TRUST
Air Conditioners

# DX TYPE WATER-COOLED SCREW CHILLER


TRUST AIR CONDITIONING EQUIPMENT CO.
Prepared By: Engineering & R & D Department.

Shiraz- AUG 2015

# Contents

# Ⅰ. Safety precautions

Before use, read through the operating instructions to ensure proper using. Please keep it well so that the professional technician can refer to it anytime.

## 1. Installation safety considerations

Access to the unit must be reserved to authorized personnel, qualified and trained in monitoring and maintenance. The access limitation device must be installed by the customer (e.g. cut-off, enclosure). After the unit has been received, when it is ready to be installed or reinstalled, and before it is started up, it must be inspected for damage. Check that the refrigerant circuit(s) is (are) intact, especially that no components or pipes have shifted (e.g. following a shock). If in doubt, carry out a leak tightness check and verify with the manufacturer that the circuit integrity has not been impaired. If damage is detected upon receipt, immediately file a claim with the shipping company. Trust strongly recommends employing a specialized company to unload the machine.

It is compulsory to wear personal protection equipment. Do not remove the skid or the packaging until the unit is in its final position. These units can be moved with a fork lift truck, as long as the forks are positioned in the right place and direction on the unit.

The units can also be lifted with slings, using only the designated lifting points marked on the unit. Use slings with the correct capacity, and always follow the lifting instructions on the certified drawings supplied with the unit. Safety is only guaranteed, if these instructions are carefully followed. If this is not the case, there is a risk of material deterioration and injuries to personnel. Never cover any safety devices. This applies to the relief valve(s) in the refrigerant circuit(s). Ensure that the valves are correctly installed, before operating the unit.

The relief valves are designed and installed to ensure protection against overpressure caused by fire. The relief valve must only be removed if the fire risk is fully controlled and after checking that this is allowed by local regulations and authorities. This is the responsibility of the operator. If the unit is installed in a room, the safety valves must be connected to discharge pipes.

**Note:**

(1) These pipes must be installed in a way that ensures that people and property are not exposed to refrigerant leaks. These fluids may be diffused in the air, but far away from any building air intake, or they must be discharged in a quantity that is appropriate for a suitably absorbing environment. It is recommended to install an indicating device to show if part of the refrigerant has leaked from the valve.

(2) The presence of oil at the outlet orifice is a useful indicator that refrigerant has leaked. Keep this orifice clean to ensure that any leaks are obvious. The calibration of a valve that has leaked is generally lower than its original calibration. The new calibration may affect the operating range.

(3) To avoid a nuisance tripping or leaks, replace or re-calibrate the valve. Periodic check the relief valves. Ensure good ventilation, as accumulation of refrigerant in an enclosed space can displace

oxygen and cause asphyxiation or explosions. Inhalation of high concentrations of vapour is harmful and may cause heart irregularities, unconsciousness, or death. Vapour is heavier than air and reduces the amount of oxygen available for breathing. These products cause eye and skin irritation. Decomposition products are hazardous.

## 2. Maintenance safety considerations

### 2.1 Engineers safety consideration

Engineers working on the electric or refrigeration components must be authorized, trained and fully qualified to do so. All refrigerant circuit repairs must be carried out by a trained person fully qualified to work on these units. He must have been trained and be familiar with the equipment and the installation. All welding operations must be carried out by qualified specialists.

The insulation must be removed and heat generation must be limited by using a wet cloth. Any manipulation (opening or closing) of a shut-off valve must be carried out by a qualified and authorized engineer. These procedures must be carried out with the unit shut-down.

**Note:**

(1) During any handling, maintenance and service operations the engineers working on the unit must be equipped with safety gloves, glasses, shoes and protective clothing.

(2) Never work on a unit that is still energized.

(3) Never work on any of the electrical components, until the general power supply to the unit has been cut using the disconnect switch in the control box.

(4) If any maintenance operations are carried out on the unit, lock the power supply circuit ahead of the machine.

(5) If the work is interrupted, always ensure that all circuits are still de-energized before resuming the work.

**Attention:** Even if the unit has been switched off, the power circuit remains energized, unless the unit or circuit disconnect switch is open. Refer to the wiring diagram for further details. Attach appropriate safety labels.

### 2.2 Operating checks:

Important information regarding the refrigerant used:

- Refrigerant type: R22
- Periodic inspections for refrigerant leaks may be required depending on local legislation. Please contact your local dealer for more information.
- During the life-time of the system, inspection and tests must be carried out in accordance with national regulations.

### 2.3 Safety device checks:

- The safety devices and external overpressure devices (safety valves) must be checked on site regularly.
- At least once a year thoroughly inspect the protection devices (valves). If the machine operates in regularly carry out leak tests and immediately repair any leaks.

- Ensure regularly that the vibration levels remain acceptable and close to those at the initial unit start-up. Before opening a refrigerant circuit, purge and consult the pressure gauges.
- Change the refrigerant when there are equipment failures, following related regulations or carry out a refrigerant analysis in a specialist laboratory.
- If the refrigerant circuit remains open for longer than a day after an intervention (such as a component replacement), the openings must be plugged and the circuit must be charged with nitrogen (inertia principle). The objective is to prevent penetration of atmospheric humidity and the resulting corrosion on the internal walls and on non-protected steel surfaces.

## 3. Repair safety considerations

**Note:** It is compulsory to wear personal protection equipment. The insulation must be removed and warming up must be limited by using a wet cloth. Before opening the unit always ensures that the circuit has been purged.

- All installation parts must be maintained by qualified and skilled technicians, in order to avoid material deterioration and injuries to people. Faults and leaks must be repaired immediately. The authorized technician must have the responsibility to repair the fault immediately. Each time repairs have been carried out to the unit, the operation of the safety devices must be re-checked.
- Comply with the regulations and recommendations in unit and installation safety standards. If a leak occurs or if the refrigerant becomes contaminated (e.g. by a short circuit in a motor) remove the complete charge using a recovery unit and store the refrigerant in mobile containers.
- Repair the leak detected and recharge the circuit with the total R22 charge, as indicated on the unit name plate. Certain parts of the circuit can be isolated. Only charge liquid refrigerant R22 at the liquid line. Ensure that you are using the correct refrigerant type before recharging the unit. Charging any refrigerant other than the original charge type R22 will impair machine operation and can even lead to a destruction of the compressors. The compressors operating with this refrigerant type are lubricated with synthetic oil.
- Do not use oxygen to purge lines or to pressurize a machine for any purpose. Oxygen gas reacts violently with oil, grease, and other common substances.
- Never exceed the specified maximum operating pressures. Verify the allowable maximum high- and low-side test pressures by checking the instructions in this manual and the pressures given on the unit name plate.
- Do not use air for leak testing. Use only refrigerant or dry nitrogen.
- Do not unweld or flame cut the refrigerant lines or any refrigerant circuit component until all refrigerant (liquid and vapour) has been removed from chiller. Traces of vapour should be displaced with dry air nitrogen. Refrigerant in contact with an open flame produces toxic gases.
- The necessary protection equipment must be available, and appropriate fire extinguishers for the system and the refrigerant type used must be within easy reach.

- Do not siphon refrigerant. Avoid spilling liquid refrigerant on skin or splashing it into the eyes. Use safety goggles. Wash any spills from the skin with soap and water. If liquid refrigerant enters the eyes, immediately and abundantly flush the eyes with water and consult a doctor.
- Never apply an open flame or live steam to a refrigerant container. Dangerous overpressure can result. If it is necessary to heat refrigerant, use only warm water.
- During refrigerant removal and storage operations follow applicable regulations. These regulations, permitting conditioning and recovery of halogenated hydrocarbons under optimum quality conditions for the products and optimum safety conditions for people, property and the environment.
- Any refrigerant transfer and recovery operations must be carried out using a transfer unit. The units must never be modified to add refrigerant and oil charging, removal and purging devices. All these devices are provided with the units. Please refer to the certified dimensional drawings for the units.
- Do not re-use disposable (non-returnable) cylinders or attempt to refill them. It is dangerous and illegal. When cylinders are empty, evacuate the remaining gas pressure, and move the cylinders to a place designated for their recovery. Do not incinerate.
- Do not attempt to remove refrigerant circuit components or fittings, while the machine is under pressure or while it is running. Be sure pressure is at 0 kPa before removing components or opening a circuit.
- Do not attempt to repair or recondition any safety devices when corrosion or build-up of foreign material (rust, dirt, scale, etc.) is found within the valve body or mechanism.
- If necessary, replace the device. Do not install safety valves in series or backwards.

**ATTENTION:** No part of the unit must be used as a walkway, rack or support. Periodically check and repair or if necessary replace any component or piping that shows signs of damage. The refrigerant lines can break under the weight and release refrigerant, causing personal injury. Do not climb on a machine. Use a platform, or staging to work at higher levels.

- Use mechanical lifting equipment (crane, hoist, winch, etc.) to lift or move heavy components. For lighter components, use lifting equipment when there is a risk of slipping or losing your balance.
- Use only original replacement parts for any repair or component replacement.
- Do not drain water circuits containing industrial brines, without informing the technical service department at the installation site or a competent body first.
- Close the entering and leaving water shut off valves and purge the unit water circuit, before working on the components installed on the circuit (screen filter, pump, water flow switch, etc.).
- Do not close the water box bolts until the water boxes have been completely drained.
- Periodically inspect all valves, fittings and pipes of the refrigerant and hydraulic circuits to ensure that they do not show any corrosion or any signs of leaks.
- It is recommended to wear ear defenders, when working near the unit and the unit is in operation.

# Ⅱ. Product

## 1.General information

### 1.1.Product Lineup

| Series | Model | Power supply | Cooling Capacity (kW) | Compressor |
|---|---|---|---|---|
| Single head | *TMCU0253B3O3/2WT1DB* | 380V/3N/50Hz | 253 | 1 |
| | *TMCU0318B3O3/2WT1DB* | 380V/3N/50Hz | 318 | 1 |
| | *TMCU0400B3O3/2WT1DB* | 380V/3N/50Hz | 400 | 1 |
| | *TMCU0485B3O3/2WT1DB* | 380V/3N/50Hz | 485 | 1 |
| | *TMCU0628B3O3/2WT1DB* | 380V/3N/50Hz | 628 | 1 |
| | *TMCU0859B3O3/2WT1DB* | 380V/3N/50Hz | 859 | 1 |
| Dual heads | *TMCU0970B3O3/2WT1DB* | 380V/3N/50Hz | 970 | 2 |
| | *TMCU1057B3O3/2WT1DB* | 380V/3N/50Hz | 1057 | 2 |
| | *TMCU1256B3O3/2WT1DB* | 380V/3N/50Hz | 1256 | 2 |
| | *TMCU1487B3O3/2WT1DB* | 380V/3N/50Hz | 1487 | 2 |

## 1.2. External Appearance

TMCU0253B3O3/2WT1DB~ TMCU0859B3O3/2WT1DB


TMCU0970B3O3/2WT1DB~ TMCU1487B3O3/2WT1DB

## 2. Features

### Leading technology of twin screw compressor

- **Trust** screw chiller is equipped with the 3rd generation industrial compressor that has the latest advanced 5-6 asymmetry dentiform semi-hermetic screw rotors.
- The rotors are processed by high-precision CNC and each part is well-proportioned and none-gap matched, which minimizes the friction resistance and clearance lost and also guarantees quiet running and good duration.

### High efficiency, energy saving

- Extremely high full load and partial load energy efficiency.
- New twin-rotor screw compressor equipped with a high-efficiency motor and a variable capacity valve that can adjust the capacity of 25%, 50%, 75% and 100% in 4 stages (Stepless control as an option) and permits exact matching of the cooling capacity to the actual load.
- A decrease in chiller energy costs, particularly at the part-load conditions at which the chiller operates most of the time.

### Outstanding reliability

- Full factory testing of the unit with water hookup helps provides a trouble-free start-up.
- Extensive quality control checks during testing means that each equipment protection and operating control is properly adjusted and operates correctly before it leaves the factory.
- Transport simulation test in the laboratory on a vibrating table.
- Factory-installed options minimize field expenses and startup labor.

### Intelligent control, easy operation

- Microprocessor control as standard on all the units. A display illustrates the machine's operation status and programmable parameters (set point) e.g. water temperature and refrigeration pressure and temperature, allowing the operator to determine the unit status and also allow changes to various set points. The control system adopts PCB with predictive logic to select the most energy efficient combination of compressors.

### Easy and fast installation

- The unit has passed full factory test before being delivered to ensure the reliable working on the site. The unit can be placed in service only after being connected with power and water supply during field installation.

- The installation and adjustment are simple .Standard flange connection and wire mesh to the electrical panel. Refrigerant and lubrication oil are provided to the unit in the factory. Only piping connection and power supply connection are required on the site.

## Wide application range

- Water cooled screw chiller are widely applied in school, hospital, shopping mall, office as well as the factory and manufacturing processing area.

School | Factory | Hotel | Hospital | Office

# 3. Specifications

## Single head

| TMCUxxxxB3O3/2WT1DB | | 255 | 320 | 400 | 485 | 630 | 860 |
|---|---|---|---|---|---|---|---|
| Cooling capacity | kW | 253 | 318 | 400 | 485 | 628 | 859 |
| Power input | kW | 53.6 | 67 | 85 | 100 | 125 | 173 |
| EER | kW/kW | 4.73 | 4.75 | 4.71 | 4.85 | 5.02 | 4.97 |
| Semi-hermetic screw compressor | | | | | | | |
| Circuit A | Quantity | 1 | 1 | 1 | 1 | 1 | 1 |
| Circuit B | Quantity | -- | -- | -- | -- | -- | -- |
| Capacity Control | % | 25%,50%,75%,100% four steps control (25%,50%-100% Stepless as Option) | | | | | |
| Oil recharge | Type | HBR-B01 | | | | | |
| Circuit A | L | 14 | 14 | 15 | 18 | 23 | 28 |
| Circuit B | L | -- | -- | -- | -- | -- | -- |
| Refrigerant | Type | R22 | | | | | |
| Circuit A | kg | 35 | 40 | 60 | 80 | 110 | 160 |
| Circuit B | kg | -- | -- | -- | -- | -- | -- |
| Control Type | | TXV | TXV | TXV | TXV | TXV | EXV |
| Evaporator | Type | Shell-tube Direct Expansion Evaporator | | | | | |
| Water content | L | 100 | 150 | 80 | 120 | 340 | 290 |
| Water flow | m³/h | 43.5 | 54.7 | 68.8 | 83.4 | 108 | 147.7 |
| Pressure drop | kPa | 41 | 36 | 73 | 54 | 65 | 65 |
| Connection Type | | Victaulic coupling | | | | | |
| Max. pressure | MPa | 1 | 1 | 1 | 1 | 1 | 1 |
| Water inlet/outlet pipe dia. | mm | 80 | 80 | 100 | 125 | 125 | 150 |
| Condenser | Type | Tube-and shell condenser | | | | | |
| Water content | L | 150 | 150 | 130 | 160 | 320 | 260 |
| Water flow | m³/h | 54.4 | 68.4 | 86 | 104.3 | 135 | 184.7 |
| Pressure drop | kPa | 36 | 41 | 22 | 49 | 81 | 41 |
| Max. pressure | MPa | 1 | 1 | 1 | 1 | 1 | 1 |
| Water inlet/outlet pipe dia. | mm | 80 | 80 | 100 | 125 | 125 | 150 |
| Unit length | mm | 2800 | 2800 | 2860 | 3200 | 3430 | 3430 |
| Unit width | mm | 1165 | 1165 | 1285 | 1300 | 1480 | 1610 |
| Unit height | mm | 1350 | 1350 | 1420 | 1450 | 1600 | 1730 |
| Shipping weight | kg | 1540 | 1870 | 2250 | 2610 | 2975 | 3780 |
| Running weight | kg | 1840 | 2070 | 2550 | 2910 | 3375 | 4180 |

| | |
|---|---|
| Safety protection device | The following safety devices are equipped as standard.<br>High pressure (pressure switch);Low pressure (pressure sensor)<br>Compressor thermal protection<br>High discharge temperature on the compressor<br>Phase monitor; Low-pressure ratio; Low oil level protection<br>Interrupter protection ;Overload compressor protection<br>Over-voltage & low- voltage protection<br>Sensor malfunction protection<br>Contactor malfunction protection<br>Freeze protection |

Note:

Nominal cooling capacities are based on the following conditions:

Chilled water inlet/outlet temp: 12℃/7℃; (53.6F/44.6F); Cooling water inlet/outlet temperature 30/35℃ (86F/96F).

The design fouling factor for both evaporator and condenser are 0.086 $m^2$. ℃/kW, otherwise can be customized.

## Dual heads

| TMCUxxxxB3O3/2WT1DB | | 970 | 1060 | 1260 | 1490 |
|---|---|---|---|---|---|
| Cooling capacity | kW | 970 | 1057 | 1256 | 1487 |
| Power input | kW | 200 | 214 | 250 | 298 |
| EER | kW/kW | 4.85 | 4.94 | 5.02 | 4.99 |
| Semi-hermetic screw compressor | | | | | |
| Circuit A | Quantity | 1 | 1 | 1 | 1 |
| Circuit B | Quantity | 1 | 1 | 1 | 1 |
| Capacity Control | % | 25%,50%,75%,100% four step control (25%,50%-100% Stepless as Option) | | | |
| Oil recharge | Type | HBR-B01 | | | |
| Circuit A | L | 18 | 18 | 23 | 23 |
| Circuit B | L | 18 | 23 | 23 | 28 |
| Refrigerant | Type | R22 | | | |
| Circuit A | kg | 80 | 80 | 110 | 110 |
| Circuit B | kg | 80 | 90 | 110 | 130 |
| Control Type | | TXV | TXV | TXV | TXV+EXV |
| Evaporator | Type | Shell-tube Direct Expansion Evaporator | | | |
| Water content | L | 360 | 530 | 740 | 660 |
| Water flow | m³/h | 166.8 | 181.8 | 216 | 255.8 |
| Pressure drop | kPa | 83 | 85 | 87 | 76 |
| Connection Type | | Victaulic coupling | | | |
| Max. pressure | MPa | 1 | 1 | 1 | 1 |
| Water inlet/outlet pipe dia. | mm | 150 | 150 | 200 | 200 |
| Condenser | Type | Tube-and shell condenser | | | |
| Water content | L | 360 | 320 | 460 | 430 |
| Water flow | m³/h | 208.6 | 227.3 | 270 | 319.7 |
| Pressure drop | kPa | 40 | 99 | 56 | 99 |
| Max. pressure | MPa | 1 | 1 | 1 | 1 |
| Water inlet/outlet pipe dia. | mm | 150 | 150 | 200 | 200 |
| Unit length | mm | 4100 | 4100 | 4450 | 4600 |
| Unit width | mm | 1630 | 1740 | 1780 | 1810 |
| Unit height | mm | 1680 | 1680 | 1730 | 1920 |
| Shipping weight | kg | 4630 | 4870 | 5840 | 6490 |
| Running weight | kg | 5080 | 5320 | 6340 | 7090 |

| | |
|---|---|
| Safety protection device | The following safety devices are equipped as standard.<br>High pressure (pressure switch)<br>Low pressure (pressure sensor)<br>Compressor thermal protection<br>High discharge temperature on the compressor<br>Phase monitor; Low-pressure ratio; Low oil level protection<br>Interrupter protection; Overload compressor protection<br>Over-voltage & low- voltage protection<br>Sensor malfunction protection<br>Contactor malfunction protection<br>Freeze protection |

Note:

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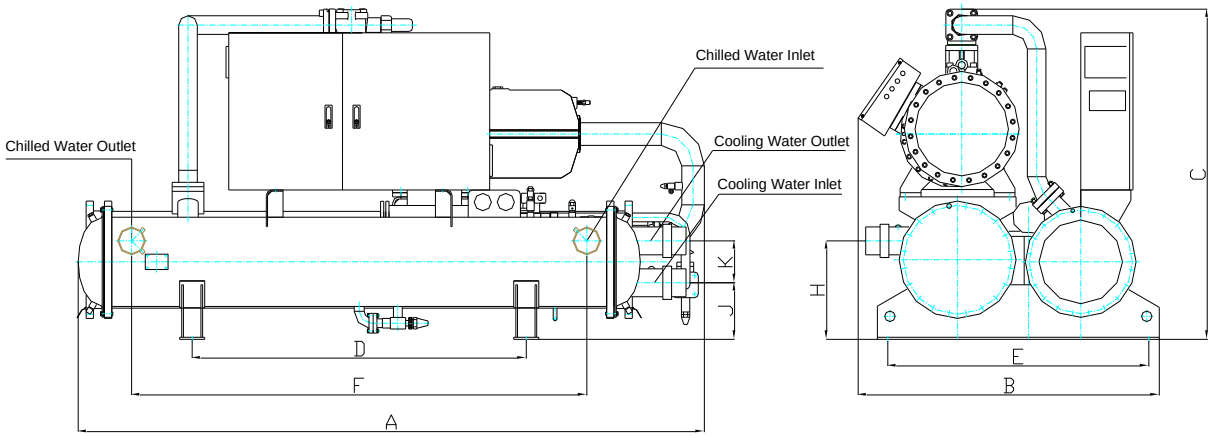
The design fouling factor for both evaporator and condenser are 0.086 $m^2$. ℃/kW, otherwise can be customized.

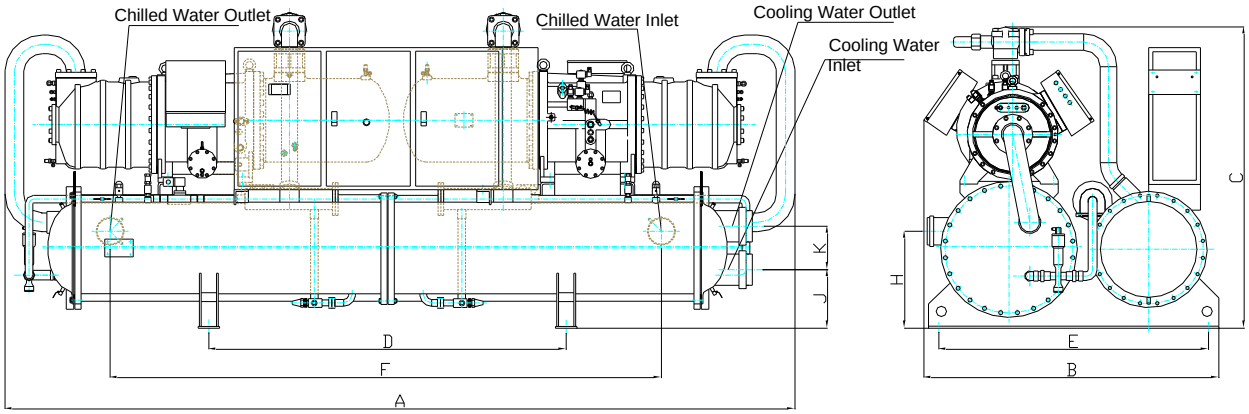
# 4.Outline Dimension

## Single head




| Model | A | B | C | D | E | F | H | J | K | Cooling Water In/outlet | Chilled Water In/outlet |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 253B3O3/2WT1DB | 2800 | 1165 | 1350 | 1600 | 880 | 1780 | 280 | 210 | 140 | DN80 | DN80 |
| 318B3O3/2WT1DB | 2800 | 1165 | 1350 | 1600 | 880 | 1760 | 280 | 210 | 140 | DN80 | DN80 |
| 400B3O3/2WT1DB | 2860 | 1285 | 1420 | 1600 | 1000 | 1780 | 328 | 246 | 160 | DN100 | DN100 |
| 485B3O3/2WT1DB | 3200 | 1300 | 1450 | 1600 | 1000 | 1660 | 330 | 230 | 200 | DN125 | DN125 |
| 628B3O3/2WT1DB | 3430 | 1480 | 1600 | 1800 | 1220 | 2150 | 360 | 260 | 200 | DN125 | DN125 |
| 859B3O3/2WT1DB | 3430 | 1610 | 1730 | 1800 | 1360 | 2120 | 400 | 300 | 200 | DN150 | DN150 |

## Dual heads



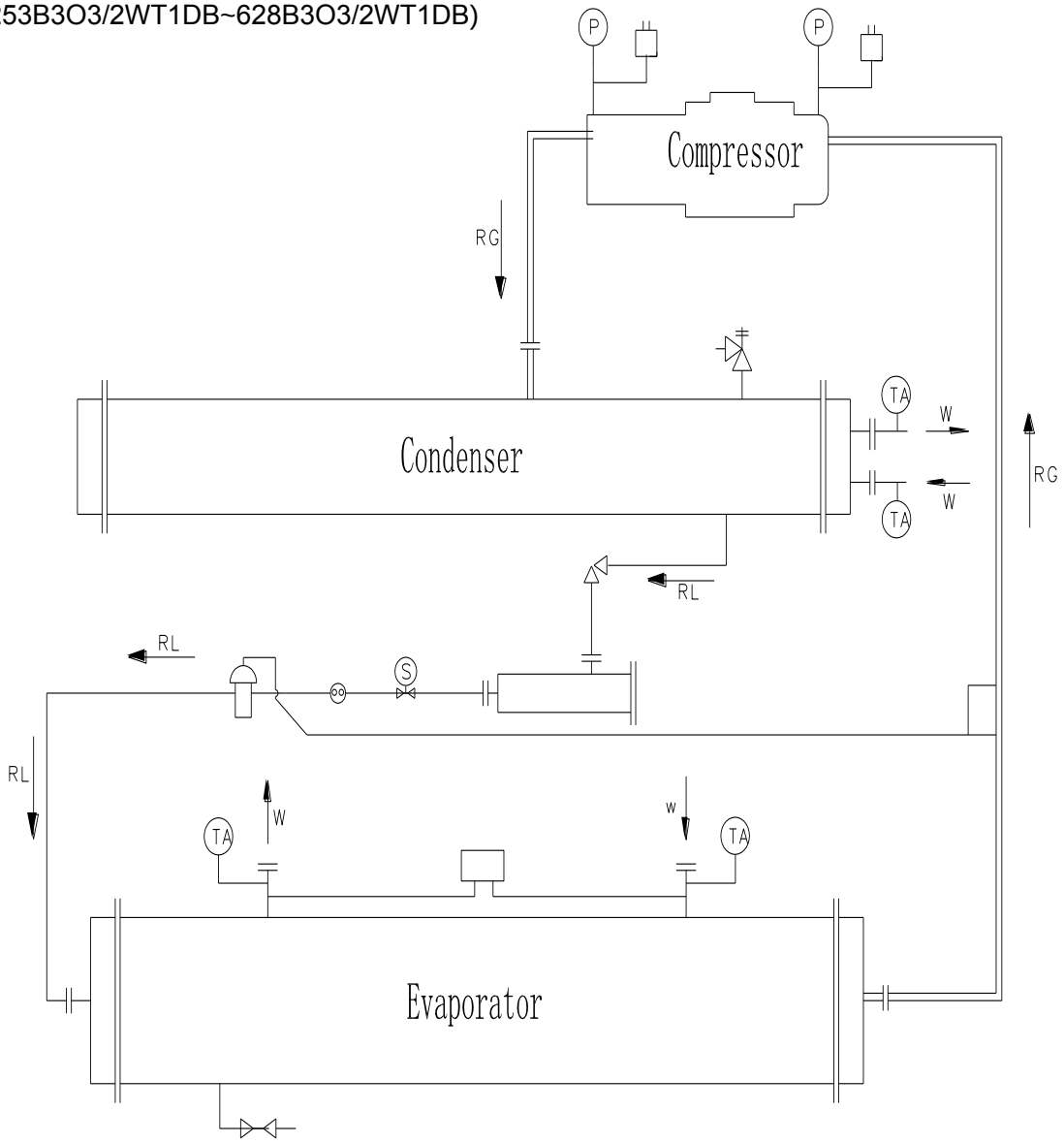

| Model | A | B | C | D | E | F | H | J | K | Cooling Water In/outlet | Chilled Water In/outlet |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 970B3O3/2WT1DB | 4100 | 1630 | 1680 | 1800 | 1440 | 2120 | 415 | 290 | 200 | DN150 | DN150 |
| 1057B3O3/2WT1DB | 4100 | 1740 | 1680 | 1800 | 1440 | 2680 | 415 | 290 | 200 | DN150 | DN150 |
| 1256B3O3/2WT1DB | 4450 | 1780 | 1730 | 2000 | 1540 | 3080 | 415 | 285 | 260 | DN200 | DN200 |
| 1487B3O3/2WT1DB | 4600 | 1810 | 1920 | 2000 | 1640 | 3080 | 650 | 340 | 260 | DN200 | DN200 |

**NOTE:** Drawings are not contractually binding. Before designing an installation, consult the certified dimensional drawings supplied with the unit or available on request.

For the positioning of the fixing points, weight distribution and center of gravity coordinates please refer to the dimensional drawings.

