Technical Information

Revised: 7/03/2023

SELECTION 79/74　1,000-1,260℃

SELECTION 79 : Lead- and cadmium-free glaze effect inglaze colors

SELECTION 74 : Lead-free cadmium containing inclusion glaze effect inglaze colors

1. General Information and Color chart

Features!

・Glaze effect can be controlled by application method.
・Can be used with SELECTION 78/64 inglaze colors.
・Suitable for wide range of substrates and firing conditions.
・High chemical durability.

Technical Information

Revised: 7/03/2023

Combination of
78706 inglaze black +
79661 reactive brown

Combination of
78706 inglaze black + 78721 gray +
79864 reactive cyan

Combination of
79736 metallic black +
79766 reactive black

Combination of
79535 metallic gold brown +
74664 reactive red

SELECTION 79/74

1,000–1,260℃ Lead– and cadmium–free, intermixable, glaze effect inglaze colors for hard porcelain, porcelain, bone china, earthenware, fine china, vitreous china and tile. SELECTION 74 colors contain cadmium as inclusion pigments.

Table 1

Product No.	Color tone	Pantone No.	Intermixable	Lead free (below 90ppm)	Cadmium free (below 40ppm)	Acid resistant, DIN 1388-1-2 *1	Alkali resistant, ASTM C556-88 *2	78193, 78194, 79101 flux over printing and mixing	79102 mat flux over printing and mixing	Tile, bone, vitreous china, earthenware	Oxidized porcelain (fine china)	Porcelain, hard porcelain	Reduction conditions over 1300-1400℃	Remarks
Transparent reactive effect flux														
	78193	sharp reactive flux		✔	✔	✔	✔	✔			✔	✔	✔	✔	reactive flux to get sharp emboss effect
	78194	wavy reactive flux		✔	✔	✔	✔	✔			✔	✔	✔	✔	wavy effect reactive flux for mixing and over printing
	79101	flux		✔	✔	✔	✔	✔			✔	✔	✔	✔	transparent flux relief, mixing and covering. No reactive effect
Mat effect colors														
	79102	mat flux		✔	✔	✔	✔	✔		✔	✔	✔	✔		suitable for mixing with mat effect colors
	79301	yellow	100U	✔	✔	✔	✔	✔		✔	✔	✔	✔		
	79406	blue green	326U	✔	✔	✔	✔	✔		✔	✔	✔	✔		
	79508	rose wood	157U	✔	✔	✔	✔	✔		✔	✔	✔	✔		
	79706	black	433U	✔	✔	✔	✔	✔		✔	✔	✔	✔		
	79801	turquoise	290U	✔	✔	✔	✔	✔		✔	✔	✔	✔		
	79806	cobalt blue	2728U	✔	✔	✔	✔	✔		✔	✔	✔	✔		
Metallic effect colors														
	79532	gold/brown	8601C/8621C	✔	✔	✔	*3	*3	✔		✔	✔	✔		color shade depend on thickness of color deposit
	79533	gold/brown	8621C/8602C	✔	✔	✔	*3	*3	✔		✔	✔	✔		color shade depend on thickness of color deposit
	79535	silver/brown	8621C/8623C	✔	✔	✔	*3	*3	✔		✔	✔	✔		color shade depend on thickness of color deposit
	79736	silver/black	8603C	✔	✔	✔	*3	*3	✔		✔	✔	✔		color shade depend on thickness of color deposit
Wavy reactive effect colors														
	79261	opaque white		✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	mixing and overprinting opaque white
	79262	mixing white		✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	mixing and overprinting white
	74363 *4	cadmium yellow		✔	✔		✔	✔	✔		✔	✔	✔	✔	cadmium containing color
	74368 *4	cadmium orange		✔	✔		✔	✔	✔		✔	✔	✔	✔	cadmium containing color
	79461	brown green		✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	color shade depend on thickness of color deposit
	79464	chrome green		✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	
	79466	blue green		✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	
	79568	rose wood		✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	
	79661	red brown		✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	color shade depend on thickness of color deposit
	74663 *4	cadmium red		✔	✔		✔	✔	✔		✔	✔	✔	✔	cadmium containing color
	74664 *4	cadmium red		✔	✔		✔	✔	✔		✔	✔	✔	✔	cadmium containing color
	79766	black		✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	
	79864	cyan green		✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	
	79866	cobalt blue		✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	
Additive materials														
	79197	reactive agent		✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	mixing for reactive effect colors, increase reactive effect
	88203	white agent		✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	mixing for reactive effect colors, make them opaque effect

