

# Amphenol

connecting tomorrow

## Leadfree technology and Whiskers

Dear Ladies and Gentlemen,

In this document you will find a lab report about solders and surface coatings with lead-free technology used by Amphenol-Tuchel Electronics to ensure protection against 'whiskers' and in order to meet current test requirements.



### The Problems

50 years ago it became apparent that when using tin alloy, especially for solder and surfaces, so-called 'whiskers' could appear. In a worse case scenario, these can lead to electrical short-circuits.

### Our Expertise

An essential aspect that needs to be observed when converting to lead-free, is the question of whisker safety from the block tin surfaces, or rather from lead-free coating with a high block tin content. It has been made known from numerous test results published in technical literature, that a Nickel underlayer can be used as an effective measure in the minimisation of the risk of whiskers. Amphenol can confirm this, as we have over 25 years of experience with block tin coated connectors.

### Global Partnership

Amphenol, in collaboration with three other large name connector manufacturers ( Tyco Electronics, Molex and FCI ), has decided on block tin for the surfacing of choice for connectors.

### Our testing for whisker safety

Therefore a currently running and still Sn90Pb10 containing connector was chosen by switching over to pure tin matte terminal finish over a nickel underlayer. To request of adding compression stress to the deposit has been satisfied by the 180° bending of the solder terminals. Additionally, test samples have been subjected to 500 thermal shock cycles as follows:

|                    |                |
|--------------------|----------------|
| Temperature range: | -55°C to 100°C |
| Dwell time:        | 30 minutes     |
| Time for transfer: | ≤ 20 seconds   |

Afterwards, the test samples were exposed to heat / humidity (52°C ± 5°C and 90% ± 5% RH) over 6 months in parallel with samples stored over 6 month under ambient conditions (without thermal shock preconditioning).

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## Evaluation

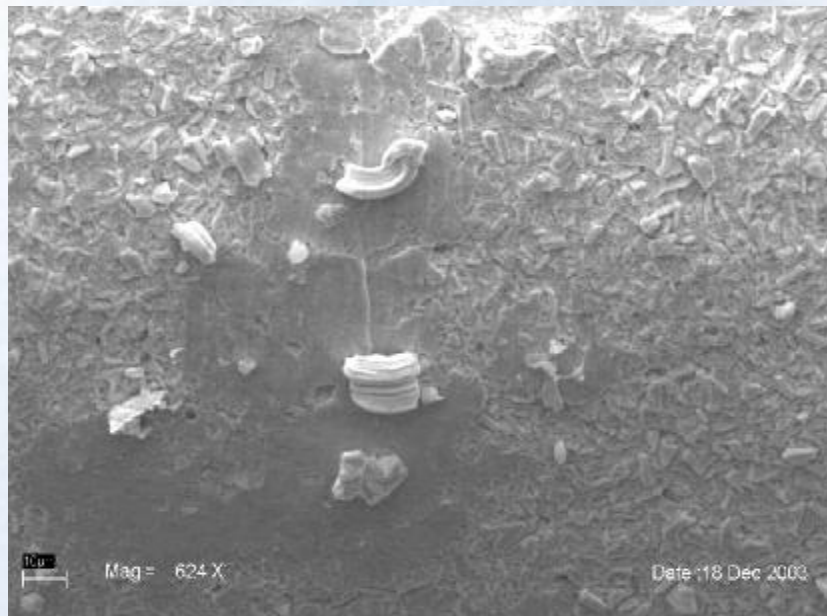
The final inspection has been done by means of scanning electron microscopy (SEM) and completed by EDX analysis.

## Results of the investigation

There was no evidence of needle like whiskers to be stated on any of the tested samples. As it can be seen on the attached photo, some curved eruptions are located especially in the bended area of the tested contacts. Since their length is going from 10 – 20µm, there is no risk of shorts or any other functional impact to be expected.

The EDX analysis shows an 100% tin content of the eruptions

Whisker acceptance criteria for the tested pure tin plating with nickel underlayer are fulfilled



QS-Labor

For further questions on this topic, please contact our Customer Services department:  
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20.07.2004