P/N: 1.2149BE2

Thermo Electric Cooler A T

A T 半导体空调系列

User Manual

文件版本 File version: HRMTEC -D

发布日期 Release date: 2015-12-07

Please read the manual carefully before installation and using!

在产品安装使用前请仔细阅读本手册！

前　言 Foreword

概述　Summary

该手册介绍 A T 半导体空调的使用须知、产品组成、工作原理、产品接线、操作指导、日常维护、故障处理和技术指标。

The manual introduces the A T TEC instructions, product composition, working principle, wiring, operating instructions, routine maintenance, troubleshooting, and technical indicators.

读者对象　Read

本手册主要适用于以下工程师：

This manual is for the following engineers:

- 技术支持工程师　Technical support engineer
- 维护工程师　Maintenance engineer
- 市场工程师　Marketing Engineer
- 服务工程师　Service Engineer

修改记录　Revision records

修改记录累积了每次文档更新的说明。

最新版本的文档包含以前所有文档版本的更新内容。

Revision records accumulated each document updated instructions.

The latest version of the document contains all the previous document version updates.

变更记录 Change History

文档版本：HRMTEC -D

2015-12-07 第四次正式发布

Document version：HRMTEC -D

The fourth official release is 2015-12-07

目　录 Catalog

1 使用须知 Instructions

- 本手册适用如下型号：

  A T

  This manual especially writhen for:

  A T

- 使用本机前请务必阅读本使用说明书。

  Be sure to read this manual before using the unit。

- 用户必须按照本手册规定的内容执行才可享受到产品正常质保服务.

  The user must be in accordance with the regulations manual content execution can enjoy normal warranty service.

2 产品概述 Product Overview

关于本章 About this chapter

本章介绍了 **A T** 半导体空调的应用场景、产品特点、产品组成、工作原理、风道设计、控制逻辑、通讯协议及用户参数、告警及故障处理信息。请严格按照本手册的相关规定执行！

This chapter introduces the outlook of the **A T** Thermo Electric Cooler (TEC), application scenarios, product features, product composition, technical parameters, the working principle, duct design, control logic, communication protocols and user parameters, alarm and fault processing of information. Please strictly in accordance with the relevant provisions of this manual!

2.1 CE 声明 CE declaration

Declaration of Conformity

We herewith declare the following products:
Product Name: A T

is in conformity with the following directives:

2006/42/EC	Machine Directive	EN ISO 12100 Machine Safety
2006/95/EC	Low Voltage Directive	EN 60335-1:2012
2004/108/EC	EMC-Directive	EN 60335-2-40:2012
2009/105/EC	Simple Pressure Vessels	EN 61000-6-1:2007 Immunity
97/23/EC	The Pressure Equipment Directive, article 3, section 3.	EN 61000-6-4, Emission
	The Pressure Equipment Directive, category 1	
	The Pressure Equipment Directive, category 2	

and was manufactured in conformity with the following harmonised standard:

furthermore manufactured in conformity with the following disharmonised standard:

2011/65/EU	RoHS Directive
2002/96/EC	Waste of Electrical and Electronic Equipment (WEEE)

and furthermore declares that it is not allowed to put the machinery into service until the machinery into which it is to be incorporated or of which it is to be a component has been found and declared to be in conformity with the provisions of above-mentioned Directives and with national implementing legislation i.e. as a whole, including the machinery referred to this declaration.

Place and date

Technical Responsible Person

2.2 RoHS 符合性声明 RoHS Compliance Declaration

European Guidelines 2011/65/EU (RoHS)

Legal regulation for Substances

Dear Sir/Madam,

Referring to the European guideline of 2011/65/EU, we confirmed that according to the current status of our knowledge and in accordance with the regulations, we could produce products complying with above mentioned guidelines especially for below type:

☒ A T

Yours Sincerely

General Manager

Mr. Li zizhi

At the end of the unit working life, the produce must not be disposed of as urban waste; it must be taken to a special local authority differentiated waste collection centre or to a dealer providing this service.

到本产品使用期限或不再使用该产品时，请勿将本产品直接作为垃圾处理，请交给当地政府认可的废物收集中心进行处理。

2.3 应用场景 Application of scence

Important

- 该产品是专为通讯或相关工业设备应用场合而设计的高性能半导体空调，使用 48V 直流电源供电。其安装的意义在于对控制柜（正常工作时为密闭状态）内部实行温度控制，将柜内温度控制在24～40℃之间，以保证柜内的所有热敏元件可以正常工作，发挥其最佳工作性能。

  The unit is designed for communication or related industrial equipment applications and design of high performance TEC. Please use the DC 48V power, the significance of installing it is control internal temperature of the cabinet (normal work to a closed state), keep internal temperature of the cabinet between 24 to 40 degrees Celsius, to ensure that all the thermal elements in cabinet can work normally and play the best performance.

- 除以上说明的应用对象以外的其他任何应用场合所造成的任何损害，我方不承担责任。

  In addition to any damage caused by any other applications except for the application objects described above, we can not responsible for it.

Warning

- 运输：搬运或运输该产品过程中，请勿翻倒或过度倾斜该产品。

  Transport: In the process of handling or transporting of the product, do not overturn or excessive tilt of the product.

- 存放：不要露天存放，或者长时间存放在高温、高湿的环境下(70℃,95%)。

  Store: Don't open stored or stored for a long time at high temperature and high humidity environment (70℃, 95%).

