STANNOL

ALU1

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ALU1 is a flux cored solder wire for the soldering on pure aluminium and several aluminium alloys. The flux system ALU1 does not contain any toxic substances. It is based on chemically modified resins and contains no natural rosin. The flux system passed the SIR-tested according to J-STD 004B and is therefore classified as a No-Clean flux **REL1.**

- Chemically modified resin, reducing the health risks of using rosin based fluxes.
- Leaves just slightly coloured residues
- Does not contain any toxic substances
- Suitable for pure aluminium and several aluminium alloys
- No-Clean

Removal of the residues after soldering is not necessary, as the residues are non-corrosive according to standard (see INFOBOX). Is a cleaning required it can be done using alkaline or solvent based cleaning agents like the Flux-Ex200B or Flux-Ex 500. The link to the data sheets of these mentioned cleaners can be found on page 10 of this document.

Soldering on Aluminium is always a very ambitious task, it cannot be compared with soldering on conventional surfaces. This solder wire had been designed to achieve a good wetting on aluminium or aluminium alloys with low amounts of other additions. It is important to take care about the following topics to achieve a proper solder joint.

Temperature is key to success.
The aluminium parts to be soldered need to reach to a high temperature prior to wetting. Please consider different methods of energy transfer and/or add proper preheating to the solder goods. This becomes more important the bigger the aluminium parts become.

Tested methods of heat transfer are:

- Induction soldering
- Resistance soldering
- Soldering irons *[1]
- Micro flame *[2]

*[1] We recommend a solder tip temperature of 350-400°C for soldering with a soldering iron. Soldering irons/stations are not always the optimum source for transferring the energy, especially when bigger parts need to be soldered. Additionally the solder tips might wear out in a very short time.

*[2] Heat transfer by micro flame or plasma is only recommended if there is no direct contact to the solder wire, as this will destroy the resin based flux in very short time.

Preheating of the aluminium parts to be soldered can be advantageous.

The aluminium parts should reach before starting to apply the solder wire at least > 250°C.

The innovative No-Clean soldering series for aluminium is patent pending.
Furthermore a liquid flux, solder paste and a flux gel are in development. Updates will be communicated regularly on our website www.stannol.de

For safety aspects we kindly ask you to refer to our Safety Data Sheet. The download link can be found at page 10 of this document.

INFOBOX

FLUX CLASSIFICATION ACCORDING TO J-STD 004C

The test methods described in the standard are used to categorize fluxes for their properties under standardized conditions. Depending on the results, the fluxes are divided into the categories L, M and H. The following number indicates whether the flux contains halide (1) or is halide-free (0). If all tests are passed in the uncleaned state, the products are generally referred to as No-Clean products. However, this designation only indicates that the respective products have passed the tests in the uncleaned state.
The test conditions, however, do not cover all possible environmental conditions that a PCB can experience in the field. The final risk assessment of the residues and the associated decision as to whether the flux residues must be removed by cleaning after the soldering process is always the responsibility of the electronics manufacturer.

HANDLING GUIDELINES ALU1

The optimal wetting behaviour of ALU1 is, what makes it outstanding. The right top picture shows a dispersion according to DIN EN ISO 9455 for the determination of flux residues. Soldering was carried out on an aluminium 99.5% at a surface temperature of 300°C.

We have carried out various solderability and wetting test with ALU1 during the development in our laboratories. The following surfaces show a good wetting in combination with the ALU1 solder wire:
- Al 99,5 (1050A)
- AlSi1 / AlSi12
- AlCuMg1 (2017A)
- Copper / Brass / Tin

The following surfaces show no wetting in combination with the ALU1 solder wire:
- AlMgSi (6082)
- AlMg3 (5754)
- AlMg1 (5005A)
- Stainless steels

