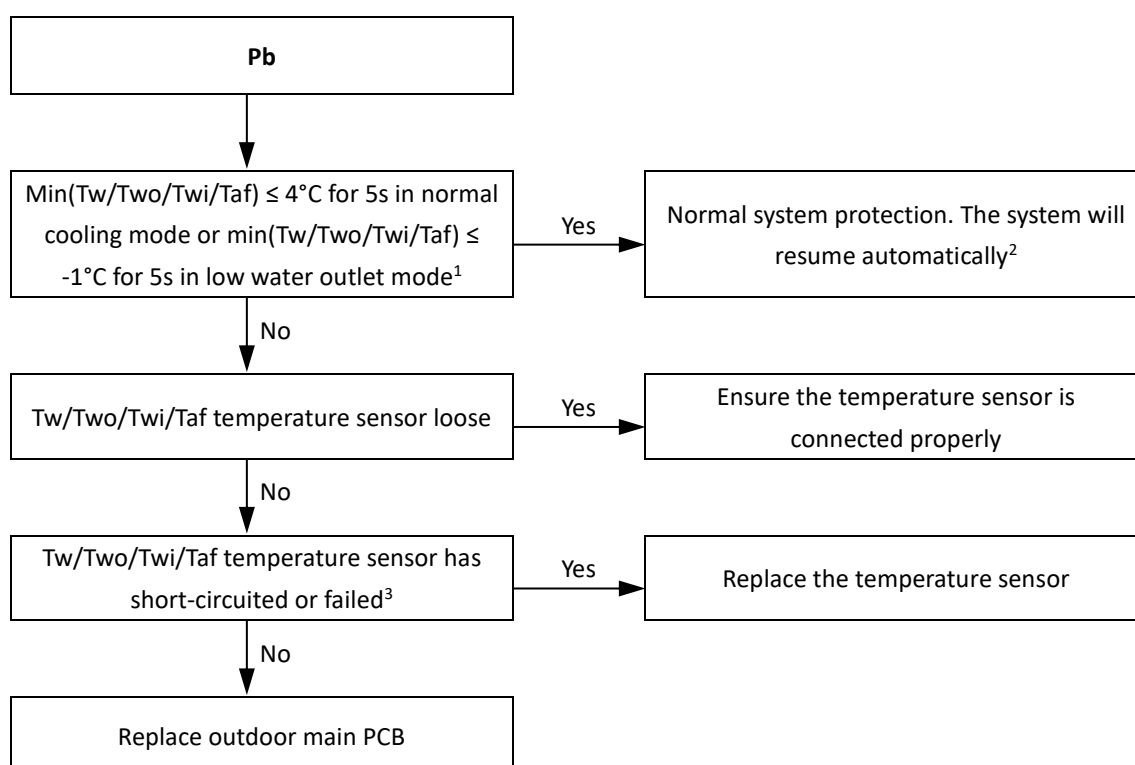
### 5.17.2 Description

- Water side heat exchanger anti-freeze protection.
- The unit enters anti-freezing mode (When the unit is a single water pump, all the units jointly determine the entry and exit conditions of anti-freezing protection. When multiple water pumps are used, the main unit and slave units respectively determine the entry and exit conditions of anti-freezing protection).
- Error code is displayed on main PCB and ANTI.FREEZE icon is displayed on user interface.

### 5.17.3 Possible causes

- Normal system protection.
- Temperature sensor not connected properly or has malfunctioned.
- For MC-SU75-RN8L-B and MC-SU140-RN8L-B, main PCB or slave PCB damaged;  
For MC-SU90-RN8L-B and MC-SU180-RN8L-B, main PCB damaged.

### 5.17.4 Procedure



#### Notes:

- For MC-SU75-RN8L-B and MC-SU140-RN8L-B, combined Water side heat exchanger water outlet temperature sensor(Two), water side heat exchanger water inlet temperature sensor (Twi) and water side heat exchanger anti-freezing temperature sensor(Taf2) connections are ports CN4 and CN45 on the main PCB(labeled 29,21 in Part 4, 2.2.1 Main PCB component).Water outlet temperature sensor (Tw) connections is ports CN101 on the slave PCB (labeled 14 in Part 4, 2.7 Slave PCB component).
- For MC-SU90-RN8L-B and MC-SU180-RN8L-B, combined water outlet temperature sensor (Tw), Water side heat exchanger water outlet temperature sensor(Two), water side heat exchanger water inlet temperature sensor (Twi) and water side heat exchanger anti-freezing temperature sensor(Taf, include Taf1 and Taf2) connections are ports CN31 and CN69 on the main PCB (labeled 31,32 in Part 4, 2.2.1 Main PCB component).
- Refer to Part 3, 6.7 "Water Side Heat Exchanger Anti-freeze Protection Control".
- Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Part 4, 6.1 "Temperature Sensor Resistance Characteristics".

## Aqua thermal

### 5.18 PC Troubleshooting

#### 5.18.1 Digital display output

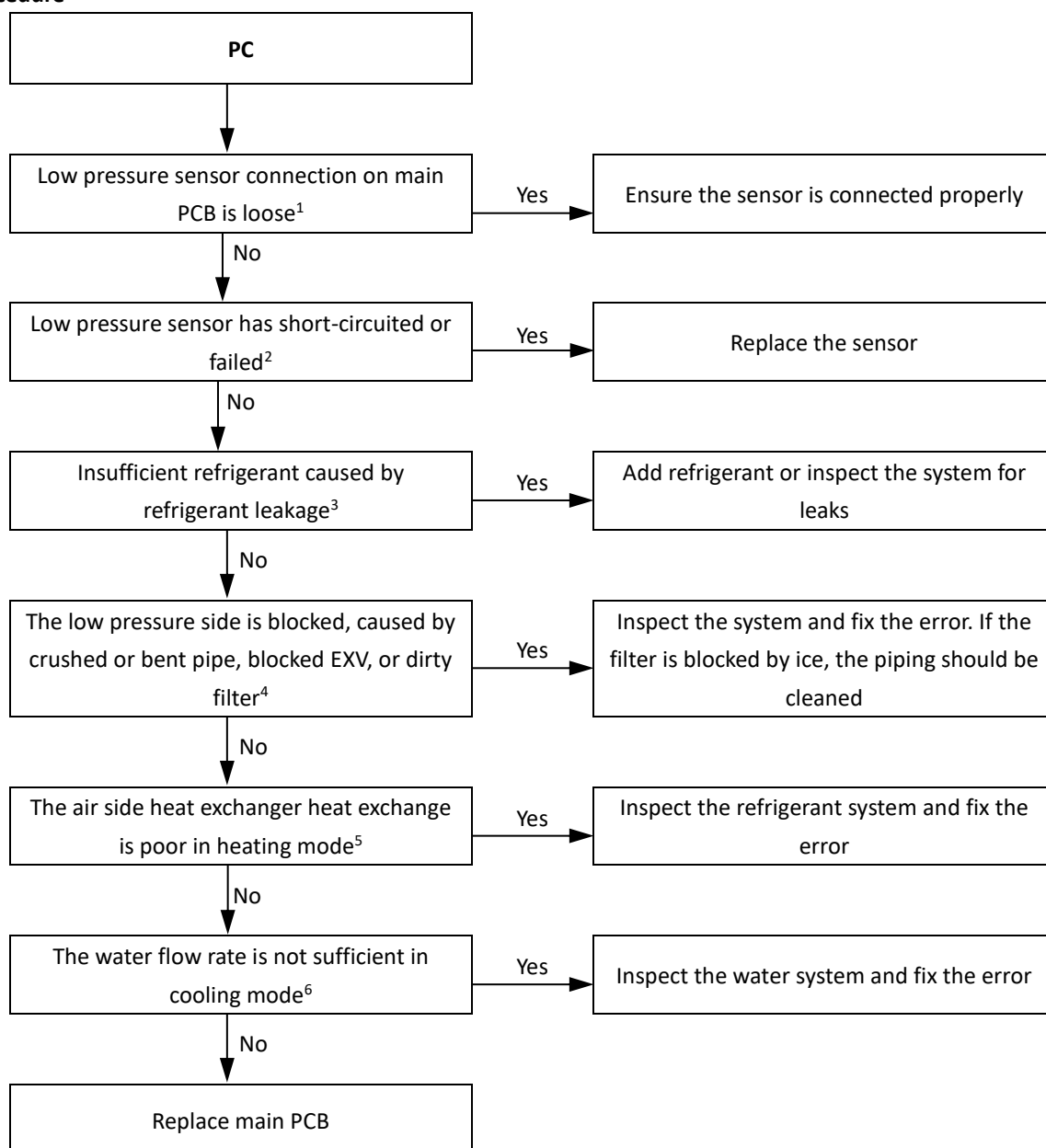


#### 5.18.2 Description

- Water side heat exchanger low pressure protection.
- The faulty unit stops running.
- Error code is displayed on main PCB and user interface.

#### 5.18.3 Possible causes

- Low pressure switch not connected properly or has malfunctioned.
- Insufficient refrigerant.
- Low pressure side blockage.
- Poor evaporator heat exchange in heating mode.
- Insufficient water flow in cooling mode.
- Main PCB damaged.

**5.18.4 Procedure**

**Notes:**

1. For MC-SU75-RN8L-B and MC-SU140-RN8L-B, low pressure sensor connection is port CN42 on the main PCB (labeled 27 in Part 4, 2.2.1 Main PCB component). For MC-SU90-RN8L-B and MC-SU180-RN8L-B, low pressure sensor connection is port CN16 on the main PCB (labeled 30 in Part 4, 2.2.1 Main PCB component);
2. Measure the resistance among the three terminals of the pressure sensor. If the resistance is of the order of mega Ohms or infinite, the pressure sensor has failed;
3. To check for insufficient refrigerant: An insufficiency of refrigerant causes compressor discharge temperature to be higher than normal, discharge and suction pressures to be lower than normal and compressor current to be lower than normal, and may cause frosting to occur on the suction pipe. These issues disappear once sufficient refrigerant has been charged into the system;
4. A low pressure side blockage causes compressor discharge temperature to be higher than normal, suction pressure to be lower than normal and compressor current to be lower than normal, and may cause frosting to occur on the suction pipe. For normal system parameters;
5. Check air side heat exchanger, fan(s) and air outlets for dirt/blockages;
6. Check water side heat exchanger, water piping, circulator pumps and water flow switch for dirt/blockages.

## Aqua thermal



### 5.19 PH Troubleshooting

#### 5.19.1 Digital display output



#### 5.19.2 Description

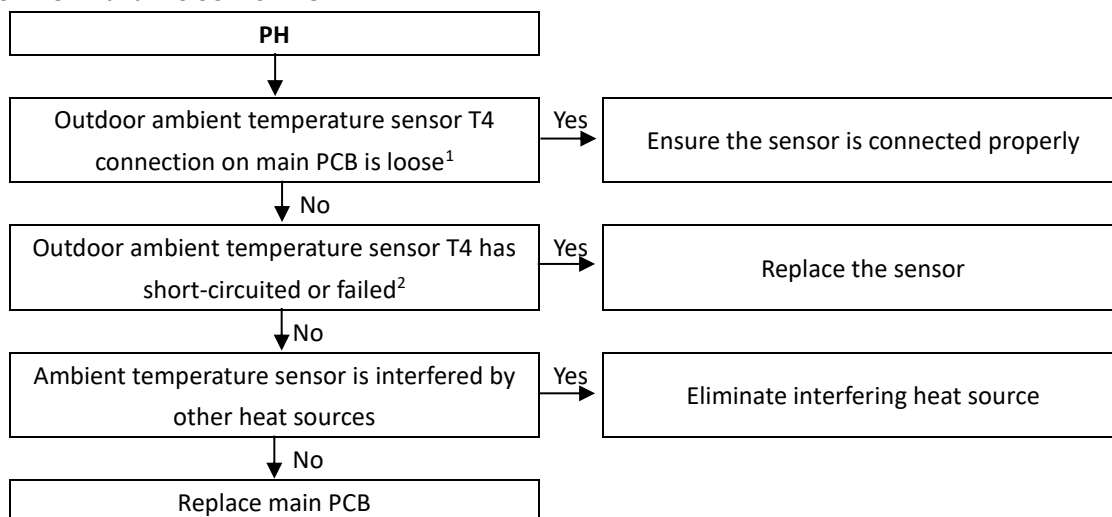
- Ambient temperature too high protection in heating mode.
- The faulty unit stops running.
- Error code is displayed on main PCB and user interface.

#### 5.19.3 Possible causes

- Temperature sensor not connected properly or has malfunctioned.
- Actual ambient temperature is higher than 43°C.
- Main PCB damaged.

#### 5.19.4 Procedure

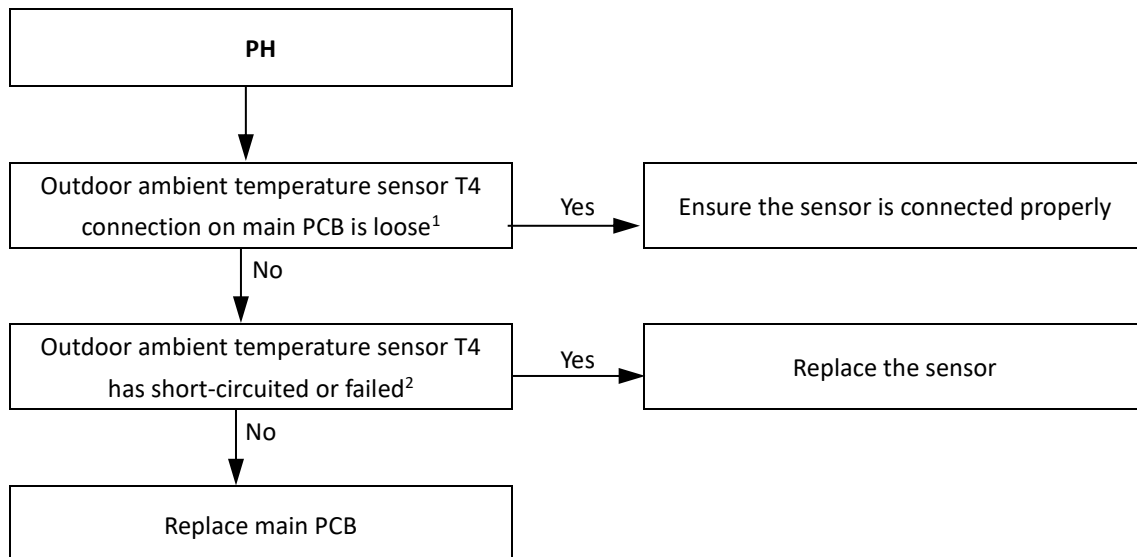
For MC-SU75-RN8L-B and MC-SU140-RN8L-B



Notes:

1. T4 temperature sensor connection is port CN30 on the main PCB (labeled 23 in Part 4, 2.2.1 Main PCB component).
2. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Table 5-5.1 in Part 5, 5.1 "Temperature Sensor Resistance Characteristics".

For MC-SU90-RN8L-B and MC-SU180-RN8L-B



Notes:

3. T4 temperature sensor connection is port CN1 on the main PCB (labeled 29 in Part 4, 2.2.1 Main PCB component).
4. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Table 5-5.1 in Part 5, 5.1 "Temperature Sensor Resistance Characteristics".

## Aqua thermal



### 5.20 PE Troubleshooting

#### 5.20.1 Digital display output



#### 5.20.2 Description

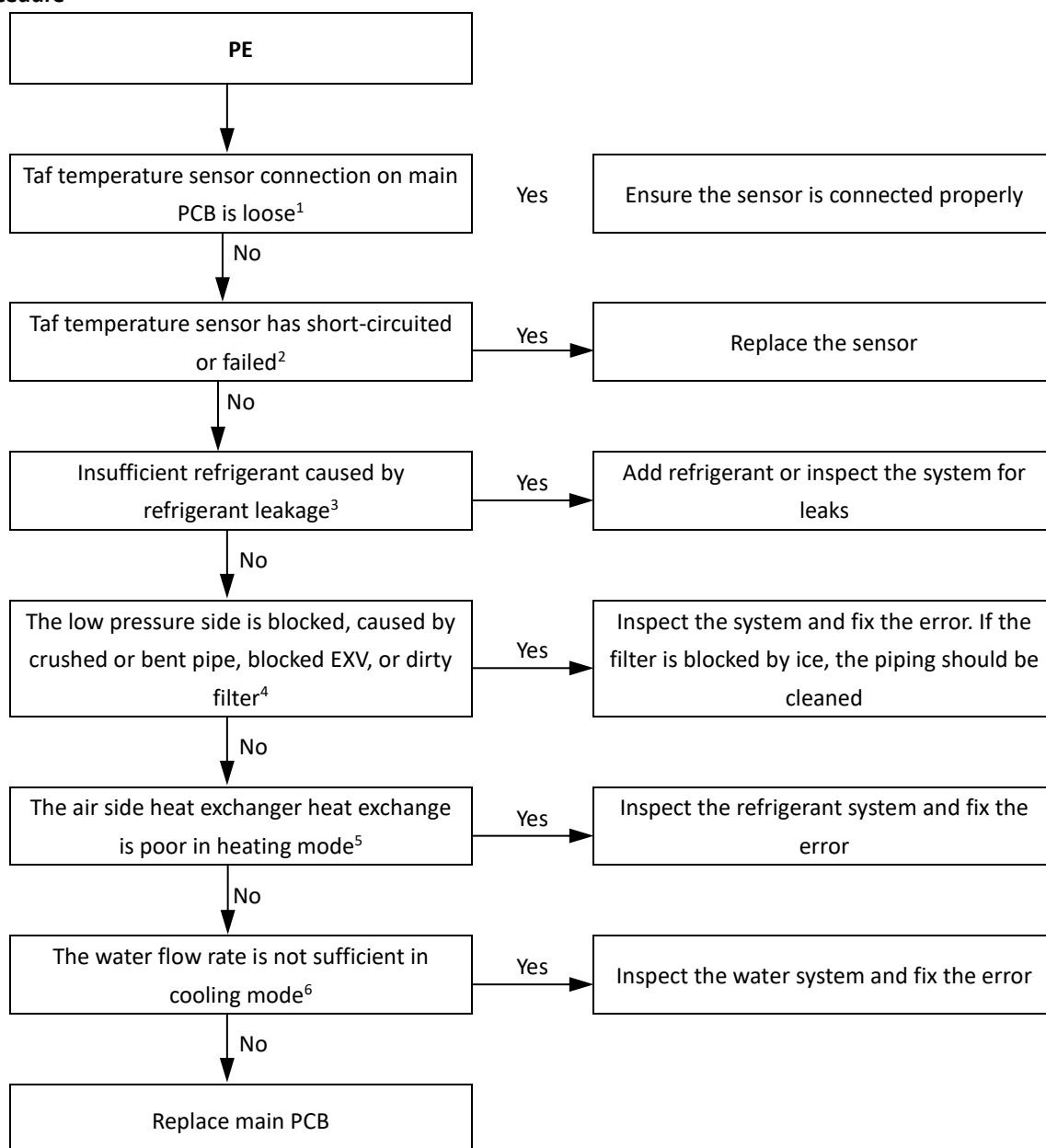
- Water side heat exchanger low temperature antifreeze protection.
- The faulty unit stops running.
- Error code is displayed on main PCB and user interface.

#### 5.20.3 Possible causes

- Temperature sensor not connected properly or has malfunctioned.
- Insufficient refrigerant.
- Low pressure side blockage.
- Poor evaporator heat exchange in heating mode.
- Insufficient water flow in cooling mode.
- Main PCB damaged.



