Lead Free No Clean Solder Paste 4900P Technical Data Sheet

Description

MG Chemicals has developed a unique flux system designed specifically for high temperature lead free alloys. It provides the fluxing activity levels that promote thermal stability and prevents thermal degradation when reflowing under air atmosphere (normal). Since use of nitrogen is not required, MG 4900P Lead Free Solder paste will provide excellent cost savings.

In addition, MG 4900P Lead Free solder paste exhibits superior joint strength, excellent wettability, and extraordinary print definition and tack life. The post soldering residues of MG 4900P are non-conductive, non-corrosive and highly insulated.

Benefits

- Low residues
- Easily dispensed
- Long tack-time
- Excellent wettability
- Hard non-conductive residues

Solder Composition of MG 4900P No Clean Solder Paste

MG Chemicals Sn/Ag/Cu (Tin/Silver/Cu) Alloys are designed as a lead-free alternative for Sn/Pb alloys for electronics assembly operations. The MG Chemicals Sn/Ag/Cu alloys conform and exceed the impurity requirements of J-Std-006 and all other relevant international standards.

Typical Analysis

	Sn	Ag	Cu	Pb	Sb	Bi	In	As	Fe	Ni	Cd	Al	Zn	Au
LF955-38	Bal	3.6-4.0	0.5-0.9	0.050 Max	0.050 Max	0.050 Max	0.050 Max	0.010 Max	0.010 Max	0.005 Max	0.001 Max	0.001 Max	0.001 Max	0.002 Max
LF958-35	Bal	3.3-3.7	0.5-0.9	0.050 Max	0.050 Max	0.050 Max	0.050 Max	0.010 Max	0.010 Max	0.005 Max	0.001 Max	0.001 Max	0.001 Max	0.002 Max
LF965-30	Bal	2.8-3.2	0.3-0.7	0.050 Max	0.050 Max	0.050 Max	0.050 Max	0.010 Max	0.010 Max	0.005 Max	0.001 Max	0.001 Max	0.001 Max	0.002 Max
LF217	Bal	3.8-4.2	0.3-0.7	0.050 Max	0.050 Max	0.050 Max	0.050 Max	0.010 Max	0.010 Max	0.005 Max	0.001 Max	0.001 Max	0.001 Max	0.002 Max

Particle Size

Sn/Ag/Cu alloys are available in Type 3 and J-STD-005 powder distribution. Solder powder distribution is measured utilizing laser diffraction, optical analysis and sieve analysis. Careful control of solder powder manufacturing processes ensures the particles' shape are 95% spherical minimum (aspect ratio < 1.5) and that the alloy contains a typical maximum oxide level of 80 ppm.

Classification of Solder Powder by Particle Size

Powder Type	Fines		Majority		Coarse	Typical Mesh
	<10%	**>80%**	**>90%**	**<1%**	**0%**	
3	20	25-45		45	50	325/500

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Metal Loading

Typical metal loading for dispensing application is 85-87%. Compared to typical Sn63/Sn62 solder pastes manufactured with 88% by weight metal loading, MG 4900P Lead Free provides as much as 10-12% higher metal volume than Sn63/Sn62. This increased in volume of MG 4900P promotes better wetting and spreading of Sn/Ag/Cu Lead Free alloy.

Properties

MG 4900P	Sn/Ag/CU	SN63/Pb37
Melting Point, °C	217-221	183 E
Hardness, Brinell	15HB	14HB
Coefficient of Thermal Expansion	Pure Sn=23.5	24.7
Tensile Strength, psi	4312	4442
Density, g/cc	7.39	8.42
Electrical Resistivity, (µohm-cm)	13.0	14.5
Electrical Conductivity, %IACS	16.6	11.9
Yield Strength, psi	3724	3950
Total Elongation,%	27	48
Joint Shear Strength, at 0.1mm/min 20°C	27	23
Joint Shear Strength, at 0.1mm/min 100°C	17	14
Creep Strength, N/mm² at 0.1mm/min 20°C	13.0	3.3
Creep Strength, N/mm² at 0.1mm/min 100°C	5	1
Thermal Conductivity, W/m.K	58.7	50.9

	Specification	Test Method
Flux Classification	ROL0	JST0-004
Copper Mirror	No removal of copper film	IPC-TM-650 2.3.32
Silver Chromate	Pass	IPC-TM-650 2.3.33
Corrosion	Pass	IPC-TM-650 2.6.15
SIR		
JST0-004	6.55 x 10_{11} ohms	IPC-TM-650 2.6.3.3
Bellcore (Telecordia)	5.22 x 10_{11} ohms	Bellcore GR-78-CORE 13.1.3
Electromigration	Pass	Bellcore GR-78-CORE 13.1.4
Post Reflow Flux Residue	45%	TGA Analysis
Acid Value	110	IPC-TM-650 2.3.13
Metal Loading	86%	IPC-TM-650 2.2.20
Viscosity		
Brookfield (1), kcps	400+/-10% kcps	IPC-TM-650 2.4.34 modified
Malcom (2), poise	85-125	IPC-TM-650 2.4.34.3 modified
Thixotropic Index	0.50-0.60	
Slump Test		
25 C, 0.63 vertical/horizontal	No bridges all spacings	IPC-TM-650 2.4.35
150 C, 0.63 vertical/horizontal	No bridges all spacings	IPC-TM-650 2.4.35

