

SANWOOD

One-Stop Test Solutions Provider

Thermal Test System



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Technical Specification For Thermal Test System



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1. Equipment introduction

This equipment is a Thermal Test System for high/low temperature air stream thermal shock, developed and manufactured by Sanwood. It applies hot and cold air streams directly onto the Device Under Test (DUT) to achieve rapid temperature switching. It is widely used for temperature cycling, rapid temperature change, and high/low temperature thermal shock reliability testing of semiconductors, optical fibers, advanced technology, telecommunications, sensors, automotive, electronic testing, aerospace/defense and other products. It meets the requirements of laboratory R&D verification, mass production screening, failure analysis and other applications.

Typical applications: dynamic hot/cold testing, temperature cycling testing, product engineering, back-end final test, incoming inspection, IC sorter verification, functional testing, failure analysis, environmental stress screening, etc.

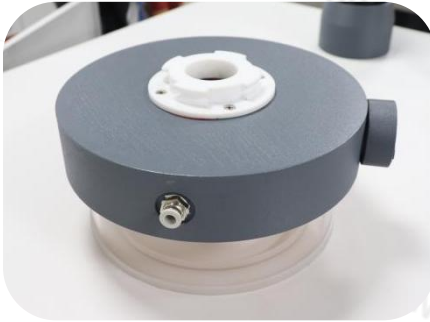
For products such as automotive electronics, chip semiconductors, aerospace, and aviation, as well as testing institutions such as quality inspection institutes, research institutes and universities, it provides a virtual space simulating real environments for product inspection and verification of R&D results. The tester is an indispensable assistant for shortening development cycles and improving product quality and reliability.

2. Core technical advantages

Energy Saving	Unique architecture saves up to 50% power consumption
Universal Power Supply	220~230V AC, 50/60Hz, no reconfiguration required
Quiet Operation	Auto-cascade refrigeration technology, noise level <65dBA
No LN₂/CO₂ Required	Built-in refrigeration unit and air dryer
Rapid Temperature Switching	Typical temperature switching time <10 seconds
Precise Control	Temperature accuracy $\pm 0.5^{\circ}\text{C}$, resolution $\pm 0.1^{\circ}\text{C}$
Flexible Mechanical Adaptation	Standard telescopic arm-lifting mechanism with adjustable thermal stream probe angle; It comes with a variety of glass heat shields and flexible duct accessories to accommodate different test devices such as chips, BGAs, power modules and optical modules.
Comprehensive Certification	Compliant with CE certification and ISO 9001 quality management system

3. Main technical parameters

Product Name	Thermal Test System
Product Model	SMS-810-10S
Cooling Method	Air-cooled
Temperature Range	-80°C ~ +225°C Note: During equipment operation, the air outlet temperature can reach up to +225°C and as low as -80°C. Do not directly face the air outlet to prevent frostbite or burns
Typical Temperature Change Rate	-55°C ~ +125°C, bidirectional switching time is approx. 10 seconds
Pre-cooling Time	RT to -40°C, ≤10min; RT to -80°C, ≤20min;
Temperature Control Accuracy	±0.5°C
Display Resolution	±0.1°C
Air Flow Rate	4~18 SCFM (1.89~8.50 L/S)
Main Control Interface	10-inch TFT high-definition color touch screen 
System Language	Chinese/English bilingual switching
Operation Mode	Manual set-point mode / program operation mode
Temperature	AIR control mode / DUT control mode

Control Mode	
Temperature Acquisition Mode	Internal thermocouple / remote/external supports Type T and Type K thermocouples
Communication Interface	LAN and CAN communication interfaces, supporting remote monitoring via host computer
Refrigerant	Mixed eco-friendly refrigerant
Lifting Mechanism Control	Lifting rod: electrically driven; impact head (HEAD): pneumatically controlled; supports local operation and remote interface control; 
Cantilever Extension Dimensions	Max vertical lifting displacement: 594mm; Max horizontal extension displacement: 1,141mm. 
Insulation Hood Dimensions	Glass insulation hood: $\Phi 186\text{mm}$ 
Main Unit Maximum Dimensions	W1930*H2163*D911mm Note: The width dimension is the maximum size with the mechanical arm fully extended;

