说明书

水、风冷终端负载

型号：GZF-1 系列

一． 引言

本产品技术先进。具有体积小，承受功率高，使用及维修方便等特点。本说明书含有强迫风冷（纯水内循环）型终端负载的使用说明及示意图。

二． 技术指标

阻值 <u>50 Ohm</u>

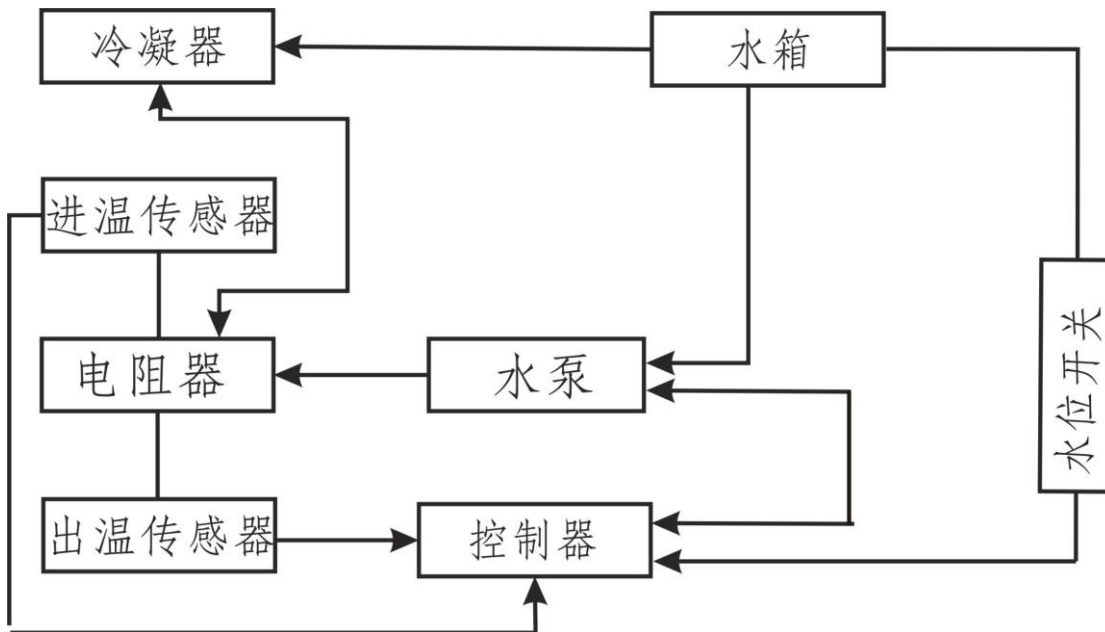**负载冷却液** <u>蒸馏水/纯水</u>

环境温度 <u>-20℃～45℃</u>

型号	平均功率	频率范围/电压驻波比	接口	尺寸(约）	重量（约）
GZF5-1	5kW		L29 L36 1-5/8"	720×450×610	70kg
GZF10-1	10kW	DC-860MHz S≤1.15 所需 频率点 S≤1.10max	L29 L36 1-5/8" 3-1/8"	720×450×610	70kg
GZF20-1	20kW		L36 1-5/8" 3-1/8"	1000×460×750	100kg
GZF30-1	30kW		L36 1-5/8" 3-1/8"	1000×525×1100	130kg
GZF40-1	40kW		3-1/8"	1195×500×1360	130kg

三． 工作原理

本终端负载由电阻器、冷却部分及控制器等部分组成。具体示意图如下：

四． 安装准备

1. 拆箱后先检查负载外表是否损坏，有无漏水，再接通电源检查风扇和水泵是否正常运转。
2. 用万用表测量负载的输入阻抗，按照发射机的阻抗，两者阻值因该相同。若不同，则不能使用。
3. 检查联锁功能，将万用表开到电阻档，将其表棒与联锁线连接，先不接通负载电源，万用表不通；再接通电源，万用表阻值为 0，表明联锁正常。
4. 联锁功能说明：当未开机或电源断开、水位低、进水温度大于 80℃时，延迟时联锁均起控，并由蜂鸣器发出报警声音，告诫工作人员机器发生故障。
5. 在终端负载一米内的任何物品都将干扰其空气循环，影响负载冷却效果。

五． 安装

1. 将负载接口与发射机馈管连接。
2. 接通负载电源，检查风扇和水泵的运行情况。
3. 接通负载电源，观察温度显示数字，直到冷却系统稳定，这个过程需 10 分钟。

六． 射频功率测量

1. 功率测量有很多方法，IEC244-1 推荐的方法有许多，我们认为量热法则测量功率精度高，适合我们制造的终端负载。负载中吸收功率的热耗元件（电阻器）是用流动的纯水作为冷却剂进行冷却，使得发射机所加的射频功率转换成热量。这样热耗元件上的功率，可以通过冷却剂的温差、流量及冷却剂的性能参数计算出来。

