Quality is more than a word

espec

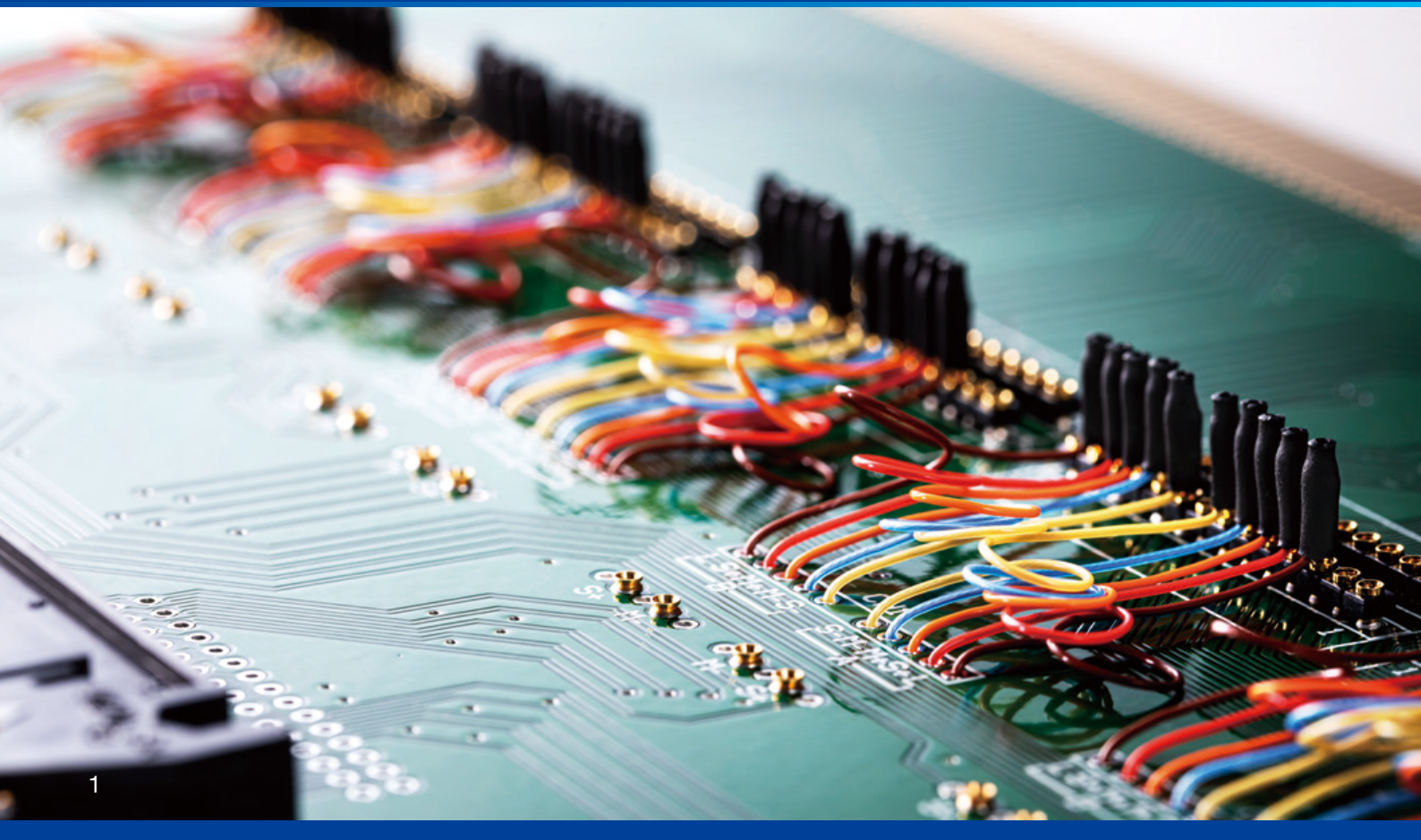
Electromigration Evaluation System

AEM Series

CAT.NO.E05519-Y2012

Electromigration evaluation at 350°C

As the miniaturization of semiconductor devices progresses, evaluating electromigration under excessively severe conditions is becoming essential.
The AEM Series Electro-Migration Evaluation System offers accurate measurements based on temperature and current stress — two major factors affecting a device's service life — and analysis software for determining the necessary parameters for judging the life of a device.
Designed to meet a wide range of evaluation needs, from cutting-edge evaluations to production management, the AEM Series offers enhanced operability, superior reliability, and simplified data analysis.

