

Quality is more than a word



Liquid to Liquid Thermal Shock Chamber

TSB-21 · TSB-51



Key technology for ensuring reliability Supports the current trend toward higher stress.

High accuracy is increasingly demanded in the pursuit of reliability in the field of electronics.

“Liquid-to-liquid” type thermal shock testing is now attracting attention for its ability to impose higher thermal stress on specimens than “air-to-air” type testing, and to deliver test results quickly.

ESPEC has successfully developed next-generation liquid-to-liquid thermal shock chambers that satisfy the demand for environmental conservation and lower running costs from brine and power consumption, which have traditionally been regarded as stumbling blocks with liquid-to-liquid thermal shock chambers.

ESPEC takes great pride in offering this cutting-edge chamber as a key technology in ensuring higher reliability.

TSB-51



- **A number of mechanisms for drastically reducing brine consumption**

To reduce brine consumption, the airtightness of the test area has been enhanced to prevent vapor leakage and brine evaporation. Numerous mechanisms have also been adopted, including a water separation filter for removing brine from water for the purpose of brine recycling. As a result, these new chamber models have reduced brine consumption by approximately 65% compared to the preceding model (TSB-5).



Test Area

- **Both single-liquid and double-liquid brine applicable**

Either single-liquid brine or double-liquid brine can be selected simply by switching the valve.

- **Two models available to suit the specimen size and weight**

Two different models are available: TSB-21 can hold specimens weighing up to 1.0 kg, while TSB-51 can hold specimens weighing up to 2.0 kg. Capable of handling a wide variety of electronic parts, from ICs to printed circuit boards.

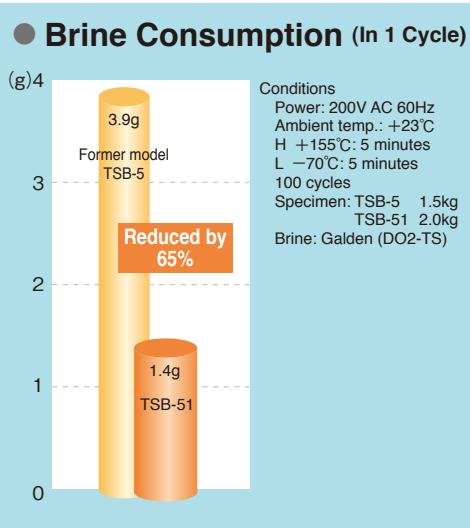
- **Smooth transfer of specimens realized**

An air cylinder system that suppresses vibration of the specimens and a new specimen loading system that prevents unnecessary stress to the specimens during transfers between the hot bath and the cold bath.

- **Recorder terminals as the standard device**

Thermal shock chamber has one piece of the recorder terminal that outputs the temperature of the specimens.* Additionally, the thermal shock chamber has a specimen power supply control terminal and a time signal.

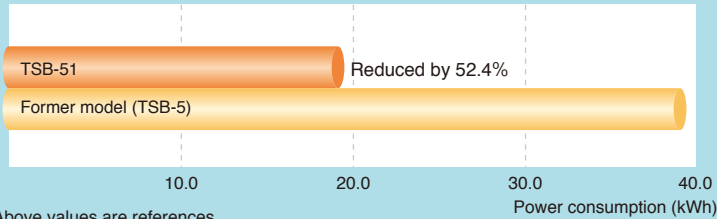
*Up to 5 pieces of the recorder terminals can be added as an option.



The external alarm terminal is optional.

● Comparison of power consumption

Conditions : 20 cycles
 H : +155°C 5 min.
 L : -70°C 5 min.
 Specimen : TSB-51 2.0 kg
 TSB-5 1.5 kg



*Above values are references.



Paperless recorder (optional)

● Energy savings achieved

Dramatic energy savings have been achieved through the adoption of a new refrigeration circuit, with power consumption slashed by as much as 52% (compared to former ESPEC models).

● Installation environment improved through reduced operation noise

The operation noise level of the chamber has been reduced to as low as 65 dB (A-characteristic) by providing sound-proofing panels for the noise-emitting machine compartment, including the refrigerator.