$$P=k1 \times P \times C \times QV \times \triangle T \quad ……………（1）$$

式中：

P —— 耗散功率 W

$k1$ —— 出厂前的修正系数

ρ —— 纯水的密度为 1kg/L

C —— 比热容，J（kg/）纯水的比热用为 4184 焦耳（kg/℃ ）

qv —— 流量

$\triangle t$ —— 平衡时的温差℃

用

纯水做冷却剂时，若 qvv 的单位用 L/S 其所长，则式（1）变为：

$$P=4.178 \times k1 \times qv \times \triangle t（kW） \quad …………………（2）$$

用纯水做冷却剂时，若 qv 的单位用 L/min，其所长，则式（1）变为：

$$P=0.0698 \times k1 \times qv \times \triangle t（kW） \quad …………………（3）$$

用纯水做冷却剂时，若 qv 的单位用 L/h 其所长，则式（1）变为：
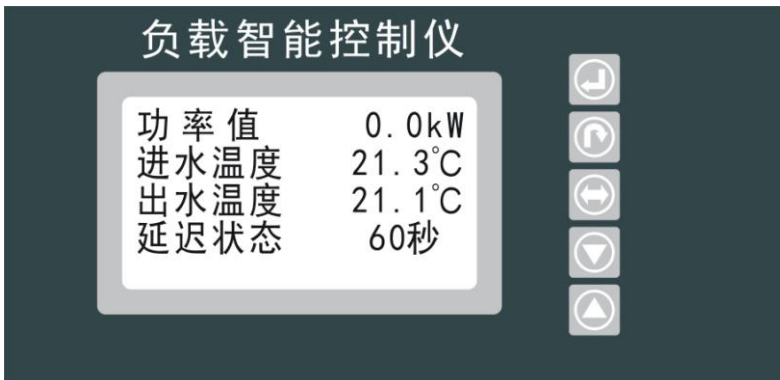
$$P=0.0169 \times k1 \times qv \times \triangle t（kW） \quad …………………（4）$$

注：1.冷却剂入口温度和出口温度有控制器直接读取。

2.终端负载冷却剂流动方式是内循环，因此流量数值不变。

3.终端负载周围不能有强辐射场，否则会影响显示读数。

4.为了方便用户，根据量热法，由控制器直接显示功率值。

5. P=0.0169×k1×qv×△t（kW）其中 k1 与 qv 为常数。因此我们另设

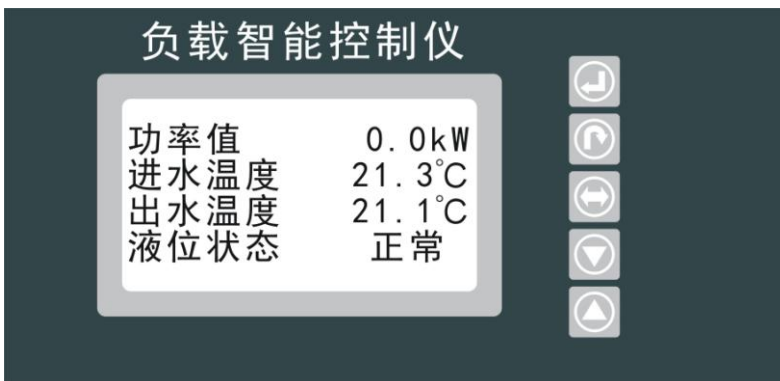0.0169×k1×qv=K，则 P= K×△t（kW）。功率系数由本公司给出。
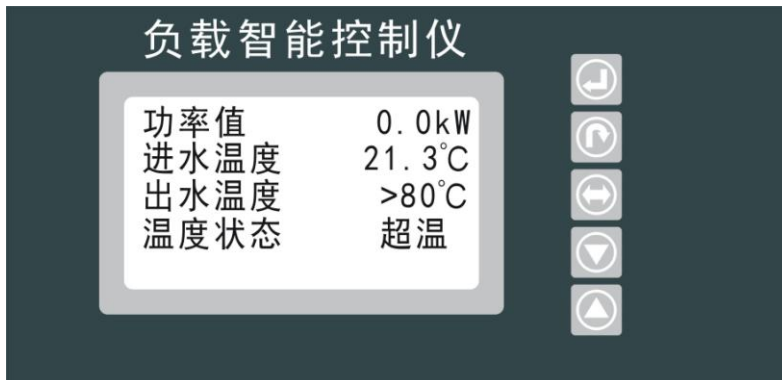
（一）控制器具体操作步骤

1. 开启电源 开启电源后屏幕显示：
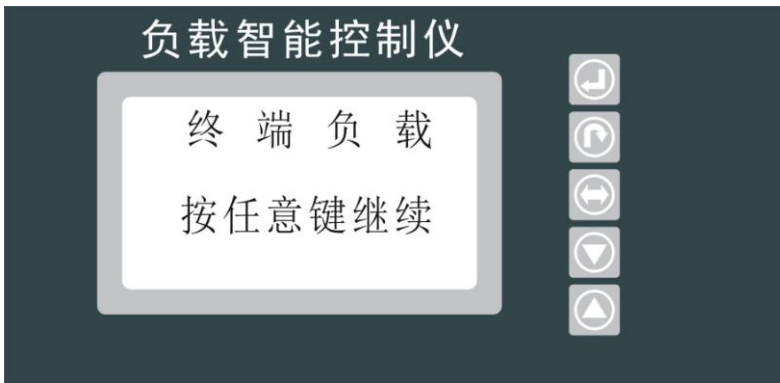
按 2.3.4.5 任意键后仪器进入延迟〔出厂已设定为 1 分钟〕状态,屏幕显示：