Power Requirements	AC 220V 50Hz, single-phase 3-wire; Max operating power: approx. 6.5kW; Max operating current: approx. 30.6A; Equipped with 32A circuit breaker; power cable: 2x6.0mm² + 1x4.0mm².
Noise Level	≤72dB (measured at 1m from the equipment door, at 1.2m height)
Net Weight	Approx 239kgs, equipped with 4 anti-static swivel casters
Usage Precautions	1. The equipment temperature switching time and actual air flow rate are affected by sample size, fixture structure, environmental conditions, and air supply stability. Rated parameters are measured under standard operating conditions; 2. The air supply, pressure-stabilizing piping, and power distribution wiring are to be provided by the customer according to the specification requirements; 3. Do not place your hand under the impact head when adjusting its position to prevent pinching injuries; 4. During sample testing, maintain a reasonable distance between the impact head and the sample to avoid directly squeezing the DUT; 5. Sanwood reserves the right of final interpretation if technical parameters are upgraded or optimized. The formal contract is subject to the version confirmed by both parties.

3.1 Meets Test Standards

Test Standards	IEC 60068-1 Environmental Testing - General IEC 60068-2-1 Test A: Low Temperature IEC 60068-2-2 Test B: High Temperature
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	IEC 60068-2-14 Test N: Temperature Cycling JESD22-A104 Temperature Cycling JESD22-A106 Thermal Shock JESD22-A118 Rapid Thermal Cycling MIL-STD-810H Environmental Engineering Considerations and Laboratory Tests - Method 501 (High Temperature), 502 (Low Temperature), 503 (Temperature Shock), 505 (Temperature Cycling) AEC-Q100 Stress Test Qualification for Integrated Circuits Chapters: Temperature Cycling, Temperature Shock, High/Low Temperature Operating Life AEC-Q101 Discrete Semiconductor Devices AEC-Q102 Optical-electronic Semiconductors ISO 16750-4 Road Vehicles - Environmental Conditions and Testing for Electrical and Electronic Equipment: High/Low Temperature, Temperature Cycling
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4. Equipment Composition

4.1 Equipment Function Introduction

This equipment is a localized spot temperature forcing system (Thermal Test System). It adopts fully sealed auto-cascade mechanical refrigeration to output controllable clean hot/cold air streams, directly applying spot temperature loading to the Device Under Test (DUT) without the need to place the entire board/unit into a temperature chamber. It supports in-situ powered testing; electric lifting adjustment and pneumatic impact head control; supports both air stream temperature control and direct thermocouple temperature control on the sample; bilingual Chinese/English touch screen system with remote communication capability to host computer.



Equipment	1. Control Panel
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Functions

Touch screen, emergency stop button, USB interface



2. Dual Temperature Control Modes

Supports both air stream (AIR) temperature control and direct thermocouple temperature control on the DUT. Can be flexibly switched according to test standards for precise control of actual sample temperature.



3. Ultra-Fast Temperature Switching

Single-unit auto-cascade refrigeration architecture enables rapid switching between hot and cold air streams, achieving high/low temperature alternation in a short time to meet chip rapid temperature change and thermal shock testing requirements.

4. Programmable Operation

Built-in multi-step program editing function allows setting temperature, dwell time, and cycle

count, automatically running the entire test process; supports manual single-point constant temperature operation.

5. Comprehensive Communication Expansion

Standard LAN + CAN communication interfaces can connect to customer test host computers and production line MES systems for remote start/stop, data acquisition, and status monitoring.



6. Electric Lifting + Pneumatic Impact Head

The impact head is pneumatically driven, and the lifting rod is electrically adjusted for height to accommodate samples of different sizes; supports local touch screen operation and remote signal control for easy integration into test fixtures. The touch screen interface is equipped with up/down buttons for slow adjustment of the impact head height, and the lifting can also be controlled via the controller on the cantilever arm;



7. Cantilever Bracket

Provides horizontal extension and vertical lifting adjustment, allowing free adjustment of the thermal stream probe height and front/back position to precisely align with the DUT, adapting to different test bench heights, PCB boards, and chip module layouts. The probe weight is carried by the cantilever, eliminating the need for operators to hold it by hand. During testing, the probe angle and distance can

be fine-tuned for repeated alignment and sample replacement.



