

Quality is more than a word



Faster Temperature (& Humidity) Chamber

SML-2·SMU-2

SMS-2·SMG-2



Stress of 5°C/min. or more achieved with the large-capacity 1800L models.

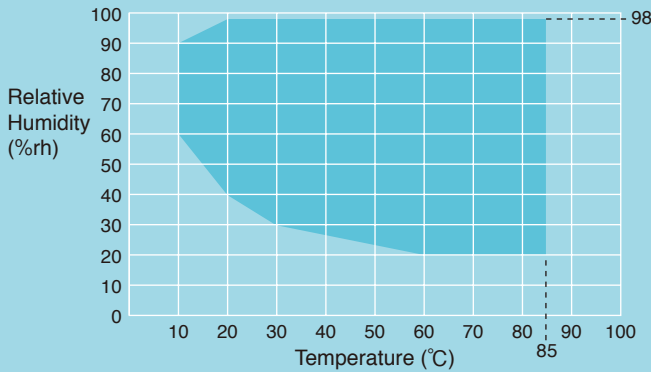
A faster temperature and humidity chamber with 1800 L capacity has been developed for reliability testing of increasingly large display devices to be used in automotive components, in car electronics systems, and more.

This marks the arrival of a long-awaited large-capacity temperature and humidity chamber capable of providing a temperature change rate of 5°C/min. or more. The chamber is packed with numerous features, including a shorter time of delivery, thanks to its standardized component units. Lower power consumption, proper height for specimen setting, and other features.





● Temperature & Humidity Controllable Range



*When the chamber is operated below +30°C to +40°C, continuous operation is restricted due to the dew condensation in the cooler (also functions as a dehumidifier).



Wick installation (Test area)



External view of wick (Right side)



Right side

● Application of high stress of 5°C/ min. or more now possible

This faster temperature (& humidity) chamber enables the application of high stress to the specimen at a steep temperature rate of change of 5°C/min. or more. 5 °C/min. or more achieved from -45 °C ⇔ +155 °C with models SMG and SMS, and from -18 °C ⇔ +158 °C with models SML and SMU (without specimens loaded), thanks to the larger refrigeration systems installed in this series. The chamber features operation within wide temperature ranges: -70 °C to +180 °C and -40 °C to +180 °C.

● Power consumption cut

An improvement in the refrigeration system has resulted in lower power consumption in the large-capacity model temperature and humidity chamber.

● Simple replacement of wick

The wick located at the upper rear of the test area must be replaced periodically in order to maintain high precision of humidity measurement at all times. To this end, the wick has been designed for easy replacement from the exterior.

● Free access of the chamber

Since the machinery compartment is located in the back of the test area, virtually no maintenance space is required on either side of the equipment, enabling access either from the right or the left.

● Door unlocking system inside the chamber

A door unlocking handle is installed inside the chamber, so that the door can be opened from inside, should someone be locked in by mistake.

● Easy to set specimens

For cases in which specimens are set in the chamber using a hand-lift, an insertion hole has been provided at the bottom of the chamber, and the test area has also been lowered, so that large-sized specimens and heavy articles can easily be inserted or withdrawn.

● New shelves structure (Japanese patent no.4418691)

Due to the large size (1200mm wide×1500mm deep) of the test area shelves are relatively heavy. With this in mind, shelves have been designed in a two-piece structure. Moreover, storage space is provided at the bottom of the device to hold the shelves.



Test area (one set of shelves and shelf supports equipped as standard)

● Pocket for printed material

A pocket is provided at the lower front of the chamber to store printed material such as the operation manual.

● Four models with 1800L capacity

Two models are available for each of the temperature ranges from -40°C to $+180^{\circ}\text{C}$ / -70°C to $+180^{\circ}\text{C}$, with a humidity model (from 20 to 98%rh) also available for each type. Thus, a chamber model can be selected from four models to suit the intended application at best.



Shelves storage space



Pocket

Paperless recorder (Optional)

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

*Outside dimensions change when attaching the paperless recorder. (see p.9)

Control operation



Instrumentation panel

● Program monitoring



● Program setting



● Alarm



● Service guide



● Instrumentation integrated into the door

To minimize the required installation space for the device, the instrumentation section has been integrated into the door. The instrumentation produces indications on a bright, easy-to-view color LCD, which features an interactive touch-screen system.

