AMTECH Inc. **DATA-SHEET Advanced Products**
LICO Electronics GmbH www.lico.at, www.lico.hu www.loettechnik.com, email h.miksch@lico.at

SynTECH – LF

Synthetic Poly-Adduct No-Clean Solder Cream

Sn96.5/Ag3.0/Cu0.5

The Amtech *SynTECH -LF* series solder cream is a synthetic poly-adduct designed to exceed requirements for reliable solder joints in SMT PC board assemblies. This cream was formulated to replace traditional rosin/resin based no clean formulations with more reliable synthetic materials. This formula is designed to have a wider process window and better compatibility with OSP's than previous no-clean formulations. *SynTECH-LF* has been formulated to work with all no lead formulations, including the tin/silver/copper alloys without compromising SIR values. In addition, the *SynTECH-LF* series does not require refrigeration if left at room temperature for 6 months and has a 12-18 month refrigerated shelf life. This formulation exhibits long print life and tack time in various environmental conditions.

1.0 Scope:

This specification covers the solder paste *SynTECH -LF*; 89.0% for stencil printing and 86.0% for dispensing in interconnection of surface mount devices.

2.0 Performance and Standard:

Stencil Life: 12-18 hours under proper process parameters

Tack Time: 18-24 hours under proper process parameters

Chatillon Tack Values: .059grams – 6 Hours; .045grams – 8 Hours; .044grams – 24 Hours

Solder Alloy: Sn96.5/Ag3.0/Cu0.5 - 217-219C

Flux Content (wt%): Printing applications 11.0% +/-1%; Dispensing applications 14.0% +/- 1%
Tested according to IPC-TM-650 2.2.20

Viscosity: Printing Applications, T2,T2A,T3 &T4 800Kcps to 900Kcps +/-10%, Dispensing Applications, T2,T2A 375-475Kcps +/-10%; T3 400-500Kcps +/-10%; T4,T5 450-550Kcps +/-10%. Tested according to IPC-TM-650 2.4.34 and 2.4.34.2

Grain Size: -200/+325 (T2) 75-45 microns; -270/+400 (T2A) 53-38 microns; -325/+500 (T3) 45-25 microns; -400/+500 (T4) 38-25 microns; -500/+635 (T5) 25-20 microns. Tested according to IPC-TM-650 2.2.14 and 2.2.14.2

Particle Sphericity: 99.5% of the powder spheres exceed 85% roundness factor

Chlorine Content in Flux (%): Pass – IPC-TM-650 2.3.33, less than 2.5$\mu g/in^2$ via Ion Chromatography

Flux Classification/Copper Mirror: RELO as classified by IPC-TM-650 2.3.32

Insulation Resistance: Greater than $1.8x10^{11}$ after humidity exposure. Tested according to IPC-TM-650 2.6.3.3

3.0 Test Result Report:

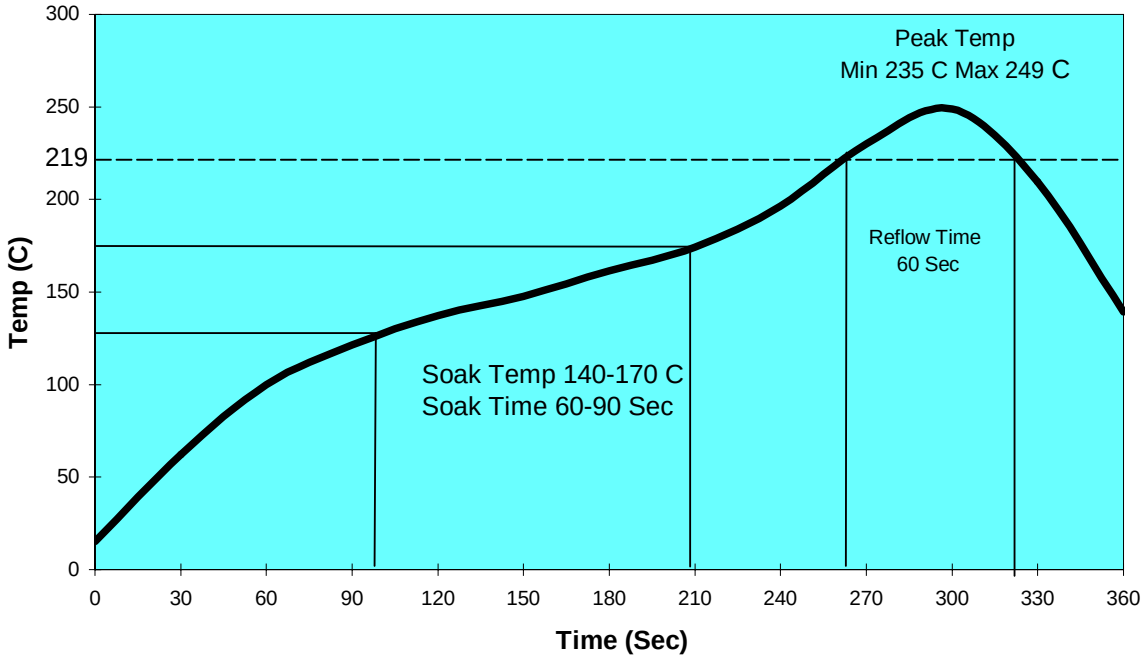
Report contains metal percentage, viscosity, wetting and solder ball tests. A detailed chemical analysis of the alloy is also available.

