Ion Migration Evaluation System

AMI

CAT.NO.E94513-U611

Analysis and evaluation of ion migration and evaluation of insulation resistance made more accurate, efficient, and easier

Evaluations of ion migration and insulation resistance are assuming a greater degree of importance as electronic devices are miniaturized further and mounted with higher density. The “Ion Migration Evaluation System” allows these evaluations to be performed continuously with a high degree of accuracy and efficiency.
Environmental testing has been successfully merged with measurements/evaluations.

AMI

MEASUREMENT EVALUATION SYSTEM

ION MIGRATION EVALUATION SYSTEM

■ MAIN USE

- EVALUATION OF ION MIGRATION
- EVALUATION OF INSULATION DETERIORATION PROPERTY
- FLUX, PRINTED CIRCUIT BOARDS, RESIST, SOLDER, RESIN, CONDUCTIVE ADHESIVE AND OTHER MATERIALS RELATED TO PRINTED WIRING BOARDS AND HIGH-DENSITY MOUNTING
- BGA, CSP AND OTHER FINE-PITCH PATTERN IC PACKAGES
- PDP
- CAPACITORS, CONNECTORS AND OTHER ELECTRONIC COMPONENTS AND MATERIALS
- EVALUATION OF HYGROSCOPIC PROPERTY OF INSULATION MATERIALS

■ MAIN FEATURES

- High precision measurement realized by ESPEC's unique scanner operation technology supported by continuous power supply and international standards-compatible measurement equipment.
- Stress constant voltage (stress voltage and measurement voltage): 100V, 300V, and 500V. (300V and 500V are optional)
- Leak-touch detection accurately detects ion migration in micro second.
- Real-time measurement is enabled using a personal computer. Data editing and browsing is available during the measurement.
- Improved operability and safety achieved by the interaction with the environmental test chambers.

CONDUCTOR RESISTANCE EVALUATION SYSTEM

- THROUGH-HOLE CONDUCTOR EVALUATION SYSTEM
- SOLDER-JOINT CONTACT EVALUATION SYSTEM
- BGA, CSP SOLDER JOINT CONTACT EVALUATION SYSTEM
- CONNECTOR CONTACT RESISTANCE EVALUATION SYSTEM
- FPC LIFE EVALUATION SYSTEM
- OTHER INTERCONNECTION MATERIAL CONTACT EVALUATION SYSTEM

LOW-K INSULATION CHARACTERISTIC EVALUATION SYSTEM

LEAK CURRENT MEASUREMENT SYSTEM

- CAPACITOR LEAK CURRENT MEASUREMENT SYSTEM
- FET LEAK CURRENT MEASUREMENT SYSTEM
- SEMICONDUCTOR REVERSE BIAS LEAK CURRENT MEASUREMENT SYSTEM

CAPACITOR TEMPERATURE PROPERTY EVALUATION SYSTEM

ELECTRO-MIGRATION EVALUATION SYSTEM

- LSI ELECTRO-MIGRATION EVALUATION SYSTEM
- GMR HEAD ELECTRO-MIGRATION EVALUATION SYSTEM
- GMR HEAD ELECTRO-MIGRATION RH EVALUATION SYSTEM
- HIGH FREQUENCY ELECTRO-MIGRATION EVALUATION SYSTEM

TDDB EVALUATION SYSTEM

- WAFER LEVEL
- PACKAGE LEVEL

SEMICONDUCTOR PARAMETER AUTOMATIC EVALUATION SYSTEM

- FET(HOT-CARRIER) PROPERTY EVALUATION SYSTEM
- TRANSISTOR PROPERTY EVALUATION SYSTEM

Utility

Using the international standard traceable precision instrument guarantees most accurate and compatible measurement data.

We have always earned our customers' confidence

AMI is equipped with highly reliable measurement equipment and an ammeter for micro-electric current that are designed to meet international standards in order to obtain most reliable measurement data. We offer a calibration service to maintain the equipment's accuracy (ISO / IEC 17025 compliant).

AMI

Measures a wide range of insulation resistance

The unit measures insulation resistances with high accuracy over a wide range from 2×10^{3} to $1\times10^{13}\Omega$ at the tip of the measurement cable (3m). The scanner board for the micro-electric current employs an advanced cable arrangement in order to avoid leakage current influences on the printed circuit boards.