● Remote control from your PC

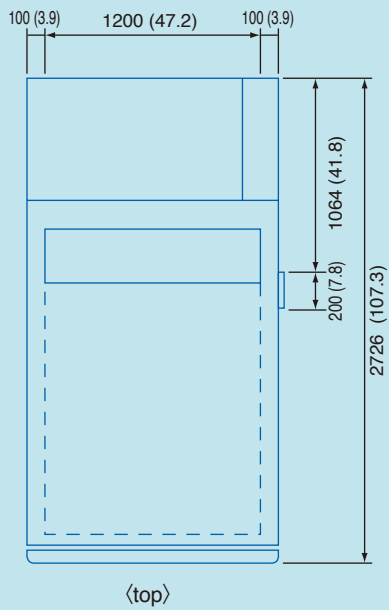
Please contact us for details on using a PC to monitor and remotely control the equipment.

Temp. & Humid. controller

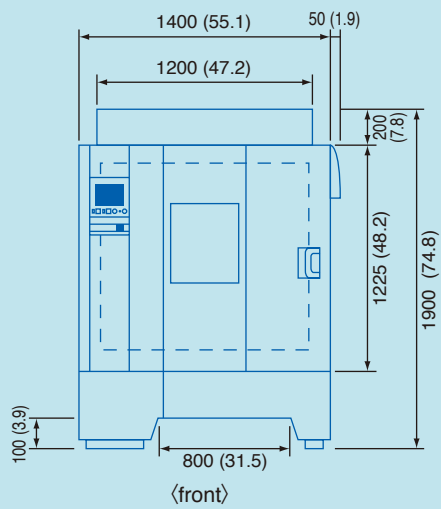
Operating mode	Program operation, Constant operation
Display	TFT Color LCD (6.5in.)
Setting	Interactive key input by touch panel
Program capacity	User's patterns: 20 program patterns · 99 steps per one pattern · pattern linking possible ROM patterns: 10 program patterns
Setting ranges	Temp. : -75 to +185°C Humid. : 0 to 100% rh Time : 0 to 999 hours 59 minutes
Setting resolution	Temp. : 0.1°C Humid. : 1% rh Time : 1 minute
Input	Thermocouple type T (Copper/ Copper-Nickel)
Control	PID control
Interface	RS-485
Auxiliary functions	- Time signal - Input burn-out detection - Upper and lower temperature & humidity limit alarm - Self-diagnostic - Alarm indication - Power shut-off - Timer preset (automatic start/stop) - Refrigerator control mode - Trend graph display - Help

DIMENSIONS

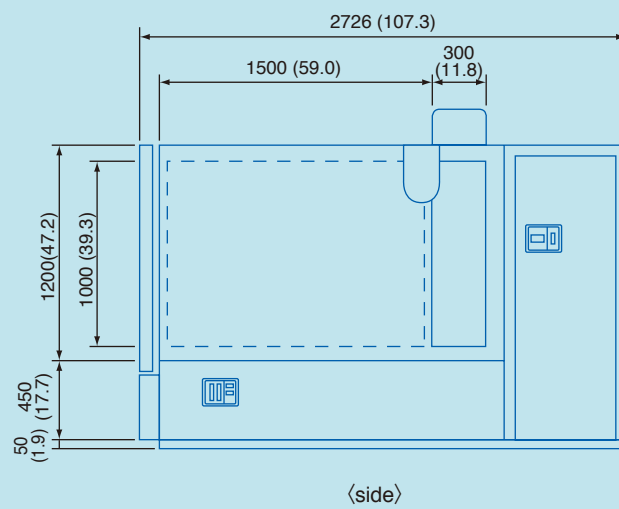
unit : mm (inch)



