ESPEC

Rapid-Rate Thermal Cycle Chamber

TCC-150

CAT.NO.E06132-Z610

Uniform and highly-repeatable temperature change rate. TCC-150 enables specimen temperature ramp control.

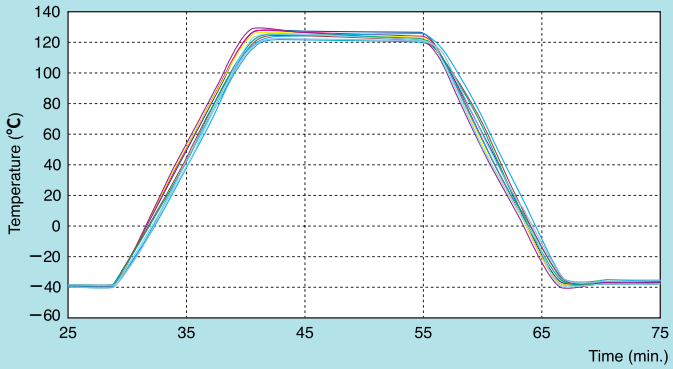
Advent of the Rapid-Rate Thermal Cycle Chamber just suited
for quick changes in specimen temperature,
covering various applications from JEDEC standard tests to screening.
The Rapid-Rate Thermal Cycle Chamber incorporates new technologies,
such as a specimen temperature control that maintains
linear specimen temperature change rates, during rapid thermal cycling,
and temperature ramp control.
ESPEC offers a new chamber that sets the industrial standard
for the new era of thermal cycling.

*The emergency stop switch, paperless recorder and casters are optional.

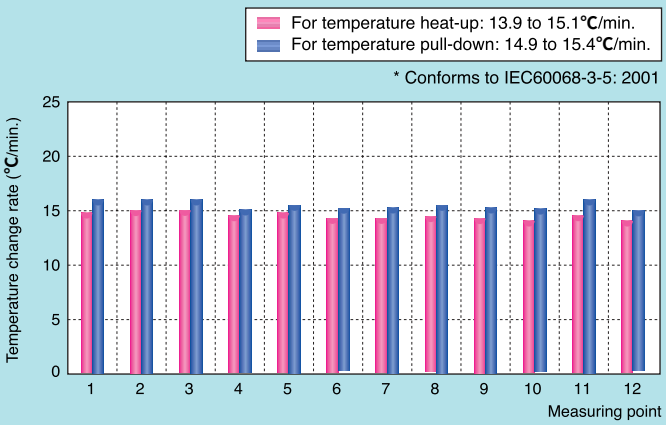
Performance

Temperature change (Example)

■ Temperature change measurement data



■ Temperature change rate at twelve measuring points (Average)

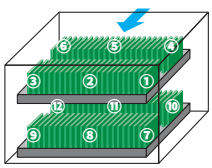


Test conditions

High temp. soak : +125°C
Low temp. soak : −40°C
Ramp rate : 15°C/min.
Control point : Air outlet sensor
Specimen : Glass epoxy substrate 145 × 130 mm, 90 specimens

Measuring method

As shown on the right, thermocouples are attached to the specimens at twelve measuring points.



TCC-150 provides uniform temperature load, and highly-repeatable temperature change rate.

Through simulation of wind volume and wind speed, TCC-150 can minimize specimen temperature variations, enabling more accurate quick temperature change testing. For specimen temperature, the ramp rate is 15°C/min. For air temperature, the ramp rate is 23°C /min (temperature heat-up average).

Conformity to JEDEC JESD22-A104-B standard test

The Rapid-Rate Thermal Cycle Chamber meets the requirements of the JESD22-A104-B standard for semiconductor package evaluation and solder joint evaluation, enabling specimen temperature ramp control at 15°C/min. (from −40°C to +125°C).