## 5.20.4 Procedure



## Notes:

1. For MC-SU75-RN8L-B and MC-SU140-RN8L-B, Water side heat exchanger anti-freezing temperature sensor (Taf2) connection are ports CN45 on the main PCB (labeled 21 in Part 4, 2.2.1 Main PCB component). For MC-SU90-RN8L-B and MC-SU180-RN8L-B, Water side heat exchanger anti-freezing temperature sensor (Taf, include Taf1 and Taf2) connection are ports CN31 and CN69 on the main PCB (labeled 31,32 in Part 4, 2.2.1 Main PCB component);
2. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Part 4, 6.1 "Temperature Sensor Resistance Characteristics";
3. To check for insufficient refrigerant: an insufficiency of refrigerant causes compressor discharge temperature to be higher than normal, discharge and suction pressures to be lower than normal and compressor current to be lower than normal, and may cause frosting to occur on the suction pipe. These issues disappear once sufficient refrigerant has been charged into the system;
4. A low pressure side blockage causes compressor discharge temperature to be higher than normal, suction pressure to be lower than normal and compressor current to be lower than normal, and may cause frosting to occur on the suction pipe. For normal system parameters;
5. Check air side heat exchanger, fan(s) and air outlets for dirt/blockages;
6. Check water side heat exchanger, water piping, circulator pumps and water flow switch for dirt/blockages.

## Aqua thermal



### 5.21 PL/C7 Troubleshooting

#### 5.21.1 Digital display output



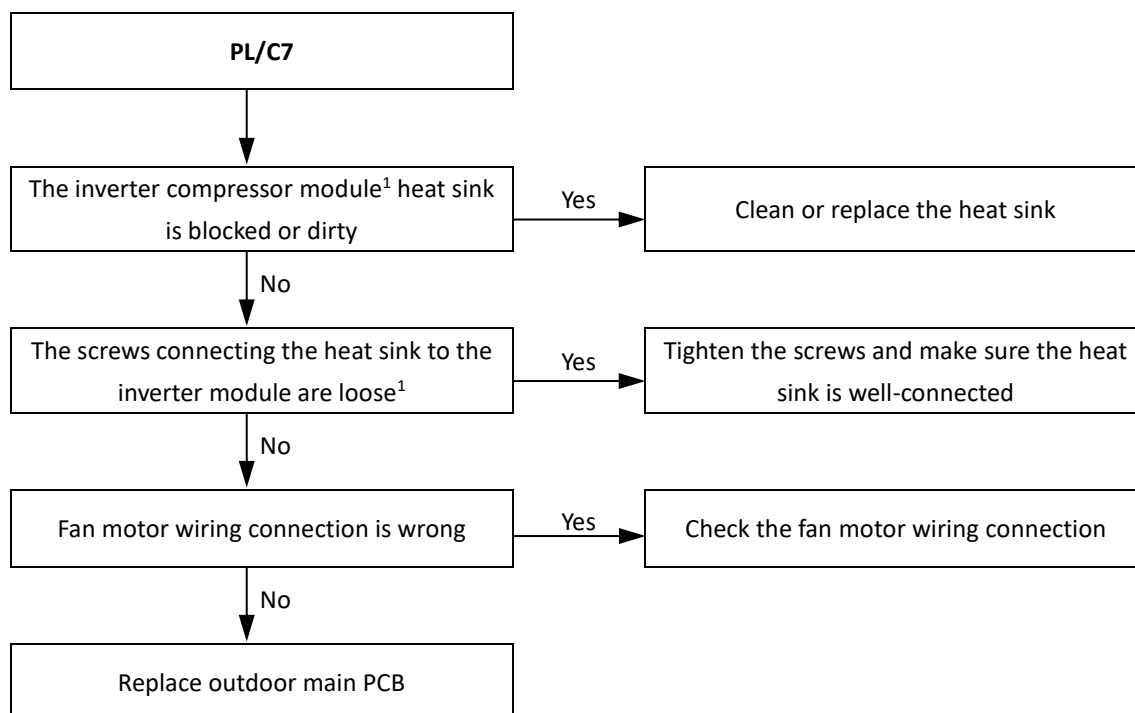
#### 5.21.2 Description

- PL indicates inverter module temperature protection. When the main inverter module temperature rises above 100°C, the system displays PL protection and the faulty unit stops running. When the inverter module temperature drops below 70°C, the compressor enters re-start control
- When a PL error occurs 3 times in 100 minutes, C7 will display, a manual system restart is required before the system can resume operation.
- Error code is displayed on the main PCB and user interface.

#### 5.21.3 Possible causes

- Blocked, dirty or loose heat sink.
- Temperature sensor not connected properly or has malfunctioned.
- Fan motor wiring connection is wrong.
- Main PCB damaged.

## 5.21.4 Procedure



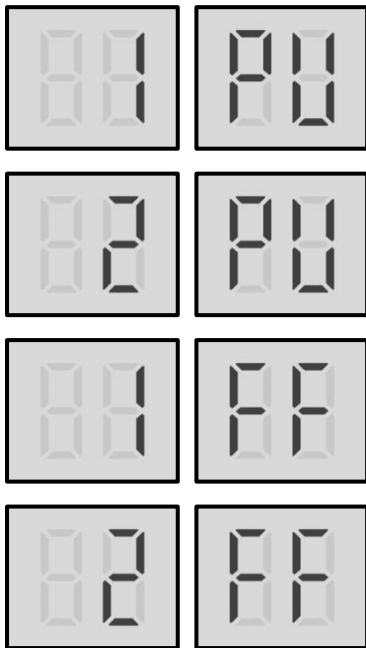
## Notes:

1. Refer to Part 4, 1 "Electric Control Box Layout".

## Aqua thermal

### 5.22 PU/FF Troubleshooting

#### 5.22.1 Digital display output



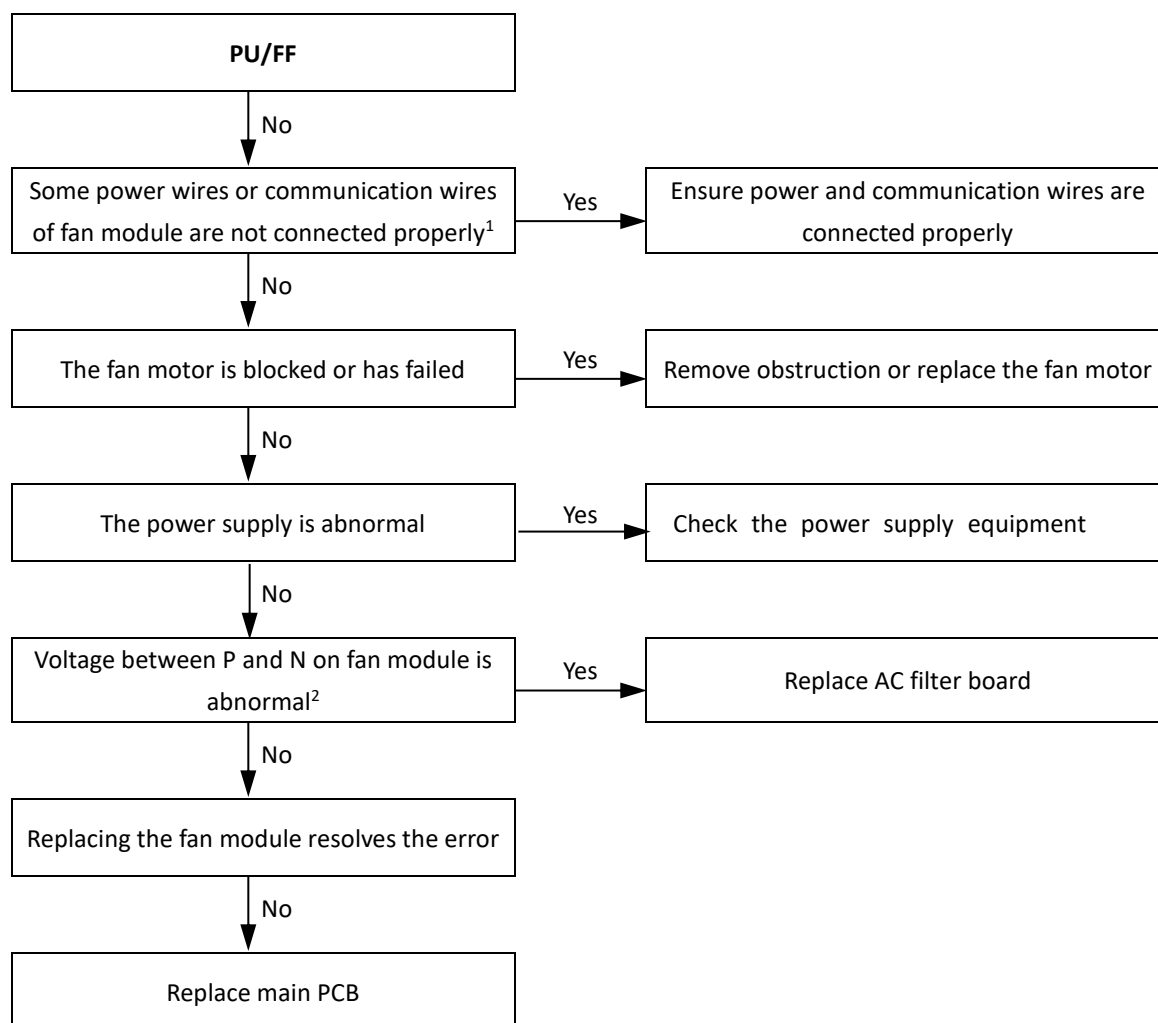
#### 5.22.2 Description

- 1PU/FF indicates fan A module protection.
- 2PU/FF indicates fan B module protection.
- FF indicates PU protection has displayed 10 times. When a FF occurred, a manual system restart is required before the system can resume operation.
- The faulty unit stops running. If 10 PU occurs in 120 minutes, FF fault is reported, and the power must be cut off and cannot be recovered.
- Error code is only displayed on the main PCB and user interface.

#### 5.22.3 Possible causes

- Switch SW1 incorrectly set.
- Power or communication wires not connected properly.
- Fan motor blocked or has failed.
- Power supply abnormal.
- AC filter board damaged.
- Fan module damaged.
- Inverter module PCB damaged.

## 5.22.4 Procedure



## Notes:

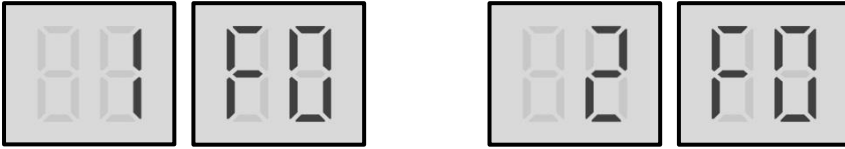
1. Refer to Part 4, 3 "Wiring diagram" and PCB components to make sure wire connection is firm.
2. The normal voltage between P and N on the fan module is 650V DC. Refer to Part 4, 1 "Outdoor Unit Electric Control Box Layout" and to Part 4, 2.4 "Fan module board".

## Aqua thermal



### 5.23 F0 Troubleshooting

#### 5.23.1 Digital display output



#### 5.23.2 Description

- 1F0 indicates a communication error between the main control chip and the compressor A inverter driver chip.
- 2F0 indicates a communication error between the main control chip and the compressor B inverter driver chip.
- The faulty unit stops running.
- Error code is only displayed on the unit with the error.

#### 5.23.3 Trigger / recover condition

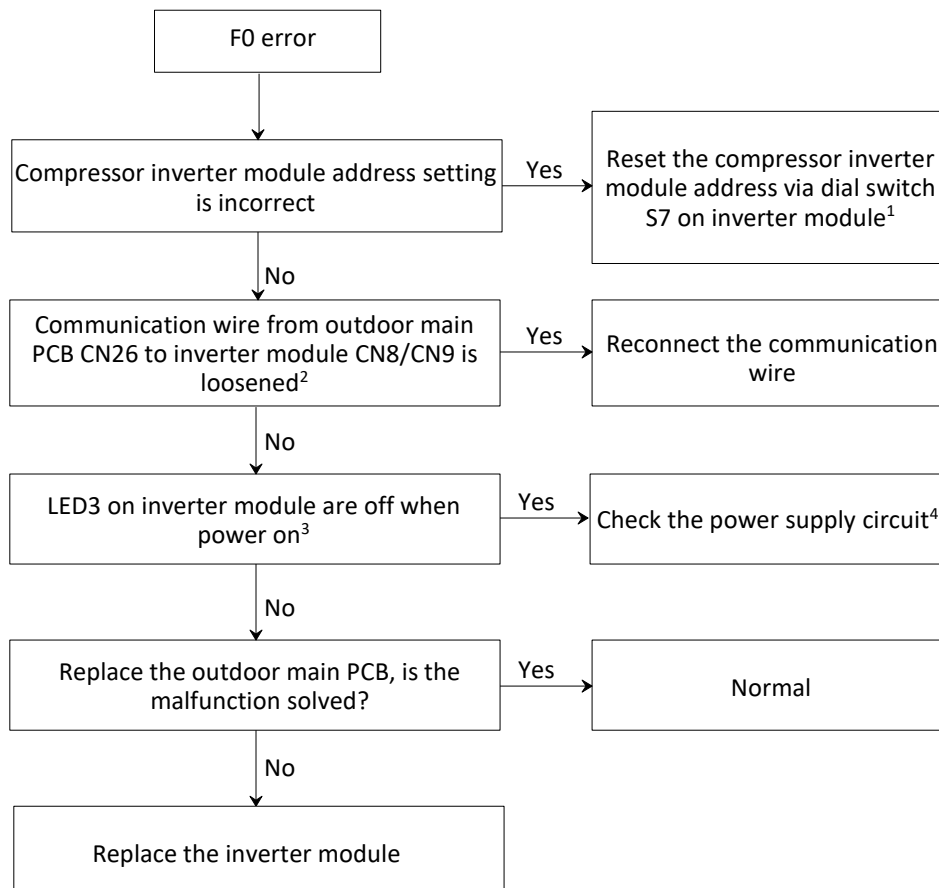
- Trigger condition: Main control chip and inverter driver chip cannot communication for 2 minutes.
- Recover condition: Communication go back to normal.
- Reset method: Resume automatically.

#### 5.23.4 Possible causes

- Incorrect compressor inverter module address setting.
- Bridge rectifier damaged.
- Loosened communication wiring from the main PCB to the inverter module.
- Main PCB damaged.
- Compressor inverter module damaged.

#### 5.23.5 Procedure,

For MC-SU75-RN8L-B and MC-SU140-RN8L-B

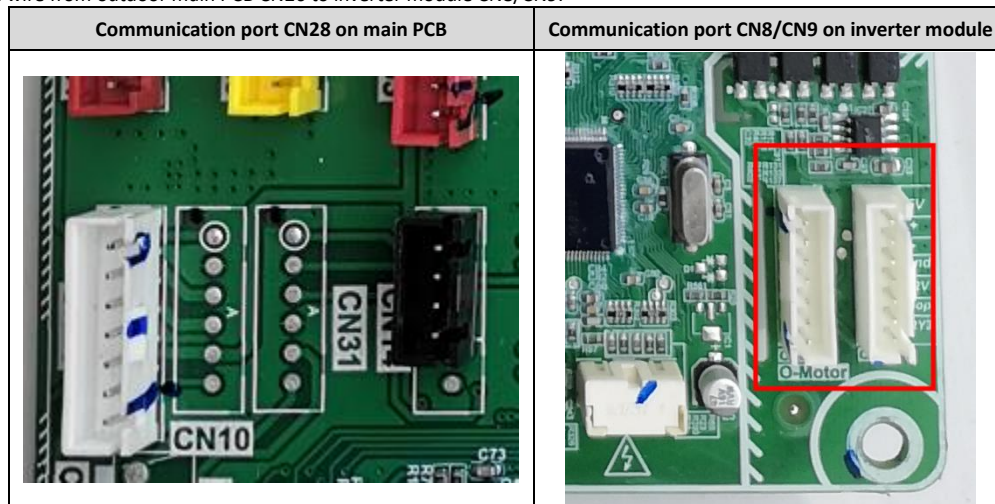


## Notes:

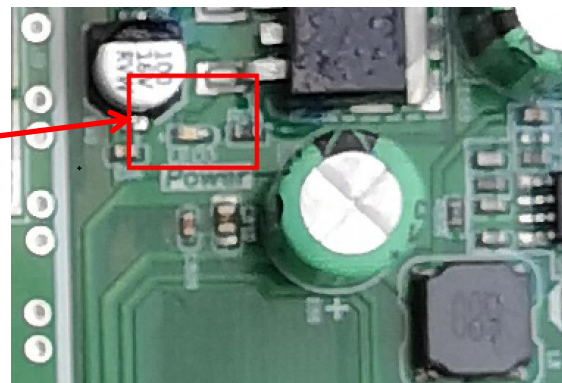
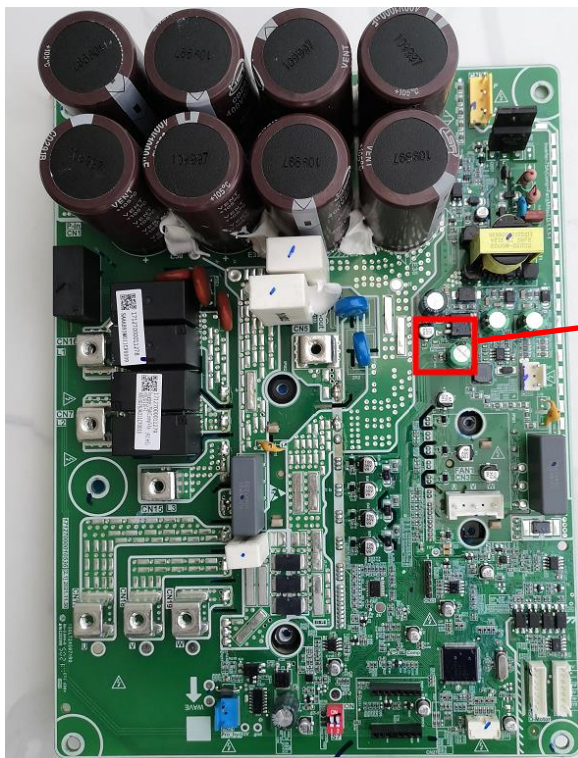
- Compressor inverter module address is set through dial switch S7 on the inverter module. The compressor inverter module A/B location refers to the wiring diagram.

| Switch                                                                                         | Description                                  | S7-1 | S7-2 |
|------------------------------------------------------------------------------------------------|----------------------------------------------|------|------|
| <b>S7</b><br> | Compressor A inverter module address setting | OFF  | OFF  |
|                                                                                                | Compressor B inverter module address setting | OFF  | ON   |

- Communication wire from outdoor main PCB CN26 to inverter module CN8/CN9.



- LED3 on inverter module

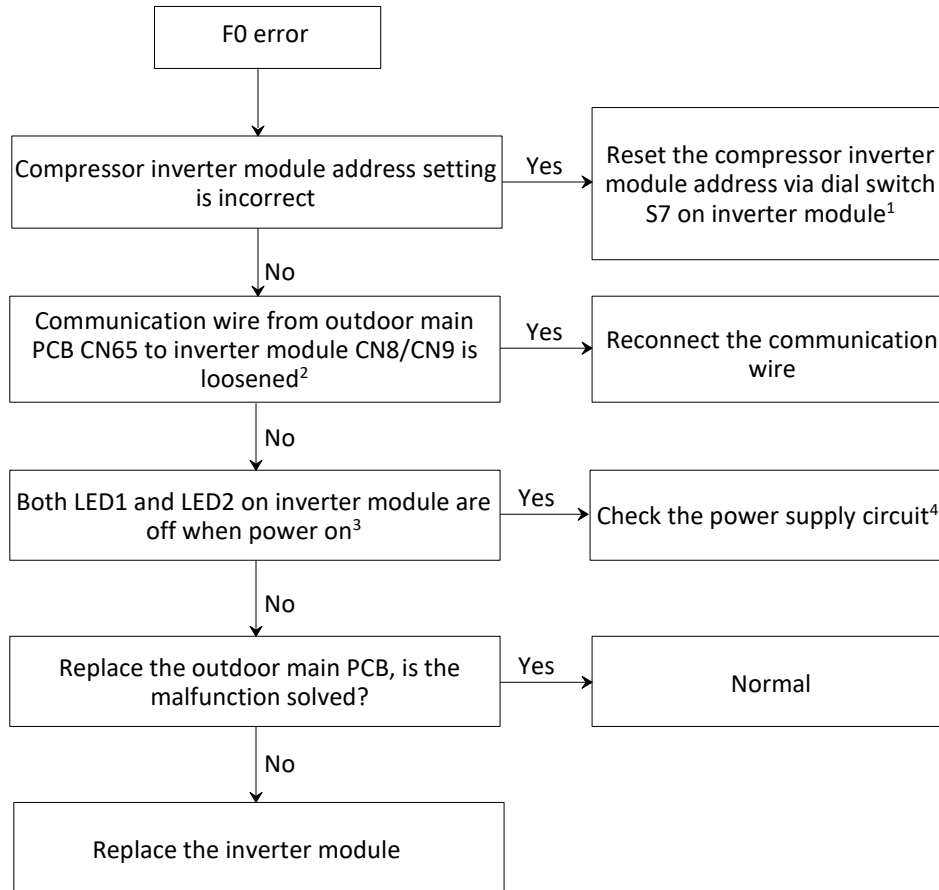


- Check the wired connection between CN5/CN6/CN7 of filter board and CN6/CN7/CN15 of compressor module board, the normal voltage should be 380-415VAC.



