

Quality is more than a word



Air to Air Thermal Shock Chambers

TSA Series



Providing the highest specifications demanded in thermal shock chambers

The TSA Series combines various performance specifications to serve the high-level needs of thermal shock tests.

The advanced model realizes

1000-cycle consecutive tests without defrosting (optional)

and has a reduced temperature recovery time and heat-up/pull-down time.

And, this environmentally-friendly thermal shock chamber provides further power-saving by the eco operation mode.





TSA-71



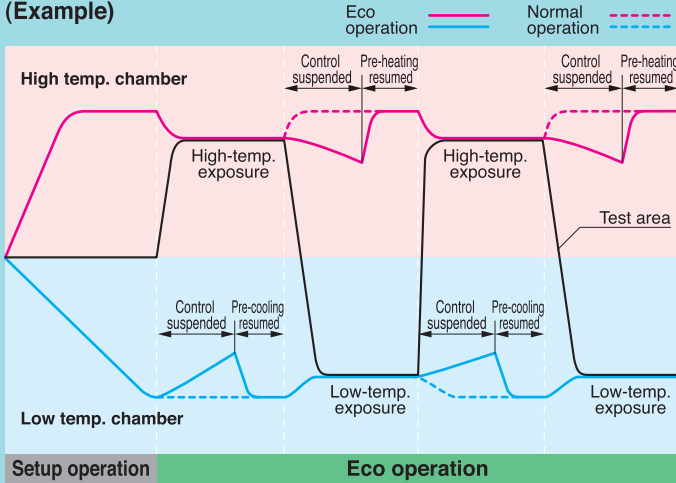
TSA-101



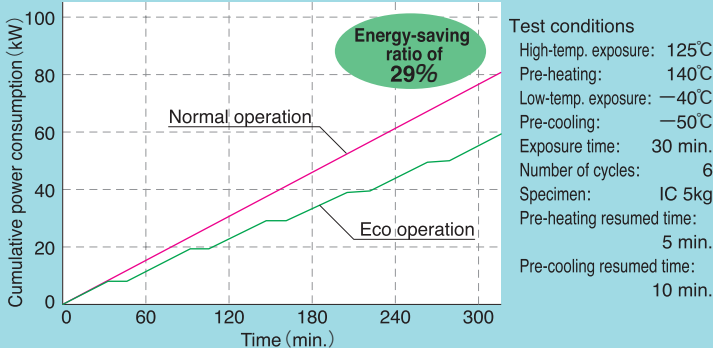
*The paperless recorder, recorder, additional overheat protector, automatic door and caster are optional.

Reducing power consumption with the Eco operation mode and 1000-cycle consecutive tests (500 hours).

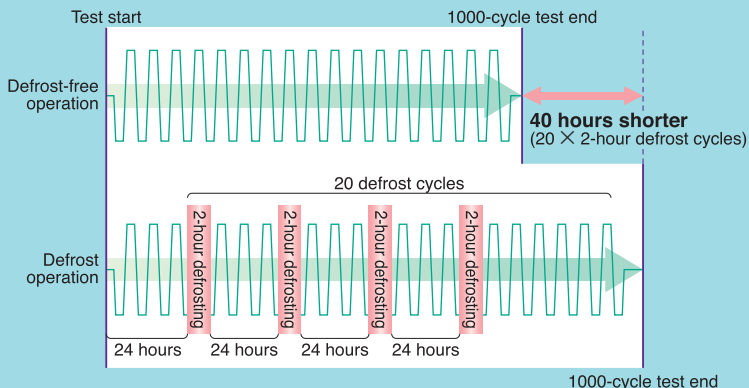
● Change in temperature during eco operation (Example)



● Cumulative power consumption during eco operation TSA-71S-W measurement example



● 1000-cycle test time comparison (optional) TSA-71H-W measurement example



Test conditions (2-zone, without test interruption)

High-temp. exposure:	150°C 15 min.	Sensor position:	Downstream of specimen
Low-temp. exposure:	-65°C 15 min.	Specimen:	5.0 kg
Ambient temp. and humid.:	23°C, 60% rh	(Plastic molded ICs)	3.5 kg
Cooling water temp.:	25°C	(Specimen basket, shelf bracket)	1.5 kg
Supply voltage:	200 VAC ±5% max.	Temp. recovery time:	within 5 min. max.

● Eco operation mode

With the eco operation mode, the TSA series reduces the operating time of the pre-conditioning chamber temperature by temporarily suspending following pre-conditioning operation.

- Pre-cooling of the low-temperature chamber during high-temp. exposure.
- Pre-heating of the high-temperature chamber during low-temp. exposure.

The power consumption can be reduced drastically in tests with large cycle numbers and long exposure time. (except TSA-41L)

● Enables 1000-cycle (500-hour) consecutive tests* (optional: defrost-free operation)

ESPEC has developed a unique chamber construction (patent No. 3514735) that enables 2-zone 1000-cycle (500-hour) consecutive tests without defrosting.

The construction prevents outside air that causes frost from entering the equipment, maintaining constant environmental conditions to allow defrost-free operation.

● Reduces test time (optional: defrost-free operation)

Since the TSA Series can enable 2-zone 1000-cycle (500-hour) consecutive tests* without defrosting, they eliminate the defrosting time required by conventional thermal shock chambers, greatly reducing the total test time. Power consumption previously required for defrosting is also reduced as a result.

*Models supporting defrost-free operation
 TSA-71H-W :1000 cycles (500 hours)
 TSA-201S-W :500 cycles (500 hours)
 Continuous operation is not supported for some test conditions.

Performance

Designed for high performance, high reliability and ease of use.

- **Higher performance (temperature recovery, temperature uniformity)**

By providing improved temperature recovery capacity, the TSA Series shortens temperature recovery time and temperature rise/fall times, resulting in a shorter total test time. The maximum temperature recovery time for 2-zone (+150°C and -65°C) and 3-zone upstream air is just 5 minutes (10 minutes for TSA-201S and TSA-301L).

