Part I (第一部分)

Quotation (报价单)

1 Contact information/联系信息：

Attention/联系人：		**From/报价方：**	
Company/公司：	**大众汽车（安徽）有限公司**	**Company/公司：**	**上海增达科技股份有限公司**
Tel/电话：		**Tel/电话：**	
Mob/手机：		**Mob/手机：**	
Fax/传真：		**Fax/传真：**	
Email/邮箱：		**Email/邮箱：**	
No./编号：	**XM_2024070813**	**Version/版本：**	**1.0**
Date/报价日期：	**2024-07**		
Valid/有效期：			

2 Quotation/报价:

Item 编号	Qty 数量	Model 型号	Description 描述	Price 价格 (CNY,VAT include) （人民币，含税）
1	1	AZTH1000L-BT	Climatic Test Chamber for Battery Testing 电池测试温湿度试验箱	

3 Commercial terms/商务条款:

3.1 Delivery time: 100 days after advance payment;
交货期：收到预付款后的 100 天内；

3.2 Payment terms/付款方式:

3.2.1 First payment is 30% advance payment within 10 business days after contract signed off;
预付款：签订合同后的 10 个工作日内支付 30%的预付款；

3.2.2 Next 60% payment before delivery;
第二笔款：发货前支付 60%的货款；

3.2.3 Final 10% payment within 10 business days after commissioning and final acceptance;
尾款：调试验收后的 10 个工作日支付 10%的尾款；

3.2.4 The final price includes 13%VAT;
合同最终价含 13%增值税；

3.2.5 All the payments are remitted to designated account by T/T;
所有款项以电汇方式付到卖方指定账户；

3.3 After-sales service/售后服务：

3.3.1 One year charge-free warranty from the date of equipment acceptance;
自验收之日起至 1 年为设备质保期；

3.3.2 Respond to customer enquiry within 24 hours;
响应时间为 24 小时内；

Part II (第二部分)

Technical Proposal (技术指标)

Climatic Test Chamber for Battery Testing

电池测试温湿度试验箱

Model: AZTH1000L-BT

型号: AZTH1000L-BT

（Reference only）

（图片仅供参考）

Revision history/修改历史

Date 日期	Version 版本	Revised content 修订内容
2024-7	**1.0**	

1 Key Technical Specifications/主要性能参数:

1.1 Equipment: Climatic Test Chamber for Battery Testing
设备名称：电池测试温湿度试验箱

1.2 Model: AZTH1000L-BT
型号：AZTH1000L-BT

1.3 Useful capacity: 1000L approx
有效容积：约 1000 升

1.4 Interior dimension: W1000mm×D1000mm×H1000mm
内部尺寸：宽 1000mm×深 1000mm×高 1000mm

1.5 Exterior dimension: W1330mm×D2000mm×H2350mm (to be determined)
外部尺寸：宽 1330mm×深 2000mm×高 2350mm（待确定）

1.6 Temperature range: -40℃～+90℃
温度范围：-40℃～+90℃

1.7 Temperature fluctuation: ±0.5℃
温度波动度：≤±0.5℃

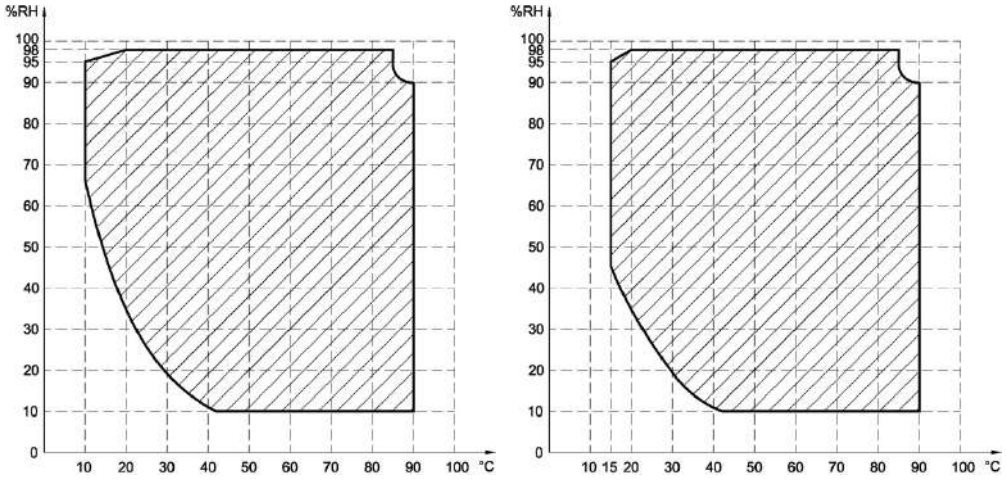
1.8 Temperature deviation: ±2.0℃
温度偏差：≤±2.0℃

1.9 Temperature uniformity: ≤2.0℃
温度均匀度：≤2.0℃

1.10 Humidity range: from 10% to 98% in the temperature range +10℃ to +90℃
湿度范围：从 10%到 98%在环境温度范围：+10℃到+90℃

1.11 Dew point range：+5℃～+85℃
露点温度范围：+5℃～+85℃

1.12 Applicable humidity test points: as follows
适用的温湿度测试点，如下图：



1.13 Temperature and humidity requirements:
温湿度技术要求：

参数名称 parameter name		温度 Temperature	相对湿度 Relative humidity	
		（-40~90℃）	（10~90℃） >75%RH	（10~90℃） ≤75%RH
偏差	温度/Temperature	±2.0℃	±2.0℃	±2.0℃

Deviation	湿度/Humidity	--	±3.0%RH	±5.0%RH
均匀度 Uniformity	温度/Temperature	2.0℃	2.0℃	2.0℃
	湿度/Humidity	--	5.0%RH	7.0%RH
波动度 Fluctuation	温度/ Temperature	±0.5℃	±0.5℃	±1.0℃
	湿度/Humidity	--	±3.0%RH	±3.0%RH

参数名称 parameter name		温度 Temperature		相对湿度 Relative humidity	
		（-70~150℃）	（150~180℃）	（10~90℃） >75%RH	（10~90℃） ≤75%RH
偏差 Deviation	温度/Temperature	±2.0℃	±2.0℃	±2.0℃	±2.0℃
	湿度/Humidity	--	--	±3.0%RH	±5.0%RH
均匀度 Uniformity	温度/Temperature	2.0℃	3.0℃	2.0℃	2.0℃
	湿度/Humidity	--	--	5.0%RH	7.0%RH
波动度 Fluctuation	温度/ Temperature	±0.5℃	±0.5℃	±0.5℃	±1.0℃
	湿度/Humidity	--	--	±3.0%RH	±3.0%RH

Note: The above performance is measured at steady state, without any load and heat dissipation;

注：上述性能是在稳态条件，无负载和散热的条件下测得；

1.14 Temperature rate of change

温度变化速率：

- Heating up rate/升温速率：

  Heating up rate: from -40℃ to 90℃, global average speed 2 K/min;(With DUT, without heat dissipation

  -40℃~+90℃，平均速度 2K/min（带 DUT，无散热）

- Cooling down rate/降温速率：

  Cooling down rate: from 90℃ to -40℃, global average speed 2K/min;(With DUT, without heat dissipation

  +90℃~-40℃，平均速度 2K/min（带 DUT，无散热）

Note: All the above specifications are measured at the room temperature of +25℃, temperature and humidity performance test is measured according to the related regulations of national standards;

