



Technical Information

STANNOL® - Flux-Gels Rework fluxes

STANNOL GmbH manufactures and provides a wide range of pasty fluxes since many years. These are applicable for different application ranges. Since decades the STANNOL® **Lötfett „Soldering paste (grease)“** in the „blue jar“ is known for soldering in handicraft, engineering, metal works and piping. This traditional product is limited in use because of its corrosive properties. Therefore electric or electronic equipment is excluded. Despite of the fact that there is a risk, it is used for those applications, where the flux residue is removed by wiping or where the residue can be left around the solder joint.

Kontaktlötpaste "Contact Soldering Paste" is a further development of the soldering paste (grease) based on rosin, adjusted to requirements on ISO flux type 1.1.2. It is used for simple repair of electric and electronic consumer products.

With the development of modern PCB assemblies with fine pitch structures where surface mount technology has been evolved, modern flux-gels are the latest development towards newest soldering technology.

For modern solder paste technology, applicable for printing processes a flux medium was required to combine solderability with applicability in printing and dispensing machines. The medium for solderpaste without any metal powder has already the required properties of a **Flux-Gel**. The first STANNOL® product of this type is **Flux-Gel RMA04**. The well established solder cream RMA04 (now as type SP04 in our program) is used as a robust medium in the Surface-Mount-Technology. Flux-Gels of this type are generally designed as „No-Clean“ products and have in principle the same physical and chemical properties like the corresponding solder creams. Since that time a wide range of flux-gels has been developed with different properties to cope with different requirements: **Flux-Gel RMA04**, **Flux-Gel 135** and **Multifix 450-01**. Special Formulations with fast evaporating solvents are **Kolopaste No.8** and **Smart-Gel No. 8D**. For those who prefer water soluble flux residues **Flux-Gel HX21** is a suitable product.

| Product | Basis | Dispensability | Printability | Method of reflow |
|-----------------|-------------------|----------------|--------------|-----------------------|
| RMA04 | Rosin | fine | good | Reflow |
| Flux-Gel 135 | | fine | very good | Reflow |
| Multifix 450-01 | Resin | fine | good | Reflow/Soldering iron |
| Kolopaste No. 8 | Rosin | coarse | fair | Iron/hot gas |
| Smart-Gel No.8D | | very fine | good | Iron/hot gas/Reflow |
| Flux-Gel HX21 | water-soluble Wax | coarse | poor | Iron/hot gas/Reflow |

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Flux-Gels consist on following compositions: **Rosin (Resin)**, **Solvent** and **Activator**, which are used for a resin solution. Additionally a **rheologic additive** is contained to give the right flow properties, which are typically necessary for a printing or dispensing process. This four principal ingredients vary from type to type to adjust the gel to specific applications.

The individual components will act in a flux gel as follows:

| Component | Influences to | | | |
|----------------------|---------------------|------------|-------------------------------|----------|
| Solvent | Open time | Stickiness | Viscosity | Residues |
| Resin | | Stickiness | Viscosity | Residues |
| Activator | Wetting | | | Residues |
| Rheological Additive | Dosing and Printing | | Slump resistance Viscosity | |

The basic viscosity is formed by the activated resin solution and must be stable enough for a long time and temperature range. The choice of the solvent will influence the drying time. Fast drying is achieved with solvents which have a high evaporation rate and solvents with high boiling point and low evaporation rate will give a long open time of the paste. They will be liquid over the whole soldering process. These will not dry completely when a spot heating is applied e.g. with soldering iron. Residues will be sticky for a long time and will dry very slowly. To avoid the problem a cleaning process is helpful. But if a real reflow profile is applied such residues behave like in a reflow machine and they will dry out as it is known with solder paste (products: **RMA 04**, **Multifix 450-01**, **Flux-Gel 135**).

If there is only local heating like it is commonly used in repair, a flux-gel with a high vapour pressure should be used to get complete and fast drying residues (products: **Kolopaste No. 8** and for fine dispensing with a needle **Smart-Gel No. 8D**).

The activated resin solution need a rheologic additive, to reduce the viscosity and give a good slump resistance for stencil printing. In a dispensing process, the shape of a dot will remain and the drop will not spread out. A good dot definition is necessary in an automated dispensing process. Therefore **Flux-Gel 135** is the best solution.

Water soluble flux-gels are something special. They are normally highly active, and give a good wetting of solder and a good shape of a solder joint. Effective and easy cleaning of the flux residue with water is the advantage of this type of Flux-gel. Water is the best and easiest no-VOC cleaning solvent. **Water soluble gels require cleaning and complete removal of flux residues**. Residues contain ionic contaminants which can lead to electromigration and corrosion.

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The activators for flux-gels are similar to those in solder creams. The chemical activity, their potential to react with oxides will influence the wetting of the solder. But on the other side they influence the reactivity of the residues. Therefore all flux gels are No-Clean products with the exception of the water soluble type.

| Properties and Data: | Smart-Gel No. 8D | Kolopaste No. 8 | Flux-Gel RMA04 | Flux-Gel 135 | Multifix 450-01 | HX21 |
|--|------------------|-----------------|----------------|--------------|-----------------|--------|
| EN 29454 / ISO9454 | 1.1.3 | 1.1.3 | 1.1.2 | 1.1.2 | 1.2.3 | 2.1.2 |
| Colour | yellow | yellow | yellow | yellow | white | yellow |
| Solid content/ % | 53 | 57 | 72 | 65 | 55 | 90 |
| Viscosity/ green needle, 2 bar (dosing at 23°C) / mg | 170 | 120 | 0,8 | 3,8 | 4,8 | 49 |
| Density (20°C) / g/cm ³ | 0,93 | 0.93 | 0,95 | 0,95 | 0,82 | 1,0 |
| Flashpoint (cc) / °C: | 19 | 19 | 109 | 111 | >100 | >120 |
| Ignition temperature / °C | >325 | >325 | >325 | >325 | >325 | >325 |

It is worth to regard the colour of the gels, which are given by the type of resin which is contained. Dark amber to colourless gels are available. Multifix 450-01 is colourless using the same resins which are used for solid flux Kristall 400, a mix of synthetic resins. The water-soluble Flux-Gel Type HX21 is also colourless or yellow at ambient conditions.