*1: DIN EN 1388-1-2 : The test pieces are immersed in a 4% acetic acid solution for 24 hours at 22±2℃. Refer section 7.2 and 7.3
*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. Refer section 7.4
*3: Slightly visible attack can be seen depend on thickness of color deposit and firing conditions.
*4: lead- free cadmium containing colors as inclusion pigments.

Technical Information

Revised: 7/03/2023

2. Firing Conditions

Type of ware	Firing range
Hard porcelain	1,230–1,260℃
Porcelain	1,180–1,230℃
Bone china	1,000–1,150℃
Earthenware	1,000–1,050℃
Fine china	1,000–1,200℃
Vitreous china	1,000–1,200℃

SELECTION 79/74 colors are suitable for both normal firing of 3–10 hours and fast-firing of 60–120 minutes, cold-to-cold conditions. They can be fired at glaze firing conditions of all type of wares even reduction firing conditions up to 1400℃. Their color tone will be vary under different firing conditions, therefore, we recommend to test under several firing conditions to check their color variation range.

3. Application

SELECTION 79/74 colors are suitable for screen-transfer printing, direct printing, spraying, pad printing and hand painting.
They can be used with **SELECTION 78/64** basic inglaze colors and fired at same temperatures.

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

Product	D_{50} average	D_{100} biggest
79101 transparent flux	4.5 μm （±1.0）	35 μm （±5.0）
79102 mat flux	4.5 μm （±1.0）	35 μm （±5.0）
78193 sharp reactive flux	5.0 μm （±1.0）	35 μm （±5.0）
78194 wavy reactive flux	4.5 μm （±1.0）	35 μm （±5.0）
SELECTION 79 mat colors	4.5 μm （±1.0）	35 μm （±5.0）
SELECTION 79 metallic colors	5.0–25 μm （±1–5）	35–200 μm （±5–20）
SELECTION 79/74 reactive colors	4.5 μm （±1.0）	35 μm （±5.0）

5. Printing

【5.1 Mesh size】

We recommend polyester screen with 60–305 mesh/inch (24–120 thread/cm) for all screen applications.
Their color tones depend on the thickness of color deposit.

【5.2 Medium ratio】

Product	Color : medium	Recommended mesh
79101 transparent flux : Medium PM2	10 : 7–9	60–305 mesh/inch (24–120 thread/cm)
79102 mat flux : Medium PM2	10 : 7–9	60–305 mesh/inch (24–120 thread/cm)
78193 sharp reactive flux : Medium PM2	10 : 7–9	60–305 mesh/inch (24–120 thread/cm)
78194 wavy reactive flux : Medium PM2	10 : 7–8	60–123 mesh/inch (24–48 thread/cm)
SELECTION 79 mat colors : Medium PM2	10 : 7–8	60–123 mesh/inch (24–48 thread/cm)
SELECTION 79 metallic colors : Medium PM2	10 : 4–8	60–123 mesh/inch (24–48 thread/cm)
SELECTION 79/74 reactive colors : Medium PM2	10 : 7–8	60–123 mesh/inch (24–48 thread/cm)

We recommend C12 cover coat by printing 70 mesh/inch (27 thread/cm).

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

6. Mixability

SELECTION 79/74 colors can be mixed with each other in any proportions. They are also intermixable with **SELECTION 78/64** basic inglaze colors. However, we recommend testing the stability of mixing colors and overprinted flux and colors under end-user's firing conditions before mass production. Please note following points and refer to Table 1.

Mixing flux: Low COE, high firing temperature **79101** flux is suitable for all of **SELECTION 79/74** colors as mixing flux. **78101** low firing temperature flux can be mixed with **SELECTION 79/74 colors.**

79101 transparent flux: This is a flux which can make transparent inglaze relief. In order to obtain a transparent colored relief, we recommend mixing with a small amount of **SELECTION 78/64** basic inglaze colors.