注：上述指标在室温+25℃时测量，温湿度性能测试根据国家标准；

2 Cabinet Structural Features/箱体结构特性:

2.1 Overall structure: mono-block construction which comprises all systems necessary for operation;

箱体结构：单一结构，包括所有箱体工作所必须的系统；

2.1.1 Machine group and control panel are in the frame behind the test chamber;

机组和电控系统位于箱体后部的框架内；

2.1.2 The controller is on the main door;

控制器在大门上；

2.2 Outer chamber materials: the outer frame is made of high quality galvanized steel sheet, painted inside and outside and baked at high temperature; The test chamber has strong corrosion resistance; light grey, RAL7035;

外部材料：外部框架由高质量电镀锌钢板组成，内外喷塑处理并经高温烘烤。箱体具有很强的抗腐蚀能力；浅灰色，RAL7035；

2.3 Test space: the internal test space will be made of t=1mm non-magnetic SUS-304 stainless steel. All the seams will be TIG welded and vapor tight, and with reinforcing bar;

测试空间：箱体内胆材料为厚度 1mm 的 SUS304 不锈钢。所有缝隙都由 TIG（钨极惰性气体保护电弧焊）无缝焊接完成，保证密封，并有额外的加强筋；

2.4 Thermal insulation material: it will be of low 'k' factor, high intensity and non-hygroscopic nature. The insulation will be multi layered with double vapor barrier. Asbestos free mineral fiber insulation will be used and the thickness is about 125mm;

保温材料：使用低“K”值的绝热材料，高强度和不可燃、无沉积特性。这种绝热材料为多层分层，每层两面都有蒸汽绝热，厚度 125mm；

岩棉可以耐受最高+600℃高温，根据 GB/T9978.1 耐火性能为 120 分钟

2.5 Door: fully-opened and single wing type, double silicone seal, hinges and lock. Light grey, RAL7035;

箱门：全开单翼型，带有双层硅橡胶密封和门锁。浅灰色，RAL7035；

2.5.1 Door useful dimensions: W1000mm x H1000mm;

门的有效尺寸：宽 1000mm x 高 1000 mm；

2.5.2 Heaters installed around door prevent external frosting;

门框内嵌加热丝，防止外部结霜凝露；

2.5.3 Reinforced door hinge and door lock;

加强型门铰链和门锁；

2.5.4 The door is equipped with safety chain x 2;

门上配置安全链条 x 2；

2.6 Inspection windows: the door of the test chamber is provided with one electric heated demisting glass observation window with explosion-proof grille; Size: 435mm x 495mm;

观测窗：试验箱的门上配备一个带防爆栅的电加热除雾玻璃观察窗。尺寸：435mm x 495mm；

注：以上 2.3~2.6 条款箱体满足具有 200℃的连续温度稳定性和 40~100mbar 的压力稳定性；

2.7 Standard configuration:

标准配置：

2.7.1 Internal lighting: 1x35W. The control switch placed on the control panel with the function of delay automatic closing;

内部照明：1x35W。控制开关在箱体外部控制面板上，具有延时自动关闭功能；

2.7.2 One height adjustable stainless steel shelf: shelf support load: 20kg uniformly distributed;

一个高度可调节的不锈钢搁架；搁架承重：可均匀承重 20 公斤；

2.7.3 Cable port: 2xΦ100mm, by low thermal conductivity materials and equipped with blind plugs;

测试孔：2xΦ100mm，带有由绝热材料做成的绝热塞；（位于箱体两侧）

2.7.4 One Emergency Stop;

备急停开关 1 个；

2.7.5 Three color status indicator with buzzer x 1;
三色警示灯带蜂鸣器 1 个；

2.7.6 Four castors for easy moving positioning and leveling;
4 个脚轮，方便箱体自由移动、定位和调平；

2.7.7 Pressure compensation system: the chamber is equipped with a pressure balance system; When the pressure inside the chamber is not balanced, the system will run automatically;
压力补偿平衡系统：箱体配有一个压力补偿系统，当箱体内外压力不平衡时，系统将会自动运行；

3 Safety device and design for battery testing/电池测试的安全设备和装置：

3.1 Anti-spark design:
防火花设计：

3.1.1 Interior lighting: explosion-proof, heat and moisture resistant halogen lamp;
内部照明：防爆，耐温防潮卤素灯；

3.1.2 The test chamber shall be well grounded to avoid sparks caused by static electricity;
试验箱的整体良好接地，避免静电产生火花；

3.1.3 The volute and impeller of the fan shall maintain a safe gap and adopt special materials to avoid electric sparks in case of friction or collision;
空气循环系统的蜗壳与叶轮保持安全间隙，并采用特殊材料，避免机械摩擦碰撞时产生电火花；

3.1.4 Heating: Spiral and finned shielded heater, protected by failure-safe thermostats; To avoid the spark or high temperature on the heater surface;
加热：螺旋翅片管加热器，配备故障保护温度开关；避免加热器表面过热或者火花；

3.1.5 Enhanced chamber body and door lock to bear 50mbar pressure inside the chamber;
箱体及门加强结构，可以承受 50mbar 的压力；

3.1.6 With safety chains on the door;
门上有额外的安全链；

3.2 EUCAR Hazard Level of climatic chamber: Level V;
环境箱对应的 EUCAR 电池危险等级：等级 5；

Hazard level	Description	Classification Criteria & Effect
0	No effect	No effect; No loss of functionality
1	Passive protection activated	No defect; No leakage; No venting,fire or flame; No rupture; No explosion; No exothermic reaction or thermal runaway. Cell reversibly damaged. Repair of protection device needed
2	Defect/Damage	No defect; No leakage; No venting,fire or flame; No rupture; No explosion; No exothermic reaction or thermal runaway. Cell irreversibly damaged.Repair or protection device needed.
3	Leakage Δ mass<50%	No venting,fire or flame; No rupture; No explosion;Weightloss<50% of electrolyte weight (electrolyte=solvent + salt)
4	Venting Δ mass≥50%	No fire or flame; No rupture; No explosion;Weightloss≥50% of electrolyte weight (electrolyte=solvent + salt)
5	Fire or flame	No rupture;No explosion;(No flying parts)
6	Rupture	No explosion; but flying parts of the active mass
7	Explosion	Explosion;(disintegration of the cell)

3.3 Aspirated smoke detector:
吸气式气体采样系统：

3.3.1 System composition: composed of gas collection and temperature regulation device and gas sensors, gas sensors installed in the gas collection sample box;
系统组成：由气体采集和温度调节装置和气体传感器组成，气体传感器安装于气体采集样盒内；

3.3.2 Gas Sensor Type:
气体传感器类型：

- Gas detection HC sensor;
  HC 碳氢浓度传感器【国产】；
- Gas detection H2 sensor;
  H2 氢气浓度传感器【国产】；
- Gas detection CO sensor;
  CO 一氧化碳浓度传感器【国产】；

3.3.3 When the concentration of gas in the chamber exceeds the set value, the test chamber will immediately alarm and open the waste discharge system;
当箱内的气体浓度超过设定值之后，立刻报警，并且打开排废系统；

3.4 Aspirated smoke detector:
吸气式烟感探测器：

3.4.1 System composition: composed of a gas collection device and a smoke detector, the smoke detector is installed in the gas collection sample box;
系统组成：由气体采集装置和烟感探测器组成，烟感探测器安装于气体采集样盒内；