2. 延迟完毕进入测量控制

3. 如果进水温度超过 80℃仪器进入报警状态, 联锁断开, 同时蜂鸣器报警, 屏幕显示：
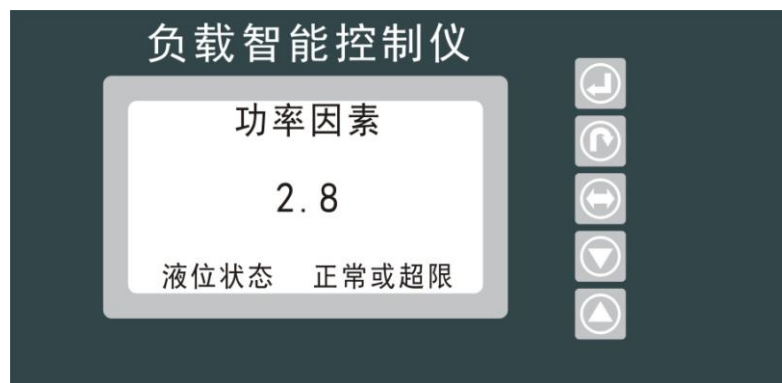

4. 如果系统断水或水泵不运转, 仪器报警状态, 联锁断开, 同时蜂鸣器报警, 屏幕显示：
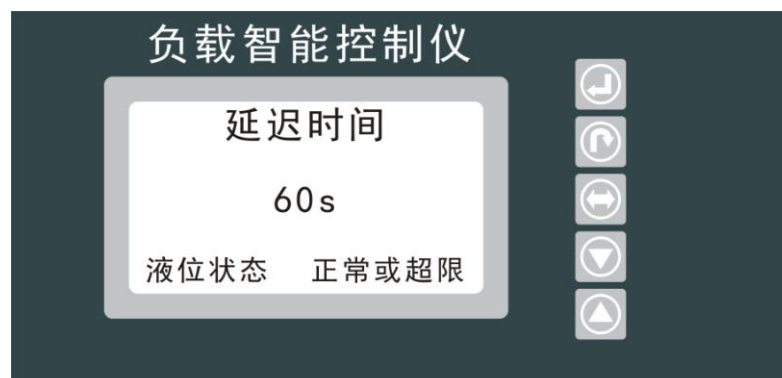

（二）控制器参数设置

1. 功率系数设置：按 键进入设置菜单, 屏幕显示

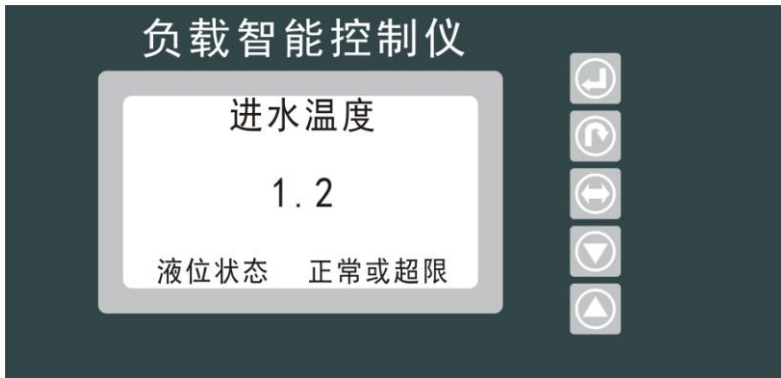按 或 键可对所选数据进行修改, 直到用户所需的数据。生产厂均已调试, 用户不必调整。

2. 延迟系数设置按 键进入延迟系数设置菜单, 屏幕显示

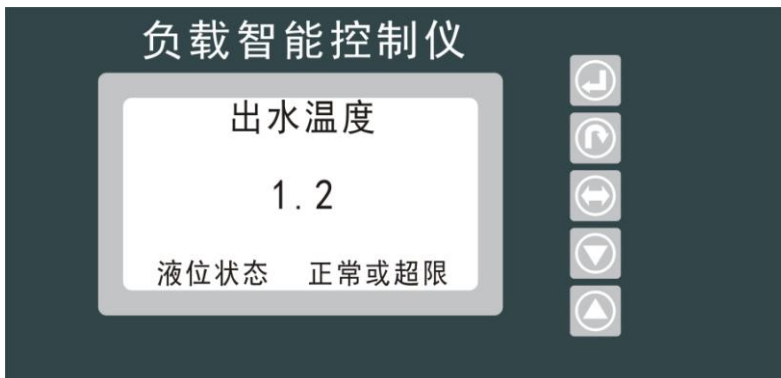按 🔼 或 🔽 键可对所选数据进行修改,直到用户所需的数据。生产厂均已调试,用户不必调整。

3.温度系数设置

（1）进水温度系数设置

按 🔄 键进入温度系数设置菜单,屏幕显示

按 🔼 或 🔽 键可对所选的数据进行修改,直到用户所需的数据。

（2）出水温度系数设置

按 🔄 键进入温度系数设置菜单,屏幕显示

按 🔼 或 🔽 键可对所选的数据进行修改,直到用户所需的数据

注:用 🔄 键可确认,数据有效并退出设置菜单

注:也可按 🔄 键进入设置菜单,选中某一项按 🔼 或 🔽 键对选项数据进行修改,直到用户所需数据用 🔄 键可确认数据有效并退出菜单。

设 置 表

序号	名　　　称	范　围
1	功率系数（POWER COEF.）	0～9.9
2	侦测延时时间性（DELAY TIME）	0～9.9
3	进水温度补偿值（T1 OFFSET）	-9.9～9.9℃
4	出水温度补偿值（T2 OFFSET）	-9.9～9.9℃

