
Product & Soldering Guide
DECA-FLUX
PINCEL
ECOCREAM®
Soft Soldering Fluxes
Brazing Fluxes
Liquid-Gel-Paste-Cream-Powder
NON ACID - NON TOXIC

# SOFT SOLDERING

## SOLDERING METALS WITH TIN ALLOYS

### *What is a Soft Solder?*

By soldering is meant the set of techniques by which metals are joined by applying heat and adding to the union an alloy of metals that are different to the metals that we want to join and with a melting point lower than that of these metals. **On cooling, this joint will be able to resist all those movements of expansion, torsion and bending** without causing alterations in the joint in the course of time and under the conditions for which the soldering has been done, pressure temperature, etc. We will define as **Soft Soldering**, that in which the alloy used in the joint has a **melting point of less than 450°C.**

### *What is capillarity?*

When the alloy used melts it does so in a very fluid form in the narrow space between the pipe and the accessory, even although they are in a vertical and ascending position; this effect is called "Capillarity". When this alloy cools, a permanent union remains between metal, alloy and metal.

### *Why is cleaning or descaling so important?*

To bring about the union through the melting of the alloy, we have to achieve that when it liquefies, it flows, "wetting" the metal in such a way that it covers it completely. This adherence depends on the cleanliness between the external layer of metal and the part of the fused alloy that covers it. This means that **if there is something between the metal base and the added alloy that prevents intimate union, the soldering will be defective** since the alloy will not have spread completely. This is very often the reason why the soldering process fails.

Two mechanical and two chemical methods can basically be used for **obtaining a clean surface on the metal.**



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**Mechanical cleaning is nothing more than rubbing with a wire brush or steel wool** to eliminate dirt and metal oxides from the surface, leaving it free of any impediment to the free spreading of the alloy over it. **During mechanical cleaning the surface of the metal is slightly scratched**, producing microscopic grooves which **increase enormously the surface of the metal**: this roughness **greatly favours an increase in the adhesion of the alloy to the metal**, because there is more surface for doing so. **Chemical cleaning consists in using chemical products** containing acids or products that react with the metal oxide and remove it from the surface of the metal.

### *What function has the descalant or flux during the heating?*

Once the surface of the metal is "clean" of impurities, oxide or residues of this, we still cannot proceed with the heating of either the metal or the alloy because we must **protect the metal from the new formation of oxide during heating**. This product which prevents the formation of oxide during heating and so makes sure the surfaces are clean during the whole soldering process **is called a "descalant" or "flux"**. Given that the descalant or flux tends to prevent the formation of oxide between the surfaces to be soldered it is evident that during its application **we must make sure that it is distributed evenly over the whole area where the alloy has to flow.**

### *Why is overheating to be avoided?*

During the soldering process, **it is important not to allow "overheating"** and the possible destruction of the descalant or flux whereby they would be unable to dissolve the oxides that might form during heating and then eliminate them. This fault appears too frequently in soldering that fails. **To prevent this "overheating" it is advisable that we check continually that the alloy has reached its melting temperature** by bringing it close to the hot area that has to be joined, or better still, by using a mixture of descalant and alloy in powder form. **Copper loses its mechanical properties if it is overheated.**

It is important not to use too large a source of heat, as for example using an oxyacetylene torch to solder a size 12 fitting.

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*It is important to know which product we have in hand.*
*The Standards are important.*

**Safety is also an important factor** to be kept in mind during soldering, since the fluxes as well as the alloys often contain harmful products.

Descalants or fluxes applied cold or when heated during soldering decompose in the form of vapours into **products that are potentially toxic and form a health hazard**. It is therefore recommended because of all this that the work place is well ventilated, and that the maker complies with the current regulations on toxicity as well as reading all the properties described on the labels. In some countries their use must comply with the regulations of the local authorities for the use of fluxes in copper pipes for water and gas, as a preventative measure for harmful substances.

## Instructions:

- **No need to clean from oxides the copper from oxides beforehand**
- **Apply the flux on the area to be soldered**
- **Insert the fitting and twist it to ensure even coverage by the flux**
- **Heat the copper pipe near the fitting (not over the flux) with a torch**
- **Apply solder straight to the joint while keeping the torch heating the pipe (not the solder tin wire). Do not overheat the pipe nor the fitting.**
- **Remove excess flux from the exterior of the joint with a wet cotton rag**



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## Soldering cuprous metals -copper, brass and bronze- with tin alloys (tin/silver, tin/copper or tin/lead)

## LIQUID

### STANDARD SERIES

**DECALIQUID**

1-Apply the liquid to the pieces to be soldered (application brush included). No need to clean the copper beforehand.
2-Apply heat and add the tin solder. This is then dispersed by capillary action.
3-After soldering, remove excess flux.

