

注意

“注意安全”是为了安全正确地使用该产品，以防止危险事故的发生，请遵守以下内容。  
注意安全可分为“警告”与“注意”两个部分，其意思如下：  
**警告** 如违反此项，可能导致严重伤害或伤亡。  
**注意** 如违反此项，可能导致轻度伤害或产品损坏。  
△ 表示在特殊情况下可能会发生意外或危险

警告

- 用于对人身及财产有重大影响的机器（如：核能控制，医疗设备，船舶，车辆，铁道，航空，燃烧设备，安全装置，防盗 / 防災装置等）时，需要安装双重安全保护装置后使用。  
否则可能会引起火灾，人身伤亡或财产损失。
- 使用时必须要安装面板。  
否则有触电的危险。
- 通电状态下请勿进行检修作业。  
否则有触电的危险。
- 接线时请先确认端子号再进行接线。  
否则可能引起火灾。
- 除本公司维修人员外不得改造本产品。  
否则可能发生触电或火灾。

注意

- 请勿在室外使用该产品。  
否则会缩短该产品的使用寿命或发生触电事故。
- 电源输入端和继电器输出端接线时，请使用 AWG20(0.50mm<sup>2</sup>) 规格的线绳，拧螺丝的扭矩保持在 0.74-0.90Nm。  
接触不良时有可能引起火灾。
- 请在额定规格范围内使用该产品。  
否则会缩短该产品的寿命，有火灾隐患。
- 请使用小于继电器触点允许容量的负载。  
否则会造成绝缘不良，粗点粘合，接触不良，继电器损坏，火灾等。
- 清洁时请勿用水或有机溶剂，应用干毛巾擦拭。  
否则会引起触电或火灾。
- 在易燃易爆，潮湿，太阳光直射，热辐射，振动等场所应避免使用该产品。  
否则会引起火灾或爆炸。
- 请勿使灰尘或线缆残渣进入产品内部。  
否则会引起火灾或产品的故障。
- 请确认端子的极性后，正确连接热电偶配线。  
否则会引起火灾或爆炸。
- 为了达到强化绝缘的目的，请使用能确保基础绝缘以上的电源装置。

电气规格

|        |                                                         |
|--------|---------------------------------------------------------|
| 额定电压   | 100-240V AC, 50HZ                                       |
| 电源功耗   | ≤ 5VA                                                   |
| 工作环境   | 环境温度: 0℃ -50℃<br>相对湿度: 35%-85% RH (无凝露)                 |
| 存储温度   | -25℃ -65℃ (避免结冰或结露)                                     |
| 分辨率    | 1℃, 0.1℃ (可调)                                           |
| 接线方式   | 接线端子                                                    |
| 测量精度   | ±0.5%FS                                                 |
| 内存保护   | 非易失性内存                                                  |
| 安装环境   | 安装种类Ⅱ, 污染等级 2                                           |
| 继电器输出  | 继电器接点 AC220V/DC30V,3A                                   |
| 逻辑电平输出 | ON 时: DC1.2V; OFF 时: DC0.5V 以下;<br>最大流: 30mA, 负载电阻 ≥ 1K |

产品选型

C TN 4 S 4 1 1

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

|       |    |                    |
|-------|----|--------------------|
| ①公司名称 | C  | 昌得电气科技有限公司         |
| ②系列   | TN | 标准型数码双显示 PID 温度控制器 |
|       | TZ | 高精度数码双显示 PID 温度控制器 |

|       |   |            |
|-------|---|------------|
| ③显示数位 | 4 | 9999 (4 位) |
| ④外形尺寸 | S | 4848       |
|       | V | 4896       |
|       | H | 9648       |
|       | M | 7272       |
|       | L | 9696       |

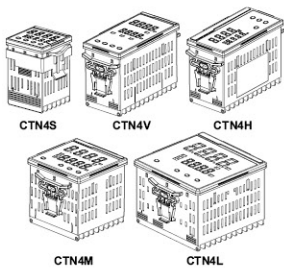
|       |   |                          |
|-------|---|--------------------------|
| ⑤电源电压 | 2 | 24VAC 50/60Hz, 24-48VDC  |
|       | 4 | 开关电源 (85~265VAC 50/60Hz) |

|       |   |        |   |            |
|-------|---|--------|---|------------|
| ⑥控制输出 | 1 | 继电器    | 4 | 可控硅过零输出    |
|       | 2 | SSR 输出 | 5 | 可控硅自带 (5A) |
|       | 3 | 模拟量输出  | 6 | SSR+ 继电器输出 |

|       |   |        |   |         |
|-------|---|--------|---|---------|
| ⑦报警输出 | 1 | 1 路继电器 | 3 | 1 路 SSR |
|       | 2 | 2 路继电器 | 4 | 2 路 SSR |

|      |   |                                    |
|------|---|------------------------------------|
| ⑧分度号 | 无 | 热电偶多输入<br>(默认 K),E,J,N,W3-25,W5-26 |
|      | P | 热电阻输入 PT100                        |
|      | C | 热电阻输入 Cu50                         |

