



精于心 别于形

新型干变温控器

New dry temperature controller

使用说明书

Instruction manual



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1. 技术指标

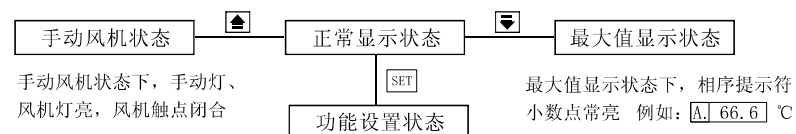
1.1 基本技术参数

环境温度 : $-25^{\circ}\text{C} \sim +55^{\circ}\text{C}$
 环境湿度 : $\leq 95\%$ (25 $^{\circ}\text{C}$)
 工作电压 : AC220V ($\pm 10\%$); 可根据用户特殊需求定制
 工作频率 : 50Hz或60Hz ($\pm 2\text{Hz}$)
 测量范围 : $-30.0^{\circ}\text{C} \sim 240.0^{\circ}\text{C}$
 测量精度 : $\pm 1\%$ FS (温控器0.5级, 传感器B级)
 分辨率 : 0.1 $^{\circ}\text{C}$
 风机触点容量 : 6A/250VAC (COS $\Phi=0.4$)
 控制触点容量 : 5A/250VAC; 5A/30VDC (阻性)
 功耗 : $\leq 8\text{W}$

1.2 标准

生产标准 : JB/T7631-2016《变压器用电子温控器》行业标准
 通过认证标准 : ISO9001:2015国际质量管理体系认证
 ISO14001:2015环境管理体系认证
 ISO45001:2018职业健康安全管理体系认证
 通过实验标准 : IEC61000-4:2005 国际标准
 GB/T17626-2008《电磁兼容试验和测量技术》标准

2. 功能示意图



功能设置状态下, 相序提示符小数点灯闪烁 例如: $\boxed{F} \boxed{.} \boxed{-C1-}$

功能码	01	02	03	04	05	06	07
功能说明	黑匣子	风机定时启动	参数设置	调零	模拟测试	模拟测试跳闸允许	RS485通讯参数设置

3. 各个功能设定流程图

3.1 “黑匣子”功能

可通过该功能查看历史最高温度以及温控器最近一次停电前瞬间各相的温度值。

1. Technical Index

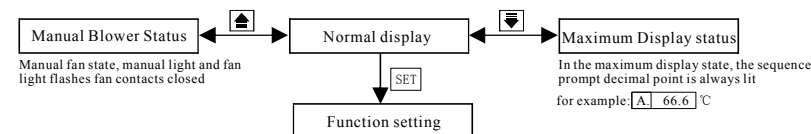
1.1 Basic technical parameters

Ambient temperature : $-25^{\circ}\text{C} \sim +55^{\circ}\text{C}$
 Ambient humidity : $\leq 95\%$ (25 $^{\circ}\text{C}$)
 Operating voltage : AC220V ($+10\%$), can be customized according to user's special needs
 Operating frequency : 50Hz or 60Hz ($\pm 2\text{Hz}$)
 Measurement range : $-30.0^{\circ}\text{C} \sim 240.0^{\circ}\text{C}$
 Measurement accuracy : $\pm 1\%$ FS (thermostat level of 0.5 class, sensor of B class)
 Resolution : 0.1 $^{\circ}\text{C}$
 Fan contact capacity : 6A/250VAC (COS $\Phi=0.4$)
 Control contact capacity : 5A/250VAC; 5A/30VDC (Resistive)
 Power : $\leq 8\text{W}$

1.2 Standard

Production standard : JB/T7631-2016《Electronic thermostat for Transformers》
 Industry standards
 Certification standards : ISO9001:2015 International Quality Management System certification
 ISO14001:2015 Environmental Management System Certification
 ISO45001:2018 Occupational Health And Safety Management System Certification
 Test standards : IEC61000-4:2005 International Standards
 GB/T17626-2008《Electromagnetic Compatibility Test And Measurement Technology》Standard

2. Functional diagram



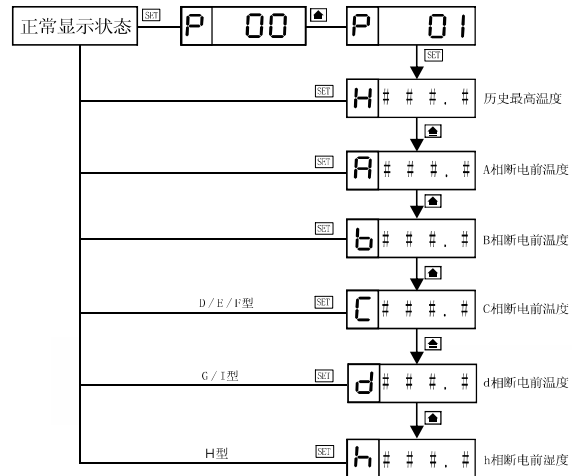
Function settings State, the sequence prompt decimal point light flash For example: $\boxed{F} \boxed{.} \boxed{-C1-}$

