



Product X33 and X33-04

August 2006

NO RESIDUE HALIDE FREE FLUXES

Multicore X33 and X33-04 are superior second generation no residue halide free fluxes from the pioneers of 'no clean' technology.

- **Unique patented formulation**
- **Fast soldering on conventional leaded and SMD components – no bridges or icicles**
- **No cleaning - reduces costs**
- **Non corrosive - safer than RMA fluxes**
- **High surface insulation resistance – without cleaning**
- **No residues to interfere with ATE probes – without cleaning**

APPLICATION

Recommended for consumer electronics and telecommunications use and for professional applications with conformal coatings.

In some applications, customers have experienced difficulties with certain low residue liquid fluxes due to occasional auto-ignition of the solvent in the vicinity of the wave. These problems have been overcome with Multicore X33-04 by a modification to the solvent blend. The resin and activator system employed is identical to that used in X33.

RECOMMENDED OPERATING CONDITIONS

The Printed Circuit Board: Multicore X33 and X33-04 are recommended for use on clean copper or clean tin/lead coated PCBs. Multicore X33 and X33-04 will solder satisfactorily over most rosin based surface preservatives but the rosin residues from the preservative will reduce board cleanliness unless cleaning is employed. Heavily oxidised copper surfaces often require particular flux activators for optimum performance and in such circumstances, customers should consider X33-12i.

Multicore X33 and X33-04 have been formulated to work over a wider range of solder resists than the original X32 grades of no residue fluxes. They leave lower residues than X32F-06i and X32S-06i. The solvent system in Multicore X33 and X33-04 is designed for optimum wetting of surfaces but prolonged contact with polystyrene, PVC or polycarbonate is not recommended. **PCBs soldered with Multicore X33 and X33-04 may be conformally coated if required without cleaning.**

Machine: When switching to X33 or X33-04 from any other flux, ensure all fingers, pallets and conveyors are thoroughly cleaned.

It is recommended that Multicore PC70i Solvent Cleaner or MCF800 be used in the finger cleaners.

Multicore X33 and X33-04 are compatible with machine construction materials and may be used in air or inerted processes.

Build up of solvent condensate in fully enclosed inert machines has been avoided by careful choice of the solvent system.

Fluxing: Multicore X33 and X33-04 have been formulated for use in foam, spray or wave fluxers in the same way as ordinary fluxes on standard wave soldering machines. The upper limit for flux coverage to ensure that soldered PCBs pass cleanliness tests is 25gm⁻² of circuit. Good soldering can be achieved at half this volume. It is important to remove excess flux from the circuit boards using the standard air knife or brushes supplied on the wave soldering machine. An air pressure of about 5-7psi is recommended and the nozzle should be about 2.5cm 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 transferring droplets to the top of the following board. Sufficient space should be allowed between the foam fluxer and the air knife to prevent the air stream disturbing the foam.

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

1. Use **DRY AIR**.
2. Keep the flux tank **FULL** at all times.
3. The top of the foaming stone should be no more than 2cm below the surface of the liquid flux. A fine foaming stone (eg 10µm pores) is preferred and if necessary, raise the level of the stone.
4. The preferred width of the slot (opening) of the foam fluxer is 10mm. If it is wider, add a strip of stainless steel to narrow the opening to 10mm. It is preferable to have a chimney for the foam which tapers towards the top.
5. **DO NOT** use hot fixtures or pallets as these cause the foam to deteriorate and increase losses by evaporation.
6. **DO NOT** use fixtures that have the potential to entrap flux.

The specific gravities of the flux and thinners are similar and they vary with their water contents. As a result, flux concentration control by measurement of the acid value is preferred. The Multicore SCK001 test kit for use at the production line is available.

Preheating: As X33 and X33-04 contain more solvent than conventional fluxes, it will be necessary to increase the preheater control setting to remove the additional solvent and to ensure that the flux is properly activated. The optimum preheat temperature and time for a PCB depends on its design and the thermal mass of the components but the cycle should be sufficient to ensure that the flux coating is not visibly wet when it contacts the wave. Combinations which have given good results are shown in the following table:

CONVEYOR SPEED	Ft/min	3	4	5
	M/min	0.91	1.22	1.52
TOPSIDE PREHEAT	°C	95	100-105	110
	°F	203	212-221	230

It is advantageous to fit a topside canopy over the preheaters to produce more effective drying and activation. This will allow the use of faster conveyor speeds and improve soldering. At a speed of 5ft/min, a contact length of 1.5-2" 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 particularly useful when setting up a machine to measure the preheat using a temperature profiling system.

IT IS IMPORTANT that flux solvent be removed by the preheat and that the PCB IS NOT WET when it reaches the solder wave.

Solders: Multicore X33 and X33-04 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 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 drossing. Dwell time on the wave should be 1.5-2.5 seconds. Conveyor speed for dual wave systems should be at least 4ft/min.

To complete your no-clean assembly, use the compatible Multicore Cored Solder Wire and Solder Paste. Soldering iron tips should be kept clean with Multicore Tip Tinner/Cleaner TTC1 (data sheet available).

Cleaning: Multicore X33 and X33-04 fluxes properly applied and processed leave no discernible residues without cleaning.

It is recommended that the soldering system itself be tested for cleanliness using an unfluxed board passed over the soldering machine. Suppliers should be requested to supply clean components and clean boards with good solderability.