In addition, the high temperature uniformity of Series models provides outstanding specimen temperature tracking to ensure uniform temperature stresses are applied to specimens.

- **Superior uniformity**

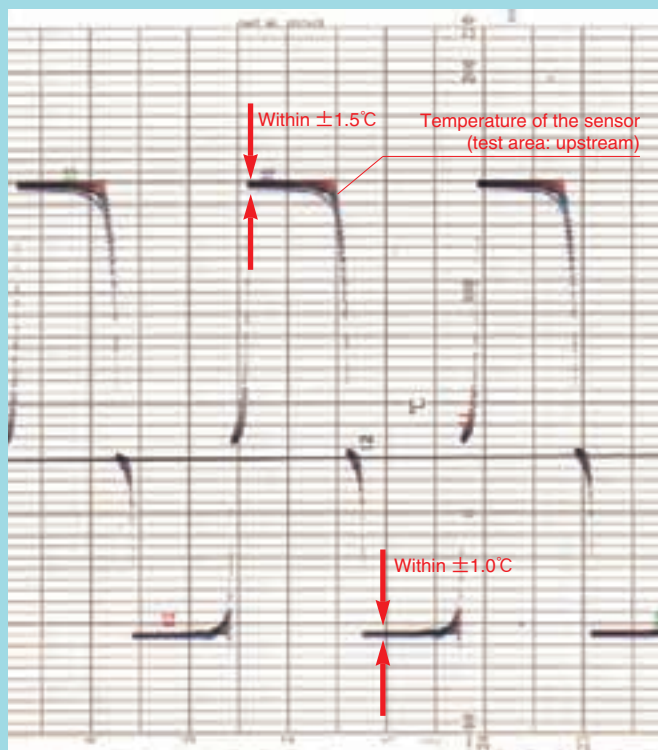
The side-flow system in which air flows horizontally through the test area provides superior specimen temperature uniformity performance.

- **Temperature uniformity performance**
Measurement example from TSA-71L-A

Test conditions

High-temp. exposure: +150°C 30 min.
Ambient temp. exposure: 5 min.
Low-temp. exposure: -55°C 30 min.
Specimen: Plastic molded ICs 2.5 kg

Temperature uniformity measurement method
Thermocouples were embedded in 10 plastic molded ICs (16-pin DIPs), which were then placed on two levels in each of the corners and in the center of a specimen basket.



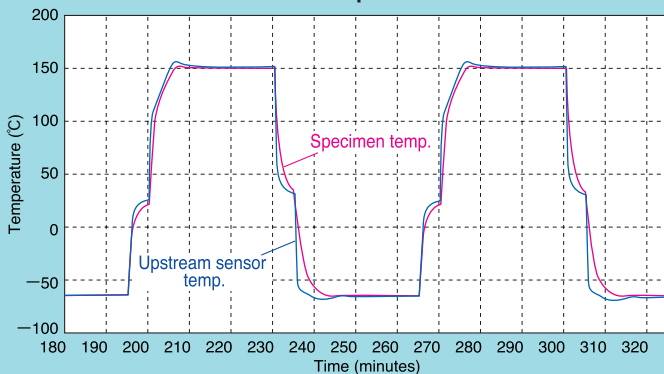
Test area

Performance

Two available options provide higher reliability and precision.

● Specimen temperature control (optional)

TSA-71S-A measurement example



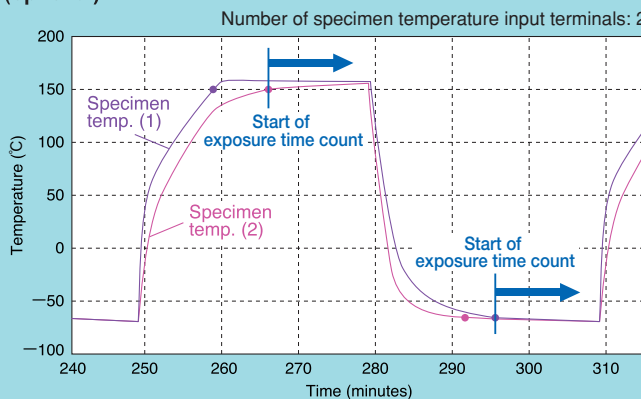
Test conditions

High-temp. exposure: +150°C	30 min.	Specimen:	Molded plastic ICs (3.5 kg)
Ambient-temp. exposure:	5 min.	Specimen baskets:	2nd and 6th levels from top
Low-temp. exposure: -65°C	30 min.	Control point:	208-pin QFP (quad flat package) with sensor is installed in center of 6th level.

● For more reliable tests (optional: specimen temperature control)

This option uses a single sensor attached to the specimen to let you monitor its temperature and control the equipment operation based on the specimen temperature. Conventionally, the test area is controlled by the air temperature, and controlling the precise specimen temperature is difficult, requiring trial-runs to regulate preheating or precooling temperatures. The specimen temperature control option lets you control the equipment so that the specimen reaches and maintains the preset temperature as quickly and precisely as possible. This makes it easy to carry out reliable tests using the specimen temperature as the test reference.

● Specimen temperature monitor with trigger function (optional)



● Specimen temperature monitoring (optional: specimen temperature monitor with trigger function)

This option uses two sensors attached to the specimens to let you monitor their temperature, displayed in the instrumentation. When the specimen temperature reaches the preset temperature goal, a trigger function starts the exposure time count. When this function is used for conventional air temperature control mode, starting exposure time when the specimen has reached its temperature goal makes the test more precise. The sensors can be connected to a temperature recorder to record the temperatures of the specimen and test area.

Preservation of the ozone layer and protection of natural resources—Environmental technologies resulting from heightened environmental awareness.

● Reduced load current

A lower maximum load current means less stress on customers' power system.

● Reduced operating noise

Operating noise has been reduced to less than 65 dB to improve user comfort.

Measurement location:
1 m from front of chamber and 1 m height
Measurement conditions:
A characteristics (complied with JIS-Z-8731)
* May vary depending on environmental conditions.

