SELECTION 64 950-1250℃

Lead-free cadmium containing inclusion inglaze colors

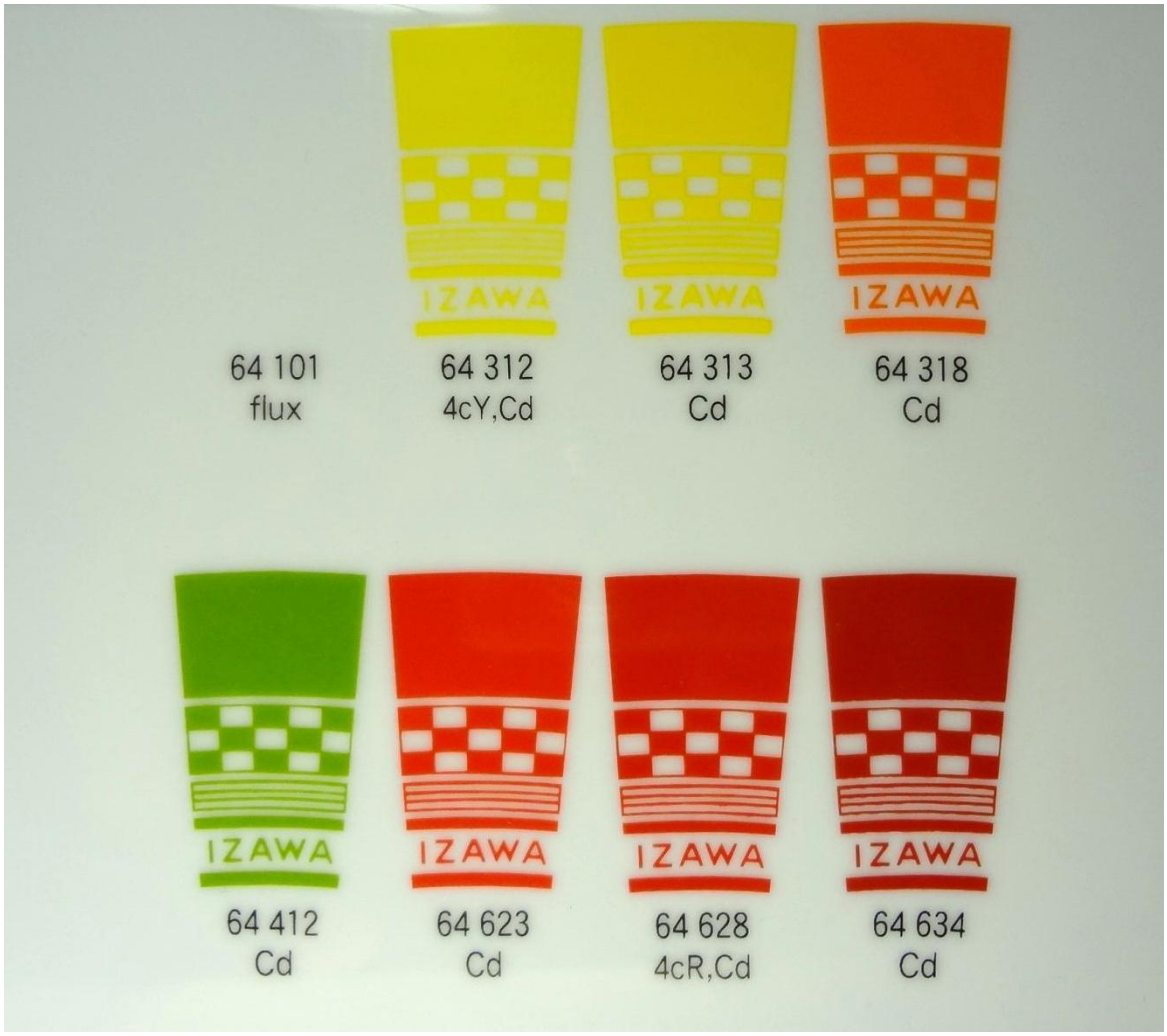
1. General Information and Color chart

SELECTION 64 series is a range of lead- free cadmium containing, inclusion inglaze colors for hard porcelain, porcelain, bone china, earthenware, vitreous china and tile. They show very intensive color tone and are stable at low- and high-firing temperatures. Even though, they do not show cadmium release after proper firing, we separated them from the **SELECTION 66 and 78** series because they contain cadmium. **SELECTION 64** colors are intermixable and can be used with SELECTION 66 and 78 inglaze colors under their firing conditions. As overprinting flux for **SELECTION 64 colors**, we recommend 64101 flux.