## 5.Refrigeration system

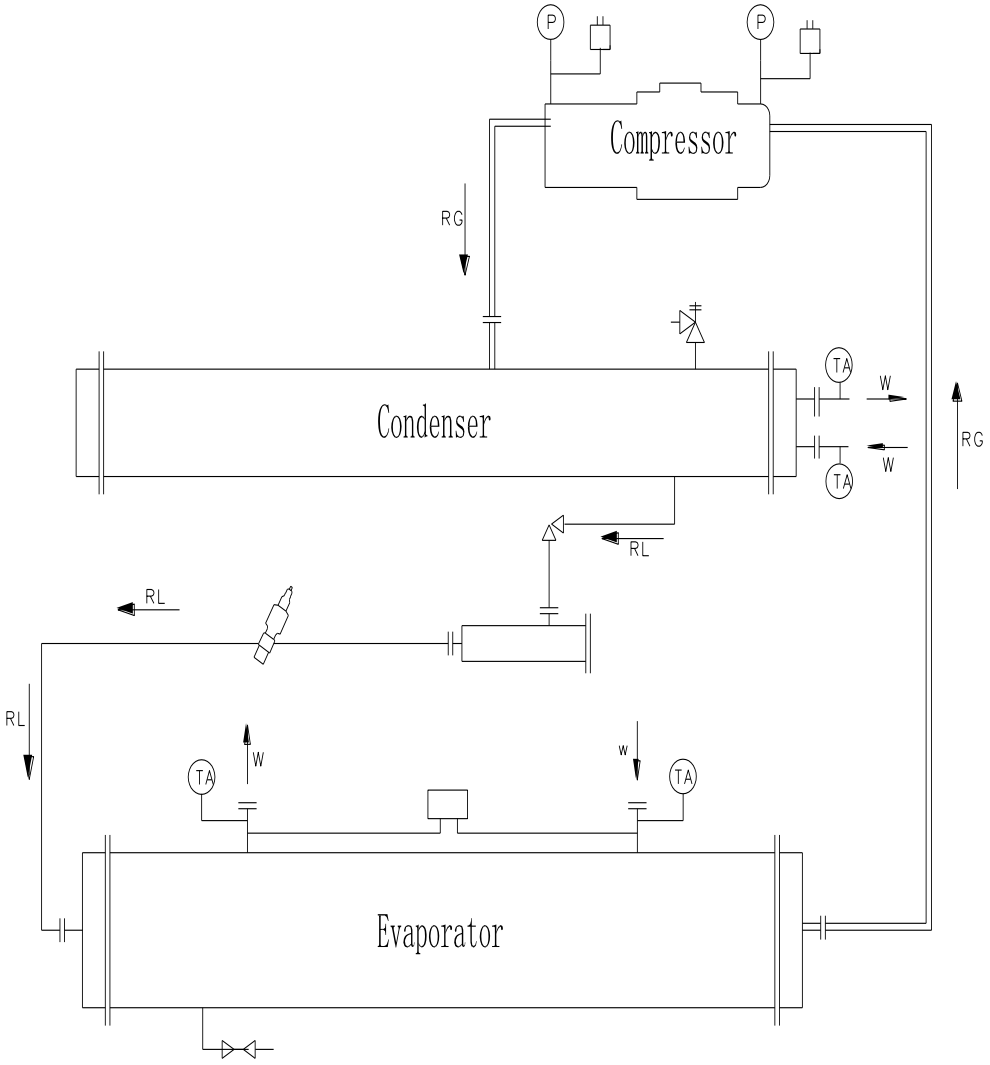
For single head unit
(253B3O3/2WT1DB~628B3O3/2WT1DB)




| Symbol | Part name |
|---|---|
| P | Pressure gauge |
| TA | Temperature sensor |
| | Liquid mirror |
| S | Solenoid valve |
| | Safety valve |
| | Right angle stop valve |
| | High & low pressure switch |
| | Thermal expansion valve |
| | Drier filter |
| | Water pressure difference controller |
| | Stop valve |
| RG RG | RG: Refrigerant gas pipeline |
| RL RL | RL: Refrigerant liquid pipeline |
| W | W: Water pipeline |

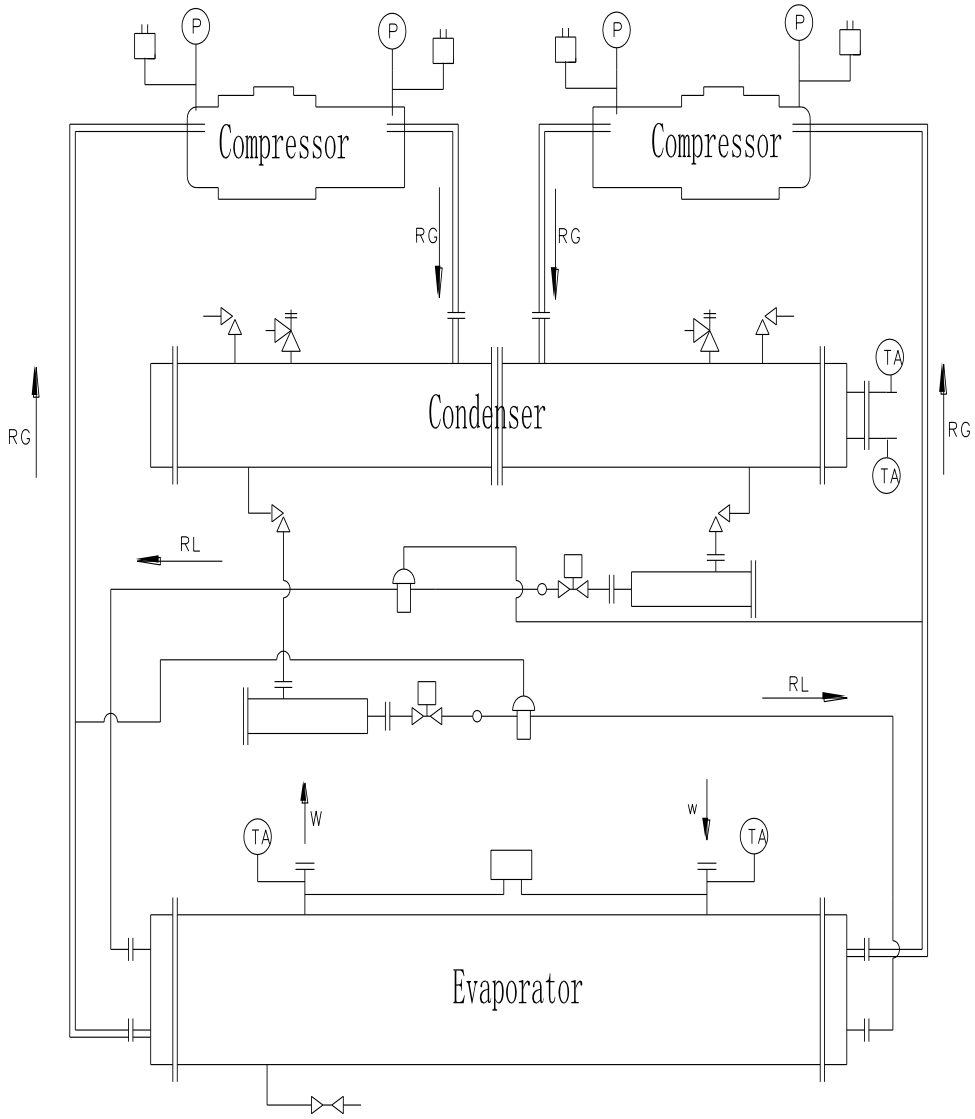
For single head unit

(859B3O3/2WT1DB)



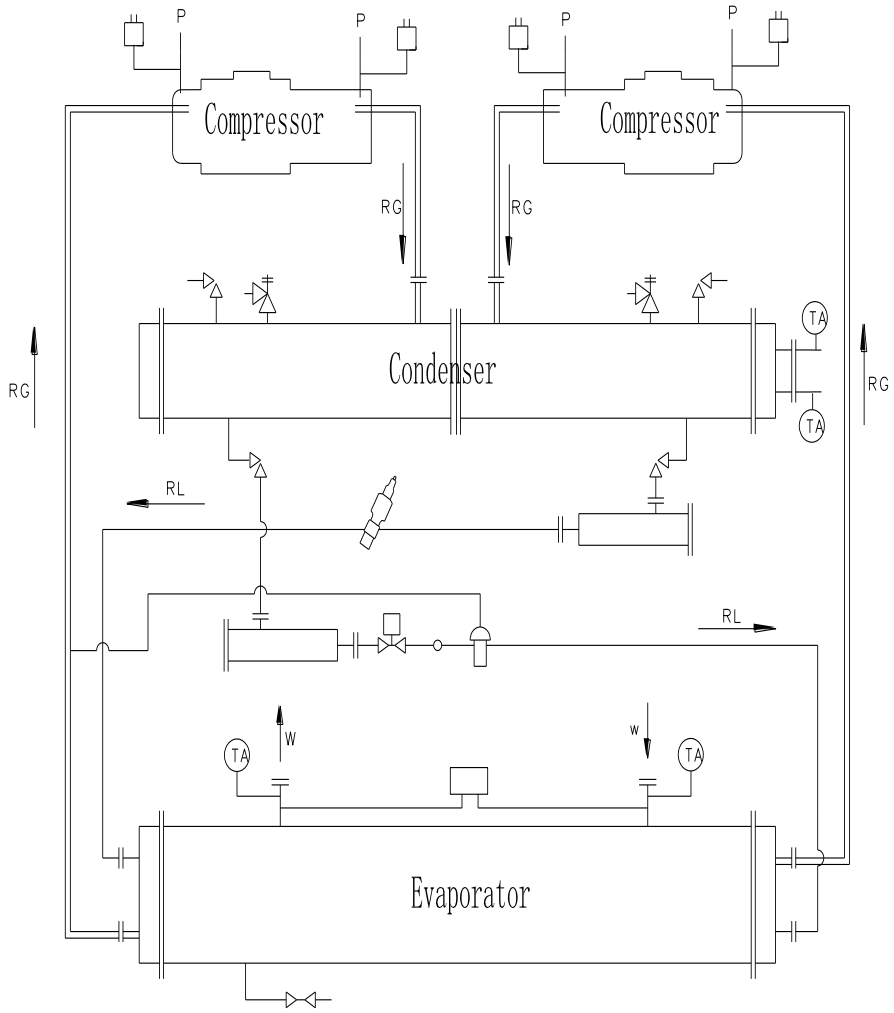

| Symbol | Part name |
|---|---|
| P | Pressure gauge |
| TA | Temperature sensor |
| | Safety valve |
| | Right angle stop valve |
| | High & low pressure switch |
| | EXV valve |
| | Drier filter |
| | Water pressure difference controller |
| | Stop valve |
| RG RG | RG: Refrigerant gas pipeline |
| RL RL | RL: Refrigerant liquid pipeline |
| W | W: Water pipeline |

For dual heads unit
(970B3O3/2WT1DB~1256B3O3/2WT1DB)




| Symbol | Part name |
|---|---|
| P | Pressure gauge |
| TA | Temperature sensor |
| | Liquid mirror |
| S | Solenoid valve |
| | Safety valve |
| | Right angle stop valve |
| | High & low pressure switch |
| | Thermal expansion valve |
| | Drier filter |
| | Water pressure difference controller |
| | Stop valve |
| RG RG | RG: Refrigerant gas pipeline |
| RL RL | RL: Refrigerant liquid pipeline |
| W | W: Water pipeline |

For dual heads unit
(1487B3O3/2WT1DB)

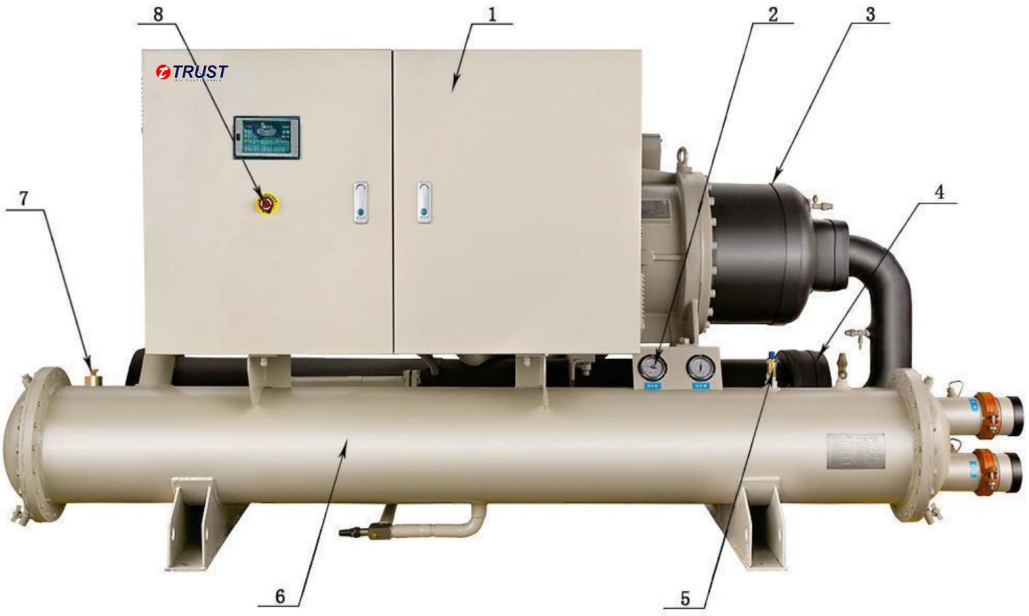



| Symbol | Part name |
|---|---|
| P | Pressure gauge |
| TA | Temperature sensor |
| | Liquid mirror |
| S | Solenoid valve |
| | Safety valve |
| | Right angle stop valve |
| | High & low pressure switch |
| | Thermal expansion valve |
| | EXV valve |
| | Drier filter |
| | Water pressure difference controller |
| | Stop valve |
| RG RG | RG: Refrigerant gas pipeline |
| RL RL | RL: Refrigerant liquid pipeline |
| W | W: Water pipeline |

# 6. Major System Components

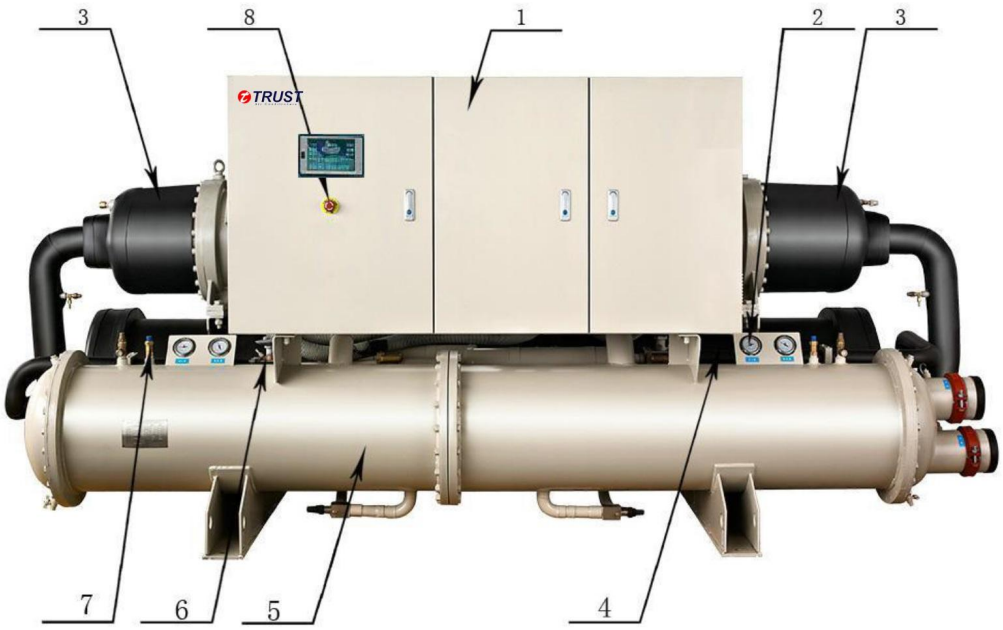
## Major components of the unit

### (1)Single compressor parataxis type unit



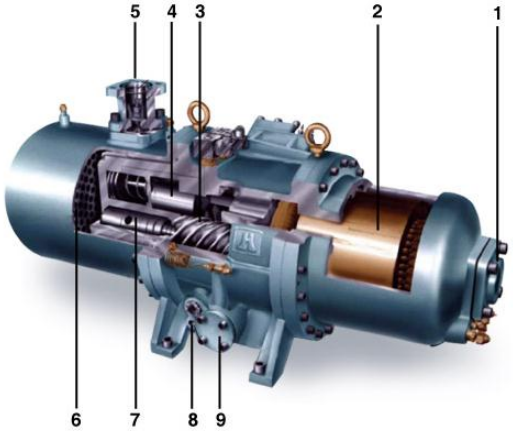

| No. | Name |
|---|---|
| 1 | Controller |
| 2 | Pressure Gauge |
| 3 | Compressor |
| 4 | Evaporator |
| 5 | Safety Valve |
| 6 | Condenser |
| 7 | Expansion Valve |
| 8 | Emergency Stop |

**(2) Dual compressors parataxis type unit**




| No. | Name |
|---|---|
| 1 | Controller |
| 2 | Pressure Gauge |
| 3 | Compressor |
| 4 | Evaporator |
| 5 | Condenser |
| 6 | Expansion Valve |
| 7 | Safety Valve |
| 8 | Emergency Stop |

**6.1 Compressor**
**Advanced twin screw compressor**



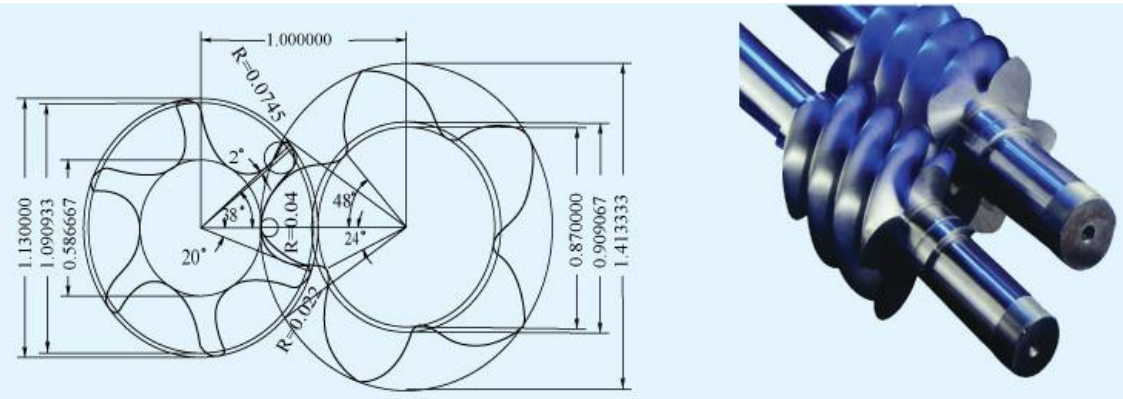

1. Suction Port
2. Motor
3. Screw
4. Modulation Slide Valve
5. Discharge Port
6. Oil Separator
7. Discharge Bearing
8. Oil Heater
9. Oil Filter

➢ **Trust** screw chiller equipped with the 3rd generation industrial compressor that has the latest advanced 5-6 asymmetry dentiform semi-hermetic screw rotors. The rotors are processed by high-precision CNC and each part is well-proportioned and none-gap matching, which minimizes the friction resistance and clearance lost, guarantees quiet running and good duration.

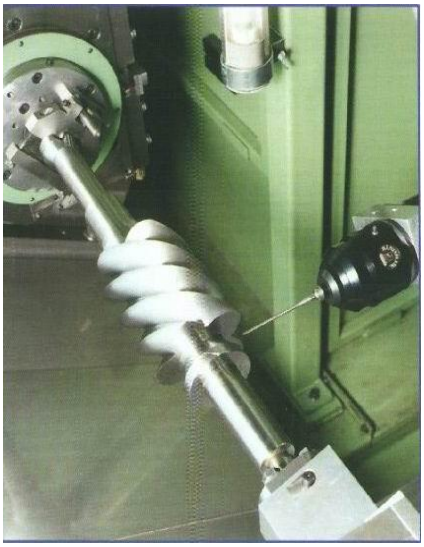
➢ Compressors have a infinitely variable control down to 25% of its total capacity. This control is made by means of capacity slides controlled by microprocessors.

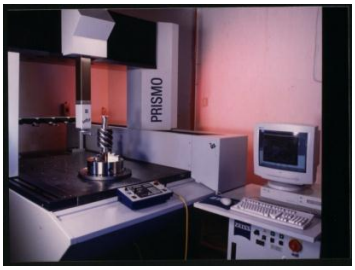
➢ Standard starter is star-delta type. Infinitely capacity control type is available (as option).

➢ With 5-6 asymmetry dentiform, the screw rotor gained patent by improving the shape of German rotor GHH, proved having good balance, small vibration, and low noise due to balance testing by special machine. Comparing with normal screw rotor with 4-6 dentiform, heat efficiency of the rotor with male and female rotor adopting 5-6 dentiform increase by 10-12% and energy saves by 25%, the rotor also gained British and American patent.



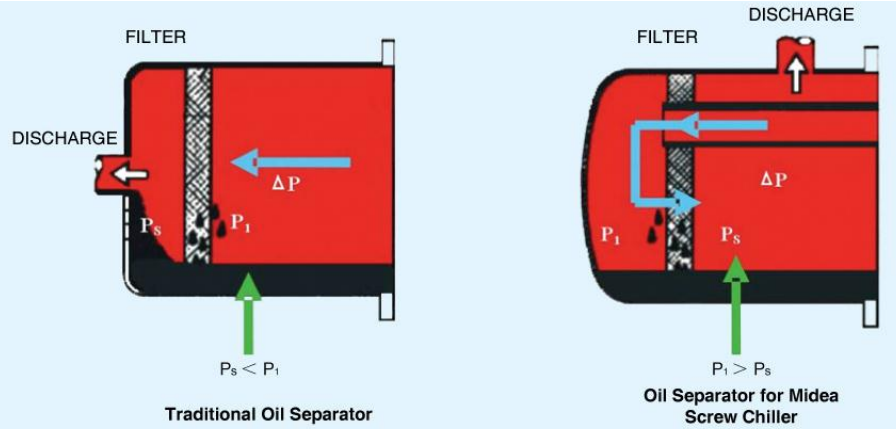

➢ The bearing of compressor is from SKF, Sweden, the long lifespan of which ensures screw-type main unit to run continuously more than 50,000 hours.



➢ Lubricant:

The lubricant is supplied automatically by pressure difference inside the compressor. It is unnecessary to add an extra lubricant pump.




➢ The Oil Separator comes from MANN of Germany and has reliable qualification. The oil content can be controlled below 3ppm (the oil content treated by oil-gas separator of common like screw-type air compressor is no less than 8-10ppm). The oil-gas separator amount is double of same kind of other products. The large oil filtering area reduces refrigerant flux speed, and has better separating affect and long lifespan by the secondary reflux technology adopted.

## 6.2 Pressure vessels

### 6.2.1 General

Monitoring during operation, re-qualification, re-testing and re-testing dispensation:

➢ Follow the regulations on monitoring pressurized equipment.

➢ It is normally required that the user or operator sets up and maintains a monitoring and maintenance file.

➢ Follow the control programs.

➢ If they exist follow local professional recommendations.

➢ Regularly inspect the condition of the coating (paint) to detect blistering resulting from corrosion. To do this, check a non-insulated section of the container or the rust formation at the insulation joints.

➢ Regularly check for possible presence of impurities (e.g. silicon grains) in the heat exchange fluids. These impurities maybe the cause of the wear or corrosion by puncture

➢ Filter the heat exchange fluid check and carry out internal inspections as described in EN 378-2.

➢ In case of re-testing please refer to the maximum operating pressure given on the unit nameplate.

➢ The reports of periodical checks by the user or operator must be included in the supervision and maintenance file.

### 6.2.2 Repair

Any repair or modification, including the replacement of moving parts:

➢ Must follow local regulations and be made by qualified operators and in accordance with qualified procedures, including changing the heat exchanger tubes.

➢ Must be made in accordance with the instructions of the original manufacturer. Repair and modification that necessitate permanent assembly (soldering, welding, expanding etc.) must be made using the correct procedures and by qualified operators.

➢ An indication of any modification or repair must be shown in the monitoring and maintenance file.

### 6.2.3 Corrosion allowances:

Gas side: 0 mm

Heat exchange fluid side: 1 mm for tubular plates in lightly alloyed steels, 0 mm for stainless steel plates or plates with copper-nickel or stainless steel protection.

### 6.2.4 Operating life

The evaporator and condenser are designed for: prolonged usage of 20 years for high-quality materials.

### 6.2.5 Security

The condenser is equipped with safety valves. And ball valve is connecting safety valve to condenser. The ball valve maintain full-state, it is closed only when safety valve is opening or replaced.

Ball valve can protect life and property because it can prevent refrigerant from flowing into the air when safety valve is opening or replaced.

### 6.2.6 Evaporator

Trust Screw Chiller is equipped with high efficiency shell and tube evaporator that are constructed by seamless steel tube with anti-corrosive treatment. The evaporator is a direct expansion type with refrigerant inside the copper tubes and water on the outside. The copper tubes are roll expanded into carbon steel tube plates.

Constructed with seamless integrally finned copper, the water pipe system makes the evaporator attain optimal heat exchange efficient. Also they are removable, which makes it available for efficient. Also they are removable, which makes it available for altering water piping arrangement.

The design working pressure for both evaporator and condenser are 1.0MPa, higher pressure demand can be customized.

### 6.2.7 Condenser

Shell and tube operates with refrigerant in shell and water in tubes. Replaceable water tubes are fabricated from integral finned cooper and mechanically bonded to steel tube sheets. The condenser is GB151-1999 (Chinese standard) designed, constructed, inspected and stamped. Water side working pressure is designed for 1.0MPa.

The condenser is used high-efficient tubes to enhance its transfer performance. Meanwhile, the system's COP can be increased largely by adding the subcooler.

### 6.2.8 Throttle valve

The chiller is equipped with expansion valve to decompress and expanse refrigerant.

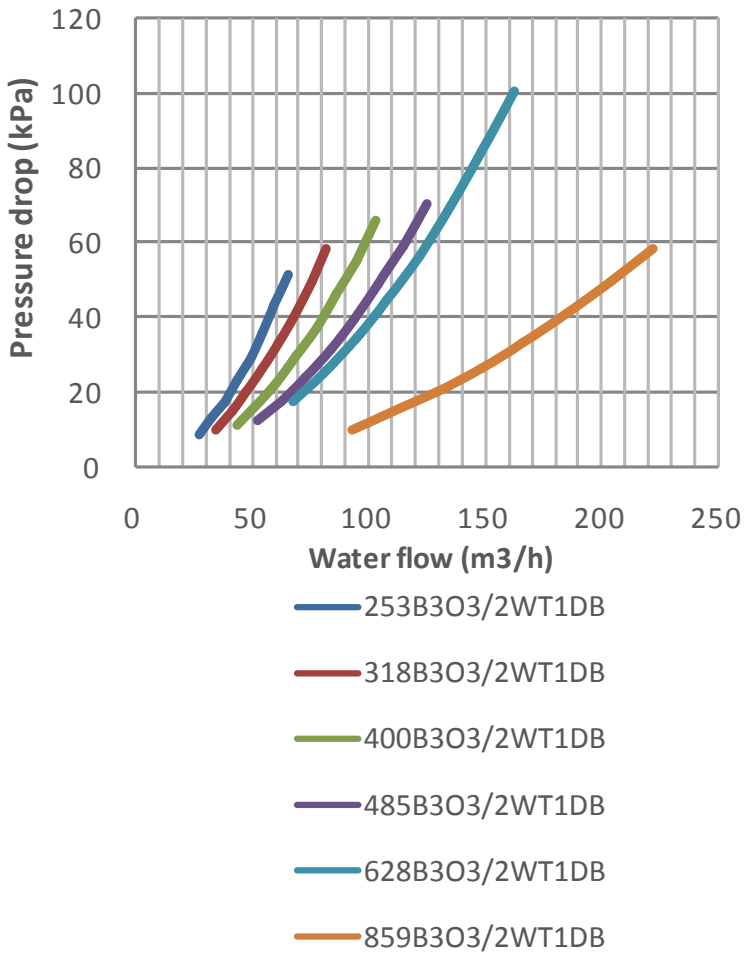
## 7.Water Flow

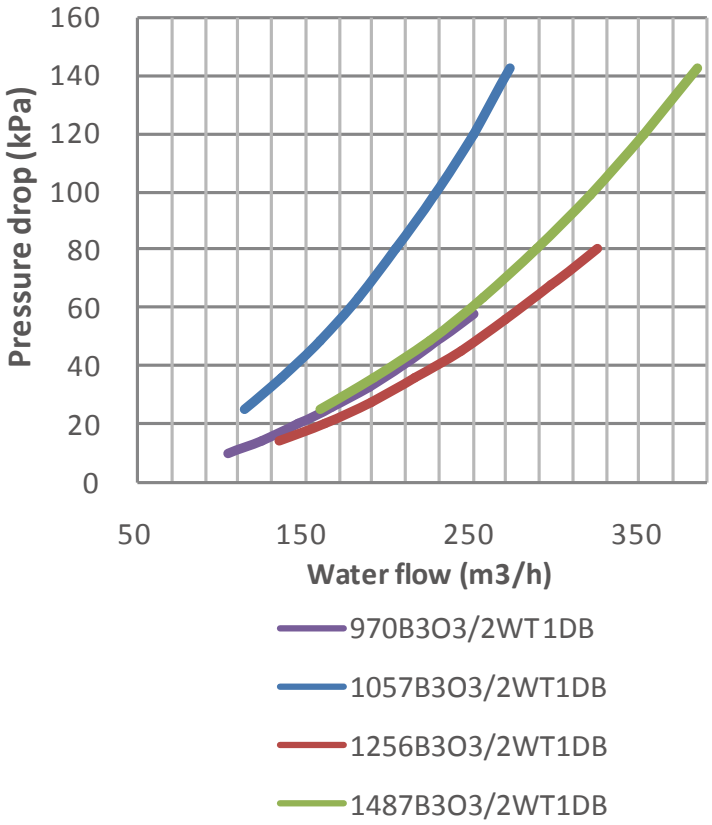
Balance the chilled water flow through the evaporator and the condenser water flow through the condenser. The flow rates must fall between the minimum and maximum values shown in the below table. Flow rates below the minimum values shown will result in laminar flow which will reduce efficiency, cause erratic operation of the electronic expansion valve and could cause low temperature cutouts. On the other hand, flow rates exceeding the maximum values shown can cause erosion on the heat exchanges water connections and tubes, even piping breaking.

