

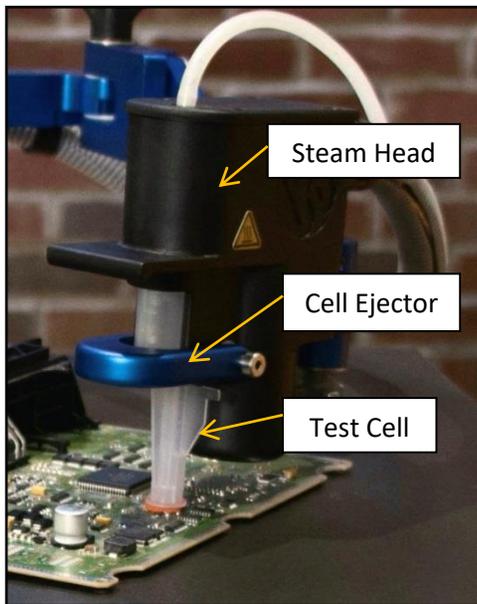


# CRITICAL • CLEANLINESS • CONTROL

More residue-related, performance and reliability issues are affecting electronic assemblies today than ever before. The Foresite C3 Critical Cleanliness Control® is unique among electronics cleanliness testers - it remains the only tester on the market that indicates whether a specific, critical area of a PCBA is clean.

Simply select the components and/or areas of circuitry that are most sensitive and prone to contamination-related performance and/or reliability issues and test a small (0.1 in<sup>2</sup>) area. The C3 quickly provides feedback as to whether potentially detrimental residues, frequently from manufacturing processes, are present.

Once critical areas have been identified to test, the operator simply slides a new, single-use, test cell into the steam head and manually moves the head on the articulated arm into place over the test area.

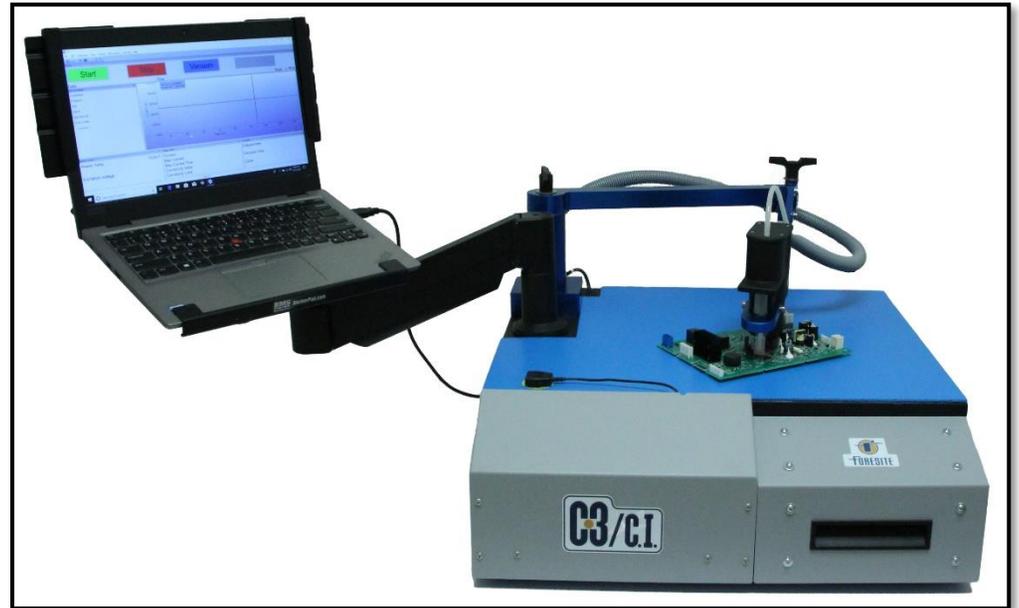


The weight of the arm and steam head seals the test cell on the test surface.

The operator then starts

the automated, non-destructive, extraction and test sequence. The C3 test consists of applying a voltage across copper traces on the test cell electrode, submerged in the extracted sample, and measuring the leakage current (in  $\mu\text{A}$ ). The current resulting from the corrosiveness and/or conductivity of the sample is compared to a programmed current limit until a programmed decision time elapses. If the current limit is reached or exceeded prior to the decision time, the test result is "dirty". This test method not only indicates increased sample conductivity, but senses electro-migration. In 7-10 minutes the operator knows whether the tested product area is an area of cleanliness concern. The C3 can be used right in the manufacturing area.

