

MLR 22 *MLR 22 mini*

New Release!



Conduction reliability evaluation system

- Micro resistance measurement system by AC/DC application (Kelvin bridge method).
- Best suited for joint reliability evaluation of lead-free solder and other materials as well as conduction reliability evaluation of PCBA.
- Best suited for continuous measurement of micro resistance of automotive electronics components within the temperature cycle test chamber.

Continuously measures micro resistance of specimens within the temperature cycle chamber. It accurately evaluates conduction reliability of solder joints and others.

Just launched, a new AC/DC 2-way, micro resistance measurement system!

In 1996, ETAC developed an automatic measurement system called "MLR 20" for joint reliability evaluation of CSP-mounted boards. Since then, we have been continually improving the system and in 2005, it has evolved into the "MLR 22" and the "MLR 22 mini". As a result, the users now have the choice of using either AC or DC for measurements, accommodating various needs for conduction reliability evaluations from consumer products to automotive electronics components. Moreover, the DC application allows the users to evaluate their specimens under close-to-actual usage conditions.

ETAC's multichannel, high speed, micro resistance measurement technique by which specimens are expanded and shrunk within the temperature cycle chamber has already been considered as the industry standard, and the "MLR 22" and the "MLR 22 mini" are state-of-the-art technologies in this field.



Main features

- 1) Using a PC as a system controller, the MLR 22 or the MLR 22 mini and a temperature cycle test chamber (TS 100) can be simultaneously controlled. Furthermore, it enables the user to record and output temperature, resistance values and a Weibull plot on the same PC.
- 2) The MLR assures high measurement accuracy of $\pm 0.4\%$ FS (Full Scale).
- 3) A special jig which allows automatic continuous measurement within the chamber without taking specimens out will be also provided.

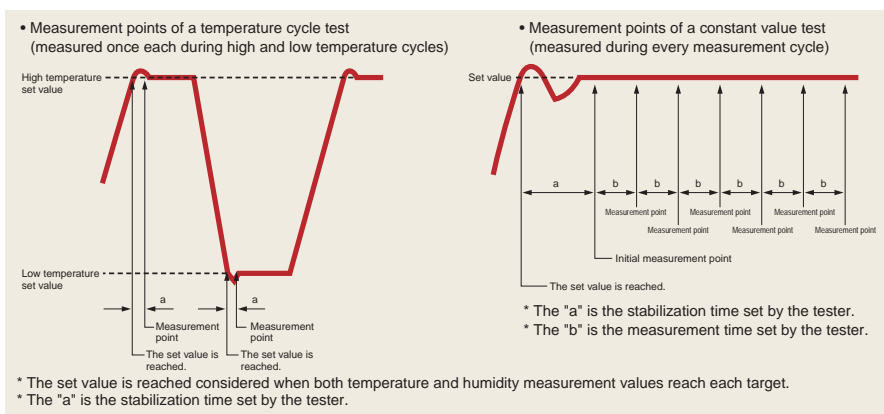


• Heat-resistant measurement cable



• Special jig which enables highly accurate evaluations

- 4) The measurement points of cycle and constant value test modes are as shown in the graph below. Furthermore, either an absolute value or relative value judgment can be selected. For relative value judgment, either resistance value, variation, or rate of change can be set and if the value is exceeded, the system will judge it as an error.



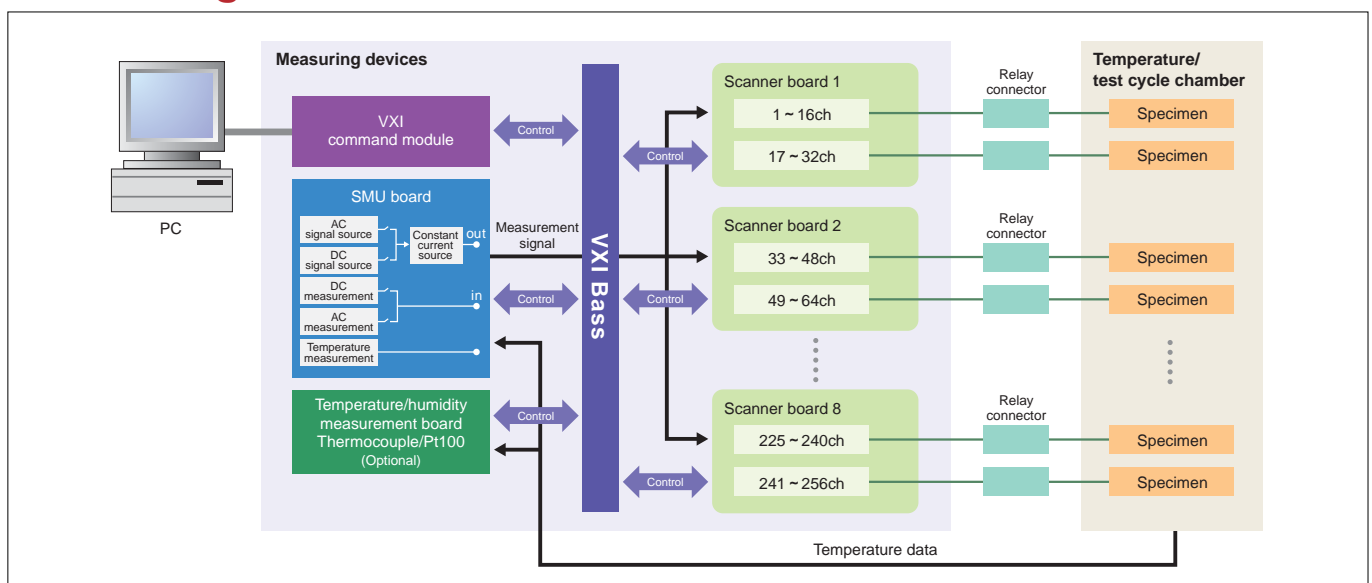
- Temperature cycle test mode
Thermal shock test, temperature cycle test
- Constant value test mode
Constant temperature test, no temperature judgment

