

Technical Information

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Metallic100 – Lead Free and Cadmium Free Metallic Colors for Porcelain, Bone China, Vitreous China, Earthenware and Enamel

In this technical information leaflet Ferro presents the Metallic100 series, the latest generation of our metallic colors. With a maximum lead content < 100 ppm, this series sets new standards for lead free onglaze decoration. The colors have excellent processing characteristics in all conventional decorating methods like screen printing (direct and indirect), lining and banding, spraying as well as hand painting. All available color shades can be found in table 2 and fig. 1.

Screen Printing (Direct and Indirect)

We recommend for the coarser colors polyester screens with 49 – 77 threads/cm (125 - 195 mesh/inch) or stainless steel screens VA 110 - VA 115 (180 - 280 mesh/inch). The finer colors should be printed with polyester screens with 73 to 77 threads/cm or stainless steel with 270 to 300 mesh/inch. Table 2 lists the coarser colors, that fire with a stronger metallic effect, as well as the finer colors, that have less metallic effect but a smoother surface.

The color layer should not be too thick on porcelain in order to avoid cracking of the colors.

Machine Lining and Banding

Color suspensions applied with brushes, steel- or neoprene-rollers are generally based on water-soluble media.

Spraying

Color suspensions for spraying application can be produced with oil-based media as well as with water-soluble media.

For all standard methods, Ferro offers suitable media and covercoats. Further detailed technical information can be found in our **CerDePrint Media Guide**.

The colors should be stored in a dry place. Opened containers should be closed carefully. To ensure that the colors have not absorbed any humidity, we recommend drying the color powder at approx. 130 °C prior to mixing.

Miscibility

All colors are all intermixable. Very interesting shades can be obtained by mixing Metallic100 colors with our lead and cadmium free **Samba100** series. These mixtures can also be used on porcelain. The mixing ratio should be approx. 85 parts of colors of the Metallic100 series and 15 parts of the Samba100 colors. Fig. 2 shows some mixing examples. However, we recommend to tests the mixtures under the individual processing conditions prior to use.

Firing Conditions

Table 1 shows the firing conditions for various substrates.

Table 1: Firing conditions

Substrate	Firing Conditions
Porcelain	Normal firing: 800 - 820 °C Fast firing: 830 – 880 °C
Bone China	Normal firing: 800 - 820 °C Fast firing: 800 – 880 °C
Vitreous China	800 - 850 °C
Earthenware	Normal firing: 780 - 820 °C
Enamel	780 - 820 °C

Resistance

The alkali and acid resistance of fired color layers is influenced by the thickness of the layer, the firing conditions, and the glaze.

Correctly fired, decorations produced with metallic colors of the range *Metallic100* show a rather smooth surface for this kind of decorated material. This supports a good abrasion fastness and dishwasher resistance of the decoration. For a further improvement of the surface and of the resistance, the metallic colors can be overprinted with the special flux 10 55050 (for temperatures higher than 830 °C).

The colors of the **Metallic100** series show in laboratory tests and under industrial conditions on a variety of different substrates no visible acid or alkali attack (tested with 3% hydrochloric acid, 20 °C, 5 h, as well as with 0.5 % Calgonite solution, 77 °C, 24 h).

Heavy Metal Release and Heavy Metal Content

The colors of the *Metallic100* series are controlled lead and cadmium free, with following upper limits: 100 ppm Pb and 600 ppm Cd. This ensures that the limits for heavy metal release according to EN 1388 1-2 as well as the Californian prop. 65 and the FDA requirements will be fulfilled. However, it is still necessary that the end user tests the heavy metal release according to the relevant standard procedures for all products manufactured under his technical production conditions.

It is absolutely necessary to apply the colors on lead free glazes. Due to the reaction between color and glaze the surface of lead containing glazes may be altered chemically during firing, and considerable amounts of lead are released.

Our safety data sheets, which are available for every product, provide you with useful advice for working with our products.

Fig. 1: Color samples of the Metallic100 series

While every attempt has been made to reproduce colors exactly, the samples printed here may differ slightly from the finished ceramic products.

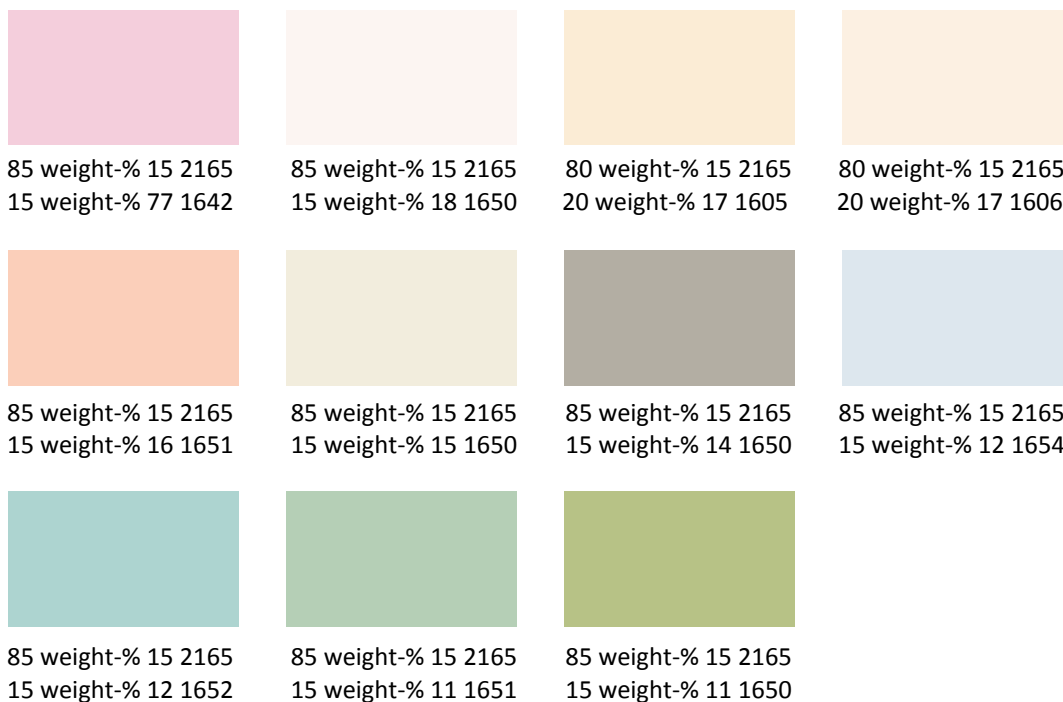
Table 2: The available Metallic100 color shades

Product No.	Color Shade	Pantone® Code*	Product Type
13 2165	Golden Yellow	141 c M	coarser colors with stronger metallic effect
13 2166	Antique Gold	7403 c M	
15 2165	Silver	7534 c M	
15 2166	Antique Silver	7235 c M	
16 2165	Bronze	722 c M	
17 2165	Red	167 c M	
13 55324	Light Gold	1215 c M	finer colors with smoother surface
13 55325	Gold	1245 c M	
13 55326	Reddish Gold	8962 c M	
15 55009	Light Silver	472 c M	
15 55010	Silver Grey	420 c M	
15 55881	Light Platinum	8001 c M	
15 55885	Dark Platinum	877 c M	
16 55222	Light Bronze	876 c M	
17 55671	Copper	8900 c M	

* The above mentioned **Pantone®** code is only a guideline for the color shade.

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Fig. 2: Mixing examples with color 15 2165 and a selection of Samba100 colors



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