

Quality is more than a word



# Highly Accelerated Stress Test System (HAST Chamber)



# Creates temperature, humidity, and pressure environments to IEC60068-2-66 standard.

Humidity resistance evaluation tests for electronic components

Customers require test results that correlate accurately to those from the field in a minimal amount of time.

The Highly Accelerated Stress Test Chamber EHS Series offer high performance, functionality and ease of use, and are compliant with the international IEC60068-2-66 standard.

Many convenient functions and safety features are included for bias testing.





EHS-211M



EHS-221MD



## Improved functionality and ease-of-use for bias testing.



Chamber interior

- **The chamber interior is formed for easier specimen loading**

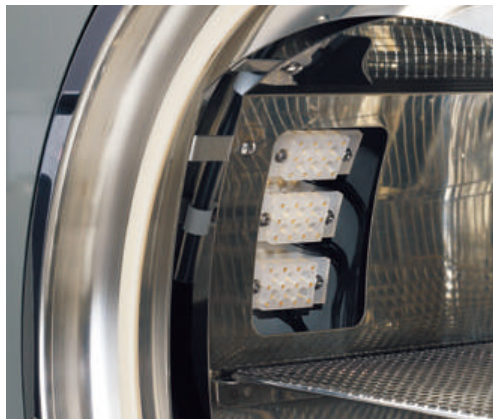
The pressure vessel is of spherical form which distributes pressure evenly and has superior strength. The test area is expanded to its maximum size to easily load printed circuit boards and other specimens.

- **The double stage model answers the need for diverse test conditions and large capacity (MD type)**

The units are designed so that the test condition of each chamber can be set individually, enabling this model to effectively reproduce diverse test conditions on a large number of specimens.



Specimen signal terminals



Signal terminals inside chamber

- **Specimen signal terminals can be added depending on requirements**

The standard configuration is 12 specimen signal terminal pins. For double-stage type, 12 pins for each chamber. The EHS-211(M·MD) and 411(M·MD) can be expanded up to a maximum of 60 pins, in 12-pin units (optional), and the EHS-221(M·MD) to 72 pins for each chamber. (optional)



Customized sliding rack (example)

- **Customized racks that free complicated wiring (sold separately)**

We can customize racks to fit the client's specimens to enable voltage and signal application, simply by setting a printed circuit board to the connector. We also offer sliding racks, for easier positioning and wiring of specimen.

## Even greater convenience and safety.

### ● Easy program setting

Program capacity of 10 patterns with 30 steps per pattern. Simple operation using up and down keys for program setting, as well as adjustment of temperature, humidity and time values.

### ● Safe and reliable door

The system employs a button operated automatic door locking mechanism. It prevents the door from being opened while the test chamber is pressurized.

### ● Automatic humidifying water supply system

At the start of testing, the humidifying water needed for that test is automatically taken from a water tank. A slit on the front side allows the remaining amount of water in the tank to be checked at a glance.

### ● Protection measures for specimen

Standard equipment includes a specimen power supply control terminal, which output contact signals to allow voltage and signals to be applied to the specimen during testing. When a problem occurs, specimens and chamber are fully protected. Power supply to the specimen is halted, and protection mechanisms for preventing overheating and boil-dry are activated.

### ● Supports anxiety-free use

A variety of protective mechanisms include; overheat/overpressure protector, boil-dry protector, detection of water supply failure and incomplete door-lock, leakage breaker, and temperature sensor disconnection protector. The system also employs an external alarm terminal with an alarm buzzer and lamp. When a problem occurs, those in the vicinity are immediately warned.



Instrumentation panel



The bottom of the unit includes a water tank and storage space for a power supply unit or peripheral equipment.

# Control operation

## Complies with IEC60068-2-66 standard testing while maintaining compatibility with conventional test methods

### ● Conforms to international IEC60068-2-66 standard

- IEC60068-2-66 is an environmental testing standard of the IEC (International Electro-technical Commission). With ESPEC's unique wet and dry bulb temperature control function, the EHS Series meets all requirements for test equipment and test operation specified in IEC60068-2-66. The EHS Series can also satisfy other test conditions of EIAJED 4701, JEDEC and EIA/ JESD22-A110-A as well as IEC.

