# WS700 LEAD FREE Water Soluble (OA) SOLDER WIRE

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## Physical Properties

## Solder Composition

Qualitek Sn/Ag/Cu (Tin/Silver/Cu) Alloys are designed as a lead-free alternative for Sn/Pb alloys for electronics assembly operations. The Qualitek Sn/Ag/Cu alloys conform and exceed the impurity requirements of J-Std-006 and all other relevant international standards.

**Typical Analysis**

| | Sn | Ag | Cu | Pb | Sb | Bi | In | As | Fe | Ni | Cd | Al | Zn | Au |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **LF955-38** | Bal | 3.6-4.0 | 0.5-0.9 | 0.050 Max | 0.050 Max | 0.050 Max | 0.050 Max | 0.010 Max | 0.010 Max | 0.005 Max | 0.001 Max | 0.001 Max | 0.001 Max | 0.002 Max |
| **LF958-35** | Bal | 3.3-3.7 | 0.5-0.9 | 0.050 Max | 0.050 Max | 0.050 Max | 0.050 Max | 0.010 Max | 0.010 Max | 0.005 Max | 0.001 Max | 0.001 Max | 0.001 Max | 0.002 Max |
| **LF965-30** | Bal | 2.8-3.2 | 0.3-0.7 | 0.050 Max | 0.050 Max | 0.050 Max | 0.050 Max | 0.010 Max | 0.010 Max | 0.005 Max | 0.001 Max | 0.001 Max | 0.001 Max | 0.002 Max |
| **LF217** | Bal | 3.8-4.2 | 0.3-0.7 | 0.050 Max | 0.050 Max | 0.050 Max | 0.050 Max | 0.010 Max | 0.010 Max | 0.005 Max | 0.001 Max | 0.001 Max | 0.001 Max | 0.002 Max |

| | Sn/Ag/Cu | Sn63/Pb37 |
|---|---|---|
| Melting Point, °C | 217-221 | 183 E |
| Hardness, Brinell | 15HB | 14HB |
| Coefficient of Thermal Expansion | Pure Sn= 23.5 | 24.7 |
| Tensile Strength, psi | 4312 | 4442 |
| Density, g/cc | 7.39 | 8.42 |
| Electrical Resistivity , (µohm-cm) | 13.0 | 14.5 |
| Electrical Conductivity, %IACS | 16.6 | 11.9 |

| | Sn/Ag/Cu | Sn63/Pb37 |
|---|---|---|
| Yield Strength, psi | 3724 | 3950 |
| Total Elongation,% | 27 | 48 |
| Joint Shear Strength, at 0.1mm/min 20 C | 27 | 23 |
| Joint Shear Strength, at 0.1mm/min 100 C | 17 | 14 |
| Creep Strength, $N/mm^2$ at 0.1mm/min 20 C | 13.0 | 3.3 |
| Creep Strength, $N/mm^2$ at 0.1mm/min 100 C | 5 | 1 |
| Thermal Conductivity, W/m.K | 58.7 | 50.9 |

## Wire Diameter

SnAgCu alloy wire is available in a variety of diameters. The chosen diameter is based on application methods, pad size, and desired solder joint volume. Generally, the diameter of the wire should be slightly larger than the width/diameter of the joint or connection to be soldered. Below is a list of standard diameters.

**Standard wire diameters**

| Diamter/Inch | 0.125 | 0.092 | 0.062 | 0.050 | 0.040 | 0.032 | 0.028 | 0.025 | 0.020 | 0.015 | 0.010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Diameter/mm | 3.18 | 2.33 | 1.57 | 1.27 | 1.01 | 0.81 | 0.71 | 0.63 | 0.51 | 0.38 | 0.25 |
| Std.Wire Gauge | 11 | 13 | 16 | 18 | 19 | 21 | 22 | 23 | 25 | 28 | 31 |
| Tolerance, in. | +/-0.006 | +/-0.005 | +/-0.003 | +/-0.003 | +/-0.002 | +/-0.002 | +/-0.002 | +/-0.002 | +/-0.002 | +/-0.002 | +/-0.002 |

## Flux Percentage

Qualitek utilizes a state-of–the-art automatic wire extrusion and wire drawing machines to manufacture consistent solder. The introduction of flux core in the wire extrusion process involves constant monitoring of flux percentage to ensure minimal flux voids and irregular wire. Typical flux percentage for lead free solder is **2.0-4.0%.**

## Flux Core

Qualitek has developed a unique flux system designed specifically for high temperature lead free alloys. It provides the fluxing activity levels that promote fast wetting action and maximum wetting spread. WS700 exhibits virtually no spattering. WS700 conforms to J-STD-004, ORH1.

Main Features

- Excellent wettability
- Flux does not carbonize or decompose under prolonged heat

| | Specification | Test Method |
|---|---|---|
| **Flux Classification** | ORH1 | JSTD-004 |
| **Copper Mirror** | Complete removal of copper film | IPC-TM-650 2.3.32 |
| **Silver Chromate** | Fail | IPC-TM-650 2.3.33 |
| **Corrosion** | Pass (cleaned coupons) | IPC-TM-650 2.6.15 |
| **SIR (cleaned)** | | |
| JSTD-004,Pattern Down | $1.49\times 10^{10}$ | IPC-TM-650 2.6.3.3 |
| Bellcore (Telecordia) | $4.12 \times 10^{11}$ ohms | Bellcore GR-78-CORE 13.1.3 |
| **Post Reflow Flux Residue** | 65% | TGA Analysis |
| **Acid Value** | 120-130 | IPC-TM-650 2.3.13 |
| **Flux Residue Dryness** | Pass | IPC-TM-650 2.4.47 |
| **Spitting of Flux-Cored Solder** | 0.4% | IPC-TM-650 2.4.48 |
| **Solder Spread** | 130 $mm^2$ | IPC-TM-650 2.4.46 |

## CLEANING

WS700 is a water-soluble formulation therefore the residues **must** be removed for typical applications. Residue removal is easily achieved, with the use of hot 60 C (140 F) de-ionized water in either a batch or conveyorized cleaner. Spray pressures so be maintained at 20-30 psi and conveyor speed of 3-6ft/min.

## Storage & Shelf Life

Solder wire storage should be in a 65-80°F environment away from direct heat.  When directly handling solder wire it is recommend to use appropriate gloves.  Solder wire has an indefinite shelf life.

## Disposal

WS700 Lead Free solder should be disposed of in accordance with state & local authority requirements.

## Packaging

Qualitek flux-core wire and solid wire are packed in
12.5lb -box of ½ lb spools
25 lb -box of 1 lb spools
12.5kg -box of ½ kg spools
8 kg -box of 1kg spools
40 lb -box of 5 lb spools
20 lb -box of 20 lb spools