Service manual

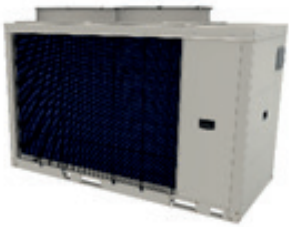
WiSAN-YSE 1 10.1-55.2

SM23E018GB-01 10-2023

Sommario

1. General Information

1.1 Unit Capacities and External Appearance

Model	10.1 - 14.1 EXC/PRM (Sheen 30kW)	16.2 - 22.2 EXC/PRM (Sheen 60kW) & 45.2-55.2 PRM (Sheen 130kW)	30.2 - 35.2 EXC/PRM (Sheen 90kW) & 43.2 – 45.2 EXC (Sheen 130kW)
Appearance			
Power supply	380-415V/3Ph/50Hz		

1.2 Water outlet temperature range

Mode		Range
Cooling	Normal	5-20°C (1)
	Low water outlet	0-20°C(reserved) (2)
Heating	Normal	25-60°C

Notes:

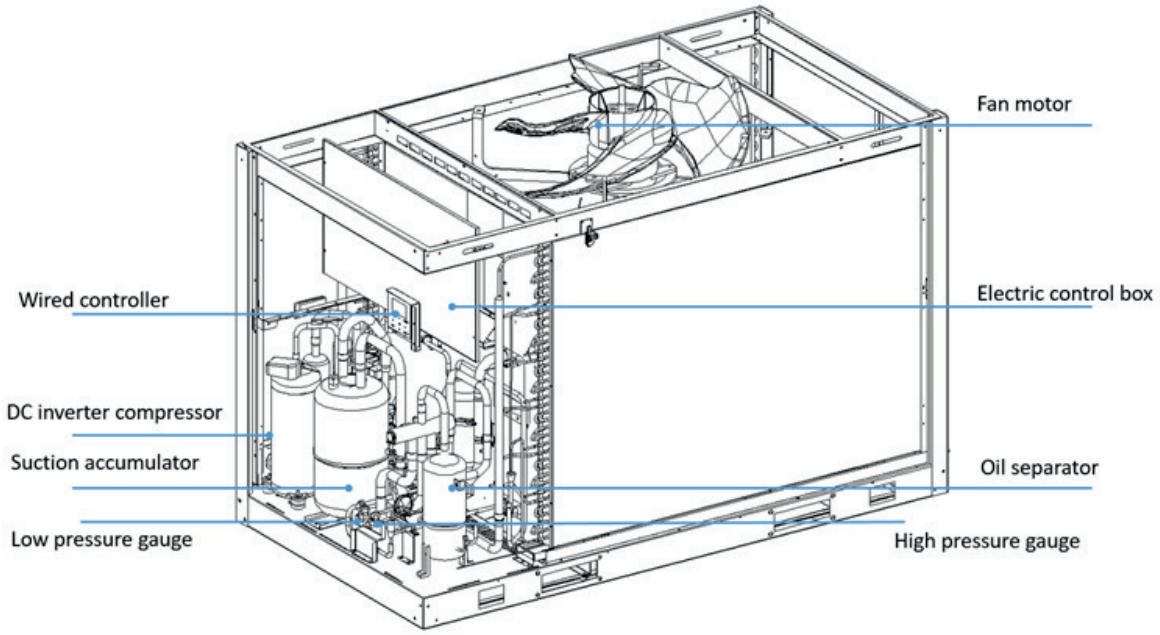
1 When the ambient temperature is below 10°C, the water outlet temperature range is 10-20°C. When the ambient temperature is above 10°C, all the units water outlet temperature range is 5-20°C.

2 Use dial switch S12_3 on the main PCB to select the water outlet temperature range.

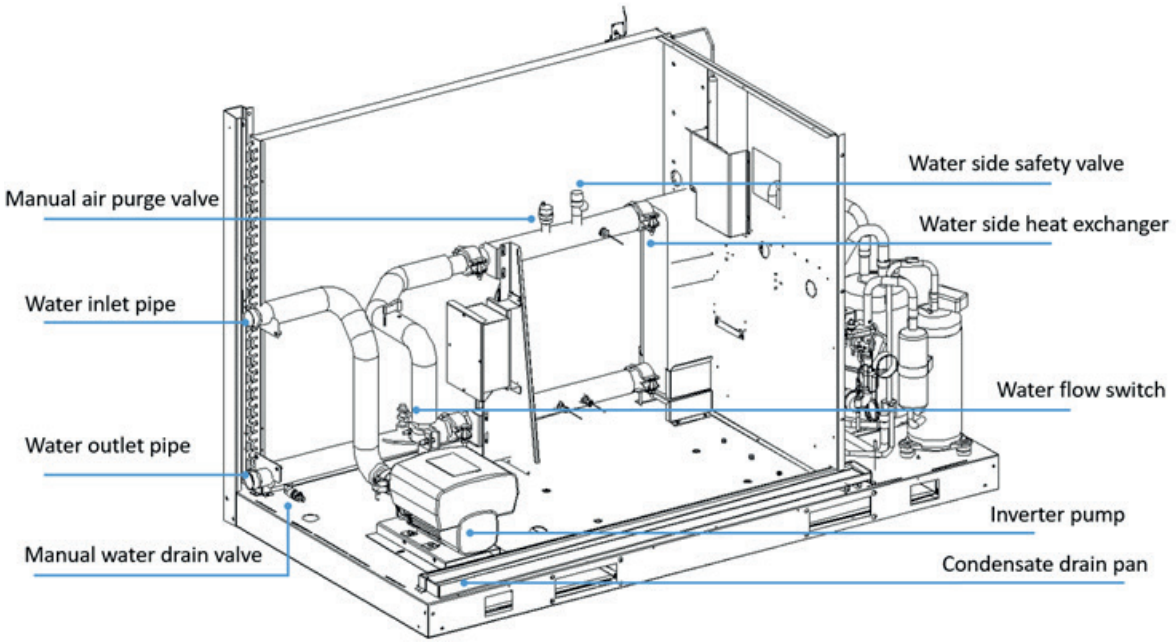
2. Layout of Functional Components

2.2.1 Size 10.1 – 14.1

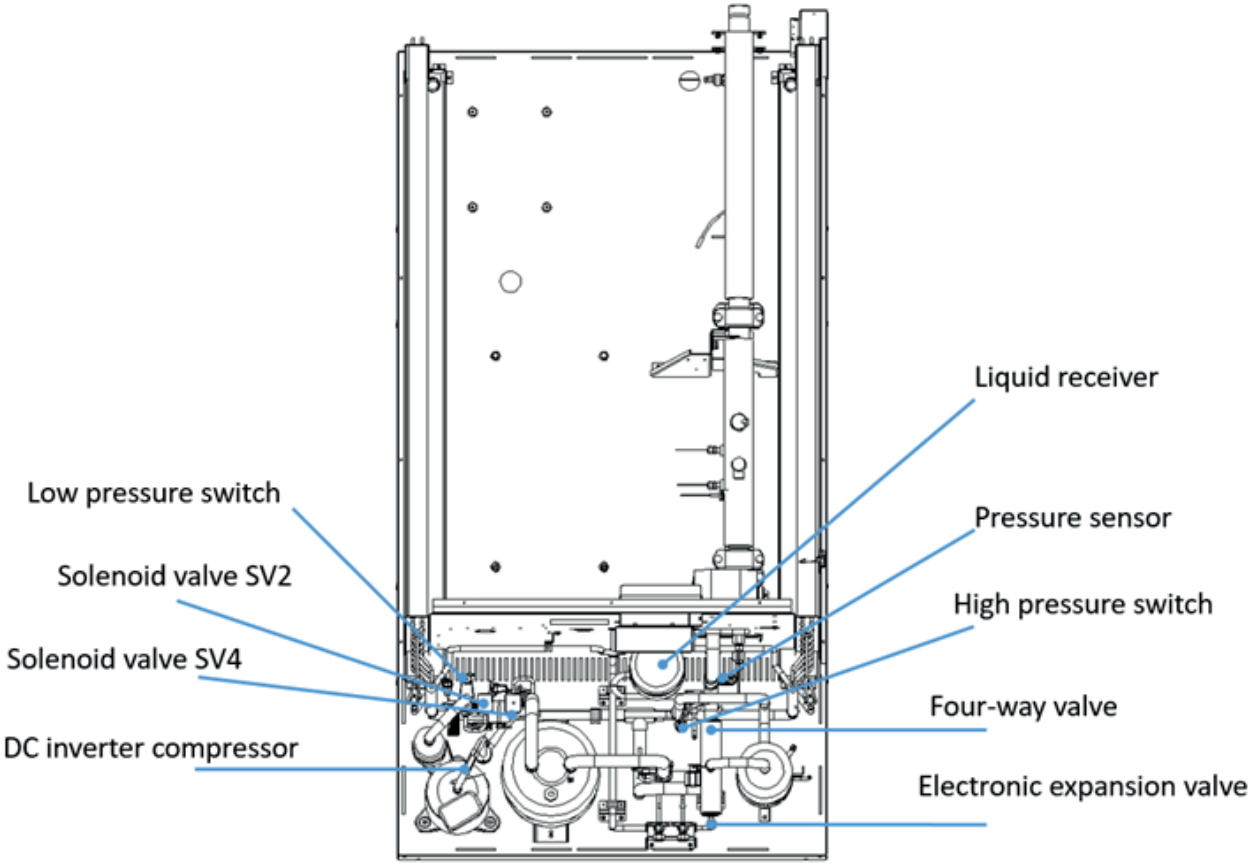
2.2.2 Front view



2.2.3 Rear view

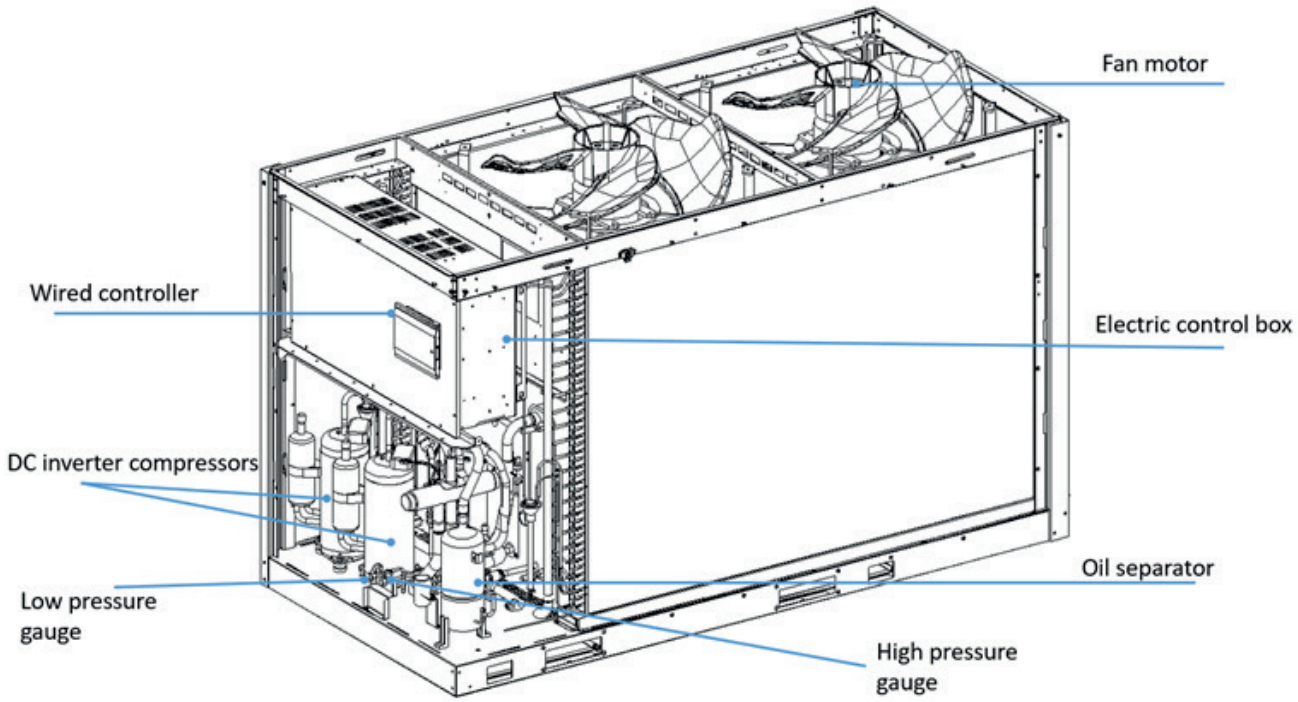


2.2.4 **Top view**

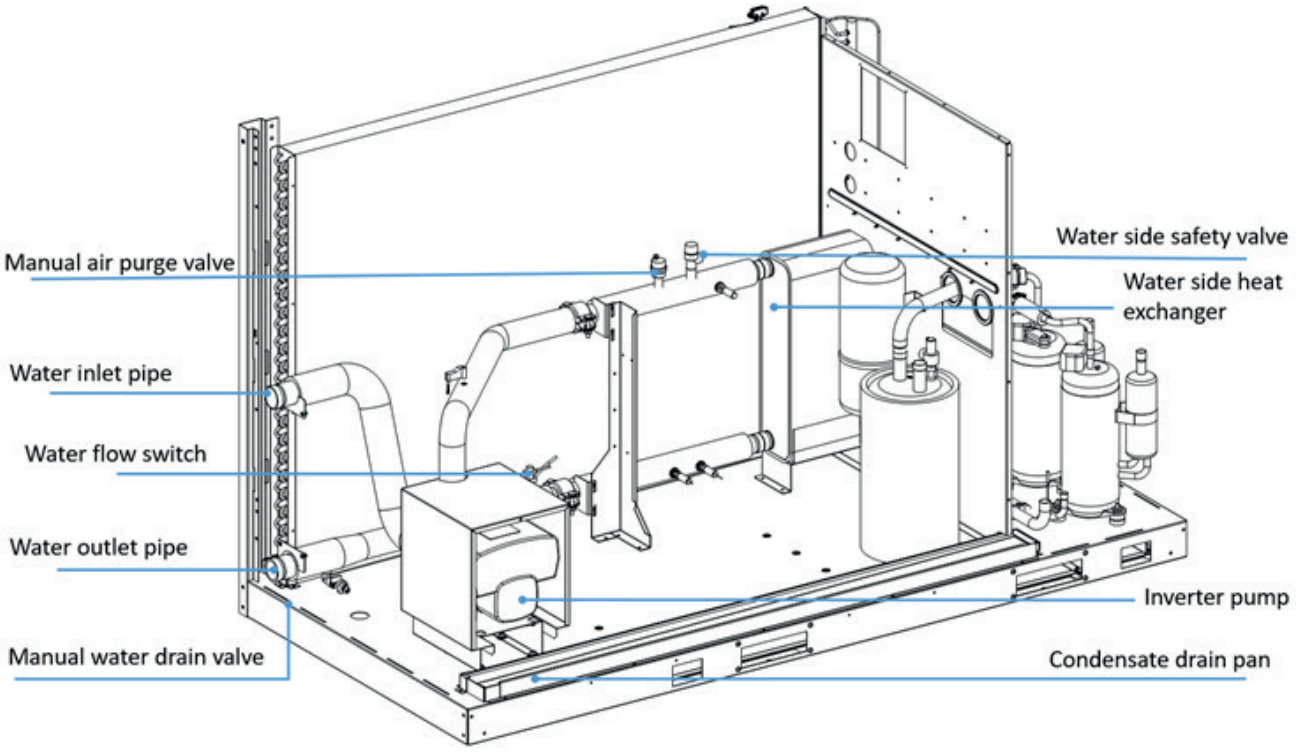

Liquid receiver
Low pressure switch
Pressure sensor
Solenoid valve SV2
High pressure switch
Solenoid valve SV4
Four-way valve
DC inverter compressor
Electronic expansion valve

2.1 Size 16.2 – 22.2

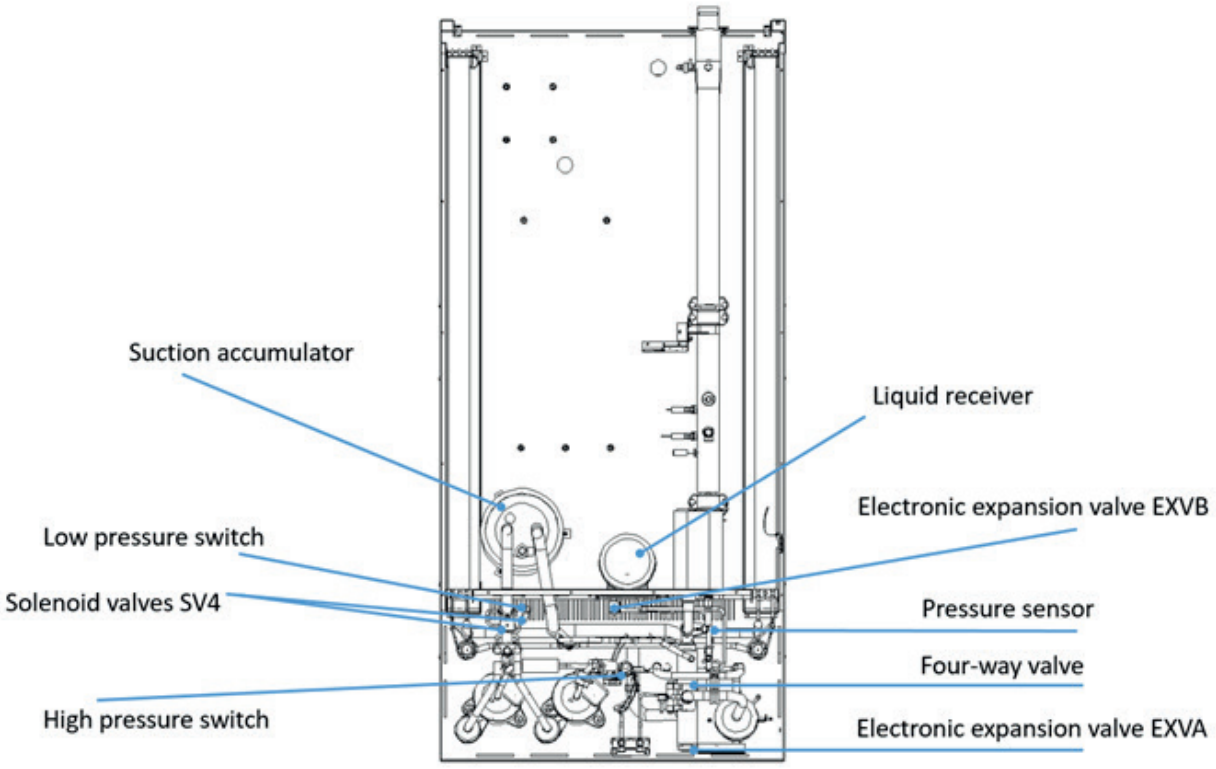
2.1.1 Front view



2.1.2 Rear view

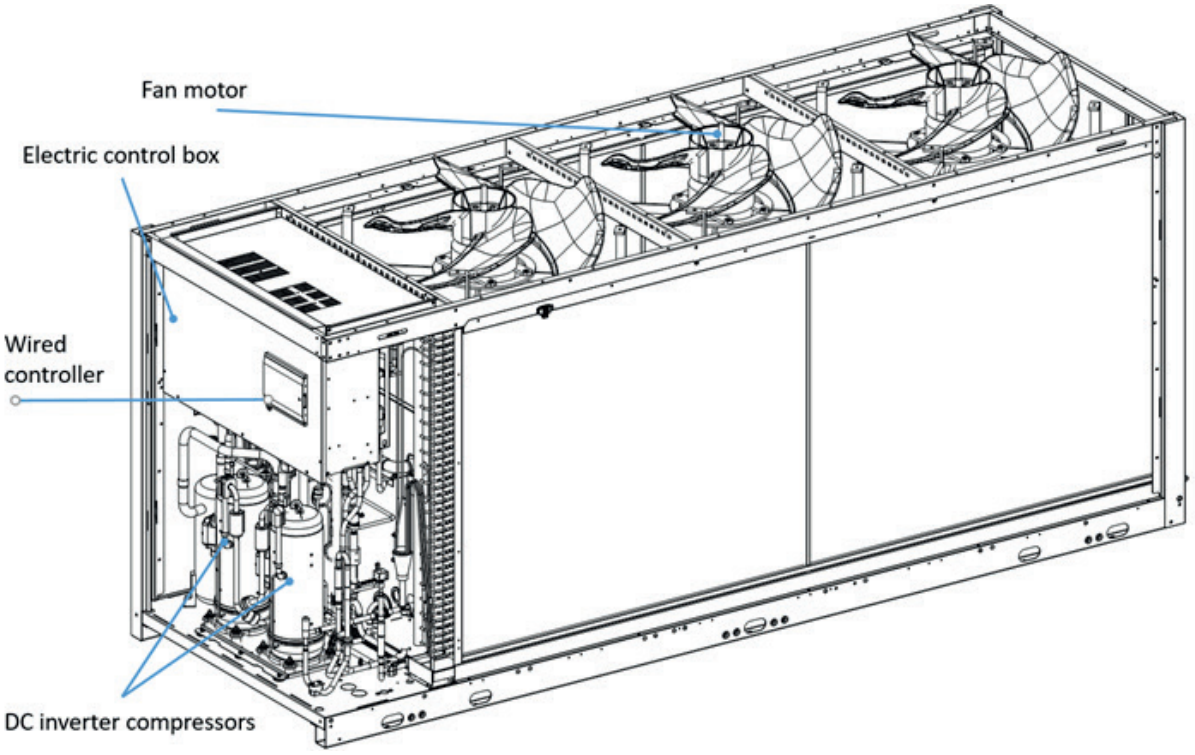


2.1.3 Top view

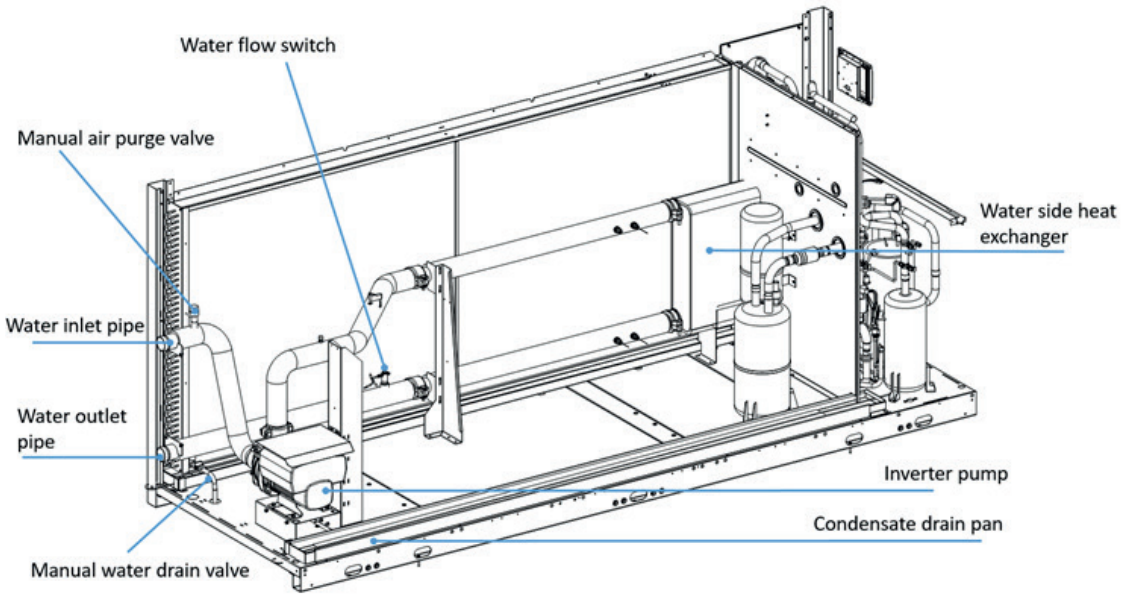

Suction accumulator
Liquid receiver
Electronic expansion valve EXVB
Low pressure switch
Solenoid valves SV4
Pressure sensor
Four-way valve
High pressure switch
Electronic expansion valve EXVA

2.2 Size 30.2 – 35.2

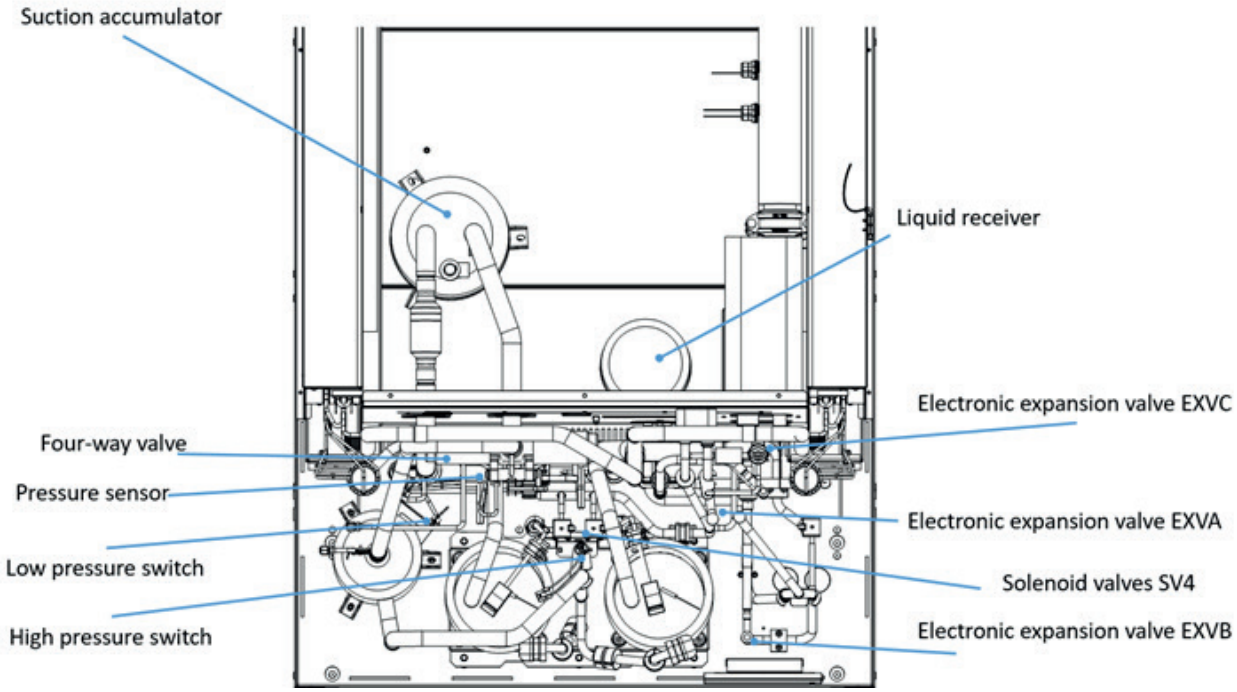
2.2.1 Front view



2.2.2 Rear view



2.2.3 Top view


Suction accumulator
Liquid receiver
Electronic expansion valve EXVC
Four-way valve
Pressure sensor
Electronic expansion valve EXVA
Low pressure switch
Solenoid valves SV4
High pressure switch
Electronic expansion valve EXVB

2.3 Size 43.2.2 – 45.2 Exc

2.3.1 Front view

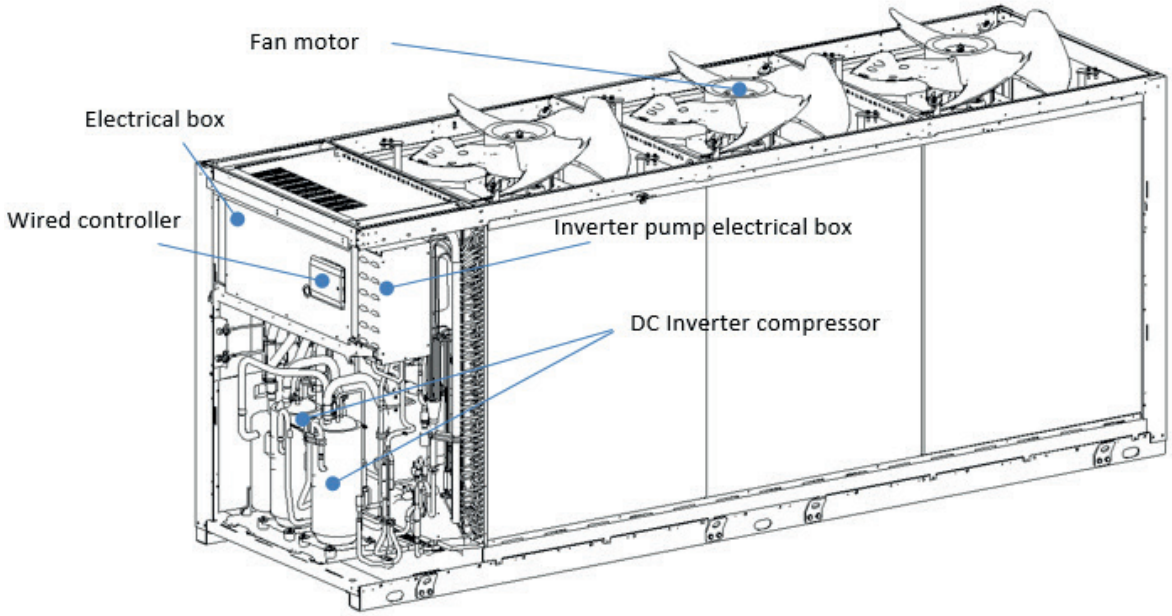
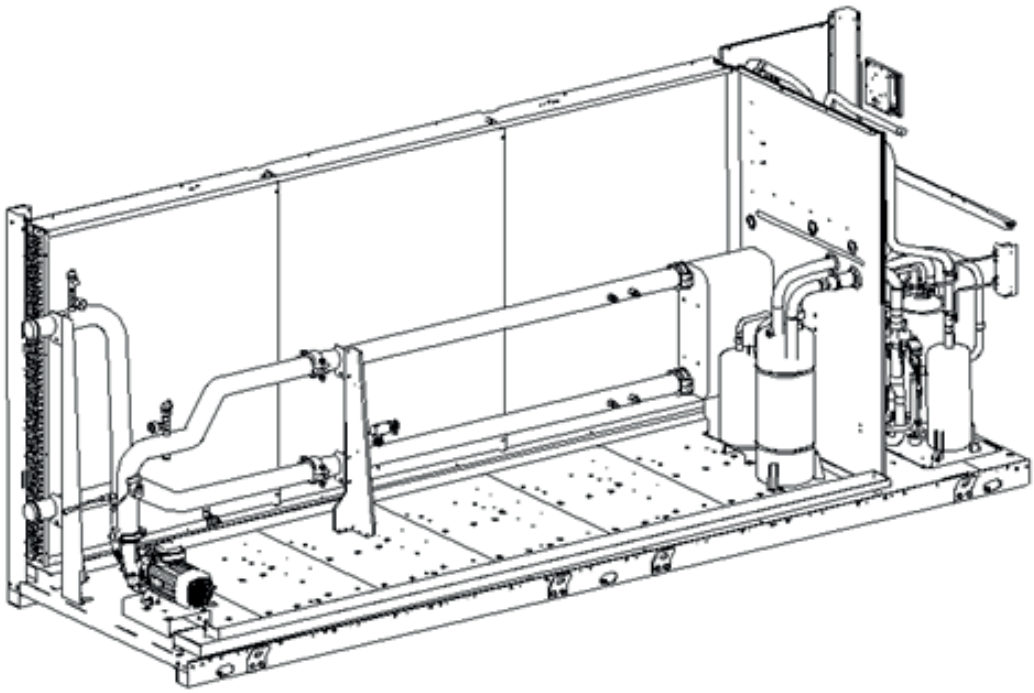


Figure 1: Front view

2.3.2 Rear view



2.3.3 Top view

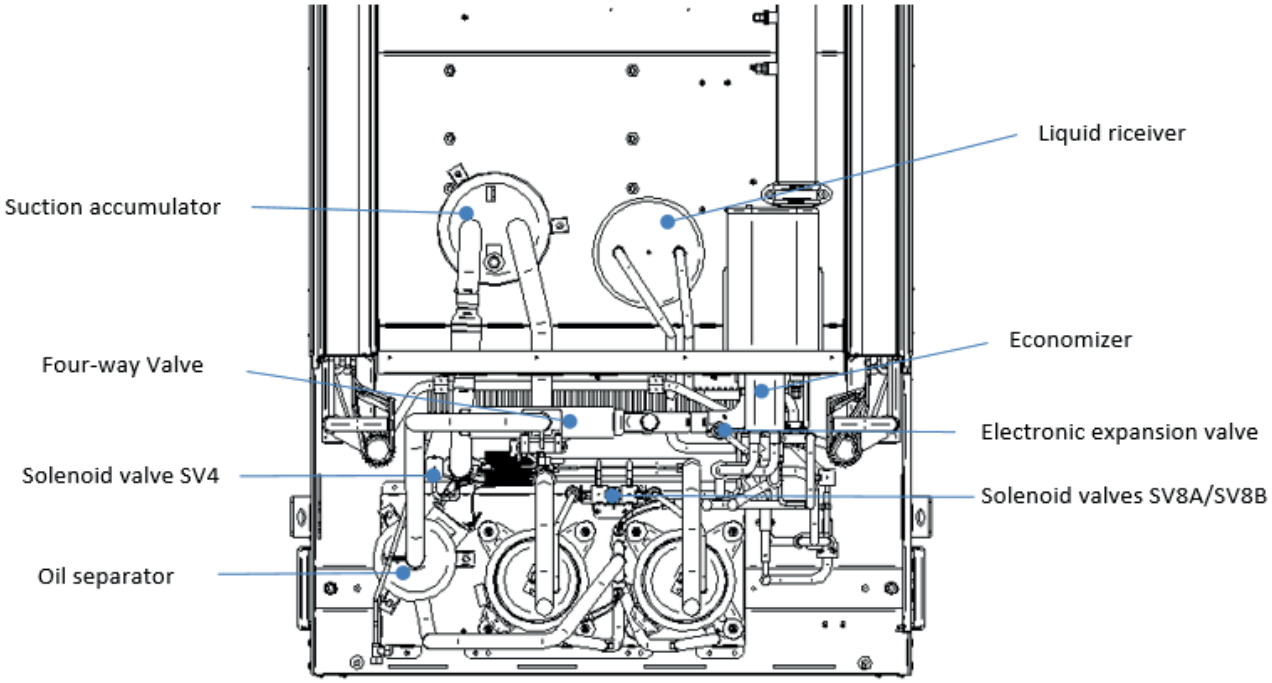
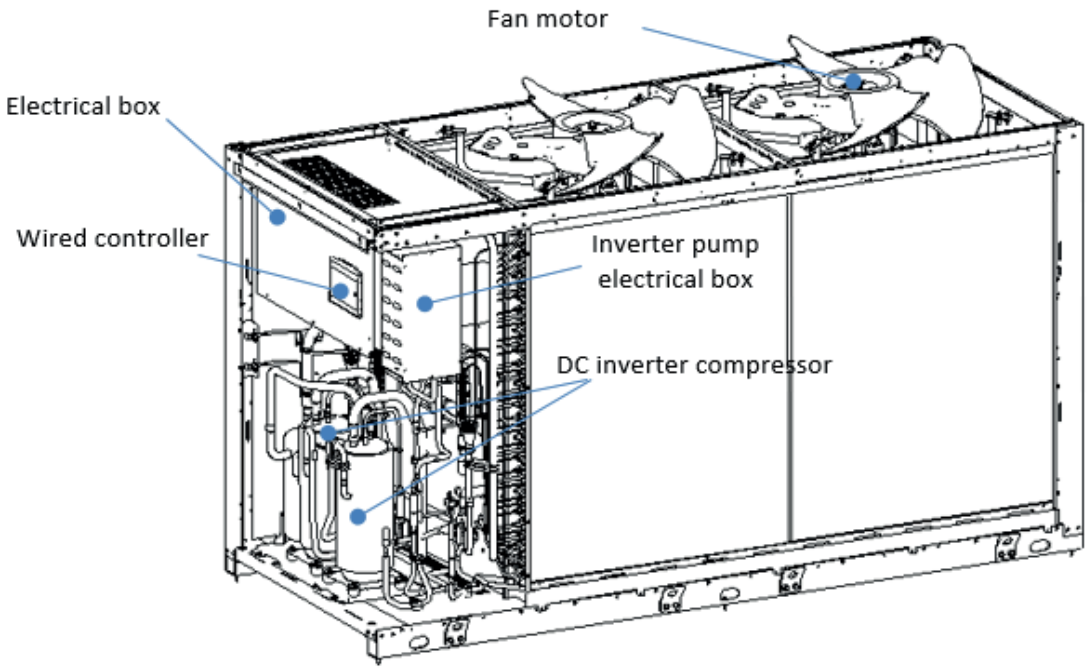


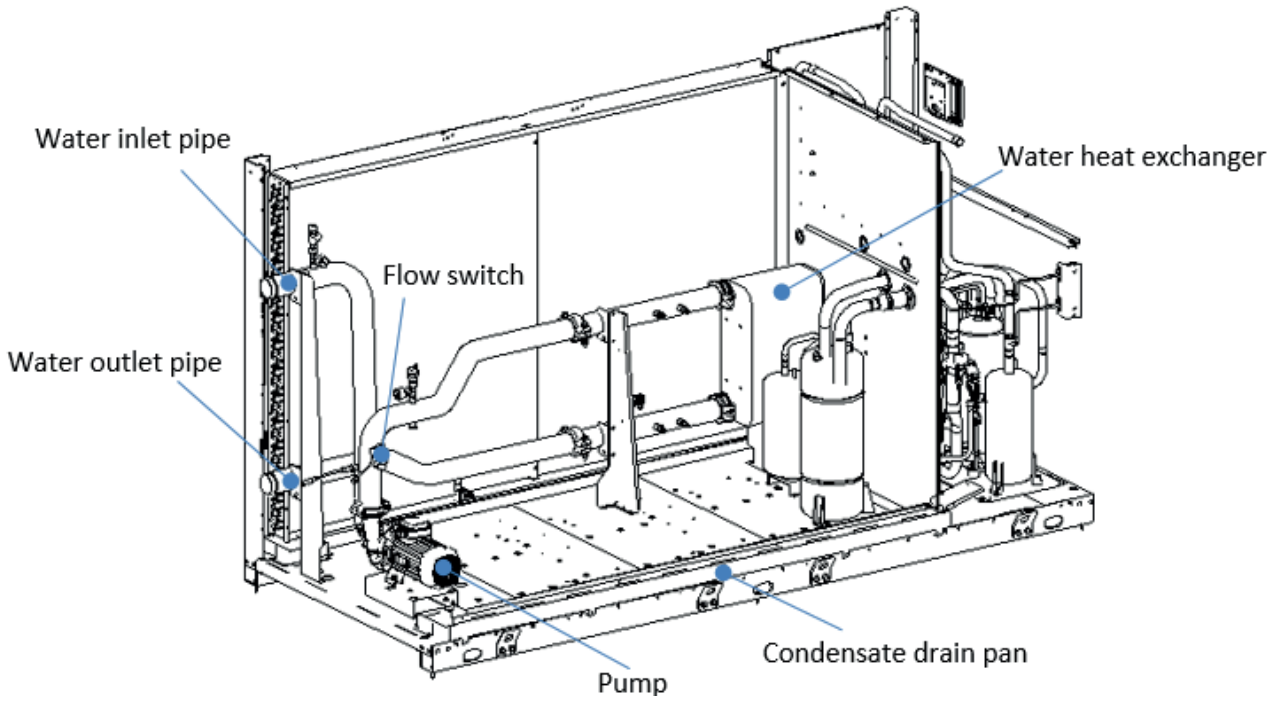
Figure 3: Top view

2.4 Size 45.2.2 – 55.2 Prm

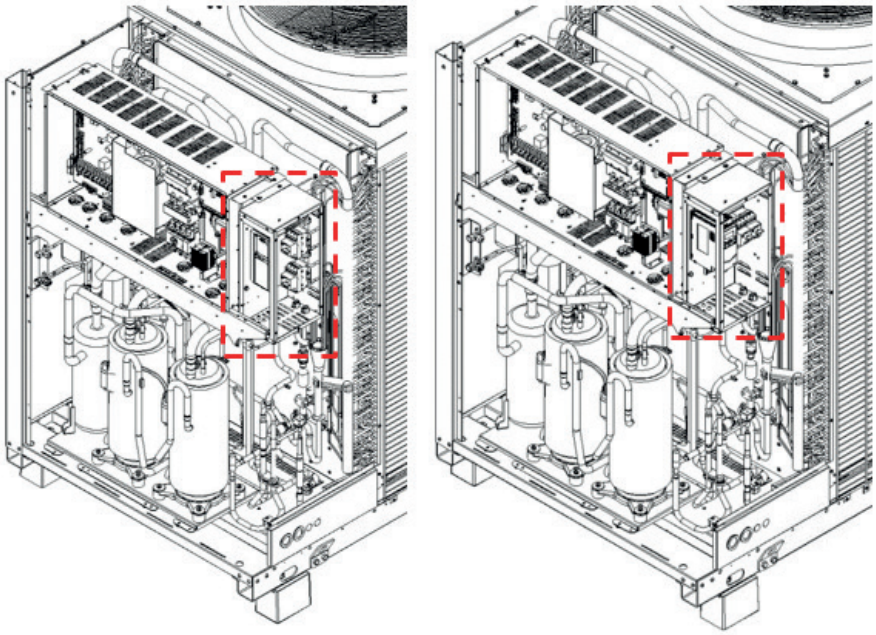
2.4.1 Front view



2.4.2 Rear view

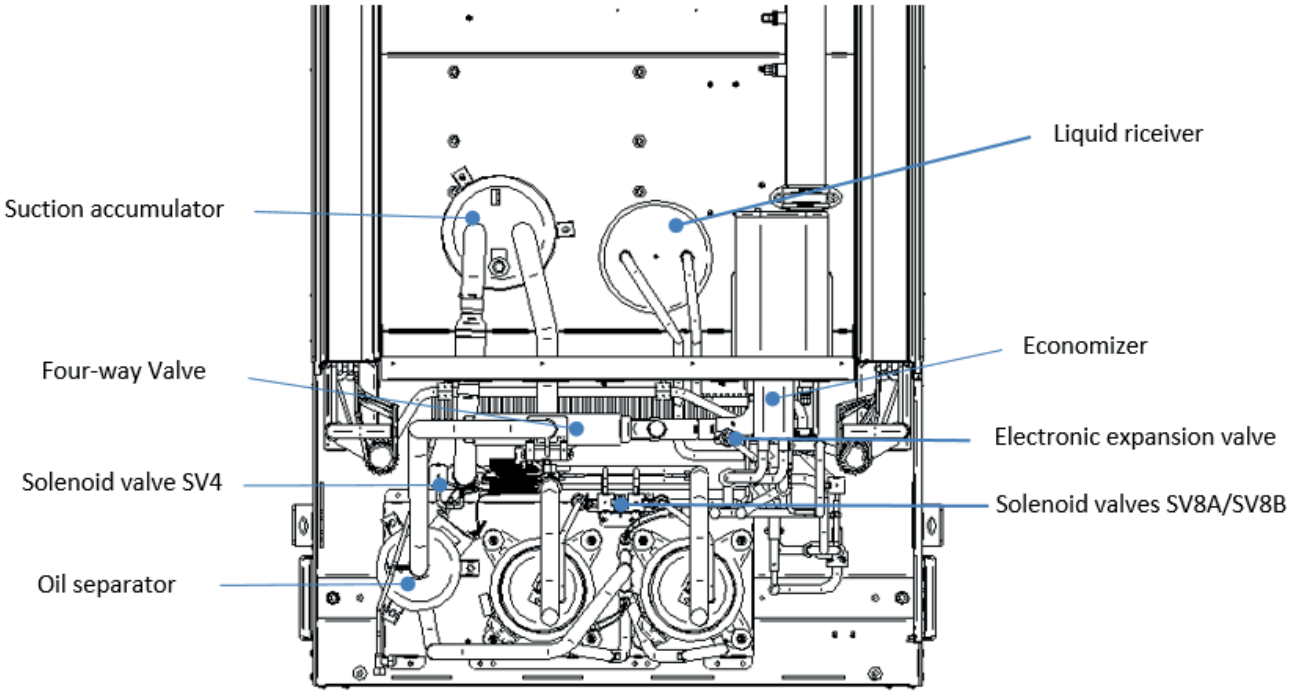


2.4.3 Electrical box with Danfoss and ABB inverter pump configuration



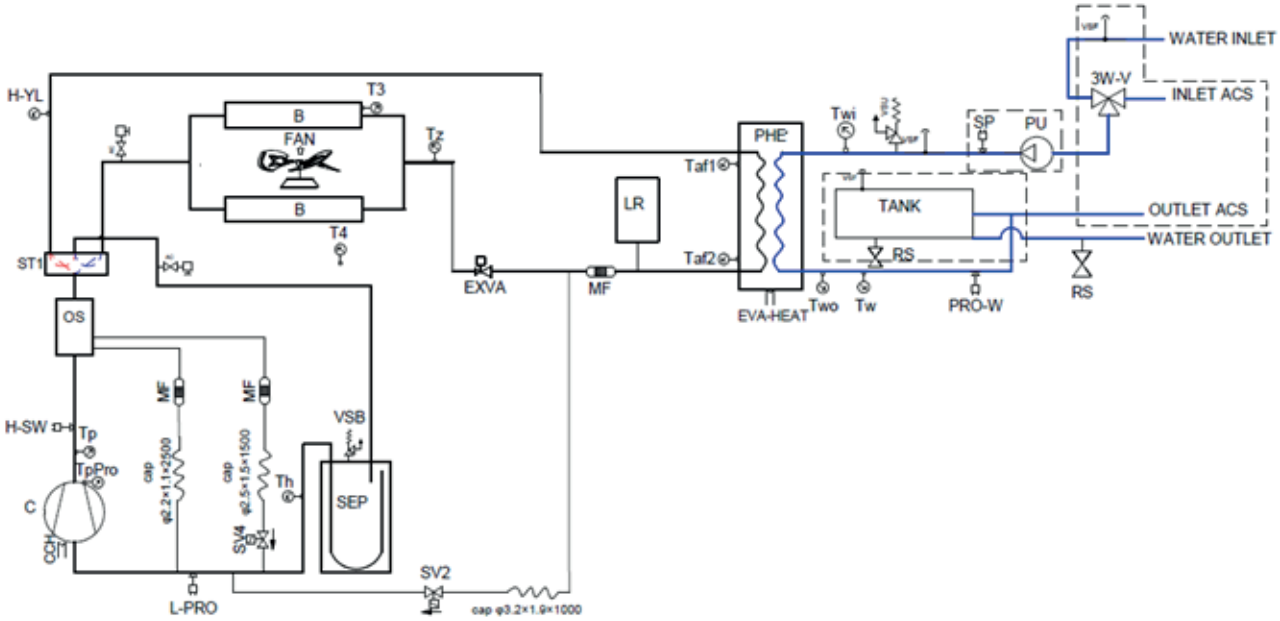
Electrical box with Danfoss and ABB inverter pump configuration