Function code	01	02	03	04	05	06	07
Function description	Black box	Fan timing Start	Parameter setting	Zero setting	Simulation test	Simulation test the trip allows	RS485 Communications parameter setting

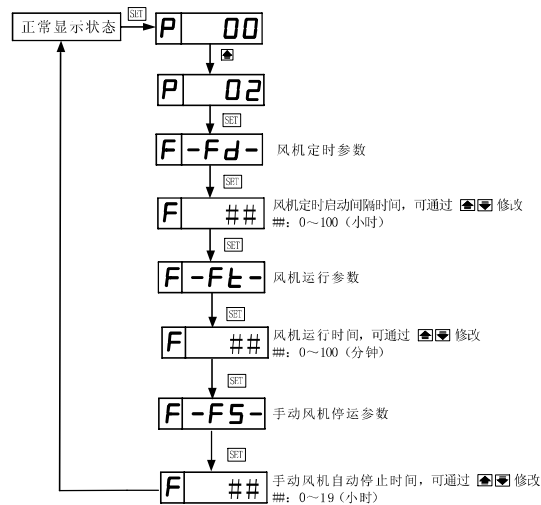
3. Each function set flow chart

3.1 "Black box"

This function allows you to view the history of the highest temperature and the temperature of the thermostat before the latest blackout.



3.2 风机定时启动设定功能

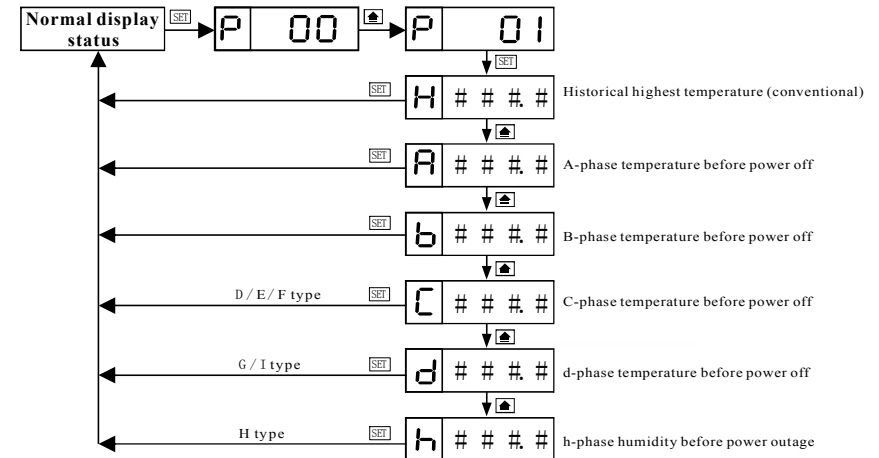


3.3 参数设置功能

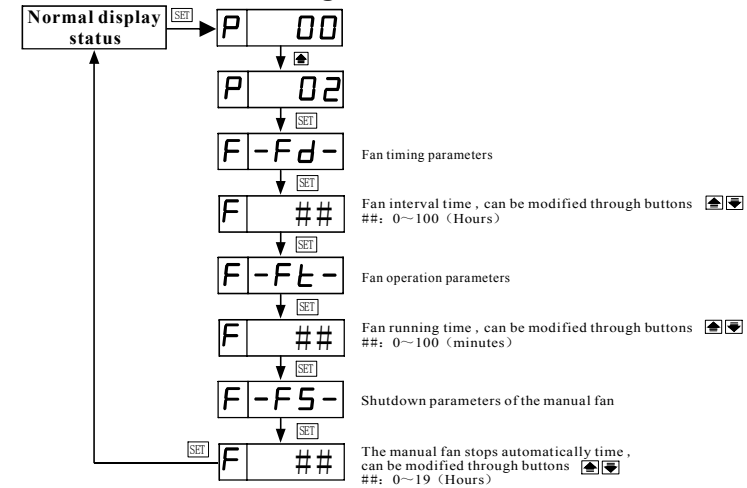
参数提示符含义如下：

提示符	C1	C2	C3	C4	C5	C6	C7	C8	C9	CA
参数含义	风机停止	风机启动	超温报警	超温跳闸	机房风扇停止	机房风扇启动	机房超温跳闸	铁芯超温报警	加热器停止	加热器启动
参考值	80℃	100℃	130℃	150℃	32.5℃	37.5℃	70.0℃	130.0℃	55%RH	60%RH
对应型号	D/E/F/G/I/H型				G型			I型	H型	