8. Comprehensive Safety Protection System

Equipped with multiple safety interlocks including over-temperature protection, compressor overload protection, low air supply pressure alarm, abnormal flow alarm, etc., ensuring the safety of the equipment and test samples.

9. Bilingual Operation Interface

The equipment is equipped with a 10-inch high-definition touch screen with one-click Chinese/English switching, suitable for both domestic and overseas customers.

Refrigeration System

● Compressor

The working chamber adopts a single-unit auto-cascade refrigeration system composed of fully hermetic piston compressors.

● Evaporator

Adopts sloped copper fin evaporator with automatic defrosting function or anti-frosting function for the evaporator.

● Cooling Method

Air-cooled

● Condenser

Air-cooled fin-type condenser with cooling fan heat dissipation;

● Throttling System

Adopts throttling device that automatically adjusts refrigerant flow according to the load for faster stabilization and energy saving.

● Refrigeration Solenoid Valve

a. The main refrigeration solenoid valve and hot gas bypass solenoid valve are selected from well-known brands such as Sporlan, Saginomiya, Castel and etc.;

- b. Necessary refrigerant pressure-reducing and buffering measures must be taken for the main refrigeration solenoid valve and hot gas bypass solenoid valve, such as copper tube bending, adding manual valves, capillary tubes, etc.;
- c. When welding solenoid valves, the valve head must be disassembled and necessary valve core cooling protection measures must be taken to prevent valve core deformation caused by excessive welding temperature, which could lead to solenoid valve leakage during use.

● Refrigerant

Adopts mixed environmentally-friendly refrigerant.



● Temperature Measurement Method

Temperature: Type T / Type K thermocouple;

● Controller

Adopts Sanwood self-developed control system with **10-inch color LCD touch screen**, allowing direct input, display, and control of temperature and flow rate; bilingual Chinese/English operation interface with one-click switching.

Displays test start time, elapsed time, remaining time, and estimated end date and time



● Function Menu

Measurement
and Control
System

a. Manual operation, program editing, parameter setting, communication setting, system setting, language switching.

b. Alarm message pop-ups;

c. Current set temperature, actual outlet temperature / DUT temperature, flow rate;

d. Running status, running time, cycle count;

- **Temperature Control Mode Selection**

AIR control mode / DUT control mode

- **Operation Mode**

Manual mode / program mode

- **Control Method**

Adopts intelligent microcomputer PID + SSR/SCR with automatic forward/reverse bidirectional synchronous output.

- **Operation Modes**

Three operation modes are available: manual setpoint / program / linkage, meeting various temperature test conditions.

- **Program Capacity**

120 program groups can be set, with a maximum of 100 segments per program. Multiple cycles (overall cycle and segment cycle) can be set, and programs can be linked.

- **Cycle Setting**

Each operation program can execute 9,999 cycles or infinite repeated cycles. Each operation program can be further divided into 4 segment groups for additional partial cycles.

- **Curve Display**

Set-point and actual value curves are displayed in real time. When temperature, time, cycle count and other data are set, the corresponding setting curve is immediately available, and the actual operating curve can also be viewed during operation.

- **Data Storage and Communication Functions**

a. Data can be stored to USB flash drive via USB interface, supporting hot-plug and direct download to USB drive; data can be copied or directly displayed and printed via PC. Data can be directly exported as CSV format with automatic saving. The export data format follows the operating system language.

b. Equipped with standard LAN Ethernet communication interface, enabling remote communication management between the central control instrument and computer. Open communication protocol is provided with communication protocol manual.

- **High-Precision Closed-Loop Temperature Control**

Supports dual modes of air stream temperature control and DUT thermocouple closed-loop temperature control; real-time acquisition of temperature, pressure, and flow signals with dynamic adjustment of electronic expansion valve and heating power to suppress temperature overshoot and ensure constant temperature accuracy.