2.4.4 Top view



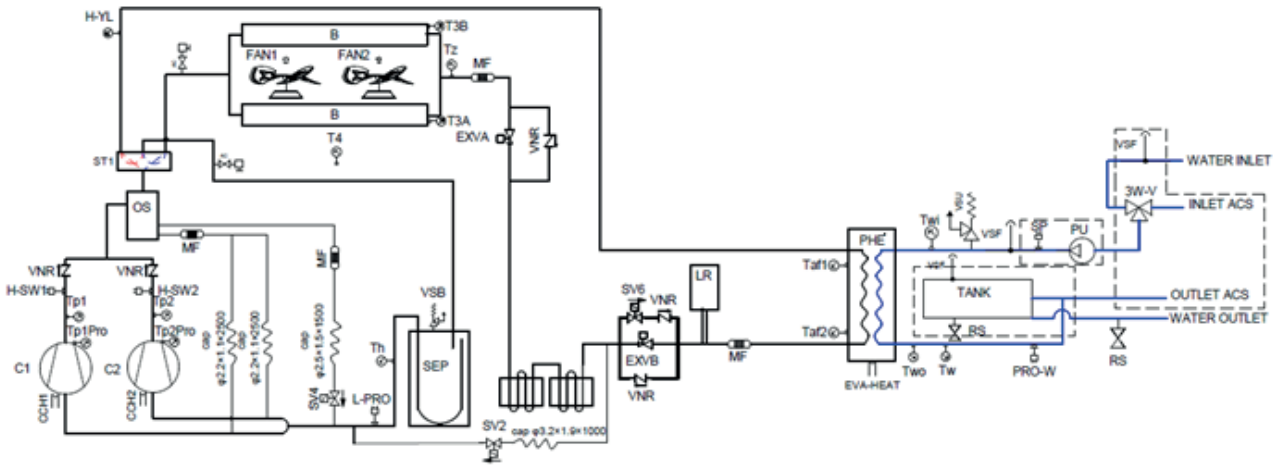
3. Piping Diagrams

3.1 Sheen 30 kW



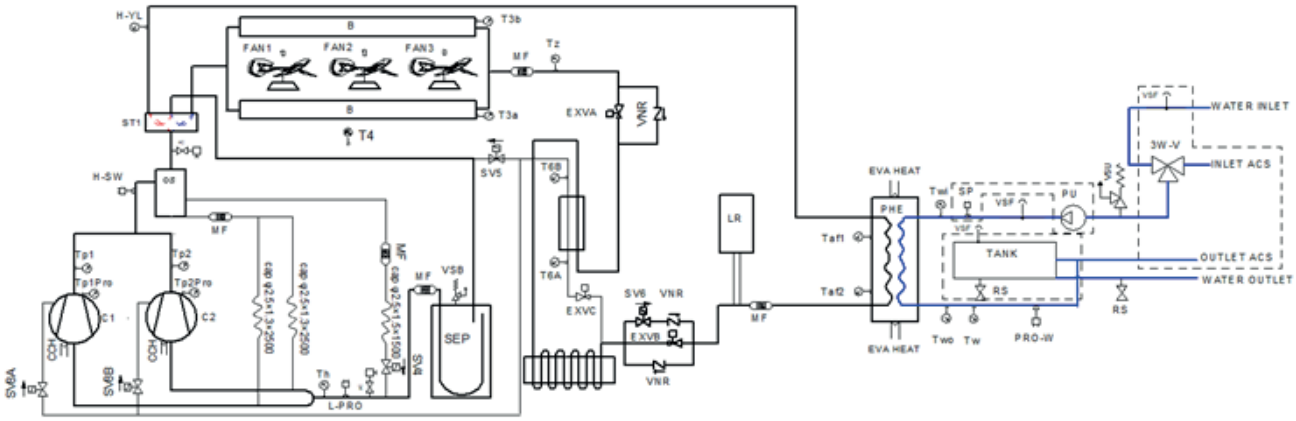
Functional components	
SYMBOLS	**DESCRIPTION**
AC	CHARGE ACCESS
B	FINNED PACK EXCHANGER
C	COMPRESSOR
CAP	CAPILLARY
CCH	CRAKCASE HEATER
EVA HEAT	EVAPORATOR HEATER
EXVA	ELECTRONIC EXPANSION VALVE
FAN	FAN
H-SW	HIGH PRESSURE SWITCH
H-YL	SYSTEM PRESSURE SENSOR
LR	LIQUID RECEIVER
L-PRO	LOW PRESSURE SWITCH
MF	MESH FILTER
OS	OIL SEPARATOR
PHE	PLATE HEAT EXCHANGER
SEP	LIQUID SEPARATOR
ST1	FOUR - WAY VALVE
SV2, SV4	SOLENOID VALVE
T3	FIN HEAT EXCHANGER OUTLET TEMPERATURE
T4	OUTDOOR AMBIENT TEMPERATURE PROBE
Taf1-Taf2	WATER SIDE ANTIFREEZE TEMPERATURE
Th	SYSTEM RETURN REFRIGERANT TEMPERATURE PROBE
Tp	INVERTER COMPRESSOR DISCHARGE TEMPERATURE
TpPro	DISCHARGE TEMPERATURE CONTROL SWITCH A
Tw	WATER TEMPERATURE PROBE
Twi	UNIT WATER INLET TEMPERATURE PROBE
Two	UNIT WATER OUTLET TEMPERATURE PROBE
VNR	NON-RETURN VALVE
VSB	LOW PRESSURE SAFETY VALVE
PRO-W	WATER FLOW SWITCH
VSF	AUTOMATIC RELIEF VALVE
VSU	WATER PRESSURE SAFETY VALVE
PU	PUMP
3W-V	THREE-WAY VALVE
RS	WATER SHUT-OFF VALVE
TANK	WATER TANK
SP	MIN WATER PRESSURE SWITCH

3.2 **Sheen 60 kW**



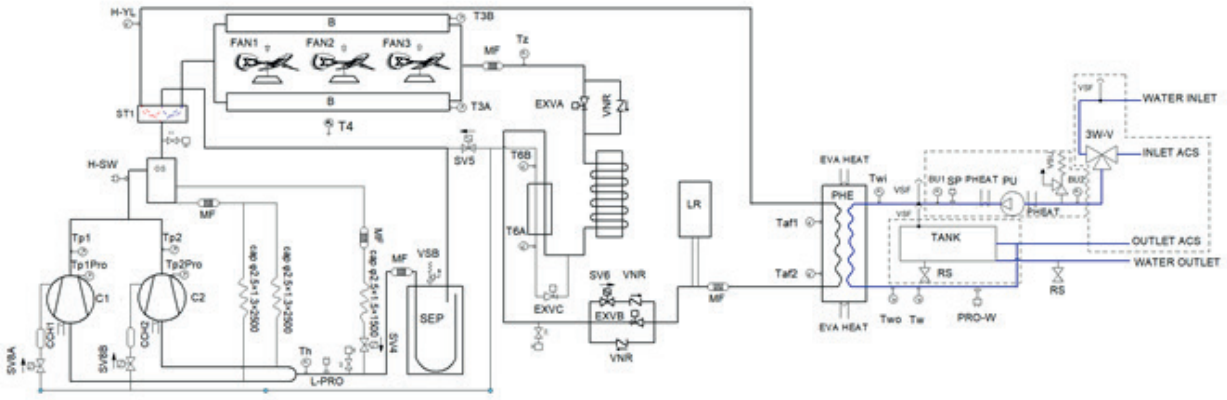
Functional components	
SYMBOLS	**DESCRIPTION**
AC	CHARGE ACCESS
B	FINNED PACK EXCHANGER
C	COMPRESSOR
CAP	CAPILLARY
CCH	CRAKCASE HEATER
EVA HEAT	EVAPORATOR HEATER
EXVA	ELECTRONIC EXPANSION VALVE
FAN	FAN
H-SW	HIGH PRESSURE SWITCH
H-YL	SYSTEM PRESSURE SENSOR
LR	LIQUID RECEIVER
L-PRO	LOW PRESSURE SWITCH
MF	MESH FILTER
OS	OIL SEPARATOR
PHE	PLATE HEAT EXCHANGER
SEP	LIQUID SEPARATOR
ST1	FOUR - WAY VALVE
SV2, SV4	SOLENOID VALVE
T3	FIN HEAT EXCHANGER OUTLET TEMPERATURE
T4	OUTDOOR AMBIENT TEMPERATURE PROBE
Taf1-Taf2	WATER SIDE ANTIFREEZE TEMPERATURE
Th	SYSTEM RETURN REFRIGERANT TEMPERATURE PROBE
Tp	INVERTER COMPRESSOR DISCHARGE TEMPERATURE
TpPro	DISCHARGE TEMPERATURE CONTROL SWITCH A
Tw	WATER TEMPERATURE PROBE
Twi	UNIT WATER INLET TEMPERATURE PROBE
Two	UNIT WATER OUTLET TEMPERATURE PROBE
VNR	NON-RETURN VALVE
VSB	LOW PRESSURE SAFETY VALVE
PRO-W	WATER FLOW SWITCH
VSF	AUTOMATIC RELIEF VALVE
VSU	WATER PRESSURE SAFETY VALVE
PU	PUMP
3W-V	THREE-WAY VALVE
RS	WATER SHUT-OFF VALVE
TANK	WATER TANK
SP	MIN WATER PRESSURE SWITCH

3.3 **Sheen 90 kW**



Functional components	
SYMBOLS	**DESCRIPTION**
AC	CHARGE ACCESS
B	FINNED PACK EXCHANGER
C	COMPRESSOR
CAP	CAPILLARY
ECO	ECONOMIZER
EVA HEAT	EVAPORATOR HEATER
CCH1, CCH2	CRANKCASE HEATER
EXVA, EXVB, EXVC	ELECTRONIC EXPANSION VALVE
FAN1, FAN2, FAN3	FAN
H-SW	HIGH PRESSURE SWITCH
H-YL	SYSTEM PRESSURE SENSOR
LR	LIQUID RECEIVER
L-PRO	LOW PRESSURE SWITCH
MF	MESH FILTER
OS	OIL SEPARATOR
PHE	PLATE EXCHANGER
SEP	LIQUID SEPARATOR
ST1	FOUR - WAY VALVE
SV4, SV5, SV6, SV8A, SV8B	SOLENOID VALVE
T3A, T3B	FIN HEAT EXCHANGER OUTLET TEMPERATURE
T4	OUTDOOR AMBIENT TEMPERATURE PROBE
T6A,T6B	ECONOMIZER IN-OUT TEMPERATURE PROBE
Taf1,Taf2	WATER SIDE ANTIFREEZE TEMPERATURE
Th	SYSTEM RETURN REFRIGERANT TEMPERATURE PROBE
Tp1,Tp2	INVERTER COMPRESSOR 1-2 DISCHARGE TEMPERATURE
Tp1Pro,Tp2Pro	DISCHARGE TEMPERATURE CONTROL SWITCH A
Tw	WATER TEMPERATURE PROBE
Twi	UNIT WATER INLET TEMPERATURE PROBE
Two	UNIT WATER OUTLET TEMPERATURE PROBE
VNR	NON-RETURN VALVE
VSB	LOW PRESSURE SAFETY VALVE
PRO-W	WATER FLOW SWITCH
VSU	WATER PRESSURE SAFETY VALVE
VSF	AUTOMATIC RELIEF VALVE
PU	PUMP
3W-V	THREE-WAY VALVE
RS	WATER SHUT-OFF VALVE
SP	MIN WATER PRESSURE SWITCH
TANK	WATER TANK

3.4 **Sheen 130 kW EXC/PRM**



Functional components	
SYMBOLS	**DESCRIPTION**
AC	CHARGE ACCESS
B	FINNED PACK EXCHANGER
BU1	MANOMETER DISCHARGE PRESSURE USER PUMP
BU2	MANOMETER SUCTION PRESSURE USER PUMP
C	COMPRESSOR
CAP	CAPILLARY
ECO	ECONOMIZER
EVA HEAT	EVAPORATOR HEATER
CCH1, CCH2	CRANKCASE HEATER
EXVA, EXVB, EXVC	ELECTRONIC EXPANSION VALVE
FAN1, FAN2, FAN3	FAN
H-SW	HIGH PRESSURE SWITCH
H-YL	SYSTEM PRESSURE SENSOR
LR	LIQUID RECEIVER
L-PRO	LOW PRESSURE SWITCH
MF	MESH FILTER
OS	OIL SEPARATOR
PHE	PLATE EXCHANGER
SEP	LIQUID SEPARATOR
ST1	FOUR - WAY VALVE
SV4, SV5, SV6, SV8A, SV8B	SOLENOID VALVE
T3A, T3B	FIN HEAT EXCHANGER OUTLET TEMPERATURE
T4	OUTDOOR AMBIENT TEMPERATURE PROBE
T6A,T6B	ECONOMIZER IN-OUT TEMPERATURE PROBE
Taf1,Taf2	WATER SIDE ANTIFREEZE TEMPERATURE
Th	SYSTEM RETURN REFRIGERANT TEMPERATURE PROBE
Tp1,Tp2	INVERTER COMPRESSOR 1-2 DISCHARGE TEMPERATURE
Tp1Pro,Tp2Pro	DISCHARGE TEMPERATURE CONTROL SWITCH A
Tw	WATER TEMPERATURE PROBE
Twi	UNIT WATER INLET TEMPERATURE PROBE
Two	UNIT WATER OUTLET TEMPERATURE PROBE
VNR	NON-RETURN VALVE
VSB	LOW PRESSURE SAFETY VALVE
PRO-W	WATER FLOW SWITCH (flow switch can be in a different position basing on water circuit layout)
VSU	WATER PRESSURE SAFETY VALVE
VSF	AUTOMATIC RELIEF VALVE
PU	PUMP
3W-V	THREE-WAY VALVE
RS	WATER SHUT-OFF VALVE
SP	MIN WATER PRESSURE SWITCH
TANK	WATER TANK

PRM: Premium version have two fans instead of three

3.5 Key components:

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

B Fan:
Ventilates the air side heat exchanger.

C 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%.

D Liquid separator (suction accumulator):
Stores liquid refrigerant and oil to protect the compressor from liquid hammering.

E Electronic expansion valve (EXVA/B/C):
Controls refrigerant flow and reduces refrigerant pressure.

F 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.

G 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.

H Discharge temperature switch:
Protects the compressor from abnormally high temperatures and transient spikes in temperature.

I Air purge valve:
Automatically removes air from the water circuit.

J Safety valve:
Prevents excessive water pressure by opening at 43.5psi (3bar) and discharging water from the water circuit.

K Water flow switch:
Detects water flow rate to protect the compressor and water pump in the event of insufficient water flow.

L Water pump:
Circulates water in the water circuit.

M Pressure sensor:
Measures refrigerant system pressure.

N Crankcase heater:
Prevents refrigerant from mixing with compressor oil when the compressors are stopped.

O Water side heat exchanger electric heater:
Protects the water side heat exchanger from ice formation.

P Water flow switch electric heater:
Provides additional heating when heating capacity provided by the heat pump is insufficient due to low ambient temperatures, it also protects external water pipes from freezing.

Q Solenoid valve SV4:
Returns oil to the compressor. It opens after 19 minutes of compressor operation, closes after 1 minutes, then opens again for 1 minutes at 19 minute increments.

R Plate heat exchanger:

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.

S Pressure gauge joint (high and low pressure side):
Charges or discharges refrigerant.

T Capillary:
Throttles and reduces pressure in the liquid injection cooling pipe.

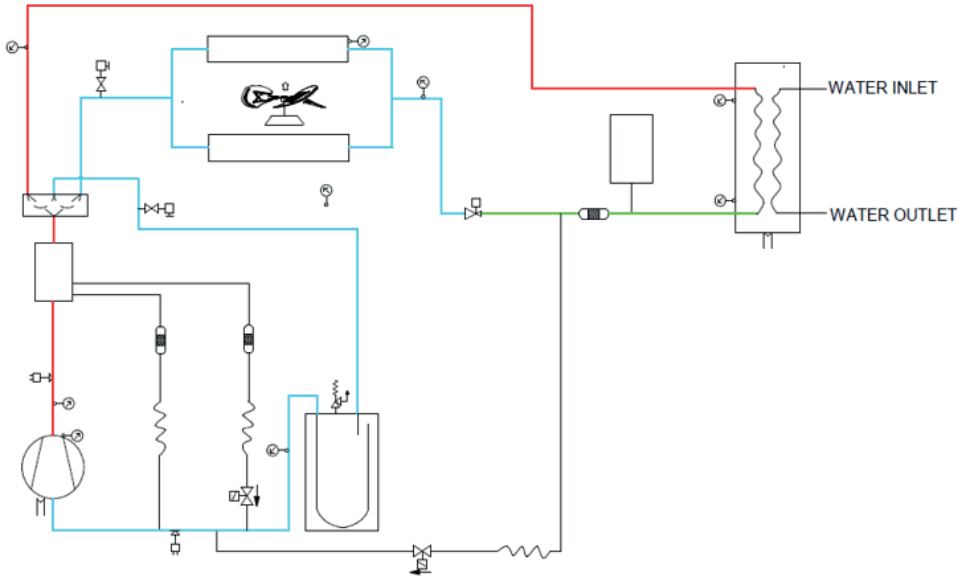
U Solenoid valve SV2 (only for size 10.1-22.2):
Control the on-off of the liquid injection. It opens at the maximum discharge temperature reaching 103°C While it closes at the maximum discharge temperature below 95°C or both the maximum discharge temperature below 100°C and minimum discharge temperature below 90°C .

4. Refrigerant Flow Diagrams

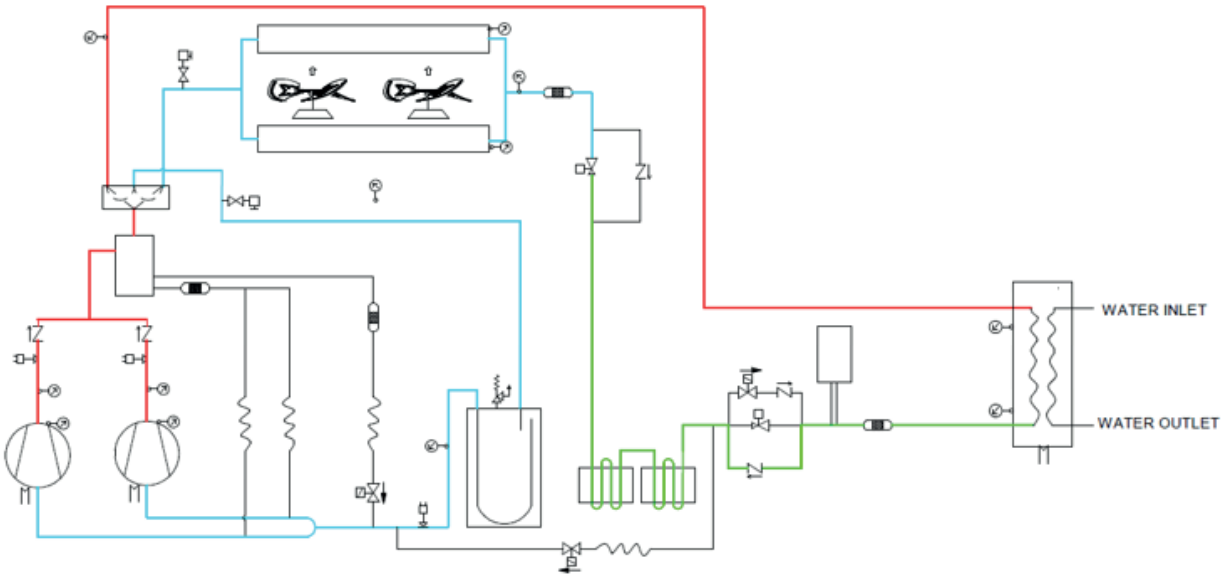
High temperature, high press gas
High temperature, high press liquid
Low temperature, low pressure

4.1 Heating operation

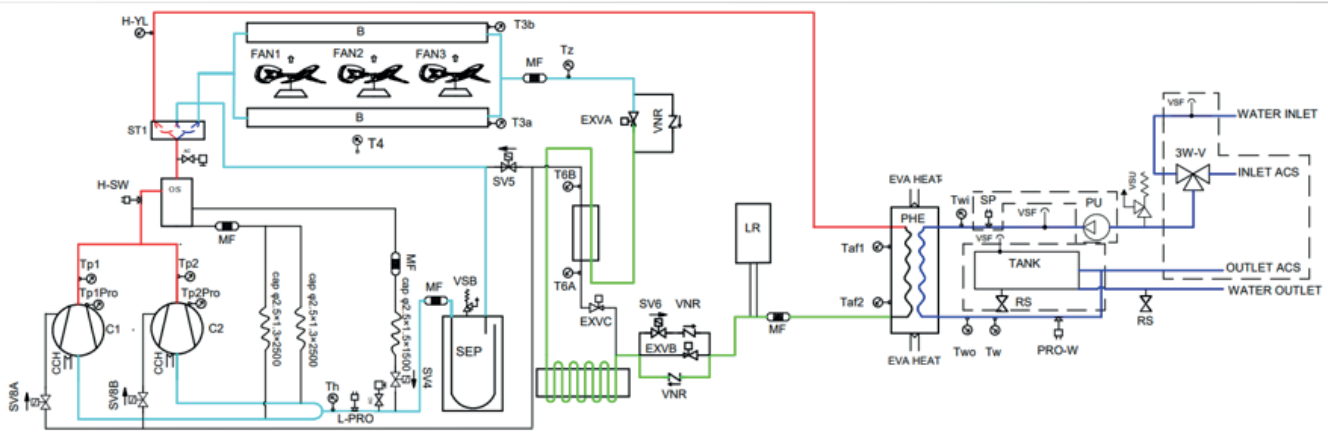
4.1.1 Refrigerant flow during heating operation for sizes 10.1 – 14.1 kW



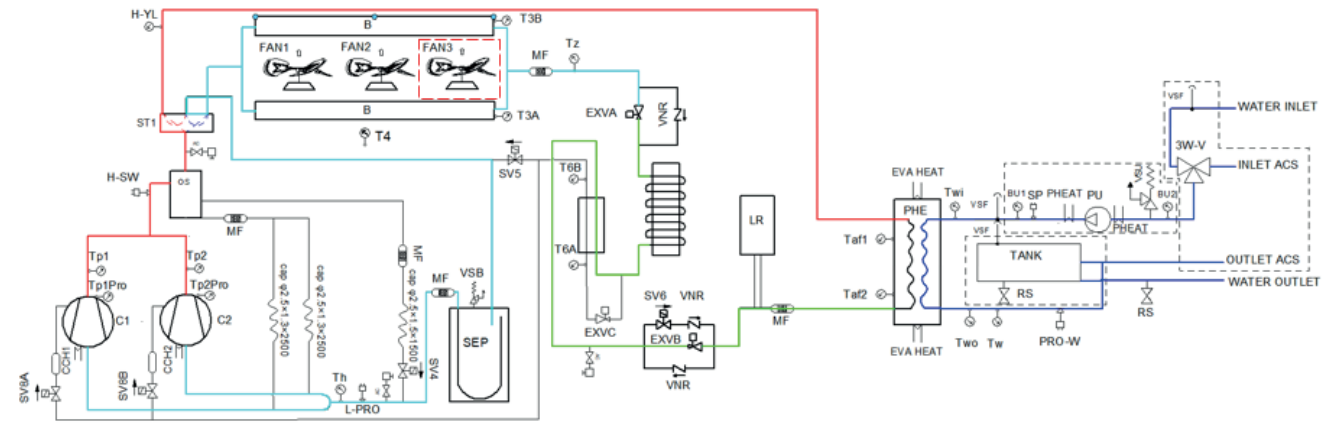
Refrigerant flow during heating operation for sizes 16.2 – 22.2



4.1.2 Refrigerant flow during heating operation for sizes 30.2 – 35.2



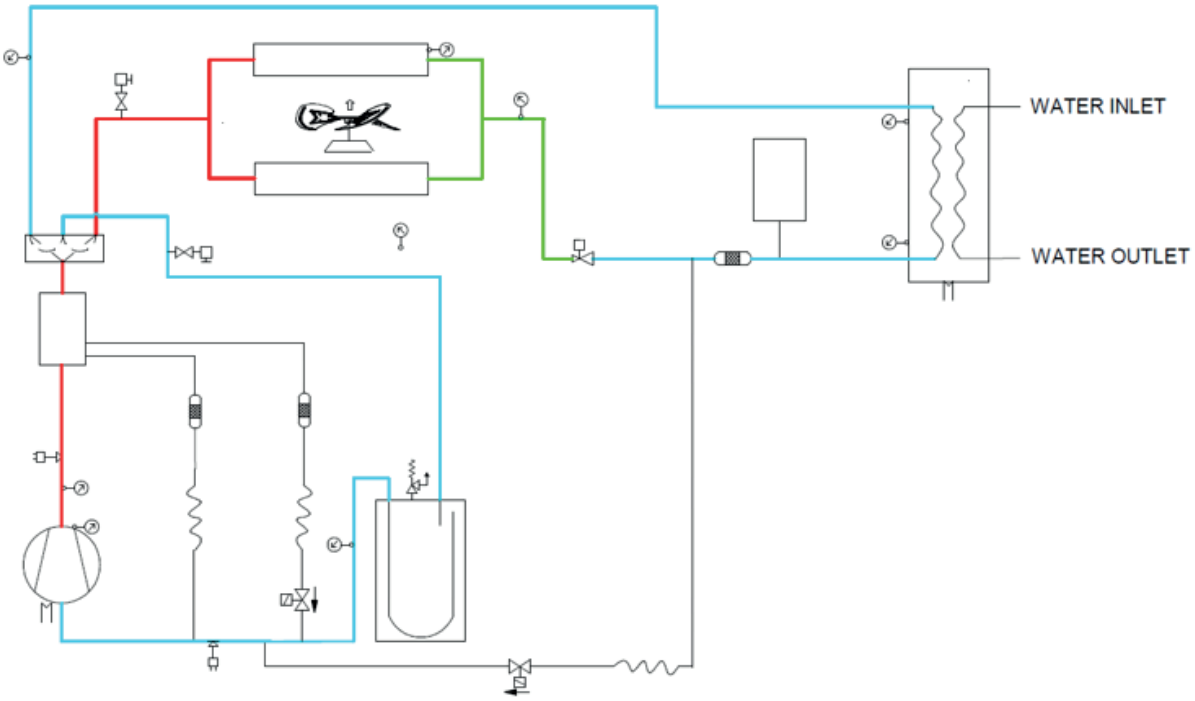
Refrigerant flow during heating operation for sizes 43.2 – 55.2



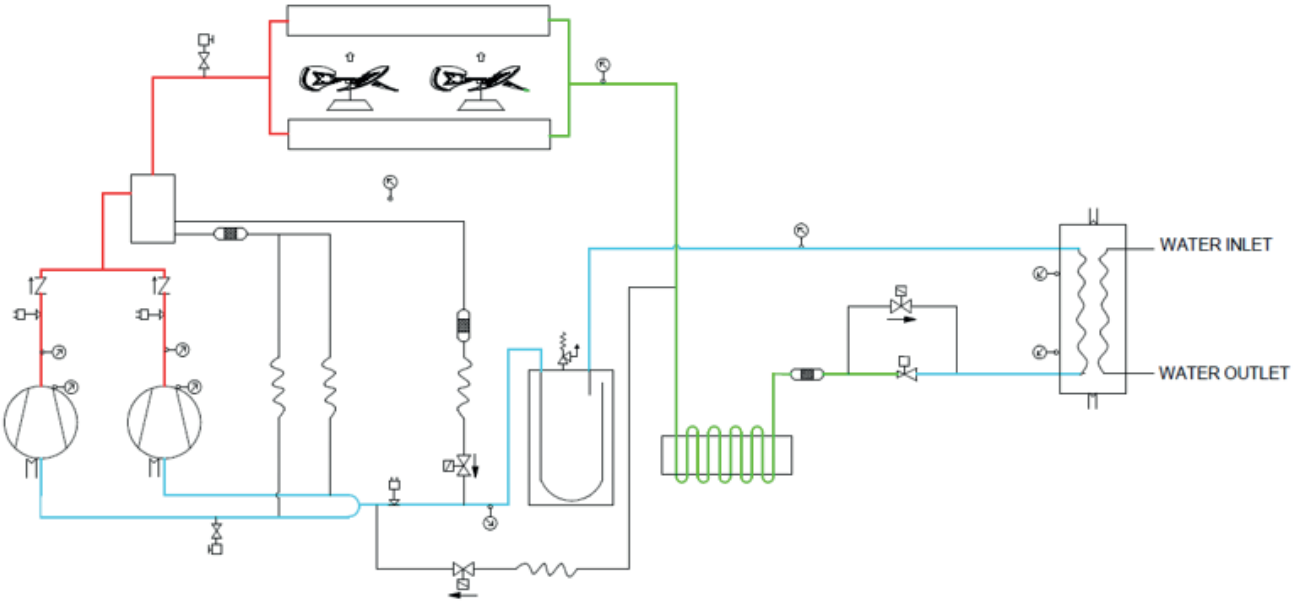
PRM – Premium unit have 2 fans instead of 3 fans

4.2 Cooling and defrosting operation

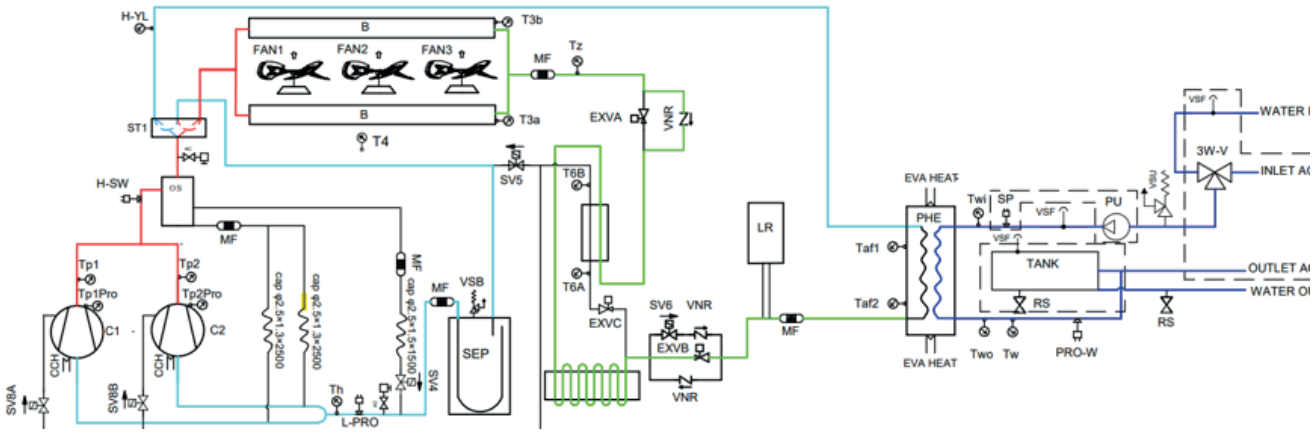
4.2.1 Refrigerant flow during cooling and defrosting operations for sizes 10.1 – 14.1



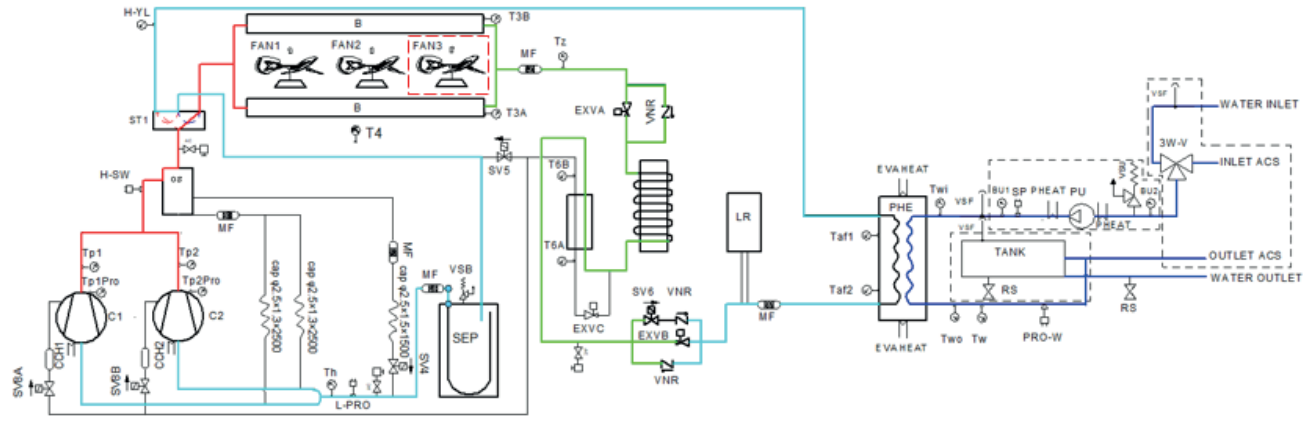
4.2.2 Refrigerant flow during cooling and defrosting operations for sizes 16.2 – 22.2



4.2.3 Refrigerant flow during cooling and defrosting operations for sizes 30.2 – 35.2



4.2.4 Refrigerant flow during cooling operation for sizes 43.2 – 55.2



PRE – Premium version have 2 fans instead of 3

5. Control

5.1 General Control Scheme Flowchart

Stop operation
- Abnormal shutdown
- System stops

YES → Ensure the flow switch is connected properly

↓

Standby control
- Crankcase heater control
- Water pump control

YES → Check the water piping and valves. Make sure the piping is clean, there is no air in the piping and all valves are open. If the circulator pump is not already set to maximum speed, increase its speed.

NO ↓

Startup control 4
- Compressor startup delay control
- Compressor startup program
- Startup control for heating operation
- Startup control for cooling operation

YES → • Unit duty cycling

NO ↓

TNormal operation control
- Component control during normal operation
- Compressor output control
- Compressor step control
- Water pump select control
- Four-way valve control
- Electronic expansion valve control
- Outdoor fan control
- Spray liquid cooling control

YES → Replace the blown fuse

↓

Protection control
- High pressure protection control
- Low pressure protection control
- Discharge temperature protection control
- Compressor and inverter module protection control
- Voltage protection control
- DC fan motor protection control
- Water side heat exchanger anti-freeze protection control
- Air side heat exchanger high temperature protection control
- Water side heat exchanger temperature difference protection control
- Water side heat exchanger low temperature protection control
- Water side heat exchanger low pressure protection control

Note:

1. Numbers in the top right-hand corners of boxes indicate the relevant section of text on the following pages.
2. S5_3 to set additional control.

5.2 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 unit's PCB digital displays and on the user interface.

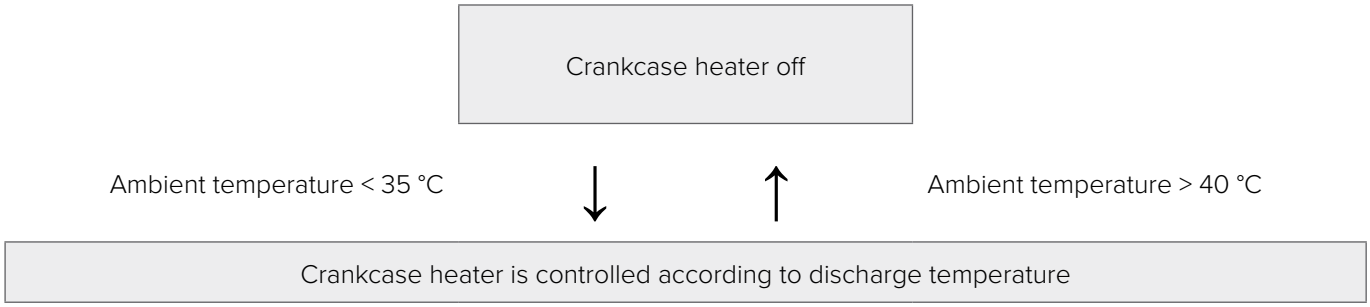
2 The system stops when the set temperature has been reached.

5.3 Standby Control

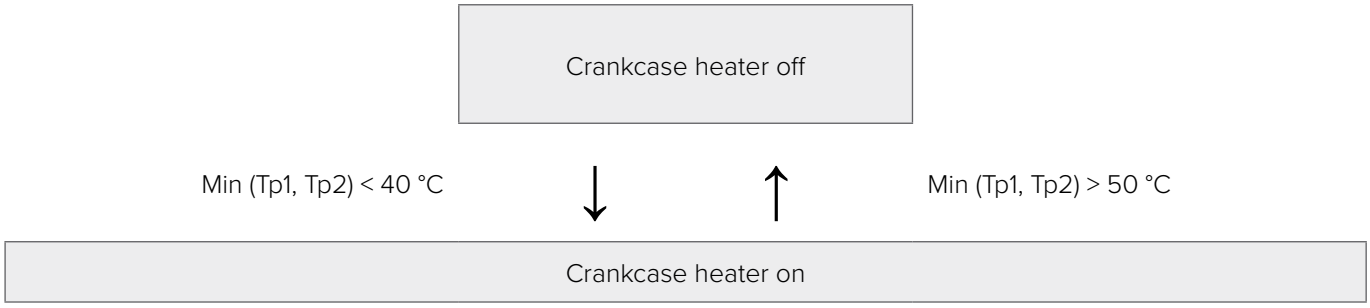
5.3.1 Crankcase Heater Control

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.

Crankcase heater controlled according to outdoor ambient temperature



Crankcase heater controlled according to discharge temperature



Notes:

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

5.3.2 Water Pump Control

When the unit is in standby, the circulator pumps run continuously or follows the ON/OFF time settings.

5.4 Startup Control

5.4.1 Compressor Startup Delay Control

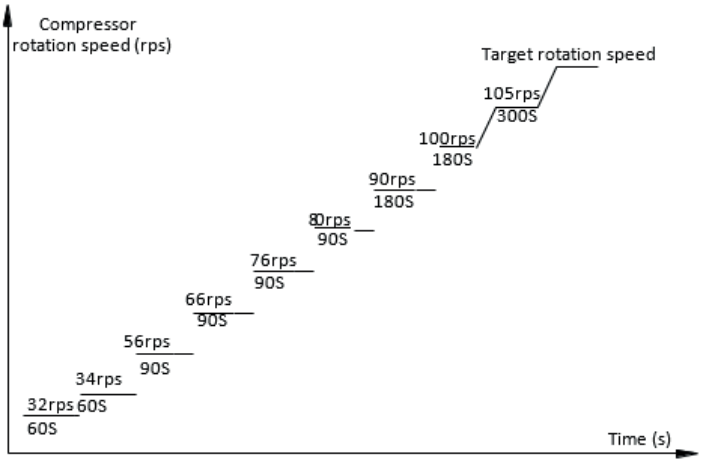
In initial startup control and restart control (except in defrosting operation), compressor startup is delayed such that a minimum 7 minutes has elapsed since the compressor stopped, in order to prevent frequency compressor on/off and to equalize the pressure within the refrigerant system.

5.4.2 Compressor Startup Program

In initial startup control and in re-start control, compressor startup is controlled according to outdoor ambient temperature and leaving water temperature. Compressor startup follows one of two startup programs until the target rotation speed is reached.

During startup program power control according to setpoint is not active.

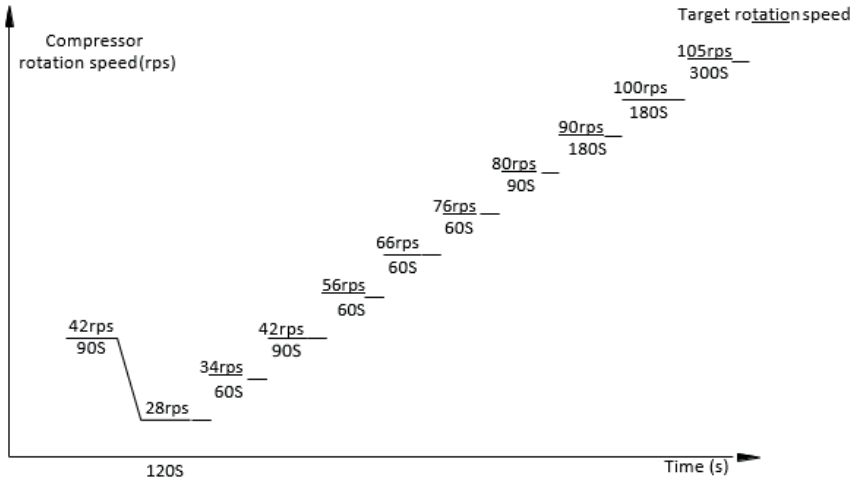
size 10.1-14.1 and 16.2-22.2 compressor startup program1
when ambient temperature is above 10°C



Notes:

Once the first, 60-second stage of the program is complete, the program proceeds to the subsequent stages in a step-by-step fashion and exits when the target rotation speed has been reached.

size 10.1-14.1 and 16.2-22.2 compressor startup program1
when ambient temperature is at or below 10°C



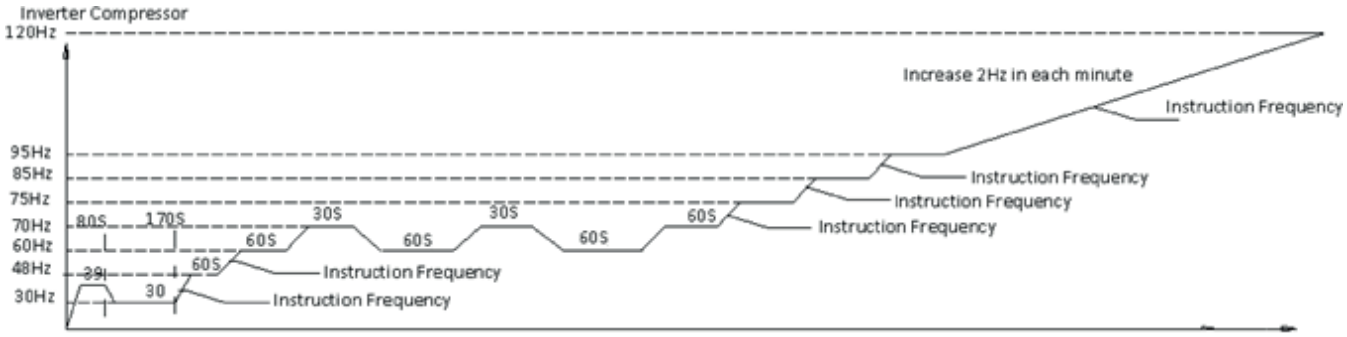
Notes:

1. Once the first, 90-second stage of the program is complete, the program proceeds to the subsequent stages in a step-by-step fashion and exits when the target rotation speed has been reached.

