



**KTON**

PARTNERING WITH EXPERIENCE



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AUTO / EV



BATTERY



BATTERY  
SUSTAINABILITY



AUTOMOTIVE  
CHIPS

# Connecting the US Battery & Electrification industry with Asian technology





KTON is a US firm specializing in the Onshoring of technology companies in the Battery & Electrification space. Our objective is to play a critical role in the development of a US-based Battery & Electrification infrastructure by bringing established technologies from Korea, Japan, and other APAC countries.

We are a proud member of NAATBatt, and co-chair of the Onshoring Technology Committee.



**KTON**

PARTNERING WITH EXPERIENCE

**NAATBatt**  
INTERNATIONAL

## **KTON brings value to partners and clients through:**



Penetrating insights into battery industries in Asia and the US

Critical understanding of industry pain points and key solutions



Large network of experienced technology and business partners in both APAC and the US

Key relationships within the US industry and stakeholders

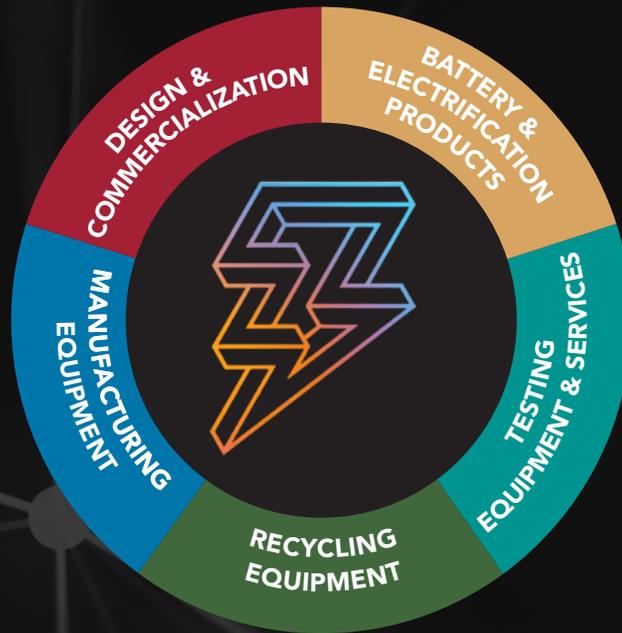


Access to battery testing, manufacturing, and recycling equipment and technology

Unparalleled expertise in US-Asia business culture and communication

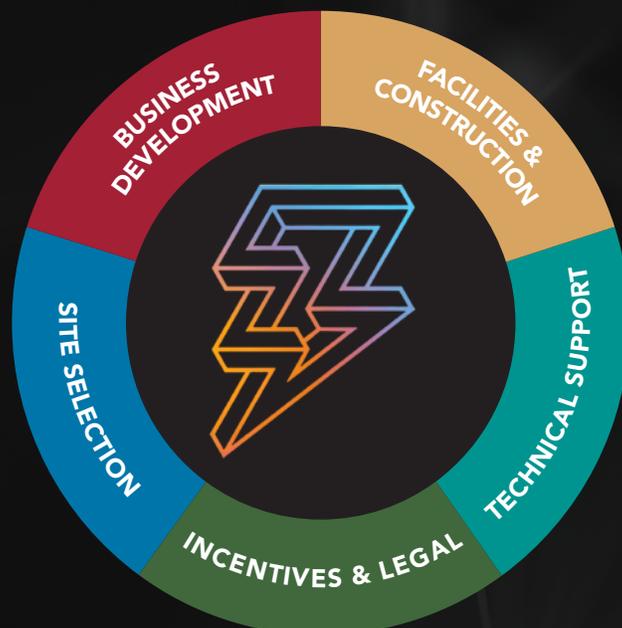
## Battery & Electrification Products and Services

We brought together a group of the top companies in the battery industry to provide equipment, services, and technology from Asia to the US.



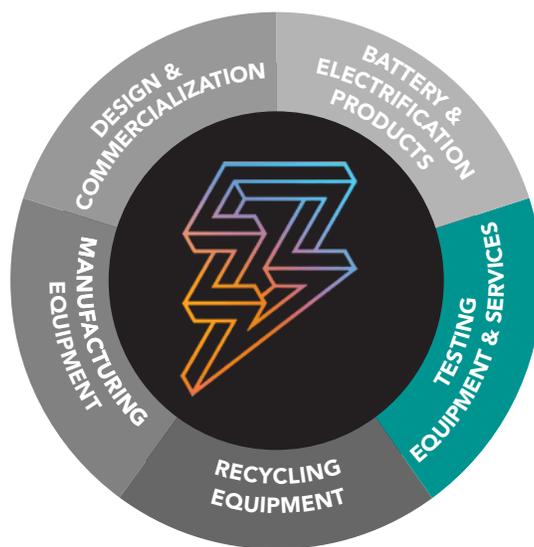
## US Onshoring Services

We created a strategic alliance with American service providers to assist Asian companies with their FDI Onshoring endeavors into the US.





**KTON  
PARTNER**





Essential element for performance and safety tests of secondary batteries

# Battery Test Chamber / Chiller



Company Profile

# About JEIO TECH

## Welcome to JEIO TECH Co., Ltd.

We are a premier global technology company specializing in the development and manufacture of industrial laboratory equipment including environmental test chambers and battery safety testing equipment. Established in 1988, leveraging South Korea's vast legacy in technology, JEIO TECH serves a diverse set of industries including automotive, battery and energy storage systems, aerospace, communications, consumer and industrial electronics, etc. as well as at scientific and government research institutes.



## Our Product Quality is Second to None

JEIO TECH products are put through rigorous quality control from the most basic metal processing to final inspections. Based on over 28 years of technical experience in instrument manufacturing, our highly integrated team of engineers strive to deliver outstanding quality to our clients. Our professional know-how is the basis of our reputation as the primary partner for the customers research needs across the globe.

## Immaculate Service

We endeavor to enhance customer value through superior service to our customers. Our ergonomically designed products minimize maintenance and mechanical issues. Our worldwide service teams, made up of highly trained service engineers, are ready to provide you a tailored customer service experience.

### Modernized One-stop Manufacturing System

All of our processes are systematically managed, with continued investment into manufacturing facilities ensuring quality and productivity.



#### 01 Sheet metal fabrication

Primary fabrication of detailed parts using advanced automated machinery for the manufacturing of various products.



#### 02 Painting

Painting to improve the corrosive resistance of fabricated parts using automated machinery to maintain stringent quality standards.



#### 03 Assembly

Assembly of a wide range of products from compact to large-scale with all processes under direct operation, reliability ensured by long experience in manufacturing.



#### 04 Testing

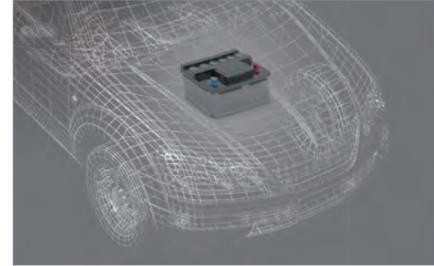
Tests performed to deliver promised quality and performance to our customers, with reliability and quality as our top priority.

# Battery Test Chamber

## Battery Testing Applications for EV

One of the most visible and exciting applications in the field of battery testing is electric vehicles. JEIO TECH products offer a comprehensive range of testing capabilities adhering to key international evaluation standards in performance and safety.

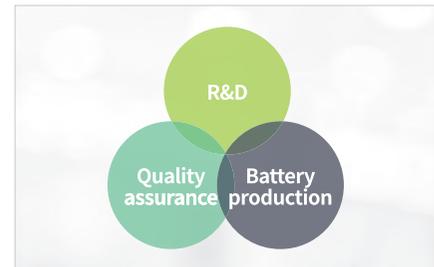
- Performance tests include cycle life, shelf life, temperature characteristics, and constant current load characteristics tests.
- Safety testing in both nominal as well as failure states (i.e., abuse situations) includes electrical, mechanical, and environmental testing, particularly in relation to temperature, continuous heat and gas generation (a.k.a. thermal runaway)



Battery drawing attention as an environment-friendly means of energy supply

## Battery Test Chamber for Battery Performance and Safety Tests

JEIO TECH's battery test chambers can be used to perform various tests including temperature cycling tests, altitude tests, and heat resistance tests. These test chambers are applicable to R&D, quality assurance, and battery production. In addition, the chambers are suitable for performance and safety tests of batteries. They are equipped with separate safety devices to protect against ignition and explosion, which may occur during the testing processes.



Scope of applications of battery test chambers



TC-JT-446LS



TC-JT-6570L

## Specification

Model	TC-JT-446LS	TC-JT-6570L
Chamber Volume	446L / 15.8 cu ft	6570L / 232.0 cu ft
Temperature Range	-10°C ~ 80°C	-50°C ~ 80°C
Air Flow	Vertical	Horizontal
Interior Dimension	750 x 700 x 850 mm / 29.5 x 27.6 x 33.5 inch	3000 x 1500 x 1500 mm / 118.1 x 59.1 x 59.1 inch
Exterior Dimension	1300 x 1350 x 1800 mm / 51.2 x 33.1 x 70.9 inch	3900 x 3100 x 2200 mm / 153.5 x 122.0 x 86.6 inch
Door Type	Single Door	Double Door
Cable Port	Φ80 mm / 3.15 inch x 1ea	Φ100 mm / 3.94 inch x 4ea
Safety Option	Signal Lamp, Vent Blast Door, Pressure Relief Exhaust Duct, Flame Sensor, Smoke Sensor, Fire Suppression System	

※ Custom-built chambers

## Automatic Sensors for Preventing Fire During Charging



### Smoke Sensor

The Smoke sensor is automatically activated to extinguish fire.



### Flame Sensor

A flame is detected and automatically extinguished.



### Automatic CO<sub>2</sub> Purge

The automatic fire extinguishing system (carbon dioxide spray) engages if abnormal temperature, smoke, or fire detected.



### Automatic/Manual Spray Control

The CO<sub>2</sub> purge system triggered automatically or manually (internal or external).



### Vent Blast Door

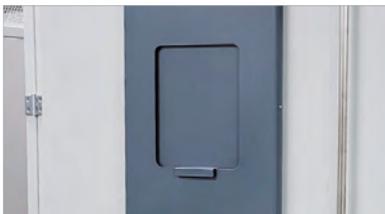
Upon explosion, ducts are automatically opened to relieve pressure and gas.



### Gas Discharge Duct

After an explosion event, pressure and gas are automatically vented to the building's ventilation/scrubbing system.

## Safety Devices for Protecting Users



### Window Cover

A cover for the inspection window is provided in the event of a fire or explosion.



### Door Locking Mechanism

The door is locked during testing or after an event.



### Automatic/Manual Spray Control

Audiovisual alarms are provided to check the operation of the fire extinguisher system.

## Solid and Convenient Structure



### Heavy Load Shelf Structure

Punched shelf made of insulative epoxy can bear a maximum load of 200 kg.



### Fixable Caster

Casters make products easily movable and can support heavy loads.

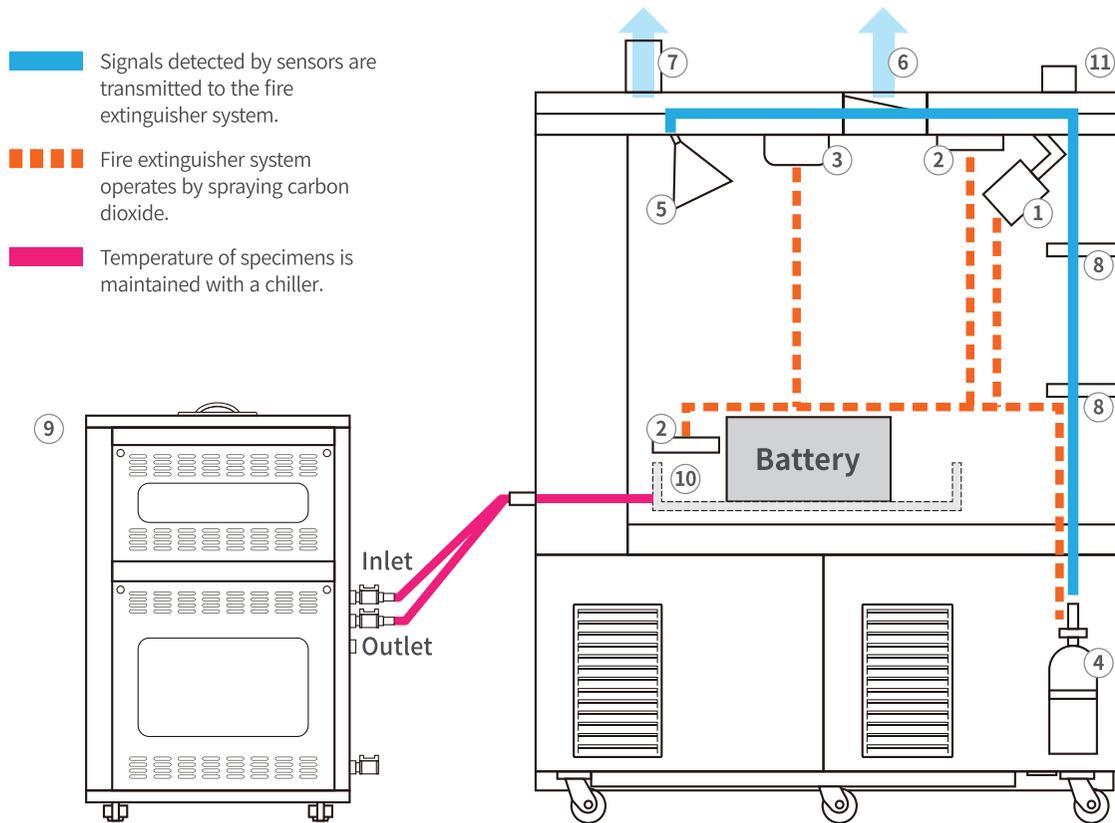


### Ports with Easy External Connections

Additional cable ports of various sizes are available.

## Battery Test Chamber Use Configuration

Signals detected by sensors are transmitted to fire extinguisher system. Fire extinguisher system operates by spraying carbon dioxide. Temperature of specimens is maintained through connection with a chiller.



- ① Flame Sensor: Detects infrared and ultraviolet rays and analyzes their wavelengths.
- ② Temperature Sensor: Detects if temperature of chamber and battery specimen is higher than setup temperature.
- ③ Smoke Sensor: Detects smoke manually or automatically.
- ④ CO<sub>2</sub> Fire Extinguisher System: Automatically operates when chamber temperature is higher than setup temperature, or when flame sensor or smoke sensor is activated.
- ⑤ Spray Nozzle: Nozzle to spray CO<sub>2</sub> from fire extinguisher system.
- ⑥ Vent Blast Door: Instantaneously opens to discharge pressure and gas.
- ⑦ Pressure Relief Exhaust Duct: Discharges pressure and gas after an explosion, through a duct connected to building's exhaust system.
- ⑧ Door Interlock Switch: Prevents door opening during test or after an event.
- ⑨ Chiller: Keeping the battery temperature (module and pack) low during a charge/discharge performance test.
- ⑩ Specimen tray: A tray for containing a battery specimen is provided, wherein the tray is connected to a chiller to keep the specimen temperature low.
- ⑪ Alarm: Audiovisual alarms are provided to notify the operation of the fire extinguisher system.

# Chiller

## Essential Elements for Keeping Battery Temperature Low

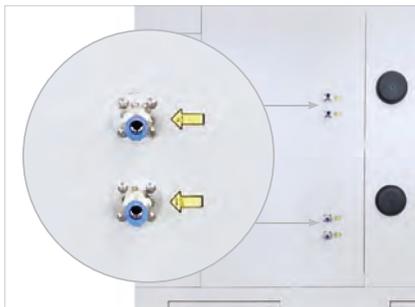
During a performance test, such as the shelf-life test or cycle life test, the battery temperature may become elevated due to repeated charge and discharge of the battery module or pack. A chiller is employed to keep the temperature of the battery constant during charge and discharge. The chiller can be used to monitor the inlet/outlet temperature, flow rate, and pressure.



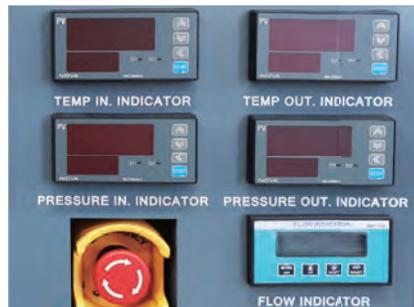
RW-2B-30L



RW-JT-80L



Line for connecting chiller with battery test chamber



Display showing temperature and pressure



Set and control temperature and flow rate

## Specification

Model	RW-2B-30L	RW-JT-80L
<b>Bath Capacity</b>	30L / 1.06 cu ft x 2Bath	80L / 2.83 cu ft
<b>Temperature Range</b>	10 ~ 80°C / 50 ~ 176°F	-30 ~ 60°C / -22 ~ 140°F
<b>Temperature Stability</b>	±1.0°C / 1.8°F	±1.0°C / 1.8°F
<b>Pump Flow rate (Max.)</b>	20 L/min / 5.3 gal/min	20 L/min / 5.3 gal/min
<b>Pump Pressure</b>	3 ~ 5 bar / 43.5 ~ 72.5 psi	3 ~ 5 bar / 43.5 ~ 72.5 psi
<b>Exterior Dimension</b>	500 x 1942 x 1773 mm / 19.7 x 76.5 x 69.8 inch	800 x 1400 x 1800 mm / 31.5 x 55.1 x 70.9 inch

※ Custom-built chambers

# Customized Product

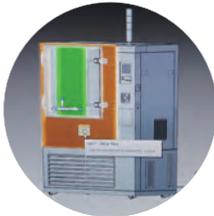
## Custom-Built Test Chambers (SP Division)

Conducting specialized consultation regarding customer requirements to provide the best designed solutions.



### Our Valuable Customers

We accurately identify all key needs and requirements through close consultation with our customers.



### Equipment design

Based on our long industry experience, we satisfy customer needs through superior design.



### Thorough QC

We adhere to ISO 9001 production processes to ensure the high quality of our products.



### On-site installation and training

We accurately identify all key needs and requirements through close consultation with our customers.

## Examples of Delivery of Non-standard Products in Various Forms



Fireproof temperature test chamber



Explosion-proof temperature test chamber



Double-door chamber



Top-and-bottom dual chamber



Multistage drawer type oven



Tunnel type oven



Front-and rear double-door chamber



Sliding door chamber

## Standard & Customized Test Chambers in JEIO TECH

From small table top chamber to large walk in chamber



Walk in Chamber



Heating & Cooling Chamber



Temperature & Humidity Chamber



Chiller  
(Recirculating Coolers)

### Consultation with customer to develop customized solutions

Please contact JEIO TECH for more information and services.

*Your best business partner*

#### JEIO TECH SP Division

Address. 153, Techno2-ro, Yuseong-gu, Daejeon, Korea

Tel. +82-42-933-4296 (201)

Fax. +82-42-933-4211

E-mail. [spsales@jeiotech.com](mailto:spsales@jeiotech.com)

[www. JeioTech.com](http://www.JeioTech.com)



**KTON.US**

#### KTON LLC

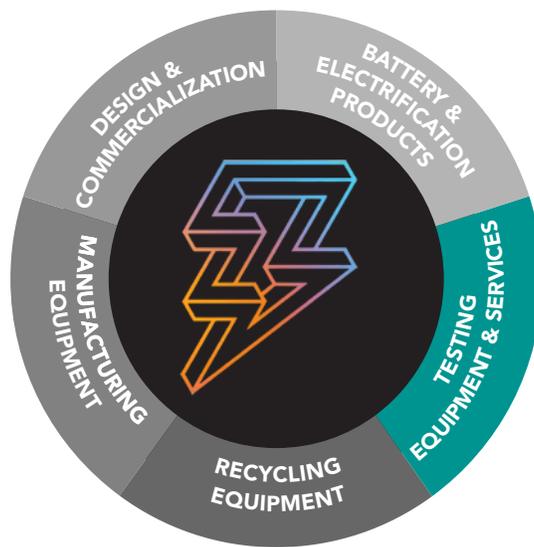
Address. 1250 S. Falcon Dr Palatine IL 60067

Tel. +1-847-370-2471

E-mail. [info@kton.us](mailto:info@kton.us)



**KTON  
PARTNER**





Guangdong Bell Experiment Equipment Co.,Ltd  
广东贝尔试验设备有限公司  
Bell Industry (Hong Kong) Co.,Ltd  
贝尔实业（香港）有限公司

Add: No.11 Wusong 1st Street, Yuwu, Dongcheng District,  
Dongguan 523117, Guangdong, China  
Tel: +86 769 2328 0911  
Fax: +86 769 2267 3576  
Email: sales@bellgroup.cc  
www.bellgroup.cc  
www.belltestchamber.com



Guangdong Bell Experiment Equipment Co.,Ltd  
广东贝尔试验设备有限公司  
Bell Industry (Hong Kong) Co.,Ltd  
贝尔实业（香港）有限公司



## Development History



## Company Profile

### General Information

Guangdong Bell Experiment Equipment Co.,Ltd was established in 2005 with a registered capital of RMB 16.8 million. Located in Dongcheng District of Dongguan City, its factory covers an area of 20,000 square meters, with building area of 12,000 square meters. As Bell attaches great importance to producing first-rate products, talents are highly valued. Among the 120 employees, half of them are with college education background and 15 senior engineers. Enable us to provide excellent equipment and service to satisfy various customers, especially the customized non-standard equipment. Currently, after great efforts over the last 14 years, our annual production capacity has reached RMB 120 million.

### Main Products

Bell not only focuses on the research and development of test equipment, but also specializes in its manufacture, selling as well as customer service. A wide variety of products are introduced into market, such as Li-ion Battery Safety Test Equipment, EV (Electric Vehicle) Battery Safety Test Equipment, Environmental Test Equipment and Mechanical Test Equipment. We cooperated with many international famous corporations from Europe, Asia, South America and Australia, including auto companies, battery companies, electronic production companies, detection institutions and laboratories.

### Corporate Mission & Vision

As a responsible enterprise, Bell's mission lies, on one hand, in creating a platform for staff to pursue happiness and fulfill their dreams, and on the other hand, providing customers with top-class testing solutions. To become the leading brand of test equipment industry, Bell stresses commitment, pragmatism, service and creativity as its core value, and is always in the pursuit of high quality, customer satisfaction, continuous improvement as well as perfection and excellence of products.



- **2005**  
Bell established and introduced with Environmental reliable testing equipment R&D Technologies from Taiwan
- **2006**  
Introduced with Package Testing Equipment and tensile testing equipment R&D Technologies from Taiwan.
- **2007**  
Cooperated with Beijing Institute of Standardization to R&D Battery safety testing and inspection equipment.
- **2008**  
Established Bell Industry (Hong Kong) Co., Ltd and enable our excellent products going to overseas market
- **2009**  
Obtained 3 Utility Model Patents
- **2010**  
Passed ISO9001:2007 Certifications  
Obtained the Honored Title of Private Technology Enterprise in Dongguan City  
Launched a novel patent of New Product of Battery Crush Penetration Machine  
Obtained 8 Utility Model Patents  
Awarded The Top20 Enterprise of China Instrument and meter 2010
- **2011**  
Awarded "China Famous Brand"  
Obtained 5 Utility Model Patents  
Awarded the Honored Title of Private Technology Enterprise in Guangdong Province.
- **2012**  
Launched new product of battery washing testing machine and applied for patent successfully.
- **2013**  
Introduced with German technology and advanced manufacturing technology, manufacturing high quality environmental testing equipment
- **2014**  
Obtained the power battery standardization technical committee member unit  
Obtained High-tech enterprise certificate
- **2015**  
Passed ISO9001:2015 Certification
- **2016**  
Researched and developed Large-scale test equipment and applied for a patent
- **2017**  
Introduced German technology and manufacturing machine to manufacture high-quality testing equipment
- **2018**  
Awarded "The Golden Globe Award" and "Employee Respect Enterprise" of GGLB Annual Award

# Qualification Certificate

Guangdong Bell Experiment Equipment Co.ltd ,which was established in 2005 with more than 10 years of original adherence, excellent quality, leading strategy, Won the award of Chinese top 20 excellent instrument manufacturers by CCTV in 2010 and let the leading brand for test equipment be our duty .We focus on the test equipment industry and passed the "ISO9001:2015 Quality System" certification while obtaining more than "honored Chinese brands", "private technology enterprises in Guangdong Province", "private technology enterprises in Dongguan City" and more than 20 patented technologies and other honors. Our products are always sold throughout the whole country, while being exported to Southeast Asia, Europe and the United States, Africa, Australia and other countries and regions to achieve the simultaneous growth of the domestic market and the international market.



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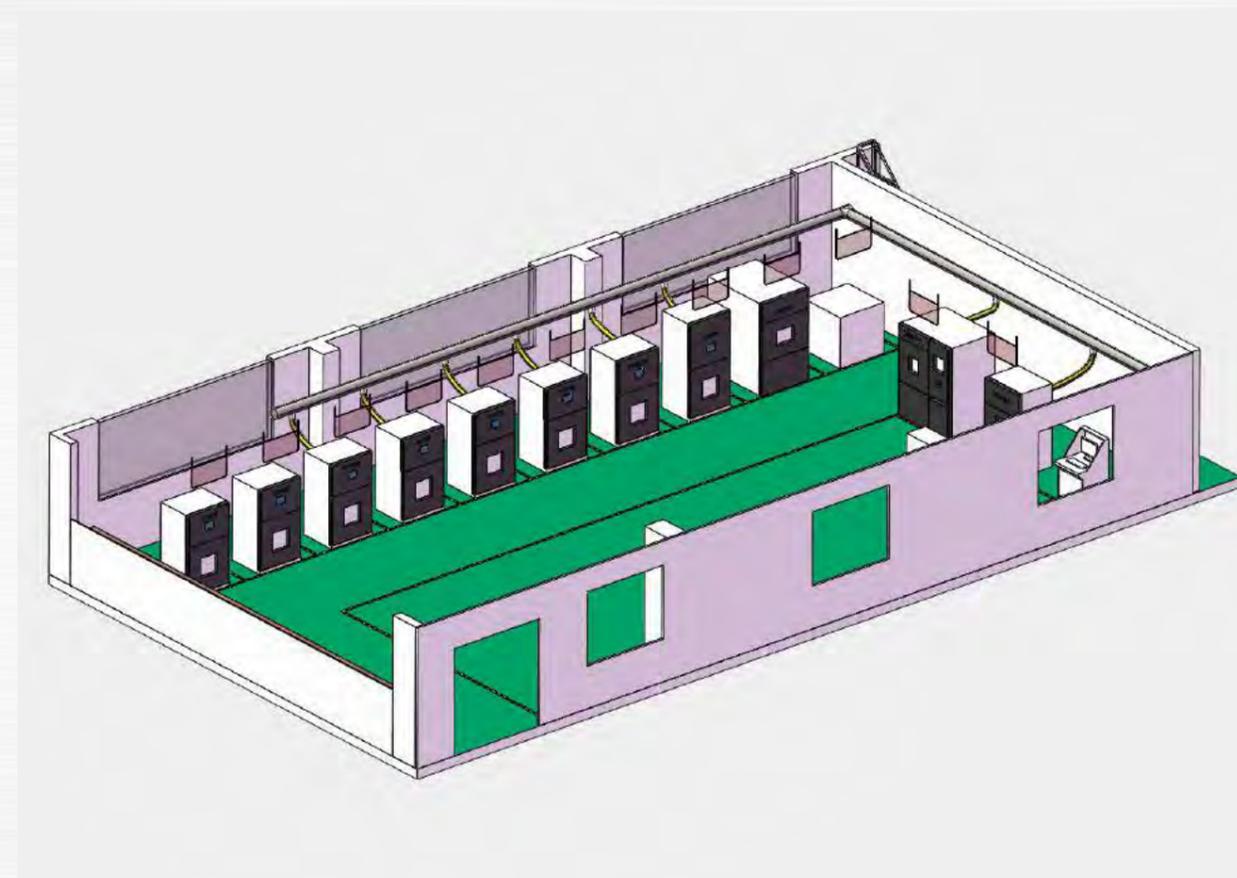
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**IEC62133**  
**UL1642**  
**UN38.3**  
**GB/T31485-2015**

The Overall Solution of Battery Safety  
Environment Test Equipment

# Double-deck High & Low Temperature Chamber



## Product structure

The chamber is composed of refrigeration system, heating system, control system, forced internal circulation system, exhaust box, and explosion-proof system etc.

## Standard compliance

IEC60068-2-1:2007 / GB/T2423.1-2008 Low temperature testing  
 IEC60068-2-2:2007 / GB/T2423.2-2008 High temperature testing  
 GJB150.3-1986 High temperature testing  
 CJB150.4-1986 Low temperature testing  
 GB/T 31485-2015 Safety requirements and test methods for electric vehicles' power batteries

## Performance parameters

Model	BTL-D2-252C	BTL-D2-288C
Single Cabinet Inner Dimension	W600 X D700 X H600 MM	W800 X D600 X H600 MM
External Dimension	W1300 X D1800 X H1950 MM	W1500*H1950*D1700 MM
Structure Mode	An integral structure with upper and lower cabinets.	
Temperature Range	-40°C to +150°C	
Temperature Fluctuation	±0.3°C	
Heating Rate	Average 1~3° C/minute (non-linear no-load)	
Cooling Rate	Average 1.0° C/min Full rang (non-linear no-load)	
Temperature Uniformity	≤ ±2°C (at no load, constant state)	
Observation Window	Three-layer vacuum tempered glass	
Test Terminal	12 sets of terminals are connected to the test cabinet inside and outside of the chamber	
Cooling Mode	Air cooling / Water cooling (Optional)	
Compressor	Tecumseh (France)	Bock (Germany)
Controlling Mode	Touch screen programmable control PLC, with USB interface, with RS485 .interface can be connected to computer control, special network control software, convenient remote monitoring, data acquisition	
Internal Chamber Material	1.0MM thick SUS304# stainless steel with mirror finish, sprayed with Teflon insulation	
External Chamber Material	1.2 MM thick Galvanized sheet, dusting painted with high temperature plasticized coating.	
Power Supply	AC380V 50HZ 12KW	AC380V 50HZ 14KW
Safety Protection	Automatic explosion-proof pressure relief device, explosion-proof chain, tri-color light alarm device, remote control, smoke exhaust device, fire extinguishing device, etc.	
Extension Function	Provide communication protocol, able to accompanied use with charge and discharge machine	

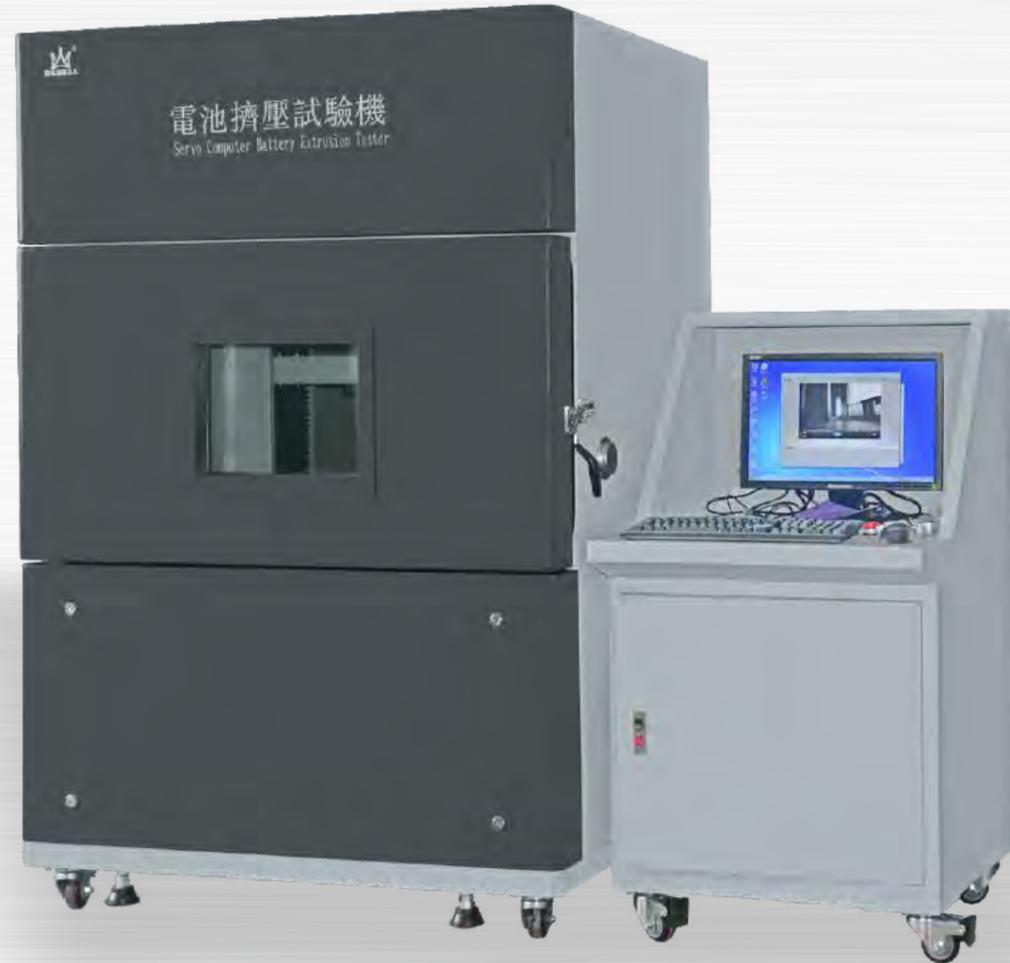
# Double-deck High Temperature Aging Test Chamber



## Performance parameters

Model	BTT-D2-216A	BTT-D2-360A
Single Cabinet Inner Dimension	W600 X D600 X H600 MM	W1000 X D600 X H600 MM
External Dimension	W1340*D1085*H1765mm	
Structure Mode	An integral structure with upper and lower cabinets.	
Temperature Range	Room temperature +10°C to +150°C	
Temperature Fluctuation	±0.3°C	
Heating Time	RT+10~+100° C for about 10 minutes	
Temperature Uniformity	≤ ±2°C (No load, constant state)	
Observation Window	Explosion-proof glass with explosion-proof membrane	
Cooling Mode	Air cooling	
Controlling Mode	Touch screen programmable control PLC, with USB interface, with RS485 .interface can be connected to computer control, special network control software, convenient remote monitoring, data acquisition	
Inner Chamber Material	1.0MM thick SUS304# mirror stainless steel, sprayed with Teflon insulation	
External Chamber Material	1.2 MM thick Galvanized sheet, dusting painted with high temperature plasticized coating.	
Power Supply	AC380V 50HZ	AC380V 50HZ
Safety Protection	Automatic explosion-proof pressure relief device, explosion-proof chain, tri-color light alarm device, remote control, smoke exhaust device, fire extinguishing device, etc.	
Cable Port	∅100mm each opening one with soft silicone plug and stainless steel cover	
Extension Function	Provide communication protocol, able to accompanied use with charge and discharge machine	

# Servo Computer Battery Crush Tester



## Performance parameters

Model	BE-6045D-2T	BE-6045D-5T
Pressure Range	0-20KN	0-50KN
Crush Speed	The crush speed is adjustable. The speed of the first contact point during extrusion can be set to 1.5cm/s; the speed range of the test process is 0.01~900mm/min / 0.01~1.5cm/sec (Adjustable)	
Driving Method	Electric Servo Drive	
Unit Conversion	Kg/N/Lb	
Crush Range	0~300MM	
Extrusion Accuracy	±0.5%	
Extrusion Remaining Time	0~99 hours 99 mins 99 secs	
Controlling Mode	Split type, computer control	
Main Voltage	1 channel (control via software interface)	
Test Space	≥ W300*D300*H300mm	
Overall Dimension	W1200 X D1100 X H1800 mm	
Observation window	Laminated 300*300mm explosion-proof glass with explosion-proof membrane	
Power Supply	AC 220V 50HZ	
Testing Conditions	The main control software can simultaneously collect the force, displacement and voltage changes in the extrusion process and make corresponding program control according to the test standard requirements.	
Communication	Using RS485 communication interface, ensure the stability and real-time of remote collection, with explosion-proof function	
Voltage Acquisition System (Optional)	Resolution: 5mv Acquisition range: 0-60V Acquisition channels: 2 (multiple channels can be customized as required)	
Temperature Acquisition System (Optional)	Resolution: 0.1° C Acquisition range: 0-1200° C Acquisition channels: 2 (multiple channels can be customized as required)	
Safety Protection	Automatic explosion-proof pressure relief device, smoke exhaust device, fire extinguishing device, video monitoring system, electronic door lock system, safety stop switch	

## Related Standard Test Requirements

IEC62133-2017  
UN38.3  
UL1642  
GB31241-2014

## Battery Crush Test Chamber

(Patent No: ZL 2010 220541654.2)

### Related Standard Test Requirements

IEC62133-2017  
UL1642  
UN38.3  
GB/T31241-2014



### Performance parameters

Model	BE-8101
Max. Pressure	1KN-20KN (Can be customized according to requirements)
Piston Diameter	32mm
Driving Mode	Hydraulic Press
Unit Conversion	Kg/N/Lb
Crush Range	0~300MM
Extrusion Accuracy	± 1%
Extrusion Remaining Time	0~99 hours 99 mins 99 secs
Controlling Mode	PLC touch screen control system (7-inch touch screen) + remote control
Testing Space	W500xD300xH300 mm
Overall Dimension	W940xD780xH1620 mm
Observation Window	390 X 360mm (20mm thick tempered glass with explosion-proof grid)
Power Supply	AC 380V / 50HZ / 2.0KW
USB Interface	With USB interface, the test data can be output
Auxiliary Function	Explosion-proof pressure relief device, Smoke exhaust device, Explosion-proof chain
Options	Video monitoring system, Temperature, Voltage acquisition system, Fire extinguishing system

## Altitude Simulation Test Chamber



### Related Standard Test Requirements

IEC62133-2017  
UL1642  
UN38.3  
GB31241-2014



### Performance parameters

Model	BE-8104
Structure	All-in-one structure, door with explosion-proof lock and explosion-proof chain
Temperature Range	Room temperature
Display Mode	PLC touch screen display (7-inch touch screen) + remote control
Unit	Kpa
Internal Chamber Dimension	W600xD600xH600 mm
External Chamber Dimension	W940xD780xH1620 mm
Internal Chamber Material	Reinforced steel + stainless steel (thickness 6.0mm)
External Chamber Material	SECC steel plate, Fine powder paint coating (thickness 1.5mm)
Timing Range	99H 59M 59S
Observation Window	390 X 360mm (20mm thick tempered glass with explosion-proof film)
Air Pressure	Normal pressure ~5Kpa (Adjustable)
Controlling Mode	PLC touch screen display + remote control
Power Supply	AC 220V / 50HZ / 1KW
USB Interface	With USB interface, the test data can be output
Options	Video surveillance system, terminal device

## Temperature Control Battery Short Circuit Test Chamber

### Related Standard Test Requirements

IEC62133-2017  
UL1642  
UN38.3  
GB31241-2014



### Performance parameters

Model	BE-8102
Structure	All-in-one structure, the door with explosion-proof lock and explosion-proof chain
Max. short-circuit current	1000A
Internal Resistance	80 ± 20 mΩ (Load-current 400A)
Remote Control Available Distance	7 meters without solid barrier
Controlling Mode	PLC touch type (7 inch) + remote control
Mechanical Life	300 thousand times
Electric Life	Resistive load 50,000 times
Temperature Range	Normal temperature to 80° C or 0-80° C (Optional)
Temperature Fluctuation	± 1°C
Temperature Deviation	± 2°C
Inner Chamber Dimension	W600 X D500 X H600mm
Inner Chamber Material	1.0mm thickness 304# stainless steel
External Chamber Dimension	W940XD780XH1620 mm
External Chamber Material	Cold-rolled sheet paint with 1.5mm thickness, total thickness together with inner chamber is 100mm)
Observation Window	390 X 360mm (20mm thick explosion-proof tempered glass) and protective steel mesh
Power Supply	AC220V / 3.0KW
Data Output	Current and voltage temperature can be recorded with the interface display. The test data can be directly output by USB flash disk
Security System	Explosion-proof pressure relief device, smoke exhaust device, fire extinguishing system, electronic door lock system, safety stop switch
Options	Temperature acquisition, voltage acquisition system, video monitoring system

## Thermal Abuse Test Chamber



### Related Standard Test Requirements

IEC62133-2017  
UL1642  
GB31241-2014



### Performance parameters

Model	BE-8103
Structure	All-in-one structure, the door uses explosion-proof lock + explosion-proof chain
Temperature Range	Normal temperature to 150° C (Adjustable)
Controlling Accuracy	± 0.5°C
Temperature Deviation	± 2.0°C, No load
Heating Rate	RT~150° C (Linear 5° C/min)
Control Display	PLC touch type (7 inch) + remote control
Working Cabinet Dimension	W600XD500XH600 mm
External Dimension	W940XD780XH1620 mm
Inner Chamber Material	SUS304 Stainless steel with mirror-finish
External Chamber Material	SECC steel plate, fine powder paint coating (thickness 1.5mm)
Bottom	With universal wheel
Observation Window	390 X 360mm (20mm thick explosion-proof glass, explosion-proof mesh)
Insulation Material	Imported high-density glass wool, good heat insulation, to ensure maximum temperature insulation, tight sealing materials for high temperature resistant silicone, withstanding high temperatures over 300 degrees for a long time
Terminal Hole	Diameter 50mm Terminal hole on the left and right sides
Power Supply	220V / 50HZ / 4.0KW
USB Interface	With USB interface, the test data can be exported
Auxiliary Function	Explosion-proof pressure relief device, smoke exhaust device, explosion-proof lighting device, electronic door lock system, safety stop switch

## Heavy Impact Tester

### Related Standard Test Requirements

UL1642  
UN38.3  
GB31241-2014



### Performance parameters

Model	BE-8106
Structure	All-in-one structure, the door with explosion-proof lock and explosion-proof chain
Drop Ball Weight	9.1kg ± 0.1kg
Dropping Height	0~770mm (Adjustable)
Control Mode	PLC Touch Screen Control+ Remote Control
Crossing Bar Diameter	15.8 mm
Inner Cabinet Dimension	W500 X D300 X H800mm
Effective Test Space	W300XD300XH300mm
Internal Material	1.0mm thickness SUS 304# Stainless steel (reinforced). Total 80mm thickness together with external chamber.
External Material	1.5mm thickness Cool-rolled plate
Air Vent	Diameter: 150mm, at the top of chamber back
Observation Window	390 X 360mm (20mm thick explosion-proof glass, install explosion-proof stainless steel mesh)
Lifting Mode	Electric
Top / Bottom Impact Surface	Steel Plate
Test Space	W300XD400XH200 mm
Overall Dimensions	W940XD780XH1620 mm
Power Supply	AC 220V / 2.0KW
Data Output	Test data can be output by USB flash disk directly .
Safety Protection	Explosion-proof pressure relief device, smoke exhaust device, fire extinguishing system, electronic door lock system, safety stop switch
Options	Temperature acquisition system, voltage acquisition system, video monitoring system

## Battery Drop Tester

### Related Standard Test Requirements

IEC62133-2017  
GB31241-2014



### Performance parameters

Model	BE-8108
Drop Height	300~1500mm (Adjustable)
Testing Method	Free fall
Test Loading	0~5kg
Specimen Max. Dimension	W200 x D200 x H200mm
Machine Dimension	W700 X D900 X H1800mm
Motor Power	90W
Control Mode	PLC touch screen (7-inch touch screen) + Remote control
Internal Material	SUS 304# Stainless steel
External Material	1.5mm thickness Cold plate
Falling Method	Pneumatic drop
Lifting Method	Electric
Power Supply	220V 50Hz
Safety device	Fully enclosed explosion-proof device
Pressure	> 0.3Mpa
Drop Panel Size	W600 x D700 x H10mm (solid steel), hardwood, cement board (optional)
Observation Window	390 X 360mm (20mm thickness tempered explosion-proof glass)
Data Output	Test data can be output by USB flash disk directly .
Safety Protection	Explosion-proof pressure relief device, smoke exhaust device, fire extinguishing system, electronic door lock system, safety stop switch
Options	Temperature acquisition system, voltage acquisition system, video monitoring system

# Battery Burning Tester

## Related Standard Test Requirements

UL1642  
GB31241-2014



## Performance parameters

Model	BE-8105
Structure	All-in-one structure, the door with explosion-proof lock and explosion-proof chain
Burner	Bunsen burner with inner diameter of 0.375 inch (9.5mm) and length approx. 100mm
Flame Application Time	99H 59M 59S
Flame Height	*10~75±2mm (Adjustable) *Mesh should be placed approx. 38mm above the flame (GB31241-2014)
Test Rod Diameter	1/4inch (6.35mm) × 14inch(355.6mm)
Octagon Shape Stainless Steel Mesh Enclosure	Distance between each parallel sides: 24 inches (610mm) Height: 14 inches (305mm), Angle iron : spec. 12.7mmX12.7mm
Mesh Top Cover	Square shape with length approx. 650mm
Test Aluminum Mesh Specification	0.010inch (0.25mm) 16 grit x16 grit
Test Round Hole Surface Diameter	102mm
Ignition Device	Automatic ignition
Display Mode	PLC touch + Remote control
Observation window	390x360mm (20mm thick explosion-proof glass, install explosion-proof stainless steel mesh)
Control Method	Remote control, automatic control through the entire test.
Combustion Gas Requirements	High purity liquefied petroleum gas. (Prepared by user)
Data Output	Test data can be output by USB flash disk directly .
Safety Protection	Explosion-proof pressure relief device, smoke exhaust device, fire extinguishing system, electronic door lock system, safety stop switch
Options	Temperature acquisition system, voltage acquisition system, video monitoring system

# Battery Crush Nail Penetration Tester



## Related Standard Test Requirements

IEC62133-2017  
UL1642  
UN38.3  
GB/T31241-2014



## Performance parameters

Model	BE-8111
Structure	All-in-one structure, the door with explosion-proof lock and explosion-proof chain
Max.Pressure	1KN-20KN (Adjustable, customized according to requirements)
Piston Diameter	32mm
Driving Mode	Hydraulic
Unit Conversion	Kg/N/Lb
Crush/Nail Penetration Range	0~200MM
Crush Accuracy	± 1%
Nail Penetration Test Speed	0-40mm/s (Adjustable)
Crush Application Time	0~99h99m99s
Control Mode	PLC touch screen control system (7-inch touch screen) + Remote control
Testing Space	W500xD300xH300 mm
Overall Dimension	W940xD780xH1620 mm
Observation Window	390 X 360mm (20mm thickness explosion-proof glass, install explosion-proof stainless steel mesh)
Power Supply	AC 380V / 50HZ / 3.0KW
USB Interface	With USB interface, test data can be output
Safety Protection	Explosion-proof pressure relief device, smoke exhaust device, explosion-proof chain
Options	Video monitoring system, temperature, voltage acquisition system

# Battery Internal Short-Circuit Tester



## Related standard test requirements

IEC62133-2017

## Performance parameters

	Model	BE-6045W
Temperature Chamber Technical Parameters	Temperature Range	-10℃ ~ +80℃ (Controllable)
	Temperature Rising Rate	Ave.3℃/min (-10℃ to 80℃、Nonlinear, No-load)
	Temperature Cooling Rate	Ave.1℃/min (80℃ to 10℃、Nonlinear, No-load)
	Inner Chamber Dimension	W600 X H750 X D500 MM
	External Chamber Dimension	W1170 X H1850 X D1020MM
	Inner Chamber Material	Stainless steel with mirror-finish, bottom reinforcement
	External Chamber Material	Cold-Rolled Steel with paint-baked coating
	Observation Window	The single-opening door is accompanied by a 3-layer vacuum large glass observation window (W430mm x H 580mm); The door frame is equipped with electric heating (automatic adjustment) anti-frost, anti-condensation device; so that you can clearly observe the Test status of the test sample in the box through the observation window at any time.
Internal Short Circuit Technical Parameters	Max. Loading	200KG
	Resolution	1/10000
	Force Accuracy	≤0.5%
	Displacement resolution	1/1000
	Accuracy of displacement	≤0.5%
	Speed Range	0.01 – 5MM/S
	Effective Range	0 ~ 200mm
	Max. Test Area	300X300MM (Can be customized)
	Voltage Range	0-60V
	Voltage Resolution	5mV
Voltage Acquisition Frequency	100HZ	
Control System	Servo motor + Servo control system	
Safety Protection	Explosion-proof pressure relief device, smoke exhaust device, fire extinguishing system, electronic door lock system, safety stop switch	

# Battery Washing Tester



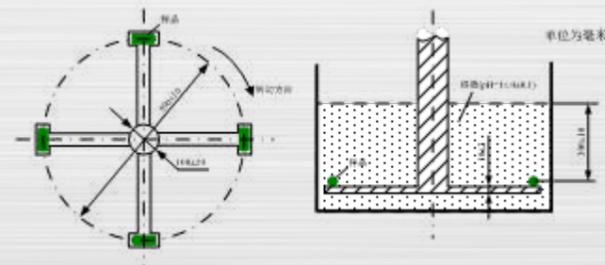
## Performance parameters

Model	BE-8109
Instruction	All-in-one structure, install explosion-proof lock + explosion-proof door
Testing Rotary Plate Diameter	500 ± 10MM
Inner Barrel Diameter	650MM
Inner Barrel Depth	550MM
Plate Rotation Speed Range	1-900rpm/min controllable
Speed Accuracy	1%
Control System	PLC touch control + Remote control
Control Method	Programmable, fully automatic testing. Returning to origin - adding water - raising - heating - dropping - soaking - stirring - draining - dewatering - de-cylindering - drying - complete.
Servo Motor	Japan Panasonic servo motor
Time Setting	0-999 hours (Adjustable)
Liquid Temperature Range	RT+10°C ~ 80°C (controllable)
Water Temperature Deviation	± 2°C
Water Temperature Accuracy	0.1°C
Water Temperature Heating Rate	RT ~ 45°C ,Less than 40min
Drying Temperature Range	RT+10°C ~ 80°C (controllable)
Wind Temperature Deviation	± 2°C
Wind Temperature Display Accuracy	0.1°C
Wind Temperature Heating Rate	RT ~ 45°C ,Less than 40min
Water Control Method	Automatic water pump
Heating Control System	Heating tube: water temperature control heating and thermostat control heating control separately
Transmission System	Driven by motor, screw drive control lift
Alarm Device	Tri-color warning light
Observation Window	370X350MM, Three-layers vacuum tempered glass
Internal Material	SUS 316# ,Stainless steel
External Material	1.5mm thickness Cold plate paint baked coating
Power Supply	AC 380V /14.0KW
Total Dimension	W1150 X H1780 X D1550 MM
USB Interface	With USB interface, test data can be output

## Related standard test requirements

GB31241-2014

The schematic diagram of the test device for the washing tester (see Appendix F) is as follows



# Temperature Cycling Test Chamber

## Related Standard Test Requirements

IEC62133-2017  
 UL1642  
 UN38.3  
 GB31241-2014



## Performance parameters

Model	BTKS5-150C	BTKS5-225C	BTKS5-408C	BTKS5-800C	BTKS5-1000C
Testing Space W x H x D (mm)	500x600x500	500x750x600	600x850x800	1000x1000x800	1000x1000x1000
External Dimension	W750xH1780xD1500mm				
Cooling Mode	Air-cooled	Air-cooled	Air-cooled	Water-cooled	Water-cooled
Power Source	8KW	10KW	13KW	30KW	32KW
Temperature Range	-70°C~+150°C (Adjustable)				
Humidity Range	20%RH-98%RH				
Temperature Fluctuation	±0.5°C				
Humidity Fluctuation	±2%RH				
Temperature Deviation	≤2.0°C				
Humidity Deviation	≤+2,-3%RH(Humidity>75%RH), ≤±5%RH(Humidity<75%RH)				
Temperature Uniformity	≤±2.0°C				
Humidity Uniformity	+2,-3%RH				
Heating Rate	From -40°C to 85°C, full range non-linear average about5°C/mins, no load				
Cooling rate	From 80°C to -40°C, full range non-linear average about5°C/mins, no load				
Temperature Overshoot	≤±2°C				
Internal Material	1.2mm thick SUS#304 temperature resistance stainless steel.				
External Material	Galvanized plate with Double-sided electrostatic powder coating.				
Control Mode	Touch screen programmable PLC, with USB interface, with RS485 interface can be connected to computer controlling, special network control software, convenient remote monitoring, data acquisition.				
Compressor	Tecumseh (France)-fully air-cooled double-fall cooling compressor. Or Bock (Germany) semi-enclosed air-cooled refrigeration.				
Safety Protection	Explosion-proof pressure relief device, explosion-proof chain, mobile phone alarm device, networking, smoke exhaust device, fire extinguishing device, etc.				

# Shock Tester



## Related Standard Test Requirements

IEC62133-2017  
 UL1642  
 UN38.3  
 GB31241-2014



## Performance parameters

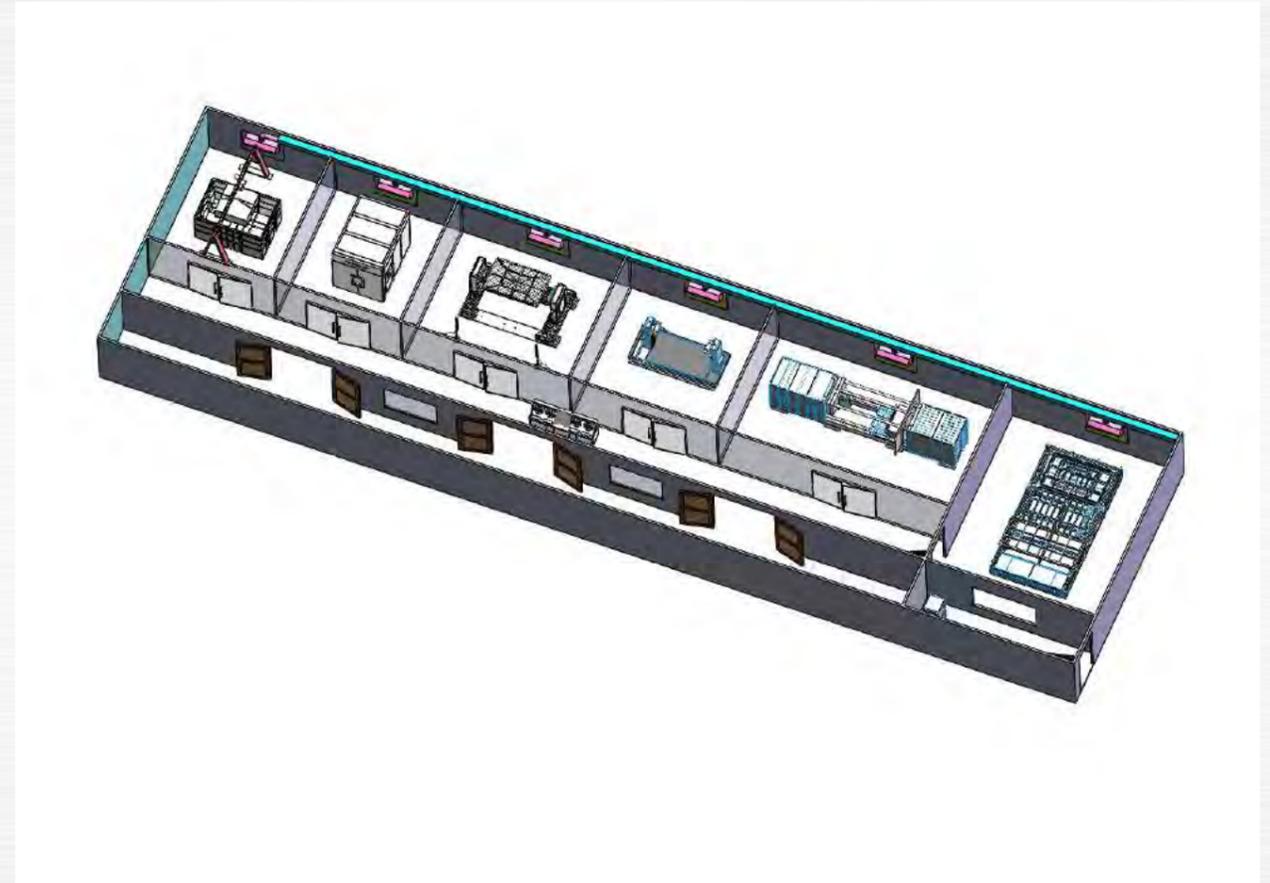
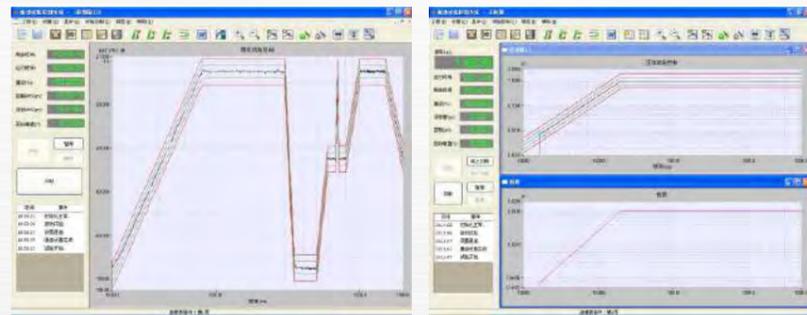
Model	BE-IS200	
Specified Load	10 kg, (Including fixtures and test specimen)	
Bench Dimension	L200 x W200 mm	
Pulse Wave:	Half sinusoidal wave	
Shock Impact Peak Acceleration	150~15000 m/s <sup>2</sup>	
Pulse Duration:	0.6~20ms	
External Dimension	L1000mm x W500mm x H2700mm	
Total Weight	1500 kg	
Impact Form	Free fall	
Max. Drop Height	1500mm	
Power Supply	Three phase 380V, 50/60 Hz	
Hydraulic Source	With the equipment	
Ambient Condition	Temperature	0~40°C
	Humidity (25°C)	< 85%
Reliability	1. Average failure-free accumulation working time ≥ 1000h; 2. The half-sine waveform generator has no less than 5000 consecutive impacts; 3. The half-sine waveform generators have a storage time of no less than 5 years in a clean room temperature environment.	
Testing System	Shock DAQ, Impact, collision measurement control system	
Usage Standard	GJB150、GJB360、GJB548、GB/T2423、GJB1217、JJG497、GIEC68-2-27	
Testing Standard	Acceleration amplitude, pulse width, uniformity, and lateral motion ratio meet the requirements of JJG541-88.	

