



APPLICATION MANUAL

Setting, Soldering, Plating

PRECIOSA



Setting, soldering, plating

OVERVIEW OF PRECIOSA PRODUCTS

| COMPONENTS | | SETTING | SOLDERING | PLATING |
|---|---------------------|---------|-----------|---------|
| Fashion Jewellery Stones | Round Stones | ✓ | | |
| | Fancy Stones | ✓ | | |
| Flat Back Stones | No Hotfix | ✓ | | |
| Fashion and Fashion Jewellery Components | Cup Chains | | ✓ | ✓ |
| | Metal Bandings | | | ✓ |
| | Rondelles and Balls | | | ✓ |
| Cabochons | Cabochons | ✓ | | |

Setting

MACHINE SETTING IN CUP CHAIN

The most common way of machine setting is setting the stones in a cup chain. An endless chain is produced and then cut into smaller parts according to the costume jewellery design.

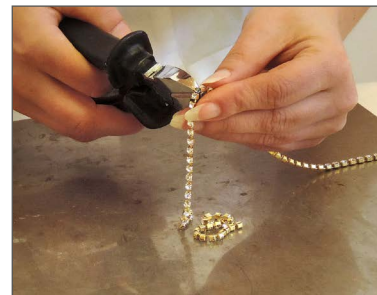
Machine setting is done with a single-purpose machine. The stone is mechanically gathered, placed into the cup and fixed in its position by a pressure head (the cup prongs are closed, i.e. bent and pressed towards the stone). The technical solution can differ in individual stone processing companies.



An endless chain without stones



An endless chain with machine set stones



Cutting of the cup chain

MANUAL SETTING

Setting by hand is used for individual cups or alternative metal parts. The procedure is shown in the following pictures.



Setting the stone into the cup



Manual bending and closing of the prongs with tweezers

Setting tools



Setting and closing tool for individual cups



Tools for closing the cup by hand



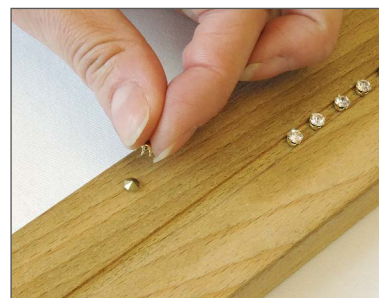
Pressing device



Device for prong closing when setting bigger stones

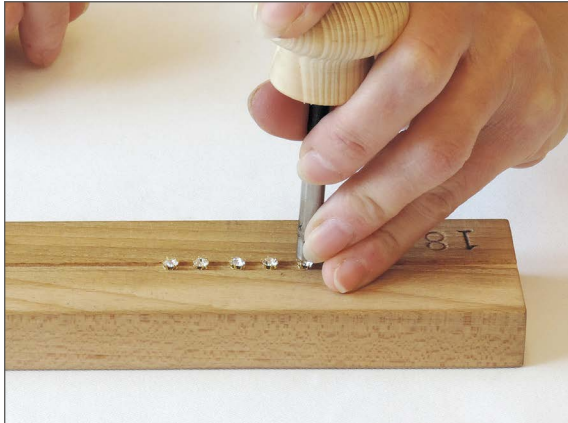


Device for manual setting of rhinestone balls



A simple tool with one groove for manual stone setting

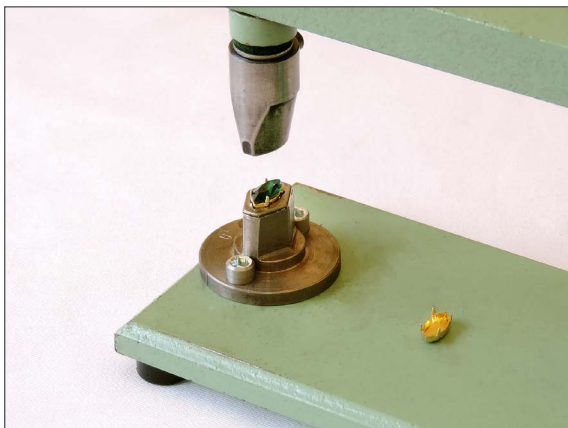
Different ways of fixing the stone in the cup



Fixing the stone in the cup with a tool



Closing the cup by hand



Simple device for setting bigger stones



Fixing the stone in the cup with a pressing device



Note:

Before setting stones, the cup chain should be properly degreased and dried. The stones have to be set with an utmost care and caution as the stone edges must not be damaged.