3.4.2 Air pump extract air from chamber to sampling box; When the smoke detector detects an anomaly, immediately stop and alarm, and open the exhaust system;
空气泵从箱体内抽出后送往采样盒；当烟感探测器探测到异常后，立刻停机报警，并且打开排气系统；

3.5 Infrared Fire Flame Detector:
红外火灾火焰探测器：

3.5.1 It is installed in the test chamber, through the detection of special wavelengths of ultraviolet light, infrared and visible light emitted by the flame, and at the same time with the characteristics of the flame flicker frequency to identify and detect fire;
安装于试验箱内，通过检测火焰辐射出的特殊波长的紫外线、红外线及可见光等，同时配合对火焰特征闪烁频率来识别、探测火灾；

3.6 Sample temperature sensor: thermocouple TC x 2;
试件温度采样温度传感器：热电偶 TC x 2；
对试件表面温度进行实时监控，超过一定温度，发出警报并自动停机；
(测量温度范围-50~+150 度，可以进行多级报阈值设定)

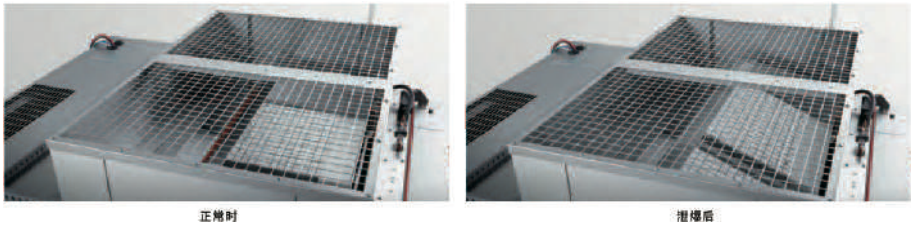
3.7 Pressure relief device:
紧急泄压装置：

3.7.1 When the pressure in the chamber rises rapidly by more than 0.02bar, the pressure relief device is opened to quickly reduce the pressure in the chamber;
当箱内压力急速升高超过 0.02bar 的时候，此泄压装置打开快速降低箱内压力；

3.7.2 The pressure relief device is equipped with protective cover and position switch. The position switch is used to detect the actual position of the pressure relief device and whether it is open;
泄压装置配置防护罩和位置开关；位置开关用于探测泄压装置的实际位置，是否打开，一旦触发立刻停机并发送报警；

3.7.3 The pressure relief port is equipped with flame arrester to prevent flame splashing;
泄压口配置阻火器，防止火焰喷溅；

3.7.4 Size of the pressure relief port：≥150mm x 150mm;
泄压口尺寸：不小于 150mm x 150mm；



3.8 Exhaust system:
排废系统：

3.8.1 The system is composed of exhaust fan, exhaust valve, fresh air valve and auxiliary piping;
排废系统组成：排风风机、排风风阀、新风风阀及附属管路组成；

3.8.2 Passive (emergency) waste discharge function: emergency waste discharge triggered by pressure relief device;
被动（紧急）排废功能：由泄压装置触发紧急排废；

3.8.3 Active exhaust function: It can be triggered manually to replace the harmful gas in the test chamber, or it can be automatically triggered to reduce the harmful gas in the test chamber by the gas sensor;
主动排废功能：可以人工触发对试验箱内的有害气体进行置换，或者由气体采样系统自动触发稀释试验箱内有害气体的浓度；

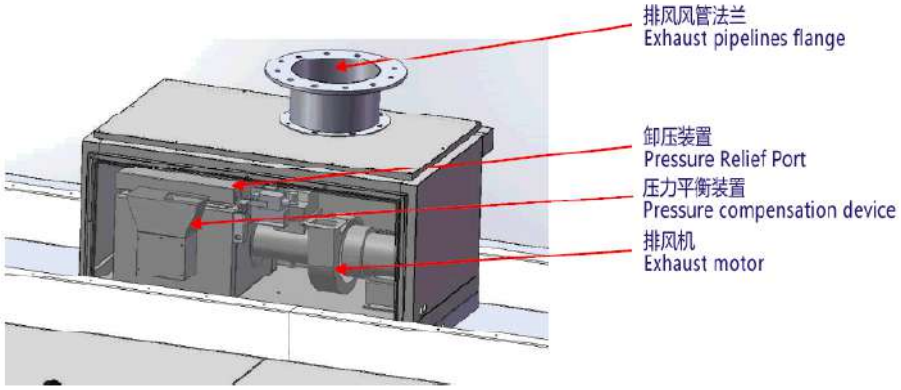
3.8.4 Air Flux of exhaust system: more than 100m^3/h
排废系统流量：大于 100m^3/h

3.8.5 Fresh air system: It is composed of fresh air valve and outdoor pipeline;
新风补充：通过新风风阀；

Note：The main exhaust pipes from chamber to outside is not in the scope of supply of climatic chamber;
注：从环境箱通往室外的排风主管路不在环境箱的供货范围内；

3.9 Emergency pressure relief and waste discharge system:
紧急泄压及排废系统：

The system is composed of pressure compensation device, emergency pressure relief device, exhaust fan, exhaust valve, fresh air valve and closed shell;
系统由压力平衡装置、紧急泄压装置、排风风机、排风风阀、新风风阀及封闭外壳组成；



3.9.1 Pressure compensation system: the chamber is equipped with a pressure balance system; When the pressure inside the chamber is not balanced, the system will run automatically;
压力补偿平衡系统：箱体配有一个压力补偿系统，当箱体内外压力不平衡时，系统将会自动运行；

3.9.2 Emergency pressure relief device: When the pressure rises rapidly more than 0.02bar in the test chamber, the pressure relief device is opened to ensure that the chamber body is not damaged; The pressure relief device is equipped with a position switch to detect whether the pressure relief device is started and send a signal;

紧急泄压装置：当箱内压力急速升高（仓内外的差压大于 0.02Bar），此泄压装置打开以保证箱体不被破坏；泄压装置配备位置开关，用于探测泄压装置是否启动并发送信号；

Size of the pressure relief port：≥150mm x 150mm;

泄压口尺寸：不小于 150mm x 150mm；

3.9.3 Passive (emergency) waste discharge function: emergency waste discharge triggered by pressure relief device;

被动（紧急）排废功能：由泄压装置触发紧急排废；

3.9.4 Active exhaust function: It can be triggered manually to replace the harmful gas in the test chamber, or the concentration of harmful gas in the diluting test chamber can be triggered automatically by the gas concentration sensor;

主动排废功能：可以人工触发对试验箱内的有害气体进行置换，或者由气体浓度传感器自动触发稀释试验箱内有害气体的浓度；

- Air Flux of exhaust system: more than 300m^3/h

  排废系统流量：大于 300m^3/h
- Fresh air system: It is composed of fresh air valve and outdoor pipeline;

  新风补充：通过新风风阀和连接于户外的管路；

Note：The exhaust main pipe from chamber to outside is not in the scope of supply of climatic chamber;

注：从环境箱通往室外的排风主管不在环境箱的供货范围内

3.10 Suspended CO2 fire extinguishing system

悬挂式二氧化碳灭火装置：

3.10.1 Fire extinguishing system is composed of storage container, container valve, nozzle, temperature detector, manual start button, fire alarm controller, etc;

