

Technical Information

DF36



64 Series – Resistant Onglaze Colors for Porcelain, Bone China, Vitreous China, and Earthenware

In this Technical Information Ferro presents the colors of the **64 Series**. These decorating colors have excellent processing characteristics in all conventional decorating methods like screen printing (direct and indirect), spraying, lining and banding as well as hand painting. They show high color intensity as well as strong mechanical and chemical resistance.

Screen Printing

For the cadmium containing colors **13 64336**, **17 64779** and **17 64777** we recommend polyester screens with 73-90 threads/cm (185-230 mesh/inch).

The purple colors **77 64671**, **77 64673** and **77 64675** should be printed with polyester screens with 120-140 threads/cm (300-355 mesh/inch).

All other colors should be printed with polyester screens with 68-100 threads/cm (170-260 mesh/inch).

Rich cobalt blues require double printing.

Spraying

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

Machine Lining and Banding

Color suspensions applied with brushes, steel- or neoprene-rollers are generally based on 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 of the 64 Series are intermixable, with very few exceptions. In any case, we recommend to test mixtures under the specific processing conditions prior to use.

The exceptions are the cadmium containing colors **13 64336**, **17 64779** and **17 64777**. These are miscible only with each other. Mixtures with up to 5 % Green, Blue, Black or flux are possible according to our experience. Extreme firing conditions or too thin color deposits may negatively affect the firing stability of the mixed shade.

Overprinting with Flux

The 64 Series includes the overprinting fluxes 10 64052 and 10 64064. In our tests, colors overprinted with flux showed no color change after firing. Only exception: Iron Red 17 64723.

For firing temperatures between 800 and 880°C we recommend to use the low fusing flux 10 64052, for higher firing temperatures the more resistant flux 10 64064 may be used.

Firing Conditions

The optimum firing result depends on the firing temperature, on the total firing time, the soak time and not least on the properties of the glaze. To achieve an optimized firing result, we therefore recommend the user to check under his own individual conditions.

Table 1: Firing conditions

Substrate	Firing Temperature
Porcelain	800 - 880 °C
Bone China	750 - 880 °C
Vitreous China	750 - 850 °C
Earthenware	740 - 850 °C

Color Deposit

The maximum color 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 color in combination with the glaze. Too thin layers may result in an uneven, matt surface; too thick layers of color may lead to chipping or cracking.

Acid and Alkali Resistance

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

The colors of the **64 Series** show in laboratory tests and under industrial conditions on various substrates only a very slight alkali attack (test with 0.5% Calgonite solution, 77 °C, 16 h).

Heavy Metal Release

The release of heavy metals is primarily influenced by the glaze composition, the color deposit and the firing conditions. If the layers are too thin, the firing temperature too high, the firing cycle at peak temperature too long or the kiln atmosphere reductive due to insufficient ventilation, heavy metal release might be higher.

Test decorations produced with colors of Sunshine series proved to be resistant according to DIN 51032. As the resistance of a decor depends not only on the used color, but also on the individual production conditions, this information can be considered a guideline only. It does not replace own test.