\* ESPEC was directly involved in drawing up the IEC60068-2-66 standard, and our technical concepts and measurement data were used in its development.

### ● Evaluation of ion migration



Example of the Highly accelerated stress test system with the Ion migration evaluation system

### ● Wet and dry bulb temperature control (M type) conforms to IEC60068-2-66 standard

With ESPEC's unique wet and dry bulb temperature control on M type chamber, temperature and humidity are measured directly using a wet and dry bulb temperature sensor. This ensures highly precise temperature and humidity control over the entire testing process, from before testing to the post-testing temperature decrease or hold process. After testing is complete, the temperature and humidity are allowed to drop for a fixed period. In the hold process, the chamber is kept at a fixed environment until the door is opened and specimens are removed. This makes it possible to place a specimen in a constantly controlled temperature/humidity environment, and keep it from drying after returning to atmospheric pressure.

### ● Free from pressure and temperature shock and drying of specimens after test

In all control modes, abrupt changes in pressure and temperature after testing have been eliminated through mechanisms for gradual depressurization, and air/water discharge. This prevents vaporization of moisture contained in the specimen, and provide accurate test results in correlation to the field.

# Control operation

## Control functions to enable use of previous data

The control mode can be switched to match previous data.

M type:

Wet and dry bulb temperature control

Unsaturated control

Wet saturated control

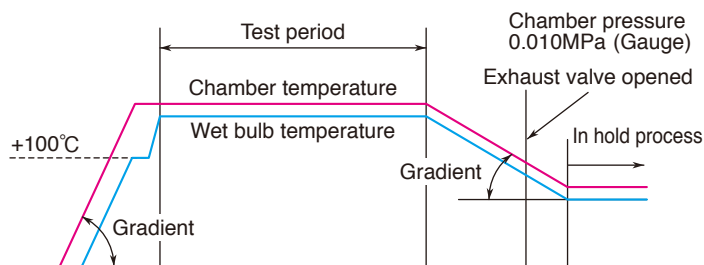
Standard type:

Unsaturated control

Wet saturated control

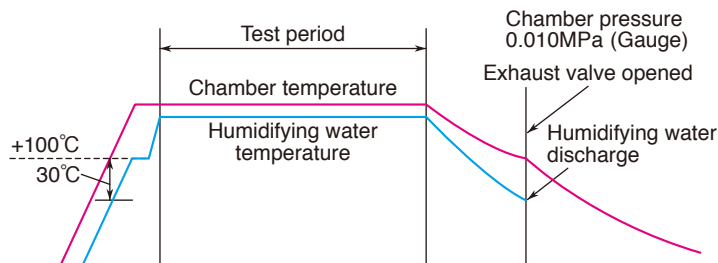
## Three modes of operation control

### Wet and dry bulb temperature control (M type)



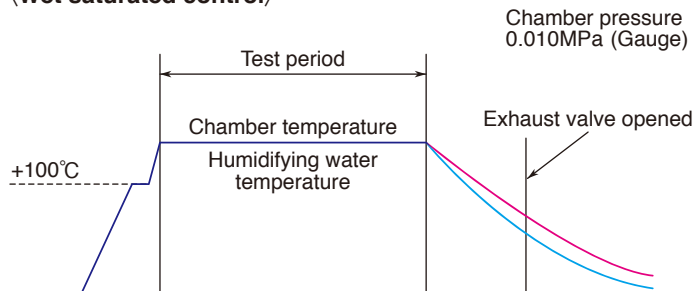
- The temperature and humidity gradient before and after testing can be controlled.
- After testing is complete and chamber pressure reaches 0.010MPa (Gauge), only air is discharged; humidifying water is retained.
- In the hold process, temperature and humidity inside the chamber are maintained at the specified level. (+50 to +95°C/75 to 95%rh)

### Unsaturated control (humidifying water temperature control)



- During temperature heat-up when condensation can easily occur on the reverse side of the specimen, the temperature of the humidifying water automatically increases while keeping it 30°C lower than the chamber temperature.
- After testing is complete, the chamber is left to cool and depressurize naturally until chamber pressure reaches 0.010MPa (Gauge). Then both air and water are discharged.

