

Quality is more than a word



Customized Applications



ESPEC: Custom-Engineered Solutions for Testing and Evaluation

Evaluation targets, test conditions, and required environments vary by market.

This collection introduces ESPEC's customized solutions and application examples for the AI-related, aerospace, automotive, photovoltaic cell, battery, and construction markets.

Refer to the examples most relevant to your application when planning system installation and evaluation environments.

* This publication is based on products sold and delivered in Japan. Product availability, specifications, and support may vary by country or region depending on local regulations, export restrictions, and installation or service conditions.

Contact ESPEC for more information.



AI-Related Market



Aerospace and
Satellite
Communications
Market



Automotive Market



Photovoltaic Market



Battery Market



Building and Building
Materials Market

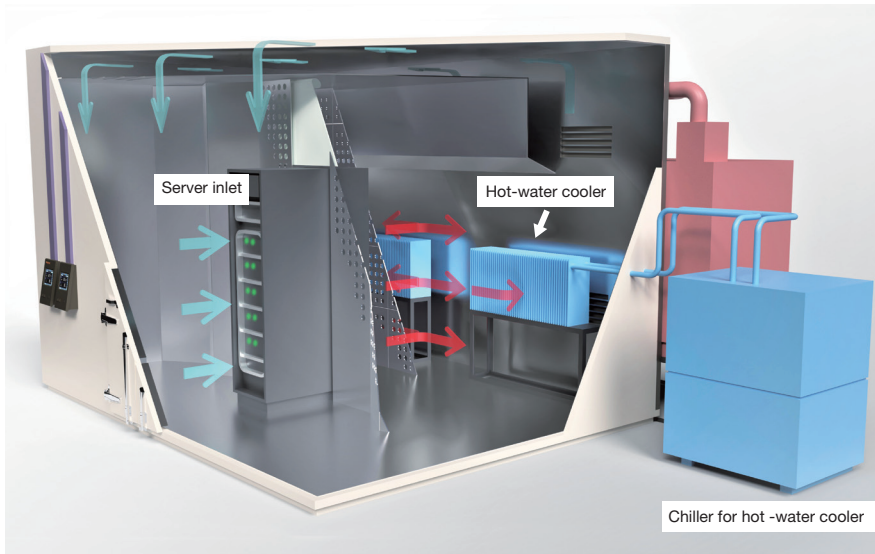
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AI Server Rack Reliability Testing



Target Specimens

- AI Server
- Rack



Contact Us

Features

- Proprietary hot-water cooler control that supports high heat-generation loads of up to 60 kW
- Equipped with an optional feature for managing server air inlet temperature, a key parameter in testing
- Combines energy savings with a compact footprint

Applicable Products

Walk-in Chamber for High Heat-Generation Loads

Applications



Research & Development



Engineering & Design



Quality Control

AI Server Module/Unit Durability and Reliability Evaluation Testing



Target Specimens

- AI Servers
- Modules
- Units
- Electronic components



Contact Us

Features

- Enables rapid temperature cycling tests even when test specimen is generating heat
- Available for customizing internal dimensions and temperature change rates
- Stable control at High Ramp Rates
([Ref.] Temperature range: -45°C to +155°C, 15°C to 25°C/min)

Applicable Products

AR Series
HR Series
FD Series

Applications



Research & Development



Engineering & Design



Quality Control

IEC 60068-2-66 HAST/Highly Accelerated Stress Testing



Specimen signal terminals (internal)

Specimen signal terminals (external)

Target Specimens

- Semiconductor devices
- Electronic components
- Circuit-mounted boards
- Packaging/Sealing materials



Contact Us

Features

- Large chamber capacity for Large PCBs and higher throughput
- Supports various power-on evaluations with extensive through-hole options for different voltage/current and pin count requirement
- Air HAST control with residual air retention

Applicable Products

Large Highly Accelerated Stress Test System (HAST Chamber)
Model: EHS-432

Applications



Research & Development

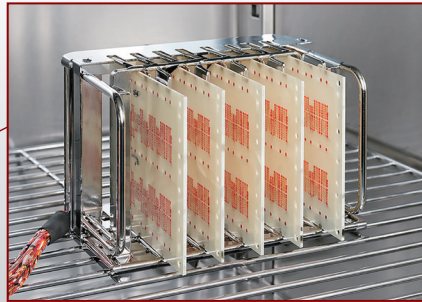


Engineering & Design



Quality Control

Insulation Resistance/Leakage Current Measurement, Lifetime Evaluation



Test jig

Target Specimens

- Electronic components
- PCBs
- Semiconductor materials



Contact Us

Features

- Automated multi-sample insulation resistance and leakage current measurement
- Instantly detects migration to prevent overlooked failures
- Chamber-integrated environmental and measurement synchronization
- Dedicated jigs for reduced wiring effort and improved connection reliability

Applicable Products

Electrochemical Migration Evaluation System (Leakage Current Evaluation System) AMI Series

