

HanLi

WUHAN HANLI REFRIGERATION TECHNOLOGY CO. LTD

Website: <http://www.hanlizl.com/>

Mailbox: [hanli@hanli-wh.com](mailto:hanli@hanli-wh.com)

Company address: No. 89, Lujia Street, Wuchang District, Wuhan, Hubei

Sales hotline: 027-88517741

Service hotline: 18674080486 Technician Zhou

Version No.: HL-S2-SP2.0

HanLi



Laser Chiller

# User Guide

WUHAN HANLI REFRIGERATION TECHNOLOGY CO. LTD

## Contents

|   |    |
|---|----|
| [Introduction].....   | 4  |
| I. Model Description.....   | 5  |
| 1.1. The model description of JL series.....  | 5  |
| II. Technical Description.....  | 7  |
| 2.1. Products characteristics.....  | 7  |
| III. Installation of Equipment and Use of Operation.....  | 8  |
| 3.1. Installation of equipment.....   | 8  |
| 3.2 Use of operation.....   | 9  |
| IV. The Setting of the Instrument and Usage.....  | 11 |
| V. Setting of parameters of pressure controller.....  | 22 |
| VI. Analysis and exclusion of common faults of equipment.....   | 23 |
| 6.1. No display after power on.....   | 23 |
| 6.2. Water pump hasn't water or pressure is lack of.....  | 23 |
| 6.3 Insufficient pump flow.....   | 24 |
| 6.4. Noise of the water pump is too large.....  | 25 |
| 6.5. The compressor cannot start or suddenly shutdowns during running<br>(overload indicator of temperature controller lights)..... | 25 |
| 6.6. The compressor cannot be start or suddenly shutdowns during running<br>(overload indicator lights).....                        | 25 |
| 6.7. Light of water level lights when running, and buzzer warns.....  | 25 |
| 6.8. Insufficient refrigerating capacity.....   | 25 |
| 6.9. Exhaust temperature is too high.....   | 27 |
| 6.10. The machine is cooling all the time (high precision).....   | 27 |
| VII. General Maintenance Methods of Equipment.....  | 28 |
| VIII. Specific operations of maintenance in summer and freeze protection in winter.....   | 29 |
| 8.1 Heat-stroke prevention measures in summer.....  | 29 |
| 8.2 Cold-resistant measures in winter.....  | 30 |
| Appendix I List of Standard Accessories.....  | 32 |
| Appendix II Product Qualification Certificate.....  | 33 |

## [Introduction]

Thanks for using the JL series industrial chiller of our company. We will provide the perfect after-sales service, please properly keep the product manual and other attachments in order to better use for you.

### **1. Product object**

The manual is prepared for the owner and user of chiller. It includes the product performance, working principle, easy fault description and elimination methods that used for the installation, operation, adjustment and maintenance.

### **2. Applicable readers**

The manual must be read carefully by the customers who initially use the industrial chiller or have had the using experience to avoid the inconvenience to you caused by misoperation.

### **3. Warranty conditions of chiller**

#### 3) Warranty coverage

Our company provides the maintenance and parts changing for free in case the fault caused by the obvious defects of design or the quality problem generated by the manufacturing within 12 months As of the date of purchasing products from our company.

**After the expiry of warranty, provide a pay-needed maintenance service for life.**

#### b) Conditions beyond the warranty coverage

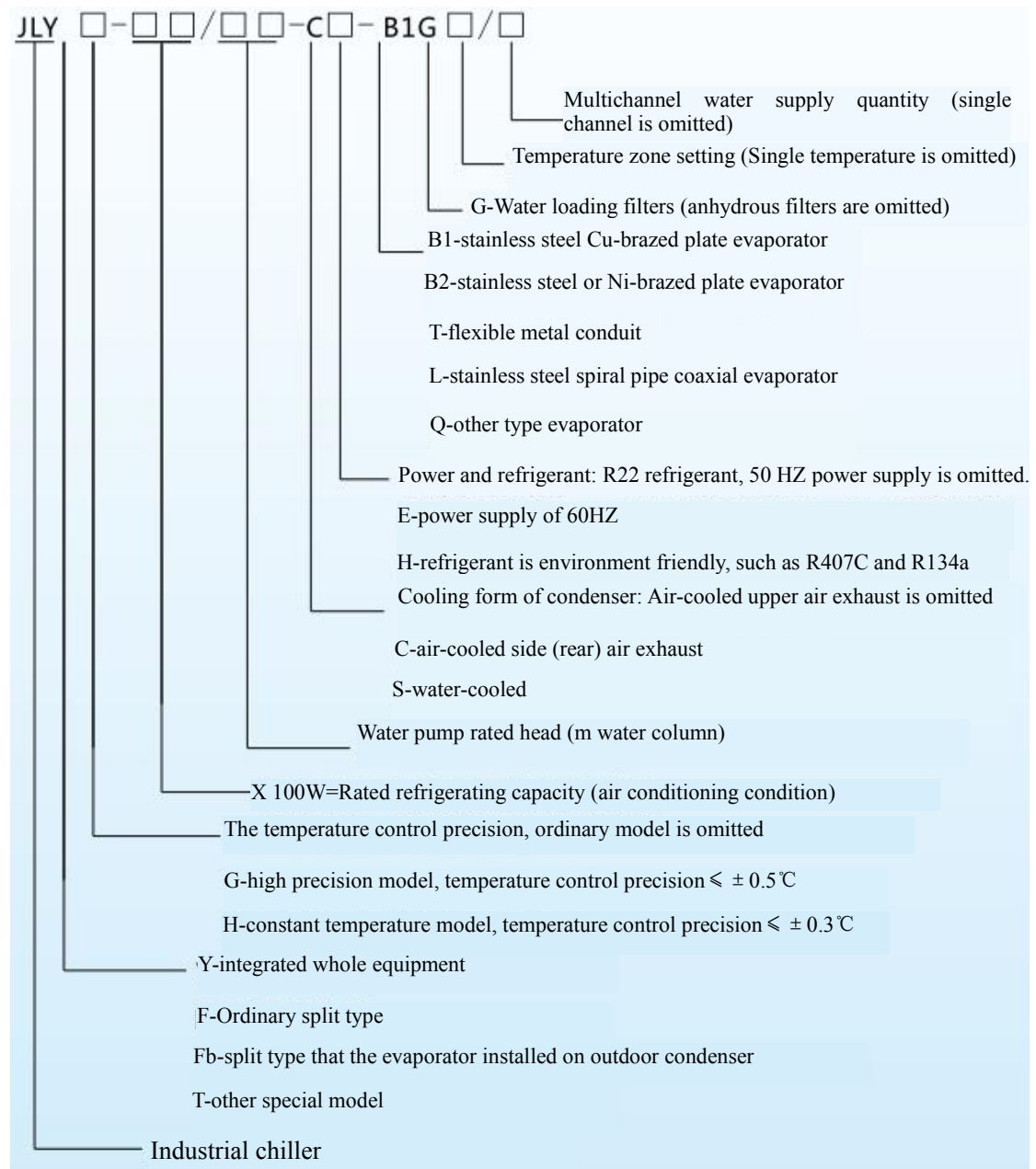
- The damage caused by the installation, using and maintenance that are not in accordance with the manual or the external conditions such as the power supply etc. are unqualifized.
- The damage caused by the transport of non-our-company or inappropriate storage;
- The damage caused by the human factors such as the reconstruction of our company's products;
- The damage caused by force majure factors. For example: Natural disasters and wars etc.;
- The damage caused by installing them on the vehicles and ships or using overseas;
- The damage caused by equipment fault;

Note:

1. The installation of power supply shall conform to the wiring standards of the state! (the voltage, frequency and pressure difference all must conform to the requirements)!
2. In case that the power line is damaged, replacement must be conducted by professionals assigned by manufacturer, maintenance department or similar departments to avoid risk.
3. The power supply must be closed when maintain!
4. The water must be pure water or distilled water.