# Aqua thermal

For MC-SU90-RN8L-B and MC-SU180-RN8L-B

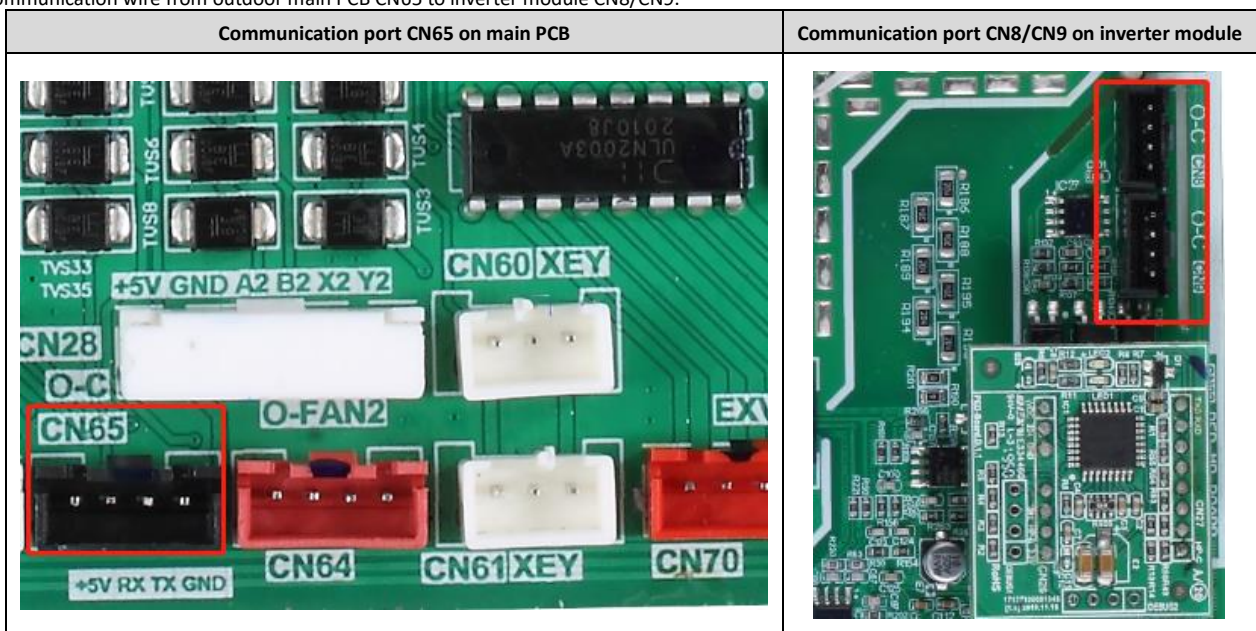


Notes:

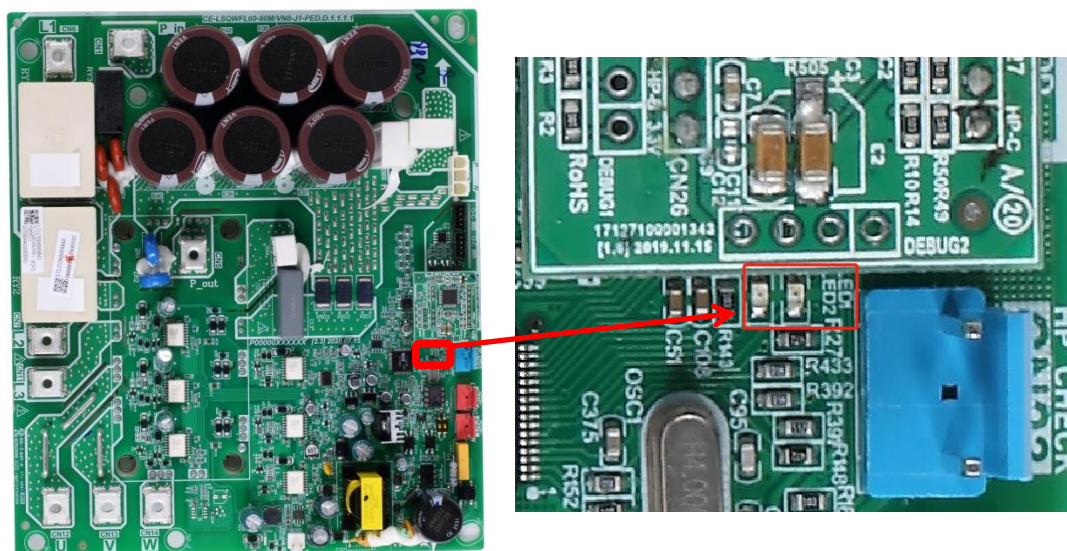
- Compressor inverter module address is set through dial switch S7 on the inverter module. The compressor inverter module A/B location refers to the wiring diagram.

| Switch        | Description                                  | S7-1 | S7-2 |
|---------------|----------------------------------------------|------|------|
| <b>S7</b><br> | Compressor A inverter module address setting | OFF  | OFF  |
|               | Compressor B inverter module address setting | OFF  | ON   |

- Communication wire from outdoor main PCB CN65 to inverter module CN8/CN9.







4. Check the wired connection between CN36 of filter board and CN2/CN3 of compressor module board, the normal voltage should be 230AC. Check the wired connection between CN30 of filter board and CN58 of main control board, the normal voltage should be DC12V.

## 5.24 H5 Troubleshooting

### 5.24.1 Digital display output



### 5.24.2 Description

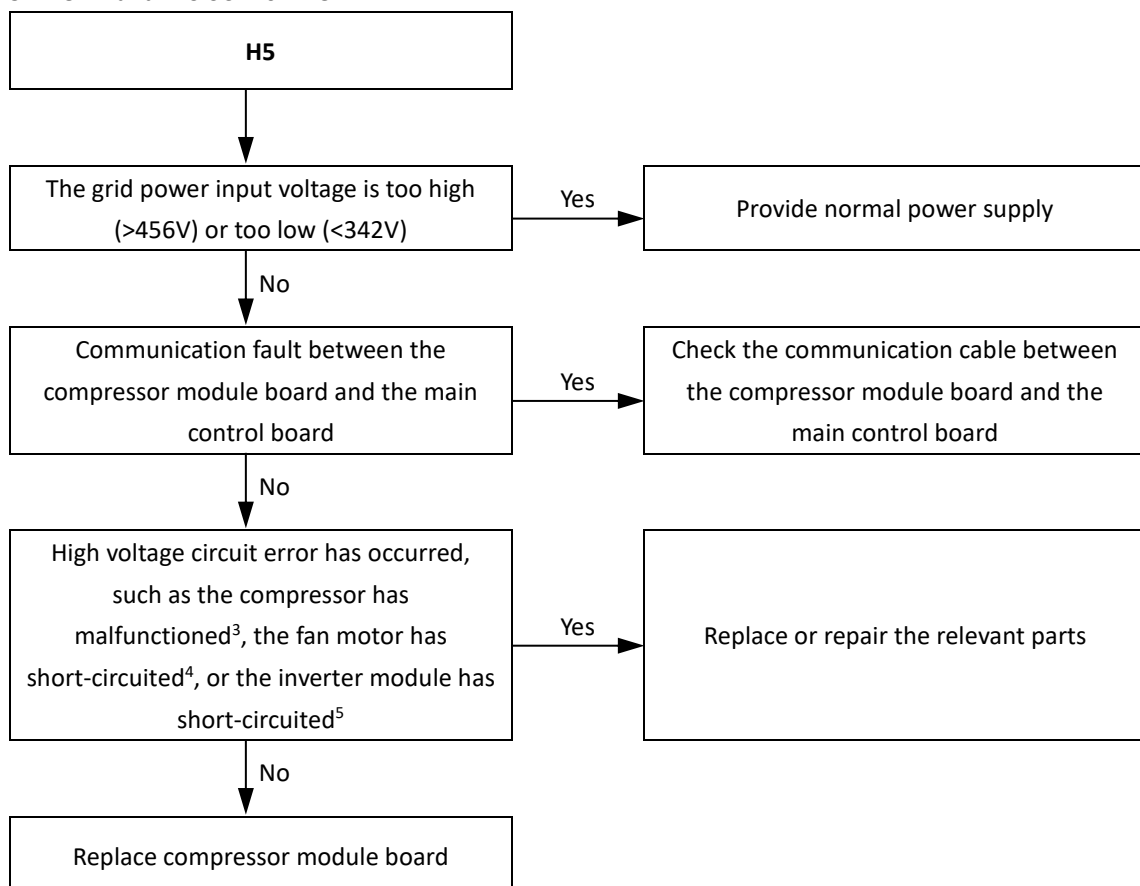
- Abnormal power supply voltage.
- The faulty unit stops running.
- Error code is only displayed on main PCB and user interface.

### 5.24.3 Possible causes

- Outdoor unit power supply voltage at or above 265V or drops below 170V or a phase is missing.
- Loosened wiring within electric control box.
- High voltage circuit error.
- Main PCB damaged.

### 5.24.4 Procedure

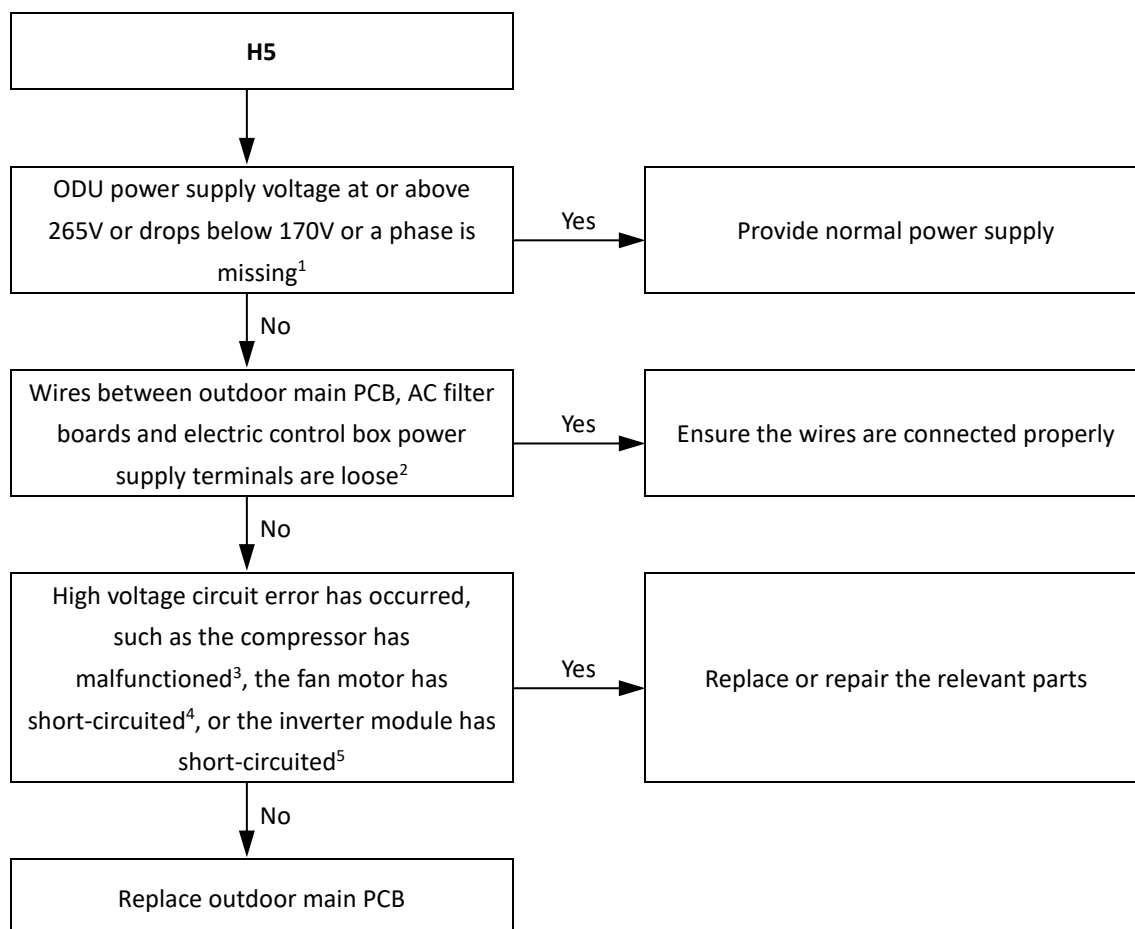
For MC-SU75-RN8L-B and MC-SU140-RN8L-B



#### Notes:

1. The detected voltage is detected by the compressor module board and sent to the main control board, and the main control board judges according to the voltage value sent by the compressor module board (report a fault if it is >456V or <342V).
2. Refer to Part 4, 3 "Wiring diagram" and PCB components to make sure wire connection is firm.
3. The normal resistances of the inverter compressor is 0.124Ω(at 20°C ambient temperature) among U V W and infinite between each of U V W and ground. If any of the resistances differ from these specifications, the compressor has malfunctioned.
4. The normal resistances of the fan motor coil among U V W are less than 15Ω. If a measured resistance is 0Ω, the fan motor has short-circuited.
5. Set a multi-meter to buzzer mode and test any two terminals of P N and U V W of the inverter module. If the buzzer sounds, the inverter module has short-circuited. Refer to Part 4, 1 "Outdoor Unit Electric Control Box Layout".

For MC-SU90-RN8L-B and MC-SU180-RN8L-B



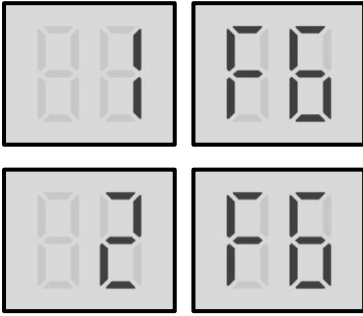
## Notes:

1. The normal voltage between A and N, B and N, and C and N is 207-253V.
2. Refer to Part 4, 3 "Wiring diagram" and PCB components to make sure wire connection is firm.
3. The normal resistances of the inverter compressor is 0.124Ω(at 20°C ambient temperature) among U V W and infinite between each of U V W and ground. If any of the resistances differ from these specifications, the compressor has malfunctioned.
4. The normal resistances of the fan motor coil among U V W are less than 15Ω. If a measured resistance is 0Ω, the fan motor has short-circuited.
5. Set a multi-meter to buzzer mode and test any two terminals of P N and U V W of the inverter module. If the buzzer sounds, the inverter module has short-circuited. Refer to Part 4, 1 "Outdoor Unit Electric Control Box Layout".

## Aqua thermal

### 5.25 F6 Troubleshooting

#### 5.25.1 Digital display output



#### 5.25.2 Description

- 1F6 indicates A system buss voltage error (PTC).
- 2F6 indicates B system buss voltage error (PTC).
- Only occurred in standby status.
- Error code is displayed on main PCB and user interface.

#### 5.25.3 Possible causes

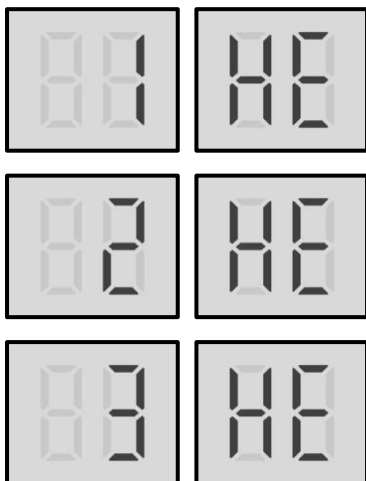
- Abnormal power supply voltage
- Loosened wiring within electric control box
- High voltage circuit error
- AC filter board damaged
- 3-phase bridge rectifier damaged
- Compressor Inverter module damaged

#### 5.25.4 Procedure

Refer to P6 protection troubleshooting: xL1 and xL2.

## 5.26 HE Troubleshooting

### 5.26.1 Digital display output



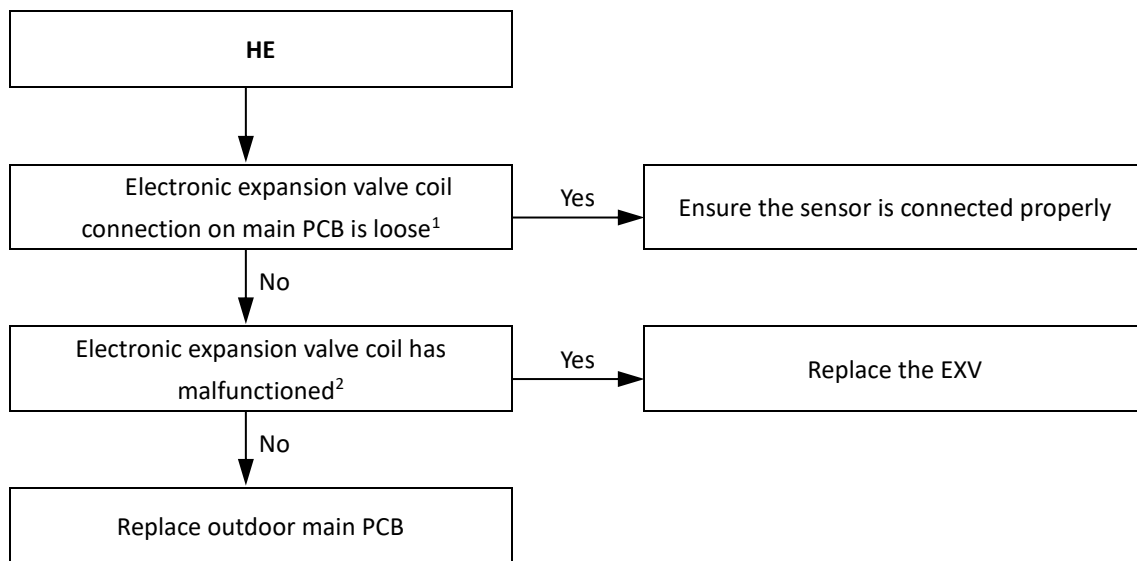
### 5.26.2 Description

- Electronic expansion valve connection error.
- The faulty unit stops running.
- Error code is only displayed on the unit with the error.

### 5.26.3 Possible causes

- Electronic expansion valve coil not connected properly or has malfunctioned.
- Damaged main PCB.

## 5.26.4 Procedure

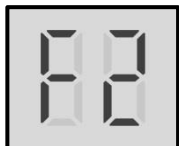


## Notes:

1. For MC-SU75-RN8L-B and MC-SU140-RN8L-B, electronic expansion valve coil connections are port CN70, CN71 and CN72 on the main PCB (labeled 31, 32, 30 in Part 4, 2.2.1 Main PCB component). For MC-SU90-RN8L-B and MC-SU180-RN8L-B, electronic expansion valve coil connections are port CN70, CN71 and CN72 on the main PCB (labeled 22, 20, 21 in Part 4, 2.2.1 Main PCB component).
2. The normal resistances between EXV coil wiring terminals is 40-50Ω. If any of the resistances differ from the value, the EXV coil has malfunctioned.

## 5.27 F2 Troubleshooting

### 5.27.1 Digital display output



### 5.27.2 Description

- Insufficient protection of exhaust superheat.
- The faulty unit stops running.
- Error code is only displayed on main PCB and user interface.