- Contains zinc chloride
- pH 2/3
- Irritant product
- Corrosive product
- Toxic in contained amounts

Standard DIN EN 29454 3.1.1.A


### ECOLOGICAL SERIES

**ECOLIQUID**

1-Apply the liquid to the pieces to be soldered (application brush included). No need to clean the copper beforehand. The product can be applied either with the brush or with the finger as it is NOT IRRITANT to the skin due to its Neutral pH.
2-Apply slightly heat, sufficient for the flux to act and add the solder. This is then dispersed by capillary action.
3-After soldering, remove excess flux; if there is a little remaining it will not be dangerous because it is NOT CORROSIVE. The product has been toxicologically tested and proved not to be TOXIC by ingestion.
Precaution: Do not overheat, it can destroy the flux.

- Does not contain zinc chloride
- pH 7
- Non-irritant product
- Non-corrosive product
- Non-toxic in contained amounts

Standard DIN EN 29454 2.1.2.A

# PINCEL SOFT SOLDERING FLUXES

## GEL

### STANDARD SERIES

**DECAGEL**

1-Apply the gel to the pieces to be soldered (application brush included). No need to clean the copper beforehand.
2-Apply heat and add the solder. This is then dispersed by capillary action.
3-After soldering, remove excess flux.

- Contains zinc chloride
- pH: 4/5
- Irritant product
- Corrosive product
- Non-toxic in contained amounts

Standard DIN EN 29454 3.1.1.C

### ECOLOGICAL SERIES

**ECOGEL**

1-Apply the gel to the pieces to be soldered (application brush included). No need to clean the copper beforehand. The product can be applied either with the brush or with the finger as it is NOT IRRITANT to the skin due to its Neutral pH.
2-Apply slightly heat, sufficient for the flux to act and add the solder. This is then dispersed by capillary action.
3-After soldering, remove excess flux; if there is a little remaining it will not be dangerous because it is NOT CORROSIVE. The product has been toxicologically tested and proved not to be TOXIC by ingestion.
Precaution: Do not overheat, it can destroy the flux

- Does not contain zinc chloride
- pH: 7
- Non-irritant product
- Non-corrosive product
- Non-toxic in contained amounts

Standard DIN EN 29454 2.1.2.C




# PINCEL SOFT SOLDERING FLUXES

## PASTE

### STANDARD SERIES

**STANFLUX (FLUX + POWDER ALLOY)**

1-Apply the previously mixed paste with the application brush around the tube and inside the fitting to be soldered in sufficient quantity to avoid excesses.
2-Insert the fitting and apply heat till alloy paste melts. Complete the soldering adding a little of welding wire.
3-After soldering, remove excess flux. There is no danger of overheating the flux.

Presentations:
99.9% Sn
Sn 97% / Cu 3%
Sn 60% / Pb 40%
Sn 50% / Pb 50%
Sn 40% / Pb 60%
Sn 30% / Pb 70%

- Contains zinc chloride
- pH: 4/5- Irritant product
- Corrosive product
- Product toxic in contained amounts

Standard DIN EN 29454
3.1.1.CStandard DIN 1707 L-SnCu3

### ECOLOGICAL SERIES

**ECOPASTE / ECOCREAM**

1-Apply the paste to the pieces to be soldered (application brush included). No need to clean the copper beforehand. The product can be applied either with the brush or with the finger as it is NOT IRRITANT to the skin due to its Neutral pH.
2-Apply slightly heat, sufficient for the flux to act and add the solder. This is then dispersed by capillary action.
3-After soldering, remove excess flux; if there is a little remaining it will not be dangerous because it is NOT CORROSIVE. The product has been toxicologically tested and proved not to be TOXIC by ingestion.

Precaution: Do not overheat, it candestroy the flux.

- Does not contain chloride
- pH: 7
- Non-irritant product
- Non-corrosive product
- Non-toxic in contained amounts

Standard DIN EN 29454 2.1.2.C

# ALLOYS FOR SOFT SOLDERING - With tin alloys

## *Choice of alloy for soldering copper*

Copper and its alloys. Copper is an important construction metal due to its many properties, workability and resistance to environmental corrosion. For soldering it, it is important to **choose an alloy with the lowest possible melting point**, but fulfilling the conditions for which it has been chosen. **The reason for this is that copper looses its hardness at high temperatures**, loosing part of its characteristic qualities. For this reason, wherever possible, **it is preferable to choose a soft solder rather than a hard one**. With pipes of diameter greater than 50 mm. or of great length, a hard solder should be used, and this type of solder should also be used when working temperatures reach 100°C.