30.2-35.2 & 43.2-50.2 & 45.2-55.2 - Compressor Start-up

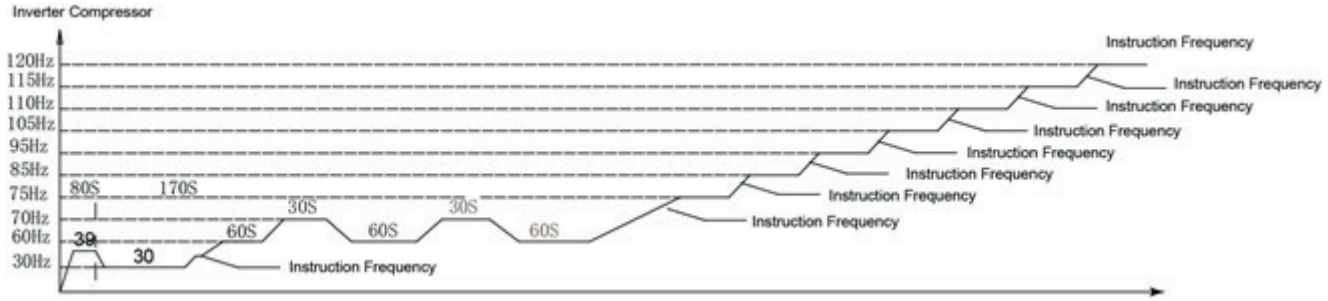
Cooling Start-up

System startup program: the following startup program is executed when the system is powered on:



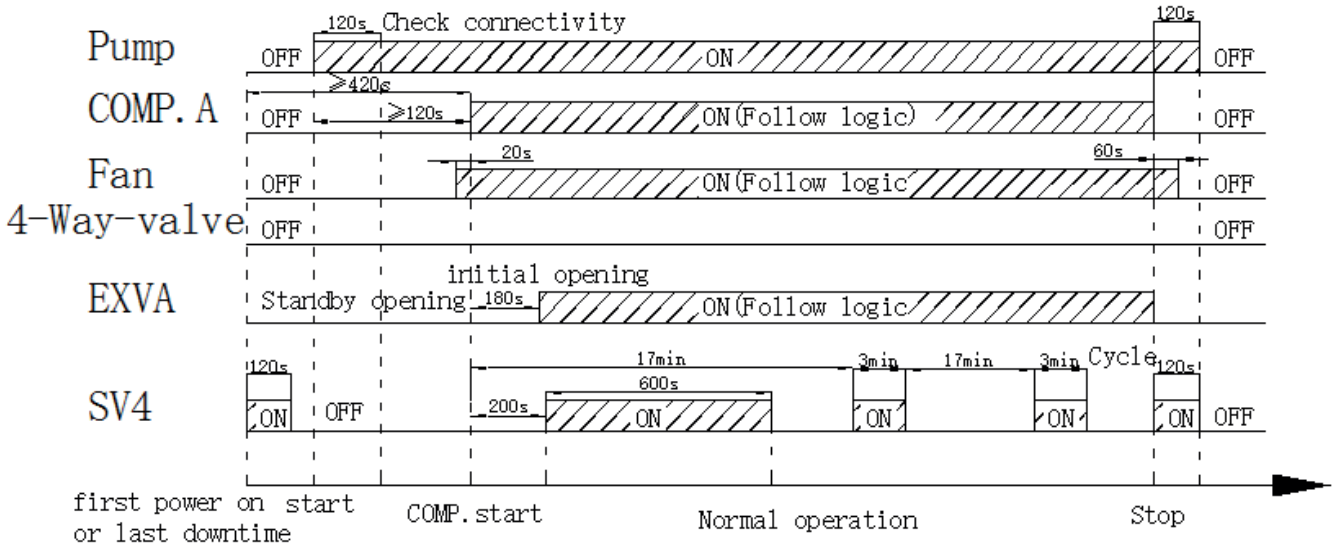
Heating/Water Heating Start-up

System startup program: the following startup program is executed when the system is powered on:

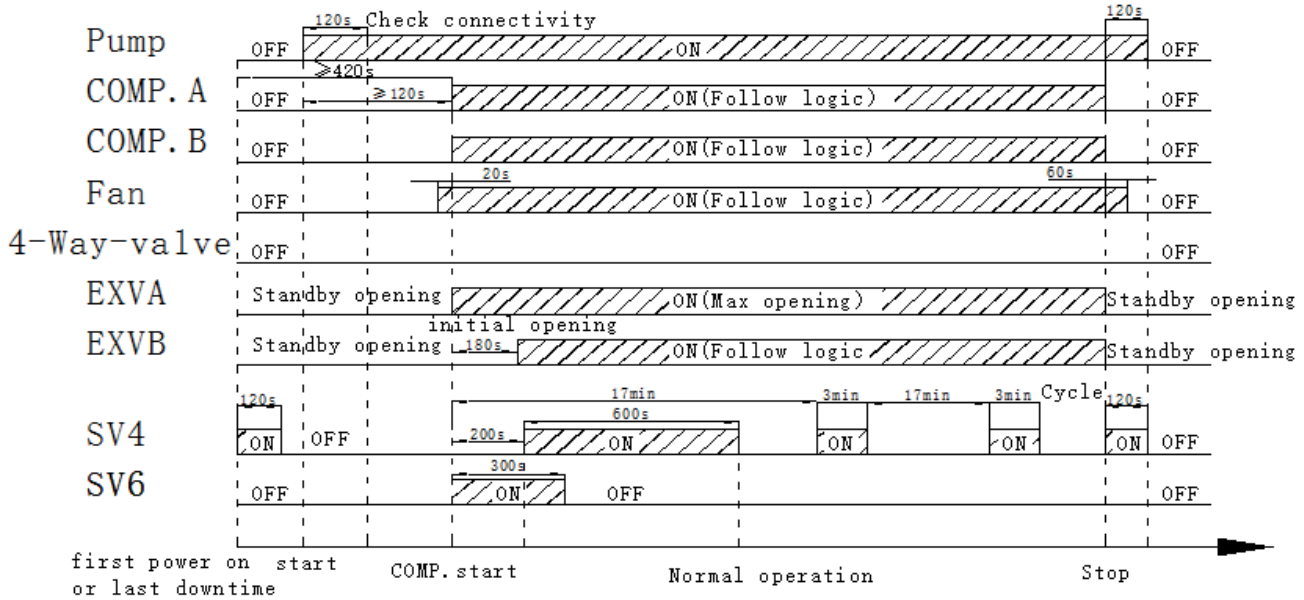


5.4.3 Component Control for Normal Cooling Operation

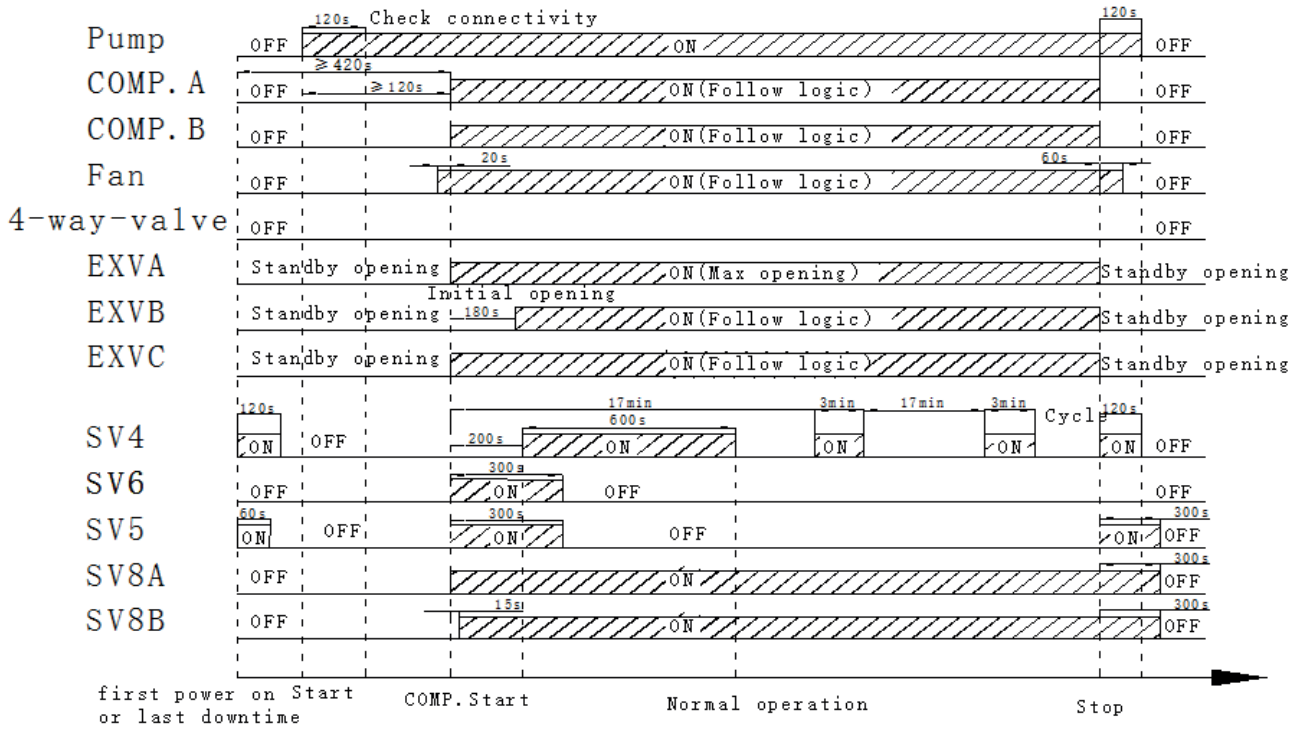
5.4.3.1 Component control for normal cooling operation of Sheen 30kW



5.4.3.2 Component control for normal cooling operation of Sheen 60kW



5.4.3.3 Component control for normal cooling operation of Sheen 90 / 130kW

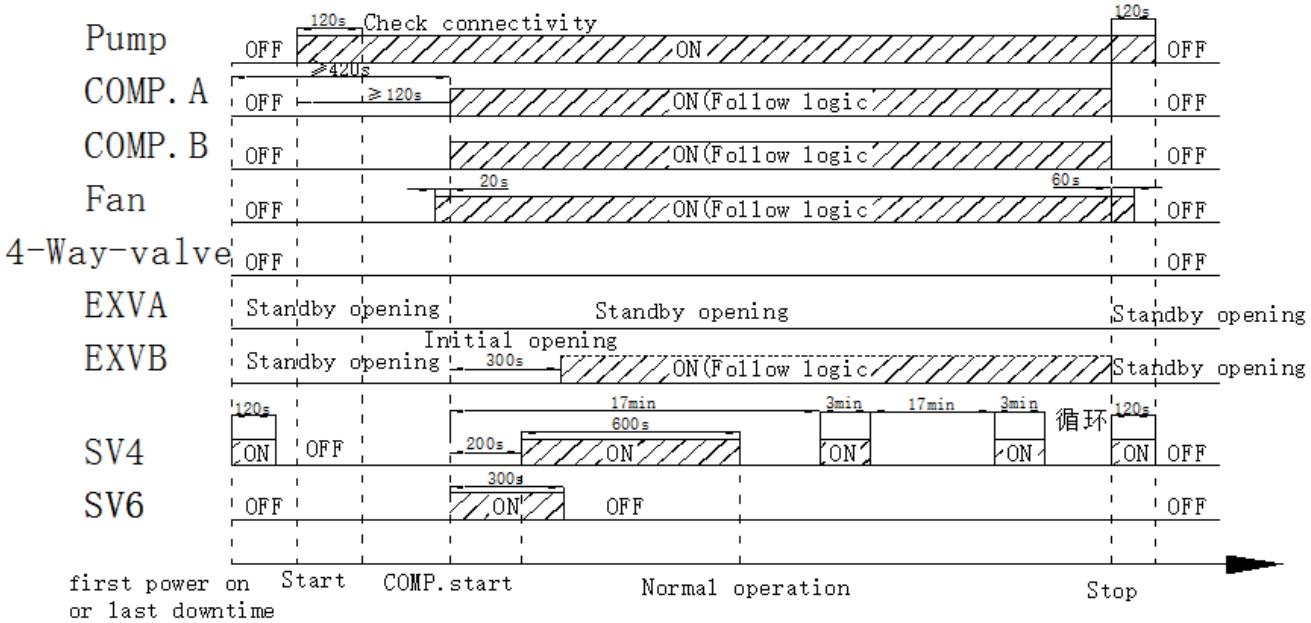


5.4.4 Component control for Low Cooling Operation

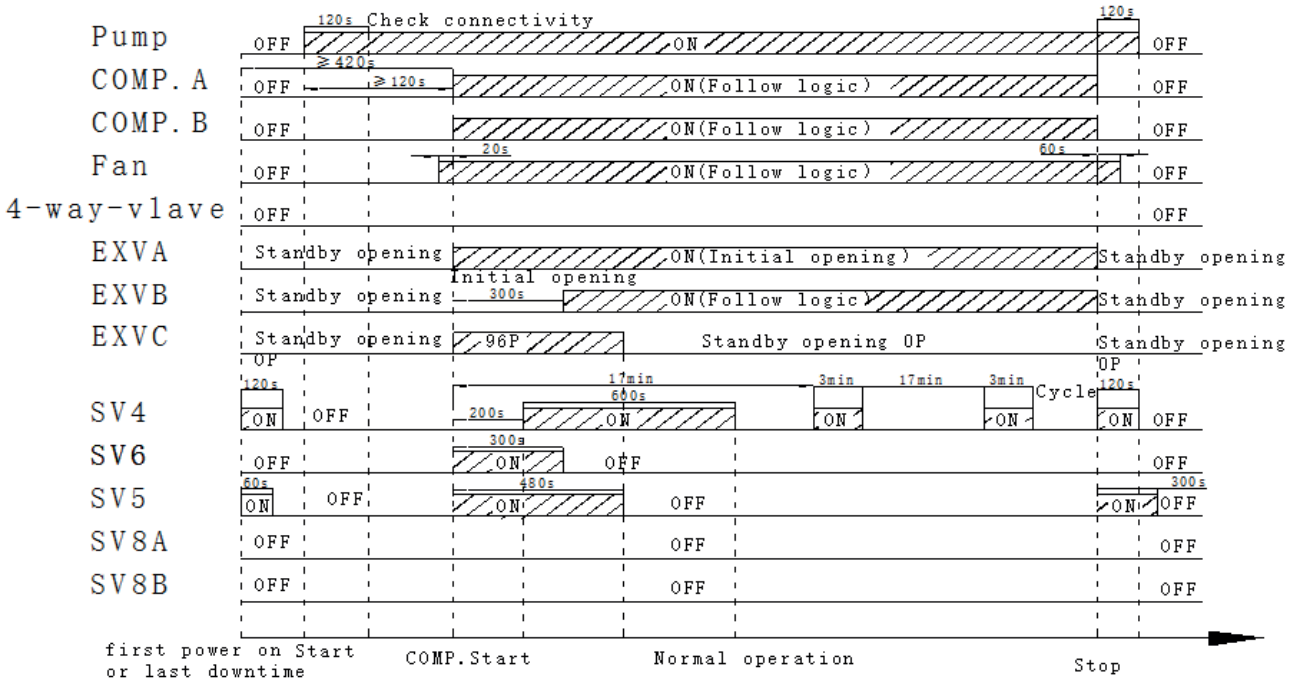
The unit will enter into this function automatically when the outdoor air temperature is under 10°C. Check the unit envelope to have a better understanding on the restriction for the working range of this unit.

Sheen 30kW: Not applicable

5.4.4.1 Component control for low cooling operation of Sheen 60kW



5.4.4.2 Component control for low cooling operation of Sheen 90 / 130kW



5.5 Compressor Output Control

The compressor rotation speed is controlled according to the load requirement. Before compressor startup, the unit determines the compressor target speed according to outdoor ambient temperature, discharge temperature and then runs the appropriate compressor startup program. Refer to Part 3, 4.2 “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 cascade 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 cascade system, the compressor speed is limited by the inverter module temperature (Tf), ambient temperature (T4), discharge temperature (Tp1/Tp2), condensing temperature (Tz) and low pressure (Prs_MPa).

In heating mode: In a single system, the compressor speed is controlled according to the water outlet temperature and water outlet setting temperature. In a cascade system, all compressors are controlled according to the total water outlet temperature and the water outlet setting temperature. Both in a single system and cascade system, the compressor speed is limited by inverter module temperature (Tf), ambient temperature (T4), discharge temperature (Tp1/Tp2) and discharge pressure (Prs_MPa).

5.6 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.

The compressor capacity control is performed when frequency is stable for at least 5 min: the frequency is adjusted according to Tws and Two every 60s till reach stable condition.

5.7 Water pump select control

In a cascade system if the dial switch S12_2 on the main PCB is in ON position, means that each unit of the system is equipped with a pump, meanwhile if the dial switch S12_2 on the main PCB is in OFF position means that the system is equipped with a pump controlled by the Master unit.

S12_2 is switched OFF, the system runs “one large pump controlled by master unit” mode.

- One pump control: only the master unit output pump signal, no pump signal output on the slave units.
- Multiple pump control: output pump signal on all units.
- In the single pump system, the dial switch S12_2 must be set in the “OFF” position for each unit in the Master - Slave system otherwise the FP error (Dip-Switch compatibility) will be displayed.
- In case of a cascade system single pump configuration any alarm which occurs on the Master unit stop the system, if the alarm happens on a slave unit the system continues to work.
- In case of a cascade system multiple pump configuration any alarm which occurs on the unit stop only the unit not the entire system.

5.8 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. Refer to Part 2, 3 “Refrigerant Flow Diagrams”.

During heating operation, the four-way valve is “ON”; during cooling and defrosting operation, the four-way valve is “OFF”.

5.9 Electronic Expansion Valve Control

The position of the electronic expansion valve (EXV) is controlled in steps from fully closed to fully open.

- At power-on:
- The EXV first closes fully, then moves to the standby position. After 30 seconds the EXV moves to an initial running position, which is determined according to the operating mode and outdoor ambient temperature.
- When the unit operate in cooling mode, after 60 seconds, the EXV is controlled according to suction superheat, water inlet temperature and compressor frequency.
- When the unit operates in heating mode, after a further 60 seconds, the EXV is controlled according to discharge superheat and compressor frequency, and uses the suction temperature, air side heater exchanger temperature, discharge temperature to modify the control.
- When the unit is in standby:

  30kW: The EXV is at position 352 (steps).

  60/90/130kW: The EXV is at position 2000 (steps).
- When the unit stops:

  The EXV first closes fully, then moves to the standby position.

5.10 Outdoor Fan Control

The speed of the unit fan(s) is adjusted in steps, as shown in Table

.

Fan speed index	Fan speed (rpm)					
	10.1-14.1	16.2-22.2 & 45.2-55.2		30.2-35.2 & 43.2-45.2		
	FAN 1	FAN 1	FAN 2	FAN 1	FAN 2	FAN 3
0	0	0	0	0	0	0
1	150	0	150	0	150	0

2	170	0	190	0	190	0
3	190	0	210	150	170	0
4	210	0	230	170	190	0
5	230	0	250	190	210	0
6	250	150	150	150	150	150
7	270	150	170	150	170	150
8	290	150	190	150	150	170
9	310	170	190	190	170	190
10	330	210	190	210	190	210
11	350	230	210	230	210	230
12	370	250	230	250	230	250
13	400	270	250	270	250	270
14	430	290	270	290	270	290
15	60	310	290	310	290	310
16	490	330	310	330	310	330
17	520	350	330	350	330	350
18	550	370	350	370	350	370
19	580	400	370	400	370	400
20	610	430	400	430	400	430
21	640	470	430	470	430	470
22	670	510	470	510	470	510
23	700	550	510	550	510	550
24	720	600	550	600	550	600
25	740	650	600	650	600	650
26	760	700	650	700	650	700
27	780	750	700	750	700	750
28	780	800	750	800	750	800
29	800	830	800	820	820	820
30	800	850	830	840	840	840
31	820	870	850	860	860	860
32	820	890	870	880	880	880

5.11 Spray liquid cooling control

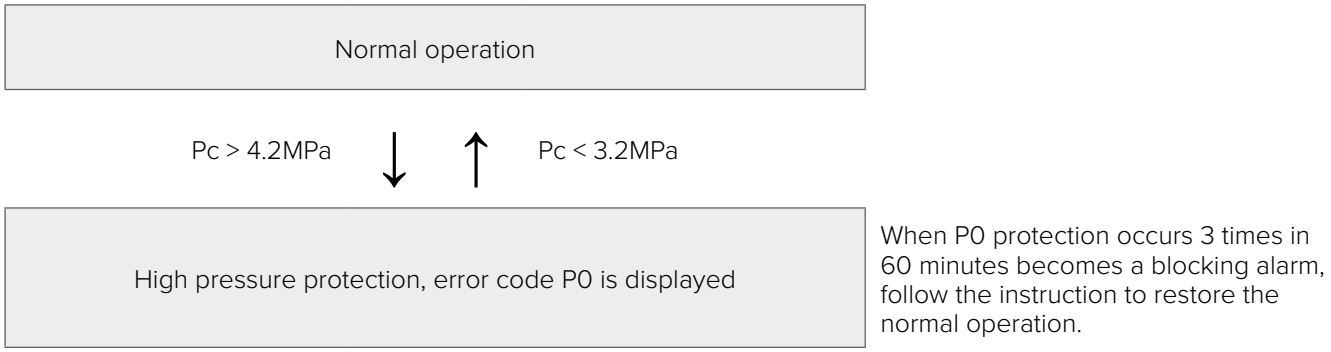
When the discharge temperature of compressor exceeds 103°C the solenoid valve SV2 opens and the discharge temperature reduces. When the discharge temperature is below 90°C, the solenoid valve closes.

5.12 Protection Control

Note: Once the unit entered in a blocking alarm in order to restore the normal operation is necessary a manual restart of the unit or a reset of the blocking alarms from HMI (Service menu->Clear alarm history->Clear blocking alarms).

5.12.1 High Pressure Protection Control

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

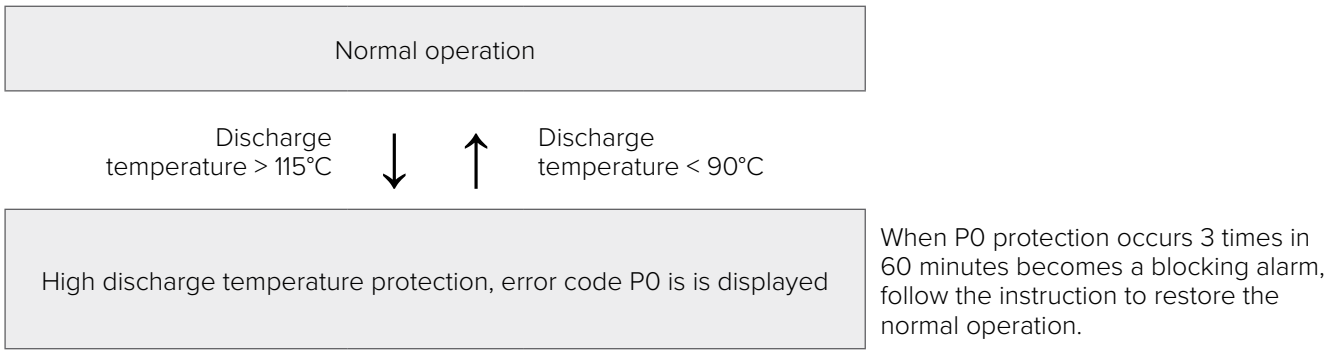


Pc: Discharge pressure

When the discharge pressure rises above 4.2MPa the system displays P0 protection and the unit stop running.

When the discharge pressure drops below 3.2MPa, the compressor enters re-start control.

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

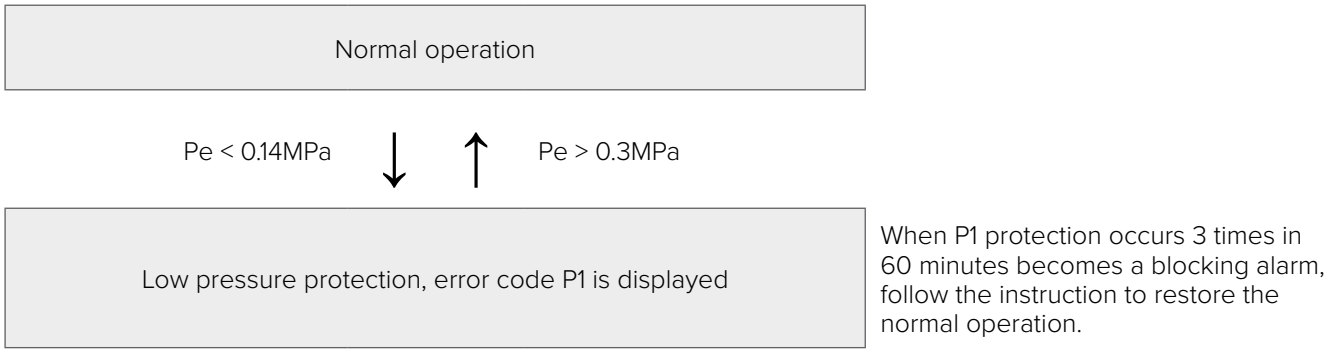


When the discharge temperature rises above 115°C the system displays P0 protection and the unit stop running.

When the discharge temperature drops below 90°C, the compressor enters re-start control.

5.12.2 Low Pressure Protection Control

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

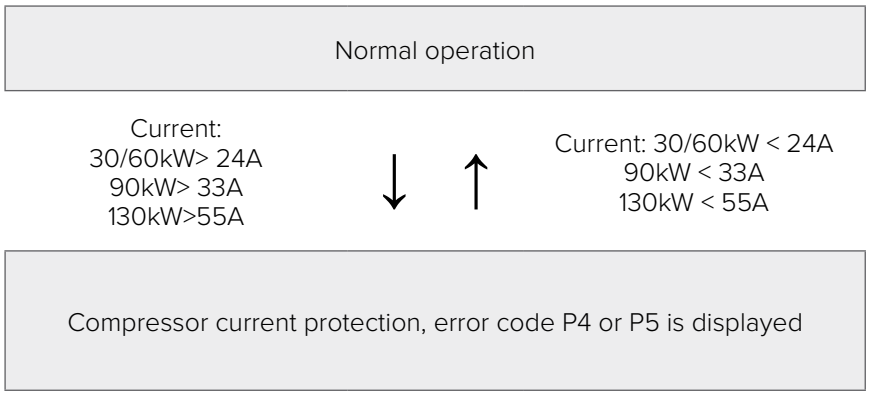


When the suction pressure drops below 0.14MPa the system displays P1 protection and the unit stop running. When the suction pressure rises above 0.3MPa, the compressor enters re-start control.

P1 alarm is a mechanical protection meanwhile PC alarm is an electronic alarm.

5.12.3 Current inverter Protection Control P4/P5

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.

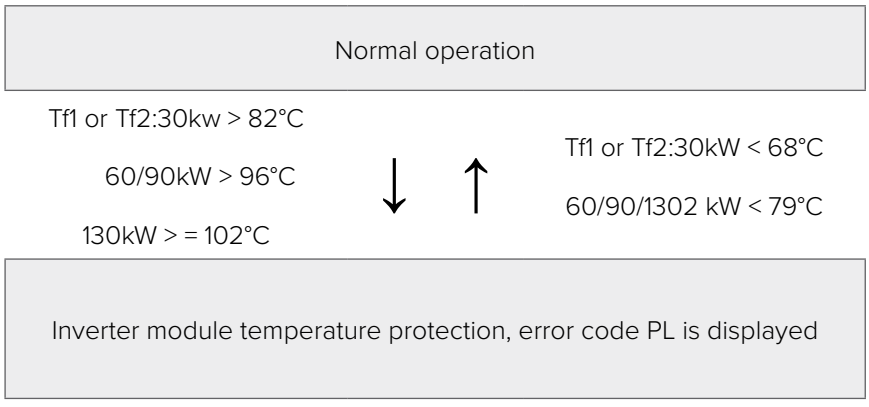


When P4/P5 protection occurs 3 times in 60 minutes becomes a blocking alarm, follow the instruction to restore the normal operation.

P4 is the protection for the power supply phase B, P5 is the protection for the power supply phase C.

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

5.12.4 Temperature inverter protection



C7 is displayed when PL error occurs 3 times in 100 minutes. C7 is a blocking alarm, follow the instruction to restore the normal operation

Notes:

Tf1: Heat sink temperature 1; Tf2:Heat sink temperature 2

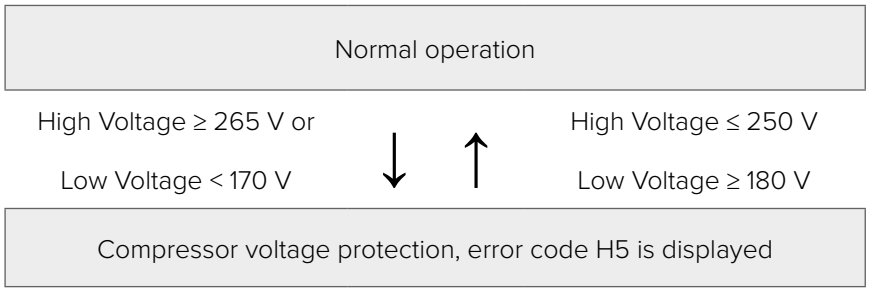
Data indicated can be different for Sheen 130kW

When the Tf1 or Tf2 temperature rises above upper limited value, the system displays PL protection and the unit stop running. When the Tf1 and Tf2 temperature drops below lower limited value, the compressor enters re-start control.

5.12.5 Voltage Protection Control

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

The check is done on each phase



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

When the phase voltage is below 170 V for more than 30 seconds, the system displays H5 protection and the unit stop running. When the AC voltage rises to at or above 180 V for more than 30 seconds, the refrigerant system restarts once the compressor re-start delay has elapsed.

5.12.6 DC Fan Motor Protection Control

This control protects the DC fan motors from abnormal power supply.

- The PU protection will be automatically cleared after 30 s of fan protection occurs;
- When 10 times of PU protection occurs within 120 min, it will report FF fault (recovery from power failure);
- If the main control and the fan drive module cannot communicate continuously for 2 min, it will report PU.

FF is a blocking alarm, follow the instruction to restore the normal operation after solved the issue.

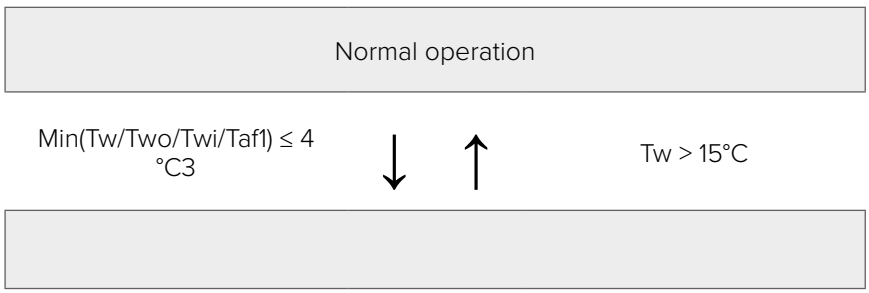
5.12.7 Water Side Heat Exchanger Anti-freeze Protection Control

This control protects the water side heat exchanger from ice formation. The water side heat exchanger electric heater is controlled according to water side heat exchanger anti-freezing temperature (Taf), water inlet temperature (Twi), water outlet temperature (Two) and total water outlet temperature (Tw).

When water side heat exchanger anti-freeze protection occurs the system displays a pre-alarm code Pb and the unit will enter in anti-freeze protection logic.

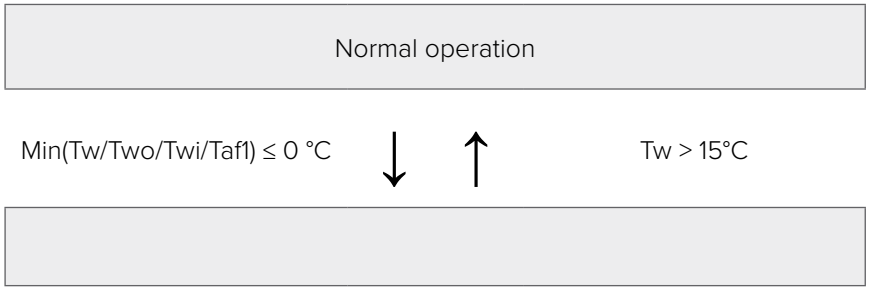
During anti-freeze operation the system can use heater onboard, use external additional heat source or run the unit in heating mode till the pre-alarm is restored. The operation can be different basing on the operating mode, dip-switch setting, system layout, antifreeze set.

Anti-freeze protection control in normal cooling mode



Note: Taf include Taf1 and Taf2.

Anti-freeze protection control in low water outlet cooling mode



Note:

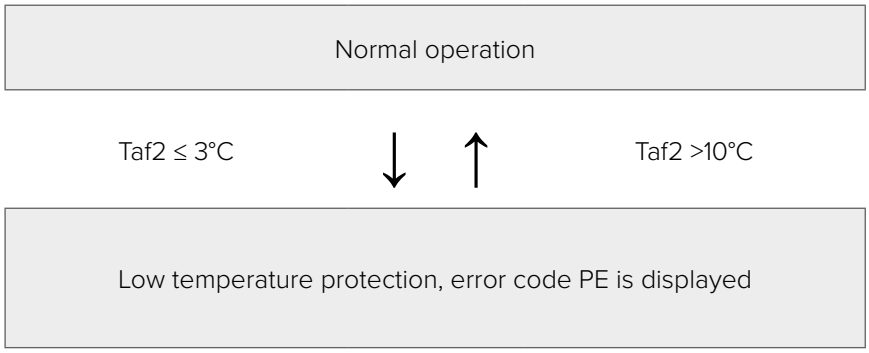
Taf include Taf1 and Taf2.

If antifreeze is added in the system, the lower limit of starting antifreeze protection can be lowered.

5.12.8 Water Side Heat Exchanger Low Temperature Protection Control

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

Water side heat exchanger low temperature protection control in normal cooling mode

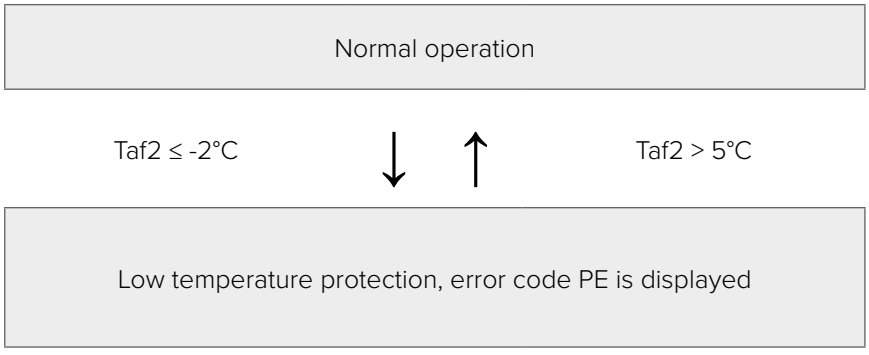


When PE protection occurs 3 times in 60 minutes, it becomes a blocking alarm, follow the instruction to restore the normal operation.

Taf2: Water side heat exchanger anti-freezing temperature

When water side heat exchanger anti-freezing temperature (Taf) is at or below 3°C for more than 3 seconds, the system displays PE protection and the corresponding unit stop running. When water side heat exchanger anti-freezing temperature (Taf) rise to 10°C or higher and downtime of more than 3 minutes, the compressor enters re-start control. Use the user interface to clear the error.

Water side heat exchanger low temperature protection control in low outlet water mode



When PE protection occurs 3 times in 60 minutes, it becomes a blocking alarm, follow the instruction to restore the normal operation.

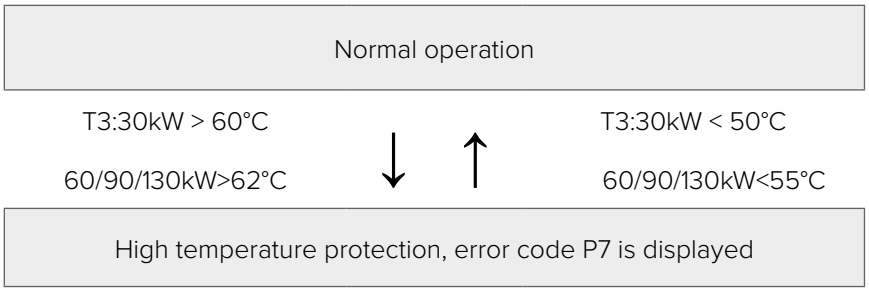
When water side heat exchanger anti-freezing temperature (Taf) is at or below -2°C for more than 3 seconds, the system displays PE protection and orders the corresponding units to stop running. When water side heat exchanger anti-freezing temperature (Taf) rise to 5°C or higher and downtime of more than 7 minutes, the compressor enters re-start control. Use the user interface to clear the error.

Note: If antifreeze is added in the system, the lower limit of starting antifreeze protection can be lowered.

5.12.9 Source liquid temperature limit protection control

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

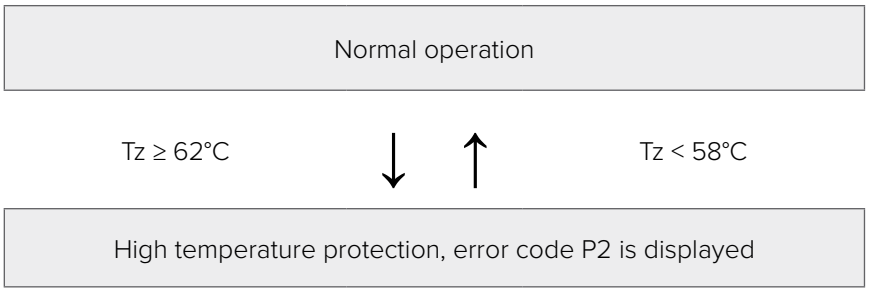
Air side heat exchanger high temperature protection control 1



Note: T3: Air side heat exchanger refrigerant outlet temperature

When the air side heat exchanger refrigerant outlet temperature (T3) rises above the limits indicated above, the system displays P7 protection and the unit stops running. When the air side heat exchanger refrigerant outlet temperature (T3) drops below the restoring value, the compressor enters re-start control.

Air side heat exchanger temperature protection control



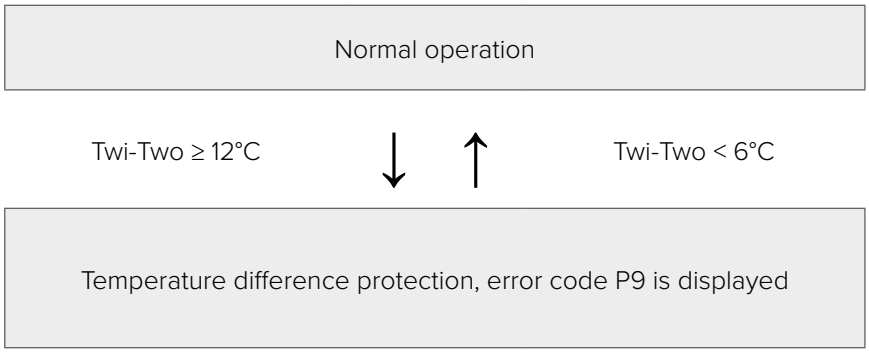
Note:. Tz: Air side heat exchanger refrigerant total outlet temperature

When the air side heat exchanger refrigerant outlet temperature (Tz) rises above the limits indicated above, the system displays P2 protection and the unit stops running. When the air side heat exchanger refrigerant outlet temperature (Tz) drops below the restoring value, the compressor enters re-start control.

5.12.10 Water Side Heat Exchanger Temperature Difference Protection Control

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

Water side heat exchanger temperature difference protection control



When P9 protection occurs 3 times in 60 minutes, it becomes a blocking alarm, follow the instruction to restore the normal operation.

Notes:

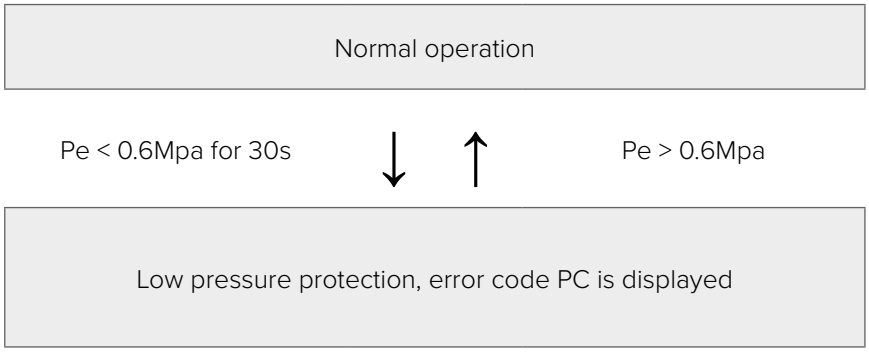
1. Twi: Water side heat exchanger inlet temperature
2. Two: Water side heat exchanger outlet temperature
3. The value of | Twi-Two | can be changed according to actual usage by HMI.

When the temperature difference rises at or above 12°C, the system displays P9 protection and the unit stops running. When the Temperature difference drops below 6°C, the compressor enters re-start control.

5.12.11 Water Side Heat Exchanger Low Pressure Protection Control

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

Water side heat exchanger low pressure protection control in normal cooling mode

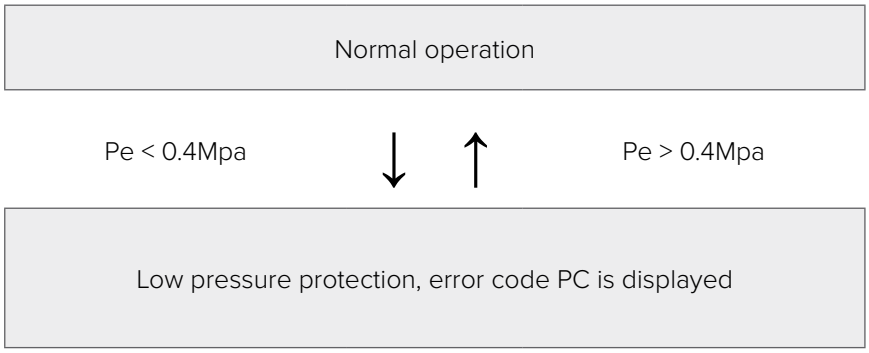


When system displays PC protection and a manual system restart is required before the system can resume operation.