### 5.27.3 Possible causes

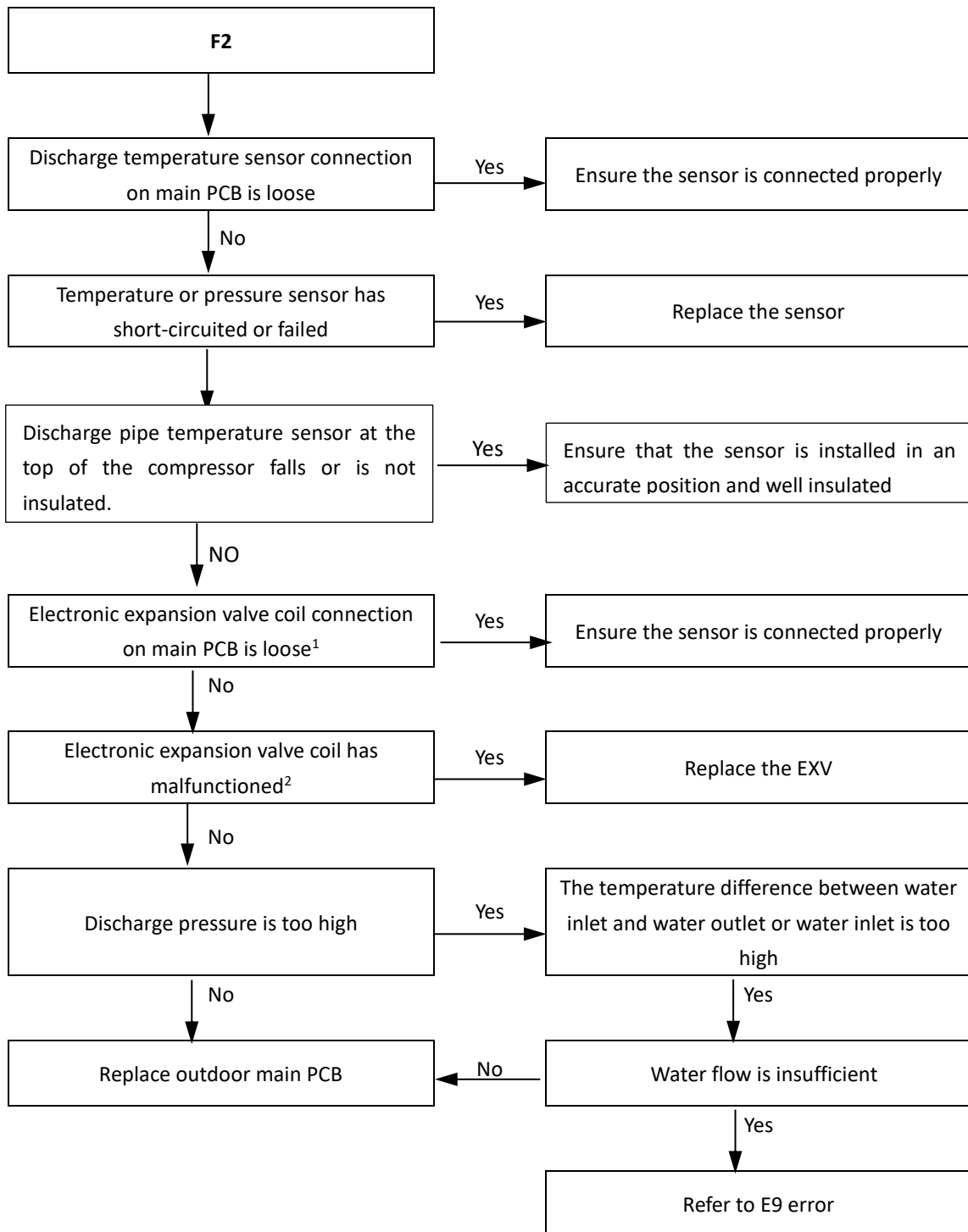
- Discharge pipe temperature sensor connected properly or has malfunctioned.
- For MC-SU75-RN8L-B and MC-SU140-RN8L-B, discharge pipe temperature sensor at the top of the compressor falls or is not insulated. For MC-SU90-RN8L-B and MC-SU180-RN8L-B, electronic expansion valve coil not connected properly or has malfunctioned.
- Damaged main PCB.

## Aqua thermal



### 5.27.4 Procedure

For MC-SU75-RN8L-B and MC-SU140-RN8L-B

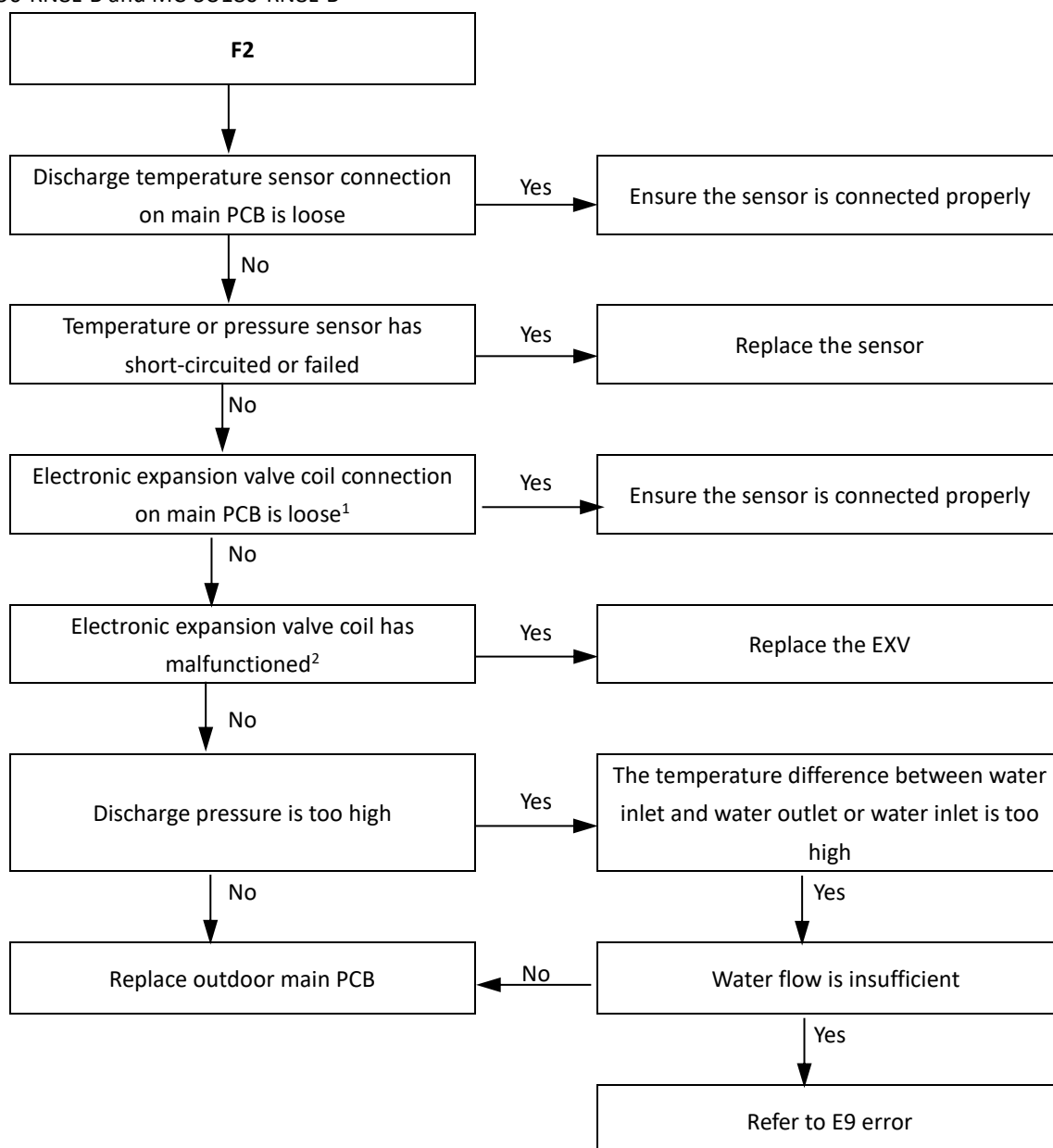


#### Notes:

1. Electronic expansion valve coil connections are port CN70, CN71 and CN72 on the main PCB (labeled 31, 32, 30 in Part 4, 2.2.1 Main PCB component).
2. The normal resistances between EXV coil wiring terminals is 40-50Ω. If any of the resistances differ from the value, the EXV coil has malfunctioned.



For MC-SU90-RN8L-B and MC-SU180-RN8L-B



Notes:

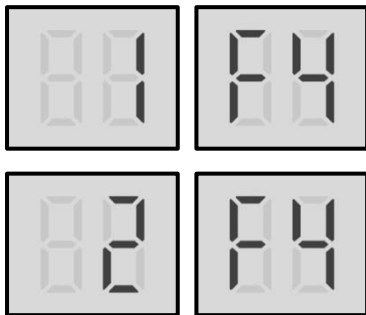
1. Electronic expansion valve coil connections are port CN70, CN71 and CN72 on the main PCB (labeled 22, 20,21 in Part 4, 2.2.1 Main PCB component).
2. The normal resistances between EXV coil wiring terminals is 40-50Ω. If any of the resistances differ from the value, the EXV coil has malfunctioned.

## Aqua thermal



### 5.28 F4 Troubleshooting

#### 5.28.1 Digital display output



#### 5.28.2 Description

- 1F4 module A L0 or L1 protection occurs for 3 times in 60 minutes.
- 2F4 module B L0 or L1 protection occurs for 3 times in 60 minutes.
- When F4 displays, a manual system restart is required before the system can resume operation.

#### 5.28.3 Possible causes

- Refer to L0 or L1 error troubleshooting.

#### 5.28.4 Procedure

- Refer to L0 or L1 error troubleshooting.

## 5.29 FP Troubleshooting

### 5.29.1 Digital display output



### 5.29.2 Description

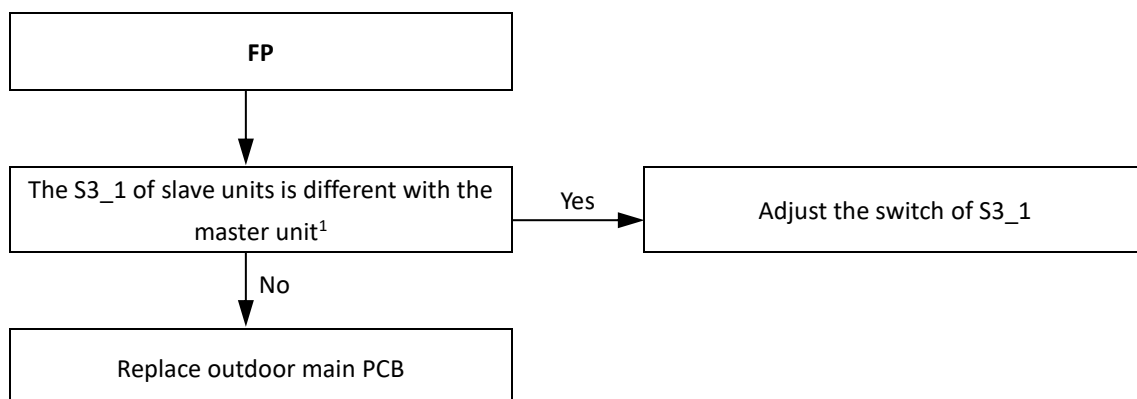
- FP indicates pump in a combination system dial to different status. When the FP displayed, a manual system restart is required before the system can resume operation.
- The faulty unit stops running.
- Error code is only displayed on main PCB and user interface.

### 5.29.3 Possible causes

- For MC-SU75-RN8L-B and MC-SU140-RN8L-B, The S3\_1 of slave units is different with the master unit.  
For MC-SU90-RN8L-B and MC-SU180-RN8L-B, the S12\_2 of slave units is different with the master unit.
- Main PCB damaged.

### 5.29.4 Procedure

For MC-SU75-RN8L-B and MC-SU140-RN8L-B

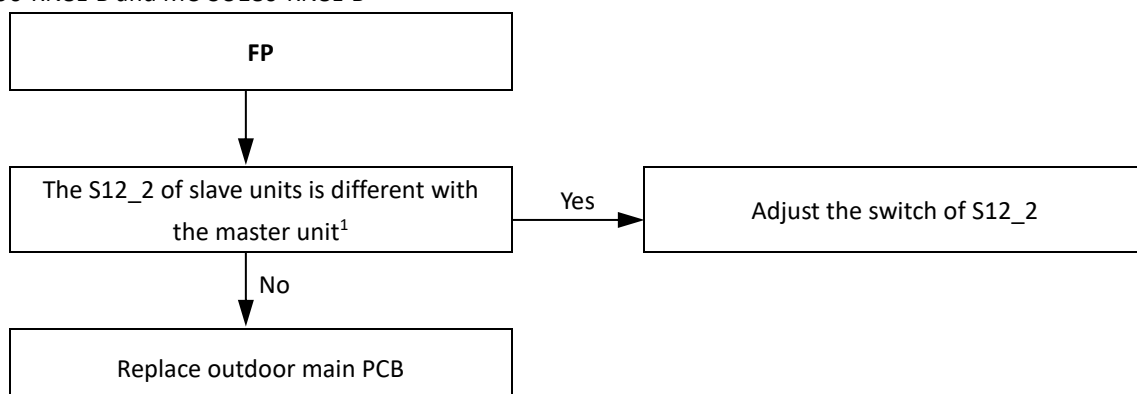


Notes:

- Dial switch S3\_1 on the main PCB

| Switch |      | Description | ON                     | OFF                 | Default factory setting |
|--------|------|-------------|------------------------|---------------------|-------------------------|
| <br>S3 | S3-1 | Water pump  | Multiple pumps control | Single pump control | OFF                     |
|        |      |             |                        |                     |                         |

For MC-SU90-RN8L-B and MC-SU180-RN8L-B



# Aqua thermal



Notes:

- Dial switch S12\_2 on the main PCB

| Switch                                                                                          |       | Description | ON                     | OFF                 | Default factory setting |
|-------------------------------------------------------------------------------------------------|-------|-------------|------------------------|---------------------|-------------------------|
| <b>S12</b><br> | S12-2 | Water pump  | Multiple pumps control | Single pump control | OFF                     |
|                                                                                                 |       |             |                        |                     |                         |

## 5.30 bH troubleshooting

### 5.30.1 Digital display output



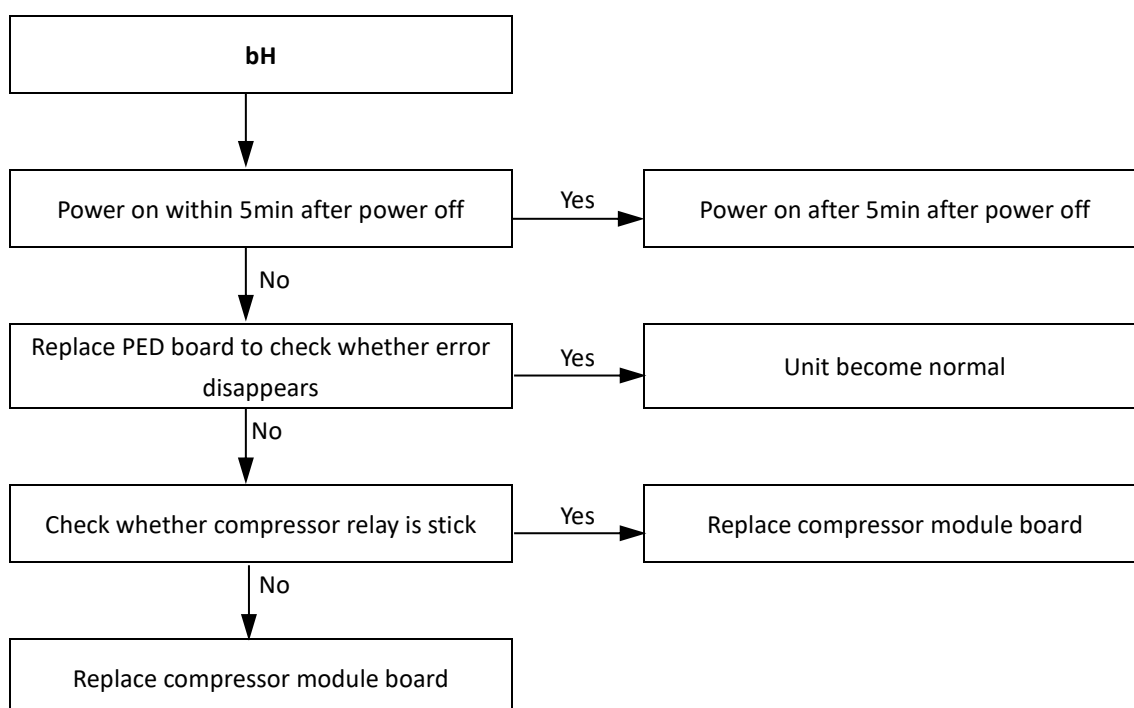
### 5.30.2 Description

- bH indicates adhesion of compressor relay or PED board damaged.
- The faulty unit stops running.
- Error code is only displayed on main PCB and user interface.

### 5.30.3 Possible causes

- Power on within 5min after power off
- PED board damaged
- Adhesion of compressor relay
- Compressor module board damaged

### 5.30.4 Procedure



Notes:

3. Dial switch S12\_2 on the main PCB

| Switch         |       | Description | ON                     | OFF                 | Default factory setting |
|----------------|-------|-------------|------------------------|---------------------|-------------------------|
| <b>S12</b><br> | S12-2 | Water pump  | Multiple pumps control | Single pump control | OFF                     |
|                |       |             |                        |                     |                         |

## Aqua thermal

### 5.31 HC troubleshooting

#### 5.31.1 Digital display output



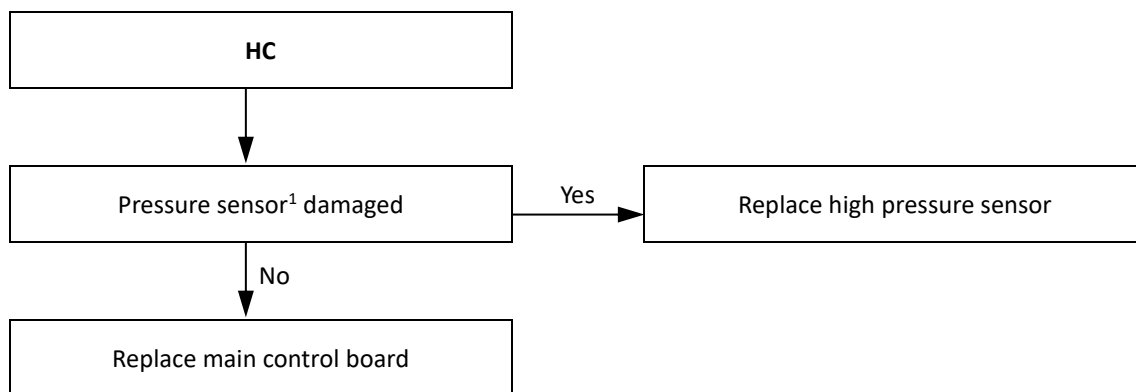
#### 5.31.2 Description

- HC indicates high pressure sensor error
- The faulty unit stops running.
- Error code is only displayed on main PCB and user interface.

#### 5.31.3 Possible causes

- Pressure sensor damaged
- Main control board damaged

#### 5.31.4 Procedure



Note:

1. For MC-SU75-RN8L-B and MC-SU140-RN8L-B, pressure sensor connection is port CN40 on the main PCB (labeled 20 in Part 4, 2.2.1 Main PCB component). Measure the resistance among the three terminals of the pressure sensor. If the resistance is of the order of mega Ohms or infinite, the pressure sensor has failed.
2. For MC-SU90-RN8L-B and MC-SU180-RN8L-B, pressure sensor connection is port CN16 on the main PCB (labeled 30 in Part 4, 2.2.1 Main PCB component). Measure the resistance among the three terminals of the pressure sensor. If the resistance is of the order of mega Ohms or infinite, the pressure sensor has failed.