注：具体参数值以温控器出厂为准！



3.2 Fan Timer start setting function

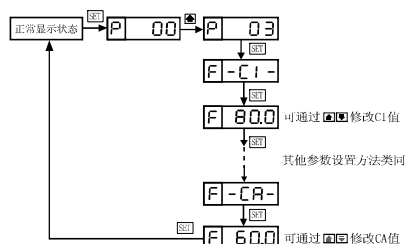


3.3 Parameter setting function

The meaning of the parameter prompt is shown in the figure:

Prompt	C1	C2	C3	C4	C5	C6	C7	C8	C9	CA
Parameter meaning	Fan stop	Fan start	Over-temperature alarm	Over-temperature trip	Engine room fan stop	Engine room fan start	Engine room fan trip	Iron core over-temperature alarm	Heater stops	Heating start
Reference value	80.0℃	100.0℃	130.0℃	150.0℃	32.5℃	37.5℃	70.0℃	130.0℃	55%RH	60%RH
Corresponding model	D/E/F/G/I/H type				G type			I type	H type	

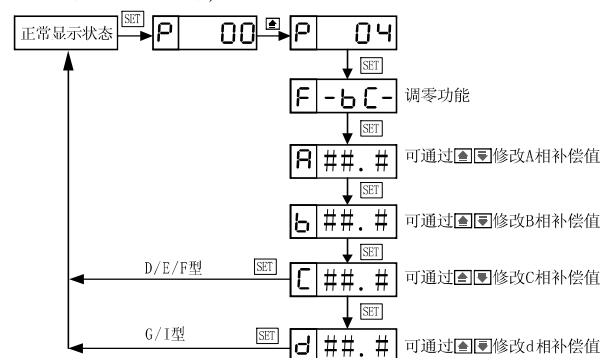
Note: The specific parameter values shall be subject to the actual



- a. C3、C4、C7、C8目标值回差均默认为0.4℃。
 b. 以上所示参数均为参考值,具体设定值以出厂为准。
 c. 常用三路温控器只有 C1、C2、C3、C4参数设置。
 d. G型产品含C5、C6、C7参数设置, I型产品含C8参数设置, H型产品含C9、CA参数设置。

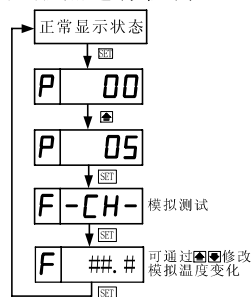
3.4 调零功能

温控器在测量显示变压器各相温度时,若各相温度测量值与温度实际值偏差较大,可进入调零功能对各相测量值进行校正。(补偿范围:-19.9℃~+19.9℃)



3.5 模拟测试功能

可以通过数字设定,模拟测量温度的变化,对温控器的输出状态及对应触点进行检测。



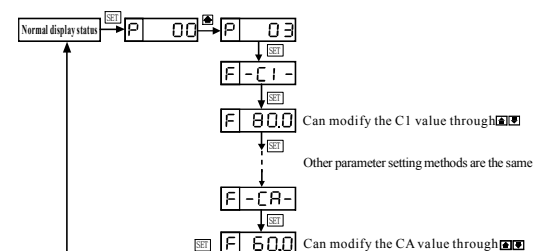
模拟温度输出说明:

≥100.1℃: 风机灯亮, 风机触点闭合
 ≥130.5℃: 报警灯亮, 报警触点闭合
 ≥150.5℃: 跳闸灯亮, 跳闸触点闭合
 ≥240.1℃: 故障灯亮, 故障触点闭合,
 超出量程上限

≤240.0℃: 故障灯灭, 故障触点断开
 ≤149.5℃: 跳闸灯灭, 跳闸触点断开
 ≤129.5℃: 报警灯灭, 报警触点断开
 ≤79.9℃: 风机灯灭, 风机触点断开
 ≤-30.1℃: 故障灯亮, 故障触点闭合,
 低于量程下限

注:各功能触点启动温度值以温控器出厂设置参数为准!