- **Multi-Segment Temperature Program Logic Management**

Built-in program scheduling engine supports editing multi-segment ramp, soak, and cycling test curves; automatically executes temperature cycling and thermal shock sequences with precise control of high/low temperature switching, dwell time, and cycle count.

- **Comprehensive Safety Interlock Protection**

Real-time monitoring of compressor discharge temperature, system pressure, air supply pressure, overload, leakage, etc.; multi-level alarms for high/low temperature over-limit, abnormal pressure, air supply loss, communication failure, etc., triggering protection logic to prevent damage to the equipment and DUT.

- **Local HMI Collaborative Control**

PLC and 10-inch touch screen work in real-time coordination to complete parameter setting, curve display, operation logs, and fault code display; supports operator permission level management, distinguishing manual mode and automatic program mode.

- **Anti-Interference Industrial Design**

Hardware is optimized for electromagnetic environments in laboratories and production lines with strong anti-interference capability; supports power-loss memory and fault recording. Test programs can be restored after restart, suitable for long-duration continuous reliability testing.

4.2 Safety Protection Functions

Refrigeration System	Compressor overload, over-high pressure, low pressure protection
Test Chamber	Controller or PLC high/low temperature limit protection, electronic independent over-temperature protection

Heating System	Mechanical over-temperature protection of heating tube, heating tube short-circuit protection
Power Supply	Power leakage/circuit breaker, under-voltage, over-voltage protection; Reliable grounding protection device, static bridging on distribution cabinet door; Control circuit overload or short-circuit protection.
Air Supply Protection	Compressed air low pressure alarm, abnormal flow alarm

4.3 List of Main Accessories

Name	Brand	Remarks
Controller	Sanwood Self-developed	
Refrigeration Compressor	Tecumseh	Imported from oversea
Condenser	Sanwood Customized	
Drier Filter	Danfoss/Saginomiya	Denmark/Japan
Solenoid Valve	Saginomiya/Sporlan/Castel	Japan/USA/Italy
Pressure Switch	Danfoss/Saginomiya	Japan/Denmark
Leakage Protection Switch	LS/Schneider Electric	Korea/France
AC Contactor	Schneider	
Thermal Overload Relay	Schneider	
Solid State Relay	Carlo Gavazzi / JIALE	
Temperature Sensor	DeMing	Taiwan, China
Over-Temperature Protection	RAINBOW	Korea

Note: The above components use international brands or equivalent premium brands

4.4 Equipment Appearance Requirements

- The equipment exterior color is international color code RAL9003 (sand-textured white), and can also be customized according to customer requirements.
- Equipment noise is measured directly in front of the equipment door, 1m from the outer wall and at a height of 1.2m.
- **Equipment LOGO Requirements**

The Sanwood LOGO is attached to the front of the equipment; customer LOGO can also be customized;

- **Electrical Identification**

All electrical wiring has wire labels, and all electronic components have function description labels;

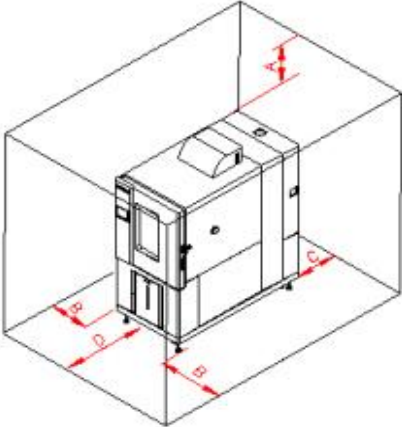
- **Piping and Electrical Specifications**

The distribution box has physical isolation, and air pipes, refrigerant pipes, etc. are labeled with medium and flow direction;

- **Equipment Nameplate**

The equipment nameplate must indicate the factory serial number, total power, model, production date and other necessary information;

5. Conditions of Equipment Usage

Site Requirements	Floor drain within 2 meters of the equipment Floor load capacity no less than 500kg/m² The equipment is placed horizontally in a well-ventilated laboratory with sufficient space around for operation and maintenance: A: No less than 30cm B: No less than 50cm C: No less than 70cm D: No less than 90cm	
Operating Environment	Choose a well-ventilated location without direct sunlight or direct radiation from other heat sources No strong air currents around: when forced air flow is required, the air flow should not blow directly onto the chamber Flat, vibration-free floor No strong electromagnetic field interference around No condensation, corrosive gases, high-concentration dust or corrosive substances	