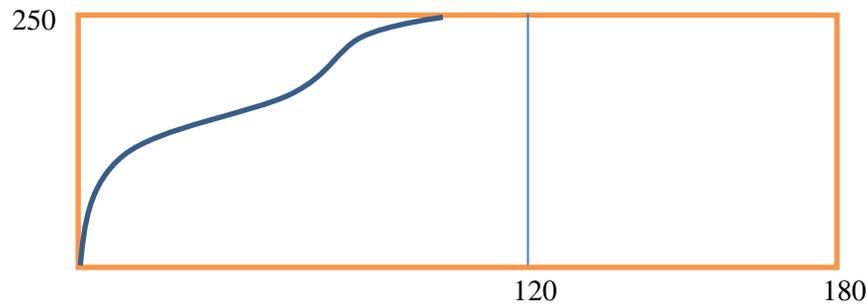
At the conclusion of the test, the cell can be easily removed with the help of the cell ejector on the head. The approx. 2.0 ml test sample in the cell is efficiently extracted from the small, test area through repeated cycles of steam bursts and soak (solubilization) time. This sample can be further laboratory analyzed to identify the particular contaminants present and in what concentrations. The entire test is simple and easy for the operator, and the result is not operator-dependent. Use of the Foresite, single-use, test cells and extraction solution avoids cross-contamination of the sample.



The **C3/C.I. model** (pictured) includes a dedicated, integral, mini PC operating on MS Windows, a 16" widescreen LCD monitor and a full-size, water-resistant keyboard with touchpad. Thus, data and test parameter entry is easy for the operator, with minimal training. The test progress and test result graphics are clearly displayed on the large color screen. Test results are stored in a data log and can be easily downloaded: USB port; WiFi; Bluetooth.

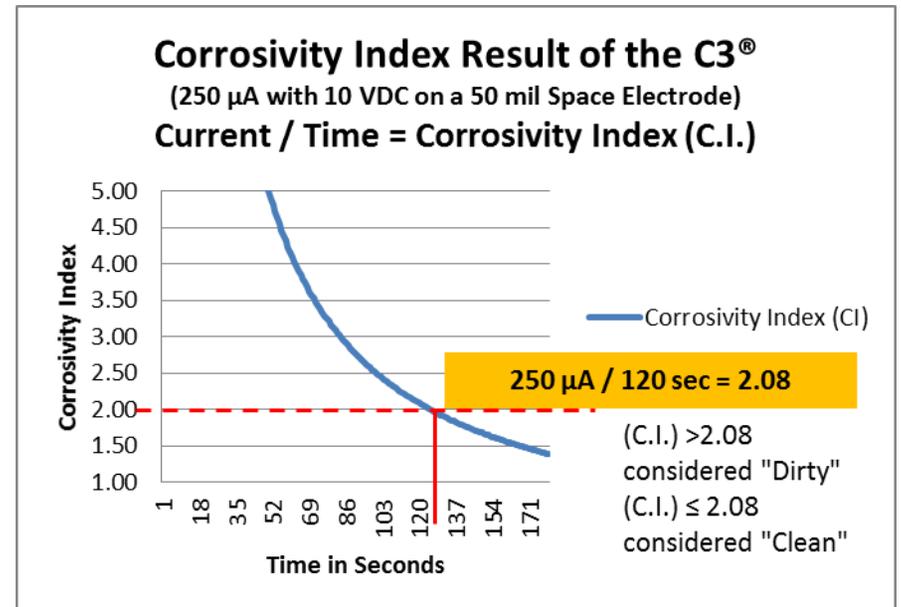
The C3/C.I. calculates and displays the **C3 Corrosivity Index™** (C.I.) for the completed test and the C.I. limit for the test. The C.I. is an indicator of the cleanliness of a test site analyzed by the C3. The index is calculated by dividing the maximum current seen during the test by the elapsed time of the test. The operator can choose to graph and display on the screen the C.I. for a group of tests (a particular product or test site). The index provides a single test result value that can be plotted over time to track trending in product cleanliness – the lower the C.I. the less likely a tested product site will suffer performance problems due to the presence of a detrimental ionic residue.

