

Technical Information

DF37

Performance Pigments and Colors

57 Series – Lead and Cadmium Free Onglaze Colours for Porcelain, Bone China, Vitreous China, and Earthenware

In this Technical Information Ferro presents the **57 Series** onglaze colours. This series comprises 24 lead and cadmium free colours as well as four supplementary cadmium colours. Designed for a firing range from 800 °C (normal firing) up to 950 °C (fast firing), these colours reach their optimum regarding brilliance, mechanical and chemical resistance generally at firing temperatures from 850 to 900 °C.

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

Application

The colours of the **57 Series** have excellent processing characteristics in all conventional decorating methods like screen printing (direct and indirect), spraying, lining and banding as well as hand painting. For cleaning the equipment and screens we recommend cleaning oil 80 452.

Colour Deposit

The maximum colour deposit depends on the firing cycle, the body, the glaze, and the form of the decorated surface as well as on the sintering grade of the colour in combination with the glaze. Too thin layers may result in an uneven, matt surface; too thick layers of colour may lead to chipping or cracking.

Screen Printing (Direct and Indirect)

For direct and indirect screen printing, we recommend polyester screens with 77-120 threads/cm (195-300 mesh/inch) or VA with 270-400 mesh/inch.

Spraying

Colour suspensions for spraying application can be produced with oil-based media as well as with water-soluble media. Water containing colour suspensions with **purple colours** should be consumed immediately and not be stored for a longer time.

Machine Lining and Banding

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

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

All colours of the 57 Series are intermixable, with very few exceptions. The exceptions are the supplementary cadmium colours, these are miscible only with each other. In any case, we recommend to test mixtures under the specific processing conditions prior to use.

Firing Conditions

The firing range for porcelain in fast firing conditions (60 to 90 minutes) is between 850 and 950 °C, in normal firing conditions 800 to 900 °C.

On bone china, the firing temperature ranges in fast firing from 850 to 900 °C, in normal firing from 800 to 880 °C.

It is absolutely necessary to apply lead free colours on lead free glazes. Due to the reactions between colour and glaze the surface of lead containing glazes may be altered chemically during firing and considerable amounts of lead can be released. Lead free products should not be fired together with those containing lead as the resulting emissions could have adverse effects on the heavy metal release. Lead free colours could then be contaminated with lead.

Acid and Alkali Resistance

The alkali and acid resistance of fired colour layers is influenced by the thickness of the layer, the firing conditions, and the glaze. The colours of the **57 Series** show in laboratory tests and under industrial conditions no visible acid attack (tested with 3% hydrochloric acid, 20 °C, 5 h). A few colours show a slight alkali attack (tested with 0.5% Calgonite solution, 77 °C, 16 h).

Heavy Metal Release and Heavy Metal Content

The colours of the **57 Series** are controlled lead and cadmium free, with the following upper limits: 300 ppm Pb and 600 ppm Cd. The cadmium colours are lead free with an upper limit of 300 ppm Pb.

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

Fig. 1: The available colours of the 57 Series

11 57418 Blue Green



11 57434 Light Green



11 57436 Grass Green



11 57447 Chrome Green



12 57014 Cobalt Blue



12 57103 Light Blue



12 57124 Cyan



72 57192 Derby Blue



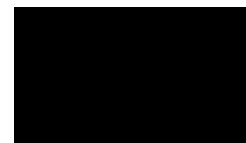
72 57193 Delfter Blue



13 57303 Lemon Yellow



13 57351 Sun Yellow



14 57888 Black



15 57885 Grey



16 57225 Light Brown



16 57226 Brown



16 57228 Dark Brown



17 57601 Salmon



77 1640 Rose



77 1641 Magenta



77 1642 Dark Purple



77 1643 Pink



77 1644 Maroon



77 1645 Dark Maroon



13 57301 Yellow



17 57701 Orange



17 57702 Light Red



17 57703 Red

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 57 Series colours

| Product No. | Colour Shade | Pantone® Code ¹ |
|-----------------------|-------------------|----------------------------|
| 11 57418 | Blue Green | 322 c |
| 11 57434 | Light Green | 362 c |
| 11 57436 | Grass Green | 341 c |
| 11 57447 | Chrome Green | 364 c |
| 12 57014 | Cobalt Blue | 072 c |
| 12 57103 | Light Blue | 2905 c |
| 12 57124 | Cyan | 3015 c |
| 72 57192 | Derby Blue | 2738 c |
| 72 57193 | Delfter Blue | 289 c |
| 13 57303 | Lemon Yellow | 393 c |
| 13 57351 | Sun Yellow | 143 c |
| 14 57888 | Black | Process Black c |
| 15 57885 | Grey | 7540 c |
| 16 57225 | Light Brown | 471 c |
| 16 57226 | Brown | 478 c |
| 16 57228 | Dark Brown | 477 c |
| 17 57601 | Salmon | 487 c |
| 77 1640 | Rose | 203 c |
| 77 1641 | Magenta (4 colour | 207 c |
| 77 1642 | Dark Purple | 208 c |
| 77 1643 | Pink | 197 c |
| 77 1644 | Maroon | 702 c |
| 77 1645 | Dark Maroon | 201 c |
| 19 57006 | Mixing White | |
| 19 57008 | Opaque White | |
| 13 57301 ² | Yellow | 116 c |
| 17 57701 ² | Orange | 151 c |
| 17 57702 ² | Light Red | 172 c |
| 17 57703 ² | Red | 1795 c |

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

² Cadmium colours.

The information and statements contained herein are provided free of charge. They are believed to be accurate at time of publication, but Ferro makes no warranty with respect thereto, including but not limited to any results to be obtained or the infringement of any proprietary rights. Use or application of such information or statements is at user's sole discretion, without any liability on Ferro's part. Nothing herein shall be construed as a license of or recommendation for use that infringes upon any proprietary rights. All sales are subject to Ferro's General Conditions of Sale and Delivery.

PPC•DS•DF37•04/12•E

Ferro GmbH Performance Pigments and Colors • Gutleutstr. 215 • 60327 Frankfurt/M.
Tel. ++49/(0)69/27116-0 • Fax ++49/(0)69/27116-333 • e-mail: pigments@ferro.com