- 关机：若长时间不使用该产品，请关掉主电源。

  Shutdown: If not using this product for a long time, please turn off the main power

Warning

- 为了更好的使用本产品，请勿在高油污、高腐蚀性环境、含爆炸易燃气体环境使用，否则，将会造成对该产品严重的损害，我们将不会提供正常的售后服务。

  Don’t use the product under the condition of high oil, burning gas, explosive gas and strong corrosively condition area. Otherwise the product warrantee service is not been offered by manufacture.

- 严禁未成年人、身体或心理存在严重缺陷及不具有相关该产品知识的人员操作该产品。

  This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliances by a person responsible for their safety.

- 严禁儿童玩弄或使用该产品。

  Children are forbidden to play with or use this product.

- 为了避免风险，请一定使用同一公司或使用同规格的有质量认证的产品。

  If the power supply cord is damaged, it must be replaced by the manufacturer, or service agency or similarly qualified person in order to avoid a hazard.

2.4 产品特点 Product features

- 内、外循环 IP55 防护等级，防尘、防水，可完全安装于室外；

  The internal and external interface of product is IP 55 level protected to avoid moisture, dust, water penetrating into inside of enclosure. Inside electronics equipment is completely well protected;

- 精湛工艺及高质量国际名牌配件确保产品更加稳定可靠；

  Strict process control and international brand parts deployed to ensure high quality and reliable of product;

- 多重保护功能、可视化人机界面、RS485 接口（MODBUS 协议）；

  Multiple self protection design & Interchangeable monitoring software interface, RS485 communication through MODBUS protocol;

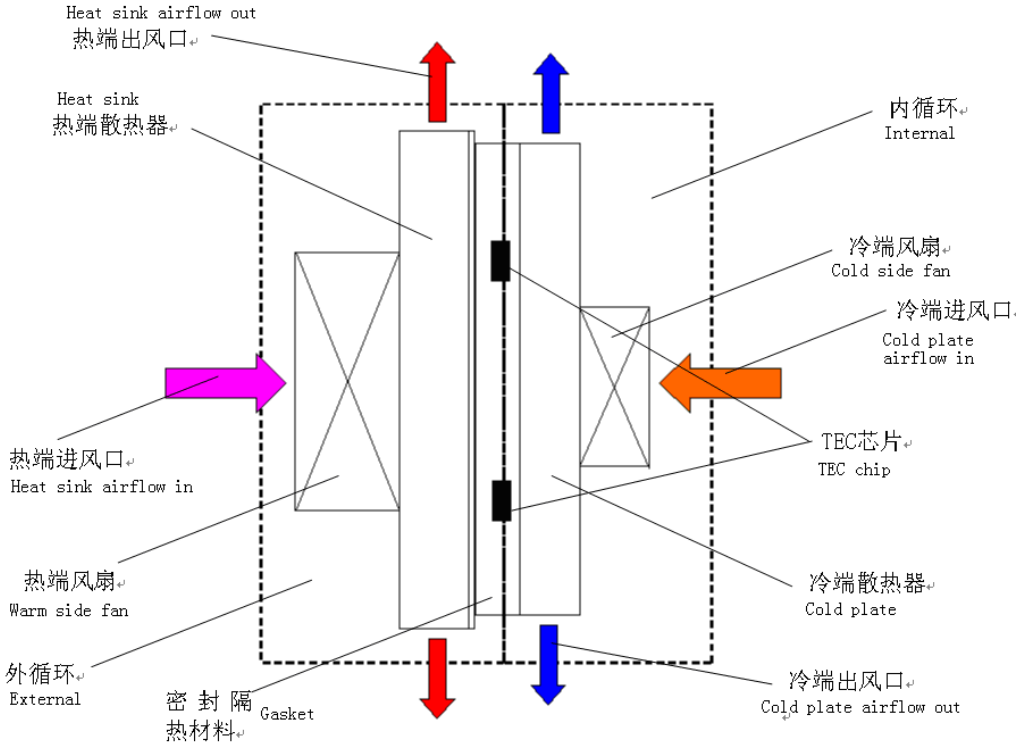
- 直流电机调速，能耗更小，噪音更低；

  DC speed control motor, lower energy consumption, and low noise;

2.5 产品组成 Product composition

系统由以下几部分组成 The system is composed of the following parts:

图2-1. 组成图 Figure2-1 System composition diagram



2.6 工作原理 Working Principle

- 半导体空调由半导体致冷片、含密封和隔热材料、冷端散热器、热端散热器、冷端风扇、热端风扇、监控模块六部分组成。当给半导体空调供电时，半导体致冷片一侧制冷，另一侧制热，所产生的冷（热）量分别通过冷（热）端散热器和风扇扩散到周围环境。其中，冷端散热器和冷端风扇组成内循环，用于给机柜内部环境制冷；热端散热器和热端风扇组成外循环，用于向外界环境散热。

  TEC include TE module, gasket, cold plate, heat sink, cold side fan, warm side fan and controller. When TEC unit be feed by DC supply, the TEC chip one side cold, another side warm. Energy arising from the cold (warm) side respectively through the cold plate heat sink and fan spread to the surrounding environment. Internal are make up of cold plate and cold side fan, are used to down temperature of cabinet inner. External are make up of heat sink and warm side fan, are used to spread heat to ambient.

