Instruction Manual for RY1005A Temperature Controller

Part 1: Overview

Function Description:

This controller is suitable for controlling a water chiller. It can accurately control the water temperature by controlling the start-stop of the refrigeration compressor and the control refrigerant solenoid valve. In smart mode, it can automatically adjust the water temperature setting value based on the change in ambient temperature.

Controller Features:

Uses a refrigerant solenoid valve to control compressor cooling capacity.

Main Technical Specifications:

Power Supply: 24VDC -30 /+10%

Rated Power: Less than 3W

Relay Outputs:

Compressor Output Relay: 17A relay (four-pin relay)

Solenoid Valve Output Relay: 10A relay (five-pin relay)

Signal and Indicator Light Relay: 2A relay (eight-pin relay)

Inputs: Two NTC sensors with a resistance of 10 KΩ at 25 °C and a wire length of 1 meter.

Four Buttons: SET, RST, Up, Down

Three-digit LED temperature display (temperature display resolution: 0.1 degree)

Opening Size: 30*71

There are two status indicator lights, an alarm buzzer, indicating the working status of the controller.

Temperature Controller Parameter Setting Menu

The adjustable parameters of the temperature controller are listed in the table below:

Order	Code	Setting Item	Range	Factory Setting	Remarks
1	F0	Set Temperature	F9～F8/-30～50	25.0	Intelligent Temperature Control Mode/Constant Temperature Mode
2	F1	Temperature Difference Value	–15～5	-2.0	
3	F2	Cooling Hysteresis	0.1～9.0	0.8	Accuracy: 0.1 degree
4	F3	Control Mode	0～1	1	1 Intelligent / 0 Constant Temperature
5	F4	High Water Temperature Alarm	1～80	20	
6	F5	Low Water Temperature Alarm	1～40	25	
7	F6	High Air Temperature Alarm	40～50	45.0	
8	F7	Password	00～99	6	
9	F8	Maximum Set Water Temperature	(F9+1)～50	30.0	
10	F9	Minimum Set Water Temperature	-30～(F8-1)	20.0	
11	A0	Heating Hysteresis	0.1～5.0	2.0	
12	A1	Startup Alarm Delay	0～30	10	minutes
13	A2	Startup Delay	10～99	30	seconds
14	A3	State Transition Delay	0～99	5	seconds
15	A4	Room Temperature Calibration	-10.0～10.0	0.0	

Order	Code	Setting Item	Range	Factory Setting	Remarks
16	A5	Water Temperature Calibration	-10.0～10.0	0.0	
17	A6	System Inertia Coefficient	0～40	0	
18	A7	Compressor Start Protection	0～99	30	seconds
19	A8	Electric Heating Rod Control Hysteresis	-5.0～20.0	0.2	Reserved
20	A9	Input Signal Alarm Delay	0-99	2	seconds
21	A10	Input Signal Normally Open/Closed Setting	NO/NC	NC	NO-normally open, NC-normally closed
22	A11	Electromagnetic Valve Delayed Opening	0-4.0	0	F0-A11 energized electromagnetic valve
23	A12	Function during E6 Alarm	0/1	0	Normal operation, 1 system stopped
24	A13	External Alarm Output Recovery Delay	0-99	2	seconds
25	A14	Compressor Start Electromagnetic Valve Delayed Closure	0-30	0	seconds
26	A15	Status during Er1-Er5 Signal Relay Alarm	0/1	1	0-stop 1-continuous

1.Parameters F0-F9 are adjustable by the user.

2.Parameters A0-A15 can only be adjusted by the manufacturer.

Here are the specific adjustment methods:

1.Manufacturer Parameter Adjustment Method:

Press and hold the SET and RST buttons simultaneously while powering on the temperature controller. The LED display will show "99" after three seconds.

Use the ▲ and ▼ buttons to enter the password for modifying the factory settings (**) and press the SET button to enter the menu.