After setting, the stone should be slightly movable. The cup must be constructed so that the stone can be easily set into it without damaging the foiling or protective varnish. When the cup is too tight or the prongs are bent the foiling or protective varnish can be damaged, possibly resulting in a corrosion (the conductive material of the cup gets into contact with the reflecting layer under the protective varnish). This would negatively influence the optical and aesthetic properties of the stone.

THE MOST COMMON MISTAKES BY STONE SETTING

| PROBLEM | RECOMMENDATION |
|---|---|
| | Check the correct position of the stone in the cup. |
| 1 The stone is set askew. | Check if the right cup size has been used. |
| | Check the correct choice of the cup chain standard – the cup density on one meter length of the cup chain. |
| 2 The stone is too loose in the cup. | |
| 3 The stone is chipped or otherwise damaged after setting. | Set a correct stroke height of the setting head. The prongs should touch the stone surface just lightly and spring minimally. |



Soldering

GENERAL RULES AND RECOMMENDATIONS FOR SOLDERING

Soldering tools



Plate and impression paste



Tweezers



Wire cutters



Solder wire



Smoother



Cup chain



Oxygen/hydrogen soldering kit



Chain spool

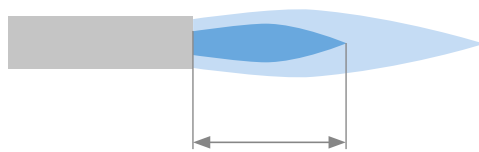
Impression paste

The impression paste should be elastic and should not dry out. It has to effectively remove the heat from the product.

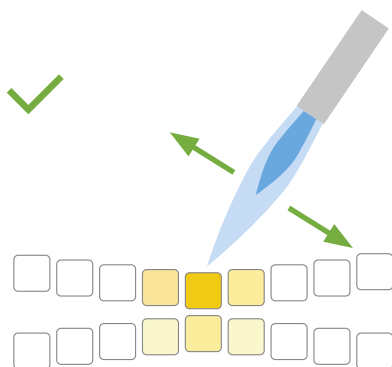
Flame



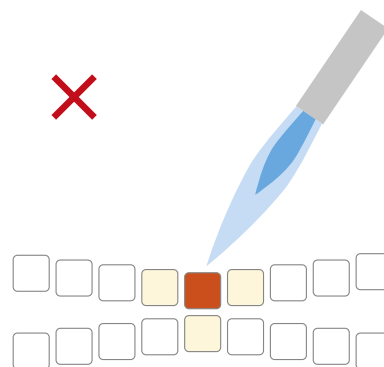
- Change the solder diameter according to the product thickness and dimensions.
- The probability of damaging the stones can be highly reduced by using a burner with a precise flame which can be focused on a minimal area of the soldered joint.
- The flame core should be 5 – 10 mm long; set the oxygen/hydrogen soldering kit accordingly.
- Do not focus the flame on one spot but move it slightly to and fro during soldering.
- Using a proper soldering technique with precise oxygen/hydrogen flame provides the highest labour efficiency.