These systems enable high-density data recording while performing effective memory capacity management.

- 1 channel: Up to 50,000 points
[Maximum recording capacity]
200MB/256 channels

- 5) The system comes with the manual test function which allows the user to change the range of measurement signal electric current and measurement resistance while performing the test if the resistance value of the specimen such as a prototype is unknown. (Please note that with this mode, the data can not be collected.)
- 6) The maximum number of channels of the MLR 22, MLR 22 mini, and TS 100 are 256 channels (32 channel/board, total 8 boards), 64 channels (32 channel/board, total 2 boards), and 128 channels respectively. The MLR 22 and the MLR 22 mini can measure temperatures at 4 points and 2 points (up to 4 points) respectively and can work with up to 4 temperature cycle test chambers simultaneously regardless of whether ETAC or non-ETAC models.

Basic configuration



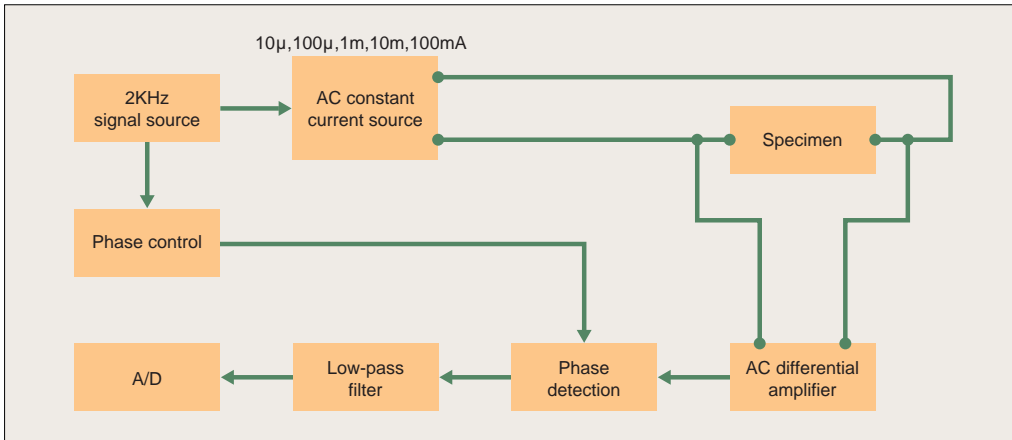
* The number of channels signifies the number of specimens.

* The maximum number of channels of the MLR 22 and the MLR 22 mini are 256 channels (32 channels/board, total 8 boards) and 64 channels (32 channels/board, total 2 boards) respectively and it can be expanded by 32 channels per measurement board (2 measurement cables).

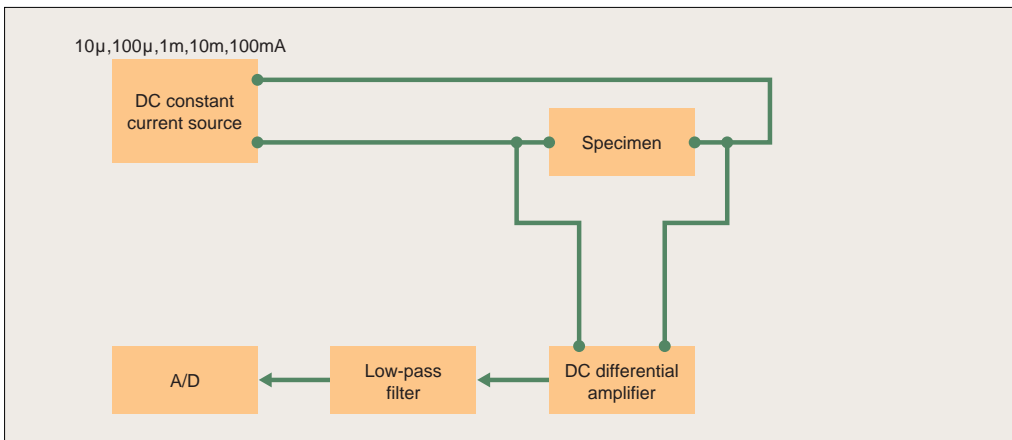
* As the standard specification, these systems work with 2 chambers simultaneously. However, by adding temperature/humidity measurement boards (optional), they work with up to 4 chambers simultaneously.