# Vibration Test System



## Related Standard Test Requirements

IEC62133-2017  
 UL1642  
 UN38.3  
 GB31241-2014



## Main Technical Parameters

Model	BT-3-150
Rated Sine Excitation Force	3000 N
Rated Random Excitation Force	3000 N
Shock Excitation Force	6000 N
Frequency Range	5-4,000 Hz
Max. Displacement	25mm
Rated Speed	2 m/s
Rated Acceleration	500 m/s <sup>2</sup>
First-order resonant frequency	2,900 Hz ± 5%
Max. Loading	100 kg
Vibration Frequency	3 Hz
Working Table Diameter	Φ150 mm
Moving Parts Equivalent Weight	2 kg
Dimension	L764 × W530 × H660 mm
Single Vibration Table Weight	Approx. 480kg
Cooling Method	Forced air cooling



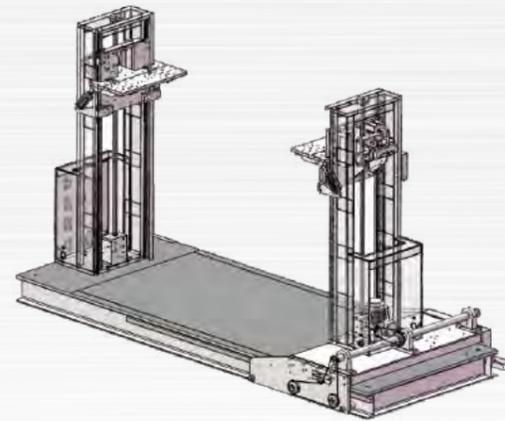
**ECER 100**  
**UL2580**  
**GB31467.3**

Electric Vehicle Lithium-ion Battery Pack and System Test Solution

# Battery Pack Drop Tester

## Related Standard Test Requirements

1. Test object: battery pack and system
2. Test steps: Test object in the direction of most likely to fall in the actual maintenance or installation. if it is unable to determine the most probable fall direction ,drop it along the Z axis, drop the battery pack from the height of 1m to the cement floor, observe for 2 hours.
3. Accept standard: The battery pack or system has no electrolyte leakage, fire nor explosion.



## Performance parameters

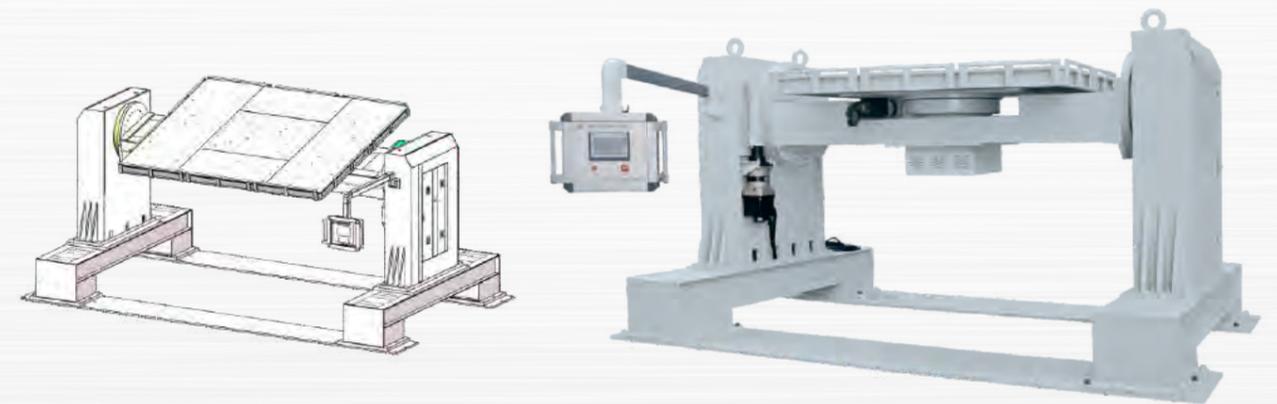
Model	BE-8206-1500	BE-8206-2000
Drop Height	500~1500mm	500~2000mm
Displacement Accuracy	± 5mm	
Max. Test Space	W3000 x D2000 x H1000mm(can be customized)	
Max. Load	1000KG or more	
Control Mode	PLC+Touch screen adjustment with computer remote control	
Testing Method	Plane,corner dropping	
Drop Floor Material	Cement floor surrounded with channel steel	
Overall Dimension	W4500 X D2500 X H2700mm	
Machine Weight	Approx 5000KG	
Power Supply	AC 380V Three Phase, 4.5KW	
Other Requirement	*Explosion-proof device *Lighting system *Video monitoring system *Strong smoke exhaust system *Misoperation-proof system	

# Battery Pack Rotate Test Device



## Related Standard Test Requirements

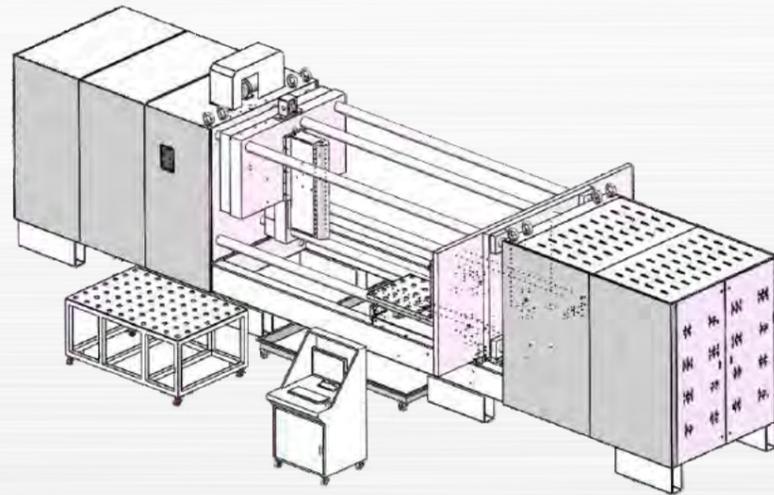
1. Test object: Battery storage pack or system
2. Rotate the battery pack 360° around X axis with rotation speed of 6° /s; secondly rotate it 90° ,180° ,270° ,360° ,and remain for one hour after each move. Then stop and observe for 2 hours.
3. Rotate the batter pack 360° around Y axis with rotation speed of 6° /s; secondly rotate it 90° ,180° ,270° ,360° ,and remain for one hour after each move. Then stop and observe for 2 hours.
4. Accept standard: Battery pack or system has no electrolyte leakage, no rupture at case, no fire nor explosion. And remain the connection reliable, the structure intact, the insulation resistance value not less than 100 Omega /v.



## Performance parameters

Model	BE-8206-1500	BE-8206-2000
Rotation Angle	-360° ~+360° (adjustable)	
Rotate Speed	1° /s—12° /s adjustable	
Rotate Direction	X/Y axis automatic switching	
Max.Test Space	W2500 X D2000X H1000mm	W3000 XD2000 X H1000mm
Max. Test Load	1000KG	2000KG
Max.Overall Dimension	W4650 X D2780X H2400mm	W5470 X D2570X H2510mm
Rotate Plate Dimension	W2500 X D2000X H100mm	W2000 X D1000X H112mm
Equipment Weight	Approx 5 Tons	Approx 8 Tons
Control Mode	PLC touch screen control + PC remote control (Dual Control)	
Running Mode	1. Programming mode: adopt fully automatic design, after the battery pack is placed on the rotating plate, press the start button. The whole test will be Auto-completed according to the program. The rotation of X/Y axis can be switched automatically without manual adjustment. 2.Fix Value mode.	
Workbench	The rotation of X/Y axis can be switched automatically.	
Power Supply	AC 220V 9KW	AC 380V 23KW
Other Requirement	*Video Monitoring System *Safety Protection System for Close Operation, *Working Status Display System.	

# Horizontal Battery Crush Nail Penetration Test Machine



## Related Standard Test Requirements

1. Test object: Battery storage pack or system.

2. Crush according to the following conditions

2.1 Crush plate: half cylinder with radius 75mm, length of the plate should be larger than the crushed battery size but shorter than 1m;

2.2 Crush Direction: X and Y direction (car driving direction called X axis, another horizontal direction perpendicular to car driving direction called Y axis). To ensure the safety of test operation, tests can be performed on two test objects separately.

2.3 Crush level: Stop the crush when the crush force reached 100KN or the crush deformed by 30% of the total size of the crush direction for the battery pack, remain for 10mins.

3. After testing, observe for 1h under the testing temperature.

## Performance parameters

Model	BE-6047AP-20	TBE-6047AP-50T	BE-6047AP-100T
Pressure (T)	20	50	100
Structure	Horizontal	Horizontal	Horizontal
Crush Mode	Horizontal	Horizontal	Horizontal
Drive Mode	Electro-hydraulic servo		
Chamber	Independent horizontal structure and control system		
Test Space	W2500 X D2000 X H1000mm (can be customized)		
Overall Dimension	W8500 X D2500 X H2400mm		
Energy Saving Design	Adopt dual hydraulic cylinder driving, main-subsidary hydraulic cylinder design. Maximized saving space and reduce the total power configuration of the equipment.		
Power Supply	AC380V 50HZ		
Crush Speed	1~400mm/min (Adjustable)		
Nail Penetration Speed	1~40mm/s (Adjustable)		
Test Condition	The variable of force, displacement, speed, time, auxiliary voltage, auxiliary temperature (.etc) can be used as control variable in nail penetration and crush tests.		
Control Mode	MCU+PC combined control mode, remote control operation to ensure the safety of testing.		
Running Mode	Available for Programming Mode and Constant Mode		
Crush Accuracy	≤0.5%(FSR)		
Nail Penetration Accuracy	≤1%(FSR)		
Crush Deformation	0~100% multistage setting, multi-layer crush deformation loading available.		
Crush Fixture	Arc crush plate ( Radius 75mm ) , available for different fixtures according to different test standards.		
Data Acquisition Module	Independent remote collection and isolation, Multiplex voltage, temperature, current acquisition channel, ensure the data correctly .		
Safety Alarm Device	Electrical leakage, over voltage, overload and over temperature, over current protection, abnormal sound and light alarm, smoke alarm lamp, etc		
Safety device	<ul style="list-style-type: none"> <li>*Flame resistance and explosion-proof design for the test area.</li> <li>*Rust-proof and anti-corrosion design for the test area.</li> <li>*Emergency stop button.</li> <li>*Over pressure protection</li> <li>*Crush limit protection device.</li> <li>*Water-proof for the test area.</li> <li>*Other safety design.</li> </ul>		

# Walk-in Type Rapid Rate Temperature & Humidity Test Chamber



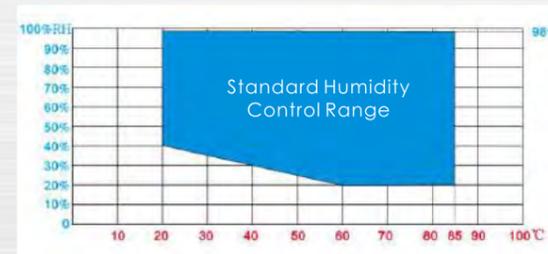
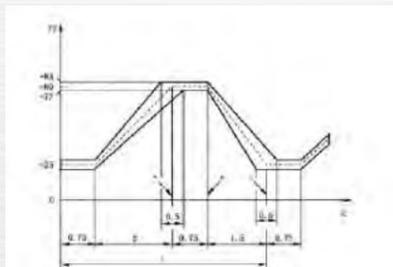
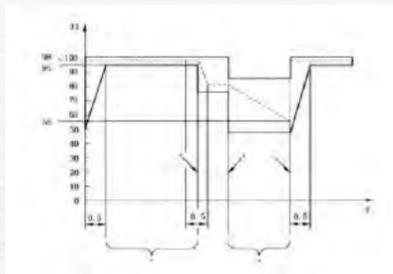
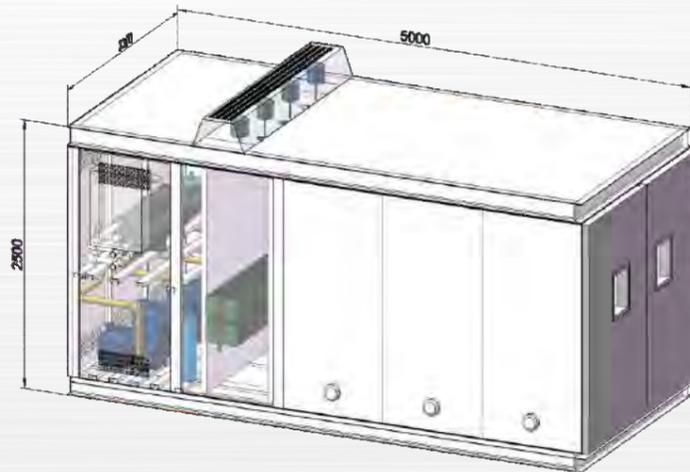
## Related Standard Test Requirements

### 1. Temperature shock

- 1.1 Test Object: Battery storage pack or system.
- 1.2 Li-ion battery pack or system placed in  $(-40 \pm 2)^\circ\text{C} \sim (85 \pm 2)^\circ\text{C}$  alternation temperature, the conversion time of two extreme temperatures is less than 30 minutes. Place the test objects into each extreme temperature keep 8h, test 5 cycles.
- 1.3 Observe for 2 hours under the room temperature after testing,

### 2. Humidity & Temperature Cycling

- 2.1 Test Object: Battery storage pack or system.
- 2.2 Refer the GB/T2423.4 Test Db, variable refer the Graph 4, the highest temperature is  $+80^\circ\text{C}$ , 5 cycles. Observe for 2h under the room temperature.



Humidity Range

Y1: Relative humidity %RH;  
 Y2: Temperature, °C;  
 X: Time, h;  
 a: end of the heating; m  
 b: cooling start;  
 c: recommended temperature and humidity values;  
 d: condensation;  
 e: desiccation; f: 1 cycle.

## Performance parameters

Model	BTKS5-12m <sup>3</sup> -C
Internal Dimension	W2000 X D3000 X H2000mm
External Dimension	W2400 X D4500 X H2940mm
Temperature Range	-50°C ~ +150°C (Adjustable)
Humidity Range	20%RH-98%RH (Limit temperature section, see the Humidity Range figure )
Temperature Fluctuation	± 0.5°C
Humidity Fluctuation	± 2.0%RH
Temperature Deviation	2.0°C
Humidity Deviation	≤ +2, -3%RH (Humidity > 75%RH), ≤ ± 5%RH (Humidity < 75%RH)。
Heating Rate	≧ 5°C/min (From -40°C up to +80°C, Non-linear, load 800kg)
Cooling Rate	≧ 5°C/min (From -40°C up to +80°C, Non-linear, load 800kg)
Temperature overshoot	≤ ± 2°C
Weight	Approx 5 Tons
Power Supply	AC 380V, 50HZ, 127KW
Noise	≤ 70dB (A Level)
External Material	Galvanized sheet with high temperature electrostatic resin coating at both sides.
Internal Material	1.2 mm thickness SUS# 304 heat and cold resistant stainless steel with seal welding.
Controller	24 bit high accuracy 7 inch TFT true colors LCD touch screen.
Compressor	Semi-Hermetic Compressors BOCK / BITZER (Germany)
Cooling Type	Air cooling or water cooling (Optional)
Other Requirement	*Main-subsiary type trolley for specimen in and out of the test chamber. *Explosion-proof lighting system. *Explosion-proof pressure relief system. *Smoke exhaust system. *Automatic Water Supply System. *Fire extinguishing device; spray device; smoke alarm device;

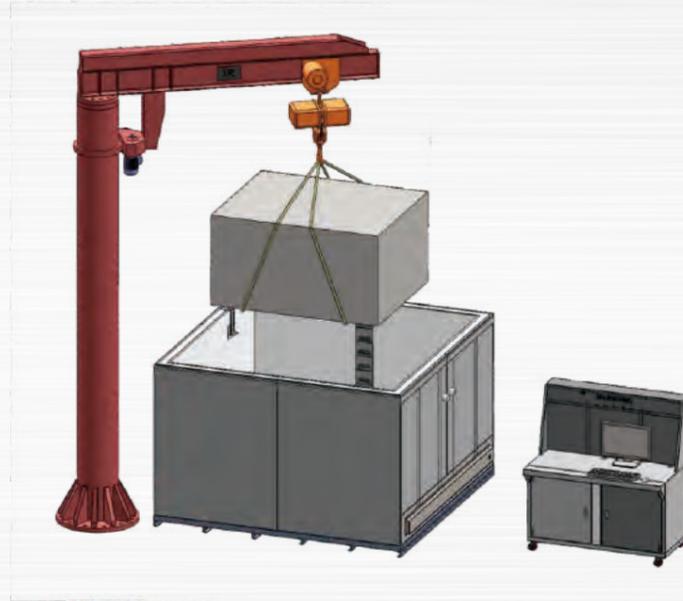
# Sea Water Immersion Test Device

## Related Standard Test Requirements

1. Test Object: Battery storage pack or system.

2. The test object connects all the wiring harness, connector and other parts according to the whole vehicle connection mode. Select one of the following two methods to operate test at the room temperature.

- 2.1 Immerse the test objects (in the direction of real vehicle assembling) into 3.5% NaCl solution (mass fraction, simulated under normal temperature water composition) for 2 hours. The water depth is to be sufficient to completely submerge the test objects.
- 2.2 Test objects according to GB/T4208-2017 part 14.2.7 test method and test process.



## Performance parameters

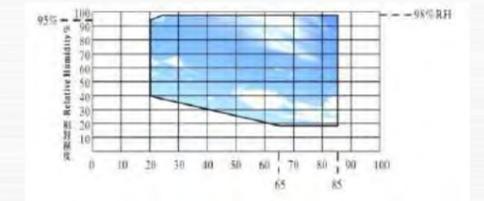
Model	BE-HS-1000L
Water Tank Internal Dimension	W3500 X D2500 X H1200mm (can be customized)
Space Occupation	W6000 X D5000 X H5000mm
Single Crane	Cantilever Lifting, Rotatable, Multi-dimensional Lifting
Travelling Crane	Travelling crane can move up/down and move forward/backward. It is easy to install the test object.
Lifting belt	For immobilizing the test object when lifting
Water Tank Material	PP plate (Insulation and corrosion resistance) Or directly digging a pool on the ground, concrete casting structure, and paste bright colored tiles.
Max Load	1000KG (can be customized)
Equipment Weight	Approx 3.5 Tons
Power Supply	AC 380V, 7.0KW
Other requirement	<ul style="list-style-type: none"> <li>*Automatic filling and draining water system.</li> <li>*Brine mixing system.</li> <li>*On-line monitoring of brine concentration, manual addition of salt, automatic detection of concentration.</li> <li>*PLC touch screen control + Computer remote control system.</li> <li>*Video monitoring system, Lighting system.</li> </ul>

# Complex Salt Spray Test Chamber



## Related Standard Test Requirements

1. Test Object: battery pack and system.
2. Refer GB/T28046.4 part 5.5.2 test method, test according to GT/T2423.17 test conditions.
3. The salt solution was made up with sodium chloride (chemically pure and analytically pure) and distilled or deionized water, Its concentration is (5 ± 1)% (mass fraction). (35 ± 2) °C, the measured pH value is between 6.5-7.2.
4. Placed the test objects in the salt spray chamber for cycling test. Each cycling duration for 24h. Spray salt solution to the test object for 8 hours under the temperature of (35 ± 2) °C, remain for 16 hours. Between the fourth and the fifth hour in one cycles should be according to test requirement in GB/T 28046.1-2011, test mode with 3.2.
5. Total 6 cycles testing.
6. Salt spray test is not necessary for the test objects being installed in passenger, luggage or cargo compartments.



## Performance parameters

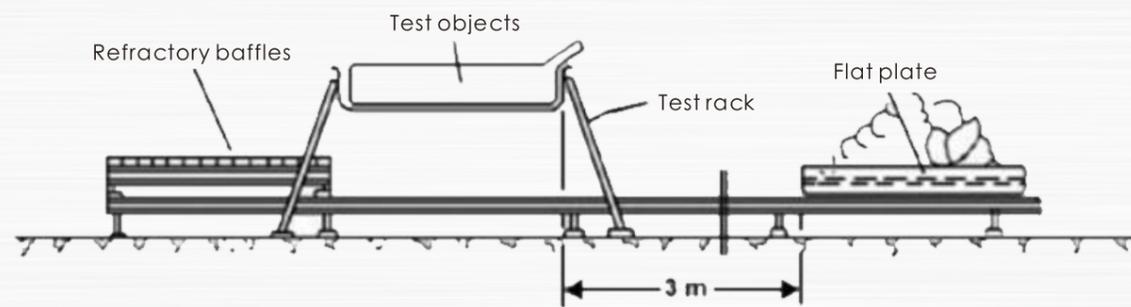
Model	BE-8209-12m³	BE-8209-15m³
Internal Dimension	W2000 X D3000 X H2000 mm	W2500 X D3000 X H2000 mm
External Dimension	W2400 X D5000 X H3000 mm	W2900 X D5000 X H3000 mm
Max Load	1000KG for battery pack	
Temp. Range	0°C ~ +85°C	
Temp. Fluctuation	± 0.5°C	
Temp. Deviation	2°C	
Spray Capacity	1~2mL/80cm²/hr (Collect at least 16 hours, take the average)	
Spray Pressure	1.00 ± 0.01 kgf/cm²	
Resolution	Temp: 0.01 °C, Humidity: 0.01% R.H.	
Humidity Range	30%~98% R.H. (see the Humidity Range figure)	
Humidity Fluctuation	± 3% R.H.	
Potion PH	Neutral 6.0~7.0 Acidity 3.0~3.1	
Spray Solution PH	Neutral 6.5~7.2 Acidity 3.1~3.3	
Test Time Range	1S ~ 9999H (Settable)	
Control Mode	Touch screen programmable control PLC, networking; mobile phone APP alarm; with USB interface, with RS485 interface can be connected to computer control, exclusive network control software. Remote monitoring and data acquisition.	
Internal material	Acid and alkali resistant SUS316 material	
External material	Cold and heat resistant steel plate with spray coating	
Cooling Mode	Air cooling / water cooling	
Total Weight	Approx 7 Tons	
Power Supply	AC 380V, 55KW	
Other Auxiliary Functions	<ul style="list-style-type: none"> <li>*Main-subsidary type trolley for specimen in and out of the test chamber.</li> <li>*Explosion-proof, Pressure relief, Smoke exhaust, Fire extinguishing, Video monitoring.</li> </ul>	

# External Flammability Test Device

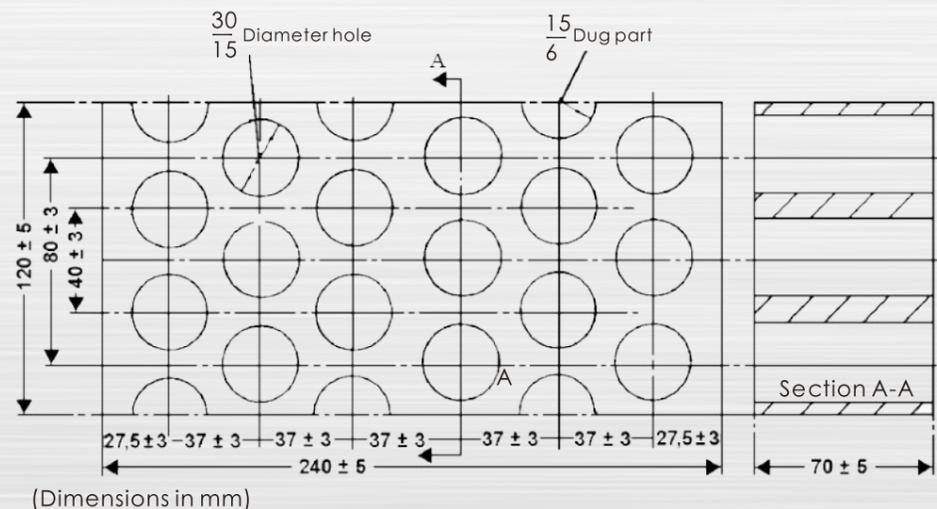


## Related Standard Test Requirements

1. Test Object: Battery pack and system.
2. The test ambient temperature should be above 0 °C, wind speed is not more than 2.5 km/h, and the SOC requirement of battery pack is more than 50%.
3. In the test, the size of the Flat plate with gasoline should exceeds to the horizontal size of the test object by 20 cm, no more than 50 cm. The height of Flat plate should no more than 8 cm above the gasoline. The test object should be placed in the middle. The distance between gasoline level and the test object is set to 50 cm. Inject water to the bottom of Flat plate before testing. The external burning diagram is shown in the graph.



4. Test Phase 1: Preheat. Ignite the gasoline at least 3M away from the test object. After 60 seconds preheating, put the gasoline plate below the test device. If the gasoline Flat plate size is too large to move, move the test object and rack instead.
5. Test Phase 2: Direct burning. Test subjects being exposed directly to the flame for 70 seconds.
6. Test Phase 3: Indirect burning. Cover the gasoline plate with refractory baffles. keep the test object in this condition for 60 seconds. Alternative, by mutual consent, test object continue to be exposed directly to the flame for another 60 seconds. Refractory baffles are made of standard refractory bricks. The sieve hole size is shown in the figure below. Refractory can also be made with reference to this size.



## Performance parameters

Model	BE-8202-2500	BE-8202-3000
Test Space	W1500 X D2500 X H800mm	W2000 X D3000 X H1000mm
Equipment Dimension	W7500 X D3700 X H960mm	W8500 X D4200 X H960mm
Movable Rack	W1500 X D3000 mm	W2200 X D3200 mm
Max. Load	1000KG (2000KG,3000KG can be customized)	
Object Holder Moving Speed	6000mm/min (Adjustable)	
Refractory Rack Moving Speed	6000mm/min (Adjustable)	
Control System	PLC touch screen close control + computer remote control	
Ignition Mode	Automatic high pressure pack ignition	
Distance Between Burning Plate and gasoline	The distance between the gasoline and the test object can be adjusted within the range of 450cm~550mm. The defaulted 500mm; the bottom of the gasoline plate is filled with water.	
Refractory Brick Size	In accordance with the standard of ECER100, Refractory Brick Size 240mm*120mm*70mm.	
Gasoline Plate Size	3 gasoline plates-can be changed easily according to the test object size. the height of gasoline plate is no more than 80cm from the gasoline level	
Power Supply	AC 380V,7.0KW	AC 380V,8.0KW
Weight	Approx 3.5 Tons	Approx 4.0 Tons
Other requirement	<ul style="list-style-type: none"> <li>*The ignition area of gasoline plate can be adjusted according to requirements.</li> <li>*Automatic gasoline filling.</li> <li>*Remote control.</li> <li>*Electrical ignition according to test requirements.</li> <li>*Video monitoring system, lighting system.</li> </ul>	

# Large Current Battery Short Circuit Test Device



5. Keep short circuit until any of the following conditions are met and the test is completed.

- 5.1 The protection function of the test object works and the short circuit current is terminated.
- 5.2 After the temperature of the test object's shell is stable (the temperature gradient is less than 4°C within 2h), the short circuit will continue for at least 1h.

6. After testing, observe for 2h under the room temperature.

## Performance parameters

Model	BE-XL-10000A	BE-XL-15000A
Max. Operating Current	10000A	16000A
Max. Transient Current	12000A	16000A
Temp. Range	Ambient Temperature	
Inner Resistance	< 1mΩ, < 5mΩ, < 10mΩ, < 20mΩ, < 50mΩ, < 100mΩ (Optional)	
Control Mode	Close PLC touch screen control + computer remote control + remote control	
External Dimension	W700xD1050xH1830mmW700xD1050xH1830mm	
Explosion-proof Cabinet Dimension	W2000xD3000xH2000mm (Option)	
Voltage Measurement Range	0~1000V	
Short Circuit Response Time	≤ 20ms	
Data Interface	USB, Data card, etc...	
Safety device	Video monitor system, explosion protection system, smoke exhaust system, smoke alarm device, explosion proof lighting device, etc.	
Data Acquisition Module	Independent remote acquisition and quarantine, multi-voltage/temperature/current acquisition channels ensure data accuracy. Acquisition frequency 100HZ	
Short Circuit Method	Pneumatic + vacuum arc extinguishing	
Safety Alarm device	Electric leakage, over-current protection, abnormal sound-light alarm, smoke alarm, dual protection system, etc.	
Testing Fixture	Customize according to actual testing condition	
Power Supply	220V 50Hz	

## Related Standard Test Requirements

1. Test object: battery pack and system

2. Test conditions:

2.1 Test temperature should be at the 20 ± 10°C or higher. (According to battery system manufacturer's request).

2.2 All protective devices that affect the function of the test objects and related to the test results shall be in normal operation when test start.

3. The main contactors used for charging and discharging should be closed to indicate the feasible vehicle mode and the mode of allowing external charging. If it is not available to be completed in one single test, process two or more tests.

4. The positive and negative terminals of the test object being connected to each other to create a short circuit. The resistance of the connection (including wiring) which used to create short circuit should not exceeding 5mΩ.

# Thermal Runaway Test Machine



## Related Standard Test Requirements

### Test objects

The test object is the whole vehicle or the complete vehicle-borne Li-ion battery system or the subsystem of vehicle-borne lithium-ion battery system, including lithium-ion batteries and electrically connected lithium-ion batteries.

### Test conditions:

- The test shall be started under the following conditions.
1. Testing should be started at temperature higher than 0 °C, relative humidity 15%~90%, and the atmospheric pressure 86~106 kpa.
  2. Before testing, The SOC of the test object should be adjusted to 90% or 95% of the normal SOC working range specified by the manufacturer.
  3. Before testing, all the test device must be running normally.
  4. The test objects should be modified as little as possible when testing, and the manufacturer should submit a list for all changes.
  5. Testing should be at the room temperature or wind speed is not more than 2.5 km/h.

### Thermal runaway trigger object

Heating and needling are recommended as candidates for thermal runaway test of lithium ion battery systems. Manufacturers can choose one of them.

### Heating triggered thermal runaway

Use planar or rod-shaped heating devices, and their surfaces should be covered with ceramic, metal or insulating layers. If the block heating devices has the same size as lithium-ion batteries, the heating device can be replaced one of the lithium-ion batteries to make direct contact with the surface of the trigger object; For thin film heating devices, they should always be attached to the surface of the trigger object. Wherever possible, the heating area of the heating device should not bigger than the surface area of the lithium ion battery; The heating surface of the heating device is directly contacted with the surface of the battery, the position of the heating device shall correspond to the position of the temperature sensor specified in 1.6; Start the heating device immediately after installation, the trigger object is heated by the maximum power of the heating device, the power of the heating device is shown in Table A1.1, but it can not be mandatory. Stop triggering when thermal runaway happened or the temperature of the 1.6-defined that the temperature of monitoring point reaches 300 °C.

Test Objects Energy E (Wh)	Max. Power of Heating Device (W)
E<100	30~300
100 ≤ E<400	300~1000
400 ≤ E<800	300~2000
E ≥ 800	>600

According to one or more of the following conditions, the manufacturer shall determine whether thermal runaway happened or not, and shall specify the conditions for determining thermal runaway in the technical documents.

1. Voltage drop occurred at test objects.
2. The temperature of the monitoring point reaches the maximum operating temperature specified by the manufacturer.
3. The temperature heating rate of the monitoring point.
4. Other parameters set by the manufacturer.

### Monitoring of voltage and temperature

Monitoring the voltage and temperature of the trigger object to determine whether thermal runaway happens. When monitoring the voltage, the original circuit should not be changed. Monitoring temperature is defined as temperature A (the highest surface temperature of the trigger object in the testing). The sampling interval of temperature data should be less than 1s, the accuracy should be ± 2 °C, and the diameter of temperature sensor cusp should be less than 1 mm. When the needle is triggered, the position of the temperature sensor should be as close as possible to the short circuit point.

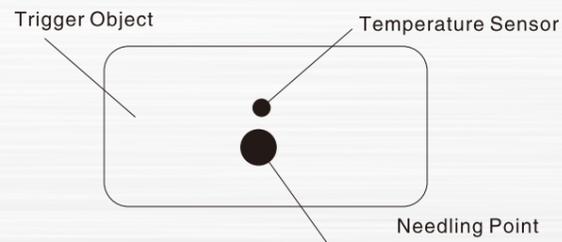
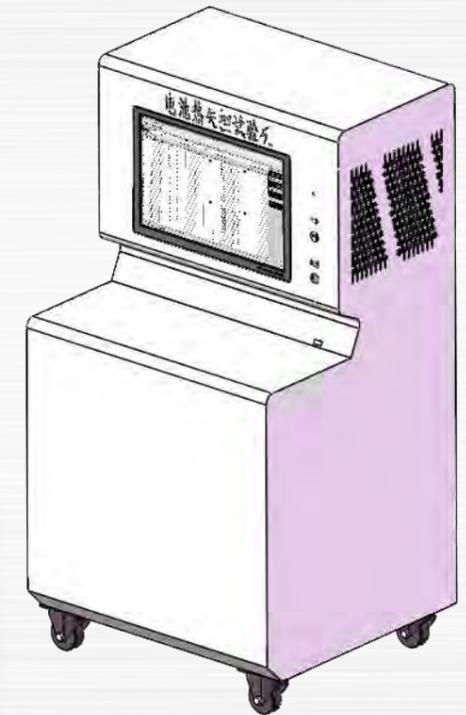
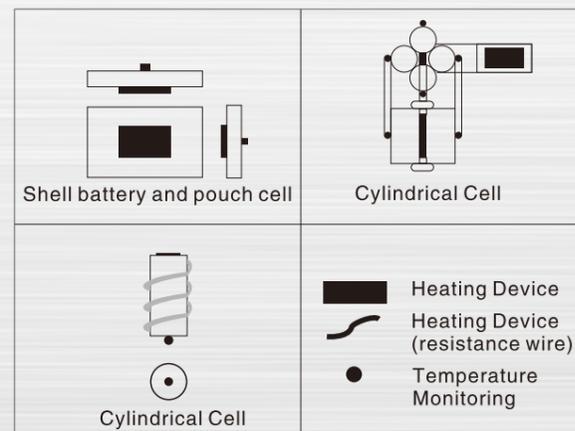


Table A.1 Schematic of temperature sensor placement during needle triggering

When heating is triggered, temperature sensors are arranged on the side far from heat conduction. Which means on the opposite side of the heating device (Table. A.2). If it is difficult to install temperature sensors directly, they can be arranged in a position where continuous temperature rise of the trigger object can be detected.



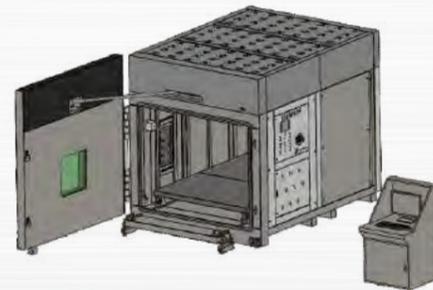
## Performance parameters

Model	BE-8401
Trigger Mode	Overcharging and heating (Optional)
Heating Mode Channel	2 channel(1 in common used, 1 for spare)
Max. Heating Power	3KW, Single channel
Power Adjust Mode	Changed the heating tube with different capacity + Adjust the input current.
Power Supply	AC 220V 50Hz
Max. Overcharging Voltage	10V and 100V
Voltage Acquisition Channel	10 channel,20 channel,40 channel (Optional)
Temp. Acquisition Channel	10 channel,20 channel,40 channel (Optional)
Control Mode	PLC+PC control (PC and main chamber integrated)
Control Host Overall Dimension	W700 X D650 X H1360mm
Explosion-proof Chamber Dimension	W2000xD3000xH2000mm (Optional)
Total Weight	1000KG
Power Supply	AC 220V , 7.0KW

# Altitude Simulated Test Chamber

## Related Standard Test Requirements

1. Test Object: battery pack and system
2. Test Conditions: Altitude 4000m or the equate air pressure condition, at room temperature.
3. The test objects stay in the test condition as Item 2 for 5 hours.
4. Subject the test object to 1C (no more than 400A) constant current discharge until reaching the cutoff condition.
5. After testing, observe for 2h under the room temperature.



## Performance parameters

Model	BE-8203-5m <sup>3</sup>	BE-8203-12m <sup>3</sup>
Internal Dimension	W1600 X D2400 X H1300mm	W2000 X D3000 X H2000mm
External Dimension	W2050 X D2700 X H2200mm	W2450 X D3300 X H2900mm
Equipment weight	Approx 6 ton	Approx 9ton
Power Supply	AC 380V,6.0KW	AC 380V,8.0KW
Pressure Range	10.0KPa—101.3KPa (Adjustable)	
Pressure Reducing Time	Less than 30 min	
Pressure Recovery Time	Less than 30 min	
Pressure Maintenance	≥ 10 hours	
High Tension Terminal	4 pieces, Max. DC 500A,1000V	
Low Tension Terminal	4 pieces, Max. DC 500A,1000V	
Data Cable Interface	2 groups, DB9 line	
Observe Window	W400 X H600 mm	
Auto Door	Adopt hydraulic automatic open design	
Inner Material	SUS304# stainless steel+45# steel	
External Material	SECC steel plate, powder painted	
Power Supply	AC 380V,6.0KW	
Other Requirement	PLC touch screen control + computer remote control. Can be charge and discharge in vacuum condition. Inner chamber has signal wire interface. Lighting system and video monitor system Slide rail installed, test object can be carried into and out automatically.	

# Walk In Dust-proof Test Chamber



## Related Standard Test Requirements

### Introduction

1. Providing a simulated environment of dry sand blowing and dust emission.
2. Long time and continuous running without fault.
3. Ensure a certain amount of dust blowing, dust blowing speed, dust blowing time and automatically set.
4. With dust dehumidifying and controlling the temperature and humidity of the inner environment.
5. Ensure the whole test is recyclable.
6. Perfect safety protection function

### Standard Compliance

IEC 60529:2001 / GB 4208-2008 of protection provided by enclosure (IP code)  
 IEC 60034-5: 2000 / GB/T 4942.1-2006 Rotating electrical machines-Part 5: Degree of protection provided by the integral design of rotating electrical machines (IP code)-Classification, IDT  
 IEC 60068-2-68: 1994 / GB/T 2423.37-2006 Environmental testing-Part 2: Tests-Test L: Dust and sand IDT  
 IEC 60068-1:1988 / GB/T 2421-2008 Environmental testing- Part 1: General and guidance, IDT  
 IEC 60068-5-2:1990 / GB/T 2422-2012 Environmental testing-Part 5: Guide to drafting of test methods-Terms and definitions, IDT



## Performance parameters

Model	BE-XR-12M <sup>3</sup>
Internal Dimension	W2000 X H2400 X D3000mm
External Dimension	W2400 X H3000 X D4100mm
Max. Load	≥ 1000KG, equipped with sample holder which able to moved on the guide rail
Observe window	5mm tempered glass with a large size 500mm*500mm, sand dust cleaner, and lighting.
Internal Material	1.0mm SUS304# heat resistant and cold resistant stainless steel plate. (Mirror finished).
External Material	1.2mm cool-rolled steel plate with high temperature coating.
Temp. Range	RT+10°C~+80°C (Adjustable)
Humidity Range	≤ 85%R.H
Dust Ingredients	Composed of 100% inorganic minerals, the content of 34%-40% silica (secondary angular structure quartz sand) is 0.2, and the hardness is 7° . 17%-23% is ferric oxide. 26%-32% is three oxidation of two aluminum. The rest are natural impurities.
Sand and Dust Particle Composition	68% about 10um、 12% about 10-20um、 14% about 20-50um、 6% about 50-75um.
Sand Concentration	0.177g/m <sup>3</sup> , 1.1 ± 0.25g/m <sup>3</sup> , 2.2 ± 0.5g/m <sup>3</sup> (Optional)
Dust Dosage	2-4kg ± 7g/m <sup>3</sup> (can set and display)
Blowing Speed	1~2m/s (Adjustable, can be set and display)
Air Velocity	≤ 2m/s
Shock Time	≥ 999h99min (Adjustable)
Blowing Time	≥ 999h99min (Adjustable, Timing automatic control, control accuracy 1 min)
Negative-pressure System	Pressure 0~-2kpa ( can be set and controlled) Air exhaust speed: ≤ 60 times of the volume of air in the shell per hour. Displayed the pressure in the testing chamber.
Testing Sectional Area	Blowing sand under the wind speed of 29m/s, the testing sectional area 1000*1000mm.
Control Mode	High precision touch screen temperature and humidity controller (using direct-reading sensor for relative humidity)
Operation Mode	Fixed value, program operation mode.
Safety Protective	Safe and reliable grounding protection device; power supply under voltage and leakage protection; motor overload protection; blower motor overload protection; safety interlocking device on the system.
Options	Video monitoring system

# Walk In Explosion-proof Chamber



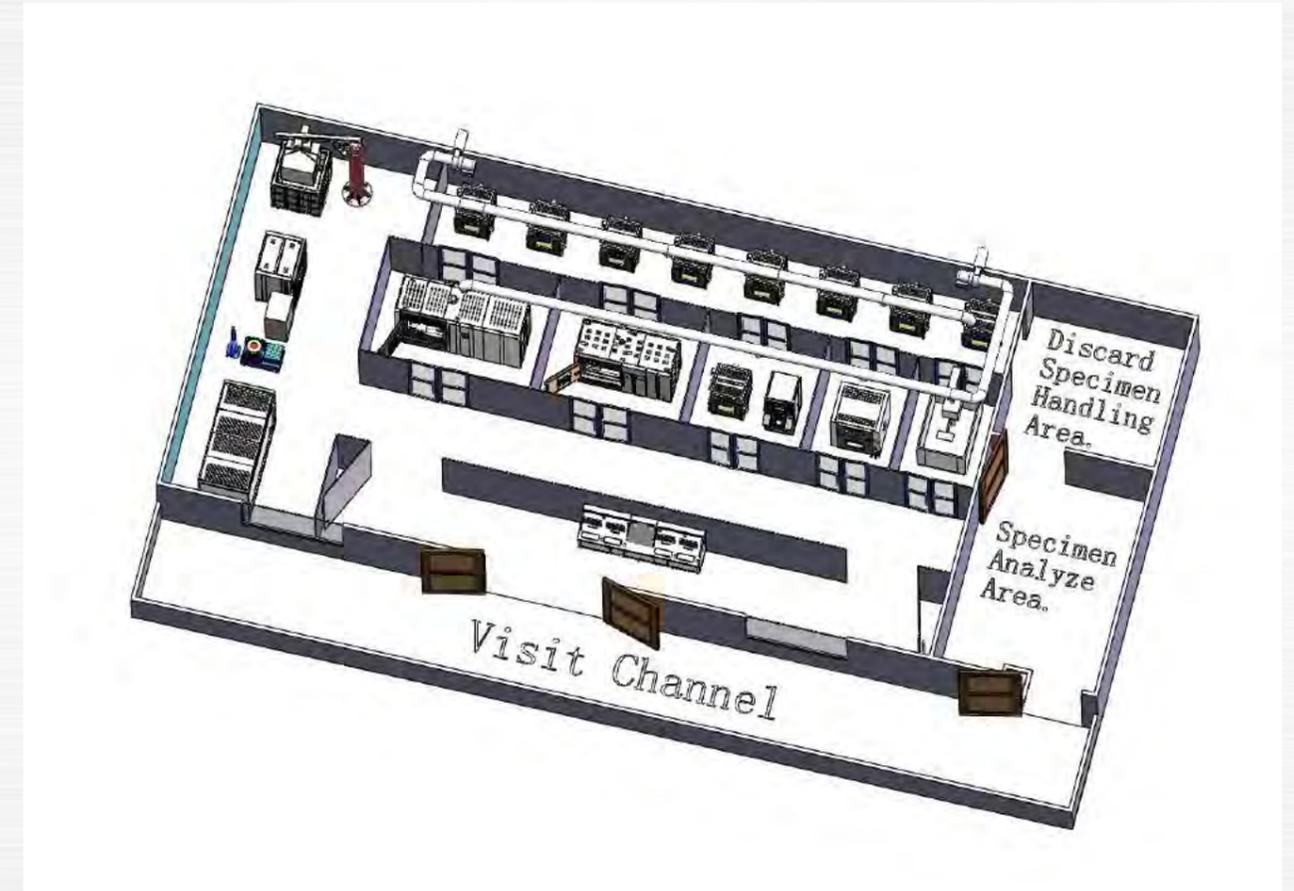
## Related Standard Test Requirements

### Application

Walk-in Explosion-proof is mainly used to test the safety performance of lithium ion battery, battery pack and battery pack. Preventing the test operator and other test equipments from being hurt by combustion and explosion. Meanwhile, The explosion-proof test chamber with smoke exhaust system, which is able to exhaust the fume occurred in the test to outdoors.

### Features

1. Integral construction with many auxiliary functions: Lighting, smoke exhaust, fire extinguishing, explosion-proof pressure relief device, etc.
2. The inner chamber is composed of high temperature resistant and flame retardant components. The chamber door is sealed with high temperature resistant sealing strip.
3. Integrated internal construction, no holes nor gap inside chamber, easier to clean.



## Performance parameters

Model	BE-8214
Interior Dimension	W2000 X D3000 X H2000 MM
Internal Material	45# die steel with spray coating
Internal Chamber Thickness	10mm
Overall Dimension	W2300 X D3500 X H2600 MM
External Chamber Thickness	10mm
Door Operation Mode	Hydraulic
Air Output	45m <sup>3</sup> /min
Total Weight	Approx 8 Tons
Power Source	AC 380V , 5.5KW
Other Function	Explosion proof pressure relief system Smoke exhaust system Sprinkler fire-extinguishing system Explosion proof lighting system video monitoring system Drainage system.



**IEC62619**  
**UL2580**  
**GB31485-2015**

Electric Vehicle Lithium-ion Battery  
Safety Requirement and Test Solution

# Traction Battery Short Circuit Test Machine

## Related Standard Test Requirements

### Single Storage Cell Safety Test

6.2.4 Short circuit

A) Charge the single storage cell according to 6.1.3 standard

B) The cell is to be short-circuited by connecting the positive and negative terminal with a external resistance of less than 5mΩ for 10 min

C) Observe for 1H

### Battery module safety test

6.3.4 Short circuit

A) Charge the battery module according to standard 6.1.4

B) The battery module is to be short-circuited by connecting the positive and negative terminal with a external resistance of less than 5mΩ for 10 min

C) Observe for 1H



Model	BE-XL-2000A	BE-XL-3000A	BE-XL-5000A
Max. Operating Current (A)	2000A	3000A	5000A
Max. Instantaneous Current(A)	3000A	4000A	6000A
Temp. Range	Ambient Temperature		
Inner Resistance	< 1mΩ, < 5mΩ, < 10mΩ, < 20mΩ, < 50mΩ, < 100mΩ(Optional)		
Control Mode	PLC Touch Screen + Computer remote control + Remote controller		
Overall Dimension	W700xD1050xH1830mm		
Explosion proof Chamber Dimension	800 X 800 X 800mm, 1000 X 1000 X 1000mm (Optional)		
Voltage Measurement Range	0~500V		
Short Circuit Response Time	≤ 20ms		
Data Interface	USB, Data card, etc.		
Data Acquisition Module	Independent remote acquisition, multi-voltage/temperature/current acquisition channels ensure data accuracy. Acquisition frequency 100HZ		
Short Circuit Mode	Pneumatic + vacuum arc extinguishing		
Safety Device	Electric leakage, over current protection ,smoke alarm device, abnormal sound light alarm.		
Testing Fixture	Customize according to actual testing condition		
Power Supply	220V 50HZ		

# Thermal Abuse Test Chamber

## Related Standard Test Requirements

### Single storage cell Safety Test

Heating test steps:

a) Charge the battery according to the standard 6.1.3

b) Place it into the chamber

--For lithium storage battery, the oven temperature is raised at a rate of 5°C/min to a temperature of 130°C ± 2°C, remain this temperature for 30min, then stop heating;

--For metal cyanide nickel battery, the oven temperature is raised at a rate of 5°C/min to a temperature of 85°C ± 2°C, remain this temperature for 2h, then stop heating.

c) Observe for 1h

### Storage Battery Module Safety Test

a) Charge the battery module according to the standard 6.1.4

b) Place it into the chamber

-For lithium storage battery, the oven temperature is raised at a rate of 5°C/min to a temperature of 130°C ± 2°C, remain this temperature for 30min, then stop heating;

--For metal cyanide nickel battery, the oven temperature is raised at a rate of 5°C/min to a temperature of 85°C ± 2°C, remain this temperature for 2h, then stop heating.

c) Observe for 1h



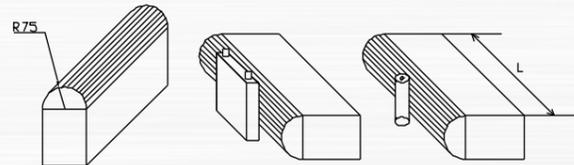
## Performance parameters

Model	BE-101-1000A
Temp. Range	Ambient~200°C (Controllable)
Control Accuracy	± 0.5°C
Temp. Uniformity	± 2.0°C ( No load)
Temp. Rising Speed	RT~ 150°C ( ≥ 5°C/min, liner with load 40kg module)
Temp. overshoot	≤ 2.0°C
Control Display Method	PLC Touch screen + remote control, networking, cell phone APP alarm device, with USB interface, RS485 interface can be connected to computer controlling.
Testing Room Dimension	W1000 X D1000 X H1000 mm
External Chamber Dimension	W1400 X D1300 X H1840 mm
Inner chamber Material	SUS304 Stainless Steel (Mirror finished)
External chamber Material	SECC Steel Plate, Powder Painted
Basement	With universal wheel
Observation Window	390 X 360mm (20mm Tempered Explosion Proof Glass)
Power Source	380V 50HZ
Heating Power	About 12KW
Safety Protection Device	over voltage, over temperature, over current protection, protection for short circuit caused by incorrect operation of the operator and battery electrode, battery positive and negative connection, etc
Safety Device	Smoke exhaust system, explosion proof pressure relief port, tri-color light alarm.

# Cell Battery Crush Test Equipment(Vertical)

## Related Standard Test Requirements

1. Test object: Li-ion cell battery.
2. Testing according to the following conditions:
  - Crush plate: half cylinder with radius 75mm , Length of the plate should be larger than the crushed cell size ;
  - Crush speed:  $\leq 2\text{mm/s}$ ;
  - Crush degree: release when voltage drop to 0V or deform 30% or crush force reached 100KN ;
  - Keep 10 min
3. After testing, observe for 1h under the testing temperature.
4. Crush head



## Performance parameters

Model	BE-6045C-20T	BE-6045C-50T
Pressure (ton)	20	50
Structure	Vertical Type	Vertical Type
Crush Method	Vertical	Vertical
Chamber	Independent vertical test machine and control system	Independent vertical test machine and control system
Testing Space	W600 X D600 X H400mm	W600 X D600 X H400mm
Overall Dimension	W1300 X D800 X H2100mm	
Power Source	AC380V 50HZ	
Crush Speed	1~400mm/min (Controllable)	
Test Condition	Force, displacement (deformation) , voltage, one of the three or combined	
Control Method	Computer remote Control	
Drive Method	Electro hydraulic servo	
Crush Accuracy	$\pm 0.5\%$	
Crush Deformation	0~100% multi gear set , available for multi layer crush deformation	
Main Voltage Acquisition Channel	1 channel	
Crush Fixture	Half cylinder crush head with radius 75mm, fixtures in different size upon different standards	
Data Acquisition Module	Independent remote acquisition, multi voltage, temperature, current acquisition channel(optional); Acquisition frequency 100Hz	
Safety Alarm Device	Electrical leakage, over temperature, over voltage, over loading, over current protection, abnormal sound light alarm, smoke alarm etc.	
Safety Device	Camera monitoring system, safety and explosion protection system, smoke emission system, smoke alarm device, explosion proof lighting device, etc.	
Standard Configuration	Crush machine, computer cabinet, control software, voltage current temperature acquisition system, crush fixture, camera monitoring system, fire- extinguishing system, computer	

# Battery Crush Test Equipment(Horizontal)



## Performance parameters

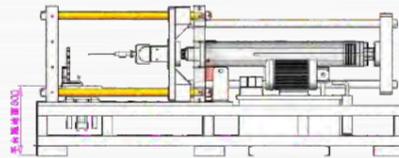
Model	BE-6045C-20T	BE-6045C-50T
Pressure (ton)	20	50
Structure	Horizontal Type	Horizontal Type
Crush Method	Horizontal	Horizontal
Chamber	Independent horizontal test machine and control system	Independent horizontal test machine and control system
Testing Space	W800 X D800 X H800mm	W1000 X D1000 X H1000mm
Overall Dimension	W3650 X D1050 X H2100mm	W3850 X D1230 X H2300mm
Power Source	AC380V 50HZ	
Crush Speed	1~400mm/min (Controllable)	
Test Condition	Force, displacement (deformation) , voltage, one of the three or combined	
Control Method	Computer remote Control, force, displacement ,total voltage or single voltage can be completed independently or combine as control variable ,the test will be stopped when any condition reaches the set value.	
Drive Method	Electro hydraulic servo	
Crush Accuracy	$\leq \pm 0.5\%$	
Crush Deformation	0~100% multi gear set , available for multi layer crush deformation	
Main Voltage Acquisition Channel	1 channel	
Crush Fixture	Half cylinder crush head with radius 75mm, fixtures in different size upon different standards	
Data Acquisition Module	Independent remote acquisition, multi voltage, temperature, current acquisition channel(optional); Acquisition frequency 100Hz	
Communication Interface	Ethernet port	
Safety Alarm Device	Electrical leakage, over temperature, over voltage, over loading, over current protection, abnormal sound light alarm, smoke alarm etc.	
Safety Device	Camera monitoring system, safety and explosion protection system, smoke emission system, smoke alarm device, explosion proof lighting device, etc.	
Standard Configuration	Crush machine, computer cabinet, control software, voltage current temperature acquisition system, crush fixture, camera monitoring system, fire- extinguishing system, computer	

# Battery Crush Nail Penetration Tester



Horizontal Type

Vertical Type



## Performance parameters

Model	BE-6047C-20T	BE-6047C-50T
Pressure (Ton)	20	50
Structure	Vertical	Horizontal
Crush method	Vertical	Horizontal
Chamber	Independent vertical structure and control system	Independent horizontal structure and control system
Test Space	W600 X D600 X H400mm	W1000 X D1000 X H1000mm
Overall Dimensions	W1300 X D870 X H2100mm	W3860 X D1230 X H2300mm
Power Supply	AC380V 50HZ	
Crush speed	1~400mm/min (Adjustable)	
Nail Penetration Speed	1~40mm/s	
Test Method	Force and displacement (deformation), voltage, or a combination of these three	
Control Method	Computer remote Control, force, displacement, total voltage or single voltage can be completed independently or combine as control variable ,the test will be stopped when any condition reaches the set value.	
Drive Mode	Electro-hydraulic servo	
Crush Accuracy	± 0.5%	
Nail Penetration Accuracy	± 1 mm/s	
Crush Deformation	0~100% multi-gears set, multi-layer crush deformation loading available	
Crush Fixture	Special-shaped crush head (300X150mm) , Flat crush plate , Arc crush plate (Radius 75mm) , fixtures in different size according to different standards	
Data Acquisition Module	Independent remote collection and isolation ,Multiplex voltage, temperature, current acquisition channel, ensure the data correctly , Acquisition frequency 100HZ	
Safety Alarm Device	Electrical leakage, over voltage, overload and over temperature, over current protection, abnormal sound and light alarm, smoke alarm lamp, etc	
Safety Device	Video monitoring system, safety explosion protection system, smoke, smoke alarm devices, explosion-proof lighting, etc	
Standard Configuration	Crush penetration test machine, computer control cabinet, control software, the voltage current temperature acquisition system, crush fixture, video monitoring system, fire extinguishing system, computer, etc. Each 1 set	

# Traction Battery Drop Tester

## Related Standard Test Requirements

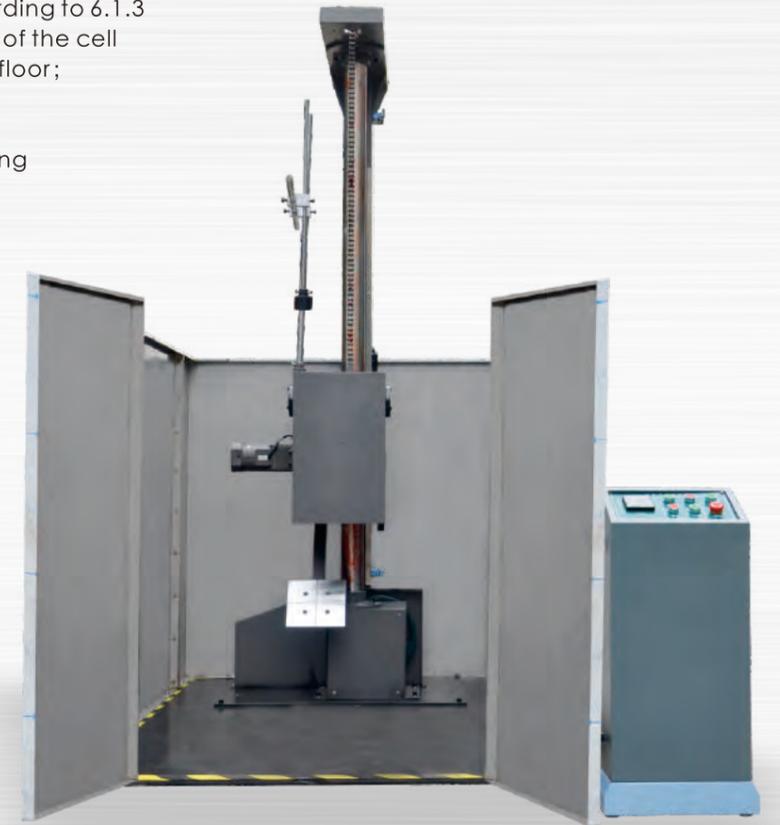
### Single Storage Cell Safety Test

Drop testing steps:

- Charge the single storage cell according to 6.1.3
- Drop the positive negative terminals of the cell from the height of 1.5m to the concrete floor;
- Observe for 1h

### Battery Module Safety Test

- Charge the battery module according to the standard 6.1.4
- Drop the positive negative terminals of the battery from the height of 1.2m to the concrete floor
- Observe for 1h



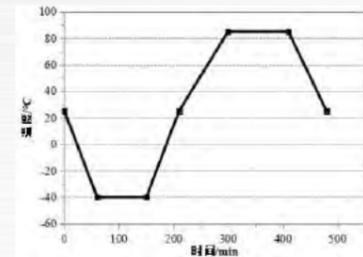
## Performance parameters

Model	BF-F-315ST
Drop Height	300~1500mm (Adjustable)
Display Mode	Digital display,adjustable
Max. Load	0~70KG (can be customized 100KG,200KG etc.)
Testing Method	Plane,edge,corner dropping
Control Method	Machine & Controller remote control independently
Drop & Lifting Method	Electric
Specimen Max. Size	W800 X D600 X H800mm (Customized available)
Overall Dimension	W1200 X D1700 X H2400mm
Drop Floor Material	Standard Steel Plate (Optional: Cement plate, marble plate, wood plate)
Power Source	AC 380V 50HZ 0.75KW
Machine Weight	Approx 750KG
Safety Alarm Device	Electric leakage, over temperature, over voltage, over loading, over current protection, abnormal sound light alarm, smoke alarm etc.
Safety Protection	Explosion-proof fence surrounded

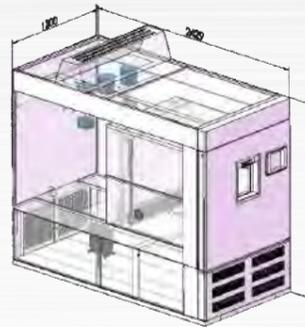
# Temperature Cycling Test Chamber

## Related Standard Test Requirements

- 1.1 Test object: Li-ion cell battery.
- 1.2 The test battery should be charged according to the method 7.1.1.
- 1.3 Put the test battery into the temperature chamber, temperature of the chamber adjusted according to table 1 and figure 2, test 5 cycles
- 1.4 After testing, observe for 1h under the testing temperature.