79102 mat flux: This is a flux which can make a mat relief. In order to obtain mat colored relief, we recommend mixing with **SELECTION 79** mat colors.

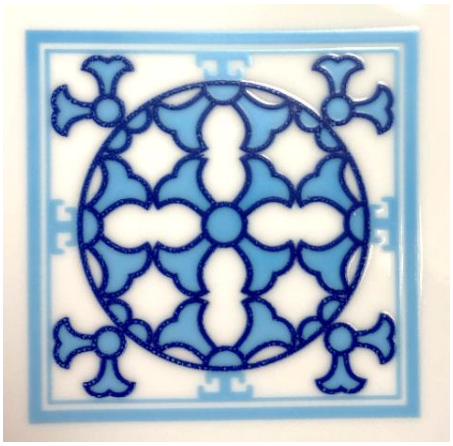
78193, 78194 reactive flux: To get sharp emboss reactive effect, we recommend **78193** reactive flux. To get wavy reactive effect, we recommend **78194** reactive flux.
These flux can be used as mixing and overprinting flux for SELECTION 79/74 colors.

79261, 79262 reactive white: To get pastel color tone of **SELECTION 78/64** and **79/74 c**olors, we recommend to mix or overprinting **79261** opaque white and **79262** white. **79261** show stable opaque pastel color shade and **79262** can be developed unique light pastel shade depend on the colors.

Technical Information

Revised: 7/03/2023

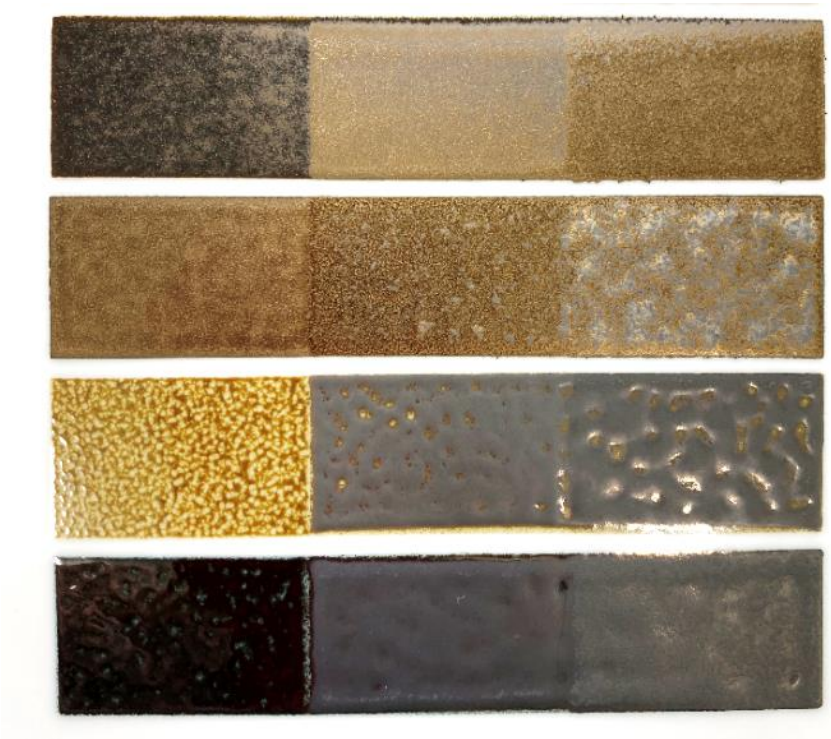
Mat effect colors: **79301, 79404, 79508, 79801, 79706, 79801**and **79806** are mat effect colors. Their mat effects are very smooth and are not affected by the thickness of colors. To lighten these colors, adding **79102** is recommended to maintain the mat effect. They can be mixed with each other and **SELECTION 78/64** colors.



Technical Information

Revised: 7/03/2023

Metallic effect colors: **79532, 79533, 79535** and **79736** are metallic effect colors. Their metallic effect is directly affected by the thickness of colors. If their deposits of colors are not thick enough, the metallic effect cannot be developed. They can be mixed with each other and **SELECTION 78/64** basic inglaze colors. To maintain the metallic effect, adding **79101** is recommended for mixing only, not for covering. As for acid resistance according to DIN EN 1388-1-2 test, they show slightly visible attack.