Performance

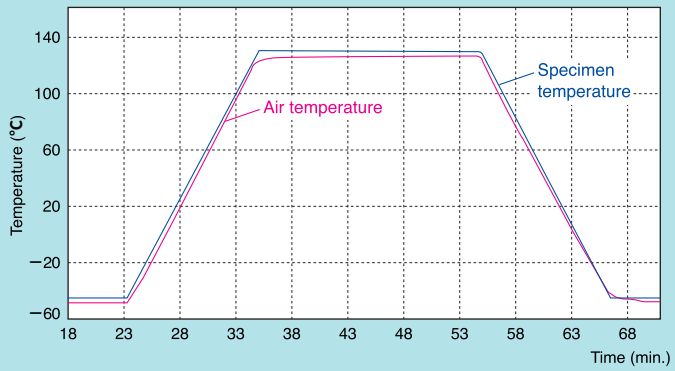
New temperature ramp control functions

To maintain a constant temperature change rate for test specimens, the TCC-150 uses a sensor (positioned by the user) for specimen temperature measurement, and a newly-developed high-speed controller that enables highly precise specimen temperature control. This controller enables measurement and control processing at a higher speed than conventional controllers. Furthermore, the TCC-150 uses a new technologies for specimen temperature ramp control, for example:

- Technology to increase refrigeration capacity at low temperatures;
- Conditioning technology to minimize differences between specimen temperature and air temperature in the chamber; and
- Technology to ensure airflow speed uniformity so that specimen temperature variations can be minimized.

Specimen temperature ramp control (Example)

■ Specimen temperature control data



Test conditions

High temp. soak	: +130℃
Low temp. soak	: −45℃
Ramp rate	: 15℃/min.
Control point	: Front center substrate on the lower stage
Specimen	: Glass epoxy substrate, 145 × 130 mm, 90 specimens

Measuring method

With 45 substrates placed in two rows on two stages in the specimen basket, thermocouples are attached to the surface of each specimen at the control point.

Specimen temperature control and air temperature control

The TCC-150 has two temperature control modes:

- A specimen temperature control mode that provides a specimen temperature ramp rate of 15 ℃/min. in accordance with the JEDEC standard; and
- An air temperature control mode for temperature cycle tests.

The TCC-150 supports a wide range of applications, covering various standard tests and screening.

Utility

Test area

Specimen temperature input (Left)
Specimen power supply control output (Right)

Cable port

Paperless recorder (Optional)

Large-volume test area

The test area can contain up to sixty substrates(257W×182H mm), when set vertically.

Easy wiring access

The chamber features clear cabinet sides, allowing easy access for specimen measurement or voltage-application wiring. Cable ports are provided on the right as well as left sides of the chamber.

Door hinge with self-closing prevention

The chamber door uses hinges that prevents self-closing. When the door is opened or closed, it temporarily stops at 60 degrees and 120 degrees to ensure greater safety.

Safety measures

The TCC-150 provides various safety devices and functions: For example, if you attempt to start operation without locking the door securely, the alarm buzzer sounds.

Material identifiers for ease of recycling

The TCC-150 provides material identifiers for molded resin components, and allows recyclable components to be easily detached, so that components can be easily recycled later. Thus, the TCC-150 demonstrates a commitment to environmental conservation.

Ozone layer protection

The HFC refrigerant used is completely safe for the ozone layer.

Paperless recording (Optional)

The paperless recorder makes it easy record the temperatures of different items, such as the chamber temperature, on a memory card (Compact Flash).

Control operation

Color LCD interactive touch-screen system

The color LCD touch-screen instrumentation simplifies operation and setting, allowing users to touch the screen as indicated by the displayed instructions. The screen allows at-a-glance confirmation of test patterns, test area temperatures, temperature cycles, upstream/ downstream control, and trend graph displays.

Three operation modes

The TCC-150 features three operation modes: Program Operation, Constant Operation, and Cycle Operation, allowing easy operation of various test patterns.

Door-mounted instrumentation

Instrumentation, including the touch-screen controller, is incorporated into the door. This reduces the overall footprint and frees up both sides of the chamber for easy access.