Measurement equipment (Keithley Instruments, Inc.)

Low-voltage to high-voltage tests available

AMI can offer three range of apply voltage such as (0 - 100V), (0 - 300V*) and (0 - 500V*). Small voltage for precision devices and large voltage for automotive application.

*300V and 500V are optional.

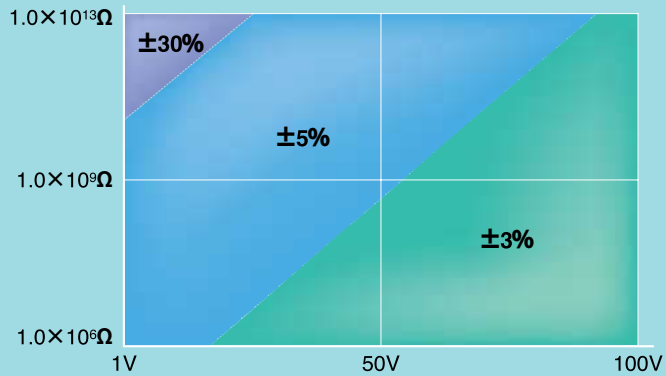
Multi-channel continuous measurement accurately detects a change in the insulation resistance

Continuously measuring the insulation resistance on multi-channels while applying voltage under a high-temperature and high-humidity environment detects the decrease in the insulation resistance more accurately.

Accuracy range of resistance to the measurement voltage

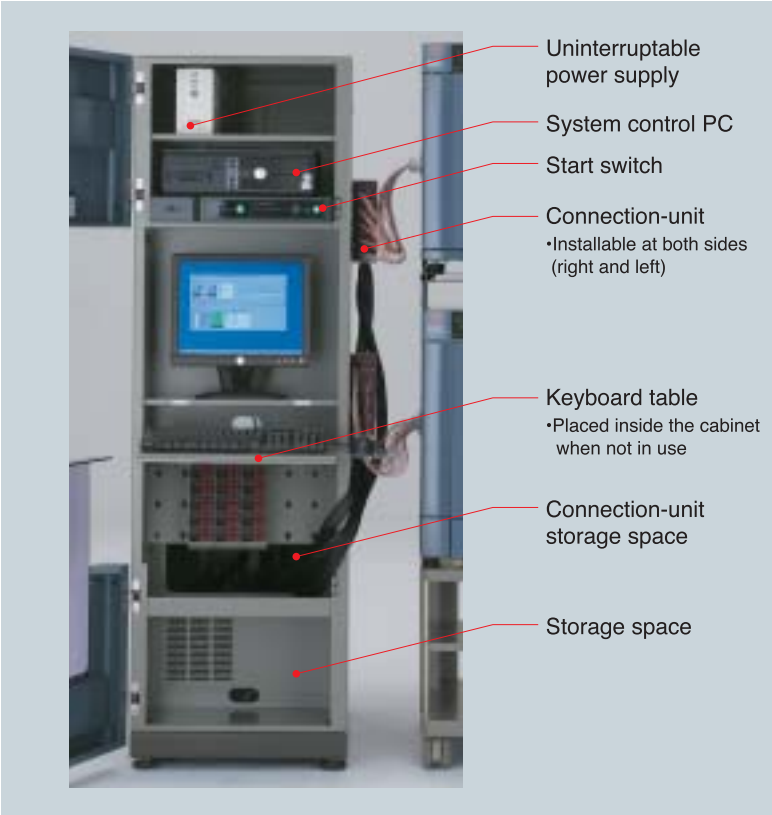
Accuracy at the tip of the measurement cable inside the environmental test chambers

Outside temperature : 23℃±5℃
Measurement mode : Medium
Measurement range : AUTO
Number of averaging measurements : 4



Utility

Multifunction rack that pursues ease of use improves the workability.



System rack

Connection unit

SIR test coupon type IPC-B-24 and test board rack type A (optional)

Control on 5ch and 25ch basis

Individual test programming on a module basis has been realized. We offer two types of modules, 5-channel and 25-channel.

