SELECTION 18M 620-700℃

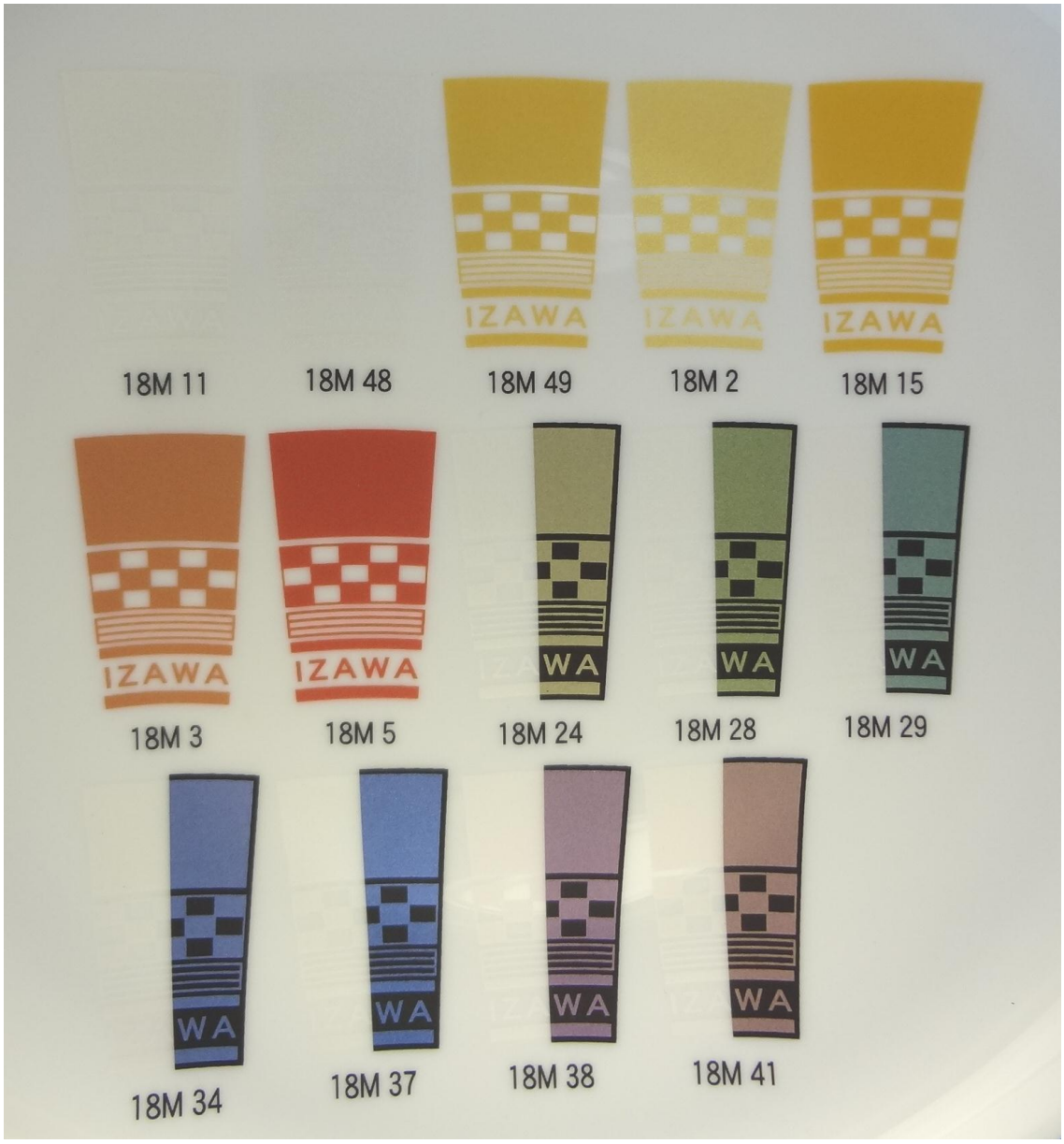
Lead- and cadmium-free high resistant metallic glass colors

1. General Information and Color chart

SELECTION 18M series is a range of lead-and cadmium-free intermixable, metallic and interference metallic glass colors for bottles, cosmetic containers and glass tableware.

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

SELECTION 18: Lead and cadmium free glass colors.



SELECTION 18M

620–700℃ Lead- and cadmium-free, intermixable, high resistant, metallic and interference metallic glass colors for bottles, cosmetic containers and glass tableware.