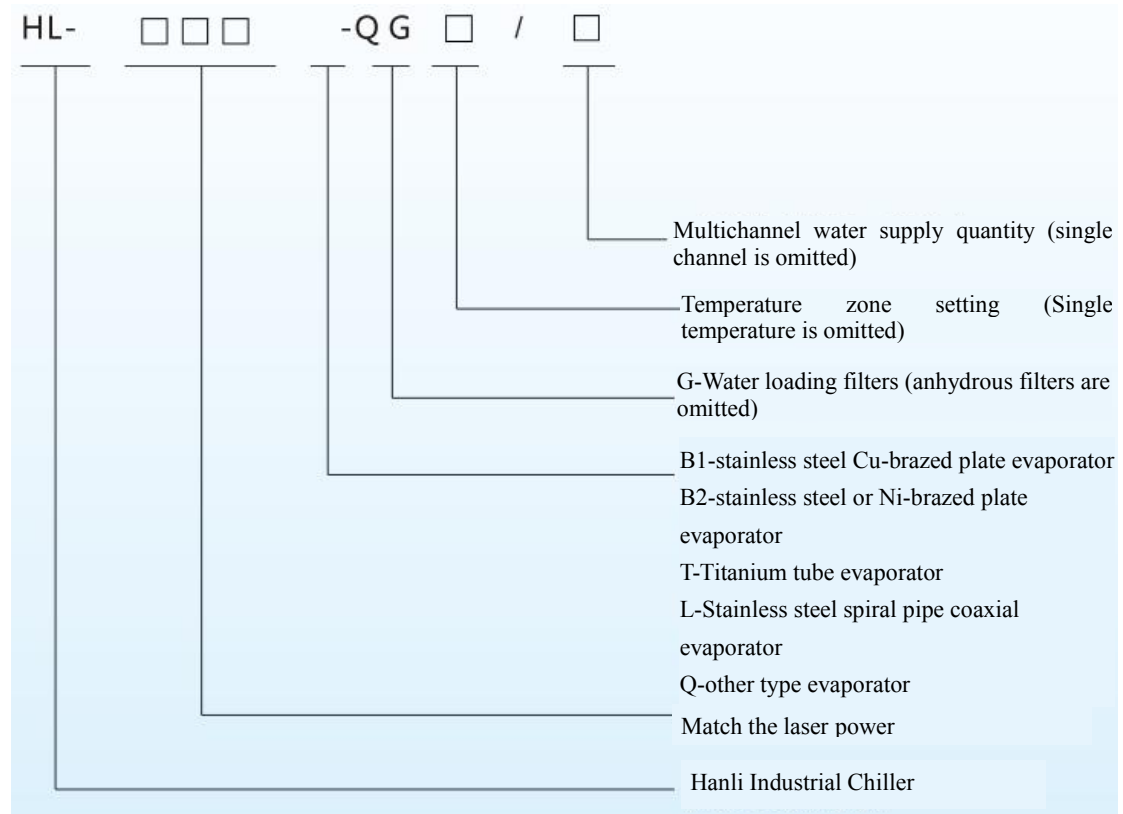
## I. Model Description

### 1.1. The model description of JL series



For example: Type JLY-50/21-QG represents the integrated water chilling unit with 5.0KW refrigerating capacity, 21m pump head, other model evaporator and water loading filters.

### 1.2. The model description of HL series



For example: Model HL-500-QG2/2 represents Hanli Industrial Chiller matching with 500W laser-cutting machine.

## **II. Technical Description**

### **2.1. Products characteristics**

a) Adopt the famous brands for accessories

Adopt the famous compressors such as Hitachi, Copeland and SANYO etc. The evaporator adopts the stainless steel pipe of high quality (the non-standard products can also adopt the stainless steel plate evaporator)

#### **b) The structure of system**

The condenser is the air-cooled upper air exhaust or side air exhaust, it may also adopt the water-cooled type. The circulating water pump adopts the stainless steel multistage pump, the refrigerant system uses the dry filter and thermal expansion valve to achieve the superior quality, high efficiency, energy-saving and low noise.

#### **c) One-button operation**

The equipment adopts the automatic controlling method, the system sets up the comprehensive protection devices such as: 1. high and low voltage protection, 2. compressor overheating protection, 3. overcurrent protection 4. three-phase supply phase-loss and phase sequence protection, 5. anti-creeping grounding protection 6. temperature setting adjustment and multifunction display, 7. low water alarm of water tank, signal transfer output of flow lacking and overtop water temperature, 8. dry and filtering of refrigeration system, 9. circulating water filter etc. To ensure the safe and reliable operation of the unit.

#### **d) Compact structure**

The equipment has compact structure, small volume, flexible mobile, convenient installation and easy operation.

#### **e) Non-standard customization**

It can be customized according the customers demands, including but not limited to: color, appearance, electric control mode (plc or traditional relay circuit), condensation method (air cooling and water cooling).

### III. Installation of Equipment and Use of Operation

#### 3.1. Installation of equipment

a) The integrated equipment:

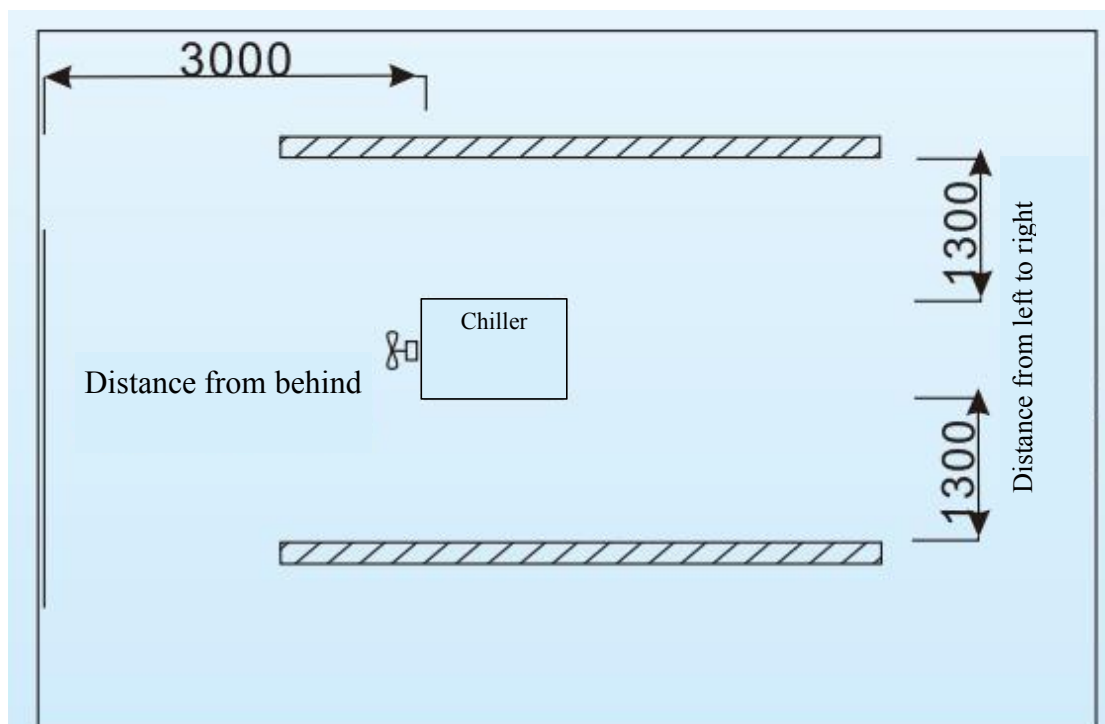
Equipped with the braking universal wheel and is easy to move, it can be installed near the mainframe, the unit should be in the well ventilated place for good heat dissipation effect, around the unit, keep 1.5m space as shown in figure without the shelter and the 3m space should be kept at the thermovent. The height above the machine is more than 3m.

b) Split type equipment:

The indoor and outdoor condensers should be well installed with the connecting pipes and connection line machine, the outdoor condenser should be installed in the solid wall, the vacuum pumping or fluoride adding are adopted by the indoor condense requirements for emptying, open the valves of the indoor and outdoor condensers after well connecting the pipeline, the connection line should be connected as per the markers on the line end.

The emptying method of split type connecting pipes:

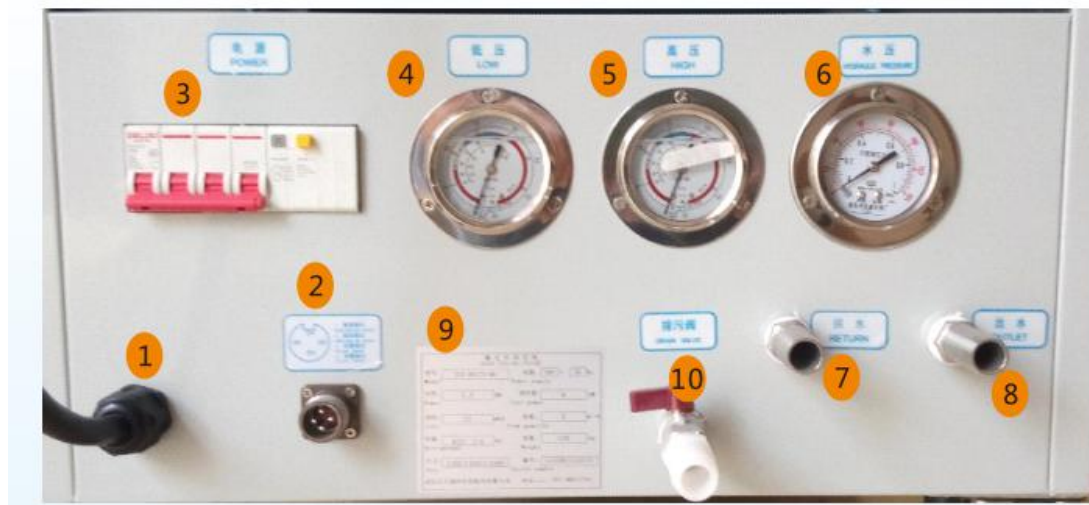
Firstly install the connection popes, open the angle valve of indoor condensor, and connect the end with thimble on the vacuum pump then remove the fluoride adding tube and fully open the angle valves of the outdoor condensor.