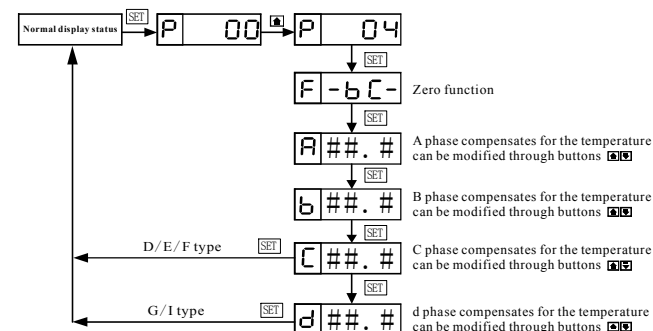
出厂功能设置: 模拟测试时, 默认支持超温跳闸功能触点启动;若模拟测试时, 要求超温跳闸功能触点不予启动, 可根据点3.6进行操作设置。



- a. C3, C4, C7, C8 the target value feedback difference defaults to 0.4℃.
 b. All the parameters indicated above are reference values, and the specific setting values are based on the factory.
 c. Commonly used three-way thermostat only C1, C2, C3, C4 parameter settings.
 d. G-type products containing C5, C6, C7 parameters settings, I-type products containing C8 parameter settings, H-type products containing C9, CA parameter setting.

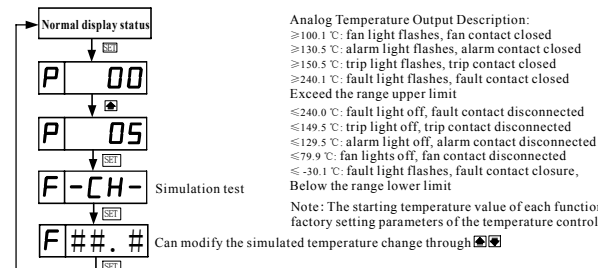
3.4 Zero function

When the temperature controller is used to measure and display the temperature of each phase of the transformer, the deviation between the measured value and the actual value of temperature is large, and the zero adjustment function can be adjusted to correct the measured values of each phase. (Compensation range:-19.9℃~+19.9℃)



3.5 Simulation test function

The output state of the temperature controller and the corresponding contact can be detected by the digital setting and simulating the measurement of the temperature change.



Analog Temperature Output Description:

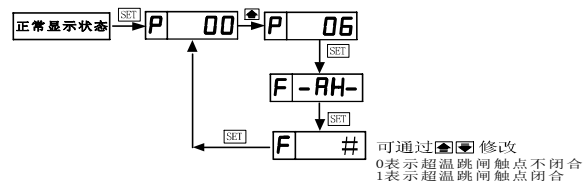
≥100.1℃: fan light flashes, fan contact closed
 ≥130.5℃: alarm light flashes, alarm contact closed
 ≥150.5℃: trip light flashes, trip contact closed
 ≥240.1℃: fault light flashes, fault contact closed
 Exceed the range upper limit
 ≤240.0℃: fault light off, fault contact disconnected
 ≤149.5℃: trip light off, trip contact disconnected
 ≤129.5℃: alarm light off, alarm contact disconnected
 ≤79.9℃: fan lights off, fan contact disconnected
 ≤-30.1℃: fault light flashes, fault contact closure,
 Below the range lower limit

Note: The starting temperature value of each function contact is subject to the factory setting parameters of the temperature controller!

Factory function setting: during the simulation test, the overtemperature trip functioncontact is started by default; If the simulation test requires the overtemperature trip function contact point not to start, can be set according to point 3.6.

