S-THERM

SiNCLAiR

HEAT PUMPS

IMPORTANT NOTE:

Read this manual carefully before installing or operating your new heat pump.
Make sure to save this manual for future reference.

Content

1 Product lineup

1.1 Outdoor unit

Model MSH-	MSH-40EB	MSH-60EB
Power Supply (V/Ph/Hz)	220-240/1 /50	220-240/1 /50
Appearance		

Model MSH-	MSH-80EB	MSH-100EB	MSH-120EB	MSH-120EB-3	MSH-140EB	MSH-140EB-3	MSH-160EB	MSH-160EB-3
Power Supply (V/Ph/Hz)	220-240/1/50	220-240/1/50	220-240/1/50	380-415/3/50	220-240/1/50	380-415/3/50	220-240/1/50	380-415/3/50
Appearance								

1.2 Hydro module with water tank

Model	MSH-190TB/3	MSH-240TB/3	MSH-190TB-3/9	MSH-240TB-3/9
Power Supply (V/Ph/Hz)	220-240/1 /50	220-240/1 /50	380-415/3 /50	380-415/3 /50
Compatible outdoor unit model	MSH-60EB	MSH-120EB MSH-140EB MSH-160EB	MSH-80EB MSH-100EB	MSH-120EB-3 MSH-140EB-3 MSH-160EB-3
Appearance				

2 Layout of Functional Components

2.1 Outdoor Unit Layout
MSH-40EB / MSH-60EB

Top view

Air side heater exchanger
Pressure sensor
High pressure switch
Gas-liquid separator
Low pressure switch

Front view

Fan motor
Electric control box
Four-way valve assembly
gas side stop valve
liquid side stop valve
DC Inverter rotary compressor
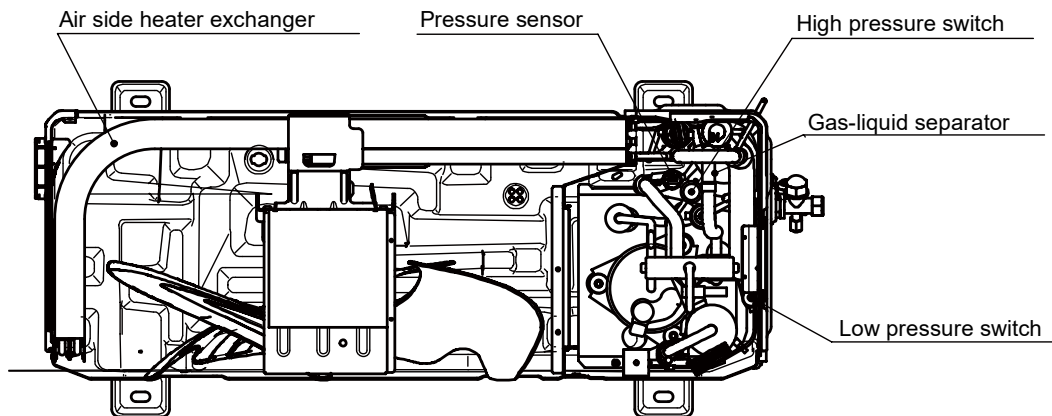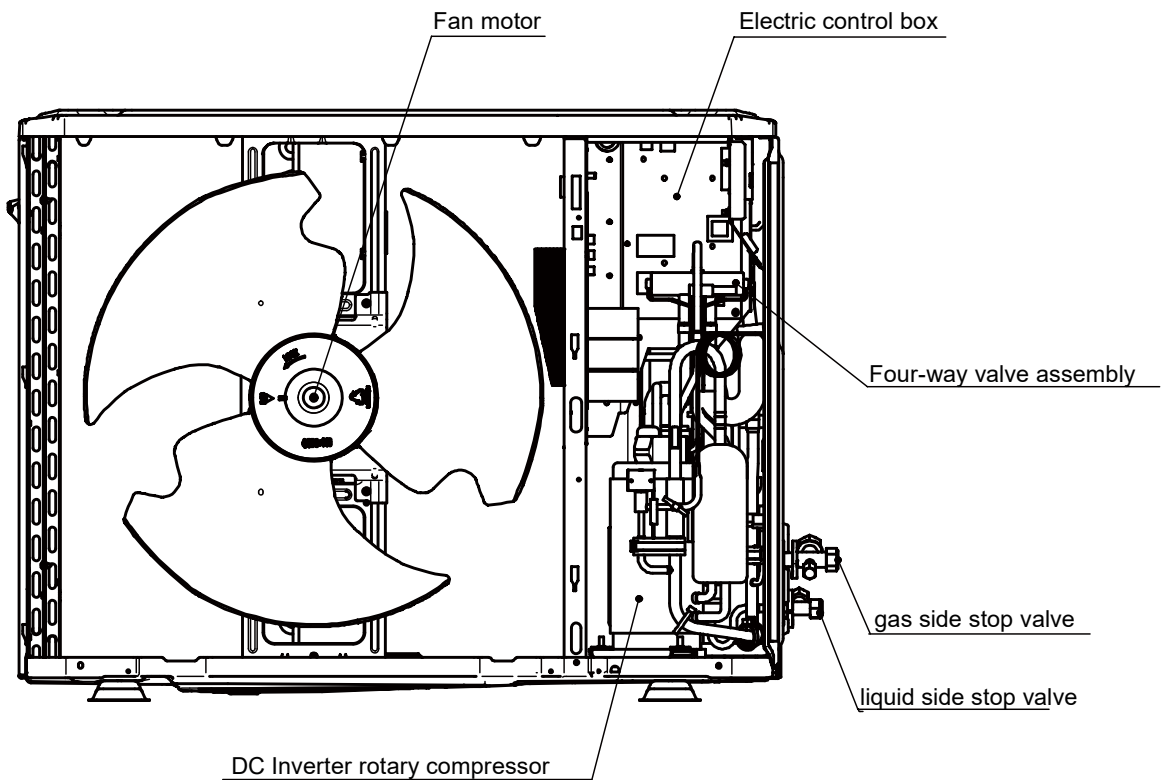
MSH-80EB / MSH-100EB

Top view

air side heater exchanger

high pressure switch

pressure sensor

low pressure switch

Front view

fan moter

electric control box

four-way valve assembly

gas side stop valve

liquid side stop valve

DC Inverter rotary compressor

gas-liquid separator
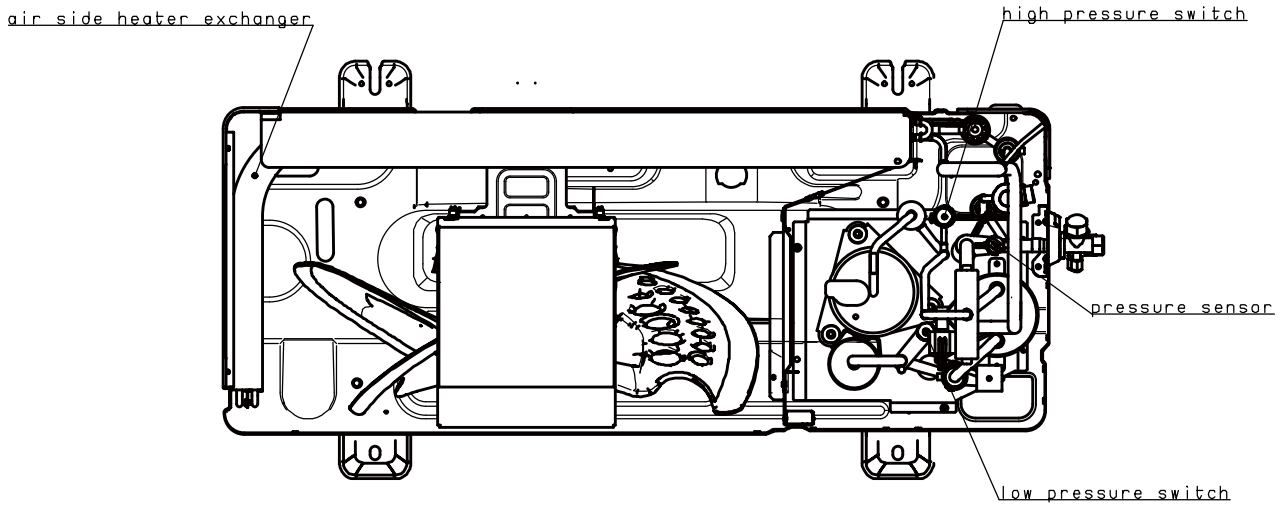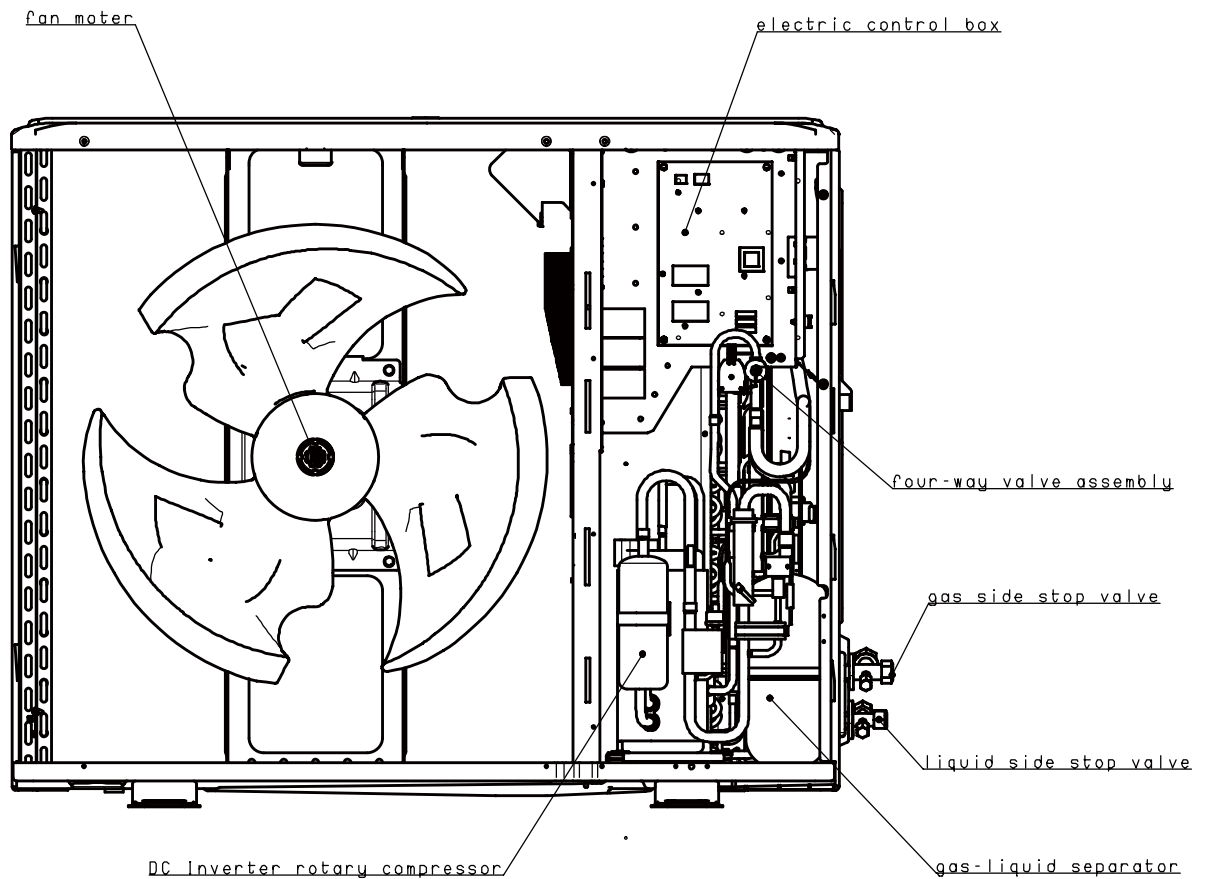
MSH-120EB / MSH-140EB / MSH-160EB

Top view

air side heater exchanger high pressure switch pressure sensor

gas-liquid separator

fove-way valve assembly

low pressure switch

Front view

fan motor electric control box

liquid side stop valve

gas side stop valve

DC inverter rotary compressor
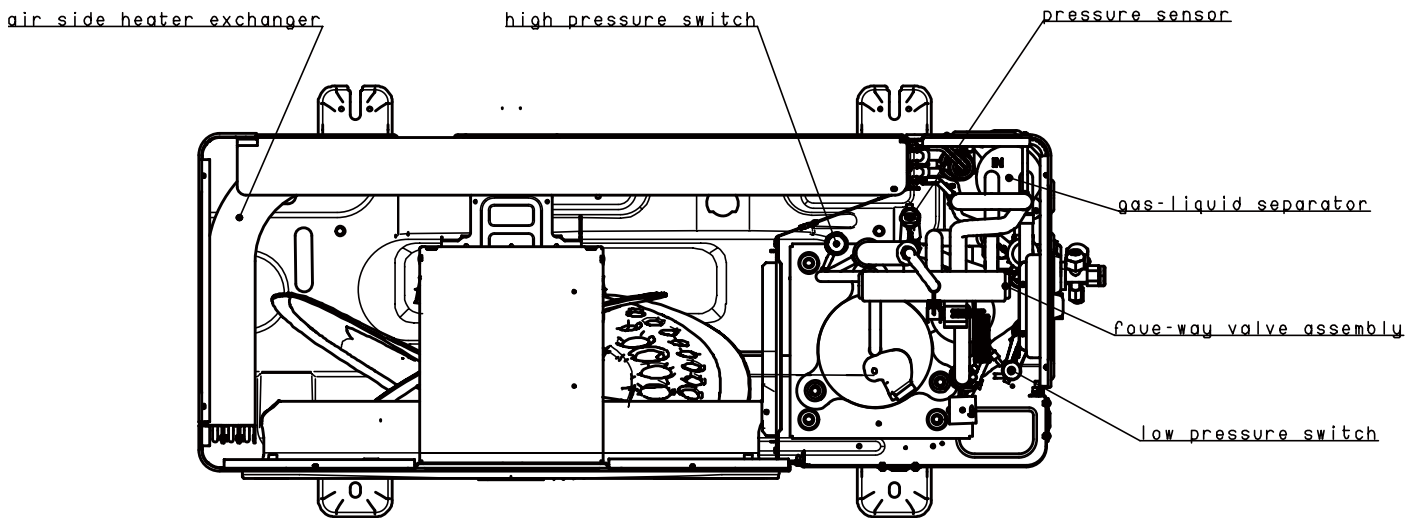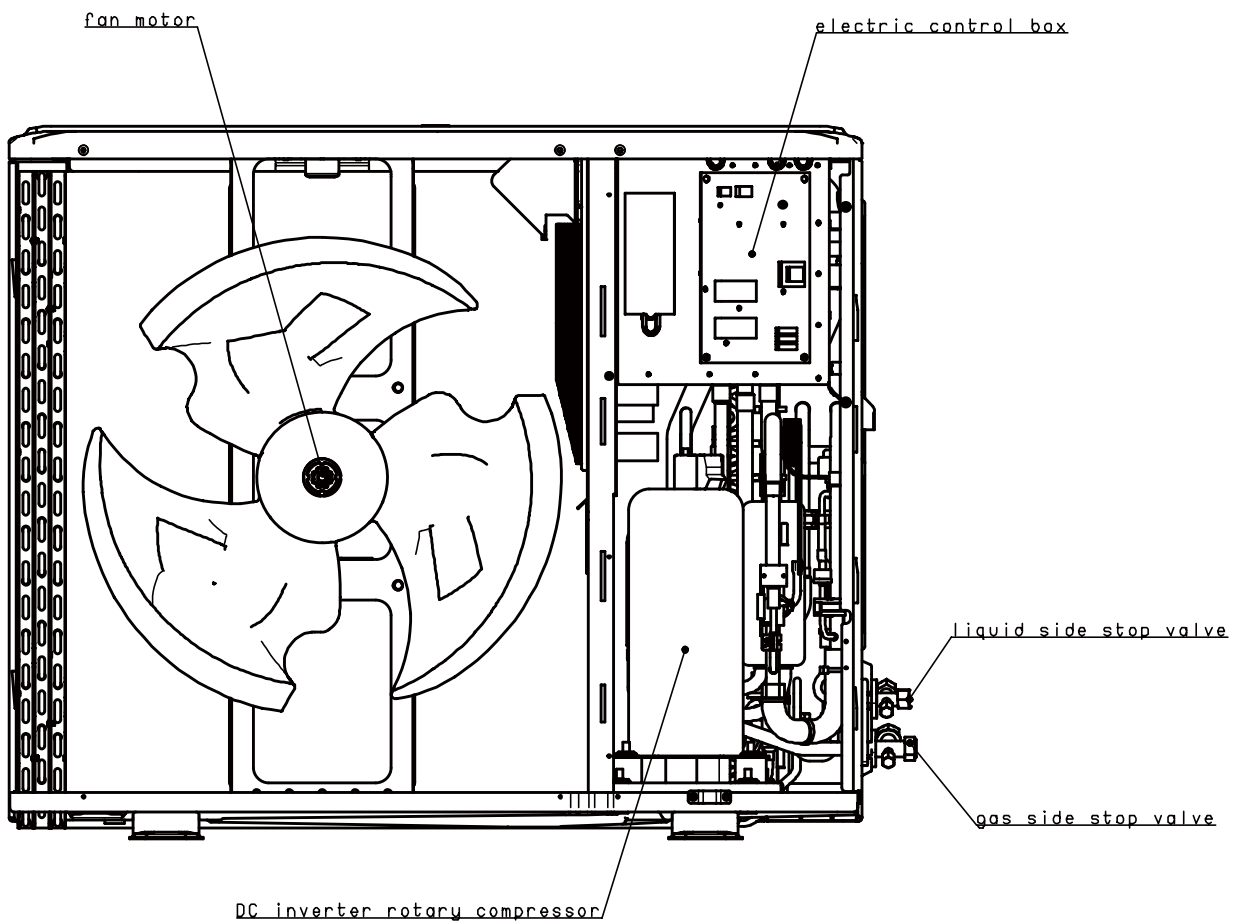
MSH-120EB-3 / MSH-140EB-3 / MSH-160EB-3

Top view

air side heater exchanger   high pressure switch   pressure sensor   gas-liquid separator   four-way valve assembly   low pressure switch

Front view

fan motor   electric control box   liquid side stop valve   gas side stop valve   DC inverter rotary compressor
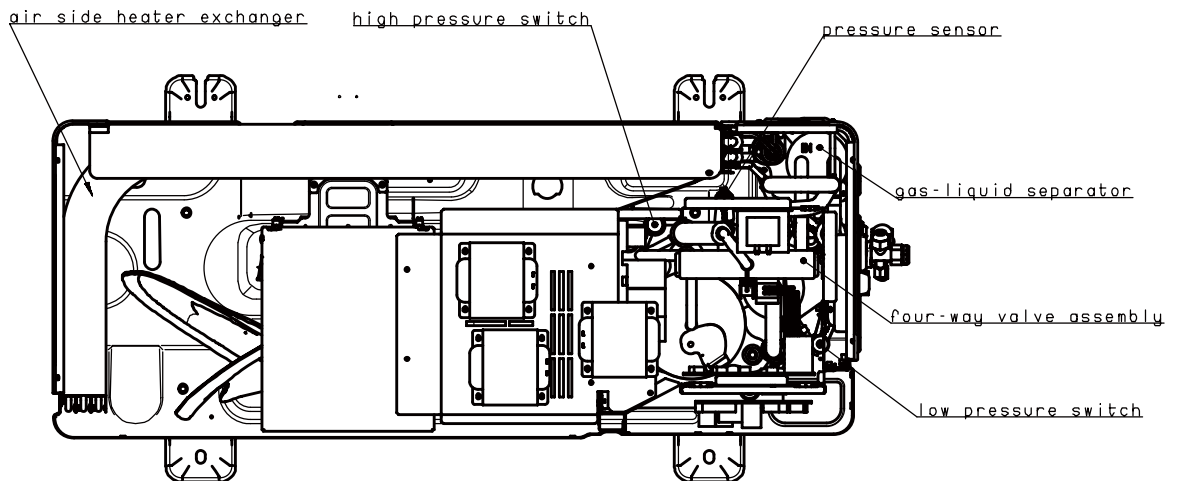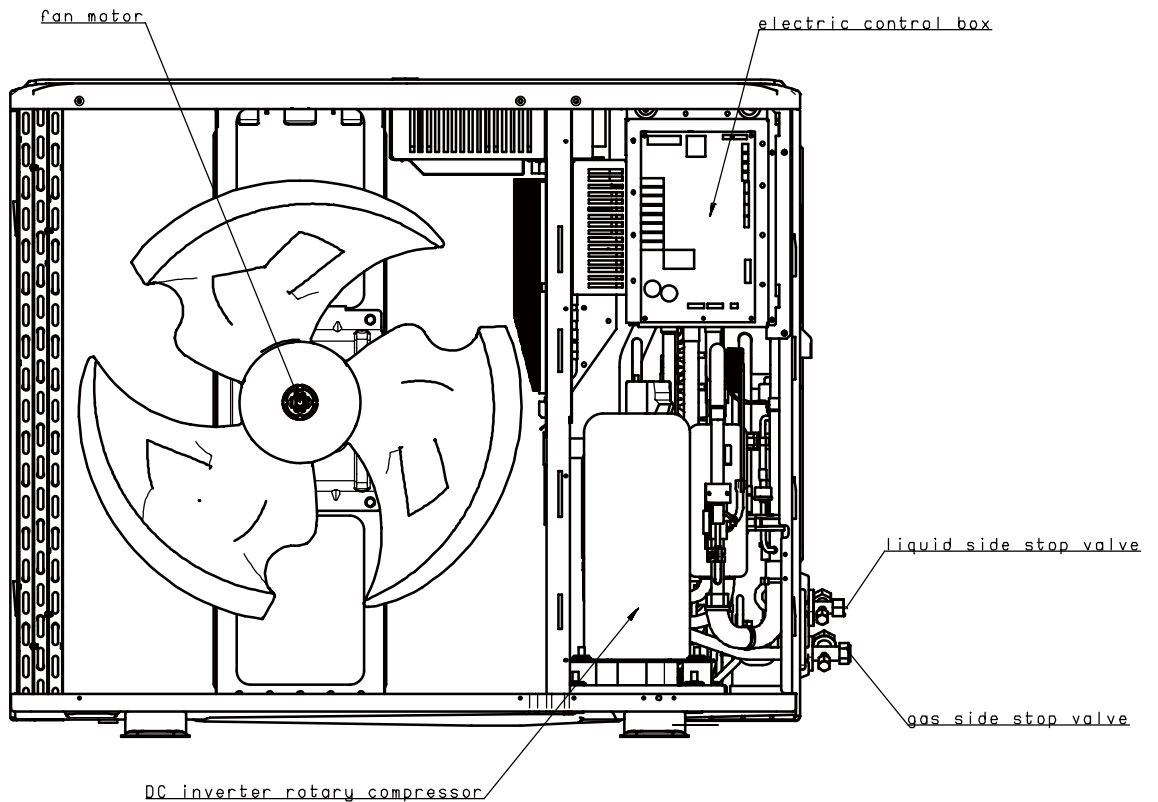
2.2 Hydronic Box Layout

Oblique view

Plate heat exchanger

Domestic hot water outlet

Safty valve

Domestic hot water recirculation water inlet

Refrigerant pipe (Liquip pipe)

Domestic cold water inlet

Refrigerant pipe (Gas pipe)

Space heating/cooling water inlet

Water flow switch

Space heating/cooling water outlet

Air purge valve

Expansion vessel

Electric control box

3-way valve

Electric heater

Water pump

Stainless steel water tank

3 Piping Diagrams

3.1 Outdoor Unit Piping

Refrigerant piping graphic example:

——————— High temperature, high pressure gas

——————— High temperature, high pressure liquid

——————— Low temperature, low pressure gas

——————— Low temperature, low pressure gas liquid mixture

Heating and DHW mode
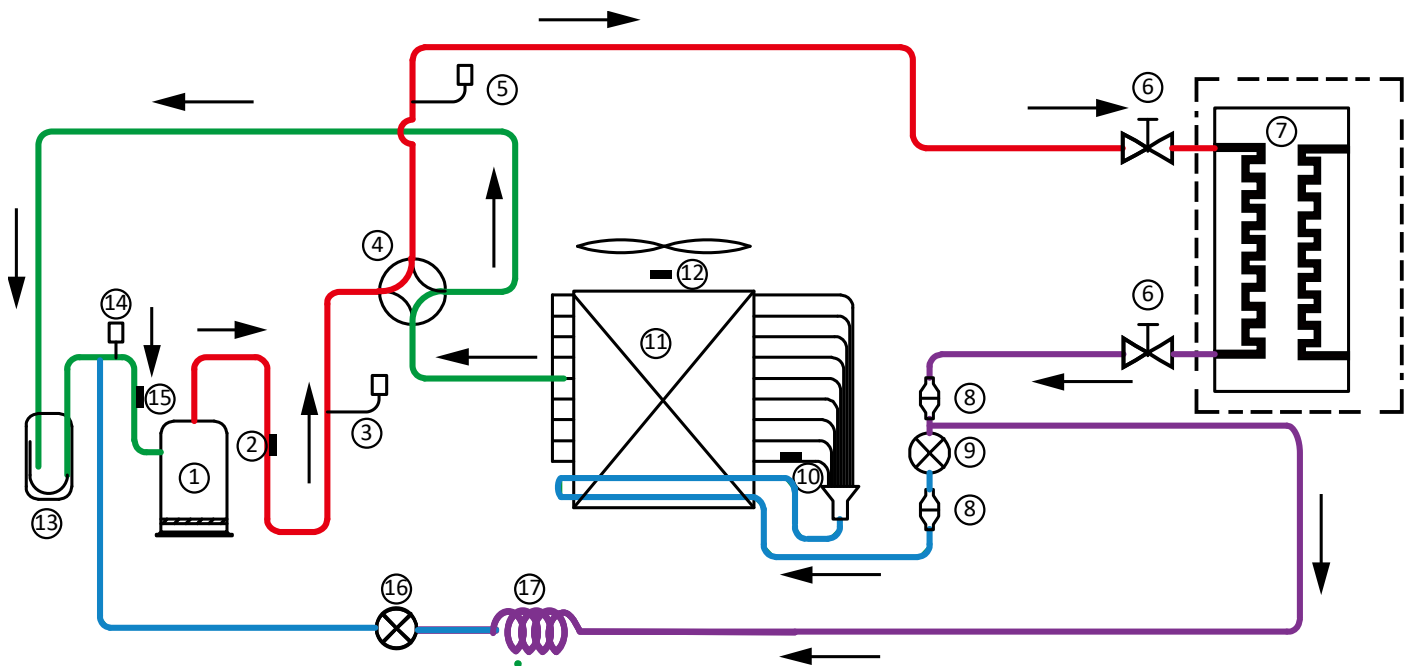
Cooling mode
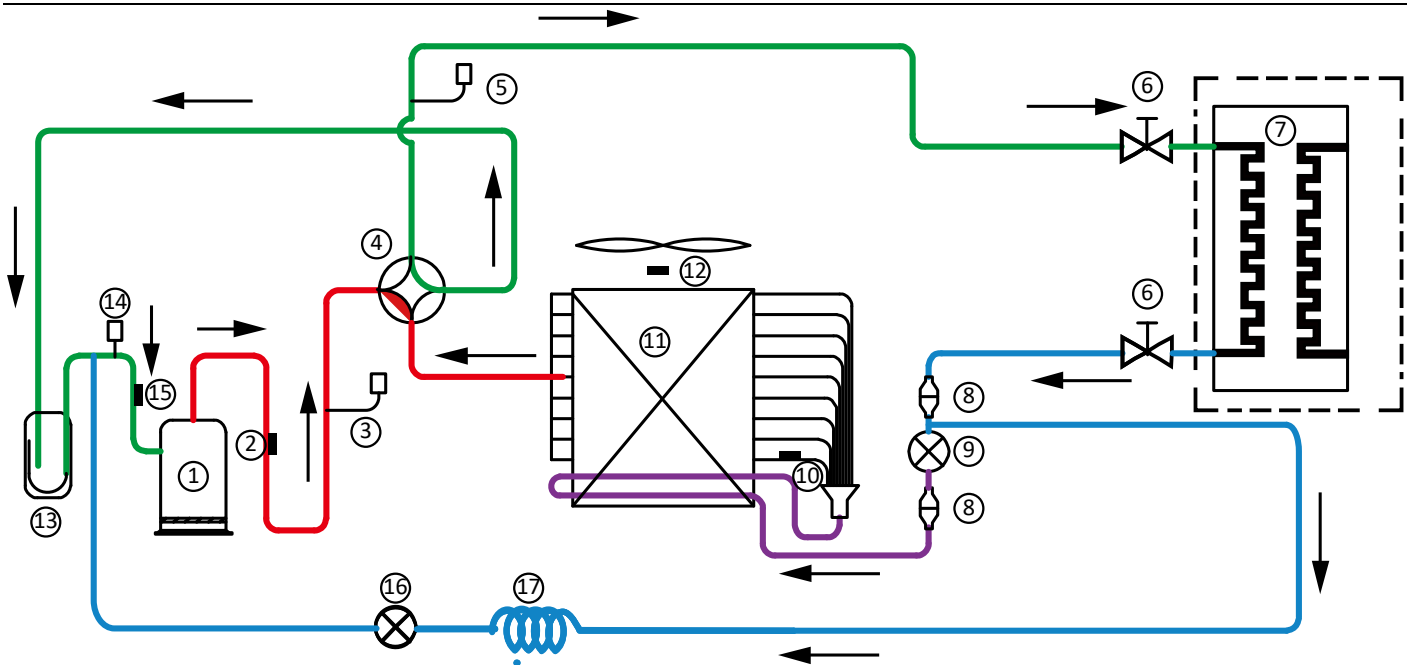
Legend				
1	Compressor	10	Evaporation sensor in heating (Condenser sensor in cooling)	
2	Discharge temperature sensor(Tp)	11	Air side heat exchanger	
3	High Pressure Switch	12	Outdoor temperature sensor(T4)	
4	4-way valve	13	Gas-liquid separator	
5	Pressure sensor	14	Low Pressure Switch	
6	Stop valve	15	Suction temperature sensor (Th)	
7	Plate heat exchanger	16	Single-way electromagnetic valve	
8	Strainer	17	Capillary	
9	Electronic expansion Valve			

Key components:

1. **Electronic expansion valve (EXV):**

   Controls refrigerant flow and reduces refrigerant pressure.

2. **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.

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

   Regulate refrigerant system pressure. When 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.

4. **Separator:**

   Separates liquid refrigerant from gas refrigerant to protect compressor from liquid hammering.

3.2 Hydronic box Piping

Refrigerant piping graphic example:

High temperature, high pressure gas

High temperature, high pressure liquid

Low temperature, low pressure gas

Low temperature, low pressure gas liquid mixture

Heating and DHW mode
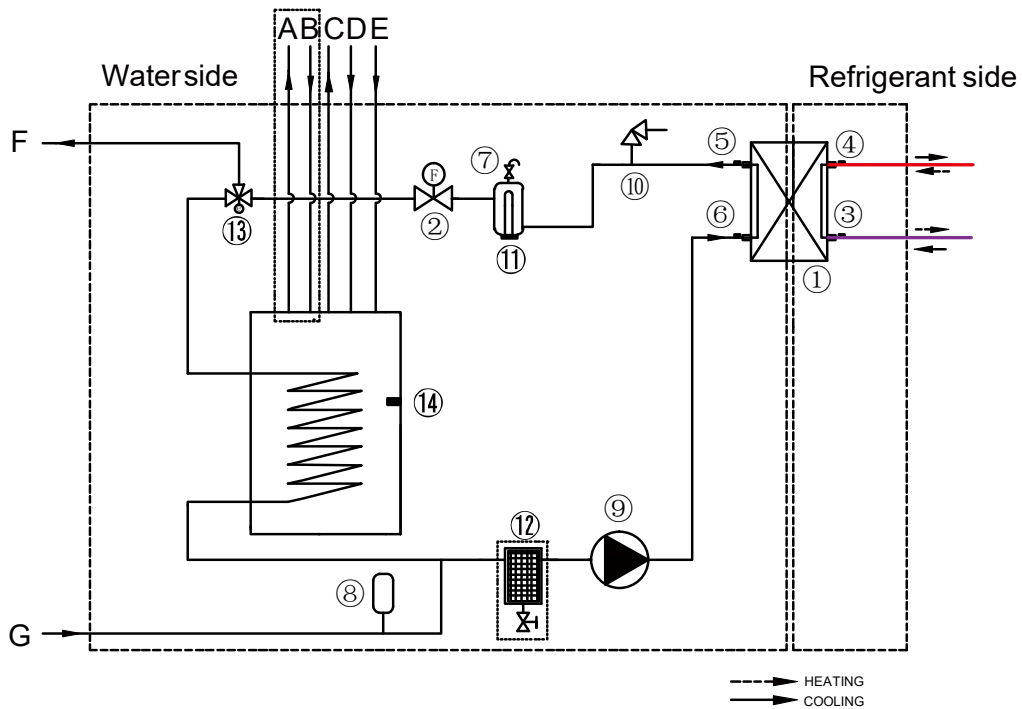
Cooling mode
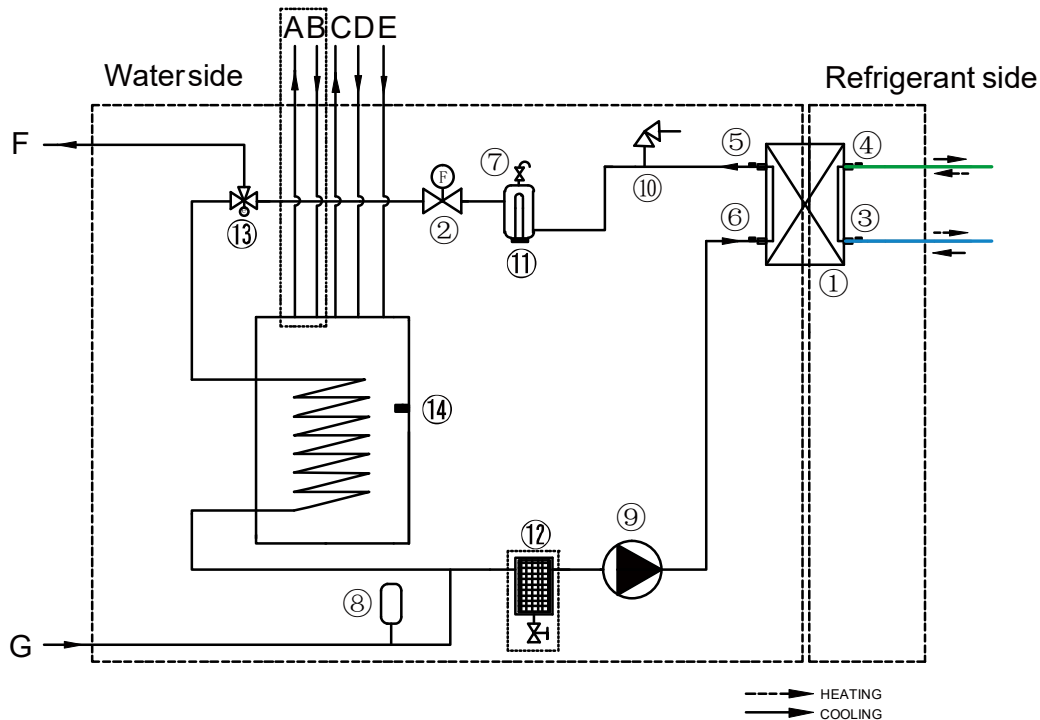
Legend			
1	Water side heat exchanger	12	Magnetic separator(Optional)
2	Water flow switch	13	3-Way valve
3	Refrigerant liquid pipe temperature sensor(T2)	14	Domestic water tank temperature sensor (T5)
4	Refrigerant gas pipe temperature sensor(T2B)	A	Solar circulation outlet(Optional)
5	Water outlet temperature sensor(Tw_out)	B	Solar circulation inlet(Optional)
6	Water inlet temperature sensor(Tw_in)	C	Domestic cold water outlet
7	Automatic air purge valve	D	Domestic hot water recirculation inlet
8	Expansion vessel	E	Domestic cold water inlet
9	Water pump	F	Space heating/cooling water outlet
10	Pressure relief valve	G	Space heating/cooling water inlet
11	Backup heater		

Key components:

1. **Air purge valve:**

   Automatically removes air from the water circuit.

2. **Safety valve:**

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

3. **Expansion vessel:**

   Balances water system pressure. (Expansion vessel volume: 8L.)

4. **Water flow switch:**

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

5. **Backup electric heater:**

   Provides additional heating capacity when the heating capacity of the heat pump is insufficient due to very low outdoor temperature. Also protects the external water piping from freezing.

6. **Water pump:**

   Circulates water in the water circuit.

7. **3-way valve**

   Change the refrigerant circuit between DHW mode and heating/cooling mode.

8. **Magnetic separator(Optional)**

   Adsorb iron scrap impurities and deposit sediment to keep the water system clean.

4 Stop Operation

The stop operation occurs for one of the following reasons:

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

5 Standby Control

5.1 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 outdoor ambient temperature and the compressor on/off state. When the outdoor ambient temperature is above 8°C or the compressor is running, the crankcase heater is off; when the outdoor ambient temperature is at or below 8°C and either the compressor has been stopped for more than 3 hours or the unit has just been powered-on (either manually or when the power has returned following a power outage), the crankcase heater turns on.

5.2 Water Pump Control

When the outdoor unit is in standby, the internal and external circulator pumps run continuously.

6 Startup Control

6.1 Compressor Startup Delay Control

In initial startup control and in restart control (except in oil return operation and defrosting operation), compressor startup is delayed such that a minimum of the set re-start delay time has elapsed since the compressor stopped, in order to prevent frequent compressor on/off and to equalize the pressure within the refrigerant system. The compressor re-start delays for cooling and heating modes are set on the user interface. Refer to the Yukon Split Engineering Data Book Part 3, 8.5 "COOL MODE SETTING Menu" and Part 3, 8.6 "HEAT MODE SETTING Menu".

6.2 Compressor Startup Program

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

MSH-40EB/MSH-60EB compressor startup program1 when ambient temperature is above 3°C

Notes:
1. Once the first, 40-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.

MSH-40EB/MSH-60EB compressor startup program1 when ambient temperature is at or below 3°C

Notes:
1. Once the first, 40-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.

MSH-80EB/MSH-100EB compressor startup program[1] when ambient temperature is above 11°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.

MSH-80EB/MSH-100EB compressor startup program[1] when ambient temperature is at or below 11°C

Notes:

1. Once the first, 40-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.

MSH-120EB(-3)/MSH-140EB(-3)/ MSH-160EB(-3) compressor startup program1 when ambient temperature is above 3°C

Notes:

1. Once the first, 40-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.

MSH-120EB(-3)/MSH-140EB(-3)/ MSH-160EB(-3) compressor startup program1 when ambient temperature is at or below 3°C

Notes:

1. Once the first, 40-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.

6.3 Startup Control for Heating and Domestic Hot Water Operation

Component control during startup in heating and domestic hot water modes

Component	Wiring diagram label	4-16kW	Control functions and states
Inverter compressor	COMP	●	Compressor startup program selected according to ambient temperature[1]
DC fan motor	FAN	●	Fan run at maximum speed[2]
Electronic expansion valve	EXV	●	Position (steps) from 0 (fully closed) to 480 (fully open), controlled according to outdoor ambient temperature, discharge temperature, suction superheat,
Four-way valve	4-WAY	●	On

Notes:
1. Refer to Part 3, 3.2 "Compressor Startup Program".
2. Refer to Table 3-4.3 in Part 3, 4.6 "Outdoor Fan Control".

6.4 Startup Control for Cooling Operation

Component control during startup in cooling mode

Component	Wiring diagram label	4-16kW	Control functions and states
Inverter compressor	COMP	●	Compressor startup program selected according to ambient temperature[1]
DC fan motor	FAN	●	Fan run at maximum speed[2]
Electronic expansion valve	EXV	●	Position (steps) from 0 (fully closed) to 480 (fully open), controlled according to outdoor ambient temperature, discharge temperature, suction superheat
Four-way valve	4-WAY	●	Off

Notes:
1. Refer to Part 3, 3.2 "Compressor Startup Program".
2. Refer to Table 3-4.3 in Part 3, 4.6 "Outdoor Fan Control".

7 Normal Operation Control

7.1 Component Control during Normal Operation

Component control during heating and domestic hot water operations

Component	Wiring diagram label	4-16kW	Control functions and states
Inverter compressor	COMP	●	Controlled according to load requirement from hydronic system
DC fan motor	FAN	●	Controlled according to outdoor heat exchanger pipe temperature
Electronic expansion valve	EXV	●	Position (steps) from 0 (fully closed) to 480 (fully open), controlled according to discharge temperature, suction superheat and compressor speed
Four-way valve	4-WAY	●	On

Component control during cooling operation

Component	Wiring diagram label	4-16kW	Control functions and states
Inverter compressor	COMP	●	Controlled according to load requirement from hydronic system
DC fan motor	FAN	●	Controlled according to outdoor heat exchanger pipe temperature
Electronic expansion valve	EXV	●	Position (steps) from 0 (fully closed) to 480 (fully open), controlled according to discharge temperature, suction superheat and compressor speed
Four-way valve	4-WAY	●	Off

7.2 Compressor Output Control

The compressor rotation speed is controlled according to the load requirement. Before compressor startup, the Yukon Split outdoor unit determines the compressor target speed according to outdoor ambient temperature, leaving water set temperature and actual leaving water temperature and then runs the appropriate compressor startup program. Refer to Part 3, 3.2 "Compressor Startup Program". Once the startup program is complete, the compressor runs at the target rotation speed.

7.3 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 per second.

7.4 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/DHW operations. Refer to Part 2, 3 "Refrigerant Flow Diagrams". During heating and DHW operations, the four-way valve is on; during cooling and defrosting operations, the four-way valve is off.

7.5 Electronic Expansion Valve Control

The position of the electronic expansion valve (EXV) is controlled in steps from 0 (fully closed) to 480 (fully open).

- At power-on:
  - The EXV first closes fully, then moves to the standby position. After a few seconds the EXV moves to an initial running position, which is determined according to operating mode and outdoor ambient temperature. After a further a few minutes, the EXV is controlled according to suction superheat and discharge temperature. Once a further a few minutes have elapsed, the EXV is then controlled according to suction superheat, discharge

temperature and compressor speed.

- When the outdoor unit is in standby:
  - The EXV is at standby position.
- When the outdoor unit stops:
  - The EXV first closes fully, then moves to the standby position.

7.6 Outdoor Fan Control

The speed of the outdoor unit fan is adjusted in steps, as shown in below:

Fan speed index	Fan speed (rpm)		
	4/6/8/10kW	12/14kW	16kW
W1	200	200	200
W2	250	250	250
W3	300	300	300
W4	350	350	350
W5	400	400	400
W6	450	450	450
W7	500	500	500
W8	530	550	550
W9	550	580	600
W10	580	610	650
W11	600	630	700
W12	600	650	730

8 Protection Control

8.1 High Pressure Protection Control

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

```
                    ┌─────────────────────┐
                    │  Normal operation   │
                    └─────────────────────┘
                       │              ▲
            $P_c$ > 4.3MPa │              │ $P_c$ < 3.6MPa
                       ▼              │
        ┌────────────────────────────────────────────┐
        │ High pressure protection, error code P1 is  │
        │ displayed                                   │
        └────────────────────────────────────────────┘
```
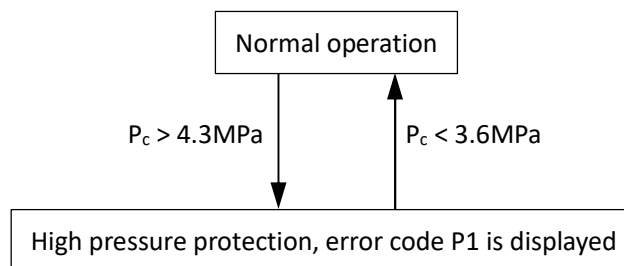
Notes:
1. P_c: Discharge pressure

When the discharge pressure rises above 4.3MPa the system displays P1 protection and the unit stops running. When the discharge pressure drops below 3.6MPa, the compressor enters re-start control.

8.2 Low Pressure Protection Control

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

```
                        ┌─────────────────────┐
                        │  Normal operation   │
                        └─────────────────────┘
                            │            ↑
              $P_e$ < 0.14MPa │            │ $P_e$ > 0.30MPa
                            ↓            │
            ┌──────────────────────────────────────────┐
            │ Low pressure protection, error code P0    │
            │ is displayed                              │
            └──────────────────────────────────────────┘
```
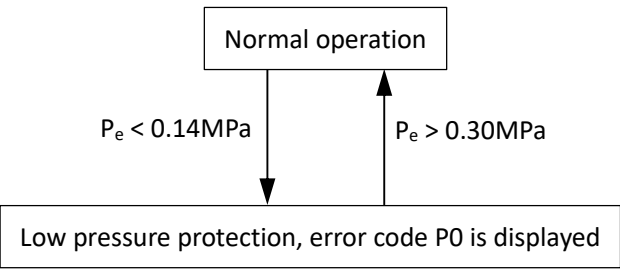
Notes:
1. P_e: Suction pressure

When the suction pressure drops below 0.14MPa the system displays P0 protection and the unit stops running. When the suction pressure rises above 0.3MPa, the compressor enters re-start control.

8.3 Discharge Temperature Protection Control

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

High discharge temperature protection control

```
                        ┌─────────────────────┐
                        │  Normal operation   │
                        └─────────────────────┘
                            │            ↑
 Discharge temperature > 115°C │            │ Discharge temperature < 95°C
                            ↓            │
            ┌──────────────────────────────────────────────────┐
            │ High discharge temperature protection, error code │
            │ P4 is displayed                                   │
            └──────────────────────────────────────────────────┘
```
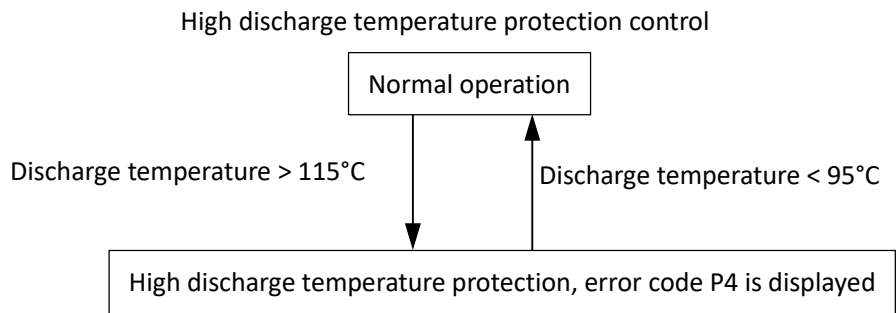
When the discharge temperature rises above 115°C the system displays P4 protection and the unit stops running. When the discharge temperature drops below 95°C, the compressor enters re-start control.

Low discharge temperature protection control

```
                        ┌─────────────────────┐
                        │  Normal operation   │
                        └─────────────────────┘
                            │            ↑
 Tp ＜Th for more than 5 minutes │            │ Tp ≥ Th
                            ↓            │
            ┌──────────────────────────────────────────────────┐
            │ Low discharge temperature protection, error code  │
            │ EA is displayed                                   │
            └──────────────────────────────────────────────────┘
```
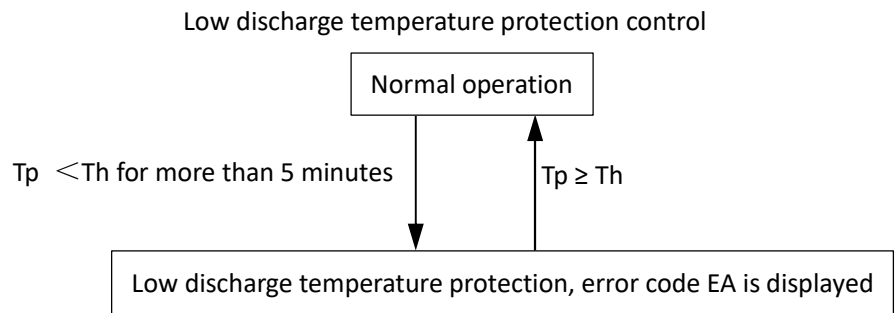
When the discharge temperature is lower than suction temperature for more than 5 minutes, the system displays EA protection and the unit stops running. When the discharge temperature is higher than suction temperature, the compressor enters re-start control.

8.4 Compressor Current Protection Control

This control protects the compressor from abnormally high currents.

```
          ┌─────────────────────┐
          │  Normal operation   │
          └─────────────────────┘
Current > Current_max      Current < Current_max
          ┌──────────────────────────────────────────────────┐
          │ Compressor current protection, error code P3 is displayed │
          └──────────────────────────────────────────────────┘
```
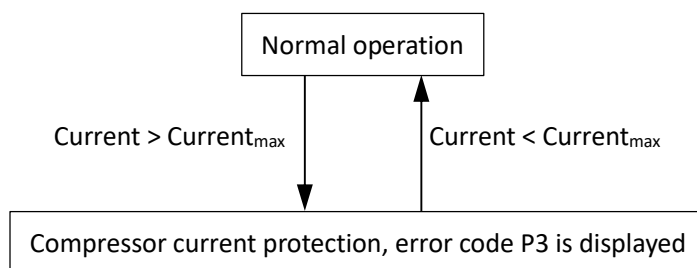
Current limitation for compressors

Model name	MSH-40EB / MSH-60EB	MSH-80EB / MSH-100EB	MSH-120EB/MSH-140EB/ MSH-160EB	MSH-120EB-3/MSH-140EB-3/ MSH-160EB-3
Current$_{max}$	18A	19A	30A	14A

When the compressor current rises above Current$_{max}$ the system displays P3 protection and the unit stops running. When the compressor current drops below Current$_{max}$, the compressor enters re-start control.

8.5 Voltage Protection Control
This control protects the Yukon Split from abnormally high or abnormally low voltages.

```
                    ┌─────────────────────┐
                    │  Normal operation   │
                    └─────────────────────┘
Single phase model: Voltage ≥          Single phase model: Voltage <
265V for 30s or Voltage ≤ 172V         256V for 30s or Voltage ≥ 180V

Three phase model: Voltage ≥           Three phase model: Voltage <
457V for 30s or Voltage ≤ 298V         440V for 30s or Voltage ≥ 312V
                    ┌──────────────────────────────────────────────────┐
                    │ Compressor voltage protection, error code H7 is displayed │
                    └──────────────────────────────────────────────────┘
```
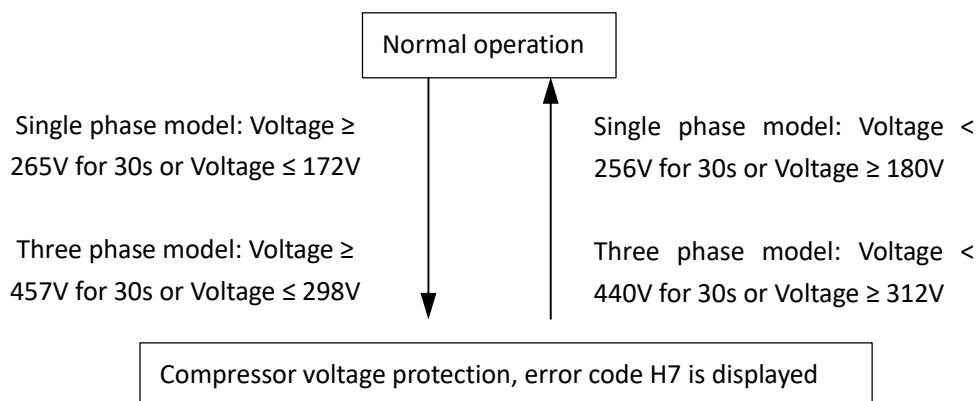
For single phase models, when the phase voltage of AC power supply is at or above 265V for more than 30 seconds, the system displays H7 protection and the unit stops running. When the phase voltage drops below 265V for more than 30 seconds, the refrigerant system restarts once the compressor re-start delay has elapsed. When the phase voltage is below 172V, the system displays H7 protection and the unit stops running. When the AC voltage rises to more than 180V, the refrigerant system restarts once the compressor re-start delay has elapsed.

For three phase models, when the phase voltage of AC power supply is at or above 457V for more than 30 seconds, the system displays H7 protection and the unit stops running. When the phase voltage drops below 440V for more than 30 seconds, the refrigerant system restarts once the compressor re-start delay has elapsed. When the phase voltage is below 298V, the system displays H7 protection and the unit stops running. When the AC voltage rises to more than 312V, the refrigerant system restarts once the compressor re-start delay has elapsed.

8.6 DC Fan Motor Protection Control
This control protects the DC fan motors from strong winds and abnormal power supply. DC fan motor protection occurs when any one of the following the following three sets of conditions are met:

- Outdoor ambient temperature is at or above 4°C and actual fan speed differs from target fan speed by 200rpm or more for more than 3 minutes.

- Outdoor ambient temperature is below 4°C and actual fan speed differs from target fan speed by 300rpm or more for more than 3 minutes.
- Actual fan speed is less than 150rpm for more than 90 seconds.

When DC fan motor protection control occurs the system displays the H6 error code and the unit stops running. After 3 minutes, the unit restarts automatically. When H6 protection occurs 10 times in 120 minutes, the HH error is displayed. When an HH error occurs, a manual system restart is required before the system can resume operation.

8.7 Water Side Heat Exchanger Anti-freeze Protection Control

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

In cooling mode, if inlet water temperature or leaving water temperature or auxiliary heat source leaving water temperature is below 4°C, heat pump stops and water pump keeps running for 30min. If water temperature is still below 4°C, heat pump turns to heating mode.

In heating/DHW standby mode, if ambient temperature is below 3°C and inlet water temperature or leaving water temperature or auxiliary heat source leaving water temperature is below 5°C, heat pump stops and water pump keeps running for 30min. If ambient temperature is still below 3°C and water temperature is still below 5°C, heat pump turns to heating mode.

In heating/DHW standby mode, if leaving water temperature is below 2°C, heat pump stops and water pump keeps running for 30min. If water temperature is still below 2°C heat pump turns to heating mode to protect from anti-freezing.

When water side heat exchanger anti-freeze protection occurs the system displays error code Pb and the unit stops running.

9 Special Control

9.1 Oil Return Operation

In order to prevent the compressor from running out of oil, the oil return operation is conducted to recover oil that has flowed out of the compressor and into the refrigerant piping.

The oil return operation starts when the following condition occurs:
- When the compressor cumulative operating time reaches 6 hours.

The oil return operation ceases when any one of the following three conditions occurs:
- Oil return operation duration reaches 5 minutes.
- Compressor stops.

Component control during oil return operation in cooling mode.

Component	Wiring diagram label	4-16kW	Control functions and states
Inverter compressor	COMP	●	Runs at oil return operation rotation speed
DC fan motor	FAN	●	Controlled according to cooling mode
Electronic expansion valve	EXV	●	304 (steps)
Four-way valve	4-WAY	●	Off

Component control during oil return operation in heating and DHW modes.

Component	Wiring diagram label	4-16kW	Control functions and states
Inverter compressor	COMP	●	Runs at oil return operation rotation speed
DC fan motor	FAN	●	Controlled according to heating mode
Electronic expansion valve	EXV	●	304 (steps)
Four-way valve	4-WAY	●	On

9.2 Defrosting Operation

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

Component control during defrosting operation

Component	Wiring diagram label	4-16kW	Control functions and states
Inverter compressor	COMP	●	Runs at defrosting operation rotation speed
DC fan motor	FAN	●	Off
Electronic expansion valve	EXV	●	480 (steps)
Four-way valve	4-WAY	●	Off

9.3 Force Cooling Operation

The force cooling operation helps the refrigerant recovering before removal the water side heat exchanger.

Press the button on outdoor refrigerant system main PCB named "FORCE" for 5s to enter refrigerant recovery mode.
If heat pump is standby before entering cooling mode, it will enter cooling mode directly. In other cases, heat pump will stop running current mode firstly and after 5min has passed, heat pump will change to cooling mode. After entering cooling mode, FC code appears on the PCB digital tube. When compressor starts, PCB digital tube displays compressor frequency. When the system pressure is below 0.24MPa, the number 15 displays on the PCB and is reduced by 1 every 1s until 0. Then heat pump stops.
The force cool mode can be ended by pushing the button on the outdoor refrigerant system main PCB named "FORCE" for 5s or this mode will be ended automatic if the system has operated force cool mode for more than 30 minutes.

Component	Wiring diagram label	4-16kW	Control functions and states
Inverter compressor	COMP	●	Runs at force cooling operation rotation speed
DC fan motor	FAN	●	Runs at force cooling operation speed
Electronic expansion valve	EXV	●	304 (steps)
Four-way valve	4-WAY	●	Off

9.4 Fast DHW Operation

Fast DHW operation is used to quickly meet a requirement for domestic hot water when DHW priority has been set on the user interface.

Domestic hot water demand priority can be ended by changing the switch on controller from "on" to "off".

Component	Wiring diagram label	4/6kW	8/10/12/14/16kW	Control functions and states
Inverter compressor	COMP	●	●	Controlled according to load requirement
DC fan motor	FAN	●	●	Controlled according to outdoor heat exchanger pipe temperature
Electronic expansion valve	EXV	●	●	Position (steps) from 0 (fully closed) to 480 (fully open), controlled according to discharge superheat
Four-way valve	ST	●	●	On

Tank electric heater	TBH	●	●	On

9.5 Two zones control[1]

Two zones control function is used to control temperature of each zone separately, thus different type radiator will operate at its optimal temperature and water pump cycle time will be reduced to save energy.

- Cooling mode

In two zones control for cooling mode, when the setting temperature of a certain zones is reached, the zone and water pump of this zone will turn off.

- Heating mode

In two zones control for heating mode, the on/off control of zone and water pump is same with cooling mode, but in addition, the mixing valve (3-way valve SV3) control function will be activated to adjust the water temperature of the low temperature zone by control the opening time and closing time of the valve. The mixing valve will only turn on when two zones control for heating is activated. On other conditions, the mixing valve will keep off. When the valve initially turns on, the opening time and closing time is same and then the time is controlled according to the difference between water pipe temperature and setting water temperature of the controlling zone.

- Hydraulic adapter PCB (Optional)

With the help of hydraulic adapter PCB, totally 8 thermostats can be used at the same time for maximum 8 rooms to control heat pump.

Note: 1.Yukon units just have the controlling function, while the mixing valve, water pump of each zone need to be field supplied and connect to Yukon unit.

9.6 Smart grid control

Unit adjusts the operation according to different electrical signals to realize energy saving.

EVU signal	SG signal	Control
ON	ON	As long as the DHW mode is set to be valid, heat pump and IBH will operate in DHW mode at the same time automatically. When T5 rises to 60°C, DHW mode will exit and switch to cooling/heating mode normally.
ON	OFF	As long as the DHW mode is on, heat pump and IBH will operate in DHW mode at the same time automatically, when T5≥Min(T5S+3,60), DHW mode will exit and switch to cooling/heating mode normally.
OFF	ON	Normal operation according to customers' requirement.
OFF	OFF	Prohibit DHW mode, IBH and disinfect operation. Heat pump runs cooling/heating mode for "SG RUNNING TIME" which is set on wired controller and then turns off.

Note:

1. EVU signal and SG signal are provided from the Smart Grid system

2. T5S means water tank setting temperature

9.7 Balance tank temperature control

Balance tank temperature sensor is used to control on/off of heat pump.

Once the heat pump stops, internal pump stops to save energy and then balance tank provides hot water for space heating. In addition, balance tank temperature control can meet both space heating and domestic hot water needs at the same time. Balance tank can store energy to provide hot water whilst heat pump runs heat mode/cooling, which can reduce the host selection and the initial investment.

9.8 Dry contract M1M2 control

M1M2 can be set in the wired controller for heat pump on/off control, TBH control, AHS control.

- For heat pump on/off control

    When dry contract closes for 1s, heat pump stops. When dry contract opens for 5s, heat pump on/off according to wired controller or room thermostat setting.

- For TBH control

    TBH is only controlled by M1M2. If dry contract closes, T5<65℃ then TBH opens until water tank temperature reaches 70℃.

- For AHS control

    In heating mode，AHS on/off is only controlled by M1M2. In DHW mode, M1M2 control does not affect AHS on/off.

9.9 USB data transfer

9.9.1 Parameters setting transfer between wired controllers

Installer can quickly copy the wired controller parameter settings from unit A to unit B via USB disk, which save the time of on-site installation. Steps are as follows:

Step 1:

Plug U disk into the port of hydro PCB of A unit.

"USB" appears on digital display

Wired controller interface automatically changes

USB port
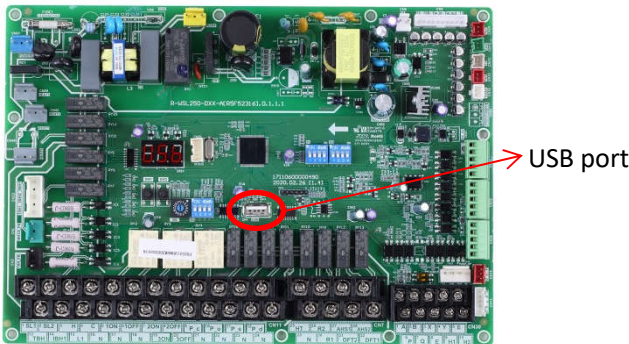
```
USB FUNCTION
READ SET PARAMETER
WRITE SET PARAMETER



OK                              ⇕
```

Step 2:

Select "READ SET PARAMETER" and press "OK" button then rate of progress will appear. When the process is finished, "SUCCESS" appears below and an EXCEL file which can not be seen in the wired controller interface but users can find it on computer will be generated inside the USB disk.

Select "READ SET PARAMETER"

```
USB FUNCTION
READ SET PARAMETER        63%
WRITE SET PARAMETER




OK                              ⇕
```

Finished

```
USB FUNCTION
READ SET PARAMETER
WRITE SET PARAMETER




OK        SUCCESS               ⇕
```

EXCEL generated

M_Thermal_Config(Prohibit to rewrite)
PD25319B84M200415V24
PD25319B86M200421V35

After that, if parameter correction is needed, please connect the USB with computer and open the EXCEL file to change parameters and then save it. Please do not change the file name or format. Parameters are not allowed for non-professionals to change and Sinclair recommends to use the wired controller to change the parameters.

Step 3:

Plug USB disk into the port of hydro PCB of B unit and select "WRITE SET PARAMETER" then rate of progress will appear. When the process is finished, "SUCCESS" appears below.

Select "WRITE SET PARAMETER"

```
USB FUNCTION
READ SET PARAMETER
WRITE SET PARAMETER       25%




OK                              ⇕
```

Finished

```
USB FUNCTION
READ SET PARAMETER
WRITE SET PARAMETER




OK        SUCCESS               ⇕
```

9.9.2 Convenient program upgrade for unit

There is no need to carry any heavy equipment but only USB disk can realize program upgrade. Steps are as follows:

Step 1:

Copy new program in U disk root directory where other files in bin format are not allowed in

Step 2:

Power on and make sure communication is normal.

Step 3:

Plug U disk into the port of hydro PCB.

<table>
<tr><td>"USB" appears on digital display</td><td>Wired controller interface automatically changes</td></tr>
</table>
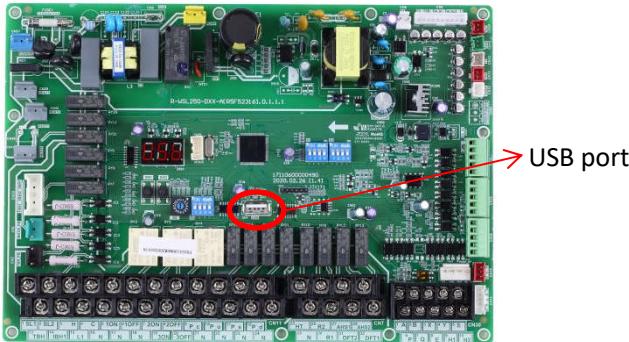
USB port

USB FUNCTION	
READ SET PARAMETER	
WRITE SET PARAMETER	
PD25319B84M200415V24.bin	
PD25319B86M200421V35.bin	
OK	⬍

Step 4:

Please distinguish between programs for main control PCB and hydro PCB. Select one of them and press "OK" button then rate of progress appears. When the process is finished, "SUCCESS" appears below. For upgrading outdoor unit, the process normally lasts for several minutes while only few seconds is needed for indoor unit.

Select program

USB FUNCTION	
READ SET PARAMETER	
WRITE SET PARAMETER	
PD25319B84M200415V24.bin	51%
PD25319B86M200421V35.bin	
OK	⬍

Finished

USB FUNCTION	
READ SET PARAMETER	
WRITE SET PARAMETER	
PD25319B84M200415V24.bin	
PD25319B86M200421V35.bin	
OK SUCCESS	⬍

Step 5:

Pull out U disk and power on again to finish upgrading program. Check the program version to make sure upgrade is successful.

Check IDU software version

OPERATION PARAMETER	#00
Tbt1 BUFFERTANK_UP TEMP.	XX ℃
Tbt2 BUFFERTANK_LOW TEMP.	XX ℃
Tsolar	XX ℃
IDU SOFTWARE XX-XX-XXXXXXX	
◀▶ ADDRESS	5/9 ⬍

Check ODU software version

OPERATION PARAMETER	#00
T3 OUTDOOR EXCHANGE TEMP.	XX ℃
T4 OUTDOOR AIR TEMP	XX ℃
TF MODULE TEMP.	XX ℃
P1 COMP PRESSURE	XX Kpa
ODU SOFTWARE XX-XX-XXXXXXX	
HMI SOFTWARE XX-XX-XXXXXXX	
◀▶ ADDRESS	9/9 ⬍

10 Electric Control Box Layout

10.1 Outdoor Unit Electric Control Box Layout

Figure 4-1.1: MSH-40EB/MSH-60EB electric control box

Main PCB

Inverter module
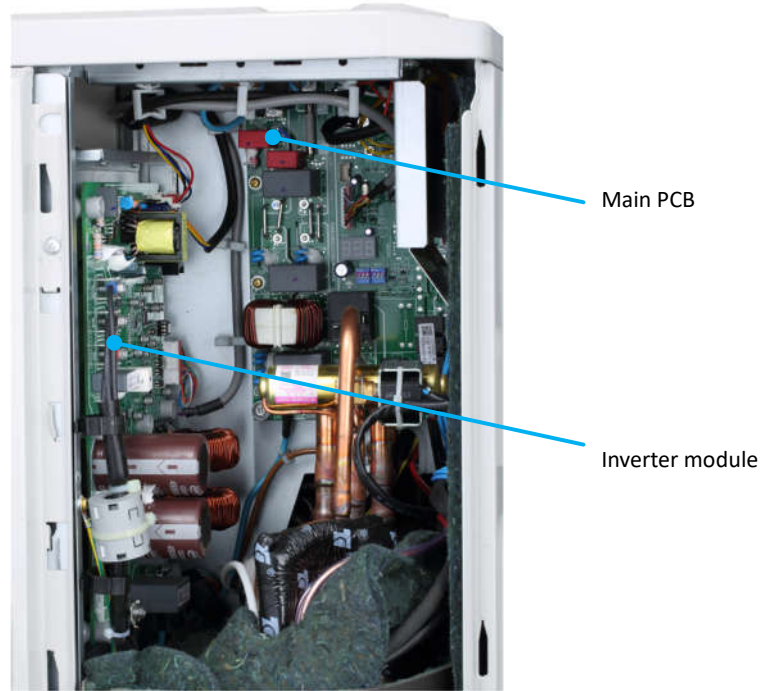
Figure 4-1.2: MSH-80EB/MSH-100EB electric control box

Main PCB

Inverter module
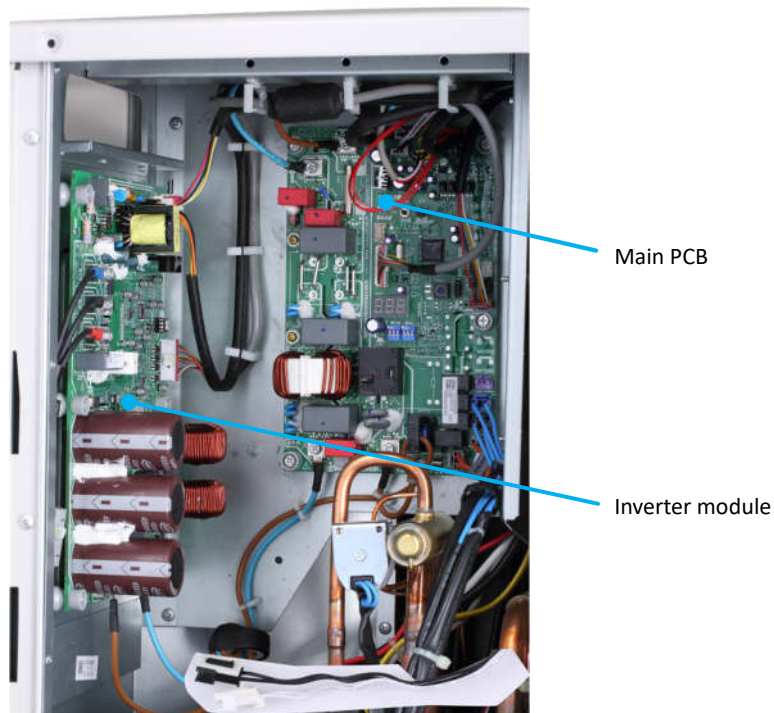
Figure 4-1.3: MSH-120EB/MSH-140EB/MSH-160EB electric

Main PCB

Inverter module
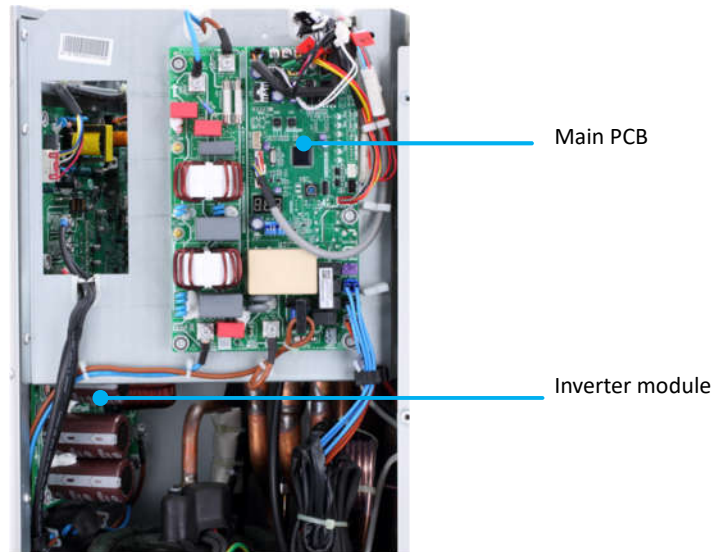
Figure 4-1.4: MSH-120EB-3/MSH-140EB-3/MSH-160EB-3 electric

control box

Main PCB

Inverter module

Main Power

Electric Reactor

Filter board

DCFAN Electric

Reactor
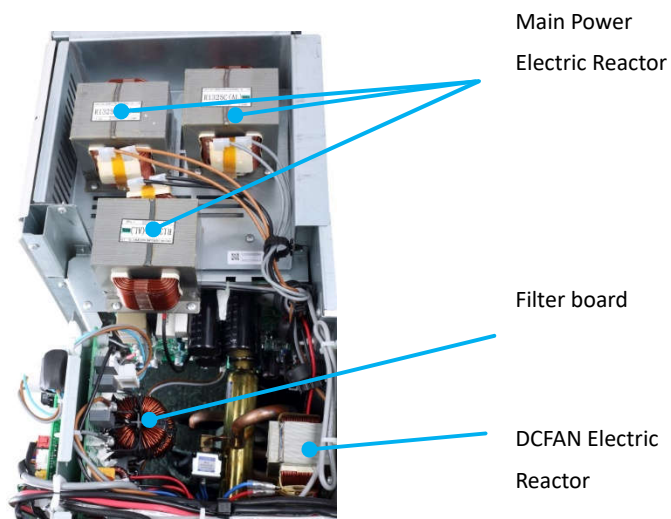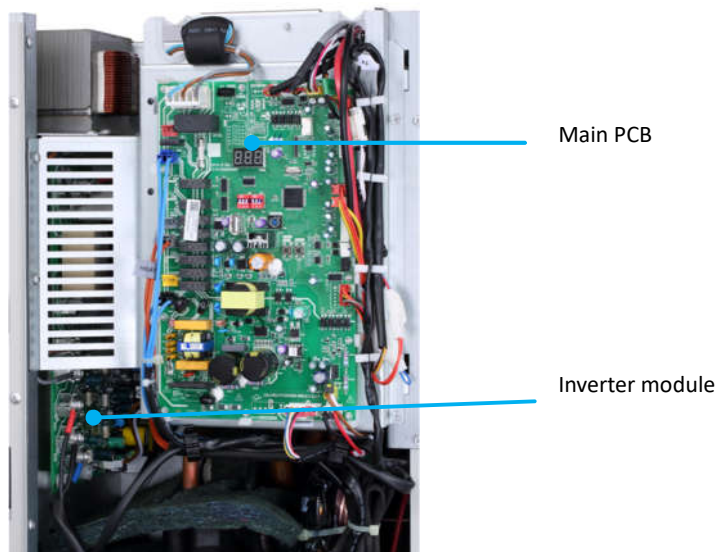
10.2 Hydronic Box Electric Control Box Layout

Figure 4-1.5:HBT-A100/190CD30GN8-B, HBT-A100/240CD30GN8-B, HBT-A160/240CD30GN8-B electric control box

Manual resetthermal cutout

Backup electric heater contactors

Auto reset thermal cutout

Power supply terminals

Main PCB for hydro system
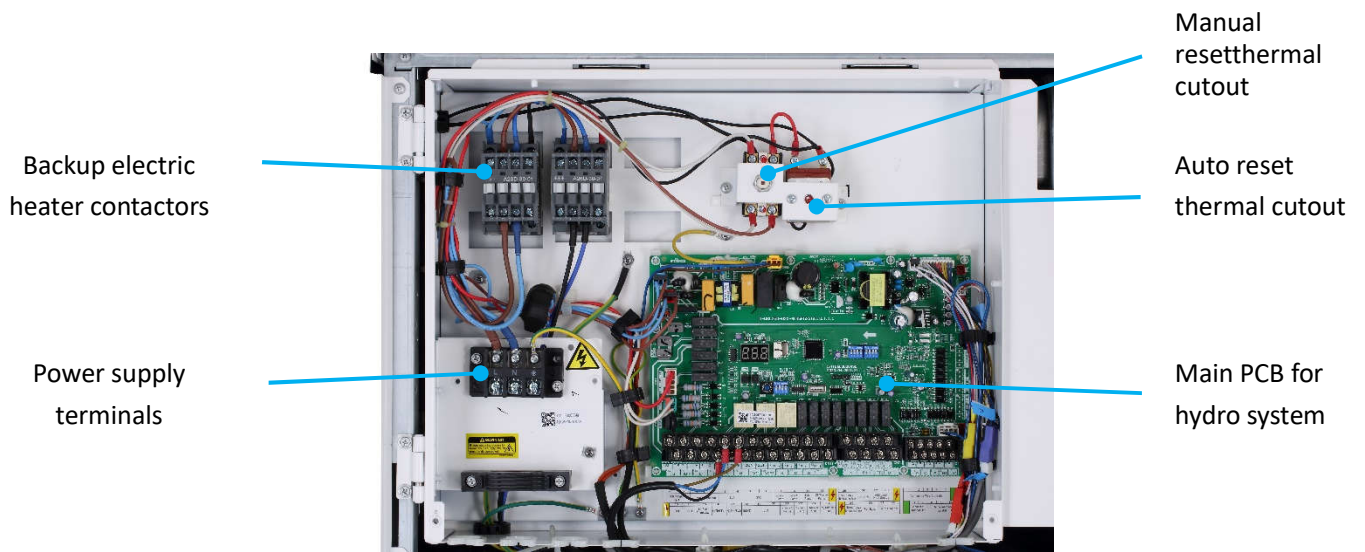
11 PCBs

11.1 Outdoor Unit PCB

There are one type of main PCB for the 4kW to 16kW models. In addition to the main PCB, all models have an inverter module.

The locations of each PCB in the outdoor unit electric control box are shown in Figures 4-1.1 to Figure 4-1.4 in Part 4, 1.1 "Outdoor Unit Electric Control Box Layout". The locations of each PCB in the hydronic box electric control box are shown in Figures 4-1.5 in Part 4, 1.2 "Hydronic Box Electric Control Box Layout".

