

Freezing and Refrigeration Control Board

Operation Instructions

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1. Function and Technical parameters:

This controller is a dedicated controller for fixed frequency compressors, suitable for three-phase/single-phase power supply.

1.1. Main Function

Compressor control: optional 220V startup signal and passive switch signal can be used to control the start and stop of the compressor. In case of output failure, protection shutdown and delayed start can be achieved;

Control of condensing fan: There are two fan modes to choose from: constant speed and variable speed. In the speed regulation mode, the condensing fan is equipped with 5-speed regulation, which is adjusted according to the condensing temperature.

Liquid injection solenoid valve/electronic expansion valve control: Control the start and stop of the solenoid valve or the opening degree of the expansion valve based on the discharge temperature;

Control of the compressor crankcase heating element: automatically turns on at low temperatures when the compressor is stopped, turns off when the temperature is exceeded, automatically turns off when the compressor is running;

Discharge protection: discharge temperature over temperature alarm and compressor shutdown protection;

Condensation temperature protection: condensation temperature over temperature alarm and compressor shutdown protection;

High and low pressure protection: High and low pressure alarm and shutdown protection;

Three phase power supply protection: Three phase power supply missing phase, phase sequence error, phase sequence imbalance alarm and shutdown protection;

:

Temperature detection: discharge, ambient temperature, and condensation temperature detection.

1.2. Main technical index

Operating environment: Temperature -20~60 °C, humidity < 85%, no condensation, no corrosion;

Power supply voltage: Applicable voltage 220V and 380V (needs to be set to adapt to the unit), 50/60HZ

Current usage: The current requirement is not to exceed 5A

Temperature sensor

NTC: Discharge: $R_{0^{\circ}\text{C}}=187.25\text{K}\Omega\pm 6.3\%$ (1500C6*30Cu) ,

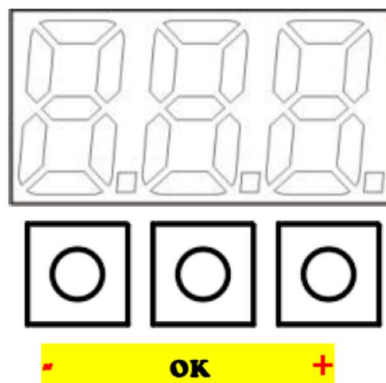
Other: $R_{25^{\circ}\text{C}}=5.00\text{K}\Omega\pm 1\%$ (1300C5*25SUS);

2. Basic operation guide

The controller adopts button operation, digital tube intelligent display, and buzzer auxiliary reminder alarm;

After the digital tube is powered on and self checked, the main interface is displayed by default, and the following parameters are displayed statically during rotation: P01 discharge temperature, P02 condensation temperature, and P03 ambient temperature.

Operation interface:



Parameter Query: When in the default interface, press the +/- button to query, press OK to display the value, short press OK to return to parameter selection, long press to exit and return to the main interface (note that the parameter query interface is used to confirm real-time data, so it will not automatically exit. After using the query, long press to exit or power off to exit), as shown in the query status parameter table (Table 2);

Advanced parameter settings: When in the default interface, press and hold OK to enter the settings. After entering the settings, select the corresponding settings through "+/-", press OK to enter the settings, select the required parameters through "+/-", and use the OK key to save the settings. Click OK again to confirm the settings, press and hold OK or do not operate for 30 seconds to exit and return to the main interface. The relevant settings parameters can be found in the Set function parameter table (Table 3);

Note: After modifying the parameters and exiting the query and settings interface, the parameters will only take effect and can be remembered after power failure

DIP Switch:

Table 1		
DIP	ON	OFF
SW1	Single-phase electricity	Three-phase electricity
SW2	High voltage protection does not lock	High voltage protection lock

Query Status Parameter:

Table 2 Query Status Parameter Table		
Code	Item	Description
P01	Discharge Temp	/
P02	Condensing Temp	/
P03	Ambient temp	/
P04	Return air temp (reserved)	/
P05	Solenoid valve status	0 close 1 open
P06	EEV opening	0 close 500 fully open
P08	Fault record query	/

Table 3: Set function parameter table

Code	Item	Range	Value	Unit	Description
F00	Ultra-low wind speed duty cycle of the fan	20 <	30	%	Used for adjusting the proportion of wind speed in each gear of the condensing fan
F01	Low wind speed duty cycle of the fan		45	%	
F02	Medium wind speed duty cycle of the fan		65	%	
F03	High wind speed duty cycle of the fan		85	%	
F04	Ultra high wind speed duty cycle of the fan		100	%	
F05	Discharge alarm Temp	80-120	115	°C	
F06	Discharge Temp protection shutdown Temp	90-125	122	°C	
F07	Discharge Temp protection reset Temp	70-100	90	°C	
F08	Liquid injection solenoid valve opening temperature	80-120	100	°C	
F09	Liquid injection solenoid valve closing temperature	50-90	85	°C	
F10	Shutdown Tempe of condensing fan	0-100	15	°C	
F11	Starting Temp of condensing fan	0-100	20	°C	
F12	Condensation alarm Temp	0-100	60	°C	
F13	Condensation protection shutdown Temp	0-100	65	°C	
F14	Condensation protection reset Temp	0-100	50	°C	
F15	Initial opening of EEV	0-500	200	step	
F16	Temp difference of liquid impact protection	0-100	15	°C	
F17	Minimum compressor downtime	0-600	180	S	
F18	Low pressure switch protection action time	0-300	5	S	
F19	High pressure switch protection action time	0-100	0	S	
F20	Pressure switch reset action time	0-100	2	S	
F21	Delayed start time of compressor	0-100	3	S	
F22	Delayed shutdown time of condensing fan	0-100	10	S	
F23	Delayed shutdown time of condensing fan during compressor temperature protection	0-300	180	S	
F24	Heating band opening Temp	0-20	5	°C	
F25	High pressure switch lock time interval	0-24	3	H	During this time, there were 3 occurrences of high voltage protection triggering and locking
F26	Fan type settings	0-2	0		0, speed regulation, 1, Start-stop mode
F27	Power error locked 3 times	0-1	1		1, enable; 0, disable

3. Alarm output

When the compressor malfunctions or detects abnormalities, the control board digital tube outputs the corresponding fault code :

Fault Code:

E01	Discharge Temp sensor malfunction
E02	Condensation Temp sensor malfunction
E03	Ambient Temp sensor malfunction
E04	Return air Temp sensor malfunction
E05	High pressure protection
E06	Low pressure protection
E08	Discharge Temp protection
E09	Condensation Temp protection
E10	Liquid shock protection
E11	Phase loss
E12	Phase sequence error
E13	Three-phase unbalance
E14	Lock up after three power errors
HP	High voltage protection lock

4. Basic control logic

4.1. Compressor on/off control

4.1.1. Compressor startup:

Single phase: The high and low pressure switches are closed, L is powered on, and the compressor can be started by closing ON/OFF;

Three phase: additional power supply protection is tested before starting, and other starting conditions are the same as single-phase;

First time startup mode

When the controller is powered on and started for the first time, or when the compressor is restarted after being stopped for more than one hour, it enters the initial startup mode. The initial startup mode operates as follows: The compressor runs for 3 seconds and stops for 17 seconds three times in a row. After the initial startup mode is complete, the controller enters the normal operation mode.