Table 1

Product No.	Color tone	Pantone No. / interference color on 18 74 black	Intermixable	Lead free(<300ppm)	Cadmium free (<100ppm)	Acid resistant, DIN 1388-1-2 *1	Alkali resistant, ASTM C556-88 *2	Fine particle size *3	Coarse particle size *4	Glass	Earthenware	Remarks
Metallic colors												
18M 11	white silver		✔	✔	✔			✔		✔	✔	fine particle size, mixing base for color metallic
18M 48	white silver		✔	✔	✔				✔	✔	✔	mixing base for color metallic
18M 49	lemon gold	8640C	✔	✔	✔				✔	✔	✔	
18M 2	lemon gold	8641C	✔	✔	✔				✔	✔	✔	very intensive color, high temperature stand able
18M 15	lemon gold	871C	✔	✔	✔			✔		✔	✔	fine particle size
18M 3	copper	876C	✔	✔	✔			✔		✔	✔	fine particle size
18M 5	red copper	8903C	✔	✔	✔			✔		✔	✔	fine particle size,
Interference metallic colors												
18M 24	orange gold	-/8660C	✔	✔	✔			✔		✔	✔	fine particle size
18M 28	yellow green	-/8702C	✔	✔	✔				✔	✔	✔	very intensive color, high temperature stand able
18M 29	green	-/8322C	✔	✔	✔			✔		✔	✔	fine particle size
18M 34	blue	-/8182C	✔	✔	✔			✔		✔	✔	fine particle size
18M 37	blue	-/8183C	✔	✔	✔				✔	✔	✔	very intensive color, high temperature stand able
18M 38	lilac	-/8143C	✔	✔	✔			✔		✔	✔	fine particle size
18M 41	red	-/8082C	✔	✔	✔			✔		✔	✔	fine particle size
Special colors for 18M colors												
18 22	underlay white		✔	✔	✔					✔	✔	underlay white
18 74	black	process blackC	✔	✔	✔					✔	✔	underlay black

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

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

*3: average 8-10 μ m, biggest 30 μ m, can be printed up to 250 mesh (100T)

*4: average 12-18 μ m, biggest 60 μ m, can be printed up to 200 mesh (80T)

2. Firing Conditions

Normal firing is from 620–700℃ in a cycle of 60–150 minutes, cold-to-cold, with 10 minutes for soaking. The best firing condition depends on firing speed and type of ware and kiln.

3. Application

SELECTION 18M colors are suitable for screen-transfer printing, direct printing, spraying, pad printing and hand painting.

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

Product	Thermal Expansion (C.O.E.)
SELECTION 18M colors (average)	Varies between 9.0–9.5 × 10^{-6}/℃

If **SELECTION 18M** colors are applied in very thick layers, the colors could crack or chip off, depending on the type of ware and thickness of the colors. We recommend you test the application of the colors under your conditions before use.

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

【5.1 Mesh size】

SELECTION 18M metallic colors have two range of particle size, fine and coarse types. They have the following appearances and recommended mesh size to print. For each color please refer to Table 1

	Fine particle color range	**Coarse particle color range**
Appearance	Smooth and opaque	Intensive and high metallic effect
Particle size	Average 8–10 μm, biggest 30 μm	Average 12–18 μm, biggest 60 μm
Mesh size (polyester)	100–250 mesh/40–100T	100–200 mesh/40–80T

【5.2 Medium ratio】

SELECTION 18M color : Medium PM2	10 : 11–13

Screen-transfer printing: We recommend PM2 flowing medium for printing **SELECTION 18M** metallic colors. We recommend C12 cover coat by printing 70 mesh (27T).
We recommend adding a little more medium for fine particle-color range to get a better homogenous of paste because the gravity of fine-particle colors is lighter than rough-particle colors. If the ink is not a good homogeneous paste, the color will dry on the screen during printing and, after firing, the gloss will become

worse.

Lead- and cadmium-free glass metallic 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 18M metallic colors can be mixed with each other in any proportions. Mixing with other **SELECTION 18** colors can be developed a wide range of metallic effect colors. However, we recommend testing the stability of mixing colors under end-user's firing conditions before mass production. Please note the following recommendations.

Mixing white silver: To obtain colored metallic, it is suitable to mix 18M11 or 18M48 white silver with approximate 15-30% of **SELECTION 18** colors. To make gray silver tone, mixing 18M 11 or 18M 14 white silver with 1874 black is recommended. 1832 Cd yellow, 1833 Cd orange, 1864 and 1865 Cd red can be mixed with 16M metallic colors.

Underlay colors: Any of **SELECTION 18** colors and 18M metallic colors can be printed as underlay colors. 1874 black and 1822 white are recommended as underlay colors for both metallic and interference metallic colors to get intensive effect. If the underlay colors are over fired, especially interference metallic colors, they lose the metallic effect. In this case, we recommend firing lower.

Mixing flux: 1811 flux is recommended to mix with **SELECTION 18M** metallic colors to lighten the colors. According to our experience, maximum 30% of additional flux is allowed.

7. Chemical durability (refer to the Table 1)

Chemical durability of **SELECTION 18M** colors depends on type of ware, kiln, color deposit and firing conditions. The following are the results of tests on soda lime glass, fired at 650℃, 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 18M metallic colors contain less than 300 ppm residual lead and less than 100 ppm residual cadmium and are therefore in compliance with Californian Proposition 65, FDA, EU and Japanese requirements.

【7.2 Lead and cadmium release】

According to the DI EN 1388-1-2 test, **SELECTION 18M** colors show lead and cadmium releases are below AAS limits.

【7.3 Acid resistance】

According to the DI EN 1388-1-2 test, **SELECTION 18M** colors do not show any visible attack after immersion in a 4% acetic acid solution for 24 hours at room temperature 22±2℃.

【7.4 Alkali resistance】

According to the ASTM C556-88 test, **SELECTION 18M** colors do not show any visible attack for up to 4 hours.

8. Material Safety Data Sheet (MSDS)

Material safety data sheet (MSDS) of **SELECTION 18M** colors are available on request.

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