2.7 工作控制逻辑 Control logic

半导体空调上电后，首先执行自检程序，自检过程中若发现故障，则产生告警，手操器显示告警故障代码，系统按照对应的告警进入故障处理方式运转。自检过程中若无故障，则自检结束后按照正常模式运行。

Power on the switch, the product will perform a self-tested running program firstly. If there is any trouble during self-tested, the alarm will be generated, the monitor display alarm fault code, the system will enter fault handling operation according to the alarm fault code. If there is no trouble during the self-tested, the system will be normal running automatically.

- 自检：Self-tested

  自检过程如下：The self-test procedure is as following:

  第一步：检测电压；

  First: Detection of supply voltage;

  第二步：检测温度传感器；

  Second: Detection of temperature sensor;

  第三步：检测外风机；

  The Third: Detection of external fan;

  第四步：检测内风机；

  The Fourth: Detection of internal fan;

  第五步：检测制冷片。

  The Fifth: Detection of TE

  系统的正常工作状态包括待机、制冷、制热三种状态

  The normal work state of the system includes standby, cooling and heating.

- 待机状态 Standby mode

若回风温度低于制冷启动设定温度减去温差，则半导体空调处于待机状态，此时只低速运行内风机。

If the air temperature is lower than the setting temperature of minus temperature cooling start, then the product in standby state, and only internal fan running with low speed.

- 制冷运行 Cooling

  若回风温度大于制冷启动设置温度，则半导体空调进行制冷运行。

  If the air temperature is higher than cooling start temperature, the product is running cooling.

  制冷运行有标准模式、低噪音模式两种可选模式，默认为标准模式。低噪音模式采用降低外风机转速的方式来减小噪音，半导体空调冷量会降低。当回风温度小于（高温告警温度－1）°C 时，外风机低速运行；当回风温度大于等于（高温告警温度－1）°C 时，外风机全速运行。

  There are normal mode and low noise mode for optional, normal mode as default. Low noise mode with the method of reduce the external fan speed, the TEC cooling capacity is reduced. When the air temperature is less than (high temperature -1)°C, the external fan runs at low speed; when the air temperature is greater than or equal to (high temperature -1) °C, the external fan runs at full speed.

- 制热运行 Heating （可选项/Optional）

  若回风温度小于制热启动设置温度，则半导体空调进行制热运行。

  If the air temperature is lower than heating start temperature, the product is running heating.

2.8 控制板接口 Control board interface

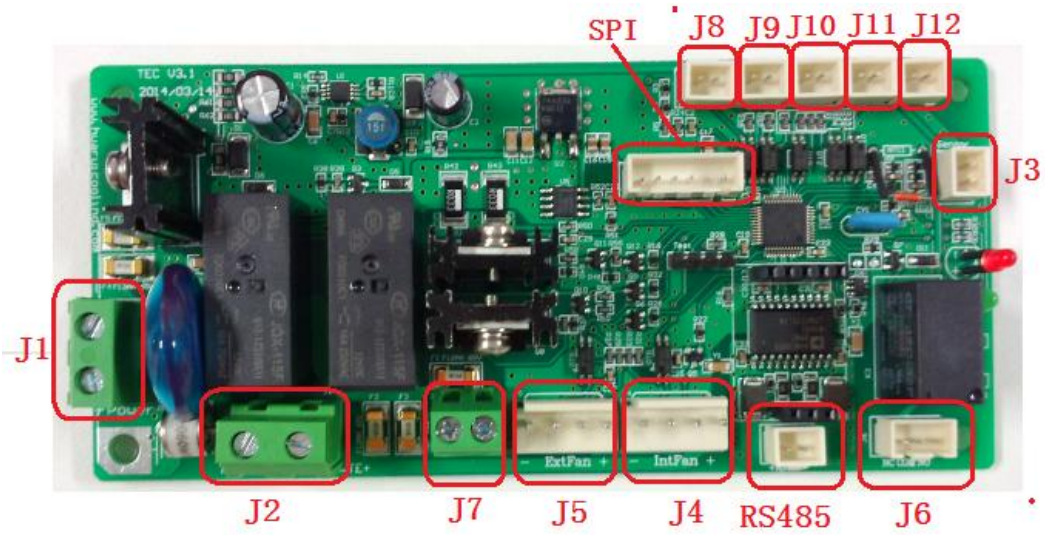


表2-1. 接口说明 table 2-1 Interface explain

接口 Interface	描述 Description	控制输入输出 Control Input Output	规格 Specifications
J1	直流电源(48V) //DC 48V power supply		7.86mm*2pin
J2	连接 TE //TE power supply	输出// Output	7.86mm*2pin
J3	柜内温度传感器// Return air temperature sensor	输出// Output	2.5mm*2pin

J4	内风机//Internal fan	输出// Output	3.96mm*4pin
J5	外风机//External fan	输出// Output	3.96mm*4pin
J6	干接点告警// Dry switch alarming connector	输出// Output	2.5mm*2pin
J7	排氢// Hydrogen discharging	输出// Output	5.0mm*2pin
J8	外部干节点告警输入// External dry switch alarming input	输入// input	2.5mm*2pin
J9	外部干节点告警输入// External dry switch alarming input	输入// input	2.5mm*2pin
J10	外部干节点告警输入// External dry switch alarming input	输入// input	2.5mm*2pin
J11	外部干节点告警输入// External dry switch alarming input	输入// input	2.5mm*2pin
J12	外部干节点告警输入// External dry switch alarming input	输入// input	2.5mm*2pin
SPI	手操器//Monitor	输出// Output	2.5mm*6pin
RS485	RS485 端口// RS485 port	输出// Output	2.5mm*2pin