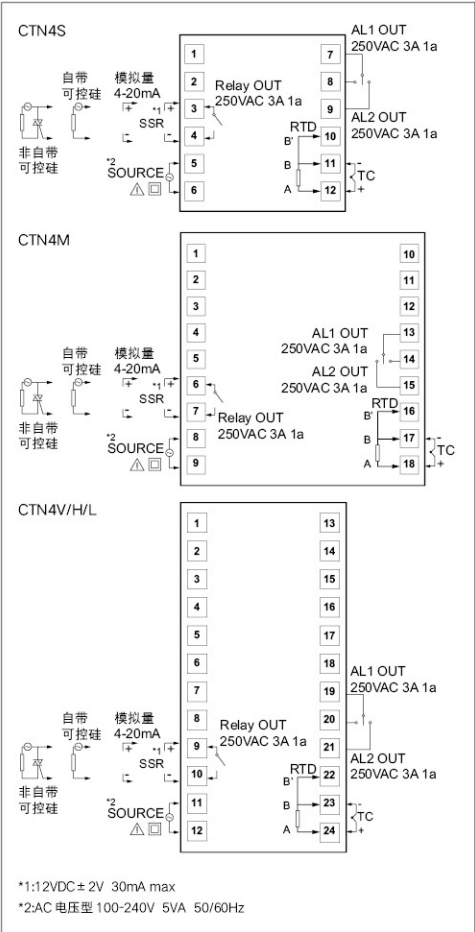
外形与开孔尺寸表



单位: mm

| 型号    | 面板尺寸<br>(长 × 宽 × 高) | 壳体尺寸<br>(长 × 宽 × 高) | 开孔尺寸    |
|-------|---------------------|---------------------|---------|
| CTN4S | 48 × 48             | 48 × 48 × 81        | 46 × 46 |
| CTN4V | 48 × 96             | 48 × 96 × 71        | 46 × 93 |
| CTN4H | 96 × 48             | 96 × 48 × 71        | 93 × 46 |
| CTN4M | 72 × 72             | 72 × 72 × 81        | 69 × 69 |
| CTN4L | 96 × 96             | 96 × 96 × 71        | 93 × 93 |

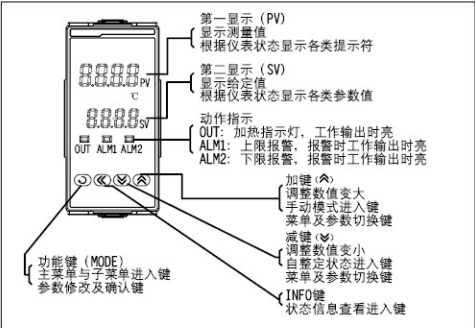
端子接线



| 端子号  | a   | b      | c      |
|------|-----|--------|--------|
| 1~24 | 6~8 | 2.1 以下 | 4.2 以下 |

|   | (圆型)     | (叉状)     |
|---|----------|----------|
| a | 3.0mm 以上 | 3.0mm 以上 |
| b | 5.8mm 以下 | 5.8mm 以下 |

操作面板功能说明



特别说明:

不同的加热装置需自整定一次，控制效果更佳。自整定方法，正常控温状态下测量值远低于目标值长按 (AT) 键 5 秒当 PV 测量温度值闪烁时代表进入自整定状态。取消自整定依然长按 (AT) 键 3 秒退出自整定状态。自整定过程为位式控制，依据不同的加热模型 (装置) 自整定的时间有所不同，温度可能有较大的波动。自整定完成后 PV 窗口的测量值停止闪烁，整定出来的值自动保存，仪表返回正常控温状态，以新的 P, I, D 值运算控温。  
注: 请参照仪表操作指导。

菜单显示说明

| 代码  | 菜单功能      | 默认值       | 设定范围         | 权限 | 描述                                           |
|-----|-----------|-----------|--------------|----|----------------------------------------------|
| P00 | 参数锁       | 0         | 0~900        | 0  | 0 为 0 级权限; 1 为 1 级权限; 18 为 2 级权限; 110 为恢复出厂值 |
| P12 | 显示精度      | 0         | 0~1          | 1  | P12=0 为无小数点 P12=1 为有小数点                      |
| P13 | 温度补偿      | 0         | P32 值 ~P33 值 | 1  | 当传感器位置问题或其他影响温度的因素产生时，用于温度修正                 |
| P16 | 输入分度号类型   | 有效类型      | 0~11         | 1  | 详情参见《输入分度号类型选择》                              |
| P17 | 报警 1 模式   | 1         | 0~24         | 1  |                                              |
| P18 | 报警 1 上限   | 10        | P32 值 ~P33 值 | 1  | 第一路报警方式，设定详情参见《ALM 报警模式定义》                   |
| P19 | 报警 1 下限   | 0         | P32 值 ~P33 值 | 0  |                                              |
| P20 | 报警 1 参数   | 0         | 0~7          | 1  |                                              |
| P22 | 报警 2 模式   | 0         | 0~24         | 2  |                                              |
| P23 | 报警 2 上限   | 0         | P32 值 ~P33 值 | 2  | 第二路报警方式，设定方式同第一路，详情参见《ALM 报警模式定义》            |
| P24 | 报警 2 下限   | 0         | P32 值 ~P33 值 | 0  |                                              |
| P25 | 报警 2 参数   | 0         | 0~7          | 2  |                                              |
| P28 | 手动输出量     | 0         | -100~100     | 0  | 手动输出量                                        |
| P31 | 华摄氏度切换    | 0         | 0~1          | 2  | P31=0 为摄氏度 P31=1 为华氏度                        |
| P32 | 设定温度上限    | 传感器适用温度范围 |              | 1  | 允许设定温度的最大值                                   |
| P33 | 设定温度下限    | 传感器适用温度范围 |              | 2  | 允许设定温度的最小值                                   |
| P46 | SV 操作方式选择 | 0         | 0~1          | 2  | 详情参见《SV 操作方式选择》                              |
| P67 | PID 控制模式  | 0         | 0~2          | 1  | 详情参见《PID 控制方式选择》                             |
| P70 | 加热回差      | 0.5       | 0~999.9      | 1  | 当 P67=2 位式控制时，修改加热回差值，为加热回差控制                |
| P72 | 自整定 AT    | 0         | 0~2          | 0  | 用于使 PID 参数自动适应用户系统的自动演算功能                    |
| P73 | 超调抑制系数    | 3         | 0~20         | 1  | 超调抑制系数                                       |
| P74 | 限制强度系数    | 1         | 0~3          | 2  | 限制强度系数                                       |
| P76 | 加热参数 P    | 12        | 0.1~最大 (℃)   | 1  | 比例作用调节，P 值越大比例作用越小，系统增益越低                    |