● Ozone layer protection

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

● Recycling

Material of recyclable molded resin are all clearly marked.

● Consolidated System

ESPEC's "conductor resistance evaluation system" continuously measures slight resistance of conductive parts, soldered or connected with a connector, during a thermal cycle of high and low temperatures.

Using a computer, the system provides you with automatic measurement, data recording and data processing. It can also be used with the thermal shock chamber connected.

● Remote control from your PC

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



Time signal part (material marked)



Perforated cable port cap (material marked)

● Load current and required electricity

Model	Maximum load current	Required electricity
TSA- 71H	112A	125A
TSA- 71S	80A	100A
TSA-101S	80A	100A
TSA-201S	130A	150A
TSA- 41L	49A	60A
TSA- 71L	60A	75A
TSA-101L	60A	75A
TSA-301L	130A	150A



Example of the thermal shock chamber connected with the conductor resistance evaluation system

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 on-screen instructions. The screen allows at-a-glance confirmation of test patterns, test area temperatures, test cycles, upstream/downstream control, and trend graph displays.

● Test resume/ restart function

When a test is interrupted, this function lets you select whether to resume the test from the point of the interruption, or to start testing again from the beginning.

● Eco operation



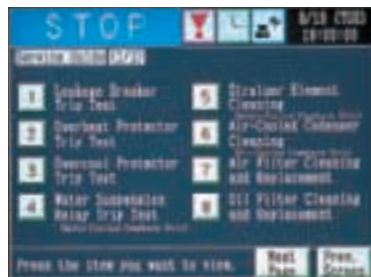
● Test detail monitor



● Test settings



● Service guide



● Alarm



Setting	Interactive key input by touch panel
Display	TFT Color LCD (10.4 inch)
Temperature control function	Test area: exposure temp. High-temp. chamber: pre-heating temp. Low-temp. chamber: pre-cooling/defrosting temp. PID control
Setting and indication resolution	Temperature: 1°C Time: 1 minute (Time left display in 1second)
Input	Thermocouple type T (Copper/Copper-Nickel)
Setting and indication ranges	Exposure time: 1 min. to 99 hours 59 min. Test cycle: 1 to 9999 cycles
Test patterns	RAM mode: 40 patterns (writable) ROM mode: 20 standard test patterns (registered)
Accessory function	<ul style="list-style-type: none"> • Timer preset function • Test continuity selection function • Overheat/overcool protection function • Up-stream/down-stream sensor selection function • Stable time control function • Exposure time reducing function • Eco operation function • Power failure/recovery operation selecting function • Automatic defrosting function • Temperature recovery time setting function • Preconditioning/after conditioning function • Dry operation function • Program memory function • Automatic power shut-off function • Programmed time display function • Test halt function • Test completion mode selecting function • Trend graph function • Alarm history display function • Sensor calibration function • RS-485 communications

TEST STANDARD AND COMPATIBLE MODELS

Test standard	Exposure temperature			Exposure time		Temp. recovery time	Number of cycles	Test starting point	Model *1			
	High temp.	Ambient temp.	Low temp.	High/low temp.	Ambient temp.				H type	S type	L type	
MIL-STD-883E (Method No.1010.7)	A	+ 85°C ⁺¹⁰ ₀	—	- 55°C ⁰ ₋₁₀	More than 10 min.	—	Worst case load temp. within 15 min.	Minimum 10 cycles	Low temp. or high temp.	<input type="radio"/>	<input type="radio"/>	—
	B	+125°C ⁺¹⁵ ₀								<input type="radio"/>	<input type="radio"/>	—
	C	+150°C ⁺¹⁵ ₀		- 65°C ⁰ ₋₁₀						<input type="radio"/>	—	—
	D	+200°C ⁺¹⁵ ₀								—	—	—
	E	+300°C ⁺¹⁵ ₀		<input type="radio"/>						—	—	
	F	+175°C ⁺¹⁵ ₀		<input type="radio"/>						—	—	
MIL-STD-202G (Method No. 107G)	A	+ 85°C ⁺³ ₀	+ 25°C ⁺¹⁰ ₋₅	- 55°C ⁰ ₋₃	Differs according to the weight of specimen: 28g and below 15 min. or 30min. 28 to 136g 30min. 136g to 1.36kg 60min. 1.36 to 13.6kg 120min. 13.6 to 136 kg 240min.	Max 5 min.	Upstream of specimen within 5 min.	5cycles 25cycles 50cycles 100cycles	Low temp.	<input type="radio"/>	<input type="radio"/> *2	<input type="radio"/> *2
	B	+125°C ⁺³ ₀								<input type="radio"/>	<input type="radio"/> *2	—
	C	+200°C ⁺⁵ ₀		<input type="radio"/>						—	—	
	D	+350°C ⁺⁵ ₀		—						—	—	
	E	+500°C ⁺⁵ ₀		—						—	—	
	F	+150°C ⁺³ ₀		<input type="radio"/>						<input type="radio"/> *2	—	
IEC 60068-2-14 Test Na (JIS C 0025) *3	+ 70°C ±2 + 85°C ±2 +100°C ±2 +125°C ±2 +155°C ±2 +175°C ±2 +200°C ±2	Ambient temp.	- 5°C ±3 -10°C ±3 -25°C ±3 -40°C ±3 -55°C ±3 -65°C ±3	3 hours 2 hours 1 hour 3 hours if not specified	2 to 3 min.	Within 10% of exposure time	5 cycles unless otherwise specified	Low temp.	<input type="radio"/>	<input type="radio"/> *2	<input type="radio"/> *2	
JASO D 001	1	+ 85°C	Ambient temp.	-40°C	Less than 0.2kg/ 1 hour +15min. 0 0.2 to 0.8kg 2 hours +15min. 0 0.8 to 1.5kg 3 hours +15min. 0 more than 1.5kg 4 hours +15min. 0	As short as possible	Upstream of specimen within 5 min.	6 cycles	High temp.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	2	+ 75°C								<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	3	+120°C								<input type="radio"/>	<input type="radio"/>	—
IEC 61747-5 (EIAJ ED-2531A) *3	+ 60°C ±2 + 65°C ±2 + 70°C ±2 + 75°C ±2 + 80°C ±2 + 85°C ±2 + 90°C ±2 + 95°C ±2 +100°C ±2	Ambient temp.	0°C ±3 - 5°C ±3 -10°C ±3 -15°C ±3 -20°C ±3 -25°C ±3 -30°C ±3 -35°C ±3 -40°C ±3 -45°C ±3 -50°C ±3	3 hours 2 hours 1 hour 3 hours if not specified	2 to 3 min.	Within 10% of exposure time	5 or 10 cycles	Low temp.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

*1 The test results may not meet specifications depending on the quantity of specimens or the setting method.