AC/DC (2-way) resistance measurement system

• Measurement of micro resistance by applying AC



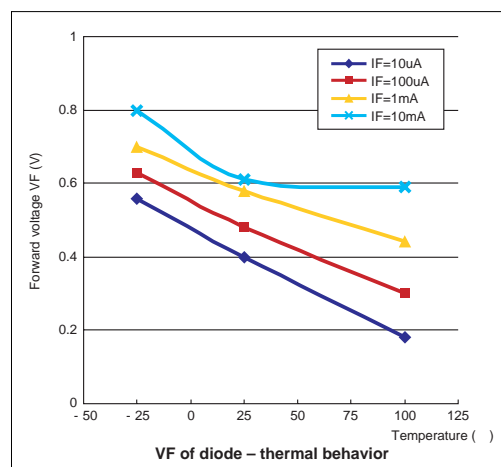
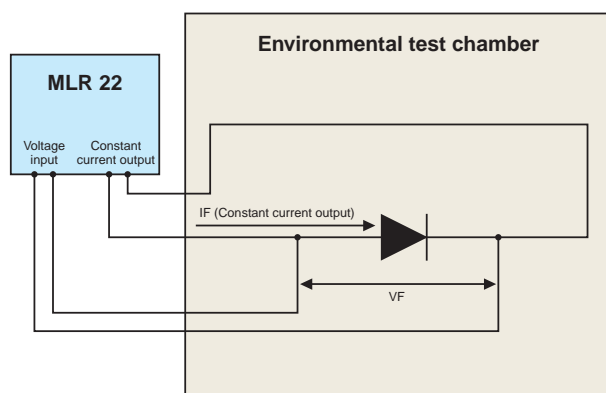
• Measurement of voltage and micro resistance value by applying DC



Examples of main applications

- Reliability evaluation of lead-free solder by combining with temperature cycle or thermal shock test chamber.
- Joint reliability evaluation of BGA and CSP solder balls.
- Reliability evaluation of connectors and switches
- Whisker evaluation of microconnector
- Conduction reliability evaluation of automotive electric components
- Voltage (resistance) measurement of polarized components including diodes.

An example of measurement of voltage by MLR 22: VF of diode – thermal behavior



Advantages of continuous measurement within the chamber

The continuous measurement within the chamber will provide the most accurate data for evaluations of high-density mounting boards and life tests.

Traditional measurement

If specimens are taken out from the chamber at a certain interval in order to measure the resistance as in the past, the time of failure which is most critical for life prediction can not be identified. In addition, at room temperature, the electric current recovers as if there is no crack and no change in resistance value can be captured, resulting in inaccurate measurements.

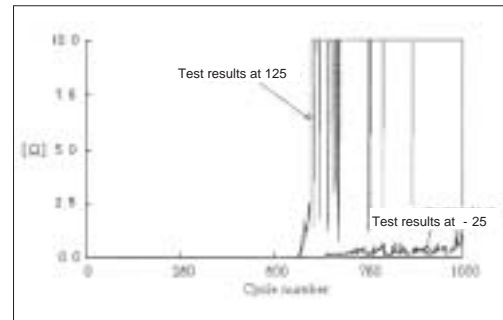


continuous measurement within the chamber

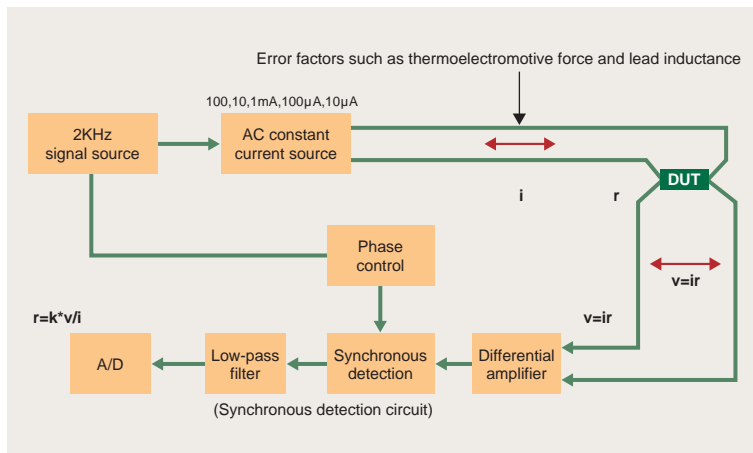
In the case of a high-density mounting board such as BGA and CSP, the stress which was generated by the difference of the coefficient of thermal expansion between a chip and a board is not distributed and concentrates on the solder joints. As a result, cracks are formed at the solder joints.

