QUALITEK INTERNATIONAL, INC.

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Qualification Test Report

Formula 737N Water Soluble Liquid Flux

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QUALIFICATION TEST REPORT

FORMULA 737N WATER SOLUBLE LIQUID FLUX

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1. INTRODUCTION

This Qualification Test Report summarizes the qualification testing of Formula 737N Water Soluble Liquid Flux per J-STD-004, January 1995.

2. SOLDERING FLUX QUALIFICATION

737N Water Soluble Liquid Flux is classified as Flux type ORH1; per J-STD-004.

Fluxes shall be considered compliant if they meet the acceptance criteria for each of the following tests:

1. Flux Induced Corrosion (copper mirror method)
2. Presence of Halides in Flux (silver chromate method)
3. Halide Content, Quantitative (Chloride & Bromide)
4. Fluorides by Spot Test
5. Flux Solids (Nonvolatile) Determination
6. Surface Insulation Resistance (SIR) Test

2.1 Flux Induced Corrosion (copper mirror method)
The corrosive properties of the flux shall be determined in accordance with IPC-TM-650, Test Method 2.3.32

2.2 Presence of Halides in Flux (silver chromate method)
The presence of chlorides and bromides shall be determined in accordance with IPC-TM-650, Test Method 2.3.33. If the flux fail the silver chromate test, then a quantitative halide content test for chloride and bromide will be performed. The combined concentration of chlorides and bromides shall be determined in accordance with IPC-TM-650, Test Method 2.3.35.

2.3 Fluorides by Spot Test
The presence of fluorides shall be determined in accordance with IPC-TM-650, Test Method 2.3.35.1. If the flux fail the spot test, then a quantitative halide content test for fluoride will be performed. The concentration of fluorides shall be determined in accordance with IPC-TM-650, Test Method 2.3.35.2.

2.4 Flux Solids (Nonvolatile) Determination
The determination of the amount of residual solids content of liquid fluxes shall be made in accordance with IPC-TM-650, Test Method 2.3.34.

2.5 Surface Insulation Resistance (SIR) Test

The surface insulation requirements for fluxes shall be determined in accordance with IPC-TM-650, Test Method 2.6.3.3.

3. QUALIFICATION TEST RESULTS SUMMARY

3.1 Flux Induced Corrosion (copper mirror method)

Acceptance Criteria: When the flux is tested as specified, if there is any complete removal of the copper film as evidence by the background showing through the glass, the test flux has failed the L category. Complete removal of the copper only around the perimeter of the drop defines the flux as M. Complete removal of the copper places the flux in the H category.

Result: Formula 737N-When tested by this method, there was breakthrough in more than 50% of the copper film. **CLASSIFIED H**

3.2 Presence of Halides in Flux (silver chromate method)

Acceptance Criteria: When the flux is tested as specified, the test paper showed no chlorides or bromides present as evidence by a color change of the test paper to off-white or yellow-white.

Result: Formula 737N-When tested by this method, there was a color change to yellow-white. This indicates the presence of halides, and the quantitative test must be carried out to determine the halide content. **FAIL**

3.3 Halide Content, Quantitative (Chloride & Bromide)

The percentage of halides as chloride based on flux solids content is calculated using the following formula:

$$\text{Halides, as \% chlorides} = \frac{3.55 \text{ VN x } 100}{mS}$$

Where:

V = the volume of 0.1N silver nitrate in mL.
N = the normality of silver nitrate solution.
m = the mass (weight) of flux sample in gram.
S = the percentage of solids (non-volatiles) of the flux.

Result: Formula 737N-When tested by this method, the halide content, as percentage of chlorides was found to be 2.044%.

3.4 Fluorides by Spot Test

Acceptance Criteria: When the flux is tested as specified, the alizarin purple lake would change from purple to yellow assuming halides were present. In the absence of fluorides, the alizarin lake remains purple.

Result: Formula 737N-When tested by this method, no color from purple to yellow was observed. This indicated no presence of fluorides. **PASS**

3.5 Flux Solids (Nonvolatile) Determination

The residual solids is calculated as follows:

$$\text{Solids content (\%)} = \frac{100 \times m_2}{m_1}$$

Where:

m_2 = the mass of residual after drying, in grams
m_1 = the mass of original test flux specimen, in grams

Result: Formula 737N-When tested by this method, the solids content was found to be 16.44%.

3.6 Surface Insulation Resistance Test (SIR)

Acceptance Criteria: When the flux is tested as specified with pattern type 0.4mm and 0.5mm spacing (IPC-B-24). The average insulation resistance should be greater than 100 megaohm [1×10^8 ohms].

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Result: The average insulation resistance is:

FORMULA 737N:

	737N
IR$_{INITIAL}$	**4.19E+10**
IR$_{FINAL}$	**5.99E+10**

RESULT: PASS

4. Surface Insulation Resistance Test Results

4.1 Test Pattern Preparation

Flux was applied by brushing liberal quantities onto the entire surface of the test boards. The boards were then drained vertically for one minute. The test coupons were exposed to solder by floating the fluxed comb patterns face down in a solder pot at 245-260 °C for 4+/- one second. A second set of comb patterns were fluxed and floated pattern side up on the solder pot. After soldering the boards were thoroughly cleaned with de-ionized water for 10 minutes and dried.

4.2 Test Results Evaluation

The following pages contain the resistance readings, the average resistance calculations and the test results.

The following formula was used to determine the average:

$$IR_{avg} = 10^{\left(\frac{1}{N\sum \log IR_i}\right)}$$

Where:
   IR$_I$ is the individual resistance measurement.
   N is the number of measurement taken.

Measurements were taken at 85°C & 85% RH.