Technical Information
DF42

Performance Pigments and Colors

31 Series – Transparent Glass Colours

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

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

Application

The colours 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 colour intensity, a white underlayer may be printed first. For this purpose 19 33007 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 colours should be stored in a dry place. Opened containers should be closed carefully. To ensure that the colours have not absorbed any humidity, we recommend drying the colour powder at approx. 130 °C prior to mixing.

Miscibility and Compatibility

The gold and silver containing colours (73 31331, 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 colours of this series we recommend to perform tests to ensure the firing stability of the mixed shades. The gold and silver free colours are all intermixable. The transparent flux 10 104 may be added to every colour for obtaining lighter shades. In table 2, some mixing recommendations are given. The colour 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 colour shade of purple colours 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 colours lies between 100 and 120 x 10-7/K.

Acid and Alkali Resistance

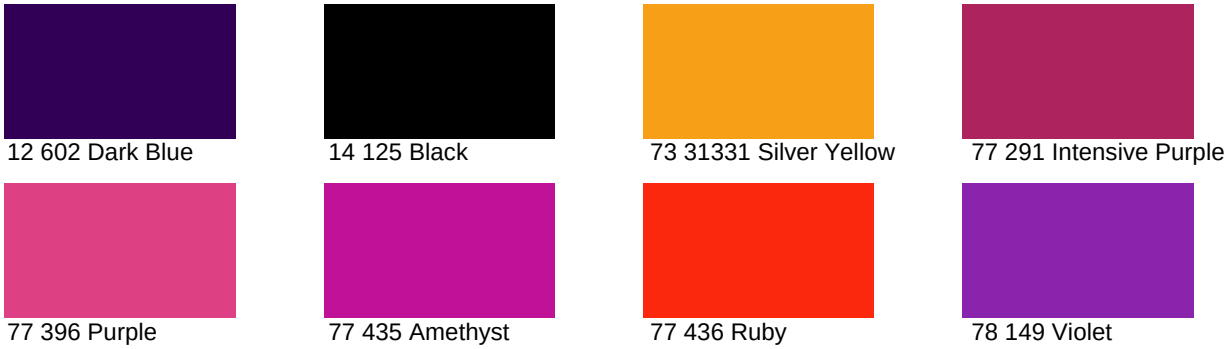
The alkali and acid resistance of fired colour layers is influenced by the thickness of the layer and the firing conditions. The colours of the **31 Series** are not resistant to acids and alkalis (tested with 4% acetic acid, 22 °C, 5 h, as well as with 0.5 % Calgonite solution, 77 °C, 16 h).

Heavy Metal Release and Heavy Metal Content

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

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

Fig. 1: The available colours of the 31 Series



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

Table 1: The colours of the 31 Series

Product No.	Colour Shade	Pantone® Code[1]
12 602 [1]	Dark Blue	Reflex Blue c
14 125 [1]	Black	Black c
73 31331 [2]	Silver Yellow	131 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 33007 [1]	Underlayer White	
10 104 [1]	Transparent Flux	

[1] GHS symbol 07, 08, 09, H phrases 302, 332, 360Df, 373, 410
[2] GHS symbol 07, 08, 09, H phrases 302, 317, 332, 350i, 360Df, 373, 410

Table 2: Mixing recommendations

Colour Shade	Mixing Recommendation	Pantone® Code[1]
Light Green	80% 73 31331 + 20% 12 602	390 c
Green	60% 73 31331 + 40% 12 602	370 c
Blue Green	30% 73 31331 + 70% 12 602	341 c
Turquoise	10% 73 31331 + 90% 12 602	640 c
Light Blue	50% 12 602 + 50% 10 104	2716 c
Mustard Yellow	90% 73 31331 + 10% 12 602	103 c
Grey	90% 10 104 + 10% 14 125	Cool Grey 8c
Brown	70% 73 31331 + 25% 77 436 + 5% 14 125	724 c

[1] The above mentioned **Pantone®** code is only a guideline for the colour shade. **Pantone®** is a registered trade mark of Pantone Inc.

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