

Quality is more than a word



# Air to Air Thermal Shock Chambers

## TSA Series



# Now more reliable than ever, the TSA series provides network connectivity

The TSA series is ESPEC's best-selling damper-type thermal shock chamber.

The TSA series is equipped with the kind of useful features that are typical of ESPEC.

With new instrumentation featuring significantly increased processing speed and network connectivity, it is now possible to monitor and manage the status of test chambers in remote locations while sitting at your desk.

This functionality will result in more reliable tests and reduce the workload of the test conductor.

Experience the improved ease-of-use of the TSA series for yourself.

TSA-73



TSA-103





TSA-203



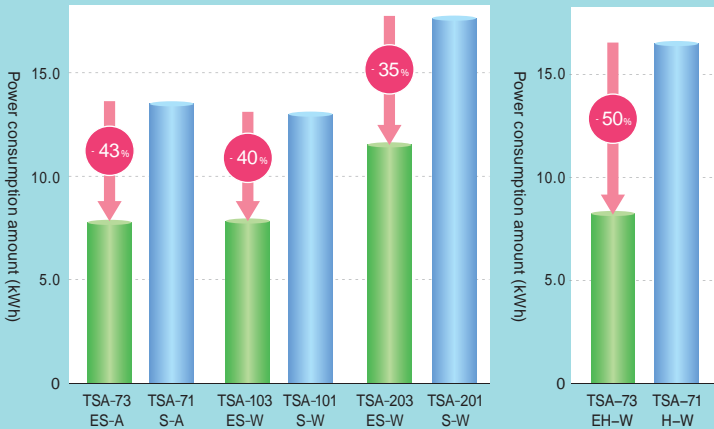
TSA-303



# Characteristics

## Maximum 50% reduction in power consumption with Eco operation mode and new refrigerator control system

### ● Power consumption amount comparison example (Power consumption amount per cycle by comparing ESPEC chambers)



Test conditions (Two-zone)  
 High-temp. exposure : +125°C  
 Low-temp. exposure : -40°C  
 Specimen: Plastic molded ICs: 5 kg (73, 103)  
 10 kg (203)  
 Exposure time : 30 min.  
 Temperature recovery time : Within 5 min.

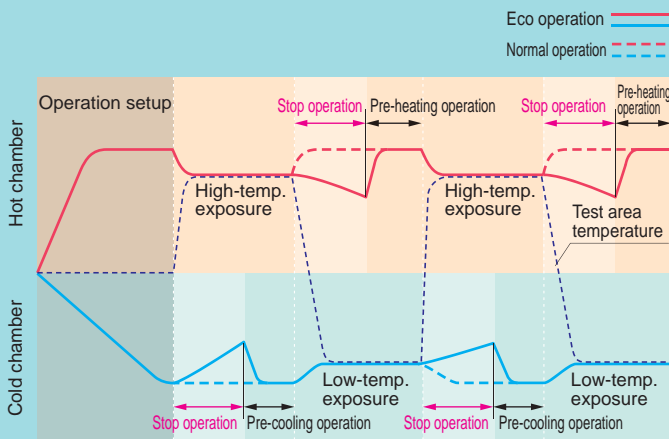
### ● Automatic setting of pre-cooling and pre-heating in energy saving, Eco operation mode [patent 5204808]

The new series incorporates an algorithm that calculates the minimum operation time for pre-cooling and pre-heating by constantly measuring the amount of heat required for these processes in eco operation mode. This feature can further reduce power consumption and remove the inaccuracies and hassles caused by adjustments based on preliminary experiments. Tests operation achieves both energy savings and reproducibility/reliability.

### ● Parallel refrigerator control system for energy-saving control [patent 5487167]

To optimize further the power consumption, the chamber features a parallel control system that connects two small refrigerators in parallel to the secondary side of the refrigeration circuit. The chamber can operate at the optimal refrigeration capacity based on the controlled temperature, by switching operation between two refrigerators simultaneously or a single refrigerator. At stable low-temperature exposures, power consumption is also reduced by limiting refrigeration capacity with an electronic expansion valve.

### ● Temperature changes under Eco operation (example)



# Characteristics

- **Minimizing defrosting burden with defrost-free operation (option: defrost-free operation)**

Until now testing was interrupted for defrosting when necessary, but ESPEC has developed a unique structure that stops frost formation under low temperatures by preventing the penetration of outside air (defrost-free operation [patent 3514735]). Defrosting during cycle tests is then unnecessary, thus reducing defrosting time and the power consumed for this operation.

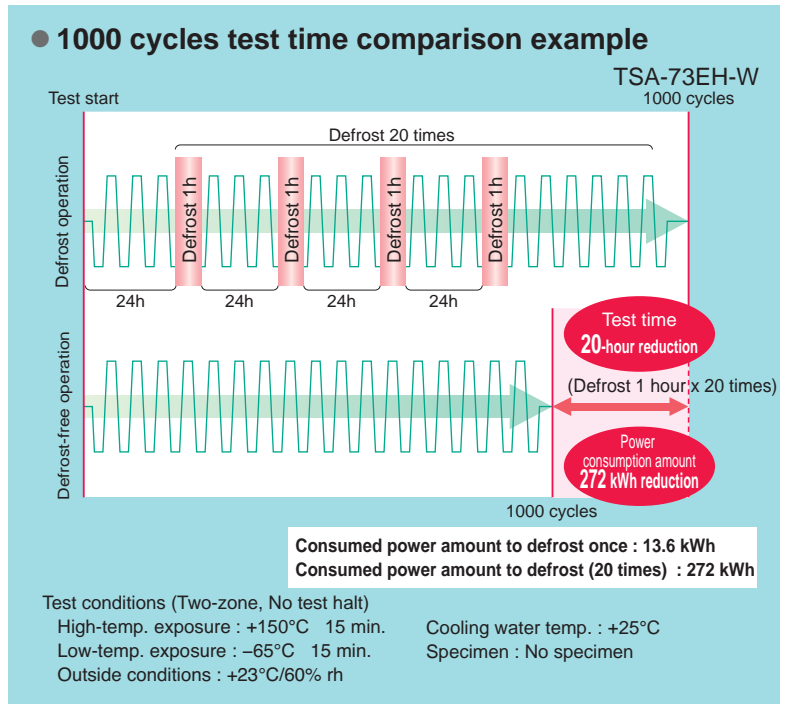
- **1000 cycles continuous operation (option: defrost-free operation)**

Defrost-free operation is provided as an option so 500-hour continuous operation can be performed without interruption (if test conditions are set for 15-minute exposure).

- **Highly accurate temperature recovery**

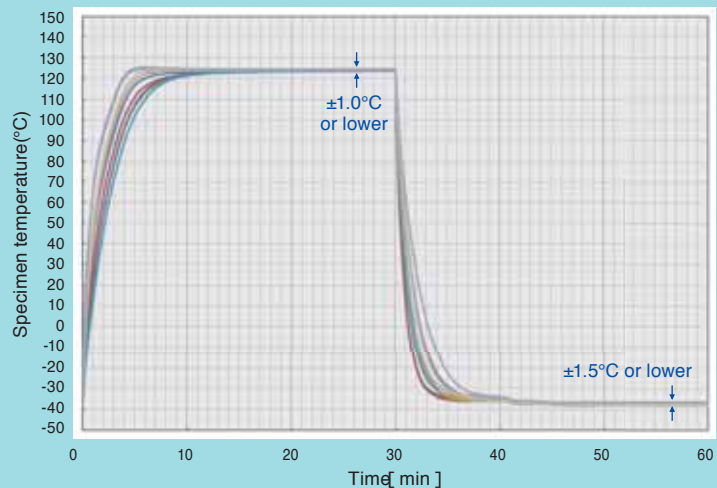
Dampers with integrated rectifying function minimize variation in exposure conditions due to specimen position within the test area. This reduces the overall test time and shortens temperature recovery time, especially during low-temperature exposure. The uniformity in test conditions brought by this innovation also contributes to improved test reproducibility and reliability.