|     |         |      |            |   |                                 |
|-----|---------|------|------------|---|---------------------------------|
| P77 | 加热参数 I  | 135  | 1~最大 (s)   | 1 | 积分作用时间常数，I 值越大，积分作用越强，I=0 PD 控制 |
| P78 | 加热参数 D  | 27   | 1~最大 (s)   | 1 | 微分作用时间常数，D 值越大，微分作用越强，D=0 PI 控制 |
| P79 | 提前控制量   | 5.0  | 0.1~10.0   | 1 | 提前进入控制状态 单位: 度                  |
| P80 | 加热周期 HT | 20   | 1~100      | 1 | 继电器: 20 逻辑电平: 3                 |
| P82 | 制冷周期 HT | 20   | 1~100      | 1 | 继电器: 20 逻辑电平: 3                 |
| P83 | 制冷参数 P  | 10   | 0.1~最大 (℃) | 1 | 比例作用调节，P 值越大比例作用越小，系统增益越低       |
| P84 | 制冷参数 I  | 240  | 1~最大 (s)   | 1 | 积分作用时间常数，I 值越大，积分作用越强，I=0 PD 控制 |
| P85 | 制冷参数 D  | 40   | 1~最大 (s)   | 1 | 微分作用时间常数，D 值越大，微分作用越强，D=0 PI 控制 |
| P89 | 输出最大值限制 | 100  | 0~100      | 0 | 输出最大值限制                         |
| P90 | 输出最小值限制 | -100 | -100~0     | 2 | 输出最小值限制                         |
| P91 | 输出变化量限制 | 0    | 0~100      | 2 | 输出变化量限制                         |

ALM 报警模式定义

| P17/P22 代码 | 报警名称          | 说明                                     |
|------------|---------------|----------------------------------------|
| 0          | 无报警           | 无报警输出                                  |
| 1          | 偏差上限          | 当 PV > SV+P18 时报警                      |
| 2          | 偏差下限          | 当 PV < SV-P19 时报警                      |
| 3          | 偏差上下限         | 当 PV > SV+P18 或 PV < SV-P19 时报警        |
| 4          | 偏差上下限范围       | 当 PV < SV+P18 且 PV > SV-P19 时报警        |
| 5          | 偏差上限 (保持)     | 当 PV > SV+P18 时报警                      |
| 6          | 偏差下限 (保持)     | 当 PV < SV-P19 时报警                      |
| 7          | 偏差上下限 (保持)    | 当 PV > SV+P18 或 PV < SV-P19 时报警        |
| 8          | 偏差上下限范围 (保持)  | 当 PV < SV+P18 且 PV>SV-P19 时报警          |
| 9          | 绝对值上限         | 当 PV > P18 时报警                         |
| 10         | 绝对值下限         | 当 PV < P19 时报警                         |
| 11         | 绝对值上下限        | 当 PV > P18 或 PV < P19 时报警              |
| 12         | 绝对值上下限范围      | 当 PV < P18 且 PV > P19 时报警              |
| 13         | 绝对值上限 (保持)    | 当 PV > P18 时报警                         |
| 14         | 绝对值下限 (保持)    | 当 PV < P19 时报警                         |
| 15         | 绝对值上下限 (保持)   | 当 PV > P18 或 PV < P19 时报警              |
| 16         | 绝对值上下限范围 (保持) | 当 PV < P18 且 PV > P19 时报警              |
| 17         | 上限回差          | 出现 PV > SV+P18 后报警，直到 PV < SV-P19 后不报警 |
| 18         | 下限回差          | 出现 PV < SV-P19 后报警，直到 PV > SV+P18 后不报警 |
| 19         | 绝对值上限回差       | 出现 PV > P18 后报警，直到 PV < P19 后不报警       |
| 20         | 绝对值下限回差       | 出现 PV < P19 后报警，直到 PV > P18 后不报警       |
| 21         | 上限回差 (保持)     | 出现 PV > SV+P18 后报警，直到 PV < SV-P19 后不报警 |
| 22         | 下限回差 (保持)     | 出现 PV < SV-P19 后报警，直到 PV > SV+P18 后不报警 |
| 23         | 绝对值上限回差 (保持)  | 出现 PV > P18 后报警，直到 PV < P19 后不报警       |
| 24         | 绝对值下限回差 (保持)  | 出现 PV < P19 后报警，直到 PV > P18 后不报警       |

注: “保持”意思是上电开机报警消除; 如果温控表在一开机就处于报警状态，则不进行报警，要先使温控进入正常状态，再次达到报警条件后才进行报警。

ALM 报警参数定义

| P20/P25 代码 | 无             | 说明                                                 |
|------------|---------------|----------------------------------------------------|
| 0          | 报警输出 1 (ALM1) | 选择此代码，则对应报警点动作会等同于 ALM1 的动作                        |
| 1          | 报警输出 2 (ALM2) | 选择此代码，则对应报警点动作会等同于 ALM2 的动作                        |
| 2          | 加热输出          | 切换加热输出点，详情参见《仪表操作指导》                               |
| 3          | 制冷输出          | 双向 PID 配置制冷输出点                                     |
| 4          | 手动标志          | 启用手动输出功能时对应动作标志位                                   |
| 5          | 信息标志          | 当 INFO 菜单: 代码 F.01 里的值不为 0 时可配置的动作输出点，详情参见《状态信息说明》 |
| 6          | 错误标志          | 当出现错误故障时可配置的动作输出点，详情参见《错误显示说明》                     |
| 7          | 偏差上下限 (保持)    | 当 PV > SV+P18 或 PV < SV-P19 时报警                    |