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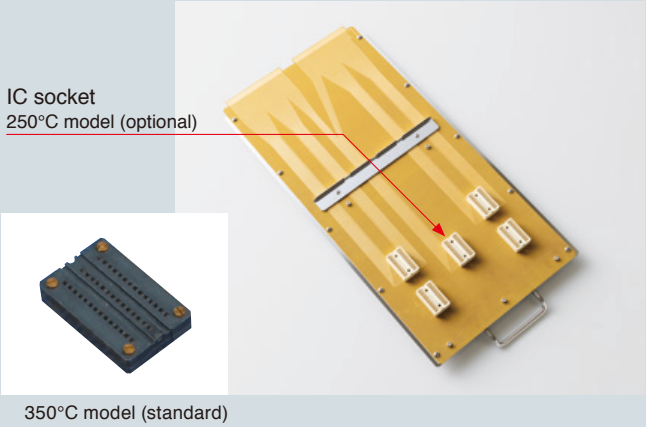
Performance

240-channel model

DUT board



350°C model (standard)

240-channel evaluation testing over 3 oven in a single cabinet

2 channels (DUTs) = 1 Socket
5 Sockets = 1 DUT Board
8 DUT boards = 1 Oven
3 Ovens = 1 Cabinet
Maximum of 80 channels or DUTs can be tested in a single oven, makes it 240 channels per cabinet. The host PC, however, can control upto 1,200 channels or five fully-loaded cabinets.

High-accuracy temperature control up to 350°C

The oven are capable of testing temperatures of up to 350°C and offer highly accurate temperature distributions of ±3.5°C at 300°C.
Each oven comes with an independent controller for separate temperature settings.

Current stress application up to 200 mA

The AEM Series is capable of applying stress currents between 0.1 mA and 200 mA.

Highly reliable dual-contact board structure (Patent No. 4304189)

The DUT boards and socket connections feature a dual-contact structure for a stronger hold. ESPEC's proprietary design also prevents the DUTs from disconnecting. This structure design ensures greater reliability for long-term evaluations at high temperatures.
*350°C model sockets (300 mil and 600 mil) equipped as standard. 250°C models (600 mil only) are also available (optional).

DUT board
Size: 220 (W) × 465 (H) × 460 (D) mm
Weight: About 1.6 kg

Utility

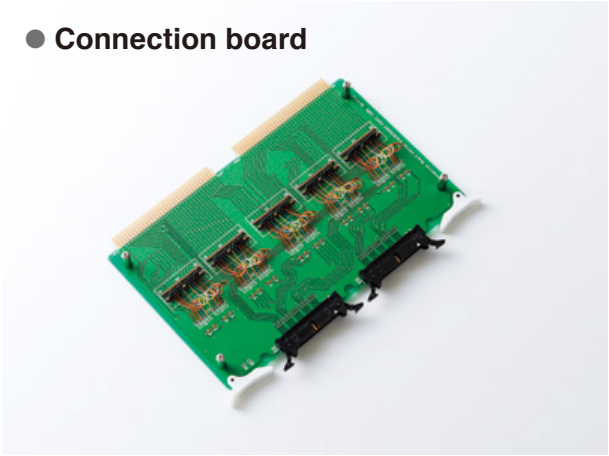
Connection board

The pin assignment scramble function makes it possible to evaluate ESPEC DUT boards even using DUTs with different pin layouts.

Four test modes

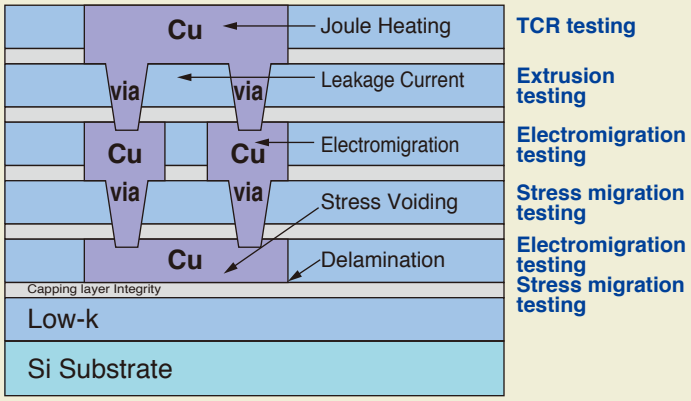
The AEM Series is capable of performing four different tests by measuring resistance while stressing temperature and current: Electromigration, Stress migration, Temperature characteristic (TCR), and Extrusion.

