GEN3 SYSTEMS

CM SERIES
Ionic Contamination Testers

ENGINEERING RELIABILITY IN ELECTRONICS

Process Cleanliness Control – Made Simple

To test, simply input the circuit length and width, put the item into the tank and push the button – it's as simple as that.

The NEW CM60 utilises a unique Volumetric Measurement Cell (VMC). This automatically and precisely calculates the displaced test solution that determines the surface area (volume) that is about to be tested. All other test cycle operations are fully automated allowing the use of unskilled personnel with a minimum of training.

Commonly referred to as "Cleanliness Testing" this test method has, for over 40 years, been acknowledged as an important Quality Assurance and Process Control tool in the manufacture of electronic circuit boards, components and assemblies.

The Contaminometer (CM Series) test system was originally developed by Protonique, the business of industry guru Brian Ellis. They featured in the early development programmes of "cleanliness measurement" carried out by the US DOD at China Lake in the 70's.

They are used to measure the amount of ionic contamination, usually referred to as cleanliness levels, in accordance with IPC/ANSI-J-STD001D and UK DEF-STD and other international specifications. They are often referred to as ROSE (Resistivity Of Solvent Extracted) or SEC (Solvent Extract Conductivity) testers.

The CM Series of contamination testers are ergonomically designed. CM11 AND CM12 are table top models for small size PCBs and components.

The CM60 is a floor standing model, designed to test large PCB panels and assemblies. The CM60 can be equipped with different sized tanks dependant upon the size of the test pieces.

Ionic Contamination Testing

Ionic contamination testing is required as ionic residues remaining from both the PCB manufacturing process and the soldering process may affect the reliability of a finished assembly.

In a humid environment, ionic contaminants can cause problems such as shorting between conductors by electrolytic dendrite growth, corrosion that erodes the conductors themselves or loss of insulation resistance. It is therefore important to monitor the level of ionic contamination, giving an indication of the cleanliness and thereby the expected reliability of an assembly.
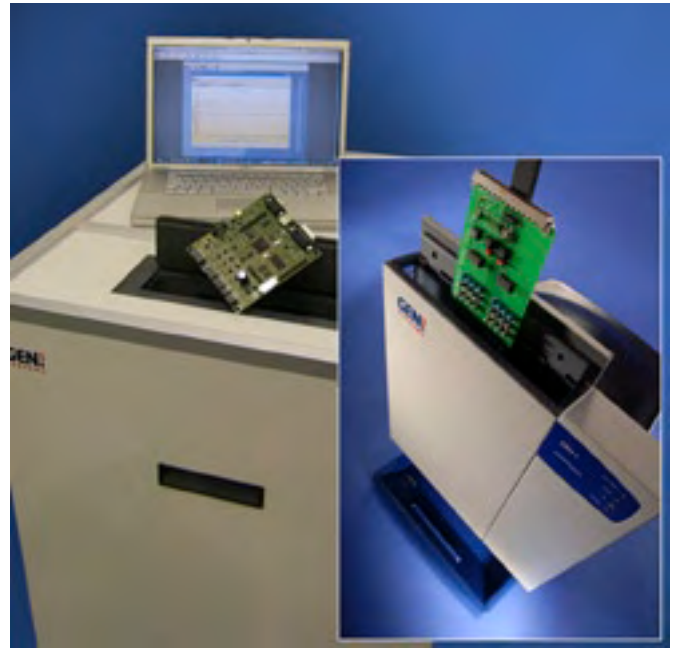
Ionic contamination is measured by immersing a sample in a test solution of 2-propanol and de-ionised water to dissolve the contaminants. The dissolved ionic substances cause a change in conductivity of the test solution; this change is precisely measured and converted into a contamination value expressed as $\mu g/cm^2$ NaCl equivalence.

Soldering & Cleaning Control

With the increasing use of no clean or low solids fluxes and controlled atmosphere soldering systems, ionic contamination monitoring has become an essential process control parameter in the production environment. The Contaminometers are exceptional measurement instruments for SPC (Statistical Process Control) of the soldering and cleaning processes. Testing a number of samples per hour or per day, any changes in ionic contamination level will be detected, rapidly alerting the operator to a process variation or fault affecting the contamination level and thus quality of the boards. The test results are immediately documented by a hard copy with graphical data presentation. Statistical analyses can be made instantly.