● Paperless recording (optional)

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

● Remote control from your PC

Please contact us for details on using a PC to monitor and remotely control the equipment.

Control operation

Visibility and ease of use improved through interactive input using a touch-screen system and color LCD screen

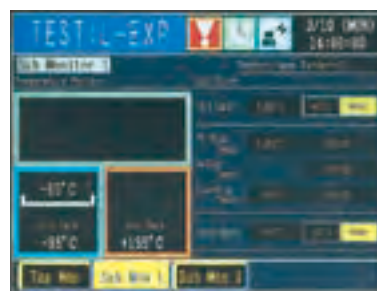
- Uses a color LCD interactive touch-panel system employed throughout the Thermal Shock Chamber Series

A color LCD panel design allows settings to be made simply by touching the screen in accordance with the display. The test pattern, test area temperature, number of temperature cycles, trend-graph display, etc., are all displayed on the screen.

| | |
|---------------------------|---|
| Setting system | Interactive input system using a touch panel |
| Display | Color TFT LCD panel (6.5 inch) |
| Temperature-control | <ul style="list-style-type: none"> • Test area exposure temperature • Hot bath preheating temperature • Cold bath precooling temperature • Liquid temperature recovery for hot bath • Liquid temperature recovery for cold bath |
| Temperature-setting range | High-temperature side: +60 to +200°C Low-temperature side: -75 to 0°C |
| Setting resolution | 1°C |
| Input | Thermocouple T (JIS C 1602) |
| Control system | PID control |
| Time-setting range | 1 sec. to 99 min. 59 sec. |
| Cycle-setting range | 1 to 9999 cycles |
| Programs | RAM mode: Max. 40 patterns (writable) ROM mode: 10 standard test patterns (registered) |
| Auxiliary functions | <ul style="list-style-type: none"> • Timer preset • Test continuity selection • Overheat/overcool protection • Stable time control • Power-saving operation • Power-failure/ recovery operation selection • Liquid temperature recovery • Recycling operation • Automatic preheating/ precooling setting • Time signal • Program memory • Automatic power shutoff • Programmed time display • Test starting point selection • Test halt preset • Test completion mode selection • Trend graph • Alarm history display • Sensor calibration • RS-485 communication |