Connection unit

Installing the connection unit facilitates the measurement cable connection. The connection unit can be installed in front of the rack or on the left or right side of the rack according to the work environment.

High accuracy measurement realized

AMI employs a single cable (positive side) and a co-axial cable (negative side) to restrict the influence of micro-noises. The circuitry of AMI keeps the impedance remarkably low in order to realize accurate measurement. Cables are coated with Teflon, which guarantees advantages in resistance to heat, humidity, and voltage.

SIR test coupon type IPC-B-24 and test board rack (optional)

SIR test coupon type IPC-B-24 and test board rack conforming to IPC-B-24 as stipulated in ISO 9455-17 for efficient SIR testing. The test board rack holds up to five PCBs, and allows measurement of up to 20 channels.

Connectors (optional)

We offer connection jigs tailored to the specimen as an option. Connection jigs facilitate the connection between a specimen and a cable and improves the test efficiency.

Global environmental problems

Components are mounted by lead-free soldering. In addition, power consumption is reduced by 24% (in comparison with the previous model) in consideration of global environmental problems.

*except for purchased items such as PCs and measuring instruments.

Utility

Tests simplified by interaction of the measurement system with various environmental test chambers.

Interaction with the environmental test chambers

Interaction with the environmental test chambers enables accurate measurement and makes the best use of the test chambers. AMI can connect up to 3 environmental test chambers for testing.

Real-time monitoring of temperature and humidity

AMI monitors and records the temp. and humid. inside the environmental test chamber. Data is recorded simultaneously with the measurement by the measurement system. The statistics processing software displays the recorded data in synchronization with the data of the resistance value.

Temp. and humid. delay-control when interacting with the environmental test chambers

When interacting with the environmental test chambers, rapidly increasing the humid. at the beginning of the test could generate dew condensation on the surface of the specimen. The temp. and humid. delay-control prevents the effects of the dew condensation on the specimen. Additionally, test scheduling is possible (start, pause, and stop).

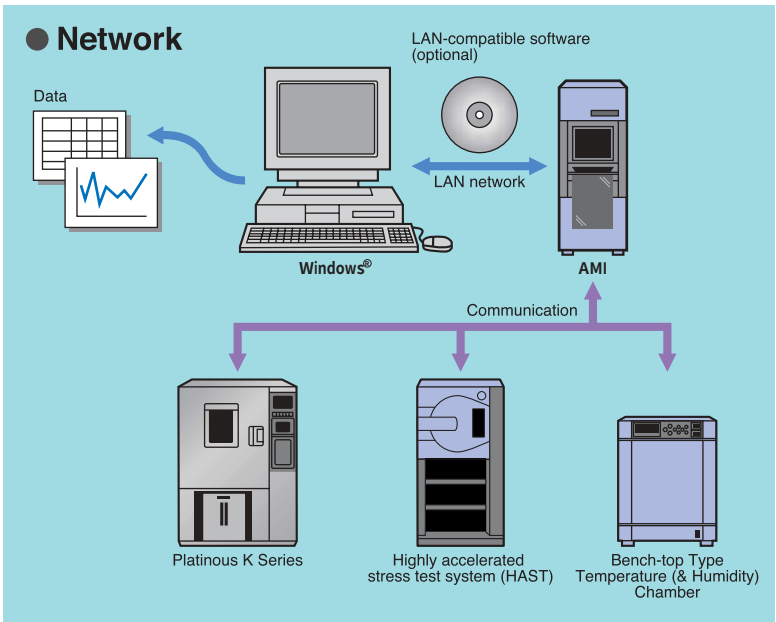
Safety design guaranteed by abnormality detection

When a failure occurs in the environmental test chamber or in AMI during testing, the network system protects the specimen from stress voltage and saves data until the failure is found.

Remote processing of the test data (optional)

LAN-compatible software enables remote test checking and data processing, such as from a remote office.
Additionally, we offer software licenses according to the number of users so that multiple PC monitoring is possible.