Special applications may have regulations insisting on board cleaning and in such cases Multicore MCF800 or PC70i may be used. These are economic cleaners which may also be used to remove any small accumulation of flux solids that might develop on parts of the soldering machine after prolonged use. Machine contamination will in any case be much less than with conventional rosin fluxes. Unlike water soluble fluxes, Multicore X33 and X33-04 fluxes are not corrosive towards PCB handling equipment.

TECHNICAL SPECIFICATIONS

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

General Properties	X33	X33-04
Colour	Colourless	
Smell - in fluxer - during soldering	Alcoholic odour No irritant fumes	
Solids content	2% w/w	1.6% w/w
Specific gravity at 25°C (77°F)	0.800	0.805
Halide content	Zero	
Flash point (Abel)	12°C (53°F)	
Acid value (on liquid) mg KOH/g	16.5	15
Thinners	PC70i	
Flux classification		
J-STD-004	OR MO	OR MO
IPC-SF-818	M3CN	M3CN
EN 29454 Pt 1	2.2.3	2.2.3

SPECIAL PROPERTIES

Boards soldered with Multicore X33 and X33-04 fluxes pass MIL-P-28809A ionic contamination test without cleaning provided excess flux is not applied and a clean system and components are used.

Multicore X33 and X33-04 fluxes pass the following corrosion tests:

- USA Copper Mirror Test per MIL-F-14256D**
- UK Ministry of Defence DTD 599A**
- German Standard DIN 8527 using the test for F-SW32 type fluxes to DIN 8511**
- French Standard NF C90-550**
- Japanese Standard JIS-Z-3197**
- USA Bellcore TR-TSY-000078**

Surface Insulation Resistance

Multicore X33 and X33-04 liquid fluxes gave the PASS results shown in the following table during surface insulation resistance tests.

NOT FOR PRODUCT SPECIFICATIONS
THE TECHNICAL INFORMATION CONTAINED HEREIN IS INTENDED FOR REFERENCE ONLY. PLEASE CONTACT HENKEL TECHNOLOGIES TECHNICAL SERVICE FOR ASSISTANCE AND RECOMMENDATIONS ON SPECIFICATIONS FOR THIS PRODUCT.



Surface Insulation Resistance Measurements on Uncleaned Soldered Combs						
Specification	Ageing Conditions				Test Voltage V	Typical SIR ohms
	Temp °C	Relative Humidity %	Time hr	Voltage V		
Bellcore TR-TSY-000078	35	90	96	50	100	X33 5 x 10 ¹¹
						X33-04 1.4 x 10 ¹¹
Philips	40	95	1344	None	500	X33 1 x 10 ¹¹
						X33-04 -
Philips	40	95	1344	100	500	X33 5 x 10 ¹⁰
						X33-04 -
IPC-SF-818 Class 3	50	90	168	50	100	X33 8 x 10 ¹⁰
						X33-04 7 x 10 ¹⁰
JIS-Z-3197	40	90	96	None	500	X33 5 x 10 ¹³
						X33-04 5 x 10 ¹⁰
Sony B208	40	90	96	None	500	X33 5 x 10 ¹³
						X33-04 -

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.

Electromigration

Multicore X33 and X33-04 PASS the electromigration test requirements of Bellcore TR-NWT-000078 at 10V bias for 500hr at 85°C and 85% RH.

Conformal Coatings

Extended surface insulation resistance tests using conformally coated IPC-B-25 test combs were carried out at 40°C and 90% RH and a test voltage of 500V. The following table shows that conformal coatings perform well over uncleaned X33 and X33-04 residues compared with the same coatings over cleaned, unfluxed boards.

Flux Type	Conformal Coating Type	Surface Insulation Resistance, ohms		
		24h	336h	672h
None	Acrylic	4.2 x 10 ¹⁰	2.1 x 10 ¹⁰	2.2 x 10 ¹⁰
X33		8.8 x 10 ¹⁰	3.7 x 10 ¹⁰	9.8 x 10 ⁹
X33-04		5.8 x 10 ¹⁰	3.5 x 10 ¹⁰	2.8 x 10 ¹⁰
None	Silicone	4.4 x 10 ¹⁰	3.2 x 10 ¹⁰	3.5 x 10 ¹⁰
X33		2.3 x 10 ¹⁰	1.3 x 10 ¹⁰	1.0 x 10 ¹⁰
X33-04		3.3 x 10 ¹⁰	7.7 x 10 ¹⁰	6.7 x 10 ¹⁰
None	UV curable	1.7 x 10 ⁹	6.3 x 10 ⁹	1.3 x 10 ¹⁰
X33 X33-04		2.1 x 10 ⁹	2.1 x 10 ⁹	2.1 x 10 ⁹

GENERAL INFORMATION

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

Americas

Henkel Corporation
15350 Barranca Parkway
Irvine, CA 92618 U.S.A.
949.789.2500

Europe

Henkel Loctite Adhesives Ltd
Technologies House, Wood Lane End
Hemel Hempstead
Hertfordshire HP2 4RQ, United Kingdom
+44 (0) 1442 278 000

Asia

Henkel Loctite (China) Co. Ltd
No. 90 Zhujiang Road
Yantai Development Zone
Shandong, China 264006
+86 535 6399820

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