Variable chilled water flow through the heat exchanges while the compressor(s) are operating is not recommended. The chiller control set points are based upon a constant flow and variable temperature.

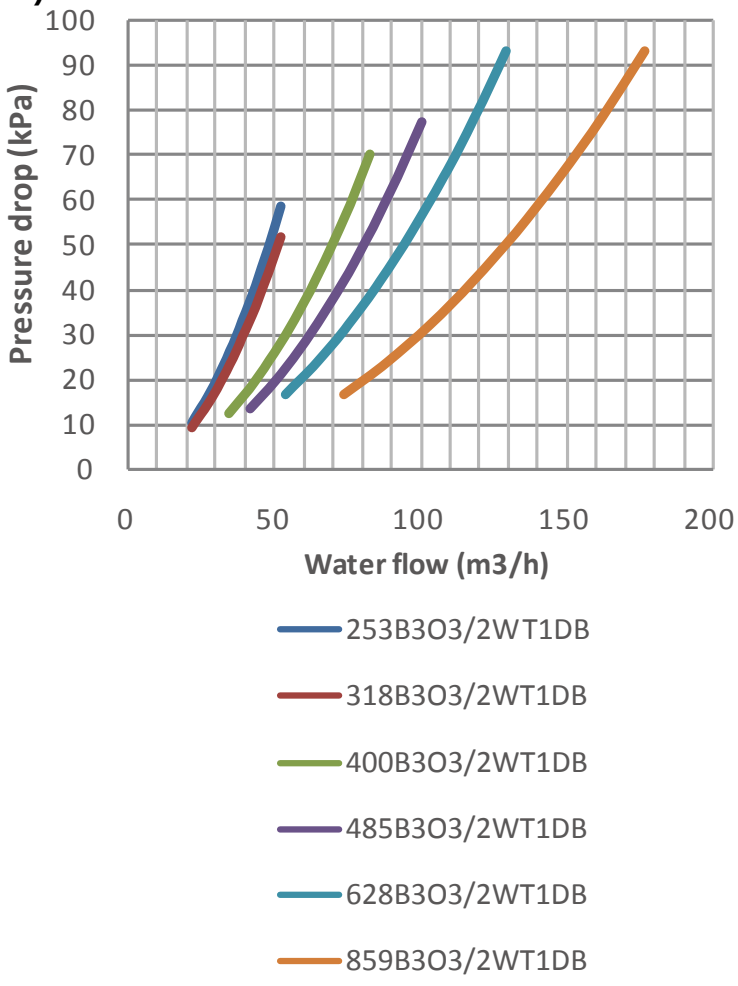
| Model | Evaporator water flow rate $m^3/h$ | | | Condenser water flow rate $m^3/h$ | | |
|---|---|---|---|---|---|---|
| | Chilled water minimum | Chilled water rated | Chilled water maximum | Cooling water minimum | Cooling water rated | Cooling water maximum |
| 253B3O3/2WT1DB | 31 | 44 | 57 | 38 | 54 | 70 |
| 318B3O3/2WT1DB | 38 | 55 | 71 | 48 | 68 | 88 |
| 400B3O3/2WT1DB | 48 | 69 | 90 | 60 | 86 | 111 |
| 485B3O3/2WT1DB | 58 | 83 | 108 | 74 | 104 | 134 |
| 628B3O3/2WT1DB | 76 | 108 | 140 | 95 | 135 | 176 |
| 859B3O3/2WT1DB | 104 | 148 | 192 | 129 | 184 | 239 |
| 970B3O3/2WT1DB | 117 | 167 | 217 | 146 | 209 | 271 |
| 1057B3O3/2WT1DB | 127 | 182 | 237 | 159 | 227 | 295 |
| 1256B3O3/2WT1DB | 151 | 216 | 281 | 189 | 270 | 351 |
| 1487B3O3/2WT1DB | 179 | 256 | 333 | 224 | 320 | 416 |

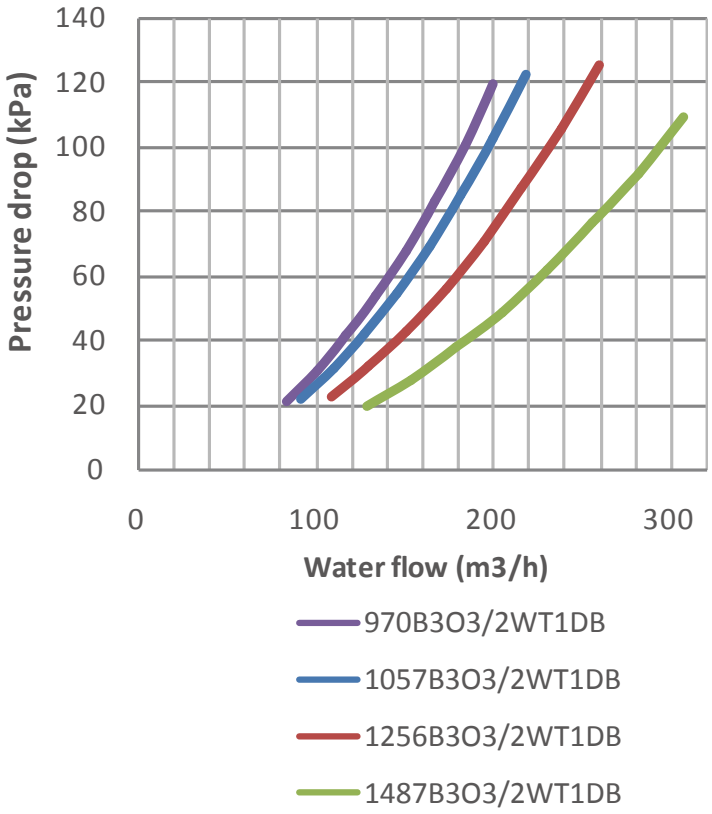
## Pressure drop
## DX type (Evaporator)






**DX type (Condenser)**

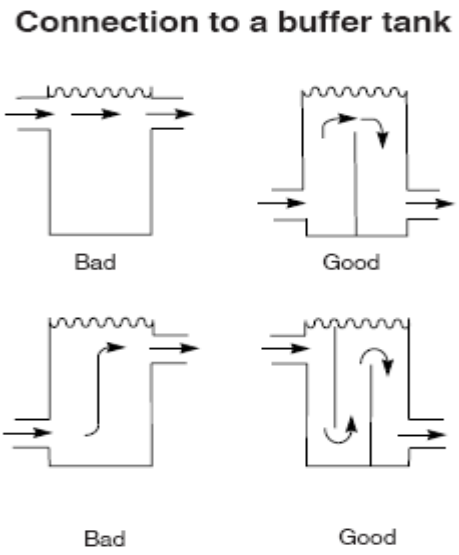





## System minimum water volume:

It is often necessary to add a buffer water tank to the circuit in order to achieve the required water volume. The tank itself must be internally baffled in order to ensure proper mixing of the liquid (water or brine). Water tank volume is large than 1 / 10 whole system water volume at least.

Refer to the examples below.




How to calculate minimum volume in pipeline system:

W=QgT/CP▽t
W — Minimum water volume（kg）；
Qg — Total cooling/heating capacity of the terminal（kW）；
T — Thermal stability time requirement，Take（8～10）×60s；
CP — Water specific heat at constant pressure，4.187kj/（kg·℃）；
▽t — Water temperature fluctuation required value，take 5℃。

For system, Qg is calculated according to the lowest load so that it operates steadily.
It can also calculated according to 0.5Q(50%). T takes 8 minutes, the shortest time that the unit running. That is 480s. Cp=4.18kj/kg, ▽t =5℃

According to the above formula, the result is as following:
W=0.5Q*480/（4.18*5）=11.48Q kg

**Note:**

The above formula is only for reference, different factor should be adopted to suit for different condition.

## 8. Unit sound levels

| Unit Model | Compressor Model | Sound pressure level(dB) | Unit Model | Compressor Model | Sound pressure level(dB) |
|---|---|---|---|---|---|
| 253B3O3/2WT1DB | RC-2-M255B | 80.7 | 859B3O3/2WT1DB | RC-2-M860B | 83 |
| 318B3O3/2WT1DB | RC-2-M320B | 81 | 970B3O3/2WT1DB | 2×RC-2-M485B | 83.3 |
| 400B3O3/2WT1DB | RC-2-M400B | 81.4 | 1057B3O3/2WT1DB | RC-2-M485B + RC-2-M570B | 83.5 |
| 485B3O3/2WT1DB | RC-2-M485B | 81.7 | 1256B3O3/2WT1DB | 2×RC-2-M630B | 84 |
| 628B3O3/2WT1DB | RC-2-M630B | 82.5 | 1487B3O3/2WT1DB | RC-2-M630B + RC-2-M860B | 84.6 |

## 9. Compressor oil

Refrigeration oil type is subject to the compressor nameplate. The compressor recommended oil level are as follow:

| Unit Model | Compressor Model | Oil level(L) | Unit Model | Compressor Model | Oil level(L) |
|---|---|---|---|---|---|
| 253B3O3/2WT1DB | RC-2-M255B | 14 | 859B3O3/2WT1DB | RC-2-M860B | 28 |
| 318B3O3/2WT1DB | RC-2-M320B | 14 | 970B3O3/2WT1DB | 2×RC-2-M485B | 2×18 |
| 400B3O3/2WT1DB | RC-2-M400B | 15 | 1057B3O3/2WT1DB | RC-2-M485B + RC-2-M570B | 18+23 |
| 485B3O3/2WT1DB | RC-2-M485B | 18 | 1256B3O3/2WT1DB | 2×RC-2-M630B | 2×23 |
| 628B3O3/2WT1DB | RC-2-M630B | 23 | 1487B3O3/2WT1DB | RC-2-M630B + RC-2-M860B | 23+28 |

## 10. Recommend breaker current

All units has equipped with breaker with user. All refrigerant circuit repairs must be carried out by a trained, qualified and skilled technician and following local regulations

Trust recommended breaker current for units as follow:

| Model | Rated current (A) | Maximal current (A) | Start current (A) | Recommend breaker current |
|---|---|---|---|---|
| 253B3O3/2WT1DB | 92 | 120 | 230 | 171 |
| 318B3O3/2WT1DB | 119 | 148 | 260 | 203 |
| 400B3O3/2WT1DB | 146 | 189 | 292 | 268 |
| 485B3O3/2WT1DB | 171 | 205 | 407 | 310 |
| 628B3O3/2WT1DB | 213 | 277 | 503 | 393 |
| 859B3O3/2WT1DB | 295 | 383 | 785 | 534 |
| 970B3O3/2WT1DB | 341 | 445 | 407 | 620 |
| 1057B3O3/2WT1DB | 365 | 458 | 443 | 665 |
| 1256B3O3/2WT1DB | 427 | 554 | 503 | 786 |
| 1487B3O3/2WT1DB | 509 | 662 | 785 | 927 |

**Note:** 970-1487 models are the dual compressor units, because two compressors do not start at the

same time, so the starting current of 970-1487 models are the single compressor start-up current value.

**Note:**
(1) Values obtained at standard unit operating conditions: evaporator entering/leaving water temperature = 12°C/7°C. Condenser entering/leaving water temperature = 30°C/35°C.
(2) For the dual compressor unit, we suggest equipped with breaker for each circuit.

## 11.Operating Range

| Content | Running range |
|---|---|
| Chilled Leaving Water Temperature | 5℃～15℃ |
| Cooling Entering water Temperature | 20℃~35℃ |
| Water flow volume | Rating flow volume ±20% |
| Inlet/outlet water Temp. difference | 3.8℃~ 7.1℃ |
| Fouling factor ($m^2$·℃/kW) | 0.086 |
| Voltage tolerance | Rating Voltage±10% |
| Phase tolerance | ±2% |
| Power supply frequency | Rating frequency±2% |
| Evaporator max working pressure on water side | 1.0MPa |
| Compressor max. start count | 4 times/h |
| Environment quality | High corrosive environment and high humidity should be avoided. |
| Drainage system | The height of water drainage should not be higher than the base of the unit on the spot |
| Normal operation ambient temperature | -10℃~45℃ |
| Storage and transport temperature | -15℃～50℃ |
| Applicable altitude range： | No more than 1000m |

**Operating limits and changes water temperature curve**

| TMCUxxxxB3O3/2WT1DB evaporator | Minimum | Maximum |
|---|---|---|
| Entering temperature at start-up | 12°C | 35°C |
| Leaving temperature during operation | 5°C | 15°C |
| Entering/leaving temperature difference at full load | 3.8°C | 7.1°C |

| TMCUxxxxB3O3/2WT1DB condenser | Minimum | Maximum |
|---|---|---|
| Entering temperature at start-up | 19°C | 35°C |
| Leaving temperature during operation | 25°C | 40°C |
| Entering/leaving temperature difference at full load | 3.8°C | 7.1°C |

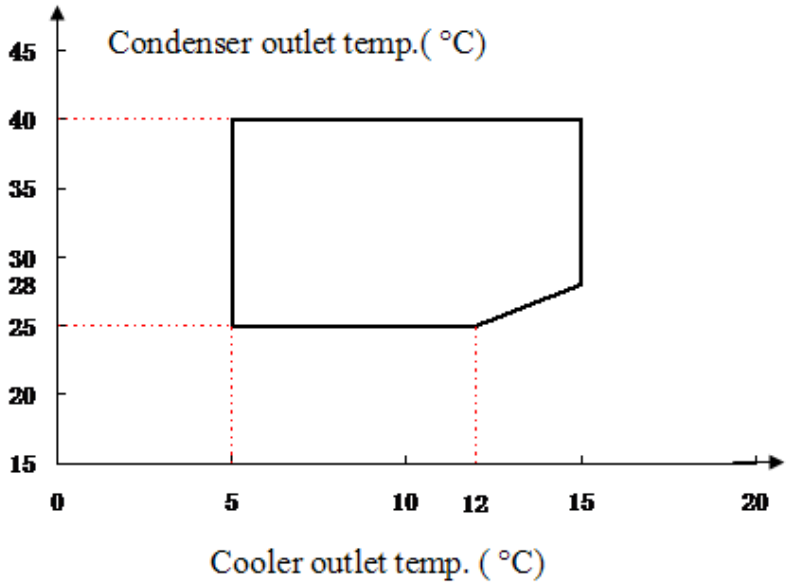
**Note:**

(1) For low-temperature applications, where the leaving water temperature is below 5°C, freeze protection switch will work unit stop.

(2) If the temperature leaving the condenser is below 19°C,the unit will stop and warning.

(3) Ambient temperatures: During storage and transport of the LSBLG***/M units. Including by container the minimum and maximum permissible temperatures is -20°C ~50°C.

**Changes water temperature curve in the operation**



## 12.Capacity table

### 253B3O3/2WT1DB

| Chilled Water Outlet Temp. | Cooling Water Inlet Temp.(°C) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 25.00 | | 26.00 | | 27.00 | | 29.00 | | 30.00 | | 32.00 | | 33.00 | | 35.00 | |
| | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power |
| (°C) | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW |
| 5.00 | 232.70 | 47.13 | 230.19 | 47.92 | 227.68 | 48.76 | 222.43 | 50.45 | 219.69 | 51.29 | 214.19 | 53.19 | 211.44 | 54.08 | 205.93 | 56.04 |
| 6.00 | 249.70 | 48.15 | 246.82 | 48.95 | 244.18 | 49.80 | 238.56 | 51.56 | 235.75 | 52.42 | 229.88 | 54.29 | 227.06 | 55.25 | 221.17 | 57.23 |
| 7.00 | 267.76 | 49.18 | 265.06 | 50.04 | 262.11 | 50.90 | 255.96 | 52.68 | 253.00 | 53.60 | 246.88 | 55.49 | 243.70 | 56.47 | 237.32 | 58.47 |
| 8.00 | 287.45 | 50.35 | 284.40 | 51.22 | 281.35 | 52.04 | 274.99 | 53.85 | 271.67 | 54.84 | 265.04 | 56.75 | 261.73 | 57.74 | 254.90 | 59.77 |
| 9.00 | / | / | 304.82 | 52.30 | 301.40 | 53.25 | 294.58 | 55.08 | 291.17 | 56.08 | 284.34 | 58.02 | 280.66 | 59.02 | 273.55 | 61.14 |
| 10.00 | / | / | 326.08 | 53.51 | 322.57 | 54.42 | 315.54 | 56.33 | 312.02 | 57.29 | 304.34 | 59.25 | 300.44 | 59.76 | 292.63 | 62.49 |
| 11.00 | / | / | 348.10 | 54.64 | 344.46 | 55.55 | 336.90 | 57.54 | 332.98 | 58.51 | 325.14 | 60.56 | 321.21 | 61.59 | 312.87 | 63.77 |
| 12.00 | / | / | 372.52 | 55.94 | 368.75 | 56.87 | 360.64 | 58.83 | 356.28 | 59.87 | 347.88 | 61.95 | 343.81 | 62.99 | 335.10 | 65.25 |
| 13.00 | / | / | / | / | 393.25 | 58.09 | 384.87 | 60.14 | 380.37 | 61.19 | 371.38 | 63.30 | 366.88 | 64.41 | 357.93 | 66.70 |
| 14.00 | / | / | / | / | 419.21 | 59.38 | 410.28 | 61.46 | 405.67 | 62.47 | 396.12 | 64.67 | 391.50 | 65.85 | 381.63 | 68.17 |
| 15.00 | / | / | / | / | 446.92 | 60.74 | 437.43 | 62.85 | 432.67 | 63.87 | 422.84 | 66.10 | 417.77 | 67.24 | 407.31 | 69.66 |

### 318B3O3/2WT1DB

| Chilled Water Outlet Temp. | Cooling Water Inlet Temp.(°C) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 25.00 | | 26.00 | | 27.00 | | 29.00 | | 30.00 | | 32.00 | | 33.00 | | 35.00 | |
| | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power |
| (°C) | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW |
| 5.00 | 292.48 | 58.91 | 289.33 | 59.90 | 286.18 | 60.95 | 279.58 | 63.06 | 276.13 | 64.11 | 269.22 | 66.48 | 265.76 | 67.61 | 258.83 | 70.04 |
| 6.00 | 313.85 | 60.19 | 310.23 | 61.19 | 306.92 | 62.25 | 299.85 | 64.45 | 296.32 | 65.52 | 288.94 | 67.86 | 285.39 | 69.07 | 277.99 | 71.54 |
| 7.00 | 336.55 | 61.47 | 333.16 | 62.55 | 329.45 | 63.63 | 321.72 | 65.85 | 318.00 | 67.00 | 310.31 | 69.37 | 306.31 | 70.59 | 298.30 | 73.09 |
| 8.00 | 361.30 | 62.94 | 357.47 | 64.03 | 353.64 | 65.06 | 345.64 | 67.31 | 341.47 | 68.54 | 333.14 | 70.94 | 328.97 | 72.17 | 320.39 | 74.72 |
| 9.00 | / | / | 383.14 | 65.38 | 378.84 | 66.56 | 370.26 | 68.85 | 365.97 | 70.10 | 357.39 | 72.53 | 352.76 | 73.78 | 343.83 | 76.42 |
| 10.00 | / | / | 409.86 | 66.89 | 405.45 | 68.02 | 396.61 | 70.41 | 392.19 | 71.61 | 382.53 | 74.07 | 377.62 | 74.69 | 367.81 | 78.11 |
| 11.00 | / | / | 437.53 | 68.29 | 432.95 | 69.43 | 423.46 | 71.92 | 418.53 | 73.14 | 408.67 | 75.70 | 403.73 | 76.99 | 393.25 | 79.71 |
| 12.00 | / | / | 468.23 | 69.93 | 463.49 | 71.08 | 453.29 | 73.54 | 447.82 | 74.84 | 437.25 | 77.44 | 432.15 | 78.74 | 421.19 | 81.56 |
| 13.00 | / | / | / | / | 494.29 | 72.61 | 483.75 | 75.17 | 478.10 | 76.49 | 466.79 | 79.12 | 461.14 | 80.51 | 449.89 | 83.37 |
| 14.00 | / | / | / | / | 526.91 | 74.23 | 515.69 | 76.82 | 509.89 | 78.09 | 497.90 | 80.83 | 492.08 | 82.32 | 479.67 | 85.22 |
| 15.00 | / | / | / | / | 561.75 | 75.93 | 549.81 | 78.56 | 543.83 | 79.84 | 531.47 | 82.62 | 525.10 | 84.06 | 511.96 | 87.07 |

Note: The inlet/outlet water temperature difference is 5 ℃.

## **400**B3O3/2WT1DB

| Chilled Water Outlet Temp. | Cooling Water Inlet Temp.(°C) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 25.00 | | 26.00 | | 27.00 | | 29.00 | | 30.00 | | 32.00 | | 33.00 | | 35.00 | |
| | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power |
| (°C) | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW |
| 5.00 | 367.90 | 74.74 | 363.94 | 75.99 | 359.97 | 77.32 | 351.67 | 80.00 | 347.33 | 81.34 | 338.64 | 84.35 | 334.29 | 85.77 | 325.58 | 88.86 |
| 6.00 | 394.78 | 76.36 | 390.22 | 77.63 | 386.06 | 78.97 | 377.17 | 81.77 | 372.73 | 83.13 | 363.45 | 86.10 | 358.98 | 87.62 | 349.67 | 90.76 |
| 7.00 | 423.34 | 77.98 | 419.07 | 79.35 | 414.40 | 80.72 | 404.67 | 83.55 | 400.00 | 85.00 | 390.33 | 88.00 | 385.30 | 89.55 | 375.22 | 92.73 |
| 8.00 | 454.47 | 79.84 | 449.65 | 81.23 | 444.82 | 82.53 | 434.76 | 85.40 | 429.53 | 86.96 | 419.04 | 90.00 | 413.80 | 91.56 | 403.00 | 94.79 |
| 9.00 | / | / | 481.93 | 82.95 | 476.53 | 84.44 | 465.73 | 87.35 | 460.34 | 88.93 | 449.55 | 92.02 | 443.73 | 93.60 | 432.49 | 96.95 |
| 10.00 | / | / | 515.55 | 84.86 | 509.99 | 86.29 | 498.88 | 89.33 | 493.32 | 90.85 | 481.17 | 93.96 | 475.00 | 94.76 | 462.65 | 99.10 |
| 11.00 | / | / | 550.35 | 86.64 | 544.60 | 88.09 | 532.66 | 91.25 | 526.46 | 92.79 | 514.05 | 96.04 | 507.84 | 97.67 | 494.65 | 101.12 |
| 12.00 | / | / | 588.97 | 88.71 | 583.01 | 90.18 | 570.18 | 93.29 | 563.29 | 94.94 | 550.00 | 98.25 | 543.58 | 99.90 | 529.80 | 103.47 |
| 13.00 | / | / | / | / | 621.75 | 92.12 | 608.49 | 95.36 | 601.38 | 97.03 | 587.16 | 100.38 | 580.05 | 102.14 | 565.89 | 105.77 |
| 14.00 | / | / | / | / | 662.78 | 94.17 | 648.67 | 97.46 | 641.38 | 99.06 | 626.28 | 102.55 | 618.97 | 104.43 | 603.36 | 108.11 |
| 15.00 | / | / | / | / | 706.60 | 96.33 | 691.58 | 99.67 | 684.06 | 101.29 | 668.52 | 104.82 | 660.51 | 106.64 | 643.97 | 110.47 |

## **485**B3O3/2WT1DB

| Chilled Water Outlet Temp. | Cooling Water Inlet Temp.(°C) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 25.00 | | 26.00 | | 27.00 | | 29.00 | | 30.00 | | 32.00 | | 33.00 | | 35.00 | |
| | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power |
| (°C) | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW |
| 5.00 | 446.08 | 87.93 | 441.28 | 89.40 | 436.47 | 90.97 | 426.40 | 94.12 | 421.14 | 95.69 | 410.61 | 99.23 | 405.33 | 100.90 | 394.76 | 104.54 |
| 6.00 | 478.66 | 89.84 | 473.14 | 91.33 | 468.09 | 92.91 | 457.32 | 96.20 | 451.93 | 97.80 | 440.68 | 101.29 | 435.27 | 103.09 | 423.98 | 106.78 |
| 7.00 | 513.30 | 91.74 | 508.12 | 93.35 | 502.46 | 94.96 | 490.67 | 98.29 | 485.00 | 100.00 | 473.28 | 103.53 | 467.17 | 105.35 | 454.95 | 109.09 |
| 8.00 | 551.05 | 93.93 | 545.20 | 95.57 | 539.35 | 97.10 | 527.15 | 100.47 | 520.80 | 102.31 | 508.09 | 105.88 | 501.73 | 107.72 | 488.64 | 111.52 |
| 9.00 | / | / | 584.34 | 97.58 | 577.79 | 99.34 | 564.70 | 102.76 | 558.16 | 104.63 | 545.07 | 108.25 | 538.02 | 110.12 | 524.39 | 114.06 |
| 10.00 | / | / | 625.10 | 99.84 | 618.37 | 101.52 | 604.89 | 105.09 | 598.15 | 106.88 | 583.42 | 110.55 | 575.93 | 111.48 | 560.96 | 116.59 |
| 11.00 | / | / | 667.30 | 101.93 | 660.32 | 103.63 | 645.84 | 107.35 | 638.33 | 109.16 | 623.28 | 112.99 | 615.75 | 114.90 | 599.76 | 118.97 |
| 12.00 | / | / | 714.12 | 104.37 | 706.90 | 106.09 | 691.34 | 109.76 | 682.99 | 111.70 | 666.88 | 115.58 | 659.09 | 117.52 | 642.38 | 121.73 |
| 13.00 | / | / | / | / | 753.87 | 108.37 | 737.79 | 112.19 | 729.18 | 114.16 | 711.93 | 118.09 | 703.31 | 120.17 | 686.15 | 124.44 |
| 14.00 | / | / | / | / | 803.62 | 110.79 | 786.51 | 114.66 | 777.67 | 116.55 | 759.37 | 120.65 | 750.51 | 122.86 | 731.58 | 127.19 |
| 15.00 | / | / | / | / | 856.75 | 113.33 | 838.54 | 117.25 | 829.43 | 119.16 | 810.58 | 123.32 | 800.86 | 125.46 | 780.81 | 129.96 |

Note: The inlet/outlet water temperature difference is 5 ℃.