By continuously measuring the micro resistance of the specimen inside the chamber, the time when a crack is formed and the behavior of resistance at low and high temperature can be precisely captured.

Moreover, the efficiency significantly improves as compared with the traditional manual measurement technique because various data including a Weibull plot is output by the fully automated system.



•From EIAJET-7407 Appendix "2-3"



•Resistance measurement circuit using a four-wire Kelvin Bridge method applying AC
With the four-wire Kelvin Bridge method and phase detection, DC resistance and reactance error are cancelled, enabling accurate measurement of micro resistance.



•Special jig for specimen (left) and MLR 22 (right)

MLR main body and board configuration

In order to meet various needs such as; "we do not need so many simultaneous measurement channels", "we are looking for a compact and low-cost system", and "we need a system which allows us to control it with a notebook PC", the "MLR 22 mini" was newly added in our product line-up.



•MLR 22: 8-slot 32 channels/board (Maximum 256 channels)



•MLR 22 mini: 2-slot 32 channels/board (Maximum 64 channels)

Evaluation examples

• Examples of BGA joint reliability evaluation by thermal fatigue

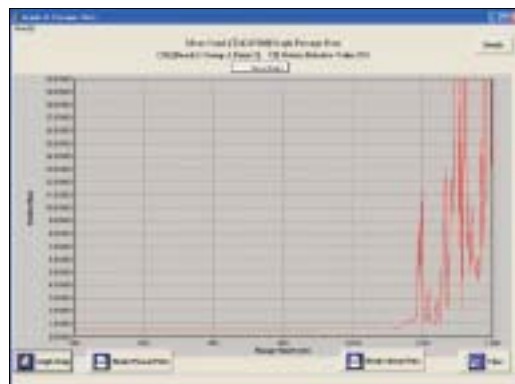
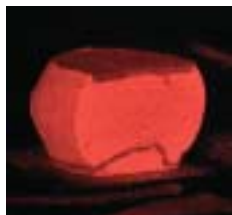
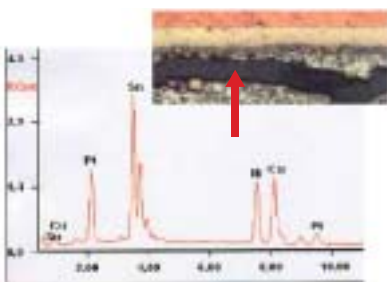
An image of polished cross-section