Schematic diagram of temperature cycle test



Temp.	°C	25	-40	-40	25	85	85	25
Time increment	min	0	60	90	60	90	110	70
Cumulative time	min	0	60	150	210	300	410	480
Temp. Variety Rate	°C/min	0	13/12	0	13/12	2/3	0	6/7

## Performance parameters

Model	BTH-1000D
Effective Volume	1000L
Internal Dimension	W1000 X H1000 X D1000mm (Can be customized)
External Dimension	W1200 X H2250 X D2400mm(including the motor height for the top of the chamber)
Temperature Range	-70°C ~ +150°C (Can be customized)
Humidity Range	20%RH-98%RH (Limit temperature section, see the regional figure)
Temperature Fluctuation	± 0.5°C
Humidity Fluctuation	± 2.5%RH
Temperature Deviation	≤ ± 2.0°C
Humidity Deviation	≤ +2,-3%RH (Humidity>75%RH) , ≤ ± 5%RH (Humidity<75%RH)
Temperature Uniformity	≤ ± 1.0°C
Heating Rate	0.1~1.2°C/min(From -40°C up to +80°C ,average, linear with load)
Cooling time	0.1~1.2°C/min(From -40°C up to +80°C ,average, linear with load)
Temperature Overshoot	≤ ± 2°C
Maximum Load	20KG
Constant Max. Heating Load	No
Noise	≤ 70dB (A Level)
External Material	Galvanized sheet with high temperature electrostatic resin coating at both sides.
Internal Material	1.2 mm thickness SUS# 304 heat and cold resistant stainless steel with seal welding.
Control Method	Touch screen programmable PLC, with USB interface, with RS485 interface can be connected to computer controlling, special network control software, convenient remote monitoring, data acquisition.
Compressor	Semi-Hermetic Compressors BOCK (Germany)
Observe Window	With 3-layers vacuum glass observation window on the door(W430mm*H580mm) ; Door frame with electric heat function (auto adjustable), anti-frosting, anti-condensing devices, ensures clear observation of the specimen under testing
Power Supply	AC 380V 50HZ 14.0KW
Auxiliary Function	Explosion-proof pressure relief device, explosion-proof chain, mobile phone alarm device, networking, smoke exhaust device, fire extinguishing device, etc.

# Some Of Our Cooperated Customers



\*\*The below companies logos are arranged in alphabetical order

## Electronic Products Companies



## New Energy Battery Companies



## New Energy Vehicles Companies

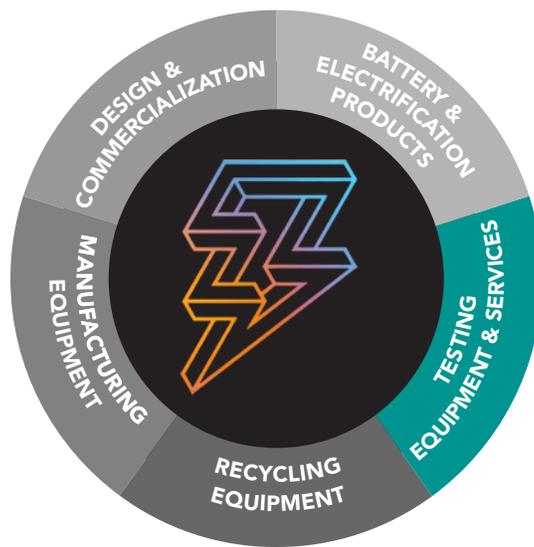


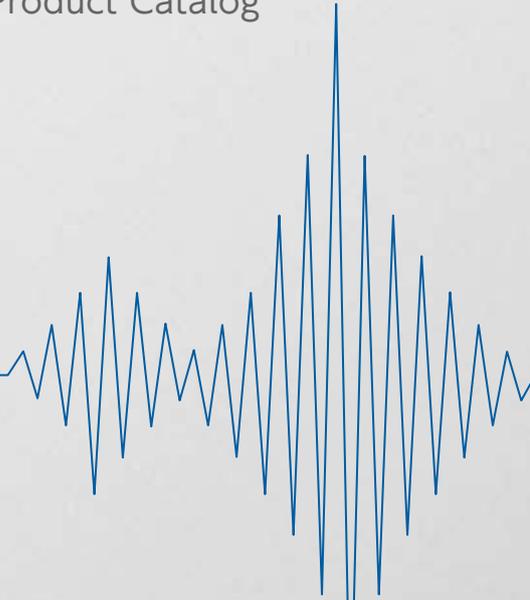
## Third-party Detection Institutions



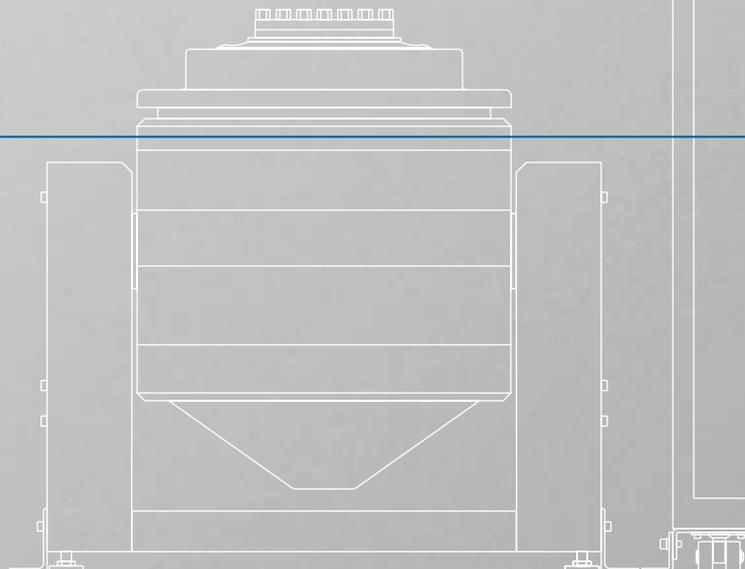
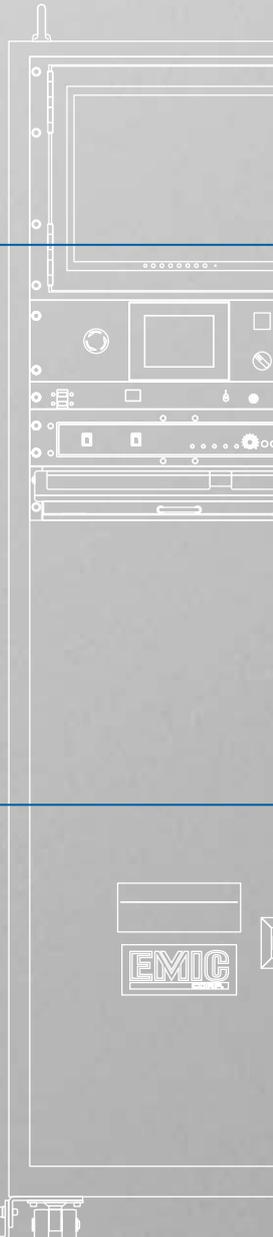


**KTON  
PARTNER**





**EMIC**  
**VIBRATION**  
**TESTING**  
**SYSTEM**



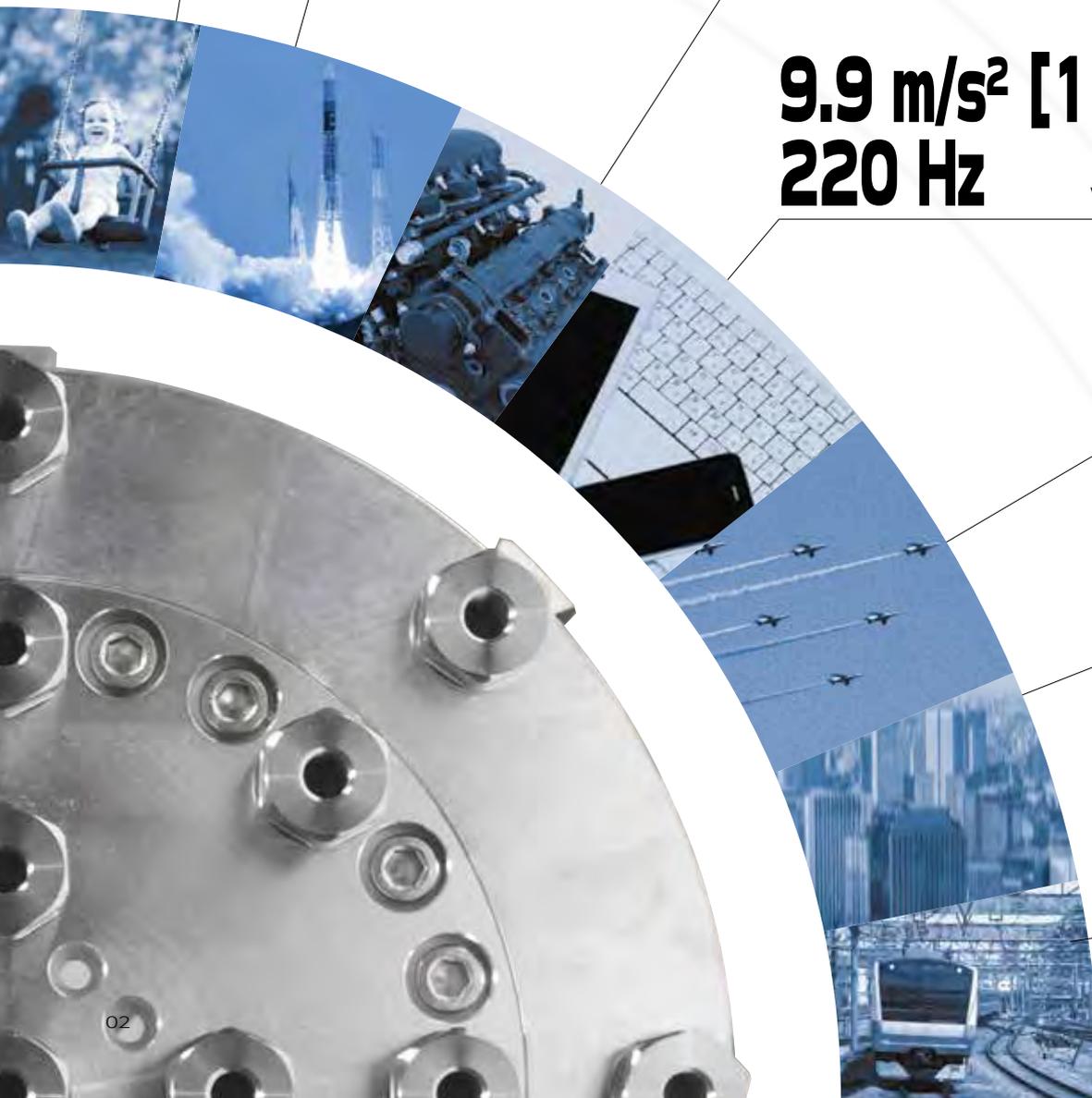
Every item in the world experiences vibrations!

**9.8 m/s<sup>2</sup> [1 G] at 2.8 Hz** Swing in the park

**70.7 m/s<sup>2</sup> [7.2 G] rms (137 dB)  
from 20 Hz to 8 kHz** Launch of a rocket

**100,000 m/s<sup>2</sup> [10,000 G]  
at 250 Hz** Motion of F1 engine piston

**9.9 m/s<sup>2</sup> [1.01 G] at  
220 Hz** Vibrations of cell-phone



# Partner for Your Quality.

Technological advances bring about rapidfire succession in each field of industry, and produce many epoch-making products.

Furthermore, reliability and safety with "Excellent Durability" guaranteed are necessary for highly advanced products.

It is EMIC that provides testing systems and solution to offer various tests such as vibration, combined environmental, quality assurance, quality control, reliability, durability, etc.

We support each customer with the highest product and quality and, as a partner, will contribute to people, society and the future.

**43.4 m/s<sup>2</sup> [4.43 G] rms from 5 Hz to 500 Hz**

Fighter Jets (Max. 9 G)

**10.764 m/s<sup>2</sup> [1.09 G] from 2 Hz to 33 Hz**

Equivalent to upper 6 seismic intensity

**5.7 m/s<sup>2</sup> [0.58 G] rms from 2 Hz to 250 Hz**

Vibrations in Commuter Express

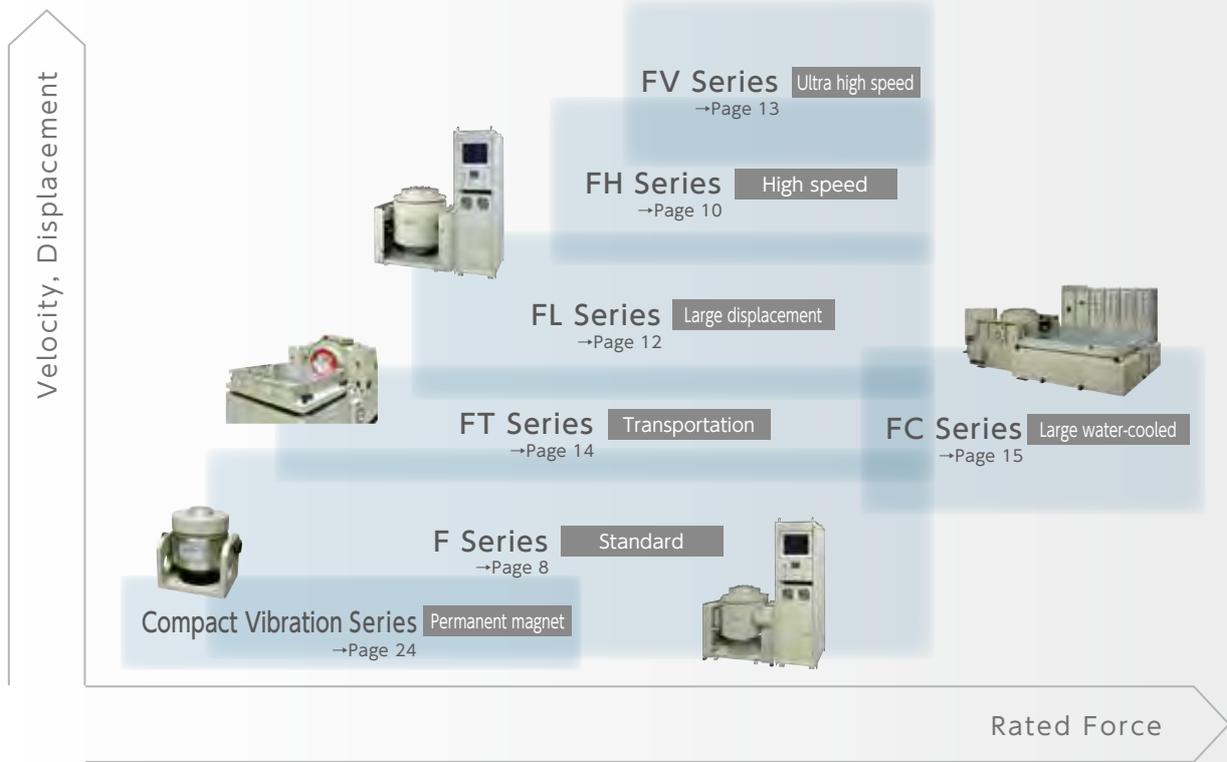
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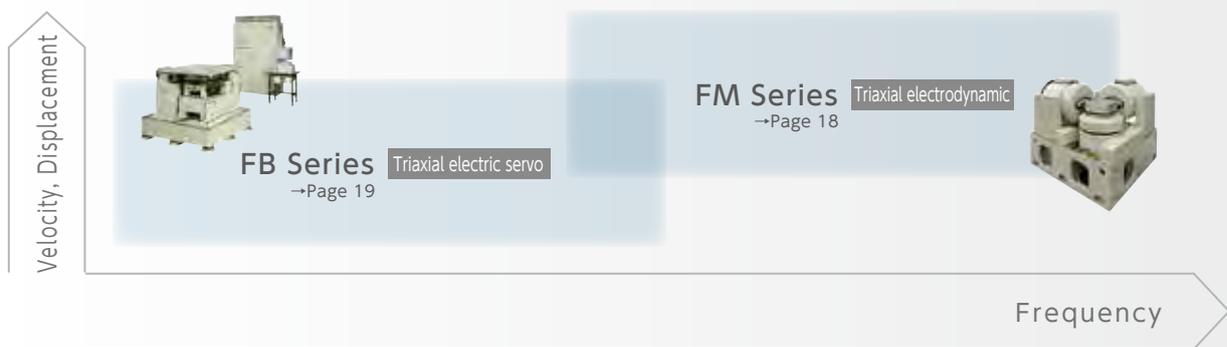
※The vibration level mentioned above introduces the representative level and maximum, not for specifying a real vibration environment.

# Lineup

## Uniaxial Vibration Testing System



## Triaxial Vibration Testing System



## Energy-saving Vibration Testing System





	 Electric, Electronic and Precision Equipment				 Automotive Equipment				 Railroad		 Aerospace			 Transport (Truck)		 Building		
	Home electric appliance (television monitor, camera)	IT equipment (notebook PC, tablet)	Industrial electric apparatus (large motor, control unit, industrial robot, electricity meter, solar panel)	Measuring instruments (sensor)	Power train (engine, motor, catalyst, exhaust system)	Large battery (lithium ion battery, inverter)	In-vehicle electric apparatus (ECU, car navigation system, light, accessory for meter)	Body, interior finishing (seat, interior)	Collision damping device (airbag)	Rolling stock equipment (train security, inverter controller, master controller, brakes, bogie)	Railroad facilities (rail, turnout, signal)	Aircraft engine and airframe parts	Electronic device for aircraft (radar)	Space apparatus (rocket propulsion apparatus, satellite)	Daily necessities (drinking water, pharmaceutical products, food)	Delivery to home, baggage transportation (cardboard packing materials, transportation means)	Structure analysis (building, apartment, bridge, earthquake-related)	Damage evaluation (concrete structure, bridge)
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(Adaptation level: 1 being the least efficient. 5 being the most efficient)

Endures vibrations.

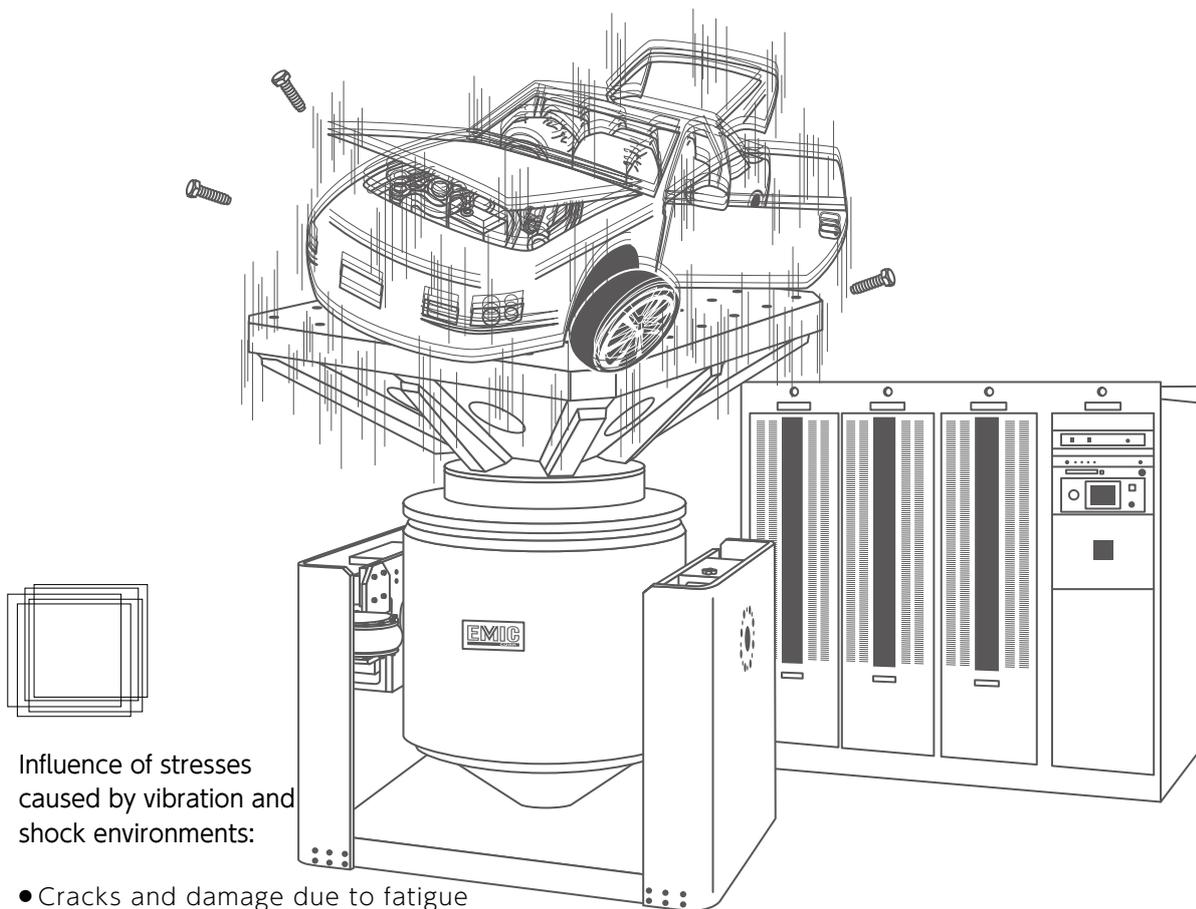
## From a product that cannot be judged for reliability. To a product that cannot be broken due to reliability.

All industrial products shall be utilized safely and trouble free from the framework such as automobile, railroad, aerospace to an IT apparatus, and imminent household electrical appliance. The product must endure against the temperature of scorching heat and arctic weather, humidity, severe vibration and shock.

EMIC's testing systems can evaluate the function, performance, reliability and quality of various industrial products. In addition, the testing equipment will provide safety and security.

Vibration test and combined environmental test are used for evaluating products at the designing and experimental stage of products.

How you look at an example of how a vibration test is performed.



Influence of stresses caused by vibration and shock environments:

- Cracks and damage due to fatigue
- Electrical and mechanical characteristic change
- Wear of contact parts
- Surface change due to abrasion
- Loosening of screws and bolts
- Corrosion acceleration
- Interference between components

The vibration testing system is used for applying vibration stresses to a testing object by creating a fore rating. As an artificial vibration source, it is suitable for precise and severe loading.

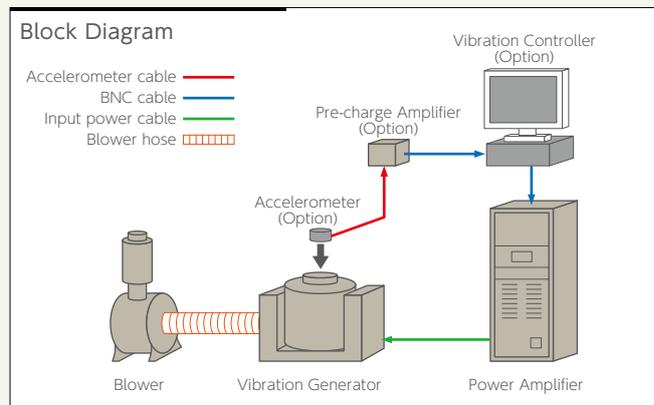
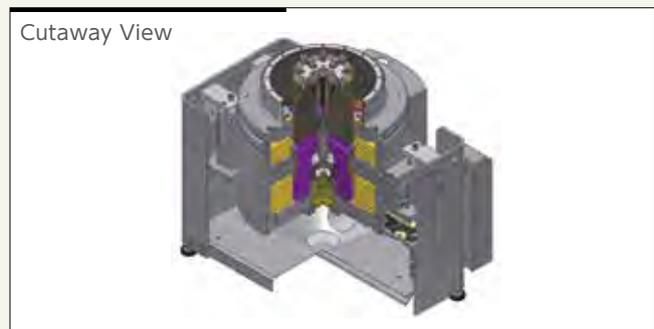


## Configuration of Electrodynamic Vibration Testing System

EMIC's vibration testing system can perform various vibration tests by forcefully exciting a test object with frequency and acceleration set arbitrarily. The electrodynamic type uses electrical energy to create dynamic motion and the feature is that the waveform distortion is less and frequency higher compared with the servo-hydraulic and mechanical type.

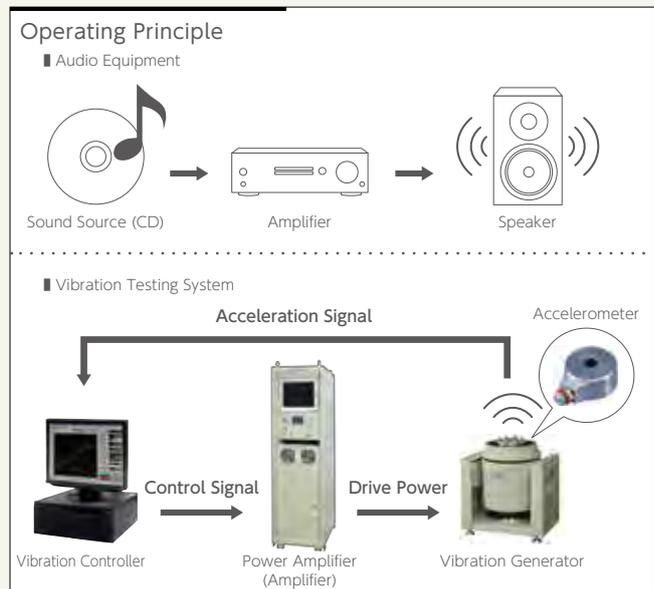
### Names of Components:

- **Vibration Generator**  
Generates vibrations for exciting a test object including a fixture which is attached to the top. The force is created with two kinds of coils, armature coils and field coil for magnet structure.
- **Power Amplifier**  
Provides AC power for armature coil.
- **Console Rack**  
Incorporates a power module, field power supply, vibration controller, operator panel and other (I/O).
- **Air Cooling Blower**  
Cools moving element (armature) and field coil of a vibration generator with forced air.
- **Accelerometer**  
Measures vibration acceleration.
- **Pre-charge Amplifier**  
Converts the charge output from an accelerometer into a voltage signal, and then amplifies it.
- **Vibration Controller**  
Controls the vibration on the vibration generator to match to the user defined frequency and amplitude specification.



### Operating Principle:

The vibration generator generates any desired vibration, but its operating principle is the same as audio equipment which plays music. The audio equipment amplifies the minute electrical signal of the sound source (CDs) with an amplifier and makes a sound with a dynamic loudspeaker with high power. In the same manner the electrodynamic vibration system also amplifies the minute electrical signal from the vibration controller with the power amplifier to generate the vibration with the vibration generator corresponding to the loudspeaker. However, one operating principle is different from the audio equipment because the vibration testing system controls the frequency and amplitude using the accelerometer and vibration controller.



# F Series Vibration Testing System

Standard

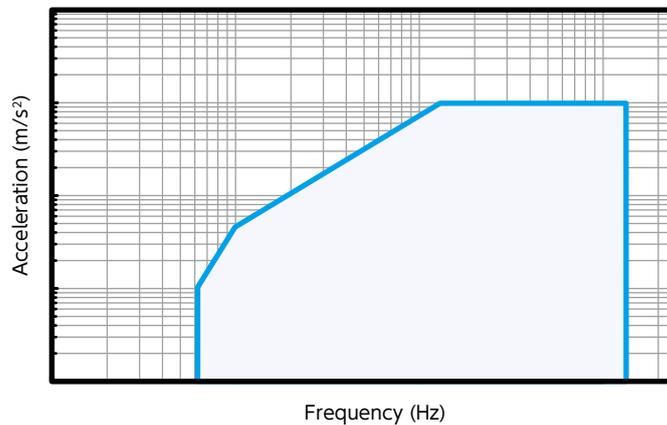


The standard F series vibration testing system has been sold for over 40 years.

This system can generate force from 1.3 kN to 60 kN over the broad range of frequency and has high durability to perform various vibration tests.

※The vibration controller is mounted in the console rack. (Optional)

## ■ Maximum Rated Exciting Capability Curve of Standard System



※This performance curve is how you look at each system for comparison.



## F Series Specifications

Model		F-1K/15	F-2K/20	F-2K/20A	F-3K/20	F-3K/20A	F-6K/20
Rated Force	Sine	kN <sub>0-p</sub> 1.3	2.0	2.0	3.0	3.0	6.0
	Random	kN <sub>rms</sub> 1.3	2.0	2.0	3.0	3.0	6.0
	Shock	kN <sub>0-p</sub> 2.6	4	4	6	6	13.2(★4)
Frequency range		Hz to 4000	to 4000	to 3000	to 4000	to 3000	to 3500
Max. acceleration		m/s <sup>2</sup> 1000	625	500	938	750	923
Max. velocity		m/s 1.4	1.4	1.4	1.6	1.6	1.8
Max. displacement		mm <sub>p-p</sub> 15	20	20	20	20	20
Max. payload		kg 30	40	150	40	150	60
Input power		kVA 4.1	6.2	6.2	7.3	7.3	9.8
Armature Mass		kg 1.3	3.2	4.0	3.2	4.0	6.5
Allowable offset load		N·m 26	40	40	60	60	120
Cooling method		Air-cooled	Air-cooled	Air-cooled	Air-cooled	Air-cooled	Air-cooled
Vibration Generator		902-FN	903-FN	903-FN/A	903-FN	903-FN/A	906-FN
Power Amplifier		369A-0101A-02	369A-0101A-03	369A-0101A-03	369A-0101A-03	369A-0101A-03	369A-0101A-06
Console Rack		CRD-1500-02	CRD-1500-03	CRD-1500-03	CRD-1500-03	CRD-1500-03	CRD-2000-06
Armature Size		mm ∅80	∅120	∅120	∅120	∅120	□120
Size	Vib. Generator	mm 460W×490H×490D	630W×602H×528D	630W×602H×528D	630W×602H×528D	630W×602H×528D	720W×675H×628D
	Console Rack	mm 554W×1462H×1010D	554W×1462H×1010D	554W×1462H×1010D	554W×1462H×1010D	554W×1462H×1010D	554W×2000H×1010D
	Blower	mm 474.5W×1040H×495D	474.5W×1040H×495D	474.5W×1040H×495D	474.5W×1040H×753D	474.5W×1040H×753D	474.5W×1040H×674D
Mass approx.	Vib. Generator	kg 240	350	350	350	350	520
	Console Rack	kg 285	290	290	290	290	420
	Blower	kg 31	31	31	39	39	55

Model		F-6K/30	F-10K/56	F-15K/56	F-22K/60	F-25K/60	F-28K/60
Rated Force	Sine	kN <sub>0-p</sub> 6.0	10.0	15.0	22.0	25.0	28.0
	Random	kN <sub>rms</sub> 6.0	10.0	15.0	22.0	25.0	28.0
	Shock	kN <sub>0-p</sub> 13.2(★4)	22.0(★4)	33.0(★4)	48.4(★4)	55.0(★4)	61.6(★4)
Frequency range		Hz to 2300	to 3000	to 3000	to 2500	to 2500	to 2200
Max. acceleration		m/s <sup>2</sup> 706	667	1000	846	961	848
Max. velocity		m/s 1.8	1.2	1.8	1.8	1.8	1.8
Max. displacement		mm <sub>p-p</sub> 30	56	56	60	60	60
Max. payload		kg 200	200(300)(★2)	200(300)(★2)	400(500)(★2)	400(500)(★2)	400(500)(★2)
Input power		kVA 9.8	19.3	22.6	26.8	28.4	37.5
Armature Mass		kg 8.5	15.0	15.0	26.0	26.0	33.0
Allowable offset load		N·m 120	500	500	700	700	900
Cooling method		Air-cooled	Air-cooled	Air-cooled	Air-cooled	Air-cooled	Air-cooled
Vibration Generator		906-FN/A	916-BP/LA	916-AP/LA	926-AP/LA	926-AP/LA	936-AP/LA
Power Amplifier		369A-0101A-06	369A-0501A-16BP	369A-0502A-16AP	369A-0503A-26AP	369A-0504A-26AP	369A-0504A-36AP
Console Rack		CRD-2000-06	CRD-2000-16	CRD-2000-16	CRD-2000-26	CRD-2000-26	CRD-2000-36
Armature Size		mm □120	∅230	∅230	∅270	∅270	∅330
Size	Vib. Generator	mm 720W×675H×628D	975W×885H×700D	975W×885H×700D	1106W×1047H×855D	1106W×1047H×855D	1224W×1107H×971D
	Console Rack	mm 554W×2000H×1010D	554W×2000H×1010D	554W×2000H×1010D	554W×2000H×1010D	554W×2000H×1010D	554W×2000H×1010D
	Blower	mm 474.5W×1040H×674D	707W×1681H×908D	707W×1681H×908D	707W×1681H×908D	707W×1681H×996D	707W×1666H×1072D
Mass approx.	Vib. Generator	kg 500	1200	1200	2200	2200	3100
	Console Rack	kg 420	520	520	520	530	570
	Blower	kg 55	220	220	220	255	260

Model		F-33K/60	F-35K/60	F-40K/60	F-43K/60	F-51K/60	F-60K/60
Rated Force	Sine	kN <sub>0-p</sub> 33.0	35.0	40.0	43.0	51.0	60.0
	Random	kN <sub>rms</sub> 33.0	35.0	40.0	43.0	51.0	60.0
	Shock	kN <sub>0-p</sub> 72.6(★4)	77.0(★4)	88.0(★4)	94.6(★4)	112.2(★4)	132.0(★4)
Frequency range		Hz to 2200	to 2200	to 2200	to 2500(★1)	to 2500(★1)	to 2500(★1)
Max. acceleration		m/s <sup>2</sup> 1000	1000(★3)	1000(★3)	623	739	869
Max. velocity		m/s 1.8	1.8	1.8	1.3	1.3	1.3
Max. displacement		mm <sub>p-p</sub> 60	60	60	60	60	60
Max. payload		kg 400(500)(★2)	400(500)(★2)	400(500)(★2)	500	500	500
Input power		kVA 42.2	47.8	57.0	61.8	64.8	68.3
Armature Mass		kg 33.0	33.0	36.0	69.0	69.0	69.0
Allowable offset load		N·m 900	900	900	1200	1200	1200
Cooling method		Air-cooled	Air-cooled	Air-cooled	Air-cooled	Air-cooled	Air-cooled
Vibration Generator		936-AP/LA	936-AP/LA	936-AP/LA	960-AP/LA	960-AP/LA	960-AP/LA
Power Amplifier		369A-0505A-36AP	369A-0505A-36AP	369A-1006A-36AP	369A-1005A-60AP	369A-1006A-60AP	369A-1008A-60AP
Console Rack		CRD-2000-36	CRD-2000-36	CRD-2000W-36	CRD-2000W-60	CRD-2000W-60	CRD-2000W-60
Armature Size		mm ∅330	∅330	∅330	∅430	∅430	∅430
Size	Vib. Generator	mm 1224W×1107H×971D	1224W×1107H×971D	1224W×1107H×971D	1452W×1252H×1215D	1452W×1252H×1215D	1452W×1252H×1215D
	Console Rack	mm 554W×2000H×1010D	554W×2000H×1010D	1108W×2000H×1010D	1108W×2000H×1010D	1108W×2000H×1010D	1108W×2000H×1010D
	Blower	mm 707W×1681H×946D	869W×1856H×1094D	869W×1856H×1094D	1021W×2170H×1149D	1021W×2170H×1149D	1021W×2170H×1149D
Mass approx.	Vib. Generator	kg 3500	3500	3900	5000	5000	5000
	Console Rack	kg 580	600	600	600	650	700
	Blower	kg 260	325	380	400	400	450

※ Input power specification is for 3φ AC200 V 50/60 Hz. ※ Lower limit frequency should be determined by a performance of an available vibration control system. ※ When exporting Vibration Testing System from Japan to overseas, Export License from the Ministry of Economy, Trade and Industry in Japan may be required depending on the specifications such as rated force. Please contact us for details. (★1) The rated force is available up 500 Hz and the force level from 500 Hz to 2500 Hz is 70% of its maximum. (★2) We will customize per your instructions. (★3) Not a theoretical value, for limiting the maximum acceleration. (★4) Shock rated force can be increased by adding power modules.

# FH Series Vibration Testing System

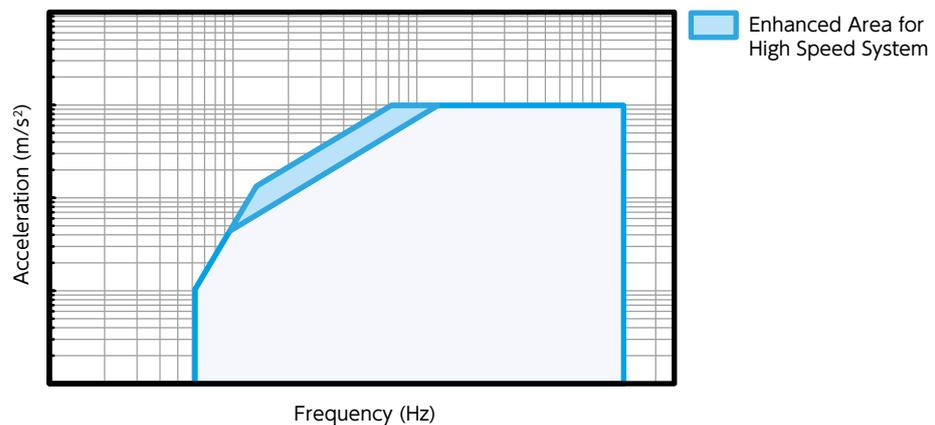
High Speed



When higher acceleration levels are required, especially around the frequencies from 20 to 80 Hz, a vibration testing system that can simulate high velocity is necessary. The FH series system is suitable for such test condition.

※The vibration controller is mounted in the console rack. (Optional)

## ■ Comparison of High Speed System with Standard System



※This performance curve is how you look at each system for comparison.



## FH Series Specifications

Model		FH-8K/51S	FH-10K/56	FH-15K/56	FH-08K/56	FH-12K/56	FH-16K/56
Rated Force	Sine	kN <sub>0-p</sub> 8.5	10.0	15.0	8.0	12.0	16.0
	Random	kNrms 8.5	10.0	15.0	8.0	12.0	16.0
	Shock	kN <sub>0-p</sub> 17.0	22.0(★3)	33.0(★3)	17.6(★3)	26.4(★3)	35.2(★3)
Frequency range		Hz to 3000	to 3000	to 2000	to 3000	to 3000	to 3000
Max. acceleration		m/s <sup>2</sup> 850	667	1000	533	800	1000(★2)
Max. velocity		m/s 2.0	2.0	2.0	2.3	2.3	2.3
Max. displacement		mm <sub>p-p</sub> 51	56	56	56	56	56
Max. payload		kg 350	200(300)(★1)	200(300)(★1)	200(300)(★1)	200(300)(★1)	200(300)(★1)
Input power		kVA 19.5	22.9	25.9	23.5	27.6	31.8
Armature Mass		kg 10.0	15.0	15.0	15.0	15.0	15.0
Allowable offset load		N·m 500	500	500	500	500	500
Cooling method		Air-cooled	Air-cooled	Air-cooled	Air-cooled	Air-cooled	Air-cooled
Model		Vibration Generator S085-AW/LA	916-BW/LA	916-BW/LA	916-AW/LA	916-AW/LA	916-AW/LA
Power Amplifier		369A-0202A-085SF	369A-0502A-16BW	369A-0503A-16BW	369A-0502A-16AW	369A-0503A-16AW	369A-0504A-16AW
Model		Console Rack CRD-1500-085	CRD-2000-16	CRD-2000-16	CRD-2000-16	CRD-2000-16	CRD-2000-16
Size		Armature Size mm ∅ 230	∅ 230	∅ 230	∅ 230	∅ 230	∅ 230
Vib. Generator		mm 797W×775H×635D	974W×1035H×700D	974W×1035H×700D	974W×1035H×700D	974W×1035H×700D	974W×1035H×700D
Console Rack		mm 554W×1462H×1010D	554W×2000H×1010D	554W×2000H×1010D	554W×2000H×1010D	554W×2000H×1010D	554W×2000H×1010D
Blower		mm 411W×810H×525D	707W×1681H×908D	707W×1681H×908D	707W×1681H×908D	707W×1681H×908D	707W×1681H×908D
Mass approx.	Vib. Generator	kg 640	1200	1200	1200	1200	1200
	Console Rack	kg 300	520	520	430	440	520
	Blower	kg 60	220	220	220	220	220

Model		FH-22K/60	FH-26K/60	FH-28K/60	FH-33K/60	FH-35K/60	FH-40K/60
Rated Force	Sine	kN <sub>0-p</sub> 22.0	26.0	28.0	33.0	35.0	40.0
	Random	kNrms 22.0	26.0	28.0	33.0	35.0	40.0
	Shock	kN <sub>0-p</sub> 55	65	70	82.5	87.5	100
Frequency range		Hz to 2500	to 2500	to 2200	to 2200	to 2200	to 2200
Max. acceleration		m/s <sup>2</sup> 846	1000	848	1000	1000(★2)	1000(★2)
Max. velocity		m/s 2.3	2.3	2.0	2.0	2.0	2.0
Max. displacement		mm <sub>p-p</sub> 60	60	60	60	60	60
Max. payload		kg 400(500)(★1)	400(500)(★1)	400(500)(★1)	400(500)(★1)	400(500)(★1)	400(500)(★1)
Input power		kVA 35.9	39.0	45.3	49.6	55.9	64.6
Armature Mass		kg 26.0	26.0	33.0	33.0	33.0	36.0
Allowable offset load		N·m 700	700	900	900	900	900
Cooling method		Air-cooled	Air-cooled	Air-cooled	Air-cooled	Air-cooled	Air-cooled
Model		Vibration Generator 926-AW/LA	926-AW/LA	936-AW/LA	936-AW/LA	936-AW/LA	936-AW/LA
Power Amplifier		368A-0503B-26AW	368A-0504B-26AW	368A-0504B-36AW	368A-0505B-36AW	368A-0505B-36AW	368A-0606B-36AW
Model		Console Rack CRD-2000-26	CRD-2000-26	CRD-2000-36	CRD-2000-36	CRD-2000-36	CRD-2000-36
Size		Armature Size mm ∅ 270	∅ 270	∅ 330	∅ 330	∅ 330	∅ 330
Vib. Generator		mm 1106W×1135H×880D	1106W×1135H×880D	1106W×1135H×880D	1125W×1200H×965D	1125W×1200H×965D	1125W×1200H×965D
Console Rack		mm 554W×2000H×1010D	554W×2000H×1010D	554W×2000H×1010D	554W×2000H×1010D	554W×2000H×1010D	554W×2000H×1010D
Blower		mm 707W×1681H×908D	707W×1681H×908D	946W×1681H×908D	946W×1681H×908D	869W×1856H×1094D	869W×1856H×1094D
Mass approx.	Vib. Generator	kg 2200	2200	3500	3500	3500	3900
	Console Rack	kg 600	600	600	600	600	600
	Blower	kg 220	220	260	245	325	325

Model		FH-43K/60	FH-51K/60	FH-60K/60
Rated Force	Sine	kN <sub>0-p</sub> 43.0	51.0	60.0
	Random	kNrms 43.0	51.0	60.0
	Shock	kN <sub>0-p</sub> 107.5	127.5	150
Frequency range		Hz to 2500	to 2500	to 2500
Max. acceleration		m/s <sup>2</sup> 623	739	869
Max. velocity		m/s 1.78	1.78	1.78
Max. displacement		mm <sub>p-p</sub> 60	60	60
Max. payload		kg 500	500	500
Input power		kVA 68.2	72.2	82.6
Armature Mass		kg 69.0	69.0	69.0
Allowable offset load		N·m 1200	1200	1200
Cooling method		Air-cooled	Air-cooled	Air-cooled
Model		Vibration Generator 960-AW/LA	960-AW/LA	960-AW/LA
Power Amplifier		368A-1005B-60AW	368A-1006B-60AW	368A-1007B-60AW
Model		Console Rack CRD-2000W-60	CRD-2000W-60	CRD-2000W-60
Size		Armature Size mm ∅ 430	∅ 430	∅ 430
Vib. Generator		mm 1452W×1297H×1231D	1452W×1297H×1231D	1452W×1297H×1231D
Console Rack		mm 1108W×2000H×1010D	1108W×2000H×1010D	1108W×2000H×1010D
Blower		mm 1021W×2170H×1149D	1021W×2170H×1149D	869W×2016H×1147D
Mass approx.	Vib. Generator	kg 5000	5000	5000
	Console Rack	kg 700	750	800
	Blower	kg 450	450	450

\* Input power specification is for 3φ AC200 V 50/60 Hz. \* Lower limit frequency should be determined by a performance of an available vibration control system. \* When exporting Vibration Testing System from Japan to overseas, Export License from the Ministry of Economy, Trade and Industry in Japan may be required depending on the specifications such as rated force. Please contact us for details. (★1) We will customize per your instructions. (★2) Not a theoretical value, for limiting the maximum acceleration. (★3) Shock rated force can be increased by adding power modules.

# FL Series Vibration Testing System

Large Displacement



The FL series system expands the maximum displacement to 100 mm<sub>p-p</sub>. In particular, it responds to the test condition of large displacement of less than 10 Hz.

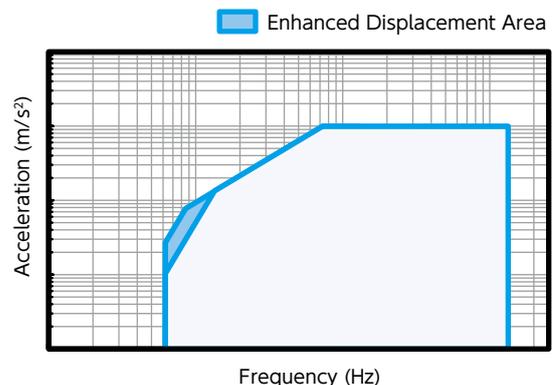
※The vibration controller is mounted in the console rack. (Optional)

## FL Series Specifications

Model	FL-08K/100	FL-12K/100	FL-16K/100	FL-22K/100	FL-26K/100	FL-28K/100	
Rated Force	Sine	kN <sub>o-p</sub> 8.0	12.0	16.0	22.0	28.0	
	Random	kN <sub>rms</sub> 8.0	12.0	16.0	22.0	28.0	
	Shock	kN <sub>o-p</sub> 17.6(★2)	26.4(★2)	35.2(★2)	55.0	65.0	70.0
Frequency range	Hz to 2000	to 2000	to 2000	to 2000	to 2000	to 2000	
Max. acceleration	m/s <sup>2</sup> 320	480	640	647	765	667	
Max. velocity	m/s 2.0	2.0	2.0	2.0	2.0	2.0	
Max. displacement	mm <sub>p-p</sub> 100	100	100	100	100	100	
Max. payload	kg 200(300)(★1)	200(300)(★1)	200(300)(★1)	200(300)(★1)	200(300)(★1)	200(300)(★1)	
Input power	kVA 23.5	27.6	31.8	35.9	39.0	45.3	
Armature Mass	kg 25.0	25.0	25.0	34.0	34.0	42.0	
Allowable offset load	N·m 350	350	350	500	500	700	
Cooling method	Air-cooled	Air-cooled	Air-cooled	Air-cooled	Air-cooled	Air-cooled	
Model	Vibration Generator 916-AW/SLS	916-AW/SLS	916-AW/SLS	926-AW/SLS	926-AW/SLS	936-AW/SLS	
	Power Amplifier 369A-0502A-16SLS	369A-0503A-16SLS	369A-0504A-16SLS	368A-0503B-26SLS	368A-0504B-26SLS	368A-0504B-36SLS	
	Console Rack CRD-2000-16	CRD-2000-16	CRD-2000-16	CRD-2000-26	CRD-2000-26	CRD-2000-36	
Size	Armature Size	mm ø 230	ø 230	ø 230	ø 270	ø 270	ø 330
	Vib. Generator	mm 974W×1035H×700D	974W×1035H×700D	974W×1035H×700D	1082W×1163H×866D	1082W×1163H×866D	1125W×1200H×965D
	Console Rack	mm 554W×2000H×1010D	554W×2000H×1010D	554W×2000H×1010D	554W×2000H×1010D	554W×2000H×1010D	554W×2000H×1010D
	Blower	mm 707W×1681H×996D	707W×1681H×908D	707W×1681H×908D	707W×1681H×908D	707W×1681H×908D	869W×1856H×1094D
Mass approx.	Vib. Generator	kg 1300	1300	1300	2500	2500	3400
	Console Rack	kg 430	440	450	600	600	600
	Blower	kg 255	220	220	220	220	325

Model	FL-35K/100	FL-60K/100	
Rated Force	Sine	kN <sub>o-p</sub> 35.0	60.0
	Random	kN <sub>rms</sub> 35.0	60.0
	Shock	kN <sub>o-p</sub> 87.5	150
Frequency range	Hz to 2000	to 2000	
Max. acceleration	m/s <sup>2</sup> 833	750	
Max. velocity	m/s 2.0	1.78	
Max. displacement	mm <sub>p-p</sub> 100	100	
Max. payload	kg 200(300)(★1)	300	
Input power	kVA 55.9	82.6	
Armature Mass	kg 42.0	80.0	
Allowable offset load	N·m 700	1000	
Cooling method	Air-cooled	Air-cooled	
Model	Vibration Generator 936-AW/SLS	960-AW/SLS	
	Power Amplifier 368A-0505B-36SLS	368A-1007B-60SLS	
	Console Rack CRD-2000-36	CRD-2000W-60	
Size	Armature Size	mm ø 330	ø 430
	Vib. Generator	mm 1125W×1200H×965D	1452W×1297H×1231D
	Console Rack	mm 554W×2000H×1010D	1108W×2000H×1010D
	Blower	mm 869W×1856H×1094D	869W×2016H×1147D
Mass approx.	Vib. Generator	kg 3400	5000
	Console Rack	kg 600	1800
	Blower	kg 325	400

## Comparison of Large Displacement System with Standard System



※This performance curve is how you look at each system for comparison.

※ Input power specification is for 3φ AC200 V 50/60 Hz. ※ Lower limit frequency should be determined by a performance of an available vibration control system. ※ When exporting Vibration Testing System from Japan to overseas, Export License from the Ministry of Economy, Trade and Industry in Japan may be required depending on the specifications such as rated force. Please contact us for details.

# FV Series Vibration Testing System

Ultra High Speed



The FV series system responds to shock test conditions;  
Shock Pulse Duration 11 ms & Level 980 m/s<sup>2</sup> (100 G)

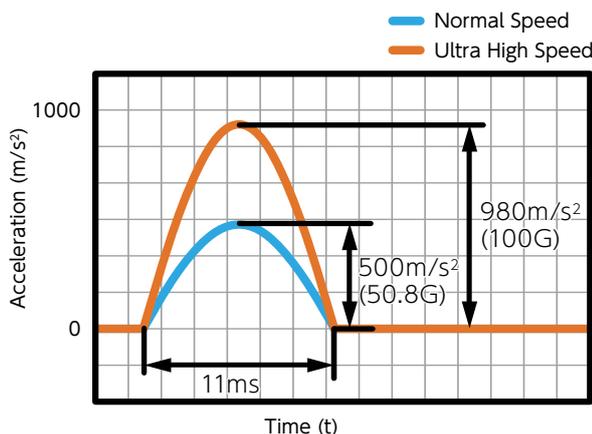
※The vibration controller is mounted in the console rack. (Optional)

## FV Series Specifications

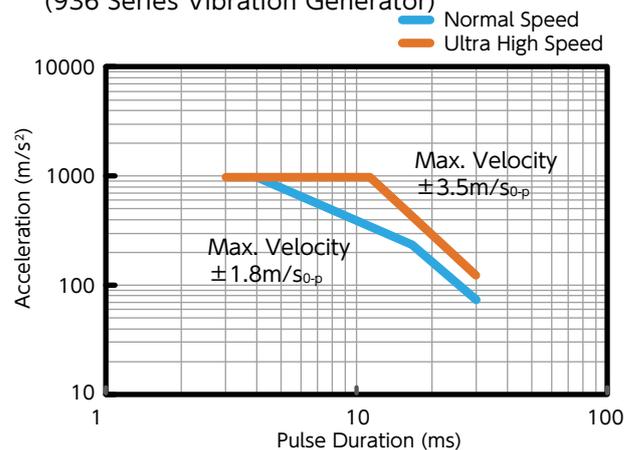
Model		FV-15K/100	FV-26K/100	FV-35K/100	FV-60K/100	
Rated Force	Sine	kNo-p	15.6	26.0	35.0	60.0
	Random	kNrms	15.6	26.0	35.0	60.0
	Shock (6ms)	kNo-p	46	68	90	150
	Shock (11ms)	kNo-p	46	68	90	150
	Frequency range	Hz	to 2000	to 2000	to 2000	to 2000
Max. accel. (Sine)	m/s <sup>2</sup>	636	765	833	750	
Max. accel. (Shock)	m/s <sup>2</sup>	1470(★2)	1470(★2)	1470(★2)	1470(★2)	
Max. velocity. (Sine)	m/s	2.0	2.0	2.0	1.8	
Max. velocity. (Shock)	m/s	3.5	3.5	3.5	3.5	
Max. displacement	mm <sub>p-p</sub>	100	100	100	100	
Max. payload (Sine)	kg	200(300)(★1)	200(300)(★1)	200(300)(★1)	200	
Max. payload (Shock)	kg	22	35	50	73	
Input power	kVA	31.6	43.6	68.1	148.7	
Armature Mass	kg	24.5	34.0	42.0	80.0	
Allowable offset load	N-m	500	500	500	500	
Cooling method		Air-cooled	Air-cooled	Air-cooled	Air-cooled	
Model	Vibration Generator	916-AW/SLS	926-AW/SLS	936-AW/SLS	960-AW/SLS	
	Power Amplifier	369A-1212B-16SLS	368A-1212B-26SLS	368A-2016B-36SLS	369A-4040B-60SLS	
	Console Rack	CRD-2000W-16SLS	CRD-2000T-26SLS	CRD-2000T-36SLS	CRD-2000Q-60SLS	
Size	Armature Size	mm	∅ 230	∅ 270	∅ 330	∅ 430
	Vib. Generator	mm	974W×1035H×700D	1106W×1135H×880D	1225W×1200H×965D	1452W×1297H×1231D
	Console Rack	mm	1108W×2000H×1010D	1662W×2059H×1010D	1662W×2059H×1010D	2770W×2059H×1010D
	Blower	mm	707W×1681H×908D	707W×1681H×908D	869W×1856H×1094D	869W×2016H×1147D
Mass approx.	Vib. Generator	kg	1300	2500	3400	5000
	Console Rack	kg	800	1150	1300	2000
	Blower	kg	220	220	325	400

※ Input power specification is for 3φ AC200 V 50/60 Hz. ※ Lower limit frequency should be determined by a performance of an available vibration control system. ※ When exporting Vibration Testing System from Japan to overseas, Export License from the Ministry of Economy, Trade and Industry in Japan may be required depending on the specifications such as rated force. Please contact us for details. (★1) We will customize per your instructions. (★2) Not a theoretical value, for limiting the maximum acceleration.

■ Duration: 11 ms, peak acceleration: 980 m/s<sup>2</sup>



■ Peak acceleration: 980 m/s<sup>2</sup>  
Maximum Rated Shock Excitation Capability  
(936 Series Vibration Generator)



※This performance curve is how you look at each system for comparison.