Connection board



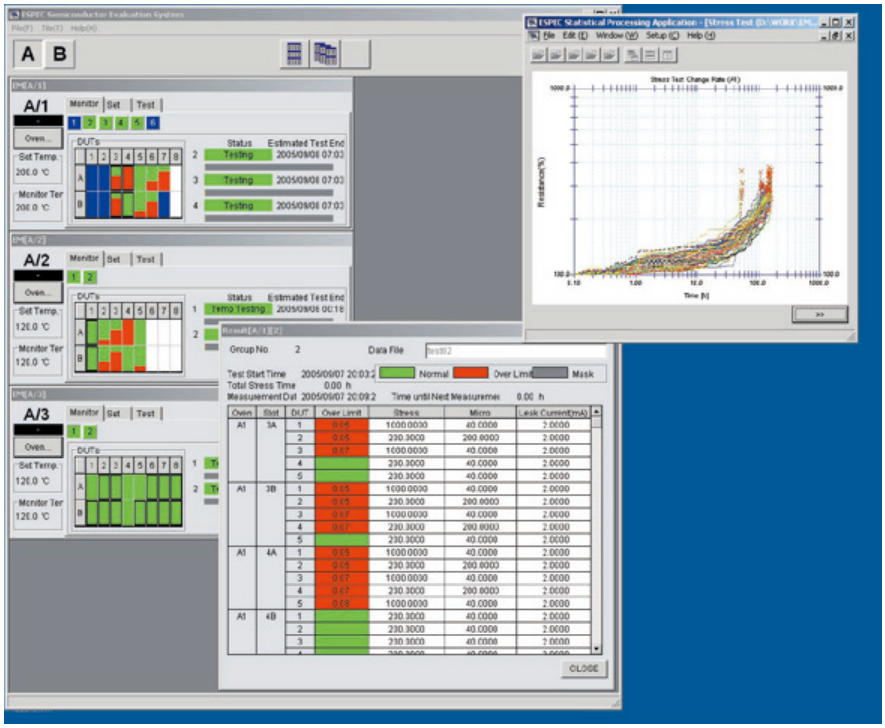
Reliability concerns for Cu damascene

Cu damascene offers the benefits of low resistance and high reliability, but a wide range of phenomena appear in via structures linking multi-layer wiring when subjected to thermal stress.