注: 当配置此参数时，相对应的 P17 或 P22 应配置为 0 才可进行操作

输入分度号类型选择

| 温度输入<br>(P16) | 输入信号   | 分度号   | 设定代码 | 设定范围        |
|---------------|--------|-------|------|-------------|
|               | (默认) K | K     | 0    | -200℃~1200℃ |
|               |        | E     | 1    | -200℃~650℃  |
|               |        | J     | 2    | -200℃~850℃  |
|               |        | N     | 5    | -200℃~1300℃ |
|               |        | W3-25 | 10   | 0℃~2300℃    |
|               |        | W5-26 | 11   | 0℃~2300℃    |
|               | P      | PT100 | 8    | -200℃~850℃  |
|               | C      | Cu50  | 9    | -50℃~150℃   |

PID 控制方式选择

|         |        |        |      |
|---------|--------|--------|------|
| P67 设定值 | 0      | 1      | 2    |
| 模式      | 单向 PID | 双向 PID | 位式控制 |

状态信息说明

| INFO 状态信息表 |           |      |          |
|------------|-----------|------|----------|
| 参数代码       | 代码意义      | 参数代码 | 代码意义     |
| F.01       | 信息报警代码    | F.91 | 生产时间: 月  |
| F.10       | 控制输出量     | F.92 | 生产时间: 日  |
| F.11       | 冷端温度 (室温) | F.93 | 软件版本号    |
| F.12       | 内部参数      | F.94 | PID 库版本号 |
| F.90       | 生产时间: 年   | F.95 | 用户版本号    |

错误显示说明

| 错误故障代码表 |        |              |                 |
|---------|--------|--------------|-----------------|
| 错误显示    | 代码意义   | 排除故障         | 备注              |
| Er0     | 无错误状态  | 无            |                 |
| Er1     | 调试参数无效 | 仪表故障，请联系厂家   |                 |
| Er2     | 热电阻断线  | 检查热电阻连接线是否断开 | 上排数码管 (PV) 闪烁显示 |
| Er3     | 冷端温度异常 | 仪表故障，请联系厂家   |                 |
| Er4     | 超出量程上限 | 检查热电偶连接线是否断开 |                 |
| Er5     | 超出量程下限 | 检查热电偶连接线是否断开 |                 |

SV 操作方式选择

| 代码  | 参数值 | 说明                                   | 权限  |
|-----|-----|--------------------------------------|-----|
| P46 | 0   | 设定温度时，先单击 MODE 键，后按加减键调节，再按 MODE 键确定 | 2 级 |
|     | 1   | 设定温度时，直接按加减键调节，停止调节后自动确认             |     |

其他信息

单相 PID 与双向 PID 区别:

- 减少能量损耗，实现精确控温
- 制冷加热同时实现 PID 智能控制
- 突破传统位式制冷导致温度大幅震荡的局限
- 制冷由原来的定点回差控制，改为 PID 智能控制，进步程度相当于原来的指针表升级为智能表

仪表操作指导

自整定 (AT) 操作

温度设定操作

系统参数操作

案例: 加热 OUT 输出点配置到 ALM1 输出点上输出的设置方法

备注:

- P17: 报警 1 模式详细内容参照《ALM 报警模式定义》
- P20: 报警 1 参数详细内容参照《ALM 报警参数定义》



## INSTRUCTION MANUAL

"Product safety Cautions" is for using the product safely and correctly. In case any dangerous accidents happen, please follow the following instructions.

"Product safety Cautions" is for using the product safely and correctly. In case any dangerous accidents happen, please follow the following instructions.

"Product safety Cautions" can be divided into two parts, "warning" and "attention". They are explained as followed.

**For warning,** if you violate regarding instructions, it may cause severely injury or death.

**For attention**, if you violate regarding instructions, it may cause slightly injury or product damage.

 It means under any exceptional circumstances, it may cause accidents or danger.

1. When it is being used on machines that has significant impact on personal safety and their property (like Nuclear energy control, armamentarium, boats and ships, vehicles, railway, aviation,

1. When it is being used on machines that has significant impact on personal safety and their property (like Nuclear energy control, armamentarium, boats and ships, vehicles, railway, aviation, burning equipment, safety devices, anti-theft device, disaster prevention device etc. ), it needs to install double safety protection device. Otherwise, it may cause fire, personal injury or property loss.
2. You must install panel before you use it, or you will get electric shock.
3. Do not repair it if the power is on, or you will get electric shock.
4. Please confirm the terminal number before wiring. Otherwise it may cause a fire.
5. Do not reform the product other than maintenance staff in our company, or it may cause electric shock or fire.

1. Do not use this product outside. Otherwise, it will reduce the useful lifespan or cause electric shock.
2. When wiring the power input terminal and relay output terminal

1. Do not use this product outside. Otherwise, it will reduce the useful lifespan or cause an electric shock.
2. When wiring the power input terminal and relay output terminal, please use cable of AWG20 (0.50mm<sup>2</sup>), with tightening torque of 0.74-0.90Nm for the screws. There is a risk of fire in case of poor contact.
3. Please use the product within rated specifications. Otherwise, it will reduce the useful lifespan or cause fire.
4. The load should be smaller than the allowable capacity of relay contacts. Otherwise it will result in poor insulation, contacts bonding, poor contact, relay damage, fire, etc.
5. Do not use water or organic solvent to clean the product. Please use dry towel. Otherwise it may cause electric shock or fire.
6. Avoid using this product in places that are explosive, damp, sunlight exposed, thermal-radiating, vibrational etc. Otherwise, it will cause fire or explosion.
7. Make sure no dust or cable residue inside the product, or it will cause fire or product failure.
8. Connect the terminals first, then correctly connect the wire of thermocouple. Otherwise, it will cause fire or explosion.
9. In order to achieve the purpose of strengthening insulation, please use fundamental insulation or above power supply devices.