Notes:. Pe: Suction pressure

In normal cooling mode, when the suction pressure drops below 0.6MPa for 30s, the system displays PC protection and the unit stops running. When the suction pressure is above 0.6Mpa, the compressor enters re-start control. It will not display the PC error when the suction pressure drops below 0.6Mpa for 30s for the first time until the suction pressure drops below 0.6Mpa for 30s for the second time in 30 minutes.

Water side heat exchanger low pressure protection control in low outlet water cooling mode



When system displays PC protection and a manual system restart is required before the system can resume operation.

Notes:. Pe: Suction pressure

In low outlet water cooling mode, when the suction pressure drops below 0.4Mpa, the system displays PC protection and all the units stop running. When the suction pressure is above 0.4Mpa, the compressor enters re-start control. It will not display the PC error when the suction pressure drops below 0.4Mpa for the first time until the suction pressure drops below 0.4Mpa for the second time in 30 minutes.

5.12.12 Pump motor protector pre-alarm

This logic is applied only for Sheen 130 kW with double pump configuration. Motor protectors for the pumps are normally open and they will close when one of the pump have a failure.

The electrical connections are in this way: each pump is connect to a motor protector, this is necessary to assure the continuity of the system if one pump have a failure the second pump will continue to work. The main board is connected to the motor protector on connecter CN3=pump1 and CN10=pump2.

This function work in 2 steps:

- Step 1: Failure on pump1 ➔ motor protector of pump1 open ➔ connecter CN3 open ➔ display 1Pf ➔ pump2 continue to run
- Step 2: Failure on pump2 ➔ motor protector of pump2 open ➔ connecter CN10 open ➔ display 2Pf ➔ pump1 continue to run

The pre-alarm gives an information to the user that should ask for a technical assistance, ensuring that the system in most of the case will continue to operate (maybe with reduced flowrate compared to the nominal one).

5.12.13 Tp probe failure or TDSH protection

After the compressor runs for 5 min, F2 is detected according to the following conditions:

- If TDSH ≤ 0 last for 20 min, stop the unit and display F2
- If TDSH ≤ 5 last for 60 min, stop the unit and display F2

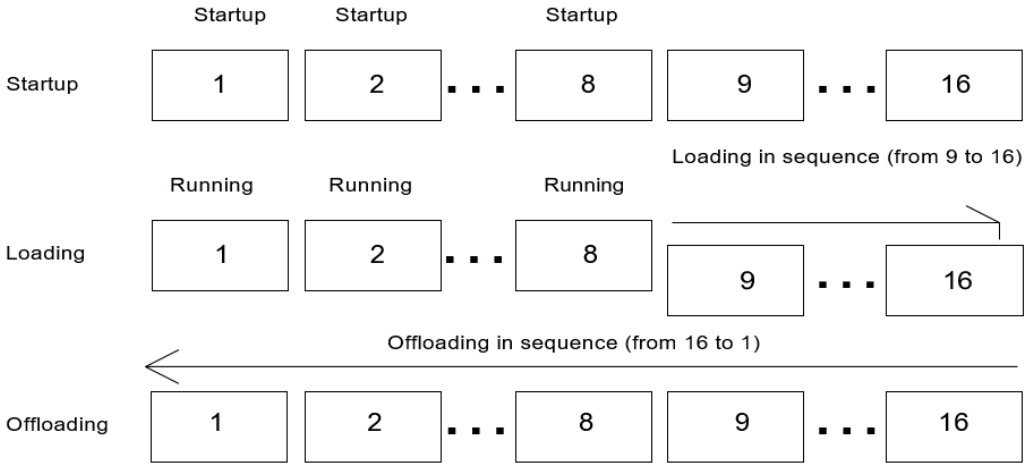
During defrosting F2 is not detected.

5.12.14 Loading and offloading for multiple units system

In systems with multiple units ,

- When the units are powered on for the first time, if there is a load requirement, 50% of the units turn on, starting with the master unit. As the leaving water temperature approaches its set temperature, units shut down in succession, starting with the unit with the highest address. Once the set temperature has been reached, the master unit shuts down.
- The next time a load requirement exists, Start loading from the last one, and load in the order of addresses from large to small. When the unit satisfies the unloading conditions, the last-loaded unit will be unloaded first.

Bellow an example in a system with 16 units.



Note: Set the correct address on each unit. Address 0 for Master unit and from 1 to 16 for slaves units

5.12.15 Defrosting Operation

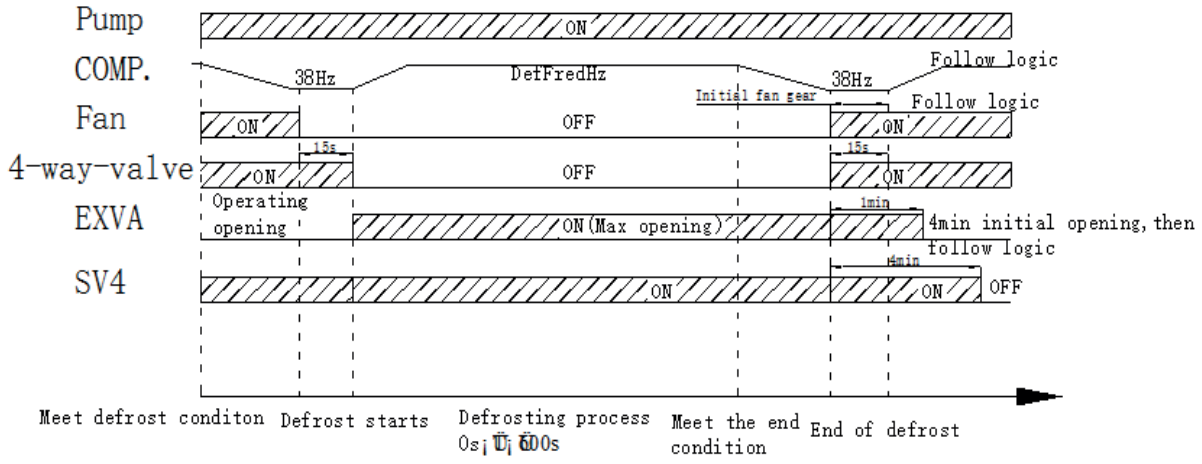
In order to recover heating capacity, the defrosting operation is conducted when the unit air side heat exchanger is performing as an evaporator. The defrosting operation is controlled according to outdoor ambient temperature (T4), air side heat exchanger refrigerant outlet temperature (T3), the compressor running time and inlet water temperature (Twi).

The condition to enter in defrosting mode are related to T3, Twi, time of operation: when T3<-2°C for a defined time, the unit enter in defrosting mode. The counting time is related to Twi and T4.

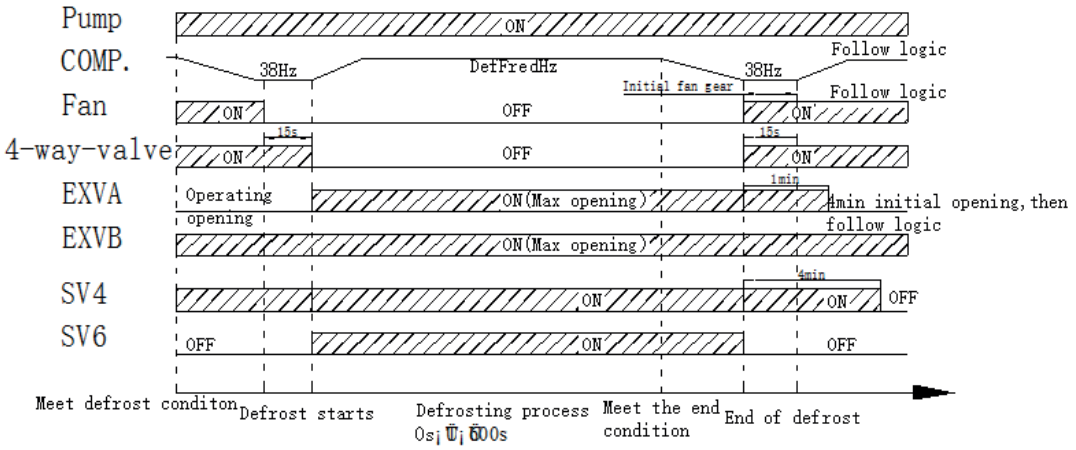
The defrosting operation ceases when any one of the following three conditions occurs:

- Defrosting operation duration reaches a maximum timing.
- The air side heat exchanger refrigerant outlet temperature reaches the target temperature (T3 = 15 °C).
- The water outlet temperature is at or below 5 °C.

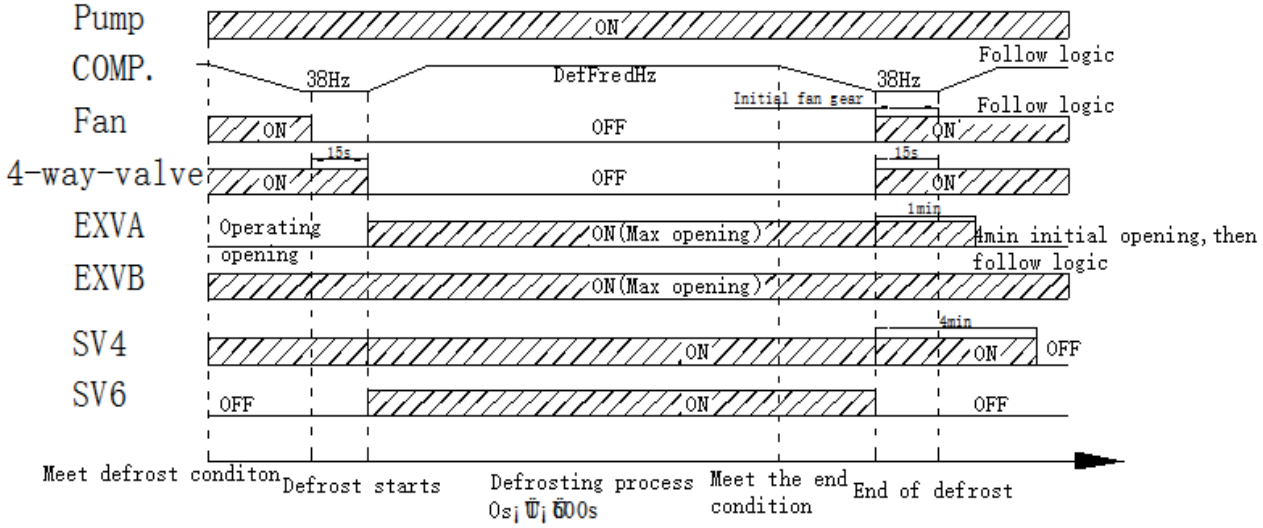
Component control during defrosting for Sheen 30kW



Component control during defrosting for Sheen 60kW



Component control during defrosting for Sheen 90/130kW



5.12.16 Additional control

When dial switch S5_3 on main PCB is switched ON, additional control HMI is valid. Connect a remote controller to command the unit. When dial switch S5_3 is switched OFF, additional control is invalid. Use HMI on-board to command the unit. In a cascade system only master unit have HMI that can command the system. In any case it's possible to run the system with a remote controller connected to the master if the master is configured with S5_3 ON.

When dial switch S5_3 is switched ON and disconnect a wired controller:

- The system ON/OFF state is controlled by the ON/OFF port (XT2 15-24 on the customer connections terminals). Close contact means system on, open contacts means system off.
- The mode of the system is controlled by the Cool/Heat port (XT2 15-24 on the customer connections terminals). Close contact means system running heating mode, open contacts means system system running cooling mode.
- The default water outlet temperature setting in heating mode is 45°C and in cooling mode is 7°C. The default hysteresis temperature setting is 2°C.

When dial switch S5_3 is switched ON and the unit is connected to a remote wired controller, the HMI on-board is not operative.

The double set point is controlled by the TEMP-SW port. Close the contact XT2 20-25 enable the second set point, open contact means the primary set point is valid.

6. Mandatory Commissioning settings

- Pump settings
- Pum control
- Temperature compensation settings
- Auxiliary heaters settings Heat1 & Heat2
- Silence function settings
- Energy saving or Demand limit settings
- DHW (Domestic hot water) settings

6.1 Pump settings

It can be four configurations of the pump based on the system configuration.

6.1.1 Stand-alone configuration with an inverter pump.

A If the unit is equipped with an inverter pump on board, as a first check see if Dip-Switch S12-2 is set to ON (upward). In this case the unit will automatically control the pump, varying the flow rate, maintaining a ΔT=5°C (value that cannot be modified). In Menu ➜Project Menu (under password) ➜ Inv. pump ratio the default values are Min. ratio = 80% Max. ratio = 100%. Once the unit has been installed, it is up to the ATC to properly evaluate the system pressure drops and consequently evaluate the Min.ratio value at which the inverter pump must operate. This value is essential as it must indicate the minimum speed of the pump to guarantee the minimum water flow to the unit declared in the bulletin, otherwise flow alarms will occur when the unit limits the frequency of the compressors.
Periodic function setting
With Dip-Switch S12-2 set to ON Menu ➜ Service Menu (under password) ➜ Pump control ➜ Pump on/off time. After reaching the set point and the post-pumping time, the unit switches off the pump for a time equal to Pump OFF Time and switches on again for a time equal to Pump ON Time. If during this period there is no request to switch on the compressors, the unit switches off the pump again. With Pump OFF Time = 0 the pump is always on.

B If you want to have a fixed flow rate in the system, first check whether Dip-Switch S12-2 is set to ON (upwards).
In the Menu ➜ Project Menu (under password) ➜ Inv. pump ratio
Set the same value for Min. ratio and Max ratio. Min. ratio = Max. ratio The value must be defined in order to obtain the design delta T at nominal operating conditions.

6.1.2 Configuration of multiple units in cascade, where each unit is equipped with an on-board inverter pump.

A Set Dip-Switch S12-2 in the ON position (upward) for each unit: refer to point 1

6.1.3 Configuring multiple units in cascade, with single pump in the system.

A Set Dip-Switch S12-2 to the OFF position (down) for each unit. Menu ➜ Service Menu (under service password) ➜ Inv pump setting ➜ Switch on the pump (set Yes) ➜ Ratio Pump (set the pump speed according to the system pressure drops in order to guarantee a required flow rate (higher than the minimum flow required)

6.1.4 Stand alone or cascade unit configuration with ON-OFF pump on board the unit

A Check that Dip-Switch S12-2 is set in the ON position (upwards). In this case there will be no possibility of having a modulating flow rate to maintain ΔT=5°C.
General DIP switch setting overview:

	Single unit	Cascade system
Pump on board	S12_2 ON	S12_2 ON
External pump	S12_2 ON	S12_2 OFF

6.2 Pump control

This system supports both fixed frequency water pump and inverter water pump. The fixed frequency water pump is controlled by the PUMP port, fixed port, the inverter water pump is controlled by the PUMP-V port, the 0-10 V port.

Inv pump ratio		
Min. ratio	◀80 ▶	%
Max. ratio	◀100 ▶	%
←Ok	▲▼◀▶	

6.2.1 Stand-alone system pump control

Multiple pump configuration Dip-Switch S12-2 ON, for the pump configuration. In case the unit is equipped with an inverter pump is necessary to define the minimum ratio of the pump after an accurate evaluation of the system pressure losses. In addition this type of configuration allows to have a ΔT=5K water flow control.

Note:

When the remote control is valid, the system is not connected to the HMI, the pump keeps outputting 100% (10V).

6.2.2 ΔT=5K control multiple pump system

In cooling/heating mode, the pump adjustment range is [Ratio_Min, Ratio_Max]; in DHW mode, the system keeps the output at 100%.

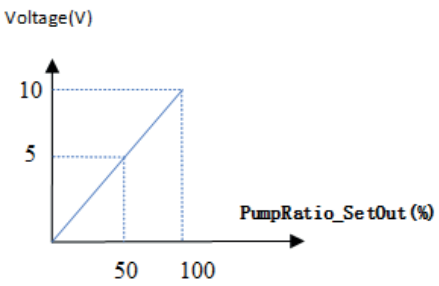
If it is the first time start-up, after being powered on, the pump start with Ratio_Max and enters the temperature difference control after compressor runs for 30 min. After entering the temperature difference control, any change in the compressor status like: defrost or during the anti-freezing operation, the pump runs at Ratio_Max for 20 min of compressor work and then enters the temperature difference adjustment. The adjustment period is 2 min.

6.2.3 Single pump system

The following function is working only if the Min.Ratio=MaxRatio

The voltage output follows the control logic:

For example: if PumpRatio =50%, the PCB outputs 5V; if PumpRatio=100%, the PCB outputs 10V.



Note: Min.ratio=30%

6.2.4 Forced pump open

The HMI can be set to force the pump on (one-time effective). In single pump system, the master judges; in multiple pumps system, each unit judges separately.

Pump control	Forced pump open	
Forced pump open	Select address	◀ 7 ▶#
Inv pump setting	Forced pump open	◀No ▶
Pump on/off time		
⮐ Enter	⮐ Ok	

Entry conditions (all met):

- Receive the force on command from the HMI;
- The unit is in shutdown mode;
- After 4 min of meeting the above 2 conditions, turn on the water pump;

Exit one met conditions:

- Non-shutdown mode;
- The water pump runs for 2h;
- starting anti-freeze protection;
- When H5, E8, E9 are reported, the water pump will be shut down immediately.

6.2.5 Inverter pump setting

Function valid with single pump configuration Dip-Switch S12-2 OFF.

Pump control	Inv pump setting	
Forced pump open	Select address	◀ 7 ▶
Inv pump setting	Switch on the pump	◀Yes▶
Pump on/off time	Ratio pump	◀100▶ %
⮐ Enter	⮐ Ok	

6.2.6 ON/OFF time pump settings

Pump on/off time	
Pump on time	◀ 5 ▶ min
Pump off time	◀ 5 ▶ min
⮐ Ok	

“Pump on time” sets the running time, the setting range is 5~60, the default is 5, and the adjustment range is 5; “Pump off time” sets the interval off time. The setting range is 0~60, the default is 0, and the adjustment range is 5.

6.3 Cascade system

6.3.1 Cooling – cascade system loading and unloading function

In a cascade system, when starting up, if Tw≥Tws+10, the initial loading unit number = the total online number *Ratio_Cool_First ; otherwise, the initial loading unit number = 1. After finishing loading the initial loading unit number, it performs a cycle loading and unloading calculation according to the Tvc=Tw-Tws.

Note: Ratio_Cool_First and Ratio_Heat_First can be adjusted in Project Menu -> Set parallel unit default value is 50%

6.3.2 Heating – cascade system loading and unloading function

In a cascade system, when starting up, if Tw≤Tws-10, the initial loading unit number = the total number of online*Ratio_Heat_First; otherwise, the boot loading unit number = 1. After the boot loading is completed, it performs a cycle loading and unloading calculation according to the following table.

6.3.3 System rotation function

Loading (+1): Loading boots from #0 for the first time after power-ON, the master loads the slaves in the ascending sequence of addresses. After all units are shut down, when being restarted again, the loading procedure works in descending sequence.

Unloading (-1): When the master is going to unload the slaves, the one that is loaded lastly shall be unloaded firstly.

Code	Modbus Errore code (1)	Description	Troubleshooting	
			Stop system	Stop unit
E2	3	XYE communication lost	✓ (master)	✓ (slave)
E3	4	Tw failure (the master is valid)	✓	
E4	5	Twout failure		✓
E5	6	1E5- T3A failure		✓
		2E5- T3B failure		✓
E6	7	T5 failure	✓ single pump (2)	✓ multi-pump
E7	8	T4 failure		✓
E8	9	Power phase detector alarm	✓ (master)	✓ (slave)
E9	10	E9 Water flow detection failure	✓ (single pump)	✓ (multi-pump)
		2E9 Water pressure detection failure	✓ (single pump)	✓ (multi-pump)
xEb	12	1Eb-Taf1 failure		✓
		2Eb-Taf2 failure		✓
EC	13	Slave module reduction	x (3)	x
Ed	14	Both Tp of A system and Tp of B system are failure		✓
EE	15	1EE-T6A failure		✓
		2EE-T6B failure		
EF	16	Twi failure		✓
EP	19	Tp is too high		✓
EU	20	Tz failure		✓
P0	21	System high pressure protection or Tp protection		✓
P1	22	System low pressure protection		✓
P2	23	Tz is too high		✓
P3	24	T4 is out of cooling working range		✓
P4	25	System A Current Protection		✓
P5	26	System B Current protection		✓
P7	28	T3 is too high		✓

Code	Modbus Errore code (1)	Description	Troubleshooting	
			Stop system	Stop unit
P9	30	The difference between Twi and Two is too high		✓
PA	31	The difference between Twi and Two is abnormal		✓
xPb	32	Pb- Anti-freeze reminder	x	x
		1Pb- electric heating insufficient reminder	x	x
		2Pb- electric heating is seriously insufficient reminder	x	x
PE	35	Cooling evaporator low temperature antifreeze protection		
PH	37	T4 is out of heating working range		
xPf	36	1Pf pump motor protector pre-alarm	(stop pump)	(stop pump)
		2Pf pump motor protector pre-alarm	(stop pump)	(stop pump)
PL	38	Tfin is too high		✓
xPU	40	1PU-DC fan A module protection		✓
		2PU-DC fan B module protection		
H5	46	Voltage is too high or too low		✓
xH9	50	1H9: A press drive model does not match		✓
		2H9: B press drive model does not match		
xHE	55	A valve is not inserted fault 1HE		✓
		B valve not inserted fault 2HE		
		C valve not inserted fault 3HE		
xF0	61	1F0: IPM module communication failure		✓
		2F0: IPM module communication failure		
F2	63	Insufficient exhaust superheat protection or exhaust temperature sensor falling off		✓
xF4	65	1F4: L0 or L1 protection occurs 3 times within 60 min		✓
		2F4: 3 occurrences of L0 or L1 protection within 60 min		
xF6	67	1F6 A system bus voltage fault (PTC)		✓
		2F6 B System bus voltage fault (PTC)		✓
Fb	72	Pressure sensor failure		✓
Fd	74	Return air temperature sensor failure		✓

Code	Modbus Errore code (1)	Description	Troubleshooting	
			Stop system	Stop unit
xFF	76	1FF-DC fan A fault		✓
		2FF-DC fan B fault		
		3FF-DC fan B fault		
FP	79	Dial codes of multiple pumps are inconsistent		✓
C7	88	3 times PL report C7		✓
dF	136	Defrosting reminder	x	x
L0	101	L0 module protection	✓ (single pump)	✓ (multi-pump)
L1	102	L1 low voltage protection		
L2	103	L2 high voltage protection		
L3	104	Reserved		
L4	105	L4MCE failure		
L5	106	L5 zero speed protection		
L6	107	Reserved		
L7	108	L7 phase loss		
L8	109	L8 frequency changes over 15Hz		
L9	110	L9 frequency difference 15Hz		
xbH	157	1bH: Module 1 relay is stuck or 908 chip self-check failed 2bH: Module 2 relay is stuck or 908 chip self-check failed		

1 When the error code appears, the error code corresponding to the error code can be obtained through the H1 - H2 port by using the host computer to query the wired controller register

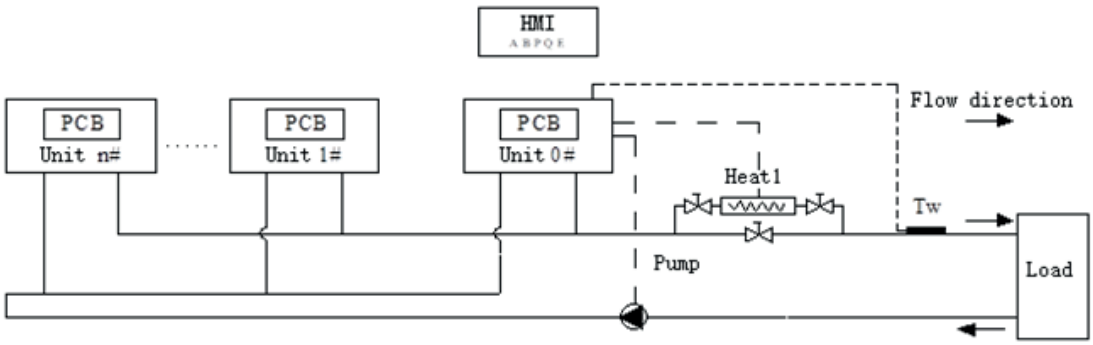
2 In single-pump system, if T5 failure, then the whole system works no more in DHW; but the AC mode can work.

3 “x” represents that this error has no business with troubleshooting.

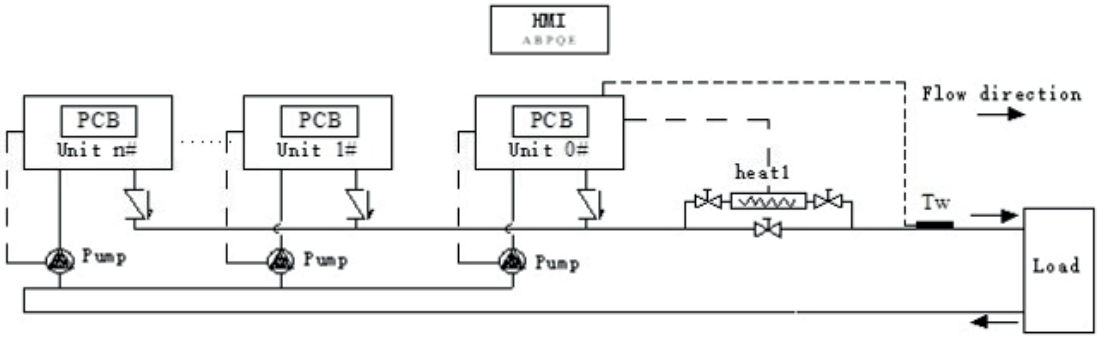
6.3.4 Heating/Cooling pump control

Troubleshooting: In the single pump system, when the master has a fault and needs to be shut down, all the units will be shut down; in the multiple pumps system check the error code table.

Schematic diagram of multiple pump system in cascade heating/cooling (n≤15):



Schematic diagram of multiple pump system in cascade heating/cooling (n≤15)



6.3.5 Cascade system DHW pump control

To switch from (Heating/Cooling) to DHW, the system will be stopped firstly and then switches to DHW. When installing the unit, it needs to select whether it is a single pump or a multi-pump installation through the SW12-2. All unit water pump settings in the same system should be consistent. When the water pump dial code selection is inconsistent, FP will be reported. FP stop the whole system.

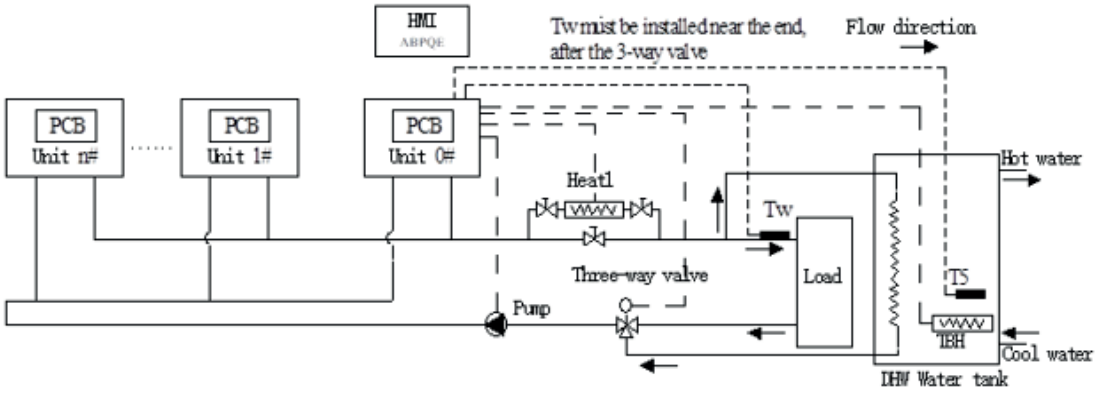
Pump selection (S12-2)	DHW enable (HMI config)	DHW switch	DHW priority (HMI config)	
single pump	disable	DHW doesn't work	Configuration invalid	valid on master unit
	enable	Control by user	Configuration invalid	
Multi-pump	disable	DHW doesn't work	Configuration invalid	valid on both master and slave unit
	enable	Control by user	Configuration valid	

6.4 Single pump

In the single pump system only the master controls the water pump, and the slaves do not, the master DHW is valid, and the slave DHW is invalid. The priority of DHW mode is invalid, and the mode only can be switched manually on the HMI. Only the master detects T5, the slave does not.

When the master has H5, E8, and E9, the water pump will be shut down immediately, and rebooted after the fault is restored. When the master has other fault, the pump will be shut down with a delay of 2 min, and rebooted after the fault is recovered.

DHW schematic diagram of single pump system in cascade (n≤15)

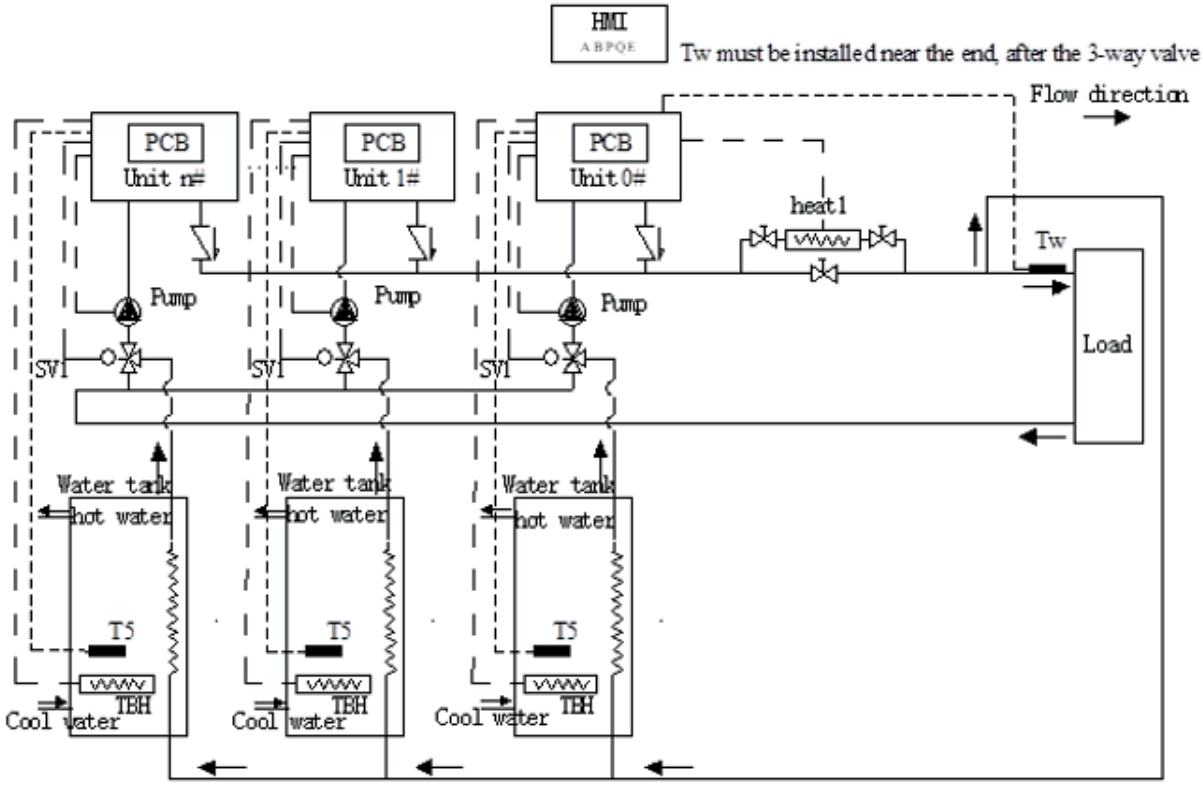


6.5 Multi-pump

In multiple pumps system, both master and slaves can be configured separately whether DHW is valid. If the DHW is set to be valid, it is necessary to set whether DHW has priority at the same time. The units with DHW valid have the following controls:

- The T5 and Taf1 sensor states must be detected; in this case, two modes of cooling and heating are displayed on the HMI, and the DHW on/off and T5s are set separately on the HMI based on the unit address.

DHW schematic diagram of multiple pump system in cascade (n≤15)



Note: Check the parameter on Project Menu -> Set DHW time

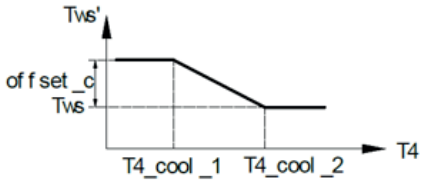
6.6 Temperature compensation

(Under service password)

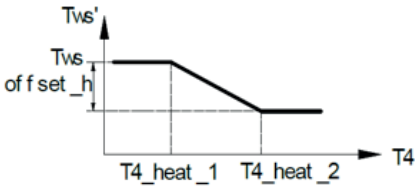
Temperature compensation

Press “▲” or “▼” to select “TEMPERATURE COMPENSATION ” under the “SERVICE MENU” page. Press “OK ” and enter submenu:

Temp. compensation	
Cool mode enable	◀Yes ▶
T4_Cool_1	◀25 ▶°C
T4_Cool_2	◀40 ▶°C
Offset_C	◀10 ▶°C
←Ok 1/2	▲▼◀▶



Temp. compensation	
Heat mode enable	◀Yes ▶
T4_Heat_1	◀-10 ▶°C
T4_Heat_2	◀15 ▶°C
Offset_H	◀10 ▶°C
←Ok 2/2	▲▼◀▶



Press “▲” or “▼” to select item and press “←” or “→” to set value. Then press “ ” to confirm

Tws – is not showed on the HMI display, check it in the User Menu

Title	Effect	Predetermined area	Defaults	Adjustment range
Cool mode enable	Cooling is effective	Yes/No	NO	/
T4_Cool_1	T4 temperature 1	15°C-30°C	25°C	1
T4_Cool_2	T4 temperature 2	35°C-45°C	40°C	1
Offset_C	return temperature	0°C-15°C	10°C	1
Heat mode enable	Heating is effective	Yes/No	NO	/
T4_Heat_1	T4 temperature 1	-15°C-10°C	5°C	1
T4_Heat_2	T4 temperature 2	15°C-30°C	15°C	1
Offset_H	return temperature	0°C-30°C	10°C	1

6.7 Auxiliary heaters settings Heat1 & Heat2

6.7.1 HEAT1 (system)

The following description is only valid for heat pump operation

Antifreeze electric Heating (Valid only with auxiliary heaters)

Function valid with Dip-Switch S6-1 in OFF position (downwards). In this case the electric heaters work as antifreeze protection. The heater activates once the Two<6°C and deactivate it for Two≥°C.

6.7.1.1 Auxiliary heater as integration of the heat pump

To activate the functions of the heat pump integration resistor you must make sure that the Dip-Switch S6-1 is in the ON position (upwards) in addition to the Dip-Switch make sure you have activated the Heat1 from the HMI Menu → Service Menu → Heat Control → Heat1 → Heat1 Enable (set Yes), as for the other parameters, they must be configured according to your needs once you understand their function that is described below. Within 2 minutes after switching on the pump the auxiliary heater control is kept in OFF after which the following cases may occur:

a. Operation of the auxiliary heater when the heat pump can't work

When the heat pump cannot work due to failure or is in alarm protection (not limitation of compressors) in this case the auxiliary heater intervenes in place of the heat pump when the water temperature is less than 3K compared to the set point and turns OFF once the water temperature has exceeded the set point of 2K (Value adjustable by the HMI).

b. Force Heat1 in ON

To force the auxiliary heater follow the instruction: Menu ➔ Service Menu ➔ Heat Control ➔ Heat1 ➔ Heat1 Enable ➔ Force Heat1 open (Set Yes). This will start the operation of the auxiliary heater manually. Once you reach the set point of the auxiliary heater it will turn off. The manual command is valid only once so even if the water temperature drops below the set point it will not start automatically and will need a new manual command to start.

c. Auxiliary heater with low outdoor air temperature

In case the unit is operating in heat pump with an air temperature lower than 5 ° C (Value adjustable by the HMI) but does not reach the set point within 90 min (value adjustable by HM) then the auxiliary heater is integrated with the heat pump.

d. Auxiliary heater when the heat pump capacity is insufficient

In case the set point is higher than the maximum set point of the unit envelope then the auxiliary heater is activated in integration with the heat pump.

Values adjustable from the HMI for Heat1

Title	Effect	Predetermined Area	Default
Heat1 Enable	Auxiliary heater	No/Yes	No
T_Heat1_Delay	Activation time	60.....240 min	90 min
DT_Heat1_OFF	ΔT off as regards set point	2.....10°C	2°C
T4_Heat1_ON	Outdoor air temperature under which auxiliary heater intervenes Heat1	-5.....13°C	5°C

6.7.2 HEAT2 (DHW – domestic hot water)

Activate the Heat2 from Menu ➔ Service Menu ➔ Heat Control ➔ Heat2 ➔ Heat2 Enable (set Yes). If the unit is in E6 protection (T5 error – DHW tank probe) or T5>71°C the electrical heater doesn't active.

a. Operation of the auxiliary heater when the heat pump can't work.

When the heat pump cannot work due to failure or is in alarm protection (not limitation of compressors) in this case the auxiliary heater intervenes in place of the heat pump when the water temperature is less than 5K (value settable by the HMI) compared to the set point and turns OFF once the water temperature has exceeded the set point of 5K (Value adjustable by the HMI).

b. Force Heat2 in ON.

To force the auxiliary heater follow the instruction: Menu ➔ Service Menu ➔ Heat Control ➔ Heat2 ➔ Heat2 Enable ➔ Force Heat2 open (Set Yes). This will start the operation of the auxiliary heater manually. Once you reach the set point of the auxiliary heater it will turn off. The manual command is valid only once so even if the water temperature drops below the set point it will not start automatically and will need a new manual command to start.

c. Auxiliary heater with low outdoor air temperature.

In case the unit is operating in heat pump with an air temperature lower than 5 ° C (Value adjustable by the HMI) but does not reach the set point within 90 min (value adjustable by HM) then the auxiliary heater is integrated with the heat pump.

d. Auxiliary heater when the heat pump capacity is insufficient.

In case the set point is higher than the maximum set point of the unit envelope then the auxiliary heater is

activated in integration with the heat pump.

e. Auxiliary operation when the tank temperature is too low.

This function activates when the tank temperature T5<15°C and continue to be activated until the T5>15°C.

f. Auxiliary operation with multiple ON7OFF of the compressor in DHW.

When there is a succession of ON-OFF cycles greater than 2 of the compressor in DHW mode, to avoid too many ON-OFF cycles the auxiliary heater intervenes.

Values adjustable from the HMI for Heat2

Title	Effect	Predetermined Area	Default
Heat2 Enable	Auxiliary heater for DHW	No/Yes	No
T_Heat2_Delay	Activation time	60.....240 min	90 min
DT_Heat2_OFF	ΔT off as regards set point	2.....10°C	2 °C
T4_Heat2_ON	Outdoor air temperature under which auxiliary heater intervenes Heat2	-5.....13°C	5°C

Adjustable parameter for Heat1 and Heat2

	Parameter role	Predetermined area	Defaults	Adjustment range
Heat1 enable	Electric heating 1 enable	Yes/No	No	/
T-Heat1-Delay	Heat1 opening delay	60~240 min	90min	5min
dTw_Heat1_Off	Stop hysteresis temperature	2~10°C	2°C	1°C
T4_Heat1_On	T4 start temperature	-5~20°C	5°C	1°C [SF1]
All heat2 disable	All electric heating 2 are not allowed to be turned on	Yes/No	No	/
Select address	Unit address selection	0~15	0	1
Heat2-Enable	Current address Electric heating 2 is on	Yes/No	No	/
T_Heat2_Delay	Delay opening time	60~240min	90min	5min
dT5_Heat2_Off	Stop hysteresis temperature	2°C10°C	5V	1
T4_Heat2_On	T4 allow opening temperature	-5°C20°C	2°C	1
Select address	Address selection	0~15	0	1
Forced heat2 open	Force Heat2 on	Yes/No	No	/

[SF1]New items. Valid only when SW6-1 is ON

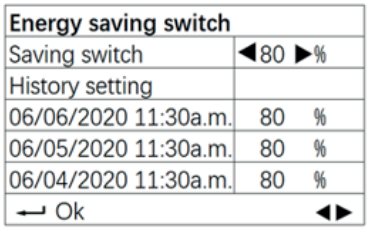
6.8 Silent mode

This menu is used to configure parameters related to the mute function. After entering, the interface is shown below

Switch to set the silent mode (Standard, Silent, Super silent, Night silent1). After the mute mode is turned on, the mute icon is illuminated.

6.9 Energy saving / demand limit

This menu is used to configure parameters related to system energy saving.



: Energy saving or Demand limit selection from HMI

The result of energy saving setting is converted into energy saving mode and sent to the system, and the corresponding relationship is shown in Table

Saving switch	100	90	80	70	60	50	40	40
energy saving mode	1 (reserved) (1)	2	3	4	5	6	7	8 (reserved) (2)

If the Energy Saving (Demand limit) control is enabled on the REMAU board it will overwrite the setting on the HMI.

1 There aren't any limitation to power input

2 Unit limited to 40% of the total power input

6.10 Energy monitoring

From the user menu Menu ➔ User Menu ➔ Query ➔ State query

This submenu is used to query the brief running status information of each unit. The interface is shown in figure.

At page 2 the current and the total capacity are shown as well as the current and the total power consumption and the current efficiency.

State query	
Select address	◀ 11 ▶ #
Operation state	standby
Running mode	cool
Current silent mode	super silent
⮌ Back 1/3	◀▶

State query	
Current capacity	100 KW
Current power	50 KW
Current efficiency	2
Total capacity	100 MW
⮌ Back 2/3	◀▶

State query	
Total power	50 MW
⮌ Back 3/3	◀▶

6.11 DHW priority

This menu is used to configure parameters related to hot water production. If the system has no hot water production function, you cannot enter this submenu. After entering, the interface is shown in Figure.

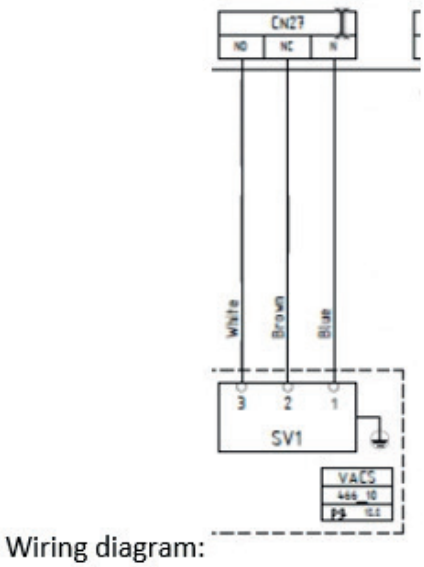
DHW switch	
Select address	◀ 11 ▶ #
DHW switch	◀ Yes ▶
DHW first	◀ Yes ▶
00 01 02 03 04 05 06 07	
08 09 10 11 12 13 14 15	
⮐OK	▲▼◀▶

Switch configuration items and modify setting values by selecting keys (default value Select address=00, DHW switch=No, DHW first=No). When the DHW switch of address X=Yes, the lower unit address displays white characters on a black background, otherwise it displays black characters on a white background.

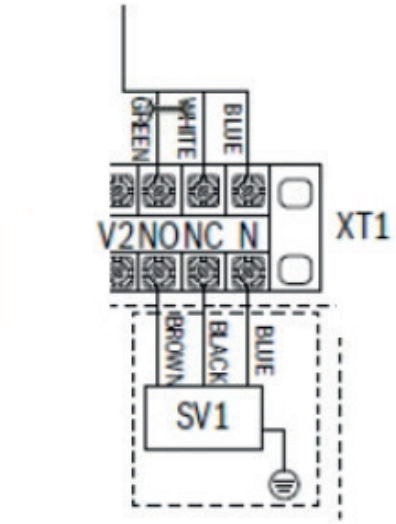
For a cascade system with the following configurations

- Dip-switch S12-2 ON, the DHW priority can be controlled for each unit in addition the system manages itself the Heating/Cooling + DHW mode
- Dip-switch S12-2 OFF, it is not possible to decide the priority of the DHW and it is also not possible to have Heating/Cooling + DHW enabled at the same time; the selection of the operating mode must be done manually from the HMI.