注：

1. J7 输出最大直流电压 V_{DC}=48±20%V；最大电流 I=2A ；
2. J8、J9、J10、J11、J12 外部干节点告警输入，可以输入门禁告警、水浸告警、湿度告警、烟雾告警、碰撞告警等告警。

Note:

1. J7 Maximum output DC voltage V_{DC}=48±20%V; maximum current I_{Max}=2A;
2. J8, J9, J10, J11, J12 are external dry switch alarming input connectors, the Gate intrude alarming, Water intrude alarming, Humidity alarming, Smog monitor alarming, Bump intrude alarming can be connected.

2.9 告警 Alarm

告警时红灯闪烁。如果选配手操器，手操器交替显示回风温度和告警代码。红灯闪烁次数定义如下表：

When alarms, the red LED lighting. The temperature and alarm codes are displayed alternately if monitor is chosen. The red LED lighting times are as following:

表2-2. 告警代码 table 2-2 Alarm code

代码 Code	红灯闪烁次数 Red LED lighting times	含义 Signification
E01	1 time	柜内温度传感器故障//Cabinet inside temperature sensor failure
E03	3 times	柜内低温报警//Cabinet inside low temperature alarm

E04	4 times	柜内高温报警//Cabinet inside high temperature alarm
E07	7 times	内风扇故障//Internal Fan failure
E08	8 times	外风扇故障//External Fan failure
E09	9 times	TE 过流告警//Over TE supply current alarm
E10	10 times	TE 欠流告警//Low TE supply current alarm
E11	11 times	系统供电电压过高告警//Over TEC supply voltage alarm
E12	12 times	系统供电电压过低告警//Low TEC supply voltage alarm
E13	13 times	外部输入告警//External input alarm
E14	14 times	外部输入告警// External input alarm
E15	15 times	外部输入告警// External input alarm
E16	16 times	外部输入告警// External input alarm
E17	17 times	外部输入告警// External input alarm

2.10 无极性干接点继电器功能 Relay of no polarity dry switch function

Function 1:NC type Alarm（Optional）

Alarming type: normally closed, no polarity dry switch type.

功能 1：NC 型报警（可选）

告警方式： 正常闭合，无极性干节点输出。

Unit alarm will be activated when component failure happen, for example, the internal fan alarm, the external fan alarm, the TE module, the temperature inside cabinet as well as temperature sensor. The alarm type is only for chief alarm, it cannot know which component failure happen when alarm is activated.

如果任何一个零件故障，如内风扇告警、外风扇告警、TE 模块、机柜内部温度、温度传感器，都会产生系统告警。此报警方式仅用于总告警，报警时不能明确具体的失效零件类别。

Function 2: The relay can be feed with load(s), but the load should meet the following requests:

1. Max. Voltage: 277V AC / 30V DC;
2. Max. Power: 831VA / 90W;
3. Max. Load current: 3A.

功能 2：继电器可以带负载，但负载需同时满足下列条件：

1.最大电压：277VAC / 30VDC；

2.最大功率：831VA / 90W；

3.最大负载电流：3A。

2.11 手操器操作 Monitor operation

该部分为选配件 These parts are optional

手操器界面如下：

The interface of the monitor is as following:

图2-2. 显示器操作界面 Figure 2-2 Interface of the monitor

面板上的指示灯从左到右排列的功能含义如下表：

The definitions of the symbols are as following (from left to right):

表2-3. 面板指示灯含义 Table2-3 Definition of the symbols

指示灯 Indicator	指示灯含义 Definition	亮 Light
	设定温度//setting	正在温度/设置状态//Under setting
	制冷//Cooling	正在制冷//Cooling running
	制热//Heating	正在制热//Heating running
	外风机//External fan	外风机运转//External fan running
	告警//Alarm	告警//Alarm

- 参数设置：Parameters setting

长按“M”键 5 秒，进入参数设置状态，显示参数代码，用“≪≫”键选择参数代码，选择一个代码后按“Set”键则显示该代码对应的参数值，这时再用“≪≫”键即可对参数值进行设置（按住“≪”或“≫”键不放可连发），设置完成后再按“Set”键，回到显示参数代码状态。在显示参数时长按“M”键可退出参数设置状态，在设置参数值过程中按“M”键表示放弃，退出但不改变参数值。

Press "M" key for 5 seconds, enter the parameters setting mode, the code of parameters will be shown on monitor, press "≪≫" key to select the code of parameters, select a code and press "Set" button will display corresponding parameter values of the code, then re-press "≪≫" button to set the parameters, after finishing the setting, press "Set "button, return to display states. During

the setting mode, Press "M" key to exit the parameter setting mode, pressing "M" button during the process of setting parameters to give up, the system will quit but not change the parameters value.

具体参数请见“ 输入电压查询：Voltage query

在主显示界面，按一次“≽”键，将显示当前输入电压值，单位 V。

Under the main interface, press “≽” button will show the voltage, the unit is V.

用户参数 table 2-4 user parameter”

Please refer " 输入电压查询：Voltage query

在主显示界面，按一次“≽”键，将显示当前输入电压值，单位 V。

Under the main interface, press “≽” button will show the voltage, the unit is V.