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Wetting and spread of solder

For testing the suitability for soldering, the gel is printed onto a copper or a brass coupon. Then a pellet of solder, 200mg, is placed onto the print. The coupon is reflowed at 300°C on a solder bath surface. After melting the solder is spreading, and the solder spread area gives an information on the soldering action. Besides common Sn60Pb40 alloy the lead-free alloy Sn96Ag4 has been tested. Many trials show that under similar conditions the spread area of the lead-free alloy is less than of a tin lead alloy.



printed



placed



reflowed

Examples: Spread on copper



Alloy: SnPb SnAg
Flux-Gel: Multifix 450-01



SnPb SnAg
Flux-Gel 135

Examples: Spread on brass



Alloy: SnPb SnAg
Flux-Gel: Multifix 450-01



SnPb SnAg
Flux-Gel 135

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| Area of spread/mm ² , 200mg solder pellets, Solder bath 300°C | | | | |
|--|---------------------|---------------------|------------------------|------------------------|
| Flux-Gel | Cu-test coupon SnAg | Cu-test coupon SnPb | Brass test coupon SnAg | Brass test coupon SnPb |
| Multifix 450-01 | 33,2 | 38,5 | 38,5 | 52,8 |
| Kolopaste No. 8 | 39,6 | 58,8 | 33,2 | 64,3 |
| Smart-Gel No. 8D | 38,5 | 59,4 | 35,3 | 63,6 |
| Flux-Gel RMA04 | 54,1 | 83,3 | 34,2 | 49,0 |
| Flux-Gel 135 | 44,2 | 91,6 | 34,2 | 52,8 |
| Flux-Gel HX21 | 43,0 | 78,5 | 32,2 | 45,4 |

Dispensing properties:

All of the flux-gels are suitable for dispensing, but there are some points to regard: When using an air pressure system, it is important to make the right choice for the needle and pressure. In the table below there are recommendations for needle sizes. The inside diameter should not be smaller than indicated in the table, larger needle diameters are possible, if accordingly the pressure impulse (pressure/time) is adapted. Another alternative, which is suitable straight for proportioning by hand, are conical TT needles made of plastic. They are suitable particularly for very viscous media, which have poor flow characteristics.

| Product | Recommended Conditions | | |
|------------------|------------------------|--------------|--|
| Multifix 450-01 | 3 bar | pink needle | Inner diameter 0,58 mm |
| Kolopaste No.8 | 2 bar | pink needle | Inner diameter 0,58 mm or conical TT-Needle for better flow properties |
| Smart-Gel No. 8D | 2 bar | pink needle | Inner diameter 0,25 mm |
| RMA04, | 3 bar | pink needle | Inner diameter 0,58 mm |
| Flux-Gel 135 | 3 bar | pink needle | Inner diameter 0,58 mm |
| Flux-Gel HX21 | 1,5 bar | green needle | Inner diameter 0,84 mm or conical TT-Needle for better flow properties |



Dosing needles need care, in particular with longer operating interrupts. The gels tend to dry and the needles start blocking. This can be avoided, if the needle is removed and rinsed with a cleaning gel, by simply putting the needles onto the STANNOL® Clean Gel cartridge.

Clean-Gel is a coloured gel for rinsing the dosing needle, which keeps these open during a very long period. Before a new use the needle must be filled with the appropriate flux

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gel, which can be recognised by the change of colouring. **Clean-Gel** is well soluble in alcohol and is miscible with all flux gels. **Clean-Gel** is coloured with an intensive red dye. It is not dangerous and does not influence the soldering results, if slight red coloration is displaced in small amounts into the flux gel, because remainders of the cleaning gel evaporate when soldering with the solvent system of the flux gel.

Summary:

There are flux gels for different ranges of application in the electronics manufacturing. There are 3 typical types of flux-gels:

- 1) flux gels, which are derived from solder paste media and exhibit similar characteristics, like the solder pastes themselves: **Multifix 450-01**, **Flux-Gel RMA04** and **Flux-Gel 135**. They are suitable for reflow soldering, where sticky gels can hold the components where they are to be soldered ("Tacky flux").
- 2) flux gels with volatile solvents, whose residues dry fast and simply: **Kolopaste No. 8** and **Smart-Gel No. 8D**, well for bit soldering, repair by soldering
- 3) flux gels with water-soluble residues: **Flux Gel HX21** applicable for simple aqueous cleaning

The selection depends on the kind of application:

Printing / Dispensing
Reflow / Hot gas / Iron / Hot bar soldering
No-Clean / Cleaning after soldering

Differences:

Compared with RMA04, the **Flux-Gel 135** has a higher outline stability, higher tackiness, a slightly lower viscosity, and is easier to dispense.

Compared with Kolopaste No. 8, the **Smart-Gel No. 8D** can be dispensed considerably finer and has a lower viscosity. This allows to work with needles with very fine inner diameters.

Further utilities:

STANNOL® Cleaner Flux-Ex 400, and Flux-Ex 500 as spray
STANNOL® solvent saturated wipes
STANNOL® Clean-Gel needle cleaner