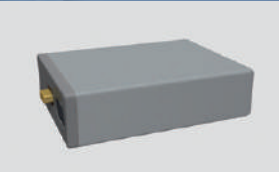


**ESPEC Solutions for:
Fuel cell and Secondary battery testing**

ESPEC



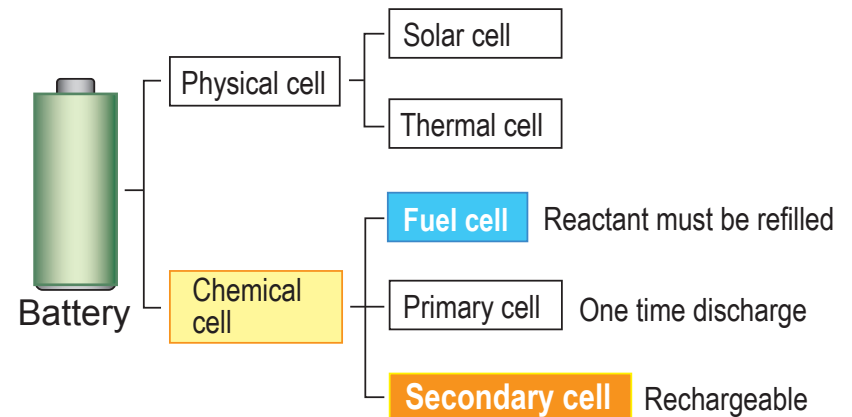
Secondary (rechargeable) batteries, also known as “storage batteries” are a popular storage media for alternative energy sources.

Beside the existing and most common technologies for storage batteries such as Nickel-hydride and Lithium-ion batteries, the Fuel Cell is also another arising technology.

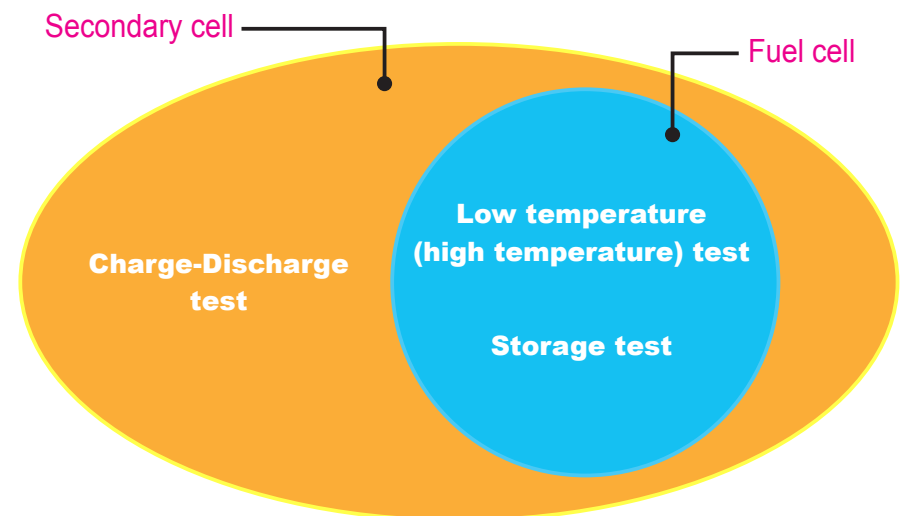
A fuel cell is different from an electrochemical battery in the respect that it consumes reactant which must be refilled, whereas electrochemical batteries have a closed system.

To ensure users’ safety, these batteries must pass various reliability and performance tests before they go out on the market.

Battery Types



Test Types



※ Humidity condition will be added depending on battery type and its application.

Standard test applications are categorized into the areas as shown in the table below.

	Charge-discharge test	Low temperature (high temperature) characteristic test	Storage test
Summary	To check the performance of battery when battery is charged and discharged repeatedly at a specific environment.	To check the characteristics when secondary battery is charged and discharged at various temperatures.	To check the stability and gas leak by storing the battery for a long time at a special environment.
Test conditions (example)	Temperature: random several points between -30 to +30°C (The temperature range will be widened depending on battery type and its application.)	Temperature: random several points between -30 to +30°C (The temperature range will be widened depending on battery type and its application.)	Temperature: random several points between -10 to +70°C (The temperature range will be widened depending on battery type and its application.)
ESPEC products	Platinous series SMx Series Walk-in Series BenchTop Series Labostar Series	Platinous Series Walk-in Series	Platinous series SMx Series Walk-in Series BenchTop Series Labostar Series

* Humidity condition will be added depending on battery type and its application.

ESPEC's product range provides solutions over the complete range.

ESPEC as a manufacturer of temperature and climatic test chambers has been a partner for the storage battery Industry for many years.

We have developed test chambers incorporating safety features to protect the operator from the hazard resulting from the reliability and performance test in a high or low temperature environment.