Example of AMI with connected the Bench-top type temp. (& humid.) chamber



Evaluation

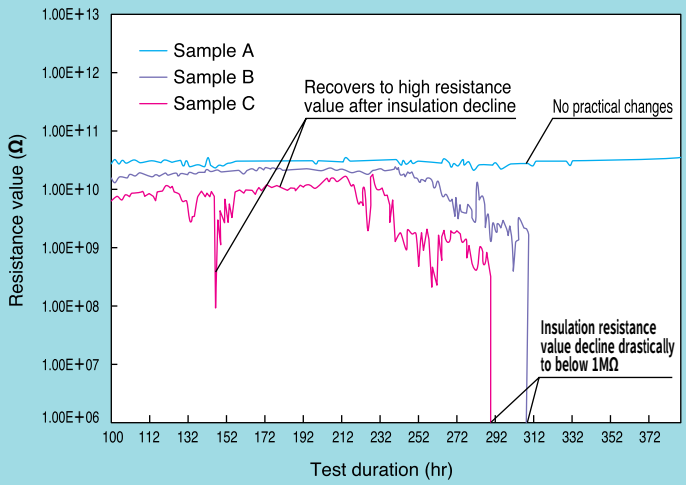
AMI employs a measurement method for insulation resistance that meets various types of test requirements such as ion migration evaluation, insulation deterioration characteristics evaluation, and so on.

An example of measurement results obtained from the ion migration evaluation system (AMI)

Insulation resistance variation characteristics of flux under high-temperature and high-humidity conditions

Measurement condition

Test condition, temperature and humidity condition : 40℃, 90%rh
Stress voltage : 50 V DC
Measurement voltage : 50 V DC
Measurement intervals : 0.5h



In the example above, the leak-touch occurs at 291.2 hours and at 311.8 hours after the measurement starts.

***The data above is the measurement data obtained from the ion migration evaluation system and processed using Excel (spreadsheet software).**

Ion migration evaluation

The insulation resistance on each channel is measured at the preset measurement cycle (6 minutes at minimum) and the results are saved. AMI employs batch charging that enables the measured voltage charging within any time frame.

Characteristics evaluation of insulation deterioration

The stress voltage and measurement voltage can be set individually. The charging time, which is for measurement when voltage is applied for a given length of time, can also be set.
When no stress voltage (0V) is selected in the test condition settings, the insulation resistance of the voltage applied only at measurement can be measured.

Evaluation

Continuous measurement mode with stress voltage

When stress voltage and measurement voltage are same, you can save test time by using this mode. It will use stress voltage as measurement voltage without recharging by measurement voltage. The test time is defined as accumulation of stressed time. The time for measurement (charge and measure) is not count as the test time.

One shot charge

To measure the insulation resistance, the sample(s) must be charged before measurement. AMI will charge by module (either 5 channels or 25 channels) and saving test time rather than charge and measurement one by one.

Individual voltage supply per channel

One channel with one power supply guarantee no effect of voltage drop by leak on other channels. Each channel has also individual voltage monitor to secure correct voltage applied to each channel.

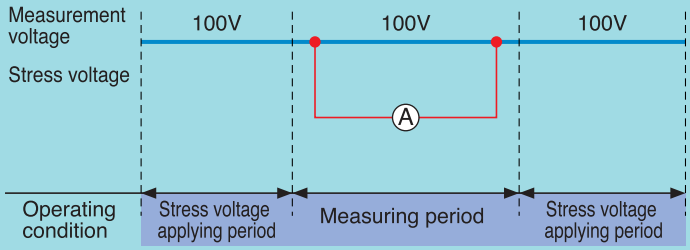
No interruption of voltage supply with specially designed scanner

ESPEC designed scanner guarantees “no interruption of voltage apply” from stress to measurement. It is possible by the control from its voltage supply. (same on stress and measurement)

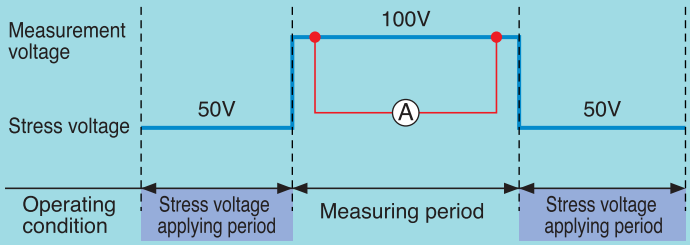
Voltage migration image obtained by continuous power supply scanner operation technology

