



## Thermoplastic Bright Palladium Paste GPP 1119D/TH H

### 1 General Information

GPP 1119D/TH H is a standard thermoplastic bright palladium paste for direct screenprinting on glass. It is used for the decoration of drinking glasses as well as for glass bottles.

### 2 Standard Firing Range

| Substrate                          | Firing range |
|------------------------------------|--------------|
| Soda-lime-glass (drinking glasses) | 560 – 620°C  |
| glass bottles                      | 600 – 640°C  |

The 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 a firing test under the users 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.

In case of screen-printing preparations, before firing, we check the physical properties (e. g. viscosity, thixotropy) and the printing properties compared to a predefined standard. After firing under standard firing conditions, we check the gold colour shade and the adhesion to the substrate. Controlling each single production lot assures the highest product quality and lot-to-lot consistency.

#### 3.1 Processing

We supply bright precious metal preparations for thermoplastic screen printing ready to use. GPP 1119D/TH H has a thixotropic nature, means the typical printing viscosity is reached at certain printing speed, when the thixotropy is temporarily broken. The applied material hardens instantly and assure a sharp outline of the print.

#### 3.2 Storage

Thermoplastic bright metal pastes are subject to an ageing process. Therefore, we recommend using the material within 9 months. The material should be stored at room temperature (20°C). Cool storage – but no freezing – has a positive impact on the shelf life.

#### 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 0,30g/100 cm<sup>2</sup>.

### 4 Properties of finished decorations

The properties of finished decorations are influenced by a number of factors which interact with each other: The precious metal preparation used, possible bordering colours, application, substrate, possible substrate treatment and last but not least the firing conditions. We processed GPP 1119D/TH H under defined, standard test conditions and run certain tests of the achieved precious metal decoration.

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.

## 4.1 Dishwasher durability

All details as to whether decorations are dishwasher durable are to be regarded as approximate values, as test results vary widely according to the type of dishwasher, washing programme, washing-up detergent, water quality and firing conditions. Heraeus tests the dishwasher durability of glass decorations under defined test conditions in a Winterhalter Gastronom GS 29 with an automatic proportion of the detergent and the clear rinse.

Precious metal decorations on glass usually do not achieve the resistance of a similar decoration on ceramics. If a decor withstands 200 wash cycles under our conditions essentially without damage, we designate it as dishwasher durable.

Test decorations prepared with GPP 1119D/TH H had been dishwasher durable.

## 4.2 Abrasion resistance

In tests decorations created with GPP 1119D/TH H showed a good abrasion resistance.

## 4.3 Oxydation resistance

GPP 1119D/TH H contains only a small amount of silver, therefore there is little risk that the decoration tarnishes over time in unfavourable storage conditions. Risk factors for tarnishing of a bright metal decoration are the contact to cardboard boxes, high humidity and high temperature.

## 4.4 Precious metal colour shade at the reverse side

Precious metal decorations on glass often show a reddish discoloration on the reverse side. The tendency to this kind of red discoloration is strongly related to the chemical formulation of the glass, but also influenced by the precious metal product used and the kiln atmosphere during firing.

Under our test conditions GPP 1119D/TH H showed no reddish discoloration on the reverse side.

## 5 Application recommendations

### 5.1 Preparation of the substrate to be decorated

- 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 are not taken from a cold store into a warm shop. A fine condensation film may occur, which is not visible to the naked eye. This results in firing disturbance (pinholes) in the fired precious metal decoration. Allow enough time so that they can adjust to the decoration room temperature.

### 5.2 Application of the paste

- Work in a well-ventilated room. Good printing conditions occur at a room temperature of 20 to 25°C.
- For printing GPP 1119D/TH H 400 to 500 mesh stainless steel screens are recommended to be used.
- For a good printing result, it is important to have a well sharpened squeegee (hardness: 60-75° shore).
- To print thermoplastic bright palladium paste the screen needs to be heated to a temperature of 65 to 75°C.
- Mostly the material chunks are pre-melted. The pre-melting temperature should not be higher than the recommended screen temperature.

### 5.3 Firing

- During the first heating phase the organic components of the preparation burn off. This process is completed at approx. 400°C. The gold film is 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.

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- 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).

## 6 Typical defects, root causes and countermeasures to prevent them

| Defect   | Possible cause  | Countermeasure   |
|--|---|--|
| Streaks in the printed precious metal film                 | The squeegee is possibly scratched  | Exchange or sharpen the squeegee   |
| Squashed print   | The squeegee is not sharp enough or it is worn out  | Exchange or sharpen the squeegee   |
| Spots, firing disturbance                                  | Objects were soiled by dust, finger marks or water drops before printing  | clean the object before decorating   |
|  | problems in the kiln such as: <ul style="list-style-type: none"> <li>furnace atmosphere reduction</li> <li>insufficient ventilation</li> <li>too quick heat up in the critical phase between 200-400°C</li> <li>too many objects in the kiln</li> </ul> | <ul style="list-style-type: none"> <li>increase air addition</li> <li>improvement ventilation</li> <li>reduce the heating speed</li> <li>reduce the number of objects in the kiln</li> </ul> |
| Fired result is blotchy or matt                            | Screen used is too coarse; printed layer is too thick   | we recommend a 400-500 mesh steel screen.  |
| Blurred outline after firing (spreading or running)        | too many objects in the kiln  | reduce the number of objects in the kiln   |
| Paste will not print properly                              | Screen temperature was too high. Product has been stored for too long.  | Remove product from the screen (=> recycling). Cleaning the screen and print with fresh preparation. Be sure that the screen temperature is 65 -75°C   |
| Precious metal flakes off during firing                    | Printed layer was too thick.  | Reduce thickness of applied film.  |
| Fine pinholes  | moisture on the objects before decoration leads to firing faults (pinholes)   | give the ware enough time to acclimate to the temperature of the decoration shop and so a possible condensation film to evaporate  |
| low mechanical resistance of the precious metal decoration | firing temperature was too low  | increase firing temperature  |
|  | printed layer is too thin   | Use 425-500 mesh steel screen to print thermoplastic precious metal preparations   |
| screen is clogged  | Product is not sufficiently molten  | Stop printing and allow the product to melt thoroughly. Check screen temperature. We recommend pre-melting thermoplastic precious metal preparations in a drying cabinet at 80°C / 175°F.    |
|  | Localized cooling of the screen   | Check the screen's heating system.   |
| red/very dark backside of the precious metal decoration    | coating of the glass  | Eventually, the organic coating of glass is to be removed by pre-firing  |
|  | Kiln atmosphere   | Eventually adjust the firing profile   |

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