## 5.32 P2 troubleshooting (for MC-SU90-RN8L-B and MC-SU180-RN8L-B only)

### 5.32.1 Digital display output



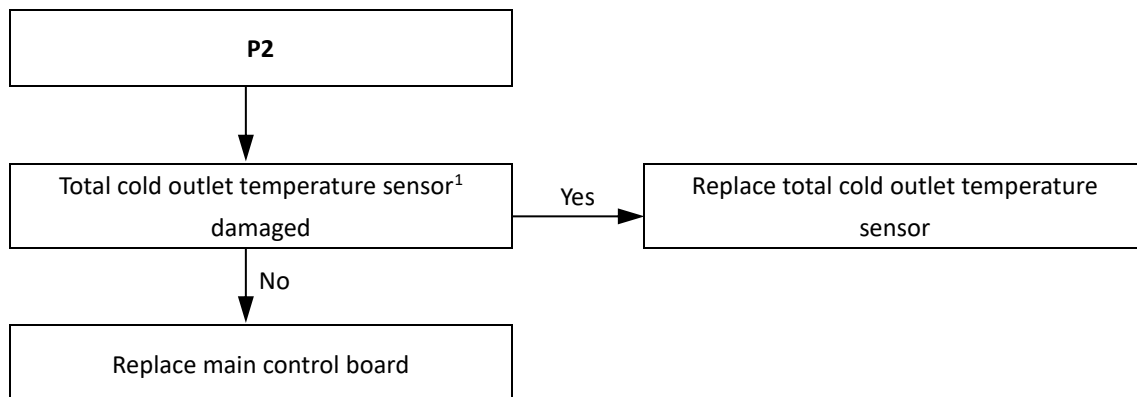
### 5.32.2 Description

- P2 indicates total cold outlet temperature too high.
- The faulty unit stops running.
- Error code is only displayed on main PCB and user interface.

### 5.32.3 Possible causes

- Temperature sensor damaged
- Main control board damaged

### 5.32.4 Procedure



Note:

1. Total cold outlet temperature sensor connection port is CN31 on the main PCB (labeled 31 in Part 4, 2.2.1 Main PCB component). Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Part 4, 6.1 "Temperature Sensor Resistance Characteristics".

## Aqua thermal

### 5.33 P3 troubleshooting

#### 5.33.1 Digital display output



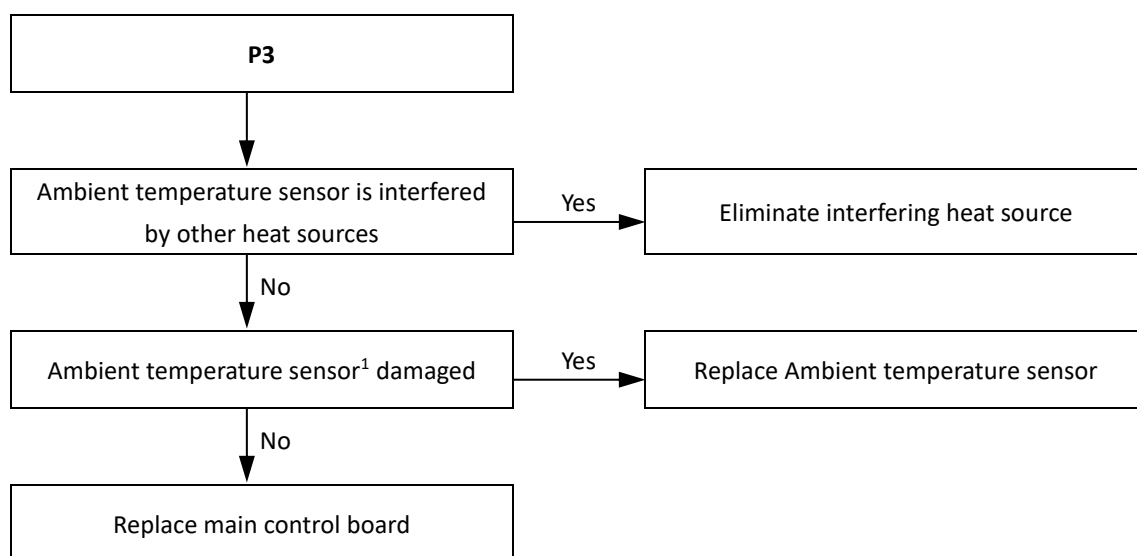
#### 5.33.2 Description

- P3 indicates ambient temperature too high for cooling mode
- The faulty unit stops running.
- Error code is only displayed on main PCB and user interface.

#### 5.33.3 Possible causes

- Ambient temperature sensor is interfered by other heat sources and the temperature detection value exceeds 65°C
- Ambient temperature sensor damaged
- Main control board damaged

#### 5.33.4 Procedure



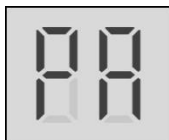
Note:

1. For MC-SU75-RN8L-B and MC-SU140-RN8L-B, ambient temperature sensor connection port is CN30 on the main PCB (labeled 23 in Part 4, 2.2.1 Main PCB component). Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Part 4, 6.1 "Temperature Sensor Resistance Characteristics".
2. For MC-SU90-RN8L-B and MC-SU180-RN8L-B, ambient temperature sensor connection port is CN1 on the main PCB (labeled 29 in Part 4, 2.2.1 Main PCB component). Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Part 4, 6.1 "Temperature Sensor Resistance Characteristics".



## 5.34 PA troubleshooting

### 5.34.1 Digital display output



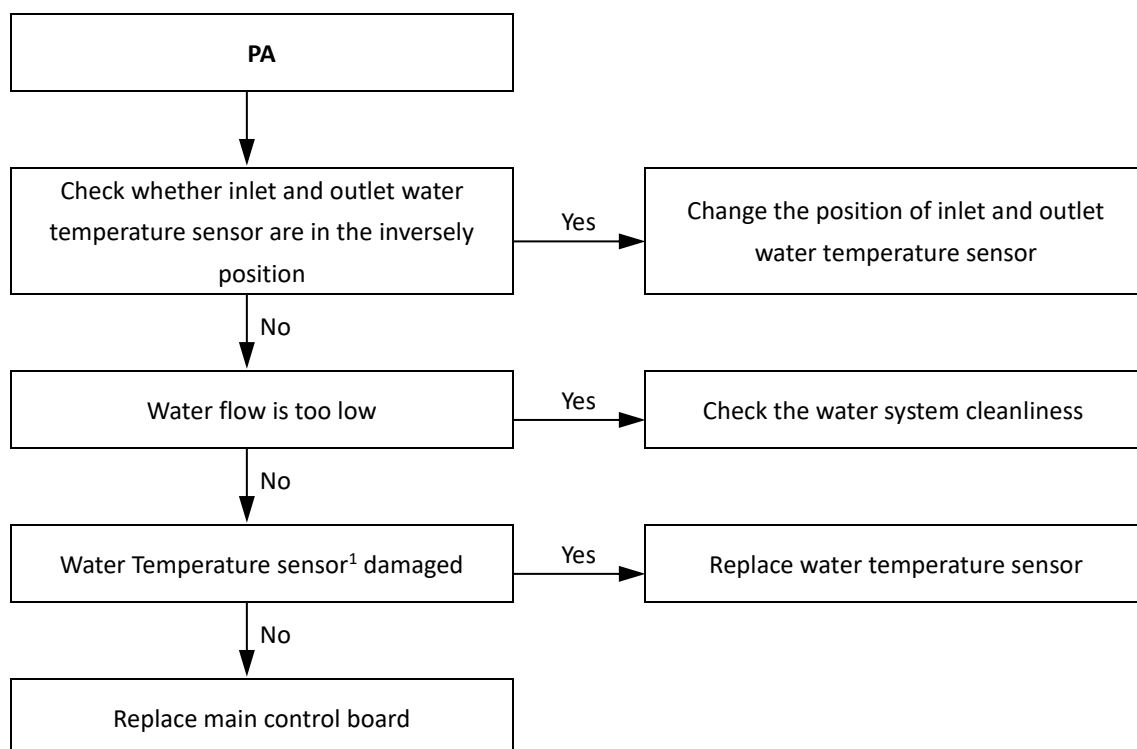
### 5.34.2 Description

- PA indicates abnormal water inlet and outlet temperature difference protection.
- The faulty unit stops running.
- Error code is only displayed on main PCB and user interface.

### 5.34.3 Possible causes

- Water temperature sensor damaged
- Inlet and outlet water temperature sensor are in the inversely position
- Water flow is too low
- Main control board damaged

### 5.34.4 Procedure



Note:

- For MC-SU75-RN8L-B and MC-SU140-RN8L-B, inlet and outlet water temperature sensor connection port is CN4 on the main PCB (labeled 29 in Part 4, 2.2.1 Main PCB component). Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Part 4, 6.1 "Temperature Sensor Resistance Characteristics".
- For MC-SU90-RN8L-B and MC-SU180-RN8L-B, inlet and outlet water temperature sensor connection port is CN31 on the main PCB (labeled 31 in Part 4, 2.2.1 Main PCB component). Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Part 4, 6.1 "Temperature Sensor Resistance Characteristics".

## Aqua thermal



### 5.35 PC troubleshooting

#### 5.35.1 Digital display output



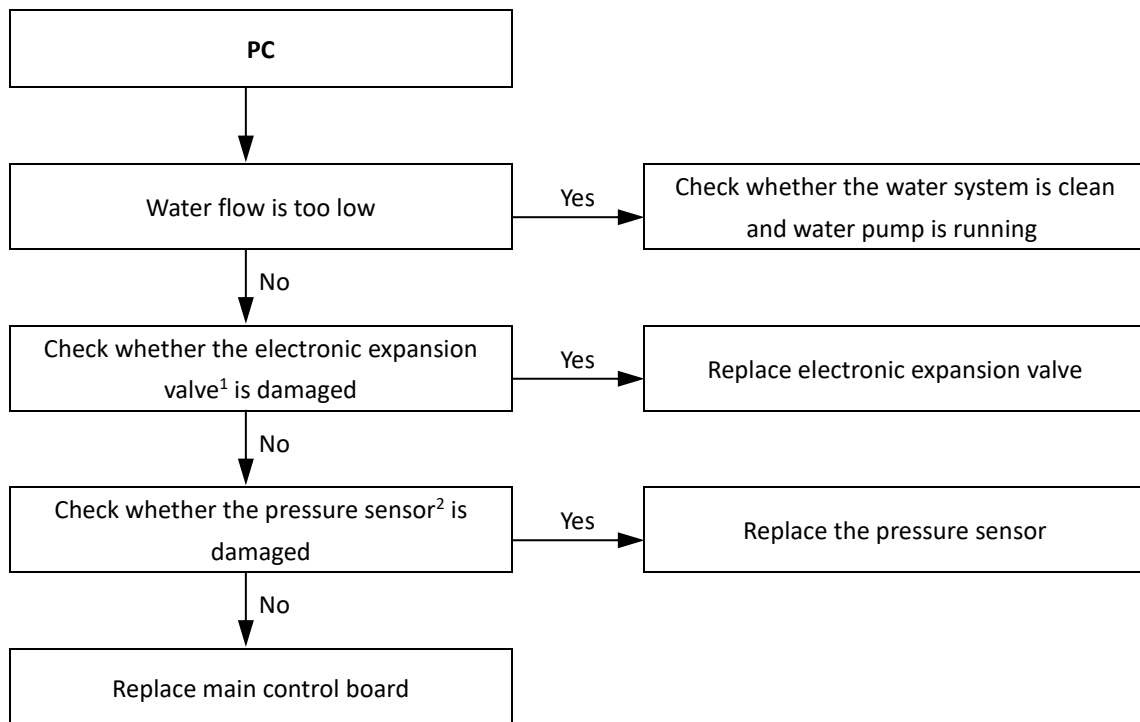
#### 5.35.2 Description

- PC indicates cooling evaporator pressure too low
- The faulty unit stops running.
- Error code is only displayed on main PCB and user interface.

#### 5.35.3 Possible causes

- Evaporator pressure less than 0.6MPa
- Water flow is too low
- Electronic expansion valve damaged
- Pressure sensor damaged
- Main control board damaged

#### 5.35.4 Procedure



#### Note:

1. For MC-SU75-RN8L-B and MC-SU140-RN8L-B, electronic expansion valve coil connections are port CN70, CN71 and CN72 on the main PCB (labeled 31, 32, 30 in Part 4, 2.2.1 Main PCB component). The normal resistances between EXV coil wiring terminals is 40-50Ω. If any of the resistances differ from the value, the EXV coil has malfunctioned.
2. For MC-SU90-RN8L-B and MC-SU180-RN8L-B, electronic expansion valve coil connections are port CN70, CN71 and CN72 on the main PCB (labeled 22, 20, 21 in Part 4, 2.2.1 Main PCB component). The normal resistances between EXV coil wiring terminals is 40-50Ω. If any of the resistances differ from the value, the EXV coil has malfunctioned.
3. For MC-SU75-RN8L-B and MC-SU140-RN8L-B, pressure sensor connection is port CN41 on the main PCB (labeled 19 in Part 4, 2.2.1 Main PCB component). Measure the resistance among the three terminals of the pressure sensor. If the resistance is of the order of mega Ohms or infinite, the pressure sensor has failed.
4. For MC-SU90-RN8L-B and MC-SU180-RN8L-B, pressure sensor connection is port CN16 on the main PCB (labeled 30 in Part 4, 2.2.1 Main PCB component). Measure the resistance among the three terminals of the pressure sensor. If the resistance is of the order of mega Ohms or infinite, the pressure sensor has failed.

## 6 Drive Module Failure

(For MC-SU75-RN8L-B and MC-SU140-RN8L-B only)

### 6.1 Error code table

| Error code | Content                                                   | Error category         | Need to power on again |
|------------|-----------------------------------------------------------|------------------------|------------------------|
| L10        | Overcurrent protection                                    | Overcurrent fault      | NO                     |
| L11        | Transient phase current overcurrent protection            |                        | NO                     |
| L12        | Phase current overcurrent lasts 30s protection            |                        | NO                     |
| L20        | Module over temperature protection                        | Over temperature fault | NO                     |
| L30        | Low bus voltage error                                     | Power fault            | NO                     |
| L31        | High bus voltage error                                    |                        | NO                     |
| L32        | Excessively high bus voltage error                        |                        | NO                     |
| L34        | Phase loss error                                          |                        | NO                     |
| L43        | Abnormal phase current sampling bias                      | hardware fault         | NO                     |
| L45        | Motor code not match                                      |                        | YES                    |
| L46        | IPM protection (FO)                                       |                        | NO                     |
| L47        | Module type not match (After module resistance detection) |                        | YES                    |
| L50        | Startup failure                                           | Control fault          | NO                     |
| L51        | Out of step error (Reserved)                              |                        | NO                     |
| L52        | Zero speed protection                                     |                        | NO                     |
| L60        | Fan motor phase loss protection                           | Diagnostic fault       | NO                     |
| L65        | IPM short circuit error                                   |                        | NO                     |
| L66        | FCT detection error                                       |                        | NO                     |
| L6A        | Open circuit of U-phase upper tube                        |                        | NO                     |
| L6b        | Open circuit of U-phase lower tube                        |                        | NO                     |
| L6C        | Open circuit of V-phase upper tube                        |                        | NO                     |
| L6d        | Open circuit of V-phase lower tube                        |                        | NO                     |
| L6E        | Open circuit of W-phase upper tube                        |                        | NO                     |
| L6F        | Open circuit of W-phase lower tube                        |                        | NO                     |
| Lb0        | High pressure switch motion                               | Authentication fault   | NO                     |
| Lb1        | Relay adhesion (Reserved)                                 |                        | NO                     |
| Lb2        | RAM check error (Reserved)                                |                        | NO                     |
| Lb3        | ROM check error (Reserved)                                |                        | NO                     |
| Lb4        | Register or ALU check error (Reserved)                    |                        | NO                     |
| Lb5        | Stack over flow check error (Reserved)                    |                        | NO                     |
| Lb6        | Program stream check error (Reserved)                     |                        | NO                     |
| Lb7        | Other abnormal check /PED diagnostic errors               |                        | NO                     |
| Lb8        | PED 5V abnormal (Reserved)                                |                        | NO                     |

## Aqua thermal

### 6.2 L10: Hardware overcurrent

#### 6.2.1 Description

- The current exceeds the OCP protection value (peak value) set by the hardware or receives the FO signal from the IPM module.
- After the fault, the compressor stops running. If the fault disappears after one minute, the compressor starts again.

#### 6.2.2 Trigger/resume condition

- The current reaches the OCP protection value

Trigger condition: The current reaches the OCP protection value.

Resume condition: The compressor shuts down after a fault, and resumes after reaching the fault exit condition one minute later.

Reset method: Automatic recovery after reaching the fault exit condition one minute later.

- A falling edge or continuously low level of the FO signal is detected:

Trigger condition: The falling edge or continuously low electrical level of the FO signal is detected.

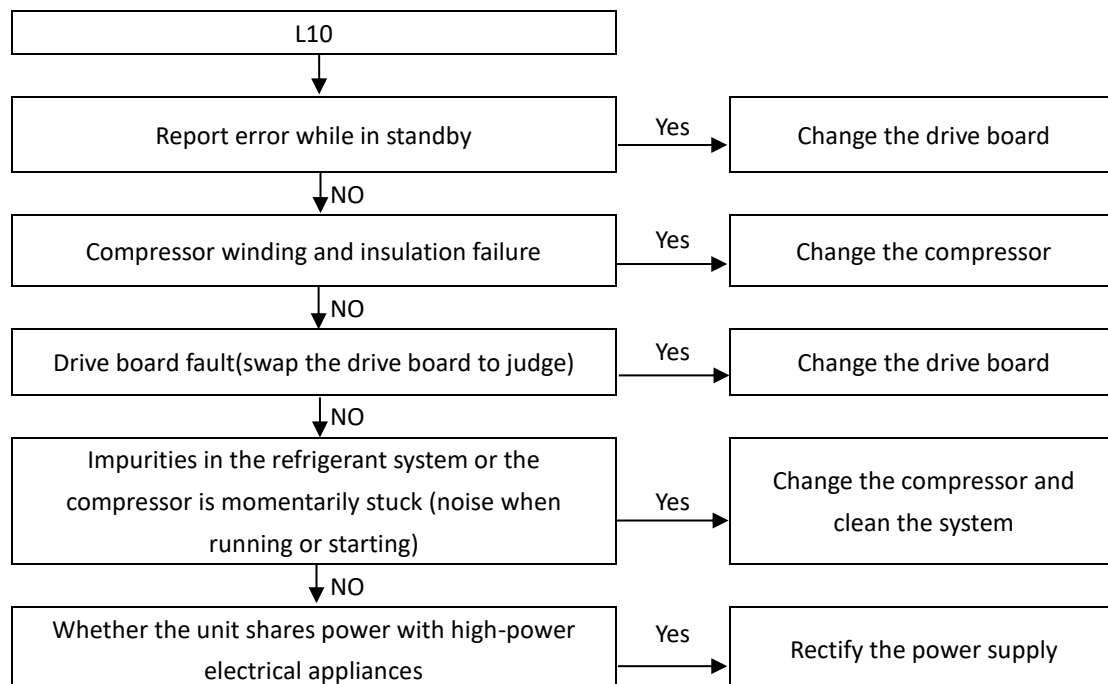
Recovery Condition: The FO signal turns into high level.

Reset method: Automatic recovery after reaching the fault exit condition one minute later.

#### 6.2.3 Possible causes

- There are impurities in the refrigerant system or the compressor is momentarily stuck, causing the current surge to trigger OCP;
- The compressor winding is short-circuited between phases, resulting in instantaneous high current to trigger OCP or FO;
- The voltage of the system power supply drops or is interrupted for a short time, resulting in an instantaneous surge of current to trigger OCP;
- Condensation of the IPM module leads to a short circuit between the control pins;
- System backflow;
- The rotor has a certain speed when the compressor is started (commonly when a compressor has been started or the main engine has been started, and the refrigerant drives the rotor of the compressor that is about to start when the four-way valve is reversed);
- The abnormality of the module board (Idc, OCP comparison circuit, PWM circuit, IPM, IGBT drive power circuit) causes the control to lose step and generate a large current to trigger the OCP.