## **628**B3O3/2WT1DB

| Chilled Water Outlet Temp. | Cooling Water Inlet Temp.(°C) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 25.00 | | 26.00 | | 27.00 | | 29.00 | | 30.00 | | 32.00 | | 33.00 | | 35.00 | |
| | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power |
| (°C) | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW |
| 5.00 | 577.61 | 109.91 | 571.38 | 111.75 | 565.16 | 113.71 | 552.12 | 117.65 | 545.31 | 119.61 | 531.67 | 124.04 | 524.84 | 126.13 | 511.15 | 130.68 |
| 6.00 | 619.80 | 112.30 | 612.65 | 114.16 | 606.11 | 116.14 | 592.16 | 120.25 | 585.18 | 122.25 | 570.61 | 126.61 | 563.60 | 128.86 | 548.98 | 133.47 |
| 7.00 | 664.64 | 114.68 | 657.93 | 116.69 | 650.61 | 118.71 | 635.34 | 122.86 | 628.00 | 125.00 | 612.82 | 129.42 | 604.92 | 131.69 | 589.09 | 136.36 |
| 8.00 | 713.52 | 117.42 | 705.95 | 119.46 | 698.37 | 121.37 | 682.58 | 125.58 | 674.36 | 127.88 | 657.89 | 132.35 | 649.67 | 134.65 | 632.72 | 139.40 |
| 9.00 | / | / | 756.63 | 121.98 | 748.15 | 124.18 | 731.20 | 128.45 | 722.73 | 130.78 | 705.79 | 135.32 | 696.65 | 137.65 | 679.01 | 142.58 |
| 10.00 | / | / | 809.41 | 124.80 | 800.69 | 126.90 | 783.24 | 131.37 | 774.51 | 133.60 | 755.44 | 138.18 | 745.75 | 139.35 | 726.36 | 145.74 |
| 11.00 | / | / | 864.06 | 127.41 | 855.02 | 129.54 | 836.27 | 134.19 | 826.54 | 136.45 | 807.06 | 141.24 | 797.31 | 143.63 | 776.60 | 148.71 |
| 12.00 | / | / | 924.68 | 130.46 | 915.33 | 132.62 | 895.18 | 137.20 | 884.37 | 139.62 | 863.50 | 144.48 | 853.42 | 146.91 | 831.79 | 152.17 |
| 13.00 | / | / | / | / | 976.14 | 135.47 | 955.33 | 140.24 | 944.17 | 142.70 | 921.84 | 147.61 | 910.68 | 150.21 | 888.45 | 155.55 |
| 14.00 | / | / | / | / | 1040.56 | 138.48 | 1018.41 | 143.33 | 1006.96 | 145.68 | 983.26 | 150.81 | 971.79 | 153.58 | 947.28 | 158.99 |
| 15.00 | / | / | / | / | 1109.36 | 141.66 | 1085.78 | 146.57 | 1073.98 | 148.95 | 1049.57 | 154.15 | 1036.99 | 156.82 | 1011.03 | 162.45 |

## 859B3O3/2WT1DB

| Chilled Water Outlet Temp. | Cooling Water Inlet Temp.(°C) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 25.00 | | 26.00 | | 27.00 | | 29.00 | | 30.00 | | 32.00 | | 33.00 | | 35.00 | |
| | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power |
| (°C) | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW |
| 5.00 | 790.07 | 152.11 | 781.56 | 154.66 | 773.04 | 157.38 | 755.21 | 162.82 | 745.89 | 165.54 | 727.24 | 171.67 | 717.89 | 174.56 | 699.17 | 180.86 |
| 6.00 | 847.78 | 155.42 | 838.00 | 157.99 | 829.06 | 160.74 | 809.98 | 166.43 | 800.43 | 169.19 | 780.50 | 175.23 | 770.92 | 178.34 | 750.92 | 184.73 |
| 7.00 | 909.12 | 158.72 | 899.94 | 161.50 | 889.93 | 164.29 | 869.04 | 170.04 | 859.00 | 173.00 | 838.24 | 179.11 | 827.43 | 182.26 | 805.77 | 188.73 |
| 8.00 | 975.97 | 162.51 | 965.62 | 165.33 | 955.26 | 167.98 | 933.65 | 173.81 | 922.41 | 176.99 | 899.89 | 183.17 | 888.64 | 186.36 | 865.45 | 192.93 |
| 9.00 | / | / | 1034.95 | 168.82 | 1023.34 | 171.86 | 1000.16 | 177.78 | 988.58 | 181.00 | 965.40 | 187.28 | 952.90 | 190.51 | 928.77 | 197.33 |
| 10.00 | / | / | 1107.13 | 172.72 | 1095.21 | 175.63 | 1071.34 | 181.81 | 1059.40 | 184.90 | 1033.31 | 191.24 | 1020.06 | 192.87 | 993.54 | 201.70 |
| 11.00 | / | / | 1181.89 | 176.34 | 1169.52 | 179.28 | 1143.88 | 185.72 | 1130.57 | 188.85 | 1103.92 | 195.47 | 1090.58 | 198.79 | 1062.26 | 205.82 |
| 12.00 | / | / | 1264.80 | 180.56 | 1252.02 | 183.54 | 1224.45 | 189.88 | 1209.67 | 193.24 | 1181.13 | 199.96 | 1167.33 | 203.32 | 1137.74 | 210.60 |
| 13.00 | / | / | / | / | 1335.20 | 187.49 | 1306.73 | 194.09 | 1291.47 | 197.49 | 1260.92 | 204.30 | 1245.65 | 207.89 | 1215.26 | 215.28 |
| 14.00 | / | / | / | / | 1423.32 | 191.66 | 1393.02 | 198.36 | 1377.35 | 201.62 | 1344.94 | 208.72 | 1329.25 | 212.55 | 1295.72 | 220.04 |
| 15.00 | / | / | / | / | 1517.42 | 196.06 | 1485.17 | 202.85 | 1469.03 | 206.15 | 1435.64 | 213.34 | 1418.44 | 217.04 | 1382.92 | 224.83 |

Note: The inlet/outlet water temperature difference is 5 ℃.

## 970B3O3/2WT1DB

| Chilled Water Outlet Temp. | Cooling Water Inlet Temp.(°C) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 25.00 | | 26.00 | | 27.00 | | 29.00 | | 30.00 | | 32.00 | | 33.00 | | 35.00 | |
| | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power |
| (°C) | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW |
| 5.00 | 892.16 | 175.85 | 882.55 | 178.80 | 872.93 | 181.94 | 852.80 | 188.23 | 842.28 | 191.38 | 821.21 | 198.46 | 810.66 | 201.81 | 789.52 | 209.09 |
| 6.00 | 957.33 | 179.68 | 946.29 | 182.65 | 936.19 | 185.82 | 914.65 | 192.40 | 903.86 | 195.59 | 881.36 | 202.58 | 870.53 | 206.17 | 847.95 | 213.56 |
| 7.00 | 1026.60 | 183.49 | 1016.23 | 186.71 | 1004.92 | 189.93 | 981.33 | 196.58 | 970.00 | 200.00 | 946.56 | 207.07 | 934.35 | 210.70 | 909.90 | 218.18 |
| 8.00 | 1102.09 | 187.87 | 1090.40 | 191.13 | 1078.70 | 194.20 | 1054.30 | 200.94 | 1041.60 | 204.61 | 1016.17 | 211.76 | 1003.47 | 215.44 | 977.29 | 223.04 |
| 9.00 | / | / | 1168.68 | 195.17 | 1155.58 | 198.69 | 1129.40 | 205.53 | 1116.33 | 209.25 | 1090.15 | 216.51 | 1076.03 | 220.24 | 1048.78 | 228.12 |
| 10.00 | / | / | 1250.20 | 199.68 | 1236.74 | 203.04 | 1209.78 | 210.19 | 1196.29 | 213.76 | 1166.84 | 221.09 | 1151.87 | 222.97 | 1121.92 | 233.18 |
| 11.00 | / | / | 1334.61 | 203.86 | 1320.64 | 207.26 | 1291.69 | 214.70 | 1276.66 | 218.32 | 1246.57 | 225.98 | 1231.51 | 229.81 | 1199.52 | 237.94 |
| 12.00 | / | / | 1428.24 | 208.74 | 1413.80 | 212.19 | 1382.68 | 219.52 | 1365.99 | 223.40 | 1333.76 | 231.17 | 1318.18 | 235.05 | 1284.76 | 243.47 |
| 13.00 | / | / | / | / | 1507.73 | 216.75 | 1475.59 | 224.39 | 1458.35 | 228.32 | 1423.85 | 236.18 | 1406.62 | 240.33 | 1372.29 | 248.88 |
| 14.00 | / | / | / | / | 1607.24 | 221.58 | 1573.03 | 229.32 | 1555.34 | 233.09 | 1518.74 | 241.30 | 1501.01 | 245.73 | 1463.16 | 254.38 |
| 15.00 | / | / | / | / | 1713.51 | 226.65 | 1677.08 | 234.51 | 1658.86 | 238.33 | 1621.15 | 246.64 | 1601.73 | 250.91 | 1561.63 | 259.92 |

## 1057B3O3/2WT1DB

| Chilled Water Outlet Temp. | Cooling Water Inlet Temp.(°C) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 25.00 | | 26.00 | | 27.00 | | 29.00 | | 30.00 | | 32.00 | | 33.00 | | 35.00 | |
| | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power |
| (°C) | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW |
| 5.00 | 972.18 | 188.16 | 961.71 | 191.31 | 951.23 | 194.68 | 929.29 | 201.41 | 917.82 | 204.78 | 894.87 | 212.35 | 883.37 | 215.93 | 860.33 | 223.72 |
| 6.00 | 1043.19 | 192.26 | 1031.16 | 195.44 | 1020.15 | 198.83 | 996.68 | 205.87 | 984.93 | 209.29 | 960.40 | 216.76 | 948.61 | 220.60 | 924.01 | 228.51 |
| 7.00 | 1118.67 | 196.33 | 1107.38 | 199.78 | 1095.06 | 203.22 | 1069.35 | 210.34 | 1057.00 | 214.00 | 1031.45 | 221.56 | 1018.15 | 225.45 | 991.51 | 233.45 |
| 8.00 | 1200.94 | 201.02 | 1188.20 | 204.51 | 1175.45 | 207.79 | 1148.86 | 215.00 | 1135.02 | 218.93 | 1107.31 | 226.59 | 1093.47 | 230.52 | 1064.94 | 238.65 |
| 9.00 | / | / | 1273.50 | 208.83 | 1259.23 | 212.60 | 1230.70 | 219.91 | 1216.45 | 223.90 | 1187.92 | 231.66 | 1172.54 | 235.66 | 1142.85 | 244.09 |
| 10.00 | / | / | 1362.33 | 213.66 | 1347.66 | 217.25 | 1318.29 | 224.90 | 1303.59 | 228.72 | 1271.49 | 236.57 | 1255.18 | 238.57 | 1222.55 | 249.50 |
| 11.00 | / | / | 1454.31 | 218.13 | 1439.09 | 221.77 | 1407.54 | 229.73 | 1391.16 | 233.60 | 1358.37 | 241.80 | 1341.96 | 245.90 | 1307.11 | 254.59 |
| 12.00 | / | / | 1556.34 | 223.35 | 1540.61 | 227.04 | 1506.69 | 234.88 | 1488.51 | 239.04 | 1453.38 | 247.35 | 1436.41 | 251.50 | 1400.00 | 260.51 |
| 13.00 | / | / | / | / | 1642.96 | 231.92 | 1607.94 | 240.09 | 1589.15 | 244.30 | 1551.56 | 252.71 | 1532.78 | 257.16 | 1495.38 | 266.30 |
| 14.00 | / | / | / | / | 1751.39 | 237.09 | 1714.12 | 245.37 | 1694.84 | 249.41 | 1654.95 | 258.19 | 1635.64 | 262.93 | 1594.39 | 272.19 |
| 15.00 | / | / | / | / | 1867.19 | 242.52 | 1827.50 | 250.93 | 1807.64 | 255.01 | 1766.55 | 263.90 | 1745.39 | 268.48 | 1701.69 | 278.11 |

Note: The inlet/outlet water temperature difference is 5 ℃.

## 1257B3O3/2WT1DB

| Chilled Water Outlet Temp. | Cooling Water Inlet Temp.(°C) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 25.00 | | 26.00 | | 27.00 | | 29.00 | | 30.00 | | 32.00 | | 33.00 | | 35.00 | |
| | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power |
| (°C) | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW |
| 5.00 | 1155.21 | 219.81 | 1142.77 | 223.50 | 1130.31 | 227.43 | 1104.24 | 235.29 | 1090.62 | 239.23 | 1063.35 | 248.07 | 1049.68 | 252.26 | 1022.31 | 261.36 |
| 6.00 | 1239.59 | 224.60 | 1225.30 | 228.31 | 1212.22 | 232.28 | 1184.33 | 240.50 | 1170.36 | 244.49 | 1141.22 | 253.22 | 1127.21 | 257.71 | 1097.97 | 266.95 |
| 7.00 | 1329.28 | 229.36 | 1315.87 | 233.39 | 1301.22 | 237.41 | 1270.68 | 245.72 | 1256.00 | 250.00 | 1225.64 | 258.83 | 1209.83 | 263.38 | 1178.18 | 272.73 |
| 8.00 | 1427.04 | 234.83 | 1411.90 | 238.92 | 1396.75 | 242.75 | 1365.16 | 251.17 | 1348.71 | 255.76 | 1315.79 | 264.70 | 1299.34 | 269.30 | 1265.43 | 278.80 |
| 9.00 | / | / | 1513.26 | 243.96 | 1496.30 | 248.36 | 1462.40 | 256.91 | 1445.47 | 261.57 | 1411.57 | 270.64 | 1393.30 | 275.30 | 1358.01 | 285.15 |
| 10.00 | / | / | 1618.81 | 249.60 | 1601.38 | 253.80 | 1566.48 | 262.73 | 1549.01 | 267.20 | 1510.88 | 276.36 | 1491.49 | 278.71 | 1452.72 | 291.47 |
| 11.00 | / | / | 1728.11 | 254.83 | 1710.03 | 259.08 | 1672.54 | 268.38 | 1653.08 | 272.90 | 1614.11 | 282.47 | 1594.61 | 287.26 | 1553.20 | 297.42 |
| 12.00 | / | / | 1849.35 | 260.92 | 1830.65 | 265.23 | 1790.35 | 274.40 | 1768.74 | 279.25 | 1727.01 | 288.96 | 1706.84 | 293.81 | 1663.57 | 304.33 |
| 13.00 | / | / | / | / | 1952.28 | 270.93 | 1910.66 | 280.48 | 1888.34 | 285.40 | 1843.67 | 295.23 | 1821.35 | 300.42 | 1776.91 | 311.10 |
| 14.00 | / | / | / | / | 2081.13 | 276.97 | 2036.83 | 286.65 | 2013.92 | 291.36 | 1966.53 | 301.62 | 1943.58 | 307.16 | 1894.56 | 317.98 |
| 15.00 | / | / | / | / | 2218.72 | 283.32 | 2171.57 | 293.14 | 2147.96 | 297.91 | 2099.14 | 308.30 | 2073.99 | 313.64 | 2022.07 | 324.90 |

## 1487B3O3/2WT1DB

| Chilled Water Outlet Temp. | Cooling Water Inlet Temp.(°C) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 25.00 | | 26.00 | | 27.00 | | 29.00 | | 30.00 | | 32.00 | | 33.00 | | 35.00 | |
| | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power | Capacity | Power |
| (°C) | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW | kW |
| 5.00 | 1367.68 | 262.02 | 1352.94 | 266.41 | 1338.20 | 271.09 | 1307.33 | 280.47 | 1291.21 | 285.16 | 1258.91 | 295.71 | 1242.73 | 300.69 | 1210.33 | 311.54 |
| 6.00 | 1467.58 | 267.72 | 1450.65 | 272.15 | 1435.17 | 276.87 | 1402.15 | 286.68 | 1385.61 | 291.44 | 1351.11 | 301.84 | 1334.52 | 307.19 | 1299.90 | 318.20 |
| 7.00 | 1573.76 | 273.40 | 1557.88 | 278.20 | 1540.54 | 283.00 | 1504.38 | 292.90 | 1487.00 | 298.00 | 1451.06 | 308.53 | 1432.34 | 313.95 | 1394.86 | 325.09 |
| 8.00 | 1689.49 | 279.92 | 1671.57 | 284.79 | 1653.63 | 289.35 | 1616.23 | 299.39 | 1596.76 | 304.87 | 1557.78 | 315.53 | 1538.31 | 321.01 | 1498.17 | 332.33 |
| 9.00 | / | / | 1791.58 | 290.80 | 1771.49 | 296.04 | 1731.36 | 306.23 | 1711.32 | 311.79 | 1671.19 | 322.60 | 1649.55 | 328.16 | 1607.77 | 339.90 |
| 10.00 | / | / | 1916.54 | 297.52 | 1895.90 | 302.53 | 1854.59 | 313.18 | 1833.90 | 318.50 | 1788.75 | 329.43 | 1765.80 | 332.22 | 1719.90 | 347.43 |
| 11.00 | / | / | 2045.94 | 303.76 | 2024.54 | 308.82 | 1980.15 | 319.90 | 1957.11 | 325.29 | 1910.98 | 336.71 | 1887.89 | 342.42 | 1838.86 | 354.53 |
| 12.00 | / | / | 2189.48 | 311.02 | 2167.34 | 316.16 | 2119.63 | 327.08 | 2094.05 | 332.87 | 2044.63 | 344.44 | 2020.75 | 350.22 | 1969.53 | 362.76 |
| 13.00 | / | / | / | / | 2311.34 | 322.95 | 2262.06 | 334.34 | 2235.64 | 340.19 | 2182.75 | 351.91 | 2156.33 | 358.10 | 2103.71 | 370.83 |
| 14.00 | / | / | / | / | 2463.88 | 330.15 | 2411.44 | 341.69 | 2384.32 | 347.31 | 2328.21 | 359.53 | 2301.03 | 366.13 | 2243.00 | 379.03 |
| 15.00 | / | / | / | / | 2626.79 | 337.71 | 2570.95 | 349.42 | 2543.01 | 355.11 | 2485.21 | 367.49 | 2455.43 | 373.86 | 2393.96 | 387.28 |

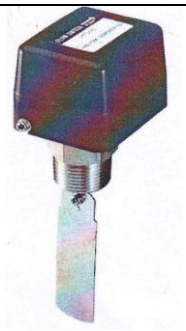
Note: The inlet/outlet water temperature difference is 5 ℃.

## 13. Accessories

### Standard accessories

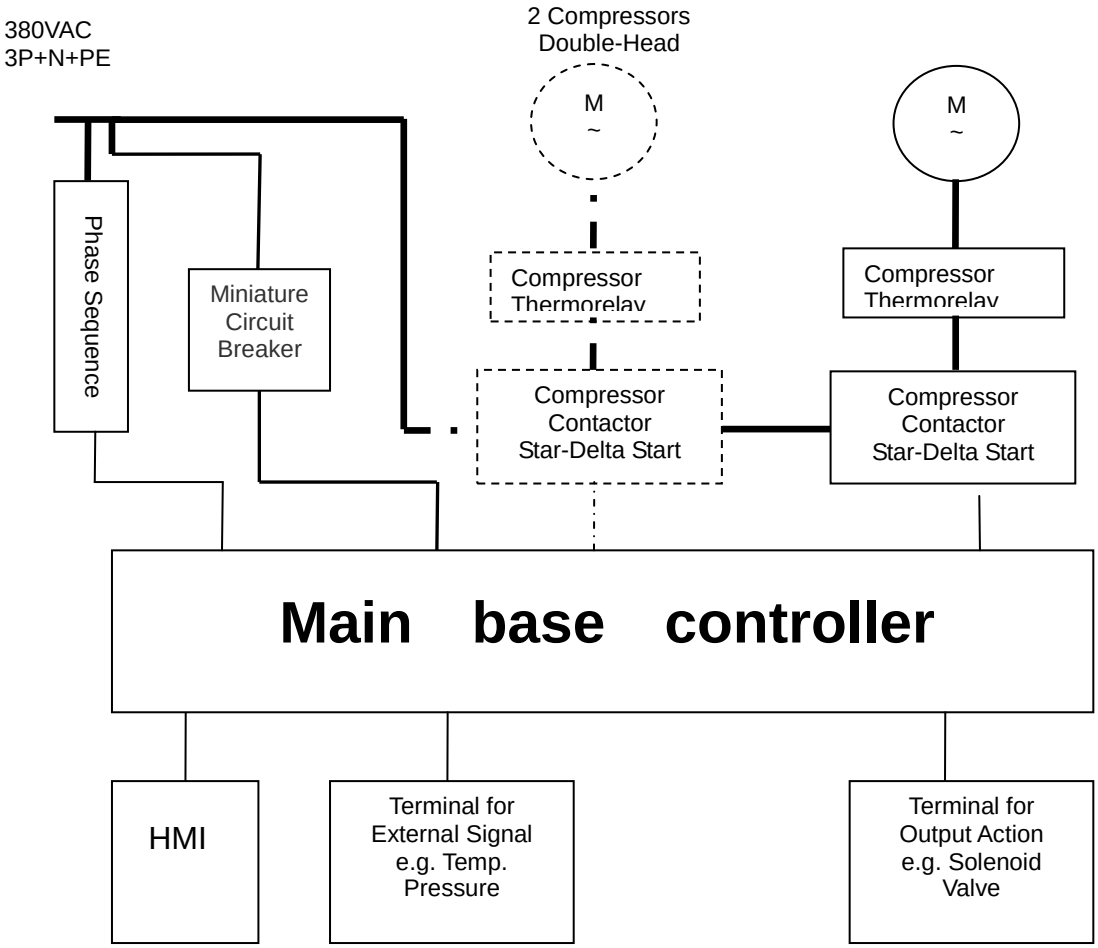
| NO. | Name | Quantity |
|---|---|---|
| 1 | User manual | 1 |
| 2 | Water flow switch | 1 |
| 3 | Packing list | 1 |

### Optional Accessories

| NO. | Name | Model | Instructions | Picture | Quantity |
|---|---|---|---|---|---|
| 1 | Water flow switch | WFS-1001-H (Honeywell) | Installed on evaporator outlet pipe to prevent heat exchange pipe from frost crack. |  | 2 |
| 2 | Vibration damper | MHD series | To avoid vibration and noise, it must be used between base and foundation when install the unit. |  | 4 |
| 3 | Remote control cabinet | YCKZ-P | Can be installed in the control room. Through the cable connected to the unit touch screen, it can display all states information and complete all the operations of unit (startup/shutdown, error confirm, etc.) |  | 1 |
| 4 | Flange | JB81/94 Standard flange | Flange connection can be chosen for water pipe connection. Customer can choose water side pressure 1.6MPa according to requirement. |  | 9 |

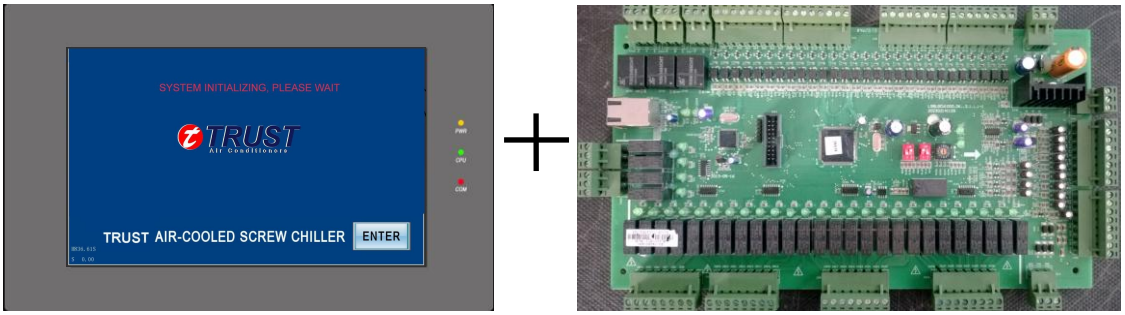
# Ⅲ. Control

## 1. Control Flow Chart

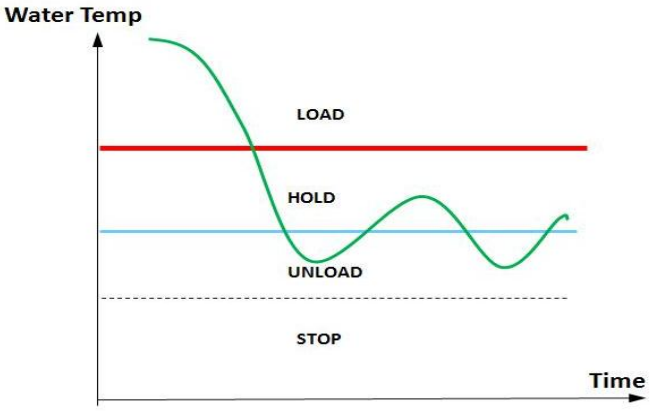



Main base controller gathers signals through input terminals, such as pressure, temperature and the state of protection switches and ensures unit's current condition. At the same time, according to input signal from HMI, such as starting signal, controller performs the logical operations and outputs signals. These signals act on components, time relay, contactors and so on.

**HMI+ Main base controller:**

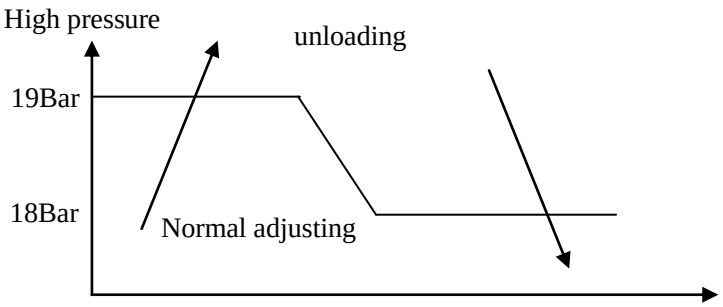


## 2. Energy Adjustment



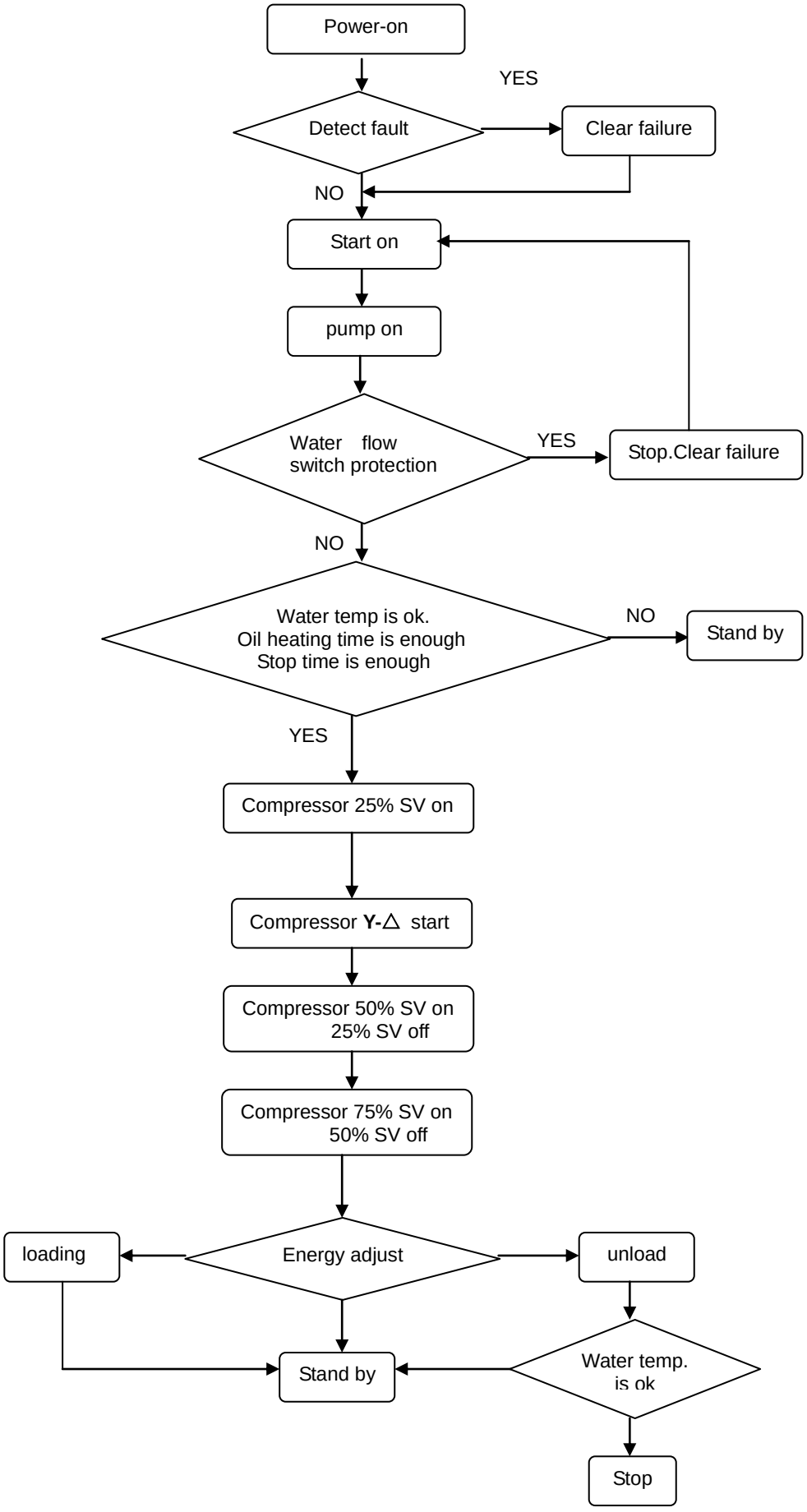

The unit adjust capacity by chilled water. The control logic refers to the picture.

Energy adjustment is districted when starting high pressure is too high.