- **1000 cycles test time comparison example**



- **Temperature uniformity**

TSA-203ES-W measurement example



Test conditions

High-temp. exposure: +125°C, 30 min. Specimen: Printed circuit boards 150 pcs.  
 Pre-heating temperature: +145°C Measuring points: 10  
 Low-temp. exposure: -40°C, 30 min.  
 Pre-cooling temperature: -55°C

# Characteristics



Product temperature control(example)

- **Accurate and dependable test result**  
(option: product temperature control\*)

The product temperature control is the function of chamber to be controlled by a temperature sensor is attached to the product.

This option is capable of accurate test securing product exposure to the set temperature. Because there is great difference between air temperature inside of test area and actual product temperature.

\* The function is not applicable Eco operation mode.

- **Monitoring product temperature**

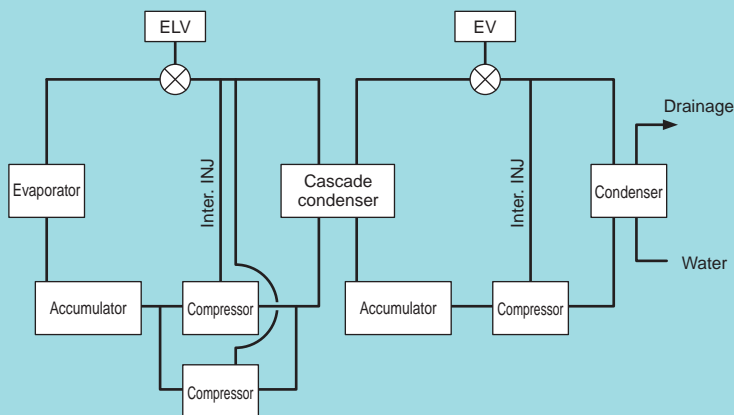
(option: product temperature monitor with trigger function)

Two temperature sensors on products in the test area for monitoring product temperatures during test.

The exposure time is only counted by the trigger temperatures are achieved set temperature.

- **Refrigeration circuit**

(Parallel refrigeration system:[patent 5487167])



- **ESPEC's patent parallel refrigeration system improves reliability**

Thanks to parallel refrigeration system and newly designed refrigeration circuit, reliability is improved. Circuit prevents refrigerant leaks by reducing thermal stress to refrigerators

and prevent corrosion in the pipings with changing material and thickness.

# Characteristics

- **Vertical sliding door**

Equipped with a vertical sliding structure, the door does not disrupt when inserting and removing specimens or when connecting cables to a specimen. The door has been lightened so that it can be easily opened and closed.

- **Available various cable ports**

A standard equipped  $\varnothing 50$  mm cable port is capable of cables with terminal connectors and plugs can be easily connected to specimen. An optional flat cable port is available.

- **System integration with ESPEC's evaluation system**

The ESPEC's Conductor Resistance Evaluation System AMR (Sold separately) and TSA series are interlocked as evaluation system.

The system continuously measures the micro resistance in solder joints and the conductive resistance of connectors during thermal cycle test.



Automatic door(option)



Vertically sliding door



Cable port



Conductor Resistance Evaluation System AMR with TSA

# Characteristics



Backtrace setting

## Online Diagnostics Service

(<http://www.espec.co.jp/english/support/onlinediagnosticservice.html>)



### ● Backtrace function

Backtrace data are created when the chamber triggers an alarm. All items required for chamber control including set temperature, measured temperature, etc. are recorded for the period before and after the alarm was triggered.

When the chamber stops because of trouble, the operation state just before the chamber stops is automatically recorded and saved. Saved data can be sent to ESPEC, by using our Online Diagnostics Service, and we will perform troubleshooting.

### ● Online Diagnostics Service

Online Diagnostics service is available using the backtrace data recorded by the chamber. Send the backtrace data to ESPEC via email; we will analyse the cause of the trouble and report the diagnosis back to you.

This service ensures accurately-performed diagnosis s that, in case repair work is required, appropriate troubleshooting will be prescribed ensuring reduced testing downtime.

### ● International Standards

The TSA series supports the following safety standards: Safety of machinery (ISO 12100,) Low voltages (IEC 60204,) and EMC (IEC 61000-6-2 and IEC 61000-6-4).

It is also RoHS- and Pressure Equipment Directive-compliant.

(Only models with power supply voltage of 400 V/415 V are PED-compliant.)

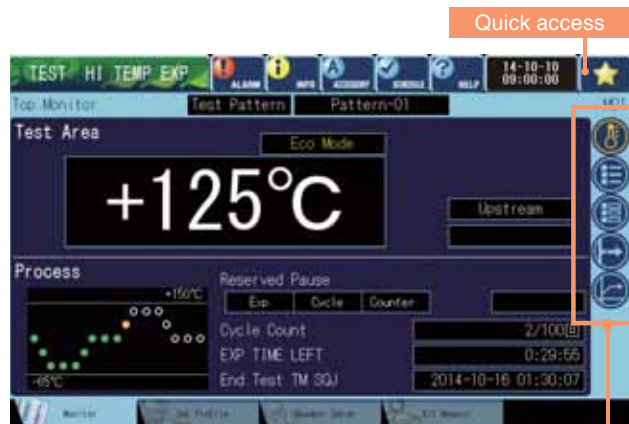


● **N-instrumentation equipped with a color LCD touch panel**

Wide 9-inch screen with LED backlight is clearer and provides faster display speed.

● **Quick access button**

The star mark (★) on the right top corner of the controller can be set to have instant access to any page you often need, either registered test program start, on else.



● **Enhanced test halt preset function [patent 5456600]**

It is now possible to program tests to halt after cycle or exposure completion. Six cycle counters are also built-in to the instrumentation so a test halt preset can be programmed for each counter. The function can be used to multiple ends such as removing specimens to the chamber.

● **Schedule memo : Download Add-on (plug-in)**

It allows you to take notes schedule and details test from controller or your PC via web browser.

\* Add-on software can be down loaded from membership Test Navi page.

● **Copy of test program patterns**

Transfer test programs between chambers without the need of a PC, via USB stick.

\* The USB memory is not included.

● **Trend graph output on USB memory**

Trend graphs can be displayed on the web application or downloaded on a USB memory. It is also possible to continuously register data on the USB memory if numerous data records are needed.

● **Multilingual display**

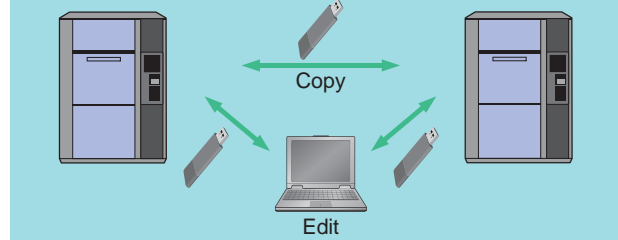
A simple operation changes display text to Japanese, Chinese (simplified, traditional), or Korean. Select the language that suits your needs.