### Wet saturated control



- Chamber temperature is controlled through a humidifying heater. (chamber temperature = humidifying water temperature)
- After testing is complete, the chamber is left to cool and depressurize naturally until chamber pressure reaches 0.010MPa (Gauge). Then only air is discharged; humidifying water is retained.

## SPECIFICATIONS

Model		EHS-211(M)	EHS-211MD	EHS-221(M)	EHS-221MD	EHS-411(M)	EHS-411MD		
Test system classification		Single vessel type							
Control system	System	Fixed value continuous temperature and humidity control; program operation; humidity control when temperature is rising or falling (M/ MD type)							
	Temperature and Humidity setting	User-set from operating panel							
	Control	PID control with SSR drive							
Power supply		200V AC 1φ 50/60Hz, 220V AC 1φ 50/60Hz, 230V AC 1φ 50Hz <sup>*1</sup>							
Pressure vessel type		Small pressure vessel as specified in the Enforcement Order of Industrial Safety and Health Law in Japan							
Full load current	200V	15.0A	30.0A	20.0A	40.0A	15.0A	30.0A		
	220V	14.0A	28.0A	18.5A	37.0A	14.0A	28.0A		
	230V	13.5A	27.0A	17.5A	35.0A	13.5A	27.0A		
Noise emission <sup>*2</sup>		below 46dB	below 50dB	below 46dB	below 50dB	below 46dB	below 50dB		
Performance	Unsaturation control	Temperature control range	+105.0 to +142.9°C (+221 to +289.2°F)				+105.0 to +162.2°C (+221 to +324°F)		
		Humidity control range	75 to 100%rh						
		Pressure range	0.020 to 0.196MPa (Gauge)				0.020 to 0.392MPa (Gauge)		
		Temperature and humidity fluctuation	±0.5°C / ±3%rh						
		Temperature uniformity	±0.5°C at 100%rh, ±0.7°C at 75%rh						
		Heat up and pressurization time (at RT+23°C)	0→0.196MPa (Gauge) Approx. 30 min.		0→0.196MPa (Gauge) Approx. 60 min.		0→0.392MPa (Gauge) Approx. 45 min.		
	Wet saturation control	Temperature control range	+105.0 to +132.9°C (+221 to +289.2°F)				+105.0 to +151.1°C (+221 to +304°F)		
		Pressure range	0.020 to 0.196 MPa (Gauge)				0.020 to 0.392 MPa (Gauge)		
		Temperature fluctuation	±0.5°C						
		Temperature uniformity	±0.5°C						
		Heat up and pressurization time (at RT+23°C)	0→0.196MPa (Gauge) Approx. 45 min.		0→0.196MPa (Gauge) Approx. 75 min.		0→0.392MPa (Gauge) Approx. 60 min.		
	Wet and dry bulb temperature control (M type)	Temp. heat-up	Temperature control range	+105.6 to +142.9°C (+221 to +289.2°F)				+105.0 to +151.1°C (+221 to +324°F)	
			Humidity control range	75 to 95%rh					
		Test process	Heat up and pressurization time (at RT+23°C)	0→0.196MPa (Gauge) Approx. 60 min.		0→0.196MPa (Gauge) Approx. 90 min.		0→0.392MPa (Gauge) Approx. 75 min.	
			Temperature control range	+105.6 to +142.9°C (+221 to +289.2°F)				+105.0 to +162.2°C (+221 to +324°F)	
		Temp. pull-down	Humidity control range	75 to 98%rh					
			Pressure range	0.020 to 0.196MPa (Gauge)				0.020 to 0.392MPa (Gauge)	
	Temperature and humidity fluctuation		±0.5°C / ±3%rh						
	Wet and dry bulb temperature control (M type)	Temp. pull-down	Temperature uniformity	±0.5°C at 98%rh, ±0.7°C at 75%rh					
			Temperature control range	+50.0 to +95.0°C (+112 to +203°F)					
		Hold process	Temperature pull-down time (at RT+23°C, no specimen)	From +142.9°C / 75%rh to +85.0°C / 85%rh Approx. 120 min.				From +162.2°C / 75%rh to +85.0°C / 85%rh Approx. 120 min.	
			Temperature control range	+50.0 to +95.0°C (+112 to +203°F)					
	Wet and dry bulb temperature control (M type)	Hold process	Humidity control range	75 to 95%rh					
			Wet-bulb wick	Capable of approx 200hr chamber running time (Figure given for +162.2°C, 75%rh and no specimens.)					