4. 背光

在待机和运行状态,按 ⬆ 键可打开背光,再按 ⬇ 键可关闭背光。

七． 停机操作

1. 关闭射频功率。

2. 终端负载继续工作 20 分钟后至工作环境温度。

3. 关闭负载电源。

八． 维护和保养

要使终端负载能长期使用并保持良好的性能指标，就必须做好保养和维护工作。

检查项目	迹象	故障原因	措施
电压驻波比	大	连接处接触不好或电阻体损坏	与制造单位联系修理
互锁电路	失控	传感器或继电器损坏	与制造单位联系修理
风扇	不规则转动和停转	风叶不平衡或电机损坏	与制造单位联系修理
泵	噪声大或停转	固定松动或叶片碰到外壳及损坏	与制造单位联系修理
数字显示	数字乱跳或蜂鸣器啸叫	显示部位受强电干扰	远离干扰源
纯水液位	液位不显示	漏水或长时间消耗	若是链接管或其它部位漏水，请与制造单位联系

九． 安全注意事项

1. 联锁线路必须连接到发射机上高压前端或同轴开关上。由于该终端负载是纯水内循环强迫风冷，若加射频功率时，负载的风扇和泵未正常运转，负载将立即被烧毁！

2. 在寒冷地区，使用前请将终端负载在室内放置 3 天以上，防止负载散热器冻裂。负载的环境温度（工作室或不工作时）均应大于 5℃.

3. 若用户必须在 0℃以下环境中使用，在购买时应向制造单位说明情况，由制造商另配冷却剂提供给用户使用。

4. 由于终端负载承受功率大，对冷却剂的要求很高，请发射机生产厂用户，经常更换冷却剂，一般用户每半年更换一次冷却剂。

十. 终端负载电路图

大功率终端负载控制器线路图：
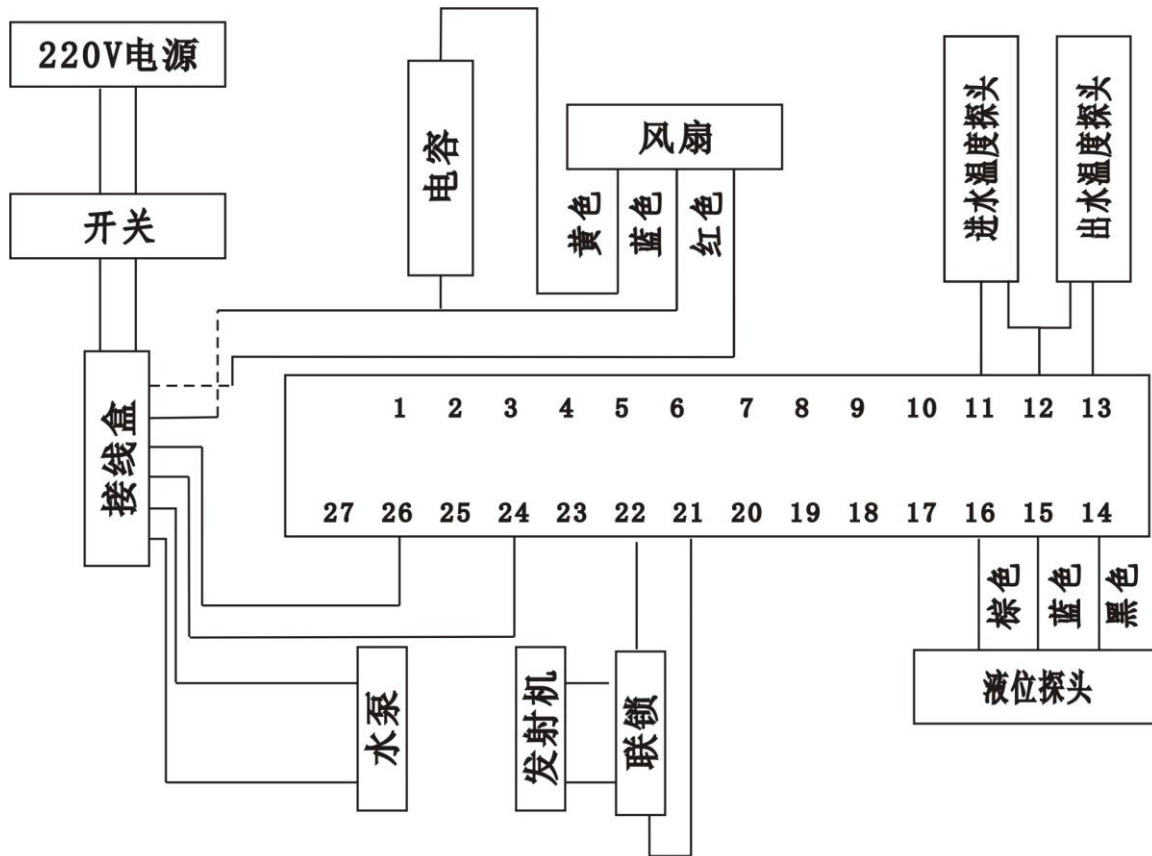
十一. 附件

1. 使用说明书
2. 电源线一根

INSTRUCTION BOOK

Water-Cooled Terminations Loads

SERIES: GZF-1

I Introduction

The product has advanced technology, which is equivalent with foreign advanced level. It has the characteristics of small size, high handling power, convenient use and maintenance and the like. This manual contains use instructions and diagrams of forced air cooling (pure water inner cycling) type terminal load.