**Safe &
Reliable**

**Many Sales
Records**
Approx. 600 units
in 2007

Safety Features

- ✓ Gas detection system with wide temperature range
- ✓ Rapid air exchange function
- ✓ Pressure relief vent
- ✓ Reinforced chamber door
- ✓ Safety door lock
- ✓ Control signal for external systems
- ✓ Fire extinguisher system
- ✓ Additional (independent) overheat protector

.... and more on individual requests

For Safety - Platinous Series

Temperature (& Humidity) Chamber

ESPEC's most popular temperature/climatic chamber, it has optimum operational ease, safety and environmental friendliness and superb performance and reliability.

**Climatic chamber
+ plus!
Safety features**



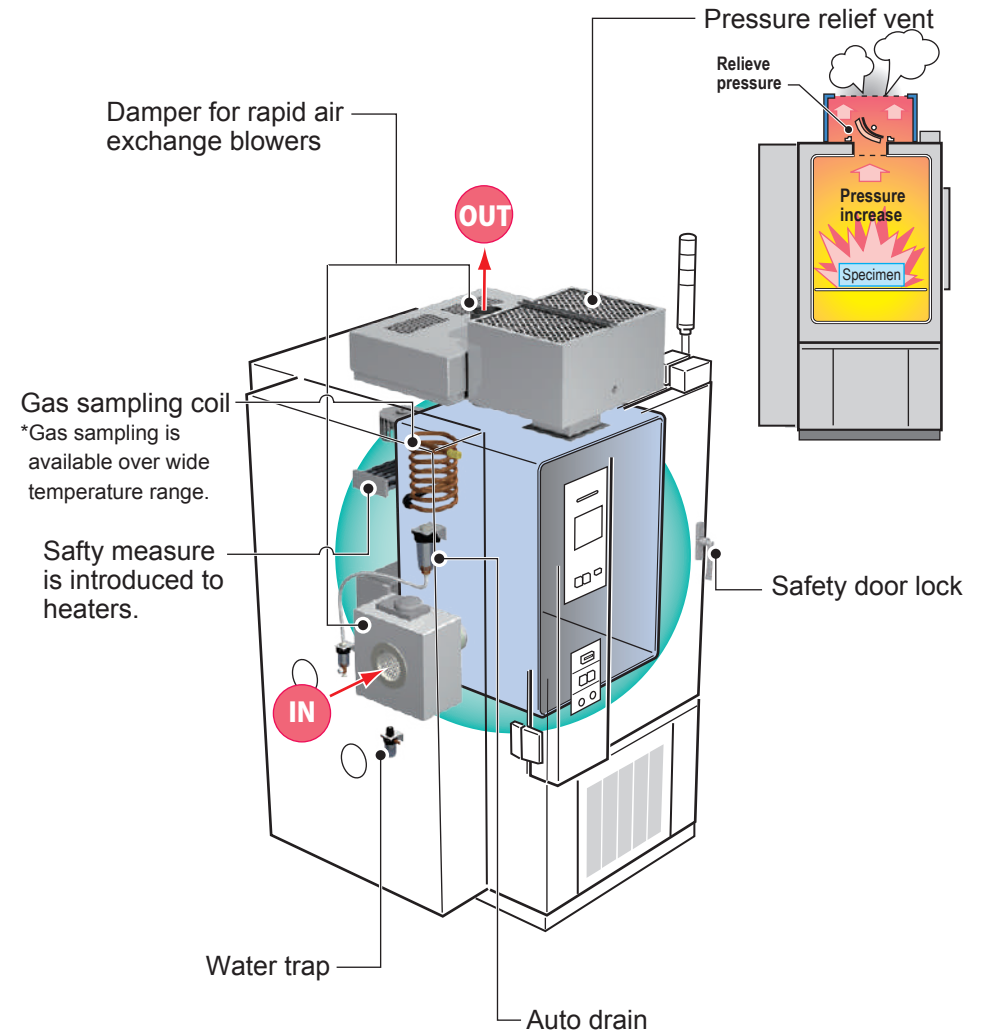
*Chamber image

The design is subject to change depending on customer's specification request.