|                         |                                                                                   |
|-------------------------|-----------------------------------------------------------------------------------|
| Rated voltage           | 100-240V AC , 50HZ                                                                |
| Power consumption       | ≤ 5VA                                                                             |
| Operating ambient       | Ambient temperature : 0℃ -50℃<br>Relative humidity: 35%-85% RH<br>(No-condensing) |
| Storage Temperature     | -25℃ -65℃ (Avoid freezing)                                                        |
| Resolution power        | 1℃ , 0.1℃ (Adjustable)                                                            |
| Wiring method           | Connecting terminal                                                               |
| Measuring accuracy      | ± 0.5%FS                                                                          |
| Memory Protection       | Non-volatile memory                                                               |
| Installation conditions | Installation type II, Pollution degree 2                                          |
| Relay output            | Relay contact : AC220V/DC30V,3A                                                   |
| Logic level output      | ON: DC12V; OFF: Below DC0.5V;<br>Maximum Flow: 30mA, Oad resistance ≥ 1K          |

C TN 4 S 4 1 1

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

|                       |   |      |
|-----------------------|---|------|
| ① Name of the company | C | CNTD |
|-----------------------|---|------|

|          |    |                                                                   |
|----------|----|-------------------------------------------------------------------|
| ② Series | TN | Standard digital dual display<br>PID temperature controller       |
|          | TZ | High precision digital dual display<br>PID temperature controller |

|         |   |                  |
|---------|---|------------------|
| ③ Digit | 4 | 9999 ( 4 digit ) |
|---------|---|------------------|

|                   |   |      |
|-------------------|---|------|
| ④ Dimen-<br>sions | S | 4848 |
|                   | V | 4896 |
|                   | H | 9648 |
|                   | M | 7272 |
|                   | L | 9696 |

|                  |   |                                         |
|------------------|---|-----------------------------------------|
| ⑤ Voltage supply | 2 | 24VAC 50/60Hz, 24-48VDC                 |
|                  | 4 | Switch power supply (85~265VAC 50/60Hz) |

|                  |   |               |   |                          |
|------------------|---|---------------|---|--------------------------|
| ⑥ Control output | 1 | Relay         | 4 | SCR zero-crossing output |
|                  | 2 | SSR output    | 5 | SCR built-in (5A)        |
|                  | 3 | Analog output | 6 | SSR + relay output       |

|                |   |             |   |           |
|----------------|---|-------------|---|-----------|
| ⑦ Alarm output | 1 | 1-way relay | 3 | 1-way SSR |
|                | 2 | 2-way relay | 4 | 2-way SSR |

|              |     |                                                                      |
|--------------|-----|----------------------------------------------------------------------|
| ⑧ Graduation | Non | Thermocouple multiple input<br>(default setting K),E,J,N,W3-25,W5-26 |
|              | P   | Thermal resistance input PT100                                       |
|              | C   | Thermal resistance input Cu50                                        |

The image displays five different models of the CTN series of high-voltage capacitors. The models shown are CTN4S, CTN4V, CTMH, and two others. Each capacitor is a rectangular metal can with a central terminal and a base terminal. The top of the can features a label with technical specifications and a part number. The capacitors are arranged in two rows: three in the top row and two in the bottom row.

Unit: mm

| Type  | Panel size | Shell Dimension<br>(L × W × H) | Hole size |
|-------|------------|--------------------------------|-----------|
| CTN4S | 48 × 48    | 48 × 48 × 81                   | 46 × 46   |
| CTN4V | 48 × 96    | 48 × 96 × 71                   | 46 × 93   |
| CTN4H | 96 × 48    | 96 × 48 × 71                   | 93 × 46   |
| CTN4M | 72 × 72    | 72 × 72 × 81                   | 69 × 69   |
| CTN4L | 96 × 96    | 96 × 96 × 71                   | 93 × 93   |

|                         | Signal input | Graduation | Setup code | Setup range    |
|-------------------------|--------------|------------|------------|----------------|
| Temperature input (P16) | (Default) K  | K          | 0          | -200°C -1200°C |
|                         |              | E          | 1          | -200°C -650°C  |
|                         |              | J          | 2          | -200°C -850°C  |
|                         |              | N          | 5          | -200°C -1300°C |
|                         |              | W3-25      | 10         | 0°C -2300°C    |
|                         |              | W5-26      | 11         | 0°C -2300°C    |
|                         | P            | PT100      | 8          | -200°C -850°C  |
|                         | C            | Cu50       | 9          | -50°C -150°C   |

**CTN4S**

Diagram showing the pin configuration for the CTN4S module. The module has 12 pins. The left side (pins 1-6) is labeled "Non-built-in SCR" and "SCR built-in". The right side (pins 7-12) is labeled "Relay OUT 250VAC 3A 1a", "AL1 OUT 250VAC 3A 1a", "AL2 OUT 250VAC 3A 1a", "RTD B'", "RTD B", "RTD A", and "TC". The module also features an "Analog quantity 4-20mA" input and an "SSR" output.

**CTN4V/H/L**

Diagram showing the pin configuration for the CTN4V/H/L module. The module has 24 pins. The left side (pins 1-12) is labeled "Non-built-in SCR" and "SCR built-in". The right side (pins 13-24) is labeled "Relay OUT 250VAC 3A 1a", "AL1 OUT 250VAC 3A 1a", "AL2 OUT 250VAC 3A 1a", "RTD B'", "RTD B", "RTD A", and "TC". The module also features an "Analog quantity 4-20mA" input and an "SSR" output.