SOFTWARE

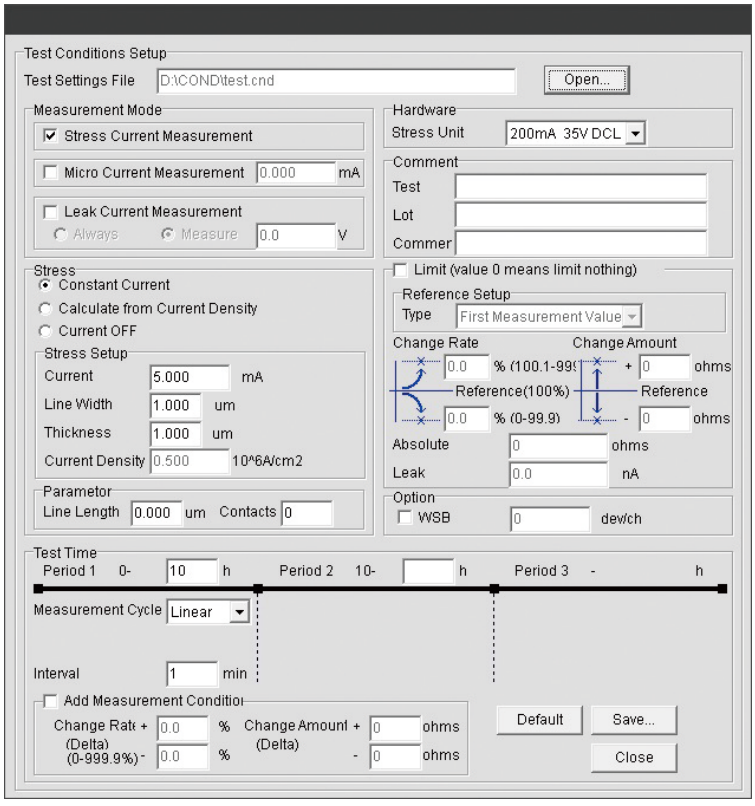
● Monitor screen



The monitor screen offers real-time information on the test progress, resistance, and rate of change of all DUTs at a glance.

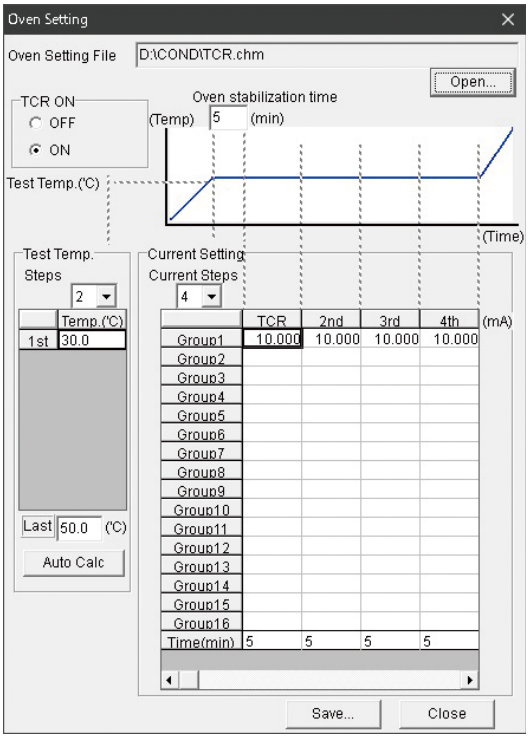
● Condition setting screen

Electrical parameters and time settings can be configured for each DUT.



Test condition settings

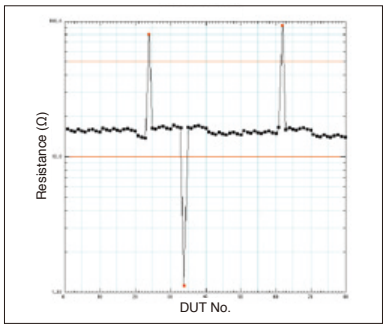
Temperature characteristic testing parameters and stress testing temperature settings can also be configured.



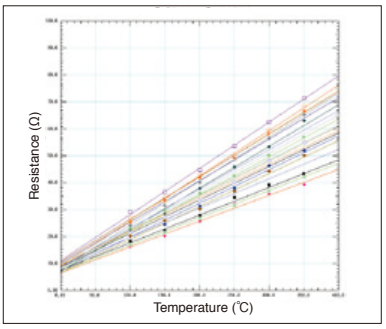
Oven condition settings

ANALYTICAL SOFTWARE

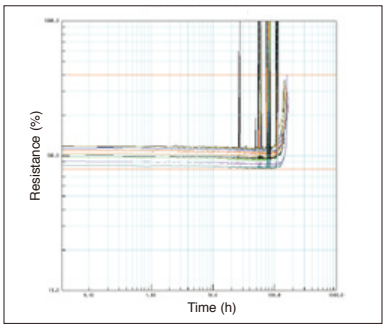
Pre-test → **TCR testing** → **Electromigration testing** → **END**



Displays the measured resistance for each DUT in graph form



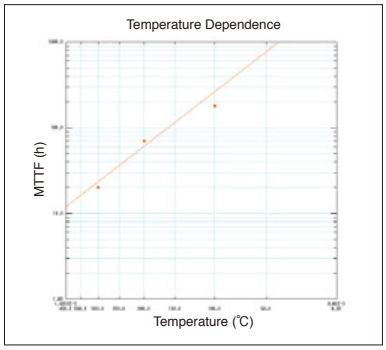
Displays the measured resistance for each DUT and temperature in graph form



Displays the measured resistance for each DUT and time in graph form. Absolute or relative values can be displayed.