〈top〉



〈front〉



〈side〉

SPECIFICATIONS

Model		SML-2	SMU-2	SMS-2	SMG-2	
System		Balanced Temperature (& Humidity) Control system (BT(H)C system)				
Performance ^{*1}	Temperature range	−40 to +180℃ (−40 to +356℉)		−70 to +180℃ (−94 to +356℉)		
	Humidity range	20 to 98% rh	——	20 to 98% rh	——	
	Temperature fluctuation	±0.5℃ (−40 to +100℃) ±1.0℃ (+101 to +180℃)		±0.5℃ (−70 to +100℃) ±1.0℃ (+101 to +180℃)		
	Humidity fluctuation	±5% rh	——	±5% rh	——	
	Temperature gradient	3℃				
	Humidity gradient	10% rh	——	10% rh	——	
	Temperature variation in space	3℃				
	Humidity variation in space	10% rh	——	10% rh	——	
	Temperature rate of change	−18℃⇔+158℃ 5℃/min. no specimen (Average)		−45℃⇔+155℃ 5℃/min. no specimen (Average)		
	Lowest attainable temperature	−40℃		−70℃		
Construction	Exterior material	Cold-rolled rust-proofed treated steel plate				
	Test area material	18-8 Cr-Ni stainless steel plate (2B polish)				
	Insulation	Glass wool				
	Heater	Fin-type sheathed heater				
	Humidifying boiler	18-12-2.5 Cr-Ni-Mo stainless steal sheathed heater	——	18-12-2.5 Cr-Ni-Mo stainless steal sheathed heater	——	
	Cooler	Plate fin cooler (Also works as a dehumidifier)				
	Refrigeration unit	System	Mechanical single stage refrigeration system		Mechanical cascade refrigeration system	
		Refrigerator capacity	7.5 kW		7.5 kW + 7.5 kW	
		Refrigerator	Scroll-type compressor, Water-cooled condenser, Cascade condenser (SMS, SMG only), Electronic expansion valve system, Refrigerant (R404A, R23 ‹SMS, SMG only›)			
	Air circulator		Sirocco fan (Direct-coupled electric motor type, 100 W×4)			
Humidifying water supply	water quality	Electrical conductivity 0.1 to 10 μs/cm	——	Electrical conductivity 0.1 to 10 μs/cm	——	
	Supply water pressure	0.07 to 0.5MPa		0.07 to 0.5MPa		
Fittings		Viewing window (W340×H440 mm), Chamber lamp, Integrating hour meter, Cable port×2 (φ 50 mm, each side)				
Chamber total load resistance		100 kg				
Inside dimensions (mm) ^{*2}		W1200×H1000×D1500 (W47.2×H39.3×D59.0 inch)				
Outside dimensions (mm) ^{*2}		W1400×H1900×D2726 (W55.1×H74.8×D107.3 inch)				
Capacity		1800 L				
Weight		1250 kg		1400 kg		
Utility requirements	Allowable ambient conditions		Ambient temperature range: 0 to +40℃ (+32 to +104℉) Cooling water temperature range: +5 to +32℃ (+41 to +89.6℉)			
	Power supply ^{*3}	200V AC 3 φ 3W 50/60Hz	109 A	86 A	120 A	
		220V AC 3 φ 3W 60Hz	97 A	75 A	109 A	
		380V AC 3 φ 4W 50Hz	56 A	45 A	63 A	
		400V AC 3 φ 4W 50Hz	57 A	45 A	64 A	
	Cooling water supply pressure		0.2 to 0.5MPa			
	Cooling water supply rate		2350 L/h (Reference temperature +25℃), 4400 L/h (Reference temperature +32℃)			
	Piping connection size		32A			
Noise level ^{*4}		Max. 65dB				

^{*1} The performance values are based on IEC 60068-3-5:2001, JTM K07:2007, and IEC 60068-3-6:2001, JTM K09:2009. Performance figures are given for a +23°C ambient temperature, a +25°C refrigerator cooling water temperature, no specimens inside the test area and refrigerator capacity set to auto.

^{*2} Excluding protrusions

^{*3} Voltage fluctuation: ±10% of rated value.

^{*4} 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).

MODEL

SM□-2

Temperature & humidity range

L : -40°C / 20 to 98%rh

U : -40°C

S : -70°C / 20 to 98%rh

G : -70°C

ACCESSORIES

- Cable port rubber plug (Silicone sponge rubber, ϕ 50mm) 2
- Shelf brackets, 18-8 Cr-Ni stainless steel (Class CP) 1 set
- Shelf, 18-8 Cr-Ni stainless steel plate
 - (front: 1160×700mm) 1
 - (back: 1160×700mm) 1
- Cartridge fuse, Class A, 250V
 - For SML, SMS, SMG
 - 200, 380, 400V AC spec 5
 - 220V AC spec 6
 - For SMU
 - 200, 380, 400V AC spec 4
 - 220V AC spec 5
- Wet-bulb wick (For SML, SMS) 1 box
- Operation Manual 1 set