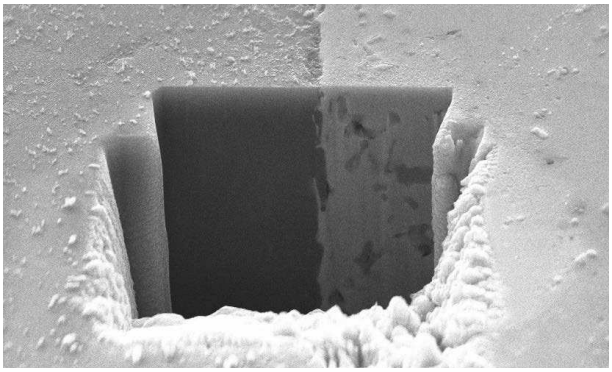
The R&D Team is of course working on further formulations to be able to solder additional aluminium surfaces in the future. Further information can be received from our laboratory on info@stannol.de

Fields of application for the ALU1 solder wire are:
- Cable assembly
- Manufacturing and assembly of winding motors
- Heat sink construction and assembly
- Manufacturing of inductors
- Future application

TRANSPORTATION / STORAGE:
Transport and storage of solder wire is not temperature sensitive. Transportation time should be limited to the required minimum. Transport temperatures for some days of -20°C to +80°C can be tolerated and will show no influence on the properties or behaviour of the solder wire. Storage at dry room temperature (0-40°C) is recommended. STANNOL flux cored solder wires are not limited shelf life items.

Wetting behaviour

Application video



SEM image of the material-locking

INFOBOX

SEM (SCANNING ELECTRON MICROSCOPE)

SEM image of the material-locking, single-phase connection between aluminium (left) and solder Sn99Cu1 (right) in cross section with additional depth section exposed by focused ion beam (FIB)

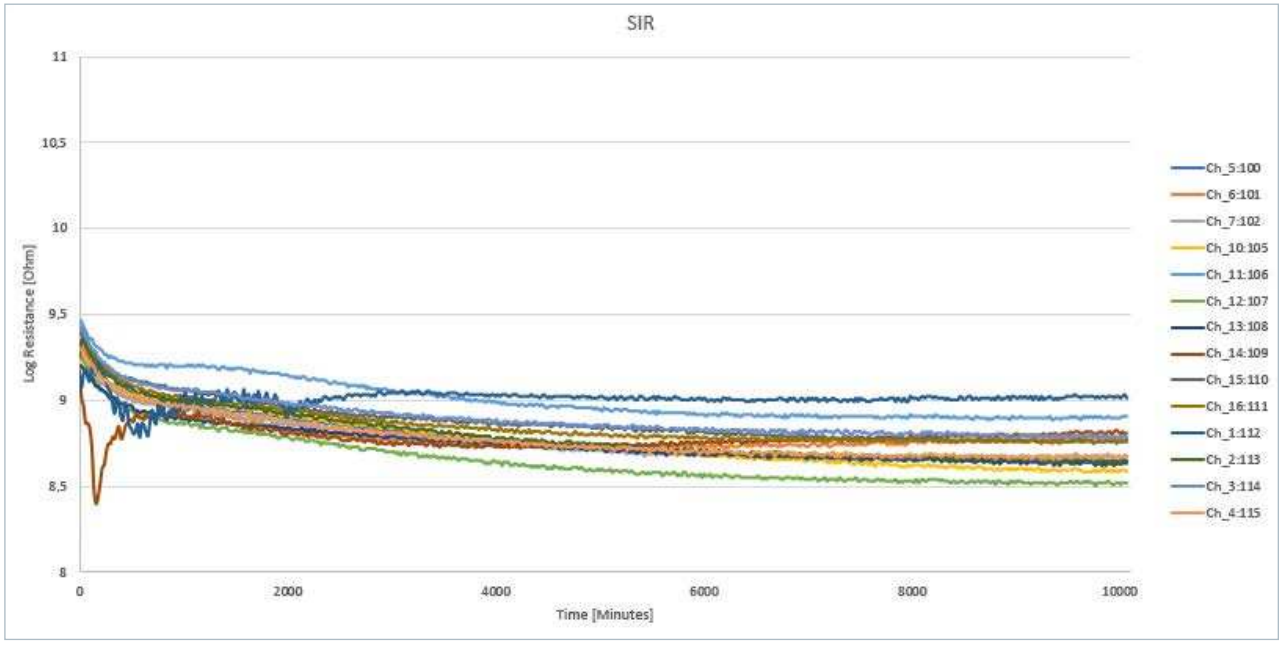
SURFACE INSULATION RESISTANCE (IPC-TM-650, METHOD 2.6.3.3 / 2.6.3.7)

INTRODUCTION:
The acronym SIR stands for Surface Insulation Resistance. SIR is defined as the electrical resistance of an insulating material between a pair of contacts, conduc- tors or grounding devices and that is determined under specified environmental and electrical conditions.