The optimal length of the flame core is 5 – 10 mm



Moving the flame slightly to and fro during soldering provides an even warming of the joint and does not damage the stones



Focusing the flame on one spot causes stone damage – loss of optical-aesthetic qualities (brilliance, fire)

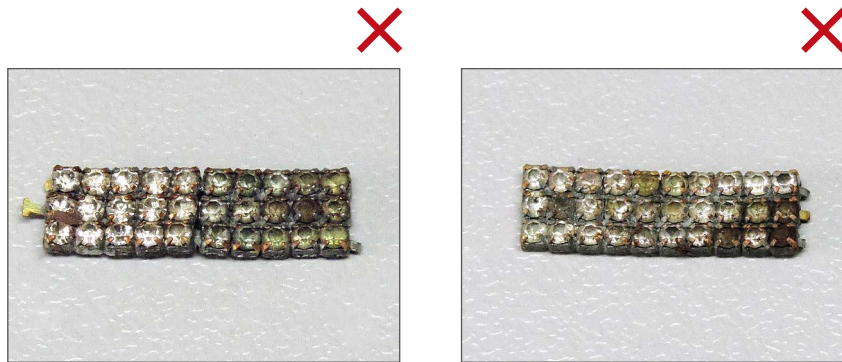
Soldering time and temperature



The right flame size and time of its application are important criteria for a successful cup chain soldering. The size of the flame must comply with the instructions for use. Only that part of the jewellery piece should be heated, where the solder has to flow. If the flame is focused on the jewellery piece too long the stone and the article may become overheated and therefore damaged or destroyed.

A hidden damage becomes usually evident only after further surface treatments, e.g. after degreasing or plating.

A foiling damage by soldering has a negative influence on the results of the subsequent plating process (deterioration of optical-aesthetic qualities).



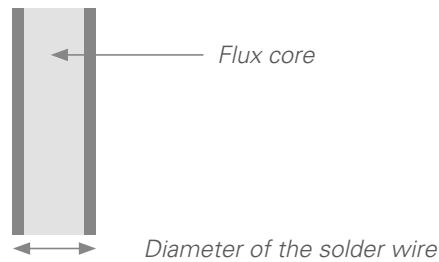
Stones damaged by a long soldering and high temperature

Choosing a proper solder and flux

A solder wire with an integrated flux core is best for soldering cup chains. When using solder pellets or a wire without the flux core, it is necessary to adapt the flux according to the instructions of the solder manufacturer. Corrosive effects on the foiling should be tested in advance.



Solder wire with a flux core



The results should be assessed after the surface treatment as the damage done during the soldering is visible at this point.

Working temperatures and flow characteristics are of particular importance when selecting a solder. Solders are available from various manufacturers in a wire form with or without a flux core, as a paste or in pellets.



When using lead-free solders, an exact temperature control due to higher working temperatures is necessary.

WORKING WITH THE SOLDER

Soldering is a method of producing costume jewellery articles by connecting cup chains with a molten solder. In contrast to brazing, soldering is used for processing semi-products with already set stones. An advantage of this method is its high labour efficiency, its disadvantage (compared to brazing) is a lower joint strength and a greater heat stress of stones during soldering.





The solder amount used for joining the parts should be in accordance with the size of the soldered parts. Too much solder, as well as too little solder, can negatively influence the quality of the product.

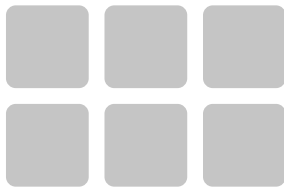


Optimal quantity of the solder



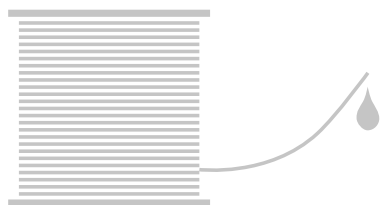
Too much solder (the solder flows over the cups)

Recommended width of the joint



The joint between the soldered parts should be 0,1 – 0,3 mm

Recommended melting temperature of the solder



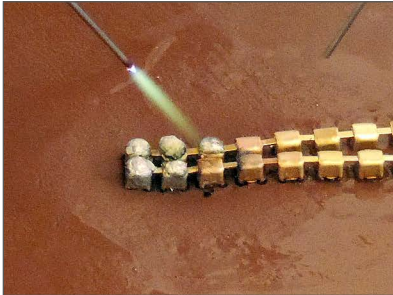
The recommended melting temperature of the solder (S-Sn60Pb40) should be max. 190 °C / 375 °F.