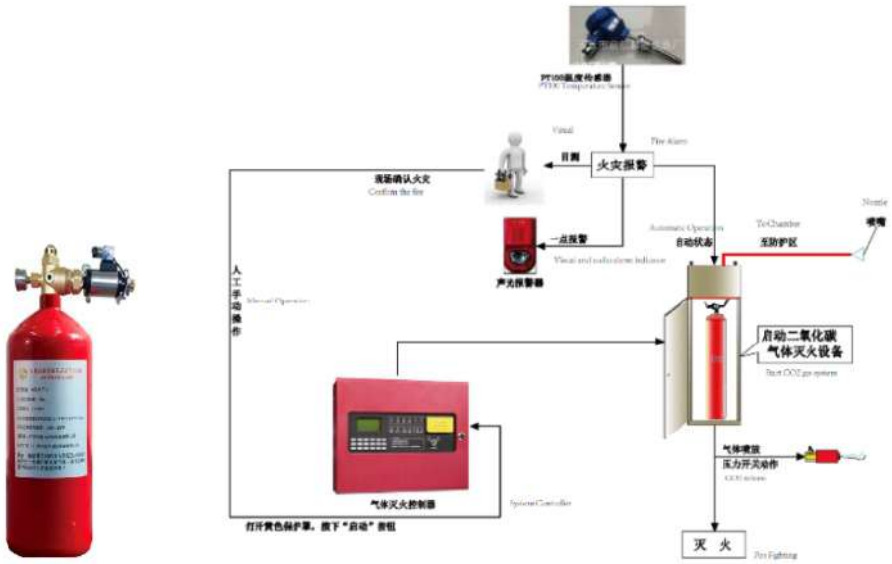
灭火装置由储存容器、容器阀、喷嘴、温度探测器、手动启动按钮、报警控制器等组成；

3.10.2 The gas bottle is hung on the outer side of the test chamber, and the Nozzles are installed inside the test chamber;

气瓶悬挂于试验箱的外侧面，喷嘴安装于试验箱箱内；

3.10.3 The fire extinguishing device automatically or manually starts the fire extinguishing function through gas sensor or infrared fire flame detector and temperature detector;

灭火装置通过气体传感器或红外火焰火灾探测器和温度探测器自动或手动启动灭火功能；



3.11 Suspended FM-200 fire extinguishing system

悬挂式七氟丙烷灭火装置：

3.11.1 Fire extinguishing system is composed of storage container, container valve, nozzle, temperature detector, manual start button, fire alarm controller, etc;

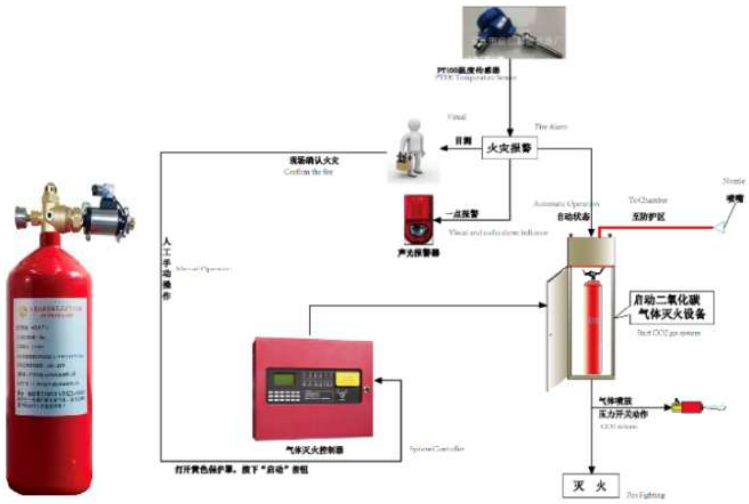
灭火装置由储存容器、容器阀、喷嘴、温度探测器、手动启动按钮、报警控制器等组成；

3.11.2 The gas bottle is hung on the outer side of the test chamber, and the Nozzles are installed inside the test chamber;

气瓶悬挂于试验箱的外侧面，喷嘴安装于试验箱箱内；

3.11.3 The fire extinguishing device automatically or manually starts the fire extinguishing function through gas sensor or infrared fire flame detector and temperature detector;

灭火装置通过气体传感器或红外火焰火灾探测器和温度探测器自动或手动启动灭火功能；

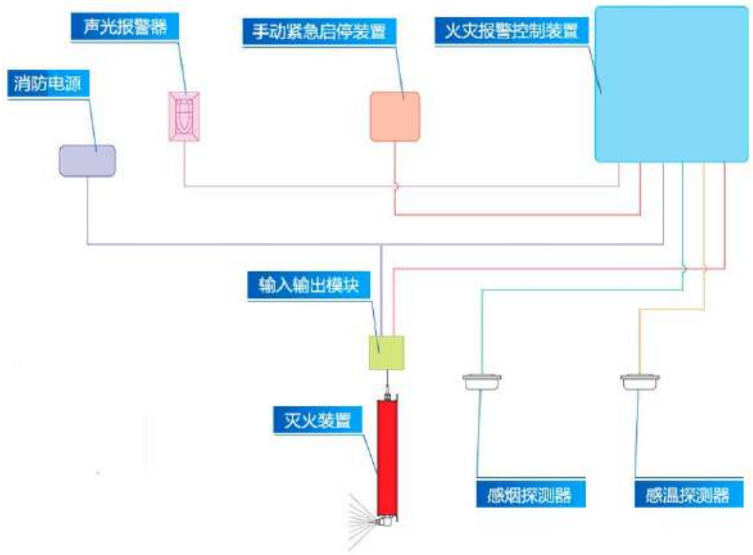


3.12 Suspended novec1230 fire extinguishing device:

悬挂式全氟己酮灭火装置：

3.12.1 Fire extinguishing system is composed of storage container, container valve, nozzle, temperature detector, manual start button, fire alarm controller, etc;

灭火装置由储存容器、容器阀、喷嘴、温度探测器、手动启动按钮、报警控制器等组成；



3.12.2 The gas bottle is hung on the outer side of the test chamber, and the Nozzles are installed inside the test chamber;

气瓶悬挂于试验箱的外侧面，喷嘴安装于试验箱箱内；

3.12.3 The fire extinguishing device automatically or manually starts the fire extinguishing function through gas sensor or infrared fire flame detector and temperature detector;

灭火装置通过气体传感器或红外火焰火灾探测器和温度探测器自动或手动启动灭火功能；

3.13 Sprinkler fire extinguishing:

喷淋灭火系统：

3.13.1 Install sprinkler on top of inside of test chamber;

试验箱内部顶部安装喷淋装置；

3.13.2 Sprinkler fire extinguishing system consists of water inlet interface with electric valve and manual ball valve (parallel connection), sprinkler head, drainage and auxiliary piping, temperature detector, controller, etc.