*2 Some models can not be used depending on test conditions. For further information, please contact us.

*3 Only conditions mentioned above.

CHAMBER AND UTILITY REQUIREMENTS

Model	H type	S type				L type				
	71H-W	71S-A	71S-W	101S-W	201S-W	41L-A	71L-A	101L-A	301L-W	
	Water-cooled	Air-cooled	Water-cooled			Air-cooled			Water-cooled	
Temperature range	+60 to +200°C (+140 to 392°F) -70 to 0°C (-94 to +32°F)					+60 to +200°C (+140 to 392°F) -65 to 0°C (-85 to +32°F)				
Test area mm (inch)	W 410 (16.1) H 460 (18.1) D 370 (14.6)		W 650 (25.6) H 460 (18.1) D 370 (14.6)		W 650 (25.6) H 460 (18.1) D 670 (26.4)	W 240 (9.4) H 460 (18.1) D 370 (14.6)	W 410 (16.1) H 460 (18.1) D 370 (14.6)	W 650 (25.6) H 460 (18.1) D 370 (14.6)	W 970 (38.1) H 460 (18.1) D 670 (26.4)	
System	2-zone or 3-zone system by means of damper switching									
Power supply	200V AC 3 ϕ 3W 50/60Hz, 220V AC 3 ϕ 3W 60Hz, 380V AC 3 ϕ 4W 50Hz, 400/415V AC 3 ϕ 4W 50Hz (CE Marking)									
Maximum load current	200V AC	112A	80A			130A	49A	60A		130A
	220V AC	108A	77A			125A	47A	58A		125A
	380V AC	60A	50A			70A	27A	36A		70A
	400/415V AC	60A	50A			70A	27A	36A		70A
Air	0.4 to 0.7MPa (4 to 7kgf/ cm ²)									
Condensation load (KJ/h)	50Hz	87900	—	62800		87900	—	—		87900
	60Hz	104600	—	73200		104600	—	—		104600
Cooling water supply volume (at reference water temp.+25°C)	2350L/ h	—	1540L/ h			2350L/ h	—	—		2350L/ h
Water pressure	0.2 to 0.5MPa (2 to 5kgf/ cm ²)	—	0.2 to 0.5MPa (2 to 5kgf/ cm ²)			—	—		0.2 to 0.5MPa (2 to 5kgf/ cm ²)	
Outside dimensions mm (inch)	W 1310 (51.6) H 1900 (74.8) D 1670 (65.7)	W 1310 (51.6) H 1900 (74.8) D 1370 (53.9)		W 1550 (61) H 1900 (74.8) D 1370 (53.9)	W 1550 (61) H 1900 (74.8) D 1670 (65.7)	W 1140 (44.9) H 1900 (74.8) D 1170 (46.1)	W 1310 (51.6) H 1900 (74.8) D 1370 (53.9)	W 1550 (61) H 1900 (74.8) D 1370 (53.9)	W 1870 (73.6) H 1900 (74.8) D 1670 (65.7)	

H TYPE

HIGH PERFORMANCE MODEL

Model		TSA-71H-W	
System		2-zone or 3 zone system by means of damper switching	
Operating temperature		0 to +40°C (+32 to +104°F)	
Performance ^{*3}	Test area	High temp. exposure range	+60 to +200°C (+140 to +392°F)
		Low temp. exposure range	-70 to 0°C (-94 to +32°F)
		Temperature fluctuation ^{*1}	±0.5°C (±0.9°F)
	High temp. chamber	Pre-heat upper limit	+205°C (+401°F)
		Temp. heat-up time ^{*2}	Ambient temp. to +200°C (+392°F) within 15 min.
	Low temp. chamber	Pre-cool lower limit	-77°C (-106.6°F)
		Temp. pull-down time ^{*2}	Ambient temp. to -75°C (-103°F) within 50 min.
	Temp. recovery performance	Recovery conditions	<ul style="list-style-type: none"> • 2 zone: <ul style="list-style-type: none"> High-temp. exposure +150°C (+302°F) 15 min. Low-temp. exposure -65°C (-85°F) 15 min. • Supply voltage normal voltage • Sensor position Downstream of specimen • Specimen 5.0kg (Plastic molded ICs 3.5kg (Specimen basket, shelf bracket 1.5kg))
		Temp. recovery time	Within 5 min.
	Noise ^{*4}		Max. 65dB
Construction	Outer shell	Painted steel (Melamine coating)	
	Interior	18-8 Cr-Ni stainless steel plate	
	Insulation	Glass wool, expanded polyurethane	
Heater		Stripped wire heater	
Cooler		Plate fin cooler and cold accumulator	
Air circulator		Sirocco fan	
Test area door		Hand-operated vertically sliding door	
Refrigerator unit	Refrigeration system	Mechanical cascade refrigeration system (water-cooled condenser)	
	Compressor	Hermetically sealed scroll compressor	
	Refrigerant	High temp. chamber: R404A Low temp. chamber: R23	
	Expansion mechanism	Electronic expansion valve, others	
Damper driving unit		Air cylinder	
Fittings		Cable port (25 × 100mm slot on the left side of body), Specimen power supply control terminal, Time signal (2) , Integrating hour meter	
Test area load capacity		30kg (equally distributed load)	
Inside dimensions (W×H×Dmm/ in.)		410×460×370 / 16.1×18.1×14.6	
Outside dimensions ^{*5} (W×H×Dmm/ in.)		1310×1900×1670 / 51.6×74.8×65.7	
Weight		Approx. 1250kg	
Utility requirement	Power supply	200V AC 3 φ 3W 50/60Hz, 220V AC 3 φ 3W 60Hz, 380V AC 3 φ 4W 50Hz, 400/ 415V AC 3 φ 4W 50Hz ^{*6}	
	Air	0.4 to 0.7MPa (4 to 7kgf/ cm ²)	
	Water pressure	0.2 to 0.5 MPa (2 to 5kgf/ cm ²)	
	Cooling water supply volume ^{*7}	2350L/ h (at reference water temp. +25°C) 4400L/ h (at reference water temp. +32°C)	
	Piping connection size	32A	
	Operatable cooling water temp. range	+5 to +38°C (+41 to +100°F)	