SAFETY DEVICES

- Leakage breaker for power supply (200 to 380V AC spec.)
- Circuit breaker for power supply (400V AC spec.)
- Circuit breaker for refrigerator
- Boil dry protector (SML, SMS only)
- SSR overload and short circuit protecting circuit breaker
- Temperature switch for air circulator
- Control circuit overload and short circuit protection fuse
- Electrical compartment door switch
- Refrigerator high /low pressure switch
- Thermal fuse
- Temperature switch for compressor
- Specimen power supply control terminal
- Reverse-prevention relay
- Upper and lower temperature (& humidity) limit alarms (built-in temperature (& humidity) controller)
- Burn-out circuit (built-in temperature (& humidity) controller)
- Watchdog timer (built-in temperature (& humidity) controller)
- Overheat protector (independent type)
- Water suspension relay
- Circuit breaker for heater
- Circuit breaker for humidifying heater (SML, SMS only)
- Switch for humidifying boiler water level detection (SML, SMS only)
- Wick insertion port switch (SML, SMS only)



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

OPTIONS

Paperless recorder

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

Recorder location: Top or Left side

Size: 220×210 mm

*External dimensions change when attaching the recorder. (Please refer to the recorder location.)

Data saving cycle: 5 sec.

External recording media:

CF memory card (256MB)

Language support: ENG, JPN

[Temperature type]

Temperature range: -100 to +200°C

Number of inputs (Initial setting):

Temperature 1

(5 more channels can be turned ON)

[Temperature and humidity type]

Temperature range: -100 to +200°C

Humidity range: 0~100% rh

Number of inputs (Initial setting):

Temperature 1 / Humidity 1

(4 more channels can be turned ON)



Temperature recorder (digital)

[RJ25]

-100 to +200°C

6 dots

Recorder location: Top or Left side

Size: 220×210 mm

*External dimensions change when attaching the recorder. (Please refer to the recorder location.)

Temperature and humidity recorder (digital)

[RJ15]

-100 to +200°C

0 to 100%rh

6 dots

Recorder location: Top or Left side

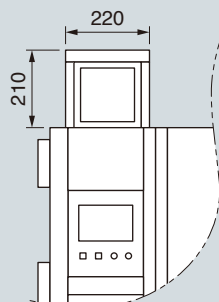
Size: 220×210 mm

*External dimensions change when attaching the recorder. (Please refer to the recorder location.)

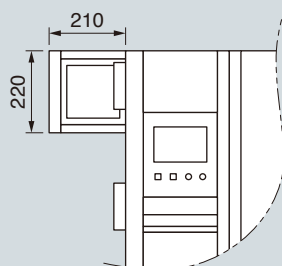


● Recorder location unit:mm

Top



Left side



Thermocouple

Attached to specimen to measure specimen temperature.

*Thermocouple type T (Copper/ Copper-Nickel)

• 2m

• 4m

• 6m

Connecting terminal for temp. and humid. recorder

Output terminals for chamber temperature and humidity.

*Cannot be installed in conjunction with a recorder



Temperature sensor terminal

Terminal boards for dry-bulb sensor in the chamber.

(SMU, SMG only)

Product temperature monitor

When temperature measurement is performed on the specimen by the temperature sensor, the results are displayed on the instrumentation monitor screen. In programmed operation, the exposure time can be controlled, provided that the specimen temperature is within the available set temperature specifications.

- Measurement point: 1
- Sensor in use: Thermocouple, Type T
- Appurtenances: Terminal board1
- Connecting position:
Right side of the main unit (front)
- Accessories:
Thermocouple, Type T1
(ϕ 0.32mm, 6m)
Connector1

OPTIONS

Additional relay contacts

Nine relay contacts (time signals) added.
(Two contacts standard equipped)



External alarm terminal

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

Emergency stop push button

Stops the chamber immediately.

Additional overheat protector

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

Overcool protector

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

Integrating hour meter with reset

Additional accessory to the standard hour meter, allowing reset.



Frost-free circuit

Prevents frost from accumulating on the refrigeration circuit to allow long-term continuous operation.
With models SMS and SMG, it is applicable with all chambers except those equipped with cascade refrigeration.

Shelf, Shelf bracket

Equivalent to standard accessory.

Anchoring fixtures

Used to bolt the chamber to the floor.

Additional cable port

Provided in addition/replacement of the standard cable port (left-side).
*Equipped with rubber plug.

- $\phi 25$ mm
- $\phi 50$ mm
- $\phi 100$ mm

Cable port rubber plug

Comes with the cable port.

Interface

Serial interface: RS-232C

Computer interface: GPIB

*Select instead of standard RS-485.

Communication cables

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

Power cable

- 5m
- 10m

*AC 200, 220V only

*The chamber does not come with a power cable.

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ISO 14001 (JIS Q 14001)

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