11.2 Main PCB for Hydronic System

Figure 4-2.1: Hydronic box main PCB
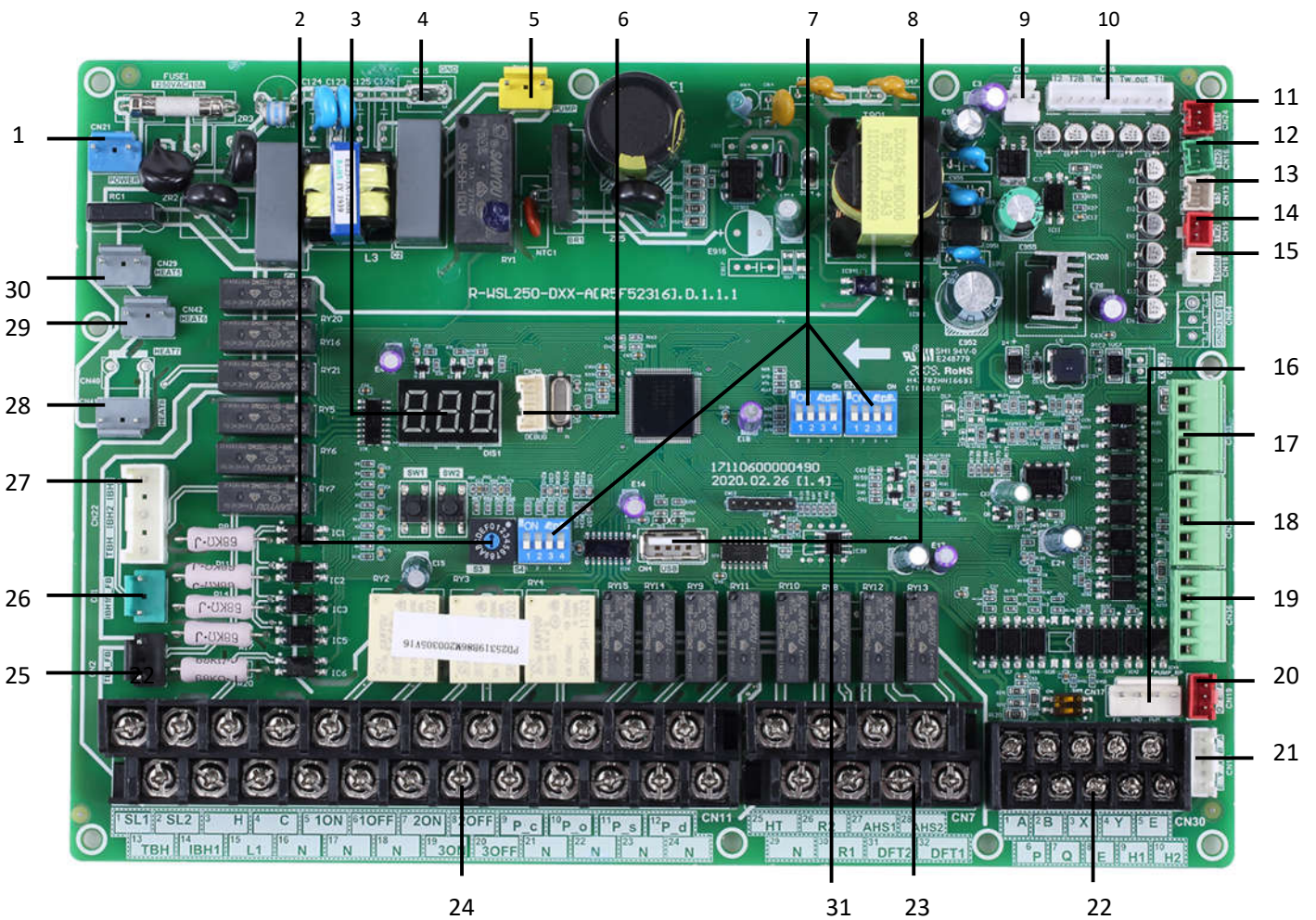
Table 4-2.1: Hydronic box main PCB

Label in Figure 4-2.1	Code	Content
1	CN21	Port for power supply
2	S3	Rotary dip switch
3	DIS1	Digital display
4	CN5	Port for ground
5	CN28	Port for variable speed pump power input
6	CN25	Port for IC programming
7	S1,S2,S4	Dip switch
8	CN4	Port for USB programming
9	CN8	Port for Flow switch
10	CN6	Port for temp. sensors (T2,T2B,TW_out,TW_in, T1,)
11	CN24	Port for temp. sensor(Tbt1, The balanced water tank of up temp. sensor)
12	CN16	Port for temp. sensor(Tbt2, The balanced water tank of up temp. sensor)
13	CN13	Port for temp. sensor(T5, domestic hot water tank temp. sensor)
14	CN15	Port for temp. sensor(Tw2, The outlet water for zone 2 temp. sensor)
15	CN18	Port for temp. sensor(Tsolar, Solar panel temp. sensor)
16	CN17	Port for variable speed pump communication
17	CN31	Control port for room thermostat (heating mode)(HT)/Control port for room thermostat (cooling mode)(CL)/Power port for room thermostat(COM)
18	CN35	Port for smart grid (grid signal, photovoltaic signal)
19	CN36	Port for remote switch, temperature board
20	CN19	Communicate port between indoor unit and outdoor unit
21	CN14	Port for communication with the wired controller
22	CN30	Communicate port between indoor unit and outdoor unit, port for communication with the wired controller, internal machine parallel
23	CN7	Port for antifreeze E-heating tape(external), additional heat source, compressor run/defrost run
24	CN11	Control port for tank booster heater, internal backup heater 1, input port for solar energy, Port for room thermostat, SV1(3-way valve), SV2(3-way valve), SV3(3-way valve), zone 2 pump, outside circulation pump, solar energy pump, DHW pipe pump,
25	CN2	Feedback port for external temp. switch(shorted in default)
26	CN1	Feedback port for temperature switch(shorted in default)
27	CN22	Control port for backup heater1/booster heater/Reserved
28	CN41	Port for anti-freeze electric heating tape
29	CN42	Port for anti-freeze electric heating tape
30	CN29	Port for anti-freeze electric heating tape
31	IC39	EEPROM

11.3 Main PCBs for Refrigerant System, Inverter Module

Figure 4-2.2: MSH-40EB / MSH-60EB / MSH-80EB / MSH-100EB outdoor unit main PCB for refrigerant system
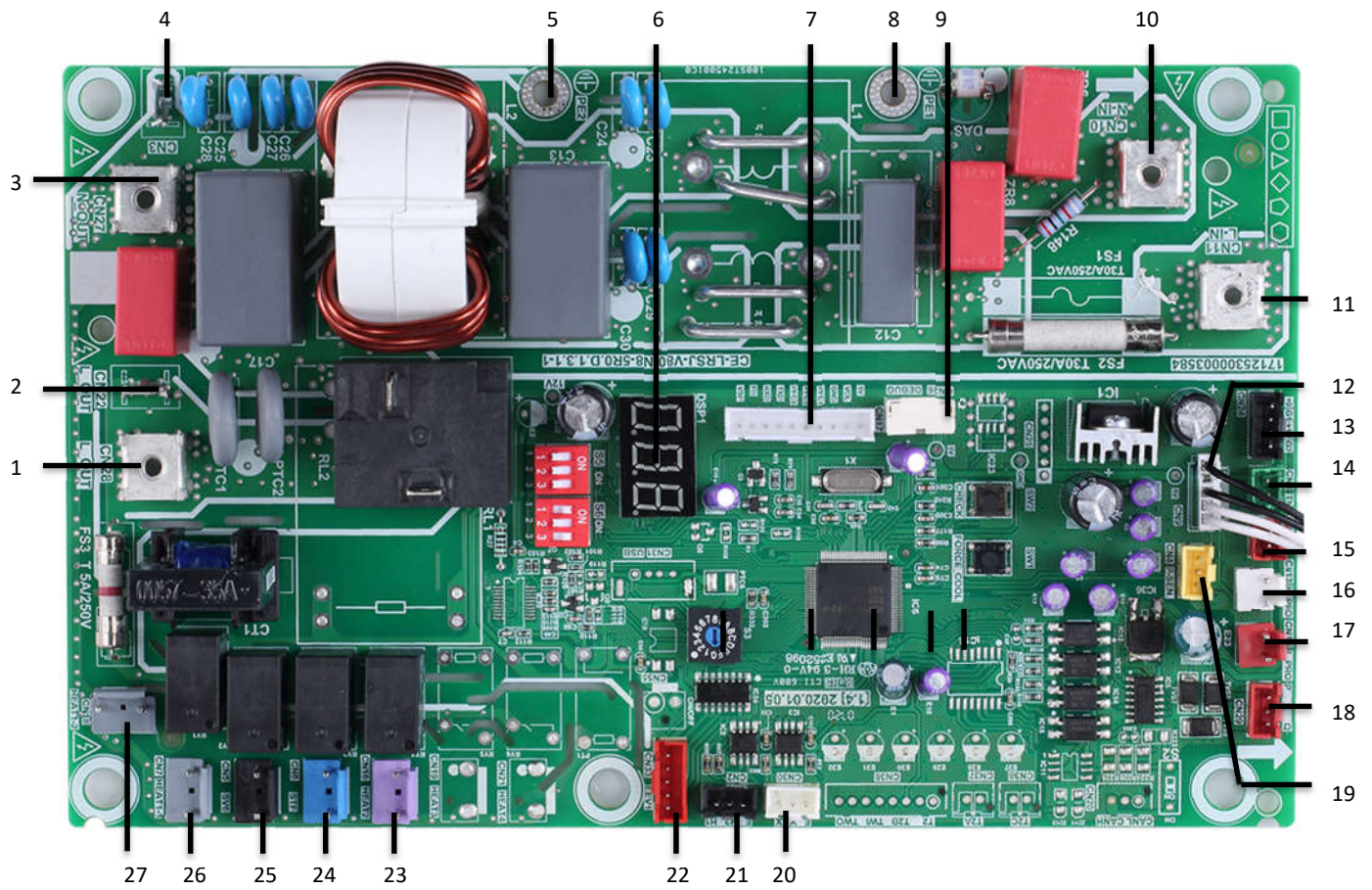
Table 4-2.2: MSH-40EB / MSH-60EB / MSH-80EB / MSH-100EB outdoor unit main PCB for refrigerant system

Label in Figure 4-2.2	Code	Content
1	CN28	Ourput port L to main PCB for refrigerant system
2	CN22	Reserved
3	CN27	Output port N to main PCB for refrigerant system
4	CN3	Reserved
5	PE2	Port for ground wire
6	DSP1	Digital display
7	CN17	Port for communication with main PCB for refrigerant system
8	PE1	Port for ground wire
9	CN26	Reserved
10	CN10	Input port for neutral wire
11	CN11	Input port for live wire
12	CN9	Port for outdoor ambient temp. sensor and condenser temp. sensor
13	CN24	Input port for +12V/9V
14	CN1	Port for suction temp. sensor
15	CN8	Port for discharge temp. sensor
16	CN13	Port for high pressure switch
17	CN14	Port for low pressure switch
18	CN29	Port for communication with hydro-box control board
19	CN4	Port for pressure sensor
20	CN30	Port for communication(reserved)
21	CN2	Port for communication(reserved)
22	CN33	Port for electrical expansion value
23	CN16	Port for chassis electrical heating tape(Optional)
24	CN6	Port for 4-way value
25	CN5	Port for SV6 value
26	CN7	Port for compressor electric heating tape 1
27	CN18	Port for compressor electric heating tape 2

Figure 4-2.3 MSH-120EB / MSH-140EB / MSH-160EB outdoor unit main PCB for refrigerant system
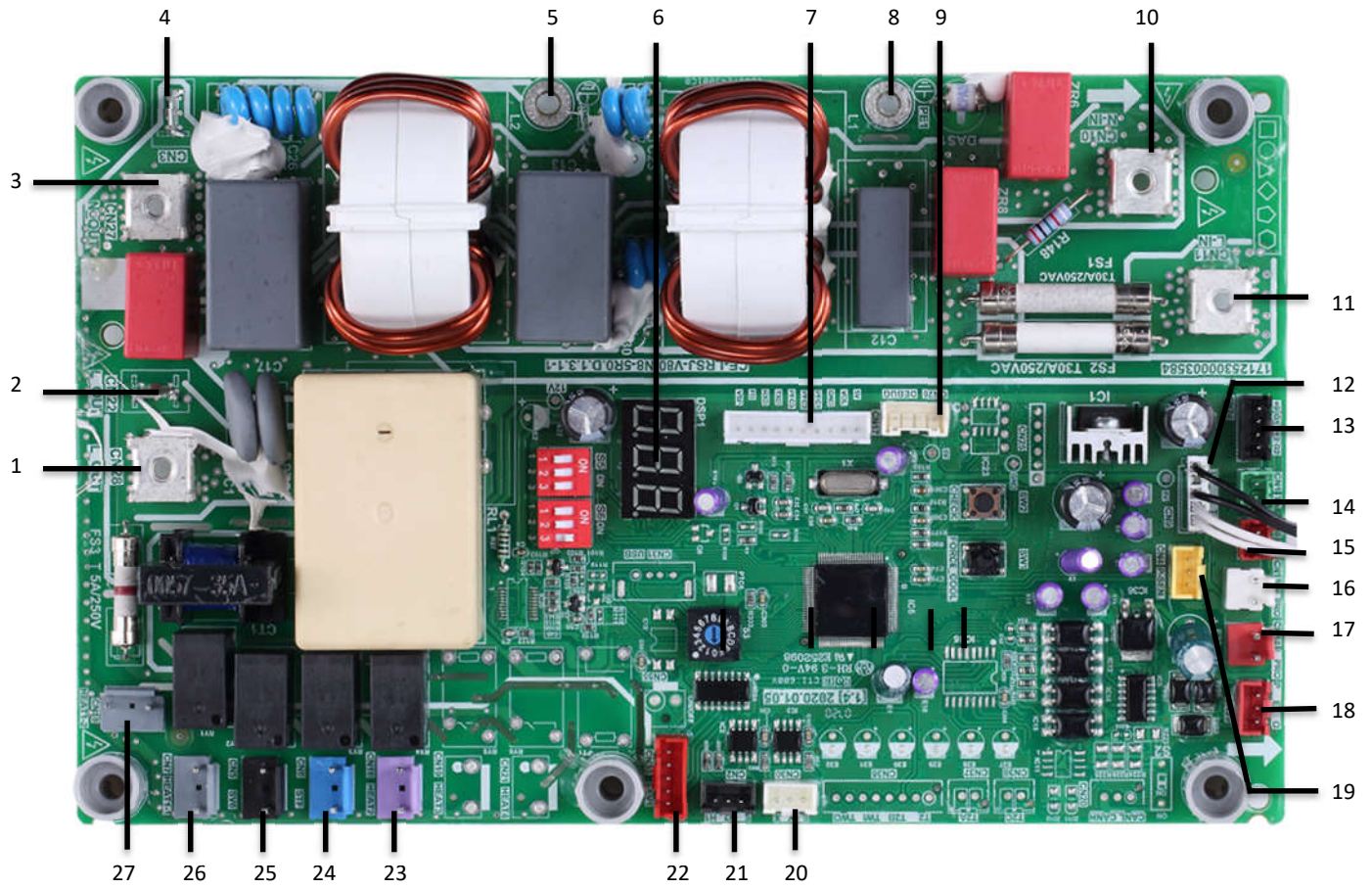
Table 4-2.3: MSH-120EB / MSH-140EB / MSH-160EB outdoor unit main PCB for refrigerant system

Label in Figure 4-2.3	Code	Content
1	CN28	Ourput port L to main PCB for refrigerant system
2	CN22	Reserved
3	CN27	Output port N to main PCB for refrigerant system
4	CN3	Reserved
5	PE2	Port for ground wire
6	DSP1	Digital display
7	CN17	Port for communication with main PCB for refrigerant system
8	PE1	Port for ground wire
9	CN26	Reserved
10	CN10	Input port for neutral wire
11	CN11	Input port for live wire
12	CN9	Port for outdoor ambient temp. sensor and condenser temp. sensor
13	CN24	Input port for +12V/9V
14	CN1	Port for suction temp. sensor
15	CN8	Port for discharge temp. sensor
16	CN13	Port for high pressure switch
17	CN14	Port for low pressure switch
18	CN29	Port for communication with hydro-box control board
19	CN4	Port for pressure sensor
20	CN30	Port for communication(reserved)
21	CN2	Port for communication(reserved)
22	CN33	Port for electrical expansion value
23	CN16	Port for chassis electrical heating tape(Optional)
24	CN6	Port for 4-way value
25	CN5	Port for SV6 value
26	CN7	Port for compressor electric heating tape 1
27	CN18	Port for compressor electric heating tape 2

Figure 4-2.4 MSH-120EB-3 / MSH-140EB-3 / MSH-160EB-3 outdoor unit main PCB for refrigerant system
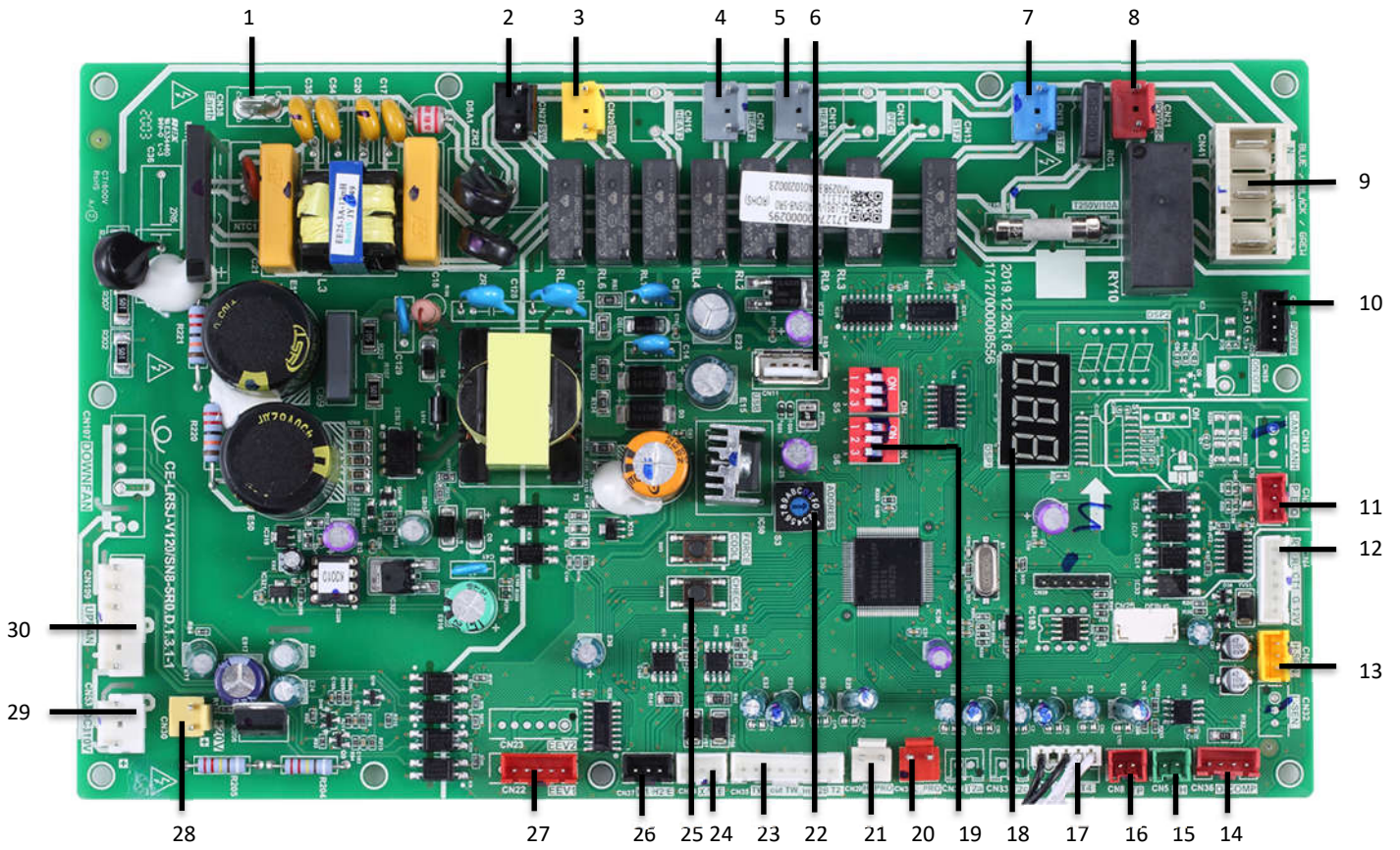
Table 4-2.4: MSH-120EB-3 / MSH-140EB-3 / MSH-160EB-3 outdoor unit main PCB for refrigerant system

Label in Figure 4-2.4	Code	Content
1	CN38	Port for GND
2	CN27	Port for 2-way valve 6
3	CN20	Port for 2-way valve 5
4	CN7	Port for eletric heating tape2
5	CN10	Port for eletric heating tape1
6	CN11	Reserved
7	CN18	Port for 4-way value
8	CN21	Reserved
9	CN41	Power supply port from main PCB for invert module board
10	CN26	Port for communication with Power Meter
11	CN24	Port for communication with hydro-box control board
12	CN4	Port for communication with main PCB for invert module board
13	CN6	Port for pressure sensor
14	CN36	Port for communication with main PCB for refrigerant system
15	CN5	Port for temp. sensor Th
16	CN8	Port for temp. sensor Tp
17	CN9	Port for outdoor ambient temp. sensor and condenser temp. sensor
18	DSP1	Digital display(DSP1)
19	S5,S6	DIP switch(S5,S6)
20	CN31	Port for low pressure switch(CN31)
21	CN29	Port for high pressure switch and quick check(CN29)
22	S3	Rotary dip switch(S3)
23	CN35	Port for temp. sensors(TW_out, TW_in, T1, T2,T2B)
24	CN28	Port for communication XYE
25	S3, S4	Key for fore cool & check
26	CN37	Port for communication H1H2E
27	CN22	Port for electrical expansion value
28	CN30	Port for fan 15VDC power supply
29	CN53	Port for fan 310VDC power supply
30	CN109	Port for fan

Figure 4-2.5 MSH-40EB / MSH-60EB / MSH-80EB / MSH-100EB outdoor unit inverter module

For 4/6kW model
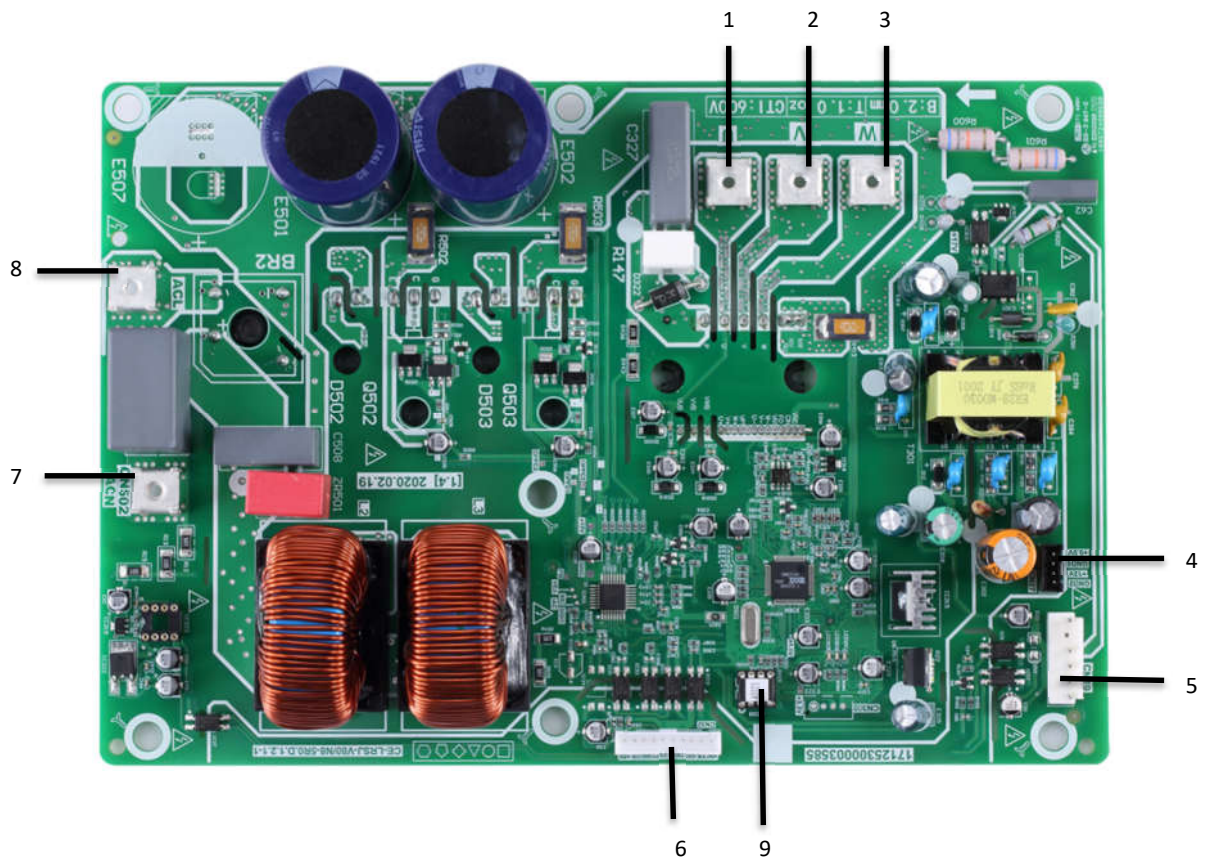
For 8/10kW model
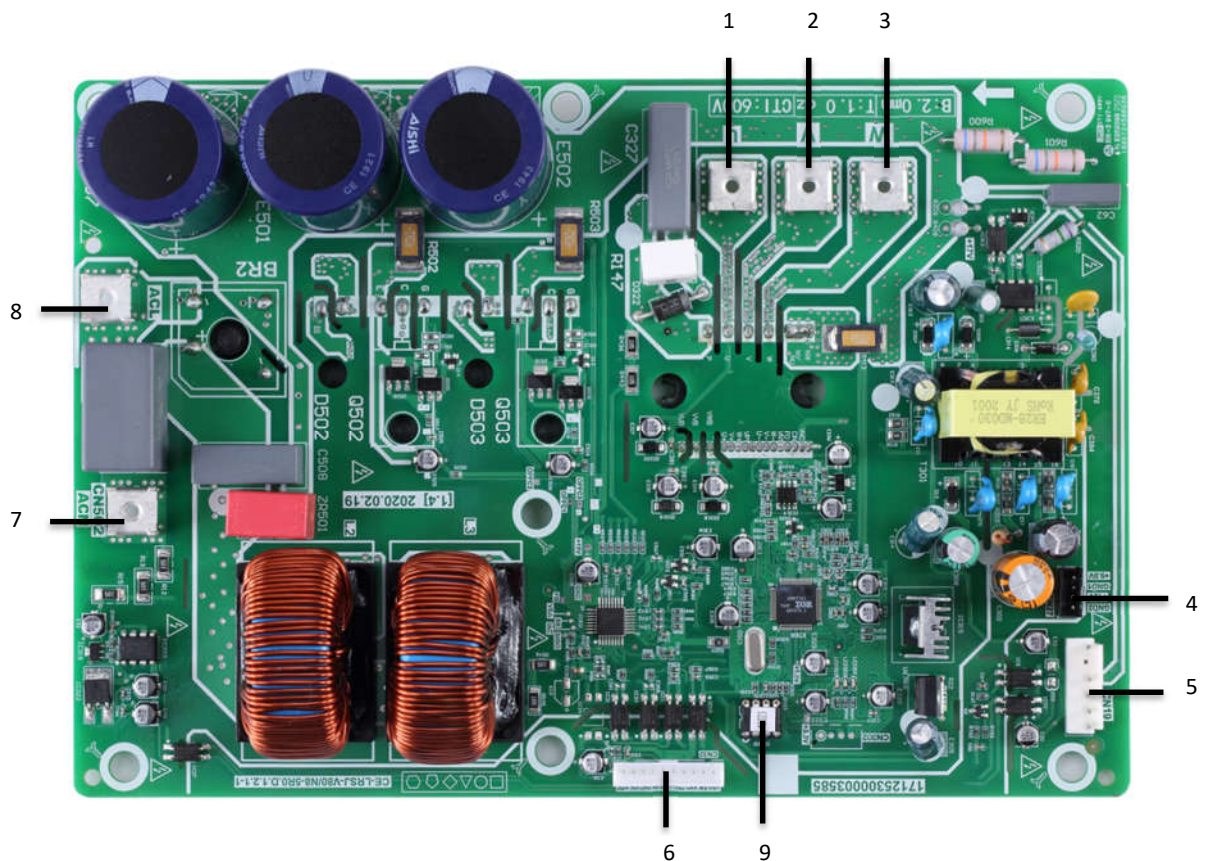
Table 4-2.5: MSH-40EB / MSH-60EB / MSH-80EB / MSH-100EB outdoor unit inverter module

Label in Figure 4-2.5	Code	Content
1	U	Compressor connection port U
2	V	Compressor connection port V
3	W	Compressor connection port W
4	CN20	Output port for +12V/9V
5	CN19	Port for fan
6	CN32	Port for communication with main PCB for filter board
7	CN502	Input port N for rectifier bridge
8	CN501	Input port L for rectifier bridge
9	IC320	EEPROM

Figure 4-2.6: MSH-120EB / MSH-140EB / MSH-160EB outdoor unit inverter module
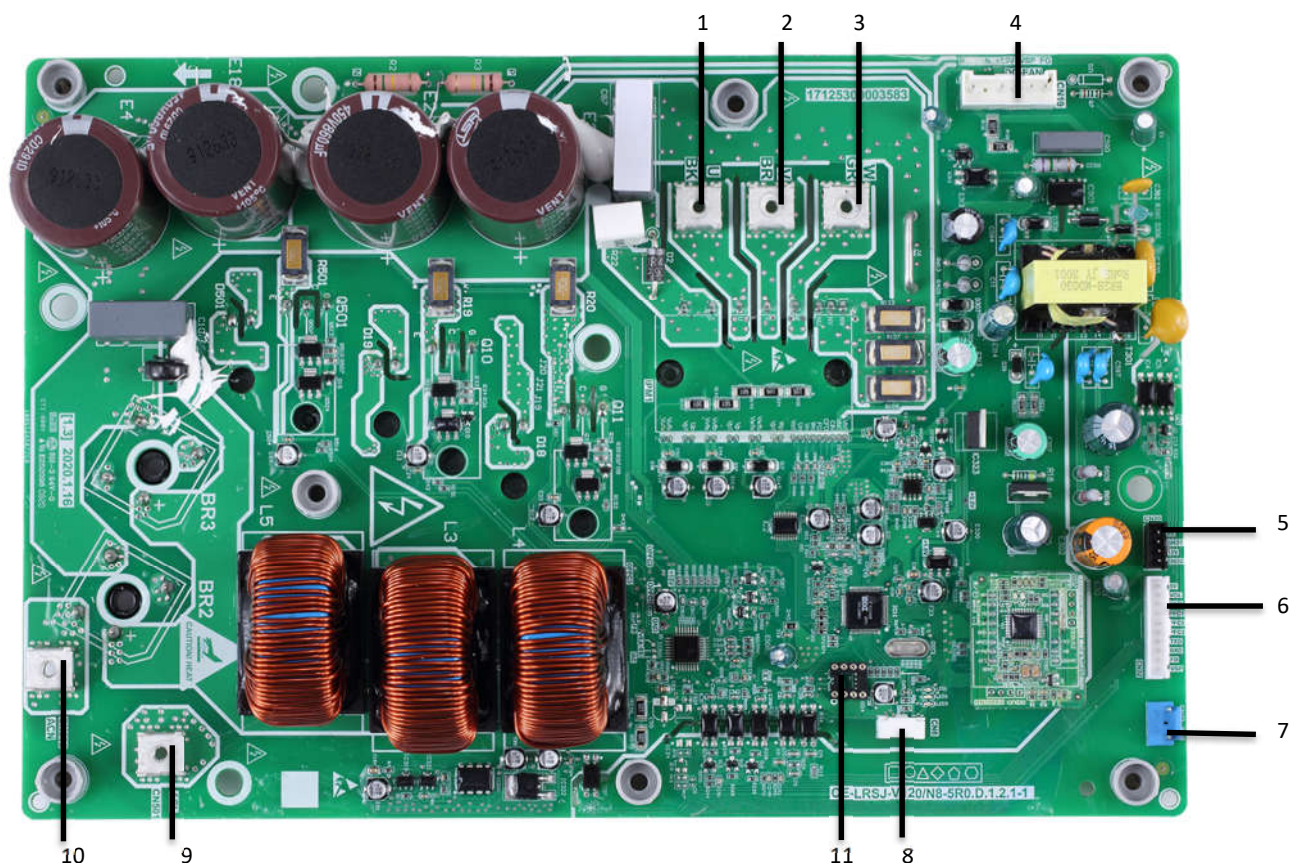
Table 4-2.6: MSH-120EB / MSH-140EB / MSH-160EB outdoor unit inverter module

Label in Figure 4-2.6	Code	Content
1	U	Compressor connection port U
2	V	Compressor connection port V
3	W	Compressor connection port W
4	CN19	Port for fan
5	CN20	Output port for +12V/9V
6	CN32	Port for communication with main PCB for filter board
7	CN23	Port for high pressure switch
8	CN6	Reserved
9	CN501	Input port L for rectifier bridge
10	CN502	Input port N for rectifier bridge
11	IC14	EEPROM

Figure 4-2.7: MSH-120EB-3 / MSH-140EB-3 / MSH-160EB-3 outdoor unit inverter module
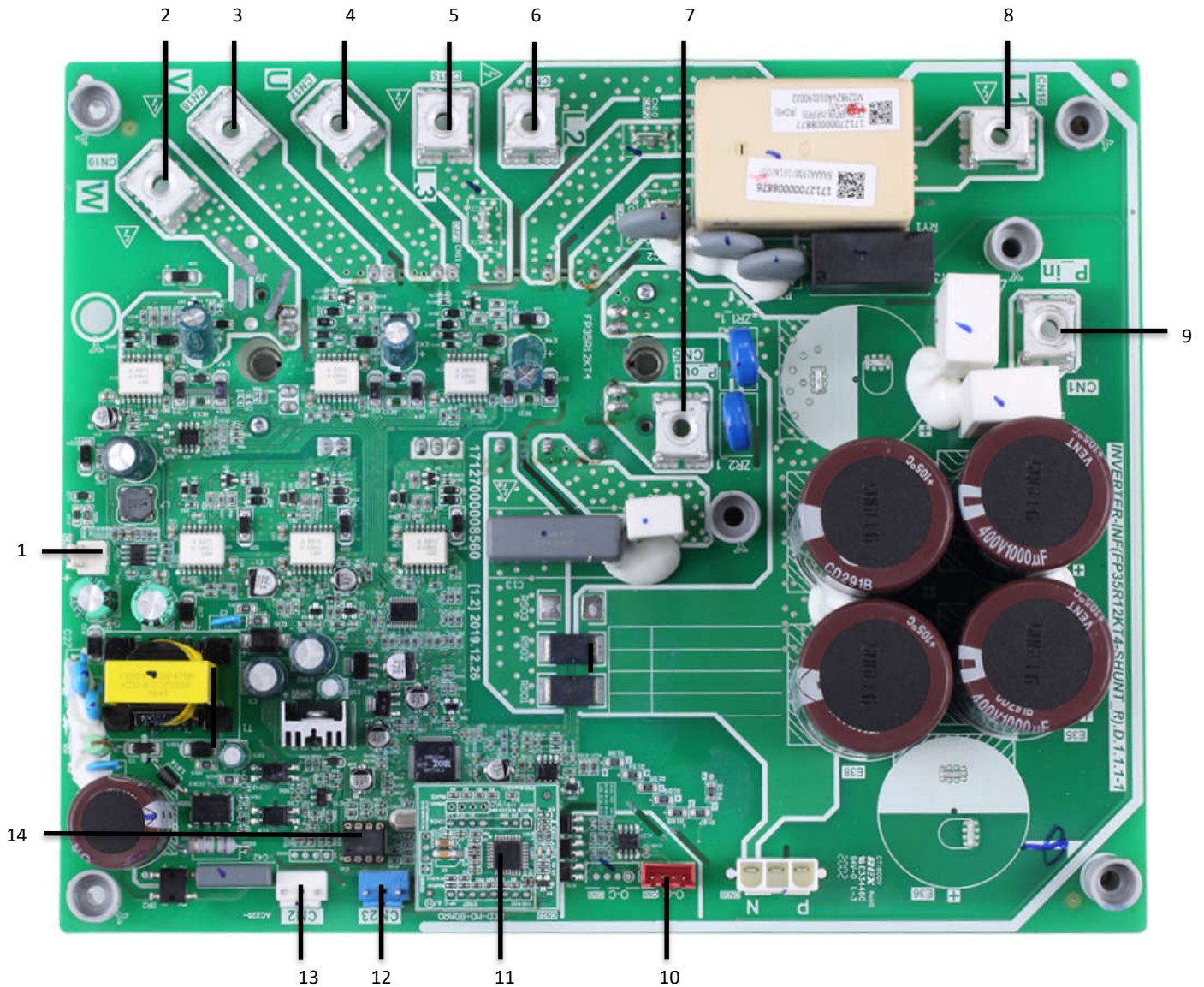
Table 4-2.7: MSH-120EB-3 / MSH-140EB-3 / MSH-160EB-3 outdoor unit inverter module

Label in Figure 4-2.7	Code	Content
1	CN20	Output port for +15V
2	CN19	Compressor connection port W
3	CN18	Compressor connection port V
4	CN17	Compressor connection port U
5	CN15	Power Input port L3
6	CN7	Power Input port L2
7	CN5	Input port P_out for IPM module
8	CN16	Power Input port L1
9	CN1	Input port P_in for IPM module
10	CN8	Port for communication with main PCB for filter board
11	CN22	PED board
12	CN23	Power for high pressure switch
13	CN2	Port for communication with PCB

14	IC25	EEPROM

Figure 4-2.8: MSH-120EB-3 / MSH-140EB-3 / MSH-160EB-3 outdoor unit filter board
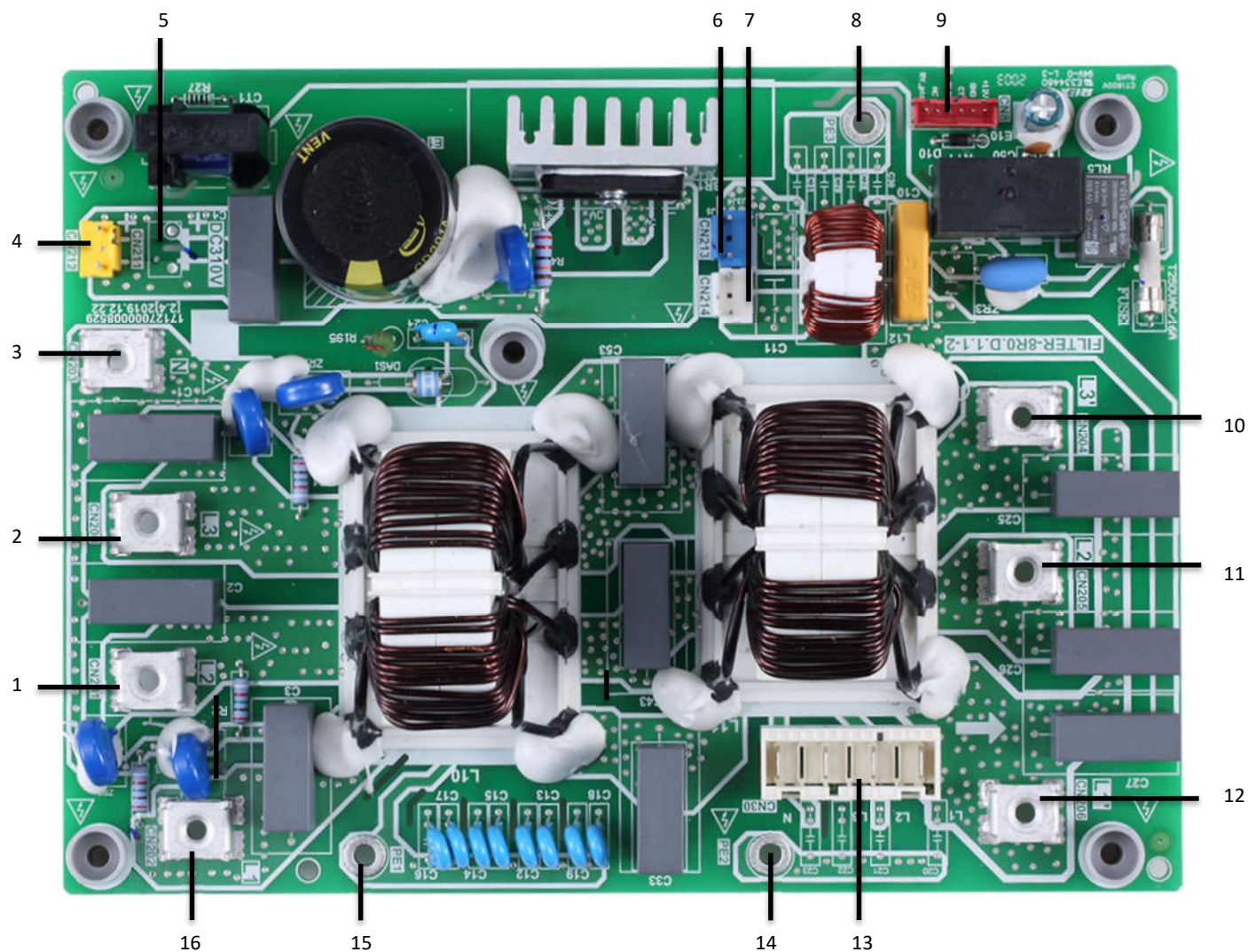
Table 4-2.8: MSH-120EB-3 / MSH-140EB-3 / MSH-160EB-3 outdoor unit filter board

Label in Figure 4-2.8	Code	Content
1	CN201	Power supply L2
2	CN200	Power supply L3
3	CN203	Power supply N
4	CN212	Power supply port of 310VDC
5	CN211	Reserved
6	CN213	Port for FAN Reactor
7	CN214	Power supply port for Inverter module
8	PE3	Ground wire
9	CN8	Port for communication with main PCB for filter board
10	L3'	Power filtering L3
11	L2'	Power filtering L2
12	L1'	Power filtering L1
13	CN30	Power supply port for main control board

14	PE2	Port for ground wire
15	PE1	Port for ground wire
16	L1	Power supply L1

11.4 Digital Display Output

Table 4-2.9: Digital display output in different operating states

Yukon Split system state	Parameters displayed on outdoor unit main PCB DSP1	Parameters displayed on hydronic box main PCB DSP1	
On standby	0	0	
Normal operation	Running speed of the compressor in rotations per second	Leaving water temperature (°C)	
Error or protection	Error or protection code	Error or protection code	

11.5 DIP switch setting and Modbus function

The rotating coded switch S3(0-F) on the main control board of hydraulic module is used for setting the modbus address. By default the units have this coded switch positioned=0, but this corresponds to the modbus address 16, while the others positions corresponds the number, e.g. pos=2 is address 2, pos=5 is address 5.

Figure 4-2.10: Rotating switch

Figure 4-2.11: Connection
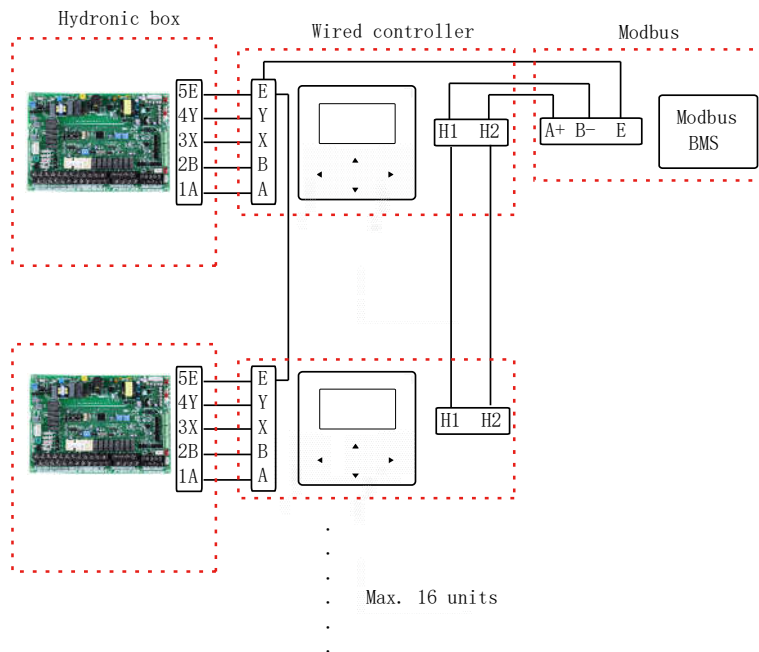
Note: Wired controller is integrated in the hydronic box.

Figure 4-2.12: Wiring

Input Voltage(A/B)	13.5VAC
Wiring size	0.75mm²
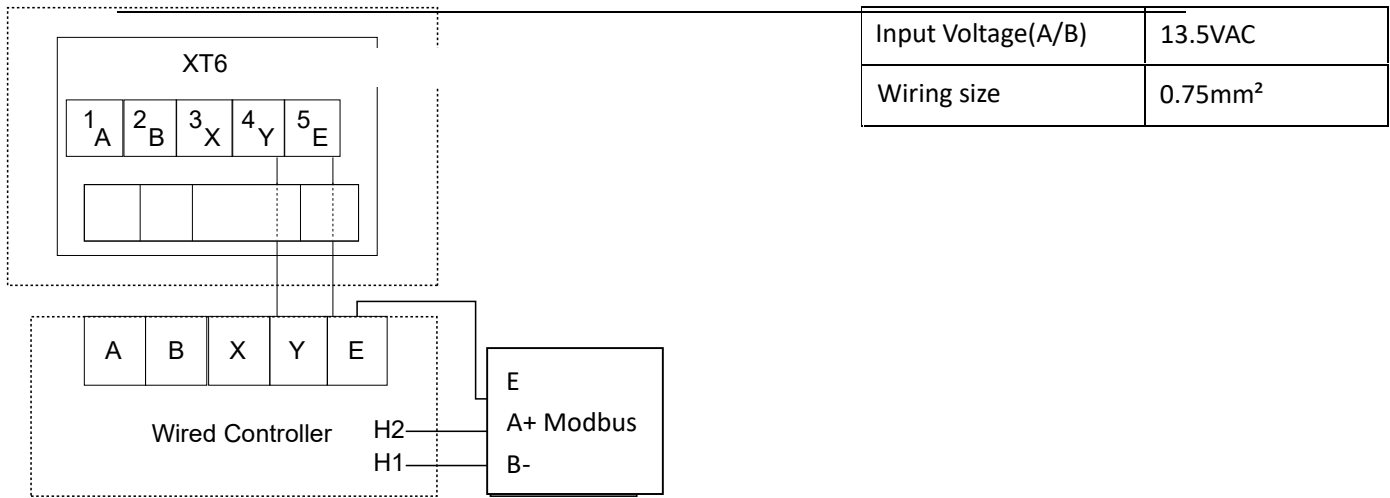
DIP switch is located on the hydraulic module main control board, please refer below for more details setting.

Switch		ON=1	OFF=0	
S1	1/2	00=IBH(One-step control) 01=IBH(Two step control) 11=IBH(Three-step control)		Set according to unit configuration by factory
	3/4	00=Without IBH and AHS 10=With IBH 01=With AHS for heating mode 11=With AHS for heating mode and DHW		Set according to unit configuration by factory or adjust onsite according to application
S2	1	Start Pump O after 24 hours will be invalid	Start Pump O after 24 hours will be valid	OFF
	2	without TBH	with TBH	ON
	3/4	Pump configuration		ON/ON
S4	1	Reserved		OFF
	2	IBH for DHW=valid	IBH for DHW=invalid	ON
	3/4	Reserved		OFF

DIP switch S5 and S6 are located on outdoor unit main PCB for refrigerant system.

	Single phase 4-16kW	S5-1	0:Mono, 1:Split
		S5-2	reserved
		S5-3	reserved
	Three phase 12-16kW	S5-1	0:Mono, 1:Split
		S5-2	reserved
		S5-3	reserved
	Single phase 4-16kW	0/0/0=4Kw, 1/0/0=6Kw, 0/1/0=8Kw, 1/1/0=10Kw, 0/0/1=12Kw, 1/0/1=14Kw, 0/1/1=16Kw,	
	Three phase 12-16kW	0/0/0=12Kw, 1/0/0=14Kw, 0/1/0=16Kw,	

The rotating coded switch S3(0-F) on the outdoor unit main PCB for refrigerant system Keep factory Settings.

SINCLAIR

3 Wiring diagram

Outdoor unit 4~10kW

FAN

BLUE — W
W(C) BLACK — V
V(S) RED — U
U(R)
MR4

CN20 CN19

CN32

PCBA,Inverter board for 1phase

CN501 CN502
ACL   ACN

COMP

Y/G

MR3

MR2

BROWN

CN27
N-OUT
CN28
L-OUT
CT1

BLUE

PE2   PE1

CN10
N-IN
CN11
L-IN

BLUE

BROWN

CN17 CN26
DEBUG

CHECK FORCE_COOL

SW2

SW1

12/9V CN24

Th CN1 Th
Tp CN8 Tp

CN9 T3 T3
     T4 T4

CN4 P-SEN P-SEN

H-PRO CN13 H-PRO
L-PRO CN14 L-PRO

CN29
P E Q

PCB B,Main control board for 1phase

S5 ON 1 2 3
S6 ON 1 2 3

CN18 HEAT1-2
CN7 HEAT1-1
CN5 SV6
CN6 STF
CN16 HEAT2
CN19 HEAT3
CN21 HEAT4
CN33 EEV1
CN2 E H2 H1
CN30 E Y X
CN36
CN37 T2A
CN38 T2C

BROWN
BROWN
BLUE
BLUE

XT3

To the heating tape of drainage outlet(<200mA)

HEAT1-2
HEAT1-1
SV6
STF
HEAT2
HEAT3
HEAT4
EEV

YELLOW
GRAY
BLACK

XT2
P Q

MR5

MR1

Y/G

XT1

L N

POWER SUPPLY
220-240V AC

P Q

To Indoor Unit Communication

NOTE：PLEASE USE 2-CORE SHIELEDE WIRE

SINCLAIR

Outdoor unit 12~16kW Single Phase

FAN

PCBA,Inverter board for 1phase

CN20 | CN32 | CN23

CN19

CN22
PED-MD-BOARD

BLUE W
W(C) BLACK V
V(S) RED U
U(R)
MR4

COMP

Y/G

CN502 CN501
ACN ACL

BLUE MR3
BROWN

MR2

CN27 N-OUT
PE2 PE1
CN10 N-IN BLUE
CN11 L-IN BROWN

CN28 L-OUT
CT1

12/9V CN24

CN17 CN26 DEBUG
CHECK FORCE_COOL
SW2
SW1

Th CN1 Th
Tp CN8 Tp

S5
PCB B,Main control board for 1phase

CN9 T3 T3
T4 T4

S6

CN4 P-SEN P-SEN

HEAT1-2 CN18
HEAT1-1 CN7
SV6 CN5
STF CN6
HEAT2 CN16
HEAT3 CN19
HEAT4 CN21
EEV1 CN33
E H2 H1 CN2
E Y X CN30
CN36
T2A CN37
T2C CN38

H-PRO CN13
L-PRO CN14 L-PRO

CN29 P E Q

BROWN
BLUE
BLUE
YELLOW
GRAY
BLACK
MR5

MR1
Y/G

XT3

XT2

XT1

HEAT1-1
SV6
STF

To the heating tape of drainage outlet(<200mA)

HEAT2
HEAT3
HEAT4
EEV

P Q

To Indoor Unit Communication

NOTE: PLEASE USE 2-CORE SHIELEDE WIRE

POWER SUPP LY 220-240V AC

![Sinclair logo]

Outdoor unit 12~16kW Three Phase

It will be at least ten minutes before the power goes back on

MAIN BOARD

H-SEN · CN32 L-SEN · CN6 H-SEN · CN4 · CN24 PQE · CN19 CAN · CN26 POWER · CN41

O-COMP CN36 · TH CN5 · TP CN8 · T4 T3 CN9 · T2c CN33 · T2a CN34 · L_PRO CN31 · H_PRO CN29 · CN35 CN28 CN37 · EEV1 CN22 · CN30 DC310V CN63 · UPFAN CN109 · CN38 Earth

WHITE BLACK RED · EEV1 · FAN

DSP1 · ON 1 2 3 S6 · ON 1 2 3 S5 · ADDRESS S3 · SW4 SW3 · FORCE COOL · CHECK

POWER-I CN21 · STF1 CN18 · STF2 CN13 · HEAT1 CN10 · HEAT2 CN7 · HEAT3 CN16 · SV5 CN20 · SV6 CN27

STF1 · STF2 · XT3 HEAT1 HEAT2 · HEAT3 · SV5 · SV6

To the heating tape of drainage outlet (<200mA)

Ferrite core

COMPRESSOR DRIVER BOARD

CN8 (CN9) · CN22 PED-MD-BOARD · CN23 H_PRO · CN2 · CN20

P_in CN1 RED · P_out CN5 RED · L1 CN16 · L2 CN7 · L3 CN15 · CN17 CN18 · CN19

BLACK BROWN GRAY RED BLACK BLUE

FILTER BOARD

BLACK L1' · BROWN L2' · GRAY L3' · CN206 CN205 CN204 · CN30 · PE2 PE1 · L1 BLACK CN202 · L2 BROWN CN201 · L3 GRAY CN200 · N BLUE CN203 · CN214 · CN213 · PE3 · CN8 · CT1 · CN212

Ferrite core

RA1 RA2 RA3 · BLACK BLACK BROWN BROWN GRAY GRAY

ADDITIONAL HEAT SOURCE · Y/G · RA4

BLACK BLUE RED · V W U

XT2

BLACK GRAY YELLOW · P Q · To Indoor unit communication

XT1 · POWER SUPPLY · BLACK BROWN GRAY BLUE · N L3 L2 L1

Ferrite core

Hydro module with tank

Y/G

Tbt1 Tbt2 T5 (T5U) Tw2 Tsolar

PUMP

Temperature Controller

WIRE CONTROLLER

X Y E B A

BROWN
BLACK
YELLOW
RED
WHITE

ROOM THERMOSTAT (LOW VOLTAGE)

SMART GRID (LOW VOLTAGE)

CN24 CN16 CN13 CN15 CN18

CN31 — CL COM HT GND PF

CN35 — EVU SG

CN36 — E1 T1 T2 M1 M2

CN19 — Q E P

CN14 — E Y X B A

CN6

T1 — BLUE
TW-out — YELLOW
TW-in — RED
T2B — BLACK
T2 — WHITE

FS — WHITE — CN8

FS

S1 — ON DIP 1 2 3 4
S2 — ON DIP 1 2 3 4
S4 — ON DIP 1 2 3 4

S3 — 0123456789ABCDEF

CN17 PUMP_BP — FG GND PWM NC

CN30 — 1 A 2 B 3 X 4 Y 5 E / 6 P 7 Q 8 9 H1 10 H2

SW9 — NO NC

CN7 — 25 HT 26 R2 27 AHS1 28 AHS2 / 29 30 OFF 31 R1 32 DFT1 / DFT2

Main control board of indoor unit

CN11 — 3 H 4 C 5 1ON 6 1OFF 7 2ON 8 2OFF 9 P_c 10 P_o 11 P_s 12 P_d / 15 L1 16 N 17 N 18 N 19 3ON 20 3OFF 21 N 22 N 23 N 24 N

PUMP CN28

Y/G

GND CN5

DIS1

SW1 SW2

Power CN21
IBH0 CN32

HEAT5 CN29
HEAT6 CN42
HEAT7 CN40
HEAT8 CN41

CN22 — IBH1/2-FB TBH IBH2 IBH1
CN1
CN2 — TBH-FB

SL1 SL2 13 14 TBH IBH1

Heat belt / Heat belt / Heat belt / Heat belt

Ferrite core

BROWN
BLUE

L N

BROWN
BLACK
BLUE

BLACK

SV1

Figure1: 1-Phase 3KW IBH(One step control)

Figure2: 1-Phase 2/4/6KW IBH(Three step control)

Figure3: 3-Phase 3/6/9KW IBH(Three step control)

12 Error Code Table

Table 4-3.1: Error code table

Error code	Serial Number[1]	Content[2]	Remarks
C7	65	High temperature protection of transducer module	
E0	1	Water flow failure(E8 appears for 3 times)	
E1	2	Phase sequence error	Only applies to 3-phase models
E2	3	Communication error between the main control board of hydraulic module and user interface	
E3	4	Final outlet water temperature sensor error	Sensor T1
E4	5	Domestic hot water tank temperature sensor error	Sensor T5
E5	6	Air side heat exchanger refrigerant outlet temperature sensor error	Sensor T3
E6	7	Outdoor ambient temperature sensor error	Sensor T4
E7	8	Balance tank upper temperature sensor error	Sensor Tbt1
E8	9	Water flow failure	
E9	10	Suction pipe temperature sensor error	Sensor Th
EA	11	Discharge pipe temperature sensor error	Sensor Tp
Eb	12	Solar panel temperature sensor error	Sensor Tsolar
Ec	13	Balance tank nether temperature sensor error	Sensor Tbt2
Ed	14	Water side heat exchanger water inlet temperature sensor error	Sensor Tw_in
EE	15	Hydronic box EEPROM error	
F1	116	DC generatrix voltage is too low	
H0	39	Communication error between outdoor unit main control chip and hydronic box main control chip	
H1	40	Communication error between outdoor unit main control chip and inverter driver chip	
H2	41	Water side heat exchanger refrigerant outlet (liquid pipe) temperature sensor error	Sensor T2
H3	42	Water side heat exchanger refrigerant inlet (gas pipe) temperature sensor error	Sensor T2B
H4	43	P6 appear 3 times in one hour	

H5	44	Room temperature sensor error	Sensor Ta
H6,	45	DC fan error	
H7	46	Abnormal main circuit voltage	
H8	47	Pressure sensor error	
H9	48	Circuit 2 water outlet temperature sensor error	Sensor Tw2
HA	49	Water side heat exchanger water outlet temperature sensor error	Sensor Tw_out
Hb	50	PP protection appears three times in a row and Twout<7℃	
HF	54	Invert module EEPROM error	
HH	55	DC fan error(H6 appears 10 times in 120min)	
HP	57	Low pressure protection for cooling mode	
P0	20	Low pressure switch protection	
P1	21	High pressure switch protection	
P3	23	Compressor current protection	
P4	24	Discharge temperature protection	

Table 4-3.1: Error code table (continued)

P5	25	High temperature difference between water side heat exchanger water inlet and water outlet temperatures protection	
P6	26	Inverter module protection	
L0	-	Inverter module protection	
L1	-	DC bus low voltage protection	
L2	-	DC bus high voltage protection	
L4	-	MCE error	
L5	-	Zero speed protection	
L7	-	Phase sequence error	
L8	-	Compressor frequency variation greater than 15Hz within one second protection	
L9	-	Actual compressor frequency differs from target frequency by more than 15Hz protection	
Pb	31	Water side heat exchanger anti-freeze protection	
Pd	33	High temperature protection of refrigerant outlet temperature of condenser in cooling mode	
PP	38	Water side heat exchanger inlet temperature is higher than outlet temperature in heating mode or DHW mode	
bH	112	PED board error	

Notes:

1. When the error code appears, the error code corresponding to the serial number can be obtained through the H1H2 port by using the host computer to query the wired controller register.

2. Sensor names in this service manual referring to refrigerant flow is named according refrigerant flow during cooling operation refer to Part 2, 3 "Refrigerant Flow Diagrams".

13 Troubleshooting

13.1 Warning

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

13.2 E0, E8 Troubleshooting

13.2.1 Digital display output
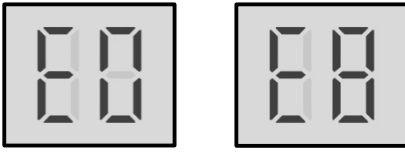
13.2.2 Description

- Water flow failure.
- E0 indicates E8 has displayed 3 times. When an E0 error occurs, a manual system restart is required before the system can resume operation.
- Yukon Split stops running.
- Error code is displayed on hydronic box main PCB and user interface.

13.2.3 Possible causes

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

13.2.4 Procedure

```
┌─────────────────────────────┐
│          E0 / E8            │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐   Yes    ┌──────────────────────────────────┐
│ Water flow switch connection │ ───────▶ │ Ensure the switch is connected   │
│ on hydronic box main PCB is  │          │ properly                         │
│ loose[1]                     │          └──────────────────────────────────┘
└─────────────────────────────┘
              │ No
              ▼
┌─────────────────────────────┐   Yes    ┌──────────────────────────────────┐
│                             │ ───────▶ │ Check the water piping and       │
│                             │          │ valves. Make sure the water      │
│                             │          │ piping is clean, there is no air │
│ Water flow is insufficient[2]│          │ in the water piping and all      │
│                             │          │ valves are open. If the internal │
│                             │          │ circulator pump is not already   │
│                             │          │ set to the highest speed,        │
│                             │          │ increase its speed.              │
└─────────────────────────────┘          └──────────────────────────────────┘
              │ No
              ▼
┌─────────────────────────────┐   Yes    ┌──────────────────────────────────┐
│ Water flow switch is damaged │ ───────▶ │ Replace the water flow switch    │
└─────────────────────────────┘          └──────────────────────────────────┘
              │ No
              ▼
┌─────────────────────────────┐   Yes    ┌──────────────────────────────────┐
│ Internal circulator pump     │ ───────▶ │ Turn off the power, check the    │
│ can't work                   │          │ wire in the pump. Once that is   │
│                             │          │ done, the pump still can't work, │
│                             │          │ replace the pump.                │
└─────────────────────────────┘          └──────────────────────────────────┘
              │ No
              ▼
┌─────────────────────────────┐
│ Replace hydronic box main    │
│ PCB                          │
└─────────────────────────────┘
```

Notes:
1. Water flow switch connection is port CN8 on the main PCB for hydronic box (labeled 9 in Figure 4-2.1 in Part4, 2.2 "Main PCB for Hydronic System").
2. Check water pressure on the manometer. If the water pressure is not > 1 bar, water flow is insufficient. Refer to Figure 2-1.9 in Part 2, 1 "Hydronic Box Layout".

13.3 E1 Troubleshooting

13.3.1 Digital display output

13.3.2 Description

- Phase sequence error.
- Only applies to 3-phase models.
- Yukon Split stops running.
- Error code is displayed on outdoor unit main PCB and user interface.

13.3.3 Possible causes

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

13.3.4 Procedure

```
┌─────────────────────────────┐
│             E1              │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐   Yes   ┌─────────────────────────────┐
│ The phase sequence of the   │────────▶│ Exchange any two of the 3   │
│ 3-phase power supply is     │         │ phase wires                 │
│ incrorrect[1]               │         └─────────────────────────────┘
└─────────────────────────────┘
              │ No
              ▼
┌─────────────────────────────┐   Yes   ┌─────────────────────────────┐
│ Some power supply terminals │────────▶│ Ensure all supply terminals │
│ are loose[2]                │         │ are securely fastened       │
└─────────────────────────────┘         └─────────────────────────────┘
              │ No
              ▼
┌─────────────────────────────┐   Yes   ┌─────────────────────────────┐
│ The power supply is abnormal│────────▶│ Check the power supply      │
│                             │         │ equipment                   │
└─────────────────────────────┘         └─────────────────────────────┘
              │ No
              ▼
┌─────────────────────────────┐
│ Replace outdoor unit main   │
│ PCB                         │
└─────────────────────────────┘
```
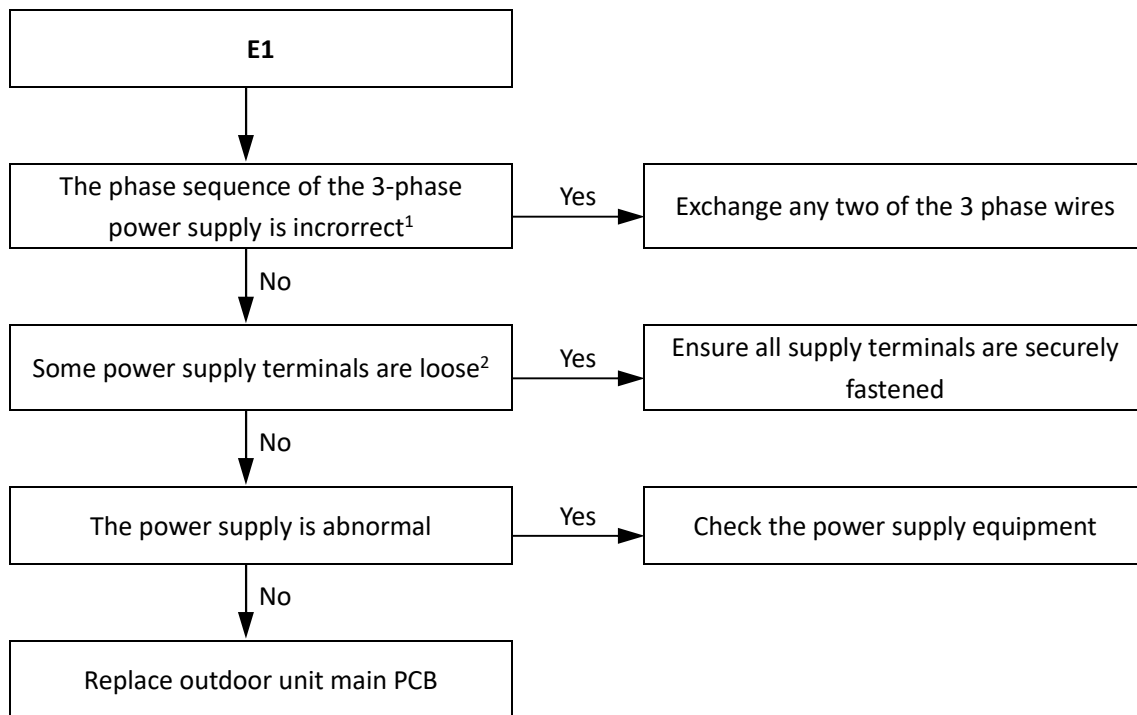
Notes:
1. The A, B, C terminals of 3-phase power supply should match compressor phase sequence requirements. If the phase sequence is inverted, the compressor will operate inversely. If the wiring connection of each outdoor unit is in A, B, C phase sequence, and multiple units are connected, the current difference between C phase and A, B phases will be very large as the power supply load of each outdoor unit will be on C phase. This can easily lead to tripped circuits and terminal wiring burnout. Therefore if multiple units are to be used, the phase sequence should be staggered, so that the current is distributed among the three phases equally.
2. Loose power supply terminals can cause the compressors to operate abnormally and compressor current to be very large.

13.4 E2 Troubleshooting

13.4.1 Digital display output

13.4.2 Description

- Communication error between hydronic box and user interface.
- Yukon Split stops running.
- Error code is displayed on hydronic box main PCB and user interface.

13.4.3 Possible causes

- Communication wires between hydronic box and user interface not connected properly.
- Communication wiring X Y E terminals misconnected.
- Loosened wiring within electric control box.
- Interference from high voltage wires or other sources of electromagnetic radiation.
- Damaged main PCB or electric control box communication terminals block.

13.4.4 Procedure

```
                    ┌─────────────────────────┐
                    │           E2            │
                    └────────────┬────────────┘
                                 │
                                 ▼
    ┌─────────────────────────────────────┐      Yes   ┌──────────────────────────────┐
    │ Communication wires X Y E have short │──────────▶ │ Reconnect the communication  │
    │ circuited, disconnected or are       │            │ wires                        │
    │ misconnected[1]                      │            └──────────────────────────────┘
    └──────────────────┬──────────────────┘
                       │ No
                       ▼
    ┌─────────────────────────────────────┐      Yes   ┌──────────────────────────────┐
    │ Communication wires X Y E are not    │──────────▶ │ Connect the communication    │
    │ connected in a daisy chain           │            │ wires in a daisy chain       │
    └──────────────────┬──────────────────┘            └──────────────────────────────┘
                       │ No
                       ▼
    ┌─────────────────────────────────────┐      Yes   ┌──────────────────────────────┐
    │ Wires between hydronic box main PCB  │──────────▶ │ Ensure the wires are         │
    │ and electric control box             │            │ connected properly           │
    │ communication terminals block are    │            └──────────────────────────────┘
    │ loose                                │
    └──────────────────┬──────────────────┘
                       │ No
                       ▼
    ┌─────────────────────────────────────┐      Yes   ┌──────────────────────────────┐
    │ Interference from high voltage       │──────────▶ │ Ensure the communication     │
    │ (220V or higher) wires               │            │ wires and high voltage wires │
    └──────────────────┬──────────────────┘            │ are separated                │
                       │ No                            └──────────────────────────────┘
                       ▼
    ┌─────────────────────────────────────┐      Yes   ┌──────────────────────────────┐
    │ Communication wires are close to a   │──────────▶ │ Remove the source of         │
    │ source of electromagnetic radiation  │            │ interference, or add         │
    │ such as transformer or strong        │            │ additional shielding to the  │
    │ fluorescent lamp                     │            │ communication wires          │
    └──────────────────┬──────────────────┘            └──────────────────────────────┘
                       │ No
                       ▼
    ┌─────────────────────────────────────┐
    │ Replacing electric control box       │
    │ communication terminals block        │
    │ resolves the error                   │
    └──────────────────┬──────────────────┘
                       │ No
                       ▼
    ┌─────────────────────────────────────┐
    │ Replace hydronic box main PCB        │
    └─────────────────────────────────────┘
```

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

13.5 E3, E4, H2, H3, Ed, HA, H5, H9, Eb, E7,Ec Troubleshooting

13.5.1 Digital display output
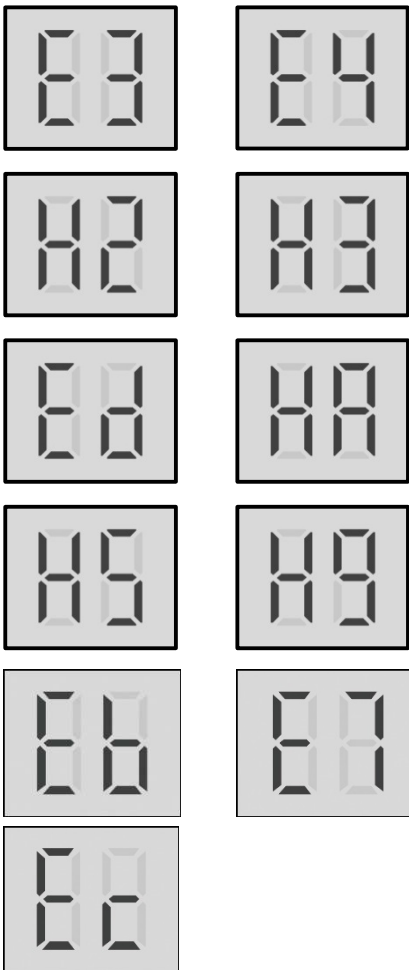
13.5.2 Description

- E3 indicates final outlet water temperature sensor error
- E4 indicates a domestic hot water tank temperature sensor error.
- H2 indicates a water side heat exchanger refrigerant outlet (liquid pipe) temperature sensor error.
- H3 indicates a water side heat exchanger refrigerant inlet (gas pipe) temperature sensor error.
- Ed indicates a water side heat exchanger water inlet temperature sensor error.
- HA indicates a water side heat exchanger water outlet temperature sensor error.
- H5 indicates a room temperature sensor error.
- H9 indicates a circuit 2 water outlet temperature sensor error.
- Eb indicates solar panel temperature sensor error
- E7 indicates balance tank upper temperature sensor error
- Ec indicates balance tank nether temperature sensor error
- Yukon Split stops running.
- Error code is displayed on hydronic box main PCB and user interface.

13.5.3 Possible causes

- Temperature sensor not connected properly or has malfunctioned.
- Damaged hydronic box main PCB.

13.5.4 Procedure

```
┌─────────────────────────────────────┐
│ E3 / E4 / H2 / H3 / Ed / HA / H5 / H9/ Eb │
│          / E7 / Ec                   │
└─────────────────────────────────────┘
                │
                ▼
┌─────────────────────────────────┐   Yes   ┌──────────────────────────────────┐
│ Temperature sensor connection on │────────▶│ Ensure the sensor is connected   │
│ hydronic box main PCB is loose   │         │ properly                         │
└─────────────────────────────────┘         └──────────────────────────────────┘
                │ No
                ▼
┌─────────────────────────────────┐   Yes   ┌──────────────────────────────────┐
│ Temperature sensor has short-    │────────▶│ Replace the sensor               │
│ circuited or failed[2]           │         │                                  │
└─────────────────────────────────┘         └──────────────────────────────────┘
                │ No
                ▼
┌─────────────────────────────────┐
│ Replace hydronic box main PCB    │
└─────────────────────────────────┘
```
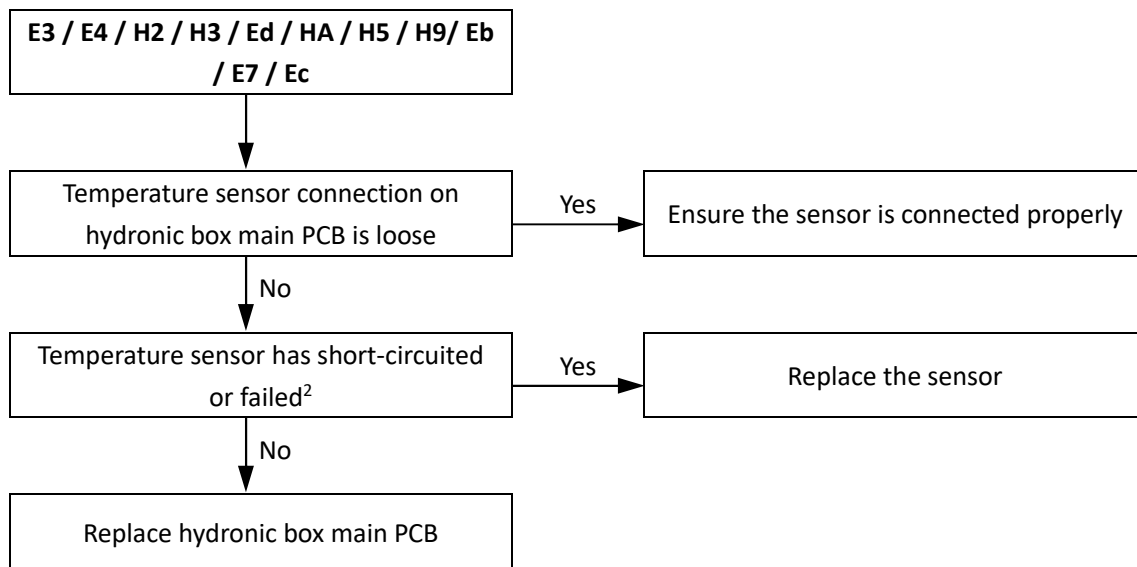
Notes:
1. Final water outlet temperature sensor, water side heat exchanger refrigerant inlet (liquid pipe) temperature sensor, water side heat exchanger refrigerant outlet (gas pipe) temperature sensor, water side heat exchanger water inlet temperature sensor and water side heat exchanger water outlet temperature sensor connections are port CN6 on the hydronic box main PCB (labeled 10 in Figure 4-2.1 in Part4, 2.2 "Main PCB for Hydronic System"). Domestic hot water tank temperature sensor connection is port CN13 on the hydronic box main PCB (labeled 13 in Figure 4-2.1 in Part4, 2.2 "Main PCB for Hydronic System"). Circuit 2 water outlet temperature sensor connection is port CN15 on the hydronic box main PCB (labeled 14 in Figure 4-2.1 in Part4, 2.2 "Main PCB for Hydronic System"). Room temperature sensor connection is port CN11 on the hydronic box main PCB (labeled 24 in Figure 4-2.1 in Part4, 2.2 "Main PCB for Hydronic System"). Solar panel temperature sensor connection is port CN18 on the hydronic box main PCB (labeled 15 in Figure 4-2.1 in Part4, 2.2 "Main PCB for Hydronic System"). Balance tank upper temperature sensor connection is port CN24 on the hydronic box main PCB (labeled 11 in Figure 4-2.1 in Part4, 2.2 "Main PCB for Hydronic System") Balance tank nether temperature sensor connection is port CN16 on the hydronic box main PCB (labeled 12 in Figure 4-2.1 in Part4, 2.2 "Main PCB for Hydronic System")
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 4-5.1 or 4-5.3 in Part 4, 5.1 "Temperature Sensor Resistance Characteristics".

13.6 E5, E6, E9, EA Troubleshooting

13.6.1 Digital display output

13.6.2 Description

- E5 indicates an air side heat exchanger refrigerant outlet temperature sensor error.
- E6 indicates an outdoor ambient temperature sensor error.
- E9 indicates a suction pipe temperature sensor error.
- EA indicates a discharge temperature sensor error.
- Yukon Split stops running.
- Error code is displayed on outdoor unit main PCB and user interface.

13.6.3 Possible causes

- Temperature sensor not connected properly or has malfunctioned.
- Damaged outdoor unit main PCB.

13.6.4 Procedure
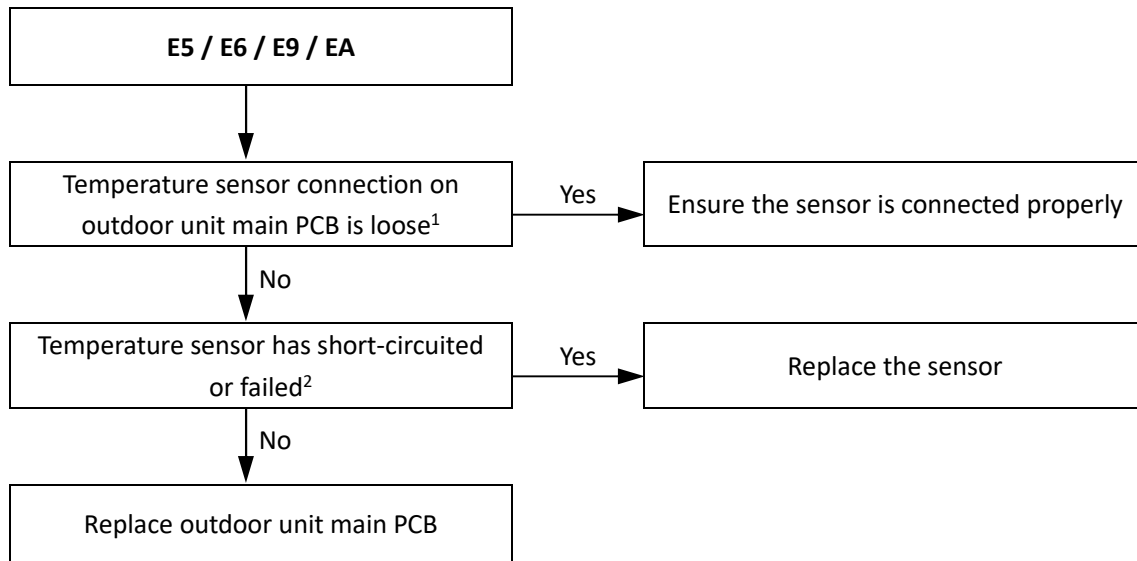
```
┌─────────────────────────────┐
│      E5 / E6 / E9 / EA       │
└─────────────────────────────┘
                │
                ▼
┌─────────────────────────────┐   Yes   ┌──────────────────────────────────┐
│ Temperature sensor connection├────────▶│ Ensure the sensor is connected   │
│ on outdoor unit main PCB is  │         │            properly              │
│          loose[1]            │         └──────────────────────────────────┘
└─────────────────────────────┘
                │ No
                ▼
┌─────────────────────────────┐   Yes   ┌──────────────────────────────────┐
│ Temperature sensor has short-├────────▶│        Replace the sensor        │
│   circuited or failed[2]     │         └──────────────────────────────────┘
└─────────────────────────────┘
                │ No
                ▼
┌─────────────────────────────┐
│ Replace outdoor unit main PCB│
└─────────────────────────────┘
```

Notes:

1. Air side heat exchanger refrigerant outlet temperature sensor and outdoor ambient temperature sensor connections are port CN9 on the MSH-40/60/80/100EB outdoor unit refrigerant system main PCB (labeled 12 in Figure 4-2.2 in Part 4, 2.1 "Main PCBs for Refrigerant System, Inverter Module"), port CN9 on the MSH-120/140/160EB outdoor unit refrigerant system main PCB (labeled 12 in Figure 4-2.3 in Part 4, 2.1 "Main PCBs for Refrigerant System, Inverter Module"), port CN9 on the MSH-120/140/160EB-3 outdoor unit refrigerant system main PCB (labeled 17 in Figure 4-2.4 in Part 4, 2.1 "Main PCBs for Refrigerant System, Inverter Module"). Discharge pipe temperature sensor connection are port CN8 on the MSH-40/60/80/100EB outdoor unit refrigerant system main PCB (labeled 15 in Figure 4-2.2 in Part 4, 2.1 "Main PCBs for Refrigerant System, Inverter Module"), port CN8 on the MSH-120/140/160EB outdoor unit refrigerant system main PCB (labeled 15 in Figure 4-2.3 in Part 4, 2.1 "Main PCBs for Refrigerant System, Inverter Module"), port CN4 on the MSH-120/140/160EB-3 outdoor unit refrigerant system main PCB (labeled 15 in Figure 4-2.4 in Part 4, 2.1 "Main PCBs for Refrigerant System, Inverter Module"). Suction pipe temperature sensor connection are port CN1 on the MSH-40/60/80/100EB outdoor unit refrigerant system main PCB (labeled 14 in Figure 4-2.2 in Part 4, 2.1 "Main PCBs for Refrigerant System, Inverter Module"), port CN1 on the MSH-120/140/160EB outdoor unit refrigerant system main PCB (labeled 14 in Figure 4-2.3 in Part 4, 2.1 "Main PCBs for Refrigerant System, Inverter Module"), port CN8 on the MSH-120/140/160EB-3 outdoor unit refrigerant system main PCB (labeled 16 in Figure 4-2.4 in Part 4, 2.1 "Main PCBs for Refrigerant System, Inverter Module").
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 4-5.1, and Table 4-5.2 in Part 4, 5.1 "Temperature Sensor Resistance Characteristics".