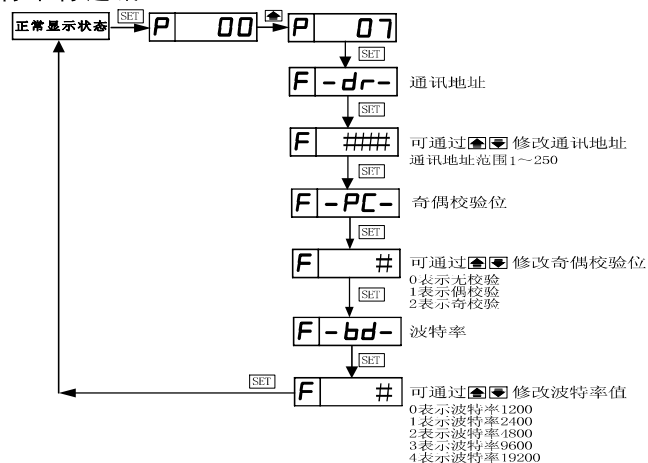
3.6 跳闸使能设置

可根据现场实际测试情况需求：对模拟测试功能是否支持超温跳闸功能触点启动进行操作设置。

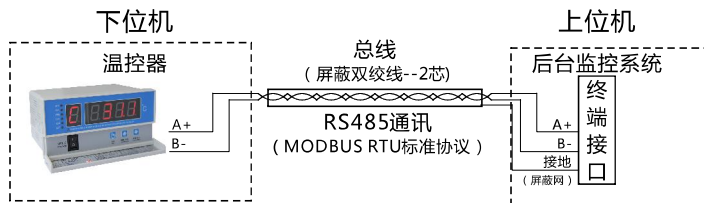


3.7 通讯参数设置

3.7.1 可以通过修改通讯地址、校验位及波特率等参数与上位机进行串行通讯。



3.7.2 温控器(箱)具备RS485串行通讯功能



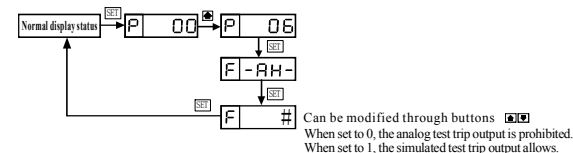
- 注：
- 1、可多台温控器并联至总线上传监测数据。（建议不超过16台）
 - 2、通讯配件--RS485/RS232转换器、通讯线。（选配）

3.7.3 数据格式

起始位	数据长度	奇偶校验位	停止位
1位	8位	0或1或2	1位

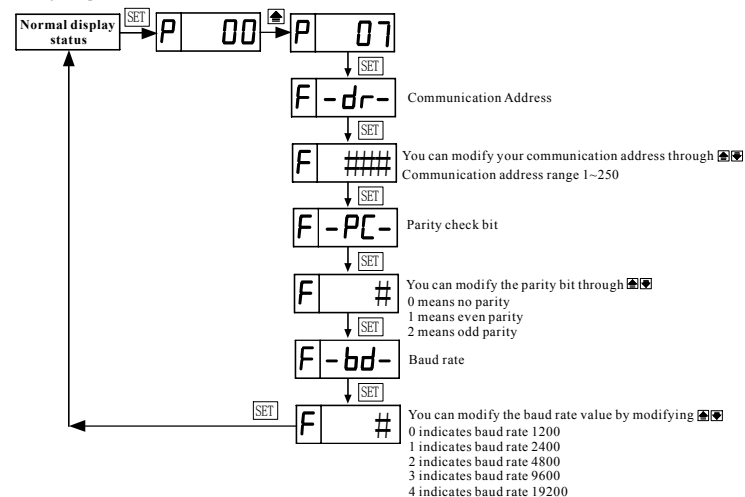
3.6 Trip enable setting

According to the actual testing requirements on site, whether the simulation testing function supports the setting of over temperature trip contact output.

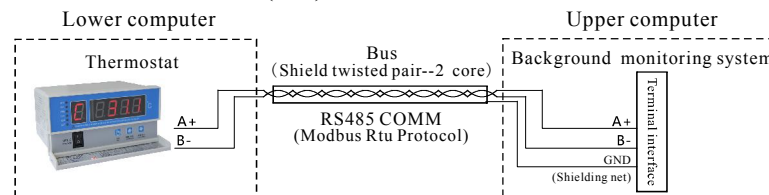


3.7 Communication parameter settings

3.7.1 Serial communication with the upper computer can be conducted by modifying the communication address, check bit and wave rate.



3.7.2 The thermostat (box) has a RS485 serial communication function



Note :

1. Multiple temperature controllers can be connected in parallel to the bus to upload the monitoring data.(No more than 16 units is recommended)
2. communication accessories- -RS485 / RS232 converter, communication line.(apologamy)

3.7.3 Data format

Starting bit	Date length	Parity check bit	Stop bit
1 bit	8 bit	0 or 1 or 2	1 bit

3.7.4 通讯规约内容(报文格式: MODBUS RTU)

1、上位机下传命令

地址	1~250
功能码	## (详见“功能码说明”)
起始地址高8位	00
起始地址低8位	## (详见“起始地址说明”)
数据量字数高8位	00
数据量字数低8位	##
CRC16校验低8位	
CRC16校验高8位	

功能码说明:

功能码为03时, 温控器回传各相温度值, 由于温控器测温路数常规为1~3路, 故上位机“数据量字数”在0001~0003之间; 功能码为04时, 温控器回传继电器输出状态, 此时上位机“数据量字数”为0001, 上位机起始地址为0000。

起始地址说明:

起始地址	说 明		寄存器定义
0000	A相温度数据高8位	A相温度数据	40001
	A相温度数据低8位		
0001	B相温度数据高8位	B相温度数据	40002
	B相温度数据低8位		
0002	C相温度数据高8位	C相温度数据	40003
	C相温度数据低8位		
0003	d相温度数据高8位	d相温度数据	40004
	d相温度数据低8位		
0004	h相湿度数据高8位	h相湿度数据	40005
	h相湿度数据低8位		

若温控器测量三路且无环境湿度监测时, 地址0003/0004为保留地址。

2、下位机回传数据

1) 温控器回传温度数据

地址	1~250
功能码	03
数据量字节数	数据量字数*2
A相温度数据高8位	各相实际温湿度 = 各相温湿度数据/10
A相温度数据低8位	
.	
.	
h相湿度数据高8位	
h相湿度数据低8位	
CRC16校验低8位	
CRC16校验高8位	

3.7.4 Communication protocol content(Message format: MODBUS RTU)

1、The upper computer download command

Address	1~250
Function code	##(the details can be seen in “function code description”)
Start address high 8-bit	00
Start address low 8-bit	## (the details can be seen in “start address description”)
Bytes of data high 8-bit	00
Bytes of data low 8-bit	##
CRC16 test low 8-bit	
CRC16 test high 8-bit	

Function code description:

When the function code is 03, the temperature controller transmits the temperature value of each phase. Because the temperature measurement number of the temperature controller is 1~3, the number of data quantity of the upper computer is between 0001 and 0003; when the function code is 04, the output state of the relay; the number of words of the upper controller is 0001, and the starting address of the upper computer is 0000.

Start address description:

Starting address	Description		Register definition
0000	A-phase temperature data high 8-bit	A-phase temperature data	40001
	A-phase temperature data low 8-bit		
0001	B-phase temperature data high 8-bit	B-phase temperature data	40002
	B-phase temperature data low 8-bit		
0002	C-phase temperature data high 8-bit	C-phase temperature data	40003
	C-phase temperature data low 8-bit		
0003	d-phase temperature data high 8-bit	d-phase temperature data	40004
	d-phase temperature data low 8-bit		
0004	h-phase humidity data high 8-bit	h-phase humidity data	40005
	h-phase humidity data low 8-bit		

If the temperature controller measures three channels and there is no environmental humidity monitoring, the starting address 0003 and 0004 is the reserved address.

2、Lower computer feedback data

1) Lower computer feedback temperature data

Address	1~250
Function code	03
Number of bytes of data	Number of data words*2
A-phase temperature data high 8-bit	Actual temperature and humidity of each phase = temperature and humidity data of each phase / 10
A-phase temperature data low 8-bit	
.	
.	
h-phase humidity data high 8-bit	
h-phase humidity data low 8-bit	
CRC16 test low 8-bit	
CRC16 test high 8-bit	

上位机发送功能码03时，若温控器送回温湿度数据高8位、低8位的数值为下表所示，则表示温控器工作在故障状态，不应计算温湿度值，要根据下表确定温控器工作状态；若温湿度数据高8位、低8位数值不为下表所示，则表示温控器工作在正常状态，可以根据温湿度数据高8位、低8位计算温湿度值。

温度数据高8位	温度数据低8位	温控器状态	说 明
0x70	0x00	-OP-	开路
0x60	0x00		超上限
0x80	0x00		超下限
0x50	0x00	-Er-	故障

2) 温控器回传继电器输出状态

地址	1~250
功能码	04
数据量字节数	02
状态数据高8位	00
状态数据低8位	## (详见“状态数据低8位定义”)
CRC16校验低8位	
CRC16校验高8位	

状态数据低8位定义：

数据位	3路测温	4路测温及湿度监测	状态
bit0	风机运行状态	风机运行状态	0=复归/1=启动
bit1	超温跳闸	超温跳闸	0=恢复/1=报警
bit2	超温报警	超温报警	0=恢复/1=报警
bit3	故障报警	铁芯报警	0=恢复/1=报警
bit4		故障报警	0=恢复/1=报警
bit5			
bit6	开门报警	开门报警	0=复归/1=门开
bit7		加热器	0=复归/1=启动

3.7.5 通讯例子

假设：当温控器(测量三路)的通讯地址为1；A相温度为开路状态(-OP-)，B相温度为-10.0℃，C相温度为105.0℃；故障报警输出，风机控制输出。

1) 上位机下传命令(读各相温度值)

01h	03h	00h	00h	00h	03h	05h	CBh
-----	-----	-----	-----	-----	-----	-----	-----

2) 温控器回传数据(各相温度值)

01h	03h	06h	70h	00h	FFh	9Ch	04h	1Ah	59h	74h
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