Density dependence plots (Normal/ Log Normal/ Wiebull)

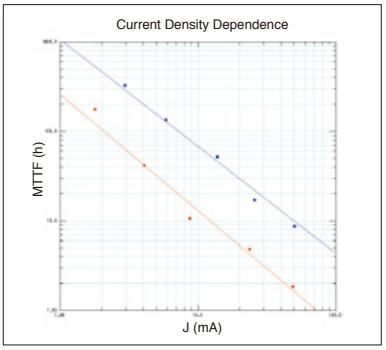
Temperature dependence



Displays the temperature-dependence in graph form based on the life (MTTF/ median) calculated from the distribution plot. (Arrhenius plot)

Activation energy (Ea)

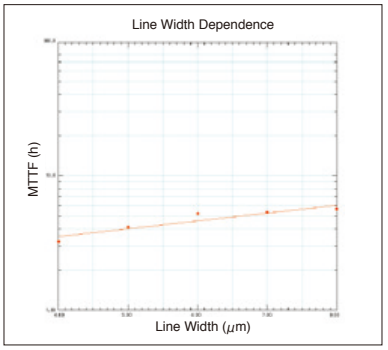
Current density dependence



Displays the current density dependence in graph form based on the life (MTTF/median) calculated from the distribution plot.

Current density index

Other parameters dependencies



Displays in graph form the dependence on wire length, wire width, thickness and number of contacts.

Black's model

SPECIFICATIONS

Evaluation item		• Electromigration testing • Stress migration testing • Temperature characteristic (TCR) testing • Extrusion testing
Stress current source	Output range	+ DC, 0.1 mA to 200 mA
	Accuracy	0.1 to 200 mA: ± (0.3% of set point + 50 μA)
	Following voltage	35V
Extrusion test voltage	Output range	−10.0 to −1.0 V / 1.0 to 20.0 V
	Accuracy	± (2% of set point + 20 mV)
Oven	Temperature control range	+65 to +350℃
	Temperature fluctuation	±0.5℃ (+65 to +350℃)
	Temperature uniformity	±1.0°C (+100°C), ±2.0°C (+200°C), ±3.5°C (+300°C)