Diagram of the instrument's display and control buttons with labels:

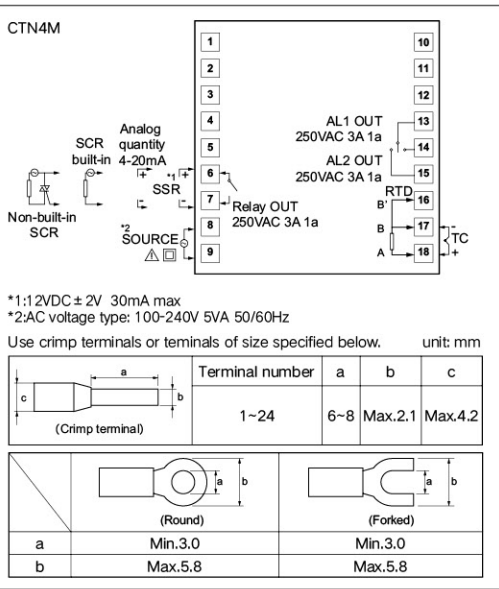
- First display (PV)  
Display measured value  
Display various prompts according to the instrument status
- Second display(SV)  
Display given value  
Display various parameter according to the instrument status
- Action directive  
OUT: Heating indicator, light on when it is operating  
ALM1: Deviation high-limit alarm, light on when it is alarming  
ALM2: Deviation low-limit alarm, light on when it is alarming
- Plus key (+)  
Increase the adjustment value  
Manual mode access key  
Menu parameter switch key
- Minus key (-)  
Decrease the adjustment value  
Auto-tuning state enter key  
Menu parameter switch key  
INFO key  
STATUS information view enter key
- Function key (Mode)  
Main menu and submenu access key  
Parameter modification and confirmation key

**Extra tip:** Different heating devices need auto-tuning once, and the control effect will be better. Auto-tuning method: When the measured value is far below the target value under normal temperature control, press and hold the  (AT) key for 5 seconds until the PV measured temperature value flickers, it means entering the auto-tuning state. The auto-tuning state can be cancelled and exited by pressing and holding the  (AT) key for 3 seconds. The self-tuning process is a stepping control, different heating models (devices) have different self-tuning control, and the temperature may fluctuate greatly. The measured value in the PV window stops flickering when the auto-tuning is completed. The tuning value is automatically saved, and the meter returns to the normal temperature control state. The new P, I, D values are used to calculate the temperature control.

Note: Please refer to the instrument operation guide.

| Code | Menu function               | Default                                | Setting range | Limits of authority | Description                                                                                                                                          |
|------|-----------------------------|----------------------------------------|---------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| P00  | Parameter lock              | 0                                      | 0-900         | 0                   | 0 is level 0 limits of authority;<br>1 is level 1 limits of authority;<br>18 is level 2 limits of authority;<br>110 is to reset to Factory Defaults; |
| P12  | Display Accuracy            | 0                                      | 0-1           | 1                   | P12=0 means there is no decimal point;<br>P12=1 means there is decimal point                                                                         |
| P13  | Temperature compensation    | 0                                      | P32-P33 value | 1                   | Used for temperature correction when sensor position problems or other factors affecting temperature occur                                           |
| P16  | put in index type           | Valid type                             | 0-11          | 1                   | For details, please see <Enter Index Type Selection>                                                                                                 |
| P17  | Alarm 1 Mode                | 1                                      | 0-24          | 1                   | First alarm mode, setting details please see <ALM Definition of Alarm parameter>                                                                     |
| P18  | Alarm 1 upper limit         | 10                                     | P32-P33 value | 1                   |                                                                                                                                                      |
| P19  | Alarm 1 lower limit         | 0                                      | P32-P33 value | 0                   |                                                                                                                                                      |
| P20  | Alarm 1 parameter           | 0                                      | 0-7           | 1                   |                                                                                                                                                      |
| P22  | Alarm 2 Mode                | 0                                      | 0-24          | 2                   | Second alarm mode is as same as first alarm mode, setting details please see <ALM Definition of Alarm parameter>                                     |
| P23  | Alarm 2 upper limit         | 0                                      | P32-P33 value | 2                   |                                                                                                                                                      |
| P24  | Alarm 2 lower limit         | 0                                      | P32-P33 value | 0                   |                                                                                                                                                      |
| P25  | Alarm 2 parameter           | 0                                      | 0-7           | 2                   |                                                                                                                                                      |
| P28  | Manual input                | 0                                      | -100-100      | 0                   | Manual input                                                                                                                                         |
| P31  | Huacentigrade switching     | 0                                      | 0-1           | 2                   | P31=0 is centigrade<br>P31=1 is Fahrenheit                                                                                                           |
| P32  | Set upper temperature limit | Applicable temperature range of sensor |               | 1                   | Maximum allowable set for temperature                                                                                                                |
| P33  | Set lower temperature limit | Applicable temperature range of sensor |               | 2                   | Minimum allowable set for temperature                                                                                                                |
| P46  | SV Operation mode selection | 0                                      | 0-1           | 2                   | Details please see <SV Operation Mode Selection>                                                                                                     |

