



## Silk Matt Gold Preparations for Brush Application on Glass

### 1 General Information

Silk matt gold forms after firing a silk matt gold film of approx. 0.2 µm. Silk matt decorations need not to be burnished and therefore they are a low-cost alternatives to the conventional burnished gold.

### 2 Standard Firing Range

Substrate Type	Firing Range
Soda Lime Glass	approx. 520 - 620°C (940 - 1150°F)
Lead Crystal	approx. 480 - 540°C (890 - 1004°F)

The optimum firing result depends on the firing temperature, on the total firing time, the soak time and not least on the glass type. To achieve an optimized firing result, we therefore recommend the user to check under his own individual conditions.

### 3 Properties of the Preparations

The major characteristics of a Heraeus precious metal preparation are determined by its production recipe. From each lot produced, we take a sample and check defined characteristics.

We check the physical properties (e.g. viscosity) and also the application properties (e.g. brushability) of our precious metal preparations for brush application against a predefined standard before firing. After the firing under defined conditions, we check the optical properties (matt level and colour). Controlling each single production lot assures the highest product quality and lot-to-lot stability.

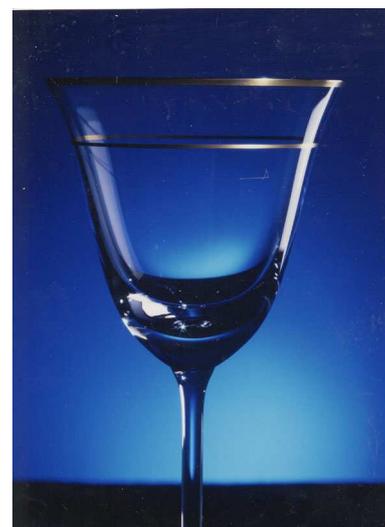
#### 3.1 Processing

We deliver silk matt precious metal preparations for brush application ready to use. They can be applied without further thinning and distinguish themselves by their excellent application properties and sharp outline. They need to be shaken before they are used. Thinning may be necessary after a longer processing time and the resulting solvent evaporation of the used preparation, or when decorating large areas.

#### 3.2 Storage

Also silk matt precious metal products are subject to an ageing process. As a rule, the viscosity increases with the storage time. Therefore, we recommend to use the preparations within 6 months. They should be stored at room temperature (approx. 20°C / 70°F).

Storage at 7-14°C / 45-57°F reduces the increase in viscosity during storage.



The statements concerning our products correspond to our current knowledge and experience. It is the obligation of the purchaser to examine the usefulness of the products in its intended use in each individual case. In order to prevent production losses the user has to test the preparations in connection with every other material being involved in the production process and has to be satisfied that the intended result can be consistently produced.

### 3.3 Consumption

The material consumption depends on the thickness of the applied precious metal layer. Under our conditions, the consumption is approx. 0.15 to 0.30 g /100 cm<sup>2</sup>.

## 4 Properties Of Finished Decorations

The main properties of fired silk matt precious metal decorations comprise matt level and precious metal tone, as well as resistance to mechanical and chemical attack.

These properties are influenced by a number of factors. The high quality of the preparation used is an absolute prerequisite for manufacturing high-quality decorations. The quality of a fired decoration, however, derives from the interplay of preparation, application, substrate surface and firing conditions. A variation in one factor – for instance, the firing conditions, has an influence that leads to altered properties of the fired decoration.

However, the user must always test the products under his own individual conditions.

### 4.1 Silver Containing Precious Metal Preparations

To achieve lemonish, light yellow and yellow gold decorations, silver is added to the formulation of precious metal preparations. Silver containing precious metal decorations can change their appearance in the course of time, under certain unfavourable external circumstances. Especially the contact to cardboard boxes, high humidity and high temperature support the reaction of silver to silver sulphide. Therefore, the user must individually check the suitability of a silver containing preparation.

