RoHS COMPLIANT ~ ISO 9001 CERTIFIED

KEYSTONE ELECTRONICS CORP.

Technical Bulletin

Solderability testing and successful assembly of Nicolloy™ plated battery terminals.

“Keystone battery holders will solder under a variety of peak temperatures and time above 235C. Unlike temperature sensitive active components, our battery terminals are not sensitive to variation in profiles provided they do not exceed the maximum conditions as defined in the J-STD-020 document’s profiles”.

Introduction:

With the introduction of RoHS requirements, it has become necessary to implement plating strategies that have a narrower process window or present reliability challenges or even assembly challenges compared to the traditional SnPb plating used for many decades.

Nicolloy is an alloy of Tin (65%) and Nickel (35%) that is plated in one process step depositing a uniform coating and is plated to the same nominal thickness as similar plating used for battery terminals and is applied over a copper strike.

Solderability Testing:

Testing of devices such as Keystone Battery Terminals falls under the requirements of the ANSI-J-STD-002 document – Solderability Tests for Component Leads, Terminations, Lugs, Terminals and Wires.

This document details specifically the type of flux to be used as a function of the solder alloy
ANSI-J-STD-002 Test Flux #1 (0.2% activation level) for SnPb alloy @ 245ºC
ANSI-J-STD-002 Test Flux #2 (0.5% activation level) for SAC 305 alloy @ 255ºC

The choice of the specified fluxes was to ensure that NO False Positives would result from solderability testing where the part “passed” the test but failed to solder during assembly.

As such the activation levels of these fluxes as defined by the ANSI J-STD-004 are very low and the activator used, Diethylammonium Hydrochloride, is considered a weak non active component typically not found in assembly flux constituents.

It should be noted that the two above specified fluxes are classified as ROL1 fluxes per the ANSI JSTD-004

Testing of Nicolloy to the parameters detailed in the ANSI-JSTD-002 document using the specified protocols results in a non wetting of the device termination by the solder and would thus be considered a failure, regardless of the alloy chosen; SnPb or SAC305 Pb-free.

However taking the same part from the same production batch and assembling the device using a solder paste reflow method reveals excellent wetting by the assembly solder with a well defined intermetallic compound visible by cross section.

This technical bulletin is intended to reconcile this significant difference and to reassure the end user that the product supplied to them by Keystone will solder in their assembly process and have a useable shelf life.

If validation solderability testing is to be used prior to lot acceptance then the following protocols should be followed:

For Dip and Look testing;

1) Obtain the flux extract from the solder paste currently being used for reflow assembly; these are readily available from the solder paste manufacturer, supplied in jars or syringes.

2) Apply some flux to the device terminals using a Q-tip, ensure that the terminal is coated with flux but not “over coated”.

3) Follow the protocol of the ANSI J-STD 002 for the alloy of choice, temperature and dwell time and immerse per the instructions.

4) Evaluate the part post testing and cleaning

For assembly simulation:

1) Stencil solder paste onto the substrate – could be a non wettable substrate such as ceramic or the PWB to which the part will ultimately be soldered to.

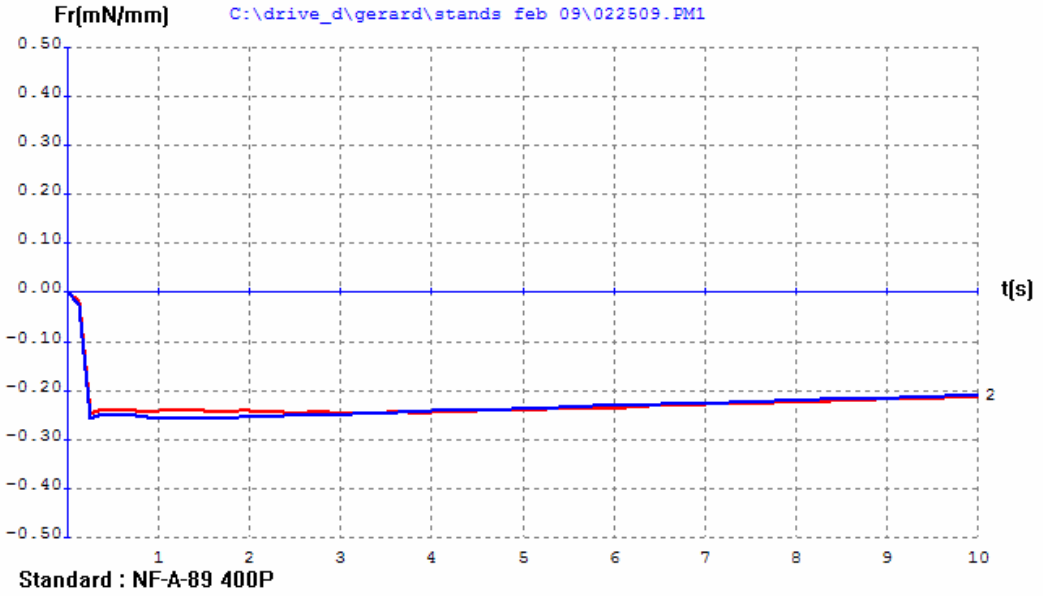
2) Place the device(s) into the paste.