用户参数 table 2-4 user parameter " to find details.

- 电流查询：Current query

  在主显示界面，按一次“≼”键，将显示制冷片的当前运行电流

  Under the main interface, press“≼”once will show TE current.

- 输入电压查询：Voltage query

  在主显示界面，按一次“≽”键，将显示当前输入电压值，单位 V。

  Under the main interface, press “≽” button will show the voltage, the unit is V.

表2-4. 用户参数 table 2-4 user parameter

代码 Code	参数名称 Parameters name	备注 Remark
*F01	制冷启动温度/ Cooling start temperature	
*F02	制冷回差温度/ Cooling stop delta temperature	
*F03	TE 制热启动温度/ heating start temperature	
*F04	TE 制热回差温度/ heating stop delta temperature	
*F05	传感器故障运行模式/ Temperature sensor fault operation mode	(0) 停止 Stop, (1) 间隔运行 Interval running
*F06	排氢间隔时间/ Exhaust hydrogen working time	小时/Hour
*F07	排氢工作时间/ Exhaust hydrogen working time	分钟/Minutes
*F08	低电压告警电压值/ Low voltage alarm voltage value	
*F09	高电压告警电压值/ High voltage alarm voltage value	
*F10	柜内低温告警温度/ Cabinet inside low temperature alarm	
*F11	柜内高温告警温度/ Cabinet inside high temperature alarm	

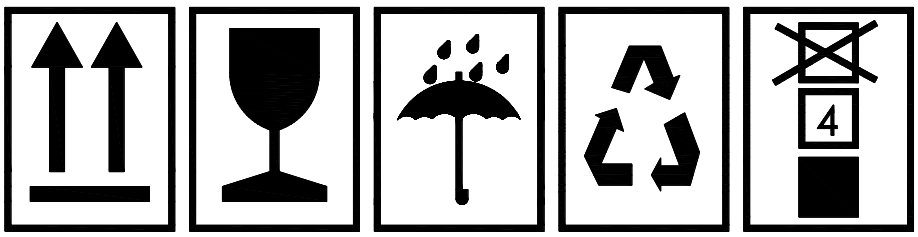
*F12	通信地址/ Communication address	
F111	输入密码/ Passwords	(1111)

3 包装与运输 Packing and shipping

- 半导体空调采用纸箱包装，1 台/箱包装。内部配有 EPE 保护垫。附件等资料也放置于包装箱内。
  TEC packed in corrugated boxes (1pc/box) with EPE protection pad. The package includes Annex.
  半导体空调在运输时请注意以下事项：
  The TEC during the transportation, please pay attention to the following matters:

Warning

图 3-1 包装箱标识 Figure3-1 Packing mark



- 搬运或者运输过程中半导体空调必须按  朝上放置。严禁倒置、平放、过度倾斜及碰撞。
  During carrying or transport, TEC must be upward placed as.  No inverted, flat, excessive tilt and collision.
- 半导体空调为精密仪器，在搬运或者运输过程中，应小心轻放，包装箱上禁止踩踏，禁止站立或放置其他重物。
  TEC is precision instrument, during handling or transport process, it should be handled carefully, do not step, prohibit standing or placing other heavy objects on the package boxes.
- 搬运或运输过程中，注意防潮、防水、防雨。
  Please pay attention to prevention of moisture, water and rain during carrying or transport process.

4 开箱与验收 Unpacking and Acceptance

Warning

- 开箱前请注意外包装箱按照图 3-1 所示向上放置，请检查胶带是否断裂、纸箱是否破损、变形、潮湿。

  Make sure the package up right as shown on Figure 4-1 before you open the package, Please check if the tape is fracture, the box is damaged, deformed and wet.
- 使用剪刀或者小刀拆除打包带，将包装木箱拆除。

  Use scissors or knives dismantling packing belt, then open the box.
- 打开包装后，请按照装箱清单核对产品

  After opening the package, please check the products according to the packing list.