喷淋灭火系统由带电动阀和手动球阀（并联）的进水接口，箱内喷淋头、排水和配套管路、温度探测器、控制器等组成；

3.13.3 The fire source to test chamber interface is the responsibility of the customer;

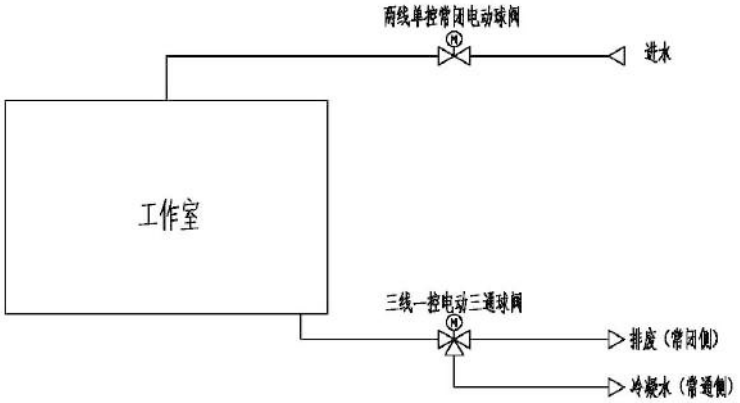
消防水源至试验箱接口由客户负责；

3.13.4 Automatically or manually start spraying after detecting dangerous situations (both temperature detectors and gas sensors are satisfied);

探测危险情况后，自动或手动启动喷淋；（温度探测器和气体传感器同时满足）

3.13.5 The drainage outlet of the test chamber is equipped with a three-wire single-control electric three-way ball valve; (The municipal drainage pipe is always connected sideways and the special sewage tank pipeline is always closed sideways)

试验箱排水口配置三线单控电动三通球阀；（常通侧接市政排水管，常闭侧接专用污水箱管路）

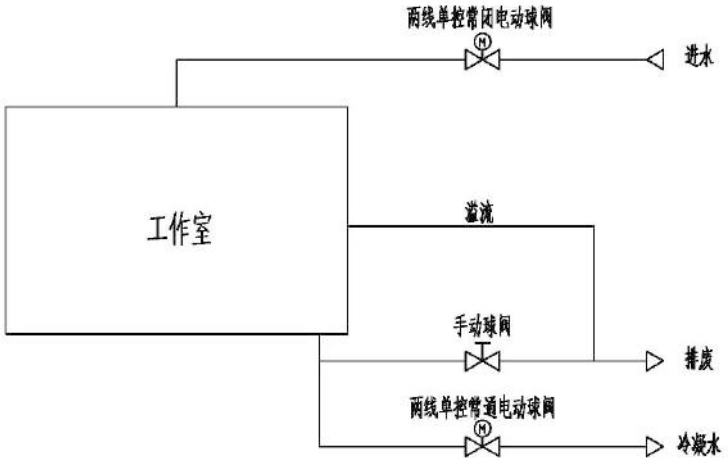


3.13.6 The outlet of the test chamber is equipped with two wire single control electric ball valve, which is linked with the sprinkler system to close the outlet;
试验箱排水口带有两线一控电动球阀，与喷淋系统联动关闭排水口；

3.13.7 After the sprinkler system is started, the water can be filled up to the height of submerged specimens and kept for 1-2 h, requiring the doors and bases not to be deformed;
喷淋系统启动后可以将水蓄满至淹没试件的高度，并保持 1～2h，要求门及底座不变形；

3.13.8 With overflow port on the height of 600mm
在 600mm 高度安装溢流口；（高度根据试件确定）

3.13.9 Configure manual waste water drain valve and separately lead out the pipeline to the waste water tank;
配置手动废水排水阀并单独引出管路到污水箱；



3.14 Fire alarm level:
消防报警级别：
Divided into one-level alarm and two-level alarm; When the gas sensors and temperature sensor give any alarm, the fire control controller triggers the first-level alarm automatically. When any two or more fire alarm signals are sent out, the fire control controller triggers the secondary alarm automatically;
分为一级报警和二级报警；当气体传感器和温度传感器任一报警，消防控制器自动触发一级报警；当任意两个或者两个以上发出报警信号时，消防控制器自动触发二级报警；

3.15 Fire alarm execution:
消防报警执行：
When first-level alarm, start the sound and light alarm, and upload the alarm signal to the upper computer

(such as the charging and discharging device test computer) and the laboratory management system. At the same time, the operator is notified to observe, and if the danger is confirmed, the fire extinguishing device is started manually. If you confirm the safety, you can cancel the alarm. When the second level alarm is in progress, the program stops running, the acousto-optic alarm starts and the fire extinguishing device starts automatically, the signal is uploaded to the upper computer system and the laboratory management system, and the operator is notified to observe and handle the danger at the same time;

一级报警时，启动声光报警、报警信号上传给上位机（例如充放电设备测试电脑）和实验室管理系统。同时通知操作人员观察，如确认危险，则手动启动灭火装置；如确认安全，可以取消报警。二级报警时，停止运行的程序，声光报警启动、自动启动灭火装置，信号上传给上位机系统和实验室管理系统，同时通知操作人员观察和处理危险；

3.16 Interface to automation system:

和系统集成商的接口：

3.16.1 The data transported to automation system

提供给集成商的数据：

Measurement size	Range	Accuracy	Rate
Test temperature	-60…+100℃	±0,5 K	1 Hz
Test humidity	0…100% RH	±3% RH	1 Hz

3.16.2 Different communication interfaces are available:

可以提供多种通讯接口：

- Digital I/O system for alarm:

  数字量的通讯：

  One digital relay output to inform external equipment when chamber alarms occur;

  一个无源继电器输入信号（ON/OFF）：通知试验箱外部设备发生报警；

  One digital relay input to inform chamber when external equipment alarms occur;

  一个无源继电器输出信号（ON/OFF）：通知外部设备试验箱发生报警；

- Communication protocol: CAN2.0, CAN Open, Modbus/RTU, Modbus/TCP and other communication protocols are optional, which can communicate with the mainstream charging and discharging systems in the market;

  通讯协议：CAN2.0, CAN Open, Modbus/RTU, Modbus/TCP 等通讯协议可选，可以和市场上主流的充放电系统进行通讯联动；

4 Air-conditioning System/空气调节装置:

4.1 Regulation and control: Forced circulation for temperature and humidity regulation; Independent PID regulation to achieve consecutive cooling and heating capability; No energy waste deriving from extra heating to compensate extra cooling;

调节和控制：强制对流调温调湿式；独立的冷端和热端 PID 调节，热量和冷量均可连续调节，避免了制冷量和加热量对冲而造成的能源浪费；

4.2 Air-circulation equipment: Powerful blowers driven by external motors with stainless steel shafts;

空气循环装置：带有不锈钢轴的外部电机驱动的高效率风扇；

The impeller and shell will be design to keep safety distance, and using special material to prevent the spark by mechanical friction or collision;

空气循环系统的风机和叶轮设计有安全间隙；并采用特殊材料，避免机械摩擦碰撞时产生电火花；

The air will be driven by the blowers driven the motors to exchange the heat between air and specimen by convection;

空气由电机带动的风扇驱动，通过空气对流对试件进行换热；

4.3 Heating: Nickel-chromium alloy wire heater with the temperature protection switch, controlled by SSR;

加热：配备温度保护开关的镍铬金属丝加热器，SSR 控制；

The temperature of the convective air increases after passing through the heating wire, which expands the heat to the air in the chamber and the test piece, playing the role of heating up;

对流空气经过加热丝后温度升高，把热量扩展到箱内的空气及试件上，起到加热升温的作用；

The power of heaters can be precisely controlled by PID algorithm, and powered by solid state relay;

加热功率由 PID 算法精确控制，通过固态继电器来调节输出功率；

4.4 Heating: spiral finned tube heater with the temperature protection switch, controlled by SSR;

加热：配备温度保护开关的螺旋翅片管加热器，SSR 控制；

The spiral finned tube heater adopts armored structure, and the heating wire is effectively isolated from the air to avoid possible open fire;

螺旋翅片管加热器采用铠装式结构，加热丝与空气有效隔离，避免可能的明火产生；

The temperature of the convective air increases after passing through the heater, which expands the heat to the air in the chamber and the test piece, playing the role of heating up;

