



## Liquid Bright Gold for porcelain GG 3021D H

### 1 General Information

GG 3021D H is a lower gold containing liquid bright gold. After firing the gold shows a light yellow colour shade. The material is also suitable to be used in our Two-Fire-Etching-Imitation-System.

### 2 Standard Firing Range

| Substrate | Firing range |
|-----------|--------------|
| Porcelain | 780 – 880°C  |
|           |              |

The firing result depends on the firing temperature, the total cycle time, the soak time as well as of the glaze chemistry of the substrate decorated. To achieve an optimal firing result, we recommend firing tests 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 liquid bright gold we check the viscosity and the application properties comparing them with the defined standard. After the firing, we check the optical appearance – glossiness and gold colour shade. Controlling each single production lot assures the highest product quality and lot-to-lot stability.

#### 3.1 Processing

We deliver GG 3021D H ready to use. The material can be applied without further thinning and distinguish themselves by its excellent application properties and a sharp outline.

#### 3.2 Storage

Liquid golds 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 main properties of fired bright precious metal decorations comprise brilliance and precious metal tone, dishwasher resistance and 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 only one factor – for instance, the firing conditions, has an immediate influence that leads to altered properties of the fired decoration.

We have processed the bright 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 bright precious metal preparations. They must, however, always be checked by the user under his own individual conditions.

### 4.1 Dishwasher resistance

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 whether finished decorations are dishwasher durable, roughly following the test-washing programme of the Technical Standards Committee for Material Testing (Fachnormenausschuss Materialprüfung) in a Miele continuous dishwasher. If a decoration withstands 500 washing cycles essentially without damage, we designate it as dishwasher durable. If it withstands 1000 washing cycles, we designate it as dishwasher resistant.

Test decorations prepared with GG 3021D H showed a reasonable dishwasher durability.

### 4.2 Abrasion resistance

Gold decorations with GG 3021D H showed a reasonable scratch resistance.

### 4.3 Oxydation resistance

GG 3021D H does not contain silver and therefore bears no risk of oxydation.

Under unfavourable conditions silver containing precious metal decorations can tarnish in the course of time. Especially the contact to cardboard boxes, high humidity and high temperature support the reaction of silver to silver sulphide.

## 5 Application recommendations

### 5.1 Preparation for the decoration

Work in a well-ventilated room. Good printing conditions occur at a room temperature of 20 to 25°C.

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 object 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. Result: Firing disturbance (pinholes) in the fired precious metal decoration! Allow enough time for the substrate to adjust to the decoration room temperature.

### 5.2 Application of the material

Do not shake the bright precious metal preparations prior to use.

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 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.

the mechanical, chemical and optical properties of the fired decoration. In extreme cases, it can lead to a reddish colour of the surface without any gold character. A too thick layer may lead to cracking, blistering, or to a matt surface.

In case the preparation is used for spraying, thinning with about 30% thinner V 35, V 16 or V 18 is required.

### 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.

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.

## 6.0 Typical defects, root causes and countermeasures

| Defect                                                     | Possible Cause                                                                                                                                                                                                                                                            | Countermeasure                                                                                                                                                                               |
|------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 slowly                                                                                                                                                                                                                              | leave the bottle open for a while, so that some of the solvent can evaporate                                                                                                                 |
|                                                            | too much organic fumes in the furnace                                                                                                                                                                                                                                     | reduce the number of objects in the furnace                                                                                                                                                  |
| preparation shows bad application                          | viscosity is too high after long application or long storage                                                                                                                                                                                                              | thinning of the product with V 35, V 16 or V 18                                                                                                                                              |
| spots, firing disturbance                                  | contamination as dust, fingerprints or water condensation                                                                                                                                                                                                                 | Carefully clean the object before decorating                                                                                                                                                 |
|                                                            | problems in the kiln such as: <ul style="list-style-type: none"> <li>reduced 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>increase air addition</li> <li>improve ventilation</li> <li>reduce the heating speed</li> <li>reduce the number of the objects in the kiln</li> </ul> |
| Precious metal chips offs during firing                    | contamination of the surface causes chip off                                                                                                                                                                                                                              | clean the substrate before decorating                                                                                                                                                        |
|                                                            | the layer of the product is too thick                                                                                                                                                                                                                                     | reduce layer of the product                                                                                                                                                                  |
| low mechanical resistance of the precious metal decoration | firing temperature is too low                                                                                                                                                                                                                                             | increase firing temperature                                                                                                                                                                  |
|                                                            | layer of the product is too thin                                                                                                                                                                                                                                          | increase layer thickness                                                                                                                                                                     |
| fine pinholes                                              | pinholes can be released by moisture on the surface of the decorated object. Taking objects from a cool store into a warm shop leads to invisible condensation on the surface.                                                                                            | allow enough time for the ware to reach shop temperature, so that the condensation has time to evaporate.                                                                                    |