4.1.2. Compressor shutdown:

During the operation of the compressor, if the signal L is powered off or the ON/OFF switch is disconnected, the compressor will stop. When the system runs abnormally, the compressor shuts down due to fault protection

4.2. Discharge temperature protection

When the discharge temperature is $\geq 115^{\circ}\text{C}$, the buzzer will sound an alarm and output the alarm code **E08**;

When the discharge temperature is $\geq 122^{\circ}\text{C}$, the compressor stops and the buzzer continuously alarms until the discharge temperature is $\leq 90^{\circ}\text{C}$. At this time, the discharge temperature protection is reset;

4.3. Condensing fan Control

4.3.1. Fan on/off control

The condensing fan can be set to speed regulation mode (0) or on/off mode (1) through parameter setting (F26)

4.3.2. Control logic of condensing fan:

①When (F26) is in speed regulation mode (0), the fan operates in multiple gears and the fan speed is adjusted according to the condensation temperature, as shown in the table:

Fan speed regulation level			
F10 (OFF Temp) 15°C , F11 (ON Temp) 20°C ,			
Condensing Temp T_c			
LV	Temp	Unit	
Stop	$T_c < 15$	$^{\circ}\text{C}$	
1 (min)	$15 < T_c \leq 20$	$^{\circ}\text{C}$	
2	$20 < T_c \leq 25$	$^{\circ}\text{C}$	
3	$25 < T_c \leq 30$	$^{\circ}\text{C}$	
4	$30 < T_c \leq 35$	$^{\circ}\text{C}$	
5 (max)	$T_c > 35$	$^{\circ}\text{C}$	

②When (F26) is set to 1 (start- stop control);

If the condensing temperature is $\geq 20^{\circ}\text{C}$ (F11) when the set condensing fan starts, and the condensing temperature when the fan runs is $<15^{\circ}\text{C}$ (F10) when the set condensing fan stops, the fan will stop

③Condensation temperature protection

When the condensation temperature is $\geq 60^{\circ}\text{C}$, the buzzer will sound an alarm and output the alarm code **E09**;

When the condensing temperature is $\geq 65^{\circ}\text{C}$, the compressor stops and the buzzer continuously alarms until the condensing temperature protection is reset. The condensing temperature is $\leq 50^{\circ}\text{C}$;

4.4. Liquid injection valve control

During the operation of the compressor, when the discharge temperature is detected to be $\geq 90^{\circ}\text{C}$, the liquid injection valve is powered on (open). When the discharge temperature is $\leq 75^{\circ}\text{C}$, the liquid injection valve is powered off (closed).

4.5. Heating strip control

When the outdoor ambient temperature is detected to be $\leq 5^{\circ}\text{C}$ and the compressor is in a shutdown state, the heating belt of the crankcase is powered on. When the outdoor ambient temperature is $\geq 5^{\circ}\text{C}$ or the compressor starts running, the heating belt of the crankcase is powered off.

