TECHNICAL INFORMATION

No-clean Flux Core Wire Solder

JM – 20

(Sn63Pb37)

1. Feature

1) Halide free, extremely high reliability.
2) Excellent solderability, very fast wetting speed.
3) High surface insulation resistance and no corrosivity, cleaning may be eliminated.
4) Little scattering of solder, very low fume.
5) Clear flux residue offers superior cosmetic.

2. Specifications

Composition / Impurities*[1]

Sn	Pb	Ag	Sb	Cu	Bi	Zn	Fe	Al	As	Cd	Ni	In	Au
63 ±0.5	rest	0.10 Max.	0.05 Max.	0.05 Max.	0.10 Max.	0.001 Max.	0.02 Max.	0.001 Max.	0.03 Max.	0.002 Max.	0.01 Max.	0.10 Max.	0.05 Max.

Solidus / Liquidus point (°C)		183 / 183
Specific gravity		8.4
Flux content (%)		2.2±0.2
Halide content (%)		0.0
Flux type		ROL0*[2]
Silver chromate paper test		No discoloration
Solder spreadability (%)		> 90
Solder wetting speed*[3] (sec.)		< 0.5
Aqueous solution resistivity (Ω•cm)*[4]		≥ 1 × 10^5
Surface insulation resistance*[5]	Initial value (Ω)	≥ 1 × 10^{13}
	After humidification (Ω)	≥ 1 × 10^{12}
Copper corrosion*[6]	Copper plate	Passed
	Copper mirror	Passed
Flux residue stickiness (by chalk powder)		No attachment
Wire diameter (mm)		0.3, 0.4, 0.5, 0.6, 0.8, 1.0, 1.2, 1.6

1. Impurities .....Conforms to IPC J-STD-006C 3.3
2. Flux type.....IPC J-STD-004
3. Solder wetting speed .....By Meniscograph with copper plate (30×7×0.2mm) at 230°C
4. Aqueous solution resistivity .....In accordance with MIL specifications.
5. SIR .....40°C×90%RH×96Hr
6. Copper corrosion.....In accordance with JIS.

3. Flux content

Take about 30g of sample (1.0mm diameter) and measure its accurate mass as W_1 (g) after cleaning the surface with special/grade acetone specified in JIS-K-8034, put the sample into glycerin specified in JIS-K-3351 to melt by heating and, after removing the flux from the resin flux cored solder completely, leave it to cool and solidify.

Next, take out the solidified solder and wash it with water. And after immersing in alcohol for about 5 min., rewashing and drying at ordinary temperature, measure the accurate mass as W_2 (g), and calculate the flux content from the formula (1).

$$\text{Flux content (wt\%)} = \frac{W_1 - W_2}{W_1} \times 100 \quad \text{..... (1)}$$

Koki standard		2.2±0.2
n	1	2.30
	2	2.29
	3	2.30
	4	2.26
	5	2.11
	6	2.30
Average		2.26

4. Halide content (Chloride content)

Wash the surface of solder with special/grade acetone specified in JIS-K-8034, take an amount of solder wire approx. 50g and cut it into chips of 2 to 3mm in length and measure the accurate mass as W_1 (g). Put the solder chips in a 300ml beaker. Add 50ml of the mixture of pure alcohol and benzene (alcohol 10 volume + benzene specified in JIS-K-8858 1 volume), cover it with a watch glass, and shake for about 15min at ordinary temperature to elute the flux. After eluting the flux completely, gently pour the supernatant portion of the eluate into a 300ml beaker. Wash solder chips with 30ml of the above solution 3 or 4 times and add the washing to the flux solution to obtain about 200ml of the test solution.

Solder chips from which the flux has been extracted shall be weighed accurately after drying for an hour at the temperature of approx. 100°C to obtain the mass as W_2 (g), and the difference (W_1 - W_2) in mass between the resin flux cored solder previously measured and these flux-extracted solder chips shall be determined as the mass of the flux.

Then transfer the test liquid in a potentiometric titration equipment and titrate it with N/20 silver nitrate standard solution until the end point where electric potential changes drastically.