### 3.2 Use of operation

#### a) Operation for the first time use



1>Power line interface

2 >Signal line interface

3>Air switch

4>Low pressure gas gauge

5>High-pressure gauge

6>Water pressure gauge

7>Backwater

8>Outlet water

9>Nameplate

10>Blowdown valve

1. Waterway connection:

Connect the backwater, outlet water and blowdown in turn according to the below marks and close the blowdown valve.

b) The tank watering should over the floater water level in the lower right figure (lower left, white)

Machine power supply part

Machine passive (or positive) output

Isolate the air switch

Back pressure display of compressor

Discharge pressure display of compressor

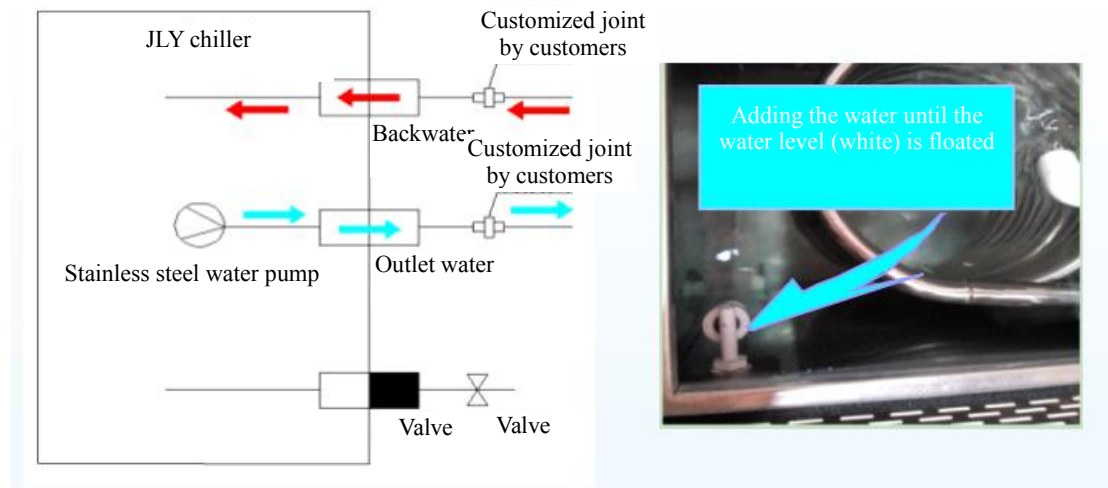
Outlet water pressure display of machine

Outlet water accessed to the laser

Inlet water accessed to the laser

The main parameters of the machine

Discharge of sewage valve



c) The main components of water circulation system, the emptying mouth can be used for the initial liquid adding installation and commissioning to help discharge the air of water circulation, use the liquid outlet to discharge the exceed liquid in the water pump to in the winter or before the transport to protect the water pump.



## II. Electric Control Connection:

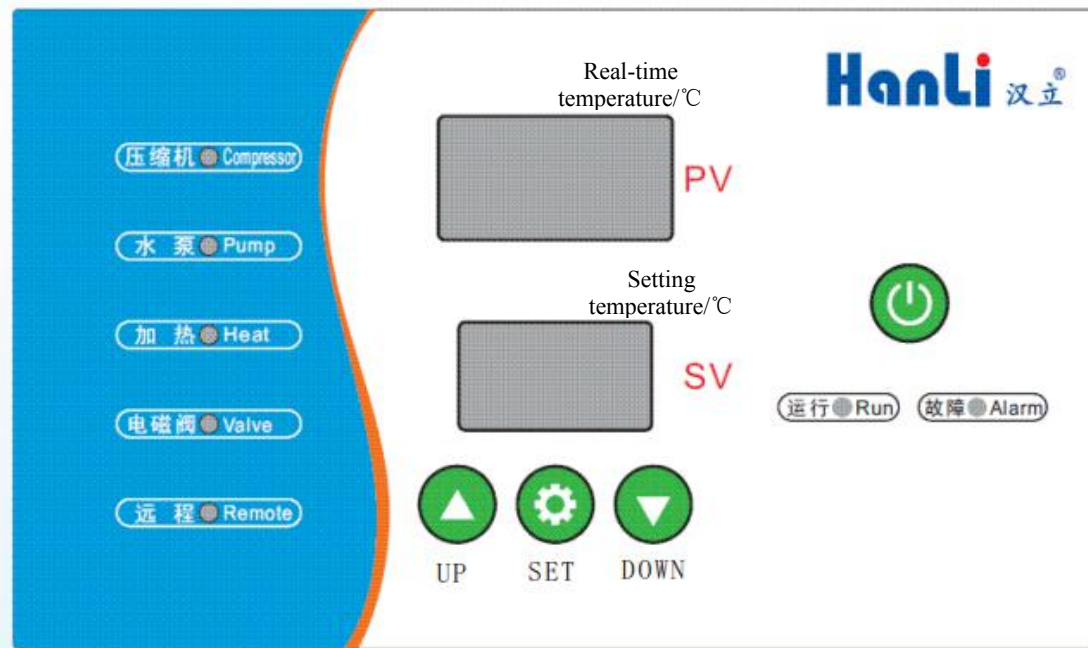
- The power line is educed from the position, connect it to power supply according to the marks on the power line.
- Connect the signal interface to your protection and control.
- Close the air switch

Note: ①. For the three-phase supply unit, after closing the power supply air switch, if the power indicator turns green, then the power phase sequence is correct, or is fault, it should be adjusted, then the temperature required can be adjusted when the phase sequence is correct and start up to operation.

②. The tap water and well water are not allowed, the water adding height just needs to over the floater water level. Because direct using of tap water are very likely to form the scaling between radiators of equipments such as the refrigerator and the external connected laser etc. thus effecting the related part' performance between the radiator and chiller.

## IV. The Setting of the Instrument and Usage

### I. Sf2035 Single Temperature Instrument



#### Operation instructions

##### 1 Panel instructions

| Digital-tube code          | Application  |
|----------------------------|--|
| Real-time temperature (PV) | Display the actual measured water temperature and alarm code.  |
| Setting temperature (SV)   | Display the "Setting Temperature"  |
| Indicator                  | Application  |
| Compressor                 | Light up: Compressor is started; Flashing: Have the refrigeration requirements but the compressor have not been started; Go out: Compressor is closed. |
| Pump                       | Light up: Pump is started; Go out: Pump is closed;   |
| Heat                       | Light up: Heat on; Go out: Heat off.   |
| Solenoid valve             | Light up: The solenoid valve is started; Go out: The solenoid valve is closed.   |
| Remote                     | Light up: Remote switch on; Go out: Remote switch off.   |
| Run                        | Light up: Unit work; Flashing: Unit is in the antifreezing mode; Go out: Unit shutdown.  |
| Fault indicator (Alarm)    | Flashing: Faulty; Go out: Fault free   |
| Button                     | Application  |
| On-off key (On/Off)        | Press the <On/Off>key for 3 seconds to power on or off   |
| Setting key (Set)          | Under the fault free status, press the <Set> key, entry/exit to the setting temperature.   |
| Upward/downward key (▲ ▼)  | In the process of setting the parameters, alter the parameters value.  |

## 2 Startup display

After the controller is powered on, the software information is displayed in the PV and SV zones, and about in 7 seconds, it enters into the temperature display status.

## 3 Temperature display

The actual measured water temperature is displayed in the PV zone; The "Setting Temperature" is displayed in the SV zone.

## 4 Fault display

When the fault is detected by the machine, the temperature and fault code "Exx" are alternatively displayed in the PV zone. If there are several faults, press <Up> or <Down> to switch to view the different fault, after pressing the <Up> or <Down> keys, the fixed display is the fault code, the temperature and fault code are alternatively displayed in 5 seconds.