4.6. Pressure protection function

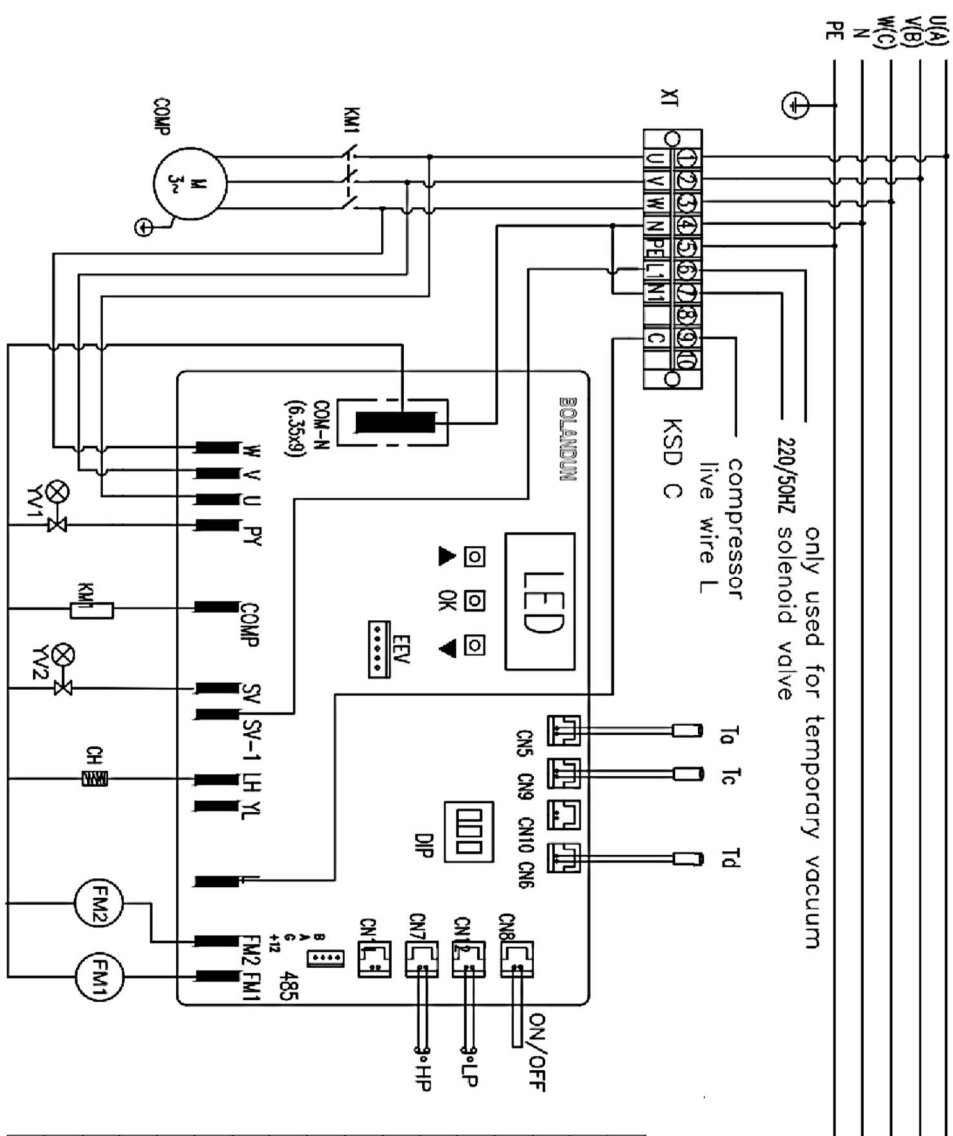
When the control panel receives the compressor start command (L signal is connected and ON/OFF switch is closed), it checks the pressure switch status. If it is in the disconnected state, the LED alarm output (E05 high pressure, E06 low pressure, no buzzer alarm) will be output, and the compressor will not operate;

4.7. Power protection function (three-phase electricity)

Detect power protection only when set to three-phase power supply. When setting up a single-phase power supply, three-phase power supply protection is not detected. If the three-phase power supply is abnormal, output the corresponding fault code;

Power supply lock up: After detecting power supply errors three times continuously during operation, it locks up and outputs the corresponding fault code. At this time, it needs to be powered off and reset. This function is enabled by default and can be set to enable/disable through **F27**.

5. Electrical Schematic Diagram



Electrical Code	
Code	Name
M	Compressor
COM-N	Common zero line
1	Compressor contactor
YV1	Liquid injection valve
YV2	Solenoid valve
CH	Crankshaft heating belt
FM1/FM2	Condensing fan
L/C	KSD Control compressor live wire
LP	Low pressure switch
HP	High pressure switch
ON/OFF	Control switch (optional)
Ta	Ambient temperature
Tc	Condensation temperature
Td	Discharge temperature
L1/N1	Temporary vacuum

Tips:

1. If it is necessary to use the passive switch ON/OFF to control the COMP, L (Terminal blocks "C") is normally power th
AC220V power (one phase of U / V / W can be led into the live line), and the COMP is controlled by the ON/OFF signal at this
time;
2. L1/N1 It is only used for temporary vacuum solenoid valve and cannot be powered on during normal operation
Other terminals shall not be connected to the circuit when vacuumizing. Before starting the compressor, it must be confirmed
that L1 and N1 external power supplies have been disconnected;