Options for this series: Please refer to their individual technical information.

SELECTION 66 and 78: Lead- and cadmium-free inglaze colors.

SELECTION 66 and 78 Relief: Lead- and cadmium-free inglaze relief flux and white.



SELECTION 64 950-1250℃ Lead- free cadmium containing inclusion inglaze colors for hard porcelain, porcelain, bone china, earthenware, vitreous china and tile.

Table 1

Product No.	Color tone	Pantone No.	Intermixable	Precious metal containing	Lead free(<300ppm)	Cadmium free (<100ppm) *1	Acid resistant, DIN 1388-1-2 *2	Alkali resistant, ASTM C556-88 *3	64 101 overprinting flux	Vetrosa	Tile	Bone, vitreous china, earthenware	Porcelain, Hard porcelain	Remarks
64 101	flux		✔		✔	✔	✔	✔	✔	✔	✔	✔	✔	special overprinting flux for 64 inclusion colors
64 312	lemon yellow	Yellow C	✔		✔	*1	✔	✔	✔	✔	✔	✔	✔	four-color orange yellow
64 313	cadmium yellow	Yellow 012C	✔		✔	*1	✔	✔	✔	✔	✔	✔	✔	
64 318	cadmium orange	Orange 021C	✔		✔	*1	✔	✔	✔	✔	✔	✔	✔	
64 412	cadmium green	377C	✔		✔	*1	✔	✔	✔	✔	✔	✔	✔	
64 623	cadmium red	Red 032C	✔		✔	*1	✔	✔	✔	✔	✔	✔	✔	
64 628	cadmium red	186C	✔		✔	*1	✔	✔	✔	✔	✔	✔	✔	four-color red
64 634	cadmium red	187C	✔		✔	*1	✔	✔	✔	✔	✔	✔	✔	

*1: lead- free cadmium containing colors

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

*3: 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
Hard porcelain	1,230–1,250℃
Porcelain	1,180–1,230℃
Vitreous china	1,000–1,200℃
Bone china	1,000–1,050℃
Earthenware	1,000–1,050℃
Tile	950–1,050℃

SELECTION 64 colors are suitable for fast-firing conditions, 30–150 minutes, cold-to-cold.
They can be used as under colors of Vetrosa for tile decorations.

3. Application

SELECTION 64 colors are suitable for screen-transfer printing, direct printing, spraying, pad printing and hand painting.

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

Product	D_{50} average	D_{100} biggest
SELECTION 64 colors (average)	5 μ m	40–50 μ m
64101 flux	3–3.5 μ m	30 μ m

5. Printing

【5.1 Mesh size】

We recommend mesh sizes that are 180–300 mesh (71–120T) for all screen applications.

【5.2 Medium ratio】

SELECTION 64 color : Medium PM2/PMT8	10 : 6–7/6.5–7.5
64101 overprinting flux : Medium PM2	10 : 9–11

We recommend PM2 flowing medium, PMT8 thixotropic medium for dot printing.
We recommend C12 cover coat by printing 70 mesh (27T).

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

6. Color and Mixability

SELECTION 64 and **SELECTION 66**, **78** inglaze colors can be mixed with each other in any proportions. 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.

Mixing flux: 66101 flux are suitable for mixing all colors. After mixing with flux, the color is lighter and glossier.

Overprinting flux: 64101overprinting flux is suitable for **SELECTION 64** inclusion colors. Overprinting flux improves color gloss and chemical durability, such as heavy metal release, alkali durability and dishwasher resistance.

7. Chemical durability (refer to the Table 1)

Chemical durability of **SELECTION 64** colors depends on type of ware, glaze, kiln, color deposit and firing conditions. The following are the results of tests on vitreous china, fired at 1,180℃, 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 64 colors contain less than 600 ppm residual lead and contain more than 50,000 ppm cadmium. After proper firing **SELECTION 64** colors do not show cadmium release therefore they can pass FDA, EU and Japanese requirements.

【7.2 Lead and cadmium release】

According to the DI EN 1388-1-2 test, **SELECTION 64** colors show lead and cadmium releases are below AAS limits.

【7.3 Acid resistance】

According to the DI EN 1388-1-2 test, **SELECTION 64** colors 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 64** colors do not show any visible attack for up to 6 hours. If 64 101 flux are overprinted, they can stand more than 6 hours.

8. Material Safety Data Sheet (MSDS)

Material safety data sheet (MSDS) of **SELECTION 64** colors are available on request.

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