Applications



Research & Development

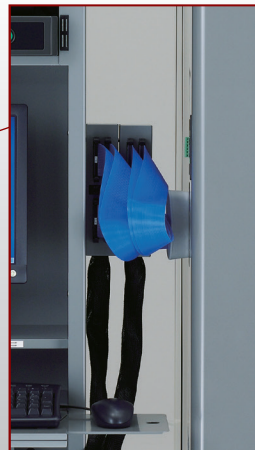


Engineering & Design



Quality Control

Chip-to-Substrate Joint Reliability and TEG (Test Element Group) Evaluation



Relay unit

Target Specimens

- Circuit-mounted boards



Contact Us

Features

- Automated continuous resistance measurement during cycling conditions
- High-precision detection of minute bond resistance changes
- Simultaneous multi-point measurement for higher evaluation efficiency
- Faster data processing with automated analysis and temperature/humidity synchronization

Applicable Products

Conductor Resistance Evaluation System AMR Series

Applications



Research & Development

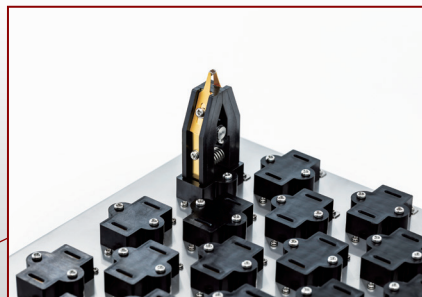


Engineering & Design



Quality Control

Temperature and Frequency Characteristic Evaluation of Electronic Components



Chip-grip jig
*Option

Target Specimens

- Capacitors
- Inductors



Contact Us

Features

- Automated measurement of electrical characteristics under varying temperature and frequency conditions
- Support for measurement of numerous parameters
- High-precision data acquisition using kelvin measurement
- Dedicated jigs reduce measurement setup time

Applicable Products

Capacitor/Inductor Temperature Characteristic Evaluation System AMQ Series

Applications



Research & Development



Engineering & Design



Quality Control



LSI micro wiring lifetime and TEG evaluation

► Multilayer interconnect and micro-bump reliability evaluation



DUT board (test area installation example)



Target Specimens

- Semiconductor LSI fine interconnects



Contact Us

Features

- Automated multi-sample stress current and resistance testing at high temperatures
- Automatic failure detection and real-time lifetime trend analysis
- Equipped with various testing modes such as Electromigration, Stress migration, Temperature characteristic, and Extrusion

Applicable Products

Electromigration Evaluation System
AEM Series

Applications



Research &
Development



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Design



Quality
Control

Characterization and Reliability Evaluation of Semiconductor Devices and Materials

► Electrical characteristic and TDDB (Time-Dependent Dielectric Breakdown) testing of discrete transistors



DUT board with shorting connectors



Target Specimens

- Discrete FET Transistors



Contact Us

Features

- Stable electrical measurements through high-precision voltage and current application
- Flexible multi-SMU configuration for various sample pin counts
- Support for real-time test data display and Weibull analysis
- Extensive library of 48 measurement programs

Applicable Products

Semiconductor Characteristic Evaluation
System
AMM Series

Applications



Research &
Development



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Design



Quality
Control

DO-160-Compliant Temperature and Altitude Testing



Target Specimens

- Aircraft components



Contact Us

Features

- Support for RTCA/DO-160 temperature and pressure testing
- Reproduces stable environments across a wide temperature range
- Altitude control up to 100,000 ft equivalent

Applicable Products

Altitude Temperature (& Humidity) Chamber MZ Series

Applications



Research & Development

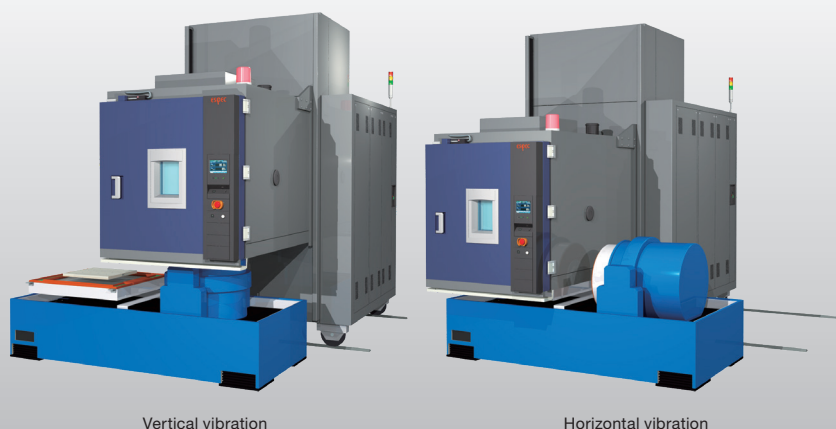


Engineering & Design



Quality Control

Combined Temperature/Vibration Testing of Aircraft Equipment



Vertical vibration

Horizontal vibration

Target Specimens

- Avionics equipment
- Control system modules



Contact Us

Features

- Temperature ramp rates up to 15°C/min
- Support for combined vertical and horizontal vibration testing
- Compatible with vibration test systems from various manufacturers