对流空气经过加热器后温度升高，把热量扩展到箱内的空气及试件上，起到加热升温的作用；

The power of heaters can be precisely controlled by PID algorithm, and powered by solid state relay;

加热功率由 PID 算法精确控制，通过固态继电器来调节输出功率；

4.5 Cooling mode: Direct cooling of refrigeration system;

冷却模式：制冷系统直接冷却；

The heat in the test chamber is transferred to the outside of the chamber through the heat exchange of the refrigerant circulating in the refrigeration system to achieve the purpose of cooling;

试验箱内的热量通过在制冷系统中循环的制冷剂作热交换转移到箱外，实现降温目的；

The power of cooling can be precisely controlled by PID algorithm, and the flow and cooling capacity of refrigeration is powered by solenoid valve;

制冷功率由 PID 算法精确控制，通过电磁阀来调节制冷剂的流量和冷量；

4.6 Dehumidification: The dehumidification is realized by means of a "cold finger" evaporator in the refrigeration system, the water in the air condensates on its surface and the moisture is separated from the air to achieve the purpose of dehumidification;

除湿系统：通过制冷系统中一种叫做“冷指”的蒸发器来完成，空气中的水分在其表面凝露，水分从空气中析出，达到除湿目的；

The power of dehumidification can be precisely controlled by PID algorithm, and the flow and cooling capacity of refrigeration is powered by solenoid valve;

除湿由 PID 算法精确控制，通过电磁阀来调节制冷剂的流量和冷量；

4.7 Humidification system: Cr-Ni-Mo stainless steel tubular humidifier;

加湿系统：不锈钢管式蒸汽发生器；

The humidifier is equipped with water purifier, stainless steel armored heater, water level switch, over-temperature switch, pump, drain valve, etc.;

加湿器配有净水器，不锈钢铠装加热器，液位开关，超温开关，水泵，排水阀等；

The humidification power is precisely controlled by SSR through PID algorithm;

加湿功率由 SSR 通过 PID 算法精确控制；

Humidification water supply: The test chamber is equipped with an independent water storage tank, which

can automatically supply water by pure water through the water purifier with the test chamber in real time, or manually add pure water to the water storage tank when the water is cut off; the capacity of the water storage tank can meet the requirements of conventional humidity test when the water is cut off;
加湿水补水方式：试验箱配备独立的储水箱，可以由去离子水自动通过试验箱配备的净水器实时补水，也可以在断水的情况下手动添加纯净水补水；储水箱的容量能满足断水情况下的常规湿度试验需求；

5 Refrigeration System/制冷系统:

5.1 Refrigeration system features:
制冷系统的特色：

5.1.1 An automatic protection design is incorporated into the cooling system and realized by injecting liquid refrigerant into compressor suction pipe. This design can prevent compressor from overheating during the cooling down period from high temperature environment;
制冷系统的设计采用了全自动的保护措施。通过将液体制冷剂喷射到压缩机吸气管路来防止压缩机在高温环境冷却阶段产生过热现象；

5.1.2 Consecutive capacity regulation capability; temperature control is realized through cooling or heating, rather than cooling and heating at the same time; the cooling capacity can be regulated from 10%~100%, refrigerant flow rate is step less regulated;
压缩机冷量连续可调：试验过程压缩机的制冷能力输出连续可调，既保证试验室的温湿度控制精度，同时也节约了试验室的运行能耗，防止冷热量对冲而导致能源浪费；

5.1.3 The compressor is equipped with pressure switch and pressure sensor. The pressure sensor can read the operating pressure in real time, cooperate with the pressure switch, and automatically coordinate the refrigeration system to ensure that the operating pressure and suction and discharge temperature of the compressor are in the best state of the design process under different temperature conditions. Even if the compressor is started at 100℃~ 150℃ for cooling, the service life and operation safety of the compressor can be guaranteed;
压缩机安装有压力开关和压力传感器，压力传感器能够实时的读取运行压力，与压力开关相互配合，自动协调制冷系统，确保在不同的温度工况条件下，压缩机运行压力、吸排气温度在设计工艺的最佳状态，既使在 100℃～150℃开启压缩机进行降温也能保证压缩机的工作寿命和运转的安全性；

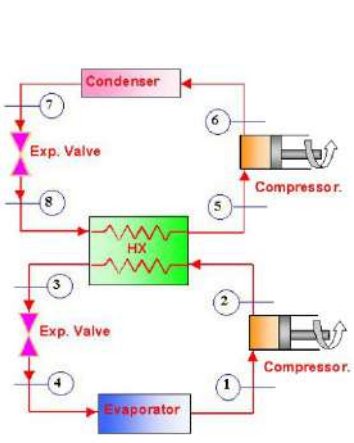
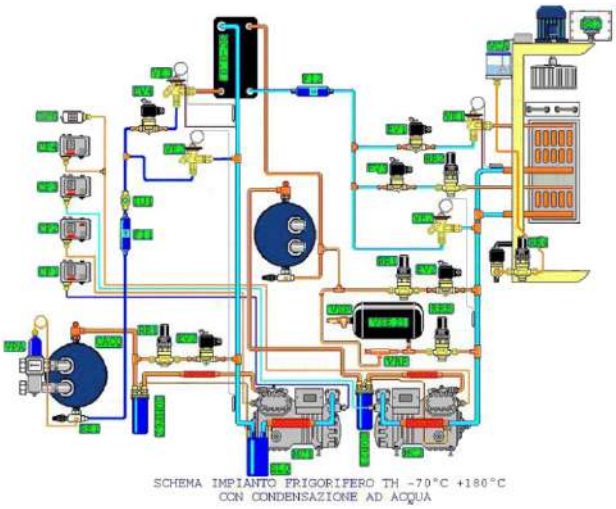


Fig. 1. A two-stage cascade refrigerator



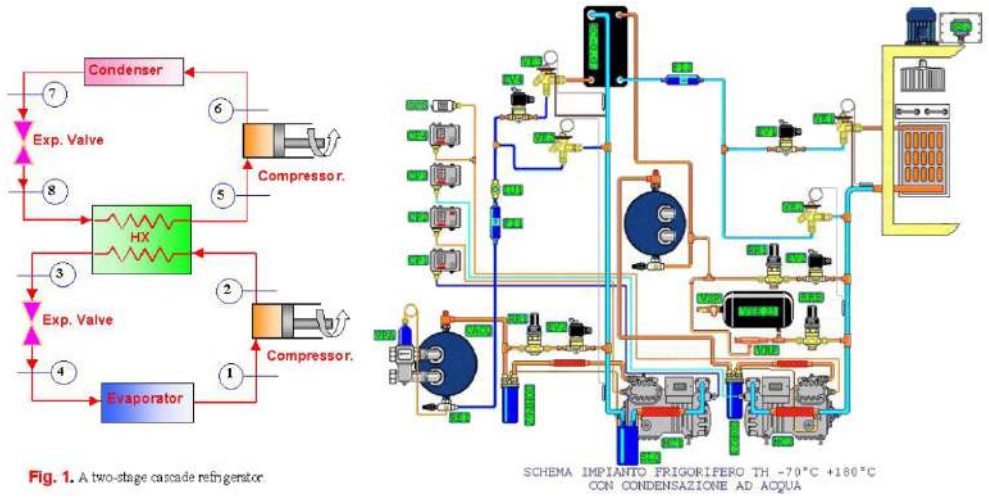


Fig. 1. A two-stage cascade refrigerator

(Demonstration of Refrigeration System Design)