The recommended melting temperature of the solder (Sn97Bi2Cu1P) should be max. 223 - 220 °C / 433 - 437 °F. Working temperature 252 °C / 486 °F.*

* Working temperature is the temperature when fluidity is the best for soldering.



When soldering, only those parts of the product should be heated between which the solder has to flow. We do not recommend to apply the solder on the whole product and heat it afterwards.



Only soldered spots should be heated



Solder applied on the whole product and heating of the whole surface



Even though the melting point of the solder is max. 190 °C (For S-Sn60Pb40) and 223 - 225 °C (for Sn97Bi2Cu1P), the real temperature affecting the stones can be much higher. When using the oxygen/hydrogen flame, the temperature of the flame core can reach even ca. 3000 °C. The resistance of jewelry stones with foiling is under 300 °C.



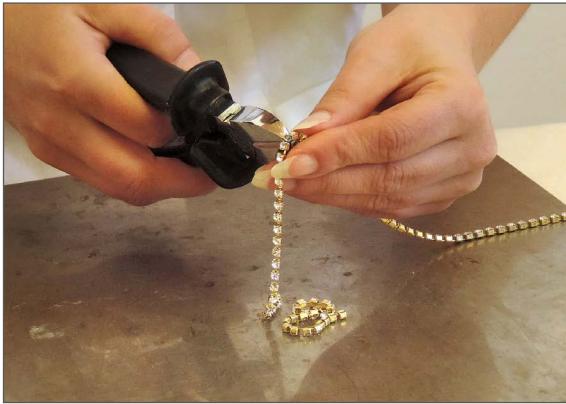
The temperature of the flame core can reach even 3000 °C



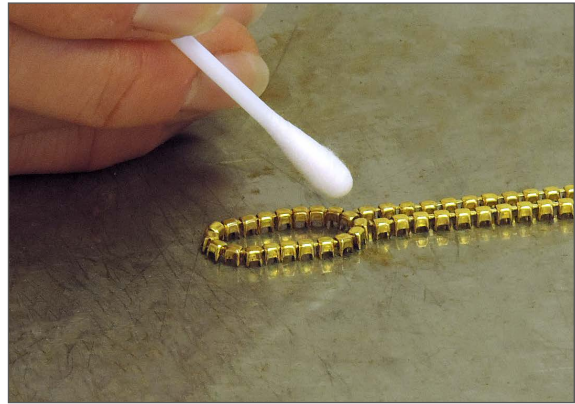
Recommendation:

Using Preciosa stones and components of the top quality together with optimal working conditions (semi-products of the best quality, proper tools, tested procedures) can considerably increase the labour efficiency.

SOLDERING OF SEMIPRODUCTS



1 Cut the cup chain with set stones into pieces of required length according to the costume jewellery design.



2 Degrease and dry the cup chain properly. Use organic solvents or aqueous solutions of suitable detergents. If you want to get a galvanic layer of the highest quality the degreasing procedure can be also done by bright pickling.

✗



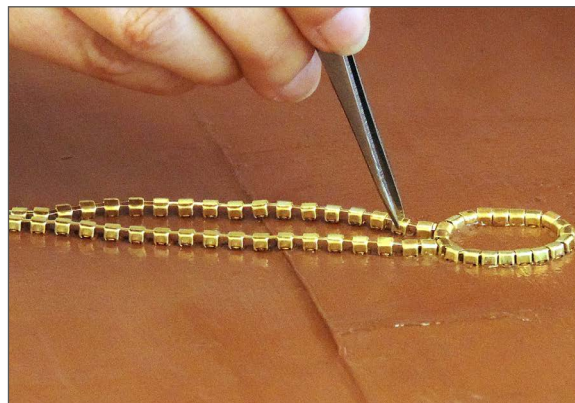
3 Prepare a soldering plate. Spread the impression paste, ram it down and smooth it even in the plate. The impression paste should be elastic and should not dry out.