TEST CONDITIONS:
Test board: 400-200µm comb,
Bare Cu on FR-4 base material
Environment: 40 ± 1°C, 90 ± 3%rH
Measurement range: up to 10^{13} Ohm with bias 5VDC
Test duration: 168h (7 days)

EVALUATION:
The criteria for passing the SIR test are:

- All SIR measurements on all test patterns shall exceed the 100 MOhm requirements.
- There shall not be evidence of electrochemical migration (filament growth) that reduces the conductor spacing by more than 20%.
- There shall not be corrosion* of the conductors.
  *Note: Minor discoloration of one pole of the comb pattern conductors is acceptable.



Results: After 168h >10^{8} Ohm PASS

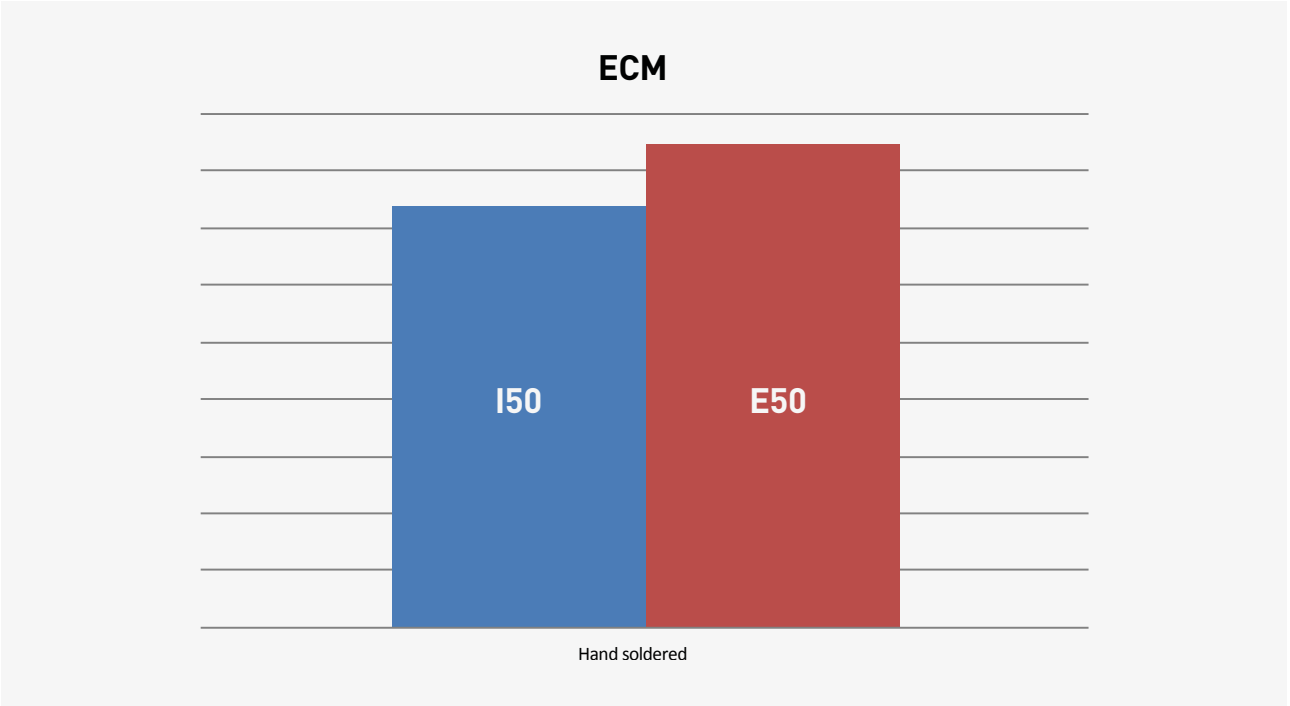
ELECTRO-MIGRATION TEST (IPC-TM-650, METHOD 2.6.14.1)

INTRODUCTION:
The acronym ECM stands for Electrochemical Migration. ECM is defined as the growth of conductive metal filaments under the influence of a DC voltage bias where growth is by electro-deposition from a solution containing metal ions that are dissolved from the anode, transported by the electric field and redeposited at the cathode and specifically excludes phenomena such as field induced metal transport in semiconductors and diffu- sion of the products arising from metallic corrosion.