6.12 Three Way valve (manual and wiring diagram)



Wiring diagram:



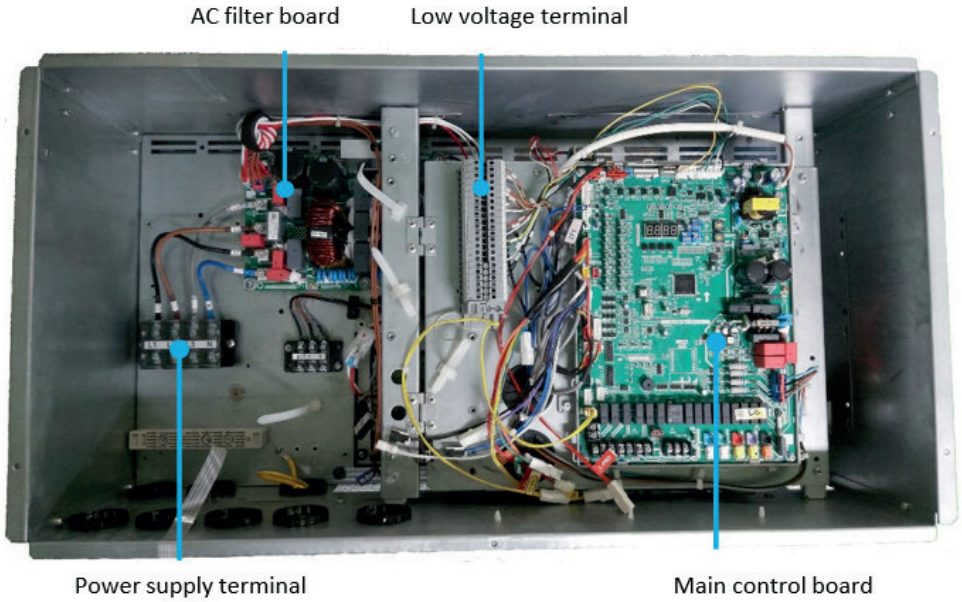
Old manual (wrong)

NC – normally closed heating mode ; NO - normally open domestic hot water mode

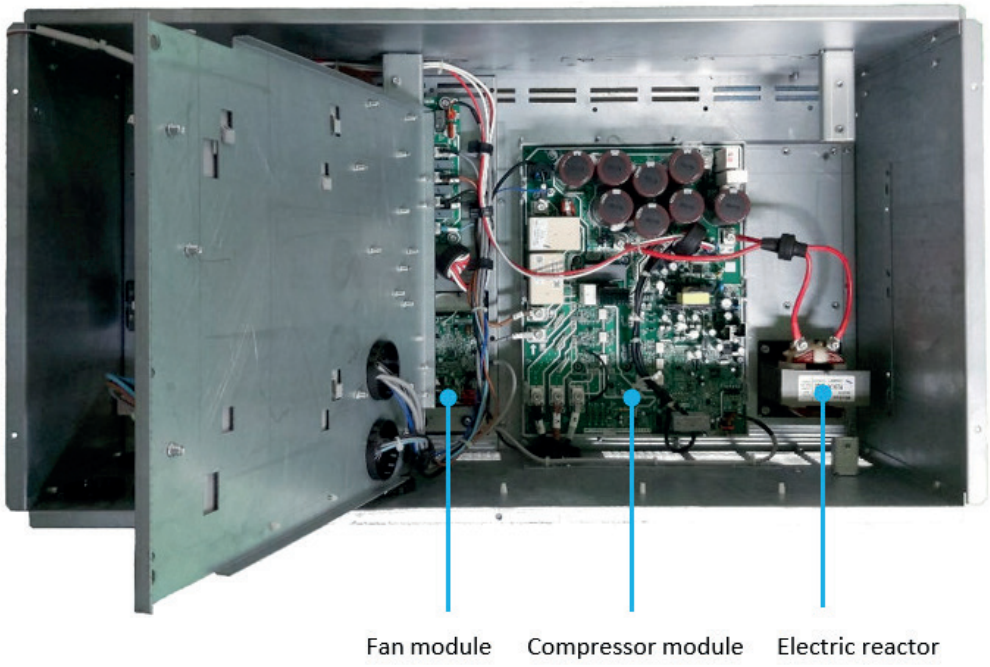
7. Unit Electric Control Box Layout

7.1 Size 10.1-14.1

7.1.1 Electric control box front view- top layer

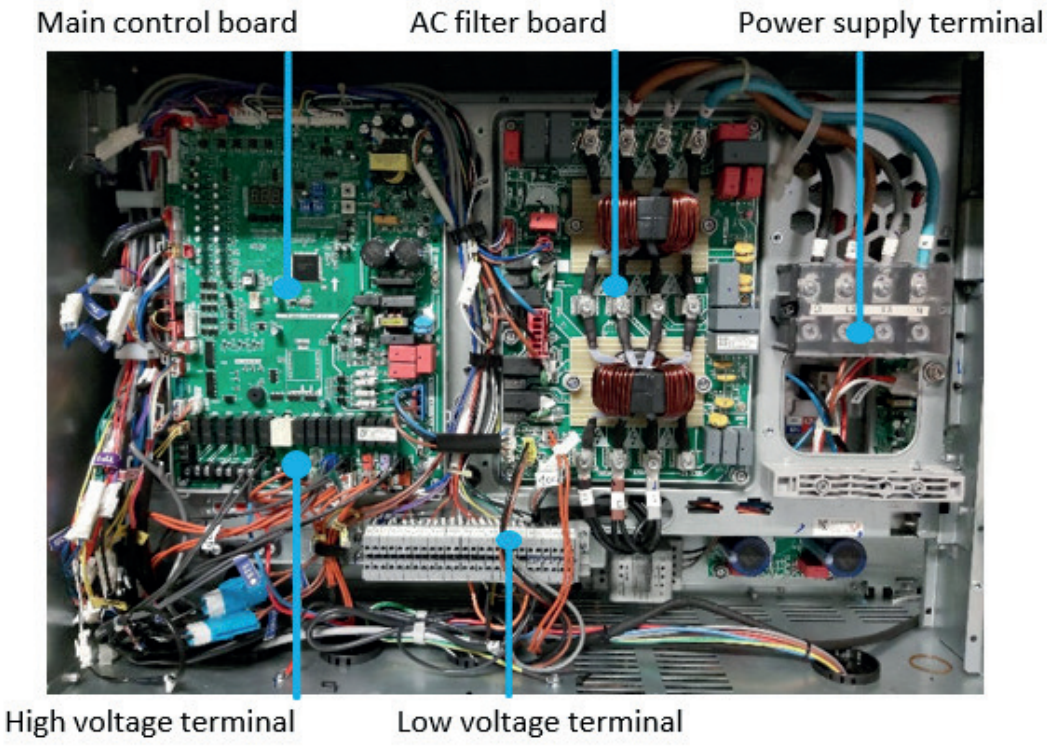


7.1.2 Electric control box front view-bottom layer

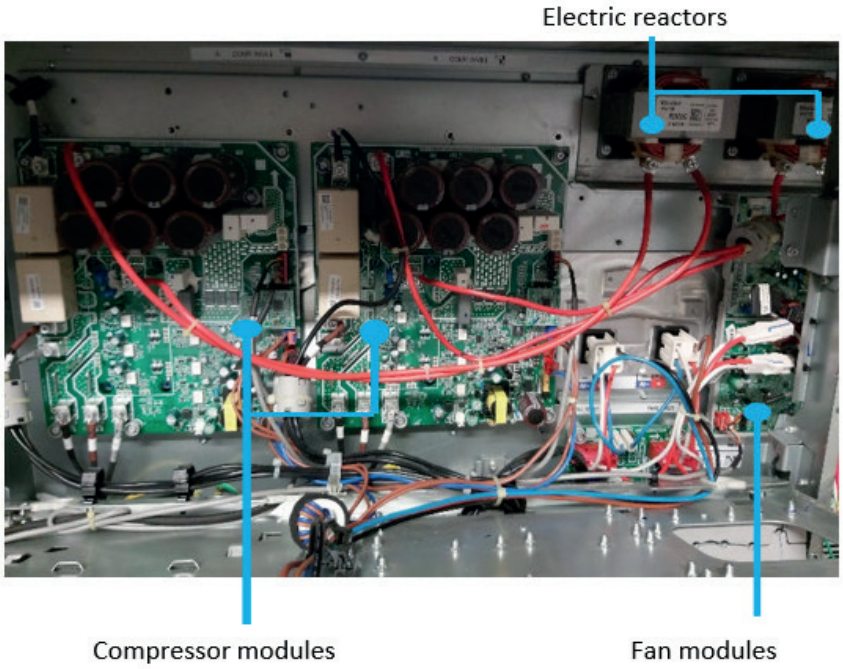


7.2 Size 16.2-22.2

7.2.1 Electric control box front view-top layer

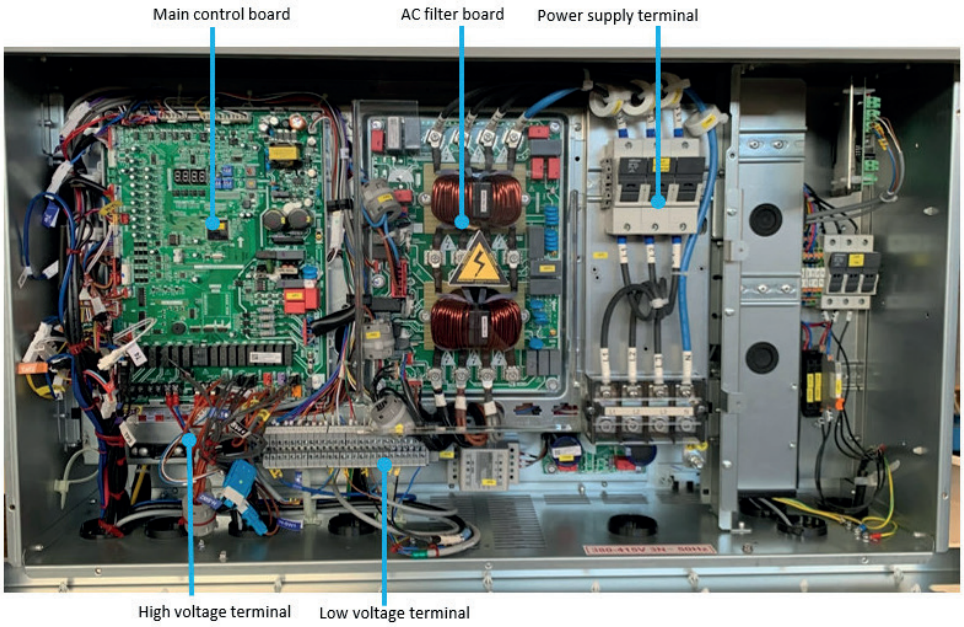


7.2.2 Electric control box side view-bottom layer

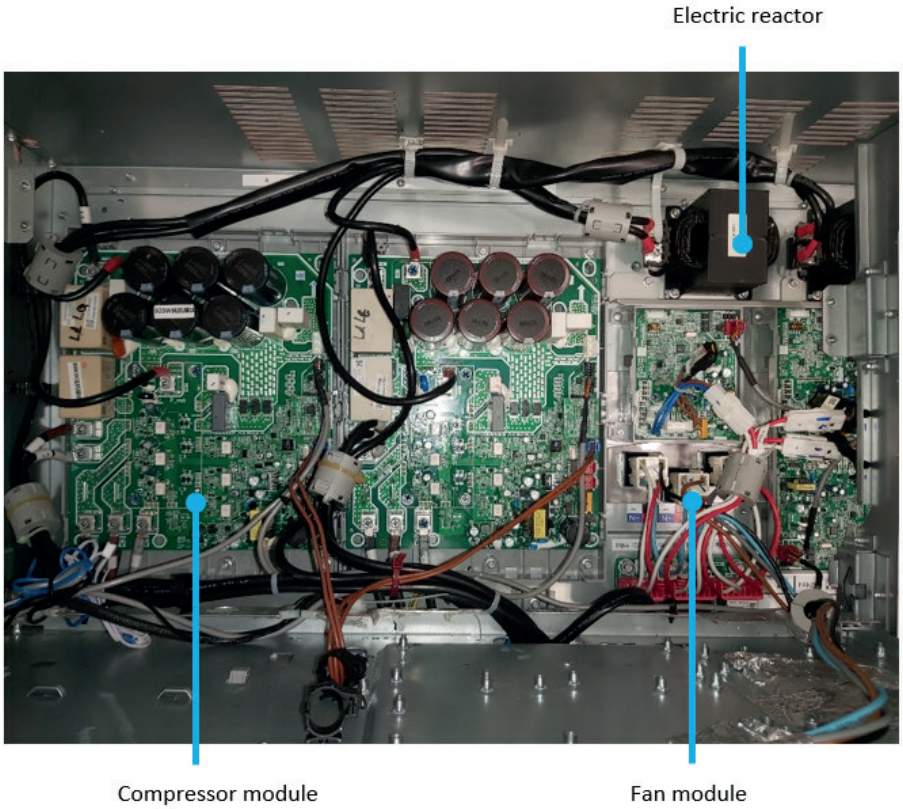


7.3 Size 30.2-55.2

7.3.1 Electric control box front view-top layer size 30.2-55.2

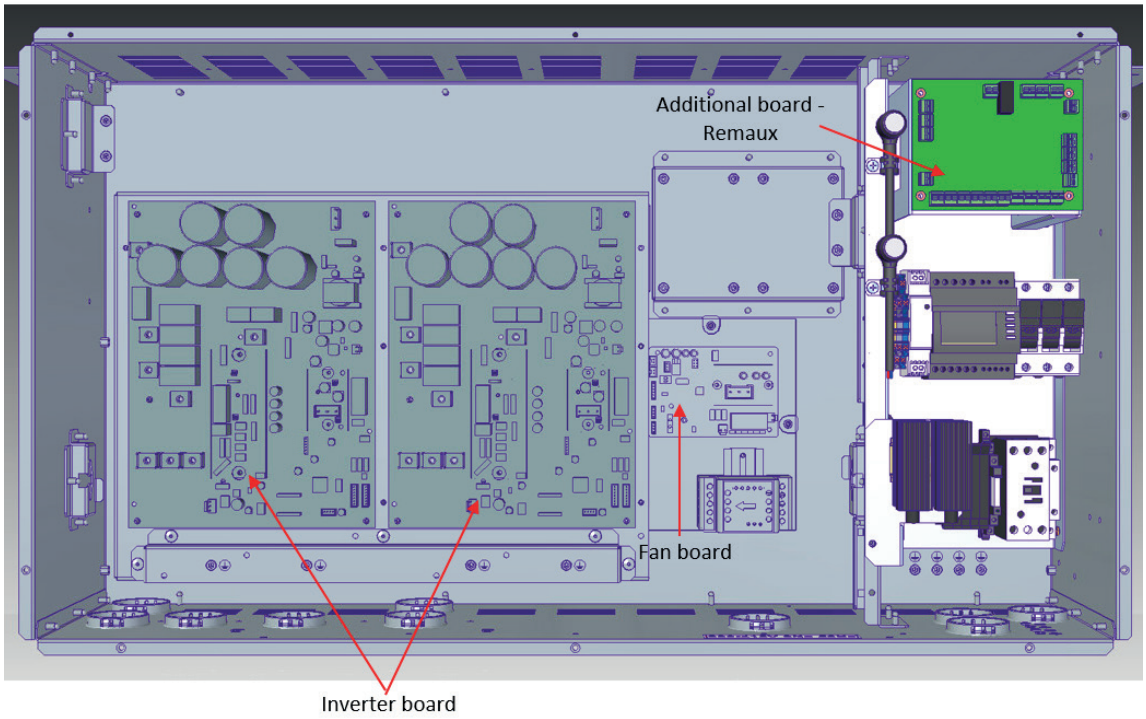


7.3.2 Electric control box side view-bottom layer size 30.2-40.2

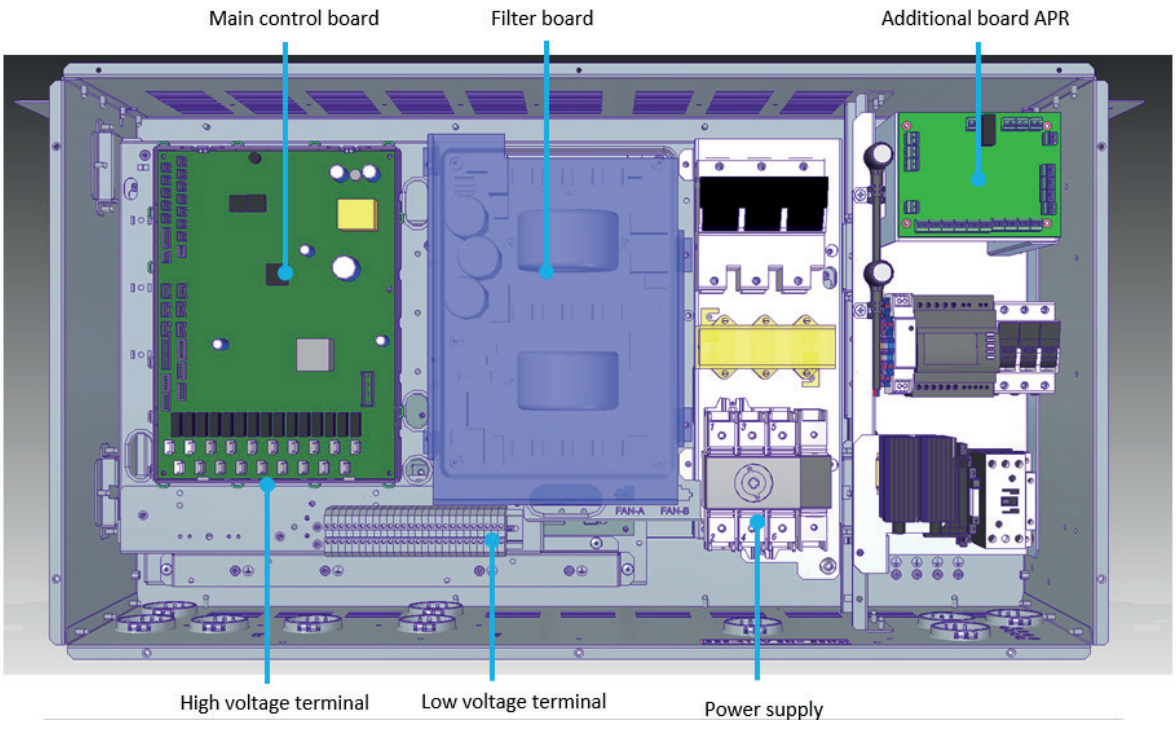


7.4 Size 42.2-55.2

7.4.1 Electric control box front view-top layer



7.4.2 Electric control box side view-bottom layer



8. Unit PCBs

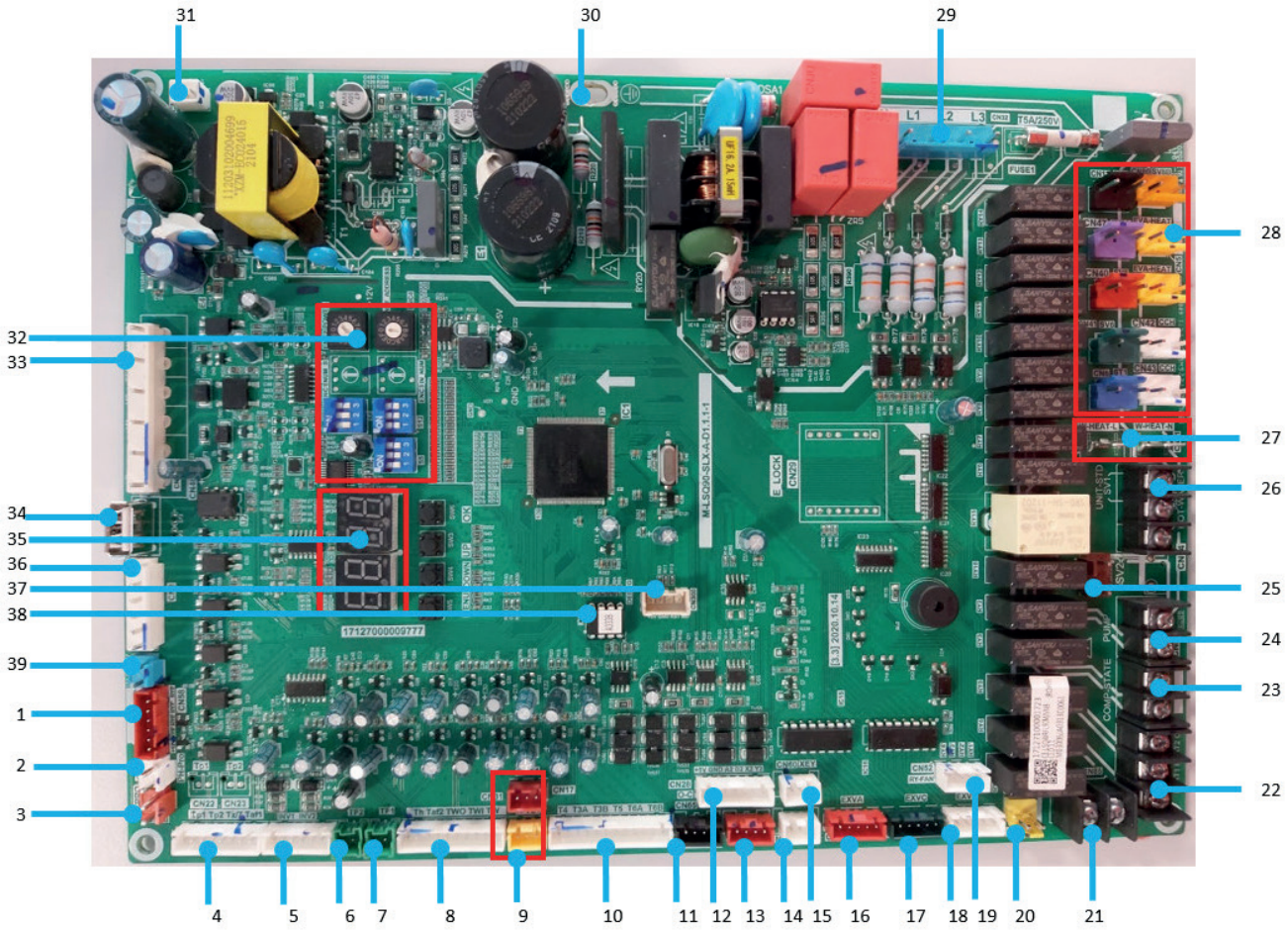
8.1 Types

The units have four PCBs – main control board, three phase AC filter board, DC fan inverter module board and compressor inverter module board.

The locations of each PCB in the unit electric control boxes are shown in “Unit Electric Control Box Layout”.

8.2 Main PCB

8.2.1 Unit main PCB for 10.1-55.2.2

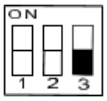
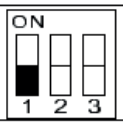
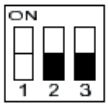
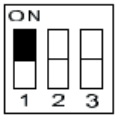
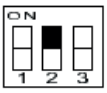
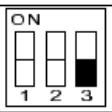


Label in Figure 4-2.1	Code	Content	Voltage
1	CN58	Signal output port for filter board relay	0 or 12V DC
2	CN91	Reserve port	0 or 12V DC
3	CN19	ON/OFF signal input port for system low pressure	0 or 5V DC
4	CN69	Temperature detection port (Tp1/Tp2/Tz/7/Taf1)	0~5V DC
5	CN15	Current inspection port of the inverter compressor A, compressor B	0~5V DC
6	CN10	Communication port between Main board and pump B motor protector	0~5V DC

Label in Figure 4-2.1	Code	Content	Voltage
7	CN3	Communication port between Main board and pump A motor protector	0~5V DC
8	CN31	Temperature detection port (Th/Taf2/Two/Twi/Tw)	0~5V DC
9	CN16 CN17	Input port for system high pressure detection	0~5V DC
10	CN1	Temperature detection port (T4/T3A/T3B/T5/T6A/T6B)	0~5V DC
11	CN65	Communication port between Main board and compressor inverter module	0~5V DC
12	CN28	Connection port of auxiliary board Reserve	0~5V DC
13	CN64	Communication port between Main board and fan inverter module	0~5V DC
14	CN61	Communication port between main board and HMI	0~5V DC
15	CN60	Communication port between units	0~5V DC
16	CN70	Actuation port of EXV A	0 or 12V DC
17	CN72	Actuation port of EXV C	0 or 12V DC
18	CN71	Actuation port of EXV B	0 or 12V DC
19	CN52	Signal output port for filter board relay	0 or 12V DC
20	CN20	ON/OFF signal input port for system discharge temperature	0 or 12V DC
21	CN85	Output port for alarm	0 or 230V AC
22	CN26	Output port for auxiliary heaters of pipeline	0 or 230V AC
23	CN33	Output port for compressor state	0 or 230V AC
24	CN25	Output port for pump	0 or 230V AC
25	CN86	Output port for valve SV2	0 or 230V AC
26	CN27 CN87	Output port for valve SV1 Output port for Hot-Water	0 or 230V AC
27	CN4 CN11	Output port for electrical heater of water switch	0 or 230V AC
28	CN5 CN13 CN42 CN43 CN6 CN41 CN40 CN47 CN12 CN80	Output port for valve and electrical heater of crankcase and plate exchanger	0 or 230V AC
29	CN32	Input of three-phase four-wire power supply	L1&N 230V AC L2&N 230V AC L3&N 230V AC
30	CN100	PE port	0V AC
31	CN74	The power supply port of the HMI .(DC9V)	9V DC
32	ENC2 ENC4 S5 S6 S12	ENC2 – Unit size rotary switch ENC4 – Unit address rotary switch S5 - Unit configuration, check wiring diagram for more info S6 - Unit configuration, check wiring diagram for more info S12 - Unit configuration, check wiring diagram for more info	0 or 5V DC
33	CN48	CN48-5/6 Pump-V 0-10V output CN48-3/4 V1 V2 performance capacity limitation 0-10V input without polarity CN48-1/2 TEMP SWITCH on/off input	IN & OUT

Label in Figure 4-2.1	Code	Content	Voltage
34	CN18	USB INTERFACE for software updating	5V DC
35	DSP1 DSP2	Digital tube display	0 or 5V DC
36	CN8	Port for water flow switch	0 or 12V DC
37	CN300	Program burn in port(WizPro200RS programming device)	-
38	IC10	EEPROM	5V DC
39	CN21	Terminal for Water Pressure Switch	0 or 12V DC

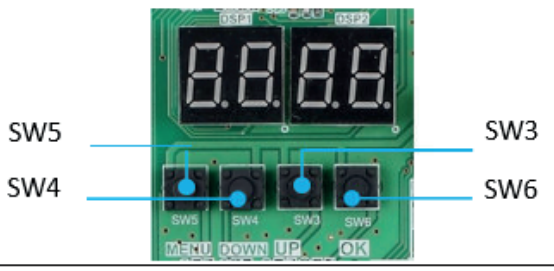
8.2.1.1 Main PCB field setting

Switch		Description	Default factory setting
S5-3		Normal control	OFF
		Remote control[1]	-
S6-1		OFF_HEAT1 connect to Electric heating of pipes	OFF
		ON_HEAT1 connect to Auxiliary electric heating or Gas Boiler	-
S6-2/3		RESERVED it is mandatory to keep the factory setting	OFF OFF
S12-1		RESERVED it is mandatory to keep the factory setting.	PRM OFF EXC ON
S12-2		OFF Single water pump control	-
		ON Multiple water pumps control	ON
S12-3		Normal cooling mode[2]	OFF
		Low-temperature cooling mode[2]	-
ENC2		DIP switch of unit capacity **it is mandatory to keep the factory setting**	0: 10.1 1: 12.1 2: 14.1 3: 16.2 4: 18.2 5: 22.2 6: 30.2 7: 35.2 8: 40.2 9: 42.2 EXC 45.2 PRM A: 45.2 EXC 50.2 PRM B: 55.2 PRM
ENC4		DIP switch of unit network address 0: master unit 1,2,3...F: slave units	0

1. Please refer to “Part 3, 7.3 Additional control” for detail operation method of using remote control.
2. Low water outlet temperature range: 0°C to 20°C; normal water outlet temperature range: 5°C to 20°C.

8.2.1.2 Function of buttons SW3 to SW6

Button	Function
SW3	Up
SW4	Down
SW5	Menu
SW6	Ok



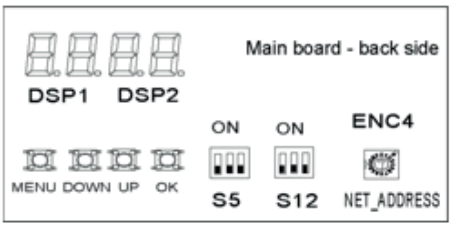
8.2.1.3 Digital display output

Unit state		Parameters displayed on DSP1	Parameters displayed on DSP2
Standby		0	1
Normal operation	For single compressor units	None	Running speed of compressor
	For dual compressor units	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

8.2.2 STATUSES DISPLAY

If the keyboard is remote, it is possible to read the unit statuses also from the display on the main board.

Press UP on the main board



Inspection table (you can continue inspection in case of failure)			
Serial number	Display rules		Display content
	Disp 1	Disp 2	
0			Standby: master address (left 88) + number of online units (right 88), Power on: Display frequency Defrost: dFdF
1	0	xx	Master address

Inspection table (you can continue inspection in case of failure)			
Serial number	Display rules		Display content
	Disp 1	Disp 2	
2	1	xx	Number of horses of external machine (60/90kW display 60/90 respectively)
3	2	xx	Number of online units (master valid)
4	3	xx	T4 ability correction (reserved to show "1")
5	4	xx	Operating modes (8 off, 1 cooling, 2 heating, 4 DHW)
6	5	xx	Fan gear (0–35)
7	6	xx	Fan gear (reserved to display "0")
8	7	xx	Min(T3a, T3b)
9	8	xx	T4 – external temperature
10	9	xx	T5 – DHW temperature
11	10	xx	Taf1 – DHW antifreeze temperature
12	11	xx	Taf2 – System temperature
13	12	xx	Tw – Cascade total outlet temperature
14	13	xx	Twi – Inlet water temperature
15	14	xx	Two – Outlet water temperature
16	15	xx	Tz – Common fin coil temperature
17	16	xx	Tm_heatR heat recovery sensor temperature (reserved to display "--")
18	17	xx	Tp1 – Discharge compressor A temperature
19	18	xx	Tp2 – Discharge compressor B temperature
20	19	xx	Tfin1 – Compressor A inverter temperature
21	20	xx	Tfin2 - Compressor B inverter temperature
22	21	xx	Tdsh – Heating desuperheat
23	22	xx	Compressor A current
24	23	xx	Compressor B current
25	24	xx	--
26	25	xx	Electronic expansion valve A degree (/20)
27	26	xx	Electronic expansion valve B degree (/20)
28	27	xx	Electronic expansion valve C degree (/4)
29	28	xx	High pressure (heating mode)
30	L	xx	Low pressure (with decimal display - display when cooling or standby)
31	30	xx	Tssh – Cooling superheat
32	31	xx	Th – Suction temperature

Inspection table (you can continue inspection in case of failure)			
Serial number	Display rules		Display content
	Disp 1	Disp 2	
33	32	xx	The first digital tube on the right: silence selection (0: night silence 1: silence 2: super silence 3: no silence) The second digital tube on the right: silence time selection (0-3) The value depends on the HMI parameters
34	33	xx	Static pressure selection (reserved)
35	34	xx	DC voltage A (reserved)
36	35	xx	DC voltage B (reserved)
37	Frequency limitation states: please refer to the following table		
38	37	xx	Defrosting process status (the first digit: T4 selection plan; the second digit: the interval in the plan; the third and fourth digits together represent the defrosting timing)
39	38	xx	Reserved display "—"
40	39	xx	Defrost plan
41	40	xx	Initial frequency
42	41	xx	Tc (saturation temperature corresponding to high pressure in heating mode)
43	42	xx	Te (saturation temperature corresponding to low pressure in cooling mode)
44	43	xx	T6a – Economizer inlet temperature
45	44	xx	T6b - Economizer outlet temperature
46	45	xx	Software version number
47	46	xx	Last failure
48	47	xx	----

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Digit 4				Digit 3				Digit 2				Digit 1			

Each DIGIT can take on values from 0 to F (15)

Digit X	Bit X			
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1

6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
A	1	0	1	0
B	1	0	1	1
C	1	1	0	0
D	1	1	0	1
E	1	1	1	0
F	1	1	1	1

Each BIT can take on values of 0 (not active) or 1 (active)

BIT 0	T4 frequency limit
BIT 1	Tp frequency limit
BIT 2	Tz frequency limit
BIT 3	Tfin frequency limit
BIT 4	Cooling Two frequency limit
BIT 5	Heating high pressure frequency limit
BIT 6	Current limit
BIT 7	Voltage limiter
BIT 8	DC bus current limit
BIT 9	Cooling low pressure frequency limit
BIT 10	Heating Two frequency limit
BIT 11	Heating Tdsh frequency reduction
BIT 12	Power restriction mode
BIT 13	Silent mode
BIT 14	Reserved
BIT 15	Reserved

8.2.3 **Vacuum function**

Vacuum function is available by entering N15 through the PCB MENU. This function is valid only from PCB menu and with the unit power supplied.

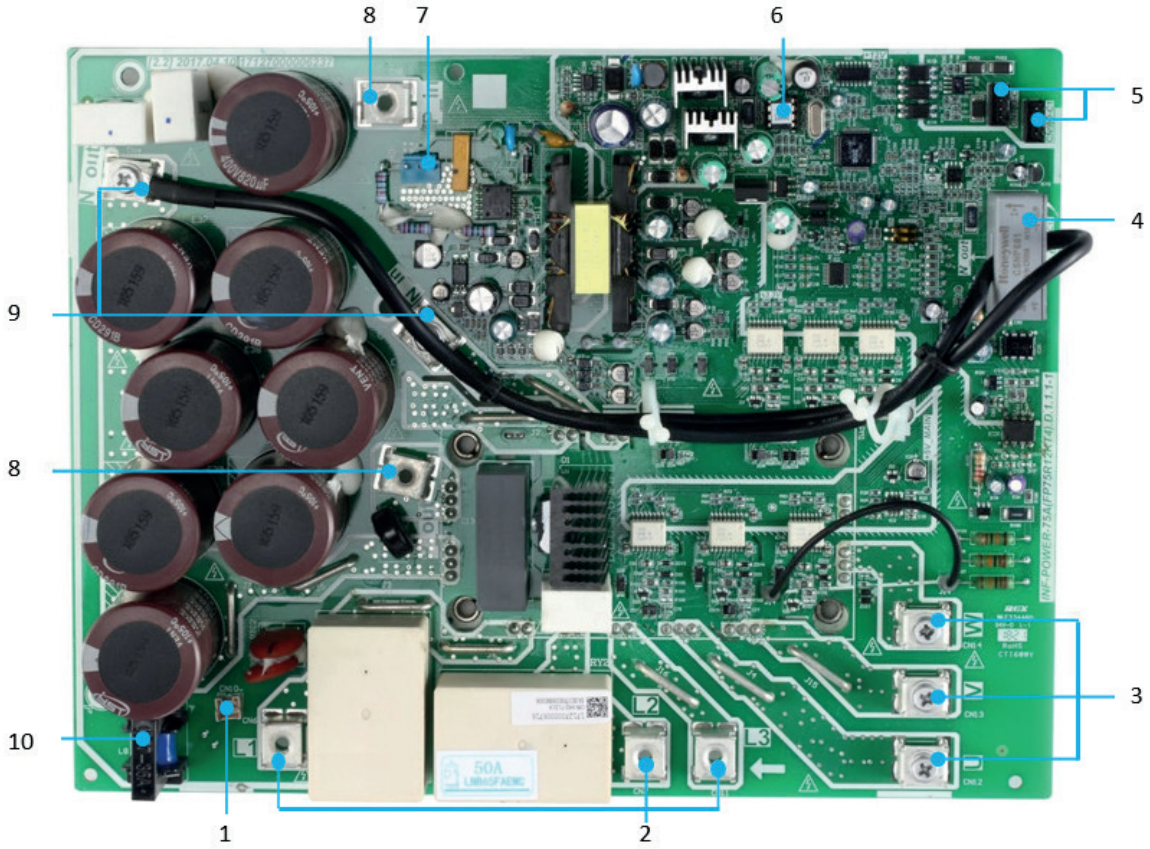
To enter in Menu N15 follow the instruction:

1. Press menu (you can now change first digit on DSP 2)
2. don't change it and just press OK
3. you can now change 2nd digit press "up" to set to 5 and press OK
4. now the unit goes into Vacuum function for 1 h after 1 h it will exit automatically.

EXVA/B/C are all turned on to the maximum, ST1/SV1/SV2/SV4/SV5/SV6/SV8A/SV8B are all kept on, and automatically exit after 1 hour.

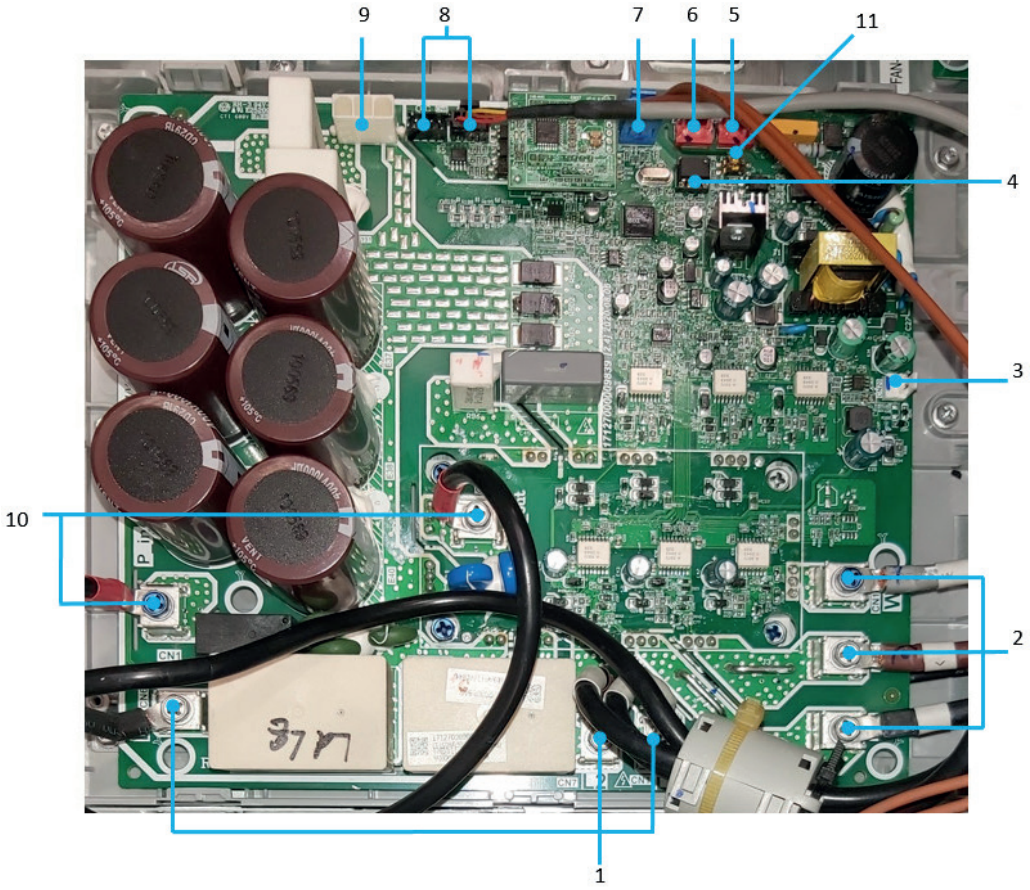
8.3 Compressor Inverter Module Board

8.3.1 Compressor inverter module PCB version Size 10.1-14.1



Label	Code	Content	Voltage
1	CN10	Port for current detection port(CN15) of main control board	0~5V DC
2	L1 L2 L3	Port for three-phase power supply of filter board	400V AC
3	U V W	Port for compressor connection	0~400V AC
4	CN17	DC bus current transformer	0~0.34V DC
5	CN8 CN9	Communication port between compressor invert modules or communication port between compressor invert module and main control board	0~5V DC
6	IC25	EEPROM	5V DC
7	CN2	Port for power supply	310V DC
8	CN1 CN5	Port for electric reactor	560V DC
9	CN3	Port for DC bus	560V DC
10	L8	Current measuring transformer	0~5V DC

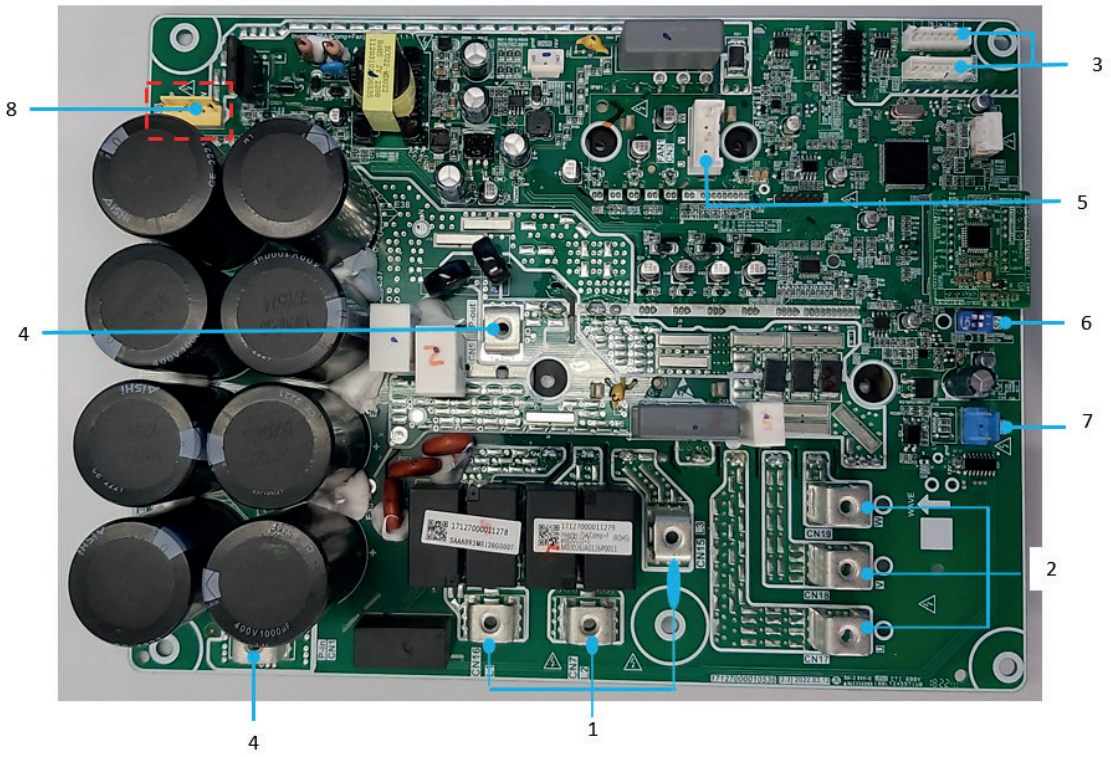
8.3.2 Compressor inverter module PCB version Size 16.2-35.2



Label	Code	Content	Voltage
1	L1 L2 L3	Port for three-phase power supply of filter board	400V AC
2	U V W	Port for compressor connection	0~400V AC
3	CN20	Low voltage power supply for fan driven board	18-22V DC
4	IC25	EEPROM	5V DC
5	CN3	230Vac supply	230Vac
6	CN2	230Vac supply, parallel with CN3	230Vac
7	CN23	High Pressure Switch Check	0-12V DC
8	CN8 CN9	Communication port between compressor invert modules or communication port between compressor invert module and main control board	0~5V DC
9	CN38	Port for DC bus	560V DC
10	CN1 CN5	Port for electric reactor	560V DC
11	S7	Dial selector do define the master compressor or slave compressor, check the wiring diagram for info.	-