## 5 Application Recommendations

### 5.1 Conditions Required For Good Results

- Work in a well-ventilated room. Good printing conditions occur at a room temperature of 20 to 25°C / 68-77°F.
- Make sure that the surface of the object to be decorated is clean and dry. Dust, fingerprints and water condensation can affect the decoration while firing.
- Take care that the objects to be decorated is not taken from a cold store into a warm shop. A fine condensation film may occur, which is not visible for the naked eye. This results in faults (e. g. pinholes) in the fired precious metal decoration! Allow enough time for the material to adjust to the decoration room temperature.

### 5.2 Application Information

- Silk matt preparations need to be shaken before they are used.
- Heraeus supplies silk matt gold preparations with a viscosity ready for use. They can be used without thinning, In some exceptions thinning cannot be avoided:
  - After long processing or
  - During decoration of large areas.

In these cases we recommend a thinning at 5 - 15% V 35 or V 39.

- Draw from the bottle only as much as you can consume within 15 or 30 minutes and close the bottle. Consider that the solvent continuously evaporates in air and therefore the viscosity slowly increases.
- Apply the preparation in a moderate layer thickness onto the object to be decorated. A too thin layer influences the mechanical, chemical and optical properties of the fired decoration. In extreme cases, it can lead to surfaces without any gold character.
- A too thick layer can lead to cracking or to an extremely matt surface.
- Ensure dust free surroundings during the application process and during drying. A wet surface is attractive to dust. After the drying, fire the decorated article as soon as possible.

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## 5.3 Firing

- During the heating up phase, first of all the organic components of the preparation burn off. This process is completed at approx. 400°C (750°F). The gold film formed. A constant, slow temperature increase, enough oxygen and sufficient ventilation are decisive for the quality of the fired precious metal decoration.
- The firing profile considerably influences the mechanical and chemical properties of the fired decoration.
- The rate of cooling has no major influence on the quality of the gold decoration, unlike the firing temperature and soak time. However, the firing process should not be stopped too abruptly after the soak time. If the rate of cooling is too fast, there may be a danger of damaging the article (cracks and broken glass).

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## 6 Frequent Faults, Their Causes And Ways Of Avoiding Them

Fault	Possible Causes	Remedy
blurred contours, running precious metal	to much thinning of the product	leave the bottle open for a while, so that some of the solvent can escape
	the substrate was dirty with a grease film	clean the substrate before decorating
	the thinner was too fat or drying too slowly	leave the bottle open for a while, so that some of the solvent can escape
	too much organic steam in the furnace	reduce the number of objects in the furnace / improve the ventilation
the fired precious metal decoration is too glossy	the preparation was not shaken enough	shake the product before using
	the layer of the product is too thin	increase the layer thickness of the precious metal decoration
the fired precious metal decoration is too dull	the layer of the product is too thick	reduce the layer of the product
preparation shows bad application	the viscosity of the product is too high	thinning of the product with V 35 or V 39
spots, firing disturbance	Objects were soiled by dust, finger marks or water condensation	clean the substrate before decorating
	problems in the kiln <ul style="list-style-type: none"> <li>• Reduce atmosphere in kiln</li> <li>• insufficient ventilation</li> <li>• heat increase is too fast during critical phase between 200-400°C (390-750°F)</li> <li>• too many objects in the kiln</li> </ul>	<ul style="list-style-type: none"> <li>• air addition to the furnace</li> <li>• improve of the ventilation</li> <li>• reduce heating speed</li> <li>• reduce the number of the objects in the kiln</li> </ul>
Precious metal cracks during firing	contamination of the surface causes cracking	clean the substrate before decorating
	the layer of the product is too thick	reduce the layer of the product
low mechanical resistance of the precious metal product	too much thinning of the product, runs give thick layers which crack during firing	less thinning of the product
	too low firing temperature	increase the firing temperature
fine pin holes	the layer of the product is too thin	increase the layer thickness of the precious metal decoration
	pin holes can be caused by moisture on the surface of the decorated object. Taking objects from a cool storage into a warm shop causes invisible condensation on the surface. Note this cannot be wiped off. It reforms immediately	allow enough time for the ware to reach shop temperature

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Colour	Product	Precious Metal Content	Glass		Borosilicate Glass		Quartz Glass	Notes
			●	●	□	□		
light yellow	MG 1012	11,4%	●	●	□	□	-	

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