TRUST
Air Conditioners

FLOODED 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

(1) 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.

(2) 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.

(3) 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.

(4) 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:

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. 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. 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

(1) 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.

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

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

(2) 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.

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

(4) If the work is interrupted, always ensure that all circuits are still deenergized 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: R134a
- 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 ensure 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 R134a charge, as indicated on the unit name plate. Certain parts of the circuit can be isolated. Only charge liquid refrigerant R134a 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 (R134a) 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 weld or flame cut the refrigerant lines or any refrigerant circuit component until all refrigerant (liquid and vapor) has been removed from chiller. Traces of vapor 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 hydronic 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

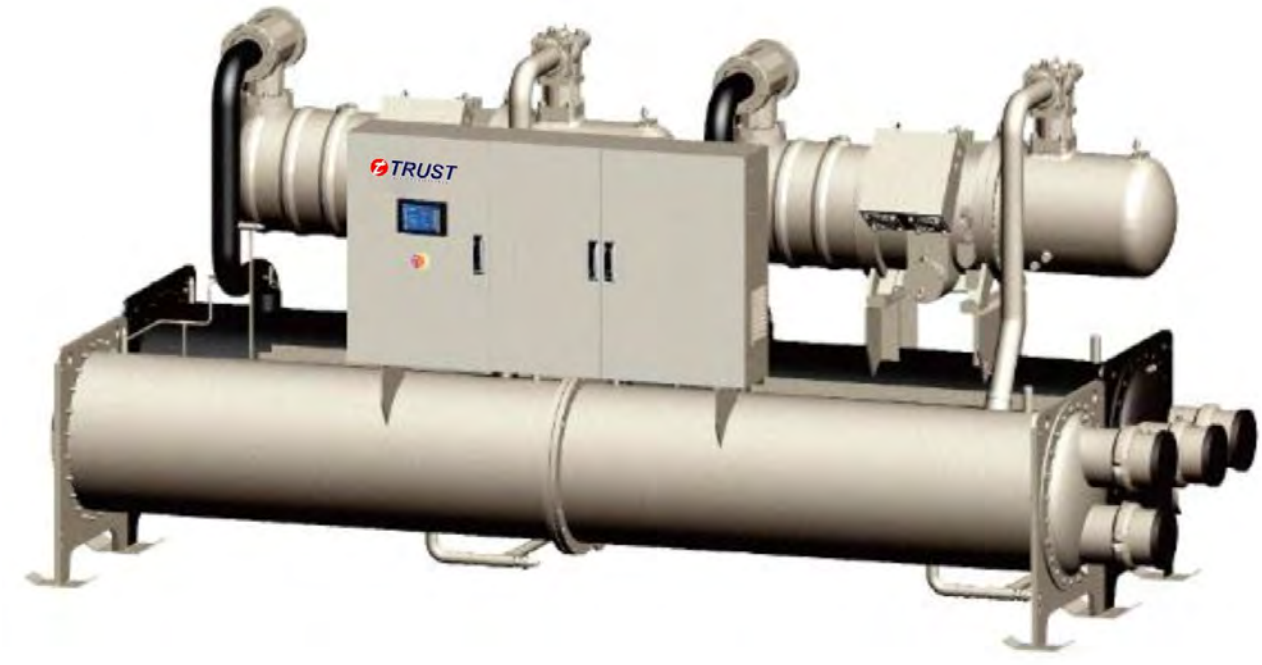
1）Product Line Up

Series	Model	Power Supply	Cooling Capacity (kW)	Quantity of Compressor
Single head	*CC03-TMCU0340BO3/1WT1FA*	380V/3Ph/50Hz	340	1
	CC03-TMCU0440BO3/1WT1FA	380V/3Ph/50Hz	440	1
	CC03-TMCU0540BO3/1WT1FA	380V/3Ph/50Hz	540	1
	CC03-TMCU0690BO3/1WT1FA	380V/3Ph/50Hz	690	1
Dual head	*CC03-TMCU0805BO3/1WT1FA*	380V/3Ph/50Hz	805	1
	CC03-TMCU0890BO3/1WT1FA	380V/3Ph/50Hz	890	1
	CC03-TMCU1080BO3/1WT1FA	380V/3Ph/50Hz	1080	2
	CC03-TMCU1200BO3/1WT1FA	380V/3Ph/50Hz	1200	2
	CC03-TMCU1385BO3/1WT1FA	380V/3Ph/50Hz	1385	2
	CC03-TMCU1620BO3/1WT1FA	380V/3Ph/50Hz	1620	2
	CC03-TMCU1780BO3/1WT1FA	380V/3Ph/50Hz	1780	2

2) External appearance

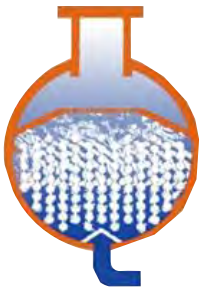
Single head(TMCU0340BO3/1WT1FA~ TMCU0890BO3/1WT1FA)

Dual head(TMCU1080BO3/1WT1FA~TMC17U80BO3/1WT1FA)



2. Features

High efficiency



- High efficiency inner grooved copper pipe enhances the heat-exchange process, improves heat exchange efficiency and makes the evaporator more compact to save installation space.
- Significantly improve the evaporating temperature and reduce heat transferring temperature difference which directly improves heat-exchange efficiency, provide most cost effective & reliable solutions to all valuable customers.
- Supreme efficiency in partial load.

Green chiller

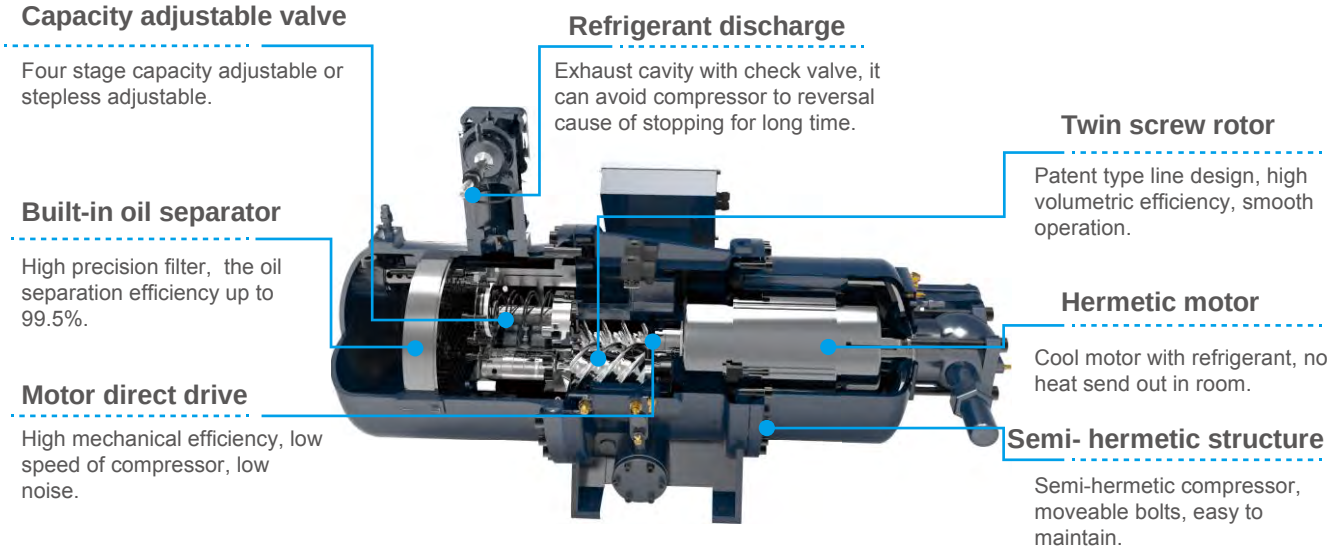
- R134a environmental-friendly refrigerant

  Refrigerant of the Chlorine-free HFC with zero ODP (Ozone Depletion Potential).

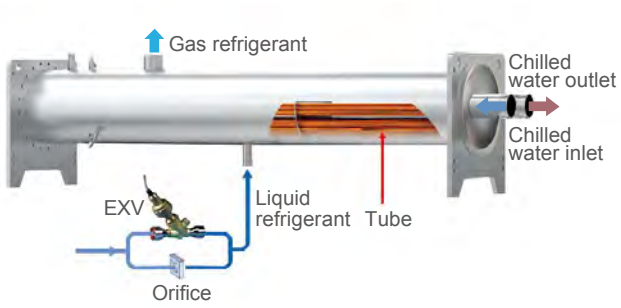
  Very low GWP (Global Warming Potential).

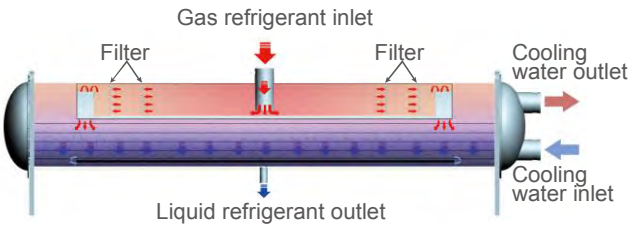
High reliability and excellent serviceability

Advanced twin-rotor screw compressor



High efficiency heat exchange technology

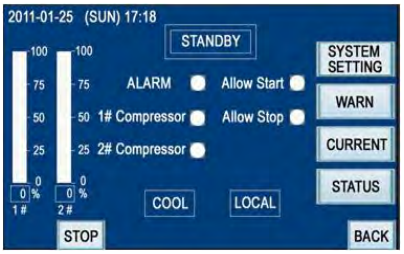




High efficiency shell and tube heat exchanger, 2 path, straight water pipe, easy to clean. End cover can be exchanged to meet customer's requirement for condenser.

- Flooded evaporator makes cleaning inside of pipes possible, and guarantees high reliability.
- Discharge cut-off valve and liquid line angle valve for simplified maintenance.
- Simplified field wiring for easy installation.

Optimized & user-friendly operating Interface



- Trust chiller adopts Trustt Microprocessor which provides advanced algorithm and reliable control.
- Graphical display of the operating state, operation scheduling. malfunction inquiry, help menu for easy trouble shooting and other user-oriented functions.

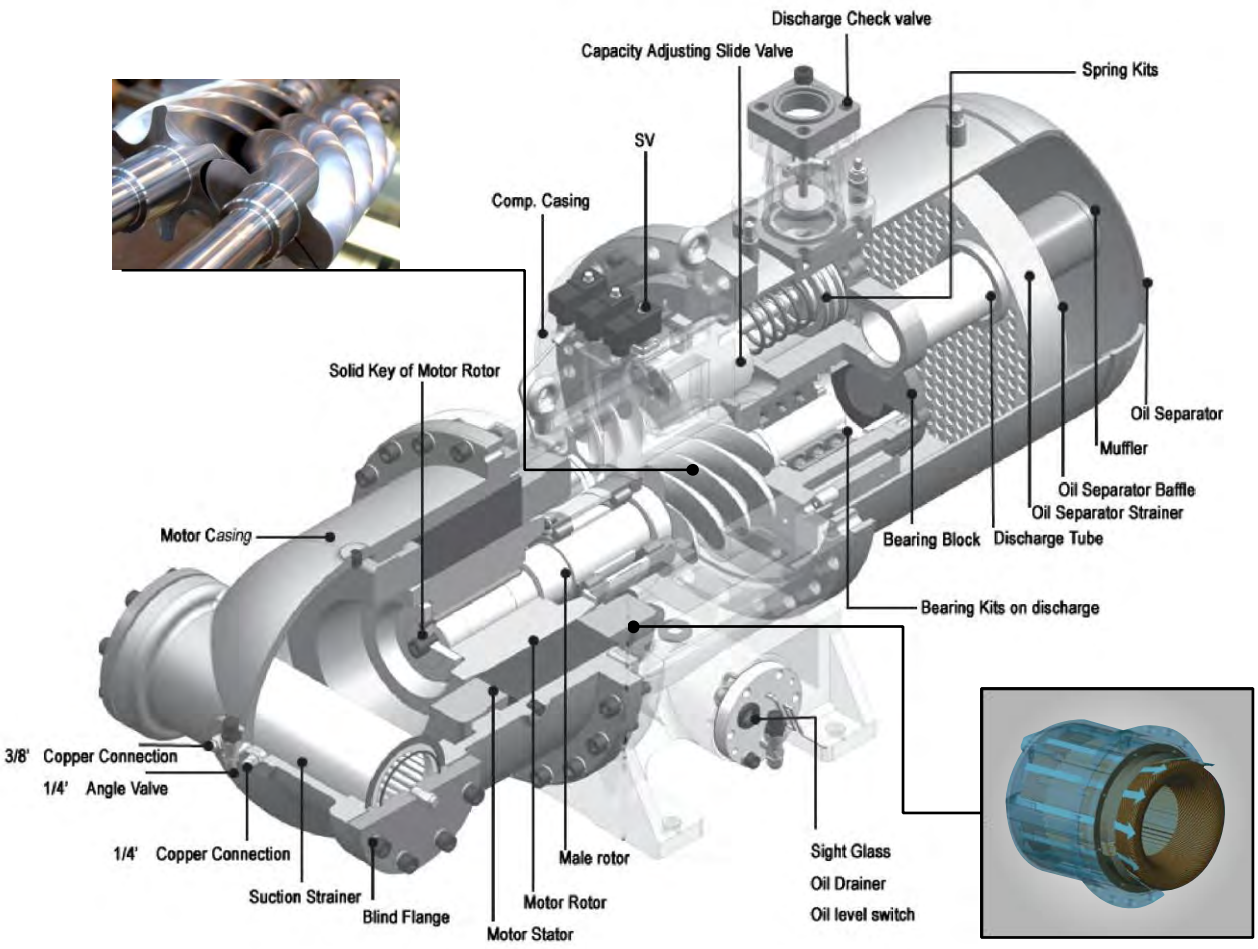
Compressor bearing

High-precision large-sized axial and radial bearings are selected to support the male and female rotors for long lasting life. With effective lubrication system, the bearing service life can be further extended. While the compressor is running, lubricant is injected into all bearings due to pressure difference.

SKF brand industry use bearing guarantees 60,000h continuous working

Advanced twin-rotor screw compressor

Trust ® Screw Chiller equipped with the 3rd generation industrial Semi-hermetic Screw compressor that has the latest advanced 5-6 asymmetry dentiform rotors. The rotors are processed by high-precision CNC and each part is well-proportioned and none-gap matching, which minimize the friction resistance and clearance loss, guarantee quiet running and good duration.



- High-precision machining and measurement make rotor clearance reach μm-class, so it reduces the leakage between high and low pressure. Under continuous operation, the rotors still keep their best clearance and achieve highest efficiency.
- Semi-hermetic compressor with low running noise and well cooled down by refrigerant, low running temperature, no leakage potential compared with open compressor.
- Patented motor-cooling design in ducts of refrigerant flow encompassing stator provides best dissipation of heat and no requirement for computer room AC.
- To reach high operation efficiency, the casing is manufactured by precise machining centers and inspected by a coordinate measuring machine to make sure that the requested precision and quality can be retained in the compressor.

Three stages oil separation

- The built-in oil separator utilizes three-stage filter mechanism with high-density filter element to achieve optimal oil separation effect and its efficiency is higher than 99.7%.Two oil separators cooperate together make the best oil separating effect.
- Detachable demister for cleaning.
- Oil supplied by pressure difference and no need of oil pump.

Dual compressors (Min. 1080 ~ Max.1780kW)

- Large cooling capacity chillers have two truly independent refrigerant circuits, compact outline and superior partial load efficiency. Besides, when one of the compressors breaks down, the other one can work independently. So the chiller can provide much higher reliability and minimize the loss of user.

Flooded-type evaporator

- Evaporator is flooded type designed for 1MPa working pressure on the chillled water side (Higher pressure vessels can be customized). Replaceable integral finned copper tubes are mechanically bonded to steel tube sheets. The evaporator has been tested under extreme conditions. The 20MM thickness insulation covers all low temperature surfaces, including the evaporator, water boxes, oil return lines, chilled water flow switch piping, etc.

- Trust heat exchangers are designed by professional design software and pass rigorous tests. Double-grooved holes at tube support for tube expansion are designed to prevent leakage and increase the durability of heat exchanger.

Condenser

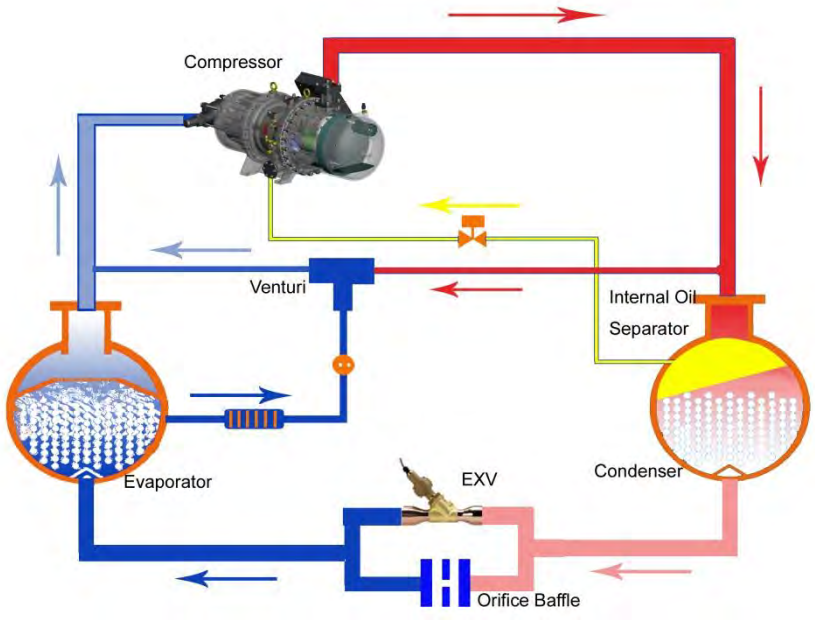
- Trust condenser has a specially designed baffle, in the entrance of condenser, to prevent direct impingement of high-velocity refrigerant gas on tube surface and thus eliminate the related vibration and noise. It has been tested under extreme conditions. Water side working pressure is designed for 1.0Mpa (Higher pressure vessels can be customized).

Throttling device

Orifice baffle without moving parts can guarantee high reliability and it cooperates with EXV（Danfoss）to throttle the high-pressure liquid refrigerant from condenser to evaporator.EXV which is controlled by EVD module provides high-precision adjustment and perfectly matches the compressor load，both full load and partial load.

Advanced oil system

As the diagram shown, the low temperature and low pressure gas enters the compressor through suction port. Then refrigerant gas that entered the compressor is compressed to a high temperature and high pressure gas and enters the condenser to release heat to cooling water. The condensed liquid passes the throttling device, becomes the



mixed state and enters the lower part of the evaporator. It is then spread into a wider surface by distributor. Finally the distributed refrigerant evaporates by taking the heat from the chilled water inside the evaporator tube and repeats the cycle.

Lubrication cycle

Three stages oil separation ensure the excellent compressor lubricant. One is integrated inside the compressor and the other is built-in oil separator located inside of the condenser. The refrigerant and oil mixture gets separated in the internal oil separator for the first time and then to the condenser oil separator of which the separating efficiency can reach 99%. Oil will return to compressor through the oil return pipe by pressure difference. Small amount of oil which remains in the evaporator will be sucked up by the Venturi tube and goes back to compressor after gas evaporating. This is the third stages oil separation. These three oil return circuits can guarantee reliable oil return efficiency.

3. Specifications

Single compressor

TMCUxxxxBO3/1WT1FA		340	440	540	690	805	890
Cooling capacity	kW	340	440	540	690	805	890
Power input	kW	60	77	94	120	140	155
COP	kW/kW	5.66	5.71	5.74	5.75	5.75	5.74
Semi-hermetic screw compressor							
Circuit A	Quantity	1	1	1	1	1	1
Circuit B	Quantity	--	--	--	--	--	--
Oil recharge							
Circuit A	L	18	20	23	28	40	40
Circuit B	L	--	--	--	--	--	--
Refrigerant	Type	R134a					
Circuit A	kg	130	145	160	200	230	250
Circuit B	kg	--	--	--	--	--	--
Control Type		EXV+Orifice					
Evaporator	Type	Shell and tube flooded					
Water content	L	150	170	190	210	240	270
Water flow	m³/h	58	76	93	119	138	153
Pressure drop	kPa	55	49	53	46	39	39
Max. pressure	kPa	1000	1000	1000	1000	1000	1000
Connection type		Victaulic coupling					
Water inlet/outlet pipe dim.	mm	150	150	150	200	200	200
Condenser	Type	Shell and tube					
Water content	L	150	170	190	210	240	270
Water flow	m³/h	73	95	116	148	173	191
Pressure drop	kPa	75	70	77	66	56	56
Max. pressure	kPa	1000	1000	1000	1000	1000	1000
Connection type		Victaulic coupling					
Water inlet/outlet pipe dim.	mm	150	150	150	200	200	200
Unit length	mm	3550	3550	3550	3600	3600	3600
Unit width	mm	1220	1220	1220	1420	1440	1440
Unit height	mm	1730	1800	1900	2000	2020	2020
Shipping weight	kg	2500	2580	2950	3550	4050	4150
Running weight	kg	2700	2820	3220	3870	4420	4550
Safety protection device		The following safety devices are equipped as standard. High pressure protection(High pressure switch & high pressure sensor) Low pressure protection(Low pressure switch & low pressure sensor) Compressor thermal protection High discharge temperature on the compressor Phase monitor; Star/Delta transition failed Low-pressure ratio; Low oil level protection Interrupter protection; Overload compressor protection Over-voltage & low- voltage protection Sensor malfunction protection Contactor malfunction protection Freeze protection					

Note:
Nominal cooling capacities are based on following conditions: Chilled water inlet/outlet temperature 12/7℃(53.6 ℉ /44.6 ℉); Cooling water inlet/outlet temperature 30/35℃(86 ℉ /96 ℉).
The design fouling factor for both evaporator and condenser are 0.086m^2•℃/kW (0.0005ft^2 F.hr/Btu).

