

## SELECTION 58M 800–840°C

Lead- and cadmium-free onglaze metallic relief colors

### 1. General Information

SELECTION 58M series is lead- and cadmium-free, intermixable, onglaze metallic relief and interference metallic relief colors for bone china, earthenware and vitreous china.

#### Features:

- Lead and cadmium free.
- Glossy metallic tone.
- Transparent and can see through underlay colors.
- Microwave and dishwasher safe.
- Coarse particle size and can make thick relief design.



## SELECTION 58M

800–850 °C lead–and cadmium–free, intermixable, onglaze

metallic relief and interference metallic relief colors for, bone china, earthenware and vitreous china.

**Table 1**

Product No.	Color tone	Pantone No.	Intermixable	Lead free (<100ppm)	Cadmium free (<50ppm)	Acid resistant, DIN 1388–1–2 *1	Alkali resistant, ASTM C556–88 *2	58 101 mixing and underlay flux	Enamel ware	Bone, vitreous china, earthenware	Porcelain	Hard porcelain	Remarks
<b>Metallic colors</b>													
58M 113	white silver		✓	✓	✓	✓	✓	✓	✓	✓	✓		can mix with other color to make color metallic relief
58M 109	lemon gold	8640C	✓	✓	✓	✓	✓	✓	✓	✓	✓		
58M 110	green gold	8660C	✓	✓	✓	✓	✓	✓	✓	✓	✓		
58M 103	copper	8920C	✓	✓	✓	✓	✓	✓	✓	✓	✓		
58M 105	red copper	8901C	✓	✓	✓	✓	✓	✓	✓	✓	✓		
<b>Interference metallic colors</b>													
58M 128	yellow green		✓	✓	✓	✓	✓	✓	✓	✓	✓		very intensive color, high temperature stand able
<b>Coarse particle intensive interference metallic colors</b>													
58M 161	rainbow		✓	✓	✓	✓	✓	✓	✓	✓	✓		very transparent intensive interference metallic color
58M 162	gold		✓	✓	✓	✓	✓	✓	✓	✓	✓		very transparent intensive interference metallic color
58M 163	blue green		✓	✓	✓	✓	✓	✓	✓	✓	✓		very transparent intensive interference metallic color
58M 164	red		✓	✓	✓	✓	✓	✓	✓	✓	✓		very transparent intensive interference metallic color
<b>Flux</b>													
58 101	mixing & underlay flux		✓	✓	✓	✓	✓	✓	✓	✓	✓		can be used as underlay and mixing for all of 58M colors

\*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, vitreous china	800–840°C

**SELECTION 58M** 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.

58M161, 58M162, 58M163 and 58M164 are sensitive for firing temperature and conditions. We recommend to fire them below 820°C under fast firing conditions otherwise they may lose metallic effect.

## 3. Application

**SELECTION 58M** 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.)
<b>SELECTION 58M</b> colors (average)	$6.5 \times 10^{-6}/^{\circ}\text{C}$

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

Product	D <sub>50</sub> average	D <sub>100</sub> biggest
<b>SELECTION 58M</b> colors (average)	15–20 μm	60–100 μm
<b>58M161, 58M162, 58M163, 58M164</b>	35–40 μm	200–350 μm

## 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 4 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】

<b>SELECTION 58M</b> colors : Medium PM2	10 : 7–9
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We recommend PM2 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 mesh (27T).

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

**SELECTION 58M** colors can be mixed with each other in any proportions.

To obtain colored metallic, it is suitable to mix 58M113 silver with approximate 15–30% of **SELECTION 35, 36 and 39** colors.

To lighten **SELECTION 58M** colors, we recommend to mix with 58101 flux. If normal onglaze flux such as 36101 and 35101 are mixed, the metallic effect maybe disappeared. According to our test, adding 20% of 58101 flux is maximum to maintain the color tone. After mixing 58101, they become lower firing temperature. 58101 flux can be also used as underlay flux and if it is printed under **SELECTION 58M** colors, the surface of metallic become smooth and glossy.

To use **SELECTION 58M** on porcelain, there is a possibility to use low C.O.E. underlay flux from leaded series. According to our experience, 32189 relief flux is suitable for 58M colors as their underlay flux. Use the same screen as **SELECTION 58M** and just print as first layer of the relief.

We cannot guarantee the heavy metal release in this case, therefore we recommend testing the stability of mixing and using with other 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 58M** depends on type of ware, glaze, kiln, color deposit and firing conditions. The following are the results of tests on bone china, fired at 820°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 58M** contains less than 100 ppm residual lead and less than 50 ppm residual cadmium and are therefore in compliance with Californian Proposition 65, FDA, EU and Japanese requirements.

### 【8.2 Lead and cadmium release】

According to the DI EN 1388-1-2 test, **SELECTION 58M** shows lead and cadmium releases are below AAS limits.

### 【8.3 Acid resistance】

According to the DI EN 1388-1-2 test, **SELECTION 58M** colors do not show any visible attack after immersion in a 4% acetic acid solution for 24 hours at a room temperature of  $22 \pm 2^\circ\text{C}$ .

### 【8.4 Alkali resistance】

According to ASTM C556-88 test, **SELECTION 58M** metallic colors do not show any visible attack up to 6 hours.

## 9. Material Safety Data Sheet (MSDS)

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

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