● **Touch navigation**

Touch icon to show navigation bar.



● **Program copy and computer editing**



USB memory port

**N-instrumentation**

Temperature control function	PID control Input: Thermocouple type T (copper/copper-nickel)
Test patterns	40 patterns max. Test cycle: 1 to 9999 cycles
Language	Japanese, English, Chinese (simplified, traditional), Korean
External memory function	Interface: USB 2.0 standard compliant (A-type connector) Supported functions: Write sampling data, Read/ Write program (application software: Patten Manager Lite) Backtrace output Add-on/system updates
Web function	Interface: Ethernet port (100base-TX) Web applications: monitoring, setting, operation, maintenance setting, email alert Browser: Windows Internet Explorer 10

## Remote monitoring and control thanks to an Web application



Remote monitoring and control

### Edit program



### Graph display



- **Remote monitoring and control (Ethernet connection)**

A unique web application allows the user to monitor the chamber, set programs, and start and stop operation from a PC connected to the chamber Ethernet port (LAN's port). No software required, the chamber can be accessed and controlled from any PC via a web browser (Smartphone, tablets and the like can also be used).

Wireless connection and multiple units' connection are also possible.

- **Email alert**

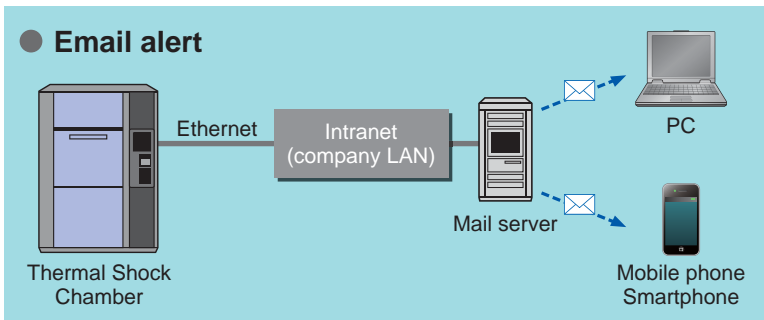
When an alarm is triggered, an e-mail is sent to the registered PC or mobile address. A notification can also be sent at the time of test completion. Set the recipient mail address from the Maintenance setting screen.

\*Requires an intranet environment capable of sending emails.

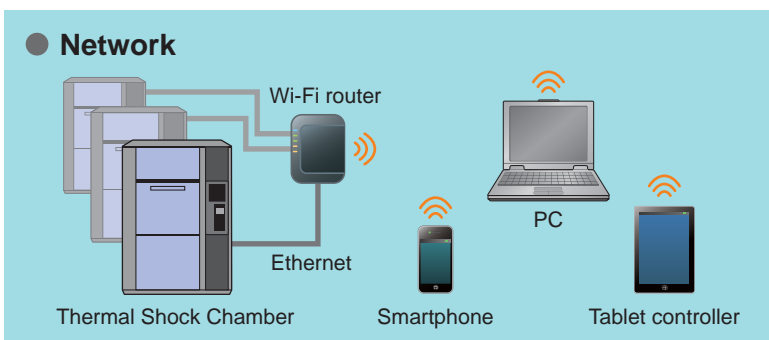
- **Multilingual display**

The language available for the Web application (Japanese/ English/ Simplified Chinese/ Traditional Chinese/ Korean) can be changed without affecting the N-instrumentation language display.

- **Email alert**



- **Network**



# Network

## ● Copy and reproduce testing

You can copy the same test edit program in multiple chambers, provided that they have the same operation range, thanks to the USB memory. No need to program each chamber, just connect the USB and the test can start.

## ● Download edit programs online

Via the Pattern Manager Lite software installed on your PC, edit programs according to your testing needs, and upload them with a USB.

## ● Edit programs

Through our online website Test Navi, dedicated to reliability and testing information, you can find most of the recognized international standard, available for download.

Charge them as is on your USB memory, or edit them and transfer to your chamber.

\* Test Navi is a website dedicated to reliability testing information and technologies. <http://www.test-navi.com/eng/index.html>

The Pattern Manager Lite software allows you to edit programs for your chamber, view and edit data as graph, etc. The software can be downloaded from the Test Navi website.

### Test Navi

(<http://www.test-navi.com/eng/index.html>)

This website provides practical knowledge on environmental testing that ESPEC has acquired through years of experience, as well as covering everything from the fundamentals to the latest information on environmental and reliability testing.

### Product Registration Membership Website

- Updates for chamber controller software
- Search for environmental test standards

### Environmental Test Standards

For Pattern Manager Lite Test methods download

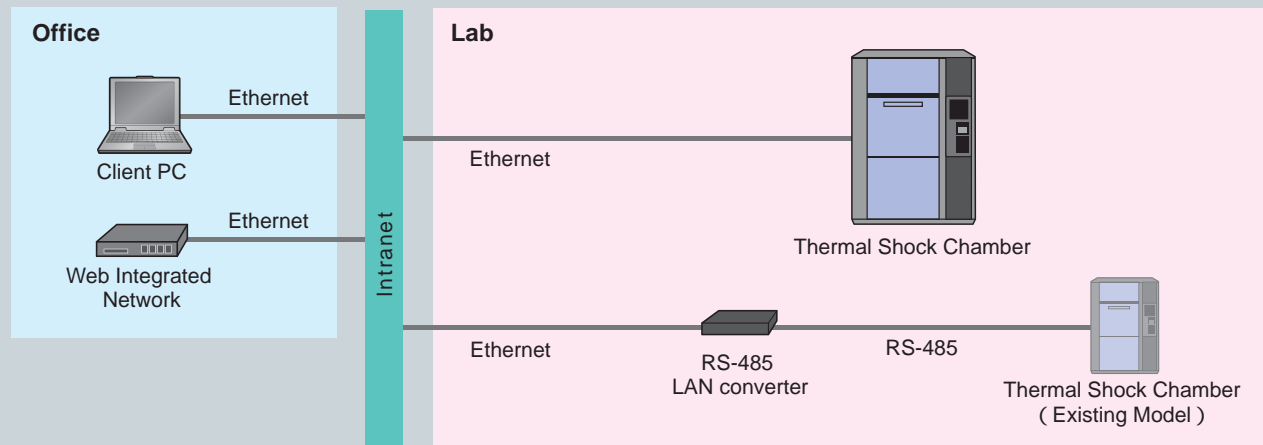
- Download test profiles from a list of environmental test standards

## Web Integrated Network (Sold separately)

Maximum 100units of connected chambers and other peripherals necessary for environmental testing are managed via Internet.