Control functions	Air temperature Specimen temperature
Operation mode	Program operation, Constant operation, Cycle operation
Setting	Interactive input system using a touch-screen
Display	TFT Color LCD display
Program capacity	Program operation User's pattern: 10 programs Rom pattern: 10 programs Cycle Operation User's pattern: 10 programs
Setting and indication ranges	Constant operation Temperature: −75 to +185℃ Program operation Temperature: −75 to +185℃ Time: 0 to 999 hours 59 minutes Cycle operation High temperature soak: +60 to +180℃ Low temperature soak: −70 to 0℃ Soak time: 1 minute to 99 hours 59 minutes Ramp rate: 5℃/min. to 15℃/min.
Display resolution	1℃
Input	Thermocouple type T (Coppen/Coppen-Nickel)
Control system	PID control
Communication function	RS-485
Auxiliary functions	Timer presetting High / Low temperature limit alarm Chamber / specimen temperature control Soak control Quick soak Power recovery Programmed time display Test pause preset Test end mode selection Trend graph Alarm history display Sensor offset

Instrumentation

Program setting

Pattern editing

Alarm

Error description

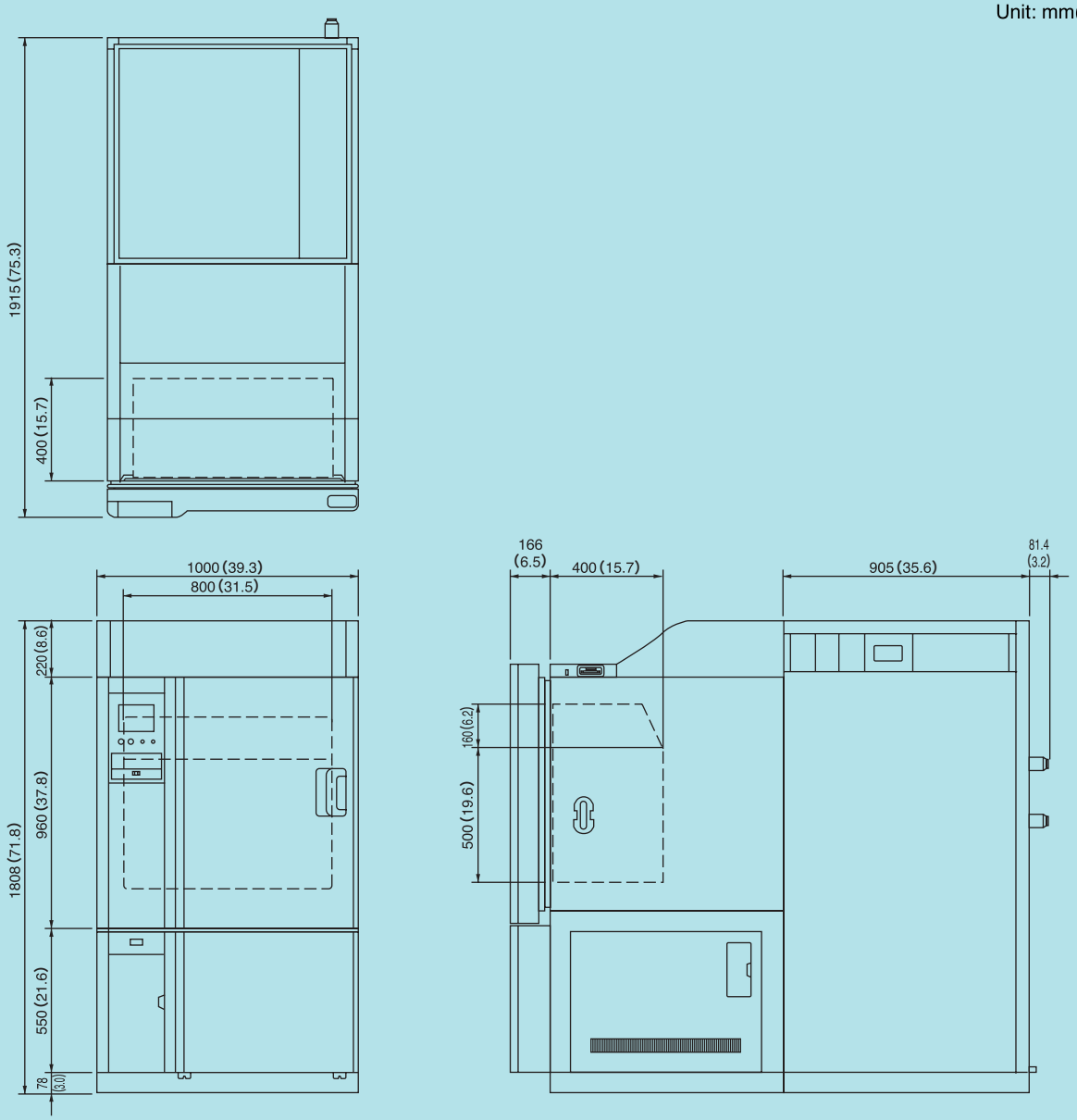
Service guide

TEST STANDARD (TCC-150 COMPATIBILTY)

Test standard		Temperature setting		Temperature change rate	Soak time	Number of cycles
		High temperature (℃)	Low temperature (℃)			
IEC 60749–25 (JESD22–A104–B)	G	+125 (+15, −0)	−40 (+0, −10)	Specimen temperature, 15℃ / min. or less	1, 5, 10, 15 min.	Not specified