**In every case, unnecessarily high temperatures should be avoided as well as an excessive time in applying heat.**

In the soft soldering of copper, with tin alloys, we find a breaking tension of 5Kgs/mm2, at 20°C, whilst the expected one for hard solder is 25Kg/mm2.

**The choice of alloy is very important, since the breaking values of the joint vary substantially with regard to its contents**. Let us look at two extreme cases: For a tin/lead alloy at 90°C we have a breaking value of half of that which it has at 20°C, while for an alloy of tin/silver (5%), at 100°C the breaking value is 6Kg/mm2. This means that if during use the alloy is not going to have to withstand high temperatures, a tin-lead alloy could be chosen, but if the temperature is going to be high, this type of alloy is not going to be suitable.

## *Types of Tin-Silver solder*

**TIN SILVER ALLOYS**. Amongst the tin-silver alloys with Standard UNE 37-403-86, the ***SnAg3, 5***, is outstanding, with 3,5% Silver and with a eutectic melting point of 221°C, and the **SnAg5** with 5% Silver with a slightly higher melting point.



PINCEL SOFT SOLDERING FLUXES

## *The advantages of Tin-Silver*

This solder has extraordinary properties for both sanitary and central heating hot water pipes. With this alloy the temperature can reach 175°C without altering its properties. The use of this alloy **eliminates the dangers** caused by harmful compounds containing **lead**. Its lasting brightness recommends its use for joints in jewellery and stainless steels.

The particularly low temperature of soldering makes this alloy an interesting **alternative to hard soldering**, as much for its lower cost as for its greater ease of working.

## *The disadvantages of Tin-Silver*

The cost of this alloy is appreciably greater than that of tin-lead and tin-copper alloys.

## *Recommended for*

- Central heating installations and hot water pipes, in which the temperatures are high and changes in temperature can produce sudden contractions in the solder.
- Pipes used for foodstuffs and drinking water.

## *Types of Tin-Copper alloys*

TIN COPPER ALLOYS. Amongst these alloys the only outstanding one is SnCu3 with 3% Copper and a eutectic fusion point of 232°C.

This solder **is an attempt to substitute silver, which is dearer, by copper** but this has not given better results. **The maximum temperature of use** in this case remains at **110°C**, appreciably lower than the 175°C which the tin-silver has. In spite of having a melting point of 232°C, complete miscibility of the Copper and Tin is achieved at 320°C, so the temperature of the solder has to be some 100°C more than that of the Tin-Silver alloy.

# PINCEL SOFT SOLDERING FLUXES

### *Recommended for*

- Central heating installations with working temperatures of less than 110°C and hot water pipes in which the temperatures are not high and changes in these cannot produce sudden contractions in the solder.
- Pipes for foodstuffs and drinking water.

### *Types of Tin-Lead alloys*

LEAD ALLOYS. These were the **most used ones in the past** because of their low melting point, but investigation has shown that both Lead and Tin, when alloyed with it, dissolve in water so **its use in sanitary installations is dangerous**. Of all the possible combinations the ones most used are the 67/33 (SnPb) and the 50/50.

### *Recommended for*

**Alloy 67/33 (Tin-Lead): Has a melting interval of 183-249°C**. This high melting interval makes this alloy **ideal for tinning laminated material**.
**Alloy 50/50 (Tin-Lead): Has a shorter melting interval, 183-216°C**, so it can be used in **heating circuits with a maximum working temperature of 90°C.**




# PINCEL BRAZING FLUXES

## BRAZING / HARD SOLDERING

### *What basic functions should be realised by a flux or deoxidant when hard soldering?*

The principal functions that a good flux or deoxidant should develop are:
- Dissolves the oxides and impurities that are found on the surface of the metal that is going to be soldered.
- Helps to fuse, and increases the fluidity, of the alloy used for soldering.
- Prevents the new formation of oxides during heating.
- Moves through the fused alloy together with the dissolved impurities, forming neither bubbles nor smoke and so eliminates the possibility of leaving pores

## SOLDERING METALS WITH SILVER ALLOYS

### *Choice of flux or deoxidant for hard soldering with silver alloys*

For Hard Soldering, the alloys contain mainly Silver and Copper, and with the object of lowering the melting point Zinc, Cadmium and Tin are added singly or together. The Fluxes or Deoxidants used for these types of alloys are basically made from Boric Acid, Borax, Fluorides, Borates and Fluoborates. The composition is adjusted to the point or interval of fusion of the alloy chosen for hard soldering. It should be kept in mind that the residues of flux must be removed when finished soldering since they are hygroscopic and can cause corrosion afterwards.
The choice of flux depends on the margin of fusion of the alloy.

