MF300 & MF300S Flux

October 2007

VOC-FREE, HIGH ACTIVITY, NO CLEAN, SPECIAL LOW SOLDER-BALLING FORMULA LIQUID FLUXES

Multicore MF300 and MF300S are low residue, resin and halide-free fluxes, which meet the most demanding legislation on volatile organic compound (VOC) emissions.

- **Highly effective on low solderability surfaces, e.g. oxidised copper**
- **Formulated to minimise solder balling**
- **No Clean**
- **<1% VOC - meets US air quality legislation**
- **Non-flammable formulation**
- **MF300 suitable for foam application only**
- **MF300S suitable for wave or spray application**

APPLICATIONS

Multicore MF300 and MF300S are designed mainly for consumer electronics applications using either conventional or nitrogen inerted wave soldering machines. These fluxes perform well, even when used on poorly preserved copper substrate. They have been designed to minimise solder balling between adjacent pads.

RECOMMENDED OPERATING CONDITIONS

The Printed Circuit Board: Multicore MF300 and MF300S have been formulated for high activity on oxidised copper and can be used in conjunction with most commonly used surface preservative materials. It is recommended that process compatibility testing be carried out prior however. Testing during the development of these fluxes confirms good PTH penetration and therefore good topside fillet formation.

Machine Preparation: Ensure the soldering machine is thoroughly cleaned, including all fingers, pallets and conveyors, so that any possible contamination has been removed. Multicore MCF800 Cleaner can be used in the finger cleaners. Multicore MF300 and MF300S are not aggressive towards plastics. However, they may be slightly corrosive towards some metal PCB handling equipment.

Fluxing:. MF300 is suitable for use in foaming & spraying applications; MF300S is optimised for improved spraying performance & is not suitable for use in foam fluxing applications. The upper limit for flux coverage to ensure that soldered PCBs pass cleanliness tests is 40g m^{-2} of circuit. MF300 is formulated to have the same foaming properties as conventional low solids liquid fluxes. As it is water based, the foam is therefore less prone to destabilisation through evaporative loss and contact with hot fixtures or pallets. Also there is no requirement for the air to be dry.

Observing the following instructions will help ensure optimum foaming and soldering results.

1. Keep the flux tank FULL at all times.
2. The top of the foaming stone should be no more than 20mm below the surface of the liquid flux. The level of the stone should be raised if this is not the case.
3. The ideal feed gas flow rate (pressure) is less than that typically used for conventional solvent liquid fluxes and the foam fluxer should taper towards a slot width of 10-20mm
4. DO NOT use fixtures which can entrap the flux. This may lead to random solder balling caused by the sudden volatilisation of the excess flux upon contact with the solder wave.

It is important to remove excess flux from the circuit boards using a standard air knife or brushes on the wave soldering machine. An air pressure of about 5-7psi is recommended and the nozzle should be about 25mm below the board and angled back at a few degrees to the perpendicular to the plane of the board. This will ensure effective removal of excess flux without blowing flux droplets onto the top of the next board. Ensure the air knife is positioned with sufficient space between it and the foam fluxer to prevent any direct or reflected air stream from disturbing the foam.

Flux Control: Being a water-based material, loss of solvent by evaporation is minimal and moisture absorption does not occur. Flux density measurements do not give a reliable guide to flux activity levels, therefore flux concentration control by measurement of acid value is recommended. If thinning is required, the use of deionised water is recommended.

NOTE: MF300 may appear cloudy after being subjected to warm temperatures. MF300S may also exhibit cloudiness but to a lesser extent. **This does not affect the performance of the flux**. Both fluxes should be stored above 10°C, as cold temperatures may cause the solids in the flux to separate from solution. Warming to room temperature and gentle agitation will restore the fluxes to normal.

Preheating: As MF300 and MF300S contain water, it may be necessary to adjust the preheater setting to ensure the water is sufficiently evaporated prior to the PCB entering the solder wave, and to ensure that the flux has reached the required activation temperature (see topside pre-heat table below). The optimum preheat temperature for a PCB depends on its design and the thermal mass of the components used, but the cycle should be sufficient to ensure that the flux coating is not visibly wet when it contacts the wave.

Preheat vs conveyor speed combinations which have given good results are shown below.

CONVEYOR SPEED	ft min^{-1}	4.2	4.9
	m min^{-1}	1.3	1.5
TOPSIDE PREHEAT	°C	110	120
	°F	230	248

Fitting a topside canopy over the preheater/s can help to produce more effective drying and activation. This will allow the use of faster conveyor speeds and improve soldering.

It is recommended to use a temperature profiling system to measure preheat and peak temperatures during set up of the wave soldering machine and for consistent process monitoring.

Wave Soldering: Excess moisture on the PCB during soldering may lead to random solder balling and poor wetting of some solder joints. IT IS IMPORTANT that the flux solvent carrier (water) is fully evaporated and that the PCB appears virtually dry when it reaches the solder wave.

At a speed of 1.5m min^{-1}, a contact length of 38-50mm between the wave and the PCB is recommended. At lower speeds, this contact length should be reduced. Very slow speeds through the solder wave may produce dull solder joints.

It is recommended to use a temperature profiling system to measure preheat and peak temperatures during set up of the wave soldering machine and for consistent process monitoring.

Multicore MF300 and MF300S fluxes can be used with all standard solder alloys. The recommended maximum solder bath temperature is 260°C (500°F). The solder bath temperature can generally be reduced when compared with processes using conventional fluxes. Temperatures as low as 235°C (455°F) may be used in some situations and this results in improved soldering and less wastage through solder bath drossing.

Dwell time on the wave should be 1.5-2.5 seconds.

For a completely no-clean process, use Multicore No Clean Cored Solder Wire and/or No Clean Solder paste. These products also generate low levels of VOC emissions due to their low flux content and heat stable resins. Soldering iron tips should be kept clean with Multicore Tip Tinner/Cleaner TTC1 (data sheet available).

TECHNICAL SPECIFICATION

The following table contains typical product data. A full description of test methods and detailed test results are available on request.

General Properties	MF300	MF300S
J--STD-004 classification	OR M0	
EN 29454 classification	2.1.3	
Colour(1)	Colourless/yellow	
Solids content	4.6%	
Halide content	Zero	
Acid value (on liquid) mg KOH g^{-1}	37	
Specific gravity at 25°C (77°F)	1.011	
Shelf life	12 months	

(1) Some yellowing of the flux may occur during storage or prolonged exposure to light. This does not affect performance

Surface Insulation Resistance

Multicore MF300 and MF300S liquid fluxes PASS the J-STD-004 surface insulation resistance test without cleaning.

Electromigration

Multicore MF300 and MF300S liquid fluxes PASS the Telcordia (formerly known as Bellcore) GR-78 CORE electromigration test without cleaning.

Corrosion

Multicore MF300 and MF300S liquid fluxes PASS the IPC-TM-650 copper mirror test (method 2.3.32) when the solids are reconstituted in 2-propanol, as permitted by table 5 of the J-STD-004 protocol.

GENERAL INFORMATION

For safe handling information on this product, consult the Material Safety Data Sheet, (MSDS).

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 suitability for the user's purpose of any production methods mentioned herein and to adopt such precautions as may be advisable for the protection of property and of persons against any hazards that may be involved in the handling and use thereof. In light of the foregoing, **Henkel Corporation specifically disclaims all warranties expressed or implied, including warranties of merchantability or fitness for a particular purpose, arising from sale or use of Henkel Corporation's products. Henkel Corporation 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 Henkel 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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