II Technical Specifications

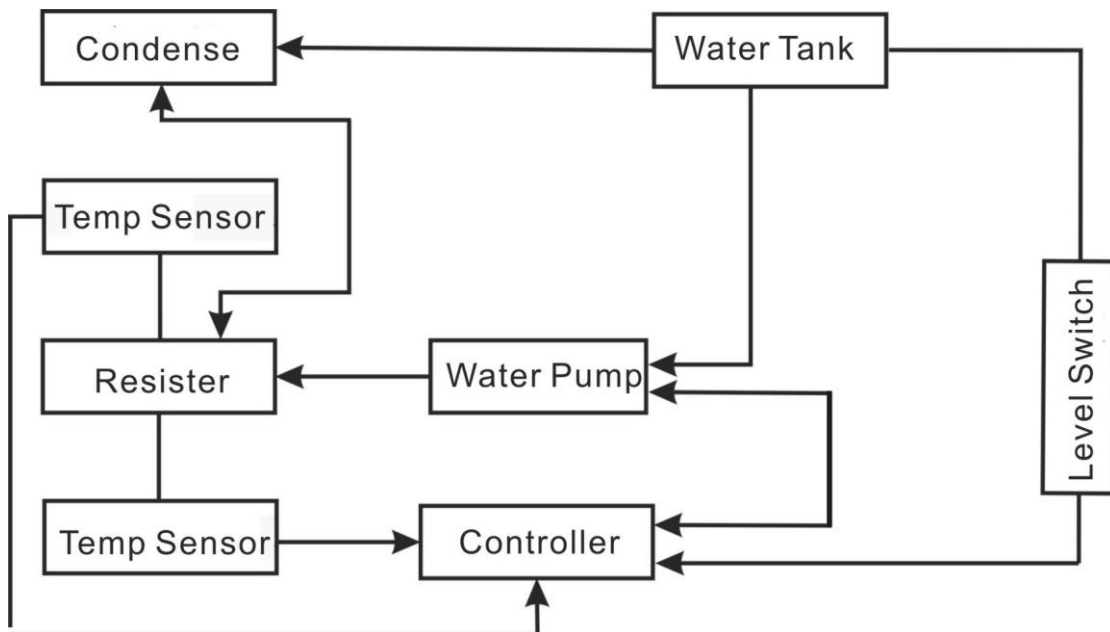Impedance <u>50 Ohm</u>

Load Coolant <u>Distilled Water/Pure Water</u>

Ambient Temperature <u>-20℃～45℃</u>

型号	平均功率	频率范围/电压驻波比	接口	尺寸(约）	重量（约）
GZF5-1	5kW		L29　L36 1-5/8"	720×450×610	70kg
GZF10-1	10kW	DC-860MHz S≤1.15 所需 频率点 S≤1.10max	L29　L36 1-5/8"　3-1/8"	720×450×610	70kg
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GZF40-1	40kW		3-1/8"	1195×500×1360	130kg

III Work Principle

The terminal load is composed of a resistor, a cooling part, a controller and other components.

Detailed diagram is as follows:

IV Installation Preparation

1. Please check whether the load appearance is damaged or not and whether water is leaked or not firstly after unpacking, and then connect the power supply to check whether the fan and the water pump operate normally or not;

2. Please use the multimeter to measure the input impedance of the load, and the two resistance values should be same according to impedance of the transmitter. The product should not be used if the two are different;

3. Please check the interlocking function, dial the multimeter to the resistance level, the indicating hand should be connected with the interlocking line, the load power supply should not be connected firstly, the multimeter is not connected, then the power supply can be connected, and the resistance value of the multimeter is 0, which indicates that the interlock is normal.

4. Interlock Function Description: When the machine is not started or the power supply is disconnected, the water level is low, the water feeding temperature is higher than 80 ℃, the interlocking starts controlling in delay, the buzzer sends out alarm sounds, thereby warning the staff that the machine breaks down.

5. Any objects within one-meter range of the terminal load can interfere air circulation, thereby affecting the load cooling effect.

V Installation

1. The load interface is connected with a feed tube of the transmitter.

2. The load power supply is connected to check the operation condition of the fan and the water pump.

3. The load power supply is connected to observe temperature display number until the cooling system is stable, and the process only needs 10 minutes.

VI. RF Power Measurement

1.   There are many ways for power measurement, there are many methods recommended by IEC244-1. We believe that measuring law has high measurement power precision, which is suitable for terminal loads manufactured by us. The heat consumption elements (resistor) absorbing power in load are cooled with flowing pure water as coolant, thereby converting RF power increased by transmitter into heat. The power on the heat consumption element can be calculated through temperature difference and flow capacity of cooling agent, and performance parameters of cooling agent.

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$$P = k_1 \times P \times C \times Q_V \times \triangle T \qquad \ldots\ldots\ldots\ldots \text{（1）}$$

P	—	ipation power W
k1	—	rection factor before leaving factory
ρ	—	sity of pure water is 1kg/L
C	—	t capacity, J (kg /) specific heat of pure water is 4184 joules used (kg / ℃)
q_v	—	v capacity
$\triangle t$	—	ilibrium temperature difference ℃

In the formula:

When pure water is used as cooling agent, if q_{vv} unit   adopts   the length L/S,   thereby the formula (1) is changed as:

$$P = 4.178 \times k1 \times q_v \times \triangle t \text{（kW）} \qquad \ldots\ldots\ldots\ldots \text{（2）}$$

When pure water is used as cooling agent, if q_v unit   adopts   the length L/min,   thereby the formula (1) is changed as:

$$P = 0.0698 \times k1 \times q_v \times \triangle t \text{（kW）} \qquad \ldots\ldots\ldots\ldots \text{（3）}$$

When pure water is used as cooling agent, if q_v unit adopts the length L/h,   thereby the formula (1) is changed as:

$$P = 0.0169 \times k1 \times q_v \times \triangle t \text{（kW）} \qquad \ldots\ldots\ldots\ldots \text{（4）}$$

Note:

1. The coolant inlet temperature and outlet temperature are directly read by the controller.
2. The coolant flowing mode of terminal load is inner circulation, and thereby the flow rate value remains unchanged.
3. Terminal load should not be provided with strong radiation field around; otherwise it will affect the display reading.
4. For the convenience of users, the power value is directly displayed by the controller according to calorimetry.