5 安装 Installation

关于本章 About this chapter

介绍半导体空调的结构件安装与接线

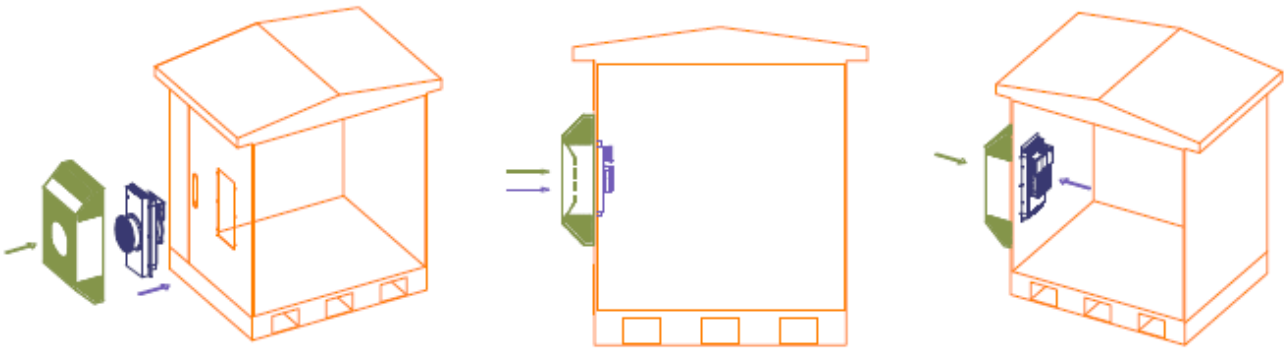
Introduce TEC installation and wiring

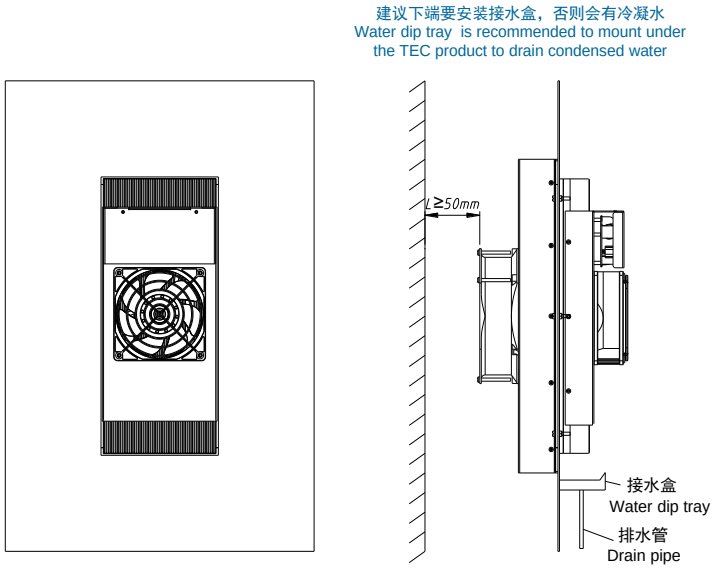
5.1 结构安装 Structure installation

请按照下图示意进行安装

Please follow the below diagram of installation

图5-1 安装示意图 Figure5-1 Installation diagram





排水示意图
Schematic diagram of drainage

Warning

本机器运转前需保证外循环侧安装防护罩以保护人和机器的安全！（该外罩非标配件，需要用户制作）。

Before the TEC running, the external side should have a shield for safety of people and TEC.

!! Note: the out cover is not a standard part of product, normally it is provided by an engineering company who install the unit.

Important

- 安装确认检验项 Installation notes

1) 请勿在高油污、易燃气体、高腐蚀性及环境温度超过 55℃、湿度超过 95%的环境下使用该产品。

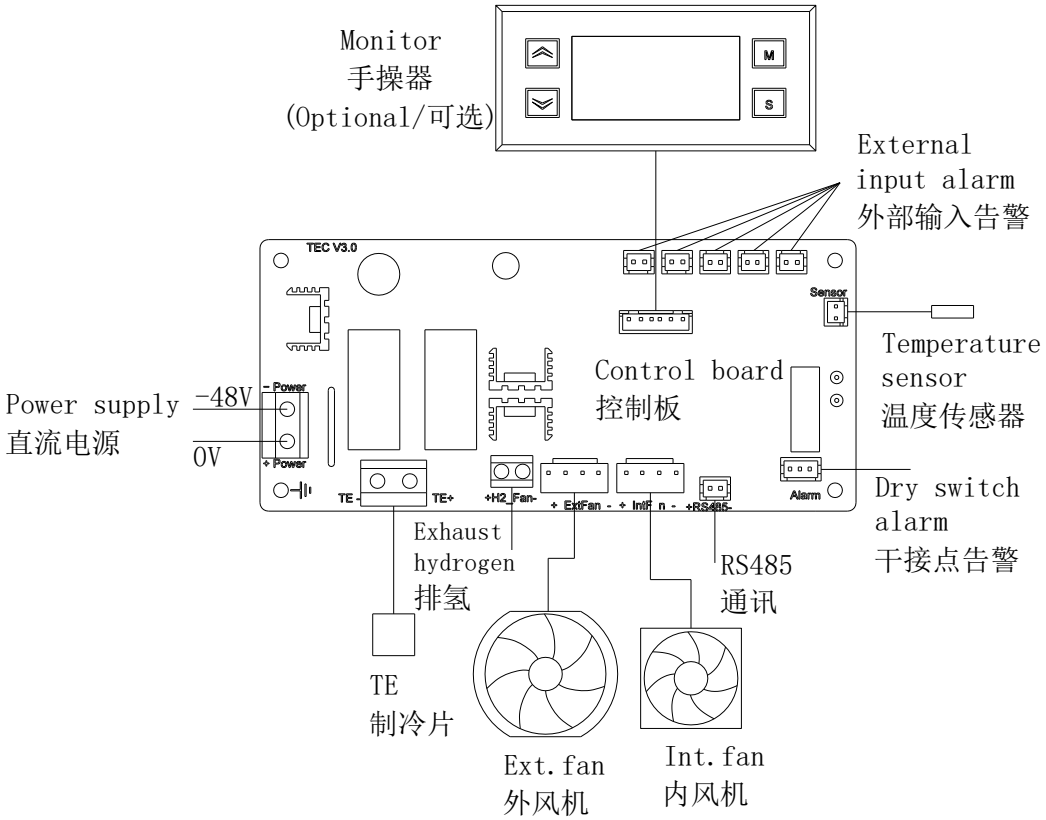
Don't apply this unit in high oil, burning gas, explosive gas, strong corrosively condition, the ambient air must be under 55℃ and the humidity not higher than 95%.