Applicable Products

Vertical/Horizontal Vibration Combined Environmental Test System

Applications



Research & Development

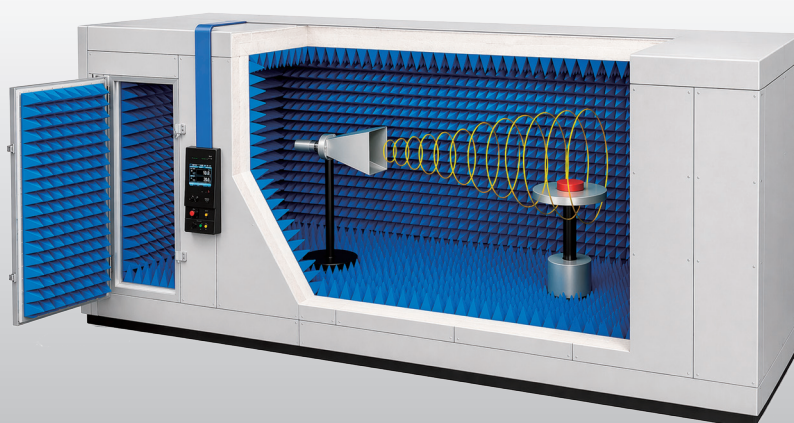


Engineering & Design



Quality Control

Temperature Characteristic Evaluation of Wireless Devices in a Test Room



Conceptual image

Target Specimens

- Communication equipment
- Radio equipment
- Antennas
- Base stations



Contact Us

Features

- RF-absorber-lined chamber for low-reflection testing
- Prevents leakage of unwanted emissions generated during testing

Applicable Products

Constant Temperature RF Anechoic Chamber for Antenna Evaluation

Applications



Research & Development



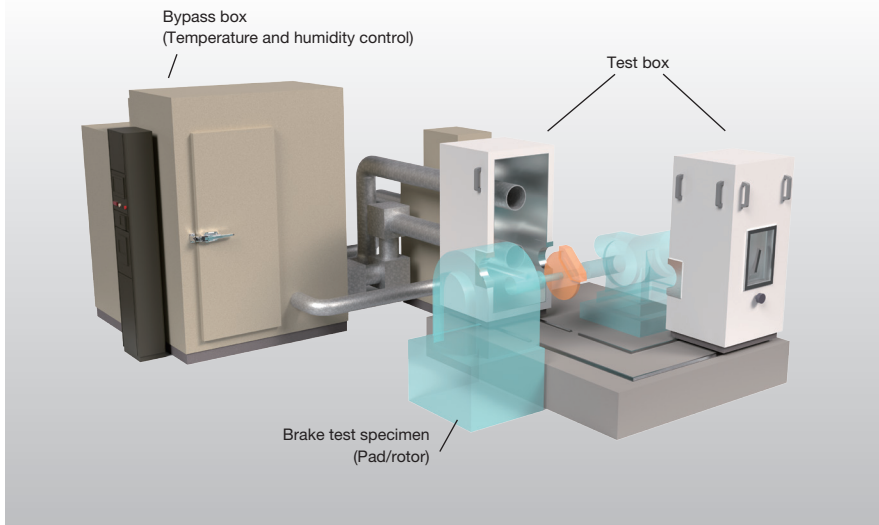
Engineering & Design



Quality Control



Brake Performance Evaluation Testing



Target Specimens

- Brake pad
- Driving units
- Dynamometer- linked equipment



Contact Us

Features

- High-precision
- Support for test-box designs optimized for dynamometer systems
- Combines a bypass box, test box, and dynamometer for brake performance evaluation under environmental conditions such as low temperature and low humidity

Applicable Products

Environmental Chamber for Brake Dynamometer Testing (ACR)

Applications



Research & Development



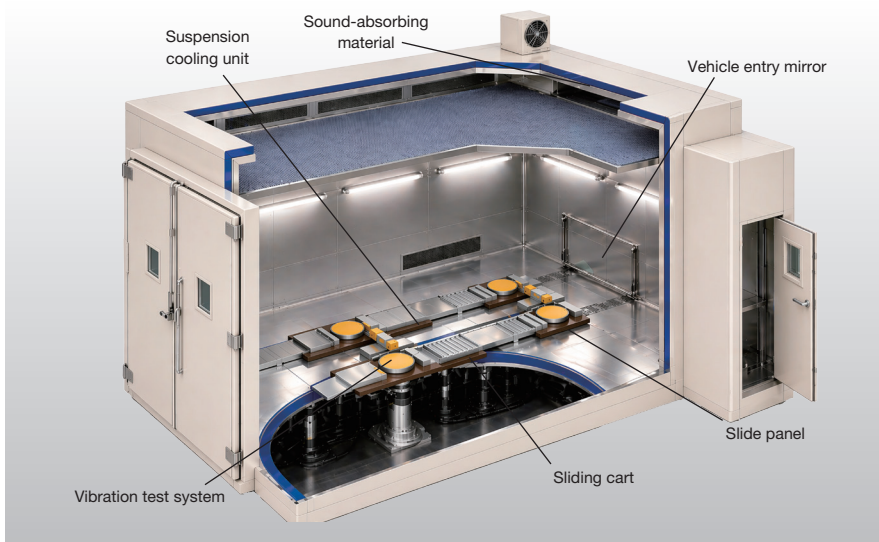
Engineering & Design



Quality Control

Suspension Abnormal Noise Evaluation Testing

► Evaluation of abnormal noise inside and outside completed vehicles, etc.