5. $P = 0.0169 \times k1 \times qv \times \triangle t$ (kW), where in k1 and qv are constant. Therefore, we separately set $0.0169 \times k1 \times qv = K$, then $P = K \times \triangle t$ (kW). Power coefficient is given by the Company.

(a) Concrete operation steps of controller

1. Start the power supply, and the screen displays the following after starting the power supply:
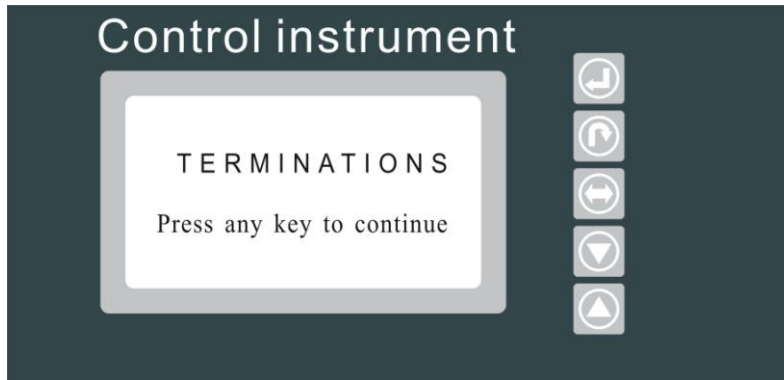
Large power terminal temperature power measuring and control instrument

2. The instrument enters delay (one minute has been set when leaving the factory) after pressing any key among 2, 3, 4 and 5, and the screen displays the following:
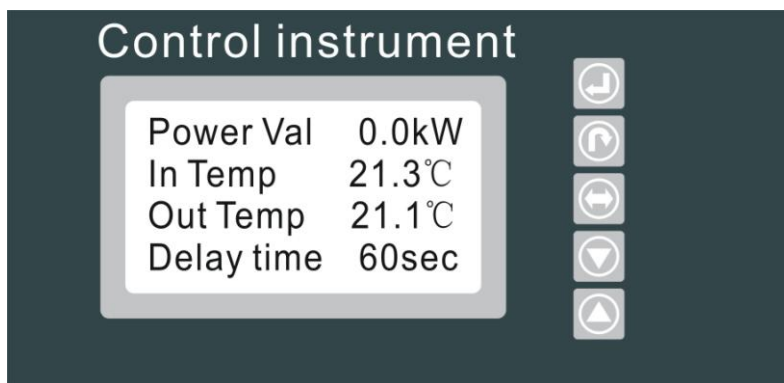
3. Complete delay and enter measurment control.
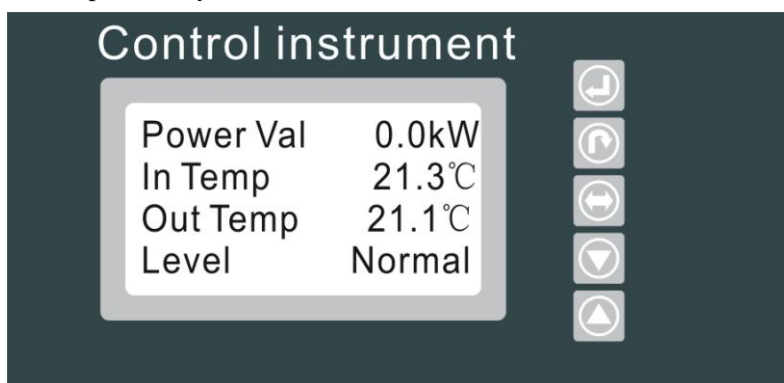
4. If the inlet water temperature exceeds 80℃, the instrument can automatically enter alarm state, the interlock is disconnected, the measuring may alarm at the same time, and the screen displays the following:
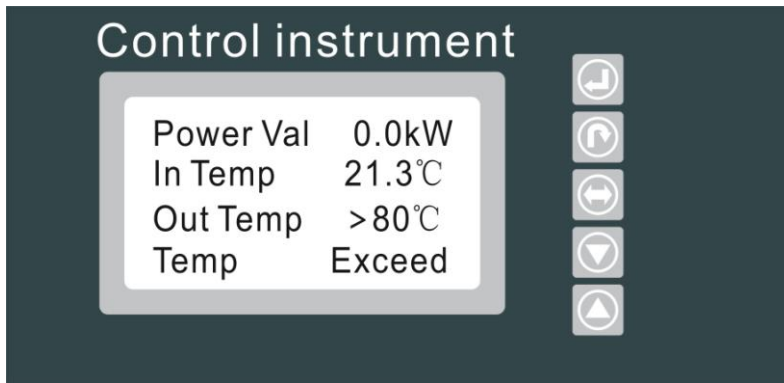
5.If system has no water or water pump does not run, the instrument will automatically enter the alarm state, interlocking is disconnected, the buzzer alarms at the same time, and screen displays the followings:
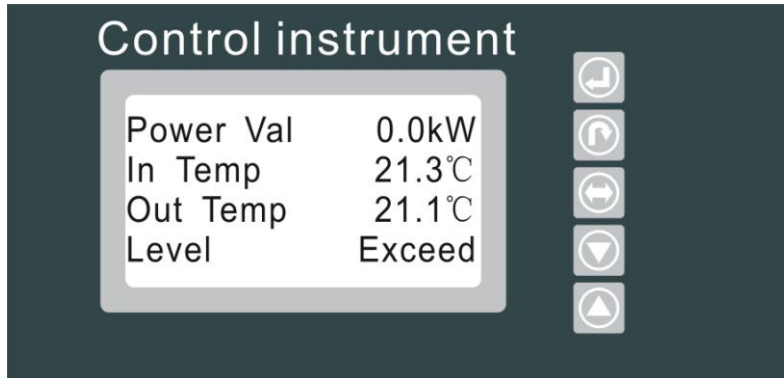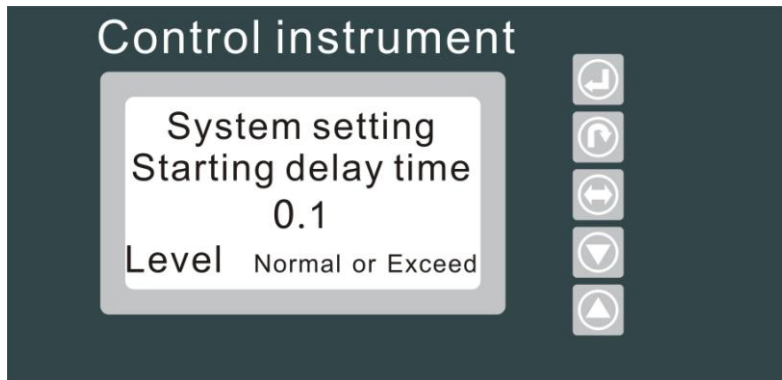