|     |                                   |      |                  |   |                                                                                                                               |
|-----|-----------------------------------|------|------------------|---|-------------------------------------------------------------------------------------------------------------------------------|
| P67 | PID control mode                  | 0    | 0~2              | 1 | Details please see <PID Control Mode Selection>                                                                               |
| P70 | Heating backlash                  | 0.5  | 0~999.9          | 1 | When P67 = 2-step control, modify the heating differential value for heating differential control                             |
| P72 | Auto-tuning AT                    | 0    | 0~2              | 0 | Automatic calculation function for automatically adapting PID parameters to user system                                       |
| P73 | Overshoot suppression coefficient | 3    | 0~20             | 1 | Overshoot suppression coefficient                                                                                             |
| P74 | Limiting strength coefficient     | 1    | 0~3              | 2 | Limiting strength coefficient                                                                                                 |
| P76 | Heating parameter P               | 12   | 0.1~maximum (°C) | 1 | Adjustment of proportional action, the larger the P value, the smaller the proportional action, and the lower the system gain |
| P77 | Heating parameter I               | 135  | 1~maximum (s)    | 1 | Integral-action time constant. The larger the I value, the weaker the integral action. I = 0 PD control                       |
| P78 | Heating parameter D               | 27   | 1~maximum (s)    | 1 | Derivate-action time constant. The larger the D value, the stronger the derivative action. D = 0 PI control                   |
| P79 | Advance control quality           | 5.0  | 0.1~10.0         | 1 | Enter control state in advance unit: degree                                                                                   |
| P80 | Heating period HT                 | 20   | 1~100            | 1 | Relay20. logic level:3                                                                                                        |
| P82 | Refrigeration period HT           | 20   | 1~100            | 1 | Relay20. logic level:3                                                                                                        |
| P83 | Refrigeration parameter P         | 10   | 0.1~maximum (°C) | 1 | Adjustment of proportional action, the larger the P value, the smaller the proportional action, and the lower the system gain |
| P84 | Refrigeration parameter I         | 240  | 1~maximum (s)    | 1 | Integral-action time constant. The larger the I value, the weaker the integral action. I = 0 PD control                       |
| P85 | Refrigeration parameter D         | 40   | 1~maximum (s)    | 1 | Derivate-action time constant. The larger the D value, the stronger the derivative action. D = 0 PI control                   |
| P89 | Output maximum limit              | 100  | 0~100            | 0 | Output maximum limit                                                                                                          |
| P90 | Output minimum limit              | -100 | -100~0           | 2 | Output minimum limit                                                                                                          |
| P91 | Limit Output variation            | 0    | 0~100            | 2 | Limit Output variation                                                                                                        |



| P17/P22 Code | Name of Alarm                                           | Illustration                                      |
|--------------|---------------------------------------------------------|---------------------------------------------------|
| 0            | No alarm                                                | No alarm output                                   |
| 1            | Upper limit of deviation                                | When PV > SV+P18, alarm                           |
| 2            | Lower limit of deviation                                | When PV < SV-P19, alarm                           |
| 3            | Upper and lower limit of deviation                      | When PV > SV+P18 or PV < SV-P19, alarm            |
| 4            | Scope of upper and lower limit of deviation             | When PV < SV+P18 and PV > SV-P19, alarm           |
| 5            | upper limit of deviation (hold)                         | When PV>SV+P18, alarm                             |
| 6            | Lower limit of deviation (hold)                         | When PV<SV-P19, alarm                             |
| 7            | Upper and lower limit of deviation (hold)               | When PV>SV+P18 or PV<SV-P19, alarm                |
| 8            | scope of upper and lower limit of deviation (hold)      | When PV<SV+P18 and PV > SV-P19, alarm             |
| 9            | Upper limit of absolute value                           | When PV>P18, alarm                                |
| 10           | Lower limit of absolute value                           | When PV<P19, alarm                                |
| 11           | Upper and lower limit of absolute value                 | When PV>P18 or PV<P19, alarm                      |
| 12           | Scope of upper and lower limit of absolute value        | When PV < P18 and PV>P19, alarm                   |
| 13           | Upper limit of absolute value (hold)                    | When PV > P18, alarm                              |
| 14           | lower limit of absolute value (hold)                    | When PV<P19, alarm                                |
| 15           | Upper and lower limit of absolute value (hold)          | When PV>P18 or PV<P19, alarm                      |
| 16           | Scope of upper and lower limit of absolute value (hold) | When PV< P18 and PV>P19, alarm                    |
| 17           | Upper limit of backlash                                 | When PV > SV+P18, alarm. No alarm until PV<SV-P19 |
| 18           | Lower limit of backlash                                 | When PV < SV-P19, alarm. No alarm until PV>SV+P18 |
| 19           | Backlash of upper limit of absolute value               | When PV > P18, alarm. No alarm until PV<P19       |
| 20           | Backlash of lower limit of absolute value               | When PV<P19, alarm. No alarm until PV>P18         |
| 21           | Upper limit of backlash (hold)                          | When PV > SV+P18, alarm. No alarm until PV<SV-P19 |
| 22           | Lower limit of backlash (hold)                          | When PV < SV-P19, alarm. No alarm until PV>SV+P18 |
| 23           | Backlash of upper limit of absolute value (hold)        | When PV > P18, alarm. No alarm until PV<P19       |
| 24           | Backlash of lower limit of absolute value (hold)        | When PV<P19, alarm. No alarm until PV>P18         |

Note: "Hold" means the alarm will be removed when turning on the power: If the temperature control meter is in alarm state when starting up, it will not give an alarm. The temperature control meter should be in normal state first, and the alarm will not be issued until the alarm condition is reached again.