Target Specimens

- Complete Vehicles



Contact Us

Features

- Support for combined environmental testing for temperature, humidity, vibration, and solar radiation
- Supports various tread and wheelbase configurations
- Low-noise operation with sound-absorbing materials

Applicable Products

Walk-in Chamber for Abnormal Noise Evaluation

Applications



Research & Development



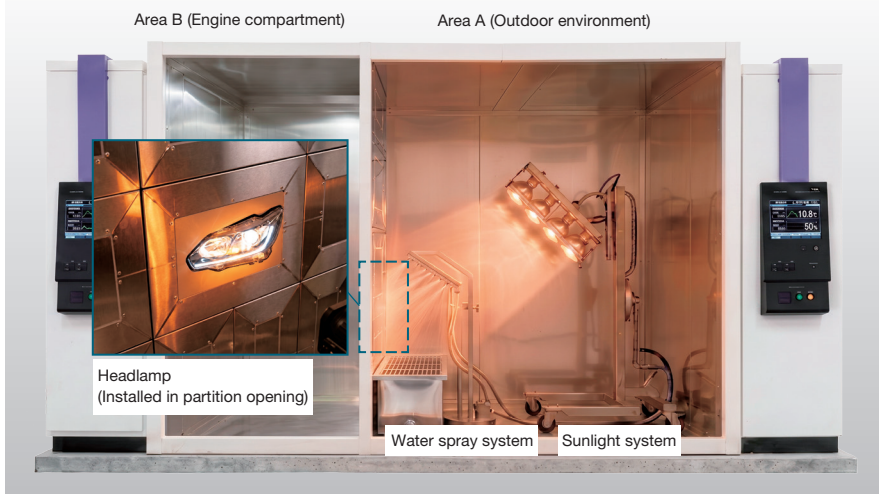
Engineering & Design



Quality Control

Automotive Headlamp Performance Evaluation Testing

► Headlamp fogging/defogging testing, headlamp environmental durability testing, etc.



Target Specimens

- Automotive headlamp



Contact Us

Features

- Dual chambers enable simultaneous simulation of outdoor and engine-room environments
- Enables evaluation under simulated real-world operating conditions
- Simulates real weather conditions with solar radiation and water spray

Applicable Products

Walk-in Chamber for Headlamp Fogging/Defogging Testing

Applications



Research & Development



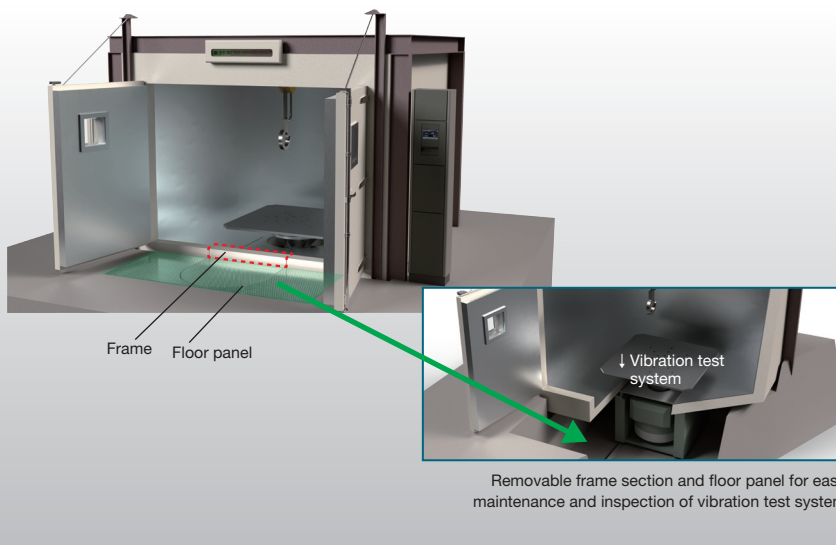
Engineering & Design



Quality Control

Vehicle Component Durability Evaluation Testing

► Combined temperature, humidity, and vibration testing using a vibration test system, etc.