8.3.3 Compressor Inverter Module Board with integrated Fan module board

8.3.3.1 Compressor inverter module PCB size 43.2-55.2



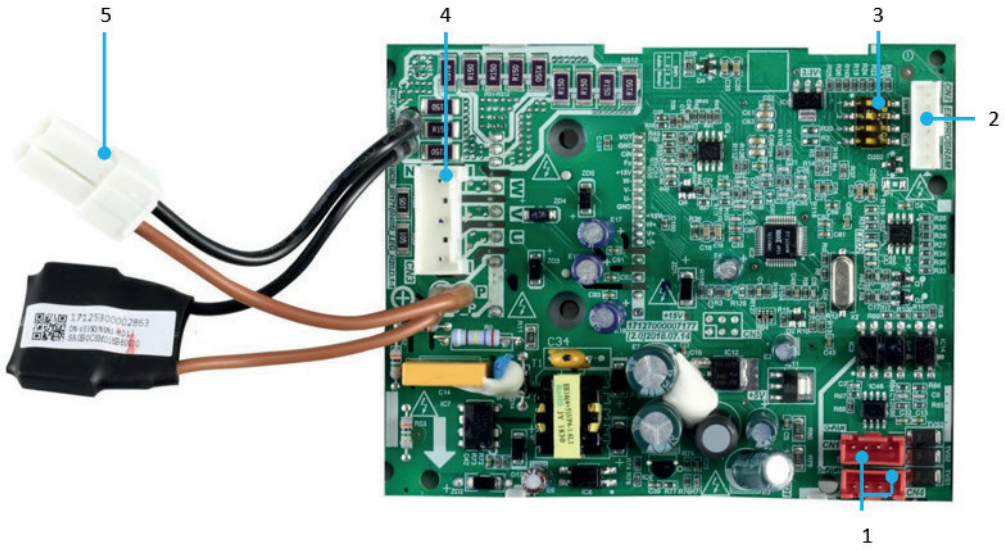
Labe	Code	Content	Voltage
1	L1 L2 L3	Port for three-phase power supply of filter board	400V AC
2	U V W	Port for compressor connection	0~400V AC
3	CN8 CN9	Communication port between compressor invert modules or communication port between compressor invert module and main control board.	0~5V DC
4	CN1 CN5	Port for electric reactor	560V DC
5	CN3	Port for fan connection	560V DC
6	S7	Dip switch for bus address	
7		Port for High pressure switch	
8	CN38	DC bus voltage	540V DC

8.3.3.2 Compressor Inverter Module PCB field setting

Switch	Description
S7 1 2	00: size 10.1-14.1 compressor inverter module address setting
	00: size 16.2-55.2 compressor A inverter module address setting
	01: size 16.2-55.2 compressor B inverter module address setting

8.4 Fan Module Board

8.4.1 Fan module PCB for size 10.1-40.2

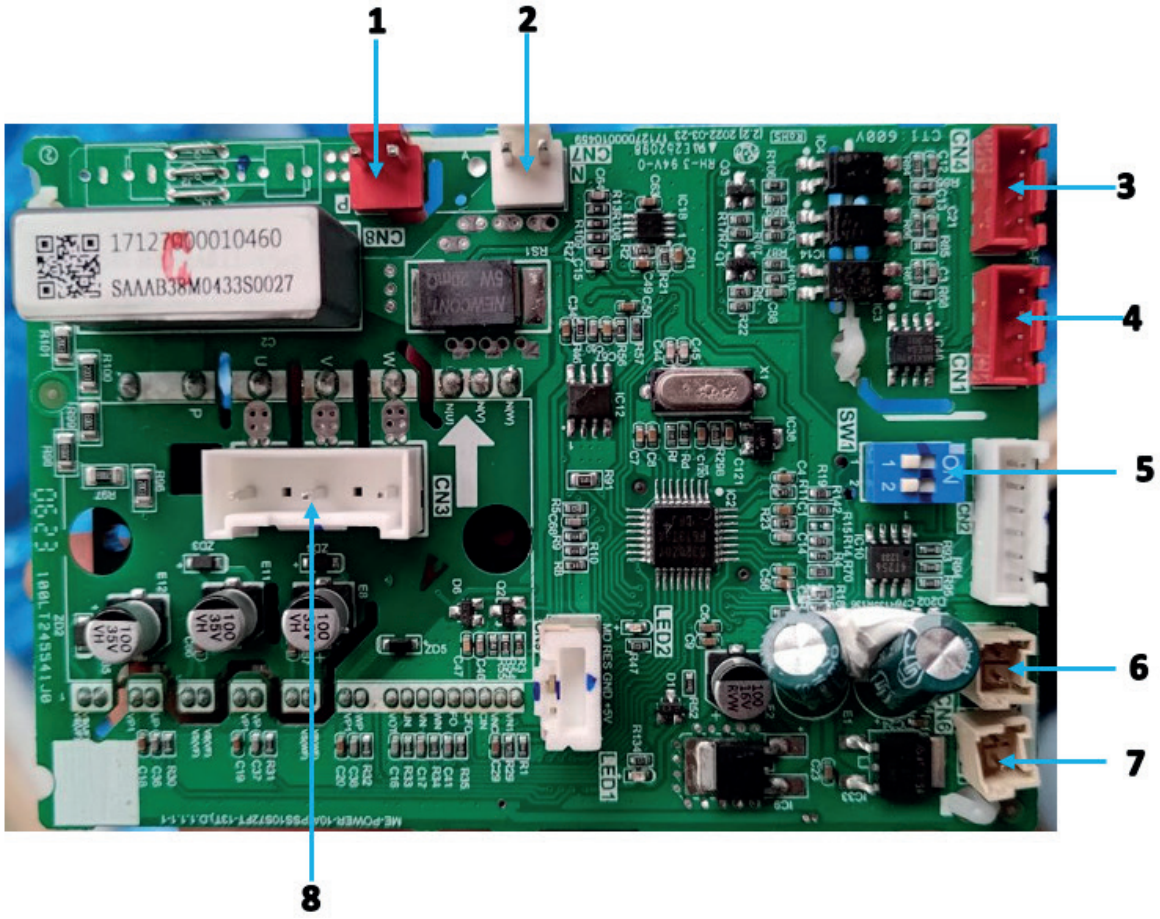


Label	Code	Content	Voltage
1	CN1 CN4	Communication port for inverter module Communication port between fan modules or communication port between fan module and main control board	0~5V DC
2	CN2	EEPROM debug port	0~5V DC
3	SW1	Address dialing code for fan module	0~5V DC
4	CN3	Port for fan motor	0~400V AC
5	P N	Port for power supply	310V DC

8.4.1.1 Fan Module PCB field setting

Switch		Description
SW1 ON OFF 1 2 3 4	SW1-1 SW1-2	00: size 10.1-14.1 fan module address setting
		00: size 16.2-22.2 fan module A address setting
		01: size 16.2-22.2 fan module B address setting
	SW1-3 SW1-4	Reserved
	SW1-2-3-4 SW1-2-3-4 SW1-2-3-4	0000: size 30.2-35.2 fan module A address setting 0100: size 30.2-35.2 fan module B address setting 0111: size 30.2-35.2 fan module C address setting

8.4.2 Fan module PCB for size 43.2-55.2 PRM

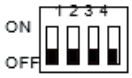


For Sheen 130kW the fans port connection can also be found in the compressor inverter board. Usually is necessary an additional fan board when the unit have more fans then compressor inverter boards.

Labe	Code	Content	Voltage
1/2	CN7 CN8	Communication port for inverter module Communication port between fan modules or communication port between fan module and main control board	0~5V DC
3/4	CN1 CN4	Fan BUS RS485	0~5V DC
5	SW1	Address dialling code for fan module	0~5V DC
6/7	CN5 CN6	19V DC power supply	-
8	CN3	Port for fan motor	0~400V AC

8.4.2.1 Fan Module PCB field setting

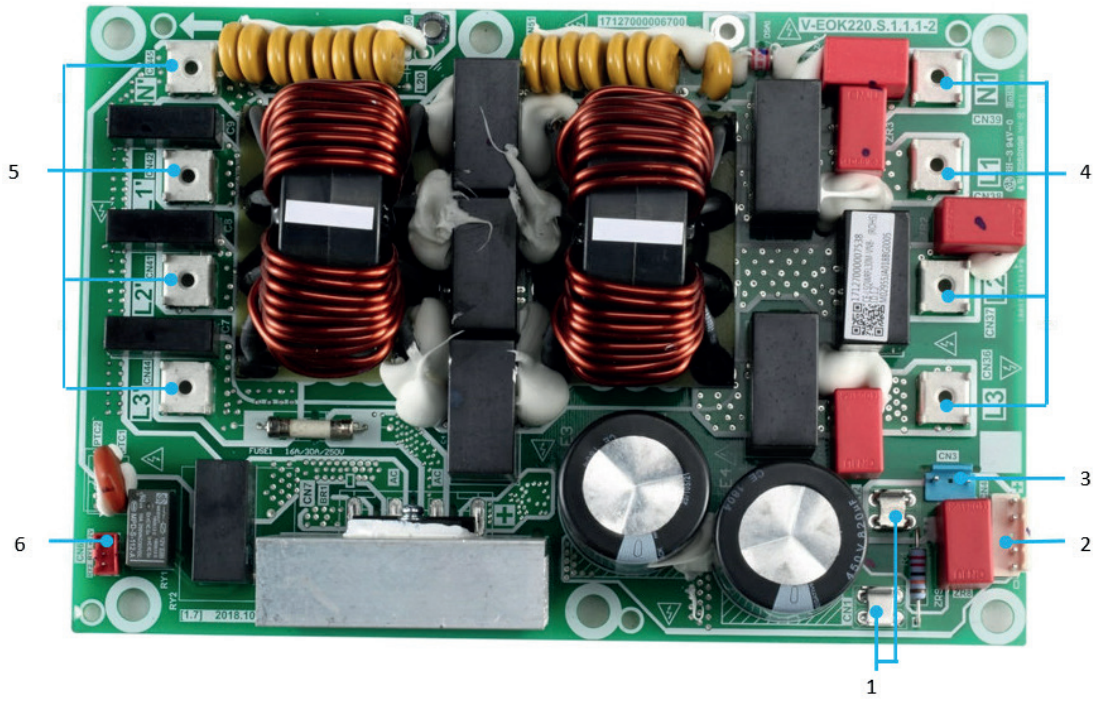
Fan module PCB switch settings size 10.1-40.2

Switch		Description
SW1 	SW1-1 SW1-2	000: size 10.1-14.1 fan module address setting
		000: size 16.2-22.2 fan module A address setting
		001: size 16.2-22.2 fan module B address setting
	SW1-3 SW1-4	Reserved
	SW1-2-3-4	0000: size 30.2-35.2 fan module A address setting
	SW1-2-3-4	0100: size 30.2-35.2 fan module B address setting
	SW1-2-3-4	0111: size 30.2-35.2 fan module C address setting

Switch		Description
SW1 	SW1-1	00: size 43.2-50.2 Fan module A address setting
		01: size 43.2-50.2 Fan module B address setting
		10: size 43.2-50.2 Fan module C address setting

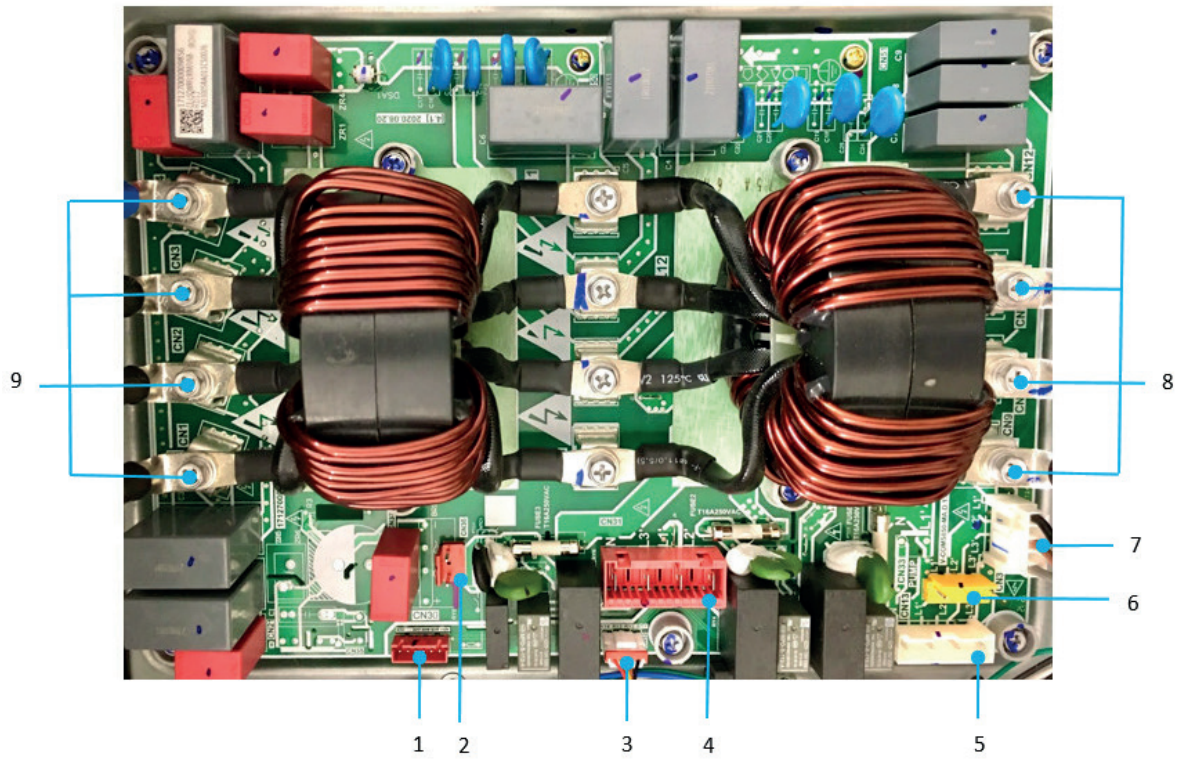
8.5 AC Filter Board

8.5.1 AC filter board1 for size 10.1-14.1



Label	Code	Content	Voltage
1	CN1 CN2	Port for fan module PCB	310V DC
2	CN4	Port for power supply of compressor inverter module	310V DC
3	CN3	Port for high pressure switch	0 or 310V DC
4	CN36 CN37 CN38CN39	Three-phase power input	L1&N:230V~ L2&N:230V~ L3&N:230V~
5	CN45 CN42 CN41CN44	Three-phase power output	L1&N:230V~ L2&N:230V~ L3&N:230V~
6	CN6	Port for relay signal control port of main control board	0 or 12V DC

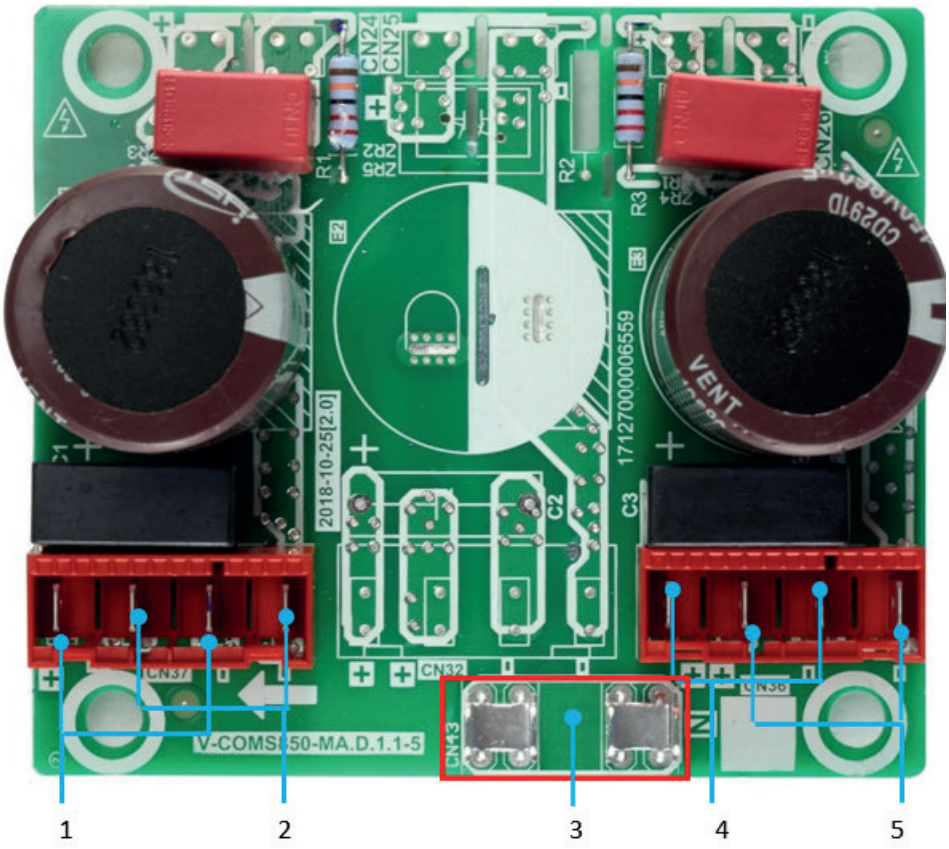
8.5.2 AC filter board1 for size 16.2-55.2



Label	Code	Content	Voltage
1	CN30	Relay signal Terminal from main control board(CN21)	310V DC
2	CN36	Terminal for power supply of compressor inverter board	12V DC
3	CN52	Relay signal Terminal from main control board(CN52)	12V DC
4	CN31	AC Power supply for fan	L1&N:230V~ L2&N:230V~ L3&N:230V~
5	CN13	Terminal for power supply of main control board	L1&N:230V~ L2&N:230V~ L3&N:230V~
6	CN34	Terminal for pump	L1&N:230V~ L2&N:230V~ L3&N:230V~
7	CN32	Terminal for three-phase protector	L1&N:230V~ L2&N:230V~ L3&N:230V~
8	CN9, CN10 CN11, CN12	Three-phase power output	L1&N:230V~ L2&N:230V~ L3&N:230V~
9	CN1 CN2 CN3 CN4	Three-phase power input	L1&N:230V~ L2&N:230V~ L3&N:230V~

8.6 Fan Module Power Board

8.6.1 Fan module power board1 for size 16.2-40.2



Label	Code	Content	Voltage
1	CN37	Port output for fan A rectifier bridge	310V DC
2	CN37	Port input for fan A inverter module board	310V DC
3	CN43	N	Neutral
4	CN36	Port output for fan B rectifier bridge	310V DC
5	CN36	Port input for fan B inverter module board	310V DC

9. Error code table

Code	Modbus Errore code (3)	Description	Troubleshooting	
			Stop system	Stop unit
E2	3	XYE communication lost	✓ (master)	✓ (slave)
E3	4	Tw failure (the master is valid)	✓	
E4	5	Twout failure		✓
E5	6	1E5- T3A failure		✓
		2E5- T3B failure		✓
E6	7	T5 failure	✓ single pump (1)	✓ multi-pump
E7	8	T4 failure		✓
E8	9	Power phase detector alarm	✓ (master)	✓ (slave)
E9	10	E9 Water flow detection failure	✓ (single pump)	✓ (multi-pump)
		2E9 Water pressure detection failure	✓ (single pump)	✓ (multi-pump)
xEb	12	1Eb-Taf1 failure		✓
		2Eb-Taf2 failure		✓
EC	13	Slave module reduction	X (2)	X
Ed	14	Both Tp of A system and Tp of B system are failure		✓
EE	15	1EE-T6A failure		✓
		2EE-T6B failure		
EF	16	Twi failure		✓
EP	19	Tp is too high		v
EU	20	Tz failure		✓
P0	21	System high pressure protection or Tp protection		✓
P1	22	System low pressure protection		✓
P2	23	Tz is too high		✓
P3	24	T4 is out of cooling working range		✓
P4	25	System A Current Protection		✓
P5	26	System B Current protection		✓
P7	28	T3 is too high		✓
P9	30	The difference between Twi and Two is too high		✓
PA	31	The difference between Twi and Two is abnormal		✓
xPb	32	Pb- Anti-freeze reminder	X	X
		1Pb- electric heating insufficient reminder	X	X
		2Pb- electric heating is seriously insufficient reminder	X	v
PC	33	Evaporator pressure too low during cooling		✓
PE	35	Cooling evaporator low temperature antifreeze protection		✓
PH	37	T4 is out of heating working range		✓

Code	Modbus Errore code (3)	Description	Troubleshooting	
			Stop system	Stop unit
xPf	36	1Pf pump motor protector pre-alarm	(stop pump)	(stop pump)
		2Pf pump motor protector pre-alarm	(stop pump)	(stop pump)
PL	38	Tfin is too high		✓
xPU	40	1PU-DC fan A module protection		✓
		2PU-DC fan B module protection		
H5	46	Voltage is too high or too low		✓
xH9	50	1H9: A press drive model does not match		✓
		2H9: B press drive model does not match		
xHE	55	A valve is not inserted fault 1HE		✓
		B valve not inserted fault 2HE		
		C valve not inserted fault 3HE		
xF0	61	1F0: IPM module communication failure		✓
		2F0: IPM module communication failure		
F2	63	Insufficient exhaust superheat protection or exhaust temperature sensor falling off		✓
xF4	65	1F4: L0 or L1 protection occurs 3 times within 60 min		✓
		2F4: 3 occurrences of L0 or L1 protection within 60 min		
xF6	67	1F6 A system bus voltage fault (PTC)		✓
		2F6 B System bus voltage fault (PTC)		✓
Fb	72	Pressure sensor failure		✓
Fd	74	Return air temperature sensor failure		✓
xFF	76	1FF-DC fan A fault		✓
		2FF-DC fan B fault		
		3FF-DC fan B fault		
FP	79	Dial codes of multiple pumps are inconsistent		✓
C7	88	3 times PL report C7		✓
dF	136	Defrosting reminder	X	X
L0	101	L0 module protection	✓(single pump)	✓ (multi-pump)
L1	102	L1 low voltage protection	✓(single pump)	✓ (multi-pump)
L2	103	L2 high voltage protection	✓(single pump)	✓ (multi-pump)
L3	104	Reserved	✓(single pump)	✓ (multi-pump)
L4	105	L4MCE failure	✓(single pump)	✓ (multi-pump)
L5	106	L5 zero speed protection	✓(single pump)	✓ (multi-pump)
L6	107	Reserved	✓(single pump)	✓ (multi-pump)
L7	108	L7 phase loss	✓(single pump)	✓ (multi-pump)
L8	109	L8 frequency changes over 15Hz	✓(single pump)	✓ (multi-pump)
L9	110	L9 frequency difference 15Hz	✓(single pump)	✓ (multi-pump)

Code	Modbus Errore code (3)	Description	Troubleshooting	
			Stop system	Stop unit
xbH	157	1bH: Module 1 relay is stuck or 908 chip self-check failed 2bH: Module 2 relay is stuck or 908 chip self-check failed		

Note:

1 In single-pump system, if T5 failure, then the whole system works no more in DHW; but the AC mode can work.

2 represents that this error has no business with troubleshooting.

3 When the error code appears, the error code corresponding to the error code can be obtained through the H1 - H2 port by using the host computer to query the wired controller register.

10. **Troubleshooting**

Warning

All electrical work must be carried out by competent and suitably qualified, certified and accredited professionals and in accordance with all applicable legislation (all national, local and other laws, standards, codes, rules, regulations and other legislation that apply in a given situation).

Power-off the 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.

10.1 **H9**

Digital display output

Description

- 1H9 indicates dials code drive (compressor A) model does not match.
- 2H9 indicates dials code drive (compressor B) model does not match.
- Error code is displayed on main PCB and user interface.

Possible causes

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

Procedure

H9

↓

Main PCB or IPM inverter module EEPROM1 is not connected properly

YES → Ensure the inverter EEPROM is connected

NO ↓

EEPROM damaged

YES → Replace the EEPROM

NO ↓

Replace Main PCB or IPM inverter module PCB

Notes:

1 Compressor inverter module PCB EEPROM is designated IC25 on compressor inverter module PCB (labeled 6 in Figure 4-2.2a and labeled 4 in Figure 4-2.2b in Part 4, 2.3 “Compressor inverter module PCB”).

10.2 **E2**
Digital display output

Description

- Communication error between unit and user interface.
- Error code is displayed on main PCB and user interface.

Possible causes

- Communication wires between unit and user interface are not connected properly.
- Communication wiring P Q E terminals misconnected.
- Loosened wiring within electric control box.
- Interference from high voltage wires or other sources of electromagnetic radiation.
- Communication wire is too long.
- Damaged main PCB, user interface or electric control box communication terminals block.

Procedure

E2

↓

Communication wires P Q E have short circuited, disconnected or are misconnected1 — YES → Reconnect the communication wires

NO ↓

Communication wires P Q E are not connected in a daisy chain — YES → Connect the communication wires in a daisy chain

NO ↓

Wires between main PCB and electric control box communication terminals block are loosened — YES → Ensure the wires are connected properly

Interference from high voltage (220V or higher) wires — YES → Ensure the communication wires and high voltage wires are separated

NO ↓

Communication wires are close to a source of electromagnetic radiation such as transformer or strong fluorescent lamp — YES → Remove the source of interference, or add additional shielding to the communication wires

Damaged control box communication terminals block — YES → Replacing electric control box communication terminals block resolves the error

NO ↓

The length of communication wire is over 1200m — YES → Reduce the wire length to less than 1200m or strengthen the signal

NO ↓

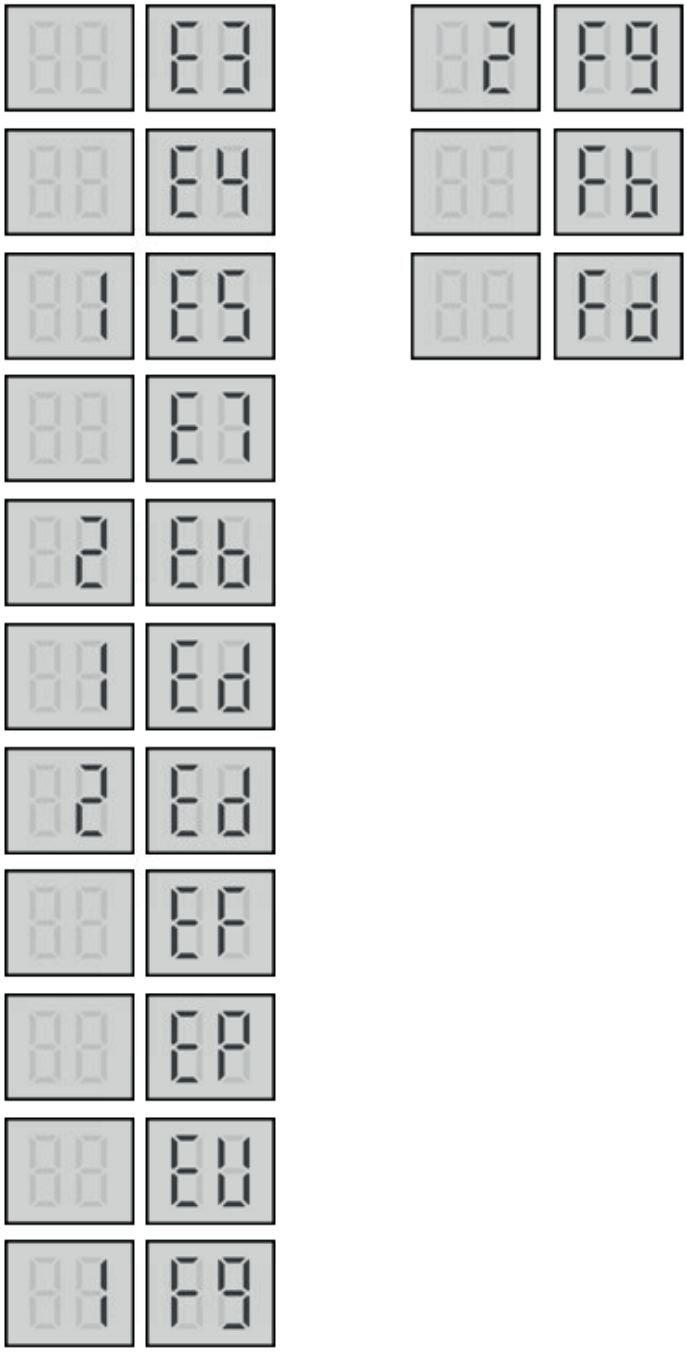
Replace main PCB or user interface

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.

10.3 **E3, E4, E5, E7, Eb, Ed, EF, EP, EU, F9,Fb, Fd**

Digital display output



Description

E3	indicates a combined water outlet temperature sensor error
E4	indicates a water outlet temperature sensor error
1E5	indicates an air side heat exchanger refrigerant outlet temperature sensor T3A error
E7	indicates an outdoor ambient temperature sensor error
2Eb	indicates a water side heat exchanger anti-freezing temperature sensor Taf2 error
1Ed	indicates a discharge pipe temperature sensor of system A error
2Ed	indicates a discharge pipe temperature sensor of system B error
EF	indicates a water inlet temperature sensor error
EP	indicates a discharge pipe temperature sensor failure alarm
EU	indicates an air side heat exchanger refrigerant total outlet temperature sensor Tz/7 error
1F9	indicates inverter module temperature sensor(Tf1) error
2F9	indicates inverter module temperature sensor(Tf2) error
Fb	indicates a pressure sensor error
Fd	indicates an air suction temperature sensor error

All stop running.

Error code is displayed on main PCB and user interface.

Possible causes

- Temperature sensor or pressure sensor are not connected properly or malfunctioned.
- Main PCB Damaged.

Procedure

E3 / E4 / E5 / E7 / Eb / Ed /EE/ EF / EP /EU / Fb / F9 / Fd

↓

Temperature sensor or pressure sensorconnection on main PCB is loosened (1) → YES → Ensure the sensor is connected properly

NO ↓

Temperature or pressure sensor has short-circuited or failed (2) → YES → Replace the sensor

NO ↓

Replace main PCB → YES →

Notes:

1 The sensors are connected to port CN1, CN16/CN17, CN31, CN3, CN10 and CN69 on the main PCB (labeled 10, 9, 8, 7, 6, 4 in figure “Main PCB”).

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 “Temperature Sensor Resistance Characteristics”.

10.4 **E8**
Digital display output

Description

- Power phase protector output error
- Error code is displayed on main PCB and user interface.

Possible causes

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

Procedure

E8

The phase sequence of the 3-phase power supply is incorrect (1) — YES → Exchange any two of the 3 phase wires

NO ↓

Power supply phases lost (2) — YES → Ensure all power supply phases is complete

NO ↓

Some power supply terminals are loosened — YES → Ensure all supply terminals are securely fastened

NO ↓

The power supply is abnormal (3) — YES → Check the power supply equipment

NO ↓

Power phase protector wire connection loosened (4) — YES → Check the wire connection of Power phase protector

NO ↓

Replace power phase protector — YES → Error code disappear

NO ↓

Replace Main PCB

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 red LED on the power phase protector will flash with 3HZ.

4 Loosened power supply terminals can cause the compressors to operate abnormally and compressor current to be very large.

10.5 **E9**

Digital display output

Description

- Water flow failure.
- E9 indicates a water flow switch error. When an E9 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.

Possible causes

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

10.6 **2E9**

Description

- Water pressure failure.
- 2E9 indicates a water pressure switch error. When a 2E9 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.

Possible causes

- The wire circuit is short connected or open.
- Water pressure in the system is is lower then 0,5 bar.
- Water pressure switch is damaged.
- Main PCB is damaged

Procedure

E9

↓

Water flow switch connection on main PCB is lost (1) — YES → Ensure the switch is connected properly and check the palette and switch are clean

NO ↓

Water flow is insufficient — YES → Check the water piping and valves. Make sure the water piping is clean, there is no air in the water piping and all valves are open. Make sure the water pump capacity is enough.

NO ↓

Water flow switch is damaged — YES → Replace the water flow switch

NO ↓

Replace main PCB — YES →

Notes:

1 Water flow switch connection is port CN8 on the main PCB (labeled 36 in Figure “Main PCB”).

2E9

↓

Water pressure switch connection on main PCB is lost (1) — YES → Ensure the switch is connected properly

NO ↓

Water pressure is insufficient — YES → Make sure the water pressure is enough, there is no air in the water piping and the system is vented.

NO ↓

Water pressure switch is damaged — YES → Replace the water pressure switch

NO ↓

Replace main PCB — YES →

Notes:

1 Water pressure switch connection is port CN21 on the main PCB (labeled 39 in Figure “Main PCB”).

10.7 EC

Digital display output

Description

- EC indicates that the number of slave units detected by master unit has decreased.
- Error code is only displayed on the user interface.

Possible causes

- Some units are powered off.
- Power supply abnormal.
- Incorrect unit address setting.
- Communication wires between units not connected properly.
- Loosened wiring within electric control box.
- Damaged main PCB or electric control box communication terminals block.

Procedure

EC

↓

Some units in the system are powered off (1) — YES → Power on all the units

NO ↓

The power supply is abnormal — YES → Check the power supply equipment

NO ↓

Troubleshoot as for an E2 error (2)

Notes:

1 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.

2 See Part “E2 Troubleshooting”.

10.8 **P0**
Digital display output

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.

Possible causes

- High pressure switch or discharge temperature switch not connected properly or has malfunctioned.
- Excess refrigerant for P0 related to the high discharge pressure or not enough refrigerant related to P0 due to high temperature discharge.
- High pressure side blockage.
- Poor condenser heat exchange.
- Main PCB is damaged.

Procedure

P0

↓

High pressure switch or discharge temperature switch connection on main PCB is lost (1) → YES → Ensure High pressure switch or discharge temperature switch are connected properly

NO ↓

High pressure switch or discharge temperature switch have short-circuited or failed (2) → YES → Replace the high pressure switch or discharge temperature switch

NO ↓

The high pressure side is blocked, caused by crushed or bent pipe or blocked EXV (3) → YES → Inspect the system and fix the error

NO ↓

The heat exchange is poor (4) → YES → Inspect the system and fix the error

NO ↓

The water flow rate is not sufficient in cooling mode → YES → Inspect the water system and fix the error

NO ↓

Replace main PCB → YES →

Notes:

1 High pressure switch connection is CN23 on compressor board for size 16.2-35.2, or CN3 on the AC filter board for size 10.1-14.1 (labeled 3 and 2 in Figure 4-2.1 in Part 4, 2.2 “Main 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.

10.9 **P1**
Digital display output

Description

- P1 indicates suction pipe low pressure protection. When the suction pressure falls below 0.14MPa, the system displays P1 protection and all units stop running. When the pressure rises above 0.3MPa, 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.

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.

Procedure

P1

↓

Insufficient refrigerant caused by refrigerant leakage (1)	YES →	Add refrigerant or inspect the system for leaks
NO ↓		
The low pressure side is blocked, caused by crushed or bent pipe, blocked EXV, or dirty filter (2)	YES →	Inspect the system and fix the error. If the filter is blocked by ice, the piping should be cleaned
NO ↓		
The air side heat exchanger heat exchange is poor in heating mode (3)	YES →	Inspect the refrigerant system and fix the error
NO ↓		
The water flow rate is not sufficient in cooling mode (4)	YES →	Inspect the water system and fix the error
NO ↓		
Replace main PCB	YES →	

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.

10.10 **P4, P5**

Description

- P4 indicates current protection on Phase A of compressor A.
- P5 indicates current protection on Phase A of compressor B.
- When the compressor current rises above the protection value 24A, the system displays P4 or P5 protection and all units stop 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.

Possible causes

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

Procedure

P4 / P5

↓

The power supply is abnormal — YES → Check the power supply equipment

NO ↓

Excess refrigerant — YES → Discharge part of the refrigerant. Add oil if it leaks during discharge process

NO ↓

System contains air or nitrogen — YES → Flush all refrigerant then vacuum the system and recharge refrigerant. Add oil to the system if it leaks

NO ↓

The condenser heat exchange is poor (1) — YES → Inspect the system and fix the error

NO ↓

The high pressure side is blocked, caused by crushed or bent pipe or blocked EXV (2) — YES → Inspect the system and fix the error

NO ↓

Inverter module has short-circuited (3) — YES → Replace the inverter module

NO ↓

Compressor has malfunctioned (4) — YES → Replace the compressor

NO ↓

Replace main PCB

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 are 0.3-2Ω 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.

10.11 **P6**
Digital display output

Description

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

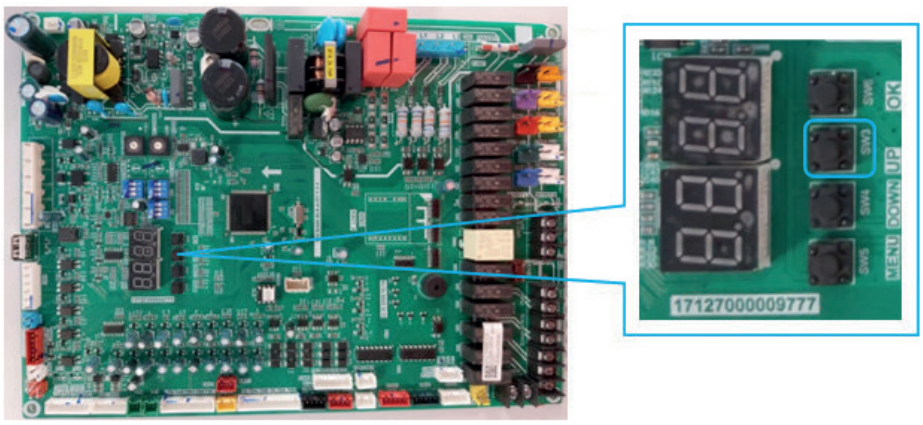
Possible causes

- 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.

Specific error codes for P6 inverter module protection

If a P6 error code is displayed, press button SW3 until one of the following specific error codes is displayed on the digital display: xL0, xL1, xL2, xL4, xL5, xL7, xL8, xL9.

Button SW3 on main PCB



Specific error codes for error xH4

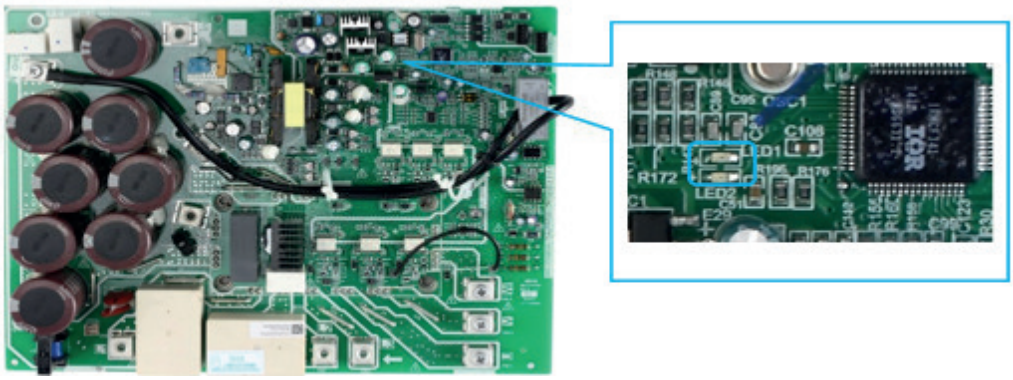
Specific error code1	Content
xL0	Inverter module protection
xL1	DC bus low voltage protection
xL2	DC bus high voltage protection
xL4	MCE error
xL5	Zero speed protection
xL7	Phase sequence error
xL8	Compressor frequency variation greater than 15Hz within one second protection
xL9	Actual compressor frequency differs from target frequency by more than 15Hz protection

Notes:

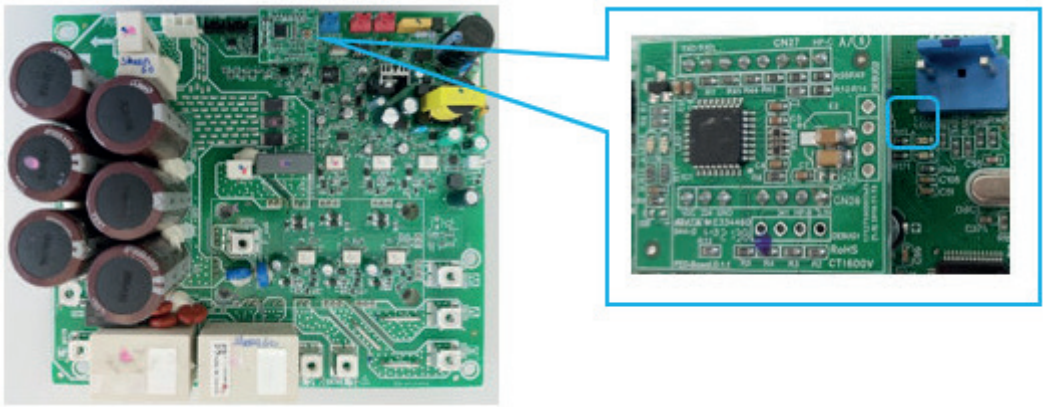
1 'x' is a placeholder for the compressor system (compressor and related electrical components), with 1 representing compressor system A and 2 representing compressor system B.

The specific error codes xL0, xL1, xL2, xL4, xL5 and xL7 can be obtained from the inverter module LED indicators. If an inverter module error has occurred, LED1 flashes.

LED indicators LED1 on inverter board size 10.1-14.1

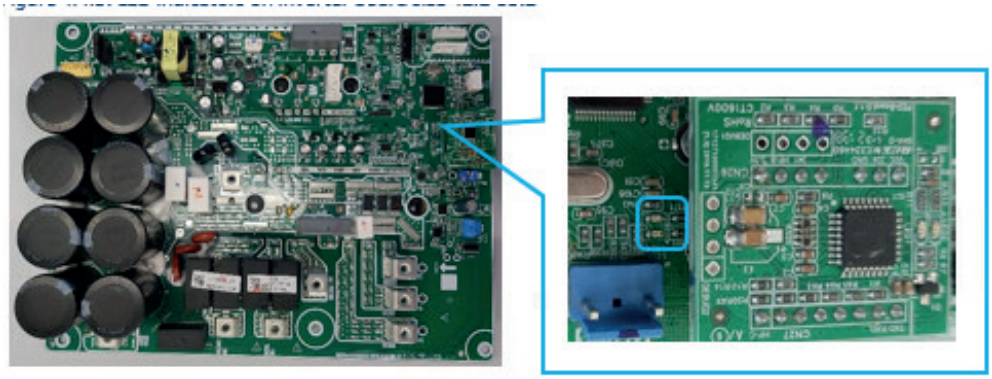


LED indicators LED1 on inverter board size 16.2-40.2



: 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
Flashes 13 times and stops for 1 second, then repeats	xL5 - Zero speed protection
Flashes 15 times and stops for 1 second, then repeats	xL7 - Phase sequence error

LED indicators on inverter board size 42.2-55.2



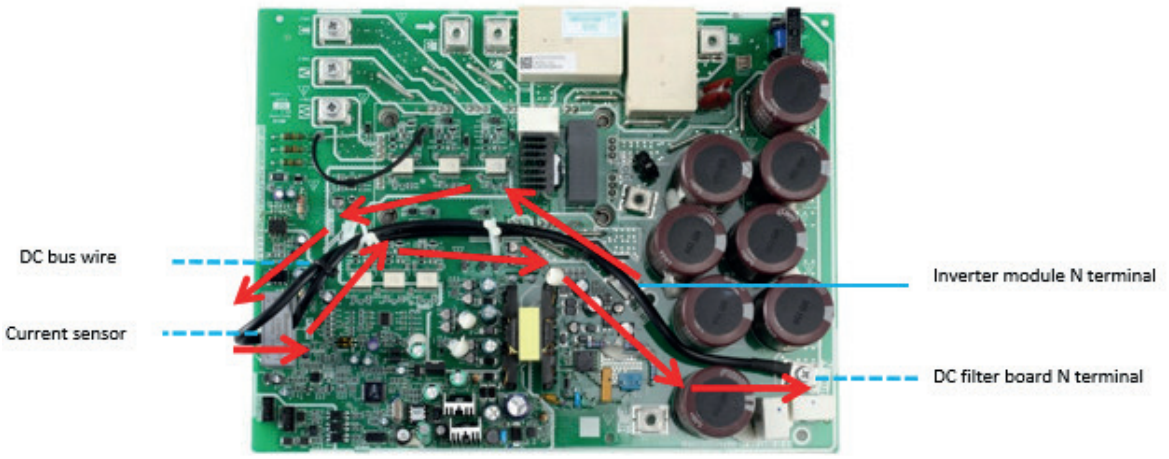
10.11.1 First troubleshooting step

To troubleshoot xP6 errors, firstly ensure that the DC bus wire is connected correctly.

