



## 977 Soldering Flux

### VOC-free No-Clean Liquid Flux for Lead-bearing and Lead-free Alloys

#### Product Description

Kester 977 is an organic, water-based, no-clean chemistry for high quality soldering of electronic circuit board assemblies. Designed for wave soldering applications, 977 provides good wetting on most surface finishes. The flux was specifically designed to reduce bridging, which is commonly associated with VOC-free no-clean fluxes. 977 has excellent soldering properties for improved productivity without sacrificing reliability of the assembly. The flux leaves bright shiny solder joints and will not attack properly cured solder masks or FR-4 Epoxy-Glass laminate. The minimal amount of residue remaining after soldering is non-conductive, non-corrosive and need not be removed. The residues left after soldering will not interfere with in-circuit testing. 977 is not detrimental to the Surface Insulation Resistance (SIR) of the soldered assembly.

#### Performance Characteristics:

- Biodegradable at pH of 2.0 or greater
- Chemically compatible with most solder masks and board laminates
- Does not degrade Surface Insulation Resistance
- No offensive odors
- Bright, shiny solder connections
- Classified as ORL0 per J-STD-004
- Compliant to Bellcore GR-78

#### RoHS Compliance

This product meets the requirements of the Restriction of Hazardous Substances (RoHS) Directive, 2015/863 for the stated banned substances.

#### Physical Properties

**Specific Gravity:** 1.012 ± 0.010  
Anton Paar DMA 35 @ 25°C

**Percent Solids (typical):** 3.25%  
Tested to J-STD-004, IPC-TM-650, Method 2.3.34

**Acid Number (typical):** 27.0 ± 1.0 mg KOH/g of flux  
Tested to J-STD-004, IPC-TM-650, Method 2.3.13

**pH (10% solution):** 3.0  
Hanna Instruments 8314 @ 25°C

**Flash Point:** >100°C (212°F)

#### Reliability Properties

**Copper Mirror Corrosion:** Low  
Tested to J-STD-004, IPC-TM-650, Method 2.3.32

**Corrosion Test:** Low  
Tested to J-STD-004, IPC-TM-650, Method 2.6.15

**Silver Chromate:** Pass  
Tested to J-STD-004, IPC-TM-650, Method 2.3.33

**Chloride and Bromides:** None Detected  
Tested to J-STD-004, IPC-TM-650, Method 2.3.35

**Fluorides by Spot Test:** Pass  
Tested to J-STD-004, IPC-TM-650, Method 2.3.35.1

**Surface Insulation Resistivity (SIR):** Pass  
Tested to J-STD-004, IPC-TM-650, Method 2.6.3.3

|       | Blank                 | 977 PD                | 977 PU                |
|-------|-----------------------|-----------------------|-----------------------|
| Day 1 | 4.1*10 <sup>9</sup> Ω | 7.1*10 <sup>8</sup> Ω | 8.4*10 <sup>8</sup> Ω |
| Day 4 | 7.0*10 <sup>9</sup> Ω | 1.3*10 <sup>9</sup> Ω | 2.8*10 <sup>9</sup> Ω |
| Day 7 | 8.0*10 <sup>9</sup> Ω | 1.7*10 <sup>9</sup> Ω | 3.5*10 <sup>9</sup> Ω |

## Flux Application

977 can be applied to circuit boards by a spray or dip process. Flux deposition should be 120-240  $\mu\text{g}$  of solids/ $\text{cm}^2$  (750-1500  $\mu\text{g}$  of solids/ $\text{in}^2$ ). An air knife after the flux tank is recommended in the dip solder application to remove excess flux from the circuit board and prevent dripping on the preheater surface.

**NOTE:** 977 is not designed to be foamed applied. It is not a good candidate for any soldering process that does not have a preheat step in the process.

## Process Considerations

The optimum preheat temperature for most circuit assemblies is typically 90-115°C (194-239°F) as measured on the top or component side of the printed circuit board. Dwell time in the wave is for a SnPb process is typically 2-4 seconds, and dwell time in the wave for a lead-free alloy's is typically 4-8 seconds. The wave soldering conveyor speed should be adjusted to accomplish proper contact time, then the preheating settings should be adjusted to meet the top board temperature requirement. Ensure all water has been evaporated. After the preheater the board should be dull without and water spots on it.

## Elimination of Splattering

Since VOC-free fluxes are water-based, splattering can be a problem. Splattering occurs when water comes in contact with molten solder, so it may be necessary to use forced air to drive off the water. Manufacturers have reported that blowing hot air at 0.28-0.85  $\text{m}^3/\text{hr}$  (10-30  $\text{ft}^3/\text{hr}$ ) greatly assists in drying the water off the circuit boards.

## Flux Control

Acid number is normally the most reliable method to control the flux concentration of low solids, no clean fluxes. Evaporative loss is minimal because this flux is water-based. To check concentration, a simple acid-base titration should be used. PS-22 Test Kit and procedure are available from Kester. The thinner for this flux is DI water.

## Cleaning

977 flux residues are non-conductive, non-corrosive that does not require removal in most applications. If residue removal is required, plain DI water at 43-54°C (110-130°F) with a Saponifier is required.

## Storage and Shelf Life

Because this formulation is water based, it is subject to freezing. A minimum storage temperature of 4°C (40°F) is recommended. If frozen, 977 is easily reconstituted by stirring at room temperature. Shelf life is 3 years from the date of manufacture when handled properly and held at 4-25°C (40-77°F).

## Health and Safety

This product, during handling or use, may be hazardous to your health or the environment. Read the Safety Data Sheet (SDS) and warning label before using this product.