\*1 In compliance with the requirements of the European Community Directives. (hereinafter referred to as CE spec)

\*2 Point of measurement : 1.2m off floor 1m in front of chamber (JIS Z8731)



## SPECIFICATIONS

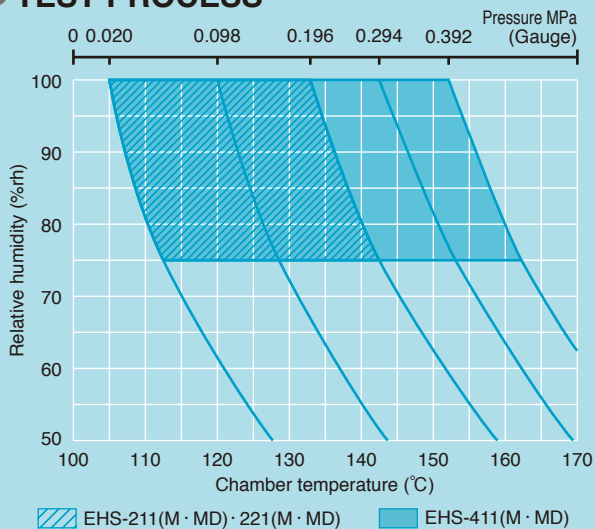
Model	EHS-211(M)	EHS-211MD	EHS-221(M)	EHS-221MD	EHS-411(M)	EHS-411MD
Pressure vessel construction	Cr-Ni-Mo stainless steel plate					
Door construction	Cr-Ni-Mo stainless steel plate					
Outer shell construction	Cold-rolled steel plate (SPC. Class1) with melamine resin baked finish, FRP (Fiber reinforced plastics) resin					
Insulation	Glass wool					
Pressure vessel components	Temperature sensor (Thermocouple type T [Copper/ Copper-Nickel] for measuring chamber temperature, humidifying water temperature, wet-bulb temperature), heater, specimen signal terminals, air-circulating fan, fan motor, overheat protector, boil-dry protector					
Door	Auto-locking mechanism (bank vault)					
Test area	Specimen shelves, shelf brackets for test area: each×2					
Control panel	Temperature/ humidity/ time displays, power ON/OFF key, setting keys, process lamps, alarm lamps, door lock/ release key					
Water supply system	Automatic water supply (Water supplied only at test start) Water supplied per start					
Water supply amount (at start)	1 L		1.5 L		1 L	
Other	Exhaust valve, air supply valve, drain filter, drain valve, air injection pump, water supply pump, water supply valve					
Components	Temperature and humidity controller, Specimen signal terminals, Communication function (RS-485), Power cable					
Pressure gauge (Bourdon type)	Scale: -0.1 to 0.4MPa (Gauge)				Scale: -0.1 to 1MPa (Gauge)	
Loading capacity	18 L	18 L×2	46 L	46 L×2	18 L	18 L×2
Test area dimensions (mm)	W255×H255×L318 (W10×H10×L12.5 inch)		W355×H355×L426 (W14×H14×L16.8 inch)		W255×H255×L318 (W10×H10×L12.5 inch)	
Chamber outer dimensions (mm)	W640×H1483×D850 (W25.2×H58.9×L33.5 inch)	W760×H1795×D1000 (W29.9×H70.7×L39.4 inch)	W740×H1553×D1000 (W29.1×H61.1×L39.4 inch)	W860×H1795×D1000 (W33.9×H70.7×L39.4 inch)	W640×H1483×D850 (W25.2×H58.4×L33.5 inch)	W760×H1795×D1000 (W29.9×H70.7×L39.4 inch)
Weight	Approx. 190 kg	Approx. 350 kg	Approx. 230 kg	Approx. 390 kg	Approx. 190 kg	Approx. 350 kg
Required transport space (mm)	W690×H1540 (W25.2×H21.3 inch)	W810×H1850 (W31.9×H72.8inch)	W790×H1610 (W31.1×H63.4 inch)	W910×H1850 (W35.8×H72.8 inch)	W690×H1540 (W25.2×H21.3 inch)	W810×H1850 (W31.9×H72.8 inch)