*1 Performance shown above is conformable to JTM K01-1998.

*2 When each chamber is operated independently.

*3 At +23°C ambient temperature.

*4 Measurements are to be taken in a location with low reverberation, such as in an anechoic chamber at a height of 1 m and 1 m from the system front face. (A characteristics: Complied with JIS-Z-8731)

*5 Excluding protrusions.

*6 This chamber is in compliance with the requirements of the European Community Directives. (CE Marking)

*7 The rate fluctuates when heat exchanger is unclean.

S TYPE

STANDARD PERFORMANCE MODEL

Model		TSA-71S-A/W	TSA-101S-W	TSA-201S-W
System		2-zone or 3 zone system by means of damper switching		
Operating temperature		0 to +40°C (+32 to +104°F)		
Performance *3	Test area	High temp. exposure range	+60 to +200°C (+140 to +392°F)	
		Low temp. exposure range	-70 to 0°C (-94 to +32°F)	
		Temperature fluctuation *1	±0.5°C (±0.9°F)	
	High temp. chamber	Pre-heat upper limit	+205°C (+401°F)	
		Temp. heat-up time *2	Ambient temp. to +200°C (+392°F) within 15 min.	
	Low temp. chamber	Pre-cool lower limit	-75°C (-103°F)	
		Temp. pull-down time *2	Within 40 min.	Within 50 min.
	Temp. recovery performance	Recovery conditions	<ul style="list-style-type: none"> • 3 zone: <ul style="list-style-type: none"> High-temp. exposure +150°C (+302°F) 30 min. Ambient-temp. exposure 5 min. Low-temp. exposure -65°C (-85°F) 30 min. • Supply voltage normal voltage • Sensor position upstream of specimen 	<ul style="list-style-type: none"> • 3 zone: <ul style="list-style-type: none"> High-temp. exposure +150°C (+302°F) 30 min. Ambient-temp. exposure 10 min. Low-temp. exposure -65°C (-85°F) 30 min. • Supply voltage normal voltage • Sensor position upstream of specimen
		Temp. recovery time	<ul style="list-style-type: none"> • Specimen 6.5kg (Plastic molded ICs 5kg Specimen basket, shelf bracket 1.5kg) 	<ul style="list-style-type: none"> • Specimen 7.5kg (Plastic molded ICs 5kg Specimen basket, shelf bracket 2.5kg)
	Noise *4		Max. 65dB	
Construction	Outer shell	Painted steel (Melamine coating)		
	Interior	18-8 Cr-Ni stainless steel plate		
	Insulation	Glass wool, expanded polyurethane		
Heater		Stripped wire heater		
Cooler		Plate fin cooler and cold accumulator		
Air circulator		Sirocco fan		
Test area door		Hand-operated vertically sliding door		
Refrigerator unit	Refrigeration system	Air-cooled condenser or water-cooled condenser	Mechanical cascade refrigeration system Water-cooled condenser	
	Compressor	Hermetically sealed scroll compressor		
	Refrigerant	High temp. chamber: R404A Low temp. chamber: R23		
	Expansion mechanism	Electronic expansion valve, others		
Damper driving unit		Air cylinder		
Fittings		Cable port (25 × 100mm slot on the left side of body), Specimen power supply control terminal, Time signal (2), Integrating hour meter		
Test area load capacity		30kg (equally distributed load)	50kg (equally distributed load)	
Inside dimensions (W×H×Dmm/ in.)		410×460×370/16.1×18.1×14.6	650×460×370/25.6×18.1×14.6	650×460×670/25.6×18.1×26.4
Outside dimensions *5 (W×H×Dmm/ in.)		1310×1900×1370/51.6×74.8×53.9	1550×1900×1370/61×74.8×53.9	1550×1900×1670/61×74.8×65.7
Weight		Approx. 1050kg	Approx. 1150kg	Approx. 1400kg
Utility requirement	Power supply	200V AC 3 φ 3W 50/60Hz, 220V AC 3 φ 3W 60Hz, 380V AC 3 φ 4W 50Hz, 400/ 415V AC 3 φ 4W 50Hz *6		
	Air	0.4 to 0.7MPa (4 to 7kgf/ cm ²)		
	Water pressure	0.2 to 0.5 MPa (2 to 5kgf/ cm ²) (water-cooled type)		0.2 to 0.5 MPa (2 to 5kgf/ cm ²)
	Cooling water supply volume *7	1540L/ h (at reference water temp. : +25°C) (water-cooled type) 2800L/ h (at reference water temp. : +32°C) (water-cooled type)		2350L/ h (at reference water temp. : +25°C) 4400L/ h (at reference water temp. : +32°C)
	Piping connection size	32A		
Operable cooling water temp. range		+5 to +38°C (+41 to +100°F) (water-cooled type)	+5 to +38°C (+41 to +100°F)	

*1 Performance shown above is conformable to JTM K01-1998.

*2 When each chamber is operated independently.

*3 At +23°C ambient temperature.