13.7 EE Troubleshooting

13.7.1 Digital display output

13.7.2 Description

- Hydronic box main PCB EEPROM error.
- Yukon Split stops running.
- Error code is displayed on hydronic box main PCB and user interface.

13.7.3 Possible causes

- Hydronic box main PCB EEPROM is not connected properly.
- Hydronic box main PCB damaged.

13.7.4 Procedure

```
┌─────────────────────────────────────┐
│                 EE                   │
└─────────────────────────────────────┘
                  │
                  ▼
┌──────────────────────────────┐   Yes   ┌────────────────────────────┐
│ Hydronic box main PCB EEPROM¹ │────────▶│ Ensure the EEPROM is       │
│ is not connected properly     │         │ connected properly         │
└──────────────────────────────┘         └────────────────────────────┘
                  │ No
                  ▼
┌──────────────────────────────┐
│ Replace hydronic box main PCB │
└──────────────────────────────┘
```
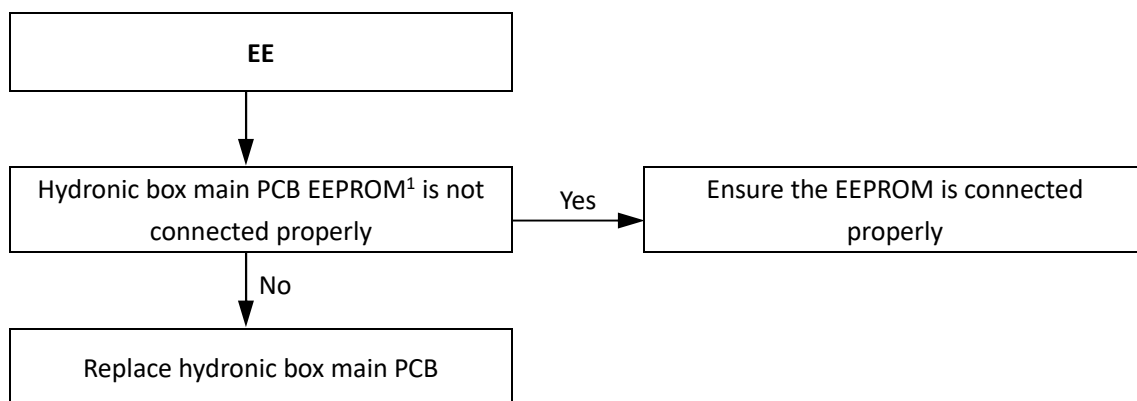
Notes:

1. Hydronic box main PCB EEPROM is designated IC39 on the main PCB for hydronic box (labeled 31 in Figure 4-2.1 in Part4, 2.2 "Main PCB for Hydronic System").

13.8 F1 Troubleshooting

13.8.1 Digital display output
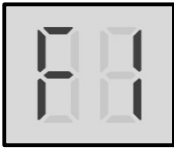
13.8.2 Description

▪ Low DC generatrix voltage.

▪ Yukon Split stops running.

▪ Error code is displayed on hydronic system main PCB and user interface.

13.8.3 Possible causes

▪ The DC generatrix voltage is too low.

13.8.4 Procedure

```
                    ┌─────────────────────┐
                    │         F1          │
                    └──────────┬──────────┘
                               │
                               ▼
        ┌─────────────────────────┐   Yes   ┌─────────────────────┐
        │ Power supply is abnormal.│ ──────▶ │ Provide normal power │
        └──────────┬──────────────┘         └─────────────────────┘
                   │ No
                   ▼
        ┌─────────────────┐   Yes   ┌─────────────────────┐  Yes  ┌──────────────────────┐
        │ LED on the      │ ──────▶ │ Voltage of PN is    │ ────▶ │ Check the main board.│
        │ Inverter        │         │ 380V.               │       └──────────────────────┘
        │ Modules is      │         └─────────────────────┘
        │ lighting        │
        └────────┬────────┘
                 │ No
                 ▼
        ┌─────────────────┐   Yes   ┌─────────────────────┐
        │ The input power │ ──────▶ │ The main board is   │
        │ of inverter     │         │ damaged, change it. │
        │ module is       │         └─────────────────────┘
        │ abnormal        │
        └────────┬────────┘
                 │ No
                 ▼
        ┌─────────────────┐
        │ The invert      │
        │ module is       │
        │ damaged, change │
        │ it.             │
        └─────────────────┘
```
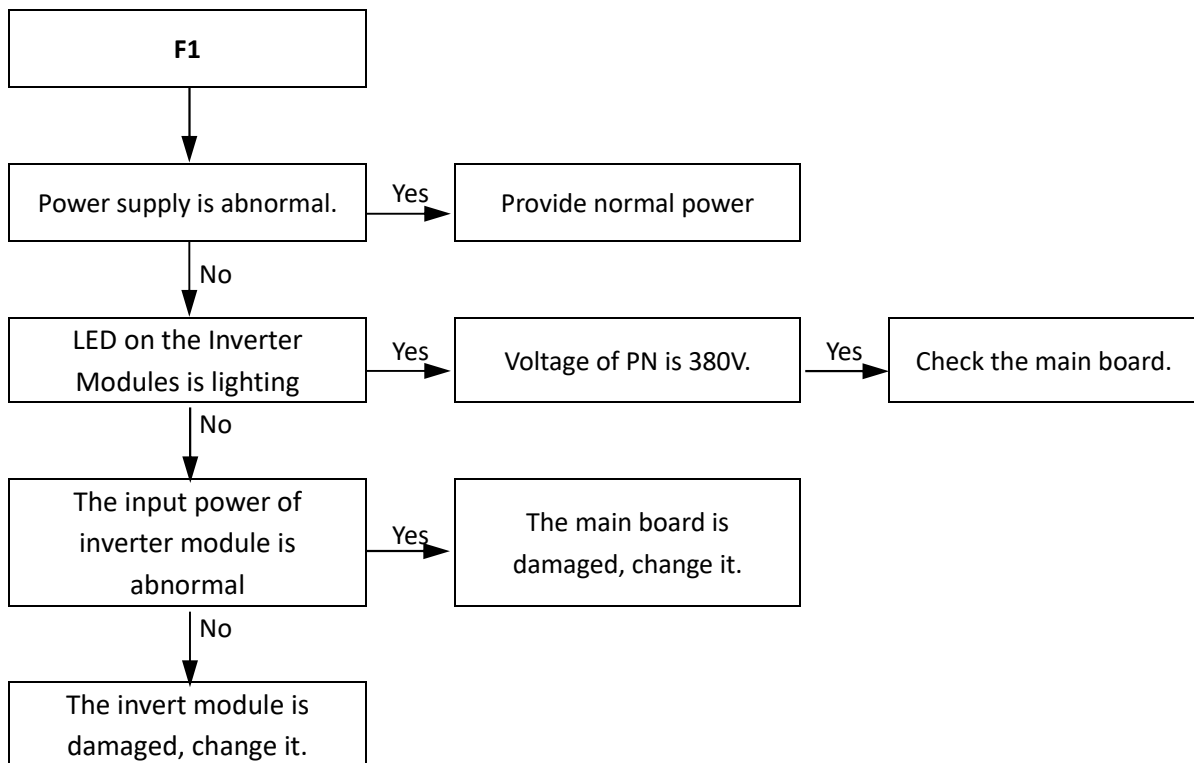
13.9 HF Troubleshooting

13.9.1 Digital display output

HF

13.9.2 Description

- Outdoor unit inverter module EEPROM error.
- Yukon Split stops running.
- Error code is displayed on outdoor unit main PCB and user interface.

13.9.3 Possible causes

- Outdoor unit invert module EEPROM is not connected properly.
- Outdoor unit invert module EEPROM damaged.

13.9.4 Procedure

```
┌─────────────────────────────┐
│             HF              │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐   Yes   ┌─────────────────────────────┐
│ Outdoor unit invert module  │────────▶│ Ensure the EEPROM is        │
│ EEPROM¹ is not connected    │         │ connected properly          │
│ properly                    │         │                             │
└─────────────────────────────┘         └─────────────────────────────┘
              │ No
              ▼
┌─────────────────────────────┐
│ Replace outdoor unit invert │
│ module                      │
└─────────────────────────────┘
```
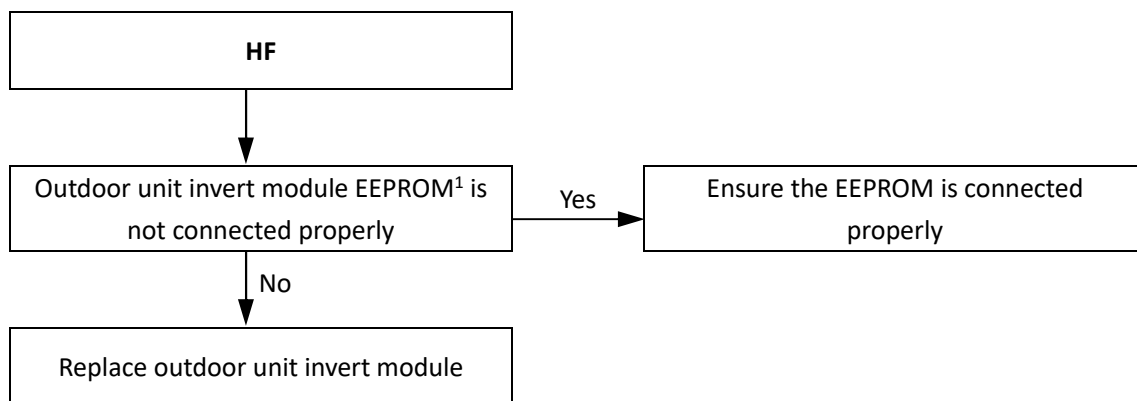
Notes:
1. Outdoor unit invert module EEPROM is designated IC320 on the MSH-40/60/80/100EB outdoor unit invert module (labeled 9 in Figure 4-2.5 in Part4, 2.3 "Main PCBs for Refrigerant System, Inverter Module"), designated IC14 on the MSH-120/140/160EB outdoor unit invert module (labeled 11 in Figure 4-2.6 in Part4, 2.3 "Main PCBs for Refrigerant System, Inverter Module"), designated IC25 on the MSH-120/140/160EB-3 outdoor unit invert module (labeled 14 in Figure 4-2.7 in Part4, 2.3 "Main PCBs for Refrigerant System, Inverter Module").

13.10 H0 Troubleshooting

13.10.1 Digital display output

13.10.2 Description

- Communication error between outdoor unit and hydronic box.
- Yukon Split stops running.
- Error code is displayed on hydronic box main PCB, outdoor unit main PCB and user interface.

13.10.3 Possible causes

- Power supply abnormal.
- Transformer malfunction.
- Interference from a source of electromagnetic radiation.
- Outdoor unit main PCB or hydronic box main PCB damaged.

13.10.4 Procedure

H0

↓

Power supply for the main control board and transformer is abnormal[1]	→Yes→	Provide normal power supply

↓ No

The transformer of hydronic unit is malfunctioned[2]	→Yes→	Replace the transformer

↓ No

There is a source of electromagnetic radiation near the unit, such as high-frequency transmitter or other high strength radiation device	→Yes→	Remove the source of interference

↓ No

Communication wires P Q E between main control board of outdoor unit and hydraulic module have short circuited, disconnected or misconnected	→Yes→	Reconnect the communication wires

↓ No

Replace outdoor unit main PCB and hydronic box main PCB in turn

Notes:
1. Measure the voltages of transformer input port and out port. The input voltage of transformer is 220V AC, output voltage of transformer is 13.5V AC. If any voltages is abnormal, the power supply for the main control board of hydraulic module and transformer will be abnormal.
2. Measure the voltages of transformer output port ports. If the voltages are not normal, the transformer has malfunctioned.

13.11 H1 Troubleshooting

13.11.1 Digital display output

```
H1
```
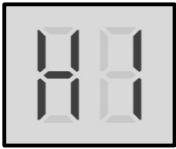
13.11.2 Description

- Communication error between outdoor unit main control board and inverter module.
- Yukon Split stops running.
- Error code is displayed on outdoor unit main PCB and user interface.

13.11.3 Possible causes

- Power supply abnormal.
- Interference from a source of electromagnetic radiation.
- Outdoor unit main PCB or inverter driven module damaged.

13.11.4 Procedure

```
┌─────────────────────────────┐
│             H1              │
└─────────────────────────────┘
                │
                ▼
┌─────────────────────────────┐   Yes   ┌─────────────────────────────┐
│ LED on the main control     │ ──────▶ │ LED is not light, the board │
│ board of outdoor unit and   │         │ is damaged or have short    │
│ inverter module are light   │         │ circuit                     │
└─────────────────────────────┘         └─────────────────────────────┘
                │ No
                ▼
┌─────────────────────────────┐   Yes   ┌─────────────────────────────┐
│ Communication wires between │ ──────▶ │ Reconnect the communication │
│ the main control board of   │         │ wires                       │
│ outdoor unit and inverter   │         │                             │
│ module is loose             │         │                             │
└─────────────────────────────┘         └─────────────────────────────┘
                │ No
                ▼
┌─────────────────────────────┐   Yes   ┌─────────────────────────────┐
│ There is a source of        │ ──────▶ │ Remove the source of        │
│ electromagnetic radiation   │         │ interference                │
│ near the unit, such as      │         │                             │
│ high-frequency transmitter  │         │                             │
│ or other high strength      │         │                             │
│ radiation device            │         │                             │
└─────────────────────────────┘         └─────────────────────────────┘
                │ No
                ▼
┌─────────────────────────────┐
│ Replace outdoor unit main   │
│ PCB and inverter driven     │
│ module in turn              │
└─────────────────────────────┘
```

13.12 H6, HH Troubleshooting

13.12.1 Digital display output
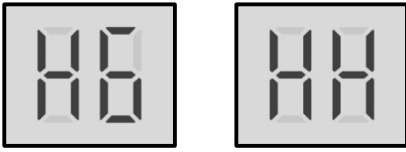
13.12.2 Description

- H6 indicates a DC fan error.
- HH indicates that H6 protection has occurred 10 times in 2 hours. When HH error occurs, a manual system restart is required before the system can resume operation. The cause of HH error should be addressed promptly in order to avoid system damage.
- Yukon Split stops running.
- Error code is displayed on outdoor unit main PCB and user interface.

13.12.3 Possible causes

- DC fan wire is loosed.
- High wind speed.
- Fan motor blocked or has failed.
- Invert module damaged.
- Main PCB is damaged.

13.12.4 Procedure

```
┌─────────────────────────────┐
│           H6 / HH           │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐      Yes    ┌─────────────────────────────────────┐
│ Strong wind is blowing      │ ──────────▶ │ Change the outdoor unit's            │
│ towards the fan, making the │             │ installation direction or            │
│ fan running in the wrong    │             │ build a shelter to protect the fan   │
│ direction                   │             │ from strong wind                     │
└─────────────────────────────┘             └─────────────────────────────────────┘
              │ No
              ▼
┌─────────────────────────────┐      Yes    ┌─────────────────────────────────────┐
│ DC fan wire is loosed[1]     │ ──────────▶ │ Reconnect DC fan wire                │
└─────────────────────────────┘             └─────────────────────────────────────┘
              │ No
              ▼
┌─────────────────────────────┐      Yes    ┌─────────────────────────────────────┐
│ The fan motor is blocked or │ ──────────▶ │ Remove obstruction or replace the    │
│ has failed                  │             │ fan motor                            │
└─────────────────────────────┘             └─────────────────────────────────────┘
              │ No
              ▼
┌─────────────────────────────┐
│ Replace inverter            │
│ module(single phase model)  │
│ or outdoor unit main        │
│ PCB(three phase model)      │
└─────────────────────────────┘
```

Notes:
1. Refer to Figures 4-1.1 to 4-1.4 in Part 4, 1.1 "Outdoor Unit Electric Control Box Layout" and to the Yukon Split Engineering Data Book, Part 4 "Wiring Diagrams".
2. Measure the voltage between the DC fan motor power supply's white and black wires. The normal voltage is 15V when the unit is in standby. If the voltage is significantly different from 15V, the IPM module on the inverter module is damaged. DC fan connection are port CN19 on the MSH-40/60/80/100EB outdoor unit inverter module PCB (labeled 5 in Figure 4-2.5 in Part4, 2.3 "Main PCB for Refrigerant System, Inverter Module"). port CN19 on the MSH-120/140/160EB outdoor unit inverter module PCB (labeled 4 in Figure 4-2.6 in Part 4, 2. 3 "Main PCB for Refrigerant System, Inverter Module"), port CN109 on the MSH-120/140/160EB-3 outdoor unit refrigerant system main PCB (labeled 30 in Figure 4-2.4 in Part 4, 2. 3 "Main PCB for Refrigerant System, Inverter Module").

13.13 H7 Troubleshooting

13.13.1 Digital display output

13.13.2 Description

- Abnormal main circuit voltage.
- Yukon Split stops running.
- Error code is displayed on outdoor unit main PCB and user interface.

13.13.3 Possible causes

- Power supply voltage not within 90%~110% of rated voltage.
- Outdoor unit main PCB is damaged.

13.13.4 Procedure

```
┌─────────────────────────────┐
│             H7              │
└─────────────────────────────┘
               │
               ▼
┌─────────────────────────────┐      Yes    ┌──────────────────────────────┐
│ Power supply voltage is not │ ──────────▶ │ Provide normal power supply  │
│  within 90%~110% of rated   │             └──────────────────────────────┘
│          voltage            │
└─────────────────────────────┘
               │ No
               ▼
┌─────────────────────────────┐
│ Replace outdoor unit main PCB│
└─────────────────────────────┘
```
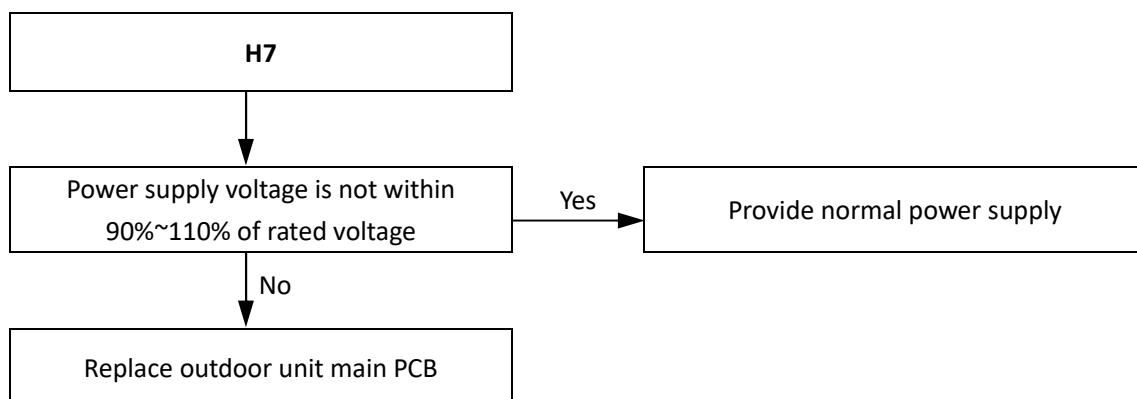
13.14 H8 Troubleshooting

13.14.1 Digital display output

13.14.2 Description

- Pressure sensor error.
- Yukon Split stops running.
- Error code is displayed on outdoor unit main PCB and user interface.
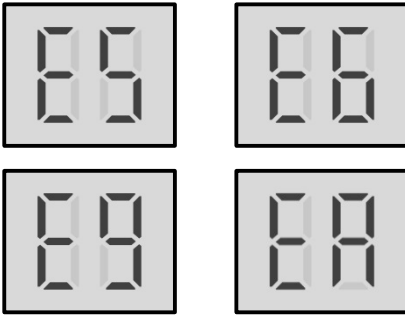
13.14.3 Possible causes

- Pressure sensor not connected properly or has malfunctioned.
- Outdoor unit main PCB is damaged.

13.14.4 Procedure
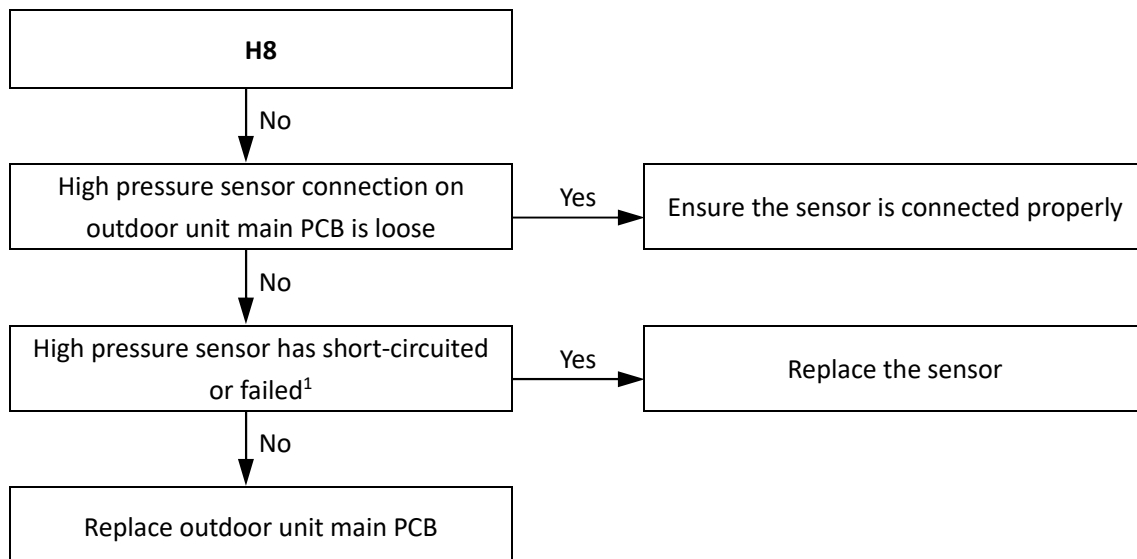
```
┌─────────────────────────────┐
│             H8              │
└─────────────────────────────┘
              │ No
              ▼
┌─────────────────────────────┐   Yes   ┌────────────────────────────────┐
│ High pressure sensor        │───────▶│ Ensure the sensor is connected │
│ connection on outdoor unit  │        │ properly                       │
│ main PCB is loose           │        └────────────────────────────────┘
└─────────────────────────────┘
              │ No
              ▼
┌─────────────────────────────┐   Yes   ┌────────────────────────────────┐
│ High pressure sensor has    │───────▶│ Replace the sensor             │
│ short-circuited or failed[1]│        └────────────────────────────────┘
└─────────────────────────────┘
              │ No
              ▼
┌─────────────────────────────┐
│ Replace outdoor unit main   │
│ PCB                         │
└─────────────────────────────┘
```

Notes:
1. 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. The pressure sensor connection are port CN4 on the MSH-40/60/80/100EB outdoor unit refrigerant system main PCB (labeled 19 in Figure 4-2.2 in Part4, 2.3 "Main PCB for Refrigerant System, Inverter Module"). port CN4 on the MSH-120/140/160EB outdoor unit refrigerant system main PCB (labeled 19 in Figure 4-2.3 in Part 4, 2. 3 "Main PCB for Refrigerant System, Inverter Module"), port CN6 on the MSH-120/140/160EB-3 outdoor unit refrigerant system main PCB (labeled 13 in Figure 4-2.4 in Part 4, 2. 3 "Main PCB for Refrigerant System, Inverter Module").

13.15 P0, HP Troubleshooting

13.15.1 Digital display output
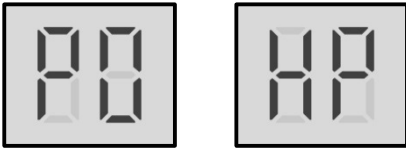
13.15.2 Description

▪ P0 indicates suction pipe low pressure protection. When the suction pressure falls below 0.14MPa, the system displays P0 protection and Yukon Split stops running. When the pressure rises above 0.3MPa, P0 is removed and normal operation resumes.

▪ HP indicates Pe<0.6Mpa occurred 3 times in an hour.

▪ Error code is displayed on outdoor unit main PCB and user interface.

13.15.3 Possible causes

▪ Low pressure switch not connected properly or has malfunctioned.

▪ Insufficient refrigerant.

▪ Low pressure side blockage.

▪ Poor evaporator heat exchange in heating mode or DHW mode.

▪ Insufficient water flow in cooling mode.

▪ Outdoor unit main PCB damaged.

13.15.4 Procedure

```
                    ┌─────────────────────────────┐
                    │          P0 / HP            │
                    └──────────────┬──────────────┘
                                   │
                    ┌──────────────▼──────────────┐   Yes   ┌─────────────────────────────┐
                    │  Insufficient refrigerant   │────────▶│  Add refrigerant or inspect │
                    │  caused by refrigerant      │         │  the system for leaks       │
                    │  leakage[1]                 │         │                             │
                    └──────────────┬──────────────┘         └─────────────────────────────┘
                                   │ No
                    ┌──────────────▼──────────────┐   Yes   ┌─────────────────────────────┐
                    │  The low pressure side is   │────────▶│  Inspect the system and fix │
                    │  blocked, caused by crushed │         │  the error. If the filter   │
                    │  or bent pipe, blocked EXV, │         │  is blocked by ice, the     │
                    │  or dirty filter[2]         │         │  piping should be cleaned   │
                    └──────────────┬──────────────┘         └─────────────────────────────┘
                                   │ No
                    ┌──────────────▼──────────────┐   Yes   ┌─────────────────────────────┐
                    │  The air side heat          │────────▶│  Inspect the refrigerant    │
                    │  exchanger heat exchange is │         │  system and fix the error   │
                    │  poor in heating or DHW     │         │                             │
                    │  mode[3]                    │         │                             │
                    └──────────────┬──────────────┘         └─────────────────────────────┘
                                   │ No
                    ┌──────────────▼──────────────┐   Yes   ┌─────────────────────────────┐
                    │  The water flow rate is not │────────▶│  Inspect the water system   │
                    │  sufficient in cooling      │         │  and fix the error          │
                    │  mode[4]                    │         │                             │
                    └──────────────┬──────────────┘         └─────────────────────────────┘
                                   │ No
                    ┌──────────────▼──────────────┐
                    │  Replace outdoor main PCB   │
                    └─────────────────────────────┘
```

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 and air outlets for dirt/blockages.
4. Check water side heat exchanger, water piping, circulator pumps and water flow switch for dirt/blockages.

13.16 P1 Troubleshooting

13.16.1 Digital display output

13.16.2 Description

▪ Discharge pipe high pressure protection. When the discharge pressure rises above 4.3MPa, the system displays P1 protection and Yukon Split stops running. When the discharge pressure falls below 3.6MPa, P1 is removed and normal operation resumes.

▪ Error code is displayed on outdoor unit main PCB and user interface.

13.16.3 Possible causes

▪ Pressure sensor/switch not connected properly or has malfunctioned.

▪ Excess refrigerant.

▪ System contains air or nitrogen.

▪ High pressure side blockage.

▪ Poor condenser heat exchange.

▪ Outdoor unit main PCB damaged.

13.16.4 Procedure

```
                              ┌─────────────────────┐
                              │         P1          │
                              └─────────────────────┘
                                         │
                                         ▼
        ┌─────────────────────────────────────────┐                    ┌───────────────────────────────────────┐
        │ High pressure switch connection or       │      Yes           │ Ensure the pressure switch is connected│
        │ pressure sensor connection on outdoor    │ ─────────────────▶ │ properly                               │
        │ unit main PCB is loose[1]                │                    └───────────────────────────────────────┘
        └─────────────────────────────────────────┘
                          │ No
                          ▼
        ┌─────────────────────────────────────────┐                    ┌───────────────────────────────────────┐
        │ Pressure sensor has short-circuited or   │      Yes           │ Replace the pressure sensor            │
        │ failed[2]                                │ ─────────────────▶ └───────────────────────────────────────┘
        └─────────────────────────────────────────┘
                          │ No
                          ▼
        ┌─────────────────────────────────────────┐                    ┌───────────────────────────────────────┐
        │ The high pressure side is blocked, caused│      Yes           │ Inspect the system and fix the error   │
        │ by crushed or bent pipe or blocked EXV[3]│ ─────────────────▶ └───────────────────────────────────────┘
        └─────────────────────────────────────────┘
                          │ No
                          ▼
        ┌─────────────────────────────────────────┐                    ┌───────────────────────────────────────┐
        │ The heat exchange is poor[4]             │      Yes           │ Inspect the system and fix the error   │
        └─────────────────────────────────────────┘ ─────────────────▶ └───────────────────────────────────────┘
                          │ No
                          ▼
        ┌─────────────────────────────────────────┐                    ┌───────────────────────────────────────┐
        │ The water flow rate is not sufficient in │      Yes           │ Inspect the water system and fix the   │
        │ cooling mode[5]                          │ ─────────────────▶ │ error                                  │
        └─────────────────────────────────────────┘                    └───────────────────────────────────────┘
                          │ No
                          ▼
        ┌─────────────────────────────────────────┐
        │ Replace outdoor main PCB                 │
        └─────────────────────────────────────────┘
```

Notes:
1. High pressure switch connection is port CN13 on the MSH-40/60/80/100EB outdoor unit refrigerant system main PCB (labeled 16 in Figure 4-2.2 in Part4, 2.3 "Main PCB for Refrigerant System, Inverter Module"). port CN13 on the MSH-120/140/160EB outdoor unit refrigerant system main PCB (labeled 16 in Figure 4-2.3 in Part 4, 2. 3 "Main PCB for Refrigerant System, Inverter Module"), port CN31 on the MSH-120/140/160EB-3 outdoor unit refrigerant system main PCB (labeled 20 in Figure 4-2.4 in Part 4, 2. 3 "Main PCB for Refrigerant System, Inverter Module").
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.
5. Check water pressure on the manometer. If the water pressure is not > 1 bar, water flow is insufficient. Refer to Figure 2-1.9 in Part 2, 1.2 "Hydronic Box Layout".

13.17 P3 Troubleshooting

13.17.1 Digital display output

13.17.2 Description

- Compressor current protection.
- When the compressor current rises above the protection value (4/6kW models 18A, 8/10kW model 19A, 12/14/16kW single phase model 30A, 12/14/16kW three phase model 14A,), the system displays P3 protection and Yukon Split stops running. When the current returns to the normal range, P3 is removed and normal operation resumes.
- Error code is displayed on refrigerant system main PCB and user interface.

13.17.3 Possible causes

- Poor condenser heat exchange.
- High pressure side blockage.
- Inverter module damaged.
- Compressor damaged.
- Outdoor unit main PCB damaged.

13.17.4 Procedure

```
┌─────────────────────────────┐
│              P3             │
└─────────────────────────────┘
                │ No
                ▼
┌─────────────────────────────┐   Yes   ┌─────────────────────────────────┐
│ The condenser heat exchange │ ──────► │ Inspect the system and fix the  │
│ is poor[1]                  │         │ error                           │
└─────────────────────────────┘         └─────────────────────────────────┘
                │ No
                ▼
┌─────────────────────────────┐   Yes   ┌─────────────────────────────────┐
│ The high pressure side is   │ ──────► │ Inspect the system and fix the  │
│ blocked, caused by crushed  │         │ error                           │
│ or bent pipe or blocked     │         └─────────────────────────────────┘
│ EXV[2]                      │
└─────────────────────────────┘
                │ No
                ▼
┌─────────────────────────────┐   Yes   ┌─────────────────────────────────┐
│ Inverter module has         │ ──────► │ Replace the inverter module     │
│ short-circuited[3]          │         └─────────────────────────────────┘
└─────────────────────────────┘
                │ No
                ▼
┌─────────────────────────────┐   Yes   ┌─────────────────────────────────┐
│ Compressor has              │ ──────► │ Replace the compressor          │
│ malfunctioned[4]            │         └─────────────────────────────────┘
└─────────────────────────────┘
                │ No
                ▼
┌─────────────────────────────┐
│ Replace outdoor 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 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 0.7-1.5Ω 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.

13.18 P4 Troubleshooting

13.18.1 Digital display output

```
P4
```

13.18.2 Description

▪ Discharge temperature protection.

▪ When the compressor the discharge temperature rises above 115°C, the system displays P4 protection and Yukon Split stops running. When the discharge temperature falls below 95°C, P4 is removed and normal operation resumes.

▪ Error code is displayed on refrigerant system main PCB and user interface.

13.18.3 Possible causes

▪ Temperature sensor error

▪ High pressure side blockage.

▪ Poor condenser heat exchange.

▪ Outdoor unit main PCB damaged.

13.18.4 Procedure

```
                              ┌─────────────────────┐
                              │         P4          │
                              └─────────────────────┘
                                        │
                                        ▼
┌─────────────────────────────────┐          ┌─────────────────────────────────┐
│ Discharge pipe temperature sensor│   Yes    │  Ensure the temperature sensor is │
│ connection on outdoor unit main  │ ───────▶ │       connected properly          │
│ PCB is loose[1]                  │          │                                   │
└─────────────────────────────────┘          └─────────────────────────────────┘
                 │ No
                 ▼
┌─────────────────────────────────┐          ┌─────────────────────────────────┐
│ Final outlet water temperature   │          │                                   │
│ sensor connection, domestic hot  │          │                                   │
│ water tank temperature sensor    │   Yes    │  Ensure the temperature sensor is │
│ connection or water side heat    │ ───────▶ │       connected properly          │
│ exchanger water outlet temperature│         │                                   │
│ sensor connection on hydronic box │         │                                   │
│ main PCB is loose[2]             │          │                                   │
└─────────────────────────────────┘          └─────────────────────────────────┘
                 │ No
                 ▼
┌─────────────────────────────────┐          ┌─────────────────────────────────┐
│ Temperature sensor has short-    │   Yes    │                                   │
│ circuited or failed[3]           │ ───────▶ │        Replace the sensor         │
└─────────────────────────────────┘          └─────────────────────────────────┘
                 │ No
                 ▼
┌─────────────────────────────────┐          ┌─────────────────────────────────┐
│ High pressure switch connection  │          │ Ensure the pressure switch is     │
│ or pressure sensor connection on │   Yes    │       connected properly          │
│ outdoor unit main PCB is loose[4]│ ───────▶ │                                   │
└─────────────────────────────────┘          └─────────────────────────────────┘
                 │ No
                 ▼
┌─────────────────────────────────┐          ┌─────────────────────────────────┐
│ Pressure sensor has short-       │   Yes    │                                   │
│ circuited or failed[5]           │ ───────▶ │     Replace the pressure sensor   │
└─────────────────────────────────┘          └─────────────────────────────────┘
                 │ No
                 ▼
┌─────────────────────────────────┐          ┌─────────────────────────────────┐
│ The high pressure side is blocked,│  Yes    │  Inspect the system and fix the   │
│ caused by crushed or bent pipe or│ ───────▶ │             error                 │
│ blocked EXV[4]                   │          │                                   │
└─────────────────────────────────┘          └─────────────────────────────────┘
                 │ No
                 ▼
┌─────────────────────────────────┐          ┌─────────────────────────────────┐
│ The condenser heat exchange is   │   Yes    │  Inspect the system and fix the   │
│ poor in heating mode[5]          │ ───────▶ │             error                 │
└─────────────────────────────────┘          └─────────────────────────────────┘
                 │ No
                 ▼
┌─────────────────────────────────┐          ┌─────────────────────────────────┐
│ The water flow rate is not       │   Yes    │  Inspect the water system and fix │
│ sufficient in cooling mode[6]    │ ───────▶ │           the error               │
└─────────────────────────────────┘          └─────────────────────────────────┘
                 │ No
                 ▼
┌─────────────────────────────────┐
│   Replace outdoor main PCB       │
└─────────────────────────────────┘
```

Notes:

1. Discharge pipe temperature sensor connection is port CN8 on the MSH-40/60/80/100EB outdoor unit refrigerant system main PCB (labeled 15 in Figure 4-2.2 in Part4, 2.3 "Main PCB for Refrigerant System, Inverter Module"). port CN8 on the MSH-120/140/160EB outdoor unit refrigerant system main PCB (labeled 15 in Figure 4-2.3 in Part 4, 2. 3 "Main PCB for Refrigerant System, Inverter Module"), port CN4 on the MSH-120/140/160EB-3 outdoor unit refrigerant system main PCB (labeled 15 in Figure 4-2.4 in Part 4, 2. 3 "Main PCB for Refrigerant System, Inverter Module").

2. Final outlet water temperature sensor and water side heat exchanger water outlet temperature sensor connections are port CN6 on the hydronic box main PCB (labeled 10 in Figure 4-2.1 in Part4, 2.2 "Main PCB for Hydronic System"). Domestic hot water tank temperature sensor connection is port CN13 on hydronic box main PCB (labeled 13 in Figure 4-2.1 in Part4, 2.2 "Main PCB for Hydronic System").

3. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Part 2, 1 "Layout of Functional Components" and to Table 5-5.1 or 5-5.2 in Part 5, 5.1 "Temperature Sensor Resistance Characteristics".

4. High pressure switch connection is port CN13 on the MSH-40/60/80/100EB outdoor unit refrigerant system main PCB (labeled 16 in Figure 4-2.2 in Part4, 2.3 "Main PCB for Refrigerant System, Inverter Module"). port CN13 on the MSH-120/140/160EB outdoor unit refrigerant system main PCB (labeled 16 in Figure 4-2.3 in Part 4, 2. 3 "Main PCB for Refrigerant System, Inverter Module"), port CN31 on the MSH-120/140/160EB-3 outdoor unit refrigerant system main PCB (labeled 20 in Figure 4-2.4 in Part 4, 2. 3 "Main PCB for Refrigerant System, Inverter Module").

5. Measure the resistance among the three terminals of the pressure sensor. If the resistance is of the order of mega Ohms or infinite, the pressure sensor has failed.

6. 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.

7. Check air side heat exchanger, fan and air outlets for dirt/blockages.

8. Check the water side heat exchanger, water piping, circulator pumps and water flow switch for dirt/blockages.

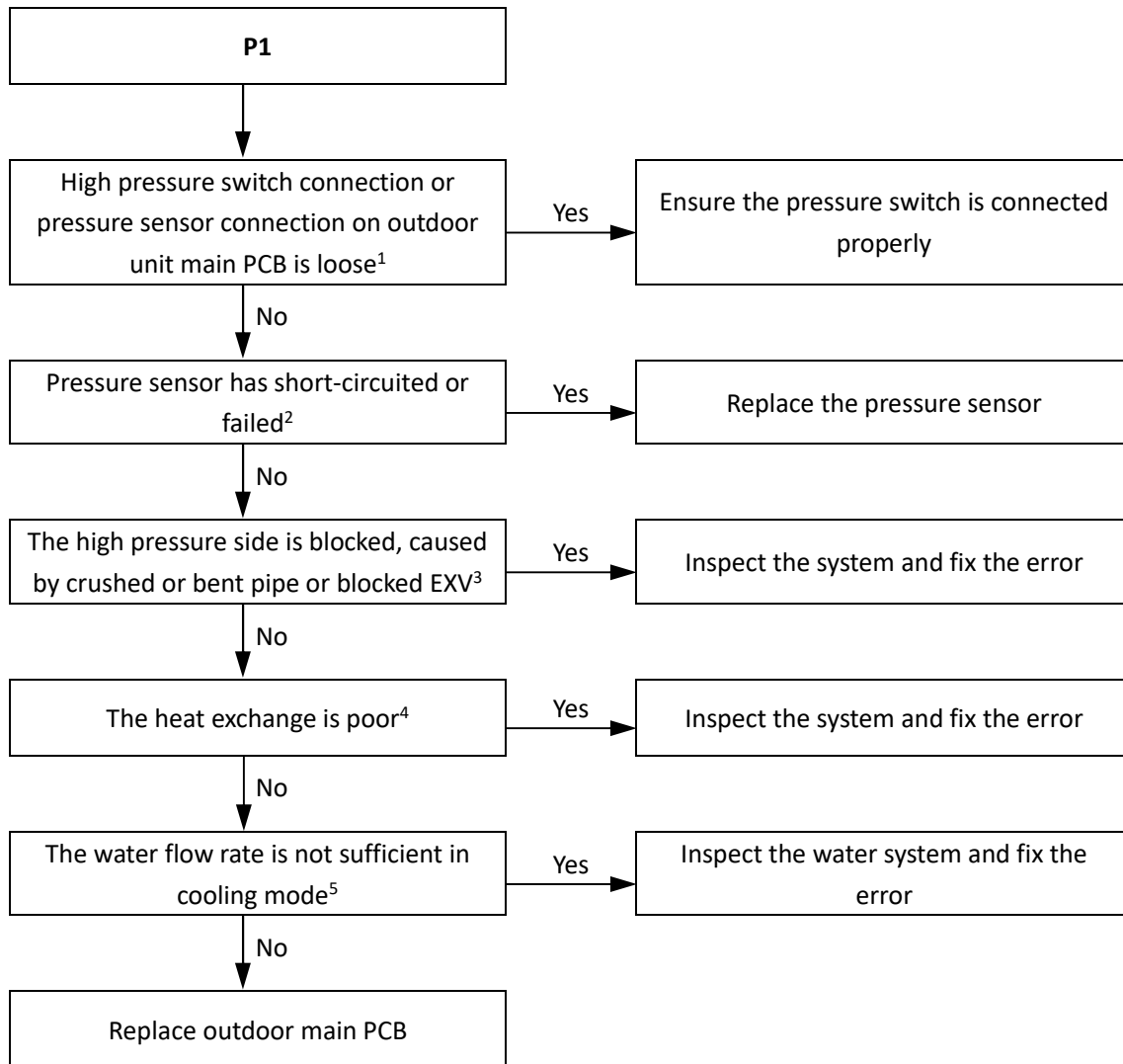## 13.19 P5 Troubleshooting

13.19.1 Digital display output

```
P5
```

13.19.2 Description

- High temperature difference between water side heat exchanger water inlet and water outlet temperatures protection.
- Yukon Split stops running.
- Error code is displayed on hydronic box main PCB and user interface.

13.19.3 Possible causes

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

13.19.4 Procedure
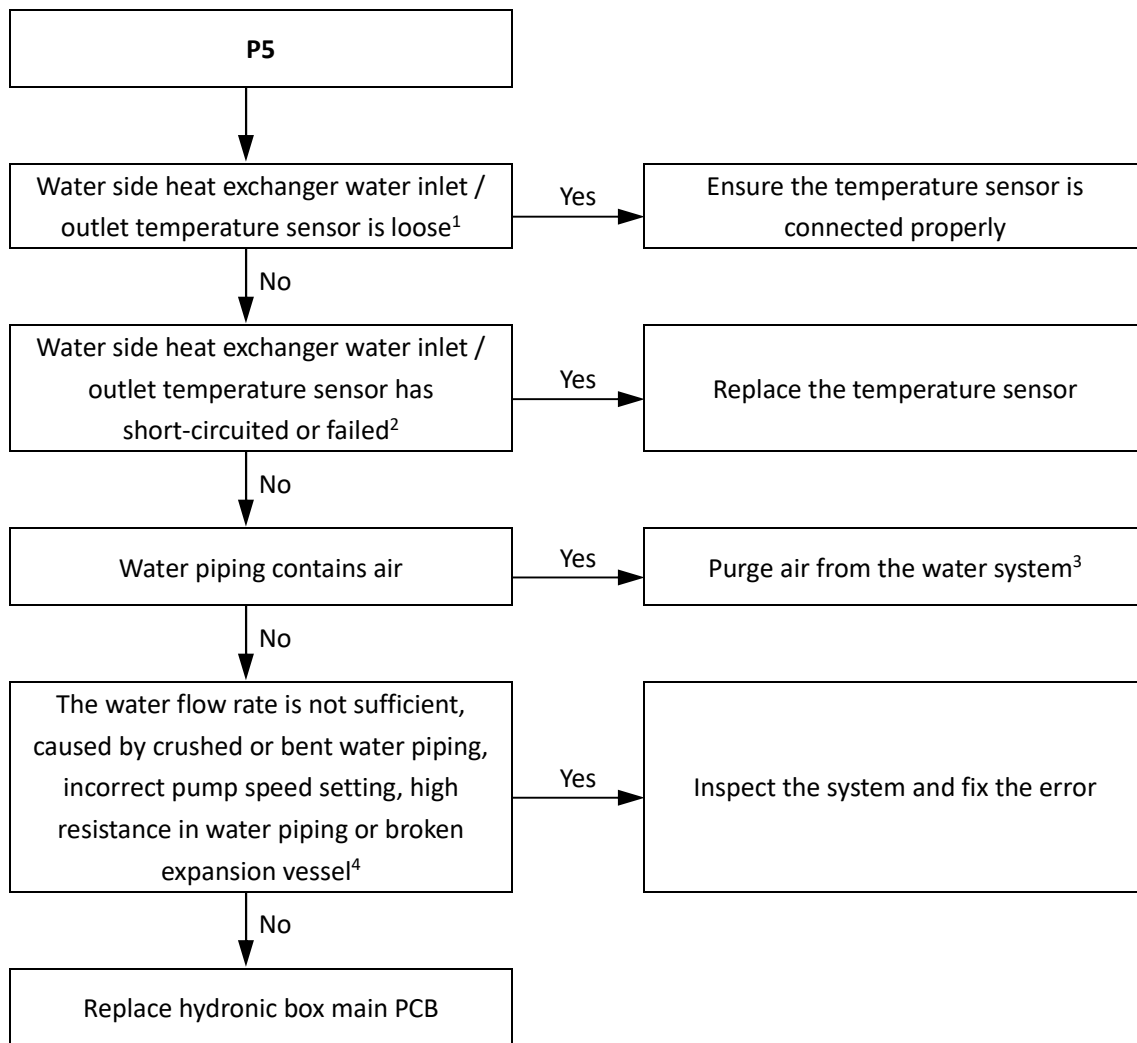
```
                              ┌─────────────────────┐
                              │         P5          │
                              └──────────┬──────────┘
                                         │
                                         ▼
┌─────────────────────────────┐  Yes  ┌─────────────────────────────┐
│ Water side heat exchanger   │──────▶│ Ensure the temperature      │
│ water inlet / outlet        │       │ sensor is connected properly│
│ temperature sensor is loose[1]│      └─────────────────────────────┘
└──────────────┬──────────────┘
               │ No
               ▼
┌─────────────────────────────┐  Yes  ┌─────────────────────────────┐
│ Water side heat exchanger   │──────▶│ Replace the temperature     │
│ water inlet / outlet        │       │ sensor                      │
│ temperature sensor has      │       └─────────────────────────────┘
│ short-circuited or failed[2]│
└──────────────┬──────────────┘
               │ No
               ▼
┌─────────────────────────────┐  Yes  ┌─────────────────────────────┐
│ Water piping contains air   │──────▶│ Purge air from the water    │
│                             │       │ system[3]                   │
└──────────────┬──────────────┘       └─────────────────────────────┘
               │ No
               ▼
┌─────────────────────────────┐  Yes  ┌─────────────────────────────┐
│ The water flow rate is not  │──────▶│ Inspect the system and fix  │
│ sufficient, caused by       │       │ the error                   │
│ crushed or bent water       │       │                             │
│ piping, incorrect pump      │       │                             │
│ speed setting, high         │       │                             │
│ resistance in water piping  │       │                             │
│ or broken expansion vessel[4]│      └─────────────────────────────┘
└──────────────┬──────────────┘
               │ No
               ▼
┌─────────────────────────────┐
│ Replace hydronic box main   │
│ PCB                         │
└─────────────────────────────┘
```

Notes:
1. Water side heat exchanger water inlet temperature sensor and water side heat exchanger water outlet temperature sensor connections are port CN6 on the hydronic box main PCB (labeled10 in Figure 4-2.1 in Part4, 2.2 "Main PCB for Hydronic System").
2. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Part 2, 1.2 "Hydronic Box Layout" and to Table 5-5.3 in Part 5, 5.1 "Temperature Sensor Resistance Characteristics".
3. Refer to the Yukon Split Engineering Data Book, Part 5, 15 "SPECIAL FUNCTIONS".
4. Check water pressure on the manometer. If the water pressure is not > 1 bar, water flow is insufficient. Refer to Figures 2-1.7 and 2-1.8 in Part 2, 1.2 "Hydronic Box Layout".

13.20 Inverter module Troubleshooting for single-phase models

13.20.1 Digital display output
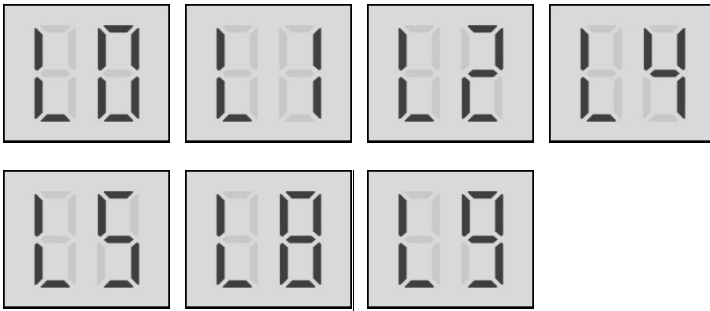
13.20.2 Description

- Inverter module protection.
- Yukon Split stops running.
- Specific error code L0, L1, L2, L4, L5, L8, L9 is displayed on the user interface and the main control board of refrigerant system.

13.20.3 Possible causes

- Inverter module protection.
- DC bus low or high voltage protection.
- MCE error(DC bus low or high voltage protection or software over current protection)
- Zero speed protection.
- Excessive compressor frequency variation.
- Actual compressor frequency differs from target frequency.
- High pressure protection.
- PED board self checking fail.

13.20.4 Specific error codes for inverter module protection

Table 4-4.1: Specific error codes

Specific error code	Content
L0	Inverter module protection
L1	DC bus low voltage protection
L2	DC bus high voltage protection
L4	MCE error(DC bus low or high voltage protection or software over current protection)
L5	Zero speed protection
L8	Compressor frequency variation greater than 15Hz within 1 second protection
L9	Actual compressor frequency differs from target frequency by more than 15Hz protection

The specific error codes can also be obtained from the LED indicators on the inverter module.

Table 4-4.2: Errors indicated on LED, single-phase 4~10kW

LED301 flashing pattern (GREEN) LED302 is always on (RED)	Corresponding error
Flashes 8 times and stops for 1 second, then repeats	L0 - Inverter module protection
Flashes 9 times and stops for 1 second, then repeats	L1 - DC bus low voltage protection
Flashes 10 times and stops for 1 second, then repeats	L2 - DC bus high voltage protection
Flashes 12 times and stops for 1 second, then repeats	L4 - MCE error
Flashes 13 times and stops for 1 second, then repeats	L5 - Zero speed protection
Flashes 16 times and stops for 1 second, then repeats	L8 - Compressor frequency variation greater than 15Hz within one second protection
Flashes 17 times and stops for 1 second, then repeats	L9 - Actual compressor frequency differs from target frequency by more than 15Hz protection

Table 4-4.3: Errors indicated on LED, single-phase 4~10kW

LED1 flashing pattern (GREEN) LED2 is always on (RED)	Corresponding error
Flashes 3 times and stops for 1 second, then repeats	P1 - High pressure protection
Flashes 5 times and stops for 1 second, then repeats	bH – PED board checking fail
Flashes 8 times and stops for 1 second, then repeats	L0 - Inverter module protection
Flashes 9 times and stops for 1 second, then repeats	L1 - DC bus low voltage protection
Flashes 10 times and stops for 1 second, then repeats	L2 - DC bus high voltage protection
Flashes 12 times and stops for 1 second, then repeats	L4 - MCE error
Flashes 13 times and stops for 1 second, then repeats	L5 - Zero speed protection
Flashes 16 times and stops for 1 second, then repeats	L8 - Compressor frequency variation greater than 15Hz within one second protection
Flashes 17 times and stops for 1 second, then repeats	L9 - Actual compressor frequency differs from target frequency by more than 15Hz protection

Figure 4-4.1: LED location of inverter module

Inverter Module(4-10KW): LED301/302/303

Inverter Module(12-16KW): LED1/LED2/LED3
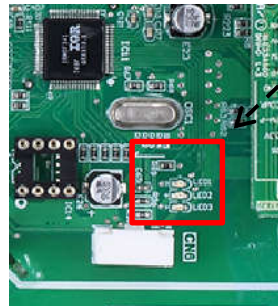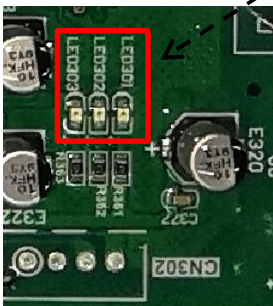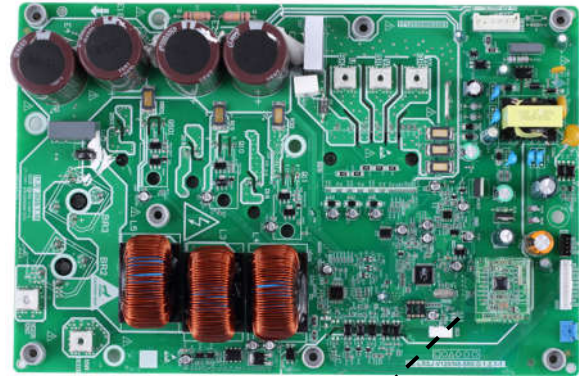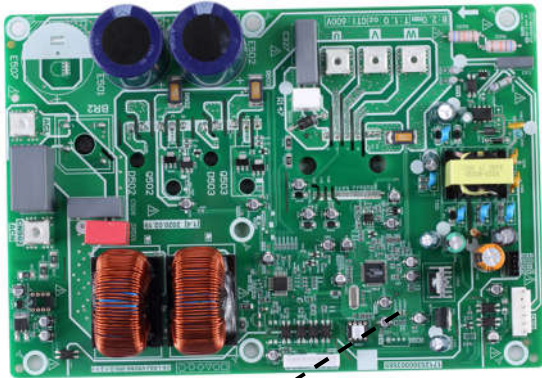
13.20.5 Principle of DC inverter
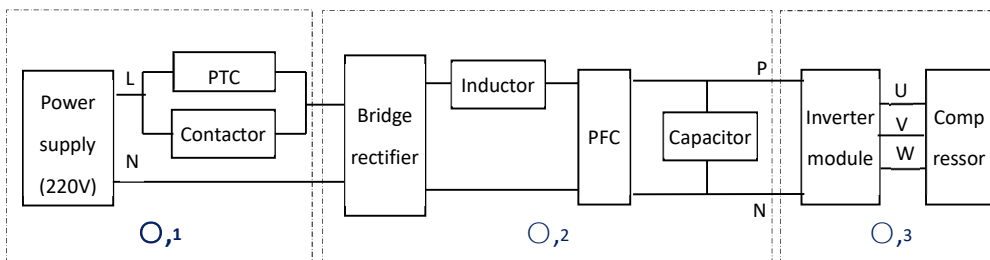
① Contactor is open, the current across the PTC to charge capacitor. After 5 seconds, the contactor closed.

② 220-240V AC power supply change to DC power supply after bridge rectifier.

③ The capacitor output steady power supply for inverter module P N terminals. In standby the voltage between P and N terminal on inverter module is 1.4 time of AC power supply. When the fan motor is running, the voltage is 377V DC.

13.20.6 L0/L4 troubleshooting

Situation 1: L0 or L4 error appears immediately after the outdoor unit is powered-on
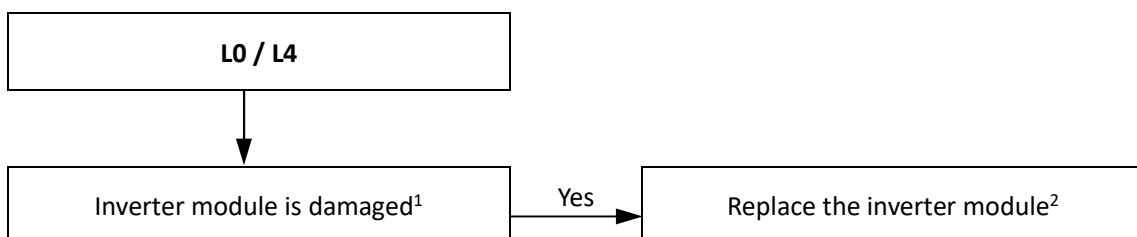
Notes:

1. Measure the resistance between each of U, V and W and each of P and N on the inverter module. All the resistances should be infinite. If any of them are not infinite, the inverter module is damaged and should be replaced. Refer to Figure 4-2.5 to 4-2.7 in Part 4, 2.1 "Main PCBs for Refrigerant System, Inverter Module".

2. When replacing an inverter module, a layer of thermally conductive silica gel should be painted on the IPM module, IGBT, diode, brigde rectifier (on the reverse side of the inverter module). Refer to Figure 4-4.2.

Figure 4-4.2: Replacing an inverter module

IPM

IGBT

diode

IGBT

diode

brigde rectifier
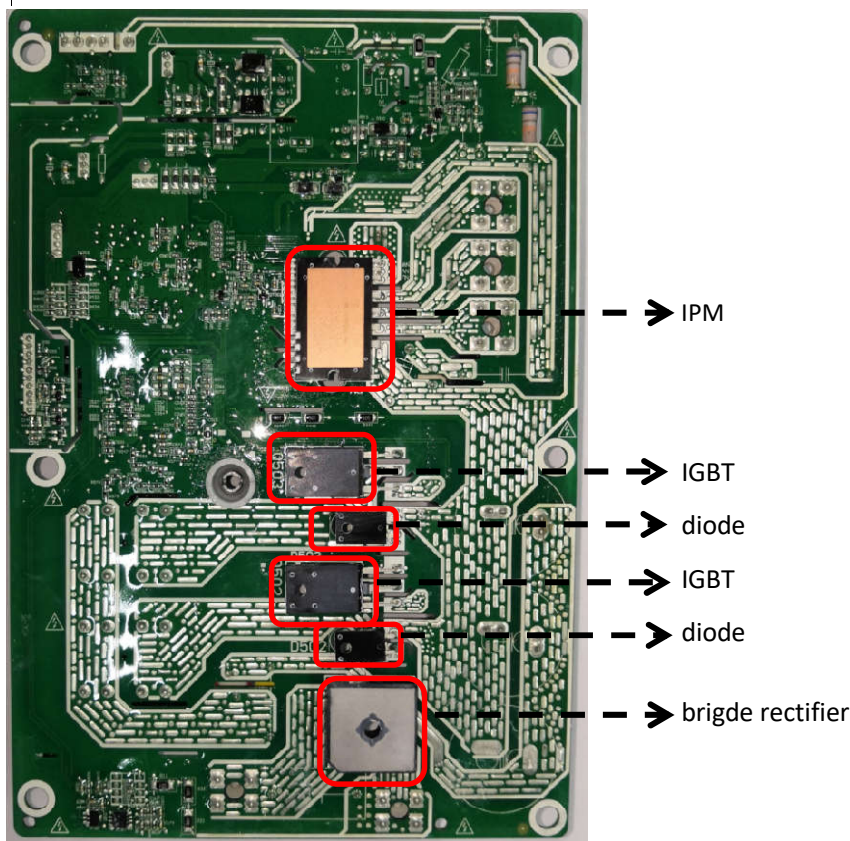
Situation 2: L0 or L4 error appears immediately after the compressor starts up
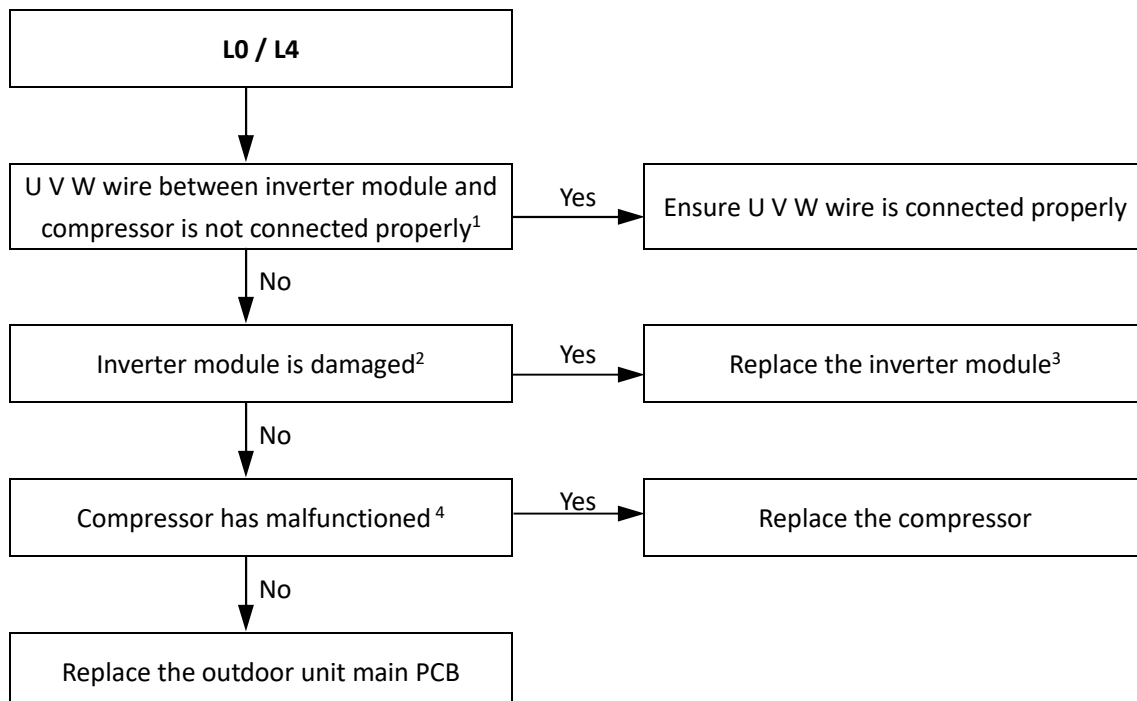
Notes:

1. Connect the U V W wire from the inverter module to the correct compressor terminals, as indicated by the labels on the compressor.
2. Measure the resistance between each of U, V and W and each of P and N on the inverter module. All the resistances should be infinite. If any of them are not infinite, the inverter module is damaged and should be replaced. Refer to Figure 4-2.5 to 4-2.7 in Part 4, 2.1 "Main PCBs for Refrigerant System, Inverter Module".
3. When replacing an inverter module, a layer of thermally conductive silica gel should be painted on the IPM module, IGBT, diode brigde rectifer (on the reverse side of the inverter module PCB). Refer to Figure 4-4.2.
4. The normal resistances of the inverter compressor are 0.7-1.5Ω 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.

Situation 3: L0 or L4 error appears after the compressor has been running for a period of time and the compressor speed is over 60rps

```
┌─────────────────────┐
│      L0 / L4        │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐    Yes    ┌──────────────────────────────┐
│                     │──────────▶│ Repaint the thermally        │
│ Inverter module has │           │ conductie silica gel on the  │
│ overheated          │           │ IPM module, IGBT, diode,     │
│                     │           │ bridge rectifier (on the     │
│                     │           │ reverse side of the inverter │
│                     │           │ module PCB)[1]               │
└─────────────────────┘           └──────────────────────────────┘
          │ No
          ▼
┌─────────────────────┐    Yes    ┌──────────────────────────────┐
│ Inverter module is  │──────────▶│    Replace the compressor    │
│ over-current[2]     │           │                              │
└─────────────────────┘           └──────────────────────────────┘
          │ No
          ▼
┌─────────────────────┐
│ Replace the inverter│
│ module[3]           │
└─────────────────────┘
```
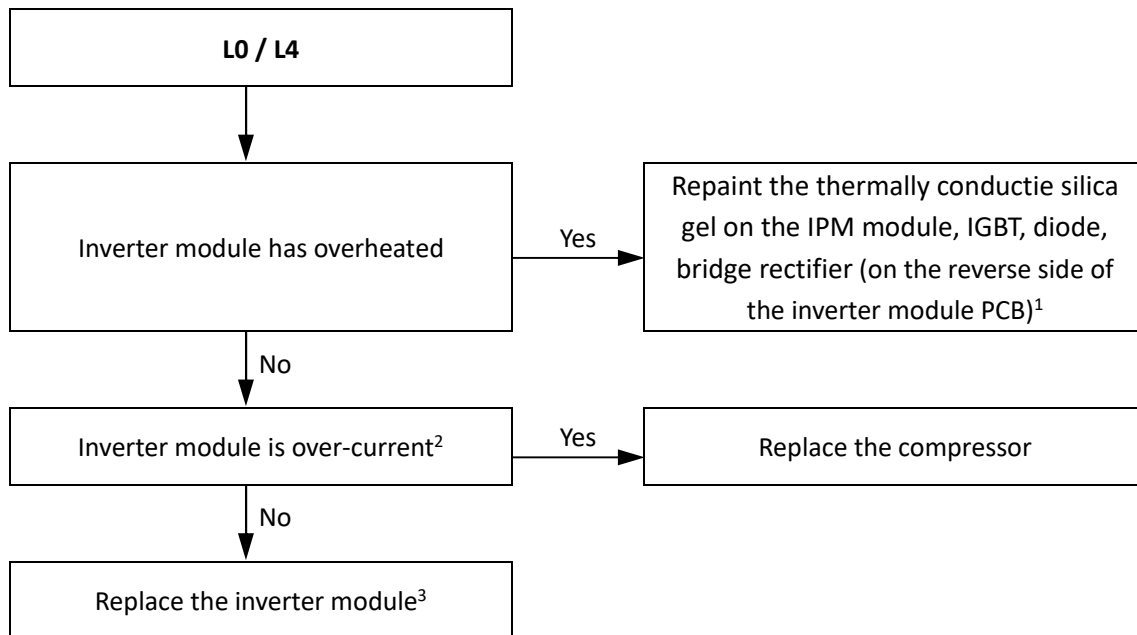
Notes:
1. Refer to Figure 4-4.2.
2. Use clip-on ammeter to measure the compressor current, if the current is normal indicates the inverter module is failed, if the current is abnormal indicates the compressor is failed.
3. When replacing an inverter module, a layer of thermally conductive silica gel should be painted on the PFC and IPM modules (on the reverse side of the inverter module PCB). Refer to Figure 4-4.2.

Situation 4: L0 error appears occasionally/irregularly

```
┌─────────────────────┐
│        L0           │
└─────────────────────┘
          │
          ▼
┌─────────────────────────┐  Yes  ┌──────────────────────────────┐
│ The outdoor unit        │──────▶│ Ensure enough space for unit │
│ ventilation is not good │       │ ventilation                  │
└─────────────────────────┘       └──────────────────────────────┘
```
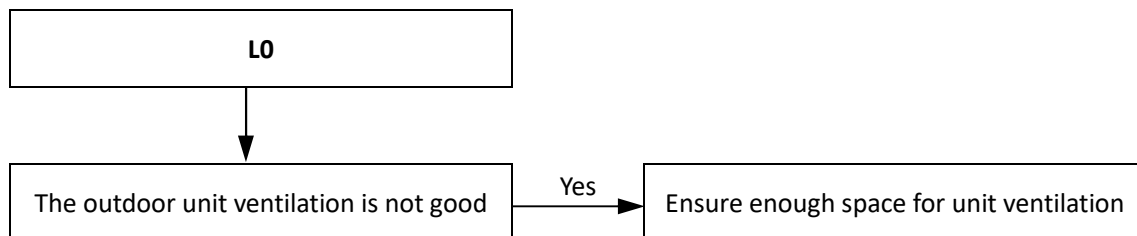
13.20.7 L1/L2 troubleshooting

The normal DC voltage between terminals P and N on inverter module is 1.4 time of AC power supply in standby , the DC voltage is 377V when the fan motor is running. If the voltage is lower than 160V, the unit displays L1. If the voltage is higher than 500V, the unit display L2.

Figure 4-4.3: Inverter module terminals

Inverter module terminals (4-10KW)   *Inverter module terminals (12-16KW)*
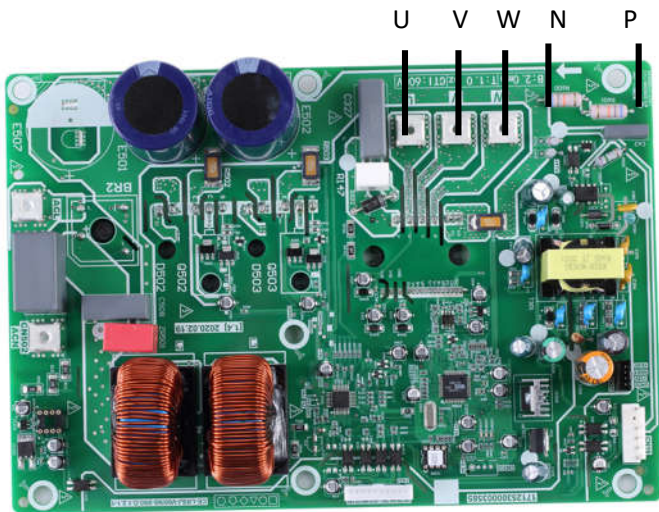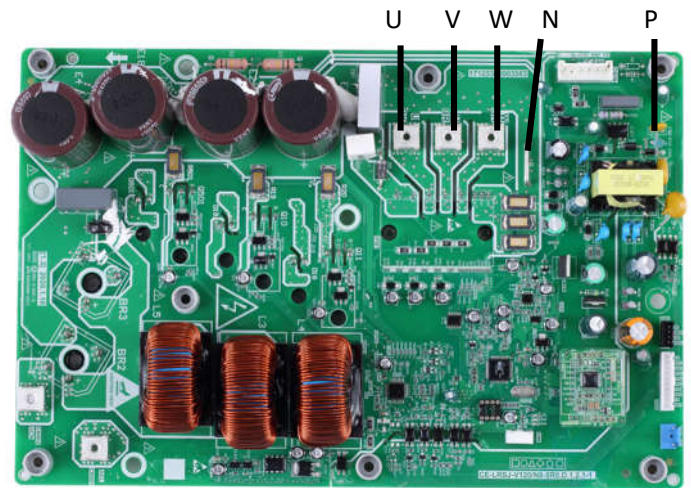
Situation 1: L1 or L2 error appears immediately after the outdoor unit is powered-on
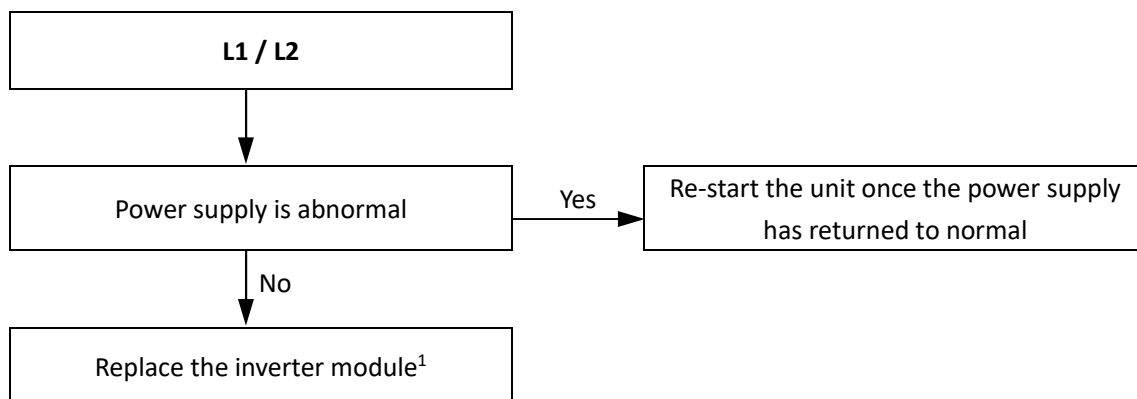
Notes:
1. When replacing an inverter module, a layer of thermally conductive silica gel should be painted on the IPM module, IGBT, diode, bridge rectifier (on the reverse side of the inverter module PCB). Refer to Figure 4-4.2.

Situation 2: L1 or L2 error appears after the compressor has been running for a period of time and the compressor speed is over 20rps

```
              ┌─────────────────────┐
              │       L1 /L2        │
              └─────────────────────┘
                        │
                        ▼
    ┌──────────────────────────────┐   Yes   ┌──────────────────────────────┐
    │ Relay on outdoor unit main   │────────▶│ Replace the outdoor unit     │
    │ PCB is open                  │         │ main PCB                     │
    └──────────────────────────────┘         └──────────────────────────────┘
                        │ No
                        ▼
    ┌──────────────────────────────┐
    │ Replace the inverter module² │
    └──────────────────────────────┘
```
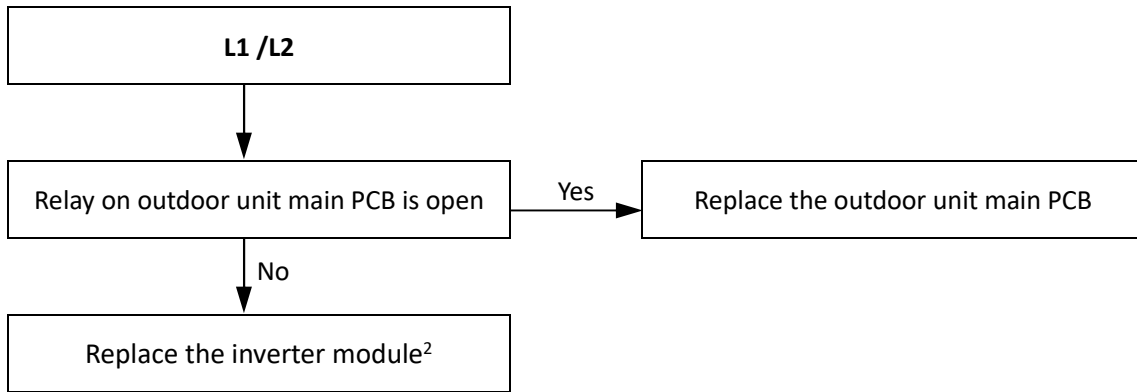
Notes:
1. If the fan motor is running and the DC voltage between terminals P and N on inverter module declined, Relay on the main control board of outdoor unit is open.
2. When replacing an inverter module, a layer of thermally conductive silica gel should be painted on IPM module (on the reverse side of the inverter module PCB). Refer to Figure 4-4.2.

Figure 4-4.4: Relay location of main PCB for refrigerant system
Single phase 4/6/8/10kW unit   *Single phase 12/14/16kW unit*
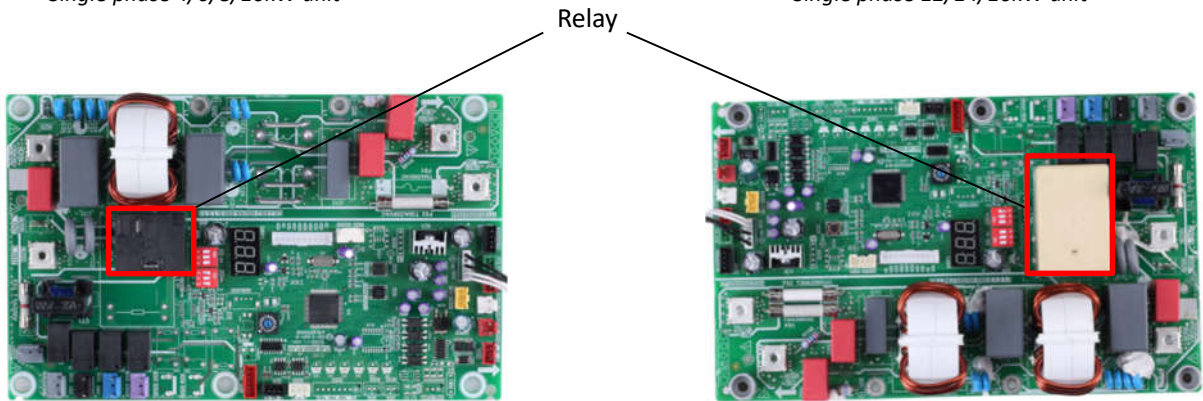
13.20.8 L5/L8/L9 troubleshooting
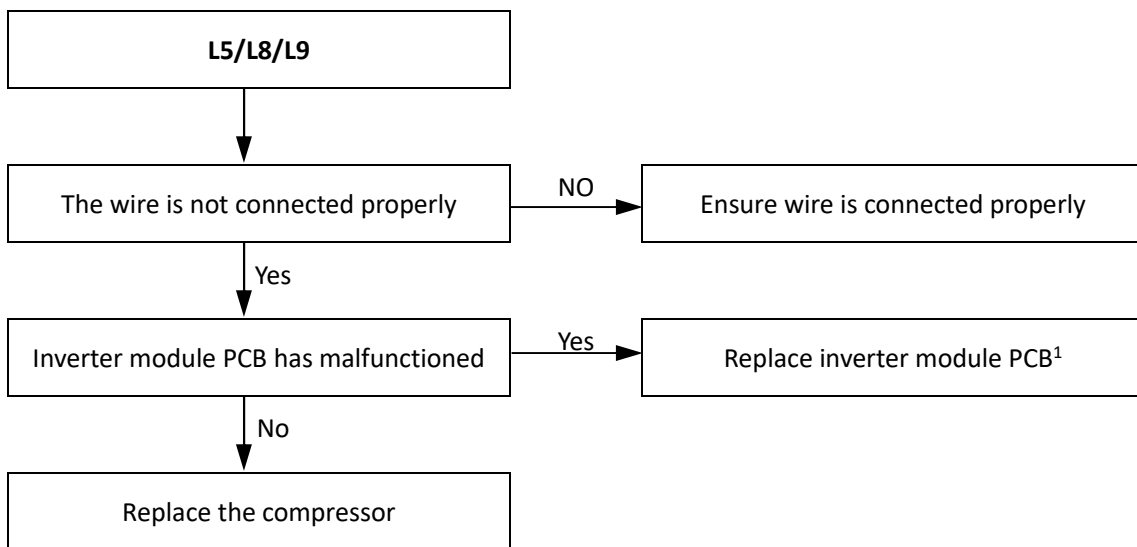
```
              ┌─────────────────────┐
              │     L5/L8/L9        │
              └─────────────────────┘
                        │
                        ▼
    ┌──────────────────────────────┐   NO    ┌──────────────────────────────┐
    │ The wire is not connected    │────────▶│ Ensure wire is connected     │
    │ properly                     │         │ properly                     │
    └──────────────────────────────┘         └──────────────────────────────┘
                        │ Yes
                        ▼
    ┌──────────────────────────────┐   Yes   ┌──────────────────────────────┐
    │ Inverter module PCB has      │────────▶│ Replace inverter module PCB¹ │
    │ malfunctioned                │         │                              │
    └──────────────────────────────┘         └──────────────────────────────┘
                        │ No
                        ▼
    ┌──────────────────────────────┐
    │ Replace the compressor       │
    └──────────────────────────────┘
```

1. When replacing an inverter module, a layer of thermally conductive silica gel should be painted on IPM module (on the reverse side of the inverter module PCB). Refer to Figure 4-4.2.

13.21 Inverter module Troubleshooting for three-phase models

13.21.1 Digital display output
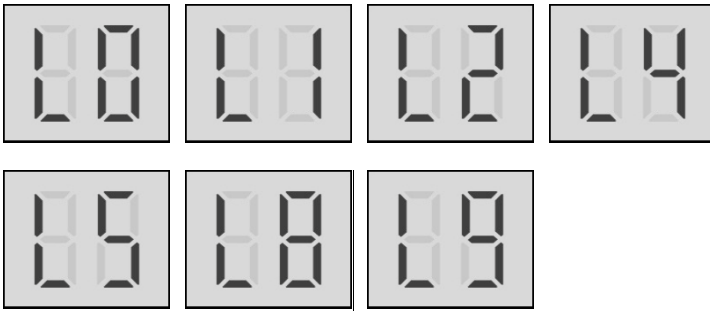
13.21.2 Description

- Inverter module protection or high pressure protection.
- Yukon Mono stops running.
- Specific error code L0, L1, L2, L4, L5, L8 , L9 is displayed on the user interface and the refrigerant system main PCB.

13.21.3 Possible causes

- Inverter module protection.
- DC bus low or high voltage protection.
- MCE error(DC bus low or high voltage protection or software over current protection)
- Zero speed protection.
- Excessive compressor frequency variation.
- Actual compressor frequency differs from target frequency.
- High pressure protection.
- Contactor stuck or 908 self checking fail.

13.21.4 Specific error codes for inverter module protection

Table 4-4.4: Specific error codes

Specific error code	Content
L0	Inverter module protection
L1	DC bus low voltage protection
L2	DC bus high voltage protection
L4	MCE error(DC bus low or high voltage protection or software over current protection)
L5	Zero speed protection
L8	Compressor frequency variation greater than 15Hz within one second protection
L9	Actual compressor frequency differs from target frequency by more than 15Hz protection

The specific error codes can also be obtained from the LED indicators LED1/LED2 on the inverter module.

Table 4-4.5: Errors indicated on LED for three-phase 12~16kW unit

LED1/2 flashing pattern	Corresponding error
Flashes 8 times and stops for 1 second, then repeats	L0 - Inverter module protection
Flashes 9 times and stops for 1 second, then repeats	L1 - DC bus low voltage protection
Flashes 10 times and stops for 1 second, then repeats	L2 - DC bus high voltage protection
Flashes 12 times and stops for 1 second, then repeats	L4 - MCE error(DC bus low or high voltage protection or software over current protection)
Flashes 13 times and stops for 1 second, then repeats	L5 - Zero speed protection
Flashes 17 times and stops for 1 second, then repeats	L8 - Compressor frequency variation greater than 15Hz within one second protection L9 - Actual compressor frequency differs from target frequency by more than 15Hz protection
Flashes 3 times and stops for 1 second, then repeats	bH - Contactor stuck or 908 self checking fail
Flashes 5 times and stops for 1 second, then repeats	P1 - High pressure protection

Figure 4-4.5: LED location of inveter module for three-phase 12~16kW unit
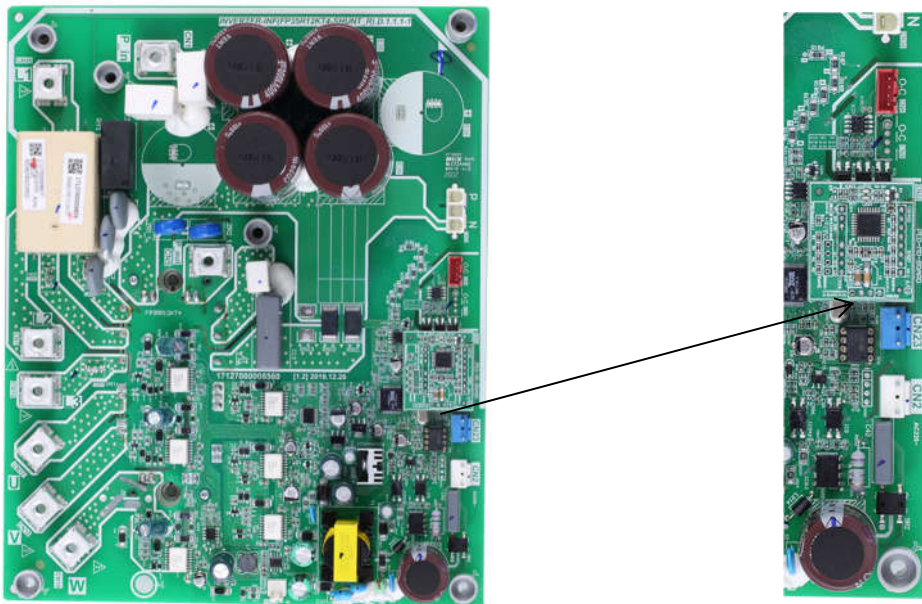
13.21.5 Principle of DC inverter
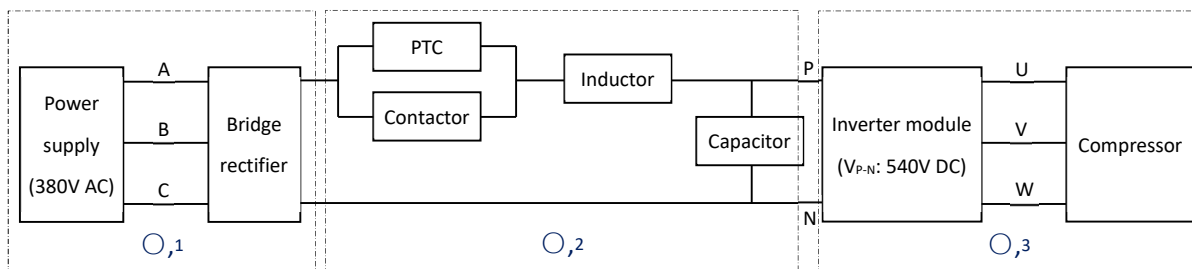
① 380-415V AC power supply change to DC power supply after bridge rectifier.

② Contactor is open the current across the PTC to charge capacitor, after 5 seconds the contactor closed.

③ The capacitor output steady 540V DC power supply for inverter module P N terminals.

13.21.6 L0 troubleshooting

Situation 1: L0 error appears immediately after the outdoor unit is powered-on