In the menu, you can modify the factory settings and change parameters (F0-F9). The parameters adjusted and saved using this method will become the factory default settings. (After setting these parameters, the F parameters can only be restored to these parameters.)

2.User Parameter Adjustment Method:

Press and hold the ▲ button, and then simultaneously press the SET button for five seconds until "00" is displayed.

Use the ▲ and ▼ buttons to select the preset password, then press the SET button to confirm.

If the password is correct, the display will change to "F0," indicating the setting status. The indicator light D1 on the panel will flash, indicating that the controller is in parameter setting mode.

If the password is incorrect, it will return to the temperature display.

In the setting status, use the ▲ button to cycle through the available setting items, and use the ▼ button to cycle in the opposite direction. (Only F0-F9 will be displayed)

After selecting the desired item, press the SET button to enter the next level of parameter modification. The original set value will be displayed. Use the ▲ and ▼ buttons to modify the parameter value. Press the SET button to return to the previous menu item.

Pressing the confirmation button (RST) at any time will save the modified parameters, exit the parameter setting mode, and return to the temperature display. The controller will operate according to the new parameters. If no button is pressed within 20 seconds, the controller will automatically exit the parameter setting mode without saving any modified parameters. (In the parameter setting mode, the system will operate based on the original parameters.)

3.Quick Restore to Factory Settings:
Press and hold the ▲ and ▼ buttons simultaneously while powering on the temperature controller.
After three seconds, "rE" will be displayed, indicating that all settings will be restored to the factory values.
After three more seconds, the controller will return to normal operation.

4.View Room Temperature:
In the non-setting status, press the ▼ button to display the detected value of the room temperature sensor. After 6 seconds, it will return to displaying the water temperature. (During this time, the D1 indicator will flash to indicate the display is showing room temperature.)

5.Quick Adjustment:
When the temperature controller is in normal operation, pressing the SET button will display the parameter value of "F0" (set temperature) if the controller is in constant temperature mode, or "F1" (temperature difference value) if in smart mode. (During this time, the D1 indicator on the panel will flash, indicating that the controller is in parameter setting mode.)
Use the ▲ and ▼ buttons to modify the set value.
Pressing the SET button or not pressing any button within 20 seconds will exit without saving the changes. Pressing the RET button will save the changes and exit, and the new parameters will take effect.

Part 2. Cooling control

Cooling Condition	Compressor Condition	Refrigerant Solenoid Valve Condition	Remarks
Cooling	Running	Closed	100% full power cooling
Micro Cooling	Running	Conducting	10% power cooling
No Cooling	Stopped	Conducting	No cooling

The above are the three operating states of the water chiller controlled by the smart temperature controller. The transition between the cooling and micro cooling states is the shortest, taking approximately 5 to 10 seconds, and can be switched multiple times within a minute. When the heat load is activated, the chiller primarily operates in these two states, allowing for precise control of the cooling water temperature. (During actual testing, the water temperature fluctuates by approximately 0.3 degrees.) When the heat load is deactivated, the water temperature will undershoot. When it reaches the A0 set value, the cooling compressor stops working.

It is important to note that there is a time difference between the transition of the chiller's operating state and the change in water temperature. Parameter A6 describes the system's inertia and based on this parameter, the controller can calculate the corresponding advance action to reduce temperature overshoot.
Compressor: When the temperature rises to the set temperature plus the cooling differential and the compressor protection delay exceeds the set time, the compressor starts working. When the temperature drops to the set temperature minus the heating differential, the compressor stops working.

Refrigerant Solenoid Valve: When the compressor is running, if the temperature decreases to or below the set temperature and the duration of the open state for the refrigerant solenoid valve exceeds the transition delay time (A3), the valve conducts. When the temperature rises above the set temperature and the duration of the conducting state for the solenoid valve exceeds the transition delay time (A3), the valve closes. When the compressor stops running, the solenoid valve conducts. When the compressor starts operating (during startup), the solenoid valve is always in the closed state (under normal conditions, this condition is satisfied).