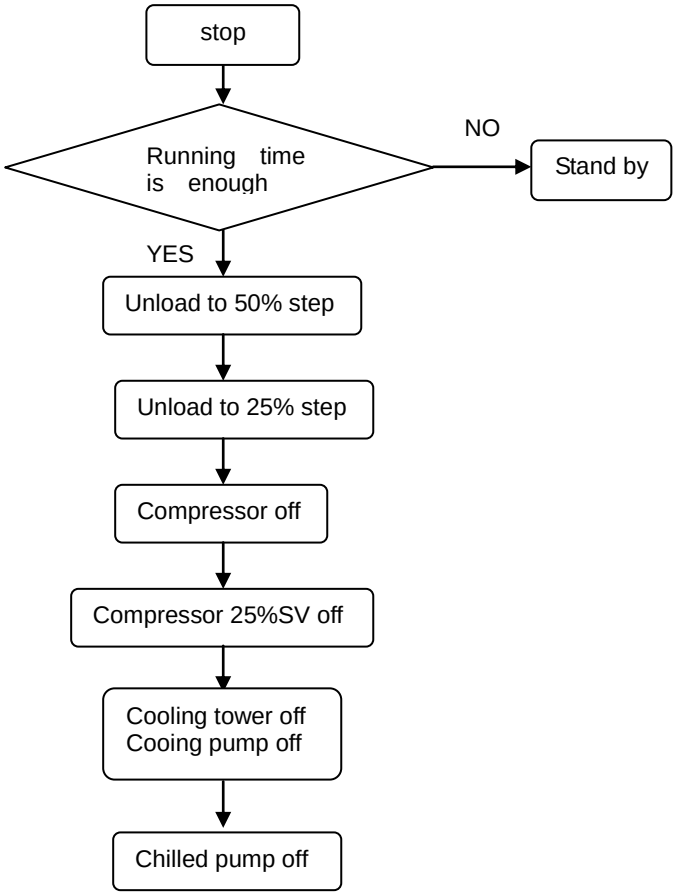


## 3. Start/stop process

### 1)Cooling start



**2) Cooling stop**




## 4. Sensors

### 1) Temperature sensors

The temperature sensors that unit use are all NTC thermistors, including chilled leaving water temperature, chilled entering water temperature, discharged temperature, EXV suction temperature.

| NO. | Name | Type | Remark |
|---|---|---|---|
| 1 | Chilled entering water temp. | NTC,10k@25℃ | Emerson |
| 2 | Chilled leaving water temp. | NTC,10k@25℃ | Emerson |
| 3 | EXV suction temp. | NTC,10k@25℃ | Carel |
| 4 | Lubrication oil temperature | NTC,10k@25℃ | Emerson |

**Thermistors**

For PTC thermistors, resistances vary with various temperatures.

➢ **Location**

Motor thermistor locates in the motor winding and is connected to the compressor protection module which will cut off the main power when motor winding temperature exceeds 110 °C. Water temperature thermistors are installed in wells on chilled water inlet/outlet and cooling water inlet/outlet. Refer to the electric control wiring diagram for detail connection information.

➢ **Thermistor replacement**

To Replace Thermistors RT1, RT2, RT3, RT4, RT5, or RT6 (Entering/Leaving chilled Water; Entering/Leaving cooling Water; Discharge Temperature; Oil temperature) — Disconnect appropriate connector from the PCB controller. New thermistors should be spliced to existing wiring close to the connector unless new connectors are required. Remove thermistor cable from harness. Remove and discard original thermistor from well. Insert new thermistor in well body to its full depth. Add a small amount of thermal conductive grease to thermistor probe and well. Tighten the screw to prevent thermistors from slipping out of the well.

➢ **To Service Compressor Motor Thermistors**

A thermistor is factory installed in each compressor. Connections for the thermistors are located in the compressor wiring box. 2 terminals are reserved for the thermistor: S1 and S2. Motor temperature is measured by leads connected to S1 and S2 terminal. The thermistors are not serviceable in the field. If the compressor motor thermistor fails, compressor replacement is required.

## 2) Pressure sensors

The pressure sensors are **pressure transmitters**, including high pressure, low pressure, EXV suction pressure transmitters. **Danfoss AKS3000** are used.

Water temp. thermistor

Suction temp. thermistor

Pressure transmitter AK3000

| NO. | Name | Type | Remark |
|---|---|---|---|
| 1 | EXV suction pressure | 4～20mA | Danfoss AKS33 |

## 5. Parts control

### 1) Oil heater control

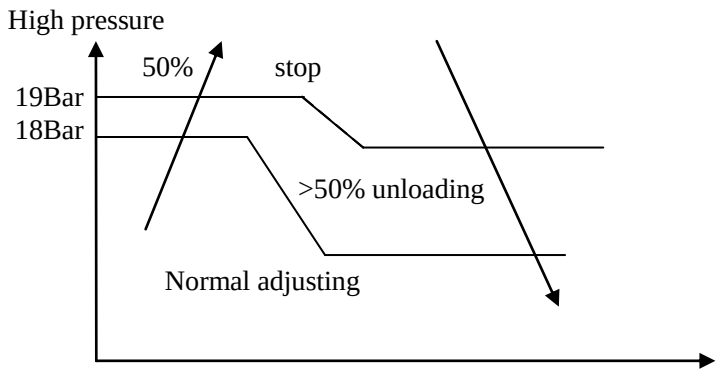
In unit sand by period, oil heater is energized to keep normal oil temperature. When unit starts, it is turned off.

Oil heating time limits:

- When cooling water inlet temperature >= 35°C (real time value), oil heating time for first startup is 0.5h. If power down happens during operation and downtime is less than 8hrs, no heating time delay is needed when unit restarts. If it exceeds 8hrs, 0.5h heating time is need.
- When cooling water inlet temperature >= 30°C (real time value), oil heating time for first startup is 1h. If power down happens during operation and downtime is less than 5hrs, no heating time delay is needed when unit restarts. If it exceeds 5hrs, 1h heating time is need.
- When cooling water inlet temperature >= 25°C (real time value), oil heating time for first startup is 2hrs. If power down happens during operation and downtime is less than 3hrs, no heating time delay is needed when unit restarts. If it exceeds 3hrs, 1h heating time is need. If it exceeds 5hrs, 2hrs heating time is need.
- When cooling water inlet temperature >= 20°C (real time value), oil heating time for first startup is 4hrs. If power down happens during operation and downtime is less than 1hrs, no heating time delay is needed when unit restarts. If it exceeds 1hrs, 2h heating time is need. If it exceeds 5hrs, 3hrs heating time is need. If it exceeds 8hrs, 4hrs heating time is need.
- When cooling water inlet temperature < 20°C (real time value), oil heating time for first startup is 8hrs. If power down happens during operation and downtime is less than 1hrs, no heating time delay is needed when unit restarts. If it exceeds 1hrs, 3h heating time is need. If it exceeds 5hrs, 5hrs heating time is need. If it exceeds 8hrs, 8hrs heating time is need.

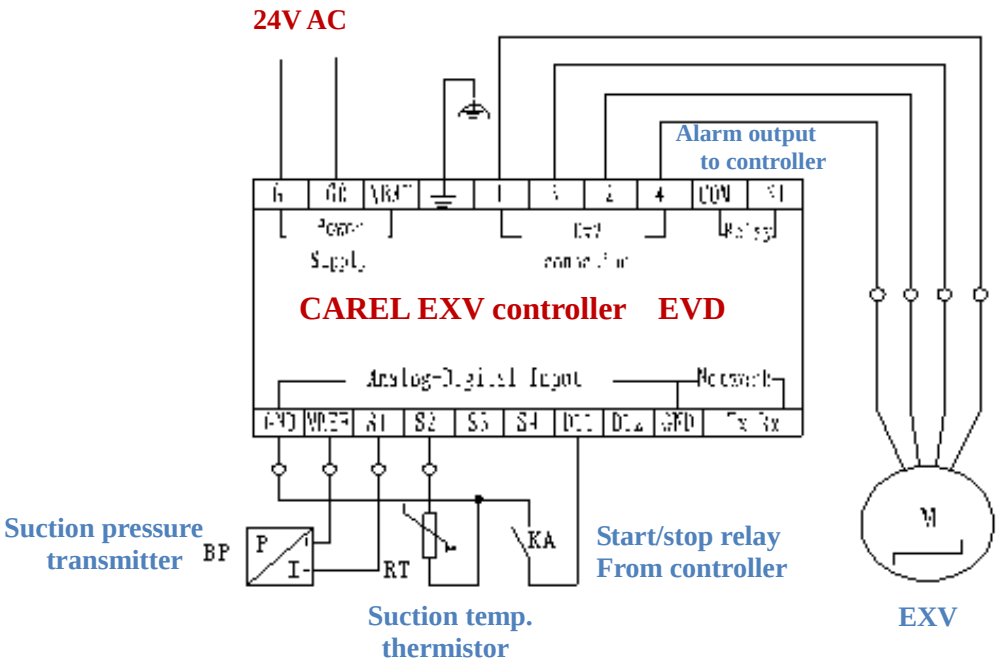
### 2)Pressure sensor Control

**High pressure control**




### 3) EXV controller Control

### a. EXV controller wiring principle



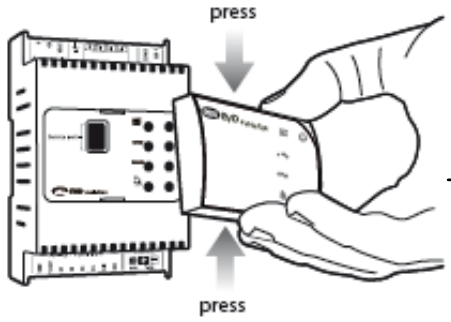

EXV controller is started by main base controller.it detects suction pressure and suction temperature and calculate suction superheat. Then it controls EXV opening depending on superheat. If it is wrong, EXV will output alarm signal to main base controller.

## b. Controller display

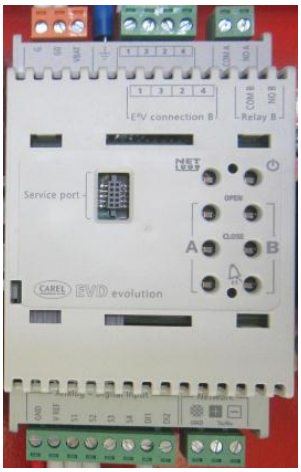
The interface of EXV controller cannot display and set parameter on unit, only running status display.

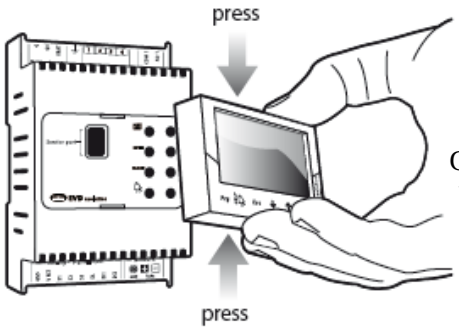

| LED | Light | Extinguish | Flicker |
|---|---|---|---|
| NET | Can be connected to the network | Not connected | Communication failure |
| OPEN | Open the valve | - | Disable the drive |
| CLOSE | Close the valve | - | Disable the drive |
| | Activate the alarm | - | - |
| | Drive power | The drive is not connected to power supply | - |

If parameter needs to be displayed and set. Interface should be changed.



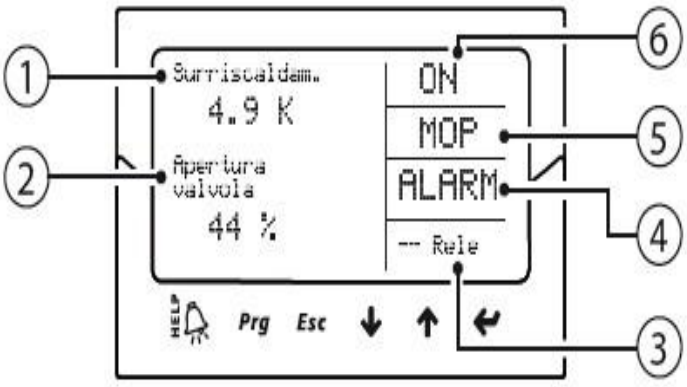

Remove cover






Change display

**Display**




| | |
|---|---|
| 1 | Display suction superheat |
| 2 | Display EXV opening |
| 3 | Relay output status |
| 4 | Alarm |
| 5 | Start of the protection |
| 6 | Control state |

| Buttons | Function |
|---|---|
| Prg | Open the display screen, enter the password to enter the programming mode |
| HELP | • In the alarm state, the display alerts the queue;<br>• When the "producer" level under the rolling parameters, the display shows the interface |
| Esc | • To exit the programming (maintenance / producer) and display mode;<br>• set a parameter, the exit without saving changes |
| ↓ / ↑ UP/DOWN | • Display screen navigation;<br>• Increase / decrease the value |

| | |
|---|---|
| ↵ Enter | • From the parameter setting mode, the display switches to<br>• Confirm the list of parameters and return the value |

**Running status display**


Press ↓/↑

Press Esc button

**Display all status**

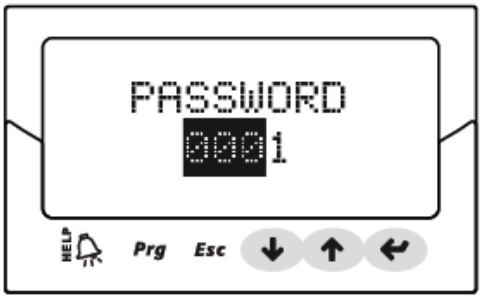

## c. Controller parameter checking and changing.

## Checking or changing repair parameters step:

① Press one or more Esc to switch to the standard display interface;

② Press Prg: display interface input password;

③ Press ENTER input repair level password: **, starting from the rightmost digit, each input a digital, confirm with ENTER ;




④ If the password is correct, it will display the first parameters can be modified: network address;

⑤ Press UP/DOWN to select parameters should be set up;

⑥ Press ENTER to move to the parameter value;

⑦ Press UP/DOWN to modify the parameter value;

⑧ Press ENTER to save the new parameter values;

⑨ Repeat the above 5, 6, 7, 8 step change other parameters;

⑩ Press Esc to exit the repair parameters modify the program.

**The following shows the detailed settings: 9 pages**

| | |
|---|---|
| Drive hardware configuration | 1/9 |
| Network address | 198 |

| | |
|---|---|
| Drive hardware configuration | 2/9 |
| Refrigerant type | |
| R134a | |
| Valve type | |
| Danfoss ETS 250 or SHE-175 | |

| | |
|---|---|
| Drive hardware configuration | 3/9 |
| Type of probe S1 | |
| 4～20mA,0~30bar | |
| Unit type | |
| Tube-shell unit | |

| | |
|---|---|
| Drive hardware configuration | 4/9 |
| Type of probe S1 | |
| NTC-CAREL | |
| Auxiliary control type | |
| Disabled | |

| | |
|---|---|
| Control parameter settings | 5/9 |
| Overheat degree | 5.0K |
| Valve opening upon start | 85% |

| | |
|---|---|
| Control parameter settings | 6/9 |
| PID profit in proportion | 119 |
| PID integration time | 150 |
| PID differential time | 5 |

| | |
|---|---|
| Control parameter settings | 7/9 |
| LowSH protection valve value | 1K |
| LowSH differential time | 5s |

| | |
|---|---|
| Control parameter settings | 8/9 |
| MOP protection valve value | 50°C |
| MOP integration time | 10s |

| | |
|---|---|
| Valve body parameter setting | 9/9 |
| Nominal step motor speed | 250Hz |
| （SHE-175valve cannot be changed.） | |
| Nominal current | |
| Stable current | |

## Checking or changing manufacturer parameters steps:

① Press one or more Esc to switch to the standard display interface;

② Press Prg: display interface input password;

③ Press ENTER input manufacturer password, starting from the rightmost digit, each input a digital, confirm with ENTER ;

④ If the password is correct, the following parameter type list will display:

- configuration parameters

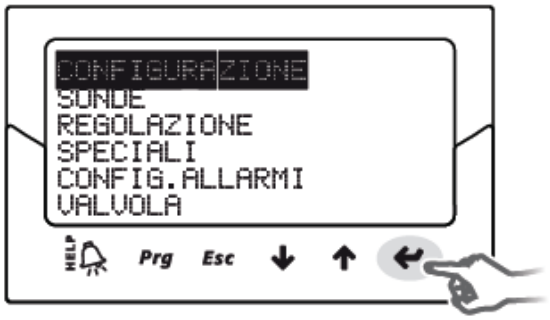
- sensor parameters

- Control parameters

- the special parameters

- alert configuration parameters

- valve parameters




⑤ Press UP/DOWN button to select the category, and then press ENTER to enter the first class number

⑥ Press UP/DOWN to select parameters to be set, and then press ENTER to move to the parameter value;

⑦Press UP/DOWN to modify the parameter value;

⑧Press ENTER to save the new parameter values;

⑨ Repeat the above 6, 7, 8 step change other parameters;

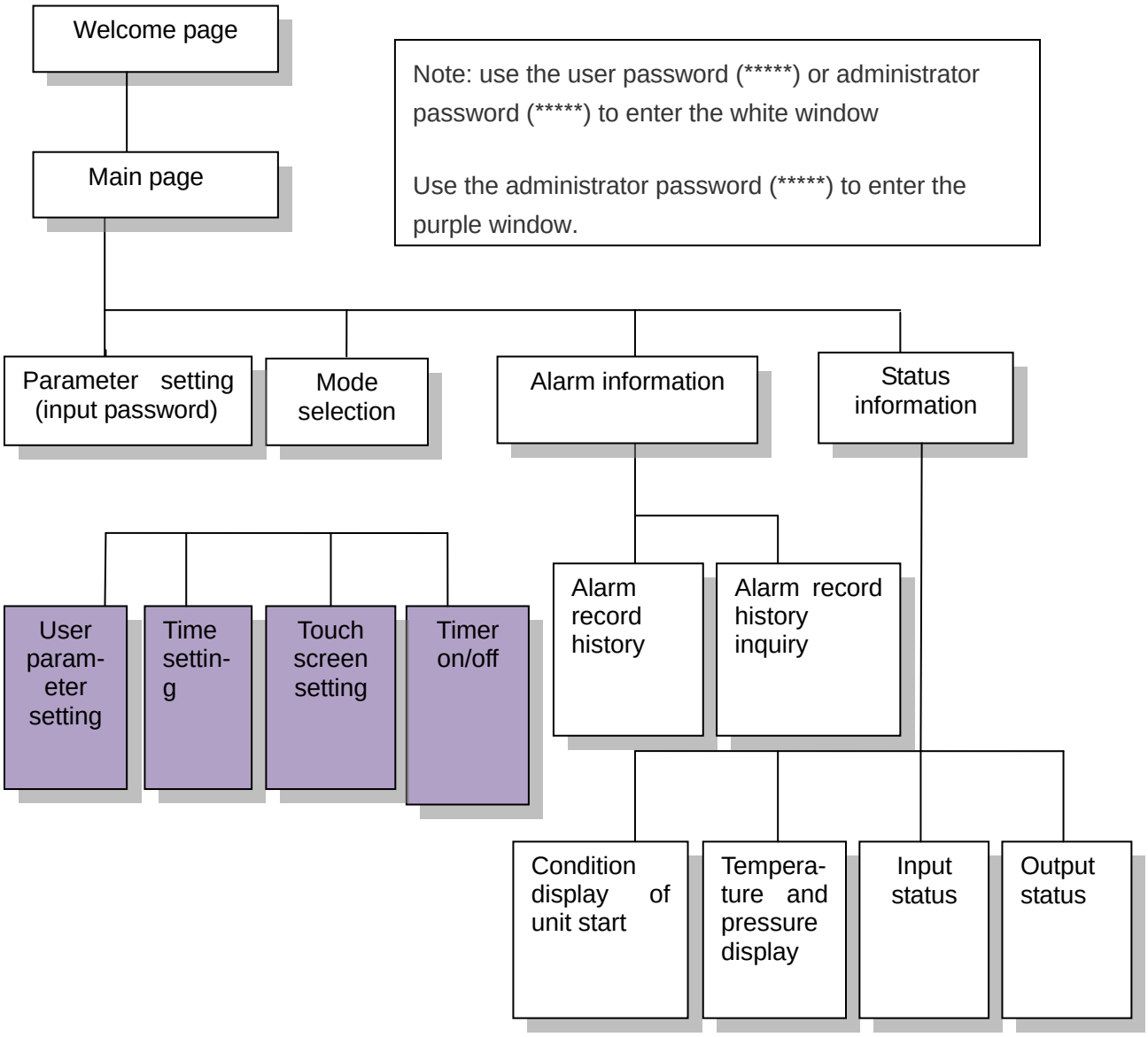
⑩ Press Esc to exit the manufacturer parameter modification program.

| Unit Type | | 380,500,600,720,880,1000,1200,1420 | Remarks |
|---|---|---|---|
| Setting parameters | Refrigerant | R134a | Selected based on the refrigerant type of the unit |
| | Valve | Danfoss ETS250 | |
| | Sensor S1 | 4-20 mA; 0-10.0 V | Automatically brought out by subsequently set parameters |
| | Control mode | shell-and-tube unit | --- |
| | Overheat degree | 6 | --- |
| | Valve opening upon start | 50% | --- |
| | Pre-positioning delay | 6 | --- |
| | Valve opening in standby state | 0 | --- |
| | Power supply mode | 1 | Available values include: (1) 0: 24 V AC (2) 1: 24 V DC; default value: 0 |
| | | | |
| Check parameters | Enable manual valve positioning | 0 | --- |
| | Manually set the valve position | 0 | --- |
| | Auxiliary control | Invalid | --- |
| | Relay settings | Alarm relay | --- |
| | DI2 settings | Invalid | --- |
| | Variable 1 on the display | Overheat degree | --- |
| | Variable 2 on the display | Valve opened | --- |
| | Sensor S1 alarm management | Valve at a fixed position | --- |
| | Sensor S2 alarm management | Valve at a fixed position | --- |
| | S1: calibration offset | 0 | --- |
| | S1: calibration gain, 4–20 | 1 | --- |

| | | | |
|---|---|---|---|
| | mA | | |
| | Pressure sensor S1: minimum value | 0 | Set based on the actual sensor |
| | Pressure sensor S1: maximum value | 30 | Set based on the actual sensor |
| | Pressure sensor S1: minimum value for alarms | 0 | Set based on the actual sensor |
| | Pressure sensor S1: maximum value for alarms | 30 | Set based on the actual sensor |
| | Sensor S2 | CAREL NTC | --- |
| | Language | English | --- |
| | Measurement unit | °C (K), barg | --- |
| | PID: proportional gain | 80 | --- |
| | PID: integration time | 40 | --- |
| | PID: derivation time | 1.5 | --- |
| | Minimum number of valve steps | 350 | --- |
| | Maximum number of valve steps | 3810 | --- |
| | Number of steps for valve closing | 3970 | --- |
| | Valve rate | 250 | --- |
| | LowSH protection: threshold | 1 | --- |
| | LowSH protection: integration time | 2.5 | --- |
| | LOP protection: threshold | -50 | --- |
| | LOP protection: integration time | 4 | --- |
| | MOP protection: threshold | 50 | --- |
| | MOP protection: integration time | 10 | --- |
| | Low overheat degree alarm delay (LowSH, 0 = no alarm) | 300 | --- |
| | Low evaporation temperature alarm delay (LOP, 0 = no alarm) | 300 | --- |
| | High evaporation temperature alarm delay (MOP, 0 = no alarm) | 600 | --- |
| | Low air suction temperature alarm threshold | -50 | --- |
| | Low air suction temperature alarm delay (0 = no alarm) | 300 | --- |

# 6. Operation Part

## 6.1 Unit operation flow chart




## 6.2 Operation part

The control system adopts touch screen, and all the operation is done on the screen directly. Take the unit with dual compressors and step control as example, the actual display of different product may have a little difference, but basically the operation is the same.

1. Welcome page

The first welcome page as the figure 6.1

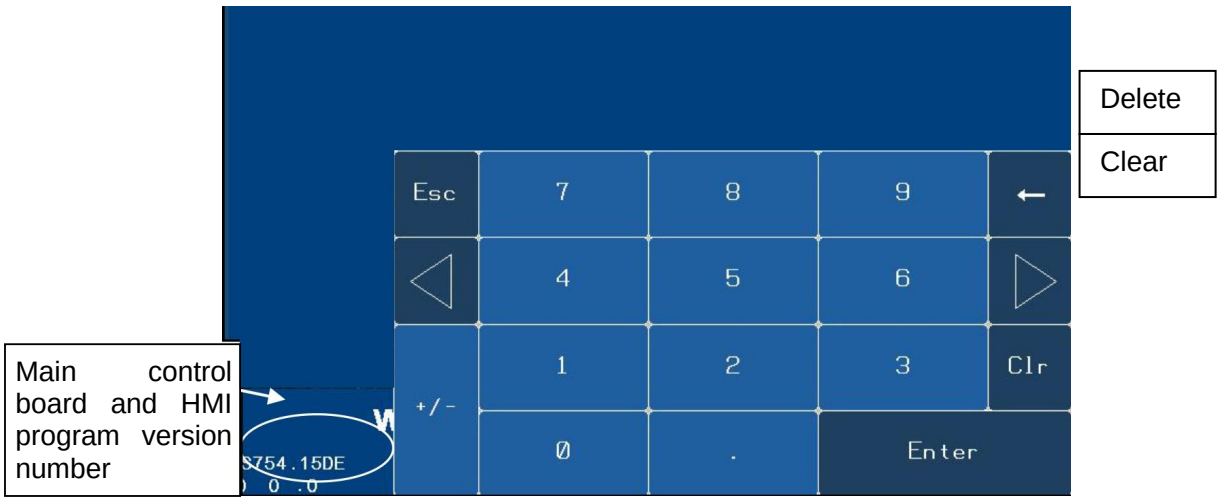



Figure 6.1

When press Enter button, password keyboard will appear. User input *****/***** and press Enter button to enter the main page.

Indicators explanation on the right are as following:

Yellow indicator is the power indicator. It keeps lighting under normal condition, if it is not light, please check if the power supply wiring is correct.

Green indicator is the touch screen operation indicator, under normal condition it flashes with low frequency.

Red indicator is communication indicator, under normal condition it flashes with high frequency, if not, please check if the communication wire connected with the main control board is connected properly and tightly.

➢ Main page

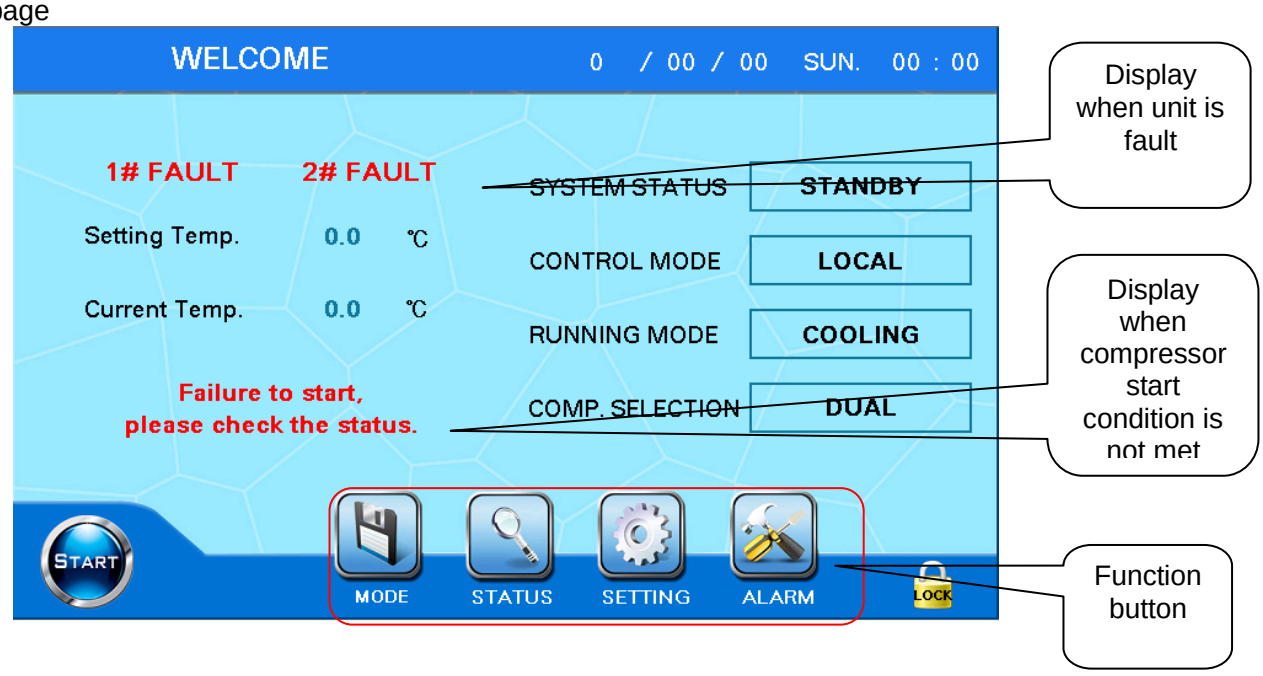



Figure 6.2

The main page displays the current status, control mode and operating mode of the unit.

Press LOCK button at the bottom right of the screen, and machine enters the initial screen, user needs to input password again to enter.

