

# NP510-LT HRL1 Solder Paste

Lead-Free, No-Clean, Low Temperature Application Paste

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## Product Description

Kester NP510-LT HRL1 is a no-clean, lead-free, zero-halogen solder paste for assemblies that have temperature sensitive substrates and components. The need for reduction of warpage induced defects is becoming more evident as complexity of product designs become more complex and packages become thinner. NP510-LT HRL1 addresses these technology needs by enabling lower temperature reflow and enhancing mechanical reliability. All components used with NP510-LT HRL1 must be lead-free to eliminate the formation of tin/lead/bismuth intermetallic which has a melting point under 100 °C.

### Performance Characteristics:

- Classified ROL0 per IPC J-STD-004B
- Zero-Halogen (none intentionally added)
- Lower reflow peak temperature (180 to 190 °C) compared to traditional lead-free alloys
- Reduction in board-to-package warpage
- Wide reflow profile window with good solderability on various PCB surface finish
- Excellent printability above 0.60 area ratio
- Colorless residues for easy post-reflow inspection
- Low voiding in various packages - BGA, MLG, DPAK, LGA

## RoHS Compliance

This product meets the requirements of the Restriction of Hazardous Substances (RoHS) Directive. Additional RoHS information is located at <https://www.kester.com/downloads/environmental>.

## Physical Properties

(Typical Values for HRL1, T4)

**Viscosity (typical):** 1900 poise  
Malcom Viscometer @ 10 rpm and 25 °C

**Initial Tackiness (typical):** 136 grams (GF)  
Tested to J-STD-005, IPC-TM-650, Method 2.4.44

**Cold Slump Test:** Pass  
Tested to J-STD-005, IPC-TM-650, Method 2.4.35

**Hot Slump Test:** Pass  
Tested to J-STD-005, IPC-TM-650, Method 2.4.35

**Solder Ball Test:** Pass

Tested to J-STD-005, IPC-TM-650, Method 2.4.43

**Wetting:** Pass

Tested to J-STD-005, IPC-TM-650, Method 2.4.45



## Reliability Properties

**Copper Mirror:** Low

Tested to J-STD-004B, IPC-TM-650, Method 2.3.32

**Copper Corrosion:** Low

Tested to J-STD-004B, IPC-TM-650, Method 2.6.15

**Halogen Content:** None Detected

Tested to J-STD-004B, IPC-TM-650, Method 2.3.81

**Electrochemical Migration (ECM):** Pass

Tested to J-STD-004B, IPC-TM-650, Method 2.6.14.1

Test Conditions: 65 °C, 85% RH, 25 days, 100V

**Surface Insulation Resistivity (SIR):** Pass

Tested to J-STD-004B, IPC-TM-650, Method 2.6.3.7

Test Conditions: 40 °C, 90% RH, 7 days, 12.5V

# Application Notes

## Availability

NP510-LT HRL1 is available in type 4 powder (20 to 38  $\mu\text{m}$ ). Type 4 is recommended for standard applications. NP510-LT HRL1 standard packaging comes in 500 gm jars. The appropriate combination depends on the process variables and the specific application. If other packaging configuration is needed, please contact your Kester representative for additional information.

## Process Considerations / Recommendations

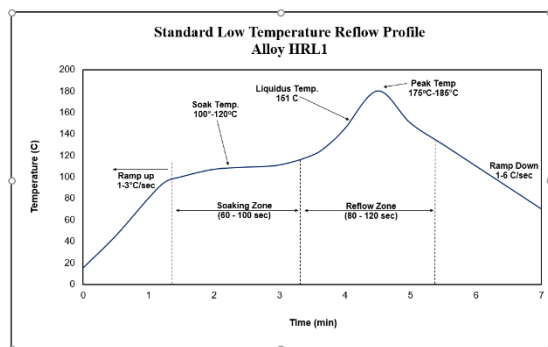
Below information are process guidelines, and it is advisable to note that the optimum setting for a given assembly may vary and this is dependent on the circuit board design, board thickness, components used and equipment used. A design of experiments is recommended to be done to optimize the soldering process.

Printing Process Parameters	Recommendations
Speed	100 to 120 mm/sec (4 to 4.7 in/sec)
Pressure <sup>1</sup>	1.8 Kg/50 mm (target 2 lb/in)
Separation Speed	Target 8 to 12 mm/sec
Stencil Life	8 hours at 23 °C (74 °F) / 50% RH
Lift Height	8 to 12 mm (0.31 in to 0.47 in)

<sup>1</sup> Pressure should be increased with increasing print speed. First set the print speed. Then set the pressure to the minimum required to clean the solder paste off of the stencil.

