

Technical Information

DF42



31 Series – Transparent Glass Colors

In this Technical Information Ferro presents the **31 Series**. This series comprises ten lead containing glass colors for the decoration of decorative glasses by indirect printing.

The available colors are listed in table 1 and fig. 1.

Application

The colors of the **31 Series** have excellent processing properties in all conventional decorating methods like screen printing (direct and indirect), spraying and brush application. For cleaning of equipment and screens, we recommend cleaning oil 80 452.

Screen Printing (Direct and Indirect)

We recommend polyester screens with 68 - 90 threads/cm (175 - 230 mesh/inch) or stainless steel screens VA with 220 – 300 mesh/inch.

For further enhancement of opacity and color intensity, a white underlayer may be printed first. For this purpose 19 33130 is perfectly suited.

Media

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

Storage

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 and Compatibility

The gold and silver containing colors (77 291, 77 396, 77 435, 77 436 and 78 149) may be mixed with each other in any desired ratio. Regarding mixtures with other colors of this series we recommend to perform tests to ensure the firing stability of the mixed shades. The gold and silver free colors are all intermixable. The transparent flux 10 104 may be added to every color for obtaining lighter shades. The color shade can be influenced by a pre-treatment of the surface, e.g. with tin or titanium, depending on the type of coating.

Firing Conditions

The firing temperature range is between 540 and 580 °C.

For a higher transparency, the higher temperature is recommended wherever possible. By adding 20-30% of the flux 10 104, the firing temperature is lowered by approx. 20 °C. The color shade of purple colors is strongly influenced by the firing temperature.

The optimum 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 the user to check under his own individual conditions.

Expansion Coefficient

The expansion coefficient of the colors lies between 100 and 120 x 10⁻⁷/K.

Acid and Alkali Resistance

The alkali and acid resistance of fired color layers is influenced by the thickness of the layer and the firing conditions. The colors of the **31 Series** are not resistant to acids and alkalis (tested with 4% acetic acid, 22 °C, 5 h, as well as with 0.5 % Calgonite solution, 77 °C, 16 h).

Heavy Metal Release and Heavy Metal Content

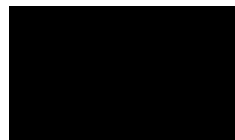
The colors of the **31 Series** are lead containing.

The colors of the **31 Series** do not fulfil the limits of the EN 1388 1-2 standard.

Fig. 1: The available colors of the 31 Series



12 33602 Dark Blue



14 125 Black



77 291 Intensive Purple



77 396 Purple



77 435 Amethyst



77 436 Ruby



78 149 Violet

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

Table 1: The colors of the 31 Series

Product No.	Color Shade	Pantone® Code ¹
12 33602 ¹	Dark Blue	Reflex Blue c
14 125 ¹	Black	Black c
77 291 ¹	Intensive Purple	227 c
77 396 ¹	Purple	226 c
77 435 ¹	Amethyst	248 c
77 436 ¹	Ruby	1797 c
78 149 ¹	Violet	2597 c
19 33130 ¹	Underlayer White	
10 104 ¹	Transparent Flux	

¹ GHS symbol 07, 08, 09, H phrases 302, 332, 360Df, 373, 410

Limitation of Warranty and Liability

Ferro believes that the information contained in this document is accurate at the time of its publication. Ferro makes no warranty with respect to the information contained in this document. The information in this document is not a product specification, either in whole or in part. Your use of the information contained in this document and your purchase and use of this Ferro product are at your sole discretion. Downstream users are responsible for determination of the suitability of this product and for testing in specific applications. Nothing in this document shall be construed as a license for use that infringes upon any property rights of any third party. Please refer to the Safety Data Sheet (SDS) for safe use, handling and disposal information. All sales by Ferro to you are subject to Ferro's Terms and Conditions of Sale, as amended from time to time and available at www.ferro.com. In the event this document conflicts with Ferro's Terms and Conditions of Sale, Ferro's Terms and Conditions of Sale shall control.