Access to video



## TEST STANDARD AND COMPATIBLE MODELS

Test standard	Exposure temperature			Exposure time		Temperature recovery time	Number of test cycles	Test starting point	Model <sup>*1</sup>			
	High temp.	Ambient temp.	Low temp.	High/low temp.	Ambient temp.				EL type	ES type	EH type	
MIL-STD-883H (Method No. 1010.8)	A	+85°C +10 0	—	-55°C 0 -10	10 min. or longer	—	Worst case specimen temp. Within 15 min.	Minimum 10	Low temp. or High temp.	—	○	○
	B	+125°C +15 0								—	○	○
	C	+150°C +15 0		—						—	○	
	D	+200°C +15 0		-65°C 0 -10						—	—	
	E	+300°C +15 0								—	—	
	F	+175°C +15 0								—	○	
MIL-STD-202G (Method No. 107G)	A	+85°C +3 0	+25°C +10 -5		-55°C 0 -3	Differs according to specimen weight 28 g or lower, 15 min. or 30 min. 28 g to 136 g, 30 min. 136 g to 1.36 kg, 60 min. 1.36 to 13.6 kg, 120 min. 13.6 to 136 kg, 240 min.	Max 5 min.	Up-stream Within 5 min.	5 cycles 25 cycles 50 cycles 100 cycles	Low temp.	○ <sup>*2</sup> <sub>*3</sub>	○ <sup>*2</sup>
	B	+125°C +3 0		—	○ <sup>*2</sup>						○	
	C	+200°C +5 0		—	—						○	
	D	+350°C +5 0		-65°C 0 -5	—						—	
	E	+500°C +5 0		—	—							
	F	+150°C +3 0		—	○ <sup>*2</sup>						○	
IEC 60068-2-14 (JIS C 60068-2-14)	+70°C ±2 +85°C ±2 +100°C ±2 +125°C ±2 +155°C ±2 +175°C ±2 +200°C ±2	—	-5°C ±3 -10°C ±3 -25°C ±3 -40°C ±3 -55°C ±3 -65°C ±3	3 hrs. 2 hrs. 1 hrs. If not specified: 3 hrs.	—	Exposure time within 10%	If not specified 5 cycles	Low temp.	○ <sup>*2</sup>	○ <sup>*2</sup>	○	
JASO D 014-4	+65°C ±2 +70°C ±2 +80°C ±2 +85°C ±2 +90°C ±2 +100°C ±2 +110°C ±2 +120°C ±2 +125°C ±2 +130°C ±2 +140°C ±2 +150°C ±2 +155°C ±2 +160°C ±2	—	-20°C ±3 -40°C ±3	20 min. 40 min. 60 min. 90 min.	—	Exposure time within 10%	If not specified 5 cycles	Low temp.	○ <sup>*2</sup>	○ <sup>*2</sup>	○	
EIAJ ED-2531B Na	+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 hrs. 2 hrs. 1 hrs. 30 min. 10 min. If not specified: 3 hrs.	2 to 3 min.	Exposure time within 10%	5 or 10 cycles	Low temp.	○ <sup>*2</sup> <sub>*3</sub>	○	○	

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

\*2 Some models cannot be used depending on test conditions. For further information, please contact ESPEC.

\*3 Applicable when equipped with the ambient-temperature exposure option.

## CHAMBER AND UTILITY REQUIREMENTS

Model	EL type					ES type				EH type
	43EL-A	73EL-A	103EL-A	203EL-W	303EL-W	73ES-A	73ES-W	103ES-W	203ES-W	73EH-W
	Air-cooled			Water-cooled		Air-cooled	Water-cooled		Water-cooled	
Power supply	200V AC	49A	70A	70A	110A	120A	78A		120A	112A
	220V AC	47A	70A	70A	110A	120A	75A		120A	108A
	380/400/415V AC	27A	45A	45A	65A	70A	50A		70A	60A
Air	0.4 to 0.7 MPa (4 to 7 kg/cm <sup>2</sup> G)									
Condensation load (KJ/h) <sup>*1</sup>	50Hz	—			95700	—	59700	95700	95700	95700
	60Hz	—			96100	—	64800	104600	96100	96100
Cooling water supply rate (at reference water temp.+32°C) <sup>*2</sup>	—			4.6 m <sup>3</sup> /h	—	3.1 m <sup>3</sup> /h	4.6 m <sup>3</sup> /h			
Water pressure	—			0.2 to 0.5 MPa (2 to 5 kg/cm <sup>2</sup> )	—	0.2 to 0.5 MPa (2 to 5 kg/cm <sup>2</sup> )				
Piping connection size	32A									
Outside dimensions mm	W 1140 H 1900 D 1270	W 1310 H 1900 D 1470	W 1550 H 1900 D 1470	W 1550 H 1900 D 1770	W 1870 H 1900 D 1770	W 1310 H 1900 D 1470		W 1550 H 1900 D 1470	W 1550 H 1900 D 1770	W 1310 H 1900 D 1770

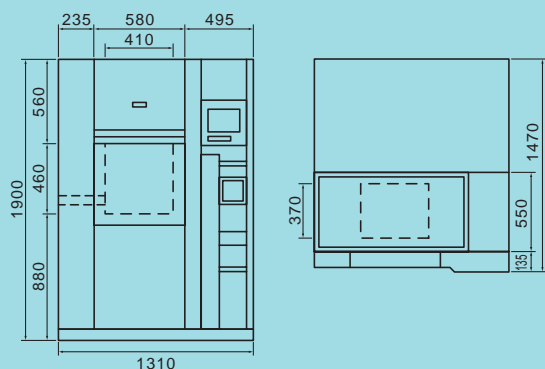
\*1 Maximum possible value during temperature recovery.

\*2 Rate depends on the cleanliness of the heat exchanger.

\*3 Excluding protrusions

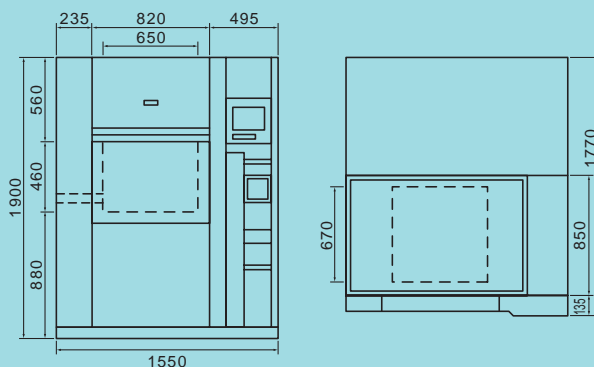
## DIMENSIONS (example)

### ● TSA-73EL · 73ES



### ● TSA-203EL · 203ES

(Unit: mm)