For mixed solder joint with SAC ball BGAs, use 0.4 to 0.6 paste to sphere volume ratio. In addition, incoming solderability inspection of circuit boards and components is recommended as part of process control to maintain consistent soldering performance and electrical reliability.

## Recommended Reflow Profile for Homogeneous Solder Joints

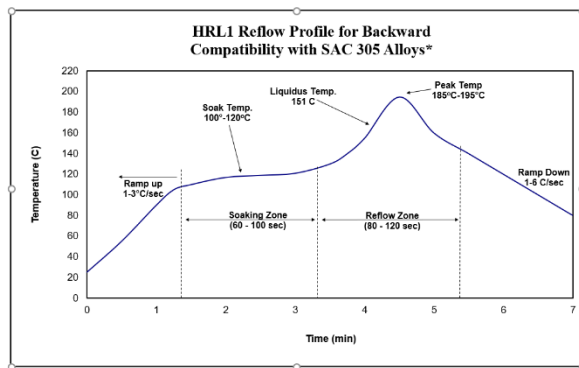


The general recommended convection reflow profile for the NP510-LT HRL1 is shown here as a starting point. Your final profile will depend on your board mass and component combination. NP510-LT HRL1 has excellent solderability and wetting capabilities in air or nitrogen reflow atmospheres reflow equipment. Your optimal profile may be different from the basic graph. Please contact Kester Technical Support if you need profiling advice.

Reflow Process Parameter	Recommendations
Ramp Rate	1 to 3 °C/sec
Soak Temperature	100 to 120 °C
Soak Time	60 to 100 sec
Peak Temperature	175 to 185 °C
Time Above Liquidus	80 to 120 sec
Cooling Rate	1 to 6 °C/sec



## Reflow Profile for Hybrid Solder Joints with Sn/Ag/Cu Alloy\*



The general recommended convection reflow profile for the NP510-LT HRL1 is shown here as a starting point. Your final profile will depend on your board mass and component combination. NP510-LT HRL1 has excellent solderability and wetting capabilities in air or nitrogen reflow atmospheres reflow equipment. Your optimal profile may be different from the basic graph. Please contact Kester Technical Support if you need profiling advice.

Reflow Process Parameter	Recommendations
Ramp Rate	1 to 3 °C/sec
Soak Temperature	100 to 120 °C
Soak Time	60 to 100 sec
Peak Temperature	185 to 195 °C
Time Above Liquidus	80 to 120 sec
Cooling Rate	1 to 6 °C/sec

\*This profile is simply a guideline.

For a reliable solder joint, diffusion of the HRL1 alloy in the SAC sphere must occur. Complete sphere collapse is not expected in HRL1 hybrid solder joint. The mixing level between the HRL1 and SAC305 alloy is a function of reflow peak temperature, time above liquidus, component size and sphere alloy. Your optimal reflow profile may be different from the one shown based on your oven, component sphere size, sphere alloy and printed solder paste volume.



## Cleaning

NP510-LT HRL1 residues are non-conductive, non-corrosive, and do not require removal. If it is desired to remove the residues, commercially available residue cleaner may be used. Contact Kester Technical Support for additional assistance.

# Application Notes

## Storage, Handling and Shelf Life

Refrigeration (0 to 10 °C/32 to 50 °F) is the recommended storage condition for solder paste to maintain consistent viscosity, re-flow characteristics and overall performance. Shelf life is 6 months from date of manufacture when refrigerated. NP510-LT HRL1 should be stabilized at room temperature prior to printing. Please contact Kester Technical Support if you require additional advice with regards to handling and storage of this material.

## Health and Safety

This product, during handling or use, may be hazardous to your health or the environment. Read the Safety Data Sheet and warning label before using this product. Safety Data Sheets are available at <https://www.kester.com/downloads/sds>.

## Contact Information

To confirm this document is the most recent version, please contact [Assembly@MacDermidAlpha.com](mailto:Assembly@MacDermidAlpha.com)

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Also read carefully warning and safety information on the Safety Data Sheet. This data sheet contains technical information required for safe and economical operation of this product. READ IT THOROUGHLY PRIOR TO PRODUCT USE. Emergency safety directory assistance: US 1 202 464 2554, Europe + 44 1235 239 670, Asia + 65 3158 1074, Brazil 0800 707 7022 and 0800 172 020, Mexico 01800 002 1400 and (55) 5559 1588

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