(供参考的制冷系统设计)

5.2 Refrigeration System Composition:

制冷系统组成：

5.2.1 Refrigerant: environment-friendly fluorine coolant R404a & R23;

制冷剂：环保制冷剂 R404a & R23；

5.2.2 Refrigeration mode: Mechanical compression cascade system;

制冷方式：机械压缩复叠制冷系统；

5.2.3 Refrigeration compressor: France Tecumseh hermetic compressors x 2;

制冷压缩机：法国泰康全封闭压缩机 x 2；

5.2.4 Refrigeration compressor: Emerson (Copeland) Worm Compressor x 2;

制冷压缩机：美国艾默生（谷轮）蜗旋压缩机 x 2；

5.2.5 Refrigeration compressor: Germany Bitzer semi-hermetic compressors x 2;

制冷压缩机：德国比泽尔半封闭压缩机 x 2；

5.2.6 Evaporator: high efficiency fin evaporator;

蒸发器：高效散热片式蒸发器；

5.2.7 Condenser: water-cooled condenser;

冷凝器：水冷冷凝器；

Note: Please clean the cooling water filter regularly, otherwise the cooling efficiency will be reduced and failure will be caused;

注：请定期清理冷却水过滤器,否则会引起制冷效率下降和故障；

5.2.8 Condensation mode: air-cooled condenser;

冷凝模式：风冷冷凝器；

Note: please note the ambient temperature around the condenser shall be no more than +25℃;

注：请保持风冷冷凝器周围的环境温度不要高于+25℃，否则会由于压缩机效率降低而影响降温速率；

5.2.9 Heat exchanger: plate heat exchanger;

热交换器：板式换热器；

5.2.10 Stainless steel condensate tray: connect with the drainage system of the test chamber;

不锈钢凝水盘：与试验箱排水系统连通；

6 Control system/控制系统:

6.1 Sampling sensor/传感器:

6.1.1 Temperature measurer and sensor: Shielded heat resistance Pt100 x 1;
温度传感器：Pt100 铂电阻 x 1；

6.1.2 Humidity sensor: Capacitive humidity sensor HMM100 from Vaisala x 1; maintenance-free device for humidity measurement, and there is no need for changing the wet bulb temperature gauze; higher accuracy and reliability is available;
湿度传感器：Vaisala 电容式电子湿度传感器 x 1，免维护型湿度测量装置，避免了需要不停更换湿球纱布的不便；具有更高的测量精度和可靠性；

6.1.3 Humidity measurer and sensor: Shielded heat resistance Pt100 x 1;
湿度传感器：Pt100 铂电阻 x 1；

6.2 Digital adjustable over-temperature protector x1: with independent alarm temperature sensor
数字型可调超温保护器 x1：带独立报警温度传感器；

6.3 PLC/可编程控制器：
Germany Siemens PLC S7 series is used in the system for more reliable performance;
采用德国西门子的 S7 型号 PLC 确保更加可靠的性能；

6.4 Controller/控制器：

6.4.1 Type of controller: AZ1000-TH;
控制器型号：AZ1000-TH；

6.4.2 Language: Chinese/English;
语言：中文/英语；

6.4.3 M-M interface: 10.2” TFT liquid-crystal colorful displayer;
M-M 界面：10.2” TFT 液晶彩色显示器；

6.4.4 Setting: Touch panel method;
设置：触摸面板方式；

(Demonstration of Software System)
(供参考的软件设计)

6.4.5 Resolution: Temperature: 0.1℃; Humidity: 0.1%RH; Time: 1min;

分辨率：温度：0.1℃；湿度：0.1%RH；时间 1 分钟；

6.4.6 Set-range: Temperature: -70℃～+150℃; Humidity: 0～100%;

设定范围：温度：-70℃～+150℃；湿度设定范围：0～100%；

6.4.7 User procedure capacity: 50 programmable programs, with maximal 60 steps(segments) in each procedure, and the procedures is linkable;

程序容量：50 个可编程程序，每个程序最大 60 步，程序可以链接；

6.4.8 Operation mode: Constant value operation, program operation;

运行方式：定值方式、程序方式；

6.4.9 Experimental data display: Preset value, measured value, total operation time, segment operation time, segment remaining time, heating status;

试验数据显示：预设值，测量值，总运行时间，每一段的运行时间和剩余时间，加热状态；

6.4.10 Failure information: in abnormal case, display the failure status and possible reason;

故障信息：发生故障时，显示故障状态和可能的原因；

6.4.11 Equipped with LAN interface to PC, the upper computer software installed on the computer can monitor the test chamber in real time and import and export the data;

配有 LAN 接口与计算机连接，可通过计算机上安装的上位机软件对试验箱实时监控和数据导入导出；

6.4.12 Automatic selection of air conditioning system: According to different test conditions, select the air conditioning system working status;

根据不同的试验工况自动选择空调系统运行状态；

6.4.13 Three level authority operation and password protection of the controller;

控制器三级权限操作及密码保护；

6.4.14 Advanced function: Timing operation, operation record, PID series subarea and PID series auto-adjustment, manifold offset, online help;

高级功能：定时功能，运行数据记录，PID 分区和自动整定，偏差设定，网上帮助等；

6.4.15 Recording function: The memory of the controller can record the test curve and data, equipment status, alarm record and the data can be downloaded by USB;

记录功能：控制器的内存能够自动记录测试曲线和数据，设备状态，报警状态等，并且能够通过 USB 下载；配备历史数据回放以及转换软件；

6.4.16 Test curve online display system on the touch screen;

测试曲线和数据直接查询，不需在 SD 卡中寻找时间文件再打开，显示屏历史曲线查询中可方便查取每分钟的温湿度数据；

6.5 Controller/控制器：

6.5.1 Type of controller: ZD2000;

控制器型号：ZD2000；

6.5.2 Language: Chinese/English;

语言：中文/英文；

6.5.3 M-M interface: 10.2” TFT liquid-crystal colorful displayer;

M-M 界面：10.2” TFT 液晶彩色显示器；

6.5.4 Setting: Capacitive screen touch mode;

设置：电容屏触摸方式；

6.5.5 Resolution: Temperature: 0.1℃; Humidity: 0.1%RH; Time: 1～60S adjustable;

分辨率：温度：0.1℃；湿度：0.1%RH；时间 1～60 秒可调；

6.5.6 Resolution: Temperature: 0.1℃; Time: 1～60S adjustable;

分辨率：温度：0.1℃；时间 1～60 秒可调；

6.5.7 Set-range: Temperature: -70℃～+150℃; Humidity: 0～100%;
设定范围：温度：-70℃～+150℃；湿度设定范围：0～100%；

6.5.8 Set-range: Temperature: -40℃～+150℃;
设定范围：温度：-40℃～+150℃；

6.5.9 User procedure capacity: 100 programmable programs, with maximal 100 steps(segments) in each procedure, and the procedures is linkable;
程序容量：100 个可编程程序，每个程序最大 100 步，程序可以链接；

6.5.10 Operation mode: Constant value operation, program operation;
运行方式：定值方式、程序方式；

6.5.11 Experimental data display: Preset value, measured value, total operation time, segment operation time, segment remaining time, heating status;
试验数据显示：预设值，测量值，总运行时间，每一段的运行时间和剩余时间，加热状态；