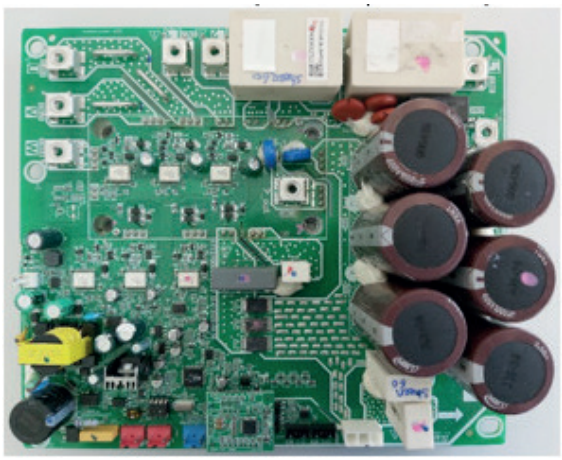
The DC bus wire should run from the N terminal on the inverter module, through the current sensor (in the direction indicated by the arrow on the current sensor), and end at the N terminal on the DC filter board for size 10.1-14.1.

The DC bus wire also should be connected to reactor tightly in serial, and check the sequence of 3 phase power input for compressor.

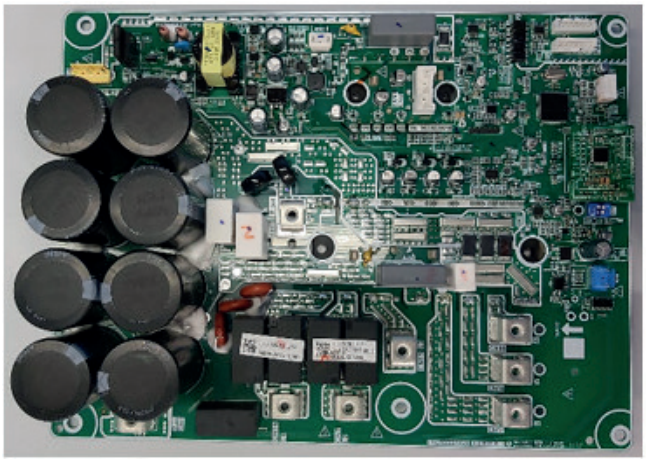
DC detection wire connection method size 10.1 - 14.1



DC detection wire connection method size 16.2 - 22.2 / 30.2 - 35.2



DC detection wire connection method size 43.2-55.2



10.11.2 **xL0 troubleshooting**

Step 1: Chek inverter board

Change the inverter board setting, for example the alarm is 2L0 it means, inverter board is damage or the troubleshooting is related to the compressor. To exclude the compressor, change the address setting of the compressor 2 from 01 to 00 and the compressor 1 from 00 to 01 if the alarm is still displaying 2L0 check the inverter board 2 and go to step 3, vice versa if the displayed alarm is 1L0 check the compressor, step 2.

Switch	Description
	00: compressor 1 inverter module address setting (both on circuit 1 and 2)
	01: compressor 2 inverter module address setting (both on circuit 1 and 2)

Step 2: Check compressor

- Check that compressor wiring is all connected properly.
- The normal resistances of the inverter compressor are shown below among U V W and in MΩ range/ infinite between each of U V W and ground. If any of the resistances differ from these specifications, the compressor has malfunctioned.
- If the resistances are normal, go to Step 3.

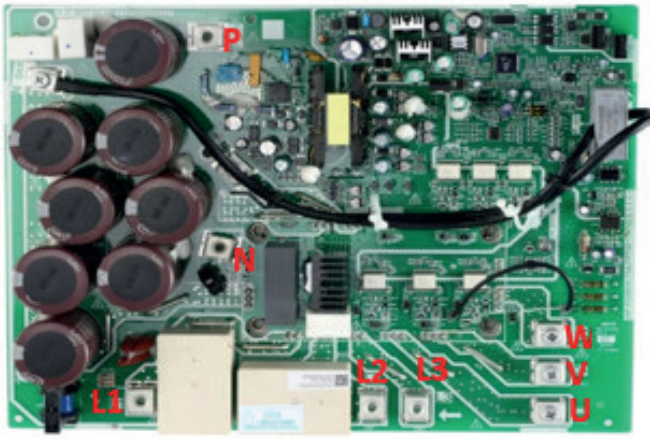
Compressor	Resistance
LVB65F	0.50Ω ±10% (at 20°C)
DA80PHDG-D1Y6	0.40Ω ±7% (at 20°C)
DD110PHDG-D1Y6	0.30Ω ±7% (at 20°C)

Measuring resistances among compressor terminals	Measuring resistances between compressor terminals and ground
	

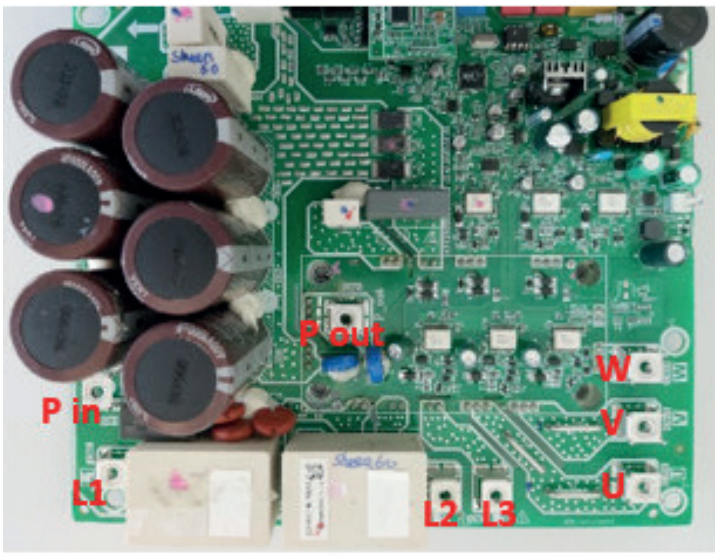
Step 3: Check inverter module

- The DC voltage between terminals P1 and N1 should be 1.414 times the local power supply voltage. The DC voltage between terminals P and N should be 537-586V (power supply voltage specification: 380~415V 3N~). If either voltage is not in the normal range, troubleshoot as for xL1 or xL2 errors. Refer to Part 4, 4.13.7 “xL1/xL4 troubleshooting” or Part 4, 4.13.8 “xL2 troubleshooting”.
- Disconnect the terminals U, V, W from the inverter compressor. Measure the resistance among terminals P, N, U, V, W. All the resistances should be huge resistance (roughly up to several MΩ). If any of them are lower than tens of Kohm, the inverter module is damaged and should be replaced.

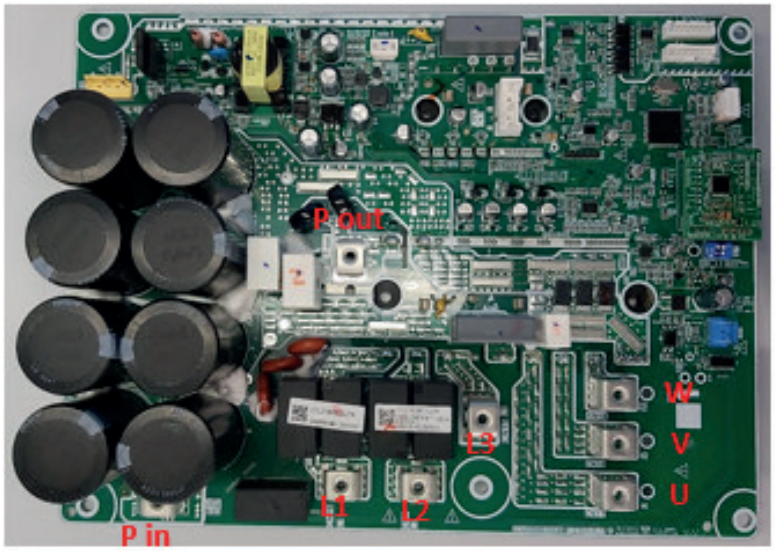
Inverter board Sheen 30



Inverter board Sheen 60 & 90 kW



Inverter board Sheen 130 kW

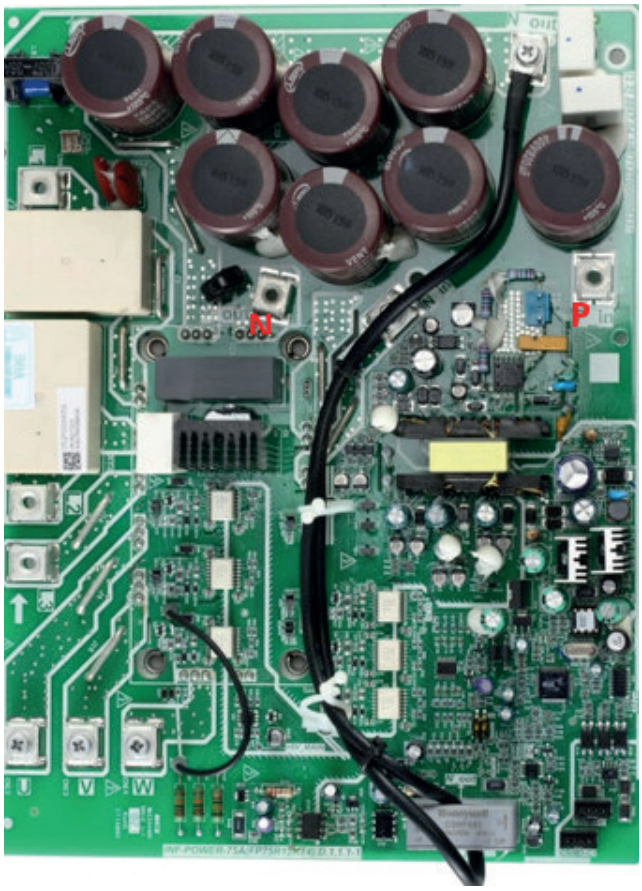


10.11.3 xL1/xL4 troubleshooting

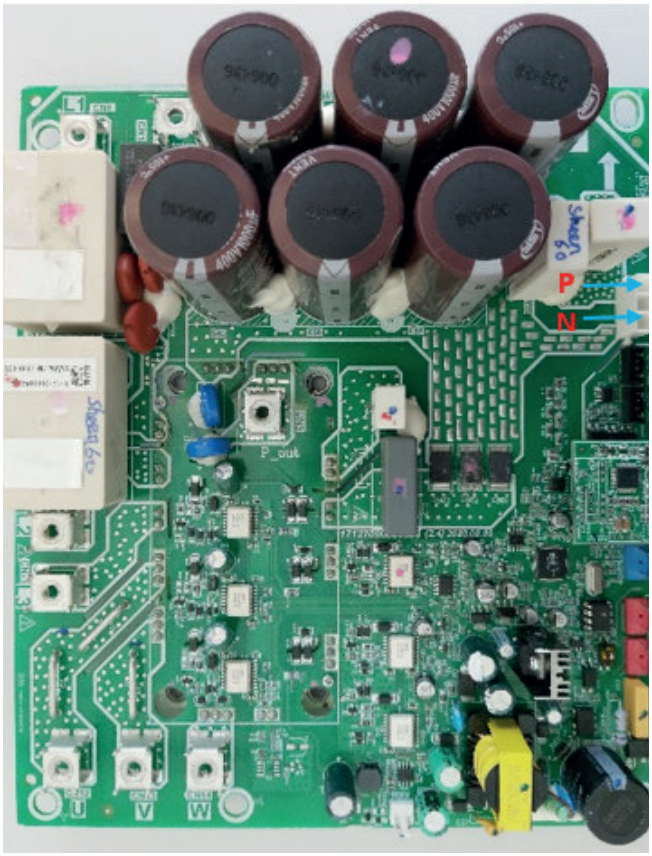
Step 1: Check inverter module

- Check the DC voltage between terminals P and N. The normal value is 537-586V (power supply voltage specification: 380~415V 3N~). If the voltage is lower than 300V, go to Step 2.

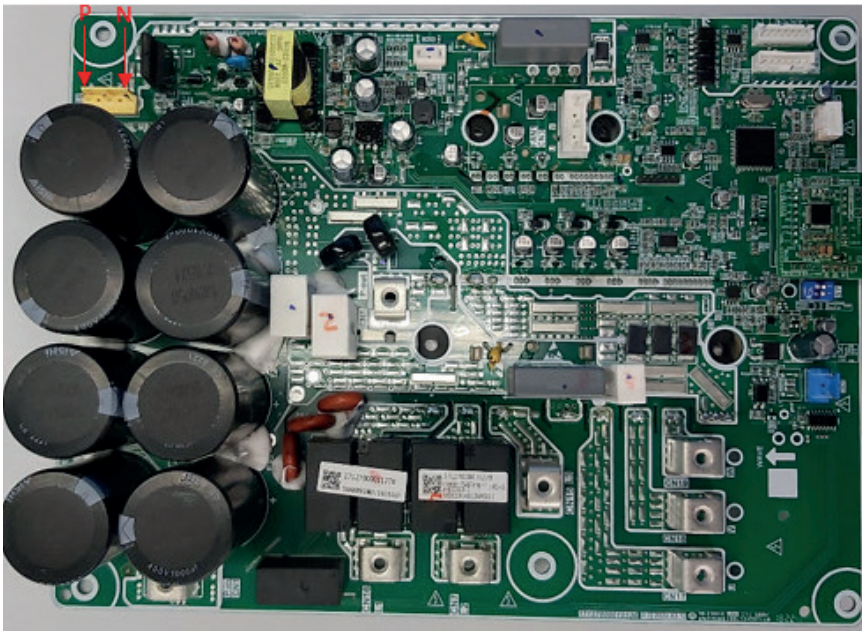
Inverter Module terminal P - N Sheen 30kW



Inverter Module terminal P - N Sheen 60/90kW



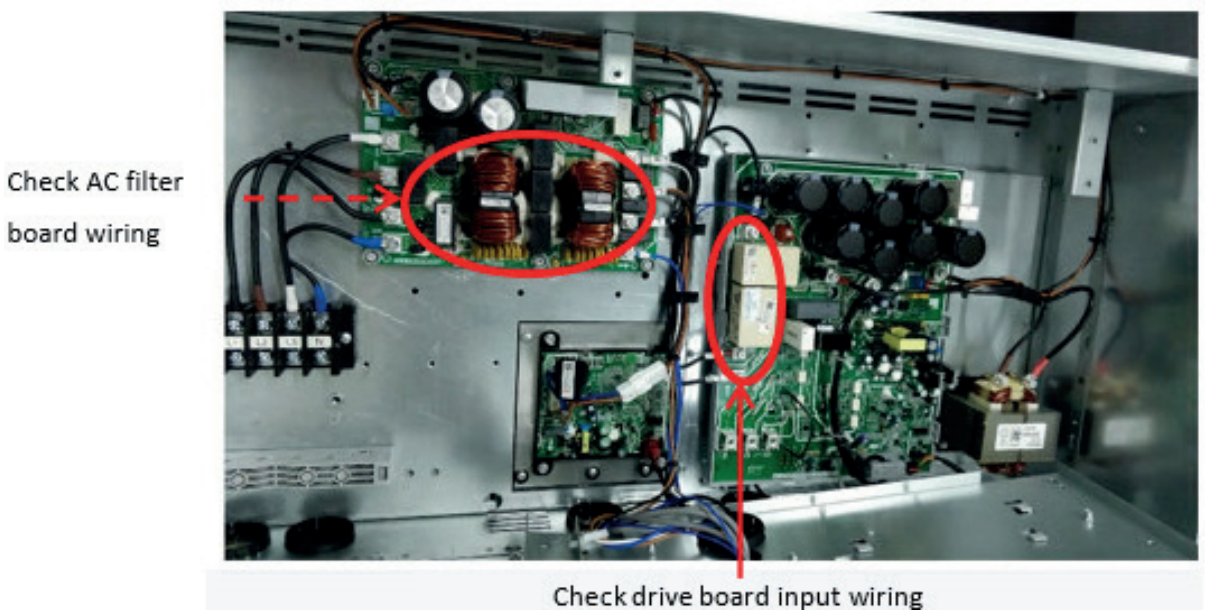
Inverter module terminals



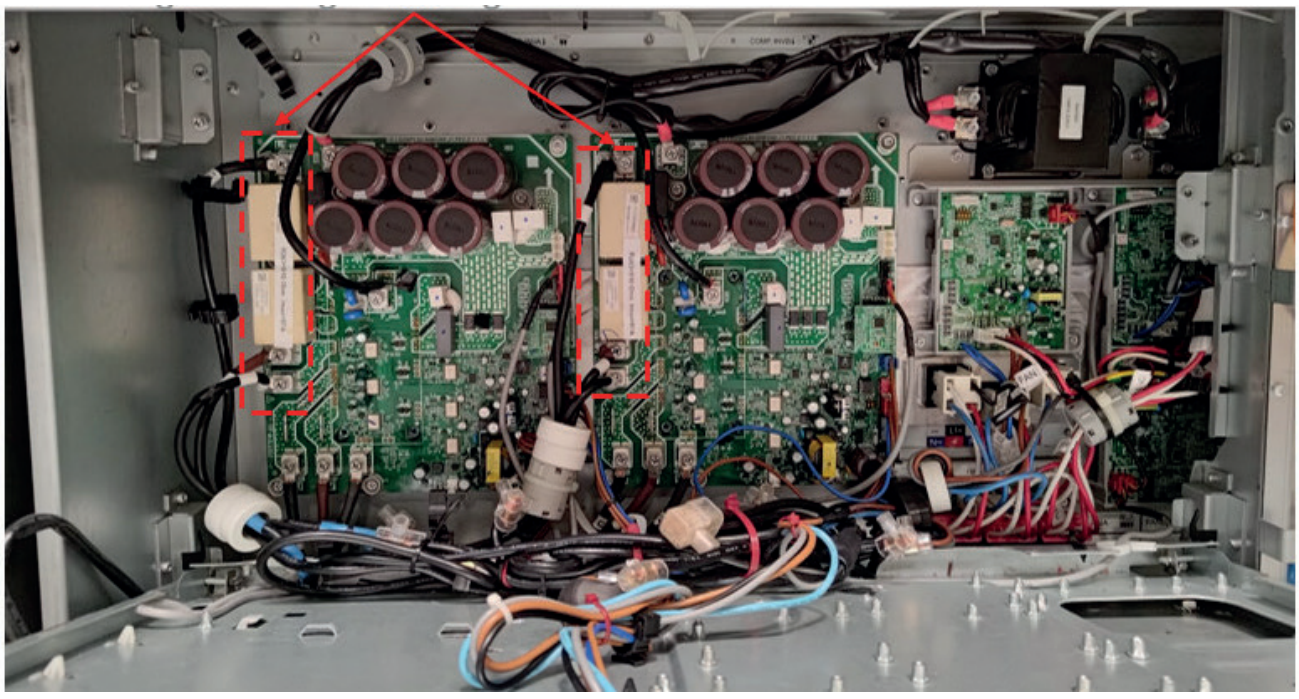
Step 2: Check rectifier wiring circuit

- If the wires are loosened, fasten the wires. If the wires are OK, replace the main PCB.

Rectifier and AC filter board in electric control box



Check drive board A and B input wiring

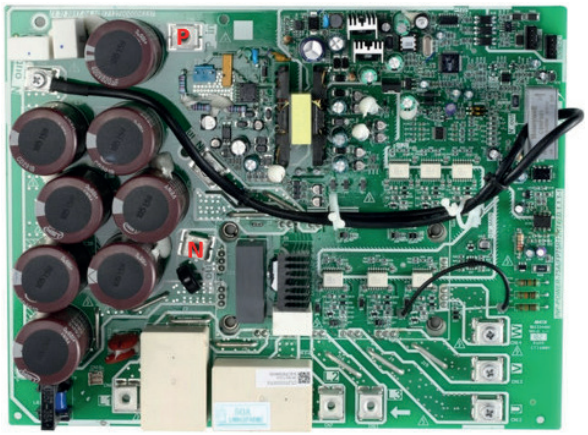


10.11.4 xL2 troubleshooting

Step 1: Check inverter module

- Check the DC voltage between terminals P and N. The normal value is 537-586V (power supply voltage specification: 380~415V 3N~), if the voltage is higher than 800V, go to Step 2.

Inverter module terminals



Step 2: Check inverter module

- Check the voltage between terminals P and N on the capacitor board. The normal value is 537-586V (power supply voltage specification:380~415V 3N~). If the voltage is not in the normal range, there is a problem with the electrolytic capacitor power supply. Check the power supply for high or unstable voltage. If the power supply voltage value is normal, then the main PCB has malfunctioned and needs to be replaced.

10.11.5 xL8/xL9 troubleshooting

Step 1: Check compressor

- The normal resistances of the inverter compressor are 0.3-2Ω among U V W and in MΩ range/infinite between each of U V W and ground. If any of the resistances differ from these specifications, the compressor has malfunctioned.
- Refer to Figures in “xL0 troubleshooting”. If the resistance values are normal, go to Step 2.

Step 2: Check compressor and main PCB

If there is another unit nearby (either in the same system or another system) that is operating normally, its electric control box can be used to determine whether the xL8/xL9 error is being caused by a compressor fault or a main PCB fault:

- If using another unit in the same system as the unit with the error to perform the test, set it as the master unit (address 0); if using a unit in another system, use the master unit.
- Disconnect the power wires of the compressor referenced in the xL8/xL9 error code.
- In the unit that is operating normally, disconnect the power wires that connect a compressor to the electric control box and use them to connect the compressor with the xL8/xL9 error to the electric control box of the unit that is operating normally. Ensure that the U, V, W terminals are connected in the right order, and then start the system that is operating normally.
- If the compressor with the xL8/xL9 error runs normally, replace the main PCB of the unit with the xL8/xL9 error and ensure the wiring is correct; if the compressor with the xL8/xL9 error still does not run normally, it needs to be replaced. Refer to Part 4, 4.13.10 “Compressor replacement procedure”.

Connecting compressor to an error-free unit

If there is no error-free unit nearby:

- Replace the main PCB of the unit with the xL8/xL9 error and ensure the wiring is correct. If the compressor with the xL8/xL9 error runs normally, a fault with the main PCB was causing the xL8/xL9 error; if the compressor with the xL8/xL9 error still does not run normally, it needs to be replaced. Refer to “Compressor replacement procedure”.

10.11.6 Compressor replacement procedure

Step 1: Remove faulty compressor and remove oil

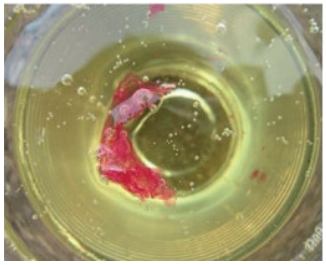
- Remove the faulty compressor from the unit.
- Before removing the oil, shake the compressor so as to not allow impurities to remain settled at the bottom.
- Drain the oil out of the compressor and retain it for inspection. Normally the oil can be drained out from the compressor discharge pipe..

Draining oil from a compressor

Step 2: Inspect oil from faulty compressor

- If the oil is clear and transparent, go to Step 6. Slightly yellow oil is not an indication of any problems.
- If the oil is dark, black or contains impurities, the system has problems and the oil needs to be changed and go to Step 3. (If the compressor oil has been spoiled, the compressor will not be being lubricated effectively. The moving parts 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)

Inspecting compressor oil

Oil is black: it has been carbonized 	oil is a little yellow, but is clear and transparent and the condition is acceptable 
Oil is still transparent but there are impurities which may clog the filter 	
Cloudy or gray oil indicates abnormal system operation 	This oil contains particles of copper 

Step 3: Replace oil separator, accumulator and high pressure tank

- If the oil from a compressor is spoiled, replace oil separator, accumulator and high pressure tank.

Step 4: Check filter

- If the oil from a compressor is spoiled, check filters in the unit. If it is blocked, clean with nitrogen or replace.

Step 5: Clear the oil in the system

- If the oil from a compressor is spoiled, clear the oil in the system by nitrogen to ensure there is no spoiled oil in it.

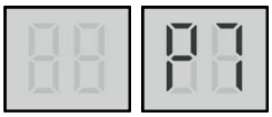
Step 6: Replace compressor

- If the oil drained from the faulty compressor is clean and transparent in Step 2, replace the faulty compressor.
- If the oil drained from the faulty compressor is spoiled in Step 3, replace the faulty compressor and other compressor in the system.

Step 7: Vacuum drying and refrigerant charging

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

10.12 **P7**



Description

- Condensing temperature too high in cooling mode.
  When the Max(T3A;T3B) condensing temperature is higher than 62°C for more than 3 seconds, the system displays P7 protection the unit stop working.
  If the condensing temperature drops below 55°C P7 is removed and normal operation restore
- Error code is displayed on main PCB and user interface

Possible causes

- Condensing temperature sensor T3A or T3B not connected properly or has malfunctioned.
- Fan motor wiring connection is wrong.
- Poor condenser heat exchange.
- Fan motor damaged.
- Main PCB damaged.

Procedure

P7

↓

Air side heat exchanger refrigerant outlet temperature sensor or air side heat exchanger refrigerant total outlet temperature sensor is loosened (1) — YES → Ensure the temperature sensor is connected properly

NO ↓

Fan motor wiring connection is wrong — YES → Ensure fan motor wiring is connected properly

NO ↓

Air side heat exchanger refrigerant outlet temperature sensor or air side heat exchanger refrigerant total outlet temperature sensor has short-circuited or failed (2) — YES → Replace the temperature sensor

NO ↓

The air side heat exchanger heat exchange is poor (3) — YES → Inspect the system and fix the error

NO ↓

The fan or fan motor is blocked or damaged — YES → Inspect the system and fix the error

NO ↓

Replace main PCB

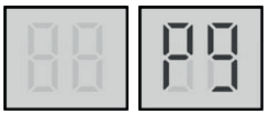
Notes:

1 Air side heat exchanger refrigerant outlet temperature sensor and air side heat exchanger refrigerant total outlet temperature sensor connection port is CN1 and CN69 on the main PCB (labeled 10 and 4 in Figure “Main PCB”).

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”.

3 Check air side heat exchanger, fan(s) and air outlets for dirt/blockages
The normal resistances of the inverter compressor are 0.3-2Ω 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.

10.13 P9



Description

- High temperature difference between water side heat exchanger water inlet and water outlet temperatures protection
- Error code is displayed on main PCB and user interface

Possible causes

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

Procedure

P9

↓

Water side heat exchanger water inlet /outlet temperature sensor is loosened (1) — YES → Ensure the temperature sensor is connected properly

NO

↓

Water side heat exchanger water inlet / outlet temperature sensor has short-circuited or failed (2) — YES → Replace the temperature sensor

NO

↓

Water piping contains air — YES → Purge air from the water system

NO

↓

The water flow rate is not sufficient, caused by crushed or bent water piping, pump capacity or high resistance in water piping — YES → Inspect the system and fix the error

NO

↓

Replace main PCB

Notes:

1 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 8 in Figure “Main PCB”).

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 in Part “Temperature Sensor Resistance Characteristics”.

10.14 PC

Description

- Water side heat exchanger low pressure protection
- Error code is displayed on main PCB and user interface

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.

Procedure

Pc

↓

Low pressure sensor connection on main PCB is loosened (1)	YES →	Ensure the sensor is connected properly
NO ↓		
Low pressure sensor has short-circuited or failed (2)	YES →	Replace the sensor
NO ↓		
Insufficient refrigerant caused by refrigerant leakage (3)	YES →	Add refrigerant or inspect the system forleaks
NO ↓		
The low pressure side is blocked, caused by crushed or bent pipe, blocked EXV, ordirty filter (4)	YES →	Inspect the system and fix the error. If the filter is blocked by ice, the piping should be cleaned
NO ↓		
The air side heat exchanger heatexchange is poor in heating mode (5)	YES →	Inspect the refrigerant system and fix the error
NO ↓		
The water flow rate is not sufficient incooling mode (6)	YES →	Inspect the water system and fix the error
NO ↓		
Replace main PCB		

Notes:

1 Low pressure sensor connection is port CN17 on the main PCB (labeled 9)

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

10.15 **PH**

Description

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

Possible causes

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

Procedure

PH

↓

T4 temperature sensor connection on main PCB is loosened (1) — YES → Ensure the sensor is connected properly

NO ↓

T4 temperature sensor has short-circuited or failed (2) — YES → Replace the sensor

NO ↓

Replace main PCB

Notes:

1 Temperature detection is port CN1 on the main PCB (labeled 10 in in Figure “Main PCB”) .

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 “Temperature Sensor Resistance Characteristics”

10.16 **PE**

Description

- Low water temperature protection in cooling mode
- Error code is displayed on main PCB and user interface.
- For outdoor air temperature T4<10°C the activation of PE alarm occurs when Taf≤-2°C last for 3s and recover once the water temperature Taf>7°C after 7 minutes.
- For outdoor air temperature T4≥10°C the activation of PE alarm occurs when Taf≤3°C last for 3s and recover once the water temperature Taf>10°C after 7 minutes.
- If PE alarm is detected 3 times within 1h the fault will be locked and is necessary a manual restart of the unit or a reset of the blocking alarms

Possible causes

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

Procedure

PE

↓

Taf temperature sensor connection on main PCB is loosened (1) → YES → Ensure the sensor is connected properly

NO ↓

Taf temperature sensor has short-circuited or failed (2) → YES → Replace the sensor

NO ↓

Insufficient refrigerant caused by refrigerant leakage (3) → YES → Add refrigerant or inspect the system for leaks

NO ↓

The low pressure side is blocked, caused by crushed or bent pipe, blocked EXV, or dirty filter (4) → YES → Inspect the system and fix the error. If the filter is blocked by ice, the piping should be cleaned

NO ↓

The water side heat exchanger heat exchange is poor in cooling mode (5) → YES → Inspect the refrigerant system and fix the error

NO ↓

The water flow rate is not sufficient in cooling mode (6) → YES → Inspect the water system and fix the error

NO ↓

Replace main PCB

Notes:

1 Water side heat exchanger anti-freezing temperature sensor (Taf, include Taf1 and Taf2) connection are ports CN69 and CN31 on the main PCB (labeled 4 and 8 in Part “Main PCB”).

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 Table “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

10.17 **PL / C7**

Description

- PL indicates inverter module temperature protection.
  When the main inverter module temperature rises above 100°C, the system displays PL protection and all the units stop running the unit stop running.
  When the inverter module temperature drops below 68°C for Sheen 30kW and respectively 78°C for Sheen 60/90/130kW, the unit recovers from the fault.
- If C7 alarm is detected 3 times within 100min the fault will be locked and is necessary a manual restart of the unit or a reset of the blocking alarms
- Error code is displayed on the main PCB and user interface.

Possible causes

- Blocked, dirty or loose heat sink.
- Refrigerant cooling pipe is blocked
- Main PCB damaged.

Procedure

PL - C7

↓

The inverter module heat sink is blocked or dirty (1) — YES → Clean or replace the heatsink

NO ↓

The screws connecting the heatsink to the inverter module are loosened (2) — YES → Tighten the screws and make sure the heatsink is well-connected

NO ↓

Refrigerant cooling pipe is blocked — YES → Cooling Pipe temperature higher than 55 degree

NO ↓

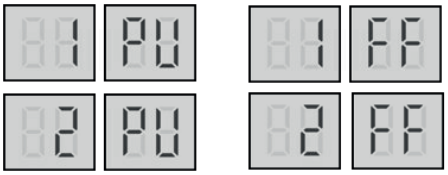
Check the quantity of grease on the heat sink of the inverter board. Replace the inverter board.

Notes:

1 Refer to Figures “Unit Electric Control Box Layout”.

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 “Temperature Sensor Resistance Characteristics”.

10.18 **PU - FF**



Description

- 1PU/1FF indicates fan module A protection.
- 2PU /2FF indicates fan module B or C protection.
- When PU error occurs 10 times in 120 minutes, FF will display, a manual system restart is required before the system can resume operation.
- Error code is only displayed on the main PCB and user interface.

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

Procedure

PU - FF

↓

Some power wires or communication wires of fan module are not connected properly (1) → YES → Ensure power and communication wires are connected properly

NO ↓

The fan motor is blocked or has failed (2) → YES → Remove obstruction or replace the fan motor

NO ↓

The power supply is abnormal → YES → Check the power supply equipment

NO ↓

Voltage between P and N on fan module is abnormal (3) → YES → Replace AC filter board

NO ↓

Replacing the fan module resolves the error → YES →

NO ↓

Replace main PCB

Notes:

1 Refer to Figures “Unit Electric Control Box Layout”.

2 Refer to “Layout of Functional Components”.

3 The normal voltage between P and N on the fan module is 520~560V DC. Refer to Figures “Unit Electric Control Box Layout” and to Figure “Fan module power board”

10.19 F0

Description

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

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

Possible causes

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

Procedure

F0

↓

Compressor inverter module address setting is incorrect → YES → Reset the compressor inverter module address via dial switch S7 on inverter module (1)

Communication wire from main PCB CN65 to inverter module CN8/CN9 is loosened (2) → YES → Reconnect the communication wire

Both LED1 and LED2 on inverter module are off when power on (3) → YES → Check the power supply circuit4

Replace the main PCB, is the malfunction solved? → YES → Normal

NO ↓

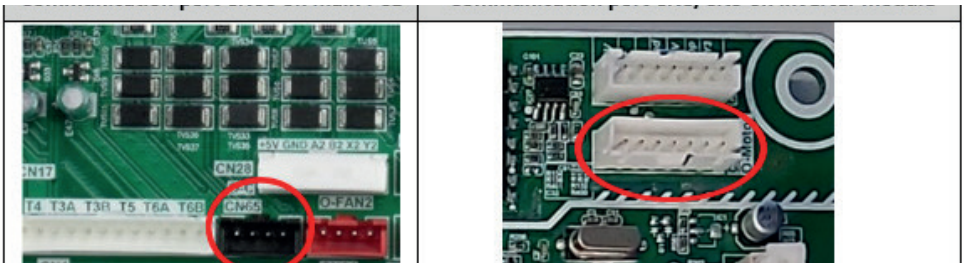
Replace main PCB

Notes:

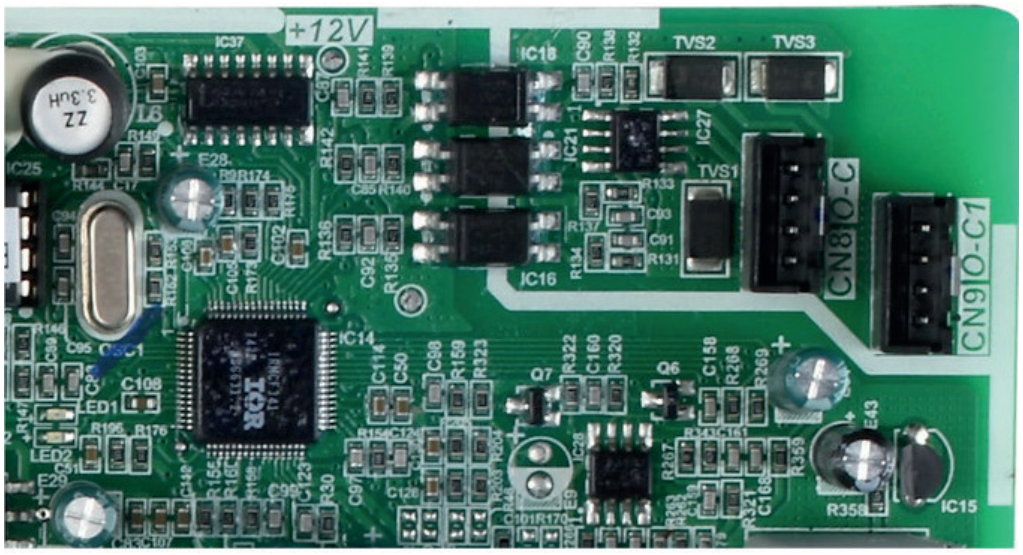
1 Compressor inverter module address is set through dial switch S7 on the inverter module. The compressor inverter module A/B location refers to the wiring diagram

S7 on inverter module	Inverter module address
	00 for compressor inverter module 1
	01 for compressor inverter module 2

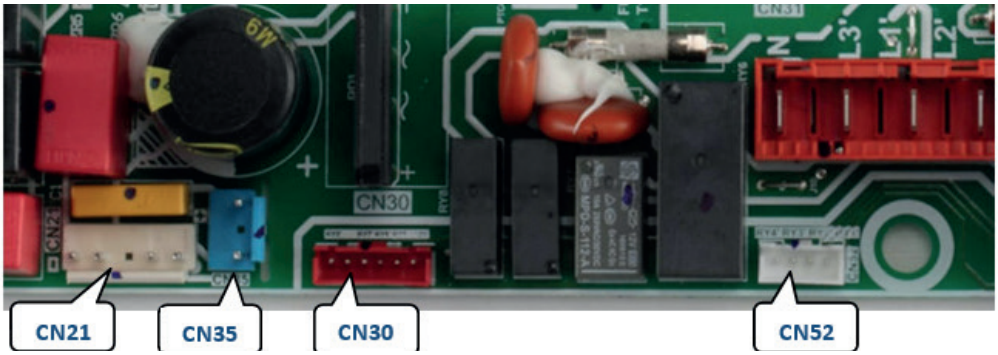
2 Communication wire from main PCB CN65 to inverter module CN8/CN9.



3 LED1/2 on inverter module



Check the power supply for the compressor inverter module, port CN21 on filter board, the normal voltage should be DC520~560V; check the high pressure switch connection port CN35 on filter board, the normal resistance should be zero; Check the connection cable from main PCB port CN58 to filter board port CN30 and check the connection cable from main PCB port CN52 to filter board port CN52.



10.20 H5

Description

- Abnormal power supply voltage.
- Error code is only displayed on main PCB and user interface

Possible causes

- Unit power supply voltage at or above 260V or drops below 165V or a phase is missing.
- Loosened wiring within electric control box.
- High voltage circuit error.
- Main PCB damaged.

Procedure

H5

↓

ODU power supply voltage at orabove 260V or drops below 165V or a phase is missing (1)

YES → Provide normal power supply

NO ↓

Wires between main PCB, AC filter boards and electric control box power supply terminals are loosened (2)

YES → Ensure the wires are connected properly

NO ↓

High voltage circuit error has occurred, such as the compressor has malfunctioned (3) , the fan motor has short-circuited (4), or the inverter modulehas short-circuited (5)

YES → Replace or repair the relevant parts

NO ↓

Replace main PCB

Notes:

1 The normal voltage between A and N, B and N, and C and N is 165-265V, depends on the area the unit was installed

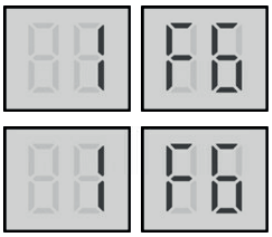
2 Refer to Figures “Unit Electric Control Box Layout”.

3 The normal resistances of the inverter compressor are 0.3-2Ω among U V W and in MΩ range/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 10Ω. If a measured resistance is 0Ω, the fan motor has short-circuited. Refer to “Layout of Functional Components”.

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 “Unit Electric Control Box Layout”.

10.21 **F6**



Description

- DC bus voltage protection.
- Only occurred in standby status.
- Error code is displayed on main PCB and user interface

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.

Procedure

F6 refer to P6 protection troubleshooting: xL1 and xL2.

10.22 HE

Description

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

Possible causes

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

Procedure

HE

↓

Electronic expansion valve coil connection on main PCB is loosened (1)

YES → Ensure the sensor is connected properly

NO ↓

Electronic expansion valve coil has malfunctioned (2)

YES → Replace the EXV

NO ↓

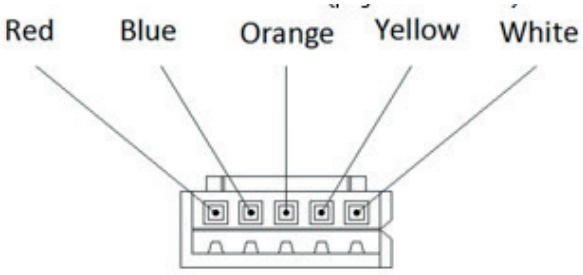
Replace main PCB

Notes:

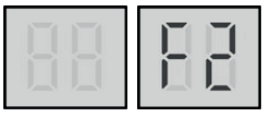
1 Electronic expansion valve coil connections are ports CN70 CN71 CN72 on the main PCB (labeled 16 in Figure “Main PCB”).

2 The normal resistances between EXV coil wiring terminals RED and white / yellow / orange / blue are 40-50Ω. If any of the resistances differ from the value, the EXV coil has malfunctioned

EXV coil wiring terminals:



10.23**F2**



Description

- Insufficient protection of discharge superheat.
- Error code is only displayed on main PCB and user interface.

Possible causes

- Discharge pipe temperature sensor connected properly or has malfunctioned.
- Electronic expansion valve coil not connected properly or has malfunctioned.
- Check the refrigerant charge.
- Damaged main PCB.

Procedure

F2

↓

Discharge temperature sensor connection on main PCB is loosened → YES → Ensure the sensor is connected properly

NO ↓

Discharge temperature or pressure sensor has short-circuited or faile → YES → Replace the sensor

NO ↓

Electronic expansion valve coil connection on main PCB is loosened → YES → Ensure the valve is connected properly

NO ↓

Electronic expansion valve coil has malfunctioned → YES → Replace the EXV

NO ↓

Discharge pressure is too high → YES → The temperature difference between water inlet and water outlet or water inlet is too high

NO ↓

Replace main PCB ← NO ← Water flow is insufficient

YES ↓

Refer to E9 error

10.24**F4**

Description

- When a L0 or L1 error occurs 3 times in 60 minutes, F4 will display, a manual system restart is required before the system can resume operation

Possible causes

- Refer to L0 or L1 error troubleshooting

Procedure

- Refer to L0 or L1 error troubleshooting.

10.25 FP

Description

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

Possible causes

- The S12_2 of slave units is different with the master unit.
- Main PCB damaged.

Procedure

FP

↓

The S12_2 of slave units is different with the master unit

YES → Adjust the switch of S12_2

NO ↓

Replace main PCB

10.26 P3

Description

- High temperature protection of ambient temperature sensor in cooling mode. When the ambient temperature is higher than 65°C, the system displays P3 protection and all units stop running. When the ambient temperature returns drops below 58°C, P3 is removed and normal operation resumes.
- Error code is displayed on main PCB and user interface.

Possible causes

- Ambient temperature sensor is not connected properly or has malfunctioned.
- Fan motor wiring connection is wrong.
- Poor condenser heat exchange.
- Fan motor damaged.
- Main PCB damaged.

Procedure

P3

↓

Ambient temperature sensor is loosened (1) — YES → Ensure the temperature sensor is connected properly

NO ↓

Fan motor wiring connection is wrong — YES → Ensure fan motor wiring is connected properly

NO ↓

Ambient temperature sensor has short-circuited or failed (2) — YES → Replace the temperature sensor

NO ↓

The fan or fan motor is blocked or damaged — YES → Inspect the system and fix the error

NO ↓

Heat exchange on air side is not good (3) — YES → Inspect the system and fix the error

NO ↓

Replace main PCB

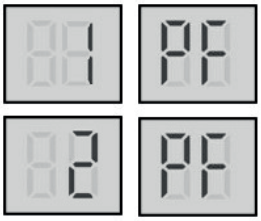
Notes:

1 Ambient temperature sensor connection port is CN1 on the main PCB (labeled 10 in Figure “Main PCB”).

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 “Temperature Sensor Resistance Characteristics”.

