Technical Data Sheet

LOCTITE® MF 300

May 2021

PRODUCT DESCRIPTION

LOCTITE® MF 300 provides the following product characteristics:

Technology	VOC-free liquid flux
Application	Wave soldering

LOCTITE® MF 300 is a water-based low residue, resin and halogen-free flux which meets the most demanding legislation on volatile organic compound (VOC) emissions.

FEATURES AND BENEFITS

- Water-based VOC free flux
- Meets US air quality legislation
- Formulated to minimize solder balling
- Residues easily removed where required
- Highly effective on difficult to solder surfaces
- Ideal for PTH and SMD applications
- Non-flammable formulation
- Suitable for both spray and foam applications
- Halogen free (no intentionally added halogens)
- Halogen-free flux: passes IC with pretreatment as per IPC-TM-650, EN14582

APPLICATIONS

LOCTITE® MF 300 is designed mainly for consumer electronics applications using either conventional or nitrogen atmosphere soldering machines. The flux performs well, even when used on poorly preserved or oxidised copper substrate. It has been designed to minimise solder balling between adjacent pads.

TECHNICAL SPECIFICATION

LOCTITE® MF 300 liquid flux is designed for application by foam however it is also suitable for use in spray fluxers.

TYPICAL PROPERTIES

Flux Properties

Solids Content, %	4.6
Halide Content, Cl %	Zero
Acid Value, mgKOH/g	37
Specific Gravity @ 25°C	1.011
Colour (1)	Colourless

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

RELIABILITY PROPERTIES

Test	Specification	Results
Copper Mirror	J-STD-004	Pass*
Chromate Paper	J-STD-004	Pass
Surface Insulation Resistance (SIR)	J-STD-004	Pass
Electromigration	Bellcore GR-78-Core	Pass
Halogen Content	EN 14582	Pass
Flux Activity Classification	J-STD-004 EN29454	ORM0 2.2.3

* when the solids are reconstituted in 2-propanol, as permitted by Table 5 of the J-STD-004 protocol

RECOMMENDED OPERATING CONDITIONS

The Printed Circuit Board:

LOCTITE® MF 300 has been formulated for high activity on oxidized copper and can be used in conjunction with most commonly used surface preservaitive materials. It is, however, recommended that process compatibility testing be performed. Testing during the development of this flux confirms good PTH penetration and therefore good topside fillet formation.

Machine Preparation:

Ensure the soldering machine is thoroughly cleaned, including all fingers, pallets and converyors, so that any possible contamination has been removed. Where possible a new foam stone should be used to ensure no cross contamination. LOCTITE® MCF 800 Cleaner can be used in the finger cleaning system.

LOCTITE® MF 300 is not aggresive towards plastics, however, it may be slightly corrosive towards some metal PCB handling equipment.

Fluxing

LOCTITE® MF 300 is designed for use in foaming applications. The upper limit for flux coverage to ensure that soldered PCBs pass cleanliness tests is 40g m^{-2} of circuit. It is formulated to have the same foaming properties as conventional alcohol based low solids liquid fluxes. As it is water based, the foam is less prone to destabilisation through evaporative loss and contact with hot fixtures or pallets. There is no requirement for the air to be dry.

Flux Process

1. Keep the flux tank FULL at all times.
2. The top of the foaming stone should be no more than 20 mm 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 former should taper towards a slot width of 10 to 20 mm.
4. DO NOT use fixtures which can entrap the flux. This may lead to random solder bailing caused by the sudden volatilisation of the excess flux upon contact with the solder wave.
5. It is important to remove excess flux from the circuit boards using a standard air knife or brushes on the wave soldering machine.
6. An air pressure of about 5 to 7 psi is recommended and the nozzle should be about 25 mm 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.
7. Ensure the air knife is positioned with the sufficent 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.

Preheating

As LOCTITE® MF 300 contains 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 and time for a PCB depends on its design and the thermal mass of 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	Topside preheat temperature °C (°F)
1.3m min^{-1} (4.2ft min^{-1})	110 (230)
1.5m min^{-1} (4.8ft min^{-1})	120 (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. This is also recommended for consistent process monitoring.

Wave Soldering:

1. Excess moisture on the PCB during soldering may lead to random solder balling and poor wetting of some solder joints.
2. 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.
3. At a speed of 1.5m min^{-1} (4.8ft min^{-1}) a contact length of 38 to 50 mm between the solder 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.
4. 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.
5. LOCTITE® MF 300 flux can be used with all standard solder alloys. The recommended maximum solder bath temperature is 250°C for leaded alloys. Temperatures as high as 275 to 280°C may be necessary for some lead-free alloys. The solder bath temperature can generally be reduced when compared with processes using conventional fluxes. Temperatures as low as 235°C may be used in some situations and this results in improved soldering and less wastage through solder dross formation.
6. Dwell time on the wave should be 1.5 to 2.5 seconds.

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

Cleaning:

LOCTITE® MF 300 is designed as a no-clean flux, however some applications may require board cleaning for which LOCTITE® MCF 800 cleaner may be used.

For a completely no-clean process, use LOCTITE® 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 LOCTITE® TTC-LF Tip Tinner/Cleaner (data sheet available).

STORAGE AND SHELF LIFE

Storage:

It is recommended to store LOCTITE® MF 300 in a dry environment at room temperature. This flux should be stored above 10°C, as cold temperatures may cause the solids in the flux to separate from the solution. Warming to room temperature and gentle agitation will restore the flux to normal. LOCTITE® MF 300 may appear cloudy after being subjected to elevated storage temperatures. **This does not affect the performance of the flux**.

Shelf Life:

Provided LOCTITE® MF 300 is stored as recommended above a shelf life of 2 years can be expected.

DATA RANGES

The data contained herein may be reported as a typical value and/or a range. Values are based on actual test data and are verified on a periodic basis

GENERAL INFORMATION

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

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.

Conversions

(°C x 1.8) + 32 = °F
kV/mm x 25.4 = V/mil
mm / 25.4 = inches
µm / 25.4 = mil
N x 0.225 = lb
N/mm x 5.71 = lb/in
N/mm² x 145 = psi
MPa x 145 = psi
N·m x 8.851 = lb·in
N·m x 0.738 = lb·ft
N·mm x 0.142 = oz·in
mPa·s = cP

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