WIL-1 No-Clean Liquid Flux

Introduction

WIL-1 is a low activity VOC free no-clean liquid flux for selective and wave solder applications. WIL-1 is compatible with spray, foaming, and drop-jet type flux systems. WIL-1 works well with leaded and Pb-free alloys and is halide free.

Attributes

- VOC free liquid flux for wave and selective soldering. 0.0 g/L VOC.
- Works well for Sn63/Pb37, SAC305 and SN100C alloys.
- Halide free formulation.

Liquid Flux Packaging	Part Number	Net Volume
Jug	WIL-1U	1 gallon
Pail	WIL-1P	5 gallons
Drum	WIL-1D	55 gallons

Compatible Products

TK-100 Titration Kit is optional. Flux control is best done through specific gravity analysis.

Storage and Handling

- Shelf life is 3 years when the unopened flux is stored between 50 to 90 °F (10 and 32 °C).
- Keep the flux sealed in the original container to limit evaporation of solvent and minimize the risk of contamination.
- When storing used flux, do not mix it into the container with the new (fresh) flux.

Process Parameters

The process parameters shown below are simply guidelines. The optimal parameters may be different based upon your equipment, circuit boards, components, and process.

Flux Parameters	Guideline
Specific gravity (SG)	1.00 to 1.03 g/cc
Acid number	40 - 50 mg KOH / gram flux
Amount of flux (Foaming)	800 - 1500 µg / in^2 of dried flux 11.4 - 21.4 mg / in^2 of wet flux
Amount of flux (Spray)	500 - 1500 µg / in^2 of dried flux 7.1 - 21.4 mg / in^2 of wet flux

Coverage of flux should be uniform over the entire fluxed area. Penetration of flux through the circuit board holes can be checked using paper or cardboard on top of the circuit board run through the fluxer. Inspect the paper or cardboard for uniform wetness at each hole. Adjust the flux system if necessary.

Wave Solder Parameters	Sn63/Pb37	SN100C or SAC305
Immersion depth in wave	½ to ⅔ of the board thickness	½ to ⅔ of the board thickness
Top side preheat temperature	110 to 130 °C	120 to 140 °C
Bottom side preheat temperature	25 to 35 °C higher than the top side	25 to 35 °C higher than the top side
Preheat ramp rate maximum	2 °C / second maximum	2 °C / second maximum
Conveyor speed	4 to 6 ft/min (1.2 - 1.8 m/min)	3 to 6 ft/min (0.9 - 1.8 m/min)
Contact time in wave	2 to 4 seconds	3 to 6 seconds
Solder pot temperature	230 to 260 °C	250 to 275 °C

Water based fluxes like WIL-1 require higher pre-heat settings than isopropanol-based fluxes to evaporate off the water completely before the circuit boards touch the molten solder. If water is left on the circuit boards then the molten solder will cause explosive vaporization resulting in solder splattering and other issues. Pre-heat should be set so that water-based fluxes are dry as the circuit boards exit the pre-heat section.

Selective Solder Parameters	Sn63/Pb37	SN100C or SAC305
Top side preheat temperature	110 to 130 °C	120 to 140 °C
Bottom side preheat temperature	25 to 35 °C higher than the top side	25 to 35 °C higher than the top side
Preheat ramp rate maximum	2 °C / second maximum	2 °C / second maximum
Movement rate while soldering	5 to 15 in/min	5 to 15 in/min
Contact time	1 to 3 seconds	1 to 4 seconds
Solder pot temperature	280 to 310 °C	290 to 320 °C

Flux Control

De-ionized water will evaporate slowly out of the flux over time and the solvent should be replaced through analysis and additions of de-ionized water. WIL-1 flux is best controlled through specific gravity analysis using the procedure below. The flux should be tested and thinned approximately once every 4 to 8 hours of operation (foaming systems), or once every 40 hours of operation (spray systems).

1. Measure the specific gravity of the flux at 68 - 72 °F.
2. Calculation for the addition of D.I. water:

   D.I. water add (% vol) = [(SG - 1.02) / (SG - 1.00)] x 100%

Maintain the specific gravity between 1.01 and 1.02 through additions of D.I. water. For example, if the specific gravity is 1.04 then the amount of D.I. water required would be 50% by volume. If the flux sump holds 20 gallons, then an addition of 10 gallons of D.I water would reduce the specific gravity from 1.04 to 1.02.

In recirculating flux equipment, the flux will accumulate contaminates and debris over time. Spent flux should be replaced after approximately 40 hours of use. The equipment, foam stone and sump should be cleaned with flux thinner before adding new (fresh) flux.

During extended shut down periods such as nights and weekends, the flux should be removed from the machine and stored in a sealed container. The air stone should be immersed in flux thinner during the shut-down period. Pumps and tubing should be flushed with flux thinner during the shut-down period.

Cleaning

Raw flux can be removed from circuit boards and equipment using flux thinner (D.I. water). After heating, no-clean flux residues are designed to be "safe" and do not need to be removed from the circuit board. If removal of the flux residues is desired, then D.I. water heated to 120 - 180 °F can be used in standard washing equipment.

Safety

Wear chemically resistant gloves and safety glasses when handling liquid flux. Avoid breathing fumes, especially during heating of the flux. Follow the guidelines in the Safety Data Sheet (SDS).

J-STD-004C Flux Standard	Test Method	Result
J-STD-004C classification	J-STD-004C methods	ORL0
Visual appearance	Visual	Clear to light yellow
Solids content	IPC 2.3.34	6.5 to 7.5% wt
Acid value	IPC 2.3.13	40 to 50 mg KOH / gram flux
Specific gravity	ASTM D-1298	1.01 to 1.02 g/cc
VOC content	Calculation	0.0 % wt (0.0 g/L)
Halide ion content (Br^-, Cl^-, F^-, I^-)	IPC 2.3.28.1	0.0 % wt
Halogen content (Br and Cl)	EN 14582, IPC 2.3.28.1	4.0 to 5.0 % wt of the solids
Halide by silver chromate	IPC 2.3.33	No halides detected
Fluoride by spot test	IPC 2.3.35.1	None detected
Copper mirror	IPC 2.3.32	Low activity
Copper corrosion	IPC 2.6.15	No corrosion
Surface Insulation Resistance (SIR) Comb-up	IPC 2.6.3.7	Pass > 1.00E+08 ohms
Surface Insulation Resistance (SIR) Comb-down	IPC 2.6.3.7	Pass > 1.00E+08 ohms
Electro Chemical Migration (ECM)	IPC 2.6.14.1	Pass

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