	I	+115 (+15, −0)	−40 (+0, −10)			
	J	+100 (+15, −0)	0 (+0, −10)			
	K	+125 (+15, −0)	0 (+0, −10)			
	L	+110 (+15, −0)	−55 (+0, −10)			
	N	+80 (+15, −0)	−30 (+0, −10)			
	O	+125 (+15, −0)	−25 (+0, −10)			
IEC–60068–2–14 Nb (JIS C 0025 Nb)		+175 ±2 +155 ±2 +125 ±2 +100 ±2 +85 ±2 +70 ±2 +55 ±2 +40 ±2 +30 ±2	−65 ±3 −55 ±3 −40 ±3 −25 ±3 −5 ±3 +5 ±3	1±0.2℃ / min. 3±0.6℃ / min. 5±1.0℃ / min. (AVG) Average for up to five minutes	3 hours, 2 hours, 1 hour, 30 min., 10 min. 3 hours if not specified in product specifications	2
IEC–61747–5 (EIAJ ED–2531A)		+100 ±2 +95 ±2 +90 ±2 +85 ±2 +80 ±2 +75 ±2 +70 ±2 +65 ±2 +60 ±2 +55 ±2 +50 ±2 +45 ±2 +40 ±2 +35 ±2 +30 ±2	−50 ±3 −45 ±3 −40 ±3 −35 ±3 −30 ±3 −25 ±3 −20 ±3 −15 ±3 −10 ±3 −5 ±3 −0 ±3	1±0.2℃ / min. 3±0.6℃ / min. 5±1.0℃ / min. (AVG) Average for up to five minutes	3 hours, 2 hours, 1 hour, 30 min., 10 min. 3 hours if not specified in product specifications	2
JESD22–A105–B	A	+85 (+10, −0)	−40 (+0, −10)	6.25℃/min.	10 min.	1000
	B	+125 (+15, −0)	−40 (+0, −10)	5.5℃/min.		
IPC–9701	TC1	100	0	Specimen temperature, 20℃/min. or less	Specimen temperature, 10 min.	200 500 1000 3000 6000
	TC2	100	−25			
	TC3	125	−40			
	TC4	125	−55			
	TC5	100	−55			
IPC–TM–650 2.6.6	A	+125 (+3, −0)	−65 (+0, −5)	———	30 min.	5
	B	+85 (+3, −0)	−55 (+0, −5)			
SAE–J1211		+85 to +150	−40	4 to 6℃/min.	Low temperature, 4 hours	———

DIMENSIONS

Unit: mm(inch)