4.0 Packaging

SynTECH is available in 35 or 100 gram syringes; 250,500 &600 gram jars; 700 & 200 gram cartridges; and 750 gram DEK Pro-Flow cassettes.

5.0 Guarantee Period

Amtech certifies that when stored properly the material will meet all specifications for 12 months from the date of manufacture. For FreshMix, it will last for 18 months from the packaging date. Proper storage: Premix 38-44F for 12-18 month shelf life; 65-72F for 6-month shelf life. Allow material to warm up to ambient temperature before opening. (Do not attempt to accelerate the warming process) Freshmix, do not store above 75F.



NOTE: Ovens larger than 5 zones may require increasing the belt speed. SynTECH can generally increase throughput by as much as 1/3.

The ultimate goal of the reflow process is to achieve high quality solder joints on all of the component leads of a particular assembly, and to do this consistently. The process involves heating the leads, pads, and cream above the melting point of the alloy so that the solder on the leads, pads, and in the cream reflows into a homogenous fillet. Consistency in the process depends on the ability to control the application of heat and the variation of heat both across the board and from board to board. This controlled heating is called the PROFILE. The typical profile includes the following zones: preheat, drying or soak and reflow or spike zone. The goal of the preheat zone is to bring the assembly up to temperature uniformly, generally at a rate of 2^{O}C /second or less. This will minimize the potential for thermal shock on the components due to varying heat capacities. The preheat zone also begins the driving off of some of the solvents added to the cream for printing and releasing. The second zone continues the drying out of solvents to prevent out gassing and possible spattering of the cream. This zone, sometimes called the soak zone, is also where the flux begins to remove the oxides from the surfaces of the leads, pads, and the powder itself. The resins and or higher boiling solvents remain as a cover to prevent the re-oxidation that would readily occur at the elevated temperatures. In the reflow, or spike zone the temperature is quickly raised 20-40^{O}C above the melting point of the alloy. It is here that the solder wets the surfaces, and forms the intermetallic bonds. The intermetallics of 63/37 and other high tin alloys with copper are Cu_3Sn on the copper side, and a relatively irregular and rough Cu_6Sn_5 on the solder side. The period of time above reflow is called the dwell time, typically 30- 60 seconds. The dwell should be long enough to allow for all of the joints to reach temperature and form the bonds. Too long of a dwell time can lead to excessive intermetallic formation. Both of the intermetallics are brittle and if they make up a large portion of the fillet can lead to premature failure of the joint.

The Recommended profile is not a line but a zone or band. The upper and lower temperatures that will still give satisfactory results for the particular cream define the width of this band. This band is also referred to as part of the process window, the larger the band the larger, or more forgiving, the window.

It would be very easy to profile an oven if you only had to reflow one component type on a uniform board. In the real world, almost every assembly has variation across the board due to different components, and/or component densities. Variations in the board itself can lead to large differences in thermal mass. If you were able to plot the profile of each joint, you would get a band corresponding to the variation across the board. A proper profile will have the board's variation band completely inside the process window. Besides variation across the board, you can also have variation across the oven. The heat sinking of the conveyer system sometimes causes this, or airflow variations near the sides, or non-uniformity across the heating element. Another source of variation is from the ability of an oven to hold temperature and recover after a board passes through. This is called the load factor of the oven. This will very from oven to oven, but a starting point would be between one half and one board length between boards.

The actual method of heating is not as important as the ability to control the heating in a repeatable manner.The information contained herein is based on technical data that we believe to be reliable and is intended for use by persons having TECHNICAL SKILL, at their own risk. Users of our products should make their own tests to determine the suitability of each product for their own particular process. AMTECH will assume no liability for results obtained or damages incurred through the application of the data presented.