● Stress voltage (100V), measurement voltage (100V)

In the measuring mode of continuously applied stress voltage



● Stress voltage (50V), measurement voltage (100V)



Voltage that is actually applied onto the specimen

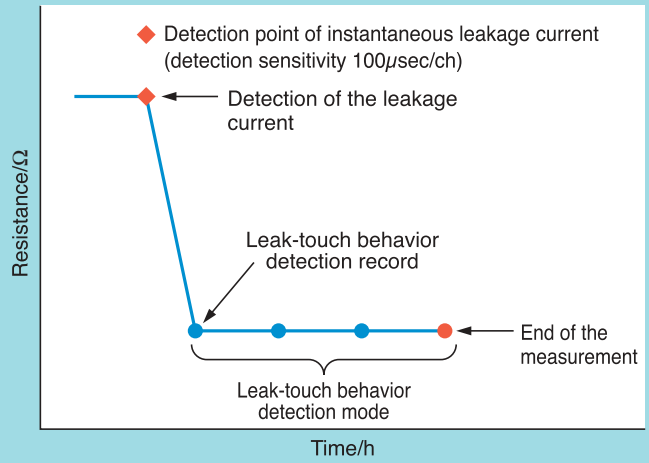
Accumulated stress voltage applying time (test time)

FAILURE RECOGNITION

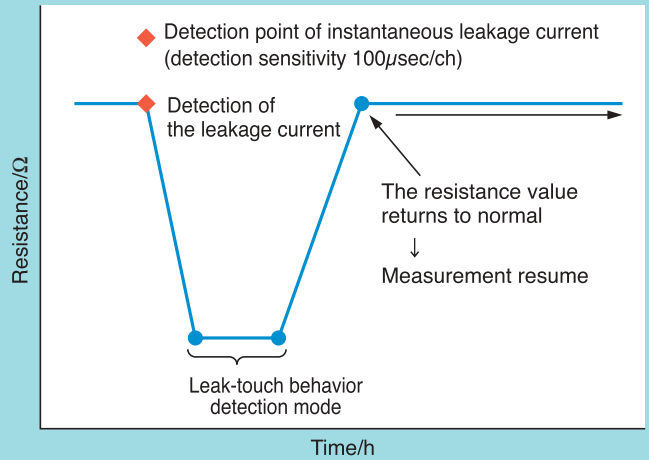
There are three recognition methods for various stage of failure.

Leak-touch behavior continuous evaluation

In the case where a failure is detected



In the case where the resistance value returns to normal during behavior detection



Three recognition methods

By set exact value (absolute value), change rate (%) and change amount. You can use these three failure criteria to set the limit (threshold) on your test on each channel.
Absolute value: You can set exact resistance value for AMI to recognize the failure.
Change rate (%): You can set % change for AMI to recognize the failure.
Change amount: You can set the value of change in resistance for AMI to recognize the failure.

"Leak Touch" detection and recognition

Between the measurement interval, leak detector can detect any small leak on each sample by their stress voltage. You can set any amount of leak current that AMI can recognize the failure. It is completely separate circuitry from measurement.

Leak touch observation mode (Optional)

Migration often come and goes by burning dendrite after its short and shows resistance recovery. This option enable to observe this "come and goes" or "recovery of resistance". You can set allowable criteria such as the value to judge recovery, how many times to be allowed and how long it should take to recover.

SOFTWARE

Main window*

- Test monitoring
- Real time display of the resistance value, temperature inside the chamber, channel on which a failure occurs
- Auto link to the data processing software
- Test control (start, stop, pause, and restart)

* The picture above shows AMI-075-S-5.

Test condition registration

Set the test duration, interval, measurement voltage, applied stress voltage, limit value, etc., and register in a file. You may enter several conditions accordingly.

Test setting

The window above selects the test module, sets the file name of the data to be saved, sets the chamber that it interacts with, whether or not to output the text data, the leak-touch behavior mode, comment entry, and so on.

Test details

Select test channel and condition. (Select from registered test condition file)

Graphic display

Current test data and previous data are graphically displayed.
Graph can be arranged by selecting the channel, setting display, and cursor display.