2) 确保机柜密封良好以免漏入空气产生不必要的冷量损失和产生过多的冷凝水。

Make sure that the cabinet should be sealed well to avoid the cooling losing and avoid ambient moisture penetrate into cabinet, this will avoid produce more condensate water.

5.2 电气接线安装 Electrical wiring installation

图5-2 控制板接线图 Figure5-7 System wiring diagram



5.2.1 The power supply must be according with the technical specification of the unit. Power supply cable size and circuit breaker size recommened as below:

所供电源、电源线缆及断路器应该满足以下表格要求：

Power supply 电源	- 48 VDC (0: positive, -48: negetive)
Power supply capacity 电源容量	It is suggest to not less than 10Amps @ 48VDC 建议主电源能力不小于 15A@ 48VDC
Calbe size 电缆规格	2 mm^2 or 14AWG （UL 1015）
Voltage loss along power supply cable 电源电缆线电压降	Max. 1.0 V. （不大于 1V）
Circuit breaker size	16 ~20 Amps

断路器规格	

5.2.2 The installation of a residual current device(RCD)having a rated residual operating current not exceeding 30mA is advisable.

建议选用的漏电保护器（RCD）动作电流不要超过 30mA。

5.2.3 There must be a breaker before the power supply cable to product, refer to above table for size.

电源和产品间必须要通过一个断路器。

5.2.4 All lines must be connected well to relevant terminals since the operation current is big.

所有电缆必须连接极性正确并确保牢靠。

5.2.5 The appliance shall be installed in accordance with national wiring regulations.

该产品的电源电缆连接需符合当地规则要求。

6 上电与检验 Running and Test

关于本章 About this chapter

介绍半导体空调上电与检验。

Introduce the TEC running and test

6.1 上电前检查 Pre-operational checks

半导体空调安装和电气连接完成后，请核对下列检查表：

After TEC installation and the electrical connection completely, please check according the following checklist:

表 6-1 上电前检查表 Table6-1 Pre-operational checklist

序号 Number	检查项目 Check items
1	装配螺钉已经紧固。 Ensure the screw have been fasten
2	内外循环的进出风口附近无明显的阻挡物。 Ensure that there is enough space near the internal and external of the air condition

序号 Number	检查项目 Check items
3	电源线极性连接正确，告警信号线缆连接正确。 Power line connect the right polarity, Alarm signal cables are connected correctly
4	用万用表检查供电电压，供电电压正常，符合铭牌上的要求。 Use the multi-meter to check the supply voltage, power supply voltage is normal, consistent with the requirements on the nameplate.

6.2 开机运行 Running

半导体空调上电后，首先执行自检程序。自检运行通过后进入正常运行状态，详细内容请参考“2.7 工作控制逻辑 Control logic”。

Power on the switch, the unit will perform a self-test running program firstly, and then the unit will run normally. The Details please refer to” 2.7 Control logic”

Warning

半导体空调上电运行过程中，若发生异常噪音、震动，请立即切断电源，并通知专业人士进行检查。

When the TEC is running, if there is abnormal noise and vibration, please cut off power immediately and notify the professionals to inspect.

7 产品维护和质保 Maintenance and Warranty

关于本章

本章介绍半导体空调的维护和质保

Introduce TEC maintenance and warranty

7.1 产品维护 Product maintance

7.1.1 准备工具：Prepare tools

表 7-1 维护工具 Table7-1 Maintenance Tools

序号 Number	工具 Tools
1	万用表 Multi-meter
2	十字螺丝刀 Phillips screwdriver
3	一字螺丝刀 Slotted screwdriver

7.1.2 日常维护 Routine maintenance

为确保制冷系统良好运行、排水顺畅及电气系统安全稳定，维持设备正常运行与良好性能，避免因维护不当导致设备寿命缩短、运行品质下降，请严格按照以下事项进行

Purpose: To ensure the proper operation of the refrigeration system, smooth drainage, and the safety and stability of the electrical system, maintain the normal operation and good performance of the equipment, and avoid shortened equipment service life and reduced operational quality due to improper maintenance, please strictly follow the following items as specified

5.1 冷凝器清洗/Condenser clearance

为了确保制冷系统良好的运行，请每年清洗一次冷凝器（如果环境比较脏建议增加清洗次数），本产品内外循环间防护等级高达 IP55，可直接用水或压缩空气对冷凝器进行清洗。

To assure the cooling system running perfectly, the condenser should be cleared once annually（if it is too dirty, the times can be increased）, this unit IP grade is IP55, so can clear the condenser with water directly.

5.2 排水检查并疏通/Drainage inspection and dredging

为排水顺畅，需不定期检查排水孔是否堵塞并疏通。

To ensure smooth drainage, it is necessary to check the drainage holes regularly for blockages and dredge them.

5.3 电气系统检查/Electrical system check

检查供电系统电压、电缆线及通讯线是否良好。

检查产品本身运行是否正常。

检查产品制冷效果是否良好。

至少每年检查 2 次。

Check the power supply and communication cable.

Check the unit running perfectly or not.

Check the cooling performance good or not.

Check the air conditioner at least 2 times every year.

5.4 注意/Maintance attention

不要用有机溶剂清洗本产品。

检修时请注意关闭电源。

若外风机风叶上积满了灰尘，可用毛刷清除。

长时间不使用本产品时，请关闭电源。

安装螺丝牢固．用螺丝刀拧动空调的安装螺丝，观察是否有松动现象，若有松动现象，则拧紧螺丝。

Don’t clear air conditioner with organic solvent.