3 Check air side heat exchanger, fan(s) and air outlets for dirt/blockages.

10.27 **xPf**



Description

- Error code is displayed on main PCB and user interface.
- Valid only for Sheen 130 kW configuration with two pumps in parallel.
- Pump motor protector pre-alarm.

Possible causes

- One of the two pumps has malfunction or is damaged
- Pump motor protector connection is faulty
- Main PCB damaged.

xPF

↓

Check the electrical connection → YES → Restore the electrical connections

NO ↓

Check the pump → YES → Replace the pump if necessary

NO ↓

Replace main PCB

11. Temperature Sensor Resistance Characteristics

11.1 Outdoor ambient temperature sensor
Outdoor heat exchanger temperature sensor resistance
Plate heat exchanger temperature sensor resistance

Temperature °C	Resistance	Temperature °C	Resistance	Temperature °C	Resistance	Temperature °C	Resistance
-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

Temperature °C	Resistance	Temperature °C	Resistance	Temperature °C	Resistance	Temperature °C	Resistance
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

11.2 Compressor top temperature sensor Discharge pipe temperature sensor resistance

Temperature °C	Resistance	Temperature °C	Resistance	Temperature °C	Resistance	Temperature °C	Resistance
-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		

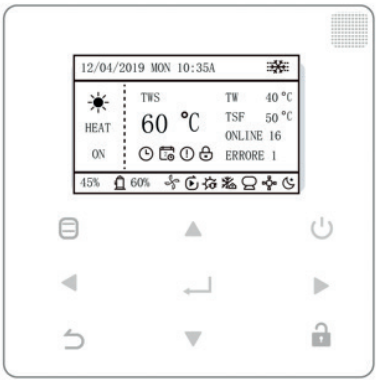
Temperature °C	Resistance	Temperature °C	Resistance	Temperature °C	Resistance	Temperature °C	Resistance
13	95.05	53	17.58	93	4.562		
14	90.66	54	16.94	94	4.426		
15	86.49	55	16.32	95	4.294		
16	82.54	56	15.73	96	4.167		
17	78.79	57	15.16	97	4.045		
18	75.24	58	14.62	98	3.927		
19	71.86	59	14.09	99	3.812		

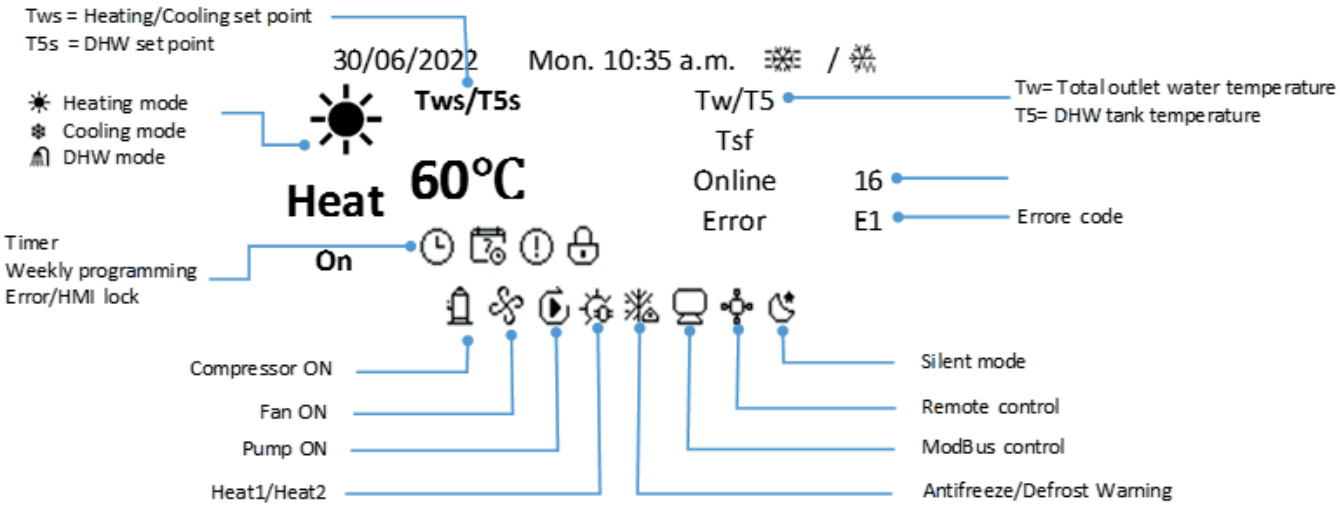
11.3 Inverter module temperature sensor resistance

Temperature °C	Resistance	Temperature °C	Resistance	Temperature °C	Resistance	Temperature °C	Resistance
-30	971.4	10	109.0	50	19.70	90	5.000
-29	912.8	11	103.9	51	18.97	91	4.855
-28	858.2	12	99.02	52	18.26	92	4.705
-27	807.3	13	94.44	53	17.59	93	4.566
-26	759.7	14	90.11	54	16.94	94	4.431
-25	715.3	15	86.00	55	16.32	95	4.301
-24	673.6	16	82.09	56	15.73	96	4.176
-23	634.7	17	78.38	57	15.16	97	4.055
-22	598.2	18	74.87	58	14.62	98	3.938
-21	564.1	19	71.53	59	14.10	99	3.825
-20	532.2	20	68.36	60	13.60	100	3.716
-19	502.2	21	65.34	61	13.12	101	3.613
-18	474.1	22	62.47	62	12.65	102	3.514
-17	447.7	23	59.75	63	12.22	103	3.418
-16	423.0	24	57.17	64	11.79	104	3.326
-15	399.8	25	54.71	65	11.39	105	3.235
-14	378.0	26	52.36	66	10.99	106	3.148
-13	357.5	27	50.13	67	10.62	107	3.063
-12	338.2	28	48.01	68	10.25	108	2.982
-11	320.1	29	45.99	69	9.909	109	2.902
-10	303.1	30	44.07	70	9.576	110	2.826
-9	287.1	31	42.23	71	9.253	111	2.747
-8	272.0	32	40.48	72	8.947	112	2.672
-7	257.8	33	38.81	73	8.646	113	2.599
-6	244.4	34	37.23	74	8.362	114	2.528
-5	231.9	35	35.71	75	8.089	115	2.460
-4	220.0	36	34.27	76	7.821	116	2.390
-3	208.7	37	32.89	77	7.569	117	2.322
-2	198.2	38	31.58	78	7.323	118	2.256
-1	188.2	39	30.33	79	7.088	119	2.193
0	178.8	40	29.13	80	6.858	120	2.132
1	169.9	41	27.98	81	6.640	121	2.073
2	161.5	42	26.89	82	6.432	122	2.017

Temperature °C	Resistance	Temperature °C	Resistance	Temperature °C	Resistance	Temperature °C	Resistance
3	153.6	43	25.85	83	6.230	123	1.962
4	146.1	44	24.85	84	6.033	124	1.910
5	139.1	45	23.90	85	5.847	125	1.859
6	132.3	46	22.98	86	5.667		
7	126.0	47	22.10	87	5.492		
8	120.0	48	21.26	88	5.322		
9	114.3	49	20.47	89	5.159		

12. ADJUSTMENTS





UNLOCK	To lockout / unlock.
▼▲	To modify current setpoint
MENU	To open the various menus from the HOME screen
▲ ▼ ◀ ▶	To move the cursor, change the selection or change the set value. The parameter can be quickly changed with a long press.
OK	To confirm an operation.
ON/OFF	To set the ON / OFF function.
BACK	To return to the previous level. Press to exit the current page and return to the previous page. Long press to return straight to the home screen.

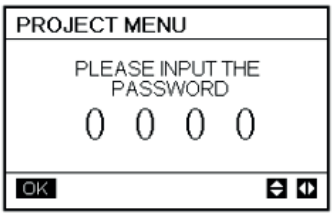
12.1 Menu STRUCTURE

Press “UNLOCK” for 3 seconds to unlock the keypad

12.1.1 Setting PROJECT MENU (pwd: 5432)

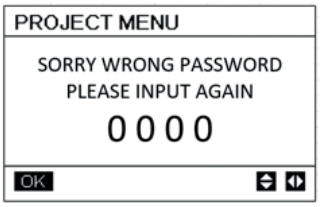
12.1.1.1 Entering the password:

Select “PROJECT MENU”, and press “OK“ to enter the menu. The screen prompts the user to enter the password, as shown below



The initial password must be obtained by a professional. Press the “⬆” and “⬇” buttons to change the number to enter, and press the “⬅” and “➡” buttons to change the bit code to enter. After the number is entered, the display is not changed. After entering the password, press the “OK“ button to enter the interface; press the “BACK“ button to go back to the previous interface; the display is as follows if the input is incorrect:

Non-professionals are not allowed to change the parameters, otherwise it may cause abnormal failures.



The query interface as follows is displayed if the input is correct:

Project menu
Set unit-air conditioning
Set parallel unit
Set DHW time
Inv pump ratio
←Enter 1/2

Project menu
Check parts
Percent of glycol
←Enter 2/2

12.1.1.2 Set unit air-conditioning:

Press “▼” and “▲” buttons to select the “SET UNIT AIR-CONDITIONING” in the “PROJECT MENU”

interface, and press the “OK“ button to enter the interface. The interface display is as follows:

Set unit		
Two_Cool_Diff	◀ 2 ▶	℃
Two_Heat_Diff	◀ 2 ▶	℃
dT5_On	◀ 8 ▶	℃
dT1s5	◀ 10 ▶	℃
←Ok 1/1		

Press “▲” or “▼” to select item and press “➡” or “⬅” to set suitable temperature or time. Press “OK” to confirm. Back to homepage if there is no operation within 60s.

Detailed setup information:

	Setting range	Default value	Adjustment value	Note
Two_COOL_DIFF	1~5℃	2℃	1℃	
Two_HEAT_DIFF	1~5℃	2℃	1℃	
dT5_ON	2~10℃	8℃	1℃	DHW
Dt1s5	5~20℃	10℃	1℃	

12.1.1.3 Set parallel unit:

Select “SET PARALLEL UNIT” and press “ ” to entry. Display as follows:

Set parallel unit		
Tim_Cap_Adj	◀180 ▶	s
Tw_Cool_Diff	◀ 2 ▶	℃
Tw_Heat_Diff	◀ 2 ▶	℃
Ratio_Cool_First	◀ 0 ▶	%
Ratio_Heat_First	◀ 50 ▶	%
←Ok		

Press “▲” or “▼” to select item to be set and press “➡” or “⬅” to set value. Press “ ” to confirm. Back to homepage

if there is no operation within 60s.

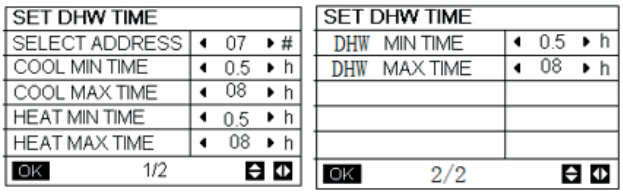
Detailed setup information:

	Setting range
Tw_Cool_diff	1~5°C
Tw_Heat_diff	1~5°C
Ratio_cool_first	5~100%
Ratio_heat_first	5~100%

12.1.1.4 DHW time setting:

Select “SET DHW TIME” and press “OK” to entry.

Display as follows:



Press “▲” or “▼” to select item to be set and press “➔” or “ ➔” to set value. Press “OK” to confirm. Back to homepage if there is no operation within 60s.

Detailed setup information:

	Function	Predetermined area	Defaults	Adjustment range
Select address	Destination address selection	0~15	0	1
Cool min. time	Cooling operation minimum time	0.5~24h	0.5h	0.5h
Cool max. time	Maximum cooling time	0.5~24h	8h	0.5h
Heat min. time	Heating operation minimum time	0.5~24h	0.5h	0.5h
Heat max. time	Maximum heating time	0.5~24h	8h	0.5h
DHW min. time	Shortest running time for hot water	0.5~24h	0.5h	0.5h
DHW max. time	The longest running time for hot water	0.5~24h	2h	0.5h

12.1.1.5 Inverter pump output setting:

Select “INV PUMP RATIO” and entry the following page to select pump: use in the case of multiple pumps, do not send instructions for single pump.

Inv pump ratio	
Min. ratio	◀80 ▶%
Max. ratio	◀100▶%
←Ok	▲▼◀▶

Press "▲" or "▼" to select item to be set and press "➔" or "➔" to set value. Press "OK" to confirm. Back to homepage if there is no operation within 60s. MINRATIO setting should ensure its flow meet the requirement of the whole unit, otherwise the unit may be damaged.

12.1.1.6 CHECK PARTS

Select "CHECK PARTS" and press "OK"to entry submenu. Display as follows:

Check parts	
Select address	◀07 ▶
Fix pump state	Off
Inv pump state	80%
Four-way valve	Off
SV1 state	Off
←Ok 1/3	▲▼◀▶

Check parts	
SV2 state	Off
SV4 state	Off
SV5 state	Off
SV6 state	Off
SV8A state	Off
←Ok 2/3	▲▼◀▶

Check parts	
SV8B state	Off
Heat1 state	Off
Heat2 state	Off
Coil valve	Off
←Ok 3/3	▲▼◀▶

Press "▲" or "▼" to view 13 state. Press " " to return to the previous page.

12.1.1.7 PERCENT OF GLYCOL

Applicable models: low temperature cooling only and FC models, (lower outlet water temperature); heat pump (water side, low temperature antifreeze)

Select "PERCENT OF GLYCOL" and press "OK" to entry submenu. Display as follows:

Percent of glycol		
Glycol type	◀ ETHE ▶	
Set the percent	◀ 80 ▶	%
Tsafe	5℃	
Paf	0.7MPa	
△Paf	◀ 0 ▶	Mpa
←Ok 1/2		▲▼◀▶

Percent of glycol		
Historical setting		
06/06/2020 11:30a.m.	5	℃
06/05/2020 11:30a.m.	5	℃
06/04/2020 11:30a.m.	5	℃
06/03/2020 11:30a.m.	5	℃
←Ok 2/2		▲▼◀▶

Press "▲" or "▼" to select item to be set and press "➔" or "➔" to set value. Press "OK" to confirm. Back to homepage if there is no operation within 60s. Up to 16 historical setting records.

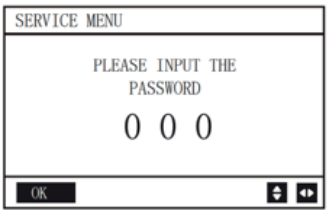
	Setting range
GLYCOL TYPE	ETHE/PROP
SET THE PERCENT	0∽50%
TSAFE	DISPLAY
PAF	DISPLAY

△PAF	0∽0.2MPa
HISTORICAL SETTING	04/06/2020 12:00A
HISTORICAL SETTING	04/06/2020 12:00A
HISTORICAL SETTING	04/06/2020 12:00A

12.1.2 Setting SERVICE MENU (pwd 234)

12.1.2.1 Entering the password:

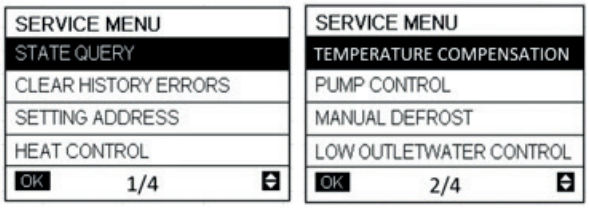
Select "SERVICE MENU", and press the "OK" button to enter the menu. The screen prompts the user to enter the password, as shown below:



Press "▲" and "▼" buttons to change the number to enter,

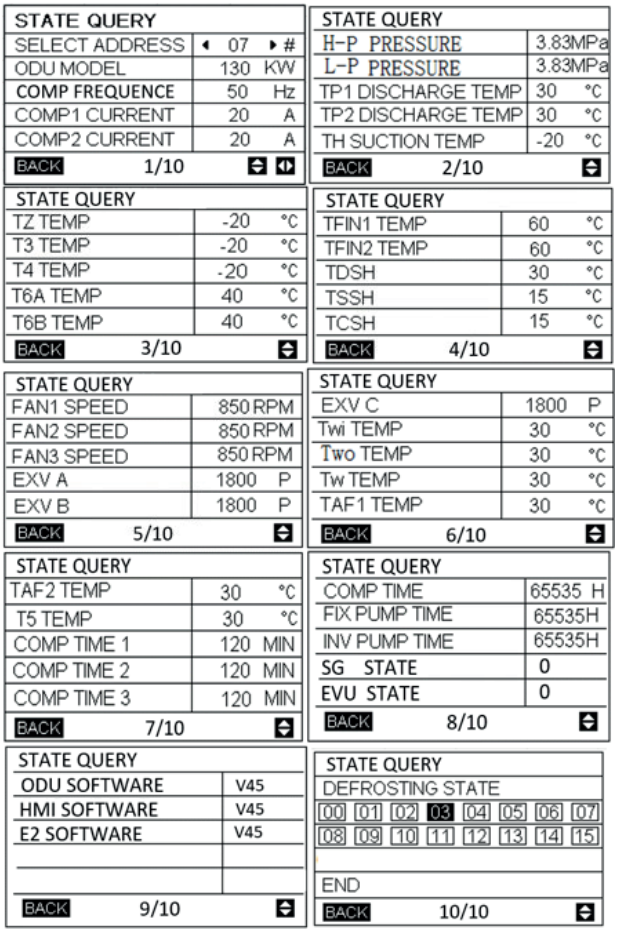
and press "→" and "←" buttons to change the bit code to enter. After the number is entered, the display is not changed. After entering the password, press "OK" button to enter the interface or Press "BACK" button to go back to the previous interface. Display as follows if the input is incorrect:

The query interface as follows is displayed if the input is correct:



12.1.2.2 State query

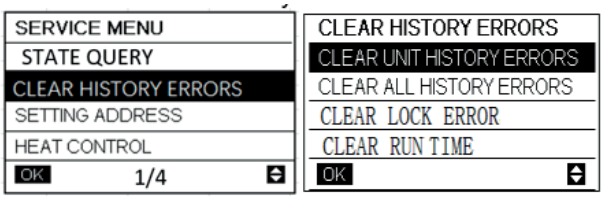
Press "▲" or "▼" to select "STATE QUERY" under "SERVICE MENU" page. Then press "OK" to enter submenu.



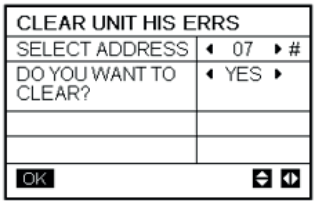
Press "→" or "←" to select the address of module to view (the offline address is skipped automatically). There are 11 pages and 49 state values. Press "▲" or "▼" buttons to select the different pages.

12.1.2.3 Clear history errors:

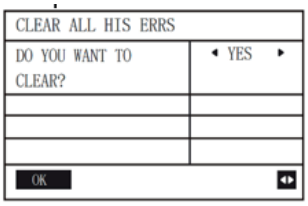
Press "▲" or "▼" to select "CLEAR HISTORY ERRORS" and confirm by "OK".



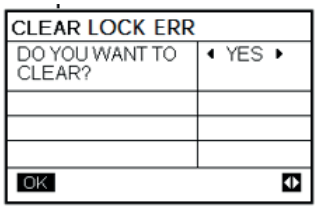
Press "▲" or "▼" to select "CLEAR UNIT HISTORY ERRORS" and press "OK" to confirm. Display as follows:



Press “▲” or “▼” to select “SELECT ADDRESS” and press “➔” or “➔” to select address value. Press “▲” or “▼” to select clear or not, and press “➔” or “➔” to select YES or NO, and press “OK” to confirm. Press”▲” or “▼” to select “CLEAR ALL HIS ERRS” and press “OK” to confirm. Display as follows:

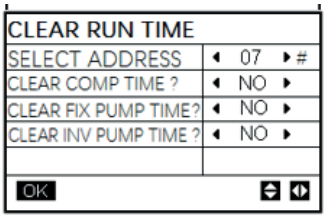


Press”▲” or “▼” to select “CLEAR LOCK ERROR” and press “OK” to confirm. Display as follows:



Press “➔” or “➔” to select YES or NO, and press “OK” to confirm.

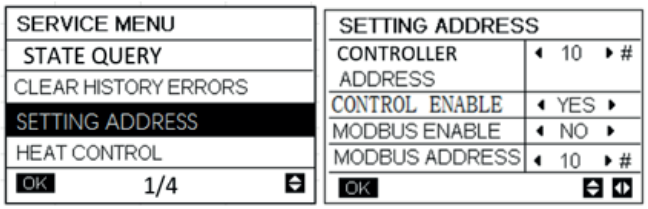
Press “▲” or “▼” to select “CLEAR RUN TIME” and press “OK” to confirm. Display as follows:



Press “▲” or “▼” to select “SELECT ADDRESS”, press “➔” or “➔” to select address value. Press “▲” or “▼” to select clear or not, and press “➔” or “➔” to select YES or NO, and press “OK” to confirm.

12.1.2.4 Setting address:

Press “▲” or “▼” under “SERVICE MENU” page to select “SETTING ADDRESS” (Can also enter by combining buttons pressing “MENU”, “➔” for 3s). Press “OK” and enter submenu.

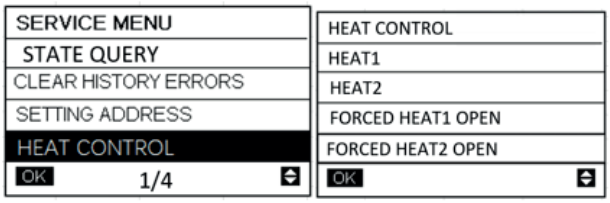


Press “▲” or “▼” to select item and press “➔” or “➔” to set value. Then press “OK” to confirm and “BACK” to back.

12.1.2.5 Heat control

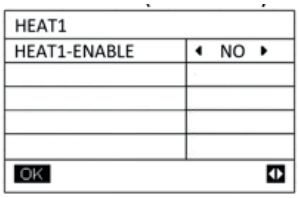
HEAT1 means pipe electric heating in cooling/heating mode. HEAT2 means tank electric heating or gas boiler in DHW mode.

Press “▲” or “▼” to select “HEAT CONTROL” under “SERVICE MENU” page. Press “OK” and enter submenu.

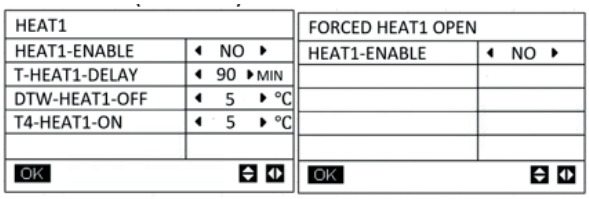


Press “▲” or “▼” to select item to be set. Press “OK” and enter submenu.

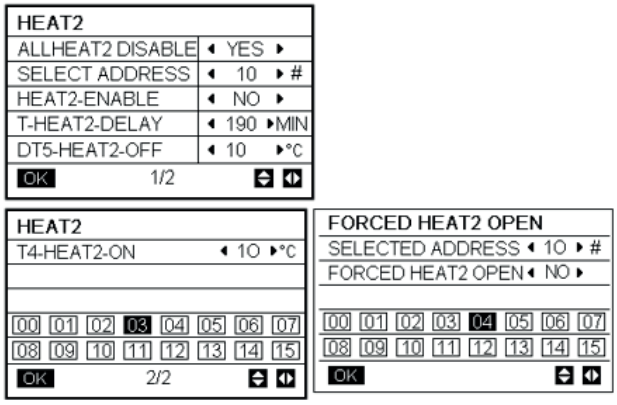
HEAT1 dial (S6-1 OFF):



HEAT1 dial (S6-1 ON):



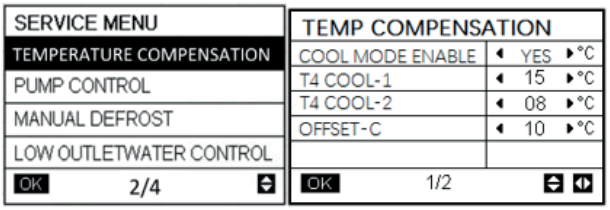
HEAT2:

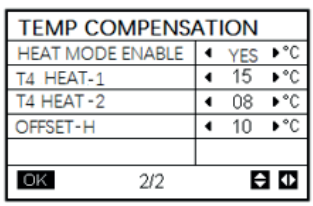


Press "▲" or "▼" to select item and press "➔" and "➔" to set value. Then press "OK" to confirm and "BACK" to back.

12.1.2.6 TEMPERATURE compensation

Press "▲" or "▼" to select "TEMPERATURE COMPENSATION" under "SERVICE MENU" page. Press "OK" and enter submenu.:



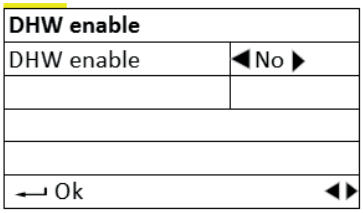


Press "▲" or "▼" to select item and press "➔" and "➔" to set value. Then press "OK" to confirm.

12.1.2.7 DHW enable:

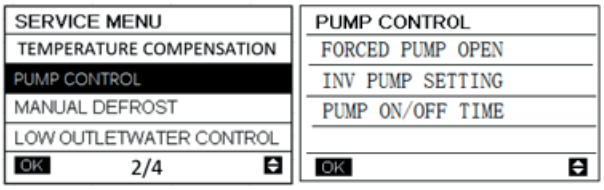
Press "▲" or "▼" to select "DHW ENABLE" under "SERVICE MENU" page. Press " " and enter submenu.

Select "YES" to enable the DHW function then activate the DHW function and the "Priority" if necessary from User Menu.



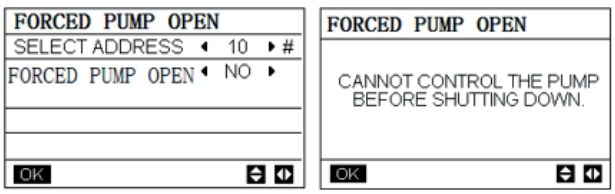
12.1.2.8 Pump Control:

Press "▲" or "▼" to select "PUMP CONTROL" under "SERVICE MENU" page. Press "OK" and enter submenu INV PUMP SETTING valid only for single pump configuration.



Press "▲" or "▼" to select "FORCED PUMP OPEN"

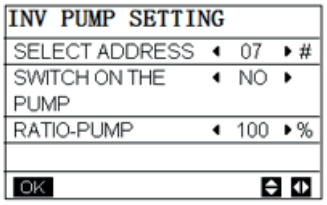
Press "OK" and enter submenu



Under "FORCED PUMP OPEN" page press "▲" or "▼" to select item and press "➔" and "➔" to set value. Press "OK" to confirm or "BACK" to go back. If the unit at that address is ON, the pump cannot be controlled by the wired controlled. Display as above. Under "INV PUMP OPEN" page, press "▲" or "▼" to select item and press "➔" and "➔" to set value. Press "OK" to confirm or "BACK" to go back." to set value. Press " " to confirm or " " to go back.

Note: Can only be set under a single pump. The setting range of RATIO-PUMP is 30%-100%. It should ensure its flow meet the requirement of whole unit, otherwise the unit may be damaged. Under "PUMP CONTROL" page, press "▲" or "▼" to select item and press "➔" and "➔" to

set value. Press “OK” to confirm or “BACK” to back.



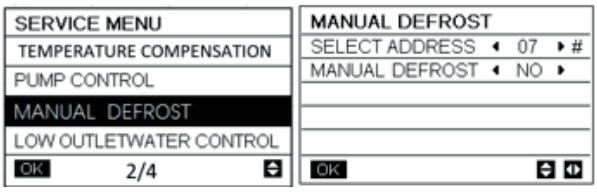
Note: Can only be set under a single pump. The setting range of RATIO-PUMP is 30%-100%. It should ensure its flow meet the requirement of whole unit, otherwise the unit may be damaged. Under “PUMP CONTROL” page, press “▲” or “▼” to select item and press “➔” and “➔” to set value. Press “OK” to confirm or “BACK” to back.

Parameter setting requirements are as follows:

	Set range	Default value	Adjustment range
PUMP ON TIME	5~60min	5	5
PUMP OFF TIME	0~60min	0	5

12.1.2.9 Manual defrost

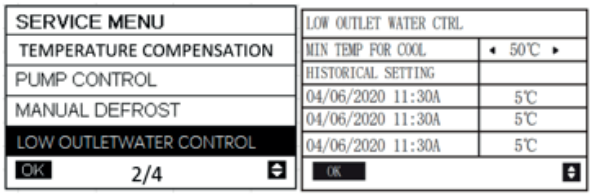
Press “▲” or “▼” to select “MANUAL DEFROST” under “SERVICE MENU” page. Press “OK” and enter submenu.



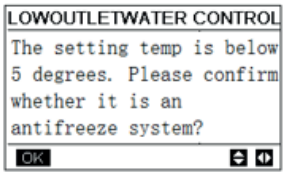
Press “▲” or “▼” to select item to be set and press “➔” or “➔” to set value. Press “ ” to confirm or “ ” to go back. If the external unit successfully enters the defrost mode after the “MANUAL DEFROST” is turned on, the defrost icon will be displayed at homepage of the wired controller.

12.1.2.10 Low outlet water temperature control

Press “▲” or “▼” to select “LOW OUTLETWATER CONTROL” under “SERVICE MENU” page. Press “ ” and enter submenu. Suitable for HP-UNIT.

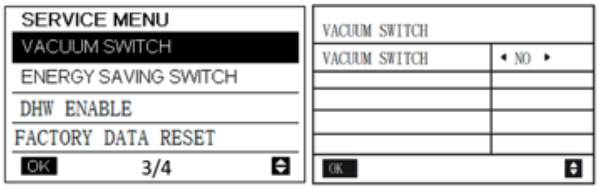


Press “➔” or “➔” to set value. Press “OK ” to confirm or “BACK” to back. At this page, the historical minimum water outlet temperature setting (setting range 0-20°C) can be viewed. When the setting temperature is less than 5°C, a prompt box will pop up:



12.1.2.11 Vacuum mode

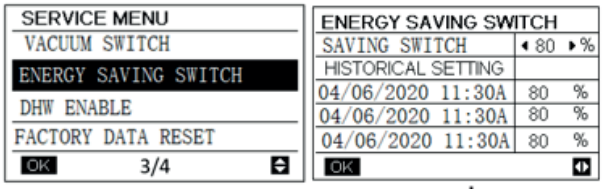
Press “▲” or “▼” to select “VACUUM SWITCH” under “SERVICE MENU” page. Press “OK” and enter submenu.



Press “➔” or “➔” to set YES or NO. Then press “ ” to confirm. Power off and restart is required to exit it.

12.1.2.12 Energy saving mode

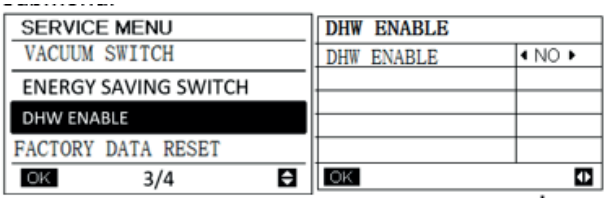
Press “▲” or “▼” to select “ENERGY SAVING SWITCH” under “SERVICE MENU” page. Press “ ” and enter submenu.



Press “←” or “→” to set value. Press “OK” to confirm or “BACK” to go back

12.1.2.13 DHW ENABLE

Press “▲” or “▼” to select “DHW ENABLE” under “SERVICE MENU” page. Press “ ” and enter submenu.

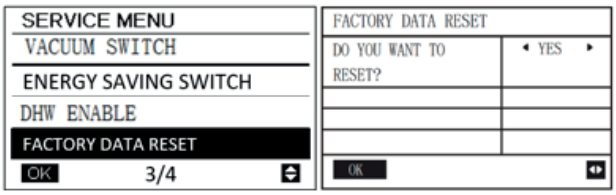


Press “←” or “→” to set value. Press “OK” to confirm or “BACK” to go back.

Note: DHW Enable is only available for custom made DHW models.

12.1.2.14 FACTORY DATA RESET

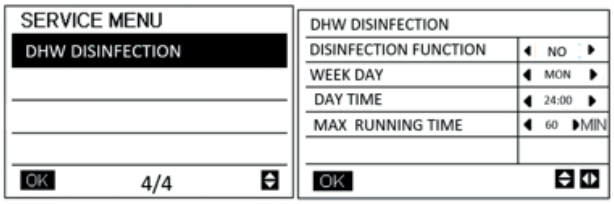
Press “▲” or “▼” to select “FACTORY DATA RESET” under “SERVICE MENU” page. Press “OK” and enter submenu.



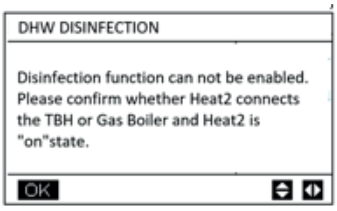
Press “▲” or “▼” to select corresponding item and press “←” or “→” to select restore or not. Press “OK” to confirm or “BACK” to go back.

12.1.2.15 DHW DISINFECTION

Press “▲” or “▼” to select DHW DISINFECTION on the SERVICE MENU interface. Press “OK” and enter submenu.



Press “▲” or “▼” to select the option to be set, and press “←” or “→” to set the desired value or state, and press the “ “ key to confirm. When setting DISINFECTION FUNCTION to “YES” state, a prompt box will pop up:



13. How to install the Inverter board

1 Open the front panel of the electric control box and, before installing the Inverter board, take a picture of the original settings and wiring positions and record the position of the cables and the terminals;

2 Check whether the Midea code on the surface of the inverter is the same as that of the replaced inverter board;

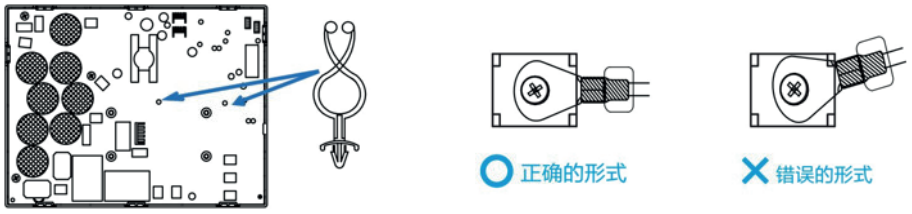
3 Since different IPM modules have different mounting torques, check whether the IPM module is correct according to the unit model. The IPM module specification on Large unit, screw size and torque used by the unit are as follows:

model	IPM Specifications for compressor	Compressor IPM screw size	Fan IPM screw size	Compressor IPM ➡ screw torque N.m	Fan IPM screw torque N.m	Compresso r cable screw torque N.m
Large 120	50A*4	M4	M3	1.2- 1.5	1.0- 1.2	1.5-1.8
Large 150	50A*2+75A*2	M4	M3	1.2- 1.5	1.0- 1.2	1.5-1.8
Large 180	75A*4	M4	M3	1.2- 1.5	1.0- 1.2	1.5-1.8
Large 240	75A*4	M4	M3	1.2- 1.5	1.0- 1.2	1.5-1.8

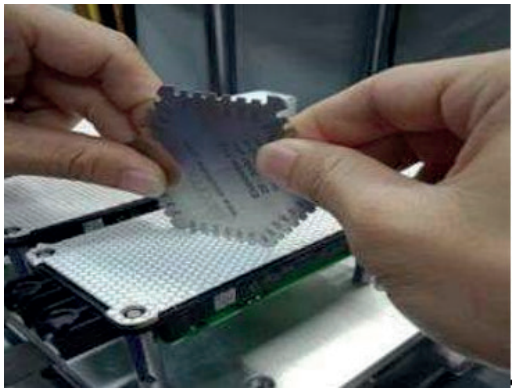
LNB/LVB65FAEMC compressor DC80PHDG-D1Y2 compressor DD110PHDG-D1Y6.

4 Remove the Inverter board to be replaced and keep the cooling surface of the radiator clean without dust, impurities, etc. adhering to the surface;

5 Place the new inverter board according to the mounting holes on the radiator. When picking up the inverter board, pls hold board by the side of the PCB, and it is forbidden to grab the components on the board directly; A newly installed inverter board for Sheen 30 should be Pre-installed the DC bus (current flows from N_in to N_out), and fix it.

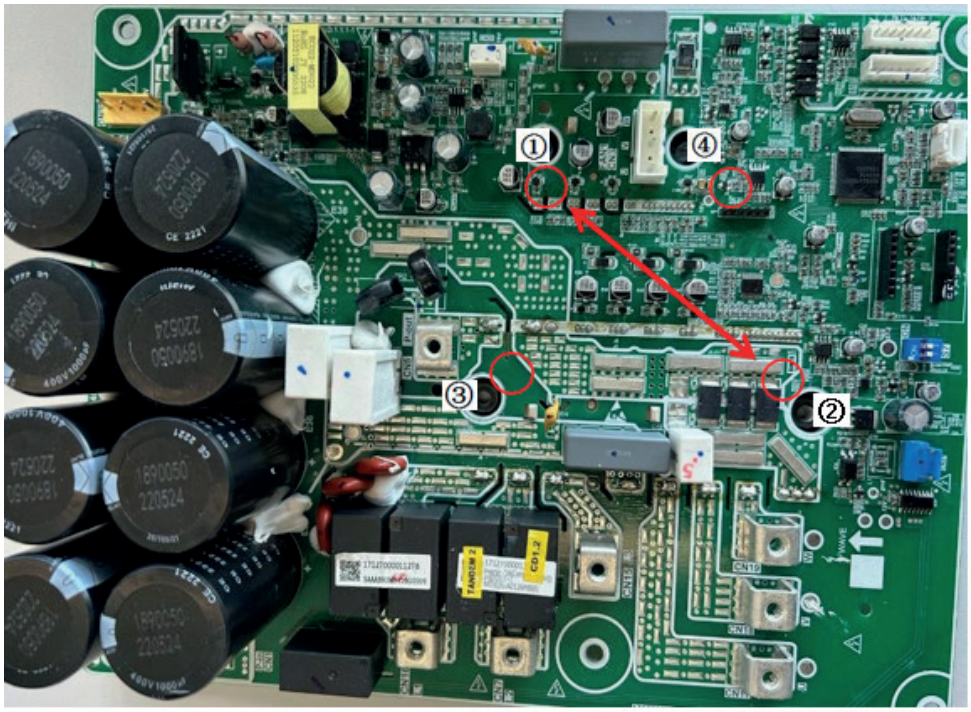


6 The surface of the IPM modules must be evenly coated with thermal conductive silicone grease. The operation method is as follows:
(A)
Before pouring thermal grease, please ensure that heat dissipation surface of the IPM modules and the surface of the radiator are free of impurities and the flatness and smoothness of the radiator are less than 30um. Spread the thermal grease evenly on the two heat dissipation surface sides with a thickness of thermal grease is 100 μm. It is not that the more you pour, the more heat is dissipated.



(B)
After coating the surface with thermal grease and before installation, please keep the two heat dissipation surfaces free from any contact to avoid impurities adhering to the heat dissipation surface and causing poor heat dissipation.
(C)
Every time an inverter board with thermal grease is installed, please clean both sides of the thermal grease before fixing the board, and re-lay the thermal grease. Do not let the heat sink surface come into contact with any other objects.

7 Fixed and tightened screws on IPM,
When assembling the screws, the screw driver is at 90° to the inverter board.
And then the other screws to be fixed on the PCBA and the sheet metal base;
(1)
Regarding to Single IPM module fixation: the first screw should be installed slowly, and if necessary, it should be installed by pre- tightening, especially for IPM modules with current not greater than 10A;
(2)
Regarding to multiple IPM modules fixation: Prioritize the assembly of the two screws at the longer diagonal positions, and engages in the pre- tightening.



Pre-tightened sequence:1 ➔2 ➔3 ➔4

Final fastening sequence:1 ➔2 ➔3 ➔4

The fixing torque value of wiring screw on board is determined according to the size of screw, where M4 reference torque 1.0- 1.2 Nm, M5 reference torque 1.5- 1.8 Nm.
The above torque requirements are tightening torques. If pre-tightening is required according to actual assembly requirements, the pre-tightening torque is 20%-30% of the tightening torque.

8 Refer to the guidelines on the wiring diagram to connect the force and weak cables, and the lugs are fixed to prevent pressing against raised platform of the terminal;

9 Refer to the picture in the 1st step, restore the wiring and settings, confirm the corresponding address of the board. After checking that everything is correct, close the upper front panel and fix the screws;

13.1 Precautions during disassembly and assembly of the Inverter board:

1 Power off for 10 minutes before removing the inverter board;

2 Do not press forcibly when disassembling or installing the Inverter board;

3 When installing the Inverter board, it is necessary to pay attention not to wrongly hide cables under the board, fix the IPM modules screws first in order 1 ➔2 ➔3 ➔4 and then fix the PCB screws;

4 All the screws in the electric control box cannot be mixed with the screws from the other structural fixtures;

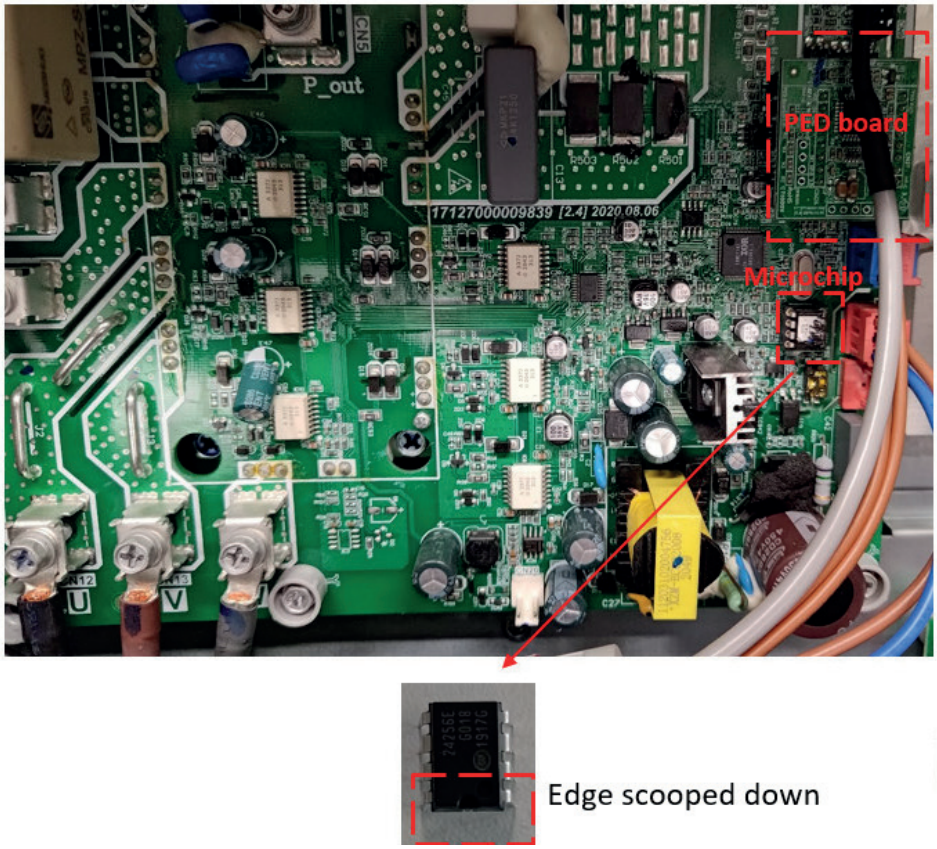
5 The wiring of the force electricity terminals on the board must be carefully and repeatedly confirmed and fake connections are prohibited!

13.2 Commisioning of inverter board

Once the inverter board was installed correctly follow the list check before power supplying the unit:

- Replace the PED board from the old inverter board to the new one
- Replace the microchip from the old inverter board on the new one
- Make sure all the electrical connectors are inserted correctly
- Make sure all the electrical power cables are connected
- Set the dip-switch for each inverter board:

Switch	Description
S7  1 2	00: size 10.1-14.1 compressor inverter module address setting
	00: size 16.2-55.2 compressor A inverter module address setting
	01: size 16.2-55.2 compressor B inverter module address setting



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