Fault codes and descriptions as shown in the table below:

|     | Fault name                        | Fault detection conditions  | Action  |
|-----|-----------------------------------|---|---|
| E01 | Fault of water temperature sensor | Start test after the machine is powered on  | The rest output are fully stopped except the water pump; Manual reset after the fault is resolved |
| E02 | High-temperature alarm            | Start test after the machine is powered on  | Alarming, only heating at the status of power failure; Manual reset after the fault is resolved   |
| E03 | Pressure fault of compressor      | Start the detection after the compressor starts the [F18 pressure detection delay] time | Stop the compressor and do not stop the water pump; Manual reset after the fault is resolved      |
| E04 | Phase sequence errors             | Start test after the machine is powered on  | Stop the complete machine; Manual reset after the fault is resolved                               |
| E05 | Flow switch alarming              | Detection after water pump running  | Alarming, only heating at the status of power failure. Manual reset after the fault is resolved   |
| E06 | Water level switch alarming       | Start test after the machine is powered on  | Alarming, only heating at the status of power failure. Manual reset after the fault is resolved   |
| E07 | Compressor overload               | Conduct the delay detection after the startup of compressor.                            | Stop the compressor Manual reset after the fault is resolved                                      |
| E08 | Low-temperature alarm             | Start test after the machine is powered on  | Stop the compressor and do not stop the water pump; Manual reset after the fault is resolved      |

[Remarks]: The fault which needs the manual reset, the fault can be reset by pressing the <Set> key after the fault is eliminated.

### **5 Modify the setting temperature**

Under the fault free status, after pressing the <Set> key, the setting temperature of SV is displayed with flashing, at the moment, the setting temperature can be altered by pressing the <Up> or <Down> key, press the <Set> to save the setting value after setting and exit the set condition. (If in the process of setting, no keys operation for 5 seconds, the system will automatically save the setting value and exit the set condition), in the main interface, press the <Up> key for 3 seconds to enter into the antifreezing mode, (under the antifreezing mode, the running indicator light flashes), press the <UP> key again to exit the antifreezing mode.

### **6 Setting of manufacturer parameters**

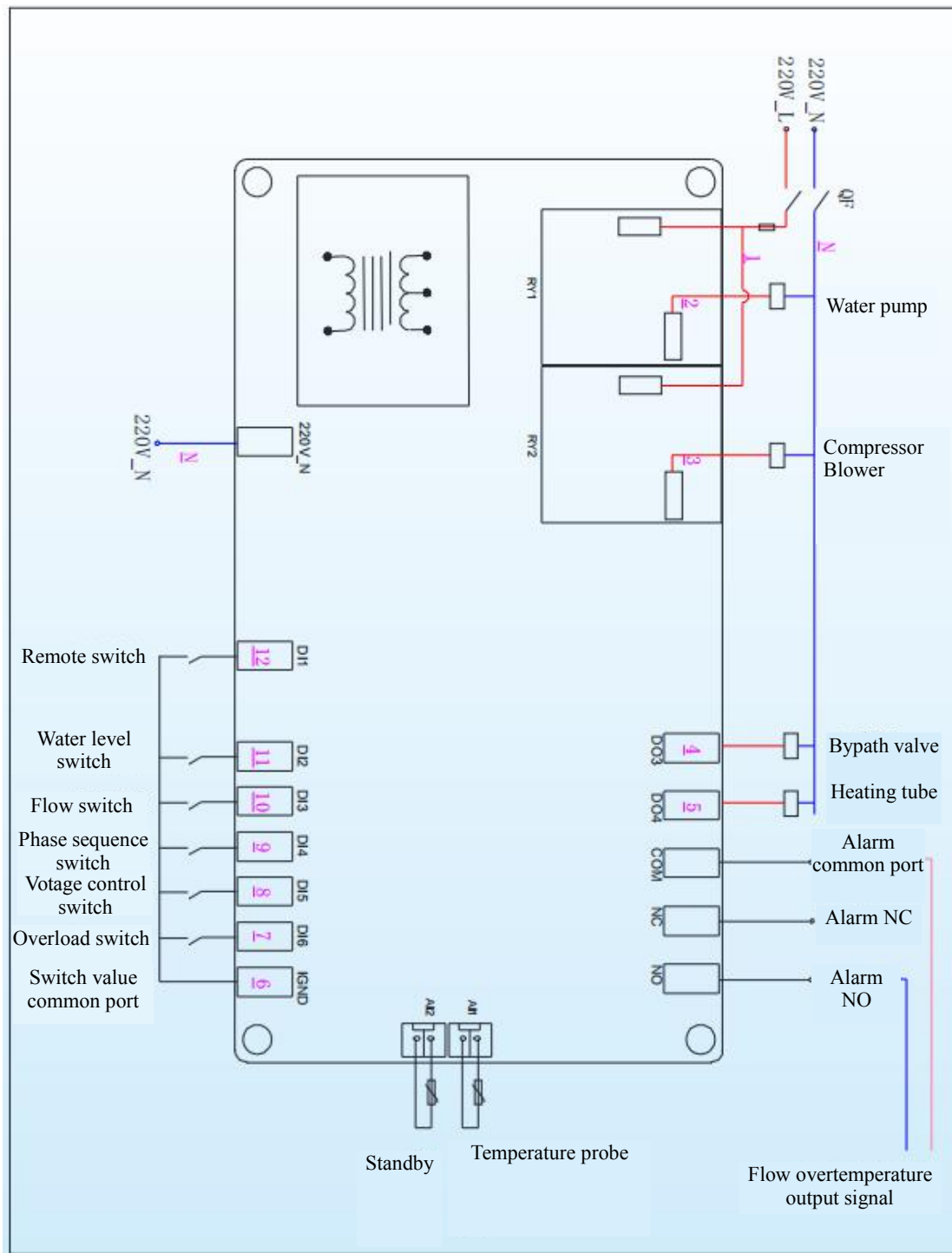
Press the <Up> + <Down> keys for 5 seconds to enter into the setting of manufacturer parameters status.

In the process of setting the manufacturer parameters, the parameter values are displayed in the SV zone. The numerical value flashing in the SV zone presents that the parameters can be altered by the <Up> or <Down>, when the numerical value in the SV zone is normally displayed, press the <Set> key to switch the parameter item, and the numerical value in the SV zone can be switched to the flashing display or normal display by the <Set> key. After the completion of altering the parameters, press the <On/Off> key to exit the setting of manufacturer parameters. (If no keys operation for 30 seconds, the system will be automatically setting of manufacturer parameters status).

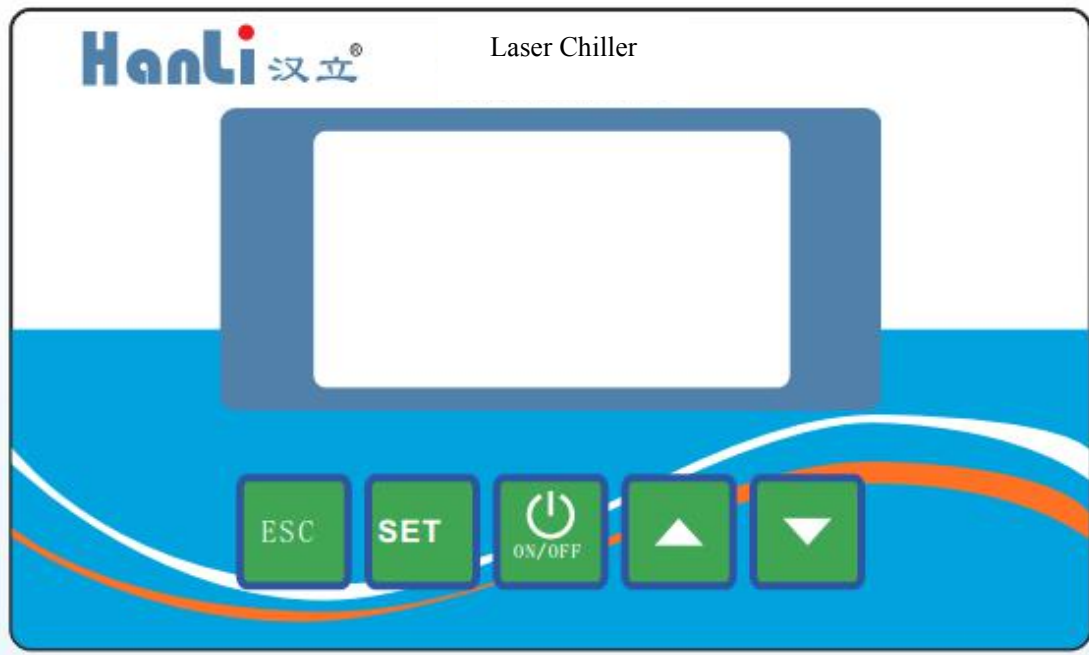
Parameter items and description as shown in the table below:

| Code | Function                                     | Initial setting | Code | Function                                | Initial setting |
|------|--|-----------------|------|---|-----------------|
| F01  | Function selection                           | 2               | F16  | Compressor startup delay                | 180s            |
| F02  | Power-on self-starting                       | 1               | F17  | High/low temperature alarm delay        | 10s             |
| F03  | Setting temperature                          | 21.0°C          | F18  | Water flow alarm delay                  | 2s              |
| F04  | Temperature difference control               | 2.0°C           | F19  | Water level alarm delay                 | 10s             |
| F05  | Temperature setting upper limit              | 27°C            | F20  | Pressure alarm delay                    | 30s             |
| F06  | Temperature setting lower limit              | 21°C            | F21  | Antifreezing water pump start-up period | 2 minutes       |
| F07  | Temperature overtemperature upper limit      | 35°C            | F22  | Pressure switch                         | 0               |
| F08  | Temperature overtemperature lower limit      | 2°C             | F23  | Phase sequence switch                   | 0               |
| F09  | Anti-freezing water pump opening temperature | 2.0°C           | F24  | Water flow switch                       | 1               |
| F10  | Anti-freezing water pump closing temperature | 5.0°C           | F25  | Water level switch                      | 1               |
| F11  | Heating return difference                    | 2.0°C           | F26  | Compressor overload switch              | 0               |
| F12  | Temperature compensation                     | 0               | F27  | Overtemperature alarm output            | 1               |
| F13  | Standby                                      | \               | F28  | Water flow alarm output                 | 1               |
| F14  | Alarm relay                                  | 1               | F29  | Water level alarm output                | 0               |
| F15  | Anti-frequent startup time of Compressor     | 3 minutes       | F30  | Factory reset                           | 0               |

