CNCU T-503 Temperature Controller Instructions

Contents

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CNCU T-503 Temperature Controller

Specifications:

- Compliance: RoSH directive
- Functions:
- Accurately control water temperature by switching on/off the compressor and solenoid valve.
- Automatically regulate water temperature set-point according to ambient temperature changes.

Product Usage Instructions

Parameter Codes:

Code No.	Parameter	Range	Default
1	F0 Temperature set-point	F9F8/-2040	25.0

Operation:

1. **Parameter Settings (for manufacturers):** Press the buttons , and RST simultaneously for 3 seconds to power on the controller. Set the default password to 50 by pressing and . Press SET to access the menu to adjust parameters from F0 to A7.

Cooling Control:
The chiller has three working statuses controlled by the smart temperature controller: Cooling ON, Micro ON, and Cooling Not Cooling OFF. The compressor operates based on the set temperature points and differential values.

Note: Use parameter A6 (System inertia coefficient) to reduce water temperature overshoot and ensure precise temperature control.

Compressor Operation:

- When the temperature reaches the water temperature set-point + cooling differential, and the compressor protection delay is exceeded, the compressor starts operating.
- When the temperature falls below the water temperature set-point – heating differential, the compressor stops operating.

FAQ:

- **Q: How can I adjust the water temperature set-point?**
  A: Access the parameter settings menu by pressing , and RST simultaneously, then use the appropriate buttons to adjust the temperature set-point.
- **Q: What should I do if the chiller status transitions are not smooth?**
  A: Adjust the System inertia coefficient (parameter A6) to reduce overshoot and ensure smooth transitions between statuses.

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 KΩ 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/Constanttemperature control mode
2	F1	Temperature difference	–15 5	-2.0	
3	F2	Cooling differential	0.1 3.0	0.8	Accuracy 0.1℃
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 temperaturealarm	1 20	15.0	
7	F6	High air temperaturealarm	40 50	45.0	
8	F7	Password	00 99	8	
9	F8	Maximum watertemperature set-point	(F9 1) 40	30.0	
10	F9	Minimum watertemperature 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 temperaturecalibration	5.0 5.0	0.0	
16	A5	Water temperaturecalibration	5.0 5.0	0.0	
17	A6	System inertia coefficient	2 30	8	
18	A7	Compressor startprotection	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 be 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℃ 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 ≤ 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 ≤ F8 or ≥ F9, water temperature set-point = room temperature + F1. Alarm

1. **Alarm Code**

E1	E2	E3	E4	E5
High room te mpe rature	High water temperatur e	Low water tem per ature	Room temperatur e sensor failure	Water temperatur e sen sor failure

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

2. Alarm Conditions
3. 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).

4. 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.
5. 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.

Documents / Resources

	**CNCU T-503 Temperature Controller** [pdf] Instructions T-503, T-503 Temperature Controller, Temperature Controller, Controller
	**CNCU T-503 Temperature Controller** [pdf] Instructions T-503, T-503 Temperature Controller, Temperature Controller, Controller

References

- **User Manual**