 (b) Controller temperature setting

1. Power coefficient setting:

Press [icon] to enter setting menu, the screen displays the following:
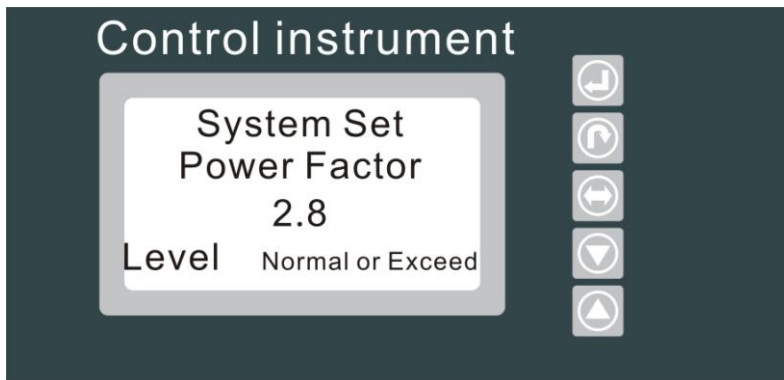
Press [icon] or [icon] to correct selected data unit data demanded by the users are displayed. Generally manufacturers have debugged well, and users do not need to adjust.

2. Delay coefficient setting

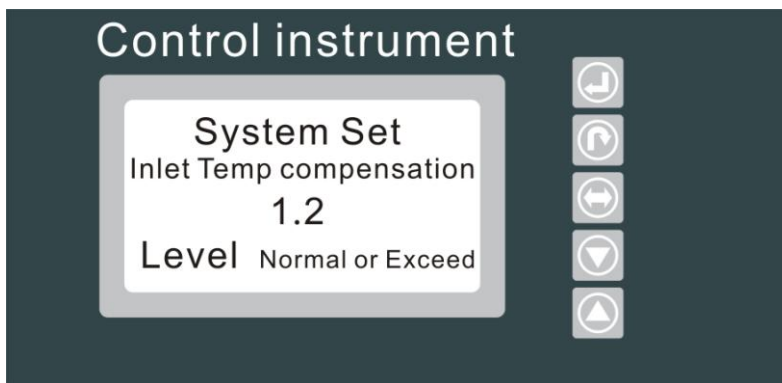Press ⟳ key to enter delay coefficient setting menu, and the screen displays the following:

Press ▲ or ▼ to correct selected data unit data demanded by the users are displayed. Generally manufacturers have debugged well, and users do not need to adjust.

3. Temperature coefficient setting
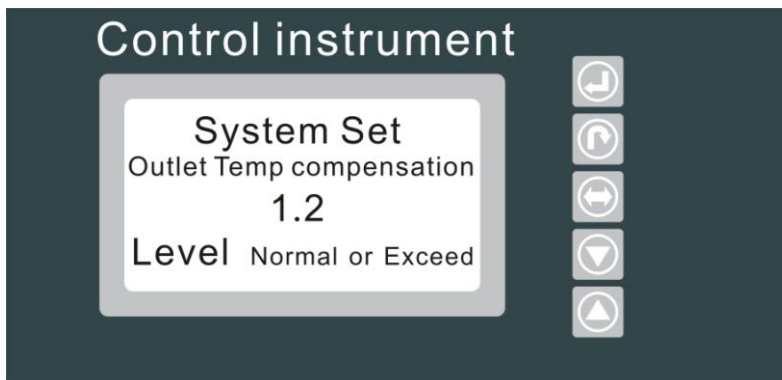
(1) Inlet temperature coefficient setting

Press ⟳ key to enter temperature coefficient setting menu, and the screen displays the following:

Press ▲ or ▼ to correct selected data unit data demanded by the users are displayed.