Dual compressors

TMCUxxxxBO3/1WT1FA		1080	1200	1385	1620	1780
Cooling capacity	kW	1080	1200	1385	1620	1780
Power input	kW	186	206	238	278	306
COP	kW/kW	5.8	5.82	5.81	5.82	5.81
Semi-hermetic screw compressor						
Circuit A	Quantity	1	1	1	1	1
Circuit B	Quantity	1	1	1	1	1
Oil recharge						
Circuit A	L	23	28	28	40	40
Circuit B	L	23	28	28	40	40
Refrigerant	Type	R134a				
Circuit A	kg	170	180	190	210	220
Circuit B	kg	170	180	190	210	220
Control type		EXV+Orifice				
Evaporator	Type	Shell and tube flooded				
Water content	L	350	400	460	520	580
Water flow	m³/h	186	206	238	279	306
Pressure drop	kPa	78	79	79	75	76
Max. pressure	kPa	1000	1000	1000	1000	1000
Connection type		Victaulic coupling				
Water inlet/outlet pipe dim.	mm	200	200	200	200	200
Condenser	Type	Shell and tube				
Water content	L	350	400	460	520	560
Water flow	m³/h	232	258	298	348	383
Pressure drop	kPa	88	87	87	85	86
Max. pressure	kPa	1000	1000	1000	1000	1000
Connection type		Victaulic coupling				
Water inlet/outlet pipe dim.	mm	200	200	200	200	200
Unit length	mm	4600	4600	4600	4800	4800
Unit width	mm	1520	1520	1520	1620	1620
Unit height	mm	2035	2035	2035	2250	2250
Shipping weight	kg	6700	6900	7150	8350	8450
Running weight	kg	7250	7490	7820	9200	9350
Safety protection device		The following safety devices are equipped as standard. High pressure protection(High pressure switch & high pressure sensor) Low pressure protection(Low pressure switch & low pressure sensor) Compressor thermal protection High discharge temperature on the compressor Phase monitor; Star/Delta transition failed Low-pressure ratio; Low oil level protection Interrupter protection; Overload compressor protection Over-voltage & low- voltage protection Sensor malfunction protection Contactor malfunction protection Freeze protection				

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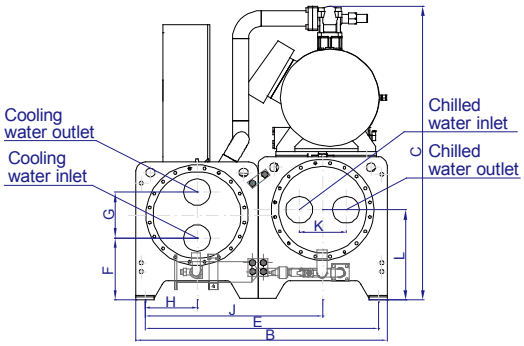
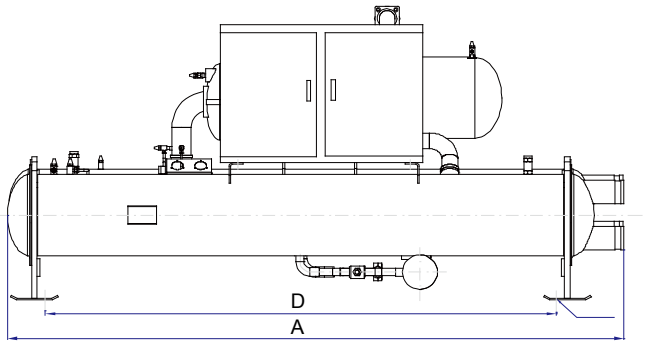
4. Outline dimension

Single head(TMCU0340BO3/1WT1FA~ TMCU0890BO3/1WT1FA)

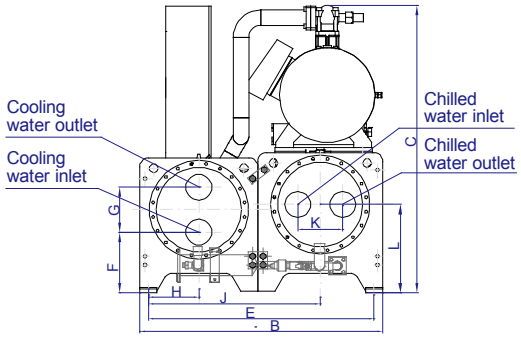


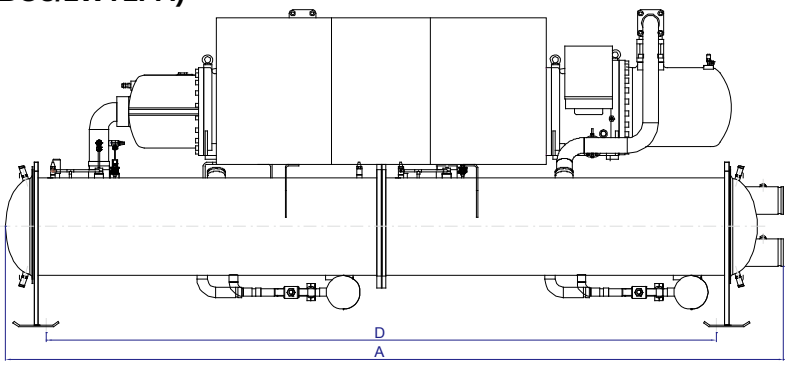


Unit: mm

Model	A	B	C	D	E	F	G	H	J	K	L	Water inlet/outlet Dim.
340BO3/1WT1FA	3550	1220	1730	2850	1100	411	260	250	850	260	541	DN150
440BO3/1WT1FA	3550	1220	1800	2850	1100	411	260	250	850	260	541	DN150
540BO3/1WT1FA	3550	1220	1900	2850	1100	411	260	250	850	260	541	DN150
690BO3/1WT1FA	3600	1420	2000	2850	1300	451	280	300	1000	280	591	DN200
805BO3/1WT1FA	3600	1440	2020	2850	1300	451	280	300	1000	280	591	DN200
890BO3/1WT1FA	3600	1440	2020	2850	1300	451	280	300	1000	280	591	DN200

Dual head(TMCU1080BO3/1WT1FA~TMC17U80BO3/1WT1FA)





Unit: mm

Model	A	B	C	D	E	F	G	H	J	K	L	Water inlet/outlet Dim.
LSBLG1080/MCF	4600	1520	2035	3850	1400	443	350	325	1075	350	618	DN200
LSBLG1200/MCF	4600	1520	2035	3850	1400	443	350	325	1075	350	618	DN200
LSBLG1385/MCF	4600	1520	2035	3850	1400	443	350	325	1075	350	618	DN200
LSBLG1620/MCF	4800	1620	2250	3850	1500	468	350	350	1150	350	643	DN200
LSBLG1780/MCF	4800	1620	2250	3850	1500	468	350	350	1150	350	643	DN200

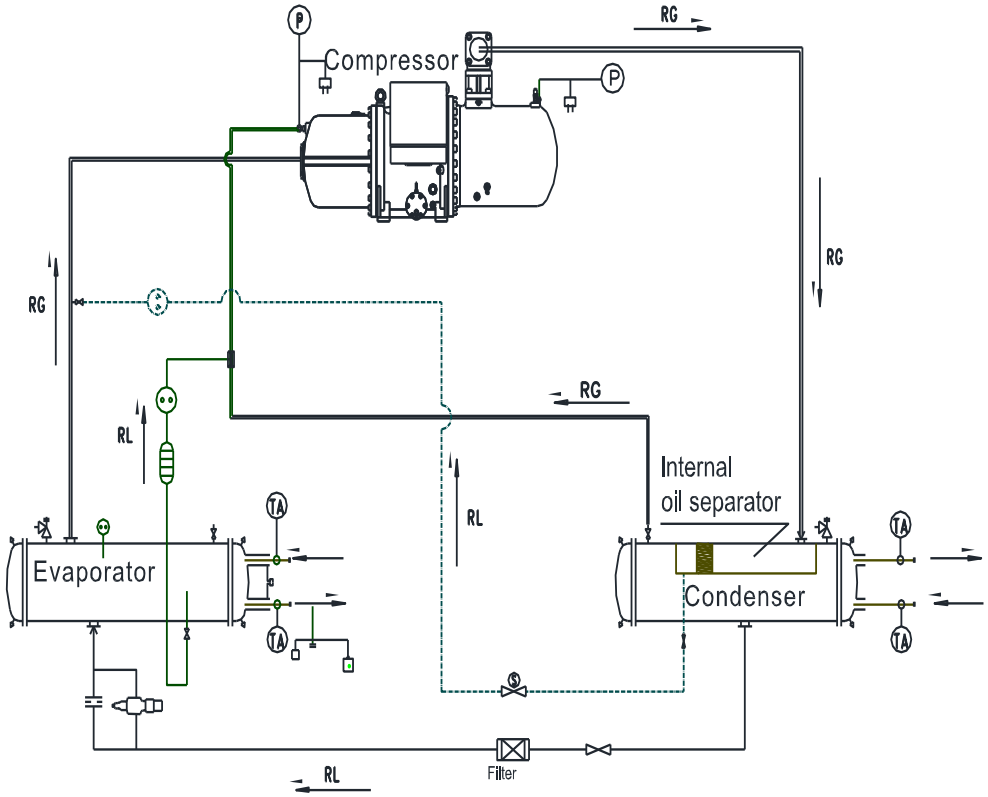
NOTE: Drawings are not contractually binding. Before designing an installation, consult the certified dimensional drawings supplied with the unit or available on request.

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

5. Refrigeration system

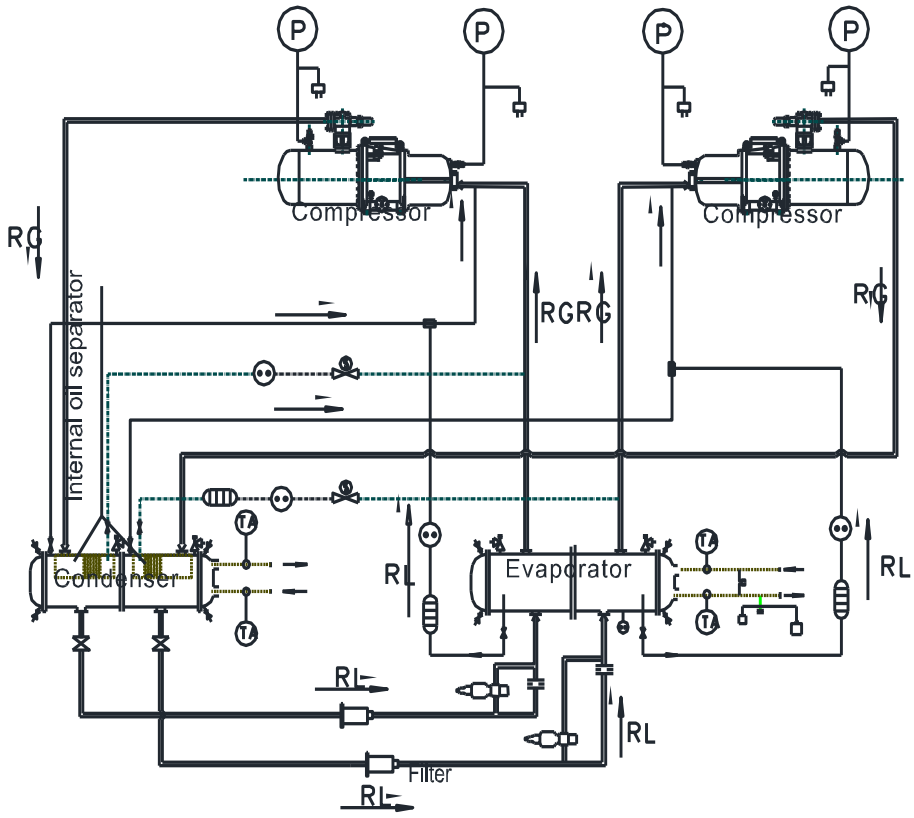
For single head unit(LSBLG340~890/MCF)

Code	Name
P	Pressure Gauge
TA	Temperature Sensor
	Sight glass
	Filter
S	Solenoid Valve
	Safety Valve
	Check Valve
	Shut-off Valve
RG RG	Refrigerant Gas Line
RL RL	Refrigerant Liquid Line
O	Oil way
W	Water way
	Throttle plate
	High/Low Pressure Switch
	Electric expansion valve
	Venturi Tube
	Pressure Difference Switch



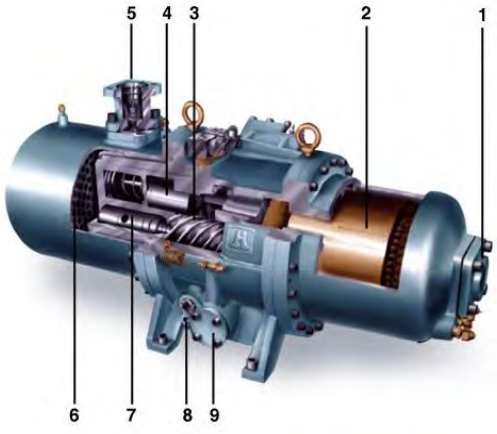
For dual heads unit(LSBLG1080~1780/MCF)

Code	Name
P	Pressure Gauge
TA	Temperature Sensor
	Sight glass
	Filter
S	Solenoid Valve
	Safety Valve
	Check Valve
	Shut-off Valve
RG RG	Refrigerant Gas Line
RL RL	Refrigerant Liquid Line
O	Oil way
W	Water way
	Throttle plate
	High/Low Pressure Switch
	Electric expansion valve
	Venturi Tube
	Pressure Difference Switch



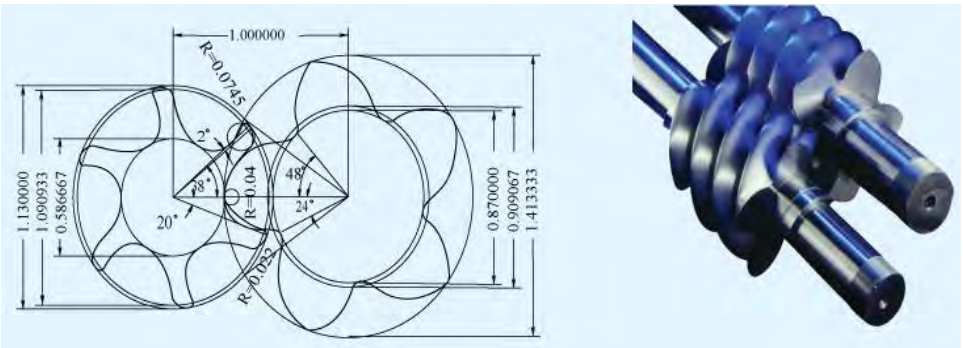
6. Major system components

6.1 Advanced twin screw compressor

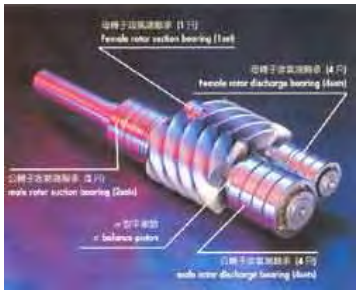
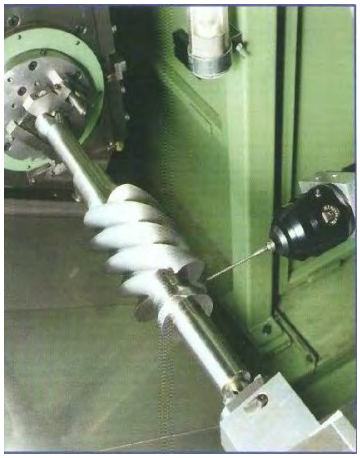


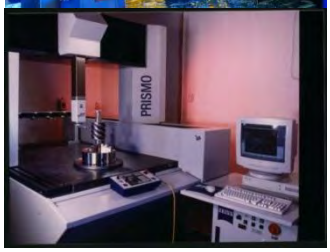
1. Suction Port
2. Motor
3. Screw
4. Modulation Slide Valve
5. Discharge Port
6. Oil Separator
7. Discharge Bearing
8. Oil Heater
9. Oil Filter

- 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.
- LSBLG/MCF Series units are provided with a high efficiency oil separator to maximize oil extraction.
- 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.



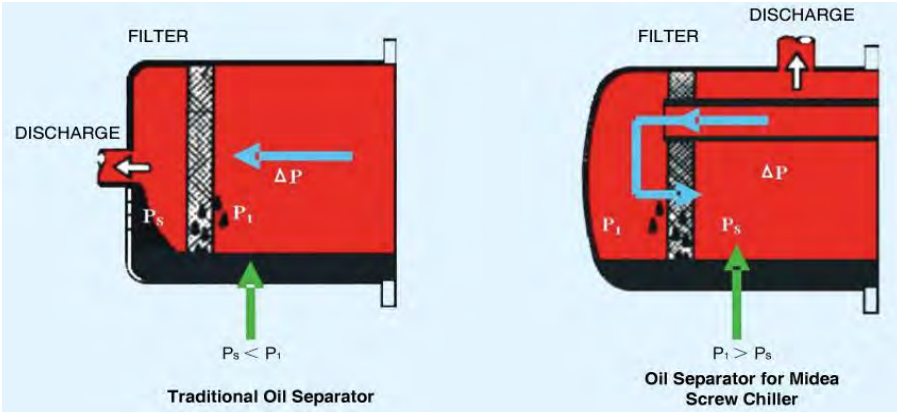
- The bearing of compressor is from SKF, Sweden, the long lifespan of which ensures screw-type main unit to run continuously more than 50,000 hours.



- Lubricant:

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



  The compressor is approved for use with the following lubricant:

  HBR-B04 for R134a unit

- 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.

- Oil filter

  The screw compressor has an independent oil filter.

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, annex C.
- 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

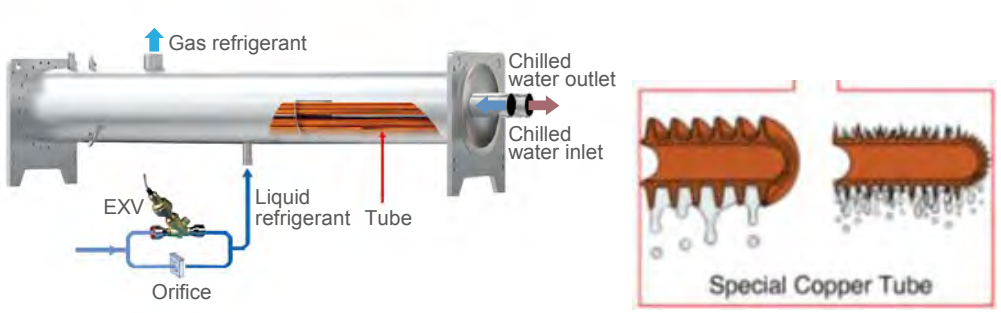
The evaporator and condenser are designed for: prolonged usage of 20 years for high-quality materials.

6.2.5 Security

The unit is equipped with safety valves. And ball valve is connecting safety valve to condenser (evaporator). 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.

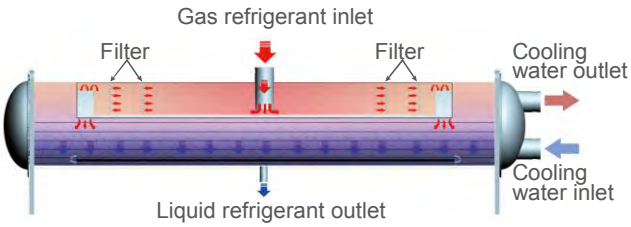
6.2.6 Evaporator



Flooded shell and tube evaporator 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 evaporator is GB151-1999 (Chinese standard) designed, constructed, inspected and stamped. Water side working pressure is designed for 1.0Mpa. Shell and non-connection water head are insulated with 3/4” thick closed cell insulation.

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.



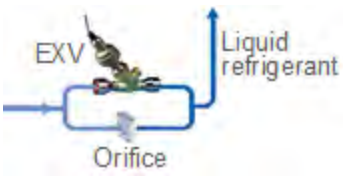
The condenser is used high-efficient tubes to enhance its transfer performance. Meanwhile, the system's COP can be increased largely by adding the subcooler.

6.2.8 Oil separator

The oil separator with unique structure separate oil from refrigerant high-efficiently. It is solve the oil recycle problem by ensure oil return to compressor normally.

6.2.9 Throttle parts

The unit achieves high-efficiency when full load and part load by parallel connecting orifice and EXV.



7. Water flow

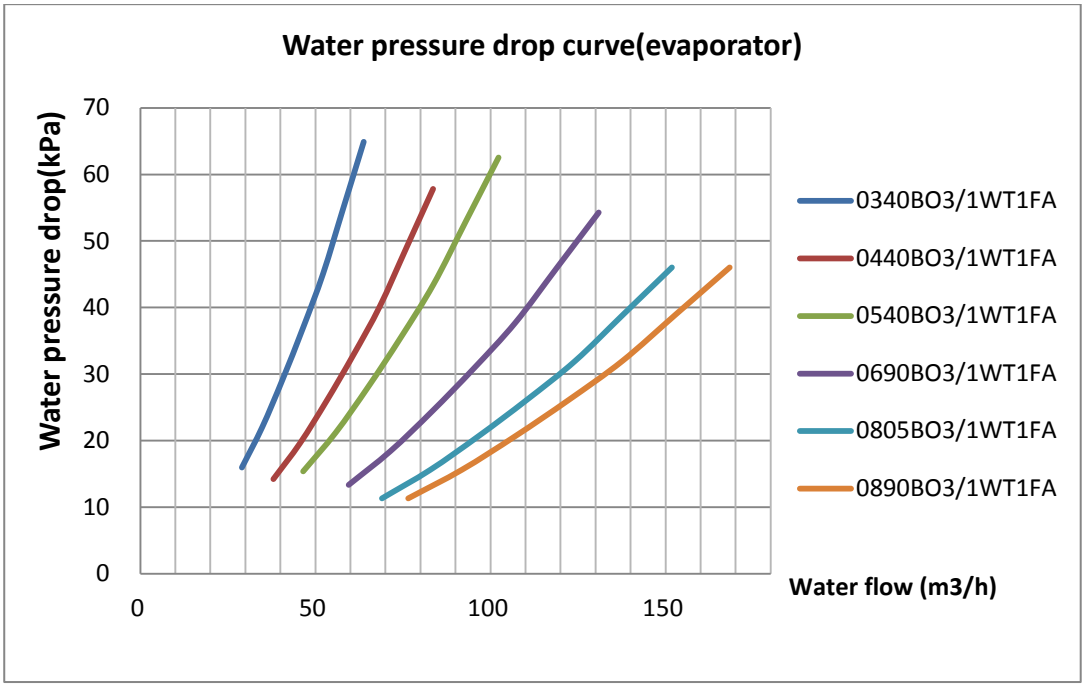
Balance the chilled water flow through the evaporator and the condenser water flow through the condenser. The flow rates must fall between the minimum and maximum values shown in the below table. Flow rates below the minimum values shown will result in laminar flow which will reduce efficiency, cause 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.

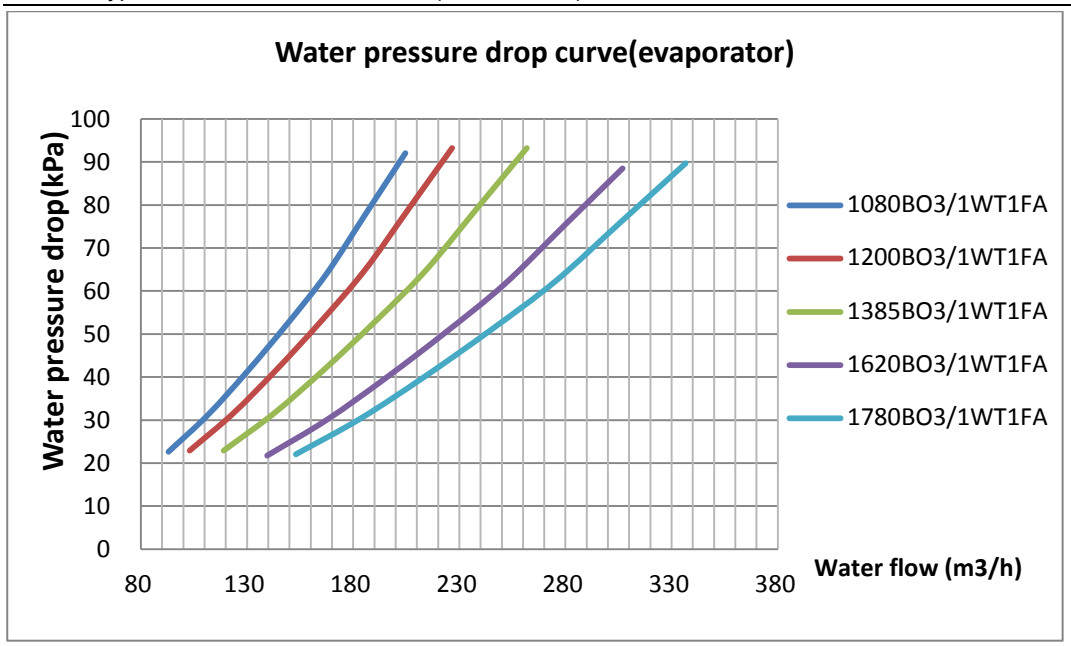
Variable chilled water flow through the heat exchanges while the compressor(s) are operating is not recommended. The chiller control set points are based upon a constant flow and variable temperature.