#### 6.2.4 Procedure



## 6.3 L11: Software overcurrent

### 6.3.1 Description

- The current exceeds the OCP protection value (peak value) set by the software;
- After the fault, the compressor stops running. If the fault disappears after one minute, the compressor starts again.

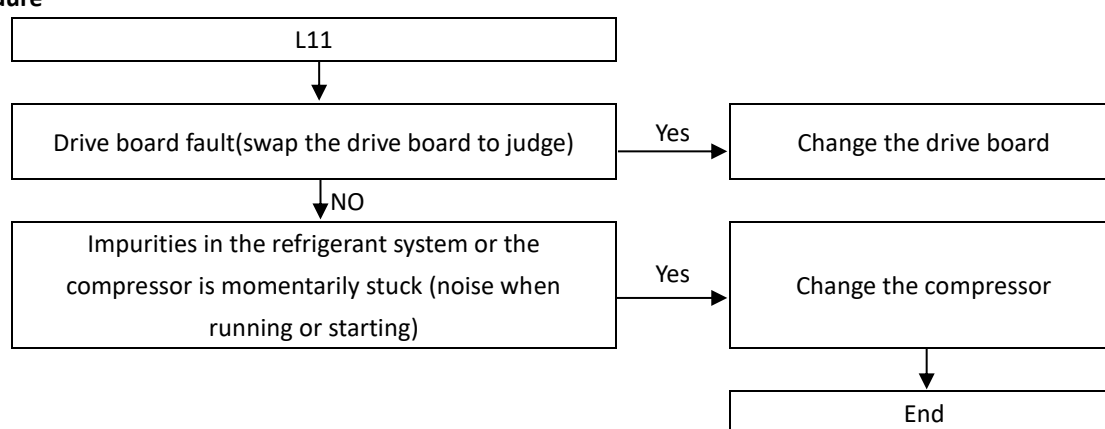
### 6.3.2 Trigger/resume condition

- Trigger condition: It is detected that the compressor current exceeds the OCP protection value set by the software for three consecutive carrier cycles.
- Resume condition: The compressor shuts down after a fault, and resumes after reaching the fault exit condition one minute later.
- Reset method: Automatic recovery after reaching the fault exit condition one minute later.

### 6.3.3 Possible causes

- There are impurities in the refrigerant system or the compressor is momentarily stuck, causing the current surge to trigger OCP;
- Module board lcd op amp sampling circuit is abnormal.

### 6.3.4 Procedure



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### 6.4 L20: Module overheat protection

#### 6.4.1 Description

- IPM module temperature exceeds 105 °C.
- After the fault, the compressor stops running, and if the fault disappears after one minute, the compressor starts again.

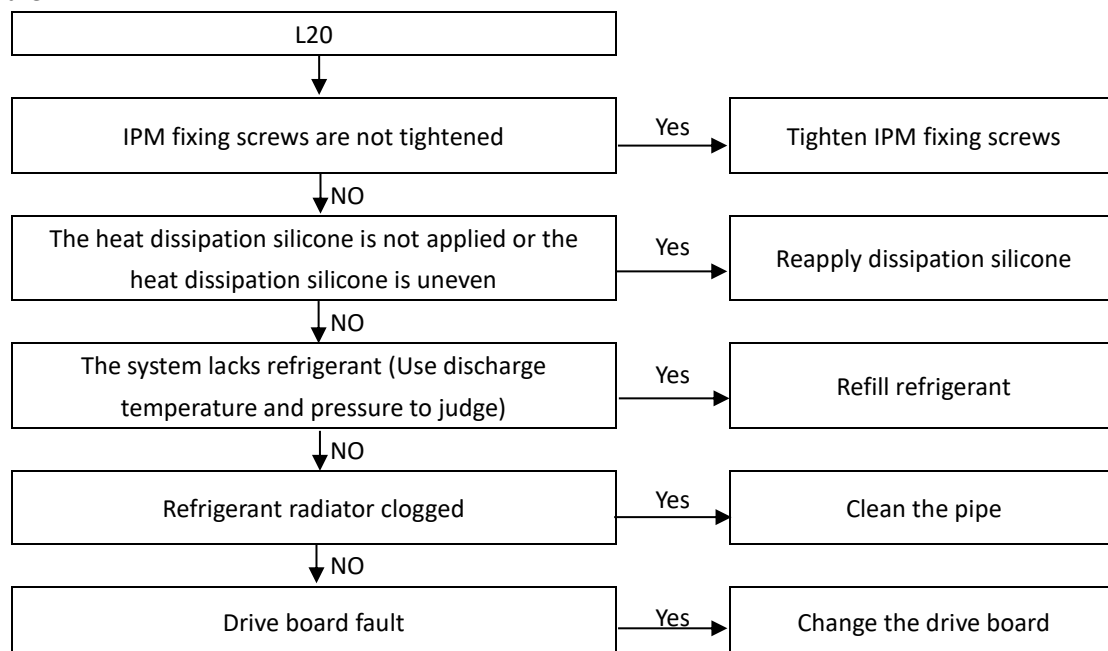
#### 6.4.2 Trigger/resume condition

- Trigger condition: IPM module temperature exceeds 105 °C;
- Resume condition: The compressor shuts down after a fault, and resumes after reaching the fault exit condition (The module temperature is lower than 105 °C) one minute later;
- Reset method: Automatic recovery after reaching the fault exit condition one minute later.

#### 6.4.3 Possible causes

- IPM fixing screws are not tightened, resulting in poor heat dissipation;
- The heat dissipation silicone of the IPM module is not evenly spread, resulting in poor heat dissipation;
- The system lacks refrigerant or the refrigerant radiator pipeline is blocked, resulting in poor heat dissipation of the refrigerant radiator;
- The system refrigerant radiator is abnormally welded, resulting in too large thermal resistance and poor heat dissipation;
- The module board IPM temperature detection circuit is abnormal.

#### 6.4.4 Procedure



## 6.5 L30: Low bus voltage protection

### 6.5.1 Description

- The bus voltage is lower than the low bus voltage protection threshold (350VDC) set by the software.
- After the fault, the compressor stops running, and if the fault disappears after one minute, the compressor starts again.

### 6.5.2 Trigger/resume condition

- Trigger condition: The bus voltage is lower than the low bus voltage protection threshold (350VDC) set by the software.
- Resume condition: The compressor shuts down after a fault, and resumes after reaching the fault exit condition (The bus voltage is higher than the low bus voltage protection threshold (350VDC) (set by the software.) one minute later.
- Reset method: Automatic recovery after reaching the fault exit condition one minute later.

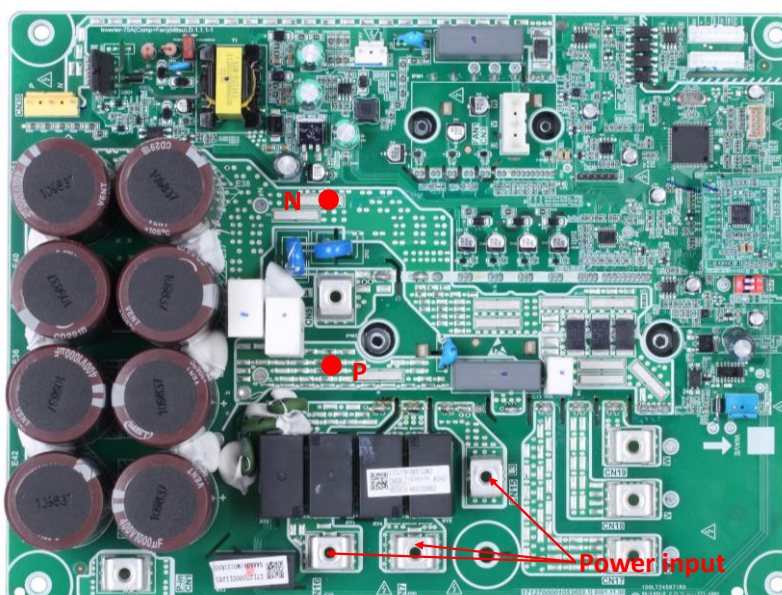
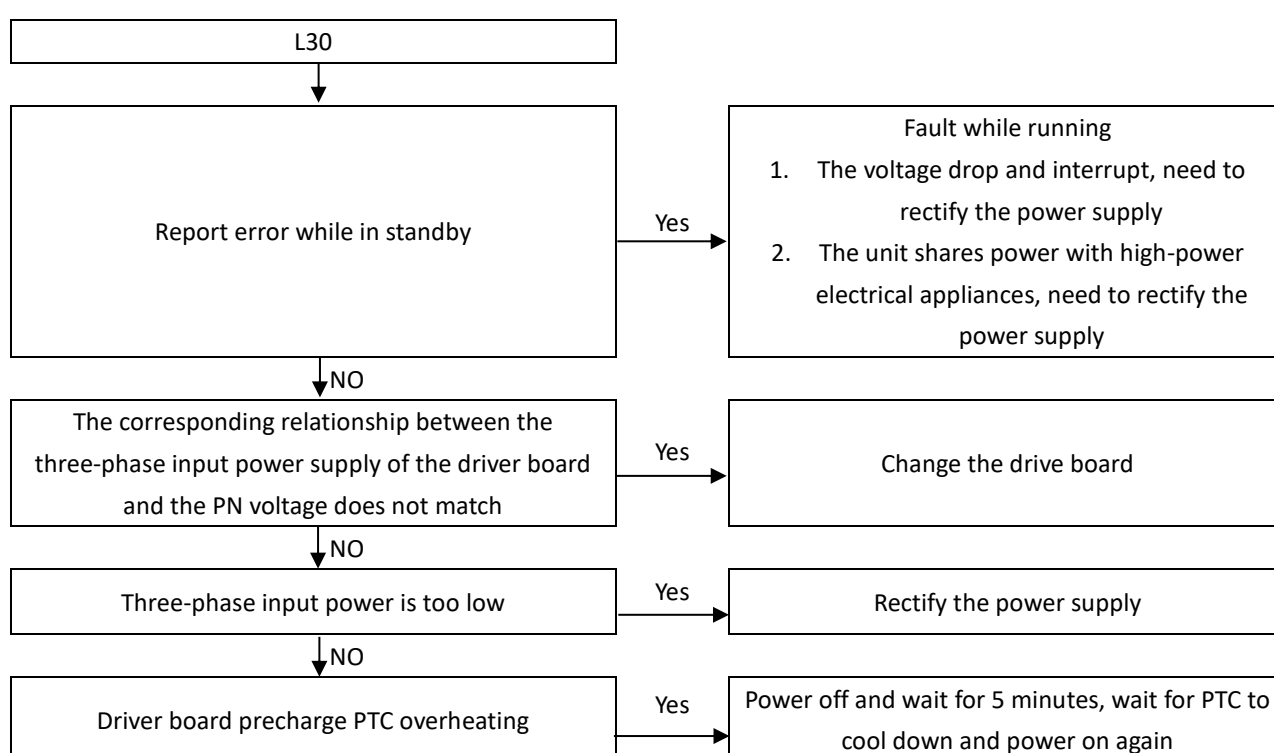
### 6.5.3 Possible causes

The input voltage is too low, resulting in low bus voltage;

The voltage drop and interrupt, resulting in the low instantaneous bus voltage;

The module board bus voltage detection circuit is abnormal.

### 6.5.4 Procedure



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### 6.6 L31: High bus voltage error

#### 6.6.1 Description

- The bus voltage is higher than the high bus voltage protection threshold (750VDC) set by the software.
- After the fault, the compressor stops running, and if the fault disappears after one minute, the compressor starts again.

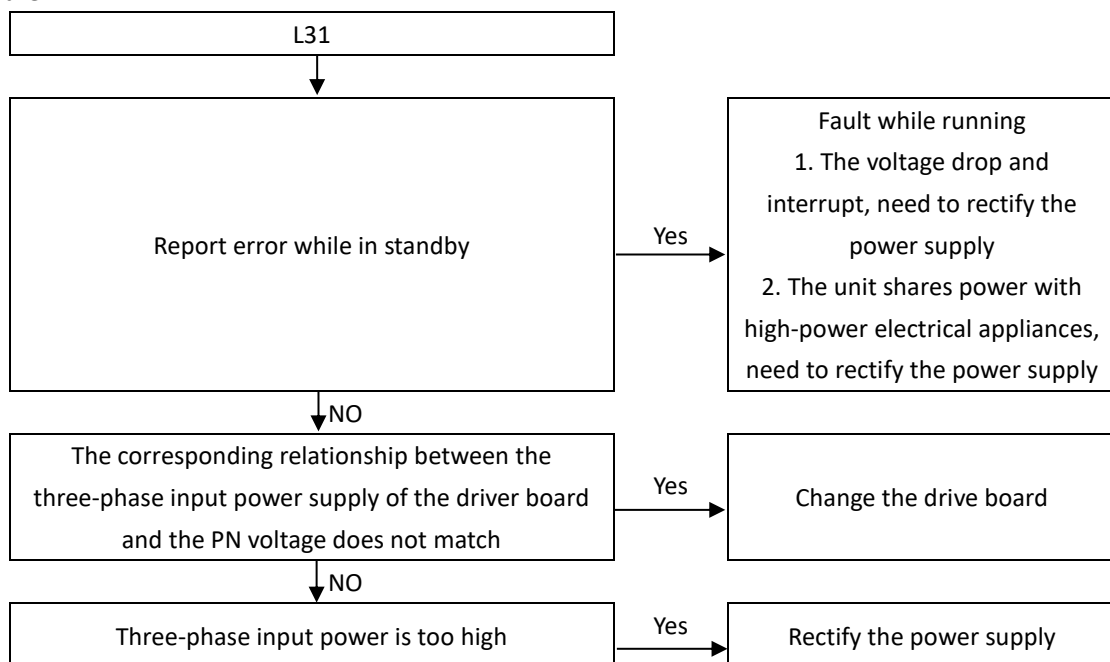
#### 6.6.2 Trigger/resume condition

- Trigger condition: The bus voltage is higher than the high bus voltage protection threshold set by the software.
- Resume condition: The compressor shuts down after a fault, and resumes after reaching the fault exit condition (The bus voltage is lower than the high bus voltage protection threshold set by the software.) one minute later.
- Reset method: Automatic recovery after reaching the fault exit condition one minute later.

#### 6.6.3 Possible causes

- The input voltage is too high, resulting in high bus voltage;
- The grid voltage is abnormally high instantaneously.
- The module board bus voltage detection circuit is abnormal.

#### 6.6.4 Procedure





## 6.7 L32: Excessively high bus voltage error

### 6.7.1 Description

- The bus voltage is higher than the excessively high bus voltage protection threshold (770VDC) set by the software.
- After the fault, the compressor stops running, and if the fault disappears after one minute, the compressor starts again.

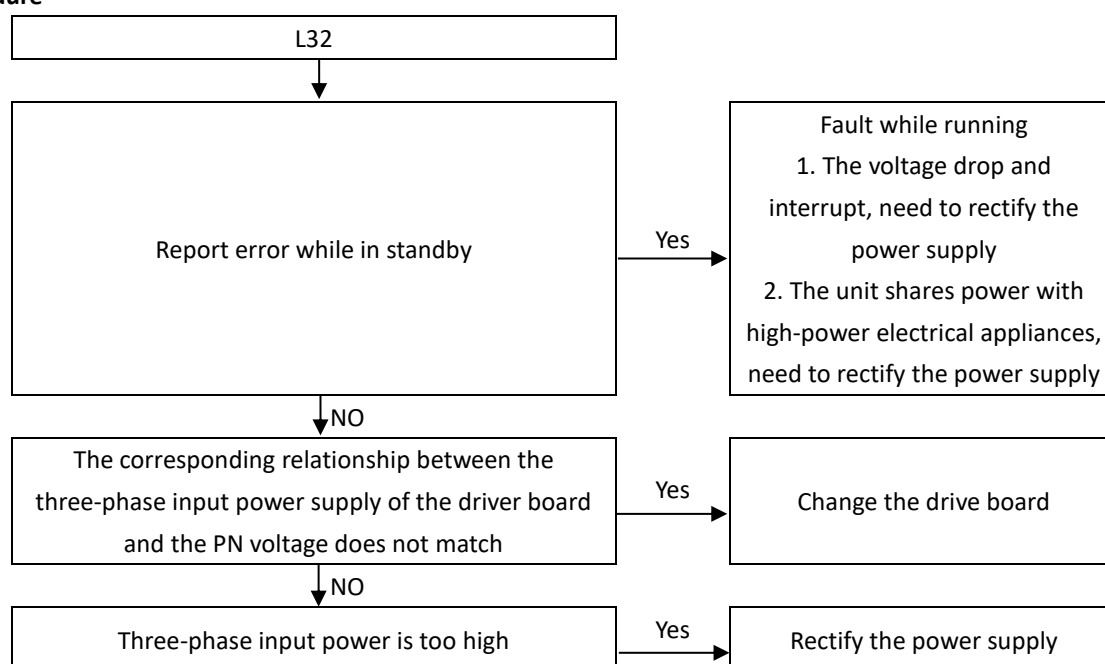
### 6.7.2 Trigger/resume condition

- Trigger condition: The bus voltage is higher than the excessively high bus voltage protection threshold set by the software.
- Resume condition: The compressor shuts down after a fault, and resumes after reaching the fault exit condition (The bus voltage is lower than the excessively high bus voltage protection threshold set by the software.) one minute later.
- Reset method: Automatic recovery after reaching the fault exit condition one minute later.

### 6.7.3 Possible causes

- The input voltage is too high, resulting in high bus voltage;
- The grid voltage is abnormally high instantaneously
- The module board bus voltage detection circuit is abnormal.

### 6.7.4 Procedure



## 6.8 L34: Phase loss error

### 6.8.1 Description

- The power input phase is missing or the three-phase power supply is seriously unbalanced.
- After the fault, the compressor stops running, and if the fault disappears after one minute, the compressor starts again.

### 6.8.2 Trigger/resume condition

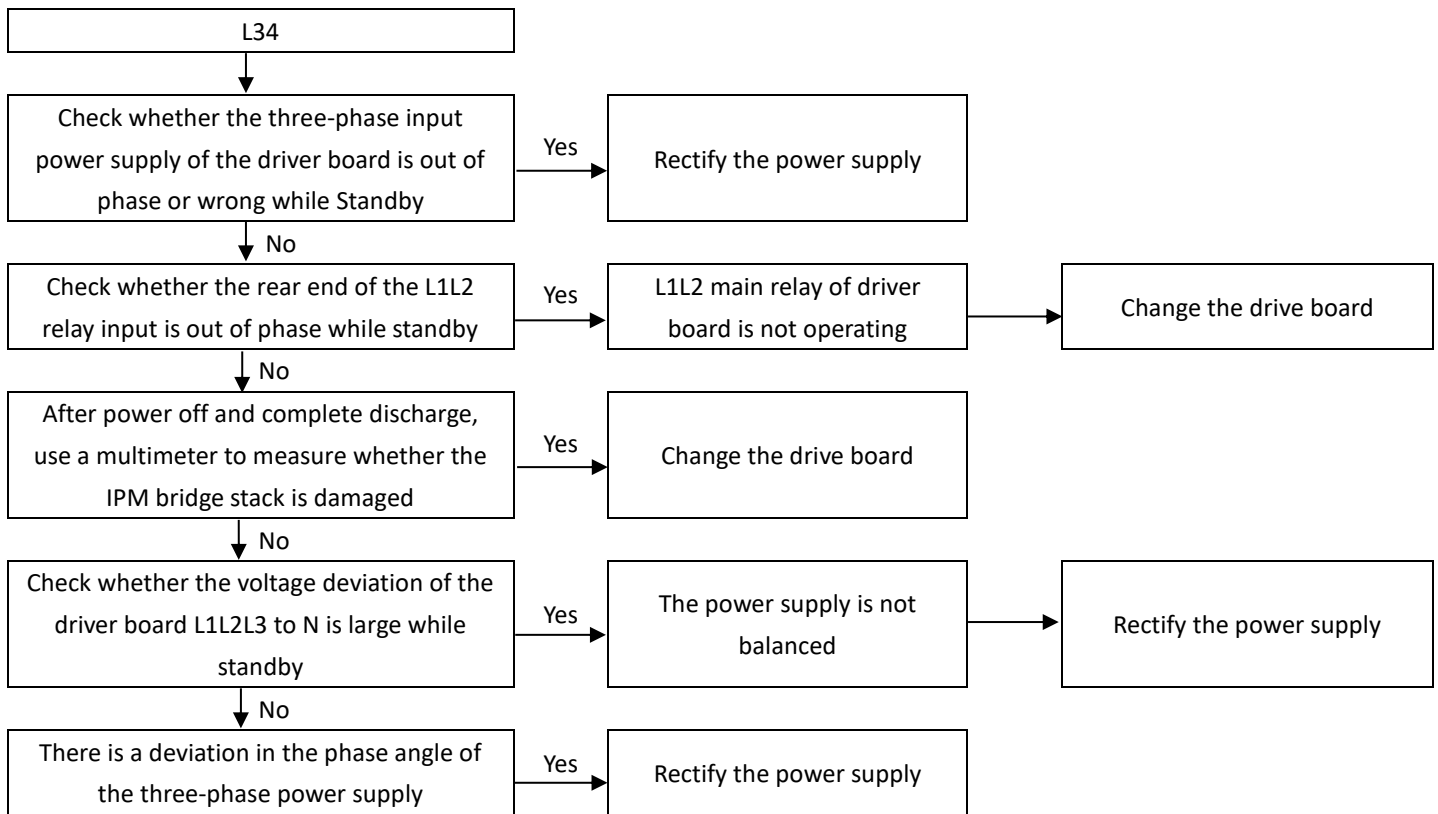
- Trigger condition: The power input phase is missing or the three-phase power supply is seriously unbalanced.
- Resume condition: Detect the factors that cause the phase loss, such as poor power input wiring or the screw of the terminal is not tightened, or disconnect other electrical equipment that shares the power supply with the unit.
- Reset method: Automatic recovery after reaching the fault exit condition one minute later.