X-ray CT, 3D image



Elemental analysis of solder ball crack areas

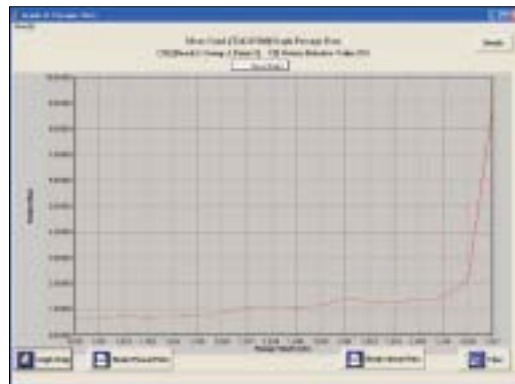


• Examples of joint reliability evaluation at relay contact points

SEM image of relay contact points

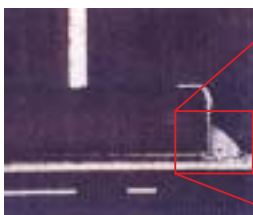


X-ray CT, 3D image of relay contact points



• Examples of SMD joint reliability evaluation by thermal fatigue

Cross-section of SMD



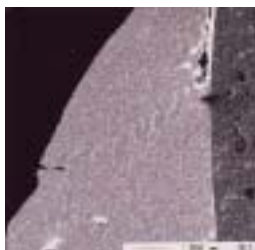
Macro photography



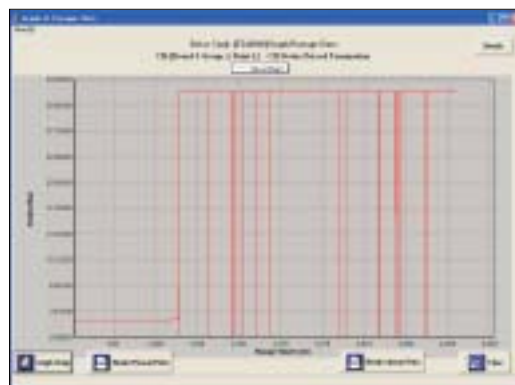
Sn



SEM image



Pb

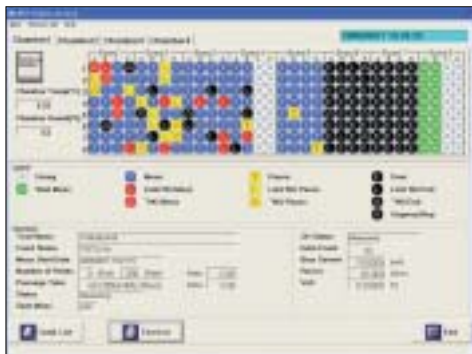


* For inquiries on evaluation results or request for a failure analysis, please contact ETAC's "Reliability Clinic" (See Page 10).

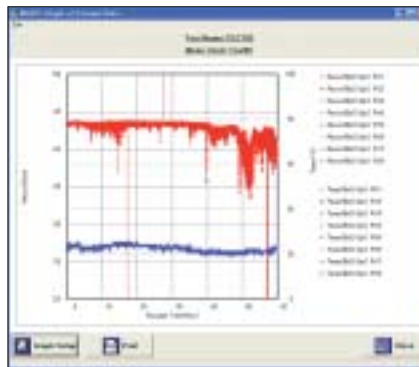
Application software

- 1) With the development of multi-tasking software, data processing speed has been enhanced.
- 2) Multi-functional software which allows the user to configure the settings for both temperature cycle test chamber (TS 100) and MLR.

System management screen



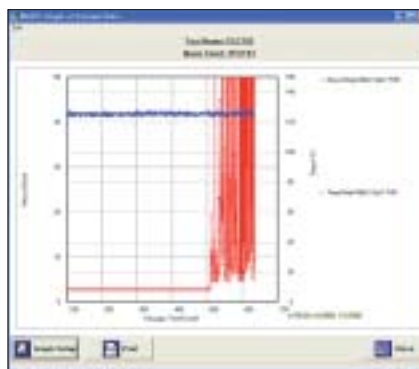
Simultaneous multichannel output data



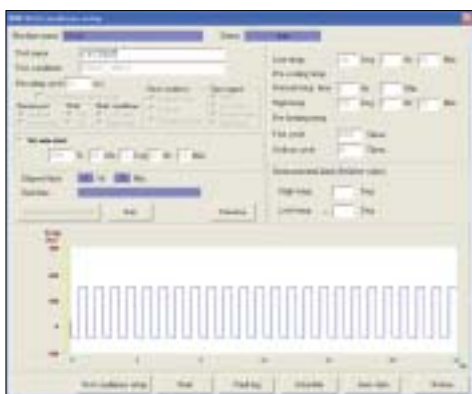
Test conditions setting screen -1 (MRL 22)



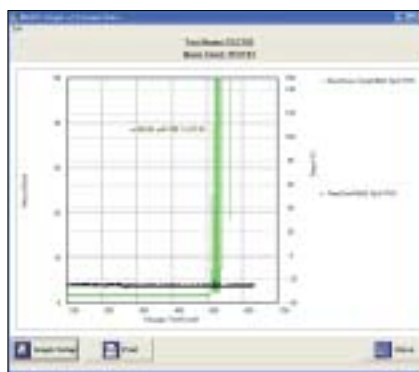
High temperature graph



Test condition setting screen-2 (TS 100)



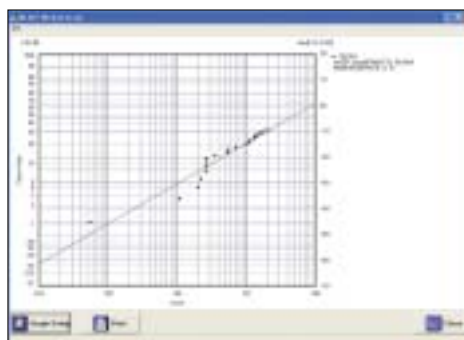
Low temperature graph



List of past data

Test No.	Test Date	Test Result
001	2008-01-01	Pass
002	2008-01-02	Pass
003	2008-01-03	Pass
004	2008-01-04	Pass
005	2008-01-05	Pass
006	2008-01-06	Pass
007	2008-01-07	Pass
008	2008-01-08	Pass
009	2008-01-09	Pass
010	2008-01-10	Pass