Model	Evaporator water flow rate m^3/h			Condenser water flow rate m^3/h		
	Rated	Minimum	Maximum	Rated	Minimum	Maximum
0340BO3/1WT1FA	58	29	64	73	37	80
0440BO3/1WT1FA	76	38	83	95	47	104
0540BO3/1WT1FA	93	46	102	116	58	128
0690BO3/1WT1FA	119	59	131	148	74	163
0805BO3/1WT1FA	138	69	152	173	87	190
0890BO3/1WT1FA	153	77	168	191	96	210
1080BO3/1WT1FA	186	93	204	232	116	255
1200BO3/1WT1FA	206	103	227	258	129	284
1385BO3/1WT1FA	238	119	262	298	149	328
1620BO3/1WT1FA	279	142	312	348	177	390
1780BO3/1WT1FA	306	153	337	383	191	421

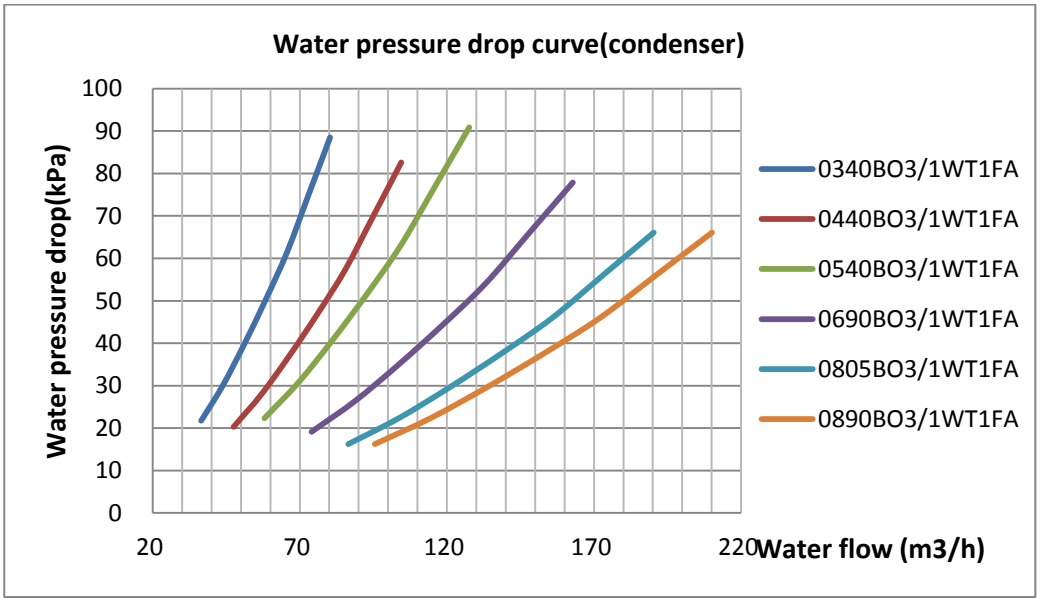
Pressure drop

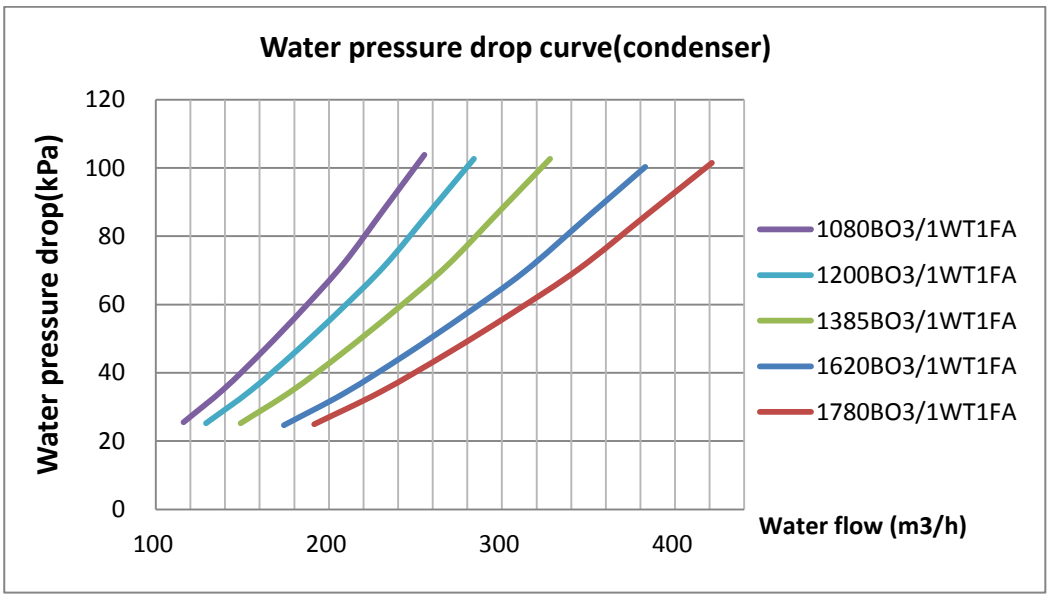
Flooded type (Evaporator)





Flooded type (Condenser)



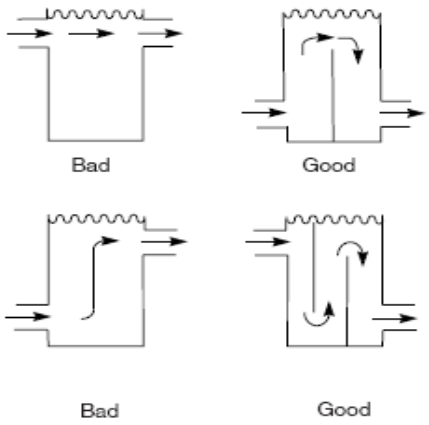


System minimum water volume

Water volume is necessary for stable operation. It is often necessary to add a buffer water tank to the circuit in order to achieve the required volume. The tank must itself 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.

Connection to a buffer tank



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. Operating range

Content	Running range
Chilled Leaving Water Temperature	5℃～15℃
Cooling Entering water Temperature	20℃~35℃
Water flow volume	Rating flow volume±20%
Max inlet/outlet water Temp. difference	8℃
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

TMCUxxxxBO3/1WT1FA evaporator	Minimum	Maximum
Entering temperature at start-up	9°C	22°C
Leaving temperature during operation	5°C	15°C
Entering/leaving temperature difference at full load	3.8°C	7.1°C

TMCUxxxxBO3/1WT1FA condenser	Minimum	Maximum
Entering temperature at start-up	19°C	33℃
Leaving temperature during operation	23℃	40℃
Entering/leaving temperature difference at full load	3.8°C	7.1°C

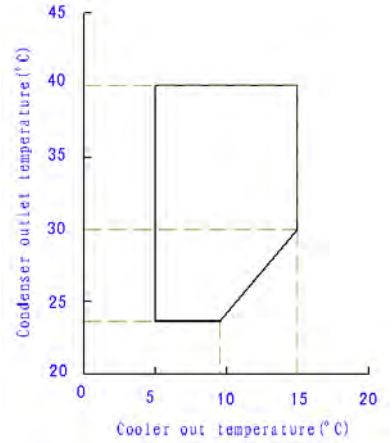
Note:

(1) For low-temperature applications, where the leaving water temperature is below 4°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/MCF units. Including by container) the minimum and maximum permissible temperatures is -20°C ~ 46°C(R134a);

Changes water temperature curve in the operation



9. Capacity table

0340BO3/1WT1FA

Chilled Water Outlet Temp.	Cooling Water Inlet(°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	334.56	54.19	331.61	56.34	328.67	56.94	322.49	58.26	319.26	58.98	313.48	60.66	309.74	61.62	302.26	63.54
6.00	346.46	55.98	343.06	56.78	339.66	57.40	332.86	58.77	329.46	59.52	323.68	61.14	319.83	62.12	312.12	64.08
7.00	356.32	55.74	353.15	57.26	349.97	57.88	343.40	59.25	340.00	60.00	332.86	61.68	329.23	62.70	321.98	64.74
8.00	368.22	56.16	364.82	57.68	361.42	58.30	354.45	59.70	350.88	60.48	343.74	62.22	338.53	63.30	328.10	65.46
9.00	378.76	56.64	375.59	58.10	372.41	58.72	365.67	60.18	362.10	61.02	354.62	62.76	350.54	63.82	342.38	65.94
10.00	389.30	57.06	386.58	58.60	383.86	59.24	376.72	60.69	372.30	61.50	365.50	63.36	361.65	64.38	353.94	66.42
11.00	/	/	397.46	59.08	394.74	59.72	387.94	61.23	384.20	62.04	377.06	63.84	372.98	64.90	364.82	67.02
12.00	/	/	/	/	405.62	60.20	399.84	61.68	395.42	62.52	388.96	64.44	384.77	65.50	376.38	67.62
13.00	/	/	/	/	/	/	411.74	62.22	407.32	63.12	400.52	64.98	396.44	66.06	388.28	68.22
14.00	/	/	/	/	/	/	425.00	62.58	421.60	63.30	412.42	65.52	408.34	66.62	400.18	68.82
15.00	/	/	/	/	/	/	437.75	63.06	434.86	63.78	425.34	66.06	421.15	67.18	412.76	69.42

Note: The above parameters are in accordance with the 7 ℃ evaporator water outlet, 30 ℃ condenser water inlet.

0440BO3/1WT1FA

Chilled Water Outlet Temp.	Cooling Water Inlet(°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	432.96	71.53	429.15	72.30	425.33	73.07	417.34	74.77	413.16	75.69	405.68	77.85	400.84	79.08	391.16	81.54
6.00	448.36	72.07	443.96	72.87	439.56	73.66	430.76	75.42	426.36	76.38	418.88	78.46	413.89	79.72	403.92	82.24
7.00	461.12	72.69	457.01	73.48	452.91	74.28	444.40	76.04	440.00	77.00	430.76	79.16	426.07	80.47	416.68	83.08
8.00	476.52	73.23	472.12	74.02	467.72	74.82	458.70	76.62	454.08	77.62	444.84	79.85	438.09	81.24	424.60	84.01
9.00	490.16	73.77	486.05	74.56	481.95	75.36	473.22	77.23	468.60	78.31	458.92	80.54	453.64	81.90	443.08	84.62
10.00	503.80	74.38	500.28	75.20	496.76	76.02	487.52	77.89	481.80	78.93	473.00	81.31	468.01	82.62	458.04	85.24
11.00	/	/	514.36	75.82	510.84	76.64	502.04	78.58	497.20	79.62	487.96	81.93	482.68	83.29	472.12	86.01
12.00	/	/	/	/	524.92	77.26	517.44	79.16	511.72	80.23	503.36	82.70	497.93	84.06	487.08	86.78
13.00	/	/	/	/	/	/	532.84	79.85	527.12	81.00	518.32	83.39	513.04	84.78	502.48	87.55
14.00	/	/	/	/	/	/	550.00	80.31	545.60	81.24	533.72	84.08	528.44	85.50	517.88	88.32
15.00	/	/	/	/	/	/	566.50	80.93	562.76	81.85	550.44	84.78	545.01	86.21	534.16	89.09

Note: The above parameters are in accordance with the 7 ℃ evaporator water outlet, 30 ℃ condenser water inlet.

0540BO3/1WT1FA

Chilled Water Outlet Temp.	Cooling Water Inlet(°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	531.36	87.33	526.68	88.27	522.00	89.21	512.19	91.27	507.06	92.40	497.88	95.03	491.94	96.54	480.06	99.55
6.00	550.26	87.98	544.86	88.96	539.46	89.93	528.66	92.07	523.26	93.25	514.08	95.79	507.96	97.32	495.72	100.39
7.00	565.92	88.74	560.88	89.71	555.84	90.68	545.40	92.83	540.00	94.00	528.66	96.63	522.90	98.23	511.38	101.43
8.00	584.82	89.39	579.42	90.37	574.02	91.34	562.95	93.53	557.28	94.75	545.94	97.48	537.66	99.17	521.10	102.55
9.00	601.56	90.05	596.52	91.02	591.48	91.99	580.77	94.28	575.10	95.60	563.22	98.32	556.74	99.98	543.78	103.31
10.00	618.30	90.80	613.98	91.81	609.66	92.81	598.32	95.08	591.30	96.35	580.50	99.26	574.38	100.86	562.14	104.06
11.00	/	/	631.26	92.56	626.94	93.56	616.14	95.93	610.20	97.20	598.86	100.02	592.38	101.68	579.42	105.00
12.00	/	/	/	/	644.22	94.31	635.04	96.63	628.02	97.95	617.76	100.96	611.10	102.62	597.78	105.94
13.00	/	/	/	/	/	/	653.94	97.48	646.92	98.89	636.12	101.80	629.64	103.49	616.68	106.88
14.00	/	/	/	/	/	/	675.00	98.04	669.60	99.17	655.02	102.65	648.54	104.37	635.58	107.82
15.00	/	/	/	/	/	/	695.25	98.79	690.66	99.92	675.54	103.49	668.88	105.25	655.56	108.76

Note: The above parameters are in accordance with the 7 ℃ evaporator water outlet, 30 ℃ condenser water inlet.

00BO3/1WT1FA

Chilled Water Outlet Temp.	Cooling Water Inlet(°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	678.96	111.48	672.98	112.68	667.00	113.88	654.47	116.52	647.91	117.96	636.18	121.32	628.59	123.24	613.41	127.08
6.00	703.11	112.32	696.21	113.56	689.31	114.80	675.51	117.54	668.61	119.04	656.88	122.28	649.06	124.24	633.42	128.16
7.00	723.12	113.28	716.68	114.52	710.24	115.76	696.90	118.50	690.00	120.00	675.51	123.36	668.15	125.40	653.43	129.48
8.00	747.27	114.12	740.37	115.36	733.47	116.60	719.33	119.40	712.08	120.96	697.59	124.44	687.01	126.60	665.85	130.92
9.00	768.66	114.96	762.22	116.20	755.78	117.44	742.10	120.36	734.85	122.04	719.67	125.52	711.39	127.64	694.83	131.88
10.00	790.05	115.92	784.53	117.20	779.01	118.48	764.52	121.38	755.55	123.00	741.75	126.72	733.93	128.76	718.29	132.84
11.00	/	/	806.61	118.16	801.09	119.44	787.29	122.46	779.70	124.08	765.21	127.68	756.93	129.80	740.37	134.04
12.00	/	/	/	/	823.17	120.40	811.44	123.36	802.47	125.04	789.36	128.88	780.85	131.00	763.83	135.24
13.00	/	/	/	/	/	/	835.59	124.44	826.62	126.24	812.82	129.96	804.54	132.12	787.98	136.44
14.00	/	/	/	/	/	/	862.50	125.16	855.60	126.60	836.97	131.04	828.69	133.24	812.13	137.64
15.00	/	/	/	/	/	/	888.38	126.12	882.51	127.56	863.19	132.12	854.68	134.36	837.66	138.84

Note: The above parameters are in accordance with the 7℃ evaporator water outlet, 30 ℃ condenser water inlet.

0805BO3/1WT1FA

Chilled Water Outlet Temp.	Cooling Water Inlet(°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	792.12	130.06	672.98	131.46	778.17	132.86	763.54	135.94	755.90	137.62	742.21	141.54	733.36	143.78	715.65	148.26
6.00	820.30	131.04	696.21	132.49	804.20	133.93	788.10	137.13	780.05	138.88	766.36	142.66	757.24	144.95	738.99	149.52
7.00	843.64	132.16	716.68	133.61	828.61	135.05	813.05	138.25	805.00	140.00	788.10	143.92	779.51	146.30	762.34	151.06
8.00	871.82	133.14	740.37	134.59	855.72	136.03	839.21	139.30	830.76	141.12	813.86	145.18	801.51	147.70	776.83	152.74
9.00	896.77	134.12	762.22	135.57	881.74	137.01	865.78	140.42	857.33	142.38	839.62	146.44	829.96	148.91	810.64	153.86
10.00	921.73	135.24	784.53	136.73	908.85	138.23	891.94	141.61	881.48	143.50	865.38	147.84	856.25	150.22	838.01	154.98
11.00	/	/	806.61	137.85	934.61	139.35	918.51	142.87	909.65	144.76	892.75	148.96	883.09	151.43	863.77	156.38
12.00	/	/	/	/	960.37	140.47	946.68	143.92	936.22	145.88	920.92	150.36	910.99	152.83	891.14	157.78
13.00	/	/	/	/	/	/	974.86	145.18	964.39	147.28	948.29	151.62	938.63	154.14	919.31	159.18
14.00	/	/	/	/	/	/	1006.25	146.02	998.20	147.70	976.47	152.88	966.81	155.45	947.49	160.58
15.00	/	/	/	/	/	/	1036.44	147.14	1029.60	148.82	1007.06	154.14	997.13	156.75	977.27	161.98

Note: The above parameters are in accordance with the 7 ℃ evaporator water outlet, 30 ℃ condenser water inlet.

0890BO3/1WT1FA

Chilled Water Outlet Temp.	Cooling Water Inlet(°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	875.76	144.00	868.05	145.55	860.33	147.10	844.17	150.51	835.71	152.37	820.58	156.71	810.79	159.19	791.21	164.15
6.00	906.91	145.08	898.01	146.68	889.11	148.28	871.31	151.82	862.41	153.76	847.28	157.95	837.19	160.48	817.02	165.54
7.00	932.72	146.32	924.41	147.92	916.11	149.52	898.90	153.06	890.00	155.00	871.31	159.34	861.82	161.98	842.83	167.25
8.00	963.87	147.41	954.97	149.01	946.07	150.61	927.83	154.23	918.48	156.24	899.79	160.74	886.14	163.53	858.85	169.11
9.00	991.46	148.49	983.15	150.09	974.85	151.69	957.20	155.47	947.85	157.64	928.27	162.13	917.59	164.87	896.23	170.35
10.00	1019.05	149.73	1011.93	151.38	1004.81	153.04	986.12	156.78	974.55	158.88	956.75	163.68	946.66	166.32	926.49	171.59
11.00	/	/	1040.41	152.62	1033.29	154.28	1015.49	158.18	1005.70	160.27	987.01	164.92	976.33	167.66	954.97	173.14
12.00	/	/	/	/	1061.77	155.52	1046.64	159.34	1035.07	161.51	1018.16	166.47	1007.18	169.21	985.23	174.69
13.00	/	/	/	/	/	/	1077.79	160.74	1066.22	163.06	1048.42	167.87	1037.74	170.66	1016.38	176.24
14.00	/	/	/	/	/	/	1112.50	161.67	1103.60	163.53	1079.57	169.26	1068.89	172.10	1047.53	177.79
15.00	/	/	/	/	/	/	1145.88	162.91	1138.31	164.77	1113.39	170.66	1102.41	173.55	1080.46	179.34

Note: The above parameters are in accordance with the 7 ℃ evaporator water outlet, 30 ℃ condenser water inlet.

1080BO3/1WT1FA

Chilled Water Outlet Temp.	Cooling Water Inlet(°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	1062.72	172.79	1053.36	174.65	1044.00	176.51	1024.38	180.61	1014.12	182.84	995.76	188.05	983.88	191.02	960.12	196.97
6.00	1100.52	174.10	1089.72	176.02	1078.92	177.94	1057.32	182.19	1046.52	184.51	1028.16	189.53	1015.92	192.57	991.44	198.65
7.00	1131.84	175.58	1121.76	177.51	1111.68	179.43	1090.80	183.68	1080.00	186.00	1057.32	191.21	1045.80	194.37	1022.76	200.69
8.00	1169.64	176.89	1158.84	178.81	1148.04	180.73	1125.90	185.07	1114.56	187.49	1091.88	192.88	1075.32	196.23	1042.20	202.93
9.00	1203.12	178.19	1193.04	180.11	1182.96	182.03	1161.54	186.56	1150.20	189.16	1126.44	194.56	1113.48	197.84	1087.56	204.41
10.00	1236.60	179.68	1227.96	181.66	1219.32	183.64	1196.64	188.14	1182.60	190.65	1161.00	196.42	1148.76	199.58	1124.28	205.90
11.00	/	/	1262.52	183.15	1253.88	185.13	1232.28	189.81	1220.40	192.32	1197.72	197.90	1184.76	201.19	1158.84	207.76
12.00	/	/	/	/	1288.44	186.62	1270.08	191.21	1256.04	193.81	1235.52	199.76	1222.20	203.05	1195.56	209.62
13.00	/	/	/	/	/	/	1307.88	192.88	1293.84	195.67	1272.24	201.44	1259.28	204.79	1233.36	211.48
14.00	/	/	/	/	/	/	1350.00	194.00	1339.20	196.23	1310.04	203.11	1297.08	206.52	1271.16	213.34
15.00	/	/	/	/	/	/	1390.50	195.49	1381.32	197.72	1351.08	204.79	1337.76	208.26	1311.12	215.20

Note: The above parameters are in accordance with the 7 ℃ evaporator water outlet, 30 ℃ condenser water inlet.

1200BO3/1WT1FA

Chilled Water Outlet Temp.	Cooling Water Inlet(°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	1180.80	191.37	1170.40	193.43	1160.00	195.49	1138.20	200.03	1126.80	202.50	1106.40	208.27	1093.20	211.56	1066.80	218.15
6.00	1222.80	192.82	1210.80	194.94	1198.80	197.07	1174.80	201.78	1162.80	204.35	1142.40	209.91	1128.80	213.28	1101.60	220.01
7.00	1257.60	194.46	1246.40	196.59	1235.20	198.72	1212.00	203.43	1200.00	206.00	1174.80	211.77	1162.00	215.27	1136.40	222.27
8.00	1299.60	195.91	1287.60	198.03	1275.60	200.16	1251.00	204.97	1238.40	207.65	1213.20	213.62	1194.80	217.33	1158.00	224.75
9.00	1336.80	197.35	1325.60	199.48	1314.40	201.61	1290.60	206.62	1278.00	209.50	1251.60	215.48	1237.20	219.12	1208.40	226.39
10.00	1374.00	199.00	1364.40	201.19	1354.80	203.39	1329.60	208.37	1314.00	211.15	1290.00	217.54	1276.40	221.04	1249.20	228.04
11.00	/	/	1402.80	202.84	1393.20	205.04	1369.20	210.22	1356.00	213.00	1330.80	219.18	1316.40	222.82	1287.60	230.10
12.00	/	/	/	/	1431.60	206.69	1411.20	211.77	1395.60	214.65	1372.80	221.24	1358.00	224.88	1328.40	232.16
13.00	/	/	/	/	/	/	1453.20	213.62	1437.60	216.71	1413.60	223.10	1399.20	226.81	1370.40	234.22
14.00	/	/	/	/	/	/	1500.00	214.86	1488.00	217.33	1455.60	224.95	1441.20	228.73	1412.40	236.28
15.00	/	/	/	/	/	/	1545.00	216.51	1534.80	218.98	1501.20	226.81	1486.40	230.65	1456.80	238.34

Note: The above parameters are in accordance with the 7 ℃ evaporator water outlet, 30 ℃ condenser water inlet.