3) 上位机下传命令(读继电器输出状态)

01h	04h	00h	00h	00h	01h	31h	CAh
-----	-----	-----	-----	-----	-----	-----	-----

4) 温控器回传数据(继电器输出状态)

01h	04h	02h	00h	09h	79h	36h
-----	-----	-----	-----	-----	-----	-----

When the upper computer sends the function code 03, if the value returned to the temperature and humidity data is shown in the table below, the thermostat is working in a fault state, and the temperature and humidity value should not be calculated. To determine the working state of the thermostat: if the temperature and humidity data high and low 8 bit value are not shown in the table below, the thermostat is working in a normal state, and the temperature and humidity value can be calculated according to the high and low temperature and humidity data.

Temperature data high 8-bit	Temperature data low 8-bit	Thermostat state	Description
0x70	0x00	-OP-	Open circuit
0x60	0x00		Over the upper limit
0x80	0x00		Over the lower limit
0x50	0x00	-Er-	Error

2) The lower computer feedback the temperature controlled relay output

Address	1~250
Function code	04
Number of bytes of data	02
Status data high 8 bits	00
Status data low 8 bits	## (the details can be seen in "Status data low 8-bit definition")
CRC16 test low 8 bits	
CRC16 test high 8 bits	

State data low 8-bit definition:

Data bit	3 Road temperature measurement	3 Road temperature measurement and humidity monitoring	State
bit0	Fan running state	Fan running state	0=Revert/1=Start
bit1	Over-temperature trip	Over-temperature trip	0=Recover/1=Alarm
bit2	Over-temperature alarm	Over-temperature alarm	0=Recover/1=Alarm
bit3	Failure warning	Iron core alarm	0=Recover/1=Alarm
bit4		Failure warning	0=Recover/1=Alarm
bit5			
bit6	Open the door alarm	Open the door alarm	0=Revert/1=Door open
bit7		Calorifier	0=Revert/1=Start

3.7.5 Communication examples

Hypothesis: When the communication address of temperature controller (measuring three roads) is 1: A phase temperature is open state (-OP-), B phase temperature is -10.0℃, C phase temperature is 105.0℃; fault alarm output, fan control output.

1) Command transmission from upper computer (read the temperature values of each phase)

01h	03h	00h	00h	00h	03h	05h	CBh
-----	-----	-----	-----	-----	-----	-----	-----

2) Return data of the temperature controller (temperature value of each phase)

01h	03h	06h	70h	00h	FFh	9Ch	04h	1Ah	59h	74h
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

3) Command transmission from upper computer (read the relay output status)

01h	04h	00h	00h	00h	01h	31h	CAh
-----	-----	-----	-----	-----	-----	-----	-----

4) Return data of the temperature controller (relay output status)

01h	04h	02h	00h	09h	79h	36h
-----	-----	-----	-----	-----	-----	-----

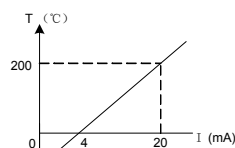
4. 电流输出功能

4.1 功能特点

电流输出功能中, 电流输出与温度值成线性对应关系, 4~20mA 电流信号对应温度 0~200℃, 此输出的电流接口可以直接与监控系统 (如 DCS 系统) 的模拟量采集卡接口连接, 用于温度显示和控制。

电流输出要求: 具体接线, 请参照温控器接线图。

4.2 电流输出的技术参数(负载电阻: $R \leq 500 \Omega$; 输出精度: $\pm 0.5\%$)



温度与电流的关系式: $I = (16T/200) + 4$

其中: T 为某相绕组温度值(℃)

I 为与该相温度对应的电流值(mA)