# FT Series Vibration Testing System

Transportation



The FT series vibration testing system is specialized for "Safe Transportation of Packaged Products". It can be equipped with a reinforcement mechanism against the offset or heavy load so that a stacked or large product may be mounted. In order to easily attach the packaged products with fixing bands, the fixture of honeycomb structure and or slip table with hooks are available. Moreover, the oilless slip table reduces the burden of maintenance.



## FT Series Specifications

Model	FT-3K/30	FT-8K/51	FT-10K/80	FT-16K/80	FT-18K/80	FT-26K/80	
Rated Force	Sine	3.0	8.5	10.0	16.0	18.0	
	Random	3.0	8.5	10.0	16.0	18.0	
	Shock	6.0	17.0	20.0	32.0	39.6(★3)	57.2(★3)
Frequency range(★1)	to 2500	to 3000	to 2000	to 2000	to 2000	to 2000	
Max. acceleration	667	850	400	640	529	764	
Max. velocity	1.6	2.0	1.0	1.0	1.0	1.0	
Max. displacement	30	51	80	80	80	80	
Max. payload(★2)	200+α	350+α	200+α	200+α	200+α	200+α	
Input power	7.3	19.5	22.6	27.8	26.8	32.0	
Armature Mass	4.5	10	25	25	34	34	
Allowable offset load	60	500	350	350	500	500	
Cooling method	Air-cooled	Air-cooled	Air-cooled	Air-cooled	Air-cooled	Air-cooled	
Model	903-FN/FA	S085-AW/LA	916-AP/SLA	916-AP/SLA	926-AP/SLA	926-AP/SLA	
Power Amplifier	369A-0101A-03	369A-0202A-0855F	369A-0502A	369A-0503A	369A-0503A	369A-0504A	
Console Rack	CRD-1500-03	CRD-1500-085	CRD-2000-16	CRD-2000-16	CRD-2000-26	CRD-2000-26	
Armature Size	∅ 120	∅ 230	∅ 230	∅ 230	∅ 270	∅ 270	
Size	Vib. Generator	630W×693H×588D	797W×775H×625D	950W×1029H×665D	950W×1029H×665D	1082W×1163H×866D	1082W×1163H×866D
	Console Rack	554W×1462H×1010D	554W×1500H×1010D	554W×2009H×1010D	554W×2009H×1010D	554W×2009H×1010D	554W×2009H×1010D
	Blower	474.5W×1040H×753D	411W×810H×525D	707W×1681H×850D	707W×1681H×850D	707W×1681H×850D	707W×1681H×850D
Compatible Mass approx.	Vib. Generator	350	640	1300	1300	2500	2500
	Console Rack	290	300	430	440	520	530
	Blower	39	60	220	220	220	220
Compatible Fixture	VHT-060	●	●	●	●	●	●
	VHT-080	●	●	●	●	●	●
	VHT-100	-	●	●	●	●	●
	VHT-120	-	-	●	●	●	●

Model	FT-28K/80	FT-35K/80	FT-60K/80	
Rated Force	Sine	28.0	35.0	60
	Random	28.0	35.0	60
	Shock	61.6(★3)	77.0(★3)	132.0(★3)
Frequency range(★1)	to 2000	to 2000	to 2500	
Max. acceleration	667	833	750	
Max. velocity	1.0	1.0	1.0	
Max. displacement	80	80	80	
Max. payload(★2)	200+α	200+α	200+α	
Input power	37.5	47.8	68.3	
Armature Mass	42	42	80	
Allowable offset load	700	700	1000	
Cooling method	Air-cooled	Air-cooled	Air-cooled	
Model	936-AP/SLA	936-AP/SLA	960-AP/SLA	
Power Amplifier	369A-0504A	369A-0505A	369A-1007A	
Console Rack	CRD-2000-36	CRD-2000-36	CRD-2000W-60	
Armature Size	∅ 330	∅ 330	∅ 430	
Size	Vib. Generator	1186W×1255H×971D	1186W×1255H×971D	1461W×1375H×1115D
	Console Rack	554W×2009H×1010D	554W×2009H×1010D	1108W×2009H×1010D
	Blower	707W×1681H×946D	869W×1856H×1094D	1461W×1375H×1115D
Compatible Mass approx.	Vib. Generator	3400	3400	5000
	Console Rack	570	580	800
	Blower	245	325	450
Compatible Fixture	VHT-060	●	●	●
	VHT-080	●	●	●
	VHT-100	●	●	●
	VHT-120	●	●	●

## Option



### ● VHT Series Honeycomb Table

Model	VHT-060-XX	VHT-080-XX	VHT-100-XX	VHT-120-XX
Size	600×600	800×800	1000×1000	1200×1200
Freq. range	to 200	to 200	to 200	to 200
Table mass	33	53	115	230



### ● Bearing Line Slip Table

Model	BT-060-XX	BT-080-XX	BT-100-XX	BT-120-XX
Size	600×600	800×800	1000×1000	1200×1200
Freq. range	to 200	to 200	to 200	to 200
Table mass	42	65	93	150

※Table mass changes with the available vibration generator.

※Frequency range and max. payload can be enhanced by a special order.

- Reinforcing Mechanism against Offset Load (Page No. 34)
- Load Support Enhancement Mechanism (Page No. 34)
- Data Logger

※ Input power specification is for 3φ AC200 V 50/60 Hz. ※ Lower limit frequency should be determined by a performance of an available vibration control system. ※ When exporting Vibration Testing System from Japan to overseas, Export License from the Ministry of Economy, Trade and Industry in Japan may be required depending on the specifications such as rated force. Please contact us for details.

(★1) The highest usable frequency depends on an available fixture. As for the details, ask your local.

(★2) The maximum payload can be increased using options, a reinforcing mechanism against offset load, load support enhancement mechanism. Contact us if any.

# FC Series Vibration Testing System

Large Water-cooled



The FC series is a large system most suitable for testing a large specimen with high rated force. Because the water-cooled type is more efficient than the air-cooled, a larger rated force can be generated. It copes with vibration tests for large electronic equipment, automobile parts, airplane parts, airborne electronic apparatus, artificial satellites, aerospace and defense system. This series is designed to perform the vibration test specified in the military or international standards including MIL, NDS, ASTM, IEC, ISO, BS, JIS.

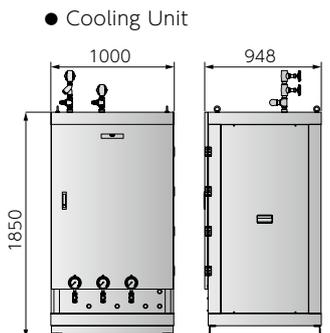


## FC Series Specifications

Model	FC-060K/60	FC-080K/60	FC-100K/60	FC-200K/60
Rated Force	Sine kN <sub>0-p</sub>	60	80	100
	Random kN <sub>rms</sub>	60	80	100
	Shock kN <sub>0-p</sub>	150	200	250
Frequency range	Hz	to 2000	to 2000	to 2000
Max. acceleration	m/s <sup>2</sup>	667	889	1000(★1)
Max. velocity	m/s	1.8	1.8	1.8
Max. displacement	mm <sub>p-p</sub>	60	60	60
Max. payload	kg	1000	1000	1000
Input power	kVA	88	100	154
Armature Mass	kg	90	90	90
Allowable offset load	N·m	1500	1500	1500
Cooling method	Water-cooled			
Cooling water flow	L/min	140(★2)	162(★2)	305(★2)
Model	Vibration Generator	9100-AWW/LA	9100-AWW/LA	9100-AWW/LA
	Power Amplifier	368A-1610B-3BAY100	368A-1612B-3BAY100	368A-1614B-3BAY100
	Console Rack	CRD-2000T	CRD-2000T	CRD-2000T
Size	Armature Size	mm	∅ 450	∅ 450
	Vib. Generator	mm	1489W×1338H×1149D	1489W×1338H×1149D
	Console Rack	mm	1662W×2059H×1030D	1662W×2059H×1030D
Mass approx.	Vib. Generator	kg	4800	4800
	Console Rack	kg	1650	1650
	Cooling Unit	kg	700	700

※ Input power specification is for 3φ AC400 V 50/60 Hz. ※ Lower limit frequency should be determined by a performance of an available vibration control system.  
 ※ When exporting Vibration Testing System from Japan to overseas, Export License from the Ministry of Economy, Trade and Industry in Japan may be required depending on the specifications such as rated force. Please contact us for details.  
 (★1) Not a theoretical value, for limiting the maximum acceleration. (★2) The water temperature is 32°C.

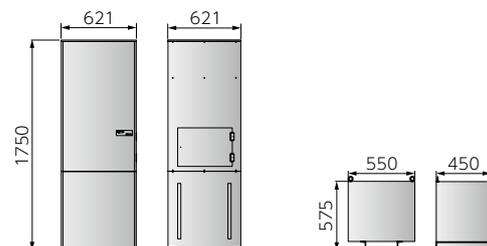
### Dimensions (approx.) mm



### Option

200 VAC 3-phase 50/60 Hz Input Power  
Hydraulic Power Supply

- Chiller
- Transformer for Chiller



# FP Series Vibration Testing System

Permanent Magnet



- Ultimate energy saving vibration generator without field coil and power supply
- Industry's first adoption of permanent magnet for more than 10 kN sine force system

"Ultimate Energy Saving" for a conventional medium-sized vibration testing system can be realized by eliminating the field coil and power supply. In addition, the cooling blower is downsized approximately 70% and its rotating speed is controlled according to the temperature of the vibration generator to drastically reduce the required input power and sound level.

※The vibration controller is mounted in the console rack. (Optional)

## [Energy-saving Effect]

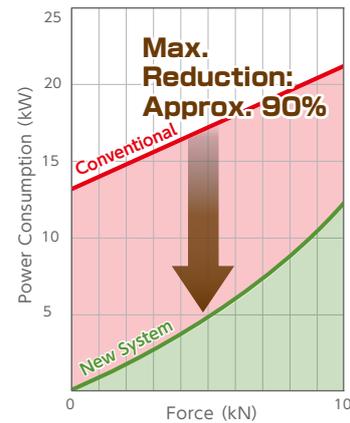
### Reduction of electric charge:

Approx. \$13820.00/year at 25% of rated output  
(Approx. JPY1,520,000.00/year at 25% of rated output)  
Approx. \$14550.00/year at 10% of rated output  
(Approx. JPY1,600,000.00/year at 10% of rated output)

### Reduction of CO<sub>2</sub>:

Approx. 42,200 kg/year at 25% of rated output  
Approx. 79,716 kg/year at 10% of rated output  
※Compared to our 916 series system for 70% of operating time  
※The discharge of CO<sub>2</sub> emission assumes it to be 0.555 kg-CO<sub>2</sub>/kWh.  
(according to law enforcement order about the promotion of global warming countermeasures, Article 3)

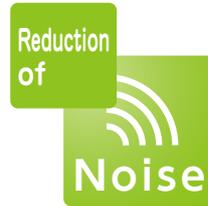
Reduction effect of power consumption for new drive system



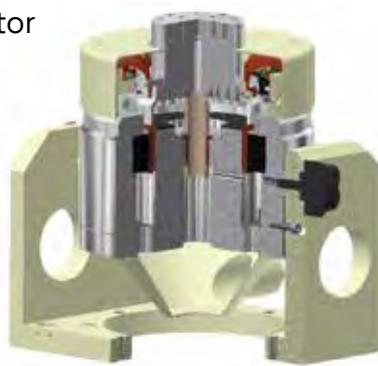
## FP Series Specifications

Model		FP-01K/30	FP-02K/25	FP-02K/30A	FP-10K/51	FP-10K/76	FP-20K/51
Rated Force	Sine	kN <sub>r-p</sub> 1.2	2.0	2.0	10.0	10.0	20.0
	Random	kN <sub>rms</sub> 0.48	1.4	1.4	10.0	10.0	20.0
	Shock	kN <sub>r-p</sub> 1.5	3.0	3.0	22.0(★1)	20.0	36.0
Frequency range		Hz to 2500	to 3000	to 2500	to 3000	to 2500	to 2500
Max. acceleration		m/s <sup>2</sup> 500	800	444	1000	606	833
Max. velocity		m/s 1.6	1.5	1.5	2.0	2.0	2.0
Max. displacement		mm <sub>r-p</sub> 30	25	30	51	76.2	51
Max. payload		kg 150	40	100	350	300	350
Input power		kVA 1.4	6.2	6.2	11.5	16	27
Armature Mass		kg 2.4	2.5	4.5	10	16	24
Allowable offset load		N·m 3	5	4	500	500	500
Cooling method		Air-cooled	Air-cooled	Air-cooled	Air-cooled	Air-cooled	Air-cooled
Model	Vibration Generator	P01-AB/AS	Σ9515-AB/SD	Σ9515-AB/AS	P10-AW/LA	P10-AW/SLS	P20-A
	Power Amplifier	375-D/P012	369A-0101A-Σ15	369A-0101A-Σ15	369A-0202A-P10	369A-0202A-P10SLS	369A-0606A-P20
	Console Rack	-	CRD-1500-Σ15	CRD-1500-Σ15	CRD-1500-P10	CRD-1500-P10	CRD-2000-P20
Size	Armature Size	mm ø 120	ø 120	ø 120	ø 230	ø 230	ø 330
	Vib. Generator	mm 384W×391.5H×360D	442W×360H×340D	442W×360H×340D	702W×763H×572D	702W×948H×625D	982W×1000H×750D
	Power Amplifier - Console Rack	mm 480W×189H×450D	554W×1462H×1010D	554W×1462H×1010D	554W×1462H×1010D	554W×1462H×1010D	554W×2000H×1010D
	Blower	mm 365.5W×700H×434D	474.5W×1040H×495D	474.5W×1040H×495D	411W×810H×525D	411W×810H×525D	707W×1681H×946D
Mass approx.	Vib. Generator	kg 75	160	165	690	760	1650
	Power Amplifier - Console Rack	kg 35	290	290	300	300	600
	Blower	kg 16	31	31	60	60	245

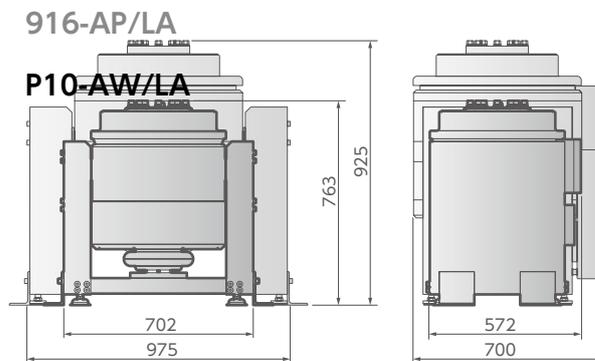
※ Input power specification is for 1φ AC100 V 50/60 Hz. or 3φ AC200 V 50/60 Hz. ※ Lower limit frequency should be determined by a performance of an available vibration control system. ※ When exporting Vibration Testing System from Japan to overseas, Export License from the Ministry of Economy, Trade and Industry in Japan may be required depending on the specifications such as rated force. Please contact us for details. (★1) Shock rated force can be increased by adding power modules.



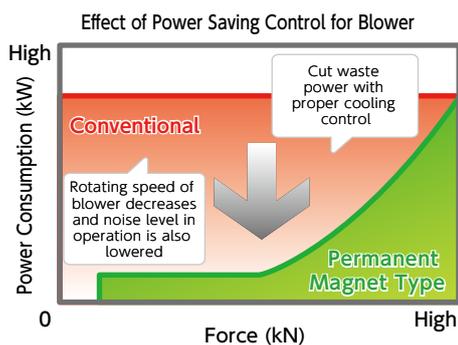
Cutaway View of Permanent Magnet Type Vibration Generator



Realization of Vibration Generator Downsizing compared with Same Class



Energy-saving Effect with Input Power (Rotating Speed) Control for Blower



# FM Series Vibration Testing System

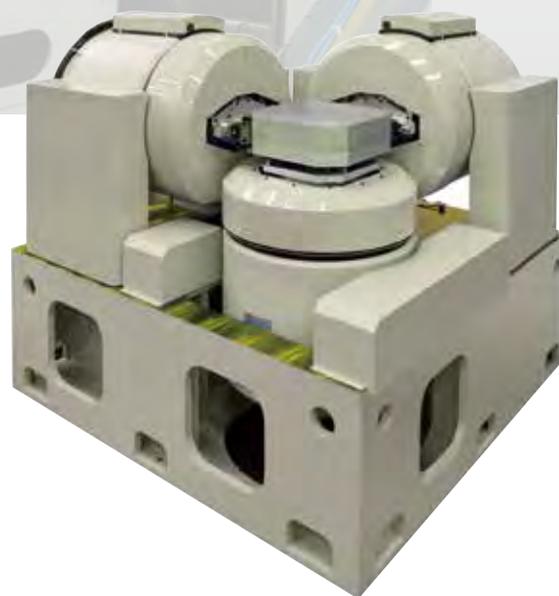
Triaxial Electrodynamic



- The FM series electrodynamic exciting system makes it possible to simultaneously excite a specimen in three directions
- According to the military standard MIL-STD-810G
- Responding to the frequency range from 5 Hz to 2000 Hz



- Multi-axis vibration test system that can excite a specimen in three axes simultaneously, which unites the electrodynamic vibration generator cultivated by EMIC for a long time with linear bearing guide mechanism manufactured by KOKUSAI Co., Ltd.
- The eco-friendly vibration test system is equipped with a energy saving drive system “ECO-Vibe neo”. It is possible to reduce power consumption after performed range selection of the rated force for application.
- The FM series can be combined with a temperature/humidity chamber for environmental reliability tests.



## FM Series Specifications

Model		FM-20K/60-3D-040	FM-30K/60-3D-040	FM-40K/60-3D-050	FM-60K/60-3D-050
Rated force	kN <sub>r.p.</sub>	20	30	40	60
Random force	kN <sub>rms</sub>	20	30	40	60
Upper limit frequency	Hz	2000	2000	2000	2000(★1)
Max. acceleration (No Load)	m/s <sup>2</sup>	133	188	235	316
Max. velocity	m/s	1.2	1.2	1.2	1.2
Max. displacement	mm <sub>p.p.</sub>	60	60	60	60
Max. payload	kg	100	100	100	100
Input power	kVA	80.4(26.8/axis)	126.6(42.2/axis)	171.0(57.0/axis)	204.9(68.3/axis)
Armature Mass	kg	150	160	170	190
Table size	mm	400×400	400×400	500×500	500×500
Cooling method		Air-cooled	Air-cooled	Air-cooled	Air-cooled

※ Input power specification is for 3φ AC200 V 50/60 Hz.

※ Lower limit frequency should be determined by a performance of an available vibration control system.

※ The table size of 600×600 mm is also available. Please contact us.

※ When exporting Vibration Testing System from Japan to overseas, Export License from the Ministry of Economy, Trade and Industry in Japan may be required depending on the specifications such as rated force. Please contact us for details.

(★1) The rated force is available up 500 Hz and the force level from 500 Hz to 2000 Hz is 70% of its maximum.

# FB Series Vibration Testing System

Triaxial Electric Servo

**EMIC**  
**VIBRATION**  
**TESTING**  
**SYSTEM**



- Multiaxial vibration testing system for transportation test or aseismic performance evaluation
- A new type of vibration testing system superior in cost performance



- Specialized for transportation test
- Reproduction of actual vibration with triaxial simultaneous excitation
- Both vertical and horizontal vibration tests can be performed by switching among three axes in a sequential manner. Since there is no need to switch the thrust axis of the vibration generator, transferring a specimen becomes unnecessary, thus the test period can be reduced.



## FB Series Specifications

Model		FB-10K/50-3D-100	FB-20K/50-3D-120	FB-30K/50-3D-050	FB-60K/50-3D-050
Rated force	kN <sub>o.p</sub>	9.8	19.6	29.4	59.5
Random force	kN <sub>rms</sub>	6.9	13.7	20.6	41.7
Frequency range	Hz	to 200	to 200	to 200	to 200
Max. acceleration	m/s <sup>2</sup>	20	20	30	30
Max. velocity	m/s	0.7	0.7	0.7	0.7
Max. displacement	mm <sub>p.p</sub>	50	50	50	50
Max. payload	kg	200	300	500	1000
Table size	mm	1000×1000	1200×1200	1500×1500	1500×1500
Input power	kVA	84	102	126	264
Power supply voltage	V	200	200	200/400	200/400
Moving element	kg	130	210	300	400
Cooling method		Air-cooled	Air-cooled	Air-cooled	Air-cooled

※ The maximum random acceleration is about 1/3 of the maximum sine acceleration.

※ Lower limit frequency should be determined by a performance of an available vibration control system.

※ When exporting Vibration Testing System from Japan to overseas, Export License from the Ministry of Economy, Trade and Industry in Japan may be required depending on the specifications such as rated force. Please contact us for details.

# FS Series Shock Test System

Shock



The FS series is specialized in high performance shock tests designed for developing air bag sensors.

The reliability of the sensor to be incorporated into an air bag system needs to be extremely sensitive in its nature. To succeed in controlling the characteristics of each sensor, the test system itself must be highly reliable and accurate. The outstanding response characteristics and control technology of an electrodynamic actuator allows success in manufacturing the test system that can meet the above requirements. We have a large selection of shock test systems depending on your application such as development, inspection in-production line and head-on and flank crash simulation.



## FS Series Specifications

Model		FS-1022/05	FS-1240B/13	FS-1040B/19	FS-2078B/29	FS-3055B/15	
Configuration	Shock Generator	905-SH/10	912-SH/12	922-SH/10	922-SH/20H	922-SH/30	
	Power Amplifier	369A-0503-S05	369A-0907-1/S	369A-0906-1/S	369A-0909-3/S	369A-0907-2/S	
	Control System	271-C	271-C	271-C	271-C	271-C	
Rating	Shock Force	kN <sub>0-P</sub> (kgf <sub>0-P</sub> )	4.9 (500)	13.72 (1400)	19.62 (2000)	29.43 (3000)	15.69 (1600)
	Maximum Acceleration	m/s <sup>2</sup>	608(62G) at 2kg load	980(100G) at 5kg load	980(100G) at 10kg load	2451(250G) at 2kg load	980(100G) at 5kg load
	Maximum Displacement	mm <sub>0-P</sub>	100	120	100	200	300
	Maximum Velocity	m/s	±2.2	±4.0	±4.0	±7.8	±5.5
	Maximum Velocity Change	m/s	4.4	6	6	10	7
	Power Consumption	kVA	9	30	33	97	50
	Maximum Payload	kg	10	10	10	10	10
	Moving Element	kg	6(including table)	9(including table)	10(including table)	10(including table)	11(including table)
Shock Generator	Table Dimensions	mm	250W×280D	250W×280D	200W×200D	200W×200D	
	Table Screw	mm	36-M6 depth9	36-M6 depth9	16-M6 depth9	16-M6 depth8	
	Outline Dimensions	mm	620W×920D×610H	760W×1200D×810H	900W×1260D×930H	900W×1460D×950H	
	Mass	kg	450	860	1470	1680	
Console Rack	Outline Dimensions	mm	630W×891D×1912H	1220W×956D×2150H	1830W×956D×2150H	2440W×956D×2150H	
	Mass	kg	390	1000	1500	2500	

Model		FS-3050B/22	FS-3093B/30H	FS-5080/16	FS-60160/20	
Configuration	Shock Generator	922-SH/30	922-SH/30H	950-SH	960-SH	
	Power Amplifier	369A-0907-2/S	369A-0908-4/S	369A-0907-2/S	369A-0907-3/S	
	Control System	271-C	271-C	271-C	271-C	
Rating	Shock Force	kN <sub>0-P</sub> (kgf <sub>0-P</sub> )	22.07 (2250)	29 (2957)	15.69 (1600)	19.61 (2000)
	Maximum Acceleration	m/s <sup>2</sup>	1470(150G) at 4kg load	1870(190G) at 4kg load	980(100G) at 2kg load	980(100G) at 2kg load
	Maximum Displacement	mm <sub>0-P</sub>	300	300	500	600
	Maximum Velocity	m/s	±5.0	±9.3	±6.0	±10.0
	Maximum Velocity Change	m/s	6	16	8	16
	Power Consumption	kVA	56	115	64	100
	Maximum Payload	kg	10	5	5	5
	Moving Element	kg	11(including table)	11.5(including table)	14(including table)	18(including table)
Shock Generator	Table Dimensions	mm	200W×200D	200W×200D	200W×200D	
	Table Screw	mm	16-M6 depth9	16-M8 depth8	16-M6 depth9	16-M6 depth9
	Outline Dimensions	mm	900W×1660D×990H	900W×1660D×990H	1180W×2446D×1215H	1180W×2469D×1215H
	Mass	kg	1900	1900	3400	3520
Console Rack	Outline Dimensions	mm	1830W×956D×2150H	3660W×956D×2150H	1830W×956D×2150H	2444W×975D×1956H
	Mass	kg	1500	3000	1500	2900

# Power Amplifier

The power amplifier of EMIC's vibration testing system adopts the high-power D class digital switching amplifier which is most suitable for an electrodynamic vibration testing system. (On the other hand, the Linear amplifier is used for the compact vibration generator system.)

- Equip high-power D class digital switching amplifier.
- Attain much space saving (our conventional products).
- Reduction of approx. 40% of consumption electricity (our conventional products).
- Electro-magnetic compatibility in accordance with both FCC and VDE rule
- Flexible built-in design using power modules of 8 kVA and 12 kVA
- Realization of wide band frequency response from DC to 4 kHz with low distortion
- Test article protection with soft start feature from shock due to overshooting
- Complete protection with multiple interlocking features.



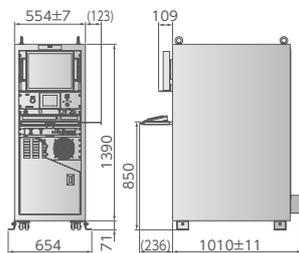
## Power Amplifier Specifications

### Specifications of Switching Amplifier Module

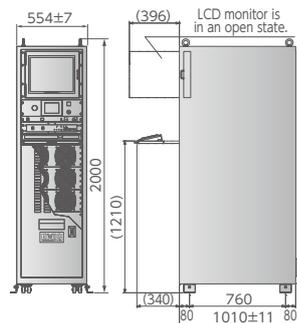
Model	368A	369A
Amplifier circuit	Switching	Switching
Apparent power	kVA 12.0	8.0
Frequency range	Hz 0 to 4000	0 to 4000
Input voltage	Vrms 1.5	1.8
Output voltage	Vrms 120	160
Output current (Sine)	Arms 100	50
Output current (Random)	A <sub>0-P</sub> 350	170

## Outline Drawing

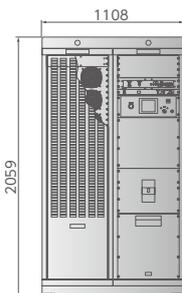
### ● CRD-1500



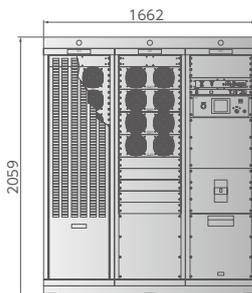
### ● CRD-2000



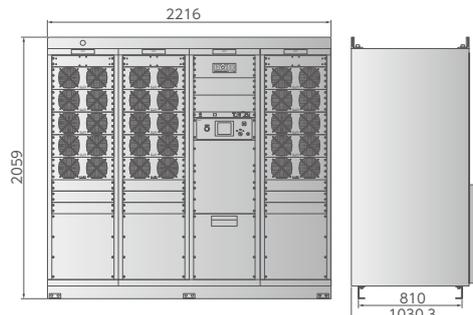
### ● CRD-2000W



### ● CRD-2000T



### ● CRD-2000Q



# Energy Saving Drive System [ECO-Vibe neo]

Originally  
Equipped



"ECO-Vibe neo" is an energy saving drive system designed to be environmentally-friendly. The vibration test condition changes with the test specifications. Generally, the required rated force can be calculated by the product of the mass such as test article, fixture, table, etc. and testing acceleration. On generic models for the other manufacturers, if the required excitation force for a test is less than the maximum force specified, the ratio of power output will be at 100% with the FCO vive NFO, power consumption can be reduced by choosing the excitation force required for the specified test. The user chooses the force range and power output of the system.

## Energy Saving Drive Mode

- NORMAL ... System Output **100%**
- MODE1 ... System Output **70%**
- MODE2 ... System Output **50%**

## Energy Saving Effect

✿ Reduction of Electric Charge:

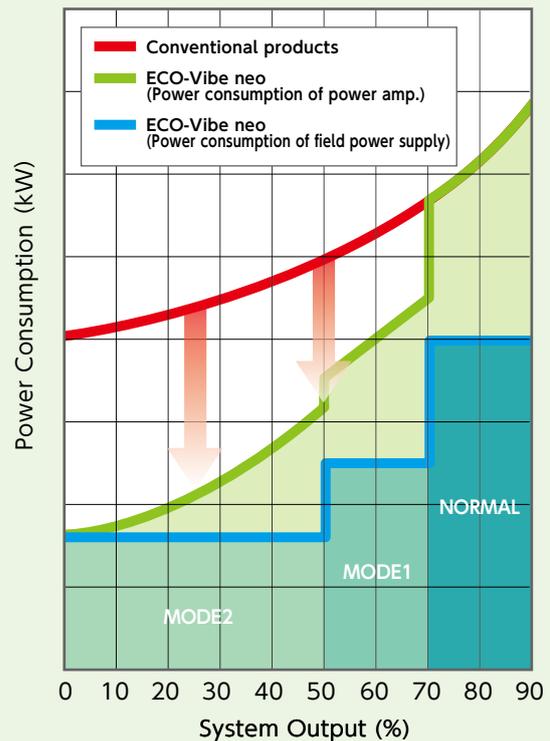
Approx. **\$7080.00**/year  
(Approx. JPY790,000.00/year)  
(Estimation at 25% of rated output for 70% of operating time)

✿ Reduction of CO<sub>2</sub>

Approx. **38** ton/year  
(Estimation at 25% of rated output for 70% of operating time)

※On March 29, 2006, estimated based on the Ministry of Economy, Trade and Industry, environment departmental order third.  
※Data of random excitation with our F-33000BD/LA36AP (33,000 N)

## Reduction of power consumption/ Difference from conventional products





### Correspondence to presence/absence of ECO-Vibe neo

New Model	Former Model	●Supported × Non-supported	New Model	Former Model	●Supported × Non-supported
F-1K/15	F-01000BM	×	FH-60K/60	F-60000BDH/LA60AW	●
-	F-01300BM	×	FL-08K/100	F-08000BDH/SLS16	●
F-2K/20	F-02000BM	×	FL-12K/100	F-12000BDH/SLS16	●
F-2K/20A	F-02000BM/A	×	FL-16K/100	F-16000BDH/SLS16	●
-	F-02000BM/FA	×	-	F-15000BDH/SLS26	●
-	F-02500AM/A	×	FL-22K/100	F-22000BDH/SLS26	●
-	F-02500AM/FA	×	FL-26K/100	F-26000BDH/SLS26	●
F-3K/20	F-03000BM	×	FL-28K/100	F-28000BDH/SLS36	●
F-3K/20A	F-03000BM/A	×	FL-35K/100	F-35000BDH/SLS36	●
FT-3K/30	F-03000BM/FA	×	FL-60K/100	F-60000BDH/SLS60	●
F-6K/20	F-06000BM	×	FV-15K/100	F-15600BDHH/SLS16	●
F-6K/30	F-06000BM/A	×	FV-26K/100	F-26000BDHH/SLS26	●
-	F-06000BM/FA	×	FV-35K/100	F-35000BDHH/SLS36	●
F-10K/56	F-10000BD/LA16BP	●	FV-60K/100	F-60000BDHH/SLS60	●
F-15K/56	F-15000BD/LA16AP	●	FT-8K/51	-	●
-	F-15000BD/LA26AP	●	FT-10K/80	-	●
F-22K/60	F-22000BD/LA26AP	●	FT-16K/80	-	●
F-25K/60	F-25000BD/LA26AP	●	FT-18K/80	-	●
F-28K/60	F-28000BD/LA36AP	●	FT-26K/80	-	●
F-33K/60	F-33000BD/LA36AP	●	FT-28K/80	-	●
F-35K/60	F-35000BD/LA36AP	●	FT-35K/80	-	●
F-40K/60	F-40000BD/LA40AP	●	FT-60K/80	-	●
F-43K/60	F-43000BD/LA60AP	●	FC-060K/60	F-060kBDH/LA100AWW	×
F-51K/60	F-51000BD/LA60AP	●	FC-080K/60	F-080kBDH/LA100AWW	×
F-60K/60	F-60000AD/LA60AP	●	FC-100K/60	F-100kBDH/LA100AWW	×
FH-8K/51S	F-08500BDH/LA085SF	●	FC-200K/60	F-200kBDH/LA200AWW	×
FH-10K/56	F-10000BDH/LA16BW	●	FP-01K/30	P01	×
FH-15K/56	F-15000ADH/LA16BW	●	FP-02K/25	Σ9515-AB/SD	×
FH-08K/56	F-08000BDH/LA16AW	●	FP-02K/30A	Σ9515-AB/AS	×
FH-12K/56	F-12000BDH/LA16AW	●	FP-10K/51	-	●
FH-16K/56	F-16000BDH/LA16AW	●	FP-20K/51	-	●
-	F-15000BDH/LA26AW	●	FM-20K/60-3D-050	-	●
FH-22K/60	F-22000BDH/LA26AW	●	FM-30K/60-3D-050	-	●
FH-26K/60	F-26000BDH/LA26AW	●	FM-40K/60-3D-050	-	●
FH-28K/60	F-28000BDH/LA36AW	●	FM-60K/60-3D-050	-	●
FH-33K/60	F-33000BDH/LA36AW	●	FB-10K/50-3D-100	-	×
FH-35K/60	F-35000BDH/LA36AW	●	FB-20K/50-3D-120	-	×
FH-40K/60	F-40000BDH/LA40AW	●	FB-30K/50-3D-150	-	×
FH-43K/60	F-43000BDH/LA60AW	●	FB-60K/50-3D-150	-	×
FH-51K/60	F-51000BDH/LA60AW	●			

※ Some former models not listed above are provided with the ECO-Vibe neo. Please contact us for more information.

# Compact Vibration Generator System 510 Series

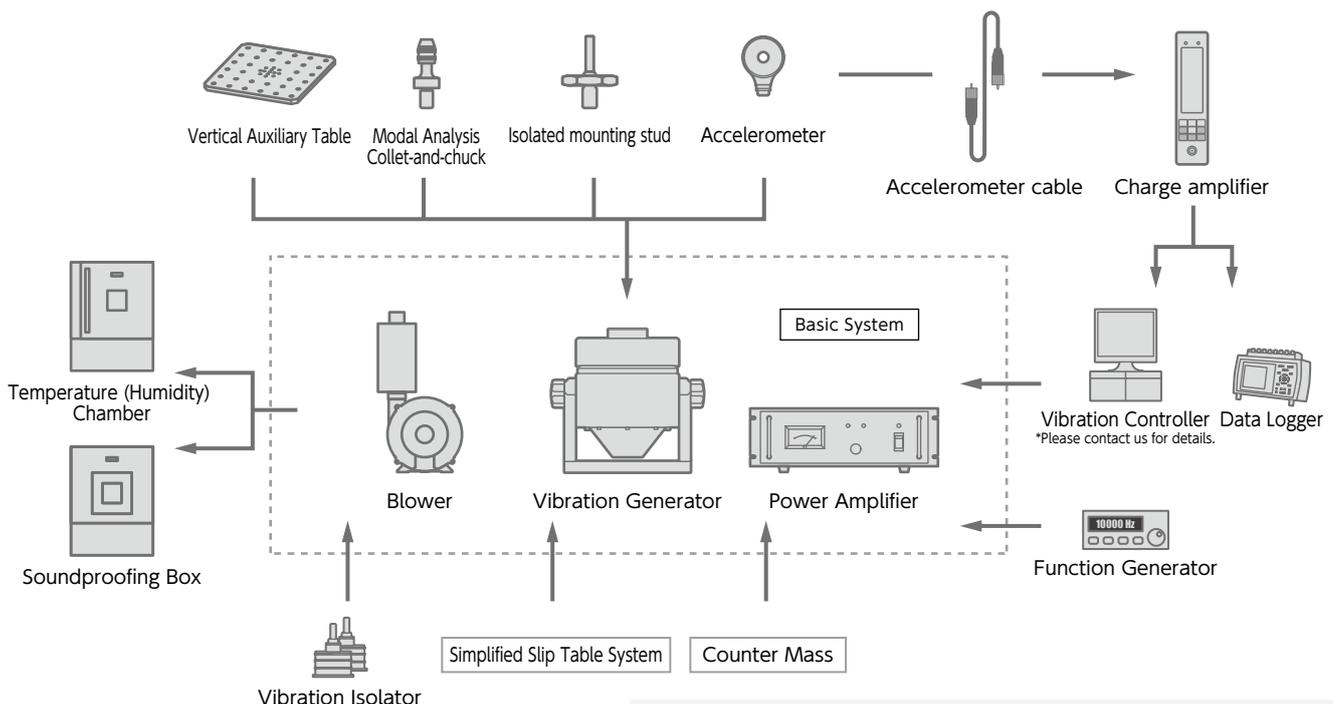


The compact vibration generator is used for vibration meter calibration, mechanical impedance measurement, modal analysis excitation source and small light weight component vibration-proof test. Particularly, concerning the Model:512-D and 513-D vibration generator, ceramic materials are used for their armatures becoming the first in the world, making excitation up to 30 kHz possible (up to 24 kHz for Model:513-D).

- Highly accurate vibration meter calibration, mechanical impedance measurement and modal analysis excitation source
- Vibration-proof test of various sensors and small light weight specimens such as electronic and electric components
- Educational material for fundamental experiment in vibration engineering



## System Configuration



### Control System or Oscillator Required:

In addition to the compact vibration generator and power amplifier unit, a vibration control system or function generator, accelerometer and charge amplifier may be required for your application. An optional oscillator is available for the power amplifier unit. As for details, please contact our sales department.



### 511·512 Series Specifications

Model	511-A	512-A	512-A/A	512-D	512-D/A
Type	Modal Analysis	Standard	High Force:64N	High Frequency:30kHz	High Frequency:30kHz·High Force:64N
Rated force	N 15	49	64	49	64
Frequency range	Hz 2 to 5k	2 to 20k	2 to 20k	2 to 30k	2 to 30k
Max. acceleration	m/s <sup>2</sup> 230.7	376.9	492.3	272.2	355.5
Max. velocity	m/s 1.26	1.14	1.31	1.00	1.14
Max. displacement	mm <sub>p-p</sub> 5.0	7.0	7.0	7.0	7.0
Axial Resonance	More than 3.9kHz	More than 16kHz	More than 16kHz	More than 32kHz	More than 32kHz
Moving Element	kg 0.065	0.13	0.13	0.18	0.18
Armature Material	Aluminum	Magnesium	Magnesium	Ceramic	Ceramic
Stiffness	N/mm 5	12	12	12	12
Armature Size	mm M6 L=20	∅40	∅40	∅40	∅40
Maximum Payload	kg —	2.0	2.0	2.0	2.0
Stray Field	—	—	—	—	—
Field Power	Permanent Magnet	Permanent Magnet	Permanent Magnet	Permanent Magnet	Permanent Magnet
Operating Environment	℃ -10 to +40 w/o dewdrop	-10 to +40 w/o dewdrop	-10 to +40 w/o dewdrop	-10 to +40 w/o dewdrop	-10 to +40 w/o dewdrop
Cooling	Natural	Natural	Forced air	Natural	Forced air
Dimensions	mm 120W×190H×100D	∅150×178(★1)	∅150×178(★1)	∅150×178(★1)	∅150×178(★1)
Mass	kg 4.2	9.5	9.5	9.5	9.5
Matched Amplifier	371-A	371-A	372-A	371-A	372-A
Blower	—	—	Yes	—	Yes
Accessory	Trunnion Stand	Interconnecting Cable×1 Grip × 2			
Option	—	Trunnion Stand (Mass 2.4kg)	Trunnion Stand (Mass 2.4kg)	Trunnion Stand (Mass 2.4kg)	Trunnion Stand (Mass 2.4kg)

(★1) Except for grip.

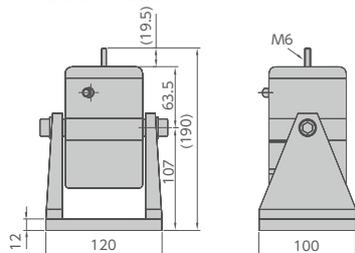
### 513 Series Specifications

Model	513-B	513-B/A	513-D	513-D/A
Type	Standard	High Force:147N·196N	High Frequency:24kHz	High Frequency:24kHz·High Force:147N
Rated force	N 98	147 196	98	147
Frequency range	Hz 3 to 13k	3 to 13k	3 to 24k	3 to 24k
Max. acceleration	m/s <sup>2</sup> 264.8	397.2 529.7	175	262.5
Max. velocity	m/s 1.17	1.43 1.67	0.92	1.14
Max. displacement	mm <sub>p-p</sub> 10	10	10	10
Axial Resonance	More than 12kHz	More than 12kHz	More than 23kHz	More than 23kHz
Moving Element	kg 0.37	0.37	0.56	0.56
Armature Material	Magnesium	Magnesium	Ceramic	Ceramic
Stiffness	N/mm 14.0	14.0	14.0	14.0
Armature Size	mm ∅79	∅79	∅79	∅79
Maximum Payload	kg 3.0	3.0	3.0	3.0
Stray Field	—	—	—	—
Field Power	Permanent Magnet	Permanent Magnet	Permanent Magnet	Permanent Magnet
Operating Environment	℃ -10 to +40 w/o dewdrop	-10 to +40 w/o dewdrop	-10 to +40 w/o dewdrop	-10 to +40 w/o dewdrop
Cooling	Natural	Forced air	Natural	Forced air
Dimensions	mm ∅215×230H(★1)	∅215×230H(★1)	∅215×230H(★1)	∅215×230H(★1)
Mass	kg 26	26	26	26
Matched Amplifier	371-A	372-A 374-A	372-A	374-A
Blower	—	Yes	—	Yes
Accessory	Interconnecting Cable×1 Grip × 2			
Option	Trunnion Stand (Mass 4.0kg)	Trunnion Stand (Mass 4.0kg)	Trunnion Stand (Mass 4.0kg)	Trunnion Stand (Mass 4.0kg)

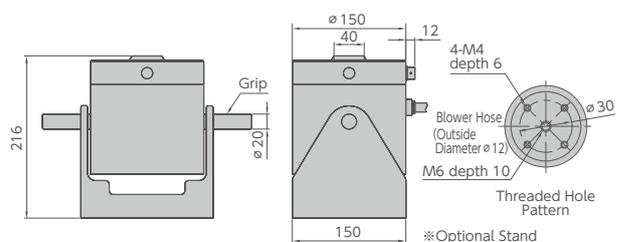
(★1) Except for grip.

### Dimensions

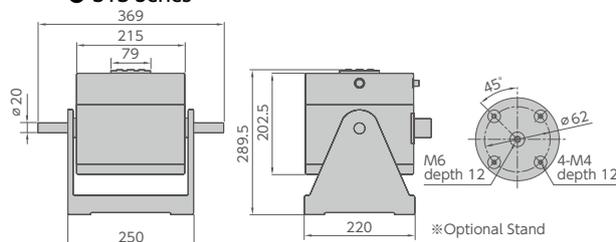
#### ● 511 Series



#### ● 512 Series



#### ● 513 Series



# Compact Vibration Generator System 9514 Series



Our new standard compact vibration generator system is able to cover various type of test.

The compact vibration generator systems, the 9514 Series, communize the major components for the vibration generator. In addition, standard specifications, increased payload specifications, through type specifications, and heat resistant specifications can apply to this system, so this enables these high-performance vibration generators to be used in various purposes. These systems also have the extensibility to handle rattle noise measurements and other required specifications, and have the capability of performing various kinds of test by combining peripheral equipment.



**9514-A Series**  
All-weather Type used in Workspace of Environmental Chamber



**9514 Series**

## 9514 Series Specifications

Model	9514-AN/SD	9514-AB/SD	9514-AN/AS	9514-AB/AS
Type	Standard	High Force:500N	Integrated Pneumatic Support Large Displacement30mm <sub>p-p</sub>	Integrated Pneumatic Support Large Displacement30mm <sub>p-p</sub> High Force500N
Rated force	N 300	500	300	500
Frequency range	Hz 5 to 5k	5 to 5k	5 to 3k	5 to 3k
Max. acceleration	m/s <sup>2</sup> 250	416.7	230.8	384.6
Max. velocity	m/s 1.2	1.2	1.2	1.2
Max. displacement	mm <sub>p-p</sub> 15(★1)	25	30	30
Axial Resonance	More than 4350Hz	More than 4350Hz	More than 3600Hz	More than 3600Hz
Moving Element	kg 1.2	1.2	1.3	1.3
Armature Material	Aluminum	Aluminum	Aluminum	Aluminum
Suspension & Guide	Half Loop Flexure Sleeve Shaft	Half Loop Flexure Sleeve Shaft	Pneumatic Payload Support Roller Bearing and Sleeve Shaft	Pneumatic Payload Support Roller Bearing and Sleeve Shaft
Stiffness	N/mm 25.0(★1)	25.0	—	—
Armature Size	mm ø75	ø75	ø75	ø75
Maximum Payload	kg 12	12	12	12
Thrust Axis	Vertical	Vertical	Vertical	Vertical
Stray Field	Less than 3mT(★2)	Less than 3mT(★2)	Less than 3mT(★2)	Less than 3mT(★2)
Field Power	Permanent Magnet	Permanent Magnet	Permanent Magnet	Permanent Magnet
Operating Environment	℃ -10 to +40 w/o dewdrop	-10 to +40 w/o dewdrop	-10 to +40 w/o dewdrop	-10 to +40 w/o dewdrop
Cooling	Natural	Forced air (Blower)	Natural	Forced air (Blower)
Dimensions(★4)	mm 283W×270H×200D	283W×270H×200D	283W×276H×200D	283W×276H×200D
Mass	kg 25	26	27	27
Matched Amplifier	373-A	375-D	373-A/Z12	375-D
Blower	—	Yes	—	Yes
Accessory	—	—	● Air Pump ● Midpoint Adjuster Block	● Air Pump ● Midpoint Adjuster Block
Option	Accelerometer Counter Mass(★3) Isolation (Rubber) Pad	Accelerometer Counter Mass(★3) Isolation (Rubber) Pad Muffler for Air Cooling Blower	Accelerometer Counter Mass(★3) Isolation (Rubber) Pad	Accelerometer Counter Mass(★3) Isolation (Rubber) Pad Muffler for Air Cooling Blower
Model	9514-AN/MD	9514-AB/WF	9514-AB/AW	
Type	Modal Analysis	High Frequency	All-weather Type used in Workspace of Environmental Chamber	
Rated force	N 300	500	300	500
Frequency range	Hz 5 to 2.5k	5 to 10k	5 to 3.0k	5 to 3.0k
Max. acceleration	m/s <sup>2</sup> 300	277.7	250.0	416.7
Max. velocity	m/s 1.2	1.2	1.2	1.2
Max. displacement	mm <sub>p-p</sub> 15	20(★1)	10	10
Axial Resonance	More than 3600Hz	More than 6500Hz	More than 4300Hz	More than 4300Hz
Moving Element	kg 1.0	1.8	1.2	1.2
Armature Material	Aluminum	Aluminum	Aluminum	Aluminum
Suspension & Guide	Half Loop Flexure Sleeve Shaft	Half Loop Flexure Sleeve Shaft	Half Loop Flexure Sleeve Shaft	Half Loop Flexure Sleeve Shaft
Stiffness	N/mm 25.0	28.0	30.0	30.0
Armature Size	mm ø50	ø75	ø83	ø83
Maximum Payload	kg 8.0	12	10	10
Thrust Axis	Vertical (Any direction by using flexure)	Vertical	Vertical	Vertical
Stray Field	Less than 3mT(★2)	Less than 3mT(★2)	Less than 3mT(★2)	Less than 3mT(★2)
Field Power	Permanent Magnet	Permanent Magnet	Permanent Magnet	Permanent Magnet
Operating Environment	℃ -10 to +40 w/o dewdrop	-10 to +40 w/o dewdrop	-40 to +125 (less than 98%RH)	
Cooling	Natural	Forced air (Blower)	Forced air (Blower)	
Dimensions(★4)	mm 283W×270H×200D	283W×270H×200D	382.5W×205H×333.5D	
Mass	kg 26	26	31	31
Matched Amplifier	373-A/Z13	375-A/Z22	373-FW	375-D
Blower	—	Yes	Yes	Yes
Accessory	Collet-and-chuck Set(ø1.0, ø1.5, ø2.0, ø2.35, ø3.0)		Built-in Accelerometer Model : 731-B, T-wrench (M5)	
Option	Accelerometer Counter Mass(★3) Isolation (Rubber) Pad Model : 9514-AN/MD/Z12 Reinforced Stiffness : 50 N/mm (limited to max. 10 mm <sub>p-p</sub> ) Model : 9514-AN/MD/Z13 Low level acceleration with low distortion (limited to max. 10 mm <sub>p-p</sub> )	Accelerometer Isolation (Rubber) Pad Muffler for Air Cooling Blower	Interconnection compatibility with chamber whose wall thickness is other than 70 to 100 mm Muffler for Air Cooling Blower	

(★1) 25 mm<sub>p-p</sub> displacement is available by changing axial stiffness to 15 N/mm. (★2) At 50 mm above table center.

(★3) When attempting to drive the vibration generator at its rated force, vibration generator should be secured to reaction mass, rigid base or floor. (★4) Without any projection.



## Air-suspension mechanism ensures displacement 9514 Series

### Relationship between payload, decreased displacement, and maximum displacement

Since the test object is supported by a spring, the increased mass of the loaded object will result in a lower neutral position thus reducing the maximum displacement for the armature of the compact vibration generator. As part of our 9514 series, we offer an optional "air suspension mechanism" that eliminates any reduction in the maximum displacement.

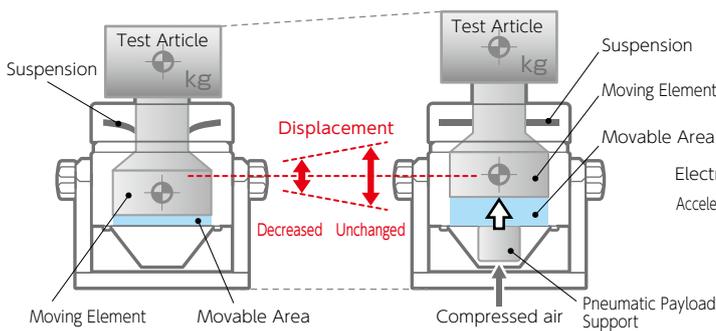
※Please contact our sales dept for details.

#### ● Standard

When a heavy test object is loaded, the support spring extends and causes the moveable range to decrease.  
→Maximum displacement decreases

#### ● Air suspension mechanism

When a heavy test object is loaded, the air suspension raises the armature equivalent to the increase in mass.  
→Maximum displacement is maintained

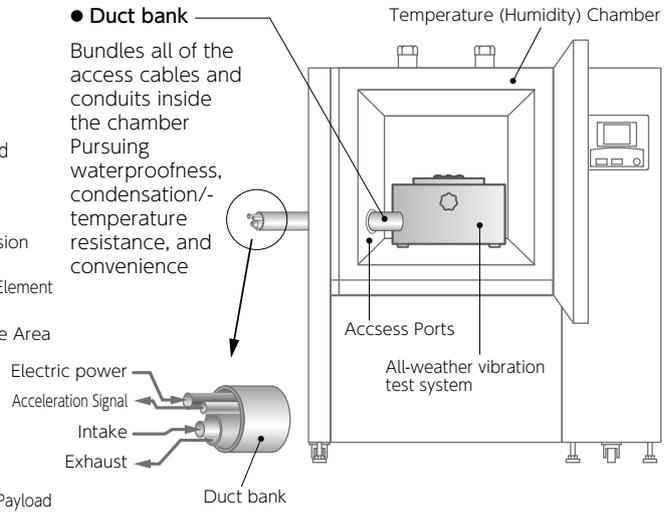


## All-weather vibration test system

The compact all-weather vibration test system can be placed in temperature and humidity test chambers to enable combined environmental reliability testing. Compact, light-weight, waterproof, and highly resistant to condensation and temperature, this test system can be placed in temperature and humidity test chambers for use as a combined environmental reliability test system. The test chamber access ports can be used to connect the devices, thus, eliminating the need to modify the testing chamber. This system can also be used as a stand-alone vibration test system, therefore allowing for the effective use of various testing equipment.

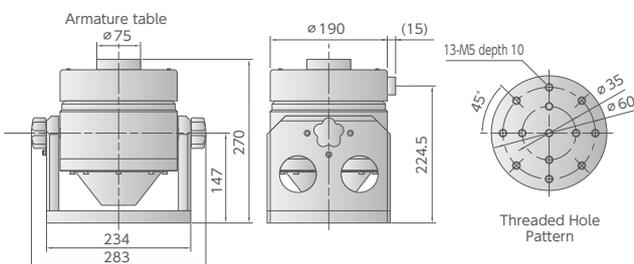
#### ● Duct bank

Bundles all of the access cables and conduits inside the chamber Pursuing waterproofness, condensation/-temperature resistance, and convenience

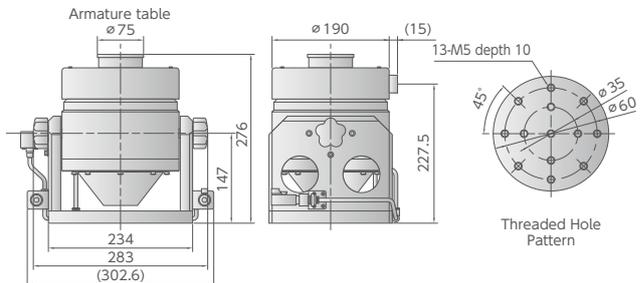


## Dimensions

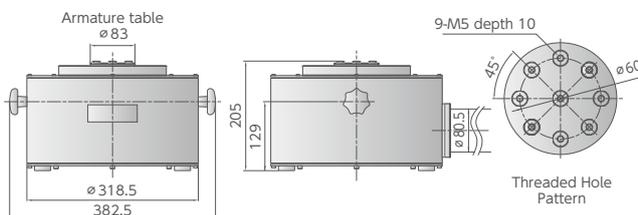
#### ● 9514-AN/SD 9514-AB/SD 9514-AB/WF



#### ● 9514-AN/AS 9514-AB/AS



#### ● 9514-AB/AW



# Compact Vibration Generator System Power Amplifier

This power amplifier is specialized for compact vibration generators.

This specialized vibration testing power amplifier is optimally designed for compact vibration generator systems and can also supply power for air-cooling blowers.

In addition, many options, such as transmitters, constant current mode, remote start and stop, duct silencers, and fan stop functions can apply, so this gives it the extensibility to suit all types of testing conditions.



## Power Amplifier Specifications

Model	371-A	372-A	373-A	373-A/Z12	373-A/Z13
Apparent power VA	110	220	330	330	330
Output voltage Vrms	20.0	27.5	20.0	20.0	20.0
Output current Arms	5.5	8.0	16.5	16.5	16.5
Frequency range Hz	2 to 30k	2 to 30k	2 to 10k	2 to 10k	DC to 10k(★1) DC to 4k(★2)
Input Impedance Ω	10k	10k	10k	10k	10k
Input voltage Vrms	1.0	1.0	1.0	1.0	1.0
Matching Impedance Ω	3.64	3.44	1.21	1.21	1.21
Load Impedance Ω	1.82	1.72	0.67	0.67	0.67
S/N dB	80	80	80	80	80
Distortion	Less than 0.5%	Less than 0.5%	Less than 0.5%	Less than 0.5%	Less than 0.5%
Meter Arms	7.5	10.0	20.0	20.0	20.0
Input Connector	BNC	BNC	BNC	BNC	BNC
Input to Blower VA	—	200Max.	—	—	—
Protector	Over current Transistor temperature	Over current Transistor temperature	Over current Transistor temperature	Over current Transistor temperature Air pressure	Over current Over voltage Transistor temperature
Input Power	AC100V 50/60Hz	AC100V 50/60Hz	AC100V 50/60Hz	AC100V 50/60Hz	AC100V 50/60Hz
Maximum Power VA	300	800	1.1k	1.1k	1.1k
Dimensions mm	480W×149H×350D	480W×149H×350D	480W×249H×400D	480W×249H×400D	480W×249H×400D
Mass kg	15	15	37.0	37.0	37.0
Operating Environment	Temp.: 0 to 40°C, hum.: 20 to 85%RH w/o dewdrop				

Model	373-FW	374-A	375-A/Z22	375-D
Apparent power VA	360	440	840	840
Output voltage Vrms	30.0	40.0	35	35
Output current Arms	12.0	11.0	24	24
Frequency range Hz	2 to 5k	2 to 20k	DC to 10.0k	DC to 5.0k
Input Impedance Ω	50k	10k	10k	10k
Input voltage Vrms	1.0	1.0	1.5	1.5
Matching Impedance Ω	1.21	3.64	1.25	1.46
Load Impedance Ω	0.67	1.82	0.63	0.73
S/N dB	70	80	80	70
Distortion	Less than 0.5%	Less than 0.5%	Less than 0.5%	Less than 1.0%
Meter Arms	20.0	20	25.0	25.0
Input Connector	BNC	BNC	BNC	BNC
Input to Blower VA	200Max.	300Max.	400Max.	200Max.
Protector	Over current Transistor temperature	Over current Transistor temperature Leakage Protector	Over current Transistor temperature Leakage Protector	Over current Over voltage Transistor temperature Overdisplacement Interlock
Input Power	AC100V 50/60Hz	AC100V 50/60Hz	AC200V 50/60Hz	AC200V 50/60Hz
Maximum Power VA	1.1k	1.5k	2.4k	1.8k
Dimensions mm	480W×249H×400D	480W×249H×400D	480W×249H×602D	480W×199H×450D
Mass kg	37.0	37.0	52.0	35.0
Operating Environment	Temp.: 0 to 40°C, hum.: 20 to 85%RH w/o dewdrop			

### Oscillator Option for Power Amplifier Unit

Model	Power Amplifier Model/G
Frequency range	2 ranges, 1 to 1kHz and 100 to 100kHz
Frequency Adjust	COARSE : Resolution 2Hz from 1 to 1kHz 200Hz from 100 to 100kHz
	FINE : more than 5Hz adjustable from 1 to 1kHz more than 50Hz adjustable from 100 to 100kHz
Frequency Accuracy	±2% (+2 scale) @ min FINE
Frequency Stability	0.5Hz/°C TYP at 1kHz (from 1 to 1kHz)
Output Waveform	Sinusoidal waveform
Output voltage	±1.0dB (within same range)
	500 Hz standard from 1 to 1kHz
	5 kHz standard from 100 to 100kHz
Distortion	less than 0.3% from 5 to 1kHz(1 to 1kHz range)
	less than 0.5% from 100 to 50kHz(100 to 100kHz range)
	less than 0.7% from 50k to 100kHz(100 to 100kHz range)

### Frequency Counter

Frequency range	1 to 100kHz
Display	6 digits
Resolution	1Hz
Accuracy	±1Hz
Gate Time	1s fixed

### Miscellaneous (Option Feature)

- Manual Operation of Blower
- DC 12 V Input Power with Pressure Alarm Switch
- Constant Current Mode
- Remote Start/Stop with Remote Control Box
- Remote Start/Stop with Timer and Remote Control Box
- Duct Silencer
- Stop Function of Fan
- Oscillator, Vibration Meter, Timer, Remote Control Switch

## Application

The following introduces several application examples using compact vibration generators.