3) Reflow the parts per the recommended profile of the paste manufacturer.

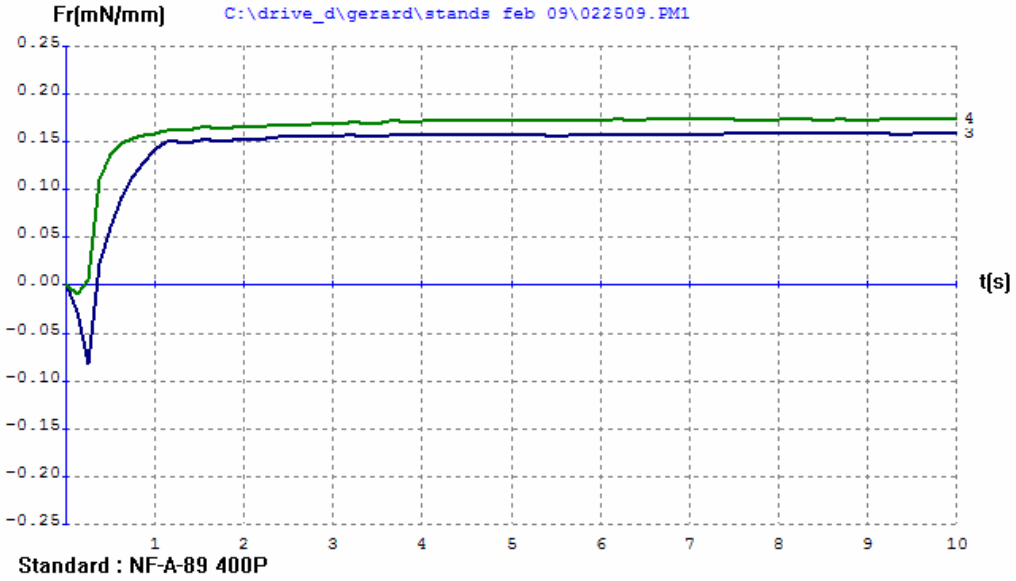
4) Clean and inspect per the standard’s requirements.

Extensive testing with multiple solder paste fluxes supplied by Industry have revealed this plating to be solderable and robust.

