



## Technical Data Sheet

# STANNOL® X33F-07I AND X33S-07I

## LOW RESIDUE NO CLEAN FLUXES

STANNOL® X33F-07i and X33S-07i are low residue, resin and halide free fluxes particularly for use on copper finishes from the pioneers of 'no clean' technology.

- No visible residues - eliminates cleaning
- Promotes through hole filling on bare, passivated and lacquered copper finishes
- Formulations for wave, spray and foaming application
- IPC classification L3CN
- Meet Bellcore TR-NWT-000078 Issue 3

### APPLICATIONS

Recommended for consumer electronics, telecommunications and for professional applications using conventional wave soldering machines or nitrogen inerted units.

### RECOMMENDED OPERATING CONDITIONS

**The Printed Circuit Board:** STANNOL® X33F-07i and X33S-07i have been formulated to work over a wide range of solder resists and are tolerant of poorly adherent finishes. The solvent system in STANNOL® X33F-07i and X33S-07i is designed for optimum wetting of surfaces and is not aggressive towards common plastics.

STANNOL® X33F-07i and X33S-07i are particularly effective on bare, passivated or lacquered (resin coated) copper circuit boards. They may also be used on tin/lead coated boards.

Low residue fluxes generally produce poor through-hole filling, particularly on copper finishes. STANNOL® X33F-07i and X33S-07i have been especially formulated to overcome this problem.

**Machine:** When switching to X33F-07i and X33S-07i from any other flux, ensure all fingers, pallets and conveyors are thoroughly cleaned.

It is recommended that STANNOL® Flux-Ex 200/B Solvent Cleaner be used in the finger cleaners.

STANNOL® X33F-07i and X33S-07i 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:** STANNOL® X33S-07i has been formulated for use in **spray** or **wave fluxers** in the same way as ordinary fluxes on standard wave soldering machines. STANNOL® X33F-07i has been formulated for use in **foaming fluxers**. The upper limit for flux coverage to ensure that soldered PCBs pass cleanliness tests is 25g.m<sup>2</sup> 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 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 or PVC across it 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.

**Flux Control:** Control of the flux concentration is achieved in the normal manner by measuring the temperature and specific gravity of the flux. A nomograph is available to show how these measurements are related to the corrective action needed.

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 more convenient. The STANNOL® Titration Kit for use at the production line is available.

**Preheating:** As STANNOL® X33F-07i and X33S-07i contain more solvent than conventional rosin fluxes, it will be necessary to adjust the preheater 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 below.

CONVEYOR SPEED	Ft/min / m/min	3 / 0.91	4 / 1.22	5 / 1.52	6 / 1.83
TOPSIDE PREHEAT	°C / °F	80-100 / 176-212	70-110 / 158-230	70-100 / 158-212	70-100 / 158-212

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 1½-2" 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 the STANNOL® Temperature Profile System (data sheet available).

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

**Solders:** STANNOL® X33F-07i and X33S-07i 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 of least 4ft/min.

To complete your no-clean assembly, use the compatible STANNOL® Cored Solder Wire. Soldering iron tips should be kept clean with STANNOL® Tippy (data sheet available).

**Cleaning:** STANNOL® X33F-07i and X33S-07i 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. Special applications may have regulations insisting on board cleaning and in such cases STANNOL® Flux-Ex 200/B may be used. These are free from ozone depleting chemicals and 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, STANNOL® X33F-07i and X33S-07i fluxes are not corrosive towards PCB handling equipment.

## 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	X33F-07i	X33S-07i
IPC classification	L3CN	
Colour	Colourless	
Smell	Alcoholic	
Solids content	2.7% ± 0.3 w/w	
Halide content	Zero	
Acid value (on liquid) mg KOH/g	19.5 ± 0.5	
Specific gravity at 25°C (77°F)	0.792 ± 0.002	
Flash point (Abel)	12°C (53°F)	
Thinners	VD 500	
DIN EN 29454 2.2.3		

## SPECIAL PROPERTIES

Boards soldered with STANNOL® X33F-07i and X33S-07i fluxes pass MIL-P-28809A ionic contamination test without cleaning provided excess flux is not applied and a clean system and components are used.

STANNOL® X33F-07i and X33S-07i fluxes pass the following corrosion tests:

USA Copper Mirror Test per MIL-F-14256D  
 UK Ministry of Defence DTD 599A  
 USA Bellcore TR-NWT-000078  
 IPC-SF-818 Flux Class 3  
 BS5625 Flux Class 4

## Surface Insulation Resistance

STANNOL® X33F-07i and X33S-07i liquid fluxes gave the PASS results shown in the following table during surface insulation resistance tests.

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-NWT-000078 Issue 3	35	85	96	50	100	X33F-07i 1.6 x 10 <sup>11</sup>
						X33S-07i 5.2 x 10 <sup>11</sup>
IPC-SF-818 Class 3	85	85	168	50	100	X33F-07i 9.6 x 10 <sup>11</sup>
						X33S-07i 2.2 x 10 <sup>9</sup>

## Electromigration

STANNOL® X33F-07i and X33S-07i PASS the electromigration test requirements of TR-NWT-000078 at 10V bias for 500hr at 85°C and 85% RH.

## Through-Hole Solder Penetration

Resin coated copper boards soldered in air.

Flux	% pth fill	
	As received	Oxidised boards
X33S-07i	98.4	95.6
Low resin LSF	93.6	48.6
Resin-free LSF	46.0	36.0

## HEALTH AND SAFETY

**WARNING:** The following information is for guidance only and users must refer to the Material Safety Data Sheets relevant to STANNOL® X33F-07i and X33S-07i Low Residue Fluxes before use.

**Fumes/Vapours and Precautions:** Excessive inhalation of the solvent vapour, which may cause headaches, dizziness and nausea and the flux fumes given off at soldering temperature, which are irritating to the throat and respiratory organs, should be avoided. The TLV of the solvent is 400ppm. STANNOL® X33F-07i and X33S-07i liquid fluxes must always be used in well ventilated areas. Suitable fume extraction equipment should be used to extract solvent vapours and flux fumes away from the operators.

**Protection and Hygiene:** Suitable protective clothing should be worn to prevent the materials from coming into contact with the skin and eyes. If the materials come into contact with the skin, the affected area should be washed with soap and water. If the materials come into contact with the eyes, they should be irrigated thoroughly with running water for at least 10 minutes and medical attention sought. Eating and drinking should not be permitted in the working area and hands should be washed thoroughly with soap and warm water before eating.

**Fire Hazards and Precautions:** STANNOL® X33F-07i and X33S-07i liquid fluxes contain a highly flammable solvent with a flashpoint of 12°C (53°F). These materials must not be used near naked flames or non-flameproof electrical equipment. Smoking must not be permitted in the working area. Carbon dioxide, alcohol resistant foam or dry powder extinguishers should be used if the materials catch fire.

**Spillage and Waste Disposal:** Spillage of the materials should be mopped up with sand or sawdust. Waste materials should be stored in closed containers and disposed of in accordance with local regulations.

The above values are typical and represent no form of specification. The Data Sheet serves merely for information purposes. Any verbal or written advice is not binding for the company, whether such information originates from the company offices or from a sales representative. This is also in respect of any protection rights of third parties, and does not release the customer from the responsibility of verifying the products of the company for suitability of use for the intended process or purpose. Should any liability on the part of the company arise, the company will only indemnify for loss or damage to the same extent as for defects in quality.