Weibull graph



MLR Specifications Table

Product name		Conduction reliability evaluation system										
Model No.		MLR 22										
Electric characteristics	Applied current	AC micro resistance measurement			DC resistance measurement				DC voltage measurement			
		Current	Accuracy	Current	Accuracy	Applied range	Current variable range	Accuracy				
		10 μ A	$\pm 10\%$	10.000 μ A	$\pm 0.4\%/FS$	10.000 μ A	10 μ A ~ 1nA	$\pm 0.4\%/FS$				
		100 μ A	$\pm 10\%$	100.00 μ A	$\pm 0.2\%/FS$	100.00 μ A	100 μ A ~ 10nA	$\pm 0.2\%/FS$				
		1mA	$\pm 10\%$	1.0000mA	$\pm 0.2\%/FS$	1.0000mA	1mA ~ 100nA	$\pm 0.2\%/FS$				
		10mA	$\pm 10\%$	10.000mA	$\pm 0.2\%/FS$	10.000mA	10mA ~ 1 μ A	$\pm 0.2\%/FS$				
		100mA	$\pm 10\%$	100.00mA	$\pm 0.2\%/FS$	100.00mA	100mA ~ 10 μ A	$\pm 0.2\%/FS$				
	Frequency	2KHz $\pm 0.1\%$			DC							
	Measurement	Resistance range	Minimum resolution	Measurement accuracy	Resistance range	Minimum resolution	Range of measurement	Measurement accuracy	Voltage range	Minimum resolution	Range of measurement	Measurement accuracy
		2.0000k	100m	$\pm 0.4\%/FS$	200.00k	10	200k ~ 0.00k	$\pm 0.6\%/FS$	2.0000V	0.1mV	0.0000V ~ 2V	$\pm 0.2\%/FS$
		200.00	10m	$\pm 0.4\%/FS$	20.000k	1	20k ~ 0.000k	$\pm 0.4\%/FS$				
		20.000	1m	$\pm 0.4\%/FS$	2.0000k	100m	2k ~ 0.0000k	$\pm 0.4\%/FS$				
		2.0000	100 μ	$\pm 0.4\%/FS$	200.00	10m	200 ~ 0.00	$\pm 0.4\%/FS$				
		200.00m	10 μ	$\pm 0.4\%/FS$	20.000	1m	20 ~ 0.000	$\pm 0.4\%/FS$				
20.000m		1 μ	$\pm 1\%/FS$									
2.0000m	100n	$\pm 5\%/FS$										
Limit voltage	20mV			4.1V *Measured at the measurement board output terminal (between HF and LF)								
Limiter accuracy	0 ~ +25%			$\pm 0.2V$								
Measuring speed	Standard cable + standard scanner board 250msec/channel											
AUTO range	Automatic per-channel optimum range selection function											
Data recording	Test mode	1) Temperature cycle 2) Constant temperature 3) No temperature judgment										
	Recording data	Number of cycle, recording time, resistance value or voltage value, judgment, input current value, temperature, humidity										
	Recording cycle	Cycle test mode : Data is collected once each at high temperature and low temperature within one cycle Constant test mode : Data is collected at a certain interval										
	Recording data volume	Up to 200MB per 256 channels per test (about 50,000 points/channel) * Data capacity depends on hard disk drive.										
	Data conversion function	Convertible to CSV format										
Temperature measurement	Temperature input I/F	<p>Number of input channels: 2 channels (2 channels for temperature or 1 channel each for temperature and humidity) *The number of temperature/humidity measurement channels can be increased up to 4 channels if the temperature/humidity measurement board or 3CS software (optional) is used. Type of temperature-sensing element: T-type thermocouple: JIS C1602 or Pt 100: JIS C1604 (3-wire type) Wire diameter of temperature-sensing element: 0.65 ~ 1.6 mm Temperature measurement range: T-type thermocouple: - 250 ~ + 350 Pt100: - 200 ~ + 550 Relative humidity measurement range: 0 ~ 100% (dry and wet bulb method) Cold junction measurement: 1 channel temperature sensitive resistor Two types of sensors, Pt100 and T-type thermocouple are available and either one of them can be selected by using a switch on the measurement board.</p>										
	Temperature adjustment by user	The temperature correction function is available from the system setting screen.										
Control unit	System control PC	Windows XP Pro. SP2 (also compatible with Windows 2000), Pentium III, 500MHz or above, memory: 256Mbyte and above										
	Connection with measurement devices	GP-IB or Ethernet										
Others	Countermeasures against power failure	The data collected just before power failure is saved to enable continued measurement. *A UPS is necessary (to be purchased separately)										
Measurement board storage unit	Available sizes	MLR 22	scanner 8-slot type External dimensions : W430 x H300 x D620mm *Do not include projecting parts. Weight : About 30 Kg (when 8 scanner boards are loaded) Consumption current : Less than 5A (when using 100V)									
		MLR 22 mini	scanner 2-slot type External dimensions : W220 x H370 x D390mm *Do not include projecting parts. Weight : About 20 Kg (when 2 scanner boards are loaded) Consumption current : Less than 2A (when using 100V)									
	Noise resistance	1 μ sec pulse 2KV 1 minute										
	Insulation resistance	DC500V 100M and above										
	Power source	AC85V ~ 264V 50/60Hz										
	Test environment	Temperature: + 10 ~ + 40 , Humidity: 75% RH and below (condensation should not occur)										
Storage environment	Temperature: - 10 ~ + 60											

* 3CS: The brand name of ETAC's "Environmental test chamber central control and monitoring software".