```
┌─────────────────────────┐
│           L0            │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐          ┌─────────────────────────┐
│ Communication wire      │   Yes    │ Ensure communication    │
│ between refrigerant     │ ───────▶ │ wire is connected       │
│ system main control     │          │ properly                │
│ board for refrigerant   │          └─────────────────────────┘
│ system and inverter     │
│ module (4 pins) not     │
│ connected properly[1]   │
└─────────────────────────┘
             │ No
             ▼
┌─────────────────────────┐   Yes
│ Inverter module is      │ ───────────────────┐
│ damaged[2]              │                    │
└─────────────────────────┘                    │
             │ No                               │
             ▼                                  ▼
┌─────────────────────────┐          ┌─────────────────────────┐
│ Voltage between pins F0 │   Yes    │                         │
│ and GND of              │ ───────▶ │ Replace the inverter    │
│ communication port for  │          │ module[4]               │
│ connection to inverter  │          │                         │
│ module on the           │          └─────────────────────────┘
│ refrigerant system main │
│ PCB is too low[3]       │
└─────────────────────────┘
```
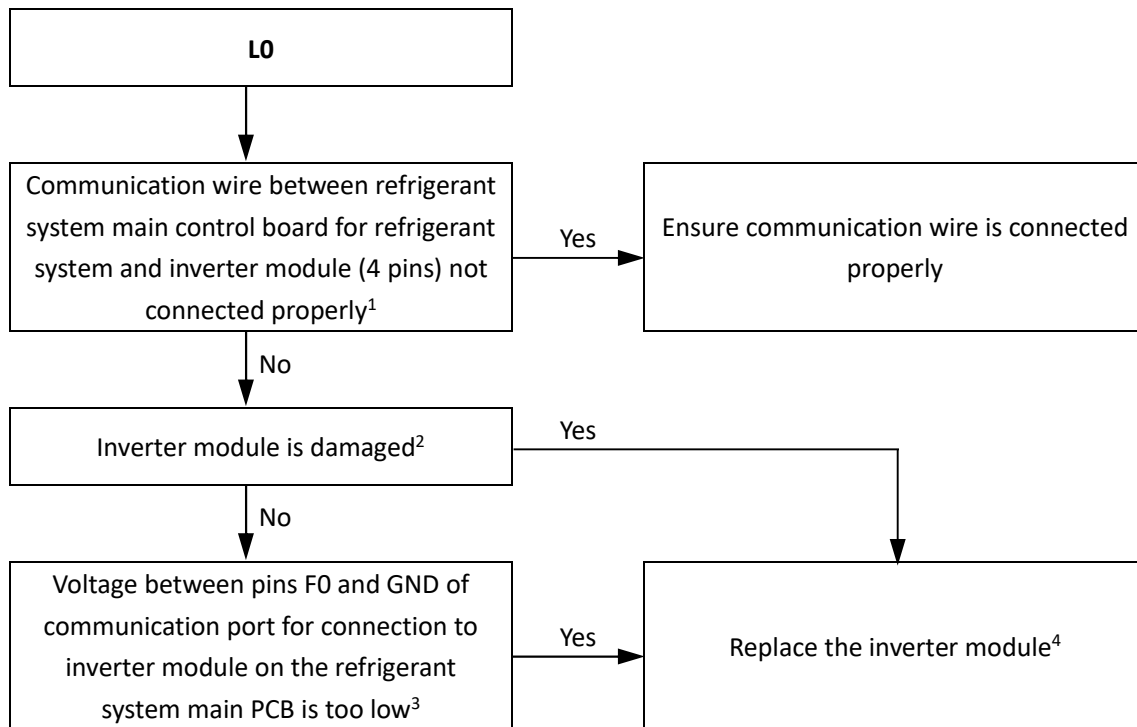
Notes:
1. For MSH-120/140/160EB-3, the communication port between refrigerant system main control board for refrigerant system inverter module is port CN36 on refrigerant system main control board for refrigerant system port CN8 on inverter module.
2. Measure the resistance between each of U, V and W and each of P and N on the inverter module. All the resistances should be infinite. If any of them are not infinite, the inverter module is damaged and should be replaced.
3. The normal voltage between F0 and GND is 5V. Refer to Figure 4-4.6.
4. When replacing an inverter module, a layer of thermally conductive silica gel should be painted on the IPM module (on the reverse side of the inverter module PCB). Refer to Figure 4-4.2.

Figure 4-4.6: F0 and GND voltage on IC28-1 （F0）, IC28-4 （GND）

Vnormal = 5V

```
        ┌───────────────┐
        │               │
        │               │
┌───────────────┐   ┌───────────────┐
│ IC28-1 （F0） │   │ IC28-4 （GND）│
└───────────────┘   └───────────────┘
```
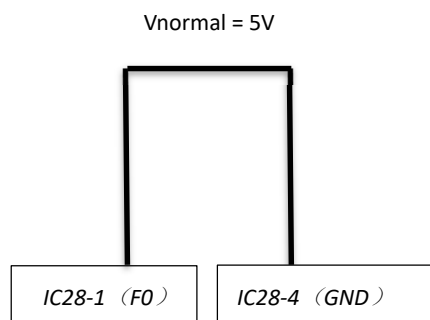
**Situation 2: L0 error appears immediately after the compressor starts up**

```
┌─────────────────────┐
│         L0          │
└─────────────────────┘
            │
            ▼
┌─────────────────────────────────┐   Yes   ┌──────────────────────────────────┐
│ DC bus wire is not connected    │────────▶│ Ensure DC bus wire is connected  │
│ properly[1]                     │         │ properly                         │
└─────────────────────────────────┘         └──────────────────────────────────┘
            │ No
            ▼
┌─────────────────────────────────┐   Yes   ┌──────────────────────────────────┐
│ Compressor has malfunctioned[2] │────────▶│ Replace the compressor           │
└─────────────────────────────────┘         └──────────────────────────────────┘
            │ No
            ▼
┌─────────────────────────────────┐
│ Replace the main PCB            │
└─────────────────────────────────┘
```
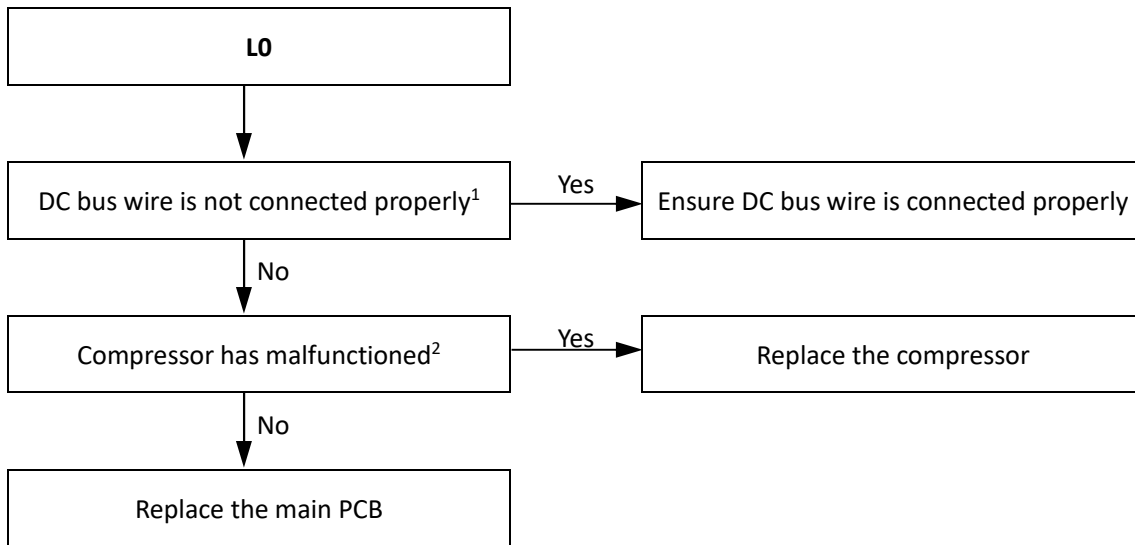
Notes:

1. 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 of capacitor. Refer to Figure 4-4.7.

Figure 4-4.7: DC bus wire connection（L1L2L3,PIN- POUT）

L1，L2，L3　　　　　　　　　　　　　Pin，Pout
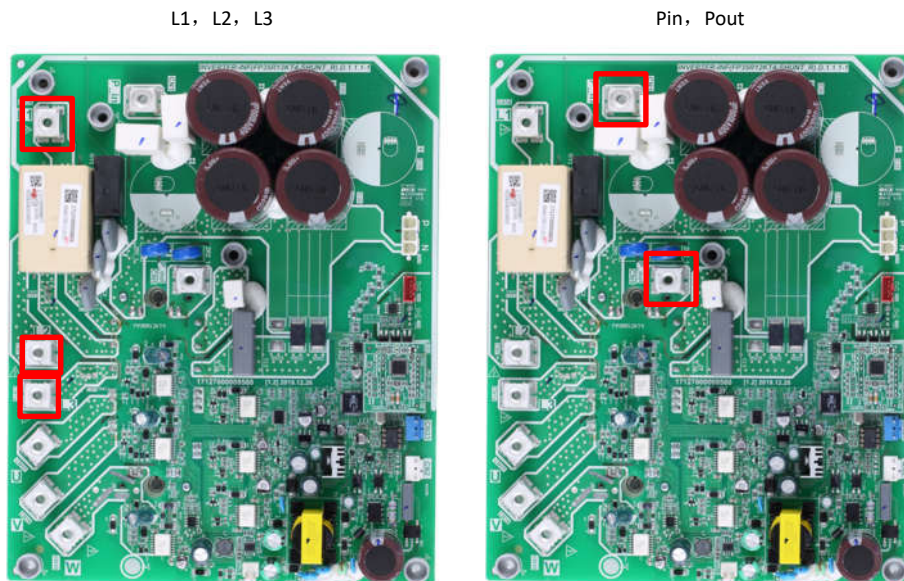
2. The normal resistances of the inverter compressor are 0.7-1.5Ω among U V W and infinite between each of U V W and ground. If any of the resistances differ from these specifications, the compressor has malfunctioned.

Situation 3: L0 error appears within 2 seconds of compressor start-up
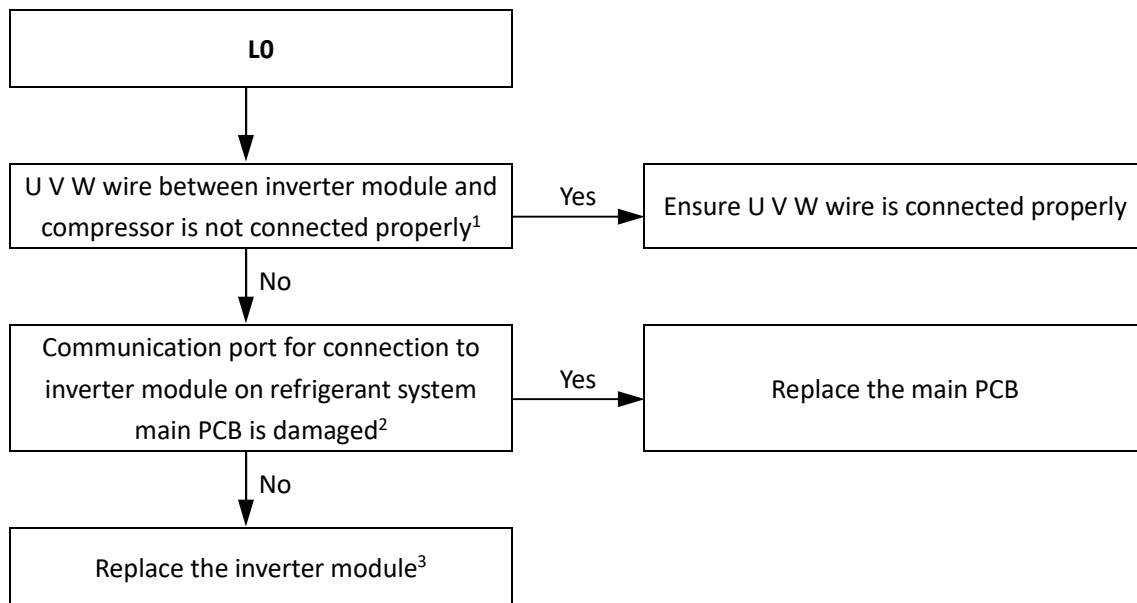
```
                        ┌─────────────────────────────┐
                        │             L0              │
                        └─────────────────────────────┘
                                      │
                                      ▼
┌──────────────────────────────────┐  Yes  ┌──────────────────────────────────┐
│ U V W wire between inverter module│─────▶│ Ensure U V W wire is connected    │
│ and compressor is not connected   │      │ properly                          │
│ properly¹                         │      └──────────────────────────────────┘
└──────────────────────────────────┘
                │ No
                ▼
┌──────────────────────────────────┐  Yes  ┌──────────────────────────────────┐
│ Communication port for connection │─────▶│                                  │
│ to inverter module on refrigerant │      │      Replace the main PCB        │
│ system main PCB is damaged²       │      │                                  │
└──────────────────────────────────┘      └──────────────────────────────────┘
                │ No
                ▼
┌──────────────────────────────────┐
│ Replace the inverter module³      │
└──────────────────────────────────┘
```

Notes:
1. Connect the U V W wire from the inverter module to the correct compressor terminals, as indicated by the labels on the compressor.
2. Measure the voltage between each of W-, W+, V-, V+, U-, U+ and GND when the unit is in standby. The normal voltage should be 2.5V-4V and the six voltages should be same, otherwise the communication terminal has failed. Refer to Figure4-4.8.

Figure 4-4.8: Connection port for inverter module
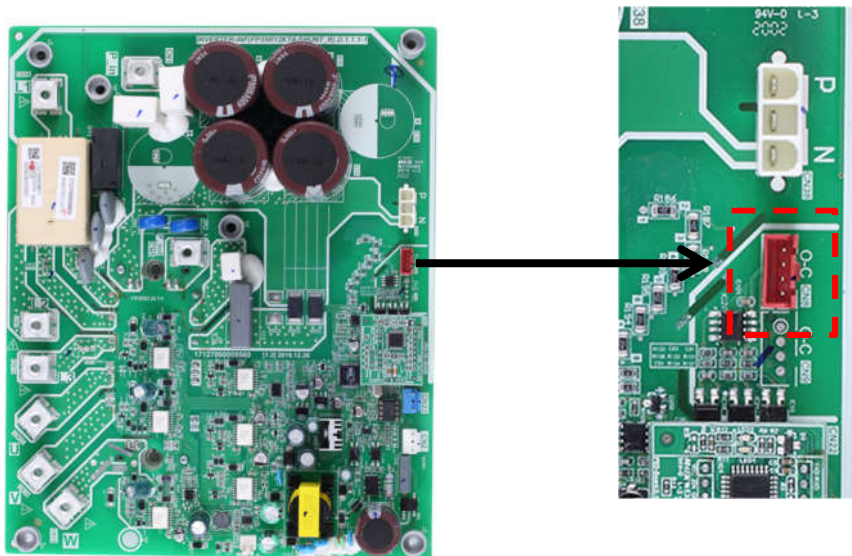

3. When replacing an inverter module, a layer of thermally conductive silica gel should be painted on the IPM module (on the reverse side of the inverter module PCB). Refer to Figure 4-4.2.

Condition 4: L0 error appears after the compressor has been running for a period of time and the compressor speed is over 60rps

```
┌─────────────────────────────┐
│             L0              │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐    Yes    ┌─────────────────────────────────┐
│                             │──────────▶│ Repaint the thermally conductive │
│ Inverter module has overheated         │ silica gel on the PFC and IPM    │
│                             │           │ modules (on the reverse side of  │
└─────────────────────────────┘           │ the inverter module PCB)[1]      │
              │                            └─────────────────────────────────┘
              │ No
              ▼
┌─────────────────────────────┐    Yes    ┌─────────────────────────────────┐
│ Inverter module is over-current[2]     │──────────▶│ Replace the compressor           │
└─────────────────────────────┘           └─────────────────────────────────┘
              │
              │ No
              ▼
┌─────────────────────────────┐
│ Replace the inverter module[2]         │
└─────────────────────────────┘
```
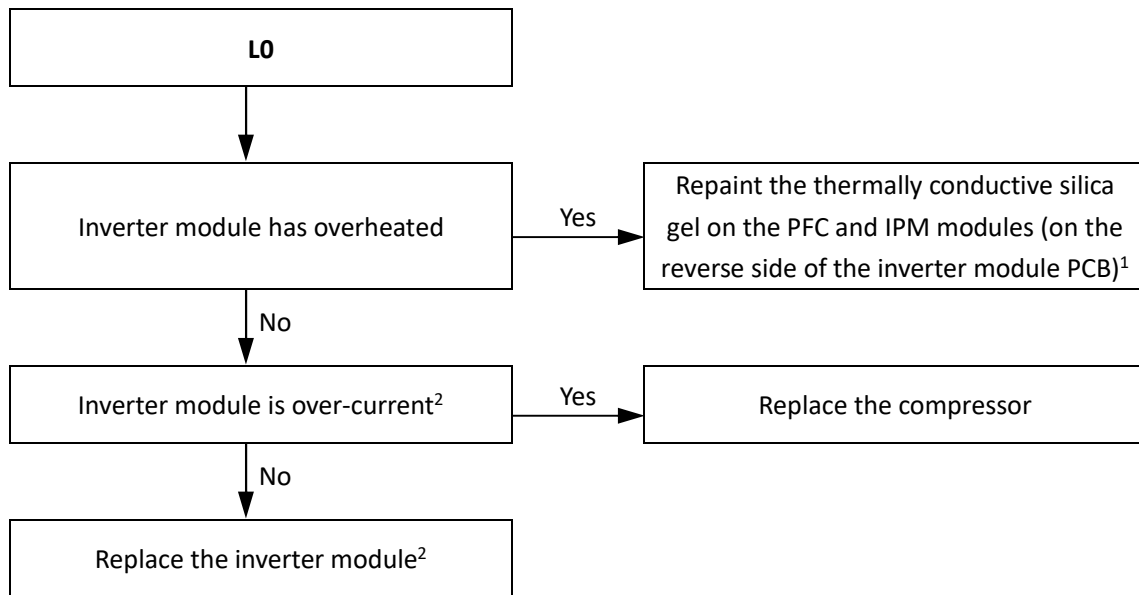
Notes:
1. When replacing an inverter module, a layer of thermally conductive silica gel should be painted on the IPM module (on the reverse side of the inverter module PCB).
2. Use clip-on ammeter to measure the compressor current, if the current is normal indicates the inverter module is failed, if the current is abnormal indicates the compressor has failed.

Situation 5: L0 error appears occasionally/irregularly

```
┌─────────────────────────────┐
│             L0              │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐    Yes    ┌─────────────────────────────────┐
│ The outdoor unit ventilation is not good│──────────▶│ Ensure enough space for unit ventilation │
└─────────────────────────────┘           └─────────────────────────────────┘
```
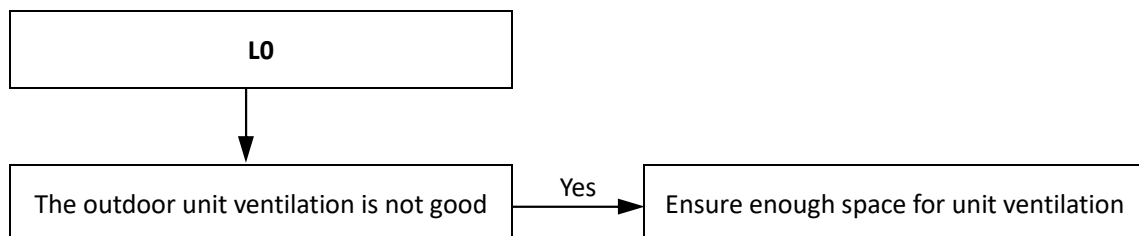
13.21.7 L1/L2 troubleshooting

The normal DC voltage between terminals P and N on inverter module is 540V. If the voltage is lower than 300V, the unit displays an L1 error; if the voltage is higher than 830V, the unit displays an L2 error. Refer to Figure4-4.9.

Figure 4-4.9: P, N terminals voltage
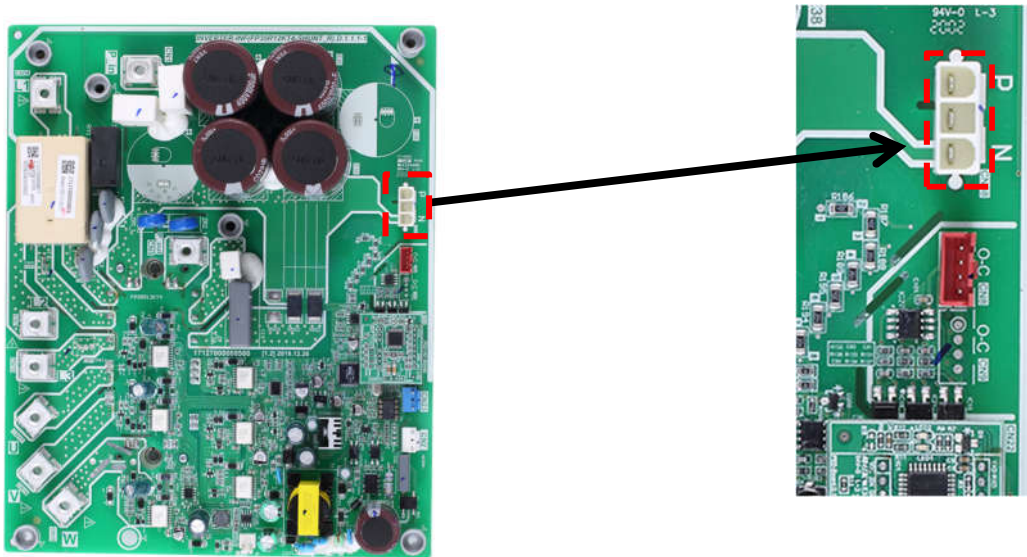
$V_{normal} = 540V$ DC

Situation 1: L1 or L2 error appears immediately after the outdoor unit is powered-on
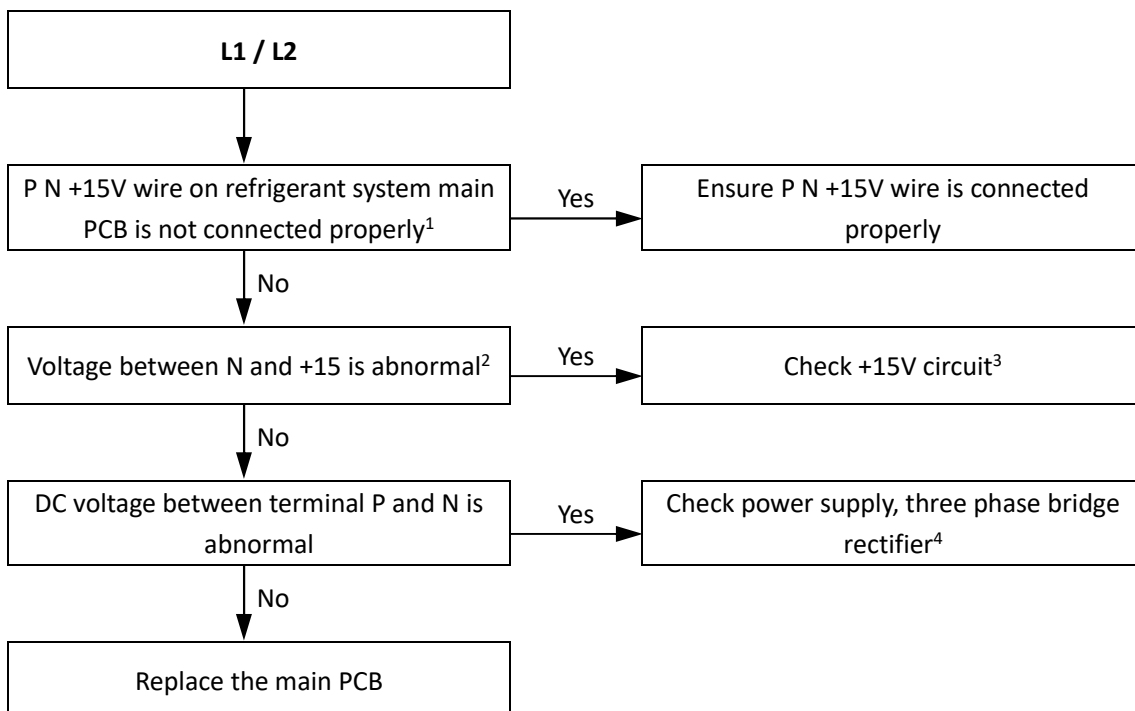
Notes:
1. P N +15V terminal on refrigerant system main PCB. Refer to Figure4-4.9.
2. Voltage between N and +15. Refer to Figure4-4.10

Figure 4-4.10: P N +15V terminal-+15V（IC4/5/6PIN12）：N-（IC/4/5、6）PIN13
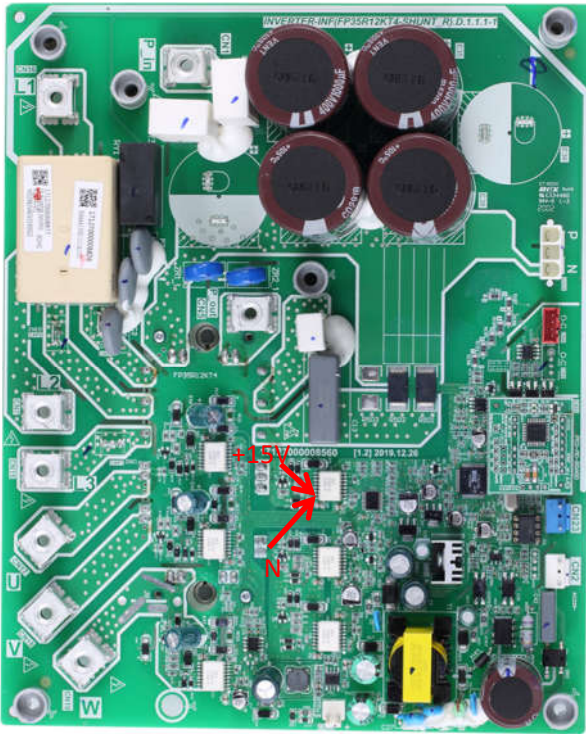
3. Check the +15V circuit according to corresponding wiring diagram. If IC4/5/6PIN12 on inverter module output voltage is not +15V means the inverter module is failed. If voltage output of inverter module is +15V means main PCB is failed.
4. Check the bridge rectifier using one of the following two methods (refer to Figure 4-4.11):
   - Method 1: measure the resistance between any two of the 5 bridge rectifier terminals. If any of the resistances is close to zero, the bridge rectifier has failed.
   - Method 2: dial a multimeter to the diode setting:
     - Put the red probe on the DC power output negative terminal (terminal 5) and put the black probe onto each of the AC power input terminals (terminals 1, 2 and 3) in turn. The voltage between terminal 5 and each of terminals 1, 2 and 3 should be around 0.378V. If the voltage is 0, the bridge rectifier has failed.
     - Put the red probe on the DC power output positive terminal (terminal 4), then put black probe onto each of the AC power input terminals (terminals 1, 2 and 3) in turn. The voltage between terminal 4 and each of terminals 1, 2 and 3 should be infinite. If the voltage is 0, the bridge rectifier has failed.

   Figure 4-4.11: Bridge rectifier

Three phase AC power input

DC power output

Schematic diagram
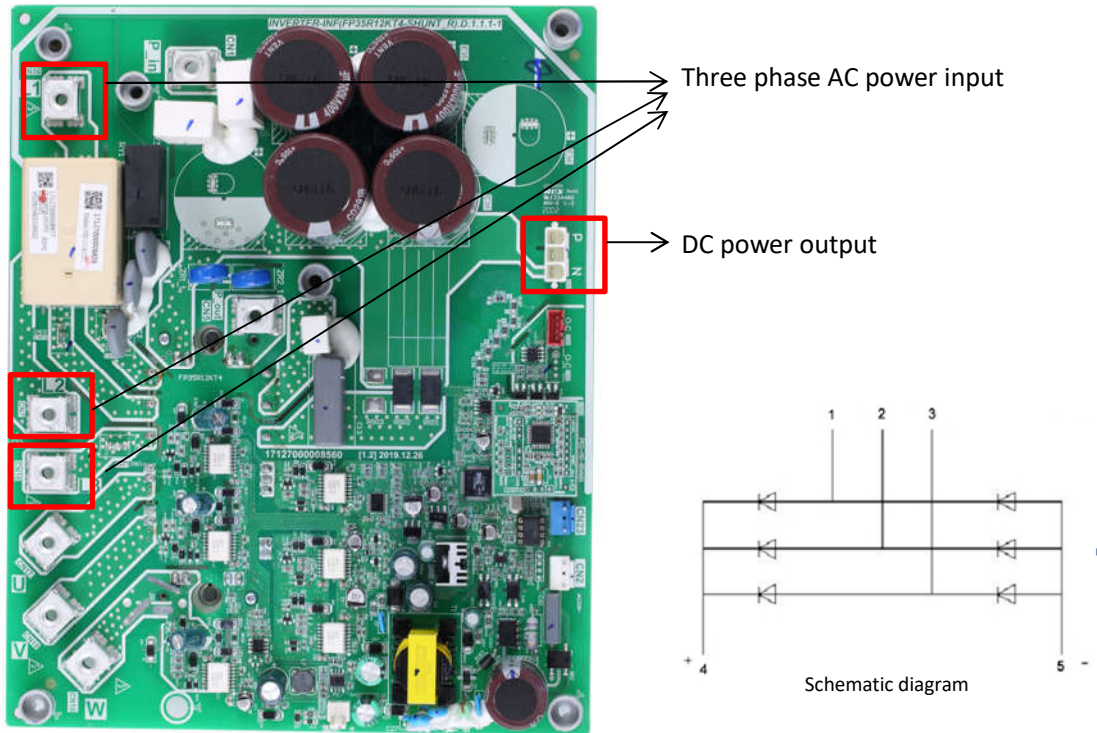
13.21.8 L4 troubleshooting(the same as L1/L2)

Situation 1: L4 error appears immediately after the outdoor unit is powered-on

```
        ┌──────────────────────┐
        │          L4          │
        └──────────┬───────────┘
                   │
                   ▼
        ┌──────────────────────┐
        │ Replace the inverter PCB │
        └──────────────────────┘
```
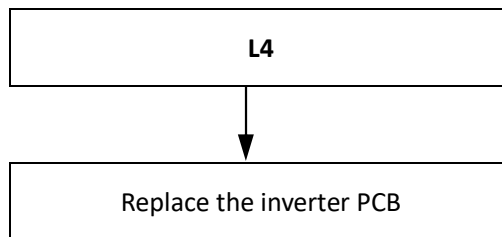
Condition 2: L4 error appears after the compressor has been running for a period of time and the compressor speed is over 60rps

```
┌──────────────────────┐
│          L4          │
└──────────┬───────────┘
           │
           ▼
┌──────────────────────┐   Yes   ┌──────────────────────────┐
│ Compressor is over-current[2] │─────────▶│ Replace the compressor   │
└──────────┬───────────┘         └──────────────────────────┘
           │ No
           ▼
┌──────────────────────┐
│ Replace the inverter PCB │
└──────────────────────┘
```
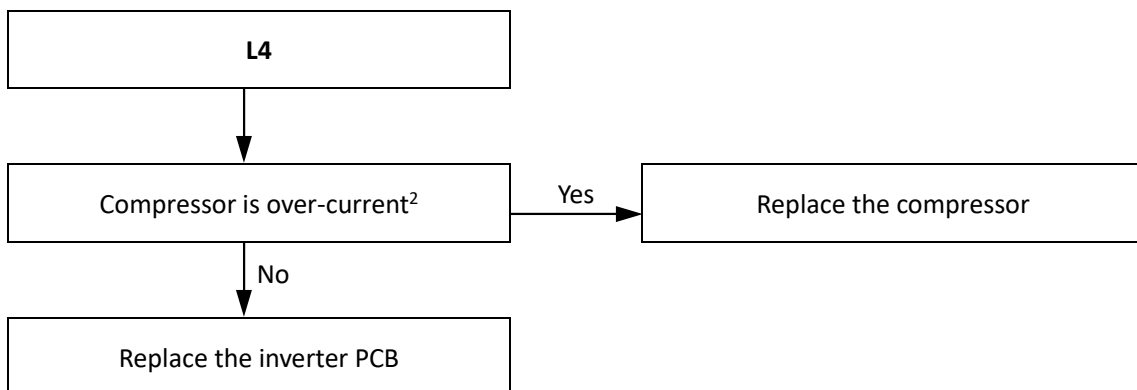
Notes:
1. Re-start the unit, use clip-on ammeter to measure the compressor current, if the current is normal indicates the compressor is failed, if the current is abnormal indicates the inverter PCB is failed..

13.21.9 L5/L8/L9 troubleshooting

```
┌─────────────────────────────┐
│          L5/L8/L9           │
└─────────────────────────────┘
               │
               ▼
┌─────────────────────────────┐   NO    ┌─────────────────────────────┐
│ The wire is not connected   │────────▶│ Ensure wire is connected    │
│ properly                    │         │ properly                    │
└─────────────────────────────┘         └─────────────────────────────┘
               │ Yes
               ▼
┌─────────────────────────────┐   Yes   ┌─────────────────────────────┐
│ Inverter module PCB has     │────────▶│ Replace inverter module PCB │
│ malfunctioned               │         │                             │
└─────────────────────────────┘         └─────────────────────────────┘
               │ No
               ▼
┌─────────────────────────────┐
│    Replace the compressor   │
└─────────────────────────────┘
```
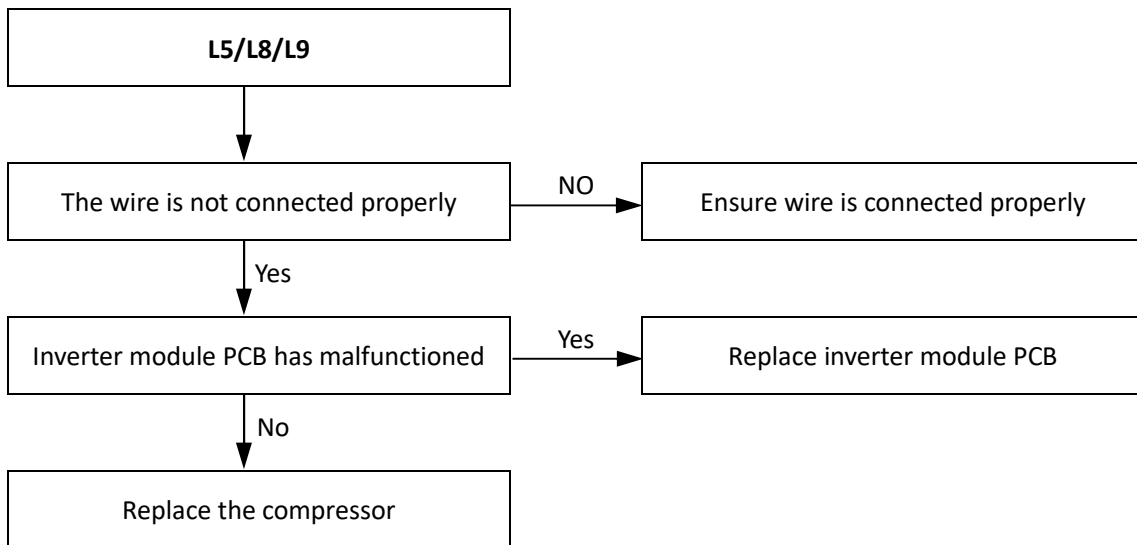
13.22 Pd Troubleshooting

13.22.1 Digital display output

```
Pd
```

13.22.2 Description

▪ High temperature protection of air side heat exchanger refrigerant outlet in cooling mode. When the air side heat exchanger refrigerant outlet temperature is higher than 61°C for more than 3 seconds, the system displays Pd protection and Yukon Split stops running. When the air side heat exchanger refrigerant outlet temperature returns drops below 55°C, Pd is removed and normal operation resumes.

▪ Yukon Split stops running.

▪ Error code is displayed on outdoor unit main PCB and user interface.

13.22.3 Possible causes

▪ Temperature sensor not connected properly or has malfunctioned.

▪ Poor condenser heat exchange.

▪ Fan motor damaged.

▪ Hydronic box main PCB damaged.

13.22.4 Procedure

```
┌─────────────────────────────────┐
│              Pd                 │
└─────────────────────────────────┘
                │
                ▼
┌─────────────────────────────────┐   Yes   ┌─────────────────────────────────┐
│ Air side heat exchanger         │────────▶│ Ensure the temperature sensor is│
│ refrigerant outlet              │         │ connected properly              │
│ temperature sensor is loose[1]  │         └─────────────────────────────────┘
└─────────────────────────────────┘
                │ No
                ▼
┌─────────────────────────────────┐   Yes   ┌─────────────────────────────────┐
│ Air side heat exchanger         │────────▶│ Replace the temperature sensor  │
│ refrigerant outlet              │         └─────────────────────────────────┘
│ temperature sensor has short-   │
│ circuited or failed[2]          │
└─────────────────────────────────┘
                │ No
                ▼
┌─────────────────────────────────┐   Yes   ┌─────────────────────────────────┐
│ The air side heat exchanger heat│────────▶│ Inspect the system and fix the  │
│ exchange is poor[3]             │         │ error                           │
└─────────────────────────────────┘         └─────────────────────────────────┘
                │ No
                ▼
┌─────────────────────────────────┐   Yes   ┌─────────────────────────────────┐
│ The fan or fan motor is blocked │────────▶│ Inspect the system and fix the  │
│ or damaged                      │         │ error                           │
└─────────────────────────────────┘         └─────────────────────────────────┘
                │ No
                ▼
┌─────────────────────────────────┐
│ Replace outdoor main PCB        │
└─────────────────────────────────┘
```

Notes:

1. Air side heat exchanger refrigerant outlet temperature sensor and outdoor ambient temperature sensor connection port are CN9 on the MSH-40/60/80/100EB outdoor unit refrigerant system main PCB (labeled 12 in Figure 4-2.2 in Part4, 2.3 "Main PCB for Refrigerant System, Inverter Module"). port CN9 on the MSH-120/140/160EB outdoor unit refrigerant system main PCB (labeled 12 in Figure 4-2.3 in Part 4, 2. 3 "Main PCB for Refrigerant System, Inverter Module"), port CN9 on the MSH-120/140/160EB-3 outdoor unit refrigerant system main PCB (labeled 17 in Figure 4-2.4 in Part 4, 2. 3 "Main PCB for Refrigerant System, Inverter Module")

2. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Part 2, 1.1 "Outdoor Unit Layout" and to Table 4-5.1 in Part 4, 5.1 "Temperature Sensor Resistance Characteristics".

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

4. High pressure switch connection is port CN13 on the

13.23 PP Troubleshooting

13.23.1 Digital display output
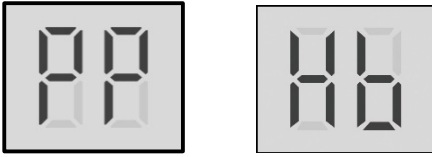
13.23.2 Description

▪ Water side heat exchanger inlet temperature is higher than outlet temperature in heating mode.

▪ Yukon Split stops running.

▪ Error code is displayed on hydronic box main PCB and user interface.

▪ Hb indicates PP has displayed 3 times.

13.23.3 Possible causes

▪ Temperature sensor not connected properly or has malfunctioned.

▪ 4-way valve is blocked or damaged.

▪ Hydronic box main PCB damaged.

13.23.4 Procedure
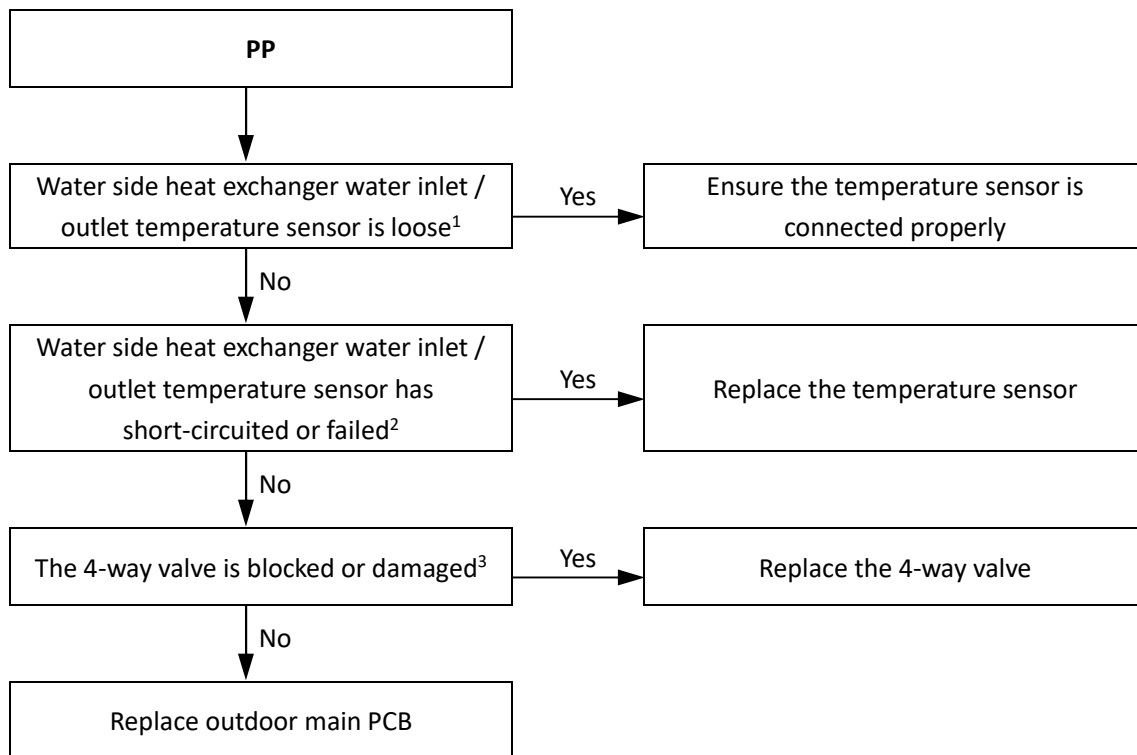
```
                        ┌─────────────────────────────┐
                        │             PP              │
                        └──────────────┬──────────────┘
                                       │
                                       ▼
┌─────────────────────────────────┐  Yes  ┌─────────────────────────────────┐
│ Water side heat exchanger water │─────▶ │ Ensure the temperature sensor is│
│ inlet / outlet temperature      │       │      connected properly         │
│ sensor is loose¹                │       └─────────────────────────────────┘
└──────────────┬──────────────────┘
               │ No
               ▼
┌─────────────────────────────────┐  Yes  ┌─────────────────────────────────┐
│ Water side heat exchanger water │─────▶ │  Replace the temperature sensor │
│ inlet / outlet temperature      │       └─────────────────────────────────┘
│ sensor has short-circuited or   │
│ failed²                         │
└──────────────┬──────────────────┘
               │ No
               ▼
┌─────────────────────────────────┐  Yes  ┌─────────────────────────────────┐
│ The 4-way valve is blocked or   │─────▶ │     Replace the 4-way valve     │
│ damaged³                        │       └─────────────────────────────────┘
└──────────────┬──────────────────┘
               │ No
               ▼
┌─────────────────────────────────┐
│    Replace outdoor main PCB     │
└─────────────────────────────────┘
```

Notes:

1. Water side heat exchanger water inlet temperature sensor and water side heat exchanger water outlet temperature sensor connections are port CN6 on the hydronic box main PCB (labeled 10 in Figure 4-2.1 in Part4, 2.2 "Main PCB for Hydronic System").
2. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Part 2, 1.2 "Hydronic Box Layout" and to Table 4-5.3 in Part 4, 5.1 "Temperature Sensor Resistance Characteristics".
3. Restart the unit in cooling mode to change the refrigerant flow direction. If the unit does not operate normally, the 4-way valve is blocked or damaged.

13.24 C7 Troubleshooting

13.24.1 Digital display output
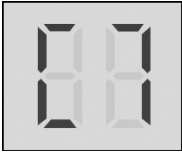
13.24.2 Description

- Transducer module temperature too high protection
- Yukon Split stops running.
- Error code is displayed on hydronic box main PCB and user interface.

13.24.3 Possible causes

- Power supply voltage of the unit is low.
- The space between the units is too narrow for heat exchanger.
- Heat exchanger is dirty or something is block on the surface.
- Fan is not running.
- Water flow rate is low.
- Water outlet temp. sensor is loosen or broken.

13.24.4 Procedure
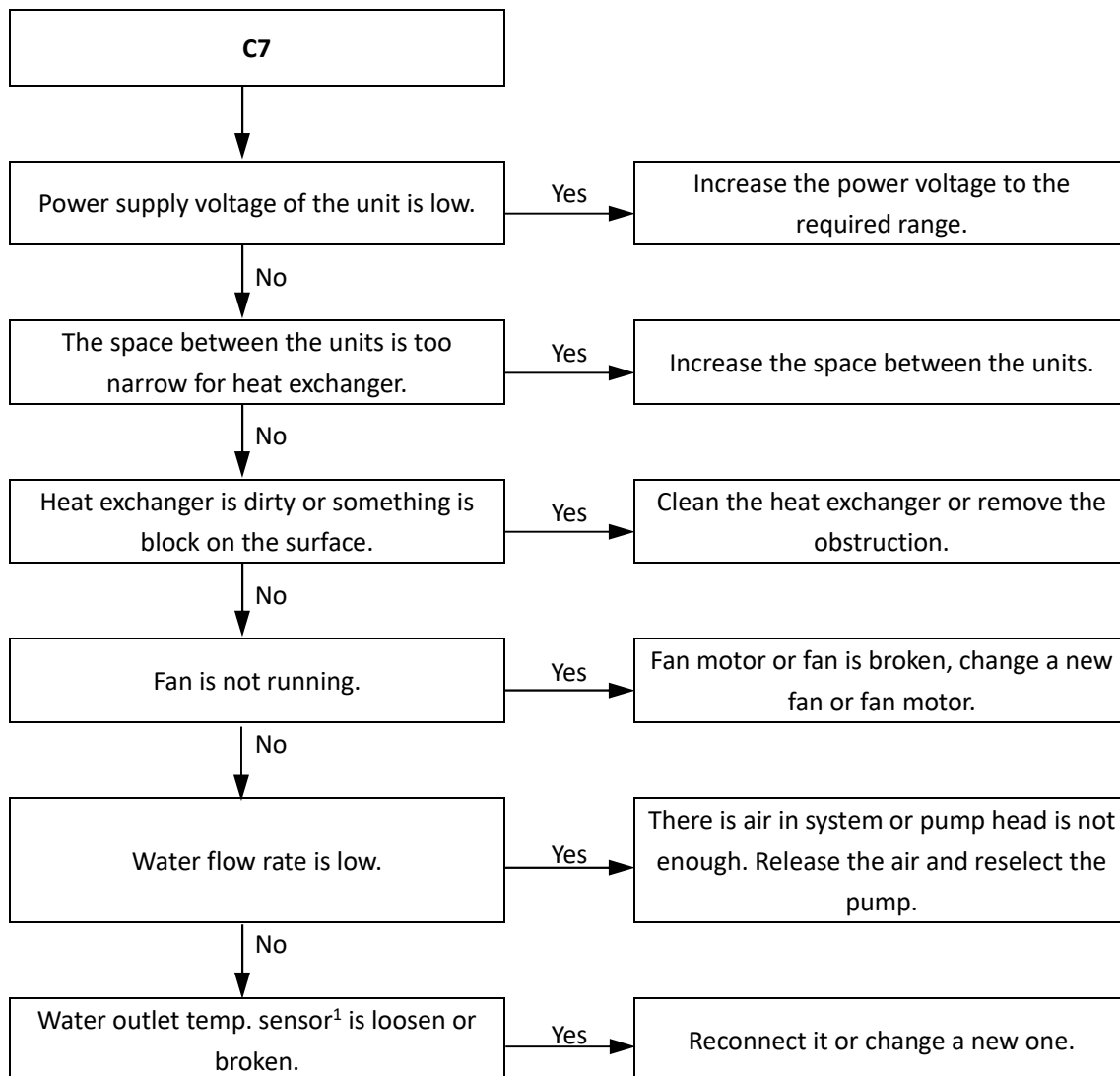
```
                          ┌─────────────────────┐
                          │         C7          │
                          └──────────┬──────────┘
                                     │
                                     ▼
        ┌────────────────────────────────────┐   Yes   ┌────────────────────────────────────┐
        │ Power supply voltage of the unit    │ ──────> │ Increase the power voltage to the  │
        │ is low.                             │         │ required range.                    │
        └────────────────┬───────────────────┘         └────────────────────────────────────┘
                         │ No
                         ▼
        ┌────────────────────────────────────┐   Yes   ┌────────────────────────────────────┐
        │ The space between the units is too  │ ──────> │ Increase the space between the     │
        │ narrow for heat exchanger.          │         │ units.                             │
        └────────────────┬───────────────────┘         └────────────────────────────────────┘
                         │ No
                         ▼
        ┌────────────────────────────────────┐   Yes   ┌────────────────────────────────────┐
        │ Heat exchanger is dirty or          │ ──────> │ Clean the heat exchanger or remove │
        │ something is block on the surface.  │         │ the obstruction.                   │
        └────────────────┬───────────────────┘         └────────────────────────────────────┘
                         │ No
                         ▼
        ┌────────────────────────────────────┐   Yes   ┌────────────────────────────────────┐
        │ Fan is not running.                 │ ──────> │ Fan motor or fan is broken, change │
        │                                     │         │ a new fan or fan motor.            │
        └────────────────┬───────────────────┘         └────────────────────────────────────┘
                         │ No
                         ▼
        ┌────────────────────────────────────┐   Yes   ┌────────────────────────────────────┐
        │ Water flow rate is low.             │ ──────> │ There is air in system or pump     │
        │                                     │         │ head is not enough. Release the    │
        │                                     │         │ air and reselect the pump.         │
        └────────────────┬───────────────────┘         └────────────────────────────────────┘
                         │ No
                         ▼
        ┌────────────────────────────────────┐   Yes   ┌────────────────────────────────────┐
        │ Water outlet temp. sensor[1] is     │ ──────> │ Reconnect it or change a new one.  │
        │ loosen or broken.                   │         │                                    │
        └────────────────────────────────────┘         └────────────────────────────────────┘
```

Notes:
1. Water side heat exchanger water inlet temperature sensor and water side heat exchanger water outlet temperature sensor connections are port CN6 on the hydronic box main PCB (labeled 10 in Figure 4-2.1 in Part4, 2.2 "Main PCB for Hydronic System").
2. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Part 2, 1.2 "Hydronic Box Layout" and to Table 4-5.3 in Part 4, 5.1 "Temperature Sensor Resistance Characteristics".

13.25 bH Troubleshooting

13.25.1 Digital display output
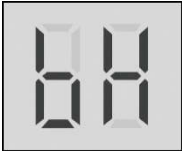
13.25.2 Description

▪ PED PCB failure
▪ Yukon Split stops running.
▪ Error code is displayed on hydronic box main PCB and user interface.

13.25.3 Possible causes

▪ Power supply problem.
▪ PED board broken.
▪ IPM module broken.

13.25.4 Procedure

```
                    ┌─────────────────────────┐
                    │           bH            │
                    └────────────┬────────────┘
                                 │
                                 ▼
┌─────────────────────────┐   Yes   ┌─────────────────────────┐
│ Power supply problem.   │ ──────▶ │ Increase the power      │
│ After 5 minutes of      │         │ voltage to the          │
│ power-off interval,     │         │ required range.         │
│ power on again and      │         └─────────────────────────┘
│ observe whether it can  │
│ be recovered.           │
└────────────┬────────────┘
             │ No
             ▼
┌─────────────────────────┐   Yes   ┌─────────────────────────┐
│ PED¹ board broken.      │ ──────▶ │ Replace PED PCB and     │
│                         │         │ power on again.         │
└────────────┬────────────┘         └─────────────────────────┘
             │ No
             ▼
┌─────────────────────────┐   Yes   ┌─────────────────────────┐
│ IPM module broken.      │ ──────▶ │ Replace IPM module and  │
│                         │         │ power on again.         │
└─────────────────────────┘         └─────────────────────────┘
```
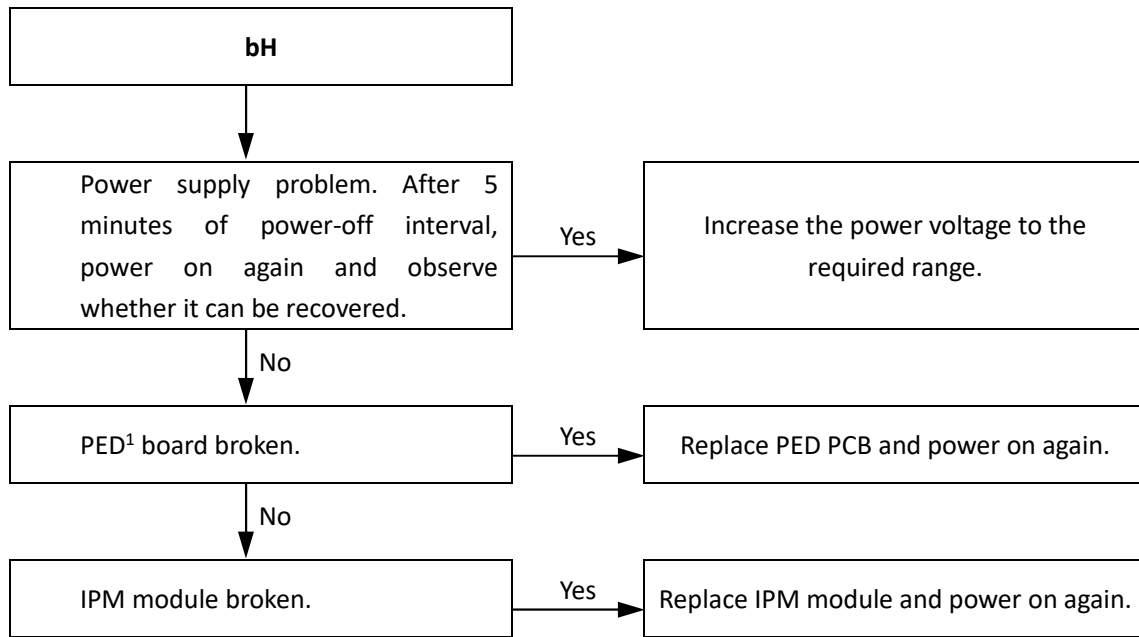
Notes:
1.   PED is port CN22 on the hydronic box main PCB (labeled 11 in Figure 4-2.7: MSH-120/140/160EB-3 outdoor unit inverter module).

13.26 Pb Troubleshooting

13.26.1 Digital display output

13.26.2 Description

▪ Water side heat exchanger anti-freeze protection.

▪ Yukon Split stops running.

▪ Error code is displayed on hydronic box main PCB and **ANTI.FREEZE** icon is displayed on user interface.

13.26.3 Possible causes

▪ Normal system protection.

▪ Temperature sensor not connected properly or has malfunctioned.

▪ Hydronic box main PCB damaged.

13.26.4 Procedure