TEST CONDITIONS:
Test board: IPC-B-25A Pattern D,
Bare Cu on FR-4 base material
Environment: 65 ± 2°C, 88,5 ± 3,5%rH
Measurement range: up to 10^{13} Ω with bias 10VDC
Test duration: 596h (25 days)

EVALUATION:
The I50 or initial insulation resistance, is the data measurement taken after a 96 hour stabilization period. The IR-initial, the daily IR measurements and the final insulation resistance E50 (IR-final) measurement values shall be reported according to the test method. The criteria for passing the ECM test are:

- The IR-final ≥ IR initial/10. That is, the IR shall not degrade by more than one decade, as a result of the applied bias.
- There shall not be evidence of electrochemical migration (filament growth) that reduces the conductor spacing by more than 20%.
- There shall not be corrosion* of the conductors.
  *Note: Minor discoloration of one pole of the comb pattern conductors is acceptable.



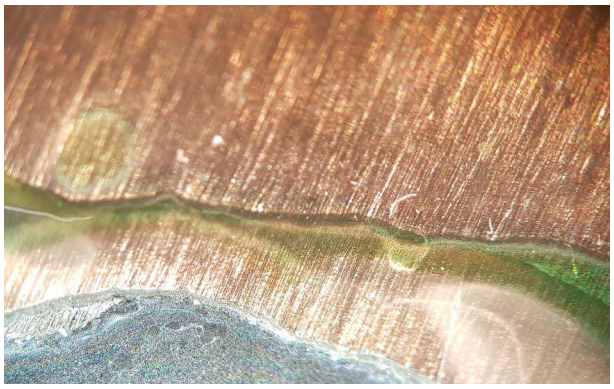
Results: No electrochemical migration. The final IR is ≥ the initial IR PASS

COPPER CORROSION (IPC-TM-650, METHOD 2.6.15)

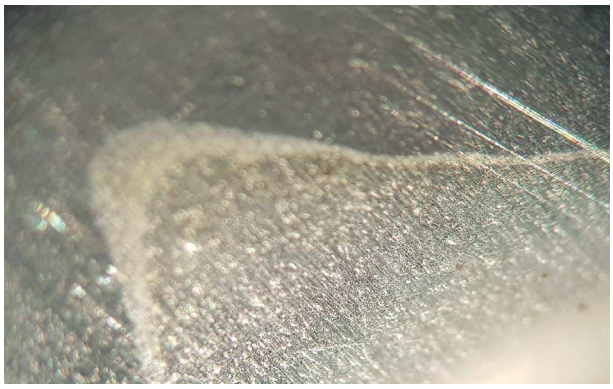
INTRODUCTION:
This test method is designed to determine the corrosive properties of flux residues under extreme environmental conditions.

TEST CONDITIONS:
Test Coupon: 50 x 50 x 0.5mm pure copper sheet
Environment: 40 ± 1°C, 93 ± 2%rH
Test duration: 240h (10 days)

EVALUATION:
No Corrosion: No evidence of corrosion is observed. Any initial change of color, which may develop when the test panel is heated during soldering.
Minor Corrosion: Discrete white or colored spots in the flux residues or a color change to green-blue without pitting of copper.
Major Corrosion: Development of green-blue discoloration/corrosion with observation of pitting of the copper panel.



Results: Copper corrosion (Classified=L)



Results: Aluminium corrosion

We made also a corrosion test on aluminium. The test stay the same only the surface has changed.

INFOBOX

ELECTROCHEMICAL CORROSION

In the case of certain material combinations and the presence of conductive liquids (electrolytes), electrochemical corrosion may occur. However, this is not due to the flux residues, but to the electrochemical potential formed by the metallic joining partners.