We offer many kinds of testing systems by adding various applications to our products corresponding to clients' requirement.

### Horizontal Testing Solution and Reinforcement against Offset Load

The figure shows the add-on features, horizontal slip table with linear bearing and enforcement against offset load in vertical vibration mode. The table size can be changed according to the customer's needs.



### Rattle Noise Check System

Used for measuring and evaluating very low abnormal noise (rattle noise) from audio equipment such as CD, DVD player, etc. mainly used for car audio systems. The system consists of a vibration controller and sound-proof box to deaden ambient noise as well as compact vibration generator and associated power amplifier.



## Model : EM-983

### Ultra High Frequency Vibration Generator

The EM-983 is a high performance vibration generator of ultra high frequency and small cross-talk. Designed for primarily measuring the high frequency characteristic of head suspension for a hard disk.

- Upper Operating Frequency : 100kHz
- Ceramic armature structure
- Use : Measuring frequency characteristic of head suspension for hard disk and accelerometer, and spurious of crystal for cellular phone.



Raised Type for Horizontal Application



Equipped with Degaussing Coil

# Vibration Control System DCS-98000MJ



DCS-98000MJ provides extensive software along with its hardware, which is most suitable for the vibration control of an electrodynamic vibration testing system. The vibration controller executes the vibration test profile that the customer requires and is designed to be able to easily perform a complicated vibration test. It carries DSP performing high-speed digital signal processing and is comprised of the industrial use PC main body of high reliability, the controller is equipped with the latest Microsoft Windows OS which it is easy to operate, and the control software standardized on the random, sine and shock and provide rich option software.

※ When exporting Software of Vibration Control System from Japan to overseas, Export License from the Ministry of Economy, Trade and Industry in Japan is required. Please contact us for details.

## Typical Software Package Specifications

Random vibration control package	
Model	ESP-121ME (English) / ESP-121MJ (Japanese)
Major Specifications	<ul style="list-style-type: none"> <li>■ Control method: PSD profile</li> <li>■ Frequency range: Max. 5000 Hz</li> <li>■ Frequency resolution: Max. 3200 line</li> <li>■ Control dynamic range: 144 dB (Theoretical value)</li> <li>■ Loop time: Less than 200 ms @ 400 line and 2000 Hz</li> <li>■ Max. input number: 16 ch</li> <li>■ Random setup profile: Breakpoint (Hz), power spectral density (PSD), slope</li> <li>■ Max. test time: 9999 hours 59 minutes 59 seconds</li> <li>■ Data I/O function: Text format output (CSV), Microsoft Excel form (xlsx)</li> </ul>



Sine vibration control package		
Model	ESP-221ME (English) / ESP-221MJ (Japanese)	
Major Specifications	■ Control method:	Maximum acceleration level Minimum acceleration level Average acceleration level
	■ Frequency range:	0.1 to 10000 Hz
	■ Preset parameter:	Frequency, Acceleration, Velocity, Displacement.
	■ Frequency control:	Sweep mode (LIN or LOG mode), Fixed mode, Manual setting mode.
	■ Time and cycle:	Duration (Max. 999 h 59 m 59 s) Cycle (Max. 10 <sup>10</sup> cycles)
	■ Control system:	Max. 2 systems
	■ Input channel:	Max. 16 ch
	■ Monitor parameter:	Acceleration, Vibration level, Frequency, Output voltage.
■ Graphic function:	Preset acceleration, Input response, Output response.	
■ Analysis feature:	Transfer function, Response spectrum.	

User-defined waveform long period equalization		
Model	ESP-421ME (English) / ESP-421MJ (Japanese)	
Major Specifications	■ Control method:	Equalizing transfer function
	■ Frequency range:	Max. 1000 Hz
	■ Freq. resolution:	Max. 1600 line
	■ Permissible data:	Max. 4096000 (app. 4.5 h/app. 100 sample)
	■ Monitor function:	Target waveform, Control waveform, Output waveform.
■ Graphic function:	Spectrum, Transfer function.	

Shock control package		
Model	ESP-321ME (English) / ESP-321MJ (Japanese)	
Major Specifications	■ Control method:	Classical shock pulse (Half sine, sawtooth, trapezoidal), Arbitrary shock waveform, Output level and spectrum.
	■ Pulse duration:	0.5 to 150 ms
	■ Freq. resolution:	Max. 25600 line
	■ Preset parameter:	Shock waveform. Pulse duration.

Software Package Option	Model
Random-on-Random (ROR) Software (10 band)	ESP-122ME (English) / ESP-122MJ (Japanese)
Sine-on-Random (SOR) Software (28 tone)	ESP-123ME (English) / ESP-123MJ (Japanese)
Limit Channels Control (Random)	ESP-124ME (English) / ESP-124MJ (Japanese)
PSD Conversion	ESP-125ME (English) / ESP-125MJ (Japanese)
Resonant Search and Dwell Control	ESP-222ME (English) / ESP-222MJ (Japanese)
Sound Skip Check	ESP-223ME (English) / ESP-223MJ (Japanese)
Limit Channels Control (Sine)	ESP-224ME (English) / ESP-224MJ (Japanese)
Swept Triangular Control	ESP-225ME (English) / ESP-225MJ (Japanese)
Shock Response Spectrum (SRS)	ESP-322ME (English) / ESP-322MJ (Japanese)
Sine Beat Control	ESP-323ME (English) / ESP-323MJ (Japanese)
CERT Program Software	ESP-621ME (English) / ESP-621MJ (Japanese)
LAN Remote Monitor Package	ESP-821ME (English) / ESP-821MJ (Japanese)
e-mail Control Package (ESP-821ME(English) / ESP-821MJ(Japanese) required)	ESP-822ME (English) / ESP-822MJ (Japanese)
Watch Dog Timer Control Package	ESP-823ME (English) / ESP-823MJ (Japanese)

※ As for the detailed information of Software Package, please contact us.

Model	Language	Input
DCS-98104ME(G)-W10	English	4ch
DCS-98104MJ(G)-W10	Japanese	4ch
DCS-98104ME(GS)-W10	English	4ch
DCS-98104MJ(GS)-W10	Japanese	4ch
DCS-98108ME(G)-W10	English	8ch
DCS-98108MJ(G)-W10	Japanese	8ch
DCS-98112ME(G)-W10	English	12ch
DCS-98112MJ(G)-W10	Japanese	12ch
DCS-98116ME(G)-W10	English	16ch
DCS-98116MJ(G)-W10	Japanese	16ch

# Option Horizontal Testing Solution



The slip table system is the most familiar option to perform horizontal testing of a bulky unit or an article, which the mounted configuration cannot be changed. It has many uses for various tests such as: transportation test of electrical appliances, computers and office equipment, durability test of railway rolling stocks, signaling equipment and automobile parts, and environmental test of aeronautical equipment.

The general purpose ST series slip table system incorporates oil film slip table technology of circulating oil between a sliding slab and a slip table, which applies to most commonly applied operated range.

The oil circulating linear bearing strongly restrains and supports a specimen against eccentric moment. Therefore, a high center of gravity and off-center loads can be excited safely. The ST series slip table system is the most practical because of its high restraint while maintaining high accuracy.

## Specification

Model	ST-050-06	ST-050-16	ST-050-26	ST-050-36	ST-060-06	ST-060-16	ST-060-26	ST-060-36
Working Area mm	500×500	500×500	500×500	500×500	600×600	600×600	600×600	600×600
Screw Size	25-M10	25-M10	25-M10	25-M10	36-M10	36-M10	36-M10	36-M10
Screw Hole Pattern mm	100	100	100	100	100	100	100	100
Operating Frequency Hz	2000	2000	2000	2000	2000	2000	2000	2000
Maximum Payload kg	500	500	500	500	500	500	500	500
Table & Joint Mass kg	28	32	34	44	35	40	41	52
Matched Shaker	906	916	926	936	906	916	926	936

Model	ST-070-06	ST-070-16	ST-070-26	ST-070-36	ST-080-06	ST-080-16	ST-080-26	ST-080-36
Working Area mm	700×700	700×700	700×700	700×700	800×800	800×800	800×800	800×800
Screw Size	49-M10	49-M10	49-M10	49-M10	64-M10	64-M10	64-M10	64-M10
Screw Hole Pattern mm	100	100	100	100	100	100	100	100
Operating Frequency Hz	1800	1800	1800	1800	1700	1700	1700	1700
Maximum Payload kg	600	600	600	600	600	600	600	600
Table & Joint Mass kg	46	51	52	65	59	64	65	80
Matched Shaker	906	916	926	936	906	916	926	936

Model	ST-100-06	ST-100-16	ST-100-26	ST-100-36	ST-120-16	ST-120-26	ST-120-36
Working Area mm	1000×1000	1000×1000	1000×1000	1000×1000	1200×1200	1200×1200	1200×1200
Screw Size	100-M10	100-M10	100-M10	100-M10	144-M10	144-M10	144-M10
Screw Hole Pattern mm	200	200	200	200	200	200	200
Operating Frequency Hz	1500	1500	1500	1500	1200	1200	1200
Maximum Payload kg	1000	1000	1000	1000	2000	2000	2000
Table & Joint Mass kg	100	105	106	110	147	148	152
Matched Shaker	906	916	926	936	916	926	936

# Option Vertical Auxiliary Table



The vertical auxiliary table is the fixture most commonly used in various vibration tests to expand a mounting surface of the vibration generator for performing the transportation package test such as food, drink, chemicals, and large products as home electric appliances, and OA apparatus. Specifications in this fixture are important, but there is close relationship among table area, upper limit of frequency, and mass. In consideration of convenience and versatility, the vertical auxiliary table has various table sizes, threaded hole pattern for attaching a specimen and L-type hook (option) available.

## Specification

Model	VT-060-16-N-A		VT-060-26-N-A		VT-060-36-N-A		VT-080-16-N-A		VT-080-26-N-A		VT-080-36-N-A		
Working Area	mm	600Wx75H x600D	600Wx175H x600D	600Wx75H x600D	600Wx175H x600D	600Wx75H x600D	600Wx175H x600D	800Wx75H x800D	800Wx175H x800D	800Wx75H x800D	800Wx175H x800D	800Wx75H x800D	800Wx175H x800D
Table Size	mm	600	600	600	600	600	600	800	800	800	800	800	800
Maximum Frequency	Hz	500	1000	500	1000	500	1000	200	500	200	500	200	500
Mass	kg	30.5	58.0	31.0	58.5	31.5	59.0	48.5	81.0	49.0	81.5	49.5	82.0
Screw Size		36-M10, DP:15		32-M10, DP:15		36-M10, DP:15		64-M10, DP:15		60-M10, DP:15		64-M10, DP:15	
Screw Pitch	mm	100	100	100	100	100	100	100	100	100	100	100	100
Compatible Model		916/P10/S-085		926		936		916/P10/S-085		926		936	
P.C.D		100-200		80-160-240		100-200-300		100-200		80-160-240		100-200-300	
Part Number		B3-J-4870	B3-J-4873	B3-J-4871	B3-J-4874	B3-J-4872	B3-J-4875	B3-J-4876	B3-J-4879	B3-J-4877	B3-J-4880	B3-J-4878	B3-J-4881

Model	VT-100-16-N-A		VT-100-26-N-A		VT-100-36-N-A		VT-120-16-N-A		VT-120-26-N-A		VT-120-36-N-A		
Working Area	mm	1000Wx125H x1000D		1000Wx125H x1000D		1000Wx125H x1000D		1200Wx150H x1200D		1200Wx150H x1200D		1200Wx150H x1200D	
Table Size	mm	1000		1000		1000		1200		1200		1200	
Maximum Frequency	Hz	200		200		200		200		200		200	
Mass	kg	90.0		91.5		92.0		126.0		126.5		127.0	
Screw Size		100-M10, DP:15		96-M10, DP:15		100-M10, DP:15		144-M10, DP:15		140-M10, DP:15		144-M10, DP:15	
Screw Pitch	mm	100		100		100		100		100		100	
Compatible Model		916/P10/S-085		926		936		916/P10/S-085		926		936	
P.C.D		100-200		80-160-240		100-200-300		100-200		80-160-240		100-200-300	
Part Number		B3-J-4882		B3-J-4883		B3-J-4884		B3-J-4885		B3-J-4886		B3-J-4887	

\* Fixture is made of Aluminum. Magnesium alloy fixture is also available.  
\* Auxiliary tables for special specimens or special vibration conditions are available. Please contact us for details.

# Option Cubic Style Fixture



The JSA series cubic style fixture is used for performing vibration test of relatively small and light specimen such as various sensors, electrical components including electronic parts, printed circuit boards. In addition, we design and produce fixtures that meets the requirements for strength, stiffness, resonance frequency by taking the mass of a test article and frequency range of the vibration testing system into consideration.

## Specification

Model	JSA-150			JSA-200			JSA-300			
Cube Size	mm	150Wx150Hx150D			200Wx200Hx200D			300Wx300Hx300D		
Maximum Frequency	Hz	2000	2000	2000	2000	2000	2000	1000	1000	1000
Mass	kg	6	6	6	11	15	11	31	31	30
Screw Size		M5, DP:10	M5, DP:10	M5, DP:10	M6, DP:12	M6, DP:12	M6, DP:12	M10, DP:20	M10, DP:20	M10, DP:20
Compatible Model		916/P10/S-085	926	936	916/P10/S-085	926	936	916/P10/S-085	926	936
P.C.D		100	80-160	100	100-200	80-160	100-200	100-200	80-160-240	100-200-300
Part Number		B3-J-5100	B3-J-5101	B3-J-5102	B3-J-5103	B3-J-5104	B3-J-5105	B3-J-5106	B3-J-5107	B3-J-5108

\* Parts mounting plate for X, Y and Z axes of test allows for tailoring of its feature to fit to your specimen.  
\* Cube mass does not include specimen mounting board. Fixture is made of Aluminum. Magnesium alloy fixture is also available.  
\* Auxiliary tables for special specimens or special vibration conditions are available. Please contact us for details.

## Option

# Add-on Mechanism for Vibration Generator

### Reinforcing Mechanism against Offset Load

This mechanism enables the mounting of a load whose center of gravity is not on the centerline of the armature table. The guide mechanism added to the vibration generator can respond to vibrations causing a large eccentric moment.



### Load Support Enhancement Mechanism

The addition of a pneumatic spring to the reinforcing mechanism against the offset load makes it possible to increase the payload mass capability of the vibration generator.



### Counter Mass

The counter mass is necessary for exciting large and heavy test specimens by suppressing shaking of the vibration generator body.



### Electrical Towing Mechanism

This mechanism is convenient for moving a vibration generator placed on the rails.



## Option

# Add-on Mechanism for Slip Table System

### Electric Rollover Mechanism

This mechanism rotates the vibration generator body to easily change the thrust axis.



### Table Liftup Mechanism

This mechanism is used for moving the vertical auxiliary table up and down for easy attachment and removal. The work for this operation can be reduced to utilize a narrow working space effectively.



### Duct switching for Thrust Axis

This duct eliminates the handling of a blower hose in changing the thrust axis of the vibration generator.



### Fixture Transfer Mechanism

Installing and removing of the vertical auxiliary table can be performed by putting it on the movement base. The work for this operation can be reduced.



## Option

# Others

### CE Marking

It is possible to fit our product in the CE marking process specified in Europe (EU).



## New Addition Options

We are manufacturing new convenient option so that we can proceed with vibration test smartly.



### Stand Automatic Lock Mechanism

A mechanism for fixing the vibration generator automatically when changing the thrust axis between vertical and horizontal.

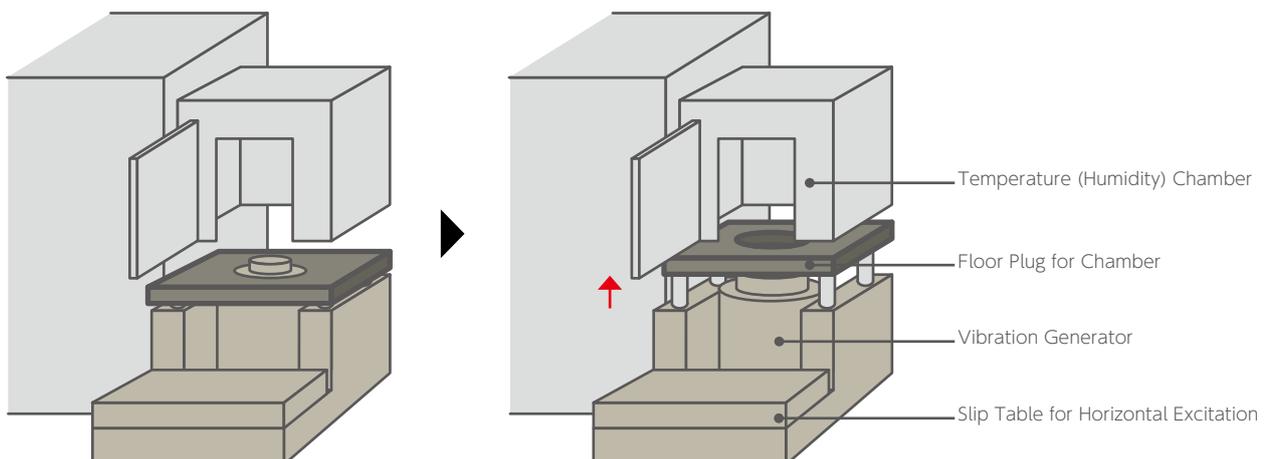
It automatically changes the thrust axis and fixes the vibration generator with one button (In case of using an electric rotating mechanism together).

In case of installing a temperature chamber, it is possible to drastically reduce the burden of narrow space work and manual work.

### Chamber Floor Plug Lifting Device

This mechanism for raising and lowering the floor plug of the chamber, makes it easy to change the vibration direction and install the chamber.

This mechanism allows operators to combine the vibration testing system and chamber without the necessity of physically placing the floor plug on the VTS. In addition, since the floor plug can be lifted to the chamber, the installation space for the entire system will be smaller.



# Vibration-Temperature (Humidity) Combined Environmental Reliability Test System

## VC Series General Purpose Vib-Tech Chamber<sup>®</sup>



※The vibration controller is mounted in the console rack. (Optional)

A combined environmental reliability test system is designed for performing vibration test under specified temperature and humidity conditions. The combined reliability tests have been performed to evaluate reliability of equipment from early days in the field of aerospace industry. But in recent years, electronic devices such as semi-conductors, etc. are rapidly advanced in technology and complex materials made of plastic are used in the automobile industry. The combined reliability test today becomes indispensable to assure product reliability. Until now, temperature, humidity, vibration, these three tests have been done separately. But, EMIC's combined environmental reliability test system enables simultaneous performance, therefore, the required test time can be reduced drastically, and the reliability of a test unit can be checked under more severe combined environmental condition than conventional test methods.

Vib-Tech Chamber<sup>®</sup> is a trademark of EMIC CORPORATION.

### Vib\_Tech Chamber<sup>®</sup> Specification

Selection Item	Code	Specification
Base Model	VC-062	600W×700H×600D mm Volume [252ℓ]
	VC-082	800W×800H×800D mm Volume [512ℓ]
	VC-102	1000W×1000H×1000D mm Volume [1000ℓ]
Category	A	Oven
	B	Temperature Chamber
	D	Temperature Humidity Chamber
Refrigerator Condensation	A	Air-cooled
	W	Water-cooled
		Not applicable
Moving Mechanism	F	Fixed to Floor Type
	M	Moving on Rail Type
	X	Drawer Type
Combination with Shaker	Y	Detachable Diaphragm Floor Plug Type
	Z	Through Hole Type
Temperature Range	(01)(02)(03)	01 (RT+10°C to 100°C) 02 (RT+10°C to 150°C) 03 (RT+10°C to 180°C)※
	(21)(22)(23)	21 (-25°C to 100°C) 22 (-25°C to 150°C) 23 (-25°C to 180°C)※
	(31)(32)(33)	31 (-40°C to 100°C) 32 (-40°C to 150°C) 33 (-40°C to 180°C)※
	(41)(42)(43)	41 (-55°C to 100°C) 42 (-55°C to 150°C) 43 (-55°C to 180°C)※
	(51)(52)(53)	51 (-70°C to 100°C) 52 (-70°C to 150°C) 53 (-70°C to 180°C)※
Programmer/Controller	M1	Manually Operated Digital Controller
	P3	LCD Touch Screen Controller
Recorder	T	5.7" TFT Color LCD, 6 CH Input, SD Card, Option: 12CH Input
	X	5.7" TFT Color LCD, 10CH Input (Expandable up to Max. 100 CH), SD Card, LAN Connection

※ Upper limit of 200°C: Option

※ When exporting Combined Environmental Testing System from Japan to overseas, Export License from the Ministry of Economy, Trade and Industry in Japan may be required depending on the specifications such as temperature range and rated force. Please contact us for details.



## Chamber Transfer Mechanism for switching Vibration Axis between Horizontal and Vertical Direction (Optional)

This mechanism is used for combining a chamber with the vibration testing system which a slip table is attached. The chamber can be easily joined with the vibration generator and slip table through a special interface using a lift mechanism to move the chamber up and down and the rails to move it horizontally. In addition, they can be used independently from each other by separating the vibration testing system from the chamber.



## Cantilever Type Chamber

The cantilever type temperature/humidity chamber has no frame around its test room to make the setup of a test article easier, therefore, the operating efficiency can be greatly improved. The test room can be moved with the test article mounted on the vibration generator.



※Crane is an option.

# Vibration-Temperature (Humidity) Combined Environmental Reliability Test System

## EHVC Series Rapid Vib-Tech Chamber®



※The vibration controller is mounted in the console rack. (Optional)

The EHVC Series Rapid Vib-Tech Chamber® is designed for highly accelerated life testing, the demand is increasing today. This is a joint system of the AGREE chamber and thermal shock chamber that we have manufactured and makes the temperature rate up to 16.8°C/min feasible with a compressor only. With this feature, the highly accelerated life test such as AGREE tests, most thermal shock tests can be done with one unit. Also the area requirement for installing the unit is about a half the space compared with the thermal shock test chamber composed of three compartments made by us until now.

Vib-Tech Chamber® is a trademark of EMIC CORPORATION.

### Specification

Model	EHVC-1118BWFY(53H13)	EHVC-1372BWFY(53H18)	EHVC-1118DWFY(53H11)	EHVC-1372DWFY(53H15)
Interior Dimensions	1118W×914H×1118D mm	1372W×1016H×1372D mm	1118W×914H×1118D mm	1372W×1219H×1372D mm
Dimensions	1981W×2440H×2845D mm	1980W×2540H×2972D mm	1981W×2440H×2845D mm	1980W×2795H×3300D mm
Temperature Range	-73 to +180°C	-73 to +180°C	-73 to +180°C	-73 to +180°C
Temperature Rise Rate	13°C/min	18°C/min	10°C/min	15°C/min
	20°C/min	25°C/min	18°C/min	18°C/min
Temperature Decrease Rate	13°C/min	18°C/min	11°C/min	15°C/min
	20°C/min	25°C/min	18°C/min	18°C/min
Temperature Decrease w/ LN2	60°C/min	60°C/min	60°C/min	60°C/min
Humidity Range	—	—	10 to 98%RH	10 to 98%RH
Option	LN2	LN2	LN2	LN2

※ The above temperature change rate is achieved under the condition of room temperature + 26°C, power supply frequency 60 Hz, regulated coolant temperature and specified flow rate. When the power supply frequency is 50 Hz, the temperature change rate is different from the above value, so please contact us.

※ It is the average temperature change rate at the vent without a test specimen over the temperature range from -40°C to +85°C.

※ When exporting Combined Environmental Testing System from Japan to overseas, Export License from the Ministry of Economy, Trade and Industry in Japan may be required depending on the specifications such as temperature range and rated force. Please contact us for details.

# HALT/HASS EVTC Series Highly Accelerated Life Test System



HALT/HASS testing challenges the design, components, sub-assemblies and final assemblies of today's manufactured products. Stresses are applied through a number of conditions to set operational limits and ultimately precipitate failure in the HALT/HASS test environment. Rapid thermal change rate is one of the classic conditions that facilitate product stress.

- Six-degree-of-freedom (6DoF), pseudo-random vibration
- Temperature range: -100 to +200 °C
- Temperature transition rate: 60 °C per minute (average)

※ To limit the usage of LN2 gas, Hybrid models equipped with refrigerators are available.

## Specification

Model	EVTC-4	EVTC-6	EVTC-9	EVTC-16	EVTC-25	EVTC-36
Interior Dimensions	762W×914H×762D mm	914W×914H×914D mm	1067W×965H×1067D mm 1067W×1270H×1067D mm	1372W×965H×1372D mm 1372W×1270H×1372D mm	1676W×965H×1676D mm 1676W×1270H×1676D mm	1930W×965H×1930D mm 1930W×1270H×1930D mm
Table Dimensions	610 mm×610 mm	762 mm×762 mm	914 mm×914 mm	1220 mm×1220 mm	1524 mm×1524 mm	1778 mm×1778 mm
Temperature Range	-100 to +200°C					
Transition Rate	60 °C/min(average)					
Maximum Acceleration	588 m/s <sup>2</sup> (59.9G) Pseudo-random					
Frequency Range	10 to 10 kHz					
Maximum Payload	315 kg	315 kg	315 kg	225 kg	225 kg	225 kg
Access Ports	∅ 152 mm×2 ∅ 25.4 mm×1	∅ 152 mm×2 ∅ 25.4 mm×1	∅ 152 mm×3 ∅ 25.4 mm×1			
Door	2	2	2(Front & Rear)	2(Front & Rear)	2(Front & Rear)	2(Front & Rear)
Viewing Window	2	2	4	4	4	4
Exterior Dimensions	1524W×2413H×1118D mm	1676W×2438H×1245D mm	1829W×2712H×1397D mm	2134W×2712H×1702D mm	2438W×2717H×2007D mm	2692W×2717H×2260D mm
Uncrated Weight	855 kg	1125 kg	1800 kg	2250 kg	2700 kg	3150 kg
Input Power	3∅AC 415V 70A	3∅AC 415V 70A	3∅AC 415V 145A	3∅AC 415V 145A	3∅AC 415V 202A	3∅AC 415V 214A

※ As for the detailed utilities (LN2, compressed air, ventilation, exhaust), please contact us.

※ When exporting Combined Environmental Testing System from Japan to overseas, Export License from the Ministry of Economy, Trade and Industry in Japan may be required depending on the specifications such as temperature range and rated force. Please contact us for details.

# Application Product

## Agree Type Combined Environmental Reliability Test System

Combined Environmental Reliability Test (CERT) system is to test equipment for aircraft according to the MIL-STD-781C standard.

- Rapid heating and cooling performance from 5°C/min to 10°C/min
- Temperature range: -55°C to +177°C



## Heat Durability of Material Surface with Infrared Ray Irradiation/vibration Cert System

CERT with Infrared Ray Irradiation for testing Heat Durability of Material Surface Combined Environmental Reliability Test System for testing inner packaging material such as instrumentation panels, cut-out bodies, doors and bumpers. In addition to a customary vibration-temperature combined environmental stress, the surface of a specimen can be simultaneously subjected to heat stress due to sunlight.

- Temperature range : -45°C to +150°C
- Humidity range : 30 to 90%RH
- Surface Temperature range : +50°C to +150°C



## CERT with Rotation Added

Vibration - Temperature/Humidity Combined Environmental Reliability Test System which forcefully rotates an actually configured specimen such as: water pumps, dynamos, alternators, etc. for a car.

- Temperature range:-40°C to +150°C
- Humidity range : 30 to 95%RH
- Rotation : 0 to 12000rpm
- Rotation torque : 0.4N·m



Details of Rotating Feature



## CERT with Hose Pressure Testing

Combined Environmental Reliability Test System for testing a pressure-proof hose or radiator hose for a car. It tests the durability of a pressure-proof hose in its actual configuration under heating and circulating anti-freeze or oil while pressurizing statistically or dynamically with a controlled temperature and vibration stress.

- Ambient temperature : -40°C to +150°C
- Hose pressurizing specification :
  - Maximum compression : 80kN
  - Maximum displacement : ±75mm
  - Pressurizing force : 1.9MPa
  - Circulating quantity : Maximum 40ℓ /min



Configuration of Hose in Workspace





## CERT for Exhaust Catalyst

Combined Environmental Reliability Test System for exhaust catalyst (catalyzer) of a car. The hot air of 1000°C generated with gas burner and the open air are supplied alternatively into the specimen on a shaker armature table. In addition, the water is also sprayed simulating the conditions of water pools and rain.

- Hot air temperature : RT to 1000°C
- Available gas : City gas, LP gas



## Low Frequency and Acceleration CERT

Combined Environmental Reliability Test System for calibration and characteristic measurement at low frequency, it can be applied to test a low frequency acceleration sensor, riding comfort sensor, sensitive instrument to earthquakes, heater safety device against earthquakes.

- Frequency range : 0.1 to 100Hz
- Max. displacement : 300mm<sub>p-p</sub>
- Rated force : 49N
- Temperature range : -50°C to +100°C



## Vacuum CERT

Vacuum CERT simulates the vibration generated by launching rockets to test aerospace components such as bearings, gears, harmonic drives, and valves. Specimen characteristics are sequentially evaluated under temperature/vacuum combined environments.

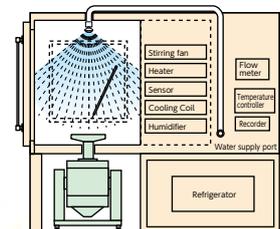
- Vacuum Chamber Dimensions : ø 1000mm×L1000mm
- Attainable pressure : Less than  $1 \times 10^{-5}$ Pa
- Temperature range : -150°C to +100°C
- Force : 80,000N(Sine)57,700N rms(Random)



## CERT with Rain and Water Spray

Combined Environmental Reliability Test System for parts around the wheel of a car and those for motorcycle. In addition to ordinary temperature and humidity tests, the water can be also sprayed simulating the conditions of water pools and rain.

- Water Splashing : Maximum 50L/min
- Water Splashing Port : Spray nozzle
- Temperature range to -40°C to +150°C



# Application Product

## Model : EMS-224 Angular Electrodynamic Shock Test System

EMS-224 is designed for testing the characteristic of an overturn angular velocity sensor (angular accelerometer for a reference acceleration signal) to be installed in a car. It is one of the various sensors used for cars and recently high performance test system for its development has been required. This shock test system is developed on an electrodynamic rotating actuator, and its control technology enables the reproductions of a haversine shock pulse and any angular velocity waveform as well as a half-sine shock pulse.



## Model : EMS-225 Dual Angular Electrodynamic Shock Test System

EMS-225 is designed for testing the characteristic of an angular velocity and acceleration sensor. A specimen-mounting table moves back and forth along a circular arc to generate angular velocity or angular acceleration according to a reference profile. It is used for measuring the frequency characteristic of sensors loaded on a car and gyro sensor for AV equipment. It is constructed to be easily combined with an environmental chamber to add temperature or humidity, which is an important environment for measuring characteristics.



## Model : EM-852 Rotating Type Shock Test System

The EM-852 applies rotating shock force to various storage devices such as: hard disk for servers, magnetic tapes, DVD drive units, vehicle-mounted equipment that has a rotor, gyro, sensor.

- Produced Energy : 60J
- Maximum Acceleration : 100krad/s<sup>2</sup> ( for pulse width of 0.5 ms)
- Table Size : ø 250mm



## Model : EM-983 Ultra High Frequency Vibration Generator

The EM-983 is a high performance vibration generator of ultra high frequency and small cross-talk. Designed for primarily measuring the high frequency characteristics of head suspension for a hard disk.

- Upper Operating Frequency : 100kHz( $f_0$ :Higher than 60kHz)
- Ceramic armature structure
- Use : Measuring frequency characteristic of head suspension for hard disks and accelerometers, and spurious of crystals for cellular phone.



Base for setting thrust axis to horizontal direction (left) and degaussing device (right) are option for EM-772.



## Rattle Noise Check System

The system is designed for measuring and evaluating faint unusual sounds (commonly called "Rattle Noise") generated from audio equipment such as a CD player mounted mainly on a car audio. A sound-proof box for attenuating surrounding noise and vibration test system matching to the usage shall be custom designed.



Stored in soundproof box.  
Vertical / Horizontal Vibration Test  
Equipment for Rattle Noise Evaluation.

## Bridge Model Exciting And Attenuating Test System

The system is designed for analyzing its structure by exciting the model of a large bridge before construction. Its attenuation constant can be measured by switching it into attenuation mode after excited with an electrodynamic shaker. The moving element is supported by the bearings, thus mechanical friction is reduced as much as possible to realize a more accurate test.



## Model : VC-101DWF(31)P2R-070BM/PAZ Vibration-temperature/humidity Characteristic Inspection System

This is the latest system installed in an inspection agency for the purpose of inspecting and measuring vibrometers and vibration sensors. The system is designed for inspecting according to the qualification system of the industrial research institute specified in the ISO/IEC directive 25 (ISO/IEC17025). Measuring accuracy is set high and the measuring features meet customer specifications. The measuring accuracy is especially determined by how to force the armature to behave in a particular way. Due to the advanced armature constraint method, the pneumatic air support will increase the clearance, lower distortion, will have low waverse sensitivity.



Inside View of  
Workspace



※ Because these products are custom ordered, EMIC may no longer manufacture these systems.

# Vibration Measuring Instruments

## Slim & High-Performance Charge Amplifier

Measuring a wide variety of vibrations: automotive, rail transportation equipment vibration, motor/pump vibration, vibration response during vibration test. Also available for a vibration test device for calibration of equipment.

Compatible with input of piezoelectric accelerometers and accelerometers with built-in pre-amplifiers.

Various options are available: PC communication port, etc.



6001-AHD

6002-A



AC Power Supply, USB Port

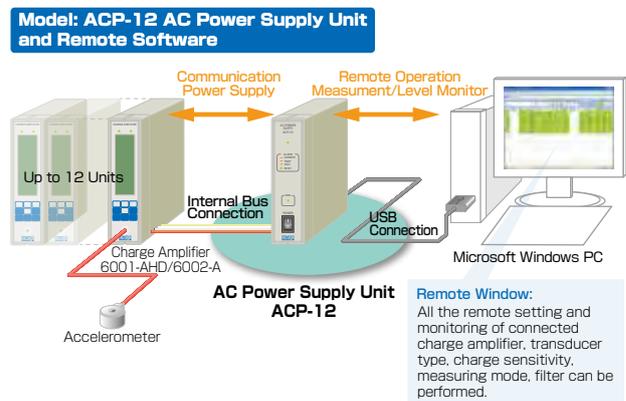
Specification		
Model	6001-AHD	6002-A
Input channel	1ch	2ch
Types	Piezoelectric accelerometers (Front Connector) Accelerometers w/built-in pre-amplifier (Rear Connector)	
Measuring Mode	Acceleration: m/s <sup>2</sup>	Acceleration: m/s <sup>2</sup>
	Velocity: mm/s	
	Displacement: mm	
Measuring Range	Acceleration: 0.1 to 10000m/s <sup>2</sup>	Acceleration: 0.1 to 10000m/s <sup>2</sup>
	Velocity: 0.1 to 10000mm/s	
	Displacement: 0.01 to 1000mm	
Input power	DC9 to 15V	
Dimension	36W×149H×240D	
Mass	1.0 kg	
Ambient Conditions	-10 to +50°C (No condensation)	

Model	ACP-12
Input power	AC 85 to 265 V 47 to 66 Hz
Output	DC+12V±5% 4A
Combined Number of Units	Max. 12 units
USB port	USB2.0
Dimension	36(W)×149(H)×240(D)
Mass	1.0 kg

## SVM Remote Software

The software can operate the 6001-AHD charge amplifier and 6002-A 2-channel charge amplifier by making it possible to remotely set the operator panel through a USB interface. The ACP-12 can connect up to 12 units in total enabling the remote operation of up to 24 channels.

- ※ It is also possible to configure the 6001-AHD up to 24 units (24 channels) using two ACP-12 units (one of them has no communication function).
- ※ As for the configuration from 25 to 99 channels, please contact us.



## 4 Channel Constant Current Power Supply Unit for Accelerometer with Integral Electronics

Power Supply Unit for Accelerometer with Integral Electronics



Power Supply Unit for Accelerometer with integral Electronics

Model	PS-504
Input channel	4 channels
I/O connector	BNC receptacle
I/O gain	×1 (fixed)
Lower limit freq.	0.2 Hz(within -3 dB), 0.7 Hz(within -5%)
Upper limit freq.	For accelerometer with integral electronics
Max. voltage	DC 24 V
Output current	DC 4mA
Input power	AC100V±10%
Max. power consumption	10 VA
Operating environments	Temp.: 0 to 50 °C, hum.: 95%RH w/o dewdrop
Outline dimensions	200W×55H×140D mm
Mass	1.3 kg

# Pre-charge Amplifier

## Pre-charge Amplifier 504 Series

The 504 series pre-charge amplifier is a signal conditioner for converting high impedance charge input into a low impedance voltage signal from a piezo-electric type accelerometer. One(1) input channel unit, two(2) input channel unit and four(4) input channel unit are available for your specific vibration control/measuring purpose. As any input charge sensitivity can be exactly set to the 504 series pre-charge amplifier within its preset range, the general purpose accelerometer in various sizes are available. A unit with a power supply is also available for various measuring purposes including vibration other than for a vibration test system as a general purpose pre-charge amplifier.



504-E



504-E-2



504-E-4



504-E-4-PS

### 504 Series Pre-charge Amplifier Specifications

Model(★1)	504-E	504-E-2	504-E-4	504-E/Z01	504-E-4/Z18
Input channel	1	2	4	1	4
Sensitivity range	0.100 to 0.999 1.00 to 9.99				
Maximum input(★2)	2200pC (0.100 to 0.999pC/(m/s <sup>2</sup> )) 22000pC (1.00 to 9.99pC/(m/s <sup>2</sup> ))	2200pC (0.100 to 0.999pC/(m/s <sup>2</sup> )) 22000pC (1.00 to 9.99pC/(m/s <sup>2</sup> ))	2200pC (0.100 to 0.999pC/(m/s <sup>2</sup> )) 22000pC (1.00 to 9.99pC/(m/s <sup>2</sup> ))	2200pC (0.100 to 0.999pC/(m/s <sup>2</sup> )) 22000pC (1.00 to 9.99pC/(m/s <sup>2</sup> ))	2200pC (0.100 to 0.999pC/(m/s <sup>2</sup> )) 22000pC (1.00 to 9.99pC/(m/s <sup>2</sup> ))
Frequency range	5 to 5000	5 to 5000	5 to 5000	5 to 5000	1 to 5000
Output voltage	5	5	5	1	5
Max. output voltage	±10	±10	±10	±10	±10
Input power	DC±15V ±15% 30mA				
Mass	0.6	0.6	1.0	0.45	1.0

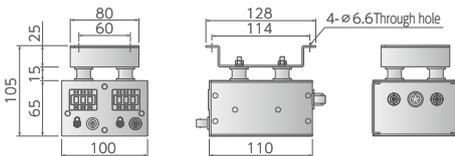
Model(★1)	504-CB/TKS	504-CB/TKS-2	504-CB/TKS-4
Input channel	1	2	4
Sensitivity range	0.100 to 9.999	0.100 to 9.999	0.100 to 9.999
Maximum input(★2)	100000pC	100000pC	100000pC
Frequency range	0.25 to 5000	0.25 to 5000	0.25 to 5000
Output voltage	10	10	10
Max. output voltage	±10	±10	±10
Input power	DC±15V ±15% 30mA	DC±15V ±15% 30mA	DC±15V ±15% 30mA
Mass	0.45	0.65	1.0

(★1) The model with a code "-PS" that can receive the input power of AC 100 V±0 V 50/60 Hz is also available.

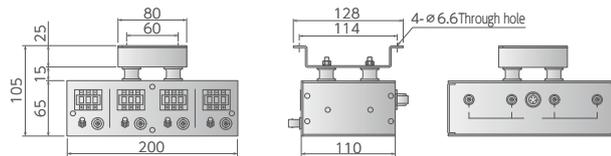
(★2) The maximum input charge is limited by the maximum output voltage.

### Outline Drawing

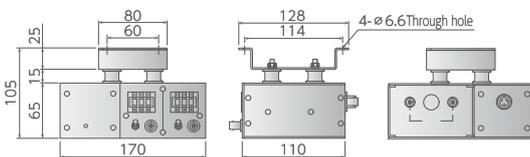
#### ● 504-E-2



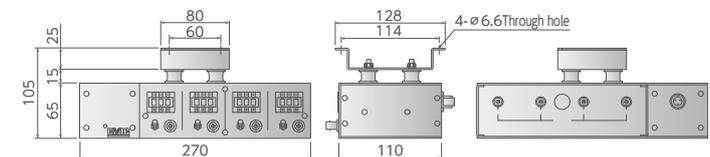
#### ● 504-E-4



#### ● 504-E-2-PS



#### ● 504-E-4-PS



# Accelerometer

## Accelerometer

EMIC offers many kinds of accelerometers available for various vibration measurements. They are ultra small, light weight accelerometers for highly precise measurements. A special tri-axial accelerometer for simultaneously measuring a vibration in three orthogonal axes is available. A large output accelerometer for measuring earthquakes and a suitable accelerometer for measuring and analyzing building structures.



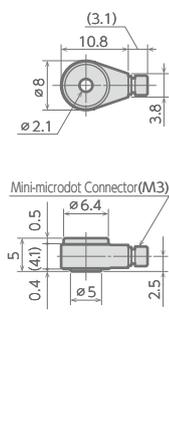
### Specification

Model	710-D	712-B3	720-BW	731-B	760-B	541-DSH
Type	Small/Light Weight	Tri-axial	Water-proof	General Purpose	Large Output	High Temperature
Dimensions mm	ø8×5	17.5W×9HX17.5D	ø15×8	ø17.5×9.8	24 <sub>HEX</sub> ×30	14 <sub>HEX</sub> ×29
Feature	Vibration measurement and modal analysis on small object	Simultaneous dynamic measurement in three orthogonal axes on small object	Center hole type suited to narrow space. Water-proof against 0.6 MPa	Center hole type suited to attach to narrow space. Side connector for easily routing cable	Most suited to low acceleration measurement on building and structure	Most suited to measurement at high temperature such as combined environmental test
Sine Vibration Limit m/s <sup>2</sup>	5000	5000	5000	5000	1250	—
Shock Limit m/s <sup>2</sup>	10000	10000	10000	15000	2500	16000
Mass g	1.9	14	11	13.5	98.6	35
Frequency Response* Hz	Up to 20k±3dB	Up to 8k±1dB	Up to 8k±1dB	Up to 7k±1dB	Up to 3.5k±1dB	Up to 5k
Charge Sensitivity pC/(m/s <sup>2</sup> )	0.2±15%	0.347±20%	1.33±20%	3.67±20%	35±20%	5.0±25%
Mounted Resonance Hz	More than 60k	More than 25k	More than 26k	38k±5	13.5k±4	More than 27k
Temperature Range °C	-50 to +160	-50 to +160	-20 to +120	-50 to +160	-20 to +120	-20 to +250
Construction	Piezoelectric Shear	Piezoelectric Shear	Piezoelectric Shear	Piezoelectric Shear	Piezoelectric Shear	Piezoelectric Compression
Capacitance pF	1200±20%	750±25%	1900±25%	1900±25%	1500±25%	1000±25%
Transverse sensitivity	Less than 5%	Less than 5%	Less than 5%	Less than 5%	Less than 5%	Less than 5%
Piezoelectric material	Pb(Zr·Ti)O <sub>3</sub>	Pb(Zr·Ti)O <sub>3</sub>	Pb(Zr·Ti)O <sub>3</sub>	Pb(Zr·Ti)O <sub>3</sub>	Pb(Zr·Ti)O <sub>3</sub>	Pb(Zr·Ti)O <sub>3</sub>
Case Material	Stainless	Titanium	Stainless	Titanium	Stainless	Stainless
Mounting	M2 thru, adhesive	M2 thru, adhesive	M4 thru	M4 thru	M8×5 Internal thread	M6×5 Internal thread
Cable/Adapter(Micro BNC)	AC-7020-BM(BLM-001)	AC-8030-AB×3	Integral 10m BNC w/plug	AC-8030-AB	AC-8030-AB	AC8020-ABH High temp.

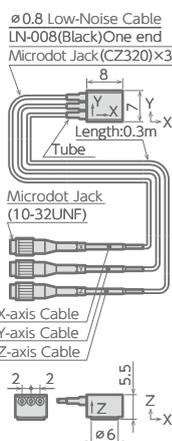
\* Low-frequency response frequency is dependent on the charge vibration meter.

### Outline View

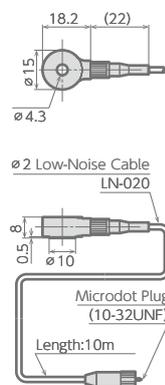
#### ● 710-D



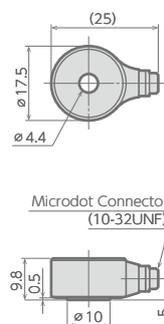
#### ● 712-B3



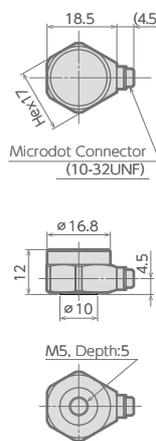
#### ● 720-BW



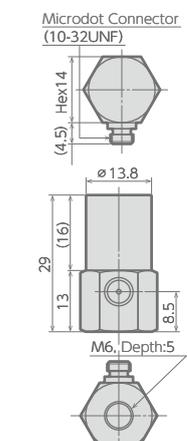
#### ● 731-B



#### ● 760-B



#### ● 541-DSH





## Accelerometer Cable

Product Description	Model	Cable Outline
Microdot Plug - BNC Plug Accelerometer Cable (2 m)	AC-8020-AB	
Microdot Plug - BNC Plug High Temp. Acc. Cable (2 m)	AC-8020-ABH	
Microdot Plug - BNC Plug Accelerometer Cable (3 m)	AC-8030-AB	
Microdot Plug - BNC Plug High Temp. Acc. Cable (3 m)	AC-8030-ABH	
Microdot Plug - BNC Plug Accelerometer Cable (5 m)	AC-8050-AB	
Microdot Plug - BNC Plug High Temp. Acc. Cable (5 m)	AC-8050-ABH	
Microdot Plug - BNC Plug Accelerometer Cable (10 m)	AC-8100-AB	
Microdot Plug - BNC Plug High Temp. Acc. Cable (10 m)	AC-8100-ABH	
Microdot Plug - Microdot Plug Accelerometer Cable (2 m)	AC-8020-AM	
Microdot Plug - Microdot Plug High Temp. Acc. Cable (2 m)	AC-8020-AMH	
Microdot Plug - Microdot Plug Accelerometer Cable (3 m)	AC-8030-AM	
Microdot Plug - Microdot Plug High Temp. Acc. Cable (3 m)	AC-8030-AMH	
Microdot Plug - Microdot Plug Accelerometer Cable (5 m)	AC-8050-AM	
Microdot Plug - Microdot Plug High Temp. Acc. Cable (5 m)	AC-8050-AMH	
Microdot Plug - Microdot Plug Accelerometer Cable (6 m)	AC-8060-AM	
Microdot Plug - Microdot Plug High Temp. Acc. Cable (6 m)	AC-8060-AMH	
Microdot Plug - Microdot Plug Accelerometer Cable (10 m)	AC-8100-AM	
Microdot Plug - Microdot Plug High Temp. Acc. Cable (10 m)	AC-8100-AMH	
Mini-microdot Plug - Microdot Plug Acc. Cable (2 m)	AC-7020-BM	
Extension Cable (Every 1 m)	-	
Conversion Adapter (BNC Plug - Microdot Jack)	BLM-001	

## Insulated Mounting Stud

Product Description	Model
Insulated Stud for 540-DT	RS-171D
Insulated Stud for 710-D	TJ-1026AC

Product Description	Model
Insulated Stud (M5) for 731-B	RS-171B14C6
Insulated Stud (M6) for 731-B	RS-171B14D6

## Accelerometer Set

In addition to the accelerometer body, this set includes all required accessories such as dedicated cables and insulators.



## Accelerometer Set

Product Description	731-B Accelerometer Set 3 m		731-B Accelerometer Set 6 m	
Model	731-B(FSET3m)		731-B(FSET6m)	
Contents of Set	Accelerometer	731-B	Accelerometer	731-B
	Accelerometer Cable	AC-8030-AM	Accelerometer Cable	AC-8060-AM
	Microdot - BNC Adapter	BLM-001	Microdot - BNC Adapter	BLM-001
	Insulated Stud	RS-171B14C6	Insulated Stud	RS-171B14C6

Product Description	Built-in Set for 902 Vibration Generator		Built-in Set for 903 Vibration Generator	
Model	BIN-PU902SET		BIN-PU903SET	
Contents of Set	Accelerometer	540-DS	Accelerometer	540-DS
	Accelerometer Cable	AC-8030-AM	Accelerometer Cable	AC-8030-AM
	Microdot - BNC Adapter	BLM-001	Microdot - BNC Adapter	BLM-001
	Insulator		Insulator	541AR-5100
	Set Screw		Set Screw	M6x10

Product Description	Built-in Set for 906 Vibration Generator		Built-in Set for BD Vibration Generator	
Model	BIN-PU906SET		BIN-PUBDSET	
Contents of Set	Accelerometer	540-DS	Accelerometer	731-B
	Accelerometer Cable	AC-8030-AM	Accelerometer Cable	AC-8030-AM
	Microdot - BNC Adapter	BLM-001	Microdot - BNC Adapter	BLM-001
	Set Screw	M6x10	Insulated Stud	RS-171B14C6

# Modernization Program

The modernization program is the renewal program of an old type vibration testing system that you currently use.

BEFORE



AFTER

## Renewal of Power Amplifier

This program replaces an old type power amplifier with the latest switching amplifier of high output and efficiency. The power amplifier can be reduced in size and the service life of the vibration testing system can be extended.



## Overhaul of Vibration Generator

Although the cleaning of the inside of the vibration generator body and replacement or adjustment of some deteriorated parts cannot be performed in usual inspection. An overhaul can allow the system to operate in an optimum working mode for the long term.



## Renewal of Vibration Controller

This program replaces your vibration controller with the state-of-the-art vibration controller. As a result, operations can be easily executed and the latest vibration control including the basic operations such as sine, random, shock becomes available.



## Addition of Chamber

An existing vibration testing system can be enhanced to a combined environmental reliability test system by adding a temperature (humidity) chamber.



## Addition of Slip Table

The addition of the slip table enables horizontal vibration tests by changing the thrust axis. It also enables testing of heavy equipment.



## ECO-Vibe neo Modification for Energy-saving Drive Mode

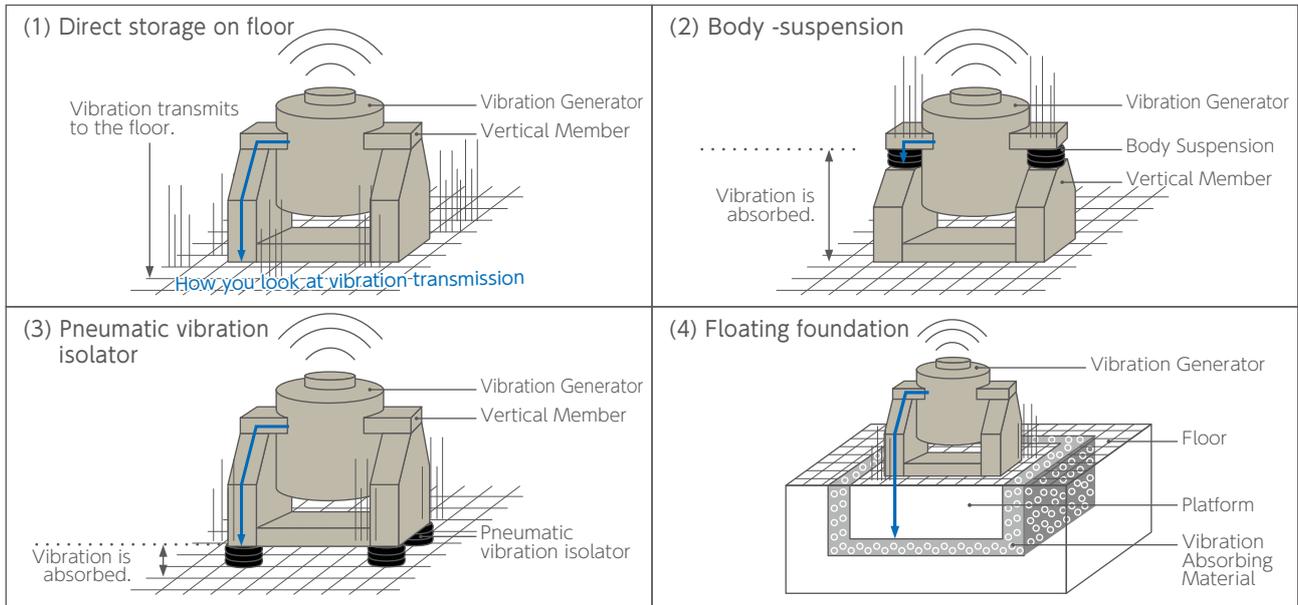
ECO-Vibe neo modifies an existing F series vibration test system and can achieve higher power saving.



# Vibration Isolation and Noise Control

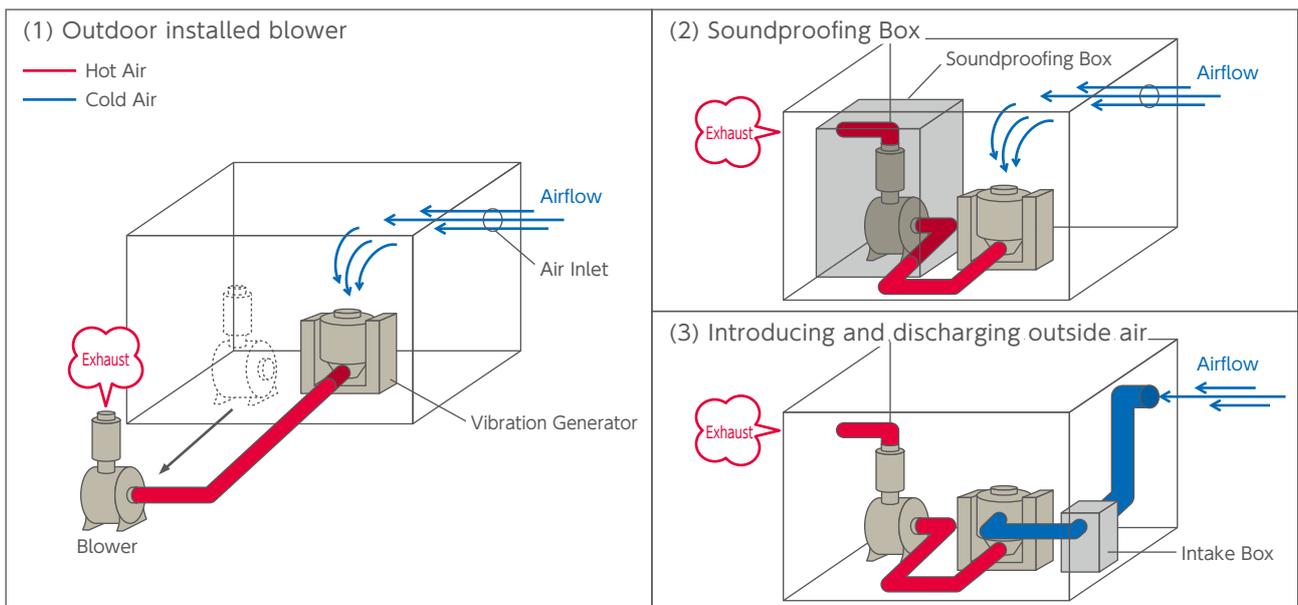
When operating a vibration testing system, the vibration transmits from a vibration generator to the floor or the building structure. When the frequency of this vibration coincides with the resonance frequency in turn, the vibration can increase significantly. To prevent vibrations from transmitting to the system, the sound or vibration control is required for the vibration testing system. The following are various countermeasures against vibration and sound depending on the test specimen, testing equipment and installation site.

