



## Lead - and Cadmium free Metal and Interference Metal Colours of Series H 55 for Porcelain, Bone China, Vitreous China and Tiles

### 1 General Information

The colours of the series H 55 are produced without adding of lead and cadmium, during the production, traces of impurities cannot be absolutely excluded. That is the reason why we offer a range 'technically' free of lead and cadmium.

Decorations produced with metal and interference colours are not abrasion resistant like onglaze colours. This depends on the used pigments. An overprint with flux H 55050 to increase the abrasion resistance is possible.

Depending of application or customer request we deliver our metal and interference metal colours in powder form or pasted.

### 2 Firing range

Type of Substrate	Firing range
• Porcelain	820°C (1516°F) - 880°C (1616°F)
• Bone China	800°C (1472°F) - 880°C (1616°F)
• Vitreous China	800°C (1472°F) - 850°C (1562°F)
• Earthenware	700°C (1292°F) - 800°C (1472°F)

### 3 Properties of the colours

#### 3.1 Heavy metal content

The colours of series H 55 are produced without addition of lead, cadmium or barium.

#### 3.2 Miscibility

All colours of this range are mixable among each other. Mixtures of interference metal colours or mixtures of interference metal colours with metal colours do not lead to attractive colour shades.

#### 4 Achievable properties of finished decorations manufactured with colours from the H55 series.

Besides their colour intensity and brilliance, the important properties of fired colour decorations are, in particular, their dishwasher resistance, the resistance to mechanical and chemical attack and the release of heavy metals.

The properties of finished decorations are influenced by a number of factors. The high quality of the colour used is an absolute

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prerequisite for the manufacture of qualitatively high grade decorations. The quality of a fired decoration, however, is derived from the interplay of colour, application, substrate glaze and the firing conditions. A variation in only one factor – for instance, the firing conditions – has an immediate influence in that it leads to altered properties of the fired decoration.

We have processed the colours of our H55 series under defined conditions. Then we determined the properties of the finished decorations. The following gives an indication of achievable quality features for the finished decorations manufactured with the colours of the H55 series. They must, however, always be checked by the user under his own individual conditions.

#### 4.1 Resistance according to DIN EN 1388-1-2

We test the heavy metal release of a decoration according to DIN EN 1388-1-2. This means that the decoration surface to be examined is exposed to the attack of an acetic acid solution with a volume concentration of 4% in darkness for 24 hours at a temperature of  $22 \pm 2^\circ\text{C}$ . Subsequently the mass concentration of lead and cadmium in the extraction solution are determined.

Using the colours of series H 55 for the decoration of a lead containing glaze could increase the release of lead substantially.

#### 4.2 Dishwasher resistance/- durability

All details as to whether ceramic decorations are dishwasher resistant or 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. To avoid defective production the user should test the colours in connection with materials involved in further processing and determine whether the desired dishwasher proof or resistant decorations are achieved.

Heraeus tests whether finished decorations are dishwasher resistant or durable following to a test washing programme of the Special Standards Committee Materials Testing (Fachnormenausschuss Materialprüfung, FNM) in a Miele continuous dishwasher.

If a decoration survives 500 washing cycles essentially without damage, it is designated by us as dishwasher durable. If it survives 1000 washing cycles, we designate it as dishwasher resistant.

The colours of series H 55 proved to be dishwasher durable.

## 5 Processing

In the following application information you will see that the paste has to be homogenized with a triple roll mill. This is very important, because matt or rough surfaces - one of the most common faults in practice - result from insufficient colour dispersion. You can prevent this problem by using a triple roll mill.

### 5.1 Brushing

All colours of the series H 55 can be pasted both with oil and water based media.

If an oily medium is preferred, we recommend our screenprinting oil Nr.221. 100 parts by weight of colour to 80 parts by weight of medium have to be pasted. The paste, homogenised on a triple roll mill, can be thinned with turpentine oil Nr.62 ready for use.

Alternatively the colour can be pasted with water based medium Nr. 46. We recommend a mixing ratio 100 parts by weight colour to approx. 80-100 parts by weight of medium. The resulting paste can be thinned with water .

### 5.2 Direct screen printing

If metal or interference metal colours should be applied by direct screenprinting, we recommend a mixing ratio of 100 parts by weight of colour to 200 parts by weight of screenprinting oil Nr.221 or Nr. 221/thix. Pay attention for a good homogenisation.