25 C, 0.33 vertical/horizontal	0.15 /0.15	IPC-TM-650 2.4.35
150 C, 0.33 vertical/horizontal	0.20/0.20	IPC-TM-650 2.4.35
Solder Ball Test	Pass	IPC-TM-650 2.4.43
Tack		
Initial	85 gm	JIS Z 3284
Tack retention @ 24 hr	110 gm	JIS Z 3284
Tack retention @ 72 hr	127 gm	JIS Z 3284

Dispensing

	Needle inner	diameter	Applicable powder
Needle Gauge	in.	µm	(mesh cut)
18	0.033	838	-200+325
20	0.023	584	-325+500
21	0.02	508	-325+500
22	0.016	406	-325+500
23	0.013	330	-325+500
25	0.01	254	-400+635
27	0.008	203	-500

The clearance gap between the needle and the substrate affects the shape and quality of the dot dispensed. If the clearance is too little, the dot tends to be flattened out, and if too large, the dot tends to have long tailing.

Pressure

The pressure applied in the syringe should be kept at a minimum, and the proper head pressure kept in the range of 15-25 lb/in² (1.05-1.76 kg/cm²). In cases where a paste requires much higher pressure (more than 40 lb/in² or 2.82 kg/cm²) to dispense, the paste will become inconsistent and clogging may be expected. The external air pressure supply should be maintained constant.