**Refers to the below table for the current status displaying and explanation of the unit::**

| | |
|---|---|
| Standby | Machine is not operating, it can start normally. |
| Malfunction | Machine has malfunction and it cannot start. Please check from malfunction query page and confirm if the malfunction has been solved. |
| Operating | Machine is operating normally |
| Starting | Machine starts to normal operation |
| Shutting down | Unload, stop the compressor and stop the water pump are the necessary process during shutting down. If the minimum running time is not reached, it needs to wait until the minimum running time has been reached. Please inspect in the first page of status information if the minimum running time is satisfied. The shutting down process will be continued when minimum running time is satisfied. |
| Pause | The compressor startup conditions are not satisfied. The compressor startup condition includes:<br>1. Water temperature is not satisfy with compressor startup condition;<br>2. Water temperature needs to be higher than compressor startup temperature in cooling mode, Water temperature needs to be lower than compressor startup temperature in heating mode,this temperature can be modified in the parameter settings page;<br>3. Oil temperature of compressor is not satisfy with startup condition;<br>4. The pausing time is too short, and it is not meet the requirements of the compressor starts intervals;<br>The above information can be check in the first page of status information. The unit starts automatically when startup conditions are satisfied. |

1) Mode setting

Press MODE button and mode settings window will be pop-up, as shown in the below:

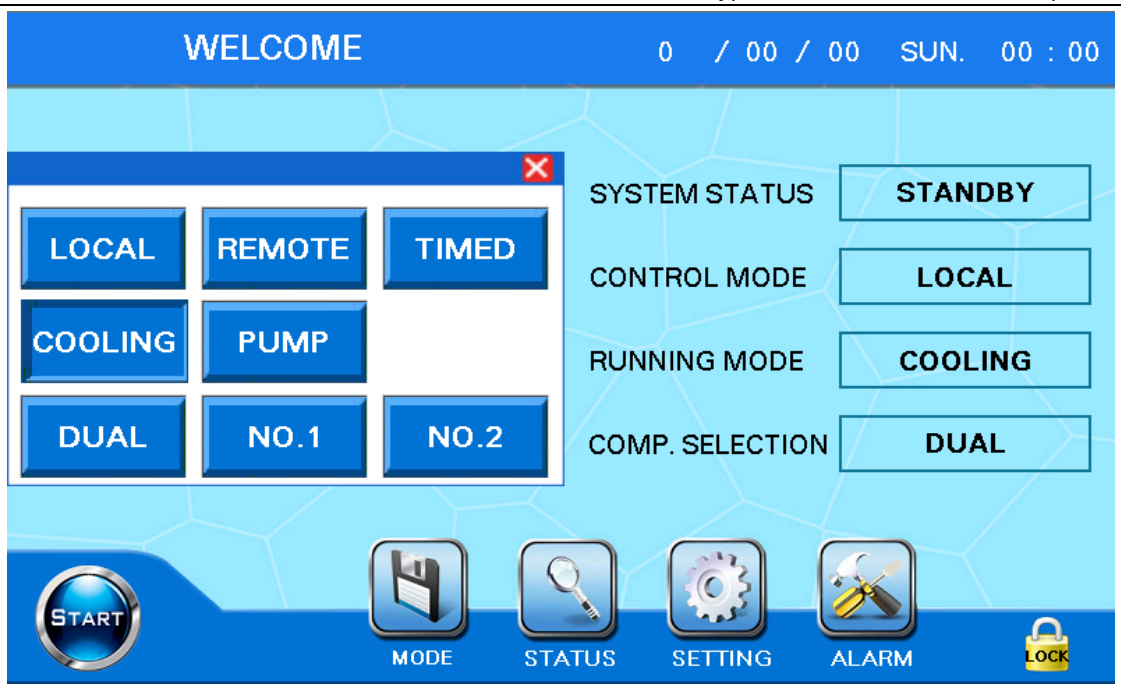



Figure 6.3

Set control mode(Local, remote, timer),operating mode(cooling, heating, pumping) and single or dual compressor(dual stage, 1#、2#) in the pop-up window. After setting is finished, click the pop-up window "X" at the top right to close the pop-up window.

①Only control mode can be switched during operating, other mode selection is invalid.

② The control mode is used as on/off mode choice. "Local" control mode can only be realized through the touch screen "on / off" button; "Remote" control mode can only be realized through the "remote start / remote stop" hardware interface; "the timer control mode", it can be only realized by setting the timer.

③ Heating mode is only available for the heat pump unit.

Note: under the "local" control mode, remote control and timer control are invalid; under the "remote" control mode, local control and timer control are invalid; under the "timed" control mode, local control and remote control are invalid.

2 ) Startup operation

It needs to confirm below before startup:

① Mode setting is correct. Operation mode (cooling, heating, pumping) and single/dual compressor ( dual stages、1#、2# ) cannot be set after startup.

② Current status of machine is standby, it cannot startup under malfunction status.

③ Please confirm if the oil heating is complete. If not, machine may stay in a pause state for a long time and compressor cannot start.

Press "start" button at bottom left of screen, pop-up window will appear. If confirm startup, please press "confirm"; if not, please click the pop-up window "X" at the top right to cancel startup.

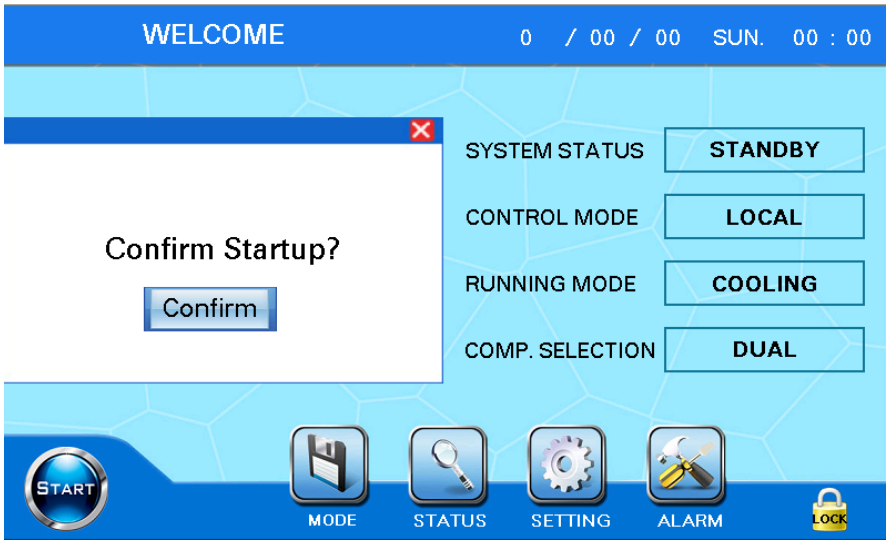
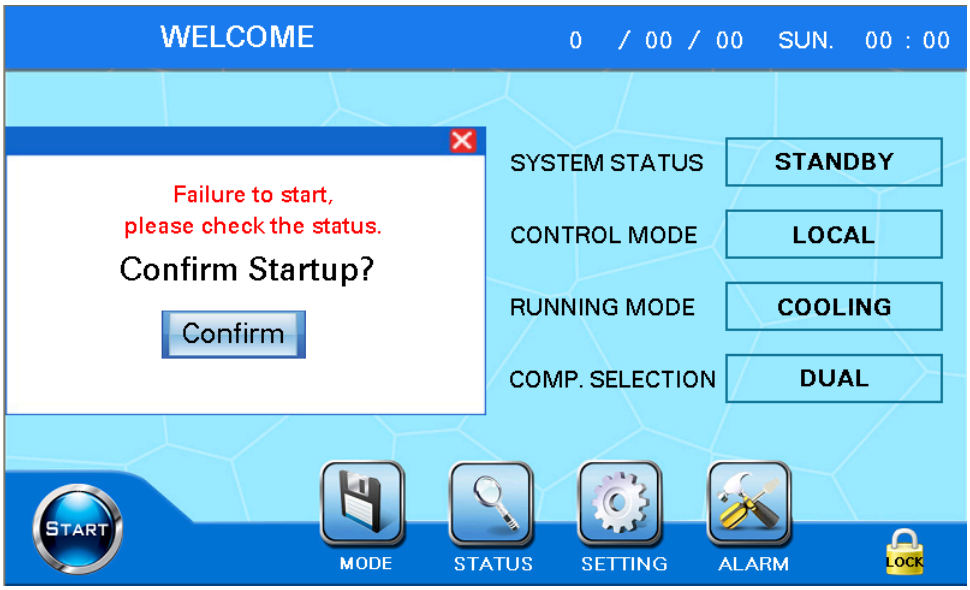



Figure 6.4

If the startup conditions are not satisfied, press "Start" button will display the prompt at the top of the pop-up boot window, it shows that "compressor start conditions are not met, please check status information". The compressor startup conditions include: temperature of oil temperature sensor, interval time of restart, startup temperature of compressor and so on. The startup can be confirmed right now, but unit will start until the compressor startup conditions are met, otherwise the main page will keep displaying that "compressor start conditions are not met, please check status information" . Please refers to the detailed explanation in the “4” for explanation of status information.



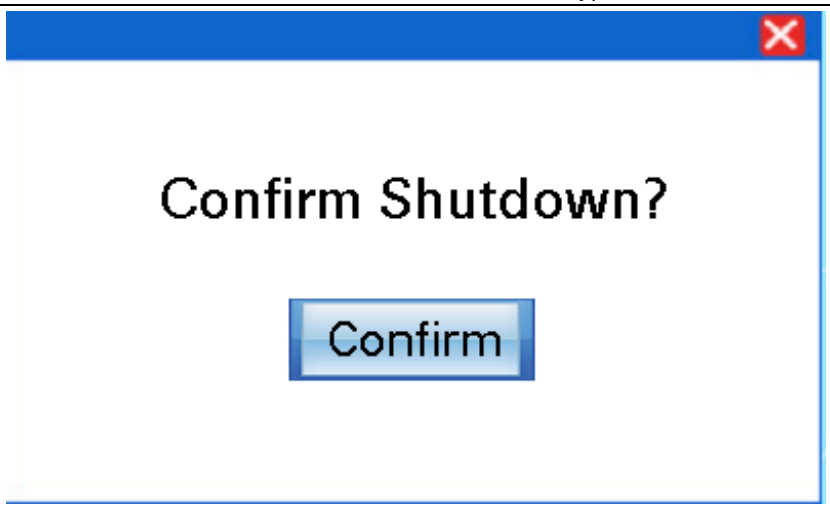



Figure 6.5

Startup operation: Press “startup” is not valid if unit is in malfunction state.

Press START button, and confirm in the pop-up window for startup, then unit can start.

If the compressor startup conditions are not satisfied, the unit goes into a pause state after running the water pump. The interface display "compressor start conditions are not satisfied, please check state information".

Shutdown operation:

Press the STOP button, pop-up window for shutdown confirmation will display. Press Confirm button, then unit status display "stop". After the unit is satisfied with the stop condition, it will carry out the shutdown process.

Standby status: machine is powered on, it will display “standby status” normally.

① Unit operation: the start-up of the unit is finished.

② Pause state: Control water temperature to be lower than water temperature of paused state. The unit enters “pause state” and compressor stops operating. Control water temperature to be higher than water temperature of compressor starting, compressor starts and enters “operating state”.

③ Shutting down：the unit enters “shutting down” state when carry out operation of shutdown to the unit. After shutdown is finished, unit enters “standby state”.

④ Unit protection：when the unit appears fault alarm, it enters “unit protection” state, and on the top of the screen will inform user which unit has malfunction.

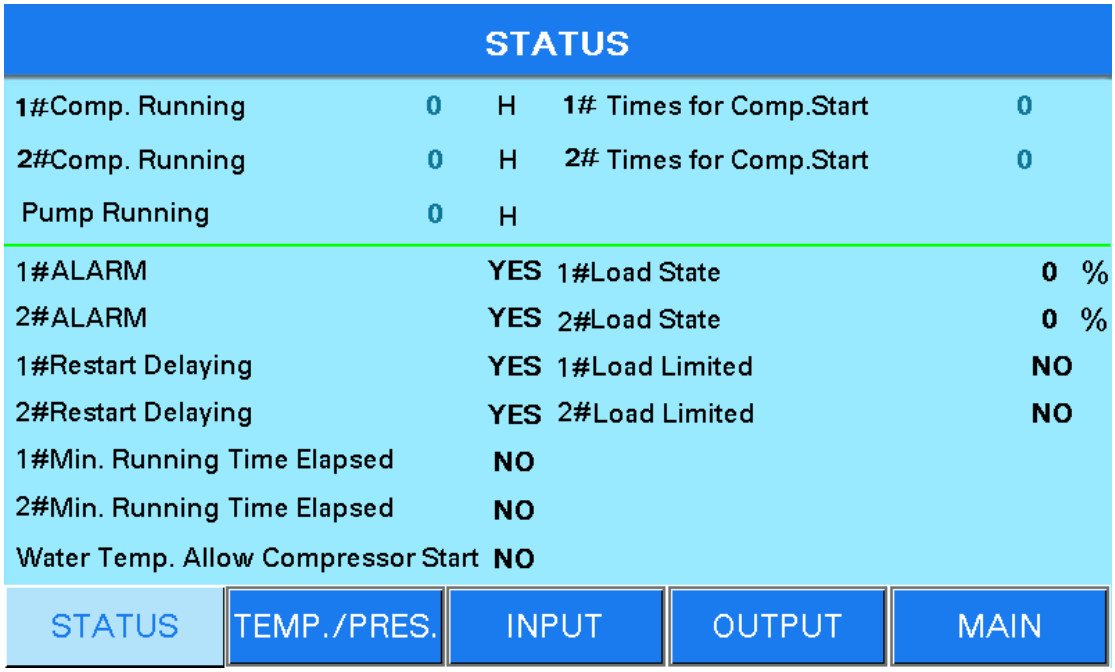
Note:

Cooling mode: water temperature of paused state = setting chilled water temperature- temperature control range. When unit is in paused state, if temperature controlling is higher than compressor starting temperature, compressor starts.

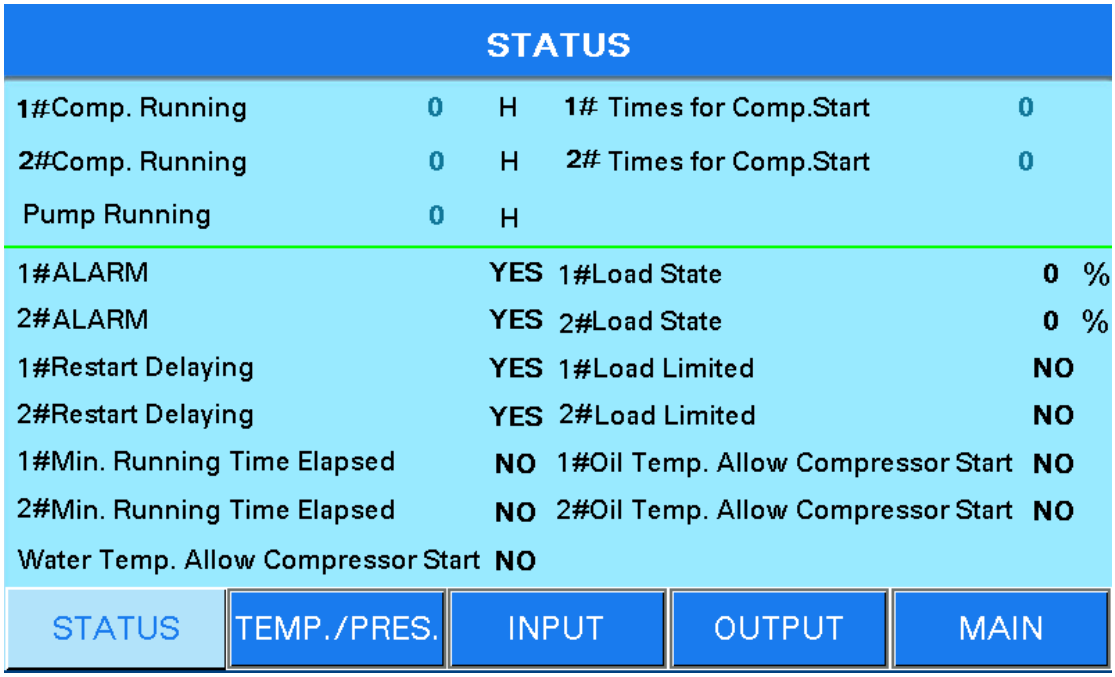
Heating mode: water temperature of paused state= setting chilled water temperature+ temperature control range. When unit is in paused state, if temperature controlling is lower than compressor starting temperature, compressor starts.

➢ Status information- operation query

Press status in the figure 6.5 and enter figure 6.6.




Displaying of unit without oil temperature sensor




displaying of unit with oil temperature sensor
Figure 6.6

Displaying contents of status information including the following:

① Display refrigerant type of the unit;

② Display operating time of compressor and water pump;

③ Display times that compressor starts;

④ You can check which state the unit operates in ( 25%、50%、75%、100% ) ;

⑤ Display if unit has been set with a limit of maximum load;

⑥ Display if unit gives an alarm, and which unit head gives the alarm exactly;

⑦ Display if the compressor oil heating is finished. If compressor starts, It need to be satisfied that oil heating time is ‘ 0 ’or oil temperature is satisfy with compressor start” is ‘ Y E S ’;

⑧ Display if the starting temperature is satisfied, when compressor starts, it need to be satisfied that water temperature is satisfied with “compressor start” is‘ Y E S ’;

⑨ Display if the delay restart is satisfy, when compressor starts, it need to be satisfied that “delay restart” is‘ N O ’;

⑩ Display if the minimum operation time is satisfy, when compressor stops, it need to be satisfy that “Min. Running Time Elapsed” is‘ Y E S ’.

Note:when the compressor has oil temperature sensor, it displays that the oil temperature is satisfied with compressor start. When it has no oil temperature sensor, it displays the remaining time of oil heating. It depends on the unit

It displays the refrigerant type on the top left of the screen.

To start the unit must meet the following conditions:

① “Delaying Restart” need to be “NO”, if it is “YES”, the delay time to start the unit is not reached.

② “Water Temperature Allow Compressor Start” need to be “YES”, if it is “NO”, that means the current water temperature is not satisfied with the startup condition of compressor.

③ “Oil Temp. Allow Compressor Start” need to be “YES”, if it is “NO”, that means the current oil temperature is not satisfy with the startup condition of compressor.

Shutdown must meet the following conditions:

“Min. Running Time Elapsed” need to be“YES”, if it is “NO”, the delay time of shutdown is not reached.

3.1 Status information- display of temperature and pressure

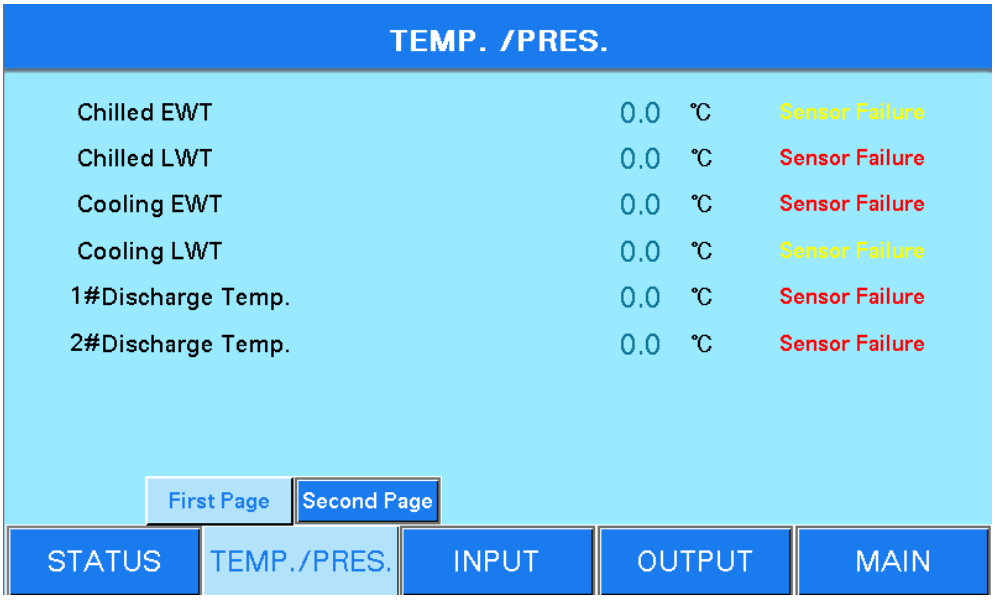



Figure 6.7

3.2 Status information-input status:

Input status page: “ON” represents the input point is closed, OFF represents the input point break. “Compressor overload protection switch”, when the machine is overload, “compressor overload protection switch” input state switches to “ON” and unit enters fault protection state. Normal state of compressor overload protection switch is “OFF”, and normal state of rest protections is “ON”.

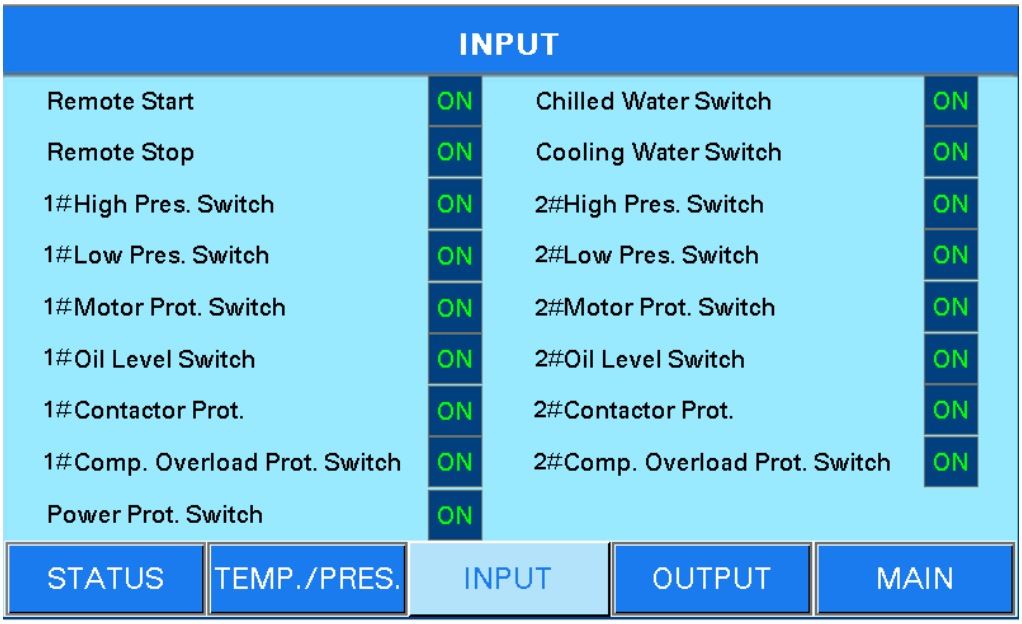



Figure 6.8 (Remark: subject to the actual principle diagrams)

① “Remote start/stop”, it displays the status of remote start or remote stop. User needs to install the point contact type control switch.

② “Chilling/Chilled water flow switch”, it outputs is OFF if water don’t flow, on the contrary, it outputs ON.

③ “Contactor protection”, the output switches from OFF to ON when the compressor operates and

contactor has action.

3.3 Status information-output status

Output status page: ON represents the output point is powered on, OFF represents the input point is powered off.

When the unit is in a shutdown state, all state display is OFF. According to the startup / shutdown command, the relative switch action is activated.

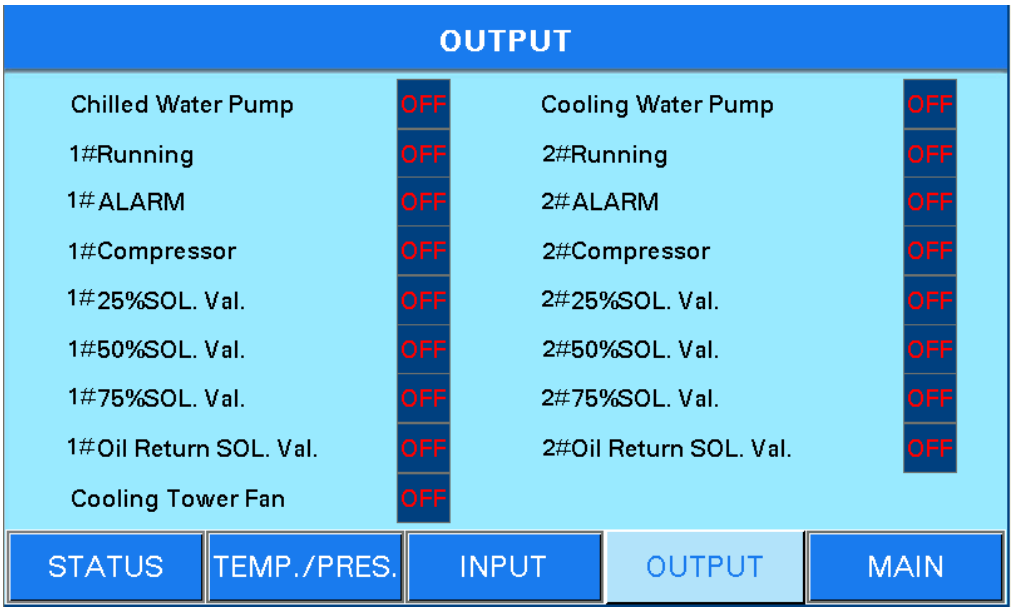



Figure 6.9 (Remark: subject to the actual principle diagrams)

➢ User parameter setting- password interface

Press Parameter setting in the main page, then password input interface appears. Input the password ( ***** )and enter the user parameter setting interface. Password input interface is shown as figure 6.10.

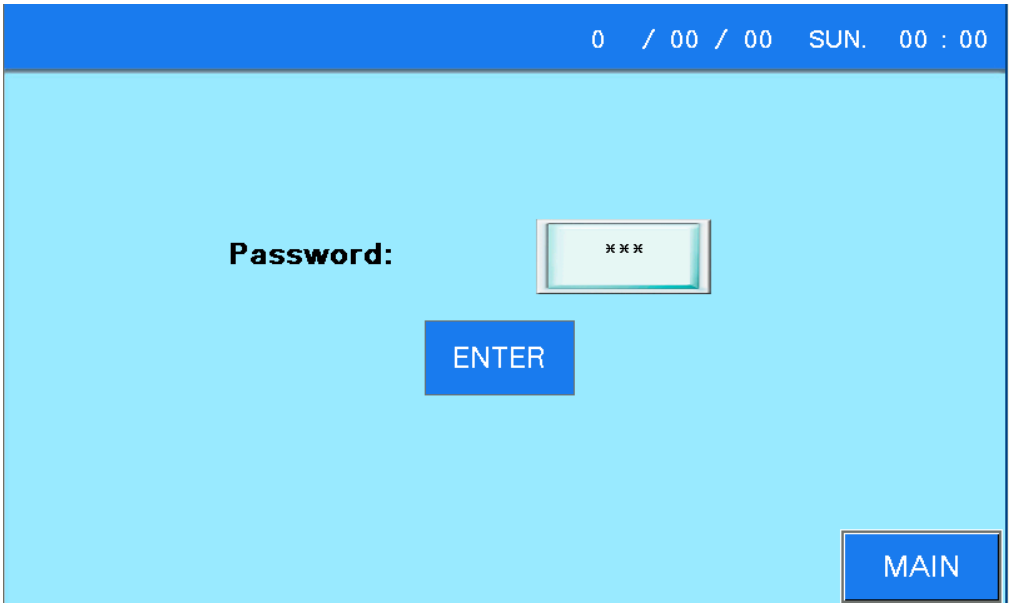



Figure 6.10

Dialog box like figure 6.11 appears if user inputs wrong password. Press Confirm button and go back to the input interface, then input password again.

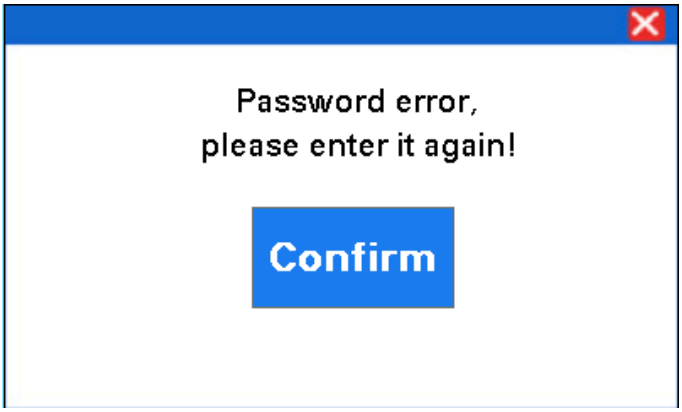



Figure 6.11

5. User parameter setting-temperature setting

Input the password （ ***** ）and enter the page as figure 6.12 as below:

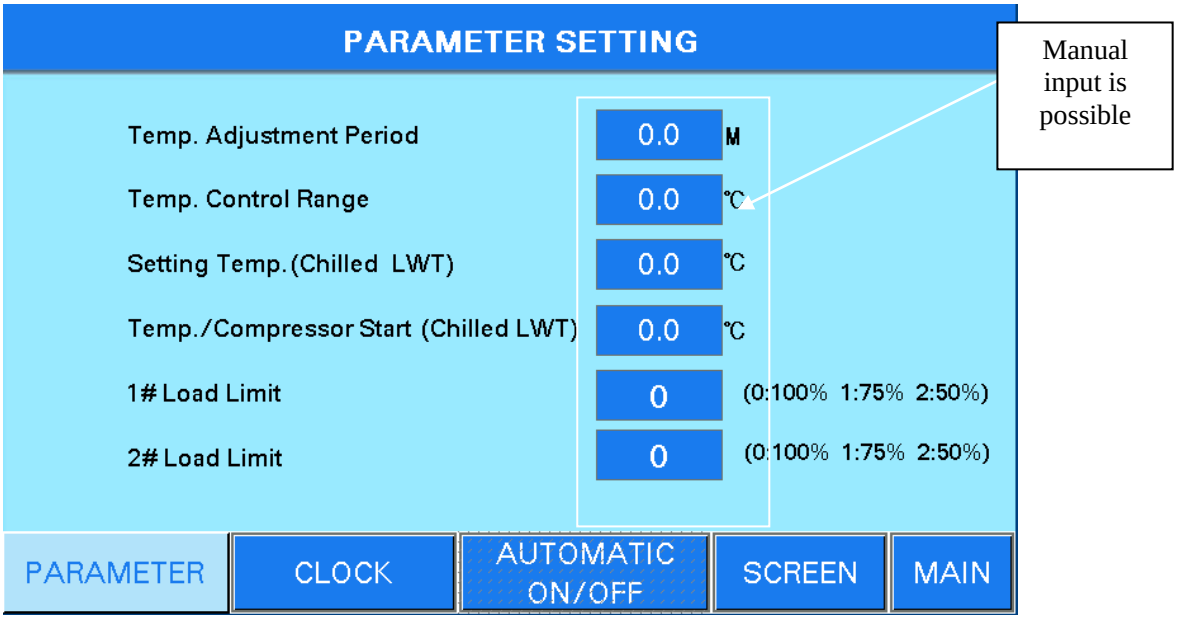



Figure 6.12

“MAX” at the top left of setting window is upper limit of parameter setting, and “MIN” is lower limit of parameter setting (out of range is not accepted). Press Enter button to confirm input. Press CLR button to cancel input, then the keyboard for number input disappears.