Target Specimens

- Vehicle components



Contact Us

Features

- Optimized design tailored to shaker specifications
- Removable frame section for easy specimen loading onto the shaker table
- Removable frame and floor panels for easy shaker maintenance

Applicable Products

Walk-in Chamber with Vibration Test System

Applications



Research & Development



Engineering & Design



Quality Control

Vehicle Component Heat Resistance Evaluation Testing



Target Specimens

- Vehicle components



Contact Us

Features

- High-precision temperature control synchronized with radiation system
- Flexible control of irradiation unit height and angle
- Optimal light source solutions to meet customer requirements

Applicable Products

Walk-in Chamber with Solar Radiation System

Applications



Research & Development

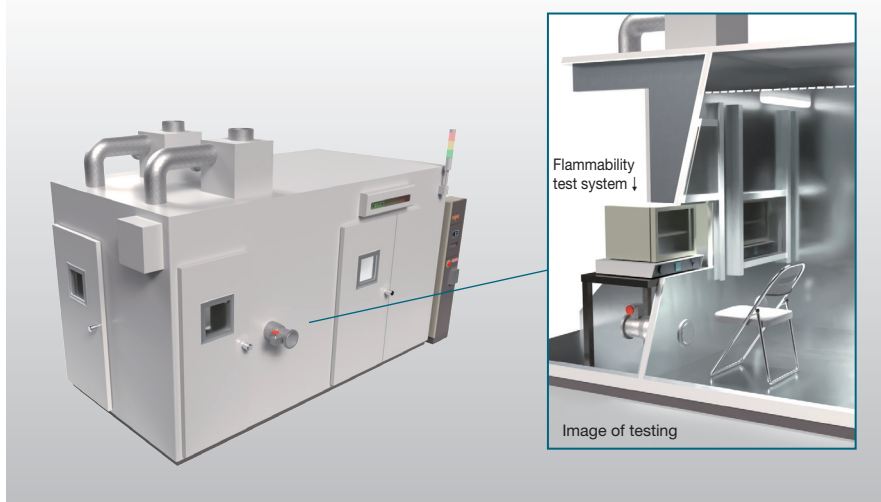


Engineering & Design



Quality Control

Flammability Evaluation Testing of Vehicle Interior Components



Target Specimens

- Vehicle interior components



Contact Us

Features

- Optimized specifications based on test standards
- Wind velocity control at designated locations
- Safety-focused customization

Applicable Products

Walk-in Chamber for Flammability Testing

Applications



Research & Development



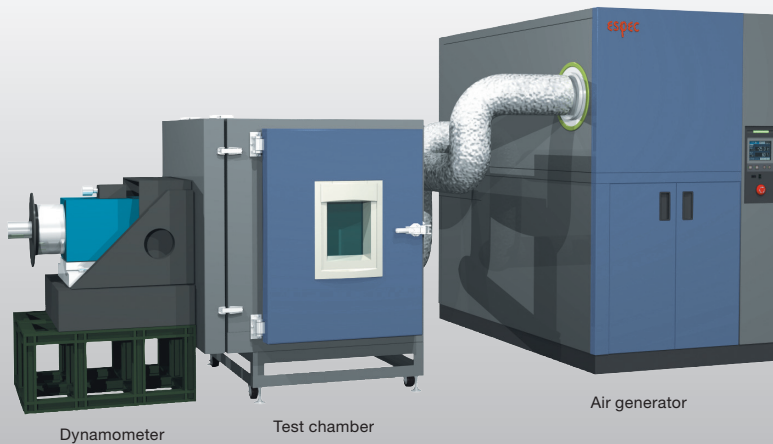
Engineering & Design



Quality Control



Environmental Characteristic Evaluation of Motors



Target Specimens

BEV motors, HEV motors, e-Axles, etc.



Contact Us

Features

- Supports motor evaluation over a wide temperature range
- One-touch chamber and duct connection for simplified operation
- Semi-open box design accommodates various shift patterns
- Optimal cooling capacity matched to motor output

Applicable Products

Temperature Chamber for Dynamometer Testing

Applications



Research & Development



Engineering & Design



Quality Control

Thermal Cycle and Dew Condensation Cycle Testing of Automotive Electrical Components



Target Specimens

Automotive ECUs, PCUs, Wiring harnesses, etc.



Contact Us

Features

- Thermal cycle testing and dew condensation cycle testing in a single unit
- Continuous low temperature, high humidity, and drying cycles
e.g., -30°C → +25°C/95%RH → +25°C
- Two-step drying process configuration available

Applicable Products

Air-to-Air Thermal Shock Chamber with Humidity
Model: TSA-103D TSA-203D

Applications



Research & Development



Engineering & Design



Quality Control

HTRB, H3TRB, and HTGB Testing

- Time-dependent dielectric breakdown evaluation of power semiconductor insulating films under high-temperature, high-humidity, and high-voltage stress



Target Specimens

Power semiconductors:
SiC MOSFETs, IGBTs, Diodes, etc.



Contact Us

Features

- HTRB, HTGB, and H3TRB evaluation in a single system
- Automated multi-specimen measurement and failure-time logging
- I-V measurement at any desired timing
- Built-in protection functions minimize specimen damage for safer testing

Applicable Products

High-Temperature Reverse Bias Test System (HTRB),
High-Temperature Gate Bias Test System (HTGB),
High-Humidity, High-Temperature Reverse Bias Test System (H3TRB)

Applications



Research & Development



Engineering & Design



Quality Control

Reliability and Thermal Design Evaluation of Power Semiconductors

► Power cycling evaluation, junction degradation due to thermal stress, and transient thermal resistance evaluation

***This product is available only in Japan.**



Target Specimens

Power semiconductors:
SiC MOSFETs, IGBTs, Diodes,
etc.