Options

- ✓ Dry Air purge (avoids condensation)
- ✓ N₂ purge (low oxygen level)
- ✓ CO₂ purge (low oxygen level)
- ✓ Communication port for Charge-Discharge Systems with programmable controller
- ✓ Cable ports available on both sides
- ✓ Reinforced chamber floor (up to 300kg)
- ✓ Cable ports of various sizes
- ✓ Additional solenoid lock

Construction



For Safety - Platinous Series

Specifications

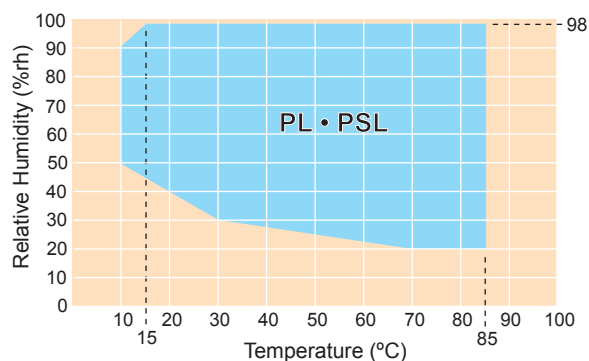
Temperature & Humidity Chamber

Model		Temp. range	Humidity range	Interior volume
PL	Low Temperature & Humidity Chamber	-40°C to +100°C	20% to 98%rh	408 L, 800 L
		-40°C to +150°C		
PSL	Ultra Low Temperature & Humidity Chamber	-70°C to +100°C	20% to 98%rh	306 L, 800 L
		-70°C to +150°C		

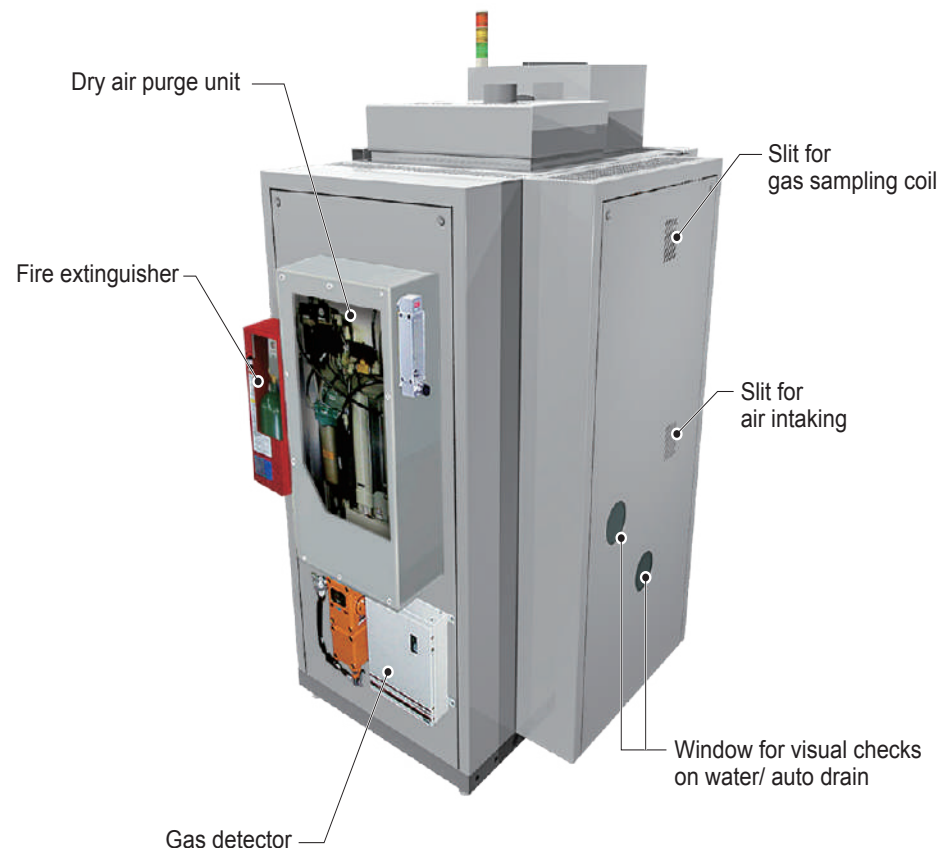
Temperature Chamber

Model		Temp. range	Humidity range	Interior volume
PU	Low Temperature Chamber	-40°C to +100°C	none	408 L, 800 L
		-40°C to +150°C		
PG	Ultra Low Temperature Chamber	-70°C to +100°C	none	306 L, 800 L
		-70°C to +150°C		

Temperature & Humidity control range



Chamber configuration example



For Large Specimen - SMx Series, Walk-in Series

Faster Temperature (& Humidity) Chamber

Fast rate chamber with 1800ltr. capacity, developed for reliability testing of increasingly larger test samples as required by the automotive market.