*4 Measurements are to be taken in a location with low reverberation, such as in an anechoic chamber at a height of 1 m and 1 m from the system front face.
(A characteristics: Complied with JIS-Z-8731)

*5 Excluding protrusions.

*6 This chamber is in compliance with the requirements of the European Community Directives. (CE Marking)

*7 The rate fluctuates when heat exchanger is unclean.

L TYPE

LIGHT PERFORMANCE MODEL

Model		TSA-41L-A	TSA-71L-A	TSA-101L-A	TSA-301L-W	
System		2-zone or 3 zone system by means of damper switching				
Operating temperature		0 to +40°C (+32 to +104°F)				
Performance ^{*3}	Test area	High temp. exposure range		+60 to +200°C (+140 to +392°F)		
		Low temp. exposure range		-65 to 0°C (-85 to +32°F)		
		Temperature fluctuation ^{*1}		±0.5°C (±0.9°F)		
	High temp. chamber	Pre-heat upper limit		+205°C (+401°F)		
		Temp. heat-up time ^{*2}	Within 10 min.	Ambient temp. to +200°C (+392°F) Within 15 min.		
	Low temp. chamber	Pre-cool lower limit		-75°C (-103°F)		
		Temp. pull-down time ^{*2}	Within 75 min.	Within 45 min.	Within 70 min.	Within 45 min.
	Temp. recovery performance	Recovery conditions		<ul style="list-style-type: none"> • 3 zone: <ul style="list-style-type: none"> High-temp. exposure +150°C (+302°F) 30 min. Ambient-temp. exposure 5 min. Low-temp. exposure -55°C (-67°F) 30 min. • Supply voltage normal voltage • Sensor position upstream of specimen 		
		Temp. recovery time	<ul style="list-style-type: none"> • Specimen 3.5kg (Plastic molded ICs 2.5kg) (Specimen basket, shelf bracket 1.0kg) • Specimen 4.0kg (Plastic molded ICs 2.5kg) (Specimen basket, shelf bracket 1.5kg) • Specimen 5.0kg (Plastic molded ICs 2.5kg) (Specimen basket, shelf bracket 2.5kg) • Specimen 31kg (Plastic molded ICs 24kg) (Specimen basket, shelf bracket 7kg) 	Within 5 min.		Within 10 min.
	Noise ^{*4}		Max. 65dB			
Construction	Outer shell		Painted steel (Melamine coating)			
	Interior		18-8 Cr-Ni stainless steel plate			
	Insulation		Glass wool, expanded polyurethane			
Heater		Stripped wire heater				
Cooler		Plate fin cooler and cold accumulator				
Air circulator		Sirocco fan				
Test area door		Hand-operated vertically sliding door				
Refrigerator unit	Refrigeration system		Mechanical cascade refrigeration system Air-cooled condenser		Water-cooled condenser	
	Compressor		Hermetically sealed rotary compressor	Hermetically sealed scroll compressor		
	Refrigerant		High temp. chamber: R404A Low temp. chamber: R508A	High temp. chamber: R404A Low temp. chamber: R23		
	Expansion mechanism		Electronic expansion valve, others			
Damper driving unit		Air cylinder				
Fittings		Cable port (25 × 100mm slot on the left side of body), Specimen power supply control terminal, Time signal (2), Integrating hour meter				
Test area load capacity		30kg (equally distributed load)		50kg (equally distributed load)		
Inside dimensions ^{*5} (W×H×Dmm/ in.)		240×460×370/9.4×18.1×14.6	410×460×370/16.1×18.1×14.6	650×460×370/25.6×18.1×14.6	970×460×670/38.1×18.1×26.4	
Outside dimensions (W×H×Dmm/ in.)		1140×1900×1170/44.9×74.8×46.1	1310×1900×1370/51.6×74.8×53.9	1550×1900×1370/61×74.8×53.9	1870×1900×1670/73.6×74.8×65.7	
Weight		Approx. 730kg	Approx. 900kg	Approx. 940kg	Approx. 1420kg	
Utility requirement	Power supply		200V AC 3 φ 3W 50/60Hz, 220V AC 3 φ 3W 60Hz, 380V AC 3 φ 4W 50Hz, 400/ 415V AC 3 φ 4W 50Hz ^{*6}			
	Air		0.4 to 0.7MPa (4 to 7kgf/ cm ²)			
	Water pressure		————		0.2 to 0.5 MPa (2 to 5kgf/ cm ²)	
	Cooling water supply volume ^{*7}		————		2350L/h (at reference water temp. : +25°C) 4400L/h (at reference water temp. : +32°C)	
	Piping connection size		————		32A	
Operatable cooling water temp. range		————		+5 to +38°C (+41 to +100°F)		

*1 Performance shown above is conformable to JTM K01-1998.

*2 When each chamber is operated independently.

*3 At +23°C ambient temperature.

*4 Measurements are to be taken in a location with low reverberation, such as in an anechoic chamber at a height of 1 m and 1 m from the system front face. (A characteristics: Complied with JIS-Z-8731)

*5 Excluding protrusions.

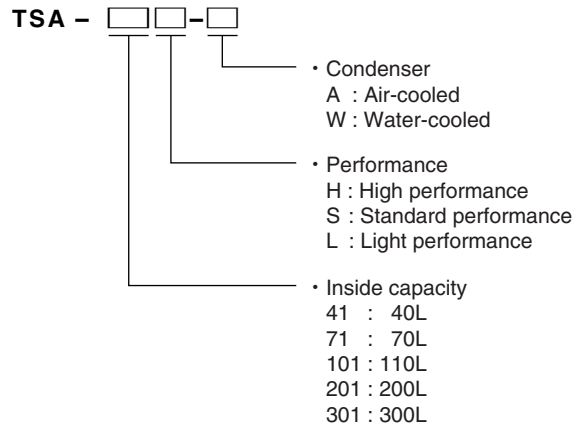
*6 This chamber is in compliance with the requirements of the European Community Directives. (CE Marking)

*7 The rate fluctuates when heat exchanger is unclean.