```
                              ┌────────────────────────────┐
                              │             Pb             │
                              └────────────────────────────┘
                                           │
                                           ▼
┌──────────────────────────────────────────────┐         ┌──────────────────────────────┐
│ 1. Outdoor ambient temperature ≤ 3°C and     │         │  Normal system protection. The│
│    water side heat exchanger water outlet     │  Yes    │     system will resume        │
│    temperature/water inlet                    │ ──────▶ │    automatically[1]           │
│    temperature/backup electric heater outlet  │         │                               │
│    water temperature＜5℃                      │         │                               │
│ 2. Water side heat exchanger water outlet     │         │                               │
│    temperature/water inlet                    │         │                               │
│    temperature/backup electric heater outlet  │         │                               │
│    water temperature＜2℃                      │         │                               │
└──────────────────────────────────────────────┘         └──────────────────────────────┘
                          │ No
                          ▼
┌──────────────────────────────────────────────┐         ┌──────────────────────────────┐
│ Water side heat exchanger water outlet        │  Yes    │  Ensure the temperature sensor│
│ temperature sensor, water inlet temperature   │ ──────▶ │    is connected properly      │
│ sensor or backup electric heater outlet       │         │                               │
│ water temperature sensor loose[2]             │         │                               │
└──────────────────────────────────────────────┘         └──────────────────────────────┘
                          │ No
                          ▼
┌──────────────────────────────────────────────┐         ┌──────────────────────────────┐
│ Water side heat exchanger water outlet        │  Yes    │  Replace the temperature sensor│
│ temperature sensor, water inlet temperature   │ ──────▶ │                               │
│ sensor or backup electric heater outlet       │         │                               │
│ water temperature sensor has short-circuited  │         │                               │
│ or failed[3]                                  │         │                               │
└──────────────────────────────────────────────┘         └──────────────────────────────┘
                          │ No
                          ▼
┌──────────────────────────────────────────────┐
│            Replace outdoor main PCB           │
└──────────────────────────────────────────────┘
```

Notes:

1. Refer to Part 3, 5.7 "Water Side Heat Exchanger Anti-freeze Protection Control".
2. Final outlet water temperature sensor, water side heat exchanger water inlet temperature sensor and water side heat exchanger water outlet temperature sensor connections are port CN6 on the hydronic box main PCB (labeled 10 in Figure 4-2.1 in Part4, 2.2 "Main PCB for Hydronic System").
3. Measure Pb sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Part 2, 1.2 "Hydronic Box Layout" and to Table 4-5.3 in Part 4, 5.1 "Temperature Sensor Resistance Characteristics".

14 Appendix to Part 4

14.1 Temperature Sensor Resistance Characteristics
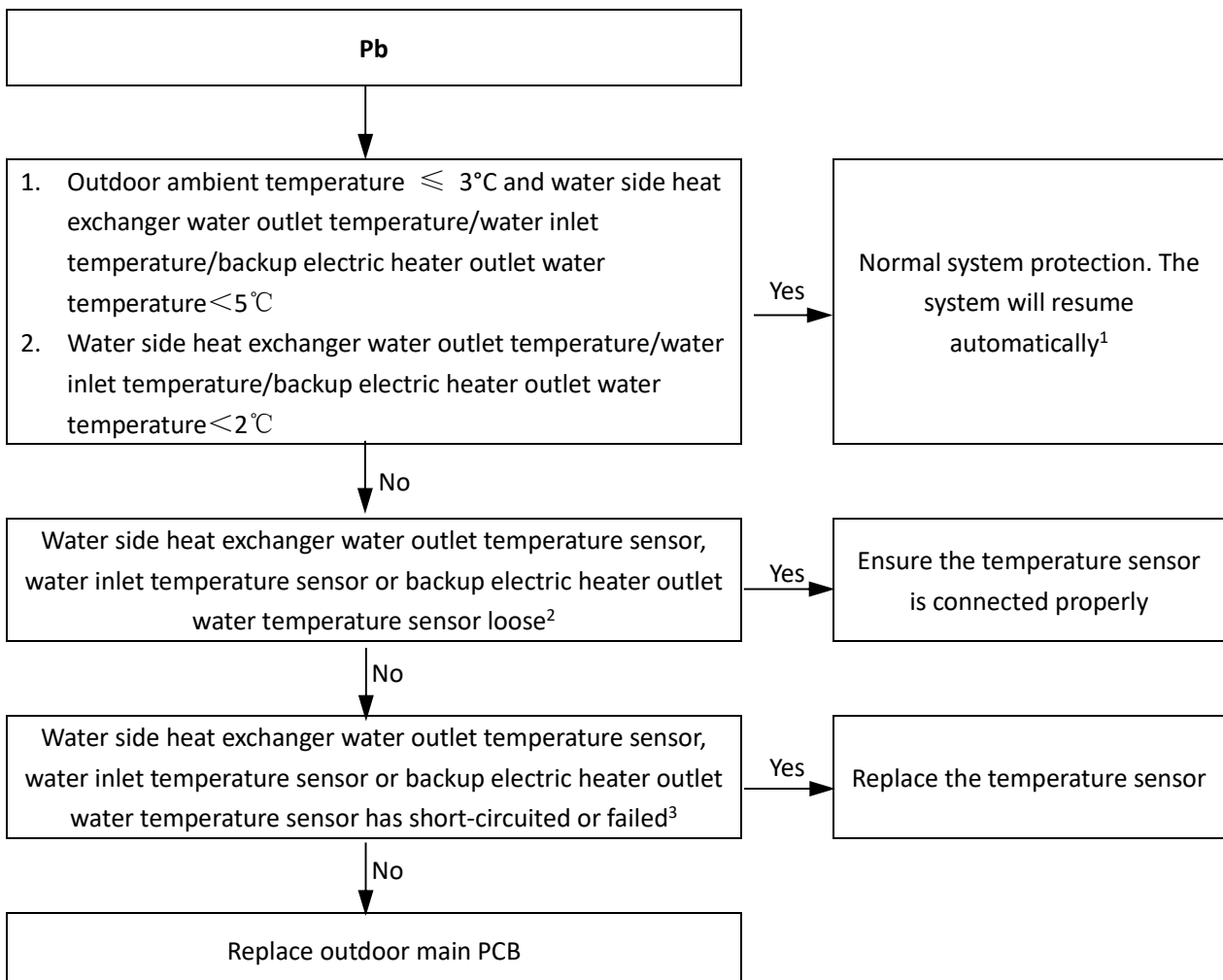
Table 4-5.1: Outdoor ambient temperature sensor, water side heat exchanger refrigerant inlet / outlet (liquid / gas pipe) temperature sensor, air side heat exchanger refrigerant out temperature sensor and suction pipe temperature sensor resistance characteristics

Temperature (°C)	Resistance (kΩ)	Temperature (°C)	Resistance (kΩ)	Temperature (°C)	Resistance (kΩ)	Temperature (°C)	Resistance (kΩ)
-25	144.266	15	16.079	55	2.841	95	0.708
-24	135.601	16	15.313	56	2.734	96	0.686
-23	127.507	17	14.588	57	2.632	97	0.666
-22	119.941	18	13.902	58	2.534	98	0.646
-21	112.867	19	13.251	59	2.44	99	0.627
-20	106.732	20	12.635	60	2.35	100	0.609
-19	100.552	21	12.05	61	2.264	101	0.591
-18	94.769	22	11.496	62	2.181	102	0.574
-17	89.353	23	10.971	63	2.102	103	0.558
-16	84.278	24	10.473	64	2.026	104	0.542
-15	79.521	25	10	65	1.953	105	0.527
-14	75.059	26	9.551	66	1.883		
-13	70.873	27	9.125	67	1.816		
-12	66.943	28	8.721	68	1.752		
-11	63.252	29	8.337	69	1.69		
-10	59.784	30	7.972	70	1.631		
-9	56.524	31	7.625	71	1.574		
-8	53.458	32	7.296	72	1.519		
-7	50.575	33	6.982	73	1.466		
-6	47.862	34	6.684	74	1.416		
-5	45.308	35	6.401	75	1.367		
-4	42.903	36	6.131	76	1.321		
-3	40.638	37	5.874	77	1.276		
-2	38.504	38	5.63	78	1.233		
-1	36.492	39	5.397	79	1.191		
0	34.596	40	5.175	80	1.151		
1	32.807	41	4.964	81	1.113		
2	31.12	42	4.763	82	1.076		
3	29.528	43	4.571	83	1.041		
4	28.026	44	4.387	84	1.007		
5	26.608	45	4.213	85	0.974		
6	25.268	46	4.046	86	0.942		
7	24.003	47	3.887	87	0.912		
8	22.808	48	3.735	88	0.883		
9	21.678	49	3.59	89	0.855		
10	20.61	50	3.451	90	0.828		
11	19.601	51	3.318	91	0.802		
12	18.646	52	3.191	92	0.777		

| 13 | 17.743 | 53 | 3.069 | 93 | 0.753 | | |
| 14 | 16.888 | 54 | 2.952 | 94 | 0.73 | | |

Table 4-5.2: Compressor discharge pipe temperature sensor resistance characteristics

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

Table 4-5.3: Water side *heat exchanger water inlet / outlet temperature sensor, final outlet water temperature sensor and DHW temperature sensor resistance characteristics*

Temperature (°C)	Resistance (kΩ)	Temperature (°C)	Resistance (kΩ)	Temperature (°C)	Resistance (kΩ)	Temperature (°C)	Resistance (kΩ)
-30	867.29	10	98.227	50	17.600	90	4.4381
-29	815.80	11	93.634	51	16.943	91	4.3022
-28	767.68	12	89.278	52	16.315	92	4.1711
-27	722.68	13	85.146	53	15.713	93	4.0446
-26	680.54	14	81.225	54	15.136	94	3.9225
-25	641.07	15	77.504	55	14.583	95	3.8046
-24	604.08	16	73.972	56	14.054	96	3.6908
-23	569.39	17	70.619	57	13.546	97	3.5810
-22	536.85	18	67.434	58	13.059	98	3.4748
-21	506.33	19	64.409	59	12.592	99	3.3724
-20	477.69	20	61.535	60	12.144	100	3.2734
-19	450.81	21	58.804	61	11.715	101	3.1777
-18	425.59	22	56.209	62	11.302	102	3.0853
-17	401.91	23	53.742	63	10.906	103	2.9960
-16	379.69	24	51.396	64	10.526	104	2.9096
-15	358.83	25	49.165	65	10.161	105	2.8262
-14	339.24	26	47.043	66	9.8105		
-13	320.85	27	45.025	67	9.4736		
-12	303.56	28	43.104	68	9.1498		
-11	287.33	29	41.276	69	8.8387		
-10	272.06	30	39.535	70	8.5396		
-9	257.71	31	37.878	71	8.2520		
-8	244.21	32	36.299	72	7.9755		
-7	231.51	33	34.796	73	7.7094		
-6	219.55	34	33.363	74	7.4536		
-5	208.28	35	31.977	75	7.2073		
-4	197.67	36	30.695	76	6.9704		
-3	187.66	37	29.453	77	6.7423		
-2	178.22	38	28.269	78	6.5228		
-1	168.31	39	27.139	79	6.3114		
0	160.90	40	26.061	80	6.1078		
1	152.96	41	25.031	81	5.9117		
2	145.45	42	24.048	82	5.7228		
3	138.35	43	23.109	83	5.5409		
4	131.64	44	22.212	84	5.3655		
5	125.28	45	21.355	85	5.1965		
6	119.27	46	20.536	86	5.0336		
7	113.58	47	19.752	87	4.8765		
8	108.18	48	19.003	88	4.7251		

9	103.07	49	18.286	89	4.5790

15 Yukon Split System

15.1 System Schematic
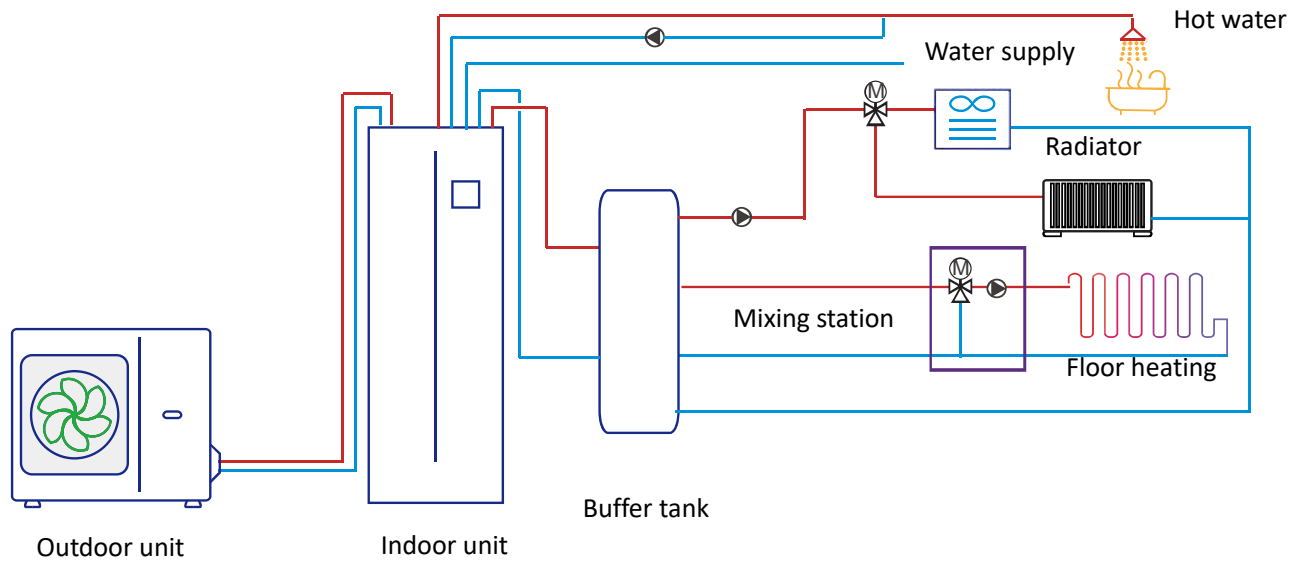
Yukon is an integrated air-to-water heat pump system which is one-stop solution for space heating, space cooling and domestic hot water. The outdoor heat pump system extracts heat from the outdoor air and transfers this heat through refrigerant piping to the plate heat exchanger in the hydro module with water tank. The heated water in the hydro module circulates to low temperature heat emitters (under-floor heating loops or low temperature radiators) to provide space heating. The 4-way valve in the outdoor unit can reverse the refrigerant cycle so that the hydro module can provide chilled water for cooling using fan coil units. Because the water tank is integrated design in the hydro module, so it can provide hot water directly to the users.

The heating capacity of heat pumps decreases with ambient temperature dropping. Backup electric heater is standard equipped to provide additional heating capacity for use during extremely cold weather when the heat pump capacity is insufficient.

15.2 System Configurations

Yukon Split is configured to run with the electric heater either and can also be used in conjunction with an auxiliary heat source such as a boiler.

The chosen configuration affects the size of heat pump that is required. Three typical configurations are described below.

Configuration 1: Heat pump only

- The heat pump covers the required capacity and no extra heating capacity is necessary.
- Requires selection of larger capacity heat pump and implies higher initial investment.
- Ideal for new construction in projects where energy efficiency is paramount.

Configuration 2: Heat pump and backup electric heater (Hydro module with water tank is standard with 3kW backup electric heater)

- Heat pump covers the required capacity until the ambient temperature drops below the point at which the heat pump is able to provide sufficient capacity. When the ambient temperature is below this equilibrium point, the backup electric heater supplies the required additional heating capacity.
- Best balance between initial investment and running costs, results in lowest lifecycle cost.
- Ideal for new construction.

Configuration 3: Heat pump conjunction with auxiliary heat source

- Heat pump covers the required capacity until the ambient temperature drops below the point at which the heat pump is able to provide sufficient capacity. When the ambient temperature is below this equilibrium point, depending on the system settings, either the auxiliary heat source supplies the required additional heating capacity or the heat pump does not run and the auxiliary heat source covers the required capacity.
- Enables selection of lower capacity heat pump.
- Ideal for refurbishments and upgrades.

System configurations
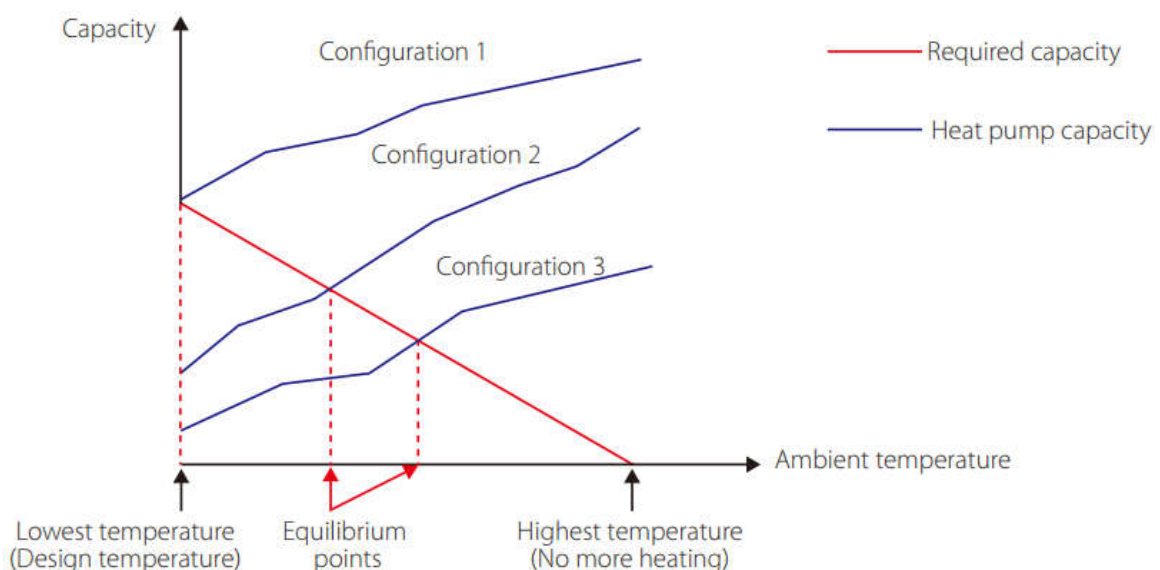
16 Unit Capacities

16.1 Outdoor unit

Model MSH-	MSH-40EB	MSH-60EB
Power Supply (V/Ph/Hz)	220-240/1 /50	220-240/1 /50
Appearance		

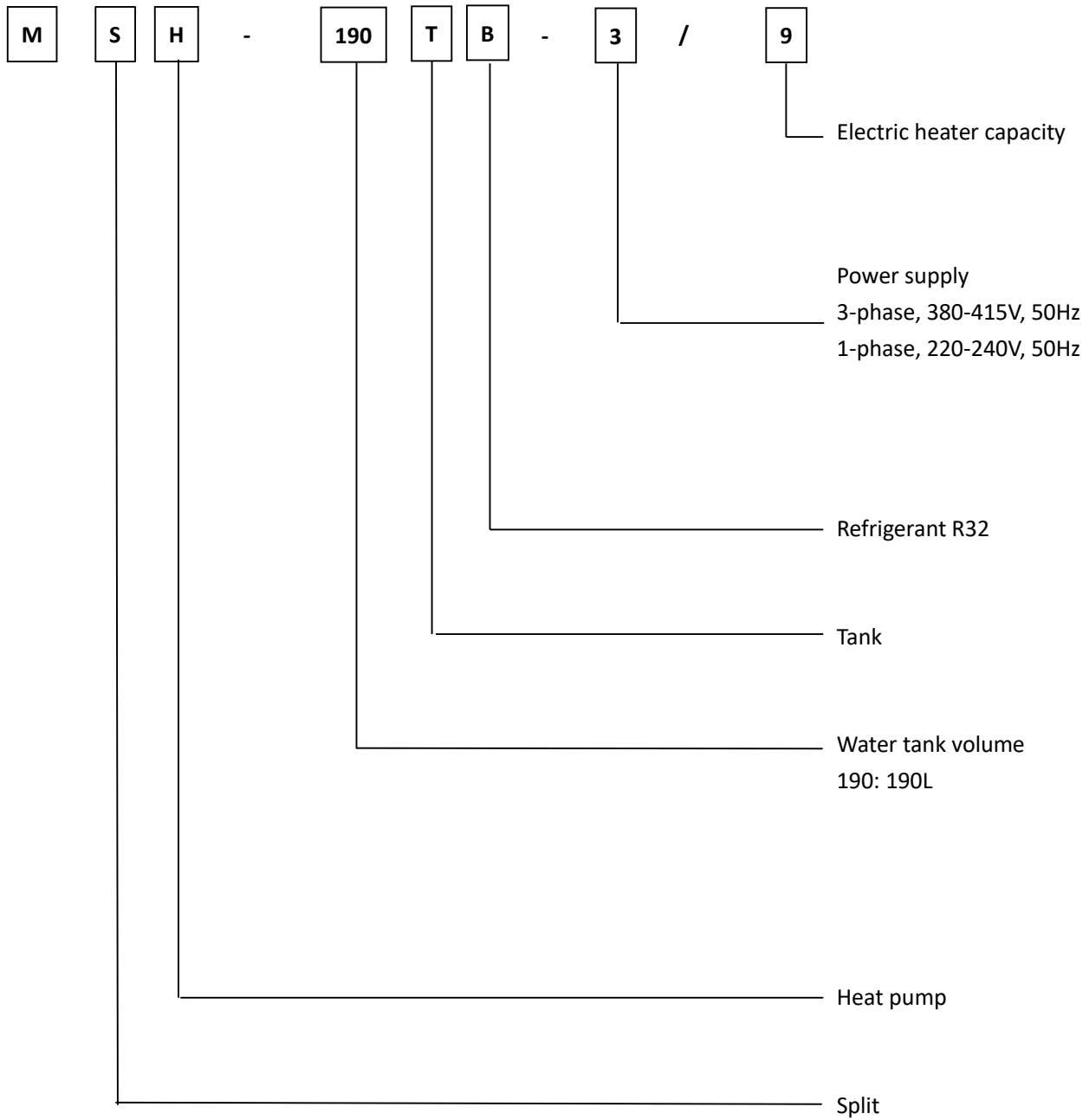| Model MSH-	MSH-80EB	MSH-100EB	MSH-120EB	MSH-120EB-3	MSH-140EB	MSH-140EB-3	MSH-160EB	MSH-160EB-3
Power Supply (V/Ph/Hz)	220-240/1/50	220-240/1/50	220-240/1/50	380-415/3/50	220-240/1/50	380-415/3/50	220-240/1/50	380-415/3/50
Appearance								

16.2 Hydro module with water tank

Model	MSH-190TB/3	MSH-190TB/3/9	MSH-240TB/3	MSH-240TB/3/9
Power Supply (V/Ph/Hz)	220-240/1 /50	380-415/3 /50	220-240/1 /50	380-415/3 /50
Compatible outdoor unit model	MSH-60EB	MSH-80EB MSH-100EB	MSH-120EB MSH-140EB MSH-160EB	MSH-120EB-3 MSH-140EB-3 MSH-160EB-3
Appearance				

17 Nomenclature

17.1 Outdoor unit

| M | S | H | - | 60 | E | B | - | 3 | / | 9 |

Electric heater capacity

Power supply
3-phase, 380-415V, 50Hz
1-phase, 220-240V, 50Hz

Refrigerant R32

External

Capacity index: The capacity in kW (6kW)

Heat pump

Split

17.2 Hydro module with water tank

| M | S | H | - | 190 | T | B | - | 3 | / | 9 |

Electric heater capacity

Power supply
3-phase, 380-415V, 50Hz
1-phase, 220-240V, 50Hz

Refrigerant R32

Tank

Water tank volume
190: 190L

Heat pump

Split
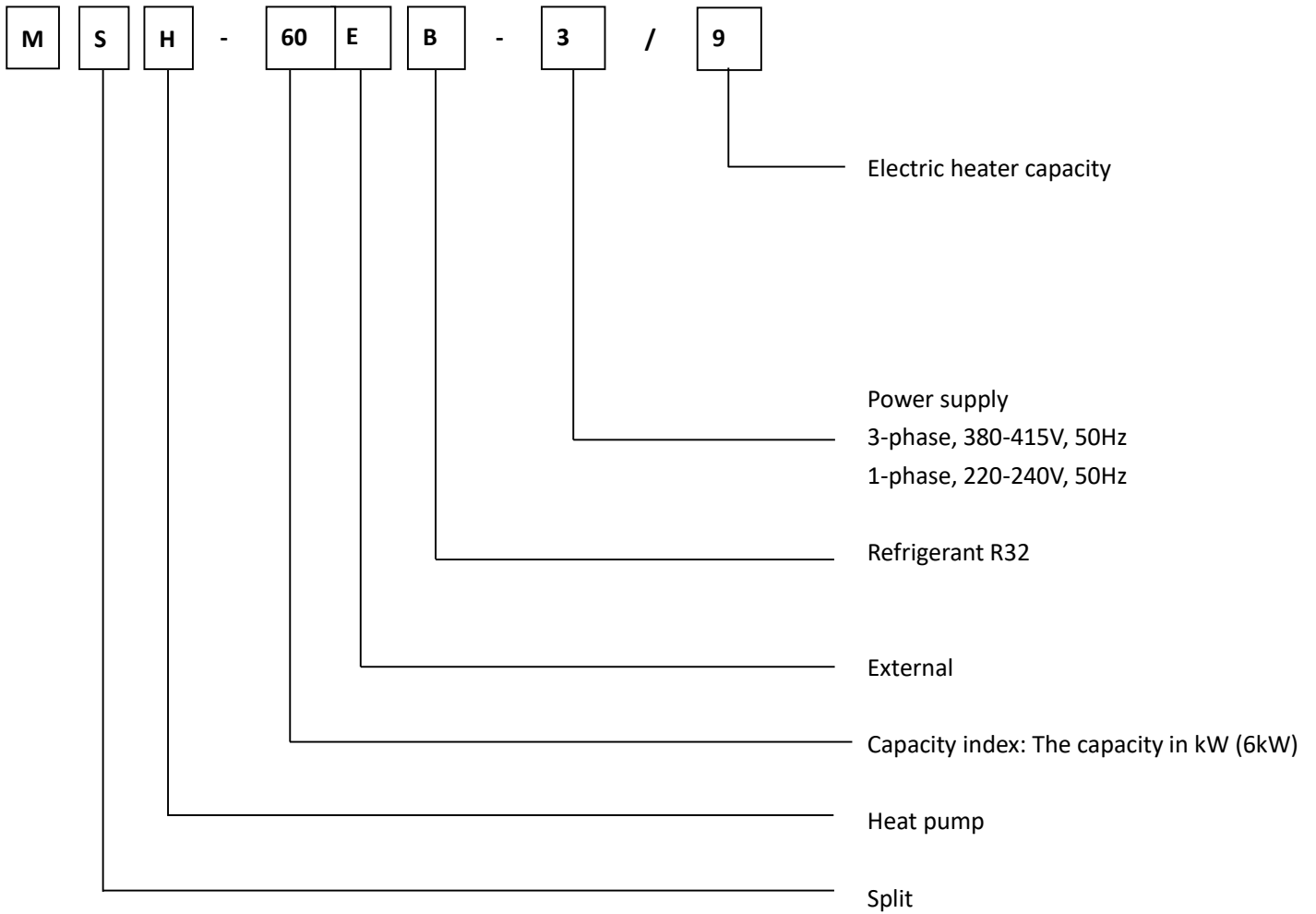
18 System Design and Unit Selection

18.1 Selection procedure

Step 1: Total heat load calculation

> Calculate conditioned surface area
> Select the heat emitters (type, quantity, water temperature and heat load)

Step 2: System configuration

> Decide whether to include AHS and set AHS's switching temperature
> Decide whether backup electric heater is enabled or disabled

Step 3: Selection of outdoor units

> Determine required total heat load on outdoor units
> Set capacity safety factor
> Select power supply

> Provisionally select Yukon Split unit capacity based on nominal capacity

> Correct capacity of the outdoor units for the following items:
> Outdoor air temperature / Outdoor humidity / Water outlet temperature[1] / Altitude / Anti-freeze fluid

> Is corrected Yukon Split unit capacity ≥ Required total heat load on outdoor units[2]

Yes

No

> Yukon Split system selection is complete

> Select a larger model or enable backup electric heater operation

Notes:
1. If the required water temperatures of the heat emitters are not all the same, the Yukon Split's outlet water temperature setting should be set at the highest of the heat emitter required water temperatures. If the water outlet design temperature falls between two temperatures listed in the outdoor unit's capacity table, calculate the corrected capacity by interpolation.
2. If the outdoor unit selection is to be based on total heating load and total cooling load, select Split units which satisfy both total heating and cooling load requirements.

18.2 Yukon Leaving Water Temperature (LWT) Selection

The recommended design LTW ranges for different types of heat emitter are:

- For floor heating: 30 to 35°C
- For fan coil units: 40 to 45°C
- For low temperature radiators: 40 to 50°C

18.3 Optimizing System Design

To get the most comfort with the lowest energy consumption with Yukon, it is important to take account of the following considerations:

- Choose heat emitters that allow the heat pump system to operate at as low a hot water temperature as possible whilst still providing sufficient heating.
- Make sure the correct weather dependency curve is selected to match the installation environment (building structure, climate) as well as ender user's demands.
- Connecting room thermostats (field supplied) to the hydro system helps prevent excessive space heating by stopping the outdoor unit and circulator pump when the room temperature is above the thermostat set point.

18.4 Tank back up heater notice

Heat pump will stop when T5(tank temperature) has reached the minimum of both T5S(tank setting temperature) and T5stop (highest tank temperature which can be reached under certain ambient temperature with heat pump only) and lasted for 5s. The value of T5stop is shown as below.

If T5S is higher than T5stop, then T5S can not be reached with heat pump only. In this case, tank back up heater is needed in order to reach T5S.

T5stop value:

Ambient temperature(℃)	< -20	-20~15	-15~-10	-10~-5	-5~0	0~5	5~10
T5stop(℃)	35	40	45	48	52	55	56

Ambient temperature(℃)	10~15	15~20	20~25	25~30	35~40	40~65	40~65
T5stop(℃)	57	56	55	52	50	48	45

19 Specifications

Outdoor Unit Model				MSH-40EB	MSH-60EB	MSH-80EB	MSH-100EB
Indoor Unit Model				MSH-190TB/3			
Heating	A7W35	Capacity	kW	4.25	6.20	8.30	10.00
		Rated input	kW	0.82	1.24	1.60	2.00
		COP		5.20	5.00	5.20	5.00
	A7W45	Capacity	kW	4.35	6.35	8.20	10.00
		Rated input	kW	1.14	1.69	2.08	2.63
		COP		3.80	3.75	3.95	3.80
	A-7W35	Capacity	kW	4.8	6.10	7.10	8.25
		Rated input	kW	1.52	2.00	2.18	2.62
		COP		3.15	3.05	3.25	3.15
	A-7W55	Capacity	kW	4.00	5.15	6.15	6.85
		Rated input	kW	2.05	2.58	3.00	3.43
		COP		1.95	2.00	2.05	2.00

Cooling	A35W18	Capacity	kW	4.50	6.55	8.40	10.00
		Rated input	kW	0.81	1.34	1.66	2.08
		EER		5.55	4.90	5.05	4.80
	A35W7	Capacity	kW	4.70	7.00	7.40	8.20
		Rated input	kW	1.36	2.33	2.19	2.48
		EER		3.45	3.00	3.38	3.30
DHW	Tapping profile according EN16147			L			
	Water heating energy efficiency class(1)	Warm climate	class	A+	A+	A+	A+
			COP	3.80	3.80	3.66	3.66
		Average climate	class	A+	A+	A+	A+
			COP	3.10	3.10	3.02	3.02
		Cold climate	class	A	A	A	A
			COP	2.50	2.50	2.61	2.61
Seasonal space heating energy efficiency class(2)		Water outlet at 35°C	class	A+++	A+++	A+++	A+++
			SCOP	4.85	4.95	5.21	5.19
		Water outlet at 55°C	class	A++	A++	A++	A++
			SCOP	3.31	3.52	3.36	3.49
Rated water flow			m³/h	0.73	1.07	1.43	1.72
Outdoor Unit	Power supply		V/Ph/Hz	220-240/1/50			
	Rated input		W	2200	2600	3300	3600
	Rated current		A	10.5	12.0	14.5	16.0
	Unit dimension (W×H×D)		mm	1008×712×426		1118×865×523	
	Packing dimension (W×H×D)		mm	1065×810×485		1190×970×560	
	Net/Gross weight		kg	60 / 65.5		78.5 / 92	
	Refrigerant	Type(GWP)		R32(675)			
		Charged volume	kg	1.50		1.65	
		Refrigerant to be added	g/m	20		38	
	Refrigerant piping connections	Liquid/Gas side	mm	φ6.35 / φ15.9		φ9.52 / φ15.9	
		Max. piping length	m	30			
		Max. difference in height	m	20			
	Drain connection			DN32			
	Outdoor unit sound Power Level(3)		dB	56	58	59	60
	Ambient temperature range	Heating	°C	-25～35			
		Cooling	°C	-5～43			
		Domestic hot water	°C	-25～43			
Indoor Unit	Power supply		V/Ph/Hz	220-240/1/50			
	Rated input		W	3095			
	Rated current		A	13.5			
	DHW Tank	Type		Stainless steel			
		Material	-	SUS 316L			
		Water Volume	l	190			
		Maximum water temperature(Disinfection mode)	°C	70			

				MSH-80EB	MSH-100EB
	Maximum water pressure limit		bar	10	
	Insulation	Material	-	Polyurethane（Cyclopentane）	
		Thickness	mm	45	
Heat Exchanger				Plate heat exchanger	
Backup E-heater	Standard mounted		kW	3	
	Capacity steps			1	
Water Pump	Type			DC-inventer	
	Max. head		m	9	
Expansion vessel	Volume		L	8	
Water Piping connection	Water circuit	Inlet		R1''	
		Outlet			
	DHW tank water circuit	Cold Inlet		R3/4''	
		Hot Outlet			
		Recirculation			
Unit dimension (W×H×D)			mm	600*600*1683	
Packing dimension (W×H×D)			mm	730*730*1920	
Net/Gross weight			kg	140 / 161	
Ambient temperature range			℃	5～35	
LWT setting range	Heating		℃	25～65	
	Cooling		℃	5～25	
	Domestic hot water		℃	30～60	
Indoor unit sound Power Level(3)			dB	38	40

Notes:

(1)According to EN16147/2017;EU No:811/2013

(2)According to EN14511/2018; EN14825/2018; EU No:811/2013

(3)Sound power in heating mode, measured according to the EN 12102 under conditions of the EN 14825

Outdoor Unit Model				MSH-80EB	MSH-100EB
Indoor Unit Model				MSH-190TB-3/9	
Heating	A7W35	Capacity	kW	8.30	10.00
		Rated input	kW	1.60	2.00
		COP		5.20	5.00
	A7W45	Capacity	kW	8.20	10.00
		Rated input	kW	2.08	2.63
		COP		3.95	3.80
	A-7W35	Capacity	kW	7.10	8.25
		Rated input	kW	2.18	2.62
		COP		3.25	3.15
	A-7W55	Capacity	kW	6.15	6.85
		Rated input	kW	3.00	3.43
		COP		2.05	2.00

Cooling	A35W18	Capacity	kW	8.40	10.00
		Rated input	kW	1.66	2.08
		EER		5.05	4.80
	A35W7	Capacity	kW	7.40	8.20
		Rated input	kW	2.19	2.48
		EER		3.38	3.30
DHW	Tapping profile according EN16147			XL	
	Water heating energy efficiency class(1)	Warm climate	class	A+	A+
			COP	4.18	4.18
		Average climate	class	A+	A+
			COP	3.36	3.36
		Cold climate	class	A	A
			COP	2.72	2.72
Seasonal space heating energy efficiency class(2)		Water outlet at 35°C	class	A+++	A+++
			SCOP	5.21	5.19
		Water outlet at 55°C	class	A++	A++
			SCOP	3.36	3.49
Rated water flow			m³/h	1.43	1.72
Outdoor Unit	Power supply		V/Ph/Hz	220-240/1/50	
	Rated input		W	3300	3600
	Rated current		A	14.5	16.0
	Unit dimension (W×H×D)		mm	1118×865×523	
	Packing dimension (W×H×D)		mm	1190×970×560	
	Net/Gross weight		kg	75 / 89	
	Refrigerant	Type(GWP)		R32(675)	
		Charged volume	kg	1.65	
		Refrigerant to be added	g/m	38.00	
	Refrigerant piping connections	Liquid/Gas side	mm	φ9.52 / φ15.9	
		Max. piping length	m	30	
		Max. difference in height	m	20	
	Drain connection			DN32	
	Outdoor unit sound Power Level(3)		dB	59	60
	Ambient temperature range	Heating	℃	-25～35	
		Cooling	℃	-5～43	
		Domestic hot water	℃	-25～43	
Indoor Unit	Power supply		V/Ph/Hz	380-415/3/50	
	Rated input		W	3095	
	Rated current		A	13.5	
	DHW Tank	Type		Stainless steel	
		Material	-	SUS 316L	
		Water Volume	l	240	
		Maximum water temperature(Disinfection mode)	℃	70	

		Maximum water pressure limit	bar		10
		Insulation	Material	-	Polyurethane（Cyclopentane）
			Thickness	mm	45
	Heat Exchanger				Plate heat exchanger
	Backup E-heater	Standard mounted	kW		9
		Capacity steps			3
	Water Pump	Type			DC Inventer
		Max. head	m		9
	Expansion vessel	Volume	L		8
	Water Piping connection	Water circuit	Inlet		R1
			Outlet		
		DHW tank water circuit	Cold Inlet		R3/4
			Hot Outlet		
			Recirculation		
	Unit dimension (W×H×D)		mm		600*600*1943
	Packing dimension (W×H×D)		mm		730*730*2180
	Net/Gross weight		kg		140 / 161
	Ambient temperature range		℃		5～35
	LWT setting range	Heating	℃		25～65
		Cooling	℃		5～25
		Domestic hot water	℃		30～60
	Indoor unit sound Power Level(3)		dB		40

Notes:

(1)According to EN16147/2017;EU No:811/2013

(2)According to EN14511/2018; EN14825/2018; EU No:811/2013

(3)Sound power in heating mode, measured according to the EN 12102 under conditions of the EN 14825

Outdoor Unit Model				MSH-120EB	MSH-140EB	MSH-160EB
Indoor Unit Model				MSH-240TB/3		
Heating	A7W35	Capacity	kW	12.10	14.50	16.00
		Rated input	kW	2.44	3.09	3.56
		COP		4.95	4.70	4.50
	A7W45	Capacity	kW	12.30	14.20	16.00
		Rated input	kW	3.24	3.89	4.44
		COP		3.80	3.65	3.60
	A-7W35	Capacity	kW	10.00	12.00	13.30
		Rated input	kW	3.33	4.29	4.93
		COP		3.00	2.80	2.70
	A-7W55	Capacity	kW	10.00	11.00	12.50

		Rated input	kW	4.88	5.37	6.19
		COP		2.05	2.05	2.02
Cooling	A35W18	Capacity	kW	12.00	13.50	14.90
		Rated input	kW	3.00	3.75	4.38
		EER		4.00	3.60	3.40
	A35W7	Capacity	kW	11.60	12.70	14.00
		Rated input	kW	4.22	4.98	5.71
		EER		2.75	2.55	2.45
DHW	Tapping profile according EN16147			XL		
	Water heating energy efficiency class(1)	Warm climate	class	A+	A+	A+
			COP	3.73	3.73	3.73
		Average climate	class	A+	A+	A+
			COP	3.00	3.00	3.00
		Cold climate	class	A	A	A
			COP	2.24	2.24	2.24
Seasonal space heating energy efficiency class(2)		Water outlet at 35°C	class	A+++	A+++	A+++
			SCOP	4.81	4.72	4.62
		Water outlet at 55°C	class	A++	A++	A++
			SCOP	3.45	3.47	3.41
Rated water flow			m³/h	2.08	2.49	2.75
Outdoor Unit	Power supply		V/Ph/Hz	220-240/1/50		
	Rated input		W	5400	5700	6100
	Rated current		A	24.5	25.0	26.0
	Unit dimension (W×H×D)		mm	1118×865×523		
	Packing dimension (W×H×D)		mm	1190×970×560		
	Net/Gross weight		kg	97 / 110.5		
	Refrigerant	Type(GWP)		R32(675)		
		Charged volume	kg	1.84		
		Refrigerant to be added	g/m	38		
	Refrigerant piping connections	Liquid/Gas side	mm	φ9.52 / φ15.9		
		Max. piping length	m	30		
		Max. difference in height	m	20		
	Drain connection			DN32		
	Outdoor unit sound Power Level(3)		dB	64	65	68
	Ambient temperature range	Heating	℃	-25～35		
		Cooling	℃	-5～43		
		Domestic hot water	℃	-25～43		
Indoor Unit	Power supply		V/Ph/Hz	220-240/1/50		
	Rated input		W	3095		
	Rated current		A	13.5		
	DHW Tank	Type		Stainless steel		
		Material	-	SUS 316L		
		Water Volume	l	240		
		Maximum water	℃	70		

		temperature(Disinfection mode)					
		Maximum water pressure limit	bar	10			
		Insulation	Material	-	Polyurethane（Cyclopentane）		
			Thickness	mm	45		
	Heat Exchanger				Plate heat exchanger		
	Backup E-heater	Standard mounted	kW	3			
		Capacity steps		1			
	Water Pump	Type		DC Inventer			
		Max. head	m	9			
	Expansion vessel	Volume	L	8			
	Water Piping connection	Water circuit	Inlet	R1''			
			Outlet				
		DHW tank water circuit	Cold Inlet	R3/4''			
			Hot Outlet				
			Recirculation				
	Unit dimension (W×H×D)		mm	600*600*1943			
	Packing dimension (W×H×D)		mm	730*730*2180			
	Net/Gross weight		kg	159 / 180			
	Ambient temperature range		℃	5～35			
	LWT setting range	Heating	℃	25～65			
		Cooling	℃	5～25			
		Domestic hot water	℃	30～60			
	Indoor unit sound Power Level(3)		dB	42	44	44	

Notes:

(1)According to EN16147/2017;EU No:811/2013

(2)According to EN14511/2018; EN14825/2018; EU No:811/2013

(3)Sound power in heating mode, measured according to the EN 12102 under conditions of the EN 14825

Outdoor Unit Model				MSH-120EB-3	MSH-140EB-3	MSH-160EB-3
Indoor Unit Model				MSH-240TB-3/9		
Heating	A7W35	Capacity	kW	12.10	14.50	16.00
		Rated input	kW	2.44	3.09	3.56
		COP		4.95	4.70	4.50
	A7W45	Capacity	kW	12.30	14.20	16.00
		Rated input	kW	3.24	3.89	4.44
		COP		3.80	3.65	3.60
	A-7W35	Capacity	kW	10.00	12.00	13.30
		Rated input	kW	3.33	4.29	4.93

		COP		3.00	2.80	2.70
	A-7W55	Capacity	kW	10.00	11.00	12.50
		Rated input	kW	4.88	5.37	6.19
		COP		2.05	2.05	2.02
Cooling	A35W18	Capacity	kW	12.00	13.50	14.90
		Rated input	kW	3.00	3.75	4.38
		EER		4.00	3.60	3.40
	A35W7	Capacity	kW	11.60	12.70	14.00
		Rated input	kW	4.22	4.98	5.71
		EER		2.75	2.55	2.45
DHW	Tapping profile according EN16147			XL		
	Water heating energy efficiency class(1)	Warm climate	class	A+	A+	A+
			COP	3.73	3.73	3.73
		Average climate	class	A+	A+	A+
			COP	3.00	3.00	3.00
		Cold climate	class	A	A	A
			COP	2.24	2.24	2.24
Seasonal space heating energy efficiency class(2)		Water outlet at 35°C	class	A+++	A+++	A+++
			SCOP	4.81	4.72	4.62
		Water outlet at 55°C	class	A++	A++	A++
			SCOP	3.45	3.47	3.41
Rated water flow			m³/h	2.08	2.49	2.75
Outdoor Unit	Power supply		V/Ph/Hz	380-415/3/50		
	Rated input		W	5400	5700	6100
	Rated current		A	9.0	10.0	11.0
	Unit dimension (W×H×D)		mm	1118×865×523		
	Packing dimension (W×H×D)		mm	1190×970×560		
	Net/Gross weight		kg	112 / 125.5		
	Refrigerant	Type(GWP)		R32(675)		
		Charged volume	kg	1.84		
		Refrigerant to be added	g/m	38		
	Refrigerant piping connections	Liquid/Gas side	mm	φ9.52 / φ15.9		
		Max. piping length	m	30		
		Max. difference in height	m	20		
	Drain connection			DN32		
	Outdoor unit sound Power Level(3)		dB	64	65	68
	Ambient temperature range	Heating	°C	-25～35		
		Cooling	°C	-5～43		
		Domestic hot water	°C	-25～43		
Indoor Unit	Power supply		V/Ph/Hz	380-415/3/50		
	Rated input		W	3095		
	Rated current		A	13.5		
	DHW Tank	Type		Stainless steel		
		Material	-	SUS 316L		

		Water Volume		l	240	
		Maximum water temperature(Disinfection mode)		℃	70	
		Maximum water pressure limit		bar	10	
		Insulation	Material	-	Polyurethane（Cyclopentane）	
			Thickness	mm	45	
	Heat Exchanger				Plate heat exchanger	
	Backup E-heater	Standard mounted		kW	9	
		Capacity steps			3	
	Water Pump	Type			DC Inventer	
		Max. head		m	9	
	Expansion vessel	Volume		L	8	
	Water Piping connection	Water circuit	Inlet		R1''	
			Outlet			
		DHW tank water circuit	Cold Inlet		R3/4''	
			Hot Outlet			
			Recirculation			
	Unit dimension (W×H×D)			mm	600*600*1943	
	Packing dimension (W×H×D)			mm	730*730*2180	
	Net/Gross weight			kg	159 / 180	
	Ambient temperature range			℃	5～35	
	LWT setting range	Heating		℃	25～65	
		Cooling		℃	5～25	
		Domestic hot water		℃	30～60	
	Indoor unit sound Power Level(3)			dB	42	44	44

Notes:

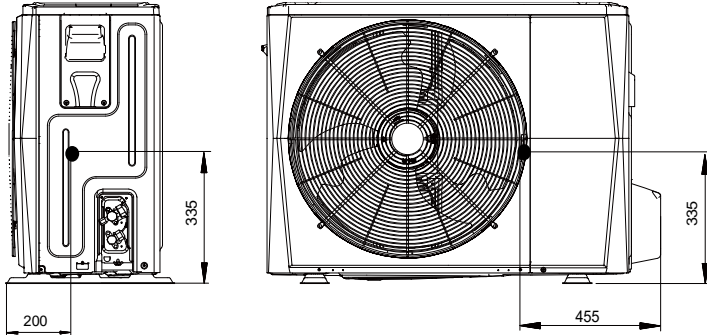(1)According to EN16147/2017;EU No:811/2013

(2)According to EN14511/2018; EN14825/2018; EU No:811/2013

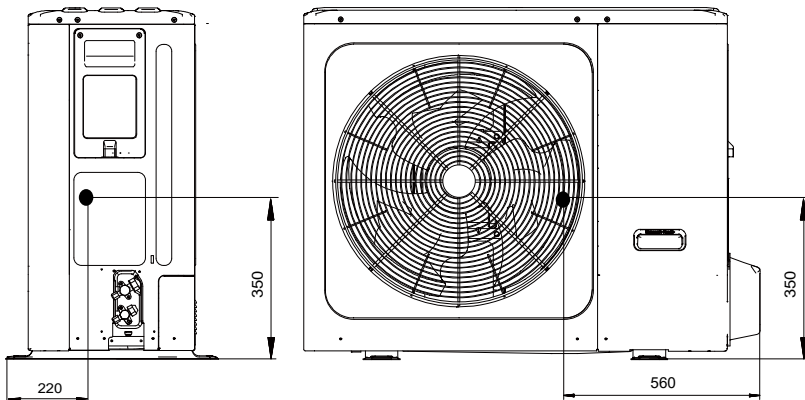(3)Sound power in heating mode, measured according to the EN 12102 under conditions of the EN 14825

20 Dimensions

20.1 Outdoor Unit
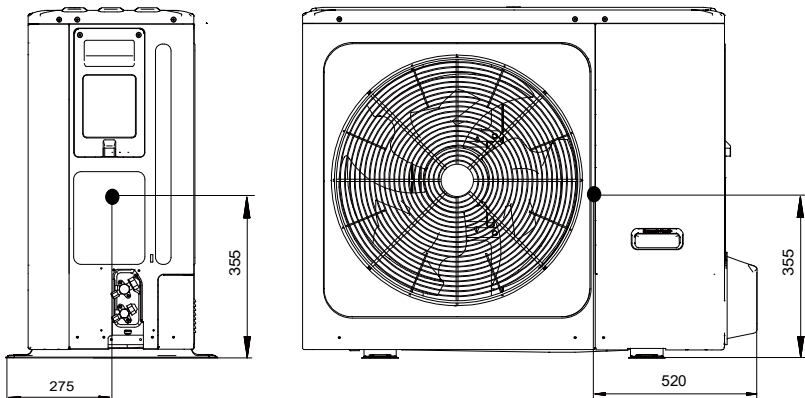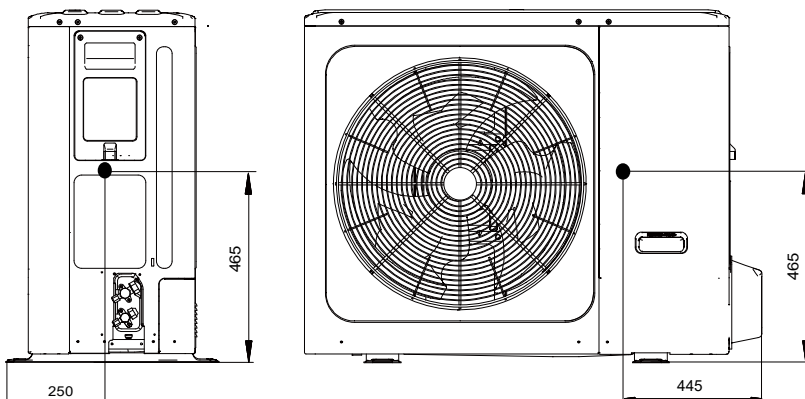
MSH-40EB / MSH-60EB

MSH-80EB / MSH-100EB

MSH-120EB / MSH-140EB / MSH-160EB

MSH-120EB-3 / MSH-140EB-3 / MSH-160EB-3

20.2 Hydro module
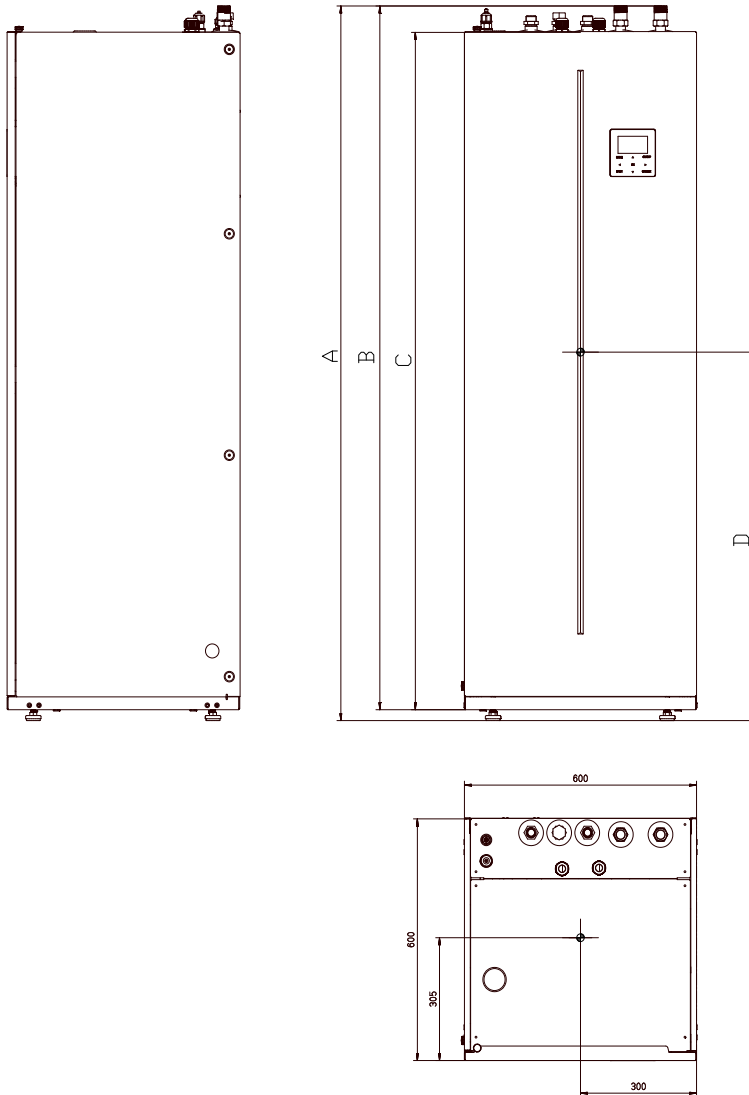
Model	A(mm)	B(mm)	C(mm)	D(mm)
MSH-190TB/3	1775	1748	1682	915
MSH-190TB-3/9	1775	1748	1682	915
MSH-240TB/3	2034	2007	1942	1045
MSH-240TB-3/9	1775	1748	1682	915

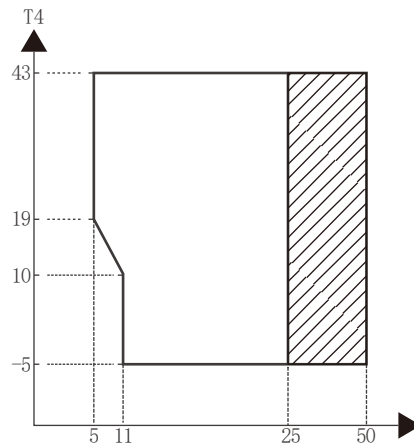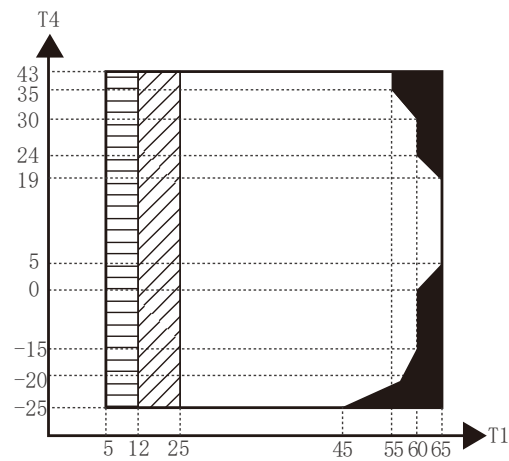# 21 Operating Limits

Heating operating limits[1]
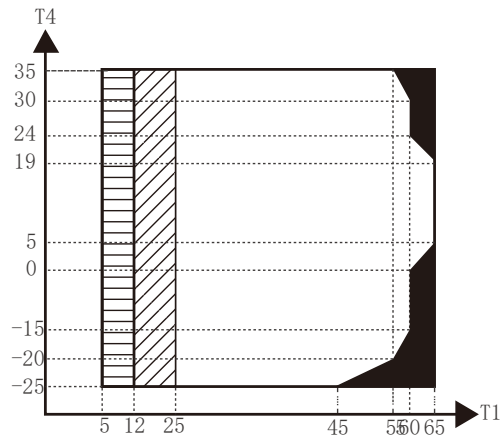
Cooling operating limits

Domestic hot water operating limits[1]

Abbreviations:

T4: Outdoor temperature (°C)

T1: Leaving water temperature (°C)

Notes:

1. ▤ If IBH/AHS setting is valid, only IBH/AHS turns on; If IBH/AHS setting is invalid, only heat pump turns on
2. ▨ Water flow temperature drop or rise interval
3. ▪ IBH/AHS only

22 Capactiy Tables

22.1 Heating Capacity Tables (Test standard：EN14511)

Heating capacity for MSH-40EB

Maximum

DB	LWT 25 HC	PI	COP	30 HC	PI	COP	35 HC	PI	COP	40 HC	PI	COP	45 HC	PI	COP	50 HC	PI	COP	55 HC	PI	COP	60 HC	PI	COP	65 HC	PI	COP
-25	2.05	1.18	1.74	1.80	1.22	1.48	1.71	1.32	1.29	1.53	1.30	1.18	1.37	1.25	1.10	/	/	/	/	/	/	/	/	/	/	/	/
-20	3.09	1.31	2.36	2.83	1.56	1.82	2.44	1.70	1.43	2.17	1.74	1.24	1.98	1.75	1.13	1.85	1.75	1.06	1.56	1.59	0.98	/	/	/	/	/	/
-15	3.60	1.19	3.03	3.41	1.22	2.78	3.25	1.36	2.39	2.93	1.49	1.97	2.50	1.60	1.56	2.20	1.68	1.31	1.84	1.56	1.18	1.73	1.68	1.03	/	/	/
-10	4.17	1.22	3.40	4.49	1.38	3.25	4.34	1.52	2.85	4.02	1.65	2.43	3.59	1.77	2.02	3.28	1.81	1.81	2.63	1.68	1.56	2.81	1.80	1.56	/	/	/
-7	4.92	1.33	3.69	5.14	1.46	3.52	4.99	1.60	3.11	4.67	1.73	2.70	4.54	1.98	2.29	4.41	2.12	2.08	4.28	2.34	1.83	3.56	1.94	1.84	/	/	/
-5	4.99	1.24	4.03	5.18	1.39	3.72	5.02	1.53	3.27	4.74	1.68	2.82	4.63	1.89	2.45	4.56	2.02	2.26	4.41	2.26	1.95	3.83	2.00	1.92	/	/	/
0	5.41	1.07	5.06	5.27	1.21	4.34	5.10	1.36	3.74	4.92	1.55	3.18	5.04	1.74	2.89	5.02	2.03	2.48	5.13	2.16	2.37	4.40	2.10	2.09	/	/	/
5	5.99	1.03	5.83	5.75	1.18	4.85	5.68	1.31	4.33	5.59	1.48	3.77	5.60	1.71	3.27	5.50	1.98	2.78	5.54	2.07	2.68	4.90	2.09	2.35	4.04	2.16	1.87
7	6.58	0.99	6.67	6.22	1.15	5.40	6.26	1.26	4.96	6.26	1.42	4.41	5.96	1.63	3.67	5.69	1.76	3.23	5.74	1.90	3.03	5.41	2.08	2.61	4.27	2.09	2.04
10	6.37	0.95	6.68	6.03	1.17	5.16	6.07	1.26	4.82	6.31	1.36	4.63	6.05	1.57	3.86	5.80	1.80	3.23	5.70	1.80	3.16	5.27	1.96	2.69	4.49	2.02	2.22
15	6.03	0.90	6.71	5.72	1.20	4.78	5.75	1.25	4.59	6.40	1.27	5.04	6.20	1.47	4.21	5.47	1.50	3.65	5.63	1.65	3.41	5.04	1.76	2.87	4.87	1.90	2.56
20	5.86	0.81	7.24	5.74	1.00	5.75	5.67	1.11	5.13	6.16	1.12	5.48	6.12	1.31	4.66	5.61	1.40	3.99	5.52	1.50	3.68	4.77	1.56	3.06	/	/	/
25	5.70	0.72	7.91	5.77	0.80	7.21	5.60	0.96	5.85	5.91	0.98	6.06	6.05	1.15	5.25	5.75	1.31	4.39	5.42	1.35	4.02	4.50	1.36	3.30	/	/	/
30	5.78	0.69	8.41	5.84	0.78	7.48	5.78	0.89	6.51	5.89	0.92	6.39	6.02	1.07	5.62	5.67	1.22	4.63	5.51	1.28	4.31	4.61	1.32	3.51	/	/	/
35	5.85	0.65	8.96	5.90	0.76	7.77	5.97	0.82	7.27	5.86	0.87	6.77	5.99	0.99	6.05	5.59	1.14	4.90	5.61	1.22	4.62	/	/	/	/	/	/
40	6.30	0.58	10.8	6.38	0.67	9.51	6.36	0.74	8.57	6.33	0.80	7.88	6.38	0.93	6.86	6.00	1.15	5.20	/	/	/	/	/	/	/	/	/
43	6.57	0.54	12.2	6.67	0.62	10.8	6.59	0.69	9.50	6.62	0.77	8.63	6.61	0.89	7.39	6.25	1.16	5.38	/	/	/	/	/	/	/	/	/

Normal

DB	LWT 25 HC	PI	COP	30 HC	PI	COP	35 HC	PI	COP	40 HC	PI	COP	45 HC	PI	COP	50 HC	PI	COP	55 HC	PI	COP	60 HC	PI	COP	65 HC	PI	COP
-25	1.90	1.07	1.78	1.65	1.08	1.52	1.56	1.19	1.31	1.42	1.20	1.19	1.28	1.18	1.09	/	/	/	/	/	/	/	/	/	/	/	/
-20	2.82	1.15	2.45	2.57	1.38	1.86	2.20	1.49	1.48	1.98	1.57	1.26	1.83	1.61	1.14	1.73	1.61	1.07	1.50	1.52	0.99	/	/	/	/	/	/
-15	3.26	1.03	3.17	3.07	1.06	2.88	2.90	1.17	2.48	2.66	1.31	2.02	2.22	1.40	1.59	1.96	1.46	1.34	1.69	1.41	1.20	1.61	1.56	1.03	/	/	/
-10	3.73	1.04	3.60	4.00	1.18	3.40	3.82	1.30	2.95	3.60	1.45	2.49	3.25	1.59	2.05	2.99	1.62	1.84	2.40	1.52	1.58	2.59	1.67	1.55	/	/	/
-7	4.59	1.19	3.85	4.63	1.27	3.65	4.80	1.52	3.15	4.26	1.52	2.81	4.30	1.83	2.35	4.12	1.93	2.14	4.00	2.05	1.95	3.15	1.68	1.87	/	/	/
-5	4.49	1.05	4.26	4.62	1.19	3.86	4.37	1.28	3.41	4.21	1.42	2.96	4.10	1.61	2.55	4.04	1.73	2.33	3.94	1.96	2.01	3.42	1.75	1.95	/	/	/
0	4.99	0.96	5.19	4.80	1.08	4.46	4.60	1.20	3.85	4.53	1.40	3.23	4.46	1.49	3.00	4.41	1.75	2.52	4.43	1.78	2.49	3.87	1.86	2.09	/	/	/
5	5.48	0.91	6.04	5.19	1.03	5.03	5.08	1.13	4.49	5.11	1.32	3.86	4.82	1.41	3.42	4.53	1.59	2.86	4.56	1.66	2.75	4.28	1.81	2.37	3.30	1.68	1.96
7	4.60	0.66	6.98	4.36	0.77	5.65	4.25	0.82	5.20	4.38	0.95	4.64	4.35	1.14	3.80	4.54	1.45	3.12	4.40	1.49	2.95	4.27	1.61	2.65	3.54	1.64	2.16
10	5.73	0.80	7.13	5.28	0.98	5.41	5.36	1.08	4.97	5.64	1.17	4.83	5.48	1.40	3.91	5.20	1.57	3.31	4.96	1.54	3.23	4.84	1.76	2.74	3.67	1.56	2.35
15	5.48	0.75	7.32	5.06	0.99	5.13	5.14	1.06	4.84	5.78	1.08	5.38	5.67	1.30	4.37	5.11	1.33	3.83	4.96	1.40	3.53	4.68	1.58	2.97	4.03	1.45	2.77
20	5.36	0.67	7.96	5.11	0.82	6.22	5.09	0.93	5.46	5.59	0.95	5.89	5.63	1.16	4.88	5.27	1.25	4.23	4.89	1.27	3.84	4.45	1.45	3.07	/	/	/
25	5.08	0.58	8.75	5.24	0.67	7.85	5.12	0.82	6.27	5.47	0.83	6.55	5.67	1.02	5.53	5.50	1.17	4.68	4.89	1.16	4.23	4.28	1.28	3.34	/	/	/
30	5.18	0.55	9.37	5.33	0.65	8.20	5.32	0.76	7.01	5.48	0.79	6.97	5.67	0.95	5.97	5.45	1.10	4.97	5.01	1.10	4.56	4.41	1.23	3.57	/	/	/
35	5.29	0.53	10.1	5.44	0.63	8.57	5.54	0.70	7.89	5.50	0.74	7.43	5.70	0.88	6.47	5.42	1.02	5.30	5.14	1.04	4.92	/	/	/	/	/	/
40	5.78	0.47	12.2	5.77	0.55	10.6	5.73	0.61	9.37	5.78	0.66	8.70	5.89	0.80	7.38	5.66	1.00	5.67	/	/	/	/	/	/	/	/	/
43	6.08	0.44	13.9	6.09	0.50	12.1	6.00	0.57	10.5	6.09	0.63	9.60	6.15	0.77	8.01	5.94	1.01	5.90	/	/	/	/	/	/	/	/	/

Minimum

DB	LWT 25 HC	PI	COP	30 HC	PI	COP	35 HC	PI	COP	40 HC	PI	COP	45 HC	PI	COP	50 HC	PI	COP	55 HC	PI	COP	60 HC	PI	COP	65 HC	PI	COP
-25	1.23	0.68	1.80	1.12	0.72	1.55	1.18	0.89	1.33	1.09	0.90	1.20	0.86	0.79	1.10	/	/	/	/	/	/	/	/	/	/	/	/
-20	1.73	0.69	2.50	1.53	0.80	1.90	1.42	0.94	1.51	1.39	1.08	1.29	1.23	1.07	1.15	1.28	1.18	1.08	1.14	1.14	1.00	/	/	/	/	/	/
-15	1.68	0.52	3.25	1.65	0.56	2.95	1.55	0.61	2.54	1.64	0.79	2.07	1.60	1.00	1.61	1.52	1.12	1.36	1.25	1.00	1.25	1.23	1.17	1.05	/	/	/
-10	1.65	0.45	3.70	1.75	0.50	3.50	1.71	0.56	3.04	2.09	0.82	2.56	2.17	1.04	2.09	2.23	1.19	1.88	1.82	1.14	1.60	2.02	1.27	1.58	/	/	/
-7	1.16	0.29	4.01	1.18	0.31	3.76	1.25	0.37	3.34	2.06	0.70	2.93	2.08	0.86	2.42	2.05	0.94	2.18	1.88	0.98	1.91	2.22	1.16	1.91	/	/	/
-5	1.36	0.31	4.38	1.36	0.34	3.98	1.42	0.40	3.51	2.06	0.67	3.07	2.16	0.83	2.60	2.09	0.92	2.27	1.99	0.98	2.04	2.29	1.15	1.99	/	/	/
0	1.45	0.27	5.37	1.51	0.33	4.61	1.42	0.36	3.98	2.12	0.63	3.34	2.22	0.72	3.07	2.24	0.90	2.48	2.21	1.00	2.21	2.61	1.22	2.14	/	/	/
5	1.97	0.31	6.28	1.99	0.38	5.23	1.92	0.41	4.66	2.58	0.64	4.01	2.59	0.74	3.52	2.58	0.91	2.84	2.79	1.05	2.66	3.05	1.25	2.44	2.33	1.14	2.04
7	2.35	0.32	7.28	2.34	0.40	5.89	2.31	0.43	5.39	2.95	0.62	4.78	3.22	0.82	3.91	3.22	1.00	3.23	3.65	1.16	3.15	3.56	1.30	2.75	2.71	1.19	2.26
10	1.95	0.26	7.46	1.77	0.31	5.67	1.92	0.37	5.21	2.84	0.56	5.06	3.27	0.81	4.06	3.19	0.93	3.44	3.60	1.07	3.35	3.53	1.24	2.85	2.87	1.17	2.44
15	2.36	0.31	7.72	2.25	0.41	5.42	2.25	0.44	5.12	2.96	0.52	5.68	3.43	0.75	4.58	3.37	0.84	4.01	4.05	1.10	3.70	3.68	1.23	3.00	3.07	1.06	2.90
20	2.64	0.31	8.41	2.81	0.43	6.58	3.01	0.52	5.78	3.88	0.62	6.23	3.80	0.74	5.12	3.65	0.82	4.44	3.70	0.92	4.04	3.19	0.99	3.23	/	/	/
25	3.14	0.34	9.25	3.40	0.41	8.30	3.52	0.53	6.63	4.31	0.62	6.94	4.35	0.75	5.81	4.31	0.88	4.92	3.89	0.87	4.44	3.28	0.93	3.52	/	/	/
30	3.32	0.34	9.90	3.59	0.41	8.68	3.79	0.51	7.43	4.03	0.55	7.37	4.42	0.71	6.27	4.39	0.84	5.22	4.10	0.85	4.79	3.48	0.93	3.76	/	/	/
35	3.92	0.37	10.6	4.01	0.44	9.08	3.91	0.47	8.36	4.04	0.51	7.87	4.44	0.65	6.80	4.47	0.80	5.57	4.38	0.85	5.18	/	/	/	/	/	/
40	4.28	0.33	12.9	4.27	0.38	11.2	4.51	0.45	9.93	4.56	0.49	9.22	4.85	0.62	7.76	4.86	0.82	5.96	/	/	/	/	/	/	/	/	/
43	4.53	0.31	14.7	4.53	0.35	12.8	4.75	0.43	11.1	4.83	0.48	10.2	5.15	0.61	8.42	5.19	0.84	6.20	/	/	/	/	/	/	/	/	/

Abbreviations:

LWT: Leaving water temperature (°C)
DB: Dry-bulb temperature for Outdoor air temperature (°C)
HC: Total heating capacity (kW)
PI: Power input (kW)

Heating capacity for MSH-60EB

Maximum

DB	25 HC	25 PI	25 COP	30 HC	30 PI	30 COP	35 HC	35 PI	35 COP	40 HC	40 PI	40 COP	45 HC	45 PI	45 COP	50 HC	50 PI	50 COP	55 HC	55 PI	55 COP	60 HC	60 PI	60 COP	65 HC	65 PI	65 COP
-25	2.57	1.49	1.72	2.25	1.53	1.46	2.14	1.67	1.28	1.91	1.64	1.17	1.71	1.57	1.09	/	/	/	/	/	/	/	/	/	/	/	/
-20	3.64	1.56	2.34	3.34	1.86	1.80	2.88	2.03	1.42	2.56	2.08	1.23	2.33	2.08	1.12	2.19	2.04	1.07	1.84	1.86	0.99	/	/	/	/	/	/
-15	4.43	1.49	2.97	4.19	1.53	2.73	4.00	1.71	2.34	3.61	1.87	1.93	3.08	2.01	1.53	2.70	2.02	1.34	2.26	1.88	1.20	2.13	2.02	1.05	/	/	/
-10	5.75	1.69	3.41	5.50	1.84	2.99	5.11	1.99	2.57	4.83	2.18	2.22	4.64	2.24	2.07	4.13	2.41	1.72	3.80	2.24	1.69	3.32	2.30	1.44	/	/	/
-7	6.55	1.77	3.71	6.30	1.92	3.28	6.21	2.17	2.86	5.79	2.32	2.50	5.57	2.38	2.35	5.29	2.63	2.01	5.22	2.66	1.96	4.57	2.61	1.75	/	/	/
-5	6.54	1.64	3.98	6.32	1.79	3.52	6.14	1.99	3.09	5.97	2.18	2.74	5.84	2.30	2.54	5.44	2.44	2.23	5.31	2.64	2.01	4.73	2.59	1.83	/	/	/
0	6.49	1.34	4.85	6.37	1.48	4.31	6.35	1.68	3.79	6.80	1.99	3.42	6.85	2.25	3.04	5.88	2.37	2.48	5.42	2.59	2.09	5.06	2.54	1.99	/	/	/
5	7.04	1.31	5.37	6.71	1.50	4.48	6.88	1.62	4.25	6.96	1.89	3.69	6.99	2.12	3.29	6.37	2.27	2.81	6.11	2.46	2.48	5.74	2.53	2.27	4.92	2.68	1.84
7	7.58	1.28	5.90	7.06	1.47	4.81	7.41	1.56	4.76	7.13	1.79	3.99	7.13	2.00	3.58	6.87	2.16	3.17	6.90	2.37	2.91	6.42	2.52	2.55	5.25	2.60	2.02
10	7.43	1.21	6.12	7.11	1.36	5.24	7.35	1.46	5.02	7.37	1.75	4.21	7.32	1.93	3.78	7.01	2.09	3.35	6.93	2.28	3.04	6.27	2.41	2.60	5.57	2.52	2.21
15	7.17	1.13	6.35	7.20	1.24	5.82	7.26	1.38	5.28	7.78	1.69	4.61	7.63	1.83	4.16	7.24	1.97	3.67	6.98	2.12	3.30	6.10	2.23	2.70	6.10	2.39	2.56
20	6.93	0.97	7.15	6.97	1.11	6.28	6.98	1.18	5.91	7.21	1.54	4.70	7.42	1.68	4.42	7.28	1.81	4.02	6.81	1.89	3.60	5.98	1.95	3.06	/	/	/
25	6.69	0.80	8.32	6.74	0.94	7.16	6.70	1.06	6.31	6.65	1.30	5.11	7.21	1.52	4.74	7.33	1.66	4.43	6.63	1.66	4.00	5.94	1.67	3.55	/	/	/
30	6.74	0.71	9.53	6.83	0.85	8.02	6.83	0.94	7.27	6.56	1.09	6.01	7.05	1.40	5.05	6.91	1.40	4.92	6.60	1.57	4.21	6.01	1.57	3.83	/	/	/
35	6.79	0.66	10.3	6.93	0.73	9.43	6.96	0.85	8.17	6.47	0.94	6.87	6.89	1.27	5.42	6.49	1.24	5.21	6.57	1.48	4.45	/	/	/	/	/	/
40	7.26	0.64	11.4	7.37	0.73	10.2	7.28	0.81	9.02	7.12	0.97	7.34	7.34	1.20	6.12	6.93	1.22	5.68	/	/	/	/	/	/	/	/	/
43	7.54	0.63	12.0	7.64	0.70	10.9	7.48	0.76	9.87	7.51	0.91	8.27	7.61	1.08	7.02	7.19	1.21	5.96	/	/	/	/	/	/	/	/	/

Normal

DB	25 HC	25 PI	25 COP	30 HC	30 PI	30 COP	35 HC	35 PI	35 COP	40 HC	40 PI	40 COP	45 HC	45 PI	45 COP	50 HC	50 PI	50 COP	55 HC	55 PI	55 COP	60 HC	60 PI	60 COP	65 HC	65 PI	65 COP
-25	2.37	1.35	1.76	2.07	1.37	1.51	1.95	1.50	1.30	1.77	1.51	1.17	1.61	1.49	1.08	/	/	/	/	/	/	/	/	/	/	/	/
-20	3.33	1.37	2.43	3.04	1.65	1.85	2.60	1.78	1.46	2.34	1.87	1.25	2.16	1.92	1.13	2.04	1.88	1.08	1.77	1.78	1.00	/	/	/	/	/	/
-15	4.01	1.29	3.11	3.77	1.33	2.83	3.57	1.47	2.43	3.27	1.65	1.98	2.73	1.76	1.56	2.41	1.76	1.37	2.08	1.70	1.22	1.98	1.88	1.05	/	/	/
-10	5.15	1.43	3.61	4.89	1.57	3.12	4.51	1.69	2.66	4.33	1.91	2.27	4.21	2.01	2.10	3.76	2.15	1.75	3.46	2.03	1.71	3.06	2.13	1.44	/	/	/
-7	6.24	1.62	3.86	6.05	1.80	3.36	6.10	2.00	3.05	5.61	2.21	2.54	5.40	2.25	2.40	5.07	2.45	2.07	5.15	2.58	2.00	4.28	2.39	1.79	/	/	/
-5	5.89	1.40	4.20	5.64	1.54	3.66	5.26	1.64	3.21	5.26	1.81	2.90	5.10	1.93	2.64	4.31	1.87	2.30	4.28	2.06	2.07	3.94	2.12	1.86	/	/	/
0	5.99	1.20	4.98	5.80	1.31	4.43	5.74	1.47	3.89	6.26	1.81	3.47	6.06	1.92	3.15	5.36	2.12	2.53	4.75	2.24	2.12	4.46	2.24	1.99	/	/	/
5	6.43	1.16	5.56	6.06	1.31	4.64	6.16	1.39	4.42	6.36	1.68	3.78	6.13	1.78	3.45	5.76	1.99	2.89	5.40	2.13	2.54	5.01	2.19	2.29	4.03	2.09	1.93
7	6.75	1.09	6.18	6.30	1.21	5.21	6.20	1.24	5.00	6.44	1.55	4.14	6.35	1.69	3.75	6.13	1.86	3.29	6.00	2.00	3.00	5.64	2.17	2.60	4.40	2.06	2.14
10	6.68	1.02	6.52	6.22	1.13	5.49	6.49	1.26	5.17	6.59	1.50	4.39	6.62	1.73	3.83	6.47	1.88	3.44	6.04	1.94	3.11	5.76	2.17	2.65	4.54	1.94	2.34
15	6.52	0.94	6.93	6.37	1.02	6.24	6.48	1.16	5.57	7.03	1.43	4.92	6.98	1.61	4.32	6.76	1.75	3.86	6.15	1.80	3.42	5.59	2.00	2.79	5.04	1.82	2.77
20	6.34	0.81	7.85	6.20	0.91	6.79	6.27	1.00	6.28	6.55	1.30	5.05	6.82	1.48	4.62	6.84	1.61	4.25	6.03	1.60	3.76	5.58	1.82	3.07	/	/	/
25	5.97	0.65	9.21	6.12	0.78	7.79	6.13	0.91	6.75	6.15	1.11	5.53	6.76	1.35	4.99	7.01	1.49	4.72	5.99	1.43	4.20	5.65	1.57	3.59	/	/	/
30	6.04	0.57	10.6	6.24	0.71	8.79	6.29	0.80	7.84	6.10	0.93	6.55	6.64	1.24	5.35	6.64	1.26	5.28	6.00	1.35	4.46	5.75	1.47	3.91	/	/	/
35	6.14	0.53	11.6	6.38	0.61	10.4	6.46	0.73	8.87	6.07	0.81	7.54	6.55	1.13	5.79	6.29	1.12	5.63	6.02	1.27	4.75	/	/	/	/	/	/
40	6.66	0.52	12.9	6.67	0.59	11.3	6.57	0.67	9.86	6.49	0.80	8.11	6.78	1.03	6.59	6.53	1.06	6.19	/	/	/	/	/	/	/	/	/
43	6.97	0.51	13.7	6.98	0.57	12.2	6.80	0.63	10.9	6.91	0.75	9.20	7.09	0.93	7.61	6.84	1.05	6.54	/	/	/	/	/	/	/	/	/

Minimum

DB	25 HC	25 PI	25 COP	30 HC	30 PI	30 COP	35 HC	35 PI	35 COP	40 HC	40 PI	40 COP	45 HC	45 PI	45 COP	50 HC	50 PI	50 COP	55 HC	55 PI	55 COP	60 HC	60 PI	60 COP	65 HC	65 PI	65 COP
-25	1.54	0.86	1.78	1.39	0.91	1.53	1.48	1.12	1.32	1.36	1.14	1.19	1.08	0.99	1.09	/	/	/	/	/	/	/	/	/	/	/	/
-20	2.04	0.82	2.47	1.80	0.96	1.88	1.67	1.12	1.49	1.64	1.28	1.28	1.45	1.27	1.14	1.51	1.38	1.09	1.34	1.34	1.01	/	/	/	/	/	/
-15	2.07	0.65	3.18	2.03	0.70	2.90	1.90	0.76	2.49	2.02	0.99	2.03	1.97	1.25	1.58	1.86	1.35	1.39	1.53	1.24	1.24	1.51	1.41	1.07	/	/	/
-10	2.28	0.62	3.71	2.14	0.67	3.21	2.02	0.74	2.74	2.51	1.07	2.34	2.81	1.32	2.14	2.63	1.51	1.74	2.38	1.63	1.47	/	/	/	/	/	/
-7	1.57	0.39	4.03	1.45	0.41	3.50	1.48	0.48	3.06	2.49	0.92	2.72	2.67	1.08	2.48	2.57	1.22	2.11	2.64	1.31	2.01	2.68	1.47	1.82	/	/	/
-5	1.78	0.41	4.32	1.66	0.44	3.76	1.70	0.52	3.30	2.59	0.87	2.98	2.82	1.05	2.69	2.59	1.10	2.35	2.81	1.33	2.11	2.72	1.43	1.90	/	/	/
0	1.74	0.34	5.15	1.82	0.40	4.58	1.77	0.44	4.02	2.93	0.82	3.59	3.02	0.93	3.23	2.99	1.15	2.59	2.85	1.31	2.17	3.00	1.47	2.04	/	/	/
5	2.31	0.40	5.78	2.32	0.48	4.82	2.33	0.51	4.59	3.21	0.82	3.93	3.29	0.93	3.54	3.43	1.15	2.98	3.46	1.32	2.62	3.58	1.52	2.36	2.85	1.42	2.01
7	2.71	0.42	6.44	2.65	0.49	5.37	2.73	0.53	5.32	3.36	0.78	4.32	3.85	0.99	3.88	4.26	1.25	3.41	4.38	1.41	3.10	4.23	1.57	2.69	3.33	1.49	2.24
10	2.27	0.33	6.83	2.08	0.36	5.75	2.32	0.43	5.42	3.32	0.72	4.60	3.96	0.99	3.99	4.22	1.18	3.57	4.37	1.35	3.23	4.20	1.53	2.75	3.55	1.46	2.43
15	2.81	0.38	7.31	2.83	0.48	6.59	2.84	0.48	5.89	3.60	0.69	5.20	4.22	0.93	4.53	4.46	1.10	4.05	5.03	1.40	3.58	4.39	1.56	2.82	3.84	1.33	2.90
20	3.12	0.38	8.30	3.41	0.48	7.18	3.70	0.56	6.65	4.54	0.85	5.34	4.60	0.95	4.86	4.73	1.06	4.46	4.56	1.15	3.95	4.00	1.24	3.23	/	/	/
25	3.68	0.38	9.73	3.97	0.48	8.24	4.22	0.59	7.15	4.85	0.83	5.85	5.19	0.99	5.24	5.50	1.11	4.96	4.76	1.08	4.41	4.34	1.15	3.78	/	/	/
30	3.88	0.35	11.2	4.20	0.45	9.30	4.47	0.54	8.30	4.49	0.65	6.94	5.18	0.92	5.63	5.35	0.96	5.55	4.91	1.05	4.69	4.54	1.10	4.11	/	/	/
35	4.55	0.37	12.3	4.71	0.43	11.0	4.57	0.49	9.40	4.46	0.56	7.99	5.10	0.84	6.09	5.19	0.88	5.92	5.13	1.03	4.99	/	/	/	/	/	/
40	4.93	0.36	13.6	4.94	0.41	11.9	5.17	0.49	10.4	5.12	0.60	8.59	5.58	0.81	6.92	5.61	0.86	6.50	/	/	/	/	/	/	/	/	/
43	5.20	0.36	14.4	5.20	0.40	13.0	5.39	0.47	11.5	5.48	0.56	9.75	5.93	0.74	8.00	5.97	0.87	6.87	/	/	/	/	/	/	/	/	/

Abbreviations:

LWT: Leaving water temperature (℃)

DB: Dry-bulb temperature for Outdoor air temperature (℃)

HC: Total heating capacity (kW)

PI: Power input (kW)

Heating capacity for MSH-80EB

Maximum

DB	25 HC	25 PI	25 COP	30 HC	30 PI	30 COP	35 HC	35 PI	35 COP	40 HC	40 PI	40 COP	45 HC	45 PI	45 COP	50 HC	50 PI	50 COP	55 HC	55 PI	55 COP	60 HC	60 PI	60 COP	65 HC	65 PI	65 COP
-25	4.45	1.98	2.25	4.00	2.04	1.96	3.59	2.19	1.64	3.34	2.15	1.55	2.81	2.17	1.30	/	/	/	/	/	/	/	/	/	/	/	/
-20	5.68	2.03	2.80	5.09	2.15	2.37	4.74	2.24	2.11	4.32	2.44	1.77	3.70	2.29	1.61	3.17	2.26	1.41	2.62	2.10	1.25	/	/	/	/	/	/
-15	6.90	2.07	3.34	6.44	2.24	2.87	6.11	2.51	2.43	5.57	2.47	2.26	5.29	2.65	2.00	4.67	2.70	1.73	4.94	2.92	1.69	3.99	2.84	1.41	/	/	/
-10	7.45	2.02	3.68	7.28	2.18	3.33	7.08	2.25	3.15	6.87	2.63	2.62	6.77	2.74	2.47	6.32	2.88	2.20	6.07	3.05	1.99	5.19	2.86	1.81	/	/	/
-7	7.64	2.03	3.76	7.47	2.20	3.40	7.27	2.26	3.21	7.05	2.64	2.67	6.94	2.76	2.52	6.48	2.89	2.24	6.22	3.07	2.03	5.32	2.88	1.85	/	/	/
-5	8.05	2.00	4.02	7.97	2.16	3.69	7.69	2.39	3.22	7.45	2.57	2.90	7.44	2.77	2.69	7.35	2.99	2.46	6.45	2.94	2.19	6.04	3.00	2.02	/	/	/
0	8.24	1.73	4.77	8.55	2.02	4.23	8.49	2.25	3.77	8.40	2.53	3.32	8.09	2.75	2.94	8.11	2.95	2.75	7.10	2.99	2.38	6.85	3.16	2.17	/	/	/
5	8.86	1.49	5.95	8.95	1.81	4.94	9.03	1.98	4.56	8.78	2.29	3.84	8.69	2.57	3.38	8.30	2.76	3.00	7.56	2.74	2.76	7.11	2.89	2.46	3.89	3.27	1.19
7	9.51	1.45	6.54	9.20	1.73	5.32	9.11	1.80	5.07	8.85	2.12	4.18	8.98	2.35	3.82	8.43	2.66	3.17	7.80	2.50	3.12	7.24	2.66	2.72	4.08	3.00	1.36
10	10.1	1.35	7.44	9.28	1.59	5.84	8.94	1.65	5.42	8.70	2.02	4.30	8.74	2.24	3.90	8.28	2.42	3.42	8.20	2.48	3.31	7.50	2.72	2.76	5.59	2.65	2.11
15	9.86	1.12	8.79	9.39	1.33	7.09	9.09	1.51	6.04	9.07	1.77	5.12	8.91	2.03	4.38	8.41	2.23	3.77	8.32	2.34	3.55	7.68	2.49	3.09	5.71	2.39	2.39
20	9.65	0.95	10.1	9.51	1.14	8.33	9.33	1.32	7.09	9.45	1.59	5.93	9.08	1.81	5.02	8.53	2.02	4.22	8.43	2.12	3.97	7.86	2.27	3.46	/	/	/
25	9.42	0.90	10.4	9.00	1.03	8.75	8.75	1.15	7.64	9.15	1.44	6.34	9.01	1.55	5.80	8.61	1.87	4.61	8.09	1.90	4.25	7.46	2.01	3.72	/	/	/
30	9.18	0.83	11.0	8.49	0.93	9.16	8.17	1.05	7.78	8.85	1.29	6.84	8.93	1.43	6.23	8.68	1.74	4.99	7.84	1.73	4.53	7.07	1.78	3.98	/	/	/
35	9.55	0.84	11.3	8.83	0.93	9.45	8.50	1.06	8.05	9.20	1.31	7.05	9.29	1.46	6.34	9.03	1.73	5.21	8.16	1.80	4.72	/	/	/	/	/	/
40	10.0	0.87	11.6	9.27	0.93	10.0	8.92	1.05	8.49	9.66	1.32	7.31	9.75	1.51	6.46	9.48	1.74	5.46	/	/	/	/	/	/	/	/	/
43	10.3	0.84	12.3	9.55	0.85	11.3	9.19	1.01	9.11	9.95	1.27	7.86	10.0	1.47	6.83	9.77	1.61	6.08	/	/	/	/	/	/	/	/	/

Normal

DB	25 HC	25 PI	25 COP	30 HC	30 PI	30 COP	35 HC	35 PI	35 COP	40 HC	40 PI	40 COP	45 HC	45 PI	45 COP	50 HC	50 PI	50 COP	55 HC	55 PI	55 COP	60 HC	60 PI	60 COP	65 HC	65 PI	65 COP
-25	4.11	1.79	2.29	3.68	1.82	2.03	3.27	1.96	1.67	3.10	1.99	1.56	2.64	2.05	1.29	/	/	/	/	/	/	/	/	/	/	/	/
-20	5.20	1.79	2.90	4.63	1.90	2.43	4.27	1.97	2.17	3.96	2.20	1.80	3.43	2.11	1.62	2.96	2.08	1.42	2.52	2.00	1.25	/	/	/	/	/	/
-15	6.24	1.79	3.49	5.80	1.95	2.98	5.45	2.15	2.53	5.04	2.18	2.32	4.69	2.31	2.03	4.16	2.36	1.76	4.55	2.65	1.72	3.72	2.64	1.41	/	/	/
-10	6.66	1.71	3.89	6.48	1.86	3.49	6.25	1.92	3.26	6.16	2.30	2.68	6.14	2.46	2.50	5.75	2.58	2.23	5.53	2.75	2.01	4.78	2.65	1.81	/	/	/
-7	7.27	1.83	3.97	7.11	2.01	3.53	7.10	2.18	3.25	6.71	2.40	2.79	6.60	2.59	2.55	6.17	2.67	2.31	6.15	3.00	2.05	5.07	2.69	1.89	/	/	/
-5	7.25	1.71	4.25	7.11	1.86	3.83	6.69	2.00	3.35	6.56	2.14	3.06	6.49	2.33	2.79	6.29	2.48	2.54	5.56	2.46	2.26	5.38	2.62	2.05	/	/	/
0	7.60	1.55	4.89	7.78	1.79	4.34	7.67	1.98	3.88	7.74	2.30	3.37	7.16	2.35	3.05	7.39	2.64	2.79	6.33	2.63	2.41	6.03	2.78	2.17	/	/	/
5	8.09	1.31	6.17	8.08	1.58	5.13	8.08	1.71	4.73	8.03	2.04	3.93	7.62	2.15	3.54	7.50	2.43	3.09	6.68	2.37	2.82	6.21	2.50	2.49	3.32	2.72	1.22
7	8.60	1.26	6.84	8.21	1.47	5.57	8.30	1.60	5.20	8.00	1.84	4.34	8.20	2.08	3.95	7.53	2.29	3.29	7.50	2.36	3.18	6.25	2.25	2.77	3.44	2.46	1.40
10	9.05	1.14	7.93	8.12	1.33	6.12	7.89	1.41	5.58	7.77	1.74	4.48	7.91	2.00	3.95	7.65	2.18	3.51	7.14	2.11	3.38	6.89	2.45	2.81	4.92	2.27	2.16
15	8.96	0.93	9.59	8.32	1.09	7.60	8.11	1.27	6.37	8.20	1.50	5.46	8.15	1.79	4.55	7.85	1.98	3.96	7.33	1.99	3.68	7.13	2.24	3.19	5.19	2.11	2.46
20	8.82	0.79	11.1	8.46	0.94	9.00	8.37	1.11	7.53	8.58	1.35	6.37	8.36	1.59	5.25	8.01	1.79	4.47	7.47	1.80	4.14	7.34	2.11	3.47	/	/	/
25	8.39	0.73	11.6	8.17	0.86	9.52	8.01	0.98	8.18	8.47	1.23	6.86	8.44	1.38	6.11	8.23	1.68	4.91	7.31	1.64	4.47	7.10	1.89	3.76	/	/	/
30	8.23	0.67	12.3	7.75	0.77	10.0	7.52	0.90	8.39	8.24	1.11	7.46	8.42	1.27	6.61	8.35	1.56	5.36	7.13	1.49	4.80	6.77	1.67	4.06	/	/	/
35	8.63	0.68	12.7	8.13	0.78	10.4	7.89	0.90	8.74	8.64	1.12	7.74	8.83	1.30	6.77	8.75	1.55	5.63	7.48	1.49	5.03	/	/	/	/	/	/
40	9.20	0.70	13.1	8.39	0.75	11.1	8.04	0.87	9.28	8.81	1.09	8.08	9.01	1.30	6.95	8.94	1.50	5.95	/	/	/	/	/	/	/	/	/
43	9.56	0.69	13.9	8.72	0.69	12.6	8.36	0.83	10.0	9.16	1.05	8.74	9.36	1.26	7.40	9.28	1.39	6.67	/	/	/	/	/	/	/	/	/

Minimum

DB	25 HC	25 PI	25 COP	30 HC	30 PI	30 COP	35 HC	35 PI	35 COP	40 HC	40 PI	40 COP	45 HC	45 PI	45 COP	50 HC	50 PI	50 COP	55 HC	55 PI	55 COP	60 HC	60 PI	60 COP	65 HC	65 PI	65 COP
-25	2.67	1.15	2.33	2.48	1.21	2.06	2.48	1.46	1.69	2.37	1.50	1.58	1.77	1.37	1.29	/	/	/	/	/	/	/	/	/	/	/	/
-20	3.18	1.08	2.96	2.75	1.11	2.48	2.75	1.24	2.22	2.76	1.51	1.83	2.29	1.40	1.64	2.19	1.52	1.44	1.91	1.51	1.27	/	/	/	/	/	/
-15	3.22	0.90	3.58	3.12	1.03	3.05	2.91	1.12	2.59	3.12	1.31	2.37	3.38	1.64	2.06	3.22	1.80	1.79	3.36	1.92	1.75	2.84	1.99	1.43	/	/	/
-10	2.96	0.74	4.01	2.84	0.79	3.59	2.80	0.84	3.35	3.57	1.30	2.76	4.10	1.61	2.55	4.29	1.88	2.28	4.20	2.05	2.05	3.72	2.02	1.84	/	/	/
-7	1.83	0.45	4.09	1.72	0.47	3.63	1.82	0.53	3.44	3.12	1.07	2.90	3.41	1.28	2.67	3.38	1.44	2.35	3.57	1.67	2.13	3.42	1.78	1.92	/	/	/
-5	2.19	0.50	4.37	2.09	0.53	3.94	2.17	0.63	3.44	3.23	1.03	3.15	3.60	1.27	2.84	3.78	1.46	2.59	3.65	1.59	2.30	3.71	1.77	2.09	/	/	/
0	2.21	0.44	5.06	2.44	0.54	4.49	2.37	0.59	4.01	3.62	1.04	3.48	3.57	1.14	3.12	4.12	1.44	2.86	3.80	1.54	2.47	4.06	1.83	2.22	/	/	/
5	2.90	0.45	6.41	3.10	0.58	5.32	3.06	0.62	4.91	4.05	0.99	4.08	4.09	1.12	3.64	4.47	1.41	3.18	4.28	1.47	2.91	4.43	1.73	2.56	2.47	1.99	1.24
7	3.40	0.48	7.14	3.46	0.60	5.81	3.36	0.61	5.54	4.17	0.92	4.53	4.85	1.17	4.15	5.23	1.54	3.40	4.95	1.49	3.33	4.76	1.66	2.87	2.69	1.89	1.42
10	3.08	0.37	8.30	2.72	0.42	6.41	2.83	0.48	5.85	3.92	0.83	4.70	4.73	1.15	4.11	4.99	1.37	3.65	5.17	1.47	3.51	5.02	1.72	2.92	3.80	1.72	2.22
15	3.86	0.38	10.1	3.69	0.46	8.03	3.55	0.53	6.73	4.20	0.73	5.76	4.94	1.04	4.77	5.19	1.25	4.15	5.99	1.55	3.86	5.60	1.74	3.23	3.82	1.52	2.52
20	4.34	0.37	11.8	4.66	0.49	9.52	4.94	0.62	7.98	5.95	0.88	6.74	5.63	1.02	5.51	5.55	1.18	4.69	5.65	1.30	4.35	5.26	1.44	3.65	/	/	/
25	5.18	0.42	12.2	5.31	0.53	10.1	5.51	0.64	8.66	6.68	0.92	7.26	6.48	1.01	6.42	6.46	1.25	5.16	5.81	1.24	4.69	5.45	1.38	3.96	/	/	/
30	5.28	0.41	13.0	5.22	0.49	10.6	5.35	0.60	8.88	6.06	0.77	7.89	6.56	0.94	6.95	6.73	1.20	5.63	5.83	1.16	5.04	5.34	1.25	4.27	/	/	/
35	6.40	0.48	13.4	6.00	0.54	11.0	5.58	0.60	9.26	6.35	0.77	8.20	6.87	0.96	7.12	7.22	1.22	5.92	6.36	1.20	5.29	/	/	/	/	/	/
40	6.82	0.49	13.8	6.21	0.53	11.8	6.34	0.64	9.84	6.96	0.81	8.56	7.41	1.01	7.31	7.68	1.23	6.25	/	/	/	/	/	/	/	/	/
43	7.13	0.48	14.7	6.49	0.49	13.4	6.62	0.62	10.6	7.27	0.78	9.26	7.83	1.01	7.78	8.11	1.16	7.01	/	/	/	/	/	/	/	/	/

Abbreviations:

LWT: Leaving water temperature (°C)
DB: Dry-bulb temperature for Outdoor air temperature (°C)
HC: Total heating capacity (kW)
PI: Power input (kW)

Heating capacity for MSH-100EB

Maximum

DB	25 HC	25 PI	25 COP	30 HC	30 PI	30 COP	35 HC	35 PI	35 COP	40 HC	40 PI	40 COP	45 HC	45 PI	45 COP	50 HC	50 PI	50 COP	55 HC	55 PI	55 COP	60 HC	60 PI	60 COP	65 HC	65 PI	65 COP
-25	4.68	2.06	2.27	4.21	2.12	1.98	3.78	2.28	1.66	3.52	2.24	1.57	2.96	2.26	1.31	/	/	/	/	/	/	/	/	/	/	/	/
-20	5.98	2.12	2.82	5.35	2.24	2.39	4.98	2.34	2.13	4.55	2.55	1.79	3.89	2.39	1.63	3.34	2.35	1.42	2.75	2.18	1.26	/	/	/	/	/	/
-15	7.26	2.15	3.37	6.78	2.34	2.90	6.43	2.62	2.46	5.86	2.57	2.28	5.57	2.76	2.02	4.91	2.82	1.74	5.20	3.04	1.71	4.20	2.96	1.42	/	/	/
-10	8.37	2.33	3.60	8.14	2.53	3.22	7.89	2.65	2.98	7.64	2.86	2.67	7.38	3.10	2.38	7.03	3.31	2.13	6.67	3.58	1.86	5.38	3.15	1.71	/	/	/
-7	8.72	2.29	3.81	8.48	2.49	3.41	8.31	2.61	3.11	7.96	2.81	2.83	7.68	3.05	2.52	7.33	3.26	2.25	7.05	3.53	1.97	5.61	3.10	1.81	/	/	/
-5	8.80	2.14	4.12	8.86	2.47	3.60	8.80	2.64	3.33	8.46	2.94	2.88	8.18	3.09	2.65	8.04	3.27	2.46	7.53	3.32	2.27	6.13	3.10	1.98	/	/	/
0	9.03	1.83	4.94	9.36	2.31	4.05	9.56	2.55	3.76	9.25	2.93	3.16	8.89	3.10	2.87	8.82	3.27	2.70	8.18	3.31	2.47	6.99	3.30	2.12	/	/	/
5	9.94	1.73	5.75	9.97	2.07	4.81	10.1	2.25	4.51	10.1	2.64	3.83	9.79	2.88	3.40	9.45	3.14	3.01	9.08	3.27	2.78	7.85	3.20	2.45	4.52	3.30	1.37
7	10.5	1.77	5.94	10.3	1.97	5.21	10.3	2.09	4.93	10.5	2.50	4.18	10.3	2.73	3.77	9.83	3.05	3.22	9.72	3.20	3.04	8.23	2.96	2.78	4.85	3.11	1.56
10	11.2	1.59	7.04	10.4	1.85	5.64	10.0	1.96	5.13	9.94	2.38	4.17	9.87	2.69	3.67	9.59	2.91	3.30	9.57	3.11	3.08	8.27	3.04	2.72	6.44	3.05	2.11
15	11.4	1.41	8.10	10.6	1.64	6.49	10.2	1.73	5.90	10.1	2.11	4.80	10.1	2.39	4.22	9.78	2.58	3.80	9.76	2.76	3.54	8.43	2.70	3.13	6.56	2.71	2.43
20	10.8	1.19	9.05	10.8	1.35	7.96	10.7	1.59	6.72	10.7	1.89	5.66	10.3	2.12	4.86	10.0	2.38	4.21	9.85	2.54	3.88	8.90	2.56	3.48	/	/	/
25	9.94	1.04	9.59	9.90	1.17	8.44	9.82	1.38	7.12	9.82	1.64	6.00	9.46	1.84	5.15	9.22	2.07	4.46	9.06	2.20	4.11	8.18	2.22	3.69	/	/	/
30	9.77	0.96	10.2	9.07	1.10	8.79	8.90	1.12	7.95	8.85	1.32	6.72	9.92	1.61	6.15	9.31	1.88	4.96	9.04	1.88	4.80	7.49	1.96	3.83	/	/	/
35	10.2	0.95	10.7	9.44	1.03	9.15	9.25	1.11	8.30	9.21	1.32	6.97	10.3	1.61	6.40	9.69	1.87	5.17	9.42	1.90	4.96	/	/	/	/	/	/
40	10.7	0.93	11.5	9.91	1.01	9.81	9.71	1.15	8.47	9.67	1.32	7.34	10.8	1.60	6.79	10.2	1.84	5.53	/	/	/	/	/	/	/	/	/
43	11.0	0.91	12.0	10.2	0.96	10.6	10.0	1.08	9.25	9.96	1.23	8.07	11.2	1.47	7.58	10.5	1.68	6.25	/	/	/	/	/	/	/	/	/