1385BO3/1WT1FA

Chilled Water Outlet Temp.	Cooling Water Inlet(°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	1362.84	221.10	1350.84	223.48	1338.83	225.86	1313.67	231.10	1300.52	233.95	1276.97	240.62	1261.74	244.43	1231.27	252.04
6.00	1411.32	222.77	1397.47	225.23	1383.62	227.69	1355.92	233.12	1342.07	236.10	1318.52	242.52	1302.82	246.41	1271.43	254.18
7.00	1451.48	224.67	1438.55	227.13	1425.63	229.59	1398.85	235.03	1385.00	238.00	1355.92	244.66	1341.14	248.71	1311.60	256.80
8.00	1499.96	226.34	1486.11	228.80	1472.26	231.26	1443.86	236.81	1429.32	239.90	1400.24	246.81	1379.00	251.09	1336.53	259.66
9.00	1542.89	228.00	1529.96	230.46	1517.04	232.92	1489.57	238.71	1475.03	242.05	1444.56	248.95	1427.94	253.15	1394.70	261.56
10.00	1585.83	229.91	1574.75	232.45	1563.67	234.99	1534.58	240.74	1516.58	243.95	1488.88	251.33	1473.18	255.37	1441.79	263.47
11.00	/	/	1619.07	234.35	1607.99	236.89	1580.29	242.88	1565.05	246.09	1535.97	253.23	1519.35	257.44	1486.11	265.85
12.00	/	/	/	/	1652.31	238.79	1628.76	244.66	1610.76	248.00	1584.44	255.61	1567.36	259.82	1533.20	268.23
13.00	/	/	/	/	/	/	1677.24	246.81	1659.23	250.38	1631.53	257.75	1614.91	262.04	1581.67	270.61
14.00	/	/	/	/	/	/	1731.25	248.23	1717.40	251.09	1680.01	259.90	1663.39	264.26	1630.15	272.99
15.00	/	/	/	/	/	/	1783.19	250.14	1771.42	252.99	1732.64	262.04	1715.55	266.48	1681.39	275.37

Note: The above parameters are in accordance with the 7 ℃ evaporator water outlet, 30 ℃ condenser water inlet.

1620BO3/1WT1FA

Chilled Water Outlet Temp.	Cooling Water Inlet(°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	1594.08	258.26	1580.04	261.04	1566.00	263.82	1536.57	269.94	1521.18	273.27	1493.64	281.06	1475.82	285.51	1440.18	294.40
6.00	1650.78	260.21	1634.58	263.08	1618.38	265.95	1585.98	272.30	1569.78	275.78	1542.24	283.28	1523.88	287.82	1487.16	296.90
7.00	1697.76	262.43	1682.64	265.30	1667.52	268.18	1636.20	274.53	1620.00	278.00	1585.98	285.78	1568.70	290.51	1534.14	299.96
8.00	1754.46	264.38	1738.26	267.25	1722.06	270.12	1688.85	276.61	1671.84	280.22	1637.82	288.29	1612.98	293.29	1563.30	303.30
9.00	1804.68	266.32	1789.56	269.20	1774.44	272.07	1742.31	278.83	1725.30	282.73	1689.66	290.79	1670.22	295.70	1631.34	305.52
10.00	1854.90	268.55	1841.94	271.51	1828.98	274.48	1794.96	281.20	1773.90	284.95	1741.50	293.57	1723.14	298.29	1686.42	307.75
11.00	/	/	1893.78	273.74	1880.82	276.70	1848.42	283.70	1830.60	287.45	1796.58	295.79	1777.14	300.70	1738.26	310.53
12.00	/	/	/	/	1932.66	278.93	1905.12	285.78	1884.06	289.68	1853.28	298.57	1833.30	303.48	1793.34	313.31
13.00	/	/	/	/	/	/	1961.82	288.29	1940.76	292.46	1908.36	301.07	1888.92	306.08	1850.04	316.09
14.00	/	/	/	/	/	/	2025.00	289.95	2008.80	293.29	1965.06	303.58	1945.62	308.67	1906.74	318.87
15.00	/	/	/	/	/	/	2085.75	292.18	2071.98	295.51	2026.62	306.08	2006.64	311.27	1966.68	321.65

Note: The above parameters are in accordance with the 7 ℃ evaporator water outlet, 30 ℃ condenser water inlet.

1780BO3/1WT1FA

Chilled Water Outlet Temp.	Cooling Water Inlet(°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	1751.52	284.27	1736.09	287.33	1720.67	290.39	1688.33	297.13	1671.42	300.80	1641.16	309.37	1621.58	314.26	1582.42	324.05
6.00	1813.82	286.42	1796.02	289.58	1778.22	292.74	1742.62	299.73	1724.82	303.55	1694.56	311.81	1674.39	316.81	1634.04	326.81
7.00	1865.44	288.86	1848.83	292.03	1832.21	295.19	1797.80	302.18	1780.00	306.00	1742.62	314.57	1723.63	319.77	1685.66	330.17
8.00	1927.74	291.01	1909.94	294.17	1892.14	297.33	1855.65	304.47	1836.96	308.45	1799.58	317.32	1772.29	322.83	1717.70	333.85
9.00	1982.92	293.15	1966.31	296.31	1949.69	299.47	1914.39	306.92	1895.70	311.20	1856.54	320.08	1835.18	325.48	1792.46	336.29
10.00	2038.10	295.60	2023.86	298.86	2009.62	302.12	1972.24	309.52	1949.10	313.65	1913.50	323.14	1893.33	328.34	1852.98	338.74
11.00	/	/	2080.82	301.31	2066.58	304.57	2030.98	312.27	2011.40	316.40	1974.02	325.58	1952.66	330.99	1909.94	341.80
12.00	/	/	/	/	2123.54	307.02	2093.28	314.57	2070.14	318.85	2036.32	328.64	2014.37	334.05	1970.46	344.86
13.00	/	/	/	/	/	/	2155.58	317.32	2132.44	321.91	2096.84	331.40	2075.48	336.91	2032.76	347.92
14.00	/	/	/	/	/	/	2225.00	319.16	2207.20	322.83	2159.14	334.15	2137.78	339.76	2095.06	350.98
15.00	/	/	/	/	/	/	2291.75	321.61	2276.62	325.28	2226.78	336.91	2204.83	342.62	2160.92	354.04

Note: The above parameters are in accordance with the 7 ℃ evaporator water outlet, 30 ℃ condenser water inlet.

10. Accessories

Standard accessories

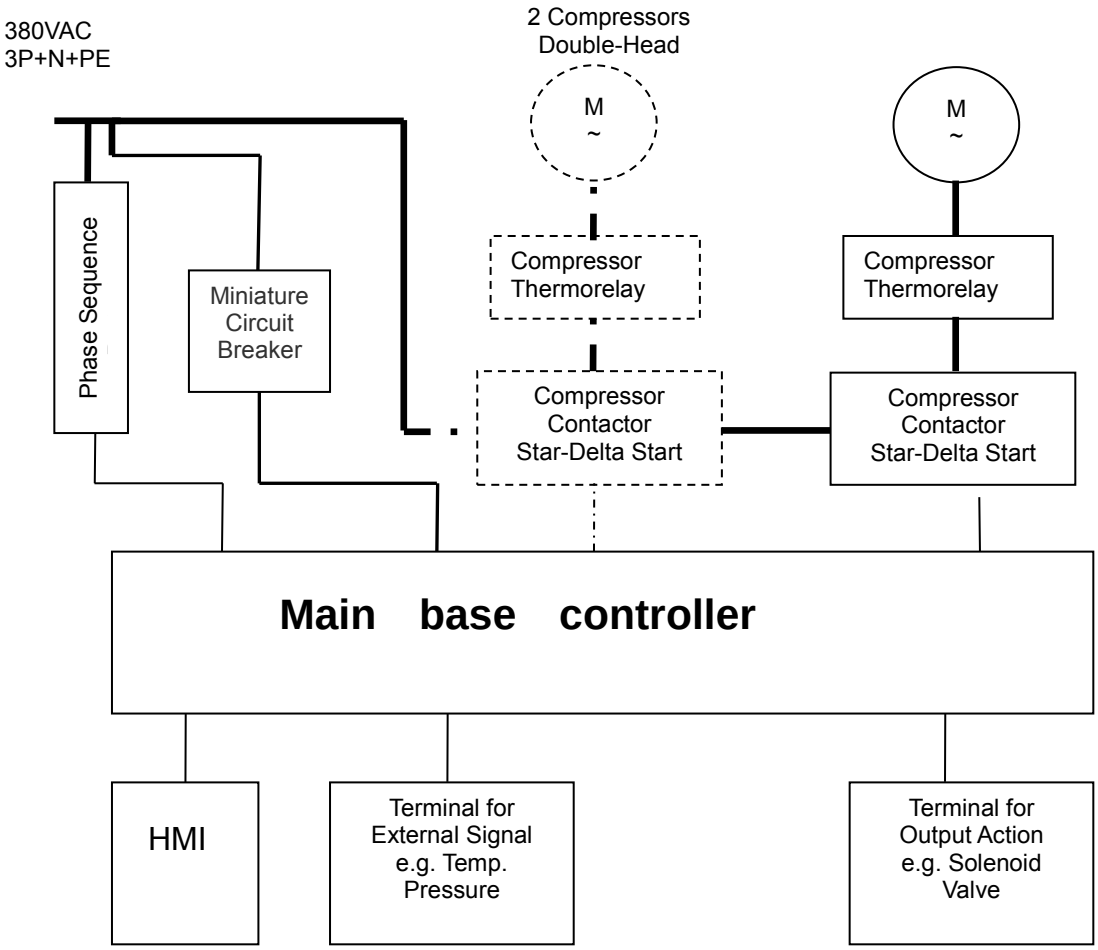
NO.	Name	Quantity
1	User manual	1
2	Water pressure difference switch	1
3	Packing list	1

Optional Accessories

NO.	Name	Model	Instructions	Picture	Qty
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	SHA-2600 (340/440/540kW) SHA-3200 (690~1780kW)	To avoid vibration and noise, it must be used between base and foundation when install the unit.		4
3	Remote control cabinet	GX03501	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	Q235-B,150-10 (340/440/540kW) Q235-B,200-10 （690~1780kW）	Flange connection can be chosen for water pipe connection. Customer can choose water side pressure 1.6MPa according to requirement.		8

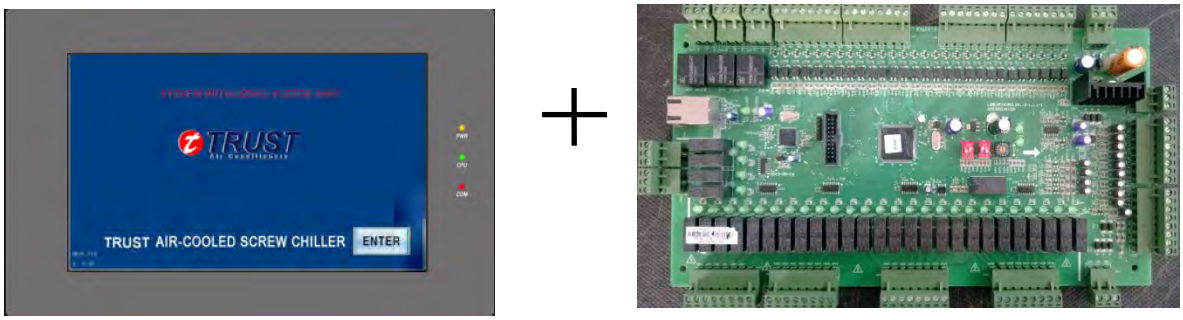
III. Control

1. Control flow chart

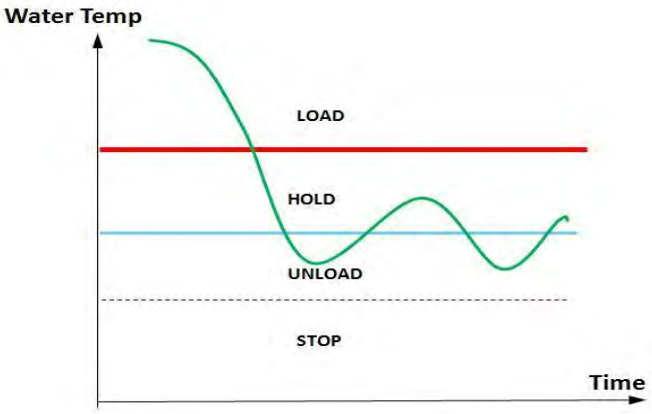


Main base controller gathers signals through input terminals, such as pressure, temperature and the state of protection switches and ensures unit's current condition. At the same time, according to input signal from HMI, such as starting signal, controller performs the logical operations and outputs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

HMI+ Main base controller:

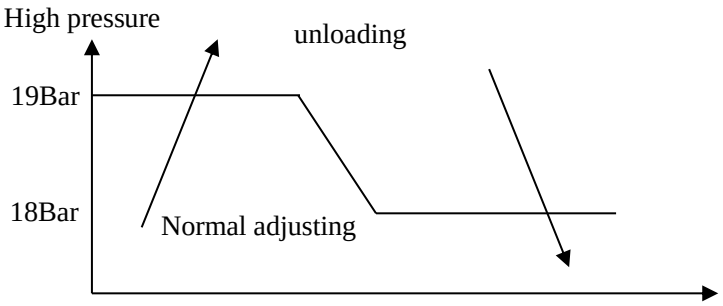


2. Energy adjustment



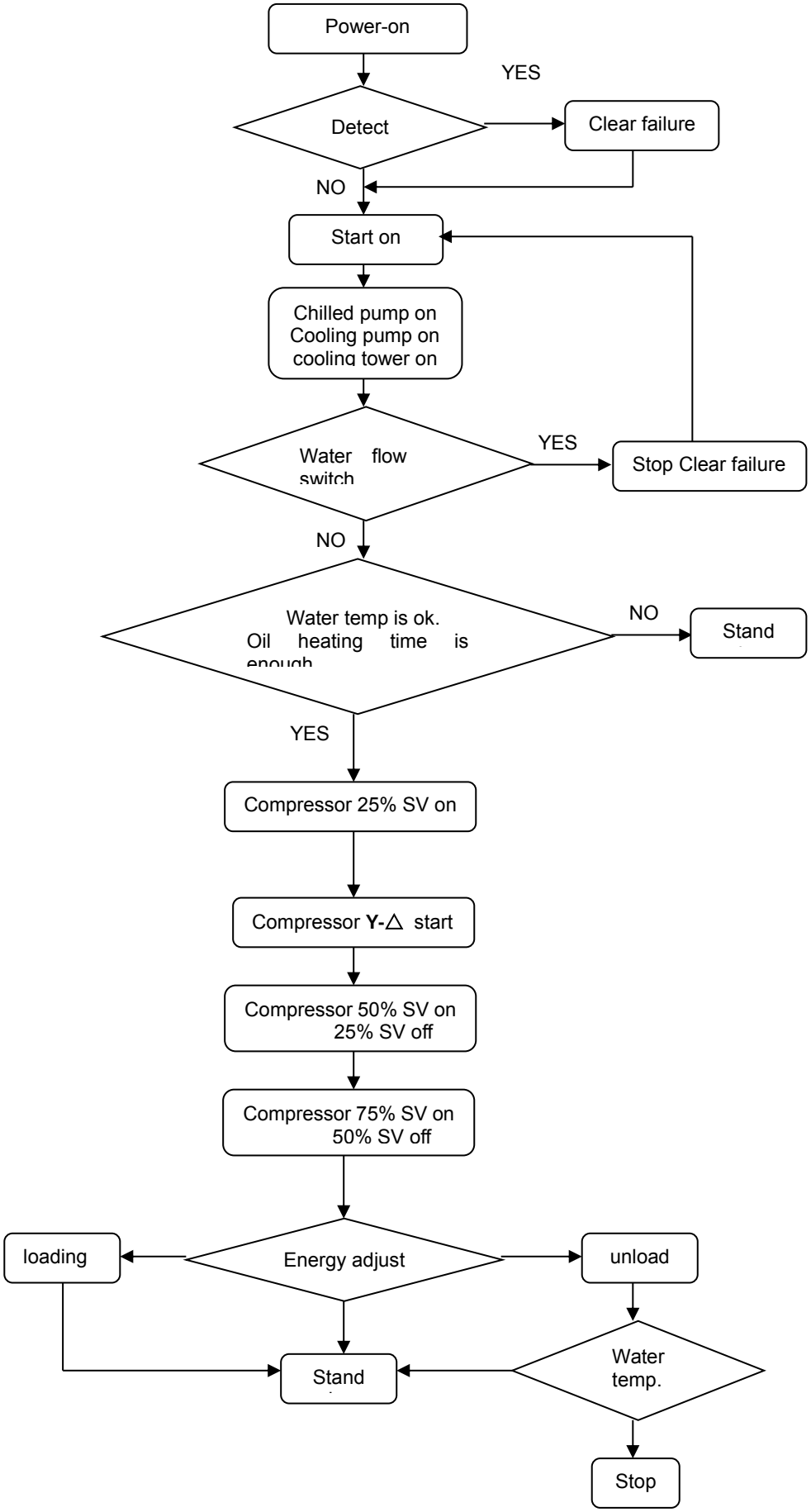
The unit adjust capacity by chilled water. The control logic see picture.

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

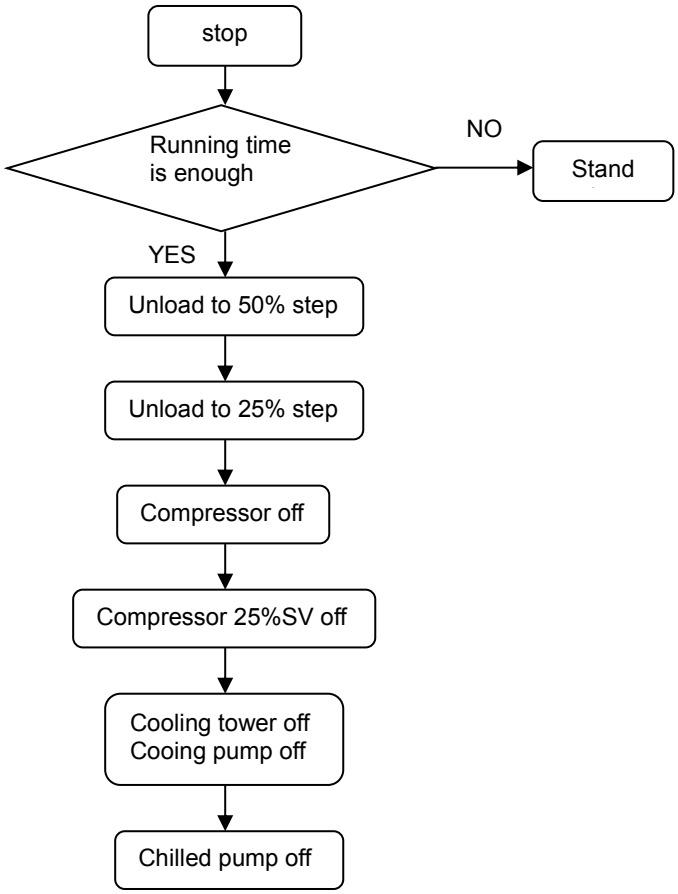


3. Start/stop process

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, discharge temperature, EXV discharge temperature.

NO.	Name	Type	Remark
1	Chilled entering water temp.	NTC,10k@25℃	Emerson
2	Chilled leaving water temp.	NTC,10k@25℃	Emerson
3	Cooling entering water temp.	NTC,10k@25℃	Emerson
4	Cooling leaving water temp.	NTC,10k@25℃	Emerson
5	Discharge temp.	50k@25℃	
6	EXV discharge temp.	NTC,50k@25℃	Carel
7	Pipe temp.		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. Danfoss AKS3000 are used.

Water temp. thermistor

suction temp. thermistor

pressure transmitter AKS3000

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.

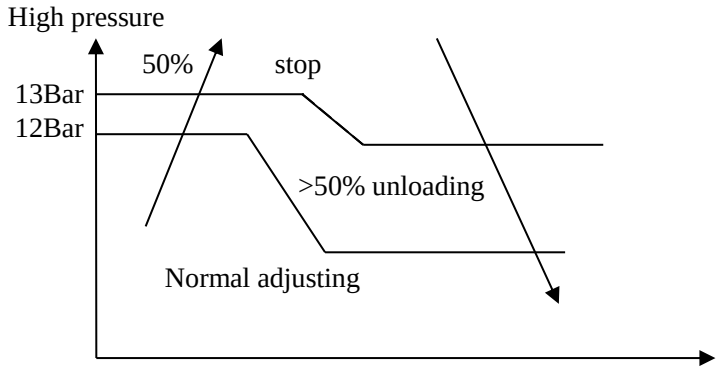
Oil heating time limits:

- When cooling water inlet temperature >= 35℃ (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℃ (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℃ (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

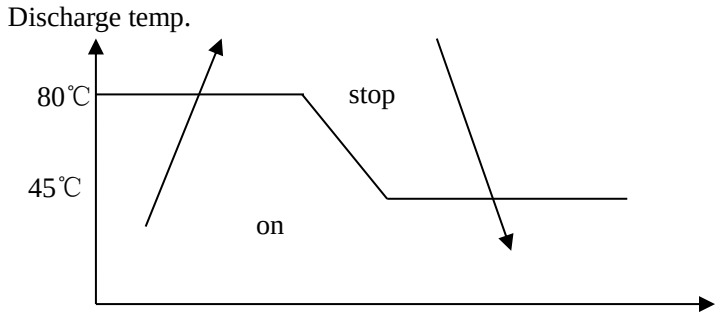
5hrs, 2hrs heating time is need.

- When cooling water inlet temperature >= 20℃ (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℃ (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.