### *Presentation in powder, paste or coating*

The flux can be presented as:
- A finely ground powder that, in coming in contact with the hot rod, melts and sticks to it and serves as a melting vehicle for the alloy. It is applied together with the alloy.
- A paste, in such a physical state that it can "paint" the areas to be

soldered. It is applied before adding the solder.

· A coating on the rod itself. It is applied together with the rod.

The physical presentation chosen will depend on the function of the type of soldering being done. If fitting or narrow spaces are being soldered the flux should flow very well and before heating the alloy to melting, so it is preferable to use paste or powder sticking to the rod and melt it on the surface being soldered, letting it penetrate and spread perfectly, and allowing the oxides formed to escape without obstructing the alloy when it is applied. The use of the coated rod is not the most suitable for this type of soldering; it is better when applied to surfaces.

***Soldering with silver rods requires a flux that melts rapidly and evenly***

Deoxidant for Silver alloys. (Temperature margin between 600 - 800°C). The flux must melt at a temperature lower than that of the alloy, that is at less than 600°C, but must not decompose at temperatures lower than 800°C, so as to support the whole fusion phase of the rod. It should not colour the flame, so that it permits working without straining the worker's vision due to the brightness. The product should be very homogeneous so that when it melts and sticks to the pre-heated rod, it is not only the crystals with low melting point in the mixture that do so.

## SOLDERING METALS WITH BRASS ALLOYS

***Soldering with brass rods requires a more heat-resistant flux***

Brass hard solder is an economic alloy for general use with metals such as copper, steel and cast iron. Its main disadvantages are its low capillarity and high melting point, about 900°C, which necessitates working with a propane/oxygen torch.

Deoxidants for brass alloys (temperature margin between 750 - 1150°C).This type of flux must be adapted to higher temperatures so its components must be able to support a higher temperature without losing their qualities, and possibly during a greater time of application.



PINCEL BRAZING FLUXES

**Brazing cuprous and non-cuprous metals with silver alloys.**
**Flux valid for a temperature range between 600° & 800° C**

## POWDER / PASTE (Deca - Fortex)

New formula: micronized product

Using instructions:
Valid for temperature range of 500-800º degrees. Use with high temperature torch. Heat rod previously and deep it into the deoxidantpowder.
Distribute the flux throughout the areas to be soldered. Follow heating till full melting and dispersal of deoxidant and alloy rod

Dispose excess flux when soldering is finished.

Deoxidant in powder or paste form for cuprous metals hard soldering (copper, brass) and ferrous metals.


- Complies with DIN EN 1045 FH 10
- Warning: Contains Fluorides.
- Can cause eye irritation.
- Can cause skin irritation.
- Can irritate the mouth and digestive tract.
- Can be harmful if breathed. Use in ventilated places only.

**Brazing cuprous and non-cuprous metals with brass alloys.**
**Flux valid for a temperature range between 750° & 1150° C**

## POWDER [Fortex Brass]

New formula: micronized product

Using instructions:
Valid for temperature range of 500-800º degrees. Use with high temperature torch. Heat rod previously and deep it into the deoxidant powder.
Distribute the flux throughout the areas to be soldered
Follow heating till full melting and dispersal of deoxidant and alloy rod.

Dispose excess flux when soldering is finished.

Deoxidant in powder or paste form for cuprous metals hard soldering (copper, brass) and ferrous metals.


- Complies with DIN EN 1045 FH 21
- Warning: Can cause eye irritation
- Can cause skin irritation
- Can irritate the mouth and digestive tract
- Can be harmful if breathed. Use in ventilated places only.