Normal

DB	25 HC	25 PI	25 COP	30 HC	30 PI	30 COP	35 HC	35 PI	35 COP	40 HC	40 PI	40 COP	45 HC	45 PI	45 COP	50 HC	50 PI	50 COP	55 HC	55 PI	55 COP	60 HC	60 PI	60 COP	65 HC	65 PI	65 COP
-25	4.33	1.87	2.32	3.87	1.89	2.05	3.45	2.05	1.68	3.26	2.07	1.57	2.78	2.14	1.30	/	/	/	/	/	/	/	/	/	/	/	/
-20	5.47	1.87	2.93	4.87	1.98	2.46	4.50	2.05	2.20	4.17	2.29	1.82	3.61	2.20	1.64	3.11	2.17	1.44	2.65	2.09	1.27	/	/	/	/	/	/
-15	6.57	1.86	3.53	6.10	2.03	3.01	5.73	2.24	2.56	5.31	2.27	2.34	4.94	2.41	2.05	4.38	2.46	1.78	4.79	2.76	1.74	3.91	2.75	1.42	/	/	/
-10	7.49	1.97	3.81	7.25	2.15	3.37	6.95	2.26	3.08	6.84	2.50	2.74	6.69	2.78	2.41	6.41	2.96	2.16	6.08	3.23	1.88	4.96	2.91	1.70	/	/	/
-7	8.28	2.11	3.92	8.18	2.33	3.51	8.25	2.62	3.15	7.43	2.54	2.93	7.35	2.88	2.55	7.00	3.04	2.30	6.85	3.43	2.00	5.14	0.00	1.84	/	/	/
-5	7.93	1.82	4.35	7.90	2.12	3.73	7.66	2.21	3.47	7.45	2.45	3.04	7.13	2.60	2.75	6.88	2.72	2.53	6.49	2.78	2.34	5.46	2.71	2.02	/	/	/
0	8.33	1.64	5.06	8.52	2.05	4.15	8.63	2.24	3.86	8.53	2.66	3.20	7.87	2.65	2.97	8.03	2.92	2.75	7.30	2.87	2.54	6.16	2.91	2.11	/	/	/
5	9.09	1.53	5.95	9.00	1.81	4.99	9.07	1.94	4.68	9.23	2.35	3.92	8.58	2.41	3.55	8.53	2.76	3.09	8.02	2.82	2.84	6.86	2.77	2.48	3.86	2.75	1.40
7	10.2	1.69	6.05	9.98	1.85	5.40	10.0	2.00	5.00	10.1	2.37	4.29	10.0	2.63	3.80	9.58	2.92	3.28	9.50	3.06	3.10	7.70	2.72	2.83	4.29	2.66	1.61
10	10.1	1.34	7.50	9.12	1.54	5.91	8.85	1.68	5.28	8.88	2.04	4.35	8.94	2.40	3.72	8.86	2.62	3.39	8.34	2.65	3.14	7.60	2.74	2.77	5.66	2.62	2.16
15	10.3	1.18	8.83	9.40	1.35	6.96	9.13	1.47	6.22	9.16	1.79	5.12	9.22	2.10	4.38	9.14	2.29	3.99	8.60	2.34	3.67	7.84	2.42	3.23	5.97	2.39	2.50
20	9.88	0.99	9.94	9.58	1.11	8.60	9.58	1.34	7.14	9.70	1.60	6.08	9.46	1.86	5.08	9.41	2.11	4.46	8.73	2.16	4.05	8.31	2.38	3.49	/	/	/
25	8.86	0.83	10.6	8.98	0.98	9.18	8.99	1.18	7.63	9.10	1.40	6.49	8.87	1.63	5.43	8.82	1.85	4.76	8.19	1.89	4.32	7.79	2.09	3.73	/	/	/
30	8.76	0.77	11.3	8.28	0.86	9.63	8.19	0.96	8.57	8.24	1.13	7.32	9.35	1.43	6.53	8.96	1.68	5.33	8.21	1.61	5.08	7.17	1.84	3.90	/	/	/
35	9.19	0.76	12.0	8.69	0.86	10.1	8.59	0.95	9.01	8.65	1.13	7.65	9.81	1.43	6.84	9.39	1.68	5.59	8.63	1.63	5.29	/	/	/	/	/	/
40	9.79	0.75	13.0	8.97	0.82	10.9	8.75	0.95	9.26	8.82	1.09	8.11	10.0	1.37	7.31	9.59	1.59	6.02	/	/	/	/	/	/	/	/	/
43	10.2	0.74	13.7	9.32	0.79	11.9	9.10	0.89	10.2	9.16	1.02	8.98	10.4	1.27	8.21	9.96	1.45	6.85	/	/	/	/	/	/	/	/	/

Minimum

DB	25 HC	25 PI	25 COP	30 HC	30 PI	30 COP	35 HC	35 PI	35 COP	40 HC	40 PI	40 COP	45 HC	45 PI	45 COP	50 HC	50 PI	50 COP	55 HC	55 PI	55 COP	60 HC	60 PI	60 COP	65 HC	65 PI	65 COP
-25	2.81	1.19	2.35	2.61	1.26	2.08	2.61	1.53	1.71	2.50	1.56	1.60	1.87	1.43	1.31	/	/	/	/	/	/	/	/	/	/	/	/
-20	3.35	1.12	2.99	2.89	1.15	2.50	2.89	1.29	2.24	2.91	1.57	1.85	2.41	1.46	1.66	2.31	1.59	1.45	2.01	1.57	1.28	/	/	/	/	/	/
-15	3.39	0.94	3.61	3.29	1.07	3.08	3.06	1.17	2.62	3.28	1.37	2.40	3.56	1.71	2.08	3.39	1.88	1.81	3.53	2.00	1.76	2.98	2.07	1.44	/	/	/
-10	3.32	0.85	3.91	3.18	0.92	3.47	3.11	0.98	3.17	3.97	1.41	2.82	4.47	1.82	2.46	4.78	2.17	2.20	4.62	2.40	1.92	3.87	2.22	1.74	/	/	/
-7	2.09	0.51	4.14	1.95	0.54	3.64	2.05	0.61	3.37	3.52	1.14	3.08	3.77	1.41	2.67	3.82	1.62	2.36	3.99	1.93	2.07	3.60	1.91	1.88	/	/	/
-5	2.39	0.53	4.48	2.32	0.60	3.84	2.48	0.70	3.57	3.67	1.17	3.13	3.95	1.41	2.80	4.13	1.60	2.58	4.26	1.79	2.38	3.76	1.83	2.06	/	/	/
0	2.42	0.46	5.24	2.68	0.62	4.30	2.67	0.67	3.99	3.99	1.20	3.31	3.92	1.29	3.04	4.48	1.59	2.82	4.38	1.68	2.61	4.14	1.91	2.17	/	/	/
5	3.26	0.53	6.18	3.45	0.67	5.18	3.43	0.71	4.86	4.65	1.14	4.07	4.61	1.26	3.66	5.08	1.60	3.18	5.14	1.76	2.92	4.89	1.92	2.55	2.87	2.02	1.42
7	3.76	0.58	6.48	3.86	0.68	5.69	3.81	0.71	5.39	4.92	1.09	4.53	5.55	1.36	4.09	6.10	1.76	3.46	6.17	1.90	3.25	5.41	1.85	2.93	3.19	1.96	1.63
10	3.43	0.44	7.86	3.05	0.49	6.19	3.17	0.57	5.54	4.47	0.98	4.55	5.34	1.38	3.86	5.78	1.64	3.52	6.04	1.85	3.27	5.54	1.92	2.88	4.38	1.98	2.22
15	4.48	0.48	9.32	4.17	0.61	7.35	4.00	0.61	6.58	4.69	0.87	5.40	5.58	1.21	4.18	6.03	1.44	4.18	7.03	1.83	3.85	6.16	1.88	3.27	4.40	1.71	2.56
20	4.86	0.46	10.5	5.27	0.58	9.10	5.66	0.75	7.56	6.73	1.05	6.44	6.38	1.19	5.34	6.51	1.39	4.68	6.60	1.55	4.25	5.96	1.62	3.67	/	/	/
25	5.47	0.49	11.2	5.84	0.60	9.72	6.19	0.77	8.07	7.17	1.04	6.87	6.81	1.19	5.70	6.92	1.38	5.00	6.51	1.43	4.54	5.97	1.52	3.93	/	/	/
30	5.62	0.47	12.0	5.58	0.55	10.2	5.83	0.64	9.08	6.06	0.78	7.75	7.29	1.06	6.86	7.22	1.29	5.59	6.71	1.26	5.34	5.65	1.38	4.11	/	/	/
35	6.81	0.53	12.7	6.42	0.60	10.7	6.07	0.64	9.55	6.35	0.78	8.10	7.64	1.06	7.19	7.75	1.32	5.88	7.34	1.32	5.56	/	/	/	/	/	/
40	7.26	0.53	13.8	6.64	0.58	11.5	6.90	0.70	9.81	6.96	0.81	8.59	8.24	1.07	7.68	8.24	1.30	6.33	/	/	/	/	/	/	/	/	/
43	7.59	0.52	14.5	6.94	0.55	12.6	7.20	0.67	10.8	7.27	0.76	9.51	8.71	1.01	8.64	8.70	1.21	7.20	/	/	/	/	/	/	/	/	/

Abbreviations:

LWT: Leaving water temperature (°C)

DB: Dry-bulb temperature for Outdoor air temperature (°C)

HC: Total heating capacity (kW)

PI: Power input (kW)

Heating capacity for MSH-120EB(-3)

Maximum

DB	25 HC	25 PI	25 COP	30 HC	30 PI	30 COP	35 HC	35 PI	35 COP	40 HC	40 PI	40 COP	45 HC	45 PI	45 COP	50 HC	50 PI	50 COP	55 HC	55 PI	55 COP	60 HC	60 PI	60 COP	65 HC	65 PI	65 COP
-25	6.03	2.78	2.17	6.26	2.91	2.15	5.03	2.96	1.70	4.53	3.12	1.45	4.23	3.29	1.28	/	/	/	/	/	/	/	/	/	/	/	/
-20	7.65	3.00	2.55	7.69	3.08	2.50	7.21	3.34	2.16	6.38	3.41	1.87	6.05	3.52	1.72	5.36	3.55	1.51	5.08	3.63	1.40	/	/	/	/	/	/
-15	8.90	3.12	2.85	8.86	3.34	2.65	8.86	3.62	2.45	7.93	3.62	2.19	7.39	3.95	1.87	6.71	3.97	1.69	6.33	4.31	1.47	5.87	4.69	1.25	/	/	/
-10	11.0	3.47	3.17	10.1	3.68	2.74	10.0	3.95	2.54	9.69	4.34	2.23	9.32	4.54	2.05	8.96	4.62	1.94	8.60	4.79	1.79	6.70	5.13	1.30	/	/	/
-7	12.3	3.52	3.49	10.9	3.62	3.02	11.0	3.89	2.83	10.4	4.27	2.44	10.4	4.50	2.31	10.6	4.74	2.24	10.6	5.25	2.02	8.05	5.06	1.59	/	/	/
-5	12.4	3.33	3.71	11.2	3.55	3.15	11.3	3.87	2.92	10.9	4.26	2.57	10.9	4.61	2.37	10.8	4.75	2.27	10.6	5.14	2.05	8.21	5.14	1.60	/	/	/
0	12.5	2.87	4.35	11.9	3.13	3.80	12.0	3.44	3.48	12.3	4.04	3.04	12.3	4.37	2.81	11.1	4.61	2.41	10.8	4.74	2.27	8.52	5.03	1.69	/	/	/
5	14.6	2.66	5.49	13.5	2.97	4.55	13.6	3.28	4.15	13.8	3.70	3.73	13.6	4.18	3.26	12.8	4.46	2.88	12.8	4.70	2.73	11.6	5.06	2.29	9.92	5.16	1.92
7	15.5	2.57	6.00	14.3	2.83	5.04	14.6	3.11	4.69	14.8	3.57	4.14	14.5	4.00	3.63	13.9	4.43	3.14	13.9	4.66	2.97	13.0	5.07	2.56	11.5	5.17	2.23
10	15.0	2.40	6.22	14.4	2.62	5.49	14.3	2.83	5.06	14.6	3.34	4.37	14.3	3.89	3.69	13.5	4.11	3.30	13.1	4.38	2.99	12.7	4.79	2.65	11.7	4.89	2.39
15	15.1	1.97	7.67	14.7	2.21	6.65	14.4	2.65	5.43	15.0	3.17	4.72	14.6	3.53	4.14	13.4	3.73	3.60	12.1	3.97	3.03	12.3	4.32	2.85	11.7	4.42	2.65
20	14.6	1.66	8.76	14.3	1.88	7.60	14.2	2.20	6.47	14.8	2.75	5.39	14.8	3.15	4.69	13.7	3.37	4.06	12.0	3.55	3.39	10.8	3.71	2.90	/	/	/
25	14.4	1.55	9.31	14.3	1.73	8.23	14.2	1.93	7.35	14.7	2.35	6.26	14.7	2.73	5.39	13.9	3.00	4.63	12.0	3.12	3.84	10.0	3.36	2.99	/	/	/
30	14.6	1.45	10.1	14.2	1.62	8.75	14.4	1.85	7.76	14.7	2.22	6.63	14.7	2.63	5.59	14.0	2.82	4.95	12.6	2.94	4.30	10.3	3.40	3.04	/	/	/
35	15.2	1.39	10.9	14.9	1.60	9.29	14.7	1.80	8.16	15.1	2.17	6.95	14.6	2.50	5.83	14.2	2.72	5.24	12.9	2.79	4.62	/	/	/	/	/	/
40	15.7	1.41	11.1	15.6	1.59	9.82	15.4	1.79	8.65	16.0	2.17	7.36	15.3	2.44	6.29	14.5	2.69	5.40	/	/	/	/	/	/	/	/	/
43	16.2	1.35	12.0	16.0	1.50	10.6	15.9	1.73	9.18	16.5	2.11	7.82	16.0	2.35	6.81	14.8	2.57	5.75	/	/	/	/	/	/	/	/	/

Normal

DB	25 HC	25 PI	25 COP	30 HC	30 PI	30 COP	35 HC	35 PI	35 COP	40 HC	40 PI	40 COP	45 HC	45 PI	45 COP	50 HC	50 PI	50 COP	55 HC	55 PI	55 COP	60 HC	60 PI	60 COP	65 HC	65 PI	65 COP
-25	5.16	2.24	2.30	5.32	2.32	2.29	4.24	2.37	1.79	3.88	2.57	1.51	3.66	2.82	1.30	/	/	/	/	/	/	/	/	/	/	/	/
-20	6.73	2.45	2.75	6.73	2.49	2.70	6.25	2.72	2.30	5.62	2.85	1.97	5.31	3.01	1.77	4.72	3.03	1.56	4.63	3.30	1.40	/	/	/	/	/	/
-15	7.43	2.41	3.09	7.35	2.55	2.88	7.28	2.78	2.62	6.63	2.86	2.32	6.04	3.13	1.93	5.51	3.14	1.75	5.30	3.58	1.48	4.96	4.01	1.24	/	/	/
-10	9.06	2.69	3.37	8.26	2.83	2.92	8.14	3.06	2.66	8.00	3.45	2.32	7.80	3.70	2.11	7.54	3.77	2.00	7.24	3.91	1.85	5.70	4.30	1.33	/	/	/
-7	11.1	3.11	3.57	10.3	3.26	3.15	10.0	3.33	3.00	10.1	4.06	2.50	10.2	4.25	2.40	10.3	4.48	2.29	10.0	4.88	2.05	7.23	4.42	1.64	/	/	/
-5	10.3	2.55	4.03	9.22	2.72	3.38	9.05	2.89	3.13	8.87	3.19	2.78	8.78	3.48	2.52	8.47	3.59	2.36	8.36	3.91	2.14	6.74	4.10	1.64	/	/	/
0	9.93	2.09	4.75	9.35	2.29	4.09	9.19	2.46	3.74	9.51	2.88	3.30	9.43	3.14	3.00	8.13	3.22	2.52	7.93	3.38	2.34	6.70	3.83	1.75	/	/	/
5	11.8	1.95	6.05	10.8	2.18	4.94	10.6	2.35	4.50	10.8	2.65	4.08	10.6	3.01	3.51	9.75	3.22	3.03	9.83	3.42	2.88	9.21	3.86	2.38	8.19	4.05	2.02
7	12.9	1.96	6.57	11.9	2.19	5.44	12.1	2.44	4.95	12.4	2.75	4.50	12.3	3.24	3.80	12.2	3.75	3.25	12.0	3.87	3.10	10.8	4.06	2.66	9.64	4.10	2.35
10	11.8	1.72	6.88	11.2	1.87	5.99	10.9	1.97	5.51	11.3	2.34	4.81	10.9	2.74	3.99	10.1	2.93	3.44	9.86	3.16	3.13	9.92	3.62	2.74	9.48	3.80	2.49
15	12.0	1.41	8.56	11.6	1.58	7.32	11.0	1.84	5.97	11.6	2.21	5.24	11.2	2.48	4.52	10.1	2.66	3.79	9.12	2.85	3.20	9.66	3.26	2.97	9.57	3.39	2.82
20	11.5	1.16	9.86	11.1	1.32	8.45	10.8	1.50	7.18	11.4	1.89	6.04	11.2	2.17	5.16	10.1	2.35	4.32	9.00	2.50	3.61	8.37	2.74	3.06	/	/	/
25	11.4	1.09	10.5	11.2	1.22	9.15	10.8	1.33	8.15	11.4	1.46	7.79	11.2	1.89	5.93	10.4	2.11	4.93	9.04	2.21	4.09	7.85	2.50	3.14	/	/	/
30	11.7	1.04	11.3	11.2	1.16	9.66	11.0	1.29	8.55	11.5	1.41	8.15	11.4	1.93	5.88	10.5	2.01	5.24	9.62	2.14	4.49	8.17	2.58	3.17	/	/	/
35	12.4	1.02	12.1	12.0	1.17	10.2	11.5	1.32	8.78	12.0	1.60	7.49	11.5	1.86	6.17	11.0	1.96	5.58	10.0	2.06	4.86	/	/	/	/	/	/
40	13.1	1.06	12.4	12.9	1.19	10.9	12.5	1.33	9.37	13.0	1.63	7.99	12.4	1.84	6.71	11.5	1.98	5.80	/	/	/	/	/	/	/	/	/
43	13.7	1.02	13.5	13.4	1.14	11.8	13.0	1.30	10.0	13.7	1.60	8.54	13.1	1.80	7.31	11.9	1.91	6.22	/	/	/	/	/	/	/	/	/

Minimum

DB	25 HC	25 PI	25 COP	30 HC	30 PI	30 COP	35 HC	35 PI	35 COP	40 HC	40 PI	40 COP	45 HC	45 PI	45 COP	50 HC	50 PI	50 COP	55 HC	55 PI	55 COP	60 HC	60 PI	60 COP	65 HC	65 PI	65 COP
-25	3.44	1.46	2.36	3.72	1.59	2.35	3.27	1.81	1.81	3.08	2.01	1.53	2.83	2.17	1.30	/	/	/	/	/	/	/	/	/	/	/	/
-20	4.24	1.52	2.78	4.42	1.61	2.74	4.08	1.75	2.33	3.72	1.86	2.00	3.93	2.25	1.75	3.75	2.43	1.54	3.60	2.58	1.39	/	/	/	/	/	/
-15	4.85	1.54	3.16	5.00	1.70	2.94	4.92	1.83	2.68	4.55	1.92	2.37	4.73	2.45	1.93	4.63	2.64	1.75	4.43	2.98	1.49	4.22	3.39	1.25	/	/	/
-10	4.67	1.34	3.49	4.48	1.48	3.03	4.36	1.59	2.74	4.39	1.84	2.38	4.85	2.25	2.15	5.11	2.50	2.04	5.33	2.83	1.89	4.49	3.32	1.35	/	/	/
-7	4.61	1.17	3.94	3.85	1.15	3.36	3.97	1.26	3.14	4.20	1.53	2.74	5.41	2.14	2.52	5.73	2.41	2.37	6.03	2.79	2.16	5.23	3.11	1.68	/	/	/
-5	4.75	1.13	4.19	4.06	1.15	3.53	4.18	1.28	3.27	4.52	1.56	2.90	5.80	2.23	2.61	5.93	2.44	2.43	6.12	2.79	2.20	5.42	3.20	1.69	/	/	/
0	4.99	1.01	4.96	4.64	1.08	4.28	4.62	1.18	3.92	5.24	1.52	3.45	6.70	2.15	3.11	6.12	2.49	2.45	6.23	2.69	2.32	5.75	3.18	1.81	/	/	/
5	5.91	0.93	6.35	5.34	1.03	5.19	5.31	1.12	4.73	5.97	1.39	4.29	7.49	2.05	3.66	7.30	2.32	3.15	8.08	2.71	2.98	7.87	3.18	2.48	6.99	3.33	2.10
7	6.15	0.88	6.98	5.53	0.96	5.79	5.58	1.04	5.38	6.30	1.31	4.80	7.88	1.92	4.10	7.83	2.26	3.46	8.63	2.64	3.27	8.71	3.13	2.79	8.06	3.28	2.46
10	6.10	0.84	7.24	5.72	0.91	6.31	5.62	0.97	5.81	6.37	1.26	5.07	7.92	1.90	4.16	7.76	2.13	3.63	8.30	2.54	3.27	8.68	3.03	2.87	8.28	3.17	2.61
15	5.93	0.66	8.96	5.78	0.75	7.68	5.62	0.90	6.26	6.92	1.26	5.49	8.09	1.72	4.69	8.28	2.08	3.98	7.83	2.35	3.33	8.73	2.83	3.09	8.62	2.95	2.92
20	5.81	0.56	10.3	5.73	0.65	8.85	5.66	0.75	7.52	6.97	1.10	6.32	8.27	1.54	5.36	8.52	1.88	4.53	7.90	2.11	3.75	7.72	2.43	3.18	/	/	/
25	5.89	0.54	11.0	5.85	0.61	9.58	5.79	0.68	8.54	7.06	0.96	7.36	8.39	1.36	6.16	8.81	1.70	5.18	8.00	1.88	4.25	7.29	2.23	3.27	/	/	/
30	6.83	0.58	11.8	6.96	0.69	10.1	7.82	0.89	8.78	8.23	1.09	7.52	8.52	1.38	6.18	8.95	1.62	5.51	8.60	1.82	4.73	7.34	2.20	3.33	/	/	/
35	7.23	0.56	12.8	7.43	0.69	10.8	8.17	0.88	9.31	8.60	1.08	7.94	8.58	1.32	6.49	9.27	1.58	5.87	8.90	1.74	5.11	/	/	/	/	/	/
40	7.63	0.58	13.1	7.95	0.69	11.5	8.75	0.88	9.93	9.09	1.07	8.47	9.05	1.28	7.05	9.60	1.57	6.10	/	/	/	/	/	/	/	/	/
43	8.10	0.57	14.3	8.37	0.67	12.5	9.22	0.87	10.6	9.64	1.06	9.06	9.75	1.27	7.69	10.0	1.53	6.54	/	/	/	/	/	/	/	/	/

Abbreviations:

LWT: Leaving water temperature (°C)

DB: Dry-bulb temperature for Outdoor air temperature (°C)

HC: Total heating capacity (kW)

PI: Power input (kW)

Heating capacity for MSH-140EB(-3)

Maximum

DB	\n LWT																										
	25			30			35			40			45			50			55			60			65		
	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP
-25	6.60	3.09	2.14	6.76	3.20	2.11	5.43	3.18	1.71	4.89	3.35	1.46	4.47	3.47	1.29	/	/	/	/	/	/	/	/	/	/	/	/
-20	8.26	3.22	2.57	8.30	3.30	2.52	7.79	3.58	2.18	6.89	3.65	1.89	6.25	3.61	1.73	5.42	3.61	1.50	5.14	3.87	1.33	/	/	/	/	/	/
-15	9.61	3.40	2.82	9.57	3.65	2.62	9.57	3.94	2.43	8.57	3.95	2.17	7.63	4.12	1.85	7.01	4.32	1.62	6.46	4.58	1.41	6.01	5.05	1.19	/	/	/
-10	11.9	3.81	3.12	11.4	4.18	2.73	11.0	4.44	2.47	10.6	4.70	2.26	9.64	4.73	2.04	9.07	5.01	1.81	8.72	5.21	1.67	6.73	5.30	1.27	/	/	/
-7	13.7	4.02	3.41	12.9	4.28	3.02	12.7	4.55	2.79	12.3	4.94	2.49	11.9	5.17	2.31	11.0	5.33	2.07	11.3	5.46	2.01	8.02	5.31	1.51	/	/	/
-5	13.9	3.78	3.68	13.2	3.87	3.41	12.5	4.16	2.99	12.6	4.61	2.73	12.1	4.99	2.42	11.2	5.24	2.13	11.1	5.32	2.09	8.25	5.06	1.63	/	/	/
0	14.3	3.40	4.21	13.7	3.54	3.87	12.4	3.82	3.26	13.0	4.32	3.01	12.7	4.85	2.62	11.9	4.99	2.38	11.8	5.19	2.27	9.34	5.48	1.70	/	/	/
5	15.4	2.93	5.25	14.9	3.30	4.51	14.3	3.63	3.94	14.3	3.95	3.61	14.2	4.59	3.11	13.8	4.98	2.77	13.8	5.18	2.66	11.7	5.38	2.17	9.76	5.33	1.83
7	16.3	2.81	5.80	15.6	3.15	4.94	15.5	3.37	4.59	15.6	3.86	4.04	15.7	4.35	3.60	15.0	4.81	3.11	14.5	4.92	2.95	13.2	5.20	2.54	10.4	4.95	2.10
10	15.5	2.28	6.81	15.5	2.89	5.36	14.9	3.10	4.79	15.3	3.60	4.24	15.0	4.08	3.67	15.3	4.62	3.31	14.2	4.60	3.08	13.2	4.91	2.69	11.2	4.98	2.26
15	15.3	2.01	7.62	15.2	2.62	5.79	15.2	2.94	5.16	15.5	3.98	3.89	15.3	4.37	3.51	13.0	4.02	3.24	12.7	4.48	2.84	11.9	4.97	2.41	/	/	/
20	14.9	1.78	8.35	14.8	2.20	6.74	14.6	2.59	5.65	15.2	3.04	5.01	15.1	3.42	4.42	15.0	3.84	3.90	12.7	3.62	3.52	11.0	3.77	2.92	/	/	/
25	14.9	1.64	9.08	14.7	1.92	7.69	14.6	2.38	6.15	14.9	2.68	5.57	14.7	2.98	4.95	14.7	3.43	4.30	12.5	3.28	3.80	10.2	3.40	2.99	/	/	/
30	15.3	1.55	9.82	14.8	1.80	8.21	14.9	2.10	7.09	15.1	2.42	6.22	15.0	2.80	5.36	14.6	3.14	4.65	12.8	2.93	4.37	10.3	3.40	3.04	/	/	/
35	16.0	1.45	11.1	15.4	1.70	9.04	15.0	1.87	8.02	15.5	2.26	6.86	15.3	2.65	5.77	14.8	2.95	5.00	13.0	2.77	4.69	/	/	/	/	/	/
40	16.2	1.40	11.6	16.4	1.59	10.3	16.2	1.89	8.57	16.0	2.20	7.26	15.8	2.59	6.08	15.0	2.78	5.38	/	/	/	/	/	/	/	/	/
43	16.5	1.36	12.2	16.7	1.54	10.8	16.5	1.88	8.81	16.3	2.12	7.69	16.1	2.56	6.27	15.2	2.73	5.54	/	/	/	/	/	/	/	/	/

Normal

DB	\n LWT																										
	25			30			35			40			45			50			55			60			65		
	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP
-25	5.65	2.48	2.27	5.75	2.55	2.25	4.57	2.55	1.79	4.19	2.76	1.51	3.88	2.97	1.30	/	/	/	/	/	/	/	/	/	/	/	/
-20	7.27	2.63	2.77	7.27	2.67	2.72	6.75	2.92	2.32	6.07	3.06	1.99	5.48	3.08	1.78	4.77	3.08	1.55	4.69	3.52	1.33	/	/	/	/	/	/
-15	8.03	2.63	3.06	7.94	2.79	2.85	7.86	3.03	2.60	7.16	3.12	2.29	6.24	3.26	1.91	5.76	3.42	1.68	5.41	3.81	1.42	5.09	4.31	1.18	/	/	/
-10	9.80	2.96	3.31	9.36	3.22	2.91	8.89	3.43	2.59	8.76	3.74	2.34	8.07	3.85	2.09	7.63	4.08	1.87	7.34	4.26	1.72	5.73	4.44	1.29	/	/	/
-7	12.7	3.56	3.56	12.2	3.94	3.09	12.0	4.29	2.80	11.9	4.46	2.66	11.8	5.02	2.35	10.9	5.15	2.11	11.0	5.37	2.05	7.41	4.77	1.55	/	/	/
-5	11.6	2.89	4.00	10.8	2.96	3.66	9.98	3.11	3.21	10.2	3.45	2.95	9.68	3.77	2.57	8.78	3.96	2.22	8.83	4.05	2.18	6.77	4.04	1.68	/	/	/
0	11.4	2.48	4.59	10.8	2.58	4.17	9.52	2.72	3.50	10.1	3.08	3.27	9.74	3.48	2.79	8.78	3.62	2.42	8.78	3.70	2.38	7.18	4.08	1.76	/	/	/
5	12.4	2.15	5.78	11.9	2.42	4.90	11.1	2.60	4.27	11.2	2.83	3.96	11.1	3.31	3.35	10.5	3.60	2.92	10.6	3.77	2.81	9.31	4.11	2.27	8.06	4.19	1.93
7	15.2	2.43	6.26	14.5	2.77	5.24	14.5	3.09	4.70	14.6	3.52	4.15	14.2	3.89	3.65	14.0	4.40	3.18	13.8	4.60	3.00	12.3	4.73	2.61	9.71	4.50	2.16
10	12.3	1.63	7.53	12.1	2.07	5.85	11.3	2.17	5.22	11.8	2.52	4.67	11.4	2.87	3.97	11.4	3.30	3.46	10.6	3.31	3.21	10.3	3.71	2.78	9.11	3.88	2.35
15	12.2	1.43	8.50	11.9	1.87	6.37	11.6	2.05	5.67	12.3	2.49	4.94	11.5	3.11	3.70	9.84	2.88	3.41	10.0	3.38	2.96	9.68	3.78	2.56	/	/	/
20	11.7	1.25	9.40	11.5	1.54	7.49	11.1	1.77	6.27	11.7	2.08	5.62	11.5	2.35	4.87	11.1	2.68	4.16	9.53	2.55	3.74	8.54	2.78	3.07	/	/	/
25	11.8	1.15	10.2	11.6	1.35	8.55	11.1	1.63	6.82	11.5	1.66	6.93	11.3	2.06	5.46	11.0	2.41	4.58	9.40	2.32	4.04	7.95	2.53	3.14	/	/	/
30	12.2	1.11	11.0	11.7	1.29	9.07	11.4	1.46	7.81	11.7	1.54	7.64	11.6	2.05	5.63	11.0	2.24	4.92	9.74	2.13	4.56	8.17	2.58	3.17	/	/	/
35	13.0	1.06	12.3	12.4	1.25	9.93	11.8	1.36	8.63	12.3	1.67	7.39	12.0	1.96	6.10	11.4	2.13	5.33	10.1	2.05	4.93	/	/	/	/	/	/
40	13.5	1.04	13.0	13.6	1.19	11.4	13.1	1.41	9.28	13.0	1.65	7.88	12.7	1.96	6.48	11.8	2.04	5.78	/	/	/	/	/	/	/	/	/
43	14.1	1.02	13.8	14.1	1.17	12.1	13.6	1.41	9.61	13.5	1.61	8.40	13.2	1.96	6.73	12.2	2.04	5.99	/	/	/	/	/	/	/	/	/

Minimum

DB	\n LWT																										
	25			25			25			25			25			25			25			25			25		
	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP
-25	3.76	1.62	2.33	4.02	1.74	2.30	3.54	1.94	1.82	3.33	2.17	1.54	3.00	2.29	1.31	/	/	/	/	/	/	/	/	/	/	/	/
-20	4.58	1.63	2.80	4.77	1.73	2.76	4.40	1.87	2.35	4.02	1.99	2.02	4.06	2.31	1.76	3.79	2.47	1.54	3.65	2.76	1.32	/	/	/	/	/	/
-15	5.24	1.68	3.13	5.40	1.85	2.91	5.31	2.00	2.66	4.91	2.09	2.35	4.88	2.56	1.91	4.84	2.87	1.68	4.52	3.17	1.43	4.33	3.65	1.19	/	/	/
-10	5.05	1.47	3.44	5.08	1.68	3.02	4.76	1.79	2.66	4.80	1.99	2.41	5.01	2.35	2.13	5.17	2.71	1.90	5.40	3.08	1.76	4.51	3.43	1.32	/	/	/
-7	5.14	1.34	3.84	4.55	1.35	3.36	4.57	1.48	3.10	4.96	1.77	2.80	6.21	2.46	2.52	5.96	2.71	2.20	6.25	2.90	2.15	5.22	3.26	1.60	/	/	/
-5	5.35	1.28	4.17	4.78	1.25	3.81	4.61	1.38	3.34	5.19	1.69	3.07	6.40	2.41	2.65	6.15	2.69	2.28	6.46	2.88	2.24	5.44	3.15	1.73	/	/	/
0	5.73	1.19	4.80	5.34	1.22	4.36	4.79	1.31	3.66	5.57	1.63	3.42	6.92	2.39	2.90	6.61	2.67	2.48	6.90	2.81	2.46	6.17	3.39	1.82	/	/	/
5	6.23	1.03	6.07	5.89	1.14	5.15	5.58	1.24	4.49	6.18	1.49	4.16	7.86	2.25	3.49	7.86	2.59	3.03	8.68	2.98	2.91	7.95	3.38	2.35	6.88	3.44	2.00
7	6.48	0.96	6.75	6.03	1.06	5.68	5.92	1.12	5.27	6.64	1.42	4.68	8.50	2.09	4.07	8.43	2.46	3.43	9.05	2.78	3.25	8.88	3.21	2.77	7.25	3.14	2.31
10	6.34	0.80	7.93	6.18	1.00	6.16	5.84	1.06	5.50	6.66	1.35	4.92	8.28	2.00	4.15	8.77	2.40	3.65	8.96	2.67	3.36	9.02	3.10	2.91	7.95	3.23	2.46
15	6.01	0.67	8.90	5.97	0.89	6.68	5.93	1.00	5.94	7.33	1.42	5.18	8.59	1.94	4.42	9.47	2.43	3.89	8.45	2.38	3.55	9.04	2.93	3.09	8.72	3.29	2.65
20	5.95	0.60	9.84	5.93	0.76	7.85	5.83	0.89	6.57	7.16	1.22	5.88	8.48	1.68	5.06	9.35	2.14	4.36	8.36	2.15	3.89	7.88	2.47	3.19	/	/	/
25	6.09	0.57	10.7	6.05	0.68	8.95	5.96	0.83	7.15	7.17	1.10	6.54	8.42	1.48	5.67	9.33	1.94	4.80	8.32	1.98	4.21	7.38	2.26	3.27	/	/	/
30	7.11	0.62	11.5	7.26	0.76	9.49	8.10	1.01	8.02	8.43	1.20	7.05	8.68	1.46	5.92	9.37	1.81	5.17	8.70	1.81	4.80	7.34	2.20	3.33	/	/	/
35	7.63	0.59	13.0	7.69	0.73	10.5	8.32	0.91	9.15	8.83	1.13	7.84	8.98	1.40	6.42	9.63	1.72	5.61	8.97	1.73	5.19	/	/	/	/	/	/
40	7.89	0.57	13.8	8.37	0.69	12.1	9.16	0.93	9.84	9.10	1.09	8.35	9.29	1.36	6.82	9.89	1.63	6.08	/	/	/	/	/	/	/	/	/
43	8.30	0.57	14.6	8.79	0.69	12.8	9.59	0.94	10.2	9.53	1.07	8.90	9.24	1.31	7.08	10.3	1.63	6.30	/	/	/	/	/	/	/	/	/

Abbreviations:

LWT: Leaving water temperature (°C)

DB: Dry-bulb temperature for Outdoor air temperature (°C)

HC: Total heating capacity (kW)

PI: Power input (kW)

Heating capacity for MSH-160EB(-3)

Maximum

DB	LWT 25			LWT 30			LWT 35			LWT 40			LWT 45			LWT 50			LWT 55			LWT 60			LWT 65		
	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP
-25	7.69	4.03	1.91	7.99	4.22	1.93	6.61	4.01	1.65	5.89	4.43	1.33	4.96	4.21	1.18	/	/	/	/	/	/	/	/	/	/	/	/
-20	9.57	3.94	2.38	9.71	4.43	2.19	8.16	4.77	1.71	7.48	4.76	1.57	6.55	4.85	1.35	5.85	4.54	1.29	5.37	4.75	1.13	/	/	/	/	/	/
-15	11.8	4.37	2.71	11.3	4.60	2.45	10.7	4.93	2.17	10.1	5.24	1.92	9.03	5.38	1.68	7.53	5.32	1.42	6.82	5.29	1.29	6.42	5.59	1.15	/	/	/
-10	13.4	4.51	2.97	13.0	4.78	2.72	12.7	5.09	2.49	12.4	5.43	2.28	11.1	5.61	1.96	9.49	5.56	1.70	8.92	5.88	1.51	7.04	5.59	1.26	/	/	/
-7	14.3	4.59	3.13	14.1	4.89	2.88	13.9	5.19	2.67	13.8	5.55	2.50	13.1	6.02	2.18	12.9	6.22	2.07	12.6	6.29	2.00	8.25	6.18	1.33	/	/	/
-5	14.6	4.27	3.47	14.3	4.61	3.13	14.0	4.93	2.86	13.8	5.33	2.61	13.4	5.88	2.28	13.0	5.82	2.22	12.8	5.92	2.13	8.62	5.97	1.45	/	/	/
0	15.1	3.49	4.33	14.7	3.91	3.75	14.3	4.27	3.34	13.9	4.80	2.88	14.1	5.33	2.64	13.4	5.14	2.61	12.8	5.42	2.37	9.56	5.54	1.72	/	/	/
5	16.8	3.25	5.19	14.6	3.61	4.06	16.1	4.00	4.04	15.6	4.57	3.43	15.9	4.96	3.20	15.3	5.05	3.02	14.5	5.21	2.77	12.7	5.36	2.37	10.7	5.24	2.04
7	17.5	3.16	5.53	15.7	3.12	4.68	16.8	3.79	4.43	16.4	4.25	3.85	16.6	4.71	3.53	16.2	5.05	3.17	16.2	5.53	2.89	14.1	5.34	2.63	11.3	5.13	2.20
10	18.0	3.01	6.02	16.4	3.34	4.96	17.6	3.73	4.74	17.1	4.33	3.96	17.3	4.72	3.67	16.7	5.12	3.26	16.1	5.16	3.11	14.3	5.15	2.79	12.2	4.97	2.46
15	18.9	2.76	6.84	19.3	3.08	6.26	18.9	3.48	5.43	18.3	4.08	4.48	18.5	4.53	4.09	17.8	4.79	3.72	17.5	5.11	3.42	14.7	4.83	3.06	12.5	4.80	2.60
20	16.7	2.08	8.03	16.9	2.38	7.10	16.7	2.69	6.21	17.4	3.40	5.12	16.1	3.77	4.28	14.6	4.06	3.60	15.0	4.32	3.46	13.1	4.39	3.00	/	/	/
25	16.2	1.83	8.86	16.2	2.23	7.26	16.0	2.31	6.94	16.6	2.87	5.81	15.7	3.23	4.87	14.5	3.46	4.20	14.1	3.68	3.82	12.4	4.05	3.07	/	/	/
30	15.6	1.55	10.1	15.5	1.88	8.21	15.4	2.00	7.68	15.9	2.45	6.49	15.3	2.81	5.46	14.4	3.01	4.79	13.2	3.15	4.18	12.7	4.11	3.10	/	/	/
35	16.3	1.50	10.8	16.6	1.84	9.01	16.3	1.94	8.42	16.6	2.42	6.87	15.9	2.79	5.68	15.0	3.00	5.01	13.4	3.07	4.35	/	/	/	/	/	/
40	16.9	1.47	11.5	17.6	1.75	10.1	17.2	1.88	9.15	17.4	2.40	7.24	16.4	2.78	5.91	15.6	2.98	5.22	/	/	/	/	/	/	/	/	/
43	17.2	1.46	11.8	18.0	1.71	10.5	17.6	1.88	9.37	17.7	2.39	7.41	16.7	2.70	6.20	15.9	2.94	5.41	/	/	/	/	/	/	/	/	/

Normal

DB	LWT 25			LWT 30			LWT 35			LWT 40			LWT 45			LWT 50			LWT 55			LWT 60			LWT 65		
	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP
-25	6.57	3.24	2.03	6.79	3.29	2.06	5.57	3.21	1.73	5.04	3.65	1.38	4.30	3.60	1.19	/	/	/	/	/	/	/	/	/	/	/	/
-20	8.42	3.29	2.56	8.50	3.59	2.37	7.07	3.88	1.82	6.59	3.99	1.65	5.74	4.14	1.39	5.15	3.88	1.33	4.89	4.33	1.13	/	/	/	/	/	/
-15	9.89	3.37	2.93	9.35	3.52	2.66	8.80	3.79	2.32	8.41	4.14	2.03	7.38	4.26	1.73	6.18	4.21	1.47	5.71	4.40	1.30	5.43	4.77	1.14	/	/	/
-10	11.1	3.51	3.15	10.7	3.68	2.90	10.3	3.95	2.61	10.3	4.34	2.37	9.25	4.59	2.01	7.98	4.55	1.75	7.51	4.83	1.55	5.99	4.69	1.28	/	/	/
-7	13.9	4.27	3.25	13.5	4.44	3.05	13.3	4.93	2.70	13.1	4.98	2.63	12.9	5.78	2.23	12.4	5.83	2.12	12.5	6.19	2.02	7.69	5.60	1.37	/	/	/
-5	12.1	3.21	3.77	11.7	3.49	3.36	11.2	3.65	3.07	11.2	3.98	2.82	10.7	4.44	2.42	10.2	4.83	2.11	9.98	4.50	2.22	7.08	4.76	1.49	/	/	/
0	12.0	2.54	4.72	11.5	2.86	4.04	10.9	3.05	3.59	10.7	3.43	3.13	10.8	3.83	2.81	10.1	4.00	2.52	9.77	3.91	2.50	7.66	4.30	1.78	/	/	/
5	13.5	2.37	5.71	11.7	2.64	4.41	12.5	2.85	4.38	12.3	3.27	3.76	12.3	3.58	3.44	11.6	3.90	2.97	11.1	3.79	2.93	10.1	4.09	2.47	8.84	4.24	2.08
7	17.0	2.87	5.91	15.2	2.98	5.11	16.0	3.56	4.50	15.7	3.99	3.94	16.0	4.44	3.60	16.0	4.92	3.24	16.0	5.52	2.90	13.2	4.86	2.72	10.2	4.60	2.23
10	14.2	2.14	6.66	12.8	2.36	5.42	13.4	2.59	5.16	13.2	3.01	4.36	13.2	3.33	3.97	12.5	3.66	3.41	12.1	3.71	3.25	11.2	3.88	2.88	9.92	3.93	2.52
15	15.0	1.97	7.63	15.2	2.20	6.89	14.5	2.43	5.97	14.2	2.84	4.98	14.2	3.19	4.46	13.4	3.41	3.92	13.2	3.67	3.61	11.6	3.64	3.19	10.2	3.81	2.67
20	13.2	1.46	9.04	13.2	1.67	7.89	12.7	1.84	6.88	13.3	2.32	5.75	12.2	2.59	4.71	10.9	2.83	3.84	11.2	3.04	3.68	10.2	3.24	3.15	/	/	/
25	12.8	1.29	9.97	12.7	1.57	8.06	12.2	1.59	7.71	12.9	1.78	7.22	12.0	2.24	5.36	10.8	2.43	4.47	10.6	2.60	4.07	9.73	3.01	3.23	/	/	/
30	12.5	1.11	11.3	12.2	1.35	9.06	11.8	1.40	8.47	12.4	1.55	7.98	11.8	2.06	5.74	10.9	2.15	5.07	10.0	2.29	4.37	10.1	3.12	3.23	/	/	/
35	13.3	1.10	12.0	13.3	1.35	9.90	12.8	1.41	9.06	13.2	1.79	7.40	12.5	2.07	6.02	11.5	2.16	5.34	10.4	2.27	4.57	/	/	/	/	/	/
40	14.1	1.10	12.8	14.6	1.31	11.1	13.9	1.40	9.91	14.1	1.80	7.86	13.2	2.10	6.30	12.3	2.19	5.61	/	/	/	/	/	/	/	/	/
43	14.7	1.10	13.3	15.1	1.29	11.7	14.4	1.41	10.2	14.7	1.81	8.10	13.7	2.06	6.66	12.8	2.19	5.85	/	/	/	/	/	/	/	/	/

Minimum

DB	LWT 25			LWT 25			LWT 25			LWT 25			LWT 25			LWT 25			LWT 25			LWT 25			LWT 25		
	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP
-25	4.38	2.11	2.08	4.74	2.25	2.11	4.30	2.44	1.76	4.01	2.86	1.40	3.33	2.77	1.20	/	/	/	/	/	/	/	/	/	/	/	/
-20	5.31	2.04	2.60	5.58	2.33	2.40	4.61	2.50	1.85	4.36	2.60	1.68	4.25	3.10	1.37	4.10	3.11	1.32	3.81	3.38	1.13	/	/	/	/	/	/
-15	6.45	2.15	3.00	6.37	2.34	2.72	5.94	2.50	2.38	5.77	2.77	2.08	5.78	3.33	1.73	5.20	3.54	1.47	4.78	3.66	1.30	4.62	4.04	1.15	/	/	/
-10	5.70	1.74	3.27	5.80	1.93	3.01	5.52	2.06	2.68	5.63	2.31	2.43	5.75	2.80	2.05	5.41	3.03	1.79	5.53	3.49	1.58	4.71	3.62	1.30	/	/	/
-7	5.38	1.53	3.52	4.96	1.55	3.21	4.99	1.68	2.97	5.58	1.99	2.80	6.83	2.86	2.38	6.94	3.17	2.19	7.11	3.27	2.17	5.36	3.80	1.41	/	/	/
-5	5.60	1.43	3.93	5.16	1.47	3.50	5.17	1.62	3.20	5.72	1.94	2.94	7.09	2.84	2.50	7.12	3.29	2.17	7.31	3.20	2.28	5.69	3.72	1.53	/	/	/
0	6.04	1.22	4.94	5.72	1.35	4.23	5.49	1.46	3.76	5.93	1.81	3.28	7.66	2.62	2.92	7.58	2.91	2.60	7.52	2.91	2.59	6.32	3.43	1.84	/	/	/
5	6.80	1.13	5.99	5.78	1.25	4.64	6.27	1.36	4.60	6.77	1.71	3.95	8.74	2.43	3.59	8.70	2.82	3.09	9.11	3.00	3.04	8.65	3.36	2.57	7.55	3.51	2.15
7	6.96	1.08	6.43	5.67	1.05	5.38	6.43	1.27	5.08	6.97	1.56	4.46	9.02	2.26	3.99	9.01	2.58	3.49	9.96	3.13	3.19	9.46	3.29	2.87	7.87	3.41	2.31
10	7.35	1.05	7.01	6.51	1.14	5.70	6.91	1.27	5.44	7.44	1.62	4.59	9.58	2.31	4.15	9.56	2.66	3.59	10.2	2.99	3.40	9.78	3.24	3.02	8.66	3.38	2.56
15	7.40	0.93	7.99	7.57	1.05	7.22	7.39	1.18	6.26	8.45	1.62	5.22	10.3	2.21	4.64	11.0	2.67	4.12	11.4	3.02	3.75	10.5	3.16	3.32	9.17	3.37	2.72
20	6.67	0.70	9.46	6.76	0.82	8.27	6.65	0.92	7.21	8.17	1.36	6.02	9.04	1.85	4.89	9.12	2.26	4.03	9.82	2.57	3.83	9.42	2.87	3.28	/	/	/
25	6.62	0.63	10.4	6.64	0.79	8.45	6.54	0.81	8.07	6.82	1.17	5.83	8.98	1.61	5.57	9.20	1.96	4.69	9.38	2.22	4.23	9.04	2.69	3.36	/	/	/
30	7.29	0.62	11.8	7.58	0.80	9.48	8.38	0.96	8.70	8.91	1.21	7.36	8.88	1.47	6.03	9.25	1.74	5.33	8.95	1.95	4.59	9.05	2.66	3.40	/	/	/
35	7.75	0.61	12.7	8.28	0.79	10.5	9.05	0.94	9.60	9.48	1.21	7.85	9.34	1.48	6.33	9.77	1.74	5.61	9.23	1.92	4.81	/	/	/	/	/	/
40	8.22	0.61	13.6	9.00	0.76	11.8	9.75	0.93	10.5	9.89	1.19	8.34	9.68	1.46	6.62	10.3	1.75	5.90	/	/	/	/	/	/	/	/	/
43	8.64	0.61	14.1	9.45	0.76	12.4	10.2	0.94	10.8	10.4	1.21	8.59	10.2	1.46	7.00	10.7	1.75	6.15	/	/	/	/	/	/	/	/	/

Abbreviations:

LWT: Leaving water temperature (°C)

DB: Dry-bulb temperature for Outdoor air temperature (°C)

HC: Total heating capacity (kW)

PI: Power input (kW)

22.2 Cooling Capacity Tables (Test standard：EN14511)

MSH-40EB cooling capacity

	Maximum														
	LWT														
DB	5			10			15			20			25		
	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER
-5	/	/	/	/	/	/	4.76	0.46	10.30	5.47	0.55	10.01	6.09	0.48	12.66
0	/	/	/	/	/	/	4.54	0.57	8.03	5.25	0.65	8.08	5.87	0.55	10.70
5	/	/	/	/	/	/	4.04	0.67	6.07	4.75	0.75	6.34	5.37	0.65	8.28
10	/	/	/	/	/	/	6.06	1.06	5.71	6.44	1.01	6.40	7.11	0.85	8.37
15	/	/	/	5.05	0.86	5.91	8.09	1.46	5.55	8.14	1.26	6.44	8.85	1.05	8.43
20	4.72	1.04	4.53	6.01	1.35	4.47	8.16	1.49	5.47	8.33	1.30	6.42	8.98	1.10	8.15
25	5.87	1.30	4.51	6.97	1.84	3.80	8.23	1.53	5.39	8.52	1.33	6.40	9.12	1.15	7.90
30	5.84	1.55	3.78	6.80	1.85	3.67	7.77	1.65	4.72	8.19	1.46	5.63	8.77	1.30	6.75
35	5.80	1.79	3.24	6.64	1.87	3.55	7.31	1.76	4.15	7.87	1.58	4.98	8.43	1.44	5.84
40	3.80	1.51	2.52	5.08	1.81	2.81	5.91	1.73	3.41	6.63	1.68	3.95	7.88	1.64	4.80
43	2.58	1.15	2.24	3.80	1.52	2.51	5.08	1.56	3.26	5.88	1.57	3.74	7.55	1.59	4.73
	Normal														
	LWT														
DB	5			10			15			20			25		
	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER
-5	/	/	/	/	/	/	3.83	0.33	11.74	4.45	0.37	11.92	4.95	0.35	14.10
0	/	/	/	/	/	/	3.66	0.39	9.35	4.28	0.44	9.81	4.78	0.36	13.31
5	/	/	/	/	/	/	3.23	0.48	6.68	3.81	0.52	7.29	4.36	0.45	9.77
10	/	/	/	/	/	/	4.87	0.77	6.29	5.19	0.70	7.37	5.79	0.59	9.89
15	/	/	/	3.79	0.61	6.25	6.79	1.15	5.89	7.00	0.99	7.06	7.44	0.80	9.29
20	3.68	0.77	4.76	4.86	1.01	4.80	6.80	1.16	5.88	7.17	1.03	6.94	7.82	0.87	8.98
25	4.65	0.97	4.78	5.72	1.40	4.09	6.96	1.21	5.74	7.44	1.07	6.98	8.05	0.91	8.85
30	4.69	1.17	4.02	5.67	1.45	3.92	6.67	1.32	5.06	7.25	1.20	6.05	7.85	1.06	7.44
35	4.51	1.32	3.40	5.45	1.43	3.82	6.02	1.35	4.47	6.87	1.28	5.36	7.69	1.20	6.39
40	3.10	1.15	2.70	4.30	1.42	3.03	5.15	1.40	3.68	5.95	1.37	4.34	7.15	1.32	5.41
43	2.12	0.91	2.33	2.99	1.15	2.59	4.04	1.18	3.43	5.04	1.25	4.04	5.97	1.15	5.18
	Minimum														
	LWT (°C)														
DB	5			10			15			20			25		
	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER
-5	/	/	/	/	/	/	2.48	0.20	12.60	2.87	0.23	12.38	3.21	0.20	15.83
0	/	/	/	/	/	/	2.37	0.24	9.92	2.77	0.27	10.09	3.11	0.23	13.40
5	/	/	/	/	/	/	1.74	0.24	7.35	2.06	0.27	7.76	2.35	0.23	10.17
10	/	/	/	/	/	/	2.70	0.39	6.99	2.90	0.37	7.91	3.21	0.31	10.39
15	/	/	/	2.32	0.35	6.64	3.64	0.58	6.29	3.50	0.45	7.80	4.25	0.41	10.32
20	1.86	0.38	4.95	2.13	0.43	5.00	3.38	0.54	6.23	3.95	0.54	7.32	4.44	0.47	9.50
25	2.23	0.46	4.89	2.37	0.55	4.29	3.29	0.54	6.04	3.92	0.53	7.33	4.38	0.47	9.28
30	2.23	0.54	4.10	2.33	0.57	4.11	3.12	0.59	5.30	3.79	0.59	6.38	4.23	0.55	7.72
35	2.05	0.59	3.50	2.53	0.63	4.00	3.01	0.63	4.79	3.66	0.63	5.81	4.23	0.62	6.84
40	1.40	0.52	2.69	2.01	0.64	3.12	2.52	0.66	3.82	3.18	0.71	4.50	4.07	0.74	5.51
43	0.73	0.31	2.38	1.43	0.53	2.68	2.11	0.59	3.57	2.57	0.62	4.17	3.80	0.71	5.38

Abbreviations:

LWT: Leaving water temperature (°C)

DB: Dry-bulb temperature for Outdoor air temperature (°C)

CC: Total cooling capacity (kW)

PI: Power input (kW)

MSH-60EB cooling capacity

Maximum															
	LWT														
DB	5			10			15			20			25		
	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER
-5	/	/	/	/	/	/	5.27	0.59	8.93	6.38	0.55	11.53	6.77	0.64	10.62
0	/	/	/	/	/	/	5.05	0.69	7.28	6.16	0.66	9.39	6.55	0.74	8.85
5	/	/	/	/	/	/	4.55	0.79	5.74	5.66	0.76	7.48	6.05	0.84	7.20
10	/	/	/	/	/	/	6.32	1.13	5.61	6.90	1.01	6.83	7.45	0.95	7.88
15	/	/	/	5.89	1.10	5.33	8.09	1.46	5.55	8.14	1.26	6.44	8.85	1.05	8.43
20	5.41	1.38	3.93	6.63	1.43	4.62	8.16	1.49	5.47	8.33	1.30	6.42	8.98	1.10	8.15
25	7.16	1.80	3.98	7.37	1.77	4.17	8.23	1.53	5.39	8.52	1.33	6.40	9.12	1.15	7.90
30	6.50	1.85	3.51	7.29	1.90	3.84	7.77	1.65	4.72	8.19	1.46	5.63	8.77	1.30	6.75
35	5.84	1.90	3.07	7.22	2.03	3.55	7.31	1.76	4.15	7.87	1.58	4.98	8.43	1.44	5.84
40	3.80	1.51	2.52	5.08	1.81	2.81	5.91	1.73	3.41	6.63	1.68	3.95	7.88	1.64	4.80
43	2.58	1.15	2.24	3.80	1.52	2.51	5.08	1.56	3.26	5.88	1.57	3.74	7.55	1.59	4.73
Normal															
	LWT														
DB	5			10			15			20			25		
	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER
-5	/	/	/	/	/	/	4.24	0.42	10.18	5.19	0.38	13.72	5.50	0.42	12.96
0	/	/	/	/	/	/	4.07	0.48	8.48	5.02	0.44	11.39	5.33	0.48	11.01
5	/	/	/	/	/	/	3.64	0.58	6.31	4.54	0.53	8.61	4.91	0.58	8.49
10	/	/	/	/	/	/	5.08	0.82	6.18	5.55	0.71	7.86	6.06	0.65	9.31
15	/	/	/	4.42	0.78	5.65	6.79	1.15	5.89	7.00	0.99	7.06	7.44	0.80	9.29
20	4.22	1.02	4.14	5.36	1.08	4.96	6.80	1.16	5.88	7.17	1.03	6.94	7.82	0.87	8.98
25	5.67	1.35	4.21	6.05	1.35	4.49	6.96	1.21	5.74	7.44	1.07	6.98	8.05	0.91	8.85
30	5.23	1.40	3.74	6.08	1.48	4.10	6.67	1.32	5.06	7.25	1.20	6.05	7.85	1.06	7.44
35	4.54	1.41	3.22	5.93	1.55	3.83	6.02	1.35	4.47	6.87	1.28	5.36	7.69	1.20	6.39
40	3.10	1.15	2.70	4.30	1.42	3.03	5.15	1.40	3.68	5.95	1.37	4.34	7.15	1.32	5.41
43	2.12	0.91	2.33	2.99	1.15	2.59	4.04	1.18	3.43	5.04	1.25	4.04	5.97	1.15	5.18
Minimum															
	LWT														
DB	5			10			15			20			25		
	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER
-5	/	/	/	/	/	/	2.75	0.25	10.92	3.35	0.23	14.26	3.57	0.27	13.17
0	/	/	/	/	/	/	2.64	0.29	9.00	3.25	0.28	11.72	3.47	0.31	11.08
5	/	/	/	/	/	/	1.96	0.28	6.95	2.46	0.27	9.16	2.64	0.30	8.84
10	/	/	/	/	/	/	2.81	0.41	6.87	3.10	0.37	8.44	3.36	0.34	9.78
15	/	/	/	2.71	0.45	5.99	3.64	0.58	6.29	3.50	0.45	7.80	4.25	0.41	10.32
20	2.13	0.50	4.30	2.35	0.45	5.17	3.38	0.54	6.23	3.95	0.54	7.32	4.44	0.47	9.50
25	2.72	0.63	4.31	2.50	0.53	4.72	3.29	0.54	6.04	3.92	0.53	7.33	4.38	0.47	9.28
30	2.48	0.65	3.81	2.49	0.58	4.30	3.12	0.59	5.30	3.79	0.59	6.38	4.23	0.55	7.72
35	2.07	0.62	3.31	2.75	0.69	4.00	3.01	0.63	4.79	3.66	0.63	5.81	4.23	0.62	6.84
40	1.40	0.52	2.69	2.01	0.64	3.12	2.52	0.66	3.82	3.18	0.71	4.50	4.07	0.74	5.51
43	0.73	0.31	2.38	1.43	0.53	2.68	2.11	0.59	3.57	2.57	0.62	4.17	3.80	0.71	5.38

Abbreviations:

LWT: Leaving water temperature (°C)

DB: Dry-bulb temperature for Outdoor air temperature (°C)

CC: Total cooling capacity (kW)

PI: Power input (kW)

MSH-80EB cooling capacity

								Maximum								
								LWT								
DB		**5**			**10**			**15**			**20**			**25**	
	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER
-5	/	/	/	/	/	/	6.39	0.63	10.07	8.21	0.76	10.82	8.74	0.71	12.31
0	/	/	/	/	/	/	6.17	0.71	8.69	7.26	0.74	9.76	7.76	0.70	11.05
5	/	/	/	/	/	/	5.96	0.82	7.30	6.30	0.72	8.69	6.78	0.69	9.78
10	/	/	/	/	/	/	6.29	0.74	8.54	7.91	0.84	9.45	8.30	0.79	10.53
15	/	/	/	5.97	0.87	6.84	7.33	0.99	7.38	9.11	1.15	7.94	9.73	1.12	8.67
20	5.68	1.15	4.96	7.06	1.29	5.46	8.38	1.35	6.22	10.31	1.60	6.43	11.15	1.64	6.81
25	6.47	1.48	4.36	7.82	1.63	4.81	9.26	1.68	5.52	11.25	1.90	5.92	12.76	2.02	6.33
30	7.27	1.89	3.85	8.57	2.01	4.25	10.15	2.06	4.93	12.20	2.20	5.54	14.36	2.40	6.00
35	7.39	2.25	3.28	8.77	2.31	3.80	10.21	2.31	4.43	11.74	2.40	4.89	13.59	2.50	5.42
40	6.61	2.52	2.62	7.42	2.37	3.14	8.88	2.53	3.51	10.23	2.51	4.07	12.27	2.83	4.34
43	5.09	2.28	2.23	5.64	2.19	2.58	6.73	2.13	3.16	8.15	2.17	3.75	10.04	2.49	4.03
								Normal								
								LWT								
DB		**5**			**10**			**15**			**20**			**25**	
	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER
-5	/	/	/	/	/	/	5.14	0.45	11.38	6.68	0.53	12.50	7.10	0.51	14.03
0	/	/	/	/	/	/	4.98	0.50	9.94	5.91	0.52	11.31	6.31	0.49	12.86
5	/	/	/	/	/	/	4.77	0.60	7.96	5.05	0.52	9.69	5.50	0.51	10.76
10	/	/	/	/	/	/	5.05	0.54	9.32	6.37	0.60	10.55	6.75	0.58	11.60
15	/	/	/	4.48	0.62	7.24	6.16	0.79	7.83	7.83	0.90	8.70	8.17	0.86	9.55
20	4.43	0.85	5.21	5.71	0.97	5.86	6.99	1.04	6.69	8.87	1.28	6.95	9.71	1.29	7.50
25	5.13	1.11	4.61	6.42	1.24	5.17	7.84	1.33	5.87	9.82	1.52	6.46	11.26	1.59	7.09
30	5.84	1.42	4.10	7.14	1.57	4.54	8.71	1.65	5.28	10.80	1.82	5.94	12.86	1.95	6.61
35	5.75	1.67	3.45	7.20	1.76	4.09	8.42	1.76	4.77	10.25	1.95	5.26	12.39	2.09	5.94
40	5.40	1.92	2.81	6.27	1.86	3.38	7.73	2.04	3.79	9.18	2.06	4.47	11.14	2.28	4.89
43	4.18	1.80	2.32	4.44	1.66	2.67	5.36	1.61	3.32	6.98	1.72	4.06	7.94	1.80	4.41
								Minimum								
								LWT								
DB		**5**			**10**			**15**			**20**			**25**	
	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER
-5	/	/	/	/	/	/	3.33	0.28	11.86	4.31	0.33	12.89	4.60	0.31	14.71
0	/	/	/	/	/	/	3.23	0.31	10.38	3.83	0.32	11.79	4.11	0.31	13.34
5	/	/	/	/	/	/	2.57	0.30	8.55	2.74	0.27	10.29	2.96	0.26	11.57
10	/	/	/	/	/	/	2.80	0.28	10.11	3.56	0.31	11.31	3.75	0.30	12.59
15	/	/	/	2.75	0.36	7.69	3.30	0.39	8.37	3.92	0.41	9.62	4.67	0.44	10.61
20	2.24	0.41	5.42	2.50	0.41	6.12	3.47	0.49	7.09	4.88	0.67	7.33	5.51	0.69	7.93
25	2.46	0.52	4.73	2.66	0.49	5.43	3.71	0.60	6.18	5.18	0.76	6.78	6.12	0.82	7.44
30	2.78	0.66	4.19	2.93	0.62	4.76	4.08	0.74	5.53	5.64	0.90	6.28	6.92	1.01	6.86
35	2.62	0.74	3.54	3.34	0.78	4.28	4.21	0.82	5.12	5.46	0.96	5.70	6.82	1.07	6.36
40	2.44	0.87	2.80	2.94	0.84	3.48	3.79	0.97	3.93	4.91	1.06	4.64	6.34	1.28	4.97
43	1.43	0.60	2.37	2.12	0.77	2.76	2.80	0.81	3.46	3.55	0.85	4.18	5.06	1.11	4.58

Abbreviations:

LWT: Leaving water temperature (°C)

DB: Dry-bulb temperature for Outdoor air temperature (°C)

CC: Total cooling capacity (kW)

PI: Power input (kW)

MSH-100EB cooling capacity

	Maximum														
	LWT														
DB	**5**			**10**			**15**			**20**			**25**		
	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER
-5	/	/	/	/	/	/	6.83	0.69	9.92	8.79	0.82	10.66	9.35	0.77	12.13
0	/	/	/	/	/	/	6.61	0.77	8.56	7.76	0.81	9.61	8.30	0.76	10.88
5	/	/	/	/	/	/	6.38	0.89	7.19	6.74	0.79	8.56	7.25	0.75	9.63
10	/	/	/	/	/	/	6.55	0.75	8.73	8.17	0.80	10.18	8.80	0.86	10.22
15	/	/	/	6.30	1.07	5.89	7.61	1.03	7.35	9.48	1.13	8.38	10.64	1.20	8.84
20	6.20	1.28	4.86	7.19	1.39	5.17	8.67	1.45	5.97	10.79	1.64	6.57	12.49	1.68	7.45
25	7.13	1.68	4.24	8.26	1.81	4.56	9.87	1.88	5.24	12.00	2.07	5.79	13.93	2.17	6.42
30	8.06	2.17	3.71	9.34	2.31	4.05	11.08	2.40	4.62	13.21	2.57	5.14	15.37	2.79	5.51
35	8.13	2.48	3.12	9.48	2.43	3.72	11.03	2.62	4.21	12.70	2.68	4.73	14.51	2.87	5.06
40	6.61	2.52	2.62	7.42	2.37	3.14	8.88	2.53	3.51	10.23	2.51	4.07	12.27	2.83	4.34
43	5.09	2.28	2.23	5.64	2.19	2.58	6.73	2.13	3.16	8.15	2.17	3.75	10.04	2.49	4.03
	Normal														
	LWT														
DB	**5**			**10**			**15**			**20**			**25**		
	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER
-5	/	/	/	/	/	/	5.50	0.49	11.21	7.15	0.58	12.31	7.59	0.55	13.82
0	/	/	/	/	/	/	5.33	0.54	9.79	6.33	0.57	11.14	6.75	0.53	12.66
5	/	/	/	/	/	/	5.11	0.65	7.84	5.41	0.57	9.54	5.88	0.56	10.60
10	/	/	/	/	/	/	5.26	0.55	9.53	6.58	0.58	11.37	7.16	0.64	11.26
15	/	/	/	4.73	0.76	6.24	6.39	0.82	7.80	8.15	0.89	9.18	8.94	0.92	9.74
20	4.83	0.95	5.11	5.82	1.05	5.55	7.23	1.13	6.42	9.29	1.31	7.10	10.87	1.32	8.21
25	5.65	1.26	4.49	6.78	1.38	4.91	8.35	1.50	5.58	10.47	1.66	6.32	12.30	1.71	7.18
30	6.48	1.64	3.95	7.78	1.80	4.32	9.51	1.92	4.95	11.69	2.12	5.51	13.76	2.26	6.08
35	6.31	1.93	3.28	7.78	1.94	4.01	9.09	2.01	4.53	11.08	2.18	5.09	13.23	2.39	5.54
40	5.40	1.92	2.81	6.27	1.86	3.38	7.73	2.04	3.79	9.18	2.06	4.47	11.14	2.28	4.89
43	4.18	1.80	2.32	4.44	1.66	2.67	5.36	1.61	3.32	6.98	1.72	4.06	7.94	1.80	4.41
	Minimum														
	LWT														
DB	**5**			**10**			**15**			**20**			**25**		
	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER
-5	/	/	/	/	/	/	3.56	0.30	11.68	4.61	0.36	12.69	4.93	0.34	14.49
0	/	/	/	/	/	/	3.46	0.34	10.23	4.09	0.35	11.61	4.39	0.33	13.14
5	/	/	/	/	/	/	2.75	0.33	8.42	2.93	0.29	10.13	3.17	0.28	11.40
10	/	/	/	/	/	/	2.92	0.28	10.33	3.67	0.30	12.18	3.97	0.33	12.22
15	/	/	/	2.90	0.44	6.62	3.42	0.41	8.33	4.08	0.40	10.14	5.11	0.47	10.81
20	2.44	0.46	5.31	2.55	0.44	5.79	3.59	0.53	6.81	5.11	0.68	7.49	6.17	0.71	8.68
25	2.71	0.59	4.60	2.81	0.55	5.15	3.95	0.67	5.88	5.52	0.83	6.64	6.69	0.89	7.54
30	3.08	0.76	4.03	3.19	0.70	4.53	4.45	0.86	5.19	6.10	1.05	5.82	7.41	1.18	6.30
35	2.88	0.85	3.37	3.61	0.86	4.19	4.55	0.94	4.86	5.90	1.07	5.52	7.28	1.23	5.93
40	2.44	0.87	2.80	2.94	0.84	3.48	3.79	0.97	3.93	4.91	1.06	4.64	6.34	1.28	4.97
43	1.43	0.60	2.37	2.12	0.77	2.76	2.80	0.81	3.46	3.55	0.85	4.18	5.06	1.11	4.58

Abbreviations:

LWT: Leaving water temperature (°C)

DB: Dry-bulb temperature for Outdoor air temperature (°C)

CC: Total cooling capacity (kW)

PI: Power input (kW)

MSH-120EB(-3)cooling capacity

Maximum														
	LWT													
DB	5			10			15			20			25		
	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER
-5	/	/	/	/	/	/	9.55	1.27	7.50	10.39	1.41	7.37	11.39	1.36	8.35
0	/	/	/	/	/	/	9.33	1.57	5.93	10.90	1.49	7.32	11.89	1.50	7.92
5	/	/	/	/	/	/	9.12	1.71	5.32	11.41	1.57	7.27	12.38	1.64	7.57
10	/	/	/	/	/	/	10.81	2.05	5.27	13.14	1.92	6.85	14.18	1.94	7.32
15	/	/	/	10.51	2.32	4.53	12.50	2.33	5.36	14.87	2.27	6.56	15.98	2.24	7.14
20	7.78	2.03	3.83	12.15	2.96	4.10	14.16	3.12	4.54	15.93	3.14	5.08	16.53	2.84	5.82
25	10.10	3.00	3.37	13.80	3.61	3.82	15.82	3.91	4.04	17.00	4.01	4.24	17.07	3.44	4.96
30	9.99	3.58	2.79	13.43	4.13	3.25	15.18	4.17	3.64	16.17	4.15	3.90	16.11	3.74	4.31
35	9.89	4.52	2.19	13.07	4.90	2.67	14.53	4.56	3.19	15.34	4.38	3.51	15.26	4.00	3.81
40	8.11	4.53	1.79	9.87	4.33	2.28	10.67	3.92	2.72	12.19	4.05	3.01	13.23	3.77	3.51
43	5.20	3.72	1.40	6.11	3.26	1.87	7.33	3.02	2.43	8.53	3.19	2.67	10.68	3.26	3.27
Normal														
	LWT													
DB	5			10			15			20			25		
	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER
-5	/	/	/	/	/	/	7.69	0.91	8.47	8.46	0.99	8.51	9.25	0.97	9.52
0	/	/	/	/	/	/	7.53	1.11	6.78	8.89	1.05	8.48	9.67	1.05	9.22
5	/	/	/	/	/	/	7.30	1.26	5.80	9.16	1.13	8.10	10.05	1.21	8.32
10	/	/	/	/	/	/	8.68	1.51	5.75	10.57	1.38	7.65	11.54	1.43	8.07
15	/	/	/	7.88	1.62	4.86	10.50	1.80	5.82	12.78	1.74	7.36	13.43	1.67	8.05
20	6.07	1.51	4.02	9.83	2.20	4.46	11.81	2.36	4.99	13.71	2.44	5.61	14.39	2.19	6.56
25	8.00	2.24	3.56	11.33	2.71	4.17	13.39	3.04	4.41	14.84	3.14	4.73	15.07	2.65	5.68
30	8.04	2.71	2.97	11.19	3.18	3.52	13.03	3.27	3.99	14.31	3.34	4.28	14.43	2.97	4.86
35	7.68	3.34	2.30	10.73	3.69	2.91	11.97	3.41	3.51	13.39	3.47	3.86	13.91	3.26	4.27
40	6.62	3.45	1.92	8.35	3.35	2.49	9.28	3.09	3.00	10.94	3.24	3.38	12.00	2.97	4.05
43	4.27	2.93	1.45	4.80	2.44	1.97	5.83	2.23	2.61	7.30	2.47	2.96	8.44	2.30	3.66
Minimum														
	LWT													
DB	5			10			15			20			25		
	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER
-5	/	/	/	/	/	/	4.98	0.56	8.83	5.46	0.62	8.78	6.00	0.60	9.98
0	/	/	/	/	/	/	4.88	0.69	7.09	5.75	0.65	8.84	6.29	0.66	9.56
5	/	/	/	/	/	/	3.93	0.63	6.23	4.96	0.58	8.61	5.41	0.60	8.95
10	/	/	/	/	/	/	4.81	0.77	6.24	5.91	0.72	8.20	6.40	0.73	8.75
15	/	/	/	4.83	0.94	5.16	5.63	0.91	6.22	6.39	0.79	8.11	7.67	0.86	8.92
20	3.07	0.73	4.18	4.30	0.92	4.65	5.86	1.11	5.29	7.55	1.28	5.92	8.16	1.18	6.93
25	3.84	1.05	3.65	4.69	1.07	4.38	6.33	1.36	4.64	7.82	1.58	4.96	8.19	1.38	5.95
30	3.82	1.26	3.03	4.59	1.25	3.68	6.10	1.46	4.17	7.47	1.65	4.51	7.77	1.54	5.04
35	3.50	1.48	2.36	4.98	1.64	3.04	5.99	1.59	3.76	7.13	1.71	4.18	7.66	1.68	4.56
40	2.99	1.56	1.91	3.91	1.53	2.56	4.55	1.46	3.11	5.85	1.67	3.50	6.83	1.66	4.12
43	1.46	0.98	1.48	2.30	1.13	2.03	3.05	1.12	2.72	3.72	1.22	3.04	5.38	1.42	3.80

Abbreviations:

LWT: Leaving water temperature (°C)

DB: Dry-bulb temperature for Outdoor air temperature (°C)

CC: Total cooling capacity (kW)

PI: Power input (kW)

MSH-140EB(-3) cooling capacity

	Maximum														
	LWT														
DB	5			10			15			20			25		
	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER
-5	/	/	/	/	/	/	10.0	1.32	7.57	10.9	1.47	7.44	12.0	1.42	8.43
0	/	/	/	/	/	/	9.80	1.67	5.87	11.4	1.58	7.24	12.5	1.59	7.84
5	/	/	/	/	/	/	9.57	1.76	5.44	12.0	1.61	7.43	13.0	1.68	7.73
10	/	/	/	/	/	/	11.3	2.18	5.21	13.1	1.92	6.85	14.2	1.94	7.32
15	/	/	/	11.0	2.32	4.60	13.1	2.32	5.45	15.5	2.32	6.67	16.4	2.32	7.26
20	8.17	2.17	3.77	12.8	3.16	4.04	14.9	3.33	4.47	15.9	3.14	5.08	16.5	2.84	5.82
25	10.6	3.19	3.32	14.5	3.84	3.77	16.6	4.16	3.99	17.0	4.01	4.24	17.1	3.44	4.96
30	10.5	3.96	2.65	14.1	4.53	3.11	15.9	4.56	3.49	16.2	4.18	3.87	16.1	3.74	4.31
35	10.4	4.81	2.16	13.7	5.32	2.58	15.3	4.88	3.13	15.3	4.44	3.45	15.3	4.12	3.71
40	8.11	4.53	1.79	9.87	4.33	2.28	10.7	3.92	2.72	12.2	4.05	3.01	13.2	3.77	3.51
43	5.20	3.72	1.40	6.11	3.26	1.87	7.33	3.02	2.43	8.53	3.19	2.67	10.7	3.26	3.27
	Normal														
	LWT														
DB	5			10			15			20			25		
	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER
-5	/	/	/	/	/	/	8.07	0.94	8.56	8.88	1.03	8.60	9.72	1.01	9.61
0	/	/	/	/	/	/	7.90	1.18	6.71	9.33	1.11	8.39	10.2	1.11	9.13
5	/	/	/	/	/	/	7.67	1.29	5.93	9.61	1.16	8.28	10.6	1.24	8.50
10	/	/	/	/	/	/	9.12	1.60	5.69	10.6	1.38	7.65	11.5	1.43	8.07
15	/	/	/	8.24	1.67	4.94	11.0	1.85	5.92	13.4	1.79	7.48	13.8	1.68	8.19
20	6.37	1.61	3.96	10.3	2.35	4.40	12.4	2.52	4.92	13.7	2.44	5.61	14.4	2.19	6.56
25	8.40	2.39	3.52	11.9	2.89	4.12	14.1	3.23	4.35	14.8	3.14	4.73	15.1	2.65	5.68
30	8.44	2.99	2.82	11.8	3.49	3.37	13.7	3.57	3.83	14.3	3.37	4.25	14.4	2.97	4.86
35	8.07	3.56	2.27	11.3	4.00	2.81	12.6	3.65	3.45	13.4	3.52	3.80	13.9	3.35	4.15
40	6.62	3.45	1.92	8.35	3.35	2.49	9.28	3.09	3.00	10.9	3.24	3.38	12.0	2.97	4.05
43	4.27	2.93	1.45	4.80	2.44	1.97	5.83	2.23	2.61	7.30	2.47	2.96	8.44	2.30	3.66
	Minimum														
	LWT														
DB	5			10			15			20			25		
	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER
-5	/	/	/	/	/	/	5.22	0.59	8.92	5.73	0.65	8.86	6.30	0.63	10.08
0	/	/	/	/	/	/	5.13	0.73	7.01	6.04	0.69	8.75	6.61	0.70	9.47
5	/	/	/	/	/	/	4.12	0.65	6.37	5.21	0.59	8.80	5.68	0.62	9.15
10	/	/	/	/	/	/	5.06	0.82	6.16	5.91	0.72	8.20	6.40	0.73	8.75
15	/	/	/	5.05	0.96	5.24	5.88	0.93	6.32	6.68	0.81	8.25	7.86	0.87	9.07
20	3.22	0.78	4.12	4.52	0.99	4.58	6.16	1.18	5.21	7.55	1.28	5.92	8.16	1.18	6.93
25	4.03	1.12	3.60	4.93	1.14	4.32	6.65	1.45	4.58	7.82	1.58	4.96	8.19	1.38	5.95
30	4.01	1.39	2.88	4.82	1.37	3.53	6.41	1.60	4.01	7.47	1.67	4.48	7.77	1.54	5.04
35	3.67	1.58	2.33	5.23	1.78	2.94	6.29	1.70	3.69	7.13	1.73	4.11	7.66	1.73	4.44
40	2.99	1.56	1.91	3.91	1.53	2.56	4.55	1.46	3.11	5.85	1.67	3.50	6.83	1.66	4.12
43	1.46	0.98	1.48	2.30	1.13	2.03	3.05	1.12	2.72	3.72	1.22	3.04	5.38	1.42	3.80

Abbreviations:

LWT: Leaving water temperature (°C)

DB: Dry-bulb temperature for Outdoor air temperature (°C)

CC: Total cooling capacity (kW)

PI: Power input (kW)

MSH-160EB(-3) cooling capacity

Maximum															
DB	LWT														
	5			10			15			20			25		
	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER
-5	/	/	/	/	/	/	10.0	1.32	7.57	10.9	1.47	7.44	12.0	1.42	8.43
0	/	/	/	/	/	/	9.80	1.67	5.87	11.4	1.58	7.24	12.5	1.59	7.84
5	/	/	/	/	/	/	9.57	1.76	5.44	12.0	1.61	7.43	13.0	1.68	7.73
10	/	/	/	/	/	/	11.3	2.18	5.21	13.1	1.92	6.85	14.2	1.94	7.32
15	/	/	/	11.4	2.43	4.67	13.5	2.44	5.53	16.1	2.37	6.77	17.0	2.30	7.37
20	8.99	2.43	3.70	14.0	3.55	3.96	15.8	3.56	4.42	16.9	3.36	5.03	17.5	3.04	5.76
25	11.7	3.59	3.25	15.9	4.32	3.69	17.4	4.47	3.90	17.9	4.31	4.14	17.9	3.70	4.84
30	11.5	4.46	2.59	15.5	5.11	3.04	17.2	5.05	3.41	17.1	4.66	3.68	16.9	4.02	4.21
35	11.4	5.42	2.11	15.1	6.00	2.52	16.5	5.60	2.94	16.3	4.96	3.27	16.2	4.47	3.62
40	8.92	5.11	1.75	10.9	4.89	2.22	11.7	4.42	2.65	13.4	4.69	2.86	14.6	4.36	3.34
43	5.98	4.50	1.33	7.33	4.12	1.78	9.01	3.91	2.31	10.5	4.13	2.54	12.0	3.85	3.11
Normal															
DB	LWT														
	5			10			15			20			25		
	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER
-5	/	/	/	/	/	/	8.07	0.94	8.56	8.88	1.03	8.60	9.72	1.01	9.61
0	/	/	/	/	/	/	7.90	1.18	6.71	9.33	1.11	8.39	10.2	1.11	9.13
5	/	/	/	/	/	/	7.67	1.29	5.93	9.61	1.16	8.28	10.6	1.24	8.50
10	/	/	/	/	/	/	9.12	1.60	5.69	10.6	1.38	7.65	11.5	1.43	8.07
15	/	/	/	8.52	1.70	5.02	11.4	1.89	6.01	13.8	1.82	7.59	14.2	1.71	8.31
20	7.01	1.80	3.88	11.4	2.63	4.31	13.1	2.70	4.87	14.5	2.62	5.56	15.3	2.35	6.49
25	9.24	2.69	3.43	13.1	3.25	4.02	14.8	3.47	4.25	15.6	3.37	4.62	15.8	2.85	5.55
30	9.28	3.37	2.75	12.9	3.93	3.29	14.8	3.95	3.74	15.2	3.75	4.04	15.1	3.19	4.75
35	8.87	4.01	2.21	12.4	4.51	2.75	13.6	4.19	3.24	14.2	3.94	3.60	14.7	3.64	4.05
40	7.28	3.89	1.87	9.18	3.78	2.43	10.2	3.49	2.93	12.0	3.75	3.21	13.2	3.43	3.84
43	4.91	3.55	1.38	5.76	3.08	1.87	7.17	2.89	2.48	8.98	3.20	2.81	9.46	2.72	3.48
Minimum															
DB	LWT														
	5			10			15			20			25		
	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER	CC	PI	EER
-5	/	/	/	/	/	/	5.22	0.59	8.92	5.73	0.65	8.86	6.30	0.63	10.08
0	/	/	/	/	/	/	5.13	0.73	7.01	6.04	0.69	8.75	6.61	0.70	9.47
5	/	/	/	/	/	/	4.12	0.65	6.37	5.21	0.59	8.80	5.68	0.62	9.15
10	/	/	/	/	/	/	5.06	0.82	6.16	5.91	0.72	8.20	6.40	0.73	8.75
15	/	/	/	5.23	0.98	5.32	6.08	0.95	6.41	6.91	0.83	8.37	8.14	0.88	9.21
20	3.54	0.88	4.04	4.97	1.11	4.49	6.53	1.27	5.15	8.01	1.37	5.86	8.65	1.26	6.86
25	4.43	1.26	3.52	5.42	1.28	4.22	6.98	1.56	4.47	8.21	1.69	4.85	8.60	1.48	5.81
30	4.41	1.57	2.81	5.31	1.54	3.44	6.92	1.77	3.91	7.92	1.86	4.26	8.15	1.66	4.92
35	4.04	1.78	2.27	5.75	2.00	2.87	6.79	1.96	3.47	7.56	1.94	3.90	8.12	1.87	4.33
40	3.29	1.76	1.86	4.30	1.72	2.50	5.01	1.65	3.03	6.43	1.93	3.33	7.52	1.92	3.91
43	1.68	1.19	1.41	2.76	1.43	1.93	3.75	1.45	2.58	4.57	1.58	2.89	6.03	1.67	3.61

Abbreviations:

LWT: Leaving water temperature (°C)

DB: Dry-bulb temperature for Outdoor air temperature (°C)

CC: Total cooling capacity (kW)

PI: Power input (kW)

Performance curves in domestic hot water production

———— 15℃~45℃
———— 15℃~50℃
———— 15℃~55℃

MSH-40(60)EB + MSH-190TB/3
Heat up
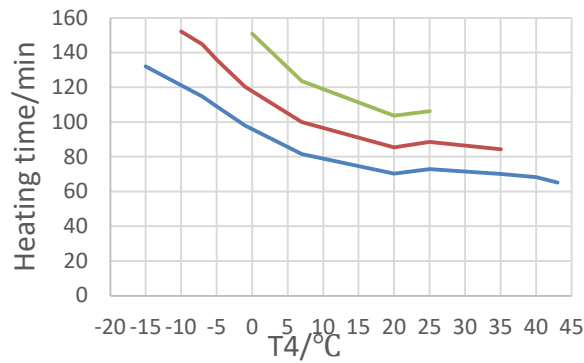
Heating Capacity
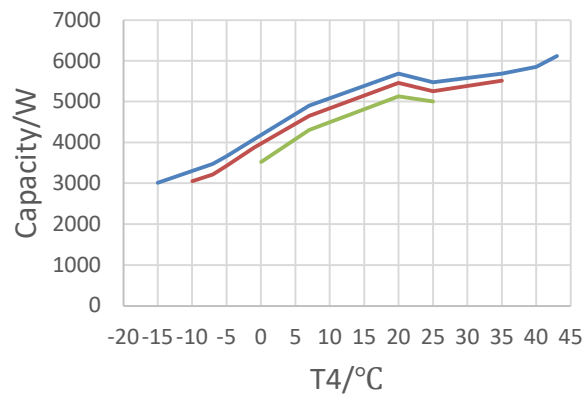
COP
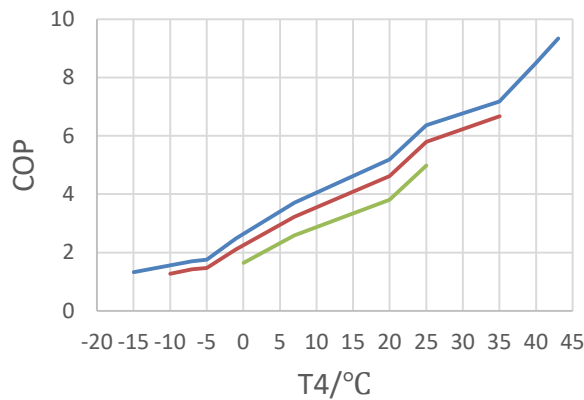
15~45

15~50

15~55

MSH-80(100)EB + MSH-190TB-3/9

Heat up

Heating Capacity

COP

COP vs T4/°C
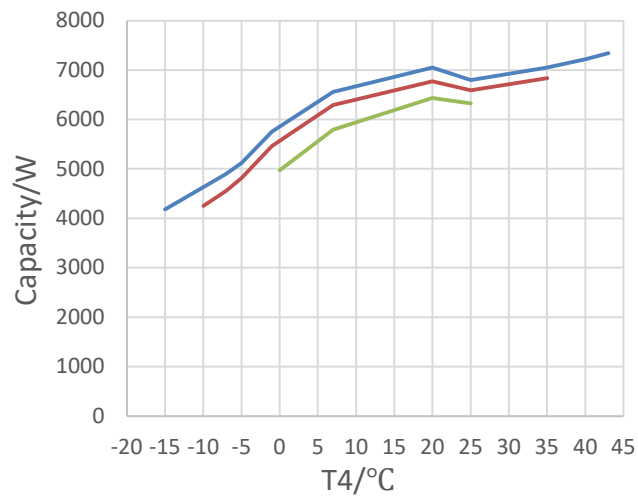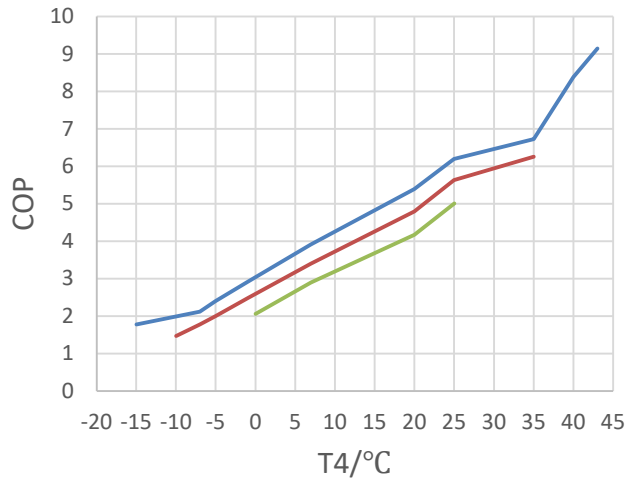
Legend:
- 15~45
- 15~50
- 15~55

MSH-120/140/160EB(-3) + MSH-240TB-3/9

Heat up

Heating time/min vs T4/°C

Capacity

Capacity/W vs T4/°C
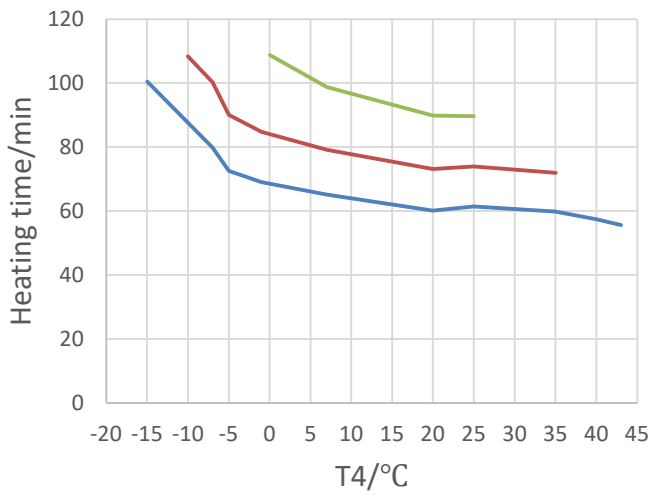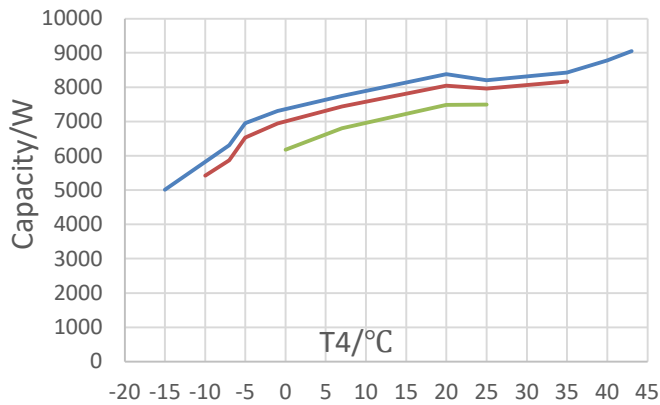
COP
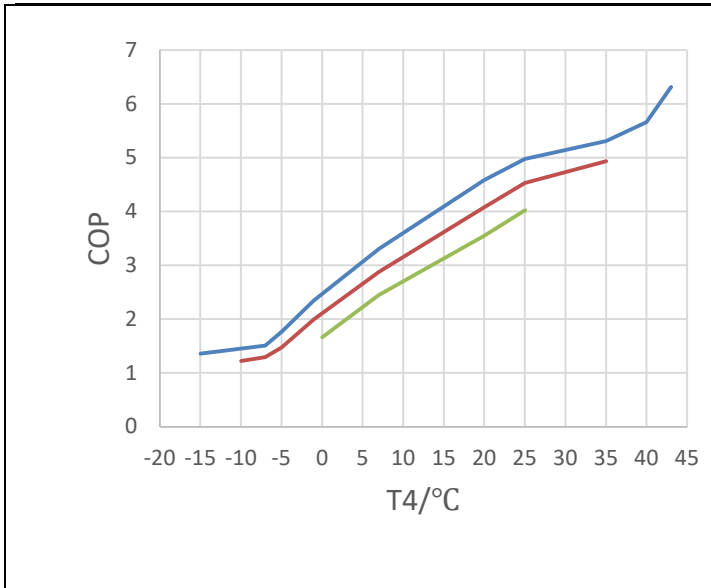
23 Hydronic Performance

Hydro module with 190L water tank
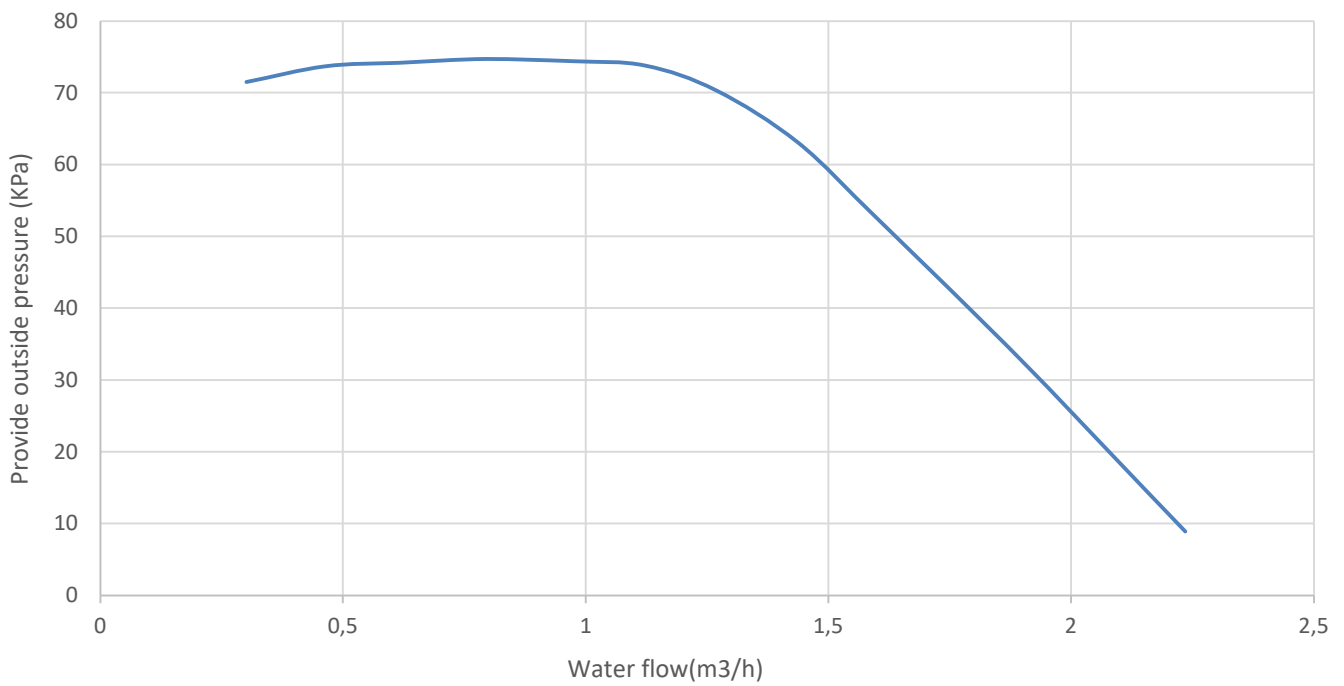
Hydro module with 240L water tank
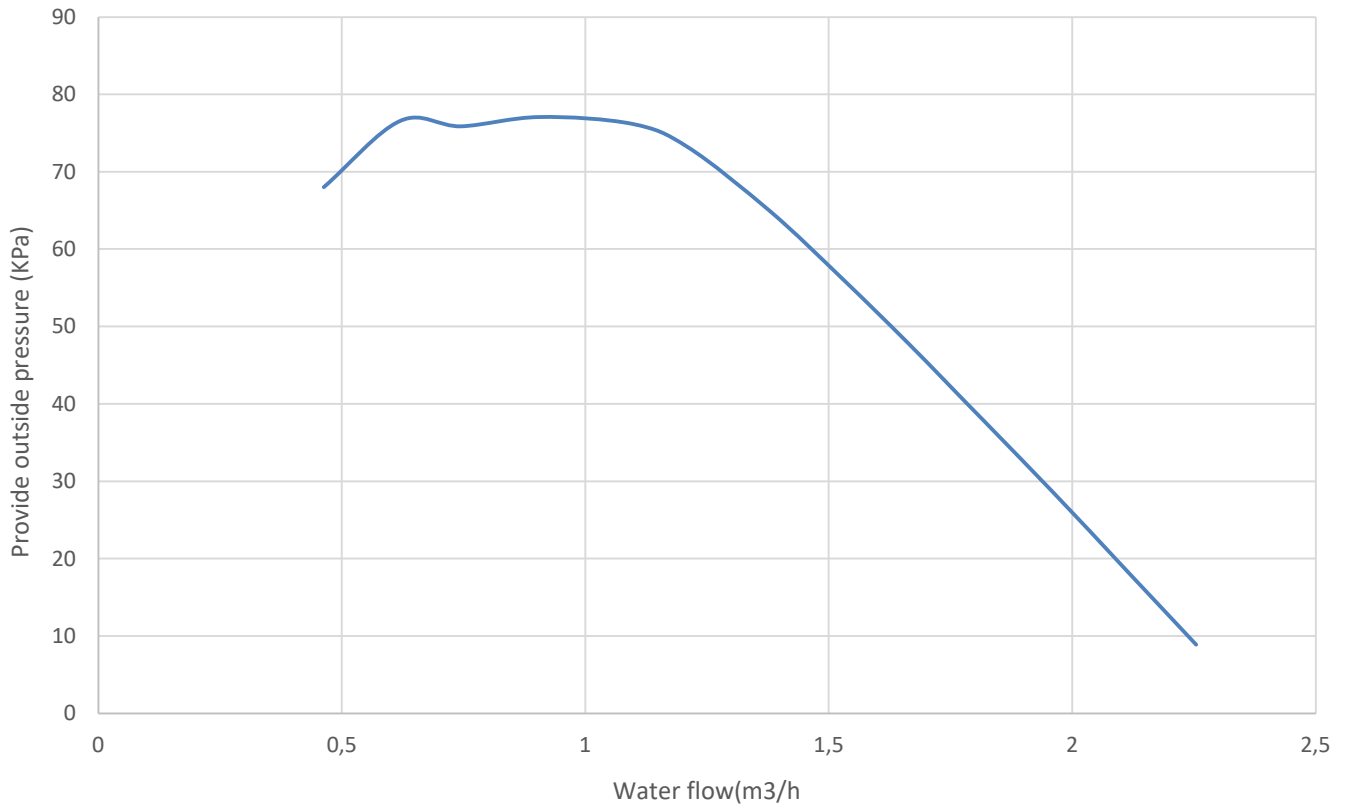
24 Sound Levels

24.1 Overall

Model name	dB
MSH-40EB	44
MSH-60EB	45
MSH-80EB	46
MSH-100EB	49
MSH-120EB	50
MSH-140EB	51
MSH-160EB	54
MSH-120EB-3	50
MSH-140EB-3	51
MSH-160EB-3	55

Notes:

2. Sound pressure level is measured at a position 1m in front of the unit and (1+H)/2m (where H is the height of the unit) above the floor in a semi-anechoic chamber. During in-situ operation, sound pressure levels may be higher as a result of ambient noise. Sound pressure level is the maximum value tested under the two conditions of Notes2 and Notes3.

Figure 2-8.1: Sound pressure level measurement (unit: mm)
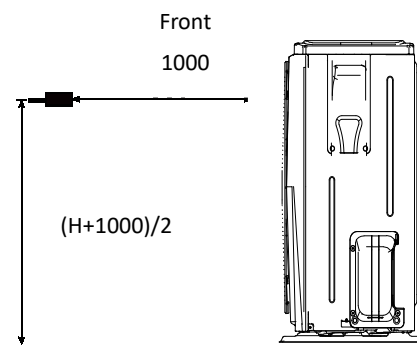
Front

1000

(H+1000)/2

3. Outdoor air temperature 7°C DB, 85% R.H.; EWT 30°C, LWT 35°C.
4. Outdoor air temperature 35°C DB; EWT 23°C, LWT 18°C..

24.2 Octave Band Levels

MSH-40EB + MSH-190TB/3 octave band levels

Outdoor air temperature 7°C DB, 85% R.H.; EWT 30°C, LWT 35°C

Outdoor air temperature 7°C DB, 85% R.H.; EWT 40°C, LWT 45°

Outdoor air temperature 35°C DB; EWT 12°C, LWT 7°C

Outdoor air temperature 35°C DB; EWT 23°C, LWT 18°C

MSH-60EB + MSH-190TB/3 octave band levels

Outdoor air temperature 7°C DB, 85% R.H.; EWT 30°C, LWT 35°C

Outdoor air temperature 7°C DB, 85% R.H.; EWT 40°C, LWT 45°

Outdoor air temperature 35°C DB; EWT 12°C, LWT 7°C

Outdoor air temperature 35°C DB; EWT 23°C, LWT 18°C
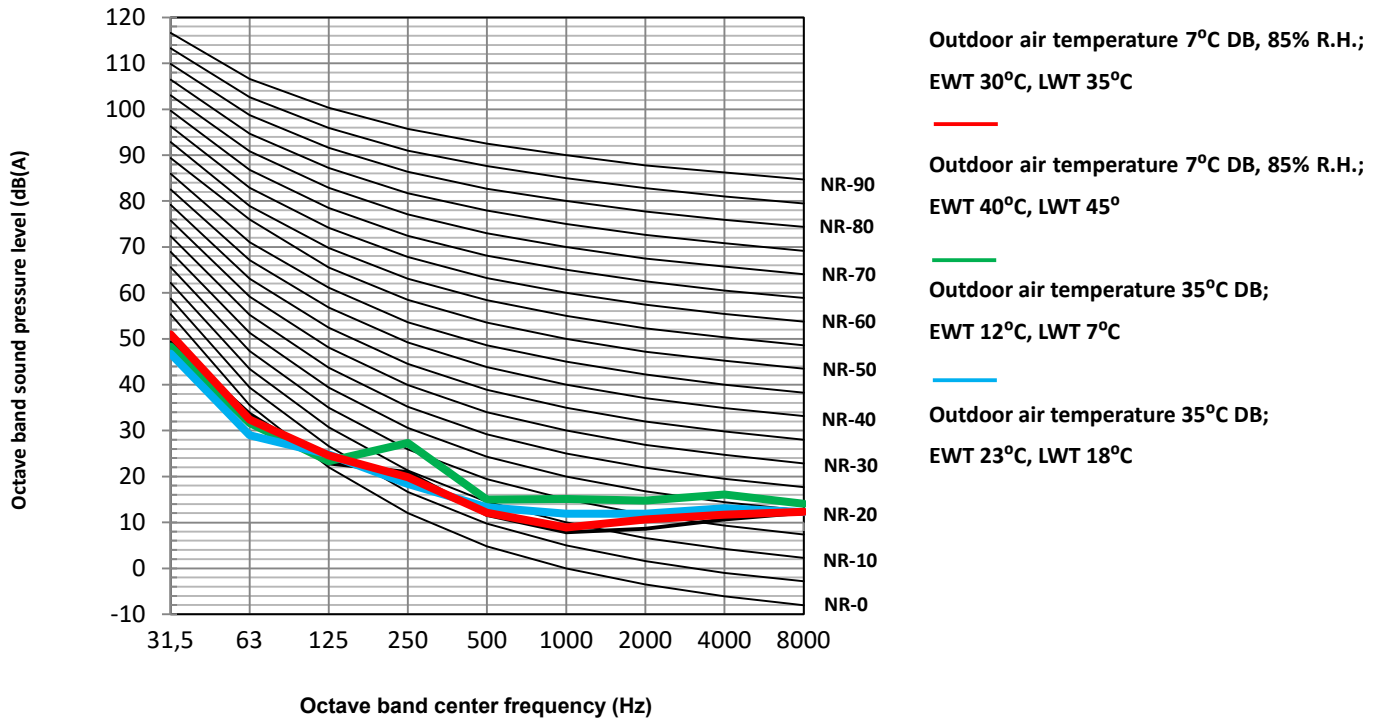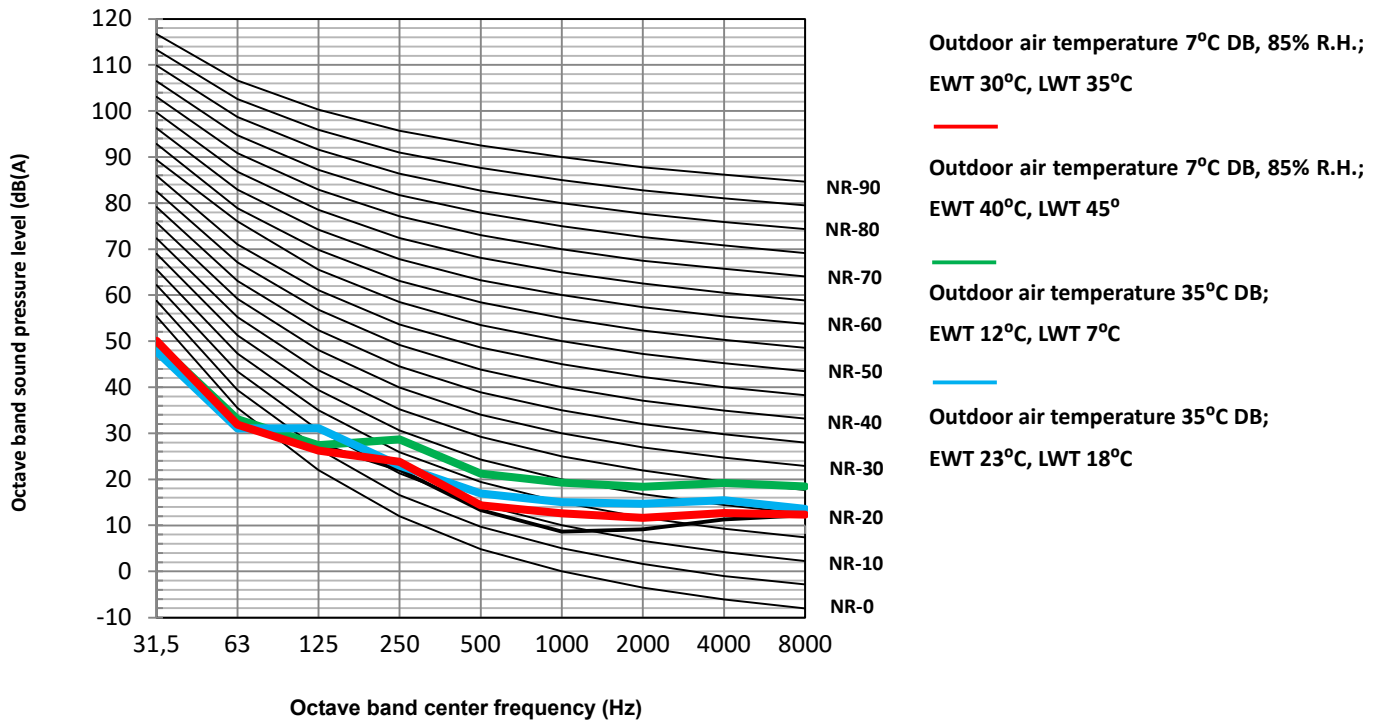
MSH-80EB + MSH-190TB/3 octave band levels
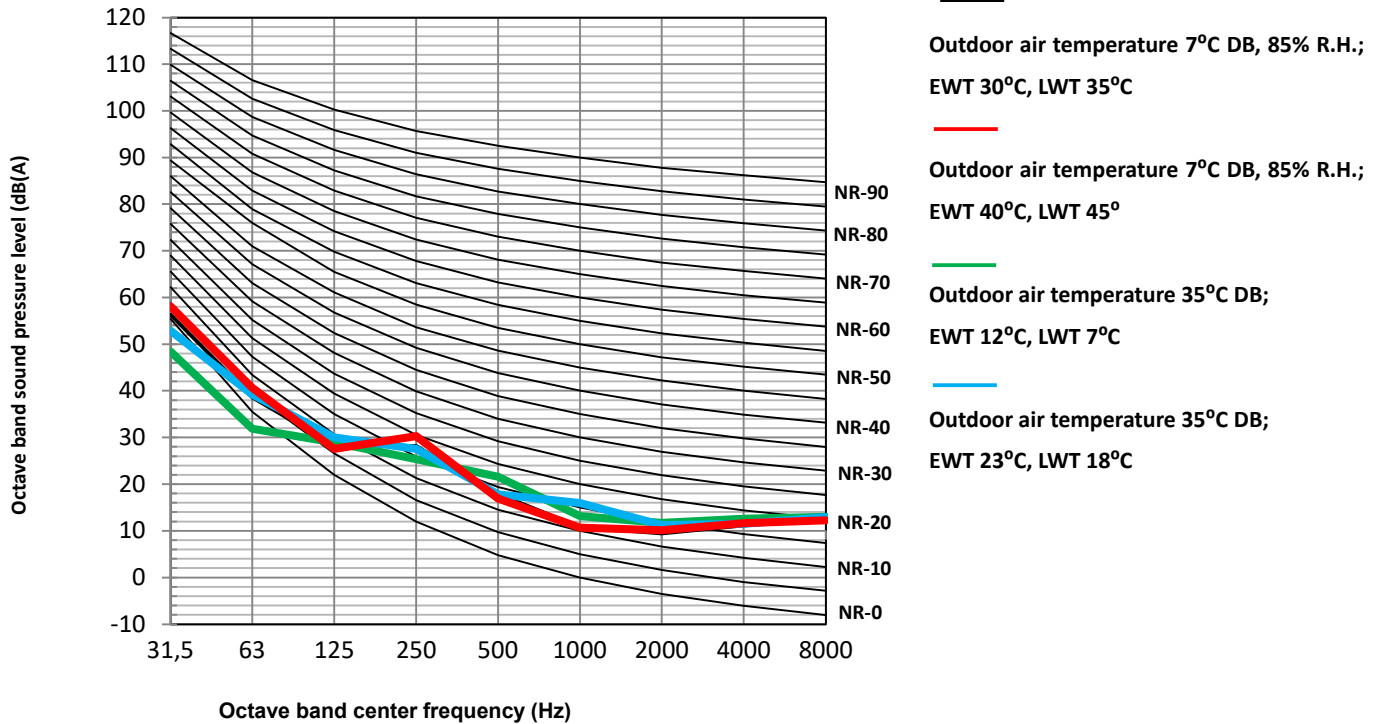
MSH-120EB(-3) + MSH-240TB-3/9 octave band levels
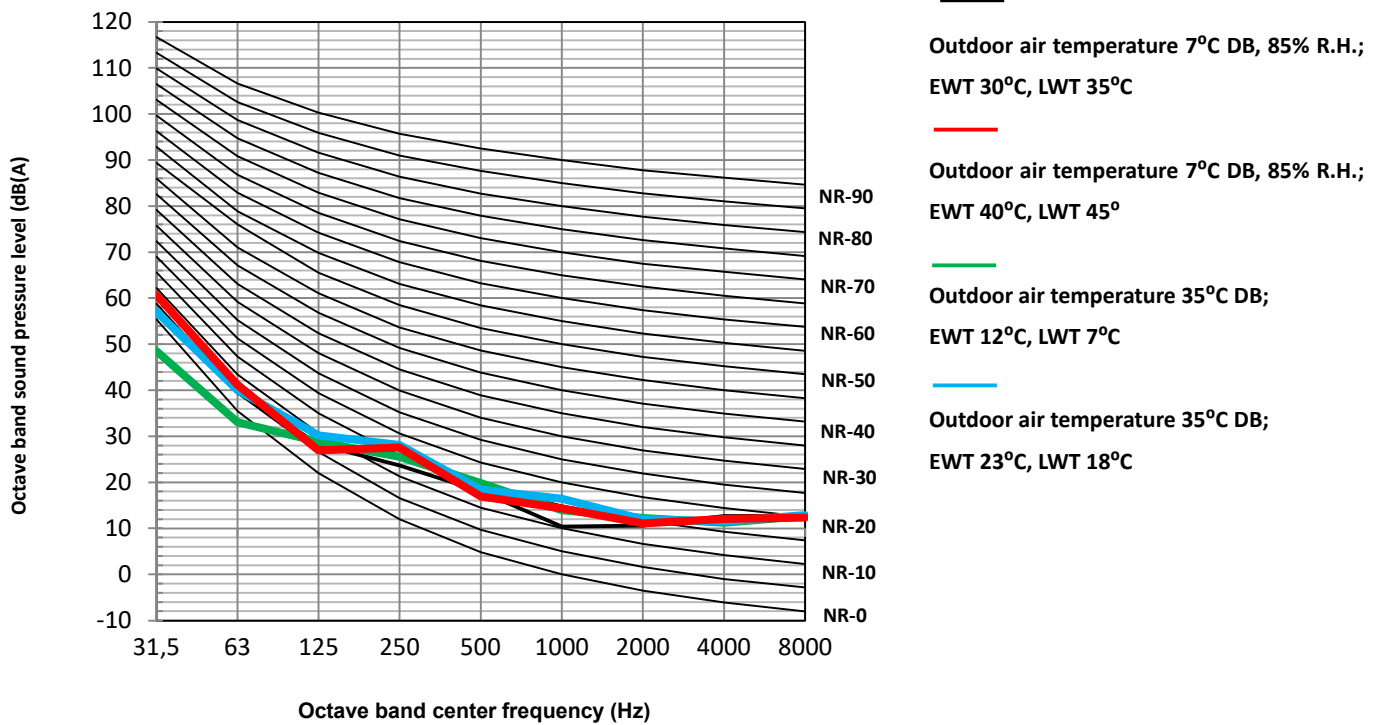
MSH-140EB(-3) + MSH-240TB-3/9 octave band levels

Outdoor air temperature 7°C DB, 85% R.H.; EWT 30°C, LWT 35°C

Outdoor air temperature 7°C DB, 85% R.H.; EWT 40°C, LWT 45°

Outdoor air temperature 35°C DB; EWT 12°C, LWT 7°C

Outdoor air temperature 35°C DB; EWT 23°C, LWT 18°C

MSH-160EB(-3) + MSH-240TB-3/9 octave band levels

Outdoor air temperature 7°C DB, 85% R.H.; EWT 30°C, LWT 35°C

Outdoor air temperature 7°C DB, 85% R.H.; EWT 40°C, LWT 45°

Outdoor air temperature 35°C DB; EWT 12°C, LWT 7°C

Outdoor air temperature 35°C DB; EWT 23°C, LWT 18°C
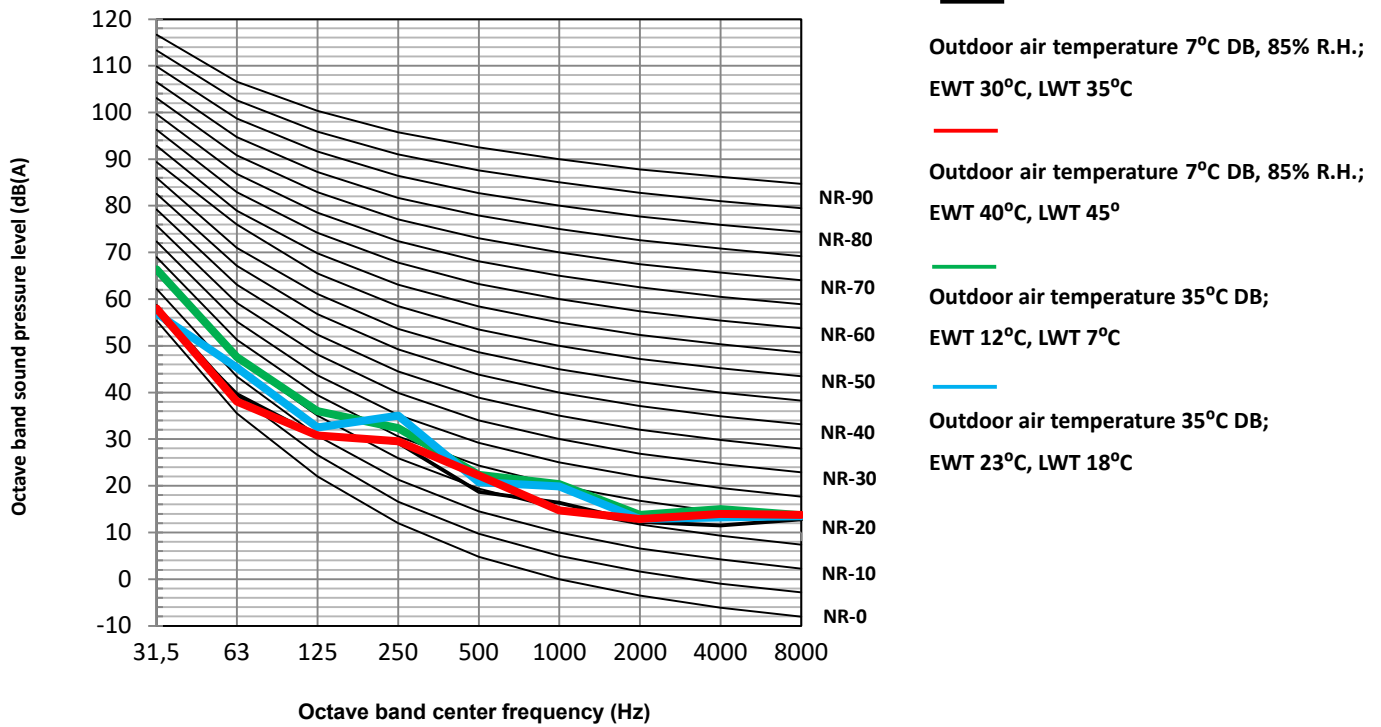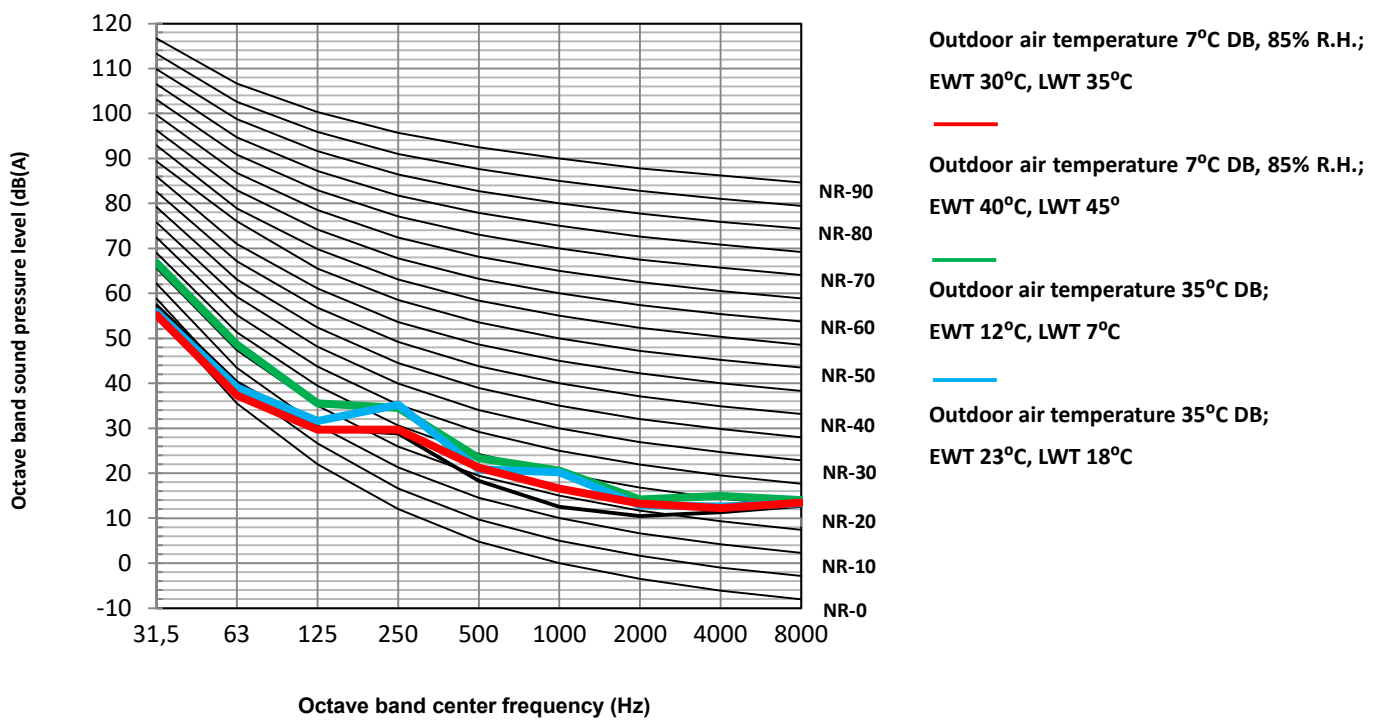
25 User Interface Field Settings

25.1 Introduction

During installation, the Yukon settings and parameters should be configured by the installer to suit the installation configuration, climate conditions and end-user preferences. The relevant settings are accessible and programmable through the **FOR SERVICEMAN** menu on the Yukon user interface. The user interface is integrated design in the hydro module.

Keys	Function
▤	Menu: Go to the menu structure
◄ ► ▼ ▲	Adjust: Navigate the cursor on the display Navigate in the menu structure Adjust settings
⏻	On/Off Turn on/off the space heating/cooling operation or DHW mode Turn on/off functions in the menu structure
⊃	Back: Come back to the up level
⚿	Unlock: Long press for unlock/lock the controller Unlock /lock some functions such as "DHW temperature adjusting"
↵	Enter: Go to the next step when programming a schedule in the menu structure and confirm a selection to enter in the submenu of the menu structure.

25.2 Menu Structure