Walk-in Type Temperature (& Humidity) Chamber

Flexible variation with a range of chamber sizes and air conditioning capacity



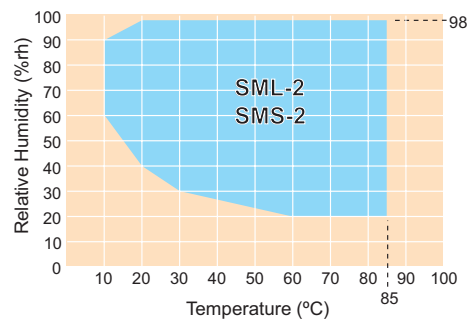
Specifications

Model	Temperature range	Humidity range	Interior dimensions
SML-2	-40 to +180°C	20 to 98%rh	W1200 × H1000 × D1500mm
SMS-2	-70 to +180°C		
SMU-2	-40 to +180°C	none	
SMG-2	-70 to +180°C		

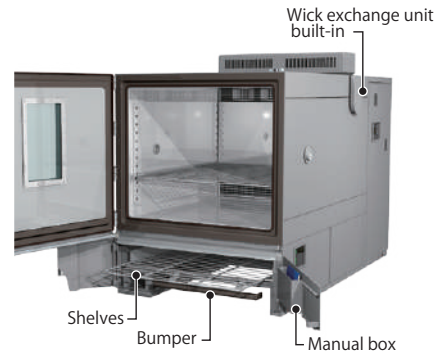
Specifications

Model	Temperature range	Humidity range	Inside capacity (floor area)
EBE	-40 to +80°C	10 to 95%rh	TYPE 1 : 4.2m ³ (2.0m ²)
EBL	-30 to +80°C	10 to 95%rh	TYPE 2 : 8.1m ³ (3.9m ²)
EBR	-10 to +80°C	20 to 95%rh	TYPE 3 : 12.5m ³ (5.9m ²)
EBF	-40 to +80°C	none	TYPE 4 : 16.8m ³ (8.0m ²)
EBU	-30 to +80°C		TYPE 6 : 25.8m ³ (12.3m ²)
EBUU	-10 to +80°C		TYPE 8 : 34.8m ³ (16.6m ²)
			TYPE 10 : 43.8m ³ (20.8m ²)
			TYPE 12 : 52.7m ³ (25.1m ²)

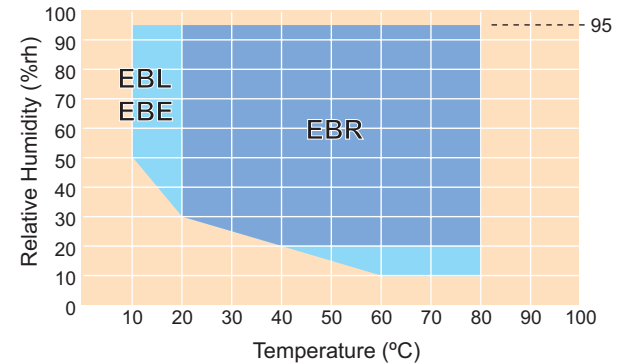
Temperature & Humidity control range



Construction



Temperature & Humidity control range



For Small & Easy use - Bench-top Series, Labostar Series

Bench-top Type Temperature (& Humidity) Chamber

Compact design temperature /climatic chambers provide the performance of larger chambers.



(Low) Temperature & Humidity Cabinet & Low Temperature Cabinet

Optimum design for laboratory use.



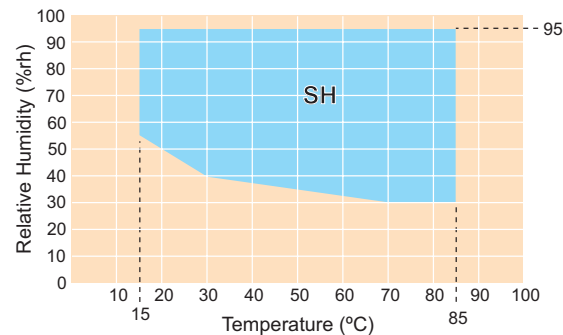
Specifications

Model	Temperature range	Humidity range	Interior dimensions
SH-221	-20 to +150°C	30 to 95%rh	W300 × H300 × D250mm (excluding protrusions)
SH-241	-40 to +150°C		
SU-221	-20 to +150°C	none	
SU-241	-40 to +150°C		

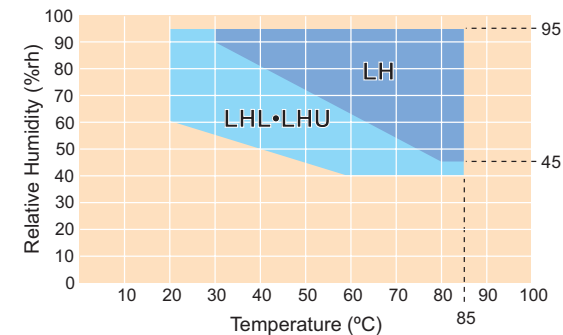
Specifications

Model	Temperature range	Humidity range	Interior dimensions
LH-113	(Ambient temp. +10) to +85°C	45 to 95%rh	W500 × H600 × D390mm
LHL-113	+5 to +85°C	40 to 95%rh	
LHU-113	-20 to +85°C		
LU-113	-20 to 85°C	none	

Temperature & Humidity control range (SH type only)



Temperature & Humidity control range



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