COPPER MIRROR (IPC-TM-650, METHOD 2.3.32)

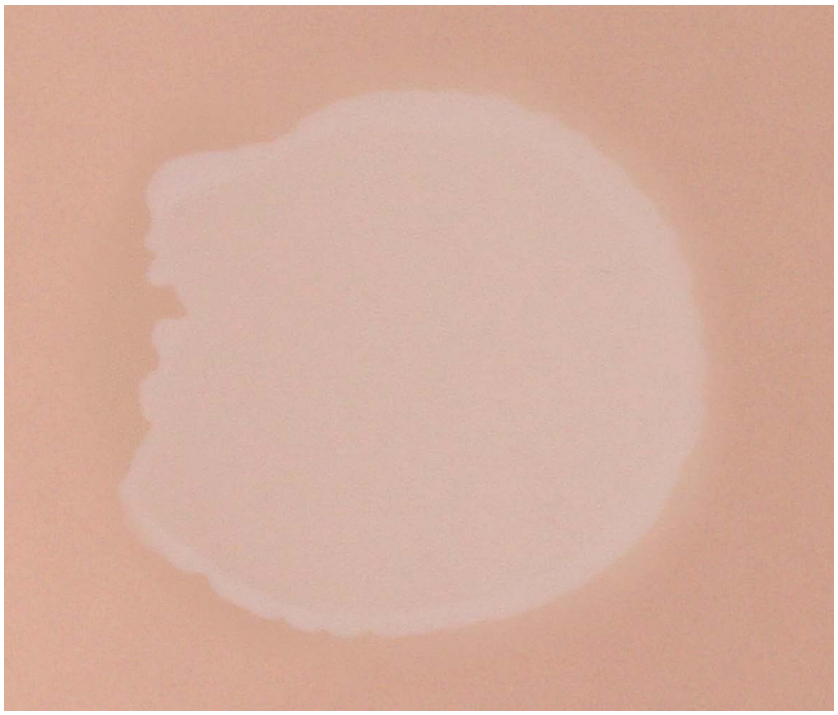
INTRODUCTION:
This test method is designed to determine the removal effect the flux has on the bright copper mirror.

TEST CONDITIONS:
Test Coupon: Test Coupon: Glas panel with a thickness of approximately 50nm
Environment: 23 ± 2°C, 50 ± 5%rH
Test duration: 24h (1 day)

EVALUATION:
L = Only if there is no complete removal of the copper film.

M = If there is complete removal of the copper only around the perimeter of the drops (less than 50% breakthrough).

H = If the copper film is completely removed (greater than 50% breakthrough).



Results: No Breakthrough = PASS (Classified=L)

ACIDE VALUE
(IPC-TM-650, METHOD 2.3.13)

INTRODUCTION:
This test method is designed to determine the acid value in the production process for internal specification.

METHOD:
Method is described in the IPC-TM-650 Method 2.6.13 Method B is used.

RESULTS:
Result: 188 mgKOH/g

QUANTITATIVE HALIDES
(IPC-TM-650, METHOD 2.3.28.1)

INTRODUCTION:
Quantitative halide test shall be used to determine the concentration of Chloride (Cl-), Bromide (Br-), Fluoride (F-) and Iodide (I-) in liquid fluxes or extracted flux solutions.

TEST CONDITIONS / EVALUATION:
Method is described in the IPC-TM-650 Method 2.3.28.1 HPLC is used.

RESULTS:
Result: 0.45%

SUPPLY FORMS

TITEL	ALLOY	DIAMETER	WEIGHT	ART.-NO.
ALU1	Sn99Cu1	1 MM	250 G	478102
ALU1	Sn99Cu1	1 MM	500 G	478101

Additional articles are available on request.

Further technical information can be found on our website at:
www.stannol.de/en/downloads

STANNOL

greenconnect

responsible soldering products

Under the name greenconnect Stannol offers a complete product range that focuses on sustainability and fairness – for a greener future!

SOLDER WIRE

FLUX

SOLDER PASTE

ACCESSORIES

SOLDER BARS

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