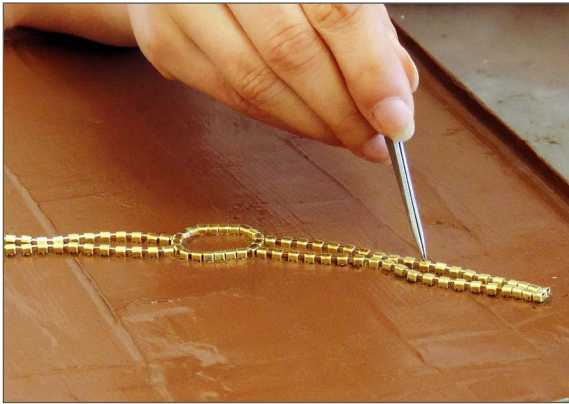
4 Place the plate on a fireproof underlay. It has to effectively remove the heat from the product.



5 Place the original design – so called “sample” – on the prepared impression paste so that the front side with stones is pressed into the paste. An impression of the sample remains in the paste after the sample is removed.



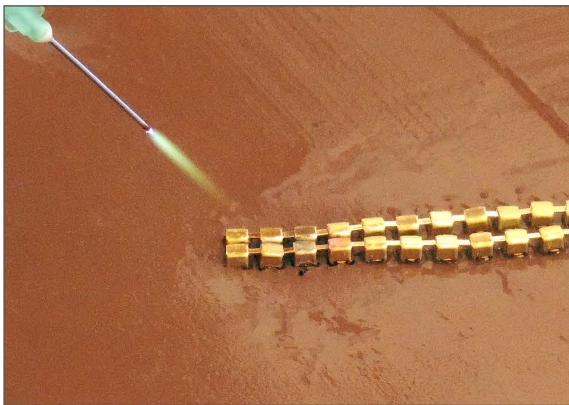
6 Place the cup chain parts into the impression using tweezers. The back side of the components has to be directed upwards, with stone tables facing the paste.



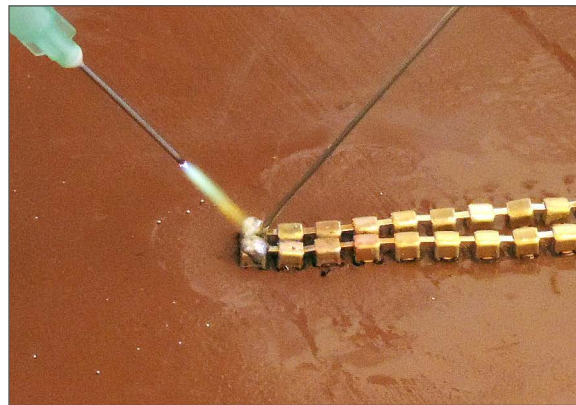
7 Check if the parts in the impression are placed according to the sample.



8 When the layout is definite press on the cup chain evenly using a small plate.



9 Adjust the flame and start to solder. Warm up the part around the soldered joint first so that it can be reliably wetted by the molten solder.



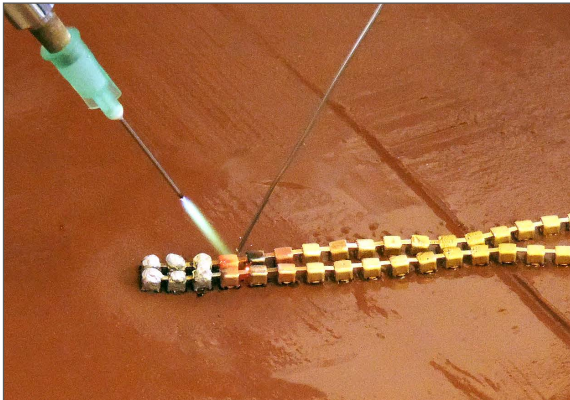
10 Place the solder wire on the hot spot and heat again till the solder melts completely and fills the joint capillary.



