

SELECTION 54/58 800-860°C

Lead- and cadmium-free onglaze transparent relief colors

SELECTION 54 is lead-free cadmium containing colors.

1. General Information

SELECTION 54 and 58 are onglaze, transparent, relief colors for bone china.

Features:

- Very transparent color tone.
- Can see under colors and looks different tone depend on them.
- Coarse particle size and can make thick relief design.
- Lead and cadmium free except SELECTION 54 colors.
- Excellent combination with SELECTION 58M metallic relief colors.



SELECTION 54/58 800–860°C Lead- and cadmium-free, intermixable, onglaze transparent relief colors for bone china.

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Table 1

Product No.	Color tone	Pantone No.	Transparent	Intermixable	Precious metal containing	Lead free (<100ppm)	Cadmium free (<50ppm)	Acid resistant, DIN 1388-1-2 *1	Alkali resistant, ASTM C556-88 *2	58 102 mixing and overprinting flux	Enamel ware	Bone, vitreous china, earthenware	Porcelain	Hard porcelain	Remarks
58 102	flux		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	mixing and underlay flux, transparent relief itself
54 301	Cd yellow		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	cadmium containing, only cannot be mixed with 58 902
58 402	green		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	
54 602	Cd red		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	cadmium containing, only cannot be mixed with 58 902
58 701	black		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	
58 803	cobalt blue		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	
58 804	turquoise		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	
58 902	magenta		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	only cannot mix with 54 301 and 54 602

*1: DIN EN 1388-1-2 : The test pieces are immersed in a 4% acetic acid solution for 24 hours at 22±2°C.

*2: ASTM C556-88 : The test pieces are immersed in a 0.5 % sodium carbonate solution in water at 95°C for 2, 4 and 6 hours.

2. Firing Conditions

Type of ware	Firing range
Bone china	800–860°C

SELECTION 54 and 58 are suitable for both normal firing for 3–10 hours and fast-firing for 60–120 minutes, cold-to-cold conditions. Also, use them with lead-free colors and glazes. Fire them only under lead-free conditions to avoid heavy lead release.

3. Application

SELECTION 54 and 58 are suitable for screen-transfer printing, direct printing and hand painting.

4. Coefficient of Thermal Expansion (C.O.E.)

Product	Thermal Expansion (C.O.E.)
SELECTION 54/58 colors	$7.5-7.9 \times 10^{-6}/^{\circ}\text{C}$

5. Particle size of Distribution (P.S.D.)

Product	D ₅₀ average	D ₁₀₀ biggest
SELECTION 54/58 colors	20–25μ m	150μ m

6. Printing

【6.1 Relief printing】

We recommend mesh sizes that are 100–120 mesh (40–48T) polyester for all screen applications. We recommend printing 1–4 times. We do not recommend printing more than four times when there is a pinhole and a bubble on the surface and there is a drying time problem.

【6.2 Medium ratio and cover coat】

SELECTION 54/58 colors : Medium PM16	10 : 6–7
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We recommend PM16 flowing medium for relief printing. Adding just sufficient medium will improve the surface of relief, if it has pinhole problems.

We recommend C33 cover coat by printing 70 meshes (27T).

【6.3 special underlay flux】

58102 fluxes is specially developed as underlay flux for **SELECTION 54** and **58** colors. Occasionally these colors react with glaze and become bubble surface. It is due to over fired, too high or too long. In this case we recommend printing 58102 underlay flux as first layer by same screen mesh of relief colors to avoid this issue.

Lead-and-cadmium free onglaze colors absorb moisture easily. Therefore, keep the powder colors in a dry place. We recommend drying the color powder before using.

7. Color and Mixability

You can mix **SELECTION 54** and **58** colors with each other in any proportions (however, you cannot mix 58902 magenta with **SELECTION 54** colors).

To lighten **SELECTION 54** and **58** colors, we recommend mixing with 58102 fluxes.

You can mix **SELECTION 54** and **58** with normal onglaze series, such as **SELECTION 35, 36** and **39**, but the relief become opaque and show bubble surface.

However, we recommend testing the stability of mixing colors and overprinted flux colors under end-user's firing conditions before mass production. Please note following points and refer to Table 1.

8. Chemical durability

Chemical durability of **SELECTION 54** and **58** depends on type of ware, glaze, kiln, color deposit, and firing conditions. The following are the results of tests on bone china, fired at 840°C, with 10 minutes of soaking time and 120 minutes of cold-to-cold firing conditions of gas kiln in production.

【8.1 Residual lead and cadmium content】

SELECTION 58 colors contain less than 100 ppm residual lead and less than 50 ppm residual cadmium (except **SELECTION 54** colors contain cadmium) and are therefore in compliance with Californian Proposition 65, FDA, EU and Japanese requirements.

Cadmium containing colors contain less than 100 ppm residual lead and contain more than 50,000 ppm cadmium.

【8.2 Lead and cadmium release】

According to the DI EN 1388-1-2 test, **SELECTION 54** and **58** colors show lead releases are below AAS limits. **SELECTION 54** colors show below cadmium 0.02 mg/ dm² release.

【8.3 Acid resistance】

According to the DI EN 1388-1-2 test, **SELECTION 54** and **58** colors do not show any visible attack after immersion in a 4% acetic acid solution for 24 hours at a room temperature 22±2°C

【8.4 Alkali resistance】

According to the ASTM C556-88 test, **SELECTION 54** and **58** colors do not show visible attack for up to 6 hours.

9. Material Safety Data Sheet (MSDS)

Material safety data sheet (MSDS) of **SELECTION 54** and **58** is available on request.

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