Part 3：Determination of Water Temperature Set Value:

When the temperature controller operates in constant temperature mode, similar to a regular temperature controller, the water temperature set value remains constant as F0.

When the temperature controller operates in smart mode, the water temperature set value is variable. (As follows)

If the room temperature + F1 is less than F9, the water temperature set value is equal to F9.

If the room temperature + F1 is greater than F8, the water temperature set value is equal to F8.

If the room temperature + F1 is less than or equal to F8 and greater than or equal to F9, the water temperature set value is equal to the room temperature + F1.

Part 4：Control in Abnormal States

1.Alarm Display

Code	E1	E2	E3	E4	E5	E6
Description	High room temperature	High water temperature	Low water temperature	Room temperature sensor malfunction	Water temperature sensor malfunction	Water flow alarm

When an alarm is triggered, all the error codes will be displayed in rotation with the water temperature.

2. Alarm Conditions:

Refer to the set code table.

E1: Room temperature > High room temperature alarm value (F6 setting).

E2: Water temperature > Set temperature + Cooling hysteresis (F2) + High water temperature alarm (F4).

E3: Water temperature < Set temperature - Heating hysteresis (A0) - Low water temperature alarm (F5).

E4: Room temperature sensor short circuit or open circuit (check if the sensor is loose or replace the sensor).

E5: Water temperature sensor short circuit or open circuit (check if the sensor is loose or replace the sensor).

Alarms E2 and E3 will be effective only after the power-on delay (A1) or when the water temperature enters the target temperature range (between the set temperature and set temperature + cooling hysteresis F2).

3. Control Status during Alarms:

When E1, E2, or E3 alarms occur, both the cooling and heating relays will operate according to normal control requirements.

When E4 alarm occurs, the water temperature set value (F0) will operate according to the factory default settings. (E4 alarm will not occur if the controller is operating in constant temperature mode.)

When E5 alarm occurs, the system should transition to a shutdown state regardless of the current operating mode.

4. Alarm Silencing: In the alarm state of the temperature controller, pressing any key will silence the alarm buzzer, but the alarm display will continue until the alarm conditions are resolved.

5. External Input Alarm: When an external input alarm signal is received and meets the time set by A9, the system will be controlled to stop or operate normally according to A12. The buzzer will sound. When the alarm is restored, it will return to normal operation after a delay of A13 time, and the buzzer will stop sounding. The corresponding indicator light will not illuminate.

Part 5. Indicator Lights:

The top red light (D1) is constantly on, indicating that the controller is operating in intelligent control mode.

The top red light (D1) is off, indicating that the controller is operating in constant temperature mode.

The top red light (D1) is flashing, indicating that the controller is operating in parameter setting mode or displaying the room temperature value.

The bottom red light (D2) is constantly on, indicating the cooling state.

The bottom red light (D2) is off, indicating the micro-cooling state.

The bottom red light (D2) is flashing, indicating the non-cooling state.

Part 6. Key Sounds

When a key on the controller is pressed, a short sound will be emitted as a key confirmation.

Part 7. Power-On Display:

After power-on, the display panel should flash for 3 seconds, simultaneously showing the indicator lights and the digital display (including D1, D2, and the date: day).

Part 8. Room Temperature and Water Temperature Calibration

If there is a deviation between the displayed temperature (room temperature or water temperature) and the actual temperature, it can be adjusted using A4 and A5 for calibration.

Part 9. Upon Power-On

After the power-on delay (A2) time, the temperature controller enters a 100% full-power cooling state for 25 seconds. Then, it controls the operation of the chiller based on the actual air temperature and water temperature. (Note: This functionality can be defined as "short-term cooling on startup." If, after the short-term cooling on startup, the water temperature is higher than the water temperature set value minus the heating hysteresis, the compressor does not stop. This functionality is designed to facilitate maintenance and servicing work.)

Part 10. Controller Wiring Diagram.