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 64 Series



11 64418 Teal



11 64434 Green



11 64447 Chrome Green



12 64015 Cobalt Blue



12 64115 Blue



72 64197 Royal Blue



72 64198 Dark Blue



13 64333 Sun Yellow



13 64336 Cadmium Yellow



13 64351 Gold Ochre



14 64888 Black



15 64885 Silver Grey



16 64225 Wood Brown



16 64226 Nut Brown



16 64228 Dark Brown



17 64723 Iron Red



17 64777 Cadmium Orange



17 64779 Cadmium Red



77 64671 Purple Rose



77 64673 Purple



77 64675 Dark Purple



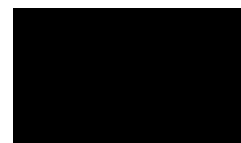
12 64124 Cyan



13 64324 Yellow



77 64604 Magenta



14 64804 Black



14 64889 Deep Black

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 colors of the 64 Series

Product No.	Color Shade	Pantone® Code ¹
11 64418 ³	Teal	322 c
11 64434 ⁴	Green	360 c
11 64447	Chrome Green	364 c
12 64015	Cobalt Blue	2728 c
12 64115	Blue	2945 c
72 64197	Royal Blue	2738 c
72 64198	Dark Blue	2758 c
13 64333 ⁵	Sun Yellow	101 c
13 64336 ²	Cadmium Yellow	109 c
13 64351	Gold Ochre	130 c
14 64888	Black	Process Black c
15 64885	Silver Grey	431 c
16 64225	Wood Brown	471 c
16 64226	Nut Brown	478 c
16 64228	Dark Brown	4695 c
17 64723	Iron Red	1815 c
17 64777 ²	Cadmium Orange	1505 c
17 64779 ²	Cadmium Red	187 c
77 64671	Purple Rose	223 c
77 64673	Purple	215 c
77 64675	Dark Purple	7435 c
19 64006	Mixing White	
19 64007	White	
19 64008	Opaque White	
Four Color Set:		
12 64124	Cyan	3015 c
13 64324 ⁵	Yellow	107 c
77 64604	Magenta	194 c
14 64804	Black	Black 3 c
14 64889	Deep Black	Process Black c
Fluxes:		
10 64050	Flux, for thinning and mixing	
10 64052	Overprinting flux	
10 64053	Cd-protection flux	
10 64064	Interim and overprinting flux (> 830 °C)	

¹ The above mentioned **Pantone®** code is only a guideline for the color shade.

Pantone® is a registered trade mark of Pantone Inc..

² Cadmium pigment colors.

³ GHS symbol 08, H phrases 360D, 373, 412

⁴ GHS symbol 07, 08, 09, H phrases 302, 360Df, 373, 410

⁵ GHS symbol 07, 08, 09, H phrases 302, 332, 360Df, 373, 410

Table 3: Mixing recommendations for Pantone® colors*

Pantone No.	Color Shade	Parts in %	Color	Parts in %	Color	Parts in %	Color	Parts in %	Color
Cool Gray 11 c	Grey	90	15 64885	10	16 64228				
100 c	Light Yellow	20	13 64333	20	13 64324	60	19 64006		
113 c	Yellow	25	13 64324	25	13 64351	50	19 64006		
116 c	Yellow	60	13 64333	40	13 64351				
<u>130 c / 124 c</u>	Orange Yellow	40	13 64333	60	13 64351				
138 c	Light Ochre	60	13 64324	40	16 64225				
141 c	Sand	10	13 64324	10	16 64225	80	19 64006		
144 c	Orange	60	13 64333	40	17 64777				
145 c	Light Ochre	25	13 64324	25	16 64225	50	19 64006		
151 c	Orange	40	13 64336	60	17 64777				
153 c	Ochre	40	13 64324	60	16 64225				
153 c	Ochre	30	13 64351	70	16 64225				
156 c	Light Beige	10	13 64351	10	16 64225	80	19 64006		
157 c	Light Ochre	25	13 64351	25	16 64225	50	19 64006		
159 c	Ochre	40	13 64351	60	16 64225				
168 c	Brown	50	16 64225	50	16 64228				
174 c	Iron Red	90	17 64723	10	13 64324				
~174 c	Iron Red	80	17 64723	20	13 64324				
175 c	Chestnut	90	17 64723	10	14 64888				
179 c	Red	40	17 64777	60	17 64779				
188 c	Purple	80	77 64675	20	16 64228				
194 c	Purple Red	40	77 64675	20	16 64225	40	19 64006		
195 c	Purple	90	77 64675	10	14 64888				
202 c	Purple	90	77 64675	10	16 64228				
~216 c	Purple	60	77 64675	40	17 64723				
257 c	Light Violet	15	77 64675	15	12 64115	70	19 64006		
261 c	Purple Violet	50	77 64604	50	12 64015				
284 c	Blue	25	12 64115	25	12 64124	50	19 64006		
300 c	Blue	40	12 64115	60	12 64124				
316 c	Dark Turquoise	80	11 64418	20	14 64888				
308 c / <u>315 c</u>	Turquoise	50	11 64418	50	12 64015				
316 c / <u>330 c</u>	Dark Turquoise	90	11 64418	10	14 64888				
316 c / <u>3302 c</u>	Dark Turquoise	80	11 64418	20	16 64228				
322 c	Turquoise	75	11 64418	25	19 64006				
322 c / 563 c	Turquoise	50	11 64418	50	19 64006				
329 c / 3298 c	Green	40	13 64324	60	12 64124				
330 c	Green	25	16 64225	75	11 64418				
336 c	Green	50	12 64124	50	13 64324				
341 c	Green	30	13 64324	70	11 64418				
344 c	Light Mint	15	11 64447	85	19 64006				
346 c	Mint	10	13 64324	15	11 64418	75	19 64006		
346 c	Mint	70	13 64324	30	12 64124				
~350 c	Dark Green	50	16 64225	50	11 64418				
360 c / <u>374 c</u>	Light Green	50	13 64324	50	11 64434				
362 c / <u>3415 c</u>	Green	50	13 64324	50	11 64418				
~363 c	Green	30	12 64124	70	13 64324				
367 c	Light Green	35	13 64324	15	11 64418	50	19 64006		
370 c	Green	70	13 64324	30	11 64418				
370 c / <u>3415 c</u>	Green	60	13 64324	40	12 64124				
372 c	Light Green	25	13 64324	5	11 64418	70	19 64006		
376 c	Green	20	13 64324	80	11 64434				
~383 c	Light Green	85	13 64324	15	11 64418				
~384 c	Green	75	13 64351	25	11 64418				
390 c	Yellow Green	90	13 64333	10	11 64418				
397 c	Yellow Green	95	13 64333	5	11 64418				