Components of the Contaminometer

All components of the Contaminometers have been carefully chosen to ensure high quality and excellent reliability. The hydraulics of each instrument is thoroughly tested and special grade polymer is used for both the tanks and the piping in contact with the CM Test Solution. This solution is a mixture of reagent grade 2-propanol and ultra-pure de-ionised water mixed at either 50% or 75% as required by the applicable standard.

The solution is re-purified automatically each time a new test is run using a special regeneration or de-ionising cartridge that is easy to exchange. Electronic control is by a low voltage system enclosed in a separated, easily accessible cabinet.

The CM Series utilise a solid gold measuring cell, ballistic amplifier and a vigorous pumping system to achieve superior measurement accuracy of <0.005mS/cm even at very low conductivity values.

The CM Systems have been designed to avoid polarisation effects between electrodes as might occur when using DC test currents. Equally error signals, caused by both DC and AC currents, are eliminated and high accuracy is ensured even at low conductivity values.

Automatic temperature compensation is incorporated in the electronic control system, the method of temperature measurement being by a thermistor positioned in the test cell. The Contaminometer software uses a complex algorithm to automatically compensate for ambient temperature, circuit volume and atmospheric absorption of iogenic gases. Temperature is monitored and all measurements are related to the international standard of 20°C (68°F).

Software Features

The user-friendly software runs under Windows® XP or Vista® ready gives on-screen instructions to guide the operator through the test cycle. The software can display up to 20 test results in a 2 dimensional or 3 dimensional representation, which can be rotated for ease of analysing the results. The software is designed to enable easy export of test results into other word processing and SPC software.

Data Processing

The analysis of the contamination test data uses a complex curve-fitting routine that gives an accurate indication of the total amount of ionic contamination on the circuit.

The graphical display of test results features auto-ranging of curves in equivalent contamination units of μg/cm2 NaCl equivalence. Contamination is plotted against time and the curve is automatically extrapolated producing meaningful data even for a short test

The test data are analysed graphically including pass/fail analysis. Statistical evaluation of up to 50 test results is incorporated in the Contaminometer software but test results may also be imported into other software packages for further enhancement or appraisal as required. The test data produced meet the requirements of international and military specifications as documented in MIL-P-28809 (obsolete, but still referenced by the industry), DEF standard 00-10/3, IPC-J-STD 001D & IPC-TM-650 and IEC specifications.
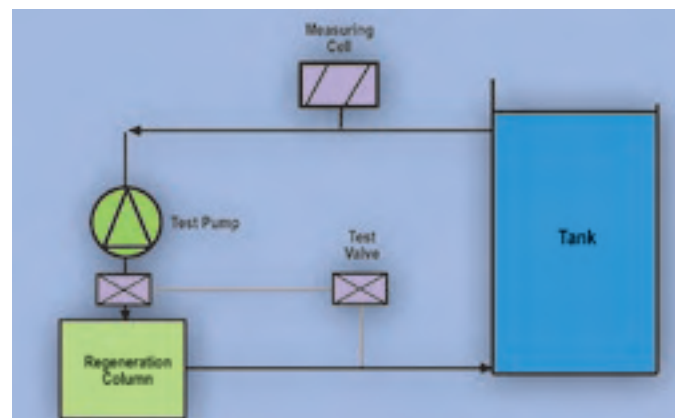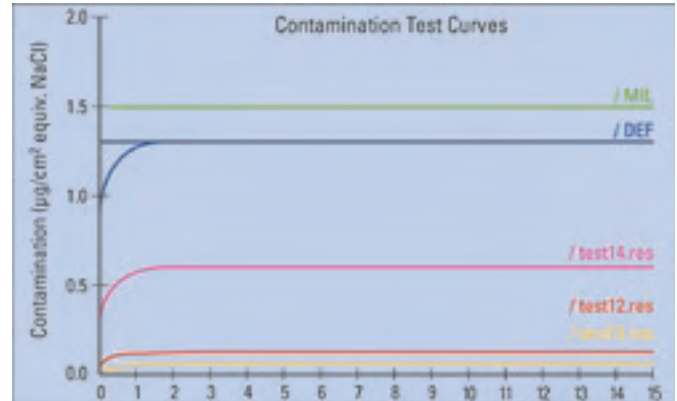
Schematic showing CM11/12 system
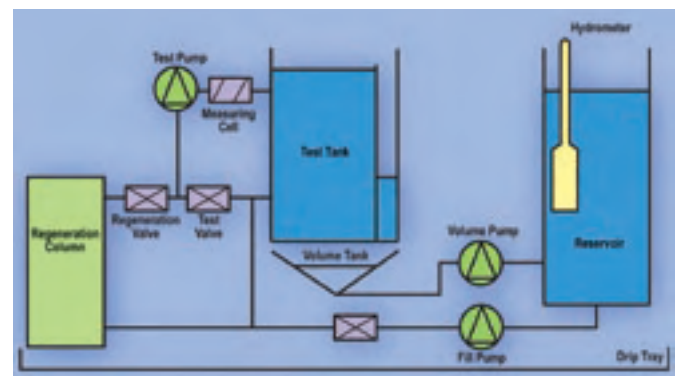
Schematic showing CM60