- Detailed test monitoring



- Selection of operating modes



- Test pattern editing



- Error description



SPECIFICATIONS

| Model | | TSB-21 | TSB-51 | |
|---|---|---|---|---|
| System | | Two-liquid bath system with specimen basket transfer | | |
| Brine | | Single-liquid or double-liquid fluorine deactivated brine | | |
| Utility requirement | Power supply (within $\pm 10\%$ of the rated voltage) | 200V AC, 3 ϕ , 3W, 50/60Hz | | |
| | Maximum load current | 25A | 43A | |
| | Operating temperature | 0 to +40°C (+32 to +104°F) | | |
| | Air-source pneumatic pressure | 0.4 to 0.7MPa (4 to 7kgf/cm ²) | | |
| | Air-source piping connection size | ϕ 8mm | | |
| | Required air-flow quantity | 15L/ min. (ANR) (3.6L/ cycle (ANR)) | | |
| Performance ^{*1} | Hot bath | Temp. range | +70 to +200°C (+158 to +392°F) | |
| | | Temp. fluctuation ^{*2} | $\pm 2^\circ\text{C}$ ($\pm 3.6^\circ\text{F}$) | |
| | | Temp. heat-up rate ^{*3} | Ambient temp. to +150°C (+302°F): within 90 min. | |
| | Cold bath | Temp. pull-down rate ^{*3} | +150 to +60°C (+302 to +140°F) Within 60 min. | +150 to +60°C (+302 to +140°F) Within 100 min. |
| | | Temp. range | -65 to 0°C (-85 to +32°F) | |
| | | Temp. fluctuation ^{*2} | $\pm 2^\circ\text{C}$ ($\pm 3.6^\circ\text{F}$) | |
| Test performance | Hot bath | Liquid temp. | +150 ⁺¹⁰ / ₀ °C (+302 ⁺¹⁸ / ₀ °F) (Galden DO2-TS) | |
| | | Cold bath | Liquid temp. | -65 ₋₁₀ / ⁰ °C (-85 ₋₁₈ / ⁰ °F) (Galden DO2-TS) |
| | Exposure time | High and low temperatures 5 min. each | | |
| | Number of cycles | 15 cycles | | |
| Specimen | Plastic molded ICs 1.0kg | Plastic molded ICs 2.0kg | | |
| Specimen transfer time | | Within 10 sec. (Time of transfer between hot and cold baths) | | |
| Noise level ^{*4} | | 65 dB or less | | |
| Construction | Exterior material | Painted steel | | |
| | Internal tank | Stainless steel plate (18-8 Cr-Ni) | | |
| | Insulation | Glass wool, foamed polyurethane | | |
| | Heater | Sheathed heater | | |
| | Cooler | Cooling-pipe coil | | |
| | Agitator | 2 units (one each for the hot and cold baths) | | |
| | Refrigerator unit | Refrigeration system: Mechanical cascade refrigeration system (Air-cooled condenser) | | |
| | Compressor | Rotary compressor | | |
| | Refrigerant | R508A, R404A | | |
| | Drive unit for specimen transfer | Horizontal and vertical air drive system | | |
| | Fluid recovery circuit | Method: Condensed recovery through refrigerator cooling Refrigerator: Cold bath cooling refrigerator | | |
| | Condensation circuit | Method: Condensation by refrigerator Refrigerator: Cold bath cooling refrigerator | | |
| | Components | Liquid-level indicator, chamber lamp, specimen transfer-area door, adjuster, specimen power-supply control terminal, time signal, recorder terminal, integrating hour meter | | |
| Specimen basket dimensions (mm) | | W120×H150×D120 (W4.7×H5.9×D4.7 in.) | W150×H150×D200 (W5.9×H5.9×D7.8 in.) | |
| Test area loading capacity | | Approx. 2.1 L | Approx. 4.5 L | |
| Specimen basket load capacity (evenly distributed load) | | 1.0 kg | 2.0 kg | |
| Inside bath dimensions (W×H×D mm) | | 260×350×440 (10.2×13.8×17.3 in.) (Approx. 40 L) | 290×350×520 (11.4×13.7×20.4 in.) (Approx. 55 L) | |
| Outside dimensions (W×H×D mm) ^{*5} | | 1140×1785×1240 (44.9×70.3×48.8 in.) | 1200×1785×1320 (47.2×70.3×52 in.) | |
| Chamber (overall) weight ^{*6} | | Approx. 650 kg | Approx. 790 kg | |

*1 Performance at an ambient temperature of +23°C

*2 Performance indications conforming to JTM K01-1998

*3 Performance when each bath is operated individually

*4 Value measured in an anechoic room at 1m from the chamber front and at a height of 1.2 m above the floor (A-characteristic: Compliant with JIS-Z-8731)

*5 Protrusions from the machine sides excluded. Leveller height not included.

*6 Weight of the liquid not included

TEST STANDARDS (satisfied by all models in the TSB Series)

| Test Standard | Test Condition | Exposure Temperature | | | Exposure Time | | Temperature Recovery Time | Number of Test Cycles | Test Starting Point |
|-------------------------------------|----------------|-------------------------------------|---------------|-----------------------------------|--|---------------|--|--|-------------------------------|
| | | High Temp. | Ambient Temp. | Low Temp. | High/ Low Temp. | Ambient Temp. | | | |
| MIL-STD-883E (Method No. 1011.9) | A | +100°C ⁺¹⁰ ₋₂ | — | 0°C ⁺² ₋₁₀ | Over 2 min., up to 5 min. | — | Temperature of the specimen under worst-case conditions, recovered within 5 min. | Min. 15 cycles | Low temp. or high temp. |
| | B | +125°C ⁺¹⁰ ₀ | — | -55°C ⁰ ₋₁₀ | | — | | | |
| | C | +150°C ⁺¹⁰ ₀ | — | -65°C ⁰ ₋₁₀ | | — | | | |
| MIL-STD-202G (Method No. 107G) | A | +100°C ⁺¹⁰ ₋₂ | — | 0°C ⁺² ₋₁₀ | Varies by specimen weight Less than 1.4 g: 0.5 min. 1.4 to 14 g: 2 min. Over 14 to 140 g: 5 min. | — | — | 5 cycles 15 cycles 25 cycles | Low temp. |
| | B | +12°C ⁺¹⁰ ₀ | — | -65°C ⁰ ₋₁₀ | | — | | | |
| | C | +150°C ⁺¹⁰ ₀ | — | | | — | | | |
| JIS C 0025 | — | +100°C | — | 0°C | 5 min. to 20 min. | — | — | 10 cycles unless otherwise specified | Low temp. |