11 Repeat the soldering in chosen parts of the jewellery article.



12 After soldering, let the product cool down.



Note:

A strong and reliable joint can only be achieved when parts around the joint are thoroughly warmed. The heat, however, should be applied only for necessary time. A correct time estimation is vital for reaching good results. Exceeding the optimal time can result in a damage of thermally overstressed stones.



Recommendation:

Consider the best layout so that a maximal number of samples can be impressed.

Cleaning of the product

After soldering, let the product cool down and then remove it from the impression paste. Clean the product by immersing it into a mild alkali bath. Use ultrasound to remove solder remainders.

To remove a slight colouring caused by oxidization use a mild acid bath with ultrasound. Natural cleaning agents or identical cleaning substances (turpentine, limonene) can be used in a solution with alcohol and water. Let the product dry at an ambient temperature or dry it in warm air.

COMMON PROBLEMS BY SOLDERING

| PROBLEM | RECOMMENDATION |
|--|---|
| 1 Incorrect impression. | Compare the impression with the sample. |
| 2 The solder does not flow properly – solder and material are heated insufficiently. | Clean mechanically and solder again. Check the solder and change it if necessary. |
| 3 Too much solder – caused by a repeated soldering or an improper solder. | Clean the joint mechanically, e.g. by grinding. |
| 4 Solder flows over the stones – the joint was heated too long. | Remove the solder, replace the damaged stones and set new ones. |
| 5 Yellow or cracked stones – caused by overheating the stones. | Replace the damaged stones and set new ones. |

Plating

Plating is a process using direct electrical current to produce thin metallic layers from solvents of metal salts; the metallic layers are deposited on electrically conductive articles but not on the stones. The stones remain untouched by this process.

Prior to plating, it is necessary to prepare the surface properly. It should be carefully cleaned (usually by degreasing), pickled and activated by dissolving a thin oxide layer on the article surface (usually using acid).



Rhinestone ball before plating



Rhinestone ball in contact silver treatment

GENERAL RULES AND RECOMMENDATIONS

Using Preciosa stones and components of the top quality together with optimal working conditions (semi-products of the best quality, proper tools, tested procedures) can considerably increase the labour efficiency.

Observing the following rules for surface treatment will avoid damaging Preciosa stones.



Note:

- Long exposition times in highly alkaline and cyanide baths together with high current densities can result in a chemical or mechanical destruction of the reflective layer on the bottom part of the stones and their complete damage.
- It is not recommended to use cyanide baths for brass or bronze platings.
- All procedures following the soldering should be carried out quickly one after another so that no excessive time delay occurs.

DEGREASING

Degreasing should be carried out immediately after soldering. If it is postponed (by a few hours or till the next day) the degreasing might not be as efficient as required.

Chemical degreasing

A warm, current-free alkali bath is used as the first degreasing step. Most of the dirt and solder remainders are removed. After degreasing, rinse the product in lukewarm water for 30 seconds.



Note: *If the ultrasound is too strong and the degreasing time too long the protective varnish of the reflective layer can be damaged.*

Electrolytic degreasing

Electrolytic degreasing is an appropriate second step for degreasing cup chain jewellery made of brass and non-ferrous metals in particular. Only cathodic degreasing is used.



Note: *The current density and time must not be exceeded. The reflective layer of the stones could be otherwise damaged (see table Basic characteristics of plating baths).*

PLATING

Pickling

Pickling is carried out in diluted acids (ca 5% HCl nebo H₂SO₄) to remove oxidization and any remainders from the soldering process.



Note: *Nitric acid (HNO₃) cannot be used for pickling. It etches and passivates the tin solder.*

Cyanide copper plating

Cyanide copper plating helps to improve the adhesion of the subsequent acid copper plating. Acid copper plating does not always adhere to the solder properly.