SAFETY DEVICES

- Leakage breaker (200, 220, 380V AC)
- Circuit breaker (400/415V AC)
- Electric parts compartment door switch
- Temperature switch for overheat protection of high temperature chamber
- Temperature switch for overheat protection of low temperature chamber
- Overheat protector for high-temp. chamber (Built-in controller)
- Overheat protector for low-temp. chamber (Built-in controller)
- Test area overheat and overcool protector (Built-in controller)
- Test area overheat and overcool protector (optional)
- Refrigerator high and low pressure switch
- Compressor built-in protector (except TSA-41L)
- Current sensing relay for compressor (TSA-71L/101L only)
- Temperature switch for compressor
- Thermal relay for compressor (TSA-41L only)
- Thermal relay for air circulator
- Motor temperature switch
- Motor reverse-prevention relay
- Air pressure switch
- Test area door switch
- Air purge valve
- Fuse
- Specimen power supply control terminal
- Water suspension relay (Only for water-cooled type)
- Cooling tower interlock terminal (Only for water-cooled type)

MODEL



ACCESSORIES

- Specimen basket
(18-8 Cr-Ni stainless steel: 5 mesh metal basket)
TSA-41 (W230×H40×D356mm/load capacity 2.5kg) 2
TSA-71 (W400×H40×D356mm/load capacity 5kg) 2
TSA-101 (W640×H40×D356mm/load capacity 5kg) 2
TSA-201 (W640×H40×D656mm/load capacity 17kg) 2
TSA-301 (W960×H40×D656mm/load capacity 17kg) 2
- Shelf bracket 2
- Cartridge fuse
1A, 2A, 7A, 10A (except 200V AC spec.) 1 each
- Cable port rubber plug 1
- Nipple (for water-cooled type only) 1
- Strainer (for water-cooled type only) 1
- Strainer element (for water-cooled type only) 1
- User's manual 1



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 user's manual before operation.

OPTIONS

Defrost-free operation

For 2-zone tests, enables continuous defrost-free tests of up to 1000 cycles. (patent No. 3514735)

Supported models

- TSA-71H-W
- TSA-201S-W

TSA-71H-W (1000 cycles [500 hours])

■ Test conditions

Temperature recovery (2 zones)

- Temp. recovery time: 5 min.

· High-temp. exposure:
150°C 15 min.

· Low-temp. exposure:
−65°C 15 min.

· Ambient temp. and humid.:
23°C, 60% rh or less

· Cooling water temp.: 25°C

· Power voltage: Normal voltage

· Sensor position:

Downstream of specimen

· Specimen: 5.0 kg

(Plastic molded ICs 3.5 kg)
(Specimen basket, shelf bracket 1.5 kg)

TSA-201S-W (500 cycles [500 hours])

■ Test conditions

Temperature recovery (2 zones)

- Temp. recovery time: 5 min.

· High-temp. exposure:
125°C 30 min.

· Low-temp. exposure:
−40°C 30 min.

· Ambient temp. and humid.:
23°C, 60% rh or less

· Cooling water temp.: 25°C

· Power voltage: Normal voltage

· Sensor position:

Downstream of specimen

· Specimen: 10 kg

(Plastic molded ICs 7 kg)
(Specimen basket, shelf bracket 3 kg)

* The specified numbers of cycles of continuous operation only apply when there are no interruptions in test cycles, test area doors are not opened/closed and no equipment errors occur during test cycles.

Specimen temperature control

A temperature sensor is attached to the specimens to control chamber operation based on the specimen temperature.

- Number of measurement points: 1
- Location: Left panel
- Thermocouple type T: 1
(Copper/ Copper-Nickel)



Specimen temperature monitor with trigger function

Two temperature sensors are attached to the specimens to enable the specimen temperature to be monitored. When the specimen temperature reaches the set temperature the exposure time count starts.

- Number of measurement points: 2
- Location: Left panel
- Thermocouple type T: 2
(Copper/ Copper-Nickel)



Paperless recorder

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

Number of inputs (Initial setting):

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.

PL4S: 4 (2 more channels can be turned ON)

Data saving cycle: 1 sec.

PL4L: 4 (2 more channels can be turned ON)

Data saving cycle: 5 sec.

PL5S: 5 (1 more channel can be turned ON)

Data saving cycle: 1 sec.

PL5L: 5 (1 more channel can be turned ON)

Data saving cycle: 5 sec.

Temperature range: −100°C to +220°C

External memory media :

CF memory card (128 MB)

Language support: ENG, JPN, CHN



Temperature recorder (digital)

−100 to +220°C/100mm

- RK-61 1 pen
- RK-63 3 pens
- RK-64 6 dots



OPTIONS

Temperature recorder for future installation

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

Recorder terminal

Serves to output the temperature within test area, high temp chamber, low temp chamber.



Thermocouple

Thermocouple measures the temperature of specimens.
· Type T with ball attached.

Exposure signal output

A signal is output via a contact switch when test area temperature is within the user-selected range. This signal can be used to control peripheral instruments, such as to apply a voltage to specimens only during high temperature exposure, or monitor test operation from a remote point.



Additional overhear protector

Additional preventive measures can be taken for excessive temperature rise in the chamber, in addition to the standard equipped double overhear protector.

External alarm terminal

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



Emergency stop switch

Stops the chamber immediately.

* If you also need the automatic door, please contact us.

Total cycle counter

Indicates cycle counts.

· Display range 1 to 99999999
(with resetting function)

Auxiliary cooling injector (LCO₂)

Used to reduce the temperature recovery time of low temperature exposure by injecting liquefied carbon dioxide at beginning of exposure.

Auxiliary cooling injector (LN₂)

Used to reduce the temperature recovery time of low temperature exposure by injecting liquefied nitrogen at beginning of exposure.

Built-in air compressor

Select when there is no air supply source.

Automatic door

Automatic vertically sliding door operates at the touch of a button. Equipped with two safety features, a photoelectric sensor, a touch sensor and a door stop switch.