	During equipment transportation, check whether doorways, passages, elevators, etc. can accommodate the equipment to avoid affecting your project schedule.
Indoor Environment	Ambient temperature: +20°C ~ +28°C Relative humidity: no greater than 60% R.H Atmospheric pressure: 86kPa ~ 106kPa
Air Supply Requirements	1. Compressed air flow rate: 9~30 SCFM (4.25~14.17 L/S); 2. Clean and dry air source: air filtration accuracy 5μm (removing solid particle impurities), oil content <0.10 ppm (by weight), oil contamination filtered to 0.01μ; 3. Air supply dew point temperature: ≤10°C; 4. Air supply pressure: 6.2~7.6 bar (90~100 PSIG); 5. Air supply medium temperature: +15°C ~ +25°C (rated standard condition: +22°C);
Equipment Voltage	AC 220V±10%, 50Hz, single-phase L+N+PE protective ground wire with grounding resistance <4Ω. The end customer needs to configure a sufficient-capacity air or power switch at the installation site; the switch must be independent and dedicated to this laboratory. The equipment power cable length is 3 meters.
Equipment Drainage Requirements	Chamber conventional drainage: each equipment is equipped with a set of φ12mm quick connectors at the rear.
Storage Environment Requirements	When the equipment is not operating, the ambient temperature should be maintained within 0°C ~ +45°C and kept dry.
Other Precautions	1. In maximum or minimum flow mode, continuous low-temperature performance may decrease under extreme temperature conditions, but periodic high/low temperature cycling performance is not affected. 2. Insufficient air supply pressure, or moisture/oil in the air supply will directly lead to insufficient flow rate, slower temperature switching, and malfunction of the impact head. 3. Maintenance of internal refrigerant and compressor of the refrigeration system must be performed by Sanwood authorized engineers. Unauthorized disassembly will void the warranty. 4. Communication protocol documents can be obtained from the Sanwood Technical Department.

5. For faults that cannot be resolved by yourself, please record the equipment serial number and alarm code, and contact Sanwood after-sales service. Do not disassemble the refrigeration circuit yourself.
6. Before using DUT mode, confirm that the thermocouple is reliably attached to the sample. A broken thermocouple wire will trigger over-temperature protection.
7. The power cable must be reliably grounded. Poor grounding will cause communication abnormalities and static damage to samples
8. Do not share the same circuit with high-power welding machines or frequency converters.
9. Turn on the air supply before starting the equipment; after shutdown, the air supply can be turned off with a delay. For long-term shutdown: stop operation first → turn off equipment power → turn off air supply.

6. Warranty And After-sales Service

Quality Assurance

From the date of acceptance, the equipment is covered by a one-year quality warranty period, during which the company provides completely free repairs (excluding damage caused by natural disasters, abnormal power supply, improper use, or improper maintenance). When the equipment cannot operate normally due to manufacturing quality issues while the buyer complies with storage, use, and installation rules, the supplier will dispatch maintenance personnel for free repairs within the committed service time after notification.

Configuration Technical Data and Accessories

Factory Delivery:

Product certificate of conformity, user manual, warranty card and etc.;

Additional delivery: circular insulation hood, air supply duct, flexible hose, air dryer.

Packaging and Transportation:

Packaging: Wooden crate + EPE foam/vacuum bag sealed transport packaging.

Transportation method: by sea/by land.