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The thickness of a deposit depends not only on the mesh size, but also on the coating thickness, the squeegee pressure and its angle. That's why it makes it difficult to recommend a particular screen, but general a 77-55 up to 100-40 (200-260 mesh) polyester screen or 270-325 mesh steel screen can be used. More than two overlapping layers should not be printed, otherwise the colour could be possibly flake off

### 5.3 Direct screen printing - decals

To print decals we recommend a mixing ratio of 100 parts by weight of colour to 200 parts by weight of our screenprinting oil Nr. 221 or Nr. 221/thix.

The same screens can be used for metal or interference metal colours, as we already recommended for direct screenprinting (see 5.2).

### 5.4 Overprinting of H 55 motifs

The series H 55 contains also the two overprinting fluxes H 55050 and H 55051. Colour tabs decorated with overprinting fluxes showed in our tests a smoother surface, less abrasion – as usual for metallic colours - and more resistant towards cutlery abrasion. With overprinting fluxes there are only some colours change tone and due to the higher glass develop a slightly different appearance.

For firing temperatures of 830 °C we recommend to use our low melting flux H 55051 and for higher temperatures H 55050 should be used.

We recommend to use a 77-55 till 100-140 polyester screen (200-260 mesh steel screen) and a mixing ratio of 100 parts by weight of flux with 100 – 150 parts by weight screenprinting covercoat Nr. 221 or Nr. 221/thix.

### 5.5 Tampon printing

For tampon printing we recommend mixing colour and medium Nr. 232 in a mixing ratio 100 : 200 (colour : medium) and to homogenize it on a triple roll mill ready to use.

For half thermoplastic printing we recommend using media Nr. 040695. Usually the colours are delivered ready pasted. The colours are usable for direct tampon printing with steel- or polymer cliché, but also for the Total Transfer procedure. The processing temperature amounts to approx. 80°C (176°F). If necessary and addition of medium Nr. 040695 for a fine tuning of the proceeding characteristics can be made. (See Technical Information Nr. 3.34 "Half Thermoplastic Colours - Total Transfer).

## 6 Firing

Directly decorated objects with thin layers can be fired immediately after decorating. With decals, decorated articles should dry 2-3 hours before firing.

The decorated object has to be fired with slowly increasing temperature. Provide good ventilation in the first firing phase (up to appr. 400°C, 752°F). This will be conducive to a good result.

## 7 Metallic- and Interference Metallic Colours of Series H 55

Number of Colour	Name of Colour	precious metal content	lead free	cadmium free	resistant DIN EN 1388-1-2	dishwasher durable	dishwasher resistant	Notes
							mixable	
<b>Metallic Colours</b>								
H 55009	Silver	●	●	●	●	●	●	
H 55010	Silver grey	●	●	●	●	●	●	
H 55112	Light blue	●	●	●	●	●	●	
H 55220	Old rose	●	●	●	●	●	●	
H 55222	Bronze	●	●	●	●	●	●	
H 55250	Apricot	●	●	●	●	●	●	
H 55321	Sand	●	●	●	●	●	●	
H 55324	Light yellow	●	●	●	●	●	●	
H 55325	Rich gold	●	●	●	●	●	●	
H 55326	Red gold	●	●	●	●	●	●	
H 55413	Turquoise green	●	●	●	●	●	●	
H 55424	Moss green	●	●	●	●	●	●	
H 55440	Light green	●	●	●	●	●	●	
H 55663	Purple	●	●	●	●	●	●	
H 55671	Copper	●	●	●	●	●	●	
H 55774	Red	●	●	●	●	●	●	
H 55881	Light platinum	●	●	●	●	●	●	
H 55885	Dark platinum	●	●	●	●	●	●	
<b>Interference Metallic Colours</b>								
H 55233	Yellow	●	●	●	●	●	●	Interference Metallic Colour
H 55114	Blue	●	●	●	●	●	●	Interference Metallic Colour
H 55233	Yellow	●	●	●	●	●	●	Interference Metallic Colour
H 55437	Green	●	●	●	●	●	●	Interference Metallic Colour
H 55764	Red	●	●	●	●	●	●	Interference Metallic Colour
H 55964	Lilac	●	●	●	●	●	●	Interference Metallic Colour
H 55050	Protection covercoat	●	●	●	●	●	●	from approx. 830°C
H 55051	Protection covercoat	●	●	●	●	●	●	till approx. 830°C

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