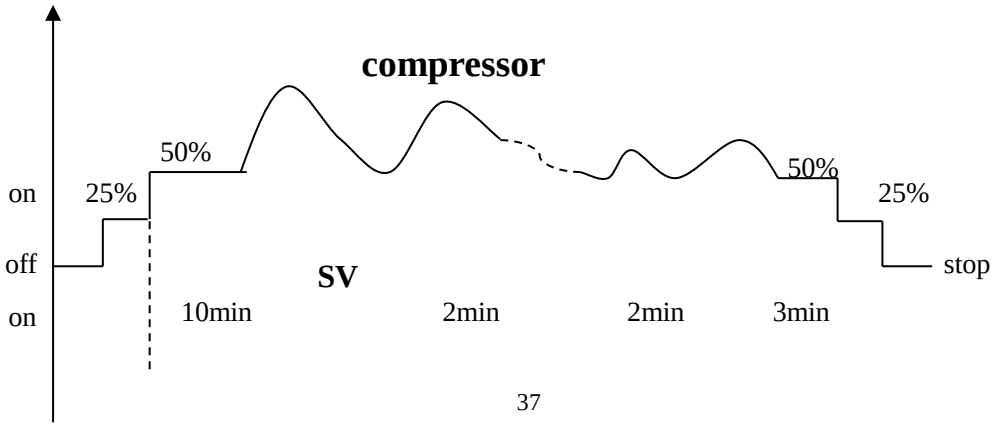
2) Pressure sensor Control
high pressure control

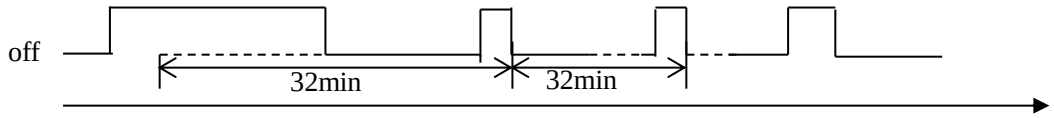


3) Discharge temp. Control



4) Return oil solenoid valve Control

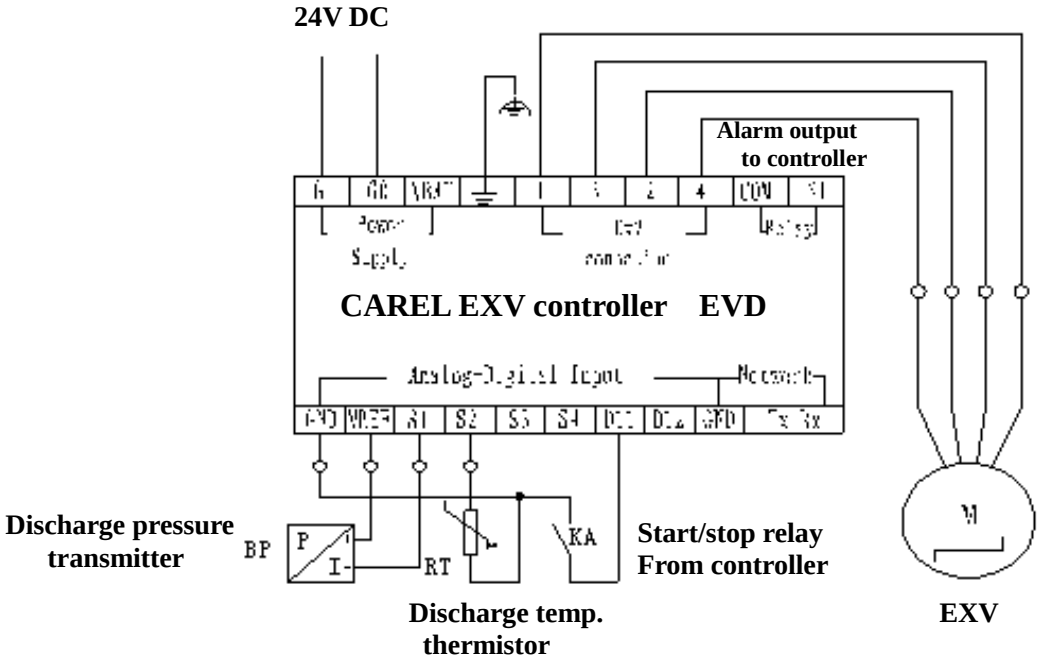




a. When compressor start, the return oil solenoid valve is opened ,closed after 10 minutes.
b. When compressor is running ,from compressor start to 50%,every 30 minutes to open return oil solenoid valve 2 minutes.
c. When compressor shut down, with the compressor unloaded into 50% return oil solenoid valve open 3 minutes.
d. When oil level protection occurs, the return oil solenoid valve is opened, closed after recovery.

5) EXV controller Control

a. EXV controller wiring principle



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

b. Controller display

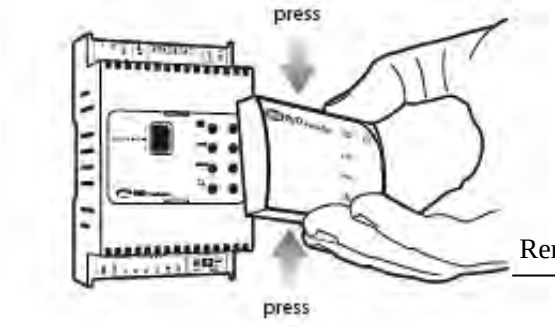
The interface of EXV controller cannot display and set the parameter on unit, only display running status.

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	-	-

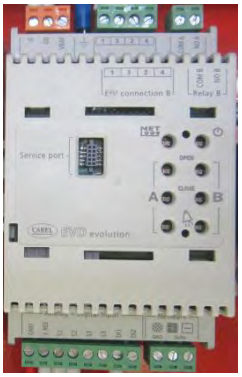
	Drive power	The drive is not connected to power supply	-

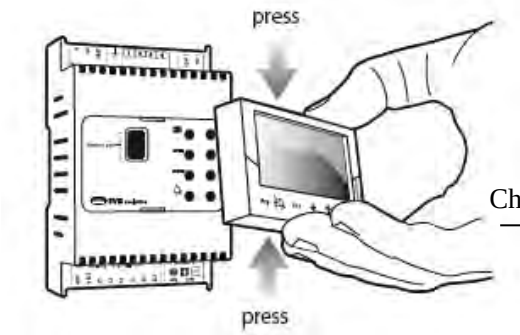
1	Display suction superheat
2	Display EXV opening
3	Relay output status
4	Alarm
5	Start of the protection

If the parameter need to be displayed and set. Interface should be changed.



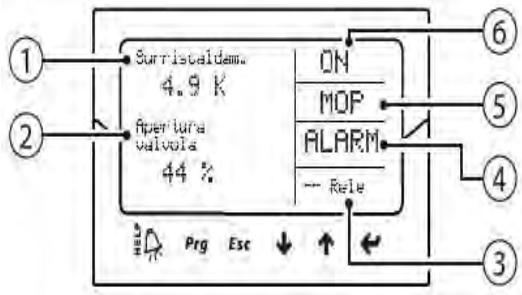
Remove cover





Change display

Display



Button	Function
Prg	Open the display screen, enter the password to enter the programming mode
HELP	• In the alarm state, the display alerts the queue; • When the "producer" level under the rolling parameters, the display shows the interface
Esc	• To exit the programming (maintenance / producer) and display mode; • set a parameter, the exit without saving changes
↓ / ↑ UP/DOWN	• Display screen navigation; • Increase / decrease the value
↵ Enter	• from the parameter setting mode, the display switches to • Confirm the list of parameters and return the value

6	Control state

Running display status **display all status**

Press ↓ / ↑

Press Esc button

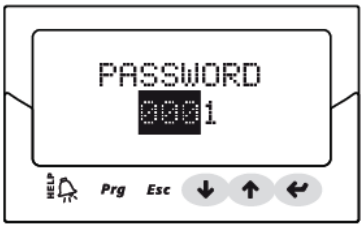
c. Controller parameter checking and changing.

Checking or changing repair parameters step:

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

②Press Prg: display interface input password;

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



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

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

⑥Press ENTER to move to the parameter value;

⑦Press UP/DOWN to modify the parameter value;

⑧Press ENTER to save the new parameter values;

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

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

The following shows the detailed settings: 13 pages

Drive hardware configuration 1/13 Network address 198	Drive hardware configuration 2/13 Refrigerant type R134a Valve type Danfoss ETS 250
Drive hardware configuration 3/13 Type of probe S1 User-defined Unit type Fin coil evaporator air-conditioner	Drive hardware configuration 4/13 Type of probe S1 NTC Carel Auxiliary control type Disabled
Drive hardware configuration 5/13 Type of probe S3 Unused Relay configuration Generate alarms	Drive hardware configuration 6/13 Type of probe S4 Unused DI1 configuration Start/stop SH control
Drive hardware configuration 7/13 Language Chinese DI2 configuration Disabled	Control parameter settings 8/13 Overheat degree 6.0K Valve opening upon start 50% Pre-positioning duration 30s
Control parameter settings 9/13 Hot air by-pass temperature --- Hot air by-pass temperature --- EPR back pressure ---	Control parameter settings 10/13 LowSH 2.0K LOP -50℃ MOP 50℃
Control parameter settings 11/13 Enable manual valve positioning 0 Manually set the valve position 0stp	Control parameter settings 12/13 HiTcond threshold 80.0℃ Constant temperature adjustment point 0℃ Constant temperature adjustment variance 0.1K

Checking or changing manufacturer parameters step:

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

②Press Prg: display interface input password;

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

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

- Configuration parameters
- ensor parameters
- Control parameters

- he special parameters
- lert configuration parameters
- Valve parameters

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

⑥Press 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;

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

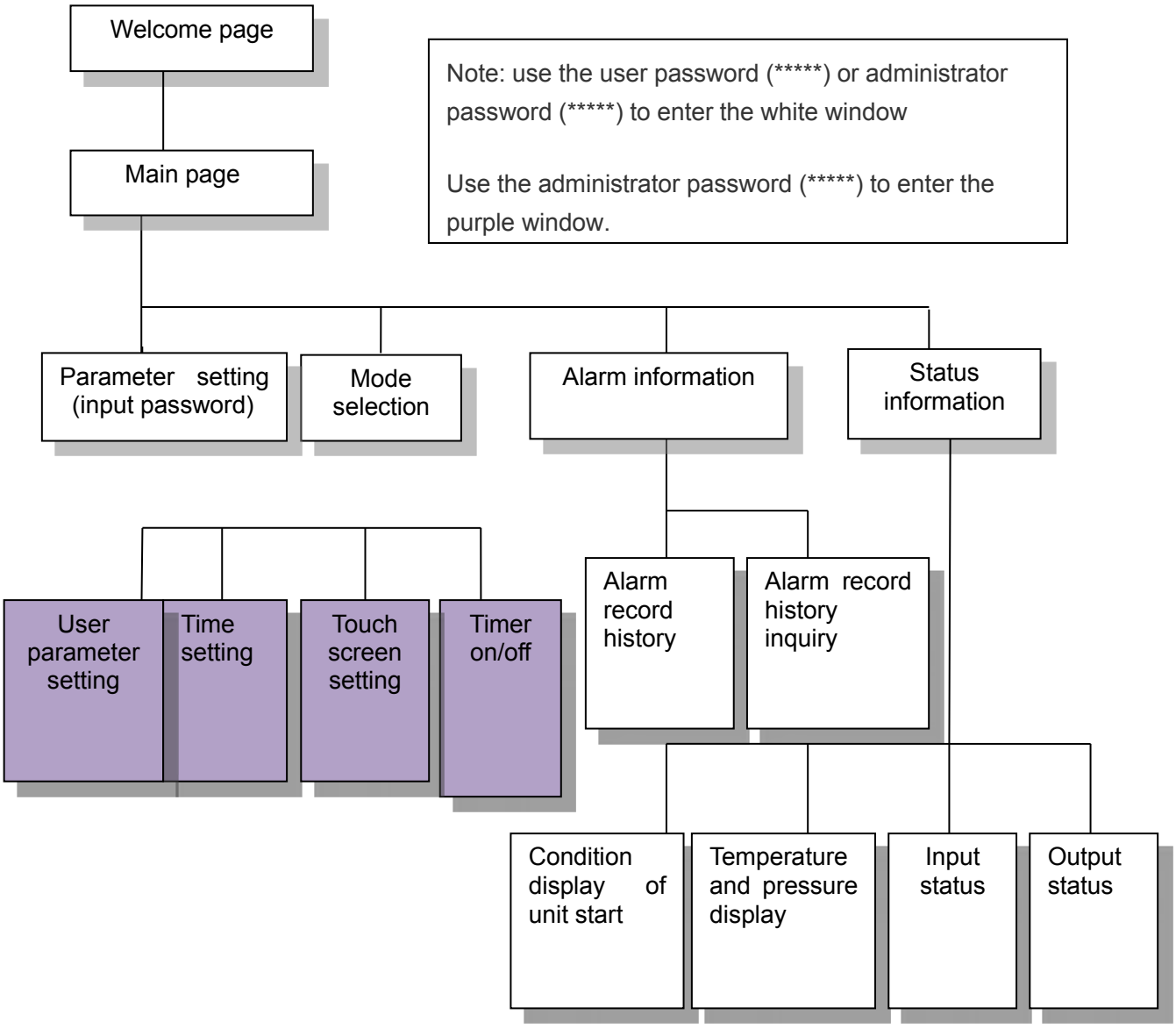
⑩Press Esc to exit the manufacturer parameter modification program.

Unit type		**340,440,540,690,805,890,1080,1200,1385,1620,1780**	**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 mA	1	
	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.

- Welcome page

  The first welcome page as the figure 6.1

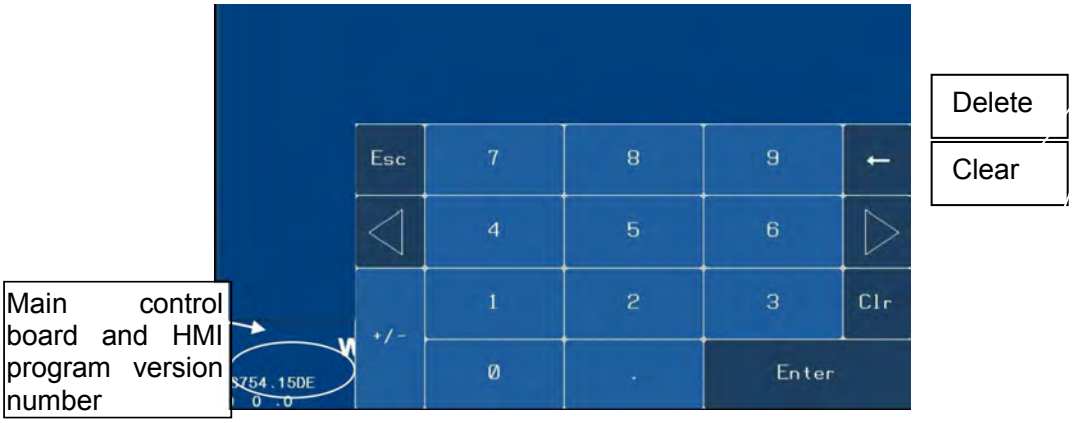


Figure 6.1

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

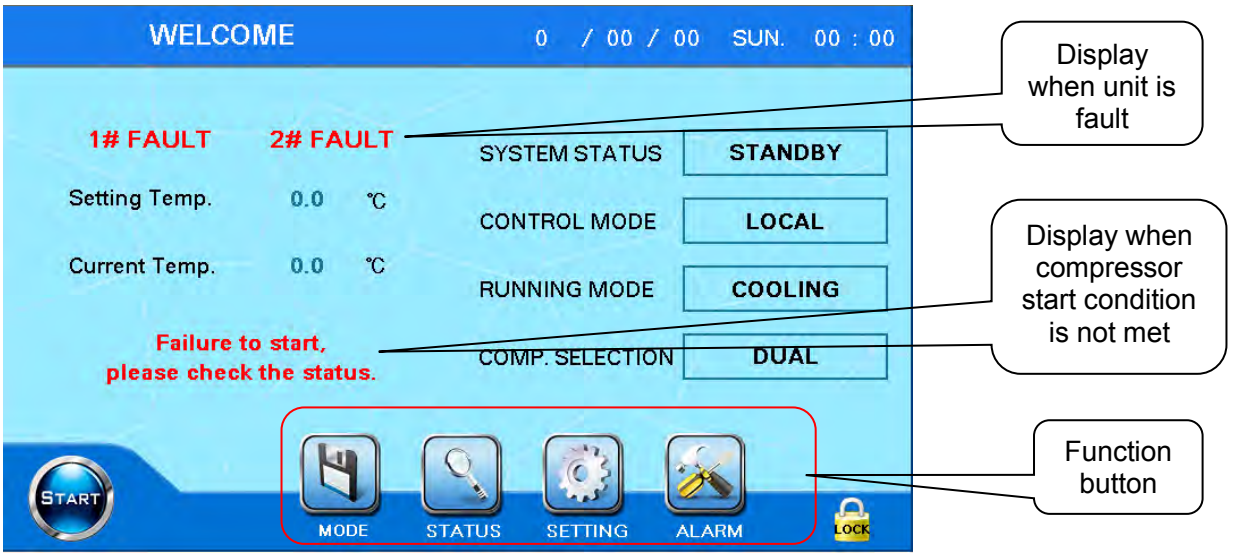


Figure 6.2

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: 1. Water temperature is not satisfy with compressor startup condition; 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; 3. Oil temperature of compressor is not satisfy with startup condition; 4. The pausing time is too short, and it is not meet the requirements of the compressor starts intervals; 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:

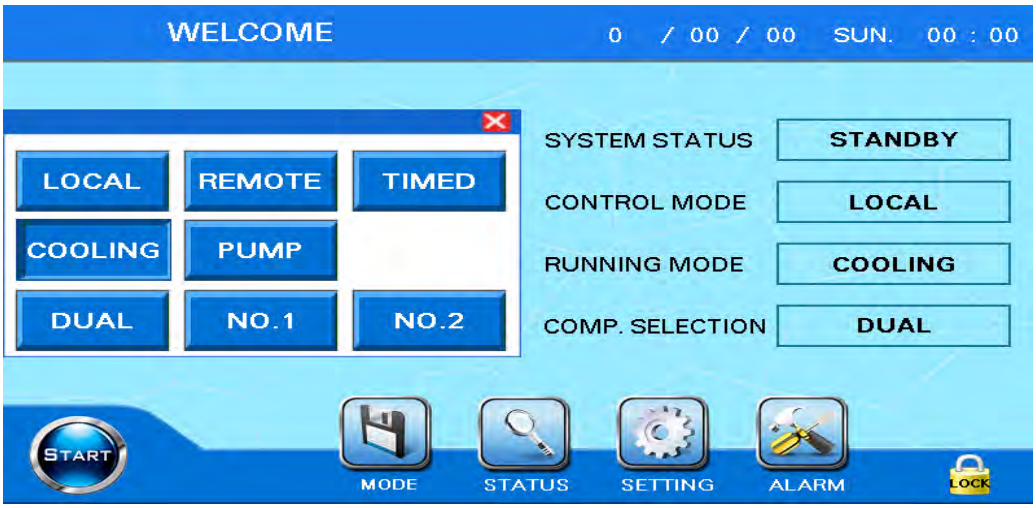


Figure 6.3

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.

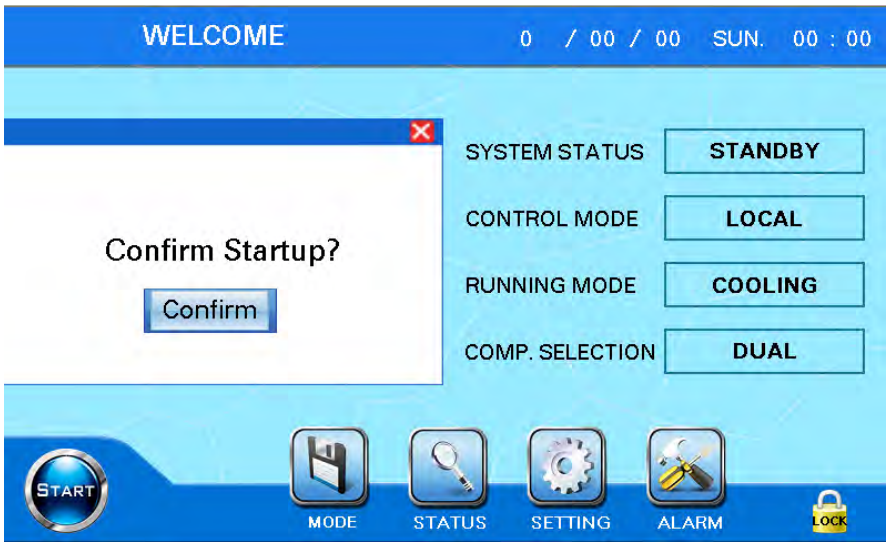


Figure 6.4

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:

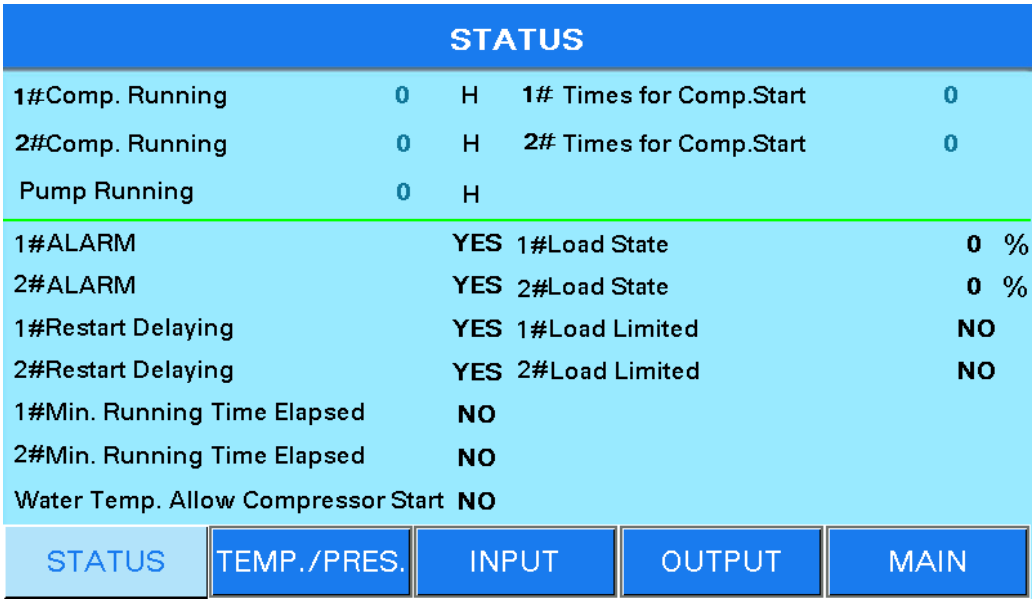
Cooling mode: water temperature of paused state = setting chilled water temperature- temperature control range. When unit is in paused state, if temperature controlling is higher than compressor starting

temperature, compressor starts.

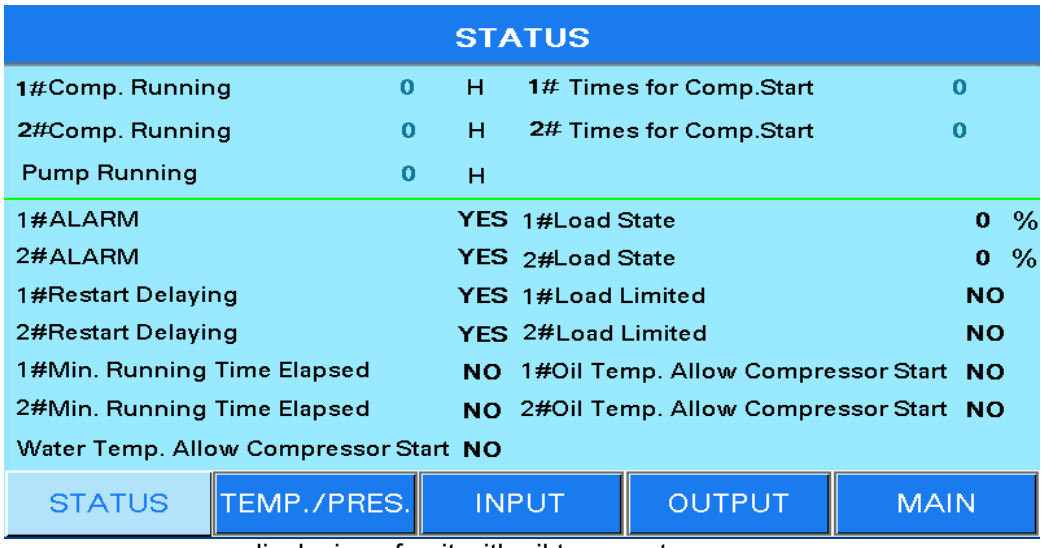
Heating mode: water temperature of paused state= setting chilled water temperature+ temperature control range. When unit is in paused state, if temperature controlling is lower than compressor starting temperature, compressor starts.