Carry out the blank test through the entire process and calculate the chlorine content in the flux from following formula (2).

$$\text{Chlorine content in flux (\%)} = \frac{(AB - CB)}{\text{Mass of flux (g)}} \times 100 \quad \text{.....(2)}$$

A : Quantity of N/20 silver nitrate used (ml)
B : Chlorine equivalent to 1ml of N/20 silver nitrate (g)
C : Quantity of N/20 silver nitrate solution used in the blank test (ml)

[Result]

Koki standard		0.0
n	1	0.0
	2	0.0

5. Copper plate corrosion

Polish the surface of a copper plate of 0.3×30×30mm in size with metal abrasive, or polish and remove the oxide film with No. 500 abrasive paper specified in JIS-R-6252 while bathed in organic solvent such as xylene, and after washing out the soil adhering to the surface with alcohol, etc., leave it in the air to dry completely.

Place the sample of approximately 0.3g on the copper plate, melt it by heating for about 5 sec. at a temperature 40 to 50°C higher than the liquidus temperature of the solder (max. 270°C) and cool it at ordinary temperature to obtain the test piece.

Prepare four test pieces and use three of them as the corrosion test pieces and preserve the remaining one as the reference test piece in dried condition at ordinary temperature.

At 250℃ and cool it at room temperature to obtain the test pieces.

Put three test pieces in a thermohygrostat of temperature 40 ± 2°C and humidity 95% for 96 hours consecutively and compare them with the reference test piece for the evidence of corrosion.

[Result]

n	1	No corrosion
	2	No corrosion
Average		No corrosion / Passed

6. Copper mirror corrosion

After cleaning the surface of a glass plate 1.0×52×76mm specified in JIS-R-3703, metallize it with copper by evaporation to such an extent that it acquires the permeability of 10±5% against the normal incident ray with wavelength of 5000Å, which shall be a test plate.

Drop about 0.05ml of the sample on the test plate described as above to obtain the test piece and put it in to thermohygrostat kept at temperature of the of 23±2℃ and 50±5%, and after leaving 24 hours, remove the flux by washing with isopropyl alcohol specified in JIS-K-8839 and visually compare the degree of corrosion on the test piece with that of the corrosion caused by isopropyl alcohol solution with 35wt% WW rosin.

[Result]

JM-20	WW rosin 35wt% I.P.A. solution
No breakthrough	No breakthrough

7. Aqueous solution resistivity

Extract the flux in purified water and carry out the test on water-soluble conductive components in the flux measuring the conductivity of the extracted water at 20℃.

Take an amount of the flux containing solid portion equivalent to 0.05±0.005g as the sample.

Put the sample in the beaker with 50ml of purified water, then cover the beaker with a watch glass, heat and boil it for about 5 minutes, and further continue heating for about 1 minute. Cool the beaker for about 10 seconds at ordinary temperature, put it in a water bath of about 20℃ to obtain the test solution, and immediately measure the resistance of this water solution with a conductivity meter.

The cell of 0.1 cell constant shall be used.

The purified water to use shall have more than 5×10^5 Ω• cm of specific resistance.

The test shall be made 3 times and take the mean value.

[Result]

Koki standard		$> 5 \times 10^5$
n	1	1.6×10^5
	2	1.3×10^5
	3	1.4×10^5
Average (Ω• cm)		1.4×10^5

8. Insulation resistance

As a test piece, use the comb type electrode of the glass fiber-based copper-clad, epoxy resin GE-3 and GE-4, both specified in JIS-C-6480. After cleaning with alcohol and thoroughly drying the surface, uniformly apply a specific quantity (JIS type-II=0.05ml) of flux (25% flux, 75% 2-propanol solution) onto the electrode and dry it at about 100℃ for 30min. and solder a lead wire onto each terminal to obtain the test piece.

Prepare three pieces of the above test piece and measure the insulation resistance (initial value = DRY) under the above-specified condition.

Put all the test pieces in a thermohygrostat and connect each lead wire with the terminals outside of the thermohygrostat.

Raise the temperature to a specific temperature first, then increase the humidity up to a specific humidity.

After a specific time,

(1) Measure the insulation resistance keeping the test pieces in the thermohygrostat

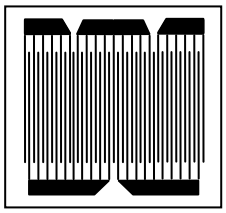
(2) Take the test pieces out of the thermohygrostat, and measure the insulation resistance under the normal temperature and humidity.