# EL Type

Model		TSA-43EL-A	TSA-73EL-A	TSA-103EL-A	TSA-203EL-W	TSA-303EL-W										
System		Two-zone test by means of damper switching														
Performance <sup>1</sup>	Test area	High temp. exposure range <sup>2</sup>					Ambient temp. +50 to +200°C (+122 to +392°F)									
		Low temp. exposure range					-65 to 0°C (-85 to +32°F)									
		Temp. fluctuation <sup>3</sup>					±0.5°C (±0.9°F)									
	Hot chamber	Pre-heat upper limit					+205°C (+401°F)									
		Temp. heat up time <sup>4</sup>		Within 10 min.		Ambient temp. to +200°C (+392°F)			Within 15 min.							
		Pre-cool lower limit					-75°C (-103°F)									
	Cold chamber	Temp. pull down time <sup>4</sup>					Within 70 min.		Within 40 min.		Within 60 min.		Within 70 min.		Within 40 min.	
		Recovery conditions					Two-zone: High temp. exposure: +125°C 30 min. Low temp. exposure: -40°C 30 min. Power supply voltage: Rated voltage Sensor position: Upstream									
		Temp. recovery time <sup>5</sup>		Within 15 min.		Within 5 min.			Within 10 min.							
	Exterior material		Cold-rolled rust proof treated steel plate (melamine resin coating)													
Interior material		Stainless steel plate														
Insulation		Glass wool, rigid polyurethane foam														
Door		Manually operated sliding door with unlock button														
Heater		Stripped wire heater														
Construction	Refrigeration unit	System					Mechanical cascade refrigeration system									
		Air-cooled condenser		Water-cooled condenser												
	Compressor		Hermetically sealed rotary compressor		Hermetically sealed scroll compressor											
	Expansion mechanism		Electronic expansion valve, other													
	Refrigerant		High temp. side: R404A Low temp. side: R508A		High temp. side: R404A Low temp. side: R23											
	Cooler		Plate fin cooler, cold accumulator													
	Air circulator		Sirocco fan													
	Damper driving unit		Air cylinder													
Test area load resistance		30 kg (Equally distributed load)			50 kg (Equally distributed load)											
Inside dimensions (W x H x D mm/in.)		240 x 460 x 370 (9.45 x 18.11 x 14.57)		410 x 460 x 370 (16.14 x 18.11 x 14.57)		650 x 460 x 370 (25.59 x 18.11 x 14.57)		650 x 460 x 670 (25.59 x 18.11 x 26.38)		970 x 460 x 670 (38.19 x 18.11 x 26.38)						
Outside dimensions (W x H x D mm/in.) <sup>6</sup>		1140 x 1900 x 1270 (44.88 x 74.80 x 50)		1310 x 1900 x 1470 (51.57 x 74.80 x 57.87)		1550 x 1900 x 1470 (61.02 x 74.80 x 57.87)		1550 x 1900 x 1770 (61.02 x 74.80 x 69.69)		1870 x 1900 x 1770 (73.62 x 74.80 x 69.69)						
Weight		Approx. 730 kg		Approx. 900 kg		Approx. 1050 kg		Approx. 1200 kg		Approx. 1420 kg						
Utility requirements	Allowable ambient conditions		0 to 40°C (+32 to +104°F)													
	Power supply <sup>7</sup>	200V AC 3ø 50/60Hz		49A		70A		70A		110A		120A				
		220V AC 3ø 60Hz		47A		70A		70A		110A		120A				
		380/400/415V AC 3ø 50Hz		27A		45A		45A		65A		70A				
	Air supply		0.4 to 0.7 MPa (4 to 7 kg/cm <sup>2</sup> )													
	Cooling water supply pressure		—					0.2 to 0.5 MPa (2 to 5 kg/cm <sup>2</sup> )								
	Cooling water supply rate <sup>8</sup>		—					4.6 m <sup>3</sup> /h (ref. water temp.: +32°C)								
	Operating cooling water temp. range		—					+5 to +38°C (+41 to +100°F)								
Maximum noise level <sup>9</sup>		65 dB					62 dB		65 dB							

\*1 Air-cooled: Ambient temperature of +23°C  
Water-cooled: Ambient temperature of +10 to +30°C and a cooling water temperature of +25°C

\*2 If the high-temperature exposure range lower limit +60°C is required, select the "ambient-temperature exposure" option

\*3 Performance shown above conforms to IEC 60068-3-5: 2001

\*4 Temperature heat-up/pull-down time are applicable only during independent chamber operation

\*5 Tolerance in temperature recovery time is based on IEC60068-2-1 and IEC60068-2-2

\*6 Excluding protrusions

\*7 400/415V AC models comply with CE marking.  
220V AC is available with or without CE marking.

\*8 Rate depends on the cleanliness of the heat exchanger

\*9 Noise level was measured in an anechoic room at a height of 1.2 m from the floor and a distance of 1 m from the chamber front panel (ISO 1996-1:2003 A-weighted sound pressure level). Actual noise emissions may increase because of surrounding reverberations in the place of installation, therefore use caution in selecting a place of use.

# ES Type

Model		TSA-73ES-A/W	TSA-103ES-W	TSA-203ES-W
System		Two-zone or three-zone test by means of damper switching		
Performance <sup>1</sup>	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)		
		Temp. fluctuation* <sup>2</sup> ±0.5°C (±0.9°F)		
	Hot chamber	Pre-heat upper limit +205°C (+401°F)		
		Temp. heat up time* <sup>3</sup> Ambient temp. to +200°C (+392°F) within 15 min.		
	Cold chamber	Pre-cool lower limit -75°C (-103°F)		
		Temp. pull down time* <sup>3</sup> Ambient temp. to -75°C (-103°F) Within 40 min. Within 50 min. Within 45 min.		
	Temp. recovery	Recovery conditions		
		Temp. recovery time* <sup>4</sup> Within 5 min. Within 10 min.		
	Exterior material		Cold rolled rust proof treated steel plate (melamine resin coating)	
Interior material		Stainless steel plate		
Insulation		Glass wool/rigid polyurethane foam		
Door		Manually operated sliding door with unlock button		
Heater		Stripped wire heater		
Construction	Refrigeration unit	Mechanical cascade refrigeration system		
		Air-cooled condenser or water-cooled condenser	Water-cooled condenser	
	Compressor	Hermetically sealed scroll compressor		
	Expansion mechanism	Electronic expansion valve, other		
	Refrigerant	High temp. side: R404A Low temp. side: R23		
	Cooler	Plate fin cooler, cold accumulator		
	Air circulator	Sirocco fan		
Damper driving unit		Air cylinder		
Test area load resistance		30 kg (Equally distributed load)	50 kg (Equally distributed load)	
Inside dimensions (W x H x D mm/in.)		410 x 460 x 370 (16.14 x 18.11 x 14.57)	650 x 460 x 370 (25.59 x 18.11 x 14.57)	650 x 460 x 670 (25.59 x 18.11 x 26.38)
Outside dimensions (W x H x D mm/in.) <sup>5</sup>		1310 x 1900 x 1470 (51.57 x 74.80 x 57.87)	1550 x 1900 x 1470 (61.02 x 74.80 x 57.87)	1550 x 1900 x 1770 (61.02 x 74.80 x 69.69)
Weight		Approx. 1050 kg	Approx. 1150 kg	Approx. 1400 kg
Utility requirements	Allowable ambient conditions		0 to +40°C (+32 to +104°F)	
	Power supply* <sup>6</sup>	200V AC 3ø 50/60Hz	78A	
		220V AC 3ø 60Hz	75A	
		380/400/415V AC 3ø 50Hz	50A	
	Air supply		0.4 to 0.7 MPa (4 to 7 kg/cm <sup>2</sup> )	
	Cooling water supply pressure		0.2 to 0.5 MPa (2 to 5 kg/cm <sup>2</sup> ) (water-cooled specification)	
	Cooling water supply rate* <sup>7</sup>		3.1 m <sup>3</sup> /h (reference water temp: +32°C) (water-cooled specification)	
	Operating cooling water temp. range		+5 to +38°C (water-cooled specification)	
	Maximum noise level* <sup>8</sup>		65 dB	

\*1 Ambient temperature of +23°C and a cooling water temperature of +25°C

\*2 Performance shown above conforms to IEC 60068-3-5: 2001

\*3 Temperature heat-up/pull-down time are applicable only during independent chamber operation

\*4 Tolerance in temperature recovery time based on IEC60068-2-1 and IEC60068-2-2

\*5 Excluding protrusions

\*6 400/415V AC models comply with CE marking.

220V AC is available with or without CE marking.

\*7 Rate depends on the cleanliness of the heat exchanger

\*8 Noise level was measured in an anechoic room at a height of 1.2 m from the floor and a distance of 1 m from the chamber front panel (ISO 1996-1:2003 A-weighted sound pressure level). Actual noise emissions may increase because of surrounding reverberations in the place of installation, therefore use caution in selecting a place of use.