➢ 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.

1)Status information- display of temperature and pressure

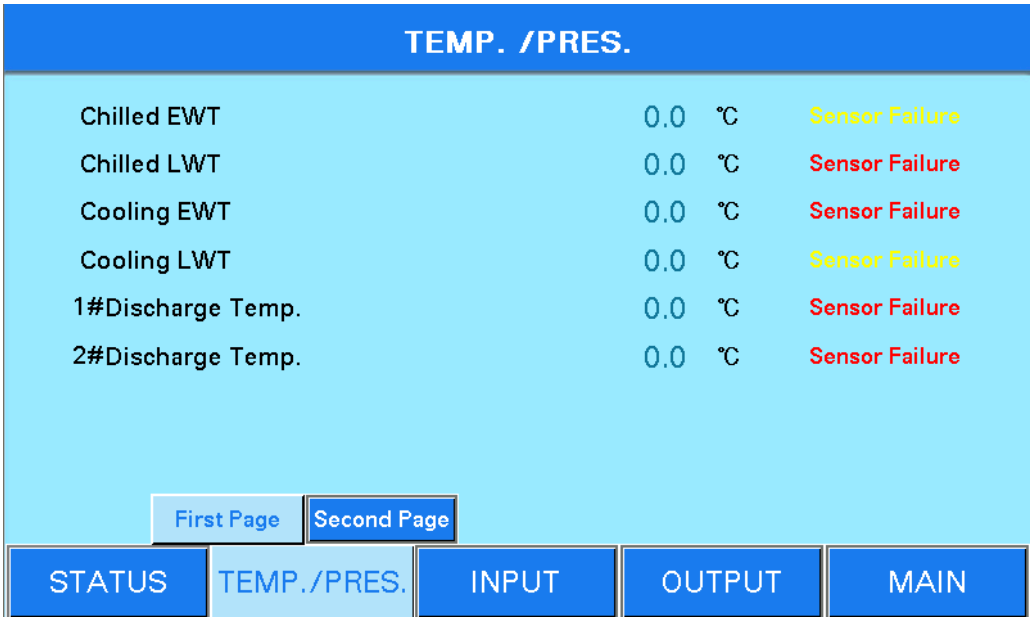


Figure 6.7

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”.

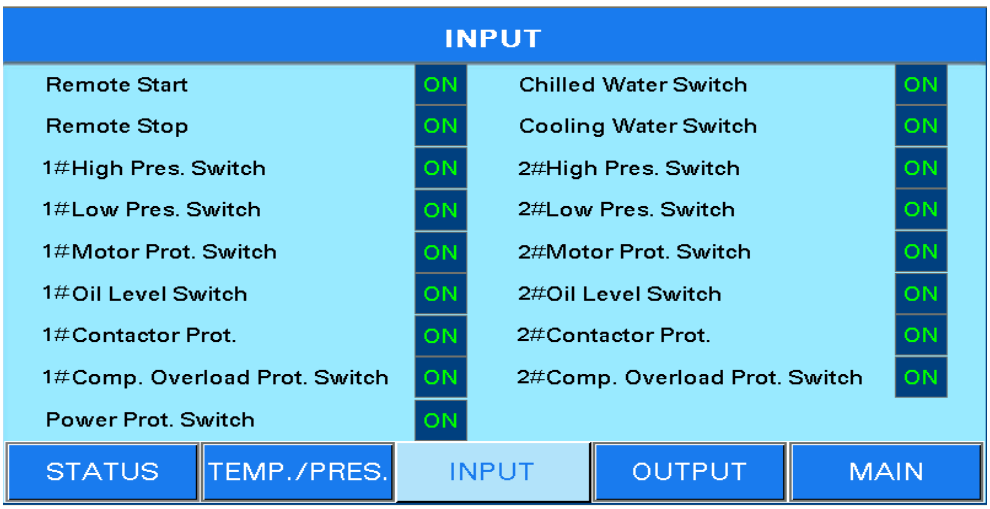


Figure 6.8 (Remark: subject to the actual principle diagrams)

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) 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.

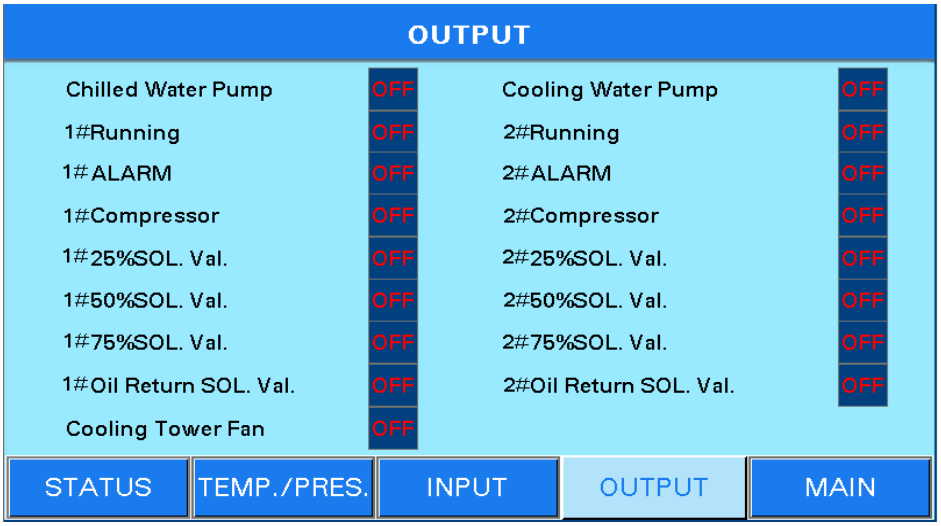


Figure 6.9 (Remark: subject to the actual principle diagrams)

➢ 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.

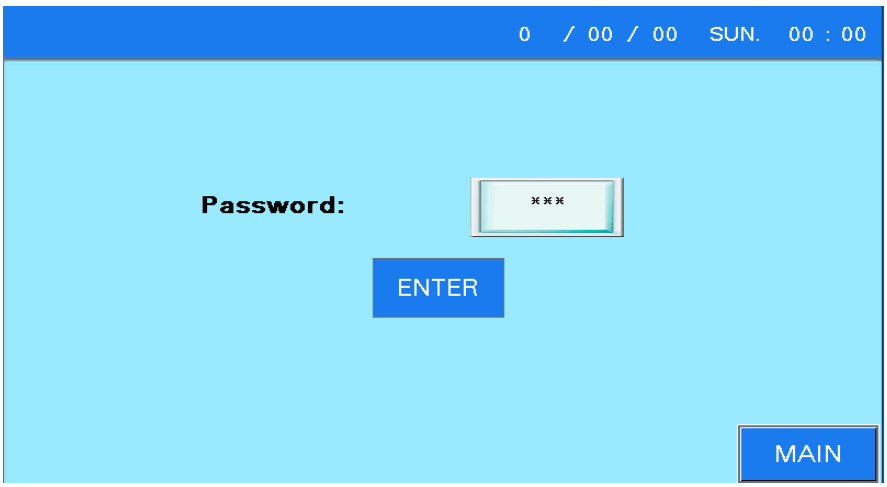


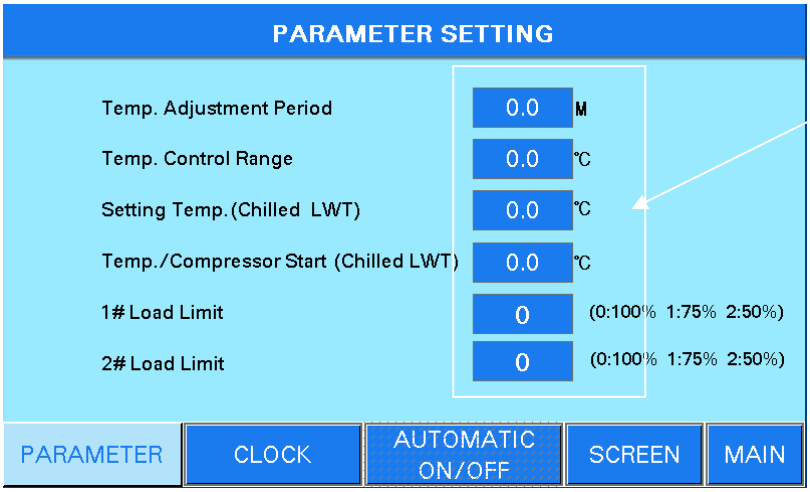
Figure 6.10

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

➢ User parameter setting-temperature setting

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



Manual input is possible

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%.

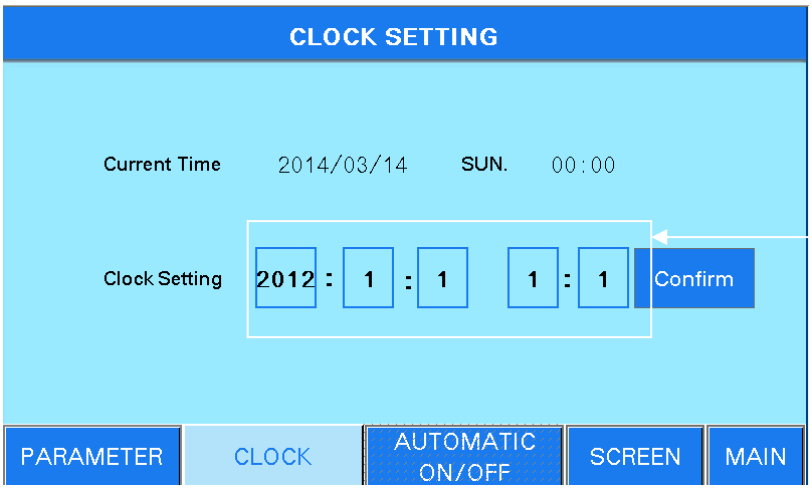
Timer setting of startup or shutdown Only when control mode is “timer”, it will display.

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.



Manual input is possible

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.

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.

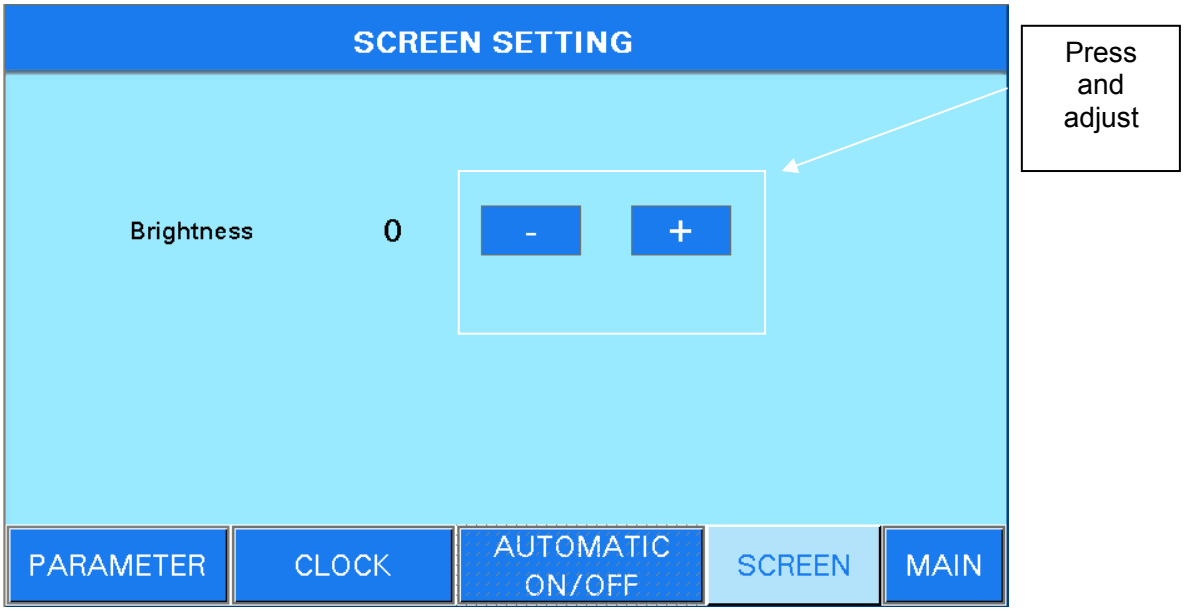


Figure 6.14

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:

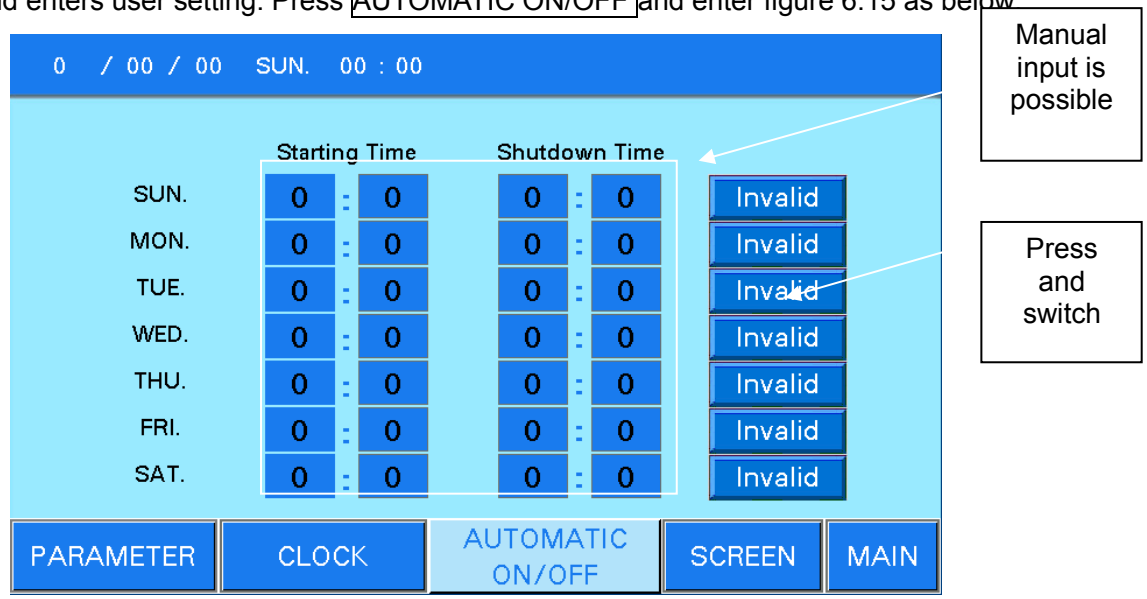


Figure 6.15

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.

➢ Alarm window

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

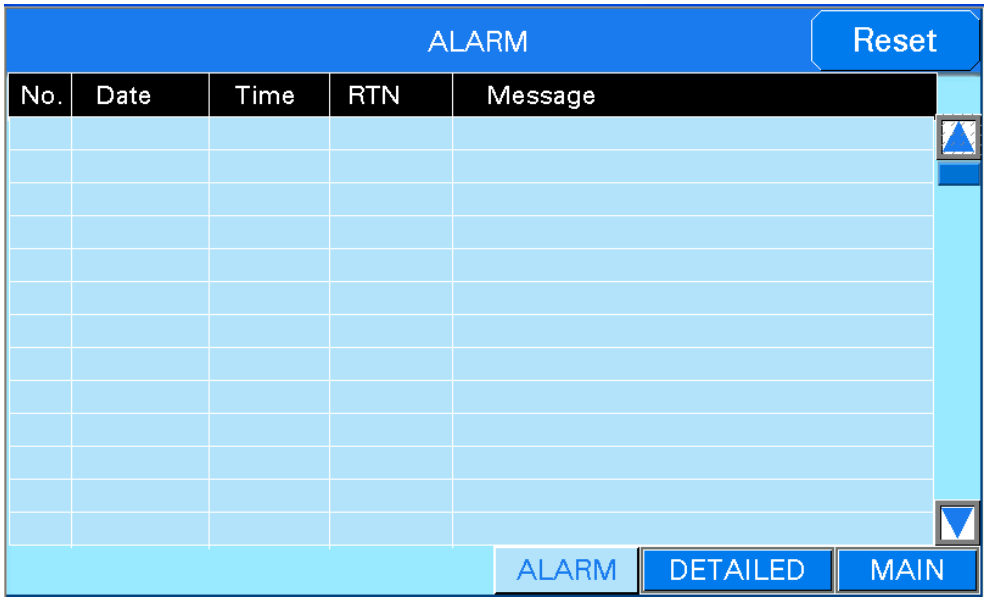


Figure 6.16

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.

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 0.10Mpa OFF 0.20Mpa	
High-pressure Switch 1	YK-1.4/0.9-C-R-7000	JUNLE	ON 1.4Mpa OFF 0.9Mpa	

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
CUxxxxBO3/1WT1FA	14bar	9bar	1bar	2bar

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

TMCUxxxxBO3/1WT1FA		365	465	560	750	825	925	1120	1230	1500
Standard voltage	V	380V~3Ph~50Hz+N+PE								
Voltage range	V	342~418								
Max. running current	A	162	200	236	311	354	380	472	518	622
Max. power consumption	kW	93.5	116.8	141.9	182.9	205.8	222	283.8	215.8	365.8
Rated current	A	106	133	162	208	253	266	324	359	417
Compressor A										
Locked rotor Amps.	A	810	875	1340	1990	810	875	1340	1430	1990
Max. allowed current	A	219.6	274.3	333.2	429.5	241.6	260.7	333.2	369.6	429.5
Rated current	A	106	133	162	208	126.5	133	162	179.5	208.5
Rated power	kW	62	78	95	126	74	78	95	105	126
Compressor B										
Locked rotor Amps.	A	--	--	--	--	810	875	1340	1430	1990
Max. allowed current	A	--	--	--	--	241.6	260.7	333.2	369.6	429.5
Rated current	A	--	--	--	--	126.5	133	162	179.5	208.5
Rated power	kW	--	--	--	--	74	78	95	105	126
Crankcase heater										
Voltage	V	220	220	220	220	220	220	220	220	220
Total input	kW	0.3	0.3	0.3	0.3	0.6	0.6	0.6	0.6	0.6
Total Amps.	A	1.36	1.36	1.36	1.36	2.72	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

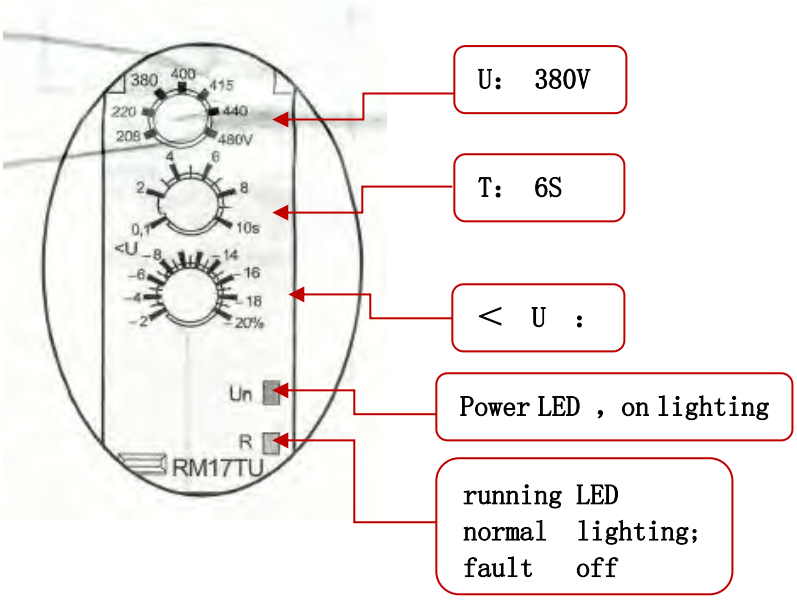
The electronic expansion valve is equipped with a stepping motor which controls the valve status. A special-purpose electronic expansion valve control module is required to drive the electronic expansion valve.

1) 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



Power protector use Schneider RM17TU type.

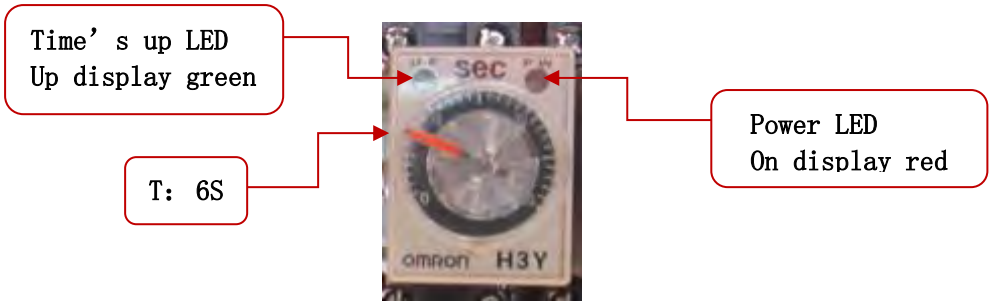
① Select the voltage class. For standard units, the voltage is 380 V.

① Set the delay to 6s.

② Set the under voltage value to 10%.

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

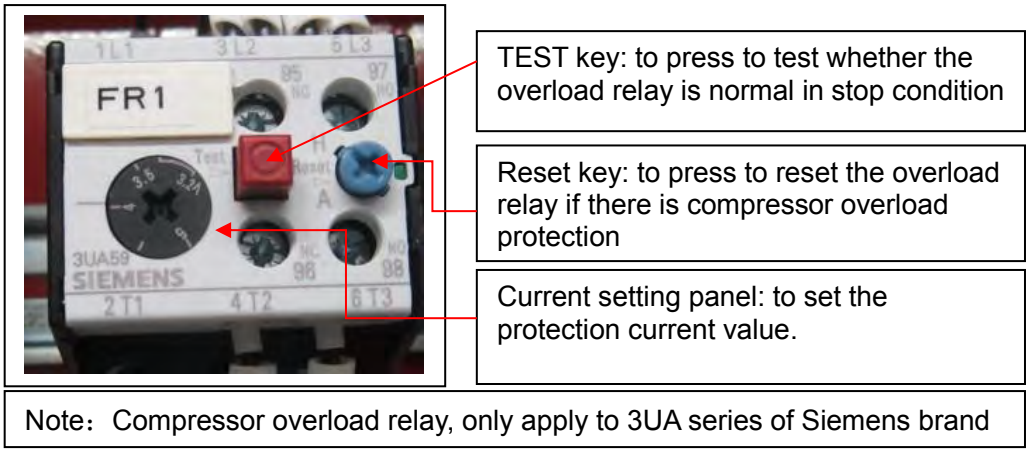
2) Time Relay



Time relay use Omron H3Y type.