Recommended Temperature Cycle Test Chamber

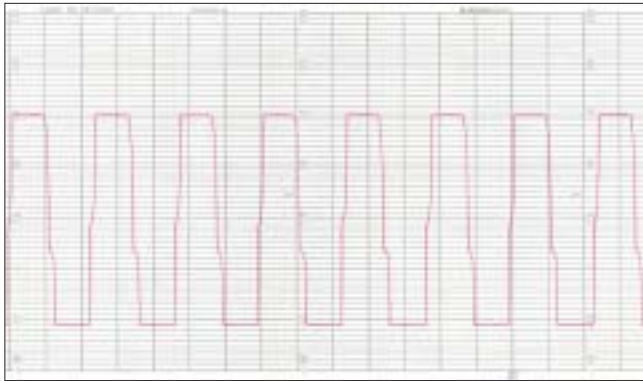
WINTECH Keyless Series TS 100

Network compatible, temperature cycle test chamber

The temperature cycle test chamber WINTECH TS 100 is ETAC's original new concept controllerless (keyless) environmental test chamber that uses the PC as a controller instead. We assure you that the chamber will deliver you the best performance by combining with the MLR.

Temperature recovers in just 5 minutes without precooling

With the dumper switching technology which minimizes heat loss and high and low temperature rooms that come with a powerful cooling/heat source, temperature is guaranteed to recover in "5 minutes".



Main features



- The chamber can be placed either the right or left side of the MLR.



- Measurement jig usable within chamber (for 128 channels)

1 Space saving

Because the controller was removed from the main body, the size of the chamber was significantly reduced as compared with standard chambers. In addition, because only a PC is required to control both the MLR and the chamber, it helps to save the user's office space. The chamber also allows smooth installation because it comes with 1 cable port each on both right and left sides of the main body.

2 Cost saving

The duplication of the controller was eliminated by the development of the keyless chamber and various interface functions were added as the standard specification, which reduced the cost for our customers.

3 Labor saving and workload reducing

The MLR and TS 100 as different equipments are fully automated by the integrated software and no manpower is required even when operating long duration tests such as 1,000 or 3,000 hours tests. Moreover, it contributes to the reduction of engineer's workload because the software can also output the test data as a Weibull plot.

WINTECH TS 100 Specifications Table

Product name		Temperature cycle test chamber		
Model No.		TS 100		
Temperature switching method		Cold and hot air switching system using dumper (specimens need not be removed)		
Type of test		2-zone and 3-zone temperature cycle tests		
Main body	Test room structure		3-room type (test room, high temperature room, low temperature room)	
	Internal dimensions (W x H x Dmm)		370 x 330 x 400 mm	
	External dimensions (W x H x Dmm)		1043 x 1800 x 1400 mm (Do not include projecting parts)	
	Weight (kg)		About 700	
	External material		Coated steel	
	Internal material		Stainless steel (SUS304)	
	Withstand load of the test room		30 kg (uniformly-distributed load)	
	Maximum number of specimen shelves		5 pieces	
	Allowable load of specimen shelf		5 kg/piece	
	Door lock mechanism		One of the doors is opened with the lock release button.	
Performance	Test room	Temperature range of low temperature test	- 65 ~ - 10	
		Temperature range of high temperature test	+ 60 ~ + 200	
		Temperature recovery time	Within 5 minutes (conditional)	
		Temperature fluctuation range	± 0.5	
	Low temperature room	Precooling temperature range	- 75 ~ - 20	
		Time to reach precooling temperature	Within 75 minutes (from room temperature to - 73)	
	High temperature room	Preheating temperature range	+ 70 ~ + 225	
		Time to reach preheating temperature	Within 15 minutes (from room temperature to + 200)	
	Performance guarantee ambient temperature		+ 5 ~ + 30	
	Operable ambient temperature		+ 5 ~ + 35	
Main unit	Circulation fan		Sirocco fan	
	Refrigeration method		Dual refrigeration system	
	Refrigerator		Air-cooling, fully sealed refrigerator	
	Refrigerant		HFC404A and HFC23	
	Condenser		Plate fin coil	
	Thermal heater		Strip wire heater	
	Damper driving mechanism		Air cylinder	
	Temperature sensor		PT100	
	Temperature controller	Control system		PID control by microprocessor
		Setting method		By interfacing with the PC (sold separately) or using the key pad (optional)
		Communication method		RS485
		Display resolution		1
		Temperature control resolution		0.1
Display type (door)		LED digital display		
Programming features		No. of registrable programs: 30 programs, temperature cycles: 0 to 9,999 cycles.		
Facilities need preparation by users	Power source		AC200V, 3-phase, 50/60Hz, power supply fluctuation range: ± 10%	
	Rated current [maximum consumption] (A)		48	
	Maximum electric power consumption (KVA)		16.3	
	Air		4 to 7 kg/cm ² G dry air Connect a nylon tube (external diameter: 6) to the back of the main body.	
	Drainage		Silicon hose (One side of the hose to be exposed to air.) / internal diameter: 8, external diameter: 11	
Protective devices		Earth leakage breaker, fan thermal relay, circulation fan negative phase preventive relay, overheat protector for high temperature room, overheat protector for test room, overheat protector for low temperature room, upper/lower temperature limits warning circuit, proximity switch for dumper, door lock mechanism, sensor disconnection detection function, refrigerator 1 & 2 overload relay, refrigerator 1 & 2 high and low pressure switch, external alarm output, interlock terminal		
Additional functions		Automatic start (operation, standby, test), automatic defrost, wait functions, test end time display, number of remaining cycles display, remaining time display, sensor switching function (upwind or downwind), precooling/preheating temperature automatic setting function, test end condition selection function (complete stop, cycle stop, complete stop after defrosting), time signal output, upper and lower temperature/humidity limits warning function, error message display function, pause function		
Standard accessories	Main body		Oval cable port: 100 x 30 mm (right and left sides of the chamber)	
	Accessories		Two shelf boards, glass fuse, operation manual, warranty card, inspection certificate, RS485 cable, etc.	
	Communications function		RS485, keypad interface	
	Software		Consists of the status, test condition setting, temperature cycle test data, temperature cycle test trend data, and the schedule control screens (compatible with Windows 95/98 and above)	