## Vibration-proof Mechanism



## Countermeasure against Sound

The vibration testing system, dependent on a test condition, makes noise larger than 100 dB. Therefore, countermeasures against noise may be necessary. The noise can be reduced by more than approx. 20 dB by constructing a soundproofing box/room. There are various noise made in exciting a specimen, intake of outside air, operating the blower motor, exhausting from the blower, etc..



## Compliance with various regulations and rules for facilities

Vibration and the noise generated from various test equipment can correspond to the levels regulated in the local regulations and the company's regulations. In this case we can provide appropriate specifications and configurations based on the applicable regulations and rules.

## Outsourcing includes quality, reliability, durability, and environmental tests EMIC's contracted test service provides high-quality and reliable services.

### Scope of Service

This service we offer allows customers to bring in test articles and perform various tests using the test equipment in our test laboratories. In addition, we can discover and solve the underlying problems that are hard to predict and provide test solutions to improve test quality and get accurate results.

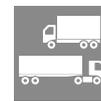
### Object to be tested by the customer



Electric/Electronic and Precision Machine



Equipment for Automobile



### Test Planning

We will jointly examine your desired test purpose, then offer you the appropriate test plan.

Safety

Reliability

Durability

Quality

Impact Resistance

Packaging Reliability

### Vibration Test, Combined Environmental Test

Sine Vibration, Random Vibration, Shock, Temperature Humidity Test, Vibration-Temperature/Humidity Combined Reliability Test, Actual Environment Simulation Test



Function and Durability Test of Engine

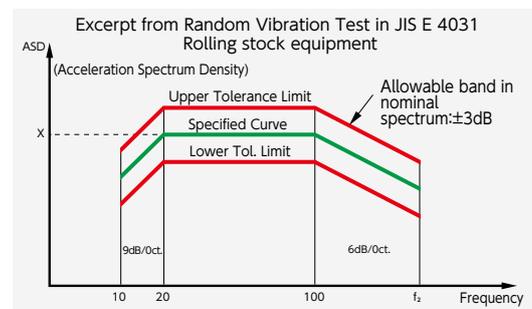
### Temperature Test

Heat Resistance and High Temperature Test

### Large-scale Vibration Test

- Enriched large vibration testing system (fully equipped with the rated force 180kN/100kN scale) corresponding to assembling item, large product and heavy specimen
- Additional large triaxial vibration testing system corresponding to the latest railway rolling stock standard and seismic simulation

- ◆ JIS E 4031 Rolling stock equipment -- Vibration and shock tests
- ◆ Corresponding to JIS E 3014 Parts for railway signal -- Vibration methods
- ◆ Corresponding to JIS Z 0232 Packaged freights -- Method of vibration test
- ◆ The earthquake simulation by seismic intensity, earthquake acceleration and earthquake actual survey data is possible.



### Highly Accelerated Life Testing (HALT), Highly Accelerated Stress Screening (HASS)

Although the conventional environmental simulation test is performed to shorten a designed validation test, lower the failure rate of products, extend the service life of products and decrease claims after the sale, the HALT and HASS apply the excessive stress to a product to check its operational limit and destructive limit to verify the design.



## Design and Manufacture of Specialized Fixture

The key role of the fixture is to attach a specimen and transmit vibration. We offer the design, analysis and manufacturing of specialized fixtures.

### The advisors with the most experience will support the testing needs of your company

In performing vibration tests, the technical design of the fixture for mounting a test article is essential.

- The key role of the fixture is to attach a specimen and transmit vibration, in particular transmitting vibration is most important.
- The fixture becomes inherently deformed depending on the test condition or vibration mode.
- Depending on the vibration mode the fixture may not transmit vibration to a specimen, therefore, the intended vibration test may not be performed.
- The vibration mode shows distinctive changes depending on the difference in size and mass of a specimen and test conditions.

EMIC has the design, analysis and manufacture of a fixture meeting the requirement for the customer's demands based on the abundant technique and actual performance of manufacturing, selling and contracted test service and realizes an accurate test.



#### EMIC CORPORATION

Technical Advisor  
Yoshio ISHITA

- Chairman, Subcommittee on Mechanical Environment of Japan Testing Machinery Association
- IEC/TC104/A National Deliberation Committee & JIS Drafting Committee
- ISO/TC108/SC6 National Deliberation Committee
- Former Guest Professor, National Institute of Technology, Numazu College
- Former Technical Advisor, Yamagata-Pref. and Fukushima-Pref.
- Former research committee member, Ministry of Economy, Trade and Industry

## Customer Response by Support Staffs

Our experts support the setup of test specimens, and operational procedure of test equipment.

## Provision of Solution required for Testing

We offer solution to discover and solve a problem with various tests.

East Japan Contracted Test Sales Dept.	Utsunomiya Test Lab Center	23-1 Kiyohara Kogyo-danchi, Utsunomiya-shi, Tochigi 321-3231, Japan
	First Saitama Test Lab Center	622-1 Asahigaoka, Hidaka-shi, Saitama 350-1203, Japan
	Second Saitama Test Lab Center	
	Mishima Test Lab Center	11 Heiseidai, Mishima-shi, Shizuoka 411-0042, Japan
Center Japan Contracted Test Sales Dept.	Mizunami Test Lab Center	2020 Yamada Cho, Mizunami-shi, Gifu 509-6104, Japan
	Yokkaichi Test Lab Center	2-1-26 Noda, Yokkaichi-shi, Mie 510-0815, Japan
	Hikone Test Lab Center	746-1 Nodayama Cho, Hikone-shi, Shiga 522-0025, Japan
West Japan Contracted Test Sales Dept.	Kobe Test Lab Center	5-2-13 Mitsugaoka, Nishi-ku, Kobe-shi, Hyogo 651-2228, Japan
	Hyogo Test Lab Center	47-13 Niijima, Harima-cho, Kako-gun, Hyogo 675-0155, Japan
Overseas	Thailand Test Lab. Center	15/1 Soi Punnavithi 28, Sukhumvit 101 Road, Bangchak, Prakanong, Bangkok 10260, Thailand

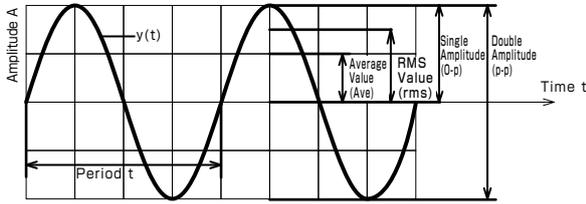
## The ISO/IEC 17025 accreditation for technical competence.

First Saitama Test Lab, Yokkaichi Test Lab and Kobe Test Lab received the accreditation on ISO/IEC 17025 "General requirements for the competence of testing and calibration laboratories" and can issue the test data with accreditation marks listed. IEC/ISO 17025 also takes the requirements in ISO/IEC Guide 25 of its technical requirements based on the requirements in ISO 9001:2000. In addition, it requires the environmental condition necessary to estimate uncertainty, validity confirmation, etc. according to UM. Accreditation of testing laboratories according to this standard assesses the conformity of technical competence as well as the operation and effectiveness of the quality management system within the laboratory. Based on accumulated much knowledge for longer than 40 years and accreditation EMIC gives a customer a reliable test result.

# Technical Notes

## Fundamentals of Vibration

### Basic Vibration

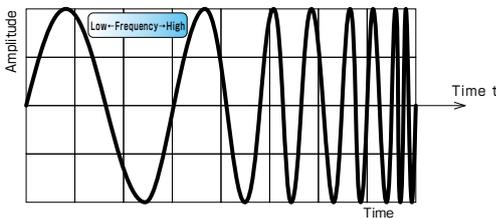


The most fundamental vibration is motion such that the amplitude is a sinusoidal function of time. The vibration level is generally represented by acceleration, velocity and displacement. The sinusoidal vibration is specified by the following parameter as:

- Period  $t=1/f$ (Frequency)
- Single Amplitude (0-p)
- Double Amplitude (p-p)=Single Amplitude (0-p)×2
- Root-mean-square Value (rms)=Single Amplitude (0-p)×1/√2
- Average Value (Ave)=Single Amplitude (0-p)×2/π

Basic Equation  $y(t)=A \cdot \sin \omega t$  ( $\omega$ :Angular Frequency)

### Sine Vibration Test



Point Test (Fixed frequency test)

The point test is done at a frequency fixed to any given value. The aim is to evaluate the durability of a unit under test at its resonant condition or the characteristics at a specified frequency.

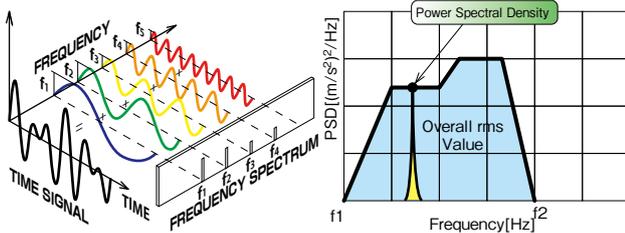
- Main Parameter
- Frequency [Hz]
  - Acceleration [m/s<sup>2</sup>]
  - Test Time [t]

Swept Sine Test

The frequency of a swept sine test changes with time continuously for the purpose of resonant search or the evaluation of characteristics over any frequency range.

- Main Parameter
- Frequency [Hz]
  - Acceleration [m/s<sup>2</sup>]
  - Test Time [t]
  - Sweep Rate [oct/min], [Hz/s]

### Random Vibration Test

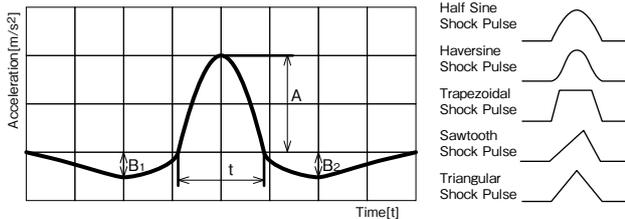


A random vibration happens when sinusoidal waves of different frequency and phase are combined. The random vibration test permits to detect many vibrations in resonance in a short time because it can excite test article at many different frequencies simultaneously. Also it can simulate vibrations close to a real environment.

Main Parameter

- Overall rms Value (rms) [m/s<sup>2</sup>rms]
- Power Spectral Density (PSD) [(m/s<sup>2</sup>)<sup>2</sup>/Hz]
- Test Time [t]

### Shock Test



● Main Shock Pulse

● Half Sine Shock Pulse

● Haversine Shock Pulse

● Trapezoidal Shock Pulse

● Sawtooth Shock Pulse

● Triangular Shock Pulse

The shock test assures that material can withstand the nonrepetitive shocks and transient vibrations as well as measuring the item's fragility.

Main Parameter

- Main Shock Pulse
- Shock Pulse Duration [s] t
- Acceleration [m/s<sup>2</sup>] A
- Velocity [m/s] V
- Pre-load [%] P<sub>1</sub> P<sub>1</sub>=B<sub>1</sub>/A×100[%]
- Post-load [%] P<sub>2</sub> P<sub>2</sub>=B<sub>2</sub>/A×100[%]

## Unit System

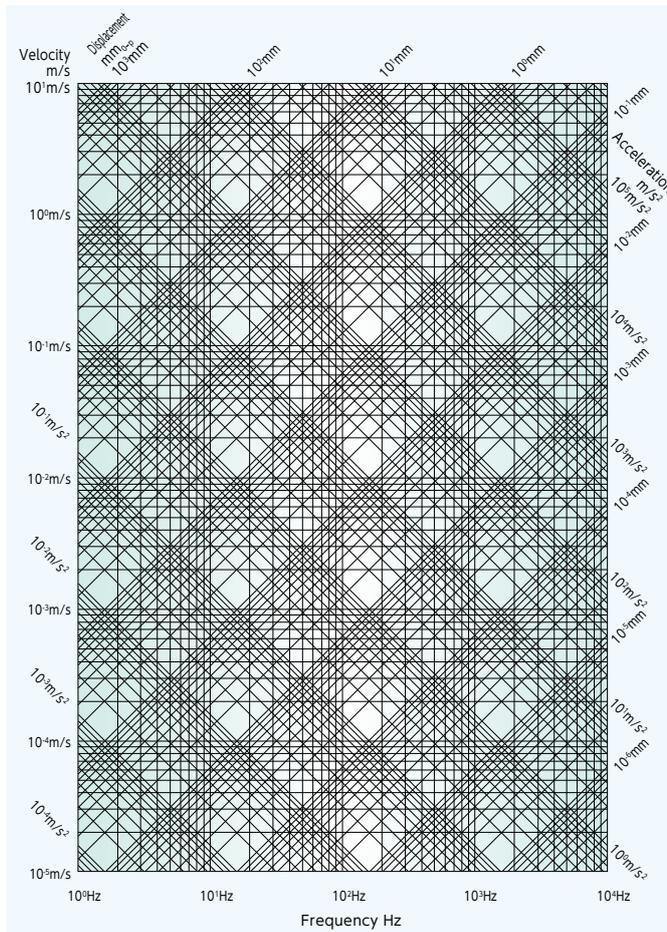
International System of Units SI (JIS Z 8202)			
	Quantity	Unit Name	Unit Symbol
Base Unit	Length	meter	m
	Mass	kilogram	kg
	Time	second	s
	Thermodynamical Temperature	Kelvin	K
Auxiliary	radian	radian	rad
Derived Unit	Velocity	meter per second	m/s
	Acceleration	meter per second square	m/s <sup>2</sup>
	Angular Velocity	radian per second	rad/s
	Angular Acceleration	radian per second squared	rad/s <sup>2</sup>
	Force	newton	N
	Moment, Torque	newton-meter	N·m

## Terminology

- **Power Spectral Density**  
Power level (energy per unit time) at each frequency. In particular, it shows a vibration environment for equipment in a random vibration test.
- **Overall rms Value**  
The square root of the sum of vibration power over a certain frequency range. In particular, it shows the overall value of vibration power (kinetic energy) such as random vibration.
- **Pre-Pulse, Post-Pulse**  
Compensation pulse of the waveform to yield zero final velocity and displacement. the compensation pulse to be added before and after the main pulse is called pre-pulse post pulse respectively.

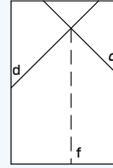


## Vibration Nomograph

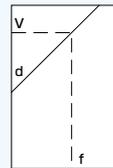


## How to Use Vibration Nomograph

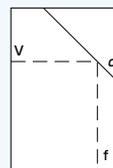
● Relation among displacement, d, acceleration,  $\alpha$  and frequency, f.



● Relation among velocity, v, frequency, f and displacement, d.



● Relation among velocity, v, frequency, f and acceleration,  $\alpha$ .



d : Displacement (mm<sub>o-p</sub>)  
V : Velocity (m/s<sub>o-p</sub>)  
 $\alpha$  : Acceleration (m/s<sup>2</sup><sub>o-p</sub>)  
f : Frequency (Hz)

## Relation Among Acceleration, Velocity and Displacement.

Relation	Equation for Estimation
Acceleration $\alpha$ [m/s <sup>2</sup> <sub>o-p</sub> ] = $(2\pi f)^2 d / 1000$ = $2\pi f v$	$\alpha$ [m/s <sup>2</sup> <sub>o-p</sub> ] $\approx 0.0394 d f^2$ ※1 $\approx 6.28 f v$ ※1
Velocity V [m/s <sub>o-p</sub> ] = $2\pi f d / 1000$ = $\alpha / 2\pi f$	$v$ [m/s <sub>o-p</sub> ] $\approx 0.00628 f d$ $\approx 0.159 \alpha / f$ ※2
Displacement d [mm <sub>o-p</sub> ] = $1000 \alpha / (2\pi f)^2$ = $1000 v / 2\pi f$	$d$ [mm <sub>o-p</sub> ] $\approx 25.3 \alpha / f^2$ ※2 $\approx 159.2 v / f$

※1 Divide the acceleration value by 9.8 when its unit is G.  
※2 Multiply the acceleration value by 9.8 when its unit is G.

## Decibel Value

The unit, decibel [dB] is used to compare the ratio of two sound intensities or vibration levels.  
Calculation Formula:

Gain of acceleration, voltage, sound pressure, etc.  $G_v(\text{dB}) = 20 \times \log_{10} (\text{Output Voltage}/\text{Input Voltage})$   
Gain of electric power, acoustic power, etc.  $G_p(\text{dB}) = 10 \times \log_{10} (\text{Output Power}/\text{Input Power})$

### ● A multiple calculation can be simplified.

The ratio can be calculated by summing the quantity in decibels of the individual components, rather than multiply the amplification factors. For example, let's compare how to calculate the amplification factor when amplifiers of different amplification factor are connected in series. If the amplifiers amplify the input signal to 56 times (35 dB or app.) and 9 times (19 dB or app.) respectively are connected in series, the total amplification factor is  $56 \times 9 = 504$  times for the multiple calculation, on the other hand,  $35 + 19 = 54$  dB for the decibel calculation. Because the decibel calculation is the summation, it can be performed easier than the multiplication.

### ● Decibel indicating relative value to reference value

The decibel indicates how many times the value (signal) to be compared is to the reference value (signal). Since the comparison of sound intensity (sound pressure), vibration and power, and the attenuation, etc. are expressed by the ratio of energy, the decibel is employed. The amplification factor and attenuation rate in the electrical system, for example, transmitting the electrical power, the ratio of output power to input power is used. The decibel expresses the ratio to a certain reference physical quantity by the common logarithm. It is the relative value, not the absolute value.

### ● Correlativity of decibel and human perception is best

In human hearing the resolution of perception is constant when the sound level changes 2 times, 4 times, 8 times, 16 times,....logarithmically (Weber-Fechner's law). This is because it uses the decibel that the volume of sound to hear changes in the same way when the volume of the acoustic equipment has been turned up.

Relation between Decibel Value and Magnification Ratio

Decibel Value	Magnification Ratio
-120[dB]	0.000001 (1/1000000)
-100[dB]	0.00001 (1/100000)
-80[dB]	0.0001 (1/10000)
-60[dB]	0.001 (1/1000)
-20[dB]	0.100 (1/10)
-10[dB]	0.316 (1/3)
-6[dB]	0.501 (1/2)
-3[dB]	0.709 (7/10)
0[dB]	1.000 (1)
3[dB]	1.410 (1.41)
6[dB]	2.000 (2)
10[dB]	3.160 (3)
20[dB]	10.00 (10)
40[dB]	100.0 (100)
60[dB]	1000 (1000)
80[dB]	10000 (10000)
100[dB]	100000 (100000)
120[dB]	1000000 (1000000)

# Vibration Generator Selection

## 1. Definition of Test Conditions

First, check and define the test conditions for the vibration test to be put into execution.

- Estimated mass of test article and fixture
- Maximum acceleration (velocity or displacement)
- Frequency or frequency range

## 2. Calculation of Required Force

Determine the required force for the vibration test using the following equation by substituting the defined test conditions above.

$$F = (m_0 + m_1 + m_2) \times \alpha$$

F : Force (N)       $m_1$  : Fixture mass (kg)

$\alpha$  : Acceleration ( $m/s^2$ )       $m_2$  : Test article mass (kg)

$m_0$  : Moving element mass (kg)

Example: Assuming that Model: F-10K/56 system is suitable for your application, the moving element mass  $m_0$ , fixture mass  $m_1$  and test article mass  $m_2$  be 15 kg, 20 kg and 35 kg respectively. Determine the required force for generating the acceleration level  $\alpha$  of  $98.0 m/s^2$  as follows;

$$F = (15kg + 20kg + 35kg) \times 98.0 m/s^2 \\ = 6860N$$

## 3. Selection of Vibration Testing System

If the following specifications of a certain vibration testing system can meet the test conditions and calculated force, that system is available for your application.

- Frequency range
- Rated force
- Maximum acceleration
- Maximum velocity
- Maximum displacement

To choose the most suitable vibration testing system:

(1) Requirement for force generated by vibration testing system.

When customers select the vibration testing system by themselves, its rated force shall be larger than 1.25 times of the required force for a test by taking the dynamical behavior of a specimen, etc. into consideration. Please contact us for advice on the above condition.

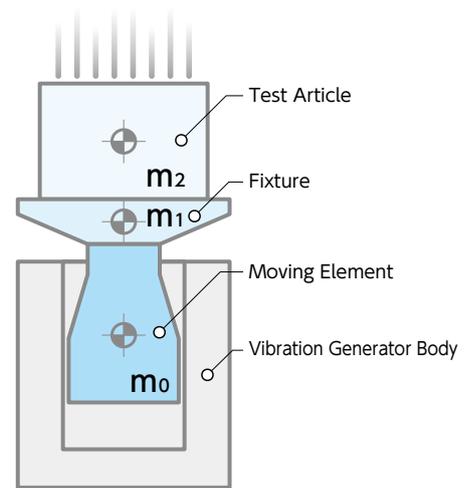
(2) Allowable moment against offset load

The ideal mounting method of a specimen is to be placed on the armature table so that its center of gravity will be positioned at the center of the armature table. The eccentric moment increases with the distance between them. Please attach the load to a suitable position by taking high acceleration level due to resonance into consideration. Please contact us for advice on large distance condition.

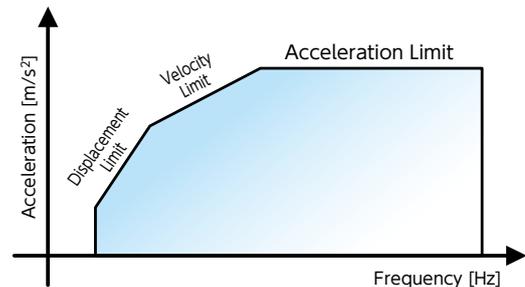
## Conversion between SI and others

Unit	SI	Gravitational
Force	1N	0.10197kg (0.102kgf or app.)
	9.80665N (9.8N or app.)	1kgf
Acceleration	1m/s <sup>2</sup>	0.101972G (0.102G or app.)
	9.80665m/s <sup>2</sup> (9.8m/s <sup>2</sup> or app.)	1G

## ■ Outline Block Diagram



## ■ Performance Curve



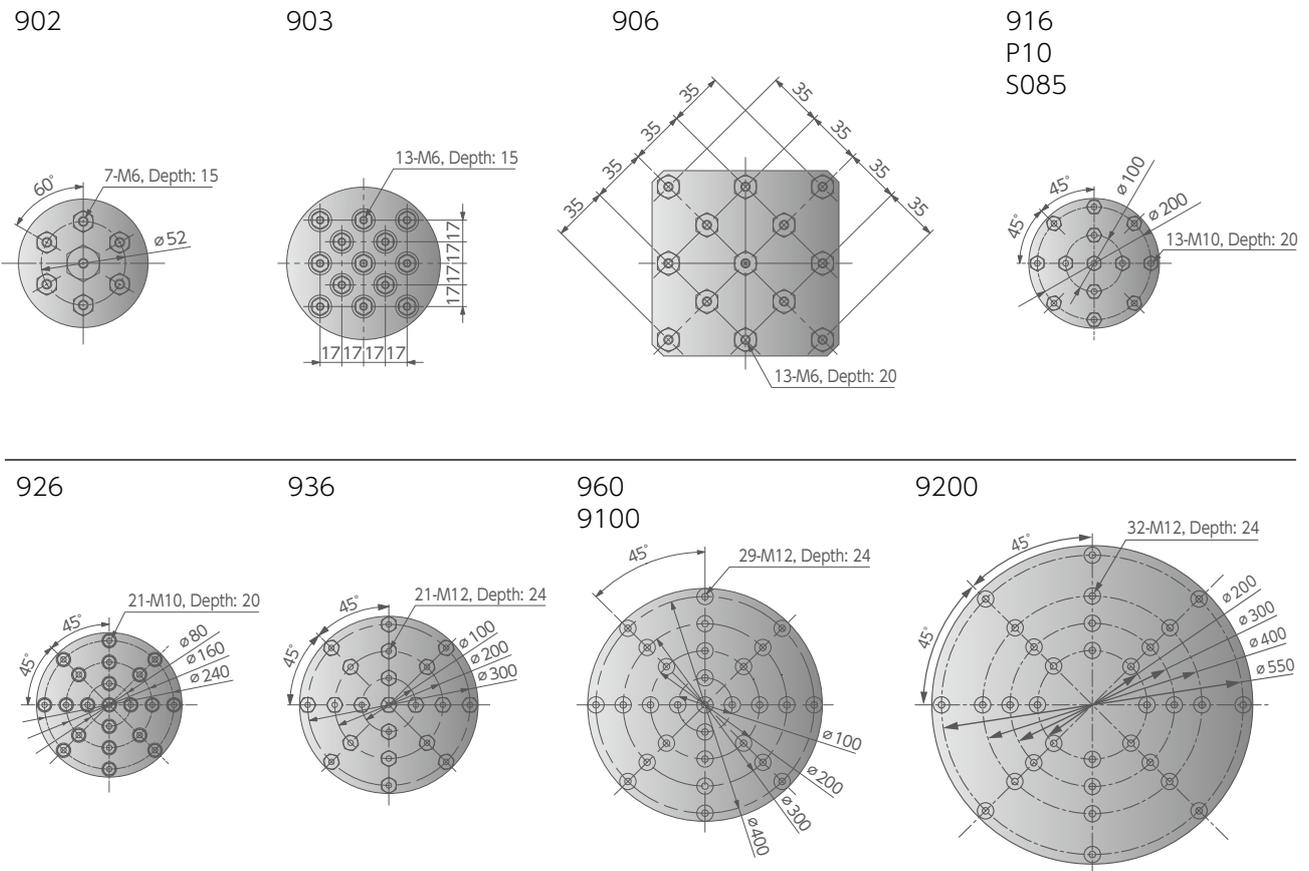
## Notes:

- 1) The catalogue states specifications when the input power of 200 VAC 3 $\phi$  50/60 Hz is applied to the vibration test system (except some parts).
- 2) If operating equipment under a high velocity condition such as swept-sine or fixed frequency test for a long time the velocity shall be less than 1.5 m/s as a guide.
- 3) The random force rating is based on our specified condition according to ISO 5344 standard.

# Armature Table Hole Pattern and Size

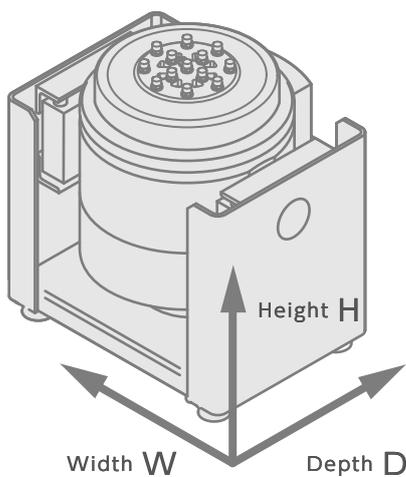


## Table Pattern



\* The inch standard mounting hole is also available.

## Exterior



Shaker	Exterior Dimensions
902-FN	460W×490H×490D mm
903-FN 903-FN/A 903-FN/FA	630W×602H×528D mm
906-FN 906-FN/A	720W×675H×628D mm
916-BP/LA 916-AP/LA	975W×885H×700D mm
926-AP/LA	1106W×1047H×855D mm
936-AP/LA	1224W×1107H×971D mm
960-AP/LA	1452W×1252H×1215D mm
S085-AW/LA	797W×775H×635D mm
916-BW/LA 916-AW/LA	974W×1035H×700D mm
926-AW/LA	1106W×1135H×880D mm
936-AW/LA	1106W×1135H×880D mm
960-AW/LA	1452W×1297H×1231D mm
916-AW/SLS	974W×1035H×700D mm
926-AW/SLS	1082W×1163H×866D mm
936-AW/SLS	1125W×1200H×965D mm
960-AW/SLS	1452W×1297H×1231D mm
916-AP/SLA	950W×1029H×665D mm
926-AP/SLA	1082W×1163H×866D mm
936-AP/SLA	1186W×1255H×971D mm
960-AP/SLA	1461W×1375H×1115D mm
9100-AWW/LA	1489W×1338H×1149D mm
9200-AWW/LA	1905W×1348H×1473D mm
P10-10AW/LA	702W×763H×572D mm
P20-A	982W×1000H×750D mm
P01-AB/AS	384W×391.5H×360D mm
Σ9515-AB/SD	442W×360H×340D mm

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**Head office :** A-PLACE Gotanda 3F, 2-27-3 Nishi-Gotanda,  
Shinagawa-ku, Tokyo 141-0031, Japan  
Tel: +81-3-3494-1221 FAX: +81-3-3494-1288

**Nagoya office :** Tomei Grand Bldg. 6 Fl., 2-30 Issha, Meito-ku,  
Nagoya-shi, Aichi 465-0093, Japan  
Tel: +81-52-753-6308 FAX: +81-52-753-6328

**Osaka office :** Hanahara 5 Bldg., 6 Fl., 8-17 Nishinakajima 7-chome,  
Yodogawa-ku, Osaka-shi, Osaka 532-001, Japan  
Tel: +81-6-6886-0451 FAX: +81-6-6886-0454

**Mishima factory :** 11 Heiseidai, Mishima-shi, Shizuoka 411-0042, Japan  
Tel: +81-55-988-8411 FAX: +81-55-988-2223

**Service Center :** 11 Heiseidai Mishima, Shizuoka 411-0042  
Tel: +81-55-988-8411 FAX: +81-55-987-1477

**THAI EMIC CO., LTD. :** 15/1 Soi Punnawithi 28, Sukhumvit 101 Road,  
Bangchak, Prakanong, Bangkok 10260, Thailand  
Tel: +66-2331-2746 / +66-2331-2747 Fax: +66-2331-2745

**EMIC North America Corporation :** 216 Bradenton Ave., Suite L, Dublin, OH. 43017, USA  
Tel: +1-614-889-8802

Contact:

※ Specifications are subject to change without notice for improvement.

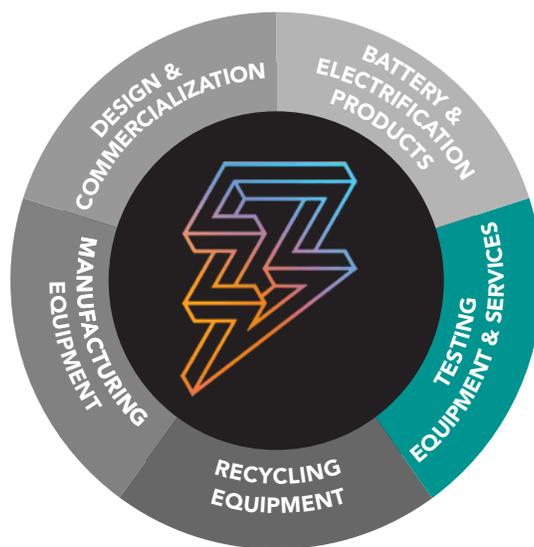
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**KTON  
PARTNER**

***Sinexcel***



# BATTERY TESTING EQUIPMENT Product Manual



**SHENZHEN HEADQUARTER**

Address: 1002 Songbai Rd, Nanshan Shenzhen China 518000

Web: [www.sinexcel.cn](http://www.sinexcel.cn)

E-mail: [sales.cn@sinexcel.com](mailto:sales.cn@sinexcel.com)

Battery testing equipment manufacturer  
with 10 years experience

Consumer & EV Cell		Max Current(A)										
		6	12	30	60	100	200	300	500	600	1000	2000
Max Voltage(V)	5	80	80	64	48	32	24	16	8	8	4	2
Other configuration customized												

Module & PACK		Max Current(A)								
		100	200	300	400	500	600	800	1000	2000
Max Voltage (V)	60	8	4	2						
	120	10	4	2	2	2				
	150	8	8	8	6	4	2			
	500	3	2	2	2	2				
	750	3	2	2	2	2				
	1000	4	4	4	2	2	2			
	1500	4	4	4	2	2	2			
Other configuration customized										

# SINEXCEL



# POWER BATTERY CELL TESTING EQUIPMENT SERIES



POWER  
BATTERY  
TESTING  
EQUIPMENT  
SERIES

## Overview

Sinexcel power battery cell testing equipment is an energy feedback testing equipment developed with advanced instrument technology and electricity&electronics technology. It has the characteristics of high precision, high safety, simple and easy to use and quick response. It's suitable for product research, product verification and quality control of power battery cell



## Application scenarios



Battery manufacturer



Automobile companies



Testing agency



Academic research institute



Echelon recycling enterprises

## Product features

- Ultra-high precision:0.05%F.S.
- Quick response:5ms
- High effective feedback:80%
- Multiple current gears automatic switch
- Powerful working condition simulation:20ms/300W+
- Integrated inspection, incubator, water cooler, etc.to achieve linkage and monitoring
- Customize templates to generate data reports
- Multi-layer hardware and software security protection, 100+ protection items

## Product parameters

	Equipment model	BTS-5V500A8CH
Input parameters	Input voltage	400Vac±10% (Customizable compatible with local power grids)
	Input frequency	50Hz±5Hz (Input frequency can be customized)
Output parameters	Output voltage range	Charge: 0V~5V;discharge: 1.5V~5V(Discharge voltage 0V can be customized)
	Voltage accuracy	±0.05%F.S. @25±5°C
	Output current range	Charge and discharge: 0.05A~500A
	Current accuracy/automatic grading	Gear 1: 0.05A~50A, ±0.05%F.S. @25±5°C
		Gear 2: 50A~100A, ±0.05%F.S. @25±5°C
		Gear 3: 100A~200A, ±0.05%F.S. @25±5°C
Gear 4: 200A~500A, ±0.05%F.S. @25±5°C		
Charge and discharge response time	≤5ms	
Charge-discharge switch time	≤10ms	
Function	Charge-discharge mode	CC,CV,CP,pulse,work condition simulation,DCIR etc.
	Cut-off/protection condition	Voltage,current,time, temperature, capacity, expression function, etc.
	Record interval	10ms/0.1mV/0.1mA
	Linkage	Incubator,water cooler,auxiliary voltage,auxiliary temperature,auxiliary pressure,ripple wave,etc.
	Protection	Resume from break-point, Battery reverse connection,battery undervoltage,cross line protection,voltage fluctuation protection,etc.
Work condition	Working temperature	0°C~45°C
	Humidity	< 85%RH
	Altitude	≤2000m
Basic parameters	Size (W*D*H)	Discharge 1.5V: 600*600*1800mm
		Discharge 0V: 800*600*2000mm

## Standard model

- BTS-5V60A48CH
- BTS-5V100A32CH
- BTS-5V200A24CH
- BTS-5V300A16CH
- BTS-5V500A8CH
- BTS-5V1000A4CH
- BTS-5V1500A2CH
- BTS-5V2000A2CH

## Application case



# BATTERY MODULE TESTING EQUIPMENT 120V SERIES



BATTERY  
MODULE  
TESTING  
EQUIPMENT  
SERIES

## Overview

Sinexcel battery module testing equipment is an energy feedback testing equipment developed with advanced instrument technology and electricity&electronics technology. It has the characteristics of high precision, high safety, simple and easy to use and quick response. It's suitable for product research, product verification and quality control of battery module



## Application scenarios



Battery manufacturer



Automobile companies



Testing agency



Academic research institute



Echelon recycling enterprises

## Product features

- Ultra-high precision:0.05%F.S.
- Quick response:5ms
- High effective feedback:90%
- Multiple current gears automatic switch
- Powerful working condition simulation:50ms/300W+
- Integrated inspection, incubator, water cooler,BMS etc. to achieve linkage and monitoring
- Customize templates to generate data reports
- Multi-layer hardware and software security protection, 100+ protection items

## Product parameters

	Equipment model	BTS-120V500A2CH
Input parameters	Input voltage	400Vac±10% (Customizable and compatible with local power grids)
	Input frequency	50Hz±5Hz (Input frequency can be customized)
Output parameters	Output voltage range	Charge and discharge: 5V~120V(Discharge voltage 0V can be customized)
	Voltage accuracy	±0.05%F.S. @25±5°C
	Output current range	Charge and discharge: 0.1A~500A
	Current accuracy/automatic grading	Gear 1: 0.1A~100A, ±0.05%F.S. @25±5°C
		Gear 2: 100A~200A, ±0.05%F.S. @25±5°C
Gear 3: 200A~300A, ±0.05%F.S. @25±5°C		
Gear 4: 300A~500A, ±0.05%F.S. @25±5°C		
Charge and discharge response time	≤5ms	
Charge-discharge switch time	≤10ms	
Function	Charge-discharge mode	CC,CV,CP,pulse,work condition simulation,DCIR etc.
	Cut-off/protection condition	Voltage, current, time, temperature, capacity, expression function, etc.
	Record interval	10ms/0.1mV/0.1mA
	Linkage	Incubator, water cooler, auxiliary voltage, auxiliary temperature,BMS, etc.
Protection	Resume from break-point, Battery reverse connection,battery undervoltage,voltage fluctuation protection,loop impedance protection,etc.	
Work condition	Working temperature	0°C~45°C
	Humidity	< 85%RH
	Altitude	≤2000m
Basic parameters	Size	800*800*2000mm (W*D*H)

## Standard model

- BTS-120V50A20CH
- BTS-120V100A10CH
- BTS-120V200A4CH
- BTS-120V300A2CH
- BTS-120V500A2CH

## Application case



# BATTERY MODULE TESTING EQUIPMENT 150V SERIES



BATTERY  
MODULE  
TESTING  
EQUIPMENT  
SERIES

## Product features

- Ultra-high precision:0.05%F.S.
- Quick response:5ms
- High effective feedback:90%
- Multiple current gears automatic switch
- Powerful working condition simulation:50ms/300W+
- Integrated inspection, incubator, water cooler,BMS etc. to achieve linkage and monitoring
- Customize templates to generate data reports
- Multi-layer hardware and software security protection, 100+ protection items

## Product parameters

	Equipment model	BTS-150V500A2CH
Input parameters	Input voltage	400Vac±10% (Customizable and compatible with local power grids)
	Input frequency	50Hz±5Hz (Input frequency can be customized)
Output parameters	Output voltage range	Charge and discharge: 5V~150V
	Voltage accuracy	±0.05%F.S. @25±5°C
	Output current range	Charge and discharge: 0.1A~500A
	Current accuracy/automatic grading	Gear 1: 0.1A~100A, ±0.05%F.S. @25±5°C
		Gear 2: 100A~200A, ±0.05%F.S. @25±5°C
Gear 3: 200A~300A, ±0.05%F.S. @25±5°C		
Gear 4: 300A~500A, ±0.05%F.S. @25±5°C		
Charge and discharge response time	≤5ms	
Charge-discharge switch time	≤10ms	
Function	Charge-discharge mode	CC,CV,CP,pulse,work condition simulation,DCIR etc.
	Cut-off/protection condition	Voltage, current, time, temperature, capacity, expression function, etc.
	Record interval	10ms/0.1mV/0.1mA
	Linkage	Incubator, water cooler, auxiliary voltage, auxiliary temperature,BMS, etc.
Protection	Resume from break-point, Battery reverse connection,battery undervoltage,voltage fluctuation protection,loop impedance protection,etc.	
Work condition	Working temperature	0°C~45°C
	Humidity	< 85%RH
	Altitude	≤2000m
Basic parameters	Size	900*800*2000mm (W*D*H)

## Overview

Sinexcel battery module testing equipment is an energy feedback testing equipment developed with advanced instrument technology and electricity&electronics technology. It has the characteristics of high precision, high safety, simple and easy to use and quick response.It's suitable for product research, product verification and quality control of battery module



## Application scenarios



Battery manufacturer



Automobile companies



Testing agency



Academic research institute



Echelon recycling enterprises

## Standard model

- BTS-150V100A8CH
- BTS-150V200A8CH
- BTS-150V300A8CH
- BTS-150V400A6CH
- BTS-150V600A2CH
- BTS-150V800A2CH

# BATTERY PACK TESTING EQUIPMENT 750V SERIES



## Product features

- Ultra-high precision:0.05%F.S.
- Quick response:10 ms
- High effective feedback:93%
- Multiple current gears automatic switch
- Powerful working condition simulation:50ms/300W+
- Integrated inspection, incubator, water cooler,BMS etc. to achieve linkage and monitoring
- Customize templates to generate data reports
- Multi-layer hardware and software security protection, 100+ protection items

## Product parameters

	Equipment model	BTS-750V500A2CH-350KW
Input parameters	Input voltage	400Vac±10% (Customizable and compatible with local power grids)
	Input frequency	50Hz±5Hz (Input frequency can be customized)
Output parameters	Output voltage range	Charge and discharge: 30V ~ 750V ((Discharge voltage 5V can be customized)
	Voltage accuracy	±0.05%F.S. @25±5°C
	Output current range	Charge and discharge: 0.1A~500A
	Current accuracy/automatic grading	Gear 1: 0.1A~100A, ±0.05%F.S.@25±5°C
		Gear 2: 100A~200A, ±0.05%F.S.@25±5°C
		Gear 3: 200A~300A, ±0.05%F.S.@25±5°C
Gear 4: 300A~500A, ±0.05%F.S.@25±5°C		
Rated power	Max 350kW, supporting reduction/free distribution	
Charge and discharge response time	≤10ms	
Charge-discharge switch time	≤20ms	
Function	Charge-discharge mode	CC,CV,CP,pulse,work condition simulation,DCIR etc.
	Cut-off/protection condition	Voltage, current, time, temperature, capacity, expression function, etc.
	Record interval	10ms/0.1mV/0.1mA
	Linkage	Incubator, water cooler, auxiliary voltage, auxiliary temperature, BMS, etc.
	Protection	Resume from break-point, Battery reverse connection,batter yunder voltage,voltage fluctuation protection,loop impedance protection,etc.
Work condition	Working temperature	0°C~45°C
	Humidity	< 85%RH
	Altitude	≤2000m
Basic parameters	Size	2300*850*2000mm (W*D*H)(subject to available products)

## Overview

Sinexcel battery PACK testing equipment is an energy feedback testing equipment developed with advanced instrument technology and electricity&electronics technology. It has the characteristics of high precision, high safety, simple and easy to use and quick response.It's suitable for product research, product verification and quality control of battery PACK



## Application scenarios



Battery manufacturer



Automobile companies



Testing agency



Academic research institute



Echelon recycling enterprises

## Standard model

- BTS-750V100A8CH -300kW
- BTS-750V200A4CH -300kW
- BTS-750V300A2CH -300kW
- BTS-750V500A2CH -350kW

## Application case



# BATTERY PACK TESTING EQUIPMENT 1000V SERIES



## Product features

- Ultra-high precision:0.05%F.S.
- Quick response:5ms
- High effective feedback:96%
- Multiple current gears Automatic switch
- Powerful working condition simulation:50ms/300W+
- Integrated inspection, incubator, water cooler,BMS etc. to achieve linkage and monitoring
- Customize templates to generate data reports
- Multi-layer hardware and software security protection, 100+ protection items

## Product parameters

	Equipment model	BTS-1000V500A2CH-600KW
Input parameters	Input voltage	400Vac±10% (Customizable and compatible with local power grids)
	Input frequency	50Hz±5Hz (Input frequency can be customized)
Output parameters	Output voltage range	Charge and discharge: 30V ~ 1000V ((Discharge voltage 5V can be customized)
	Voltage accuracy	±0.05%F.S. @25±5°C
	Output current range	Charge and discharge: 0.1A~500A
	Current accuracy/automatic grading	Gear 1: 0.1A~100A, ±0.05%F.S. @25±5°C
		Gear 2: 100A~200A, ±0.05%F.S. @25±5°C
		Gear 3: 200A~300A, ±0.05%F.S. @25±5°C
		Gear 4: 300A~500A, ±0.05%F.S. @25±5°C
Rated power	Max 600kW, supporting reduction/free distribution	
Charge and discharge response time	≤5ms	
Charge-discharge switch time	≤10ms	
Function	Charge-discharge mode	CC,CV,CP,pulse,work condition simulation,DCIR etc.
	Cut-off/protection condition	Voltage, current, time, temperature, capacity, expression function, etc.
	Record interval	10ms/0.1mV/0.1mA
	Linkage	Incubator, water cooler, auxiliary voltage, auxiliary temperature, BMS, etc.
	Protection	Resume from break-point, Battery reverse connection,battery under voltage,voltage fluctuation protection,loop impedance protection,etc.
Work condition	Working temperature	0°C~45°C
	Humidity	< 85%RH
	Altitude	≤2000m
Basic parameters	Size	3300*1000*2000mm(W*D*H)(subject to available products)

## Standard model

- BTS-1000V100A2CH-200kW
- BTS-1000V200A4CH-400kW
- BTS-1000V300A2CH-300kW
- BTS-1000V400A2CH-400kW
- BTS-1000V500A2CH-450kW
- BTS-1000V1000A1CH-450kW

## Overview

Sinexcel battery PACK testing equipment is an energy feedback testing equipment developed with advanced instrument technology and electricity&electronics technology. It has the characteristics of high precision, high safety, simple and easy to use and quick response.It's suitable for product research, product verification and quality control of battery PACK and energy storage battery



## Application scenarios



Battery manufacturer



Automobile companies



Testing agency



Academic research institute



Echelon recycling enterprises

# BATTERY PACK TESTING EQUIPMENT 1500V SERIES



## Product features

- Ultra-high precision:0.05%F.S.
- Quick response:10ms
- High effective feedback:96%
- Multiple current gears Automatic switch
- Powerful working condition simulation:100ms/300W+
- Integrated inspection, incubator, water cooler,BMS etc. to achieve linkage and monitoring
- Customize templates to generate data reports
- Multi-layer hardware and software security protection, 100+ protection items

## Product parameters

	Equipment model	BTS-1500V500A2CH-600KW
Input parameters	Input voltage	400Vac±10% (Customizable and compatible with local power grids)
	Input frequency	50Hz±5Hz (Input frequency can be customized)
Output parameters	Output voltage range	Charge and discharge: 50V ~ 1500V
	Voltage accuracy	±0.05%F.S. @25±5°C
	Output current range	Charge and discharge: 0.1A~500A
	Rated power	Max 600kW, supporting reduction/free distribution
	Charge and discharge response time	≤10ms
	Charge-discharge switch time	≤20ms
Function	Charge-discharge mode	CC,CV,CP,pulse,work condition simulation,DCIR etc.
	Cut-off/protection condition	Voltage, current, time, temperature, capacity, expression function, etc.
	Record interval	10ms/0.1mV/0.1mA
	Linkage	Incubator, water cooler, auxiliary voltage, auxiliary temperature, BMS, etc.
	Protection	Resume from break-point, Battery reverse connection,battery under voltage,voltage fluctuation protection,loop impedance protection,etc.
Work condition	Working temperature	0°C~45°C
	Humidity	< 85%RH
	Altitude	≤2000m
Basic parameters	Size	3300*1000*2000mm(W*D*H)(subject to available products)

## Overview

Sinexcel battery PACK testing equipment is an energy feedback testing equipment developed with advanced instrument technology and electricity&electronics technology. It has the characteristics of high precision, high safety, simple and easy to use and quick response.It's suitable for product research, product verification and quality control of battery PACK and energy storage battery



## Application scenarios



Battery manufacturer



Automobile companies



Testing agency



Academic research institute



Echelon recycling enterprises

## Standard model

- 1500V300A2CH-900KW
- 1500V500A2CH-900KW
- 1500V1000A2CH-900KW

# MULTI-FUNCTION DATA ACQUISITION BOX/INSPECTION SERIES



## Product features

- High precision voltage and temperature acquisition
- High-speed sampling : 10ms
- Double protection of hardware and software, more secure testing
- The voltage and temperature of the inspection box/rack are freely configured
- Multiple inspection boxes/racks are connected in series to expand sampling points
- Sampling channel isolation, withstand voltage 2000V

## Product parameters

Input parameters	Input	220Vac±10% (Portable inspection box) (Customizable and compatible with local power grids)
		24Vdc (inspection frame)
	Power consumption	≤75W (related to the quantity of inspections)
Battery voltage	Voltage acquisition range	-5V~ +5V
	Voltage acquisition accuracy	≤±0.05%F.S. @25±5°C;
	Resolution	0.1mV
	Sampling rate	10ms
Thermocouple (K/T)	Collection range	-60°C to +200°C
	Collection accuracy	±1°C
	Resolution	0.1°C
	Sampling rate	500ms
NTC	Collection range	-40°C to +125°C
	Acquisition accuracy	±1°C
	Resolution	0.1°C
	Sampling rate	500ms
Work condition	Working temperature	0°C~45°C
	Humidity	< 85%RH
	Altitude	≤2000m
Basic parameters	Size	340*158*270 (W*D*H) (Portable inspection box)
		600*500*1200(W*D*H) (Inspection frame)

## Overview

Sinexcel multi-function data acquisition box/patrol inspection is a voltage and temperature acquisition system with high precision, high speed and free configuration for battery/module /PACK testing equipment.

Realizing real-time acquisition, recording and monitoring of battery voltage and temperature

With the hardware protection function of independent and direct control of the emergency stop switch of testing equipment, testing is more safe



## Application scenarios



Battery manufacturer



Automobile companies



Testing agency



Academic research institute



Echelon recycling enterprises

# HIGH PRECISION AUTOMATIC CALIBRATION TOOLING



## Product features

- Ultra high precision, reference 0.01%F.S. imported instrument, ensuring accurate calibration
- One machine multi-function, covering 0A~500A all current calibration, automatic matching equipment grading
- Highly automated, one-button multi-channel automatic calibration, calibration time per channel < 2mins
- Intelligent reporting, customized voltage & current calibration value, report parameters and qualified standards, automatic report generation, calibration traceability

## Product parameters

Calibration range	Voltage	0V~1000V
	Current	0A~500A
Calibration time	< 2mins/CH	
Multimeter	Agilent	
Shunt	0.01%F.S. HALL or Shunt	
Function	Automatic calibration function	One-key automatic calibration of 8 channels, provide calibration report
	Automatic verification function	One-key automatic verification of 8 channels, provide verification report
	Manual calibration function	Manual selection of any channel any current point, voltage point calibration
	Manual verification function	Manually select any channel any current point, voltage point verification
	Custom report	Custom current point, voltage point, determination standard, automatic calculation of deviation and other information
Work condition	Working temperature	0°C-45°C
	Humidity	< 85%RH
	Altitude	≤ 2000m
Basic parameters	Size	600*600*900mm(W*D*H)

## Overview

Sinexcel high-precision automatic calibration tooling realizes efficient automatic calibration of one-button&multi-channel voltage and current points of battery detection equipment, and generates customized reports to realize archiving and traceability of calibration



## Application scenarios



Battery manufacturer



Automobile companies



Testing agency



Academic research institute



Echelon recycling enterprises

## Application case

# BATTERY FORMATION AND TESTING SOFTWARE

## Product overview

Sinexcel battery formation and testing software is the computer background control system designed for battery testing equipment, mainly including battery test process edit and control, real-time data and state centralized monitoring, battery test data recording analysis and other functions, the graphical interface design meet the requirements of convenient operation and high efficiency test, also have highly stability and security

## Product features

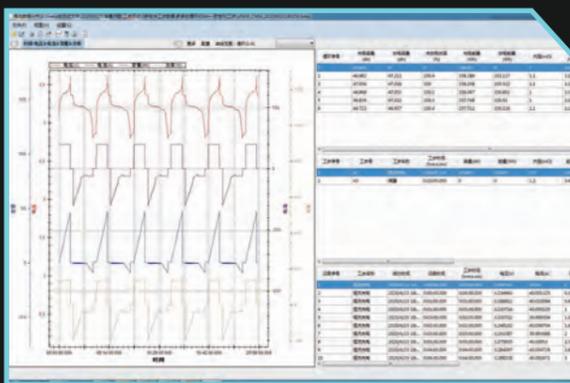
### Intuitive Interface, Convenient Operation



### Fully Functional, Flexible Editing



### Accurate Analysis, Rich Statements



### Complete Protection, Data Security



## Main function

### 1 Process editor

It supports a variety of process types, flexible editing and free combination of working step parameters, cut-off conditions and protection conditions, and supports Excel import working conditions to meet complex test requirements

### 3 Centralized monitoring

The graphical design of the monitoring interface supports personalized configuration, displays the real-time status and data information of multiple channels on multiple devices at the same time, and realizes the centralized management of testing

### 5 Peripheral linkage

Support CAN, CAN\_FD, LIN, 485, WLAN and other communication methods and incubator, water cooler, pressure acquisition, BMS and other external equipment linkage, to form a comprehensive integrated automatic test system

### 7 Compatible extensions

It supports docking with database, MES, laboratory management system and other software, and has the functions of command receiving and execution, test status and data uploading, so as to realize systematic battery testing

### 2 Complete control

Support batch start and stop, independent start and stop, bar code start, reservation pause, reset process and other operations of testing equipment, users fully control the test

### 4 Data analysis

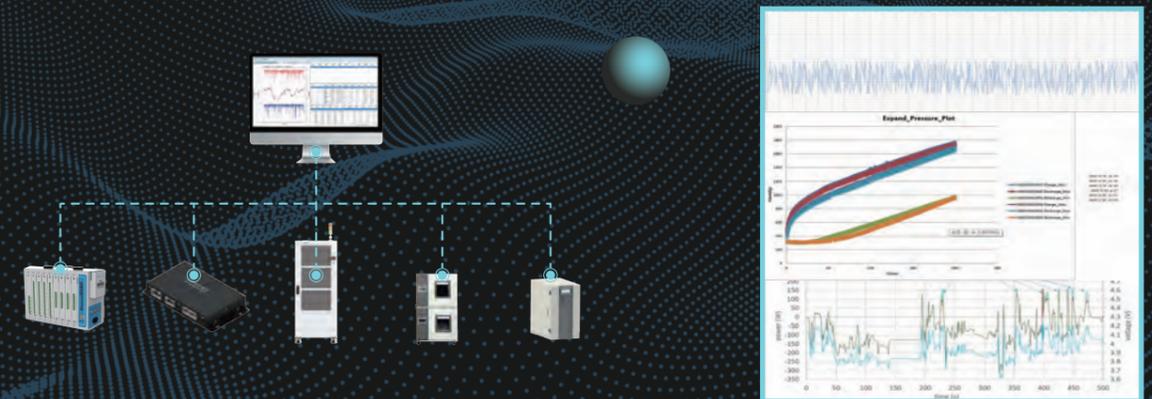
Test data support table and curve mode, can customize the selection of parameters and analysis methods, to achieve rapid and accurate evaluation of battery performance

### 6 Automatic report

According to the test project, the report template can be customized and configured to form a rich template library, and the data report can be generated automatically, greatly improving the report sorting efficiency

### 8 Security protection

It has multi-level user access rights, work step protection, process global protection, power down and double data anti-loss technology and other protection mechanisms to ensure the test process and data security



# LABORATORY INFORMATION MANAGEMENT SYSTEM(LIMS)

## Product overview

Sinexcel LIMS is a highly intelligent, informatization, standardization battery test management software. It implements equipment management, one-key identification and conversion of process flow, intelligent schedule, remote centralized monitoring, automatic data reports, and other functions, can greatly improve the efficiency of lab personnel and equipment, reduce operating costs, helping our clients achieve more efficient, more orderly and much safer battery test



LABORATORY  
MANAGEMENT  
SYSTEM



INFORMATIZATION



INTELLIGENT



STANDARDIZATION

## Product features



### Informatization

Summarize the battery testing information of orders, samples, equipment, personnel and other resources to achieve resource quantification and configuration optimization. The testing process is transparent and timely notified



### Intelligent

Intelligent identification of test requirements, automatic calculation of test duration, intelligent matching of test equipment and automatic production scheduling, generation of test plans, improve equipment utilization /OEE;Generate test report intelligently based on custom report template library



### Standardization

Standardize battery testing procedures and exception handling methods to ensure orderly and safe execution of tests

## Main function

### 1 Equipment management

- Different types of equipment from different manufacturers can be connected to manage and schedule the equipment uniformly
- The system can customize the OEE calculation rules, and automatic calculation
- Support equipment operation and maintenance such as equipment log recording, equipment calibration, software and hardware upgrade

### 3 Plan management

- Automatically recommend the optimal test channel according to sample, test process, channel capacity, etc., and make production test plan to maximize equipment utilization
- Support test changes such as queue jumping for emergency tasks, channel change, process change, sample retest and so on, adjust resources in real time

### 5 Test management

- Support one computer to centrally manage all channels across manufacturers and regions, and realize one-to-many remote monitoring
- Push various test status and fault information in a timely and directional manner to improve test efficiency and test safety

### 7 Sample management

- Batteries can be scanned in and out of storage with one click, without paper registration
- Online inquiry of sample specifications, test status, etc. The sample information is watertight

### 2 Process management

- Support 1000+ standard test process one-key identification & conversion
- Automatic process inspection, including working step parameters, cut-off conditions and protection conditions
- Centralized management of process file library for convenience of traceability

### 4 Data management

- The data of different manufacturers are uploaded to the database in accordance with the unified parameter types and formats, which is convenient for data query, export, secondary calculation and traceability
- The system can customize the configuration of the report template, form a rich template library, automatically generate data reports

### 6 Order management

- Support online order application and inquiry, realize the paperless office
- The order is bound to the sample and process, directly and clearly

### 8 Message notice

- Timely notification of order, sample and other test status information to quickly grasp the test progress
- Realize timely processing of work order approval reminders

## Application case



# GLOBAL BUSINESS SCOPE



## R&D and after-sales base

- Shenzhen Headquarter
- Xi'an R&D Center
- Suzhou Comprehensive Base
- Huizhou Manufacturing Base
- Sinexcel subsidiary in USA
- Permanent Repair Point in Poland

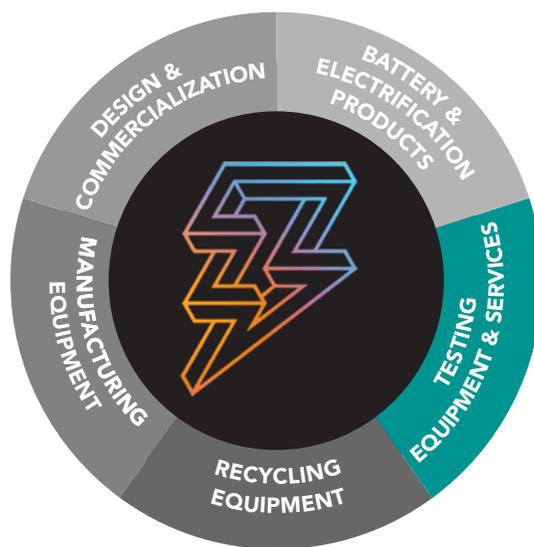
## Scope of business

- China
- India
- Ireland
- Turkey
- Korea
- Hungary
- Norway
- Brazil
- Thailand
- Germany
- Sweden
- More...