Note: *The current density and time must not be exceeded. The reflective layer of the stones could be otherwise damaged.*

Bright copper plating

A sulphuric bath for bright copper plating is recommended. The surface is perfectly evened up resulting in a bright lustre.



Note: *When using stones with AB coating, the AB coating can be plated if the recommended time for plating is exceeded.*

Nickel plating

Nickel plating is no more used as nickel is an allergen. Palladium or silver are used instead. If nickel plating is nevertheless necessary the usual chloride bath can be used. The conditions of the bath do not damage the stones.



Note: When using stones with AB coating the stone surface can be quickly plated as well. The recommended time for plating is max. 3 minutes in this case.

Palladium

Palladium is used as a white interlayer instead of nickel. Bronze cannot be used as the bronze bath is too aggressive and damages the stones.

Silver

Though a silver plating bath has a high content of cyanides and is strongly alkaline, it is used at the room temperature and is not dangerous for the stones.

Rhodium

A rhodium bath on sulphates or phosphates bases provides a high gloss plating. The bath conditions are not dangerous for the stones.

Gold

A gold plating bath can be alkaline (pH 9-10) or acid (pH 3-4). The bath conditions are not dangerous for the stones. An alkaline bath can provide plating of < 0,2 µm thickness. An acid gold plating bath should be used if a thicker gold layer is required (up to 1 µm).

Corrosion protection

To protect metal parts of cup chain jewellery against corrosion a protective organic varnish, usually on an acrylate base, is deposited by an electrophoresis. The varnish covers only conductive parts and the stones remain untouched. The varnish qualities are not dangerous for the stones.

Observing the above mentioned recommendations and rules together with using Preciosa stones and components ensure outstanding results.

BASIC CHARACTERISTICS OF PLATING BATHS

| Operation/ Plating | Bath Description | Temperature | | Acidity/ Alkalinity | Time | | Current Density A/dm ² | Rinsing | | Drying |
|-------------------------|---|-------------|---------|------------------------|------------------------|--|---|---|--------------------|--------|
| | | °C | °F | pH | Ultrasound Yes / No | 1 st Stage T= 20° C 68° F | | 2 nd Stage T= 60° C 140° F | T= 90° C 194° F | |
| Hot Degreasing | Alkaline electroless bath | < 60°C | < 140°F | < 12,5 | yes<2min | no<5min | | 30 sec. | no | no |
| Electrolytic Degreasing | Alkaline bath for cathodic degreasing | < 45°C | < 113°F | < 12,0 | no < 20 sec. | | < 3 A/dm ² | 30 sec | no | no |
| Pickling | Dilute acids 5% HCl or 5-10% H ₂ SO ₄ | < 30°C | < 85°F | < 1 | no < 20 sec. | | | 30 sec. | no | no |
| Cyanide Copper Plating | Warm cyanide copper bath | < 60°C | < 140°F | < 10,5 | no < 30 sec. | | < 2 A/dm ² | 30 sec. | no | no |
| Bright Copper Plating | Glossy acid sulphurous copper bath | < 30°C | < 85°F | < 1 | no < 10 min. | | < 3 A/dm ² | 30 sec. | no | no |
| Nickel Plating | Chloride or sulphurous nickel bath | < 60°C | < 140°F | 4 - 5 | no < 20 min. | | < 9 A/dm ² | 30 sec. | no | no |
| Palladium Plating | Cold weak alkaline bath | < 30°C | < 85°F | < 8 - 9 | no < 2 min. | | < 1 A/dm ² | 30 sec. | no | no |
| Silver Plating | Cold cyanide bath | < 30°C | < 85°F | < 12,0 | no < 1 min. | | < 2 A/dm ² | 30 sec. | no | no |
| Rhodium Plating | Sulphate- or phosphate-based baths | < 50°C | < 121°F | < 1 | no < 1 min. | | < 1 A/dm ² | 30 sec. | 30 sec. | yes |
| Gold Plating I | Acid gilding bath | < 60°C | < 140°F | 2 - 5 | no < 1 min. | | < 1 A/dm ² | 30 sec. | 30 sec. | yes |
| Gold Plating II | Alkaline cyanide gilding bath | < 60°C | < 140°F | 9 - 10 | no < 1 min. | | < 1 A/dm ² | 30 sec. | 30 sec. | yes |