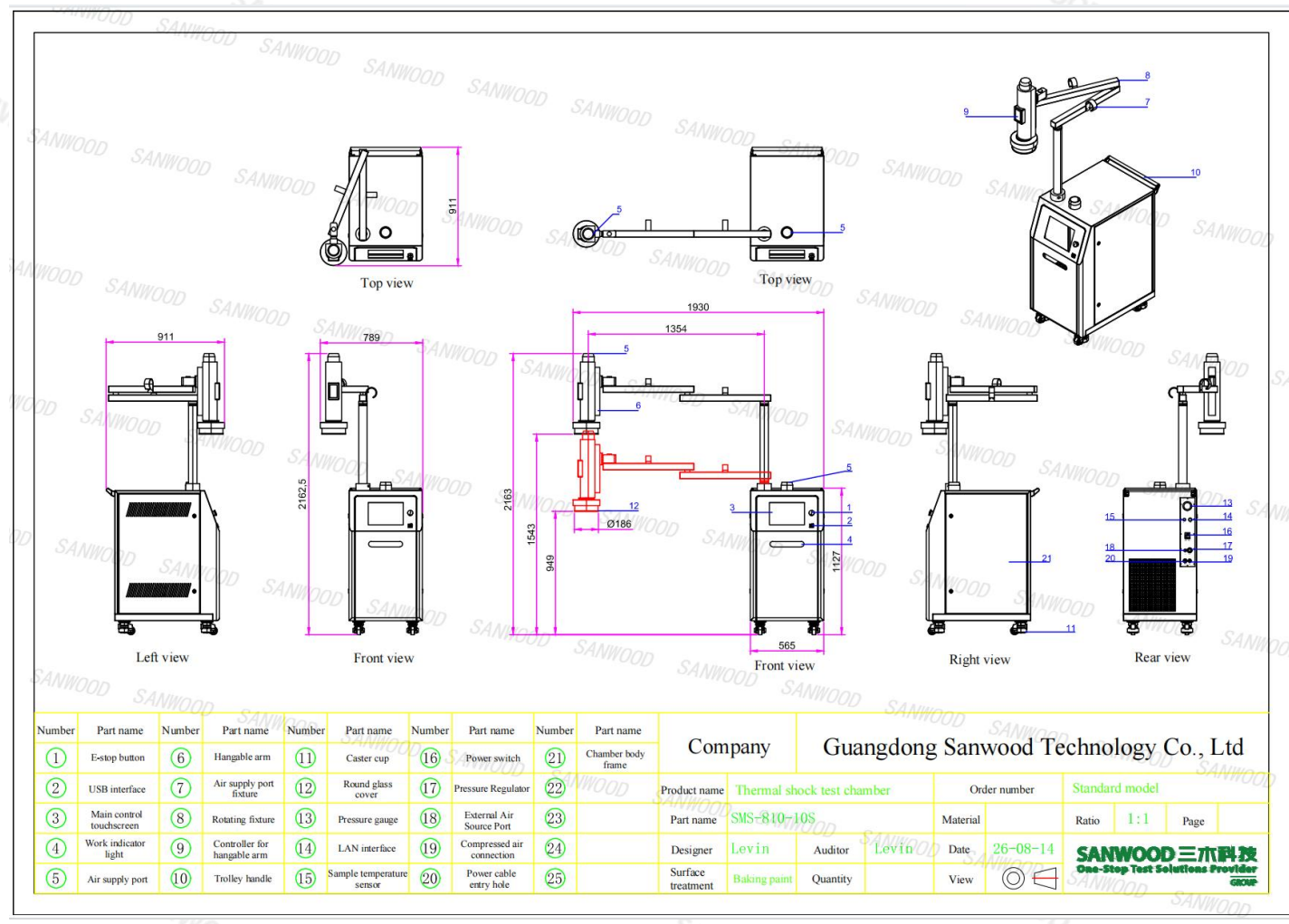
Training: Your operators will be able to operate the machine proficiently.

According to contract requirements, on-site training is provided when the equipment is installed, commissioned, and put into use;

Users can be arranged to visit the company for on-site technical training during equipment factory testing, enabling customers to understand equipment performance, learn correct usage methods, operation, daily maintenance, common fault detection and

troubleshooting, reducing equipment failures caused by improper use and saving maintenance costs for customers.

Equipment 2-Dimensional View:



7. Optional Configurations

1. Customized insulation hood, sample fixtures;
2. External thermocouple expansion channels;
3. Remote monitoring software, automatic data recording and export function;
4. Precision pre-filter for air supply and air dryer matching solution.