PINCEL BRAZING FLUXES

# ALLOYS FOR BRAZING / HARD SOLDERING

## BRAZING WITH SILVER RODS

### *Is it economical to use rods with high silver content for industrial purposes?*

In the last decade, silver solders have passed from being very selective to having great importance in the industrial field. The efficiency obtained by its use amply compensates the initial cost of the rod itself. Amongst these compensatory advantages there are:

- RELATIVELY LOW WORKING TEMPERATURE (600-800°C). Energy saving and use of simpler torches (propane and propane/oxygen instead of Oxy-acetylene).
- GOOD FLUIDITY AND LOW SURFACE TENSION. These alloys liquefy and wet perfectly, so achieving the total "penetration" of the alloy in the spaces to be joined, and thus obtaining a complete and safe joint.
- GREAT MECHANICAL RESISTANCE. Silver gives great elasticity to the joint so giving great resistance to traction and torsion. The resistance of the joint is approximately 35 Kg/mm2.
- RESISTANCE TO CORROSION. Silver, being a noble metal, strongly resists attack by exterior factors, so lengthening the life of the joint.

### *Composition of rods that contain silver*

For this type of soldering the alloys contain mainly Silver and Copper and to reduce the melting point, metals such as Zinc, Cadmium, Tin and in some cases Silicon are added. The working temperature at which we want to solder will tell us what type of alloy we have to choose. For this purpose we have to consider a set of general rules:

### *How is the ideal alloy for each job chosen?*

- We can say that in a same class of alloys with the same components, the addition of silver increasingly lowers the melting point.

(E.g. Quaternary alloys without cadmium LA25Sn (680-760°C)- Lag30Sn (650-750°C) - Lag40Sn (640-700°C) - Lag45Sn (620-660°C). We can also see that the increase in silver shortens the fusion interval, that is the transition from solid to liquid is quicker. Therefore the greater the content of silver the greater fluidity of the alloy, which allows for soldering thinner joints.

- For the same silver content, the quaternary alloys melt at a lower temperature than the ternary. (E.g. Lag30 (690-765°C) - Lag30Sn (650-750°C). Therefore there is a saving of energy and time.
- The addition of cadmium lowers the melting point. (E.g. Lag30Sn (650-750°C) - Lag30Cd (600-690°C). So there is a saving of energy and time, but the great disadvantage of cadmium is that it has a boiling point of 721°C and is a very dangerous health hazard; its use is being increasingly prohibited.
- As a general rule we could say that for the indicated silver contents, the applications are:
    - o 20% silver: Soldering Copper, Brass, Iron, Steels and Nickel
    - o 30% silver: Soldering Copper, Brass, Iron, Steels, Nickel and Stainless Steel
    - o 40% silver: Soldering Copper, Brass, Iron, Steels, Nickel, Stainless Steel and hard metal (Cutting tools)

## BRAZING WITH PHOSPHOR RODS

### *Advantages and disadvantages in using Phosphor-Copper*

Advantages: These rods are very cheap for having little or no silver. Moreover they do not contain Cadmium, a very toxic material.
Disadvantages: On the contrary, these alloys give brittle joints, needing a high temperature LCuP8 (710-770°C), which improves with the addition of silver Lag5P (650-810°C) and above all gives greater strength to the joint, reaching joint strengths of 25Kg/mm2. In some countries soldering copper pipes with phosphor alloys that do not contain silver is not permitted.



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### *When is a phosphor-copper rod used?*

Use: It is used for soldering copper water and heating pipes, with 5% silver it is used in industry for copper, brass and especially in air conditioning, refrigeration and plumbing, always given that the temperature is not a limitation. It should not be used for ferrous materials.

## BRAZING WITH BRASS RODS

### *Advantages and disadvantages in using brass rods*

Advantages: They are very economical alloys for general use on alloys of copper, steel and cast iron.
Disadvantages: Poor Capillarity (that is, it is not fluid) and needs a high working temperature (over 900°C), and so requires propane oxygen torches. It must be kept in mind that we should avoid overheating, since the alloy loses its possibilities for making a good joint.

### *When is a brass rod used?*

Use: As a carrier or filler metal, thanks to its great joint strength of approximately 39Kg/mm2, being recommended for unions in iron and its alloys when no great fluidity is needed.

# PINCEL PICKLING

## PICKLING GEL / LIQUID for stainless steel and other metals

**LIMP-INOX**

1- Apply over the surface to be cleaned with brush or sleeker, while the metal is at room temperature.
2- To clean with a wet cloth and rinse with water. Leave the cleaner acting on austenitic steels (304/316) for one hour. For other alloys or molybdenum metals it can be left up to 24 hours.
3- To clean with a wet cloth and rinse with water. Clean the used brush with water. Treated surface will be cleaned and shiny, obtaining a protective layer against corrosion.

For Professional use
Contains. Nitric acid, alkaline bi-fluorides


***ISO 9001 : 2000***



# OUR PRODUCTS


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