7. Circuit Schematic (standard)



II. Model SF2165 Instrument of 220 V, Double Temperature Type



Common interface

The common interface includes the main interface and alarm interface, different interface displays of model as shown in the following table.

|                          | Standby   |   | Normal operation   |   | Alarm   |  |
|--------------------------|---|---|--|---|---|--|
| Single temperature model | PV 20.5°C<br>SV 20.0°C<br>Status: Shutdown normally             |   | PV 20.5°C<br>SV 20.0°C<br>Status: Operation normally       |   | PV 20.5°C<br>SV 20.0°C<br>Status: Shutdown fault                |  |
| Double temperature model | Cooling water<br>PV 20.5°C<br>SV 20.0°C<br>Status: Machine halt | Normal temperature water<br>25.5°C 25.0°C<br>Normally | Cooling water<br>PV 20.5°C<br>SV 20.0°C<br>Status: Running | Normal temperature water<br>25.5°C 25.0°C<br>Normally | Cooling water<br>PV 20.5°C<br>SV 20.0°C<br>Status: Machine halt | Normal temperature water<br>25.5°C 25.0°C<br>Fault |



[Remarks 1]: The temperature displayed in the main interface SV, namely, the displayed value in the constant temperature mode is the temperature setting value, the displayed value in the room temperature homology mode is the ambient temperature + homology temperature difference.

[Remarks 2]: If the temperature control method is "Room Temperature Homology", then before the corresponding SV displayed value, it should have the "\*" maker.





## 1. Commonly used operation

### 1.1 Startup & shutdown

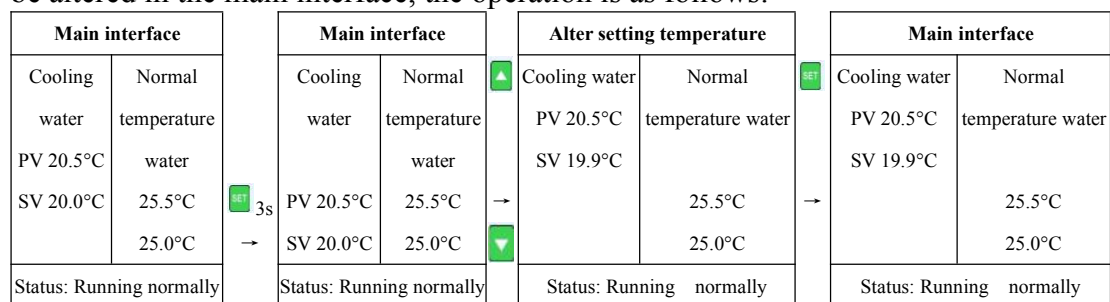
In the main interface, press  the startup for 3s, the main interface displays "Running" after the startup; Shutdown  for 3s again, the main interface displays "Shutdown" after the shutdown.

1.2 Entry/exit to the antifreezing mode


In the main interface, press  entering into the antifreezing mode for 3s, at the moment, the status bar on the main interface displays "Antifreezing"; Press  for 3s again to exit the antifreezing mode.

### 1.3 Rapid alteration of setting temperature

If the user parameter [Locking temperature] is set "No", the setting temperature can be altered in the main interface, the operation is as follows:

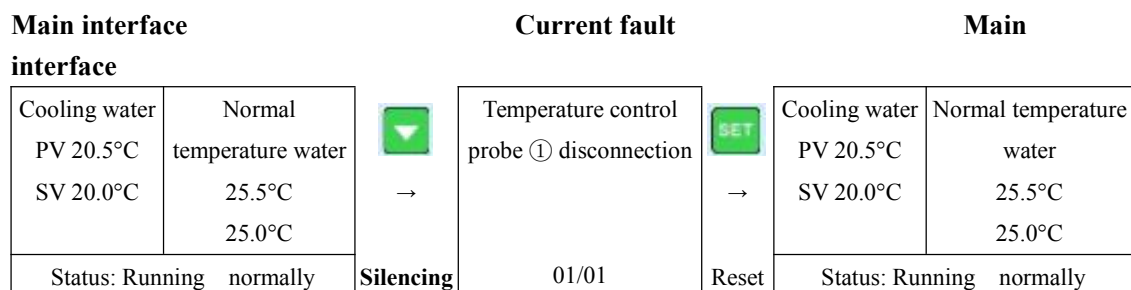


**[Remarks 1]:** The setting parameters can be altered in the user parameters.

**[Remarks 2]:** When altering the setting temperature in the double temperature mode, the key  switching can alter the low-temperature water/normal temperature water setting temperature.

### 1.4 Query/reset fault

When the fault is happening, the alarm prompt is displayed in the main interface, the query/reset fault operation as follows:




## 2. User menu

In the main interface, press + entering into the user menu.

### 2.1 Content of user menu

There are 6 contents in the user function menu, as shown in the table below:

| S/N | Menu item                  | Function  | Remarks  |
|-----|----------------------------|---|--|
| 1   | Temperature inquiry        | Inquire the low temperature water, normal temperature water and environment temperature | Display "... " during the fault of temperature probe   |
| 2   | User settings              | Set up the user parameters  | Number of user parameters and reference of meaning: 6.2 User parameter table   |
| 3   | Unit state                 | Display current running state of the unit   | If the current detection module is used, the current value of the compressor and the water pump will be displayed.         |
| 4   | History fault              | Be able to inquire the last 10 faults   | Clear history fault by pressing  for 2s |
| 5   | Equipment utilization rate | Display the accumulative running time of compressor                                     |  |
| 6   | Version information        | Inquire the current used software version   |  |