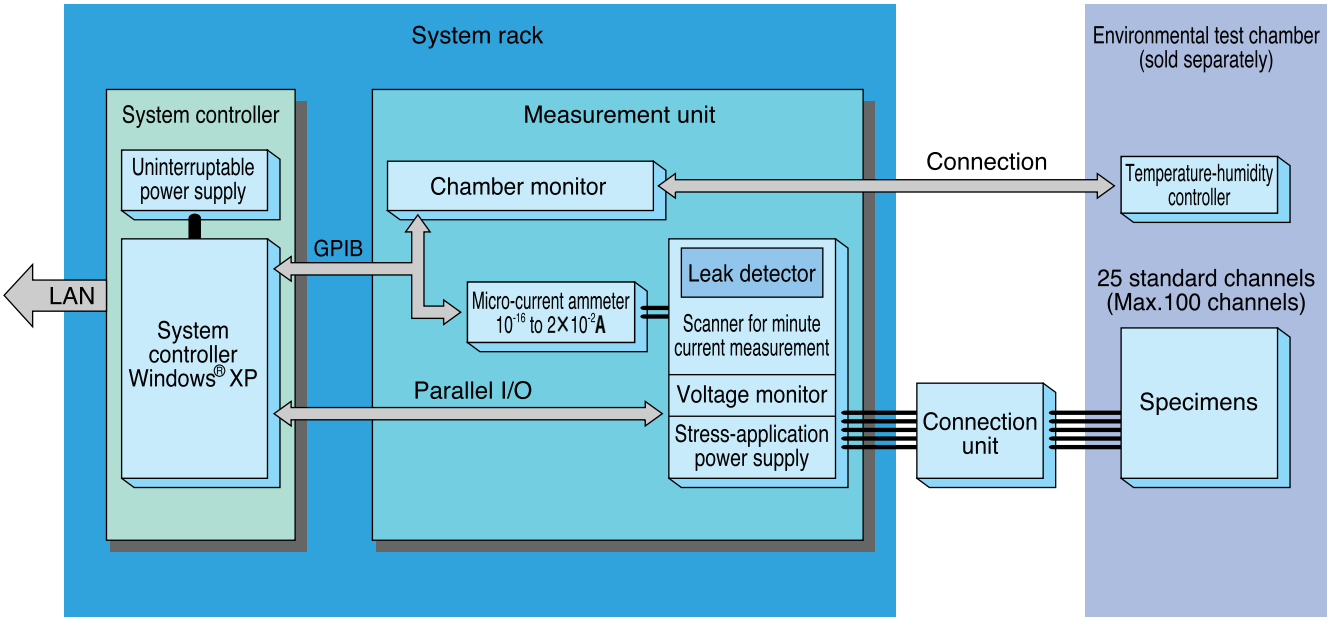
Data display

Displays current test data and previous data.

Weibull Analysis (optional)

Data-processing software (with a statistical processing function) enables Weibull analysis of test data, as well as the plotting of normal probability and logarithmic-normal probability.

SYSTEM BLOCK DIAGRAM



System controller

- System controller :

  System-control PC and LCD monitor
  Performs measurement, data processing, and control of testing equipment.

- Uninterruptable power supply :

  Backup power supply for system controller
  (reset manually when power restored)

Measurement unit

- Stress-application power supply :

  DC voltage is applied between specimen poles as electric stress.
  A power supply is provided for each channel.

- Voltage monitor :

  The output of each stress-application power supply is monitored.

- Micro-current ammeter :

  The insulation resistance of a specimen is measured at set intervals.
  (Equipped with electrometer 6514 made by Keithley Instruments, Inc.)

- Scanner for minute current :

  Measurement of standard 25 channels at resistance value $10^{3}\Omega$ to $10^{13}\Omega$.

- Leak detector :

  Constantly monitors leak current against pre-set limit under applied stress voltage between electrode.

- Chamber monitor :

  Allows temperature control, monitoring, alarm control of chamber from system controller.

- Connection unit :

  Relays the measurement cable.