* If you also need the emergency stop switch, please contact us.



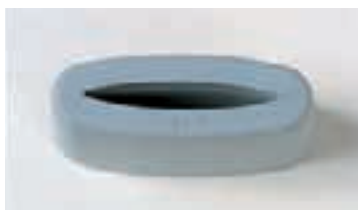
OPTIONS

Additional cable port

Provided in addition to the standard equipped cable port. Choose the addition of one or two. (25×100mm slot)

Cable port rubber plug

Prevents air leakage from the cable port.



Caster

Installed for mobility.
· 6 casters (4 casters for TSA-41L)
· 4 adjuster-feet

Specimen basket / shelf bracket

Equivalent to standard accessory.
· Material: Stainless steel (5 mesh)

Heavy-duty shelves

Used to hold heavy specimen exceeding the load capacity of the standard specimen basket.
· Load capacity : 30kg

Chamber dew tray

Prevents water leaks from the chamber onto the floor.
(Casters are recommended to be used.)

Fixture for securing body

Used to bolt the chamber to the floor.

Exhaust duct

Used when the distance between the ceiling of the installation site and the top of the chamber body is 600 mm or less, when the chamber may intake air at 40°C or higher thus exceeding the operating temperature, or in other cases where the exhaust heat is not well-ventilated.

- Tow ducts included
- Location
 - Top panel of chamber
 - mechanical parts compartment
- Exhaust direction Front
(Air-cooled specification chambers only)



Color specifications

Chamber can be painted to a desired color according to a color sample.

Communication functions

Computer interface
· GPIB
· RS-232C
(Standard: RS-485)

Power cable

5, 10m

*Not applicable for optional 380, 400/415V AC power supply specification.

For chamber with water-cooled condenser

When installing chamber with water-cooled condenser on upper floor, Water Leak Detector (sold separately) is recommended to be equipped in case of water leakage.

Thermal Shock Chamber Series

Thermal Shock Chamber TSD



Two-zone thermal shock chamber is in compliance with several Japanese and global test standards such as MIL-STD-883. The TSD model offers outstanding temperature uniformity to ensure that uniform temperature stresses are applied to specimens. TSD model can perform precise tests by monitoring the specimen temperature and then starting the exposure time count when it has reached the preset temperature or, immediately proceed to the next step in the sequence. The maximum temperature recovery time between 150 and -60°C is just 15 minutes, reducing the total test time.

Model	Temperature range	Inside dimensions (mm)
TSD-100	High-temp. zone: $+60$ to $+200^{\circ}\text{C}$ Low-temp. zone: -65 to 0°C	W710×H345×D410

Thermal Shock Chamber TSE



The TSE model for testing small specimens in limited volumes supports standards testing with no auxiliary cooling and a 2-zone ($+150^{\circ}\text{C}$ and -65°C) maximum upstream air temperature recovery time of just 5 minutes. The HFC-based refrigerant used is completely free of substances destructive to the ozone layer. TSE model provides the same performance as ESPEC's large thermal shock chamber models in a more compact design.

Model	Temperature range	Inside dimensions (mm)
TSE-11	High-temp. zone: $+60$ to $+200^{\circ}\text{C}$ Low-temp. zone: -65 to 0°C	W320×H148×D230

Liquid to Liquid Thermal Shock Chamber TSB



Liquid to liquid thermal shock chamber designed to apply higher thermal stresses to specimens requires much less space than previous models. The highly airtight test areas and large number of new mechanisms reduce brine consumption, greatly reducing running cost. The HFC-based refrigerant used is completely free of substances destructive to the ozone layer. Its operation has also been simplified by dialog-driven input with touch-sensitive keys and color LCD screens.

Model	Temperature range	Specimen basket dimensions (mm)
TSB-21	High temp. chamber: $+70$ to $+200^{\circ}\text{C}$	W120×H150×D120
TSB-51	Low temp. chamber: -65 to 0°C	W150×H150×D200

Large Capacity Thermal Shock Chamber TSA-2201-W



Large test area can accommodate large specimens

With a volume of approximately 2,200 liters, the test area can be used for tests for relatively large products, large automotive components, large FPDs (flat panel displays) or other items previously too large or heavy for conventional models to accommodate. This large volume is also ideal when rapid tests are needed for specimen volumes.

Loading/ unloading of heavy specimens made easier

The top-mounted high-temperature chamber and rear-mounted low-temperature chamber layout keeps the test area low. Furthermore, indentations for hand lifts make it easier to load and unload heavy specimens.

Model		TSA-2201-W	
System		2-zone or 3 zone system by means of damper switching	
Performance	Test area	High-temp. exposure range	+60 to +200°C
		Low temp. exposure range	-60 to 0°C
		Temperature fluctuation	±1.0°C
	High temp. chamber	Pre-heat upper limit	+200°C
		Temperature heat-up rate	20 min. max. (from ambient temp. to +200°C)
		Pre-cool lower limit	-65°C
	Low temp. chamber	Temperature pull-down rate	60 min. max. (from ambient temp. to -65°C)
		Recovery conditions	<ul style="list-style-type: none"> • 2-zone • High-temp. exposure: -60°C for 30 min. • Low-temp. exposure: -30°C for 30 min. • Supply voltage: 200V AC • Sensor position: Upstream of specimens • Specimen: 150 kg (Aluminum specimens 75kg×2)
			Temp. recovery time
Test area dimensions (mm)		W1550×H1200×D1200	
Outer dimensions (mm)		W2670×H2310×D3484	
Weight		Approx. 4000 kg	
Utility requirement	Power supply	200V AC 3φ 3W 60 Hz	
	Maximum load current	346A	
	Water pressure	0.2 to 0.5MPa (gauge pressure)	
	Cooling water supply volume	80 L/min. (at reference water temp. of +25°C), 147 L/min. (at reference water temp. of +32°C)	
	Piping connection size	50A	
Operable cooling water temp. range		+5 to +38°C	

※Performance figures are shown for operation without specimens and an ambient temperature of +23°C.