Contact Us

Features

- Visualizes heat dissipation paths through transient thermal resistance measurement
- Structure-function analysis for quantitative identification of junction degradation
- High-accuracy interface thermal resistance evaluation through noise reduction
- Streamlined workflow from evaluation to thermal design

Applicable Products

Power Cycling Test System with Transient Thermal Resistance Measurement

Applications



Research & Development



Engineering & Design



Quality Control

Reliability and Lifetime Evaluation of Insulating Materials and Heat-Dissipation Substrates

► Evaluation of discrete power semiconductors (Si/SiC/GaN), substrates, encapsulation materials, heat-dissipation materials, etc.

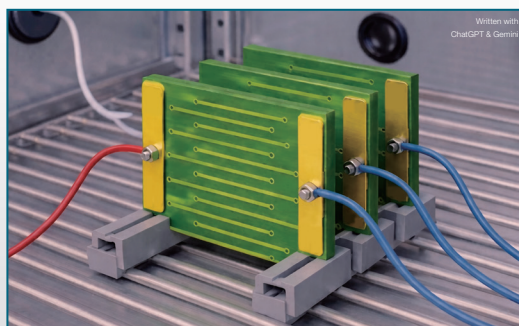


Image of test area connections



Target Specimens

Power Semiconductors (Si, SiC, GaN), and Related Materials, etc.



Contact Us

Features

- Real-time monitoring of insulation characteristics in high-temperature/high-humidity environments
- Automated high-voltage testing of multiple specimens reduces workload
- Enhanced test safety through chamber integration and safety functions
- Dedicated fixtures reduce connection errors and improve efficiency

Applicable Products

High Voltage Bias Insulation Resistance Evaluation System (AMI)

Applications



Research & Development



Engineering & Design



Quality Control



IEC 61215-Compliant Environmental Testing of Perovskite Photovoltaic Cells

► Humidity-freeze testing, thermal cycling testing, damp heat testing, etc.



Dedicated rack with guide rollers

Target Specimens

Photovoltaic modules
(Perovskite solar cells, etc.)



Contact Us

Features

- Dedicated racks with guide rollers for aligned loading of multiple panels
- Adjustable guide positions for accommodation of different specimen sizes
- Corrosion-resistant measures for gases emitted from specimens (e.g., stainless-steel coolers)
- Uniform environmental loading across multiple panels

Applicable Products

Large Temperature and Humidity Chamber
FD Series

Applications



Research &
Development



Engineering &
Design



Quality
Control

Electrical Characteristic Evaluation of Photovoltaic Cells

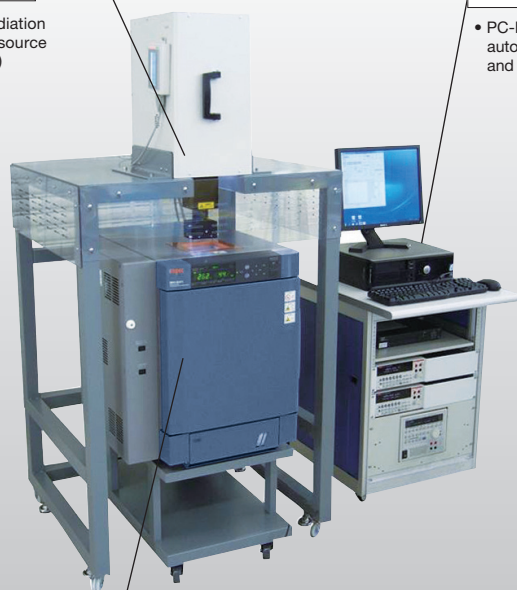
► Photovoltaic cell characteristics, combined degradation, etc.

Light irradiation unit

- Simulated solar irradiation using a xenon light source (equivalent to 1 sun)

Control PC/rack

- PC-based test setup, automatic control, and data logging



Temperature and
humidity chamber

- Temperature and humidity conditions
-40°C to +150°C / 30% to 95%RH

Target Specimens

Photovoltaic cells
(156 × 156 mm max.), etc.



Contact Us

Features

- Integrated light irradiation, temperature, and humidity for combined environmental evaluation
- Simulated sunlight irradiation for real-world condition reproduction
- Continuous I-V characteristic evaluation without specimen removal
- Automated measurement for improved testing efficiency

Applicable Products

PV I-V Evaluation System
(PV Thermal-Light Combo Test System)

Applications



Research &
Development



Engineering &
Design



Quality
Control

UN 38.3-Compliant Altitude Simulation Testing

► Transport safety standards for lithium-ion batteries, lithium metal batteries, etc.



Target Specimens

Large battery packs (for EVs/energy storage), etc.



Contact Us

Features

- Interior dimensions designed for large specimens
- Patented pressure-relief vent structure for advanced safety
- High-voltage terminals for evaluation while specimens are energized

Applicable Products

Large Low-Pressure Chamber (L Chamber)

Applications



Research & Development



Engineering & Design



Quality Control

UN ECE R100-Compliant Automotive Battery Thermal Shock Testing

► Safety standard for high-voltage systems in electric vehicles such as EVs and HEVs



Target Specimens

Large battery packs (automotive), etc.