CM 60

Simplicity of Operation

The CM60, incorporating the unique "VMC", automatically calculates the surface area to be tested by the volume of test solution that is displaced when the item is put into the test tank. This allows for a far higher level of precision and provides for more quantitative test data than other methods.

Test Tank Options

To achieve the greatest test accuracy and highest measurement sensitivity, the smallest tank that will accommodate the test sample should be used.

CM60 test tanks are available in 2 different sizes to suit individual applications.

Tank	Maximum PCB Dimension	Minimum PCB Surface Area
1	350 x 250 x 60mm (13.8" x 9.8" x 2.4")	200cm^2
2	500 x 350 x 60mm (19.7" x 13.8" x 2.4")	450cm^2
OPTION:	700 x 500 x 18mm (27.5" x 19.5" x 0.75")	500cm^2

The CM60 contains a built-in test solution reservoir. The software calculates the surface area of the PCB and allows for compensation of the component surface area.

Technical Specifications CM60

Measurement range:	0.01 - 30µg/cm^2 NaCl equivalence (auto-ranging)
Sensitivity:	< 0.25% of measurement range
Precision & Repeatability:	Better than ± 2% of range for maximum PCB surface
Solution:	50% or 75% v/v reagent grade 2-proponal in de-ionised water
Maximum liquid volume:	25 litres
Power supply:	100-240 VAC 47/60Hz
Weight:	Approx. 75 kg
Computer requirements:	Any suitable PC with Windows® XP or Vista®
Overall dimensions:	Width: 650mm x Depth: 800mm x Height: 1100mm

CM 11/12

Technical Specifications CM11

Maximum PCB Size	250 x 240 x 38mm (102" x 9.8" x 1.5")
Minimum PCB surface area*	100 cm^2
Measurement Range	0.01 - 30µg/cm^2 NaCl equivalence (auto-ranging)
Sensitivity	<0.25% of measurement range
Precision and Repeatability	Better than ±2% of range for maximum PCB surface area
Solution	50% or 75% v/v reagent grade 2-propanol in de-ionised water
Maximum Liquid Volume	3.5 litres
Power Supply	100-240 VAC 50/60 Hz
Weight	21 Kg
Computer requirements:	Any suitable PC with Windows® XP or Vista®

Technical Specifications CM12

Maximum PCB Size	250 x 290 x 32mm (102" x 11.9" x 1.3")
Minimum PCB surface area*	100 cm^2
Measurement Range	0.01 - 30µg/cm^2 NaCl equivalence (auto-ranging)
Sensitivity	<0.25% of measurement range
Precision and Repeatability	Better than ±2% of range for maximum PCB surface area
Solution	50% or 75% v/v reagent grade 2-propanol in de-ionised water
Maximum Liquid Volume	3.5 litres
Power Supply	100-240 VAC 50/60 Hz
Weight	21 Kg
Computer requirements:	Any suitable PC with Windows® XP or Vista®

* Testing PCB's with a surface area below the recommended minimum area will result in reduced accuracy.