SPECIFICATIONS

Model			TCC-150W				
Temperature control system			Balanced Temperature Control system (BTC system)				
Operating condition			Operating temperature: +5 to +35℃ [+41 to +95°F] Cooling water temperature: +5 to +32℃ [+41 to +89.6°F]				
Construction	Outer shell		Painted steel				
	Interior		18-8 Cr-Ni stainless steel plate				
	Insulation		Chamber :Glass wool + foamed polyurethane Door :Glass wool, foamed resin				
	Test chamber	Temperature control area	Register, Air circulator, Heater, Cooler, Drain port, Suction grille				
		Test area	Temperature sensor, Flat cable port				
	Door		Door handle (Right: Handle, Left: Hinge), Door dew tray, Temperature program indicator-controller, Operation switches, Overheat protector				
	Fittings	Chamber	Specimen temperature input terminal, Specimen power supply control terminal, Cable port (ϕ25 × 100 mm, One each at right and left)				
		Mechanical compartment	Time signal terminal, Cooling tower interlock terminal, Main power switch, Refrigerating unit, Dew tray				
		Chamber stand	Integrating hour meter, RS-485 connector				
	Cooling water supply / drain port		Mechanical compartment rear side (Water supply port: RC 1-1/4 inch (32A), Drain port: RC 1-1/4 inch (32A))				
	Drain port		Mechanical compartment rear side (Connection port: ϕ15 mm)				
	Heater		Nichrome strip wire heater				
	Refrigerator unit	Refrigerating system	Mechanical casade refrigeration system (Water-cooled condenser)				
		Compressor	Scroll type (7.5 kW + 7.5 kW)				
		Refrigerating capacity controller	Electronic auto-expansion valve system				
		Refrigerant	R404A, R23				
	Cooler		Plate fin cooler				
	Chamber air circulator		Sirocco fan				
	Power cable port		Mechanical compartment top (one place)				
Inside dimensions			800W × 500H × 400D mm [31.5W × 19.6H × 15.7D inch] (Effective test area)				
Outside dimensions *1			1000W × 1808H × 1915D mm [39.3W × 71.8H × 75.3D inch]				
Inside capacity			160 L				
Weight			950 kg				
Load capacity			Shelf support: 25 kg / Specimen basket: 5 kg / shelf (equally distributed load)				
Utility requirement	Power supply within ±10% of the rated voltage		200V AC 3ϕ 3W 50/60Hz	208V AC 3ϕ 3W *2 60Hz	220V AC 3ϕ 3W 60Hz	380V AC 3ϕ 4W 50Hz	400V AC 3ϕ 4W *3 50Hz (CE Marking)
	Maximum current		115 A	115 A	111 A	61 A	60 A
	Cooling water supply pressure *3		0.2 to 0.5 MPa (2 to 5 kg/cm²G)				
	Cooling water supply rate *4		4100 L / h (at reference water temp.: +25℃ [77.0°F]) 7850 L / h (at reference water temp.: +32℃ [89.6°F])				

*1 Excluding protrusions
*2 This equipment is in compliance with the requirements of the NEC (National Electric Code (NFPA 70) for the U.S.A.).
*3 The water pressure varies depending on dirt in the heat exchanger.
*4 When the water pressure exceeds 0.5 MPa (5 kg/cm²G), a pressure reducing valve is required.