3) Compressor and fan thermal overload relay

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



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

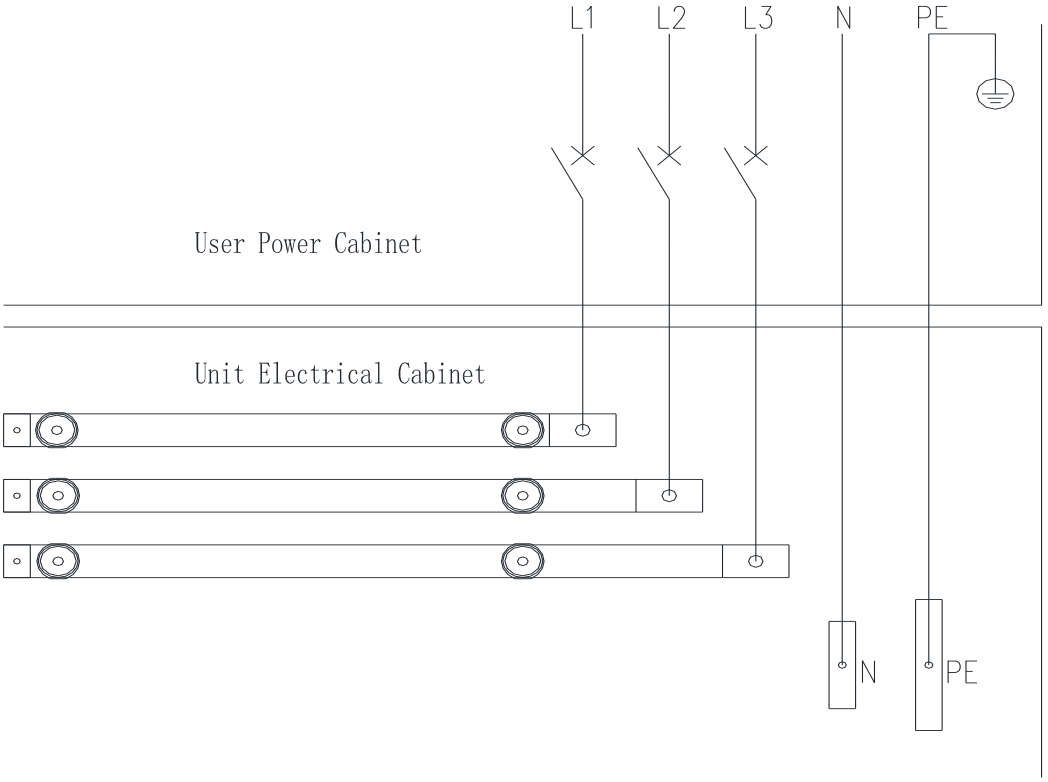
Note: Use a value that is smaller than the calculated one. For example, in the preceding calculation, the calculated value is 4.17; in practice, set the value to 4.15.

Unit Type	Maximum Running Current of Compressor	Transformation Ratio of Current Transformer	Thermal Relay Value of Compressor
340	139.6	250/5	2.8
440	174.1	250/5	3.5
540	203.5	300/5	3.4
690	277.5	400/5	3.4
805	342.7	500/5	3.4
890	370.8	500/5	3.7
1080	203.5x2	300/5	3.4
1200	224.6x2	300/5	3.7
1385	277.5x2	400/5	3.4
1620	342.7x2	500/5	3.4
1780	370.8x2	500/5	3.7

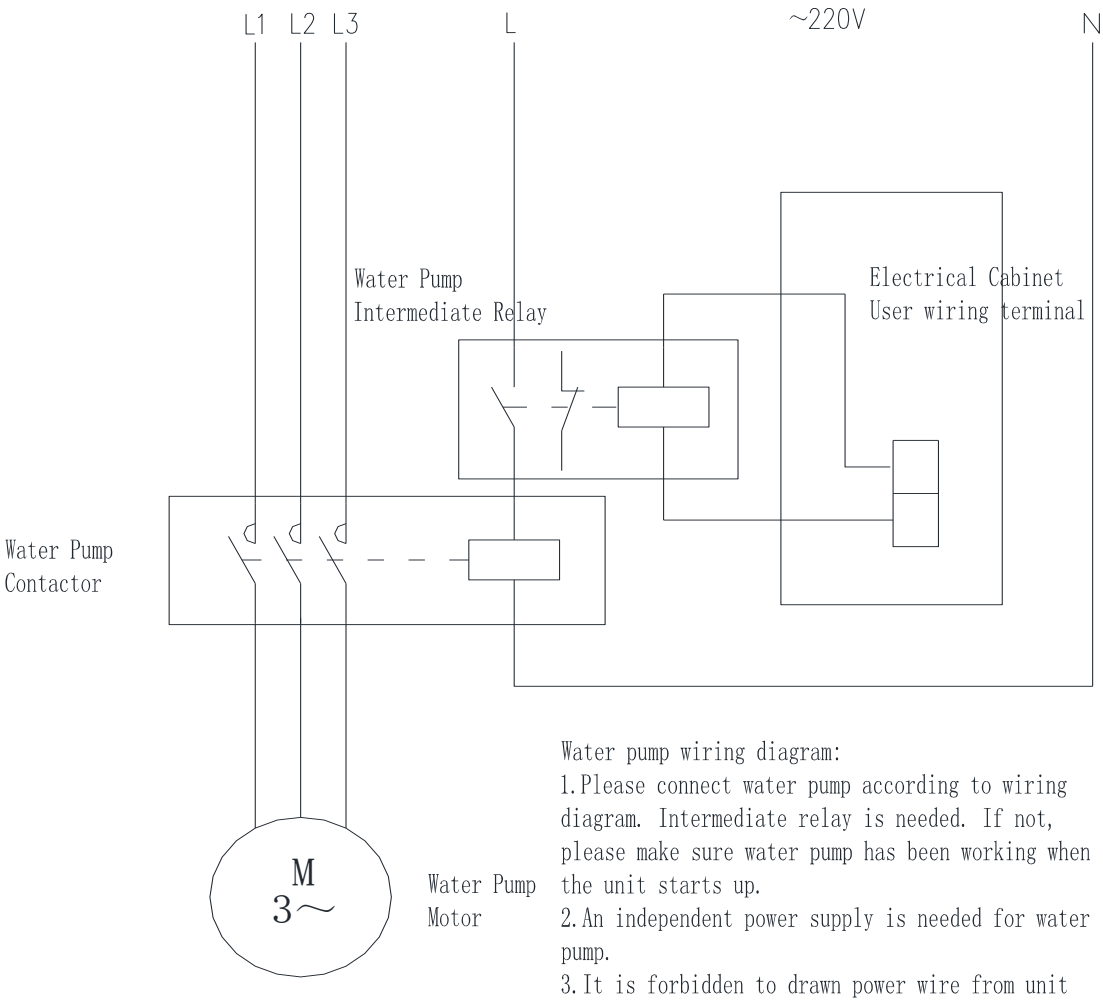
4. Field wiring

1) Wiring diagram

Power supply wiring diagram



Water Pump Wiring Diagram



Water pump wiring diagram:
1. Please connect water pump according to wiring diagram. Intermediate relay is needed. If not, please make sure water pump has been working when the unit starts up.
2. An independent power supply is needed for water pump.
3. It is forbidden to drawn power wire from unit electrical cabinet. Midea has no liability for electrical accident caused by this.

Recommended external wiring cable

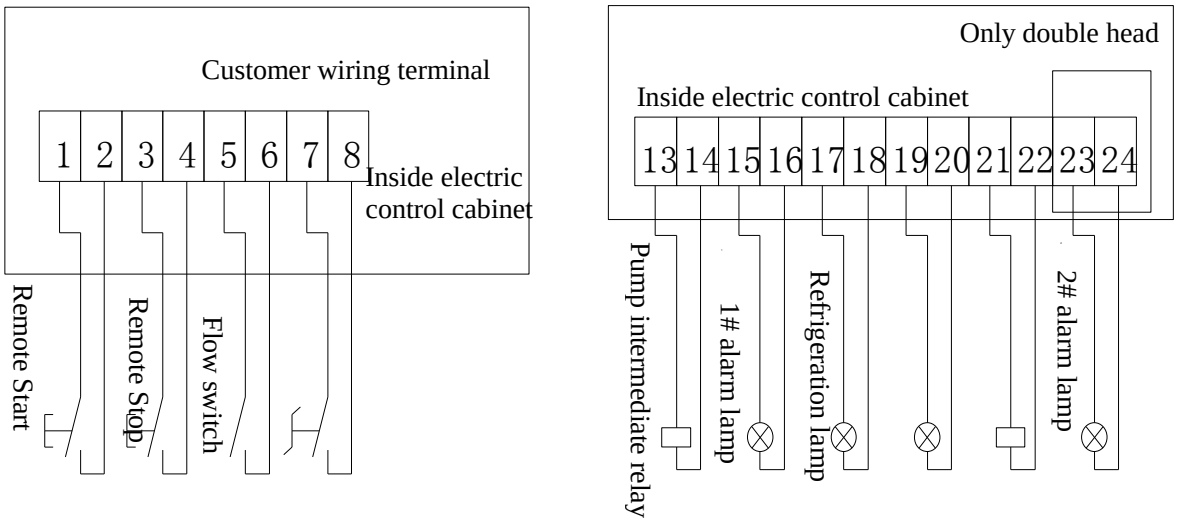
Unit Model	External wiring cable (mm2)	Unit Model	External wiring cable (mm2)
340BO3/1WT1FA	4×AWG1+AWG3	1080BO3/1WT1FA	4×AWG400+AWG4/0
440BO3/1WT1FA	4×AWG1/0+AWG3	1200BO3/1WT1FA	4×AWG500+AWG250
540BO3/1WT1FA	4×AWG3/0+AWG1	1385BO3/1WT1FA	4×AWG600+AWG300
690BO3/1WT1FA	4×AWG4/0+AWG1/0	1620BO3/1WT1FA	4×(2×AWG300)+AWG300
805BO3/1WT1FA	4×AWG300+AWG4/0	1780BO3/1WT1FA	4×(2×AWG400)+AWG500
890BO3/1WT1FA	4×AWG400+AWG4/0		

Notice: The given wire length limits the voltage drop to < 2%. If the length can not be reduced, the power cord should be bolder.

If the cable is installed in pipe or the ambient temperature is above 40℃, it's necessary to enlarge the wire section.Please refer to relevant electrical code for selection according to the max. running current.

2) 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.

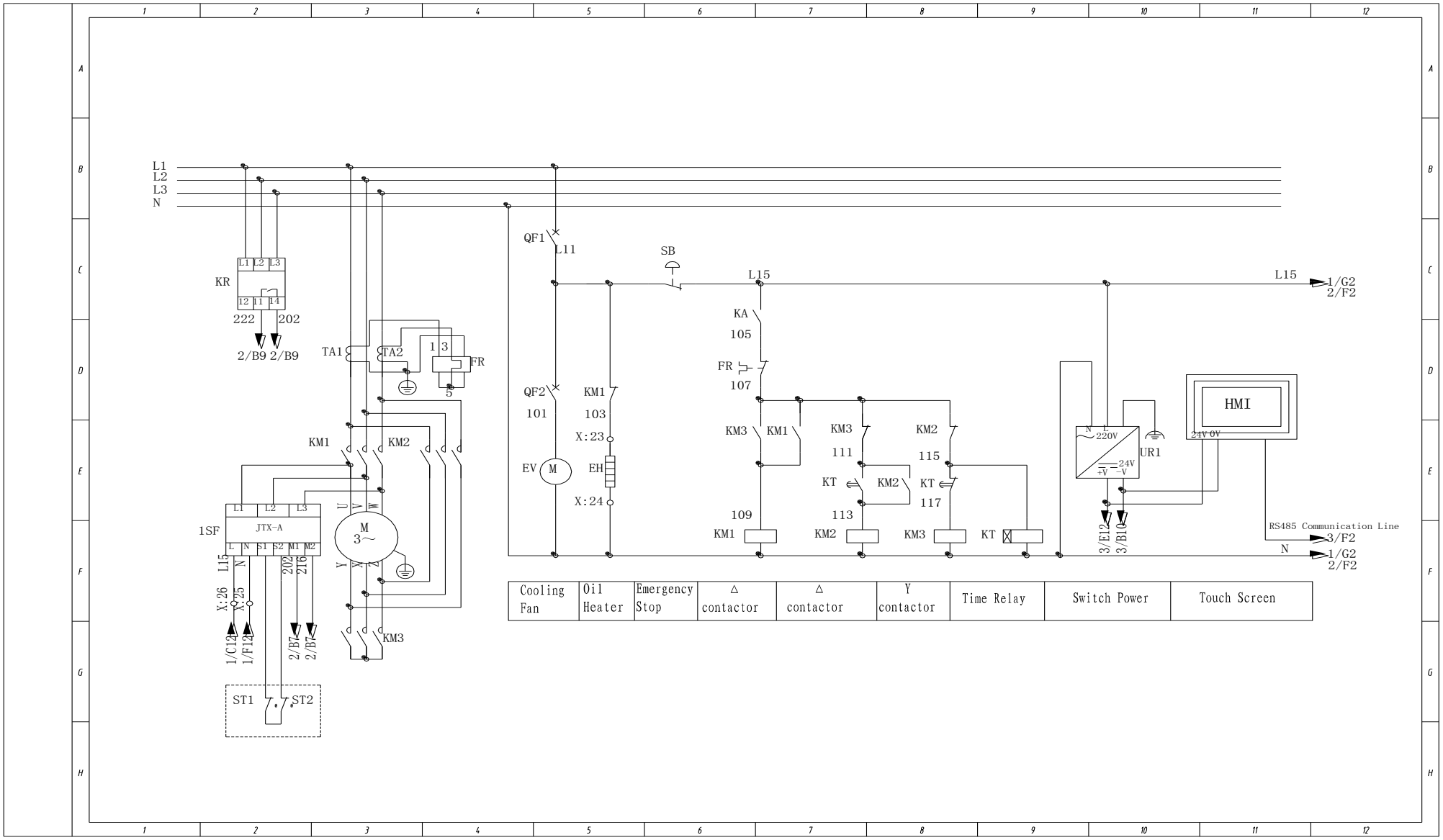


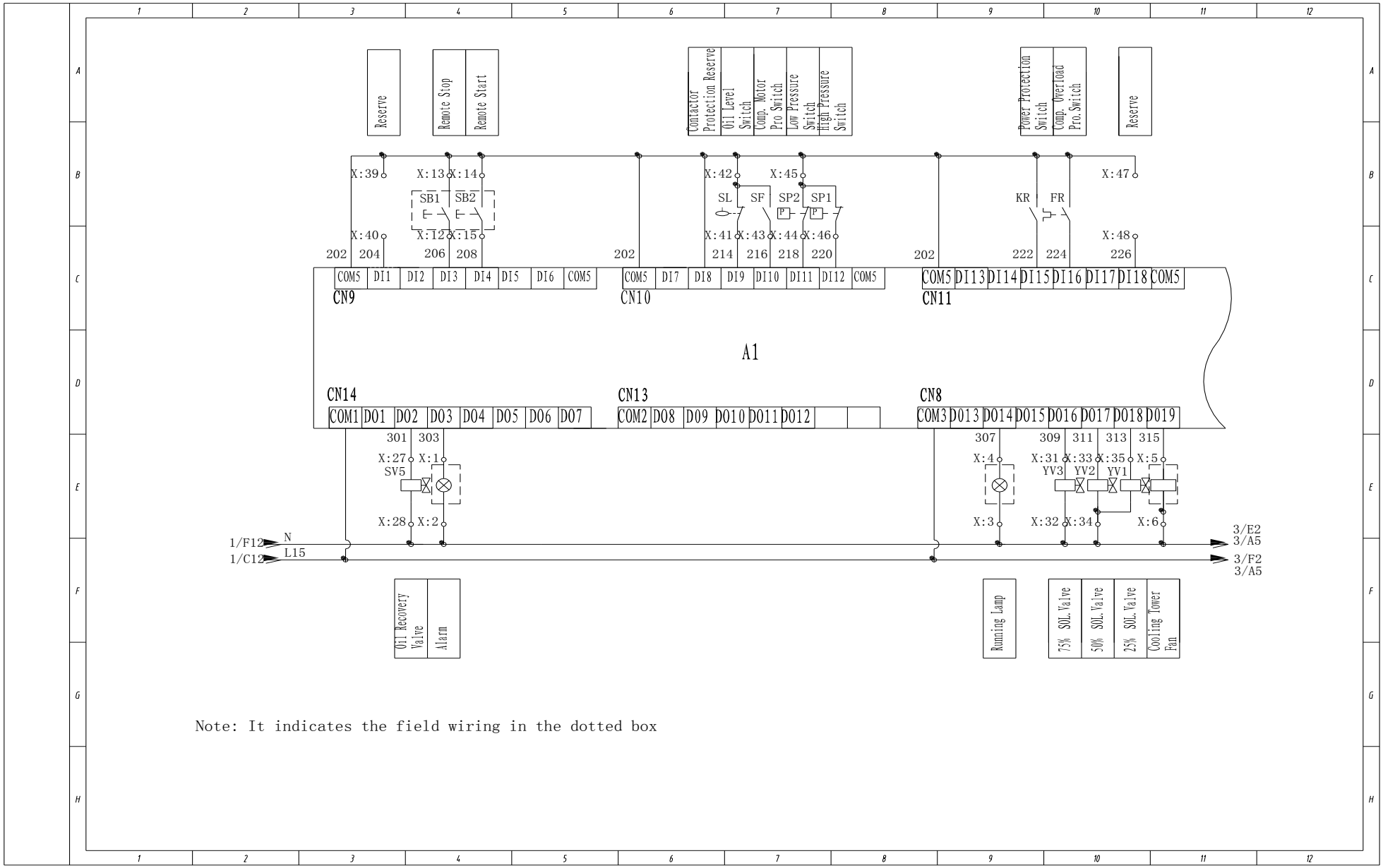
Remote start/stop switch need to use inching switch.

Lamp input 220VAC.