Noun explanation

① The temperature adjustment cycle：it represents each execution cycle of the judgment of load or unload. If it is set to be 60S, that means every 60 seconds system judges the unit temperature and check if it needs to load or unload. If it is necessary, system will execute it immediately. After 60 seconds, system judges it again, and repeats the process like this;

② Temperature control range: it means the precision of temperature control, for example, the

factory setting is 2℃,if temperature is within ±0.5℃ of control temperature, the unit does not execute the loading/unloading action;

③ The target value of temperature control: it represents the target value of water temperature control;

④ Temperature of compressor startup: it represents the control water temperature need to meet one condition when compressor starts;

⑤ In cooling mode, when control water temperature is higher than startup temperature, the compressor can start; in heating mode, when control water temperature is lower than startup temperature, the compressor can start;

⑥ Limit of load: the maximum load of unit can be set. 0-without limit of maximum load, 1- maximum load is up to 75%, 2- maximum load is up to 50%.

Timer setting of startup or shutdown Only when control mode is “timer”, it will display.

5.1 User parameter setting-mode selection

Press Clock and enter the clock setting page as figure 6.13.

Click the setting numerical keyboard, then the input numerical keyboard appears. Input the clock and press “ENT”to save the setting. “CLR”represents the input is canceled.

Press Confirm button after setting finish, check if the setting clock is the same with the current time. If it is different, press Confirm again.

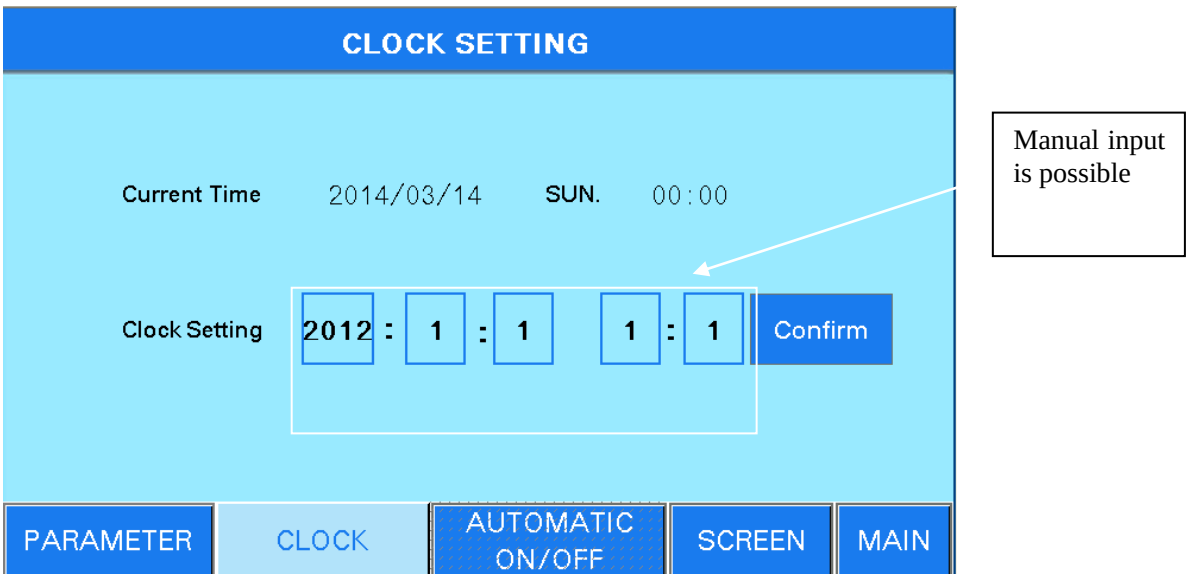



Figure 6.13

Note: when setting date and clock, please note the non-existent date and clock cannot be set, otherwise we are not responsible for any consequences.

5.2 User parameter setting-touch screen setting

User setting- press touch screen setting in the mode setting interface, then the following figure 6.14 will appear.

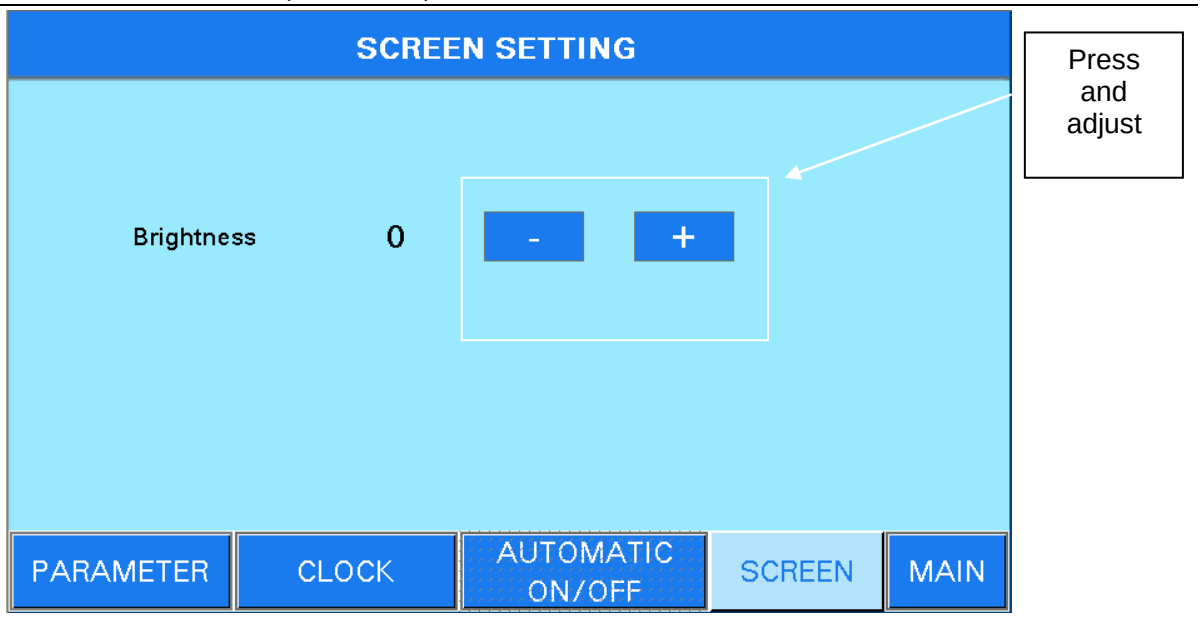



Figure 6.14

5.3 User parameter setting- Automatic On/Off

If user wants to use timer function of start or shutdown, it needs to choose “timer” in control mode of the figure 2 and enters user setting. Press AUTOMATIC ON/OFF and enter figure 6.15 as below:

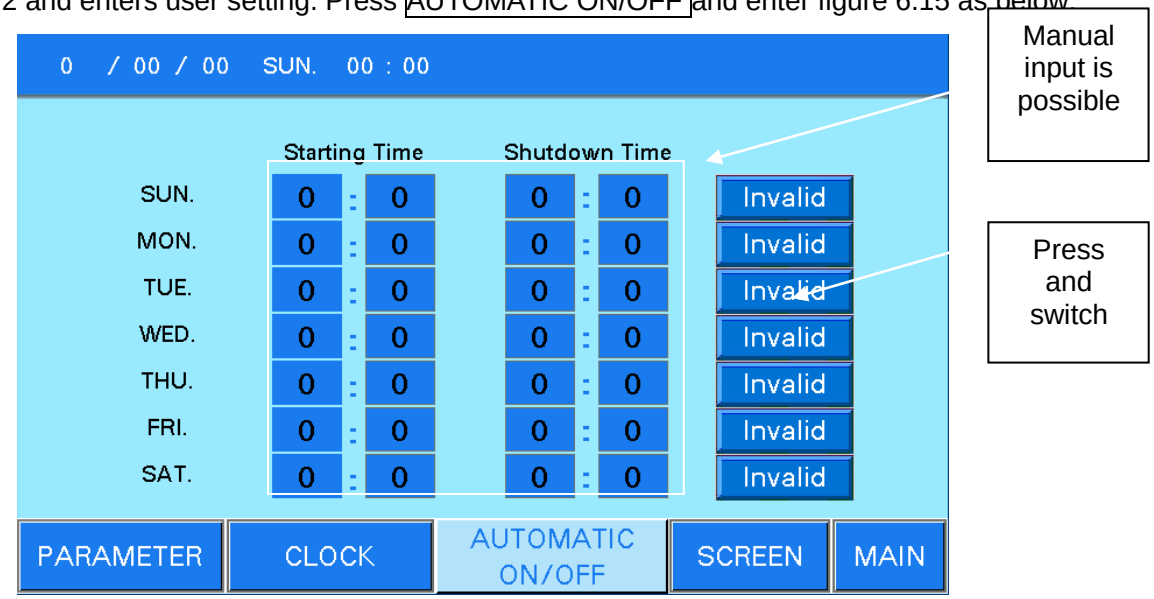



Figure 6.15

Timer of starting and shutdown in one week can be set, and unit will start or shutdown according to the timer setting. If the unit needs to continue running for a period, for example: start from Tuesday 10:00 and shutdown at 16:00 Thursday, user can set as 10:00 and switch the button from Invalid to Valid in the timer starting setting of Tuesday, then set as 16:00 and switch the button from Invalid to Valid in the timer shutdown setting of Thursday, rest timer buttons are set as Invalid .

Please check the system time when using timer function because the timer starting and shutdown is according to the system time.

6. Alarm window

Press Alarm button in the main page and enter real-time alarm window, as figure 6.16 below.

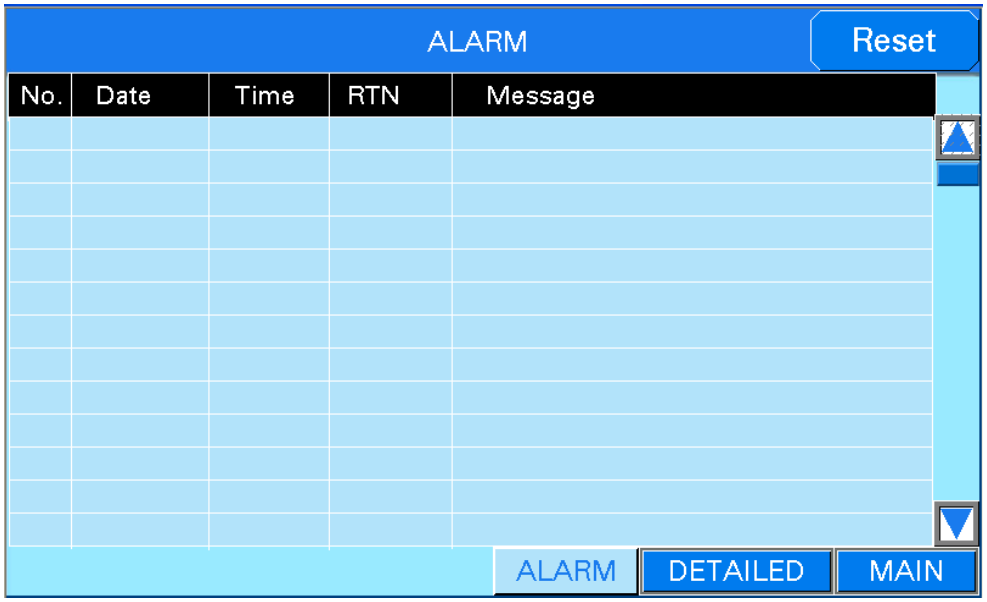



Figure 6.16

If the alarm happens, unit executes orders according to the fault program. After fault recovery, press the “reset” button, the system returns to normal state. When there are more faults, click the slide bar or arrow keys to check the faults. Red represents fault has not been eliminated, green represents fault has been eliminated.

Note:

①the high pressure protection cannot resume automatically, user needs to find the high pressure protection switch and reset it manually.

②the over load protection cannot resume automatically, user needs to find the thermal relay in the control cabinet and reset it manually.

6.1 Alarm history

Press the Detailed and enter record page, it records the alarms when compressor is running. As the figure 6.17 in the below: the alarm record can keep 5 pieces at most, it will update automatically if it is more than five. Check the real-time status including temperature, pressure, and status of input and output point.

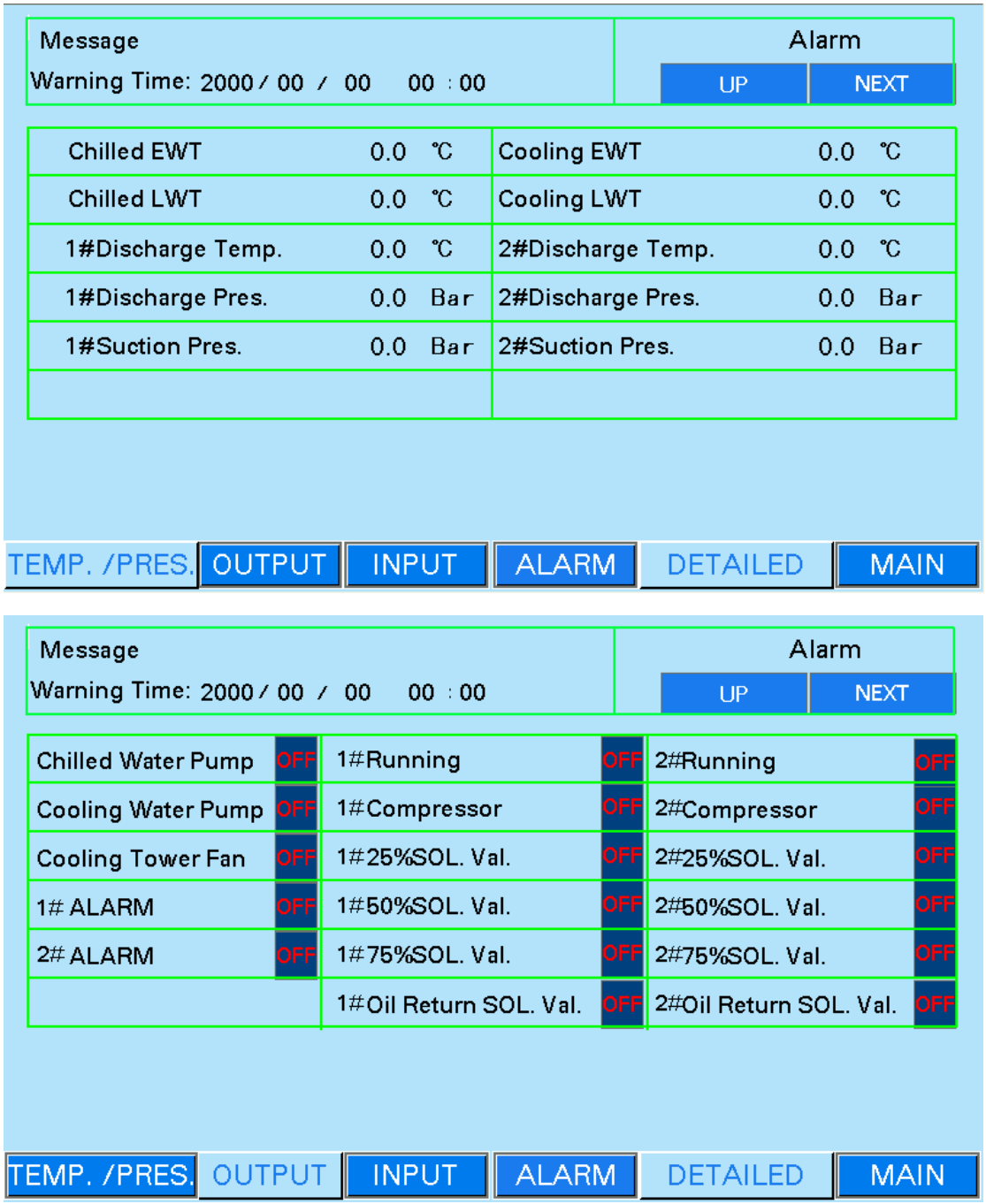
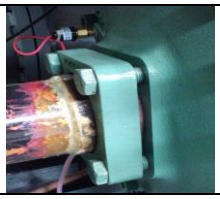



Figure 6.17

Please refers to the actual operation interface; it is subject to change without notice.

## 7. Safety protection

| Name | Code | Brand | Setting Range | Location |
|---|---|---|---|---|
| Low-pressure Switch | YK-0.3/0.20-O-R-7000 | JUNLE | ON 0.30Mpa<br>OFF 0.20Mpa |  |
| High-pressure Switch 1 | YK-1.9/1.4-C-R-7000 | JUNLE | ON 1.9Mpa<br>OFF 1.4Mpa | |

Note: Manual reset is needed for high-pressure switch.

**Safety Devices**

- **Compressor protection module**

The units are equipped with compressor protection modules built in the wiring cabinet of compressor. INT69 HBY and JTX-A module is designed to detect the motor winding temperature, phase sequence and phase loss. The detecting signal of JTX-A is voltage type. When motor winding temperature reaches set point, the module will cut off control circuit immediately. The module with phase sequence control can prevent motor reversal due to the adverse consequences. When any one phase loses, the module will cut off main power after a short delay to protect the motor from burning. When phase unbalance happens, it cuts the power immediately. In order to avoid interference and discriminate between false voltage drop and malfunction as phase loss or phase unbalance during motor operating, JTX-A will cut off main power after 3-5s delay.


- **Thermal overload relay**

Each compressor is equipped with one thermal overload relay to protect the compressor against overcurrent. Bypass the current transducers or make any changes to the factory default set points is forbidden. The configuration of the module defines the Must Trip Amps (MTA) at which the thermal overload relay will turn the compressor off.

- **High/low pressure switch**

All compressors have factory-installed high/low-pressure switches. See Table.6.10

Table – High/low-pressure switch settings

| UNIT | High-pressure switch setting | | Low pressure switch setting | |
|---|---|---|---|---|
| | Protection value | Reset Value | Protection value | Reset Value |
| xxxxB3O3/2WT1DB | 19bar | 14bar | 2bar | 3bar |

Table.6.10

If the high pressure switch continuously opens for 3s during operation, the compressor will be shut down. A manual reset of the control is required to restart the compressor. If the low pressure switch continuously opens for 1s during operation, the compressor will be shut down. It will reset automatically when malfunction gets solved and cleared on the malfunction record page of touch screen. Sometimes if the malfunction cannot be solved by reset, consider replace the pressure switches.

- **Evaporator protection-Low Chilled Leaving Water Temperature**

PCB is programmed to shut the chiller down if the leaving water temperature drops below 4 °C. When water temperature rises up to 10℃, the safety resets and the chiller restarts. Besides, the chillers are equipped with antifreeze switch which located on the outlet of chilled water. If leaving water temperature continuously keeps lower than 3 °C for 3s during operation, the chiller will be shut down. When water temperature rises up to 10 °C, the chiller resets, but it needs manually reset on the touch screen.

**IMPORTANT:** If unit is installed in an area where ambient temperature may fall below 32 F (0° C), a suitable corrosion-inhibited antifreeze solution or auxiliary electric heater must be used in the chilled water circuit.

# Ⅳ.Electrical control

## 1.Electrical data

| TMCUxxxxB3O3/2WT1DB | | 253 | 318 | 400 | 485 | 628 | 859 | 970 | 1057 | 1256 | 1487 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Standard voltage | V | 380V 3Ph 50Hz | | | | | | | | | |
| Voltage range | V | 340~420 | | | | | | | | | |
| Max. running current | A | 120 | 148 | 189 | 205 | 277 | 383 | 445 | 458 | 554 | 662 |
| Max. power consumption | kW | 80.6 | 95.5 | 127.5 | 148.1 | 188.2 | 255.5 | 296.2 | 329.6 | 376.4 | 443.7 |
| Rated current | A | 92 | 119 | 146 | 171 | 213 | 295 | 341 | 365 | 427 | 509 |
| Compressor A | | | | | | | | | | | |
| Locked rotor Amps. | A | 690 | 780 | 875 | 1220 | 1510 | 2355 | 1220 | 1220 | 1510 | 1510 |
| Max. allowed current | A | 145.2 | 171.9 | 229.6 | 266.7 | 338.9 | 460 | 266.7 | 305.1 | 338.9 | 338.9 |
| Rated current | A | 92 | 119 | 146 | 171 | 213 | 295 | 171 | 194 | 213 | 213 |
| Rated power | kW | 53.6 | 67 | 85 | 100 | 125 | 173 | 100 | 114 | 125 | 125 |
| Compressor B | | | | | | | | | | | |
| Locked rotor Amps. | A | -- | -- | -- | -- | -- | -- | 1220 | 1330 | 1510 | 2355 |
| Max. allowed current | A | -- | -- | -- | -- | -- | -- | 266.7 | 266.7 | 338.9 | 460 |
| Rated current | A | -- | -- | -- | -- | -- | -- | 171 | 171 | 213 | 295 |
| Rated power | kW | -- | -- | -- | -- | -- | -- | 100 | 100 | 125 | 173 |
| Crankcase heater | | | | | | | | | | | |
| Voltage | V | 380 | 380 | 380 | 380 | 380 | 380 | 380 | 380 | 380 | 380 |
| Total input | kW | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.6 | 0.6 | 0.6 | 0.6 |
| Total Amps. | A | 1.36 | 1.36 | 1.36 | 1.36 | 1.36 | 1.36 | 2.72 | 2.72 | 2.72 | 2.72 |

NOTE:

1). Customer to specify the exact nominal power supply available at site so that electrical components are selected accurately.

2).Main power must be supplied from a single field supplied and mounted fused circuit breaker.

3).The compressor crankcase heaters must be energized for hours before the unit is initially started or after a prolonged power disconnection.

4).All field wining must be in accordance with local standards.

5).Neutral line required on 380V-3Ph-50Hz(5 wires) power supply.

6).Rated load Amps values are on nominal conditions.

7).The ±10% voltage variation from the nominal is allowed for a short time not permanent.

## 2. Electrical components introduction

### 1) Power protector

This module is used to detect power supply and provide protection in case of phase loss, phase sequence, and under voltage of incoming line power, so as to prevent damage to the compressor or other components caused by power failure. Some models also provide protection for overvoltage and three phase imbalance.

**2) Time Relay and Intermediate Relay**

The time relay is an automatic switch device which performs delayed control based the electromagnetic or mechanical principles. It controls the star delta switching time for the compressor contactor. The preset time is star operation time (6s). The coil voltage is AC 220V. The rated contact current is usually low and is used for controlling the loop only.

The intermediate relay delivers intermediate signals among control circuits to increase the number and capacity of contacts. Normally, the main control board output controls starting and stopping of loads such as motor and water pump by using the intermediate relay to drive the contactor coil. The coil power supply can be DC or AC. Our standard screw compressor model uses the AC220V coil.

**3) Compressor thermal overload relay**

The thermal overload relay works based on the principle of heating effect of electric current. With inverse time limit action feature which is similar to the permissible overload feature of the motor, it is used to provide overcurrent protection for the compressor and fan. For compressor overload protection, the major loop current of the motor is converted to an AC 0-5 A current signal by the current mutual inductor. Then the thermal overload relay performs overload protection. For fan overload protection, the thermal overload relay is connected in series with the major loop.

**4) Current transformer and Transducer**

The current transformer transforms primary current with a larger value to secondary current with a smaller value for the purpose of protection or measurement. A current transformer with transformation ratio of 400/5 can transform 400A current to 5A.

A transducer transduces the measured current to DC voltage or DC current. After the current transformer transforms the current to AC 0-5 A current signals, the transducer outputs 4-20 mA analog signal based on the linear scale to the main control board.

**5) Electronic Expansion Valve**

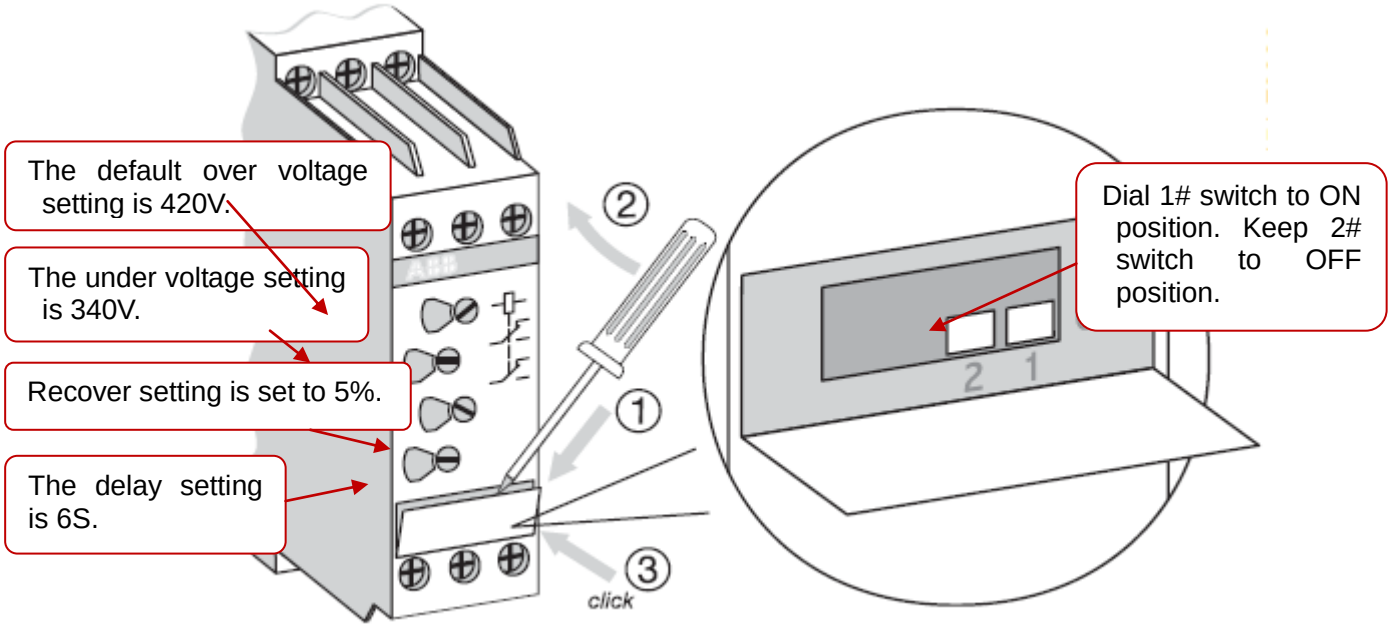
The electronic expansion valve is equipped with a stepping motor which controls the valve status. A special-purpose electronic expansion valve control module is required to drive the electronic expansion valve.

**6). Solenoid Valve**

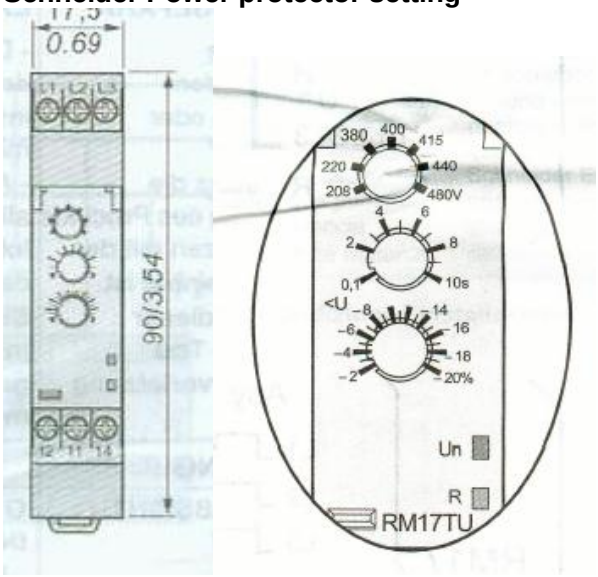
When the solenoid valve is energized, the electromagnetic coil generates electromagnetic force to pull up the closed component from the valve seat and the valve is open. When the solenoid valve is powered off, the spring pushes the closed component to the valve seat once the electromagnetic force disappears and the valve is closed. Voltage of the solenoid valve washer is AC220V, and it is driven directly by the main control board output.