SPECIFICATIONS

Model			TCC-150W				
Performance *6	Temperature range *7		−70 to +180℃ [−94 to +356˚F]				
	Temperature fluctuation *7		±0.5°C [±0.9˚F] (−70 to +180°C [−94 to +356˚F] . after the temperature is stabilized)				
	Temperature change *7	Temperature range	−45 to +155℃ [−49 to +311˚F] (Setting: −70, +180℃ [−94, +356˚F])	+155 to −45℃ [+311 to −49˚F] (Setting: +180, −70℃ [+356, −94˚F])	−23.5 to +108.5℃ [−10.3 to +227.3˚F] (Setting: −40, +125℃ [−40, +257˚F])	+108.5 to −23.5℃ [+227.3 to −10.3˚F] (Setting: +125, −40℃ [+257, −40˚F])	−23.5 to +108.5℃/ +108.5 to −23.5℃ [−10.3 to +227.3˚F/ +227.3 to −10.3˚F] (Setting: +125, −40℃ [+257, −40˚F])
		Specimen load	None	None	None	None	Yes *8
		Temperature control	Chamber temp.	Chamber temp.	Chamber temp.	Chamber temp.	Chamber temp. or Specimen temp.
		Ramp control	Off	Off	Off	Off	On
		Performance	Max. 9 min. (23℃ [41.4˚F] or more/min.)	Max. 11 min. (18℃ [32.4˚F] or more/min.)	Max. 5 min. (26℃ [46.8˚F] or more/min.)	Max. 7 min. (20℃ [36.0˚F] or more/min.)	15℃ [27.0˚F] /min.
	Noise emission *9		65 dB max.				
	Allowable heat load		8 kW (−20℃ [−4˚F] or more)				

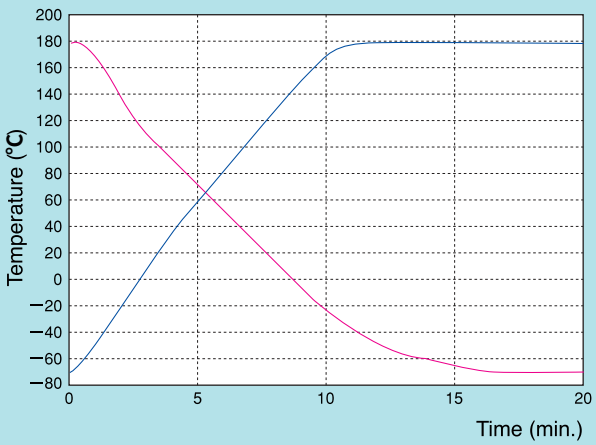
*6 When ambient air temperature is +23℃, and refrigerator cooling water temperature is +25℃, with no specimen. The ambient conditions may affect the performance specifications.

*7 Performance indications meet the IEC 60068-3-5: 2001 standard.

*8 Specimen: (Glass epoxy substrate) 5 kg + Jig: 4 kg (ESPEC standard jig)

*9 Noise level measured in an anechoic room, at 1 m distance from the front of the chamber, and 1.2 m above the chamber (Characteristic A). In conformance with JTS-Z-8731

TEMPERATURE CHANGE GRAPH



Temperature range: — −45 to +155℃ (setting: −70, +180℃)
— +155 to −45℃ (setting: +180, −70℃)
Specimen load: None
Temperature control: Chamber temperature
Ramp control: Off
Performance: — Max. 9 min. (32℃ or more/min.)
— Max. 11 min. (18℃ or more/min.)

DANGER

- Do not use specimens which are explosive or inflammable, or which contain such substances. To do so could be hazardous, as this may lead to fire or explosion.
- Do not place corrosive materials in the chamber. If corrosive substances or liquid is used, the life of the unit may be significantly shortened specifically because of the corrosion of stainless steel, resin and silicone materials.
- Do not place life forms or substances that exceed allowable heat generation.

CAUTION

Be sure to read the instruction manual before operation.

SAFETY DEVICES

- Leakage breaker (200, 220, 380V AC supply)
- Circuit breaker (208, 400V AC supply)
- Electric parts compartment cover switch
- Chamber door switch
- Thermal fuse
- Upper and lower temperature limit alarm (built inside temperature controller)
- Overheat protector
- Wiring circuit breaker
- Refrigerator thermal relay
- Refrigerator high/low-pressure switch
- Temperature switch for compressor
- Cooling water pressure switch
- Thermal relay for air circulator
- Circuit breaker for heater
- Reverse-prevention relay
- Cartridge fuse
- Specimen power supply control terminal
- Cooling tower interlock terminal