Using a programmable current limit setting of 250 µA and a decision time setting of 120 seconds, the C.I. limit is (250/120) 2.08. A C3 test performed with these settings that reaches or exceeds 250 µA before 120 seconds has a C.I. greater than 2.08, resulting in a "dirty" indication. These test parameter settings (250 µA & 120 sec.) produce relatively sensitive C3 tests and are commonly used on higher reliability electronics (e.g. IPC Class II & III).



For the above test,  $C.I. = 250/95 = 2.63$ , a failed test.

The C.I. graph at right shows the curve of C.I. values when the set current limit (250 µA) is reached, or exceeded, through the range of elapsed test times.

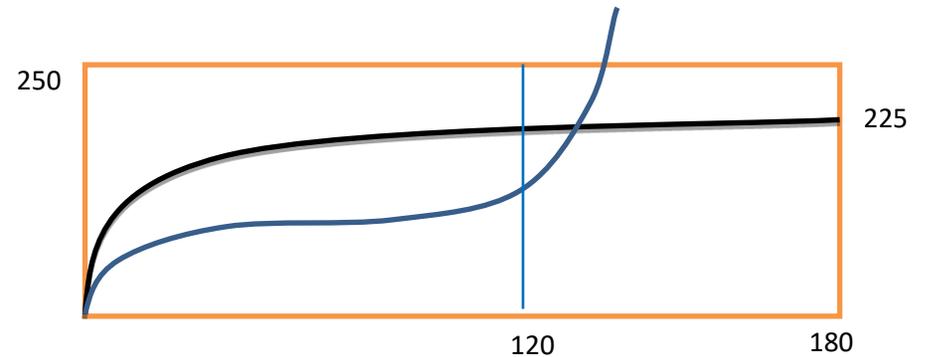


The “maximum” current used in a C.I. calculation is limited to the current set point (250  $\mu$ A in these examples). The C3 test runs until the current exceeds the current set point (limit) or the total test time of 180 seconds is reached.

In this example, two samples pass the test in that the current limit is not reached by the decision time.

Sample A (Blue Line): C.I. =  $250/135 = 1.85$

Sample B (Black Line): C.I. =  $225/180 = 1.25$



Another commonly used set of C3 test parameters is 500  $\mu$ A and 60 seconds. These settings are used on electronics for less demanding applications and environments (e.g. IPC Class I). The C.I. limit when using these settings would be  $(500/60) 8.33$ .

### C3 Localized (“Site Specific”) Extraction

Industry standard non-destructive test methods (ref. IPC-TR-583) are based upon immersing the product in a solvent solution. The intent is to mobilize any ionic contaminants into the solution. ROSE testers measure the change in resistivity of the total solution – an average cleanliness reading for the entire tested product. Even when ion chromatography is used to analyze the extraction, the result is an evaluation of the average product cleanliness, over all the exposed surfaces. For this reason, electronics can pass bulk resistivity, cleanliness testing and still fail due to concentrated areas of contamination. The C3 tests the same product area size each time; results are not affected by varying overall assembly dimensions.

The C3 is based upon directing bursts of steam at a small surface area of the product (0.1 in<sup>2</sup>). Critical areas of the product, for example areas most prone to entrap contaminants or containing the most sensitive circuitry, are selected for C3 testing – multiple sites can be selected (multiple tests performed) on a PCBA. Frequently, test readings for one or more small areas will indicate a product reliability threat when the immersion test has indicated an overall, relatively clean product that should be reliable. Collaborative third-party and Foresite testing has shown that the C3 produces results with improved correlation to SIR and reliability test results. The C3 is not dependent upon the presence of particular contaminants, but rather, indicates the conductivity and/or corrosivity of the contaminant mixture extracted from the product surface of interest.



Tip of C3 Test Cell (0.1 in<sup>2</sup> Opening) Being Positioned to PCBA

### **C3/C.I. Specifications**

Dimensions:

24" Wide x 22" Deep x 21" High (13" High with arm assembly removed)  
22.75" Wide x 18" Deep Working Surface

Weight:

Approx. 75 lbs.

Power Requirements:

100-240VAC  
50-60Hz  
5.0A @ 120VAC

Consumables (included):

Box of (100) Test Cells  
Box of (2) one liter bags of Extraction Solution