Contact Us

Features

- Interior dimensions designed for large battery packs
- Thermal shock design enables rapid thermal cycling, even for high-heat-load specimens
- Equipped with battery safety devices, including gas detectors, pressure-relief vents, fire extinguishers, and ventilation systems

Applicable Products

Large Capacity Thermal Shock Chamber
Model: TSA-1100H-W TSA-1650H-W
TSA-2310H-W

Applications



Research & Development



Engineering & Design

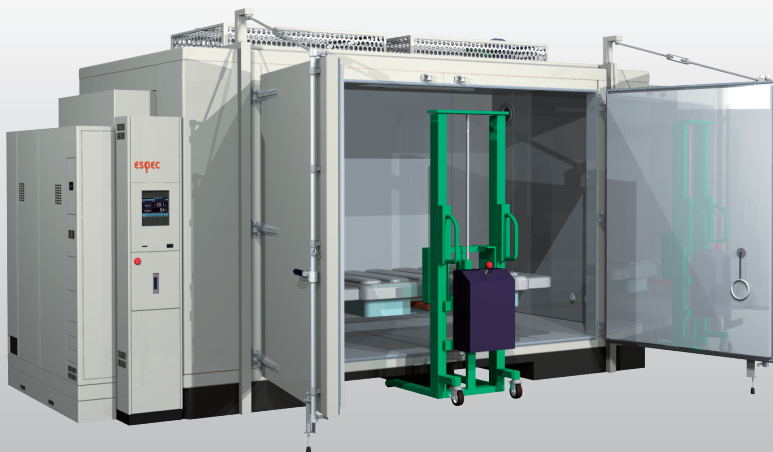


Quality Control

Battery Pack Charge/Discharge Testing

► Battery performance evaluation, lifespan assessment, and safety verification

Customers may be required to provide fire extinguishers and gas detectors.



Target Specimens

Secondary battery packs, Automotive battery packs



Contact Us

Features

- Safety options tailored to each hazard level (air supply/exhaust systems, pressure-relief vents, gas fire extinguishers, etc.)
- Flexible test area design to accommodate various specimen sizes

Applicable Products

Walk-in Chamber for Charge/Discharge Testing

Applications



Research & Development



Engineering & Design



Quality Control



Battery Module Charge/Discharge Testing

► Battery performance evaluation, lifespan assessment, and safety verification

Customers may be required to provide fire extinguishers and gas detectors.



Fire extinguisher

Target Specimens

Secondary battery modules, automotive battery modules, etc.



Contact Us

Features

- Thermal cycle testing in a large-capacity chamber
- Equipped with safety devices such as fire extinguishers, gas detectors, and pressure-relief vents
- Supports interlock integration with charge/discharge equipment
- Supports high-temperature testing from +120°C to +180°C

Applicable Products

Large Temperature and Humidity Chamber FD Series

Applications



Research & Development



Engineering & Design



Quality Control

Battery Cell Charge/Discharge Testing

► Endurance and lifetime testing, charge/discharge behavior evaluation, automotive driving pattern simulation, and pulse charge/discharge testing

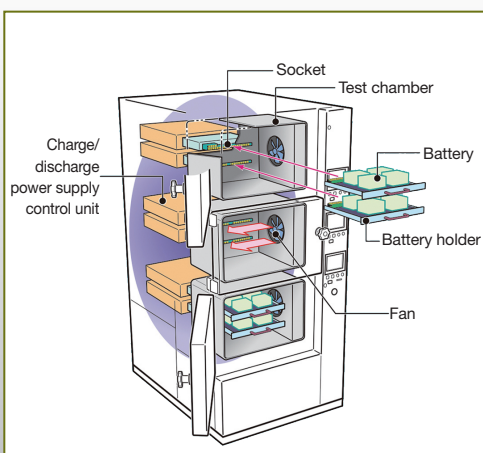


Image of configuration



Target Specimens

Secondary battery cells (cylindrical, prismatic, pouch, and coin types), etc.



Contact Us

Features

- Integrated charge/discharge system and temperature chamber for significantly reduced installation footprint
- Integrated cable-free design reduces wiring errors and setup time
- Advanced safety features address thermal runaway and electrical faults
- Intuitive UI and flexible control software support complex test conditions

Applicable Products

Advanced Battery Tester (ABT)

Applications



Research & Development



Engineering & Design



Quality Control

Battery Safety Testing

► Nail penetration, crushing, external short-circuit, overcharge, and overdischarge testing



Target Specimens

Secondary battery cells, packs, etc.



Contact Us

Features

- Multiple safety testing functions in a single unit
- Supports testing from cells to battery packs, providing greater operational flexibility
- Battery thermal runaway protection features for enhanced safety
- Test and operation consulting proposals based on practical operating experience

Applicable Products

Advanced Safety Tester (ADST)

Applications



Research & Development



Engineering & Design



Quality Control

Weather Simulation Testing for Buildings and Construction Materials

► Comprehensive testing of combined environmental effects on building materials and indoor comfort, etc.