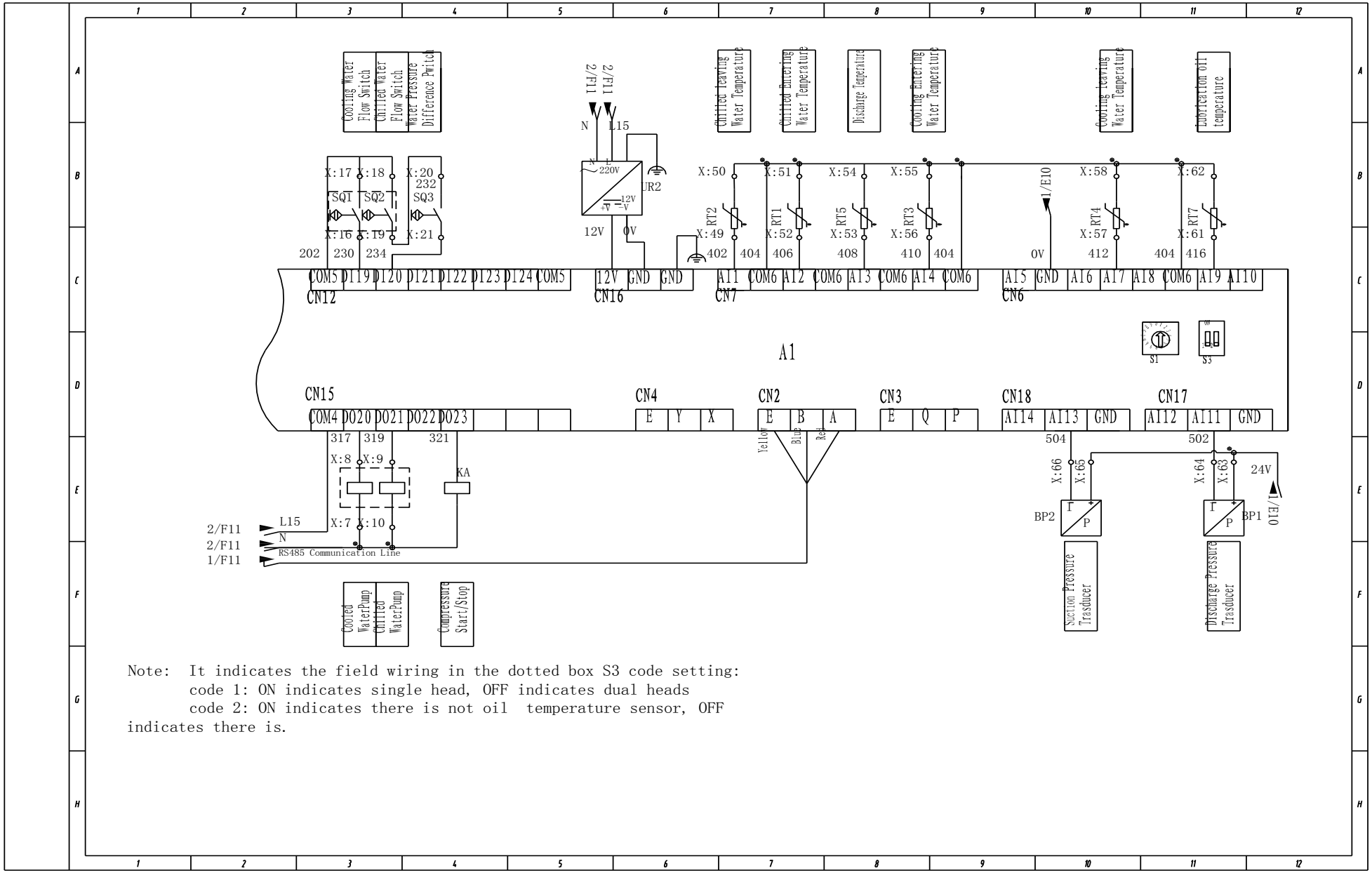
5. Wiring Diagrams

340BO3/1WT1FA ~890BO3/1WT1FA

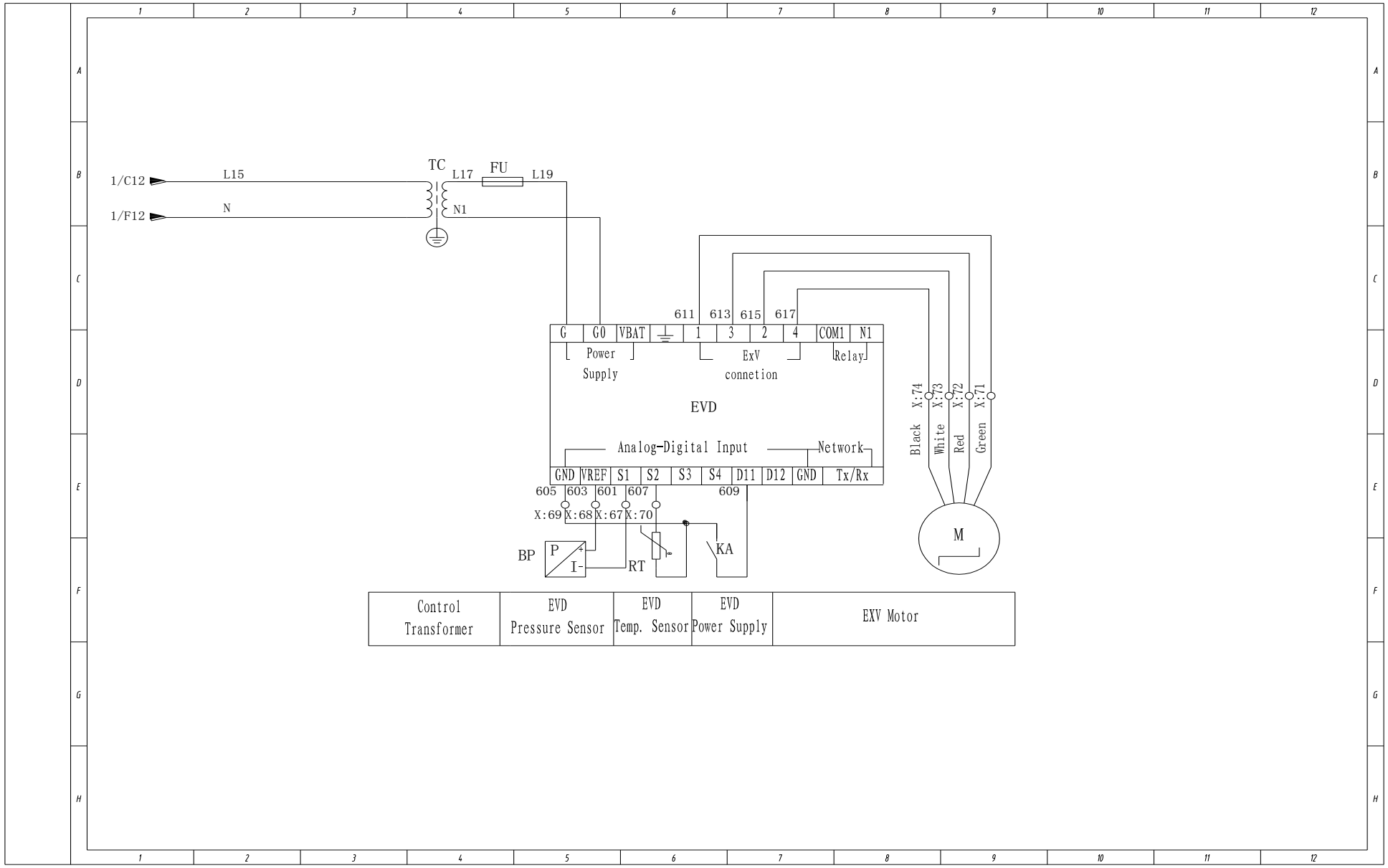




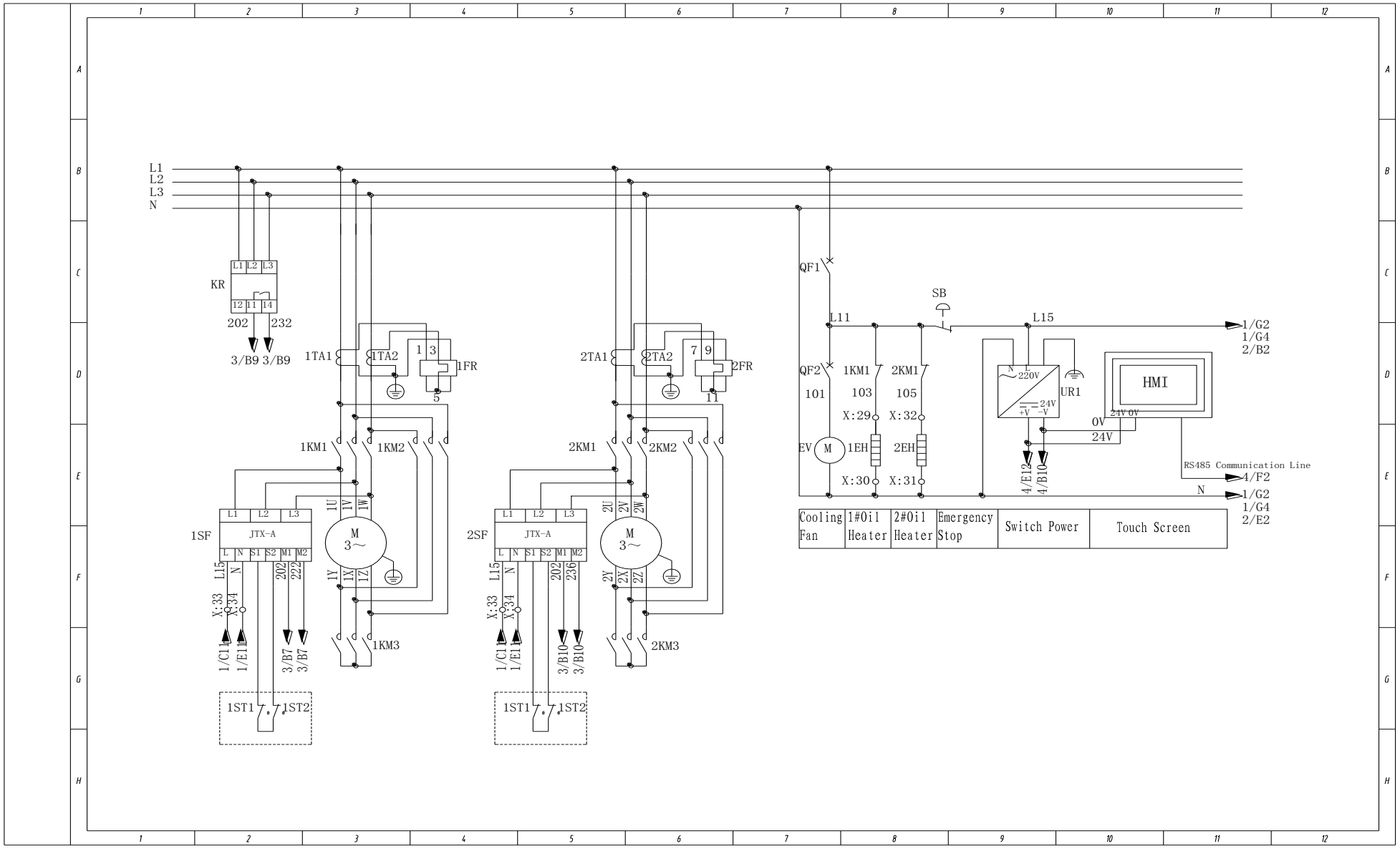
Note: It indicates the field wiring in the dotted box

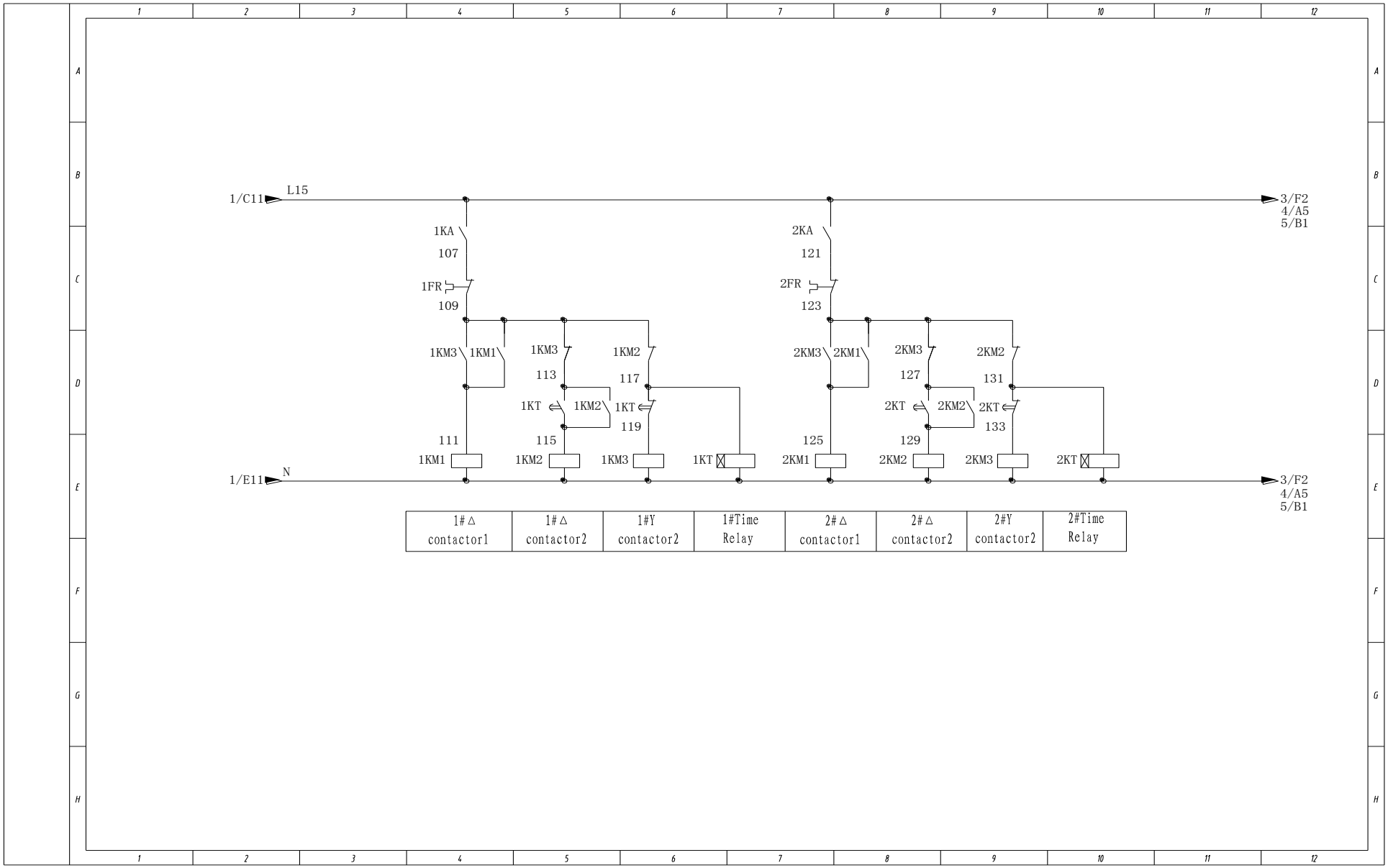


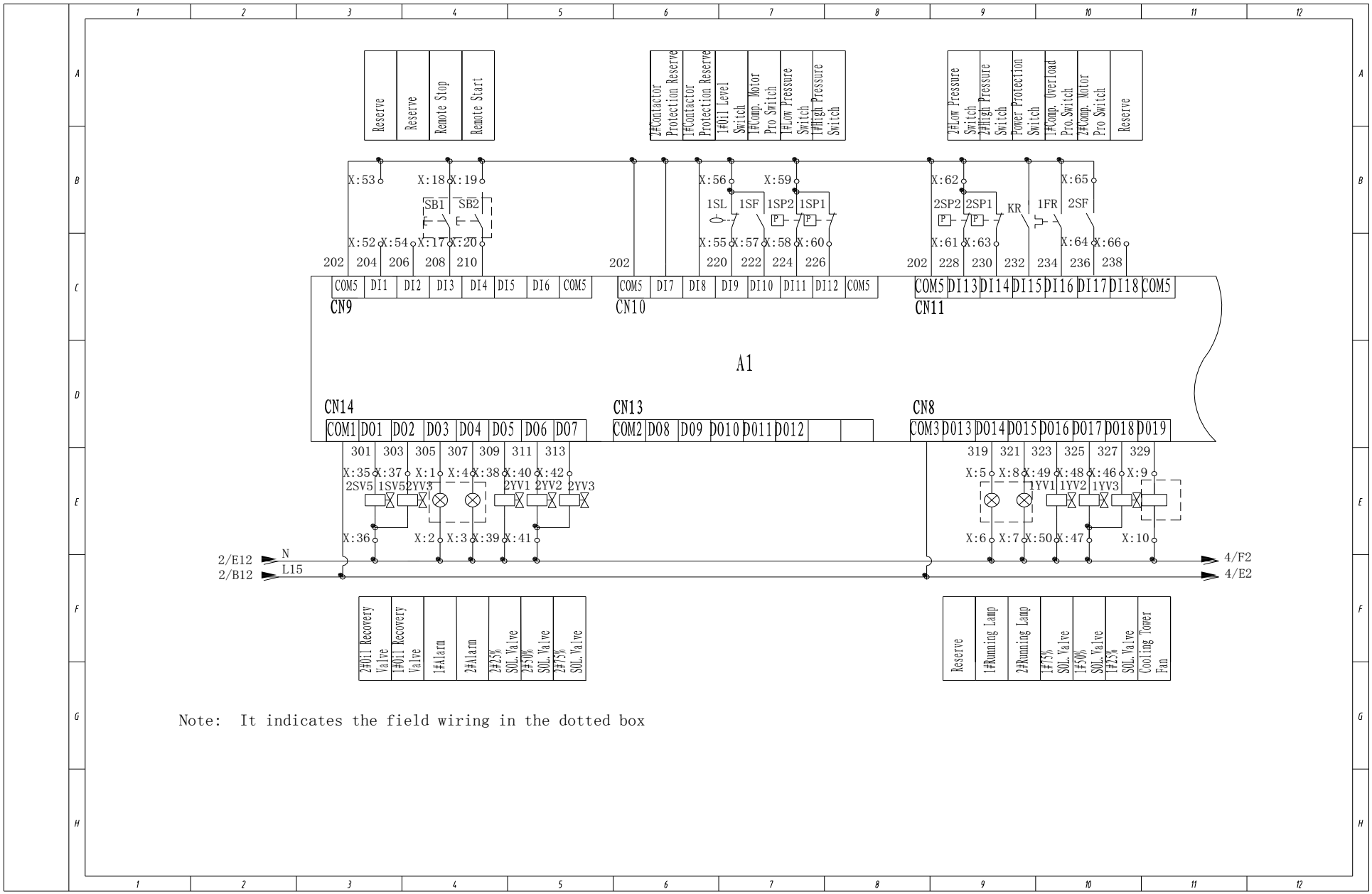
Note: It indicates the field wiring in the dotted box S3 code setting:
code 1: ON indicates single head, OFF indicates dual heads
code 2: ON indicates there is not oil temperature sensor, OFF indicates there is.


1/C12
1/F12
L15
N
TC
L17
FU
L19
N1
611
613
615
617
G
G0
VBAT
1
3
2
4
COM1
N1
Power Supply
ExV connetion
Relay
EVD
Analog-Digital Input
Network
GND
VREF
S1
S2
S3
S4
D11
D12
GND
Tx/Rx
605
603
601
607
609
X:69
X:68
X:67
X:70
BP
P
I-
RT
KA
Black
White
Red
Green
X:74
X:73
X:72
X:71
M
Control Transformer
EVD Pressure Sensor
EVD Temp. Sensor
EVD Power Supply
EXV Motor

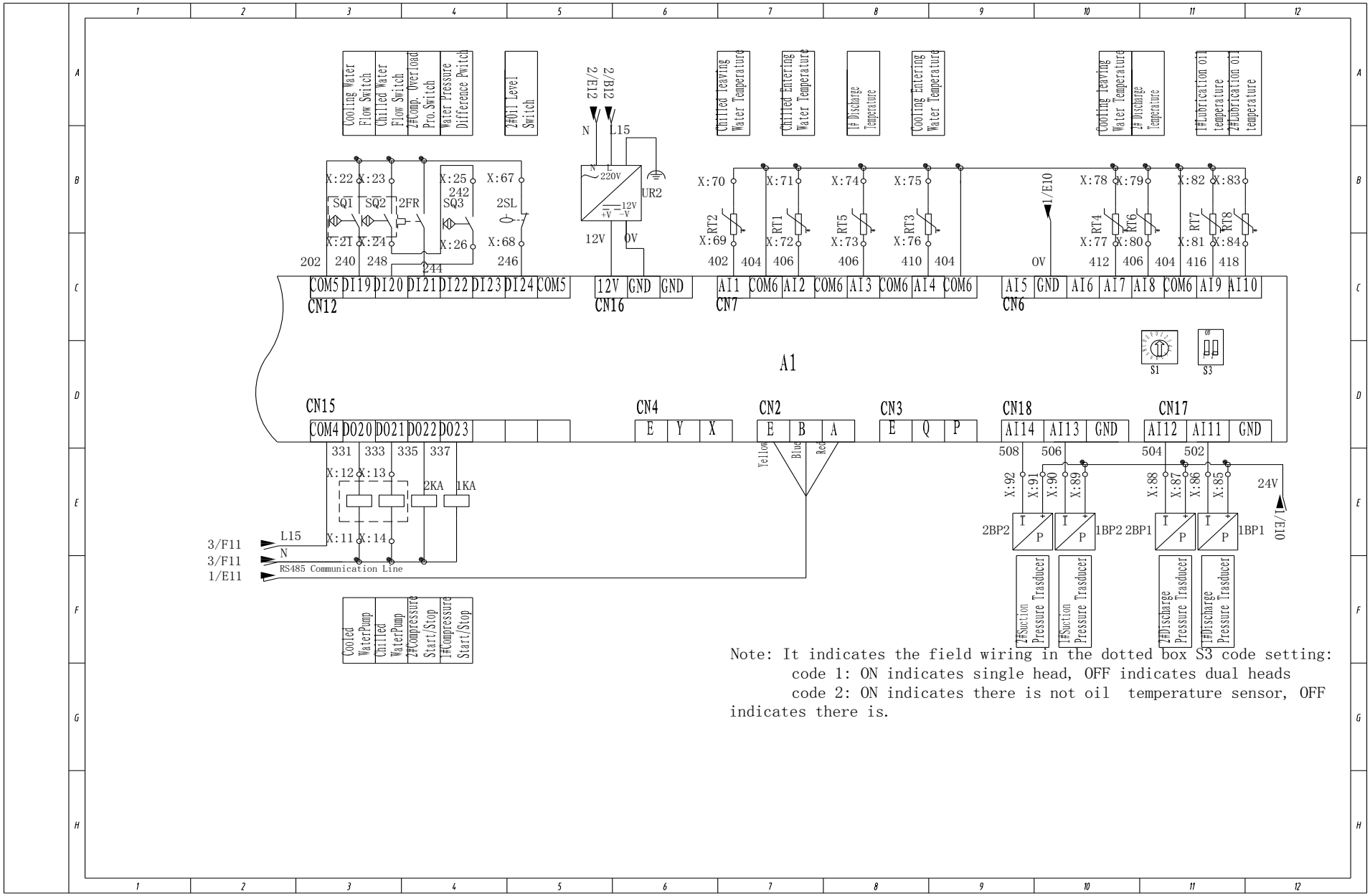
1080BO3/1WT1FA ~1780BO3/1WT1FA



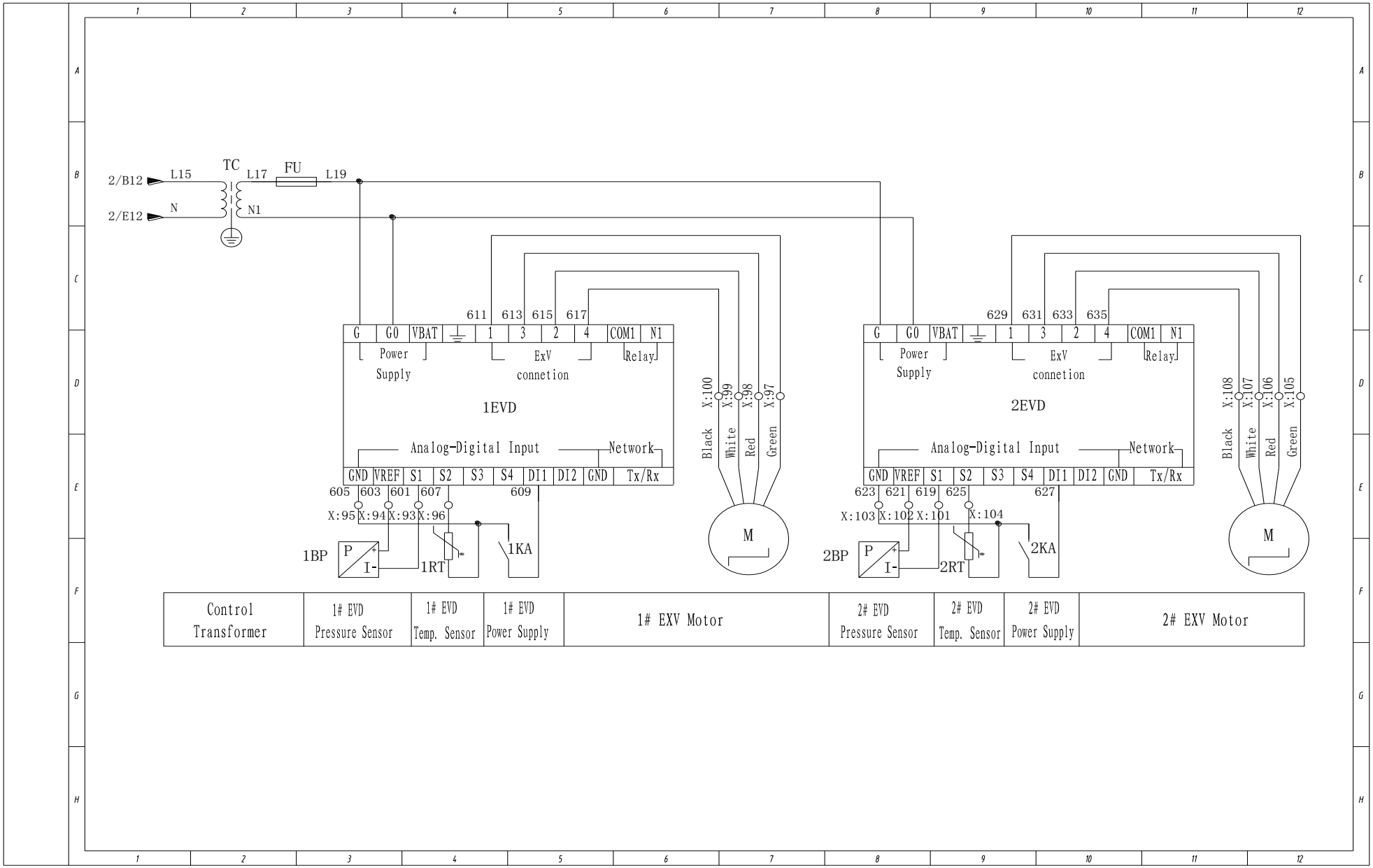

1/C11
L15
1KA
107
1FR
109
1KM3
1KM1
1KM3
113
1KT
1KM2
1KM2
117
1KT
119
111
115
1KM1
1KM2
1KM3
1KT
1/E11
N
2KA
121
2FR
123
2KM3
2KM1
2KM3
127
2KT
2KM2
2KM2
131
2KT
133
125
129
2KM1
2KM2
2KM3
2KT
3/F2
4/A5
5/B1
3/F2
4/A5
5/B1
1#△ contactor1
1#△ contactor2
1#Y contactor2
1#Time Relay
2#△ contactor1
2#△ contactor2
2#Y contactor2
2#Time Relay



Note: It indicates the field wiring in the dotted box



Note: It indicates the field wiring in the dotted box S3 code setting:
code 1: ON indicates single head, OFF indicates dual heads
code 2: ON indicates there is not oil temperature sensor, OFF indicates there is.


2/B12
L15
TC
L17
FU
L19
2/E12
N
N1
611 613 615 617
G G0 VBAT 1 3 2 4 COM1 N1
Power Supply
ExV connetion
Relay
1EVD
Analog-Digital Input
Network
GND VREF S1 S2 S3 S4 DI1 DI2 GND Tx/Rx
605 603 601 607 609
X:95 X:94 X:93 X:96
1BP
P
I-
1RT
1KA
X:100 X:99 X:98 X:97
Black White Red Green
M
629 631 633 635
2EVD
623 621 619 625 627
X:103 X:102 X:101 X:104
2BP
2RT
2KA
X:108 X:107 X:106 X:105
Control Transformer
1# EVD Pressure Sensor
1# EVD Temp. Sensor
1# EVD Power Supply
1# EXV Motor
2# EVD Pressure Sensor
2# EVD Temp. Sensor
2# EVD Power Supply
2# EXV Motor

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