## 2.2 User parameter table

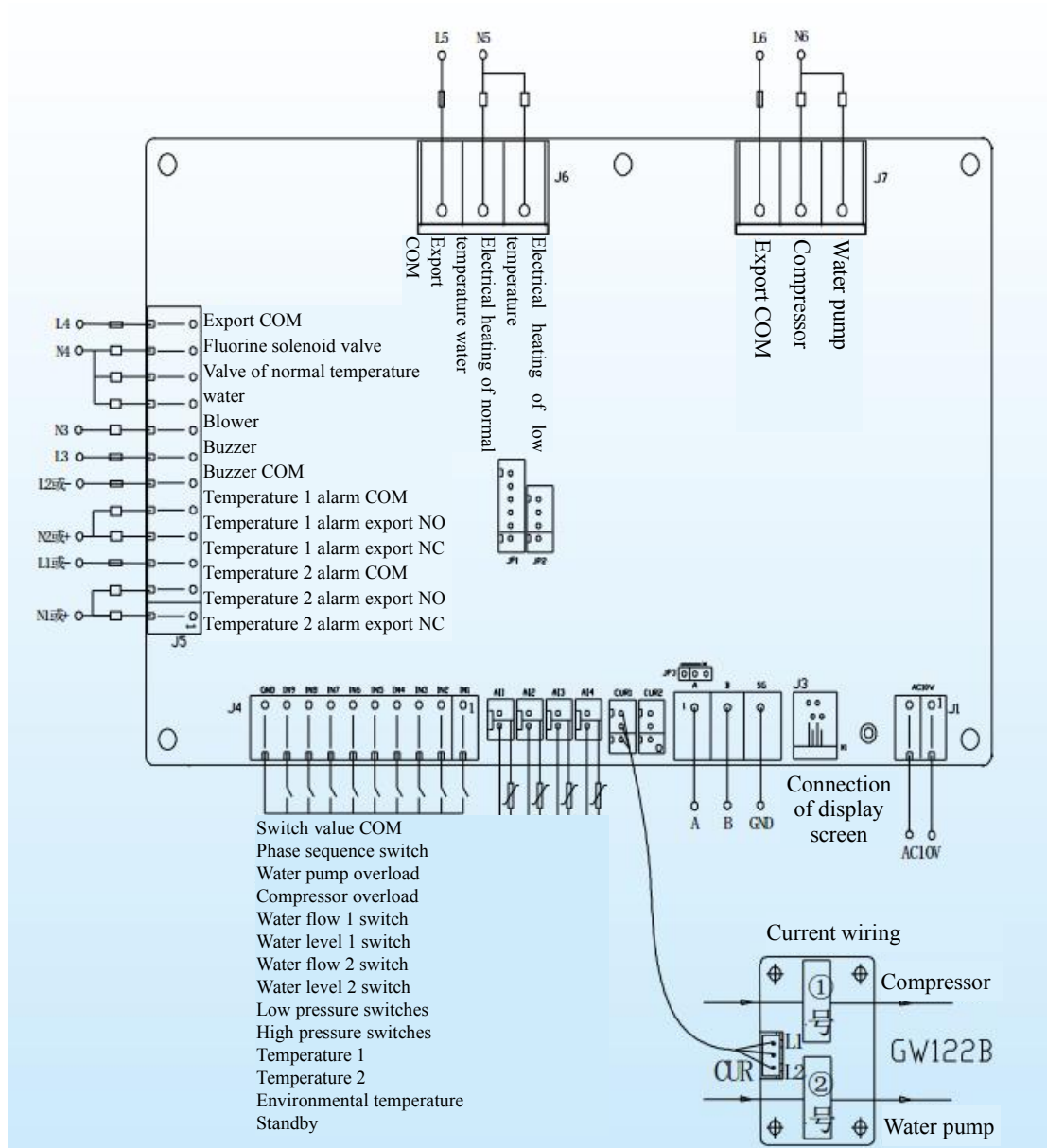
The meaning of each parameter in the user parameters is as follows:

| S/N | Parameter name                                | Factory default           | Setting range  | Remarks   |
|-----|---|---------------------------|--|---|
| 1   | Locking temperature                           | No                        | Yes; No  | Yes: It is not allowed to modify the setting temperature at the main interface after locking.<br>No: The setting temperature can be modified at the main interface. |
| 2   | Temperature ① setting                         | 21.0°C                    | -38.0-99.9°C   |   |
| 3   | Temperature ② setting                         | 28.0°C                    | -38.0-99.9°C   |   |
| 4   | Temperature ① control method                  | Constant temperature mode | Constant temperature mode; Room temperature homology |   |
| 5   | Temperature ② control method                  | Constant temperature mode | Constant temperature mode; Room temperature homology |   |
| 6   | Temperature ① homology temperature difference | 0.0°C                     | -20.0°C-20.0°C                                       |   |
| 7   | Temperature ② homology temperature difference | 0.0°C                     | -20.0°C-20.0°C                                       |   |
| 8   | Backlight time                                | 3 minutes                 | 0-200 minutes  | Setting up 0 means no backlight   |
| 9   | Language settings                             | Chinese                   | Chinese; English                                     | Select the display language   |
| 10  | Equipment address                             | 1                         | 1-32   | Set up RS485 mailing address  |
| 11  | Communication baud rate                       | 9600                      | 4800; 9600; 19200                                    | Set up RS485 communication baud rate  |

## 2.3 Fault list

| Fault name                                | Detection conditions   | Fault handling  | Reset mode |
|---|--|---|------------|
| High-voltage switch alarm                 | Detection after water pump running   | Stop the compressor and do not stop the water pump;                     | Automatic  |
| Low-voltage switch alarm                  | Detection after compressor running [low-pressure detection] time                               |   | Automatic  |
| Compressor overload                       | Detection after compressor running   |   | Manual     |
| Low current of compressor                 |  |   | Manual     |
| Water pump overload                       | Detection after water pump running   | Shutdown unit   | Manual     |
| Low current of water pump                 |  |   | Manual     |
| Probe ① low temperature alarm             |  | Stop the compressor and do not stop the water pump;                     |            |
| Probe ① high temperature alarm            |  | Alarming, only heating at the status of power failure①                  | Automatic  |
| Probe ② low temperature alarm             |  | Stop the normal temperature water valve, and do not stop the water pump | Automatic  |
| Probe ② high temperature alarm            |  | Alarming, only heating at the status of power failure②                  | Automatic  |
| Temperature control probe ① disconnection | Power-on test  | Do not stop the water pump, and output the rest Full stop               | Manual     |
| Temperature control probe ① short circuit |  |   | Manual     |
| Temperature control probe ② disconnection | Power-on test  | The rest output are fully stoped except the water pump;                 | Manual     |
| Temperature control probe ② short circuit |  |   | Manual     |
| Disconnection of environmental probe      | Power-on test  | The rest output are fully stoped except the water pump;                 | Manual     |
| Short-circuit of environmental probe      |  |   | Manual     |
| Water flow switch ① alarm                 | Detection after water pump running   | Alarming, only heating at the status of power failure①                  | Automatic  |
| Water flow switch ② alarm                 | Antifreezing mode: Water pump running and delay Test after [antifreezing flow test delay] time |   |            |
| Water level switch ① alarm                | Power-on test  | Alarming, only heating at the status of power failure①                  | Automatic  |
| Water level switch ② alarm                | Power-on test  | Alarming, only heating at the status of power failure②                  | Automatic  |
| Phase-sequence alarm                      | Power-on test  | Shutdown unit   | Manual     |

### 3. Schematic Diagram of Electrical Connection



**V. Setting of parameters of pressure controller  
(JLY-70 and the following type without pressure controller)**

**5.1 Settings of high pressure value:**

Clockwise rotate H adjusting screws(right) to increase setting value of high pressure, otherwise decrease. Then it is adjusted to 2.8Mpa when leaving the factory. Please don't alter without a consent.

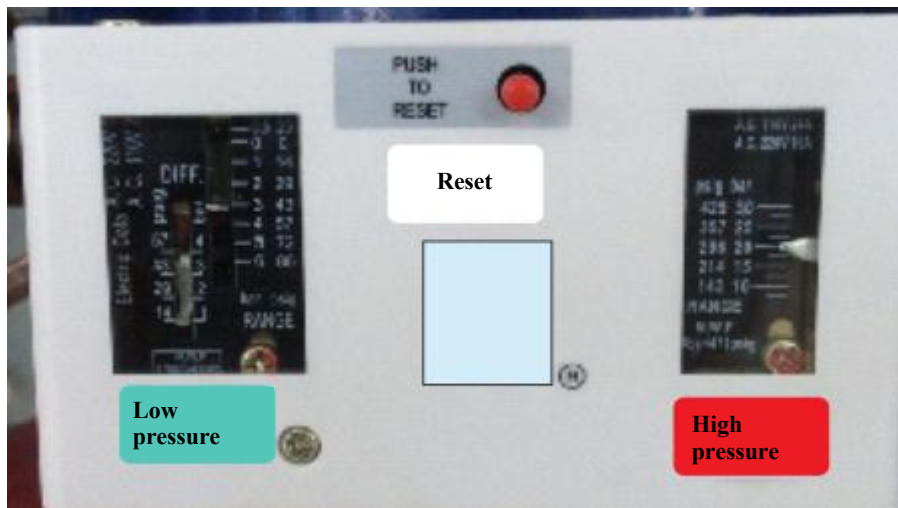
**5.2 General value setting of low pressure:**

Clockwise rotate L adjusting screws(left) to decrease setting value of low pressure, otherwise increase. Its adjusting range is 0.3—0.5MPa, and it is adjusted to 0.2MPa when leaving the factory.

**5.3. Setting of pressure differential**

Clockwise rotate adjusting screws of pressure differential (middle) to increase setting value of pressure differential, otherwise decrease. And it is adjusted to 0.1Mpa when leaving the factory, and the setting value of pressure differential has to ensure the satisfaction of :  $0.1\text{Mpa} \geq \text{general value of low pressure} - \text{pressure differential value}$ .

**Note: Red button on the pressure controller is manual reset button of high pressure.**



## VI. Analysis and exclusion of common faults of equipment

### 6.1. No display after power on

#### 1. Whether the switch is closed (see figure)



The left one is an emergency stop switch, press to break

The middle one is metal button, press to close

The right one is earth leakage protection and air switch, push up is closed (if automatic shutdown happens when pushing up, it shows: 1. Current of machine is too large, and there may be internal short circuit of some device. 2. The machine may have leakage current.)