●For humidifying water, please use pure water of not less than 0.05MΩ·cm (20μS/ cm or below).

●Temperature and humidity indication and control operations for this equipment are based on the Steam Pressure Table of Table A.1, Annex A, IEC Standard 60068-2-66.

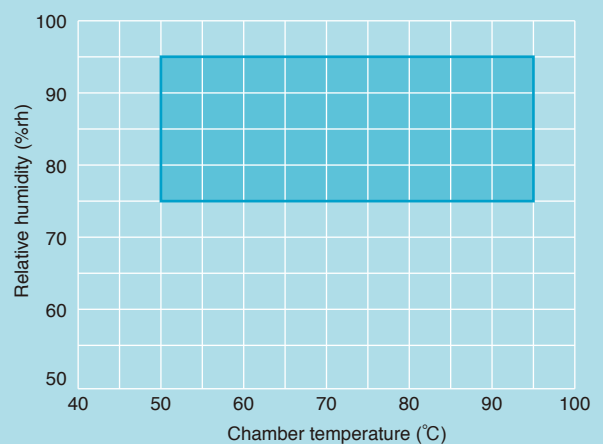
## TEMPERATURE AND HUMIDITY CONTROL RANGE

### ● TEST PROCESS

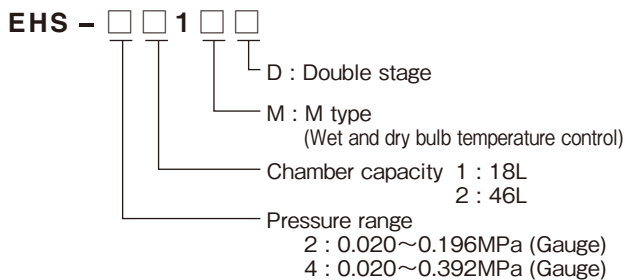


\* Temperature and humidity indication and control operations for this equipment are based on Table A. 1, Annex A, IEC Standard 60068-2-66.  
 \* Humidity range is from 75% to 98% rh for wet and dry bulb control.

### ● HOLD PROCESS



## MODEL



## INSTRUMENTATION SPECIFICATION

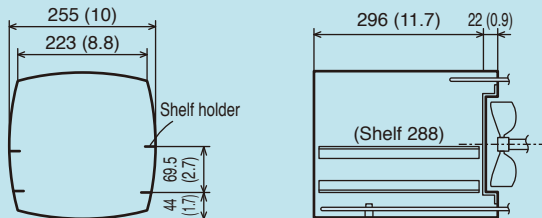
### Program control

No. of patterns	10
No. of steps	30 steps/ pattern
Control	Ramp, constant setting
Program setting	Loop, skip, end command*
Max. time setting	Total 999.9hrs per pattern

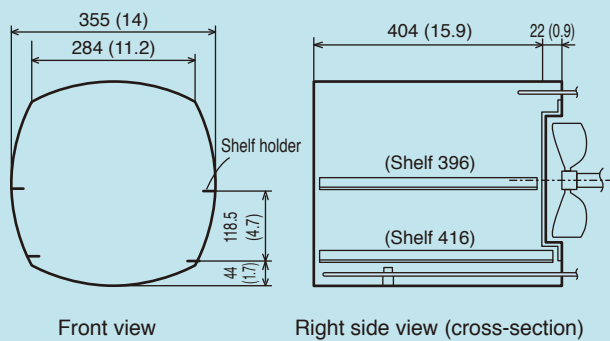
\* Time signals can be set for each step when equipped with time signal (option).  
Each loop command can repeat the specified steps up to 99 times.

