# 971M
# VOC-Free No-Clean Liquid Flux

**US Patent 5,281,281**

## Product Description

Kester 971M is an organic water-soluble, water based, no-clean chemistry for high quality soldering of electronic circuit board assemblies. Kester 971M was designed for foam fluxing, wave soldering applications. Kester 971M has good 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. Kester 971M is not detrimental to the Surface Insulation Resistance (SIR) of the soldered assembly. Kester 971M contains a biocide that prevents biological growth.

### 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

## Physical Properties

**Specific Gravity:** 1.005 ± 0.010
Antoine Paar DMA 35 @ 25°C

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

**Acid Number:** 26.8 ± 0.8 mg KOH/g of flux
Tested to J-STD-004, IPC-TM-650, Method 2.3.13

**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

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

| | Blank | 971M PD | 971M PU |
|---|---|---|---|
| Day 1 | $9.2 \times 10^9\ \Omega$ | $7.2 \times 10^9\ \Omega$ | $4.7 \times 10^9\ \Omega$ |
| Day 4 | $5.6 \times 10^9\ \Omega$ | $4.6 \times 10^9\ \Omega$ | $4.0 \times 10^9\ \Omega$ |
| Day 7 | $5.5 \times 10^9\ \Omega$ | $4.5 \times 10^9\ \Omega$ | $4.4 \times 10^9\ \Omega$ |

# Application Notes

## Flux Application:

Kester 971M can be applied to circuit boards by spray, dip or foaming equipment. Kester 971M will provide a uniform head of small bubbles. The flux level should be maintained at approximately 1.3 - 1.9 cm (1/2 - 3/4 in) above the stone in the foam fluxer. Flux deposition should be 120-240 µg of solids/$cm^2$ (750-1500 µg of solids/$in^2$). An air knife after the flux tank is recommended to remove excess flux from the circuit board and prevent dripping on the preheater surface.

## Process Considerations:

The optimum preheat temperature for most circuit assemblies is 104-116°C (220-240°F) as measured on the top or component side of the printed circuit board. Dwell time in the wave is typically 2-4 seconds. The wave soldering speed should be adjusted to accomplish proper preheating and evaporate excess water, which could cause spattering. For best results, speeds of 1.4-1.8 m/min (4½-6 ft/min) are used. The surface tension has been adjusted to help the flux form a thin film on the board surface allowing rapid water evaporation.

## 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 $m^3$/hr (10-30 $ft^3$/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-20 Test Kit and procedure are available from Kester.

## Cleaning:

Kester 971M flux residues are non-conductive, non-corrosive and do not require removal in most applications. If residue removal is required, plain DI water at 43-54°C (110-130°F) may be used.

## 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, the Kester 971M is easily reconstituted by stirring at room temperature. Shelf life is 3 years from date of manufacture when handled properly and held at 4-25°C (40-77°F).

## Health & Safety:

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

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