#### 2. Phase sequence errors:

|  |   |
|--|---|
| The upper and lower lamp is turned off | The machine isn't power on.   |
| Only one light is turn on.             | If default phase, check whether the power supply is correctly connected.<br>If phase dislocation, randomly exchange two phases of power supply. |
| The upper and lower lamps light.       | Power supply is OK.   |

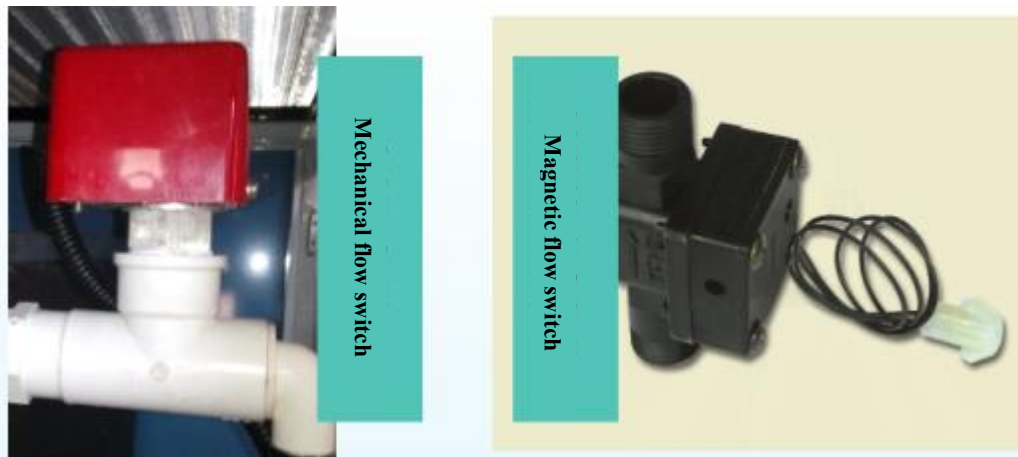


### 6.2. Water pump hasn't water or pressure is lack of.

1. The water in water tank is insufficient, and water level in the water tank has to exceed the water level of floater.

2. Impeller's runner or water filter is blocked.

3. There is air in the water pump. See the 3.2 Emptying Instruction of Water Pump



### 6.3 Insufficient pump flow

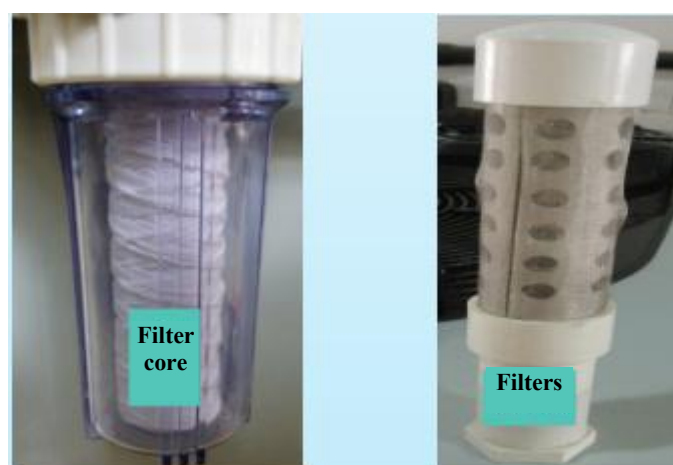
1) The flow switch is shown in the above figure (the first on the left and the second on the right).

Flow switch is a monitoring component on the circuit of water circulation system, and the front red is mechanical flow switch, which is able to adjust the scale of flow in a manual way, and the rear is a magnetic flow switch that cannot manually adjust the alarm value of flow. If Alarm 1- flow resistance is too large, and pipe resistance is higher than the rated value of water pump, pipeline needs to adjust. 2. The water pump runner is partially blocked, it needs to clean water pump, water filter and pipelines. Water flow rate is not enough, and check action of flow switch to check the reason and whether the water pump is emptied.

3) Defaults are resolved, and normal work recovers. See the water pump empty in the Installation.

4) The filter is shown in the below figure. If water quality is too dirty, those tow filters will affect flow rate and pressure of water circulation after purification of water.

5) The temperature controller has defaulted, and repair or replace temperature controller.





#### **6.4. Noise of the water pump is too large**

- 1) Because bearings of water pump damage, it needs to replace bearings.
- 2) Loading of the water pump is too large, adjust pipeline and valves.

#### **6.5. The compressor cannot start or suddenly shutdowns during running (overload indicator of temperature controller lights)**

- 1) Because the improper setting of temperature controller, temperature value has to be reset.
- 2) For thermal protection in the compressor, the thermal environment should be checked and overheating factors should be excluded.
- 3) If the capacitance of the compressor (220V), capacitance should be replaced.

#### **6.6. The compressor cannot be start or suddenly shutdowns during running (overload indicator lights)**

- 1) For improper setting of low-pressure control, general value of low pressure should reset again (See figure, voltage-controlled setting).
- 2) For action of the high pressure controller (environment temperature may be super high), low pressure protection: Lack of refrigerant, and then check leak sources and inject refrigerant corresponding to nameplate after elimination of leak sources.
- 3) HP protection: If the condenser is dirt, then clean condenser; if fan of condenser breaks down, controlling lines should be checked. And press red button of the controller to reset after treatment finishes.
- 4) Refrigeration pipe lines are blocked or leak, ask professional personnel to handle.
- 5) (Right figure) For over-current protector, please find reasons out, press rest (green button) after adjusting to normal state.
- 6) The temperature controller has default, and repair or replace temperature controller.



#### **6.7. Light of water level lights when running, and buzzer warns.**

- 1) The water level of water tank is not enough, the water level should exceeds floater of water level.
- 2) If the location of water level sensor is improper or the floater gets stuck, detection head and floater should be adjusted.
- 3) The temperature controller has default, and repair or replace temperature controller.

#### **6.8. Insufficient refrigerating capacity**

- 1) The expansion valve is opened too large or too small, and expansion valve is used to closure flow and decrease pressure in the refrigeration system: The adjustment method is shown in the figure, and if in the clockwise, it is to decrease, and the anti-clockwise direction is to open larger.
- 2) Refrigerant is insufficient or excessive, it should be adjusted to a reasonable value.
- 3) If the system includes too much air, evacuate again and inject refrigerant.

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4) The pipelines of refrigeration are dirt and blocked, then find out the reason and eliminate defaults.

5) The evaporator(including plate type) is scaling on the water side, then evaporator should clean.

6) The dust is too much on the condenser, then clean the condenser. The condenser is used for heat dissipation in the refrigeration system. If it cannot keep clean at any time, it will affect a normal running of equipment. It needs to know the arrangement mode of heat sinks for cleaning the condenser, and then get rid of wool or other dusts with banister brush following the direction of heat sinks, finally clean it from the top to the bottom with gas (too pressure is not allowed) until liens at the other side is seen through the condenser.

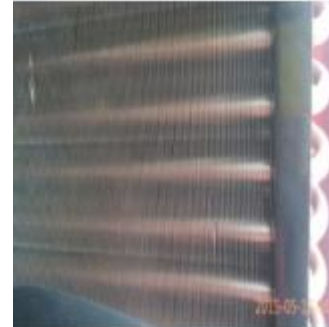
- 7) If the condensate fan has defaults, it should be repaired or replaced.
- 8) If refrigerant leaks, check leak source, and inject refrigerant after leak repairing (please operate under guidance of professional personnel).



Expansion valve



Clockwise rotation



Condenser

### 6.9. Exhaust temperature is too high

- 1) If condenser is dirt, and blast capacity of fan is insufficient, the condenser should clean, and fan is repaired or replaced.
- 2) If the refrigeration system includes too much air, evacuate again and inject refrigerant.
- 3) If the insulating layer of low-temperature pipes is damaged, restore insulating layer.
- 4) If the heating load is too large and over design, please collocate and use it as per design requirements.
- 5) If the environmental temperature is too high, improve application environment.

### 6.10. The machine is cooling all the time (high precision)

- 1) If temperature control probe is abnormal, the multimeter should be used to measure resistance between detection heads. The resistance is  $10K\Omega$  at  $25^{\circ}C$ .
- 2) If the solenoid valve is not closed, the above figure is solenoid valve.
- 3) It is used for the refrigeration system with a high precision. Its function is not to stop compressor to make refrigeration system be short circuit circulation (only the refrigeration system has not refrigeration, it will run. Check whether it is normal. Then, you just put a metal tool on the top and you will check whether there is suction. If it restores the normal action, the temperature of two both sides of the solenoid valve should be same, otherwise, there is a default on the solenoid valves. Then circuit can be checked to check the coil power supply of solenoid valve. If all are normal and no suction, then the coil has defaults. If suction exists, then the valve body of solenoid valve has defaults).



