

## Technical Information

Warning! All materials of this product and its production, storage and transportation must comply with the requirements of the RoSH directive.

### Functions:

1. Accurately control water temperature by switching on/off the compressor and solenoid valve.
2. Automatically regulate water temperature set-point according to ambient temperature changes.

### Specifications:

Mounting size: 71x29mm

Power: 24VDC -20 /+10%

Rated power < 3W

Relay output:

Compressor output relay: 16A

Solenoid valve relay: 10A

Input: 2 NTC, 10 K $\Omega$  resistance at 25 °C

Four buttons (▲, ▼, SET, RST)

3-digit nixie tubes for temperature display (resolution: 0.1°C)

Two buzzers for alarm, two status indicators for displaying controller's working status

### Parameter Codes

The following parameters can be adjusted.

No.	Code	Parameter	Range	Default	Remark
1	F0	Temperature set-point	F9 ~ F8/-20 ~ 40	25.0	Intelligent temperature control mode /Constant temperature

					control mode
2	F1	Temperature difference	-15 ~ 5	-2.0	
3	F2	Cooling differential	0.1 ~ 3.0	0.8	Accuracy 0.1°C
4	F3	Control mode	0 ~ 1	1	1: Intelligent temperature control mode; 0: Constant temperature control mode
5	F4	High water temperature alarm	1 ~ 20	10.0	
6	F5	Low water temperature alarm	1 ~ 20	15.0	
7	F6	High air temperature alarm	40 ~ 50	45.0	
8	F7	Password	00 ~ 99	8	
9	F8	Maximum water temperature set-point	(F9 + 1) ~ 40	30.0	
10	F9	Minimum water temperature set-point	1 ~ (F8 - 1)	20.0	
11	A0	Heating differential	0.1 ~ 3.0	2.0	
12	A1	Power-on alarm delay	0 ~ 30	5	min
13	A2	Start delay	10 ~ 99	30	s
14	A3	Status transition delay	0 ~ 99	20	s
15	A4	Room temperature calibration	- 5.0 ~ 5.0	0.0	
16	A5	Water temperature calibration	- 5.0 ~ 5.0	0.0	
17	A6	System inertia coefficient	2 ~ 30	8	
18	A7	Compressor start protection	0 ~ 99	60	s

Note:

1. Parameters from F0 to F9 are for users to adjust.
2. Parameters from A0 to A7 are for water chiller manufacturers only.

## Operation

### 1. Parameter Settings (for manufacturers)

Press the buttons ▲, ▼ and RST at the same time for 3 seconds, the controller is powered on and displays 99. Press ▲ and ▼ to adjust the value to 50, the default password for modifying factory settings. Press SET to enter the menu to change the parameters from F0 to A7. The parameters modified and saved in this way are the factory default parameters.

### 2. Parameter Settings (for users)

Press and hold the ▲ button first, and then press SET button at the same time for 5 seconds to display 00. Press ▲ and ▼ to adjust the value to the set password, then press SET. If the password is correct, the display will change to F0 and enter setting status. The indicator D1 (the above LED) flashes, indicating the controller is in parameter setting status. If the password is incorrect, it goes back to display temperature.

In setting status, press ▲ or ▼ to scroll through parameter codes (F0-F9). Select a code, press SET to enter the next layer. The original set value is displayed. Press ▲ or ▼ to modify it, then press SET to back to the previous parameter code.

Press RST button at any time in parameter setting status, the controller will save the change and exit settings, back to temperature display and operate according to new parameter settings. After 20 seconds of inactivity, the controller will also exit setting status automatically without saving the change. (In parameter setting status, the system operates based on the previous settings.)

### 3. Quick Reset to Default

Press and hold ▲ and ▼ to power on the controller. After 3 seconds, it displays rE, indicating all the set values have been reset to the defaults and the controller will return to normal working status in three seconds.

### 4. Check Room Temperature

In non-setting status, press ▼ to display the value read by room temperature sensor, and then the water temperature after 6 seconds. (At this time, D1 flashes, indicating room temperature is displayed.)

## 5. Quick Settings

Press SET when the controller works normally. The panel displays the value of parameter F0 (temperature set-point) in constant temperature control mode, and that of parameter F1 (temperature difference) in intelligent temperature control mode. (LED D1 flashes, indicating the controller is in parameter setting status.) Press ▲ and ▼ to change the set-point, press SET again or keep the controller inactive for 20 seconds to exit without saving the settings. Or press RST to exit with new settings saved.