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

Pantone® is a registered trade mark of Pantone Inc..

Pantone No.	Color Shade	Parts in %	Color	Parts in %	Color	Parts in %	Color	Parts in %	Color
411 c	Grey	70	15 64885	20	16 64228	10	12 64015		
412 c	Grey	60	15 64885	20	16 64228	20	12 64015		
~415 c	Brown Grey	40	15 64885	10	16 64225	50	19 64006		
~416 c	Light Grey	40	15 64885	5	16 64225	55	19 64006		
423 c	Light Grey	40	15 64885	60	19 64006				
424 c	Grey	60	15 64885	40	19 64006				
~431 c	Grey	70	15 64885	10	12 64015	20	19 64006		
~432 c	Grey	90	15 64885	10	11 64418				
444 c	Grey	50	15 64885	10	12 64015	40	19 64006		
445 c	Grey	80	15 64885	10	16 64228	10	12 64015		
462 c	Brown	30	13 64351	50	16 64225	20	14 64888		
464 c	Brown	50	13 64351	40	16 64225	10	14 64888		
483 c	Chestnut	80	17 64723	20	16 64228				
483 c / 484 c	Chestnut	80	17 64723	20	16 64228				
484 c	Red	50	17 64777	30	17 64779	20	16 64225		
485 c	Red	20	13 64333	80	17 64779				
485 c	Red	60	17 64777	40	17 64779				
492 c	Purple Red	50	77 64675	30	16 64225	20	13 64351		
~492 c	Purple Red	50	77 64675	50	17 64723				
504 c	Bordeaux	80	77 64675	20	14 64888				
507 c	Rose	30	77 64675	70	19 64006				
508 c	Rose	20	77 64675	80	19 64006				
511 c	Purple Violet	65	77 64675	35	12 64015				
511 c	Purple Violet	50	77 64675	30	12 64115	20	19 64006		
~511 c	Purple Violet	70	77 64675	30	12 64115				
525 c	Violet	60	77 64675	40	12 64115				
534 c	Blue	30	77 64675	70	12 64124				
535 c	Blue Grey	40	15 64885	20	12 64015	40	19 64006		
535 c	Blue Grey	30	15 64885	20	12 64015	50	19 64006		
540 c	Blue	25	77 64675	70	12 64124	5	14 64888		
549 c	Cyan Blue	50	12 64124	50	19 64006				
553 c	Dark Green	40	16 64225	50	11 64418	10	14 64888		
555 c	Green	50	12 64124	50	13 64324				
~555 c	Green	50	13 64324	50	12 64124				
559 c	Light Blue	50	12 64115	50	19 64006				
563 c	Light Turquoise	25	11 64418	75	19 64006				
564 c	Light Turquoise	15	11 64418	5	12 64015	80	19 64006		
576 c	Green	80	13 64324	20	12 64124				
583 c	Light Green	90	13 64324	10	11 64418				
584 c	Yellow Green	95	13 64324	5	11 64418				
584 c	Yellow Green	45	13 64324	5	11 64418	50	19 64006		
~584 c	Yellow Green	80	13 64324	20	11 64434				
601 c	Light Yellow	10	13 64324	10	13 64351	80	19 64006		
632 c	Cyan Blue	50	12 64124	50	19 64006				
633 c	Cyan Blue	75	12 64124	25	19 64006				
646 c	Blue	10	77 64675	40	12 64124	50	19 64006		
652 c	Blue	15	77 64675	35	12 64124	50	19 64006		
658 c	Light Blue	30	12 64115	70	19 64006				
686 c	Light Rose	10	77 64675	90	19 64006				
690 c	Purple	80	77 64675	20	12 64115				
695 c / 696 c	Purple	40	77 64675	20	13 64351	40	19 64006		
696 c	Purple	50	77 64675	30	13 64351	20	19 64006		