SPECIFICATIONS

Model			100 V		300 V (optional)		500 V (optional)	
Channel configuration			Standard 25ch. (max. 150ch per rack)		Standard 25ch. (max. 150ch per rack)			
Control channel			5ch	25ch	5ch	25ch	5ch	25ch
Software			Windows® XP		Windows® XP			
Measurement	Stress power supply	Stress constant voltage	Not applied/ 1 to 100 V DC		Not applied/ 1 to 300 V DC		Not applied/ 1 to 500 V DC	
		Min. set voltage resolution	0.1 V (1 to 100 V, individually able to set from the measurement voltage)		0.1 V (set at 1 to 200 V) 1.0 V (set at 200 to 300 V)		0.1 V (set at 1 to 200 V) 1.0 V (set at 200 to 500 V)	
		Applied voltage accuracy	± (0.7% of set value + 300 mA)		± (0.7% of set value + 300 mA)			
	Resistance evaluation and measurement time	DC measurement range	500 μA to less than or equal to10 pA		500 μA to less than or equal to10 pA			
		Resistance measurement range	2×10^5 to 1×10^{13} (when applying 100 V) 2×10^3 to 1×10^{11} (when applying 1 V)		2×10^5 to 1×10^{13} (when applying 300 V) 2×10^3 to 1×10^{11} (when applying 1 V)		2×10^5 to 1×10^{13} (when applying 500 V) 2×10^3 to 1×10^{11} (when applying 1 V)	
		Measurement accuracy *1	7.0×10^{12} to 1.3×10^{13}		7.0×10^{12} to 1.3×10^{13}			
		Measurement voltage	1 to 100 V DC (0.1 V step)		1 to 300 V DC (1 to 200 V DC: 0.1 V step) (200 to 300 V DC: 1.0 V step)		1 to 500 V DC (1 to 200 V DC: 0.1V step) (200 to 500 V DC: 1.0V step)	
		Measurement time (1 time) *2	15 sec. + charging time	80 sec. + charging time	15 sec. + charging time	80 sec. + charging time	15 sec. + charging time	80 sec. + charging time
Leak-touch detection			Normal 100 μ sec / less than or equal to specified number of detections on channel basis		Normal 100 μ sec / less than or equal to specified number of detections on channel basis			
Measurement cable	Type	+side	Single cable		Heat-resistant single cable			
		−side	Coaxial cable (one-layer shield)		Coaxial cable (one-layer shield)			
	Coated material		Teflon (heat resistance of + 150℃)		Teflon (heat resistance of + 150℃)			
	Length		Connects the scanner unit and connection unit: 2.5 m Beyond connection unit : 1.5 m		Connects the scanner unit and connection unit: 2.5 m Beyond connection unit : 1.5 m			
Connection unit			25-channel connection Coaxial connector		25-channel connection +side: Metallic outlet −side: Square type coaxial connector			
Measuring equipment			Model: 6514 (Keithley Instruments, Inc.)		Model: 6514 (Keithley Instruments, Inc.)			
External dimension			W: 530 × H1750 × D940 mm		W: 530 × H1750 × D940 mm			
Power supply facility			100 V AC, 1ø, 10.0 A 120 V AC, 1ø, 8.3 A 220 V AC, 1ø, 4.5 A 240 V AC, 1ø, 4.2 A		100 V AC, 1ø, 10.0 A 120 V AC, 1ø, 8.3 A 220 V AC, 1ø, 4.5 A 240 V AC, 1ø, 4.2 A			

*1 The measured value obtained from the formula 1×10^{13} Ωwhen using the connection unit (2.5m cable) and a heat-resistant measurement cable (1.5m).
The value may vary when selecting the cable extension.

*2 The charging time will be zero in the stress voltage full-time measurement mode.

MODEL

AMI − □ − S − □

Control channel
5 : 5-channel control
25 : 25-channel control

Number of channels
025 : 25 channels
050 : 50 channels
100 : 100 channels
125 : 125 channels
150 : 150 channels

ACCESSORIES

- User's manual
- System controller
- Uninterruptable power supply
- Micro-current ammeter (equipped with electrometer 6514)
- Setup CD
- GPIB board
- PPI board

OPTION

Additional channel (25 channel basis)

The channels can be added according to the capacity of the system (150 channels at maximum on 25 channel basis).