COMMON PROBLEMS BY PLATING

| PROBLEM | RECOMMENDATION |
|--|--|
| 1 Imperfect surface appearance before plating. | Before plating, clean the costume jewellery carrier properly: first mechanically, then chemically in a degreasing bath. Rinse thoroughly afterwards. |
| 2 Uneven surface after plating, so called "orange peel". | Polish the surface better next time and check the technological conditions in the plating bath. |
| 3 Corrosion. | Rinse the product in clean water. It is recommended to use de-mineralized water (conductivity <15µS/cm). Make the time gaps between individual procedures minimal. |

Important advice and information

MAINTANANCE

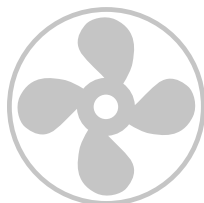
- Protect the costume jewellery from contact with hard objects.
- The costume jewellery lifetime can be prolonged if the costume jewellery is kept separately in a box or a bag.
- Do not wear the costume jewellery during activities where it can get into contact with water (bathing, showering, dish washing etc.) as it could suffer a damage.
- Do not wear the costume jewellery by sport or other physical activities, when going to bed etc. Mechanical or surface damage of the product can be thus avoided.
- Avoid a contact of the costume jewellery with chemical substances. Effects of some perfumes, creams, sea water, chlorine and other chemicals can damage surface treatments.
- Do not use the costume jewellery in surroundings where sulphur and jodine are present (e.g. spa).
- Clean the costume jewellery regularly. Use a soft cleaning cloth, aqueous solutions or cleaning creams (do not use lemon juice as it is aggressive).

CLEANNESS AND WORK SAFETY

The material and all tools should be clean and without any grease in particular. When soldering and plating, an adequate ventilation is essential. Goggles and possibly protective gloves are also important. Follow the recommendations given in the safety information sheets of particular products. Protective gloves also prevent the tools from getting dirty.



*Tools and material
without grease*



*Ventilated
working place*



Goggles



Protective gloves

GENERAL RECOMMENDATIONS

FASHION JEWELLERY STONES

FLAT BACK STONES

Stones with coatings
— use only gentle
wash cycle (30 °C).



Turn inside out, choose a gentle wash cycle and use mild laundry detergent. To protect the crystals as much as possible, the use of a soft wash bag is recommended.

Round
Stones,
Channel



Fancy
Stones,
Ball



No Hotfix
Stones



Hotfix
Stones



Sew-on
Stones



Turn inside out and use mild laundry detergent.



Do not wash!



Chlorine bleach may be used.



Do not use chlorine bleach!



Turn inside out and dry at reduced temperature.



Do not tumble dry!



Iron inside out using a silk/polyester viscose setting. Ironing the textile inside out and using a pressing cloth is recommended.



Iron inside out using a wool setting.



Do not iron! Do not iron directly over the crystals.

To protect the crystals as much as possible, the use of a soft wash bag is recommended.



The textile can be gently dry-cleaned using perchlorethylene. Turn inside out.



The textile can be gently dry-cleaned using hydrocarbon.



The textile will withstand gentle professional wet cleaning. Turn inside out.



The textile may not be dry-cleaned.



Preciosa Components

A Member of the Preciosa Group

Preciosa Group is a global leader in products *manufactured from crystal*. From the world famous Czech Beads and Crystal Components used in fashion industry, to tailor made Lighting projects for luxury hotels, royal palaces and yachts, the true craftsmanship of crystal production has been present in Bohemia since 16th century.

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