79532

79533

79535

79736

×1 **×2** **×3**

Number of printing **103 mesh/inch**

Technical Information

Revised: 7/03/2023

Reactive effect colors: **79261, 79262, 79461, 79464, 79466, 79568, 79661, 79766, 79864** (lead and cadmium free), **74363, 74368, 74663, and 74664** (lead free– cadmium containing colors) are reactive effect colors which show a very unique speckled appearance after firing. These color tones depend on type of glaze, firing conditions and thickness of color deposit. These colors can also show very attractive color shades by overlap printing or mixing each other.

79661 79864 79464 79461

1st print, underlay colors

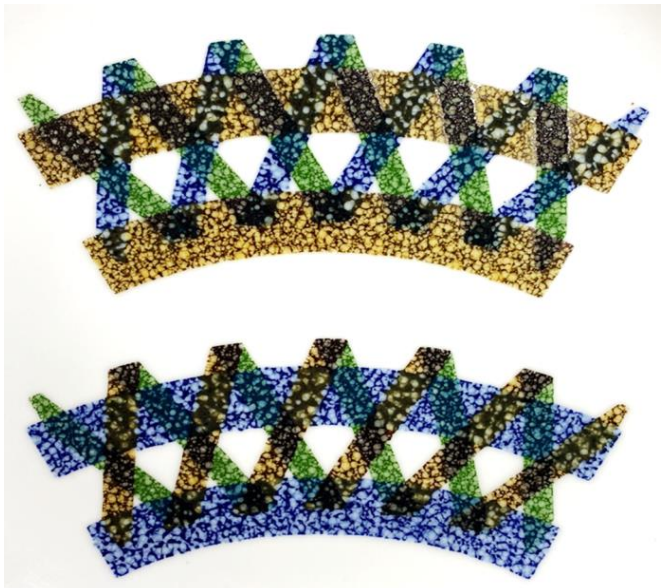
79661

79864

79464

79461

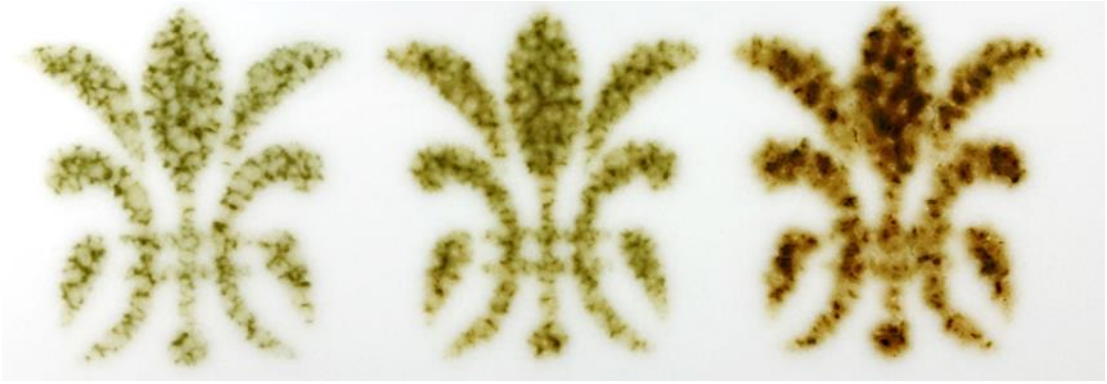
2nd print, overprinting colors



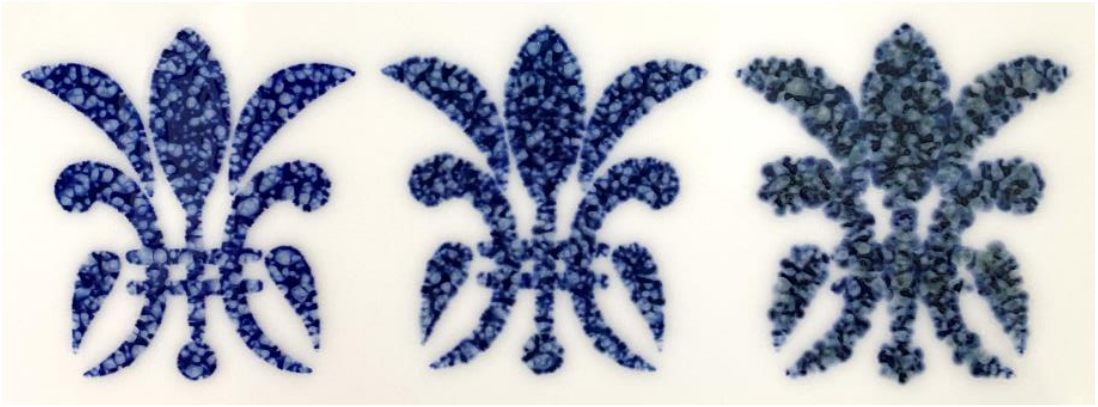
Technical Information

Revised: 7/03/2023

79197 reactive agent: This is a reactive agent for **SELECTION 79/74 reactive colors.** This flux can increase reactive effect by adding about 1–10% in to the reactive colors. By adding **79197**, the reactive effect may increase and their color shades will be changed but it also worsens their chemical resistance, especially dishwasher resistance.



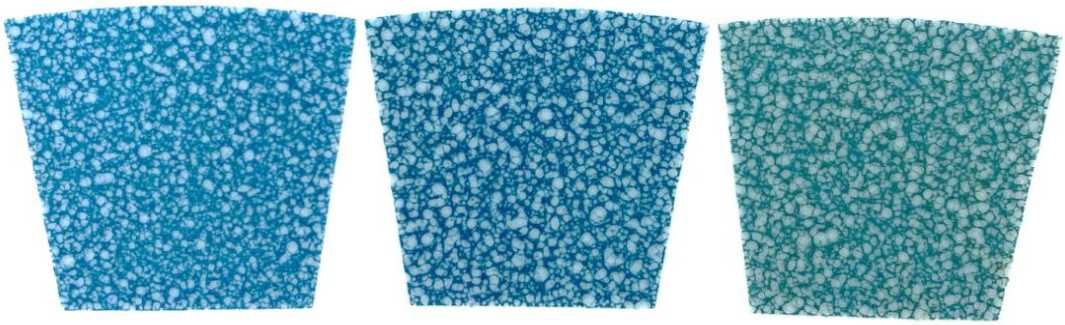
79461	79461 97% 79197 3%	79461 93% 79197 7%



79866	79866 97% 79197 3%	79866 93% 79197 7%

88203 white agent: This is a mixing white agent for **SELCTTION 79/74 reactive colors.** To get opaque and intensive reactive colors, by adding this white about 1–15% in to the reactive colors is recommended.