## TEST AREA DIMENSION DIAGRAM

### ● EHS-211 (M·MD) · 411 (M·MD) Units: mm (inch)



### ● EHS-221 (M·MD)



## SAFETY DEVICES

- Overheat protector
- Boil-dry protector
- Overpressure prevention switch
- Power loss default circuit
- Leakage breaker
- Safety valve
- Temperature sensor disconnection alarm
- Air-circulating fan/motor rotation alarm
- Wet-bulb wick dry alarm
- Door lock alarm
- Water suspension relay
- External alarm terminal
- Specimen power supply control terminal

## ACCESSORIES

### 《EHS-211(M)·221(M)·411(M)》

- Shelves ..... large×1, small×1  
EHS-211(M)·411(M) large : 248 W×288 Dmm  
small : 229 W×288 Dmm  
EHS-221(M) large : 348 W×396 Dmm  
small : 285 W×416 Dmm
- Fuse (250V 3A) ..... 2
- Plug for external alarm terminal /  
specimen power supply control terminal (with cable) ..... 2
- Cable clamp ..... 1
- Wet-bulb wick (for type M) ..... 50
- Portable water tank ..... 1  
(10L polyethylene tank)
- Brush ..... 1
- Water drain hose nipple ..... 1
- User's manual ..... 1

### 《EHS-211MD·221MD·411MD》

- Shelves ..... large×2, small×2  
EHS-211MD·411MD large : 248 W×288 Dmm  
small : 229 W×288 Dmm  
EHS-221MD large : 348 W×396 Dmm  
small : 285 W×416 Dmm
- Fuse (250V 3A) ..... 4
- Plug for external alarm terminal /  
specimen power supply control terminal (with cable) ..... 4
- Cable clamp ..... 2
- Wet-bulb wick (for type M) ..... 100
- Portable water tank ..... 1  
(10L polyethylene tank)
- Brush ..... 1
- Water drain hose nipple ..... 1
- User's manual ..... 1

## OPTIONS

### Paperless recorder (Portable type)

Records temperature, humidity and pressure inside the chamber. Additional inputs may also be recorded.

Temperature range: 0 to +200°C

Humidity range: 0 to 100%rh

Pressure range:

– 0.1 to 0.5MPa (Gauge)

Number of inputs:

Temperature 1

Humidity 1

Pressure 1

(3 more channels can be turned ON)

Data saving cycle: 5 sec

External recording media:

CF memory card port

(Includes a 256MB CF card)

USB memory port



### Temperature, humidity and pressure recorder

Records: Test area temperature  
Test area relative humidity  
Test area pressure

Recorder scale plate:

0 to +200°C / 0 to +100%rh

– 0.1 to 0.5MPa (Gauge)

### Time signal

Contact output specifications

Operation: on/ off at each step

Number of channels: 2

### Additional specimen signal terminals

EHS-211(M)·411(M)

.....12pins (6ch\*)×up to 4 sets

EHS-211MD·411MD

.....12pins (6ch\*)×up to 4 sets per chamber

EHS-221(M)

.....12pins (6ch\*)×up to 5 sets

EHS-221MD

.....12pins (6ch\*)×up to 5 sets per chamber

\* The numbers of channels given are for configurations with two I/O systems.



EHS-221 ( Standard 12 pins  
Optional 12 pins×5 sets  
total 72 pins )

### Teflon-coated shelves

Standard shelves (large, small) with Teflon coating.

### Specimen baskets

Type A: 150W×50H×150Dmm

Type B: 100W×50H×200Dmm

Type C: 95W×20H× 95Dmm



### Antiseismic brace

Used to fit chamber onto the floor.

### Communication function

Enables management of chamber operation

• RS-232C

\* Select one other than standard RS-485.

■ Some photographs listed in this catalog contain Japanese display.

### 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.
- Be sure to read the operation manual before operation.

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