ACCESSORIES

- Flat cable port rubber plug (Silicone sponge rubber) 2
- Specimen basket (18-8 Cr-Ni Stainless steel, 5 mesh metal basket) ..... 2 sets
  700 (W) × 40 (H) × 346 (D) mm
- Shelf bracket (Number of positions: 7, 60mm pitch) ..... 2 sets
- Cartridge fuse
  - 200V AC
    - JIS Class A, 250V 3A 2
    - JIS Class A, 250V 6A 1
  - 220V AC, 380V AC, 400V AC
    - JIS Class A, 250V 4A 1
    - JIS Class A, 250V 5A 1
    - JIS Class A, 250V 6A 1
- Specimen temperature measuring thermocouple 1
- Specimen temperature input connector 1
- Strainer R1¼ in. (32A) 1
- Strainer element R1¼ in. (32A) 1
- Nipple R1¼ in. (32A) 1
- User's Manual ..... 1 set

OPTIONS

Paperless recorder

Records temperature of each section such as the temperature inside the chamber.

- Number of inputs:
  2 (4 more channels can be turned ON)
- Data saving cycle: 5 seconds
- Temperature range: −100 to +200℃
- External memory media:
  CF memory card (32 MB)
- Language support: ENG/ JPN

Paperless recorder

Temperature recorder (digital)

−100 to +220℃ /100 mm

- RK-63: 3 pens
- RK-64: 6 dots

Temperature recorder

Temperature recorder for future installation

Preparation of a power cable, temperature sensor, and a grounding wire for additional installation in the future.

OPTIONS

Recorder terminal

Terminal to output internal chamber temperature and specimen temperature data.

Specimen temperature measuring thermocouple

Attached to specimens to measure specimen temperature.

- Thermocouple type T without ball (Copper/ Copper-Nickel)

* Same as accessory item

Temperature attainment output

When temperature in the chamber reach the set values, the chamber outputs a contact signal.

Integrating hour meter with reset

This hour meter can be reset if necessary. (Additional accessory for the standard integrating hour meter)

Additional overheat protector

This additional overheat protector is used to prevent the temperature in the test area from rising abnormally in addition to the standard overheat protector.

Overcool protector

If the temperature inside the chamber decreases excessively, the chamber stops operating to prevent the specimens from being damaged.

External alarm terminal

If the safety device of the chamber activates, the external alarm terminal will notify a remote alarm.

External alarm terminal

Emergency stop switch

Stops the chamber immediately.

Emergency stop switch

Additional cable port

In addition to the standard cable port, an additional cable port can be provided as required.

- Location: Right and left sides of the chamber
- Inside diameter: ϕ25 × 100 mm

* This cable port cannot be added after delivery.

Cable port rubber plug

Same as accessory item provided with cable port.

Specimen basket / shelf bracket

Equivalent to the standard accessories.

Fixture for securing body

Used to bolt the chamber to the floor.

Caster

Used to move the chamber.

- Casters: 4 pcs
- Adjustable feet: 4 pcs

Chamber dew tray

Prevents water leaks from the chamber onto the floor.

* The use of casters is recommended to facilitate operation.

Communication function

Enables continuous control of the chamber in conjunction with a PC.

- GPIB
- RS-232C

* Select one, in place of standard RS-485.

Communication cable

- RS-485: 5, 10 m
- GPIB: 2, 4 m
- RS-232C: 1.5, 3, 5 m
  (For extension: 1.5, 3, 5 m)

Power cord

Used to connect the chamber to a primary power supply.
5 m, 10 m

* Not applicable for optional 208V, 220V, 380V and 400V AC powersupply specifiication.

■Some photographs listed in this catalog contain Japanese display.

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JIS Q 9001:2000
JSAQ 004

QMS Accreditation
R001

EMS Accreditation
RE 009

EC99J2046

051

ISO 9001/JIS Q 9001
Quality Management System Assessed and Registered

ESPEC CORP. has been assessed by and registered in the Quality Management System based on the International Standard ISO 9001:2000 (JIS Q 9001:2000) through the Japanese Standards Association (JSA).

ISO 14001 (JIS Q 14001)
Environmental Management System Assessed and Registere

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