79661 | **79661 97%** **88203 3%** | **79661 94%** **88203 6%**



79864 | **79864 97%** **88203 3%** | **79864 94%** **88203 6%**

7. Chemical durability

Chemical durability of **SELECTION 79/74** colors depends on type of ware, glaze, kiln, color deposit and firing conditions. The following are the results of tests on porcelain, fired at 1,230℃, with 10 minutes of soaking time and 120 minutes of cold-to-cold firing conditions of gas kiln in production

【7.1 Residual lead and cadmium content】

SELECTION 79 colors contain less than 90 ppm residual lead and less than 40 ppm residual cadmium and are, therefore in compliance with Californian Proposition 65, FDA, CPSIA, EU, and Japanese requirements. **SELECTION 74** colors contain less than 90 ppm residual lead and contain more than 50,000 ppm cadmium as inclusion pigments.

【7.2 Lead and cadmium release】

According to the DI EN 1388-1-2 test, **SELECTION 79/74** colors show lead and cadmium releases are below AAS limits.

【7.3 Acid resistance】

According to the DI EN 1388-1-2 test, all of the **SELECTION 79/74** colors, except **79532**, **79533,79535** and **79736**, do not show any visible attack after immersion in a 4% acetic acid solution for 24 hours at a room temperature of 22±2℃.

【7.4 Alkali resistance】

According to ASTM C556-88 test, **SELECTION 79/74** colors do not show any visible attack for up to 4-6 hours.

8. Safety Data Sheet (SDS)

Safety data sheet (SDS) of **SELECTION 79/74** colors are available on request.

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