**Note: 1. It is forbidden to open circulating pump when you not open import and export valves of equipment, otherwise, damage of circulating pumps may happen.**

**2. If the machine doesn't work for a long time, then water in evaporator, water pump and pipelines should be discharged to prevent frost crack of pipeline in winter.**

**3. It is forbidden to put inflammable or conductive materials into the equipment when the equipment runs. Only the power supply is turn off and power cut, can the machine is maintained, otherwise, electric shock or personal injury may happen.**

## VII. General Maintenance Methods of Equipment

1. The compressor is operated according to the method introduced in the instructions of general refrigeration technology.
2. The equipment must be installed in a well-ventilated position.
3. The water tank and its internal strainer must be cleaned once a month.
4. The water tank must be filled with purified water or distilled water.
5. The water pump is strictly forbidden to run without water.
6. The condenser must be cleaned once every 15 days.
7. If it is found that the filter core in the filter bowl becomes brown, the filter core shall be replaced immediately.
8. The equipment must have a safe grounding, and the grounding insulation of the equipment shall be checked regularly.
9. All wiring terminals of the equipment shall be tightened every two months.
10. Freeze protection in winter

In order to prevent the damage of water pump / water tank / evaporator and other parts due to the freezing of circulating water in the water tank of chiller under the environment temperature of 0°C in winter, the ethylene glycol with the volume ratio of about 30% or motor vehicle antifreeze must be added into the circulating water tank to conduct the anti-freezing treatment, otherwise, the chiller will be seriously damaged.

The ethylene glycol is difficult for the evaporation loss during the usage due to high boiling point, and can be up to 50°C when containing 55% of water due to low freezing point. Due to the advantages of high flash point, good safety and not easy to fire, it is not only suitable for cold areas, but also meets the high-temperature work requirements of the high-load engine. The raw material is easy to be obtained, so it is the widely used antifreeze at present.

Ethylene glycol type; Concentration ratio: 55% - liquid and 45% - water, boiling point: 107°C; freezing point: -40°C. According to the required prevention temperature, 1~3 times water can be allocated. When the water is used with the mixed proportion of 1:1, the freezing point of the coolant will be reduced to -36.7°C. The maximum use concentration of ethylene glycol - water antifreeze is 75%. Remember not to exceed this concentration.

### VIII. Specific operations of maintenance in summer and freeze protection in winter

#### 8.1 Heat-stroke prevention measures in summer



1. Open the machine frame of the equipment



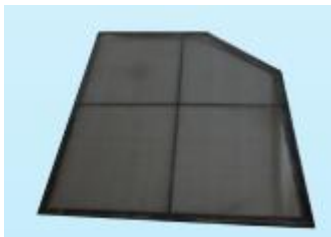
2. This is a condenser (the copper pipe of the condenser in the figure is horizontal and the fin is vertical)



3. The banister brush is used along the vertical fin (up or down). It is noted that the fins are very sharp, so the gloves must be worn during the operation.



4. Or blow the air out of the machine with an air gun



5. The strainer inside the fan or door panel can be rinsed or cleaned by air guns and other methods



6. If the machine is equipped with a pressure controller, when the compressor does not start, check whether the low pressure value is lower than 0.2MPa, (possible leakage of fluorine), and the filth blockage of the condenser may cause bad heat dissipation in case of higher than 0.2MPa. After the troubleshooting, the red reset button in the ring is pressed

## 8.2 Cold-resistant measures in winter

A. When the new equipment is used for the first time, it is necessary to carefully observe whether there is outlet water, and whether the return line has ice formation. If ice is formed or adjacent to form, the warm water (<math><40^{\circ}\text{C}</math>) shall be added into the water tank to melt, or the antifreeze or ethylene glycol shall be added into the water tank to prevent water from freezing.




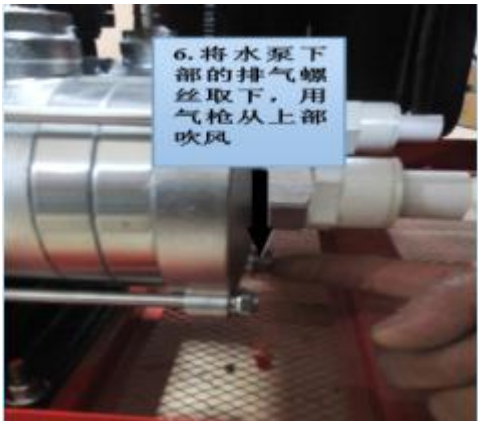
The specific ethylene glycol proportion is as follows:

| Volume fraction % | Freezing point $^{\circ}\text{C}$ | Volume fraction % | Freezing point $^{\circ}\text{C}$ | Volume fraction % | Freezing point $^{\circ}\text{C}$ |
|-------------------|-----------------------------------|-------------------|-----------------------------------|-------------------|-----------------------------------|
| 1.8               | -0.6                              | 26                | -13.0                             | 51.9              | -41.0                             |
| 3.6               | -1.3                              | 28                | -15.0                             | 53.9              | -44.0                             |
| 5.4               | -2.0                              | 29.9              | -17.0                             | 56.0              | -48.0                             |
| 7.2               | -2.7                              | 31.9              | -18.0                             | 78.9              | -47.0                             |
| 9.1               | -3.5                              | 33.8              | -20.0                             | 81.0              | -43.0                             |
| 10.9              | -4.4                              | 35.8              | -22.0                             | 83.1              | -40.0                             |
| 12.8              | -5.3                              | 37.8              | -24.0                             | 85.2              | -36.0                             |
| 14.6              | -6.3                              | 39.8              | -26.0                             | 87.3              | -33.0                             |
| 16.5              | -7.3                              | 41.8              | -28.0                             | 89.4              | -29.0                             |
| 18.4              | -8.0                              | 43.8              | -31.0                             | 91.5              | -26.0                             |
| 20.3              | -9.0                              | 45.8              | -33.0                             | 93.6              | -23.0                             |
| 22.2              | -11.0                             | 47.8              | -36.0                             | 95.8              | -19.0                             |
| 24.1              | -12.0                             | 49.8              | -38.0                             | 100               | -13.0                             |

b. Before the new equipment is transported and when the chiller is not used for a long time, the water in the water tank and in the filter cup should be drained through the blowdown valve. Meanwhile, the drainage nut under the water pump shall be unscrewed to drain the remaining water in the water pump. In order to prevent the freezing of the water system due to low environment temperature, the leakage of refrigerant due to burst of evaporator or the damage of the pump impeller (specific operation is shown in the following pages).

c. If the night temperature is less than 2° C, the customers are advised not to stop the engine or add the antifreeze (see Table I).

d. In order to ensure the refrigeration effect and prolong the service life of the equipment, please remind the customers to wash the condenser and change the water and filter core regularly to ensure the clean water quality.

|  |  |
|--|--|
|  <p>1. Firstly, open the blowdown valve to drain away water</p> <p>2. Inflate and drain away water after inserting the air gun into the water outlet</p> <p>3. Inflate and drain away water after inserting the air gun into the water inlet</p> |  <p>4. Remove the water cup in the counterclockwise direction and pour out the water</p>                                  |
|  <p>5. Remove the exhaust screw from the upper part of the water pump</p>   |  <p>6. Remove the exhaust screw from the lower part of the water pump, and blow the air from the top with an air gun</p> |

**Appendix I List of Standard Accessories**

|    | Name             | Whether contain  | Quantity | Unit | Remarks |
|----|------------------|--|----------|------|---------|
| 1  | Instructions     | <input type="checkbox"/> Yes <input type="checkbox"/> No |          | Copy |         |
| 2  | Parameter manual | <input type="checkbox"/> Yes <input type="checkbox"/> No |          | Copy |         |
| 3  | Small wrench     | <input type="checkbox"/> Yes <input type="checkbox"/> No |          | Pcs  |         |
| 4  | 5" filter core   | <input type="checkbox"/> Yes <input type="checkbox"/> No |          | Pcs  |         |
| 5  | 10" filter core  | <input type="checkbox"/> Yes <input type="checkbox"/> No |          | Pcs  |         |
| 6  | Ion              | <input type="checkbox"/> Yes <input type="checkbox"/> No |          | g    |         |
| 7  | Power line       | <input type="checkbox"/> Yes <input type="checkbox"/> No |          | m    |         |
| 8  | Signal line      | <input type="checkbox"/> Yes <input type="checkbox"/> No |          | m    |         |
| 9  | Others           | <input type="checkbox"/> Yes <input type="checkbox"/> No |          |      |         |
| 10 |                  |  |          |      |         |

Quality inspector:

Wuhan Hanli Refrigeration Technology Co., Ltd.



**Appendix II Product Qualification Certificate**

Wuhan Hanli Refrigeration Technology Co., Ltd.

**Product Qualification Certificate**

After inspection, the product meets the technical standard requirements and is allowed to leave the factory.

Product model: \_\_\_\_\_

Product No.: \_\_\_\_\_

Ex-factory date: MM/YY \_\_\_\_\_

Quality inspector: \_\_\_\_\_