* (Note) [1] The performance is guaranteed when the ambient temperature is + 20 and no specimens are placed within the chamber.
 [2] The external dimensions include the caster but no other projecting parts. * Please note that the specifications are subject to change for improvement or upgrading without any prior notice.

Related Products & Services

Insulation Degradation Evaluation System

SIR 13

SIR 13 mini New Release!

- The system accurately captures the insulation degradation phenomena which is typified by ion migration.
- The insulation characteristics of specific specimens under development can be individually measured.
- There are 8 and 3 measurement board slots for the SIR 13 and the SIR 13 mini respectively and the measurement boards are interchangeable between the systems.



Setup of the HAST chamber
"PLAMOUNT PM 420" and SIR 13 mini
* For accelerated tests

Setup of the temperature/humidity test chamber
"HIFLEX Keyless TH 403A" and SIR 13
* For environmental tests with test conditions
such as 85 /85%RH, etc.

Contracted Reliability Testing & Analysis Service



RCJ-00T-01B

ETAC's Contracted Reliability Testing & Analysis Service Department has been accredited as the third-party "Independent Test Laboratory (ITC)" under the IECQ System and our business operation is carried out in accordance with the regulations of "IECQ Approved Testing Laboratory" which complies with the international standard "ISO/IEC17025" for testing bodies



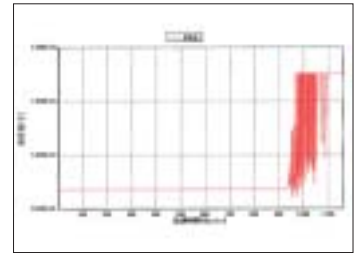
Yamagata Laboratory's external view



Inside of the temperature cycle chamber,
TS 100



Joint reliability evaluation of BGA



Our major testing services

- 1) Various sample processing/production
- 2) Precision evaluation of the produced sample (reflow resistance test/baking/X-ray peeling test/SAT observation, etc.)
- 3) Environmental test (temperature-humidity test/temperature cycle test/thermal shock test/salt-spray test/complex environmental test (temperature/humidity + vibration) etc.)
- 4) Life test (ion migration/insulation characteristics/joint reliability/capacitor characteristics/LSI wiring reliability evaluation, etc.)
- 5) Failure analysis (various observations are made using the SEM/SAT/CT with X-Ray, etc.)

* Our "Reliability Clinic" was set up in order to meet our customer's various needs starting from quality reliability improvement, failure analysis, and to proposal of solutions.

ETAC helps our customers produce "high quality products" *

ETAC®

* By making the best use of our own expertise and by providing quality service, we aim to help our customers to develop high-quality, reliable products.

<http://www.etac.kusumoto.co.jp/>

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ISO9001 Certified
JQA-QM8943



ITC approval number
RCJ-00T-01B



Notice for safe use

When using, please read attached manual carefully. Avoid installing in places where water, moisture, dust, or soot may gather. These may cause fire, accident, or electric shock.