



Silk Matt Precious Metal Preparations for Brush Application on Porcelain, Bone China and Earthenware

1 General Information

Silk matt precious metal preparations form a silk matt precious metal film of approx. 0.2 µm after firing. Decorations do not need to be burnished. Therefore, they are a low-cost alternative to conventional burnish precious metal preparations.

Heraeus supplies silk matt precious metal preparations for the decoration of porcelain, bone china and earthenware with different precious metal contents.

2 Standard Firing Range

Substrate Type	Firing Range	
Porcelain	780 - 880°C	(1436 - 1616°F)
Bone China	750 - 880°C	(1380 - 1616°F)
Vitreous China	750 - 850°C	(1380 - 1560°F)
Earthenware	650 - 740°C	(1200 - 1365°F)

The optimum firing result depends on the firing temperature, on the total firing time, the soak time and not least on the properties of the glaze. To achieve an optimized firing result, we therefore recommend the user to make tests 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 the application properties (e.g. brushability) of our precious metal preparations for brush application in comparison to a predefined standard before firing. After 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. Thinning may be necessary after a longer processing time and the resulting solvent evaporation of the used preparation, or when decorating large areas.



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.

3.2 Storage

Also silk matt precious metal products are subject to an ageing process. As a rule, the viscosity increases with the storage time. Silk matt precious metal preparations have a settlement of the matting agent, therefore the materials need to be shaken before they are used. 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 of viscosity during the storage.

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 cm².

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.

We have processed the silk matt precious metal preparations under defined conditions. Then we determined the properties of the finished decorations. The following data indicate achievable quality features for the finished decorations manufactured with silk matt precious metal preparations. 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. Under certain unfavourable external circumstances, silver containing precious metal decorations can change their appearance in the course of time. 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 / 66-77°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 precious metal preparations have a settlement of the matting agent, therefore the materials need to be shaken before they are used.
- Heraeus supplies silk matt precious metal preparations with a viscosity ready for use. They can be used without thinning, In some cases thinning cannot be avoided:

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- After long processing or
- During decoration of large areas

In these cases we recommend thinning with 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 may lead to cracking, blistering, 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.

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 precious metal 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 precious metal decoration, unlike the firing temperature and soak time. However, the firing process should not be stopped too abruptly after the soak time. In case the decorated article cools down too quickly, the glaze might crack.

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6 Frequent Faults, Their Causes And Ways Of Avoiding Them

Fault	Possible Cause	Remedy
blurred contours, running precious metal	too much thinning of the product	leave the bottle open for a while, so that some of the solvent can evaporate
	the thinner was too fat or drying too slow	leave the bottle open for a while, so that some of the solvent can evaporate
	too much organic fume in the furnace	reduce the number of objects in the kiln
the fired precious metal decoration is too glossy	the preparation was not shaken enough	shake the product prior to use
	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	contaminations as dust, finger marks or water condensation	clean the substrate before decorating
	problems in the kiln <ul style="list-style-type: none"> • furnace atmosphere reduction • insufficient ventilation • too quick heat up in the critical phase between 200-400°C (390-750°F) • too many objects in the furnace 	<ul style="list-style-type: none"> • increase air addition • increase ventilation • reduce the heating speed • reduce the number of objects in the kiln
Precious metal flakes off during firing	contamination of the surface causes cracking	clean the substrate before decorating
	printed layer of the product was too thick	reduce thickness of applied film
	too much thinning of the product	less thinning of the product
low mechanical resistance of the precious metal decoration	too low firing temperature	increase the firing temperature
	the layer of the product is too thin	increase the layer thickness of the precious metal decoration
fine pin holes	pin holes can be caused by moisture on the surface of the decorated object. Taking objects from a cool store into a warm shop causes invisible condensation on the surface.	allow enough time for the ware to reach shop temperature

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7 Silk Matt Gold Preparations For Brush Application On Porcelain

Colour	Product	Precious Metal Content	ASTM-resistant	microwave-resistant	Sanitary Ware	Notes*
yellow	MG 1316	14+16%				approved standard product
yellow	MG 1516	11%				-
bright platinum	MP 3311					-

* All liquid silk matt precious metal preparations need to be shaken before use

8 Silk Matt Gold Preparations For Brush Application On Bone China

Colour	Product	Precious Metal Content	ASTM-resistant	microwave-resistant	Sanitary Ware	Notes*
yellow	MG 1316	14+16%				-
yellow	MG 5000 D	15%				-

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