6.5.12 Failure information: in abnormal case, display the failure status and possible reason;
故障信息：发生故障时，显示故障状态和可能的原因；

6.5.13 Supports network communication to connect to other devices;
支持网络通讯同其他设备连接；

6.5.14 Equipped with LAN interface to PC, the upper computer software installed on the computer can monitor the test chamber in real time and import and export the data;
配有 LAN 接口与计算机连接，可通过计算机上安装的上位机软件对试验箱实时监控和数据导入导出；

6.5.15 Support third-party peripheral equipment, such as camera, code scanner, etc., and incorporate information into historical records for export;
支持第三方外设，例如摄像头，扫码枪等，并能将信息并入历史记录导出；

6.5.16 Automatic selection of air conditioning system: According to different test conditions, select the air conditioning system working status;
根据不同的试验工况自动选择空调系统运行状态；

6.5.17 Three level authority operation and password protection of the controller;
控制器三级权限操作及密码保护；

6.5.18 Advanced function: Power failure hold function, timing operation, operation record, PID series subarea and PID series auto-adjustment, manifold offset, online help;
高级功能：断电保持功能，定时功能，运行数据记录，PID 分区和自动整定，偏差设定，网上帮助等；

6.5.19 Recording function: The memory of the controller can record the test curve and data, equipment status, alarm record and the data can be downloaded by USB;
记录功能：控制器的内存能够自动记录测试曲线和数据，设备状态，报警状态等，并且能够通过 USB 下载；配备历史数据回放以及转换软件；

6.5.20 Test curve online display system on the touch screen;
测试曲线和数据直接查询，不需在 SD 卡中寻找时间文件再打开，显示屏历史曲线查询中可方便查取每分钟的温湿度数据；

6.5.21 Software convenient HMI is easy for operators;
方便实用的人机接口，使得操作和调整变得简单便捷；

(Demonstration of Software System)

(供参考的软件设计)

7 Standard Components for Reference/标准件参考：

7.1 Compressors/制冷压缩机——比泽尔、泰康、谷轮

Bitzer Tecumseh COPELAND Scroll Compressors

7.2 Refrigeration components/制冷元器件——丹佛斯、卡士托、斯波兰、阿法拉法

Danfoss Castel SPORLAN Alfa Laval Uniting vital technologies

7.3 Electrical components/电气元器件——施耐德、西门子、菲尼克斯、汇川技术

Schneider Electric SIEMENS PHOENIX CONTACT INOVANCE

8 Security Protection System/安全保护系统:

8.1 Independent short circuit and over current protection of control circuit/控制电路独立短路和过流保护

8.2 Lack or reverse or voltage of power phase protection/电源缺相、相序和过欠电压保护

8.3 Over-temperature and under-temperature protection/过温和低温保护

8.4 Over temperature protection of heater/加热器超温保护

8.5 Over-current protection of fan motor/风机过流保护

8.6 Over-pressure protection of compressor/压缩机超压保护

8.7 Overheating protection of compressor/压缩机过热保护

8.8 Over-current protection of compressor/压缩机过流保护

8.9 Water-shortage protection of humidifier/加湿器缺水保护

8.10 Overheating protection of humidifier/加湿器过热保护

8.11 Related protection of battery testing/电池测试相关保护

8.12 Emergency button/急停开关

9 Equipment Working Condition/设备工作条件:

9.1 Ambient Environment/环境要求：

9.1.1 Ambient temperature/环境温度：+5℃～+35℃

9.1.2 Relative humidity/相对湿度：≤80%RH

9.2 Power supply/电源要求：

9.2.1 Power voltage/电压：AC380V±10%，3P + N + PE

9.2.2 Frequency/频率：50±0.5Hz

9.2.3 Max 最大. power/最大功率：15KW

9.2.4 Max. current/电流：29A

9.3 Humidification water supply/加湿水要求：

9.3.1 Max. water consumption/最大耗水量：4L/h

9.3.2 Conductivity/电导率：5-20 μS/cm

9.3.3 Rigidity/硬度：≤0.03mmol/L (1.5mg/L, accounting by CaCO3/测量标准为碳酸钙)

9.4 Cooling water supply/冷却水要求：

9.4.1 Temperature/温度：≤32℃

9.4.2 Water pressure/水压：>2bar

9.4.3 Water flux/流量：2m^3/h

9.4.4 Pipe diameter /接口尺寸：DN25

9.5 Fire fighting water supply/消防水要求：

9.5.1 Water pressure/水压：≥2bar

9.5.2 Water flux/流量：≥3.6m^3/h

9.5.3 Pipe diameter /接口尺寸：DN25

10 Acceptance Test/验收试验:

10.1 Highest and lowest temperature

最高温度和最低温度

10.2 Heating up and cooling down time

温度上升和下降时间

10.3 Typical humidity test point

典型湿度工况

11 Customer Responsibility/用户的职责:

11.1 Floor Foundations – If necessary, provide the foundation according to vendor supplied information;

土建地基–如果必要的话，根据供应商提供的信息提供土建设计和建造，以及土建回填工作；

11.2 Main Power Supply Connection – If necessary, material & Labor, according to vendor supplied information to agreed nominated location;

主电源连接–提供材料和劳动力，接到我方设备的接口处；

11.3 Humidification Water Connection – If necessary, material & Labor, according to vendor supplied information to agreed nominated Demonized location;

去离子水连接–如果设备有去离子水要求的话，提供材料和劳动力，接到我方设备的接口处；

11.4 Cooling Water Connection – If necessary, material & Labor, according to vendor supplied information to agreed nominated location;

冷却水连接–如果设备有冷却水要求的话，提供材料和劳动力，接到我方设备的接口处；

11.5 Compressed Air Connection – If necessary, material & Labor, according to vendor supplied information to agreed nominated location;

压缩空气连接–如果设备有压缩空气要求的话，提供材料和劳动力，接到我方设备的接口处；

11.6 Drainage – If necessary, provide drainage according to vendor supplied information;

排水–如果设备有排水要求的话，提供材料和劳动力，接到我方设备的接口处；

11.7 Unpacking – Labor to unpack the package;

拆箱 - 拆包装的劳动力；

11.8 Rigging & Lifting – Provide tools and labor to carry the chamber to required location;

索具及起重–提供工具和劳动力将试验室移动到厂内要求的地点；

12 After-sale Service/售后服务:

12.1 Charge-free warranty will last for 1 year from the date of equipment acceptance;

设备的无偿保修期限为壹年，从设备验收之日起计算；

12.2 During the equipment warranty period, the maintenance service for non-human factor faults is free, and the replacement of fault parts is provided free of charge;

设备保修期内非人为因素故障免费维修服务，并免费提供故障零件更换；

12.3 If the equipment is damaged artificially during the warranty period, the replacement parts will be charged separately or settled through negotiation;

设备保修期内人为性损坏故障，所需更换零件则另行收费或协商解决；

12.4 Technical maintenance services beyond the warranty period and replacement of damaged parts will be charged as appropriate;

设备保修期以外的技术维修服务技术服务及损坏的零部件更换将酌情收费；

12.5 Corresponding time of after-sales service: within 24 hours;

售后响应时间：国内 24 小时内；

13 Accessories/附件:

13.1 The certificate of quality: one copy

合格证书：1 份

13.2 Warranty card: one copy

质保证书：1 份

13.3 Instruction Manual: one copy

操作手册：1 份

13.4 Electrical diagram: one copy

电气原理图：1 份