若用户的采集系统要求接收模拟电压信号, 可以直接在现有的电流输出端并接 250Ω 的高精度电阻, 即可取得 1~5V 的电压信号。

5. 简易故障处理方法

故障现象	原因分析	处理方法
上电不显示	1. 温控器无电源或电压过低 2. 温控器熔断器已断 3. 仪表损坏	1. 检查温控器输入电源 2. 更换温控器熔断器 3. 更换温控器或与厂家联系
闪烁显示“-OP-”故障灯亮、蜂鸣器响	1. 传感器接触不良 2. 传感器未插 3. 传感器损坏 4. 仪表损坏	1. 锁紧传感器接头螺丝 2. 插上传感器 3. 更换传感器 4. 更换温控器或与厂家联系
闪烁显示“-Er-”故障灯亮、蜂鸣器响	温控器故障	与厂家联系
温控器闪烁显示“8888”	温控器 CPU 烧坏: 1. 门开关端子接入外部电源 2. 耐压试验时传感电缆与温控器没有分离	1. 检查门开关端子接线, 撤除外部电源 2. 更换温控器或与厂家联系
温控器显示正常, 手动风机不启动	1. 风机熔断器已断 2. 风机接线错误 3. 风机继电器坏	1. 更换风机熔断器 2. 检查并更正风机接线 3. 更换温控器或与厂家联系
未达到启动风机的温度, 风机却自动运行	1. 处于手动开启状态 2. 风机定时功能自动开启	1. 按 可关闭风机 2. 正确设置风机定时参数--P02
三相温度偏差大	1. 传感器固定深度不同 2. 传感器故障 3. 仪表损坏	1. 调整传感器位置 2. 更换故障传感器 3. 更换温控器或与厂家联系
无法通讯	1. 通讯参数设置与后台不一致 2. “A+” “B-” 接线错误 3. 通讯芯片坏 (外部电压接入)	1. 更改参数设置 2. 更正接线 3. 检查外部电源来源并撤除 4. 更换温控器或与厂家联系
温度显示正常, 备用灯闪烁、蜂鸣器响	1. 门开关问题 2. 门开关端子接入外部电源	1. 变压器柜门没关到位或行程开关损坏 2. 拆除外部电源

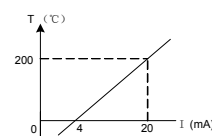
4. Current output function

4.1 Functional features

In the current output function, the current output and the temperature value are linearly corresponded, the 4~20mA current signal corresponds to the temperature 0~200℃, this output current interface can be directly connected to the analog volume acquisition card interface of the monitoring system (e. g., DCS system) for temperature display and control.

Current output requirements: For specific wiring, please refer to the wiring diagram of the temperature controller.

4.2 Technical parameters of current output(Load resistance: $R \leq 500 \Omega$; Output precision: $\pm 0.5\%$)



Calculation formula of temperature and current: $I = (16T/200) + 4$

Of which: T is the winding temperature value of a certain phase(℃)

I is the current value corresponding to the phase temperature(mA)

If the user's acquisition system requires receiving analog voltage signals, it is can be directly connected to the existing current output and access a high precision resistor of 250Ω , that is, a desirable 1~5V voltage signal.

5. Simple fault handling method

Fault phenomenon	Cause analysis	Processing method
The upper power is not displayed	1.No power or low voltage of thermostat 3.Temperature controller fuse broken 4.Instrument damage	1.Check the thermostat input power 3.Replace thermostat fuse 4.Replace the temperature controller or contact the manufacturer
Flashing display“-OP-” fault light, the buzzer sounds	1.Poor sensor contact 2.The sensor is not inserted 3.The sensor is damaged 4.Instrument is damaged	1.Lock the sensor plug screw 2.Plug in the sensor 3.Replace the sensor 4.Replace the temperature controller or contact the manufacturer
Flashing display“-Er-” fault light, the buzzer sounds	Thermostat failure	Contact the manufacturer
Thermostat displays“8888”	Thermostat CPU burnout: 1.Door switch terminals access external power supply 2.The sensor cable is not separated from the thermostat during the pressure test	1. Check the door switch terminal wiring, withdraw the external power supply 2.Replace the temperature controller or contact the manufacturer
The thermostat display is normal, manual blower can not start	1.Fan fuse has been broken 2.The fan wiring error 3.The fan relay is damaged	1.Replace the fan fuse 2.Check and correct the wind turbine wiring 3.Replace the temperature controller or contact the manufacturer
The temperature of the starting fan is not reached, but the fan runs by itself	1.In manual start state 2.The fan timing function is automatically turned on	1.Can press the to close the fan 2.Set the fan timing parameter P02 correctly
Three-phase temperature deviation is big	1.The sensor has a different depth of fixation 2.Sensor failure 3.Instrument is damaged	1.Adjust the sensor position 2.Replace the fault sensor 3.Replace the temperature controller or contact the manufacturer
Unable to communication	1.Communication parameter settings are inconsistent with background 2.“A+” “B-”Wrong wiring 3.Communication chip is damaged(External strong electric access)	1.Change the parameter setting 2.Correct the wiring 3.Check the external power source and remove. 4.Replace the temperature controller or contact the manufacturer
The temperature display is normal, the standby light flashes, the buzzer sounds	1.Door switch problem 2.Door switch terminals are connected to external power supply	1.The door of the transformer cabinet is not closed properly or the travel switch is damaged 2.Remove the external power supply

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