# EH Type

Model		TSA-73EH-W		
System		Two-zone or three-zone test by means of damper switching		
Performance <sup>1</sup>	Test area	High temp. exposure range <sup>2</sup>	+60 to +200°C (+140 to +392°F)	
		Low temp. exposure range	-70 to 0°C (-94 to +32°F)	
		Temp. fluctuation <sup>3</sup>	±0.5°C (±0.9°F)	
	Hot chamber	Pre-heat upper limit	+205°C (+401°F)	
		Temp. heat up time <sup>4</sup>	Ambient temp. to +200°C (+392°F) within 15 min.	
	Cold chamber	Pre-cool lower limit	-77°C (-106.6°F)	
		Temp. pull down time <sup>4</sup>	Ambient temp. to -75°C (-103°F) within 50 min.	
	Temp. recovery	Recovery conditions	<ul style="list-style-type: none"> <li>· Two-zone</li> <li>High-temp. exposure: +150°C, 15 min.</li> <li>Low-temp. exposure: -65°C, 15 min.</li> <li>· Power supply voltage: Rated voltage</li> <li>· Sensor position: Downstream</li> <li>· Specimen 5 kg</li> <li>Plastic molded ICs: 3.5 kg</li> <li>Specimen basket/brackets: 1.5 kg</li> </ul>	
		Temp. recovery time <sup>5</sup>	Within 5 min.	
	Construction	Exterior material		Cold rolled rust proof treated steel plate (melamine resin coating)
Interior material		Stainless steel plate		
Insulation		Glass wool/rigid polyurethane foam		
Door		Manually operated sliding door with unlock button		
Heater		Stripped wire heater		
Refrigeration unit		System		Mechanical cascade refrigeration system Water-cooled condenser
		Compressor		Hermetically sealed scroll compressor
		Expansion mechanism		Electronic expansion valve, other
		Refrigerant		High temp. side: R404A Low temp. side: R23
Cooler		Plate fin cooler, cold accumulator		
Air circulator		Sirocco fan		
Damper driving unit		Air cylinder		
Test area load resistance		30 kg (Equally distributed load)		
Inside dimensions (W x H x D mm/in.)		410 x 460 x 370 (16.14 x 18.11 x 14.57)		
Outside dimensions (W x H x D mm/in.) <sup>6</sup>		1310 x 1900 x 1770 (51.57 x 74.80 x 69.68)		
Weight		Approx. 1250 kg		
Utility requirements	Allowable ambient conditions		0 to +40°C (+32 to +104°F)	
	Power supply <sup>7</sup>	200V AC 3ø 50/60Hz	112 A	
		220V AC 3ø 60Hz	108 A	
		380/400/415V AC 3ø 50Hz	60 A	
	Air supply		0.4 to 0.7 MPa (4 to 7 kg/cm <sup>2</sup> )	
	Cooling water supply pressure		0.2 to 0.5 MPa (2 to 5 kg/cm <sup>2</sup> )	
	Cooling water supply rate <sup>8</sup>		4.6 m <sup>3</sup> /h (reference water temp: +32°C)	
	Operating cooling water temp. range		+5 to +38°C	
Maximum noise level <sup>9</sup>		65 dB		

\*1 Ambient temperature of +23°C and a cooling water temperature of +25°C

\*2 During pre-heating, prevention operation for temperature heat-up may be worked.

\*3 Performance shown above conforms to IEC 60068-3-5: 2001

\*4 Temperature heat-up/pull-down time are applicable only during independent chamber operation

\*5 Tolerance in temperature recovery time based on IEC60068-2-1 and IEC60068-2-2

\*6 Excluding protrusions

\*7 400/415V AC models comply with CE marking. 220V AC is available with or without CE marking.

\*8 Rate depends on the cleanliness of the heat exchanger

\*9 Noise level was measured in an anechoic room at a height of 1.2 m from the floor and a distance of 1 m from the chamber front panel (ISO 1996-1:2003 A-weighted sound pressure level). Actual noise emissions may increase because of surrounding reverberations in the place of installation, therefore use caution in selecting a place of use.



## SAFETY DEVICES

- Leakage breaker (200, 220V AC specifications)
- Circuit breaker (380, 400/415V AC specifications)
- Electrical compartment door switch
- Test area door switch
- Hot chamber overheat protection switch
- Cold chamber overheat protection switch
- Hot chamber overheat protector (controller)
- Cold chamber overheat protector (controller)
- Air circulator overload relay
- Refrigerator high/low pressure switches
- Compressor built-in protector (except TSA-43EL)
- Compressor temperature switch
- Thermal relay for compressor (TSA-43EL only)
- Water suspension relay (water-cooled specification only)
- Air circulator thermal relay
- Motor reverse prevention relay
- Air pressure switch
- Fuse
- Cooling tower interlock terminal (water-cooled specification only)
- Compressor circuit breaker
- Heater circuit breaker
- Test area overheat protector (controller)
- Test area overcool protector (controller)
- Overheat protector/overcool protector
- Air purge valve
- Specimen power supply control terminal

## FITTINGS

- Cable port  $\phi 50$  mm (left side) ..... 1
- Specimen power supply control terminal ..... 1
- Time signals ..... 2
- Overheat protector/overcool protector ..... 1
- USB memory port ..... 1
- Ethernet port(LAN port) ..... 1



Specimen power supply control terminal,  
Time signals



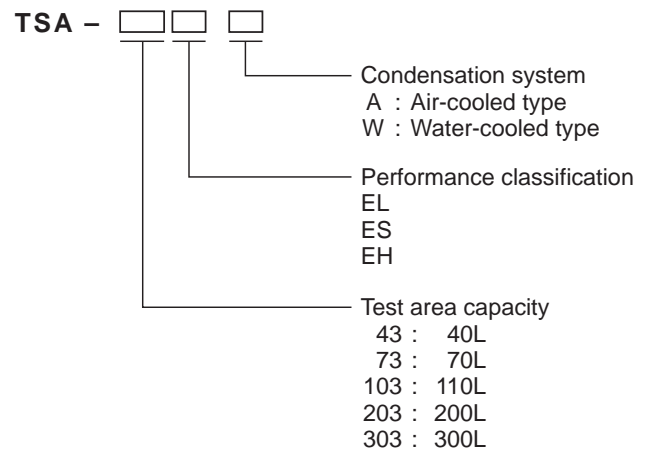
Overheat protector/overcool protector,  
USB memory port



### Safety precautions

- 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 substances in the chamber. If corrosive substances are generated by the specimen, the life of the chamber may be significantly shortened specifically because of the corrosion of stainless steel and copper and because of the deterioration of resin and silicon.
- Do not place life forms or substances that exceed allowable heat generation.
- Be sure to read the operation manual before operation.

## MODEL



## ACCESSORIES

- Specimen basket (18-8 Cr-Ni stainless steel/5 mesh metal basket)
  - TSA-43  
(W230 x H40 x D356 mm/load capacity up to 2.5 kg) ..... 2
  - TSA-73  
(W400 x H40 x D356 mm/load capacity up to 5 kg) ..... 2
  - TSA-103  
(W640 x H40 x D356 mm/load capacity up to 5 kg) ..... 2
  - TSA-203  
(W640 x H40 x D656 mm/load capacity up to 17 kg) ..... 2
  - TSA-303  
(W960 x H40 x D656 mm/load capacity up to 17 kg) ..... 2



- Shelf brackets  
(shelf attachment pitch 60 mm, adjustable in 7 levels) .... 2 sets
- Cartridge fuse
  - 5A (200V AC specification) ..... 2
  - 10A (220/380/400/415V AC specification) ..... 1
- Cable port rubber plug ..... 1
- Nipple (water-cooled specification only) ..... 1
- Strainer (water-cooled specification only) ..... 1
- Strainer element (water-cooled specification only) ..... 1
- Operation manual ..... 1

# Options

## UTILITY

### Power cable

- 5 m
- 10 m

\* The chamber does not come with a power cable.