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

Pantone® is a registered trade mark of Pantone Inc..

Pantone No.	Color Shade	Parts in %	Color	Parts in %	Color	Parts in %	Color	Parts in %	Color
722 c	Dark Beige	20	13 64351	16	16 64225	4	77 64675	60	19 64006
722 c / 728 c	Light Rosewood	28	13 64351	12	77 64675	60	19 64006		
722 c / 729 c	Rosewood	20	77 64675	40	13 64351	40	19 64006		
726 c	Skin	6	13 64351	4	16 64225	2	77 64675	88	19 64006
726 c / 727 c	Skin	5	13 64351	3	16 64225	2	77 64675	90	19 64006
729 c	Light Rosewood	18	13 64351	14	16 64225	8	77 64675	60	19 64006
731 c	Brown	50	13 64351	50	16 64228				
1385 c	Ochre	60	13 64351	40	16 64225				
1395 c	Ochre	75	13 64351	25	16 64228				
1535 c	Brown	75	16 64225	25	16 64228				
~1675 c	Purple Red	30	77 64675	50	16 64225	20	19 64006		
1795 c	Red	20	17 64777	80	17 64779				
1807 c	Purple Red	40	77 64675	40	16 64225	20	19 64006		
~1807 c	Purple Red	50	77 64675	30	16 64225	20	19 64006		
1815 c	Purple Red	40	77 64675	60	17 64723				
2613 c	Purple Violet	50	77 64675	50	12 64015				
~2622 c	Violet	30	77 64675	20	12 64124	50	19 64006		
2716 c	Blue	50	12 64015	50	19 64006				
2768 c	Blue	40	77 64675	60	12 64124				
2718 c	Blue	75	12 64015	25	19 64006				
2935 c	Blue	60	12 64115	40	12 64124				
3015 c	Cyan Blue	75	12 64124	25	19 64006				
3015 c	Blue	40	12 64115	60	19 64006				
3025 c	Blue	10	77 64675	90	12 64124				
3165 c	Turquoise	75	11 64418	25	12 64015				
3292 c	Dark Green	10	13 64324	80	11 64418	10	14 64888		
3298 c	Green	40	13 64324	60	12 64124				
3298 c	Green	25	13 64351	75	11 64418				
3305 c	Dark Green	20	13 64324	70	11 64418	10	14 64888		
~3425 c	Dark Green	40	13 64351	50	11 64418	10	14 64888		
4485 c	Green Brown	75	16 64225	25	11 64418				
4635 c	Brown	20	13 64351	40	16 64225	40	16 64228		
4695 c	Dark Brown	25	16 64225	75	16 64228				
4695 c	Brown	80	17 64723	20	14 64888				
~4695 c	Brown	25	13 64351	75	16 64228				
5255 c	Blue Violet	50	77 64675	50	12 64124				
~5275 c	Blue	20	77 64675	30	12 64124	50	19 64006		
5473 c	Turquoise	50	11 64418	30	12 64015	20	19 64006		
5473 c / 5483 c	Turquoise	40	11 64418	20	12 64015	40	19 64006		
5483 c / 5493 c	Light Turquoise	30	11 64418	10	12 64015	60	19 64006		
Proc. Yellow	Yellow	50	13 64333	50	13 64324				

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

Pantone® is a registered trade mark of Pantone Inc..

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.