(2) Outlet temperature coefficient setting

Press ⟳ key to enter temperature coefficient setting menu, and the screen displays the following:

Press ▲ or ▼ to correct selected data unit data demanded by the users are displayed.

Note ⟳ key also can be used for confirming, the data are valid and please exit the setup menu.

Note: You also can press the ⟳ key to enter settings menu, select an item, press ▲ or ▼ to correct

selected data, until data demanded by the users are displayed.　You can use to confirm, the data are effective, and please exit the menu.

Settting Table

Serial No.	Name	Range
1	Power coefficient（POWER COEF.）	0～9.9
2	Detection delay time performance（DELAY TIME）	0～9.9
3	Inlet water temperature compensation value（T1 OFFSET）	-9.9～9.9℃
4	Outlet water temperature（T2 OFFSET）	-9.9～9.9℃

4. Backlight

You can press to open the backlight and can press key to close the backlight in the standby and operation state.

VII. Stop Operation

1. Close RF power;

2. The terminal load works for 20 minutes continuously until work environment temperature;

3. Close load power.

VIII. Care and maintenance

Routine maintenance and repair work should be done well in order to make terminal load to be used for long time and maintain excellent performance indicator.

Examination Item	Evidence	Failure Cause	Measures
Voltage standing wave ratio	Excessive	The connector has bad contact or the electric resistor is damaged.	Contact with manufacturer for repair
Interlocking circuit	Out of control	Sensor or relay is damaged.	Contact with manufacturer for repair
Fan	Irregular rotation and stop rotation	The impeller is not balanced or the motor is damaged.	Contact with manufacturer for repair
Pump	High noise or stop rotation	The fixation is loosened, or the impleller is contacted with the outer shell and damaged.	Contact with manufacturer for repair
Digital display	Number flutters or the buzzer howls.	The display part is interfered by forceful electric power.	Be far away from interference source
Pure water liquid level	The liquid level is not displayed.	Water leakage or consumption for long time.	If the connection pipe or other parts leak water, please contact with manufacturer unit.

IX Safety Precaution

1. Interlocking circuits must be connected to high voltage front-end or coaxial switch of the transmitter. Since the terminal load belongs to pure water inner circulating forced air cooling, if the RF power increases, fan and the pump of the load do not operate normally, the load will immediately be destroyed.

2. In cold areas, the terminal load should be placed in rooms for more than three days before using in order to prevent the cracking of load radiator. Load environment temperature (in work or without work) should be greater than 5 ℃.

3. If the user must use the product in environment below 0 ℃, the users should explain the situation to the manufacturing units at the time of purchase, and the manufacturer will provide additional coolant for user.

4. Since the bearing power of the terminal load is high, its requirement on coolant is high, users of transmitter factory should regularly replace coolant, and the coolant should be replaced once every half a year generally.

X Circuit diagram of terminal load

High power terminal load controller circuit diagram:
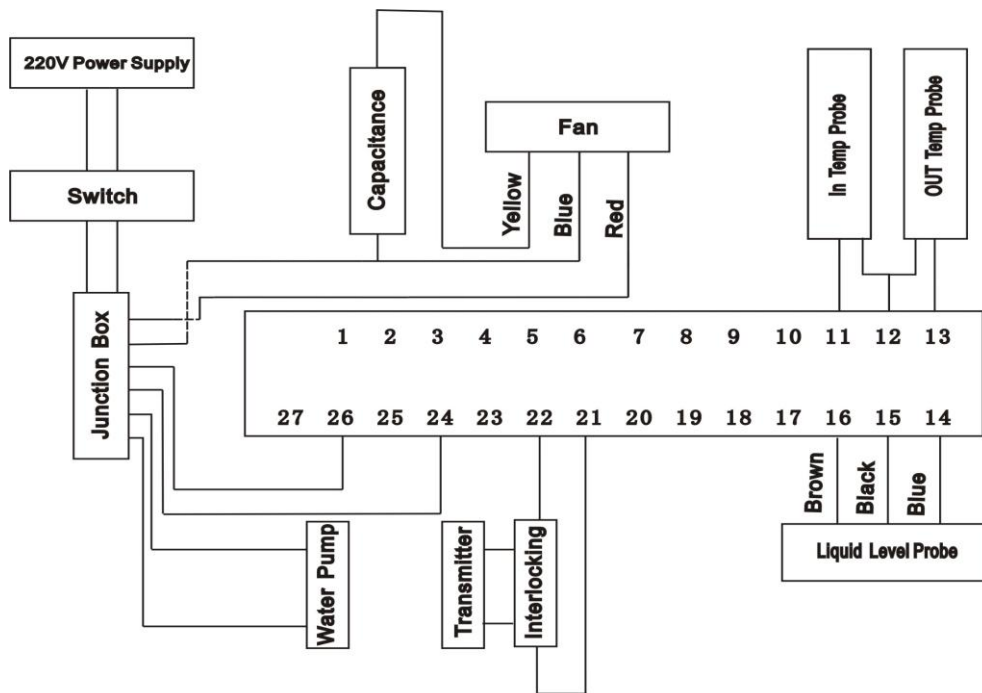
XI Annex

1. Instruction book

2. Power cord