## 3.Electrical Parts parameter setting

### 1) Power protector module setting in detailed:



**2) Schneider Power protector setting**

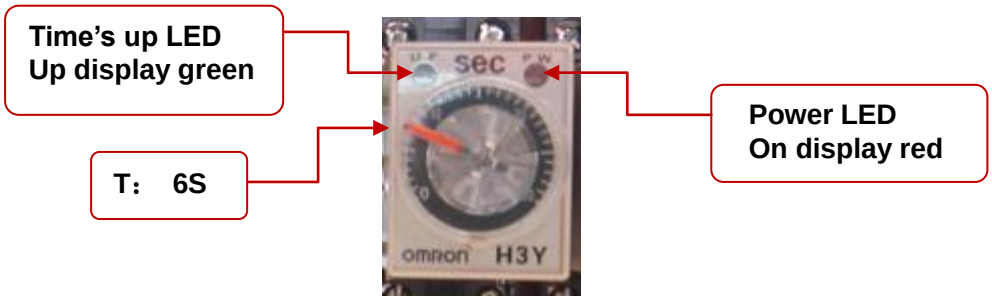



**Power protector use schneider RM17TU type.**

① Select the voltage class. For standard units, the voltage are 380 V.
② Set the delay time to 6s.
③ Set the under voltage value to 10%.

**Note: Set the processing parameters only when the system is powered off.**

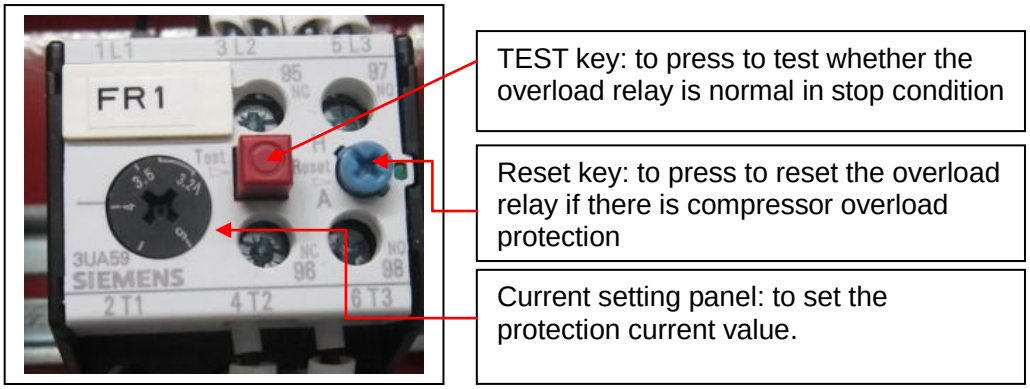
**3) Time Relay**




**Time relay use omron H3Y type.**

**4) Compressor and fan thermal overload relay**

Thermal overload relay takes advantage of heating effect to protect the compressor and fans.



Note：Compressor overload relay, only apply to 3UA series of Siemens brand

**5).Compressor thermal relay value:**

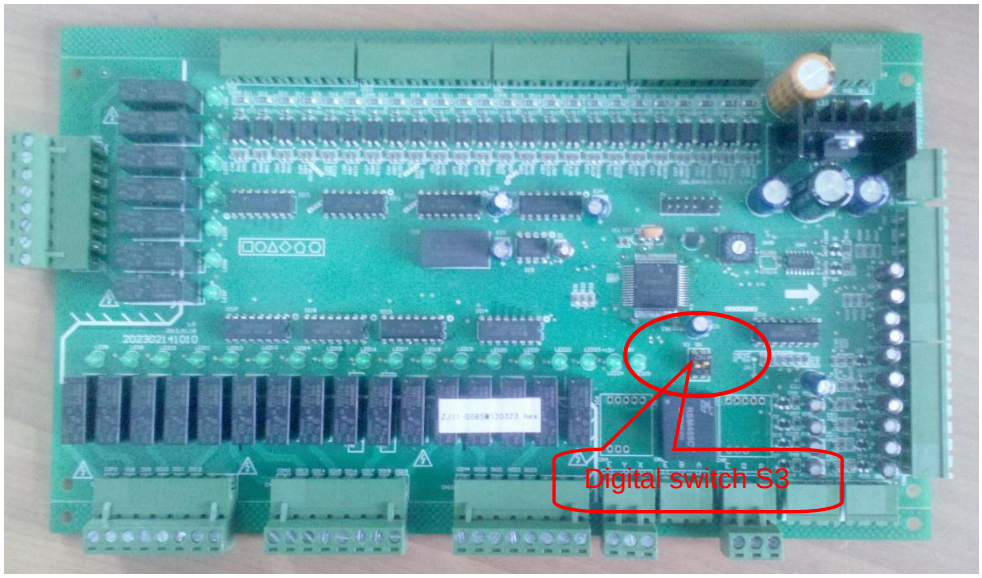
The calculation of compressor overload value (transformation ratio of current mutual inductor is A/B) is as follows:

(Maximum running current of compressor/current mutual inductor A) x B = Thermal relay value of compressor. For example, if the maximum running current of compressor is 250 A, and the transformation ratio of current mutual inductor is 300/5, Thermal relay value = (250/300) x 5 = 4.17

Note: Use a value that is smaller than the calculated one. For example, in the preceding calculation, the calculated value is 4.17; in practice, set the value to 4.15.

| Unit Type | Maximum Running Current of Compressor | Transformation Ratio of Current Transformer | Thermal Relay Value of Compressor |
|---|---|---|---|
| 253 | 126 | 200/5 | 3.2 |
| 318 | 150 | 200/5 | 3.8 |
| 400 | 200 | 300/5 | 3.4 |
| 485 | 232 | 300/5 | 3.9 |
| 628 | 295 | 400/5 | 3.7 |
| 859 | 400 | 500/5 | 4.1 |
| 970 | 464 | 300/5 | 3.9 |
| 1057 | 497 | 300/400 | 39/3.4 |
| 1256 | 589 | 400/5 | 3.7 |
| 1487 | 695 | 500/5 and 400/5 | 3.7/4.1 |

**6) Main base controller DIP setting**

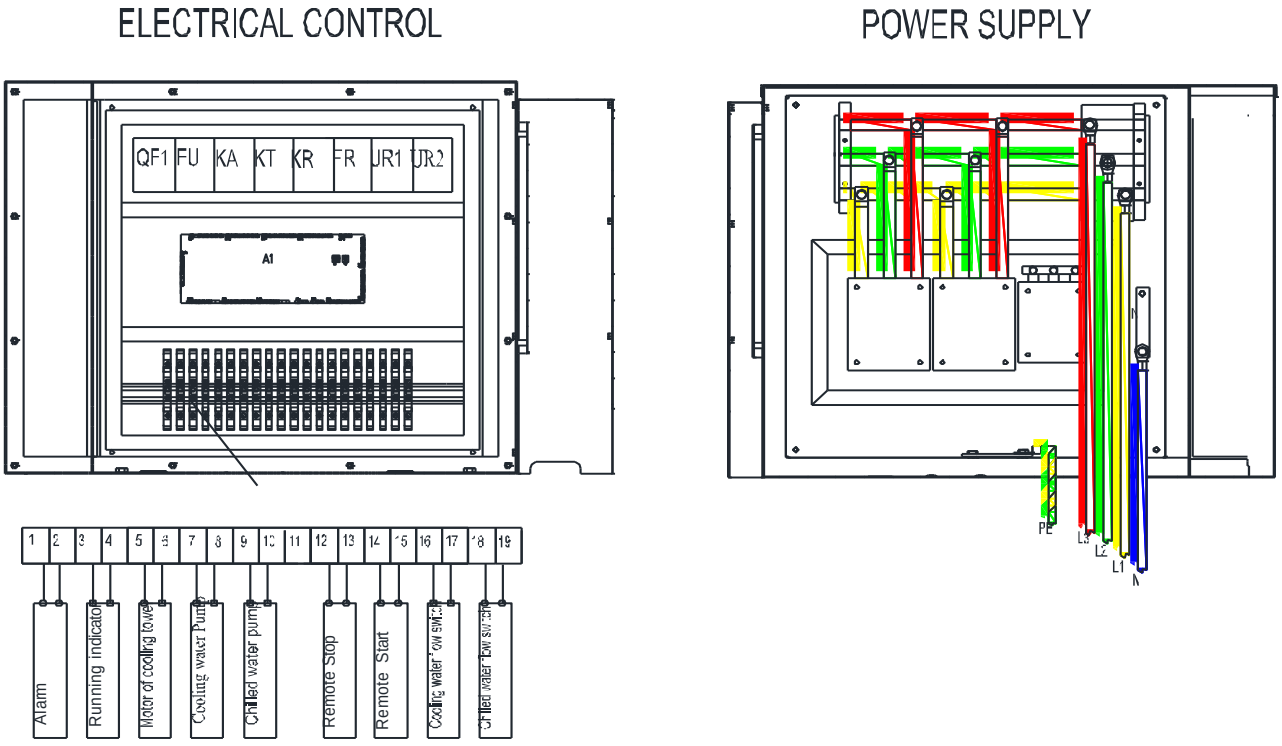



Digital switch factory default status
There are adjustable digital switch on PCB.

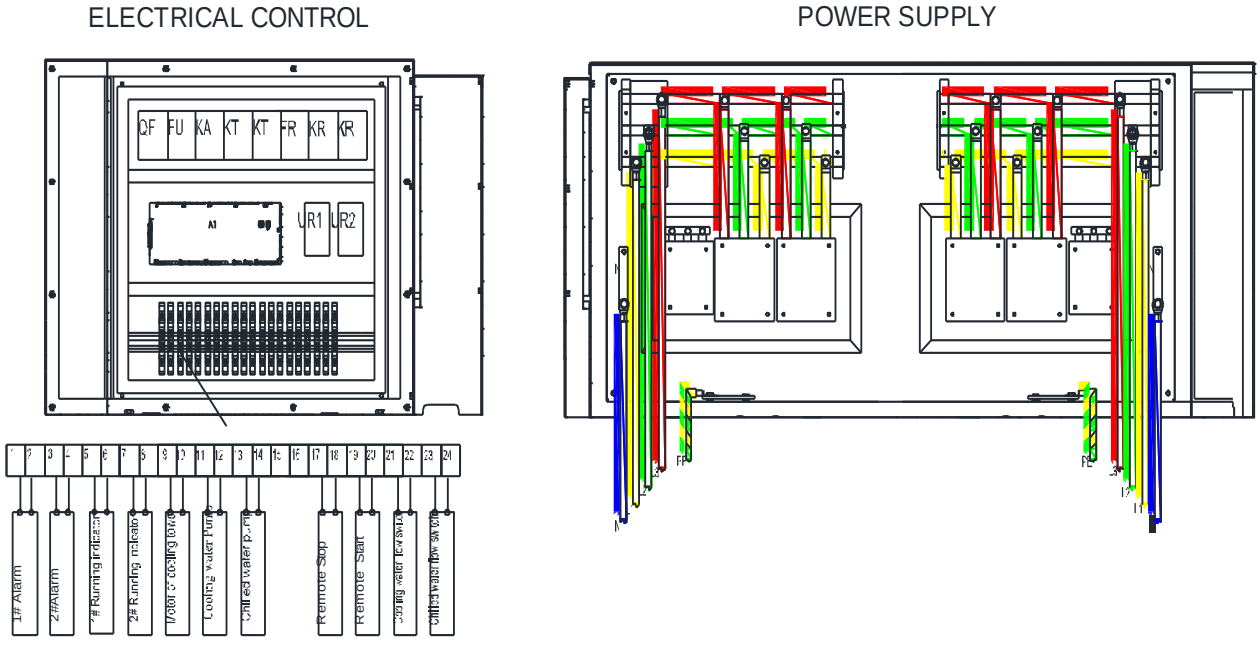
S3 digital switch instruction:
Digital switch 1：for single compressor unit, dial to ON; for dual compressors, dial to OFF.
Digital switch 2：for no lubricating oil temperature sensor unit ,dial to ON; for lubricating oil temperature sensor unit ,dial to OFF.

## 4.Field wiring

### 1) Wiring diagram




[*Wiring Diagram of 253□318□400□485;  628;  859]*




[*Wiring Diagram of 970□1057□1256□1487*]

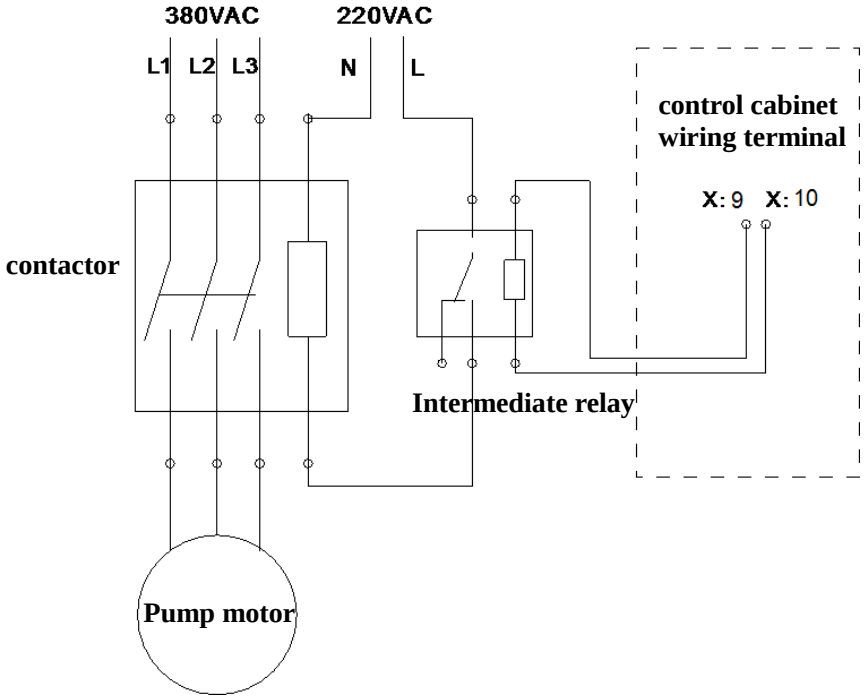
### 2)Recommended cable and mould case circuit breaker

| Type | Electric Cable ($mm^2$) | | Capacity of Breaker (A) | Note: It is recommended that only copper-conductor cables are used in this unit. In high-altitude areas with high temperature, temperature derating should be considered, that is, the capacity of breaker device should be increased properly. |
|---|---|---|---|---|
| | Phase line | PE line | | |
| 253 | 25 | 16 | 160 | |
| 318 | 35 | 16 | 160 | |
| 400 | 50 | 25 | 250 | |
| 485 | 70 | 35 | 250 | |
| 628 | 95 | 50 | 400 | |
| 859 | 150 | 70 | 400 | |
| 970 | 185 | 95 | 630 | |
| 1057 | 2*70 | 70 | 630 | |
| 1256 | 2*95 | 95 | 630 | |
| 1487 | 2*120 | 120 | 800 | |

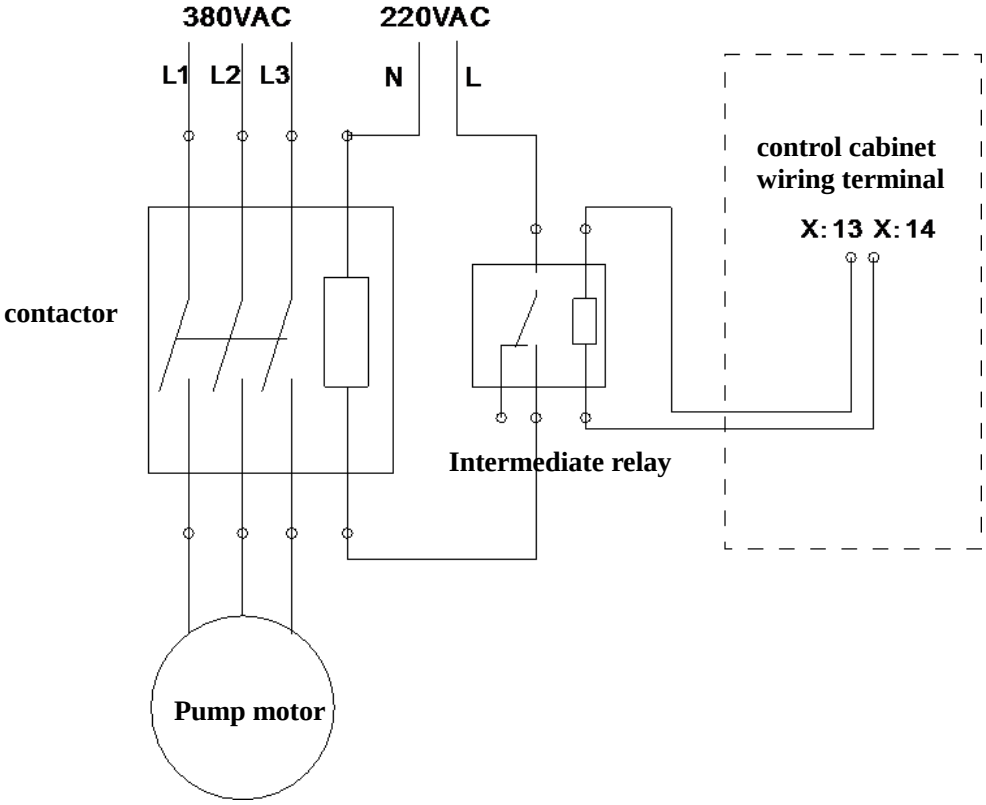
**Note: The length of leading-in power cables in the unit cannot exceed 180 m.**

**3) Cooling and chilled water pump wiring**

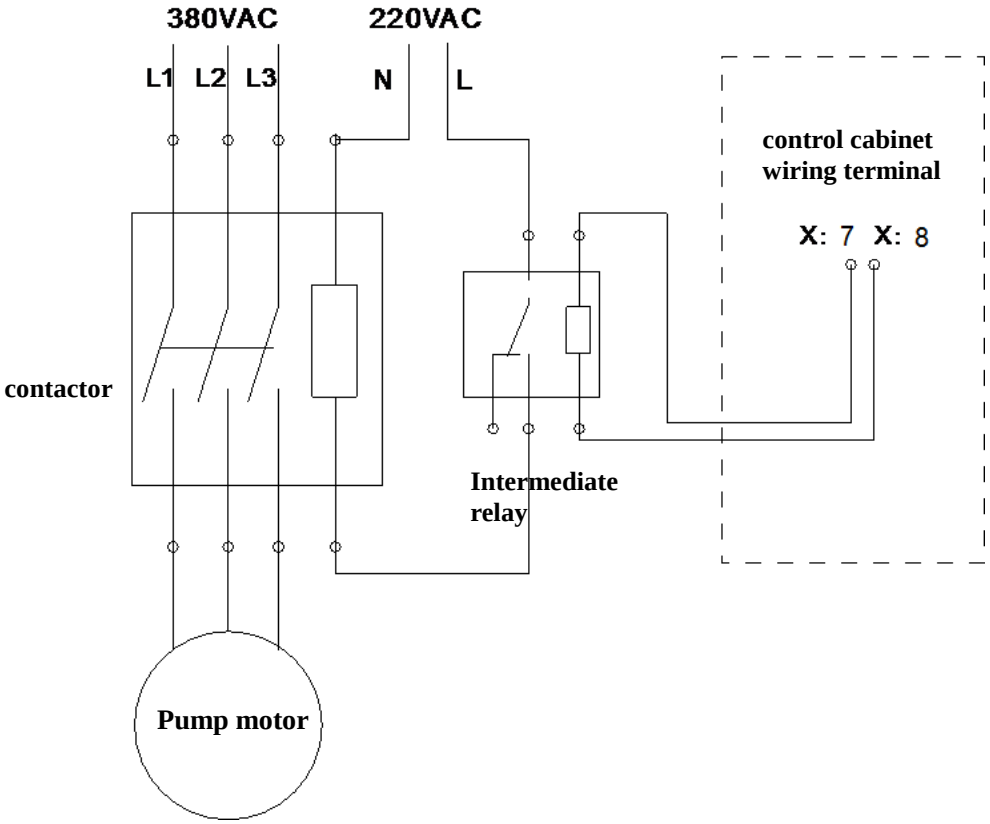
Chilled water pump wiring for 253；318；400；485； 628； 859 models



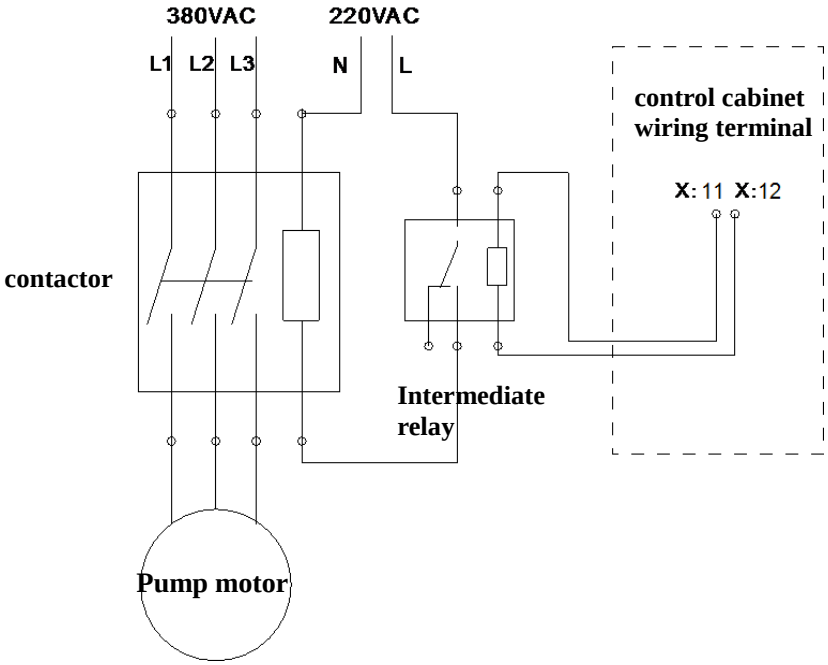
Chilled water pump wiring for 970；1059；1200；1256; 1487 models




Cooling water pump wiring for 253；318；400；485； 628； 859 models



Cooling water pump wiring for 970；1057；1200；1256; 1487 models

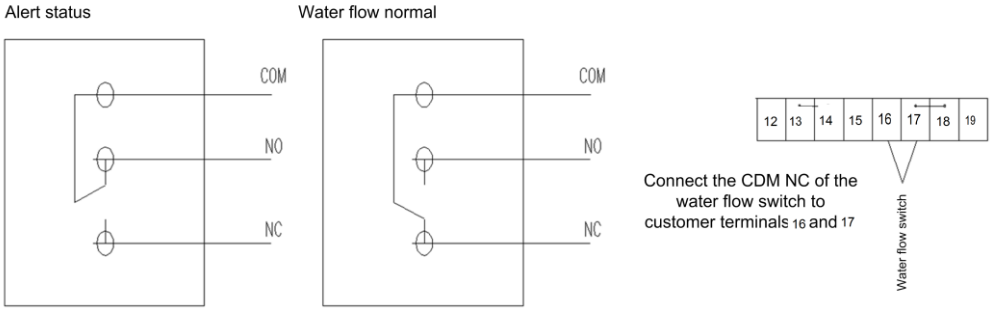



**4) Cooling and chilled water flow switch wiring**

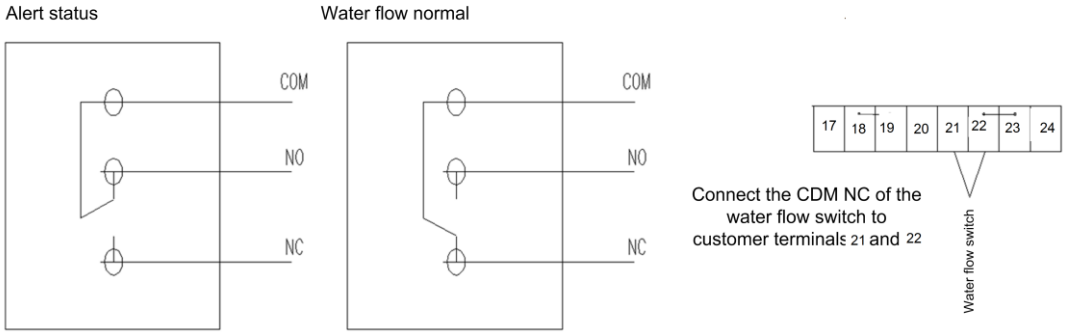
Typically, a water flow switch is installed in the pipe of cooling water system to monitor the flow status of cooling water in real time. Once the cooling water stops flowing, the water flow switch sends an alarm signal to the controller, which will perform timely processing to prevent accidents from occurring.

Note: A water flow switch is only a protection switch and cannot be used as a signal for unit power-on or power-off.

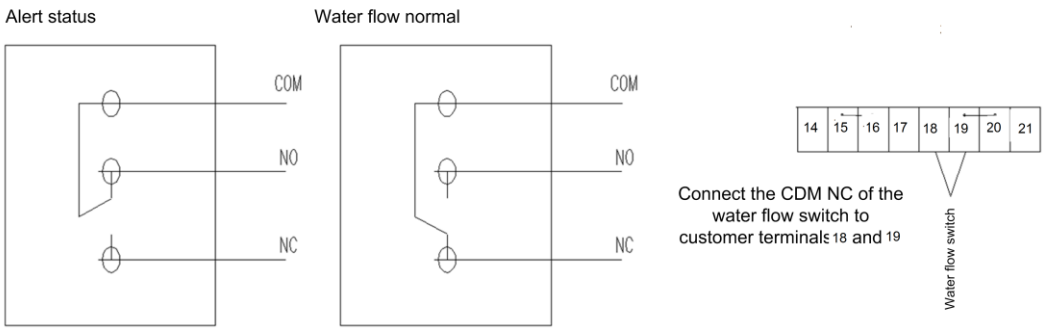
**Cooling water pump wiring Diagram of 253；318；400；485； 628； 859 models**



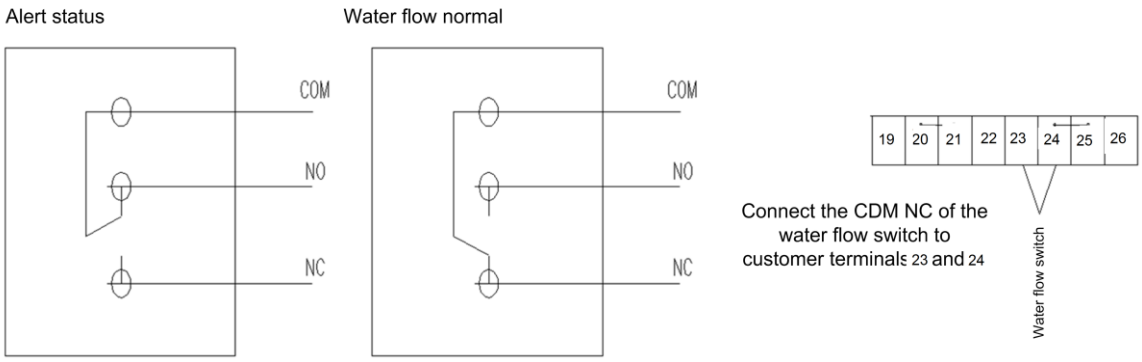

**Cooling water pump wiring Diagram of 970；1057；1200；1256; 1487 models**



**Chilled water pump wiring Diagram of 253；318；400；485； 628； 859 models**

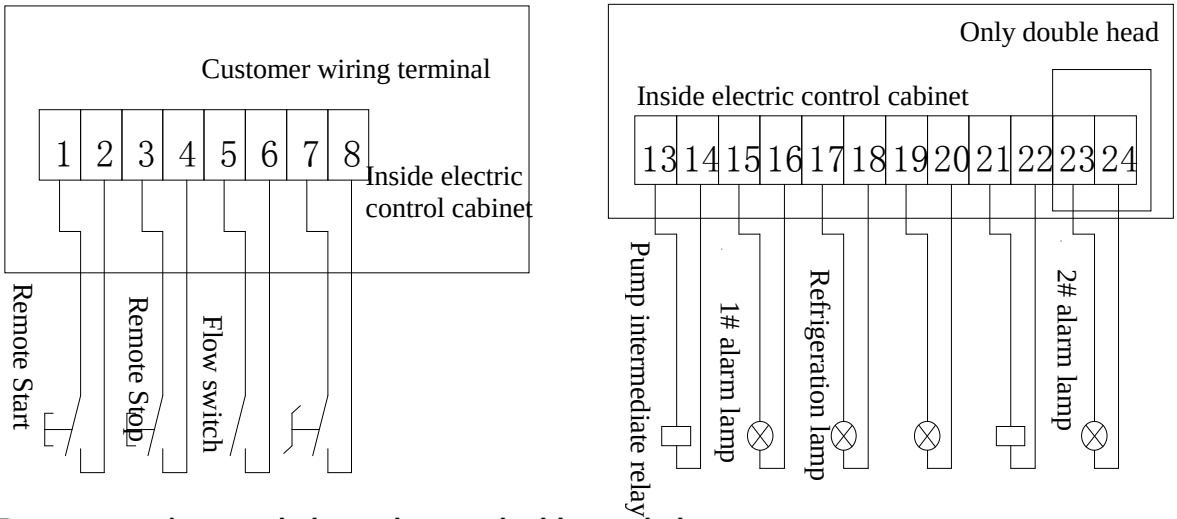



**Chilled water pump wiring Diagram of 970；1057；1200；1256; 1487 models**




**5) Remote control wiring**

The wiring ports for remote start/stop, flow switch, water pump linked control, alarm indication, etc. are reserved in the electrical cabinet of the unit, with the numbers shown in the diagram below.




**Remote start/stop switch need to use inching switch.**

**Lamp input 220VAC.**

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Air Conditioning Systems

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