



Product LF310

June 2003

LEAD FREE SOLDER PASTE

Multicore LF310 medium has been formulated for use with lead-free solders as a no clean solder paste for printing and reflow in air. LF310 lead-free solder paste offers excellent open time, and good soldering activity over a wide range of reflow profiles and surface finishes.

- **Specially formulated for lead-free alloys**
- **Effective over a wide range of printer cycle times and print speeds**
- **Long component tack time**
- **Resists solder balling**
- **Excellent slump resistance**
- **Compatible with a wide range of solderable surfaces**
- **Excellent reflow characteristics, effective over a wide range of reflow profiles in air or nitrogen**
- **Produces safe residues – eliminates the need for cleaning**
- **Low colour paste reflow residues for easy visual inspection**

PRODUCT RANGE

STENCIL PRINTING SOLDER PASTES		
Alloy Code	97SC 96SC	97SC
Powder Particle Distribution		
• Multicore code	AGS	DAP
• ANSI/J-STD-005 code	Type-3	Type 4
• Normal size range, μm	45-20	20-38
Metal content %	88.0	88.5
Viscosity, cP	640,000	680,000

RECOMMENDED OPERATING CONDITIONS

Application: Multicore LF310 lead-free solder paste is designed for high volume stencil printing applications with component lead pitches down to 0.4mm with the AGS [Type 3] powder size. Finer pitches may require the DAP powder type.

Conventional metal blade squeegees may be used with a contact angle of 60° and sweep speeds of 25mm s^{-1} up to 100mm s^{-1} . The best printing performance will be obtained under these conditions.

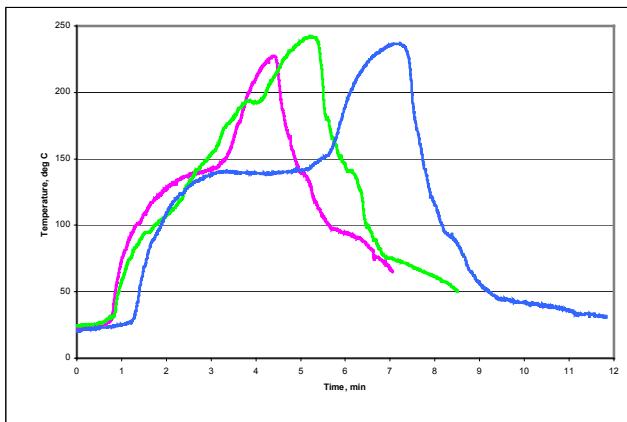
There are various methods for testing the ability of a paste to perform after an extended idle time on the stencil and each can produce different times before printing deteriorates. In a laboratory environment, LF310 paste has been left idle for 90 minutes and still gave a perfect first print for 0.4mm pitch pads at 100mm s^{-1} squeegee speed.

Relatively low printing pressures can be used with LF310 solder paste which means it is particularly well suited for double side printing processes where supporting the board on the populated side may be difficult.

Misprinted boards and stencils may be cleaned with normal proprietary cleaning solvents, including Multicore Prozone SC-01 solvent cleaner.

Reflow Profile: LF310 solder paste has been formulated for lead-free reflow in air over a wide range of temperature profiles. A minimum peak temperature of 230-235°C is required. The diagram below shows a number of reflow profiles that have been successfully used in air with LF310 solder paste made with 96SC/97SC alloy.

The LF310 solder paste is particularly well suited to withstand harsh reflow conditions. Nitrogen inerting the process increases this capability even further.



NOTE: If boards and/or component leads carrying tin/lead finishes are reflowed with this lead-free solder paste, reflow profiles with lower peak temperatures may possibly be used. The resulting joints will have the same solidification temperature and similar reliability performance as the Sn62 alloy. This combination of materials is perfectly acceptable but of course does not yield a lead-free assembly.

Due to the higher melting point of the 96SC alloy relative to Sn62/63, lead free reflow places increased demands on paste thermal stability during the reflow process. High air flow rates, intended to give as even a temperature distribution as possible across the board, may contribute to exhaustion of paste activity before reflow. LF310 has been formulated to combine excellent printing characteristic with tolerance of hot profiles and high air flow rates.

As with all solder pastes, reflow may be carried out in nitrogen if this is installed and this is likely to reduce the effects of long hot profiles and high gas circulation rates.

Soldering: The flux in LF310 is formulated to give excellent wetting on all common board and component lead finishes, including OSP copper that may have been passed through multiple reflow processes in air.

The surface tension of molten lead-free solder alloys is significantly higher than the surface tension for tin/lead alloys and this can reduce the spread of solder during reflow. In some circumstances, this may restrict the areas wetted only to where the paste was printed and the extremities of copper pads may be visible after reflow. This is a cosmetic effect only and may require review of the visual inspection standards used by operators.

If lead-free solder paste is reflowed onto tin/lead board or component lead finishes, the resulting joints may be slightly dull due to the melting range of the alloy. Joints produced from a lead-free alloy solder onto lead-free finishes tend to have a slightly frosted appearance. Also, a lead free solder paste has a very low tendency to produce solder balls during reflow and the presence of microballs on a finished assembly is a strong indication of a process related problem.

Residues: The residues from LF310 solder paste are intended to be left on completed assemblies without cleaning. However if cleaning is required, good results are likely to be achieved with popular cleaning materials and effective process equipment. It is always advisable to evaluate the compatibility of cleaning material and cleaning process.