### 6.8.3 Possible causes

- Abnormal system power wiring leads to phase loss, or the N line and the phase line are reversed;
- The system power cord is poorly wired or the screws are not tightened;
- The module board is abnormal (one-phase relay is not operating);
- There is a large load on one or two phases of the system power supply, resulting in an unbalanced supply voltage;
- The power distribution phase unbalance degree exceeds 3% (phase angle unbalance, or three-phase voltage unbalance, or both).

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### 6.8.4 Procedure



### 6.9 L45: Abnormal current sampling circuit bias

#### 6.9.1 Description

- The current sampling circuit calibration has failed.
- After this fault occurs, the compressor cannot be started. It is necessary to check whether there is a problem with the drive board.

#### 6.9.2 Trigger/resume condition

- Trigger condition: The AD offset value of the current sampling circuit reaches half of the AD full scale.
- Resume condition: After this fault occurs, the compressor cannot be started. It is necessary to check whether there is a problem with the drive board. After that, the AD bias value of the current sampling circuit is less than half of the AD full scale when the power is turned on again. Then this fault will not occur again.
- Reset method: Automatic recovery after reaching the fault exit condition one minute later.

#### 6.9.3 Possible causes

- There is a problem with sampling circuit of the driver board.

#### 6.9.4 Procedure

- Change the driver board.

### 6.10 Motor code not match

#### 6.10.1 Description

- Parameters do not match.
- After this fault occurs, the compressor cannot be started. It is necessary to check whether there is a problem with the drive board.

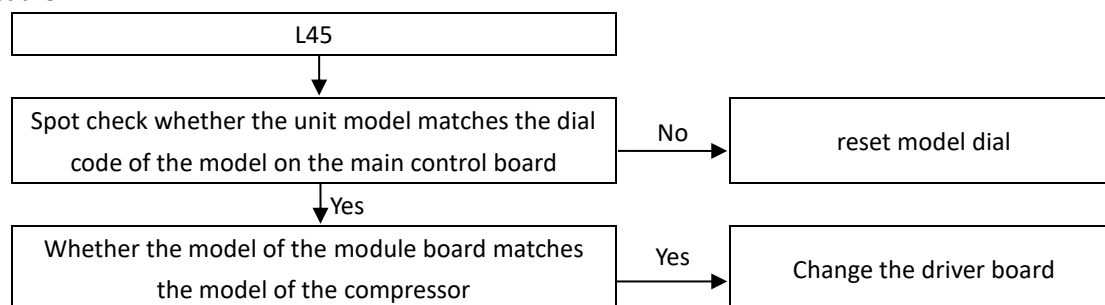
#### 6.10.2 Trigger/resume condition

- Trigger condition: The compressor model selected by the master through communication does not match the compressor drive parameters in the drive.
- Resume condition: Check whether the dial code of the model is wrongly dialed, and re-select the dial code of the corresponding model.
- Reset method: Re-select the dial code of the corresponding model, then power off and restart.

### 6.10.3 Possible causes

- The main controller's capacity dial or model dial is set incorrectly;
- The matching model of the module board is incorrectly selected;
- The main board circuit or the module board circuit is abnormal.

### 6.10.4 Procedure



## 6.11 L46: IPM protection (FO)

### 6.11.1 Description

- The FO signal of the IPM module has a falling edge or a continuous low level.
- After the fault, the compressor stops running, and if the fault disappears after one minute, the compressor starts again.

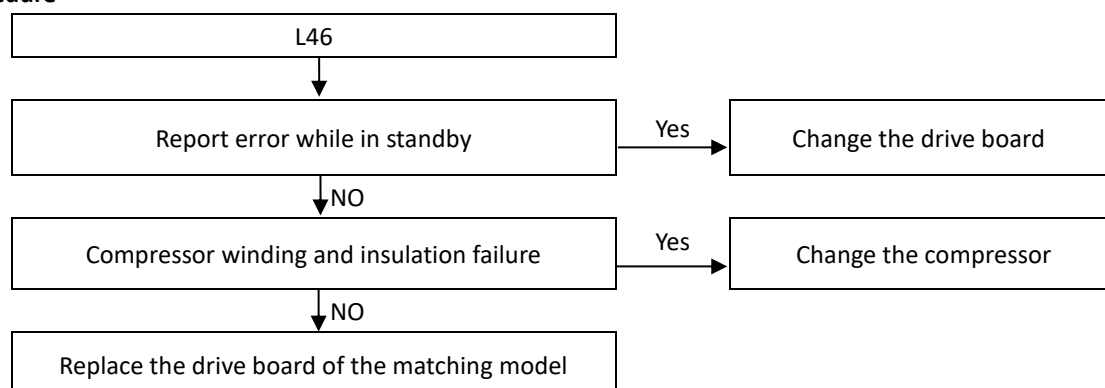
### 6.11.2 Trigger/resume condition

- Trigger condition: The FO signal of the IPM module has a falling edge or a continuous low level.
- Resume condition: The FO signal of the IPM module turns into high level.
- Reset method: Automatic recovery after reaching the fault exit condition one minute later.

### 6.11.3 Possible causes

- Internal short circuit of the IPM module;
- Short circuit of compressor winding;
- System condensation results in short circuit of IPM module pins;
- The drive voltage of the lower bridge IGBT of the IPM module is lower than 10.3V;
- The module board is abnormal.

### 6.11.4 Procedure



## 6.12 L47: Module type not match

### 6.12.1 Description

- The driver board detected by the module detection resistor does not match the setting in the driver parameter table.

### 6.12.2 Trigger/resume condition

- Trigger condition: The current level of the drive board and the compressor information detected by the module detection resistor do not match the settings in the drive parameter table.
- Resume condition: Change the module board.
- Reset method: Re-select the module board corresponding to the model, then power off and restart.

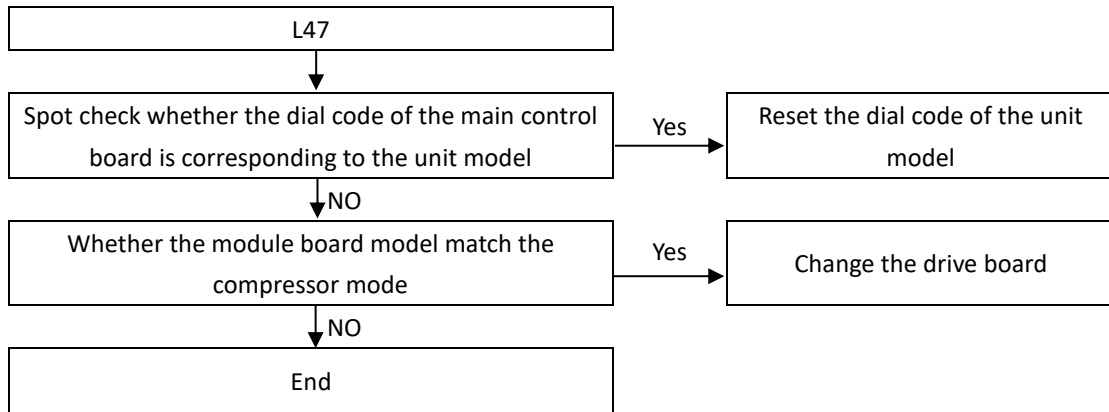
### 6.12.3 Possible causes

- The main control capacity dial code and model selection are wrong;

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- Wrong module board which does not correspond to the model;
- Module board fault.

### 6.12.4 Procedure



## 6.13 L50: Startup failure

### 6.13.1 Description

- Compressor failed to start.
- After the fault, the compressor stops running, and if the fault disappears after one minute, the compressor starts again.

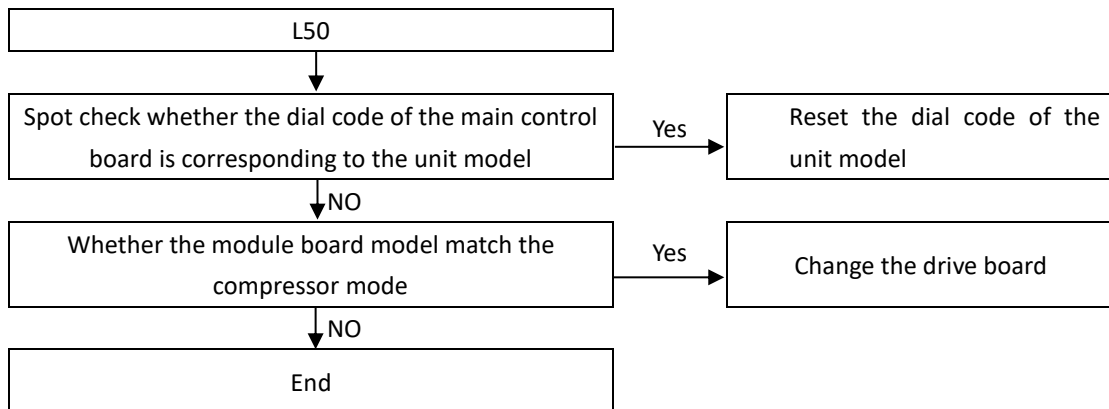
### 6.13.2 Trigger/resume condition

- Trigger condition: Compressor failed to start.
- Resume condition: After the compressor fails to start, the compressor restarts again. The fault is recovered after successful restart.
- Reset method: Automatic recovery after successful restart.

### 6.13.3 Possible causes

- There is a pressure difference when the system starts;
- Compressor stuck.

### 6.13.4 Procedure



## 6.14 L52: Zero speed protection

### 6.14.1 Description

- Compressor locks rotor.
- After the fault, the compressor stops running, and if the fault disappears after one minute, the compressor starts again.

### 6.14.2 Trigger/resume condition

- Trigger condition: Compressor locks rotor.
- Resume condition: Troubleshoot locked rotor.
- Reset method: Automatic recovery after reaching the fault exit condition.

### 6.14.3 Possible causes

- Impurities in the system or lack of lubricating oil.

**6.14.4 Procedure**

If possible, switch the compressors and start up again. If the problem persists, replace the two compressors.

**6.15 L60: Fan motor phase loss protection****6.15.1 Description**

- Compressor has phase loss protection.
- After the fault, the compressor stops running, and if the fault disappears after one minute, the compressor starts again.

**6.15.2 Trigger/resume condition**

- Trigger condition: The compressor wire is not connected or has poor contact.
- Resume condition: Check the wiring of the compressor. After wiring again, the phase loss protection fault is eliminated.
- Reset method: Automatic recovery after reaching the fault exit condition.

**6.15.3 Possible causes**

- The compressor wire is not in good contact or the terminal screws are not tightened.
- Module board is abnormal.

**6.15.4 Procedure**

- Check the UVW output connection wire of the compressor drive board, and check the UVW wiring of the compressor;
- If possible, switch the compressor wire to confirm whether the drive board is normal, otherwise replace the drive board.

**6.16 L61: Short circuit to ground protection****6.16.1 Description**

- Compressor has short circuit to ground protection.
- After the fault, the compressor stops running, and if the fault disappears after one minute, the compressor starts again.

**6.16.2 Trigger/resume condition**

- Trigger condition: Compressor has short circuit to ground protection.
- Resume condition: Check whether the compressor casing is damaged, resulting in poor insulation.
- Reset method: Automatic recovery after reaching the fault exit condition.

**6.16.3 Possible causes**

- The compressor casing is in poor insulation.

**6.16.4 Procedure**

- Disconnect the compressor wire, measure the compressor UVW resistance to ground, confirm and replace the compressor.

**6.17 L65: IPM short circuit protection****6.17.1 Description**

- The IPM corresponding to the compressor has short circuit protection.
- After the fault, the compressor stops running, and if the fault disappears after one minute, the compressor starts again.

**6.17.2 Trigger/resume condition**

- Trigger condition: The IPM corresponding to the compressor has short circuit protection.
- Resume condition: Replace the drive board.
- Reset method: Automatic recovery after reaching the fault exit condition.

**6.17.3 Possible causes**

- There is a problem with drive board.

**6.17.4 Procedure**

- Check whether the IPM virtual welding and the PWM related transmission circuit of the MCU are connected to the welding. If so, change the replace the drive board.

**6.18 L6b: Open circuit of U-phase lower tube****6.18.1 Description**

- Open circuit of U-phase lower tube.

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- After the fault, the compressor stops running, and if the fault disappears after one minute, the compressor starts again.

### 6.18.2 Trigger/resume condition

- Trigger condition: Open circuit of U-phase lower tube corresponding to compressor.
- Resume condition: Check whether the IPM module is working.
- Reset method: Change the module board. Power on and start up again.

### 6.18.3 Possible causes

- There IPM module is damaged.

### 6.18.4 Procedure

- Check whether the IPM virtual welding and the PWM related transmission circuit of the MCU are connected to the welding.  
If so, change the replace the drive board.

## 6.19 L6c: Open circuit of V-phase upper tube

### 6.19.1 Description

- Open circuit of V-phase upper tube.
- After the fault, the compressor stops running, and if the fault disappears after one minute, the compressor starts again.

### 6.19.2 Trigger/resume condition

- Trigger condition: Open circuit of V-phase upper tube corresponding to compressor.
- Resume condition: Check whether the IPM module is working.
- Reset method: Change the module board. Power on and start up again.

### 6.19.3 Possible causes

- There IPM module is damaged.

### 6.19.4 Procedure

- Check whether the IPM virtual welding and the PWM related transmission circuit of the MCU are connected to the welding.  
If so, change the replace the drive board.

## 6.20 L6d: Open circuit of V-phase lower tube

### 6.20.1 Description

- Open circuit of V-phase lower tube.
- After the fault, the compressor stops running, and if the fault disappears after one minute, the compressor starts again.

### 6.20.2 Trigger/resume condition

- Trigger condition: Open circuit of V-phase lower tube corresponding to compressor.
- Resume condition: Check whether the IPM module is working.
- Reset method: Change the module board. Power on and start up again.

### 6.20.3 Possible causes

- There IPM module is damaged.

### 6.20.4 Procedure

- Check whether the IPM virtual welding and the PWM related transmission circuit of the MCU are connected to the welding.  
If so, change the replace the drive board.

## 6.21 L6E: Open circuit of W-phase upper tube

### 6.21.1 Description

- Open circuit of W-phase upper tube.
- After the fault, the compressor stops running, and if the fault disappears after one minute, the compressor starts again.

### 6.21.2 Trigger/resume condition

- Trigger condition: Open circuit of W-phase upper tube corresponding to compressor.
- Resume condition: Check whether the IPM module is working.
- Reset method: Change the module board. Power on and start up again.

### 6.21.3 Possible causes

- There IPM module is damaged.

### 6.21.4 Procedure

- Check whether the IPM virtual welding and the PWM related transmission circuit of the MCU are connected to the welding.  
If so, change the replace the drive board.

## 6.22 L6F: Open circuit of W-phase lower tube

### 6.22.1 Description

- Open circuit of W-phase lower tube.
- After the fault, the compressor stops running, and if the fault disappears after one minute, the compressor starts again.

### 6.22.2 Trigger/resume condition

- Trigger condition: Open circuit of W-phase lower tube corresponding to compressor.
- Resume condition: Check whether the IPM module is working.
- Reset method: Change the module board. Power on and start up again.

### 6.22.3 Possible causes

- There IPM module is damaged.

### 6.22.4 Procedure

- Check whether the IPM virtual welding and the PWM related transmission circuit of the MCU are connected to the welding.  
If so, change the replace the drive board.

## 7 Appendix

### 7.1 Temperature Sensor Resistance Characteristics

Outdoor ambient temperature sensor, suction temperature sensor, coil final outlet temperature sensor, air side heat exchanger pipe temperature sensor and refrigerant temperature sensor of EVI plate heat exchanger resistance characteristics.

| Temperature<br>(°C) | Resistance<br>(kΩ) | Temperature<br>(°C) | Resistance<br>(kΩ) | Temperature<br>(°C) | Resistance<br>(kΩ) | Temperature<br>(°C) | Resistance<br>(kΩ) |
|---------------------|--------------------|---------------------|--------------------|---------------------|--------------------|---------------------|--------------------|
| -20                 | 115.3              | 20                  | 12.64              | 60                  | 2.358              | 100                 | 0.6297             |
| -19                 | 108.1              | 21                  | 12.06              | 61                  | 2.272              | 101                 | 0.6115             |
| -18                 | 101.5              | 22                  | 11.50              | 62                  | 2.191              | 102                 | 0.5939             |
| -17                 | 96.34              | 23                  | 10.97              | 63                  | 2.112              | 103                 | 0.5768             |
| -16                 | 89.59              | 24                  | 10.47              | 64                  | 2.037              | 104                 | 0.5604             |
| -15                 | 84.22              | 25                  | 10.00              | 65                  | 1.965              | 105                 | 0.5445             |
| -14                 | 79.31              | 26                  | 9.551              | 66                  | 1.896              | 106                 | 0.5291             |
| -13                 | 74.54              | 27                  | 9.124              | 67                  | 1.830              | 107                 | 0.5143             |
| -12                 | 70.17              | 28                  | 8.720              | 68                  | 1.766              | 108                 | 0.4999             |
| -11                 | 66.09              | 29                  | 8.336              | 69                  | 1.705              | 109                 | 0.4860             |
| -10                 | 62.28              | 30                  | 7.971              | 70                  | 1.647              | 110                 | 0.4726             |
| -9                  | 58.71              | 31                  | 7.624              | 71                  | 1.591              | 111                 | 0.4596             |
| -8                  | 56.37              | 32                  | 7.295              | 72                  | 1.537              | 112                 | 0.4470             |
| -7                  | 52.24              | 33                  | 6.981              | 73                  | 1.485              | 113                 | 0.4348             |
| -6                  | 49.32              | 34                  | 6.684              | 74                  | 1.435              | 114                 | 0.4230             |
| -5                  | 46.57              | 35                  | 6.400              | 75                  | 1.387              | 115                 | 0.4116             |
| -4                  | 44.00              | 36                  | 6.131              | 76                  | 1.341              | 116                 | 0.4006             |
| -3                  | 41.59              | 37                  | 5.874              | 77                  | 1.291              | 117                 | 0.3899             |
| -2                  | 39.82              | 38                  | 5.630              | 78                  | 1.254              | 118                 | 0.3796             |
| -1                  | 37.20              | 39                  | 5.397              | 79                  | 1.2133             | 119                 | 0.3695             |
| 0                   | 35.20              | 40                  | 5.175              | 80                  | 1.174              | 120                 | 0.3598             |
| 1                   | 33.33              | 41                  | 4.964              | 81                  | 1.136              | 121                 | 0.3504             |
| 2                   | 31.56              | 42                  | 4.763              | 82                  | 1.100              | 122                 | 0.3413             |
| 3                   | 29.91              | 43                  | 4.571              | 83                  | 1.064              | 123                 | 0.3325             |
| 4                   | 28.35              | 44                  | 4.387              | 84                  | 1.031              | 124                 | 0.3239             |
| 5                   | 26.88              | 45                  | 4.213              | 85                  | 0.9982             | 125                 | 0.3156             |
| 6                   | 25.50              | 46                  | 4.046              | 86                  | 0.9668             | 126                 | 0.3075             |
| 7                   | 24.19              | 47                  | 3.887              | 87                  | 0.9366             | 127                 | 0.2997             |
| 8                   | 22.57              | 48                  | 3.735              | 88                  | 0.9075             | 128                 | 0.2922             |
| 9                   | 21.81              | 49                  | 3.590              | 89                  | 0.8795             | 129                 | 0.2848             |
| 10                  | 20.72              | 50                  | 3.451              | 90                  | 0.8525             | 130                 | 0.2777             |
| 11                  | 19.69              | 51                  | 3.318              | 91                  | 0.8264             | 131                 | 0.2708             |
| 12                  | 18.72              | 52                  | 3.192              | 92                  | 0.8013             | 132                 | 0.2641             |
| 13                  | 17.80              | 53                  | 3.071              | 93                  | 0.7771             | 133                 | 0.2576             |
| 14                  | 16.93              | 54                  | 2.959              | 94                  | 0.7537             | 134                 | 0.2513             |
| 15                  | 16.12              | 55                  | 2.844              | 95                  | 0.7312             | 135                 | 0.2451             |
| 16                  | 15.34              | 56                  | 2.738              | 96                  | 0.7094             | 136                 | 0.2392             |
| 17                  | 14.62              | 57                  | 2.637              | 97                  | 0.6884             | 137                 | 0.2334             |
| 18                  | 13.92              | 58                  | 2.540              | 98                  | 0.6682             | 138                 | 0.2278             |
| 19                  | 13.26              | 59                  | 2.447              | 99                  | 0.6486             | 139                 | 0.2223             |