### Plug socket

To supply power to external equipment

- 2 plug sockets
- Rated capacity 100V AC 3A  
(Total capacity)



### Built-in air compressor

Select when there is no air supply source.

### Caster

Installed for mobility.

- 6 casters (4 for TSA-43EL)
- 4 leveling feet

## NETWORK

### I/O interface

Communication ports to connect the chamber to a PC.

- RS-485
- RS-232C
- GPIB

### Communication cable

- RS-485 5 m/10 m/30 m
- RS-232C 1.5 m/3 m/6 m
- GPIB 2 m/4 m

## TEST SAMPLE SETTING

### Automatic door

Automatic sliding door (vertical) operated by single-touch button. Equipped with 2 safety mechanisms: a photoelectric sensor, and a touch sensor. A door stop switch is also set.



Door open/  
close switch

### Additional cable port

Provided in addition / replacement of the standard cable port (left side)

- $\phi$ 50 mm round
- Flat cable port (25 x 100 mm slot)



$\phi$ 50 mm

Flat cable port

### Cable port rubber plug

Prevents air leakage from the cable port.

- $\phi$ 50 mm for round port
- For flat cables
- Spiral-wrapped plug(2m)



$\phi$ 50 mm  
for round port

For flat cables

Spiral-  
wrapped plug

### Specimen basket/shelf brackets

Equivalent to standard accessory.

- Material: stainless steel (5 mesh)

### Heavy-duty shelf

Use to hold heavy specimens exceeding the load capacity of the standard specimen basket.

- Load capacity: 30 kg

## DOCUMENTS

### Operation manual

- CD
- Booklet

### Reports & certificates

- Testing and inspection report
- Test data
- Temperature uniformity measurement
- Calibration report
- Calibration certificate
- Traceability system chart
- Traceability certificate

# Options

## LOGGING

### Paperless recorder

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

S1ch: Number of inputs: 1 (5 OFF\*)

Scan interval: 1 sec.

S3ch: Number of inputs: 3 (3 OFF\*)

Scan interval: 1 sec.

L3ch: Number of inputs: 3 (3 OFF\*)

Scan interval: 5 sec.

S4ch: Number of inputs: 4 (2 OFF\*)

Scan interval: 1 sec.

L4ch: Number of inputs: 4 (2 OFF\*)

Scan interval: 5 sec.

S5ch: Number of inputs: 5 (1 OFF\*)

Scan interval: 1 sec.

L5ch: Number of inputs: 5 (1 OFF\*)

Scan interval: 5 sec.

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

· Internal recording media:

Flash memory 8MB

· External memory

CF memory card port

(Includes a 256 MB CF card)

USB memory port

· Languages: English/Japanese, can be changed

\* Channels can be turned ON



### Chart recorder

RK-61 1 pen

RK-63 3 pens

RK-64 6 dots

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

· Effective recording chart width 100 mm



### Recorder wiring

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

### Recorder terminal

Used to output the temperature within test area, hot chamber, and cold chamber.



### Thermocouple

Attached to specimen to measure specimen temperature.

Thermocouple with a brass ball tip

Thermocouple type T (Copper/ Copper-Nickel)

· 2 m

· 4 m

· 6 m



### Exposure signal output terminal

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, like applying a voltage to specimens only during high temperature exposure, or monitoring test operation from a remote point.



### Power meter

Accumulates the amount of power the chamber uses.



### Applying DC power supply

Capable of applying voltage to the specimen, used for bias testing.

· 5V

· 12V

· 15V

· 24V

· 48V



### Total cycle counter

Indicates cycle counts.

· With reset function

· Display range: 1 to 99999999



# Options

## EASY OPERATION

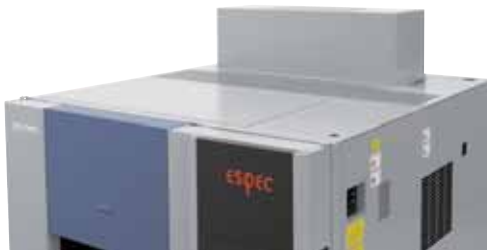
### Defrost-free operation

For two-zone tests, enables continuous tests without requiring defrosting for up to 500 hours max.

ESPEC has developed a unique structure (patent: 3514735) that prevents the penetration of outside air and uses recirculated air during testing to stop frosting on the low-temperature side.

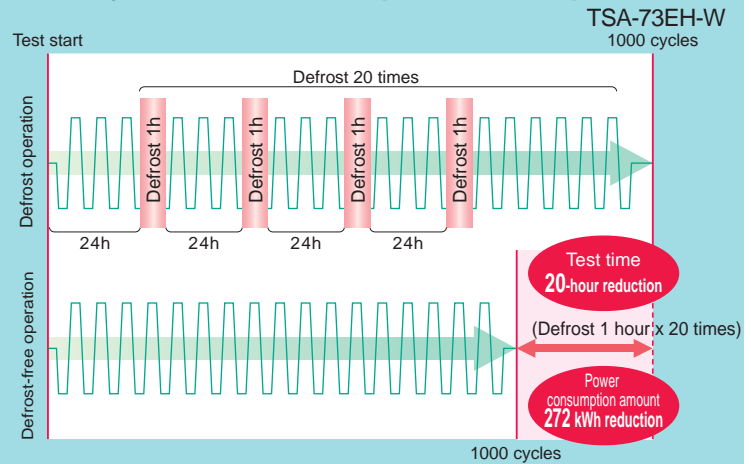
This enables continuous tests up to 500 hours, so around 20 defrost cycles during this period can be eliminated.

This option can reduce both the test time in the amount of the defrosting time (approx. 60 minutes each time) and the power consumption required for defrosting (13.6 kWh each time).



\* The TSA-43EL-A, 73EL-A, 73ES-A and 103EL-A have a 300-mm protrusion on the top.

### ● 1000 cycles test time comparison example



Power consumed amount to defrost once : 13.6 kWh  
Power consumed amount to defrost (20 times) : 272 kWh

Test conditions (Two-zone, No test halt)  
High-temp. exposure : +150°C 15 min.      Cooling water temp. : +25°C  
Low-temp. exposure : -65°C 15 min.      Specimen : No specimen  
Outside conditions : +23°C/60% rh

Model	TSA-43EL	TSA-73EL, ES	TSA-103EL, ES	TSA-203EL, ES	TSA-303EL	TSA-73EH
Number of cycles	Maximum 500 cycles (Maximum 500-hour)					Maximum 1000 cycles (Maximum 500-hour)
High-temp. exposure/time	+125°C/30 min.					+150°C/15 min.
Low-temp. exposure/time	-40°C/30 min.					-65°C/15 min.
Outside conditions	+23°C/60% rh or lower					
Cooling water temp.	+25°C					
Power supply voltage	Rated voltage					
Sensor position	Downstream of specimen					
Specimen	1.5 kg (Plastic molded ICs 1.0 kg Specimen basket/shelf brackets 0.5 kg)	5.0 kg (Plastic molded ICs 3.5 kg Specimen basket/shelf brackets 1.5 kg)		10.0 kg (Plastic molded ICs 7 kg Specimen basket/shelf brackets 3 kg)		5.0 kg (Plastic molded ICs 3.5 kg Specimen basket/shelf brackets 1.5 kg)
Temp. recovery time	Within 15 min.	Within 5 min.			Within 10 min.	Within 5 min.