Post leak-touch behavior detection mode software

The post leak-touch behavior detection mode software continuously checks and detects the leakage current flowing between the specimens and the behavior unique to the ion migration.

LAN-compatible software

LAN-compatible software enables remote test checking and data processing, such as from a remote office.

* License for multiple PC monitoring requires an additional cost.

Data processing software (with statistical processing software)

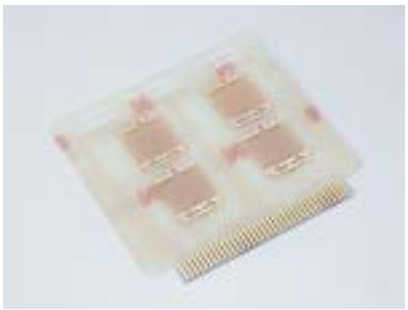
Weibull analysis is installed in addition to the standard statistical processing software.

Test board rack type A

Test board rack for SIR test coupon type IPC-B-24.

SIR test coupon type IPC-B-24

Printed circuit boards that comply with IPC-B-24 specified in ISO 9455-17.



Board holder

We offer various types of board holders. (Connection terminal: screw-type)

Measurement cable for 25 channel (standard type 1.5m)

We offer measurement cables for 25 channels including both the positive side and the negative side separately from the standard accessories. We also offer 3m cables as requested.

Extended cable that connects the scanner unit and the connection unit

We offer 4m cables (standard type 2.5m).

Emergency stop switch

Stops the system immediately.

Communication cable

E-BUS 5, 10m

VARIOUS ENVIRONMENTAL TEST CHAMBERS 〈SOLD SEPARATELY〉

Platinous K Series

Platinous Series is the series that has been developed out of a desire for new environment test standards for ideal environmental test chambers, and has improved its credibility, performance, operability, and safety.

Model	Temperature range	Humidity range	Inside capacity (L)
PR	−20 to +100℃	20 to 98%rh	120, 225, 408, 800
	−20 to +150℃		
PL	−40 to +100℃		
	−40 to +150℃		306, 800
PSL	−70 to +100℃		
	−70 to +150℃		
PH	+10 to +100℃	60 to 98%rh	120, 225, 408, 800

Bench-Top Type Temperature (& Humidity) Chamber

The bench-top type temperature & humidity chamber plays a significant role to ensure credibility in the electronics devices' R&D field. The bench-top type temperature &humidity chamber is the compact bench test equipment that is appropriate for one chamber for each worker. The bench-top type temperature &humidity chamber saves energy and reduces electricity with a unique refrigeration variable control system..

Model	Temperature range	Humidity range	Inside capacity (L)
SH-221	−20 to +150℃	30 to 95%	22.5
SH-241	−40 to +150℃		
SH-261	−60 to +150℃		
SH-641	−40 to +150℃		64
SH-661	−60 to +150℃		

Highly Accelerated Stress Test System (HAST Chamber)

The highly accelerated stress test system has functionality that has been developed based on the bias test that applies constant voltage and signals. We offer two types of control that includes two-mode standard type: the unsaturated control and heat exchange, and the M type that is the three-mode type with dry & wet-bulb temperature control, unsaturated control and heat exchange. The M type complies with the international standards IEC-60068-2-66.

Model	Temp/ humid/ pressure range	Inside capacity (L)
EHS-211 (M)	+105 to +142.9℃/ 75 to 100%rh 0.020 to 0.196Mpa (0.2kg to 2.0kg/cm^2)	18
EHS-221 (M)		46
EHS-411 (M)	+105 to +162.2℃/ 75 to 100%rh 0.020 to 0.392Mpa (0.2kg to 4.0kg/cm^2)	18

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JAB QMS Accreditation R001

JAB EMS Accreditation RE 009

ISO 14001 JACO EC99J2046

UKAS ENVIRONMENTAL MANAGEMENT 051

ISO 9001/JIS Q 9001
Quality Management System Assessed and Registered

ESPEC CORP. has been assessed by and registered in the Quality Management System based on the International Standard ISO 9001:2000 (JIS Q 9001:2000) through the Japanese Standards Association (JSA).

ISO 14001 (JIS Q 14001)
Environmental Management System Assessed and Registere

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