## Compressor discharge pipe temperature sensor resistance characteristics

| Temperature<br>(°C) | Resistance<br>(kΩ) | Temperature<br>(°C) | Resistance<br>(kΩ) | Temperature<br>(°C) | Resistance<br>(kΩ) | Temperature<br>(°C) | Resistance<br>(kΩ) |
|---------------------|--------------------|---------------------|--------------------|---------------------|--------------------|---------------------|--------------------|
| -20                 | 542.7              | 20                  | 68.66              | 60                  | 13.59              | 100                 | 3.702              |
| -19                 | 511.9              | 21                  | 65.62              | 61                  | 13.11              | 101                 | 3.595              |
| -18                 | 483.0              | 22                  | 62.73              | 62                  | 12.65              | 102                 | 3.492              |
| -17                 | 455.9              | 23                  | 59.98              | 63                  | 12.21              | 103                 | 3.392              |
| -16                 | 430.5              | 24                  | 57.37              | 64                  | 11.79              | 104                 | 3.296              |
| -15                 | 406.7              | 25                  | 54.89              | 65                  | 11.38              | 105                 | 3.203              |
| -14                 | 384.3              | 26                  | 52.53              | 66                  | 10.99              | 106                 | 3.113              |
| -13                 | 363.3              | 27                  | 50.28              | 67                  | 10.61              | 107                 | 3.025              |
| -12                 | 343.6              | 28                  | 48.14              | 68                  | 10.25              | 108                 | 2.941              |
| -11                 | 325.1              | 29                  | 46.11              | 69                  | 9.902              | 109                 | 2.860              |
| -10                 | 307.7              | 30                  | 44.17              | 70                  | 9.569              | 110                 | 2.781              |
| -9                  | 291.3              | 31                  | 42.33              | 71                  | 9.248              | 111                 | 2.704              |
| -8                  | 275.9              | 32                  | 40.57              | 72                  | 8.940              | 112                 | 2.630              |
| -7                  | 261.4              | 33                  | 38.89              | 73                  | 8.643              | 113                 | 2.559              |
| -6                  | 247.8              | 34                  | 37.30              | 74                  | 8.358              | 114                 | 2.489              |
| -5                  | 234.9              | 35                  | 35.78              | 75                  | 8.084              | 115                 | 2.422              |
| -4                  | 222.8              | 36                  | 34.32              | 76                  | 7.820              | 116                 | 2.357              |
| -3                  | 211.4              | 37                  | 32.94              | 77                  | 7.566              | 117                 | 2.294              |
| -2                  | 200.7              | 38                  | 31.62              | 78                  | 7.321              | 118                 | 2.233              |
| -1                  | 190.5              | 39                  | 30.36              | 79                  | 7.086              | 119                 | 2.174              |
| 0                   | 180.9              | 40                  | 29.15              | 80                  | 6.859              | 120                 | 2.117              |
| 1                   | 171.9              | 41                  | 28.00              | 81                  | 6.641              | 121                 | 2.061              |
| 2                   | 163.3              | 42                  | 26.90              | 82                  | 6.430              | 122                 | 2.007              |
| 3                   | 155.2              | 43                  | 25.86              | 83                  | 6.228              | 123                 | 1.955              |
| 4                   | 147.6              | 44                  | 24.85              | 84                  | 6.033              | 124                 | 1.905              |
| 5                   | 140.4              | 45                  | 23.89              | 85                  | 5.844              | 125                 | 1.856              |
| 6                   | 133.5              | 46                  | 22.89              | 86                  | 5.663              | 126                 | 1.808              |
| 7                   | 127.1              | 47                  | 22.10              | 87                  | 5.488              | 127                 | 1.762              |
| 8                   | 121.0              | 48                  | 21.26              | 88                  | 5.320              | 128                 | 1.717              |
| 9                   | 115.2              | 49                  | 20.46              | 89                  | 5.157              | 129                 | 1.674              |
| 10                  | 109.8              | 50                  | 19.69              | 90                  | 5.000              | 130                 | 1.632              |
| 11                  | 104.6              | 51                  | 18.96              | 91                  | 4.849              |                     |                    |
| 12                  | 99.69              | 52                  | 18.26              | 92                  | 4.703              |                     |                    |
| 13                  | 95.05              | 53                  | 17.58              | 93                  | 4.562              |                     |                    |
| 14                  | 90.66              | 54                  | 16.94              | 94                  | 4.426              |                     |                    |
| 15                  | 86.49              | 55                  | 16.32              | 95                  | 4.294              |                     |                    |
| 16                  | 82.54              | 56                  | 15.73              | 96                  | 4.167              |                     |                    |
| 17                  | 78.79              | 57                  | 15.16              | 97                  | 4.045              |                     |                    |
| 18                  | 75.24              | 58                  | 14.62              | 98                  | 3.927              |                     |                    |
| 19                  | 71.86              | 59                  | 14.09              | 99                  | 3.812              |                     |                    |

## Aqua thermal



Water side antifreeze temperature sensor, leaving water temperature sensor, entering water temperature and total leaving water temperature sensor resistance characteristics

| Temperature (°C) | Resistance (kΩ) | Temperature (°C) | Resistance (kΩ) | Temperature (°C) | Resistance (kΩ) | Temperature (°C) | Resistance (kΩ) |
|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|
| -20              | 470.8           | 20               | 61.2            | 60               | 12.2            | 100              | 3.3             |
| -19              | 444.5           | 21               | 58.5            | 61               | 11.7            | 101              | 3.2             |
| -18              | 419.9           | 22               | 55.9            | 62               | 11.3            | 102              | 3.1             |
| -17              | 396.8           | 23               | 53.5            | 63               | 10.9            | 103              | 3.0             |
| -16              | 375.1           | 24               | 51.2            | 64               | 10.5            | 104              | 2.9             |
| -15              | 354.7           | 25               | 49.0            | 65               | 10.2            | 105              | 2.8             |
| -14              | 335.5           | 26               | 46.9            | 66               | 9.8             | 106              | 2.8             |
| -13              | 317.5           | 27               | 44.9            | 67               | 9.5             | 107              | 2.7             |
| -12              | 300.5           | 28               | 43.0            | 68               | 9.2             | 108              | 2.6             |
| -11              | 284.6           | 29               | 41.2            | 69               | 8.8             | 109              | 2.5             |
| -10              | 269.6           | 30               | 39.4            | 70               | 8.5             | 110              | 2.5             |
| -9               | 255.4           | 31               | 37.8            | 71               | 8.3             | 111              | 2.4             |
| -8               | 242.1           | 32               | 36.2            | 72               | 8.0             | 112              | 2.3             |
| -7               | 229.6           | 33               | 34.7            | 73               | 7.7             | 113              | 2.3             |
| -6               | 217.8           | 34               | 33.3            | 74               | 7.5             | 114              | 2.2             |
| -5               | 206.6           | 35               | 31.9            | 75               | 7.2             | 115              | 2.1             |
| -4               | 196.1           | 36               | 30.7            | 76               | 7.0             | 116              | 2.1             |
| -3               | 186.2           | 37               | 29.4            | 77               | 6.8             | 117              | 2.0             |
| -2               | 176.8           | 38               | 28.2            | 78               | 6.5             | 118              | 2.0             |
| -1               | 168.0           | 39               | 27.1            | 79               | 6.3             | 119              | 1.9             |
| 0                | 159.7           | 40               | 26.0            | 80               | 6.1             | 120              | 1.9             |
| 1                | 151.8           | 41               | 25.0            | 81               | 5.9             | 121              | 1.8             |
| 2                | 144.3           | 42               | 24.0            | 82               | 5.7             | 122              | 1.8             |
| 3                | 137.3           | 43               | 23.1            | 83               | 5.5             | 123              | 1.7             |
| 4                | 130.6           | 44               | 22.2            | 84               | 5.4             | 124              | 1.7             |
| 5                | 124.3           | 45               | 21.4            | 85               | 5.2             | 125              | 1.6             |
| 6                | 118.3           | 46               | 20.5            | 86               | 5.0             | 126              | 1.6             |
| 7                | 112.7           | 47               | 19.7            | 87               | 4.9             | 127              | 1.6             |
| 8                | 107.3           | 48               | 19.0            | 88               | 4.7             | 128              | 1.5             |
| 9                | 102.3           | 49               | 18.3            | 89               | 4.6             | 129              | 1.5             |
| 10               | 97.5            | 50               | 17.6            | 90               | 4.4             | 130              | 1.4             |
| 11               | 92.9            | 51               | 16.9            | 91               | 4.3             |                  |                 |
| 12               | 88.6            | 52               | 16.3            | 92               | 4.2             |                  |                 |
| 13               | 84.5            | 53               | 15.7            | 93               | 4.1             |                  |                 |
| 14               | 80.6            | 54               | 15.1            | 94               | 3.9             |                  |                 |
| 15               | 77.0            | 55               | 14.6            | 95               | 3.8             |                  |                 |
| 16               | 73.5            | 56               | 14.1            | 96               | 3.7             |                  |                 |
| 17               | 70.1            | 57               | 13.6            | 97               | 3.6             |                  |                 |
| 18               | 67.0            | 58               | 13.1            | 98               | 3.5             |                  |                 |
| 19               | 64.0            | 59               | 12.6            | 99               | 3.4             |                  |                 |

## 7.2 Normal Operating Parameters of Refrigerant System

- If the outdoor ambient temperature is high, the system is being run in normal cooling mode with the following settings: temperature 5°C.
- If the outdoor ambient temperature is low, the system is being run in heating mode with the following settings: temperature 55°C.
- The system has been running normally for more than 30 minutes.

For MC-SU75-RN8L-B and MC-SU140-RN8L-B

Outdoor unit in normal cooling mode operating parameters

| Outdoor ambient temperature    | °C  | < 10                          | 10 to 25                  | 25 to 35                      | 35 to 48                  |
|--------------------------------|-----|-------------------------------|---------------------------|-------------------------------|---------------------------|
| Average discharge temperature  | °C  | 40-95                         | 65-105                    | 65-105                        | 75-107                    |
| Average discharge superheat    | °C  | 15-50                         | 25-60                     | 25-65                         | 30-60                     |
| Discharge pressure             | MPa | 1.6-2.9                       | 2.1-3.0                   | 2.3-3.8                       | 2.6-4.1                   |
| Average suction superheat      | °C  | 2-20                          | 2-25                      | 2-25                          | 3-25                      |
| Suction pressure               | MPa | 0.6-1.3                       | 0.7-1.0                   | 0.7-1.3                       | 0.7-1.4                   |
| Average suction temperature    | °C  | 1-30                          | 3-30                      | 3-35                          | 5-40                      |
| T3                             | °C  | 5-40                          | 15-40                     | 30-48                         | 35-54                     |
| Tz/7                           | °C  | /                             | /                         | /                             | /                         |
| Taf                            | °C  | 5-25                          | 5-25                      | 5-25                          | 5-25                      |
| T6A/B                          | °C  | /                             | 5-30                      | 8-30                          | 10-40                     |
| Twi                            | °C  | 10-25                         | 10-25                     | 10-25                         | 10-25                     |
| Two                            | °C  | 5-20                          | 5-20                      | 5-20                          | 5-20                      |
| Tw                             | °C  | 5-20                          | 5-20                      | 5-20                          | 5-20                      |
| DC fan motor current           | A   | 0.2-4 (75KW)<br>0.2-6 (140KW) | 1-4 (75KW)<br>1-6 (140KW) | 1.5-4 (75KW)<br>1.5-6 (140KW) | 2-4 (75KW)<br>2-6 (140KW) |
| DC inverter compressor current | A   | 15-45                         | 15-47                     | 20-53                         | 20-53                     |

Outdoor unit in heating mode operating parameters

| Outdoor ambient temperature    | °C  | < -10                        | -10 to 0                     | 0 to 7                       | 7 to 20                           | > 20                              |
|--------------------------------|-----|------------------------------|------------------------------|------------------------------|-----------------------------------|-----------------------------------|
| Average discharge temperature  | °C  | 60-105                       | 60-105                       | 60-105                       | 65-105                            | 65-105                            |
| Average discharge superheat    | °C  | 35-55                        | 35-63                        | 30-60                        | 20-55                             | 20-55                             |
| Discharge pressure             | MPa | 1.6-3.5                      | 1.8-3.7                      | 2.0-3.9                      | 2.0-4.0                           | 2.5-4.0                           |
| Average suction superheat      | °C  | -2-10                        | -5-15                        | -2-10                        | 0-8                               | 0-10                              |
| Suction pressure               | MPa | 0.2-0.5                      | 0.25-0.65                    | 0.3-0.9                      | 0.6-1.2                           | 0.7-1.4                           |
| Average suction temperature    | °C  | -25 to -5                    | -22 to 2                     | -12 to 7                     | 0 to 15                           | 5 to 25                           |
| T3                             | °C  | -25 to -11                   | -22 to 0                     | -12 to 6                     | 0 to 19                           | 5 to 40                           |
| Tz/7                           | °C  | 20 to 55                     | 20 to 55                     | 20 to 55                     | 20 to 55                          | 20 to 55                          |
| Taf                            | °C  | 20-55                        | 20-55                        | 20-55                        | 20-55                             | 20-55                             |
| T6A/B                          | °C  | -10-35                       | 0-45                         | 0-40                         | 8-45                              | /                                 |
| Twi                            | °C  | 20-50                        | 20-50                        | 20-50                        | 20-50                             | 20-50                             |
| Two                            | °C  | 25-55                        | 25-55                        | 25-55                        | 25-55                             | 25-55                             |
| Tw                             | °C  | 25-55                        | 25-55                        | 25-55                        | 25-55                             | 25-55                             |
| DC fan motor current           | A   | 1-4 (75KW)<br>1-6<br>(140KW) | 1-4 (75KW)<br>1-6<br>(140KW) | 1-4 (75KW)<br>1-6<br>(140KW) | 1-3.5<br>(75KW)<br>1-5<br>(140KW) | 1-3.5<br>(75KW)<br>1-5<br>(140KW) |
| DC inverter compressor current | A   | 10-45                        | 10-45                        | 20-53                        | 20-53                             | 15-45                             |

## Aqua thermal



For MC-SU90-RN8L-B and MC-SU180-RN8L-B

Outdoor unit in normal cooling mode operating parameters

|                                |     |         |          |          |          |
|--------------------------------|-----|---------|----------|----------|----------|
| Outdoor ambient temperature    | °C  | < 10    | 10 to 25 | 25 to 35 | 35 to 48 |
| Average discharge temperature  | °C  | 60-90   | 65-95    | 70-99    | 75-105   |
| Average discharge superheat    | °C  | 15-30   | 28-40    | 29-42    | 30-46    |
| Discharge pressure             | MPa | 1.8-2.9 | 1.9-3.2  | 2.0-3.8  | 2.6-3.9  |
| Average suction superheat      | °C  | 3-7     | 2-6      | 1-5      | 0-5      |
| Suction pressure               | MPa | 0.6-0.9 | 0.7-1.0  | 0.8-1.2  | 1.0-1.3  |
| Average suction temperature    | °C  | 7-18    | 7-20     | 8-22     | 10-25    |
| T3                             | °C  | 10-25   | 15-35    | 30-48    | 48-54    |
| Tz                             | °C  | 20-30   | 20-35    | 28-46    | 44-52    |
| Taf                            | °C  | 5-25    | 5-25     | 5-25     | 5-25     |
| T6A/B                          | °C  | /       | 0-20     | 3-30     | 5-40     |
| Tw                             | °C  | 10-25   | 10-25    | 10-25    | 10-25    |
| Two                            | °C  | 5-20    | 5-20     | 5-20     | 5-20     |
| Tw                             | °C  | 5-20    | 5-20     | 5-20     | 5-20     |
| DC fan motor current           | A   | 0.2-4   | 1-4      | 1.5-4    | 2-4      |
| DC inverter compressor current | A   | 15-45   | 15-48    | 20-56    | 20-56    |

Outdoor unit in heating mode operating parameters

|                                |     |            |          |          |         |         |
|--------------------------------|-----|------------|----------|----------|---------|---------|
| Outdoor ambient temperature    | °C  | < -10      | -10 to 0 | 0 to 7   | 7 to 20 | > 20    |
| Average discharge temperature  | °C  | 50-104     | 55-103   | 60-103   | 65-102  | 70-100  |
| Average discharge superheat    | °C  | 35-55      | 35-55    | 32-50    | 34-50   | 35-50   |
| Discharge pressure             | MPa | 1.8-2.9    | 1.9-2.9  | 1.9-3.4  | 2.2-3.6 | 2.4-3.9 |
| Average suction superheat      | °C  | -2-0       | -2-2     | -1-4     | 0-6     | 1-8     |
| Suction pressure               | MPa | 0.2-0.5    | 0.3-0.7  | 0.4-0.9  | 0.6-1.2 | 0.8-1.4 |
| Average suction temperature    | °C  | -25 to -11 | -16 to 2 | -10 to 5 | 0 to 15 | 5 to 18 |
| T3                             | °C  | -25 to -11 | -16 to 0 | -10 to 2 | 1 to 15 | 5 to 20 |
| Tz                             | °C  | -19 to -4  | -14 to 0 | -5 to 7  | 1 to 15 | 2 to 20 |
| Taf                            | °C  | 20-45      | 20-50    | 20-54    | 20-54   | 20-54   |
| T6A/B                          | °C  | -2-20      | 0-25     | 3-35     | 8-40    | /       |
| Tw                             | °C  | 20-40      | 20-45    | 20-50    | 20-50   | 20-50   |
| Two                            | °C  | 25-45      | 25-50    | 25-54    | 25-54   | 25-54   |
| Tw                             | °C  | 25-45      | 25-50    | 25-54    | 25-54   | 25-54   |
| DC fan motor current           | A   | 1-4        | 1-4      | 1-4      | 1-3     | 1-3     |
| DC inverter compressor current | A   | 10-45      | 10-45    | 20-54    | 20-54   | 15-45   |

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