**KTON  
PARTNER**

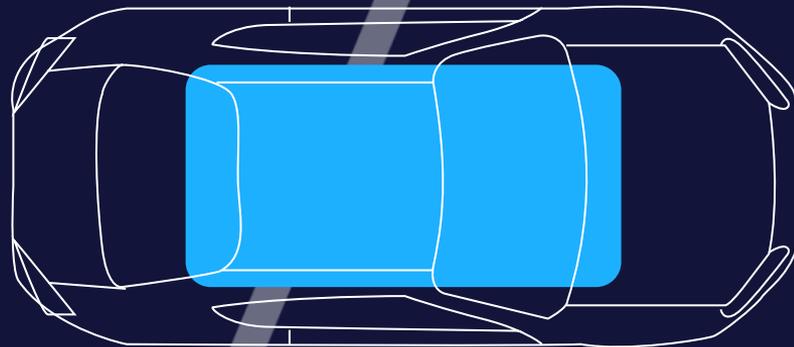
**VOLTAIQ**



# VOLTAIQ

Enterprise Battery Intelligence™

## Product Introduction



June 2023

# Enterprise Battery Intelligence (EBI)

Data is the lifeblood of the battery ecosystem. Voltaiq was first to market with a platform solution and remains the leader

- **Rapid, data-driven assessments of battery performance and health** are key to accelerating product launch, de-risking operations, and **maximizing lifetime value** of battery products
- **Voltaiq pioneered Enterprise Battery Intelligence**, offering the first full-lifecycle, battery-focused analytics software platform
- Voltaiq is **production-proven** at dozens of leading companies



- Voltaiq's EBI platform is the battery-domain "glue" **connecting** the enterprise **tools you need to run your business**

**SIEMENS**



**PDF/SOLUTIONS™**

**CITRINE**

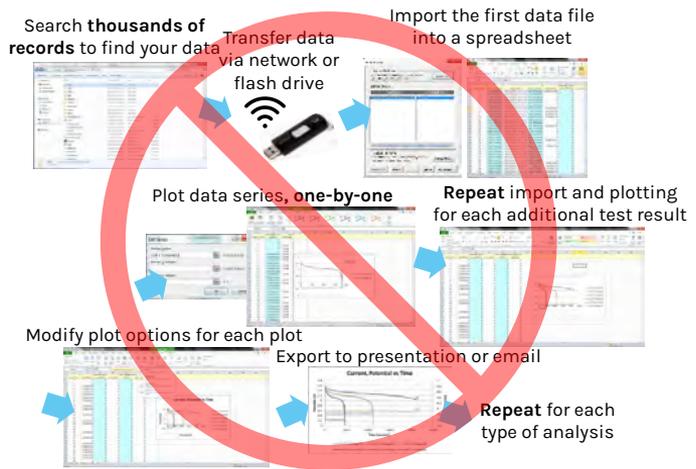
Logos reflect a selection of Voltaiq customers and partners

# Enterprise Battery Intelligence, because speed is everything

In this rapidly evolving industry, competitive advantage means learning faster than the rest

## INDUSTRY-STANDARD ANALYSIS

Lacking organization, uniformity and domain expertise, data lakes and home-built systems become data swamps



**REACTIVE, STAGE-GATE WATERFALL APPROACH**

## VOLTAIQ-POWERED ANALYSIS

Seamless access across teams, partners, business units  
Shown to be up to 20,000x faster for key workflows

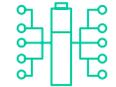


**VOLTAIQ**

Manufacturing line

Test lab

In-field



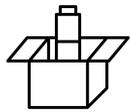
**PROACTIVE, DATA-DRIVEN AGILE WORKFLOW**

# Accelerating time to volume & profit in a dynamic environment

Only the fast, agile learners will win in a market evolving this rapidly

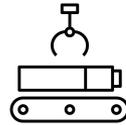
The battery sector changes constantly: chemistries, equipment, suppliers, talent, and more.

**Companies must learn faster at every lifecycle stage.**



## Product Development

You need to **qualify multiple new materials and suppliers faster**. You need **supply chain flexibility**, and 5-year product cycles – typical of the past – will no longer cut it.



## Production

**Ramping a new battery factory** to profitable yield and throughput takes the best companies **3-4 years**. **You don't have that much time** or cash to burn.



## In-Field Use

**Preventing recalls** and minimizing returns are top-of-mind as volumes grow. **EBI is the key to early service intervention**, optimizing **performance** and new **financing** and **insurance** models

**Enterprise Battery Intelligence from Voltaiq enables the real-time insight and rapid learning needed to meet aggressive timelines, maximize revenue and minimize risk**

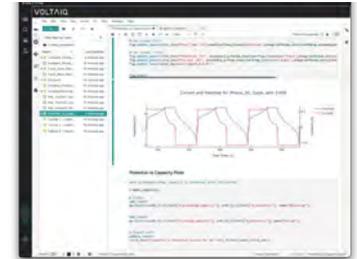
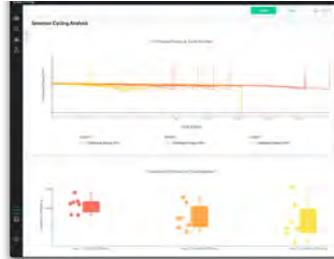
# Voltaiq Enterprise Battery Intelligence Platform

The leading end-to-end for over a decade, from the company that pioneered battery intelligence

## Demonstrated Value:

- Automates 90% of typical battery analysis tasks
- 20-20,000x battery engineering workflow acceleration
- Reduce testing time by up to 50%
- Customizable, protocol-specific analytics spanning the battery engineering lifecycle
- Seamless collaboration with teams and partners around the

## Interactive Data Visualization Protocol-Specific Analytics ML and Modeling Environment



## Automated Alerting



## Manufacturing Analytics



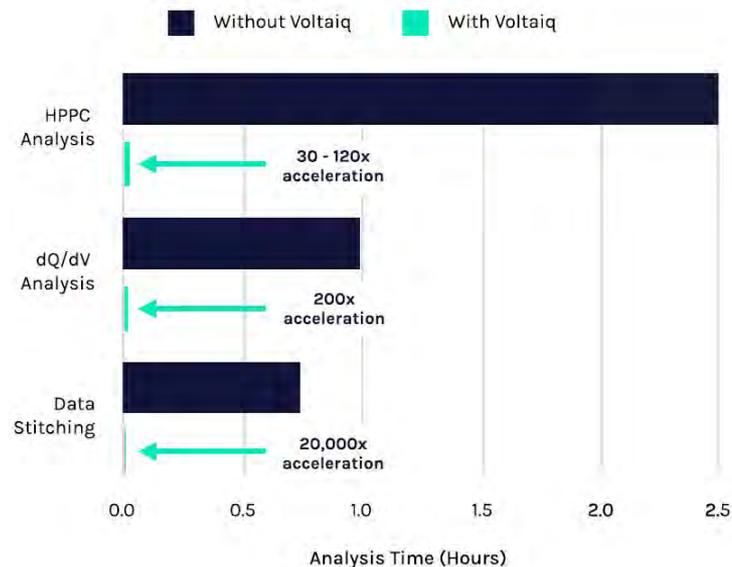
Industry-leading application for high-volume data analytics & visualization

# Avoid Costly Launch Delays with Enterprise Battery Intelligence

Get a real-time look into battery behavior to spot and correct anomalies earlier - and launch on time

## Faster Feedback Loops

Course correct through every phase of design, development, and testing. EBI speeds the discovery and analysis process



Before and after study with top 5 global OEMs

# EBI Makes Your Battery Engineers Superheroes

The best tools attract and retain the best engineers

As talent shortages persist, EBI helps free up and focus valuable engineering talent on innovation, faster time-to-market, and efficiency



TIME SAVED EVERY WEEK

10 hours



TIME SAVED EVERY MONTH

5-7 days



TIME SAVED EVERY YEAR

3 months

“

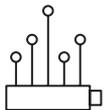
What used to take an engineer three days to do is now done instantaneously. I can hire 10 engineers, or Voltaiq.

”

Jeff Bruce, Director of Battery Technologies, Microsoft

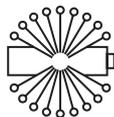
# How Voltaiq Works

Enterprise-scale data automation to faster time to insights and time-to-market



## ① Automatic data collection

Battery performance data and metadata are automatically collected, cleaned, labeled, and stored in a secure, centralized location



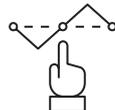
## ② Harmonization & feature extraction

Data from disparate sources is 'harmonized' to a common format. Key time-series and per-cycle KPIs and data features are extracted.



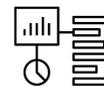
## ③ Instantaneous search

Search across serial numbers, battery properties, batches, test and operating conditions to find data instantly.



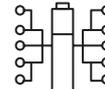
## ④ Rapid, self-serve analysis

Quickly visualize, analyze, and compare with interactive charting, configurable dashboards, and protocol-specific analytical modules.



## ⑤ Build models & ML algorithms

Develop proprietary analytics, simulation models and machine learning algorithms in-app with cleaned, featured data and open-source models.



## ⑥ Collaboration & customization

Easily share data, analysis, and alerts with colleagues, partners, and customers. Integrate with other tools and platforms through open APIs.

# A truly enterprise-grade battery analysis software platform

Mature, turnkey, scalable, flexible, and extensible

## Best-In-Class Battery Analysis Applications

Powerful built-in tools for every industry-standard analysis use case

Data Visualization

Manufacturing Quality Analysis

Materials & Process Analysis

Cell Engineering Analysis

Configurable Alerting

Anomaly Detection

EV Pack & ESS System Analysis

Lab Management Dashboard

## Data Science Tools

Prototype and productionize battery models and predictive algorithms

Analytics Studio

(Python & Matlab environment for modeling and custom AI/ML development)

Custom Data Feature / KPI Extraction In-Pipeline

Streaming Data Access API

## Productized Integrations

Production-proven integrations to industry-leading software tools

The Battery Index (Cell Benchmarking Data & Models)

Citrine Materials Informatics

Thermo Fisher LIMS

PDF Solutions Exensio

Alchemy LIMS

Siemens Simulation & Ops Software

## API Integrations

Build custom applications, integrate to the tools that run your business

MES

ERP

SCADA

PLM

LIMS

Financial Modeling Tools

Accounting Software

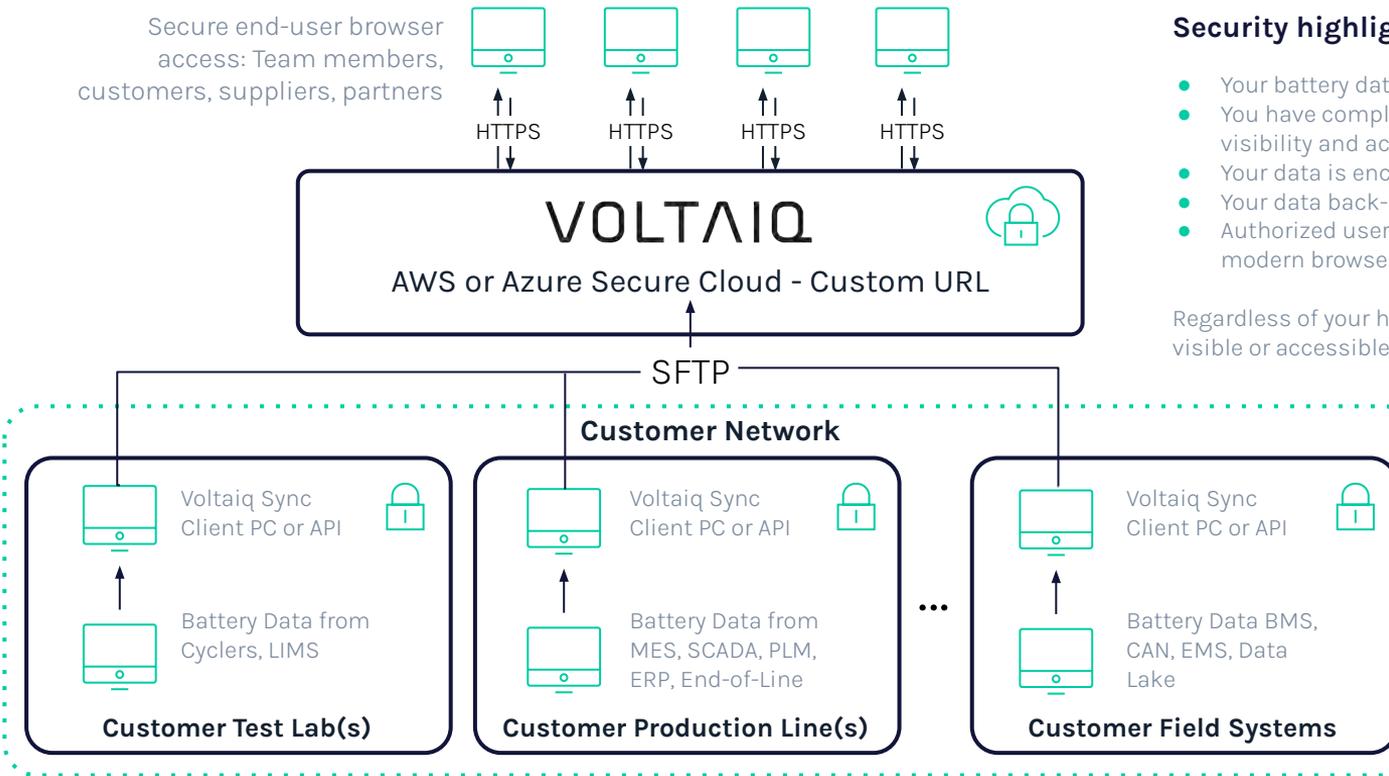
Your Own Custom Application!

## Voltaiq Data Platform

Managed Hosting • Automated Data Collection • Data Cleaning & Labeling • Harmonization & Feature Extraction

# System Architecture

Voltaiq provides a secure managed application as part of your subscription



## Security highlights

- Your battery data is always fully under your control
- You have complete administrative control over data visibility and access
- Your data is encrypted at rest and in flight
- Your data back-ups are also encrypted
- Authorized users can securely access Voltaiq via any modern browser over HTTPS

Regardless of your hosting environment, your data is never visible or accessible by Voltaiq without your express permission.

## Supported security policies & regulations

- GDPR
- ITAR
- SOC2
- SSO (single sign on)

All current technical requirements, including TLS Ciphers, backup protocols, and access control are available upon request.



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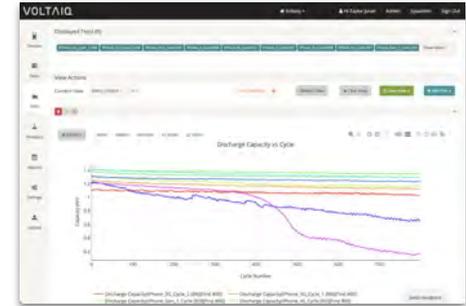
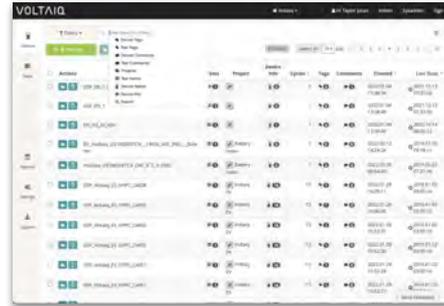
# Voltaiq Platform

# Voltaiq Platform Data Management & Visualization

Create visibility across your test operations

## Key benefits

- Rapid, powerful search
- Instant interactive plotting of 30+ time-series data fields and 70+ per-cycle metrics
- Templated plot views for convenient re-use with any data
- Construct & manage datasets
- Upload, view & edit metadata describing cell, module, or pack properties
- Seamless sharing & collaboration - onsite or remote



A screenshot of the Voltaiq web application interface showing the 'Edit Device Info' dialog box. The dialog box contains a table with columns for 'Name', 'Area', 'Cell mass', 'Active material', and 'Nominal Capacity'. The table contains several rows of data, including 'VSP-VOLTAIQ-APPC-C008'. The dialog box also includes a 'Cancel' button and a 'Save' button.

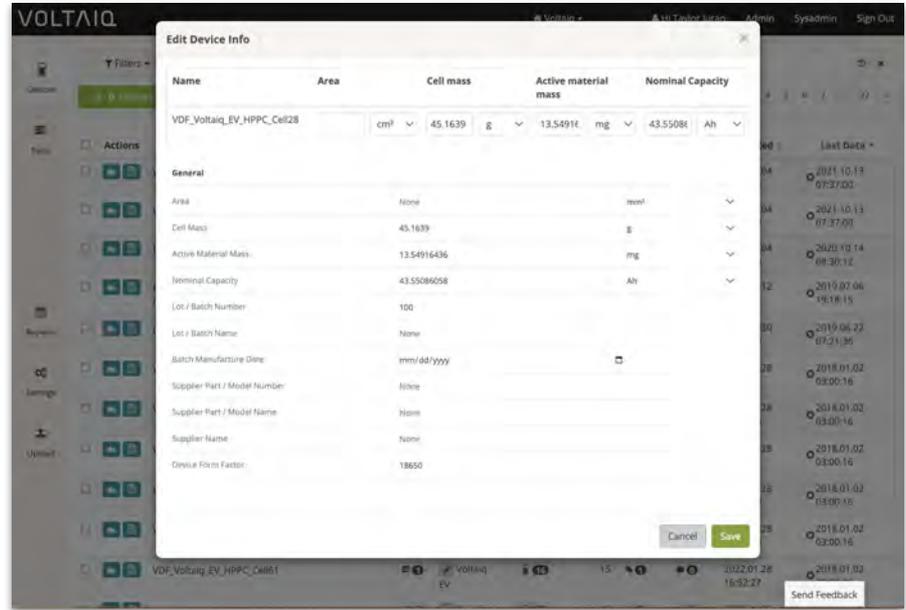
Name	Area	Cell mass	Active material	Nominal Capacity
VSP-VOLTAIQ-APPC-C008	APPC	45.1673	13.3000	43.3000

# Voltaiq Master Data Framework

Structured store for metadata (non-time series, non-cycle or BMS data)

## Key benefits

- Structured format for storing all of the most common metadata fields for cells, modules and packs
- Includes fields for dimensions, weights, serial and batch/lot numbers, materials, chemistry, pack/system configuration, image/file attachments & more
- Support for individual devices, as well as lots, batches, & groups
- 50 of the most-used fields available today. To expand to thousands over time
- Custom-configured fields available through professional services engagement

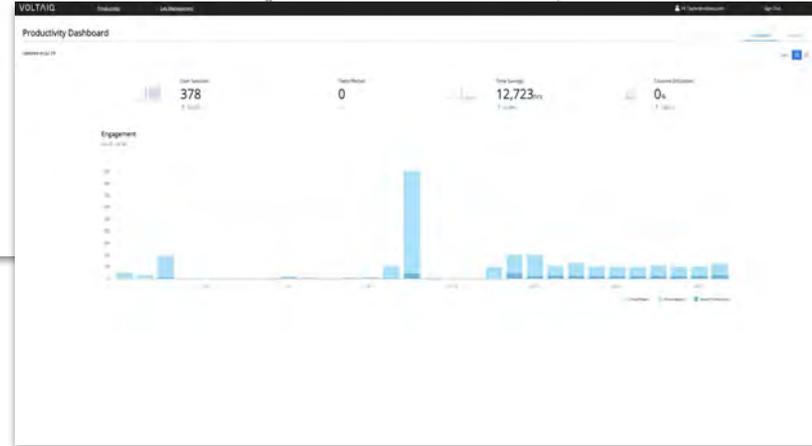
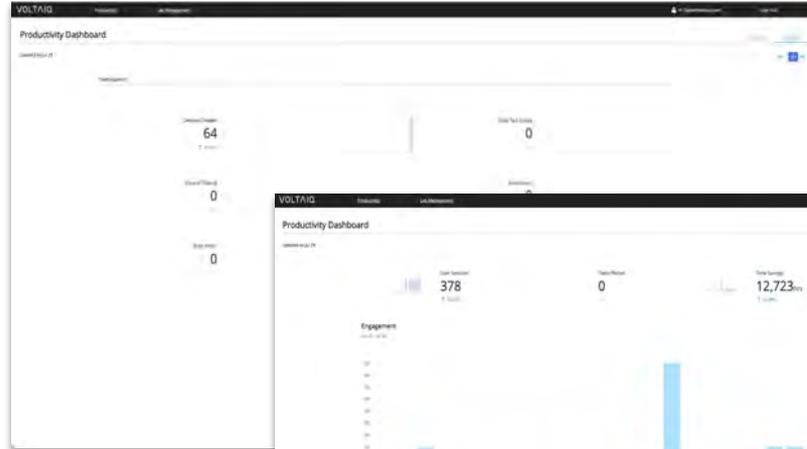


# Productivity Dashboard

Create visibility across your test operations

## Key benefits

- Gain insight into your organization's overall testing throughput & analysis activity
- Surface opportunities to increase test channel utilization & accelerate time to market
- Track key productivity metrics over time, including total devices tested, test cycles run, total capacity & energy throughput, user sessions & search, plot, and analysis activity

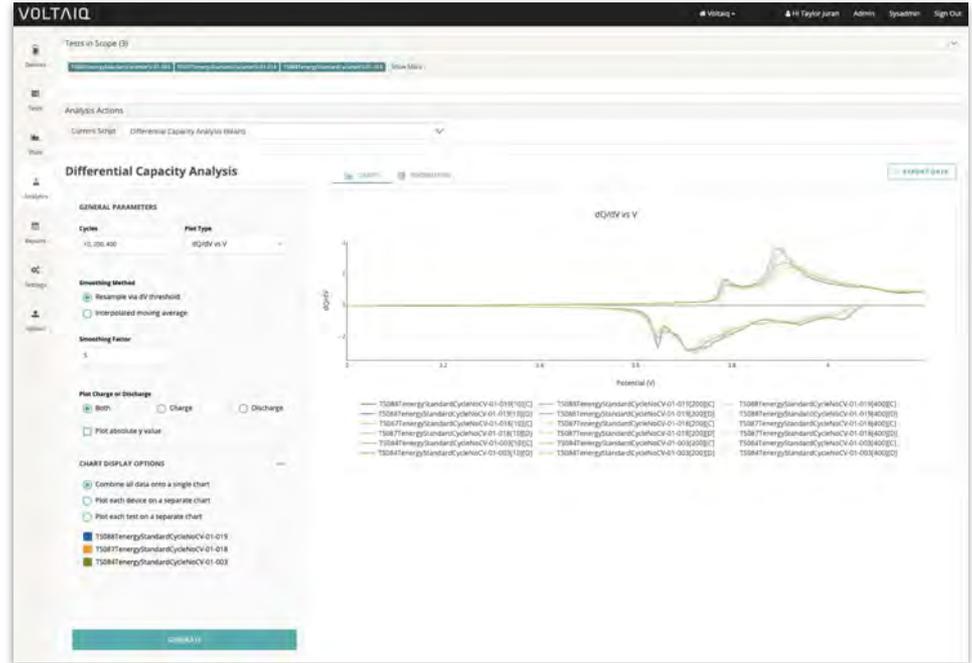


# Differential Capacity Analysis

Identify underlying product variability using your time-series data

## Key benefits

- Gain direct insight into a battery's composition, battery-to-battery variability, & degradation during normal operation
- Identify early signs of failure & perform root-cause analysis using standard charge-discharge data
- Benchmark against competitor performance or reverse-engineer unknown chemistries

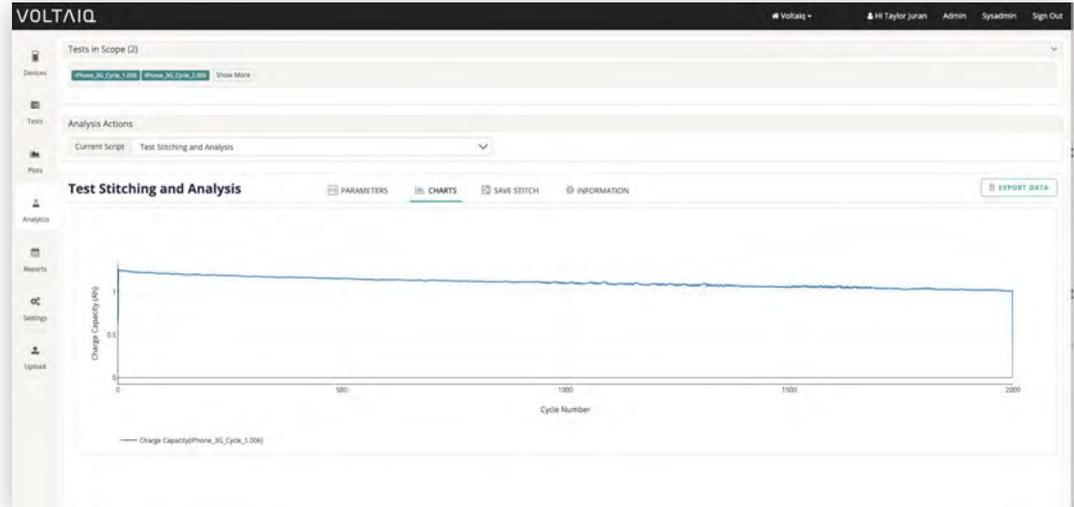


# Test File Stitching

Quickly merge data from across a device's life

## Key benefits

- Examine a battery's full lifecycle performance by quickly and seamlessly 'stitching' together every data file in its test history
- Plot any combination of per-cycle KPIs
- Easily evaluate cumulative KPIs (lifetime capacity, energy) with interactive plotting, and without spreadsheets or scripting

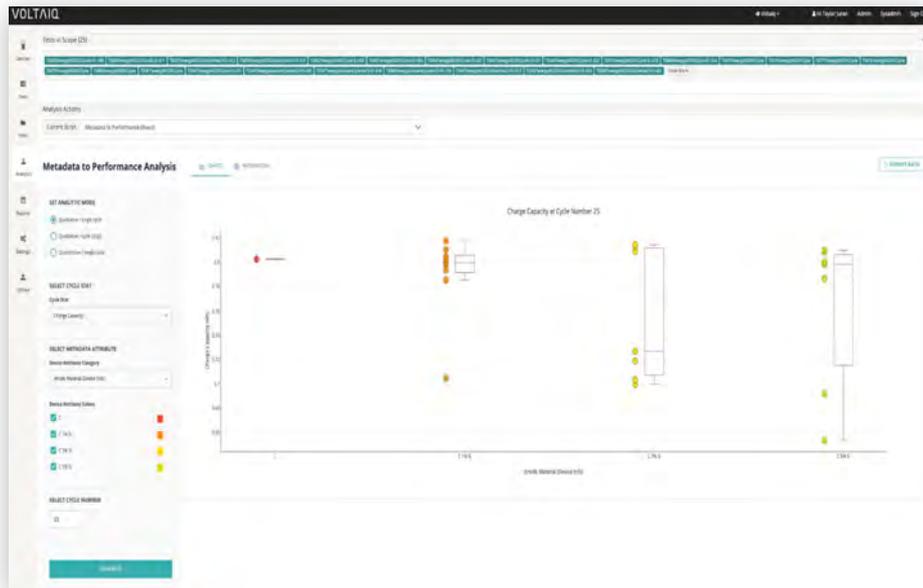


# Metadata-to-performance

Correlate device metadata to performance interactively

## Key benefits

- Correlate battery performance to quantitative properties or parameters (e.g., thickness, calendaring pressure, charge rate)
- Group & classify battery performance according to qualitative properties (e.g., supplier, chemistry, additive, environment)
- Generate statistical profiles characterizing the performance of groups of batteries
- Quickly iterate toward optimal formulations or modes of operation
- Rapidly determine root case by analyzing upstream properties alongside downstream performance





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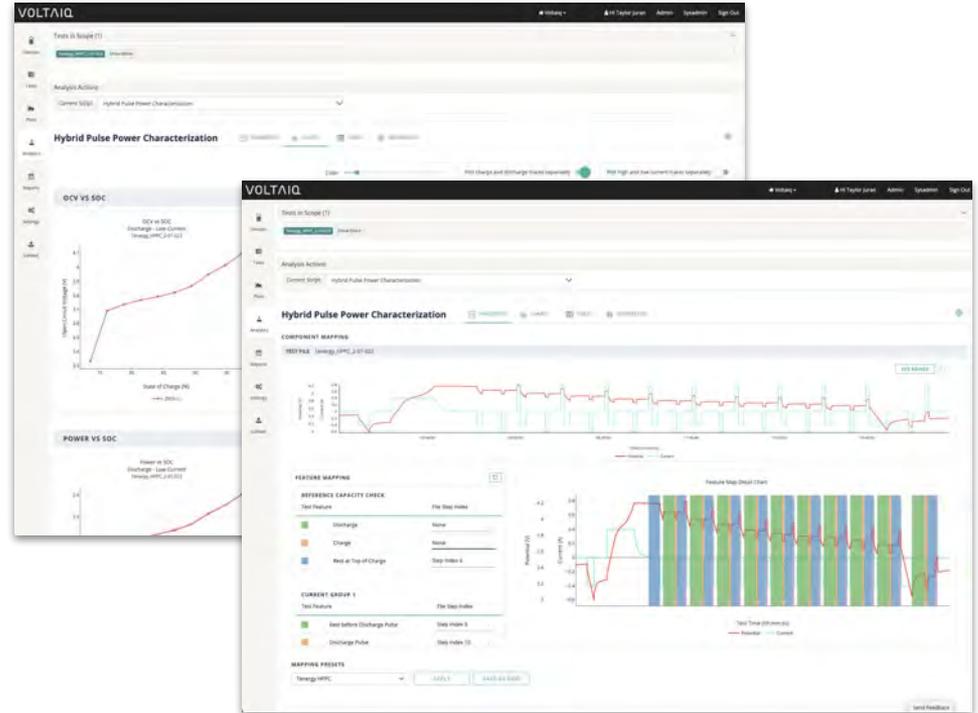
# Cell Engineering Analytics

# Hybrid Pulse Power Characterization (HPPC) Analysis

Understand the ability of your pack to accept & deliver power across its operating range

## Key benefits

- Map out battery cell, module, or pack ability to accept & deliver power over the entire operating range
- Point-and-click to configure your analysis across protocols, reuse endlessly
- Accelerate HPPC analysis by a factor of 100-10,00x



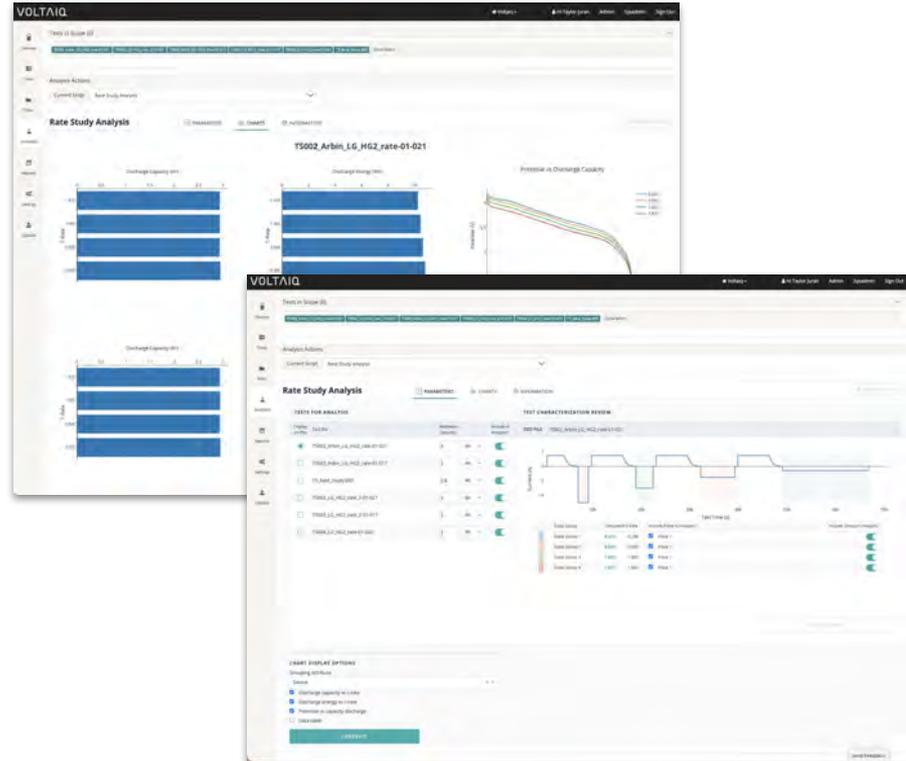


# Rate Study

Rapid interactive analysis of battery capacity at different discharge or charge rates

## Key benefits

- Quickly determine a battery's true usable capacity at different discharge rates, or ability to charge at different rates
- Automate rate analysis across any number of rate profiles and test devices
- Accelerate rate study analysis by a factor of 10-100x





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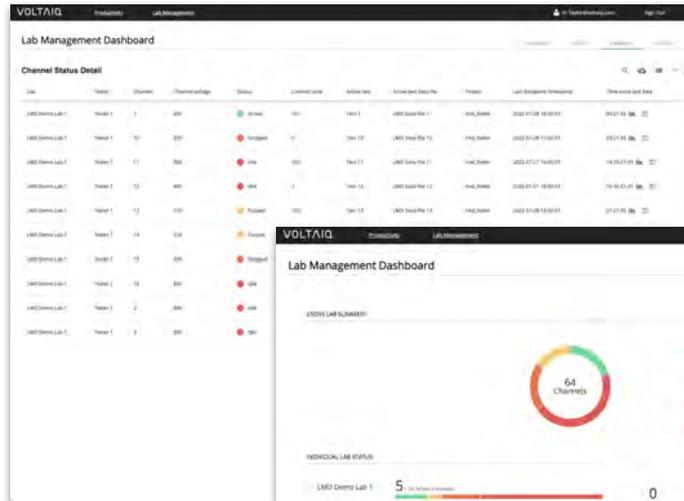
# Lab Management Dashboard

# Lab Management Dashboard

Instant visibility to all test operations in a unified view with rapid drill-down capabilities

## Key benefits

- Maximize testing throughput and equipment utilization across your entire test operation, and gain insight into equipment utilization to plan for future testing capacity expansion
- Provides battery test lab managers an overview of all test equipment and tests in progress to support capacity planning
- Quickly identify and troubleshoot issues that arise at the channel, tester, or lab level





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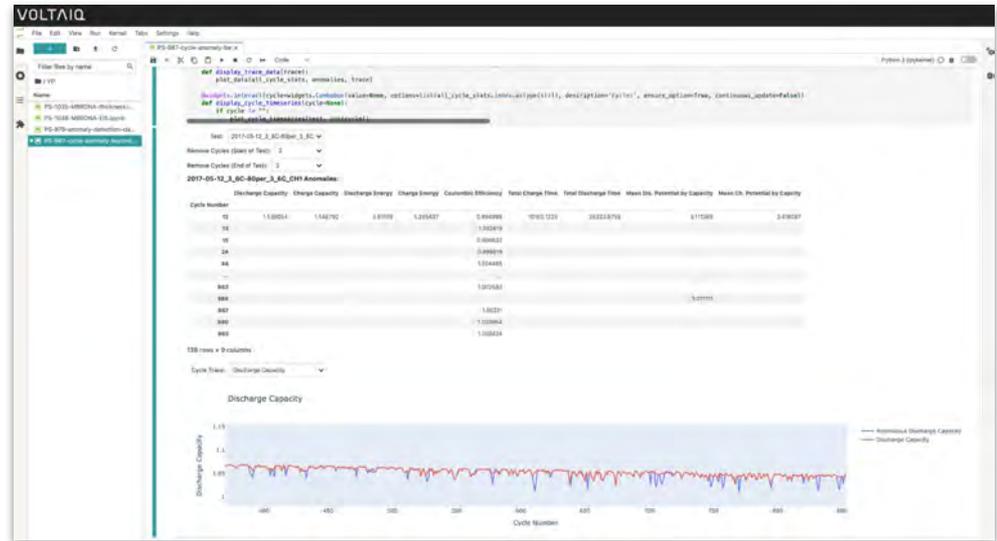
# Analytics Studio & Application Programming Interface (API)

# Analytics Studio

Built-in environment to develop proprietary analyses leveraging harmonized data

## Key benefits

- Build and run your own proprietary, fully customizable, analyses against any data in your Voltaiq system
- Prototype predictive machine learning algorithms, perform large-scale statistical studies, validate your models against real battery performance data
- Access the full library of Python scientific, numerical, machine learning, and data visualization libraries
- Voltaiq provides the environment. You develop and own the IP



# Voltaiq Analytics Studio

Battery data science, modeling, and algorithm development in Python using your own data

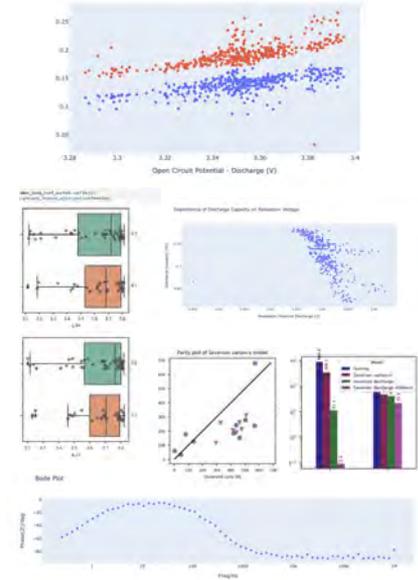
- Access all of your **cleaned, labeled, and featurized data**
- **Library of analytic templates** including **machine learning (ML)** for **anomaly detection** and **lifetime prediction** for use on your data
- **Tutorials** on machine learning and data science for battery data
- Easy collaboration and sharing
- Battery analytics libraries includes TRI's BEEP, PyBaMM, cellpy, impedance.py, and Voltaiq's growing library of powerful, battery-specific analytical tools and functions



# Voltaiq Analytics Studio

## Examples of scripts in the Library

	Industry & Process	Utility	Methods
<b>Cycle Life Prediction</b>	All - Validation, Qualification, Performance Prediction	Warranty, faster R&D, performance prediction	Various machine learning algorithms
<b>Anomaly Detection of Cycle Stats within a Test</b>	Testing, validation, lab monitoring,	Alerting, safety, quicker failure detection, quicker test response time	Local outlier factor, among others
<b>Manufacturing Correlogram</b>	R&D, metadata heavy applications, Manufacturing	Quick visual correlation between metadata to identify most strongly correlated variables	Pearson coefficient correlation
<b>ML Regression Prediction Uncertainty Estimation Tutorial</b>	Battery data science, R&D, anywhere ML is leveraged	Acceleration of ML in development lifecycle	Uncertainty estimations



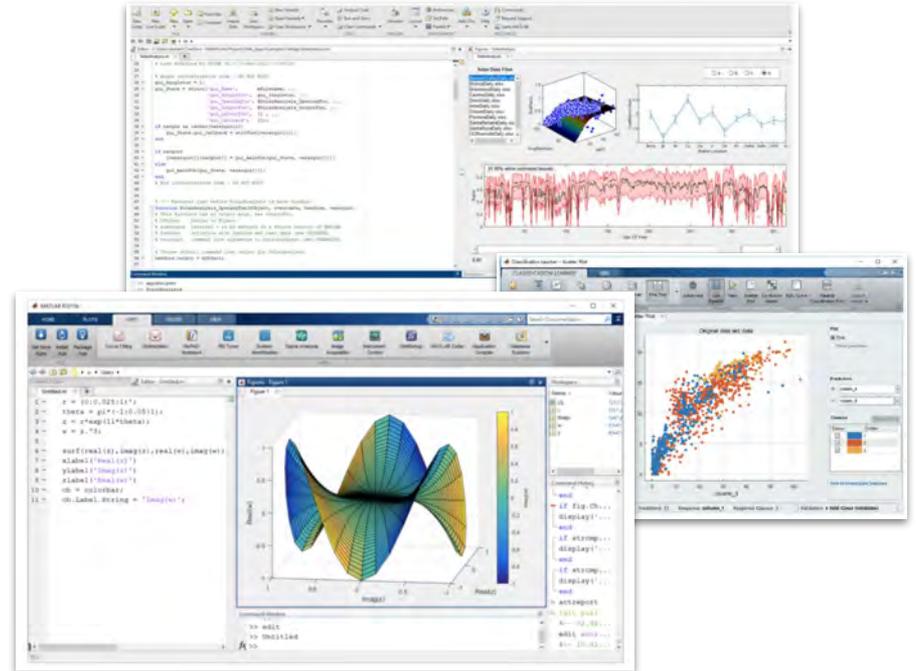
- Train model
- Test model
- Generate Parity Plots
- Plot MAPE results
- Plot RMSE results

# Analytics Studio with MATLAB®

Full power of MATLAB connected to the Voltaiq data platform

## Key benefits

- MATLAB library to access Voltaiq data. Full parity with Python library
- Powerful, cloud-hosted hardware for your use case
- Simulink and Simscape integrations



# Voltaiq External APIs

Capture and analyze data  
faster than ever before

## Features

- Time series API
- Cycle statistics / metrics API
- Metadata API

## Key benefits

- Integrate with ERP, MES, data lake, or preferred data system
- Support low latency ML deployment
- Allow for data archiving



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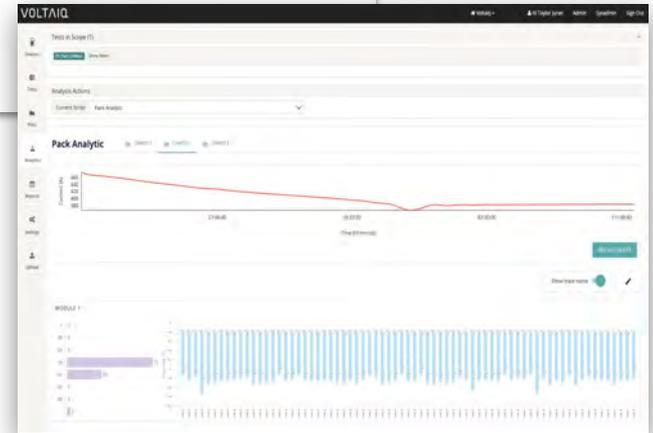
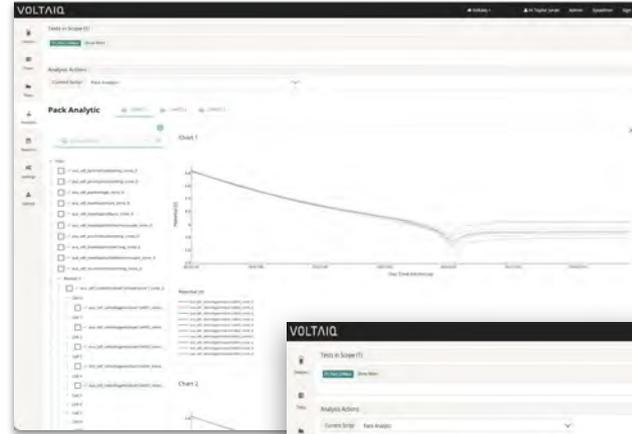
# EV Pack & ESS Analytics

# EV Pack and Energy Storage System Analysis

Rapid validation and troubleshooting of EV batteries & large-scale energy storage systems

## Key Benefits:

- Quickly validate pack or system designs, battery management algorithms & system operation
- Identify voltage anomalies, thermal or current hotspots. Troubleshoot problem cells, modules, or connections that could lead to early degradation or catastrophic failure
- Work with pack or system data from any source or format





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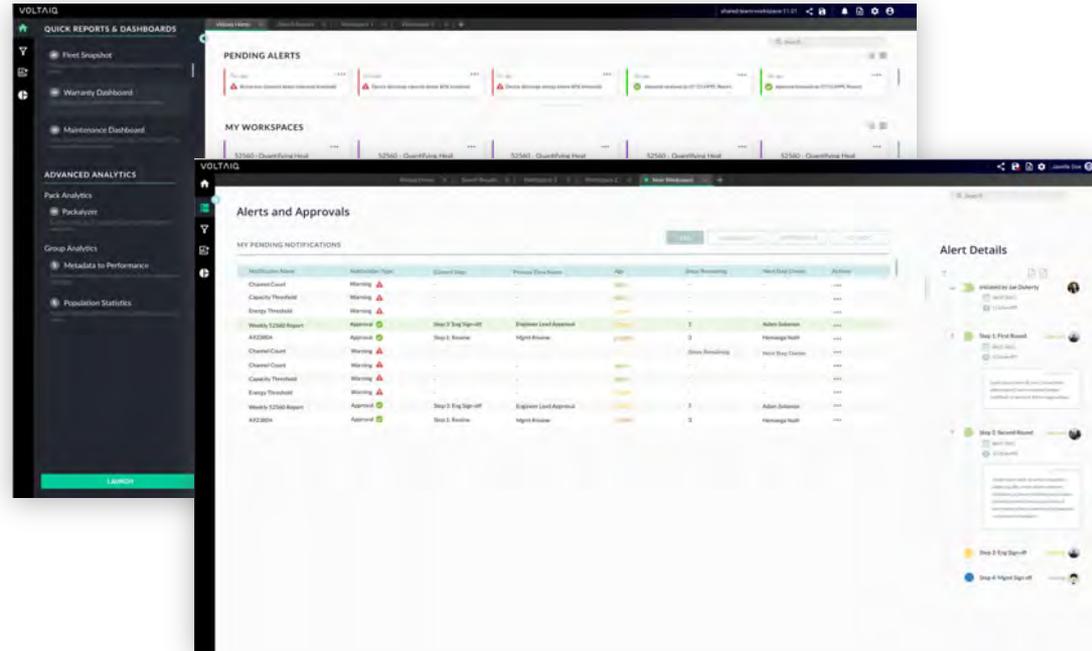
# Rules-based Alerting

# Automated Alerting

Configure Voltaiq to alert you what needs attention

## Alerting in Editions:

- Rules-based alerting for a range of entity & action types
- Configurable checks against projects, individual devices, device groups, tests & tester/cycler channels
- Email & in-app notification options
- ML-based anomaly detection to be released in Q3 2023





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# The Battery Index

# The Battery Index: Benchmarking for Agile Cell Selection

Comprehensive database of real data to solve battery design and development challenges



- Partnership between industry leaders to provide an ever-expanding database of real battery performance, composition, and high-fidelity models, generated using the industry's most robust test and modeling standards
- Available through Voltaiq's EBI platform or as a standalone solution

In partnership with:



# The Battery Index: Benchmarking for Agile Cell Selection

Comprehensive database of real data to solve battery design and development challenges

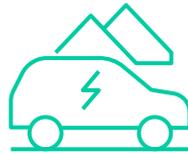
## Key Benefits



See how you stack up and ensure you're selecting the best cells for your application



Enables supply chain diversity and ability to rapidly change vendors to ensure on-time launches



Industry-best models to ensure safe, optimized battery performance by application



Accelerate qualification, BMS and system design and warranty development



Compliments in-house qualification & modeling

# The Battery Index: Benchmarking for Agile Cell Selection

**Batemo Cells – Fast. Physical. Accurate**

# BATEMO CELLS



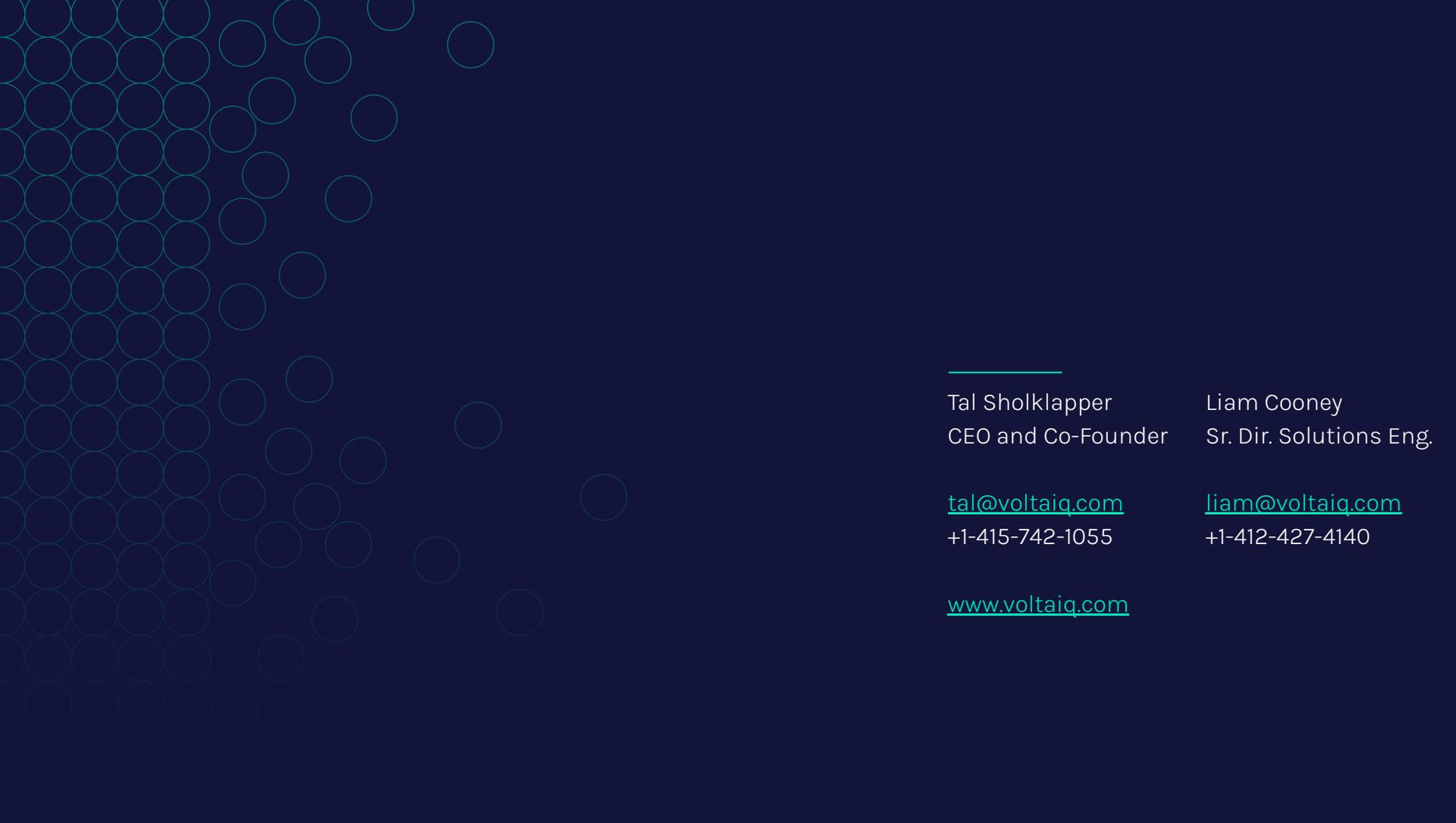
**physical  
cell model**



**specific  
parameterization**



**demonstrated  
validity**



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Tal Sholklapper  
CEO and Co-Founder

[tal@voltaiq.com](mailto:tal@voltaiq.com)  
+1-415-742-1055

[www.voltaiq.com](http://www.voltaiq.com)

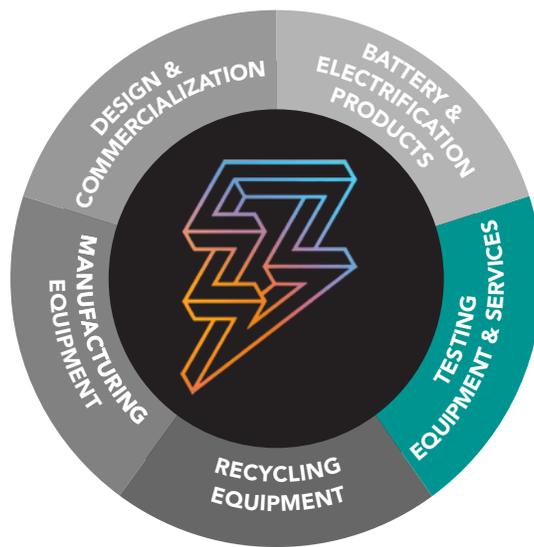
Liam Cooney  
Sr. Dir. Solutions Eng.

[liam@voltaiq.com](mailto:liam@voltaiq.com)  
+1-412-427-4140



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# BTS Product Overview

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Presented By: Kayla Buczkowski

# Agenda/Topics

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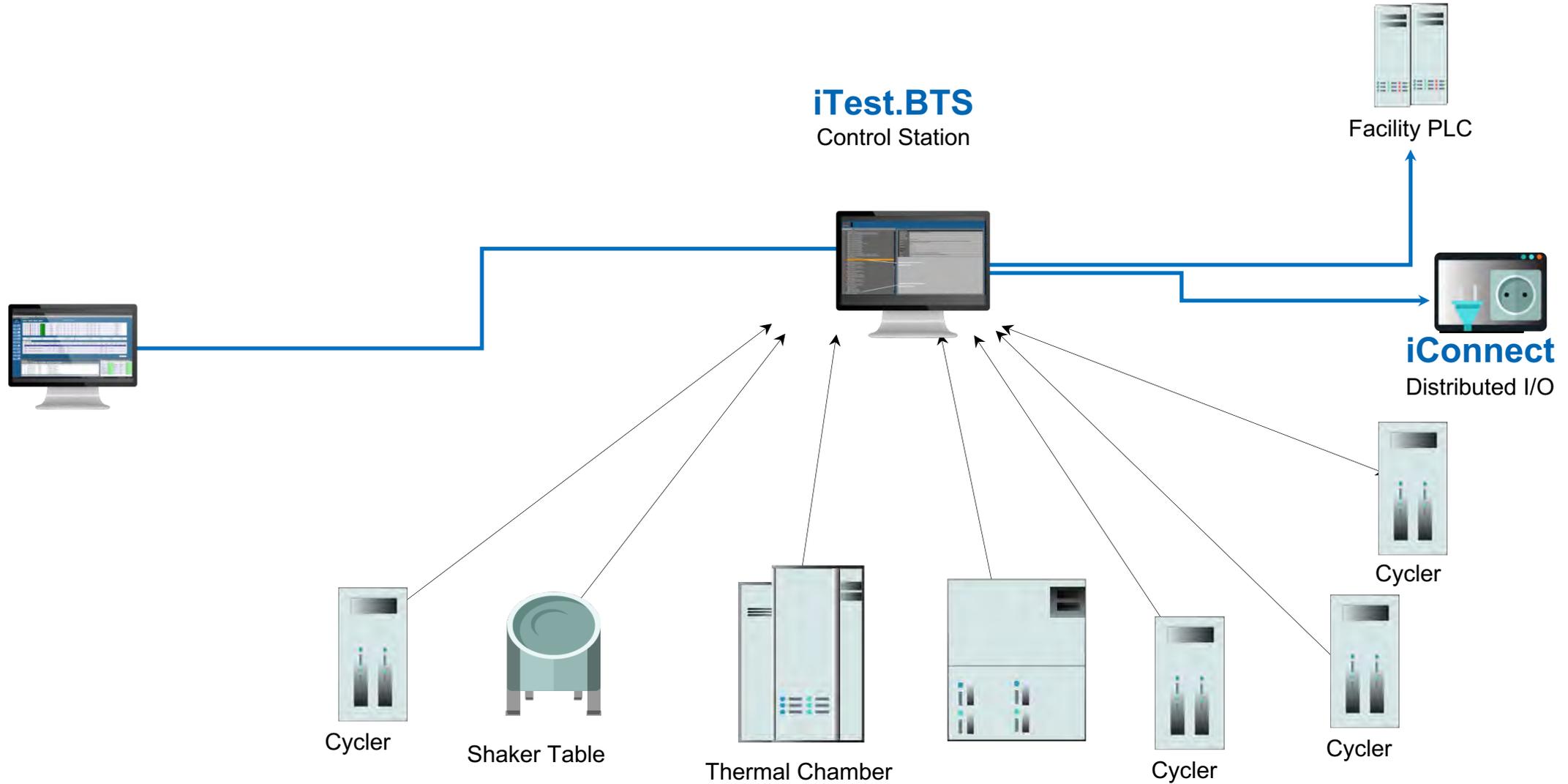
- Product Overview
- Customer Examples (the custom ones)
- BTS Startup Walkthrough
- Troubleshooting
- What's New in 4.1 and 4.2

# Equipment Integration

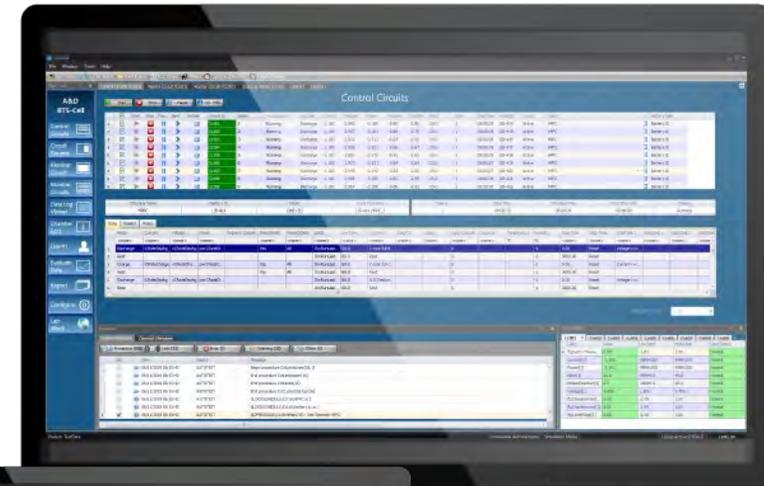


Managing and controlling this equipment is time consuming and requires extensive training.