SAFETY DEVICES

- Leakage breaker
- Circuit breaker for wiring
- Motor reverse prevention relay
- Compressor thermal relay
- Compressor temperature switch
- Electric parts compartment door switch
- Specimen transfer area door switch
- Recycling circuit fan temperature switch
- Refrigerator high-pressure switch
- Hot bath agitator temperature switch
- Cold bath agitator temperature switch
- Air-pressure switch
- Hot bath boil-dry protector
- Cold bath boil-dry protector
- Overheat protector for hot bath
- Overcool protector for cold bath
- Overheat/ overcool protector for the hot bath (built into the controller)
- Overheat/ overcool protector for the cold bath (built into the controller)
- Drive unit transfer time (built into the controller)
- Test area overheat/overcool protector (built into the controller)
- Specimen power supply control terminal
- Fuse
- Low-liquid-level alarm
- Locking mechanism for specimen transfer area door

ACCESSORIES

- Specimen basket (18-8 Cr-Ni stainless steel 5-mesh wire net)1
- Specimen basket cover1 set
- Cartridge fuse (5 A)1
- Fluid drain hose Inner dia.: 12 mm2
Inner dia.: 8 mm1
- Funnel for fluid supply1
- Fluid injection pipe (with rubber cork)1
- Connector (Terminal for temperature recorder)1
- Shutter open attachment2
- Water absorption mat1
- Thermocouple1
- User's manual1 copy



- Do not use specimens that are explosive or inflammable, or that contain such substances. Doing so may lead to fire or explosion.
- Do not use as specimens substances or creatures that may emit inflammable or corrosive gases, or substances that may exceed permissible heating values.



- Correctly clean the brine in use. Use of the incorrect liquid will significantly reduce the service life of the chamber and may produce noxious decomposition products. Before using a brine, consult with the brine manufacturer.
- Be sure to read the user's manual before operations.

OPTIONS

Paperless recorder

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

Number of inputs:

PL1S: 1 (5 more channels can be turned ON)

Data saving cycle: 1 sec

PL3S: 3 (3 more channels can be turned ON)

Data saving cycle: 1 sec

PL3L: 3 (3 more channels can be turned ON)

Data saving cycle: 5 sec

Temperature range: -100 to $+220^{\circ}\text{C}$

External recording media :

CF memory card (128 MB)

Language support: ENG, JPN



Temperature recorder

-100 to $+220^{\circ}\text{C}$ / 100 mm

RK-61: 1-pen

RK-63: 3-pens

RK-64: 6-dots



For future installation of a recorder

If the user elects to prepare a custom temperature recorder or plans to add one at a later date, the necessary power cable, temperature sensor, and grounding wire are available as options.

Thermocouple

•

Temperature recorder terminal

•

External alarm terminal

If the safety device of the chamber activates, the external alarm terminal will relay the alarm to distant place.



Emergency stop switch

Built-in air compressor

Specimen basket

Equivalent to standard accessory.

- Material Stainless steel (5-mesh)

Caster

Installed for mobility.

- Free wheels: 4

Fixture for securing the body

Used to bolt the chamber to the floor.

Power cable

For supplies electricity to the chamber.

- 5, 10m

Communication function

Connected to a PC directly to control the chamber (standard equipment: RS-485).

- GPIB
- RS-232C

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