| ALM Definition of alarm parameter - P20/P25                                                                           |                                           |                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| P20/P25 Code                                                                                                          | no                                        | Description                                                                                                                          |
| 0                                                                                                                     | Alarm output 1 (ALM1)                     | If this code is selected, the corresponding alarm point action will be equivalent to ALM1 action                                     |
| 1                                                                                                                     | Alarm output 2 (ALM2)                     | If this code is selected, the corresponding alarm point action will be equivalent to ALM2 action                                     |
| 2                                                                                                                     | Heating output                            | Switch heating output point, details see <Guide of Instrument Operation>                                                             |
| 3                                                                                                                     | Refrigeration output                      | Two way PID configuration refrigeration output point                                                                                 |
| 4                                                                                                                     | Manual sign                               | Corresponding action flag when manual output function is enabled                                                                     |
| 5                                                                                                                     | Information sign                          | When INFO menu: Configurable action output point when the value in code f.01 is not 0, details see Description of Status Information |
| 6                                                                                                                     | Error sign                                | Configurable action output point when error failure occurs, details see <Description of Error Display>                               |
| 7                                                                                                                     | Upper and lower limit of deviation (hold) | When PV>SV+P18 or PV<SV-P19, alarm                                                                                                   |
| Attention: When this parameter is configured, the corresponding P17 or P22 should be configured as 0 before operation |                                           |                                                                                                                                      |

| Code | Parameter | Description                                                                                                                         | Limits of authority |
|------|-----------|-------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| P46  | 0         | When setting the temperature, click MODE key first, then press / minus key to adjust, and then press MODE key to confirm            | 2 level             |
|      | 1         | When setting the temperature, directly press the plus/minus keys to adjust, and automatically confirm after stopping the adjustment |                     |

|               |                    |                   |        |
|---------------|--------------------|-------------------|--------|
| P67 Set value | 0                  | 1                 | 2      |
| Mode          | Unidirectional PID | Bidirectional PID | ON/OFF |

| INFO Description of status information |                                         |                |                            |
|----------------------------------------|-----------------------------------------|----------------|----------------------------|
| Parameter Code                         | Code meaning                            | Parameter Code | Code meaning               |
| F.01                                   | Code of message alarm                   | F.91           | Production time: month     |
| F.10                                   | Control output                          | F.92           | Production time: day       |
| F.11                                   | Cold end temperature (room temperature) | F.93           | Software version number    |
| F.12                                   | Internal parameters                     | F.94           | PID library version number |
| F.90                                   | Production time: Year                   | F.95           | User version number        |

| Description of error display |                                     |                                                                      |                                                 |
|------------------------------|-------------------------------------|----------------------------------------------------------------------|-------------------------------------------------|
| Error display                | Code meaning                        | Debug                                                                | Remarks                                         |
| Er0                          | No error status                     | No                                                                   | Upper row of digital tube (PV) flashing display |
| Er1                          | Invalid debug parameter             | Instrument failure, please contact the manufacturer                  |                                                 |
| Er2                          | Thermal resistance disconnection    | Check whether the thermal resistance connecting wire is disconnected |                                                 |
| Er3                          | Temperature of cold end is abnormal | Instrument failure, please contact the manufacturer                  |                                                 |
| Er4                          | Over upper limit range              | Check whether the thermocouple connecting wire is disconnected       |                                                 |
| Er5                          | Out of lower limit range            | Check whether the thermocouple connecting wire is disconnected       |                                                 |

Difference between Unidirectional PID and Bidirectional PID:  
 a. Reduce energy consumption and achieve accurate temperature control.  
 b. Cooling and heating with intelligent PID control.  
 c. Break through the limitation of temperature fluctuation caused by traditional step refrigeration.  
 d. Refrigeration is changed from fixed-point fluctuation control to intelligent PID control, and the degree of progress is equivalent to the upgrade of pointer gauge to intelligent meter.

Auto-tuning (AT) operation

The diagram illustrates the sequence of events during an Auto-tuning (AT) operation. It consists of three states of the PV and SV displays, connected by arrows indicating the flow of the process.

- Initial State:** The PV display shows a steady '30' and the SV display shows a steady '100'.
- Transition 1:** An arrow points to the next state, labeled with the instruction: "Press down  $\ominus$  (AT) for around 5 seconds" and "Enter auto-tuning".
- Auto-tuning State:** The PV display shows '30' with a flashing underline, and the SV display shows '100' with a flashing underline. This state is labeled "PV value flashing all the time" and "SV value".
- Transition 2:** An arrow points to the final state.
- Final State:** The PV display shows a steady '30' and the SV display shows a steady '100'. This state is labeled "PV value stop flashing" and "SV value".
- Completion:** The process ends with the label "Auto-tuning ends".

```

graph TD
    Start[Electricity] --> Display1["PV 30.00  
SV 10.00  
Unit kWh"]
    Display1 -- "Press briefly" --> Interface["Enter the  
modification  
interface"]
    Interface --> Display2["PV 30.00  
SV 5.00  
Unit kWh"]
    Display2 -- "Press confirm" --> Display1
    Display2 -- "Press confirm or  
cancel to  
revise SV value" --> Display3["PV 30.00  
SV 9.99  
Unit kWh"]
  
```

The menu display will be different along with the change of P00 parameter lock value, please refer to the "Menu Display Instructions"

**Electrify**

Nixie tube status display for initial inspection of meter

Auto display

Upper range value corresponding to the current graduation number

Enter the graduation number by default

Auto display

Press  for around 2 seconds

Press  briefly

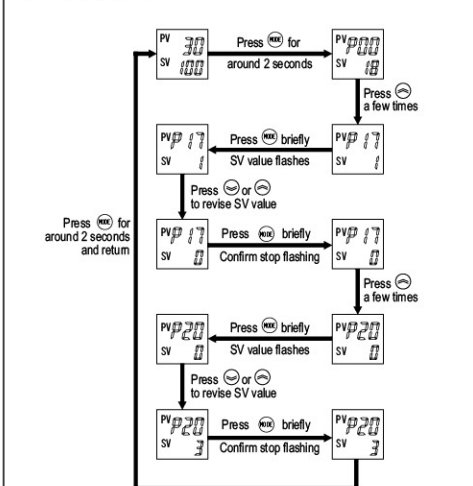
Press  briefly

Press  briefly

Press  briefly

Press  for around 2 seconds and return

Example of case: How to set the output point of heating OUT to the output point of ALM1



Remarks:  
P17: Alarm mode 1 please refer to ALM Definition of Alarm Mode  
P20: Alarm parameter 1 please refer to ALM Definition of Alarm parameter



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