# Equipment Integration



# Pictures



# Pictures of it

## Battery specification files

- Characterize the DUT while defining the safety and testing parameters for each battery
- Specification only needs to be written once for each battery type
- Master battery specification files can be pulled or pushed from optional LabCentral server
- Provides ability to quickly process test articles through test stations

Header	Test	Startup	Shutdown	Notes	
	Description		Value		
1	Description	BLT Pack			
2	Part Number	123456			
3	Manufacturer	BLT			
4	Max Battery Voltage	330.000			
5	Min Battery Voltage	240.000			
6	Max Operating Temp (°C)	50.0			
7	Rated Capacity (Ah)	80.00			
8	Max pack cell voltage (V)	4.000			
9	Min pack cell voltage (V)	2.000			
10	# of cells in pack	83			
11	# of cell temp sensors	48			
12	Cell balance procedure	CctBattCellBalNow			
13	Charge taper procedure	CctBattChargeTaper			

Header	Test	Startup	Shutdown	Notes					
	Step Time	DigOut 1	DigOut 2	DigOut 3	DigOut 4	Step Task 1	StepTask 2	StepTask 3	Operator Message
	seconds	DO1	DO2	DO3	DO4	Action When ...	OR	OR	Text
1	000:00:05.00	1	0	1	0				Battery Startup
2	000:00:01.00	0	1	0	1				Startup Complete

Header	Test	Startup	Shutdown	Notes
1	ISpecLookup			-300.000
2	VoltageLoLim			239.000
3	VoltageHiLim			331.000
4	CurrentLoLim			-250.000
5	CurrentHiLim			250.000
6	PowerLoLim			-82500.000
7	PowerHiLim			82500.000
8	vCellLim			1.950
9	vCellLim			4.050
10	mVCellDeltaHiLim			100.000
11	iBatHiLim			40.000
12	iBatChamberHiLim			40.000
13	AhStorage			4.450
14	MaxChargeTimeSec			5400.000
15	ChargeTaper			0.100
16	iCRateCharge			80.000
17	vCRateCharge			300.000
18	pwCRateCharge			26400.000
19	iCRateDischg			80.000
20	vCRateDischg			240.000
21	pwCRateDischg			26400.000
22	vCellCharge			3.800
23	vCellDischg			2.000
24	pwDSTMax			0.000
25	vPackBalancing			0.000
26	mVCellDeltaBalance			10.000
27	imBalanceTimeout			108000.000
28	imOCVBalancePause			0.000
29	vCellBalanceCharge			3.800
30	vCellBalanceDischg			3.500
31	iCellBalanceCharge			4.000
32	iCellBalanceDischg			4.000
33	ProfilePeak			6.000

# BTS Specific Schedule Runner



- Schedules are parametrized by Battery Spec File and can be applied to cell, module, or pack
  - Allows the system to run the same test without rewriting the test profile

Mode <none>	Current Amps	Voltage Volts	Power Watts	ResetAhW <none>	ResetOthe <none>	Limits <none>	Log Time sec	Log Text <none>
att Startup						On	1.00	Battery Startup
est						On	1.00	Rest
ischarge	iC-RateDischg	vC-RateDischg	pwrC-RateDischg	Yes	All	On	1.00	C-rate full discharge
est						On	1.00	Rest
harge	iC-RateCharge	vC-RateCharge	pwrC-RateCharge	Yes	All	On	1.00	C-rate full charge
est						On	1.00	Rest
ischarge	iC-RateDischg	vC-RateDischg	pwrC-RateDischg			On	1.00	C-Rate Full Discharge
est						On	1.00	Rest
harge	iC-RateCharge	vC-RateCharge	pwrC-RateCharge			On	1.00	C-Rate Full Charge
ell Bal Now	iC-RateCharge/20	vC-RateCharge	pwrC-RateCharge			On	1.00	Cell balance Routine
est						On	1.00	Rest
ischarge	iC-RateDischg	vC-RateDischg	pwrC-RateDischg			On	1.00	SOC Reduction 10%
est						On	1.00	1 hour Rest
ischarge	45	330	pwrC-RateDischg ▾			On	1.00	HPPC Discharge Pulse
est						On	1.00	Rest
harge	iCharge10s	vCharge10s	pwrC-RateCharge			On	1.00	HPPC Charge Pulse
est						On	1.00	End Of Test

# Supported Devices



## Battery Cycler

- Control and feedback from up to 4 different cyclers per system regardless of manufacturer
- Scalable Control and feedback based on system type
  - Cell application can be scaled up to control 96 total circuits per system
  - Pack & Module applications can be scaled up to control 2 total circuits per system

## Thermal Chamber

- Control and feedback from up to 4 different chambers per system regardless of manufacturer
- Temperature setpoint advancement is based on the “slowest” battery in the chamber
- Ability to share chamber control with another iTest.BTS system

Supported Cycler Manufacturers*			Supported Chamber Manufacturers*	
Chroma	NH Reserach	Digatron	Cincinnati Sub Zero	Thermotron
AeroVironment	Maccor	Yokogawa	Tenney	ESPEC
Bitrode		Neware	ETOMA	BlueM Oven
Espec ADBT	Keithly	Anderson		

\*Note #1: A&D is committed to interfacing to all capable customer specified chambers and cyclers

## BMS Communication

- Multiplexed read / write capability, up to 3 channels per battery
- Supports CAN, SMBUS, CANFD, AUTOSAR, and LIN
- Full support for BMS diagnostics multi frame messages

## Integrated Camera Systems

- Thermal camera integration with synchronized data imaging playback feature
- High speed video camera

## Miscellaneous: Chiller, Shaker Table, Power Analyzer, PLC, etc.

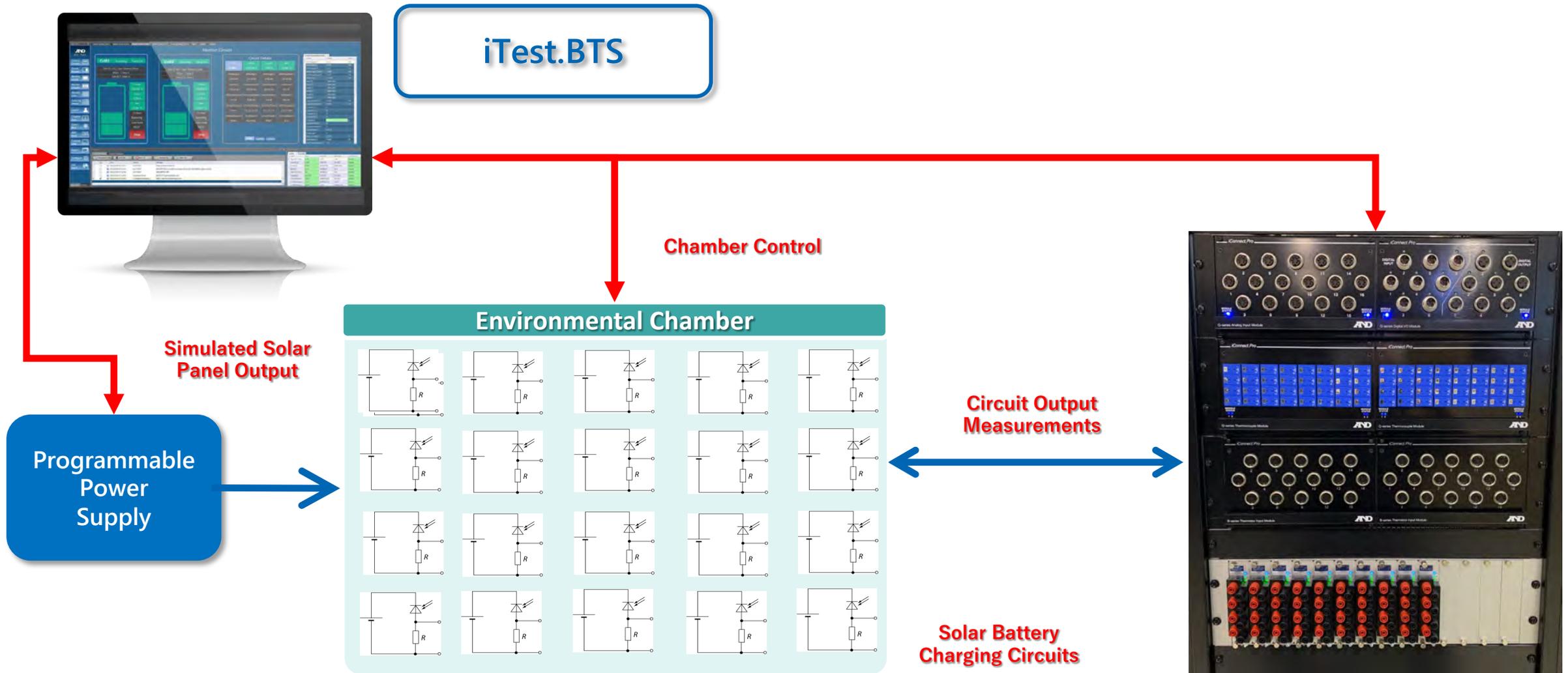
- Multiple format interfaces available or developed
- Over 150 non-A&D devices currently supported

# Customer Examples

# Solar Circuit Testing Application

- Test the functionality of solar cell battery charging circuit
- Programmable power supply simulates solar panel output
- iConnect I/O measures circuit output and provides feedback
- Chamber simulates circuit environment
- iTest BTS provides control and executes repetitive long-term tests
  - Power supply
  - iConnect I/O
  - Chamber
  - Logging and data storage

# Solar Circuit Testing

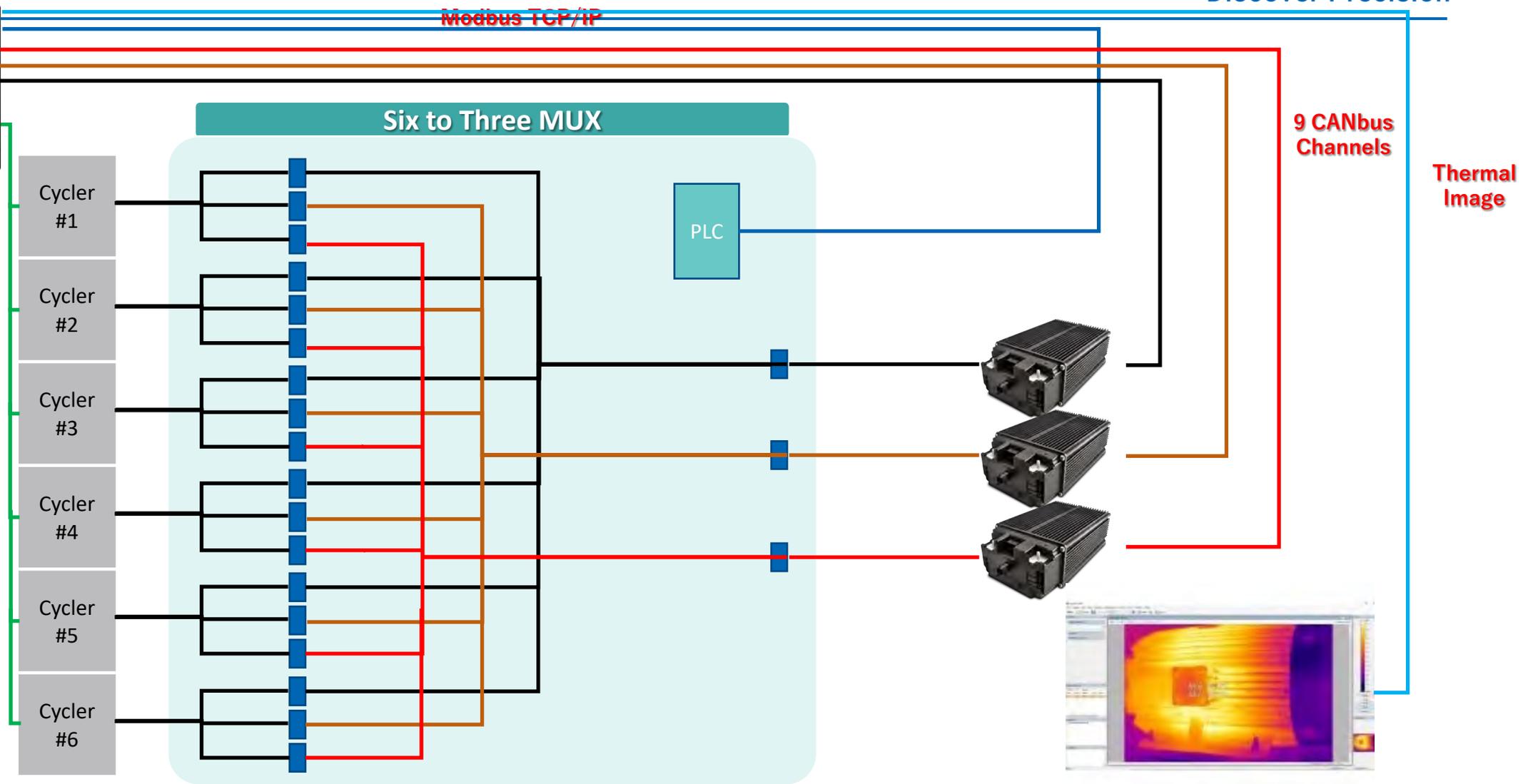


# High Current Multiplexer Application - eCombiner



- Mux up to 6 cyclers to one of three battery packs
  - Dynamic switching under test sequence control
  - Configure Six three channel cyclers to deliver up to 2000A, 1000VDC or 600kW to any Pack
  - In-built PLC for internal switch gear
  
- One iTest.BTS system provides:
  - Interface to multiplexer
  - Configuration and control of all six cyclers simultaneously
  - Duplex communications and logging of 9 CANbus channels
  - Recording video from three thermal imaging cameras

# High Current Multiplexer

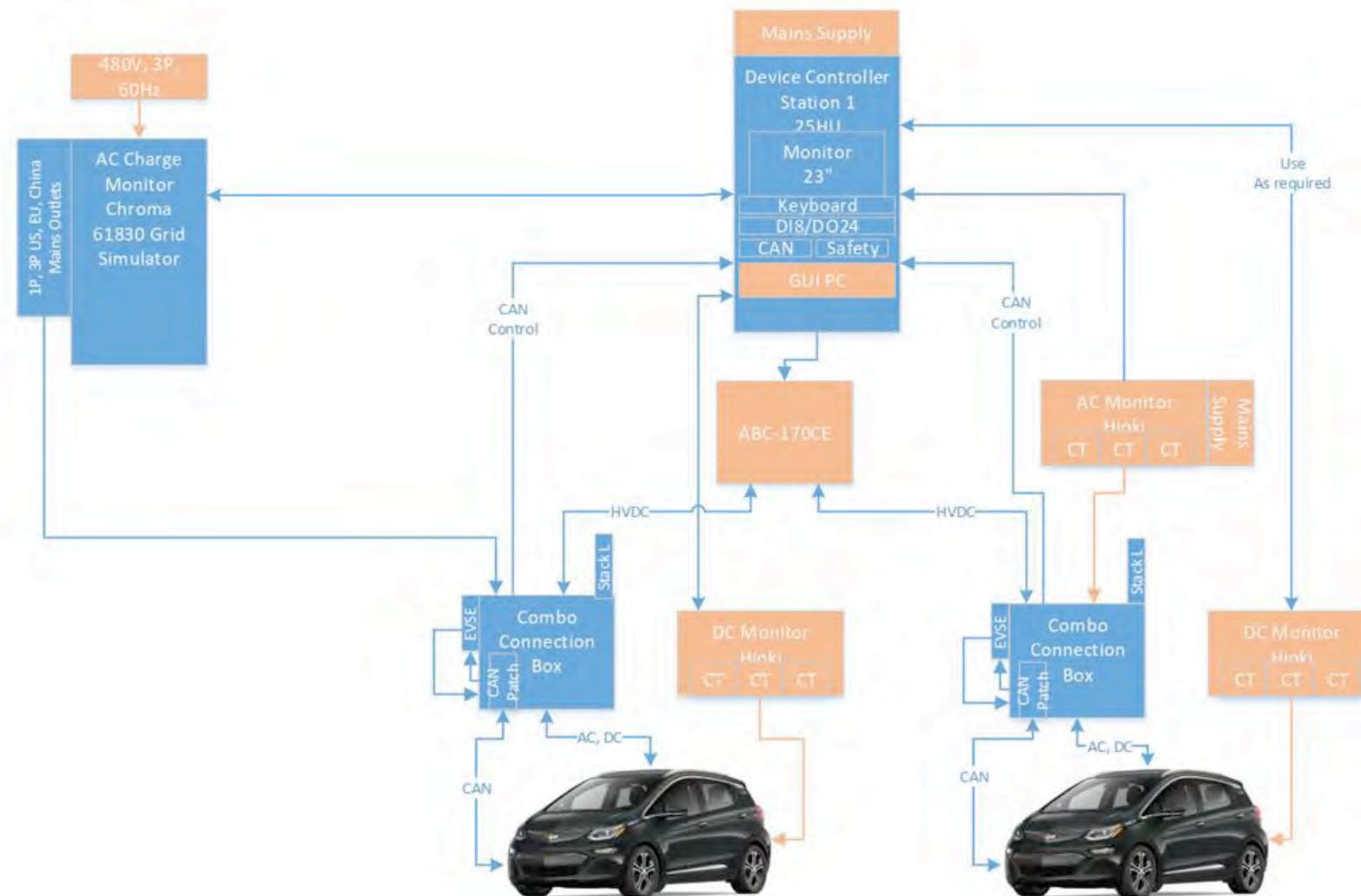


# J1634 BEV Testing



- Control / monitor energy flow and acquire data to / from multiple power charging / discharging devices concurrently or independently.
- Execute user defined / industry standard power cycling profiles through the control of multiple power supplies concurrently or independently.
- Provide a CANbus interface to monitor and record controller data over CAN allowing for CAN signals to be monitored and to be used for reactions by the test script
- Provide redundant safety circuits per the customers standards / specifications / guidelines as well as implementation of safety components identified through our experience with these types of systems.
- Interface to from external measurement devices and related telemetry.

# J1634 BEV Testing



- Make a BTS solution with the Battery Wizard
- Going from solution creation to commissioning

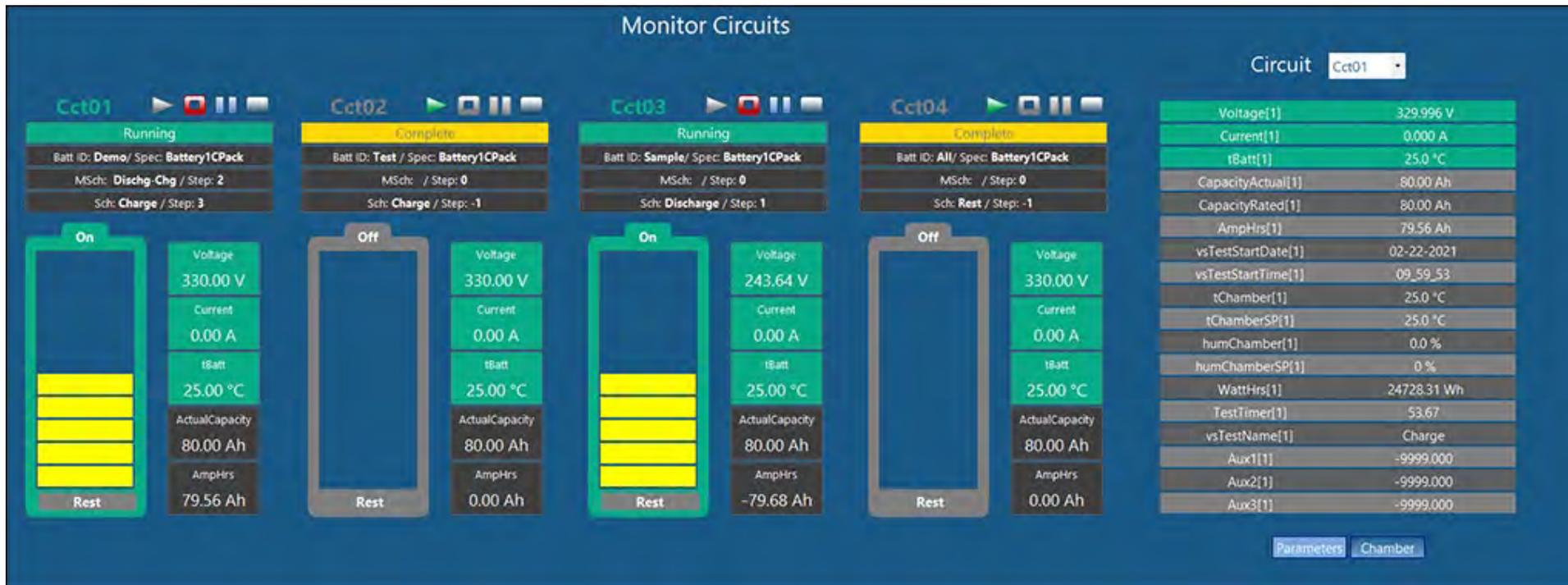
# Common Troubleshooting

- Battery BMS was not sent proper sequence to close internal contactors, so startup sequence fails.
- BMS module is missing cell voltage mapping, so exhibits behavior of min voltage limit fault.
- AVCanCycler driver communication confirmed working with ValuCAN3, does NOT work with CanNeo Fire VI 2, not confirmed with ValuCAN4 or CanNeo Fire VI.
- Chamber module does not work for the chamber because the chamber driver help document shows which chambers it supports, but the module is only designed for one of the supported chambers, so minor modifications are necessary.

# What's New?

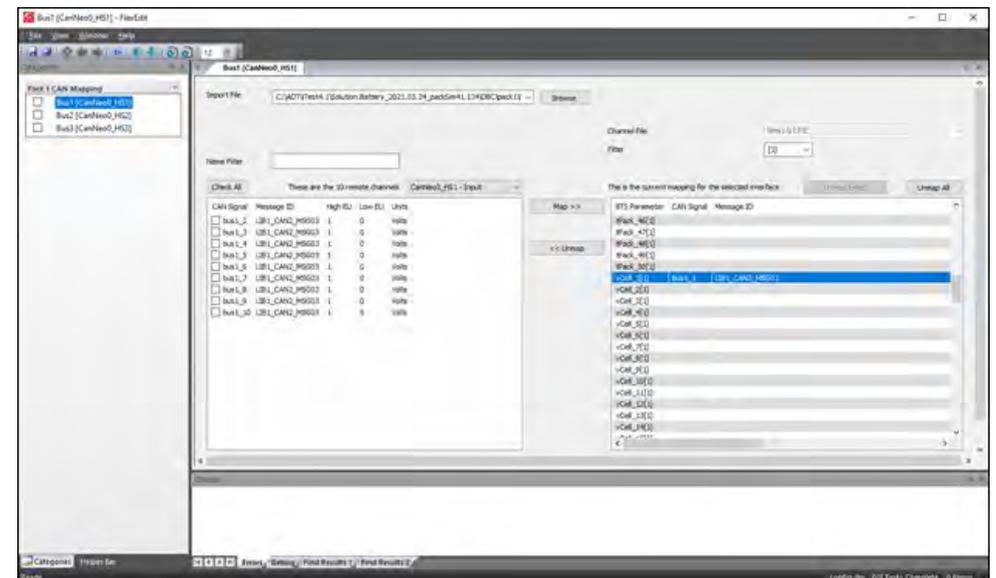
# BTS 4.1: Pack Circuits Increased to 4

- The maximum number of circuits for a pack solution has been increased from 3 to 4. The screenshot below shows 4 circuits on the new Monitor Circuits display.



# BTS 4.1: New Pack BMS Module

- The new BMS module supports up to 4 circuits with 3 CAN buses per circuit. The module also allows mapping of circuit parameters to CAN signals using a DBC file and has separate CAN bus data logging.



# BTS 4.1: Pack Voltage Matching Framework

- Often it is desirable to match the cycler voltage with the battery pack voltage as part of the circuit startup routine. A framework for this feature has been added to the pack solution; it can be customized to suit a particular cycler/pack combination.



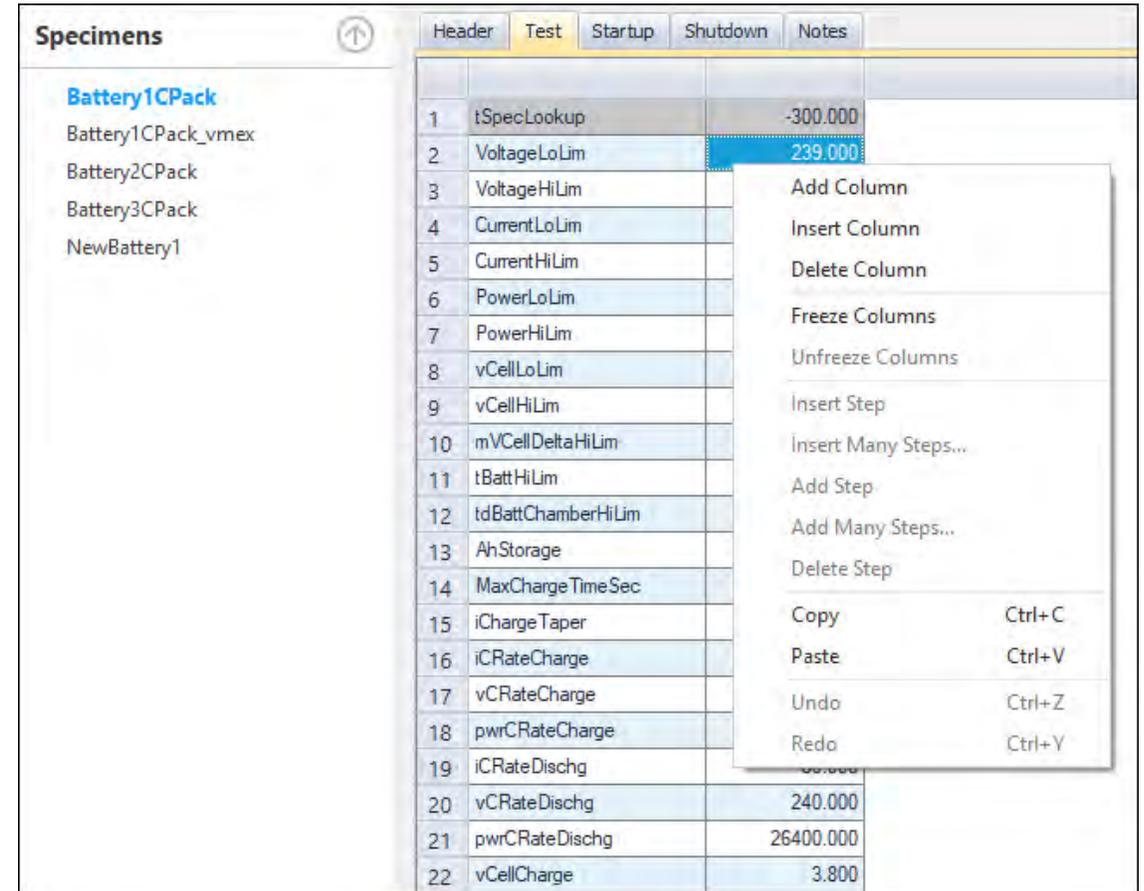
Header	Test	Startup	Shutdown	Notes					
Step Time seconds	DigOut 1 DO1	DigOut 2 DO2	DigOut 3 DO3	DigOut 4 DO4	Strip Task 1 Action Whe...	StripTask 2 OR	StripTask 3 OR	Operator Message Text	
1	3	0	0	0	0			Turning On(13)BMS Power Supply	
2	0	0	0	0	0	StepTimer >0	BMSComsStatus=1	BMSComsStatus <=0	Checking(13)BMS Comms
3	0	0	0	0	0	StepTimer >0	CydeVoltageMatchStatus=1	CydeVoltageMatchStatus <=0	Adjusting(13)Cyde Voltage
4	3	0	0	0	0				Close(13)Pack Contactor
5	1	0	0	0	0				Startup Complete

- The following mailslots have been added to enable circuit control to be independent of the Circuit Monitor panel. This allows circuits to be control programmatically or using separate button controls.
  - \$StartCircuit;<CctID>
  - \$StopCircuit;<CctID>
  - \$PauseCircuit;<CctID>
- Examples:
  - \\.\mailslot\Softpanel>>\$StartCircuit;\$index\$
  - \\.\mailslot\Softpanel>>\$StopCircuit;\$index\$
  - \\.\mailslot\Softpanel>>\$PauseCircuit;\$index\$

- Profile Peak Parameterization
  - The Profile Peak (profile gain) is now parameterized. Previously, it was defined numerically as part of the schedule definition. The new parameter has also been added to the battery specification; in this way, a normalize profile can be used with the gain by the battery specification in use.
- Editable Parameter Alias Name
  - All circuit parameter names are now editable using the SolutionBuilder parameter editor.
- Increased Number of Allowed Array Channels
  - The number of allowed array channels (used for circuit parameters) have been increased from 500 to 1000.

# BTS 4.2: Adding New Temperature Columns

- The Battery Specimens editor now includes the ability to add new temperature columns under the Test page.
- Previously, new temperature columns could only be added under the Battery Types editor.

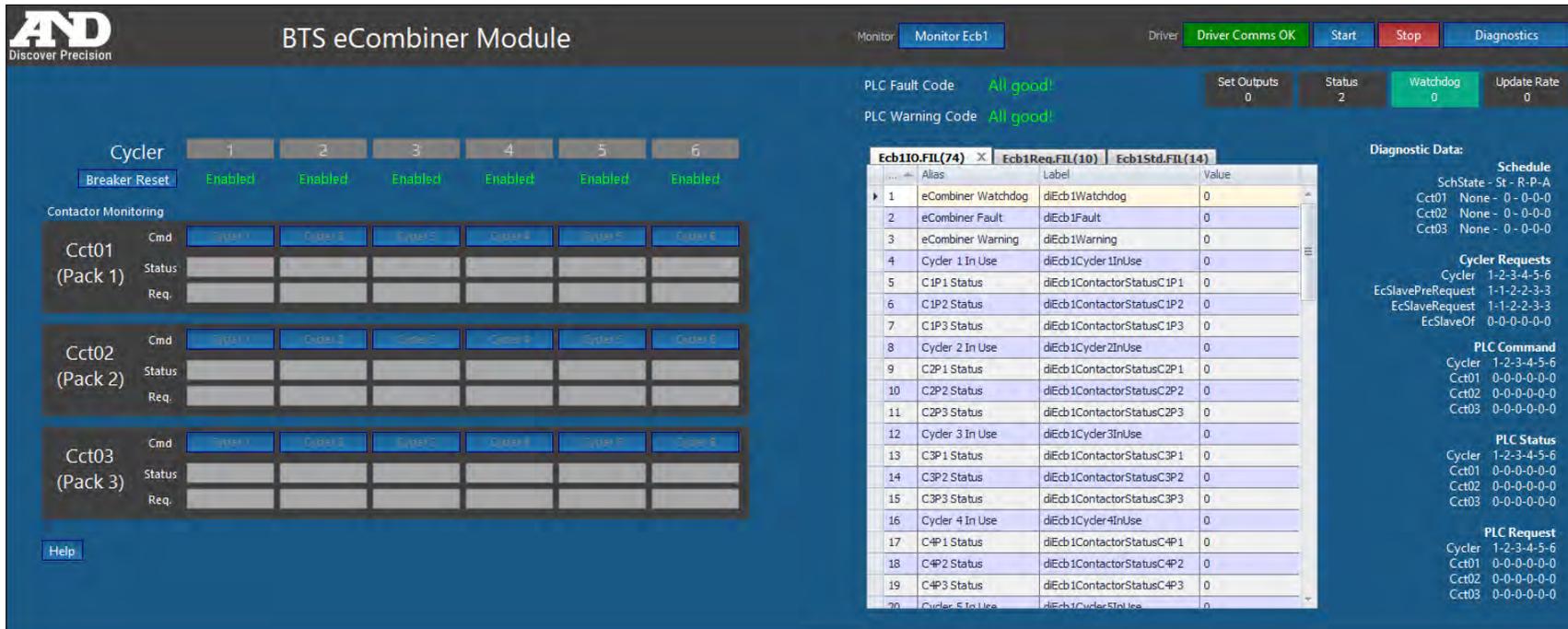


The screenshot shows the 'Specimens' editor interface. On the left, a list of battery types is shown: Battery1CPack (selected), Battery1CPack\_vmex, Battery2CPack, Battery3CPack, and NewBattery1. The main area displays a table with columns for 'Header', 'Test', 'Startup', 'Shutdown', and 'Notes'. The 'Test' column is active, and a context menu is open over it, listing actions such as 'Add Column', 'Insert Column', 'Delete Column', 'Freeze Columns', 'Unfreeze Columns', 'Insert Step', 'Insert Many Steps...', 'Add Step', 'Add Many Steps...', 'Delete Step', 'Copy', 'Paste', 'Undo', and 'Redo'. The table data is as follows:

	Header	Test	Startup	Shutdown	Notes
1	tSpecLookup				-300.000
2	VoltageLoLim				239.000
3	VoltageHiLim				
4	CurrentLoLim				
5	CurrentHiLim				
6	PowerLoLim				
7	PowerHiLim				
8	vCellLoLim				
9	vCellHiLim				
10	mVCellDeltaHiLim				
11	tBattHiLim				
12	tdBattChamberHiLim				
13	AhStorage				
14	MaxCharge TimeSec				
15	iCharge Taper				
16	iCRateCharge				
17	vCRateCharge				
18	pwrCRateCharge				
19	iCRateDischg				
20	vCRateDischg				240.000
21	pwrCRateDischg				26400.000
22	vCellCharge				3.800

# BTS 4.2: eCombiner

- In iTest.BTS, the eCombiner module is used to monitor and control dynamic paralleling of cyclers, which greatly reduces the cost of cyclers for pack testing.
- An eCombiner system can include six cycler circuits, which can be combined in multiple combinations to provide charge/discharge capability for up to three independent battery packs.
- This module is compatible with A&D's eCombiner hardware.

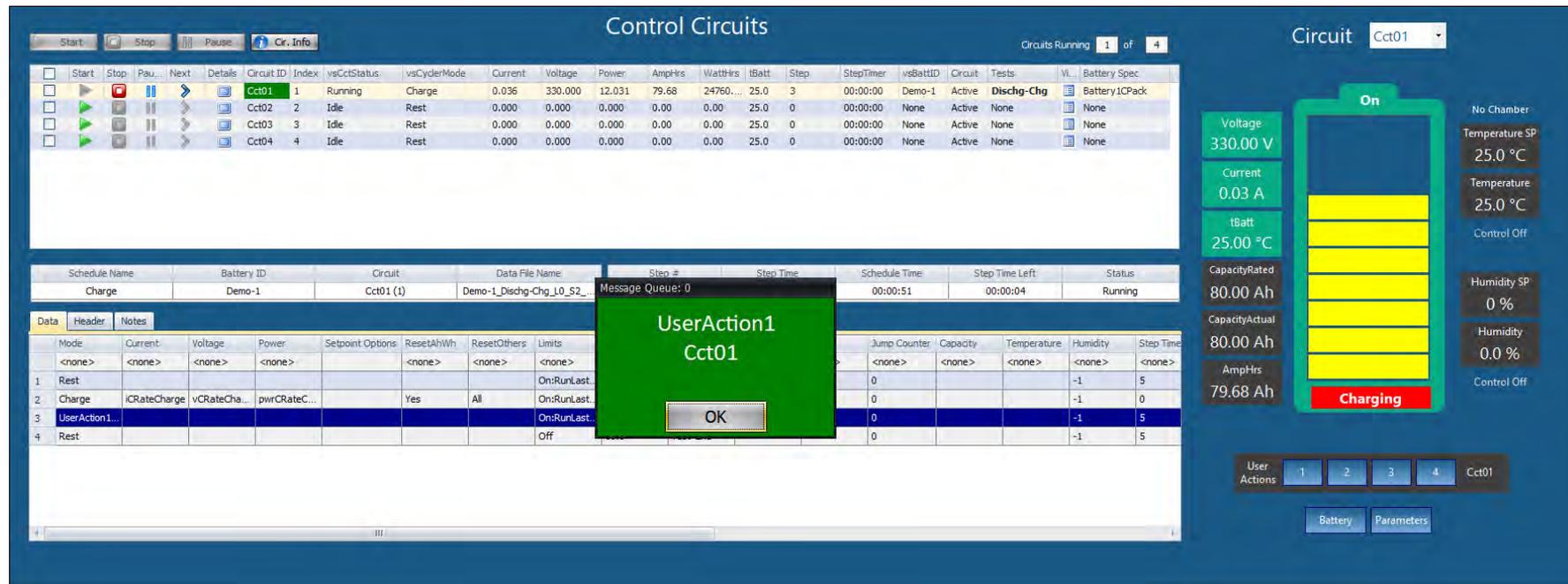


The screenshot displays the 'BTS eCombiner Module' software interface. At the top, it shows the AND Discover Precision logo and the title 'BTS eCombiner Module'. The interface includes several control panels and data displays:

- Monitor:** A 'Monitor Ecb1' button.
- Driver:** 'Driver Comms OK' status, and 'Start', 'Stop', and 'Diagnostics' buttons.
- PLC Fault Code:** 'All good!' (green text).
- PLC Warning Code:** 'All good!' (green text).
- Set Outputs:** 0
- Status:** 2
- Watchdog:** 0
- Update Rate:** 0
- Cycler:** A row of six buttons labeled 1 through 6, each with an 'Enabled' status indicator.
- Breaker Reset:** A button.
- Contactors Monitoring:** Three sections for 'Cct01 (Pack 1)', 'Cct02 (Pack 2)', and 'Cct03 (Pack 3)'. Each section has a 'Cmd' row with buttons for Cycler 1-6, and 'Status' and 'Req.' rows.
- Diagnostic Data:** A table with columns for Alias, Label, and Value. It lists various system parameters such as 'eCombiner Watchdog', 'eCombiner Fault', 'eCombiner Warning', and various 'Cycler In Use' and 'CIP Status' indicators.
- Schedule:** A section showing 'SchState - St - R - P - A' and 'Cct01 None - 0 - 0 - 0 - 0', 'Cct02 None - 0 - 0 - 0 - 0', and 'Cct03 None - 0 - 0 - 0 - 0'.
- Cycler Requests:** A section showing 'Cycler 1-2-3-4-5-6', 'EcSlavePreRequest 1-1-2-2-3-3', 'EcSlaveRequest 1-1-2-2-3-3', and 'EcSlaveOf 0-0-0-0-0-0'.
- PLC Command:** A section showing 'Cycler 1-2-3-4-5-6', 'Cct01 0-0-0-0-0-0', 'Cct02 0-0-0-0-0-0', and 'Cct03 0-0-0-0-0-0'.
- PLC Status:** A section showing 'Cycler 1-2-3-4-5-6', 'Cct01 0-0-0-0-0-0', 'Cct02 0-0-0-0-0-0', and 'Cct03 0-0-0-0-0-0'.
- PLC Request:** A section showing 'Cycler 1-2-3-4-5-6', 'Cct01 0-0-0-0-0-0', 'Cct02 0-0-0-0-0-0', and 'Cct03 0-0-0-0-0-0'.

# BTS 4.2: User-Defined Control Modes

- iTest.BTS includes four example mode procedures (UserAction1\$index\$ - UserAction4\$index\$).
- These procedures utilize the circuit index as an argument and can be edited in SolutionBuilder's Procedures editor.
- The mode procedure is started when a test schedule reaches the mode procedure step.



The screenshot displays the iTest.BTS Control Circuits interface. The top section shows a table of running circuits, with Cct01 highlighted. Below this is a test schedule table with columns for Schedule Name, Battery ID, Circuit, Data File Name, Step #, Step Time, Schedule Time, Step Time Left, and Status. A modal dialog box titled "UserAction1 Cct01" is overlaid on the schedule table. On the right side, a detailed view for Circuit Cct01 shows real-time data: Voltage (330.00 V), Current (0.03 A), tBatt (25.00 °C), CapacityRated (80.00 Ah), CapacityActual (80.00 Ah), and AmpHrs (79.68 Ah). A battery status indicator shows "On" and "Charging".

Start	Stop	Pause	Next	Details	Circuit ID	Index	vsCctStatus	vsCyderMode	Current	Voltage	Power	AmpHrs	WattHrs	tBatt	Step	StepTimer	vsBattID	Circuit	Tests	W...	Battery Spec
					Cct01	1	Running	Charge	0.036	330.000	12.031	79.68	24760...	25.0	3	00:00:00	Demo-1	Active	Dischg-Chg		Battery1CPack
					Cct02	2	Idle	Rest	0.000	0.000	0.000	0.00	0.00	25.0	0	00:00:00	None	Active	None		None
					Cct03	3	Idle	Rest	0.000	0.000	0.000	0.00	0.00	25.0	0	00:00:00	None	Active	None		None
					Cct04	4	Idle	Rest	0.000	0.000	0.000	0.00	0.00	25.0	0	00:00:00	None	Active	None		None

Schedule Name	Battery ID	Circuit	Data File Name	Step #	Step Time	Schedule Time	Step Time Left	Status
Charge	Demo-1	Cct01 (1)	Demo-1_Dischg-Chg_L0_S2...	Message Queue: 0		00:00:51	00:00:04	Running

Mode	Current	Voltage	Power	Setpoint Options	ResetAhWh	ResetOthers	Limits	Jump Counter	Capacity	Temperature	Humidity	Step Time
<none>	<none>	<none>	<none>		<none>	<none>	<none>	<none>	<none>	<none>	<none>	<none>
1 Rest							On:RunLast...	0	<none>	<none>	-1	5
2 Charge	iCRateCharge	vCRateCha...	pwrCRateC...		Yes	All	On:RunLast...	0	<none>	<none>	-1	0
3 UserAction1...							On:RunLast...	0	<none>	<none>	-1	5
4 Rest							Off	0	<none>	<none>	-1	5

# BTS 4.2: More Updates

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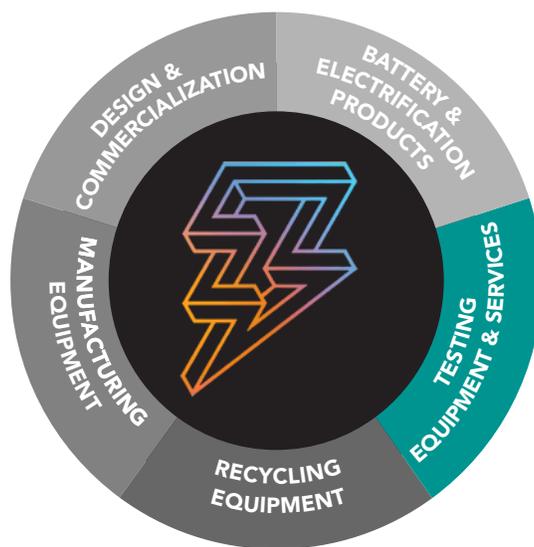


- **BTS Array Channels:**
  - The maximum amount of Virtual Array channels (both outputs and string arrays) has increased from 1000 to 1500.
- **Deprecated Features:**
  - The **Step Timer** column has been removed from the Schedules editor in iTest.BTS.



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**Amphenol**



## Ventostat TR

### Early Warning of Battery Venting/Thermal Runaway



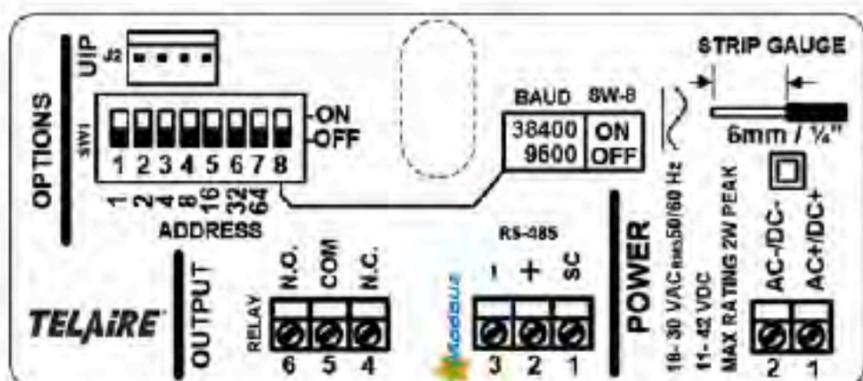
Telaire Ventostat TR Transmitter is designed to provide early warning of battery failure in industrial energy storage systems, which can lead to Thermal Runaway. If battery failure conditions are detected, the transmitter alerts the user so that proper countermeasures can be taken.

With its multi-measurement capabilities, including Carbon Dioxide (CO<sub>2</sub>), Hydrogen (H), Relative Humidity (RH) and Temperature, the Ventostat TR allows for continuous monitoring of the surrounding environment and connection to automation systems, as well as local control of ventilation equipment using onboard relays.

- Compliant with the latest NF128 LNE test protocol
- US Patents: US6526801, US6255653, US6410918, US6588250 (Patents Pending), Application No. 17/021,711

### Applications

- Detection of Thermal Runaway



### Features

- Multi-measurement capabilities:
  - Carbon Dioxide (CO<sub>2</sub>) - Patented, Absorption infrared (IR) gas sensing engine provides high accuracy in a compact low-cost package
  - Hydrogen (H) - Pre-calibrated, cutting edge technology
  - Relative Humidity (RH)
  - Temperature
- Mounting plate with two-piece terminal blocks allows for quick, easy wiring
- Standard Modbus output enables local and remote monitoring
- Relays - Output with customizable factory settings
- Sensors are shipped factory-calibrated
- Two-piece design allows unit to be replaced without the need for rewiring
- Modbus RTU RS485 Output (TCP IP is to be included in future generation releases.)

# Telaire Ventostat TR Specifications

## Transmitter

### Power Supply Requirements

- 18-30 VAC RMS, 50/60 Hz, or 10.8 to 42 VDC
- Polarity protected

### Power Consumption

- Typical 0.8 W at nominal voltage of 24V AC RMS

### Operating Conditions

- 32°F to 122°F (0°C to 50°C)
- 0 to 95% RH, non-condensing

### Storage Conditions

- -40°F to 158°F (-40°C to 70°C)

### Flammability Classification

- UL94 5VA

### Modbus

- RTU (TCP IP option in future generations.)
- RS485
- Baud rates 38400 or 9600

### Enclosure

- Standard modern wall-mount enclosure

### Relays (Hydrogen Response & CO<sub>2</sub> Response)

- Normally open and normally closed contact

### Relay Set-points and Hysteresis

- Adjustable set-points allow you to match application

### Rated Load (Typical)

- 0.50A at 125 VAC, 1A 24 VDC

### Contact Material

- Ag + Au-Alloy
- Carry Current 2A

### Max. Operating Voltage

- 125 VAC, 60 VDC

### Max. Operating Current

- 1A

### Max. Switching Capacity

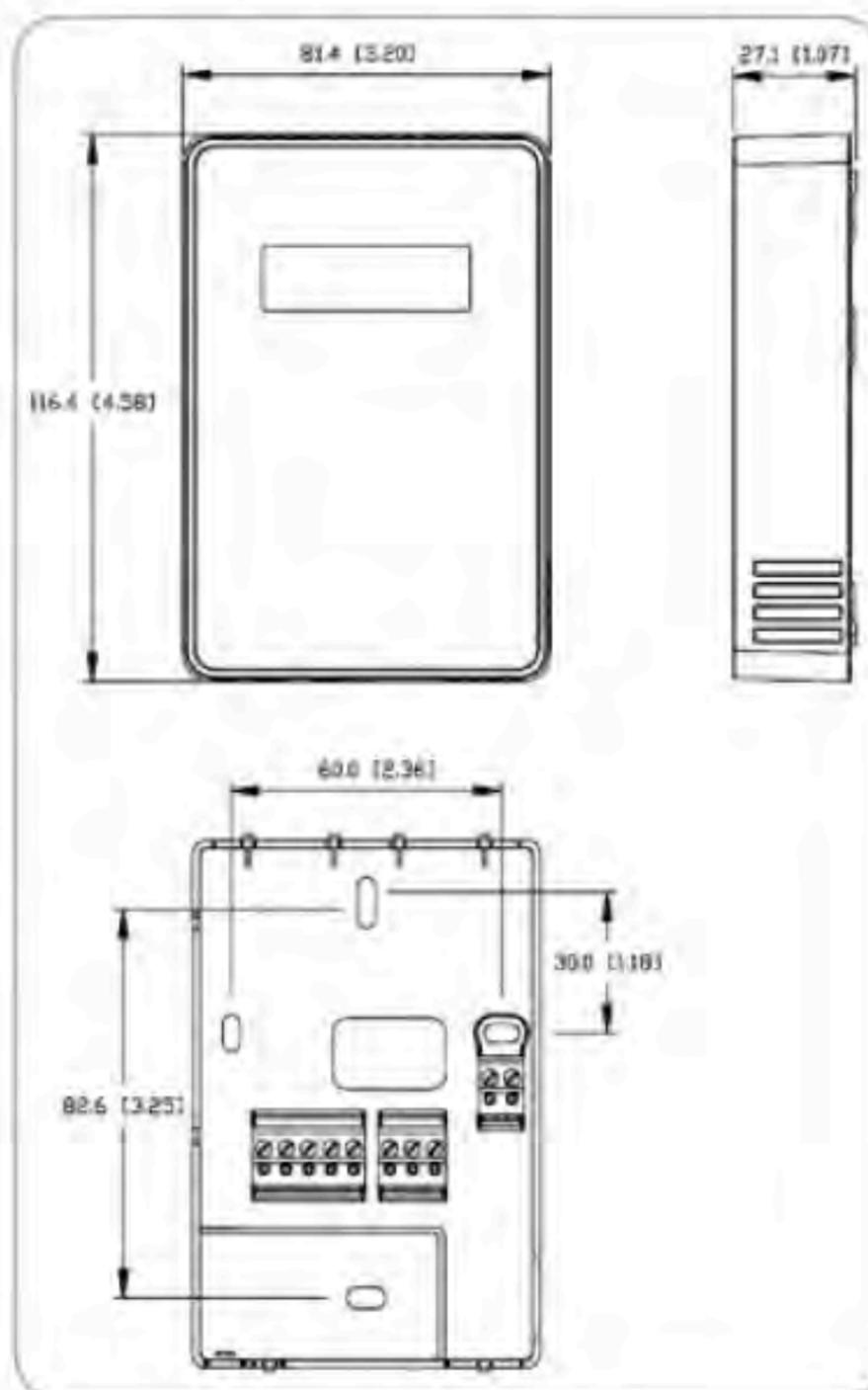
- 62.50 VA

### Certifications

- CE and RoHS, REACH, and WEEE compliant, UL 9540

### Warranty

- 12 months on mechanical defects



Ventostat wall mount dimensions

# Telaire Ventostat TR Specifications *(cont.)*

## Carbon Dioxide (CO<sub>2</sub>)

### Sensing Method

- Non-dispersive infrared (NDIR) absorption
- Gold-plated optics

### CO<sub>2</sub> Measurement Range

- 0 to 50000 ppm

### CO<sub>2</sub> Accuracy

- ±10% of reading

### Temperature Dependence

- 0.2% FS per °C (±0.11% per °F)

### Stability

- <5% of FS or <10% reading annual over life of sensor (10 years)

### Pressure Dependence

- 0.135% of reading per mm Hg

### CO<sub>2</sub> Warm-up Time

- < 2 minutes (operational)
- 10 minutes (maximum accuracy)

## Relative Humidity (RH) and Temperature

### RH Sensing Element

- Capacitive polymer sensor

### RH Range

- 0% to 99% RH (non-condensing)

### RH Accuracy (25°C)

- ±2.5% RH (20 to 80% RH)
- ±3.5% RH (<20% and >80% RH)

### Active Temperature Accuracy

- ±0.8°C @ 22°C

### Active Temperature Range

- 32°F to 122°F (0°C to 50°C)

## Hydrogen (H)

### Range

- H<sub>2</sub> Sensing Element: 0 - 160,000 ppm
- Provided over Modbus: 0 - 65,535 ppm

### Accuracy

- ±3.75% of full scale or ±6000 ppm

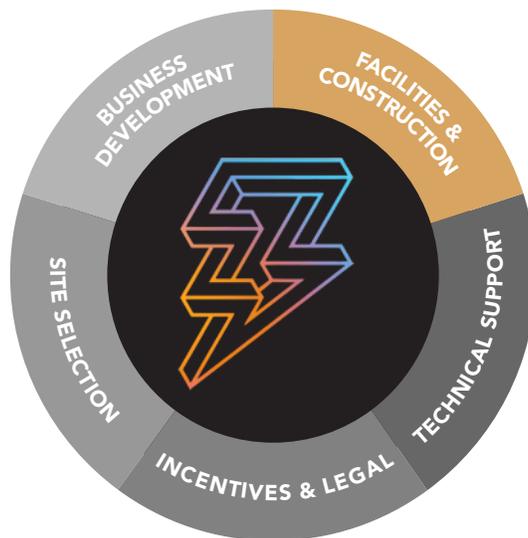
### Warm-up Time

- < 1sec





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# Inside ACS

Incorporated in 1994 and founded on the principle that elegant solutions emanate from applying fundamental engineering principles, ACS was formed to meet the expressed need for single source, turnkey delivery of complex projects. Today, we don't fit a niche so much as we fill a hole in the marketplace.

More than a contractor or equipment supplier, ACS understands the core requirements of equipment, systems, and facility integration—leading clients to trust our team with solutions to their research & development and production needs.

### Our solutions encompass:

- Designing and Building Custom Equipment and Machines
- Developing Automation and Control Systems
- Test Solutions for R&D and Production Verification
- Program and Project Management Services
- Turnkey Facility Solutions

As your partner, ACS will be a hands-on to hand-over resource for your project from planning to commissioning--assuring your performance objectives are met.

Bottom line, we deliver flawless functionality and guarantee high performance.



**We do more than meet specifications; first and foremost we meet client business objectives.**

### What can we help you accomplish?

- Improve processes for product design, test, and manufacturing
- Reduce cost and time of bringing new products to market
- Develop programs for new product development
- Develop test processes
- Manage and execute capital projects
- Automate
- Validate
- Improve operator safety
- Reduce maintenance intervals
- Gather accurate and precise data
- Decrease warranty claims
- Increase efficiency
- Reduce labor costs
- Increase part production

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# Industries & Markets

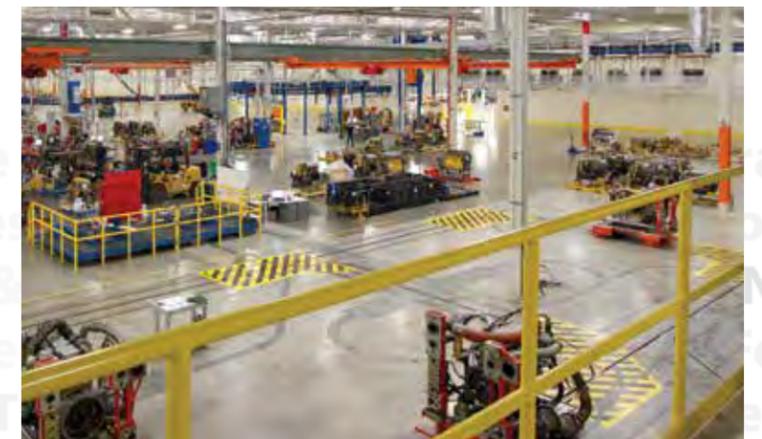
ACS routinely works in partnership with clients that are designing, testing, and manufacturing products that are better for the environment and the people who use them. They in turn depend on us to design and build equipment and facilities that improve their processes to deliver products that reflect their organization's quality and brand.

**Our experience extends to a wide range of applications and covers industries/markets including:**

- Automotive/Commercial Vehicles
- Aerospace
- Energy
- Laboratory/Research
- Chemical
- Food & Beverage
- Manufacturing

By starting out asking, "What do you want your equipment, process or facility to do?", we can collaboratively determine business objectives and technical demands—setting the framework and laying the groundwork for the desired functionality and performance.

Throughout ACS' twenty-five year history, the depth and breadth of our expertise and experience has allowed us to count among our customers numerous Fortune 500 companies as well as a number of large multinational companies with strong brand name recognition and quality products.









# Integration and Flexible Delivery

Since Day One, the ACS advantage was built on being able to offer a diverse portfolio of building and construction capabilities. Over the years, with enriched technical expertise, we have strategically evolved our contract delivery model to be flexible—with wide-ranging skills supporting the ability to execute Design-Build work to EPC (Engineering-Procurement-Construction) duties.

**Our clients tell us they prefer a single source, turnkey method because it allows ACS to:**

- Provide the client a single resource of accountability
- Assume responsibility for the entire project
- Guarantee client acceptance criteria is met

The goal of our client-tested and proven plan is to meet schedule, cost and functionality requirements. Encompassing planning, engineering, custom equipment design or procurement and assembly, project management, commissioning and long-term operational support, this unique approach enhances project value and aligns to client expectations.

To succeed, we embed ourselves within a client's operation, see their vision, and then adapt our entire process to their in-house procedures, documentation, reporting requirements and purchasing preferences while aligning needs with their budgets, project schedules and internal resources.



### Benefits of the ACS Flexible Delivery Model

- Research, Technology and Industry Expertise ensure delivery of a highly functioning facility
- Single-source responsibility and team collaboration align clients with expert resources
- Early identification of schedule and cost facilitates accurate resource allocation
- Accelerated project schedule means accelerated lead time
- Reduced administrative burden allows the client team to stay focused on core responsibilities
- Proper budget planning and control result in Total Project Cost Savings
- Facility and system functionality match client-developed criteria

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At ACS, we combine our knowledge of building design and construction with expertise and understanding of equipment, testing, process systems, automation, and controls for clients who require high performance solutions.



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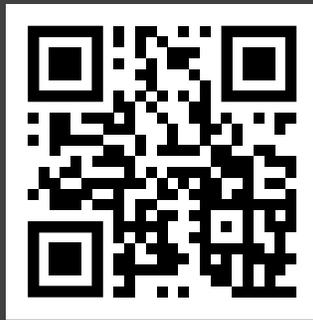


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