GENERAL PROPERTIES

Solder Powder: The 97SC [SnAg3Cu0.5] and 96SC [SnAg3.8Cu0.7] solder powders for Multicore LF310 solder paste are produced by atomising alloys conforming to the purity requirements of related alloys in J-STD-006 and EN29453.

Solder Paste Medium : Multicore LF310 contains a stable resin system and includes solvents with high boiling ranges. The flux has been formulated to meet the requirements of the IPC type L and Bellcore specification.

Test	Specification	Results
Copper Mirror Corrosion	IPC-SF-818 J-STD-004	Pass Pass
Chromate Paper Test	IPC-SF-818 J-STD-004	Pass Pass
Surface Insulation Resistance (without cleaning)	IPC-SF-819 J-STD-004 Bellcore GR-78-CORE JIS-Z-3197	Pass
Electromigration	Bellcore GR-78-CORE	Pass

Solder Paste: The properties of a solder paste depend on the metal content, the solder alloy and the solder powder particle size range. In general terms increasing metal content reduces the tendency to slump, and reduces the tack life of the solder paste, while the solder balling performances improves.

Typical properties of selected LF310 solder paste are as follows: Full details of test methods are available on request.

STENCIL PRINTING SOLDER PASTES		
Product Category	Lead-free alloy	
Alloy Code	97SC 96SC	97SC
Particle Size Distribution Multicore Code ANSI/J-STD-006 Normal Size Range, μm	AGS Type 3 45-20	DAP Type 4 38-20
Metal Content, wt%	88	88.5
Viscosity Brookfield, cP ⁽¹⁾	640,000	680,000
Slump ⁽²⁾ , IIW Test Method 1 hour @ room temperature • 0.7 mm pads • 1.5 mm pads	0.2 0.2	0.2 0.2
20 minutes @ 80°C • 0.7 mm pads • 1.5mm pads	0.2 0.2	0.2 0.2
Hot Slump, mm • 45° @ 100°C after 1 min	1.0	0.00
Tack ⁽³⁾ • Initial tack force, g mm^2 • Useful open time, h	1.40 >24	1.54 >24

¹⁾ Measured at 25°C, TF spindle at 5rpm after 2 minutes

²⁾ The slump data are expressed as minimum spacing between pads of size shown that does not allow bridging.

³⁾ Tack data are derived from laboratory tests, and do not necessarily relate to particular user conditions.

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THE TECHNICAL INFORMATION CONTAINED HEREIN IS INTENDED AS REFERENCE ONLY. PLEASE CONTACT LOCTITE CORPORATION QUALITY DEPARTMENT FOR ASSISTANCE AND RECOMMENDATIONS ON SPECIFICATIONS FOR THIS PRODUCT.

PACKAGING

Containers: Multicore LF310 solder pastes are supplied in:

- 1kg, 500g or 250g plastic jars with an air seal insert.

Other forms of packaging are available on request.

Shelf Life: Providing Multicore LF310 solder pastes are stored at 5-10°C tightly sealed in the original container, a minimum shelf life of 6 months can be expected for 96SC/97SC LF310 AGS88 paste and 3 months for 97SC LF310 DAP88.5 paste. Air shipment is recommended to minimise the time the containers are exposed to higher temperatures.

Multicore LF310 solder pastes have been formulated to reduce separation on storage to a minimum but should it occur, gentle stirring for 15 seconds will return the products to their correct rheological performance.

HEALTH AND SAFETY

Warning

The following information is for guidance only and users should refer to the Health and Safety information relevant to specific Multicore LF310 solder pastes products before use.

Fumes, Vapours and Precautions: The flux fumes given off at soldering temperatures are irritating to the nose, throat and respiratory organs. Prolonged or repeated exposure to the fumes may cause sensitisation.

These materials should always be used in a well ventilated area and suitable fume extraction equipment should be used to extract flux fumes away from the operators.

Protection and Hygiene: Suitable protective clothing should be worn to prevent materials from coming into contact with the skin and eyes. If the materials come into contact with the skin, the affected area should be cleaned with a proprietary hand cleanser followed by washing with soap and water. If the materials come in contact with the eyes, they should be irrigated thoroughly with running water for at least 10 minutes and medical attention sought.

Eating, drinking and smoking should not be permitted in the working area and hands should be washed thoroughly with soap and warm water before eating.

Fire Hazards and Precautions: The flashpoint of the solvents used in these materials is high but it is combustible. Carbon dioxide, foam, or dry powder extinguishers are suitable. High temperatures may produce heavy metal dust, fumes and/or vapours. Do not use water where molten metal is present.

Spillage and Waste Disposal: Spills of materials should be scraped up and the contaminated area washed with water. Waste materials should be stored in closed containers and disposed of in accordance with the relevant local and national regulations.

Note: The data contained herein are furnished for information only and are believed to be reliable. We cannot assume responsibility for the results obtained by others over whose methods we have no control. It is the user's responsibility to determine suitably for the user's purpose of any production of property and of persons against any hazards that may be involved in the handling and use thereof. In light of the foregoing, **Henkel specifically disclaims all warranties of merchantability or fitness for a particular purpose, arising from sale or use of Henkel's products. Henkel specifically disclaims any liability for consequential or incidental damages of any kind, including lost profits.** The discussion herein of various processes or compositions is not to be interpreted as representation that they are free from domination of patents owned by others or as a license under any Loctite Corporation patents that may cover such processes or compositions. We recommend that each prospective user test his proposed application before repetitive use, using this data as a guide. This product may be covered by one or more United States or foreign patents or patent applications.



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