SYSTEM VARIATION

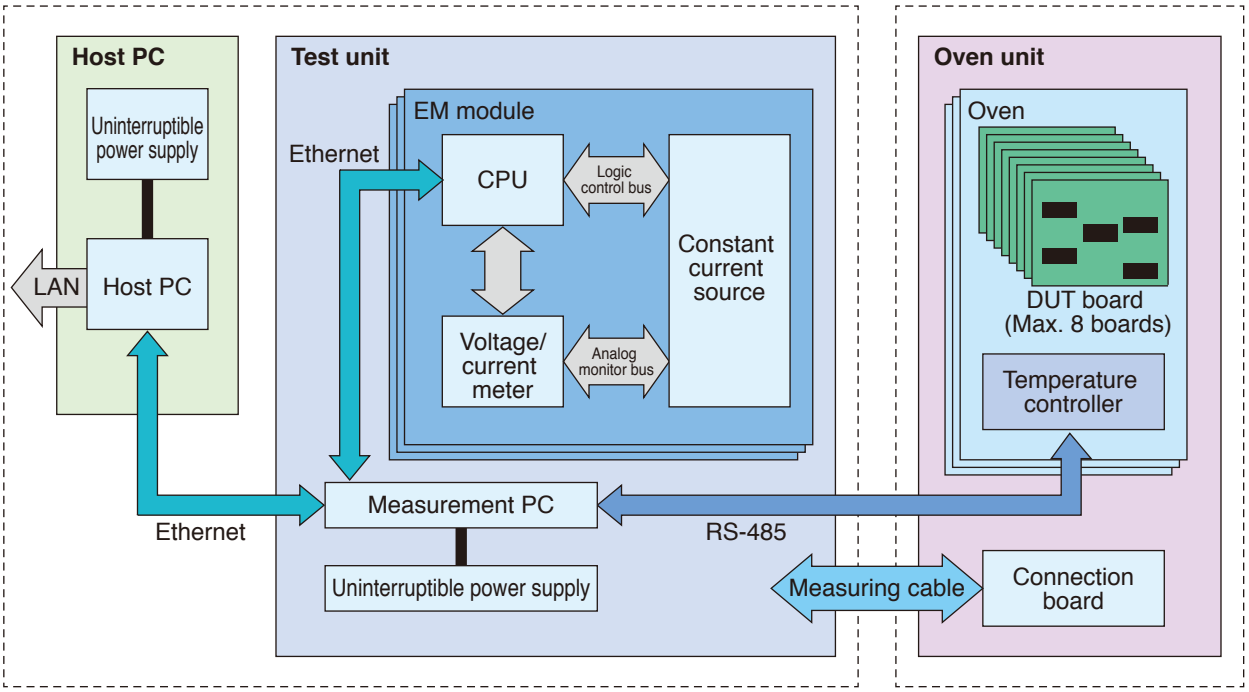
Model		AEM–240C3 AAA	AEM–160C2 0AA	AEM–080C1 00A
EM module output current	Oven 1	200mA	200mA	200mA
	Oven 2	200mA	200mA	—
	Oven 3	200mA		
Number of evaluation channels		240ch	160ch	80ch
DUT board	Number of installed units	24 (8 × 3 oven)	16 (8 × 2 oven)	8
	IC socket	5 each per board (DIP 28-pin, 600 mil and 300 mil)		
Power supply		200 V AC, 3-pole, 50/60 Hz (controller), AC 100 V, 1-pole, 50/60 Hz (PC)		
Breaker capacity	200 V (Test unit + Oven unit)	75A(25kVA)	60A(17kVA)	40A(9kVA)
	100 V (Host PC)	6.5A(650VA)		
Oven unit dimensions (mm) *1 *2		1080 (1131) (W) 1990 (H) 1055 (D)	580 (W) 1360 (H) 1220 (D)	580 (W) 730 (W) 1220 (D)
Test unit dimensions (mm) *2		580 (W) × 1942 (2217) (H) × 1210 (1302) (D)		

*1 Including stand
*2 Dimensions in parentheses include protrusions

Safety precautions

- Do not use specimens which are explosive or inflammable, or which contain such substances. To do so could be hazardous, as this may lead to fire or explosion.
- Vapor from specimens that accumlates in tanks or exhaust ducts may ignite and cause fires, so the equipment must be cleaned periodically. Vapor that seeps into and accumulates in equipment insulating layers may cause more serious fires.

SYSTEM BLOCK DIAGRAM



Host PC

- **Host PC**
  Software: Windows OS
  Test settings and test monitoring management and data analysis
- **Uninterruptible power supply**
  For host PC

Test unit

- **EM module**
  For DUT power control and DUT resistance measurement
  1 constant power source supply per channel
- **PC for measurements**
  Measurement data aggregation and measurement control
- **Uninterruptible power supply**
  For measurement PC

Oven unit

- **Oven**
  Temperature range: +65 to +350°C
- **Connection board**
  For DUT board connection;
  Includes DUT pin scrambling function.

ACCESSORIES

- DUT board (8 boards per oven)
- Setup CD
- User's manual
- Resistance check board (1 board)

SAFETY DEVICES

- Leakage breaker
- High-low temperature limit alarm
- Burn-out detection circuit
- Stand-alone overheat protector
- PC freeze detection using watchdog timer
- Status indicator light 3 level
- Emergency stop switch (test unit)

OPTIONS

- DUT board
  - ＋350°C application model
    (same as standard accessory)
  - ＋250°C application model (DIP 28 pin / 600 mil)
- Resistance check board
- Additional license for statistical software
- Temperature recorder (100 mm 6-dot type)
- Paperless recorder (externally mounted)
- N2 gas inlet hole
- Step-down transformer (external)

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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 9001:2015 (JIS Q 9001:2015) through the JSA Solutions Co.,Ltd.

＊ The organization of these certificates is ESPEC CORP. Japan.

JSA QMS JIS Q 9001 JSAQ 004

JAB MS CM001

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JSA ISMS JIS Q 27001 JSAI 165

ISMS-AC ISMS ISR006

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T1E03C00 (The contents of this catalog is as of January, 2021.)