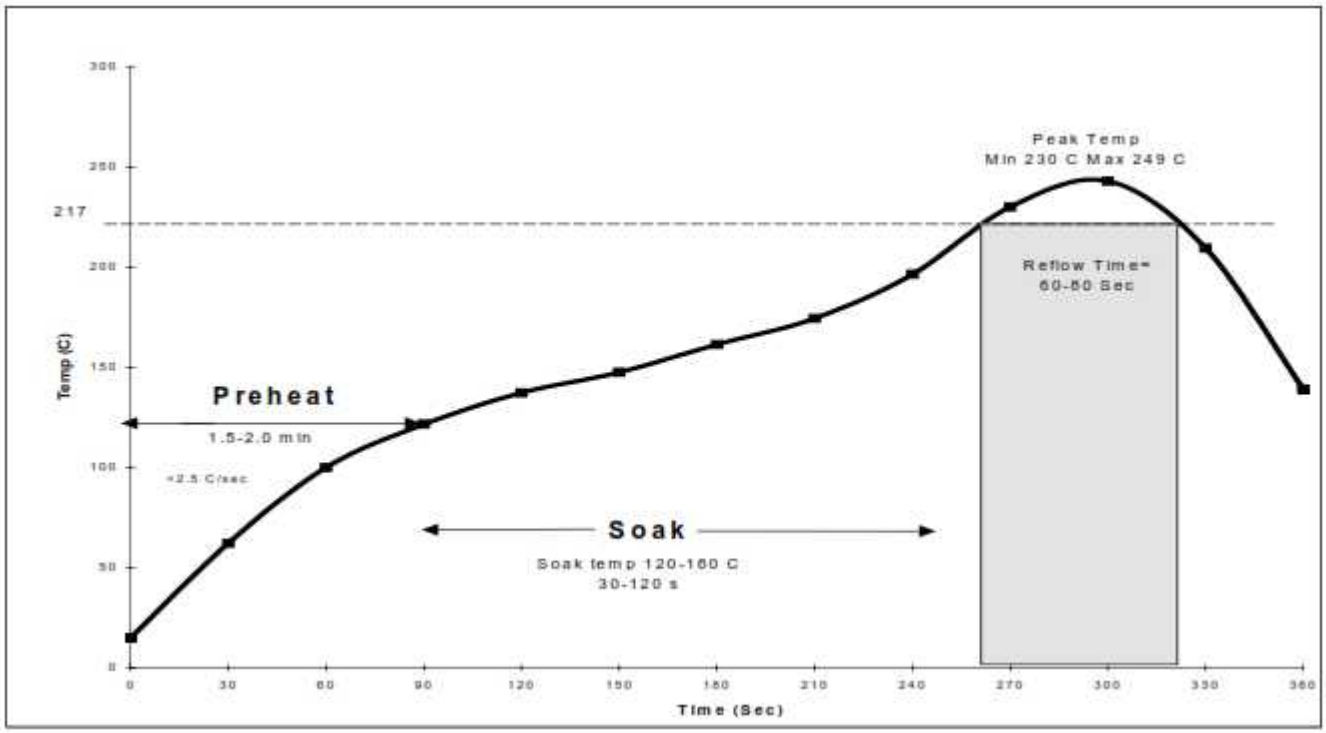
Paste Application

Solder paste should be taken out of the refrigerator at least 3 to 6 hours prior to use. This will give the paste enough time to come to thermal equilibrium with the environment. The flow rate of paste in a dispensing application depends on viscosity, which can be altered by temperature change. If solder paste is purchased in syringes pre-mixing is not necessary due to the shear action produced from the dispensing.

Reflow

Best results have been achieved when MG 4900P is reflowed in a forced air convection oven with a minimum of 8 zones (top & bottom), however reflow is possible with a 4 zone oven (top & bottom).

The following is a recommended profile for a forced air convection reflow process. The melting temperature of the solder, the heat resistance of the components, and the characteristics of the PCB (i.e. density, thickness, etc.) determine the actual reflow profile.



Preheat Zone - The preheat zone, is also referred to as the ramp zone, and is used to elevate the temperature of the PCB to the desired soak temperature. In the preheat zone the temperature of the PCB is constantly rising, at a rate that should not exceed 2.5 C/sec. The oven's preheat zone should normally occupy 25-33% of the total heated tunnel length.

The Soak Zone - normally occupies 33-50% of the total heated tunnel length exposes the PCB to a relatively steady temperature that will allow the components of different mass to be uniform in temperature. The soak zone also allows the flux to concentrate and the volatiles to escape from the paste.

The Reflow Zone - or spike zone is to elevate the temperature of the PCB assembly from the activation temperature to the recommended peak temperature. The activation temperature is always somewhat below the melting point of the alloy, while the peak temperature is always above the melting point.

Cleaning

MG 4900P is a no clean formulation therefore the residues do not need to be removed for typical applications. If residue removal is desired, use MG 8241-T or 8241-W Isopropyl Alcohol Wipes.

Storage and Handling

Store refrigerated between 2-10°C [35-50°F] to minimize solvent evaporation, flux separation, and chemical activity. Storage of syringes is preferred in an upright position with tip down to prevent flux separation and air entrapment. Use at room temperature, warm up can be achieved by removing from refrigerator 3 hours before use, faster warm up can also be achieved by placing in a sealed container in a water bath at near ambient temperature for 30 minutes.

Directions

Unscrew cap from dispensing end and screw on dispensing needle. Remove end cap from plunger and insert plunger or attach to an automatic dispenser. The supplied plunger will be slightly loose to prevent draw back when removing.

Shelf Life

Unopened container (30-50°F/2-10°C) – 6 Months
Unopened container (68-77°F/20-25°C) – 1 Months
Opened container (68-77°F/20-25°C) – 24 Hours

Reusing Solder Paste

This is not normally recommended, because it typically generates more problems than it is worth. If you do decide to reuse solder paste, these pointers may be helpful. This paste should be tightly sealed and refrigerated. Then, the paste may be reused at a later date, provided that the paste has not separated or thickened significantly compared to its original properties. Storage of syringes is preferred in an upright position with tip down to prevent flux separation and air entrapment.

Working Environment

Solder paste performs best when used in a controlled environment. Maintaining ambient temperature of between 68-77°F (20-25 °C) at a relative humidity of 40-65% will ensure consistent performance and maximum life of paste.

Cleaning Misprint Boards

If you should have a misprinted board, the paste may be cleaned off manually with MG 8241 Alcohol Wipes.

Stencil Cleaning

Periodic cleaning of the stencil during production is recommended to prevent any paste from being deposited in unwanted areas of the board. Without stencil cleaning, solder balling will increase. We recommend a periodic dry wipe (every 5 to 10 boards) with an occasional MG 8241-T or 8241-W Alcohol Wipe (every 15 to 25 boards). When running fine pitch boards, the cleaning may need to become more frequent.

Disposal

MG 4900P should be stored in a sealed container and disposed of in accordance with state & local authority requirements.

Technical Support

Contact us regarding any questions, improvement suggestions, or problems with this product. Application notes, instructions, and FAQs are located at www.mgchemicals.com.

Email: support@mgchemicals.com

Phone: 1-800-340-0772 Ext. 30 (Canada, Mexico & USA)
1-905-331-1396 Ext. 30 (International)
Fax: 1-905-331-2862 or 1-800-340-0773

Mailing address:

Manufacturing & Support
1210 Corporate Drive
Burlington, Ontario, Canada
L7L 5R6

Head Office
9347–193rd Street
Surrey, British Columbia, Canada
V4N 4E7

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