```
FOR SERVICEMAN
1 DHW MODE SETTING
2 COOL MODE SETTING
3 HEAT MODE SETTING
4 AUTO MODE SETTING
5 TEMP. TYPE SETTING
6 ROOM THERMOSTAT
7 OTHER HEATING SOURECE
8 HOLIDAY AWAY SETTING
9 SERVICE CALL
10 RESTORE FACTORY SETTINGS
11TEST RUN
12 SPECIAL FUNCTION
13 AUTO RESTART
14 POWER INPUT LIMI
TATION
15 INPUT DEFINE
16 CASCADE SET
17 HMI ADDRESS SET
```

```
2 COOL MODE SETTING
2.1 COOL MODE
2.2 t_T4_FRESH_C
2.3 T4CMAX
2.4 T4CMIN
2.5 dT1SC
2.6 dTSC
2.7 t_INTERVAL_C
2.8 T1SetC1
2.9 T1SetC2
2.10 T4C1
2.11 T4C2
2.12 ZONE1 C-EMISSION
2.13 ZONE2 C-EMISSION
```

```
4 AUTO MODE SETTING
4.1 T4AUTOCMIN
4.2 T4AUTOHMAX
```

```
5 TEMP. TYPE SETTING
5.1 WATER FLOW TEMP.
5.2 ROOM TEMP.
5.3 DOUBLE ZONE
```

```
6 ROOM THERMOSTAT
6.1 ROOM THERMOSTAT
```

```
7 OTHER HEATING SOURCE
7.1 dT1_IBH_ON
7.2 t_IBH_DELAY
7.3 T4_IBH_ON
7.4 dT1_AHS_ON
7.5 t_AHS_DELAY
7.6 T4_AHS_ON
7.7 IBH LOCATE
7.8 P_IBH1
7.9 P_IBH2
7.10 P_TBH
```

```
8 HOLIDAY AWAY SETTING
8.1 T1S_H.A._H
8.2 T5S_H.A._DHW
```

```
9  SERVICE CALL
PHONE NO.
MOBILE NO.
```

```
10 RESTORE FACTORY SETTINGS
```

```
11 TEST RUN
```

```
12 SPECIAL FUNCTION
```

```
13 AUTO RESTART
13.1 COOL/HEAT MODE
13.2 DHW MODE
```

```
14 POWER INPUT LIMITATION
14.1 POWER LIMITATION
```

```
15 INPUT DEFINE(M1M2)
15.1 ON/OFF(M1M2)
15.2 SMART   GRID
15.3 T1B(Tw2)
15.4 Tbt1
15.5 Tbt2
15.6 Ta
15.7 Ta-adj
15.8 SOLAR INPUT
15.9 F-PIPE LENGTH
15.10 RT/Ta_PCB
15.11 PUMPI SILENT MODE
```

```
1 DHW MODE SETTING
1.1 DHW MODE
1.2 DISINFECT
1.3 DHW PRIORITY
1.4 DHW PUMP
1.5 DHW PRIORITY TIME SET
1.6 dT5_ON
1.7 dT1S5
1.8 T4DHWMAX
1.9 T4DHWMIN
1.10 t_INTERVAL_DHW
1.11 dT5_TBH_OFF
1.12 T4_TBH_ON
1.13 t_TBH_DELAY
1.14 T5S_DI
1.15 t_DI_HIGHTEMP
1.16 t_DI_MAX
1.17 t_DHWHP_RESTRICT
1.18 t_DHWHP_MAX
1.19 DHW PUMP TIME RUN
1.20 PUMP RUNNING TIME
1.21 DHW PUMP DI RUN
```

```
3 HEAT MODE SETTING
3.1 HEAT MODE
3.2 t_T4_FRESH_H
3.3 T4HMAX
3.4 T4HMIN
3.5 dT1SH
3.6 dTSH
3.7 t_INTERVAL_H
3.8 T1SetH1
3.9 T1SetH2
3.10 T4H1
3.11 T4H2
3.12 ZONE1 H-EMISSION
3.13 ZONE2 H-EMISSION
3.14 t_DELAY_PUMP
```

```
16 CASCADE SET
16.1 PER_START
16.2 TIME_ADJUST
16.3 ADDRESS RESET
```

```
17 HMI ADDRESS SET
17.1 HMI SET
17.2 HMI ADDRESS FOR BMS
```

25.3 FOR SERVICEMAN Menu

FOR SERVICEMAN allows installers to input the system configuration and set the system parameters. To enter **FOR SERVICEMAN**, go to **MENU** > **FOR SERVICEMAN**.

Enter the password, using ◄ ► to navigate between digits and using ▼ ▲ to adjust the numerical values. The password is 234.

Then the following pages will be displayed after putting the password.

FOR SERVICEMAN password screen

```
┌─────────────────────────────┐
│ FOR SERVICEMAN              │
│                             │
│ Please input the password:  │
│                             │
│         ▮0▮  0   0          │
│                             │
│                             │
│                             │
│ OK ENTER   ⬍ ADJUST   ◀▶    │
└─────────────────────────────┘
```

FOR SERVICEMAN menu

```
┌───────────────────────────┐  ┌───────────────────────────┐  ┌───────────────────────────┐
│ FOR SERVICEMAN       1/3  │  │ FOR SERVICEMAN       2/3  │  │ FOR SERVICEMAN       3/3  │
│ 1. DHW MODE SETTING       │  │ 7. OTHER HEATING SOURCE   │  │ 13. AUTO RESTART          │
│ 2. COOL MODE SETTING      │  │ 8. HOLIDAY AWAY MODE SET  │  │ 14. POWER INPUT LIMITATION│
│ 3. HEAT MODE SETTING      │  │ 9. SERVICE CALL SETTING   │  │ 15. INPUT DEFINE          │
│ 4. AUTO MODE SETTING      │  │ 10. RESTORE FACTORY SETTINGS│ │ 16. CASCADE SET           │
│ 5. TEMP.TYPE SETTING      │  │ 11. TEST RUN              │  │ 17. HMI ADDRESS SET       │
│ 6. ROOM THERMOSTAT        │  │ 12. SPECIAL FUNCTION      │  │                           │
│ OK ENTER            ⬍     │  │ OK ENTER            ⬍     │  │ OK ENTER            ⬍     │
└───────────────────────────┘  └───────────────────────────┘  └───────────────────────────┘
```

25.4 DHW MODE SETTING Menu

25.4.1 DHW MODE SETTING menu overview

MENU > **FOR SERVICEMAN** > **DHW MODE SETTING**

```
┌───────────────────────────┐  ┌───────────────────────────┐  ┌───────────────────────────┐
│ 1  DHW MODE SETTING   1/5 │  │ 1 DHW MODE SETTING    2/5 │  │ 1 DHW MODE SETTING    3/5 │
│ 1.1 DHW MODE        YES   │  │ 1.6 dT5_ON         ▮5▮°C  │  │ 1.11 dT5_TBH_OFF    ▮5▮°C │
│ 1.2 DISINFECT       YES   │  │ 1.7 dT1S5          10°C   │  │ 1.12 T4_TBH_ON      5 °C  │
│ 1.3 DHW PRIORITY    YES   │  │ 1.8 T4DHWMAX       43°C   │  │ 1.13 t_TBH_DELAY    30 MIN│
│ 1.4 DHW PUMP        YES   │  │ 1.9 T4DHWMIN       -10°C  │  │ 1.14 T5S_DI         65°C  │
│ 1.5 DHW PRIORITY TIME SET NON│ │ 1.10 t_INTERVAL_DHW 5 MIN│ │ 1.15 t_DI HIGHTEMP. 15MIN │
│ ⬍ ADJUST           ◀▶     │  │ ⬍ ADJUST           ◀▶     │  │ ⬍ ADJUST           ◀▶     │
└───────────────────────────┘  └───────────────────────────┘  └───────────────────────────┘

┌───────────────────────────┐  ┌───────────────────────────┐
│ 1 DHW MODE SETTING    4/5 │  │ 1 DHW MODE SETTING    5/5 │
│ 1.16 t_DI_MAX      ▮210▮MIN│  │ 1.21 DHW PUMP DI RUN NON  │
│ 1.17 t_DHWHP_RESTRICT 30 MIN│ │                           │
│ 1.18 t_DHWHP_MAX   120 MIN│  │                           │
│ 1.19 DHWPUMP TIME RUN YES │  │                           │
│ 1.20 PUMP RUNNING TIME 5 MIN│ │                           │
│ ⬍ ADJUST           ◀▶     │  │ ⬍ ADJUST           ◀▶     │
└───────────────────────────┘  └───────────────────────────┘
```

In **DHW MODE SETTING** the following parameters should be set.

DHW MODE enables or disables DHW mode. For installations with DHW tanks, select **YES** to enable DHW mode. For installations without DHW tanks, select **NON** to disable DHW mode.

DISINFECT sets whether or not the disinfection operation is performed.

DHW PRIORITY sets whether domestic hot water heating or space heating/cooling takes priority. If **NON** is selected in the **DHW PRIORITY** mode, when it is available and the space heating/cooling is **OFF**, the heat pump will heat the water as required. If space heating/cooling is **ON**, the water will be heated as required when the immersion heater is unavailable.

Only when the space heating/cooling is **OFF** will the heat pump operate to heat domestic water.

DHW PUMP sets whether or not the DHW pump is controlled by the Yukon Split unit. If the DHW pump is to be controlled by the Yukon Split, select **YES**. If the DHW pump is not to be controlled by the Yukon Split unit, select **NON**.

DHW PUMP PRIORITY TIME SET set the operation time of DHW during **DHW PRIORITY** mode.

dT5_ON sets the temperature difference between the DHW set temperature (T5S) and the DHW tank water temperature (T5) above which the heat pump providing heated water to the DHW tank. When T5S - T5 ≥ dT5_ON the heat pump providing heated water to the DHW tank.

Note: When the heat pump's leaving water temperature is above the DHW mode leaving water temperature operating limit (T5stop), the heat pump does not provide heated water to the DHW tank.

dT1S5 sets the heat pump's leaving water set temperature (T1S) relative to DHW tank water temperature (T5). For DHW mode, the user sets the DHW set temperature (T5S) on the main screen and cannot manually set T1S. T1S is set as T1S = T5 + dT1S5.

Figure on right illustrates the operation of the heat pump and immersion heater(optional) in DHW mode. If the DHW tank water temperature (T5) is less than the minimum of the DHW set temperature (T5S) and the heat pump leaving water temperature operating limit (T5stop) less **dT5_ON**, the heat pump starts providing heated water to the DHW tank. After **t_TBH_delay** minutes have elapsed, the immersion heater is turned on. If T5 reaches T5stop, the heat pump stops but the immersion heater continues running until T5 has reached T5S + **dT5_TBH_OFF**

dT5_ON

Abbreviations:
T5: DHW tank water temperature
T5S: DHW set temperature

DHW mode operation

Abbreviations:
T5: DHW tank water temperature
T5S: DHW set temperature
T5stop: DHW mode leaving water temperature operating limit
TBH: Immersion heater in DHW tank

T4DHWMAX sets the ambient temperature above which the heat pump will not operate in DHW mode. The highest value that **T4DHWMAX** can take is 43°C, which is the DHW mode upper ambient temperature operating limit of the heat pump.

T4DHWMAX and T4DHWMIN

Abreviations:
HP: Heat pump
TBH: DWH tank immersion heater
AHS: Additional heating source

T4DHWMIN sets the ambient temperature below which the heat pump will not operate in DHW mode. The lowest value that **T4DHWMIN** can take is -25°C, which is the DHW mode lower ambient temperature operating limit of the heat pump.

t_INTERVAL_DHW sets the DHW mode compressor re-start delay. When the compressor stops running, it will not re-start until at least **t_INTERVAL_DHW** minutes have elapsed.

dT5_TBH_OFF sets the temperature difference between the DHW set temperature (T5S) and the DHW tank water temperature (T5) below which the immersion is not used. When T5 > Min(T5Stop+dT5_TBH_OFF, 65°C), the immersion

heater is off.

T4_TBH_ON sets the ambient temperature above which the immersion heater will not be used.

t_TBH_DELAY sets the delay between the compressor starting and the immersion heater being turned on.

T5S_DI sets the DHW tank disinfection operation target temperature. Caution: during the disinfection operation (duration: **t_DI_MAX**) the domestic hot water temperature at the hot water taps will at times be equal to the value set for **T5S_DI**.

t_DI_HIGHTEMP sets that length of time that the DHW tank disinfection operation target temperature is maintained.

t_DI_MAX sets the total duration of the DHW tank disinfect operation.

t_DHWHP_RESTRICT sets the maximum length of time that the heat pump will run in space heating or space cooling modes before switching to DHW mode, if a requirement for DHW mode exists. When running in space heating mode or space cooling mode, the heat pump becomes available for DHW mode either as soon as the space heating/cooling set temperatures have been reached or after **t_DHWHP_MAX** minutes have elapsed.

DHW tank disinfection
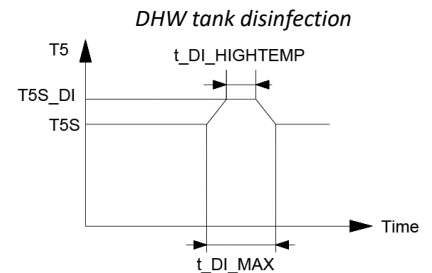
Abbreviations:
T5: DHW tank water temperature
T5S: DHW set temperature

t_DHWHP_MAX sets the maximum length of time that the heat pump will run in DWH mode before switching to space heating mode or space cooling mode if a requirement for space heating/cooling modes exists. When running in DHW mode, the heat pump becomes available for space heating/cooling either as soon as the DHW tank water temperature (T5) reaches the DHW set temperature (T5S) or after **t_DHWHP_MAX** minutes have elapsed.

Figure below illustrates the effects of **t_DHWHP_MAX** and **t_DHWHP_RESTRICT** when **DHW PRIORITY** is enabled. The heat pump initially runs in DWH mode. After **t_DHWHP_MAX** minutes, T5 has not reached
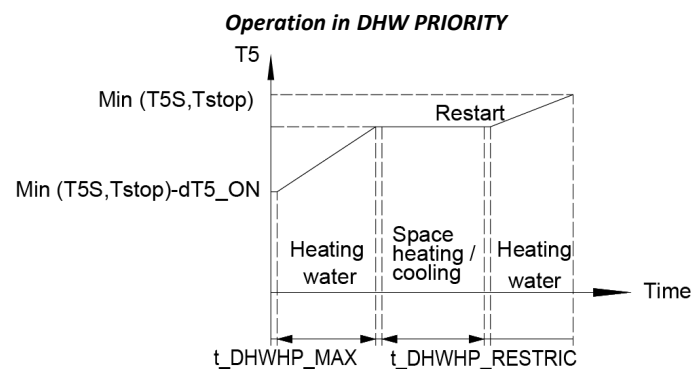
Operation in DHW PRIORITY

Abbreviations:
T5: DHW tank water temperature
T5S: DHW set temperature
T5stop: DHW mode leaving water temperature operating limit

DHWPUMP TIME RUN sets whether or not the user is able to set the DHW pump (field supply) in DHW mode. For installations with a DHW pump, select ON so that the user is able to set pump start times.
PUMP RUNNING TIME sets the length of time the pump runs for at each of the user-specified start times on the **DHW PUMP** tab on the **DOMESTIC HOT WATER (DHW)** menu, if **TIMER RUNNING** is enabled.

DHW PUMP DI RUN sets wether or not the DHW pump (field supply) operates during the disinfection mode.

25.5 COOL MODE SETTING Menu
MENU > FOR SERVICEMAN > COOL MODE SETTING

2 COOL MODE SETTING	1/3
2.1 COOL MODE	YES
2.2 t_T4_FRESH_C	2.0HRS
2.3 T4CMAX	43°C
2.4 T4CMIN	20°C
2.5 dT1SC	5°C
⬍ ADJUST	◀▶

2 COOL MODE SETTING	2/3
2.6 dTSC	2°C
2.7 t_INTERVAL_C	5MIN
2.8 T1SetC1	10°C
2.9 T1SetC2	16°C
2.10 T4C1	35°C
⬍ ADJUST	◀▶

2 COOL MODE SETTING	3/3
2.11 T4C2	25°C
2.12 ZONE1 C-EMISSION	FCU
2.13 ZONE2 C-EMISSION	FLH
⬍ ADJUST	◀▶

In **COOL MODE SETTING** the following parameters should be set.

COOL MODE enables or disables cooling mode. For installations with space cooling terminals, select **YES** to enable cooling mode. For installations without space cooling terminals, select **NON** to disable cooling mode.

t_T4_FRESH_C sets the refresh time of cooling mode climate temperature curve.

T4CMAX sets the ambient temperature above which the heat pump will operate in cooling mode with lowest compressor frequency. The highest value that **T4CMAX** can take is 46°C, which is the cooling mode upper ambient temperature operating limit of the heat pump.

T4CMIN sets the ambient temperature below which the heat pump will not operate in cooling mode. The lowest value that **T4CMIN** can take is -5°C, which is the cooling mode lower ambient temperature operating limit of the heat pump.

dT1SC sets the minimum temperature difference between the heat pump leaving water temperature (T1) and the heat pump leaving water set temperature (T1S) at which the heat pump provides chilled water to the space cooling terminals. When T1 – T1S ≥ dT1SC the heat pump provides chilled water to the space cooling terminals and when T1 ≤ T1S the heat pump does not provide chilled water to the space cooling terminals.

dTSC sets the temperature difference between the actual room temperature (Ta) and set room temperature (TS) above which the heat pump provides chilled water to the space cooling terminals. When Ta – TS ≥ dTSC the heat pump provides chilled water to the space cooling terminals and when Ta ≤ TS the heat pump does not provide chilled water to the space cooling terminals. **dTSC** is only applicable if **YES** is selected for **ROOM TEMP** in the **TEMP. TYPE SETTING** menu. Refer to Part 3, 8.8 "TEMP. TYPE SETTING Menu".

t_INTERVAL_C sets the cooling mode compressor re-start delay. When the compressor stops running, it will not re-start until at least **t_INTERVAL_C** minutes have elapsed.

T1SetC1 sets the temperature 1 of automatic setting curve for cooling mode.

T4CMAX, T4CMIN

OFF	COOL	COOL(Lowest compressor frequency)

T4CMIN   T4CMAX   → T4

Abreviations:
T4: Outdoor ambient temperature

dT1SC

T1S+dT1SC

OFF	COOL

→ T1
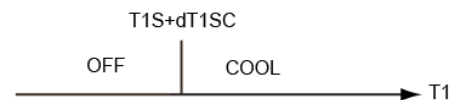
Abreviations:
T1: Heat pump leaving water temperature
T1S: Heat pump leaving water set temperature

dTSC

TS+dTSC

OFF	COOL

→ Ta
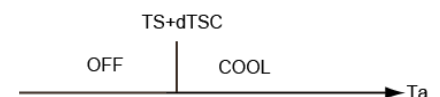
T1SetC2 sets the temperature 2 of automatic setting curve for cooling mode.

T4C1 sets the ambient temperature 1 of automatic setting curve for cooling mode.

T4C2 sets the ambient temperature 2 of automatic setting curve for cooling mode.

ZONE1 C-EMISSION sets the emission type of zone1 for cooling mode.

ZONE2 C-EMISSION sets the emission type of zone2 for cooling mode.

25.6 HEAT MODE SETTING Menu
MENU > **FOR SERVICEMAN** > **HEAT MODE SETTING**

3 HEAT MODE SETTING	1/3
3.1 HEAT MODE	**YES**
3.2 t_T4_FRESH_H	2.0HRS
3.3 T4HMAX	16°C
3.4 T4HMIN	-15°C
3.5 dT1SH	5°C
⏫ ADJUST	◀▶

3 HEAT MODE SETTING	2/3
3.6 dTSH	**2**°C
3.7 t_INTERVAL_H	5MIN
3.8 T1SetH1	35°C
3.9 T1SetH2	28°C
3.10 T4H1	-5°C
⏫ ADJUST	◀▶

3 HEAT MODE SETTING	3/3
3.11 T4H2	**7**°C
3.12 ZONE1 H-EMISSION	RAD.
3.13 ZONE2 H-EMISSION	FLH
3.14 t_DELAY_PUMP	2MIN
⏫ ADJUST	◀▶

In **HEAT MODE SETTING** the following parameters should be set.

HEAT MODE enables or disables heating mode.

t_T4_FRESH_H sets the refresh time of heating model climate temperature curve.

T4HMAX sets the ambient temperature above which the heat pump will operate heating mode with lowest compressor frequency. The highest value that **T4HMAX** can take is 35°C, which is the heating mode upper ambient temperature operating limit of the heat pump.

T4HMAX, T4HMIN

OFF	HEAT	HEAT(Lowest compressor frequency)
	T4HMIN	T4HMAX

→ T4
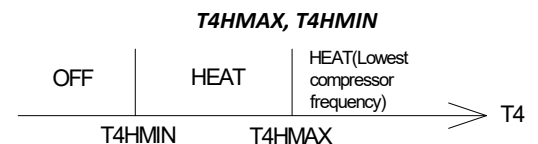
Abreviations:
T4: Outdoor ambient temperature

T4HMIN sets the ambient temperature below which the heat pump will not operate in heating mode. The lowest value that **T4CMIN** can take is -25°C, which is the heating mode lower ambient temperature operating limit of the heat pump.

dT1SH sets the temperature difference between the heat pump leaving water temperature (T1) and the heat pump leaving water set temperature (T1S) above which the heat pump provides heated water to the space heating terminals.

dTSH

TS+dTSH

HEAT	OFF	Ta
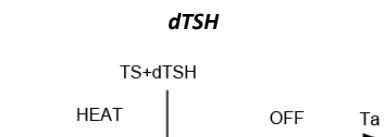
Note:
Only when ROOM TEMP is enabled will this function

be available

dTSH sets the temperature difference between the actual room temperature (Ta) and set room temperature (TS) above which the heat pump provides heated water to the space heating terminals. When TS – Ta ≥ dTSH the heat pump provides heated water to the space heating terminals and when Ta ≥ TS the heat pump does not provide heated water to the space heating terminals.   **dTSH** is only relevant if **YES** is selected for **ROOM TEMP** in the **TEMP. TYPE SETTING** menu. Refer to Part 3, 8.8 "TEMP. TYPE SETTING Menu".

t_INTERVAL_H sets the heating mode compressor re-start delay. When the compressor stops running, it will not re-start until at least **t_INTERVAL_H** minutes have elapsed.

T1SetH1 sets the temperature 1 of automatic setting curve for heating mode.

T1SetH2 sets the temperature 2 of automatic setting curve for heating mode.

T4H1 sets the ambient temperature 1 of automatic setting curve for heating mode.

T4H2 sets the ambient temperature 2 of automatic setting curve for heating mode.

ZONE1 H-EMISSION sets the emission type for heating mode.

ZONE2 H-EMISSION sets the emission type for heating mode.

25.7 AUTO MODE SETTING Menu
MENU > **FOR SERVICEMAN** > **AUTO MODE SETTING**

In **AUTO MODE SETTING** the following parameters should be set.

AUTO MODE SETTING menu

4 AUTO. MODE SETTING	
4.1 T4AUTOCMIN	25°C
4.2 T4AUTOHMAX	17°C
⬆⬇ ADJUST	◄►

T4AUTOCMIN sets the ambient temperature below which the heat pump will not provide chilled water for space cooling in auto mode.

T4AUTOHMAX sets the ambient temperature above which the heat pump will not provide heated water for space heating in auto mode.

T4AUTOCMAX, T4AUTOCMIN
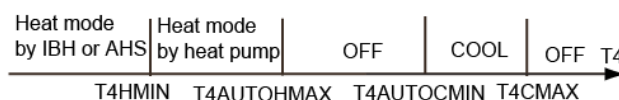
Abreviations:
HP: Heat pump
AHS: Additional heating source
IBH: Backup electric heater
T4CMAX: The ambient temperature above which the heat pump will not operate in cooling mode.
T4HMIN: The ambient temperature below which the heat pump will not operate in heating mode.

25.8 TEMP. TYPE SETTING Menu
MENU > **FOR SERVICEMAN** > **TEMP. TYPE SETTING**

The TEMP. TYPE SETTING is used for selecting whether the water flow temperature or room temperature is used to control the ON/OFF of the heat pump.

When ROOM TEMP. is enabled, the target water flow temperature will be calculated from climate-related curves.

TEMP. TYPE SETTING menu

5 TEMP. TYPE SETTING	
5.1 WATER FLOW TEMP.	**YES**
5.2 ROOM TEMP.	NON
5.3 DOUBLE ZONE	NON
⬍ ADJUST	◀▶

For installations without room thermostats, space heating and cooling modes can be controlled in one of two different ways:

- according to the Yukon leaving water temperature alone
- according to the room temperature detected by the Yukon Split user interface's built-in temperature sensor alone

WATER FLOW TEMP. sets whether space heating/cooling modes are controlled according to the Yukon leaving water temperature. If **YES** is selected, the user is able to set the Yukon Split unit's leaving water temperature set temperature on the user interface's main screen.

Only set WATER FLOW TEMP to YES
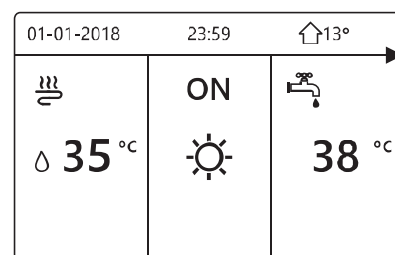
ROOM TEMP. sets whether space heating/cooling modes are controlled according to the room temperature detected by the temperature sensor in the Yukon Split user interface. If **YES** is selected, the user is able to set the room temperature set temperature on the user interface's main screen, no matter what is the setting of **WATER FLOW TEMP.**
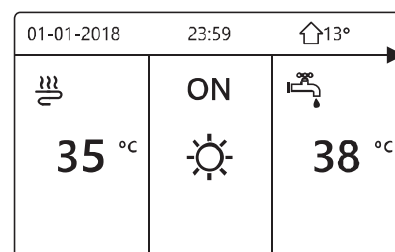
DOUBLE ZONE sets whether there are two zones.

Only set ROOM TEMP to YES

If set WATER FLOW TEMP. and ROOM TEMP. to YES, meanwhile set DOUBLE ZONE to NON or YES, the following pages will be displayed. In this case, the setting value of zone 1 is T1S, the setting value of zone 2 is T1S2 (The corresponding TIS2 is calculated according to the climate related curves.)

Set WATER FLOW TEMP. and ROOM TEMP. to YES; Set DOUBLE ZONE to NON or YES
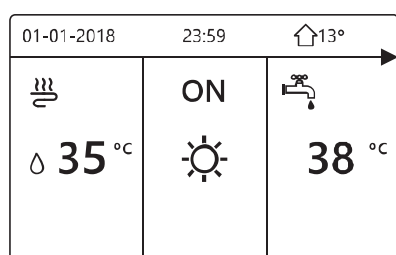
Homepage (zone 1)   Addition page (zone 2)
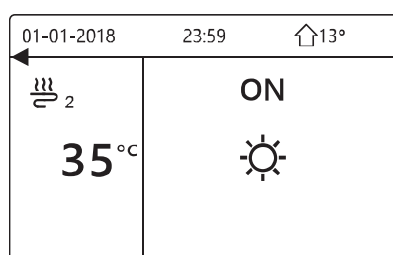
(Double zone is effective)

If set DOUBLE ZONE to YES and set ROOM TEMP. to NON, meanwhile set WATER FLOW TEMP. to YES or NON, the following

pages will be displayed. In this case, the setting value of zone 1 is T1S, the setting value of zone 2 is T1S2.

Set DOUBLE ZONE to YES and set ROOM TEMP. to NON; Set WATER FLOW TEMP. to YES or NON

01-01-2018	23:59	⌂13°
♨	ON	🚰
◊ 35 °C	☀	38 °C

01-01-2018	23:59	⌂13°
♨ 2	ON
35 °C	☀
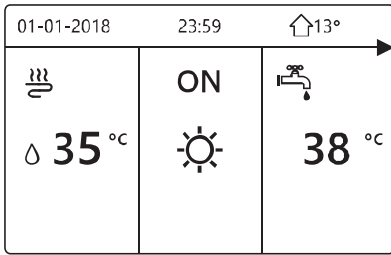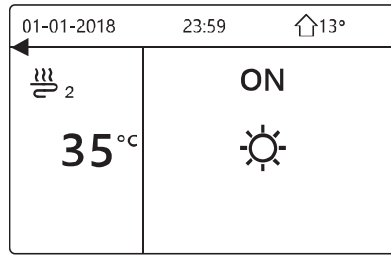
Homepage (zone 1)   Addition page (zone 2)

If set DOUBLE ZONE and ROOM TEMP. to YES, meanwhile set WATER FLOW TEMP. to YES or NON, the following page will be displayed. In this case, the setting value of zone 1 is T1S, the setting value of zone 2 is T1S2. (The corresponding TIS2 is calculated according to the climate related curves.)

Set DOUBLE ZONE and ROOM TEMP. to YES; Set WATER FLOW TEMP. to YES or NON

01-01-2018	23:59	⌂13°
♨	ON	🚰
◊ 35 °C	☀	38 °C

01-01-2018	23:59	⌂13°
♨ 2	ON
35 °C	☀
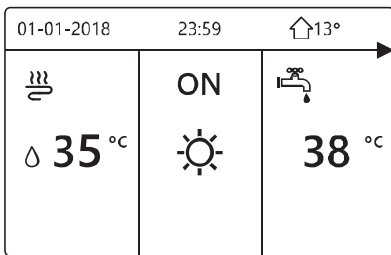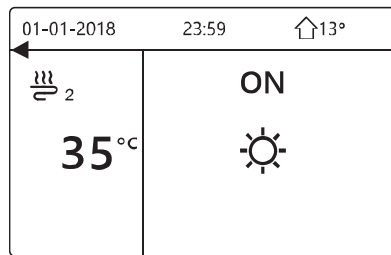
Homepage (zone 1)   Addition page (zone 2)
                                                     (Double zone is effective)

25.9 ROOM THERMOSTAT Menu
MENU > **FOR SERVICEMAN** > **ROOM THERMOSTAT**

As an alternative to controlling space heating/cooling modes according the Yukon Split unit's leaving water temperature and/or the room temperature detected by the temperature sensor in the Yukon Split user interface, separate room thermostat can be installed and used to control space heating/cooling modes.

ROOM THERMOSTAT menu

6 ROOM THERMOSTAT	
6.1 ROOM THERMOSTAT	NON
⬍ ADJUST	

In **ROOM THERMOSTAT** the following parameters should be set.

ROOM THERMOSTAT sets whether or not room thermostats are installed. For installations with room thermostats, select **YES**. For installations without room thermostats, select **NON**.

ROOM THERMOSTAT = NON: No room thermostat.

ROOM THERMOSTAT = MODE SET: Room thermostat can control heating and cooling individually.

ROOM THERMOSTAT=ONE ZONE: Room thermostat provides the switch signal to unit.

ROOM THERMOSTAT=DOUBLE ZONE: Indoor unit is connected with two room thermostat.

25.10 OTHER HEATING SOURCE Menu

25.10.1 OTHER HEATING SOURCE menu overview

MENU > FOR SERVICEMAN > OTHER HEATING SOURCE

OTHER HEATING SOURCE menu

7 OTHER HEATING SOURCE 1/2	
7.1 dT1_IBH_ON	5°C
7.2 t_IBH_DELAY	30MIN
7.3 T4_IBH_ON	-5°C
7.4 dT1_AHS_ON	5°C
7.5 t_AHS_DELAY	30MIN
⬍ ADJUST	◀▶

7 OTHER HEATING SOURCE 2/2	
7.6 T4_AHS_ON	-5°C
7.7 IBH LOCATE	PIPE LOOP
7.8 P_IBH1	0.0kW
7.9 P_IBH2	0.0kW
7.10 P_TBH	2.0kW
⬍ ADJUST	◀▶

In **OTHER HEATING SOURCE** the following parameters should be set. Backup electric heater is optional.

dT1_IBH_ON sets the temperature difference between the heat pump's leaving water set temperature (T1S) and the heat pump's leaving water temperature (T1) above which the backup electric heater heating element(s) are on. When T1S - T1 ≥ dT1_IBH_ON the backup electric heater is on (on models where the backup electric heater has a simple on/off control function).

t_IBH_DELAY sets the delay between the compressor starting and the backup electric heater being turned on.

T4_IBH_ON sets the ambient temperature below which the backup electric heater is used. If the ambient temperature is above **T4_IBH_ON**, the backup electric heater is not used. The relationship between operation of the backup heater and the ambient is shown on right.

T4_IBH_ON
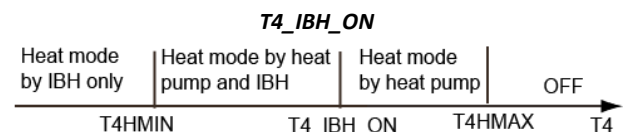
Abreviations:
T4: Outdoor ambient temperature
IBH: Backup electric heater

dT1_ASH_ON sets the temperature difference between the heat pump's leaving water set temperature (T1S) and the heat pump's leaving water temperature (T1) above which the additional heating source is on. When T1S - T1 ≥ dT1_AHS_ON the additional heating source is on.

t_ASH_DELAY sets the delay between the compressor starting and the additional heating source being turned on.

T4_AHS_ON sets the ambient temperature below which the additional heating source is used. If the ambient temperature is above **T4_ASH_ON**, the additional heating source is not used. The relationship between operation of the additional heating source and the ambient is shown in the picture below.

T4_AHS_ON
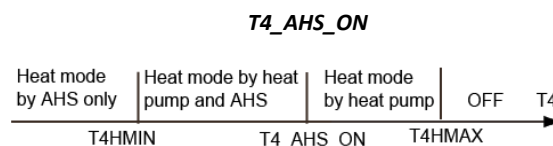
Abreviations:
AHS: *Additional heating source*
T4: Outdoor ambient temperature

IBH LOCATE means IBH is installed for pipe heating.

P_IBH1, P_IBH2 set heating capacity of IBH and **P_TBH** sets heating capacity of TBH, which are used for energy

consumption statistics.

25.11 HOLIDAY AWAY SETTING Menu
MENU > FOR SERVICEMAN > HOLIDAY AWAY SETTING

The **HOLIDAY AWAY SETTING** menu settings are used to set the outlet water temperature to prevent water pipes freezing when away from home in cold weather seasons. In **HOLIDAY AWAY SETTING** the following parameters should be set.

HOLIDAY AWAY SETTING menu

8 HOLIDAY AWAY SETTING	
8.1 T1S_H.A._H	20°C
8.2 T5S_H.A._DHW	20°C
⬍ ADJUST	◄►

T1S_H.A._H sets the heat pump's leaving water set temperature for space heating mode when in holiday away mode.

T5S_H.A._DHW sets the heat pump's leaving water set temperature for DHW mode when in holiday away mode.

25.12 SERVICE CALL Menu
MENU > FOR SERVICEMAN > SERVICE CALL

In **SERVICE CALL** the following parameters can be set.

PHONE NO. and **MOBILE NO.** can be used to set after-sales service contact numbers. If set, these numbers are displayed to users in **MENU > FOR SERVICEMAN > SERVICE CALL**

SERVICE CALL menu

9 SERVICE CALL SETTING	
PHONE NO. 0000000000000	
MOBILE NO. 0000000000000	
OK CONFIRM ⬍ ADJUST	◄►

Use ▼ ▲ to adjust the numerical values. The maximum length of the phone numbers is 14 digits.

The black rectangle found between 0 and 9 when scrolling up and down using ▼ ▲ is converted to a blank space when the phone numbers are displayed to users in **MENU > FOR SERVICEMAN > SERVICE CALL** and can be used for phone numbers less than 14 digits in length.

25.13 RESTORE FACTORY SETTINGS
MENU > FOR SERVICEMAN > RESTORE FACTORY SETTINGS

RESTORE FACTORY SETTINGS is used to restore all the parameters set in the user interface to their factory defaults.

On selecting **YES**, the process of restoring all settings to their factory defaults begins and progress is displayed as a percentage.

RESTORE FACTORY SETTINGS screens

10 RESTORE FACTORY SETTINGS
All the settings will come back to factory default.
Do you want to restore factory settings?
NO   YES
OK CONFIRM   ◄►

10 RESTORE FACTORY SETTINGS
Please wait…
5%

25.14 TEST RUN

25.14.1 TEST RUN Menu overview
MENU > FOR SERVICEMAN > TEST RUN

TEST RUN is used to check that the valves, air purge function, circulation pump, space cooling mode, space heating mode and DHW mode are all operating correctly.

TEST RUN start screen and TEST RUN menu

11 TEST RUN	11 TEST RUN	11 TEST RUN
Active the settings and active the "TEST RUN"?	**11.1 POINT CHECK**	**11.6 DHW MODE RUNNING**
	11.2 AIR PURGE	
	11.3 CIRCULATION PUMP RUNNING	
	11.4 COOL MODE RUNNING	
NO YES	11.5 HEAT MODE RUNNING	
OK CONFIRM ◄►	OK ENTER 🔼	OK ENTER 🔼
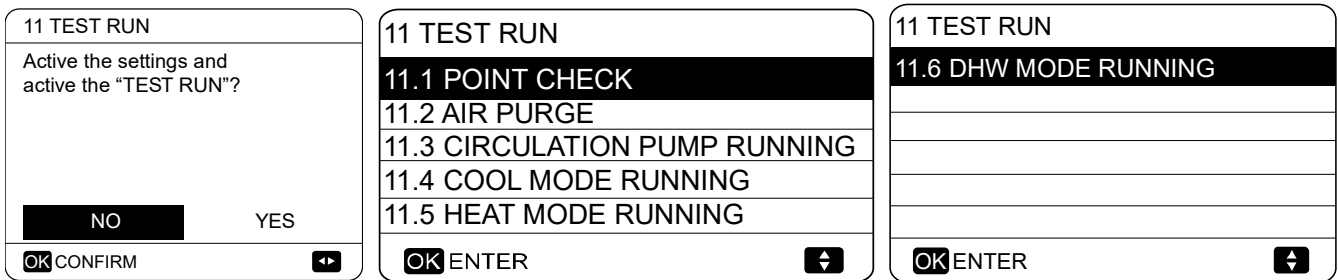
During test run, all buttons except OK are invalid. If you want to turn off the test run, please press OK. For example ,when the unit is in air purge mode, after you press OK, the following page will be displayed:

Exit air purge screen

11 TEST RUN
Do you want to turn off the test run (AIR PURGE)function?
NO   YES
OK CONFIRM ◄►
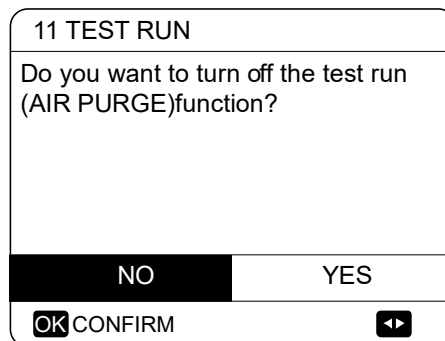
25.14.2 POINT CHECK menu
MENU > FOR SERVICEMAN > TEST RUN > POINT CHECK

The **POINT CHECK** menu is used to check the operation of individual components. Use ▼▲ to scroll to the components you want to check and press ON/OFF to toggle the on/off state of the component. If a valve does not turn on/off when its on/off state is toggled or if a pump/heater does not operate when turned on, check the component's connection to the hydro system main PCB.

POINT CHECK menu

11 TEST RUN	1/2
3-WAY VALVE 1	OFF
3-WAY VALVE 2	OFF
PUMP I	OFF
PUMP O	OFF
PUMP C	OFF
ON/OFF ON/OFF	⬍

11 TEST RUN(POINT CHECK) 2/2	
PUMPSOLAR	OFF
PUMPDHW	OFF
INNER BACKUP HEATER	OFF
TANK HEATER	OFF
3-WAY VALVE 3	OFF
ON/OFF ON/OFF	⬍

25.14.3 AIR PURGE operation
MENU > FOR SERVICEMAN > TEST RUN > AIR PURGE

Once installation is complete it is important to run the air purge function to remove any air which may be present in the water piping and which could cause malfunctions during operation.

The **AIR PURGE** operation is used to remove air from the water piping. Before running AIR PURGE mode, make sure that the air purge valve is open. When the air purge operation starts, the 3-way valve opens and the 2-way valve closes. 60 secs later the pump in the unit (PUMPI) operates for 10min during which the flow switch does not work. After the pump stops, the 3-way valve closes and the 2-way valve opens. 60 secs later both PUMPI and PUMPO operate until the next command is received. If any error code is displayed during the air purge operation, the cause should be investigated.

AIR PURGE operation

11 TEST RUN
Test run is on. Air purge is on.
OK CONFIRM

25.14.4 CIRCULATION PUMP RUNNING operation
MENU > FOR SERVICEMAN > TEST RUN > CIRCULATION PUMP RUNNING

The **CIRCULATION PUMP RUNNING** operation is used to check the operation of the circulation pump. When the circulation pump running operation starts, all running components stop. 60 secs later, the 3-way valve opens and the 2-way valve closes. After a further 60 secs PUMPI starts. 30 seconds later, if the flow switch detects that the water flow is normal, PUMPI operates for 3 min. After the pump stops 60s, the 3-way valve closes and the 2-way valve opens. 60s later both PUMI and PUMPO will operate. After a further 2 min the flow switch start to check the water flow. If the water flow rate is sufficient, both PUMPI and PUMPO operate until the next command is received. If the water flow rate is insufficient over any 15-second period, PUMPI and PUMPO stop and error code E8 is displayed. Refer to Part 3, 8.2 "Error Code table".

CIRCULATION PUMP RUNNING display

11 TEST RUN
Test run is on. Circulation pump is on.
OK CONFIRM

25.14.5 COOL MODE RUNNING operation
MENU > FOR SERVICEMAN > TEST RUN > COOL MODE RUNNING

The **COOL MODE RUNNING** operation is used to check the operation of the system in space cooling mode.

During the **COOL MODE RUNNING** operation, the Yukon Split unit leaving water set temperature is 7°C. The current actual leaving water temperature is displayed on the user interface. The unit operates until the leaving water temperature drops to

COOL MODE RUNNING display

11 TEST RUN
Test run is on. Cool mode is on. Leaving water temperature is 15°C.
OK CONFIRM

the set temperature or the next command is received.

If any error code is displayed during the cool mode running operation, the cause should be investigated. Refer to Part 3, 8.2 "Error Code table".

25.14.6 HEAT MODE RUNNING operation

The **HEAT MODE RUNNING** operation is used to check the operation of the system in space heating mode.

HEAT MODE RUNNING display

```
11 TEST RUN

Test run is on.
Heat mode is on.
Leaving water temperature is
15°C.