Target Specimens

Wall Materials, Roofing Materials, Outdoor Equipment, Louver Components, etc.



Contact Us

Features

- Reproduction of sunlight, rain, snow, wind, and other environmental conditions
- Application Examples**
 - Evaluation of rain, snow, and wind effects on building materials
 - Simulation of sunlight-induced degradation of outdoor equipment

Applicable Products

Artificial Weathering Walk-in Chamber

Applications



Research & Development



Engineering & Design



Quality Control

Indoor/Outdoor Environment Simulation Testing

► Performance evaluation of building materials and residential equipment through indoor/outdoor environment simulation, etc.

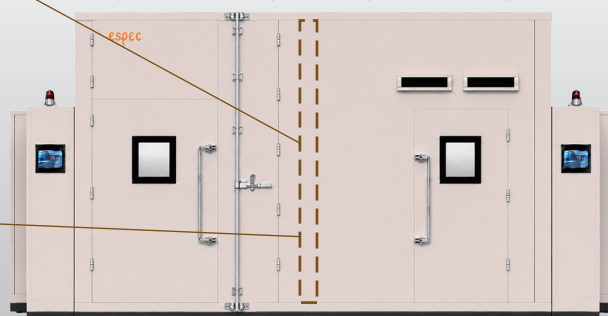


Partition section during specimen mounting



Partition section (with the full panel installed)

Area B (Outdoor environment) Area A (Indoor environment)



Target Specimens

Wall Materials, Window Sashes, Outdoor Balconies, Balcony-Mounted Equipment, etc.



Contact Us

Features

- Partitioned structure for simultaneous application of indoor and outdoor environmental stresses

Applicable Products

Walk-in Chamber for Indoor/Outdoor Environment Simulation

Applications



Research & Development



Engineering & Design



Quality Control

JIS A 1153 Accelerated Carbonation Test for Concrete

► Evaluation of concrete durability in a high-carbon-dioxide atmosphere

Customers may be required to provide CO₂ cylinders and related items.

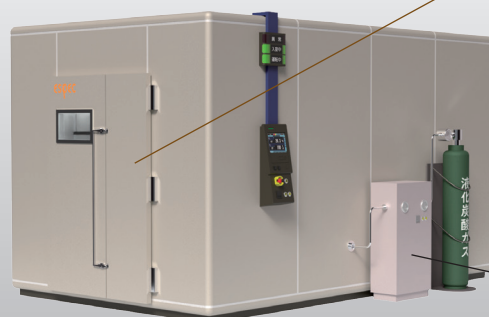


Image of specimen setup

CO₂ control system

Target Specimens

Concrete, etc.



Contact Us

Features

- Continuous, stable control under standard conditions (+20°C/60%RH, 5% CO₂)
- Frost-free design that supports long-term continuous test operation
- Various chamber sizes available based on specimen quantity
- Reduced air velocity for minimal CO₂ consumption

Applicable Products

Walk-in Chamber for Accelerated Carbonation Test for Concrete

Applications



Research & Development



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Quality Control

ESPEC CORP. <https://www.espec.co.jp/english>

Head Office

3-5-6, Tenjinbashi, Kita-ku, Osaka 530-8550, Japan

Tel: 81-6-6358-4785 Fax: 81-6-6358-4786

ESPEC NORTH AMERICA, INC.

Tel: 1-616-896-6100 Fax: 1-616-896-6150

ESPEC EUROPE GmbH

Tel: 49-211-361850-0

ESPEC ENVIRONMENTAL CHAMBERS

SALES AND ENGINEERING LTD. STI. (Turkey)

Tel: 90-212-438-1841 Fax: 90-212-438-1871

ESPEC ENVIRONMENTAL EQUIPMENT (SHANGHAI) CO., LTD.

Head Office

Tel: 86-21-51036677 Fax: 86-21-63372237

BEIJING Branch

Tel: 86-10-64627025 Fax: 86-10-64627036

GUANGZHOU Branch

Tel: 86-20-83317826 Fax: 86-20-83317825

SHENZHEN Branch

Tel: 86-755-83674422 Fax: 86-755-83674228

SUZHOU Branch

Tel: 86-512-68028890 Fax: 86-512-68028860

TIANJIN Branch

Tel: 86-22-26210366 Fax: 86-22-26282186

XI'AN Branch

Tel: 86-29-88312908 Fax: 86-29-88455957

CHENGDU Branch

Tel: 86-28-88457756 Fax: 86-28-88457756

WUXI Branch

Tel: 86-510-82735036 Fax: 86-510-82735039

ESPEC TEST TECHNOLOGY (SHANGHAI) CO., LTD.

Tel: 86-21-68798008 Fax: 86-21-68798088

ESPEC ENGINEERING (THAILAND) CO., LTD.

Tel: 66-3-810-9353 Fax: 66-3-810-9356

ESPEC ENGINEERING VIETNAM CO., LTD.

Tel: 84-24-22208811