Pb-Free testing using SAC305 Alloy at 255°C

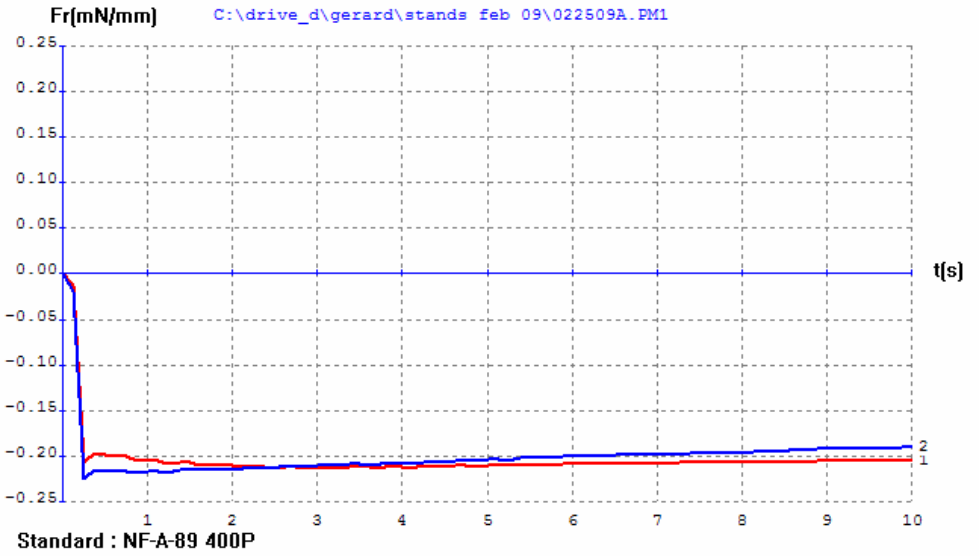


Wetting balance test results for Nicolloy™ tested as received using the Standard 0.5% test flux (ROL1) per the ANSI J-STD 002 - the part does not produce sufficient forces to cross the buoyancy line and produce positive wetting. Visual inspection of the parts post testing show non wetting to the surface of the terminals

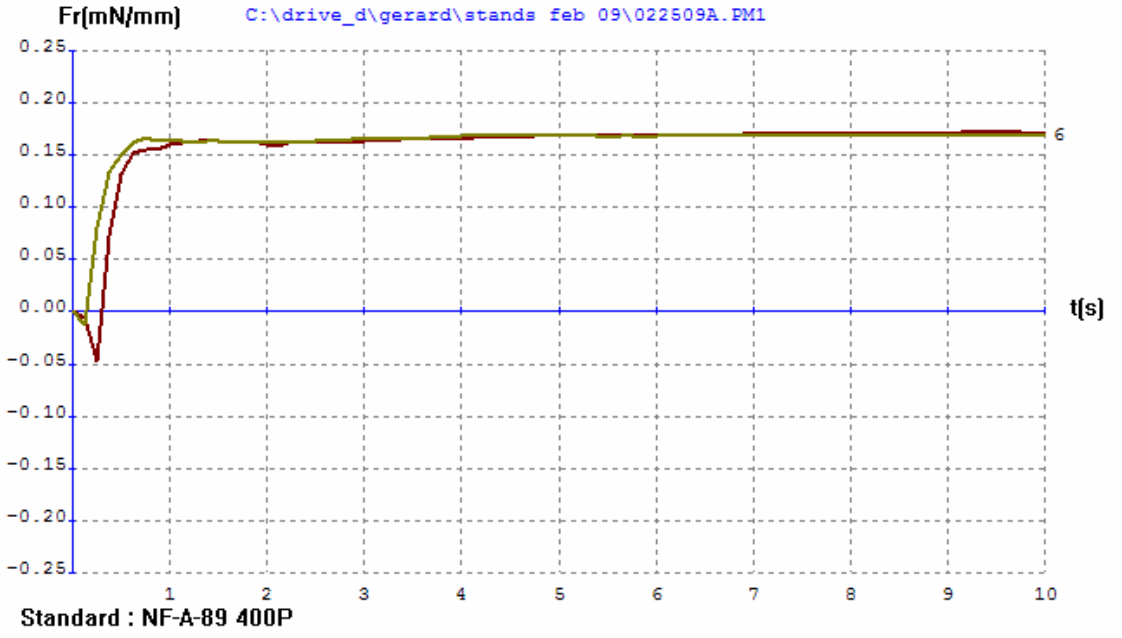


Wetting balance test results for Nicolloy™ tested as received using an ROL1 flux from a popular solder paste.
The improvement in wetting is dramatic with good wetting forces, quick wetting times and post test visual examination of the devices showing excellent uniform coating of the terminals by the solder.

Testing using Eutectic SnPb Alloy at 245°C



Wetting balance test results for Nicolloy™ tested as received using the Standard 0.2% test flux (ROL1) per the ANSI J-STD-002 - the part does not produce sufficient forces to cross the buoyancy line and produce positive wetting. Visual inspection of the parts post testing show non wetting to the surface of the terminals in the majority



Wetting balance test results for Nicolloy™ tested as received using an ROL1 flux from a popular solder paste – The improvement in wetting is dramatic with good wetting forces, quick wetting times and post test visual examination of the devices showing excellent uniform coating of the terminals by the solder.