PLS power off it before carry out maintains.

The external side fan can be cleaned with a brush if dust accumulated on fan blades.

Please power off the unit before long time stop running.

Screw firmly. Use screwdriver to screw the screws and watch whether the screw is loosening. If the screw is loosening, please tighten it. Establish a systematic maintenance ledger to achieve preventive maintenance.

5.5 维护记录与数据分析/Data Record

建立系统化维护台账，实现预防性维护。

Establish a systematic maintenance ledger to achieve preventive maintenance.

7.1.3 告警代码及处理方法 Alarm code and Processing method

表 7-3 故障信息 Table 7-3 Alarm information

故障名称 Code Name	故障机制 Principle	故障处理方法 Process Method
回风温度传感器故障 Return air temperature sensor alarm	回风温度传感器短路或断路 Return air temperature sensor is short circuit or open circuit	检查回风温度传感器是否有断路或者短路现象 Check whether the return air temperature sensor is short circuit or open circuit
内风机告警 Internal fan alarm	内风机转速不在正常范围内 Internal fan current is not within normal range	检查内风机线和内风机的连接是否脱落或松动 Check Whether the internal fan cable is loosening
外风机告警 External fan alarm	外风机转速不在正常范围内 External fan current is not within normal range	检查外风机线和外风机的连接是否脱落或松动 Check Whether the external fan line is loosening

高温告警 High temperature alarm	机柜内温度高于设定值 The cabinet temperature is higher than the set point	打开机柜门散热，直到告警消除. Open the cabinet door until the alarm stop.
电源电压超限告警 Supply voltage alarm	电源电压不在正常范围内 Power supply voltage is not within normal range	立即断掉半导体空调输入电源，用万用表测量供电电压，直到供电电压在合理范围内，才能再次运行半导体空调。 Turn off the power immediately. Use multi-meter measure the voltage, power on the switch until the power supply within the normal range

7.1.4 其他故障分析与处理 Other fault analysis and processing

表 7-4 其他故障分析与处理 Table7-4 other fault analysis and processing

故障状态 Fault state	原因分析 Analysis of the reasons	故障排除方法 Solutions
柜内温度过高，但半导体空调不运转 The cabinet temperature is too high but the unit is not working	1、停电或无电源； Power failure or no power; 2、设定温度高于柜内温度； The cooling set temperature is higher than the cabinet temperature; 3、系统故障。 System fault.	1、检查电源、电路。 Check the power supply and the electric circuit 2、根据需要设定制冷启动温度。 Setting cooling temperature according to the needs 3、请与专业维修人员联系 Please contact professional maintenance staff.
设备正常运转，但制冷效果不理想 The unit is running but the cooling effect is not good	1、该机型制冷能力与负荷不匹配； The cooling capacity of the unit is not match with the load; 2、环境温度过高； The ambience temperature is too high; 3、其他系统故障。 Other system fault.	1、 根据负荷大小重新选配或增配制冷设备。 To add or choose another TEC according to the load. 2、 请确保机器工作环境温度在正常使用范围内。 Ensure the unit is used in the correct range. 3、 请与专业维修人员联系 Please contact professional

		maintenance staff.
正常运转中。突然停止制冷，且电器系统无故障。 The unit is stopping suddenly, and the electric system is normal	1、柜内温度已达到设定温度。 The cabinet temperature greater than or equal to the cooling set temperature. 2、其他系统故障 Other system fault	1、 根据需要设定压缩机启动温度。 Setting cooling temperature according to the needs 2、 请与专业维修人员联系 Please contact professional maintenance staff.

7.2 售后服务和维修 Service and repair

- 质保范围 Warranty coverage

本产品在保修期内，凡属于产品本身质量问题而导致故障的，本公司将为您免费维修，客户报修时需提供产品标号。但是由以下任何原因造成的故障不属于我司的保修范围。

1） 已超过保修期的；

2） 不能提供产品出厂编号的（见机身贴示的铭牌）；

3） 由于在异常条件或环境中运行，或者用非本使用说明书中指定的不恰当安装方式安装、维护或操作导致的故障；

4） 非本设备造成的故障，比如由用户的设备、用户的软件等造成的故障；

5） 用户自行更换或拆装产品零部件造成损坏的，或由非授权维修服务者拆修而造成损坏的；

6） 诸如火灾、地震、洪水等不可抗拒力而造成损坏的故障。

During the warranty period, all belong to the product itself quality problems caused by fault, the company will be free for you to repair, household repair is required to provide the product label. But by any of the following causes the failure does not belong to our warranty.

1) Out of the Warranty period
2) Cannot provide the product label(the product label is on the nameplate);
3) Because of the abnormal condition or environment ,or the instructions specified in the inappropriate installation, maintenance or operation causes the fault;
4) Not caused by equipment failure, caused by user`s other equipment or software.
5) Users changed or disassemble by themselves, or maintained by the person without authorization.
6) Caused by force majeure such as fires, earthquakes, floods and other damage to the fault.

- 免责声明 Disclaimer

我司的保修仅限于已发送的产品。我司对可能由设备故障衍生的任何损失不负责任。

The warranty is limited to the delivered products.

Our company is not responsible for any loss may be derived from equipment failure.