Technical Data Sheet

STANNOL® VOC-free liquid flux WF300F & WF300S

High Activity, No-Clean, Special Low Solder-Balling Formula

- **No Clean**
- **Highly effective on low solderability surfaces, e.g. oxidised copper**
- **Formulated to minimise solder balling**
- **Non-flammable formulation - <1% VOC - meets US air quality legislation**

Description

STANNOL® WF300F and **WF300S** are low residue, resin and halide-free fluxes, which meet the most demanding legislation on volatile organic compound (VOC) emissions.

Application

STANNOL® WF300F/S 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 the effect of solder balling between adjacent pads.

Recommended Operating Conditions

The Printed Circuit Board: **STANNOL® WF300F/S** 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. **STANNOL® Flux-Ex 200B** can be used in the finger cleaners. **STANNOL® WF300F/S** are not aggressive towards plastics.

Fluxing: **STANNOL® WF300S** has been formulated for use in spray or wave fluxers and **WF300F** has been formulated for use in foam fluxers only. The upper limit for flux coverage to ensure that soldered PCBs pass cleanliness tests is 40g m^{-2} of circuit. **WF300F** 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. 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. The **STANNOL® Mini-Titration-Kit** (flux concentration test kit) is ideal for testing and maintaining the fluxing process on the production line.

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Note: **WF300F** may appear cloudy after being exposed to higher temperatures. **WF300S** may also exhibit cloudiness but to a lesser extent due to the special formulation. This **does not affect the performance of the flux.** Both fluxes should not be stored below +10°C (longtime-storage). For a short time +5°C is possible. Lower temperatures may cause the solids in the flux to separate from solution. In case this happened anyway, you can try to restore the flux to normal by consistently stirring and heating it to room temperature

Preheating: As both **STANNOL® WF300F and WF300S** 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 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	m/min^{-1}	1.3	1.5
Topside Preheat	°C	110	120

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 improved soldering.

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, which would mean a contact time of approx. 1,5-2,5 sec. At lower speeds, this contact length should be reduced. Very long contact times may produce dull solder joints.

For accurate preheat and peak temperature measurements when setting up a wave solder machine, and consistent process monitoring the **STANNOL® Thermologger 5000** temperature profile system is ideal.

Solders: **STANNOL® WF300F and WF300S** fluxes can be used with all standard solder alloys. The recommended maximum solder bath temperature is 260°C. 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 bath drossing. Dwell time on the wave should be 1.5-2.5 seconds.

Physical Data and Properties and Data:

General Properties	**WF300F***foam*	**WF300S***pray*
J-STD-004 classification	OR M0	
EN 29454 classification	2.1.3.A	
Colour(1)	colourless/yellow	
Solids content	4.6% ± 0.2 w/w	
Halide content	Zero	
Acid value (on liquid) mg KOH g^{-1}	37 ± 2.5	
Specific density at 25°C (77°F)	1.012 ± 0.002	
Recommended thinner	no thinner required	

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

Surface Insulation Resistance: **STANNOL® WF300F/S** liquid fluxes PASS the J-STD-004 surface insulation resistance test without cleaning.

Electromigration: **STANNOL® WF300F/S** liquid fluxes PASS the Bellcore electromigration test without cleaning.

Corrosion: **STANNOL® WF300F/S** 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.

Shelf life

1 year after date of delivery (provided proper storage in originally sealed container).

Health and Safety

Before using please read the material safety data sheet carefully and observe the safety precautions described.

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