OK CONFIRM
```

During the **HEAT MODE RUNNING** operation the Yukon Split unit leaving water set temperature is 35°C. The current actual leaving water temperature is displayed on the user interface. When the **HEAT MODE RUNNING** operation starts, the heat pump first runs for 10 mins.

After 10 mins:

- On systems where an auxiliary heat source (AHS) is installed, the AHS starts and runs for 10 mins (whilst the heat pump continues running), after which the AHS stops and the heat pump continues to operate until the water temperature rises to the set temperature or the heat mode running operation is exited by pressing **OK**.
- On systems where a backup electric heater is being used, the backup heater turn on (on models where the backup heater has a simple on/off control function). 3 mins later the backup electric heater will turn off. The heat pump will then operate until the water temperature rises to the set temperature or the **next command is received.**
- On systems with no auxiliary heat source (AHS), the heat pump will then operate until the water temperature rises to the set temperature or the **next command is received.**

If any error code is displayed during the cool mode running operation, the cause should be investigated. Refer to Part 3, 8.2 "Error Code table".

25.14.7 DHW MODE RUNNING operation

The **DHW MODE RUNNING** operation is used to check the operation of the system in DHW mode.

During the **DHW MODE RUNNING** operation, the DHW set temperature is 55°C. On systems where a tank boost heater is installed, the tank boost heater will turn on once the heat pump has run for 10 mins. The tank boost heater will turn off 3 min later and the heat pump will operate until the water temperature rises to the set temperature or the **next command is received.**
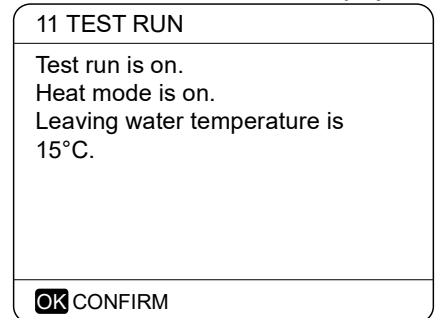
DHW MODE RUNNING display

```
┌─────────────────────────────────────┐
│ 11 TEST RUN                         │
├─────────────────────────────────────┤
│ Test run is on.                     │
│ DHW mode is on.                     │
│ Water flow temper. is 45°C          │
│ Water tank temper. is 30°C          │
│                                     │
│                                     │
│                                     │
├─────────────────────────────────────┤
│ OK CONFIRM                          │
└─────────────────────────────────────┘
```

25.15 SPECIAL FUNCTION

25.15.1 SPECIAL FUNCTION menu overview
MENU > FOR SERVICEMAN > SPECIAL FUNCTION

SPECIAL FUNCTION is used to pre-heating floor and drying up floor once installation is complete or the first time start up the unit or restart the unit after a long time stop.

Special functions menu

12 SPECIAL FUNCTION
Active the settings and active the "SPECIAL FUNCTION"?
NO   YES
OK CONFIRM   ◄►

12 SPECIAL FUNCTION
12.1 PREHEATING FOR FLOOR
12.2 FLOOR DRYING UP
OK ENTER   ◆
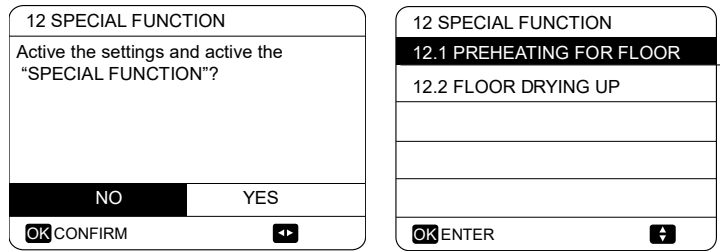
25.15.2 PREHEATING FOR FLOOR
MENU > FOR SERVICEMAN > SPECIAL FUNCTION > PREHEATING FOR FLOOR

Before floor heating, if a large amount of water remains on the floor, the floor may be warped or even rupture during floor heating operation, in order to protect the floor, floor drying is necessary, during which the temperature of the floor should be increased gradually.

During first operation of the unit, air may remain in the water system which can cause malfunctions during operation. It is necessary to run the air purge function to release the air (make sure the air purge valve is open).

T1S sets the heat pump's leaving water set temperature in preheating for floor mode.

t_fristFH sets the duration of preheating for floor mode.
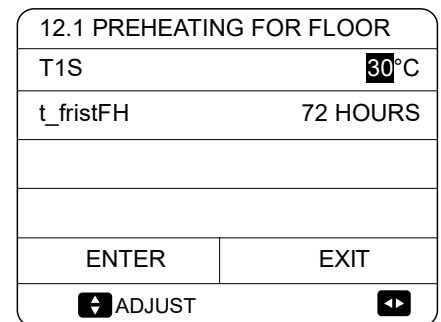
The operation of the unit during preheating for floor mode is illustrated below:.

Preheating for floor menu

12.1 PREHEATING FOR FLOOR	
T1S	30°C
t_fristFH	72 HOURS
ENTER	EXIT
◆ ADJUST	◄►

Preheating for floor
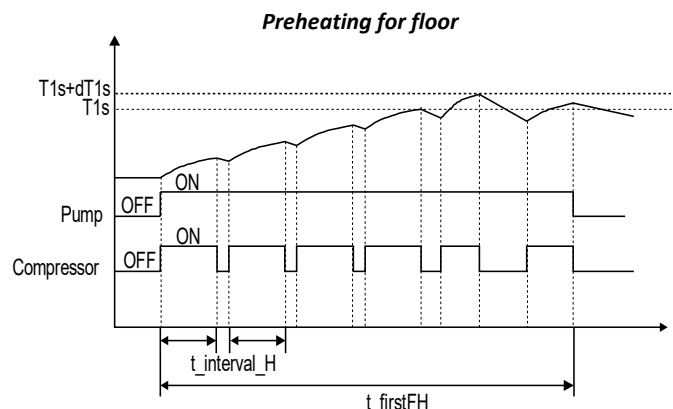
Abreviations:
t_interval_H: Compressor re-start delay in space heating mode. (Refer to Part 3, 8.6 "HEAT MODE SETTING Menu").

Whilst the preheating for floor operation is running, the number of minutes that it has been running for and the heat pump's leaving water temperature are displayed on the user interface. During the preheating for floor operation all buttons except **OK** are inactivated. To exit the preheating for floor operation, press **OK** and then select **YES** when prompted. Refer to below:

Preheating for floor screens

12.1 PREHEATING FOR FLOOR
Preheat for floor is running for 25 minutes. Water flow temperature is 20°C.
OK CONFIRM

12.1 PREHEATING FOR FLOOR
Do you want to turn off the preheating for floor function?
NO	YES
OK CONFIRM ◄►

25.15.3 FLOOR DRYING UP

MENU > **FOR SERVICEMAN** > **SPECIAL FUNCTION** > **FLOOR DRYING UP**

For newly-installed under-floor heating systems, floor drying up mode can be used to remove moisture from the floor slab and subfloor to prevent warping or rupture of the floor during floor heating operation. There are three phases to the floor drying up operation:

FLOOR DRYING UP menu

12.2 FLOOR DRYING UP	
t_DRYUP	8 days
t_HIGHPEAK	5 days
t_DRYDOWN	5 days
T_DRYPEAK	45°C
START TIME	15:00
⬍ ADJUST	◄►

12.2 FLOOR DRYING UP	
START DAY	01-01-2019
ENTER	EXIT
⬍ ADJUST	◄►

- Phase 1: gradual temperature increase from a starting point of 25°C to the peak temperature
- Phase 2: maintain peak temperature
- Phase 3: gradual temperature decrease from the peak temperature to 45°C

t_DRYUP sets the duration of Phase 1.

t_HIGHPEAK sets the duration of Phase 2.

t_DRYDOWN is the duration of Phase 3.

T_DRYPEAK sets the heat pump's leaving water set temperature for Phase 2.

START TIME sets the floor drying up operation start time.

START DATE sets the floor drying up operation start date.

FLOOR DRYING UP settings

During the floor drying up operation all buttons except **OK** are inactivated. To exit the floor drying up operation, press **OK** and then select **YES** when prompted.

Note: In the event of a heat pump malfunction, floor drying up mode will continue if a backup electric heater and/or additional heating source is available and configured to support space heating mode.
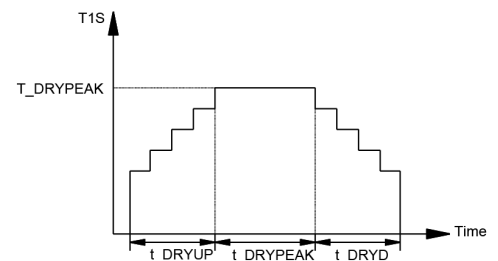
FLOOR DRYING UP screen

12.2 FLOOR DRYING UP	
START DAY	01-01-2019
ENTER	EXIT
⬍ ADJUST	◄►

25.15.4 AUTO RESTART

MENU > FOR SERVICEMAN > AUTO RESTART

AUTO RESTART sets whether or not the unit re-applies the user interface settings when the power returns following a power failure. Select **YES** to enable auto restart or **NON** to disable auto restart.

If the auto restart function is enabled, when the power returns following a power failure, the unit re-applies the user interface settings from before the power failure. If the auto restart function is disabled, when the power returns after a power failure, the unit won't auto restart.

25.16 POWER INPUT LIMITATION
MENU > FOR SERVICEMAN > POWER INPUT LIMITATION

POWER INPUT LIMITATION menu

14 POWER INPUT LIMITATION	
14.1 POWER INPUT LIMITATION	0
⬍ ADJUST	

POWER INPUT LIMITATION sets the type of power input limitation and the setting range is 0-8. If the unit will operate at larger power input, 0 should be selected. If the unit will operate at a lower power input, 1-8 should be selected and the power input and capacity will decrease.

Limitation value (unit:A)

Model No.	0	1	2	3	4	5	6	7	8
4/6kW	18	18	16	15	14	13	12	12	12
8/10kW	19	19	18	16	14	12	12	12	12
12/14kW(1N)	30	30	28	26	24	22	20	18	16
16kW(1N)	30	30	29	27	25	23	21	19	17
12/14kW(3N)	14	14	13	12	11	10	9	9	9
16kW(3N)	14	14	13	12	11	10	9	9	9

25.17 INPUT DEFINE
MENU > FOR SERVICEMAN > INPUT DEFINE

15 INPUT DEFINE	
15.1 ON/OFF(M1M2)	REMOTE
15.2 SMART GRID	NON
15.3 T1b(Tw2)	NON
15.4 Tbt1	NON
15.5 Tbt2	NON
⬍ ADJUST	◀▶

15 INPUT DEFINE	
15.6 Ta	HMI
15.7 Ta-adj	-2°C
15.8 SOLAR INPUT	NON
15.9 F-PIPE LENGTH	<10m
15.10 RT/Ta_PCB	NON
⬍ ADJUST	◀▶

15 INPUT DEFINE	
15.11 PUMPI SILENT MODE	NON
⬍ ADJUST	◀▶

INPUT DEFINE sets sensors and functions to fulfill with installation.

ON/OFF(M1M2) sets the control function of M1M2 for remote ON/OFF of unit or AHS or TBH

SMART GRID sets whether SMART GRID control signal is connected to hydronic PCB.

T1b(Tw2) sets whether T1b sensor exist in the installation.

Tbt1 set whether balance tank temperature sensors are installed in the balance tank. (Tbt1 sensor, individually purchase; Tbt2,

reserved)

Ta sets the Ta sensor connection type (HMI: Ta on wired controller; IDU: Ta connected on hydronic PCB)

Ta-adj is an correction value for Ta.

SOLAR INPUT sets whether solar control signal is connected to hydronic PCB. (0=NON; 1=CN18; Tsolar 2=CN11SL1SL2)

F-PIPE LENGTH sets the length of refrigerant pipes between outdoor unit and indoor unit.

RT/Ta_PCB sets whether M-kit is valid.

Pump silent mode can decrease water pump maximum output by 5% in order to decrease the noise of heat pump.

25.18 HMI ADDRESS SET

MENU > FOR SERVICEMAN > HMI ADDRESS SET

HMI ADDRESS SET

17 HMI ADDRESS SET	
17.1 HMI SET	MASTER
17.2 HMI ADDRESS FOR BMS	1
⬍ ADJUST	◀▶

HMI SET sets the wired controller is master or slave. (0=MASTER, 1=SLAVE)

When HMI SET is set to SLAVE, the controller can only switch the operation mode, turn on or off, set the temperature, and cannot set other parameters and functions.

HMI ADDRESS FOR BMS sets the HMI address code for BMS.(only valid for master controller)

26 Operation Parameter Checking

MENU > OPERATION PARAMETER

This menu is for installer or service engineer reviewing the operation parameters. There are nine pages for the operating parameter as following

OPERATION PARAMETER	#01
ONLINE UNITS NUMBER	1
OPERATE MODE	COOL
SV1 STATE	ON
SV2 STATE	OFF
SV3 STATE	OFF
PUMP_I	ON
◀▶ ADDRESS	1/9 ⬍

OPERATION PARAMETER	#01
PUMP-O	OFF
PUMP-C	OFF
PUMP-S	OFF
PUMP-D	OFF
PIPE BACKUP HEATER	OFF
TANK BACKUP HEATER	ON
◀▶ ADDRESS	2/9 ⬍

OPERATION PARAMETER	#01
GAS BOILER	OFF
T1 LEAVING WATER TEMP.	35°C
WATER FLOW	1.72m3/h
HEAT PUMP CAPACTIY	11.52kW
POWER CONSUM.	1000kWh
Ta ROOM TEMP	25°C
◀▶ ADDRESS	3/9 ⬍

OPERATION PARAMETER	#01
T5 WATER TANK TEMP.	53°C
Tw2 CIRCUIT2 WATER TEMP.	35°C
TIS' C1 CLIMATE CURVE TEMP.	35°C
TIS2' C2 CLIMATE CURVE TEMP.	35°C
TW_O PLATE W-OUTLET TEMP.	35°C
TW_I PLATE W-OUTLET TEMP.	30°C
◀▶ ADDRESS	4/9 ⬍

OPERATION PARAMETER	#01
Tbt1 BUFFERTANK_UP TEMP.	35°C
Tbt2 BUFFERTANK_LOW TEMP.	35°C
Tsolar	25°C
IDU SOFTWARE	01-09-2019V01
◀▶ ADDRESS	5/9 ⬍

OPERATION PARAMETER	#01
ODU MODEL	6kW
COMP.CURRENT	12A
COMP.FREQENCY	24Hz
COMP.RUN TIME	54 MIN
COMP.TOTAL RUN TIME	1000Hrs
EXPANSION VALVE	200P
◀▶ ADDRESS	6/9 ⬍

OPERATION PARAMETER	#01
FAN SPEED	600R/MIN
IDU TARGET FREQUENCY	46Hz
FREQUENCY LIMITED TYPE	5
SUPPLY VOLTAGE	230V
DC GENERATRIX VOLTAGE	420V
DC GENERATRIX CURRENT	18A
◀▶ ADDRESS	7/9 ⬍

OPERATION PARAMETER	#01
TW_O PLATE W-OUTLET TEMP.	35°C
TW_I PLATE W-INLET TEMP.	30°C
T2 PLATE F-OUT TEMP.	35°C
T2B PLATE F-IN TEMP.	35°C
Th COMP. SUCTION TEMP.	5°C
Tp COMP. DISCHARGE TEMP.	75°C
◀▶ ADDRESS	8/9 ⬍

OPERATION PARAMETER	#01
T3 OUTDOOR EXCHANGE TEMP.	5°C
T4 OUTDOOR AIR TEMP.	5°C
TF MODULE TEMP.	55°C
P1 COMP. PRESSURE	2300kPa
ODU SOFTWARE	01-09-2018V01
HMI SOFTWARE	01-09-2018V01
◀▶ ADDRESS	9/9 ⬍

27 Network Configuration Guidelines

The wired controller realizes intelligent control with a built-in WIFI module, which receives control signal from the APP. Before connecting the WLAN, please check for it if the router in your environment is active and make sure that the wired controller is well-connected to the wireless signal. When the product is connected to the network, please make sure that the phone is as close as possible to the product. Sinclair only supports 2.4GHz band routers at present. Special characters (punctuation, spaces, etc.) are not recommended as part of the WLAN name. It is recommended that you connect no more than 10 devices to a single router lest home appliances are affected by weak or unstable network signal. If the password of the router or WLAN is changed, clear all settings and reset the appliance. APP interface changes from time to time as APP is updated and may change slightly vary from those in this document.

27.1 Install APP
Scan the following QR code or research "Comfort Home" in APP STORE or GOOGLE PLAY to install the APP.

27.2 Sign in
After installation, open the APP and login.
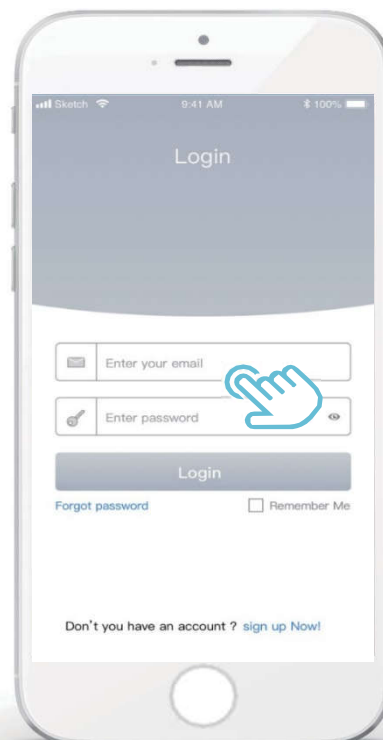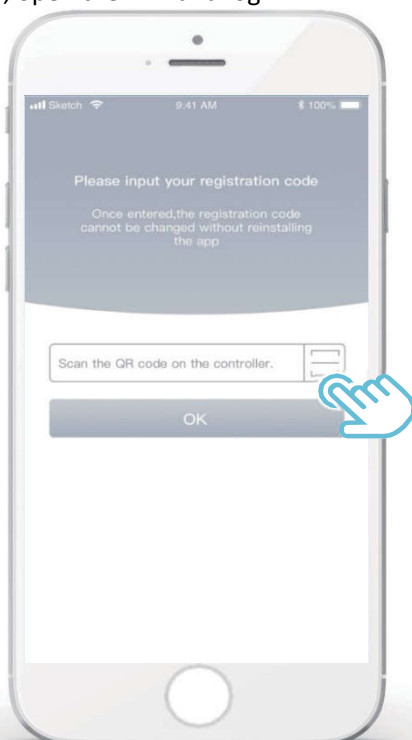
27.3 Add device and login to home Wi-Fi
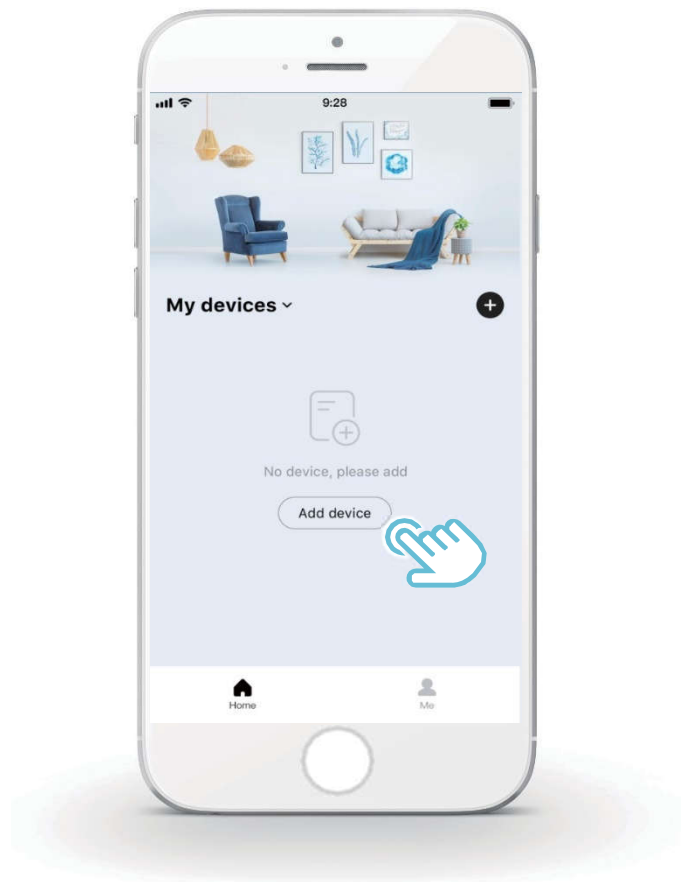
27.4 Operate the wired controller according to APP promps
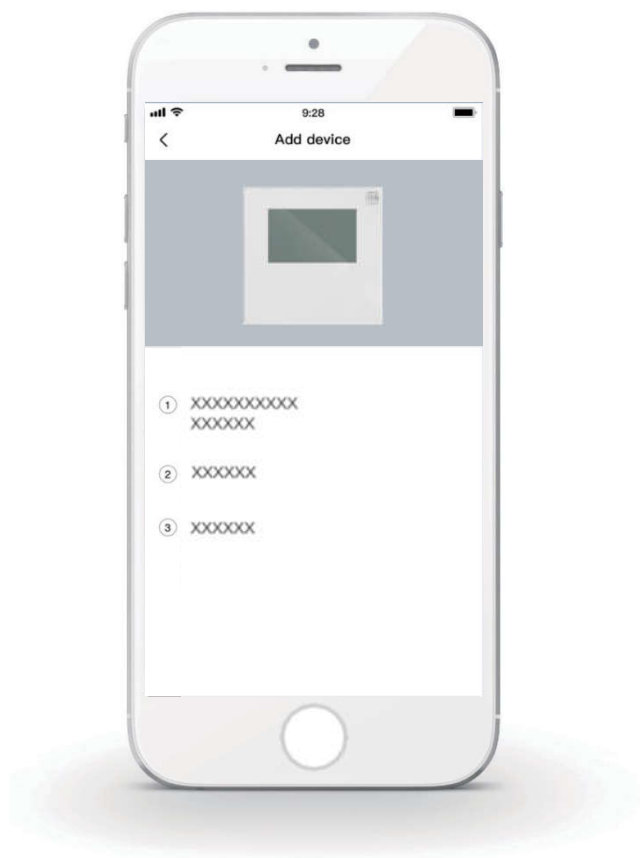
27.5 Wait for the home appliance to connect, and click "Sure".
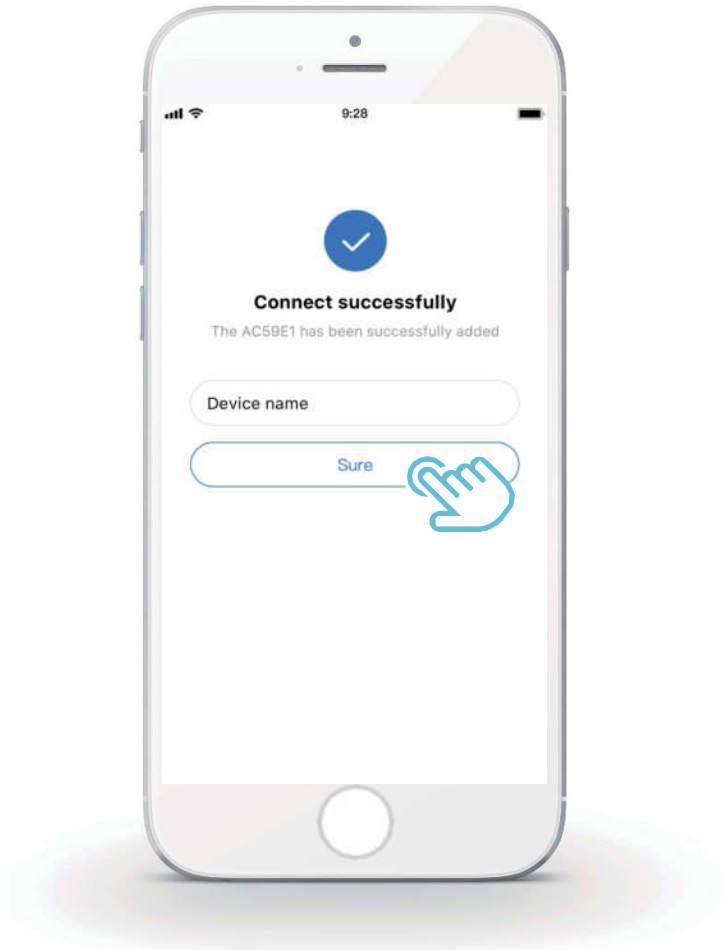
27.6 After the appliance is successfully connected, the LCD icon" " of the wired controller is constantly on, and the heat pump can be controlled through the APP.

27.7 If the network distribution process fails, or the mobile connection demands reconnection and replacement, operate "RESTORE WLAN SETTING" on the wired controller, and then repeat the above process.
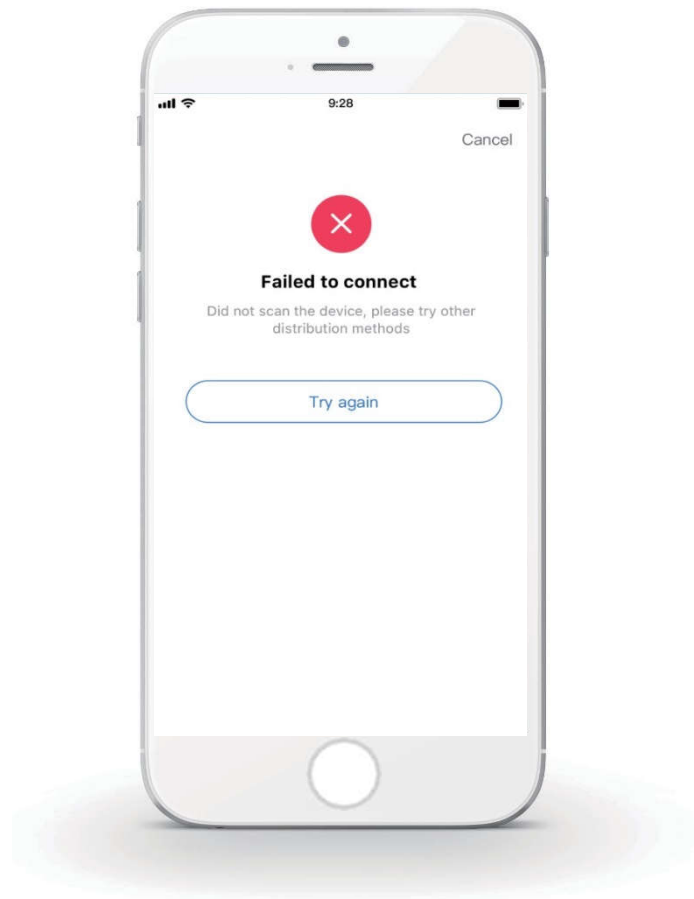
> ⚠️ **Warning and troubleshooting for networking failures**

When the product is connected to the network, please make sure that the phone is as close as possible to the product.

We only support 2.4GHz band routers at present.

Special characters (punctuation, spaces, etc.) are not recommended as part of the WLAN name.

It is recommended that you connect no more than 10 devices to a single router lest home appliances are affected by weak or unstable network signal.

If the password of the router or WLAN is changed, clear all settings and reset the appliance.

The contents of APP might change in version updates and actual operation shall prevail.

WIFI information

WIFI transmit frequency range:2.400～2.4835 GHz
EIRP not more than 20dbm

28 Climate Related Curves

The climate related curves can be selected in the user interface, **MENU > PRESET TEMPERATURE > WEATHER TEMP. SET.**

The curves for heating mode and ECO heating mode are the same but the default curve is curve 4 in heating mode, while in ECO mode, the default curve is curve 6. The default curves for cooling mode is curve 4. Once the curve is selected, the leaving water set temperature (T1s) is determined by the outdoor temperature. In each mode, each curve from the eight curves in the user interface can be selected.

WEATHER TEMP.SET menu

PRESET TEMPERATURE		
PRESET TEMP.	WEATHER TEMP.SET	ECO MODE
ZONE1 C-MODE LOW TEMP.		OFF
ZONE1 H-MODE LOW TEMP.		OFF
ZONE2 C-MODE LOW TEMP.		OFF
ZONE2 H-MODE LOW TEMP.		OFF
ON/OFF ON/OFF		

Low temperature curves for heating mode[1]
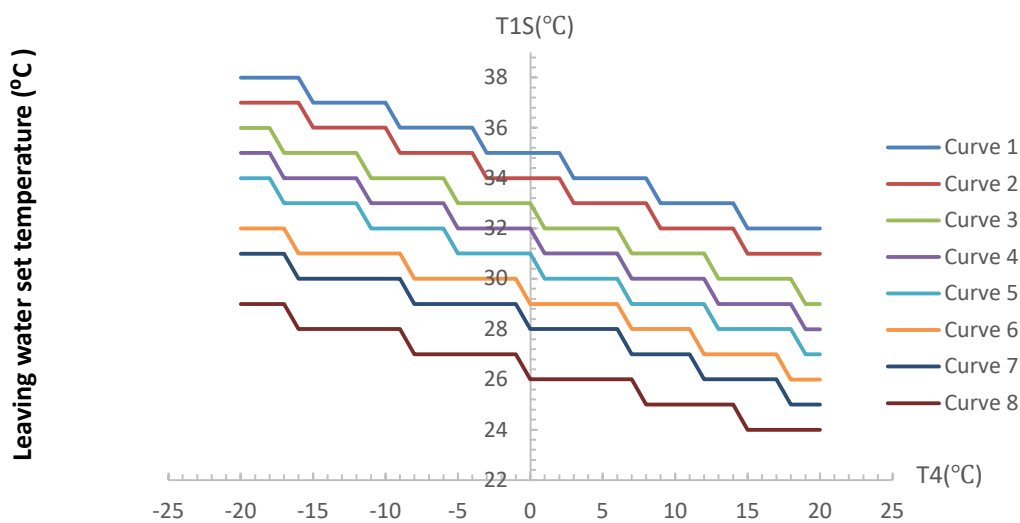
Notes:

1. It only has the curves of the low temperature setting for heating, if the low temperature is set for heating.

2. Curve 4 is default in low temperature heating mode and curve 6 is default in ECO mode.

High temperature curves for heating mode[1]
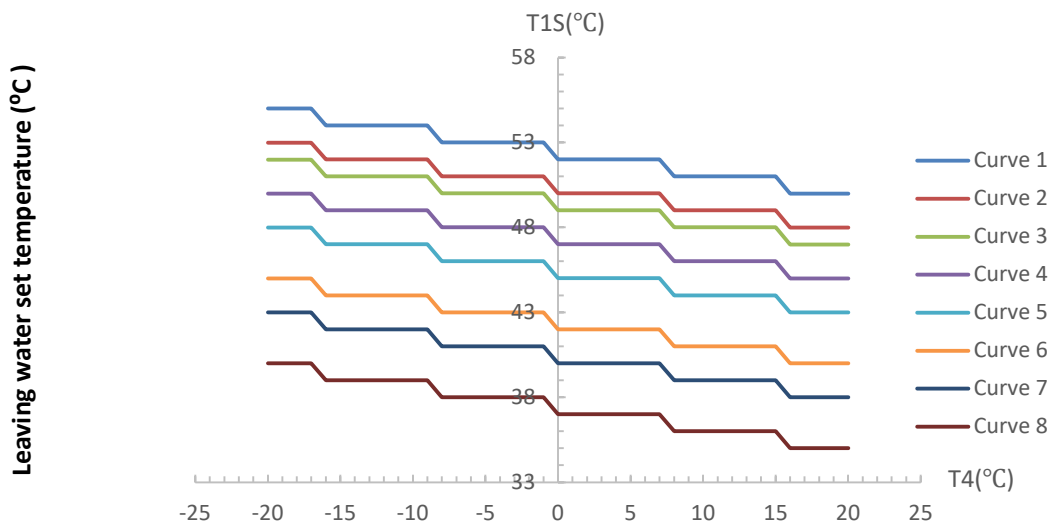
Notes:

1.   It only has the curves of the high temperature setting for heating, if the high temperature is set for heating.

2.   Curve 4 is default in high temperature heating mode and curve 6 is default in ECO mode.

Low temperature curves for cooling mode[1]
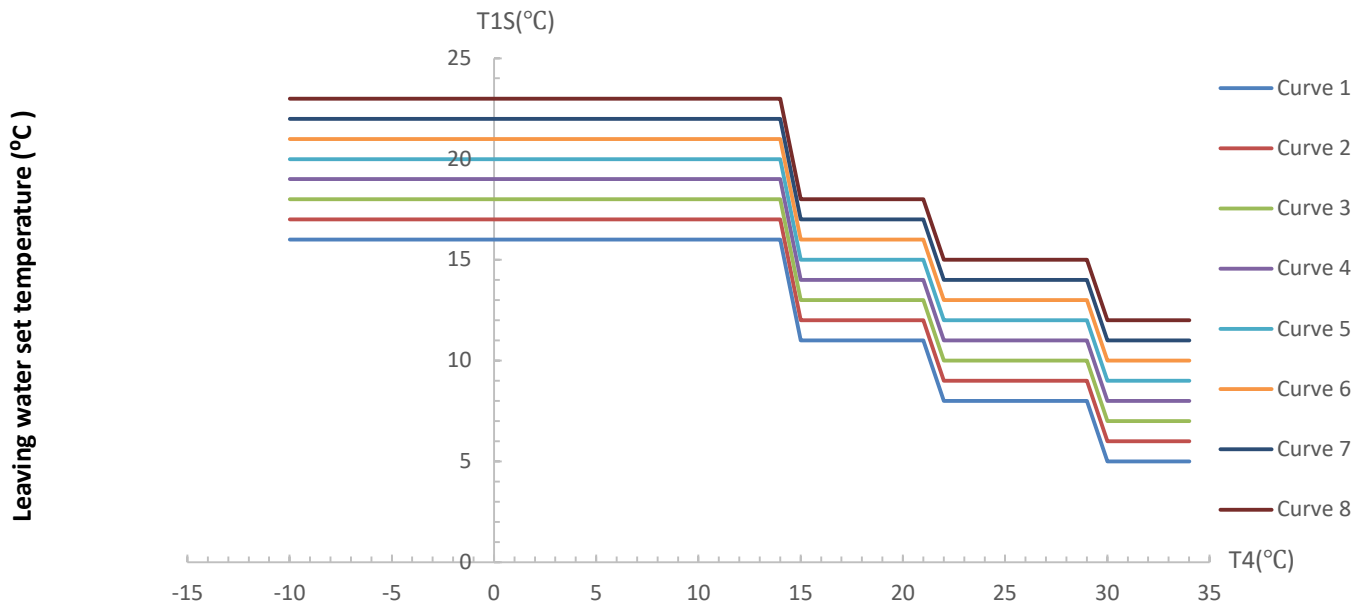
Notes:

1.   It only has the curves of the low temperature setting for cooling, if the low temperature is set for cooling.

2.   Curve 4 is default in low temperature cooling mode.

High temperature curves for cooling mode[1]
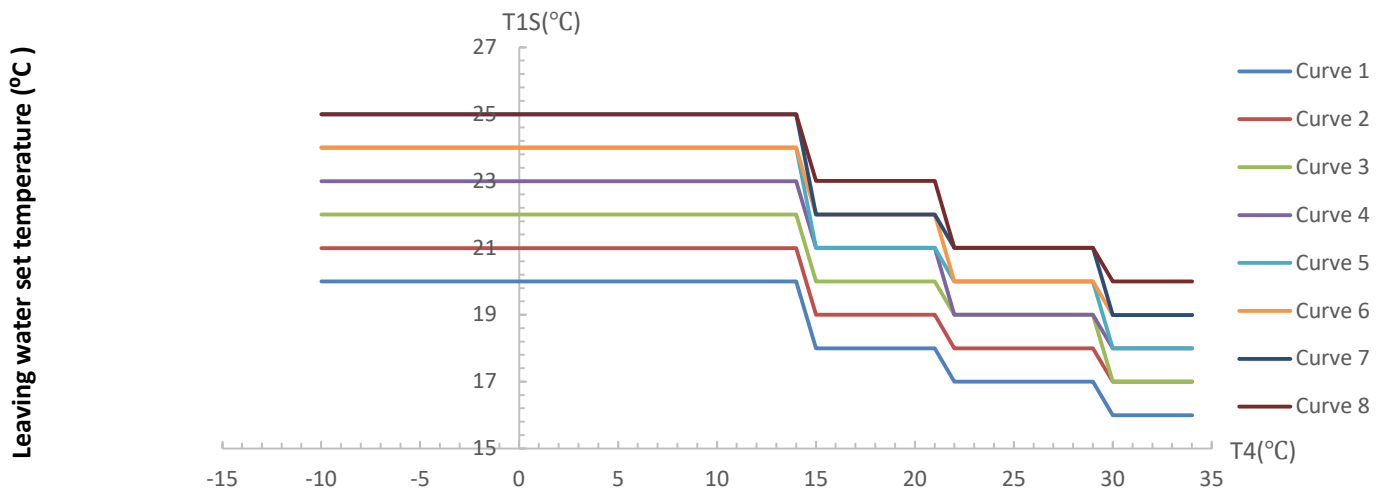
Notes:

1.   It only has the curves of the high temperature setting for cooling, if the high temperature is set for cooling.

2.   Curve 4 is default in high temperature cooling mode.

Automatic setting curve for heating mode   *Automatic setting curve for cooling mode*
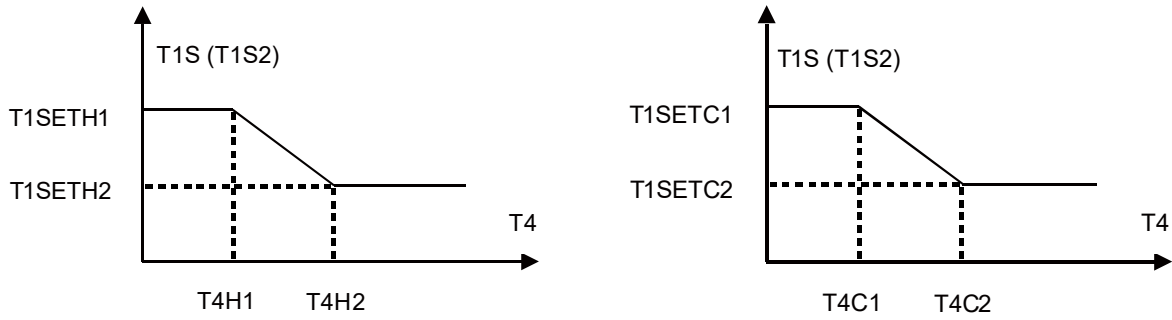
29 Spare parts

29.1 MSH-190TB/3

EX_ID	Part name(EN)	Part Code	Qty	Remark
1	Shielded pump	17400802001853	1	
2	Heat-exchanger assembly	15710600000301	1	
2.1	Plate heat exchanger	15700101001096	1	
2.2	Safety valve	15500201000025	1	
4	Connecting hose	12100509000392	1	
5	Circulating inlet water pipe assembly	15425300003402	1	
6	Water outlet pipe assembly	15425300003401	2	
7	Top cover	12210600002009	1	
8	Top cover assembly	12225300010263	1	
9	Connection hose	12110600000229	1	
10	Water inlet pipe assembly	15410600000553	1	
11	Circulating outlet water pipe assembly	15425300003400	1	
11.1	Three-way valve suit	15500215000287	1	
12	Water flow switch	17400510000474	1	
13	closed expansion vessels with built in diagram	15500509000107	1	
15	E-part box assembly	17210600000648	1	
15.1	AC contactor	11203502000493	2	
15.2	Thermostat assembly	17410600000008	1	
15.3	Thermostat assembly	17410600000009	1	
15.4	Hydraulic module, Main control board assembly	17110600000570	1	
15.5	Wire joint	17400401000073	1	
16	Right side panel assembly	12227000014393	1	
17	Wired controller	17317100005975	1	
18	Panel part	12225300010278	1	

19	Drain Pipe	12600501000408	1	
22	Water tank	12210600001937	1	
22.1	Chassis part	12225300010256	1	
22.2	Water Temperature Sensor	11201007000104	1	
22.3	Rear board assembly	12226000005999	1	
22.4	Partition board	12225300010265	1	
22.14	Frame	12218000000727	1	
22.20	Drainage pan assembly	12210600001929	1	
24	Left side panel assembly	12227000014390	1	
25	Pipe Temperature Sensor	11201007000382	2	
26	Water Temperature Sensor	11201007001983	3	
27	Electrical heater of plate heat exchanger	17402001000083	1	
28	Small water tank	12225300009063	1	
29	Exhaust valve	15500211000047	1	

29.2 MSH-240TB/3

EX ID	Part name(EN)	Part Code	Qty	Remark
1	Shielded pump	17400802001853	1	
2	Heat-exchanger assembly	15710600000302	1	
2.1	Plate heat exchanger	15700101000976	1	
2.2	Safety valve	15500201000025	1	
4	Connecting hose	12100509000392	1	
5	Circulating inlet water pipe assembly	15425300003402	1	
6	Water outlet pipe assembly	15425300003401	2	
7	Top cover	12210600002009	1	
8	Top cover assembly	12225300010263	1	
9	Connection hose	12110600000229	1	
10	Water inlet pipe assembly	15410600000553	1	
11	Circulating outlet water pipe assembly	15425300003400	1	
11.1	Three-way valve suit	15500215000287	1	
12	Water flow switch	17400510000007	1	
13	closed expansion vessels with built in diagram	15500509000107	1	
15	E-part box assembly	17210600000648	1	
15.1	AC contactor	11203502000493	2	
15.2	Thermostat assembly	17410600000008	1	
15.3	Thermostat assembly	17410600000009	1	
15.4	Hydraulic module, Main control board assembly	17110600000570	1	
15.5	Wire joint	17400401000073	1	
16	Right side panel assembly	12227000014396	1	
17	Wired controller	17317100005975	1	
18	Panel part	12225300010279	1	
19	Drain Pipe	12600501000608	1	
22	Water tank	12210600001946	1	
22.1	Chassis part	12225300010256	1	

22.2	Water Temperature Sensor	11201007000104	1	
22.3	Rear board assembly	12226000005999	1	
22.4	Partition board	12225300010285	1	
22.14	Frame	12218000000727	1	
22.20	Drainage pan assembly	12210600001929	1	
24	Left side panel assembly	12227000014399	1	
25	Pipe Temperature Sensor	11201007000382	2	
26	Water Temperature Sensor	11201007001983	3	
27	Electrical heater of plate heat exchanger	17402001000083	1	
28	Small water tank	12225300009063	1	
29	Exhaust valve	15500211000047	1	

29.3 MSH-190TB-3/9

EX ID	Part name(EN)	Part Code	Qty	Remark
1	Shielded pump	17400802001853	1	
2	Heat-exchanger assembly	15710600000301	1	
2.1	Plate heat exchanger	15700101001096	1	
2.2	Safety valve	15500201000025	1	
4	Connecting hose	12100509000392	1	
5	Circulating inlet water pipe assembly	15425300003402	1	
6	Water outlet pipe assembly	15425300003401	2	
7	Top cover	12210600002009	1	
8	Top cover assembly	12225300010263	1	
9	Connection hose	12110600000229	1	
10	Water inlet pipe assembly	15410600000553	1	
11	Circulating outlet water pipe assembly	15425300003400	1	
11.1	Three-way valve suit	15500215000287	1	
12	Water flow switch	17400510000474	1	
13	closed expansion vessels with built in diagram	15500509000107	1	
15	E-part box assembly	17210600A00310	1	
15.1	AC contactor	11203502000493	3	

15.2	Thermostat assembly	17410600000008	1	
15.3	Thermostat assembly	17410600000009	1	
15.4	Hydraulic module, Main control board assembly	17110600000570	1	
15.5	Wire joint	17400401003816	1	
16	Right side panel assembly	12227000014393	1	
17	Wired controller	17317100006916	1	
18	Panel part	12225300A02863	1	
19	Drain Pipe	12600501000408	1	
22	Water tank	12210600001937	1	
22.1	Chassis part	12225300010256	1	
22.2	Water Temperature Sensor	11201007000104	1	
22.3	Rear board assembly	12226000005999	1	
22.4	Partition board	12225300010265	1	
22.14	Frame	12218000000727	1	
22.20	Drainage pan assembly	12210600001929	1	
24	Left side panel assembly	12227000014390	1	
25	Pipe Temperature Sensor	11201007000382	2	
26	Water Temperature Sensor	11201007001983	3	
27	Electrical heater of plate heat exchanger	17402001000083	1	
28	Small water tank	12225300009065	1	
29	Exhaust valve	15500211000047	1	

29.4 MSH-240TB-3/9

EX_ID	Part name(EN)	Part Code	Qty	Remark
1	Shielded pump	17400802001853	1	
2	Heat-exchanger assembly	15710600000302	1	
2.1	Plate heat exchanger	15700101000976	1	
2.2	Safety valve	15500201000025	1	
4	Connecting hose	12100509000392	1	
5	Circulating inlet water pipe assembly	15425300003402	1	
6	Water outlet pipe assembly	15425300003401	2	
7	Top cover	12210600002009	1	
8	Top cover assembly	12225300010263	1	
9	Connection hose	12110600000229	1	
10	Water inlet pipe assembly	15410600000553	1	
11	Circulating outlet water pipe assembly	15425300003400	1	
11.1	Three-way valve suit	15500215000287	1	
12	Water flow switch	17400510000007	1	
13	closed expansion vessels with built in diagram	15500509000107	1	
15	E-part box assembly	17210600000648	1	
15.1	AC contactor	11203502000493	2	
15.2	Thermostat assembly	17410600000008	1	
15.3	Thermostat assembly	17410600000009	1	
15.4	Hydraulic module, Main control board assembly	17110600000570	1	
15.5	Wire joint	17400401000073	1	
16	Right side panel assembly	12227000014396	1	
17	Wired controller	17317100005975	1	
18	Panel part	12225300010279	1	
19	Drain Pipe	12600501000608	1	
22	Water tank	12210600001946	1	
22.1	Chassis part	12225300010256	1	
22.2	Water Temperature Sensor	11201007000104	1	
22.3	Rear board assembly	12226000005999	1	
22.4	Partition board	12225300010285	1	
22.14	Frame	12218000000727	1	
22.20	Drainage pan assembly	12210600001929	1	
24	Left side panel assembly	12227000014399	1	
25	Pipe Temperature Sensor	11201007000382	2	
26	Water Temperature Sensor	11201007001983	3	
27	Electrical heater of plate heat exchanger	17402001000083	1	
28	Small water tank	12225300009063	1	
29	Exhaust valve	15500211000047	1	

29.5 MSH-60EB
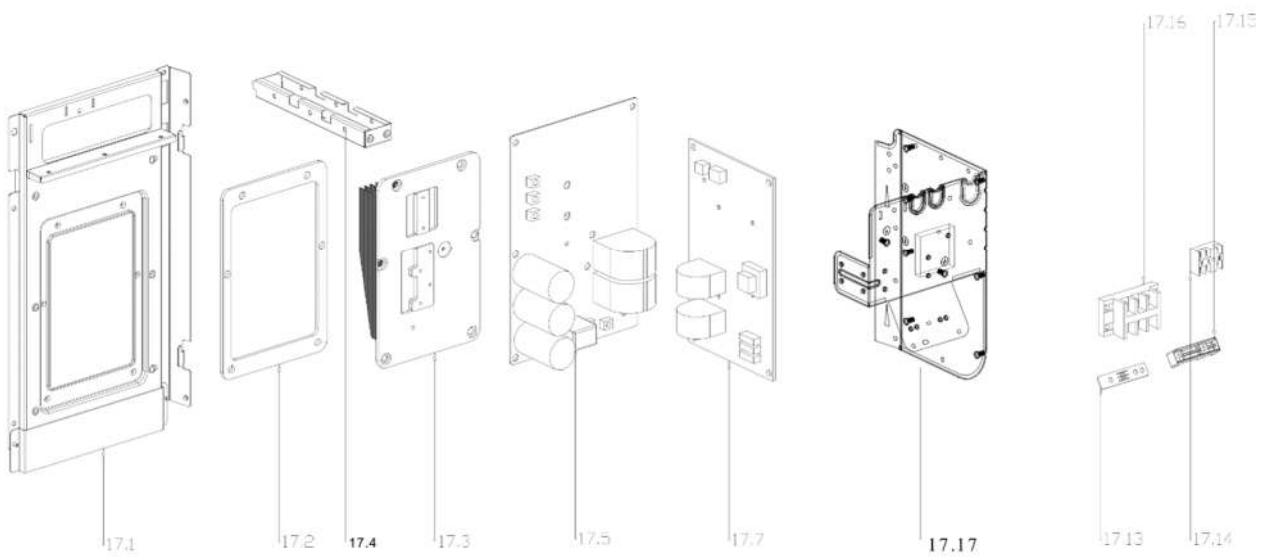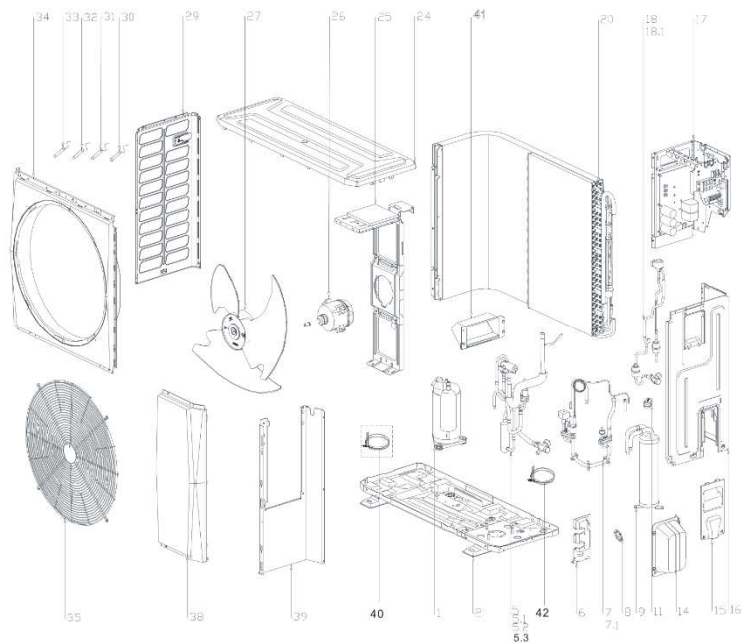
EX ID	Part name(EN)	Part Code	Qty	Remark
1	DC Inverter Rotary Compressor	11103020005759	1	
2	Chassis part	12227000016165	1	
5	Four-way valve assembly	15427000004445	1	
5.1	4-way valve suite	15500216000103	1	
5.2	Pressure sensor	11201008000033	1	
5.3	Pressure switch	17400516000808	1	
6	Valve plate	12223000012694	1	
7	Suction pipe assembly	15427000004447	1	
7.1	Pressure switch	17400516000008	1	
8	Rubber washer	12600401003653	1	

9	Liquid storage tank assembly	15425300003060	1	
11	rubber base	12600401000158	1	
14	Water collector	12122000029462	1	
15	Large handle	12227000011039	1	
16	Right Rear Side Panel Assembly	12223000012692	1	
17	E-box assembly	17223000A07099	1	
17.1	Radiator support plate	12227000015799	1	
17.2	Seal gasket	12627000000646	1	
17.3	Optional heat exchanger	12927000001412	1	
17.4	Connecting plate assembly	12227100007240	1	
17.5	Module board assembly	17125300003909	1	
17.7	Outdoor main control board assembly	17125300004203	1	
17.13	Insulation plate	12122000006931	1	
17.14	Wire joint	17400401000183	1	
17.15	Wire clip	12100303001082	1	
17.16	Terminal	17400401000026	1	
17.16	Wire joint	17400401000073	1	
17.17	Electrical appliance mounting plate assembly	12223000015288	1	
18	Expansion valve assembly	15427000004444	1	
18.1	Electronic expansion valve suite	15500213001526	1	
20	Condenser part	15827000001668	1	
24	Top cover assembly	12227000012331	1	
25	Motor holder assembly	12223000012695	1	
26	Brushless DC Motor	11002015010746	1	
27	Axial flow fan	12100105000022	1	
29	Column	12223000012696	1	
30	Room Temperature Sensor	11201007000039	1	
31	Discharge Temperature Sensor	11201007002463	1	
32	Pipe Temperature Sensor	11201007000382	1	
33	Pipe Temperature Sensor	11201007000164	1	
34	Front panel	12223000012698	1	
35	Wind nets	12927000001413	1	
38	Right Front Side Panel Assembly	12223000012691	1	
39	Partition board assembly	12222500002372	1	
40	Chassis electric heating	17402001000259	1	
41	Rainproof cover	12127000001300	1	
42	Compressor electric heater	17402001000339	2	

29.6 MSH-80ERB

17.16

17.1 17.2 17.3 17.4 17.5 17.7 7. 8 17.13 17.14 17.15

34 33 32 31 30 28 27 26 25 24 41 20 18 18.1 17 16

35 36 37 38 39 1 40 2 42 5 5.1 5.2 5.3 6 7 7.1 10 12 13 14 15

EX ID	Part name(EN)	Part Code	Qty	Remark
1	DC Inverter Rotary Compressor	11103020005012	1	
2	Chassis part	12227000016164	1	
5	Four-way valve assembly	15427000005246	1	
5.1	4-way valve suite	15500216000103	1	
5.2	Pressure sensor	11201008000033	1	
5.3	Pressure switch	17400516000808	1	
6	Valve plate	12223000012694	1	
7	D unit suction pipe assembly	15427000005245	1	
7.1	Pressure switch	17400516000008	1	
10	Gas-liquid separator	15500501001809	1	
12	Pipe fixing clamp	12200202000023	1	
13	Clapboard	12227000007795	1	
14	Water collector	12122000029462	1	
15	Big handle assembly	12227000007741	1	
16	Rear-Right Side Plate Assembly	12227000012342	1	
17	E-box assembly	17223000A07098	1	
17.1	Radiator support plate	12227000015799	1	
17.2	Seal gasket	12627000000646	1	
17.3	Optional heat exchanger	12927000001412	1	
17.4	Connecting plate assembly	12227100007239	1	
17.5	Module board assembly	17125300003905	1	
17.7	Outdoor main control board assembly	17125300004203	1	
17.8	Electrical appliance mounting plate assembly	12227000015800	1	
17.13	Insulation plate	12122000006931	1	
17.14	Wire joint	17400401000183	1	
17.15	Wire clip	12100303001082	1	
17.16	Wire joint	17400401000073	1	
17.16	Terminal	17400401000026	1	
18	Expansion valve assembly	15427000004449	1	
18.1	Electronic expansion valve suite	15500213001527	1	
20	B unit condenser assembly	15827000001670	1	
24	Top cover assembly	12227000012341	1	
25	Motor bracket I assembly	12227000012340	1	
26	Brushless DC Motor	11002015006321	1	
27	Axial fan	12100105000641	1	
28	Clapboard	12227000007803	1	
30	Room Temperature Sensor	11201007000039	1	
31	Discharge Temperature Sensor	11201007002463	1	
32	Pipe Temperature Sensor	11201007000382	1	
33	Pipe Temperature Sensor	11201007000164	1	
34	Right front panel	12227000009453	1	
35	Wind nets	12927000001414	1	
36	Panel	12127000001137	1	
38	Front Right Side Plate Assembly	12227000015910	1	
39	Partition board assembly	12227000015810	1	
40	Chassis electric heating	17402001000259	1	
41	Rainproof cover	12127000001300	1	
42	Compressor electric heater	17402001000339	2	

29.7 MSH-100EB

17.16

17.1 17.2 17.3 17.4 17.5 17.7 7.8 17.13 17.14 17.15

34 33 32 31 30 28 27 26 25 24 41 20 18 18.1 17 16

35 36 37 38 39 40 2 42 5 5.1 5.2 5.3 6 7 7.1 10 12 13 14 15

EX_ID	Part name(EN)	Part Code	Qty	Remark
1	DC Inverter Rotary Compressor	11103020005012	1	
2	Chassis part	12227000016164	1	
5	Four-way valve assembly	15427000005246	1	
5.1	4-way valve suite	15500216000103	1	
5.2	Pressure sensor	11201008000033	1	
5.3	Pressure switch	17400516000808	1	
6	Valve plate	12223000012694	1	
7	D unit suction pipe assembly	15427000005245	1	
7.1	Pressure switch	17400516000008	1	
10	Gas-liquid separator	15500501001809	1	
12	Pipe fixing clamp	12200202000023	1	
13	Clapboard	12227000007795	1	
14	Water collector	12122000029462	1	
15	Big handle assembly	12227000007741	1	
16	Rear-Right Side Plate Assembly	12227000012342	1	
17	E-box assembly	17223000A07098	1	
17.1	Radiator support plate	12227000015799	1	
17.2	Seal gasket	12627000000646	1	
17.3	Optional heat exchanger	12927000001412	1	
17.4	Connecting plate assembly	12227100007239	1	
17.5	Module board assembly	17125300003905	1	
17.7	Outdoor main control board assembly	17125300004203	1	
17.8	Electrical appliance mounting plate assembly	12227000015800	1	
17.13	Insulation plate	12122000006931	1	
17.14	Wire joint	17400401000183	1	
17.15	Wire clip	12100303001082	1	
17.16	Wire joint	17400401000073	1	
17.16	Terminal	17400401000026	1	
18	Expansion valve assembly	15427000004449	1	
18.1	Electronic expansion valve suite	15500213001527	1	
20	B unit condenser assembly	15827000001670	1	
24	Top cover assembly	12227000012341	1	
25	Motor bracket I assembly	12227000012340	1	
26	Brushless DC Motor	11002015006321	1	
27	Axial fan	12100105000641	1	
28	Clapboard	12227000007803	1	
30	Room Temperature Sensor	11201007000039	1	
31	Discharge Temperature Sensor	11201007002463	1	
32	Pipe Temperature Sensor	11201007000382	1	
33	Pipe Temperature Sensor	11201007000164	1	
34	Right front panel	12227000009453	1	
35	Wind nets	12927000001414	1	
36	Panel	12127000001137	1	
38	Front Right Side Plate Assembly	12227000015910	1	
39	Partition board assembly	12227000015810	1	
40	Chassis electric heating	17402001000259	1	
41	Rainproof cover	12127000001300	1	
42	Compressor electric heater	17402001000339	2	

29.8 MSH-120EB-3

EX ID	Part name(EN)	Part Code	Qty	Remark
1	DC Inverter Rotary Compressor	11103020006960	1	
2	Chassis part	12227000016163	1	
3	Compressor, supporting plate	12227000012450	1	
4	Compressor, damping pad	12627000000726	4	
5	Four-way valve assembly	15427000005244	1	
5.1	four-way valve assembly	15500216001041	1	
5.2	Pressure sensor	11201008000033	1	
5.3	Pressure controller	17400516000788	1	
6	Valve plate	12223000012694	1	
7	D unit suction pipe assembly	15427000004528	1	
7.1	Pressure switch	17400516000008	1	
9	Liquid storage tank assembly	15425300003080	1	
11	rubber base	12600401000158	1	
13	Clapboard	12227000007795	1	
14	Water collector	12122000029462	1	
15	Big handle assembly	12227000007741	1	
16	Rear-Right Side Plate Assembly	12227000012342	1	
17	E-box assembly	17223000A07100	1	
17.1	Radiator support plate	12227000015796	1	
17.2	Seal gasket	12627000000647	1	
17.3	Optional heat exchanger	12927000001415	1	
17.6	Compressor module board assembly	17127000008876	1	
17.7	DC inverter aqua mini chiller - Main control board	17127400000355	1	
17.10	Filter board assembly	17127000008540	1	
17.11	Terminal mounting board assembly	12225300011533	1	
17.12	Reactance	17400306000163	1	
17.13	Insulation plate	12122000006931	1	

17.14	Wire joint	17400401000183	1	
17.15	Tension clip	12100303000123	1	
17.16	Terminal	17400401000026	1	
17.16	Wire joint	17400401000049	1	
17.17	Electrical appliance mounting plate assembly	12223000015292	1	
18	Expansion valve assembly	15427000004529	1	
18.1	Electronic expansion valve suite	15500213001565	1	
19	Inductance box assembly	17225300003000	1	
20	B unit condenser assembly	15827000001708	1	
24	Top cover assembly	12227000012341	1	
25	Motor bracket I assembly	12227000012449	1	
26	Brushless DC Motor	11002015006321	1	
27	Axial fan	12100105000641	1	
28	Clapboard	12227000007803	1	
30	Room Temperature Sensor	11201007000039	1	
31	Discharge Temperature Sensor	11201007002463	1	
32	Pipe Temperature Sensor	11201007000382	1	
33	Pipe Temperature Sensor	11201007000164	1	
34	Right front panel	12227000009453	1	
35	Wind nets	12927000001414	1	
36	Panel	12127000001137	1	
38	Front Right Side Plate Assembly	12227000015910	1	
39	Partition board assembly	12227000015803	1	
40	Chassis electric heating	17402001000259	1	
42	Compressor electric heater	17402001000539	1	

29.9 MSH-140EB-3

EX ID	Part name(EN)	Part Code	Qty	Remark
1	DC Inverter Rotary Compressor	11103020006960	1	
2	Chassis part	12227000016163	1	
3	Compressor, supporting plate	12227000012450	1	
4	Compressor, damping pad	12627000000726	4	
5	Four-way valve assembly	15427000005244	1	
5.1	four-way valve assembly	15500216001041	1	
5.2	Pressure sensor	11201008000033	1	
5.3	Pressure controller	17400516000788	1	
6	Valve plate	12223000012694	1	
7	D unit suction pipe assembly	15427000004528	1	
7.1	Pressure switch	17400516000008	1	
9	Liquid storage tank assembly	15425300003080	1	
11	rubber base	12600401000158	1	
13	Clapboard	12227000007795	1	
14	Water collector	12122000029462	1	
15	Big handle assembly	12227000007741	1	
16	Rear-Right Side Plate Assembly	12227000012342	1	
17	E-box assembly	17223000A07100	1	
17.1	Radiator support plate	12227000015796	1	
17.2	Seal gasket	12627000000647	1	
17.3	Optional heat exchanger	12927000001415	1	
17.6	Compressor module board assembly	17127000008876	1	
17.7	DC inverter aqua mini chiller - Main control board	17127400000355	1	

17.10	Filter board assembly	17127000008540	1	
17.11	Terminal mounting board assembly	12225300011533	1	
17.12	Reactance	17400306000163	1	
17.13	Insulation plate	12122000006931	1	
17.14	Wire joint	17400401000183	1	
17.15	Tension clip	12100303000123	1	
17.16	Terminal	17400401000026	1	
17.16	Wire joint	17400401000049	1	
17.17	Electrical appliance mounting plate assembly	12223000015292	1	
18	Expansion valve assembly	15427000004529	1	
18.1	Electronic expansion valve suite	15500213001565	1	
19	Inductance box assembly	17225300003000	1	
20	B unit condenser assembly	15827000001708	1	
24	Top cover assembly	12227000012341	1	
25	Motor bracket I assembly	12227000012449	1	
26	Brushless DC Motor	11002015006321	1	
27	Axial fan	12100105000641	1	
28	Clapboard	12227000007803	1	
30	Room Temperature Sensor	11201007000039	1	
31	Discharge Temperature Sensor	11201007002463	1	
32	Pipe Temperature Sensor	11201007000382	1	
33	Pipe Temperature Sensor	11201007000164	1	
34	Right front panel	12227000009453	1	
35	Wind nets	12927000001414	1	
36	Panel	12127000001137	1	
38	Front Right Side Plate Assembly	12227000015910	1	
39	Partition board assembly	12227000015803	1	
40	Chassis electric heating	17402001000259	1	
42	Compressor electric heater	17402001000539	1	

29.10 MSH-160EB-3

EX ID	Part name(EN)	Part Code	Qty	Remark
1	DC Inverter Rotary Compressor	11103020006960	1	
2	Chassis part	12227000016163	1	
3	Compressor, supporting plate	12227000012450	1	
4	Compressor, damping pad	12627000000726	4	
5	Four-way valve assembly	15427000005244	1	
5.1	four-way valve assembly	15500216001041	1	
5.2	Pressure sensor	11201008000033	1	
5.3	Pressure controller	17400516000788	1	
6	Valve plate	12223000012694	1	
7	D unit suction pipe assembly	15427000004528	1	
7.1	Pressure switch	17400516000008	1	
9	Liquid storage tank assembly	15425300003080	1	
11	rubber base	12600401000158	1	
13	Clapboard	12227000007795	1	
14	Water collector	12122000029462	1	
15	Big handle assembly	12227000007741	1	
16	Rear-Right Side Plate Assembly	12227000012342	1	
17	E-box assembly	17223000A07100	1	
17.1	Radiator support plate	12227000015796	1	
17.2	Seal gasket	12627000000647	1	
17.3	Optional heat exchanger	12927000001415	1	
17.6	Compressor module board assembly	17127000008876	1	
17.7	DC inverter aqua mini chiller - Main control board	17127400000355	1	
17.10	Filter board assembly	17127000008540	1	

17.11	Terminal mounting board assembly	12225300011533	1	
17.12	Reactance	17400306000163	1	
17.13	Insulation plate	12122000006931	1	
17.14	Wire joint	17400401000183	1	
17.15	Tension clip	12100303000123	1	
17.16	Terminal	17400401000026	1	
17.16	Wire joint	17400401000049	1	
17.17	Electrical appliance mounting plate assembly	12223000015292	1	
18	Expansion valve assembly	15427000004529	1	
18.1	Electronic expansion valve suite	15500213001565	1	
19	Inductance box assembly	17225300003000	1	
20	B unit condenser assembly	15827000001708	1	
24	Top cover assembly	12227000012341	1	
25	Motor bracket I assembly	12227000012449	1	
26	Brushless DC Motor	11002015006321	1	
27	Axial fan	12100105000641	1	
28	Clapboard	12227000007803	1	
30	Room Temperature Sensor	11201007000039	1	
31	Discharge Temperature Sensor	11201007002463	1	
32	Pipe Temperature Sensor	11201007000382	1	
33	Pipe Temperature Sensor	11201007000164	1	
34	Right front panel	12227000009453	1	
35	Wind nets	12927000001414	1	
36	Panel	12127000001137	1	
38	Front Right Side Plate Assembly	12227000015910	1	
39	Partition board assembly	12227000015803	1	
40	Chassis electric heating	17402001000259	1	
42	Compressor electric heater	17402001000539	1	

NOTE CONCERNING PROTECTION OF ENVIRONMENT
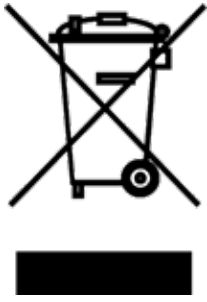
This product must not be disposed of via normal household waste after its service life, but must be taken to a collection station for the recycling of electrical and electronic devices. The symbol on the product, the operating instructions or the packaging indicate such disposal procedures. The materials are recyclable in accordance with their respective symbols. By means of re-use, material recycling or any other form of recycling old appliances you are making an important contribution to the protection of our environment. Please ask your local council where your nearest disposal station is located.

INFORMATION CONCERNING USED REFRIGERANT MEDIUM

This unit is containing fluorinated gases included in the Kyoto protocol.
The maintenance and the liquidation must be carried out by qualified personnel.

Type of refrigerant: R32
The quantity of the refrigerant: Please see the unit label.
The value GWP: 675 (1 kg R32 = 0,675 t CO_2 eq)
GWP = Global Warming Potential

Appliance filled with flammable gas R32.

In case of quality problem or other please contact your local supplier or authorized service center.
Emergency number: 112

PRODUCER

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This product was manufactured in China (Made in China).

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