Voltage to apply shall be DC100V.

Measurement shall be conducted at 4 points between each terminal pair per test piece and be expressed as a mean value.

* Test conditions : 40°C × 90%RH × 96 hours

Comb electrode type-II



Conductor width	0.318
Conductor interval	0.318
Lamination	15.75

[Result]

Measurement condition		Initial value DRY=100°C × 30min.	In thermohygrostat 40°C × 90%RH × 96 hours	Out of thermohygrostat
n	1	4.2×10^{14}	7.2×10^{10}	6.3×10^{13}
	2	3.8×10^{14}	9.0×10^{10}	4.8×10^{13}
	3	4.5×10^{14}	8.2×10^{10}	4.9×10^{13}
Average (Ω)		4.2×10^{14}	8.2×10^{10}	5.3×10^{13}

9. Voltage applied insulation resistance

As a test piece, use the comb type electrode of the glass fiber-based copper-clad, epoxy resin GE-3 and GE-4, both specified in JIS-C-6480. After cleaning with alcohol and thoroughly drying the surface, uniformly apply a specific quantity (JIS typeII=0.05ml) of flux (25% flux, 75% 2-propanol solution) onto the electrode and dry it at about 100°C for 30min. and solder a lead wire onto each terminal to obtain the test piece.

Prepare three pieces of the above test piece and measure the insulation resistance (initial value = DRY) under the above specified condition.

Put all the test pieces in a thermohygrostat and connect each lead wire with the terminals outside of the thermohygrostat.

Raise the temperature to a specific temperature first, then increase the humidity up to a specific humidity, and apply DC100V.

After a specific time,

(1) Measure the insulation resistance keeping the test pieces in the thermohygrostat.

(2) Take the test pieces out of the thermohygrostat, and measure the insulation resistance under the normal temperature and humidity.

Voltage to apply shall be DC100V for the measurement.

Measurement shall be conducted at 4 points between each terminal pair per test piece and be expressed as a mean value.
* Test conditions : 60℃×90%RH×96, 168, 300, 1000, 2000 hours

[Result]

Measurement condition		Initial value DRY=100℃ × 30min.	In thermohygrostat 40℃ × 90%RH				
			96 hours	168	300	1000	2000
n	1	3.6×10^{14}	5.6×10^{10}	8.0×10^{10}	8.0×10^{10}	8.2×10^{10}	9.1×10^{10}
	2	3.6×10^{14}	7.8×10^{10}	8.5×10^{10}	8.5×10^{10}	9.1×10^{10}	8.8×10^{10}
	3	4.3×10^{14}	8.2×10^{10}	6.3×10^{10}	7.0×10^{10}	8.2×10^{10}	8.3×10^{10}
Average (Ω)		3.8×10^{14}	7.2×10^{10}	7.6×10^{10}	7.8×10^{10}	8.5×10^{10}	8.7×10^{10}

* No evidence of electromigration nor corrosion.

10. Solder spreadability

Wind one turn in a ring form the resin flux cored solder, which has been washed with special grade acetone specified in JIS-K-8034, around a bar with a diameter 2 times the outer diameter of the solder to obtain the sample.

Use as test plate a phosphor deoxidized copper plate C 1201P or C 1220P specified in JIS-H-3100, 0.3×50×50mm in suze, and, after surface treatment by the method specified in 5., subject it to oxidizing treatment in and electric furnace maintained at about 150℃ for 1 hour.

After cooling it at ordinary temperature, remove the residual flux with alcohol, and measure the area covered by solder with a planimeter or measure the height of solder and calculate the rate of spread from the formula (3).

The height of solder shall be measured with a micrometer specified in JIS-B-7502 or with a measuring apparatus equivalent or superior to it.

$$\text{Rate of spread (\%)} = \frac{D - H}{D} \times 100 \quad \text{.....(3)}$$

H : Height of spread (mm)
D : Diameter when the solder used assumed to be a sphere 8mm)

$$D = 1.24V^{1/3}$$

V : Mass/specific gravity

[Result]

Koki standard (%)		> 90
n	1	93
	2	92
	3	93
Average (%)		93