### Ambient-temperature exposure (EL type only)

Enables three-zone tests by adding a damper mechanism and an air circulator.

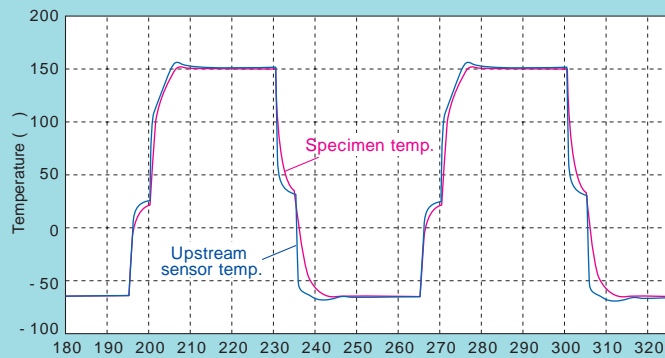
· High temp. exposure range: +60 to +200°C

# Options

## EASY OPERATION

### Product temperature control

#### ● Measurement example TSA-73ES-A



#### Test conditions

High temp. exposure	+150°C	30 min.	Specimen	Plastic molded ICs (3.5 kg)
Ambient temp. exposure		5 min.	Specimen baskets	2nd and 6th level from top
Low temp. exposure	-65°C	30 min.	Control points	28-pin QFP (quad flat package) with sensor installed at center of 6th level



A sensor is attached to the product to control the chamber based on the product temperature. The product temperature reaches and maintains the temperature setting as fast and accurately as possible.

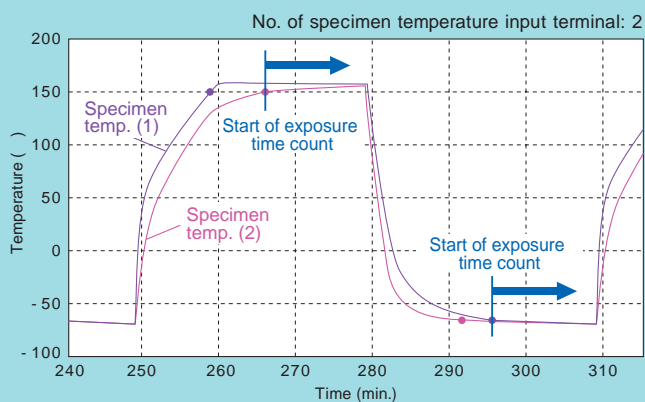
(Cannot be combined with Eco operation mode.)

- Number of measuring points: 1
- Location: Chamber front, left-side panel
- Accessory: Thermocouple type T (copper, copper-nickel) x1\*
- \* 2 when simultaneously equipped with a recorder



### Product temperature monitor with trigger function

#### ● Measurement example



Two sensors are attached to the specimen and the temperature of the specimen displayed on the instrumentation is monitored. The option has a trigger function that switches to the exposure test after the specimen temperatures reach the temperature setting, so even more precise tests can be run. It can also record the temperatures of the specimen and the test area when connected to a temperature recorder.

- Number of measuring points: 2
- Location: Chamber front, left-side panel
- Accessory: Thermocouple type T (copper, copper-nickel) x2\*
- \* 4 when simultaneously equipped with a recorder



# Options

## SAFETY

### Additional overheat protector

Additional preventive measure can be taken for excessive temperature rise in the chamber, in addition to the standard equipped overheat protector.

### External alarm terminal

If the safety device of the chamber is activated, the external alarm terminal will notify it to a remote point.

### Status indicator light

Select light color, lighting, and blinking or buzzer sound.

- 1 level, light: 1 color, height: 436 mm
- 2 levels, light: 2 colors, height: 478 mm
- 3 levels, light: 3 colors, height: 520 mm
- 4 levels, light: 4 colors, height: 560 mm
- 5 levels, light: 5 colors, height: 620 mm

\*In case of 5 levels type, the light color, lighting, blinking and buzzer sound patterns are fixed.



### Emergency stop pushbutton

Stops the chamber immediately.



With guard



With cover

### Anchoring fixtures

Used to bolt the chamber to the floor.

### Chamber dew tray

Prevents water leaks from the chamber onto the floor.

\*The use of casters is recommended to facilitate operation.

\*To prevent damage in the event of water leakage, other preventive measures are also available.

## STANDARD PRODUCT LINEUP

### Liquid to Liquid Thermal Shock Chamber TSB



The liquid to liquid thermal shock chamber is designed to apply higher stress to specimens.

It has also greatly reduced required minimum installation space. The highly airtight test areas and numerous new mechanisms reduce brine consumption, thus greatly reducing running costs.

It features easy operation thanks to the color LCD interactive touch-screen system.

Model	Temp. range	Specimen basket dimensions (mm)
TSB-21	High temp. chamber: +70 to +200°C	W120 x H150 x D120
TSB-51	Low temp. chamber: -65 to 0°C	W150 x H150 x D200

# Custom-made Product

## Thermal Shock Chamber 300°C specification

Model	TSA-202ES (+300°C specification)	TSD-100 (+300°C specification)	TSE-11 (+300°C specification)
Temp. range	High temp. side	+60 to +300°C	
	Low temp. side	-70 to 0°C	-65 to 0°C
High-temp. exposure/time	+250°C/60 min.	+270°C/40 min.	+300°C/30 min.
	Low-temp. exposure/time	-40°C/60 min.	-40°C/40 min.
Sensor position	Upstream of specimen		
Specimen	No specimen	Plastic molded ICs: 5 kg	Plastic molded ICs: 1 kg
Temp. recovery time	Within 20 min.	Within 5 min.	Within 10 min.
Test area dimensions (mm)	W650 x H460 x D670	W710 x H345 x D410	W320 x H148 x D230

## Large capacity Thermal Shock Chamber



Model	TSA-1100H	TSA-1650H	TSA-2200H
High temp. exposure	+60 to +180°C		
Low temp. exposure	-60 to -10°C		
Recovery conditions	<ul style="list-style-type: none"> <li>• Two-zone: High-temperature exposure: +150°C, 60 min.</li> <li>Low-temperature exposure: -50°C, 60 min.</li> <li>• Sensor position: Upstream of specimen</li> </ul>		
Temp. recovery time	Within 10 min.		
Test area dimensions (mm)	W1000 x H1100 x D1000	W1500 x H1100 x D1000	W2000 x H1100 x D1000

## Thermal Shock Chamber with humidity

Model	TSA-102D-W	TSA-202D-W
High temp. exposure	For Dew cycle test -10 to +100°C	
Low temp. exposure	For Dew cycle test -40 to +10°C	
Recovery conditions	<ul style="list-style-type: none"> <li>• Two-Zone: High temperature with humidity exposure +25°C/95% rh, 60min.</li> <li>Low temperature exposure -30°C, 60min.</li> <li>• Sensor position: Upstream of specimen</li> </ul>	
Temperature recovery time	Within 5 min.	
Test area dimensions (mm)	W650 x H460 x D370	W650 x H460 x D670

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**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 9001:2008 (JIS Q 9001:2008) through the Japanese Standards Association (JSA).

\* Registration : ESPEC CORP.  
(Overseas subsidiaries not included)

**ISO 14001 (JIS Q 14001)**

**Environmental Management System Assessed and Registered**

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