### Cooling Control

Chiller Status	Compressor Status	Refrigerant Solenoid Valve Status	Remark
Cooling	ON	Cut Off	100% power cooling
Micro Cooling	ON	Cut In	10% power cooling
Not Cooling	OFF	Cut In	No Cooling

The above table lists the three working status of the chiller controlled by the smart temperature controller. It takes about 5 to 10 seconds for transition between cooling and micro cooling, i.e. many times in a minute. If the heat load is turned on, the chiller mainly works in these two statuses, precisely controlling the temperature of the cooling water. (The water temperature fluctuates about 0.3°C in the actual test.) When the heat load is off, the water temperature will overshoot. When the water temperature equals A0 set-point, the compressor is switched off.

Note: There is a time difference between the chiller status transition and water temperature change. Please use the parameter A6 (System inertia coefficient) to reduce the water temperature overshoot and accurately control the temperature.

Compressor: When the temperature = water temperature set-point + cooling differential, and compressor protection delay exceeds the set time, the compressor starts to operate. When the temperature = water temperature set-point - heating differential, the compressor stops operating.

Solenoid valve: When the compressor is operating, the temperature  $\leq$  water temperature set-point, and the solenoid valve cut-off duration > status transition delay (A3), the solenoid valve cuts in. When the temperature > water temperature set-point, and the solenoid valve cut-in duration > status transition delay (A3), the solenoid valve cuts off. When the compressor stops operating, the solenoid valve cuts in. When the compressor starts to operate (switched on), the solenoid valve must be in the cut-off status.

## Water Temperature

In constant temperature control mode, the controller works as ordinary controller with water temperature set-point at F0 constantly.

In intelligent temperature control mode, water temperature set-point changes as follows:

When room temperature + F1 < F9, water temperature set-point = F9;

When room temperature + F1 > F8, water temperature set-point = F8;

When room temperature + F1  $\leq$  F8 or  $\geq$  F9, water temperature set-point = room temperature + F1.

## Alarm

### 1. Alarm Code

E1	E2	E3	E4	E5
High room temperature	High water temperature	Low water temperature	Room temperature sensor failure	Water temperature sensor failure

When an alarm occurs, all error codes and water temperature are displayed in turns.

### 2. Alarm Conditions

E1: Room temperature > High air temperature alarm (F6 set-point) ;

E2: Water temperature > Temperature set-point + Cooling differential (F2) + High water temperature alarm (F4)

E3: Water temperature < Temperature set-point - Heating differential (A0) - Low temperature alarm (F5)

E4: Room temperature sensor is short-circuited or open-circuited (check if the sensor loosens or replace the sensor)

E5: Water temperature sensor is short-circuited or open-circuited (check if the sensor loosens or replace the sensor)

E2 and E3 alarm will be valid after power-on alarm delay (A1) elapses or water temperature has entered the target temperature range (i.e., between the temperature set-point and the temperature set-point + cooling differential F2).

### 3. Control Status in Alarm

When E1, E2, and E3 alarms are triggered, the cooling and heating relays operate according to normal control requirements.

When E4 alarm is triggered, water temperature set-point (F0) equals to the factory default. (In constant temperature control mode, E4 will not be triggered.)

When E5 alarm is triggered, the system should switch to cooling status regardless of the status in which it operates.

#### 4. Buzzer

Press any button to mute the buzzer, but alarm display remains until the alarm is canceled.

#### **LED Indicator**

The red LED (D1) above is always on, indicating that the controller is operating in the intelligent temperature control mode;

The red LED (D1) above is off, indicating that the controller is operating in constant temperature control mode;

The red LED (D1) above flashes, indicating that the controller is operating in the parameter setting mode or displays room temperature;

The red LED (D2) below is always on, indicating cooling status;

The red LED (D2) below is off, indicating micro cooling status;

The red LED (D2) below flashes, indicating non cooling status.

#### **Button Tone**

When the button is pressed, a prompt tone will be heard.

#### **Power-on Display**

All the LED indicators and nixie tubes (D1, Da, Month, Day) will flash after the controller is powered on in 3 seconds.

Temperature Calibration Adjust A4 and A5 for calibration if the displayed room/water temperature deviates.

#### **Power-on Cooling**

When Power-on Delay (A2) elapses, the controller will enter 100% power cooling for 30 seconds, and then operates according to actual room and water temperature.

Note: After power-on cooling, if water temperature goes above the value water temperature

set-point minus heating differential, the compress will not be switched off. This function is designed for maintenance.